ENGINE CONTROL SYSTEM

SECTION EC

CONTENTS

CONTENTS (Cont'd.)

CONTENTS (Cont'd.)

CONTENTS (Cont'd.)

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

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

Alphabetical & P No. Index for DTC

ALPHABETICAL INDEX FOR DTC

Items (CONSULT screen terms)	DTC ECM*1	DTC CONSULT GST*2	Reference page
Unable to access ECCS	—	—	EC-67
A/T 1ST SIGNAL	1103	P0731	AT-95
A/T 2ND SIGNAL	1104	P0732	AT-98
A/T 3RD SIGNAL	1105	P0733	AT-101
A/T 4TH SIG OR TCC	1106	P0734	AT-104
A/T DIAG COMM LINE	0804	P1605	EC-200
CAMSHAFT POSI SEN	0101	P0340	EC-143
CLOSED LOOP	0307	P0130	EC-116
COOLANT TEMP SEN*3	0103	P0115	EC-96
*COOLANT TEMP SEN	0908	P0125	EC-106
CRANK P/S (OBD) COG	0905	P1336	EC-186
CRANK POS SEN (OBD)	0802	P0335	EC-138
CYL 1 MISFIRE	0608	P0301	EC-131
CYL 2 MISFIRE	0607	P0302	EC-131
CYL 3 MISFIRE	0606	P0303	EC-131
CYL 4 MISFIRE	0605	P0304	EC-131
ECM	0301	P0605	EC-172
EGR SYSTEM	0302	P0400	EC-149
EGR TEMP SENSOR	0305	P1401	EC-196
EGRC SOLENOID/V	1005	P1400	EC-191
EGRC-BPT VALVE	0306	P0402	EC-158
ENGINE SPEED SIG*3	1207	P0725	AT-93
FLUID TEMP SENSOR*3	1208	P0710	AT-88
FR O2 SEN HEATER	0901	P0135	EC-117
FRONT O2 SENSOR	0303	P0130	EC-111
FUEL INJ SYSTEM	0706	P0170	EC-126
IACV-AAC VALVE	0205	P0505	EC-167
IGN SIGNAL-PRIMARY	0201	P1320	EC-180
INHIBITOR SWITCH	1101	P0705	AT-83
INT AIR TEMP SEN	0401	P0110	EC-91
KNOCK SENSOR	0304	P0325	EC-135
LINE PRESSURE S/V*3	1205	P0745	AT-117
MASS AIR FLOW SEN*3	0102	P0100	EC-85
MULTI CYL MISFIRE	0701	P0300	EC-131
NO SELF-DIAGNOSTIC FAILURE INDICATED	Flashing*5	No DTC	EC-36
OVER HEAT	0208	P1900	EC-203
OVERRUN CLUTCH S/V*3	1203	P1760	AT-128
PARK/NEUT POSI SW	1003	P0705	EC-174
REAR O2 SENSOR	0707	P0136	EC-121
SHIFT SOLENOID/V A*3	1108	P0750	AT-120
SHIFT SOLENOID/V B*3	1201	P0755	AT-123
THROTTLE POSI SEN*3	0403	P0120	EC-100
THRTL POSI SEN A/T*3	1206	P1705	AT-126
TOR CONV CLUTCH SV*3	1204	P0740	AT-109
TW CATALYST SYSTEM	0702	P0420	EC-160
VEHICLE SPEED SEN	0104	P0500	EC-163
VHCL SPEED SEN A/T*3	1102	P0720	AT-91

*1: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*2: These numbers are prescribed by SAE J2012.
*3: When the fail-safe operation occurs, the MIL illuminates.

P NO. INDEX FOR DTC

DTC CONSULT GST*2	DTC ECM*1	Items (CONSULT screen terms)	Reference page
No DTC	Flashing*5	NO SELF-DIAGNOSTIC FAILURE INDICATED	EC-36
—	—	Unable to access ECCS	EC-67
P0000	**0505**	**NO SELF DIAGNOSTIC FAILURE INDICATED**	—
P0100	0102	MASS AIR FLOW SEN*3	EC-85
P0110	0401	INT AIR TEMP SEN	EC-91
P0115	0103	COOLANT TEMP SEN*3	EC-96
P0120	0403	THROTTLE POSI SEN*3	EC-100
P0125	0908	*COOLANT TEMP SEN	EC-106
P0130	0307	CLOSED LOOP	EC-116
P0130	0303	FRONT O2 SENSOR	EC-111
P0135	0901	FR O2 SEN HEATER	EC-117
P0136	0707	REAR O2 SENSOR	EC-121
P0170	0706	FUEL INJ SYSTEM	EC-126
P0300	0701	MULTI CYL MISFIRE	EC-131
P0301	0608	CYL 1 MISFIRE	EC-131
P0302	0607	CYL 2 MISFIRE	EC-131
P0303	0606	CYL 3 MISFIRE	EC-131
P0304	0605	CYL 4 MISFIRE	EC-131
P0325	0304	KNOCK SENSOR	EC-135
P0335	0802	CRANK POS SEN (OBD)	EC-138
P0340	0101	CAMSHAFT POSI SEN	EC-143
P0400	0302	EGR SYSTEM	EC-149
P0402	0306	EGRC-BPT VALVE	EC-158
P0420	0702	TW CATALYST SYSTEM	EC-160
P0500	0104	VEHICLE SPEED SEN	EC-163
P0505	0205	IACV-AAC VALVE	EC-167
P0605	0301	ECM	EC-172
P0705	1003	PARK/NEUT POSI SW	EC-174
P0705	1101	INHIBITOR SWITCH	AT-83
P0710	1208	FLUID TEMP SENSOR*3	AT-88
P0720	1102	VHCL SPEED SEN A/T*3	AT-91
P0725	1207	ENGINE SPEED SIG*3	AT-93
P0731	1103	A/T 1ST SIGNAL	AT-95
P0732	1104	A/T 2ND SIGNAL	AT-98
P0733	1105	A/T 3RD SIGNAL	AT-101
P0734	1106	A/T 4TH SIG OR TCC	AT-104
P0740	1204	TOR CONV CLUTCH SV*3	AT-109
P0745	1205	LINE PRESSURE S/V*3	AT-117
P0750	1108	SHIFT SOLENOID/V A*3	AT-120
P0755	1201	SHIFT SOLENOID/V B*3	AT-123
P1320	0201	IGN SIGNAL-PRIMARY	EC-180
P1336	0905	CRANK P/S (OBD) COG	EC-186
P1400	1005	EGRC SOLENOID/V	EC-191
P1401	0305	EGR TEMP SENSOR	EC-196
P1605	0804	A/T DIAG COMM LINE	EC-200
P1705	1206	THRTL POSI SEN A/T*3	AT-126
P1760	1203	OVERRUN CLUTCH S/V*3	AT-128
P1900*6	0208	OVER HEAT	EC-203

*4: The MIL illuminates after the 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.
*5:While engine is running.
*6: Since this diagnosis does not meet P1900 of SAEJ2012, it is indicated only by CONSULT. *

Alphabetical & P No. Index for DTC

ALPHABETICAL INDEX FOR DTC

Items (CONSULT screen terms)	DTC ECM*1	DTC CONSULT GST*2	Reference page
Unable to access ECCS	—	—	EC-314
ABSOL PRESS SENSOR	0803	P0105	EC-342
CAMSHAFT POSI SEN	0101	P0340	EC-418
CLOSED LOOP	0307	P0130	EC-376
CLOSED THRL POS SW	0203	P0510	EC-475
COOLANT TEMP SEN*3	0103	P0115	EC-355
*COOLANT TEMP SEN	0908	P0125	EC-366
COOLING FAN	1308	P1900	EC-544
CRANK P/S (OBD) COG	0905	P1336	EC-504
CRANK POS SEN (OBD)	0802	P0335	EC-413
CYL 1 MISFIRE	0608	P0301	EC-405
CYL 2 MISFIRE	0607	P0302	EC-405
CYL 3 MISFIRE	0606	P0303	EC-405
CYL 4 MISFIRE	0605	P0304	EC-405
ECM	0301	P0605	EC-479
EGR SYSTEM	0302	P0400	EC-424
EGR TEMP SENSOR	0305	P1401	EC-514
EGRC SOLENOID/V	1005	P1400	EC-509
EGRC-BPT VALVE	0306	P0402	EC-432
EVAP PURG FLOW/MON	0111	P1447	EC-531
EVAP (SMALL LEAK)	0705	P0440	EC-437
EVAP SYS PRESS SEN	0704	P0450	EC-460
FR O2 SEN HEATER	0901	P0135	EC-377
FRONT O2 SENSOR	0303	P0130	EC-371
FUEL SYS DIAG-LEAN	0115	P0171	EC-391
FUEL SYS DIAG-RICH	0114	P0172	EC-396
IACV-AAC VALVE	0205	P0505	EC-469
IGN SIGNAL-PRIMARY	0201	P1320	EC-498
INT AIR TEMP SEN	0401	P0110	EC-349
INT/V TIM CONT SOL	0805	P1110	EC-491
KNOCK SENSOR	0304	P0325	EC-409
MAP/BARO SW SOL/V	1302	P1105	EC-485
MASS AIR FLOW SEN*3	0102	P0100	EC-336
MULTI CYL MISFIRE	0701	P0300	EC-405
NO SELF-DIAGNOSTIC FAILURE INDICATED	Flash-ing*4	No DTC	EC-283
OVER HEAT	0208	P1900	EC-544
PARK/NEUT POSI SW	1003	P0705	EC-481
REAR O2 SENSOR	0707	P0136	EC-381
PURG CONT/V & S/V	0807	P0443	EC-447
PURG VOLUME CONT/V	1008	P1445	EC-524
RR O2 SEN HEATER	0902	P0141	EC-386
TANK FUEL TEMP SEN	0402	P0180	EC-401
THROTTLE POSI SEN*3	0403	P0120	EC-360
TOR CONV CLUTCH SV	0904	P1550	EC-539
TW CATALYST SYSTEM	0702	P0420	EC-434
VC/V BYPASS/V	0801	P1441	EC-519
VEHICLE SPEED SEN	0104	P0500	EC-465
VENT CONTROL VALVE	0903	P0446	EC-455

*1: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*2: These numbers are prescribed by SAE J2012.

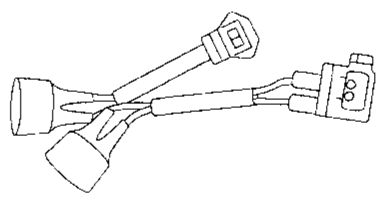
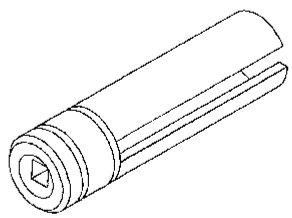
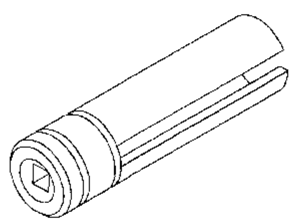
P NO. INDEX FOR DTC

DTC CONSULT GST*2	DTC ECM*1	Items (CONSULT screen terms)	Reference page
No DTC	Flash-ing*4	NO SELF-DIAGNOSTIC FAILURE INDICATED	EC-283
—	—	Unable to access ECCS	EC-314
P0000	**0505**	**NO SELF DIAGNOSTIC FAILURE INDICATED**	—
P0100	0102	MASS AIR FLOW SEN*3	EC-336
P0105	0803	ABSOL PRESS SENSOR	EC-342
P0110	0401	INT AIR TEMP SEN	EC-349
P0115	0103	COOLANT TEMP SEN*3	EC-355
P0120	0403	THROTTLE POSI SEN*3	EC-360
P0125	0908	*COOLANT TEMP SEN	EC-366
P0130	0307	CLOSED LOOP	EC-376
P0130	0303	FRONT O2 SENSOR	EC-371
P0135	0901	FR O2 SEN HEATER	EC-377
P0136	0707	REAR O2 SENSOR	EC-381
P0141	0902	RR O2 SEN HEATER	EC-386
P0171	0115	FUEL SYS DIAG-LEAN	EC-391
P0172	0114	FUEL SYS DIAG-RICH	EC-396
P0180	0402	TANK FUEL TEMP SEN	EC-401
P0300	0701	MULTI CYL MISFIRE	EC-405
P0301	0608	CYL 1 MISFIRE	EC-405
P0302	0607	CYL 2 MISFIRE	EC-405
P0303	0606	CYL 3 MISFIRE	EC-405
P0304	0605	CYL 4 MISFIRE	EC-405
P0325	0304	KNOCK SENSOR	EC-409
P0335	0802	CRANK POS SEN (OBD)	EC-413
P0340	0101	CAMSHAFT POSI SEN	EC-418
P0400	0302	EGR SYSTEM	EC-424
P0402	0306	EGRC-BPT VALVE	EC-432
P0420	0702	TW CATALYST SYSTEM	EC-434
P0440	0705	EVAP (SMALL LEAK)	EC-437
P0443	0807	PURG CONT/V & S/V	EC-447
P0446	0903	VENT CONTROL VALVE	EC-455
P0450	0704	EVAP SYS PRES SEN	EC-460
P0500	0104	VEHICLE SPEED SEN	EC-465
P0505	0205	IACV-AAC VALVE	EC-469
P0510	0203	CLOSED THRL POS SW	EC-475
P0605	0301	ECM	EC-479
P0705	1003	PARK/NEUT POSI SW	EC-481
P1105	1302	MAP/BARO SW SOL/V	EC-485
P1110	0805	INT/V TIM CONT SOL	EC-491
P1320	0201	IGN SIGNAL-PRIMARY	EC-498
P1336	0905	CRANK P/S (OBD) COG	EC-504
P1400	1005	EGRC SOLENOID/V	EC-509
P1401	0305	EGR TEMP SENSOR	EC-514
P1441	0801	VC/V BYPASS/V	EC-519
P1445	1008	PURG VOLUME CONT/V	EC-524
P1447	0111	EVAP PURG FLOW/MON	EC-531
P1550	0904	TOR CONV CLUTCH SV	EC-539
P1900	1308	COOLING FAN	EC-544
P1900*5	0208	OVER HEAT	EC-544

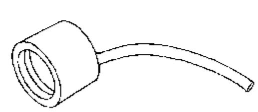
*3: When the fail-safe operation occurs, the MIL illuminates.
*4: While engine is running.
*5: Since this diagnosis does not meet P1900 of SAEJ2012, it is indicated only by CONSULT.

Special Service Tools

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

Tool number (Kent-Moore No.) Tool name	Description		Engine application SR	Engine application GA
EG11140000 (J36777-6) Ignition coil adapter harness	 NT338	Measuring engine speed	X	X
(J36471-A) Heated oxygen sensor wrench	 NT379	Loosening or tightening heated oxygen sensor with 22 mm (0.87 in) hexagon nut	X Front	X
(J36470) Heated oxygen sensor wrench	 NT379	Loosening or tightening heated oxygen sensor with 17 mm (0.67 in) hexagon nut	X Rear	–

Commercial Service Tool

Tool name	Description		Engine application SR	Engine application GA
Fuel filler cap adopter	 NT653	Checking fuel tank vacuum relief valve opening pressure	X	X

Supplemental Restraint System (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or for the complete harness, for easy identification.**

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

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

CAUTION:

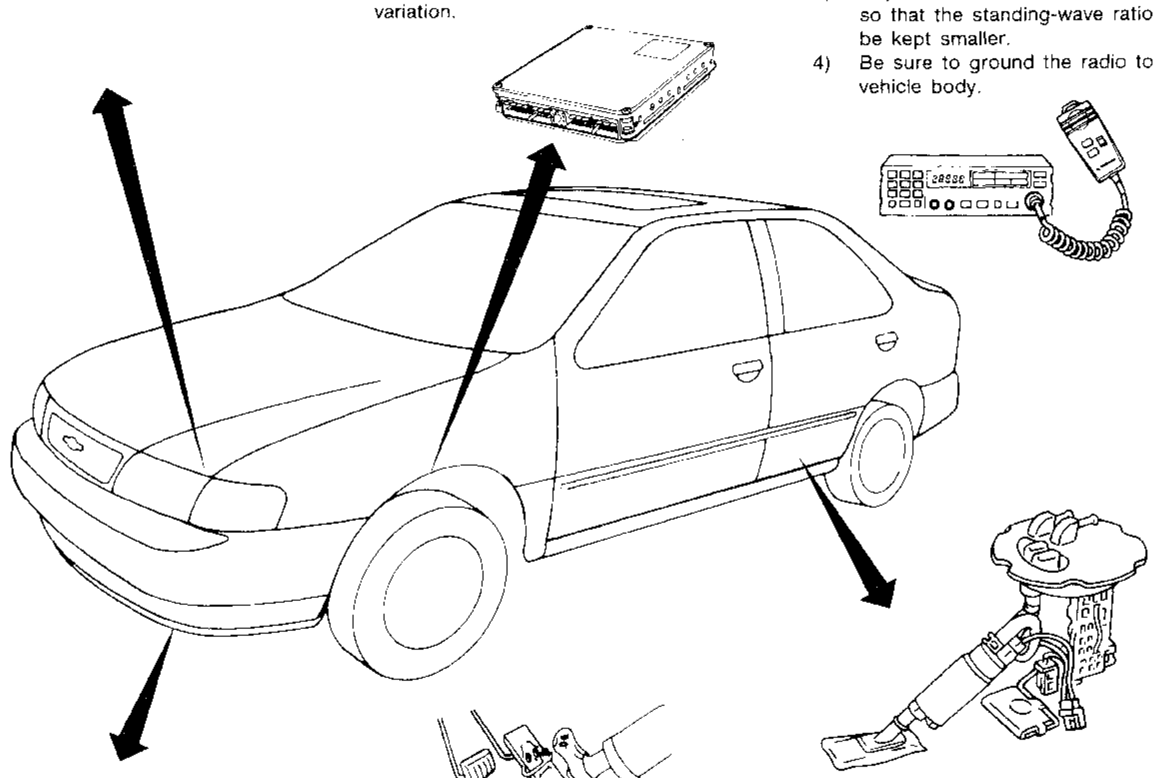
- **Be sure to turn the ignition switch "OFF" and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work.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

Engine Fuel & Emission Control System

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

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

WIRELESS EQUIPMENT
- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.
1) Keep the antenna as far as possible away from the electronic control units.
2) Keep the antenna feeder line more the 20 cm (8 in) away from the harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
4) Be sure to ground the radio to vehicle body.



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

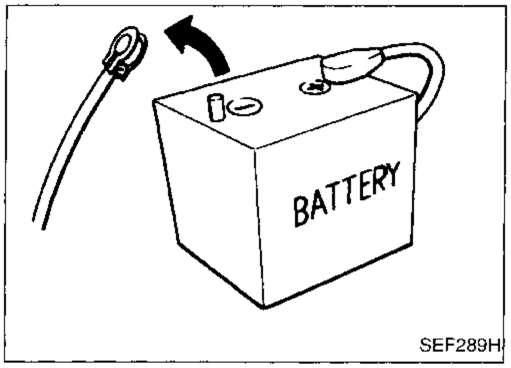
WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

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.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (4 in) away from adjacent harnesses, to prevent an ECM system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep ECM parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

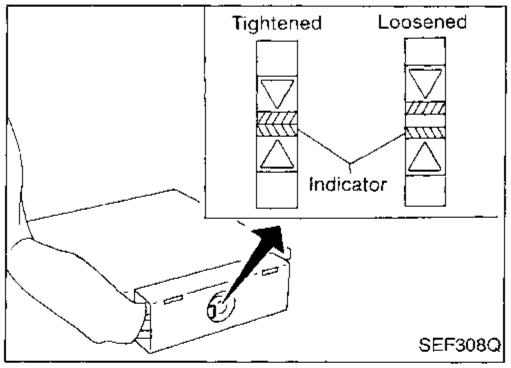
AEC802

Precautions



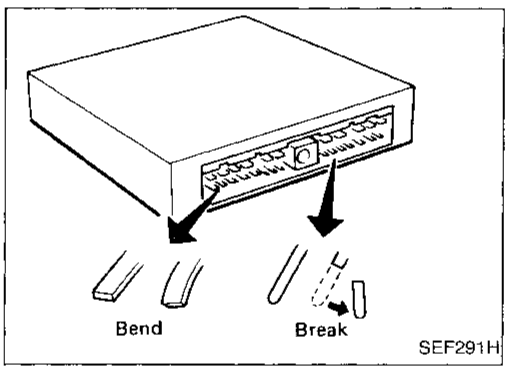
SEF289H

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



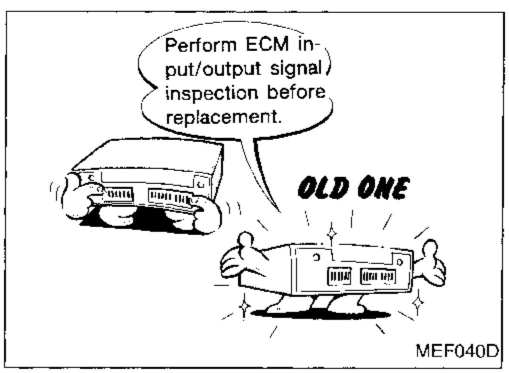
SEF308Q

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



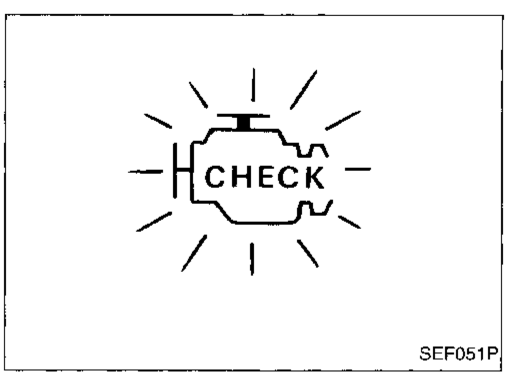
SEF291H

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



MEF040D

- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-75 for SR engine model and EC-324 for GA engine model.**

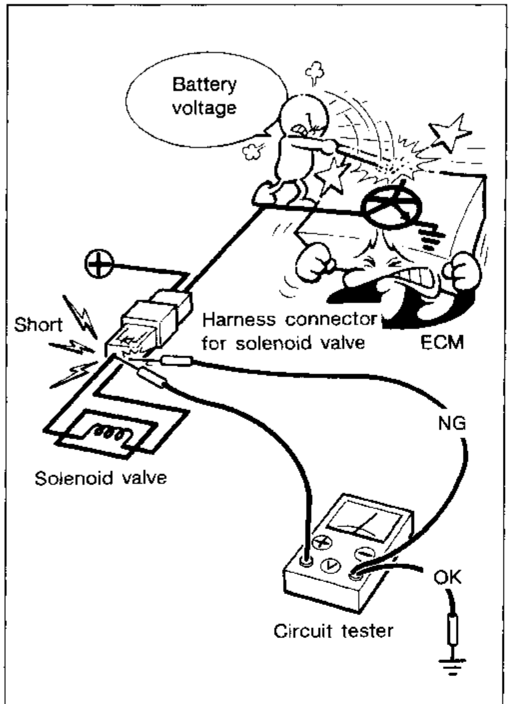


SEF051P

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

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

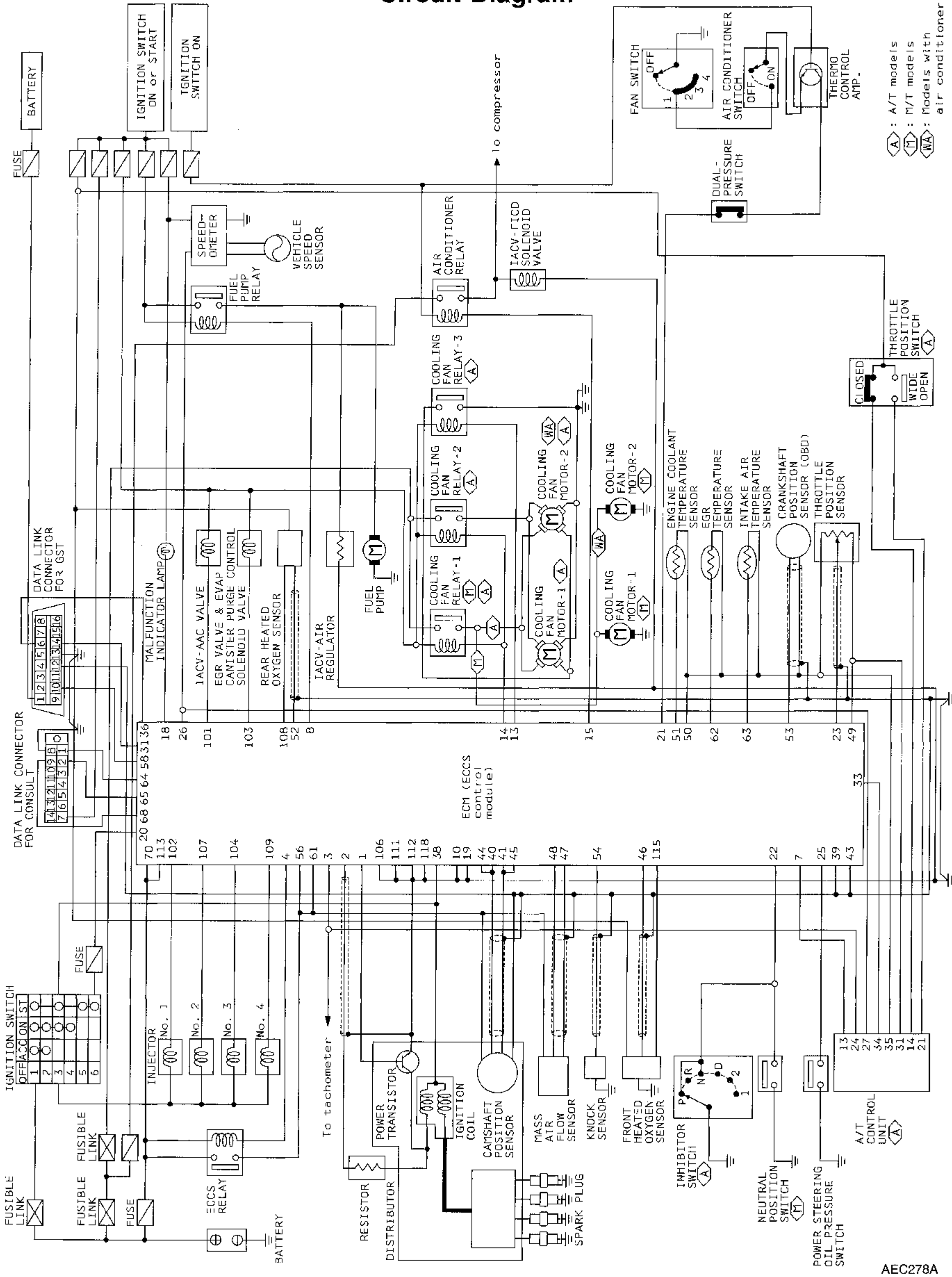
Precautions (Cont'd)



SEF348N

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

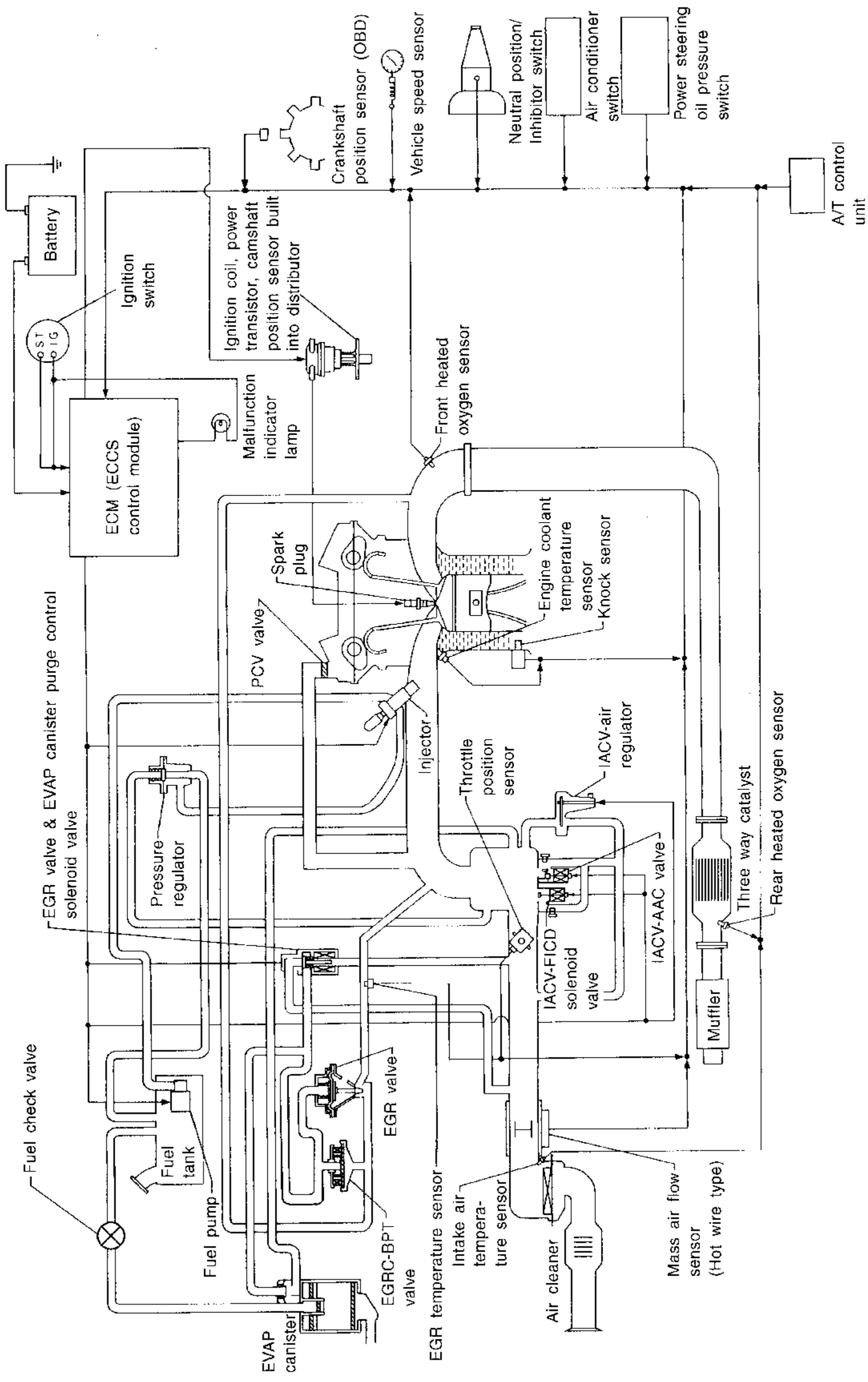
Circuit Diagram



AEC278A

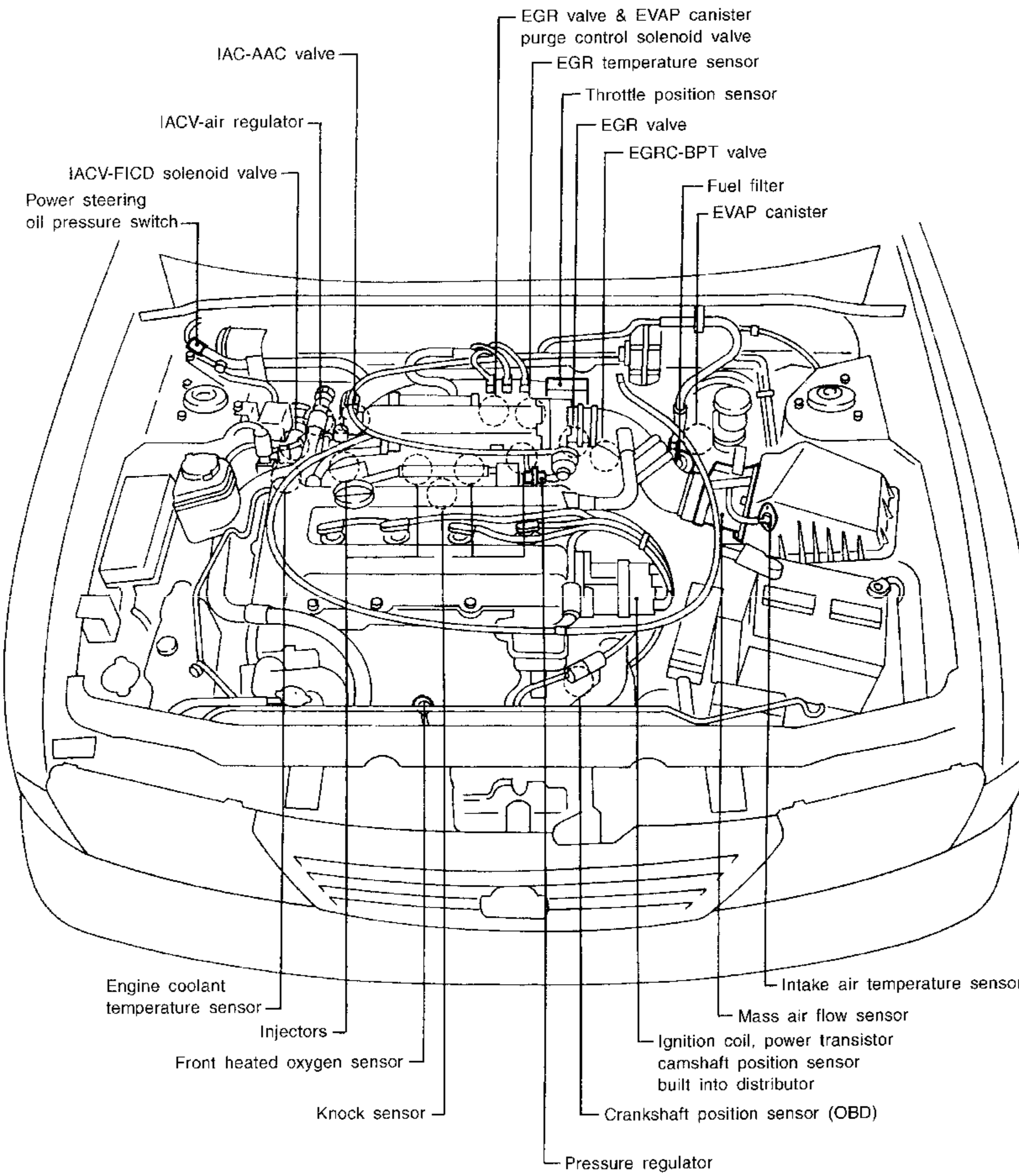
GI
MA
EM
LC
EC
FE
CL
MT
AT
FA
RA
BR
ST
RS
BT
HA
EL
IDX

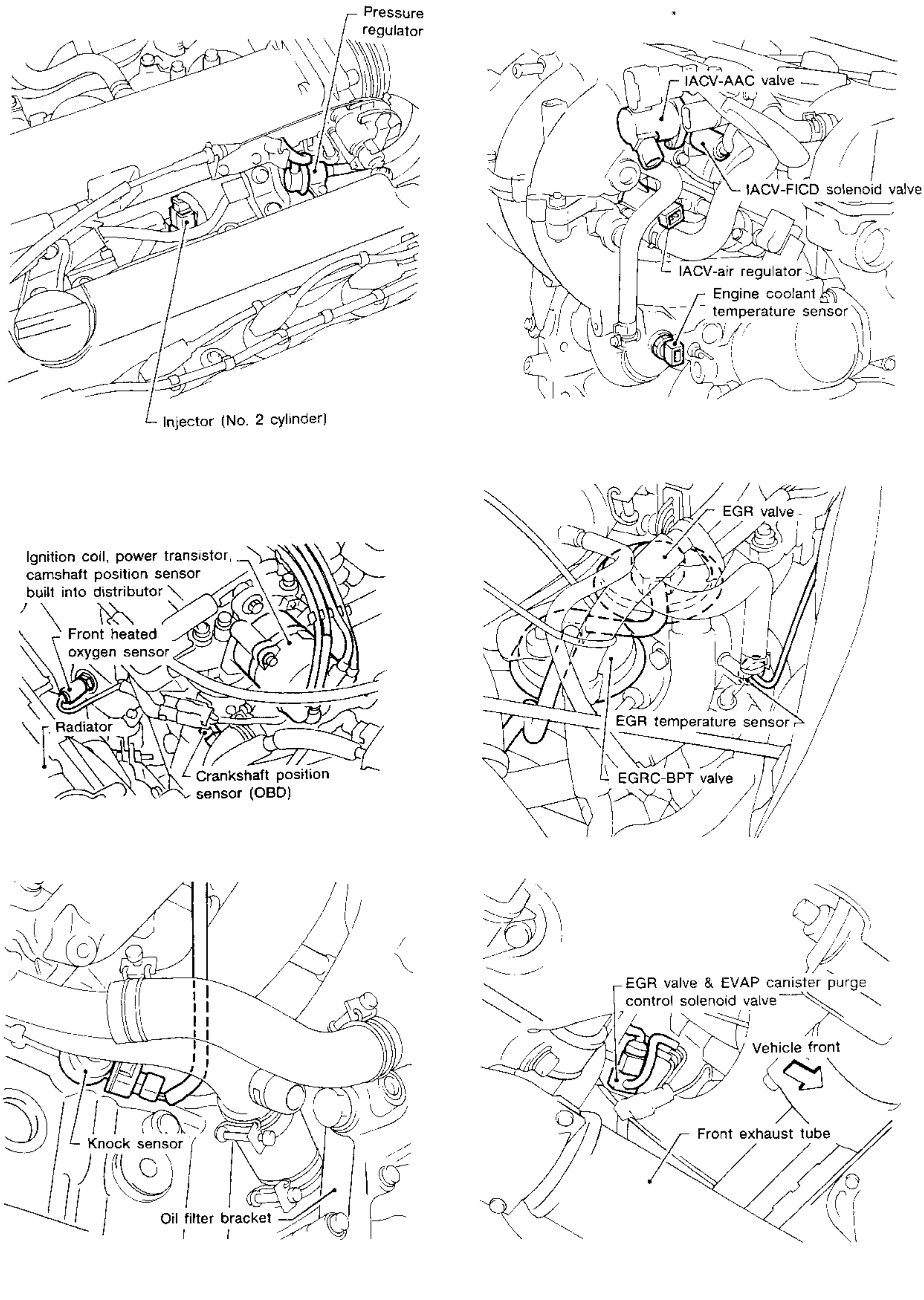
System Diagram



SEF214R

ECCS Component Parts Location

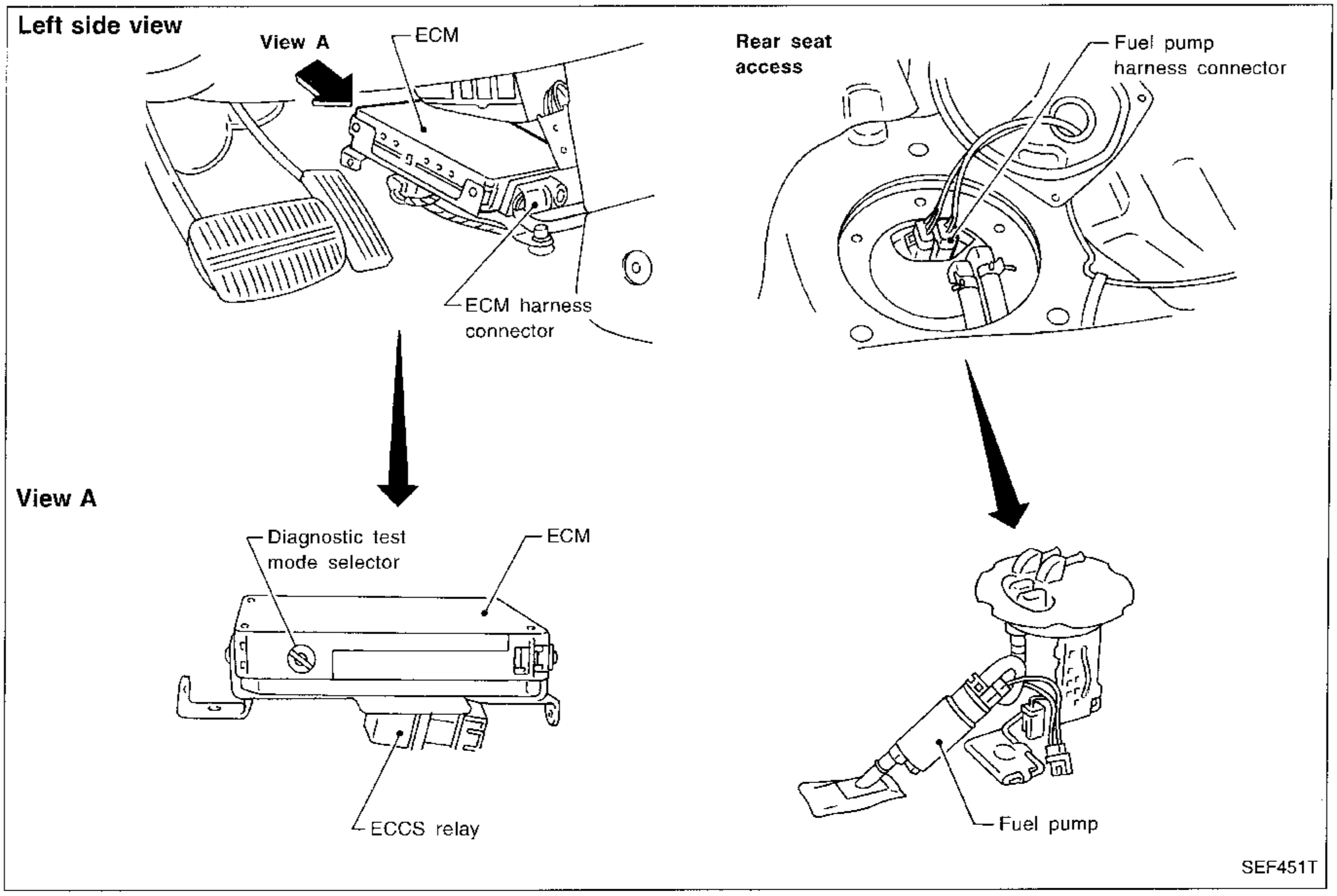


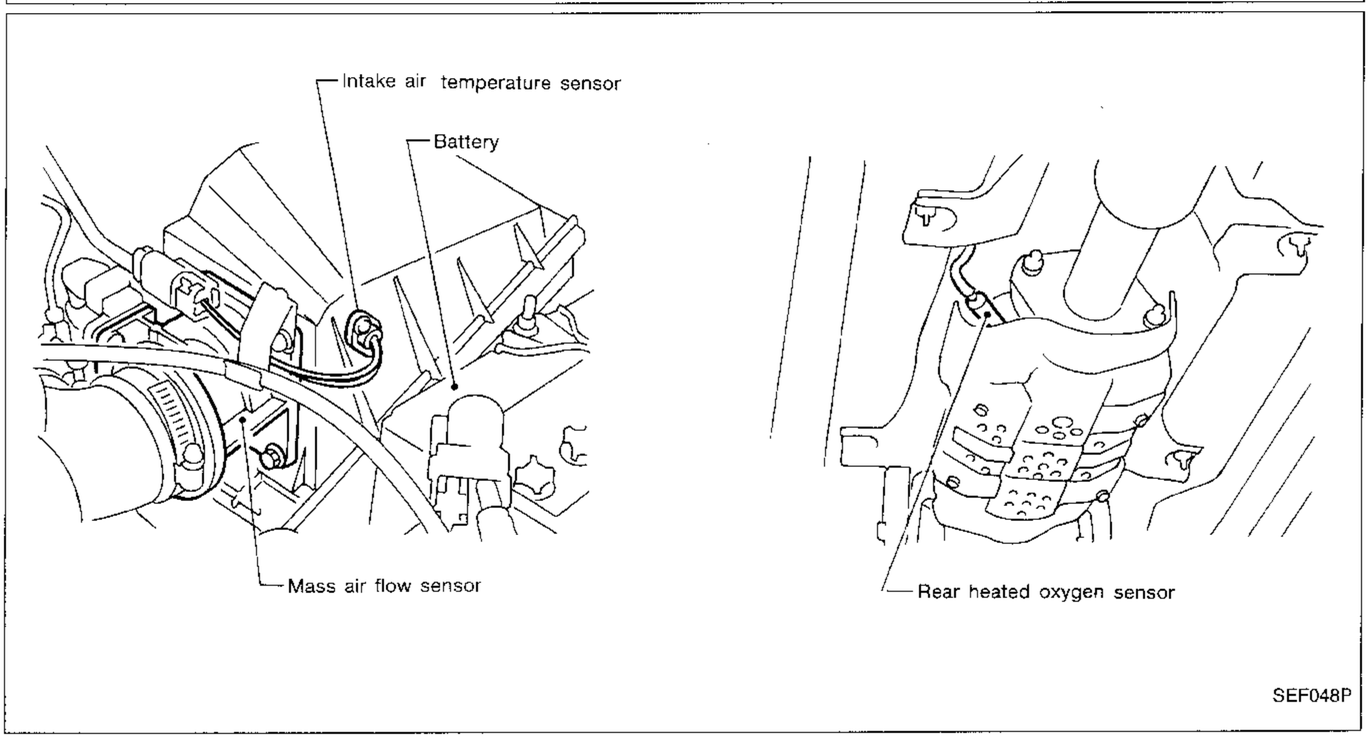


Pressure regulator
Injector (No. 2 cylinder)
IACV-AAC valve
IACV-FICD solenoid valve
IACV-air regulator
Engine coolant temperature sensor
Ignition coil, power transistor, camshaft position sensor built into distributor
Front heated oxygen sensor
Radiator
Crankshaft position sensor (OBD)
EGR valve
EGR temperature sensor
EGRC-BPT valve
Knock sensor
Oil filter bracket
EGR valve & EVAP canister purge control solenoid valve
Vehicle front
Front exhaust tube

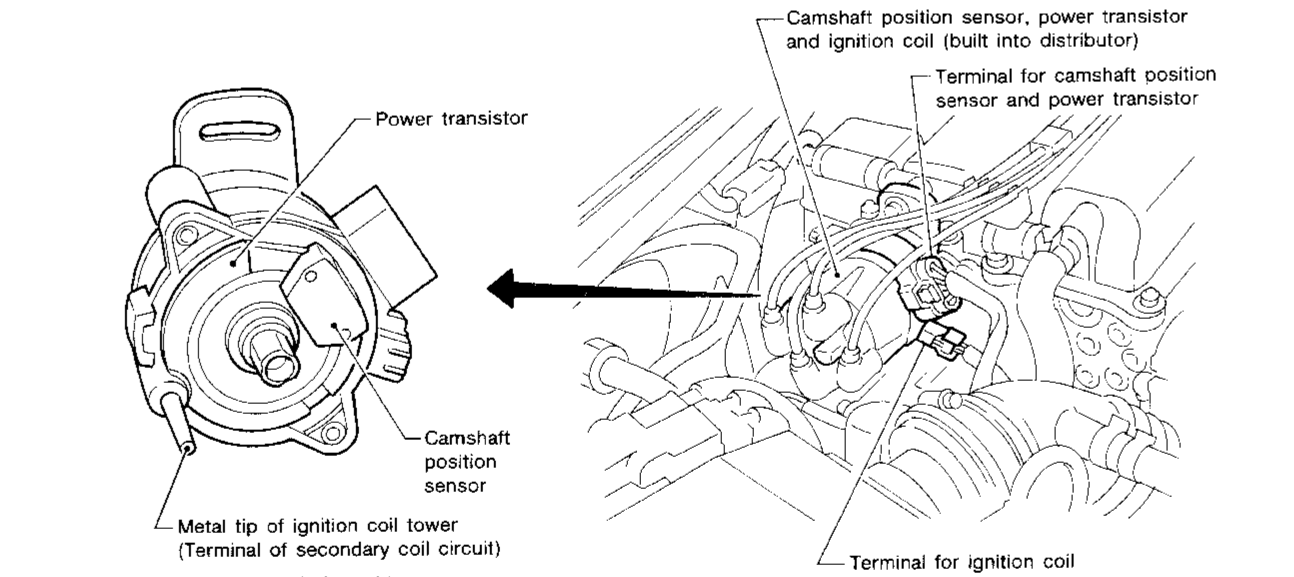
SEF047PB

ECCS Component Parts Location (Cont'd)



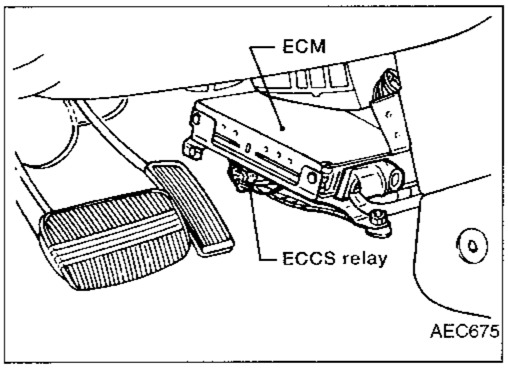


ECCS Component Parts Location (Cont'd)



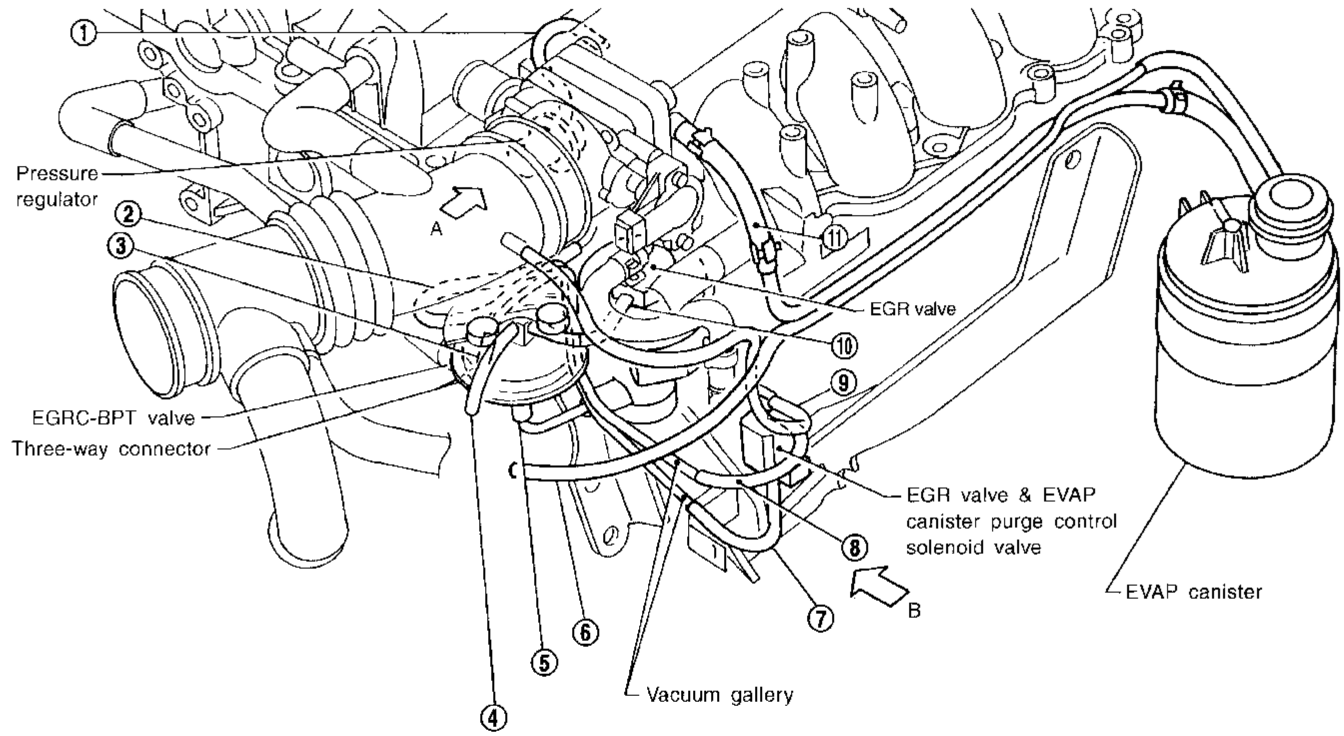
NOTE: Power transistor, camshaft position sensor, and ignition coil have to be replaced as a distributor assembly.

SEF853NA

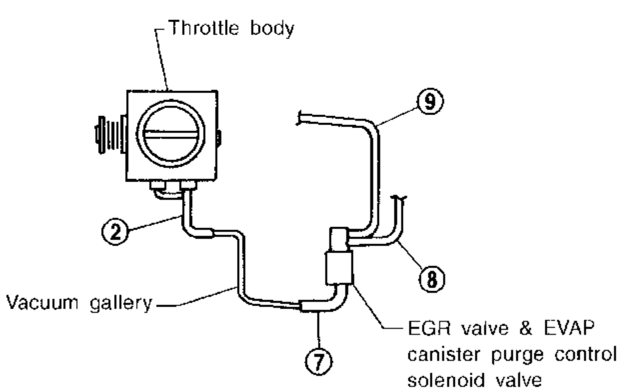


AEC675

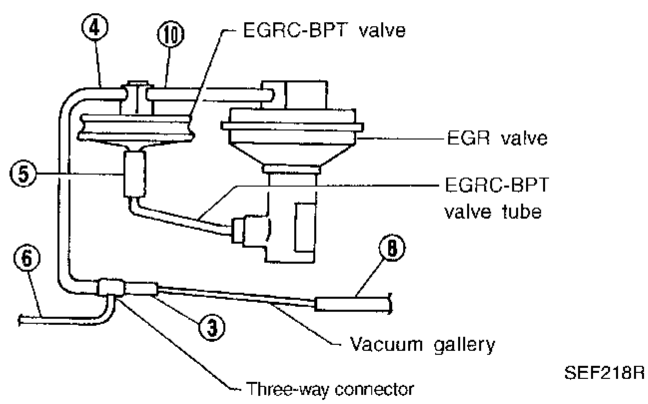
Vacuum Hose Drawing



View A



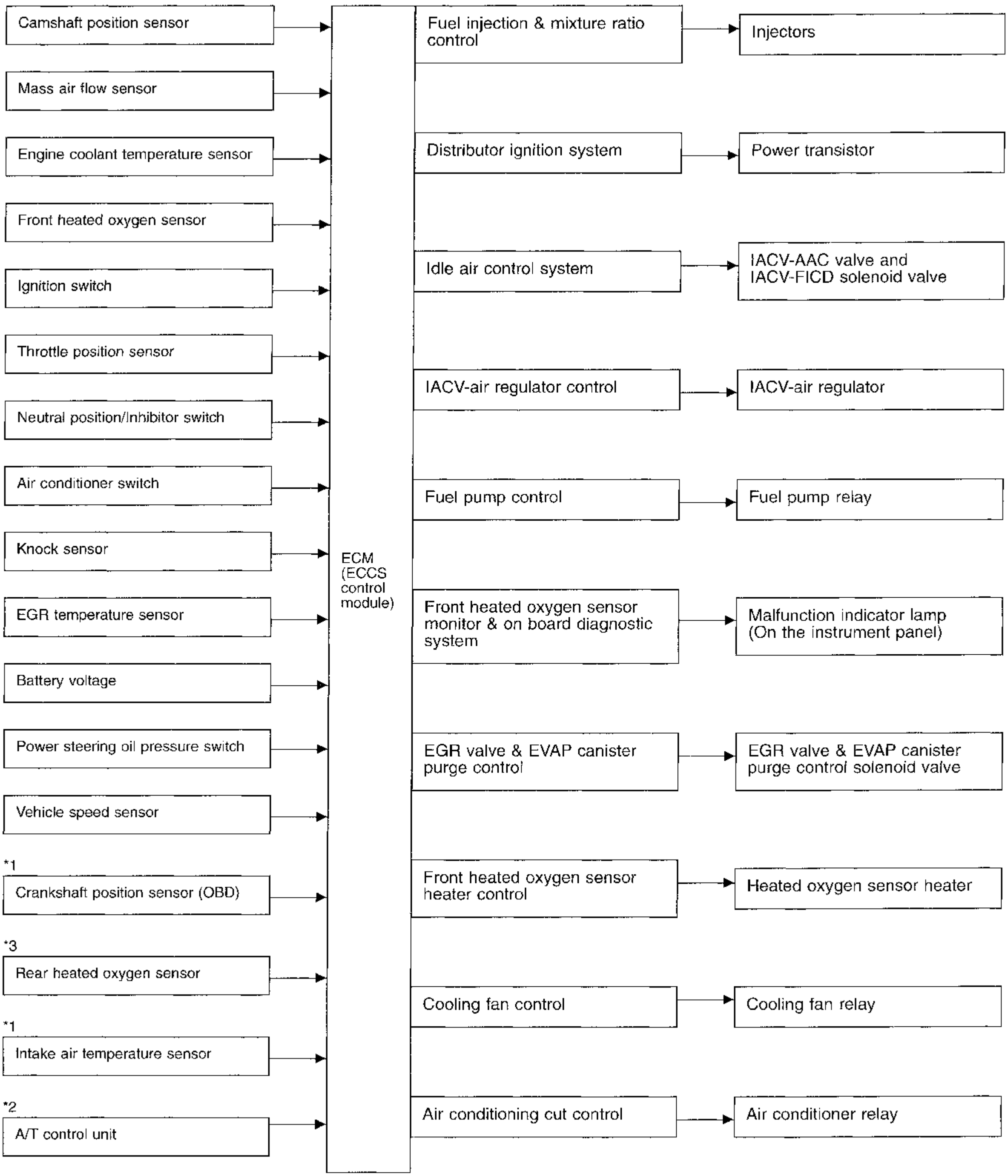
View B



1. Pressure regulator to intake manifold collector
2. Throttle body to vacuum gallery
3. Three-way connector to vacuum gallery
4. EGRC-BPT valve to three-way connector
5. EGRC-BPT valve to EGRC-BPT valve tube
6. Three-way connector to canister (vacuum line)
7. EGR valve & EVAP canister purge control solenoid valve to vacuum gallery (for throttle body)
8. EGR valve & EVAP canister purge control solenoid valve to vacuum gallery (for three-way connector)
9. EGR valve & EVAP canister purge control solenoid valve to air duct
10. EGRC-BPT valve to EGR valve
11. EVAP canister (purge line) to intake manifold collector

Refer to "System Diagram" in ENGINE AND EMISSION CONTROL OVERALL SYSTEM for vacuum control system.

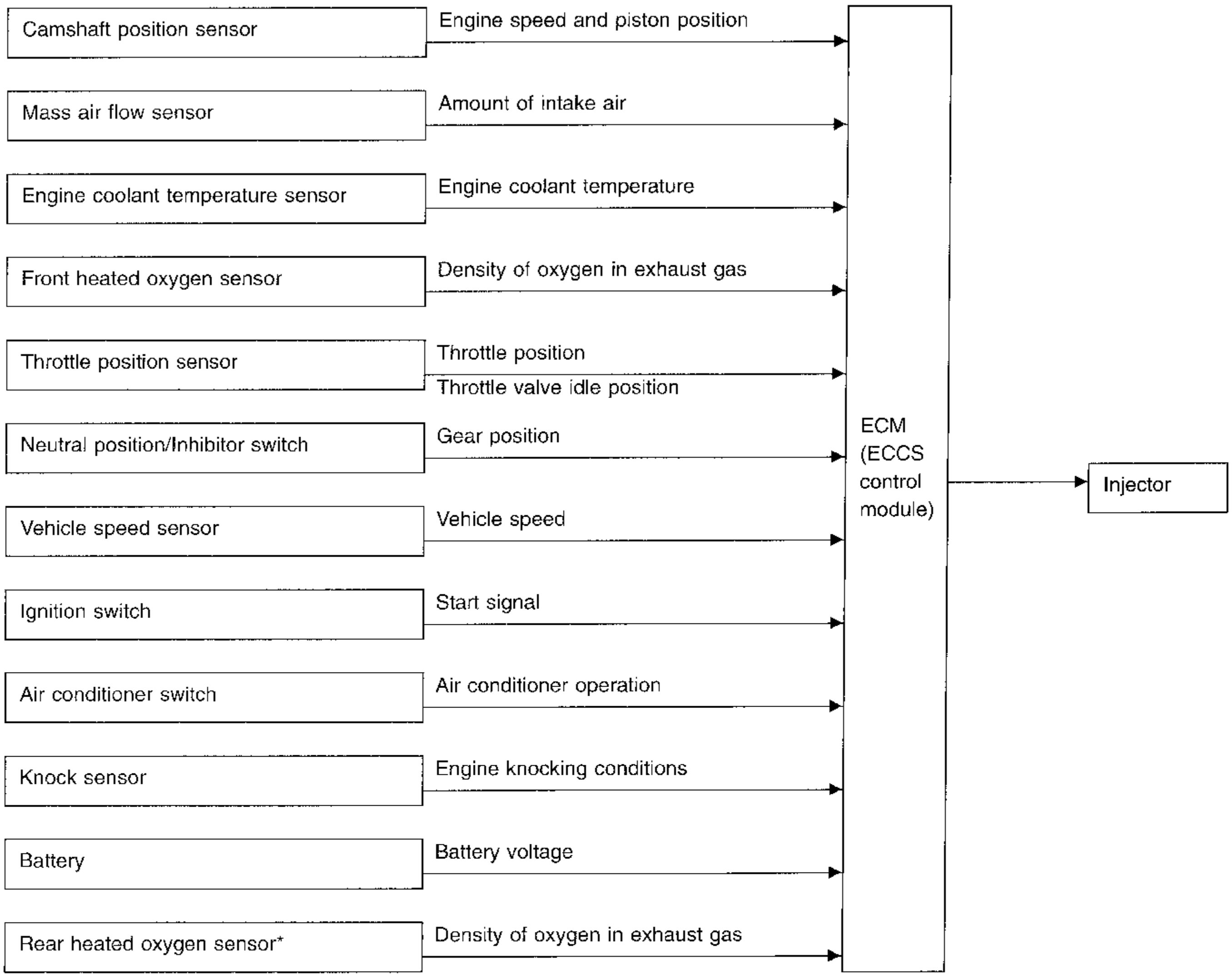
System Chart



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

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



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

BASIC MULTIPORT FUEL INJECTION SYSTEM

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

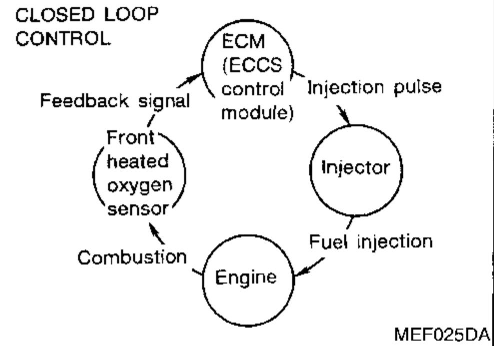
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

⟨Fuel increase⟩
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from "N" to "D" (A/T models only)
- High-load, high-speed operation

⟨Fuel decrease⟩
- During deceleration
- During high engine speed operation

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



MEF025DA

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a front heated oxygen sensor in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the front heated oxygen sensor, refer to EC-111. 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

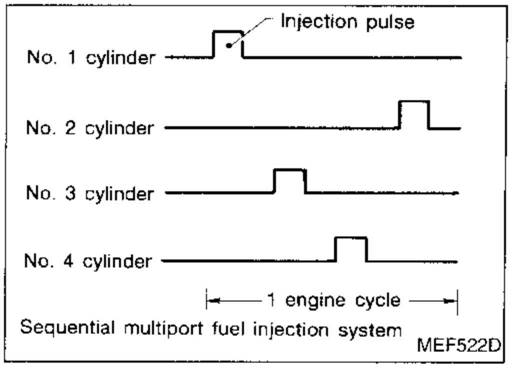
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- 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
- After shifting from "N" to "D"
- During warm-up
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

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

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

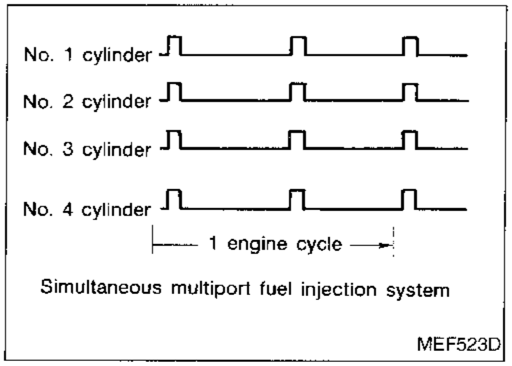


FUEL INJECTION TIMING

Two types of systems are used.

Sequential multiport fuel injection system

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



Simultaneous multiport fuel injection system

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

The four injectors will then receive the signals two times for each engine cycle.

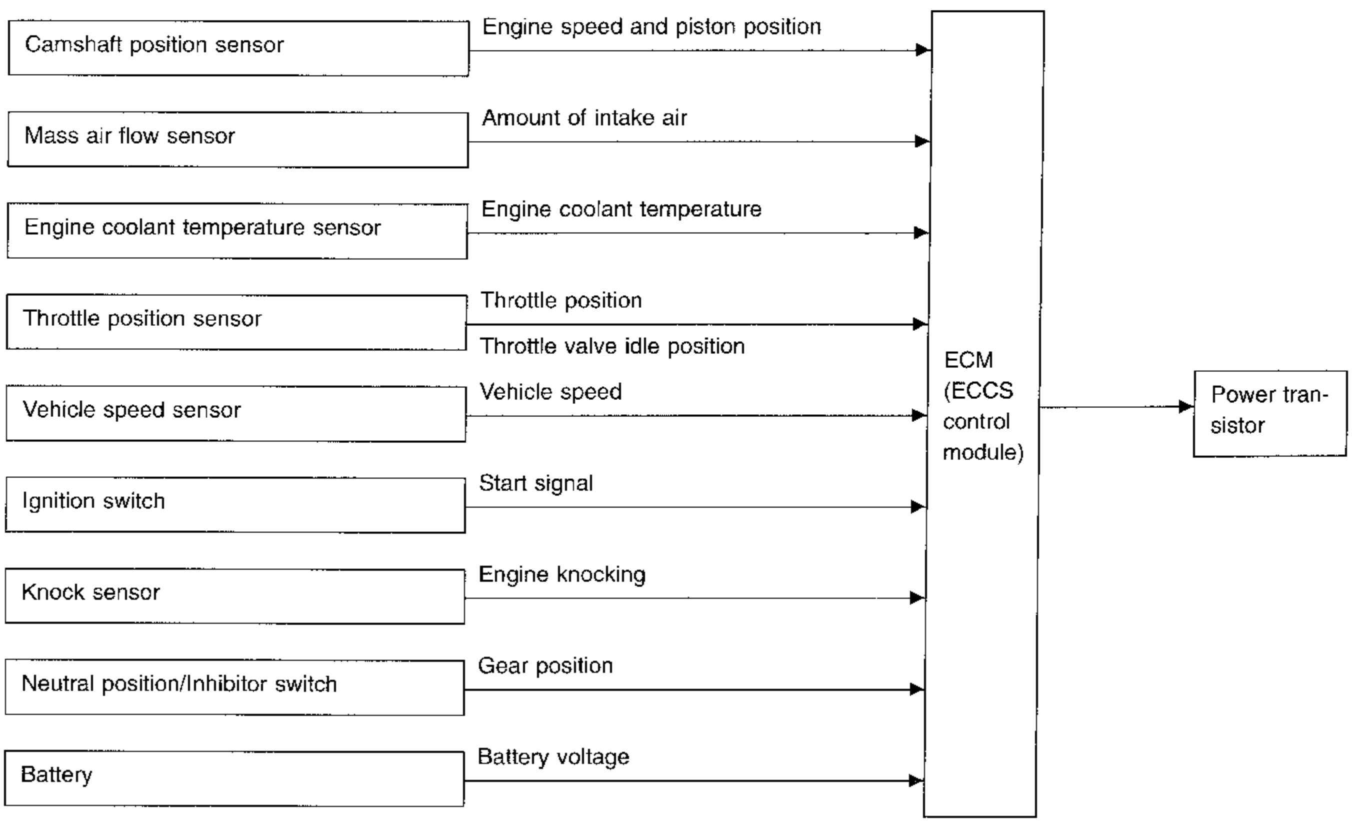
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

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

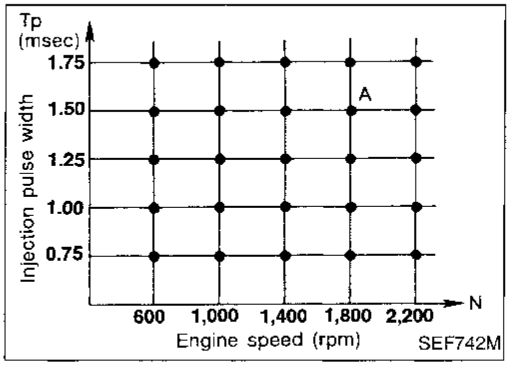
Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE



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

Distributor Ignition (DI) System (Cont'd)



SYSTEM DESCRIPTION

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

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

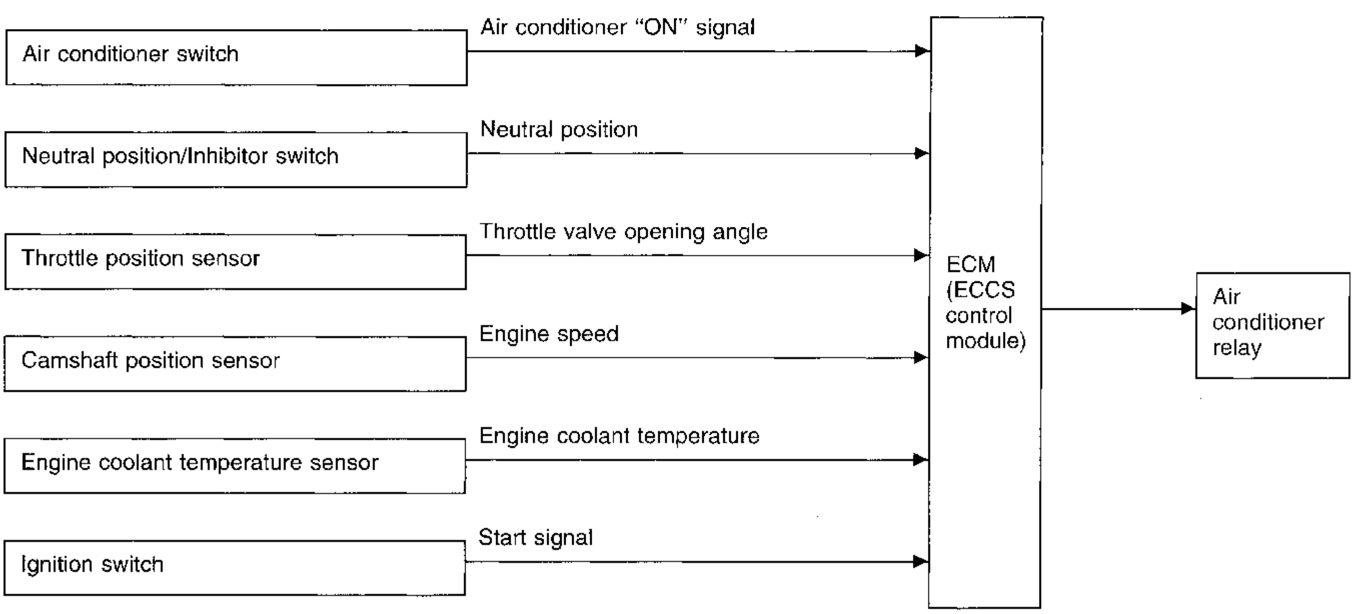
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

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

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

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE

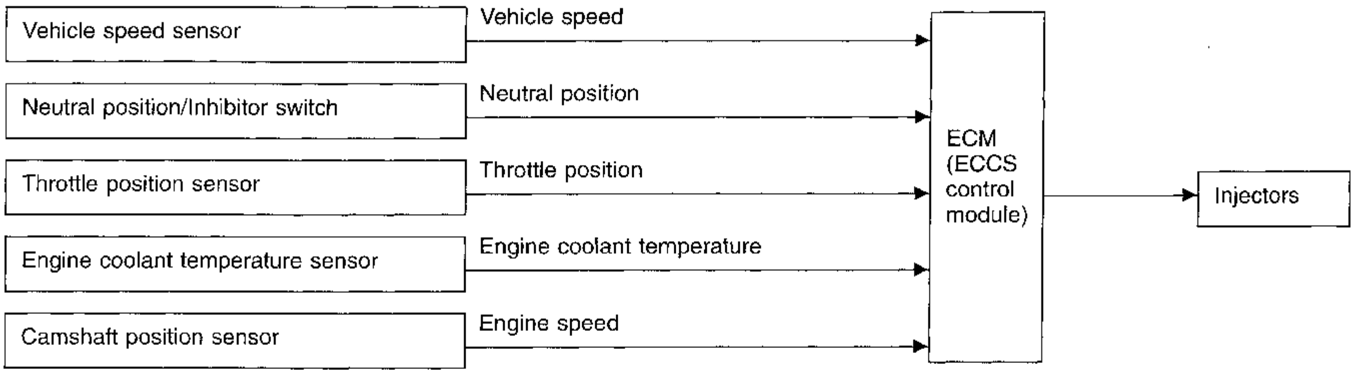


SYSTEM DESCRIPTION

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

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

INPUT/OUTPUT SIGNAL LINE



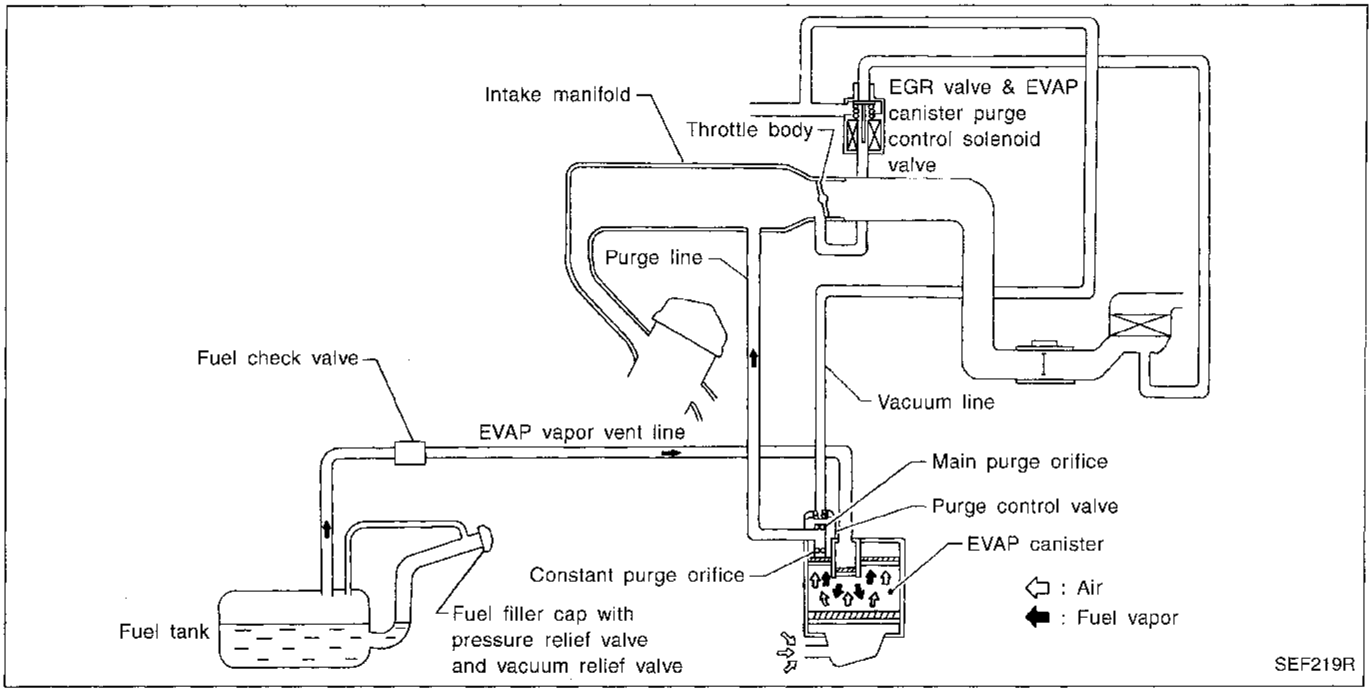
If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will operate until the engine speed reaches 1,150 rpm, then fuel cut is cancelled.

NOTE:

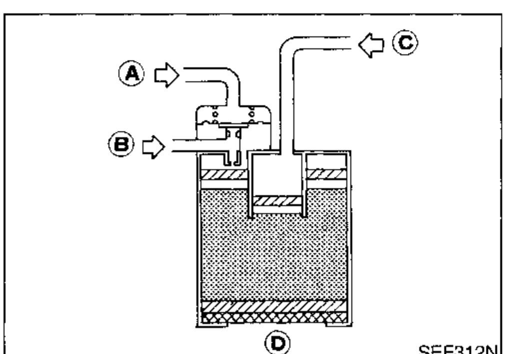
This function is different than deceleration control listed under "Multiport Fuel Injection (MFI) System" on EC-17.

Description



SEF219R

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 purge control valve is closed. Only a small amount of vapor flows into the intake manifold through the constant purge orifice.
As the engine speed increases and the throttle vacuum rises, the purge control valve opens. The vapor is sucked through both main purge and constant purge orifices.



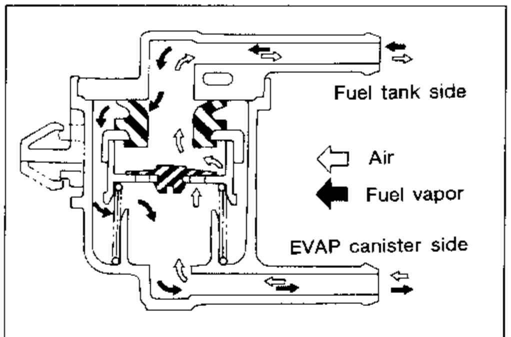
SEF312N

Inspection

EVAP CANISTER

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

Inspection (Cont'd)

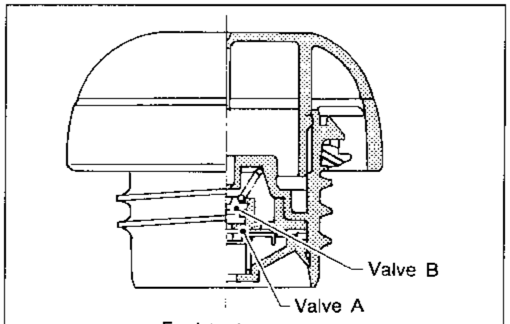


SEC309AC

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.

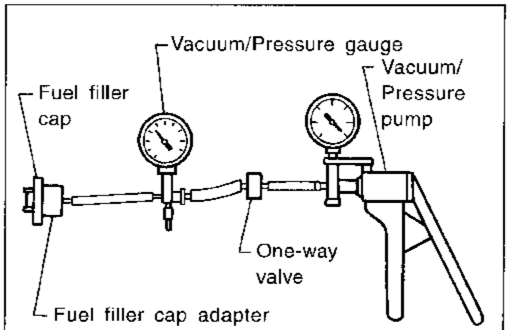


SEF427N

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.

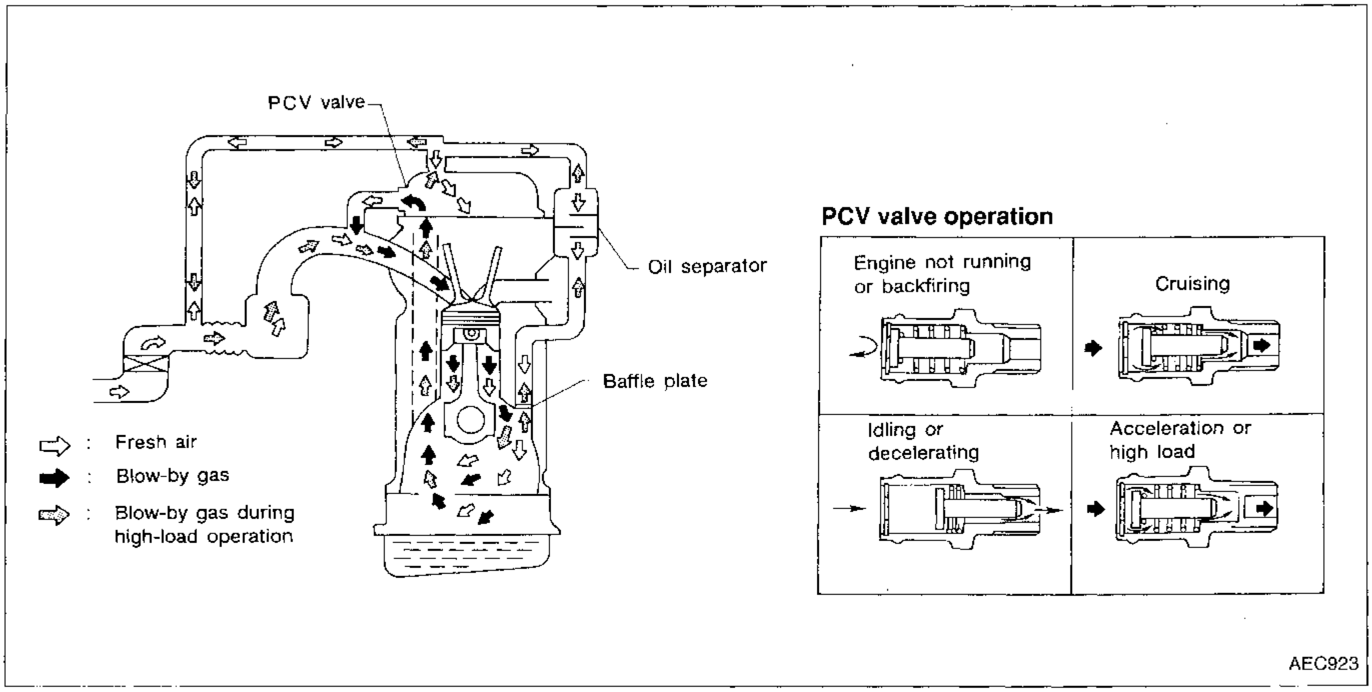
Use only a genuine filler cap as a replacement.

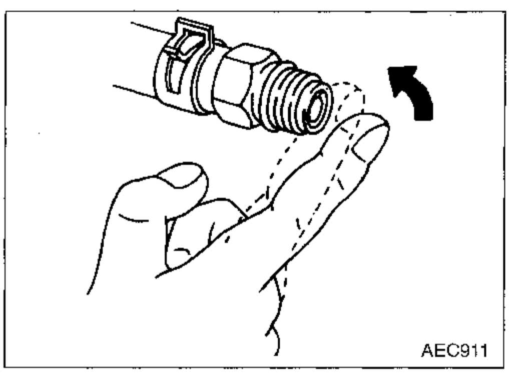


SEF943S

Description

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

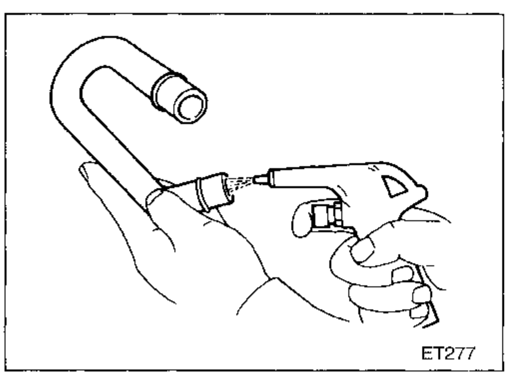




Inspection

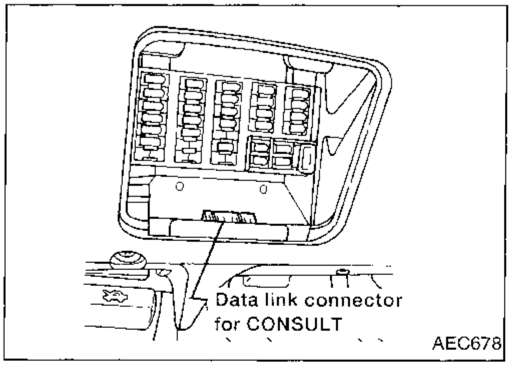
PCV (Positive Crankcase Ventilation)

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



VENTILATION HOSE

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.

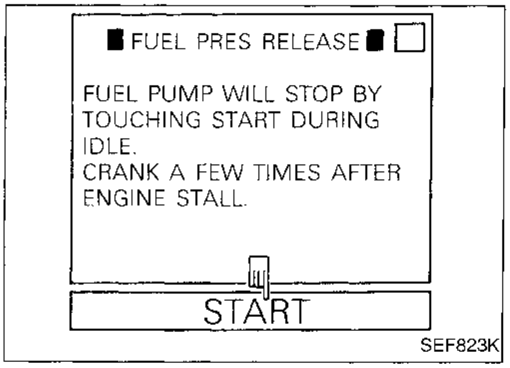


AEC678

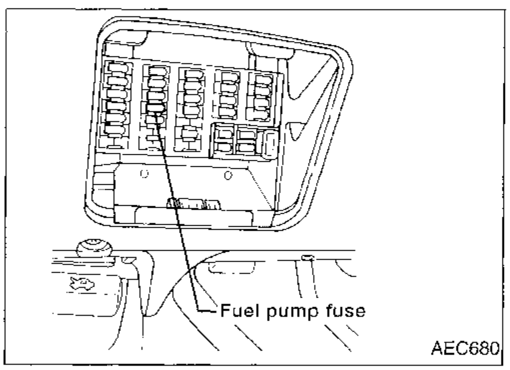
Fuel Pressure Release

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

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



SEF823K



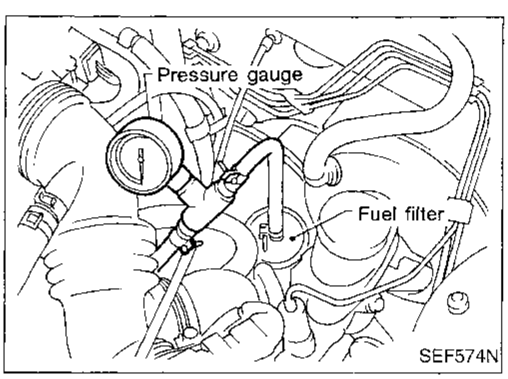
AEC680

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.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).



SEF574N

3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

   At idling:

   With vacuum hose connected

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

   With vacuum hose disconnected

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

GI
MA
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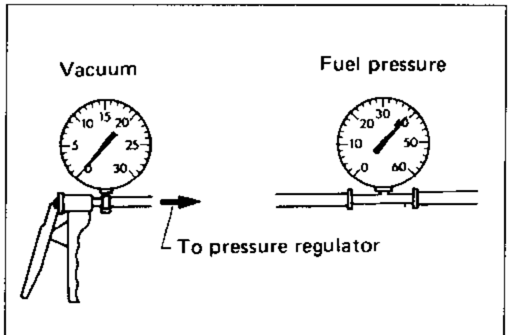
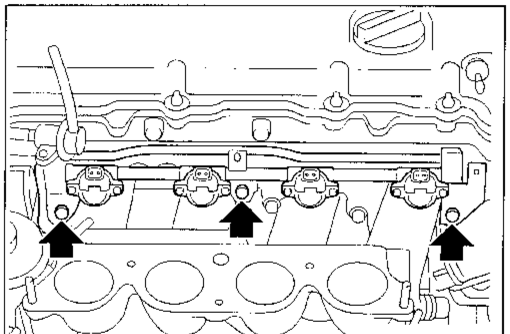
Fuel Pressure Check (Cont'd)



SEF718B

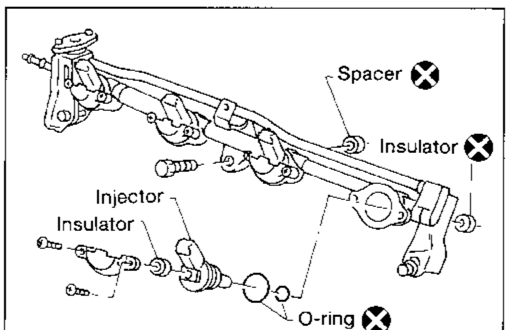
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.
9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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


SEF587N

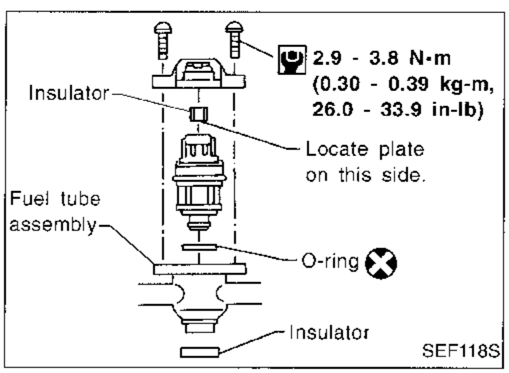
Injector Removal and Installation

1. Release fuel pressure to zero.
2. Remove intake manifold collector. Refer to EM section ("CYLINDER HEAD").
3. Disconnect vacuum hose from pressure regulator.
4. Disconnect fuel hoses from fuel tube assembly.
5. Disconnect injector harness connectors.
6. Remove injectors with fuel tube assembly.



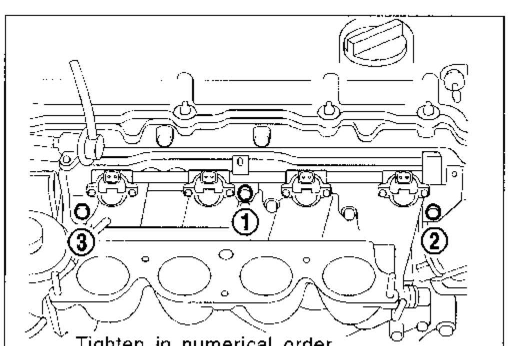
SEF615N

- Push injector tail piece.
- Do not pull on the connector.



SEF118S

7. Install injectors.
- Clean exterior of injector tail piece.
- Use new O-rings.



SEF642T

8. Install injectors with fuel tube assembly to intake manifold.
9. Install fuel hoses to fuel tube assembly.
10. Tighten fuel tube bolts to 9.32 to 10.8 N·m (0.95 to 1.10 kg-m, 6.9 to 8.0 ft-lb) as shown in the figure. Then tighten the bolts to 20.6 to 26.5 N·m (2.10 to 2.70 kg-m, 15 to 20 ft-lb).

Lubricate fuel hoses with a smear of silicone oil.

11. 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.

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

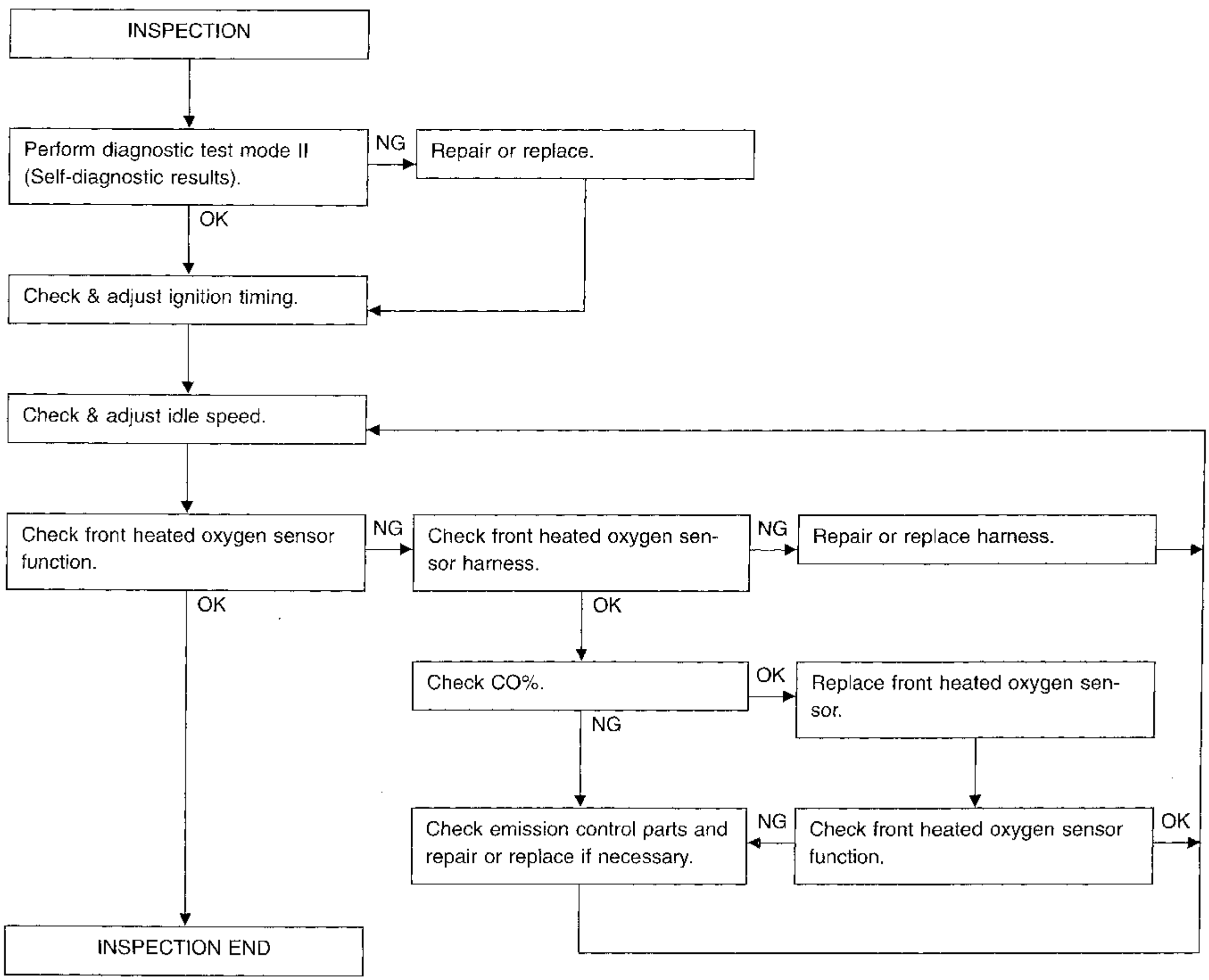
PREPARATION

- 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

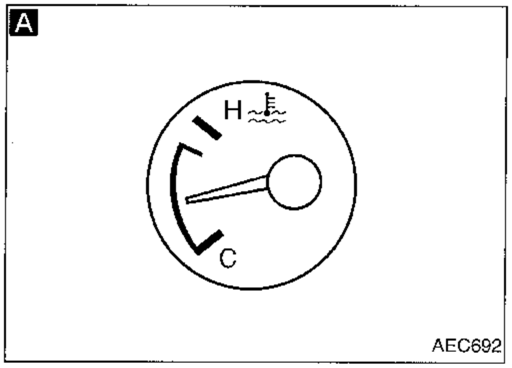
- On models equipped with air conditioner, checks should be carried out while the air conditioner is "OFF".
- On models equipped with automatic transaxle, when checking idle speed, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
- When measuring "CO"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

Overall inspection sequence

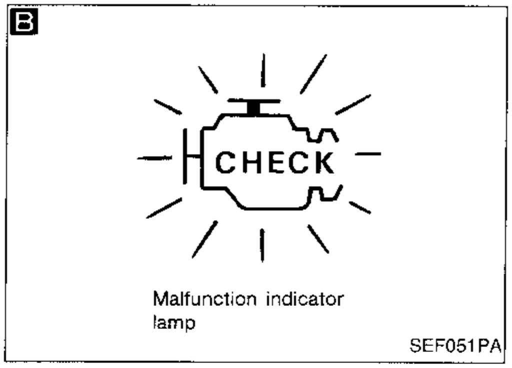


Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

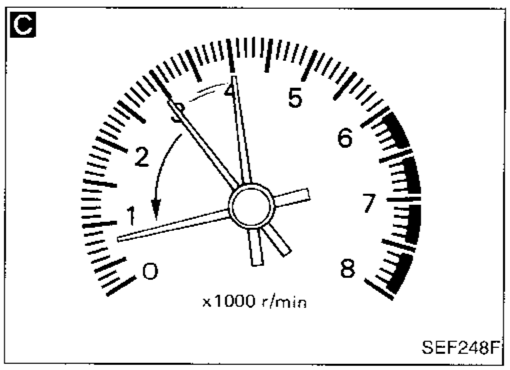
A



B



C



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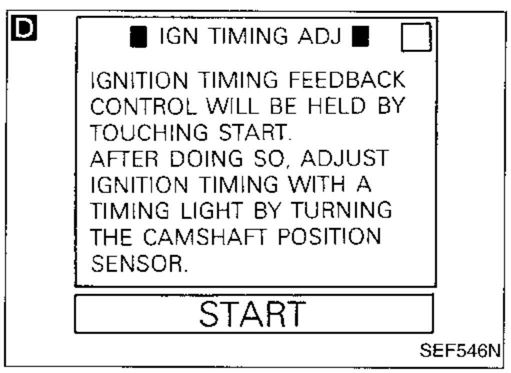
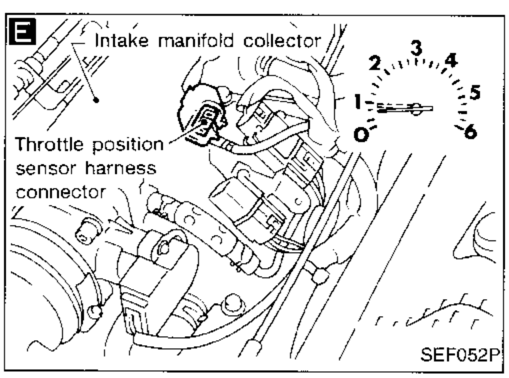


E



START

↓

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

↓

A

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

↓

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

↓

B

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

- OK → go to **C**
- NG → Repair or replace components as necessary. → go to **C**

C

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

↓

D **E**

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

OR

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

↓

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

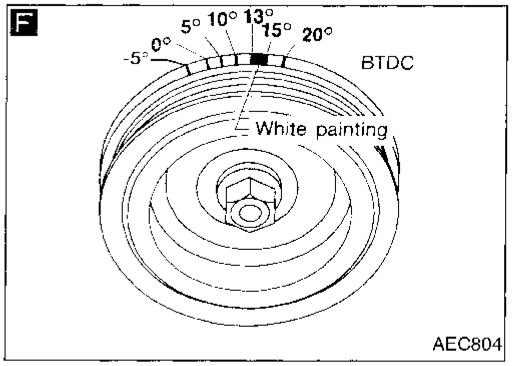
↓

Ⓐ

(Go to next page.)

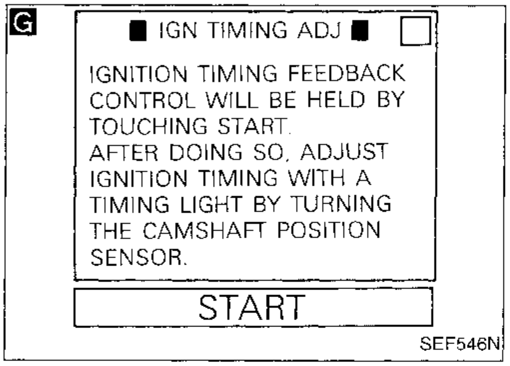
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

F



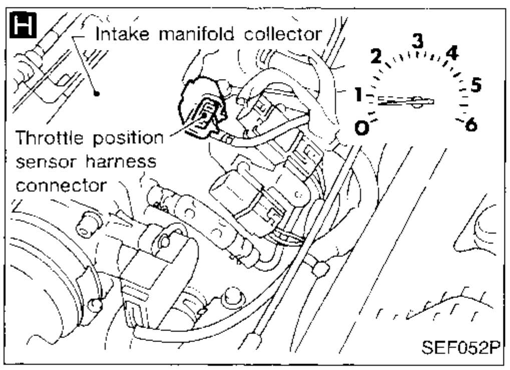
AEC804

G



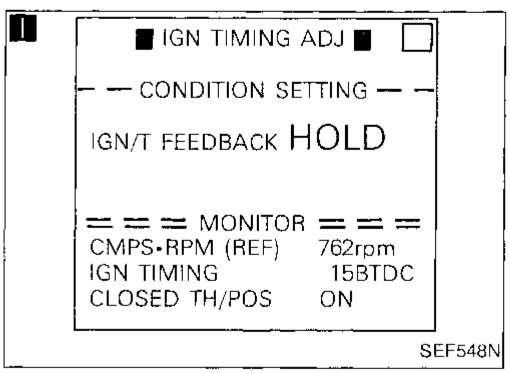
SEF546N

H



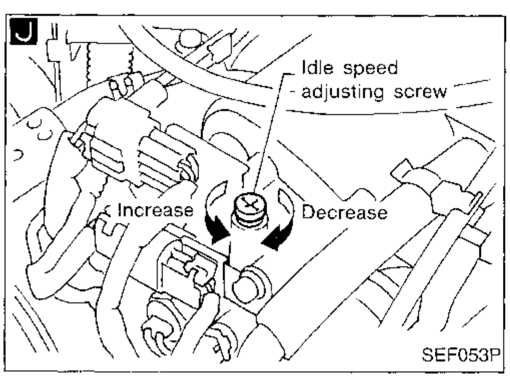
SEF052P

I



SEF548N

J



SEF053P

Ⓐ

F

Check ignition timing with a timing light.

M/T: 15°±2° BTDC
A/T: 15°±2° BTDC (in "N" position)

OK → (go to I)

NG ↓

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

M/T: 15°±2° BTDC
A/T: 15°±2° BTDC (in "N" position)

Ⓑ

G H

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

OR

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

I

Check base idle speed.

Read idle speed in "IGN TIMING ADJ" in "WORK SUPPORT" mode.

OR

Check idle speed.

M/T: 750±50 rpm
A/T: 750±50 rpm (in "N" position)

OK → (go to K)

NG ↓

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

J

Adjust idle speed by turning idle speed adjusting screw.

M/T: 750±50 rpm
A/T: 750±50 rpm (in "N" position)

K

Touch "BACK".

OR

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

↓

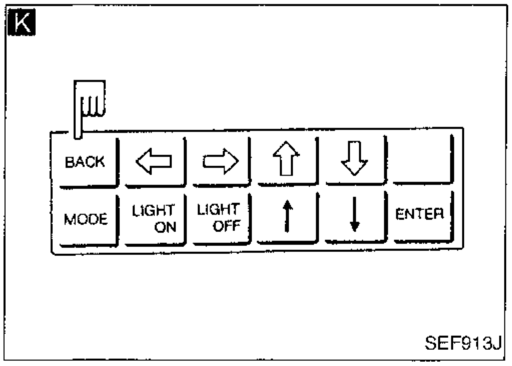
Rev engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, then run engine at idle speed.

Ⓒ

(Go to next page.)

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

K



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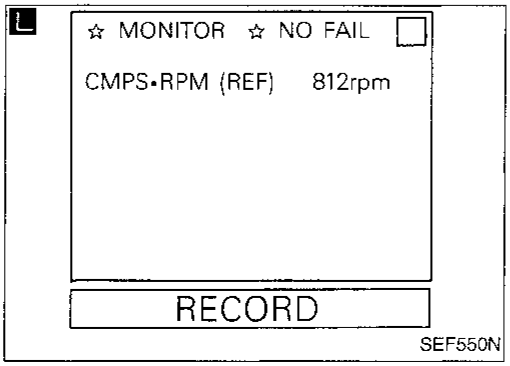
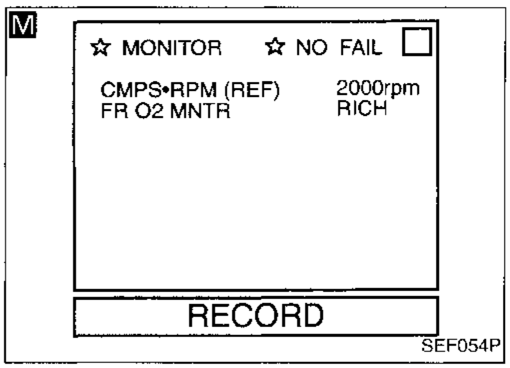
L



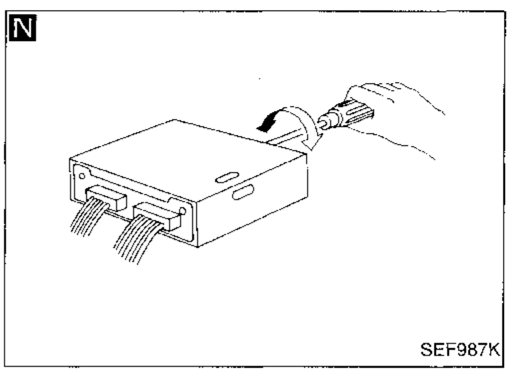
SEF550N

M



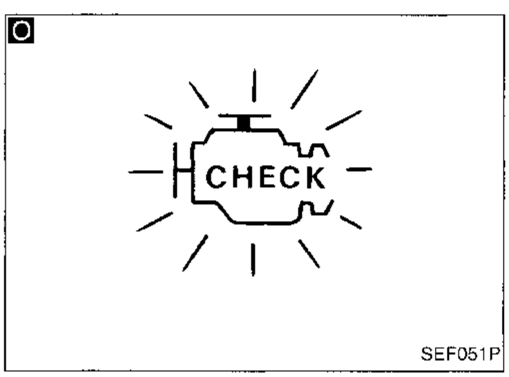
SEF054P

N



SEF987K

O



SEF051P

Ⓒ

L

Check target idle speed.

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

— OR —

Check idle speed.

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

OK → go to M N O below.

NG ↓

Check IACV-AAC valve and replace if necessary.

↓

Check IACV-AAC valve harness and repair if necessary.

↓

Check ECM function*1 by substituting another known good ECM.

↓

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

M N O

1. See "FR O2 MNTR" in "DATA MONITOR" mode.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintain engine at 2,000 rpm under no-load (engine is warmed up sufficiently). Check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH →LEAN → RICH

— OR —

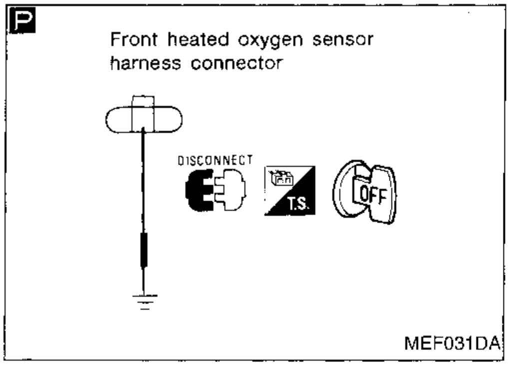
1. Set "Front heated oxygen sensor monitor" in the Diagnostic Test Mode II. (See page EC-38.)
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintain engine at 2,000 rpm under no-load. Check that the malfunction indicator lamp goes on and off more than 5 times during 10 seconds.

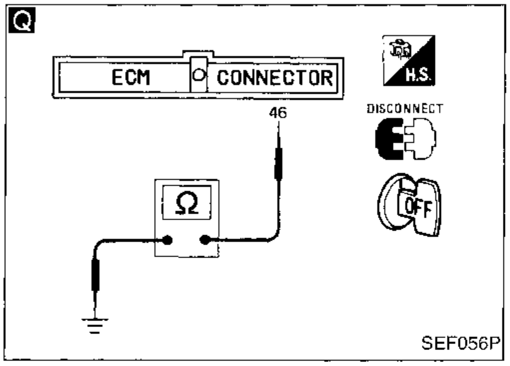
NG → Ⓓ (Go to next page.)

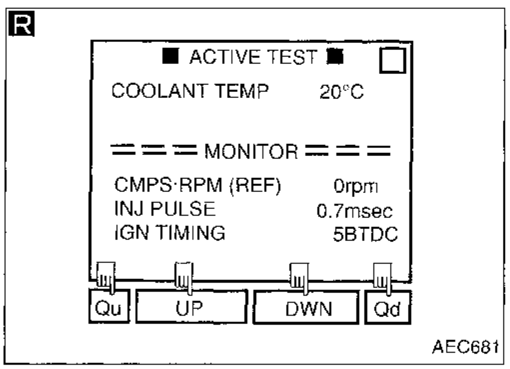
OK ↓

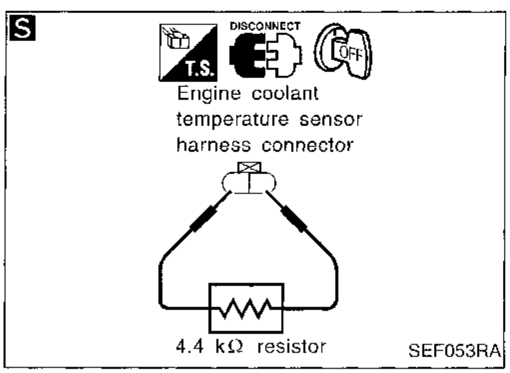
END

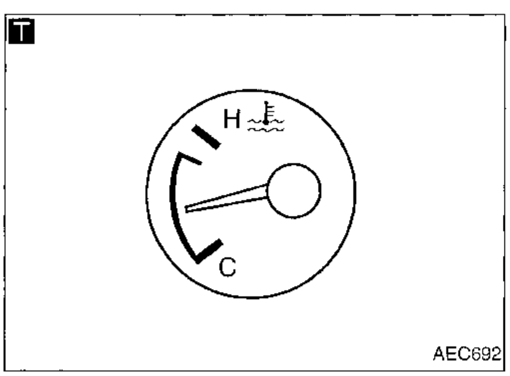
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)











Ⓓ

P Q

Check front heated oxygen sensor harness:
1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector from ECM.
3. Disconnect front heated oxygen sensor harness connector. Then connect harness side terminal for front heated oxygen sensor to ground with a jumper wire.
4. Check for continuity between terminal (46) of ECM harness connector and body ground.

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

OK → Connect ECM harness connector to ECM.

NG → Repair or replace harness. → Ⓑ

(Go to EC-29.)

Connect ECM harness connector to ECM.

R S

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

OR

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

T

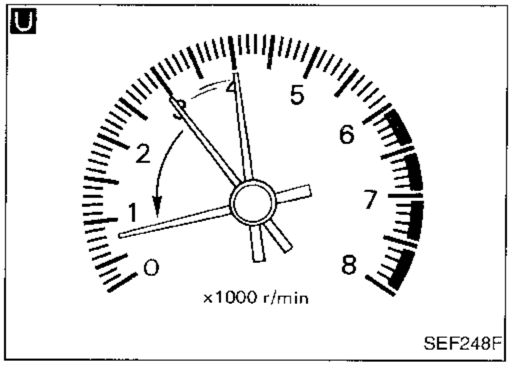
Start engine and warm it up until engine coolant temperature indicator points to middle of gauge.
(Be sure to start engine after setting "COOLANT TEMP" or installing a 4.4 kΩ resistor.)

Ⓔ

(Go to next page.)

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

U



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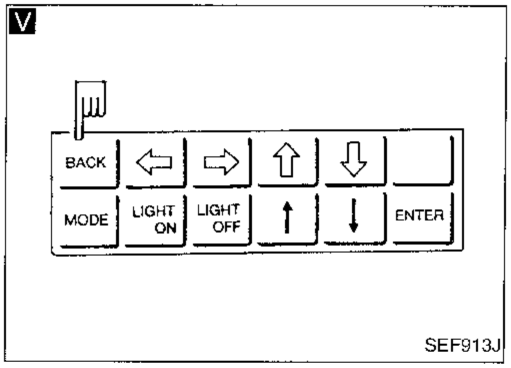
V



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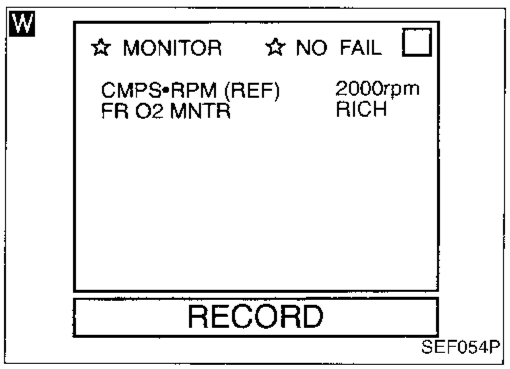
W



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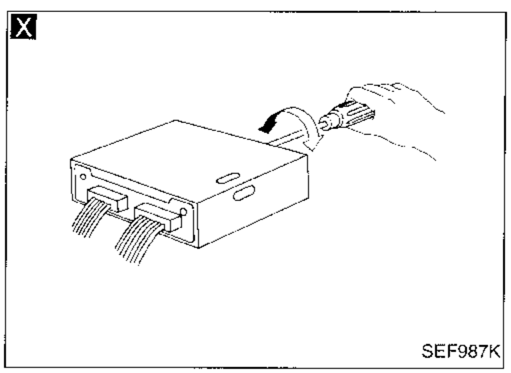
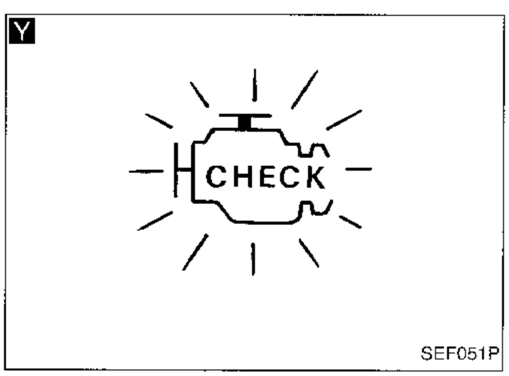
X


SEF987K

Y



SEF051P

Ⓔ

U

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

V

Check "CO"%.

Idle CO: Less than 11% and engine runs smoothly.

After checking CO%,

1. Touch "BACK".

OR

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

NG → Ⓕ

OK ↓

Replace front heated oxygen sensor.

W X Y

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

OR

1. Set "Front heated oxygen sensor monitor" in the Diagnostic Test Mode II. (Refer to EC-38.)
2. Maintain engine at 2,000 rpm under no-load. Check that the malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

NG → Ⓕ

OK → Ⓑ

Ⓕ
(Go to next page.)

Ⓑ
(Go to EC-29.)

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

(F)

↓

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

↓

Check fuel pressure regulator. Refer to EC-26.

↓

Check mass air flow sensor and its circuit.
Refer to TROUBLE DIAGNOSIS FOR DTC P0100, EC-85.

↓

Check injector and its circuit.
Refer to TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, EC-217.
Clean or replace if necessary.

↓

Check engine coolant temperature sensor and its circuit. Refer to TROUBLE DIAGNOSIS FOR DTC P0115, P0125, EC-96, 106.

↓

Check ECM function*2 by substituting another known good ECM.

↓

(B)

(Go to EC-29.)

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

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

Introduction

The ECM (ECCS control module) has an on board diagnostic system, which detects engine system malfunctions related to sensors or actuators. 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).

Two Trip Detection Logic

When a malfunction is detected for the first time, the malfunction (DTC and freeze frame data) is stored in the ECM memory. ⟨1st trip⟩ The malfunction indicator lamp will not light up at this stage.
If the same malfunction is detected during the next drive, this second detection causes the malfunction indicator lamp to light up. ⟨2nd trip⟩ Specific on board diagnostic items will light up or blink the MIL even in the 1st trip as below.

Items	MIL		
	1st trip		2nd trip lighting up
	Blinking	Lighting up	
Misfire (Possible three way catalyst damage)— DTC: P0300-P0304 (0701-0605) is being detected	X		
Misfire (Possible three way catalyst damage)— DTC: P0300-P0304 (0701-0605) has been detected		X	
Three way catalyst function — DTC: P0420 (0702)		X	
Closed loop control — DTC: P0130 (0307)		X	
Except above			X

The "trip" in the "Two Trip Detection Logic" means performing of the "DTC Confirmation Procedure".

Diagnostic Trouble Code (DTC)

HOW TO READ DTC

The diagnostic trouble code can be read by the following methods.
(Either code for the 1st trip or the 2nd trip can be read.)

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.

- **Output of the trouble code means that the indicated circuit has a malfunction. However, in case of the Mode II and GST they do not indicate whether the malfunction is still occurring or occurred in the past and returned to normal.**
  CONSULT can identify them. Therefore, using CONSULT (if available) is recommended.

HOW TO ERASE DTC

The diagnostic trouble code can be erased by the following methods.

NO TOOLS Changing the diagnostic test mode from Diagnostic Test Mode II to Mode I by turning the mode selector on the ECM. (Refer to EC-38.)

Selecting "ERASE" in the "SELF DIAG RESULTS" mode with CONSULT.

GST Selecting Mode 4 with GST (Generic Scan Tool).

- **If the battery terminal is disconnected, the diagnostic trouble code will be lost within 24 hours.**
- **When you erase the DTC, using CONSULT or GST is easier and quicker than switching the mode selector on the ECM.**

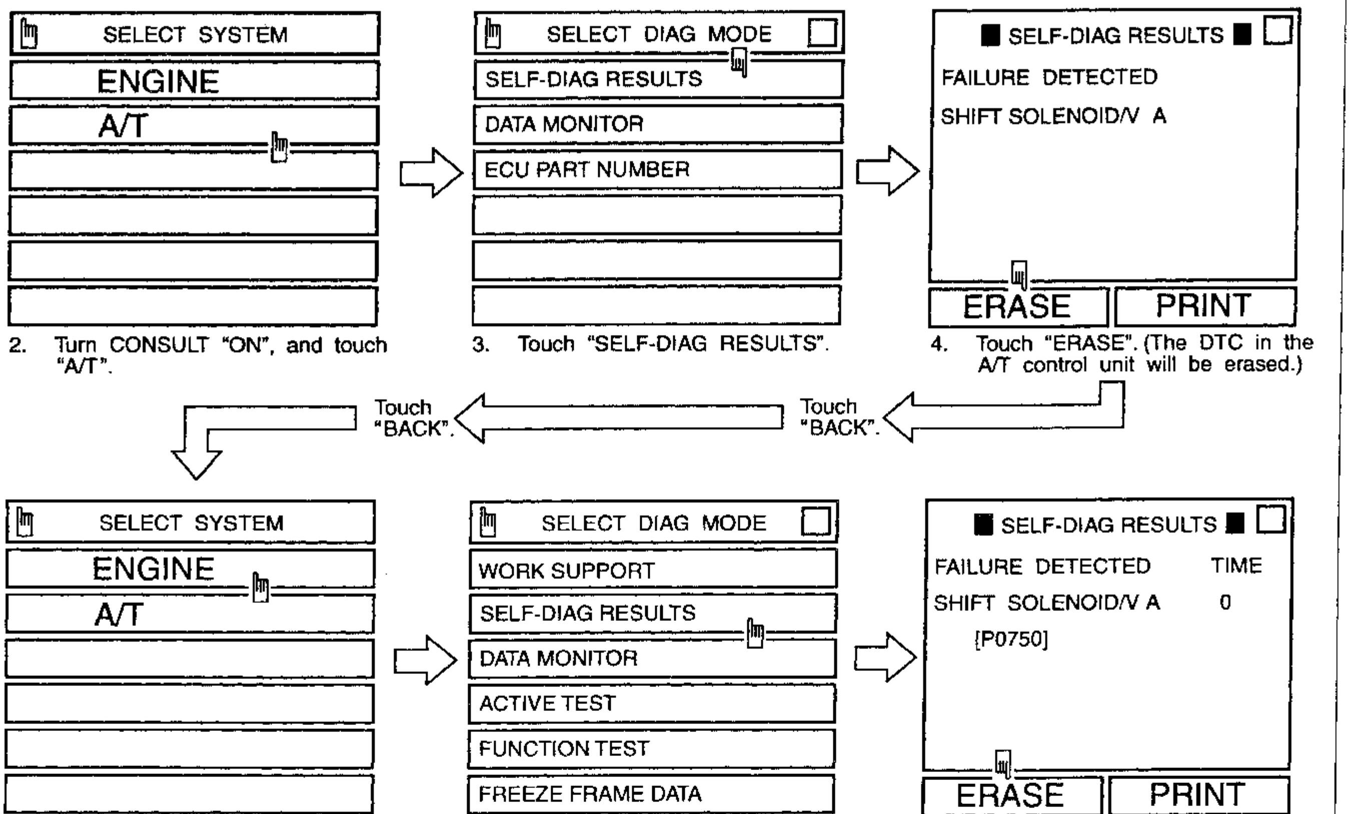
HOW TO ERASE DTC (With CONSULT)

- **If a DTC is displayed for both ECM and A/T control unit, it needs to be erased for both ECM and A/T control unit.**
- **If diagnostic trouble code is not for A/T related items (refer to 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 for 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.) Touch "BACK" twice.
5. Touch "ENGINE".
6. Touch "SELF-DIAG RESULTS".
7. Touch "ERASE". (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT)

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



2. Turn CONSULT "ON", and touch "A/T".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the A/T control unit will be erased.)
5. Touch "ENGINE".
6. Touch "SELF-DIAG RESULTS".
7. Touch "ERASE". (The DTC in the ECM will be erased.)

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HOW TO ERASE DTC (With GST)

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

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

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

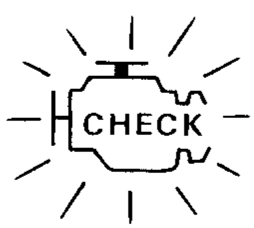
1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait for at least 5 seconds and then turn it "ON" again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)" in AT section "TROUBLE DIAGNOSIS", "Self-diagnosis".
3. Change the diagnostic test mode from Mode *II* to Mode *I* by turning the mode selector on the ECM. (See page EC-38.)

Freeze Frame Data

The ECM has a memory function which stores the driving condition at the moment the ECM detects a malfunction. This includes fuel system status, calculated load value, engine coolant temperature, short fuel trim, long fuel trim, engine speed, vehicle speed.
Stored data is called Freeze Frame Data.
The data is useful for tracking down conditions at the time of the malfunction. Such conditions include whether vehicle was running or stopped, engine warm up, air-fuel ratio, etc.
This data can be utilized to duplicate the malfunction and to diagnose the trouble.
The data will be erased along with the diagnostic trouble code by the above-mentioned method.
The data can be stored only for the 1st trip. It can not be renewed even at the 2nd trip. The freeze frame data can be stored for only one item. Therefore, the ECM has the following priorities to update the data.

Priority	Detected items
1	Misfires — DTC: P0300-P0304 (0701-0605) Fuel Injection System Function — DTC: P0170 (0706)
2	Except the above items (includes A/T items)

For example, an EGR malfunction (Priority: 2) was detected and the freeze frame data was stored at the 1st trip. After that, misfire (Priority: 1) is detected in another trip, and freeze frame data is updated from the EGR malfunction for the misfire.



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Malfunction Indicator Lamp (MIL)

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator lamp does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-241.

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 II

1. BULB CHECK : This function checks the MIL bulb for damage (blown, open circuit, etc.).
   If the MIL does not come on, check MIL circuit and ECM test mode selector. (See EC-38.)
2. MALFUNCTION WARNING : This is a usual driving condition. When a malfunction is detected twice (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected.
   Only the following malfunctions will light up or blink the MIL even in the 1st trip.
   - "Misfire (Possible three way catalyst damage)"
   - "Three way catalyst function"
   - "Closed loop control"

Diagnostic Test Mode II

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

Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES" on next page.

MIL flashing without DTC

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

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

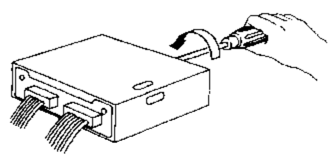
HOW TO SWITCH DIAGNOSTIC TEST MODES

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

Mode I — MALFUNCTION INDICATOR LAMP CHECK (Refer to EC-36.) **MIL should come on.**

- NG → Check MIL circuit. (See EC-241.)
  - NG → Repair harness or connector.
  - OK → Check whether ECM test mode selector can be turned counterclockwise.
    - NG → Repair or replace ECM test mode selector.
    - OK → back to Mode I — MALFUNCTION INDICATOR LAMP CHECK
- OK → Start engine. → Diagnostic Test Mode I — MALFUNCTION WARNING

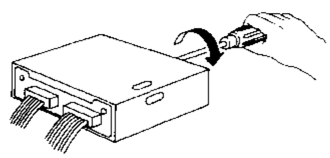
OK ↓



(Turn diagnostic test mode selector on ECM fully clockwise)

- NG → Check MIL circuit. (See EC-241.)
  - NG → Repair harness or connectors. → OK → Wait at least 2 seconds.
  - OK → Check ECM fail-safe. (See EC-67.) → OK → Wait at least 2 seconds.

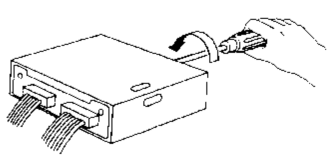
Wait at least 2 seconds.



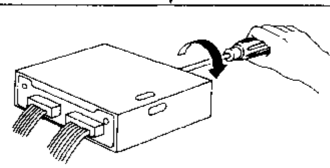
(Turn diagnostic test mode selector fully counterclockwise.)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS → Start engine. → Diagnostic Test Mode II — FRONT HEATED OXYGEN SENSOR MONITOR

*1



Wait at least 2 seconds.



(→ back to Mode I — MALFUNCTION INDICATOR LAMP CHECK)

***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 when the ECM memory is erased.
1. Diagnostic trouble codes
2. Freeze frame data
3. 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. Refer to EL section ("WARNING LAMPS AND CHIME") or see EC-241.

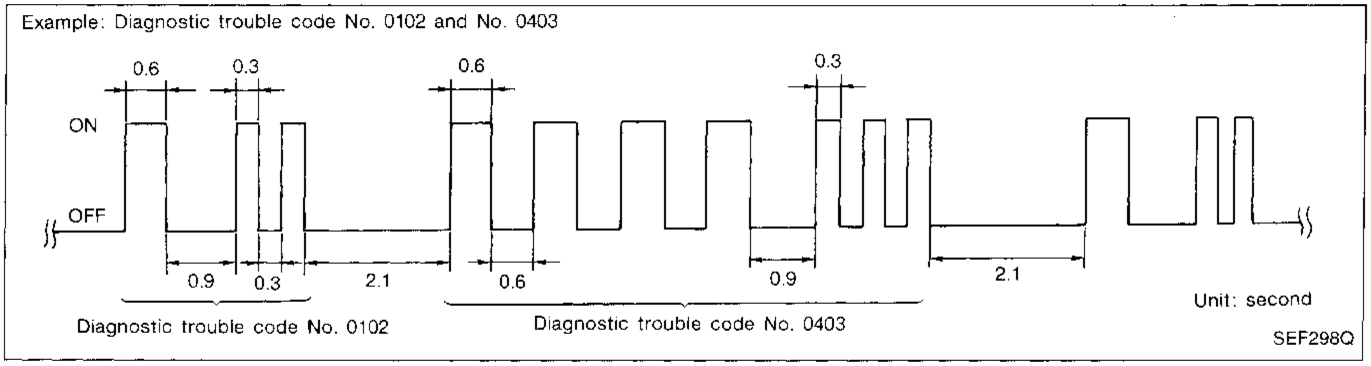
DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

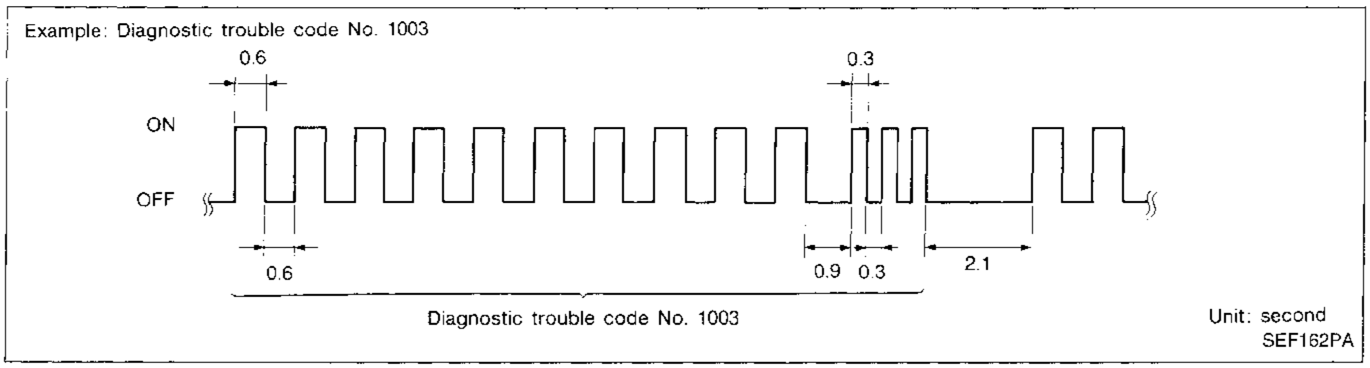
MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

- 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.





Long (0.6 second) blinking indicates the number of ten digits, and short (0.3 second) blinking indicates the number of single digits. For example, the malfunction indicator lamp blinks 10 times for 6 seconds (0.6 sec x 10 times) and then it blinks three times for about 1 second (0.3 sec x 3 times). This indicates the DTC "1003" and refers to the malfunction of the park/neutral position switch.
In this way, all the detected malfunctions are classified by their diagnostic trouble code numbers. The DTC "0505" refers to no malfunction. (See DIAGNOSTIC TROUBLE CODE INDEX, refer to EC-2.)

HOW TO ERASE DIAGNOSTIC TEST MODE II (Self-diagnostic results)

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

- **If the battery 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.**

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

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE II—FRONT HEATED OXYGEN SENSOR MONITOR

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

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

*: Maintains conditions just before switching to open loop.

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

OBD System Operation Chart

RELATIONSHIP BETWEEN MIL, DTC, CONSULT AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the DTC and the freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the MIL will come on. For details, refer to "Two Trip Detection Logic" on EC-34.
- The MIL will go off after the vehicle is driven three 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 MIL will remain on until the vehicle is driven (in the recorded driving pattern) three times with no malfunction.
- The DTC and the freeze frame data can be displayed until the vehicle is driven 40 times (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data can be displayed until the vehicle is driven 80 times. The "TIME" IN "SELF-DIAGNOSTIC RESULTS" mode of CONSULT will count in response to the number of times the vehicle is driven.

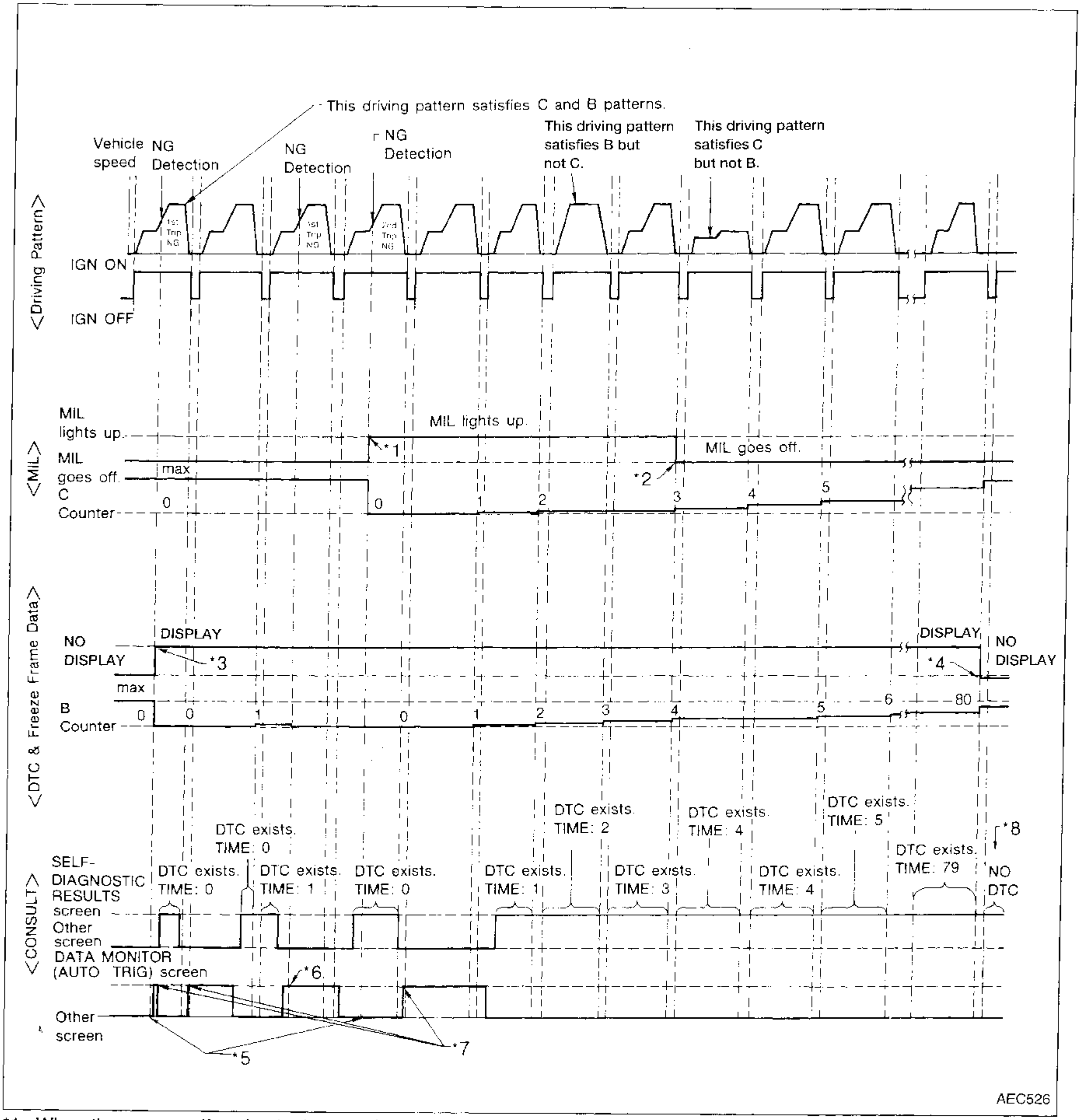
SUMMARY CHART

Items	MIL (goes off)	DTC, Freeze Frame Data (no display)
Fuel Injection System	3 (pattern C)	80 (pattern B)
Misfire	3 (pattern C)	80 (pattern B)
Except the aboves	3 (pattern B)	40 (pattern A)

Details about patterns "A", "B", and "C" are on EC-42.

OBD System Operation Chart (Cont'd)

RELATIONSHIP BETWEEN MIL, DTC, CONSULT 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 three times (pattern C) without any malfunctions.

*3: When a malfunction is detected for the first time, 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 B) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: Other screen except DATA MONITOR (AUTO TRIG) can not display the malfunction.

*6: DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.

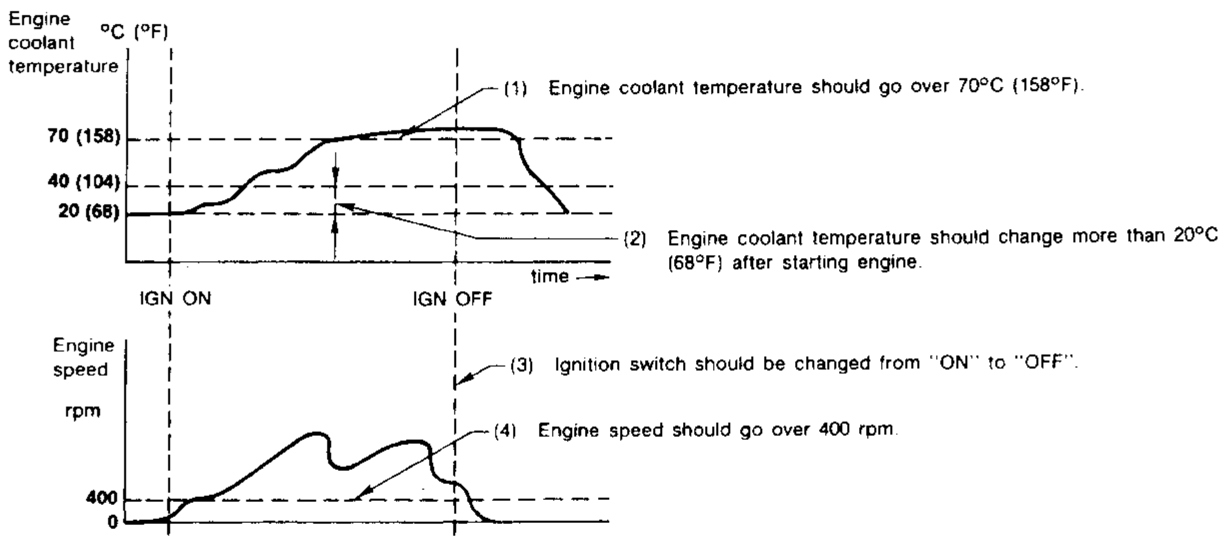
*7: The malfunction can not be displayed because the timing to set DATA MONITOR (AUTO TRIG) screen was missed against the NG detection.

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

OBD System Operation Chart (Cont'd)

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

⟨Driving pattern A⟩



AEC574

⟨Driving pattern B⟩

Driving pattern B means vehicle operation is 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 twice regardless of the driving pattern.
- The B counter will count the number of times driving pattern B is satisfied without the malfunction.
- The DTC will not be displayed after the B counter reaches 80.

⟨Driving pattern C⟩

Driving pattern C means vehicle operation is as follows:
(1) Driving pattern A should be satisfied.
(2) 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:

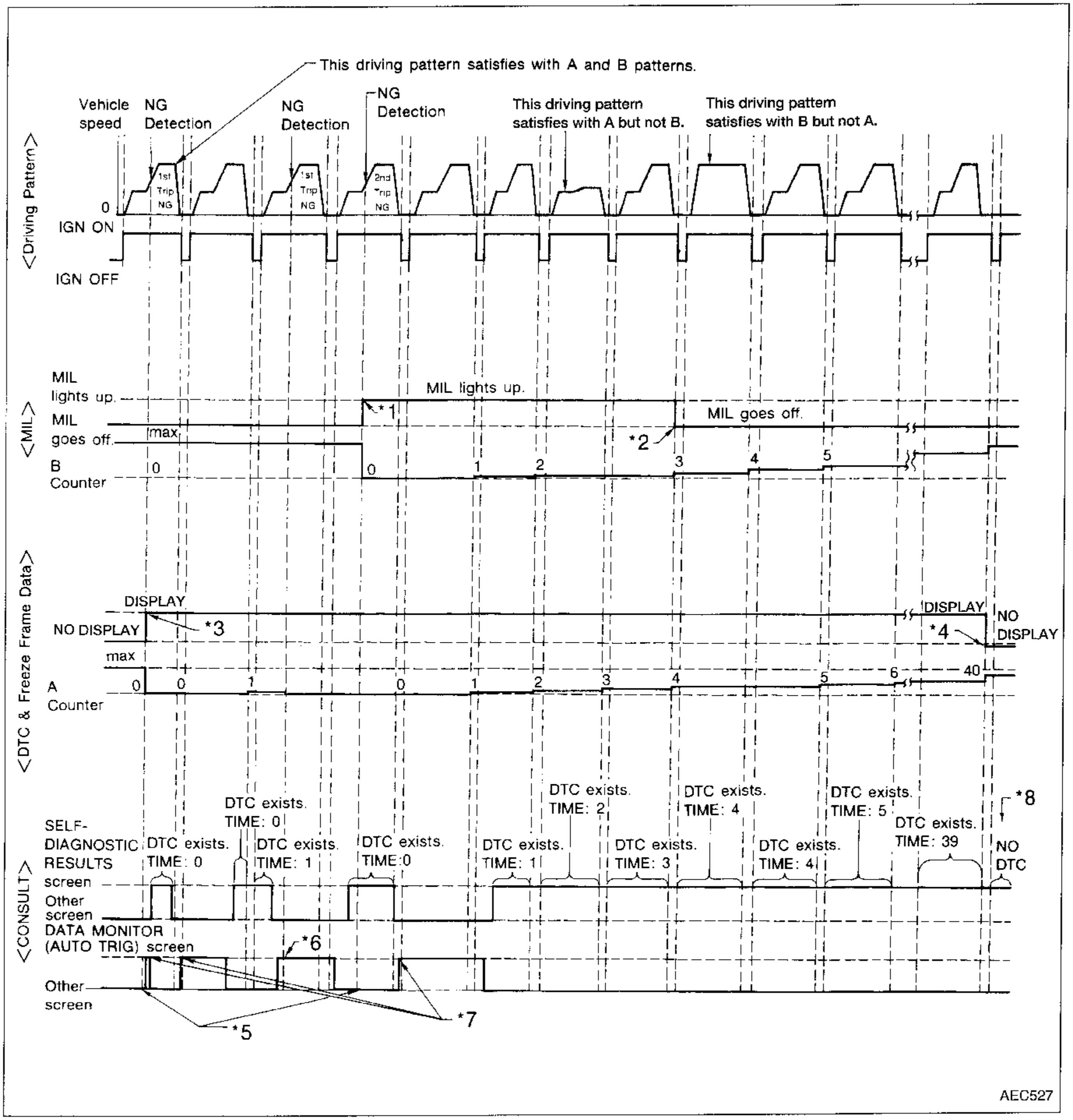
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

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), (2). (*1 in "OBD SYSTEM OPERATION CHART")
- The C counter will be counted up when (1), (2) are satisfied without the same malfunction.
- The MIL will go off when the C counter reaches 3. (*2 in "OBD SYSTEM OPERATION CHART")

OBD System Operation Chart (Cont'd)

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



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

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

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

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

*5: Other screen except DATA MONITOR (AUTO TRIG) can not display the malfunction.

*6: DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.

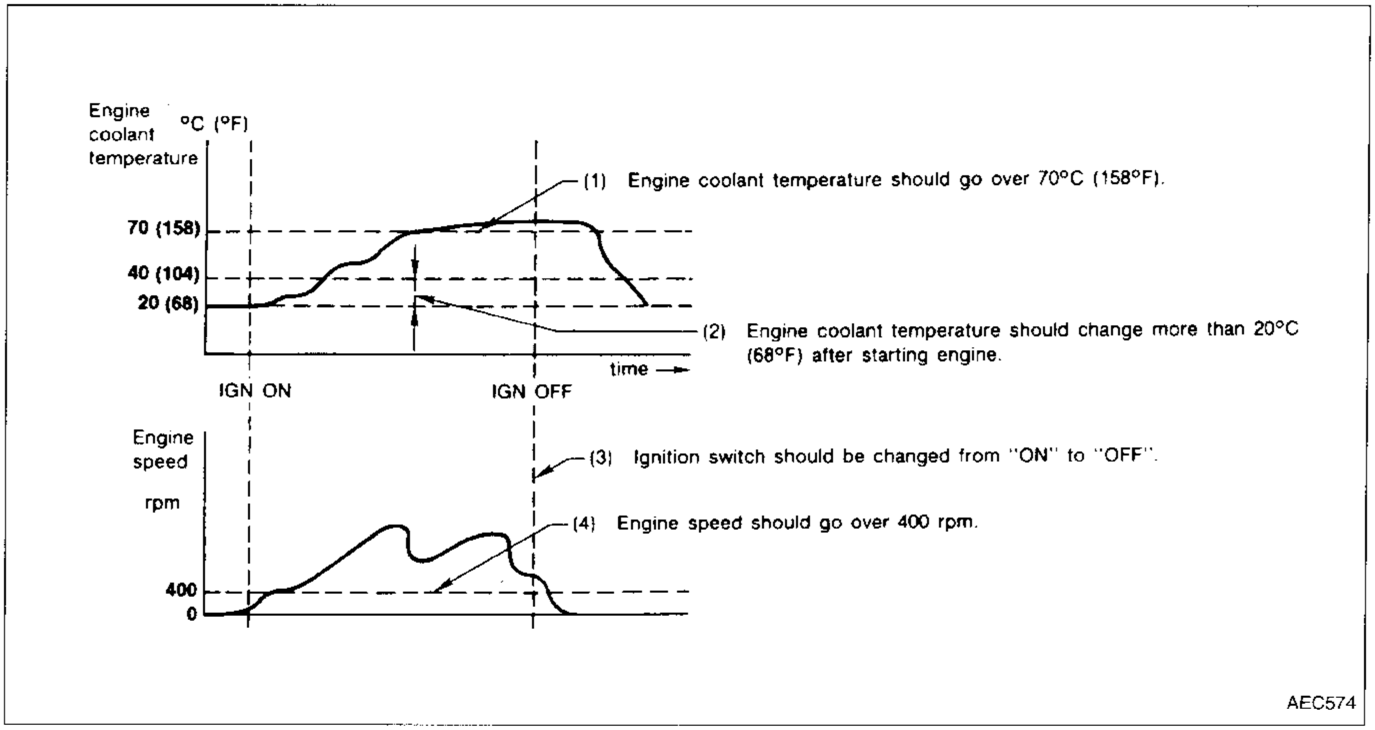
*7: The malfunction can not be displayed because the timing to set DATA MONITOR (AUTO TRIG) screen was missed against the NG detection.

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

OBD System Operation Chart (Cont'd)

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

⟨Driving pattern A⟩

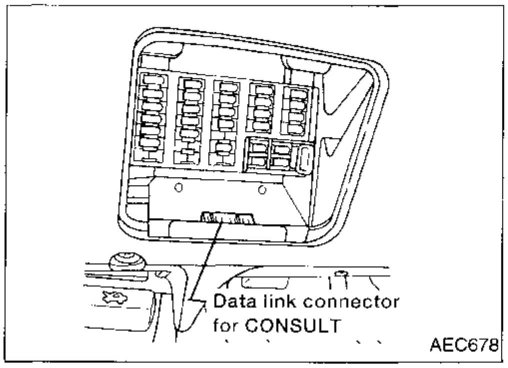


- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

⟨Driving pattern B⟩

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

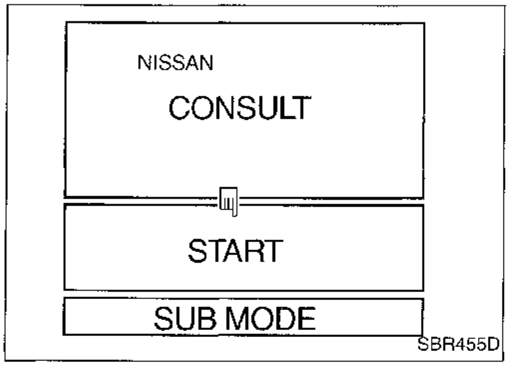
- The B counter will be cleared when the malfunction is detected twice regardless of the driving pattern (*1 in "OBD SYSTEM OPERATION CHART").
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").



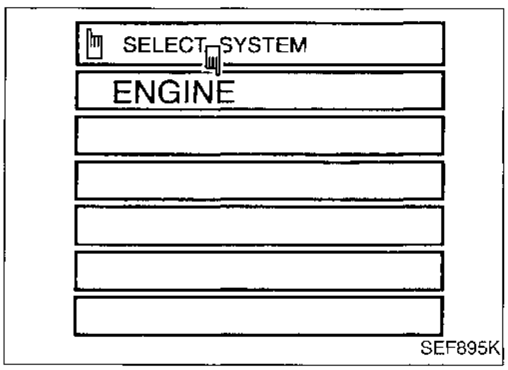
CONSULT

CONSULT INSPECTION PROCEDURE

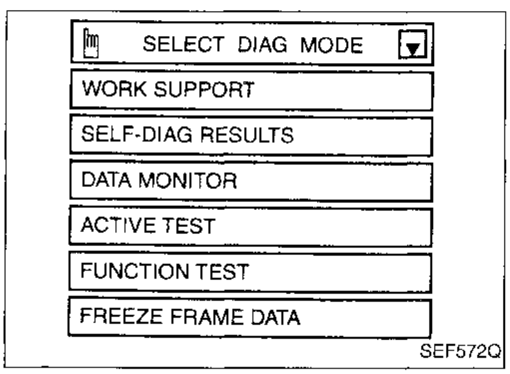
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



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

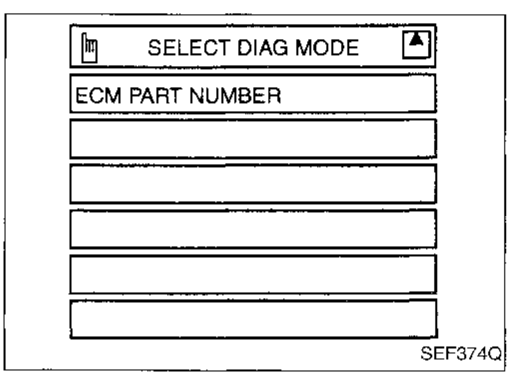


5. Touch "ENGINE".



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

For further information, see the CONSULT Operation Manual. This sample shows the display when using the UE950 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	DATA MONITOR	ACTIVE TEST	FUNCTION TEST	FREEZE FRAME DATA *1
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			
		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 (Throttle position sensor signal)			X		X	
		Air conditioner switch			X			
		Park/Neutral position switch		X	X		X	
		Power steering oil pressure switch			X		X	
		Battery voltage			X			
	OUTPUT	Injectors			X	X	X	
		Power transistor (Ignition timing)	X	X (Ignition signal)	X	X	X	
		IACV-AAC valve	X	X	X	X	X	
		Air conditioner relay			X			
		Fuel pump relay	X		X	X	X	
		Cooling fan		X	X	X	X	
		EGR valve & EVAP canister purge control solenoid valve		X	X	X	X	
		Front heated oxygen sensor heater		X	X			
		Calculated load value			X			X

X: Applicable

*1: The items appear on CONSULT screen in FREEZE FRAME DATA mode only if a diagnostic trouble code (DTC) is detected. For details, refer to EC-55.

FUNCTION

Diagnostic test mode	Function
Work support	A technician can adjust some devices faster and more accurately by following indications on CONSULT.
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Active test	CONSULT drives some actuators apart from the ECM's and also shifts some parameters in a specified range.
ECM part numbers	ECM part numbers can be read.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".
Freeze frame data	ECM stores the driving condition at the moment a malfunction is detected, and stored data can be read. For details, refer to "Freeze Frame Data" (EC-55).

*1: The following emission-related diagnostic information is cleared when ECM memory is erased.
1. Diagnostic trouble codes
2. Freeze frame data
3. Others

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THRTL POS SEN ADJ	CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED	When adjusting throttle position sensor initial position
IGNITION TIMING ADJ	● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.	When adjusting initial ignition timing
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

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "DIAGNOSTIC TROUBLE CODE (DTC) INDEX" (See page EC-2.)

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CMPS·RPM (REF) [rpm]	○	○	• Indicates the engine speed computed from the REF signal (180° signal) of the camshaft position sensor.	• Accuracy becomes poor if engine speed drops below the idle rpm. • If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS AIR/FL SE [V]	○	○	• The signal voltage of the mass air flow sensor is displayed.	• When the engine is stopped, a certain value is indicated.
COOLAN TEMP/S [°C] or [°F]	○	○	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
FR O2 SENSOR [V]	○	○	• The signal voltage of the front heated oxygen sensor is displayed.	
RR O2 SENSOR [V]	○	○	• The signal voltage of the rear heated oxygen sensor is displayed.	
FR O2 MNTR [RICH/LEAN]	○	○	• Display of front heated oxygen sensor signal during air-fuel ratio feedback control: RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN ... means the mixture became "lean", and control is being affected toward a rich mixture.	• After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins. • When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
RR O2 MNTR [RICH/LEAN]	○		• Display of rear heated oxygen sensor signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	• When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	○	○	• The vehicle speed computed from the vehicle speed sensor signal is displayed.	

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

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

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
IACV-AAC/V [%]		○	• Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals.	
A/F ALPHA [%]		○	• Indicates the mean value of the air-fuel ratio feedback correction factor per cycle.	• When the engine is stopped, a certain value is indicated. • This data also includes the data for the air-fuel ratio learning control.
AIR COND RLY [ON/OFF]			• Indicates the air conditioner relay control condition (determined by ECM according to the input signal).	
FUEL PUMP RLY [ON/OFF]			• Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]			• Indicates the control condition of the cooling fans (determined by ECM according to the input signal). HI ... High speed operation LOW ... Low speed operation OFF ... Stopped	
EGRC SOL/V [ON/OFF]			• Indicates the control condition of the EGR valve & EVAP canister purge control solenoid valve (determined by ECM according to the input signal). ON ... EGR and EVAP canister purge operation cut-off OFF ... EGR and EVAP canister purge operation not cut-off	
O2 SEN HEATER [ON/OFF]			• Indicates [ON/OFF] condition of front heated oxygen sensor heater determined by ECM according to the input signals .	
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 [gm/s]			• Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
VOLTAGE [V]			• Voltage measured by the voltage probe.	
PULSE [msec] or [Hz] or [%]			• Pulse width, frequency or duty cycle measured by the pulse probe.	• Only "#" is displayed if item is unable to be measured. • Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

CONSULT (Cont'd)

ACTIVE TEST MODE

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

FUNCTION TEST MODE

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

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. Before cranking, battery voltage and engine coolant temperature are displayed. During cranking, average battery voltage, mass air flow sensor output voltage and cranking speed are displayed.	Start signal: OFF → ON		• Harness and connector • Ignition switch
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 adjustment is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		• Adjust ignition timing (by moving camshaft position sensor or distributor) • Camshaft position sensor drive mechanism
MIXTURE RATIO TEST	• Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the front heated oxygen sensor output at 2,000 rpm under non-loaded state.	Front heated oxygen sensor COUNT: More than 5 times during 10 seconds		• INJECTION SYS (Injector, fuel pressure regulator, harness or connector) • IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector) • VACUUM SYS (Intake air leaks) • Front heated oxygen sensor circuit • Front heated oxygen sensor operation • Fuel pressure high or low • Mass air flow sensor

CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
POWER BALANCE	● After warming up, idle the engine. ● Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.)	Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder.	● Injector circuit (Injector, harness or connector) ● Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector) ● Compression ● Valve timing
IACV-AAC/V SYSTEM	● After warming up, idle the engine. ● IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 0%, 20% and 80%.	Difference in engine speed is greater than 150 rpm between when valve opening is at 80% and at 20%.	● Harness and connector ● IACV-AAC valve ● Air passage restriction between air inlet and IACV-AAC valve ● IAS (Idle adjusting screw) adjustment

FREEZE FRAME DATA

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

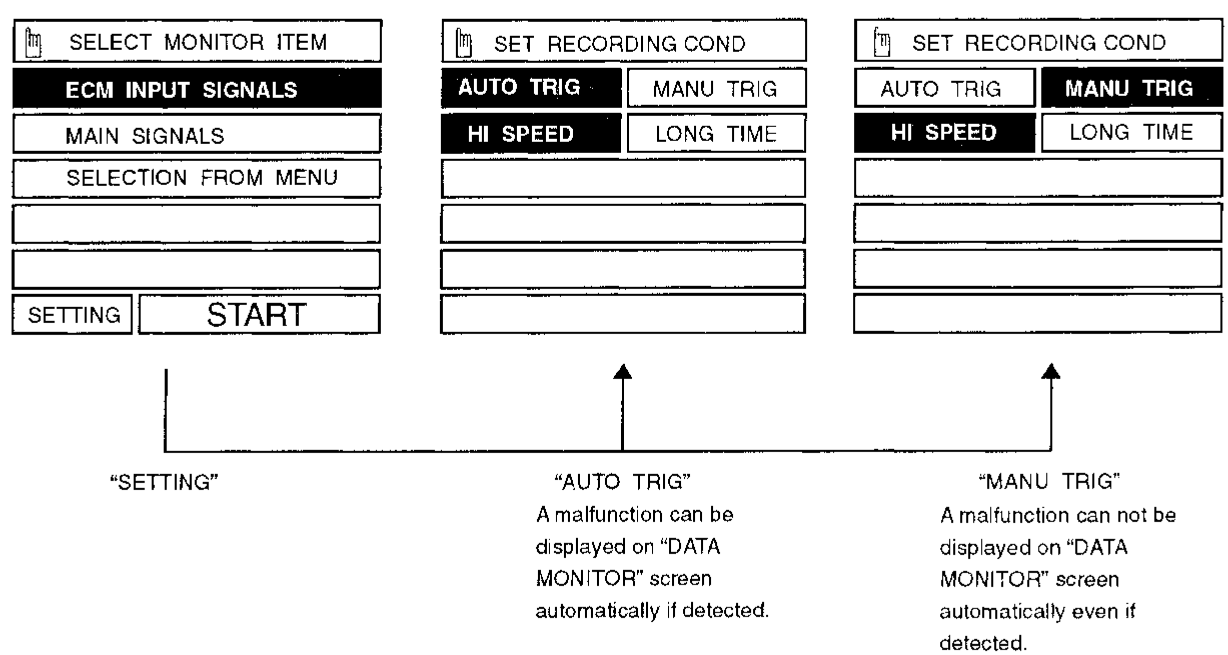
REAL TIME DIAGNOSIS IN DATA MONITOR MODE

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



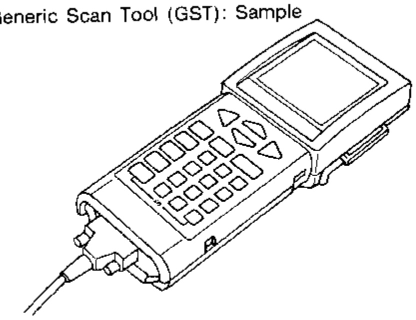
SEF529Q

Generic Scan Tool (GST)

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has five 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.

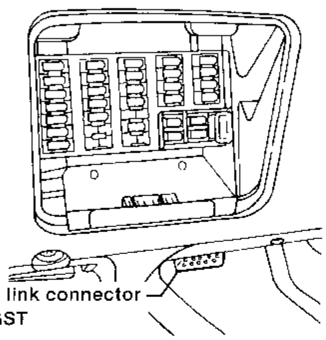
Generic Scan Tool (GST): Sample



SEF139P

GST INSPECTION PROCEDURE

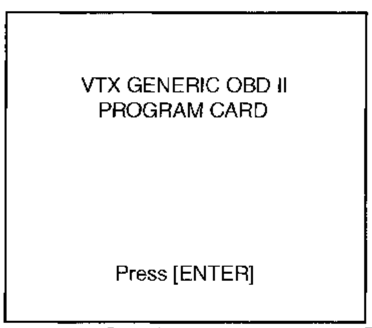
1. Turn off ignition switch.
2. Connect “GST” to data link connector for GST. (Data link connector for GST is located under LH dash panel near the fuse box cover.)



AEC679

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

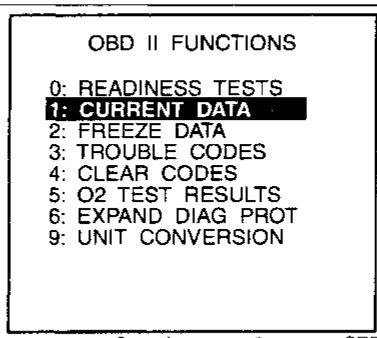
(*: Regarding GST screens in this section, sample screens are shown.)



Sample screen* SEF398S

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

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



Sample screen* SEF303QA

Generic Scan Tool (GST) (Cont'd)

FUNCTION

Diagnostic test mode		Function
MODE 1	(Current data)	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. Refer to "Freeze Frame Data" (EC-55).
MODE 3	(Trouble codes)	This mode gains access to emission-related powertrain trouble codes which were stored by ECM.
MODE 4	(Clear codes)	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 oxygen sensor test data (MODE 5) ● Reset status of system monitoring test (MODE 1)
MODE 5	(O2 test results)	This mode gains access to the on board heated oxygen sensor monitoring test results.

Introduction

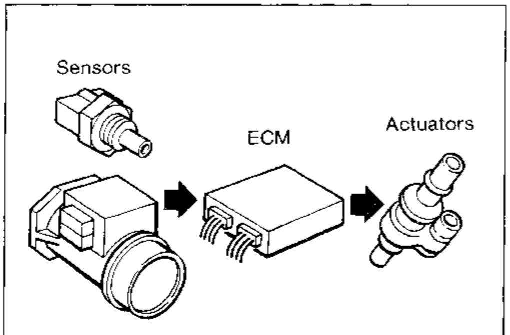
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that 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.

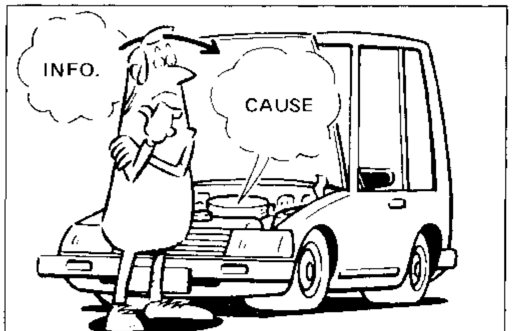
A visual check only may not find the cause of the problems. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the "Work Flow" on EC-61.

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

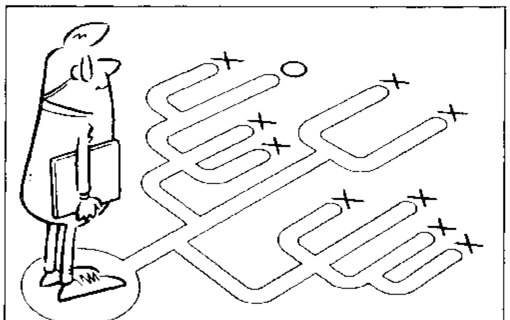
Start your diagnosis by looking for "conventional" problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.



MEF036D



SEF233G



SEF234G

Diagnostic Worksheet

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

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

Utilize a diagnostic worksheet like the one shown below in order to organize all the information for troubleshooting.

KEY POINTS

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

SEF907L

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

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

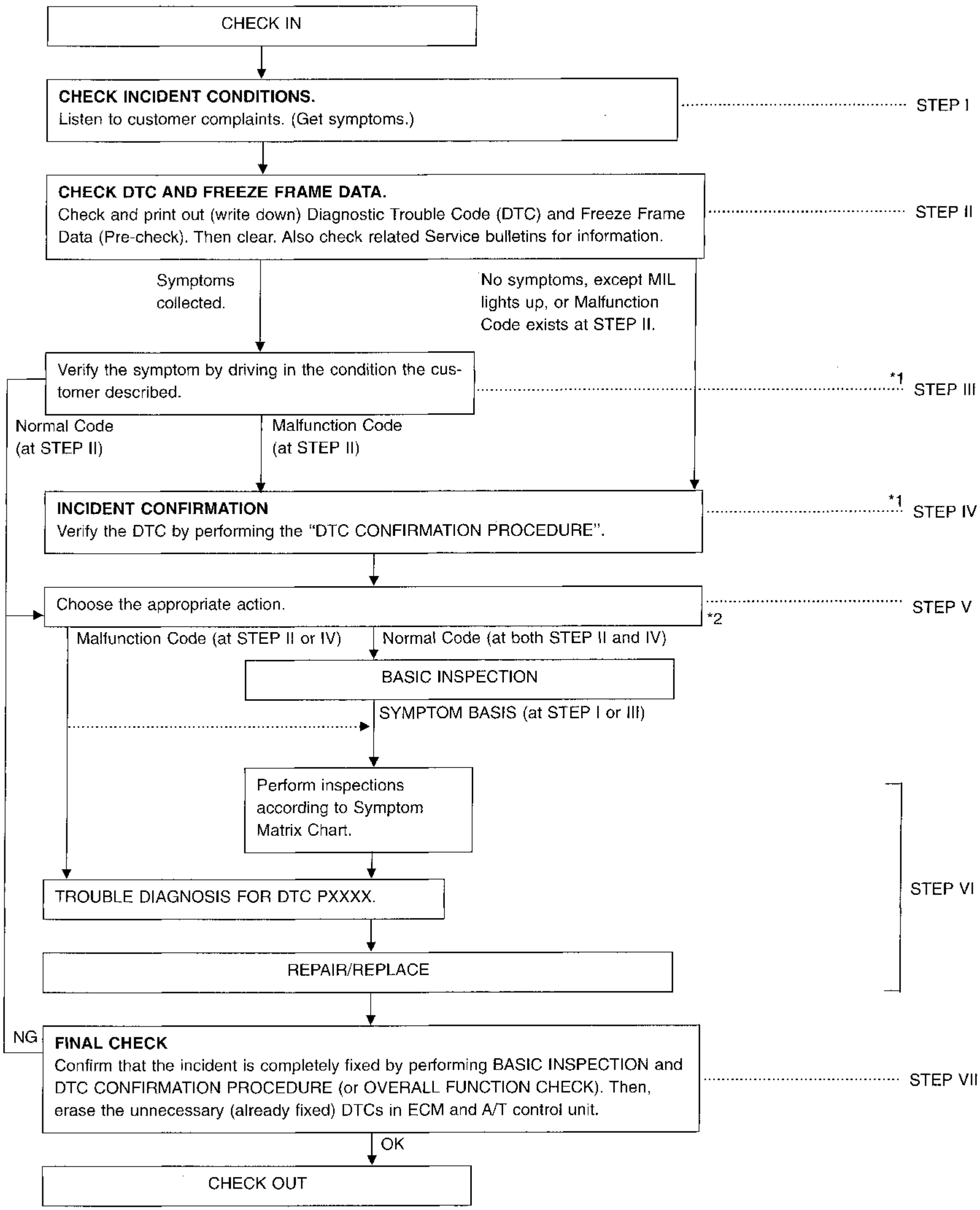
Diagnostic Worksheet (Cont'd)

WORKSHEET SAMPLE

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

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

Work Flow



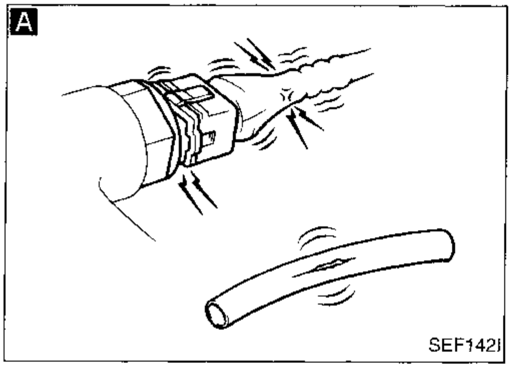
***1: If the incident cannot be duplicated, refer to GI section ("Incident Simulation Tests", "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT").**

***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-81.**

Description for Work Flow

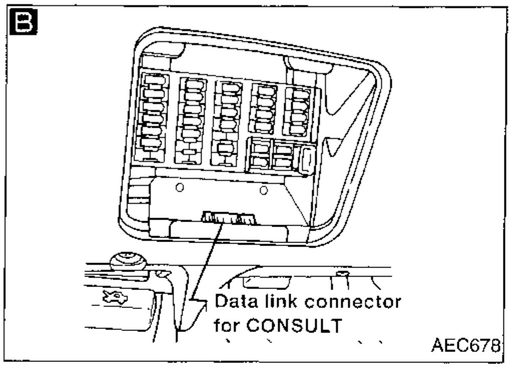
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORKSHEET" as shown on the next page.
STEP II	Before confirming the concern, check and write down (print out using CONSULT or Generic Scan Tool) the Diagnostic Trouble Code (DTC) and the freeze frame data, then erase the code and the data. Refer to EC-34.) The DTC and the freeze frame data can be used when duplicating the incident at STEP III & IV. Study the relationship between the cause, specified by DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. Refer to EC-68.)
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 Diagnostic Trouble Code (DTC) by driving in (or performing) the "DTC CONFIRMATION PROCEDURE". Check and read the DTC and freeze frame data by using CONSULT or Generic Scan Tool. During the 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 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 DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. Refer to EC-63. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-68.
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-71. 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 ("Circuit Inspection", "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"). 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. 0505 or P0000) is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) DTC in ECM and A/T control unit. (Refer to EC-34.)

A



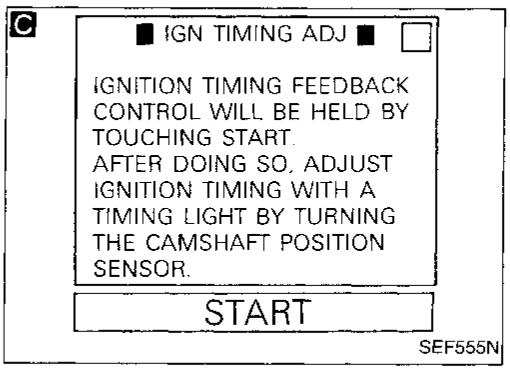
SEF142I

B



AEC678

C



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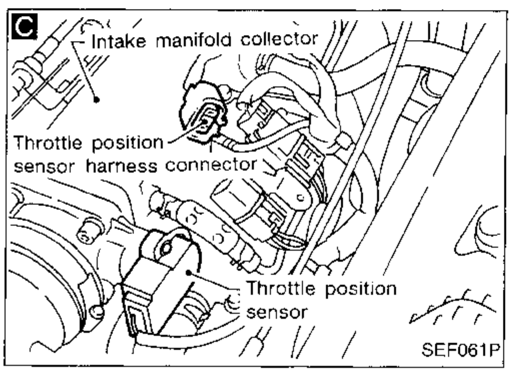
C



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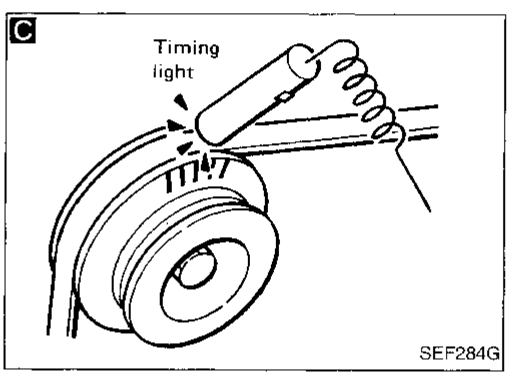
C



SEF284G

Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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

A

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

↓

B

CONNECT CONSULT TO THE VEHICLE.
Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-45.

↓

DOES ENGINE START? — No → Go to E.

Yes ↓

C

CHECK IGNITION TIMING. — NG → Adjust ignition timing by turning camshaft position sensor.

(CONSULT)
1. Warm up engine sufficiently.
2. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
3. Touch "START".
4. Check ignition timing at idle using timing light.
Ignition timing:
15°±2° BTDC

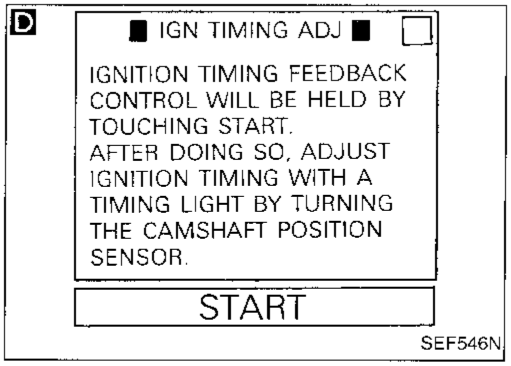
(Without CONSULT)
1. Warm up engine sufficiently.
2. Stop engine and disconnect throttle position sensor harness connector.
3. Start engine.
4. Check ignition timing at idle using timing light.
Ignition timing:
15°±2° BTDC

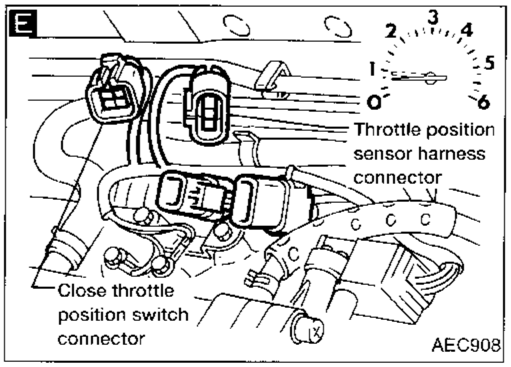
OK ↓

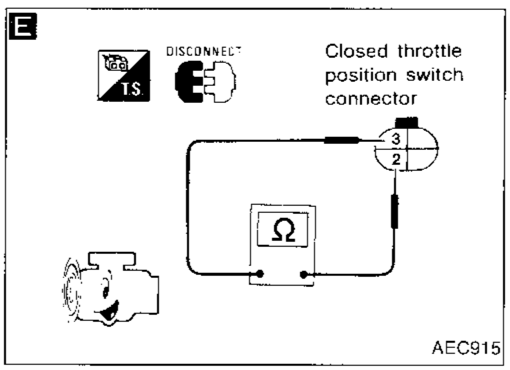
Ⓐ

(Go to next page.)

Basic Inspection (Cont'd)







Ⓐ

D

CHECK BASE IDLE SPEED.

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

OR

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

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

OK ↓

E

CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION (A/T model only).

1. Select "A/T", then "DATA MONITOR".
2. Select "ENGINE SPEED" and "CLOSED THL/SW".
3. Read "CLOSED THL/SW" signal under the following condition:
   - Raise engine speed to 2,000 rpm.
   - Gradually lower engine speed.

"CLOSED THL/SW" should turn "ON" at 1,050±150 rpm (transaxle in "N" position).

OR

1. Disconnect throttle position sensor harness connector and closed throttle position switch harness connector.
2. Check continuity between closed throttle position switch connector terminals ② and ③ as follows:
   - Raise engine speed to 2,000 rpm.
   - Gradually lower engine speed.

Continuity should exist (closed throttle position switch should close) at 1,050±150 rpm (transaxle in "N" position).

NG → Adjust continuity signal by rotating throttle position sensor body. Then, go to Ⓑ.

↓

RESET IDLE POSITION MEMORY.

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

OK ↓

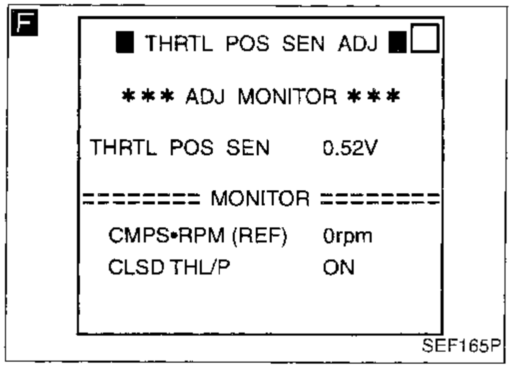
Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.

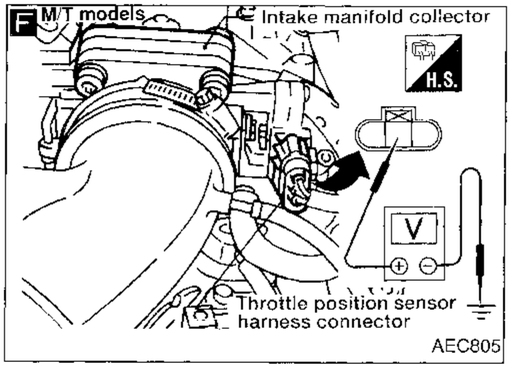
↓

Ⓑ

(Go to next page.)

Basic Inspection (Cont'd)





Ⓑ

CHECK THROTTLE POSITION SENSOR IDLE POSITION (M/T model only).

1. Perform "THRTL POS SEN ADJ" in "WORK SUPPORT" mode.
2. Check that output voltage of throttle position sensor is approx. 0.35 to 0.65V (Throttle valve fully closes.) and "CLSD THL/P SW" stays "ON".

OR

Measure output voltage of throttle position sensor using voltmeter, and check that it is approx. 0.35 to 0.65V. (Throttle valve fully closed.)

NG → Adjust output voltage to 0.50V by rotating throttle position sensor body.

↓

RESET IDLE POSITION MEMORY.

1. Warm up engine sufficiently.
2. Turn ignition switch "OFF" and wait at least 5 seconds.
3. Disconnect throttle position sensor harness connector.
4. Start engine and wait at least 5 seconds in "N" position.
5. Reconnect throttle position sensor harness connector while running engine.

OK ↓

CHECK TARGET IDLE SPEED.

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

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

OR

Check idle speed.

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

NG → Adjust idle speed. Refer to EC-27.

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-34) and "HOW TO ERASE DTC" in AT 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) • Mass air flow sensor circuit (P0100, 0102) • Throttle position sensor circuit (P0120, 0403) • EGRC solenoid valve circuit (P1400, 1005) • A/T diagnosis communication line (P1605, 0804)	• Camshaft position sensor circuit (P0340, 0101) • Vehicle speed sensor circuit (P0500, 0104) • Intake air temperature sensor circuit (P0110, 0401) • Knock sensor circuit (P0325, 0304)	• Engine coolant temperature sensor circuit (P0115, 0103) (P0125, 0908) • Ignition signal circuit (P1320, 0201) • Park/Neutral position switch circuit (P0705, 1003)
2	• EGR temperature sensor circuit (P1401, 0305) • A/T related sensors, solenoid valves and switches (P0705, 1101) (P0720, 1102) (P0750, 1108) (P0755, 1201) (P0740, 1204) (P0745, 1205) (P0725, 1207) (P0710, 1208)	• Crankshaft position sensor circuit (P0335, 0802) (P1336, 0905) • Cooling fan circuit (P1900, 0208) • Front heated oxygen sensor heater circuit (P0135, 0901)	• Front heated oxygen sensor circuit (P0130, 0303) • Rear heated oxygen sensor circuit (P0136, 0707)
3	• EGR function (P0400, 0302) • EGRC-BPT valve function (P0402, 0306) • IACV-AAC valve circuit (P0505, 0205)	• Misfire (P0300 - P0304, 0701 - 0605) • Closed loop control (P0130, 0307) • Improper shifting (P0731 - P0734, 1103 - 1106)	• Fuel injection system function (P0170, 0706) • Three way catalyst function (P0420, 0702)

Fail-Safe Chart

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

<table>
<tr><th colspan="2">DTC No.</th><th rowspan="2">Detected items</th><th rowspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><th>CONSULT
GST</th><th>ECM*1</th></tr>
<tr><td>P0100</td><td>0102</td><td>Mass air flow sensor circuit</td><td>Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>P0115</td><td>0103</td><td>Engine coolant temperature sensor circuit</td><td>Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START".
CONSULT displays the engine coolant temperature decided by the ECM.
<table>
<tr><th>Condition</th><th>Engine coolant temperature decided (CONSULT display)</th></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
</table></td></tr>
<tr><td>P0120</td><td>0403</td><td>Throttle position sensor circuit</td><td>Throttle position will be determined based on the injected fuel amount and the engine speed.
Therefore, acceleration will be poor.
<table>
<tr><th>Condition</th><th>Driving condition</th></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
</table></td></tr>
<tr><td>Unable to access ECCS</td><td>Unable to access Diagnostic Test Mode II</td><td>ECM</td><td>ECM fail-safe activating condition
The computing function of the ECM was judged to be malfunctioning.
When the fail-safe system activates (i.e., if the ECM detects a malfunction condition in the CPU of ECM), the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver.
However it is not possible to access ECCS and DTC cannot be confirmed.
Engine control with ECM fail-safe
When ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.
<table>
<tr><th></th><th>ECM fail-safe operation</th></tr>
<tr><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm</td></tr>
<tr><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td>Ignition timing</td><td>Ignition timing is fixed at the preset valve</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td>Cooling fans</td><td>Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls</td></tr>
</table>
Replace ECM, if ECM fail-safe condition is confirmed.</td></tr>
</table>

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

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM: HARD/NO START/RESTART (EXCP. HA) AA	ENGINE STALL AB	HESITATION/SURGING/FLAT SPOT AC	SPARK KNOCK/DETONATION AD	LACK OF POWER/POOR ACCELERATION AE	HIGH IDLE/LOW IDLE AF	ROUGH IDLE/HUNTING AG	IDLING VIBRATION AH	SLOW/NO RETURN TO IDLE AJ	OVERHEATS/WATER TEMPERATURE HIGH AK	EXCESSIVE FUEL CONSUMPTION AL	EXCESSIVE OIL CONSUMPTION AM	BATTERY DEAD (UNDER CHARGE) HA	Reference page
Fuel	Fuel pump circuit	●	●	●	○	●		●	●			●		○	EC-223
	Fuel pressure regulator system	●	●	●	○	●	○	●	●	○		●			EC-25
	Injector circuit	●	●	●	○	●		●	●			●			EC-217
	Evaporative emission system	○	○	○	○	○	○	○	○	○		○			EC-22
Air	Positive crankcase ventilation system	○	○	●	○	○	○	●	●	○		○	○		EC-24
	IACV-Air regulator	●	●	●	○	●	●	●	●	●		○			EC-233
	Incorrect idle speed adjustment	○	○				○	○	○	○		○			EC-27
	IACV-AAC valve circuit	●	●	●	○	●	●	●	●	●		●		○	EC-167
	IACV-FICD solenoid valve circuit	○	○	○	○	○	○	○	○	○		○			EC-237
Ignition	Incorrect ignition timing adjustment	○	○	●	●	●		●	●			●			EC-27
	Ignition circuit	●	●	●	●	●		●	●			●			EC-180
EGR	EGR valve & EVAP canister purge control solenoid valve circuit		●	●	●	○						●			EC-191
	EGR system	○	●	●	●	○	○	●	●	○		○			EC-149
Main power supply and ground circuit		○	○	○	○	○		○	○		○	○		○	EC-81
Cooling	Cooling fan circuit	○	○	○	○	○	○	○	○	○	○	○		○	EC-203
Air conditioner circuit		○	○	○	○	○	○	○	○	○		○		○	HA section

● : High Possibility Item
○ : Low Possibility Item

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — ECCS system		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
ECCS	Camshaft position sensor circuit	●	●	●	○	○		○	○			○			EC-143
	Mass air flow sensor circuit	●	●	●	○	●		●	●			●			EC-85
	Front heated oxygen sensor circuit		●	●	○	●		●	●			●			EC-111
	Engine coolant temperature sensor circuit	●	●	●	○	●	●	●	●	●		●			EC-96, 106
	Throttle position sensor circuit		●	●		●	●	●	●	●		●			EC-100
	Incorrect throttle position sensor adjustment		●	○		○	●	○	○	●		○			EC-65
	Vehicle speed sensor circuit		○	○		○						○			EC-163
	Knock sensor circuit			○	○	○						○			EC-135
	ECM	○	○	○	○	○	○	○	○	○	○	○			EC-172, 67
	Start signal circuit	○													EC-220
	Park/Neutral position switch circuit			○		○		○	○			○			EC-174
	Power steering oil pressure switch circuit		○					○	○						EC-229

●: High Possibility Item
○: Low Possibility Item

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — Engine mechanical & other		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	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	○	○	○		○		○	○			○		○	EL section
	Alternator circuit	○	○	○		○		○	○			○		○	
	Starter circuit	●													
	Flywheel	●													—
	Clutch interlock switch	○													CL section
	Inhibitor switch	○													AT section
Engine	Cylinder head	●	●	●	●	●		●	●			○			—
	Cylinder head gasket	●	●	○	○	●		○	○		○	○	○		
	Cylinder block	●	○	○	○	○		○	○			○	○		
	Piston	●	●	○	●	○		○	○			○	○		
	Piston ring	●	○	○	○	○		○	○			○	○		
	Connecting rod	○	○	○	○	○		○	○			○			
	Bearing	○	○	○	○	○		○	○			○			
	Crankshaft	○	○	○	○	○		○	○			○			
Valve mechanism	Timing chain	●	●	●	○	●		○	○			○			
	Camshaft	●	●	●	○	○		●	●			○			
	Intake valve	●	○	○	●	○		○	○			○	○		
	Exhaust valve	●	○	○	○	○		○	○			○	○		
	Hydraulic lash adjuster		○	○	○	○		○	○			○			
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	○	○	○	○	○		○	○			○			
	Three way catalyst	●	●	○	○	○		○	○			○			
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	●	○	○	○	○		●	●			○	○		
	Oil level (Low)/Filthy oil	○	○	○	○	○		○	○			○	○		
Cooling	Radiator/Hose/Radiator filler cap	○	○	○	○	○		○	○		○	○			
	Thermostat	○	○	○	○	○	○	○	○	○	○	○			
	Water pump	○	○	○	○	○		○	○		○	○			
	Water gallery	○	○	○	○	○		○	○		○	○			
	Cooling fan	○	○	○	○	○	○	○	○	○	○	○			
	Coolant level (low)/Contaminated coolant	○	○	○	○	○		○	○		○	○			

● : High Possibility Item
○ : Low Possibility Item

CONSULT Reference Value in Data Monitor Mode

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

MONITOR ITEM	CONDITION		SPECIFICATION
CMPS·RPM (REF)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	1.3 - 1.7V
		2,000 rpm	1.7 - 2.1V
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
FR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR			LEAN ↔ RICH Changes more than 5 times during 10 seconds.
RR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 ↔ Approx. 1.5V
RR O2 MNTR			LEAN ↔ RICH
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
THRTL POS SEN	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.35 - 0.65V
		Throttle valve fully opened	Approx. 4.0V
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/P SW	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever "P" or "N"	ON
		Except above	OFF

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

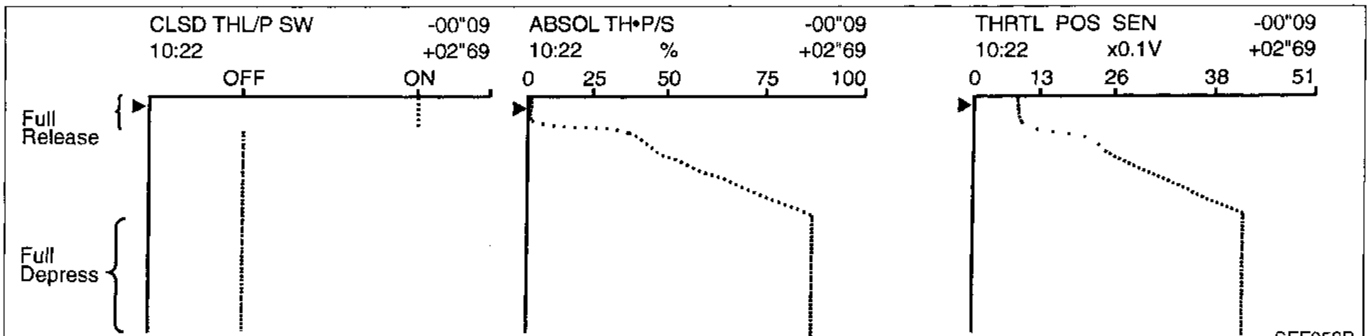
MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
IGNITION SW	● Ignition switch: ON → OFF		ON → OFF
INJ PULSE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	2.4 - 3.2 msec.
		2,000 rpm	1.9 - 2.8 msec.
B/FUEL SCHDL	ditto	Idle	1.0 - 1.6 msec
		2,000 rpm	0.7 - 1.3 msec
IGN TIMING	ditto	Idle	13 - 15° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V	ditto	Idle	20 - 40%
		2,000 rpm	—
A/F ALPHA	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	53 - 155%
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (stops in 1.0 seconds)		ON
	● Except as shown above		OFF
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less for A/T models, and 99°C (210°F) or less for M/T models	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F) for A/T models only	LOW
		Engine coolant temperature is 105°C (221°F) or more for A/T models, and 100°C (212°F) or more for M/T models	HIGH
EGRC SOL/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	ON
		2,000 rpm	OFF
FR O2 HEATER	● Engine speed: Idle		ON
	● Engine speed: Above 3,200 rpm		OFF
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	17.0 - 30.0%
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	2.5 - 5.0 g·m/s
		2,500 rpm	7.1 - 12.5 g·m/s

Major Sensor Reference Graph in Data Monitor Mode

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

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

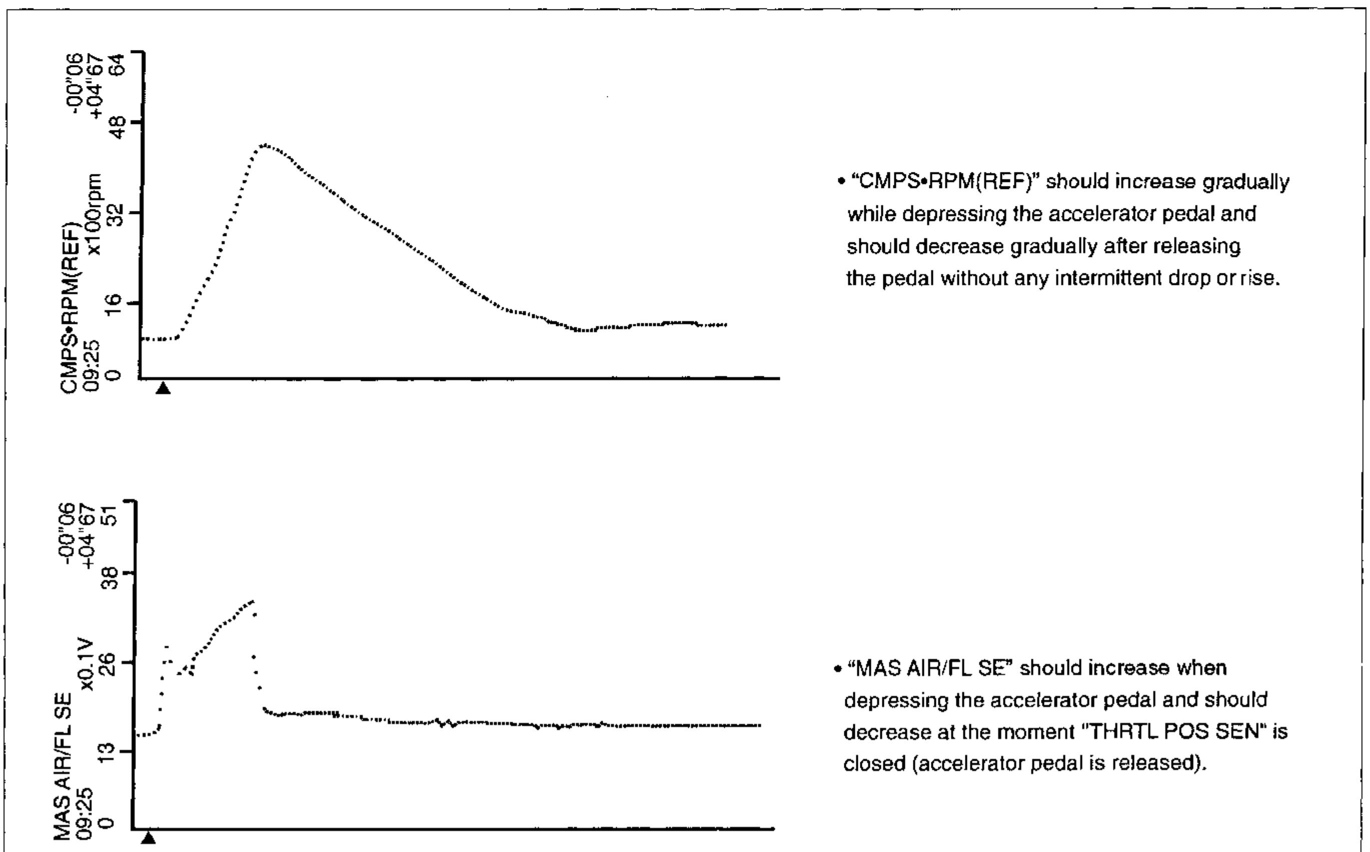
Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL/P SW" when depressing the accelerator pedal with the ignition switch "ON".
The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL/P SW" is changed from "ON" to "OFF".



SEF058P

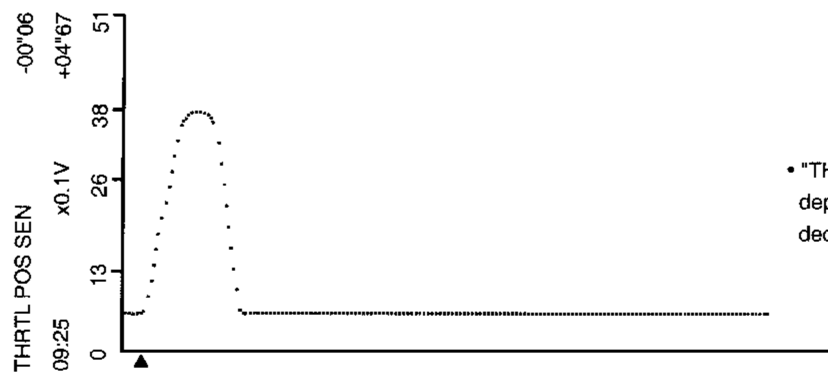
CMPS·RPM (REF), MAS AIR/FL SE, THRTL POS SEN, RR O2 SENSOR, FR O2 SENSOR, INJ PULSE

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

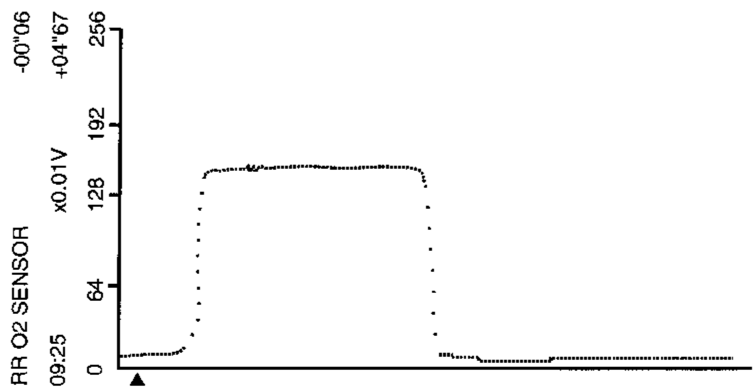


SEF059P

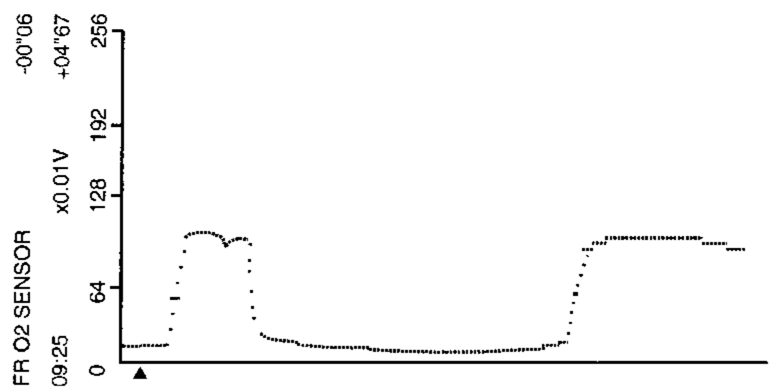
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



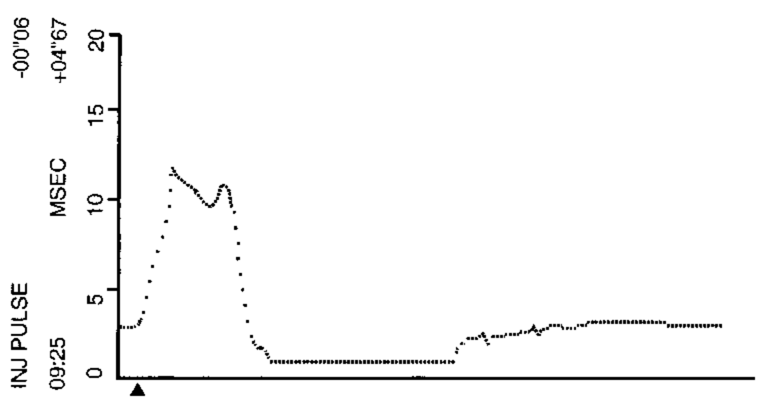
• "THRTL POS SEN" should increase while depressing the accelerator pedel and should decrease while releasing it.



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



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

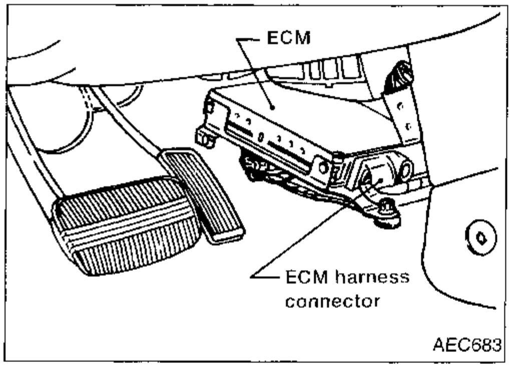


• "INJ PULSE" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

SEF060P

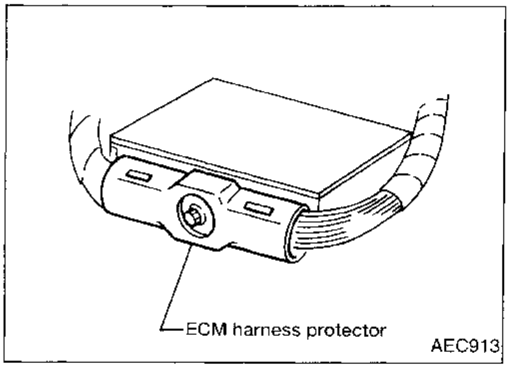
ECM Terminals and Reference Value

PREPARATION



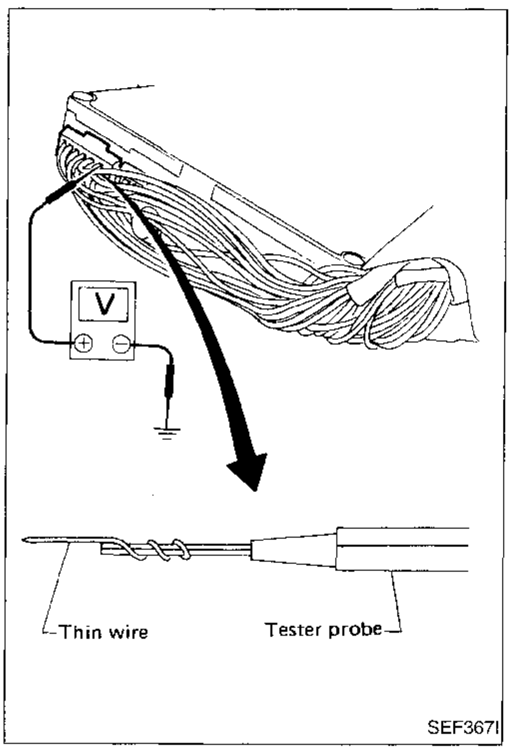
AEC683

1. ECM is located behind the center console. For this inspection, remove the front passenger center console panel.



AEC913

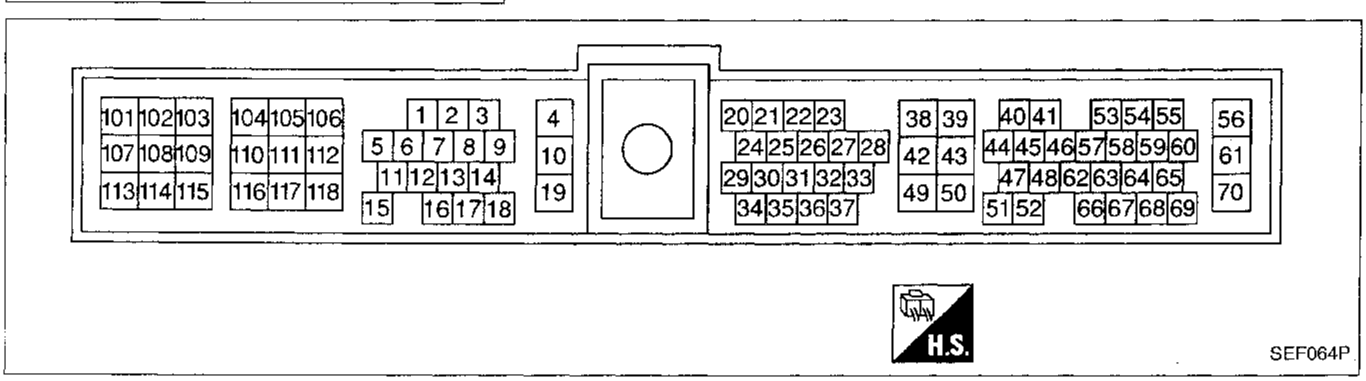
2. Remove ECM harness protector.



SEF367I

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

ECM HARNESS CONNECTOR TERMINAL LAYOUT



SEF064P

GI
MA
EM
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EC
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ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	W/B	Ignition signal	Engine is running. └ Idle speed	0.2 - 0.3V*
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.5V*
2	W	Ignition check	Engine is running. └ Idle speed	Approximately 12V*
3	L/OR	Tachometer	Engine is running. └ Idle speed	0.6 - 1.6V*
4	W/G	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
7	PU (A/T models)	A/T check signal	Ignition switch "ON" Engine is running.	1.0 - 8.0V
8	B/P	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.07 - 0.20V
			Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
10	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
13	LG (A/T models)	Cooling fan relay (High)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan (High) is operating	0.07 - 0.10V
14	LG/R	Cooling fan relay (Low)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan (Low) is operating	0.07 - 0.10V

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

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
15	G/Y	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON"	0.08 - 0.2V
			Engine is running. └ A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
18	OR/L	Malfunction indicator lamp	Ignition switch "ON"	Approximately 80mV
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
19	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
20	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
21	L/W	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			Engine is running. └ Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
22	G/OR	Neutral position switch (M/T models) Inhibitor switch (A/T models)	Ignition switch "ON" ├ Gear position is "Neutral position" (M/T models) └ Gear position is "N" or "P" (A/T models)	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	BATTERY VOLTAGE (11 - 14V)
23	Y	Throttle position sensor	Ignition switch "ON" └ Accelerator pedal released	0.35 - 0.65V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
25	SB	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned	Approximately 0V
			Engine is running. └ Steering wheel is not being turned	Approximately 5V
26	PU/R	Vehicle speed sensor	Engine is running. └ Slowly rotating front wheels	Approximately 1.8 - 2.4V* (AC voltage)

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

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	GY	Throttle position sensor signal	Ignition switch "ON" Accelerator pedal released	Approximately 0.4V
			Ignition switch "ON" Accelerator pedal fully depressed	Approximately 3V
38	B/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39	B	ECCS ground	Engine is running. Idle speed	Engine ground
40 44	L L	Camshaft position sensor (Reference signal)	Engine is running. Idle speed	Approximately 2.7V* (AC voltage)
43	B	ECCS ground	Engine is running. Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
41 45	B/W B/W	Camshaft position sensor (Position signal)	Engine is running. Idle speed	Approximately 2.7V* (AC voltage)
46	W	Front heated oxygen sensor	Engine is running. After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 1.0V (periodically change)
47	OR	Mass air flow sensor	Engine is running. (Warm-up condition) Idle speed	1.3 - 1.7V
			Engine is running. (Warm-up condition) Engine speed is 2,000 rpm	1.7 - 2.1V
48	W	Mass air flow sensor ground	Engine is running. (Warm-up condition) Idle speed	0.005 - 0.02V
49	P/L	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
50	B	Sensors' ground	Engine is running. (Warm-up condition) Idle speed	0.001 - 0.02V
51	BR/Y	Engine coolant temperature sensor	Engine is running.	0 - 4.84V Output voltage varies with engine coolant temperature.
52	W	Rear heated oxygen sensor	Engine is running. After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 2.2V**

*Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)
**During the on board diagnosis for the open circuit, approx. 1.5 - 5V will appear. This is not a malfunction. (Refer to page EC-121.)

ECM Terminals and Reference Value (Cont'd)

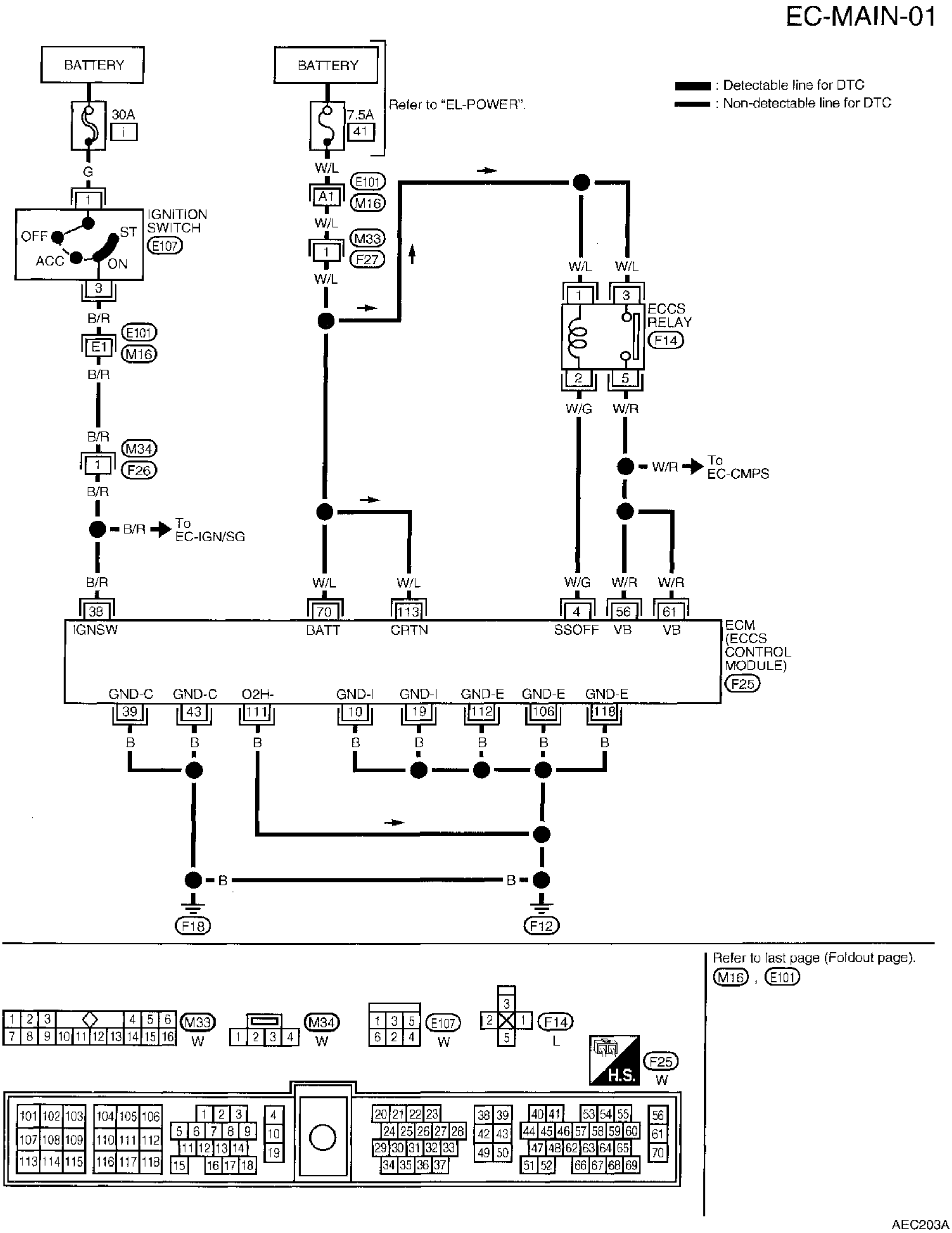
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
53	W	Crankshaft position sensor (OBD)	Engine is running. (A/T: N range, M/T: Neutral) └ Idle speed (Air conditioner switch "OFF")	More than 0.4V* (AC voltage)
54	W	Knock sensor	Engine is running. └ Idle speed	2.0 - 3.0V
56 61	W/R W/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
58	L/B	Data link connector for GST	Engine is running. └ Idle speed (GST is disconnected)	6 - 10V
62	R/B	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V
			Engine is running. (Warm-up condition) └ EGR system is operating	0 - 1.5V
63	R/Y	Intake air temperature sensor	Engine is running.	0 - 4.8V Output voltage varies with intake air temperature.
64	G/B	Data link connector for CONSULT	Engine is running. └ Idle speed (CONSULT is connected and turned on)	Approximately 0V
65	GY/L			Approximately 4 - 9V
68	G/W			Approximately 3.5V*
70	W/L	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	SB	IACV-AAC valve	Engine is running. └ Idle speed	Approximately 5 - 14V
			Engine is running. ├ Steering wheel is being turned ├ Air conditioner is operating └ Headlamps are in high position	5 - 9V
102	R/B	Injector No. 1	Engine is running	BATTERY VOLTAGE (11 - 14V)
104	G/B	Injector No. 3		
107	Y/B	Injector No. 2		
109	L/B	Injector No. 4		
103	P	EGR valve & EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Idle speed	0.06 - 0.11V
106	B	ECCS ground	Engine is running. └ Idle speed	Engine ground

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

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
108	R/Y	Rear heated oxygen sensor heater	Ignition switch "ON" Engine is running.	Approximately 0.2V
111	B	Rear heated oxygen sensor heater ground	Engine is running. └ Idle speed	0.02 - 0.07V
112	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
113	W/L	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
115	OR	Front heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,200 rpm	Approximately 0.2V
			Engine is running. └ Engine speed is above 3,200 rpm	BATTERY VOLTAGE (11 - 14V)
118	B	ECCS ground	Engine is running. └ Idle speed	Engine ground

Main Power Supply and Ground Circuit



AEC203A

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

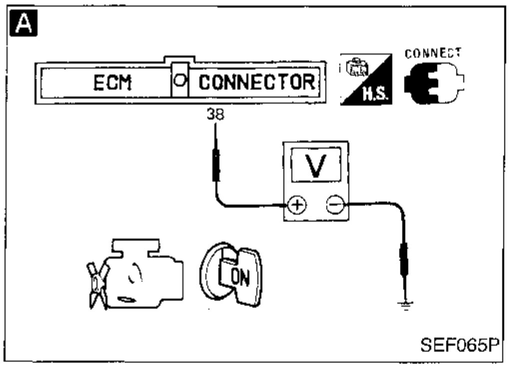
Main Power Supply and Ground Circuit (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

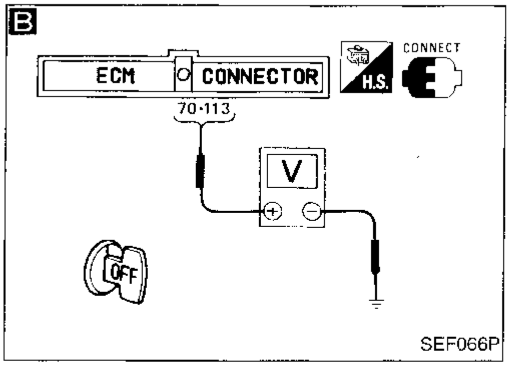
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	W/G	ECCS relay (Self-shutoff)	[Engine is running.] [Ignition switch "OFF"] └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
10	B	ECCS ground	[Engine is running.] └ Idle speed	Engine ground
19	B	ECCS ground	[Engine is running.] └ Idle speed	Engine ground
38	B/R	Ignition switch	[Ignition switch "OFF"]	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
39	B	ECCS ground	[Engine is running.] └ Idle speed	Engine ground
43	B	ECCS ground	[Engine is running.] └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
56 61	W/R W/R	Power supply for ECM	[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
70	W/L	Power supply (Back-up)	[Ignition switch "OFF"]	BATTERY VOLTAGE (11 - 14V)
106	B	ECCS ground	[Engine is running.] └ Idle speed	Engine ground
111	B	Rear heated oxygen sensor heater ground	[Engine is running.] └ Idle speed	0.02 - 0.07V
112	B	ECCS ground	[Engine is running.] └ Idle speed	Engine ground
113	W/L	Current return	[Engine is running.] └ Idle speed	BATTERY VOLTAGE (11 - 14V)
118	B	ECCS ground	[Engine is running.] └ Idle speed	Engine ground

Main Power Supply and Ground Circuit (Cont'd)



SEF065P



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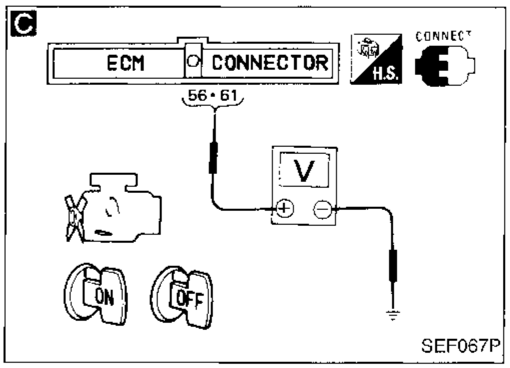

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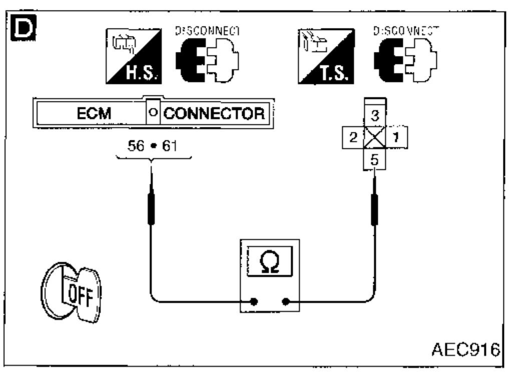


AEC916

INSPECTION START

↓

Start engine.
Is engine running?

No → **A**

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

If NG, check the following.
- Harness connectors (M16), (E101)
- Harness connectors (F26), (M34)
- Harness for open or short between ECM and ignition switch

If NG, repair harness or connectors.

↓ OK

Go to **H** "CHECK GROUND CIRCUIT" on next page.

Yes ↓

B

CHECK POWER SUPPLY-II.
1. Stop engine.
2. Check voltage between ECM terminals (70), (113) and ground with CONSULT or tester.
   Voltage: Battery voltage

NG →

Check the following.
- Harness connectors (M16), (E101)
- Harness connectors (F27), (M33)
- 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 "OFF".
2. Check voltage between ECM terminals (56), (61) and ground with CONSULT or tester.
   Voltage:
   After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

OK →

Go to **H** "CHECK GROUND CIRCUIT" on next page.

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

↓ NG

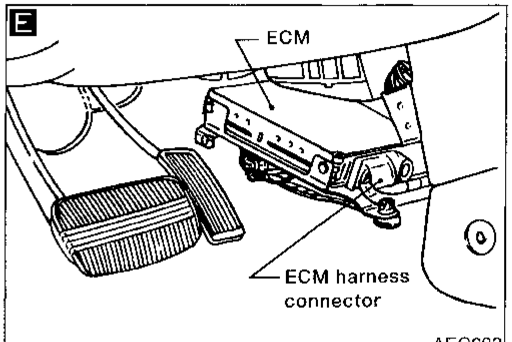
Case-2 →

Go to **G** "CHECK ECCS RELAY" on next page.

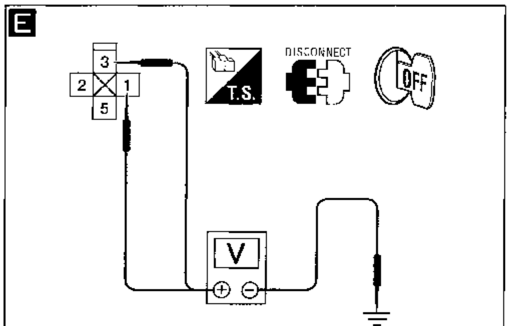
Case-1 ↓

(A)
(Go to next page.)

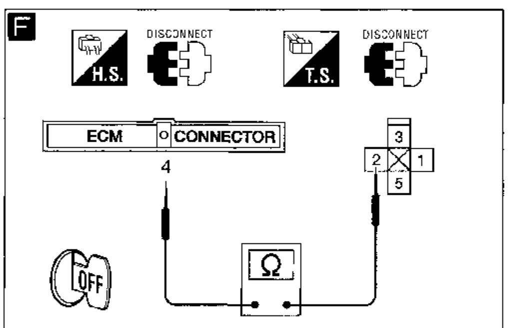
Main Power Supply and Ground Circuit (Cont'd)



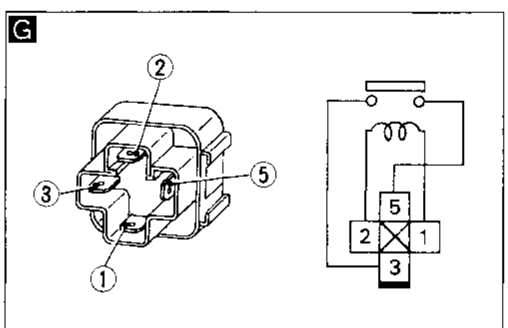
AEC683

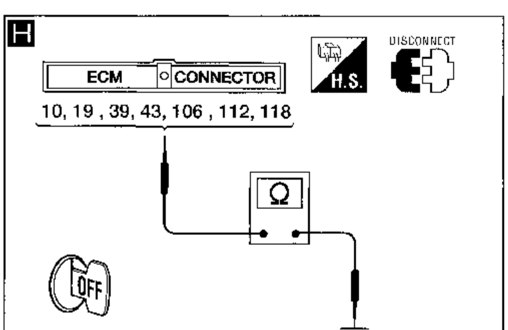


AEC684



AEC492


SEF090M



AEC496

A

D

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM
1. Disconnect ECM harness connector.
2. Disconnect ECCS relay harness connector.
3. Check harness continuity between ECM terminals 56, 61 and terminal 5.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

E

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

NG → Check the following.
- Harness for open or short between ECCS relay and battery

If NG, repair harness or connectors.

OK ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
Check harness continuity between ECM terminal 4 and terminal 2.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

G

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

NG → Replace ECCS relay.

OK ↓

H

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 10, 19, 39, 43, 106, 112, 118 and engine ground.
   Continuity should exist.
   If OK, check harness for short.

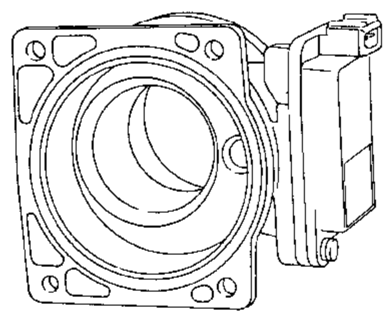
NG → Repair harness or connectors.

OK ↓

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

↓

INSPECTION END



SEF781K

Mass Air Flow Sensor (MAFS)

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	1.3 - 1.7V
		2,000 rpm	1.7 - 2.1V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	20.0 - 35.5%
		2,500 rpm	17.0 - 30.0%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	2.5 - 5.0 g·m/s
		2,500 rpm	7.1 - 12.5 g·m/s

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	OR	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.3 - 1.7V
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	1.7 - 2.1V
48	W	Mass air flow sensor ground	Engine is running. (Warm-up condition) └ Idle speed	0.005 - 0.02V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Item (Possible Cause)
P0100 0102	A) An excessively high or low voltage from the sensor is sent to ECM. .... B), C) 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

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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.

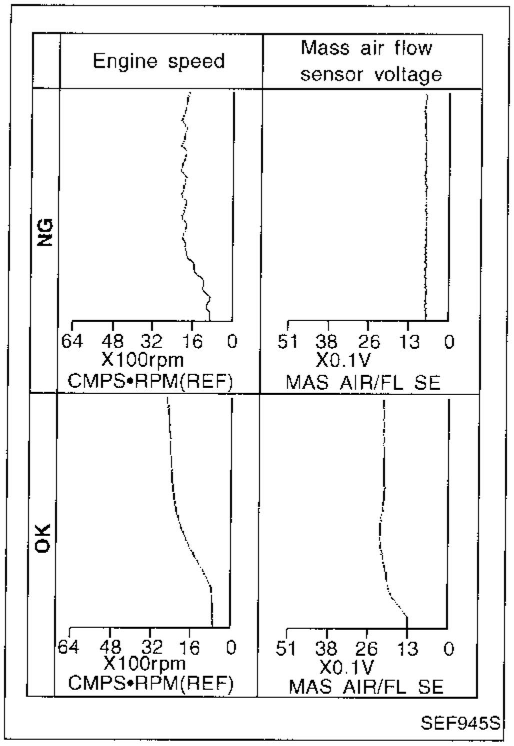
OR

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

OR

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

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



SEF945S

Procedure for malfunction B

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

OR

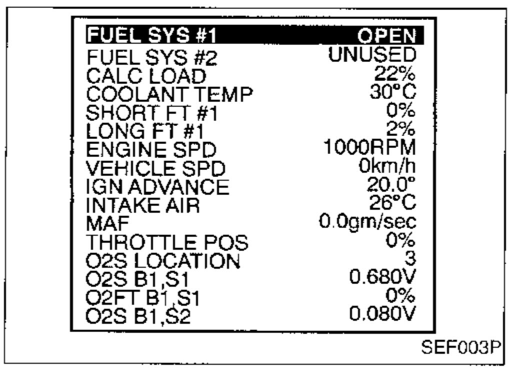
1) Turn ignition switch "ON".
2) Start engine and warm it up sufficiently.
3) Run engine for at least 10 seconds at idle speed.
4) Select "MODE 3" with GST.

OR

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

OVERALL FUNCTION CHECK

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



SEF003P

Procedure for malfunction C

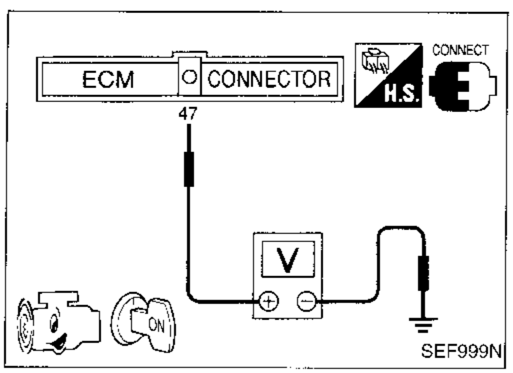
1) Turn ignition switch "ON".
2) Start engine and warm it up sufficiently.
3) Select "DATA MONITOR" mode with CONSULT.
4) Check the voltage of mass air flow sensor with "DATA MONITOR".
5) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

OR

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

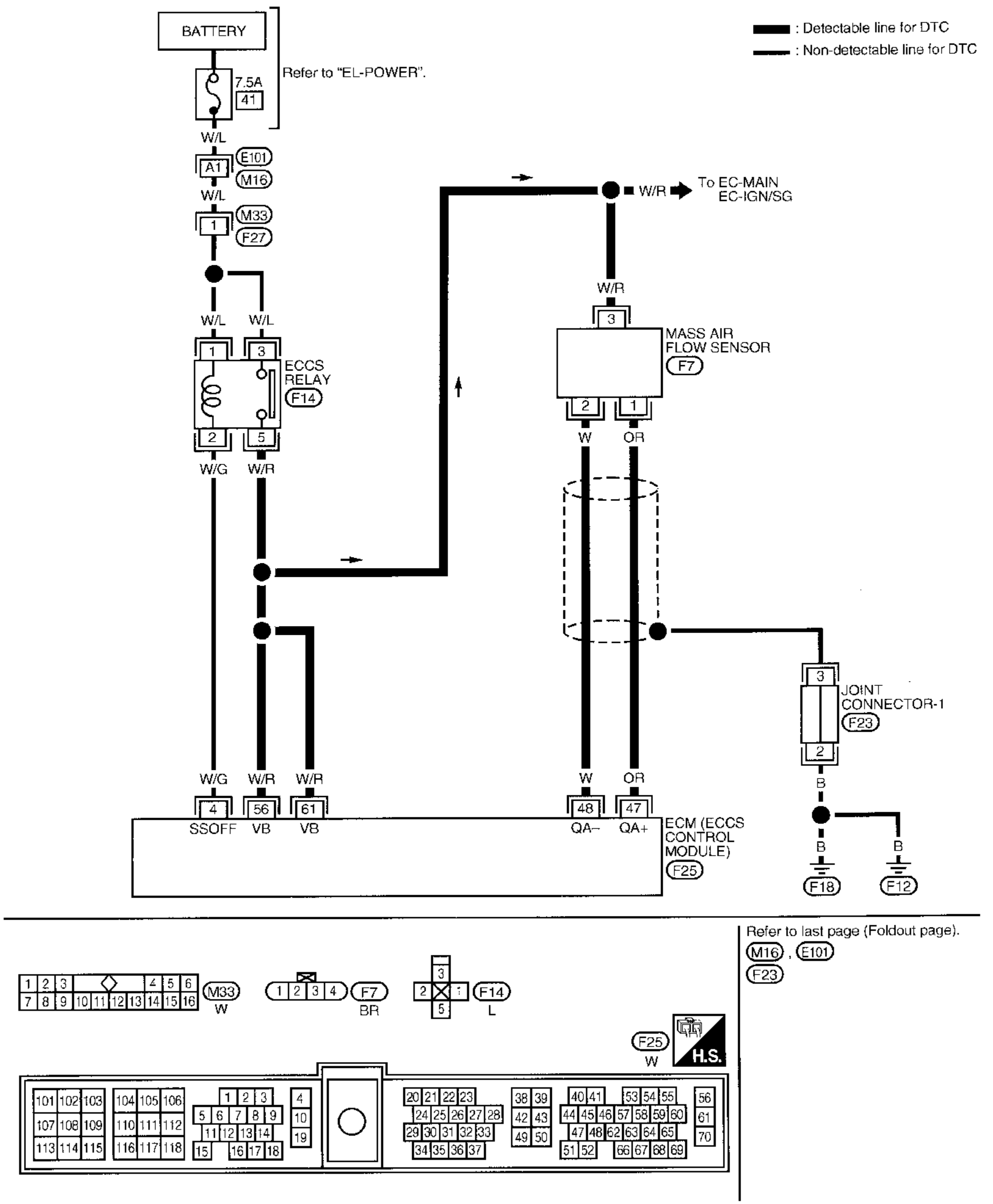
OR

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



SEF999N

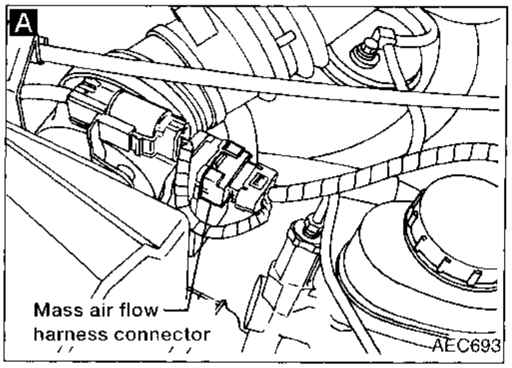
EC-MAFS-01

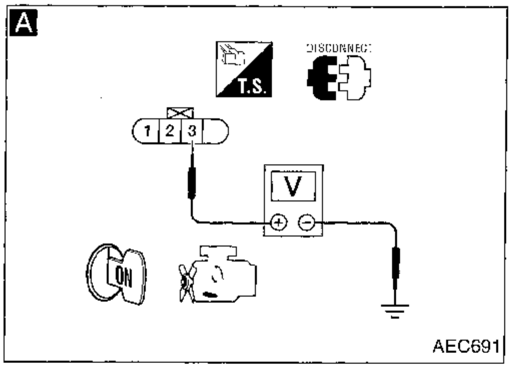


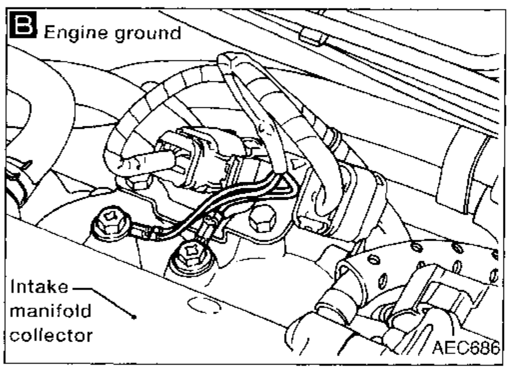
AEC204A

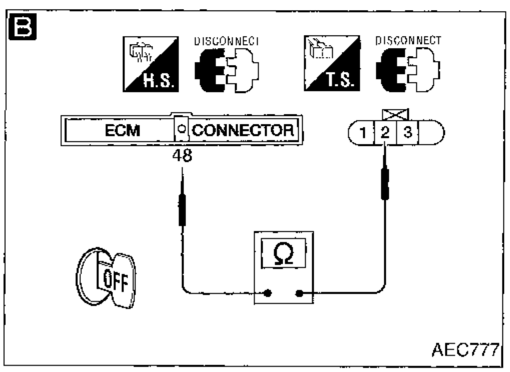
Mass Air Flow Sensor (MAFS) (Cont'd)

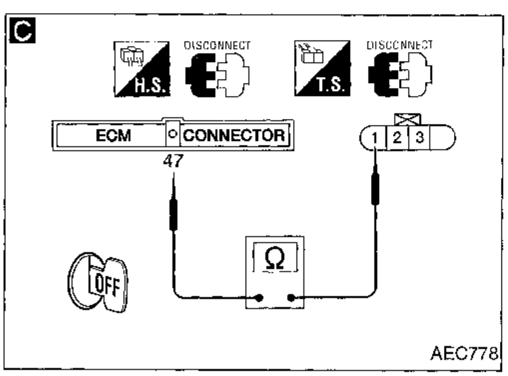
DIAGNOSTIC PROCEDURE











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 connectors.

↓ OK

B

CHECK GROUND CIRCUIT.

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

NG → Repair harness or connectors.

↓ OK

C

CHECK INPUT SIGNAL CIRCUIT.

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

NG → 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.

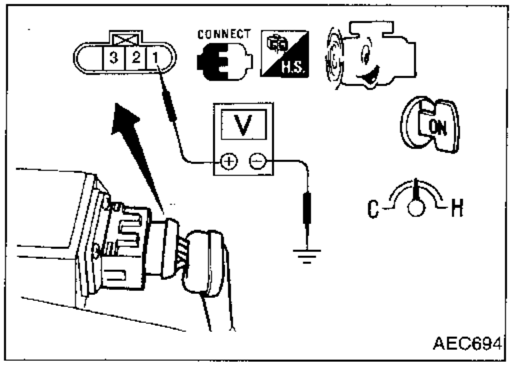
↓ Trouble is not fixed.

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

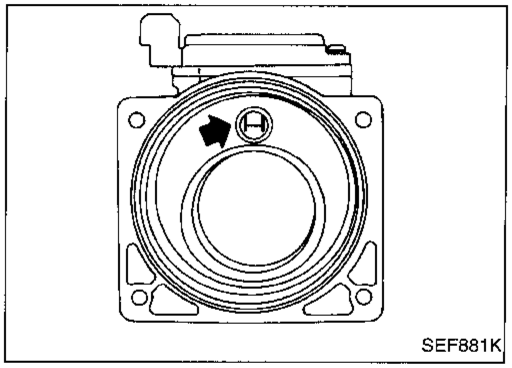
↓

INSPECTION END

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



AEC694


SEF881K

COMPONENT INSPECTION

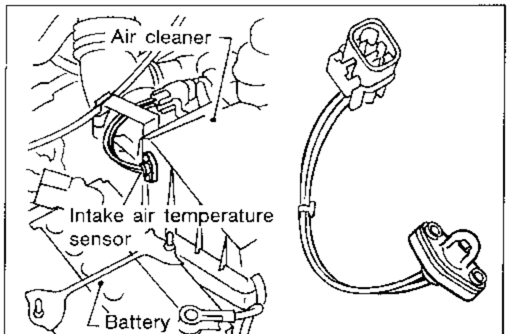
Mass air flow sensor

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

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

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

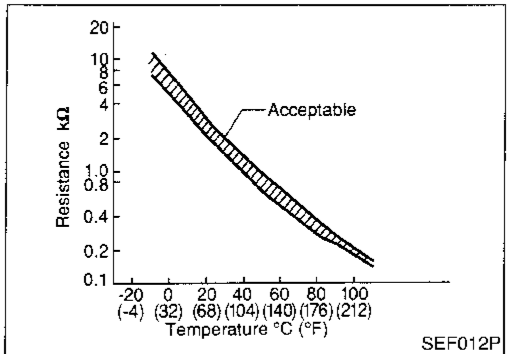
4. If NG, remove mass air flow sensor from air duct. Check hot wire for damage or dust.



SEF005P

Intake Air Temperature Sensor

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



SEF012P

⟨Reference data⟩

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

ECM TERMINALS AND REFERENCE VALUE

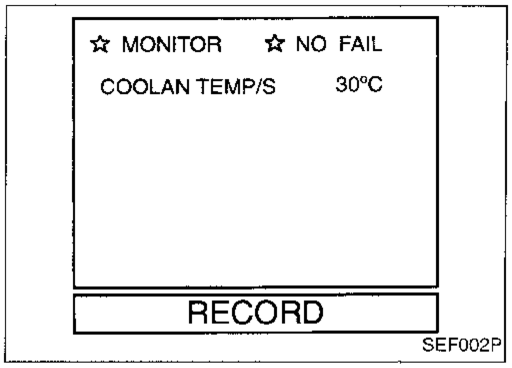
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
50	B	Sensor ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V
63	R/Y	Intake air temperature sensor	Engine is running.	0 - 4.8V Output voltage varies with intake air temperature.

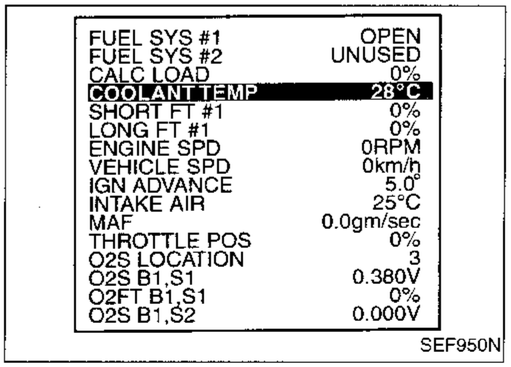
ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Item (Possible Cause)
P0110 0401	A) An excessively low or high voltage from the sensor is sent to ECM. B) Voltage sent to ECM is not practical when compared with the engine coolant temperature sensor signal.	• Harness or connectors (The sensor circuit is open or shorted.) • Intake air temperature sensor

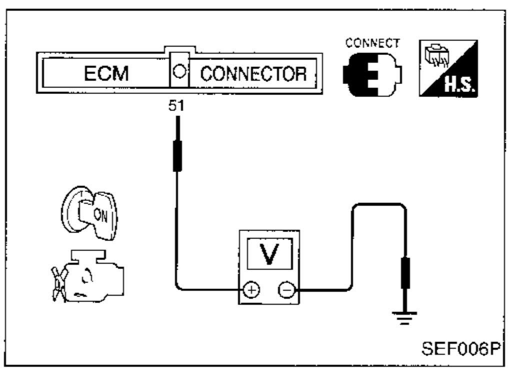
Intake Air Temperature Sensor (Cont'd)



SEF002P



SEF950N



SEF006P

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Procedure for malfunction A and B

1) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Select "DATA MONITOR" mode with CONSULT.
   (c) Check the engine coolant temperature.
   (d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.
2) Turn ignition switch "ON".
3) Select "DATA MONITOR" mode with CONSULT.
4) Wait at least 5 seconds.

OR

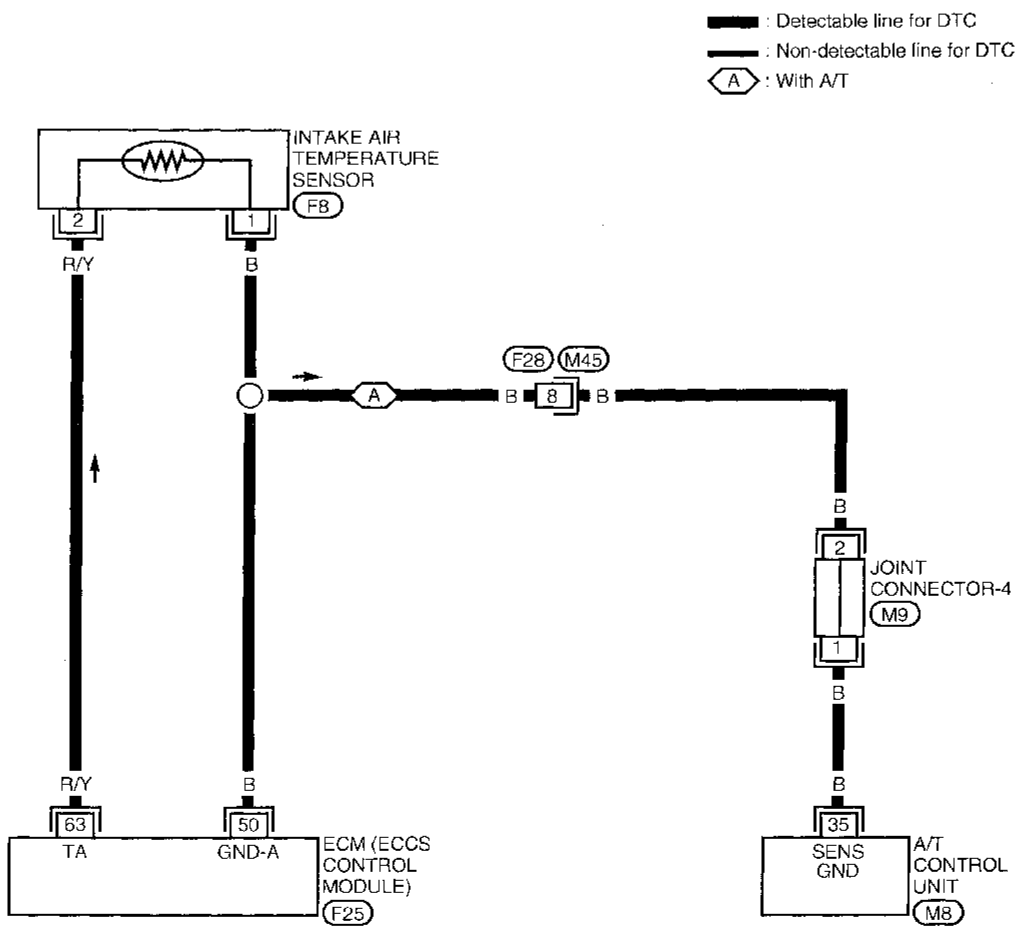
1) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Select MODE 1 with GST.
   (c) Check the engine coolant temperature.
   (d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.
2) Turn ignition switch "ON" and wait at least 5 seconds.
3) Select MODE 3 with GST.

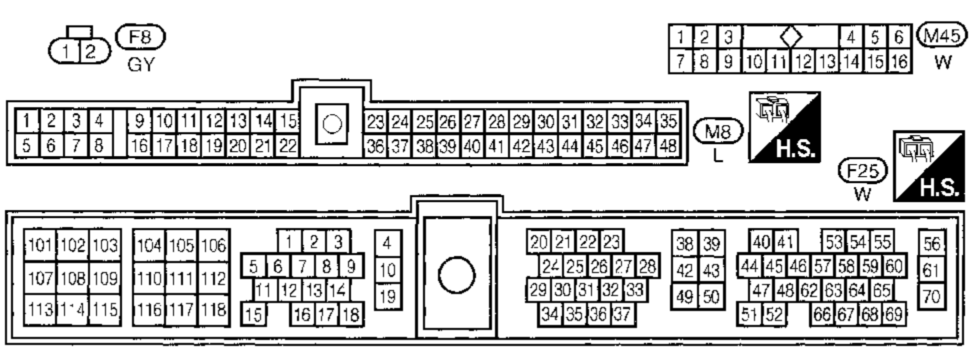
OR

NO TOOLS

1) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Check voltage between ECM terminal 51 and ground.
   Voltage: More than 1.2 (V)
   (c) If the voltage is not more than 1.2V, turn ignition switch "OFF" and cool down engine.
2) Turn ignition switch "ON" wait 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-IATS-01



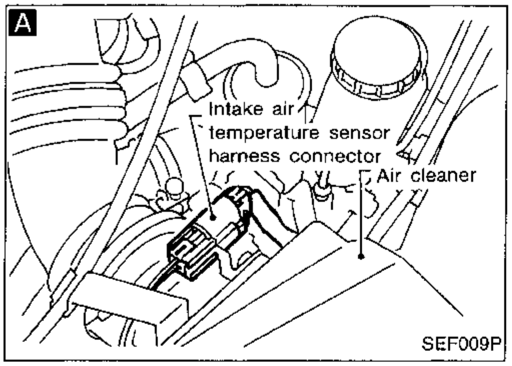


Refer to last page (Foldout page).
(M9)

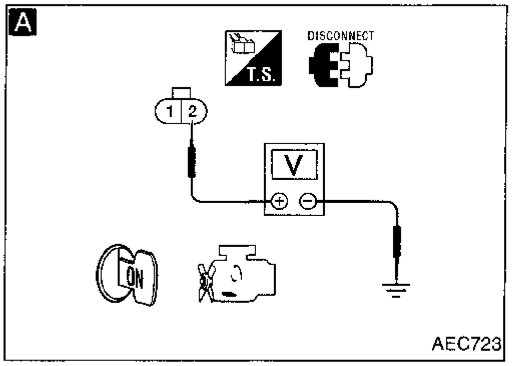
AEC205A

Intake Air Temperature Sensor (Cont'd)

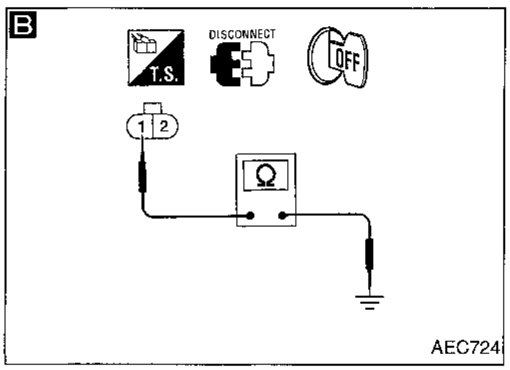
DIAGNOSTIC PROCEDURE



SEF009P



AEC723



AEC724

INSPECTION START

↓

A

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

Voltage:
Approximately 5V

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

If NG, repair harness or connectors.

OK ↓

B

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

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

NG → Check the following.
- Harness for open or short between ECM and intake air temperature sensor
- Harness for open or short between A/T control unit and intake air temperature sensor
- Harness connectors F28, M45

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.

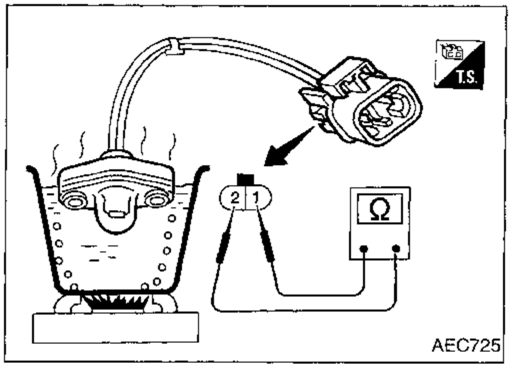
Trouble is not fixed. ↓

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

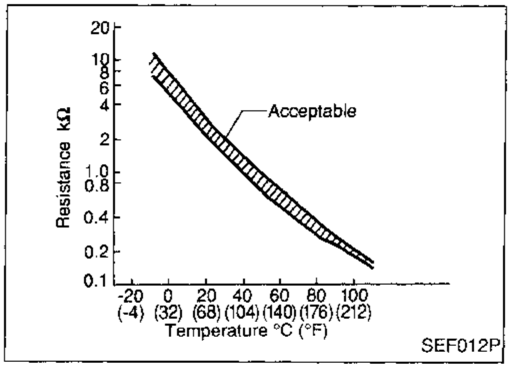
↓

INSPECTION END

Intake Air Temperature Sensor (Cont'd)



AEC725



SEF012P

COMPONENT INSPECTION

Intake air temperature sensor

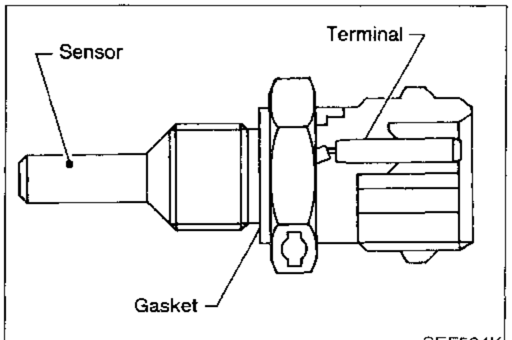
Check resistance as shown in the figure.

⟨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.

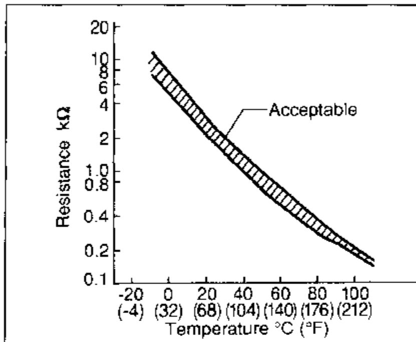
GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX



SEF594K

Engine Coolant Temperature Sensor (ECTS)

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



SEF012P

⟨Reference data⟩

Engine coolant temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
−10 (14)	4.4	9.2
20 (68)	3.5	2.5
50 (122)	2.2	0.8
90 (194)	0.9	0.2

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

ON BOARD DIAGNOSIS LOGIC

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

OR

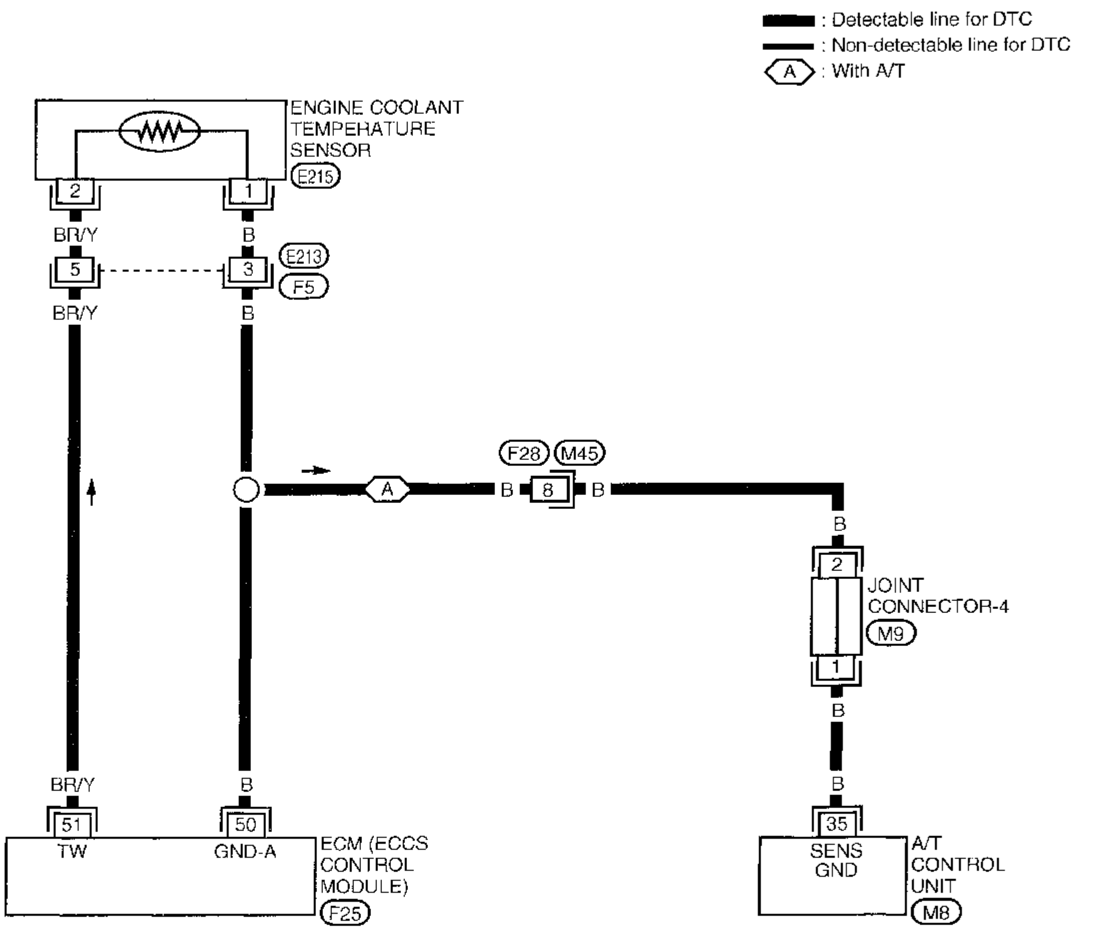
GST
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select "MODE 3" with GST.

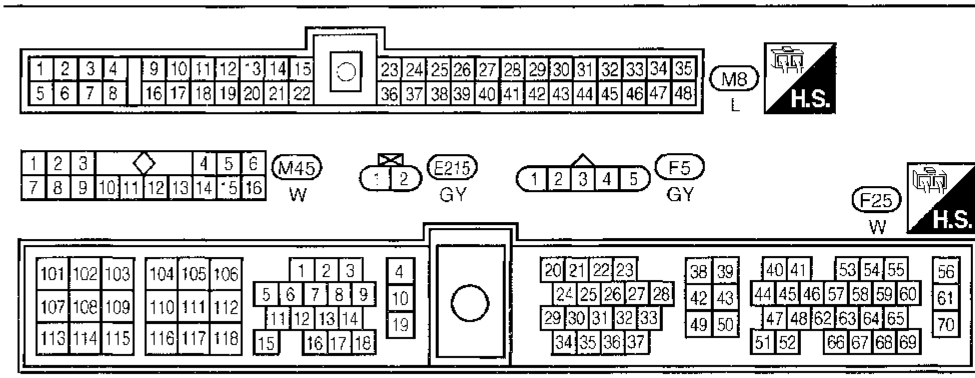
OR

NO TOOLS
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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

EC-ECTS-01



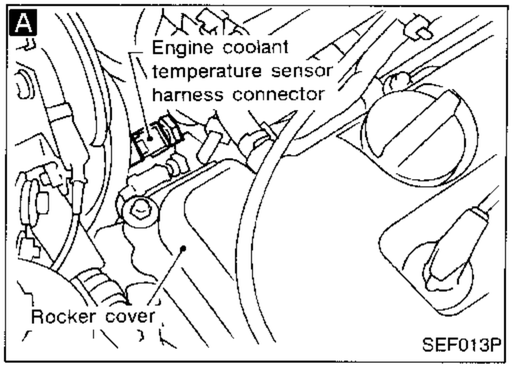


Refer to last page (Foldout page).
M9

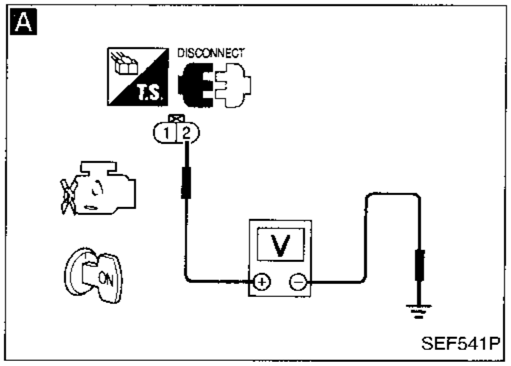
AEC206A

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

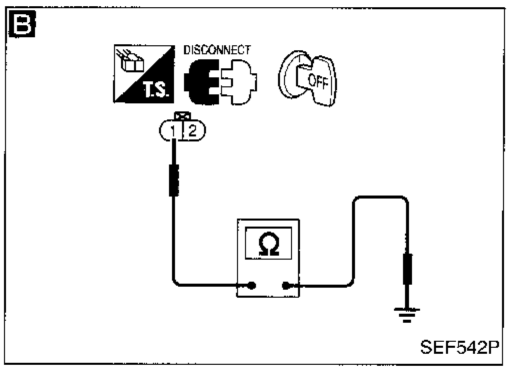
DIAGNOSTIC PROCEDURE



SEF013P



SEF541P



SEF542P

INSPECTION START

↓

A **CHECK POWER SUPPLY.**

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

NG → Check the following.
- Harness for open or short between ECM and engine coolant temperature sensor
- Harness connectors F5, E213

If NG, repair harness or connectors.

↓ OK

B **CHECK GROUND CIRCUIT.**

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

NG → Check the following.
- Harness for open or short between ECM and engine coolant temperature sensor
- Harness for open or short between A/T control unit and engine coolant temperature sensor
- Harness connectors F5, E213
- Harness connectors F28, M45

If NG, repair harness or connectors.

↓ OK

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

NG → Replace engine coolant temperature sensor.

↓ OK

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

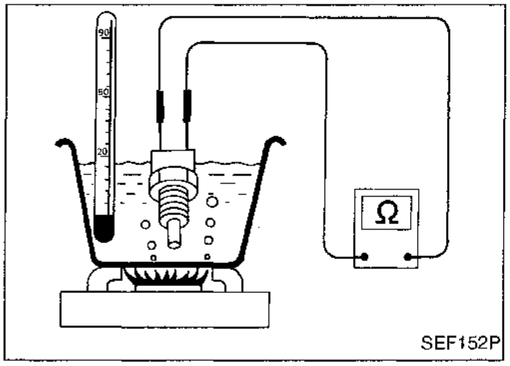
↓ Trouble is not fixed.

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

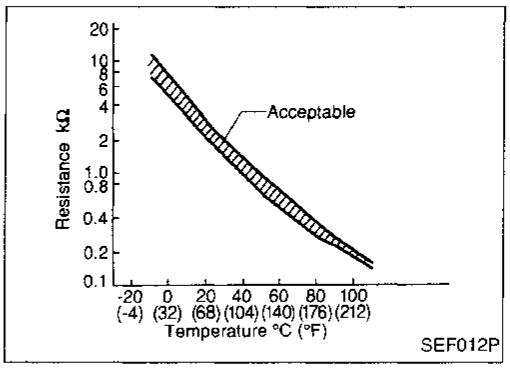
↓

INSPECTION END

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



SEF152P



SEF012P

COMPONENT INSPECTION

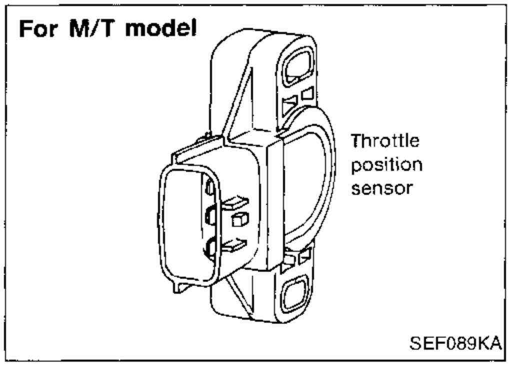
Engine coolant temperature sensor

Check resistance as shown in the figure.

⟨Reference data⟩

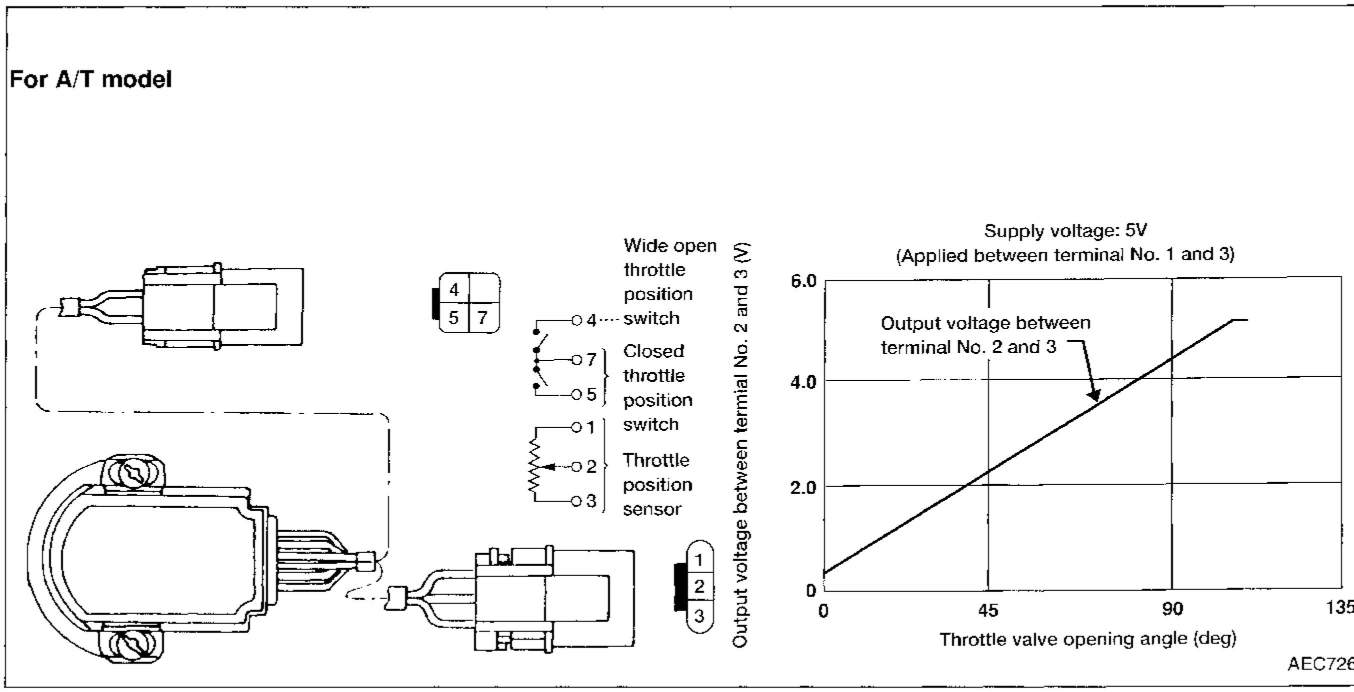
Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

If NG, replace engine coolant temperature sensor.



Throttle Position Sensor

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. On the other hand, "Wide open and closed throttle position switch", which is built into the throttle position sensor unit on A/T model, is not used for engine control.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.35 - 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

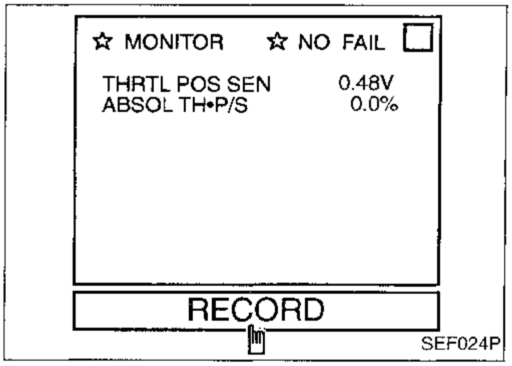
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
23	Y	Throttle position sensor	Ignition switch "ON" └ Accelerator pedal released	0.35 - 0.65V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
33	GY	Throttle position sensor signal	Ignition switch "ON" └ Accelerator pedal released	Approximately 0.4V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 3V
49	P/L	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
50	B	Sensor ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V

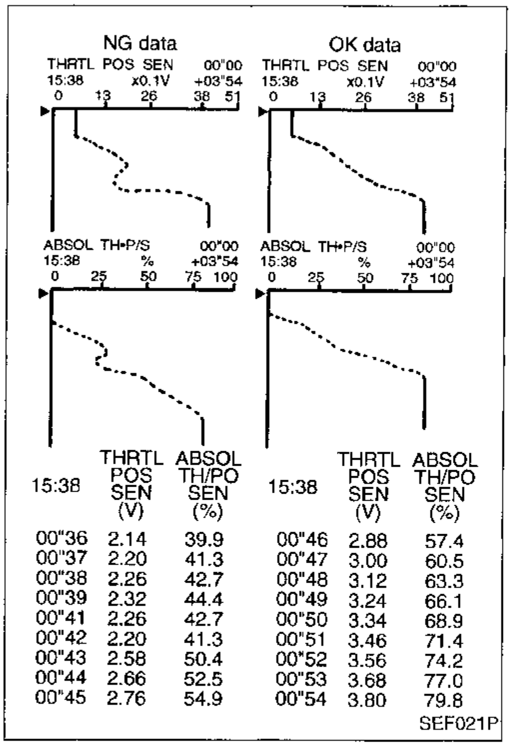
ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Item (Possible Cause)
P0120 0403	● An excessively low or high voltage from the sensor is sent to ECM. ● Voltage sent to ECM is not practical when compared with mass air flow sensor and camshaft position sensor signals.	● Harness or connectors (The sensor circuit is open or shorted.) ● Throttle position sensor

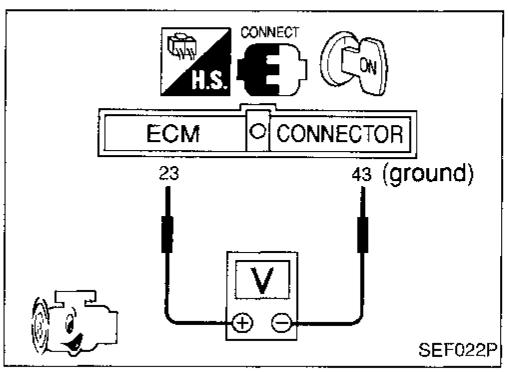
Throttle Position Sensor (Cont'd)



SEF024P



SEF021P



SEF022P

OVERALL FUNCTION CHECK

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

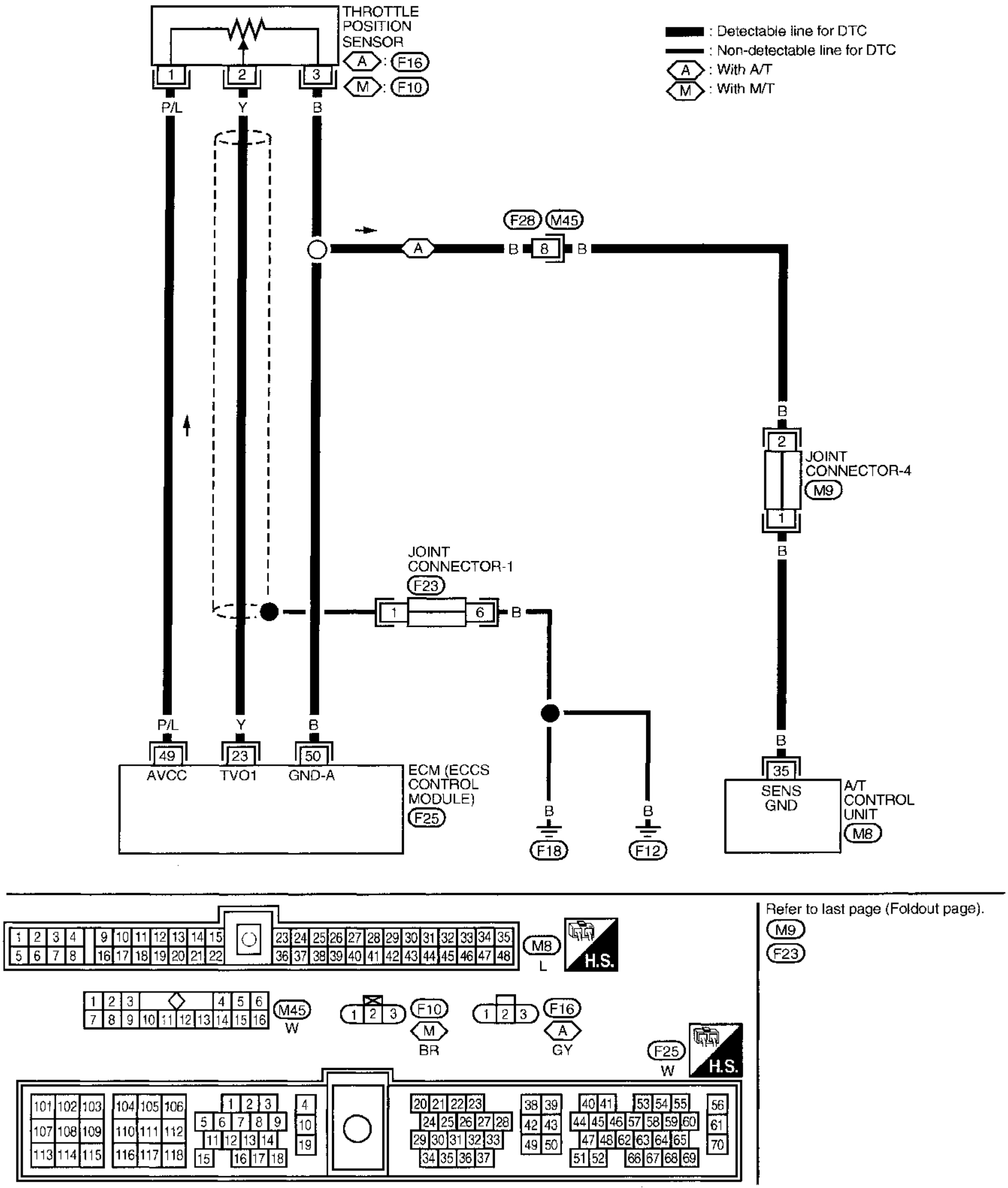
1) Turn ignition switch "ON".
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
3) Select "THRTL POS SEN" and "ABSOL TH/PS" in "DATA MONITOR" mode with CONSULT.
4) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.
5) Print out the recorded data and check the following:
   - The voltage when accelerator pedal fully released is approximately 0.35 - 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) Turn ignition switch "ON".
2) Check the voltage between ECM terminal ㉓ and ㊸ (ground) and check the following:
   - The voltage when accelerator pedal fully released is approximately 0.35 - 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

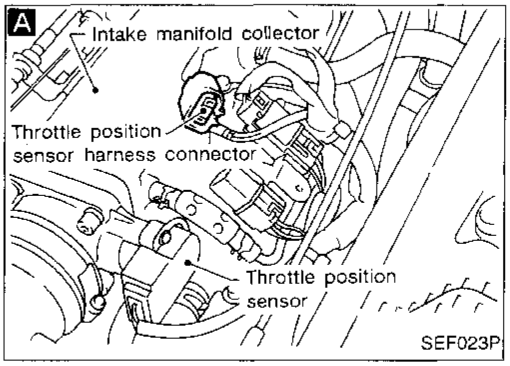


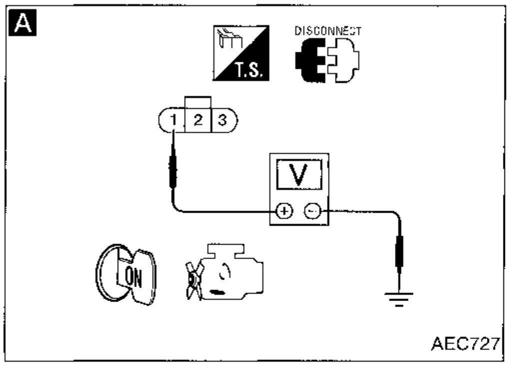
AEC207A

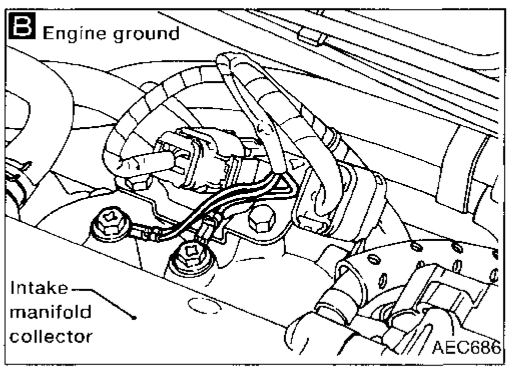
GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

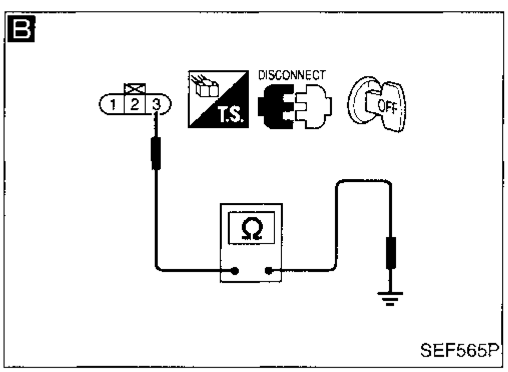
Throttle Position Sensor (Cont'd)

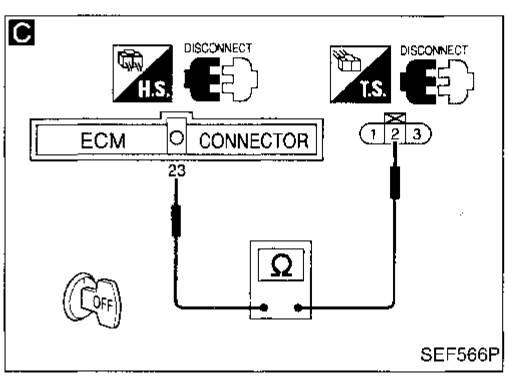
DIAGNOSTIC PROCEDURE











INSPECTION START

↓

ADJUST THROTTLE POSITION SENSOR.
Perform "Basic Inspection", EC-63.

↓ OK

A

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

NG → Repair harness or connectors.

↓ OK

B

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

NG → Check the following.
- Harness connectors F28, M45
- Harness for open or short between ECM and throttle position sensor
- Harness for open or short between A/T control unit and throttle position sensor

If NG, repair harness or connectors.

↓ OK

C

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

NG → Repair harness or connectors.

↓ OK

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

NG → Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-63.

↓ OK

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

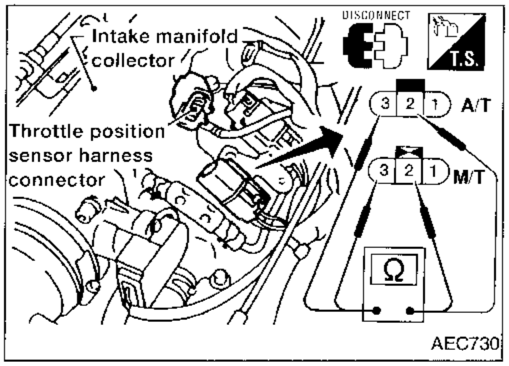
↓ Trouble is not fixed.

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

↓

INSPECTION END

Throttle Position Sensor (Cont'd)



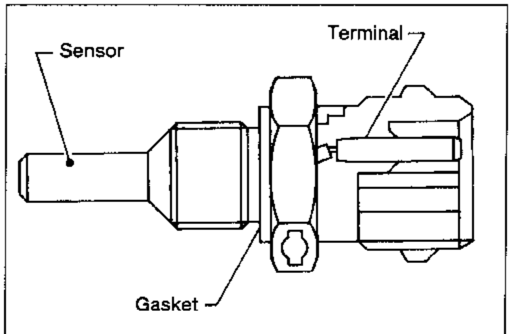
COMPONENT INSPECTION

Throttle position sensor

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

Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 1 kΩ
Partially open	1 - 10 kΩ
Completely open	Approximately 10 kΩ

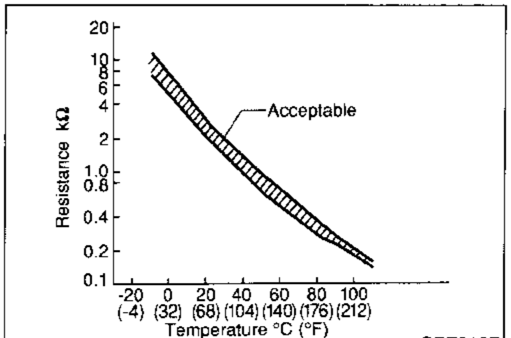
If NG, replace throttle position sensor.
To adjust it, perform "Basic Inspection", EC-63.



SEF594K

Engine Coolant Temperature (ECT) Sensor

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



SEF012P

〈Reference data〉

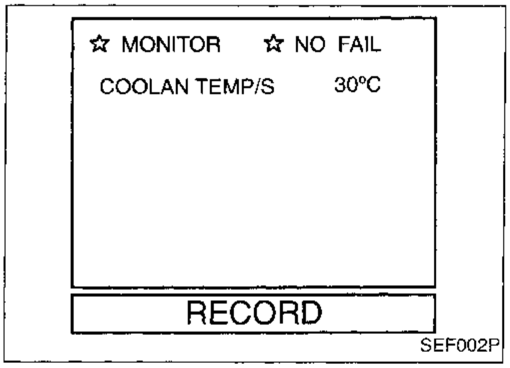
Engine coolant temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
−10 (14)	4.4	9.2
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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

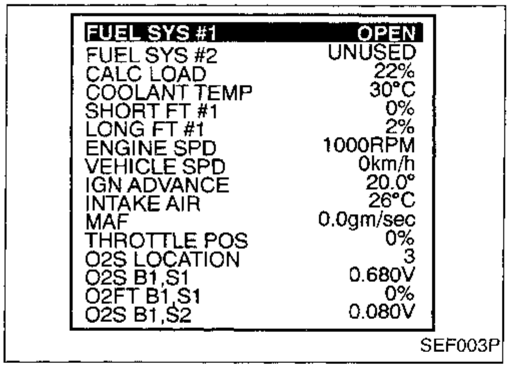
ON BOARD DIAGNOSIS LOGIC

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

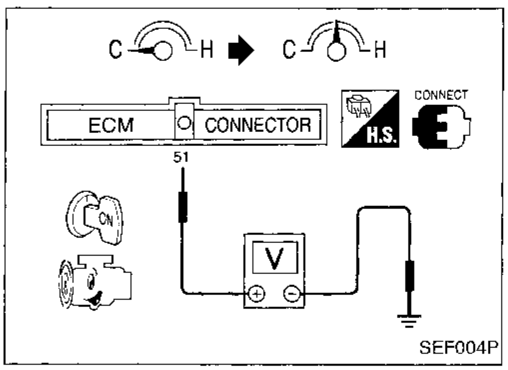
Engine Coolant Temperature (ECT) Sensor (Cont'd)



SEF002P



SEF003P



SEF004P

OVERALL FUNCTION CHECK

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

Note: If both DTC P0115 (0103) and P0125 (0908) are displayed, first perform TROUBLE DIAGNOSIS FOR DTC P0115 (0103). Refer to EC-96.

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 25°C (77°F) or more within 12 minutes. (Be careful not to overheat engine.)

OR

GST

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 25°C (77°F) or more within 12 minutes. (Be careful not to overheat engine.)

OR

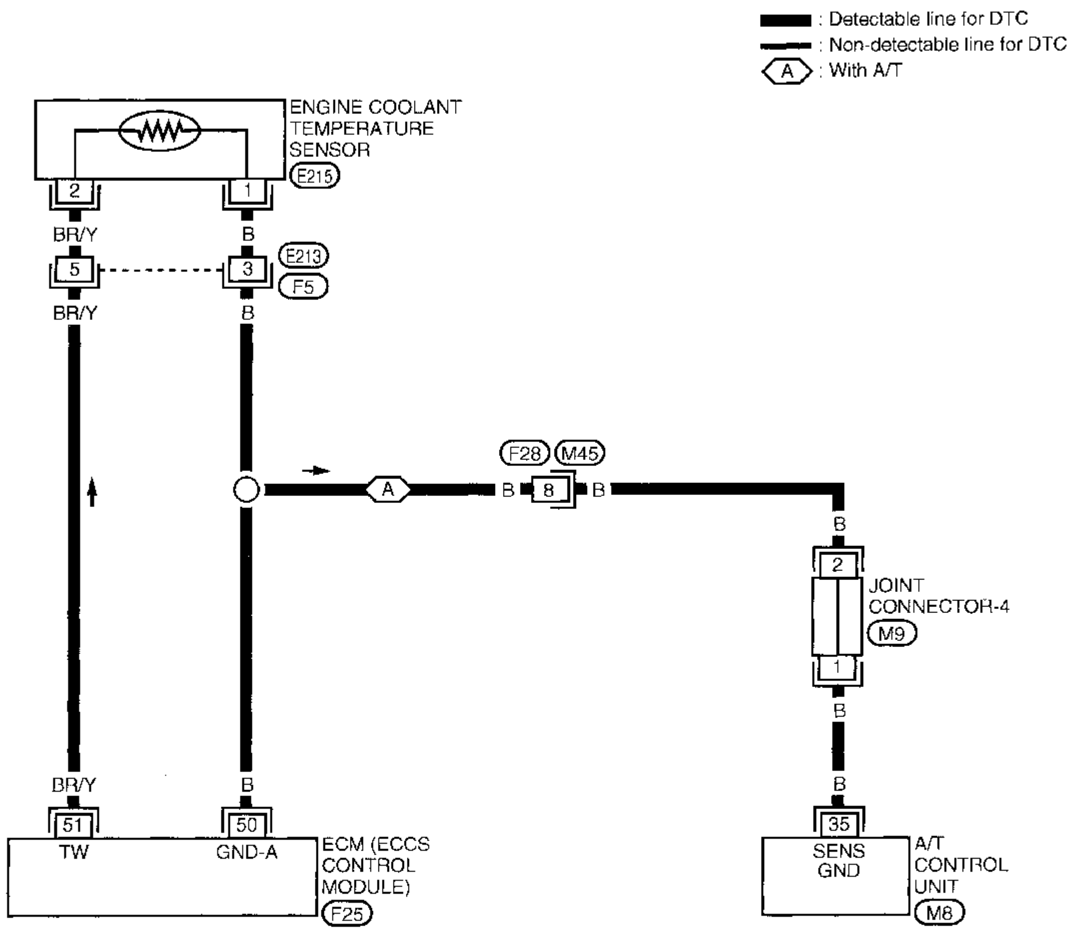
NO TOOLS

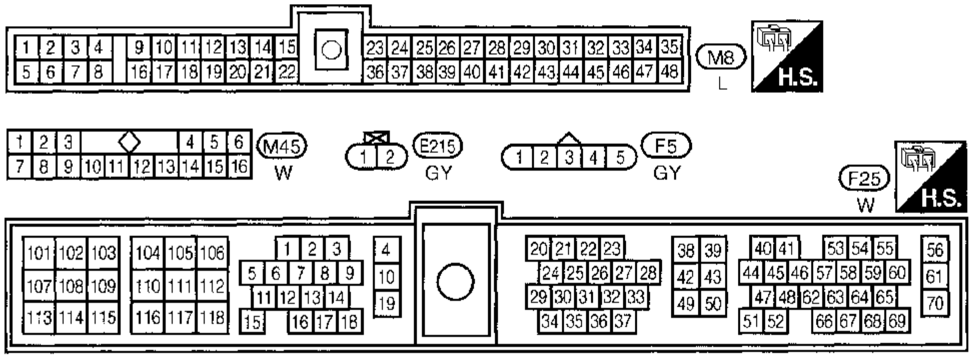
1) Turn ignition switch "ON".
2) Probe voltage meter between ECM terminal 51 and ground.
3) Start engine and run it at idle speed.
4) Check that voltage of engine coolant temperature changes to less than 3.3 (V) within 12 minutes. (Be careful not to overheat engine.)

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

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

EC-ECTS-01





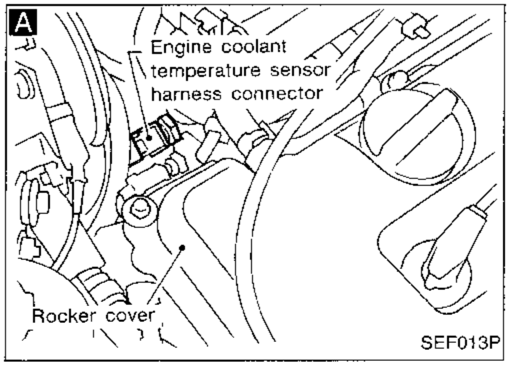
Refer to last page (Foldout page).

M9

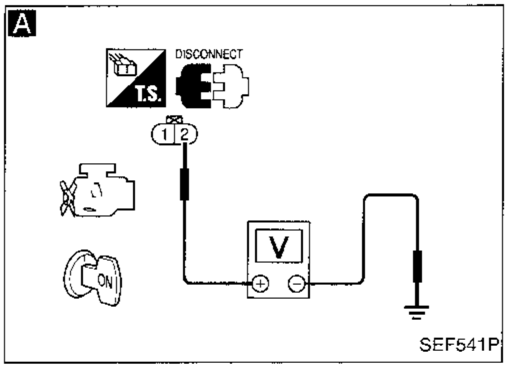
AEC206A

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

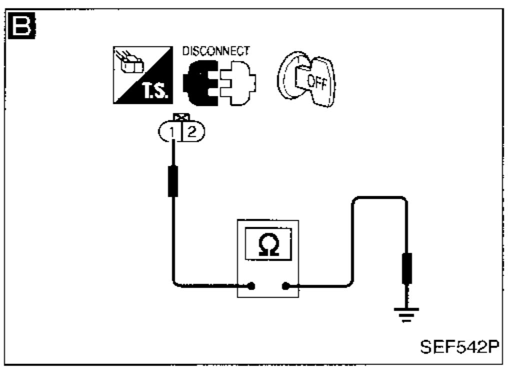
DIAGNOSTIC PROCEDURE



SEF013P



SEF541P



SEF542P

INSPECTION START

↓

A

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

NG → Check the following.
- Harness for open or short between ECM and engine coolant temperature sensor
- Harness connectors (F5), (E213)

If NG, repair harness or connectors.

OK ↓

B

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

NG → Check the following.
- Harness for open or short between ECM and engine coolant temperature sensor
- Harness connectors (F5), (E213)
- Harness for open or short between A/T control unit and engine coolant temperature sensor
- Harness connectors (F28), (M45)

If NG, repair harness or connectors.

OK ↓

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

NG → Replace engine coolant temperature sensor.

OK ↓

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

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

OK ↓

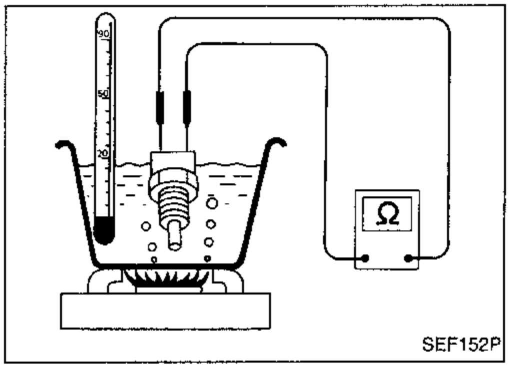
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END



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

COMPONENT INSPECTION

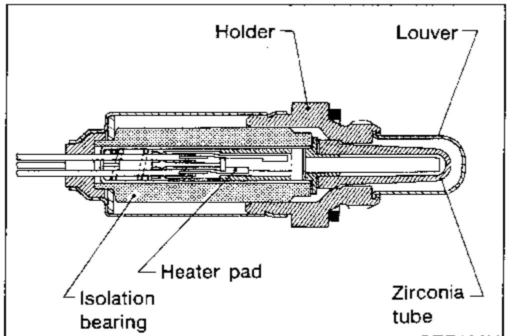
Engine coolant temperature sensor

Check resistance as shown in the figure.

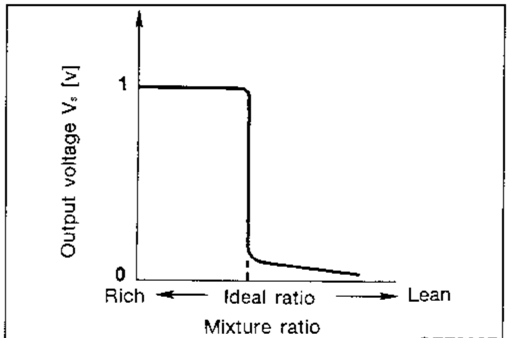
⟨Reference data⟩

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

If NG, replace engine coolant temperature sensor.



SEF406H



SEF288D

Front Heated Oxygen Sensor (Front HO2S)

The front HO2S is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The sensor has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The sensor signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

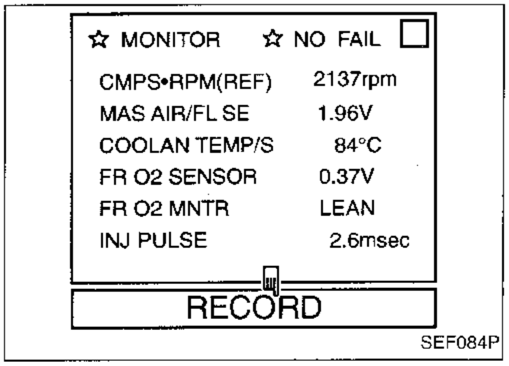
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	W	Front heated oxygen sensor	Engine is running. After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 1.0V (periodically change)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130 0303	● An excessively high voltage from the sensor is sent to ECM. ● The voltage from the sensor is constantly approx. 0.3V. ● The maximum and minimum voltages from the sensor do not reach the specified voltages. ● The sensor does not respond between rich and lean within the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Front heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks

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

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



SEF084P

OVERALL FUNCTION CHECK

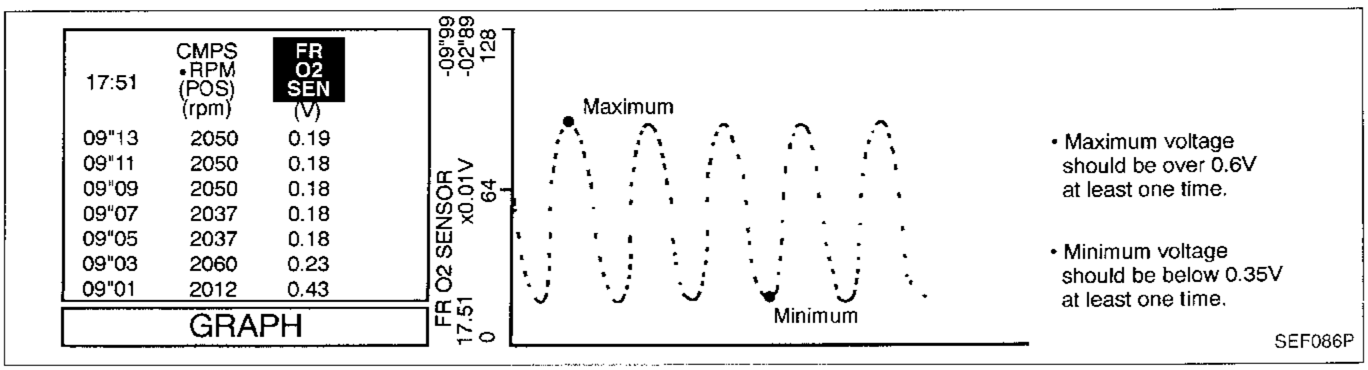
Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a DTC might not be confirmed.

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

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

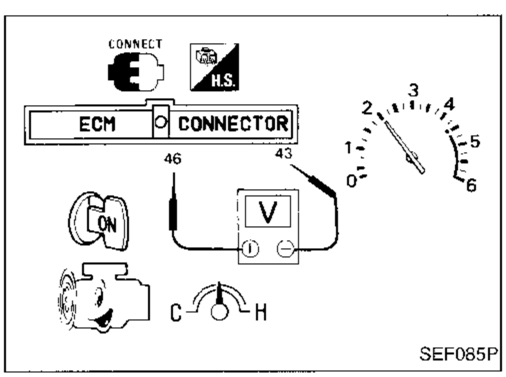
  cycle I 1 I 2 I 3 I 4 I 5 I
  FR O2 MNTR R-L-R-L-R-L-R-L-R-L-R

  R = "FR O2 MNTR", "RICH"
  L = "FR O2 MNTR", "LEAN"
- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.



SEF086P

———————— OR ————————

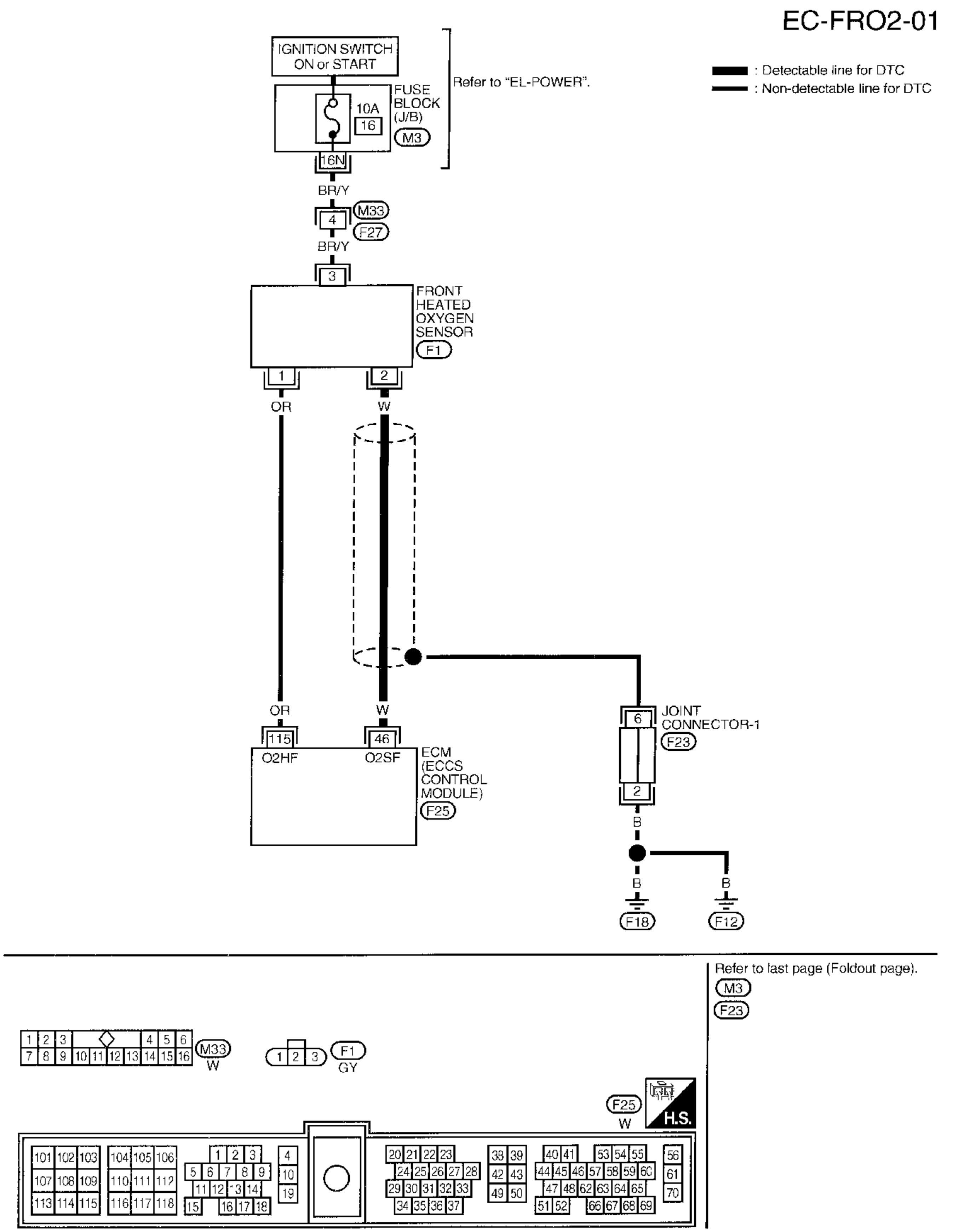


SEF085P

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

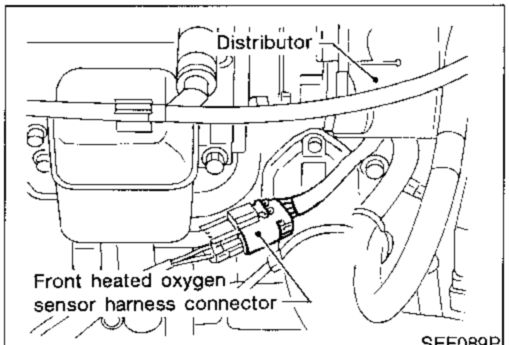
- Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.35V at least one time.

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

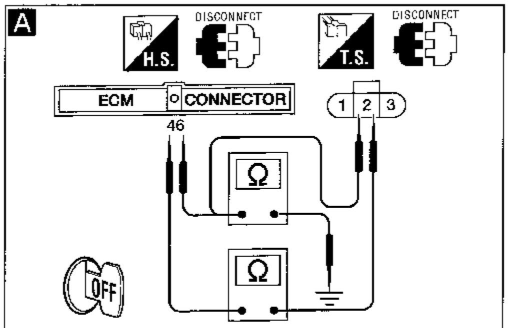


AEC208A

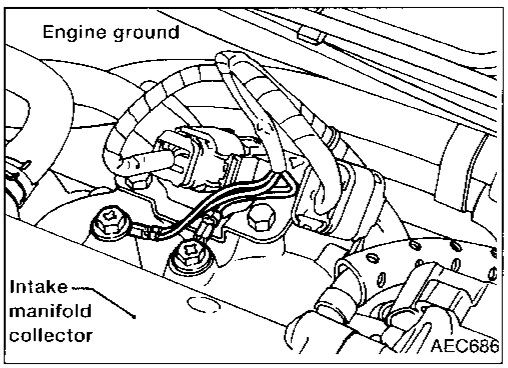
Front Heated Oxygen Sensor (Front HO2S) (Cont'd)



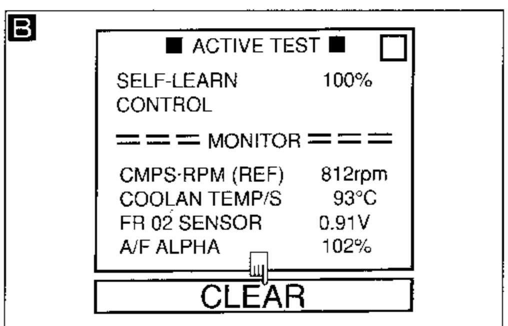
SEF089P



AEC717



AEC686



AEC547

DIAGNOSTIC PROCEDURE

INSPECTION START

↓

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal 46 and terminal 2.
   Continuity should exist.
4. Check harness continuity between ECM terminal 46 (or terminal 2) and ground.
   Continuity should not exist.

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 CONTROL" in "ACTIVE TEST" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.
   Is the DTC P0170 detected?
   Is it difficult to start engine?

OR

2. Turn ignition switch "OFF" and wait at least 5 seconds.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
7. Run engine for at least 10 minutes at idle speed.
   Is the DTC 0706 detected?
   Is it difficult to start engine?

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0170 (0706)", EC-126.

↓ No

Ⓐ

(Go to next page.)

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

Ⓐ

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 front heated oxygen sensor.

↓ OK

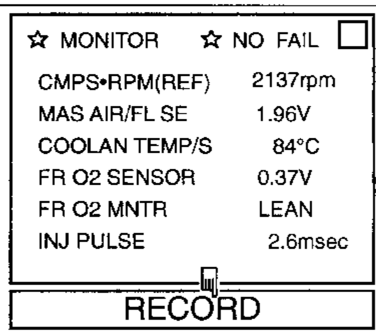
INSPECTION END

Closed Loop Control

ON BOARD DIAGNOSIS LOGIC

- **The closed loop control has one trip detection logic.**

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



SEF084P

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the closed loop control. During this check, a DTC might not be confirmed.

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

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

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

  R = “FR O2 MNTR”, “RICH”
  L = “FR O2 MNTR”, “LEAN”

——————— OR ———————

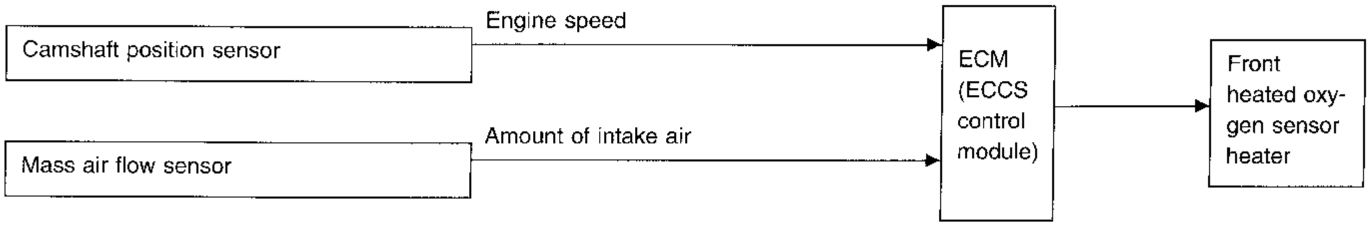
1) Start engine and warm it up sufficiently.
2) Check that malfunction indicator lamp goes on more than 5 times in 10 seconds while keeping at 2,000 rpm in Diagnostic Test Mode II.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0130 (0303) for front heated oxygen sensor. (See page EC-111.)
Refer to TROUBLE DIAGNOSIS FOR DTC P0135 (0901) for front heated oxygen sensor heater. (See next page.)

Front Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION



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

Engine speed rpm	Engine condition	Front heated oxygen sensor heater
Above 3,200	—	OFF
Below 3,200	Heavy load after warmed up	OFF
	Except above	ON

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FRONT O2 SEN HEATER	● Engine speed: Idle	ON
	● Engine speed: Above 3,200 rpm	OFF

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
115	OR	Front heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,200 rpm	Approximately 0.2V
			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 circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the front heated oxygen sensor heater.)	● Harness or connectors (The front heated oxygen sensor heater circuit is open or shorted.) ● Front heated oxygen sensor heater

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

Front Heated Oxygen Sensor Heater (Cont'd)

DIAGNOSTIC TROUBLE CODE DETECTING CONDITION

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 35 seconds at idle speed.

OR

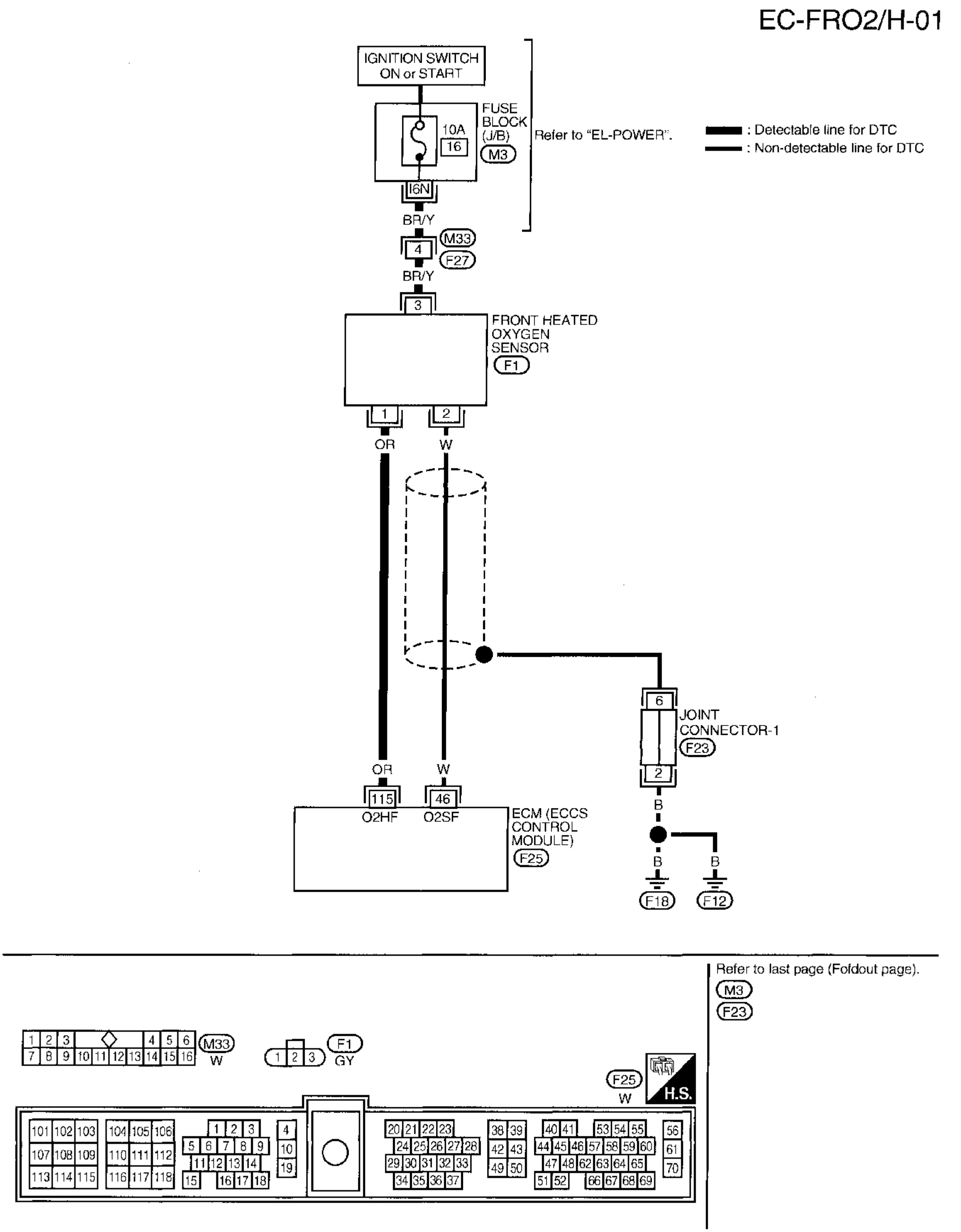
1) Start engine and run it for at least 35 seconds at idle speed.
2) Select "MODE 3" with GST.

OR

NO TOOLS

1) Start engine and run it for at least 35 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.

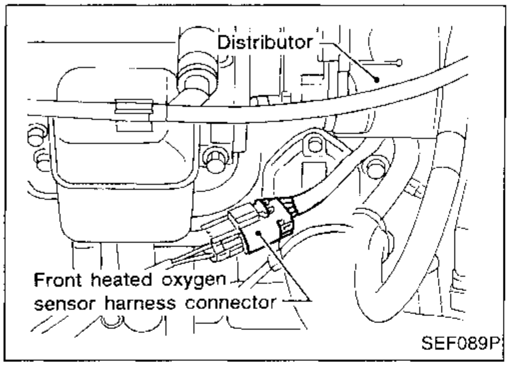
Front Heated Oxygen Sensor Heater (Cont'd)

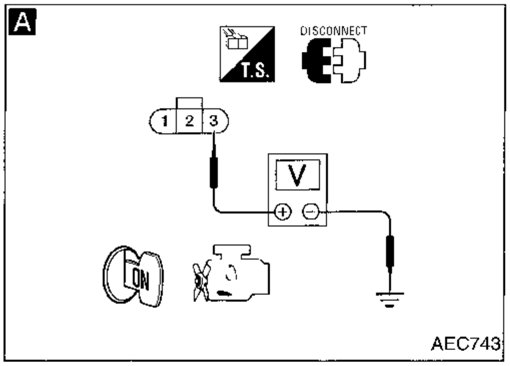


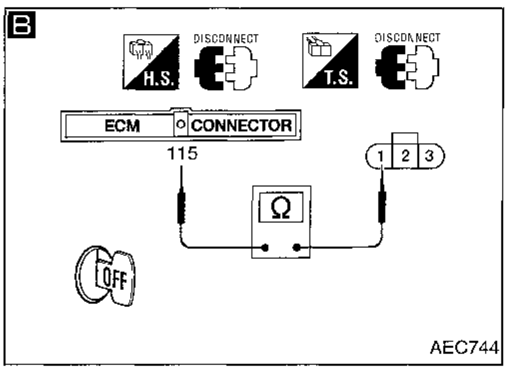
AEC209A

Front Heated Oxygen Sensor Heater (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

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

Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F27), (M33)
- 10A fuse
- Harness for open or short between front heated oxygen sensor and fuse

If NG, repair harness or connectors.

↓ OK

B **CHECK GROUND CIRCUIT.**
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ① and ECM terminal (115).

Continuity should exist.

If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

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

NG → Replace front heated oxygen sensor.

↓ OK

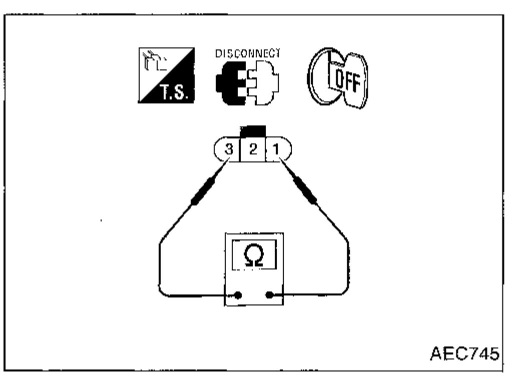
Disconnect and reconnect harness connectors in the circuit, and retest.

↓ Trouble is not fixed.

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

↓

INSPECTION END



COMPONENT INSPECTION

Front heated oxygen sensor heater

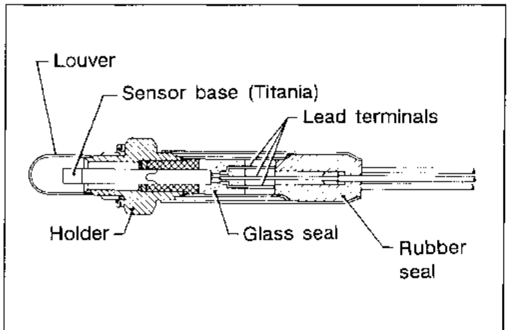
Check resistance between terminals ① and ③.

Resistance: 3.3 - 6.3Ω at 25°C (77°F)

If NG, replace 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.



SEF716DA

Rear Heated Oxygen Sensor (Rear HO2S)

The rear heated oxygen sensor (Rear HO2S), after the three way catalyst, monitors the oxygen level in the exhaust gas.
Even if the switching characteristics of the front heated oxygen sensor shift, the air-fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.
This sensor is made of ceramic titania. The electric resistance of ceramic titania drastically changes at the ideal air-fuel ratio. The output voltage of the sensor, depending on its resistance, is approximately 0 to 2.2V.
Under normal conditions, the rear heated oxygen sensor is not used for engine control operation.
It is used only for the on board diagnosis of three way catalyst.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 ↔ Approx. 1.5V
RR O2 MNTR			LEAN ↔ RICH

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
52	W	Rear heated oxygen sensor	Engine is running. — After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 2.2V**
108	R/Y	Rear heated oxygen sensor heater	Ignition switch "ON" / Engine is running.	Approximately 0.2V
111	B	Rear heated oxygen sensor heater ground	Engine is running. — Idle speed	0.02 - 0.07V

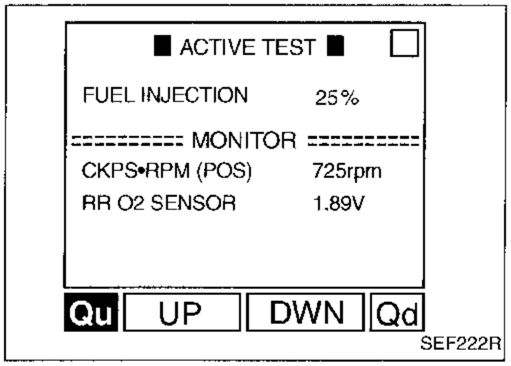
**During the on board diagnosis for the open circuit, approx. 1.5 - 5V will appear. This is not a malfunction.

ON BOARD DIAGNOSIS LOGIC

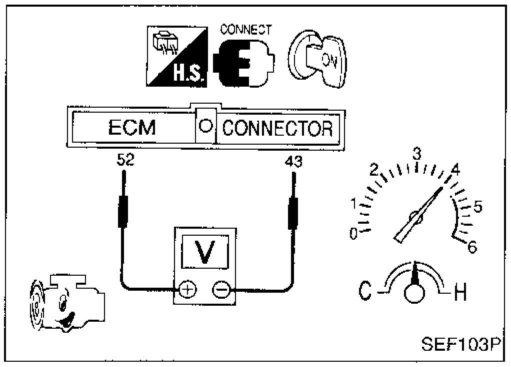
The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors the sensor's voltage 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 (The sensor circuit is open.) ● Rear heated oxygen sensor
	● The specified maximum and minimum voltages from the sensor are not reached. ● It takes more than the specified time for the sensor to respond between rich and lean.	● Harness or connectors (The sensor circuit is shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks

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



SEF222R



SEF103P

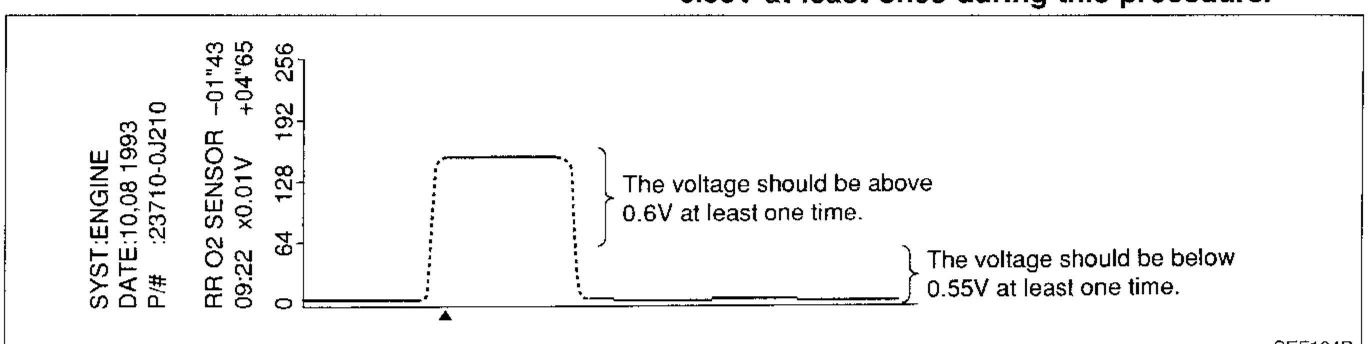
OVERALL FUNCTION CHECK

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

1) Start engine and warm it up sufficiently.
2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SENSOR" as the monitor item with CONSULT.
3) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   "RR O2 SENSOR" should be above 0.6V at least once when the "FUEL INJECTION" is +25%.
   "RR O2 SENSOR" should be below 0.55V at least once when the "FUEL INJECTION" is −25%.

OR

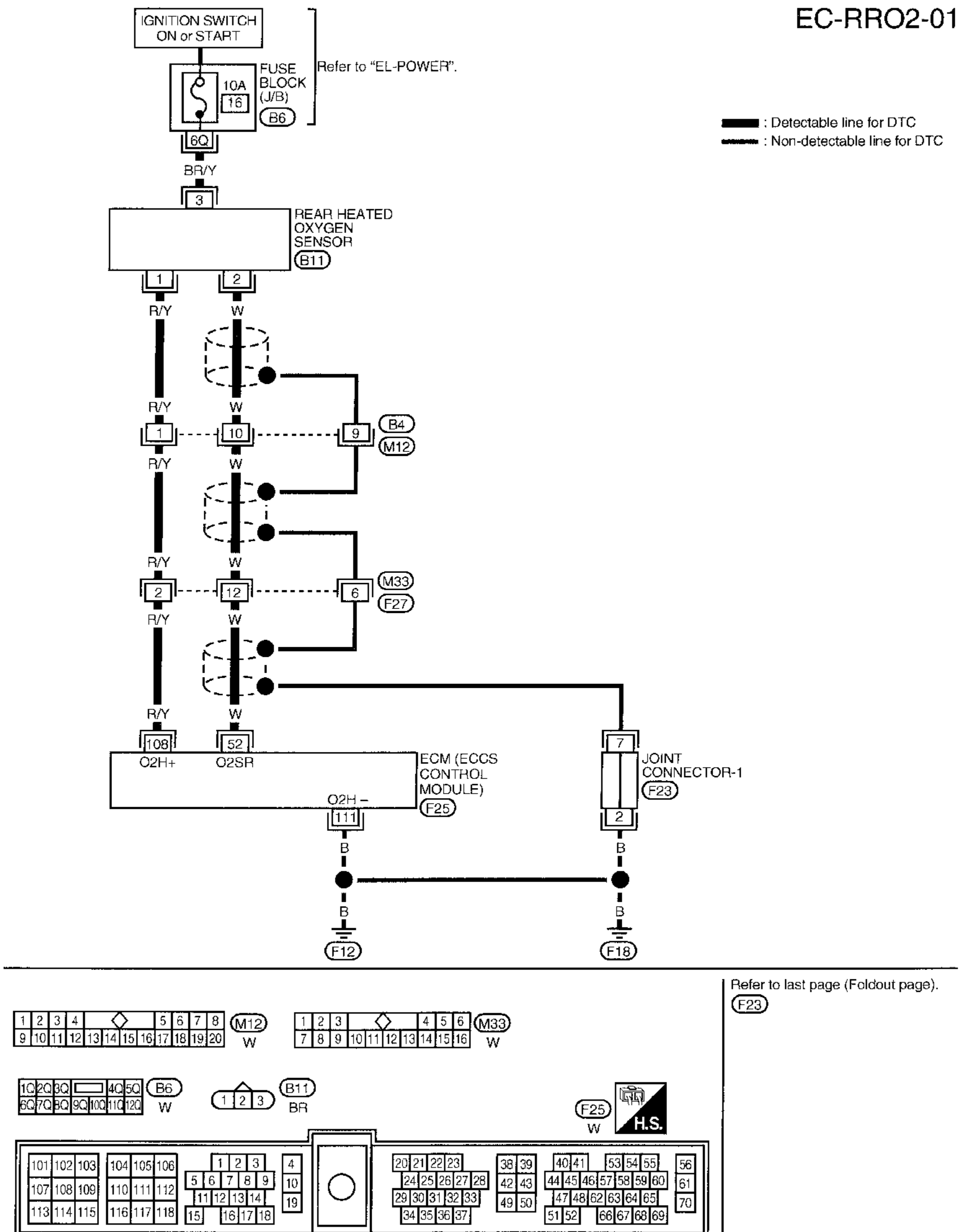
1) Start engine and warm it up sufficiently.
2) Set voltmeter probes between ECM terminals (52)(sensor signal) and (43)(engine ground).
3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
   (depress and release accelerator pedal as soon as possible)
   The voltage should be above 0.6V and below 0.55V 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 0.6V and below 0.55V at least once during this procedure.



SEF104P

Note: After starting the engine, the output voltage of the rear heated oxygen sensor indicates higher voltage (approx. 5V at highest) than the normal operating range for about 7 seconds. This is due to checking for open circuits in rear heated oxygen sensor by on board diagnosis. Therefore, if you measure the voltage (at ECM terminal (52)) during this diagnosis, the higher voltage will appear. (CONSULT will also show the higher voltage, GST may show approx. 0V.) This is not a malfunction even though it is out of the normal range.

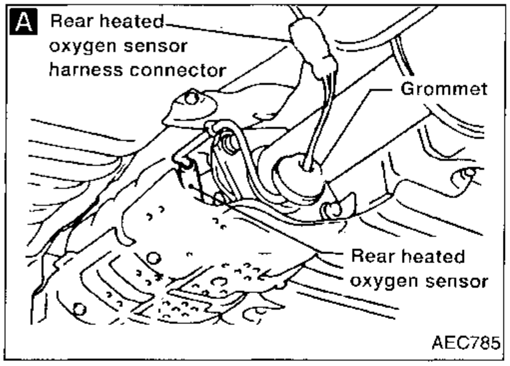
Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

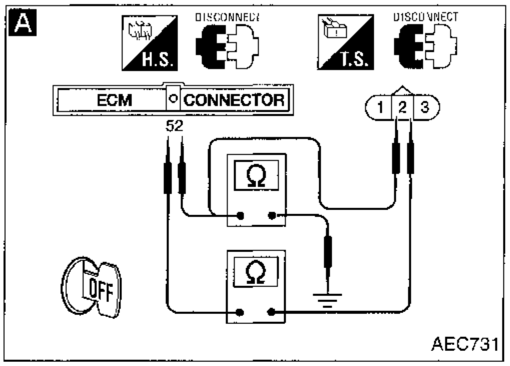


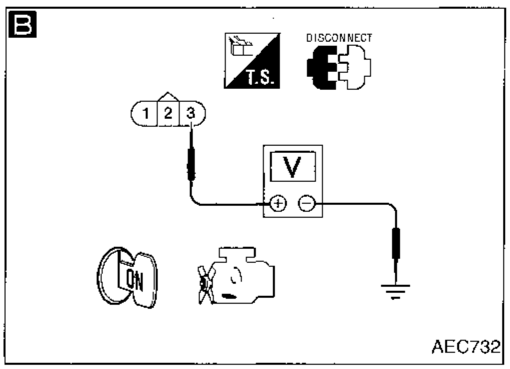
AEC210A

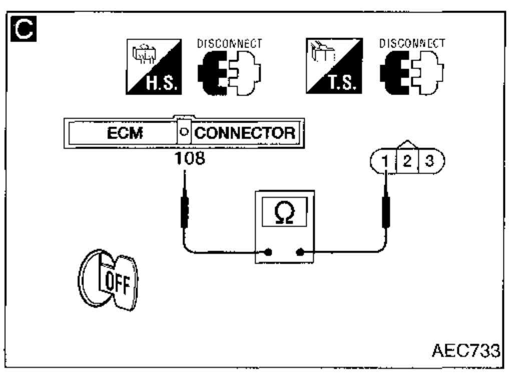
Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Remove grommet from underbody near three way catalyst to remove rear heated oxygen sensor harness connector.
3. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
4. Check harness continuity between ECM terminal (52) and terminal (2).
   Continuity should exist.
5. Check harness continuity between ECM terminal (52) (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

CHECK POWER SUPPLY.

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

NG → Check the following.
- 10A fuse
- Harness for open or short between fuse and rear heated oxygen sensor

If NG, repair harness or connectors.

OK ↓

C

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal (1) and ECM terminal (108).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (B4), (M12)
- Harness connectors (M33), (F27)
- Harness for open or short between rear heated oxygen sensor and ECM

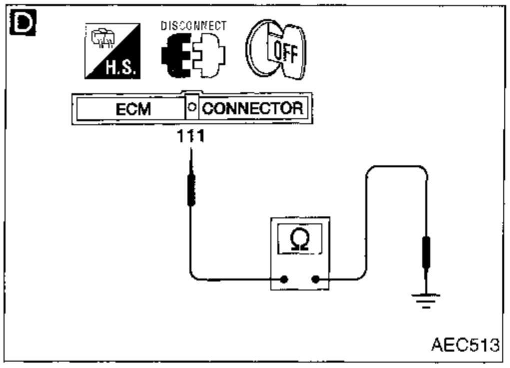
If NG, repair harness or connectors.

OK ↓

(A)

(Go to next page.)

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



Ⓐ

D

CHECK ECM GROUND CIRCUIT.
Check harness continuity between ECM terminal (111) and ground.
Continuity should exist.
If OK, check harness for short.

→ NG: Repair harness or connectors.

↓ OK

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

→ NG: Replace rear heated oxygen sensor.

↓ OK

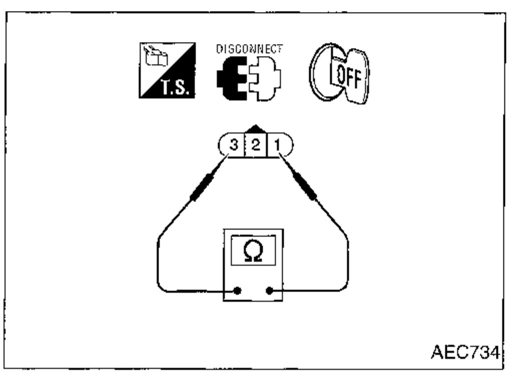
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ 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

Rear heated oxygen sensor heater

Check resistance between terminals ① and ③.

Resistance: 5.4 - 6.7Ω [at 23°C (73°F)]

If NG, replace the rear heated oxygen sensor.

CAUTION:

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

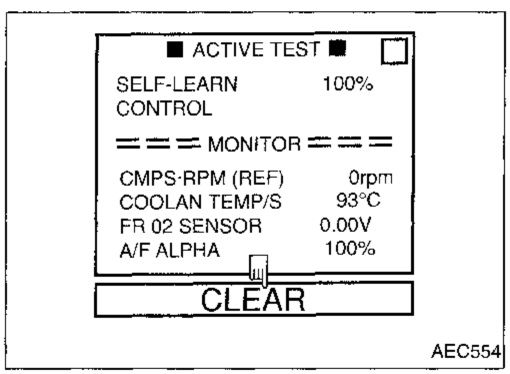
Fuel Injection System Function

ON BOARD DIAGNOSIS LOGIC

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

Front heated oxygen sensor → Density of oxygen in exhaust gas (Mixture ratio feedback signal) → ECM (ECCS control module) → Injectors

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0170 0706	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is excessive. (The mixture ratio is too lean or too rich.)	● Intake air leak ● Front heated oxygen sensor ● Injectors ● Exhaust gas leak ● 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 3 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 DTC should be detected at this stage, if a malfunction exists.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.

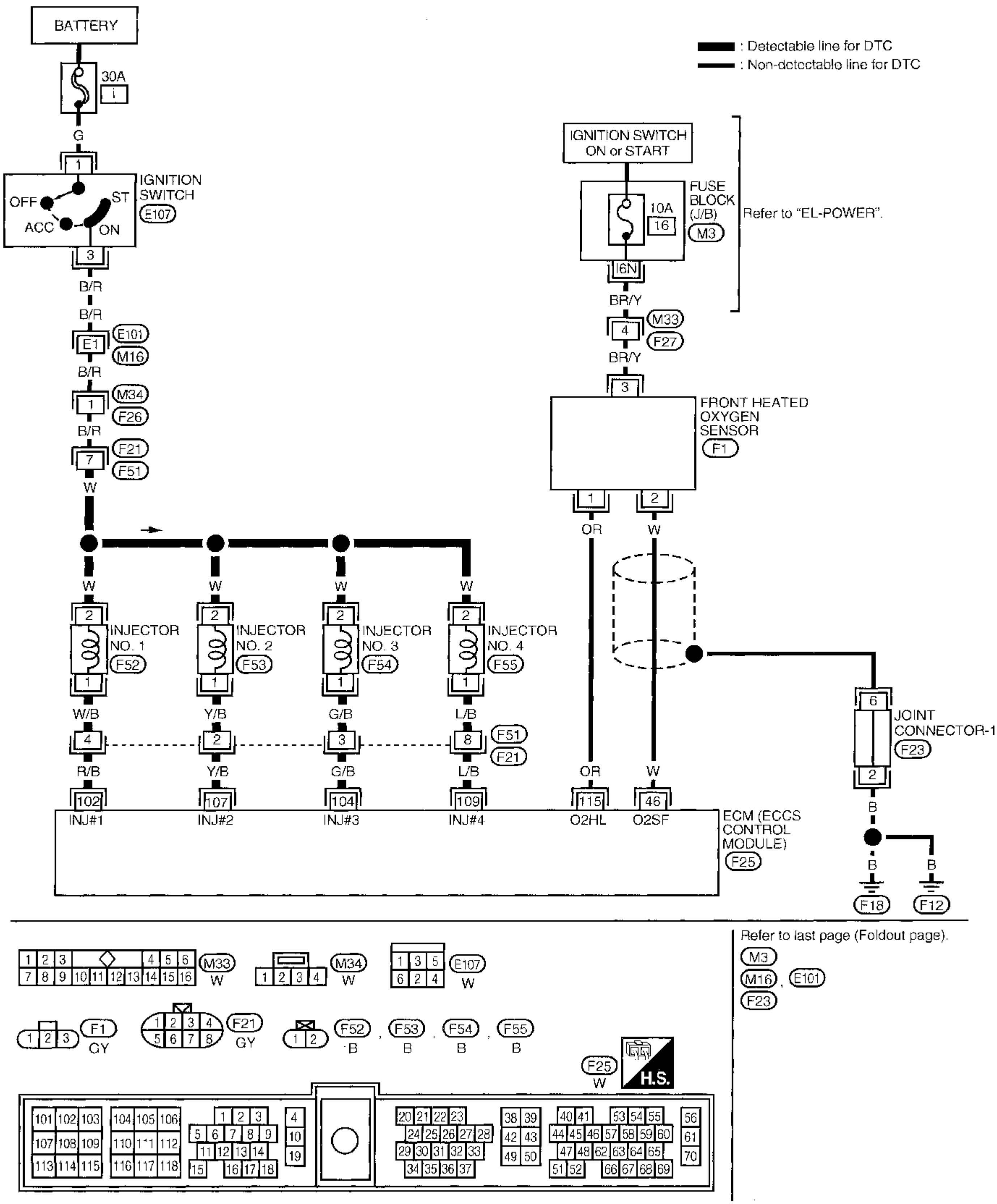
OR

Fuel Injection System Function (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) 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 0706 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.

Fuel Injection System Function (Cont'd)

EC-FUEL-01

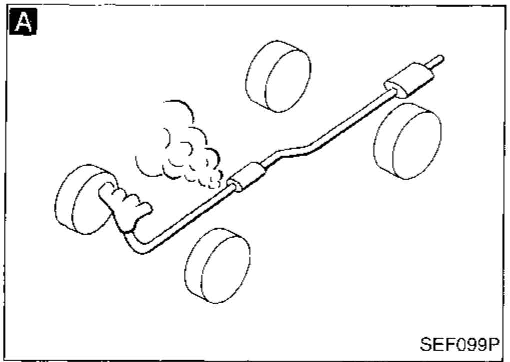


AEC211A

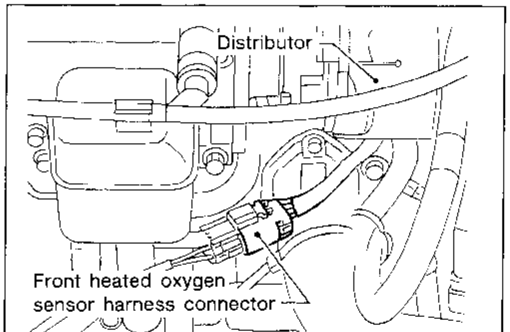
Fuel Injection System Function (Cont'd)

DIAGNOSTIC PROCEDURE

A



SEF099P



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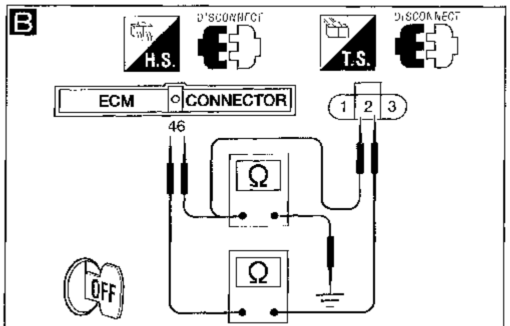
B



AEC717

INSPECTION START

↓

A

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

NG → Repair or replace.

↓ OK

B

CHECK FRONT HEATED OXYGEN SENSOR.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal 46 and terminal 2.
   Continuity should exist.
4. Check harness continuity between ECM terminal 46 (or terminal 2) and ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

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

NG → Check fuel pump and circuit. Refer to EC-223.

↓ OK

CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
2.5 - 5.0 g·m/sec: at idling
7.1 - 12.5 g·m/sec: at 2,500 rpm

OR

GST: Check "MASS AIR FLOW" in MODE 1 with GST.
2.5 - 5.0 g·m/sec: at idling
7.1 - 12.5 g·m/sec: at 2,500 rpm

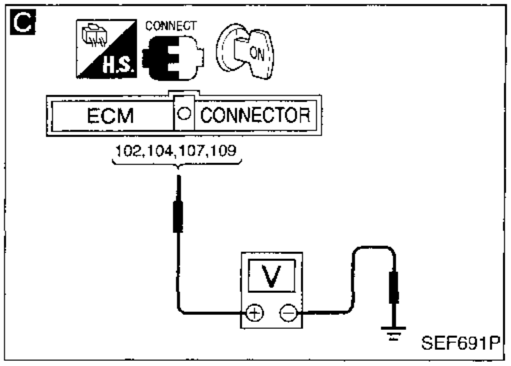
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-85.

↓ OK

Ⓐ

(Go to next page.)

Fuel Injection System Function (Cont'd)



Ⓐ

C

CHECK INJECTORS.
1. Turn ignition switch "ON".
2. Check voltage between ECM terminals 102, 104, 107, and 109 and ground with CONSULT or tester.

Battery voltage should exist.

3. Turn ignition switch "OFF".

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injector", EC-217. Repair harness or connectors.

OK ↓

Remove injector assembly.
Refer to EC-26.
Keep fuel hose and all injectors connected to injector gallery.

↓

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

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

Does not drip. ↓

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

↓

INSPECTION END

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire

ON BOARD DIAGNOSIS LOGIC

If a misfire occurs, the engine speed will fluctuate. If the fluctuation is detected by the crankshaft position sensor (OBD), the misfire is diagnosed.
The misfire detection logic consists of the following two conditions.

Crankshaft position sensor (OBD)	Engine speed →	ECM

1. One Trip Detection Logic (Three Way Catalyst Damage)
   When a misfire is detected which will overheat and damage the three way catalyst, the malfunction indicator lamp (MIL) will start blinking; even during the first trip. In this condition, ECM monitors the misfire every 200 revolutions.
   If the misfire frequency decreases to a level that will not damage the three way catalyst, the MIL will change from blinking to lighting up.
   (After the first trip detection, the MIL will light up from engine starting. If a misfire is detected that will cause three way catalyst damage, the MIL will start blinking.)
2. Two Trip Detection Logic (Exhaust quality deterioration)
   When a misfire that will not damage the three way catalyst (but will affect exhaust emission) occurs, the malfunction indicator lamp will light up based on the second consecutive trip detection logic. In this condition, ECM monitors the misfire for each 1,000 revolutions of the engine.

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

1) Turn ignition switch "ON", and select "DATA MONITOR" mode with CONSULT.
2) Start engine and warm it up sufficiently.
3) Turn ignition switch "OFF" and wait at least 3 seconds.
4) Start engine again and drive at 1,500 - 4,000 rpm for at least 10 minutes.

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 3 seconds.
3) Start engine again and drive at 1,500 - 4,000 rpm for at least 10 minutes.

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

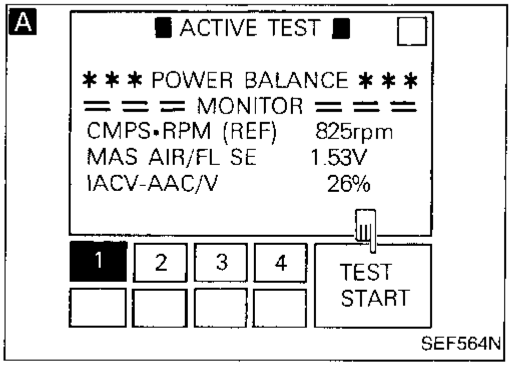
4) Select "MODE 3" with GST.

OR

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 3 seconds.
3) Start engine again and drive at 1,500 - 4,000 rpm for at least 10 minutes.
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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

DIAGNOSTIC PROCEDURE



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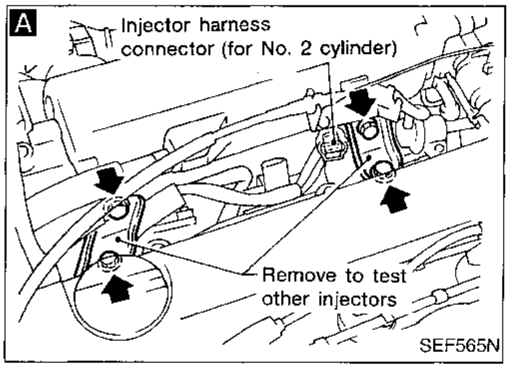

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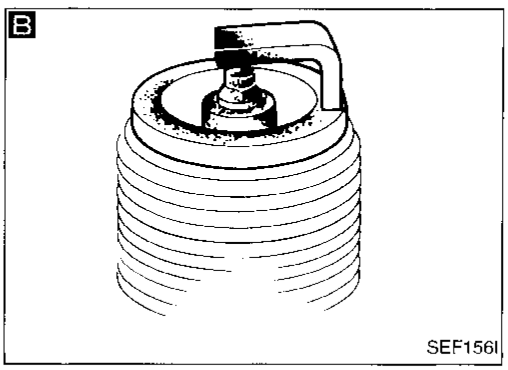
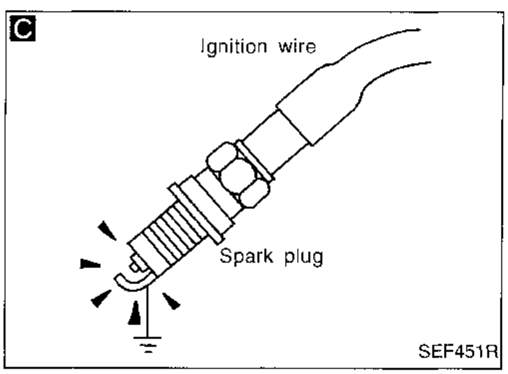
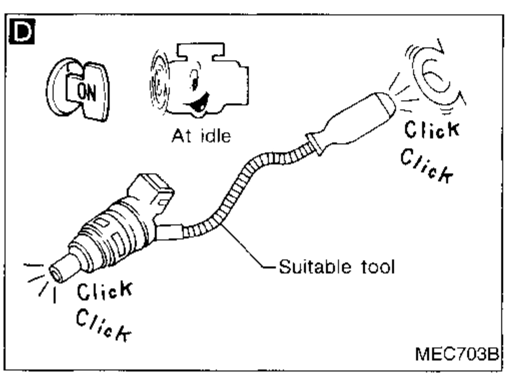


SEF156I



SEF451R



MEC703B

INSPECTION START

↓

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

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

A

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?
- Yes → Go to **D** below.
- No ↓

B

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.
- NG → Repair or replace spark plug(s).
- OK ↓

C

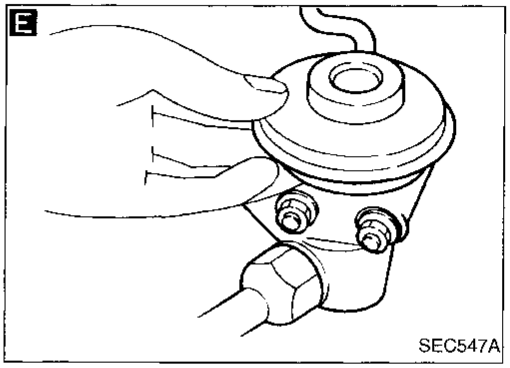
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.
- NG → CHECK COMPONENT (Ignition wires). Refer to "COMPONENT INSPECTION", EC-134.
  - NG → Replace.
  - OK → Check ignition coil, power transistor and their circuits. Refer to EC-180.
- OK ↓

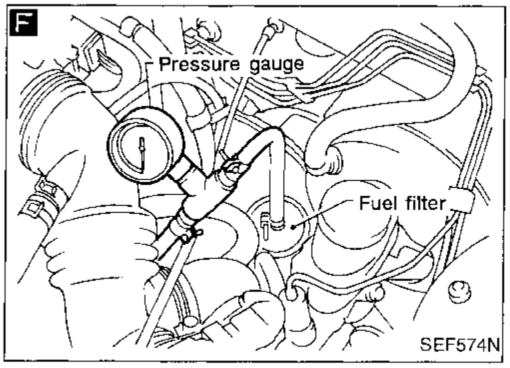
D

CHECK INJECTOR.
Does each injector make an operating sound at idle?
- No → Check injector(s) and circuit(s). Refer to EC-217.
- Yes ↓

Ⓐ
(Go to next page.)

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





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E

CHECK EGR FUNCTION.
Perform OVERALL FUNCTION CHECK (Procedure for malfunction B) for EGR Function.
Refer to EC-149.

NG → Repair EGR system.

OK ↓

F

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-25.
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 235 kPa
   (2.4 kg/cm^2, 34 psi)

NG → Check fuel pump and circuit.

OK ↓

CHECK COMPRESSION PRESSURE.
Refer to EM section.
- Check compression pressure.
  Standard:
  kPa (kg/cm^2, psi)/300 rpm
  1,226 (12.5, 178)
  Minimum:
  kPa (kg/cm^2, psi)/300 rpm
  1,030 (10.5, 149)
  Difference between each cylinder:
  kPa (kg/cm^2, psi)/300 rpm
  98 (1.0, 14)

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

OK ↓

CHECK IGNITION TIMING.
Perform "Basic Inspection", EC-63.

NG → Adjust ignition timing.

OK ↓

CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
2.5 - 5.0 g·m/sec: at idling
7.1 - 12.5 g·m/sec: at 2,500 rpm

OR

Check "MASS AIR FLOW" in MODE 1 with GST.
2.5 - 5.0 g·m/sec: at idling
7.1 - 12.5 g·m/sec: at 2,500 rpm

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-85.
If NG, repair or replace it.

OK ↓

Ⓑ

(Go to next page.)

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

Ⓑ

↓

CHECK SYMPTOM MATRIX CHART.
Check items on the rough idle symptom in "Symptom Matrix Chart", EC-68.

→ NG: Repair or replace.

↓ OK

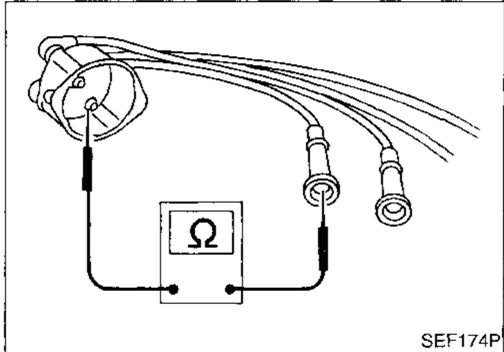
Some tests may cause a Diagnostic Trouble Code to be set.
Erase the DTC from the ECM memory after performing the tests. Refer to EC-34.

↓

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

↓

INSPECTION END

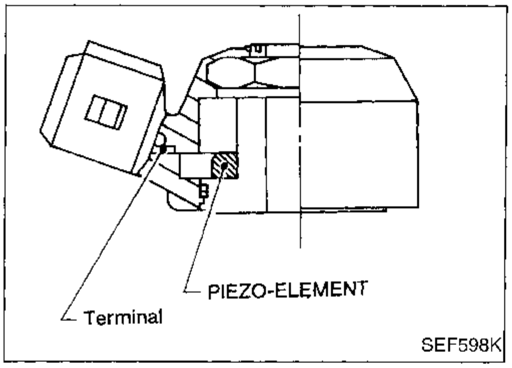


SEF174P

COMPONENT INSPECTION

Ignition wires

1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires to their distributor cap terminal. Move each wire while testing to check for intermittent breaks.
   Resistance:
   13.6 - 18.4 kΩ/m (4.15 - 5.61 kΩ/ft)
   [at 25°C (77°F)]
   If the resistance exceeds the above specification, inspect ignition wire to distributor cap connection. Clean connection or replace the ignition wire with a new one.



SEF598K

Knock Sensor (KS)

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

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

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
54	W	Knock sensor	Engine is running. — Idle speed	2.0 - 3.0V

ON BOARD DIAGNOSIS LOGIC

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 5 seconds at idle speed.

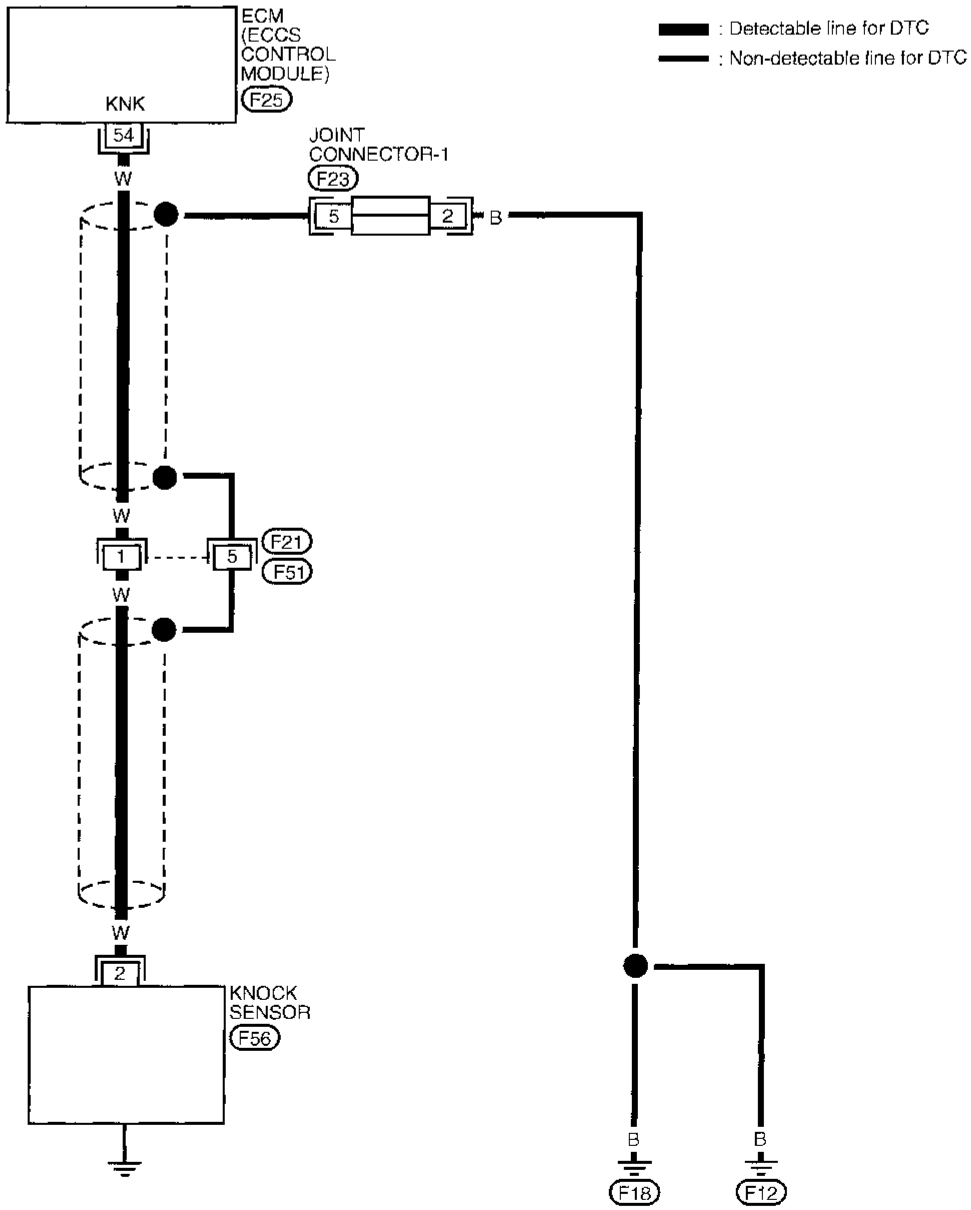
OR

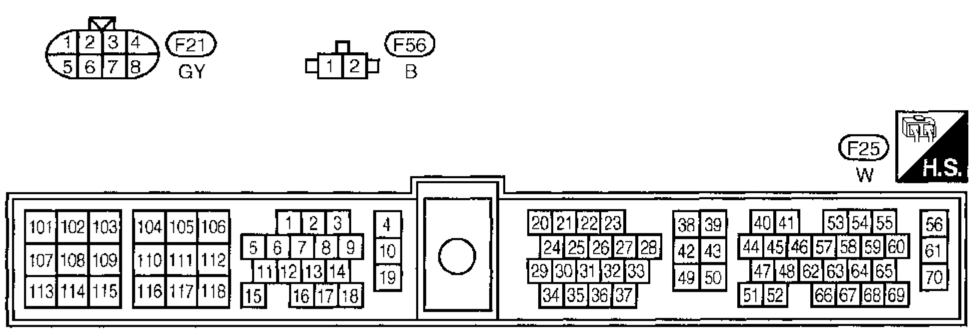
1) Start engine and run it for at least 5 seconds at idle speed.
2) Select "MODE 3" with GST.

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.

EC-KS-01

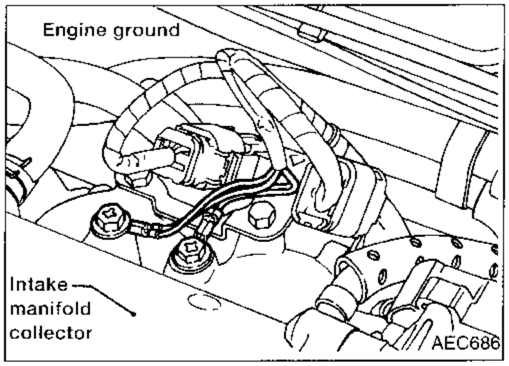


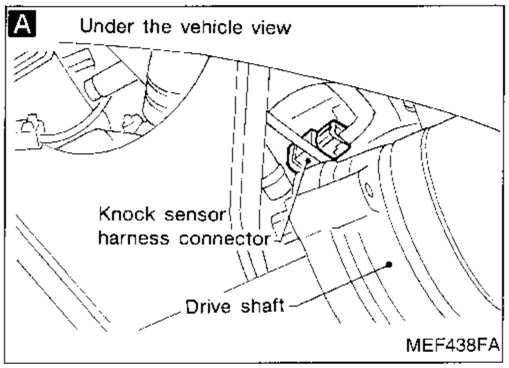


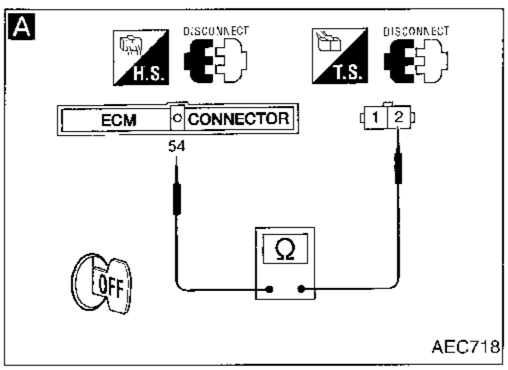
Refer to last page (Foldout page).
F23

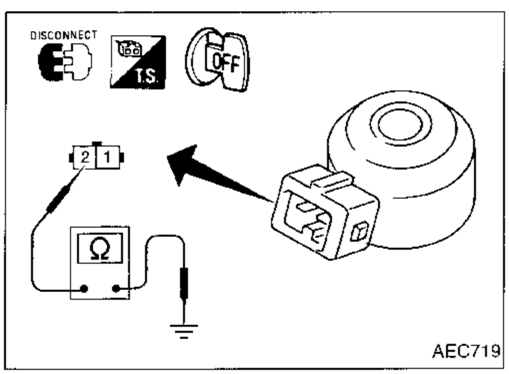
AEC212A

Knock Sensor (KS) (Cont'd)









DIAGNOSTIC PROCEDURE

INSPECTION START

↓

Loosen and retighten engine ground screws.

↓

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and knock sensor harness connector.
3. Check harness continuity between terminal ② and ECM terminal ⑭.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors, F21, F51

If NG, repair harness or connectors.

↓ OK

CHECK COMPONENT
(Knock sensor).
Refer to "COMPONENT INSPECTION" below.

NG → Replace knock sensor.

↓ OK

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

↓ Trouble is not fixed.

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

↓

INSPECTION END

COMPONENT INSPECTION

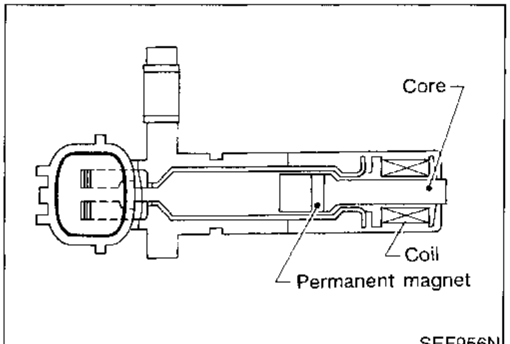
Knock sensor

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

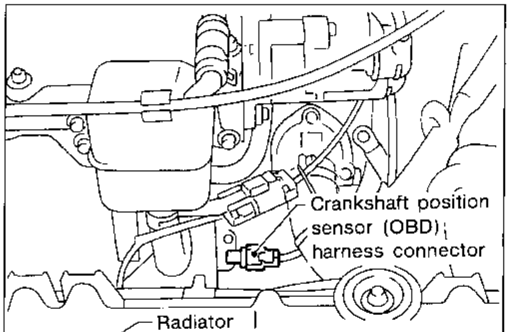
1. Disconnect knock sensor harness connector.
2. Check resistance between terminal ② and ground.

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

CAUTION:
Discard any knock sensor which has been dropped or undergone shocks; use a new one.



SEF956N



SEF957N

Crankshaft Position Sensor (CKPS) (OBD)

The crankshaft position sensor (OBD) is located on the transaxle housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
This sensor is not directly used to control the engine system. It is used only for the on board diagnosis of misfire.

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
53	W	Crankshaft position sensor (OBD)	Engine is running. (A/T: N range, M/T: Neutral) Idle speed (Air conditioner switch "OFF")	More than 0.4V* (AC voltage)

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

ON BOARD DIAGNOSIS LOGIC

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

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 15 seconds at idle speed.

OR

1) Start engine and run it for at least 15 seconds at idle speed.
2) Select "MODE 3" with GST.

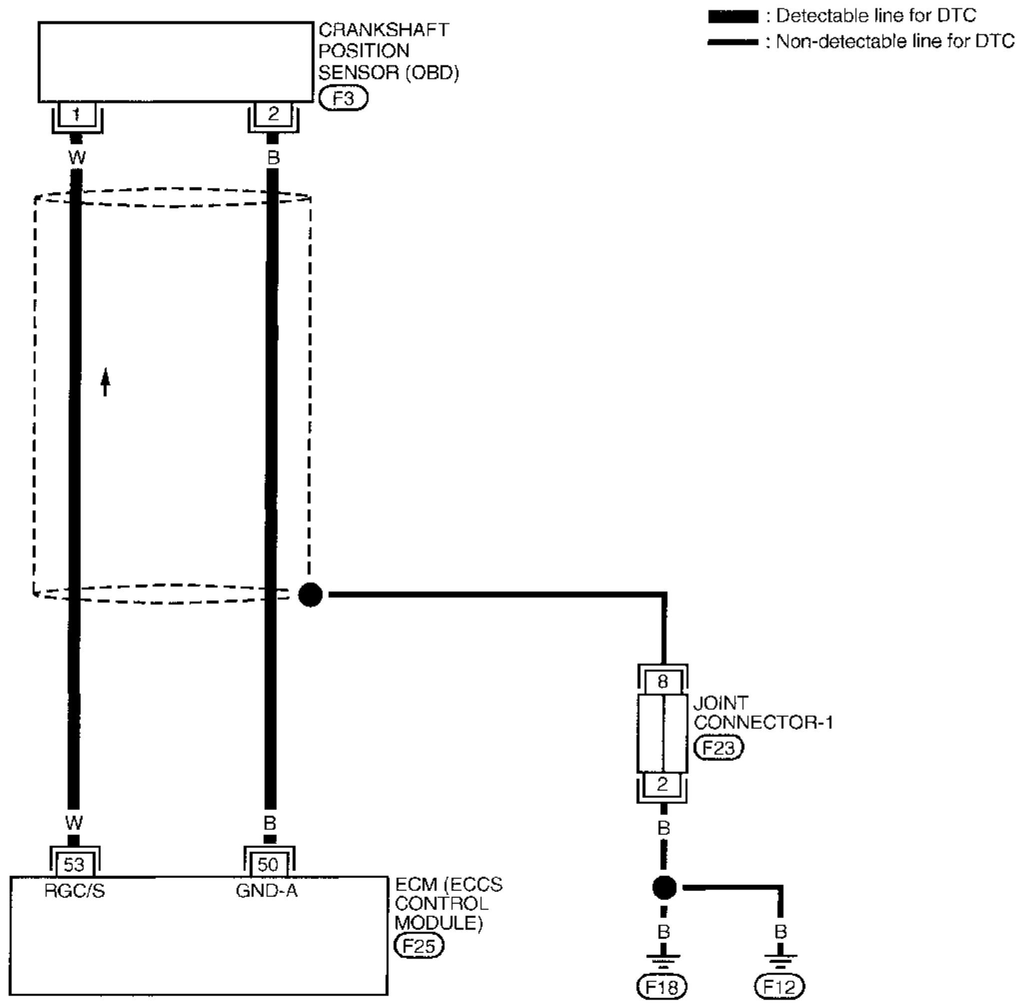
OR

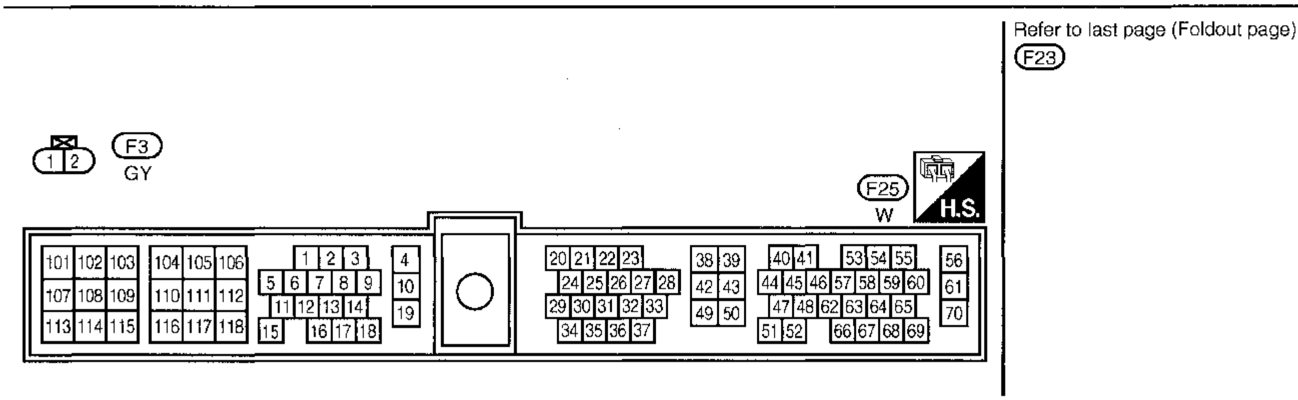
NO TOOLS

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

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

EC-CKPS-01

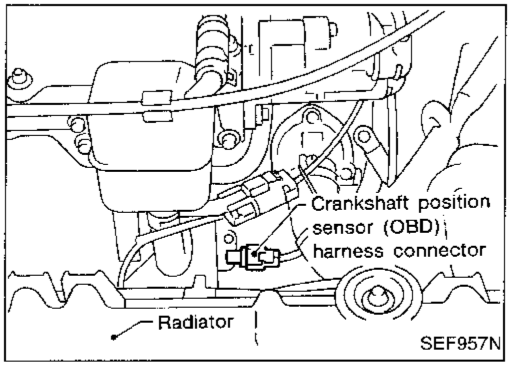




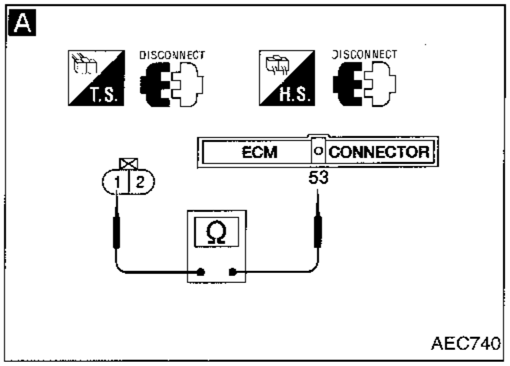
AEC341A

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

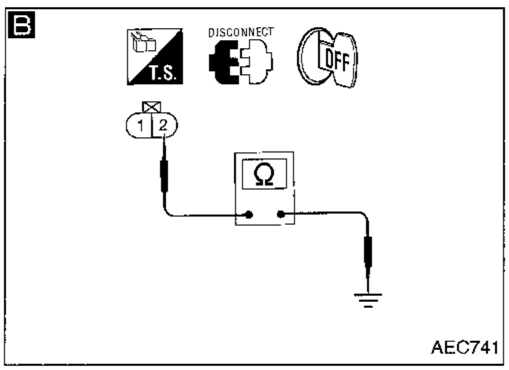
DIAGNOSTIC PROCEDURE



SEF957N



AEC740



AEC741

INSPECTION START

↓

A

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

NG → Repair harness or connectors.

↓ OK

B

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

NG → Check the following.
- Harness for open or short between ECM and crankshaft position sensor (OBD) harness connector

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.

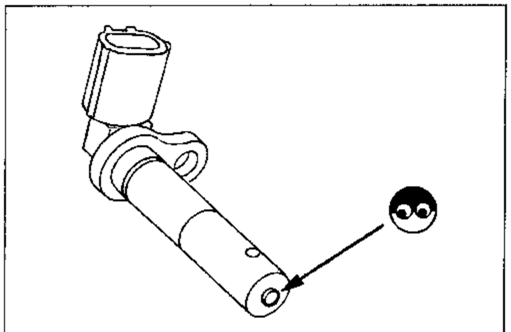
↓

INSPECTION END

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

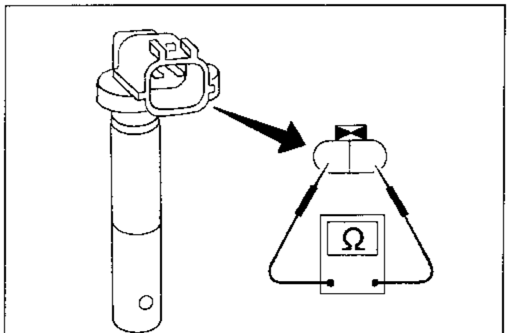
COMPONENT INSPECTION

Crankshaft position sensor (OBD)



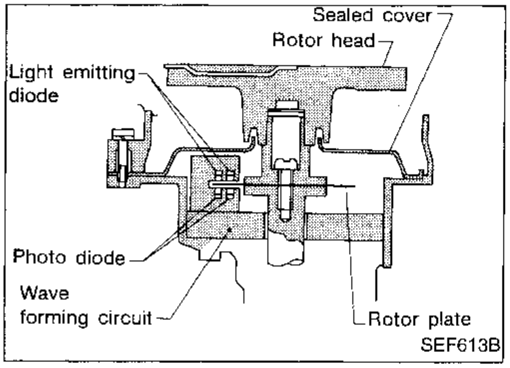
SEF960N

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

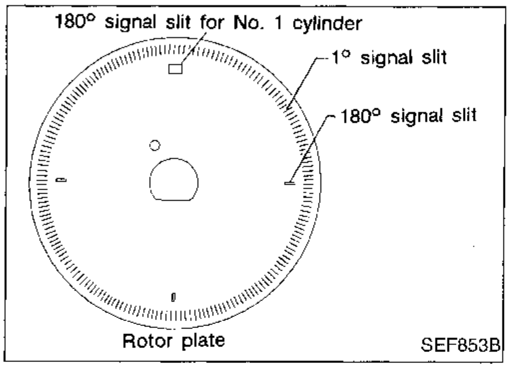


SEF151P

5. Check resistance as shown in the figure.
   Resistance: Approximately 166 - 204Ω [at 25°C (77°F)]



SEF613B



SEF853B

Camshaft Position Sensor (CMPS)

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

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

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

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40 44	L L	Camshaft position sensor (Reference signal)	[Engine is running.] └ Idle speed	Approximately 2.7V* (AC voltage)
41 45	B/W B/W	Camshaft position sensor (Position signal)	[Engine is running.] └ Idle speed	Approximately 2.7V* (AC voltage)

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0340 0101	• Either 1° or 180° signal is not sent to ECM for the first few seconds during engine cranking. • Either 1° or 180° signal is not sent to ECM often enough while the engine speed is higher than the specified engine speed. • The relation between 1° and 180° signal is not in the normal range during the specified engine speed.	• Harness or connectors (The camshaft position sensor circuit is open or shorted.) • Camshaft position sensor • Starter motor (Refer to EL section.) • Starting system circuit (Refer to EL section.) • Dead (Weak) battery

Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Crank engine for at least 2 seconds.

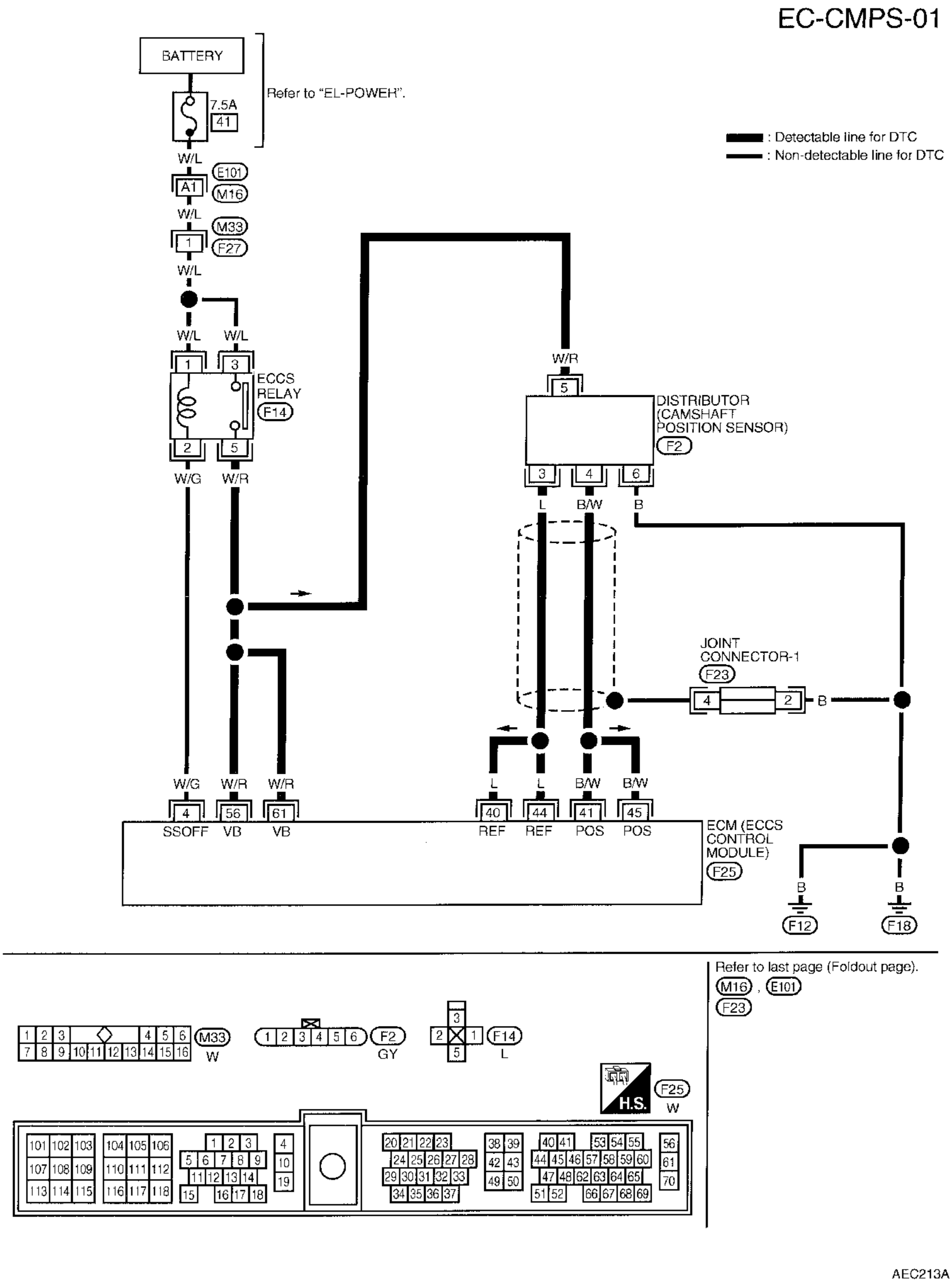
OR

1) Crank engine for at least 2 seconds.
2) Select "MODE 3" with GST.

OR

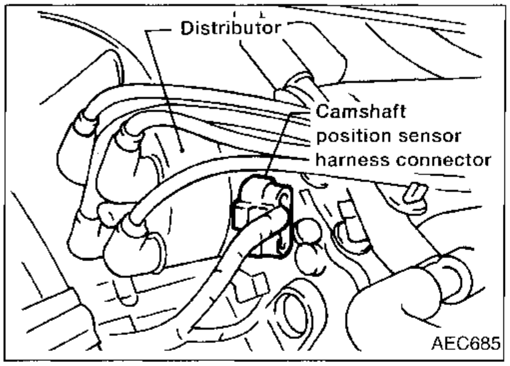
1) Crank engine for at least 2 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

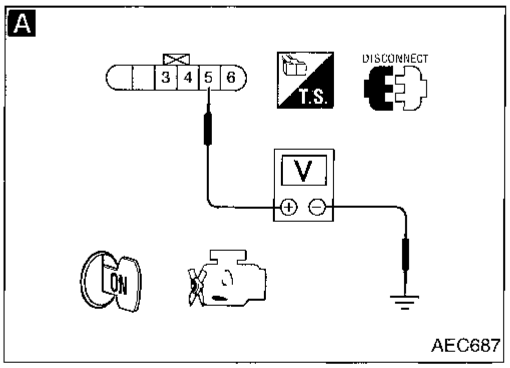
Camshaft Position Sensor (CMPS) (Cont'd)

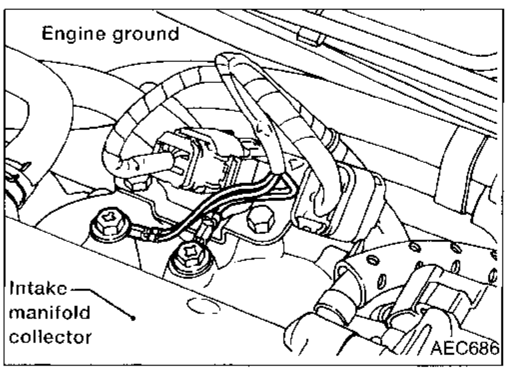


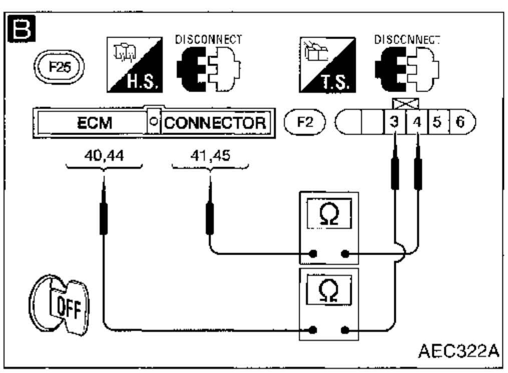
Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE (DETECTABLE CIRCUIT)









INSPECTION START

↓

A

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

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

If NG, repair harness or connectors.

↓ OK

Loosen and retighten engine ground screws.

↓

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ④ and ECM terminals ㊶, ㊺, terminal ③ and ECM terminals ㊵, ㊹.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

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

NG → Replace camshaft position sensor.

↓ OK

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

↓ Trouble is not fixed.

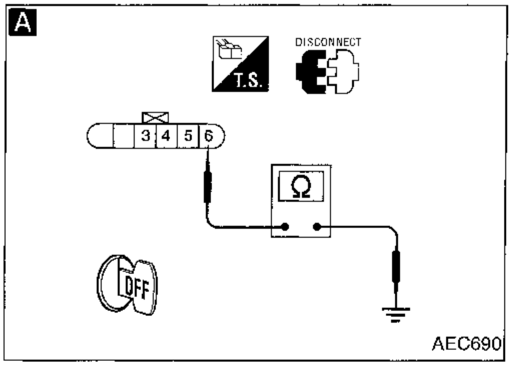
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE (NON-DETECTABLE CIRCUIT)



INSPECTION START

↓

A **CHECK GROUND CIRCUIT.**
1. Turn ignition switch "OFF".
2. Disconnect camshaft position sensor harness connector.
3. Check harness continuity between terminal ⑥ and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness for open or short between camshaft position sensor and engine ground

If NG, repair harness or connector.

↓ OK

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

NG → Replace camshaft position sensor.

↓ OK

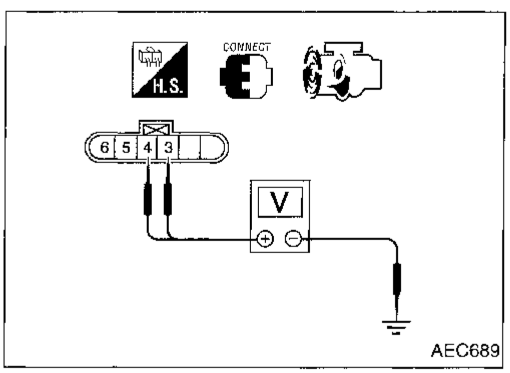
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

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

↓

INSPECTION END



COMPONENT INSPECTION

Camshaft position sensor

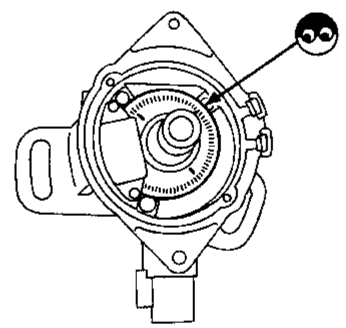
1. Start engine.
2. Check voltage between camshaft position sensor terminals ③, ④ and ground with AC range.

Condition	Terminal	Voltage
Engine running at idle	③ and ground ④ and ground	Approximately 2.7V* (AC)

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

If NG, replace distributor assembly with camshaft position sensor.

Camshaft Position Sensor (CMPS) (Cont'd)



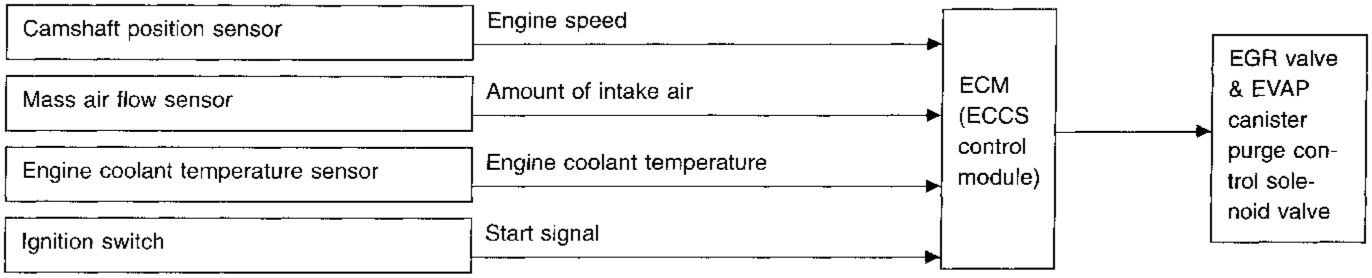
SEF887K

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

After this inspection, diagnostic trouble code No. 11 might be displayed with camshaft position sensor functioning properly. Erase the stored memory.

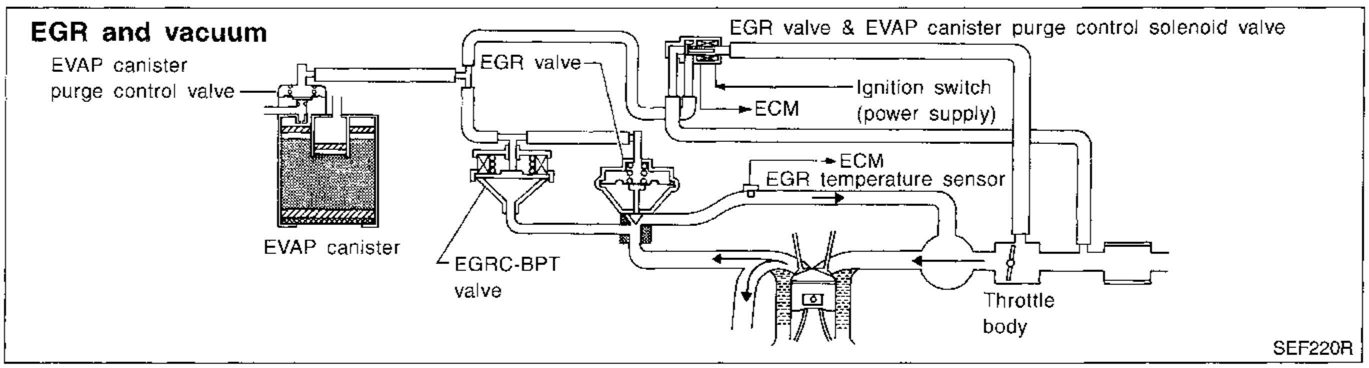
EGR Function

SYSTEM DESCRIPTION



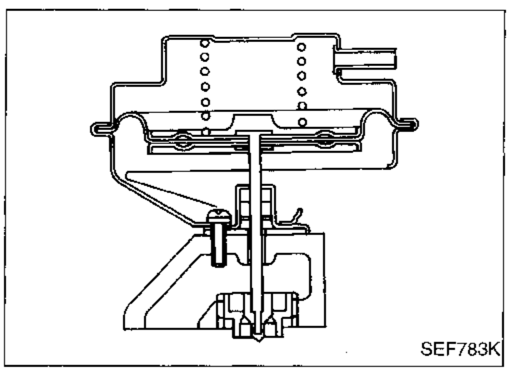
This system cuts and controls vacuum applied to the EGR valve and EVAP canister to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGR valve & EVAP canister purge control solenoid valve. When the ECM detects any of the following conditions, current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

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction



SEF220R

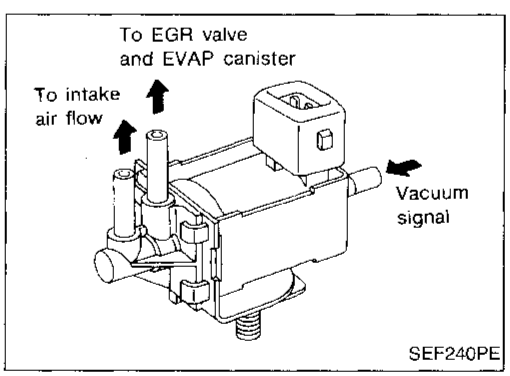
COMPONENT DESCRIPTION



SEF783K

Exhaust gas recirculation (EGR) valve

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



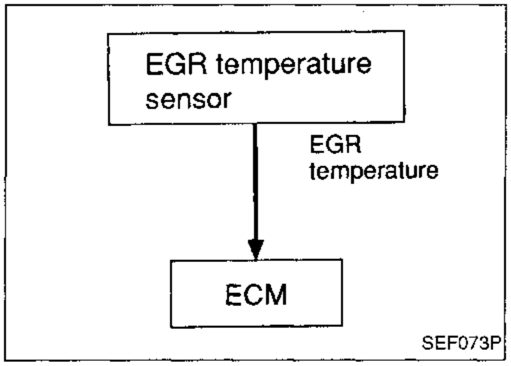
SEF240PE

EGR valve and EVAP canister purge control solenoid valve

The EGR valve and EVAP canister purge control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to cut the vacuum signal (from the throttle body to the EGR valve and EVAP canister purge control valve).

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

EGR Function (Cont'd)



ON BOARD DIAGNOSIS LOGIC

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

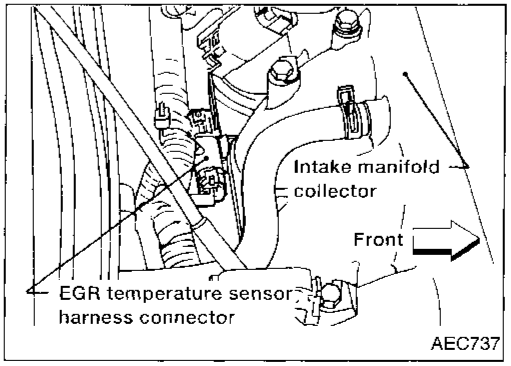
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0400 0302	A) The exhaust gas recirculation (EGR) flow is excessively low during the specified driving condition.	• EGR valve stuck closed • EGRC-BPT valve leaking • Passage blocked • EGR valve & EVAP canister purge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

OVERALL FUNCTION CHECK

Use this procedure to check the overall EGR function. During this check, a 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 71°C (160°F), perform only "Procedure for malfunction A".
If the engine coolant temperature is lower than 71°C (160°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-66.

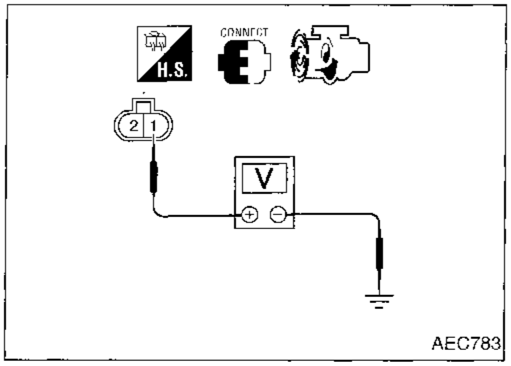
EGR Function (Cont'd)

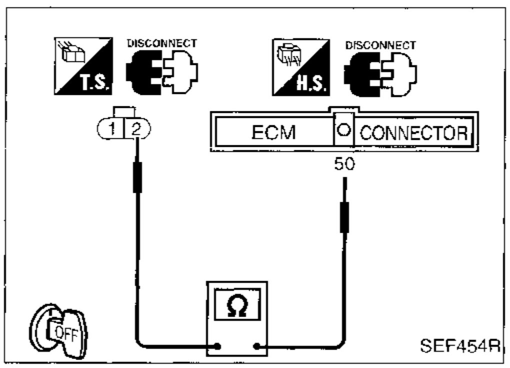


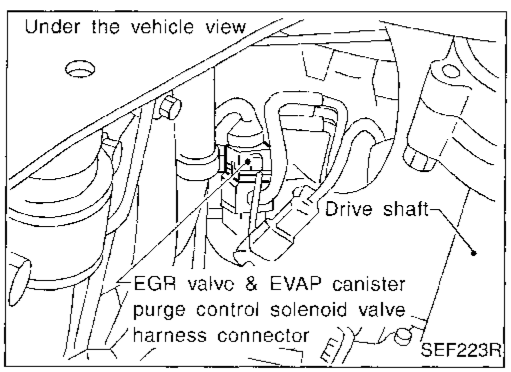
Procedure for malfunction A

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

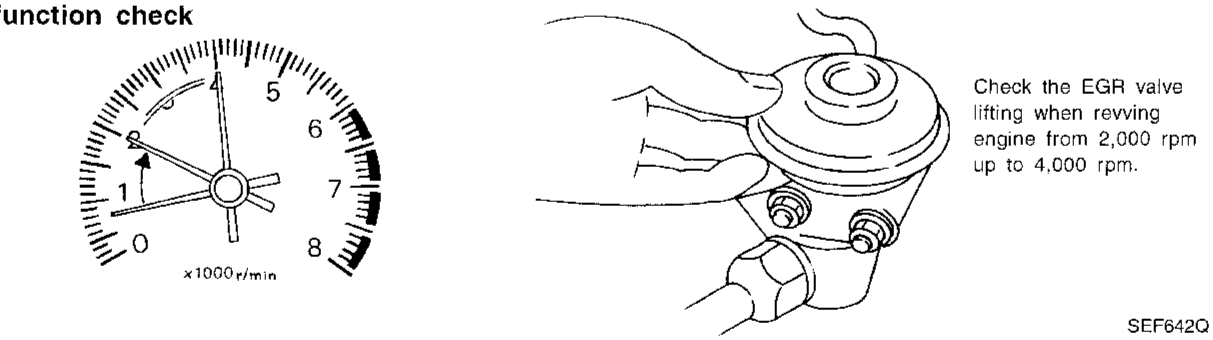
   EGR valve should lift up and down without sticking.
   If NG, go to A in DIAGNOSTIC PROCEDURE on EC-154.
3) Check voltage between EGR temperature sensor harness connector terminal ① and ground at idle speed.
   Less than 4.5V should exist.
4) Turn ignition switch "OFF".
   Check harness continuity between EGR temperature sensor harness connector terminal ② and ECM terminal ⑸⓪.
   Continuity should exist.
5) Perform "COMPONENTS INSPECTION", "EGR temperature sensor". Refer to EC-156.



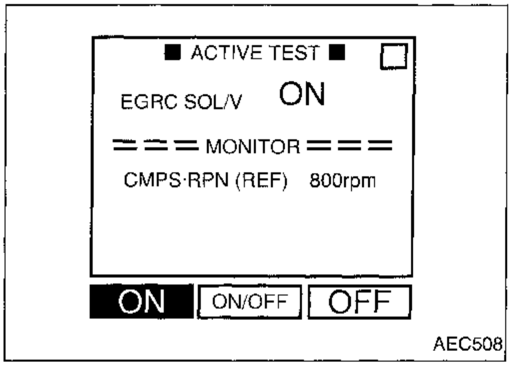




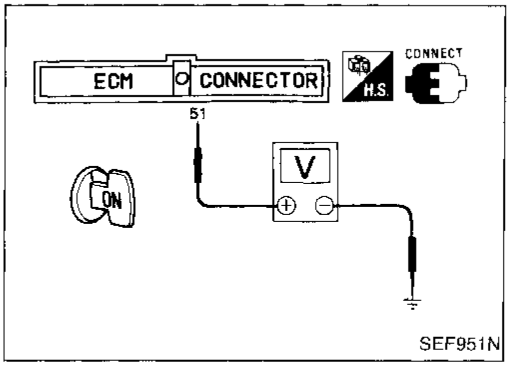
Overall function check



EGR Function (Cont'd)



AEC508



SEF951N

Procedure for malfunction B

1) Start engine.
2) Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "ON".
3) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.

EGR valve should be closed and should not lift up.

OR

1) Confirm the engine coolant temperature is lower than 71°C (160°F) in "Mode 1" with generic scan tool. Perform the following steps before its temperature becomes higher than 71°C (160°F).
2) Start engine.
3) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.

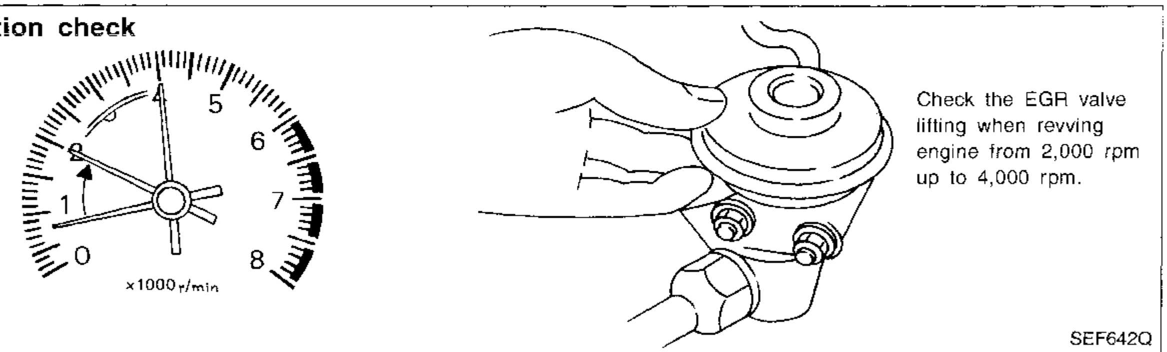
EGR valve should be closed and should not lift up.

OR

1) Confirm the voltage between ECM terminal (51) and ground is higher than 1.48V. Perform the following steps before the voltage becomes lower than 1.48V.
2) Start engine.
3) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.

EGR valve should be closed and should not lift up.

Overall function check



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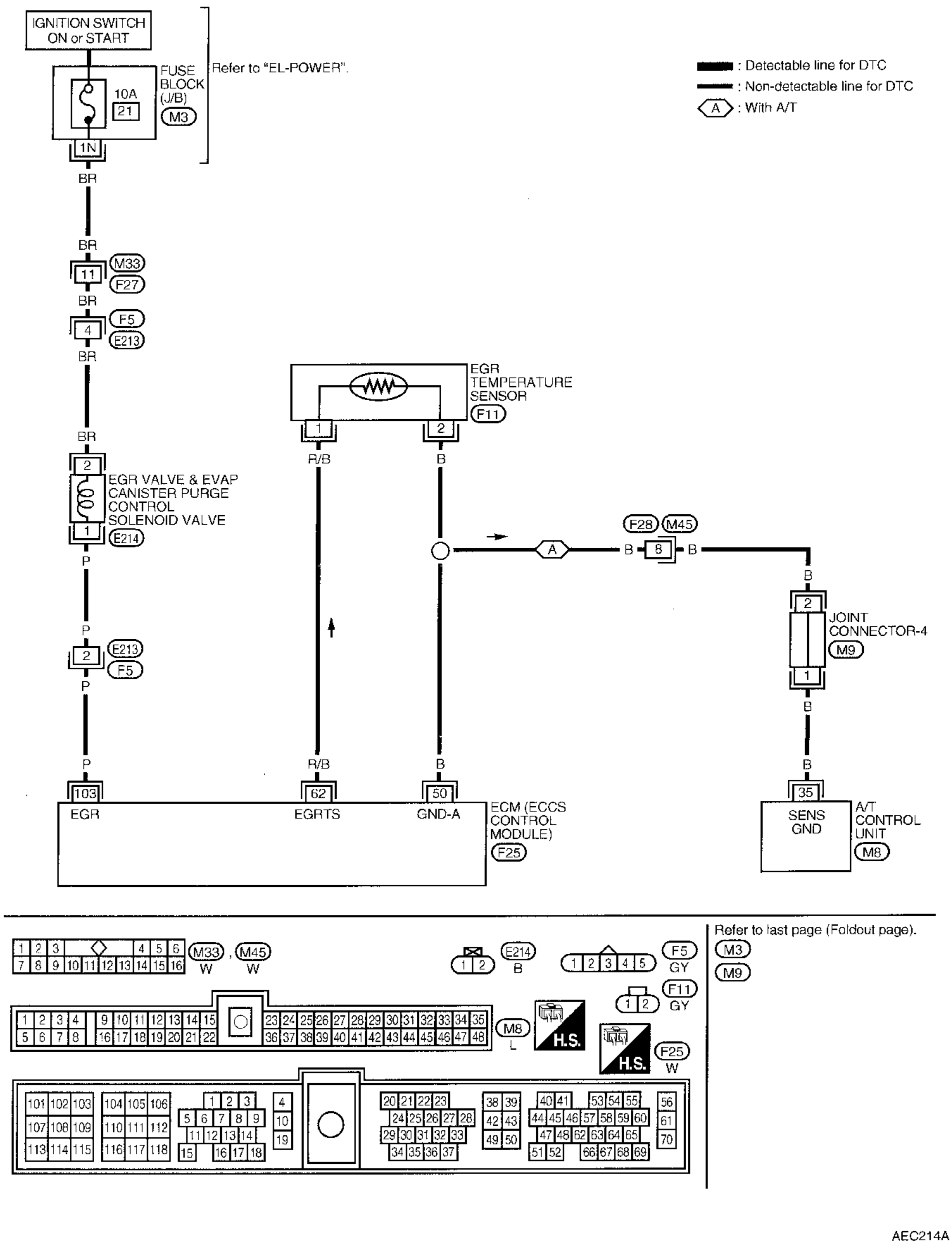
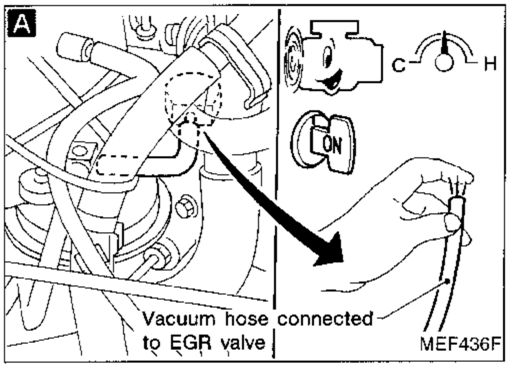
EGR Function (Cont'd)

EC-EGRC1-01

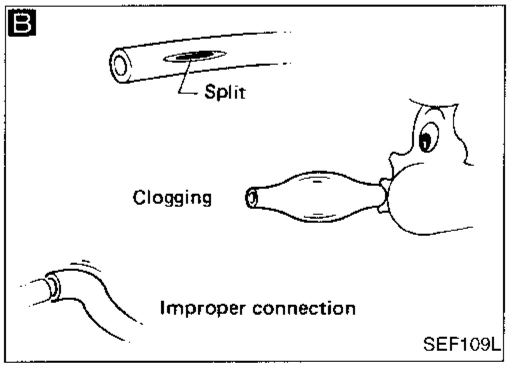


EGR Function (Cont'd)

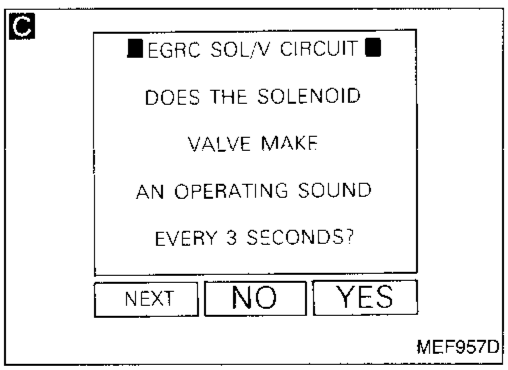
DIAGNOSTIC PROCEDURE



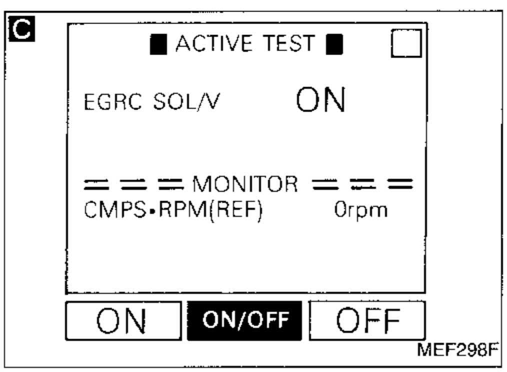
MEF436F



SEF109L



MEF957D



MEF298F

INSPECTION START

↓

A

CHECK VACUUM SOURCE TO EGR VALVE.

1. Start engine and warm it up sufficiently.
2. Disconnect vacuum hose to EGR valve.
3. Check vacuum existence.
   Vacuum should not exist at idle.
4. Check vacuum existence 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 DTC for EGR valve & EVAP canister purge control solenoid valve will be displayed, however, ignore it.)

Vacuum should exist when revving engine.

OK → CHECK COMPONENTS (EGR valve).
Refer to "COMPONENTS INSPECTION", EC-156.

NG → Replace EGR valve.

NG ↓

B

CHECK VACUUM HOSE.

Check vacuum hose for clogging, cracks, improper connection or misrouting.
Refer to "Vacuum Hose Drawing", EC-15.

NG → Repair or replace vacuum hose.

OK ↓

C

CHECK COMPONENT

(EGR valve & EVAP canister purge control solenoid valve).

1. Turn ignition switch "ON".
2. Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Turn EGR valve & EVAP canister purge control solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

1. Warm up engine sufficiently.
2. Turn ignition switch "OFF" and wait at least 5 seconds.
3. Turn ignition switch "ON".
4. Check operating sound of the solenoid valve when disconnecting and reconnecting EGR valve & EVAP canister purge control solenoid valve harness connector.

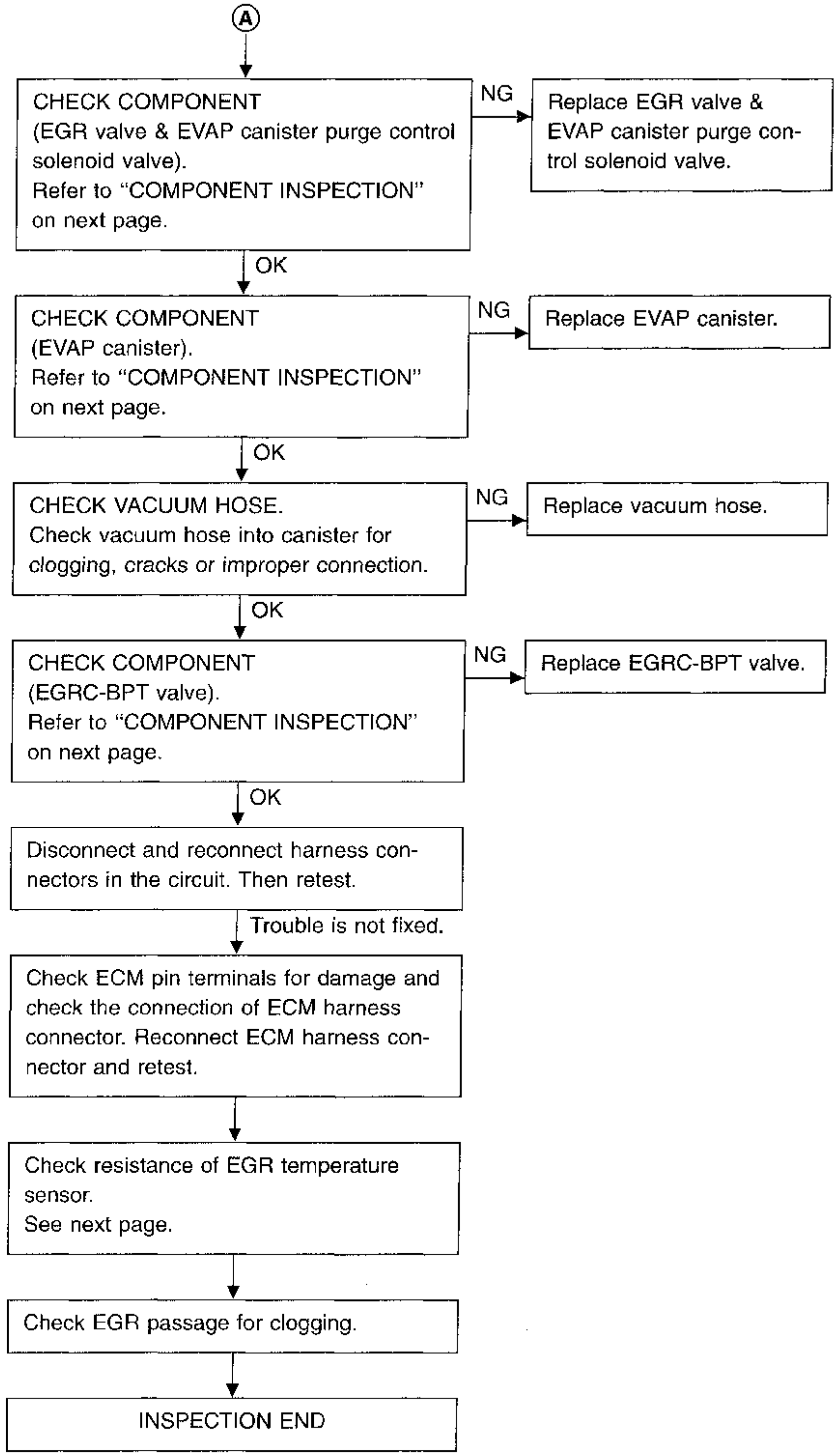
NG → Repair or replace EGR valve & EVAP canister purge control solenoid valve circuit.

OK ↓

Ⓐ

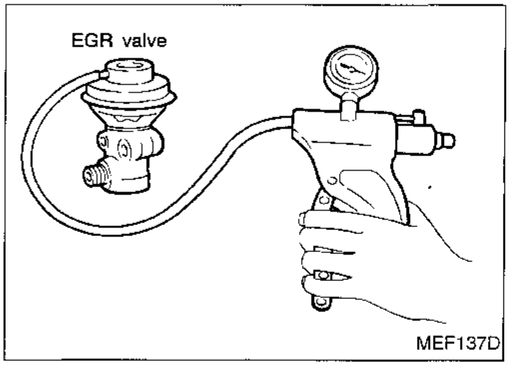
(Go to next page.)

EGR Function (Cont'd)



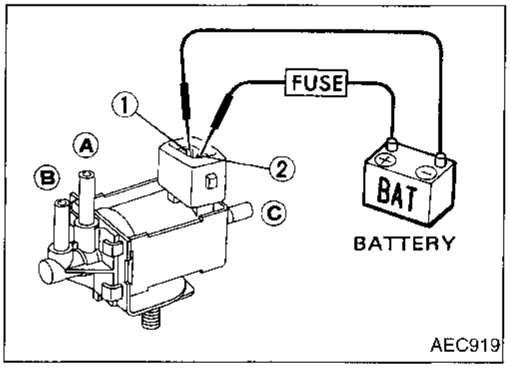
EGR Function (Cont'd)

COMPONENT INSPECTION



EGR valve

Apply vacuum to EGR vacuum port with a hand vacuum pump.
EGR valve spring should lift.
If NG, replace EGR valve.

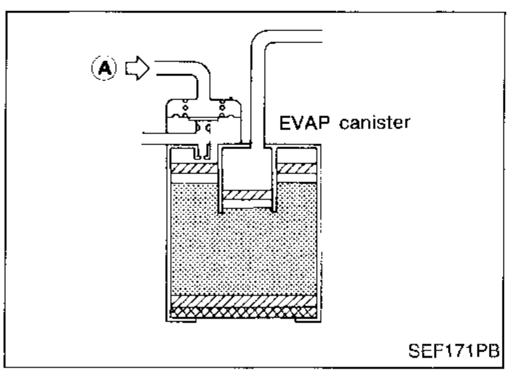


EGR valve & EVAP canister purge control solenoid valve

Check solenoid valve, following the table as shown below:

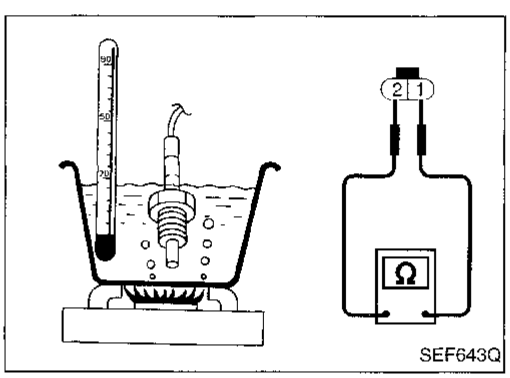
Conditions	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

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



EVAP canister

Gently blow air from Ⓐ.
No leakage should exist.



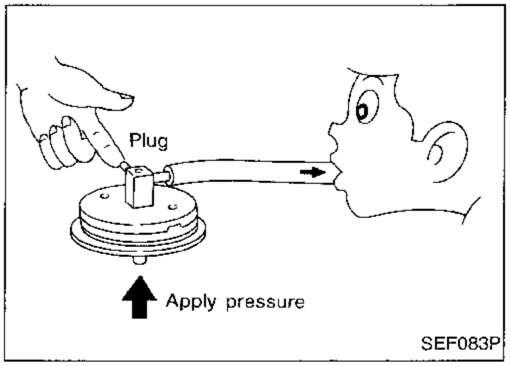
EGR temperature sensor

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.

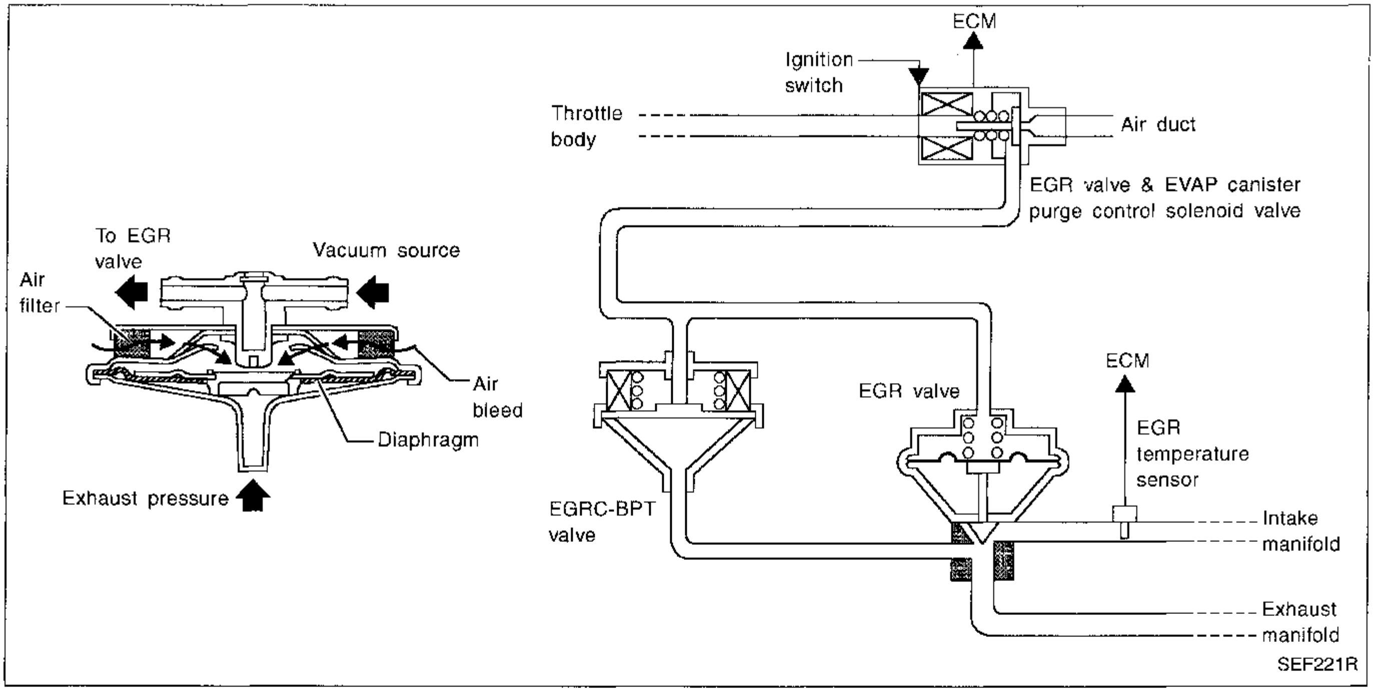
EGR Function (Cont'd)



EGRC-BPT valve

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

EGRC-BPT Valve Function



SYSTEM DESCRIPTION

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

ON BOARD DIAGNOSIS LOGIC

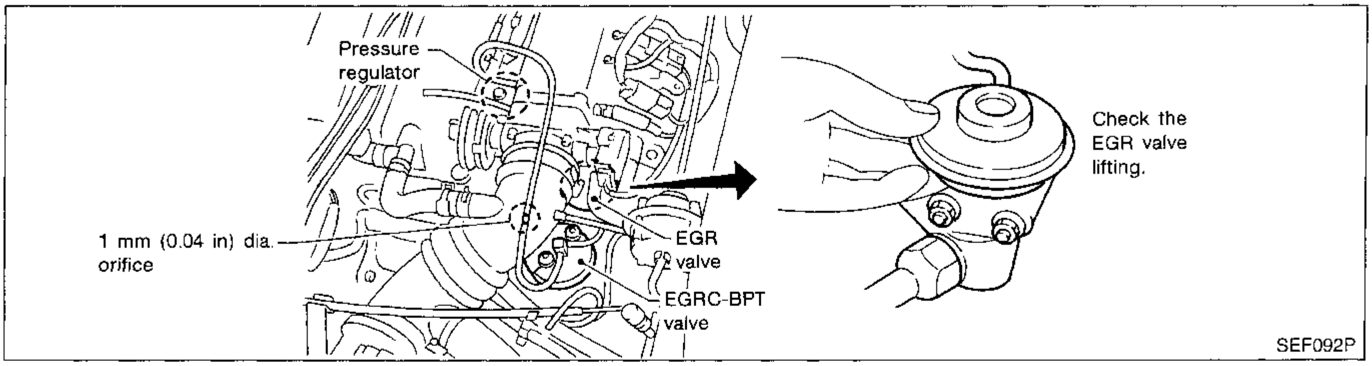
If too much EGR flow exists due to an EGRC-BPT valve malfunction, off idle engine roughness will increase. If the roughness is large, then the vacuum to the EGR valve is interrupted through the EGR & EVAP canister purge control solenoid valve. If the engine roughness is reduced at that time, the EGRC-BPT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

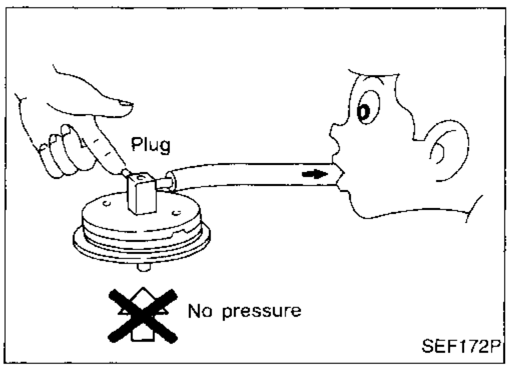
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0402 0306	● The EGRC-BPT valve does not operate properly.	● EGRC-BPT valve ● Misconnected rubber tube ● Blocked rubber tube

OVERALL FUNCTION CHECK

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

1. Disconnect the rubber tube to the fuel pressure regulator at the intake manifold.
2. Disconnect the rubber tube to the EGR valve & EVAP canister purge control solenoid valve at the EGRC-BPT valve.
   Connect the intake manifold and the EGRC-BPT valve with a rubber tube that has 1 mm (0.04 in) dia. orifice installed. (The intake manifold vacuum will be directly applied to the EGRC-BPT valve.)
3. Start engine.
4. Check for the EGR valve lifting with engine at less than 1,500 rpm under no load.
   EGR valve should remain closed.
5. Check the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.
   EGR valve should lift up, and go down without sticking when the engine is returned to idle.
6. Check rubber tube between EGR valve & EVAP canister purge control solenoid valve and throttle body for misconnection, cracks or blockages.





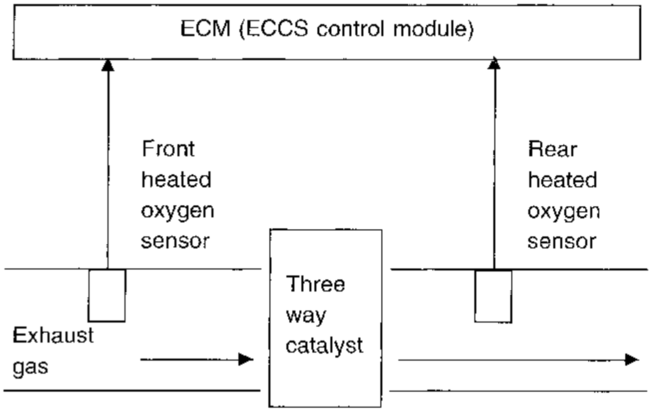
COMPONENT INSPECTION

EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check leakage without applying any pressure from under EGR-BPT valve.
   Leakage should exist.

Three Way Catalyst Function

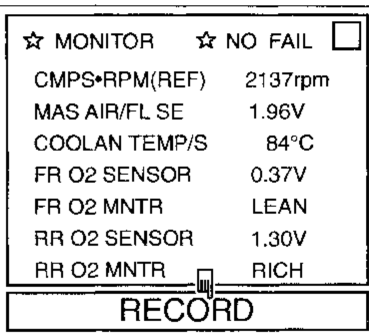
ON BOARD DIAGNOSIS LOGIC



The ECM monitors the switching frequency ratio of front heated oxygen sensor and rear heated oxygen sensor.
A three way catalyst with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor switching frequency will increase.
When the frequency ratio of front heated oxygen sensor and rear heated oxygen sensor approaches a specified limit value, the second stage diagnosis is applied.
The second stage diagnosis switches the mixture ratio feedback control using front heated oxygen sensor to rear heated oxygen sensor.
Then ECM measures the switching lag time between front heated oxygen sensor and rear heated oxygen sensor.
The longer lag time indicates the greater oxygen storage capacity. If the lag time is within the specified level, the three way catalyst malfunction is diagnosed.

- **The three way catalyst function has one trip detection logic.**

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0420 0702	● Three way catalyst does not operate properly. ● Three way catalyst does not have enough oxygen storage capacity.	● Three way catalyst ● Exhaust tube ● Intake air leak ● Injectors ● Injector leak



SEF097P

OVERALL FUNCTION CHECK

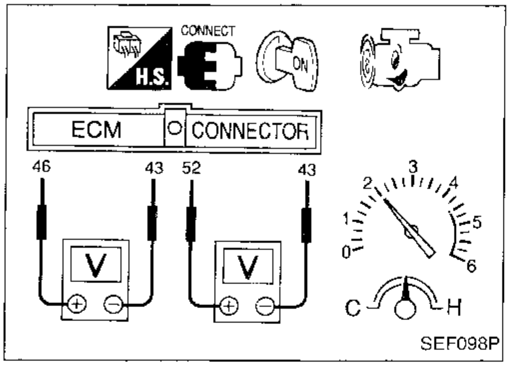
Use this procedure to check the overall function of the three way catalyst. During this check, a DTC might not be confirmed.

1) Start engine and warm it up sufficiently.
2) Set "MANU TRIG" and "HI SPEED", then select "FR O2 SENSOR", "RR O2 SENSOR", "FR O2 MNTR", "RR O2 MNTR" in "DATA MONITOR" mode with CONSULT.
3) Touch "RECORD" on CONSULT screen with engine speed held at 2,000 rpm constant under no load.
4) Make sure that the switching frequency between "RICH" and "LEAN" of "RR O2 SENSOR" is very less than that of "FR O2 SENSOR".

Switching frequency ratio =

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

Three Way Catalyst Function (Cont'd)



This ratio should be less than 0.40 for A/T models and 0.37 for M/T models.
If the ratio is greater than the above value, the three way catalyst is not operating properly.

OR

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

Switching frequency ratio =

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

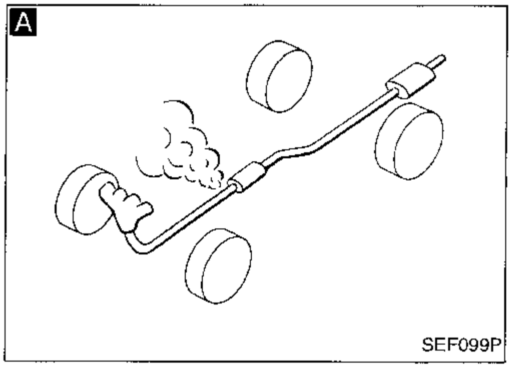
This ratio should be less than 0.40 for A/T models and 0.37 for M/T models.
If the ratio is greater than the above value, it means three way catalyst does not operate properly.

Note: **If the voltage at terminal 46 does not switch periodically more than 5 times within 10 seconds at step 3, perform TROUBLE DIAGNOSIS FOR DTC P0130 (0303) first. Refer to EC-111.**

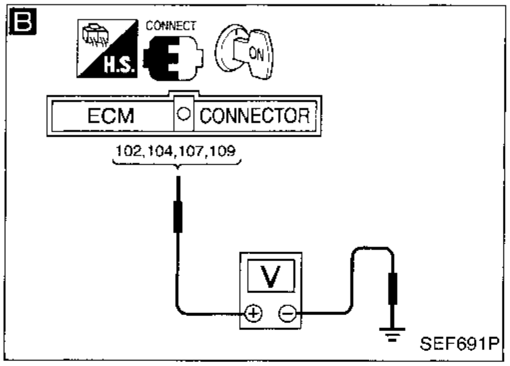
GI
MA
EM
LC
EC
FE
CL
MT
AT
FA
RA
BR
ST
RS
BT
HA
EL
IDX

Three Way Catalyst Function (Cont'd)

DIAGNOSTIC PROCEDURE



SEF099P



SEF691P

INSPECTION START

↓

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

CHECK EXHAUST AIR LEAK.
Start engine and run it at idle. Listen for an exhaust air leak before the three way catalyst.
- NG → Repair or replace.
- OK ↓

CHECK INTAKE AIR LEAK.
Start engine and run it at idle. Listen for an intake air leak after the mass air flow sensor.
- NG → Repair or replace.
- OK ↓

B **CHECK INJECTORS.**
1. Refer to WIRING DIAGRAM for Injectors, EC-217.
2. Check voltage between ECM terminals (102), (104), (107), and (109) and ground with CONSULT or tester.
   Battery voltage should exist.
3. Turn ignition switch "OFF".
- NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injector", EC-217. Repair harness or connectors.
- OK ↓

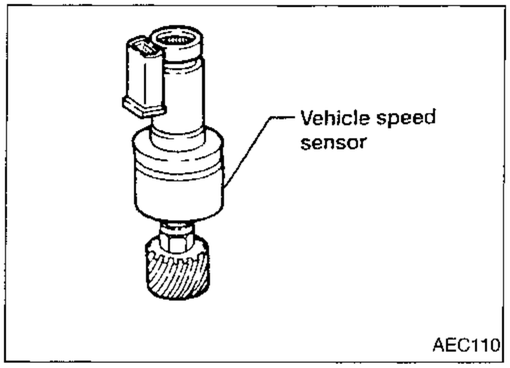
Remove injector assembly.
Refer to EC-26.
Keep fuel hose and all injectors connected to injector gallery.

↓

1. Disconnect camshaft position sensor harness connector.
2. Turn ignition switch "ON".
   Make sure fuel does not drip from injector.
- Drips → Replace the injector(s) from which fuel is dripping.
- Does not drip ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.
- Trouble is not fixed → Replace three way catalyst.
- Trouble is fixed ↓

INSPECTION END



Vehicle Speed Sensor (VSS)

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

ECM TERMINALS AND REFERENCE VALUE

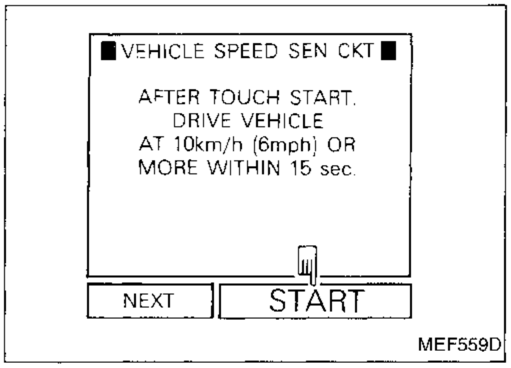
Specification data are reference values and are measured between each terminal and 43 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
26	PU/R	Vehicle speed sensor	Engine is running. └ Slowly rotating front wheels	Approximately 1.8 - 2.4V* (AC voltage)

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

ON BOARD DIAGNOSIS LOGIC

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



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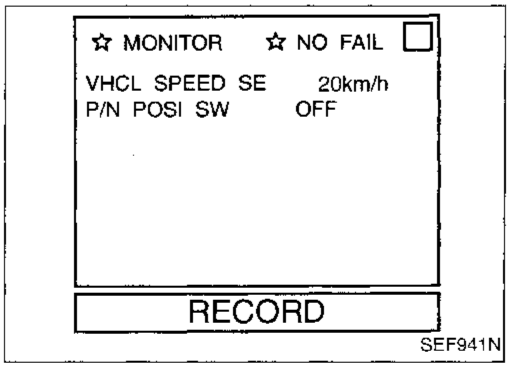
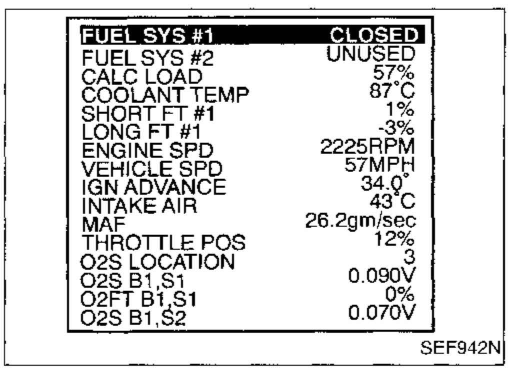


SEF941N



SEF942N

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 DTC might not be confirmed.

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

OR

1) Jack up drive wheels.
2) Start engine.
3) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.

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

OR

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

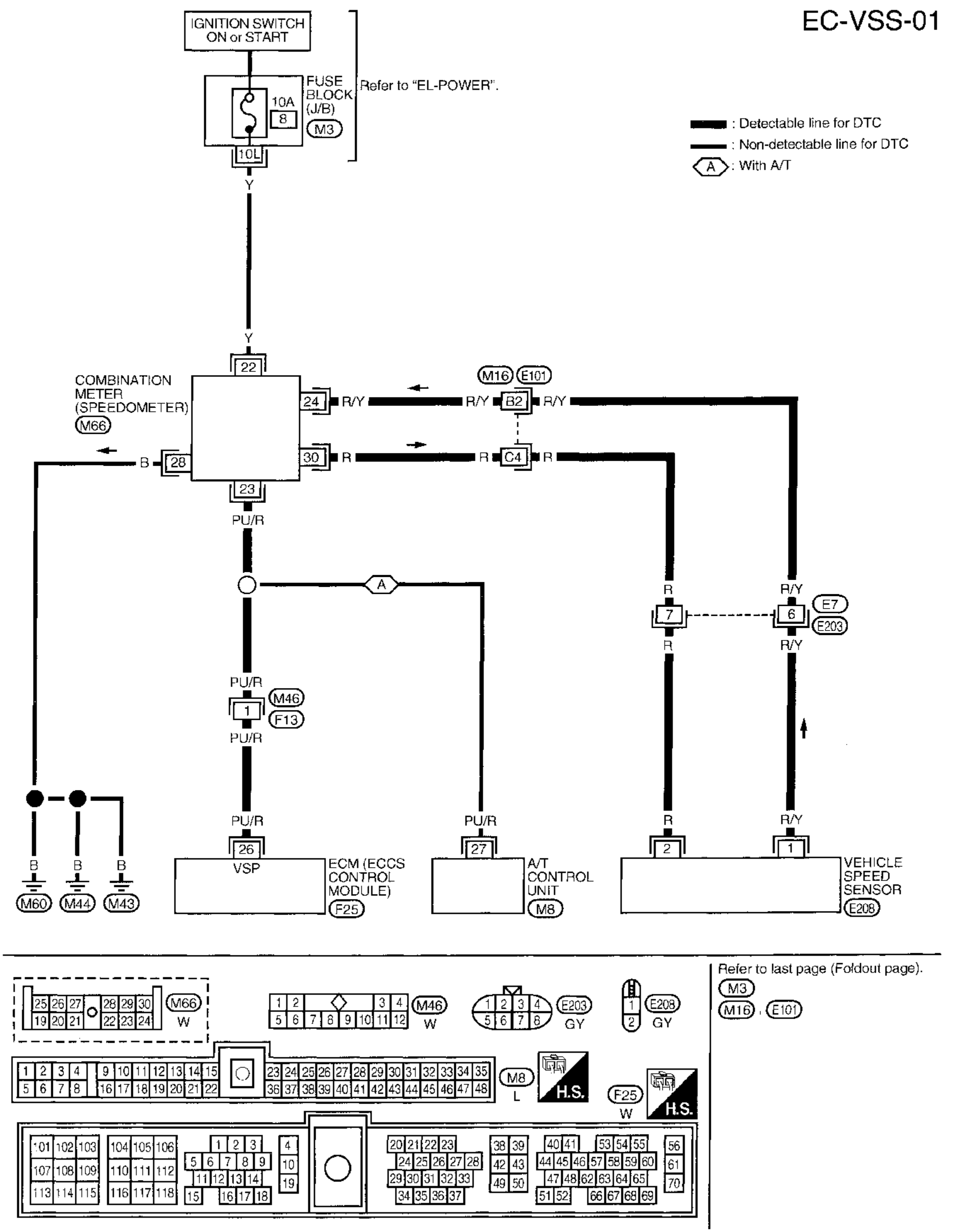
The vehicle speed on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

OR

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

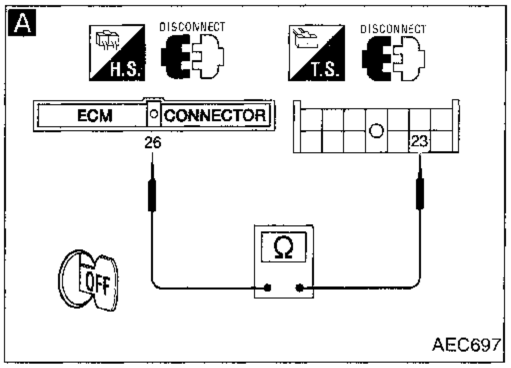
1) Start engine and warm it up sufficiently.
2) Perform test drive for at least 10 seconds continuously under the following recommended condition.
   Engine speed : (A/T models) 2,000 - 3,200 rpm
   (M/T models) 1,950 - 2,900 rpm
   Intake manifold vacuum: −40.0 to −26.7 kPa (−300 to −200 mmHg, −11.81 to −7.87 inHg)
   Gear position : Suitable position (except "N" or "P" 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 Diagnostic Trouble Code is not detected, perform the above test drive at least one more time.


EC-VSS-01
IGNITION SWITCH ON or START
10A
8
FUSE BLOCK (J/B)
M3
Refer to "EL-POWER".
10L
: Detectable line for DTC
: Non-detectable line for DTC
A : With A/T
COMBINATION METER (SPEEDOMETER)
M66
M16 E101
B2
C4
E7
E203
M46
F13
VSP
ECM (ECCS CONTROL MODULE)
F25
A/T CONTROL UNIT
M8
VEHICLE SPEED SENSOR
E208
M60 M44 M43
Refer to last page (Foldout page).
M3
M16, E101
W
GY
L
H.S.
AEC215A

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

↓

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM terminal (26) and terminal (23).
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors (F13), (M46)
- Harness for open or short between ECM and combination meter

If NG, repair harness or connectors.

↓ OK

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check the following.
- Harness connectors (M16), (E101)
- Harness connectors (E7), (E203)
- Harness for open or short between combination meter and vehicle speed sensor

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

↓ OK

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

↓ Trouble is not fixed.

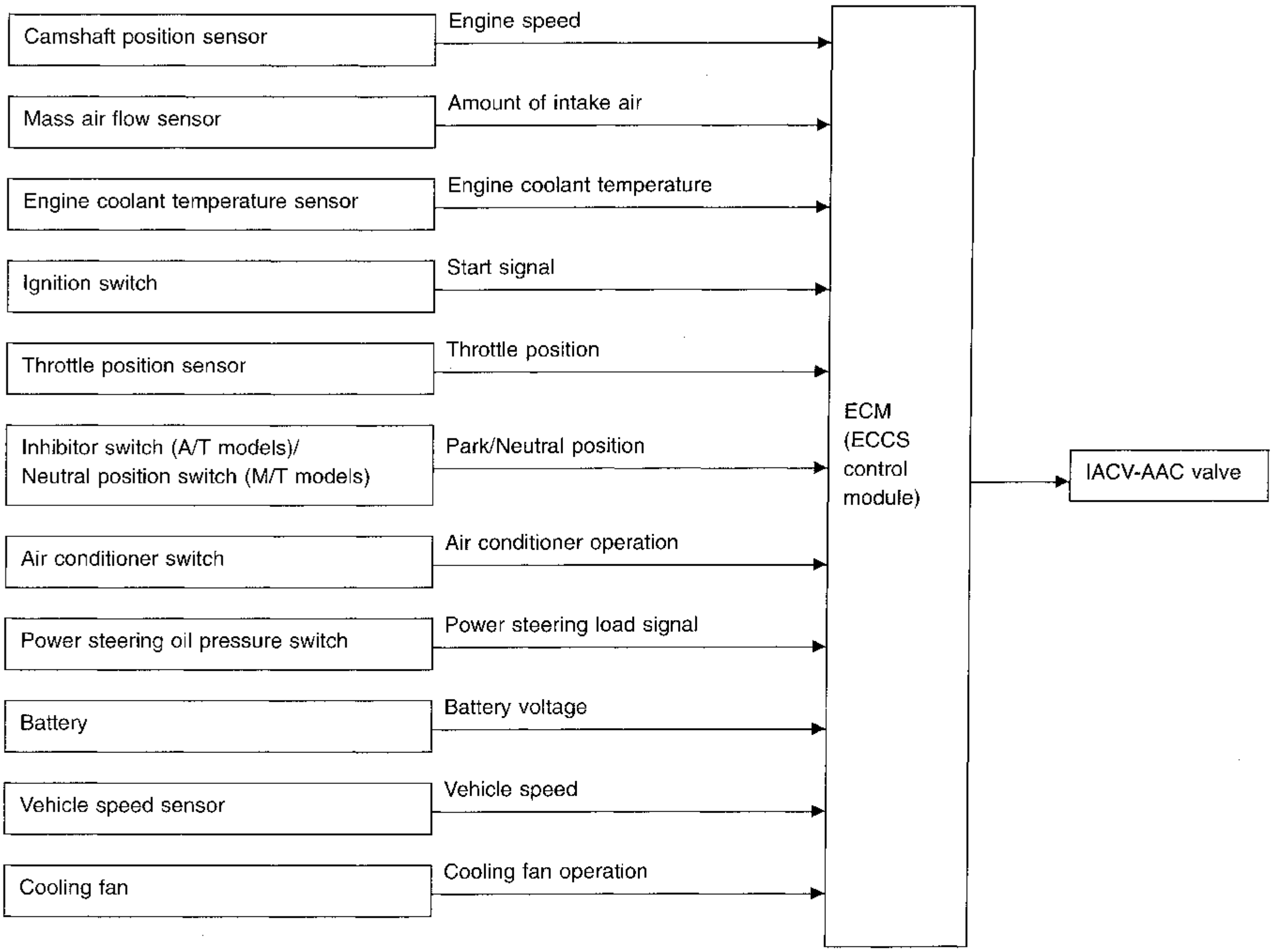
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

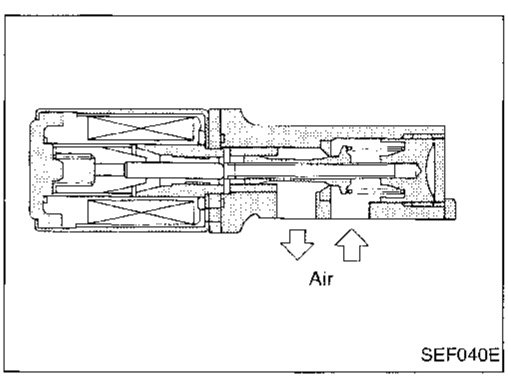
INSPECTION END

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

SYSTEM DESCRIPTION



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



COMPONENT DESCRIPTION

IACV-AAC valve

The IAC valve-AAC valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of air that will flow through the valve. The more air that flows through the valve, the higher the idle speed.

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	20 - 40%
		2,000 rpm	—

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	SB	IACV-AAC valve	Engine is running. └ Idle speed	Approximately 5 - 14V
			Engine is running. ├ Steering wheel is being turned ├ Air conditioner is operating └ Headlamps are in high position	5 - 9V

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

Procedure for malfunction A

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

OR

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

OR

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

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

Procedure for malfunction B

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
4) Start engine and run it for at least 30 seconds at idle speed.

OR

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and run it for at least 30 seconds at idle speed.
4) Select "MODE 3" with GST.

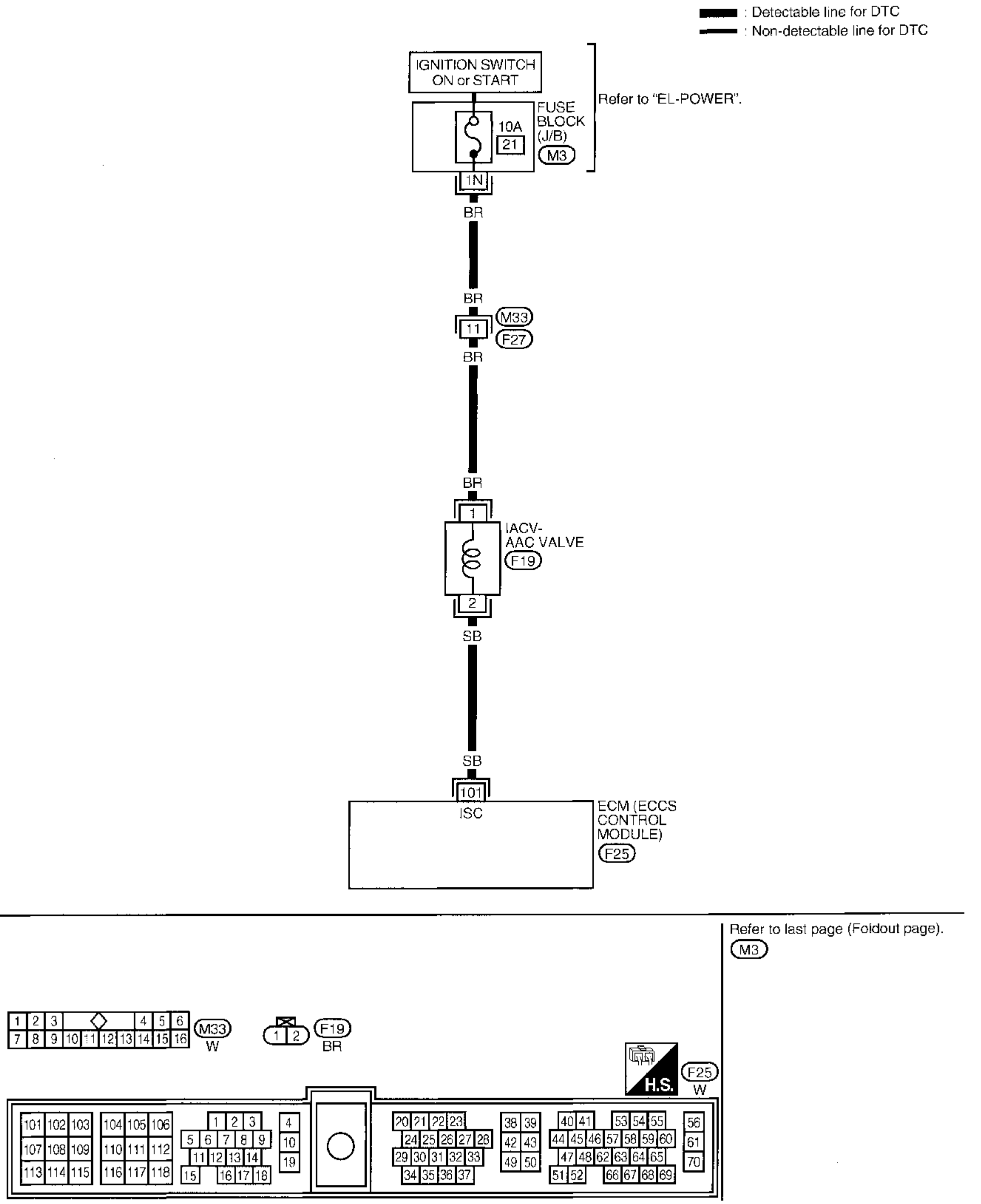
OR

NO TOOLS

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and run it for at least 30 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.

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

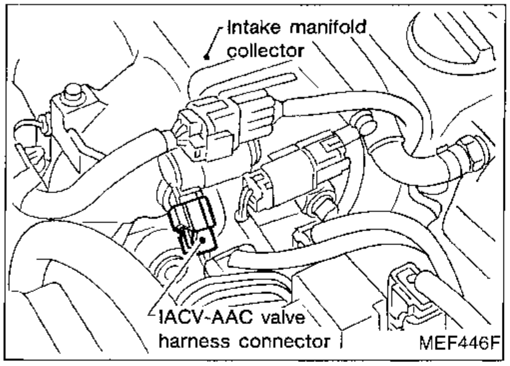
EC-AAC/V-01



AEC216A

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

DIAGNOSTIC PROCEDURE



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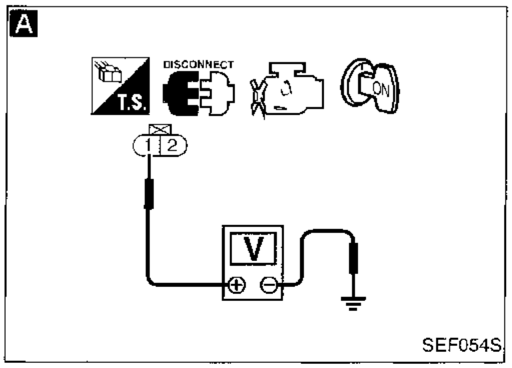
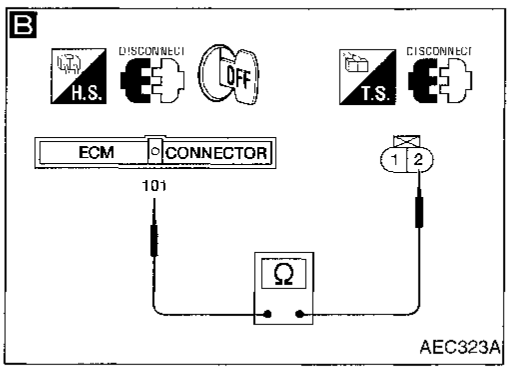


SEF054S



AEC323A

INSPECTION START

↓

A

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

NG → Check the following.
- Harness connectors (M33), (F27)
- 10A fuse
- Harness for open or short between IACV-AAC valve harness connector 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 (101) and terminal ②.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

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

NG → Replace IACV-AAC valve.

↓ OK

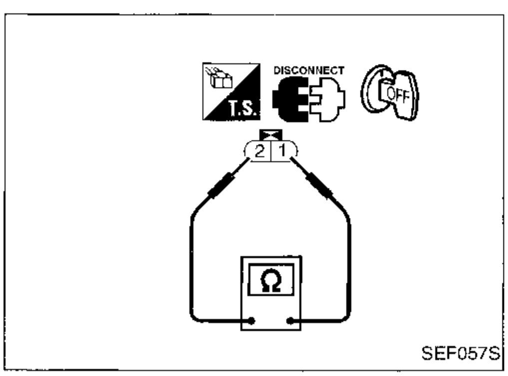
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

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

↓

INSPECTION END



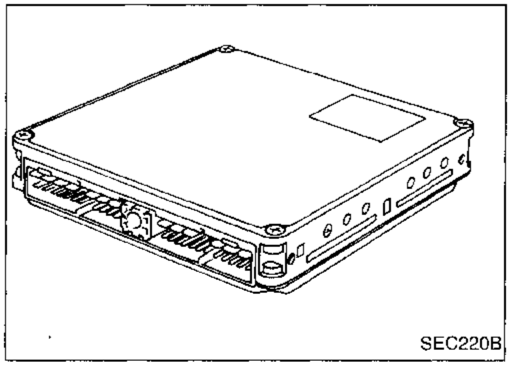
SEF057S

COMPONENT INSPECTION

IACV-AAC valve

Disconnect IACV-AAC valve harness connector.
- Check IACV-AAC valve resistance.
  Resistance:
  Approximately 10Ω [at 25°C (77°F)]
- Check plunger for seizing or sticking.
- Check for broken spring.

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



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)

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 30 seconds at idle speed.

OR

1) Turn ignition switch "ON".
2) Select "Mode 3" with GST.
3) Start engine and run it for at least 30 seconds at idle speed.

OR

1) Turn ignition switch "ON".
2) Start engine and run it for at least 30 seconds at idle speed.
3) Turn ignition "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)

DIAGNOSTIC PROCEDURE

INSPECTION START

↓

1) Turn ignition switch "ON".
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Touch "ERASE".

OR

1) Turn ignition switch "ON".
2) Select MODE 4 with GST.
3) Touch "ERASE".

OR

NO TOOLS

1) Turn ignition switch "ON".
2) Erase the Diagnostic Test Mode II (Self-diagnostic results) memory.

↓

PERFORM SELF-DIAGNOSIS.

Select "SELF-DIAG RESULTS" mode with CONSULT.

OR

Select MODE 3 with GST.

OR

NO TOOLS

PERFORM "Diagnostic Test Mode II" (SELF-DIAGNOSTIC RESULTS).

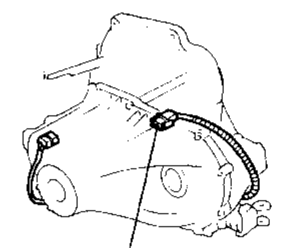
↓

Is the DTC P0605 (0301) displayed again?

Yes → Replace ECM.

↓ No

INSPECTION END



Park/Neutral Position Switch

When the gear position is "P" (A/T models only) or "N", park/neutral position switch is "ON".
ECM detects the park/neutral position when continuity with ground exists.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

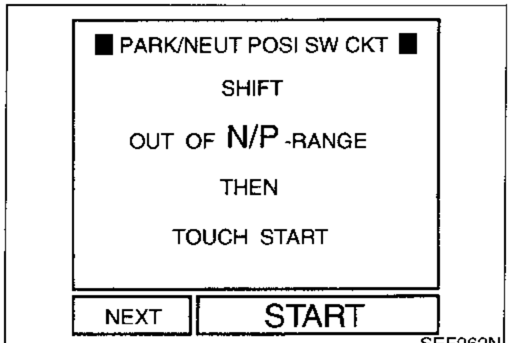
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22	G/OR	Neutral position switch (M/T models) Inhibitor switch (A/T models)	Ignition switch "ON" — Gear position is "Neutral position" (M/T models) — Gear position is "N" or "P" (A/T models)	Approximately 0V
			Ignition switch "ON" — Except the above gear position	BATTERY VOLTAGE (11 - 14V)

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 neutral position switch or inhibitor switch circuit is open or shorted.) ● Neutral position switch (M/T models) ● Inhibitor switch (A/T models)

Park/Neutral Position Switch (Cont'd)

OVERALL FUNCTION CHECK

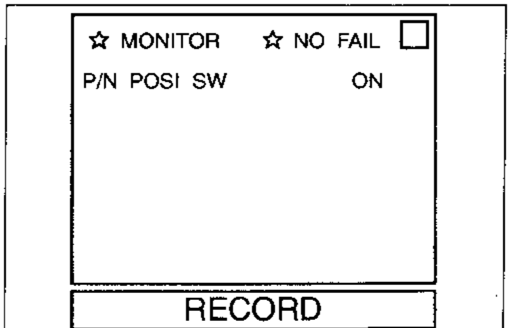


SEF962N

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

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

OR

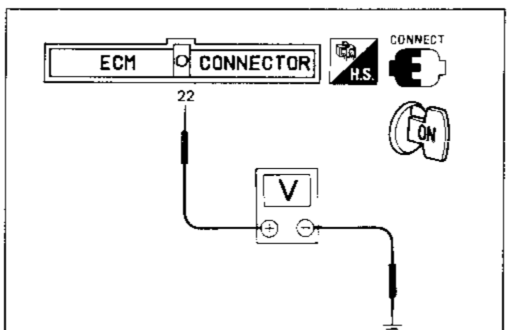


SEF963N

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

Condition (Gear position)	Signal
"P" (A/T only) and "N" position	ON
Except the above position	OFF

OR



SEF964N

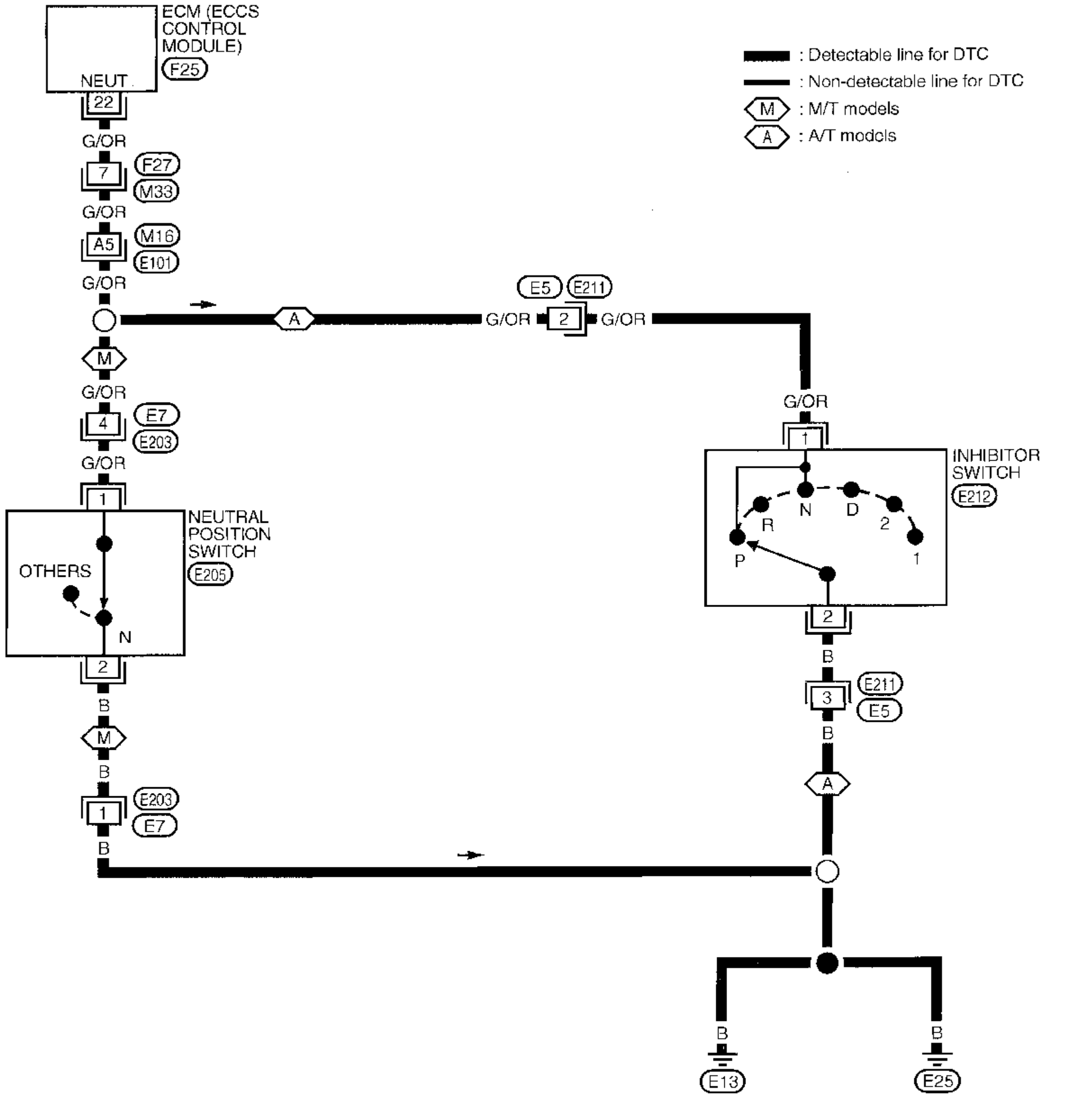
1) Turn ignition switch "ON".
2) Check voltage between ECM terminal ㉒ and body ground under the following conditions.

Condition (Gear position)	Voltage (V)
"P" (A/T only) and "N" position	Approx. 0
Except the above position	Battery voltage

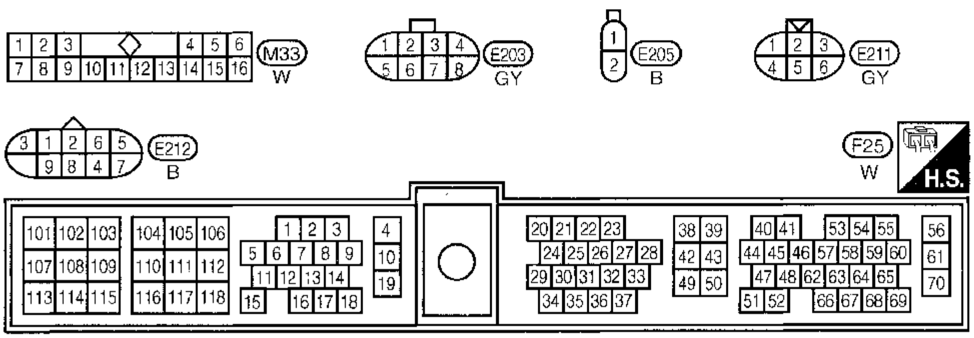
GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

Park/Neutral Position Switch (Cont'd)

EC-PNP/SW-01



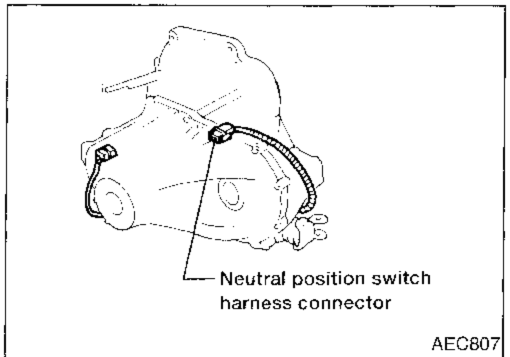
Refer to last page (Foldout page).
M16, E101

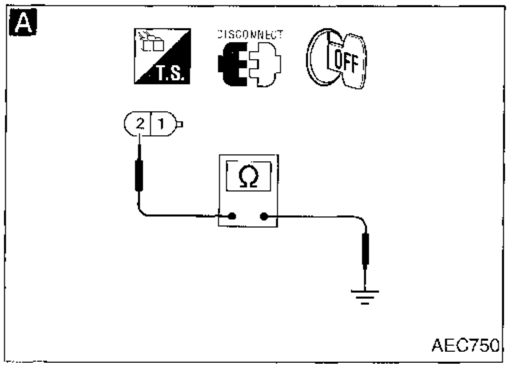


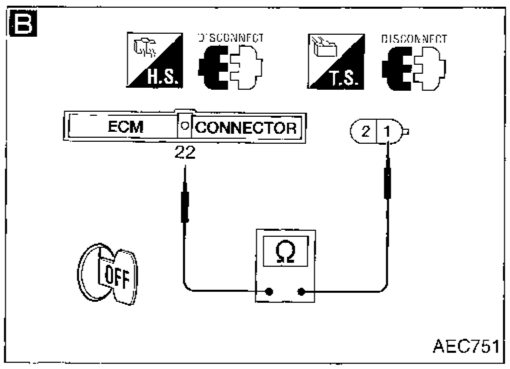
AEC279A

Park/Neutral Position Switch (Cont'd)

DIAGNOSTIC PROCEDURE







Neutral position switch (M/T models)

INSPECTION START

↓

A

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

NG → Check the following.
- Harness connectors E203, E7
- Harness for open or short between neutral position switch and body ground

If NG, repair harness or connectors.

↓ OK

B

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

NG → Check the following.
- Harness connectors F27, M33
- Harness connectors E7, E203
- Harness connectors M16, E101
- Harness for open or short between ECM and neutral position switch

If NG, repair harness or connectors.

↓ OK

CHECK COMPONENT
(Neutral position switch).
Refer to MT section

NG → Replace neutral position switch.

↓ OK

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

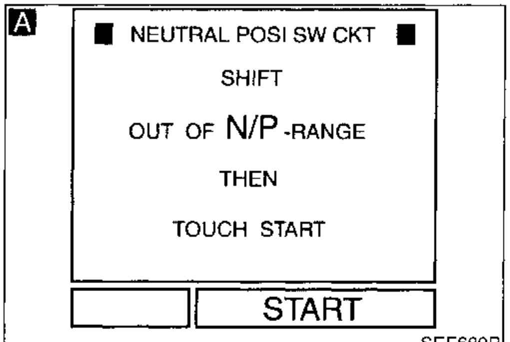
↓ Trouble is not fixed.

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

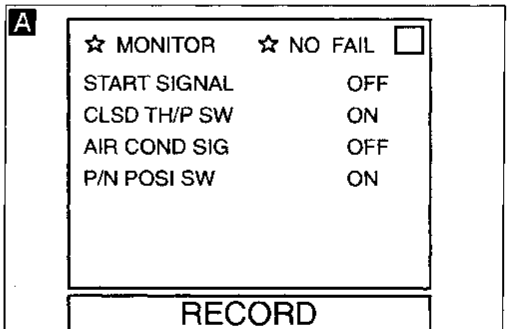
↓

INSPECTION END

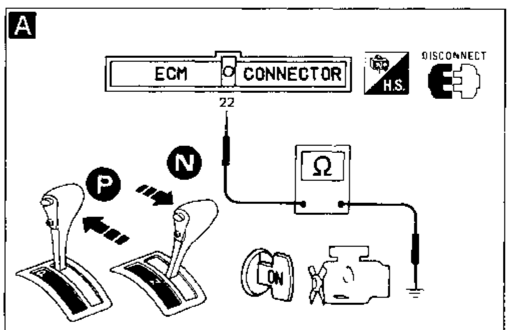
Park/Neutral Position Switch (Cont'd)



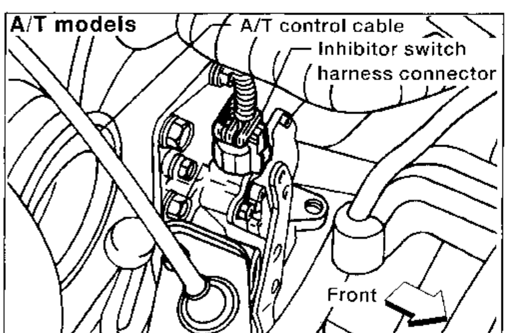
SEF689P



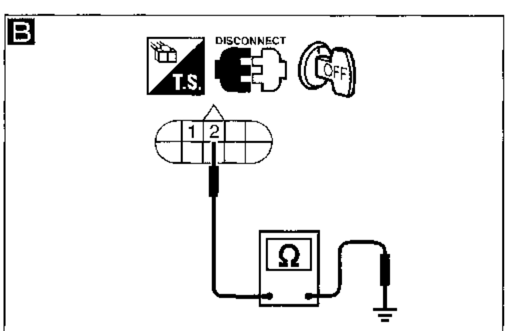
SEF111P



SEF686P



AEC752



SEF636T

Inhibitor switch (A/T models)

INSPECTION START

↓

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "NEUTRAL POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Check neutral position switch signal in "DATA MONITOR" mode with CONSULT.
   "N" or "P" position: ON
   Except above: OFF

OR

1. Make sure that inhibitor switch circuit functions properly. (Refer to AT section.)
2. Disconnect ECM harness connector.
3. Shift selector lever to "P" position.
4. Turn ignition switch "ON".
5. Check harness continuity between ECM terminal ㉒ and body ground.
   Continuity should exist.
   If OK, check harness for short.
6. Shift selector lever to "N" position.
7. Check harness continuity between ECM terminal ㉒ and body ground.
   Continuity should exist.
   If OK, check harness for short.

OK → INSPECTION END

NG ↓

B

CHECK GROUND CIRCUIT.

1. Disconnect inhibitor switch harness connector.
2. Check harness continuity between terminals ② and body ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors E211, E5
- Harness for open or short between inhibitor switch and body ground

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉒ and terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors E211, E5
- Harness connectors M16, E101
- Harness connectors F27, M33
- Harness for open or short between ECM and inhibitor switch

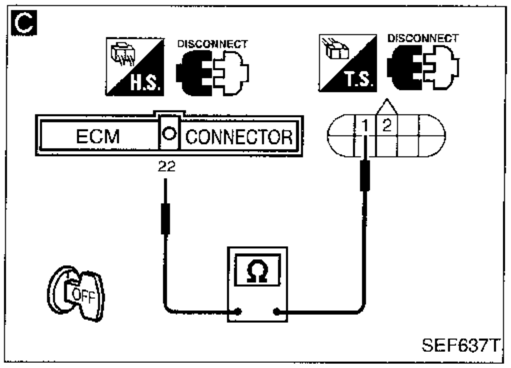
If NG, repair harness or connectors.

OK ↓

Ⓐ

(Go to next page.)

Park/Neutral Position Switch (Cont'd)



SEF637T

Ⓐ

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

NG → Replace inhibitor switch.

OK ↓

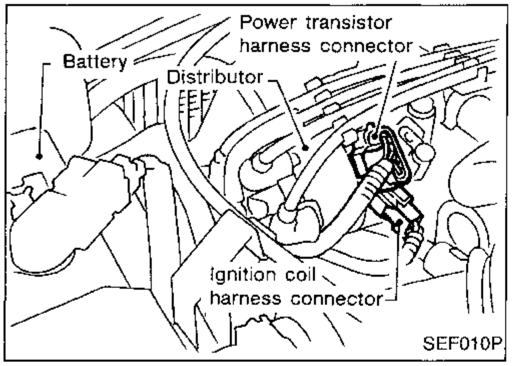
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor (Built into distributor)

The ignition coil is a small molded type. The ignition signal from the ECM is sent to the power transistor. The power transistor switches on and off the ignition coil primary circuit. As the primary circuit is turned on and off, the proper high voltage is induced in the coil secondary circuit.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
IGNITION SW	● Ignition switch: ON → OFF	ON → OFF

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	W/B	Ignition signal	Engine is running. └ Idle speed	0.2 - 0.3V*
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.5V*
2	W	Ignition check	Engine is running. └ Idle speed	Approximately 12V*
3	L/OR	Tachometer	Engine is running. └ Idle speed	Approximately 7V*

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1320 0201	● The ignition signal in the primary circuit is not sent to ECM during engine cranking or running.	● Harness or connectors (The ignition primary circuit is open or shorted.) ● Power transistor unit. ● Resistor ● Camshaft position sensor ● Camshaft position sensor circuit

Ignition Signal (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC P0340 (0101) and P1320 (0201) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340 first. Refer to EC-143.

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

OR

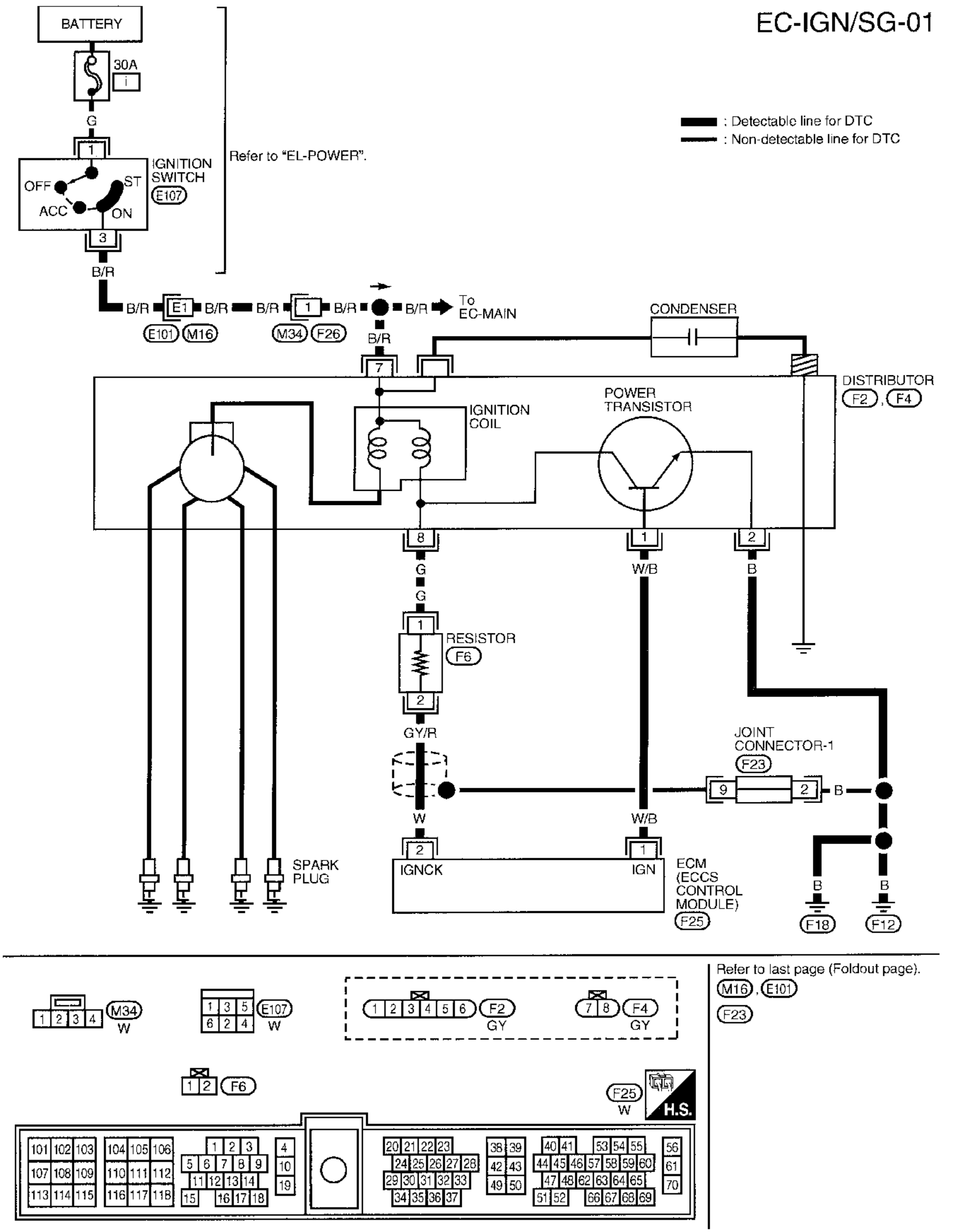
1) Turn ignition switch "ON".
2) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
3) Select MODE 3 with GST.

OR

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

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

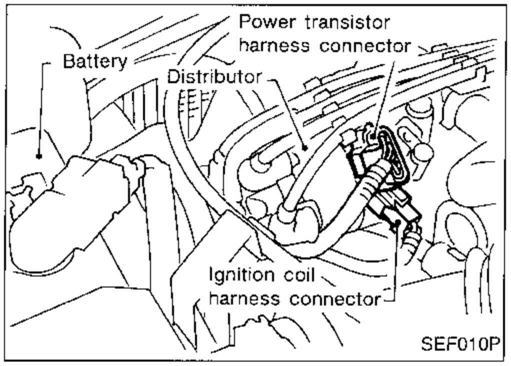
Ignition Signal (Cont'd)



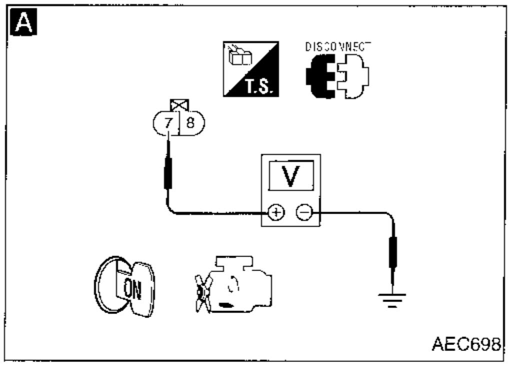
AEC217A

Ignition Signal (Cont'd)

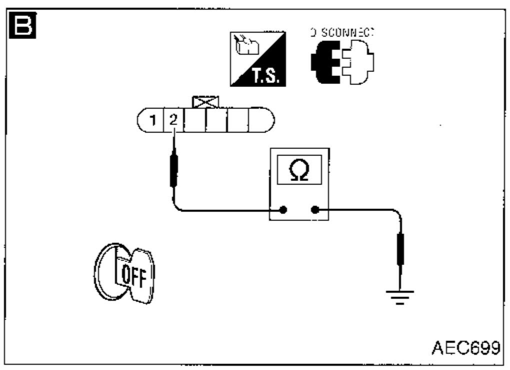
DIAGNOSTIC PROCEDURE



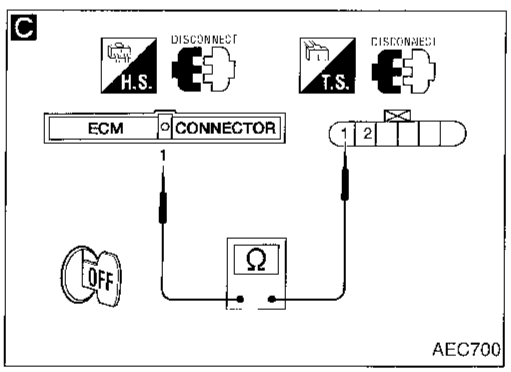
SEF010P



AEC698



AEC699



AEC700

INSPECTION START

↓

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

- Yes → Ⓐ (Go to next page.)
- No ↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect ignition coil harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ⑦ and ground with CONSULT or tester.
   Voltage: Battery voltage

- NG → Check the following.
  - Harness connectors E101, M16
  - Harness connectors M34, F26
  - Harness for open or short between ignition coil and ignition switch

  If NG, repair harness or connectors.
- OK ↓

B

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

- NG → Repair harness or connectors.
- OK ↓

C

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

- NG → Repair harness or connectors.
- OK ↓

CHECK COMPONENTS
(Ignition coil, power transistor).
Refer to "COMPONENT INSPECTION", EC-185.

- NG → Replace malfunctioning component(s).
- OK ↓

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

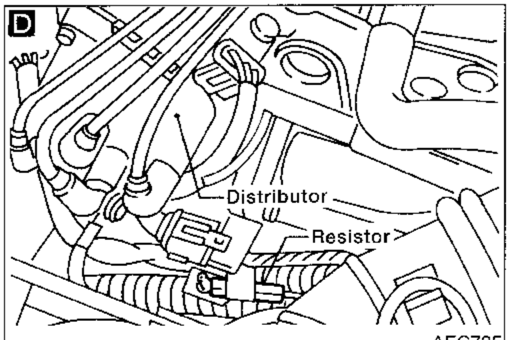
↓ Trouble is not fixed.

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

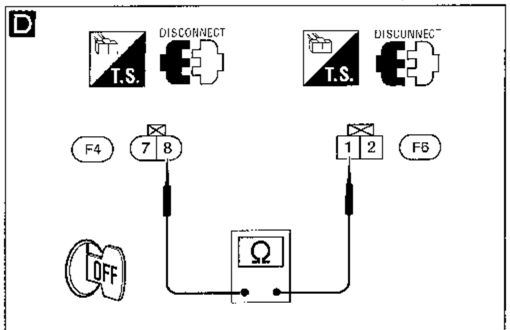
↓

INSPECTION END

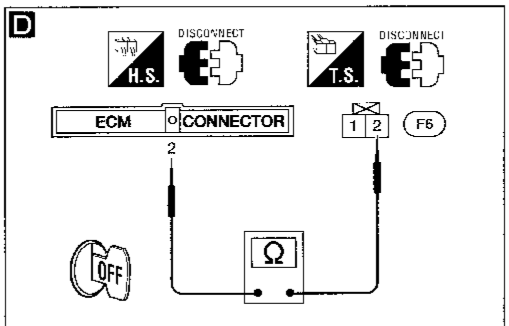
Ignition Signal (Cont'd)



AEC735



AEC701



AEC702

Ⓐ

D

CHECK INPUT SIGNAL CIRCUIT.
1. Stop engine.
2. Disconnect ignition coil harness connector.
3. Strip tape covering resistor.
4. Disconnect ECM harness connector.
5. Check harness continuity between ignition coil terminal ⑧ and resistor terminal ①, resistor terminal ② and ECM terminal ②.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENTS
(Resistor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace resistor.

OK ↓

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

Trouble is not fixed. ↓

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

↓

INSPECTION END

Ignition Signal (Cont'd)

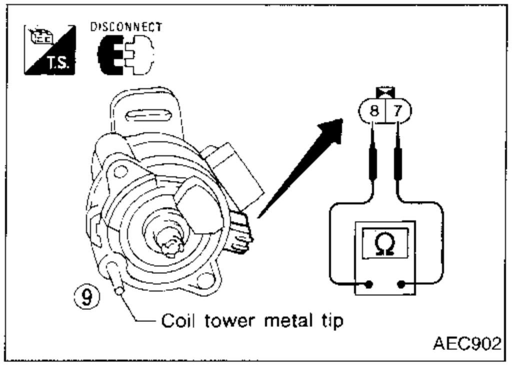
COMPONENT INSPECTION

Ignition coil

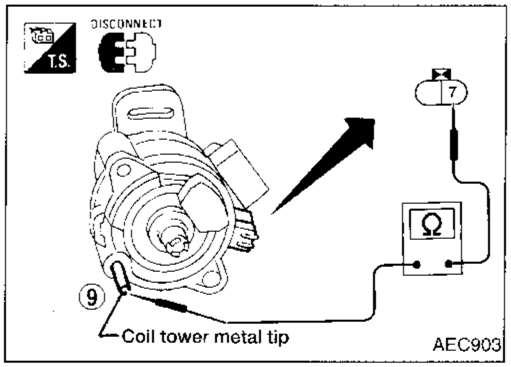
1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance [at 25°C (77°F)]
⑦ - ⑧ (Primary coil)	0.5 - 1.0Ω
⑦ - ⑨ (Secondary coil)	Approximately 25 kΩ

For checking secondary coil, remove distributor cap and measure resistance between coil tower metal tip ⑨ and terminal ⑦.
If NG, replace distributor assembly as a unit.



AEC902



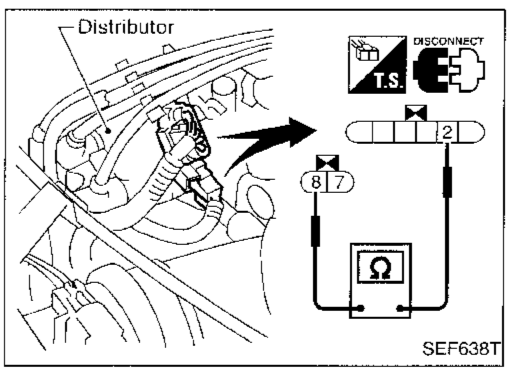
AEC903

Power transistor

1. Disconnect camshaft position sensor & power transistor harness connector and ignition coil harness connector.
2. Check power transistor resistance between terminals ② and ⑧.

Terminals	Resistance	Result
② and ⑧	Except 0Ω	OK
	0Ω	NG

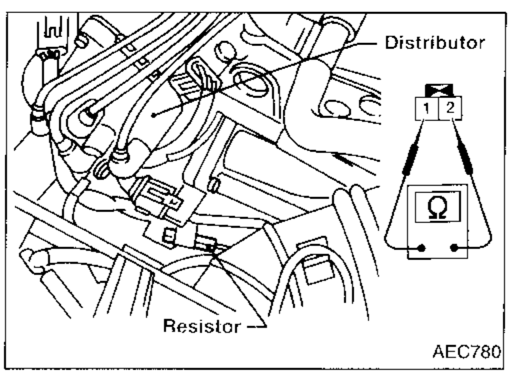
If NG, replace distributor assembly.



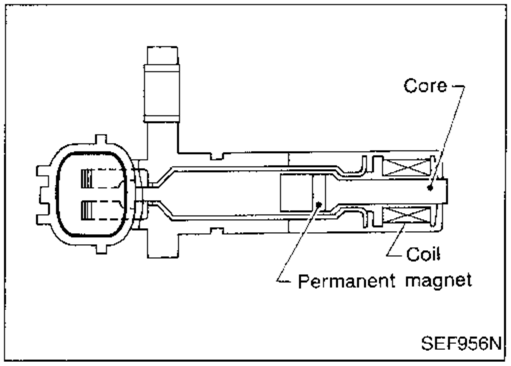
SEF638T

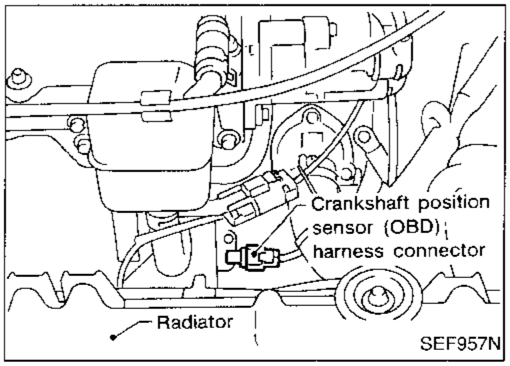
Resistor

1. Disconnect resistor harness connector.
2. Check resistance between terminals ① and ②.
   Resistance: Approximately 2.2 kΩ [at 25°C (77°F)]
   If NG, replace resistor.



AEC780





Crankshaft Position Sensor (CKPS) (OBD) (COG)

The crankshaft position sensor (OBD) is located on the transmission housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
This sensor is not directly used to control the engine system.
It is used only for the on-board diagnosis of misfire.

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
53	W	Crankshaft position sensor (OBD)	Engine is running. (A/T: N range, M/T: Neutral) Idle speed (Air conditioner switch "OFF")	More than 0.4V* (AC voltage)

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1336 0905	• A chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM.	• Harness or connectors • Crankshaft position sensor (OBD) • Flywheel (Drive plate)

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 4 minutes at idle speed.

OR

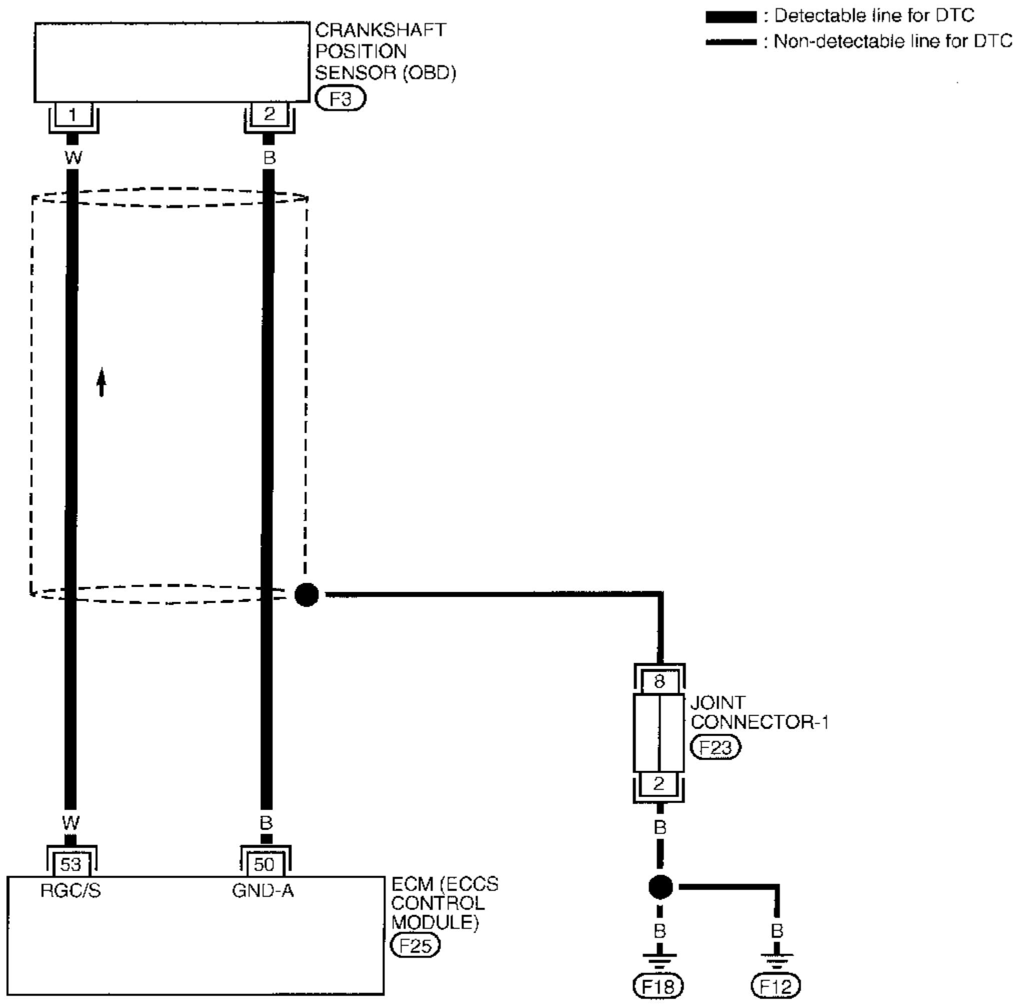
1) Start engine and run it for at least 4 minutes at idle speed.
2) Select "MODE 3" with GST.

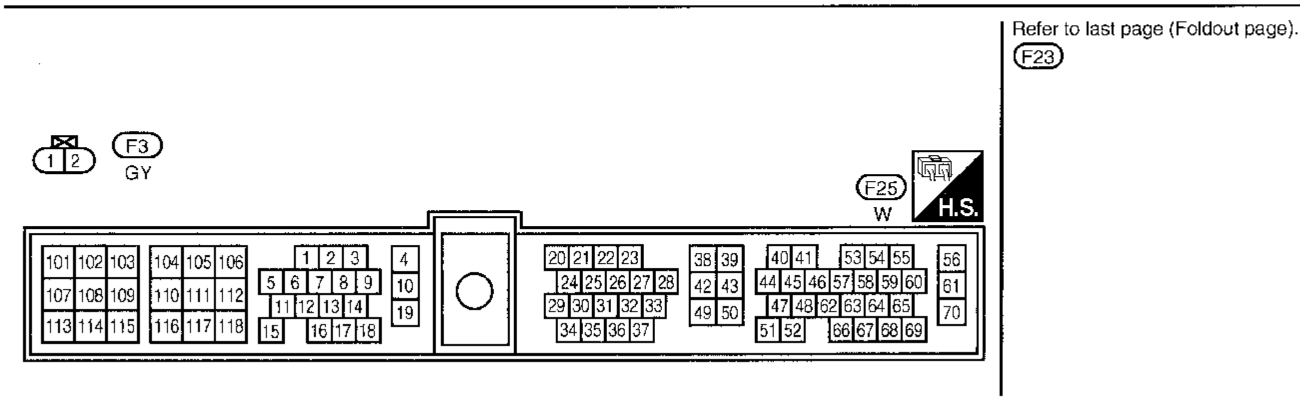
OR

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

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

EC-CKPS-01

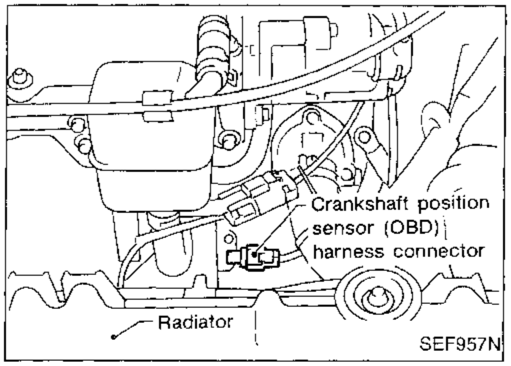


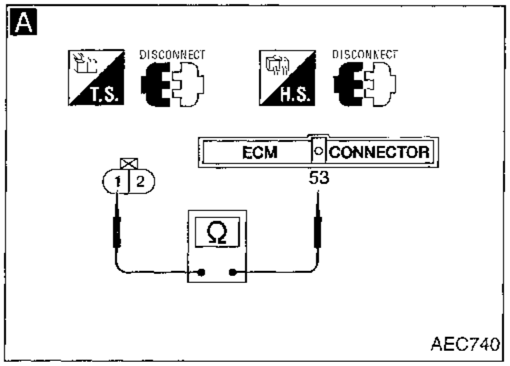


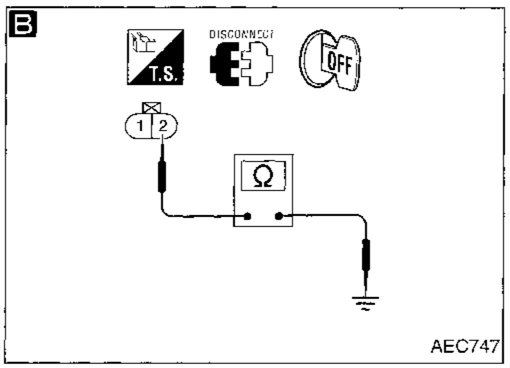
AEC341A

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

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

A

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

NG → Repair harness or connectors.

↓ OK

B

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

NG → Check the following.
- Harness for open or short between ECM and crankshaft position sensor (OBD) harness connector

If NG, repair harness or connectors.

↓ OK

Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD). Then retest.

↓ Trouble is not fixed.

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

NG → Replace crankshaft position sensor (OBD).

↓ OK

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

↓ Trouble is not fixed.

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

↓ Trouble is not fixed.

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

NG → Replace the flywheel or drive plate.

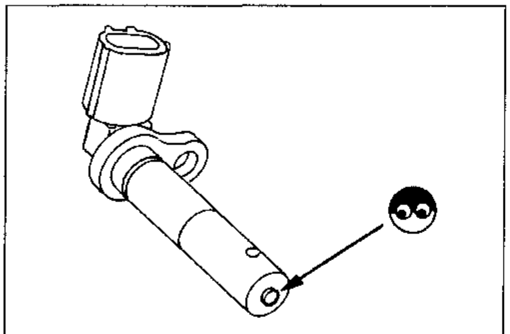
↓ OK

INSPECTION END

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

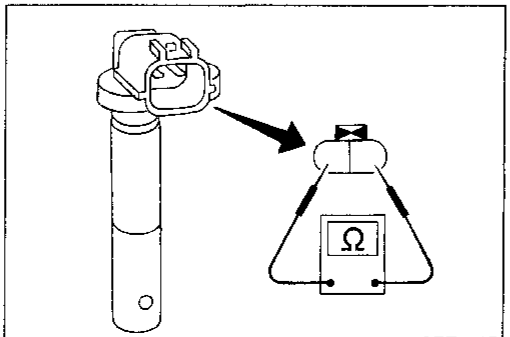
COMPONENT INSPECTION

Crankshaft position sensor (OBD)



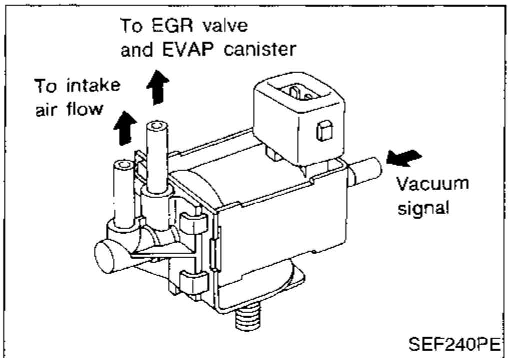
SEF960N

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



SEF151P

5. Check resistance as shown in the figure.
   Resistance: Approximately 166 - 204Ω
   [at 25°C (77°F)]



SEF240PE

EGR Valve and EVAP Canister Purge Control Solenoid Valve

The EGR valve and EVAP canister purge control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to cut the vacuum signal from the throttle body to the EGR valve and EVAP canister purge valve.
When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve and EVAP canister.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGRC SOL/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	ON
		2,000 rpm	OFF

ECM TERMINALS AND REFERENCE VALUE

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

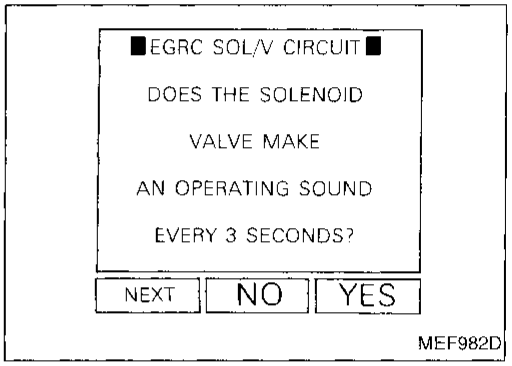
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
103	P	EGR valve & EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) Idle speed	0.06 - 0.11V

ON BOARD DIAGNOSIS LOGIC

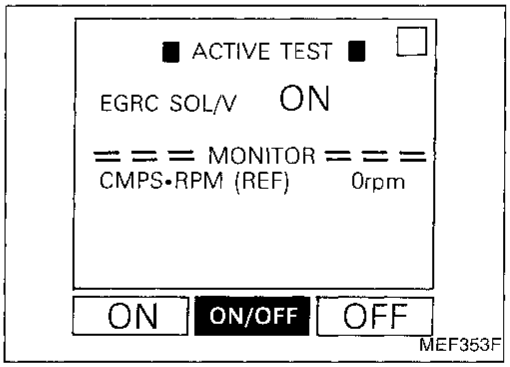
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1400 1005	● The improper voltage signal is sent to ECM through EGR valve & EVAP canister purge control solenoid valve.	● Harness or connectors (The EGR valve & EVAP canister purge control solenoid valve circuit is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

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

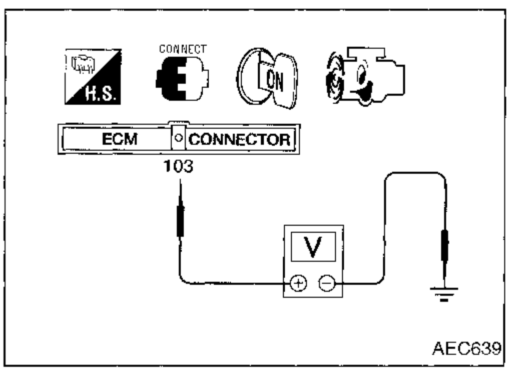
EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)



MEF982D



MEF353F



AEC639

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGR valve & EVAP canister purge control solenoid valve circuit. During this check, a DTC might not be confirmed.

1) Turn ignition switch "ON".
2) Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

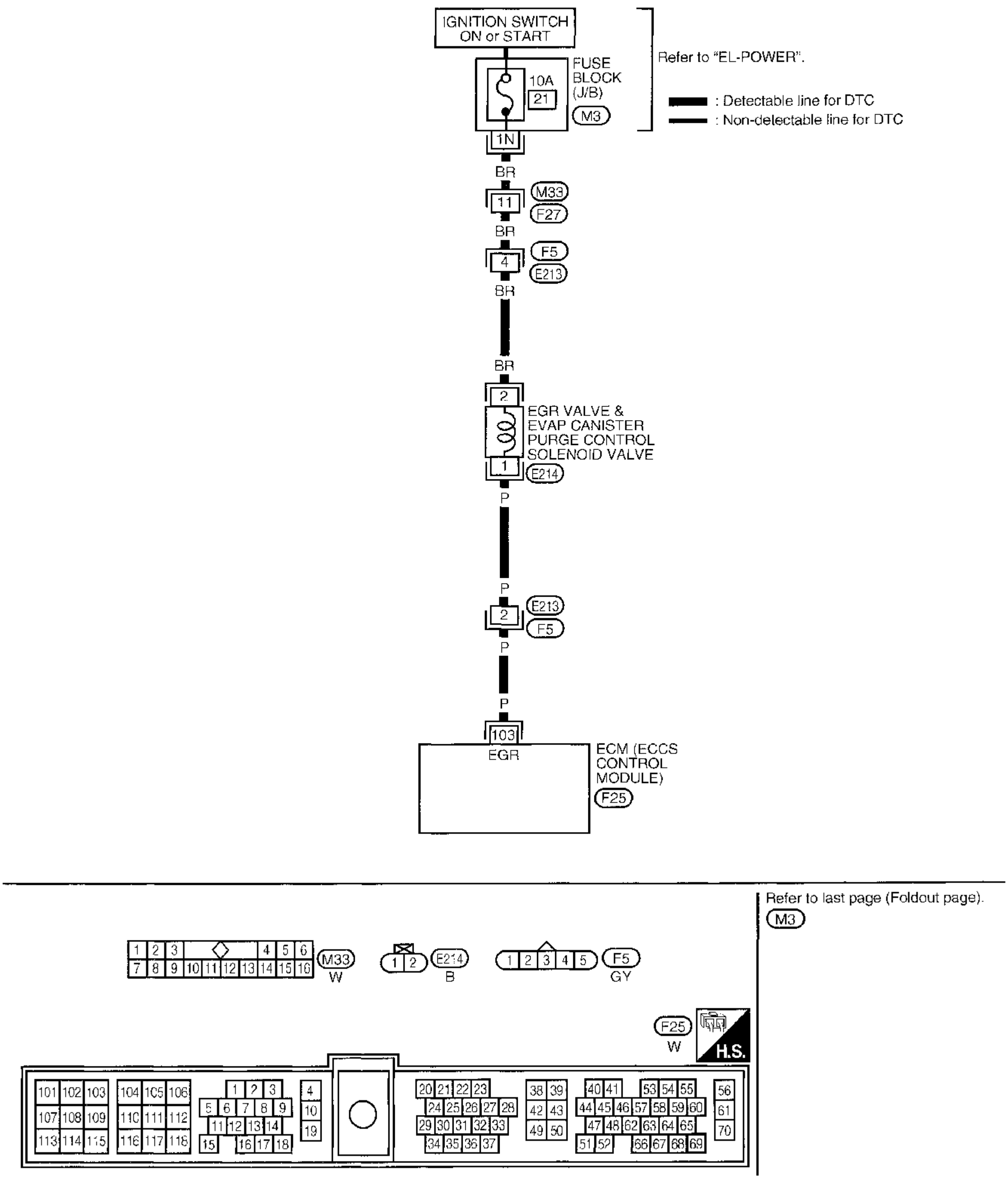
1) Turn ignition switch "ON".
2) Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and check the operating sound, according to ON/OFF switching.

OR

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again.
4) Check the voltage between ECM terminal 103 and ground at idle speed.
   Voltage: 0.06 - 0.11V
5) Check that the voltage changes to battery voltage and returns to 0.06 - 0.11V when the engine speed increases to about 3,600 rpm.

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

EC-EGRC/V-01

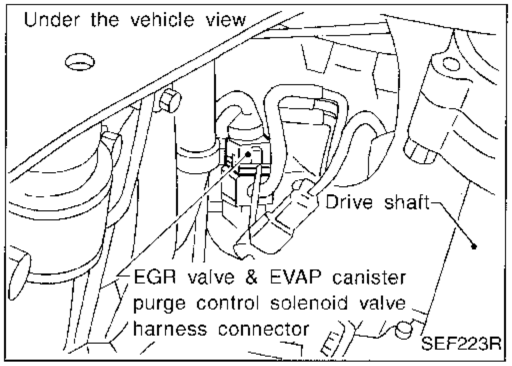


AEC218A

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

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

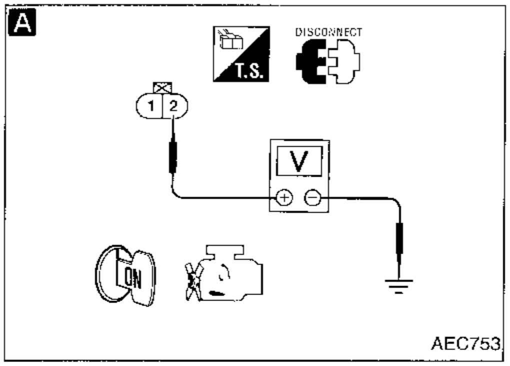
DIAGNOSTIC PROCEDURE



INSPECTION START

A

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



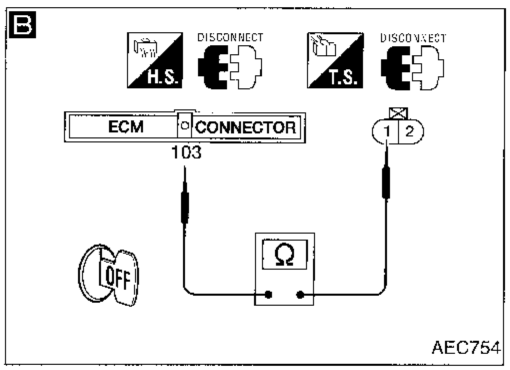
NG → Check the following.
- Harness connectors (F27), (M33)
- Harness connectors (F5), (E213)
- 10A fuse
- Harness for open or short between EGR valve & EVAP canister purge control solenoid valve harness connector and fuse

If NG, repair harness or connectors.

OK ↓

B

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



NG → Check the following.
- Harness connectors (F5), (E213)
- Harness for open or short between EGR valve & EVAP canister purge control solenoid valve harness connector and ECM

If NG, repair harness or connectors.

OK ↓

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

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

OK ↓

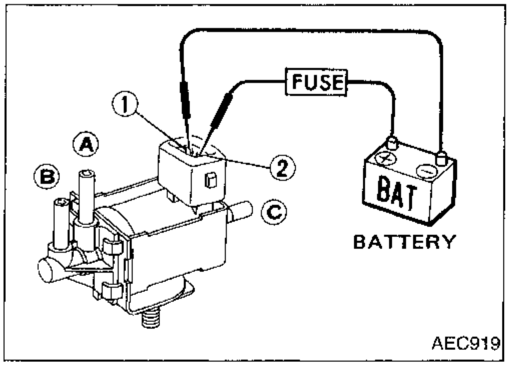
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

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

↓

INSPECTION END



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

COMPONENT INSPECTION

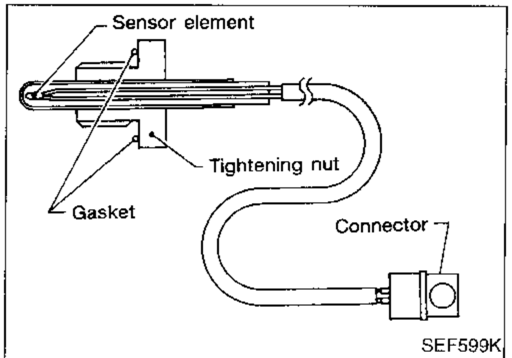
EGR valve and EVAP canister purge control solenoid valve

Check air passage continuity.

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

If NG, replace solenoid valve.

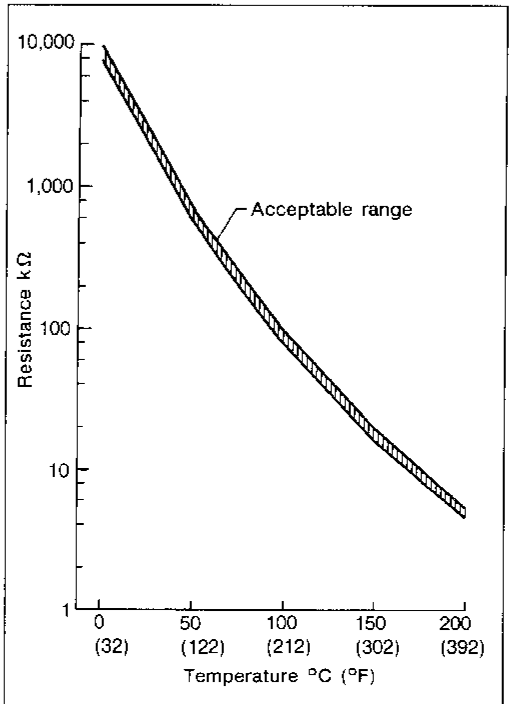
GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX



SEF599K

EGR Temperature Sensor

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.



SEF526Q

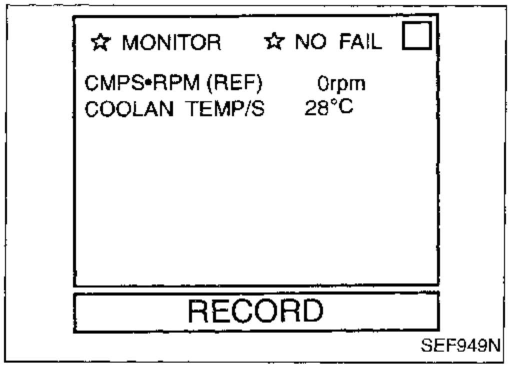
⟨Reference data⟩

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

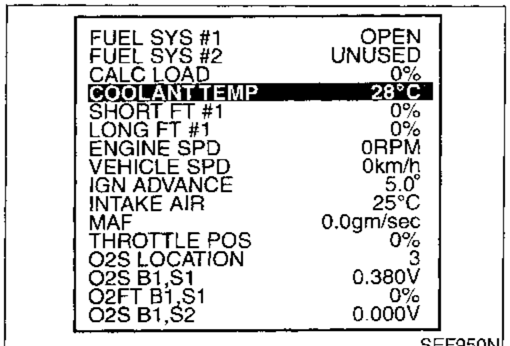
*: These data are reference values and are measured between ECM terminal 62 (EGR temperature sensor) and ECM terminal 43 (ECCS ground).
When EGR system is operating
Voltage: 0 - 1.5V

ON BOARD DIAGNOSIS LOGIC

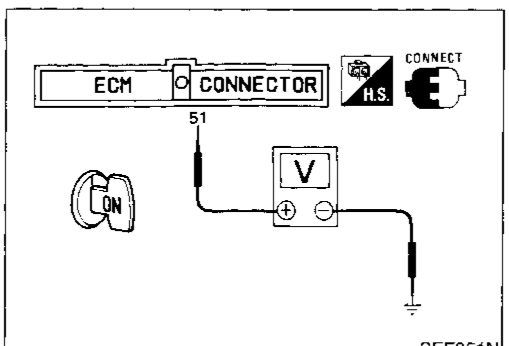
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1401 0305	A) An excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low.	• Harness or connectors (The EGR temperature sensor circuit is shorted.) • EGR temperature 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



SEF949N



SEF950N



SEF951N

EGR Temperature Sensor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Procedure for malfunction A

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Confirm that the engine coolant temperature is lower than 50°C (122°F). (If necessary, wait until the engine coolant temperature is the same as atmosphere temperature.)
3) Start engine and run it for at least 8 seconds at idle speed. [With the engine coolant temperature lower than 50°C (122°F)].

OR

1) Turn ignition switch "ON" and select "MODE 1" with GST.
2) Confirm that the engine coolant temperature is lower than 50°C (122°F). (If necessary, wait until the engine coolant temperature is the same as atmosphere temperature.)
3) Start engine and run it for at least 8 seconds at idle speed. [With the engine coolant temperature lower than 50°C (122°F)].
4) Select "MODE 3" with GST.

OR

1) Turn ignition switch "ON" and confirm that voltage between ECM terminal 51 and ground is more than 2.35V. (If necessary, wait until the engine coolant temperature is the same as atmosphere temperature.)
2) Start engine and run it for at least 8 seconds at idle speed. (With the voltage between ECM terminal 51 and ground should stay at more than 2.35V)
3) Turn ignition switch "OFF", wait at least 3 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

Procedure for malfunction B

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF", wait at least 3 seconds and then start engine again.
3) Select "DATA MONITOR" mode with CONSULT.
4) Run engine for at least 5 seconds at idle speed.

OR

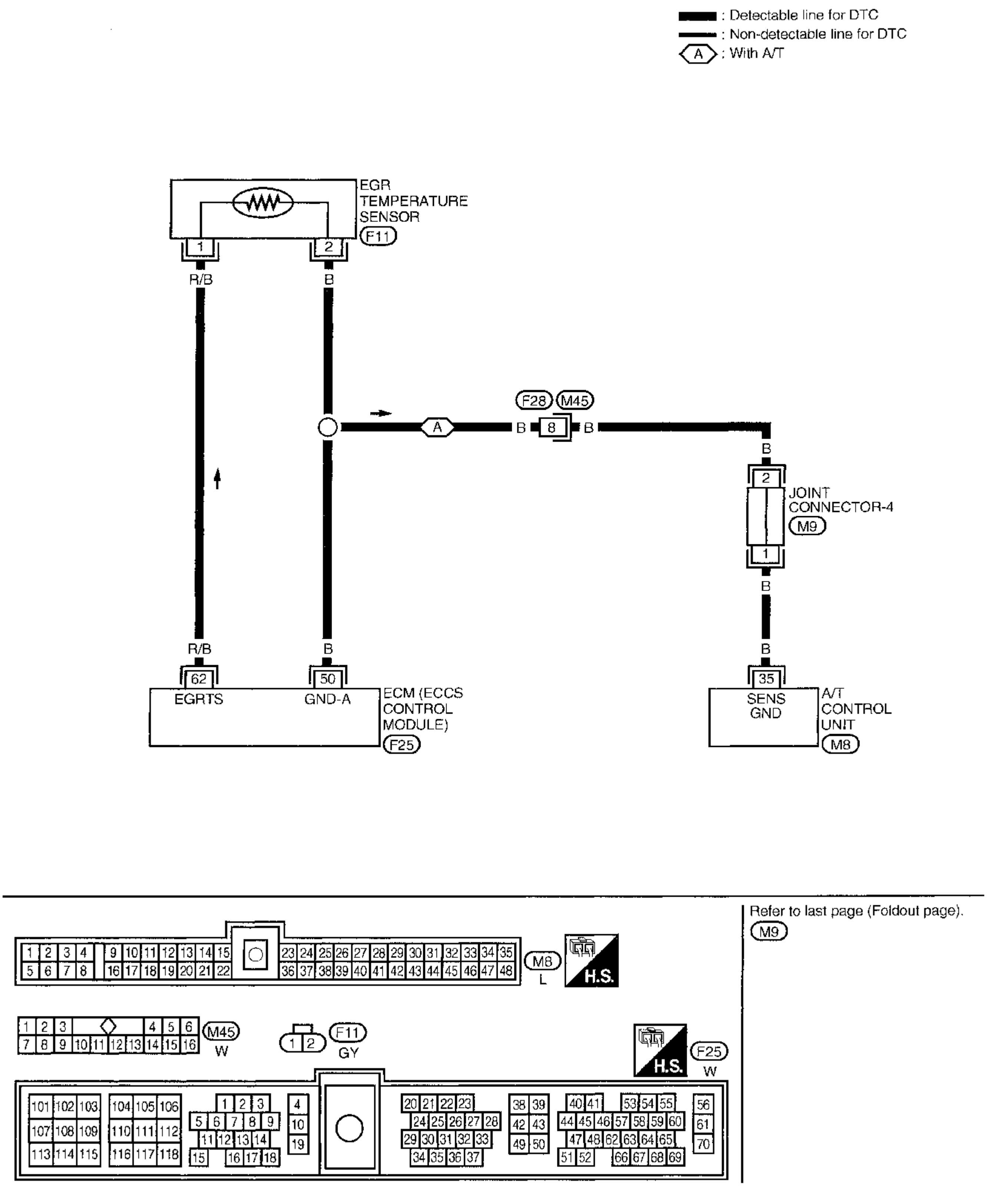
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF", wait at least 3 seconds and then start engine again.
3) Run engine for at least 5 seconds at idle speed.
4) Select "MODE 3" with GST.

OR

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF", wait at least 3 seconds and then start engine again.
3) Run engine for at least 5 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.

EGR Temperature Sensor (Cont'd)

EC-EGR/TS-01



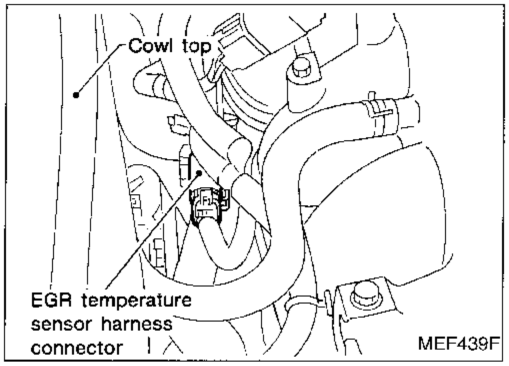
Refer to last page (Foldout page).

M9

AEC219A

EGR Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



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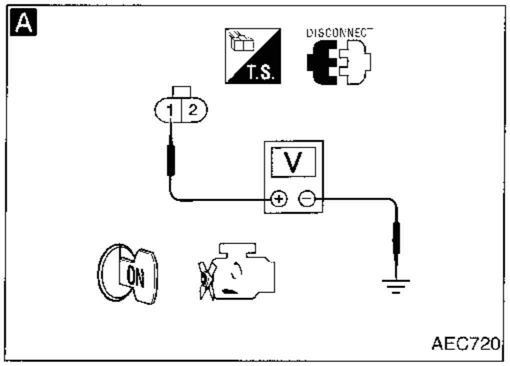
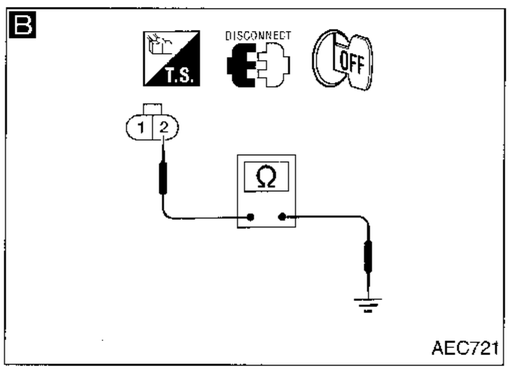


AEC720



AEC721

INSPECTION START

↓

A

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

NG → Repair harness or connectors.

↓ OK

B

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

NG → Check the following.
- Harness for open or short between ECM and EGR temperature sensor harness connector
- Harness for open or short between A/T control unit and EGR temperature sensor
- Harness connectors F28, M45

If NG, repair harness or connector.

↓ OK

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

NG → Replace EGR temperature sensor.

↓ OK

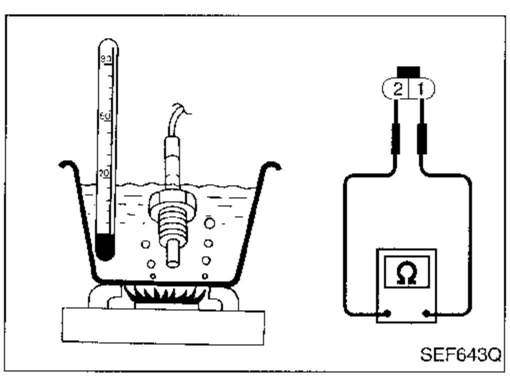
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

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

↓

INSPECTION END



SEF643Q

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.

A/T Diagnosis Communication Line

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

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
7	PU (A/T models)	A/T check signal	[Ignition switch "ON"] [Engine is running.]	1.0 - 8.0V

ON BOARD DIAGNOSIS LOGIC

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

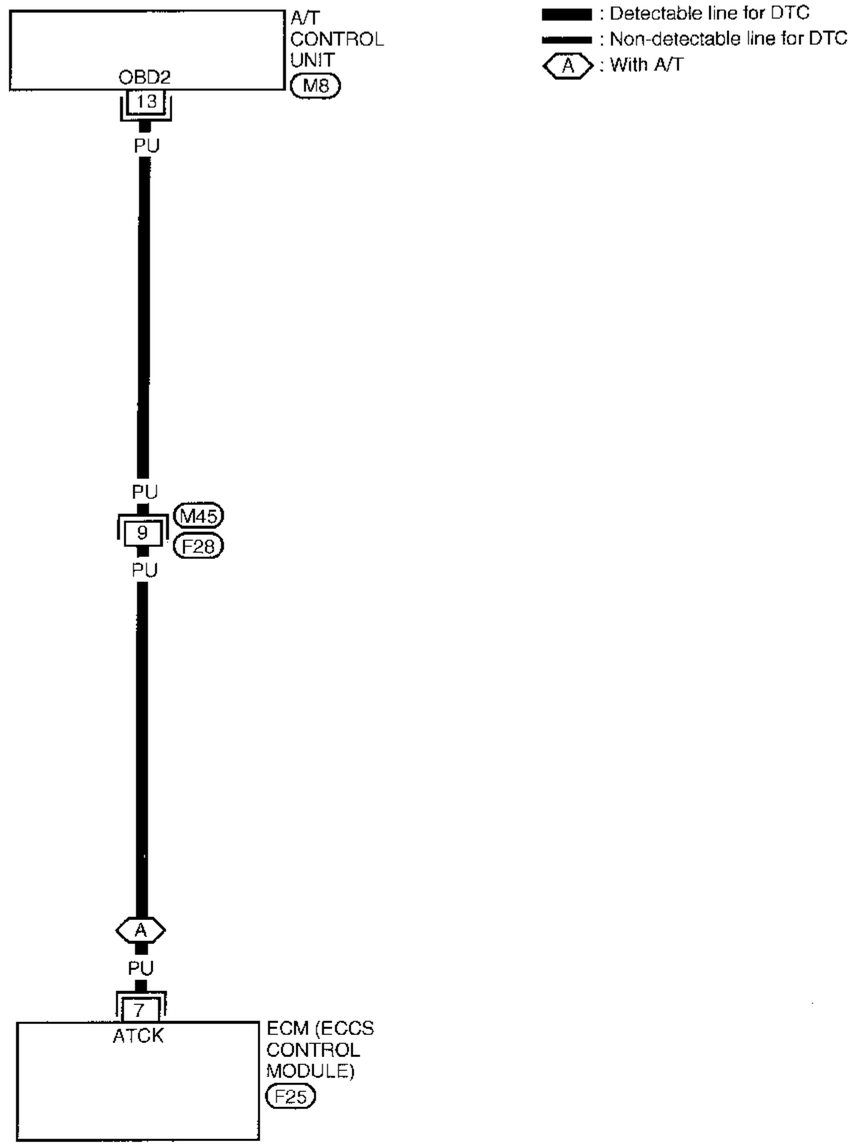
OR

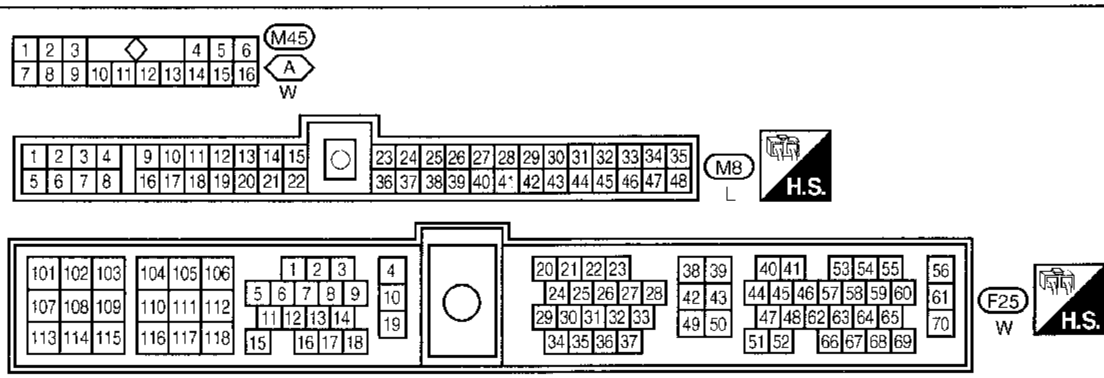
1) Start engine and let it idle for at least 40 seconds.
2) Select "MODE 3" with GST.

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.

EC-ATDIAG-01





AEC220A

GI
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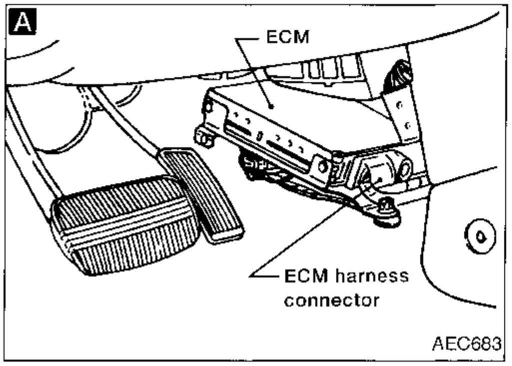
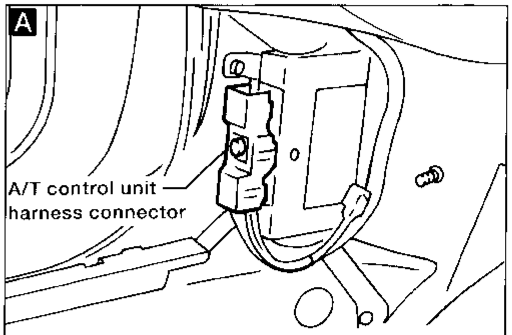
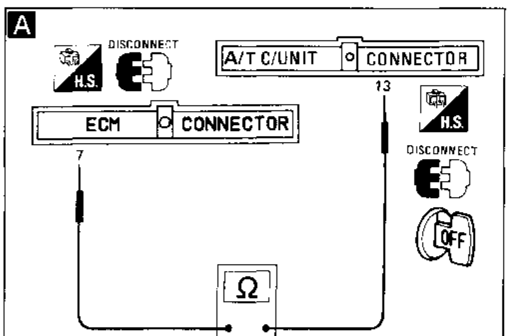
A/T Diagnosis Communication Line (Cont'd)



AEC683



AEC742



SEF033P

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 ⑦ and A/T control unit terminal ⑬.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors F28, M45
- Harness for open or short between ECM and A/T control unit.

If NG, repair harness or connectors.

↓ OK

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

↓ Trouble is not fixed.

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

↓

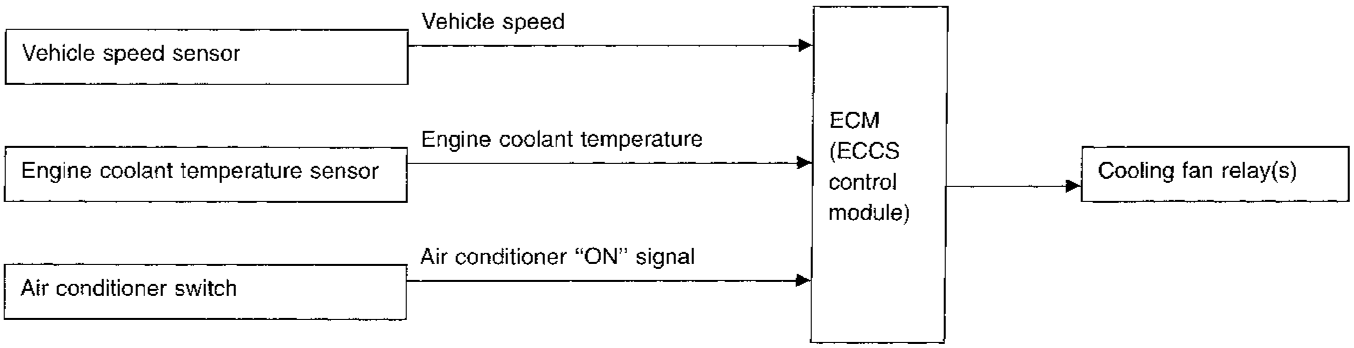
INSPECTION END

Overheat

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

SYSTEM DESCRIPTION

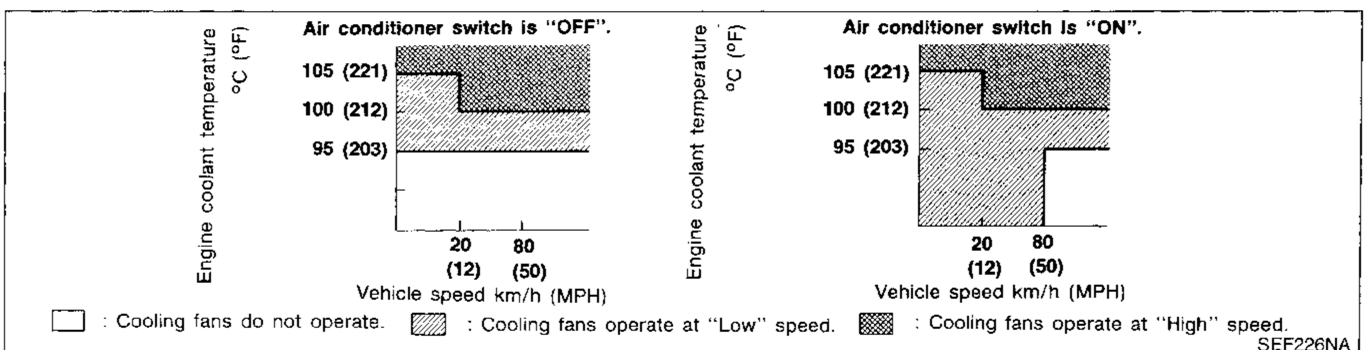
Cooling fan control



The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF] on A/T models and 2-step control [HIGH/OFF] on M/T models.

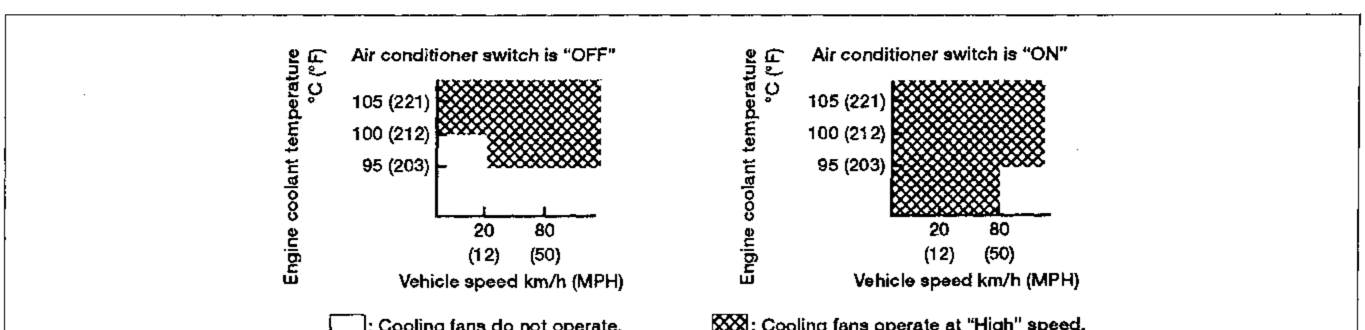
Operation

For A/T models



SEF226NA

For M/T models



AEC706

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

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 for A/T models, and 99°C (210°F) or less for M/T models	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F) for A/T models only	LOW
		Engine coolant temperature is 105°C (221°F) or more for A/T models, and 100°C (212°F) or more for M/T models	HIGH

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	LG (A/T models)	Cooling fan relay (High)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan (High) is operating	0.07 - 0.10V
14	LG/R	Cooling fan relay (Low)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan (Low) is operating	0.07 - 0.10V
21	L/W	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			Engine is running. └ Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)

DIAGNOSIS LOGIC

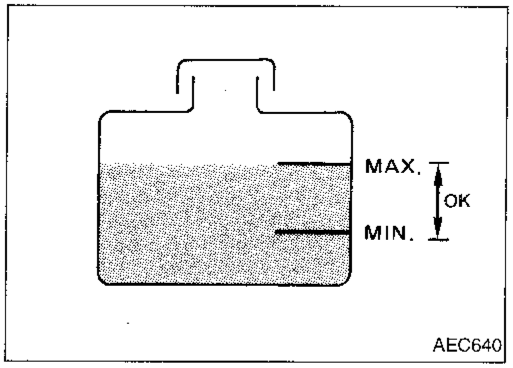
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
OVERHEAT (P1900) 0208	● Engine coolant temperature reaches an abnormally high temperature.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-215.

CAUTION:
When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.
a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").
b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

Overheat (Cont'd)

OVERALL FUNCTION CHECK

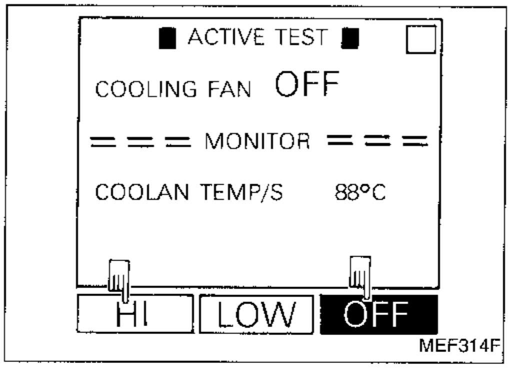


WARNING:

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

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

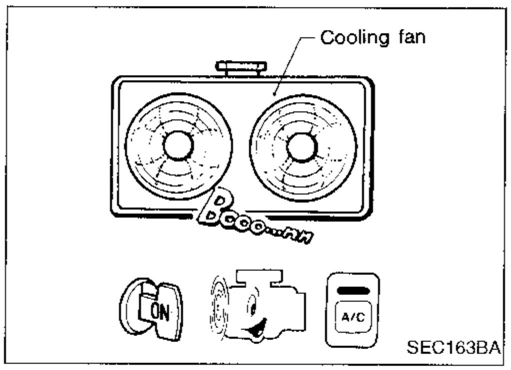
1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "DIAGNOSTIC PROCEDURE" (EC-209).
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE" (EC-209).



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

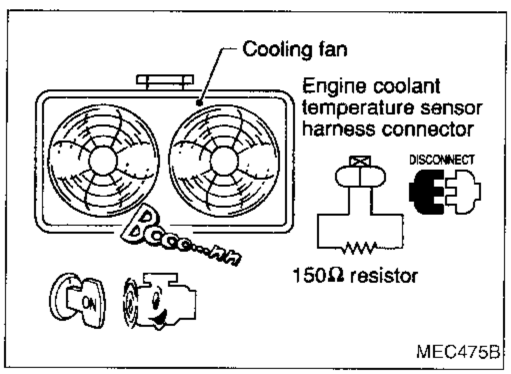
OR

3) Start engine.
   Be careful not to overheat engine.
4) Set temperature control lever to full cold position.
5) Turn air conditioner switch "ON".
6) Turn blower fan switch "ON".
7) Run engine at idle for a few minutes with air conditioner operating.
   Be careful not to overheat engine.
8) Make sure that cooling fan operates at low speed for A/T models and high speed for M/T models.
9) Turn ignition switch "OFF".
10) Turn air conditioner switch and blower fan switch "OFF".

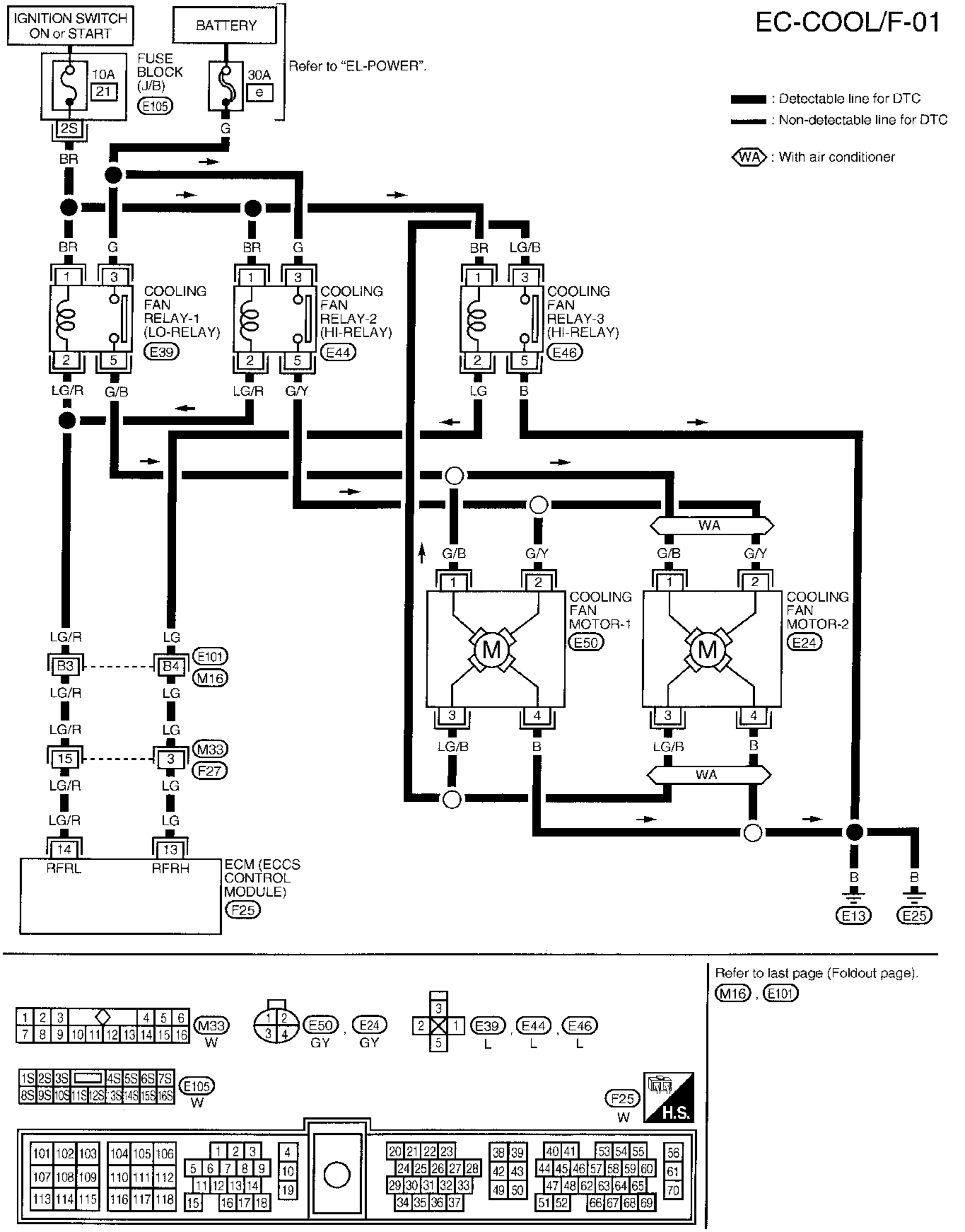


—A/T models only—

11) Disconnect engine coolant temperature sensor harness connector.
12) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
13) Restart engine and make sure that cooling fan operates at higher speed than low speed.
    Be careful not to overheat engine.



FOR A/T MODELS

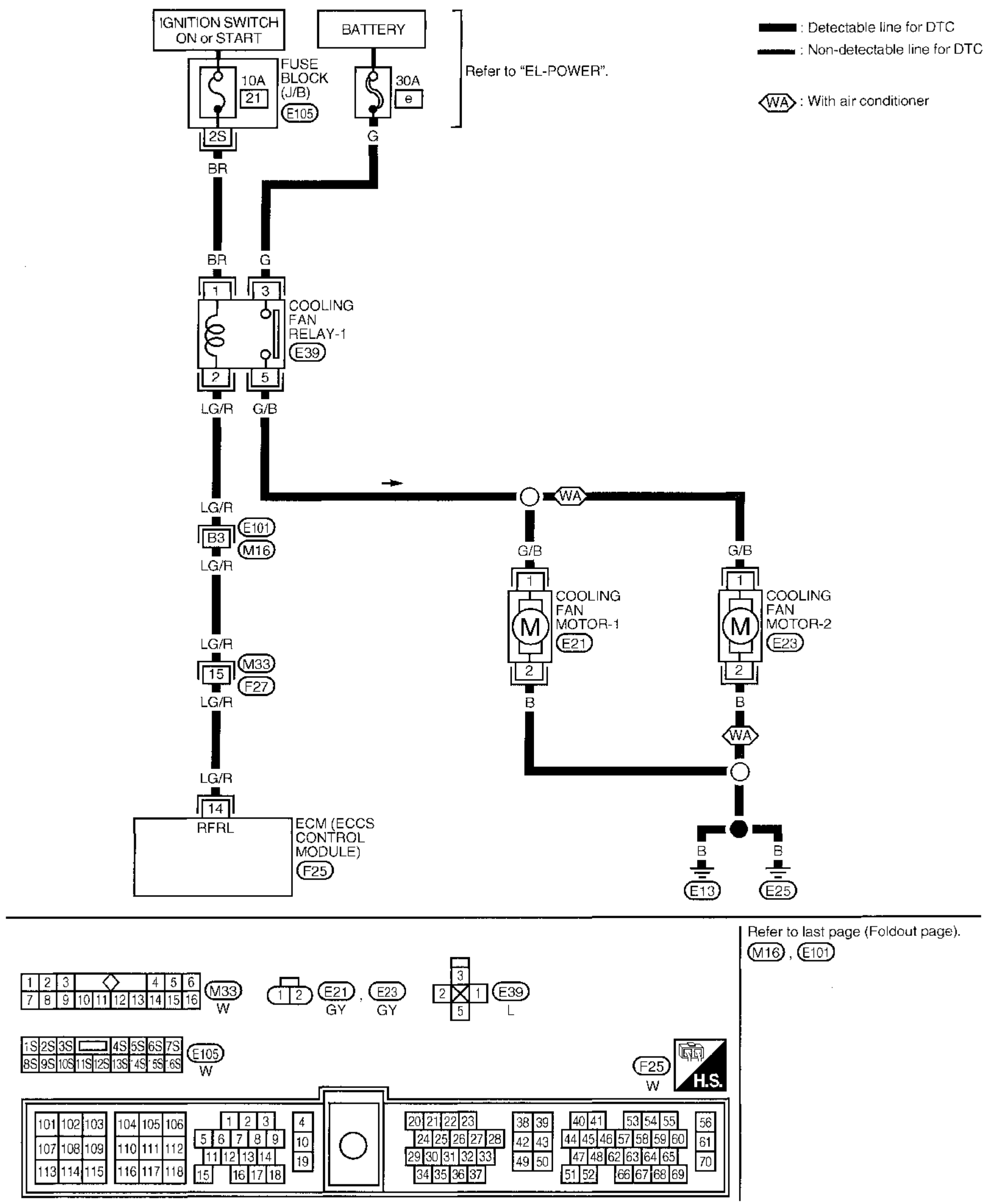


AEC221A

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

FOR M/T MODELS

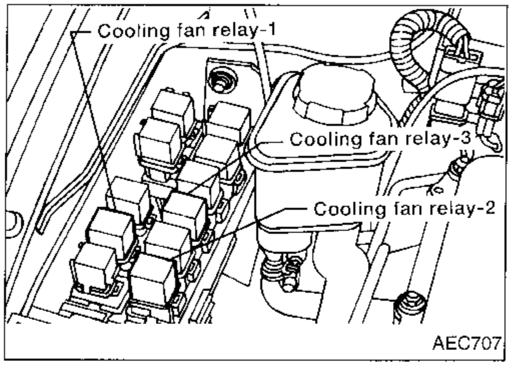
EC-COOL/F-02



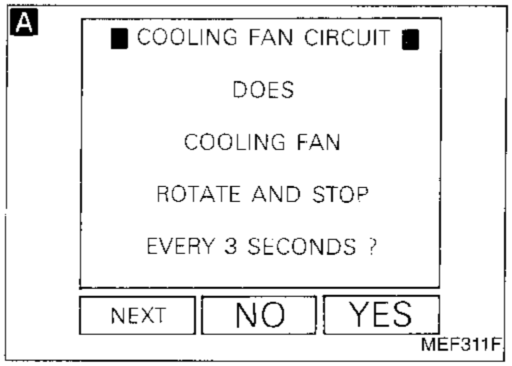
AEC222A

Overheat (Cont'd)

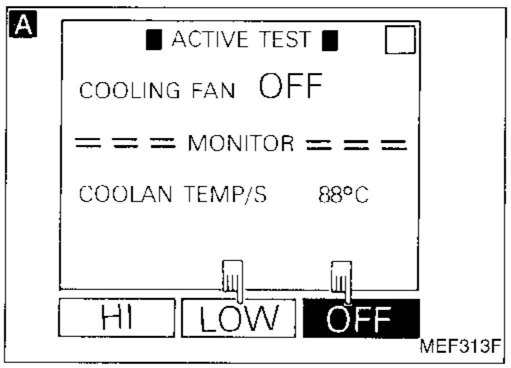
DIAGNOSTIC PROCEDURE



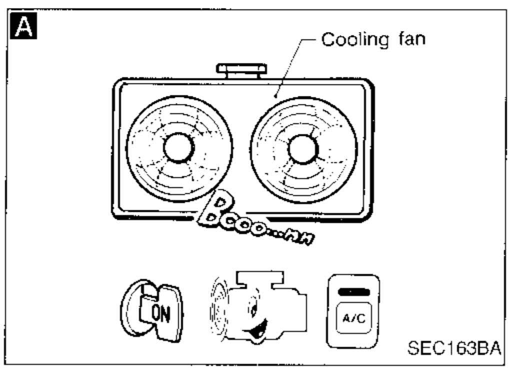
AEC707



MEF311F



MEF313F



SEC163BA

INSPECTION START

↓

A **CHECK COOLING FAN LOW SPEED OPERATION (A/T MODELS) AND HIGH SPEED OPERATION (M/T MODELS).**

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relays-2 and -3 for A/T models.
3. Turn ignition switch "ON".
4. Perform "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

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

OR

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

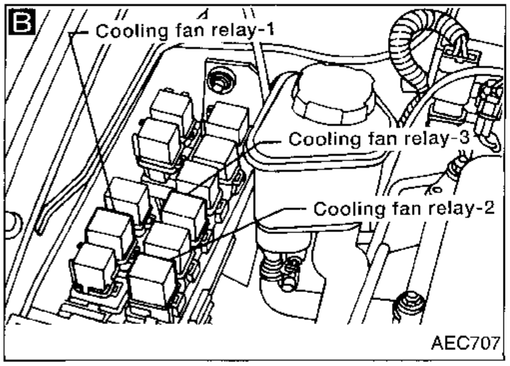
NG → Check cooling fan low speed control circuit (A/T models) and high speed control circuit (M/T models). (Go to PROCEDURE A.)

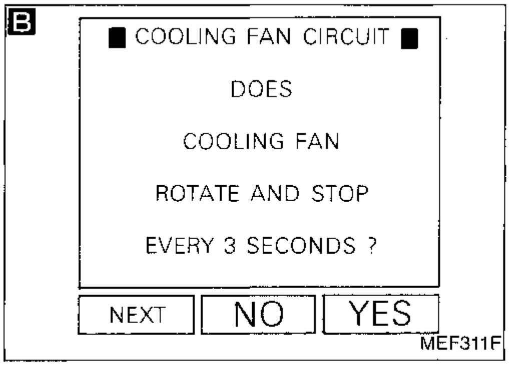
↓ OK

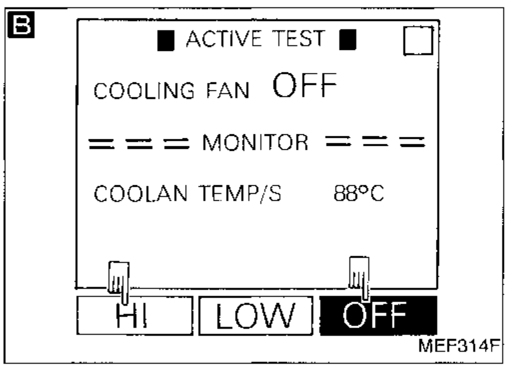
Ⓐ

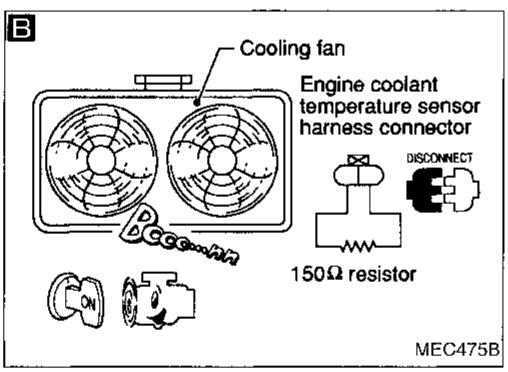
(Go to next page.)

Overheat (Cont'd)









Ⓐ

B

CHECK COOLING FAN HIGH SPEED OPERATION (A/T MODELS).

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

OR

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

OR

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

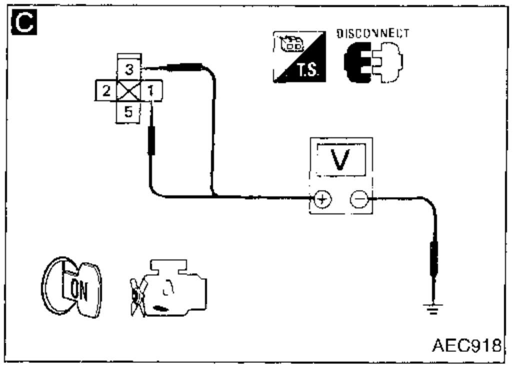
NG → Check cooling fan high speed control circuit. (Go to PROCEDURE B.)

OK ↓

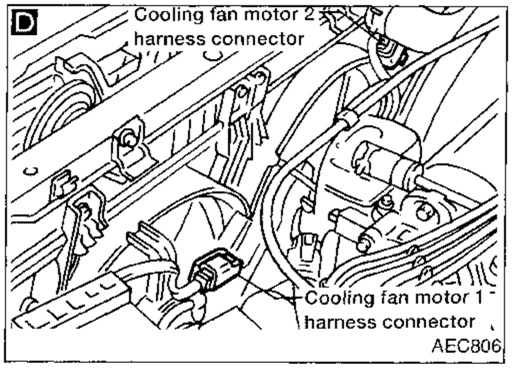
Ⓑ

(Go to EC-214).

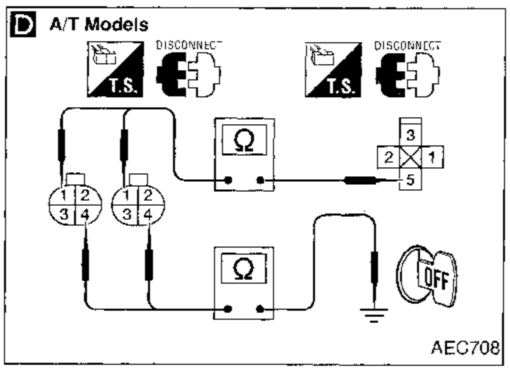
Overheat (Cont'd)



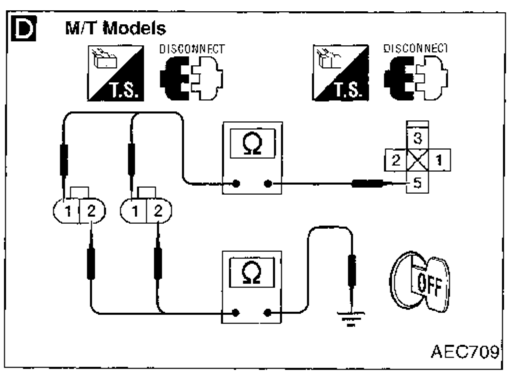
AEC918



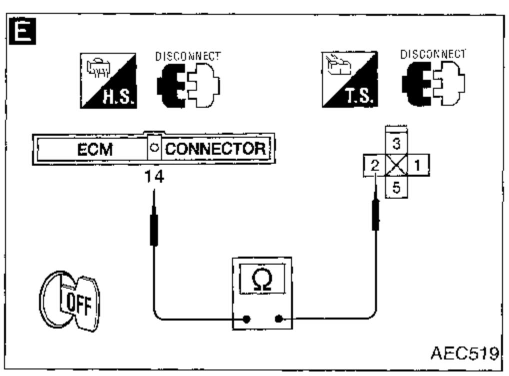
AEC806



AEC708



AEC709



AEC519

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 link
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

If NG, repair harness or connectors.

OK ↓

D

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between terminal ① and terminal ⑤.
   Continuity should exist.
   If OK, check harness for short.
4. Check harness continuity between terminal ④ (A/T models), ② (M/T models) and body ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

E

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

NG → Check the following.
- Harness connectors M16, E101
- Harness connectors F27, M33
- Harness for open or short between cooling fan relay-1 and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-1).
Refer to "COMPONENT INSPECTION", EC-216.

NG → Replace cooling fan relay.

OK ↓

Ⓒ

(Go to next page.)

Overheat (Cont'd)

C

CHECK COMPONENT
(Cooling fan motors-1 and -2).
Refer to "COMPONENT INSPECTION", EC-216.

NG → Replace cooling fan motors.

OK ↓

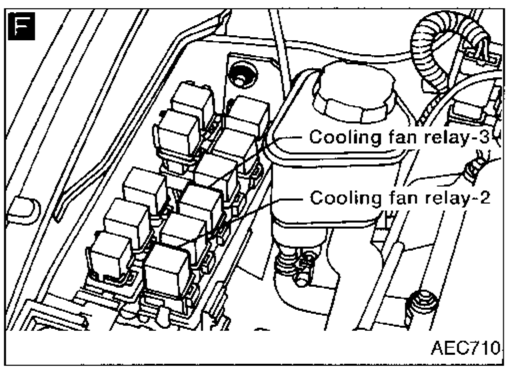
Disconnect and reconnect harness connectors in the circuit. Then retest.

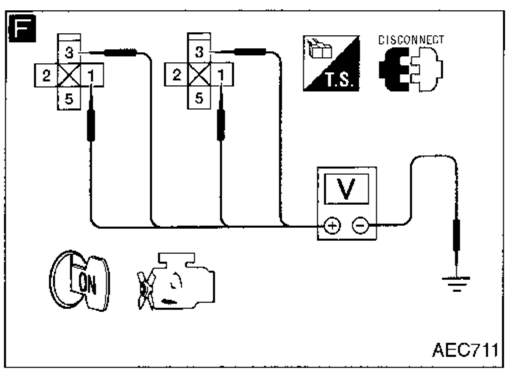
Trouble is not fixed. ↓

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

↓

INSPECTION END





PROCEDURE B (For A/T models)

INSPECTION START

↓

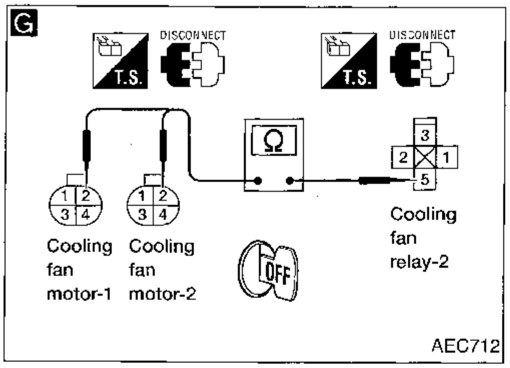
CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relays-2 and -3.
3. Turn ignition switch "ON".
4. Check voltage between cooling fan relays-2 and -3 terminals 1, 3 and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.
- 10A fuse
- 30A fusible link
- Harness for open or short between cooling fan relays-2 and -3 and fuse
- Harness for open or short between cooling fan relays-2 and -3 and battery

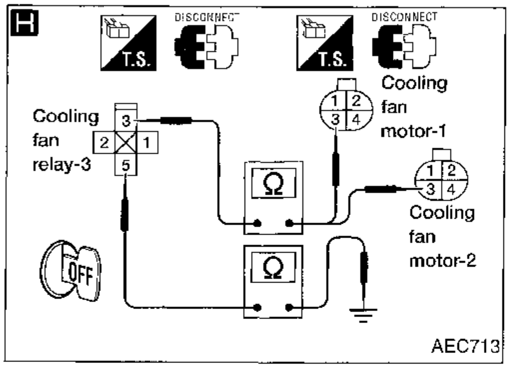
If NG, repair harness or connectors.

OK ↓

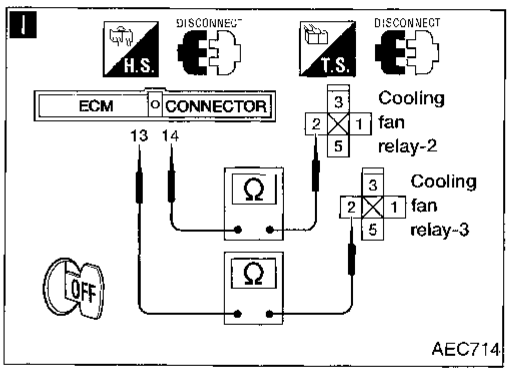
D
(Go to next page.)



AEC712



AEC713



AEC714

Ⓓ

CHECK POWER AND GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motors-1 and -2 harness connectors.
3. [G] Check harness continuity between cooling fan relay-2 terminal ⑤ and cooling fan motors-1 and -2 terminal ②.
   Continuity should exist.
   If OK, check harness for short.
4. [H] Check harness continuity between cooling fan relay-3 terminal ③ and cooling fan motors-1 and -2 terminal ③, cooling fan relay-3 terminal ⑤ and body ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

[I] **CHECK OUTPUT SIGNAL CIRCUIT.**
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑬ and cooling fan relay-3 terminal ②, ECM terminal ⑭ and cooling fan relay-2 terminal ②.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M16), (E101)
- Harness connectors (F27), (M33)
- Harness for open or short between cooling fan relays-2 and -3 and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENTS
(Cooling fan relays-2 and -3).
Refer to "COMPONENT INSPECTION", EC-216.

NG → Replace cooling fan relays.

OK ↓

CHECK COMPONENTS
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-216.

NG → Replace cooling fan motors.

OK ↓

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

Trouble is not fixed. ↓

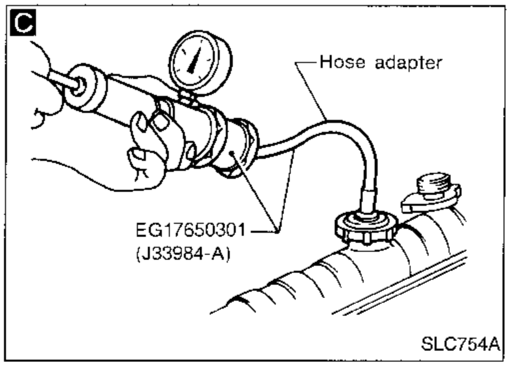
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

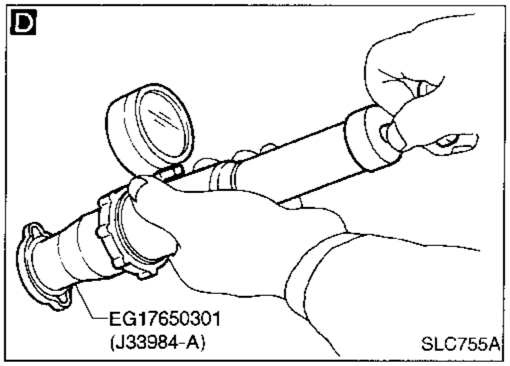
INSPECTION END

Overheat (Cont'd)

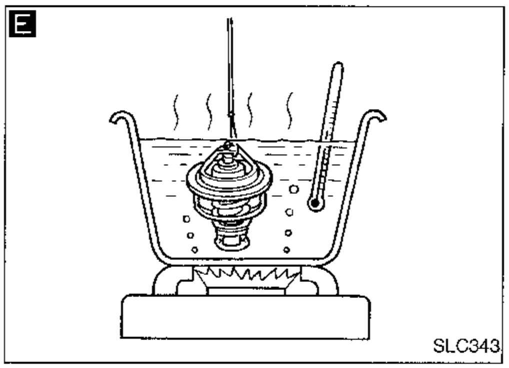
C



D



E



Ⓑ

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

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

Refer to LC section ("Water Pump").

OK ↓

D **CHECK RADIATOR CAP.**
Apply pressure to cap with a tester.
Radiator cap relief pressure:
59 - 98 kPa (0.6 - 1.0 kg/cm², 9 - 14 psi)

NG → Replace radiator cap.

OK ↓

E **CHECK THERMOSTAT.**
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.
   Valve opening temperature:
   76.5°C (170°F) [standard]
   Valve lift:
   More than 8.0 mm/90°C (0.31 in/194°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

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

NG → Replace thermostat

OK ↓

Check engine coolant temperature sensor. Refer to "COMPONENT INSPECTION", EC-216.

NG → Replace engine coolant temperature sensor.

↓

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

↓

INSPECTION END

Perform FINAL CHECK by the following procedure after repair is completed.

1. Warm up engine. Run the vehicle for at least 20 minutes. Pay attention to engine coolant temperature gauge on the instrument panel. If the reading shows an abnormally high temperature, another part may be malfunctioning.
2. Stop vehicle and let engine idle. Check the intake and exhaust systems for leaks by listening for noise or visually inspecting the components.
3. Allow engine to cool and visually check for oil and coolant leaks. Then, perform "OVERALL FUNCTION CHECK".

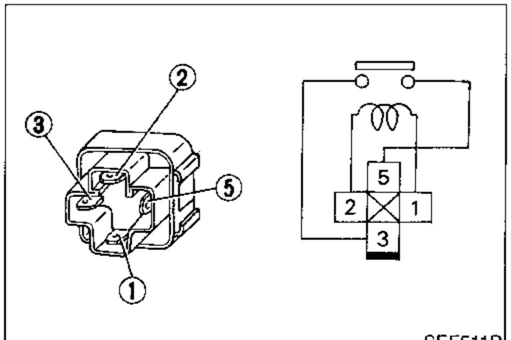
MAIN 12 CAUSES OF OVERHEATING

Engine	Step	Inspection item	Equipment	Condition	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi)	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	5	● Coolant leaks	● Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section
ON*1	7	● Cooling fan	● CONSULT	Operating	See "TROUBLE DIAGNOSIS FOR DTC P1900 (0208)" (EC-203)
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.

Overheat (Cont'd)

COMPONENT INSPECTION



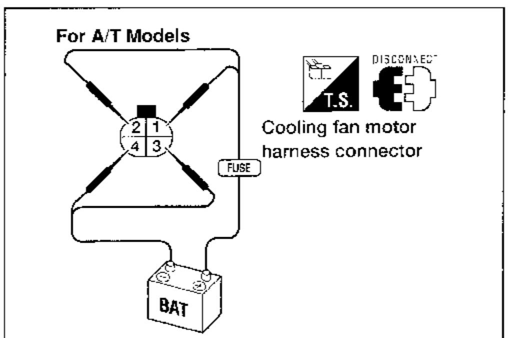
SEF511P

Cooling fan relays-1, -2 and -3

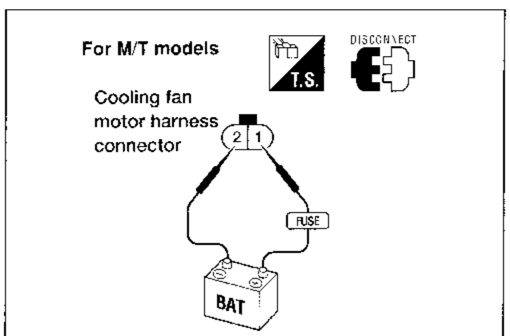
Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.



AEC715



AEC781

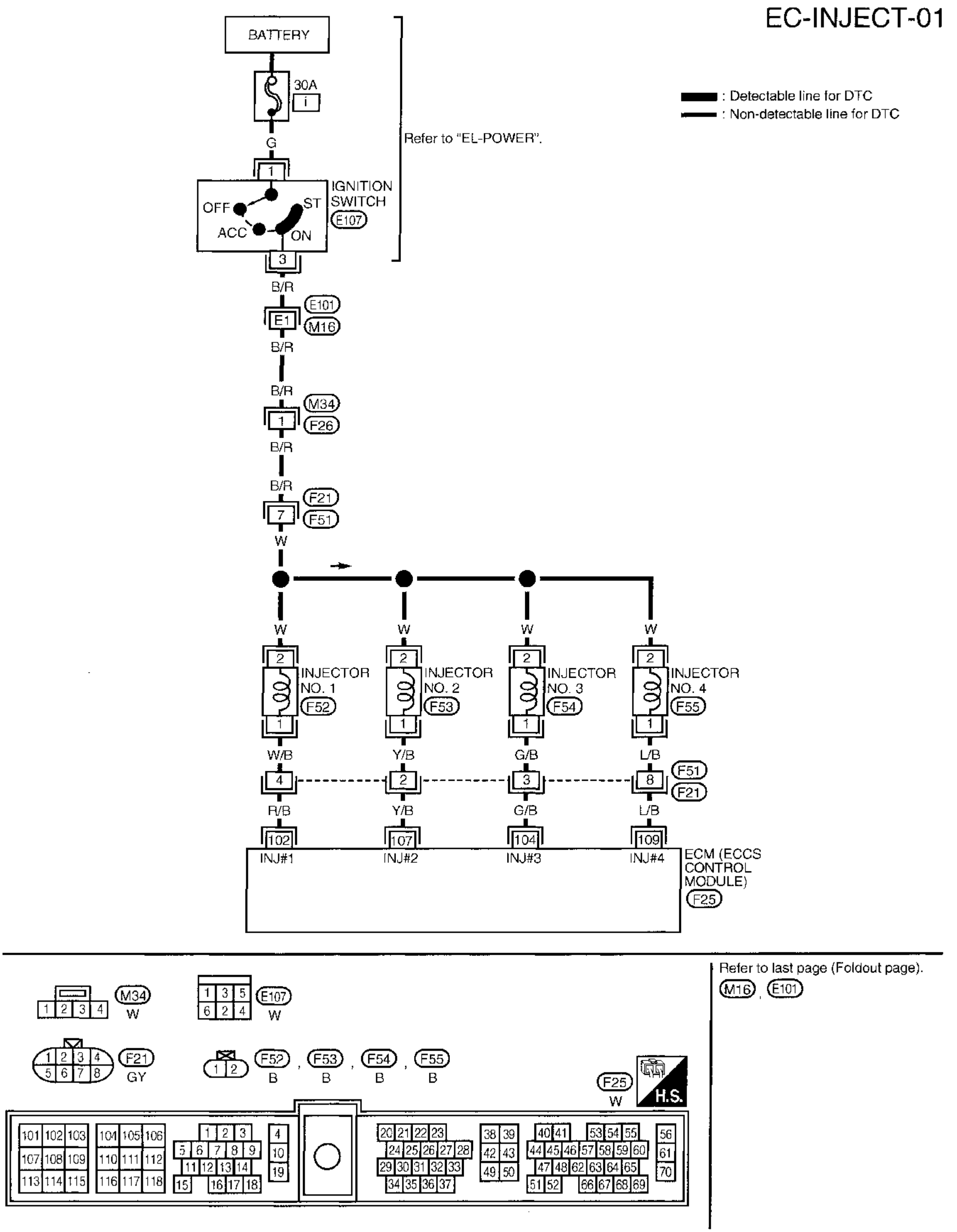
Cooling fan motors-1 and -2

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

	Speed	Terminals	
		(⊕)	(⊖)
Cooling fan motor	Low (A/T models)	①	④
	High (A/T models)	②	③
	High (M/T models)	①	②

Cooling fan motor should operate.
If NG, replace cooling fan motor.

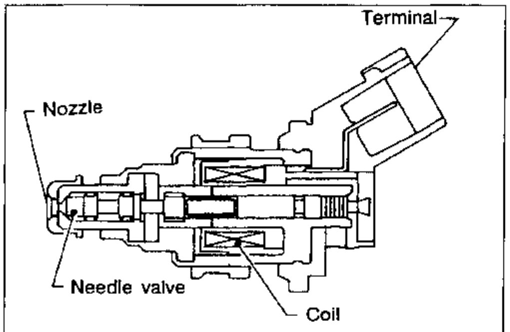
Injector



AEC223A

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

Injector (Cont'd)



SEF596K

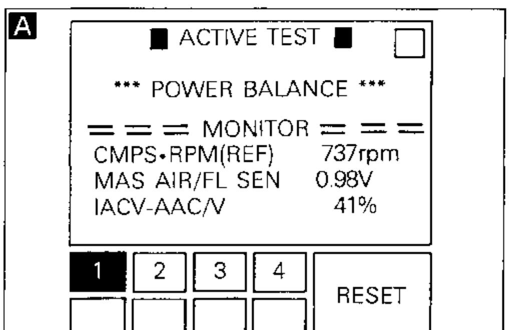
COMPONENT DESCRIPTION

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.

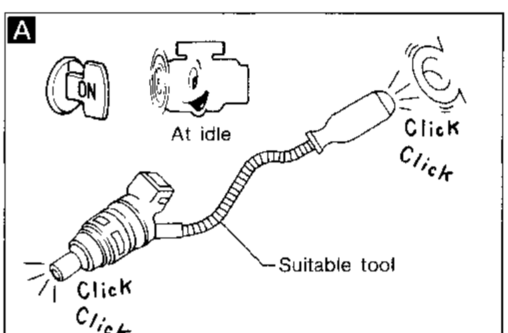
ECM TERMINALS AND REFERENCE VALUE

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

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



MEF354F



MEC703B

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

1. Start engine.
2. Listen to each injector operating sound.
Clicking noise should be heard.

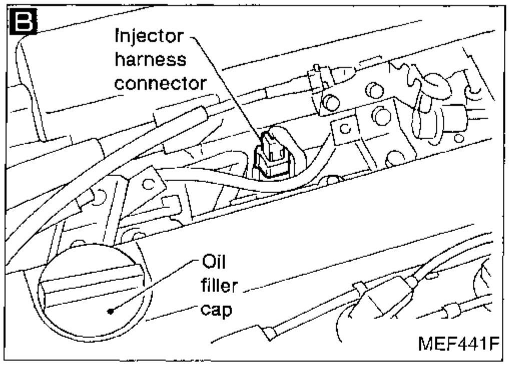
OK → INSPECTION END

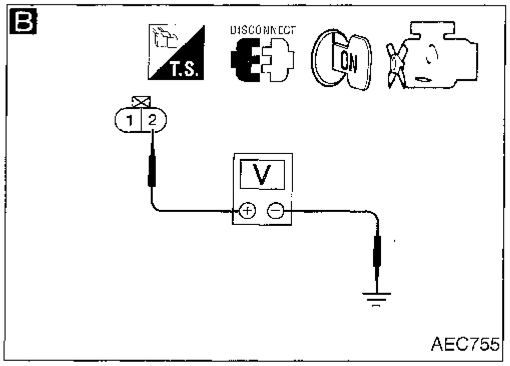
↓ NG

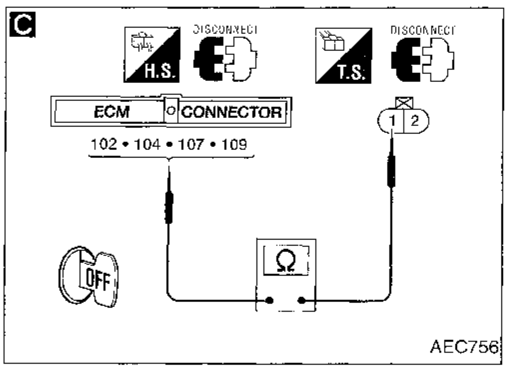
(A)

(Go to next page.)

Injector (Cont'd)







Ⓐ

B

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

NG → Check the following.
- Harness connectors E101, M16
- Harness connectors M34, F26
- Harness connectors F21, F51
- Harness for open or short between injector and ignition switch

If NG, repair harness or connectors.

OK ↓

C

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

NG → Check the following.
- Harness for open or short between ECM and injector

If NG, repair harness or connectors.

OK ↓

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

NG → Replace injector.

OK ↓

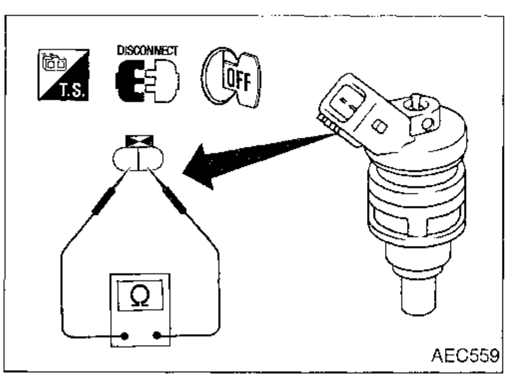
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

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

↓

INSPECTION END



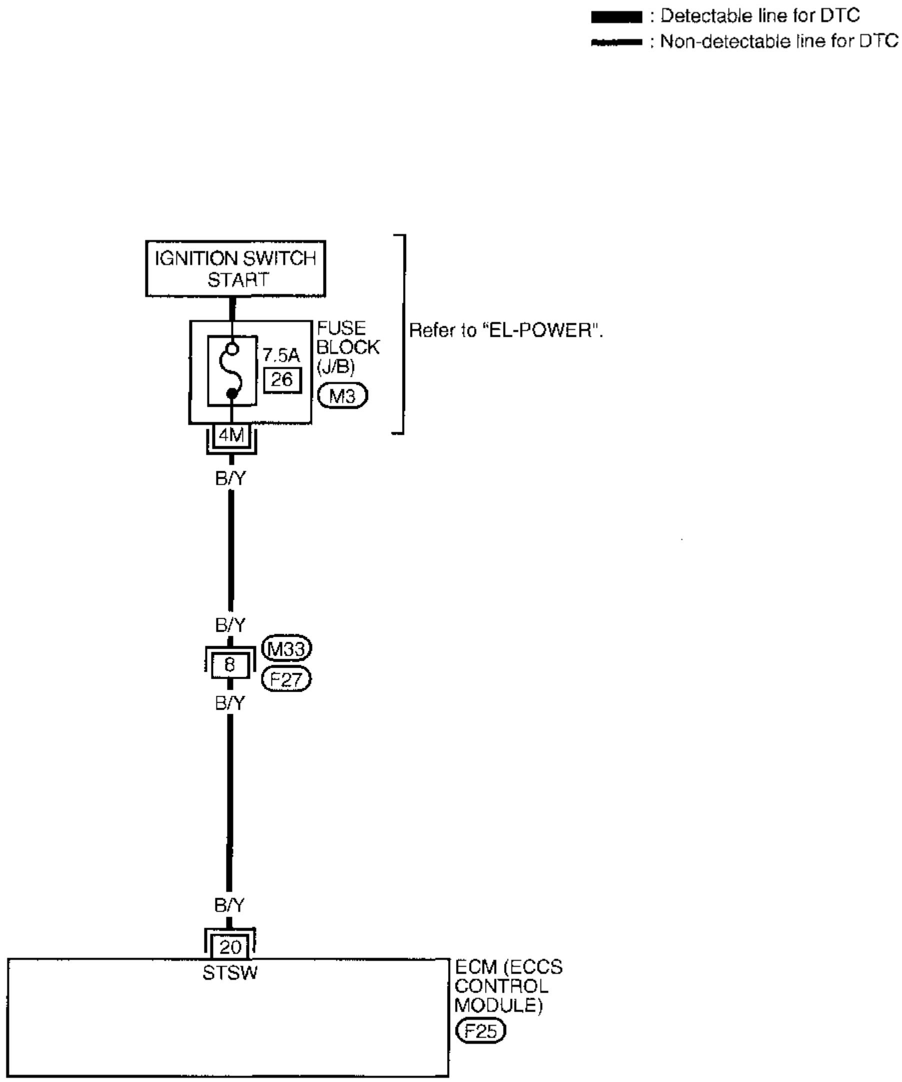
COMPONENT INSPECTION

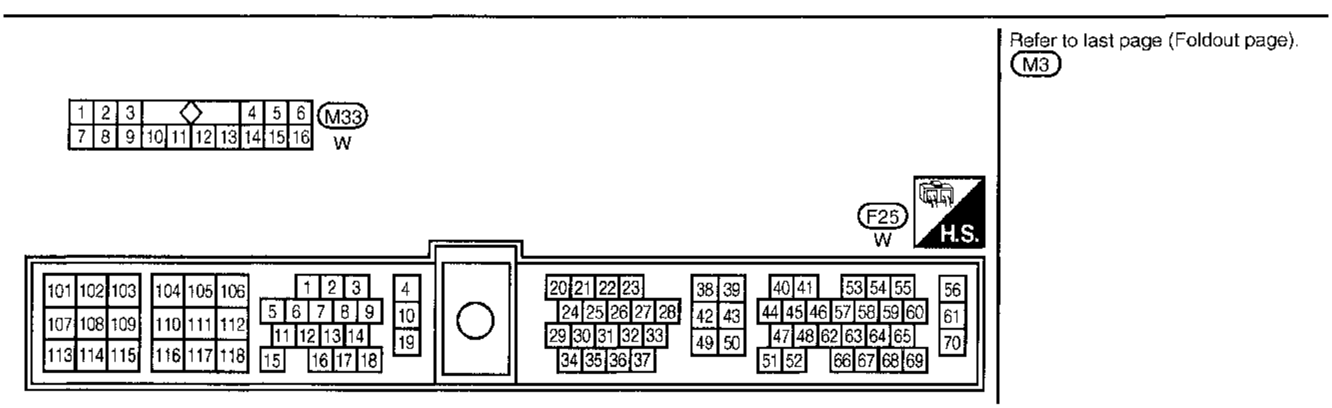
Injector

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

Start Signal

EC-S/SIG-01





AEC224A

Start Signal (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

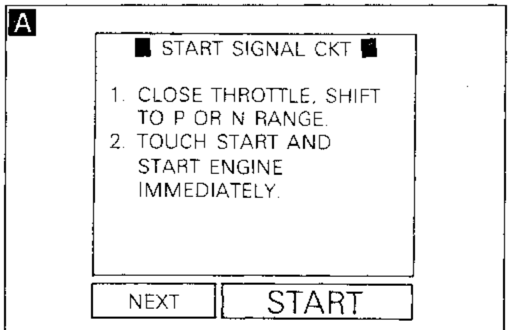
ECM TERMINALS AND REFERENCE VALUE

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

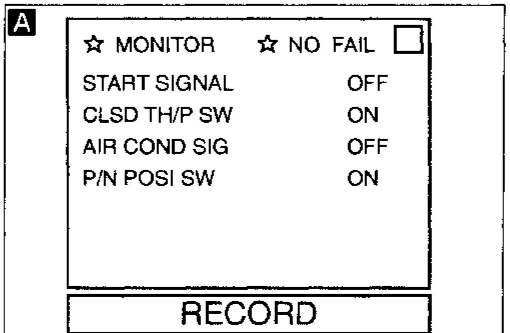
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
20	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)

Start Signal (Cont'd)

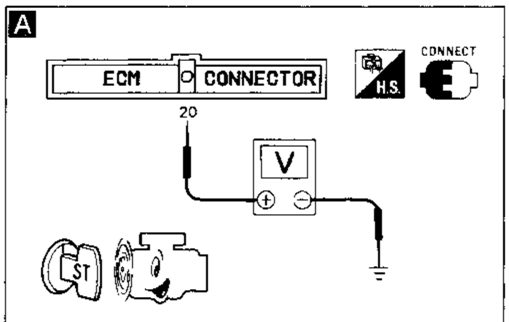
DIAGNOSTIC PROCEDURE



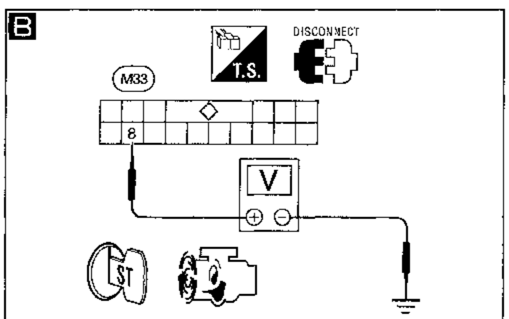
SEF191L



SEF111P



SEF109P



AEC757

INSPECTION START

↓

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "START SIGNAL CKT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1. Turn ignition switch to "START".
2. Check voltage between ECM terminal ⑳ and ground.

Voltage:
Ignition switch "START"
Battery voltage
Except above
Approximately 0V

OK → INSPECTION END

NG ↓

B

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect harness connectors M33, F27.
3. Turn ignition switch to "START".
4. Check voltage between harness connector M33 terminal ⑧ and ground.

Voltage:
Ignition switch "START"
Battery voltage
Except above
Approximately 0V

NG → Check the following.
- Harness connector M33
- 7.5A fuse
- Harness for open or short between M33 and ignition switch

If NG, repair harness or connectors.

OK ↓

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

↓ Trouble is not fixed.

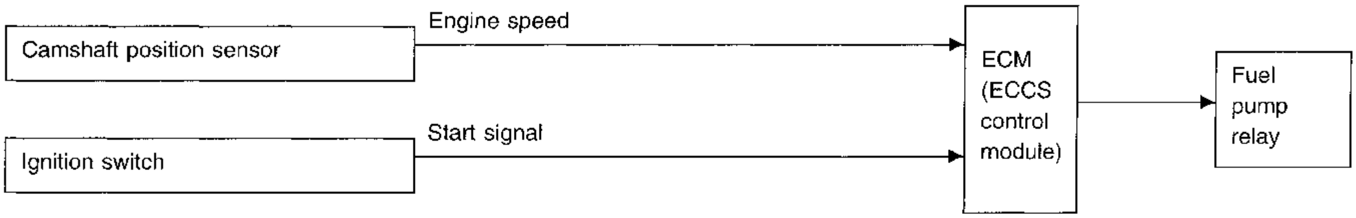
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

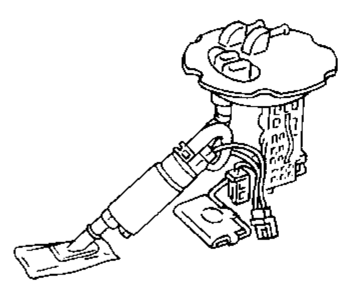
Fuel Pump

SYSTEM DESCRIPTION



The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 180° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops



AEC801

COMPONENT DESCRIPTION

The fuel pump with a fuel damper is an in-tank type (the pump and damper are located in the fuel tank).

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	• Ignition switch is turned to ON (Operates for 5 seconds) • Engine running and cranking • When engine is stopped (stops in 1.0 seconds)	ON
	• Except as shown above	OFF

Fuel Pump (Cont'd)

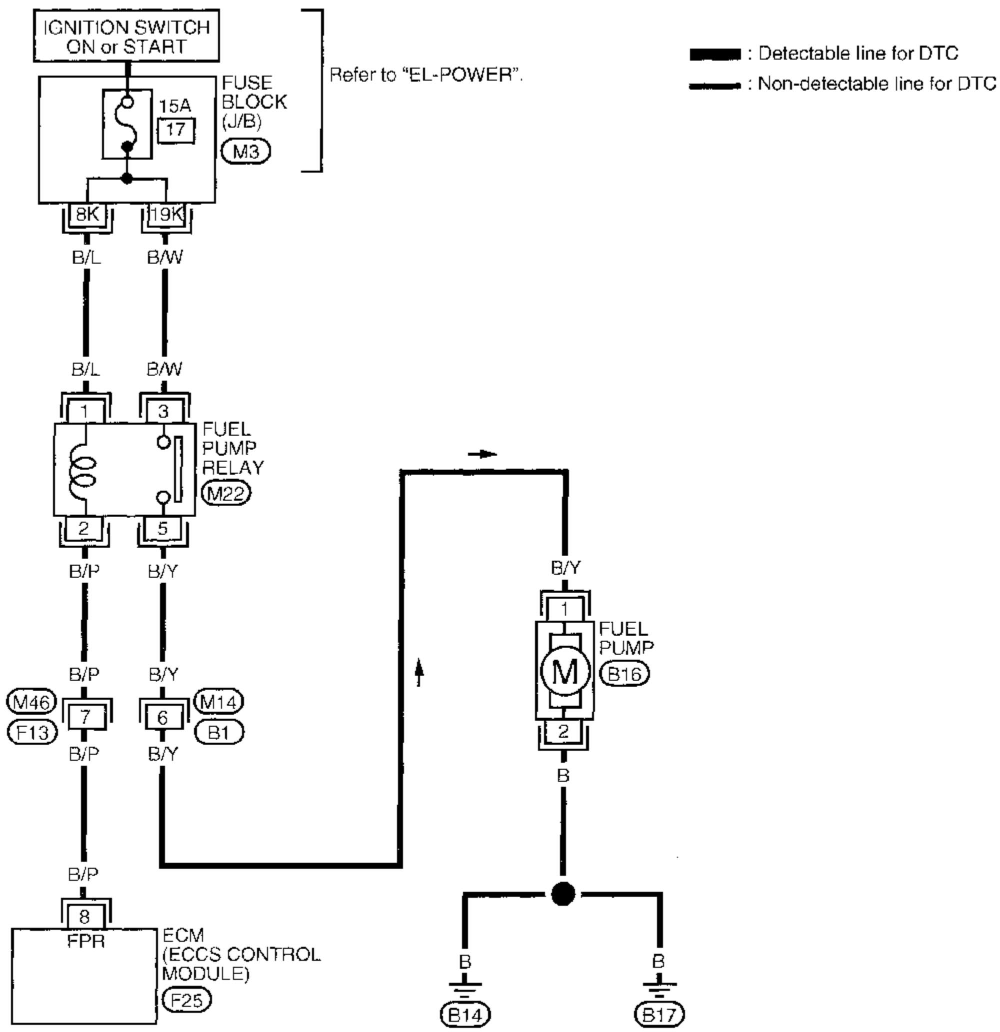
ECM TERMINALS AND REFERENCE VALUE

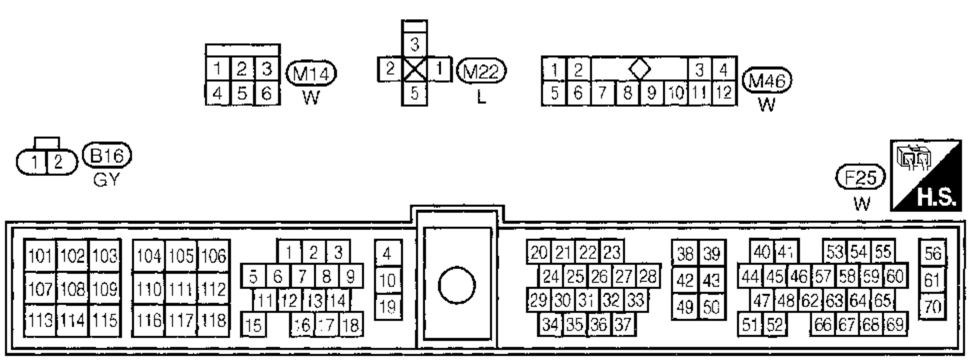
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8	B/P	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.07 - 0.20V
			Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

Fuel Pump (Cont'd)

EC-F/PUMP-01



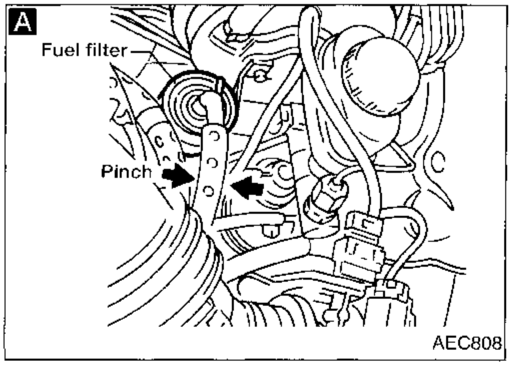


Refer to last page (Foldout page).
M3

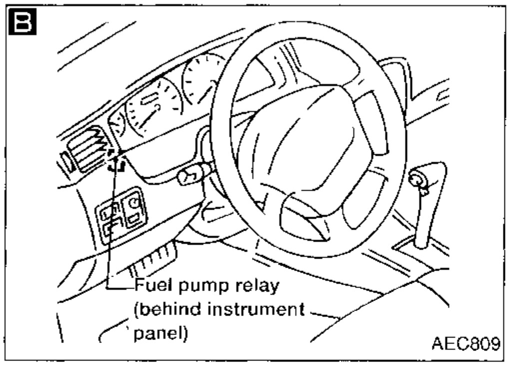
AEC225A

Fuel Pump (Cont'd)

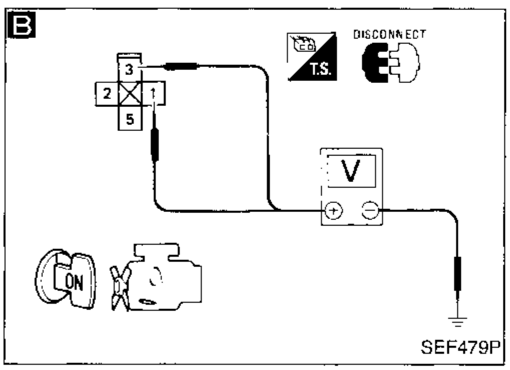
DIAGNOSTIC PROCEDURE



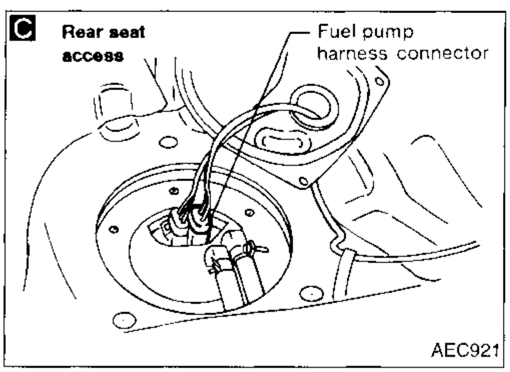
AEC808



AEC809



SEF479P



AEC921

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.
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

If NG, repair harness or connectors.

↓ OK

C

CHECK POWER AND GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.
3. Check harness continuity between terminal ② and body ground, terminal ① and fuel pump relay connector terminal ⑤.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors M14, B1
- Harness for open or short between fuel pump and body ground
- Harness for open or short between fuel pump and fuel pump relay

If NG, repair harness or connectors.

↓ OK

D

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑧ and fuel pump relay connector terminal ②.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors M46, F13
- Harness for open or short between ECM and fuel pump relay

If NG, repair harness or connectors.

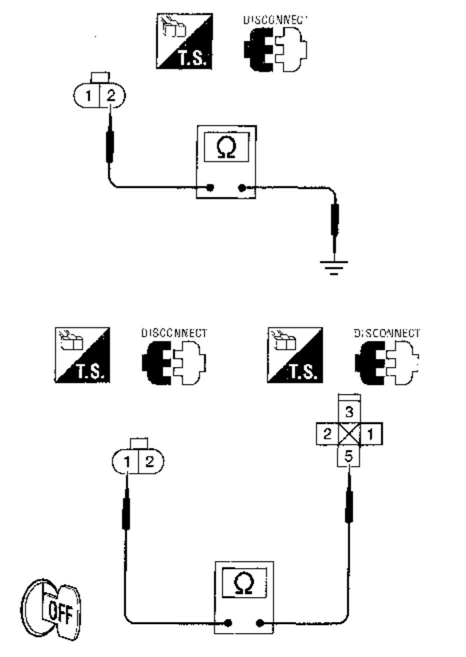
↓ OK

Ⓐ

(Go to next page.)

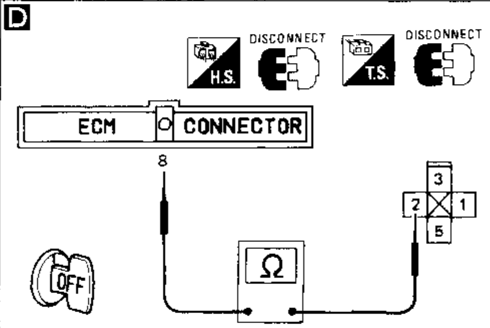
Fuel Pump (Cont'd)

C



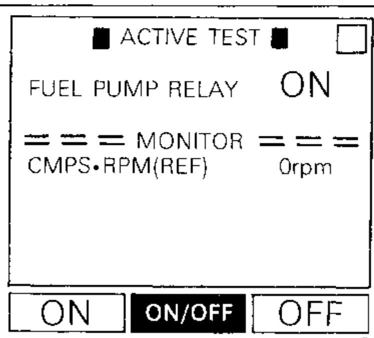
AEC758

D



SEF482P

E



MEF309F

Ⓐ

E

CHECK COMPONENT
(Fuel pump relay).
1. Reconnect fuel pump relay, fuel pump harness connector and ECM harness connector.
2. Turn ignition switch "ON".
3. Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

Refer to "COMPONENT INSPECTION" on next page.

NG → Replace fuel pump relay.

OK ↓

CHECK COMPONENT
(Fuel pump).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace fuel pump.

OK ↓

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

↓ Trouble is not fixed.

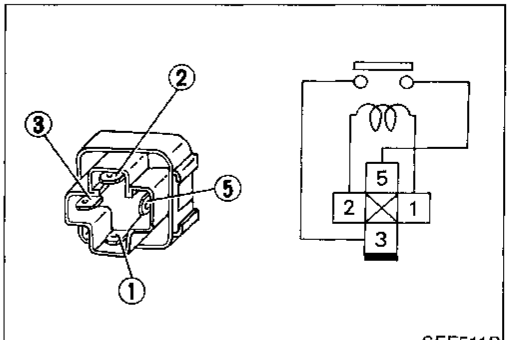
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Fuel Pump (Cont'd)

COMPONENT INSPECTION



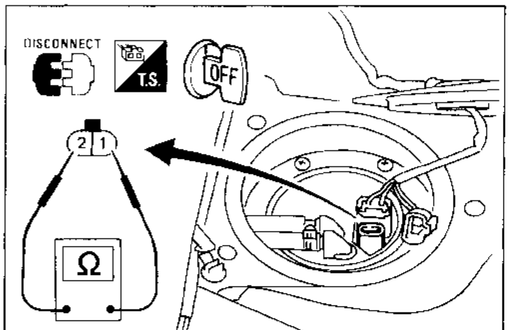
SEF511P

Fuel pump relay

Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.



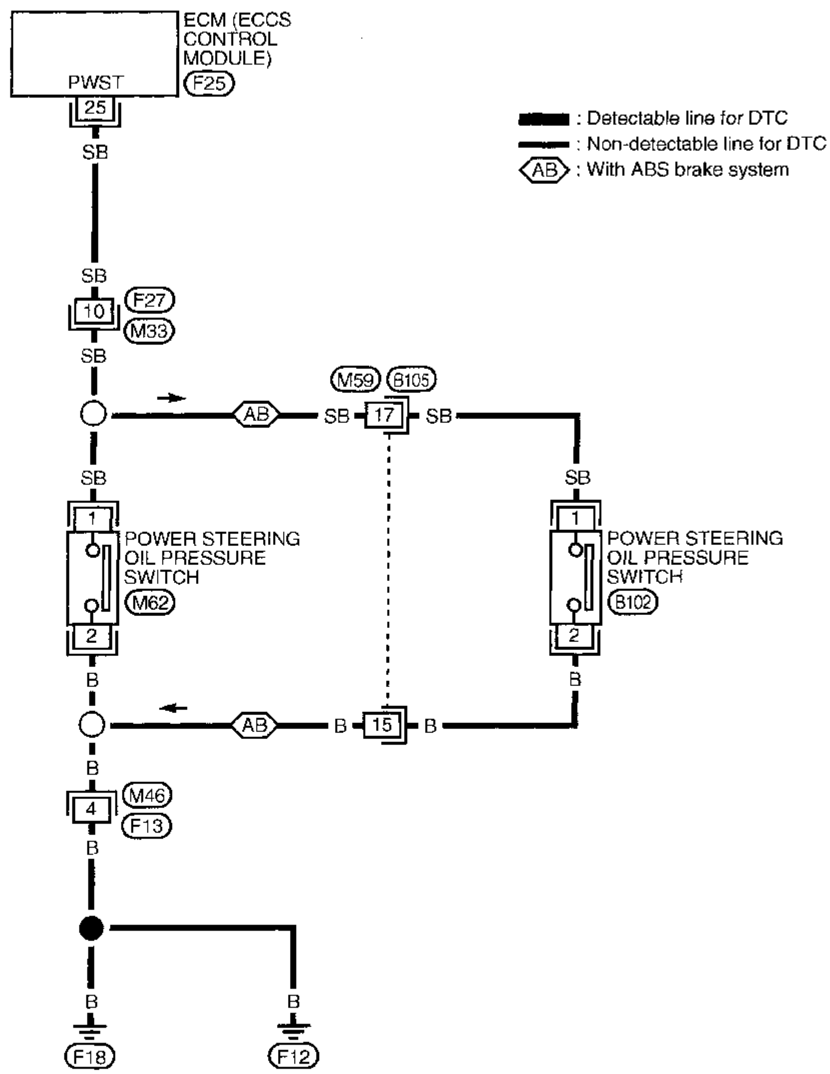
SEF203Q

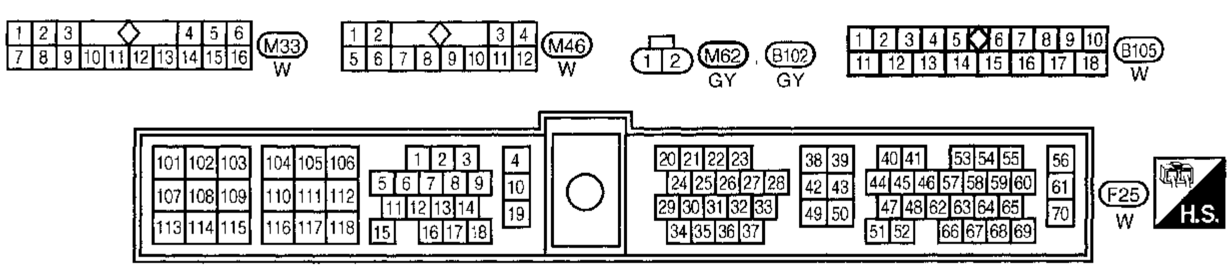
Fuel pump

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ① and ②.
   Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]
   If NG, replace fuel pump.

Power Steering Oil Pressure Switch

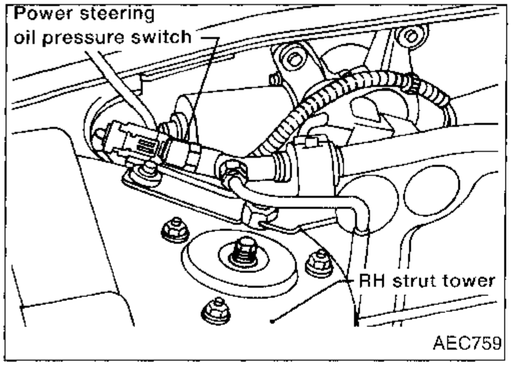
EC-PST/SW-01





AEC226A

Power Steering Oil Pressure Switch (Cont'd)



COMPONENT DESCRIPTION

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON

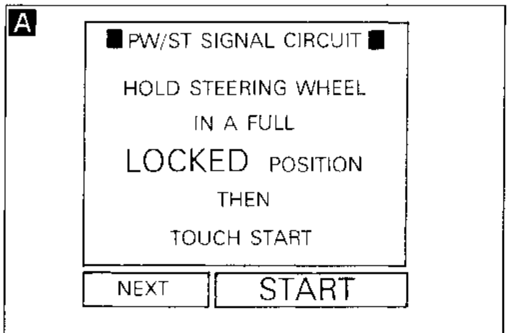
ECM TERMINALS AND REFERENCE VALUE

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

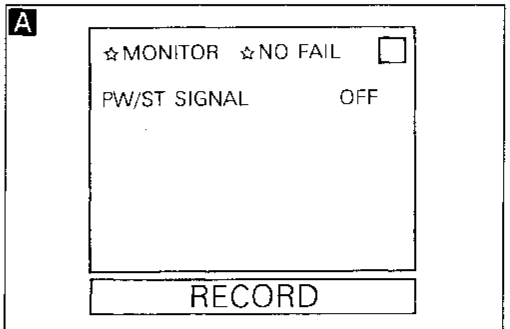
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	SB	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned	Approximately 0V
			Engine is running. └ Steering wheel is not being turned	Approximately 5V

Power Steering Oil Pressure Switch (Cont'd)

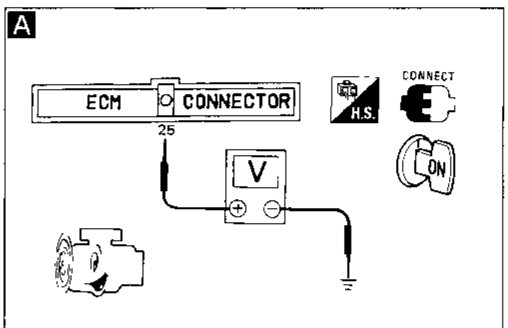
DIAGNOSTIC PROCEDURE



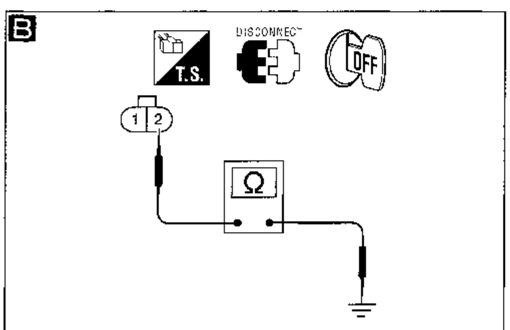
MEF023E



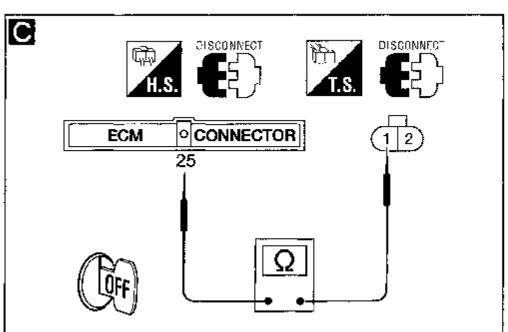
SEF591I



SEF126P



AEC760



AEC761

INSPECTION START

↓

A

CHECK OVERALL FUNCTION.
1. Turn ignition switch "ON".
2. Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Start engine.
2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT.
   Steering is in neutral position:
   OFF
   Steering is turned:
   ON

OR

1. Start engine.
2. Check voltage between ECM terminal ㉕ and ground.
   Voltage:
   When steering wheel is turned quickly.
   Approximately 0V
   Except above
   Approximately 5V

OK → INSPECTION END

NG ↓

B

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

NG → Check the following.
- Harness connectors M46, F13 (and M59, B105 for ABS models)
- Harness for open or short between power steering oil pressure switch and engine ground

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉕ and terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors F27, M33 (and M59, B105 for ABS models)
- Harness for open or short between ECM and power steering oil pressure switch

If NG, repair harness or connectors.

OK ↓

Ⓐ

(Go to next page.)

Power Steering Oil Pressure Switch (Cont'd)

Ⓐ

CHECK COMPONENT (Power steering oil pressure switch). Refer to "COMPONENT INSPECTION" below.	NG →	Replace power steering oil pressure switch.

↓ OK

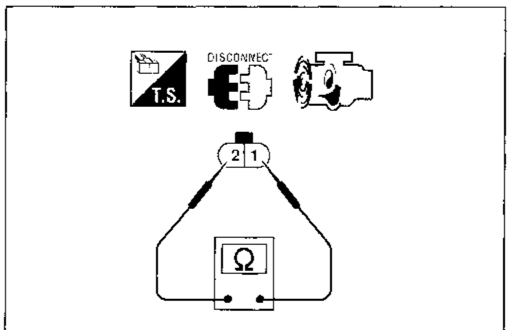
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ 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



AEC762

COMPONENT INSPECTION

Power steering oil pressure switch

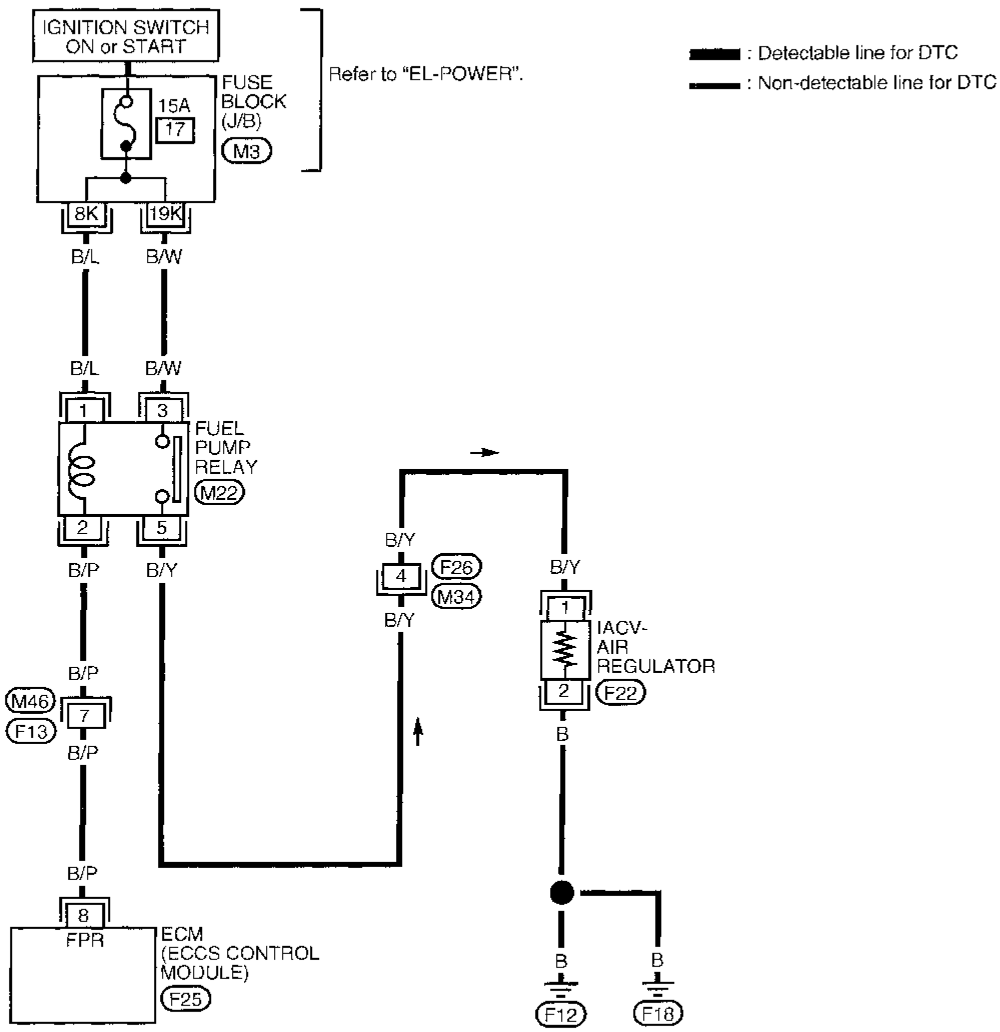
1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals ① and ②.

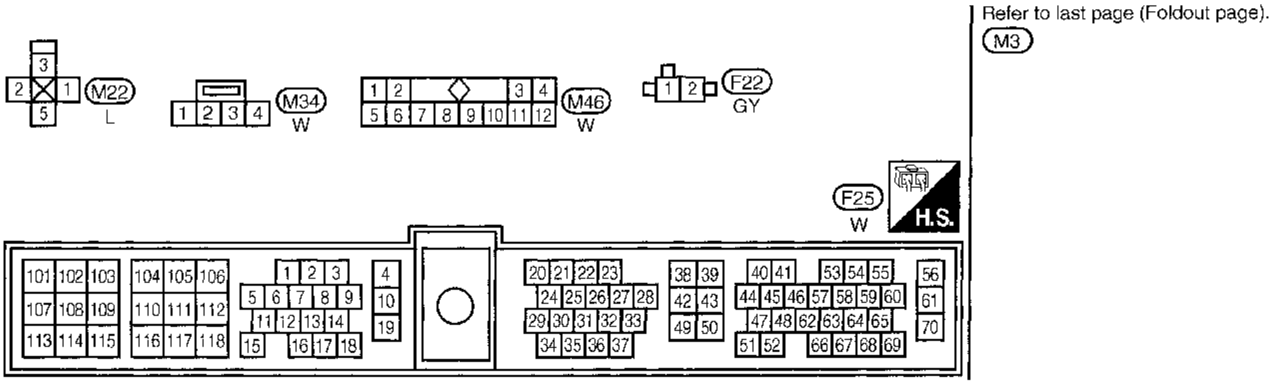
Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If NG, replace power steering oil pressure switch.

IACV-Air Regulator

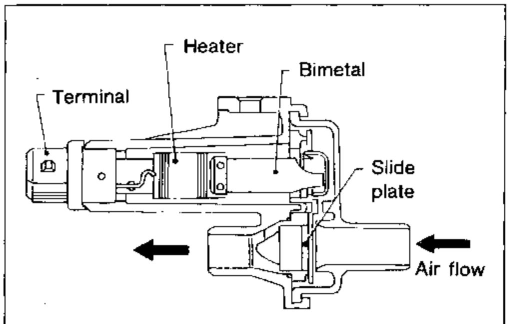
EC-AIRREG-01





AEC227A

IACV-Air Regulator (Cont'd)



SEF095K

DESCRIPTION

The idle air control valve (IACV)-air regulator provides an air bypass when the engine is cold for a fast idle during warm-up. A bimetal, heater and rotary shutter are built into the IACV-air regulator. When the bimetal temperature is low, the air bypass port opens. As the engine starts and electric current flows through a heater, the bimetal begins to turn the shutter to close the bypass port. The air passage remains closed until the engine stops and the bimetal temperature drops.

ECM TERMINALS AND REFERENCE VALUE

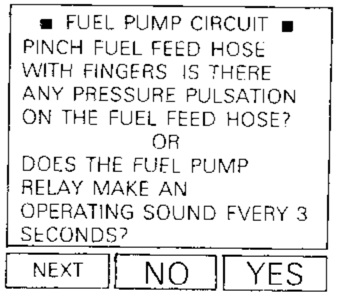
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8	B/P	Fuel pump relay	Ignition switch "ON" For 5 seconds after turning ignition switch "ON" Engine is running.	0.07 - 0.20V
			Ignition switch "ON" More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

IACV-Air Regulator (Cont'd)

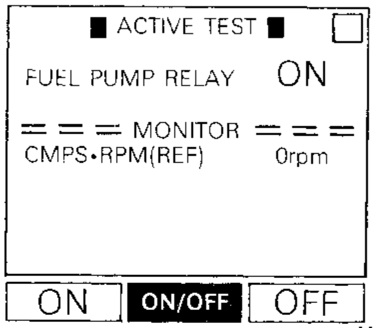
DIAGNOSTIC PROCEDURE

A



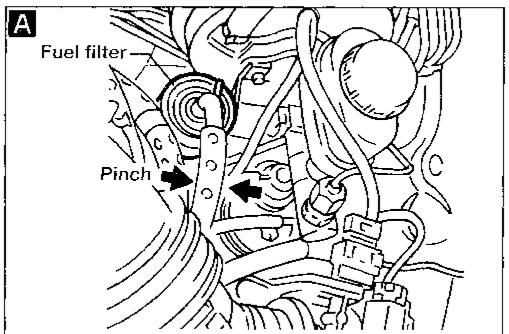
MEF591B

A

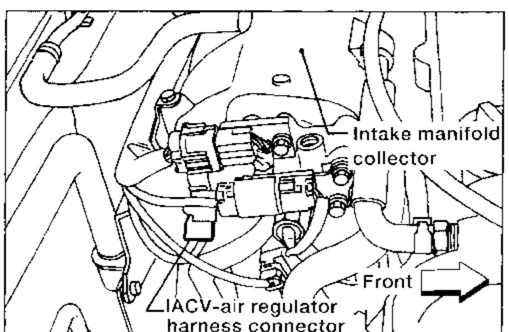


MEF309F

A

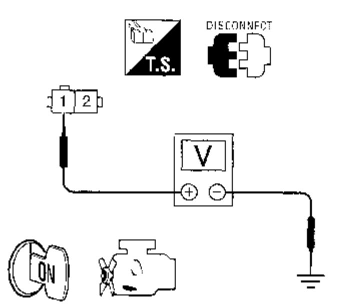


AEC808



AEC786

B



AEC763

INSPECTION START

↓

A

CHECK CONTROL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "FUEL PUMP CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

2. Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

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".

NG → Check fuel pump control circuit.
Refer to EC-223.

↓ OK

B

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect IACV-air regulator harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.
   Battery voltage should exist for 5 seconds after ignition switch is turned "ON".

NG → Check the following.
- Harness connectors F26, M34
- Harness for open or short between IACV-air regulator and fuel pump relay

If NG, repair harness or connectors.

↓ OK

Ⓐ

(Go to next page.)

GI
MA
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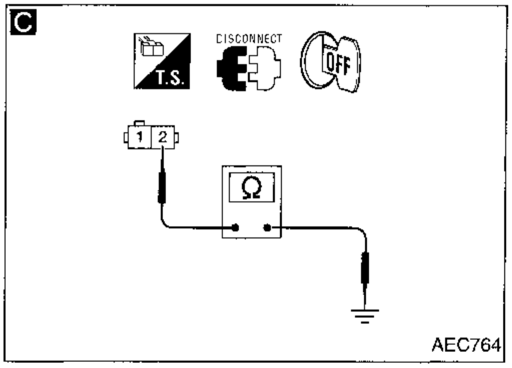
IACV-Air Regulator (Cont'd)



AEC764

Ⓐ

C

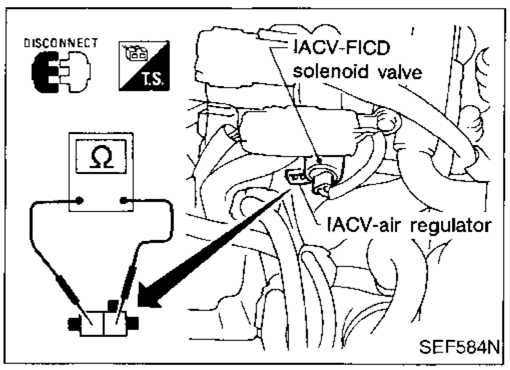
CHECK GROUND CIRCUIT.	NG	Check the following.
CHECK GROUND CIRCUIT. 1. Turn ignition switch "OFF". 2. Check harness continuity between terminal ② and body ground. **Continuity should exist.** If OK, check harness for short.	NG →	Check the following. ● Harness for open or short between IACV-air regulator and body ground If NG, repair harness or connectors.

↓ OK

CHECK COMPONENT	NG	
CHECK COMPONENT (IACV-air regulator). Refer to "COMPONENT INSPECTION" shown below.	NG →	Replace IACV-air regulator.

↓ OK

INSPECTION END



SEF584N

COMPONENT INSPECTION

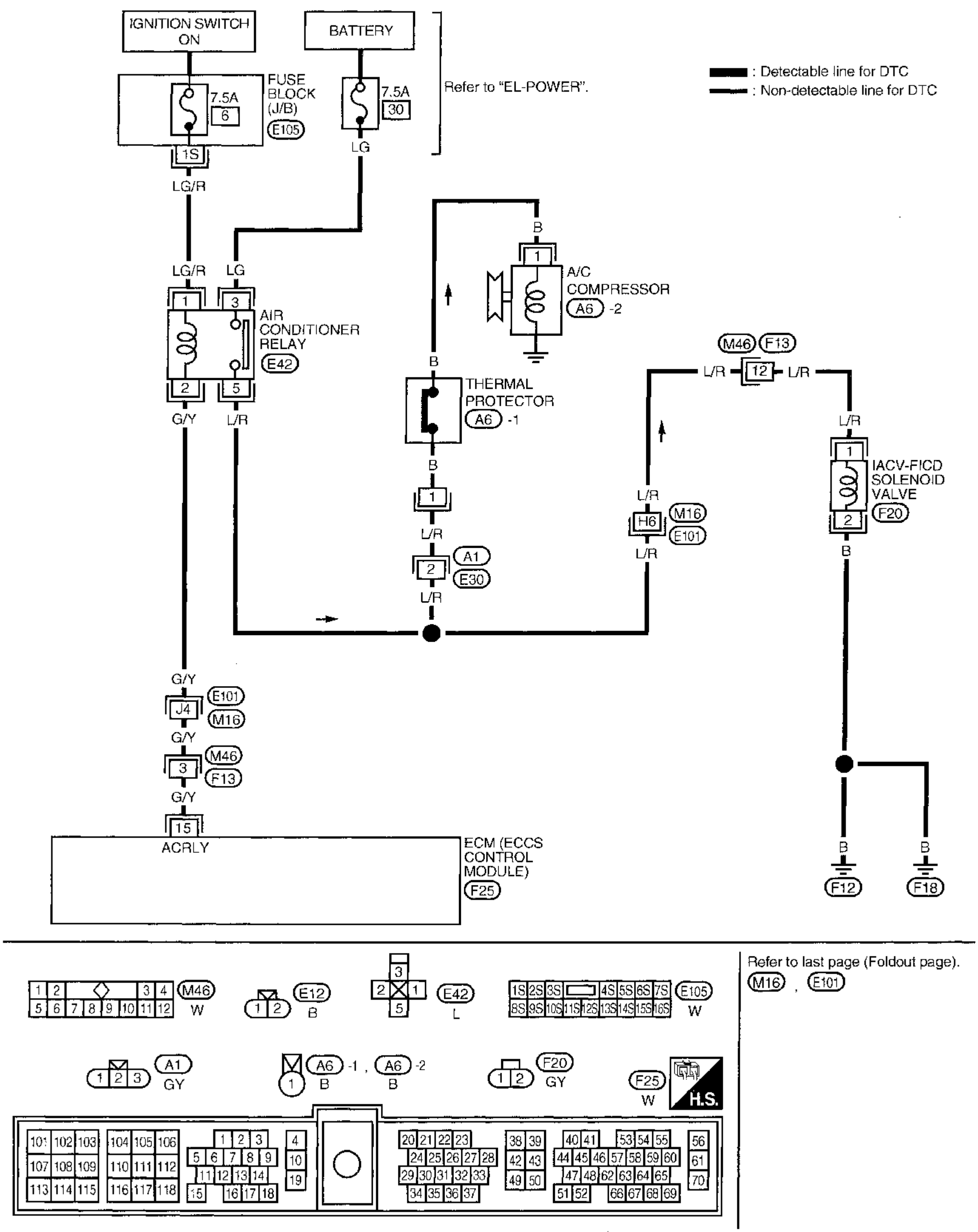
IACV-air regulator

Disconnect IACV-air regulator harness connector.

- Check IACV-air regulator resistance.
  Resistance:
  Approximately 70 - 80Ω [at 25°C (77°F)]
- Check IACV-air regulator for clogging.

IACV-FICD Solenoid Valve

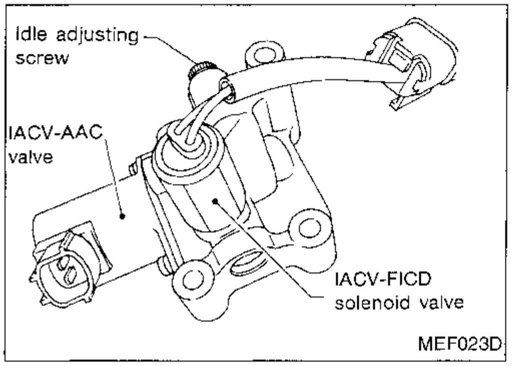
EC-FICD-01



AEC228A

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

IACV-FICD Solenoid Valve (Cont'd)



COMPONENT DESCRIPTION

When the air conditioner is on, the IAC valve-FICD solenoid valve supplies additional air to adjust to the increased load.

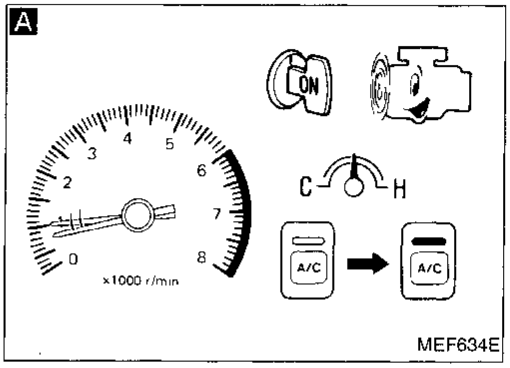
ECM TERMINALS AND REFERENCE VALUE

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

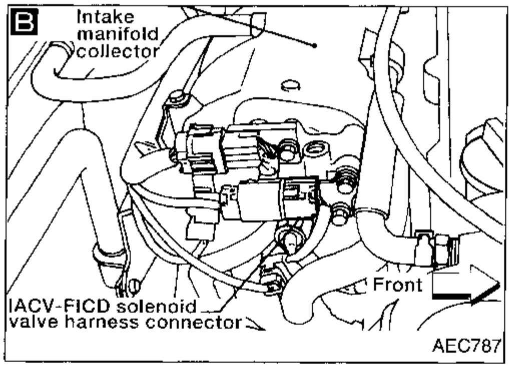
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
15	G/Y	Air conditioner relay	Engine is running. — Both A/C switch and blower switch are "ON"	0.08 - 0.2V
			Engine is running. — A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
21	L/W	Air conditioner switch	Engine is running. — Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			Engine is running. — Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)

IACV-FICD Solenoid Valve (Cont'd)

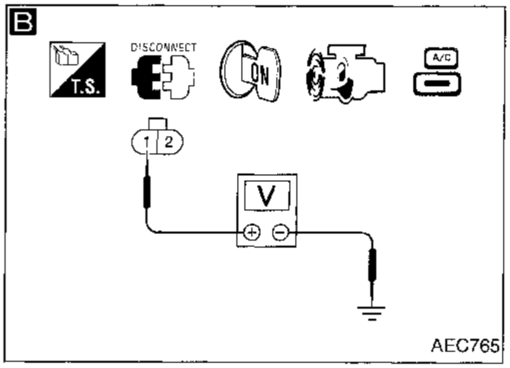
DIAGNOSTIC PROCEDURE

A


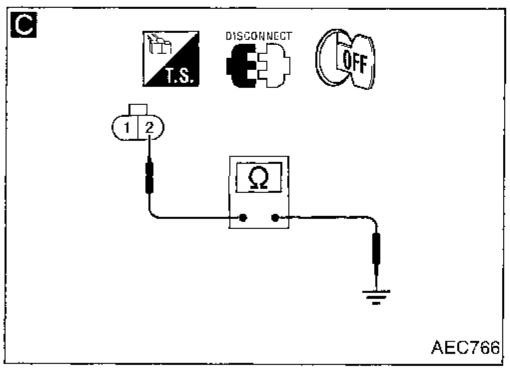
MEF634E

B


AEC787

B


AEC765

C


AEC766

INSPECTION START

↓

A **CHECK OVERALL FUNCTION.**
1. Start engine and warm it up sufficiently.
2. Check idle speed.
   M/T: 800±50 rpm
   A/T: 800±50 rpm (in "N" position)
   If NG, adjust idle speed.
3. Turn air conditioner switch and blower fan switch "ON".
4. Recheck idle speed.
   M/T: 850 rpm or more
   A/T: 850 rpm or more (in "N" position)

OK → INSPECTION END

NG ↓

Check if air conditioner compressor functions normally.

NG → Refer to "TROUBLE DIAGNOSES" in HA section.

OK ↓

B **CHECK POWER SUPPLY.**
1. Stop engine.
2. Disconnect IACV-FICD solenoid valve harness connector.
3. Start engine, then turn air conditioner switch and blower fan "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors M16, E101
- Harness connectors M46, F13
- Harness for open or short between IACV-FICD solenoid valve harness connector and air conditioner relay

If NG, repair harness or connectors.

OK ↓

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

NG → Repair harness or connectors.

OK ↓

Ⓐ

(Go to next page.)

IACV-FICD Solenoid Valve (Cont'd)

Ⓐ

↓

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

NG → Replace IACV-FICD solenoid valve.

OK ↓

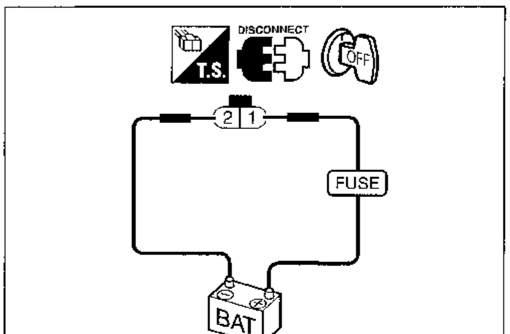
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END



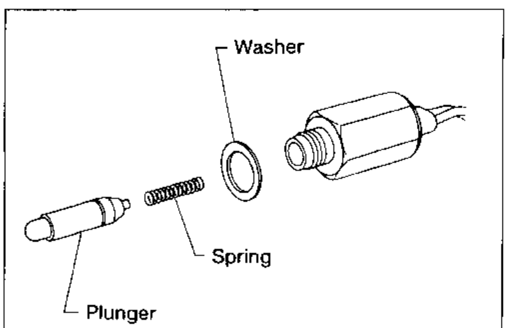
SEF721Q

COMPONENT INSPECTION

IACV-FICD solenoid valve

Disconnect IACV-FICD solenoid valve harness connector.

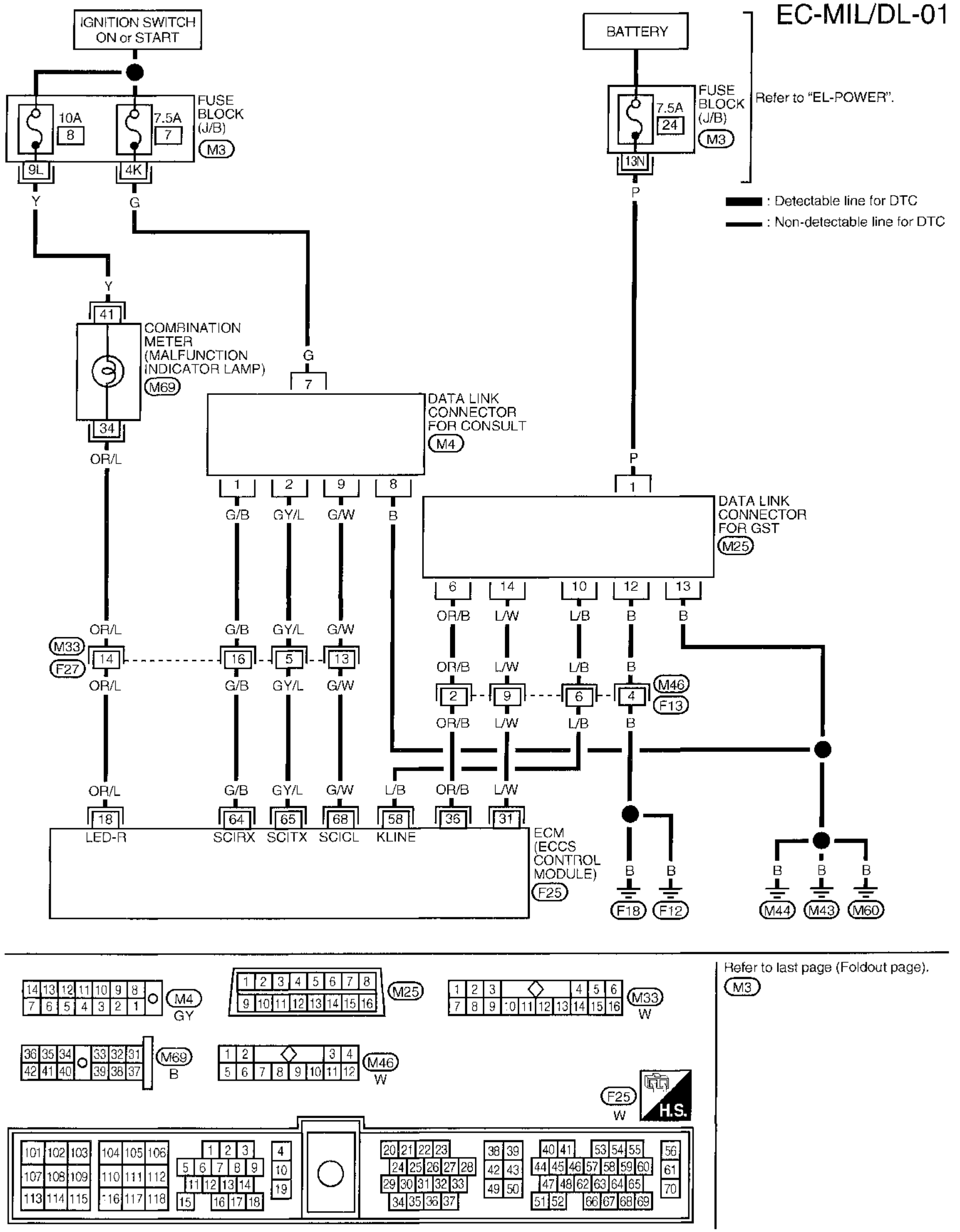
- Check for clicking sound when applying 12V direct current to terminals.



SEF097K

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

MIL & Data Link Connectors



AEC229A

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

MIL & Data Link Connectors (Cont'd)

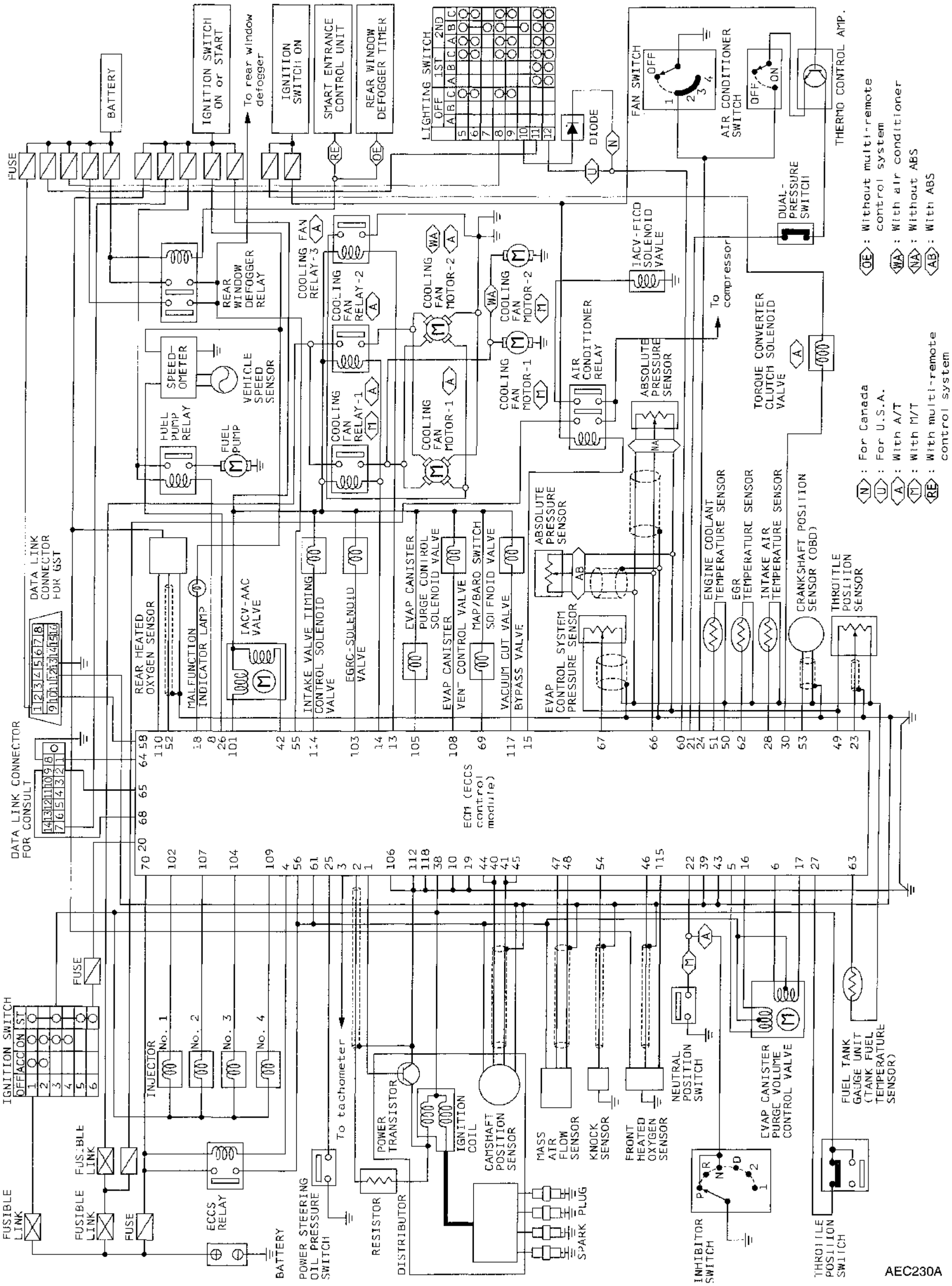
ECM Terminals and Reference Value

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
18	OR/L	Malfunction indicator lamp	Ignition switch "ON"	Approximately 80mV
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
58	L/B	Data link connector for GST	Engine is running. └ Idle speed (GST is disconnected)	6 - 10V
64	G/B	Data link connector for CONSULT	Engine is running. └ Idle speed (CONSULT is connected and turned on)	Approximately 0V
65	GY/L			Approximately 4 - 9V
68	G/W			Approximately 3.5V*

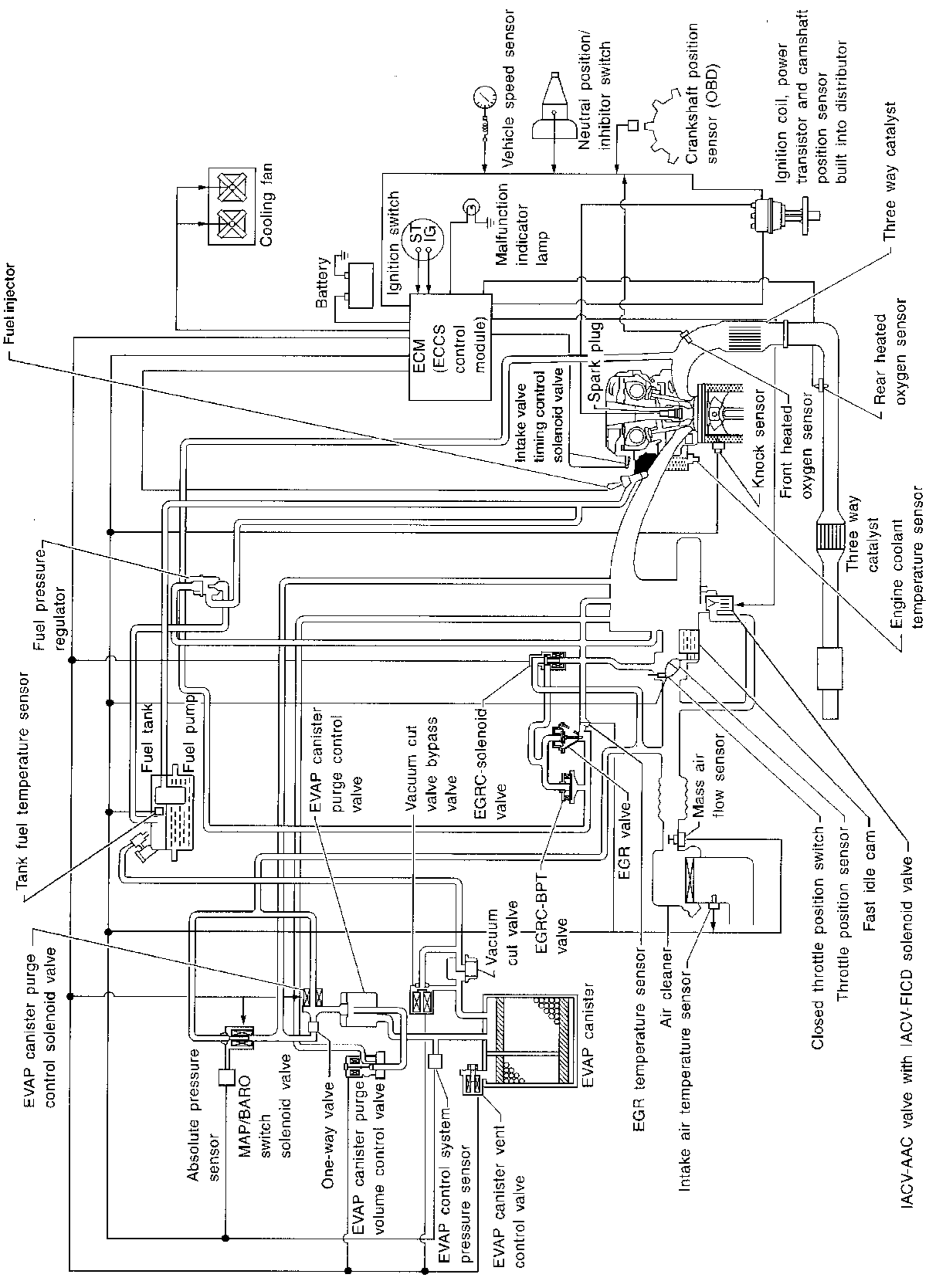
*Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Circuit Diagram



AEC230A

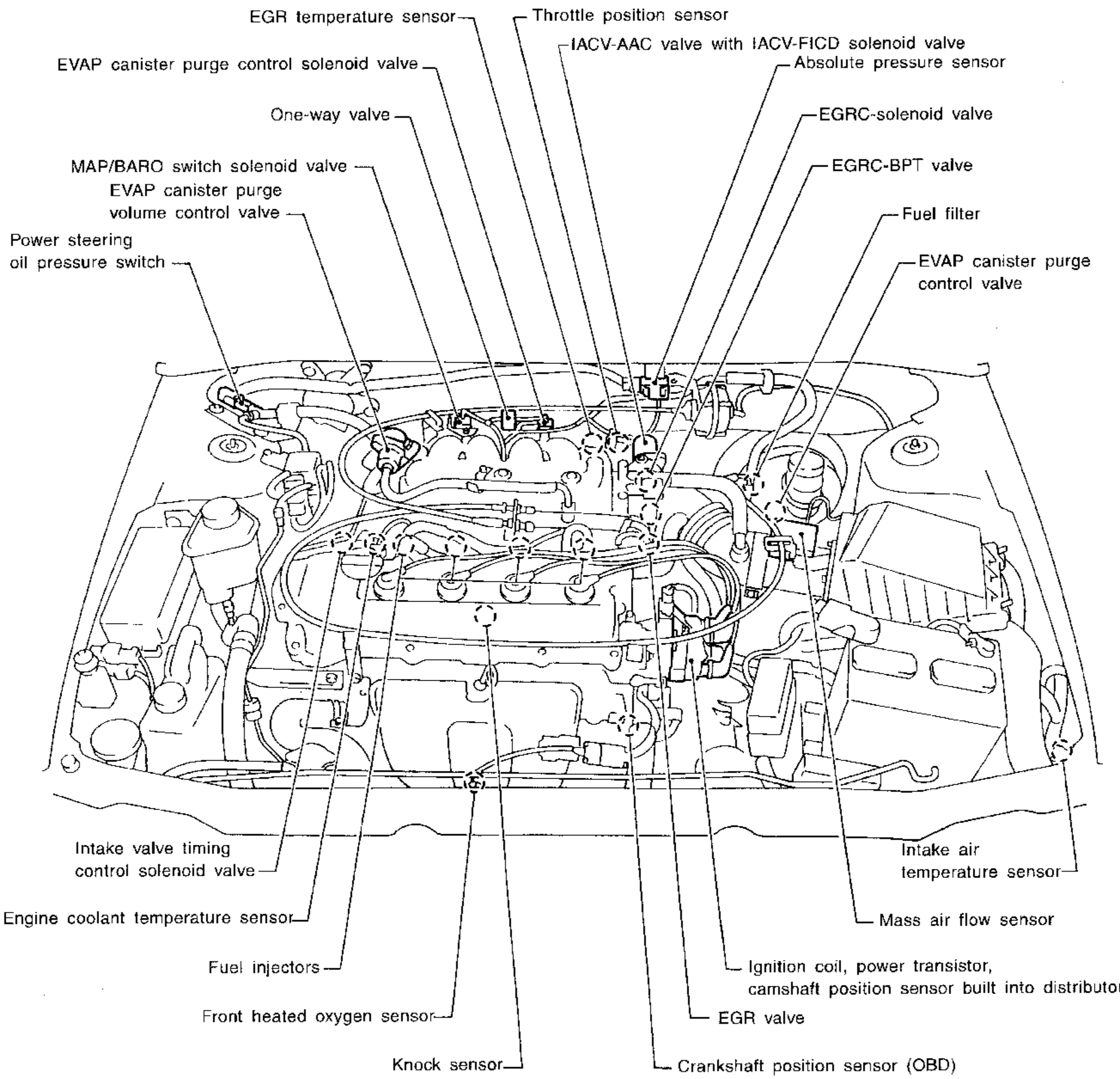
System Diagram



AEC325A

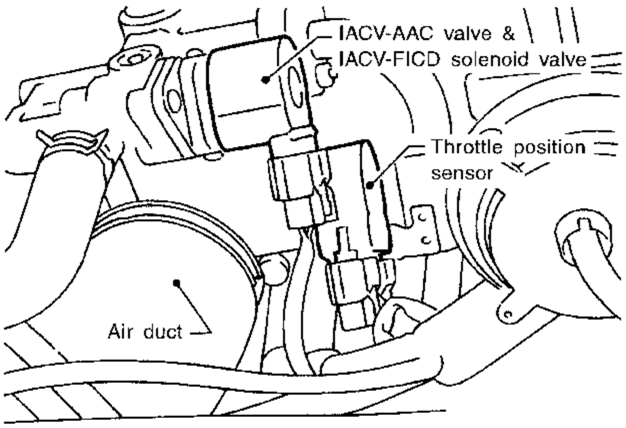
ECCS Component Parts Location

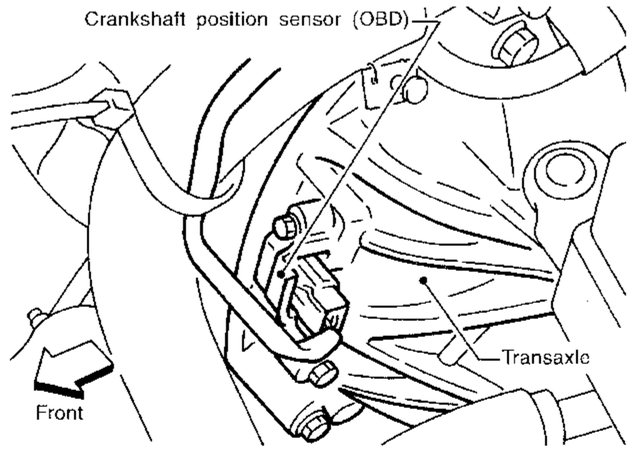
GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

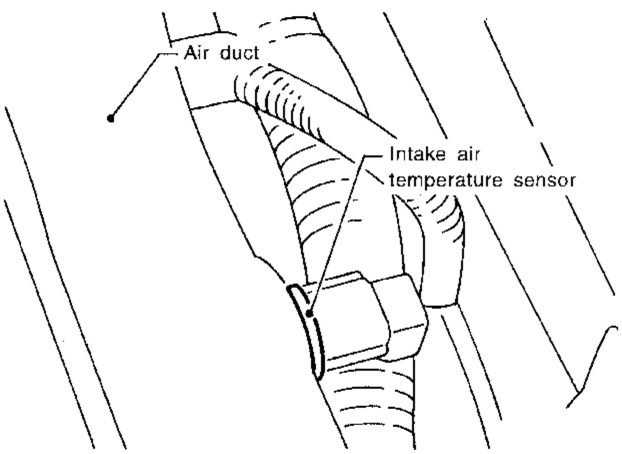


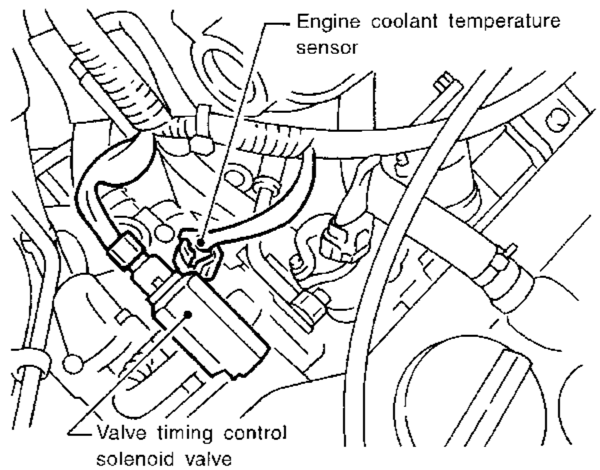
SEF183T

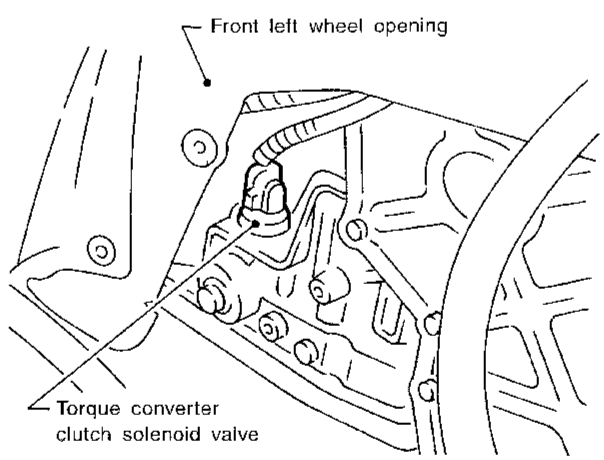
ECCS Component Parts Location (Cont'd)





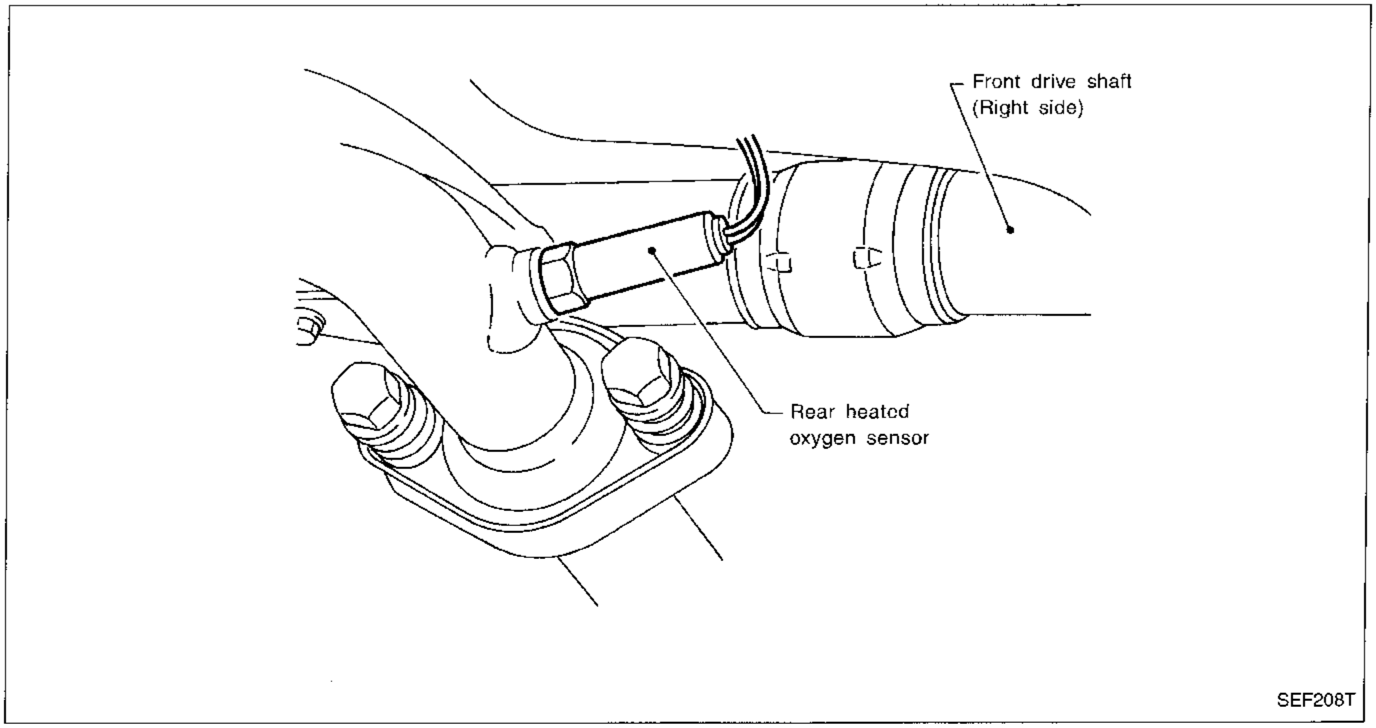


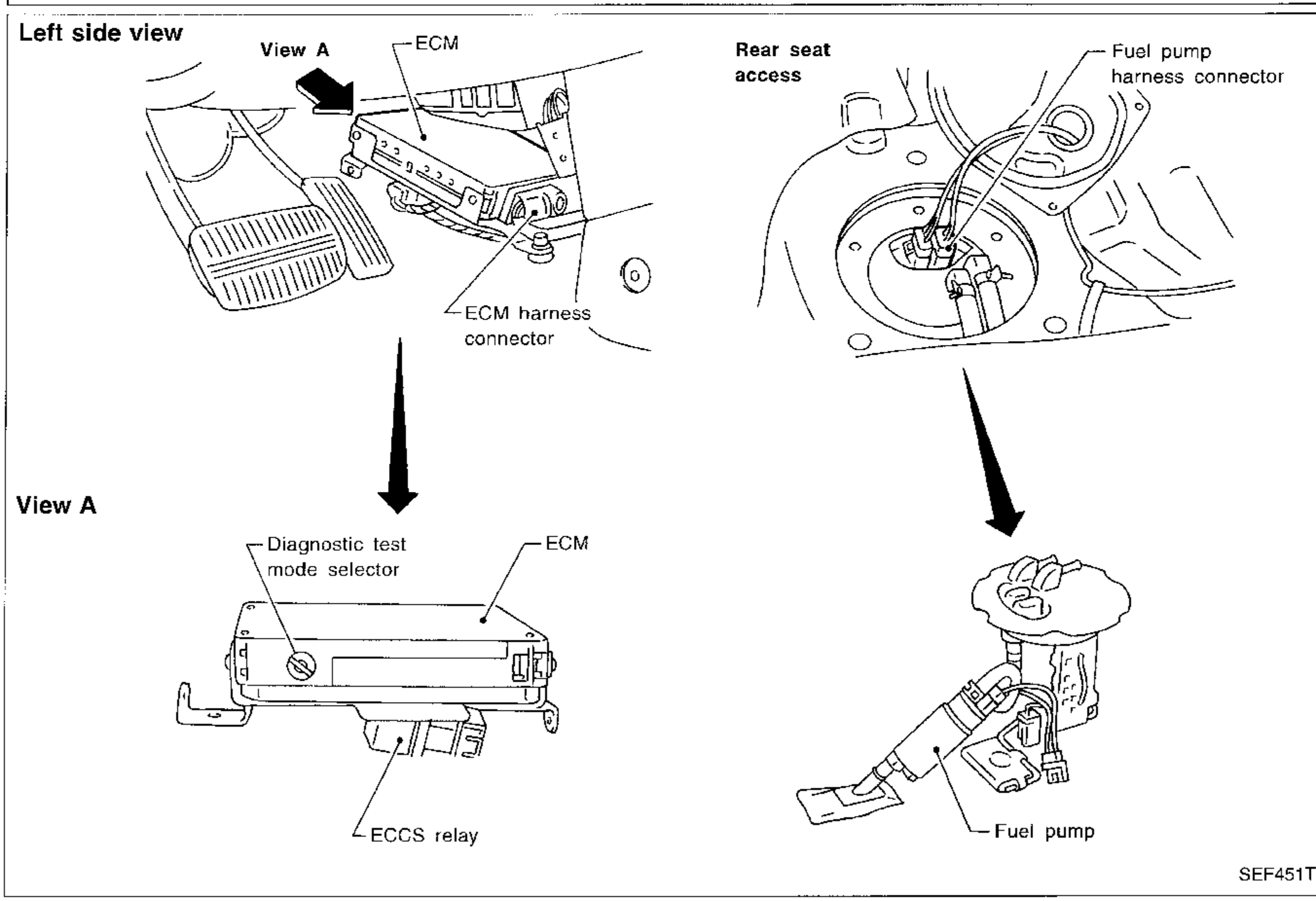




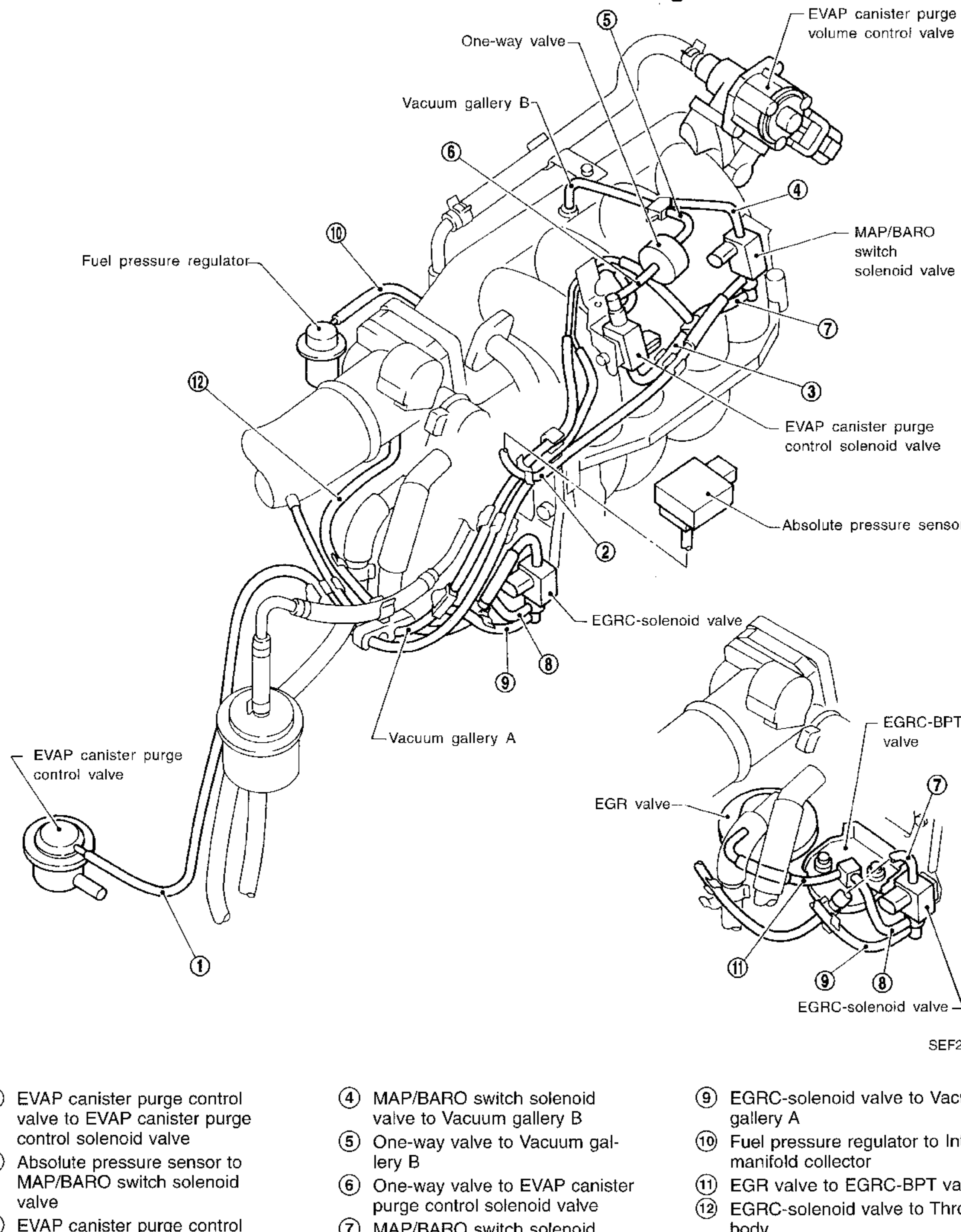
SEF207T

ECCS Component Parts Location (Cont'd)





Vacuum Hose Drawing

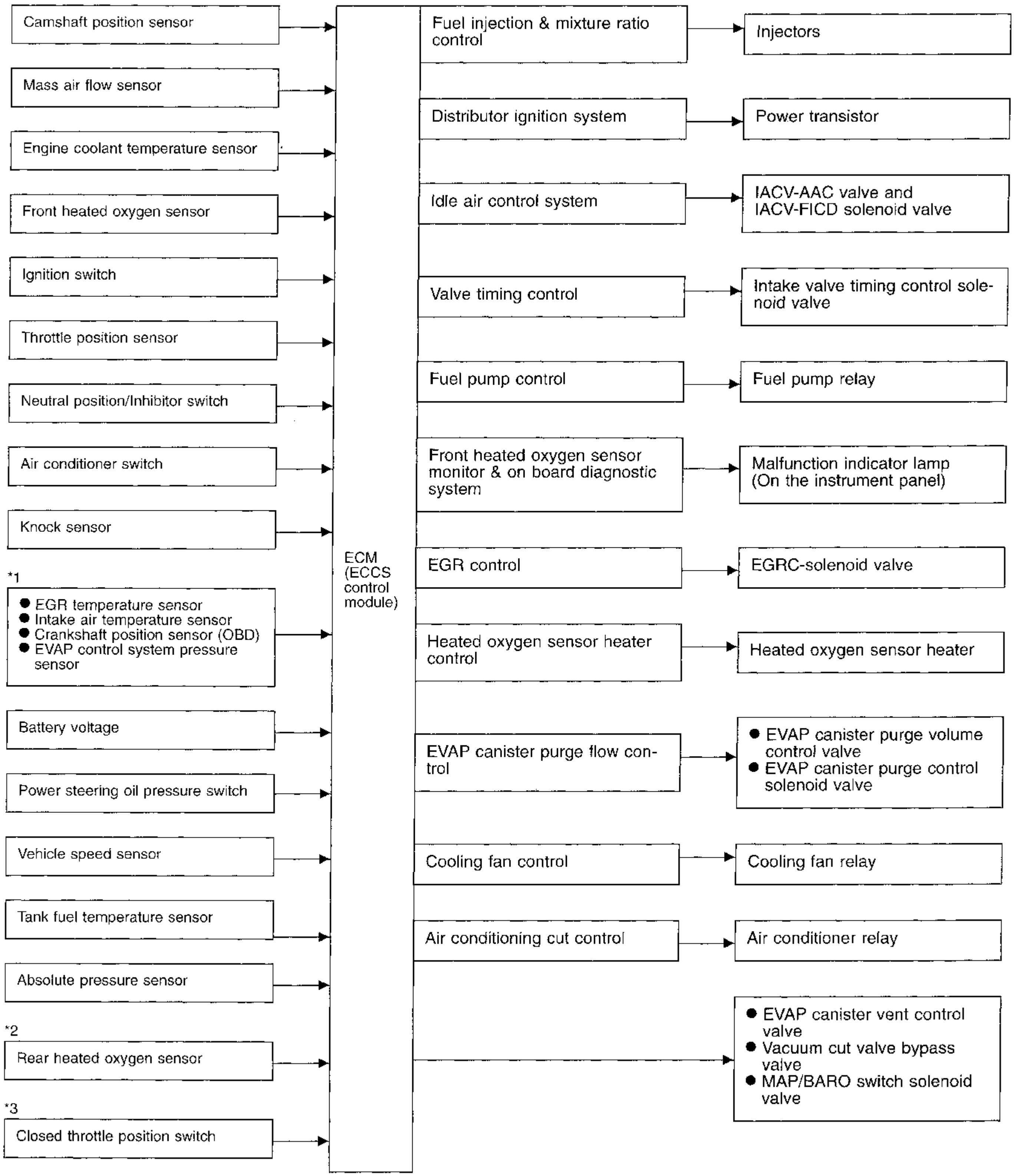


SEF209T

① EVAP canister purge control valve to EVAP canister purge control solenoid valve
② Absolute pressure sensor to MAP/BARO switch solenoid valve
③ EVAP canister purge control solenoid valve to Vacuum gallery A
④ MAP/BARO switch solenoid valve to Vacuum gallery B
⑤ One-way valve to Vacuum gallery B
⑥ One-way valve to EVAP canister purge control solenoid valve
⑦ MAP/BARO switch solenoid valve to Vacuum gallery A
⑧ EGRC-solenoid valve to EGRC-BPT valve
⑨ EGRC-solenoid valve to Vacuum gallery A
⑩ Fuel pressure regulator to Intake manifold collector
⑪ EGR valve to EGRC-BPT valve
⑫ EGRC-solenoid valve to Throttle body

Refer to "System Diagram" in ENGINE AND EMISSION CONTROL SYSTEM for vacuum control system.

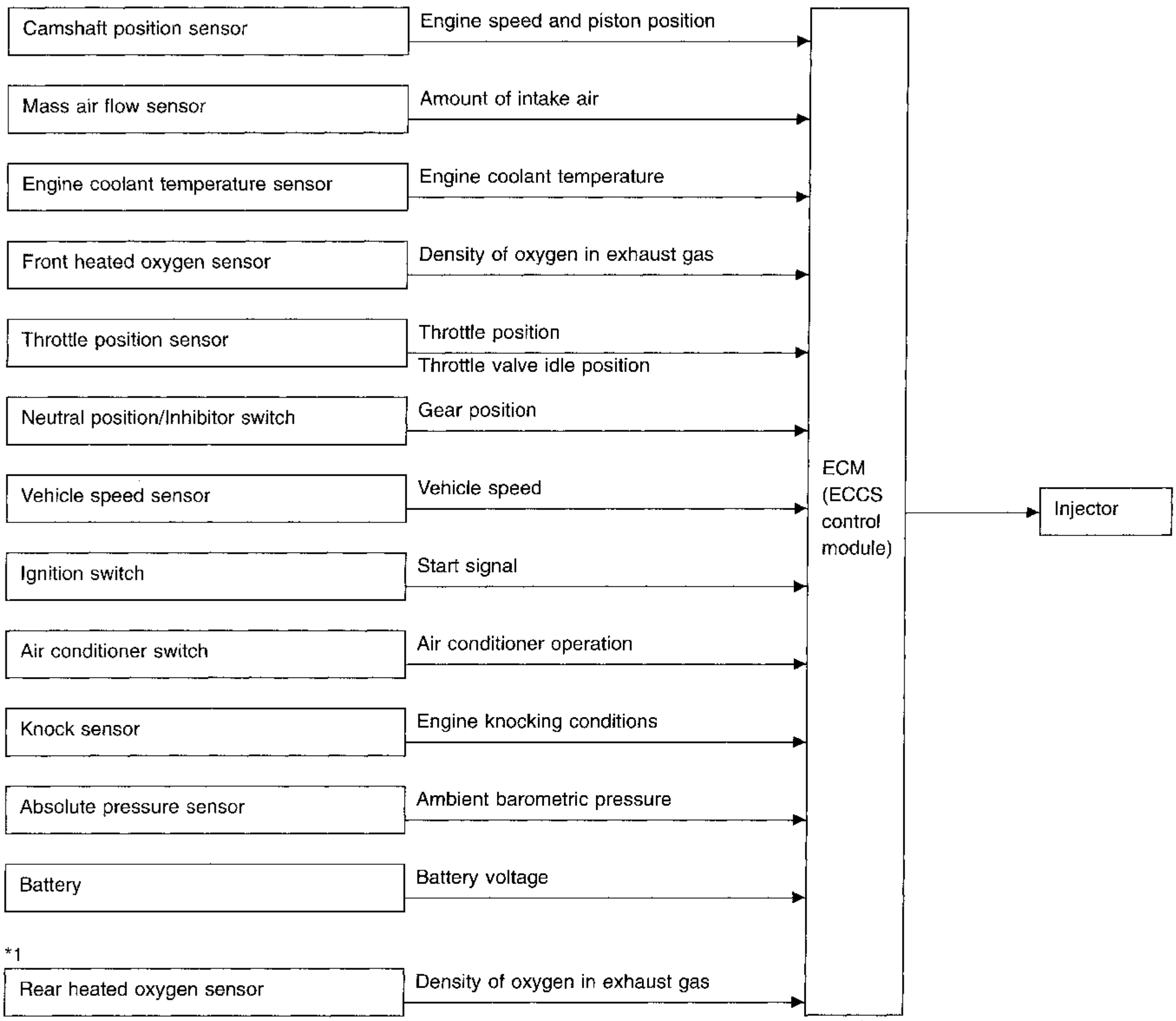
System Chart



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

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



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

BASIC MULTIPORT FUEL INJECTION SYSTEM

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

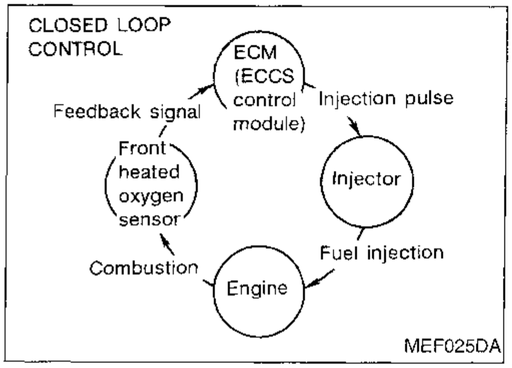
⟨Fuel increase⟩

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from "N" to "D" (A/T models only)
- High-load, high-speed operation

⟨Fuel decrease⟩

- During deceleration

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



MEF025DA

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a front heated oxygen sensor in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the front heated oxygen sensor, refer to EC-371. 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
- After shifting from "N" to "D"
- During warm-up
- When starting the engine

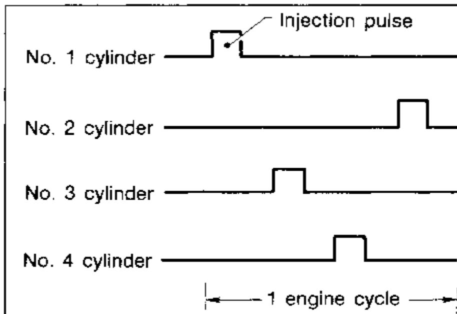
MIXTURE RATIO SELF-LEARNING CONTROL

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.

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

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

"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.



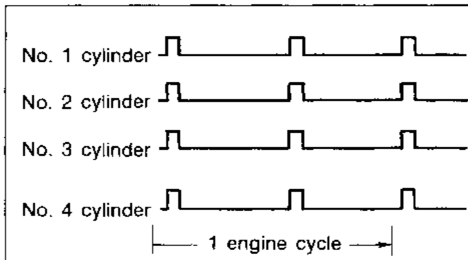
Sequential multiport fuel injection system
MEF522D

FUEL INJECTION TIMING

Two types of systems are used.

Sequential multiport fuel injection system

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



Simultaneous multiport fuel injection system
MEF523D

Simultaneous multiport fuel injection system

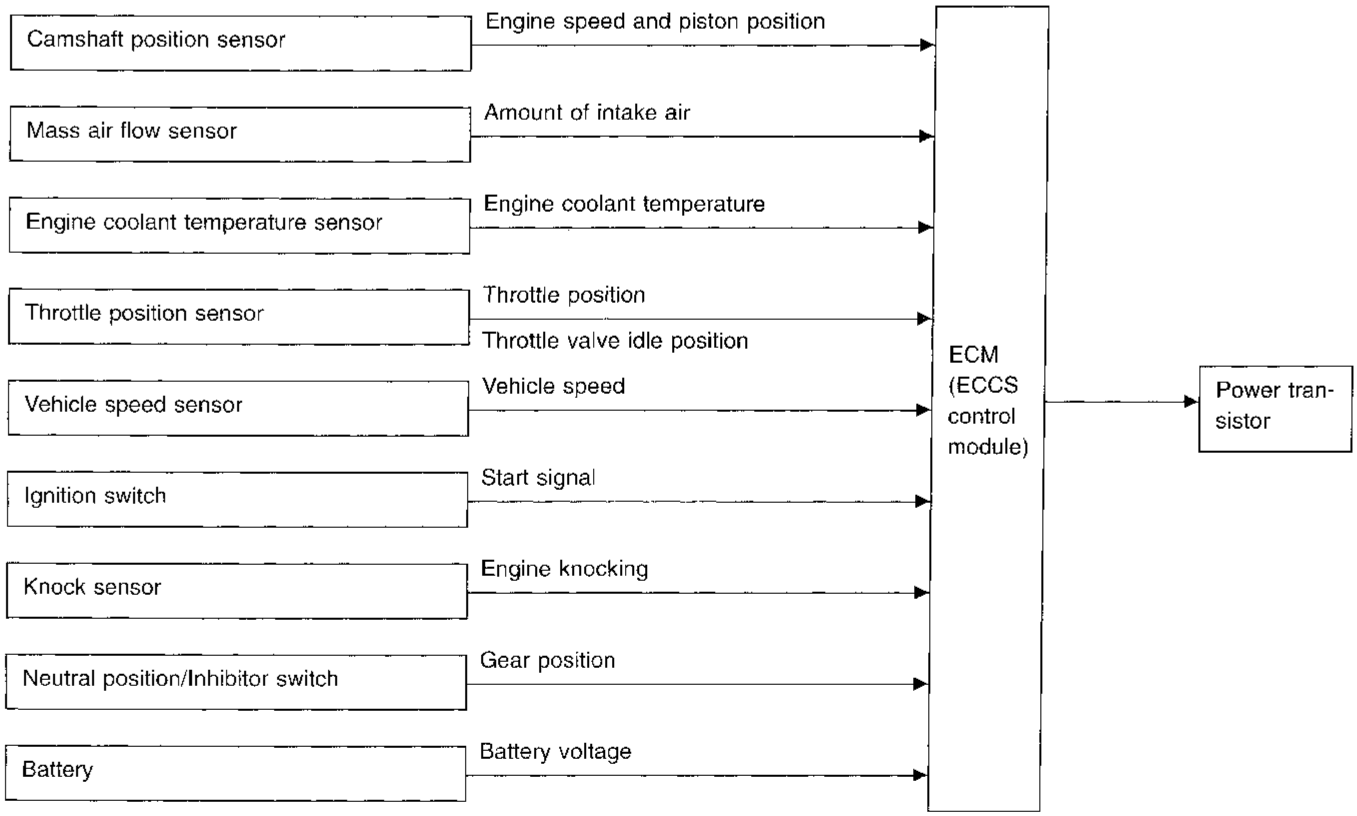
Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being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

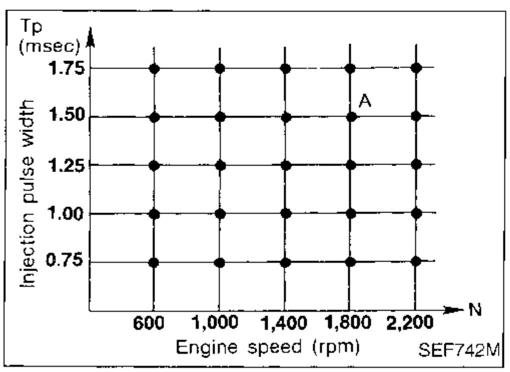
FUEL SHUT-OFF

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

Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE





SYSTEM DESCRIPTION

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

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

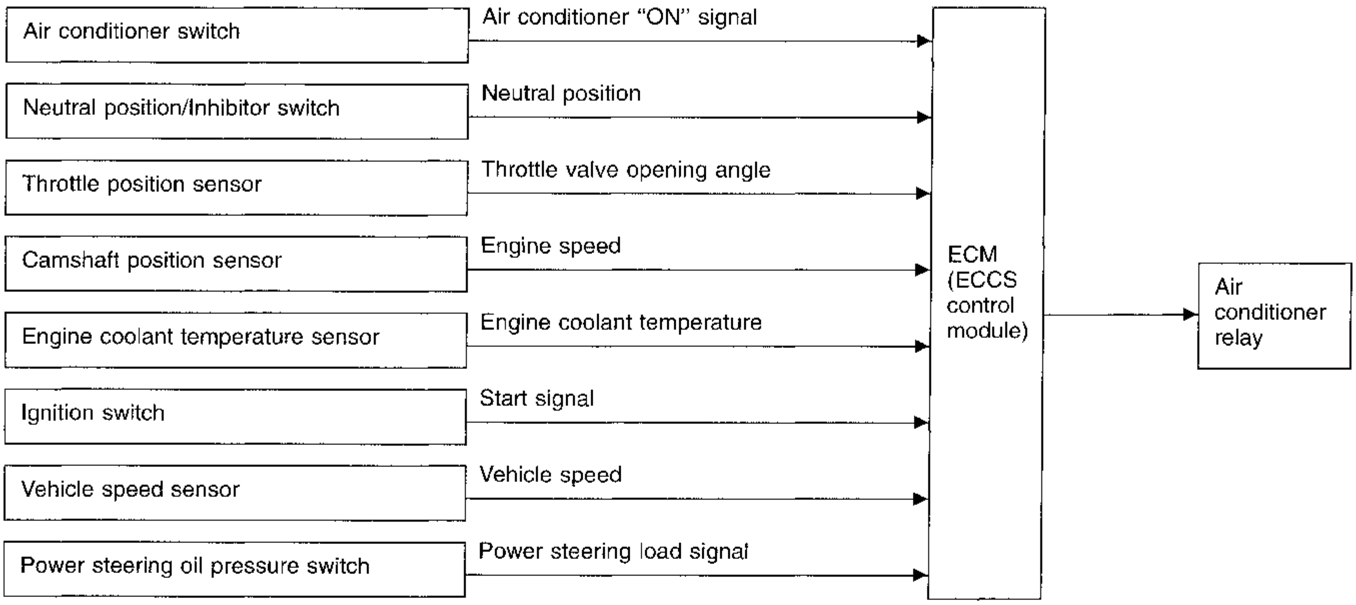
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- Hot engine operation
- During acceleration
- During high-load operation (Intake valve timing control)

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

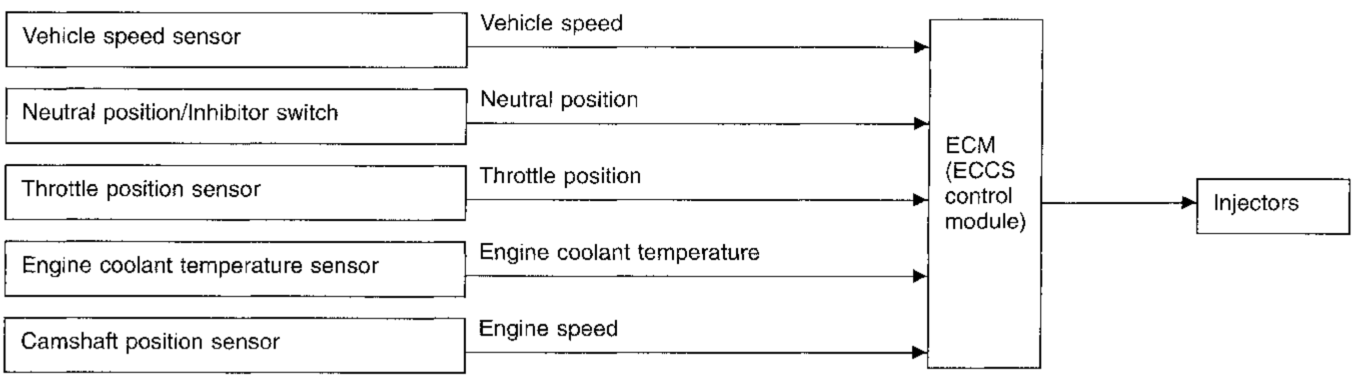


SYSTEM DESCRIPTION

This system improves acceleration when the air conditioner is used.
When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.

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

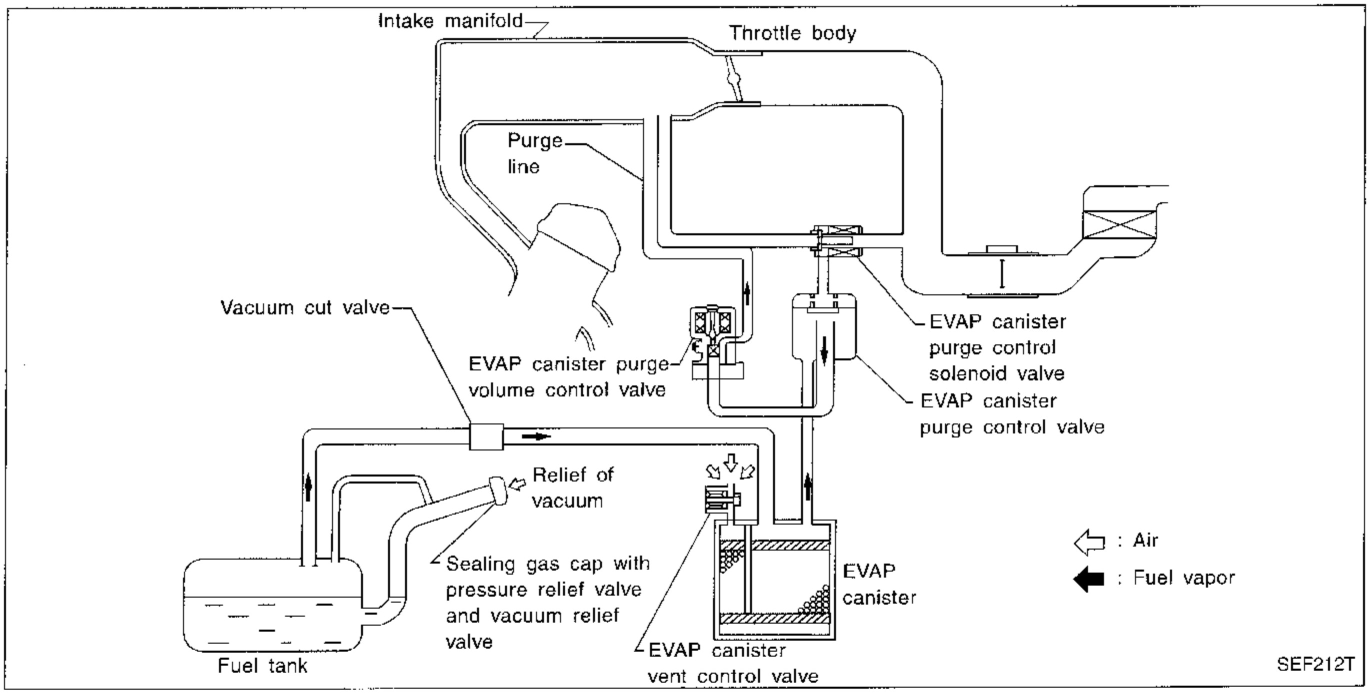
INPUT/OUTPUT SIGNAL LINE



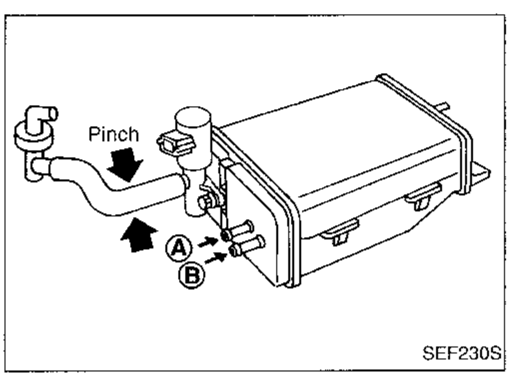
If the engine speed is above 4,000 rpm with no load (for example, in neutral and engine speed over 4,000 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.
Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different than deceleration control listed under "Multiport Fuel Injection (MFI) System" on EC-250.

Description



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control valve is controlled by engine control module. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control valve is proportionally regulated as the air flow increases.
EVAP canister purge control valve shuts off the vapor purge line during decelerating and idling, and under normal operating conditions the valve is usually open.

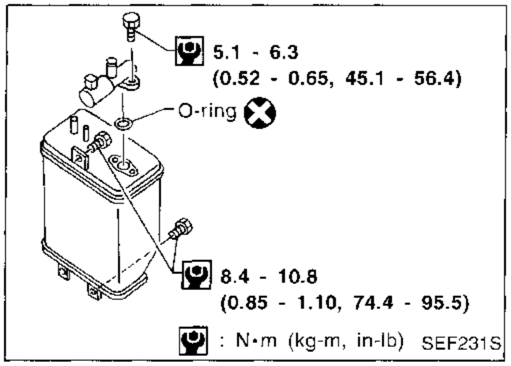


Inspection

EVAP CANISTER

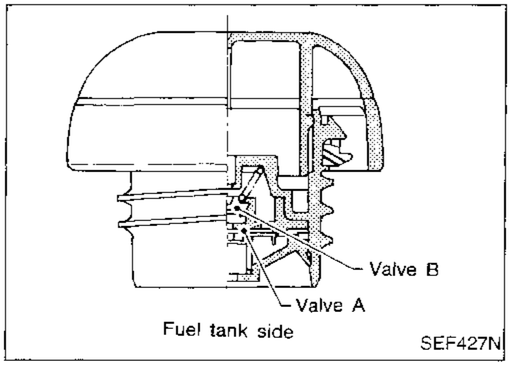
Check EVAP canister as follows:
1. Pinch the fresh air vent hose.
2. Blow air in port Ⓐ and check that it flows freely out of port Ⓑ.

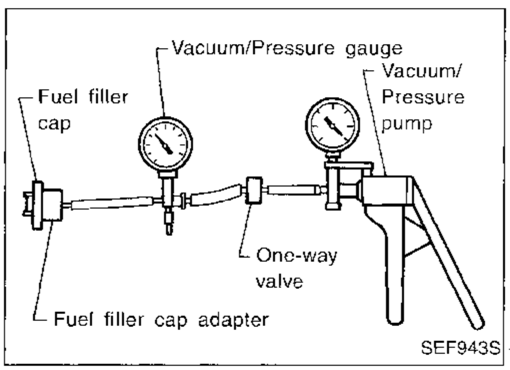
Inspection (Cont'd)



TIGHTENING TORQUE

Tighten EVAP canister as shown in the figure.





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

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

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

EVAP CANISTER PURGE CONTROL VALVE

Refer to EC-447.

VACUUM CUT VALVE

Refer to EC-523.

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VOLUME CONTROL VALVE

Refer to EC-524.

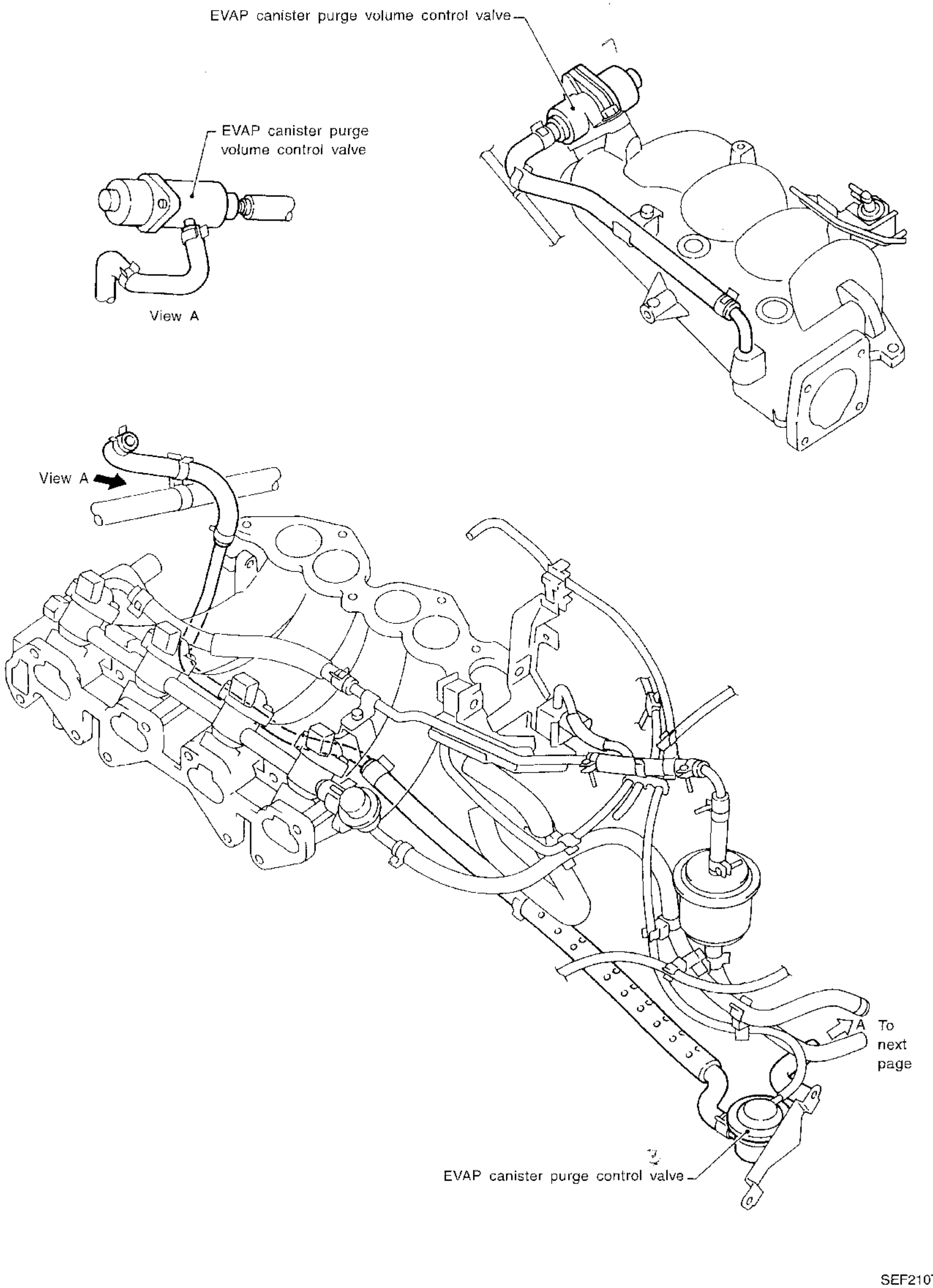
EVAPORATIVE EMISSION (EVAP) CANISTER PURGE CONTROL SOLENOID VALVE

Refer to EC-447.

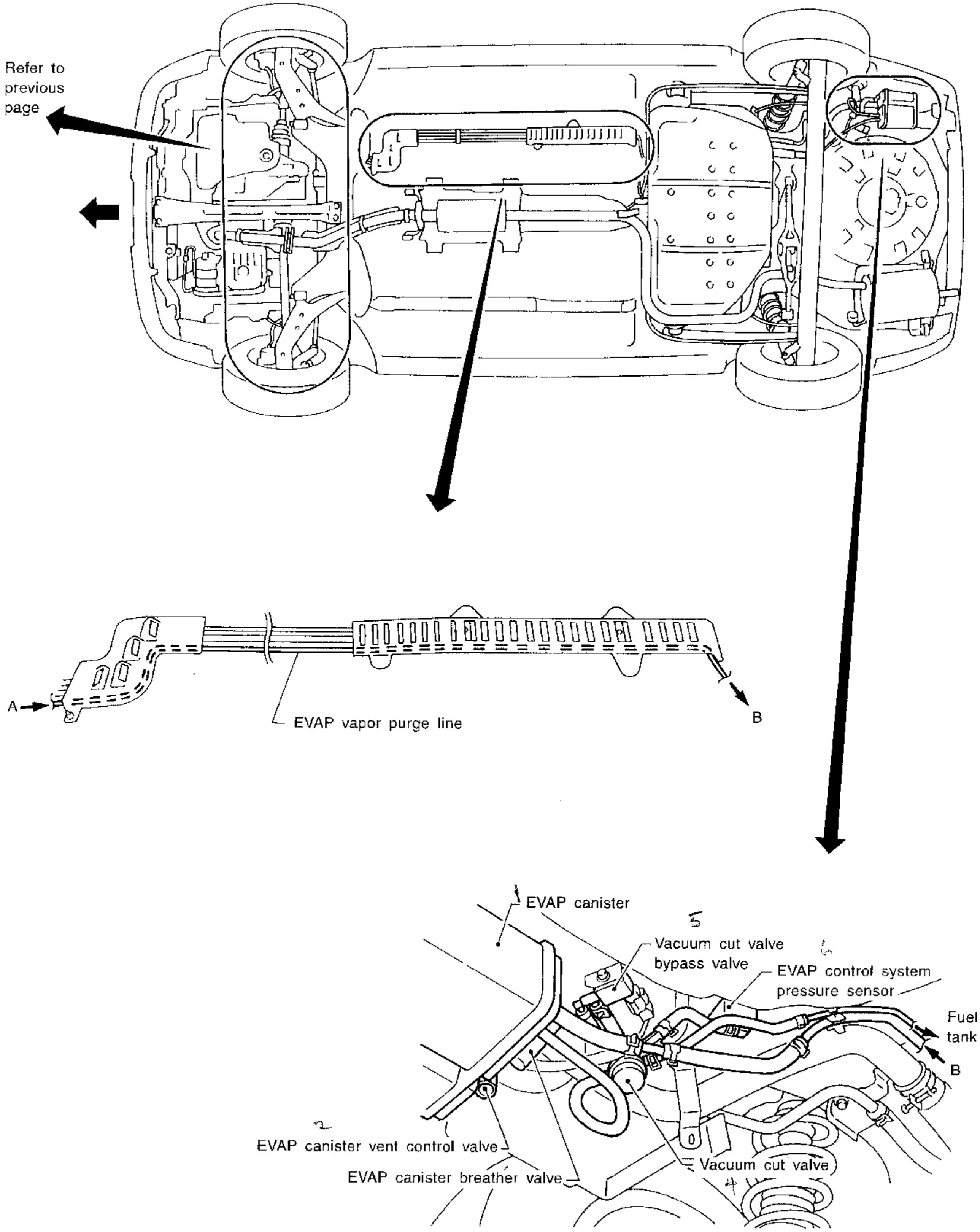
TANK FUEL TEMPERATURE SENSOR

Refer to EC-401.

Evaporative Emission Line Drawing



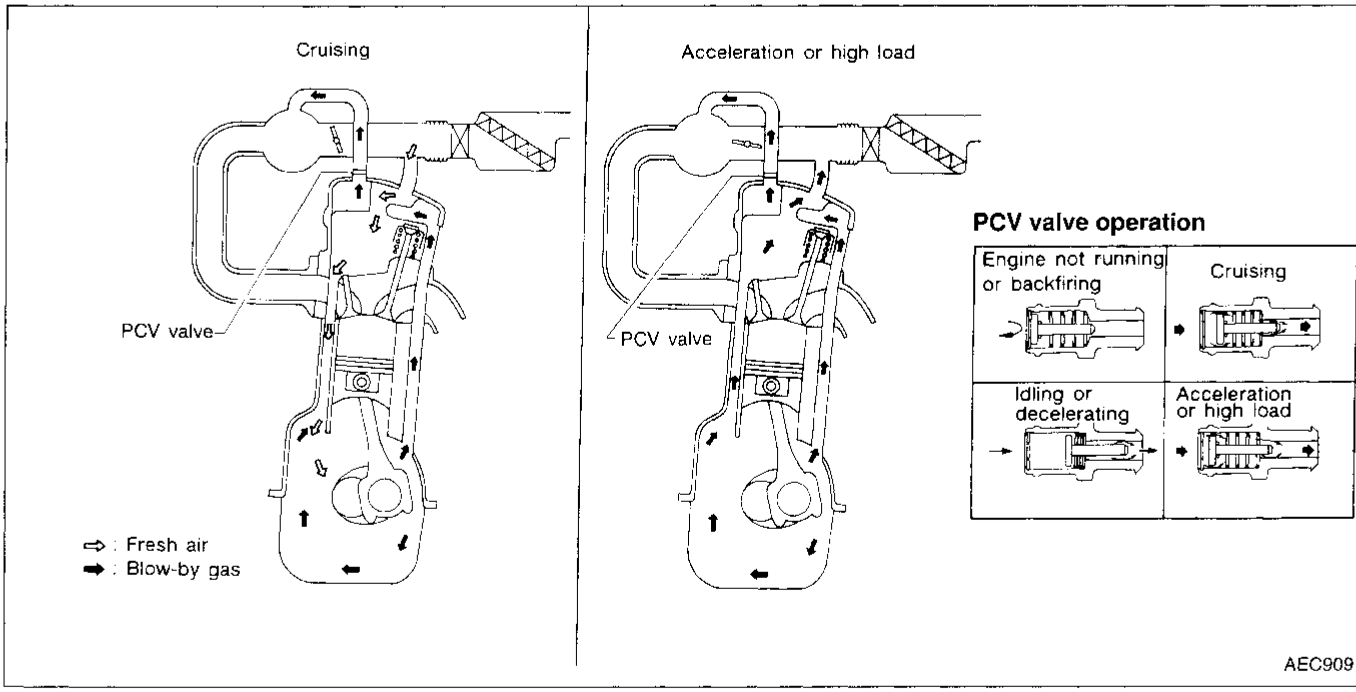
Evaporative Emission Line Drawing (Cont'd)

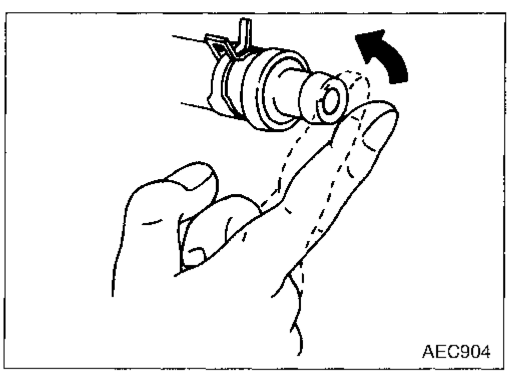


SEF211T

Description

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

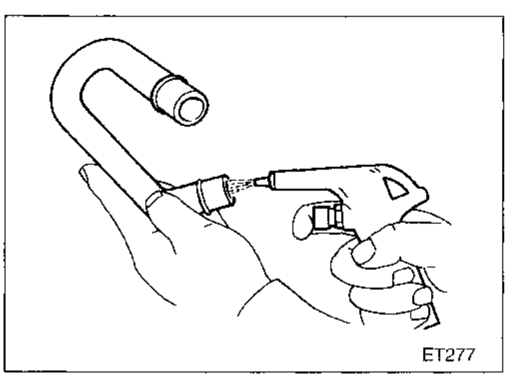




Inspection

PCV (Positive Crankcase Ventilation) VALVE

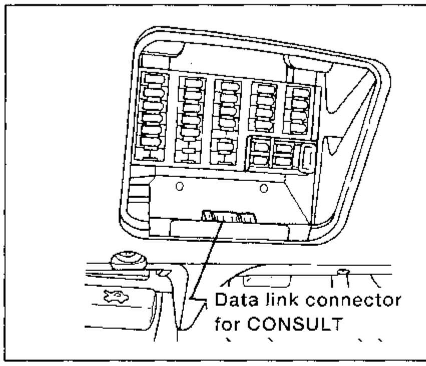
With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.



PCV HOSE

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

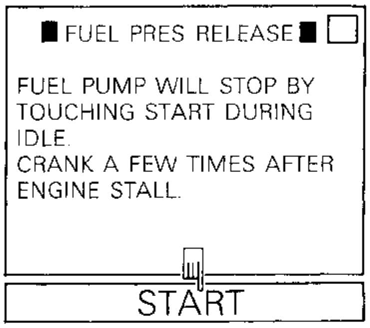
Fuel Pressure Release



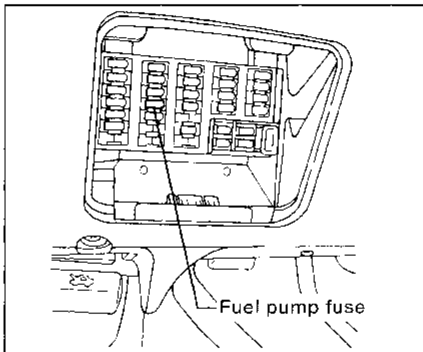
AEC678

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

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



SEF823K



AEC680

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.**
- **Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.**

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

At idling:

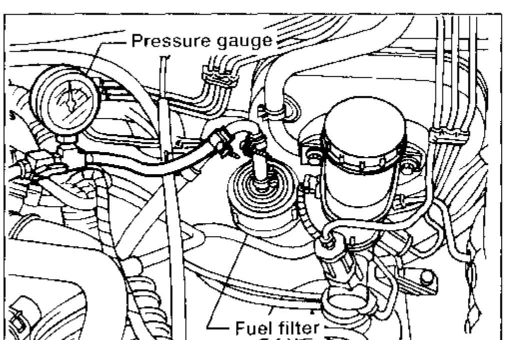
With vacuum hose connected

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

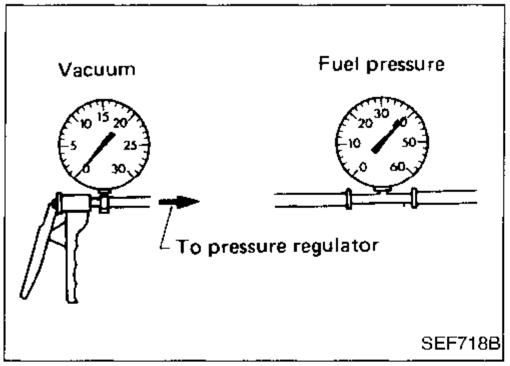
With vacuum hose disconnected

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

If results are unsatisfactory, perform Fuel Pressure Regulator Check.



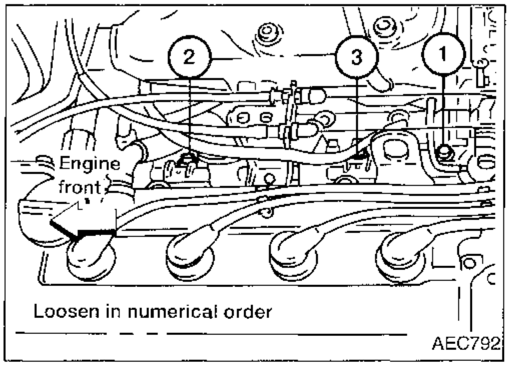
AEC873



Fuel Pressure Regulator Check

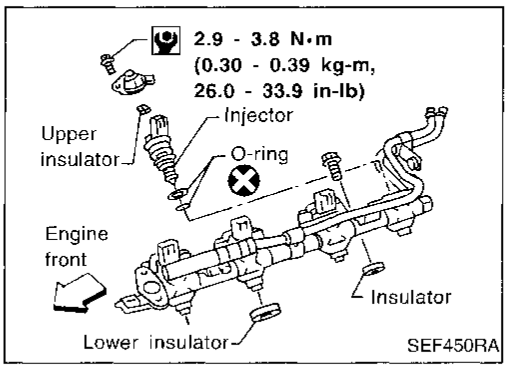
1. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
2. Plug intake manifold with a rubber cap.
3. Connect variable vacuum source to fuel pressure regulator.
4. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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



Injector Removal and Installation

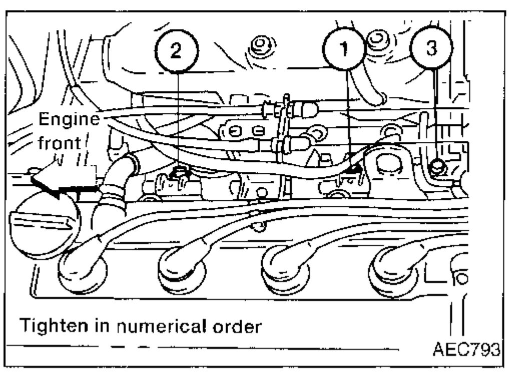
1. Release fuel pressure to zero.
2. Remove injector tube assembly with injectors from intake manifold.
3. Remove injectors from injector tube assembly.
   - Push injector tail piece.
   - Do not pull on the connector.



4. Install injectors.
   - Clean exterior of injector tail piece.
   - Use new O-rings.
   - Face metal plate of upper insulator to injector.

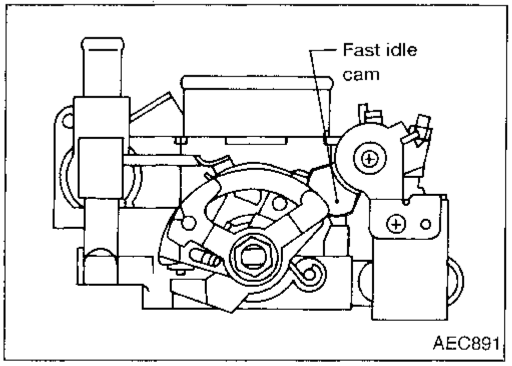
CAUTION:
After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.

5. Assemble injectors to injector tube assembly.
6. Install injector tube assembly to intake manifold.



7. Tighten fuel tube bolts to 9.32 to 10.8 N·m (0.95 to 1.10 kg-m, 6.9 to 8.0 ft-lb) as shown in the figure. Then tighten the bolts to 20.6 to 26.5 N·m (2.10 to 2.70 kg-m, 15 to 20 ft-lb).

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



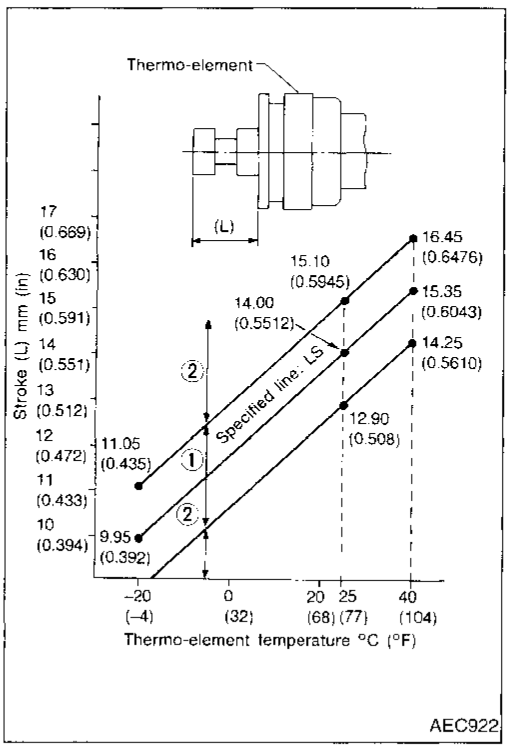
Fast Idle Cam (FIC)

COMPONENT DESCRIPTION

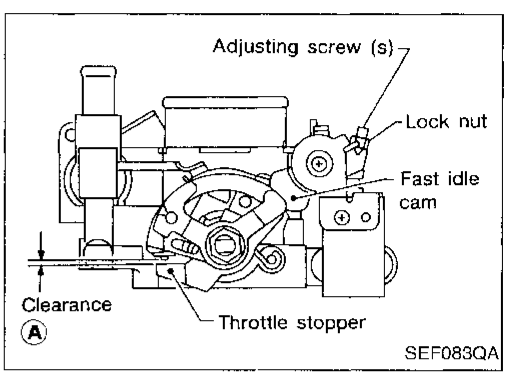
The FIC is installed on the throttle body to maintain adequate engine speed while the engine is cold. It is operated by a volumetric change in wax located inside the thermo-element. The thermo-element is operated by engine coolant temperature.

COMPONENT INSPECTION AND ADJUSTMENT

1. If engine is not completely cold, remove throttle body from engine. Then, wait for at least 3 hours.
   (This step is necessary to bring the temperature of the thermo-element to the room temperature.



2. Measure thermo-element stroke (L) and room temperature.
3. Check thermo-element stroke (L) as shown in the figure.
   If the stroke is not within the range ①, replace thermo-element with new one. Then return to step 1 again.



4. Adjust clearance Ⓐ between throttle stopper and throttle adjusting screw to specification by turning adjusting screw (S).

Models	Clearance Ⓐ mm (in)
M/T	0.72 - 1.18 (0.0283 - 0.0465)
A/T	0.95 - 1.43 (0.0374 - 0.0563)

Fast Idle Cam (FIC) (Cont'd)

5. Rotate adjusting screw (S) clockwise or counterclockwise by Z turns according to the following equation, then tighten the adjusting screw lock nut.

$$Z = \frac{L - LS^*}{Y}$$

*: Value of the specified line (Ls) at the temperature of thermo-element actually measured.
Y = 0.8 mm (0.031 in)

- Direction of adjusting screw (S) rotation

(1) Positive (+) Z: Counterclockwise
(2) Negative (-) Z: Clockwise

For example:

	Case I	Case II
Thermo-element temperature °C (°F)	25 (77)	40 (104)
Thermo-element specified stroke (Ls) mm (in)	14.0 (0.551)	15.35 (0.6043)
Thermo-element stroke (L) mm (in)	14.8 (0.583)	14.15 (0.5571)
Revolutions of adjusting screw (Z) mm/in	$Z = \frac{14.8 - 14.0}{0.8} = 1.0$ / $\frac{0.583 - 0.551}{0.031} = 1.0$	$Z = \frac{14.15 - 15.35}{0.8} = -1.5$ / $\frac{0.5571 - 0.6043}{0.031} = -1.5$
Direction of revolution	Counterclockwise	Clockwise

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

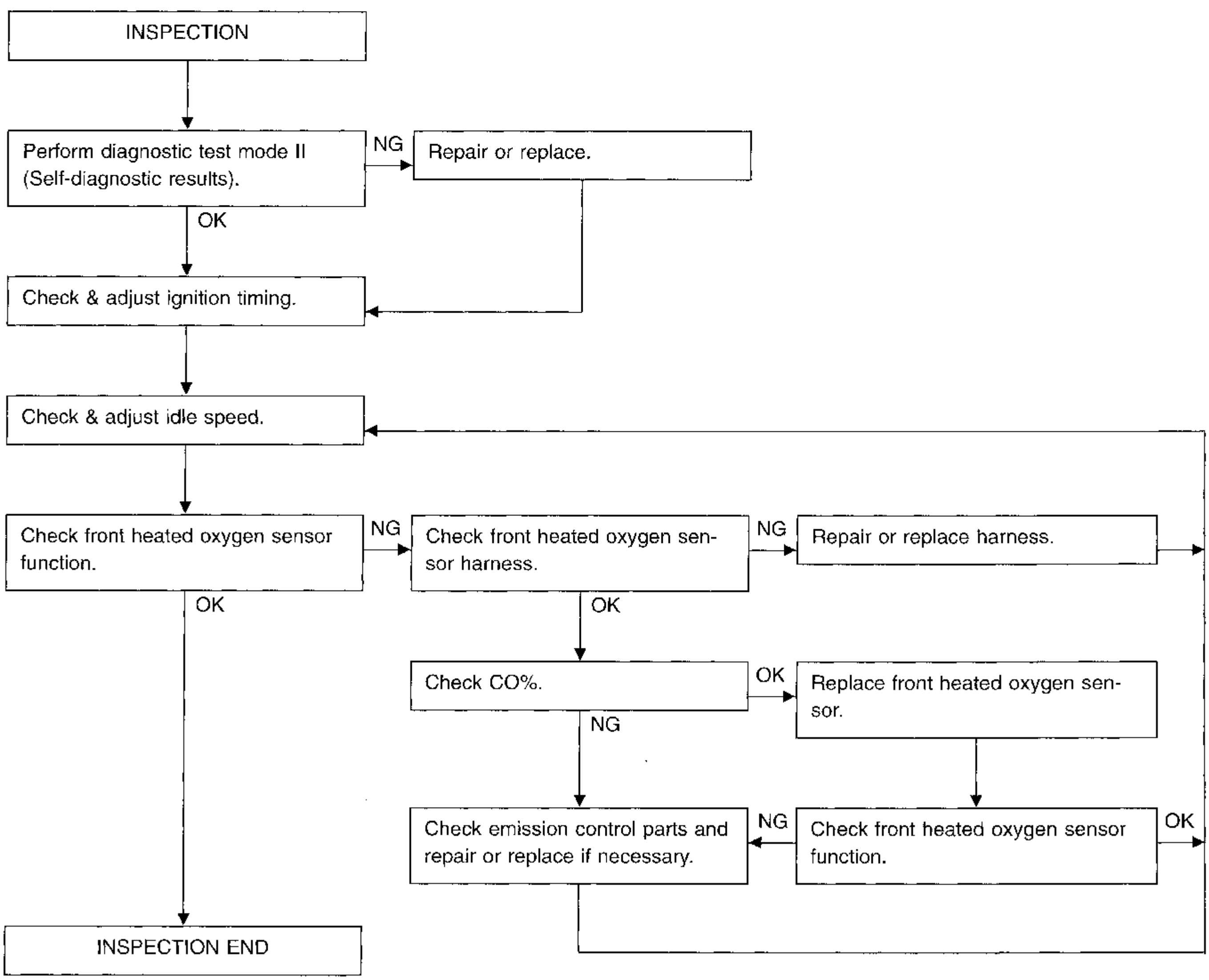
PREPARATION

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

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

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

START

↓

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

↓

A

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

↓

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

↓

B

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

- OK → go to C
- NG → Repair or replace components as necessary. → go to C

C

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

↓

D

(With CONSULT)	1. Select "IGNITION TIMING ADJ" in WORK SUPPORT mode. 2. Touch "START".
(Without CONSULT)	1. Turn off engine and disconnect throttle position sensor harness connector. 2. Start engine.

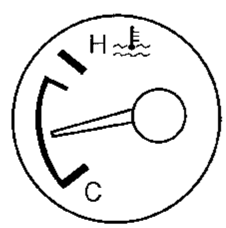
↓

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

↓

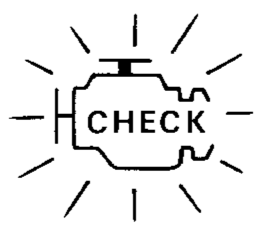
Ⓐ
(Go to next page.)

A



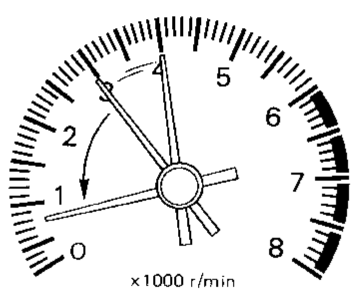
AEC692

B



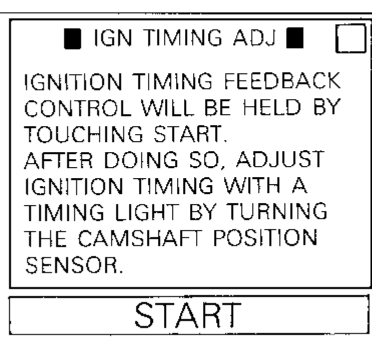
SEF051PA

C



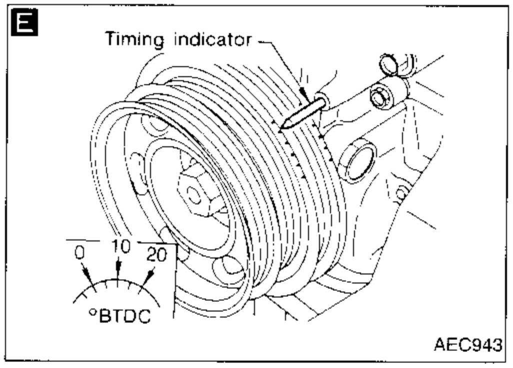
SEF248F

D

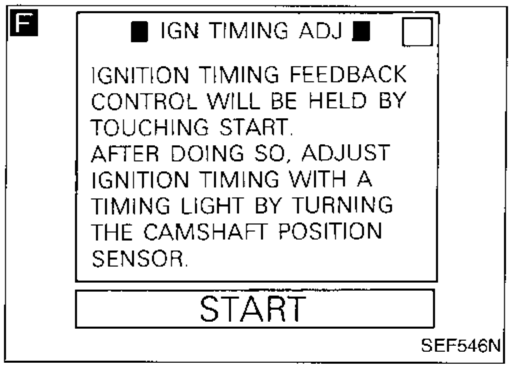


SEF546N

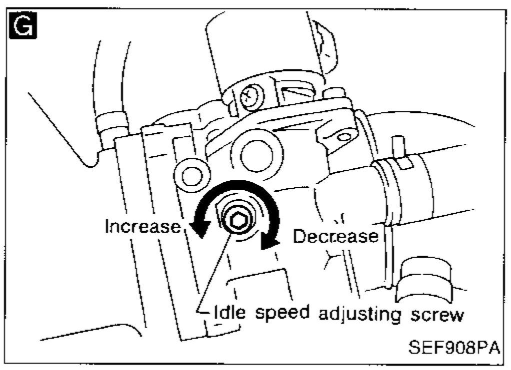
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



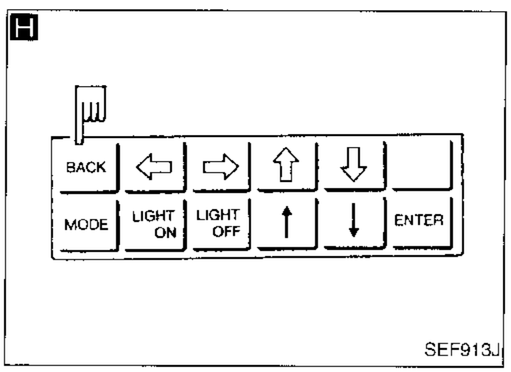
AEC943



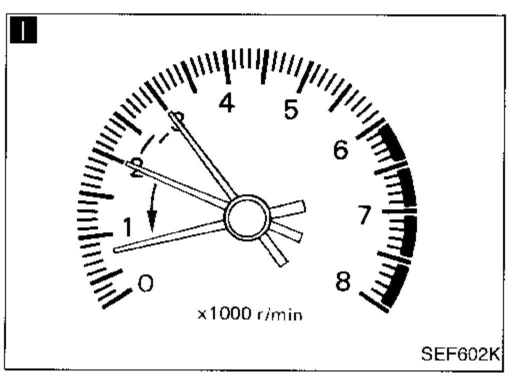
SEF546N



SEF908PA



SEF913J



SEF602K

Ⓐ

E

Check ignition timing with a timing light.
M/T: 8°±2° BTDC
A/T: 8°±2° BTDC (in "N" position)

OK → Check base idle speed.

NG ↓

Adjust ignition timing to the specified value by turning distributor after loosening bolts which secure distributor.
M/T: 8°±2° BTDC
A/T: 8°±2° BTDC (in "N" position)

Ⓑ

F

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

OR

(No CONSULT)
1. Stop engine and disconnect throttle position sensor harness connector.
2. Start engine.

Check base idle speed.

(CONSULT) Read idle speed in "IGN TIMING ADJ" in "WORK SUPPORT" mode.

OR

(No CONSULT) Check idle speed.
M/T: 625±50 rpm
A/T: 725±50 rpm (in "N" position)

OK → Touch "BACK".

NG ↓

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

G

Adjust idle speed by turning idle speed adjusting screw.
M/T: 625±50 rpm
A/T: 725±50 rpm (in "N" position)

H

(CONSULT) Touch "BACK".

OR

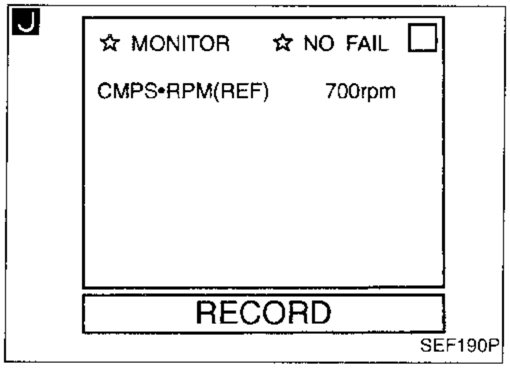
(No CONSULT)
1. Stop engine and connect throttle position sensor harness connector.
2. Start engine.

I

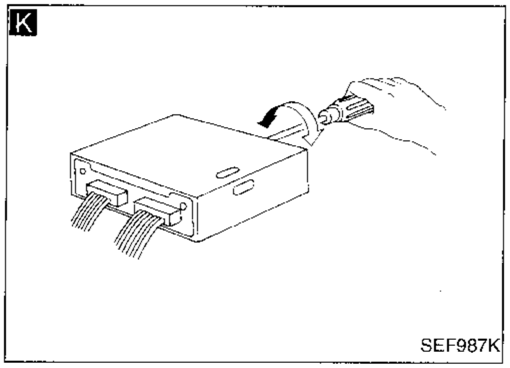
Rev engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, then run engine at idle speed.

Ⓒ
(Go to next page.)

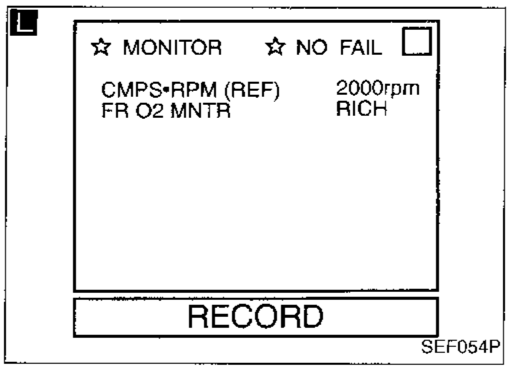
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



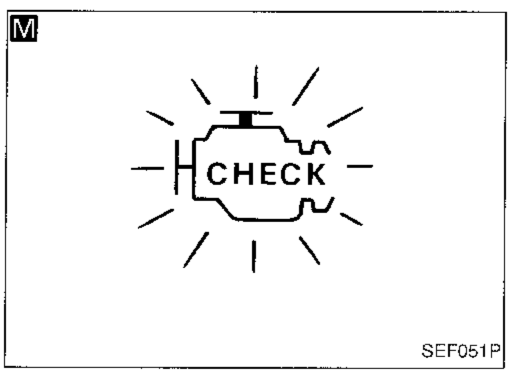
SEF190P



SEF987K



SEF054P



SEF051P

Ⓒ

J

Check target idle speed.

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

— OR —

- Check idle speed.

M/T models except for Canada: 675±50 rpm
M/T models for Canada: 750±50 rpm
A/T models: 800±50 rpm (in "N" position)

OK → go to K

NG ↓

Check IACV-AAC valve and replace if necessary.

↓

Check IACV-AAC valve harness and repair if necessary.

↓

Check ECM function*1 by substituting another known good ECM.

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

↓

K

Set the Diagnostic Test Mode II (front heated oxygen sensor monitor).

↓

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

↓

L **M**

Check front heated oxygen sensor signal.

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

— OR —

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

NG → Ⓓ (Go to next page.)

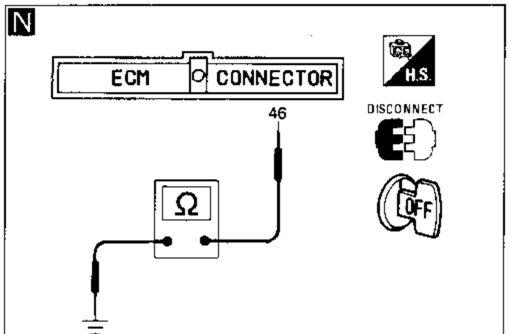
OK ↓

END

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

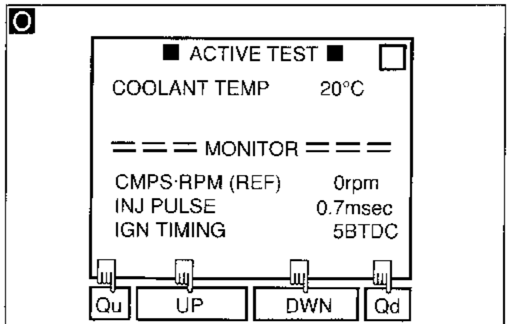
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

N



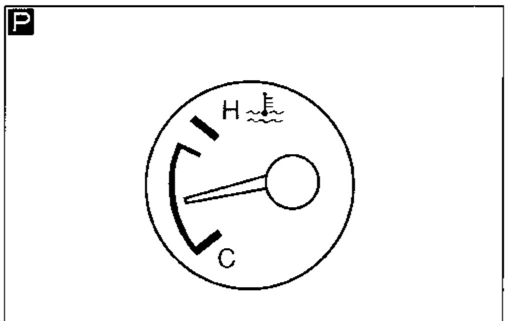
SEF056P

O



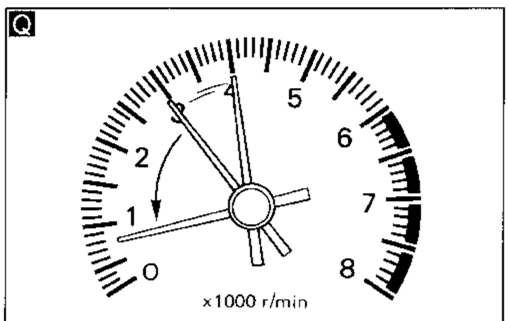
AEC681

P



AEC692

Q



SEF248F

Ⓓ

N

Check front heated oxygen sensor harness:
1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector from ECM
3. Disconnect front heated oxygen sensor harness connector. Then connect harness side terminal for front heated oxygen sensor to ground with a jumper wire.
4. Check for continuity between terminal ㊻ of ECM harness connector and body ground.

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

NG → Repair harness. → Ⓑ (Go to EC-266.)

OK ↓

Connect ECM harness connector to ECM.

↓

O

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

OR

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

↓

P

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

↓

Q

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

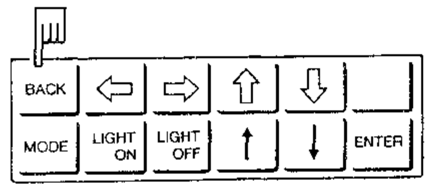
↓

Ⓔ

(Go to next page.)

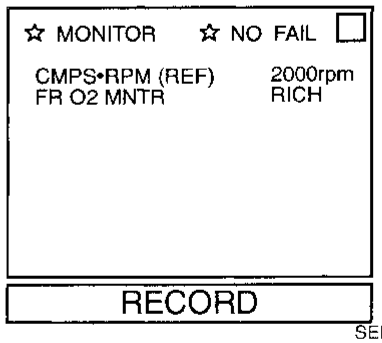
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

R



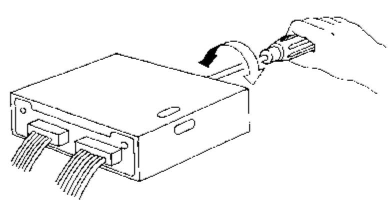
SEF913J

S



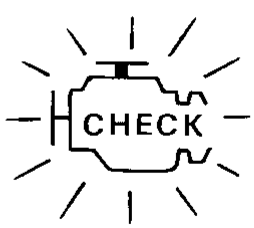
SEF054P

T



SEF987K

U



SEF051P

Ⓔ

R

Check "CO"%.

Idle CO: 2 - 11% and engine runs smoothly.

After checking "CO"%

Touch "BACK".

OR

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

NG → Ⓕ

OK ↓

Replace front heated oxygen sensor.

↓

S T U

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

OR

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

NG → Ⓕ

OK → Ⓑ

Ⓕ
(Go to next page.)

Ⓑ
(Go to EC-266.)

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

Ⓕ

↓

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

↓

Check fuel pressure regulator. Refer to EC-261.

↓

Check mass air flow sensor and its circuit.
Refer to TROUBLE DIAGNOSIS FOR DTC P0100, EC-336.

↓

Check injector and its circuit.
Refer to TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, EC-557.
Clean or replace if necessary.

↓

Check engine coolant temperature sensor and its circuit. Refer to TROUBLE DIAGNOSIS FOR DTC P0115, P0125, EC-355, 366.

↓

Check ECM function* by substituting another known good ECM.

↓

Ⓑ

(Go to EC-266.)

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

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

Introduction

The ECM (ECCS control module) has an on board diagnostic system, which detects engine system malfunctions related to engine sensors or actuators. The ECM also has 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

These data 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)	O	O*1				
CONSULT	O	O	O	O	O	O
GST	O	O*2	O		O	O

*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-314.).

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 simultaneously when the DTC is stored. ⟨2nd trip⟩ The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL and store DTC and Freeze Frame Data, even in the 1st trip, as shown below.

Items	MIL			DTC		1st trip DTC	
	1st trip		2nd trip lighting up	1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up					
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0701, 0605 - 0608) is being detected	X			X		X	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0701, 0605 - 0608) has been detected		X		X		X	
Closed loop control — DTC: P0130 (0307)		X		X		X	
Fail-safe items (Refer to EC-314.)		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 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed. If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-278.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-280. 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-308. Then perform "DTC confirmation procedure" or "Overall function check" to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

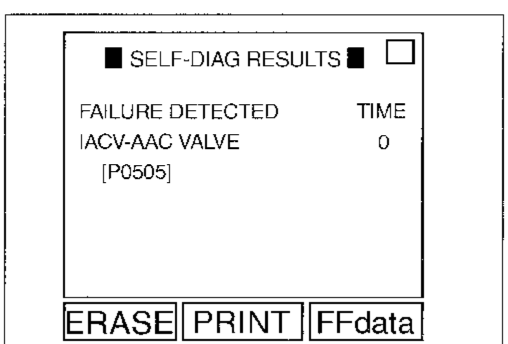
How to read DTC and 1st trip DTC

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.**

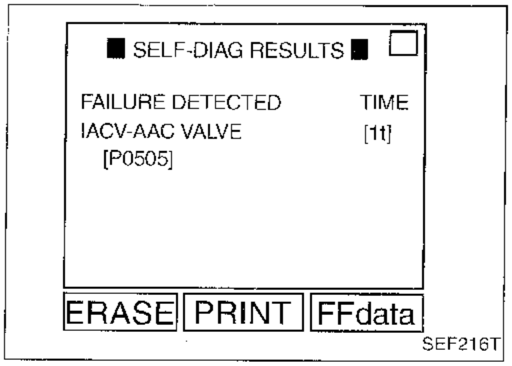


SEF215T

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]".



SEF216T

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 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-290.
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 - P0304 (0701, 0605 - 0608)
		Fuel Injection System Function — DTC: P0171 (0115), P0172 (0114)
2		Except the above items
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-278.

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979. It indicates whether the self-diagnostic tests for non-continuously monitored items have been completed or not.
Inspection/Maintenance (I/M) tests of the on board diagnostic (OBD) II system may become the legal requirements in some states/areas. All SRT codes must be set in this case. Unless all SRT codes are set, conducting the I/M test may not be allowed.
SRT codes are set after diagnosis has been performed two or more times. This occurs regardless of whether the diagnosis results in "OK" or "NG", and whether or not the diagnosis is performed in consecutive trips. The table below lists the five SRT items (9 diagnoses) for the ECCS used in B14 models.

Emission-related Diagnostic Information (Cont'd)

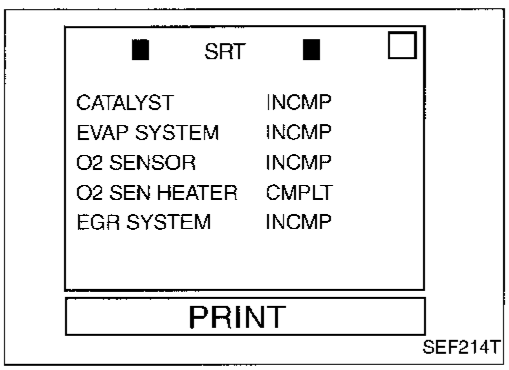
SRT items	Self-diagnostic test items
Catalyst monitoring	• Three way catalyst function P0420 (0702)
Oxygen sensor monitoring	• Front heated oxygen sensor P0130 (0503) • Rear heated oxygen sensor P0136 (0707)
Oxygen sensor heater monitoring	• Front heated oxygen sensor heater P0135 (0901) • Rear heated oxygen sensor heater P0141 (0902)
EGR system monitoring	• EGR function P0400 (0302) • EGRC-BPT valve function P0402 (0306)
EVAP system monitoring	• EVAP control system (small leak) P0440 (0705) • EVAP control system purge flow monitoring P1447 (0111)

Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-280). In addition, after ECCS components/systems are repaired or if the battery terminals remain disconnected for more than 24 hours, all SRT codes may be cleared from the ECM memory.

How to display SRT code

1. Selecting "SRT" in "SRT·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)



SEF214T

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

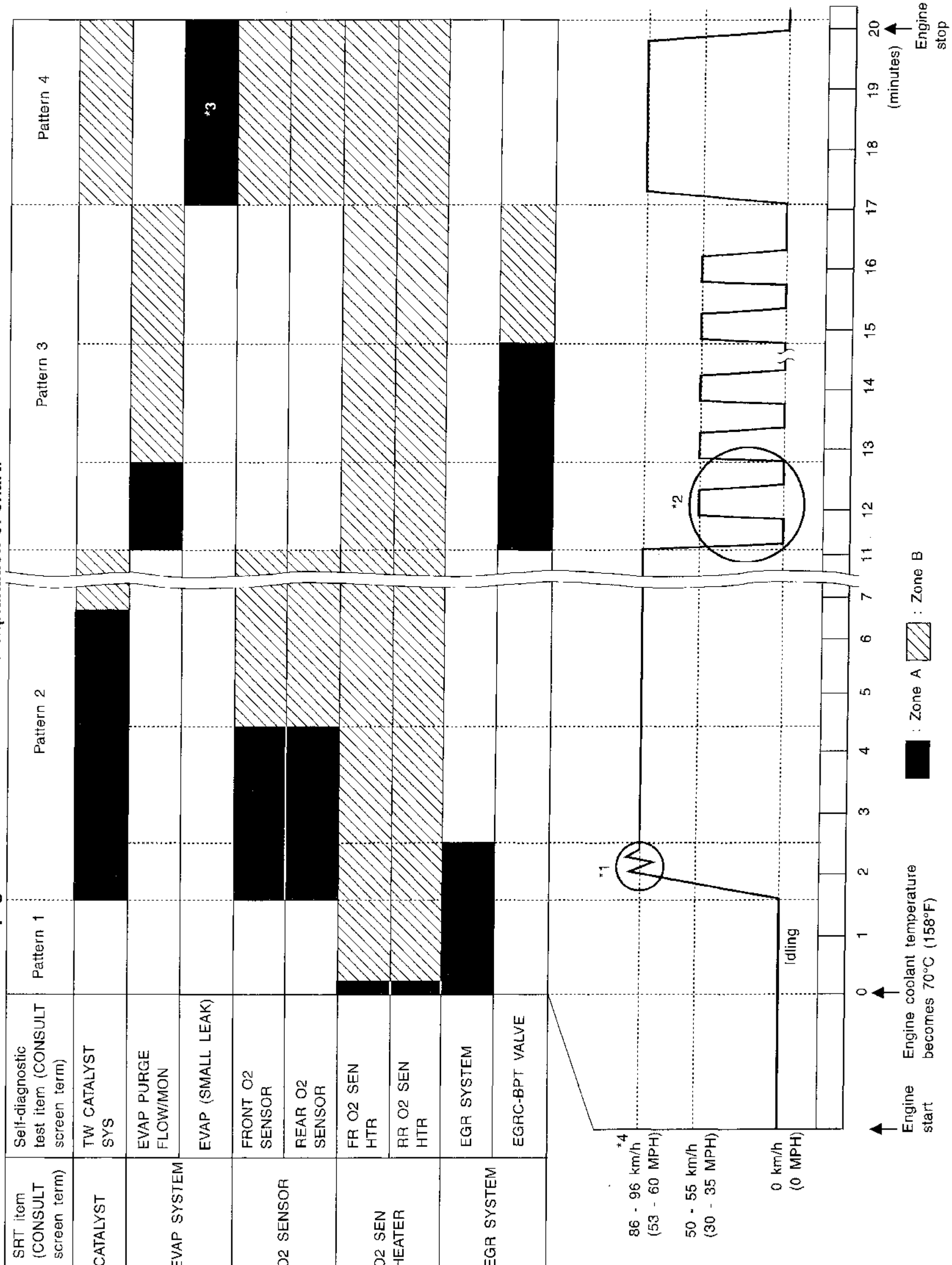
To set all SRT codes, all diagnoses indicated above must be performed two or more times. Each diagnosis may require a long period of actual driving under various conditions. The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. This type of driving pattern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

Emission-related Diagnostic Information (Cont'd)

Driving pattern

Driving pattern

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



SEF629T

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

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

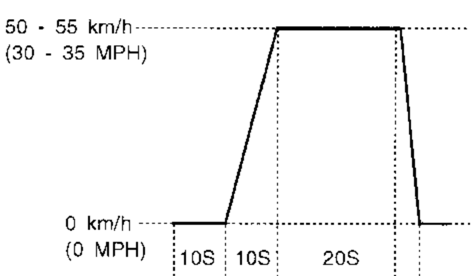
Pattern 1:
- The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminals 51 and 50 is 3.0 - 4.3V).
- The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals 51 and 50 is lower than 1.4V).

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

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

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

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



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)
1st to 2nd	24 (15)
2nd to 3rd	40 (25)
3rd to 4th	65 (40)
4th to 5th	70 (43)

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	25 (16)
2nd to 3rd	55 (34)
3rd to 4th	75 (47)
4th to 5th	80 (50)

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 (31)
2nd	90 (56)
3rd	135 (84)
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 the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items (9 test items).
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the CONSULT screen or GST.

X: Applicable
—: Not applicable

SRT item (CONSULT display)	Self-diagnostic test item	Test value			Test limit	Application
		GST display		CONSULT display		
		TID	CID			
CATALYST	Warm-up three way catalyst function	01H	01H	Parameter 1	Max.	X
		02H	81H	Parameter 2	Min.	X
EVAP SYSTEM	EVAP control system (Small leak)	05H	03H	Parameter 1	Max.	X
	EVAP control system purge flow monitoring	06H	83H	Parameter 2	Min.	X
O2 SENSOR	Front heated oxygen sensor	09H	04H	Parameter 1	Max.	X
		0AH	84H	Parameter 2	Min.	X
		0BH	04H	Parameter 3	Max.	X
		0CH	04H	Parameter 4	Max.	X
		0DH	04H	Parameter 5	Max.	X
	Rear heated oxygen sensor	19H	86H	Parameter 6	Min.	X
		1AH	86H	Parameter 7	Min.	X
		1BH	06H	Parameter 8	Max.	X
		1CH	06H	Parameter 9	Max.	X
O2 SENSOR HEATER	Front heated oxygen sensor heater	29H	08H	Parameter 1	Max.	X
		2AH	88H	Parameter 1	Min.	X
	Rear heated oxygen sensor heater	2DH	0AH	Parameter 1	Max.	X
		2EH	8AH	Parameter 1	Min.	X
EGR SYSTEM	EGR function	31H	8CH	Parameter 1	Min.	X
		32H	8CH	Parameter 2	Min.	X
		33H	8CH	Parameter 3	Min.	X
		34H	8CH	Parameter 4	Min.	X
		35H	0CH	Parameter 5	Max.	X
	EGRC-BPT valve function	36H	0CH	Parameter 6	Max.	X
		37H	8CH	Parameter 7	Min.	X

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-336
ABSOL PRESS SENSOR	P0105	0803	—	—	X	EC-342
INT AIR TEMP SEN	P0110	0401	—	—	X	EC-349
COOLANT TEMP SEN	P0115	0103	—	—	X	EC-355
THROTTLE POSI SEN	P0120	0403	—	—	X	EC-360
*COOLANT TEMP SEN	P0125	0908	—	—	X	EC-366
CLOSED LOOP	P0130	0307	—	—	X	EC-376
FRONT O2 SENSOR	P0130	0503	X	X	X*3	EC-371
FR O2 SEN HTR	P0135	0901	X	X	X*3	EC-377
REAR O2 SENSOR	P0136	0707	X	X	X*3	EC-381
RR O2 SEN HTR	P0141	0902	X	X	X*3	EC-386
FUEL SYS LEAN	P0171	0115	—	—	X	EC-391
FUEL SYS RICH	P0172	0114	—	—	X	EC-396
TANK FUEL TEMP SEN	P0180	0402	—	—	X	EC-401
MULTI CYL MISFIRE	P0300	0701	—	—	X	EC-405
CYL 1 MISFIRE	P0301	0608	—	—	X	EC-405
CYL 2 MISFIRE	P0302	0607	—	—	X	EC-405
CYL 3 MISFIRE	P0303	0606	—	—	X	EC-405
CYL 4 MISFIRE	P0304	0605	—	—	X	EC-405
KNOCK SENSOR	P0325	0304	—	—	X	EC-409
CRANK POS SEN (OBD)	P0335	0802	—	—	X	EC-413
CAMSHAFT POSI SEN	P0340	0101	—	—	X	EC-418
EGR SYSTEM	P0400	0302	X	X	X*3	EC-424
EGRC-BPT valve	P0402	0306	X	X	X	EC-432
TW CATALYST SYS	P0420	0702	X	X	X*3	EC-434

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

Emission-related Diagnostic Information (Cont'd)

X: Applicable
—: Not applicable

Items (CONSULT screen terms)	DTC*4		SRT code	Test value	1st trip DTC	Reference page
	CONSULT GST*2	ECM*1				
EVAP (SMALL LEAK)	P0440	0705	X	X	X*3	EC-437
PURG CONT/V & S/V	P0443	0807	—	—	X	EC-447
VENT CONTROL VALVE	P0446	0903	—	—	X	EC-455
EVAP SYS PRES SEN	P0450	0704	—	—	X	EC-460
VEHICLE SPEED SEN	P0500	0104	—	—	X	EC-465
IACV-AAC VALVE	P0505	0205	—	—	X	EC-469
CLOSED THRL POS SW	P0510	0203	—	—	X	EC-475
ECM	P0605	0301	—	—	X	EC-479
PARK/NEUT POSI SW	P0705	1003	—	—	X	EC-481
MAP/BARO SW SOL/V	P1105	1302	—	—	X	EC-485
INT/V TIM CONT SOL	P1110	0805	—	—	X	EC-491
IGN SIGNAL-PRIMARY	P1320	0201	—	—	X	EC-498
CRANK P/S (OBD) COG	P1336	0905	—	—	X	EC-504
EGRC SOLENOID/V	P1400	1005	—	—	X	EC-509
EGR TEMP SENSOR	P1401	0305	—	—	X	EC-514
VC/V BYPASS/V	P1441	0801	—	—	X	EC-519
PURG VOLUME CONT/V	P1445	1008	—	—	X	EC-524
EVAP PURG FLOW/MON	P1447	0111	X	X	X*3	EC-531
TOR CONV CLUTCH SV	P1550	0904	—	—	X	EC-539
COOLING FAN	P1900	1308	—	—	X	EC-544

*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)

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-283.)

- **If the battery terminal is disconnected, the emission-related diagnostic information will be lost within 24 hours.**
- **When you erase 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 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

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.

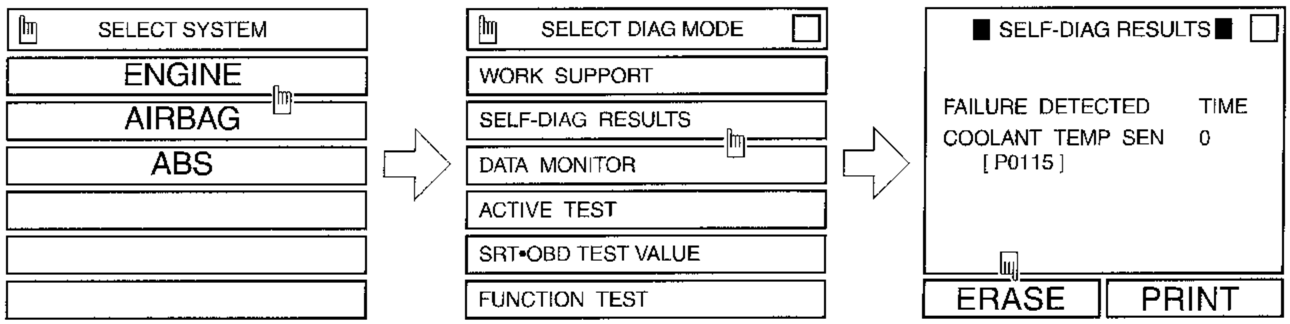
How to erase DTC (With CONSULT)

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".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the ECM will be erased.)

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" again.



2. Turn CONSULT "ON" and touch "ENGINE".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the ECM will be erased.)

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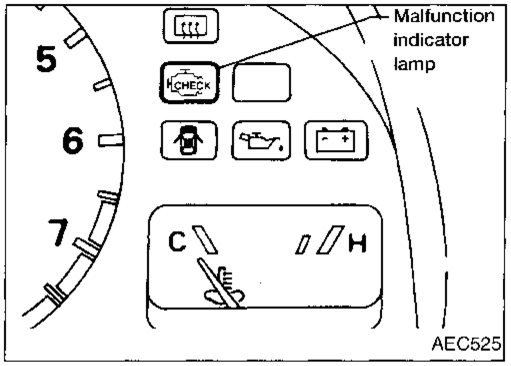
How to erase DTC (With GST)

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

How to erase DTC (No Tools)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" again.
2. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. (See EC-283.)



Malfunction Indicator Lamp (MIL)

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator lamp does not light up, refer to WARNING LAMPS in EL section (or see EC-581).
2. When the engine is started, the malfunction indicator lamp should go off.
   If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic test mode I

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

Diagnostic test mode II

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

MIL flashing without DTC

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

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

Malfunction Indicator Lamp (MIL) (Cont'd)

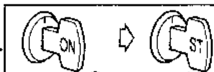
HOW TO SWITCH DIAGNOSTIC TEST MODES

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

↓

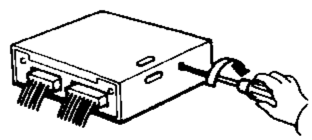
Diagnostic Test Mode I — BULB CHECK
MIL should come on.

- NG → Check MIL circuit. (See EC-581.)
  - NG → Repair or replace harness or connectors.
  - OK → Check ECM test mode selector whether it can be turned counterclockwise.
    - NG → Repair or replace ECM test mode selector.
    - OK → back to Diagnostic Test Mode I — BULB CHECK
- OK →



Start engine. → Diagnostic Test Mode I — MALFUNCTION WARNING

- OK ↓

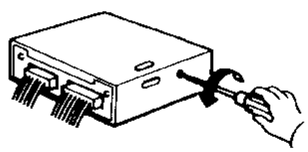


(Turn diagnostic test mode selector on ECM fully clockwise)
MIL should go off.

- NG → Check MIL circuit. (See EC-581.)
  - NG → Repair or replace harness or connectors.
    - OK → Wait at least 2 seconds.
  - OK → Check ECM fail-safe. (See EC-314.)
    - OK → Wait at least 2 seconds.
- OK ↓

Wait at least 2 seconds.

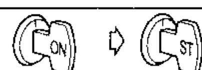
↓



(Turn diagnostic test mode selector fully counterclockwise.)

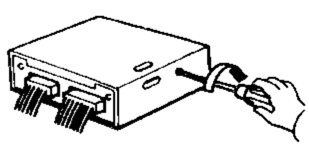
↓

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS →



Start engine. → Diagnostic Test Mode II — FRONT HEATED OXYGEN SENSOR MONITOR

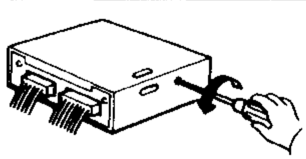
↓ *1



↓

Wait at least 2 seconds.

↓



→ back to Diagnostic Test Mode I — BULB CHECK

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

The following emission-related diagnostic information is cleared 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.**

DIAGNOSTIC TEST MODE I—BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. (Refer to WARNING LAMPS AND CHIME in EL section or see EC-581.)

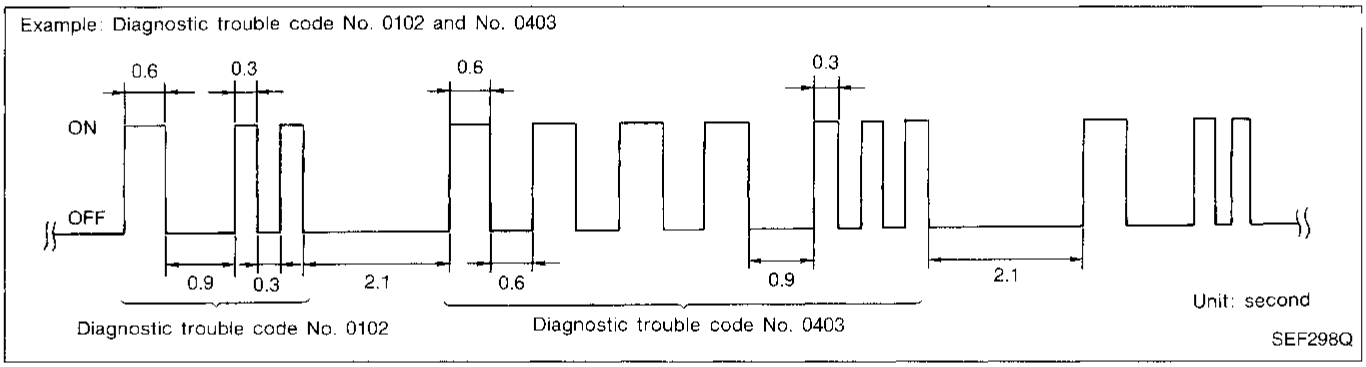
DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

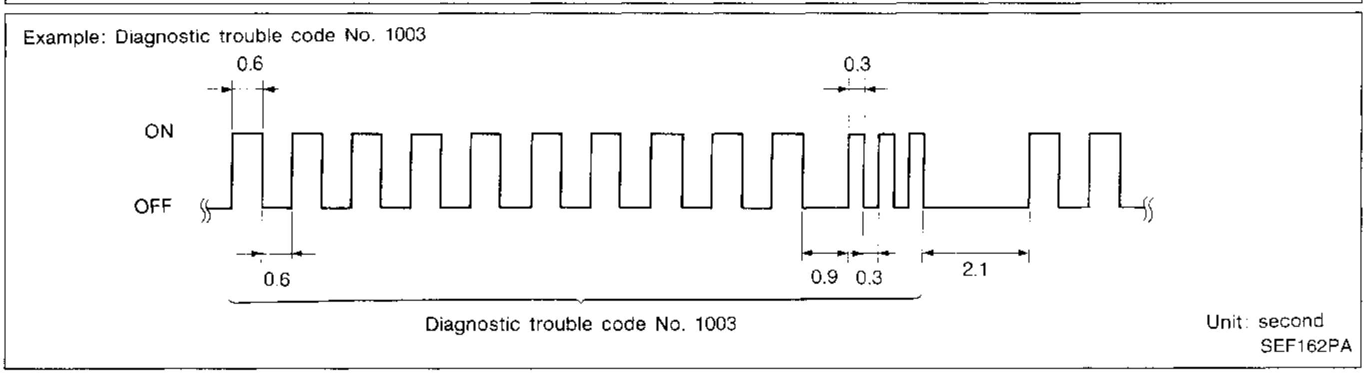
MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction

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

DIAGNOSTIC TEST MODE II—SELF-DIAGNOSTIC RESULTS

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





Long (0.6 second) blinking indicates the two LH digits of number and short (0.3 second) blinking indicates the two RH digits of number. For example, the malfunction indicator lamp blinks 10 times for 6 seconds (0.6 sec x 10 times) and then it blinks three times for about 1 second (0.3 sec x 3 times). This indicates the DTC "1003" and refers to the malfunction of the park/neutral position switch.
In this way, all the detected malfunctions are classified by their diagnostic trouble code numbers. The DTC "0505" refers to no malfunction. (See DIAGNOSTIC TROUBLE CODE INDEX, EC-581.)

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO ERASE DIAGNOSTIC TEST MODE II (Self-diagnostic results)

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

- **If the battery 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.**

DIAGNOSTIC TEST MODE II—FRONT HEATED OXYGEN SENSOR MONITOR

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

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

*: Maintains conditions just before switching to open loop.

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

OBD System Operation Chart

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

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to "Two Trip Detection Logic" on EC-271.
- 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 MIL will remain on until the vehicle is driven (in the recorded driving pattern) 3 times with no malfunction.
- The DTC and the freeze frame data can be displayed until the vehicle is driven 40 times (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data can be displayed until the vehicle is driven 80 times. The "TIME" IN "SELF-DIAGNOSTIC RESULTS" mode of CONSULT will count in response to 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.

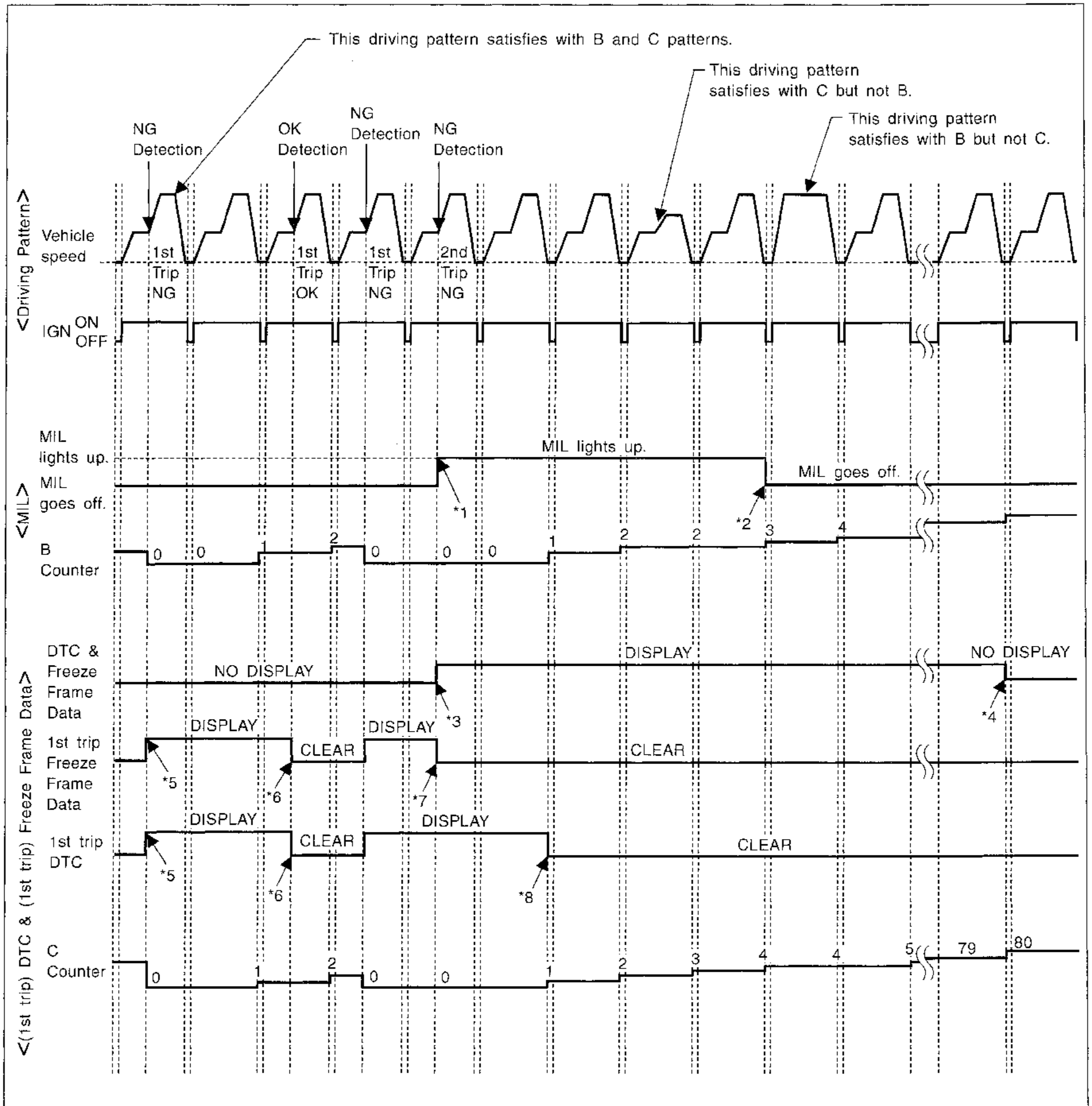
SUMMARY CHART

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-287.
*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, CONSULT AND DRIVING PATTERNS FOR "MISFIRE" <EXHAUST QUALITY DETERIORATION>, "FUEL INJECTION SYSTEM"



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*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.

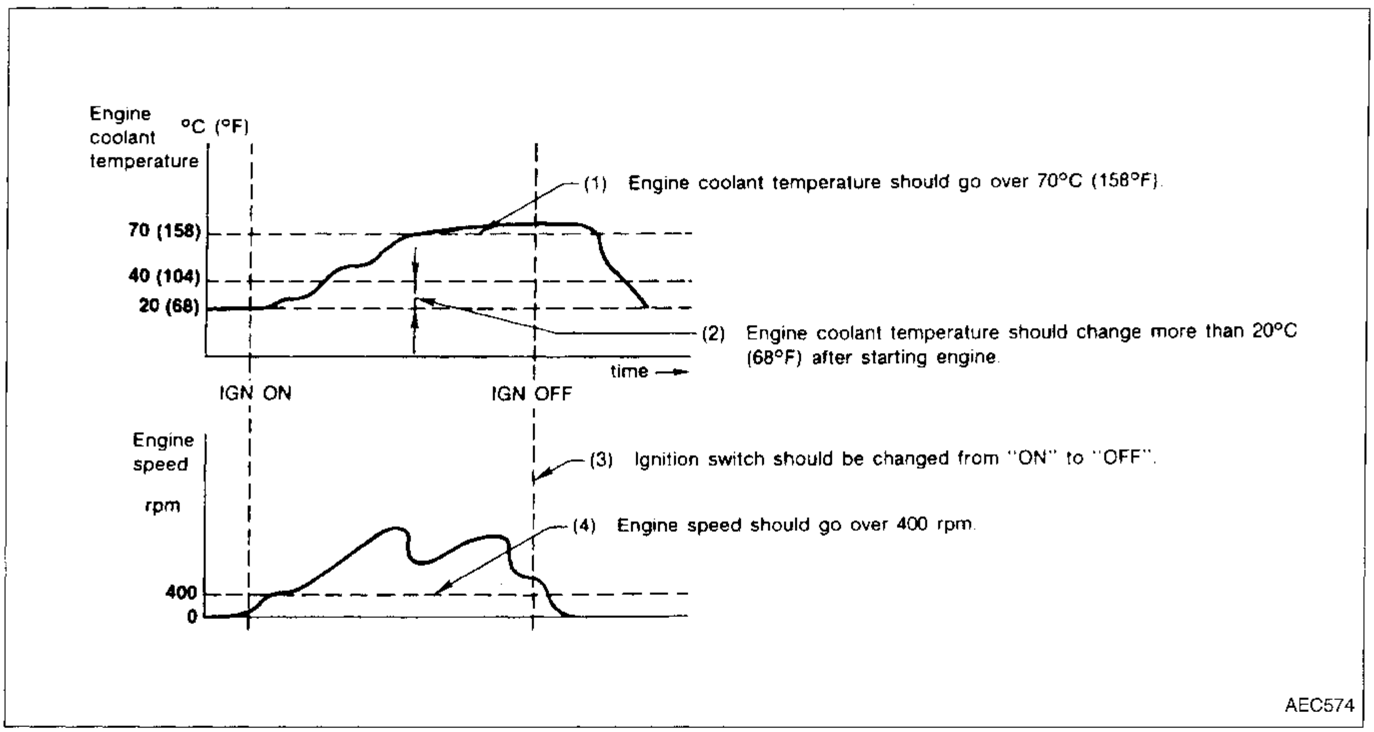
*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*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.

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

⟨Driving pattern A⟩



⟨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 when driving pattern B is satisfied without the malfunction.
- The MIL will go off when the B counter reaches 3. (*2 in "OBD SYSTEM OPERATION CHART")

⟨Driving pattern C⟩

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

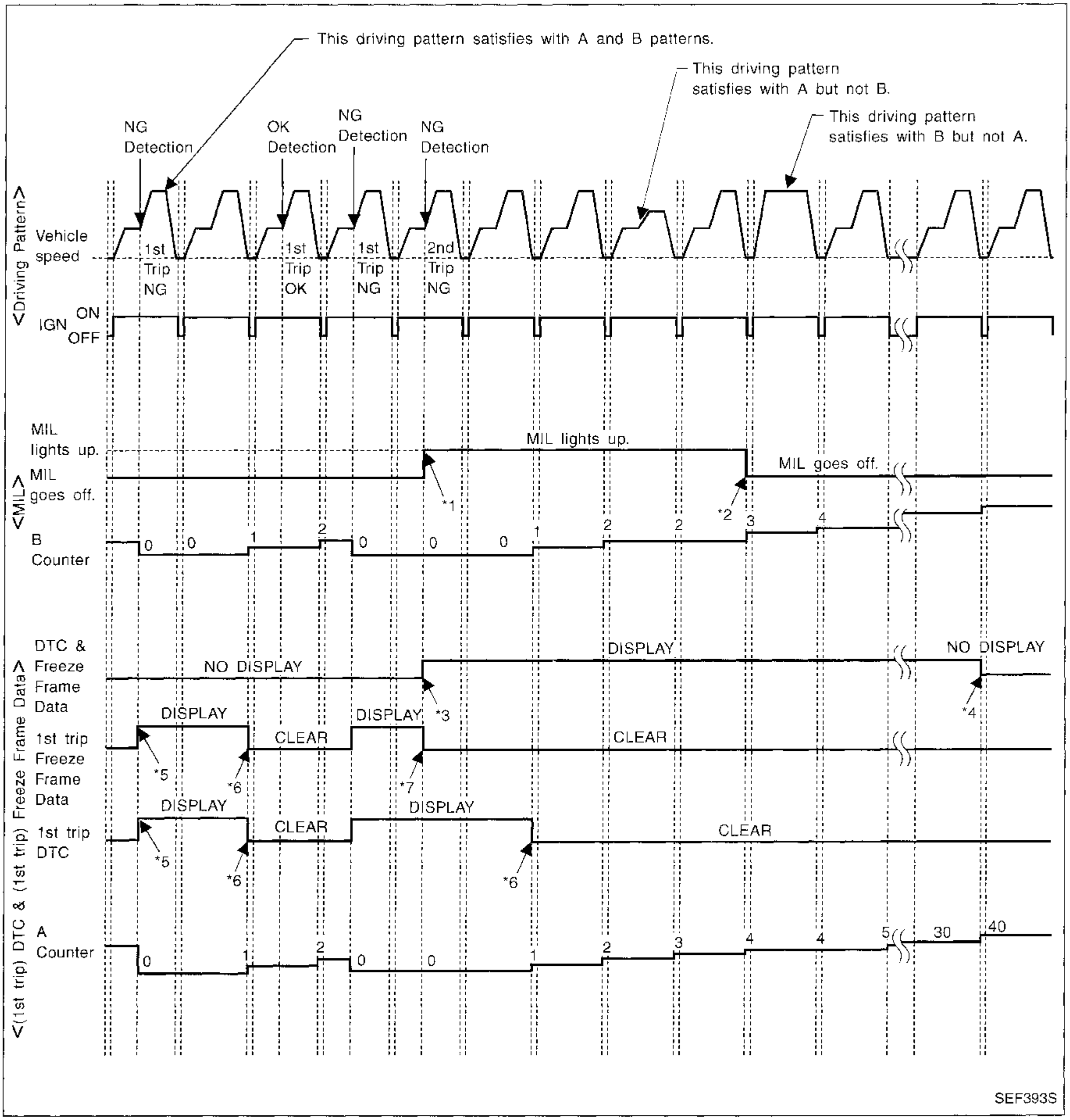
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

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, CONSULT 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.

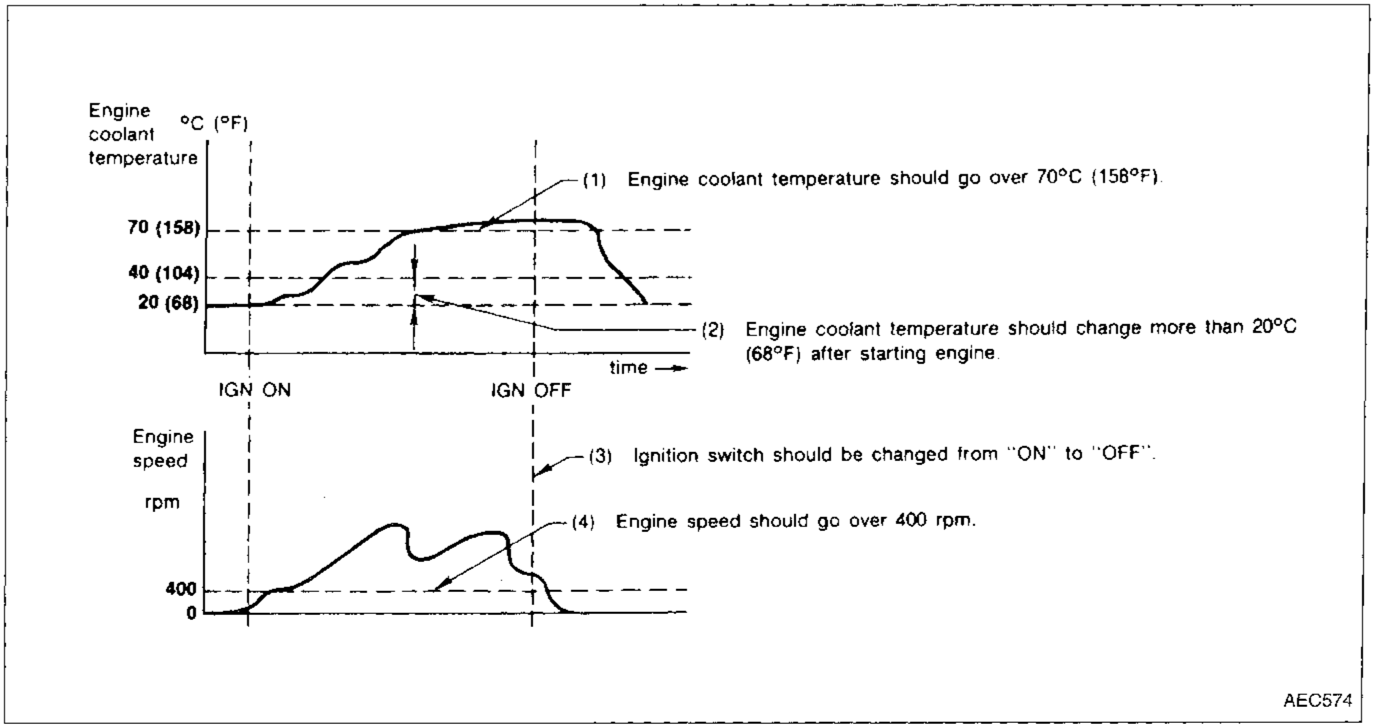
*6: 1st trip DTC will be cleared after vehicle is driven a time (pattern B) without the same malfunction.

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

OBD System Operation Chart (Cont'd)

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

⟨Driving pattern A⟩

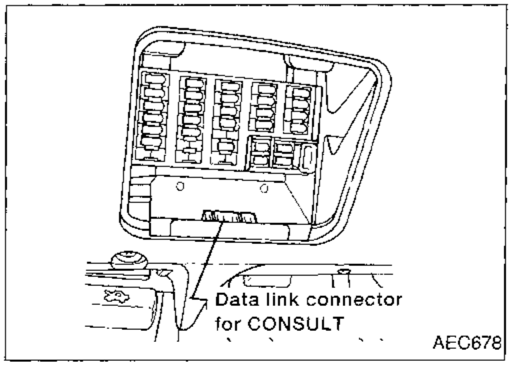


- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

⟨Driving pattern B⟩

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

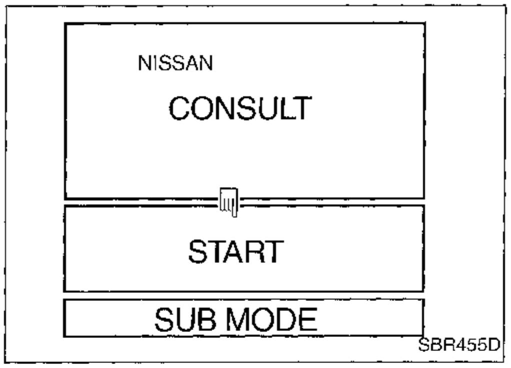
- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").



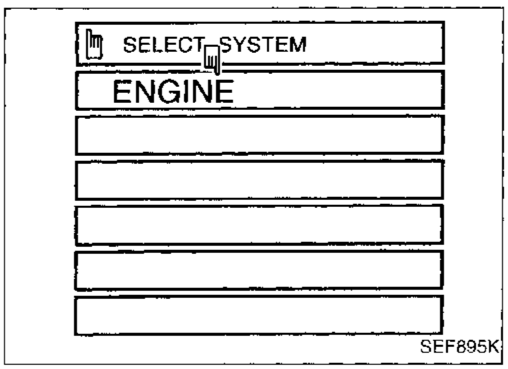
CONSULT

CONSULT INSPECTION PROCEDURE

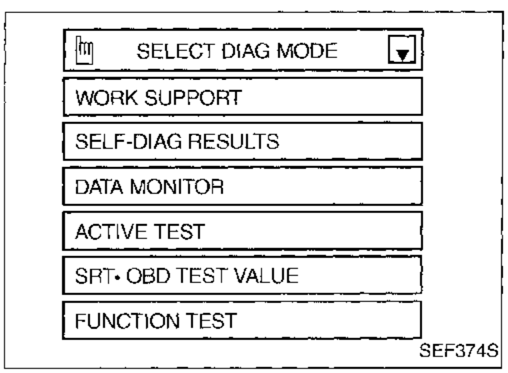
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



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



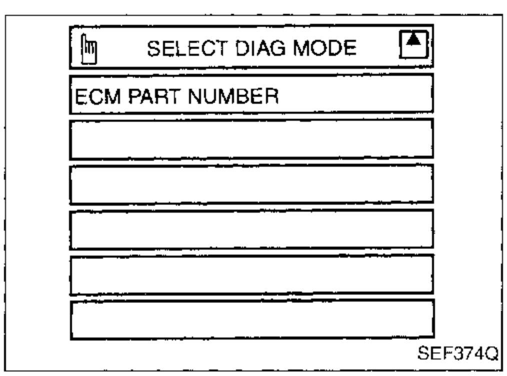
5. Touch "ENGINE".



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

For further information, see the CONSULT Operation Manual.

This sample shows the display when using the UE951 program card. Screen differs 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	FREEZE FRAME DATA*2	DATA MONITOR	ACTIVE TEST	FUNCTION TEST	SRT-OBD TEST VALUE
ECCS COMPONENT PARTS	INPUT	Camshaft position sensor		X	X	X			
		Mass air flow sensor		X		X			
		Engine coolant temperature sensor		X	X	X	X		
		Front heated oxygen sensor		X		X		X	X
		Rear heated oxygen sensor		X		X			X
		Vehicle speed sensor		X	X	X		X	
		Throttle position sensor	X	X		X		X	
		Tank fuel temperature sensor		X		X	X		
		EVAP control system pressure sensor		X		X			
		Absolute pressure sensor		X	X	X			
		EGR temperature sensor		X		X			
		Intake air temperature sensor		X		X			
		Crankshaft position sensor (OBD)		X					
		Knock sensor		X					
		Ignition switch (start signal)				X		X	
		Closed throttle position switch		X					
		Closed throttle position (throttle position sensor signal)				X		X	
		Air conditioner switch				X			
		Park/Neutral position switch		X		X		X	
		Power steering oil pressure switch				X		X	
		Air conditioner pressure switch				X			
		Heater fan switch				X			
		Battery voltage				X			
	OUTPUT	Injectors				X	X	X	
		Power transistor (Ignition timing)	X	X (Ignition signal)		X	X	X	
		IACV-AAC valve	X	X		X	X	X	
		Intake valve timing control solenoid valve		X			X	X	
		EVAP canister purge volume control valve		X		X	X		
		Torque converter clutch solenoid valve		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
		EGRC-solenoid valve		X		X	X	X	
		EVAP canister purge control solenoid valve		X		X	X		
		EVAP canister vent control valve		X		X			
		Vacuum cut valve bypass valve		X		X			
		MAP/BARO switch solenoid valve		X		X	X		
		Calculated load value			X	X			

X: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-273.

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

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THRTL POS SEN ADJ	CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED	When adjusting throttle position sensor initial position
IGNITION TIMING ADJ	● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.	When adjusting initial ignition timing
IACV-AAC/V ADJ	SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. ● ENGINE WARMED UP ● NO-LOAD	When adjusting idle speed
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line

SELF-DIAGNOSTIC MODE

DTC and 1st trip DTC

Regarding items of "DTC and 1st trip DTC", refer to "DIAGNOSTIC TROUBLE CODE INDEX (See EC-3.)

Freeze frame data and 1st trip freeze frame data

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

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

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CMPS·RPM (REF) [rpm]	○	○	● Indicates the engine speed computed from the REF signal (180° signal) of the camshaft position sensor.	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS AIR/FL SE [V]	○	○	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
COOLAN TEMP/S [°C] or [°F]	○	○	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
FR O2 SENSOR [V]	○	○	● The signal voltage of the front heated oxygen sensor is displayed.	
RR O2 SENSOR [V]	○	○	● The signal voltage of the rear heated oxygen sensor is displayed.	
FR O2 MNTR [RICH/LEAN]	○	○	● Display of front heated oxygen sensor signal during air-fuel ratio feedback control: RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN ... means the mixture became "lean". and control is being affected toward a rich mixture.	● After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
RR O2 MNTR [RICH/LEAN]	○		● Display of rear heated oxygen sensor signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	○	○	● The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	○	○	● The power supply voltage of ECM is displayed.	
THRTL POS SEN [V]	○	○	● The throttle position sensor signal voltage is displayed.	
TANK F/TMP SE [°C] or [°F]	○		● The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed.	
EGR TEMP SEN [V]	○		● The signal voltage of the EGR temperature sensor is displayed.	
INT/A TEMP SE [°C] or [°F]	○		● The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated.	
START SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.

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

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CLSD THL/P SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the closed throttle position sensor signal.	
AIR COND SIG [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioning signal.	
P/N POSI SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the park/neutral position switch signal.	
PW/ST SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal.	
LOAD SIGNAL	○	○	● Indicates [ON/OFF] condition from the rear defogger signal.	
IGNITION SW [ON/OFF]	○		● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SE [ON/OFF]	○		● Indicates [ON/OFF] condition from the heater fan switch.	
A/C PRESS SW [ON/OFF]	○		● Indicates [ON/OFF] condition of the air conditioner triple-pressure switch (medium-pressure side) determined by the pressure of the air conditioning high pressure side.	
INJ PULSE [msec]		○	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
B/FUEL SCHDL [msec]		○	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on-board correction.	
IGN TIMING [BTDC]		○	● Indicates the ignition timing computed by ECM according to the input signals.	
IACV-AAC/V [%]		○	● Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals.	
PURG VOL C/V [step]			● Indicates the EVAP canister purge volume control valve computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
A/F ALPHA [%]		○	● Indicates the mean value of the air-fuel ratio feedback correction factor per cycle.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
EVAP SYS PRES [V]			● The signal voltage of EVAP control system pressure sensor is displayed.	
AIR COND RLY [ON/OFF]			● Indicates the air conditioner relay control condition (determined by ECM according to the input signal).	
FUEL PUMP RLY [ON/OFF]			● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
INT/V TIM SOL [ON/OFF]			● The control condition of the valve timing solenoid valve (determined by ECM according to the input signal) is indicated. ON ... Intake valve timing control operating OFF ... Intake valve timing control not operating	
COOLING FAN [HI/LOW/OFF]			● Indicates the control condition of the cooling fan (determined by ECM according to the input signal). HI ... High speed operation LOW ... Low speed operation OFF ... Stop	
EGRC SOL/V [ON/OFF]			● Indicates the control condition of the EGR valve & EVAP canister purge control solenoid valve (determined by ECM according to the input signal). ● ON ... EGR valve and EVAP canister purge operation cut-off OFF ... EGR valve and EVAP canister purge operation not cut-off	
VENT CONT/V [ON/OFF]			● The control condition of the EVAP canister vent control valve (determined by ECM according to the input signal) is indicated. ● ON ... Closed OFF ... Open	
FR O2 HEATER [ON/OFF]			● Indicates [ON/OFF] condition of front heated oxygen sensor heater determined by ECM according to the input signals.	
RR O2 HEATER [ON/OFF]			● Indicates [ON/OFF] condition of rear heated oxygen sensor heater determined by ECM according to the input signals.	
VC/V BYPASS/V [ON/OFF]			● The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signal) is indicated. ● ON ... Open OFF ... Closed	
PURG CONT S/V [ON/OFF]			● The control condition of the EVAP canister purge control solenoid valve (computed by the ECM according to the input signals) is indicated. ● ON ... Canister purge is operational OFF ... Canister purge operation is cut-off	
CAL/LD VALUE [%]			● "Calculated load value" indicates the value of the current airflow divided by peak airflow.	

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
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 [gm/s]			• Indicates the mass airflow computed by ECM according to the signal voltage of the mass airflow sensor.	
MAP/BARO SW/V [MAP/BARO]			• The control condition of the MAP/BARO switch solenoid valve (determined by ECM according to the input signal) is indicated. MAP ... Intake manifold absolute pressure BARO ... Barometric pressure	
ABSOL PRES/SE [V]			• The signal voltage of the absolute pressure sensor is displayed.	
VOLTAGE [V]			• Voltage measured by the voltage probe.	
PULSE [msec] or [Hz] or [%]			• Pulse width, frequency or duty cycle measured by the pulse probe.	• Only "#" is displayed if item is unable to be measured. • Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

ACTIVE TEST MODE

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

CONSULT (Cont'd)

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
PURG CONT S/V	● Start engine. ● Turn the EVAP canister purge control solenoid valve "ON" and "OFF" using CONSULT and listen for operating sound.	EVAP canister purge control solenoid valve makes an operating sound. Check vacuum signal for EVAP canister purge control valve. VC ON ... Vacuum exists. VC OFF ... Vacuum does not exist.	● Harness and connector ● EVAP canister purge control solenoid valve ● Vacuum hose
MAP/BARO SW/V	● Ignition switch: ON (Engine stopped) ● Turn the MAP/BARO switch solenoid valve between "MAP" and "BARO" using CONSULT and listen for operating sound.	MAP/BARO switch solenoid valve makes an operating sound.	● Harness and connector ● MAP/BARO switch solenoid valve
TANK F/TEMP SEN	● Change the tank fuel temperature using CONSULT.		

FUNCTION TEST MODE

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	● Ignition switch: ON (Engine stopped) ● Displays the results of on-board diagnostic system.	—		Objective system
CLOSED THROTTLE POSI	● Ignition switch: ON (Engine stopped) ● Closed throttle position 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/Neutral position switch circuit is tested when shift lever is manipulated.	Out of N/P positions	OFF	● Harness and connector ● Neutral position switch or inhibitor switch ● Linkage or inhibitor switch adjustment
		In N/P positions	ON	
FUEL PUMP CIRCUIT	● Ignition switch: ON (Engine stopped) ● Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.	There is pressure pulsation on the fuel feed hose.		● Harness and connector ● Fuel pump ● Fuel pump relay ● Fuel filter clogging ● Fuel level
EGRC SOL/V CIRCUIT	● Ignition switch: ON (Engine stopped) ● EGRC-solenoid valve circuit is tested by checking solenoid valve operating noise.	The EGRC-solenoid valve makes an operating sound every 3 seconds.		● Harness and connector ● EGRC-solenoid valve
VALVE TIMING S/V CKT	● Ignition switch: ON (Engine stopped) ● Intake valve timing control solenoid valve circuit is tested by checking solenoid valve operating sound	The intake valve timing control solenoid valve makes an operating sound periodically.		● Harness and connector ● Intake valve timing control solenoid valve
COOLING FAN CIRCUIT	● Ignition switch: ON (Engine stopped) ● Cooling fan circuit is tested when cooling fan is rotated.	The cooling fan rotates and stops every 3 seconds.		● Harness and connector ● Cooling fan motor ● Cooling fan relay

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. Before cranking, battery voltage and engine coolant temperature are displayed. During cranking, average battery voltage, mass air flow sensor output voltage and cranking speed are displayed.	Start signal: OFF → ON		• Harness and connector • Ignition switch
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 adjustment is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		• Adjust ignition timing (by moving camshaft position sensor or distributor) • Camshaft position sensor drive mechanism
MIXTURE RATIO TEST	• Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the front heated oxygen sensor output at 2,000 rpm under non-loaded state.	Front heated oxygen sensor COUNT: More than 5 times during 10 seconds		• INJECTION SYS (Injector, fuel pressure regulator, harness or connector) • IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector) • VACUUM SYS (Intake air leaks) • Front heated oxygen sensor circuit • Front heated oxygen sensor operation • Fuel pressure high or low • Mass air flow sensor

CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
POWER BALANCE	● After warming up, idle the engine. ● Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.)	Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder.	● Injector circuit (Injector, harness or connector) ● Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector) ● Compression ● Valve timing
★1 IACV-AAC/V SYSTEM	● After warming up, idle the engine. ● IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 0%, 20% and 80%.	Difference in engine speed is greater than 150 rpm between when valve opening is at 80% and at 20%.	● Harness and connector ● IACV-AAC valve ● Air passage restriction between air inlet and IACV-AAC valve ● IAS (Idle adjusting screw) adjustment
★2 EVAP (SMALL LEAK)	● After warming up, idle the engine etc. ● EVAP system is tested by using the evaporative gas pressure in the fuel tank or engine intake manifold pressure.	● EVAP control system has no leak. ● EVAP control system operates properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge control valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line tube leaks ● EVAP purge line rubber tube bent. ● Blocked or bent rubber tube to EVAP control system pressure sensor ● EVAP canister purge control valve ● EVAP canister purge volume control valve ● EVAP canister purge control solenoid valve ● Absolute pressure sensor ● Tank fuel temperature sensor ● MAP/BARO switch solenoid valve ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve

★1: The actual function might not be NG even though the result is NG. Therefore, if NG is displayed, always check the function of IACV-AAC valve according to "TROUBLE DIAGNOSIS FOR DTC P0505", EC-469.
★2: Always select "SINGLE TEST" with CONSULT when performing the "FUNCTION TEST".

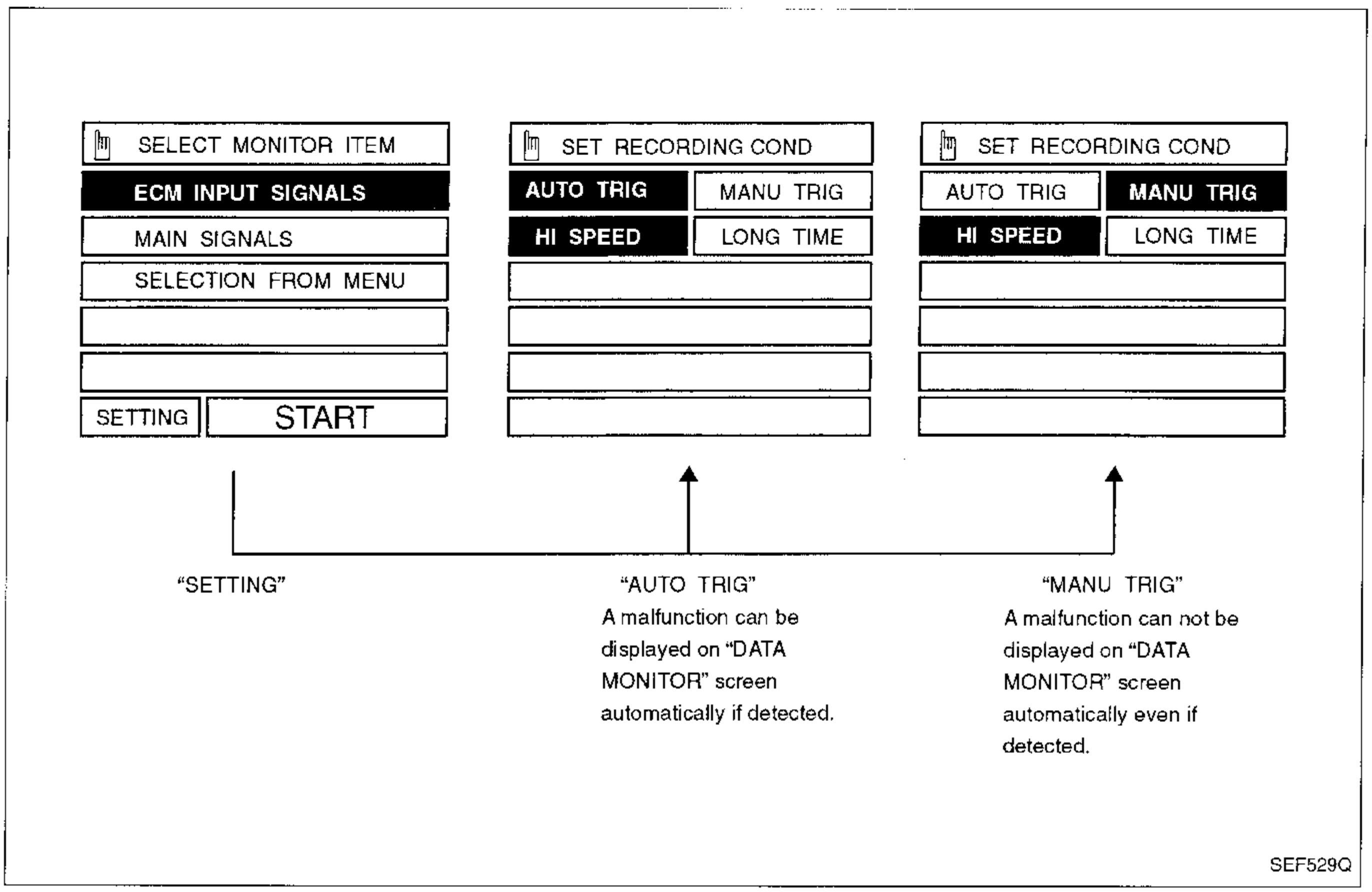
REAL TIME DIAGNOSIS IN DATA MONITOR MODE

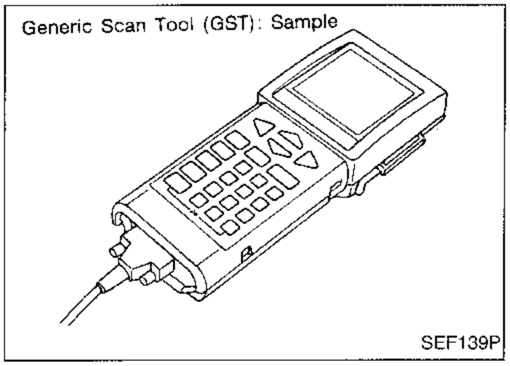
CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

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.

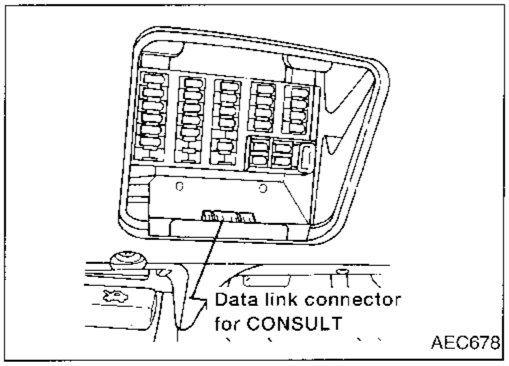




Generic Scan Tool (GST)

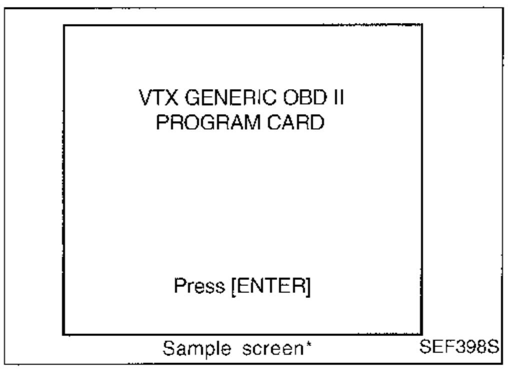
DESCRIPTION

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



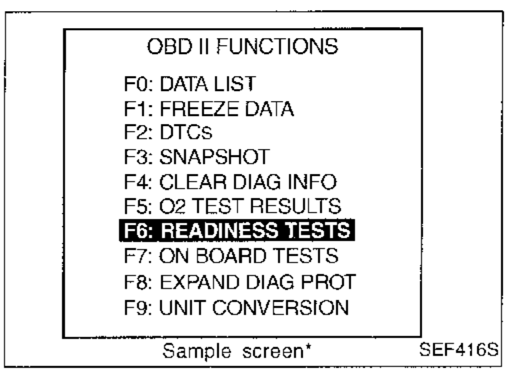
GST INSPECTION PROCEDURE

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



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

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

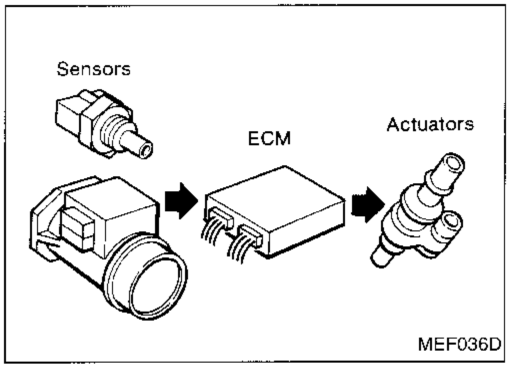


5. Perform each diagnostic mode according to each service procedure.

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

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-293).]
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.



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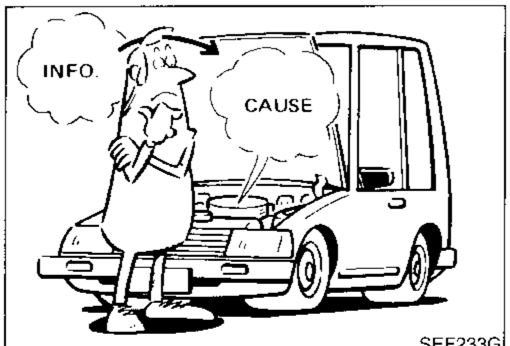

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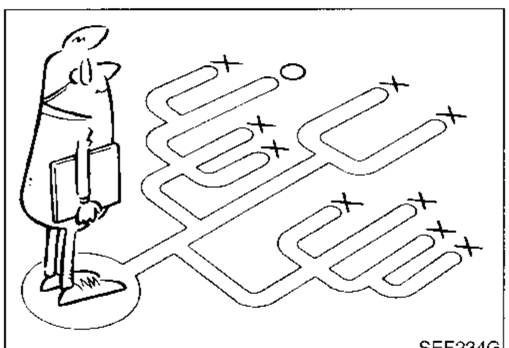
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Introduction

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.
It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.
A visual check only may not find the cause of the problems. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the "Work Flow" on EC-308.
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A "Diagnostic Worksheet" like the example on next page should be used.
Start your diagnosis by looking for "conventional" problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.

KEY POINTS

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

SEF907L

Diagnostic Worksheet

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one shown below in order to organize all the information for troubleshooting.
Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected. Examples:

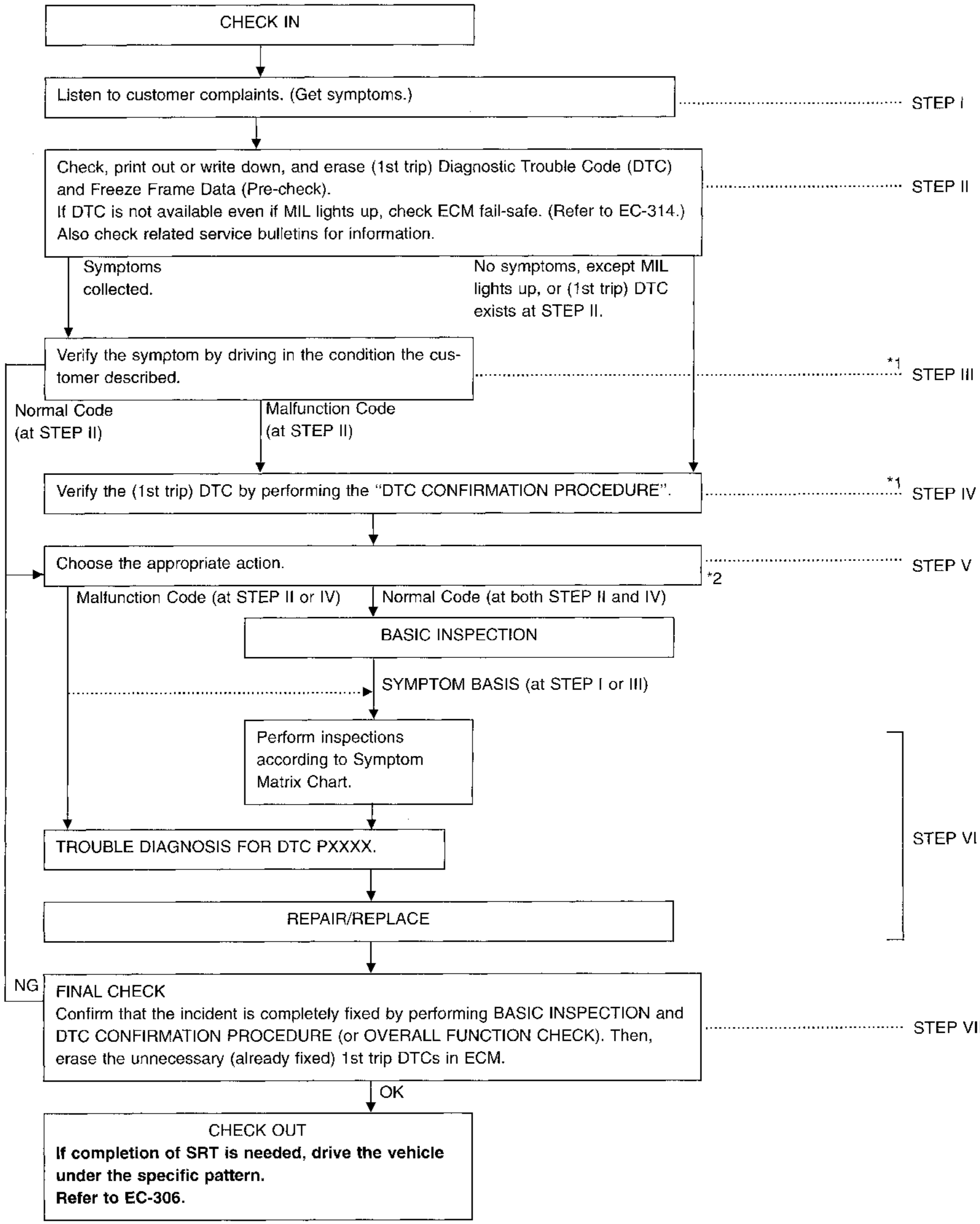
- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere [for models with EVAP (SMALL LEAK) diagnosis].

Diagnostic Worksheet (Cont'd)

WORKSHEET SAMPLE

<table>
<tr><td colspan="2">Customer name MR/MS</td><td>Model & Year</td><td>VIN</td></tr>
<tr><td colspan="2">Engine #</td><td>Trans.</td><td>Mileage</td></tr>
<tr><td colspan="2">Incident Date</td><td>Manuf. Date</td><td>In Service Date</td></tr>
<tr><td colspan="2">Fuel and fuel filler cap</td><td colspan="2">☐ Vehicle ran out of fuel causing misfire
☐ Fuel filler cap was left off or incorrectly screwed on</td></tr>
<tr><td rowspan="4">Symptoms</td><td>☐ Startability</td><td colspan="2">☐ 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 [ ]</td></tr>
<tr><td>☐ Idling</td><td colspan="2">☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle
☐ Others [ ]</td></tr>
<tr><td>☐ Driveability</td><td colspan="2">☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power
☐ Intake backfire ☐ Exhaust backfire
☐ Others [ ]</td></tr>
<tr><td>☐ Engine stall</td><td colspan="2">☐ At the time of start ☐ While idling
☐ While accelerating ☐ While decelerating
☐ Just after stopping ☐ While loading</td></tr>
<tr><td colspan="2">Incident occurrence</td><td colspan="2">☐ Just after delivery ☐ Recently
☐ In the morning ☐ At night ☐ In the daytime</td></tr>
<tr><td colspan="2">Frequency</td><td colspan="2">☐ All the time ☐ Under certain conditions ☐ Sometimes</td></tr>
<tr><td colspan="2">Weather conditions</td><td colspan="2">☐ Not affected</td></tr>
<tr><td></td><td>Weather</td><td colspan="2">☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]</td></tr>
<tr><td></td><td>Temperature</td><td colspan="2">☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F</td></tr>
<tr><td colspan="2">Engine conditions</td><td colspan="2">☐ Cold ☐ During warm-up ☐ After warm-up
Engine speed 0 2,000 4,000 6,000 8,000 rpm</td></tr>
<tr><td colspan="2">Road conditions</td><td colspan="2">☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)</td></tr>
<tr><td colspan="2">Driving conditions</td><td colspan="2">☐ 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</td></tr>
<tr><td colspan="2">Malfunction indicator lamp</td><td colspan="2">☐ Turned on ☐ Not turned on</td></tr>
</table>

Work Flow

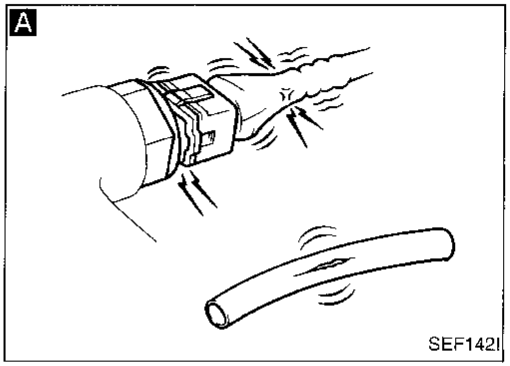


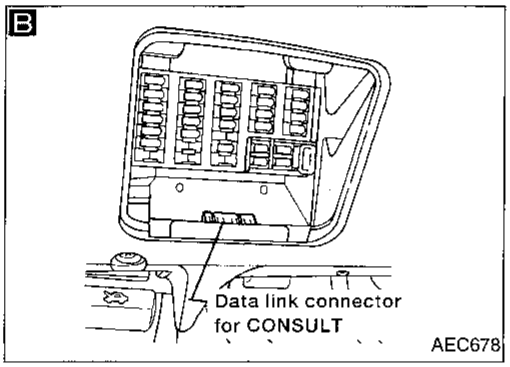
***1: If the incident cannot be duplicated, refer to GI section ("Incident Simulation Tests", "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT").**

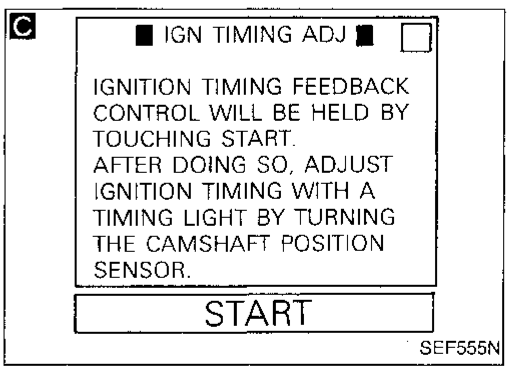
***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-332.**

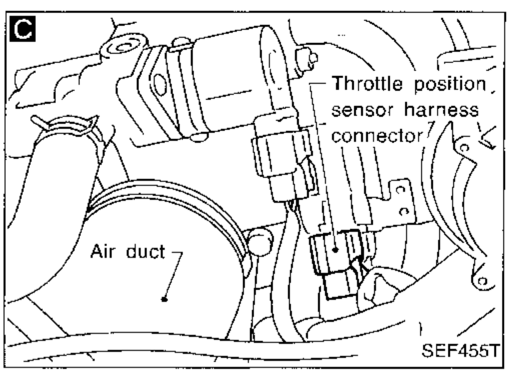
Description for Work Flow

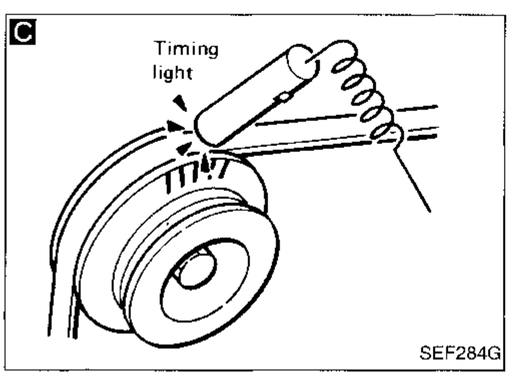
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-306.
STEP II	Before confirming the concern, check and write down (print out using CONSULT or Generic Scan Tool) the (1st trip) Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-280.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. See EC-315.) 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 the next page. Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-315.)
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-318. 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-280.)











Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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

A

BEFORE STARTING

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

↓

B

CONNECT CONSULT TO THE VEHICLE.
Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-290.

↓

DOES ENGINE START? — No → Go to E.

Yes ↓

C

CHECK IGNITION TIMING. — NG → Adjust ignition timing by turning camshaft position sensor.

1. Warm up engine sufficiently.
2. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
3. Touch "START".
4. Check ignition timing at idle using timing light.
Ignition timing:
8°±2° BTDC

---

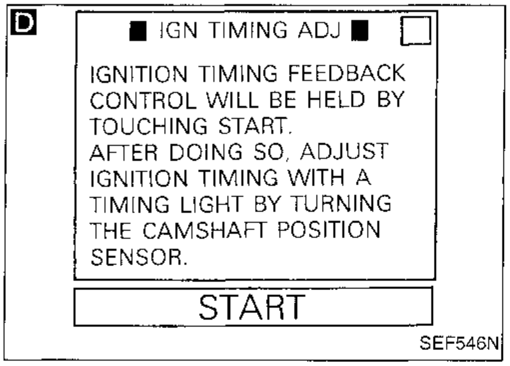
1. Warm up engine sufficiently.
2. Stop engine and disconnect throttle position sensor harness connector.
3. Start engine.
4. Check ignition timing at idle using timing light.
Ignition timing:
8°±2° BTDC

OK ↓

Ⓐ

(Go to next page.)

Basic Inspection (Cont'd)



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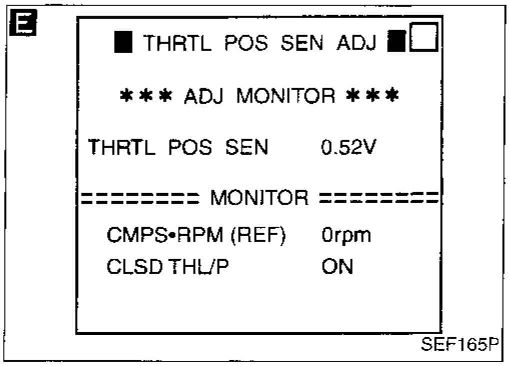
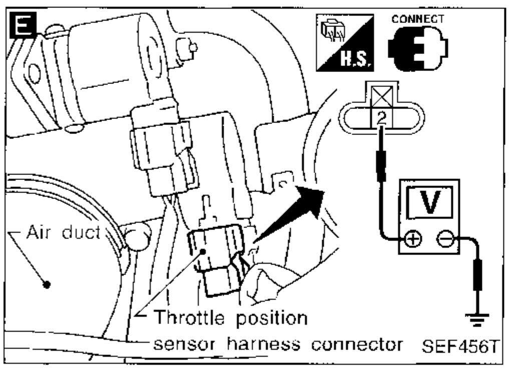


SEF165P



SEF456T

Ⓐ

D

CHECK BASE IDLE SPEED.

1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine speed fall to the following speed?
   M/T 625±50 rpm
   A/T 725±50 rpm (in "N" position)

— OR —

Does engine run at the following speed?
M/T: 625±50 rpm
A/T: 725±50 rpm (in "N" position)

NG → Adjust engine speed by turning idle adjusting screw.

OK ↓

E

CHECK THROTTLE POSITION SENSOR IDLE POSITION.

1. Perform "THRTL POS SEN ADJ" in "WORK SUPPORT" mode.
2. Check that output voltage of throttle position sensor is approx. 0.35 to 0.65V (Throttle valve fully closes.) and "CLSD THL/P SW" stays "ON".

— OR —

Measure output voltage of throttle position sensor using voltmeter, and check that it is approx. 0.35 to 0.65V. (Throttle valve fully closed.)

NG → Adjust output voltage to 0.51 ± 0.1V by rotating throttle position sensor body.

↓

RESET IDLE POSITION MEMORY.

1. Warm up engine sufficiently and stop.
   Select "CLSD THL/P SW" in "DATA MONITOR" mode (manual trigger) with CONSULT before stopping engine.
2. Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.
3. Turn ignition switch "ON".
4. Turn ignition switch "OFF" and wait at least 5 seconds.
5. Repeat steps 3. and 4. until "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT changes to "ON".
   Repeat steps 3. and 4. 20 times.

OK ↓

Ⓑ

(Go to next page.)

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

Basic Inspection (Cont'd)

Ⓑ

CHECK TARGET IDLE SPEED

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

M/T models except for Canada:
675±50 rpm
M/T models for Canada:
750±50 rpm
A/T models:
800±50 rpm (in "N" position)

OR

Check idle speed.

M/T models except for Canada:
675±50 rpm
M/T models for Canada:
750±50 rpm
A/T models:
800±50 rpm (in "N" position)

NG → Adjust idle speed. Refer EC-264.

↓ OK

After this inspection, unnecessary diagnostic trouble code No. might be displayed.
Erase the stored memory in ECM.
Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION", EC-271.

↓ 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) ● Mass air flow sensor circuit (P0100, 0102) ● Throttle position sensor circuit (P0120, 0403) ● EGRC-solenoid valve circuit (P1400, 1005)	● Camshaft position sensor circuit (P0340, 0101) ● Vehicle speed sensor circuit (P0500, 0104) ● Intake air temperature sensor circuit (P0110, 0401) ● Knock sensor circuit (P0325, 0304)	● Engine coolant temperature sensor circuit (P0115, 0103) (P0125, 0908) ● Ignition signal circuit (P1320, 0201) ● Park/Neutral position switch circuit (P0705, 1003) ● Tank fuel temperature sensor circuit (P0180, 0402)
2	● EGR temperature sensor circuit (P1401, 0305) ● T/C clutch solenoid valve (P1550, 0904) ● Absolute pressure sensor circuit (P0105, 0803) ● Vacuum cut valve bypass valve (P1441, 0801) ● EVAP canister vent control valve circuit (P0446, 0903) ● Closed throttle position switch circuit (P0510, 0203)	● Crankshaft position sensor circuit (P0335, 0802) (P1336, 0905) ● Cooling fan circuit (P1900, 0208) ● MAP/BARO switch solenoid valve circuit (P1105, 1302) ● Front heated oxygen sensor heater circuit (P0135, 0901) ● EVAP canister purge volume control valve circuit (P1445, 1008) ● Rear heated oxygen sensor heater circuit (P0141, 0902)	● Front heated oxygen sensor circuit (P0130, 0303) ● Rear heated oxygen sensor circuit (P0136, 0707) ● EVAP canister purge control valve/solenoid valve circuit (P0443, 0807) ● EVAP control system pressure sensor circuit (P0450, 0704) ● EVAP control system purge flow monitoring (P1447, 0111)
3	● EGR function (P0400, 0302) ● EGRC-BPT valve function (P0402, 0306) ● IACV-AAC valve circuit (P0505, 0205)	● Misfire (P0300 - P0304, 0605 - 0701) ● Closed loop control (P0130, 0307) ● Intake valve timing control function (P1110, 0805) ● EVAP control system (small leak) (P0440, 0705)	● Fuel injection system function (P0171, 0115) (P0172, 0114) ● Three way catalyst function (P0420, 0702)

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

Fail-Safe Chart

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

<table>
<tr><th colspan="2">DTC No.</th><th rowspan="2">Detected items</th><th rowspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><th>CON-
SULT
GST</th><th>ECM*1</th></tr>
<tr><td>P0100</td><td>0102</td><td>Mass air flow sensor circuit</td><td>Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>P0110</td><td>0401</td><td>Intake air temperature sensor</td><td>The ECM controls on the assumption that the intake air temperature is 25°C (77°F).</td></tr>
<tr><td>P0115</td><td>0103</td><td>Engine coolant temperature sensor circuit</td><td>Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START".
CONSULT displays the engine coolant temperature decided by ECM.
<table>
<tr><th>Condition</th><th>Engine coolant temperature decided
(CONSULT display)</th></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
</table>
When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0120</td><td>0403</td><td>Throttle position sensor circuit</td><td>Throttle position will be determined based on the injected fuel amount and the engine speed.
Therefore, acceleration will be poor.
<table>
<tr><th>Condition</th><th>Driving condition</th></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
</table></td></tr>
<tr><td>Unable to access ECCS</td><td>Unable to access Diagnostic Test Mode II</td><td>ECM</td><td>ECM fail-safe activating condition
The computing function of the ECM was judged to be malfunctioning.
When the fail-safe system activates (i.e., if the ECM detects a malfunction condition in the CPU of ECM), the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver.
However, it is not possible to access ECCS and DTC cannot be confirmed.
Engine control with ECM fail-safe
When ECM fail-safe 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 valve</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td>Cooling fans</td><td>Cooling fan relay "ON" when engine is running, and "OFF" when engine stalls</td></tr>
</table>
Replace ECM, if ECM fail-safe condition is confirmed.</td></tr>
</table>

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

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM: HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	●	●	●	○	●		●	●			●		○	EC-564
	Fuel pressure regulator system	●	●	●	○	●	○	●	●	○		●			EC-260
	Injector circuit	●	●	●	○	●		●	●			●			EC-557
	Evaporative emission system	○	○	○	○	○	○	○	○	○		○			EC-255
Air	Positive crankcase ventilation system	○	○	●	○	○	○	●	●	○		○			EC-259
	Incorrect idle speed adjustment	○	○				○	○	○	○		○			EC-264
	IACV-AAC valve circuit	●	●	●	○	●	●	●	●	●		●		○	EC-469
	IACV-FICD solenoid valve circuit	○	○	○	○	○	○	○	○	○		○			EC-573
Ignition	Incorrect ignition timing adjustment	○	○	●	●	●		●	●			●			EC-264
	Ignition circuit	●	●	●	●	●		●	●			●			EC-498
EGR	EGRC-solenoid valve circuit		●	●	●	○						●			EC-509
	EGR system	○	●	●	●	○	○	●	●	○		○			EC-424
Main power supply and ground circuit		○	○	○	○	○		○	○		○	○		○	EC-332
Cooling	Cooling fan circuit	○	○	○	○	○	○	○	○	○	○	○		○	EC-544
Air conditioner circuit		○	○	○	○	○	○	○	○	○		○		○	HA section

● : High Possibility Item
○ : Low Possibility Item

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — ECCS system		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
ECCS	Camshaft position sensor circuit	●	●	●	○	○		○	○			○			EC-418
	Mass air flow sensor circuit	●	●	●	○	●		●	●			●			EC-336
	Front heated oxygen sensor circuit		●	●	○	●		●	●			●			EC-371
	Engine coolant temperature sensor circuit	●	●	●	○	●	●	●	●	●		●			EC-355, 366
	Throttle position sensor circuit		●	●		●	●	●	●	●		●			EC-360
	Incorrect throttle position sensor adjustment		●	○		○	●	○	○	●		○			EC-310
	Intake valve timing control system		○	○		○		○				○			EC-491
	Vehicle speed sensor circuit		○	○		○						○			EC-465
	Knock sensor circuit			○	○	○						○			EC-409
	ECM	○	○	○	○	○	○	○	○	○	○	○			EC-479, 314
	Start signal circuit	○													EC-561
	Park/Neutral position switch circuit			○		○		○	○			○			EC-481
	Power steering oil pressure switch circuit		○					○	○						EC-569

● : High Possibility Item
○ : Low Possibility Item

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — Engine mechanical & other		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	Reference page
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	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	○	○	○		○		○	○			○		○	EL section
	Alternator circuit	○	○	○		○		○	○			○		○	
	Starter circuit	●													
	Flywheel or drive plate	●													—
	Clutch interlock switch	○													CL section
	Inhibitor switch	○													AT section
Engine	Cylinder head	●	●	●	●	●		●	●			○			
	Cylinder head gasket	●	●	○	○	●		○	○		○	○	○		
	Cylinder block	●	○	○	○	○		○	○			○	○		
	Piston	●	●	○	●	○		○	○			○	○		
	Piston ring	●	○	○	○	○		○	○			○	○		
	Connecting rod	○	○	○	○	○		○	○			○			
	Bearing	○	○	○	○	○		○	○			○			
	Crankshaft	○	○	○	○	○		○	○			○			
Valve mechanism	Timing chain	●	●	●	○	●		○	○			○			
	Camshaft	●	●	●	○	○		●	●			○			
	Intake valve	●	○	○	●	○		○	○			○	○		
	Exhaust valve	●	○	○	○	○		○	○			○	○		—
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	○	○	○	○	○		○	○			○			
	Three way catalyst	●	●	○	○	○		○	○			○			
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	●	○	○	○	○		●	●			○	○		
	Oil level (Low)/Filthy oil	○	○	○	○	○		○	○			○	○		
Cooling	Radiator/Hose/Radiator filler cap	○	○	○	○	○		○	○		○	○			
	Thermostat	○	○	○	○	○	○	○	○	○	○	○			
	Water pump	○	○	○	○	○		○	○		○	○			
	Water gallery	○	○	○	○	○		○	○		○	○			
	Cooling fan	○	○	○	○	○	○	○	○	○	○	○			
	Coolant level (low)/Contaminated coolant	○	○	○	○	○		○	○		○	○			

● : High Possibility Item
○ : Low Possibility Item

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

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

MONITOR ITEM	CONDITION		SPECIFICATION
CMPS·RPM (REF)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	1.0 - 1.7V
		2,000 rpm	1.5 - 2.1V
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
FR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR			LEAN ↔ RICH Changes more than 5 times during 10 seconds.
RR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 3,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
RR O2 MNTR			LEAN ↔ RICH
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
THRTL POS SEN	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.35 - 0.65V
		Throttle valve fully opened	Approx. 4.0V
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/P SW	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	A/C switch "OFF"	OFF
		A/C switch "ON" (Compressor operates)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever "P" or "N"	ON
		Except above	OFF

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

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger is operating and/or lighting switch* is on	ON
		Rear window defogger is not operating and lighting switch is not on	OFF
IGNITION SW	● Ignition switch: ON → OFF		ON → OFF
HEATER FAN SE	● Heater fan switch: ON → OFF		ON → OFF
INJ PULSE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	2.4 - 3.2 msec.
		2,000 rpm	1.9 - 3.2 msec.
B/FUEL SCHDL	ditto	Idle	0.7 - 1.5 msec
		2,000 rpm	0.7 - 1.5 msec
IGN TIMING	ditto	Idle	0 - 10° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V	ditto	Idle	20 - 60%
		2,000 rpm	—
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● No-load ● M/T models: Jack up drive wheels and shift to 1st gear position.	Idle	0 step
		A/T models: 2,000 rpm M/T models: 2,000 rpm and more than 16 km/h (10 MPH)	—
A/F ALPHA	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	56 - 155%
EVAP SYS PRES	● Ignition switch: ON		Approx. 3.4V
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (stops in 1.0 seconds)		ON
	● Except as shown above		OFF
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 90°C (194°F) or less	OFF
		Engine coolant temperature is 91°C (196°F) or more	ON
INT/V TIM SOL	● Engine: After warming up	Idle	OFF
		2,000 rpm	ON
VENT CONT/V	● Ignition switch: ON		OFF
EGRC SOL/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load ● M/T models: Jack up drive wheels and shift to 1st gear position	Idle	ON
		A/T models: 2,000 rpm M/T models: 2,000 rpm and more than 16 km/h (10 mph)	OFF

*: 1st position for USA models, 2nd position for Canada models

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

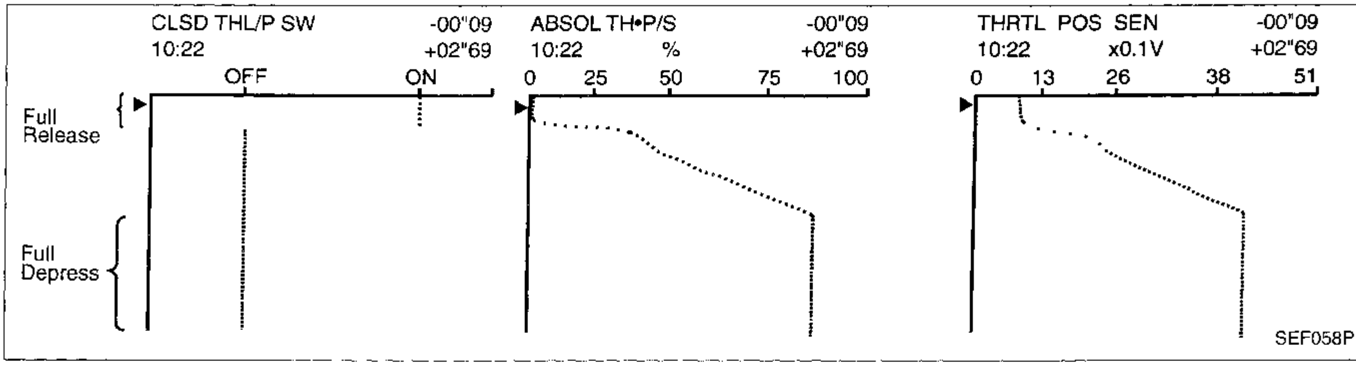
MONITOR ITEM	CONDITION		SPECIFICATION
TCC SOL/V	● Engine: After warming up	Idle	ON
		Vehicle speed is 64 km/h (40 MPH) or more in "D" position	OFF
FR O2 HEATER	● Engine speed: Idle		ON
	● Engine speed: Above 3,200 rpm		OFF
RR O2 HEATER	● Engine speed: Idle		ON
	● Engine speed: Above 3,200 rpm		OFF
VC/V BYPASS/V	● Ignition switch: ON		OFF
PURG CONT S/V	● Engine: After warming up ● Shift lever: N ● No-load ● M/T models: Jack up drive wheels and shift to 1st gear position.	Idle	OFF
		A/T models: 2,000 rpm M/T models: 2,000 rpm and more than 16 km/h (10 MPH)	ON
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	15.0 - 30.0%
		2,500 rpm	13.0 - 28.0%
ABSOL TH·P/S	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.0%
		Throttle valve fully opened	Approx. 89%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s
MAP/BARO SW/V	Engine is not running		BARO
	Idle (5 seconds after starting engine)		MAP
ABSOL PRES/SE	● Engine: After warming up	Engine is not running	Approx. 4.4V
		Idle (5 seconds after starting engine)	Approx. 1.2V

Major Sensor Reference Graph in Data Monitor Mode

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

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

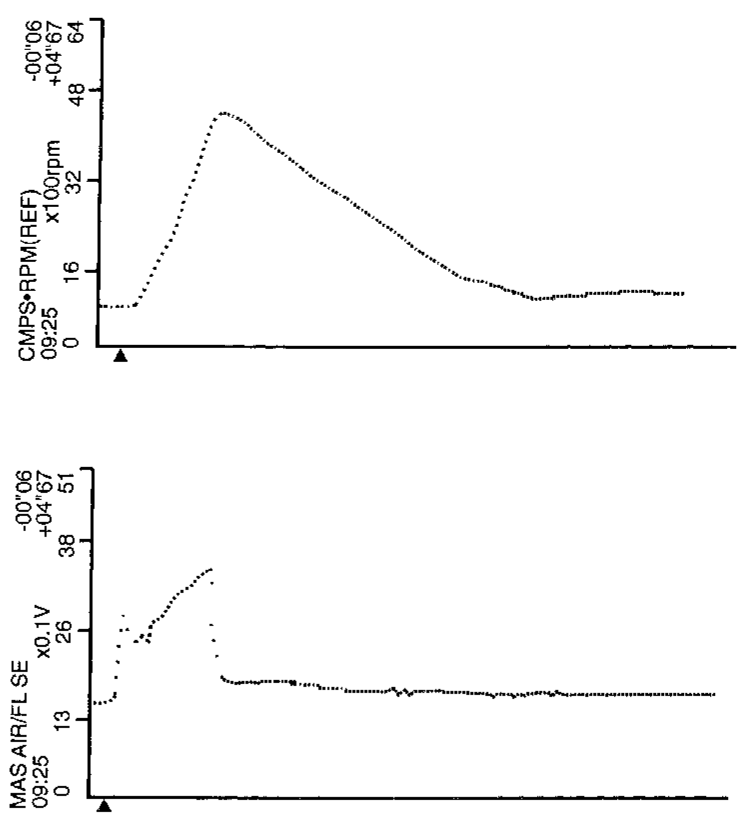
Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL/P SW" when depressing the accelerator pedal with the ignition switch "ON".
The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL/P SW" is changed from "ON" to "OFF".



SEF058P

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

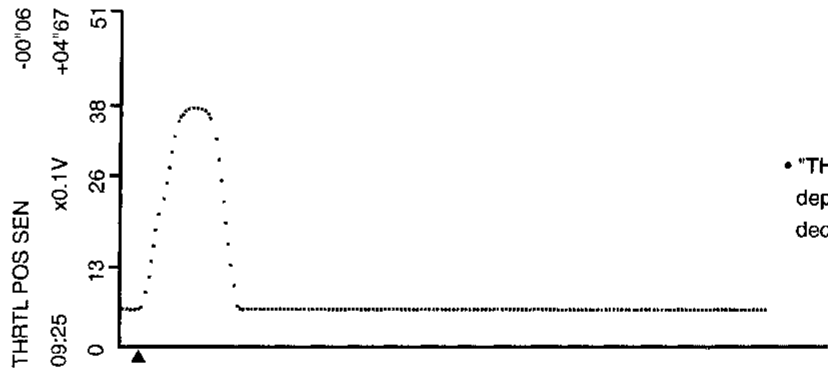
Below is the data for "CMPS·RPM (REF)", "MAS AIR/FL SE", "THRTL POS SEN", "RR O2 SENSOR", "FR O2 SENSOR" and "INJ PULSE" when revving quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



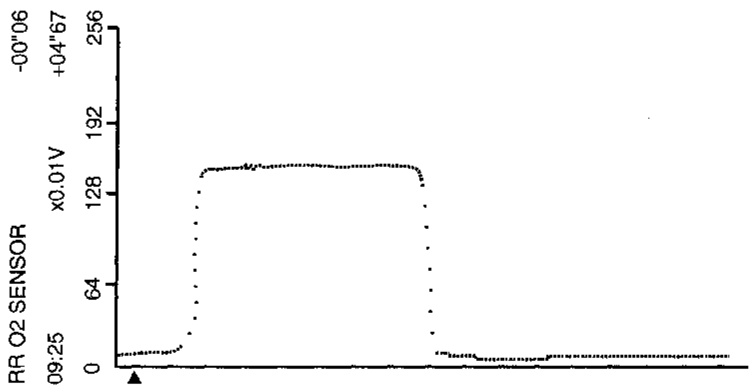
- "CMPS•RPM(REF)" should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intermittent drop or rise.
- "MAS AIR/FL SE" should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is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

SEF059P

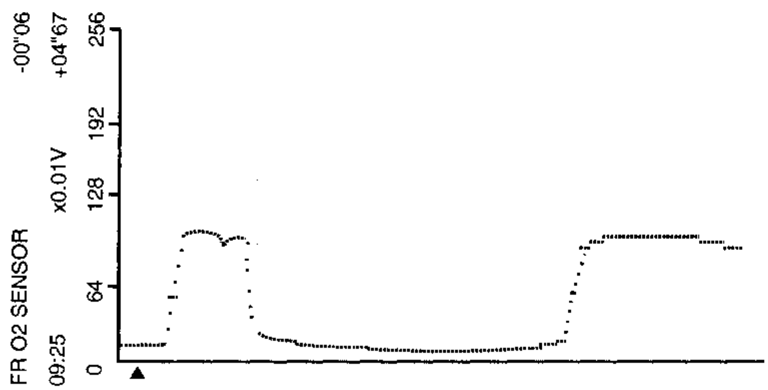
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



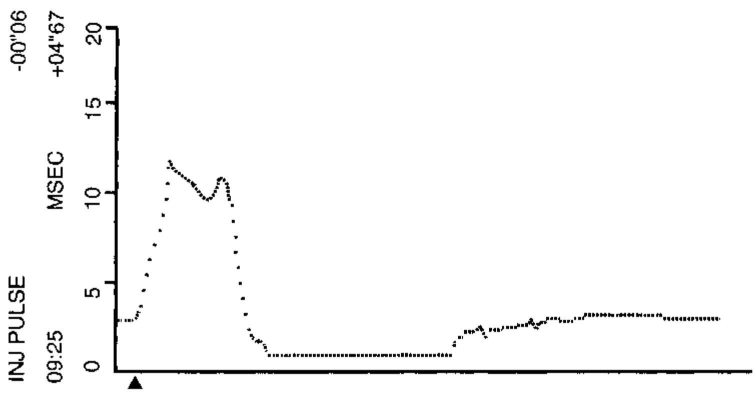
- "THRTL POS SEN" should increase while depressing the accelerator pedel and should decrease while releasing it.



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



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

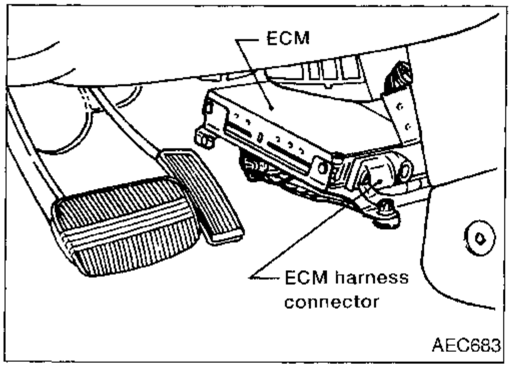


- "INJ PULSE" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

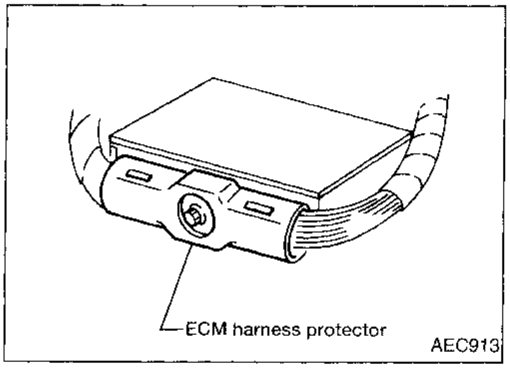
SEF060P

ECM Terminals and Reference Value

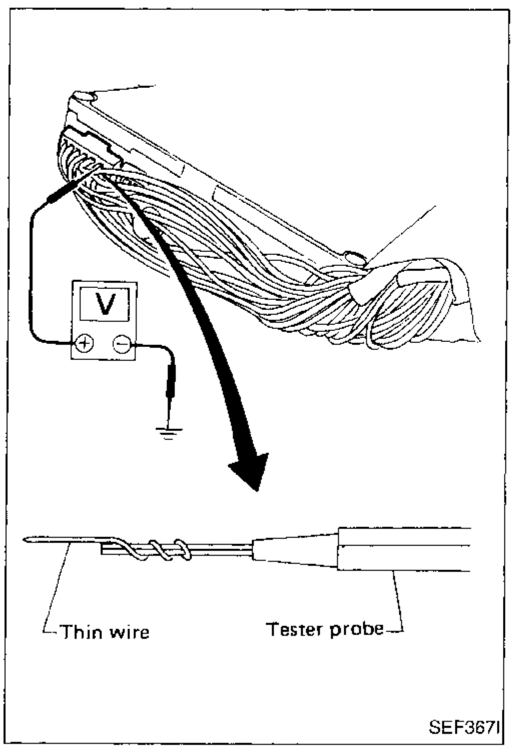
PREPARATION



1. ECM is located behind the center console. For this inspection, remove the front passenger center console panel.

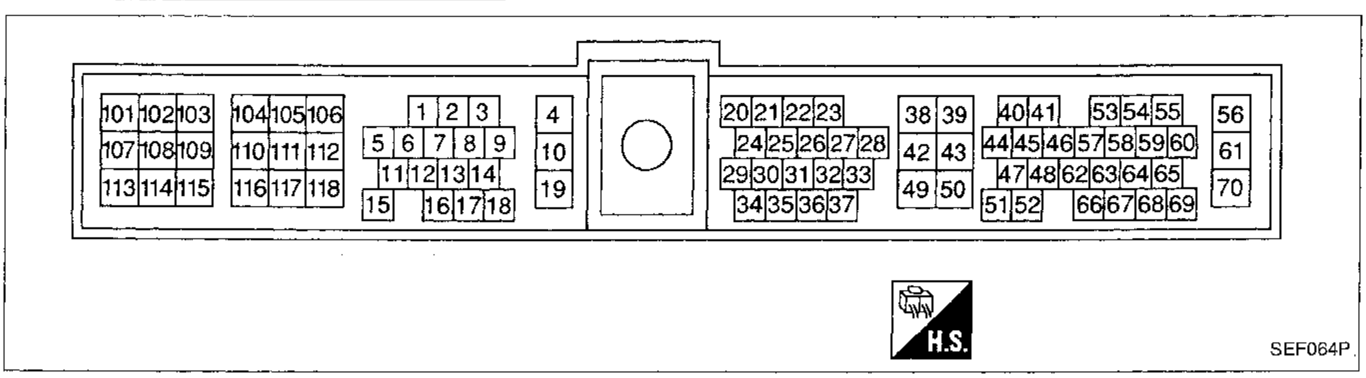


2. Remove ECM harness protector.



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

ECM HARNESS CONNECTOR TERMINAL LAYOUT



GI
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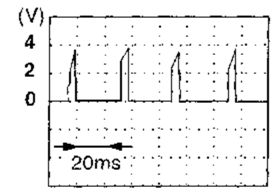
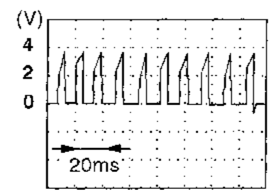
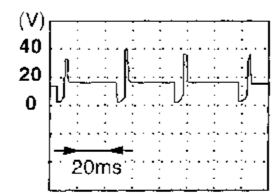
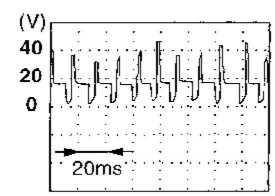
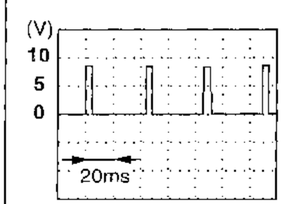
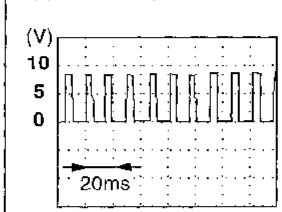
ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

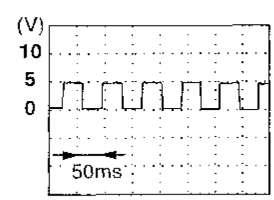
Specification data are reference values and are measured between each terminal and 43 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
1	W/B	Ignition signal	[Engine is running.] (Warm-up condition) └ Idle speed	0.2 - 0.6V  SEF186T
			[Engine is running.] └ Engine speed is 2,000 rpm	0.7 - 0.9V  SEF187T
2	W	Ignition check	[Engine is running.] (Warm-up condition) └ Idle speed	Approximately 13V  SEF188T
			[Engine is running.] └ Engine speed is 2,000 rpm.	Approximately 13V  SEF189T
3	L/OR	Tachometer	[Engine is running.] (Warm-up condition) └ Idle speed	Approximately 1V  SEF190T
			[Engine is running.] └ Engine speed is 2,000 rpm	Approximately 2.4V  SEF191T

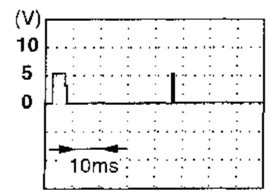
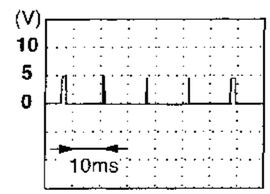
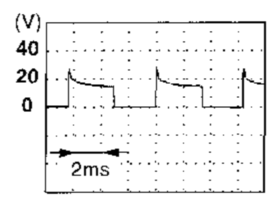
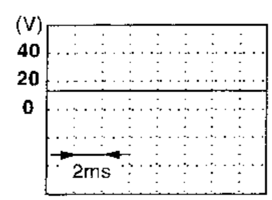
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
4	W/G	ECCS relay (Self-shutoff)	[Engine is running.] [Ignition switch "OFF"] For a few seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
5	L	EVAP canister purge volume control valve	[Engine is running.] (Warm-up condition) Idle speed	0 - 0.4V
6	G			
8	B/P	Fuel pump relay	[Ignition switch "ON"] For 5 seconds after turning ignition switch "ON" [Engine is running.]	0 - 1V
			[Ignition switch "ON"] More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
10	B	ECCS ground	[Engine is running.] Idle speed	Engine ground
13	LG (A/T models)	Cooling fan relay (High)	[Engine is running.] Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running.] Cooling fan (High) is operating	0.07 - 0.10V
14	LG/R	Cooling fan relay	[Engine is running.] Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running.] Cooling fan is operating	0.07 - 0.30V
15	G/Y	Air conditioner relay	[Engine is running.] Both A/C switch and blower switch are "ON"	0 - 0.3V
			[Engine is running.] A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
16	Y	EVAP canister purge volume control valve	[Engine is running.] Idle speed	BATTERY VOLTAGE (11 - 14V)
17	OR			
18	OR/L	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	B/Y	Start signal	[Ignition switch "ON"]	Approximately 0V
			[Ignition switch "START"]	BATTERY VOLTAGE (11 - 14V)

ECM Terminals and Reference Value (Cont'd)

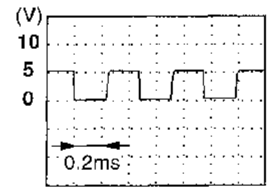
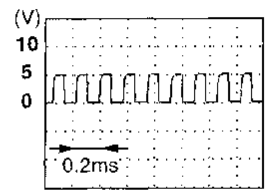
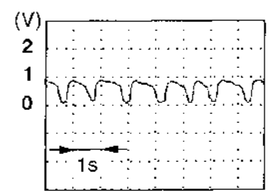
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
21	L/W	Air conditioner switch	Engine is running. — Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			Engine is running. — Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
22	G/OR	Neutral position switch (M/T models) Inhibitor switch (A/T models)	Ignition switch "ON" — Gear position is "Neutral position" (M/T models) — Gear position is "N" or "P" (A/T models)	Approximately 0V
			Ignition switch "ON" — Except the above gear position	A/T models: BATTERY VOLTAGE (11 - 14V) M/T models: Approximately 5V
23	Y	Throttle position sensor	Ignition switch "ON" — Accelerator pedal released	0.35 - 0.65V
			Ignition switch "ON" — Accelerator pedal fully depressed	Approximately 4V
24	LG/B	Blower fan switch	Ignition switch "ON" — Blower fan switch is "ON"	Approximately 0V
25	SB	Power steering oil pressure switch	Engine is running. — Steering wheel is being turned	Approximately 0V
			Engine is running. — Steering wheel is not being turned	Approximately 5V
26	PU/R	Vehicle speed sensor	Engine is running. — Lift up the vehicle. — In 2nd gear position — Vehicle speed is 40 km/h (25 MPH).	0 - Approximately 4.2V  SEF194T
27	LG	Throttle position switch (Closed position)	Ignition switch "ON" (Warm-up condition) — Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" — Accelerator pedal depressed	Approximately 0V
28	R/Y	Intake air temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
30	P/B	Torque converter clutch solenoid valve (A/T models only)	Engine is running — Idle speed	Approximately 0V
			Engine is running (Warm-up condition) — Vehicle speed is 64 km/h (40 MPH) or more in "D" position	BATTERY VOLTAGE (11 - 14V)

ECM Terminals and Reference Value (Cont'd)

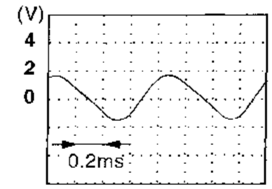
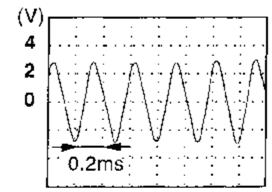
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
38	B/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
40 44	L L	Camshaft position signal (Reference signal)	Engine is running. (Warm-up condition) └ Idle speed	0.1 - 0.4V  SEF199T
			Engine is running. └ Engine speed is 2,000 rpm.	0.1 - 0.4V  SEF200T
42	PU/W	IACV-AAC valve (Close)	Engine is running. (Warm-up condition) └ Idle speed	5 - 9V  SEF197T
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 13V  SEF198T
43	B	ECCS ground	Engine is running. └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)

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

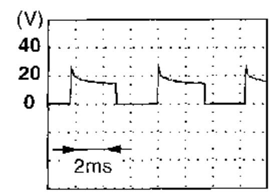
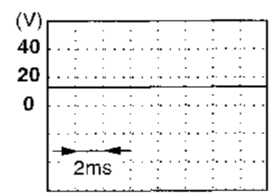
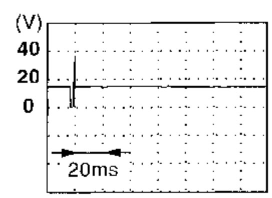
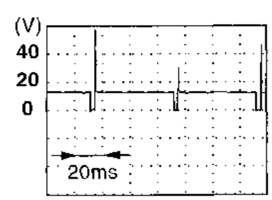
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
41 45	B/W	Camshaft position sensor (Position signal)	[Engine is running.] (Warm-up condition) └ Idle speed	Approximately 2.5V  SEF195T
			[Engine is running.] └ Engine speed is 2,000 rpm.	Approximately 2.4V  SEF196T
46	W	Front heated oxygen sensor	[Engine is running.] └ After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF201T
47	G	Mass air flow sensor	[Engine is running.] (Warm-up condition) └ Idle speed	1.0 - 1.7V
			[Engine is running.] (Warm-up condition) └ Engine speed is 2,000 rpm	1.5 - 2.1V
48	R	Mass air flow sensor ground	[Engine is running.] (Warm-up condition) └ Idle speed	0.005 - 0.02V
49	P/L	Throttle position sensor power supply	[Ignition switch "ON"]	Approximately 5V
50	B	Sensors' ground	[Engine is running.] (Warm-up condition) └ Idle speed	0.001 - 0.02V
51	BR/Y	Engine coolant temperature sensor	[Engine is running.]	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
52	W	Rear heated oxygen sensor	[Engine is running.] └ After warming up sufficiently and engine speed is 3,000 rpm	0 - Approximately 1.0V

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
53	W	Crankshaft position sensor (OBD)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.03V  SEF202T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.03V  SEF203T
54	W	Knock sensor	Engine is running. └ Idle speed	2.0 - 3.0V
55	L/R	Rear defogger relay	Ignition switch "ON" └ Rear defogger is "OFF"	Approximately 0V
			Ignition switch "ON" └ Rear defogger is "ON"	BATTERY VOLTAGE (11 - 14V)
56 61	W/R W/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
58	L/B	Data link connector for GST	Engine is running. └ Idle speed (GST is disconnected)	6 - 10V
60	R/L	Headlamp switch	Lighting switch "ON"	BATTERY VOLTAGE (11 - 14V)
			Lighting switch "OFF"	Approximately 0V
62	R/B	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V
			Engine is running. (Warm-up condition) └ EGR system is operating	0 - 3.0V
63	LG/R	Tank fuel temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with fuel temperature.
64	G/B	Data link connector for CONSULT	Engine is running. └ Idle speed (CONSULT is connected and turned on)	Approximately 0V
65	GY/L			Approximately 4 - 9V
68	G/W			Approximately 3.5V
66	W	Absolute pressure sensor	Ignition switch "ON" └ Engine is not running.	Approximately 4.4V
			Engine is running. (Warm-up condition) └ Idle speed (5 seconds after starting engine)	Approximately 1.4V

ECM Terminals and Reference Value (Cont'd)

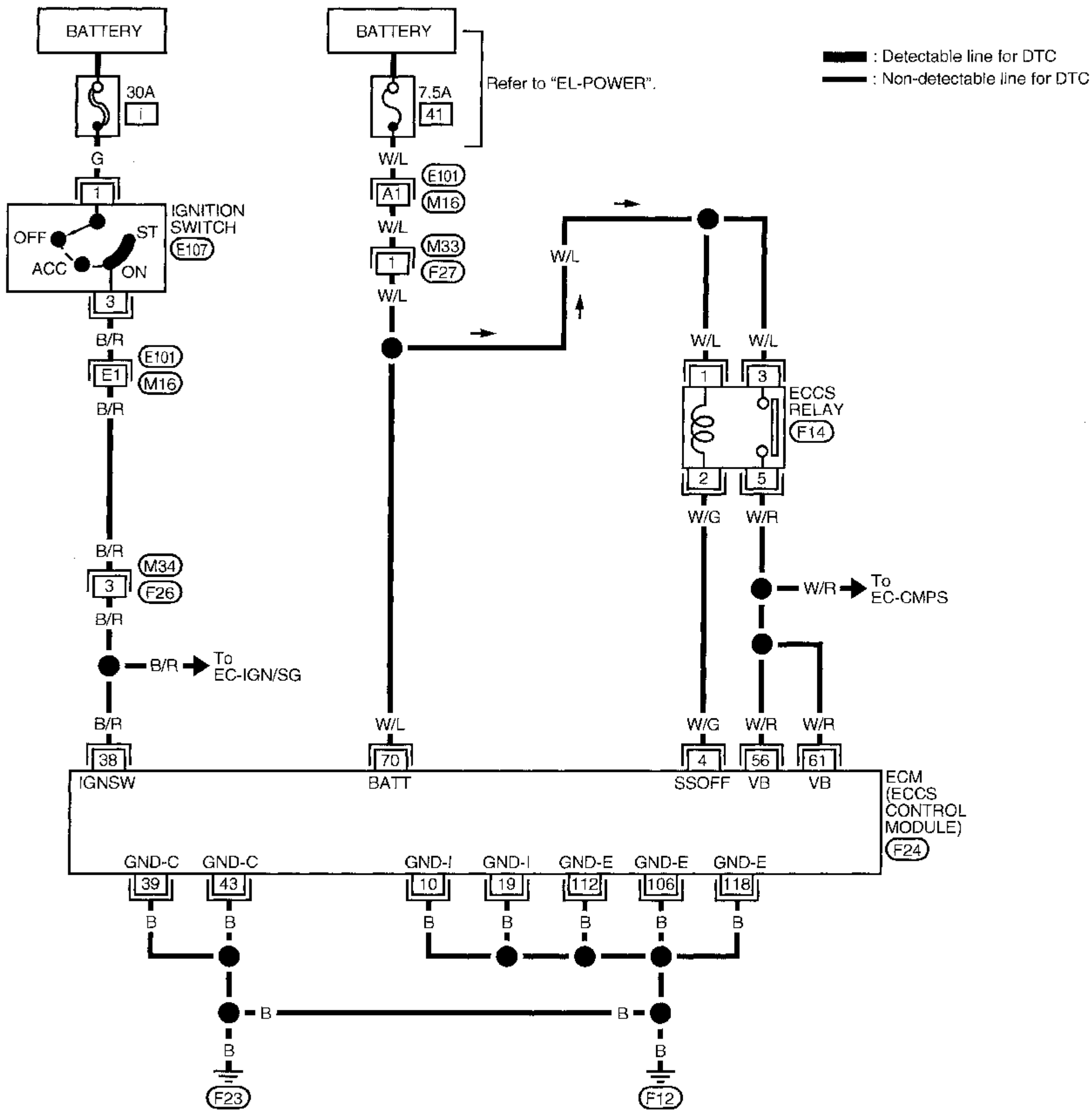
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
67	W	EVAP control system pressure sensor	[Ignition switch "ON"]	Approximately 3.4V
69	GY/R	MAP/BARO switch solenoid valve	[Ignition switch "ON"] — Engine is not running.	BATTERY VOLTAGE (11 - 14V)
			[Engine is running.] — Idle speed (5 seconds after starting engine)	Approximately 0V
70	W/L	Power supply (Back-up)	[Ignition switch "OFF"]	BATTERY VOLTAGE (11 - 14V)
101	SB	IACV-AAC valve (Open)	[Engine is running.] (Warm-up condition) — Idle speed	Approximately 10V  SEF197T
			[Engine is running.] (Warm-up condition) — Engine speed is 2,000 rpm	Approximately 0V  SEF198T
102	R/B	Injector No. 1	[Engine is running.] (Warm-up condition) — Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF204T
104	G/B	Injector No. 3		
107	Y/B	Injector No. 2	[Engine is running.] (Warm-up condition) — Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)  SEF205T
109	L/B	Injector No. 4		
103	P	EGRC-solenoid valve	[Engine is running.] (Warm-up condition) — M/T models: Jack up front wheels and drive wheels at 16 km/h (10 MPH) — Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
			[Engine is running.] (Warm-up condition) — Idle speed	Approximately 0V

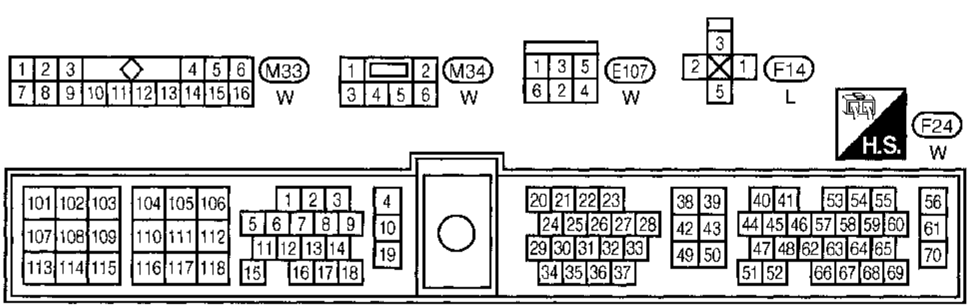
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
105	PU	EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) — M/T models: Jack up front wheels and drive wheels at 16 km/h (10 MPH) — Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) — Idle speed	Approximately 0V
106	B	ECCS ground	Engine is running. — Idle speed	Engine ground
108	PU/W	EVAP canister vent control valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
110	R/W	Front heated oxygen sensor heater	Engine is running. — Engine speed is below 3,200 rpm.	Approximately 0V
			Engine is running. — Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
112	B	ECCS ground	Engine is running. — Idle speed	Engine ground
114	Y/R	Intake valve timing control solenoid valve	Engine is running. — Idle speed	BATTERY VOLTAGE (11 - 14V)
			Engine is running. — Engine speed is 2,000 rpm	Approximately 0V
115	OR	Front heated oxygen sensor heater	Engine is running. — Engine speed is below 3,200 rpm	Approximately 0V
			Engine is running. — Engine speed is above 3,200 rpm	BATTERY VOLTAGE (11 - 14V)
117	PU/R	Vacuum cut valve bypass valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
118	B	ECCS ground	Engine is running. — Idle speed	Engine ground

Main Power Supply and Ground Circuit

EC-MAIN-01





Refer to last page (Foldout page).
M16 , E101

AEC240A

Main Power Supply and Ground Circuit (Cont'd)

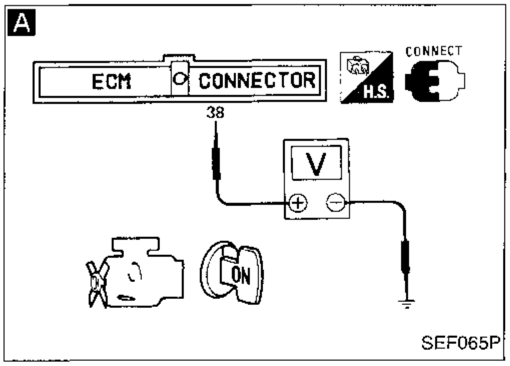
ECM TERMINALS AND REFERENCE VALUE

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

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

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

Main Power Supply and Ground Circuit (Cont'd)

A


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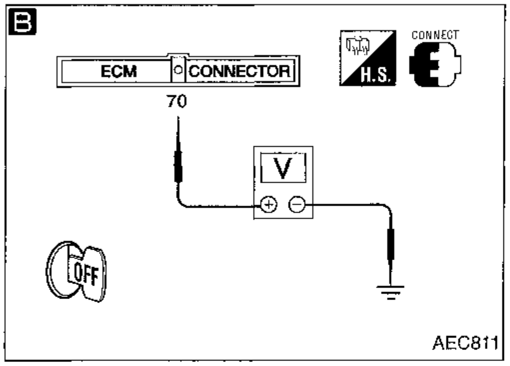

AEC811

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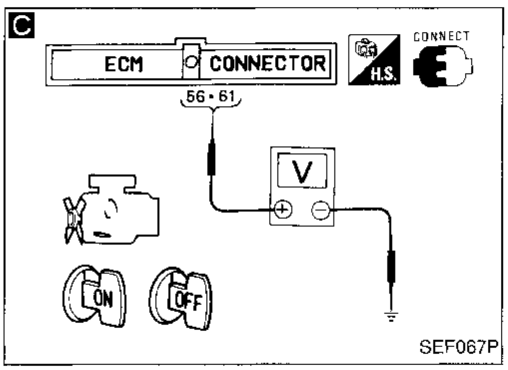

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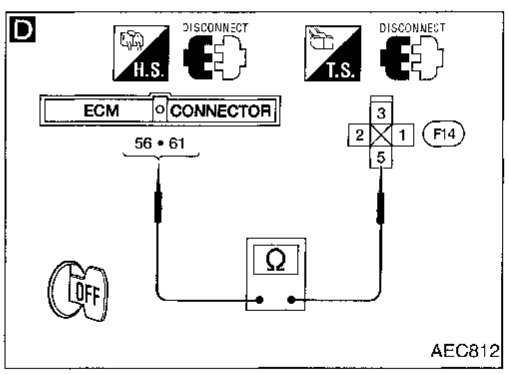


AEC812

INSPECTION START

↓

Start engine.
Is engine running?

- No → **A**

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

If NG, check the following.
- Harness connectors (M16), (E101)
- Harness connectors (F26), (M34)
- Harness for open or short between ECM and ignition switch

If NG, repair harness or connectors.

↓ OK

Go to **H** "CHECK GROUND CIRCUIT" on next page.

- Yes → **B**

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

NG →

Check the following.
- Harness connectors (M16), (E101)
- Harness connectors (F27), (M33)
- 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 "OFF".
2. Check voltage between ECM terminals (56), (61) and ground with CONSULT or tester.
   After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

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

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

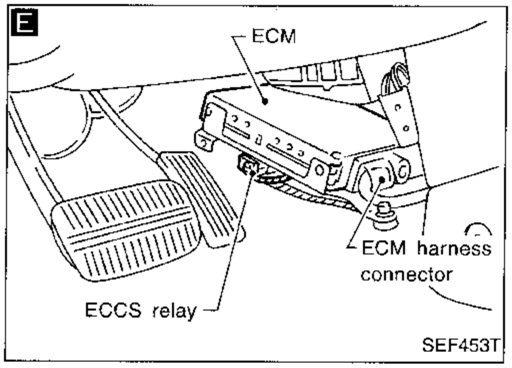
↓ NG

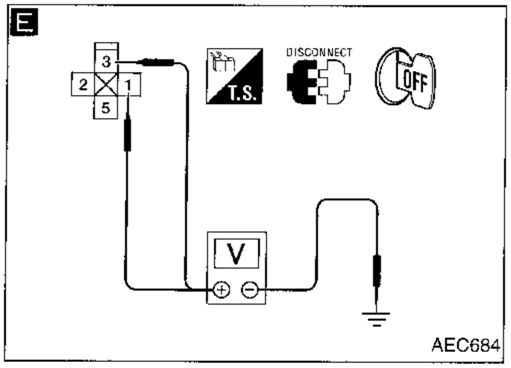
Case-2 → Go to **G** "CHECK ECCS RELAY" on next page.

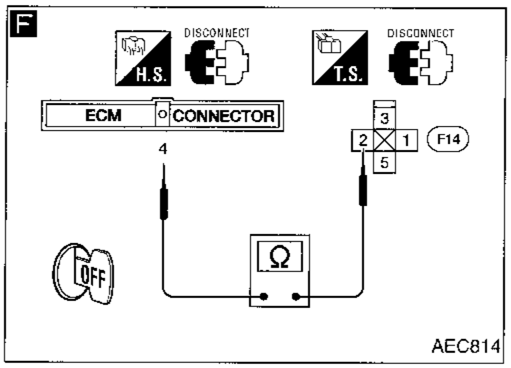
Case-1 ↓

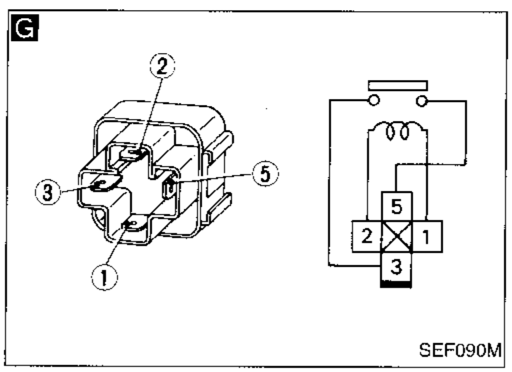
(A)
(Go to next page.)

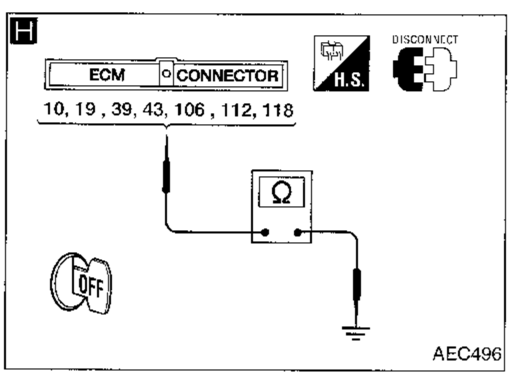
Main Power Supply and Ground Circuit (Cont'd)











Ⓐ

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 56, 61 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 terminals 1, 3 and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- 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 terminal 2.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

G

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

NG → Replace ECCS relay.

OK ↓

H

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 10, 19, 39, 43, 106, 112, 118 and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

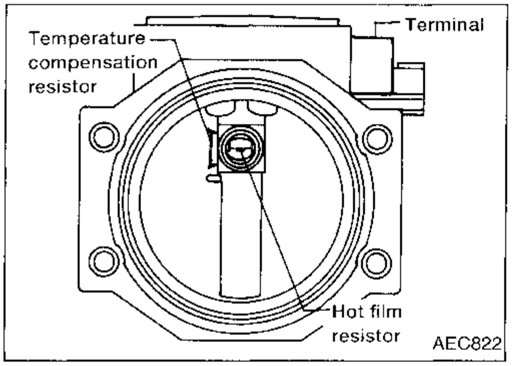
OK ↓

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

↓

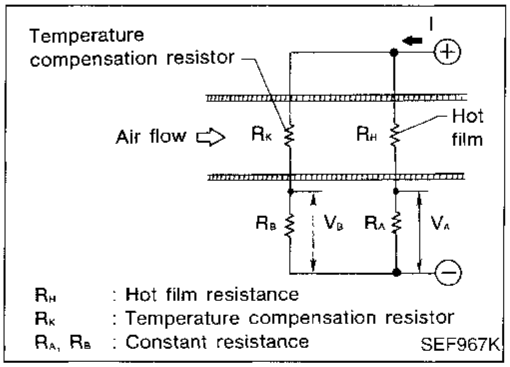
INSPECTION END

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



Mass Air Flow Sensor (MAFS)

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 resistor that is supplied with electric current from the ECM. The temperature of the hot film resistor is controlled by the ECM a certain amount. The heat generated by the hot film resistor is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film resistor as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	1.0 - 1.7V
		2,000 rpm	1.5 - 2.1V
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
47	G	Mass air flow sensor	Engine is running. (Warm-up condition) Idle speed	1.0 - 1.7V
			Engine is running. (Warm-up condition) Engine speed is 2,000 rpm	1.5 - 2.1V
48	R	Mass air flow sensor ground	Engine is running. (Warm-up condition) Idle speed	0.005 - 0.02V
56 61	W/R W/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

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

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

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

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

OR

NO TOOLS
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) Run engine for at least 10 seconds at idle speed.

OR

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

OR

NO TOOLS
1) Turn ignition switch "ON".
2) Start engine and warm it up sufficiently.
3) Run engine for at least 10 seconds at idle speed.
4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
5) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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 DTC might not be confirmed.

Procedure for malfunction C

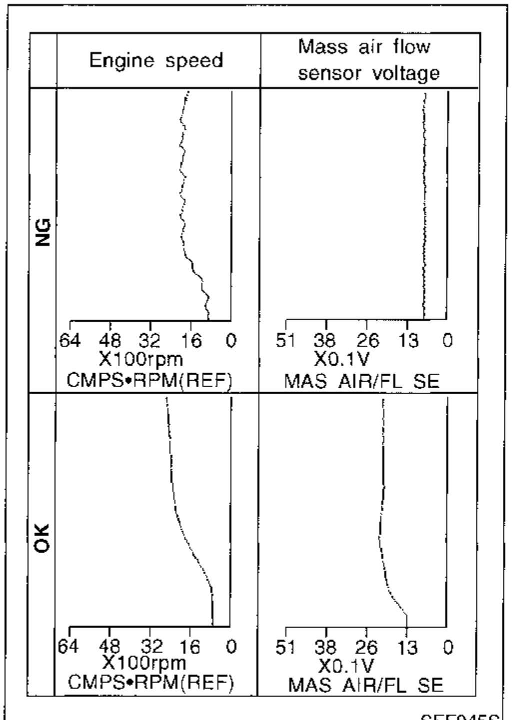
1) Turn ignition switch "ON".
2) Start engine and warm it up sufficiently.
3) Select "DATA MONITOR" mode with CONSULT.
4) Check the voltage of mass air flow sensor with "DATA MONITOR".
5) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

OR

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

OR

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



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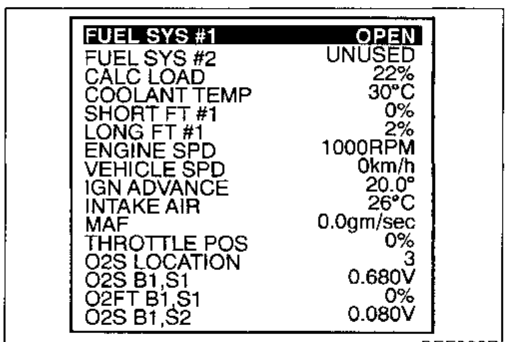

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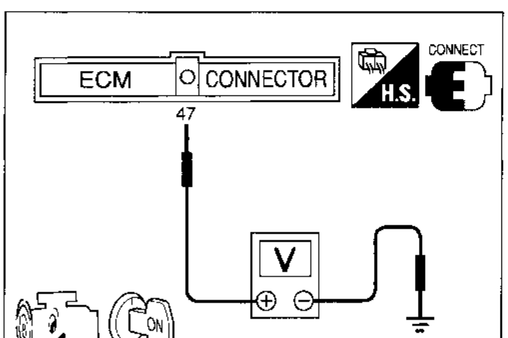
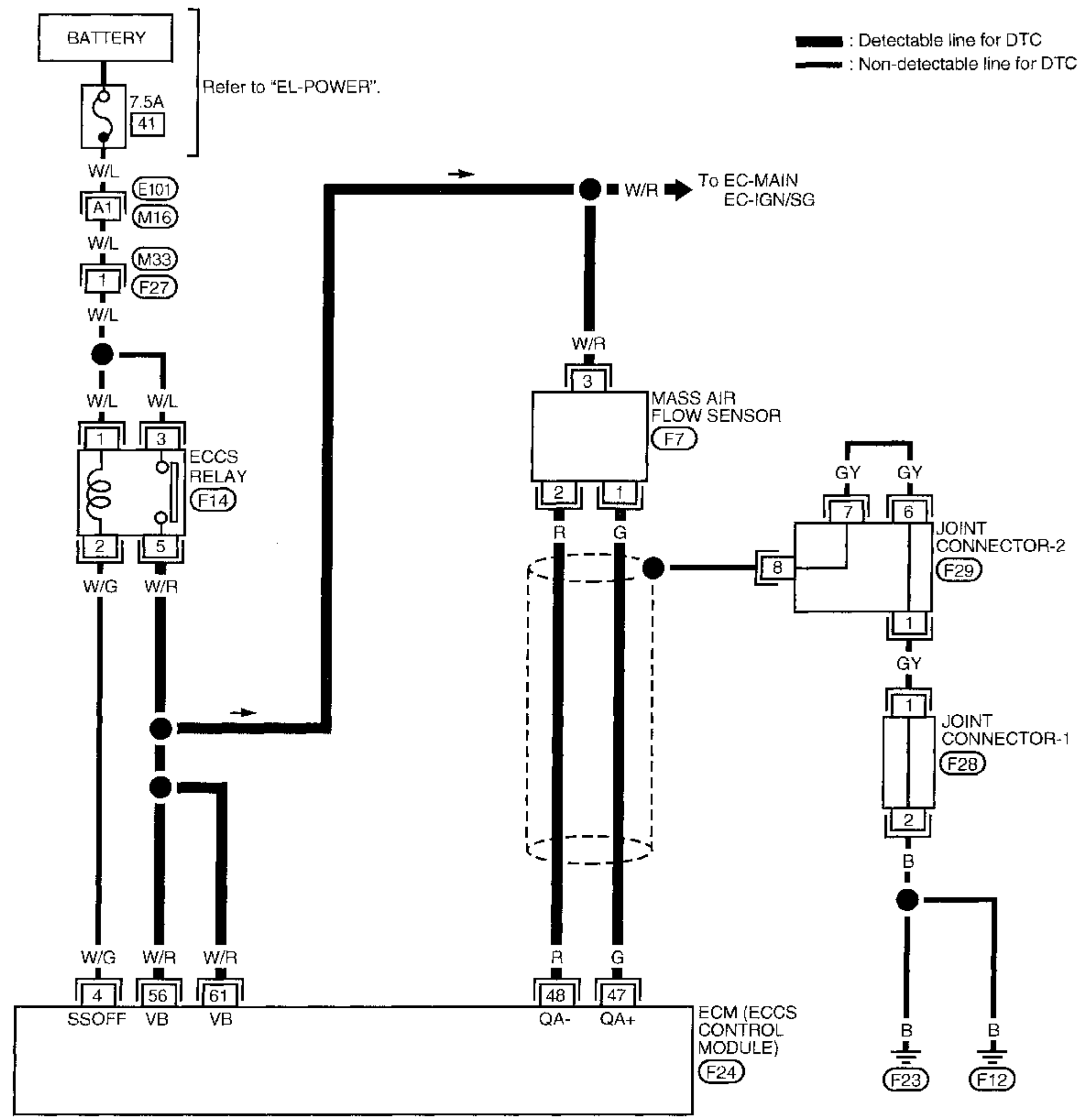
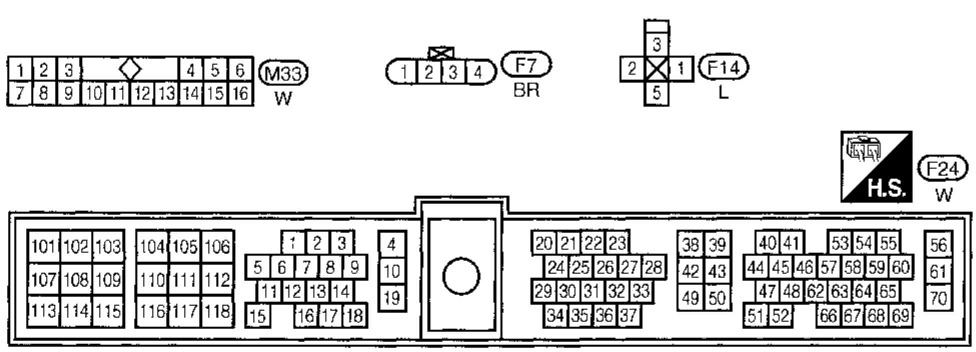


SEF999N

EC-MAFS-01





Refer to last page (Foldout page).
M16 , E101
F28
F29

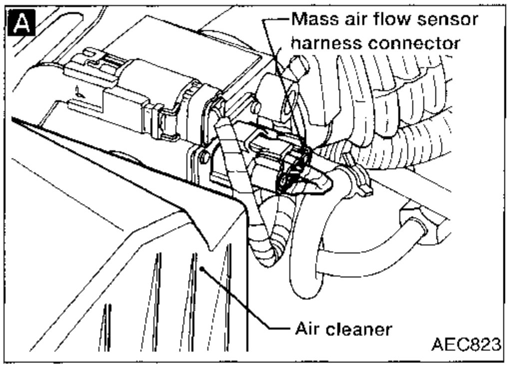
AEC241A

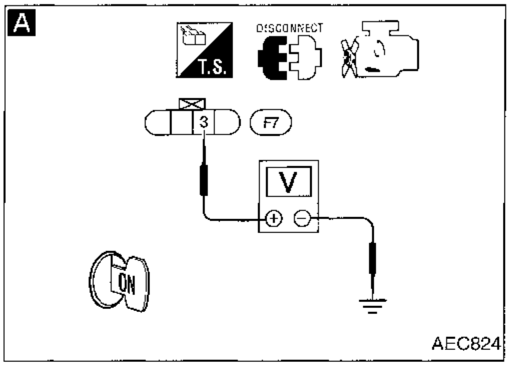
Mass Air Flow Sensor (MAFS) (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

↓



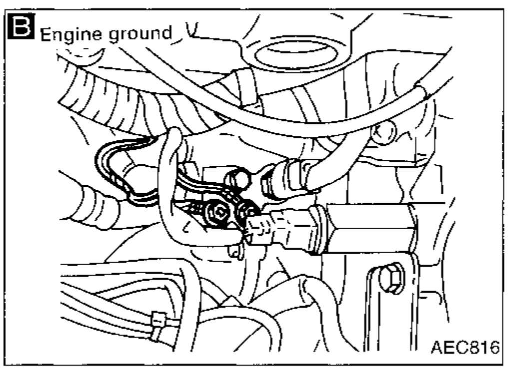


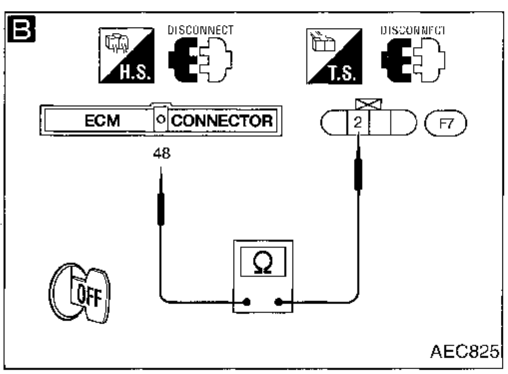
A

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

NG → Repair harness or connectors.

OK ↓



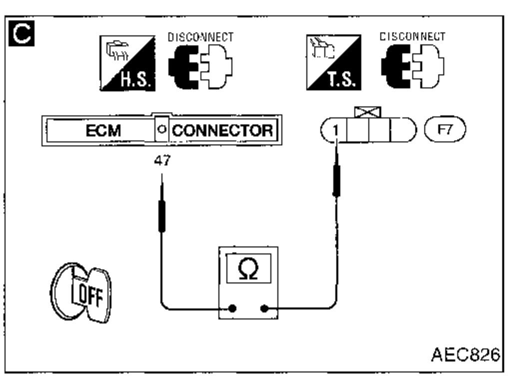


B

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

NG → Repair harness or connectors.

OK ↓



C

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

NG → Repair harness or connectors.

OK ↓

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

NG → Replace mass air flow sensor.

OK ↓

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

Trouble is not fixed. ↓

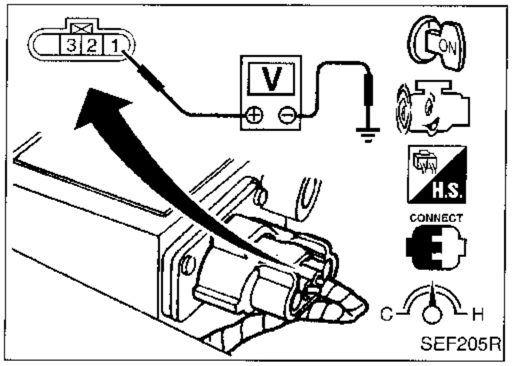
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

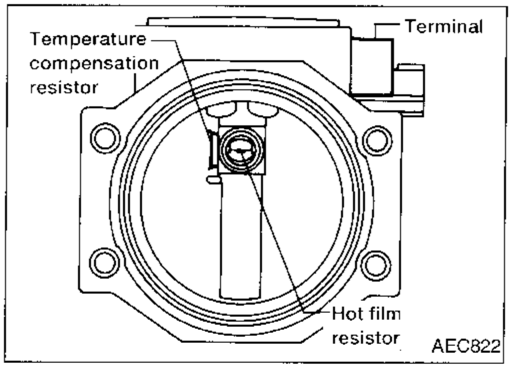
INSPECTION END

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

COMPONENT INSPECTION



SEF205R



AEC822

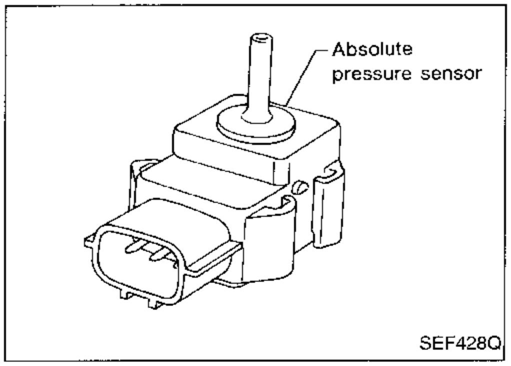
Mass air flow sensor

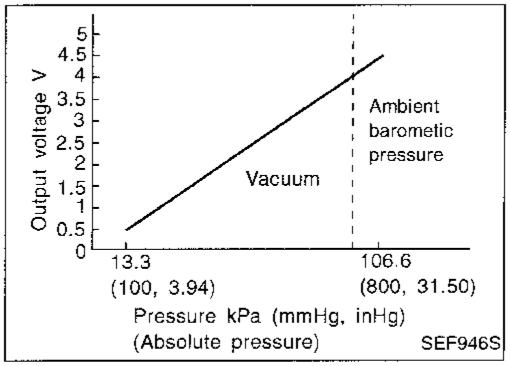
1. Turn ignition switch "ON".
2. Start engine and warm it up sufficiently.
3. Check voltage between terminal ① and ground.

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

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

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





Absolute Pressure Sensor

The absolute pressure sensor is connected to the MAP/BARO switch solenoid valve by a hose. The sensor detects ambient barometric pressure and intake manifold pressure and sends the voltage signal to the ECM. As the pressure increases, the voltage rises. The absolute pressure sensor is not used to control the engine system.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

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

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
39	B	ECCS ground	[Engine is running.] └ Idle speed	Engine ground
49	P/L	Throttle position sensor power supply	[Ignition switch "ON"]	Approximately 5V
50	B	Sensors' ground	[Engine is running.] (Warm-up condition) └ Idle speed	0.001 - 0.02V
66	W	Absolute pressure sensor	[Ignition switch "ON"] └ Engine is not running.	Approximately 4.4V
			[Engine is running.] (Warm-up condition) └ Idle speed (5 seconds after starting engine)	Approximately 1.4V

ON BOARD DIAGNOSIS LOGIC

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

Procedure for malfunction A

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

OR

GST
1) Start engine and wait at least 6 seconds.
2) Select "MODE 3" with GST.

OR

NO TOOLS
1) Start engine and wait at least 6 seconds.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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

Procedure for malfunction C

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 "DATA MONITOR" mode with CONSULT.
4) Start engine and let it idle.
5) Wait at least 20 seconds.

OR

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

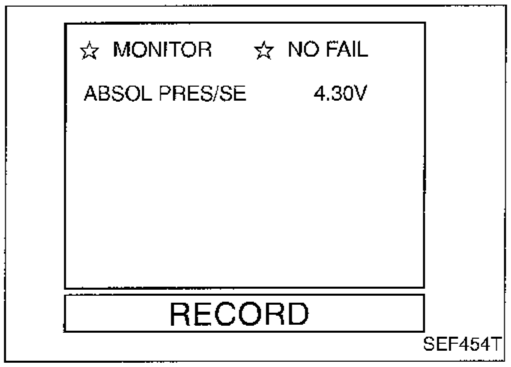
OR

NO TOOLS
1) Start engine and warm it up sufficiently.

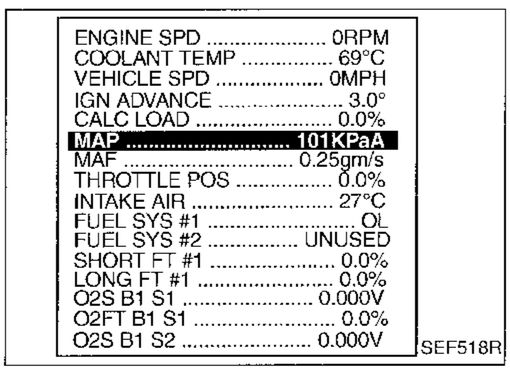
GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

Absolute Pressure Sensor (Cont'd)

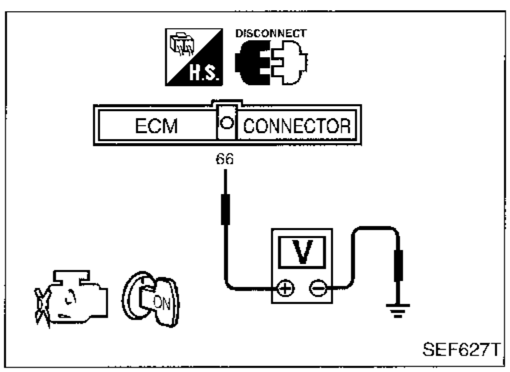
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine.
4) Let engine idle and wait at least 20 seconds.
5) Turn ignition switch "OFF".
6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



SEF454T



SEF518R



SEF627T

OVERALL FUNCTION CHECK

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

Procedure for malfunction B

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

OR

1) Turn ignition switch "ON".
2) Select "MAP" in "MODE 1" with GST.
3) Make sure that the pressure of "MAP" is more than 46 kPa (0.47 kg/cm^2, 6.7 psi).

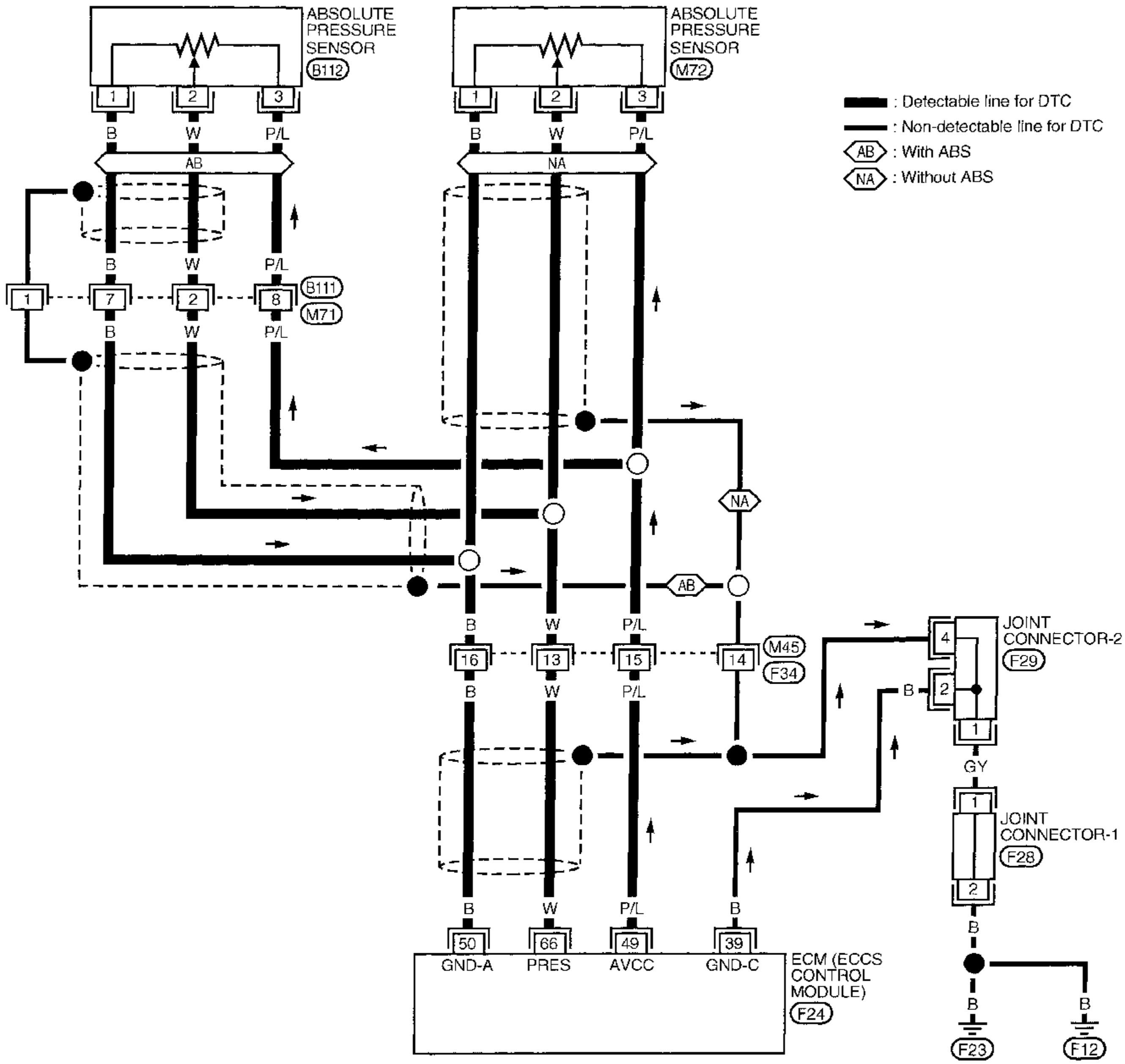
OR

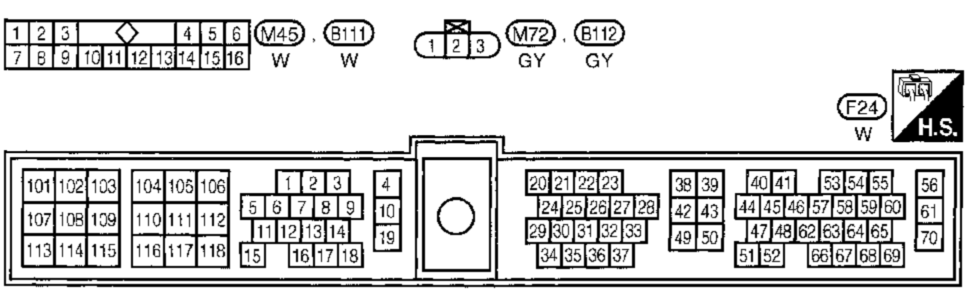
1) Turn ignition switch "ON".
2) Make sure that the voltage between ECM terminal ⑥⑥ and ground is more than 1.74 [V].

If the DTC cannot be confirmed, perform "Procedure for malfunction C" on the previous page.

Absolute Pressure Sensor (Cont'd)

EC-AP/SEN-01





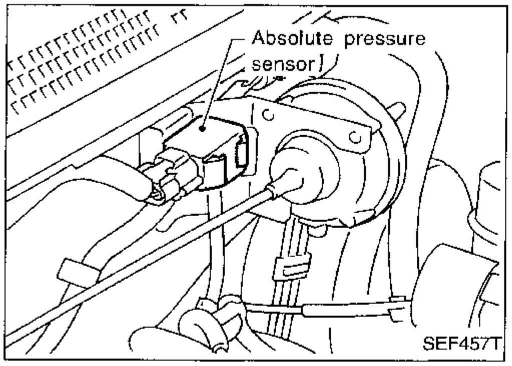
Refer to last page (Foldout page).
F28
F29

AEC236A

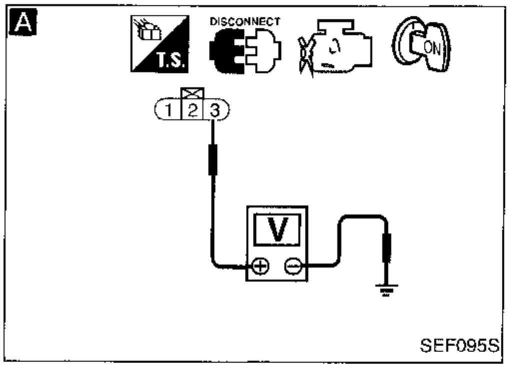
Absolute Pressure Sensor (Cont'd)

DIAGNOSTIC PROCEDURE

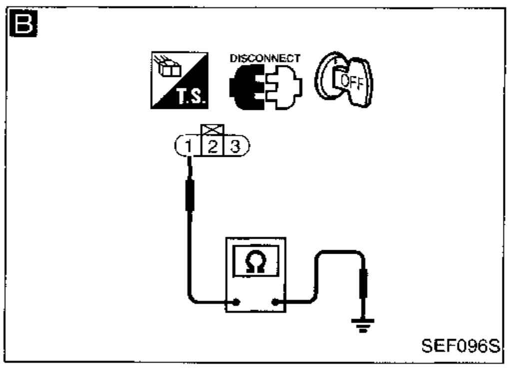
If the trouble is duplicated after "Procedure for malfunction A or B", perform "Procedure A" below. If the trouble is duplicated after "Procedure for malfunction C", perform "Procedure B" on next page.



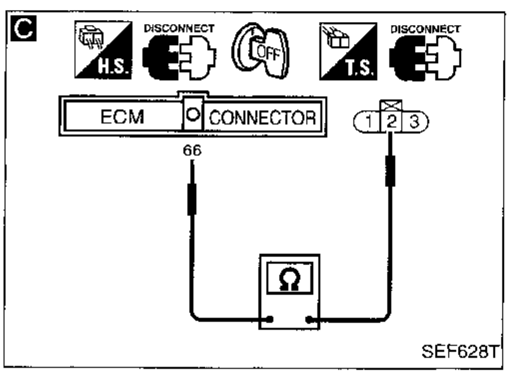
SEF457T



SEF095S



SEF096S



SEF628T

Procedure A

INSPECTION START

↓

A

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

NG → Check the following.
- Harness connectors
  With ABS: (B111), (M71), (M45), (F34)
  Without ABS: (M45), (F34)
- Harness for open or short between absolute pressure sensor and ECM

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

NG → Check the following.
- Harness connectors
  With ABS: (B111), (M71), (M45), (F34)
  Without ABS: (M45), (F34)
- Joint connector
  (F28), (F29)
- Harness for open or short between absolute pressure sensor and ECM

If NG, repair harness or connectors.

↓ OK

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑯ and terminal ②.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors
  With ABS: (B111), (M71), (M45), (F34)
  Without ABS: (M45), (F34)
- Harness for open or short between absolute pressure sensor and ECM

If NG, repair harness or connectors.

↓ OK

CHECK COMPONENT (Absolute pressure sensor).
Refer to "COMPONENT INSPECTION", EC-348.

NG → Replace absolute pressure sensor.

↓ OK

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

↓ Trouble is not fixed.

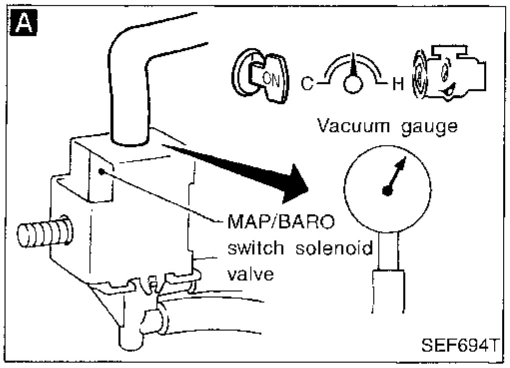
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

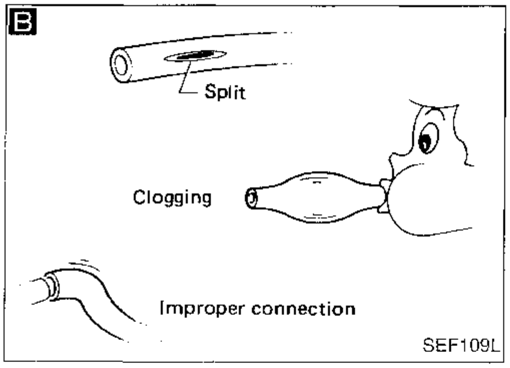
↓

INSPECTION END

Absolute Pressure Sensor (Cont'd)

Procedure B





INSPECTION START

↓

A

CHECK VACUUM SOURCE TO MAP/ BARO SWITCH SOLENOID VALVE.

1. Start engine and warm it up sufficiently.
2. Disconnect vacuum hose to absolute pressure sensor.
3. Check the vacuum pressure with vacuum gauge at idle.
   Vacuum pressure:
   Approx. −66.7 kPa (−500 mmHg, −19.69 inHg)

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

↓ OK

CHECK INTAKE SYSTEM. Check intake system for air leaks.

↓ OK

B

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

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

NG → Repair or reconnect hose.

↓ OK

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

NG → Replace absolute pressure sensor.

↓ OK

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

↓ Trouble is not fixed.

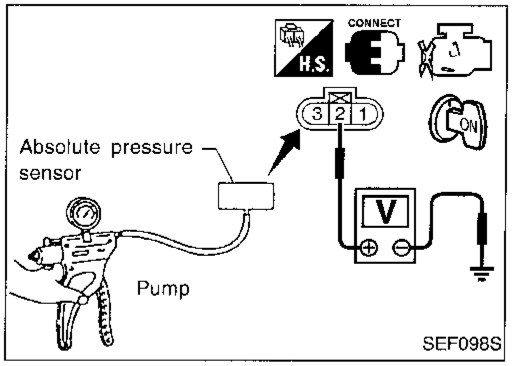
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Absolute Pressure Sensor (Cont'd)

COMPONENT INSPECTION

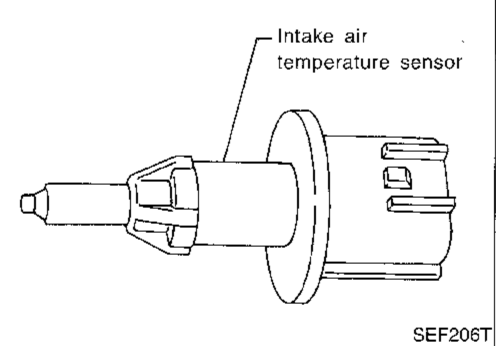


Absolute pressure sensor

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

CAUTION:
Always calibrate the vacuum pump gauge when using it.

5. If NG, replace absolute pressure sensor.



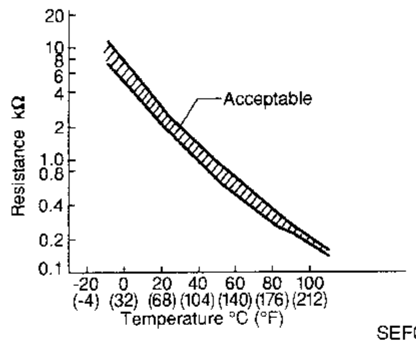
SEF206T

Intake Air Temperature Sensor

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

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

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



SEF012P

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

* These data are reference values and are measured between ECM terminal (28) (Intake air temperature sensor) and ECM terminal (43) (ECCS ground).

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0110 0401	A) An excessively low or high voltage from the sensor is sent to ECM. B) Voltage sent to ECM is not practical when compared with the engine coolant temperature sensor signal.	• Harness or connectors (The sensor circuit is open or shorted.) • Intake air temperature sensor

Engine operating condition in fail-safe mode
The ECM controls on the assumption that the intake air temperature is 25°C (77°F).

Intake Air Temperature Sensor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Procedure for malfunction B

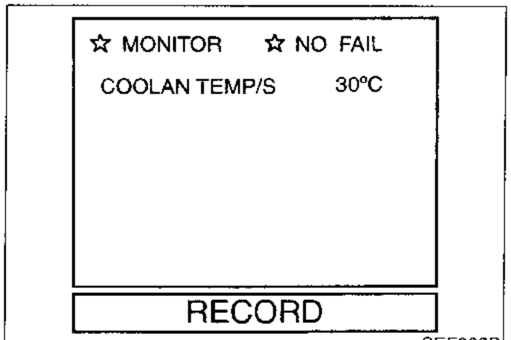
1) Lift up vehicle and open engine hood.
2) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Select "DATA MONITOR" mode with CONSULT.
   (c) Check the engine coolant temperature.
   (d) If the engine coolant temperature is not less than 90°C (194°F), 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 (A/T model) or control lever to 5th gear position (M/T model).
7) Hold vehicle speed at 70 to 80 km/h (43 to 50 MPH) for 2 minutes.

OR

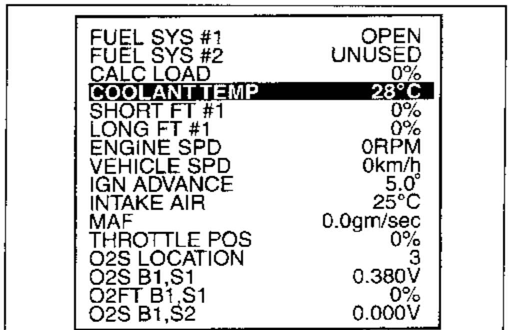
1) Lift up vehicle and open engine hood.
2) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Select MODE 1 with GST.
   (c) Check the engine coolant temperature.
   (d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before engine coolant temperature is above 90°C (194°F).
3) Start engine.
4) Shift selector lever to "D" position (A/T model) or control lever to 5th gear position (M/T model).
5) Hold vehicle speed at 70 to 80 km/h (43 to 50 MPH) for 2 minutes.
6) Select MODE 7 with GST.

OR

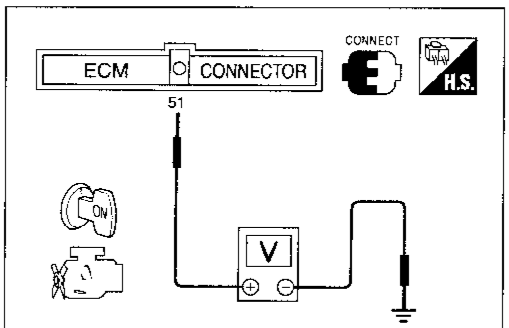
1) Lift up vehicle and open engine hood.
2) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Check voltage between ECM terminal (51) and ground.
   Voltage: More than 1.0 (V)
   (c) If the voltage is not more than 1.0 (V), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before the voltage is below 1.0V.
3) Start engine.
4) Shift selector lever to "D" position (A/T model) or control lever to 5th gear position (M/T model).
5) Hold vehicle speed at 70 to 80 km/h (43 to 50 MPH) for 2 minutes.



SEF002P



SEF950N

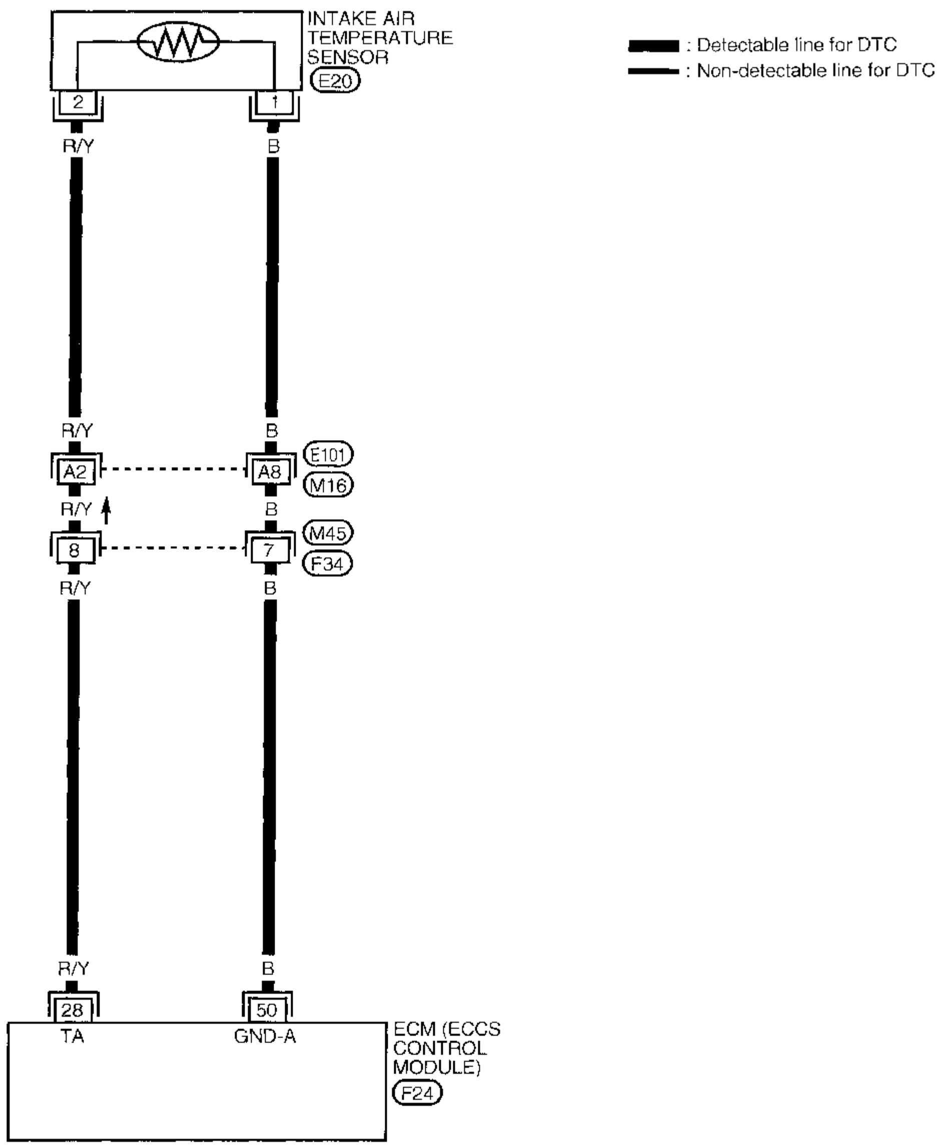


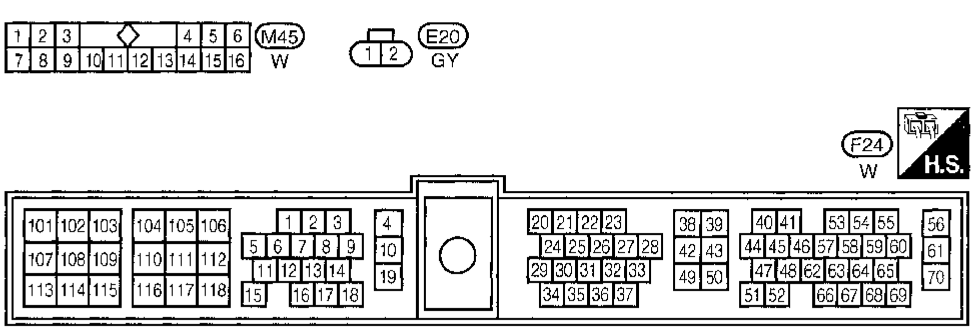
SEF006P

Intake Air Temperature Sensor (Cont'd)

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



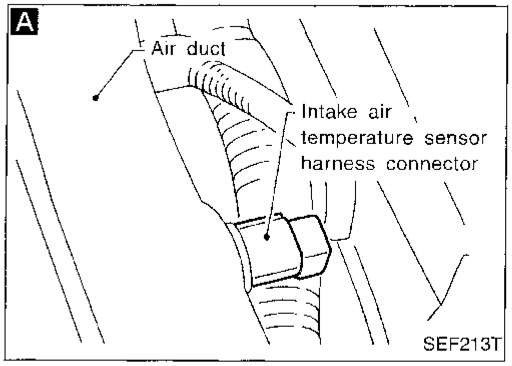


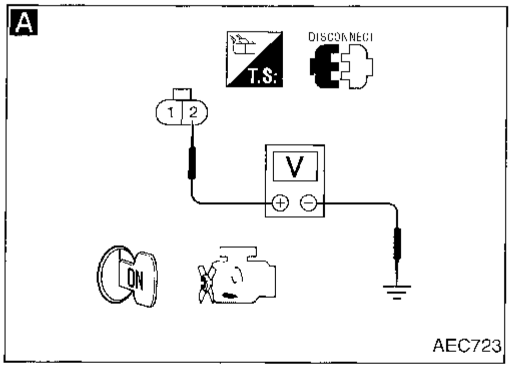
Refer to last page (Foldout page).
M16, E101

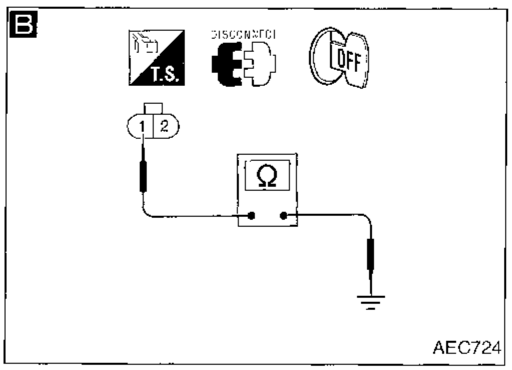
AEC242A

Intake Air Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

A

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

NG → Check the following.
- Harness connectors E101, M16, M45, F34
- Harness for open or short between ECM and intake air 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 E101, M16, M45, F34
- Harness for open or short between ECM 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.

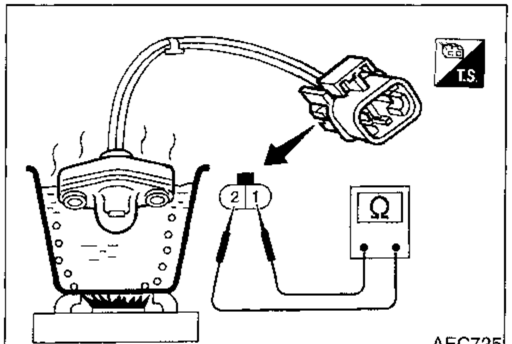
Check ECM pin terminals for damage and check the connection of ECM harness connector.
Reconnect ECM harness connector and retest.

↓

INSPECTION END

Intake Air Temperature Sensor (Cont'd)

COMPONENT INSPECTION



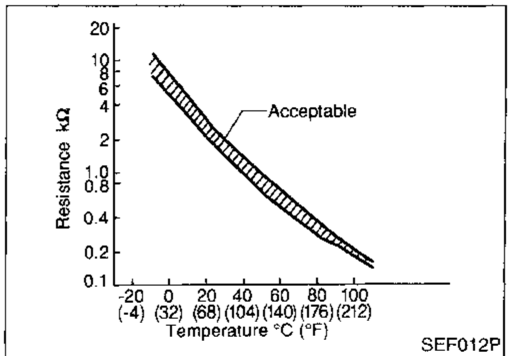
AEC725

Intake air temperature sensor

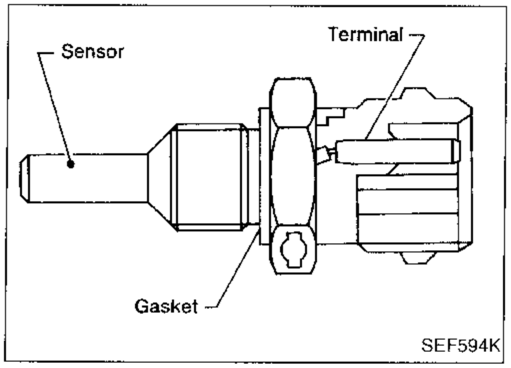
Check resistance as shown in the figure.

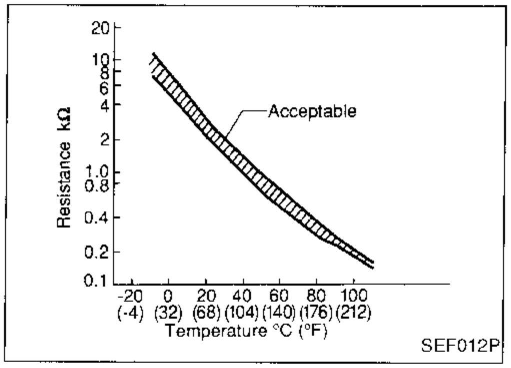
Intake air temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

If NG, replace intake air temperature sensor.



SEF012P





Engine Coolant Temperature Sensor (ECTS)

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

⟨Reference data⟩

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

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
COOLAN TEMP/S	● Engine: After warming up	More than 70°C (158°F)

ON BOARD DIAGNOSIS LOGIC

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

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

Engine operating condition in fail-safe mode	
Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START". CONSULT displays the engine coolant temperature decided by ECM.	
Condition	**Engine coolant temperature decided (CONSULT display)**
Just as ignition switch is turned ON or Start	40°C (104°F)
More than 4 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
When the fail-safe system for engine coolant temperature sensor is actived, the cooling fan operates while engine is running.	

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

GST
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select "MODE 3" with GST.

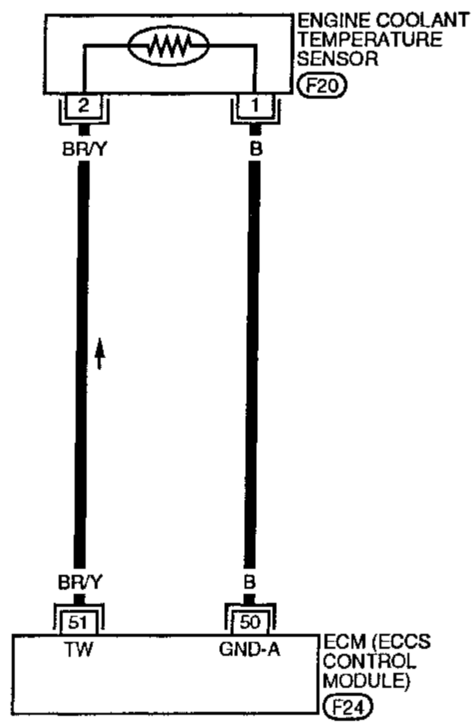
OR

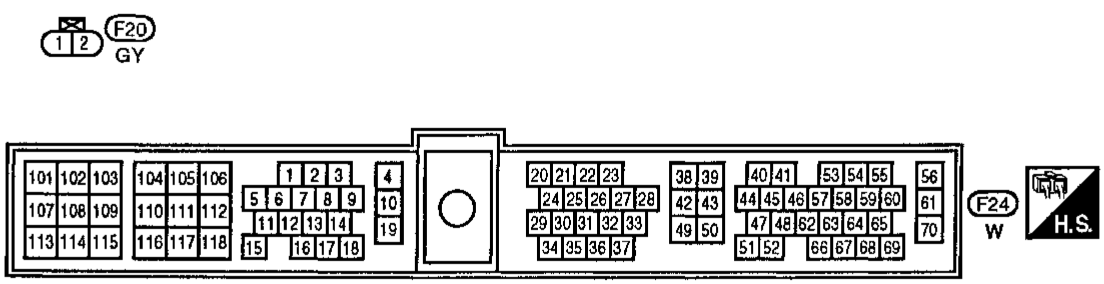
NO TOOLS
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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

EC-ECTS-01

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

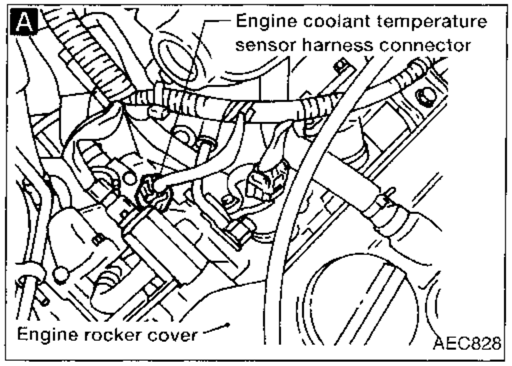


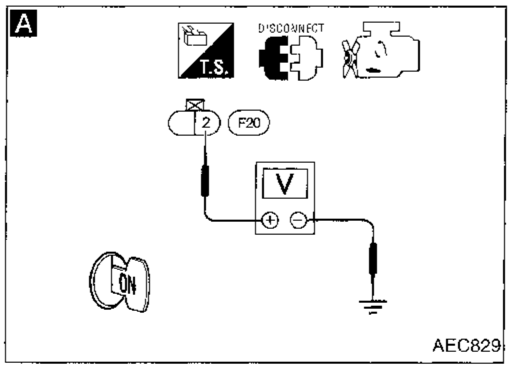


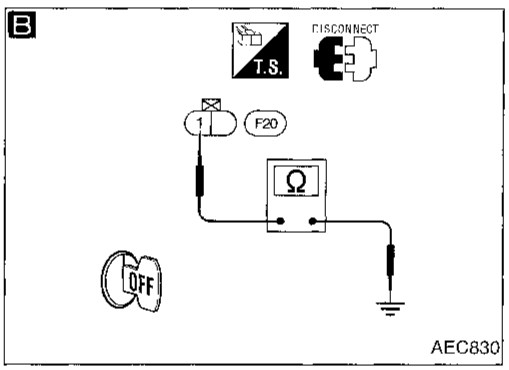
AEC580

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

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

A

CHECK POWER SUPPLY.

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

Voltage:

Approximately 5V

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

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.

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

Continuity should exist.

If OK, check harness for short.

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

If NG, repair harness or connectors.

OK ↓

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

NG → Replace engine coolant temperature sensor.

OK ↓

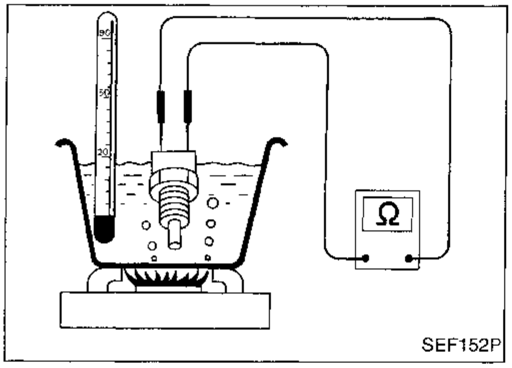
Disconnect and reconnect harness connectors in the circuits. Then retest.

Trouble is not fixed. ↓

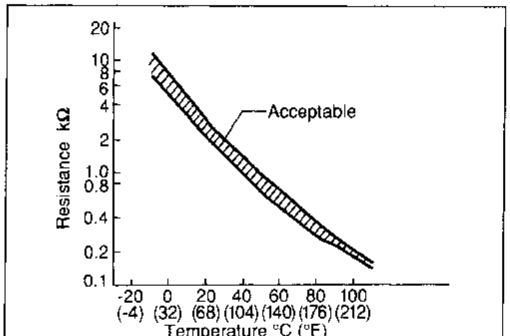
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END



SEF152P



SEF012P

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

COMPONENT INSPECTION

Engine coolant temperature sensor

Check resistance as shown in the figure.

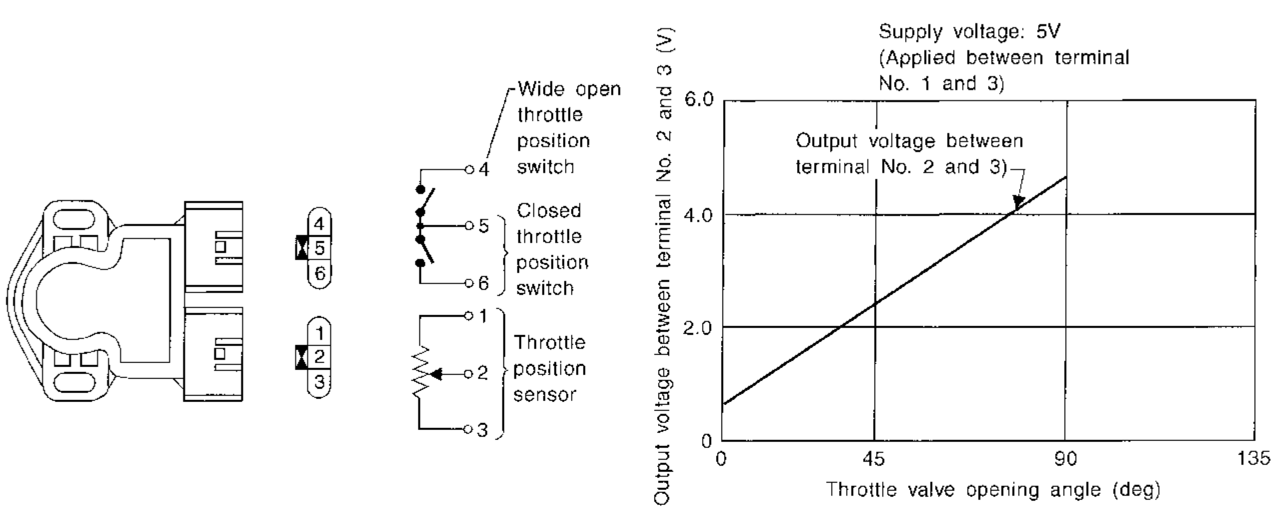
Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

If NG, replace engine coolant temperature sensor.

Throttle Position Sensor

The throttle position sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.

Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This controls engine operation such as fuel cut. The throttle position sensor unit contains a built-in "Wide open and closed throttle position switch".



SEF105S

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

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. 89%

Throttle Position Sensor (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
23	Y	Throttle position sensor	Ignition switch "ON" — Accelerator pedal released	0.35 - 0.65V
			Ignition switch "ON" — Accelerator pedal fully depressed	Approximately 4V
49	P/L	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
50	B	Sensors' ground	Engine is running. (Warm-up condition) — Idle speed	0.001 - 0.02V

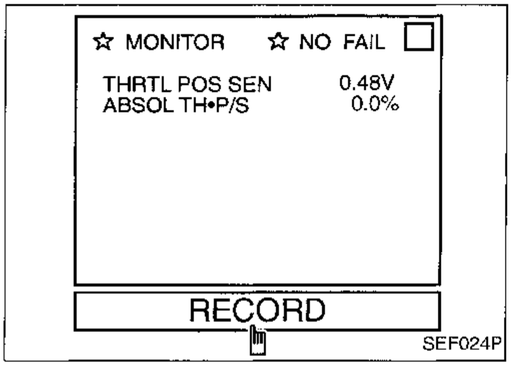
ON BOARD DIAGNOSIS LOGIC

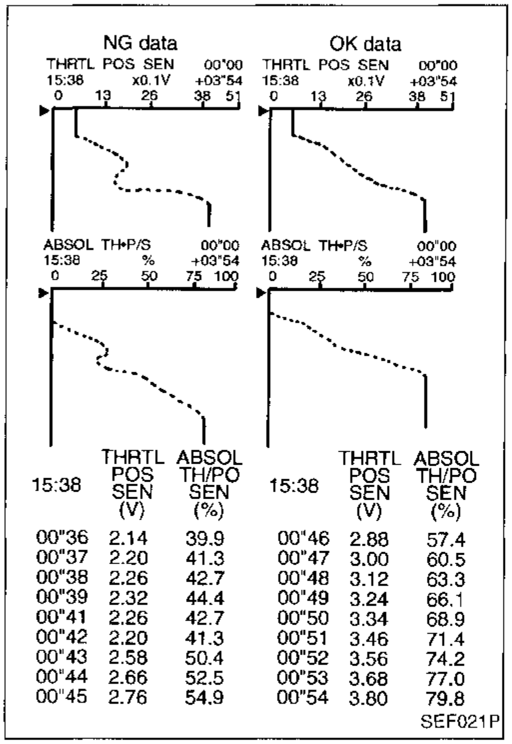
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	● An excessively low or high voltage from the sensor is sent to ECM.* ● Voltage sent to ECM is not practical when compared with mass air flow sensor and camshaft position sensor signals.	● Harness or connectors (The sensor circuit is open or shorted.) ● Throttle position sensor

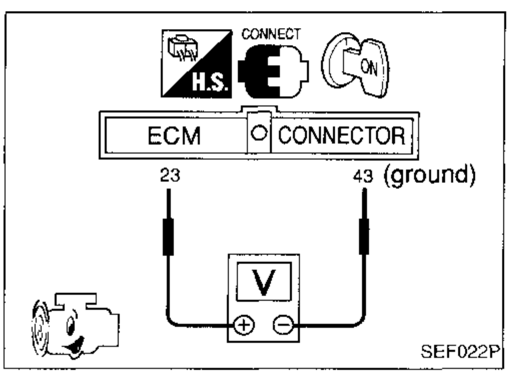
*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

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

Throttle Position Sensor (Cont'd)







OVERALL FUNCTION CHECK

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

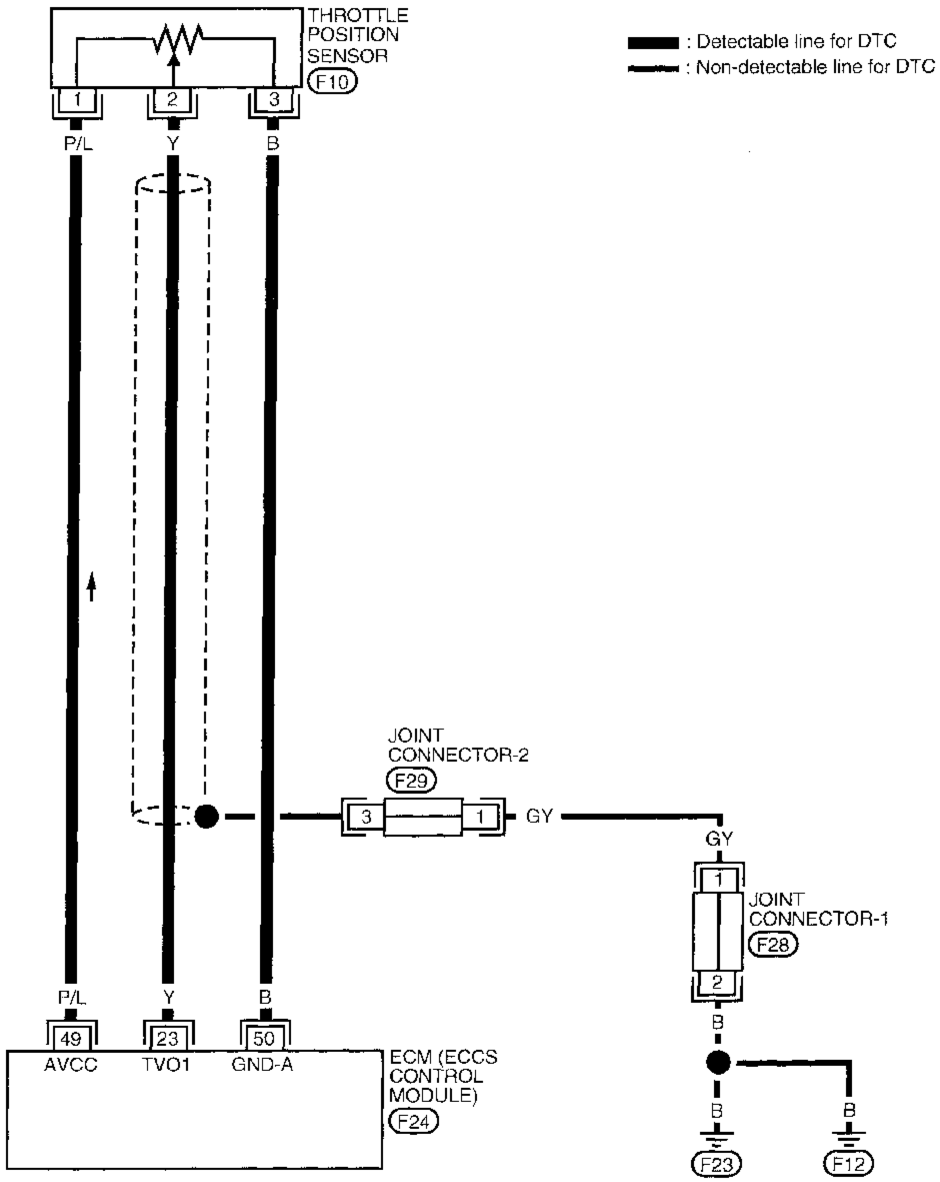
1) Turn ignition switch "ON".
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
3) Select "THRTL POS SEN" and "ABSOL TH·PS" in "DATA MONITOR" mode with CONSULT.
4) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.
5) Print out the recorded data and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

OR

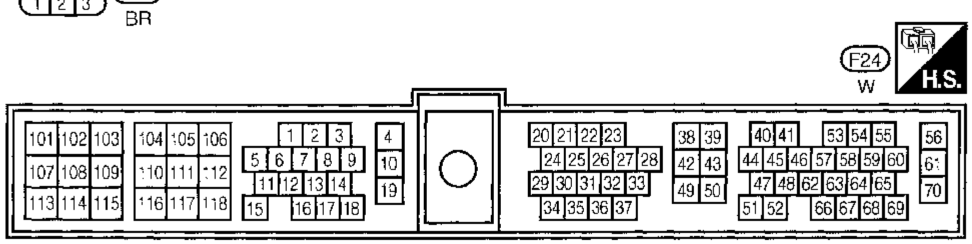
1) Turn ignition switch "ON".
2) Check the voltage between ECM terminal ㉓ and ㊸ (ground) and check the following:
   - The voltage when accelerator pedal fully released is approximately 0.35 - 0.65V.
   - The voltage rise is linear in response to accelerator pedal depression.
   - The voltage when accelerator pedal fully depressed is approximately 4V.

Throttle Position Sensor (Cont'd)

EC-TPS-01



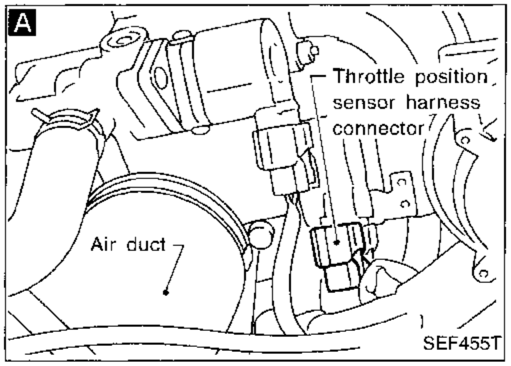
Refer to last page (Foldout page).
(F28)
(F29)

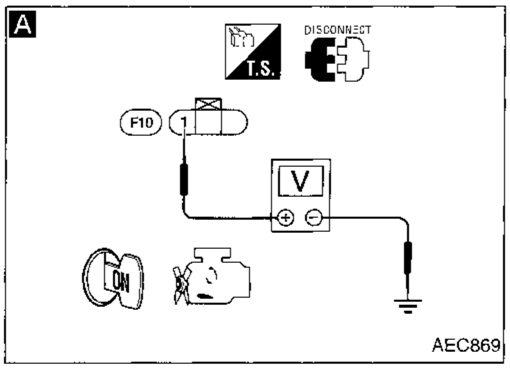


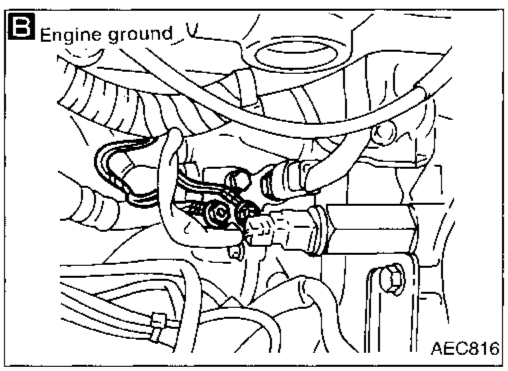
AEC243A

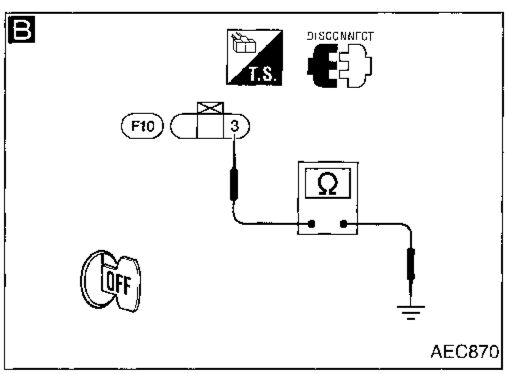
Throttle Position Sensor (Cont'd)

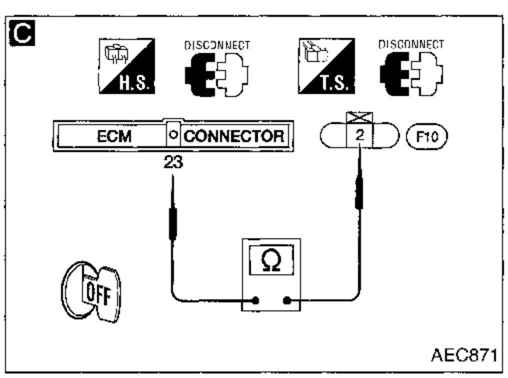
DIAGNOSTIC PROCEDURE











INSPECTION START

↓

ADJUST THROTTLE POSITION SENSOR.
Perform "Basic Inspection", EC-310.

↓

A

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

NG → Repair harness or connectors.

OK ↓

B

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

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

If NG, repair harness or connectors.

OK ↓

C

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

NG → Repair harness or connectors.

OK ↓

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

NG → Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-310.

OK ↓

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

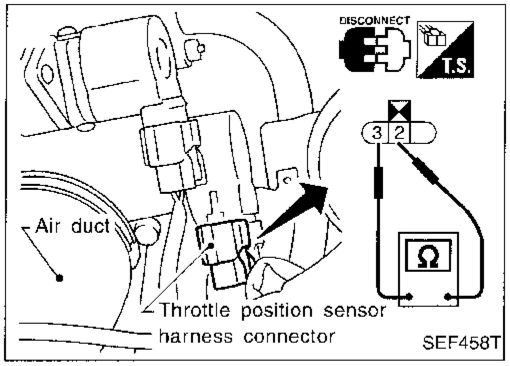
↓ Trouble is not fixed.

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

↓

INSPECTION END

Throttle Position Sensor (Cont'd)



COMPONENT INSPECTION

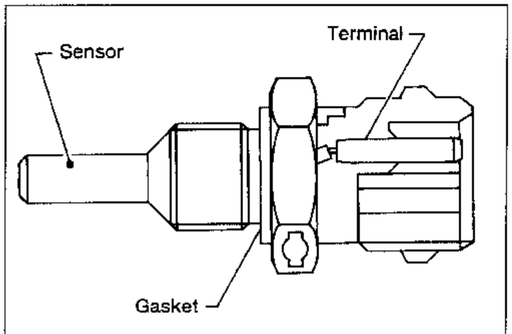
Throttle position sensor

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

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

If NG, replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-310.

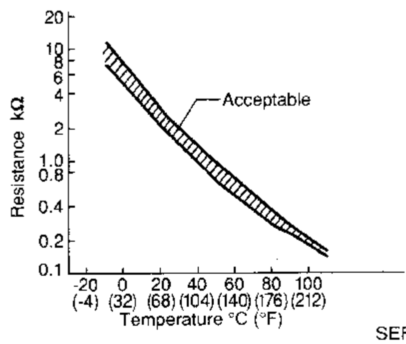
GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX



SEF594K

Engine Coolant Temperature (ECT) Sensor

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



SEF012P

⟨Reference data⟩

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

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

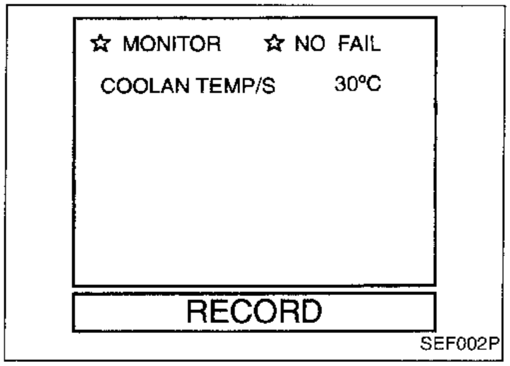
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
COOLAN TEMP/S	● Engine: After warming up	More than 70°C (158°F)

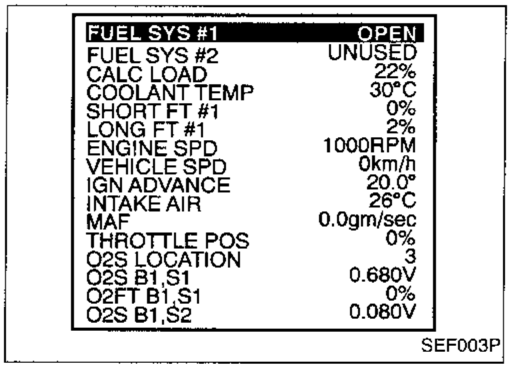
ON BOARD DIAGNOSIS LOGIC

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

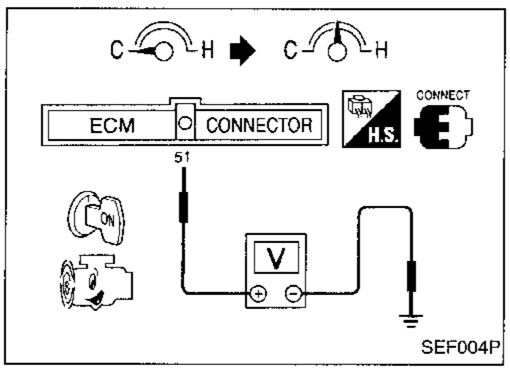
Engine Coolant Temperature (ECT) Sensor (Cont'd)



SEF002P



SEF003P



SEF004P

OVERALL FUNCTION CHECK

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

Note: If both DTC P0115 (0103) and P0125 (0908) are displayed, first perform TROUBLE DIAGNOSIS FOR DTC P0115 (0103). (See EC-355.)

1) Turn ignition switch "ON".
2) Select "COOLANT TEMP/S" in "DATA MONITOR" mode with CONSULT.
3) Start engine and run it at idle speed.
4) Check that the engine coolant temperature rises to 20°C (68°F) or more within 11 minutes. (Be careful not to overheat engine.)

OR

GST

1) Turn ignition switch "ON".
2) Select "MODE 1" with GST.
3) Start engine and run it at idle speed.
4) Check that the engine coolant temperature rises to 20°C (68°F) or more within 11 minutes. (Be careful not to overheat engine.)

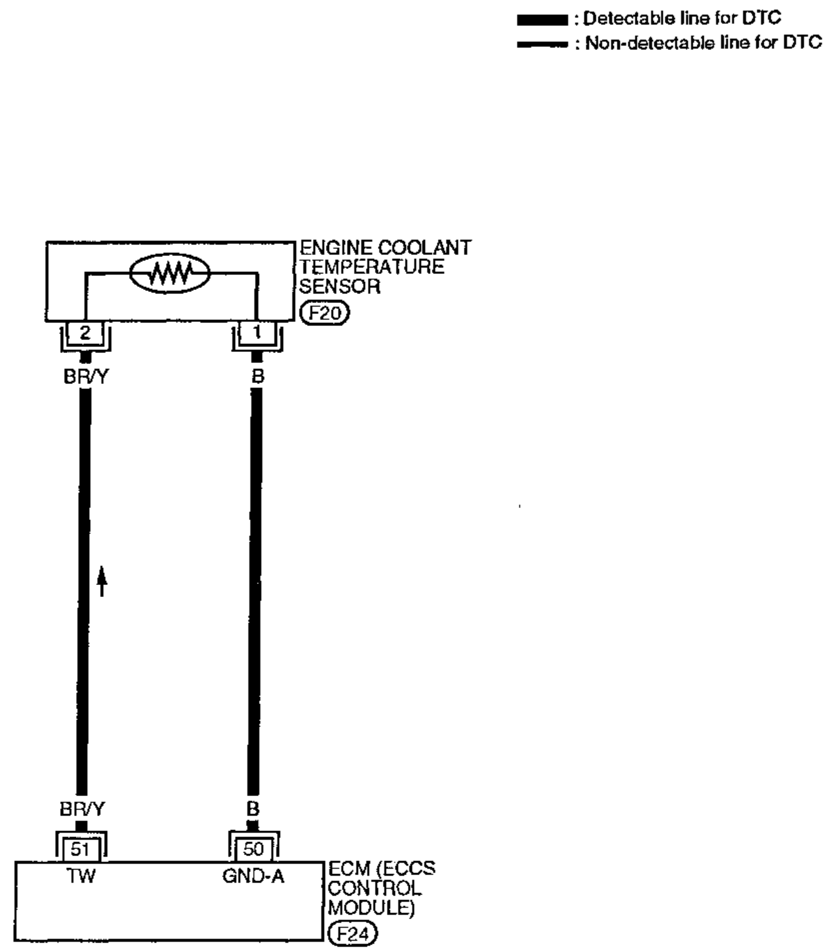
OR

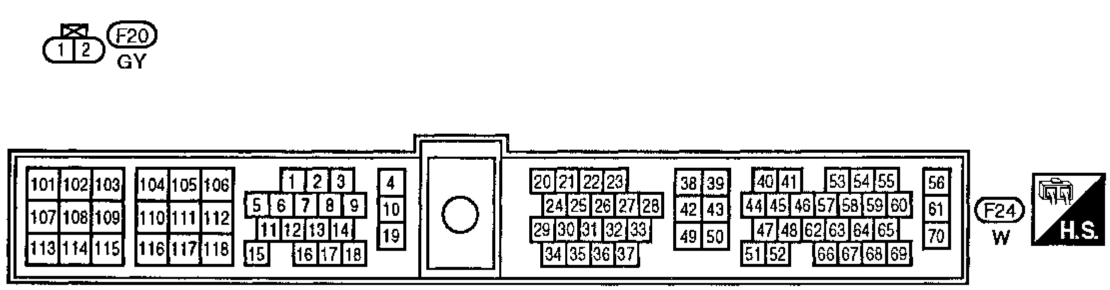
NO TOOLS

1) Turn ignition switch "ON".
2) Probe voltage meter between ECM terminal (51) and ground.
3) Start engine and run it at idle speed.
4) Check that voltage of engine coolant temperature changes to less than 3.5 (V) within 11 minutes. (Be careful not to overheat engine.)

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

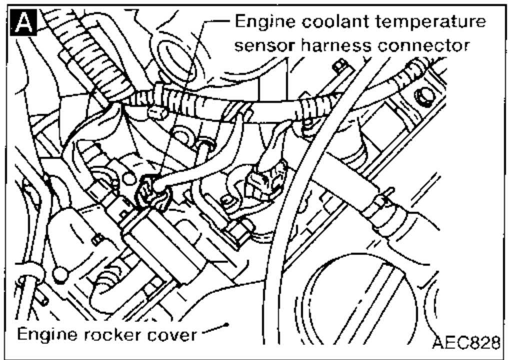
EC-ECTS-01

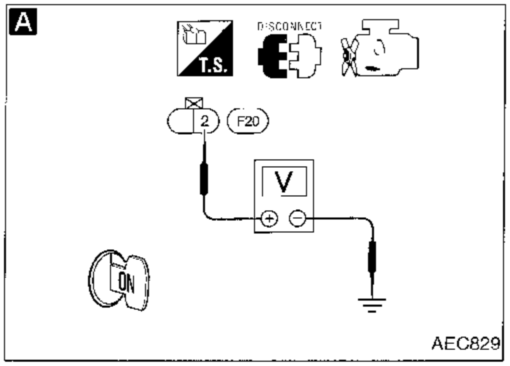


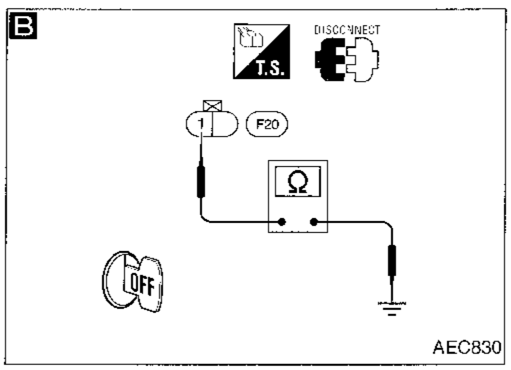


AEC580

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







DIAGNOSTIC PROCEDURE

INSPECTION START

↓

A

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

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

If NG, repair harness or connectors.

↓ OK

B

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

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

If NG, repair harness or connectors.

↓ OK

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

NG → Replace engine coolant temperature sensor.

↓ OK

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

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

↓ OK

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

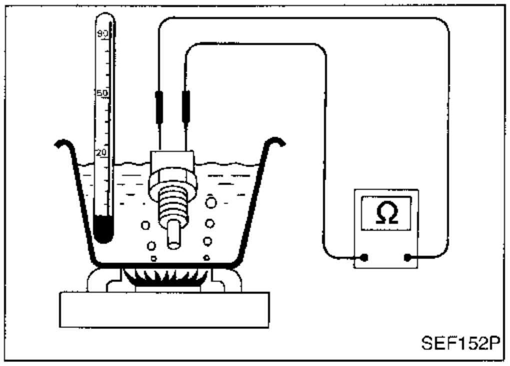
↓ Trouble is not fixed.

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

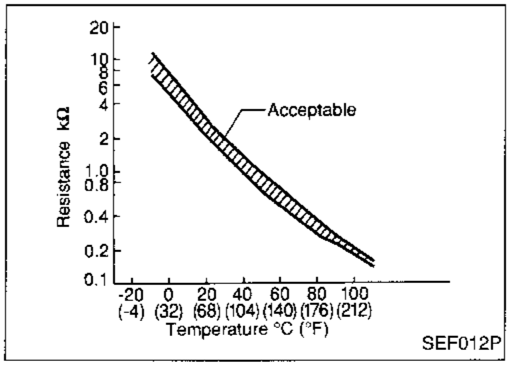
↓

INSPECTION END

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



SEF152P



SEF012P

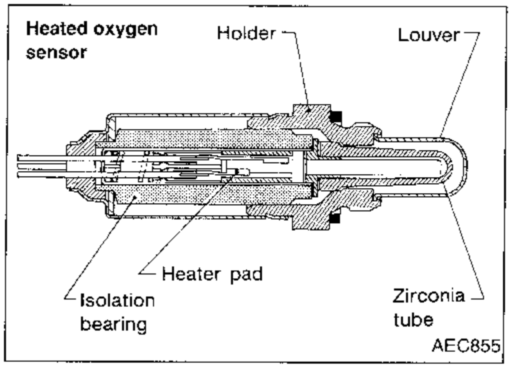
COMPONENT INSPECTION

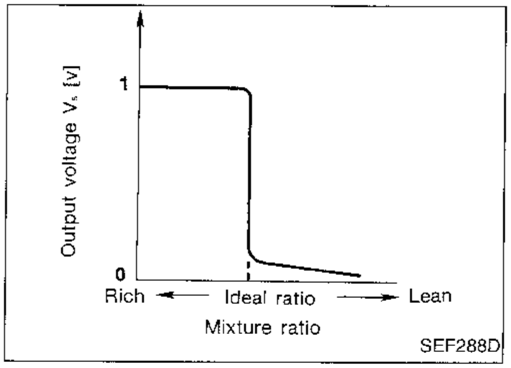
Engine coolant temperature sensor

Check resistance as shown in the figure.

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

If NG, replace engine coolant temperature sensor.





Front Heated Oxygen Sensor (Front HO2S)

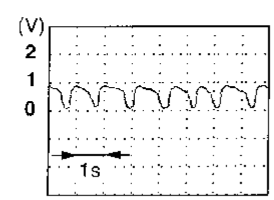
The front HO2S is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The sensor has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The sensor signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

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

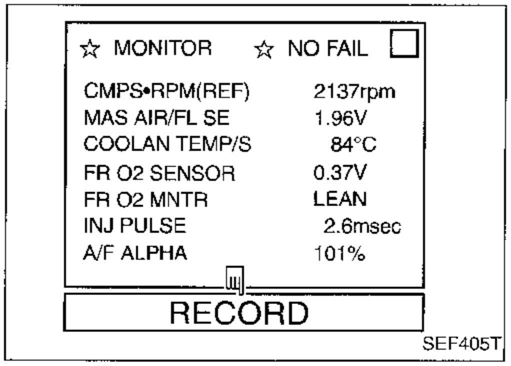
ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
46	W	Front heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 1.0V  SEF201T

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130 0303	● An excessively high voltage from the sensor is sent to ECM. ● The voltage from the sensor is constantly approx. 0.3V. ● The maximum and minimum voltages from the sensor do not reach the specified voltages. ● The sensor does not respond between rich and lean within the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Front heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks



SEF405T

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

OVERALL FUNCTION CHECK

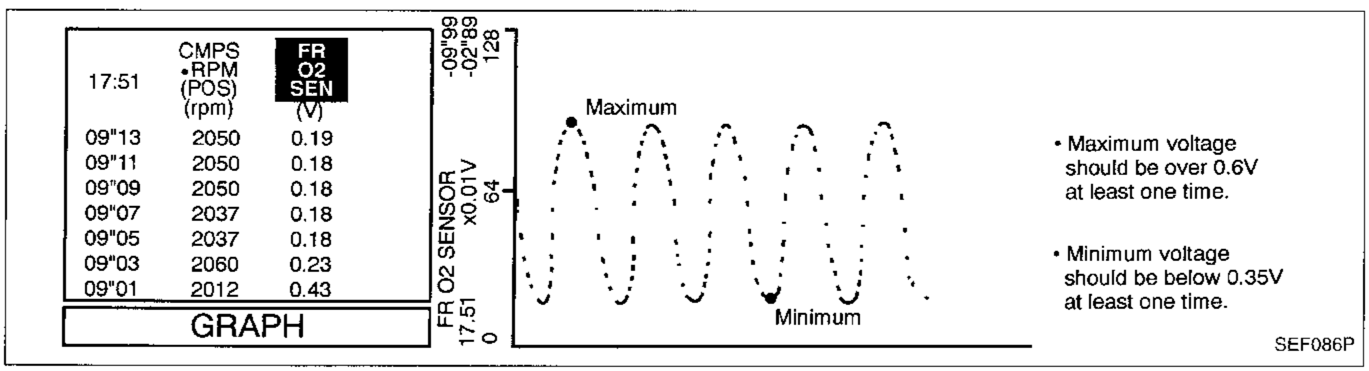
Use this procedure to check the overall function of the front oxygen sensor circuit. During this check, a DTC might not be confirmed.

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

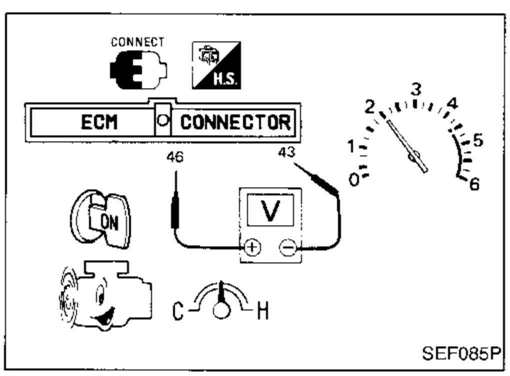
- "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:

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

  R = "FR O2 MNTR", "RICH"
  L = "FR O2 MNTR", "LEAN"
- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.



SEF086P



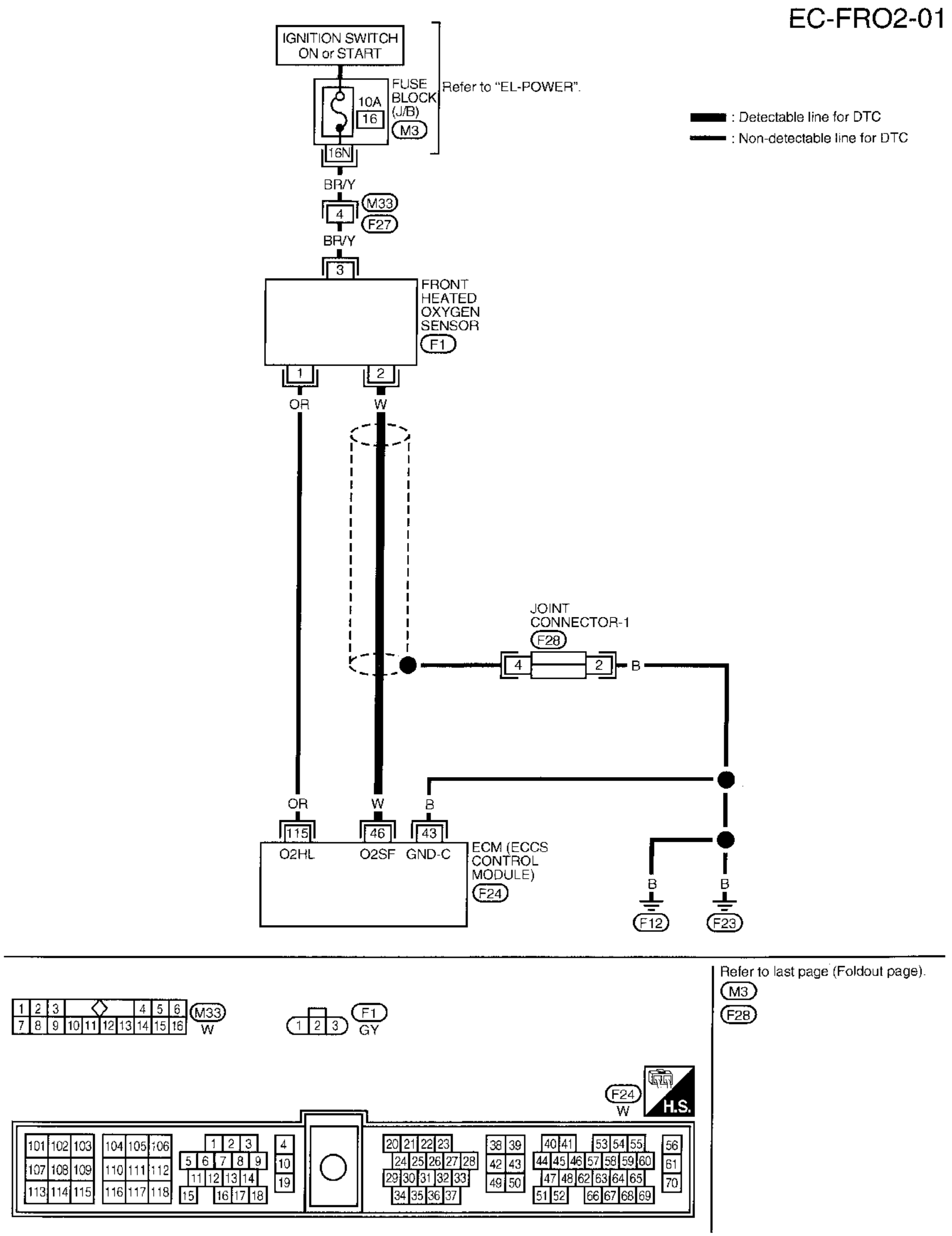
SEF085P

OR

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

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

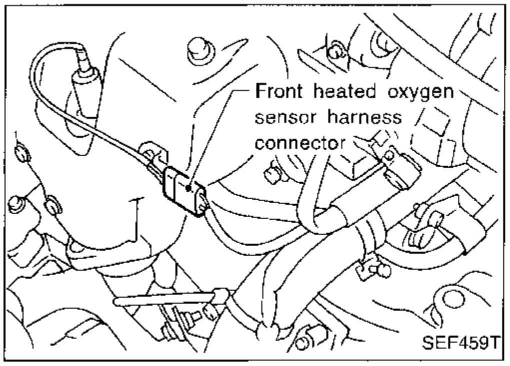
Front Heated Oxygen Sensor (Front HO2S) (Cont'd)



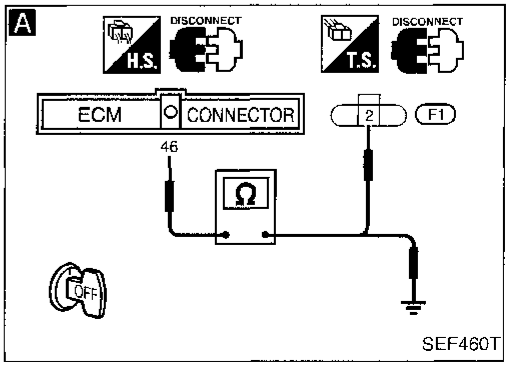
AEC244A

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

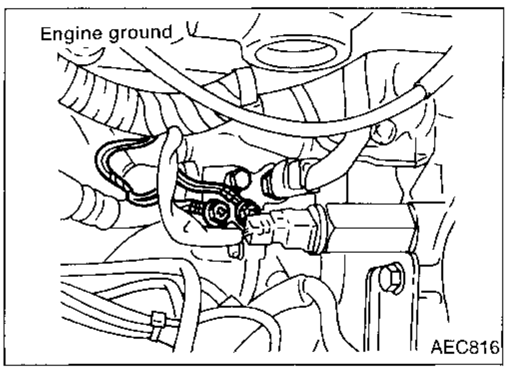
DIAGNOSTIC PROCEDURE



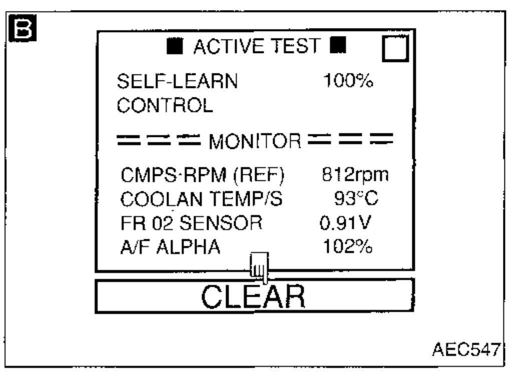
SEF459T



SEF460T



AEC816



AEC547

INSPECTION START

↓

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ㊻ and terminal ②.
   Continuity should exist.
4. Check harness continuity between ECM terminal ㊻ and ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

Loosen and retighten engine ground screws.
Note: If engine ground is loose, voltage between joint connector and engine ground may be changed by retightening.

↓

B

CLEAR THE SELF-LEARNING DATA.
1. Start engine and warm it up sufficiently.
2. Select "SELF-LEARNING CONTROL" in "ACTIVE TEST" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.
   Is the DTC P0170 detected?
   Is it difficult to start engine?

— OR —

2. Turn ignition switch "OFF" and wait for at least 3 seconds.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
7. Run engine for at least 10 minutes at idle speed.
   Is the DTC 0706 detected?
   Is it difficult to start engine?

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0170 (0706)", EC-391.

↓ No

Ⓐ

(Go to next page.)

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

A

↓

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 front heated oxygen sensor.

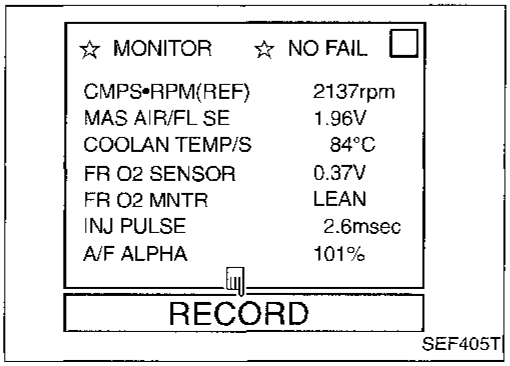
↓

INSPECTION END

Closed Loop Control

- **The closed loop control has one trip detection logic.**

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



SEF405T

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the closed loop control. During this check, a DTC might not be confirmed.

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

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

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

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

——— OR ———

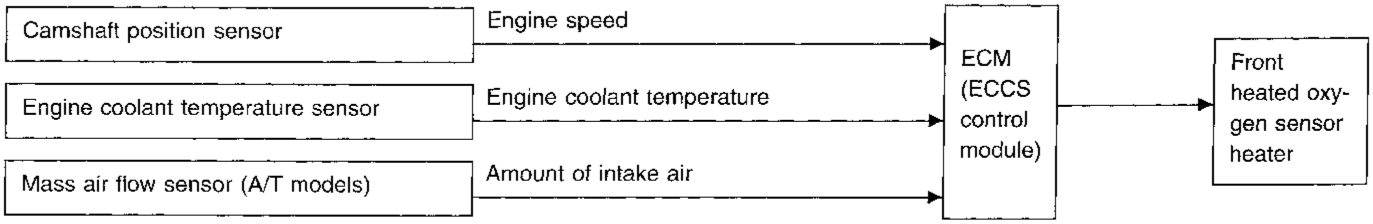
1) Start engine and warm it up sufficiently.
2) Check that malfunction indicator lamp goes on more than 5 times in 10 seconds while keeping at 2,000 rpm in Diagnostic Test Mode II.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0130, EC-371.
Refer to TROUBLE DIAGNOSIS FOR DTC P0135, EC-377.

Front Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION



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

Engine speed (rpm)	Engine condition	Front heated oxygen sensor heater
Above 3,200	—	OFF
Below 3,200	Heavy load after warmed up (A/T models)	OFF
	Except above	ON

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 HEATER	● Engine speed: Idle	ON
	● Engine speed: Above 3,200 rpm	OFF

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
115	OR	Front heated oxygen sensor heater	[Engine is running.] └ Engine speed is below 3,200 rpm	Approximately 0V
			[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 circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the front heated oxygen sensor heater.)	● Harness or connectors (The front heated oxygen sensor heater circuit is open or shorted.) ● Front heated oxygen sensor heater

Front Heated Oxygen Sensor Heater (Cont'd)

DIAGNOSTIC TROUBLE CODE DETECTING CONDITION

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it at least 6 seconds at idle speed.

OR

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

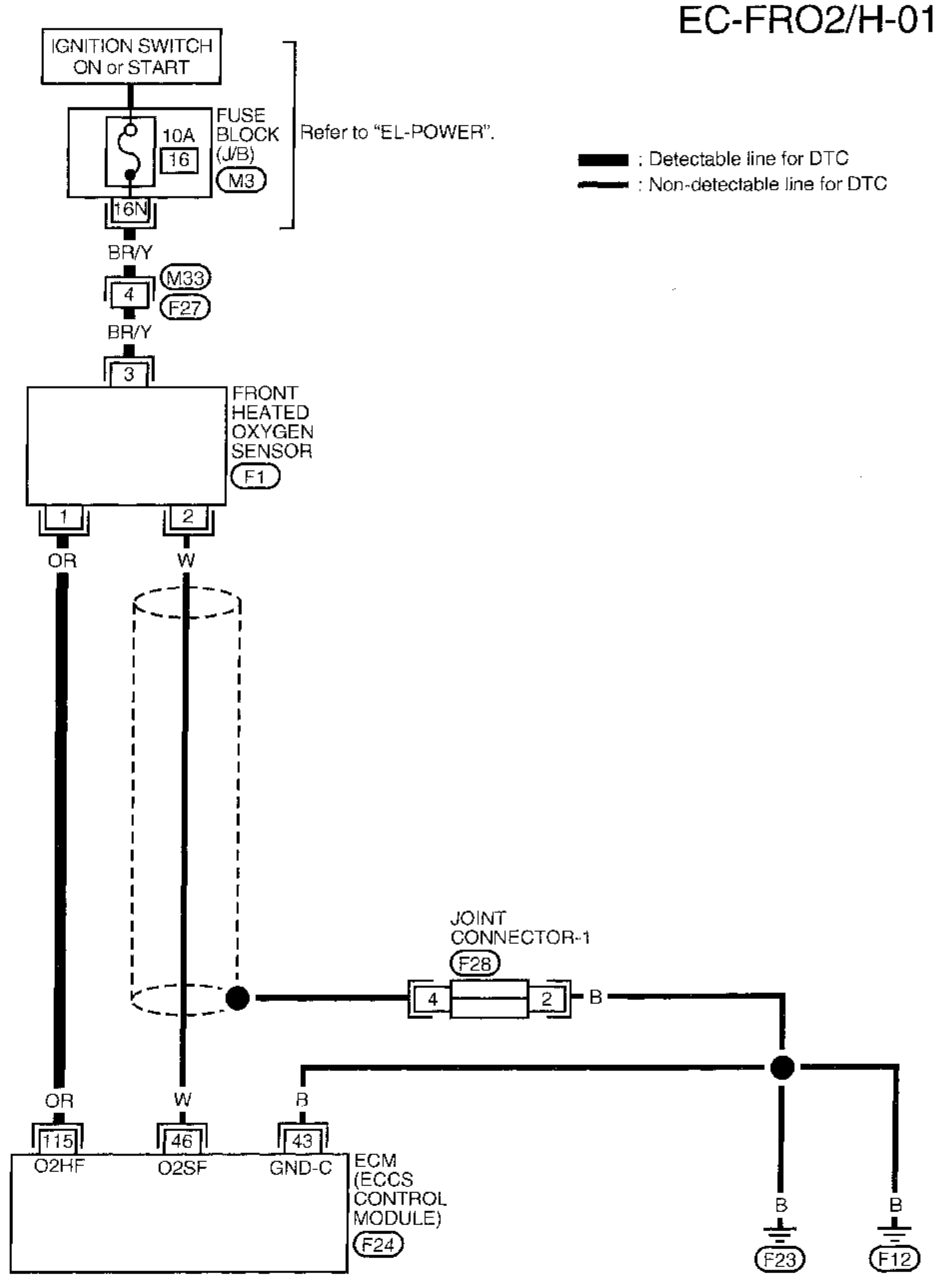
OR

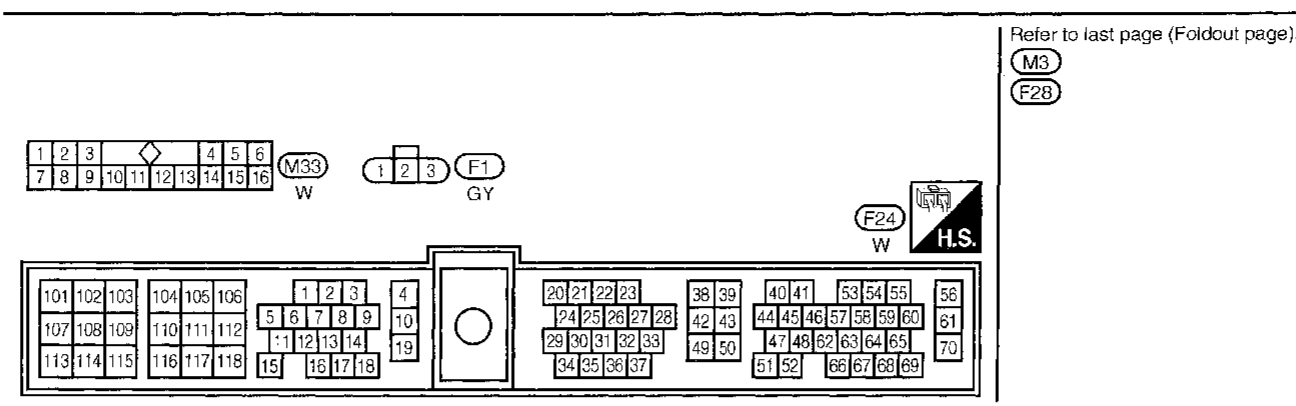
NO TOOLS

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

Front Heated Oxygen Sensor Heater (Cont'd)

EC-FRO2/H-01

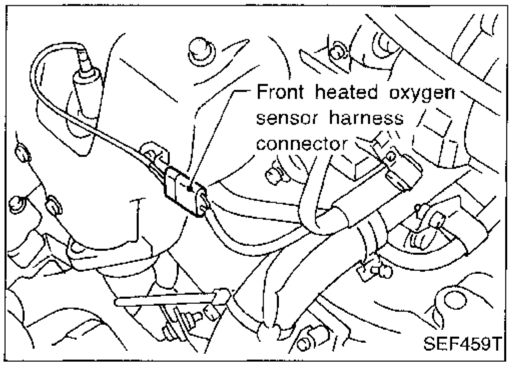




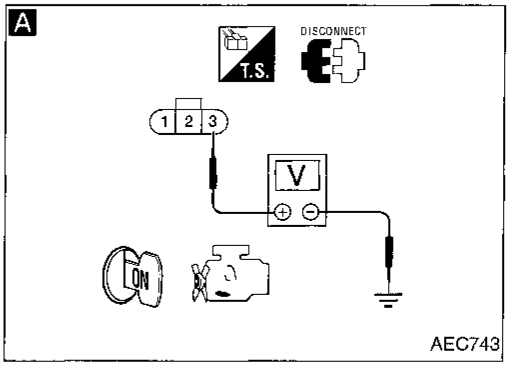
AEC245A

Front Heated Oxygen Sensor Heater (Cont'd)

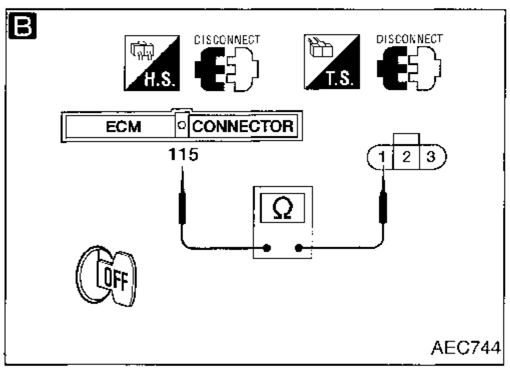
DIAGNOSTIC PROCEDURE



SEF459T



AEC743



AEC744

INSPECTION START

↓

A

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

NG → Check the following.
- Harness connectors (F27), (M33)
- 10A fuse
- Harness for open or short between front heated oxygen sensor and fuse

If NG, repair harness or connectors.

↓ OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ① and ECM terminal (115).
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

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

NG → Replace front heated oxygen sensor.

↓ OK

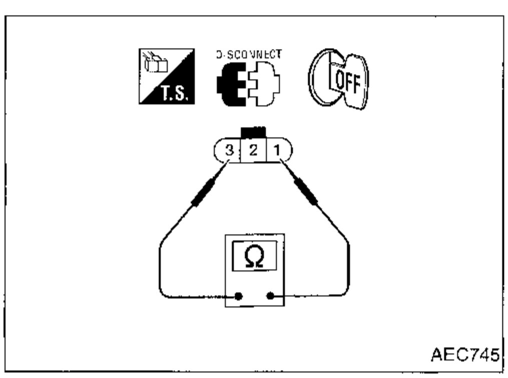
Disconnect and reconnect harness connectors in the circuit, and retest.

↓ Trouble is not fixed.

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

↓

INSPECTION END



AEC745

COMPONENT INSPECTION

Front heated oxygen sensor heater

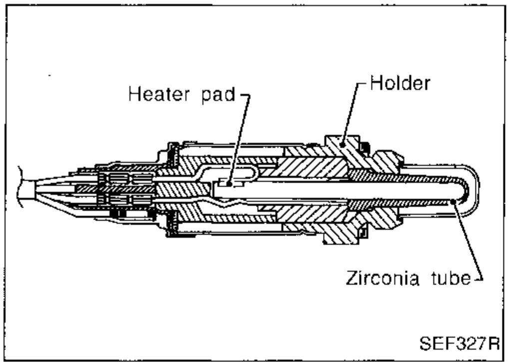
Check resistance between terminals ① and ③.

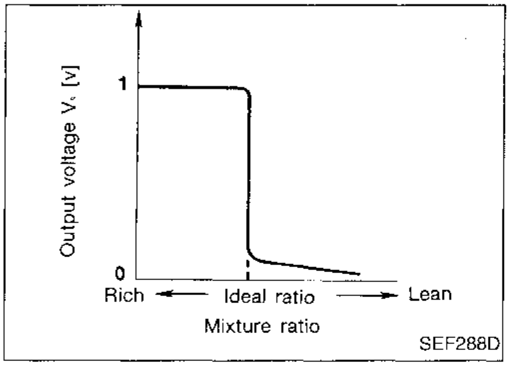
Resistance: 2.3 - 4.3Ω at 23°C (73°F)

If NG, replace 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)

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 3,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
RR O2 MNTR			LEAN ↔ RICH

ECM TERMINALS AND REFERENCE VALUE

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

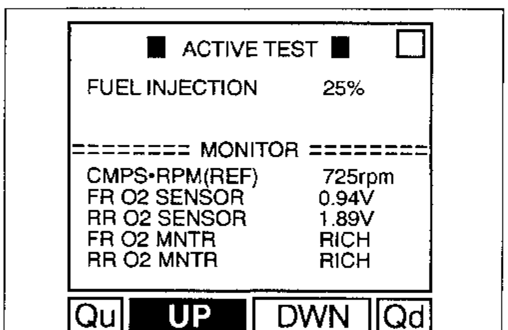
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
52	W	Rear heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 3,000 rpm	0 - Approximately 1.0V

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

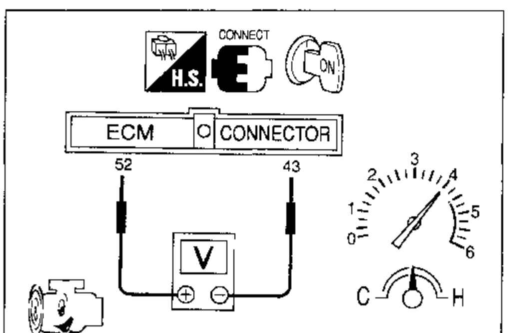
ON BOARD DIAGNOSIS LOGIC

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 warm-up 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 (The sensor circuit is open.) ● Rear heated oxygen sensor
	● The specified maximum and minimum voltages from the sensor are not reached. ● It takes more than the specified time for the sensor to respond between rich and lean.	● Harness or connectors (The sensor circuit is shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks



SEF102P



SEF103P

OVERALL FUNCTION CHECK

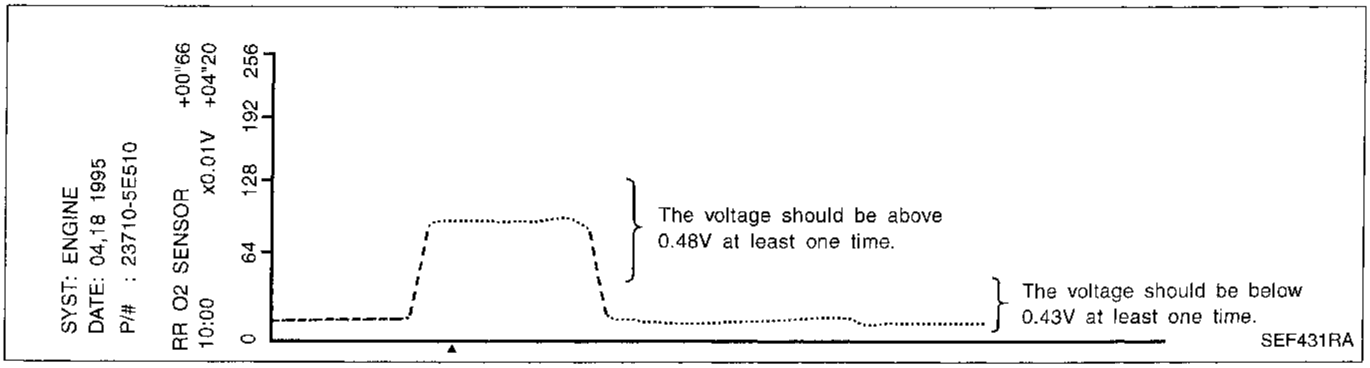
Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

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

OR

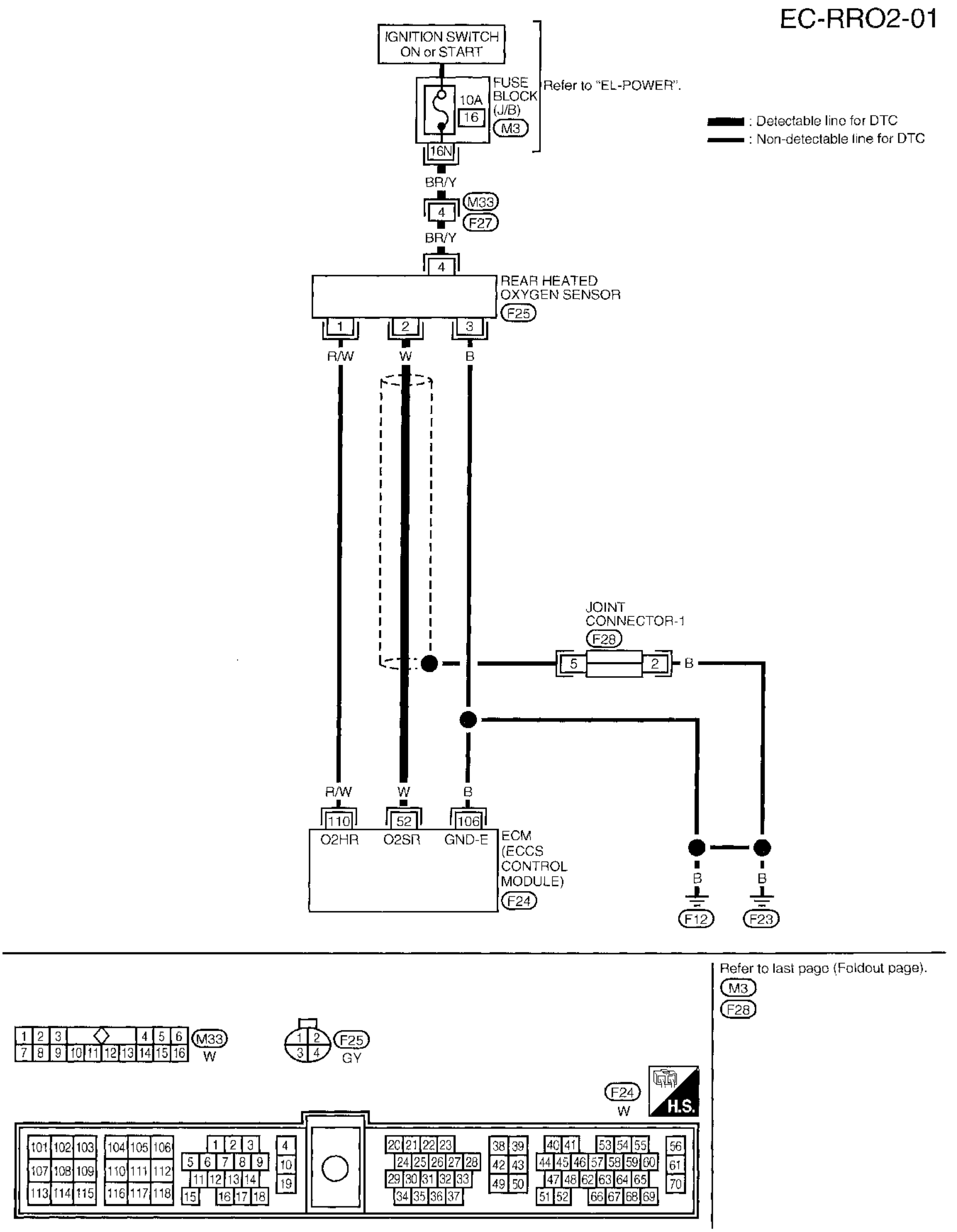
1) Start engine and warm it up sufficiently.
2) Set voltmeter probes between ECM terminals 52 (sensor signal) and 43 (engine ground).
3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
   (depress and release accelerator pedal as soon as possible)
   The voltage should be above 0.48V at least once.
   If the voltage is above 0.48V at step 3, step 4 is not necessary.
4) Check the voltage when racing up to 6,000 rpm under no load. Or 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 below 0.43V at least once.

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



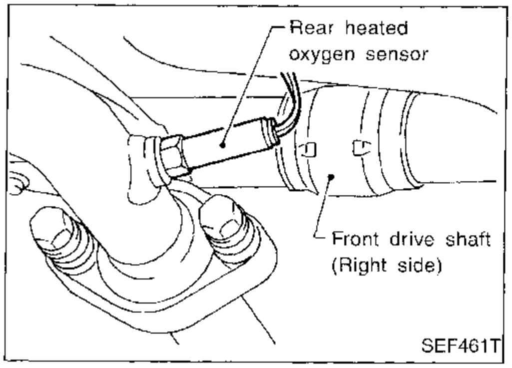
SEF431RA

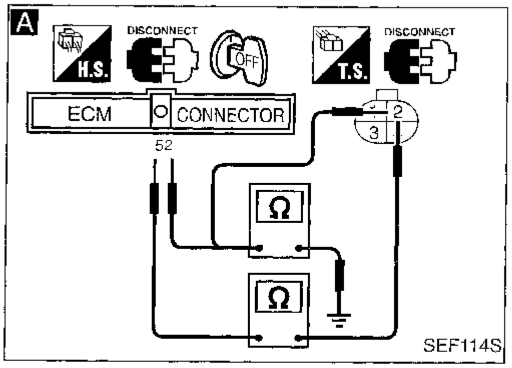
Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

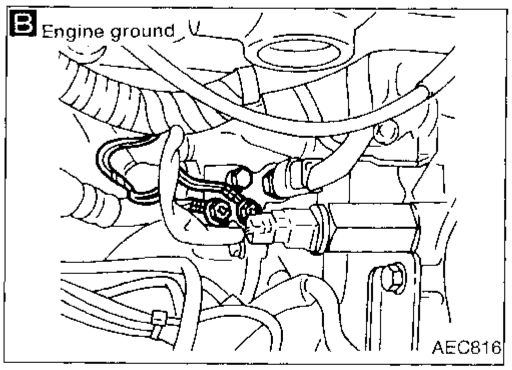


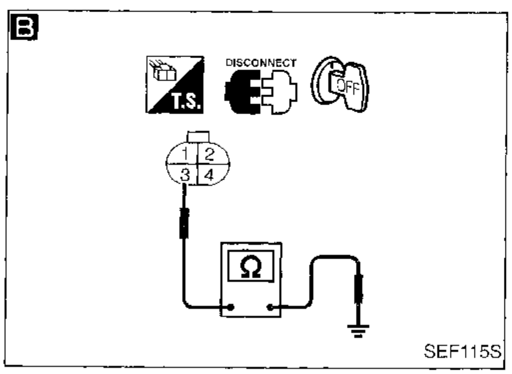
AEC246A

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









DIAGNOSTIC PROCEDURE

INSPECTION START

A

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

NG → Repair harness or connectors.

OK ↓

B

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

NG → Check the following.
- 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.

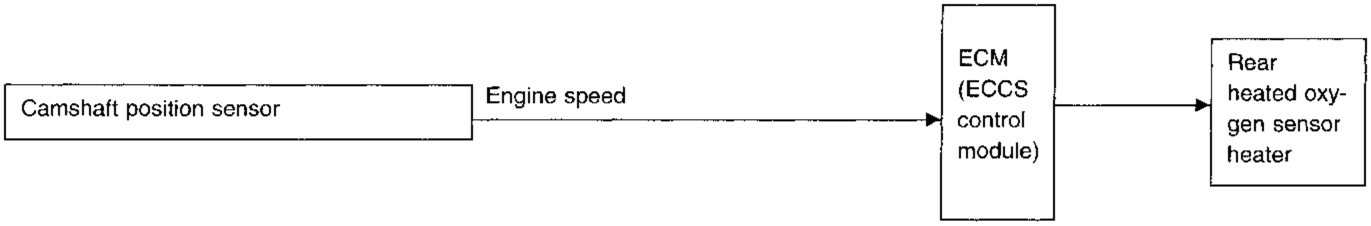
↓

INSPECTION END

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

Rear Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION



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

Engine speed (rpm)	Rear heated oxygen sensor heater
Above 3,200	OFF
Below 3,200	OFF
	ON

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 HEATER	● Engine speed: Idle	ON
	● Engine speed: Above 3,200 rpm	OFF

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
110	R/W	Front heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,200 rpm.	Approximately 0V
			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)
P0141 0902	● The current amperage in the rear heated oxygen sensor heater circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the rear heated oxygen sensor heater.)	● Harness or connectors (The rear heated oxygen sensor heater circuit is open or shorted.) ● Rear heated oxygen sensor heater

Rear Heated Oxygen Sensor Heater (Cont'd)

DIAGNOSTIC TROUBLE CODE DETECTING CONDITION

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it at least 5 seconds at idle speed.

OR

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

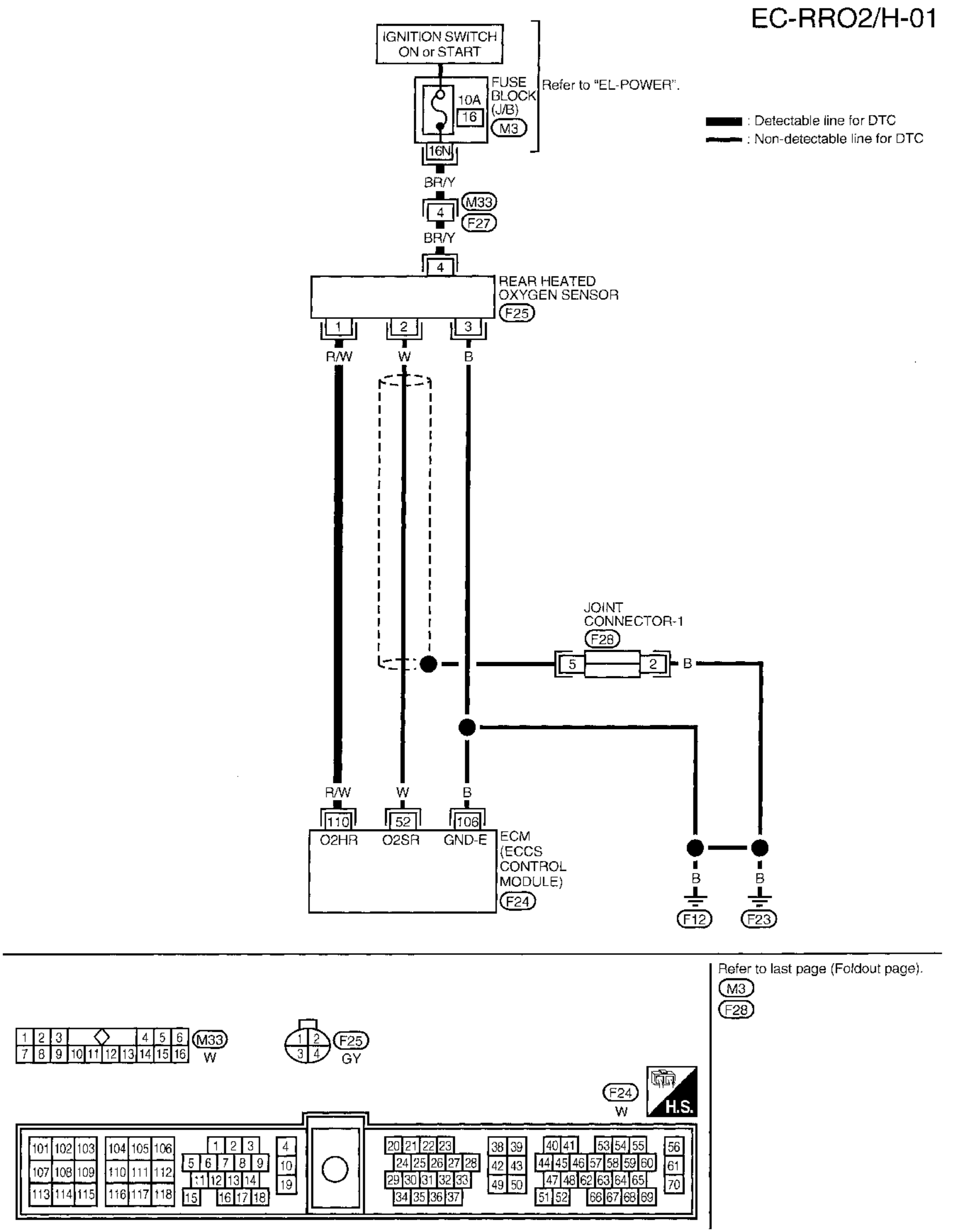
OR

NO TOOLS

1) Start engine and run it 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.

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

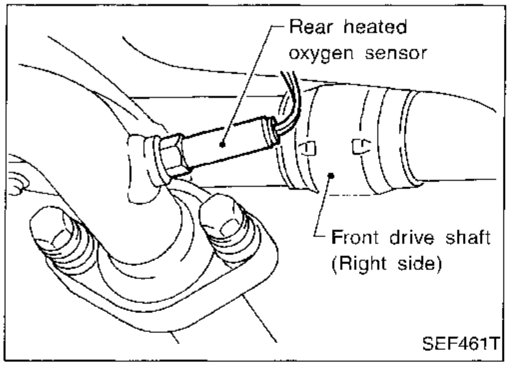
Rear Heated Oxygen Sensor Heater (Cont'd)



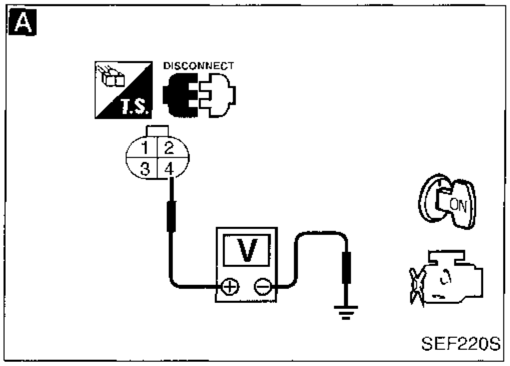
AEC247A

Rear Heated Oxygen Sensor Heater (Cont'd)

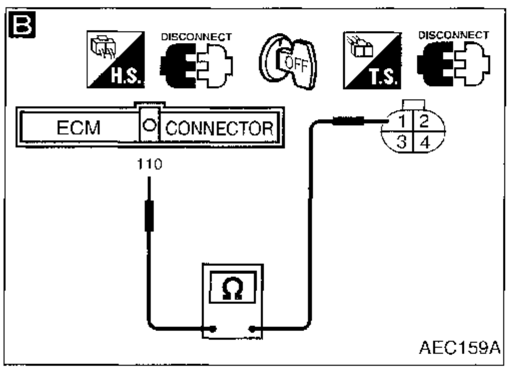
DIAGNOSTIC PROCEDURE



SEF461T



SEF220S



AEC159A

INSPECTION START

↓

A

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

NG → Check the following.
- Harness connectors (F27), (M33)
- 10A fuse
- Harness for open or short between rear heated oxygen sensor and fuse

If NG, repair harness or connectors.

↓ OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal (1) and ECM terminal (110).
   Continuity should exist.

If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

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

NG → Replace rear heated oxygen sensor.

↓ OK

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

↓ Trouble is not fixed.

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

↓

INSPECTION END

GI
MA
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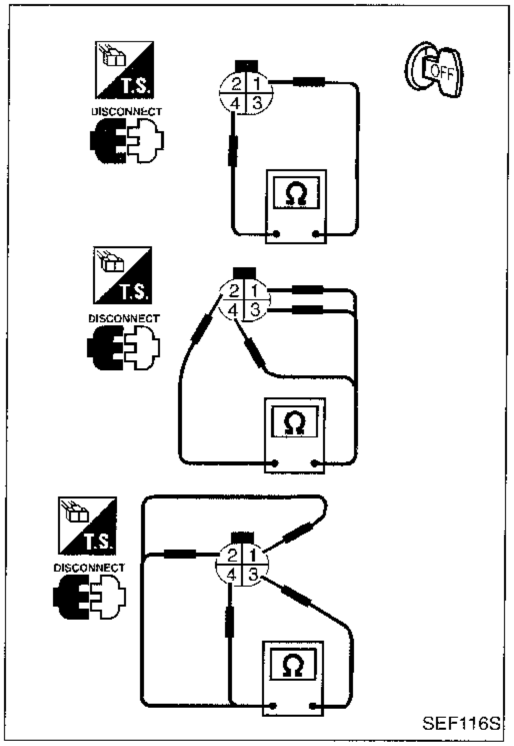
Rear Heated Oxygen Sensor Heater (Cont'd)



COMPONENT INSPECTION

Rear heated oxygen sensor heater

Check the following.

1. Check resistance between terminals ① and ④.
   Resistance: 3.0 - 4.0Ω at 25°C (77°F)
2. Check continuity.

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

If NG, replace the rear heated oxygen sensor.

CAUTION:

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

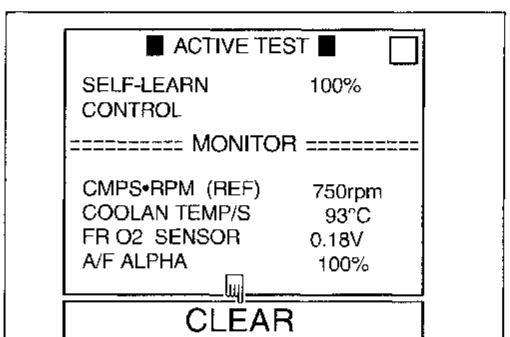
Fuel Injection System Function (Lean side)

ON BOARD DIAGNOSIS LOGIC

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

Front heated oxygen sensor → Density of oxygen in exhaust gas (Mixture ratio feedback signal) → ECM (ECCS control module) → Injectors

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 leak ● Front heated oxygen sensor ● Injectors ● Exhaust gas leak ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor



SEF423T

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 at least 10 minutes at idle speed.
   The 1st trip DTC should be detected at this stage, if a malfunction exists.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-394. If engine does not start, check exhaust and intake air leak visually again.

OR

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

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine 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 at least 10 minutes at idle speed.
8) Select "MODE 7" with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.

Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-394. If engine does not start, check exhaust and intake air leak visually again.

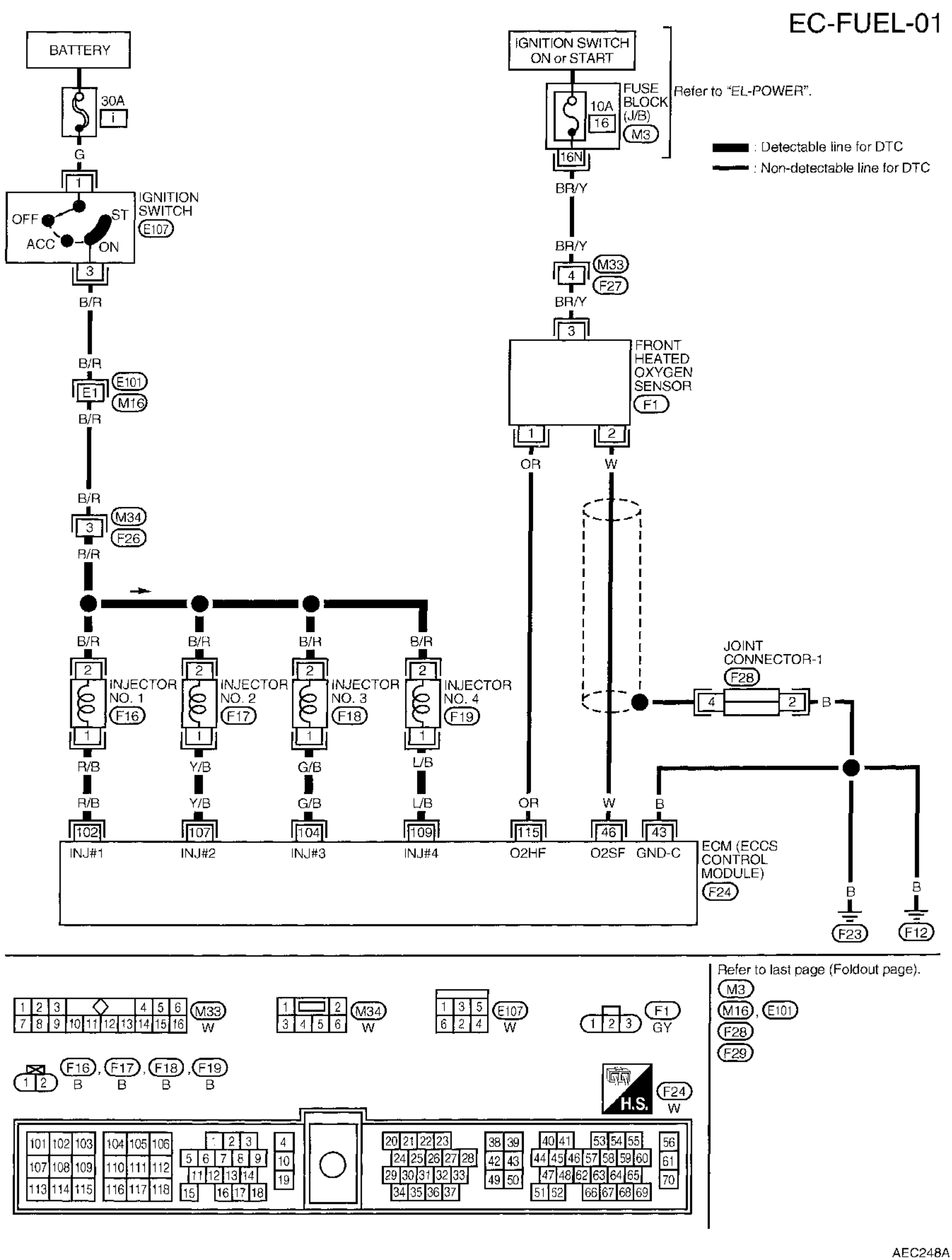
OR

NO TOOLS

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 at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
6) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
7) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
8) Start engine again and run it at least 10 minutes at idle speed.
   The 1st trip DTC 0115 should be detected at this stage, if a malfunction exists.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.

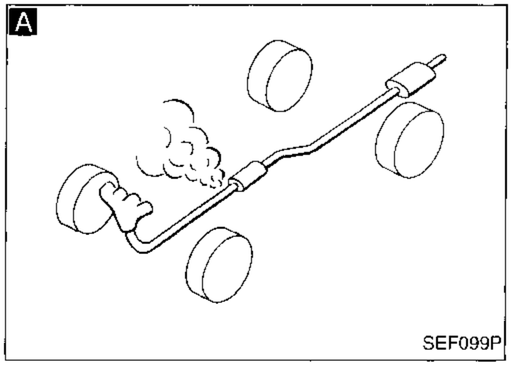
Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-394. If engine does not start, check exhaust and intake air leak visually again.

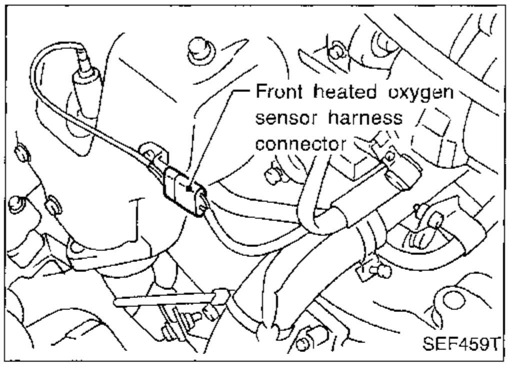
Fuel Injection System Function (Lean side) (Cont'd)

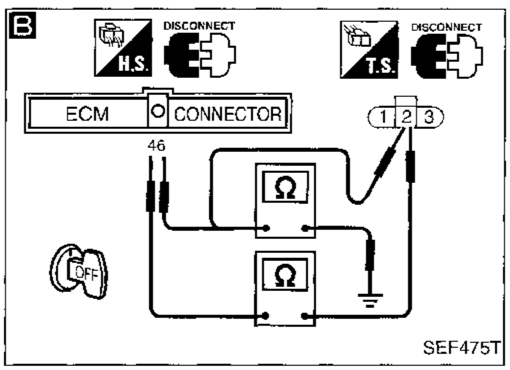


Fuel Injection System Function (Lean side) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

A

CHECK EXHAUST AIR LEAK.
Start engine and run it at idle. Listen for an exhaust air leak before the three way catalyst.

NG → Repair or replace.

↓ OK

CHECK INTAKE AIR LEAK.
Start engine and run it at idle. Listen for an intake air leak after the mass air flow sensor.

NG → Repair or replace.

↓ OK

B

CHECK FRONT HEATED OXYGEN SENSOR.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal (46) and terminal (2).
   Continuity should exist.
4. Check harness continuity between ECM terminal (46) (or terminal (2)) and ground.
   Continuity should not exist.

NG → Repair harness or connectors.

↓ OK

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero.
   Refer to page EC-260.)
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 235 kPa
   (2.4 kg/cm^2, 34 psi)
   A few seconds after ignition switch is turned OFF to ON:
   Approx. 294 kPa
   (3.0 kg/cm^2, 43 psi)

NG → Check fuel pump and circuit. Refer to EC-564.

↓ OK

CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

OR

GST: Check "mass air flow" in MODE 1 with GST.
1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-336.

↓ OK

(A)
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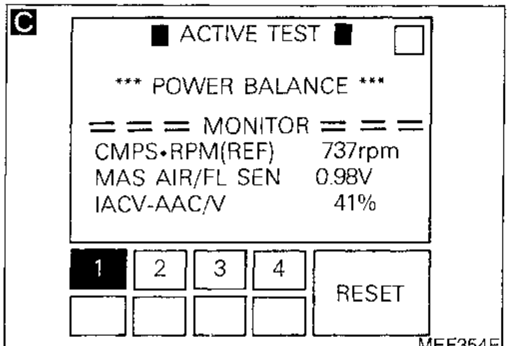
Fuel Injection System Function (Lean side) (Cont'd)



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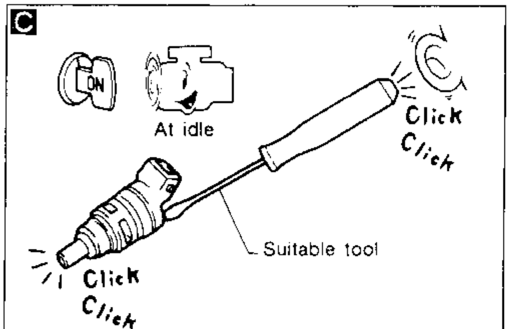
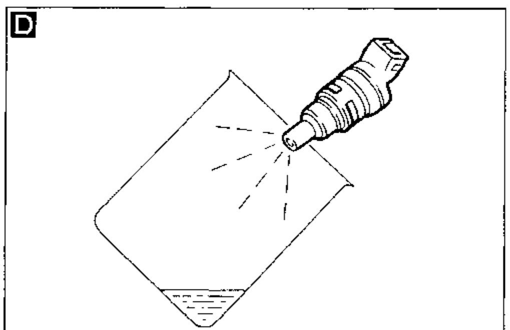


SEF730L



SEF595Q

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↓

C

CHECK FUNCTION OF INJECTORS.
1. Install all parts removed.
2. Start engine.
3. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
4. Make sure that each circuit produces a momentary engine speed drop.

OR

3. Listen to each injector operating sound.
Clicking noise should be heard.

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-557. Repair harness or connectors.

↓ OK

Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

↓

D

1. Turn ignition switch "OFF".
2. Remove injector assembly.
   Refer to EC-261.
   Keep fuel hose and all injectors connected to injector gallery.

↓

1. Disconnect ignition coil harness connector.
2. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.

NG → Replace injectors from which fuel does not spray out.

↓ OK

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

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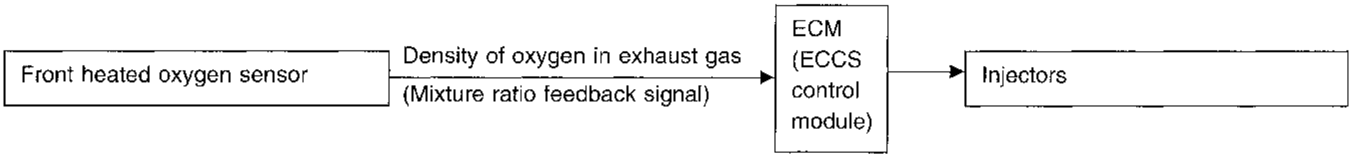
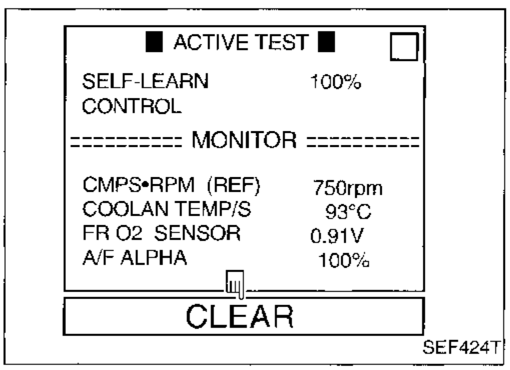
Fuel Injection System Function (Rich side)

ON BOARD DIAGNOSIS LOGIC

With Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensor. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large, the ECM judges the condition as the fuel 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 • Injectors • Exhaust gas leak • Incorrect fuel pressure • Mass air flow sensor



SEF424T

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 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

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 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 at least 10 minutes at idle speed.

Fuel Injection System Function (Rich side) (Cont'd)

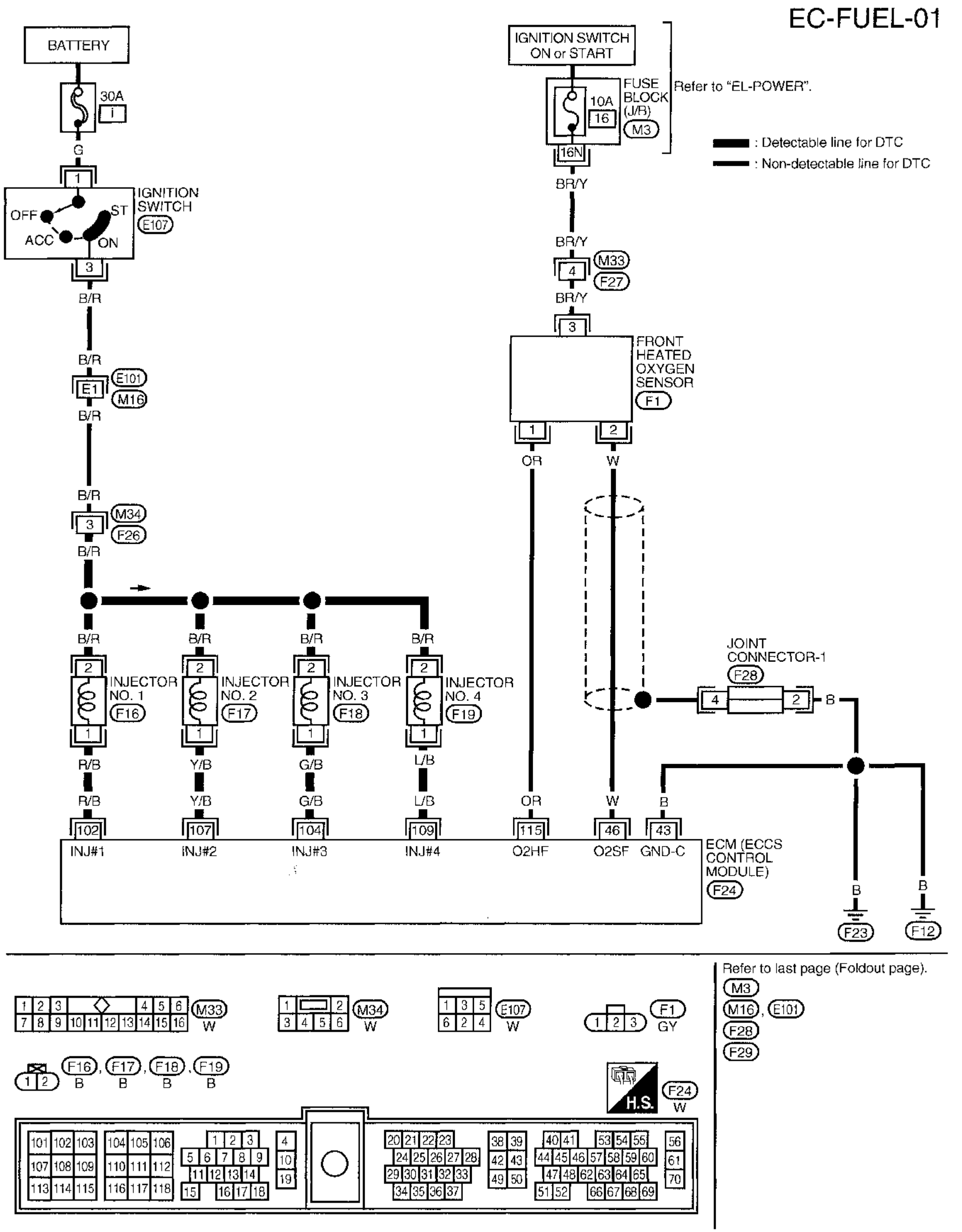
8) Select "MODE 7" with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
   If engine does not start, remove ignition plugs and check for fouling, etc.

——————— OR ———————

NO TOOLS

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 at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
6) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
7) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
8) Start engine again and run it at least 10 minutes at idle speed.
   The 1st trip DTC 0114 should be detected at this stage, if a malfunction exists.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
   If engine does not start, remove ignition plugs and check for fouling, etc.

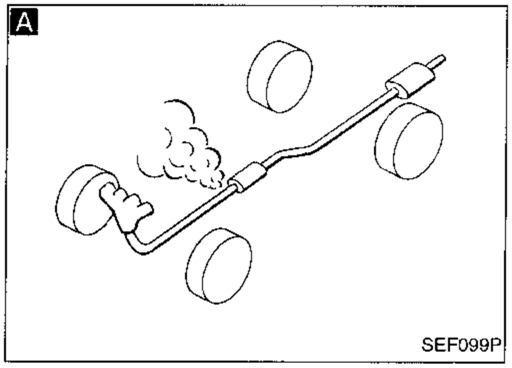
Fuel Injection System Function (Rich side) (Cont'd)

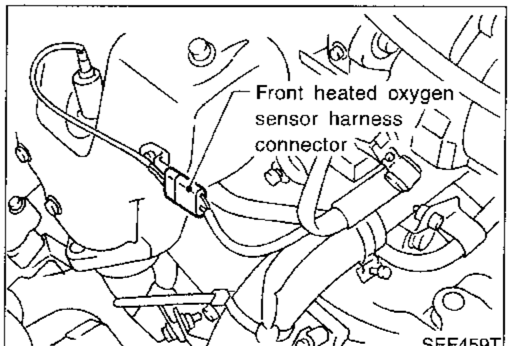


AEC248A

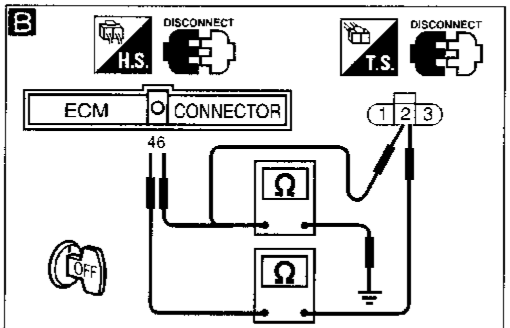
Fuel Injection System Function (Rich side) (Cont'd)

DIAGNOSTIC PROCEDURE

A

SEF099P



SEF459T

B


SEF475T

INSPECTION START

↓

A CHECK EXHAUST AIR LEAK.
Start engine and run it at idle. Listen for an exhaust air leak before the three way catalyst.

NG → Repair or replace.

↓ OK

B **CHECK FRONT HEATED OXYGEN SENSOR.**
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal 46 and terminal 2.
   Continuity should exist.
4. Check harness continuity between ECM terminal 46 (or terminal 2) and ground.
   Continuity should not exist.

NG → Repair harness or connectors.

↓ OK

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero.
   Refer to EC-260.
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 235 kPa
   (2.4 kg/cm^2, 34 psi)
   A few seconds after ignition switch is turned OFF to ON:
   Approx. 294 kPa
   (3.0 kg/cm^2, 43 psi)

NG → Check fuel pump and circuit. Refer to EC-564.

↓ OK

CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

OR

Check "mass air flow" in MODE 1 with GST.
1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

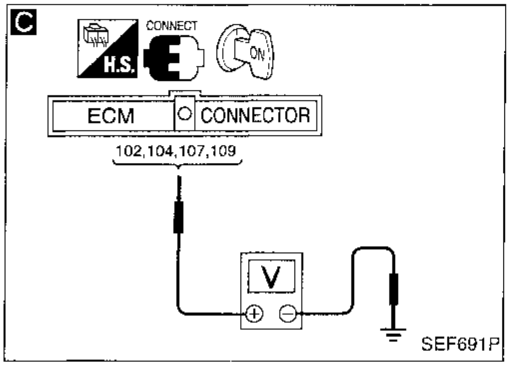
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-336.

↓ OK

A

(Go to next page.)

Fuel Injection System Function (Rich side) (Cont'd)



Ⓐ

C

CHECK INJECTORS.
1. Turn ignition switch "ON".
2. Check voltage between ECM terminals (102), (104), (107), or (109) 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-557. Repair harness or connectors.

OK ↓

Remove injector assembly.
Refer to EC-261.
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 ignition coil harness connector.
3. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

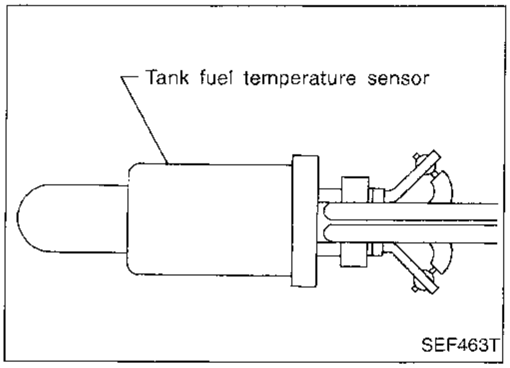
Drips → Replace the injectors from which fuel is dripping.

Does not drip. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

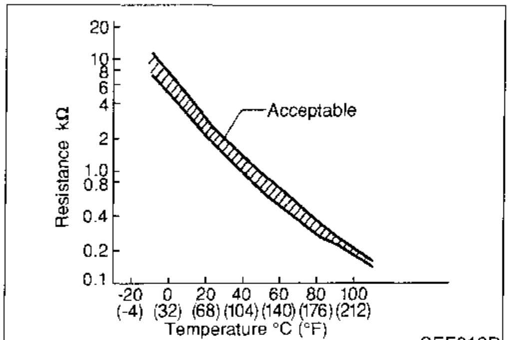
INSPECTION END



SEF463T

Tank Fuel Temperature Sensor

The tank fuel temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



SEF012P

〈Reference data〉

Fluid temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal ⑥③ (Tank fuel temperature sensor) and ECM terminal ④③ (ECCS ground).

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Causes)
P0180 0402	● An excessively high or low voltage is sent to ECM. ● Rationally incorrect voltage is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.	● Harness or connectors (the sensor circuit is open or shorted.) ● Tank fuel temperature sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 12 seconds.

OR

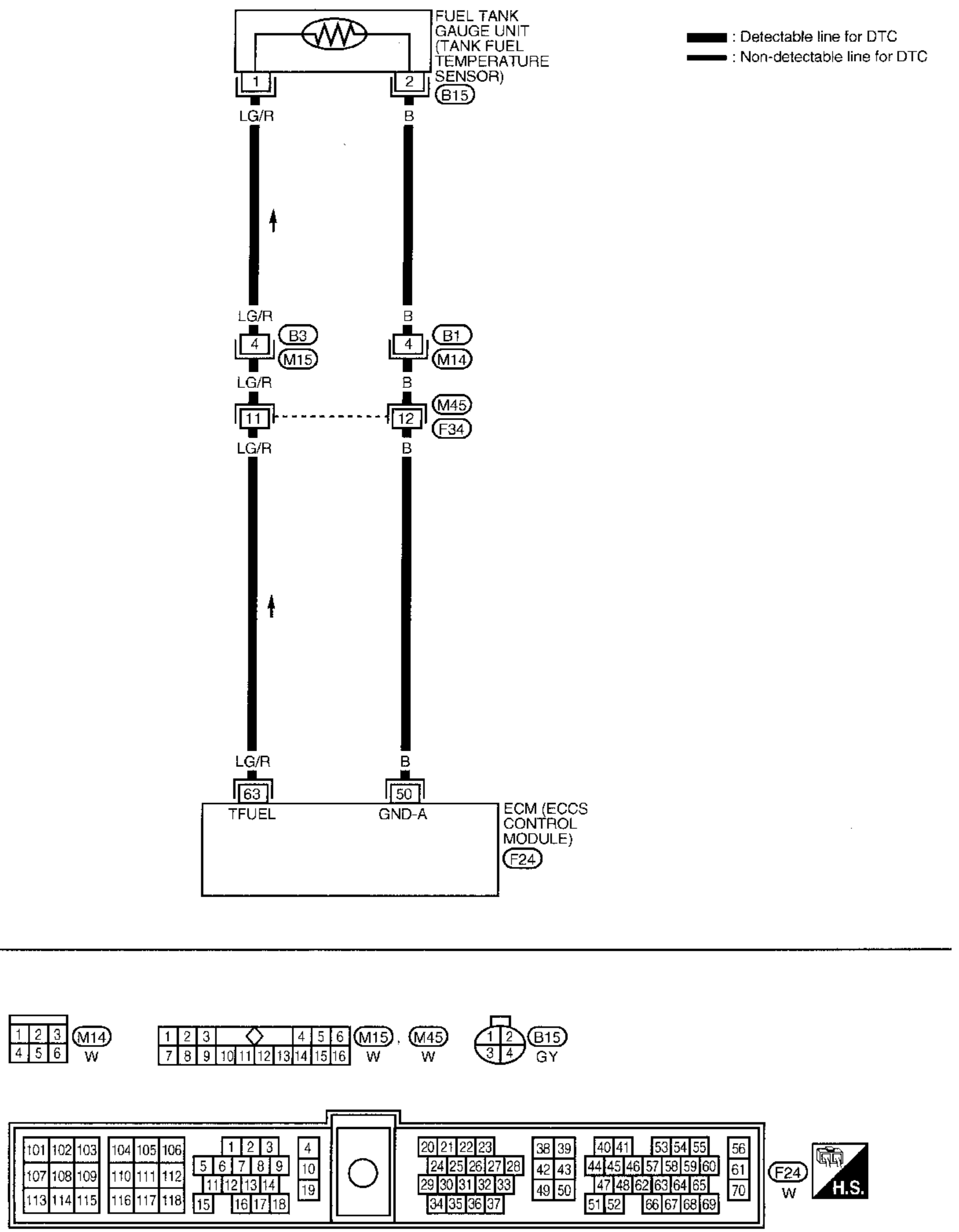
1) Turn ignition switch "ON" and wait at least 12 seconds.
2) Select "MODE 3" with GST.

OR

NO TOOLS

1) Turn ignition switch "ON" and wait at least 12 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

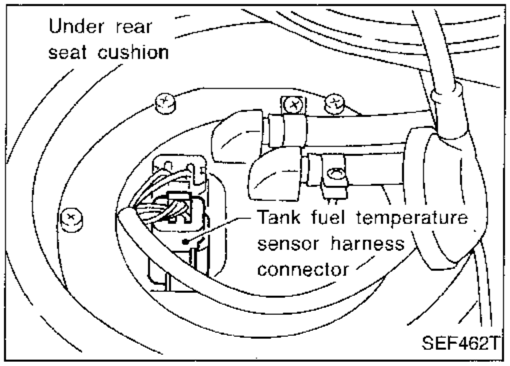
EC-TFTS-01



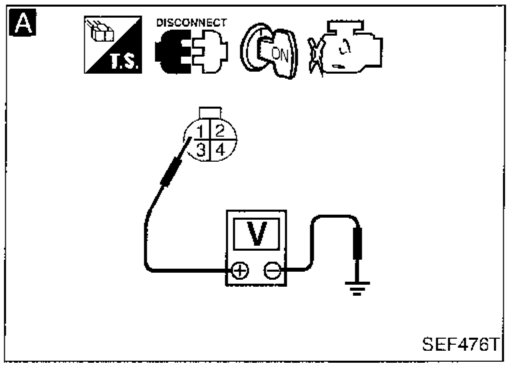
AEC237A

Tank Fuel Temperature Sensor (Cont'd)

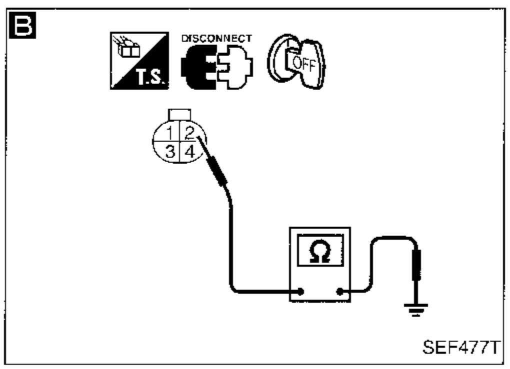
DIAGNOSTIC PROCEDURE



SEF462T



SEF476T



SEF477T

INSPECTION START

↓

A

CHECK POWER SUPPLY.
1. Disconnect tank fuel temperature sensor harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage: Approximately 5V

NG → Check the following.
- Harness connectors (B3), (M15), (F34), (M45)
- Harness for open or short between ECM and tank fuel temperature sensor

If NG, repair harness or connector.

↓ OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ② and body ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (B1), (M14), (F34), (M45)
- Harness for open or short between ECM and tank fuel temperature sensor

If NG, repair harness or connectors.

↓ OK

CHECK COMPONENT
(Tank fuel temperature sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace tank fuel temperature sensor.

↓ OK

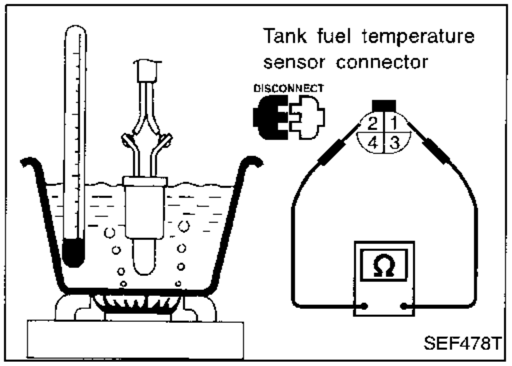
Disconnect and reconnect harness connectors in the circuit. Then retest.

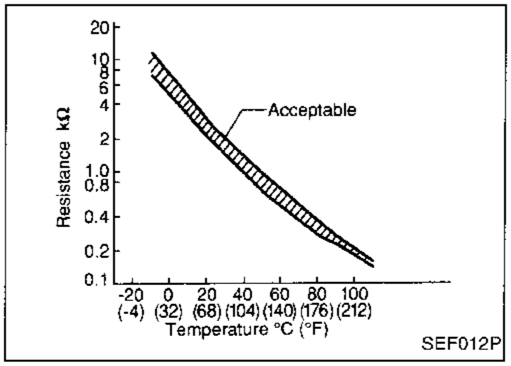
↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END





Tank Fuel Temperature Sensor (Cont'd)

COMPONENT INSPECTION

Tank fuel temperature sensor

Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace tank fuel temperature sensor.

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire

ON BOARD DIAGNOSIS LOGIC

If a misfire occurs, the engine speed will fluctuate. If the fluctuation is detected by the crankshaft position sensor (OBD), the misfire is diagnosed.
The misfire detection logic consists of the following two conditions.

Crankshaft position sensor (OBD) —Engine speed→ ECM

1. One Trip Detection Logic (Three Way Catalyst Damage)
   When a misfire is detected which will overheat and damage the three way catalyst, the malfunction indicator lamp (MIL) will start blinking; even during the first trip. In this condition, ECM monitors the misfire every 200 revolutions.
   If the misfire frequency decreases to a level that will not damage the three way catalyst, the MIL will change from blinking to lighting up.
   (After the first trip detection, the MIL will light up from engine starting. If a misfire is detected that will cause three way catalyst damage, the MIL will start blinking.)
2. Two Trip Detection Logic (Exhaust quality deterioration)
   When a misfire that will not damage the three way catalyst (but will affect exhaust emission) occurs, the malfunction indicator lamp will light up based on the second consecutive trip detection logic. In this condition, ECM monitors the misfire for each 1,000 revolutions of the engine.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0300 (0701)	● Multiple cylinders misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● EGR valve ● Injector circuit is open or shorted ● Injectors ● Intake air leak ● Ignition secondary circuit is open or shorted ● Lack of fuel ● Magnetized flywheel (drive plate)
P0301 (0608)	● No. 1 cylinder misfires.	
P0302 (0607)	● No. 2 cylinder misfires.	
P0303 (0606)	● No. 3 cylinder misfires.	
P0304 (0605)	● No. 4 cylinder misfires.	

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 at least 3 minutes.

Hold the accelerator pedal as steady as possible during driving.
Note: Refer to the freeze frame data for the test driving conditions.

OR

GST
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 at least 3 minutes.
4) Select "MODE 3" with GST.

Hold the accelerator pedal as steady as possible during driving.
Note: Refer to the freeze frame data for the test driving conditions.

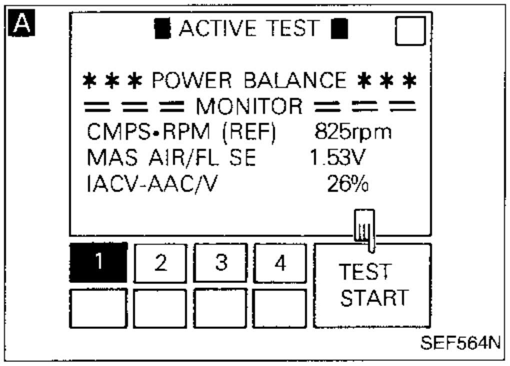
OR

NO TOOLS
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 at least 3 minutes.
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

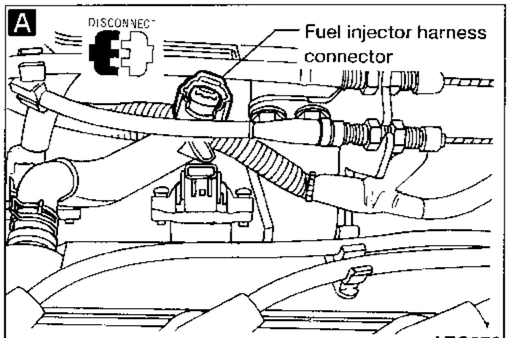
Hold the accelerator pedal as steady as possible during driving.

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

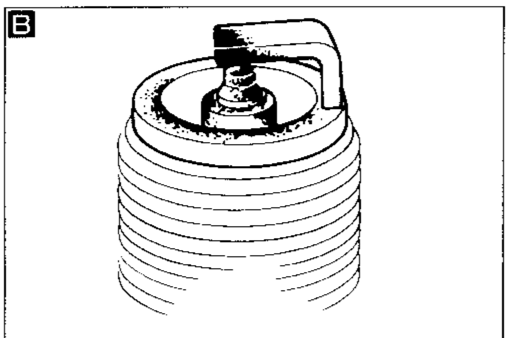
DIAGNOSTIC PROCEDURE



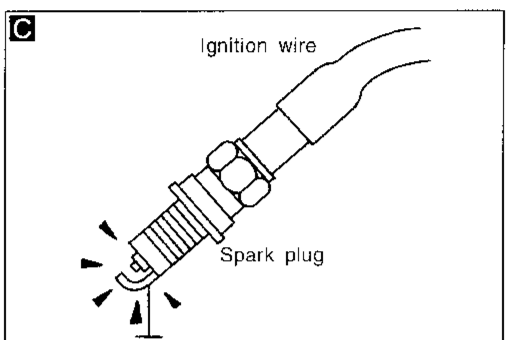
SEF564N



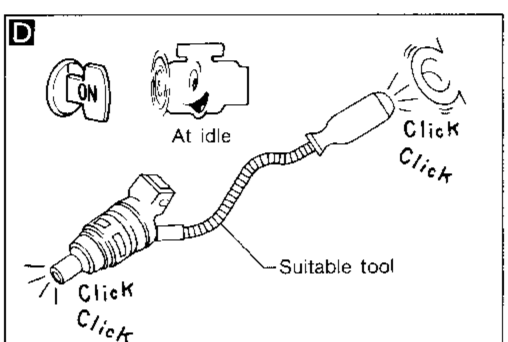
AEC872



SEF156I



SEF451R



MEC703B

INSPECTION START

↓

CHECK FOR INTAKE AIR LEAK.
Start engine and run it at idle speed. Listen for the sound of the intake air leak.
- NG → Discover air leak location and repair.
- OK ↓

CHECK FOR EXHAUST SYSTEM CLOGGING.
Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.
- NG → Repair or replace it.
- OK ↓

A

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?
- Yes → Go to D below.
- No ↓

B

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.
- NG → Repair or replace spark plug(s).
- OK ↓

C

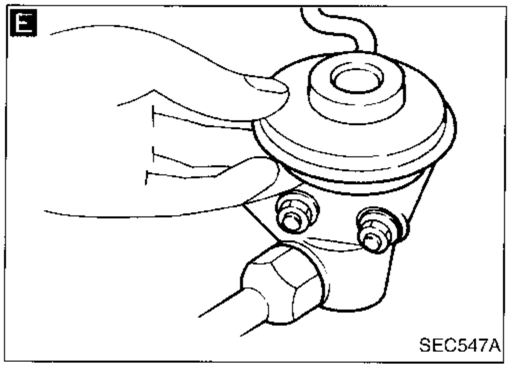
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.
- NG → CHECK COMPONENT (Ignition wires). Refer to "COMPONENT INSPECTION", EC-408.
  - NG → Replace.
  - OK → Check ignition coil, power transistor and their circuits. (Refer to EC-498.)
- OK ↓

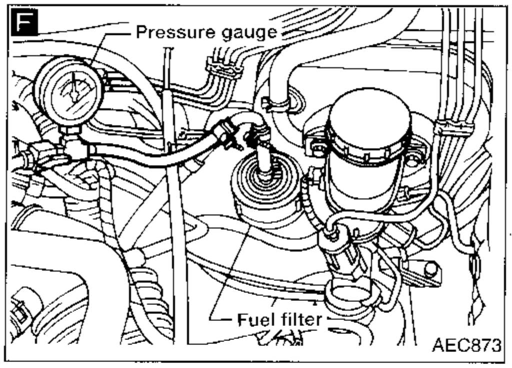
D

CHECK INJECTOR.
Does each injector make an operating sound at idle?
- No → Check injector(s) and circuit(s). Refer to EC-557.
- Yes ↓

(A)
(Go to next page.)

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)





Ⓐ

E **CHECK EGR FUNCTION.**
Perform OVERALL FUNCTION CHECK (Procedure for malfunction B) for EGR Function.
Refer to EC-424.

NG → Repair EGR system.

OK ↓

F **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. Refer to EC-260.
2. Install fuel pressure gauge and check fuel pressure.
At idle:
Approx. 235 kPa
(2.4 kg/cm^2, 34 psi)

NG → Check fuel pump and circuit.

OK ↓

CHECK COMPRESSION PRESSURE.
Refer to EM section.
- Check compression pressure.
Standard:
kPa (kg/cm^2, psi)/300 rpm
1,226 (12.5, 178)
Minimum:
kPa (kg/cm^2, psi)/300 rpm
1,030 (10.5, 149)
Difference between each cylinder:
kPa (kg/cm^2, psi)/300 rpm
98 (1.0, 14)

NG → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

OK ↓

CHECK IGNITION TIMING.
Perform "Basic Inspection", EC-310.

NG → Adjust ignition timing.

OK ↓

CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

OR

Check "MASS AIR FLOW" in MODE 1 with GST.
1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-336.
If NG, repair or replace it.

OK ↓

Ⓑ

(Go to next page.)

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

Ⓑ

↓

CHECK SYMPTOM MATRIX CHART.
Check items on the rough idle symptom in "Symptom Matrix Chart", EC-315.

NG → Repair or replace.

↓ OK

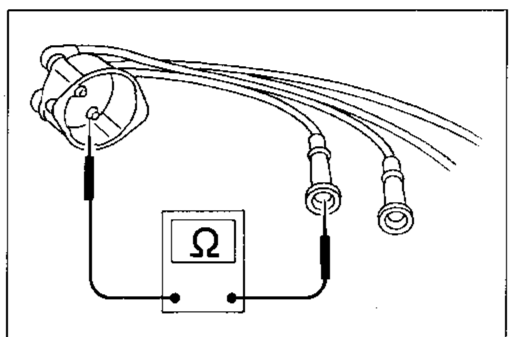
Some tests may cause a Diagnostic Trouble Code to be set.
Erase the DTC from the ECM memory after performing the tests. Refer to EC-280.

↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END



SEF174P

COMPONENT INSPECTION

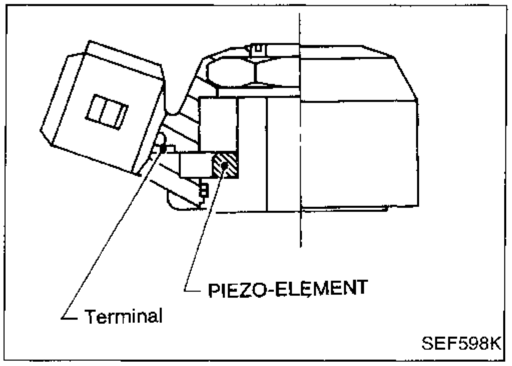
Ignition wires

1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires to their distributor cap terminal. Move each wire while testing to check for intermittent breaks.

   Resistance:

   13.6 - 18.4 kΩ/m (4.15 - 5.61 kΩ/ft)
   [at 25°C (77°F)]

   If the resistance exceeds the above specification, inspect ignition wire to distributor cap connection. Clean connection or replace the ignition wire with a new one.



SEF598K

Knock Sensor (KS)

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

*** Freeze frame data will not be stored in the ECM for the knock sensor. The MIL will not light for knock sensor malfunction.**

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
54	W	Knock sensor	Engine is running. Idle speed	2.0 - 3.0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0325 0304	● An excessively low or high voltage from the knock sensor is sent to ECM.	● Harness or connectors (The knock sensor circuit is open or shorted.) ● Knock sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it at least 5 seconds at idle speed.

OR

GST

1) Start engine and run it at least 5 seconds at idle speed.
2) Select "MODE 3" with GST.

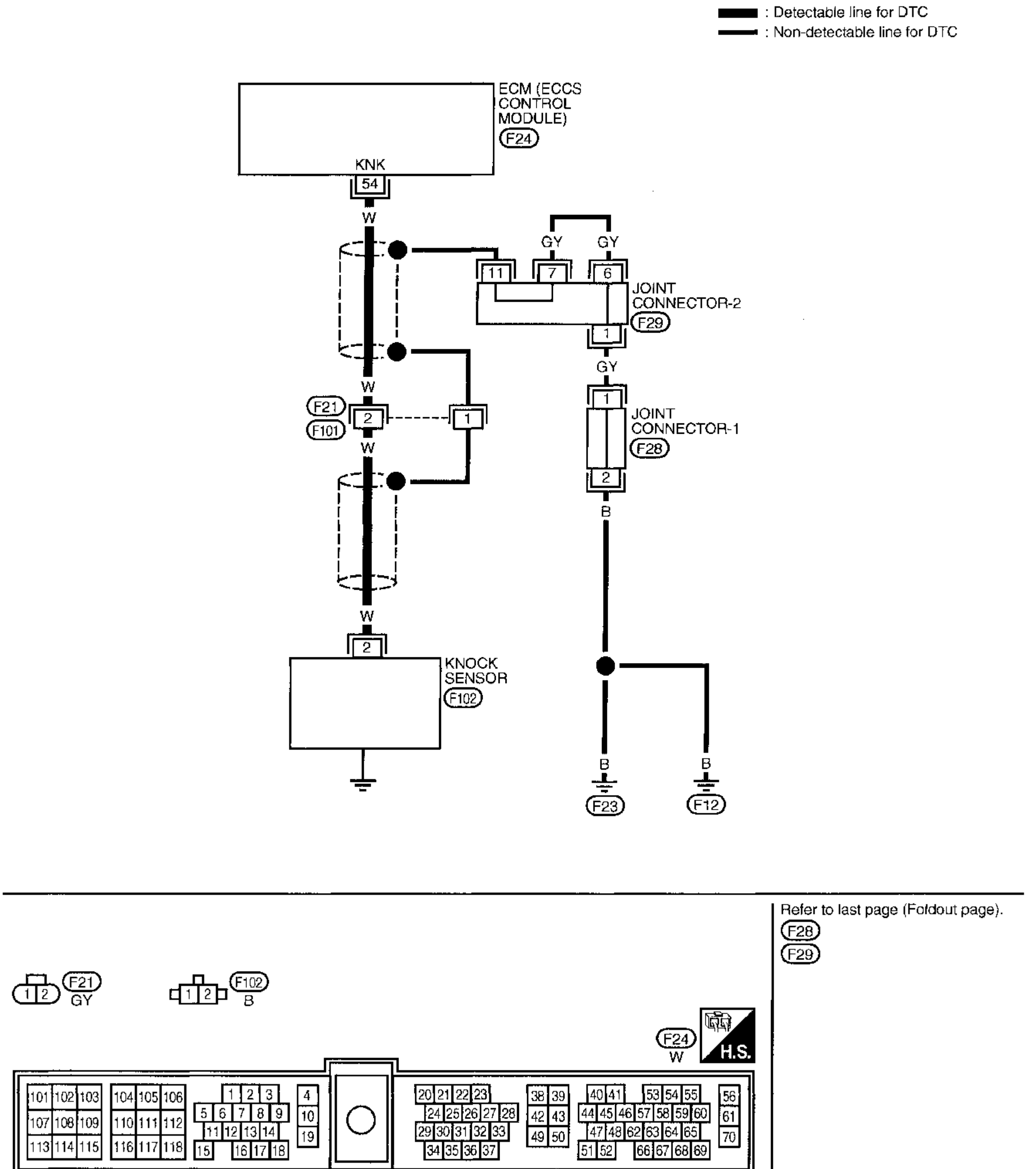
OR

NO TOOLS

1) Start engine and run it 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.

GI
MA
EM
LC
EC
FE
CL
MT
AT
FA
RA
BR
ST
RS
BT
HA
EL
IDX

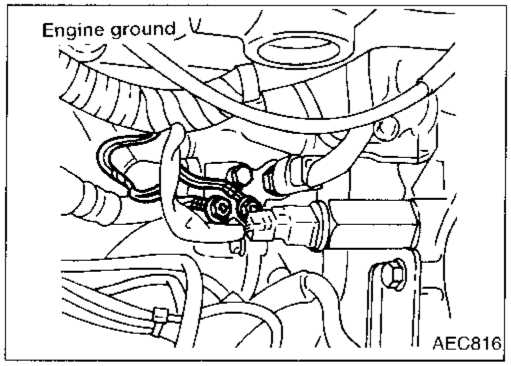
EC-KS-01



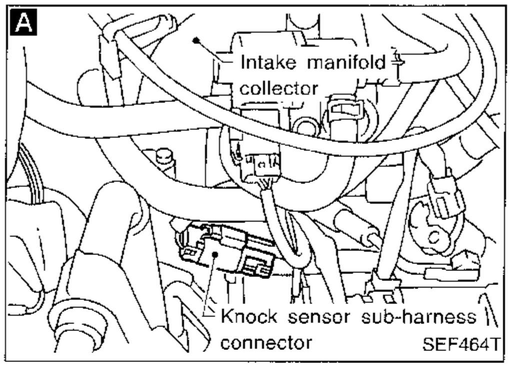
AEC249A

Knock Sensor (KS) (Cont'd)

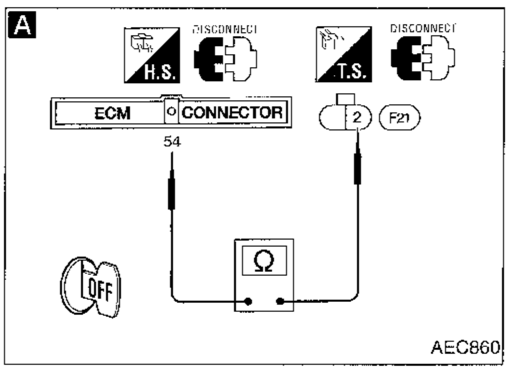
DIAGNOSTIC PROCEDURE



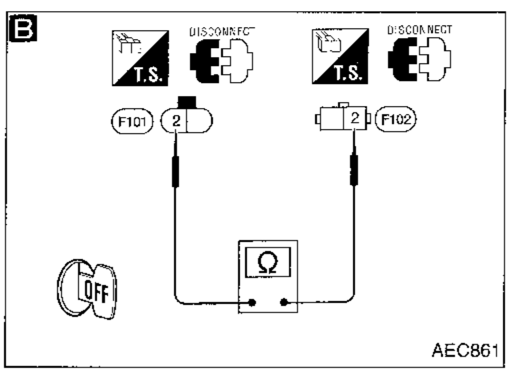
AEC816



SEF464T



AEC860



AEC861

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 ② and ECM terminal ㊺54.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

B

CHECK INPUT SIGNAL CIRCUIT-2.
1. Disconnect knock sensor harness connector.
2. Check harness continuity between knock sensor harness connector terminal ② and knock sensor sub-harness connector terminal ②.
   Continuity: Approximately 500 - 620 kΩ [at 25°C (77°F)]
   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 and knock sensor
- Continuity between sensor body and engine ground

If NG, repair harness or connectors.
- Knock sensor, "COMPONENT INSPECTION" on next page.

If NG, replace knock sensor.

↓ OK

CHECK COMPONENT (Knock sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace knock sensor.

↓ OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

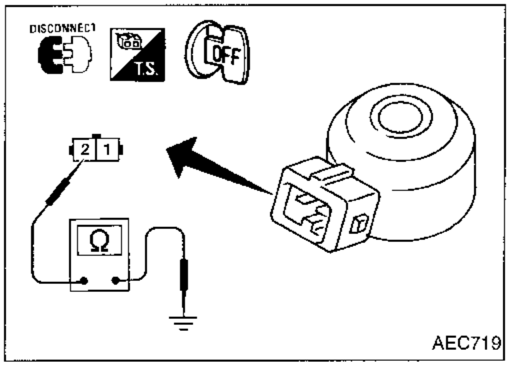
↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Knock Sensor (KS) (Cont'd)



COMPONENT INSPECTION

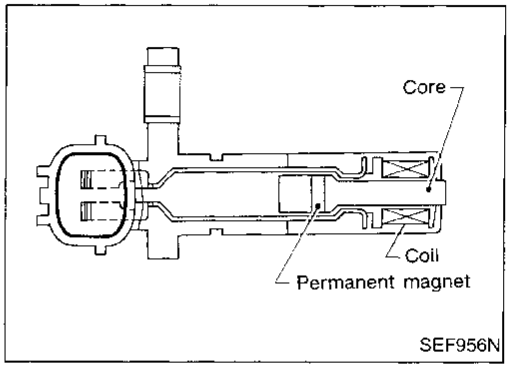
Knock sensor

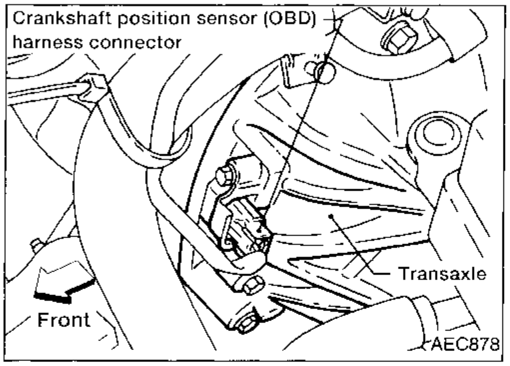
- Use an ohmmeter which can measure more than 10 MΩ.

1. Disconnect knock sensor harness connector.
2. Check resistance between terminal ② and ground.
   Resistance: 532 - 588 kΩ [at 25°C (77°F)]

CAUTION:
Discard any knock sensors that have been dropped or physically damaged. Use only new ones.

Crankshaft Position Sensor (CKPS) (OBD)

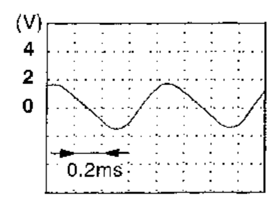
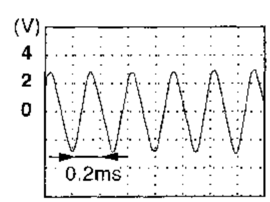




The crankshaft position sensor (OBD) is located on the transaxle housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
This sensor is not directly used to control the engine system. It is used only for the on board diagnosis of misfire.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50	B	Sensor's ground	Engine is running. (Warm-up condition) Idle speed	0.001 - 0.02V
53	W	Crankshaft position sensor (OBD)	Engine is running. (Warm-up condition) Idle speed	Approximately 0.03V  SEF202T
			Engine is running. Engine speed is 2,000 rpm.	Approximately 0.03V  SEF203T

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0335 0802	• The proper pulse signal from the crankshaft position sensor (OBD) is not sent to ECM while the engine is running at the specified engine speed.	• Harness or connectors (The crankshaft position sensor (OBD) circuit is open.) • Crankshaft position sensor (OBD) • Crankshaft position sensor (OBD) improper installation

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it at least 10 seconds at idle speed.

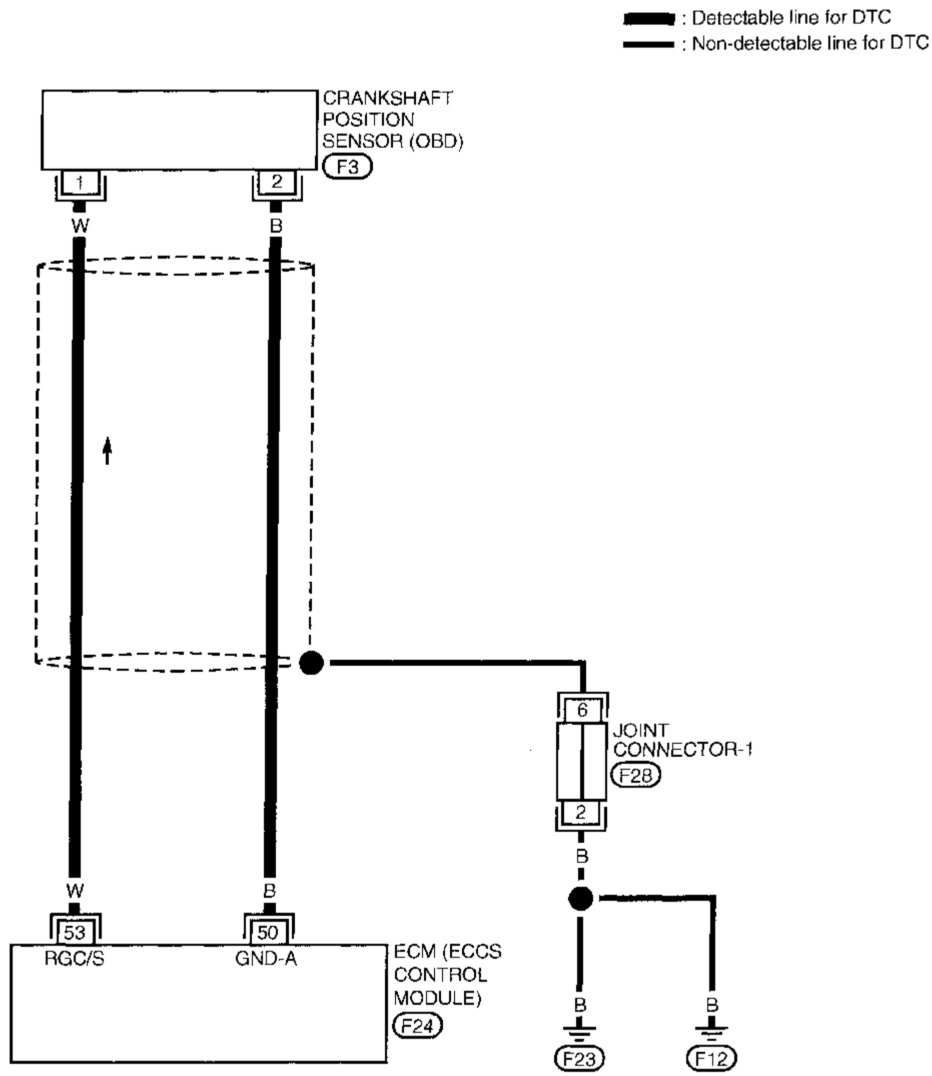
OR

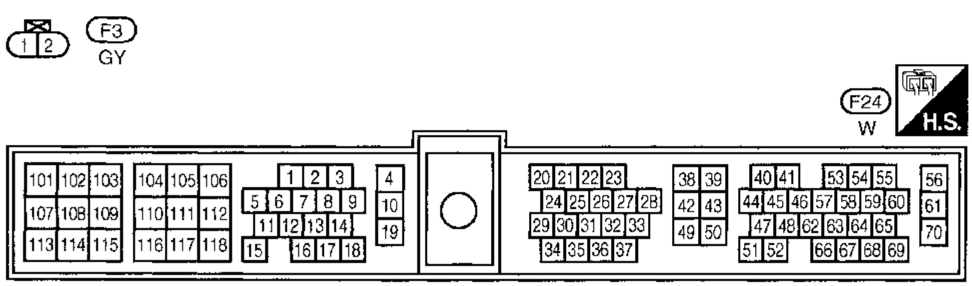
1) Start engine and run it at least 10 seconds at idle speed.
2) Select "MODE 3" with GST.

OR

1) Start engine and run it at least 10 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.

EC-CKPS-01



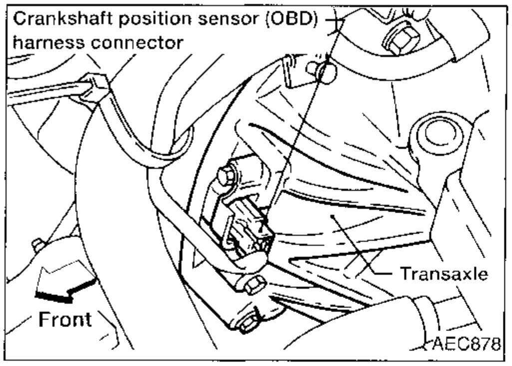


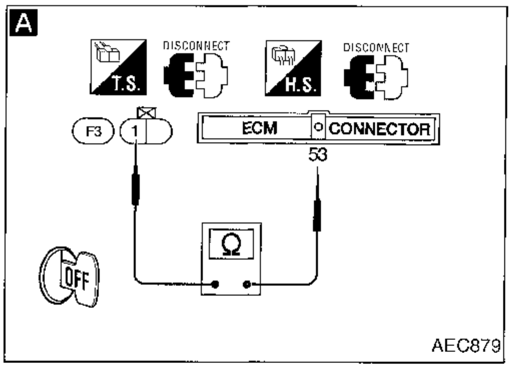
Refer to last page (Foldout page).
F28

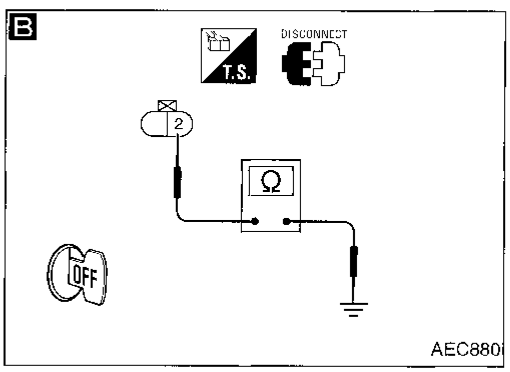
AEC250A

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 ⑤③ with CONSULT or tester.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

B

CHECK GROUND CIRCUIT.
1. Connect ECM harness connector.
2. Check harness continuity between terminal ② and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness for open or short between ECM and crankshaft position sensor (OBD) harness connector

If NG, repair harness or connectors.

↓ OK

CHECK INSTALLATION.
Check that crankshaft position sensor (OBD) is installed properly.

NG → Reinstall crankshaft position sensor properly.

↓ 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.

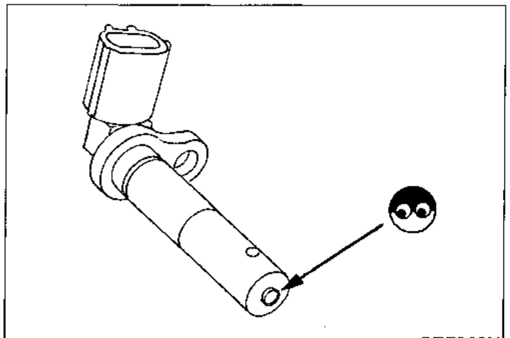
↓

INSPECTION END

Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

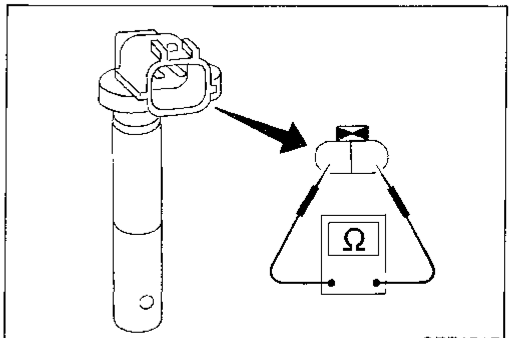
COMPONENT INSPECTION

Crankshaft position sensor (OBD)



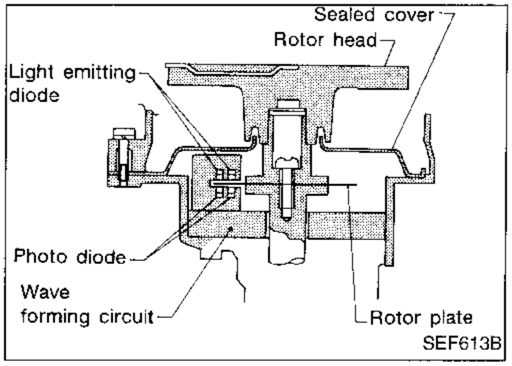
SEF960N

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.

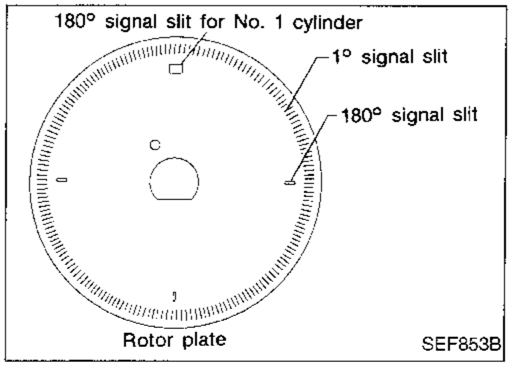


SEF151P

5. Check resistance as shown in the figure.
   Resistance:
   M/T models
   432 - 528Ω [at 25°C (77°F)]
   A/T models
   166.5 - 203.5Ω [at 25°C (77°F)]



SEF613B



SEF853B

Camshaft Position Sensor (CMPS)

The camshaft position sensor is a basic component of the ECCS. It monitors engine speed and piston position. These input signals to the ECM are used to control fuel injection, ignition timing and other functions.

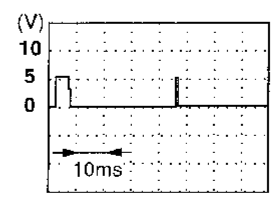
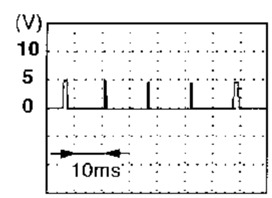
The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for a 1° (POS) signal and 4 slits for a 180° (REF) signal. The wave-forming circuit consists of Light Emitting Diodes (LED) and photo diodes.

The rotor plate is positioned between the LED and the photo diode. The LED transmits light to the photo diode. As the rotor plate turns, the slits cut the light to generate rough-shaped pulses. These pulses are converted into on-off signals by the wave-forming circuit and sent to the ECM.

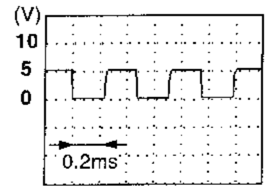
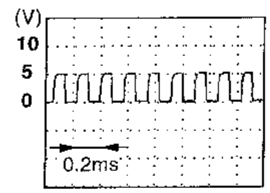
The distributor is not repairable and must be replaced as an assembly except distributor cap.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
40 44	L L	Camshaft position signal (Reference signal)	Engine is running. (Warm-up condition) Idle speed	0.1 - 0.4V  SEF199T
			Engine is running. Engine speed is 2,000 rpm.	0.1 - 0.4V  SEF200T

Camshaft Position Sensor (CMPS) (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
41 45	B/W	Camshaft position sensor (Position signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.5V  SEF195T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 2.4V  SEF196T
56 61	W/R W/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0340 0101	• Either 1° or 180° signal is not sent to ECM for the first few seconds during engine cranking. • Either 1° or 180° signal is not sent to ECM often enough while the engine speed is higher than the specified engine speed. • The relation between 1° and 180° signal is not in the normal range during the specified engine speed.	• Harness or connectors (The camshaft position sensor circuit is open or shorted.) • Camshaft position sensor • Starter motor (Refer to EL section.) • Starting system circuit (Refer to EL section.) • Dead (Weak) battery

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Before performing the following procedure, confirm that battery voltage is more than 10.5 V.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Crank engine at least 2 seconds.

OR

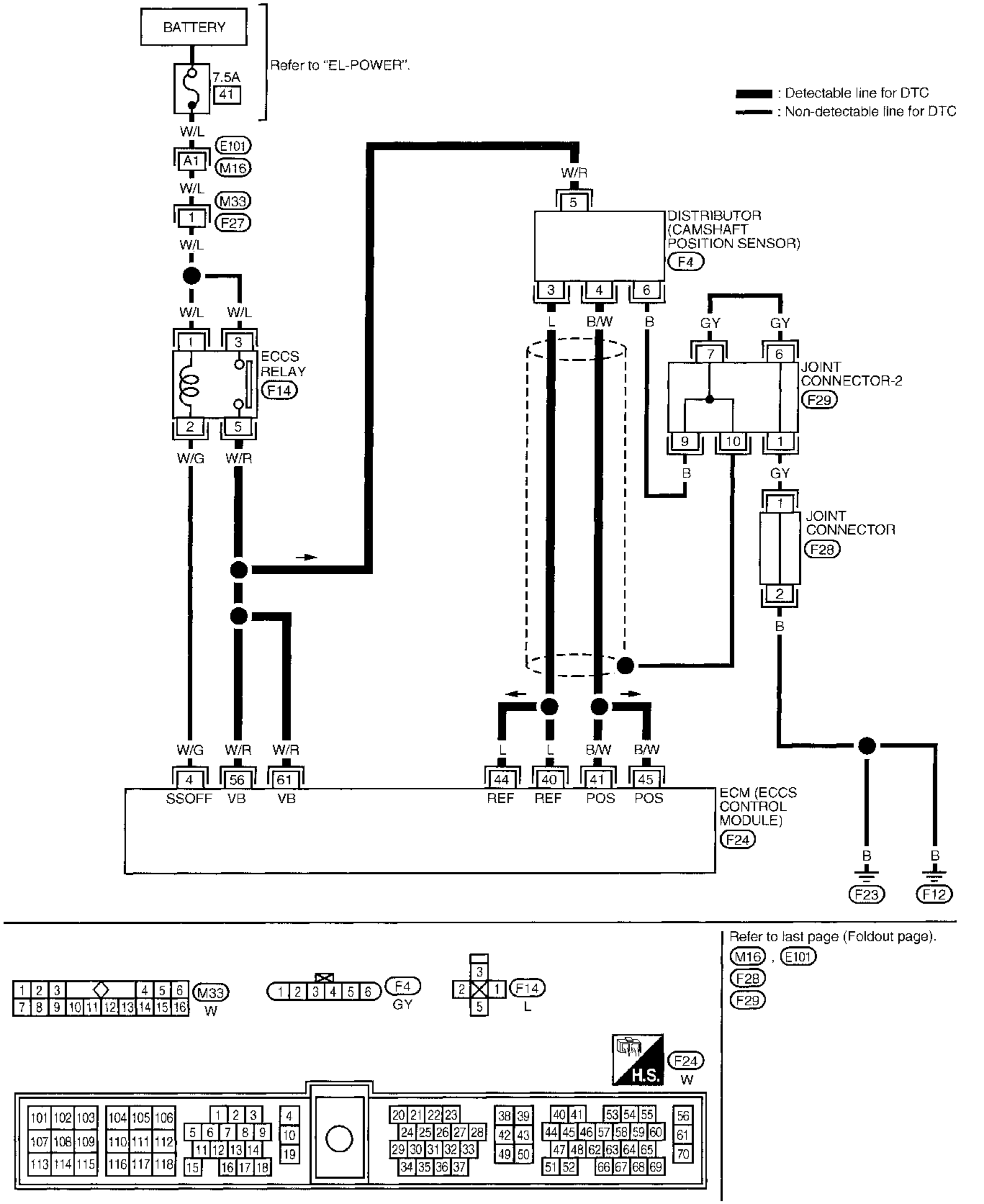
1) Crank engine at least 2 seconds.
2) Select "MODE 3" with GST.

OR

1) Crank engine 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.

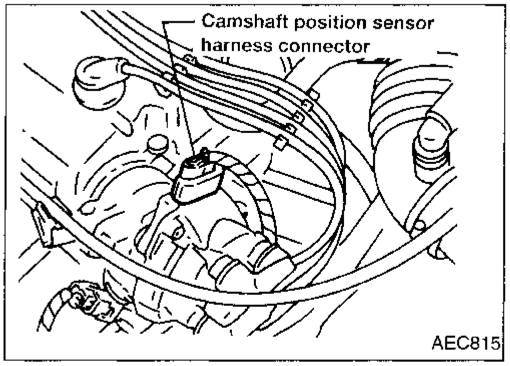
GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

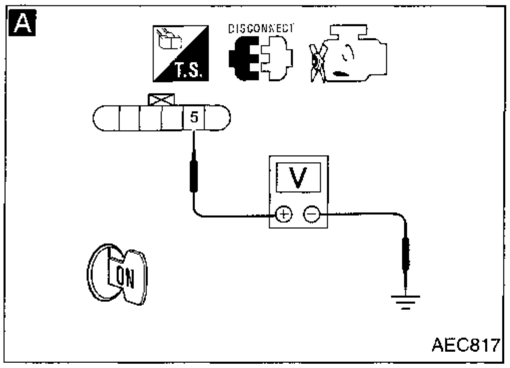
EC-CMPS-01


BATTERY
7.5A
41
Refer to "EL-POWER".
: Detectable line for DTC
: Non-detectable line for DTC
W/L
E101
A1
M16
W/L
M33
1
F27
W/L
W/L
W/L
1
3
ECCS
RELAY
F14
2
5
W/G
W/R
W/R
5
DISTRIBUTOR
(CAMSHAFT
POSITION SENSOR)
F4
3
4
6
L
B/W
B
GY
GY
7
6
JOINT
CONNECTOR-2
F29
9
10
1
B
GY
1
JOINT
CONNECTOR
F28
2
B
W/G
W/R
W/R
L
L
B/W
B/W
4
56
61
44
40
41
45
SSOFF
VB
VB
REF
REF
POS
POS
ECM (ECCS
CONTROL
MODULE)
F24
B
B
F23
F12
Refer to last page (Foldout page).
M16 , E101
F28
F29
M33
W
F4
GY
F14
L
H.S.
F24
W
AEC251A

Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE (DETECTABLE CIRCUIT)





INSPECTION START

↓

A

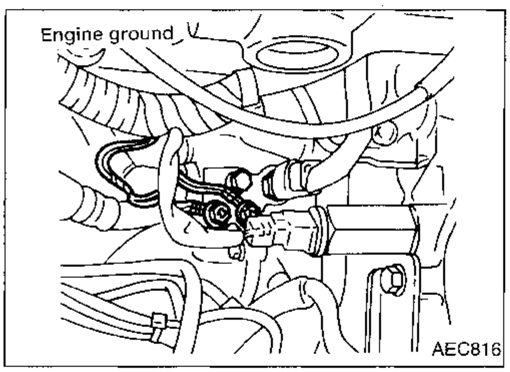
CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect camshaft position sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ⑤ and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.
- Harness for open or short between camshaft position sensor and ECCS relay

If NG, repair harness or connectors.

OK ↓



Loosen and retighten engine ground screws.

↓

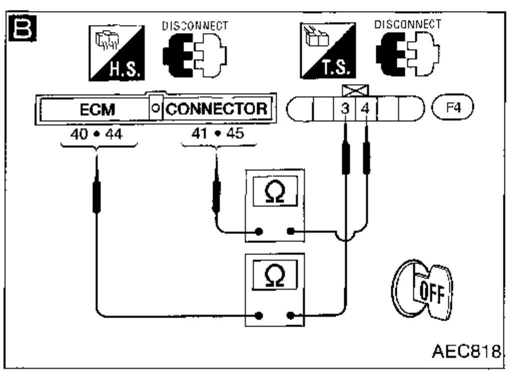
B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ④ and ECM terminals ㊶, ㊺, terminal ③ and ECM terminals ㊵, ㊹.

Continuity should exist.

If OK, check harness for short.

NG → Repair harness or connectors.



OK ↓

CHECK COMPONENT (Camshaft position sensor). Refer to "COMPONENT INSPECTION" on next page.

NG → Replace camshaft position sensor.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

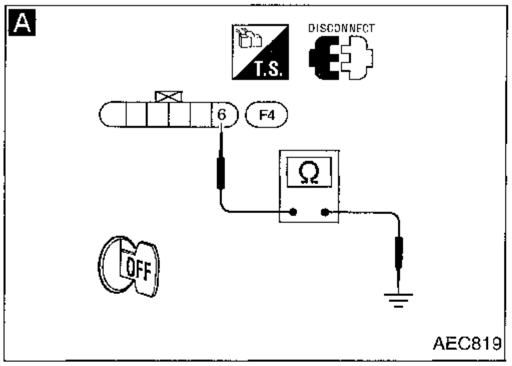
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE (NON-DETECTABLE CIRCUIT)



INSPECTION START

↓

A

CHECK GROUND CIRCUIT.
Check harness continuity between terminal ⑥ and engine ground.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Joint connector-2 (F29)
- Joint connector (F28)

If NG, repair connectors.

↓ OK

CHECK COMPONENT
(Camshaft position sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace camshaft position sensor.

↓ OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

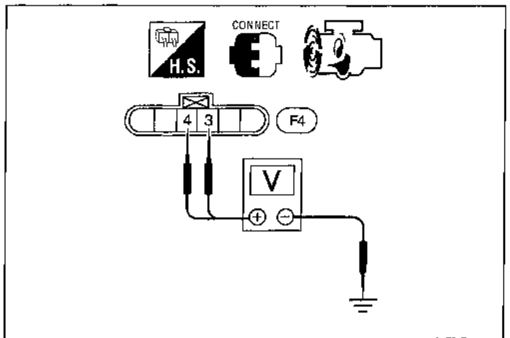
↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Camshaft Position Sensor (CMPS) (Cont'd)



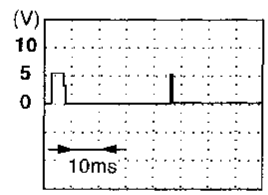
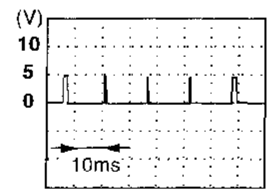
AEC820

COMPONENT INSPECTION

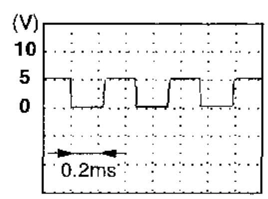
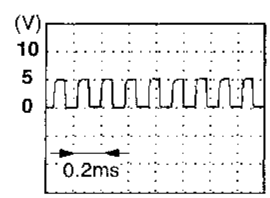
Camshaft position sensor

1. Start engine and warm it up sufficiently.
2. Check voltage between terminals ③, ④ and ground.

Terminal ③ and engine ground

Condition	Idle	2,000 rpm
Voltage	0.1 - 0.4V	0.1 - 0.4V
Pulse signal	 SEF199T	 SEF200T

Terminal ④ and engine ground

Condition	Idle	2,000 rpm
Voltage	Approximately 2.5V	Approximately 2.4V
Pulse signal	 SEF195T	 SEF196T

If NG, replace distributor assembly with camshaft position sensor.

After this inspection, diagnostic trouble code No. P0340 might be displayed with camshaft position sensor functioning properly. Erase the stored memory.

GI
MA
EM
LC
EC
FE
CL
MT
AT
FA
RA
BR
ST
RS
BT
HA
EL
IDX

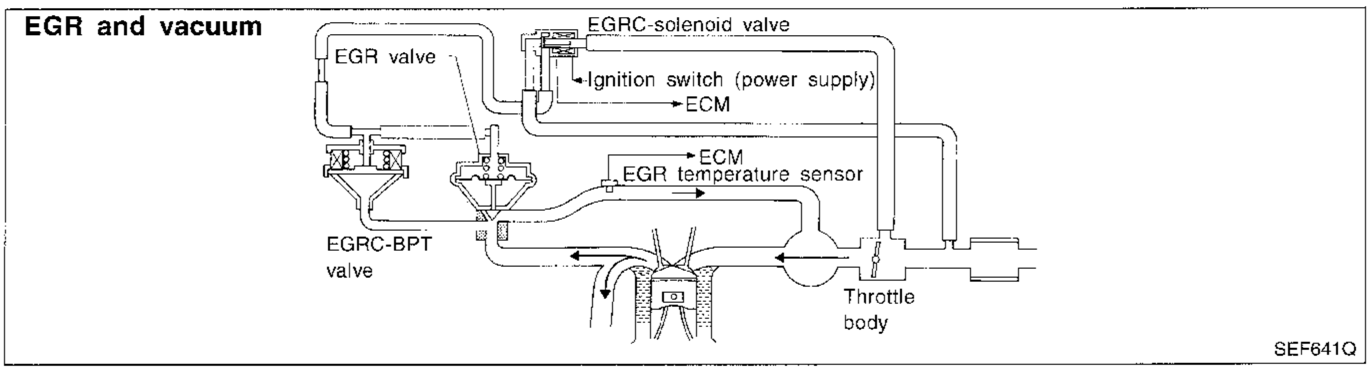
EGR Function

SYSTEM DESCRIPTION

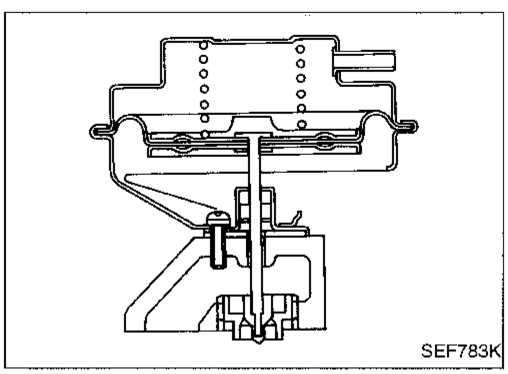
Sensor	Input signal	Control unit	Actuator
Camshaft position sensor	Engine speed	ECM (ECCS control module)	EGRC-control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor (M/T models)	Vehicle speed		

This system cuts and controls vacuum applied to EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and EGRC-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 remains closed.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction
- Low vehicle speed (M/T models)
- For 20 seconds after starting engine



SEF641Q



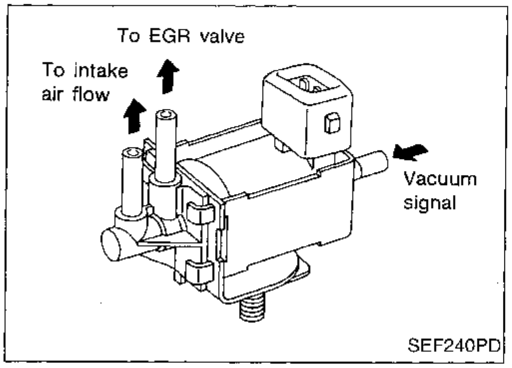
SEF783K

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.

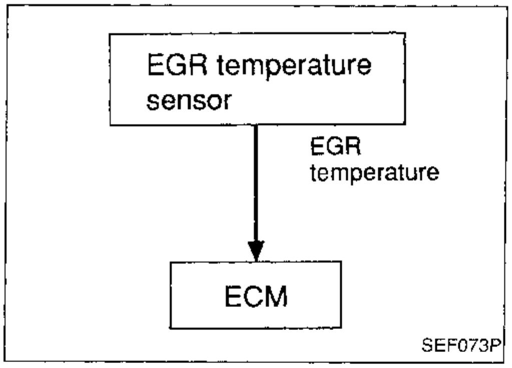
EGR Function (Cont'd)



SEF240PD

EGRC-solenoid valve

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to cut the vacuum signal (from the throttle body to the EGR valve). When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve.



SEF073P

ON BOARD DIAGNOSIS LOGIC

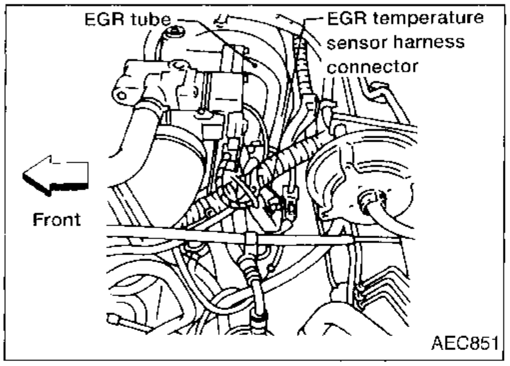
If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.
If EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0400 0302	A) The exhaust gas recirculation (EGR) flow is excessively low during the specified driving condition.	● EGR valve stuck closed ● EGRC-BPT valve leaking ● Passage blocked ● EGRC-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.	● EGRC-solenoid valve ● EGR valve leaking or stuck open ● EGR temperature sensor

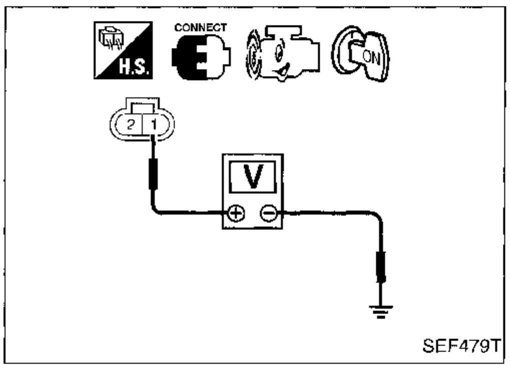
OVERALL FUNCTION CHECK

Use this procedure to check the overall EGR function. During this check, a DTC might not be confirmed.

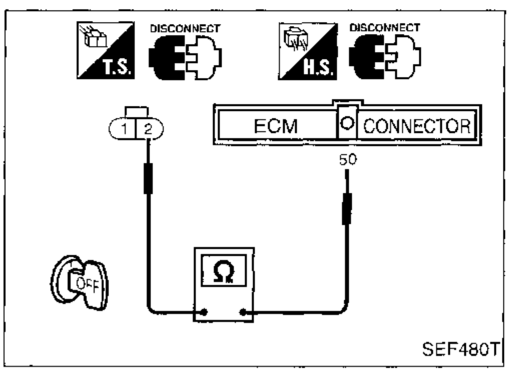
Before starting with the following procedure, check the engine coolant temperature of the freeze frame data with CONSULT or Generic Scan Tool.
If the engine coolant temperature is higher than or equal to 71°C (160°F), perform only "Procedure for malfunction A".
If the engine coolant temperature is lower than 71°C (160°F), perform both "Procedure for malfunction A" and "Procedure for malfunction B".



AEC851



SEF479T



SEF480T

Procedure for malfunction A

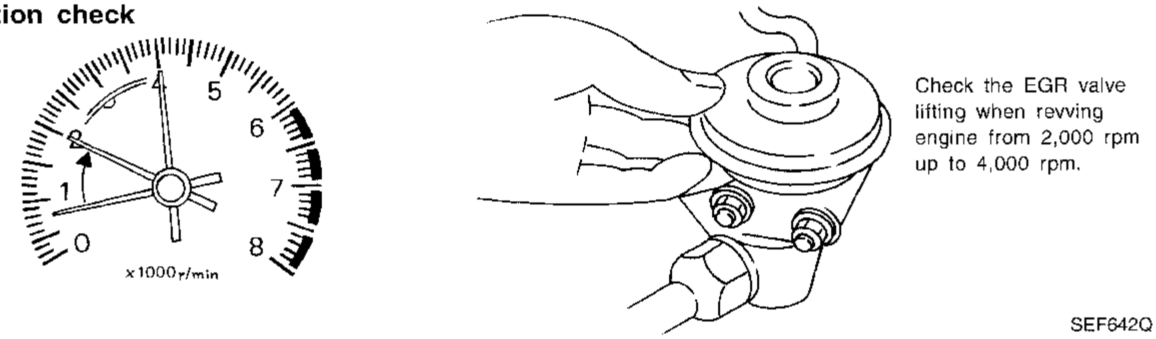
1) Start engine and warm it up sufficiently.
2) Check the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.
   EGR valve should lift up and down without sticking.

If EGR valve does not lift up and down, try again with either of the following methods:

- Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "OFF".
- Disconnect EGRC-solenoid valve harness connector. (The DTC for EGRC-solenoid valve will be displayed, however, ignore it.)

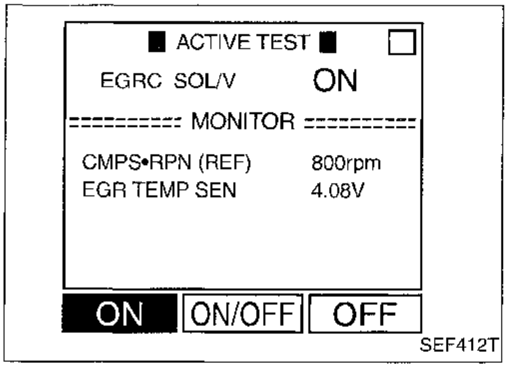
3) Check voltage between EGR temperature sensor harness connector terminal ① and engine ground at idle speed.
   Less than 4.5V should exist.
4) Turn ignition switch "OFF".
5) Disconnect ECM harness connector and EGR temperature sensor harness connector.
6) Check harness continuity between EGR temperature sensor harness connector terminal ② and ECM terminal ㊿.
   Continuity should exist.
7) Perform "COMPONENT INSPECTION", "EGR temperature sensor". Refer to EC-431.

Overall function check

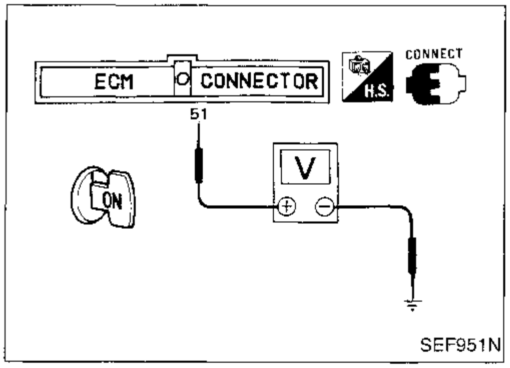


SEF642Q

EGR Function (Cont'd)



SEF412T



SEF951N

Procedure for malfunction B

1) Start engine.
2) Select “EGRC SOLENOID VALVE” in “ACTIVE TEST” mode with CONSULT and turn the solenoid valve “ON”.
3) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.

EGR valve should be closed and should not lift up.

OR

1) Confirm the engine coolant temperature is lower than 65°C (149°F) in “Mode 1” with generic scan tool. Perform the following steps before its temperature becomes higher than 65°C (149°F).
2) Start engine.
3) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.

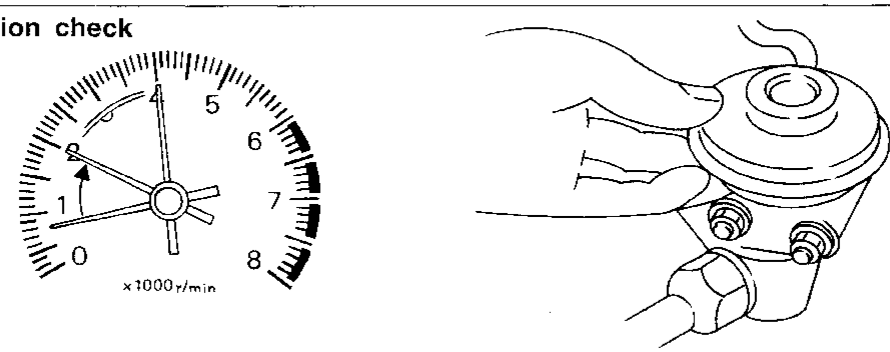
EGR valve should be closed and should not lift up.

OR

1) Confirm the voltage between ECM terminal (51) and ground is higher than 1.7V. Perform the following steps before the voltage becomes lower than 1.7V.
2) Start engine.
3) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.

EGR valve should be closed and should not lift up.

Overall function check

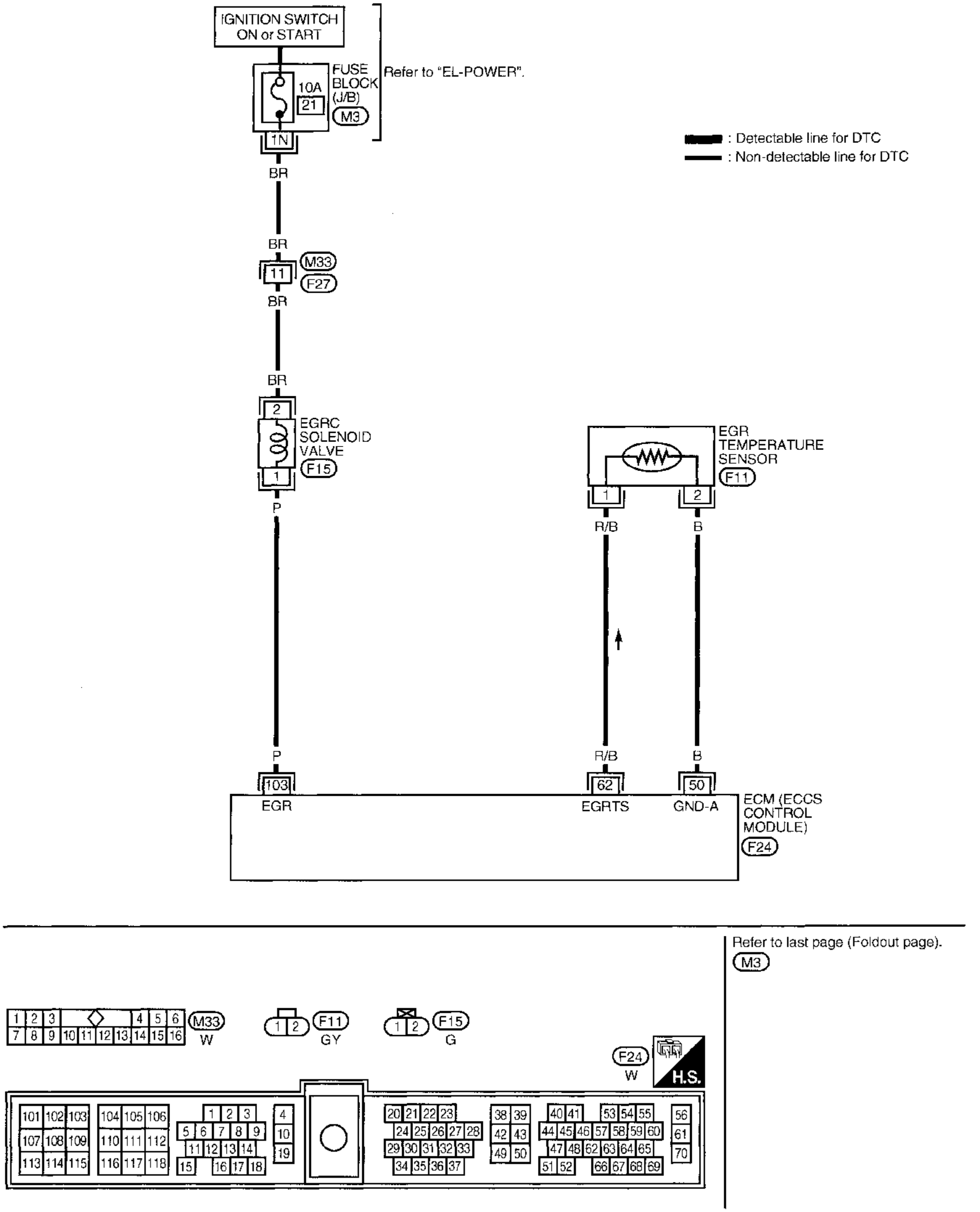


Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm.

SEF642Q

EGR Function (Cont'd)

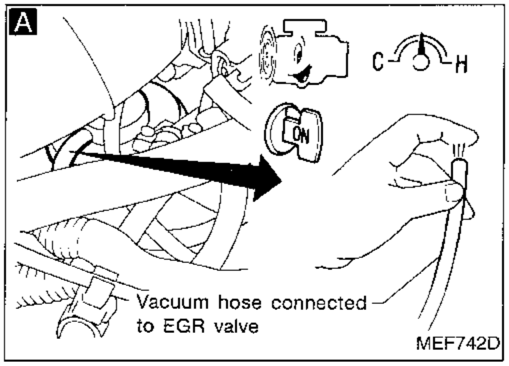
EC-EGRC1-01



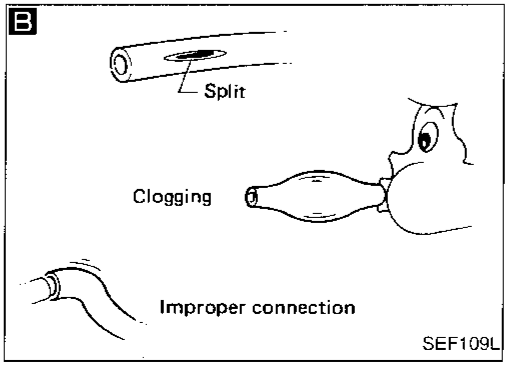
AEC252A

EGR Function (Cont'd)

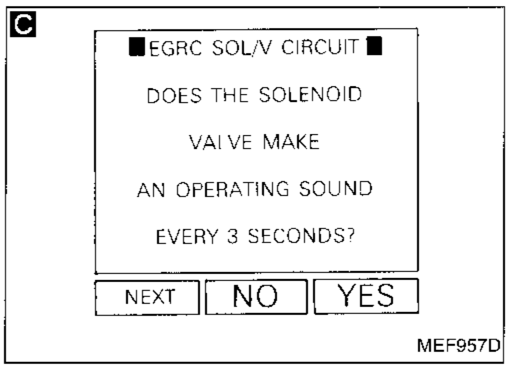
DIAGNOSTIC PROCEDURE



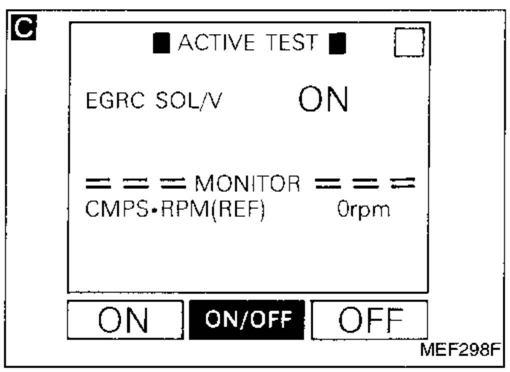
MEF742D



SEF109L



MEF957D



MEF298F

INSPECTION START

↓

A

CHECK VACUUM SOURCE TO EGR VALVE.

1. Start engine and warm it up sufficiently.
2. Disconnect vacuum hose to EGR valve.
3. Check for vacuum at hose.
   Vacuum should not exist at idle.
4. Check for vacuum when revving from 2,000 rpm up to 4,000 rpm using either of the following methods:
   - Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "OFF".

   OR

   - Disconnect EGRC-solenoid valve harness connector.
     (The DTC for EGRC-solenoid valve will be displayed, however, ignore it.)

Vacuum should exist when revving engine.

OK → CHECK COMPONENTS (EGR valve). Refer to "COMPONENTS INSPECTION", EC-430.
NG ↓ Replace EGR valve.

NG ↓

B

CHECK VACUUM HOSE.

Check vacuum hose for clogging, cracks, improper connection or misrouting. Refer to "Vacuum Hose Drawing" on EC-248.

NG → Repair or replace vacuum hose, or correct routing.

OK ↓

C

CHECK COMPONENT

(EGRC-solenoid valve).

1. Turn ignition switch "ON".
2. Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Turn EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

1. Turn ignition switch "ON".
2. Check operating sound of the solenoid valve when disconnecting and reconnecting EGRC-solenoid valve harness connector.

NG → Repair or replace EGRC-solenoid valve circuit.

OK ↓

Ⓐ

(Go to next page.)

EGR Function (Cont'd)

Ⓐ

↓

CHECK COMPONENT (EGRC-control solenoid valve). Refer to "COMPONENT INSPECTION" below.

→ NG: Replace EGRC-solenoid valve.

↓ OK

CHECK COMPONENT (EGRC-BPT valve). Refer to "COMPONENT INSPECTION" on next page.

→ NG: Replace EGRC-BPT valve.

↓ OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

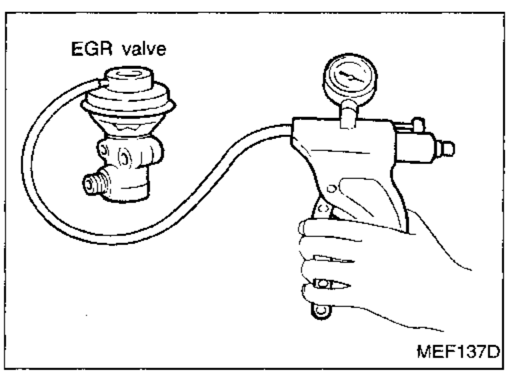
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

Check resistance of EGR temperature sensor. See next page.

↓

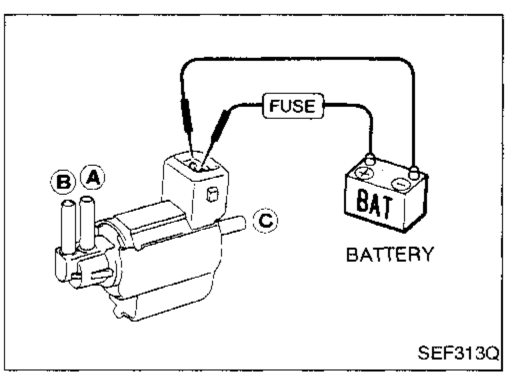
INSPECTION END



COMPONENT INSPECTION

EGR valve

Apply vacuum to EGR vacuum port with a hand vacuum pump.
EGR valve spring should lift.
If NG, replace EGR valve.



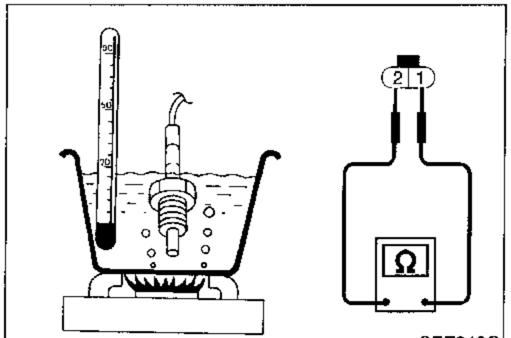
EGRC-solenoid valve

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	Yes	No
No supply	No	Yes

If NG, replace EGRC-solenoid valve.

EGR Function (Cont'd)

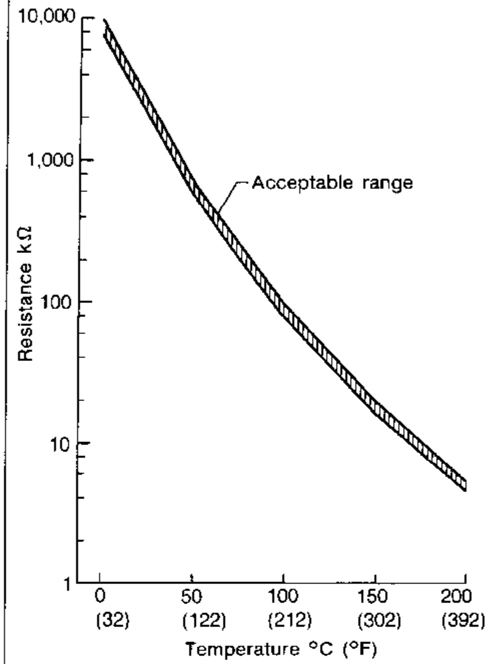

SEF643Q

EGR temperature sensor

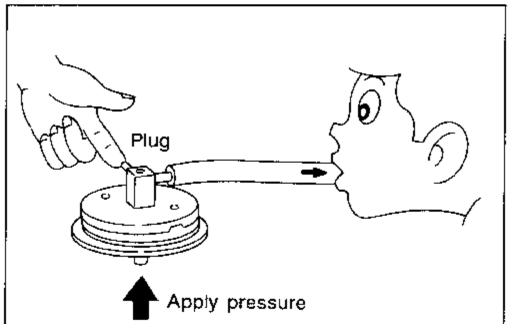
Check resistance change and resistance value.

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.



SEF526Q

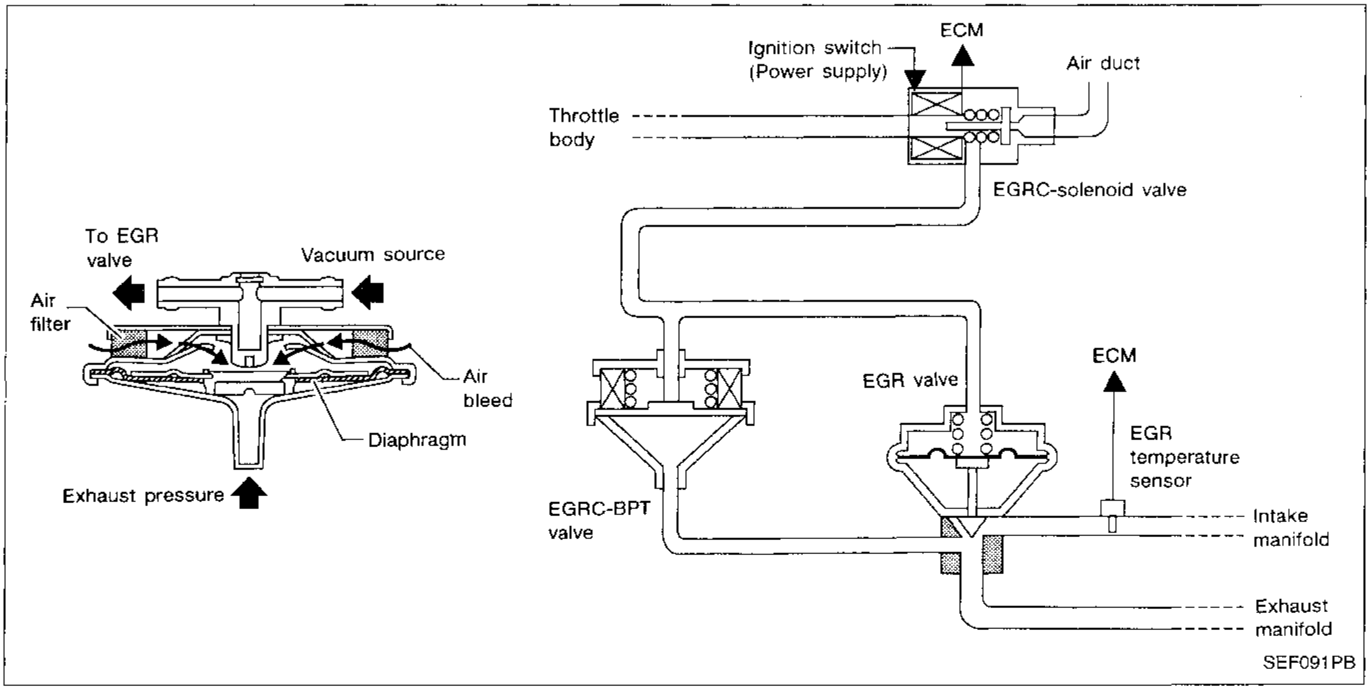


SEF083P

EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH_2O, 3.94 inH_2O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

EGRC-BPT Valve Function



SYSTEM DESCRIPTION

The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.

ON BOARD DIAGNOSIS LOGIC

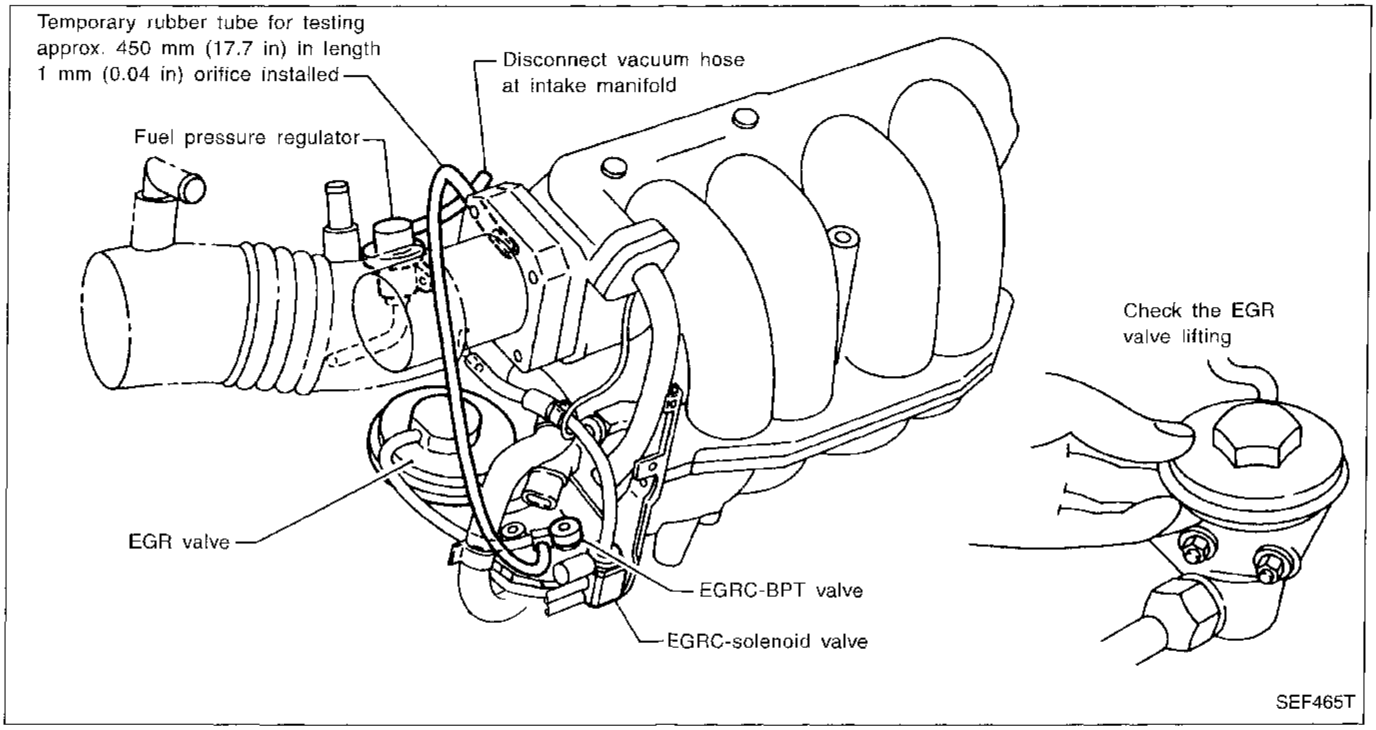
If too much EGR flow exists due to an EGRC-BPT valve malfunction, off idle engine roughness will increase. If roughness is large, then vacuum to the EGR valve is interrupted through the EGR valve & EGRC-solenoid valve. If the engine roughness is reduced at that time, the EGRC-BPT valve malfunction is indicated.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0402 0306	• The EGRC-BPT valve does not operate properly.	• EGRC-BPT valve • Misconnected rubber tube • Blocked rubber tube • Intake manifold EGR passage

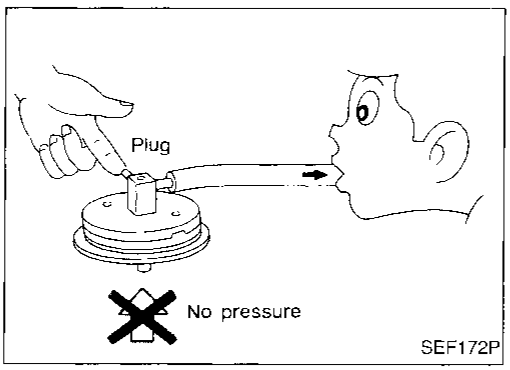
OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGRC-BPT valve. During this check, a DTC might not be confirmed.

1. Disconnect the vacuum hose to the fuel pressure regulator at the intake manifold.
2. Disconnect the vacuum hose to the EGRC-solenoid valve at the EGRC-BPT valve.
   Connect the intake manifold and the EGRC-BPT valve with a rubber tube that has 1 mm (0.04 in) dia. orifice installed. (The intake manifold vacuum will be directly applied to the EGRC-BPT valve.)
3. Start engine.
4. Check for the EGR valve lifting with engine at less than 2,000 rpm under no load.
   EGR valve should remain closed.
5. Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm quickly under no load.
   EGR valve should lift up, and go down without sticking when the engine is returned to idle.
6. Check rubber tube between EGRC-solenoid valve and throttle body for misconnection, cracks or blockages.



SEF465T



SEF172P

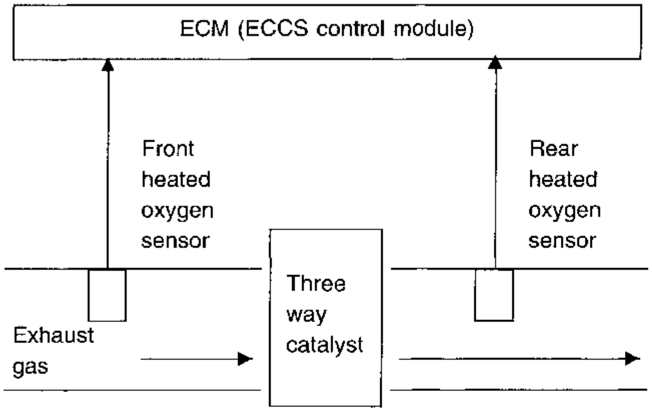
COMPONENT INSPECTION

EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check leakage without applying any pressure from under EGR-BPT valve.
   Leakage should exist.

Three Way Catalyst Function

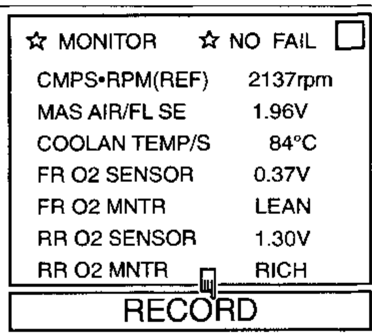
ON BOARD DIAGNOSIS LOGIC



The ECM monitors the switching frequency ratio of front heated oxygen sensor and rear heated oxygen sensor.
A three way catalyst with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor switching frequency will increase.
When the frequency ratio of front heated oxygen sensor and rear heated oxygen sensor approaches a specified limit value, the second stage diagnosis is applied.
The second stage diagnosis switches the mixture ratio feedback control using front heated oxygen sensor to rear heated oxygen sensor.
Then ECM measures the switching lag time between front heated oxygen sensor and rear heated oxygen sensor.
The longer lag time indicates the greater oxygen storage capacity. If the lag time is within the specified level, the three way catalyst malfunction is diagnosed.

- **The three way catalyst function has one trip detection logic.**

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0420 0702	● Three way catalyst does not operate properly. ● Three way catalyst does not have enough oxygen storage capacity.	● Three way catalyst ● Exhaust tube ● Intake air leak ● Injectors ● Injector leak



SEF097P

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 SENSOR", "RR O2 SENSOR", "FR O2 MNTR", "RR O2 MNTR" in "DATA MONITOR" mode with CONSULT.
3) Touch "RECORD" on CONSULT screen with engine speed held at 2,000 rpm constant under no load.
4) Make sure that the switching frequency between "RICH" and "LEAN" of "RR O2 MNTR" is very less than that of "FR O2 MNTR".

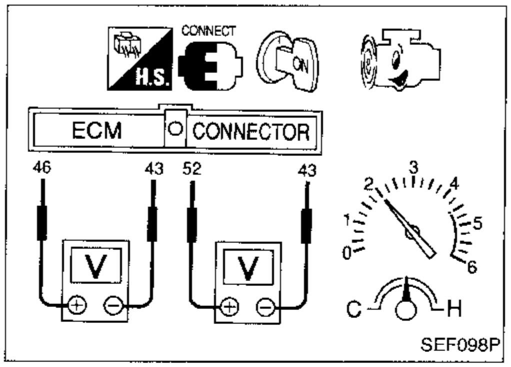
Switching frequency ratio =

$$\frac{\textbf{Rear heated oxygen sensor switching frequency}}{\textbf{Front oxygen sensor switching frequency}}$$

Three Way Catalyst Function (Cont'd)

This ratio should be less than 0.78.
If the ratio is greater than the above, the three way catalyst is not operating properly.

OR



SEF098P

1) Start engine and warm it up sufficiently.
2) Set voltmeter probes between ECM terminals ㊻ (front heated oxygen sensor signal) and ㊸ (engine ground), and ECM terminals ㊿② (rear heated oxygen sensor signal) and ㊸ (engine ground).
3) Keep engine speed at 2,000 rpm constant under no load.
4) Make sure that the voltage switching frequency (high & low) between ECM terminals (52) and ㊸ is much less than that of ECM terminals ㊻ and ㊸.

Switching frequency ratio =

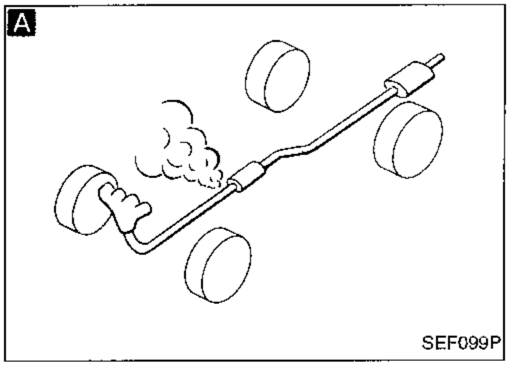
$$\frac{\text{Rear heated oxygen sensor voltage switching frequency}}{\text{Front oxygen sensor voltage switching frequency}}$$

This ratio should be less than 0.78.
If the ratio is greater than the above, it means three way catalyst does not operate properly.

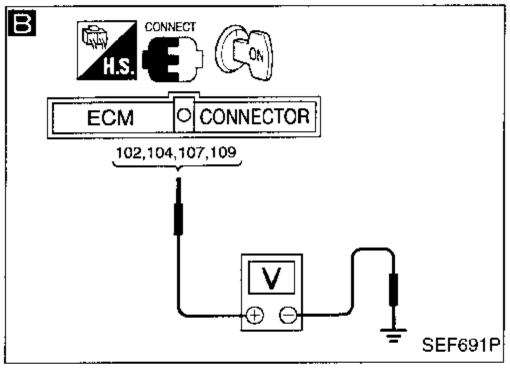
Note: If the voltage at terminal ㊻ does not switch periodically more than 5 times within 10 seconds at step 3, perform TROUBLE DIAGNOSIS FOR DTC P0130 first. Refer to EC-371.

Three Way Catalyst Function (Cont'd)

DIAGNOSTIC PROCEDURE



SEF099P



SEF691P

INSPECTION START

↓

CHECK EXHAUST SYSTEM.
Visually check exhaust tubes and muffler for dents.

NG → Repair or replace it.

↓ OK

A

CHECK EXHAUST AIR LEAK.
Start engine and run it at idle. Listen for an exhaust air leak before the three way catalyst.

NG → Repair or replace.

↓ OK

CHECK INTAKE AIR LEAK.
Start engine and run it at idle. Listen for an intake air leak after the mass air flow sensor.

NG → Repair or replace.

↓ OK

B

CHECK INJECTORS.

1. Refer to WIRING DIAGRAM for Injectors, EC-557.
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between ECM terminals 102, 104, 107, and 109 and ground with CONSULT or tester.
   Battery voltage should exist.
4. Turn ignition switch "OFF".

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injector", EC-557. Repair harness or connectors.

↓ OK

Remove injector assembly.
Refer to EC-261.
Keep fuel hose and all injectors connected to injector gallery.

↓

1. Disconnect camshaft position sensor harness connector.
2. Turn ignition switch "ON".
   Make sure fuel does not drip from injector.

Drips → Replace the injector(s) from which fuel is dripping.

↓ Does not drip

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Trouble is not fixed → Replace three way catalyst.

↓ Trouble is fixed

INSPECTION END

Evaporative Emission (EVAP) Control System (Small Leak)

Note: If both DTC P0440 and P0446 are displayed, perform TROUBLE DIAGNOSIS FOR P0446 first. (See EC-455.)

ON BOARD DIAGNOSIS LOGIC

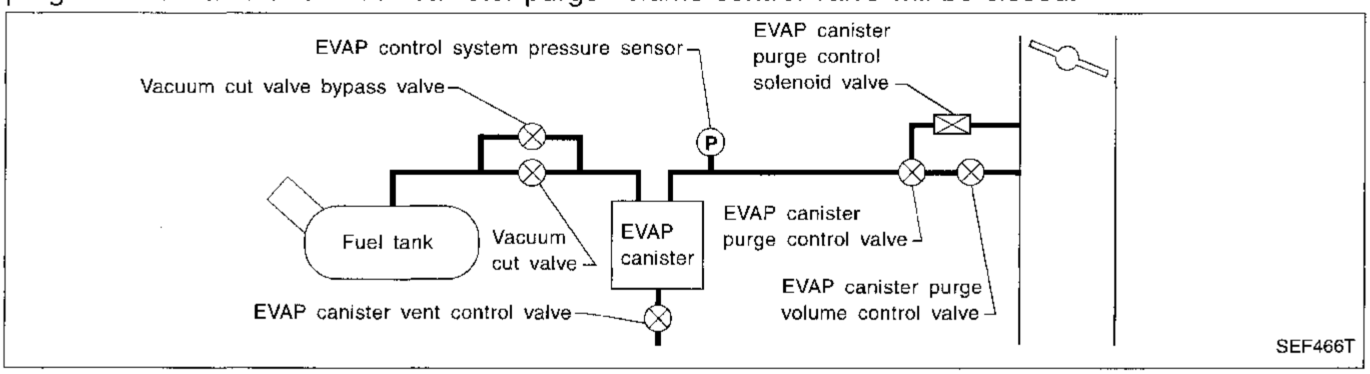
This diagnosis uses two methods to detect leaks in the EVAP purge line.
The first method, the pressure test, makes use of vapor pressure in the fuel tank. The second method, the vacuum test, makes use of engine intake manifold vacuum.

Pressure test

The EVAP canister vent control valve is closed to shut the EVAP purge line. The vacuum cut valve bypass valve will then be opened to clear the line between the fuel tank and the EVAP canister purge control valve. The EVAP control system pressure sensor can now monitor the pressure inside the fuel tank.
If pressure increases, the ECM will check for leaks in the line between the vacuum cut valve and EVAP canister purge control valve. If no pressure does not increase, the ECM will perform the "Vacuum test".

Vacuum test

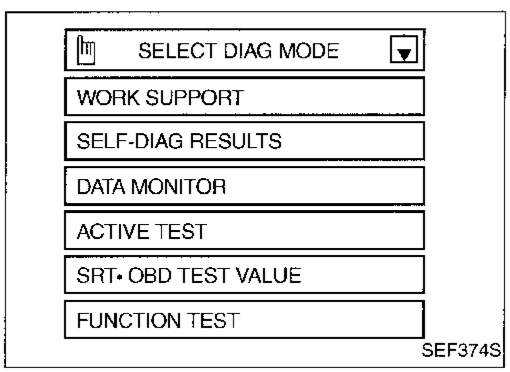
If pressure does not increase in the "Pressure test", the ECM will check for leaks in the line between the fuel tank and EVAP canister purge control valve, under the following "Vacuum test" conditions.
The vacuum cut valve bypass valve is opened to clear the line between the fuel tank and the EVAP canister purge control valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control valve and EVAP canister purge control valve are opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge control valve and EVAP canister purge volume control valve will be closed.



Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0440 0705	• EVAP control system has a leak. • EVAP control system does not operate properly.	• Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or fails to close. • Foreign matter caught in fuel filler cap. • Leak is in line between intake manifold and EVAP canister purge control valve. • Foreign matter caught in EVAP canister vent control valve. • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent. • Blocked or bent rubber tube to EVAP control system pressure sensor • Loose or disconnected rubber tube • EVAP canister purge control valve • EVAP canister purge volume control valve • EVAP canister purge control solenoid valve • Absolute pressure sensor • Tank fuel temperature sensor • MAP/BARO switch solenoid valve • Blocked or bent rubber tube to MAP/BARO switch solenoid valve • O-ring of EVAP canister vent control valve is missing.

CAUTION:
- **Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine rubber tube as a replacement.**



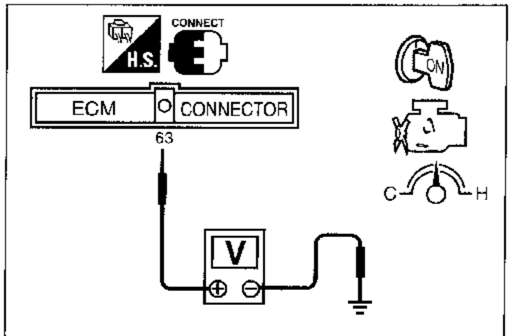
SEF374S

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

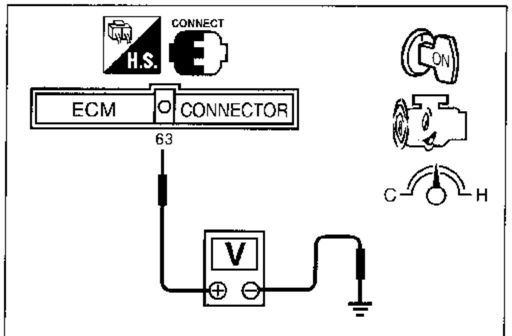
CAUTION:
- **Always select "SINGLE TEST" with CONSULT when performing the "FUNCTION TEST".**
- **Perform "FUNCTION TEST" when the fuel level is less than 3/4 full. If not, inspect fuel filler cap and fuel tank separately. Refer to EC-440.**

1) Select "EVAP (SMALL LEAK)" in "FUNCTION TEST" mode with CONSULT.
2) Make sure that "OK" is displayed with "EVAP (SMALL LEAK)". (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)

Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)



SEF531T



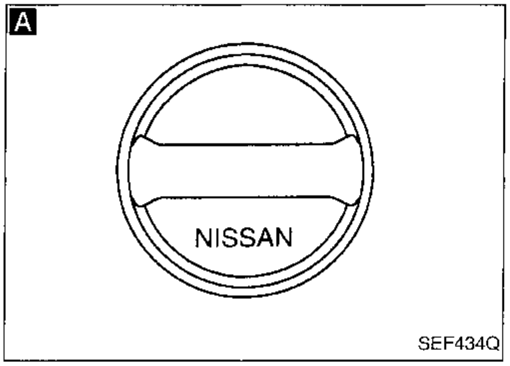
SEF532T

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 wait at least 12 seconds.
4) Check voltage between ECM terminal ⑥③ and ground (**Voltage 1**).
   Voltage: 1.9 - 4.2V
5) Restart engine and let it idle at least 70 seconds.
6) Maintain the following conditions at least 80 seconds.
   Gear position: Suitable gear position
   Vehicle speed: 40 - 80 km/h (25 - 50 MPH)
   Engine speed: 1,500 - 2,500 rpm
   Engine coolant temperature: Less than 100°C (212°F)
7) Decelerate the vehicle to idle.
8) Maintain the following conditions at least 2 seconds.
   Gear position: Suitable gear position
   Vehicle speed: 40 - 60 km/h (25 - 38 MPH)
   Engine speed: 1,500 - 2,500 rpm
   Engine coolant temperature: Less than 100°C (212°F)
9) Perform steps 7, 8 more than 10 times.
10) Decelerate the vehicle to idle and wait at least 10 seconds.
11) Check voltage between ECM terminal ⑥③ and ground (**Voltage 2**).
   Voltage: 1.9 - 4.2V
12) Check voltage decrease between **Voltage 1 and 2.**
   Voltage 2 – Voltage 1 $\geqq$ 0.01V
13) Maintain the following conditions for 9 minutes after 12 minutes have passed from restarting engine in step 5.
   Gear position: Suitable gear position
   Vehicle speed: 20 - 80 km/h (12 - 50 MPH)
   Engine speed: 800 - 3,500 rpm
   Engine coolant temperature: Less than 100°C (212°F)
14) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds, and then turn "ON".
15) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

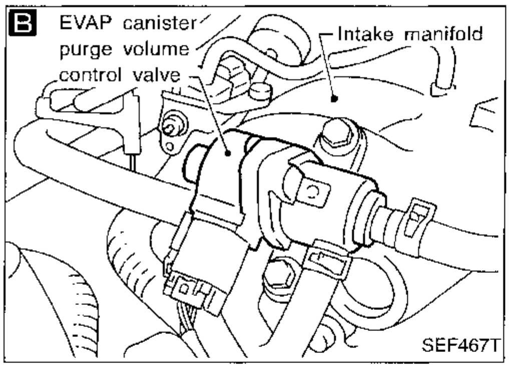
Note: • **Hold the accelerator pedal as steady as possible during driving in steps 6, 8 and 13.**
• **It is better that the fuel level is low.**

Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

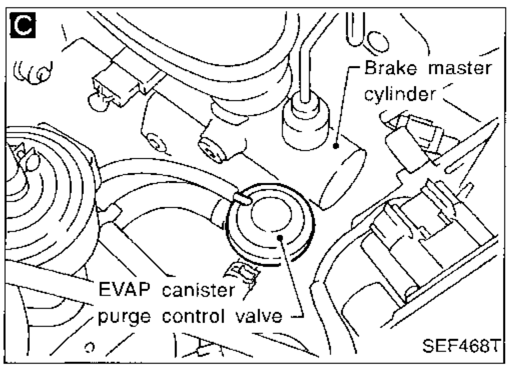
DIAGNOSTIC PROCEDURE



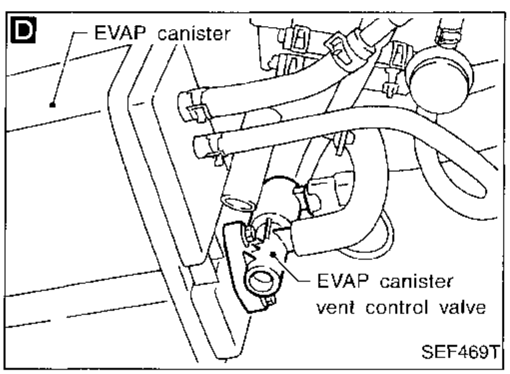
SEF434Q



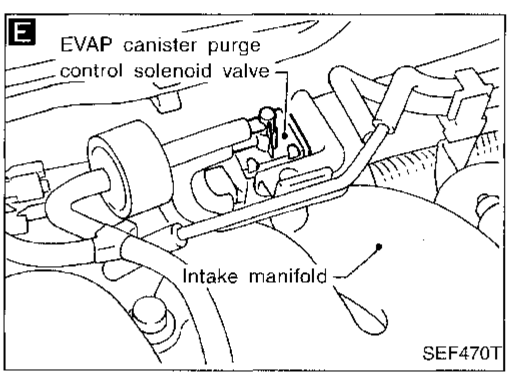
SEF467T



SEF468T



SEF469T



SEF470T

INSPECTION START

↓

A

CHECK FUEL FILLER CAP.
1. Check that fuel filler cap does not remain open, closes properly and does not contain foreign matter.
2. Check for genuine fuel filler cap design.
3. Check fuel tank vacuum relief valve. Refer to "EVAPORATIVE EMISSION SYSTEM", EC-256.

NG → 1. Check fuel filler cap. Refer to EC-256, "Inspection" of "FUEL TANK VACUUM RELIEF VALVE".
2. If out of specification, replace fuel filler cap as an assembly. **Use only a genuine fuel filler cap as a replacement.**

↓ OK

B

CHECK COMPONENT
(EVAP canister purge volume control valve).
Refer to "COMPONENT INSPECTION", EC-443.

NG → Replace EVAP canister purge volume control valve.

↓ OK

C

CHECK COMPONENT
(EVAP canister purge control valve).
Refer to "COMPONENT INSPECTION", EC-444.

NG → Replace EVAP canister purge control valve.

↓ OK

D

CHECK COMPONENT
(EVAP canister vent control valve).
Refer to "COMPONENT INSPECTION", EC-444.

NG → Replace EVAP canister vent control valve.

↓ OK

E

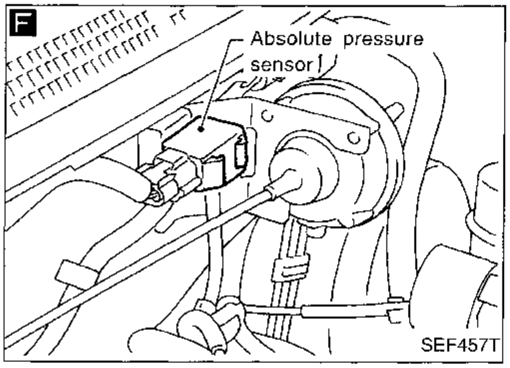
CHECK COMPONENT
(EVAP canister purge control solenoid valve).
Refer to "COMPONENT INSPECTION", EC-454.

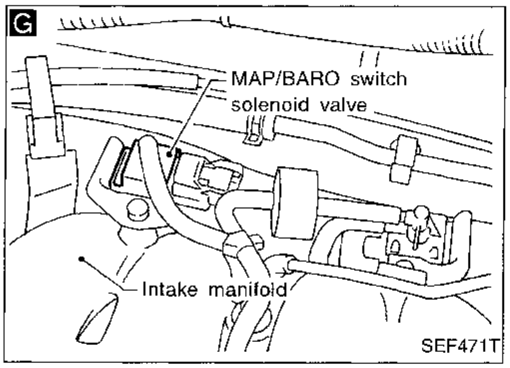
NG → Replace EVAP canister purge control solenoid valve.

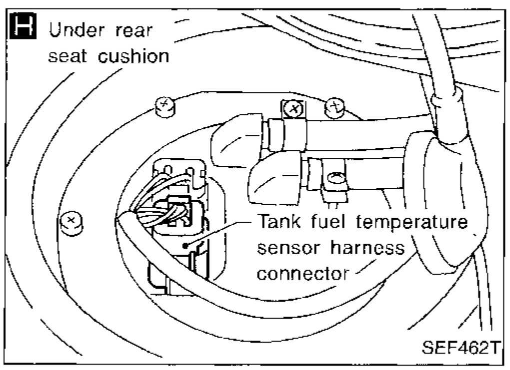
↓ OK

Ⓐ

Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)







Ⓐ

F

CHECK COMPONENT
(Absolute pressure sensor).
Refer to "COMPONENT INSPECTION", EC-445.

NG → Replace absolute pressure sensor.

OK ↓

G

CHECK COMPONENT
(MAP/BARO switch solenoid valve).
Refer to "COMPONENT INSPECTION", EC-445.

NG → Replace MAP/BARO switch solenoid valve.

OK ↓

H

CHECK COMPONENT
(Tank fuel temperature sensor).
Refer to "COMPONENT INSPECTION", EC-446.

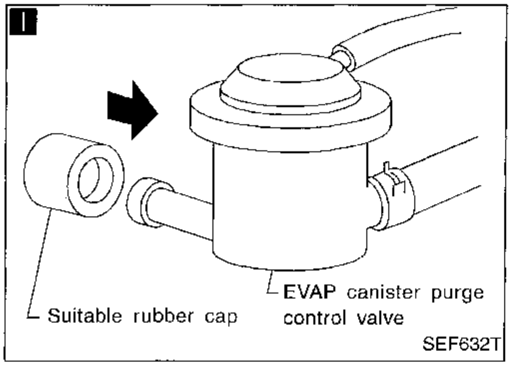
NG → Replace tank fuel temperature sensor.

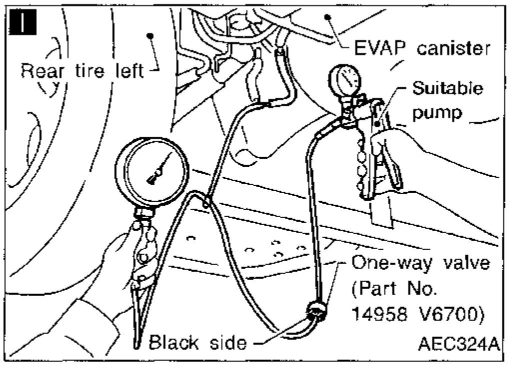
OK ↓

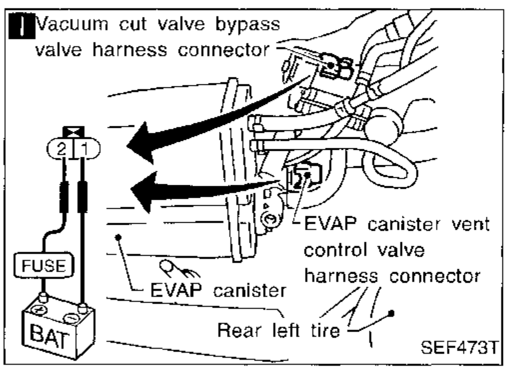
Ⓑ

(Go to next page.)

Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)







Ⓑ

CHECK EVAP PURGE LINE.
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks.
Refer to "EVAPORATIVE EMISSION SYSTEM, EC-257.
To locate cracked areas, apply soapy water to locations in question. Disconnect EVAP hose running between EVAP canister purge volume control valve and EVAP canister purge control valve. Plug EVAP canister purge control valve connector using a rubber blind cap. Apply pump pressure as shown in the figure at left. Air bubbles will appear from cracked areas.
CAUTION:
Do not allow pump pressure to exceed 13.3 kPa (100 mmHg, 3.94 inHg). A higher pressure may damage fuel tank and EVAP canister.
- **Do not use super color check liquid, etc.**
- **Do not depressurize inside EVAP purge line.**

1. Turn ignition switch "OFF".
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12V until the end of test.)
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)
4. Disconnect rubber tube between EVAP canister and EVAP canister purge control valve. Set up one-way valve (Part No. 14958 V6700), pressure gauge and suitable pump as shown at left.

NG → Repair or replace it.

↓ OK

Clean EVAP purge line (pipe and rubber tube) using air blower.

↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

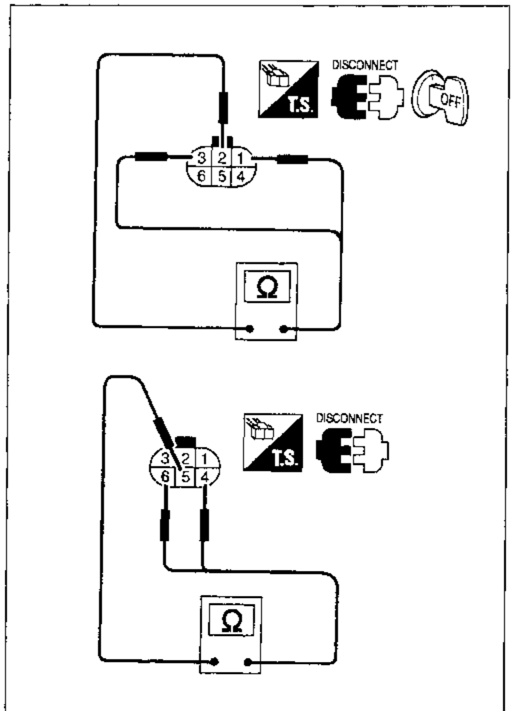
↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

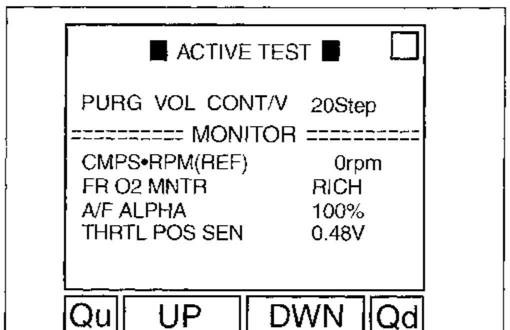
↓

INSPECTION END

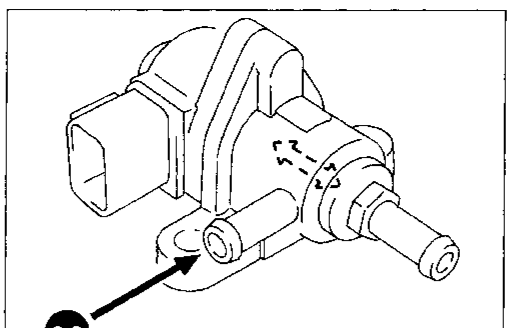
Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

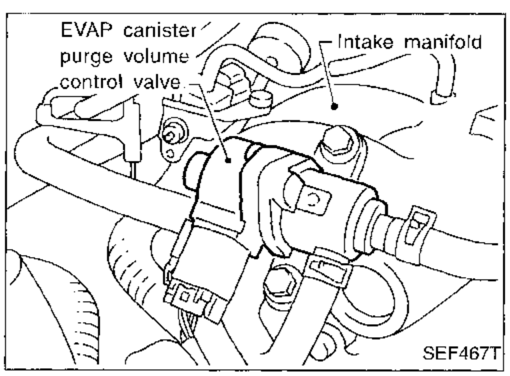


SEF353Q



SEF507R


SEF474T



SEF467T

COMPONENT INSPECTION

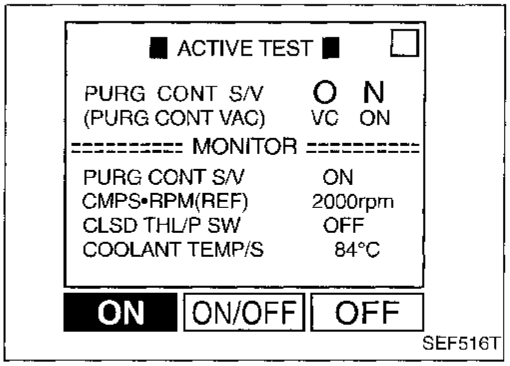
EVAP canister purge volume control valve

1. Disconnect EVAP canister purge volume control valve harness connector.
2. Check resistance between the following terminals.
   terminal ② and terminals ①, ③
   terminal ⑤ and terminals ④, ⑥
   Resistance:
   Approximately 41Ω [At 20°C (68°F)]
3. Reconnect EVAP canister purge volume control valve harness connector.
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
   (Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5. Turn ignition switch "ON".
6. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the valve opening.
   If NG, replace the EVAP canister purge volume control valve.

OR

1. Disconnect EVAP canister purge volume control valve harness connector.
2. Check resistance between the following terminals.
   terminal ② and terminals ①, ③
   terminal ⑤ and terminals ④, ⑥
   Resistance:
   Approximately 41Ω [At 20°C (68°F)]
3. Reconnect EVAP canister purge volume control valve harness connector.
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
   (Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5. Turn ignition switch "ON" and "OFF". Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EVAP canister purge volume control valve.

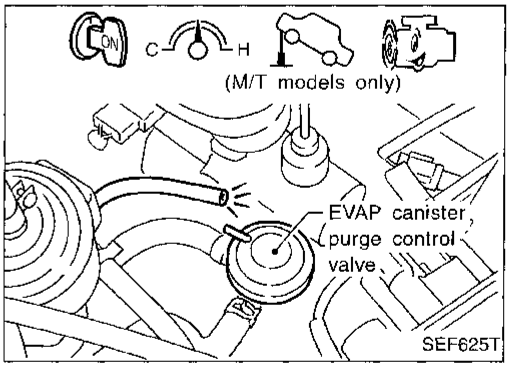
Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)



SEF516T

EVAP canister purge control solenoid valve

1. Jack up driving wheels (M/T models only).
2. Turn ignition switch "ON".
3. Select "PURG CONT S/V" of "ACTIVE TEST" mode with CONSULT.
4. Start engine and warm it up sufficiently.
5. Disconnect vacuum hose at EVAP canister purge control valve.
6. Touch "ON" and "OFF" and check for vacuum passing through the hose.

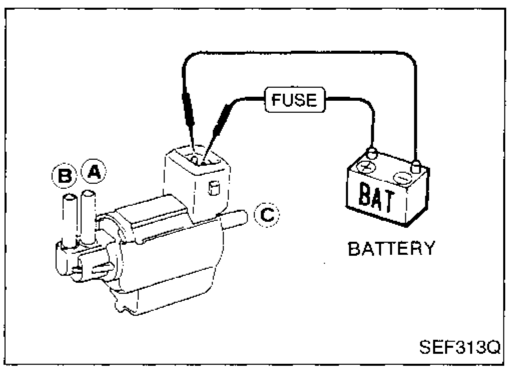


SEF625T

Condition	Vacuum
Idle	Not exist
2,000 rpm (A/T models) 2,000 rpm with 1 gear position (M/T models)	Exist

OR

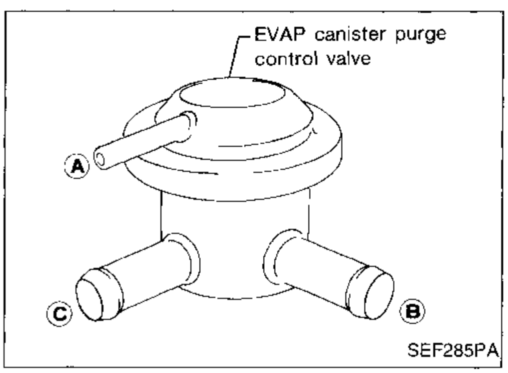
Check air passage continuity.



SEF313Q

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.

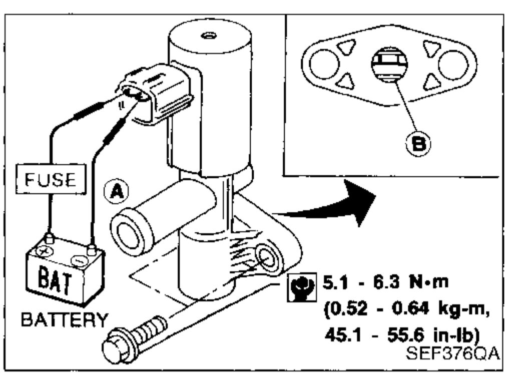


SEF285PA

EVAP canister purge control valve

Check EVAP canister purge control valve as follows:

1. Plug the port Ⓑ.
2. Apply pressure [80.0 kPa (600 mmHg, 23.62 inHg)] to port Ⓐ. Then keep it for 15 seconds, and check there is no leakage.
3. Repeat step 2 for port Ⓒ.



SEF376QA

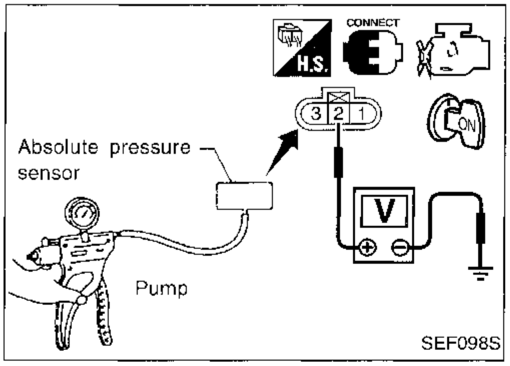
EVAP canister vent control valve

Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	No
No supply	Yes

If NG, clean valve using air blower or replace as necessary.

Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)



SEF098S

Absolute pressure sensor

1. Remove absolute pressure sensor from bracket with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Turn ignition switch "ON" and check output voltage between terminal ② and engine ground.
   The voltage should be 3.2 to 4.8 V.
4. Use pump to apply vacuum of −26.7 kPa (−200 mmHg, −7.87 inHg) to absolute pressure sensor as shown in figure and check the output voltage.
   The voltage should be 1.0 to 1.4 V lower than the value measured in step 3.

CAUTION:
Always calibrate the vacuum pump gauge when using it.

5. If NG, replace absolute pressure sensor.

■ ACTIVE TEST ■

MAP/BARO SW/V MAP

========== MONITOR ==========

CMPS•RPM(REF)	700rpm
COOLANT TEMP/SE	87°C
MAP/BARO SW/V	MAP
ABSOL PRES/SE	1.34V

BARO MAP

SEF481T

■ ACTIVE TEST ■

MAP/BARO SW/V BARO

========== MONITOR ==========

CMPS•RPM(REF)	700rpm
COOLANT TEMP/SE	87°C
MAP/BARO SW/V	BARO
ABSOL PRES/SE	4.30V

BARO MAP

SEF482T

MAP/BARO switch solenoid valve

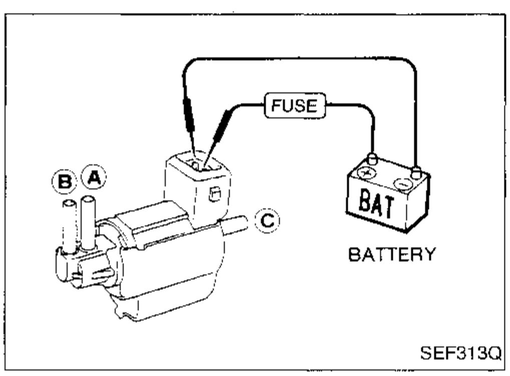
1. Start engine and warm it up sufficiently.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
   - When "MAP" is selected, "ABSOL PRES/SE" indicates approximately 1.3V.
   - When "BARO" is selected, "ABSOL PRES/SE" indicates approximately 4.3V.
4. If NG, replace solenoid valve.

OR

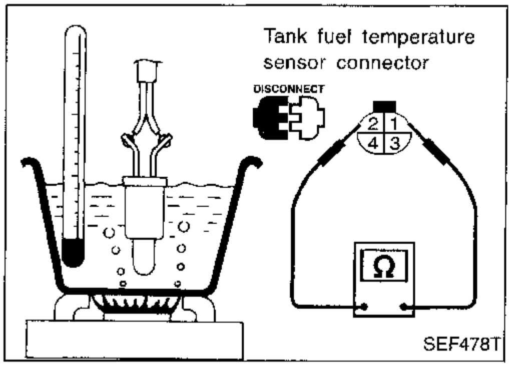
1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals	Yes	No
No supply	No	Yes

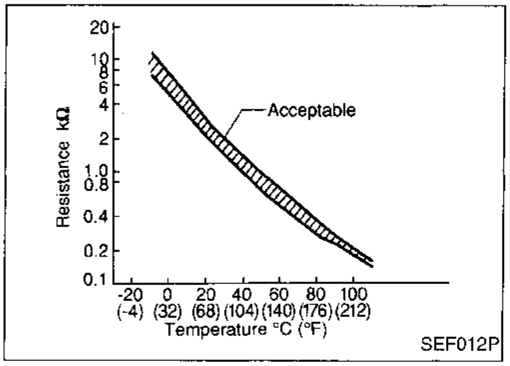
3. If NG, replace solenoid valve.



SEF313Q



SEF478T



SEF012P

Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

Tank fuel temperature sensor

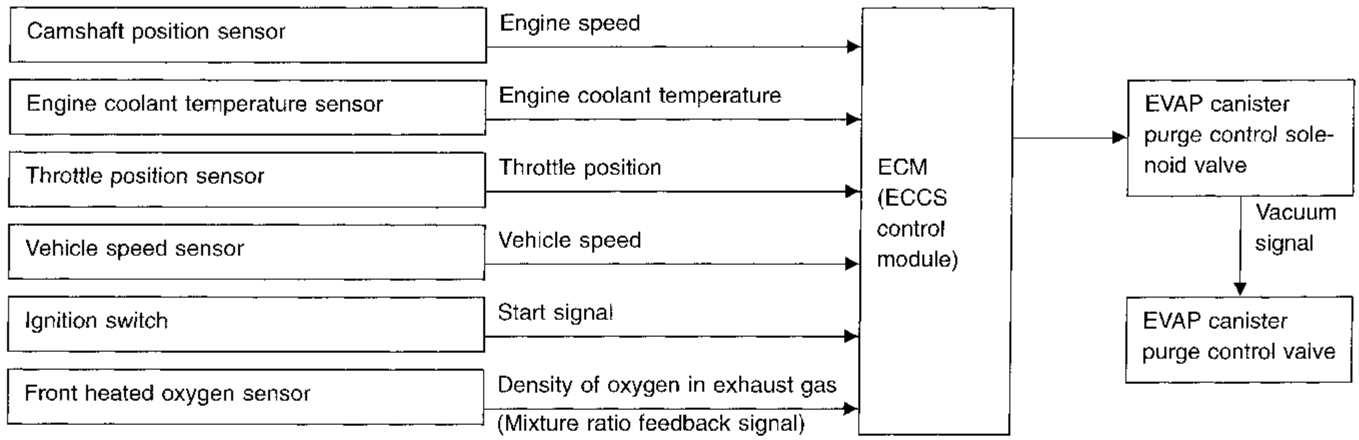
Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace tank fuel temperature sensor.

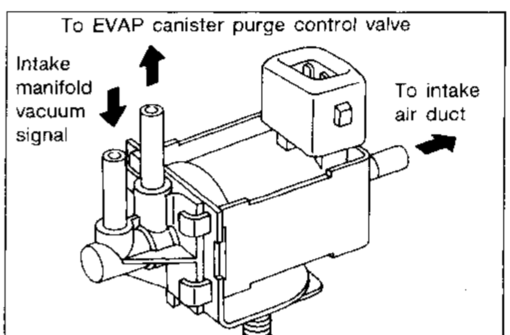
Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve

SYSTEM DESCRIPTION

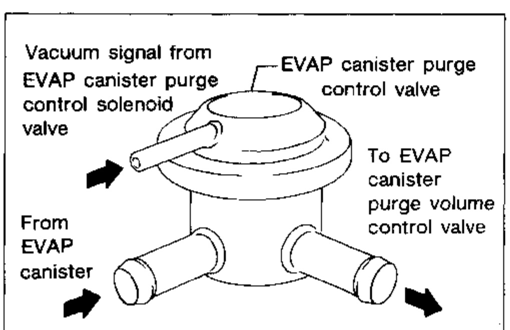


This system controls the vacuum signal applied to the EVAP canister purge control valve.
When the ECM detects any of the following conditions, current does not flow through the EVAP canister purge control solenoid valve.
The solenoid valve cuts the vacuum signal so that the EVAP canister purge control valve remains closed.

- Ignition switch "ON"
- Closed throttle position
- Low engine coolant temperature
- During deceleration
- Engine stopped
- Low vehicle speed (M/T models)



SEF673PA



SEF343QA

COMPONENT DESCRIPTION

EVAP canister purge control solenoid valve

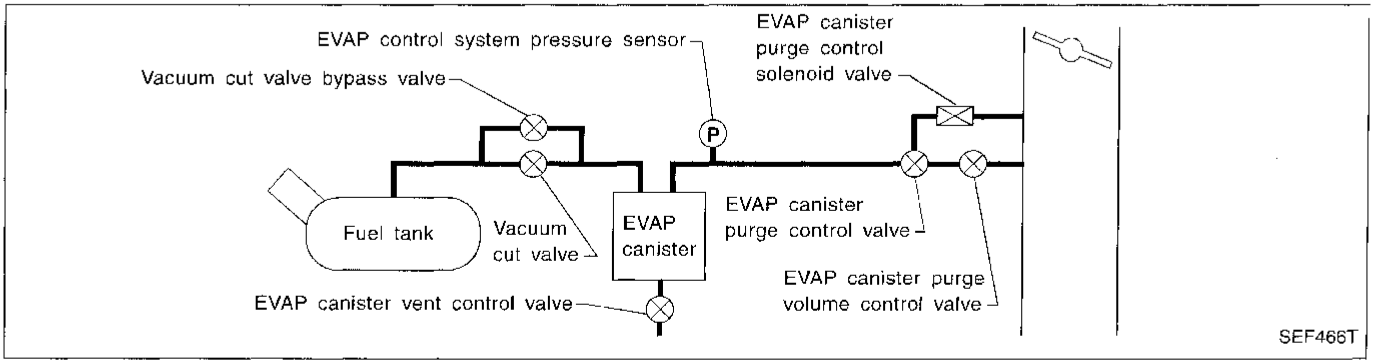
The EVAP canister purge control solenoid valve responds to signals from the ECM. When the ECM sends an OFF signal, the vacuum signal (from the intake manifold to the EVAP canister purge control valve) is cut.
When the ECM sends an ON (ground) signal, the vacuum signal passes through the EVAP canister purge control solenoid valve. The signal then opens the EVAP canister purge control valve.

EVAP canister purge control valve

When the vacuum signal is cut by EVAP canister purge control solenoid valve, EVAP canister purge control valve closes.

Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
PURG CONT S/V	● Engine: After warming up ● Shift lever: N ● No-load ● M/T models: Jack up drive wheels and shift to 1st gear position.	Idle	OFF
		A/T models: 2,000 rpm M/T models: 2,000 rpm and more than 16 km/h (10 MPH)	ON

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
105	PU	EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) — M/T models: Jack up front wheels and drive wheels at 16 km/h (10 MPH) — Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) — Idle speed	Approximately 0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0443 0807	A) An improper voltage signal is sent to ECM through EVAP canister purge control solenoid valve.	● Harness or connectors (The EVAP canister purge control solenoid valve circuit is open or shorted.) ● EVAP canister purge control solenoid valve
	B) EVAP canister purge control valve does not operate properly (stuck open).	● EVAP canister purge control valve ● EVAP canister purge control solenoid valve ● Vacuum hoses for clogging or disconnection ● EVAP control system pressure sensor

Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the DTC cannot be confirmed, perform "Procedure for malfunction B" on next page.

Procedure for malfunction A

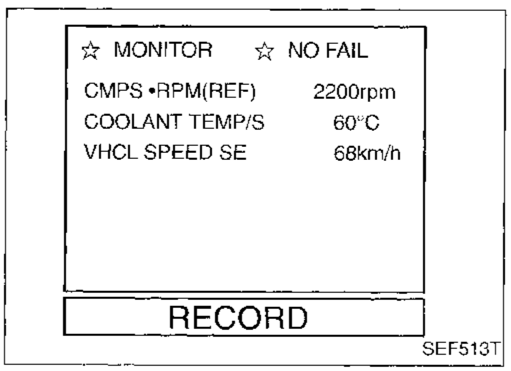
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

OR

1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select "MODE 3" 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.

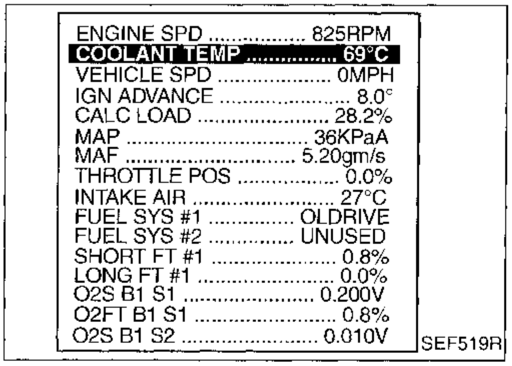


SEF513T

Procedure for malfunction B

1) Jack up drive wheels.
2) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
3) Start engine and warm it up sufficiently.
4) Check that tank fuel temperature is above 0°C (32°F).
5) Turn ignition switch "OFF" and wait at least 5 seconds.
6) Start engine and let it idle for at least 70 seconds.
7) Maintain the following conditions for at least 10 seconds.
   Headlamp switch: ON
   Rear window defogger switch: ON
   A/C: ON
   Gear position:
   "2" or "D" range (A/T)
   "4th" gear (M/T)
   Vehicle speed:
   50 - 80 km/h (31 - 50 MPH)
   Engine speed:
   2,000 - 2,500 rpm
   Coolant temperature:
   Less than 100°C (212°F)

Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

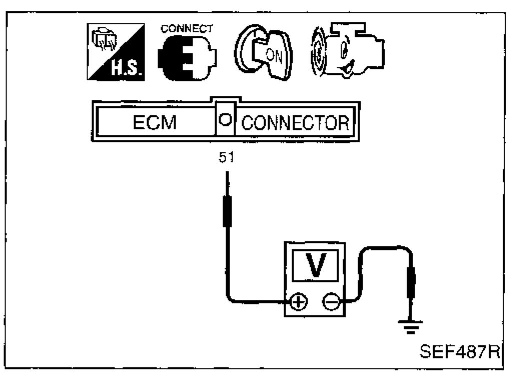


SEF519R

——— OR ———

GST

1) Jack up drive wheels.
2) Turn ignition switch "ON" and select "MODE 1" with GST.
3) Start engine and warm it up sufficiently.
4) Check that voltage between ECM terminal 63 and ground is less than 4.2V.
5) Turn ignition switch "OFF" and wait at least 5 seconds.
6) Start engine and let it idle for at least 70 seconds.
7) Maintain the following conditions for at least 10 seconds.
   Headlamp switch: ON
   Rear window defogger switch: ON
   A/C: ON
   Gear position:
   "2" or "D" range (A/T)
   "4th" gear (M/T)
   Vehicle speed:
   50 - 80 km/h (31 - 50 MPH)
   Engine speed:
   2,000 - 2,500 rpm
   Coolant temperature:
   Less than 100°C (212°F)
8) Select "MODE 3" with GST.



SEF487R

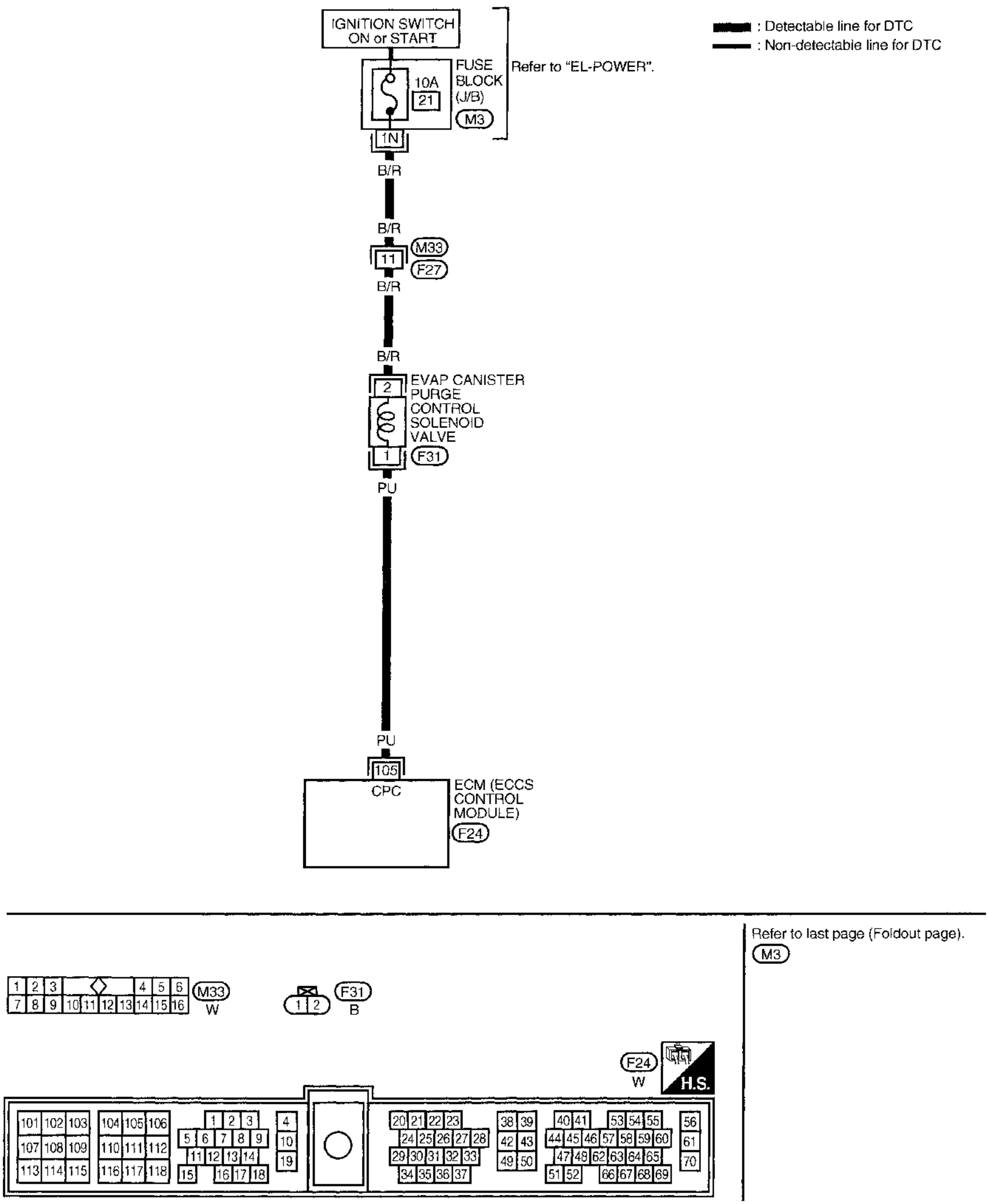
——— OR ———

NO TOOLS

1) Jack up drive wheels.
2) Turn ignition switch "ON".
3) Start engine and warm it up sufficiently.
4) Check that voltage between ECM terminal 63 and ground is less than 4.2V.
5) Turn ignition switch "OFF" and wait at least 5 seconds.
6) Start engine and let it idle for at least 70 seconds.
7) Maintain the following conditions for at least 10 seconds.
   Gear position:
   "2" or "D" range (A/T)
   "4th" gear (M/T)
   Vehicle speed:
   50 - 80 km/h (31 - 50 MPH)
   Engine speed:
   2,000 - 2,500 rpm
   Voltage between ECM terminal 51 and ground:
   More than 0.8V
8) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
9) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

EC-CANI/V-01

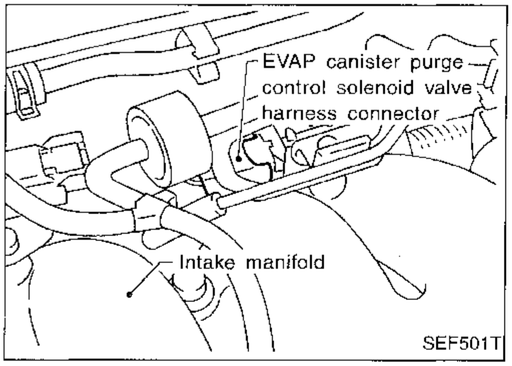


AEC232A

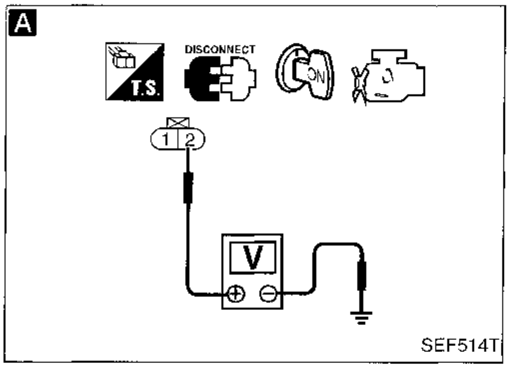
Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE

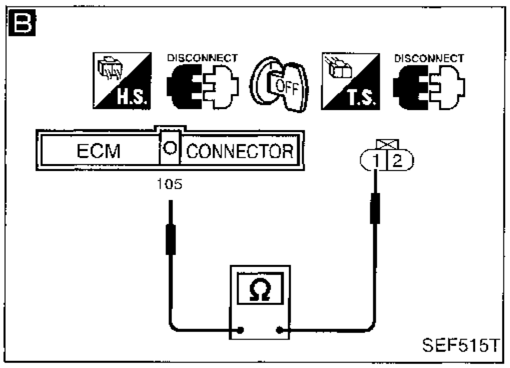
Procedure for malfunction A



SEF501T



SEF514T



SEF515T

INSPECTION START

↓

A **CHECK POWER SUPPLY.**
1. Disconnect 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.
- 10A fuse
- Harness connectors (M33), (F27)
- Harness for open or short between EVAP canister purge control solenoid valve and fuse

If NG, repair harness or connectors.

OK ↓

B **CHECK OUTPUT SIGNAL CIRCUIT.**
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (105) and terminal ①.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(EVAP canister purge control solenoid valve).
Refer to "COMPONENT INSPECTION", EC-454.

NG → Replace EVAP canister purge control solenoid valve.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

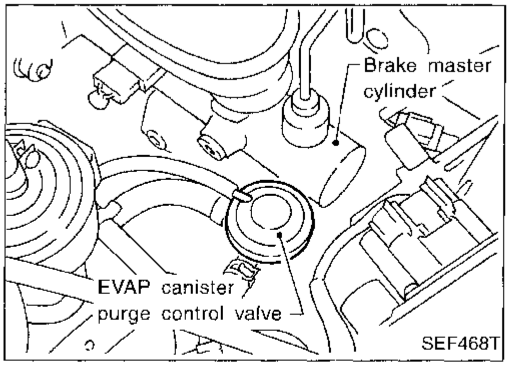
↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

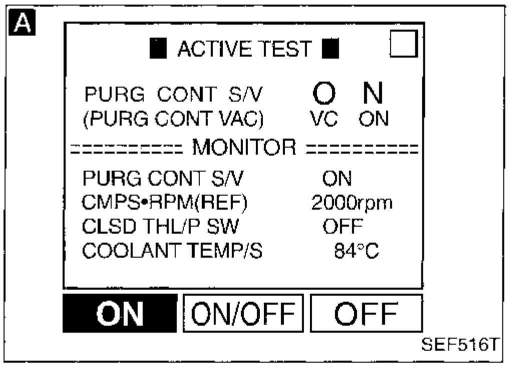
↓

INSPECTION END

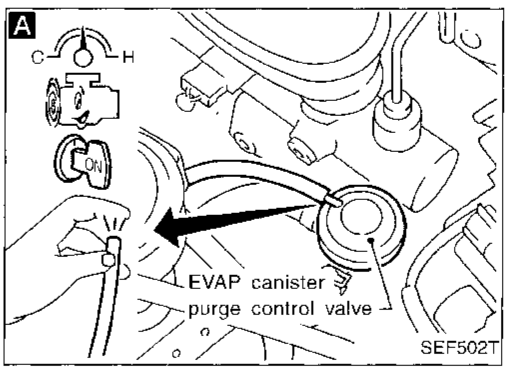
Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)



SEF468T



SEF516T



SEF502T

Procedure for malfunction B

INSPECTION START

↓

A **CHECK VACUUM SIGNAL.**

1. Disconnect vacuum hose to EVAP canister purge control valve.
2. Start engine.
3. Perform "PURG CONT S/V" in "ACTIVE TEST" mode.
4. Select "ON" in CONSULT screen to turn on "PURG CONT S/V".
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OR

1. Start engine and warm it up sufficiently.
2. Stop engine.
3. Jack up drive wheels.
4. Disconnect vacuum hose to EVAP canister purge control valve.
5. Start engine.
6. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

NG → CHECK COMPONENTS (EVAP canister purge control solenoid valve). Refer to "COMPONENTS INSPECTION" on next page.

- OK → Check vacuum hoses for clogging or disconnection. Refer to "Vacuum Hose Drawing", EC-248.

↓ OK

CHECK COMPONENT (EVAP canister purge control valve). Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP canister purge control valve.

↓ OK

Go to "TROUBLE DIAGNOSIS FOR DTC P0450", "EVAP Control System Pressure Sensor", EC-460.

↓ OK

CHECK EVAPORATIVE EMISSION LINE. Check EVAP purge line hoses for leak or clogging. Refer to "Evaporative Emission Line Drawing", EC-257.

NG → Repair EVAP purge line hoses.

↓ OK

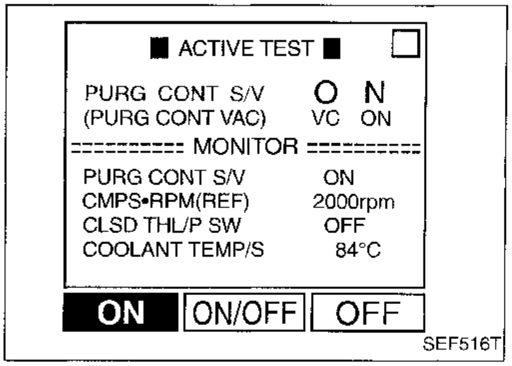
INSPECTION END

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

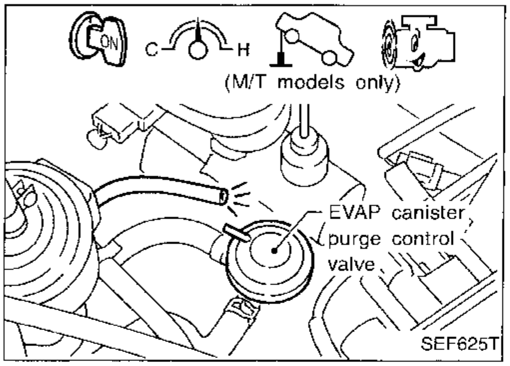
COMPONENT INSPECTION

EVAP canister purge control solenoid valve



SEF516T

1. Jack up driving wheels (M/T models only).
2. Turn ignition switch "ON".
3. Select "PURG CONT S/V" of "ACTIVE TEST" mode with CONSULT.
4. Start engine and warm it up sufficiently.
5. Disconnect vacuum hose at EVAP canister purge control valve.
6. Touch "ON" and "OFF" and check for vacuum passing through the hose.

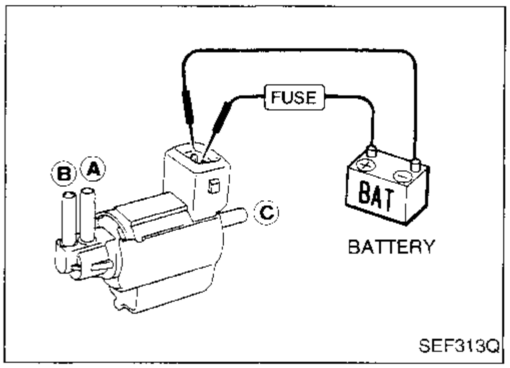


SEF625T

Condition	Vacuum
Idle	Not exist
2,000 rpm (A/T models) 2,000 rpm with 1 gear position (M/T models)	Exist

OR

Check air passage continuity.

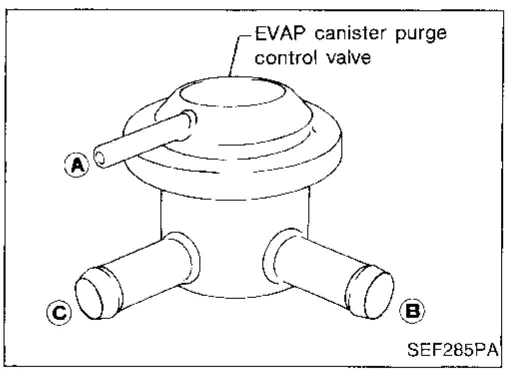


SEF313Q

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals	Yes	No
No supply	No	Yes

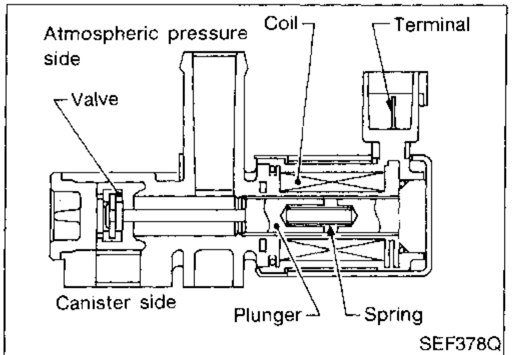
If NG, replace solenoid valve.

EVAP canister purge control valve

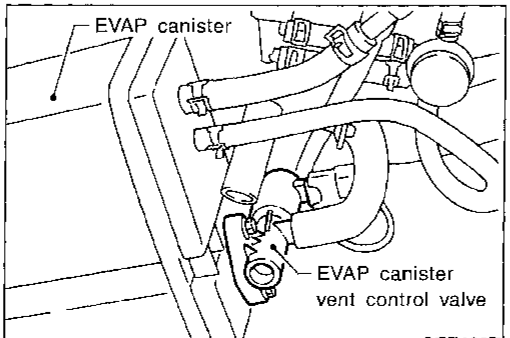


SEF285PA

Check EVAP canister purge control valve as follows.
1. Plug the port Ⓑ.
2. Apply pressure [80.0 kPa (600 mmHg, 23.62 inHg)] to port Ⓐ. Then keep it for 15 seconds, and check there is no leakage.
3. Repeat step 2 for port Ⓒ.



SEF378Q



SEF469T

Evaporative Emission (EVAP) Canister Vent Control Valve

COMPONENT INSPECTION

Note: If both DTC P0440 and P0446 are displayed, perform TROUBLE DIAGNOSIS FOR P0446 first.

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.
When the ECM sends an ON signal, the coil in the solenoid valve is energized.
A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative loss system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative loss system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
108	PU/W	EVAP canister vent control valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0446 0903	A) An improper voltage signal is sent to ECM through EVAP canister vent control valve.	● Harness or connectors [EVAP canister vent control valve circuit is open or shorted.]
	B) EVAP canister vent control valve does not operate properly.	● EVAP canister vent control valve ● EVAP control system pressure sensor ● Blocked rubber tube to EVAP canister vent control valve ● EVAP canister breather valve

Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A". If the DTC cannot be confirmed, perform "Procedure for malfunction B" on next page.

Procedure for malfunction A

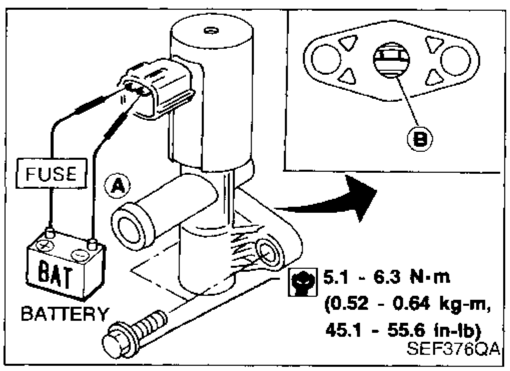
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 5 seconds.

OR

1) Start engine and wait at least 5 seconds.
2) Select "MODE 3" with GST.

OR

1) Start engine and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a DTC might not be confirmed.

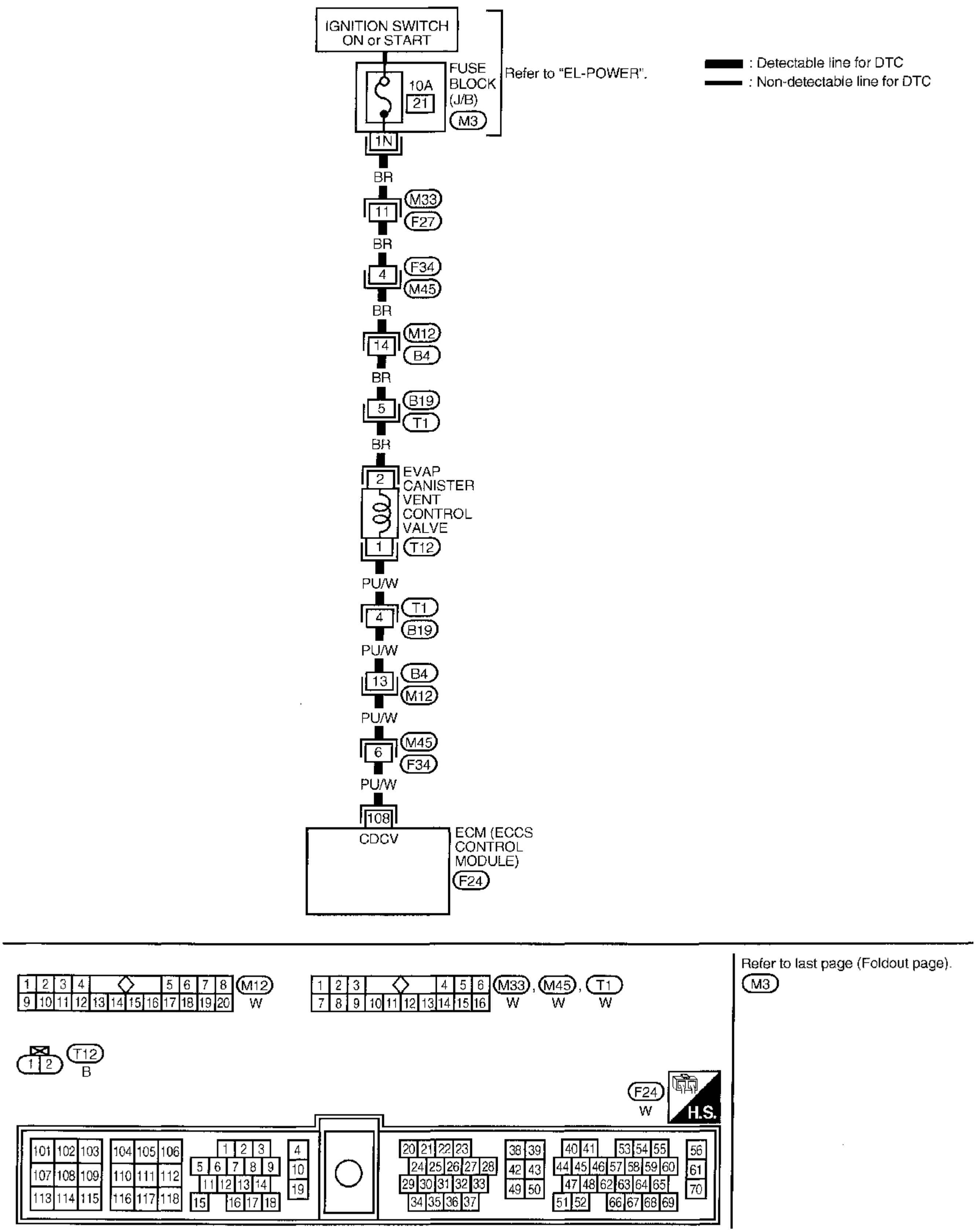
Procedure for malfunction B

1) Remove EVAP canister vent control valve from EVAP canister and disconnect hoses from the valve.
2) Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	No
No supply	Yes

Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd)

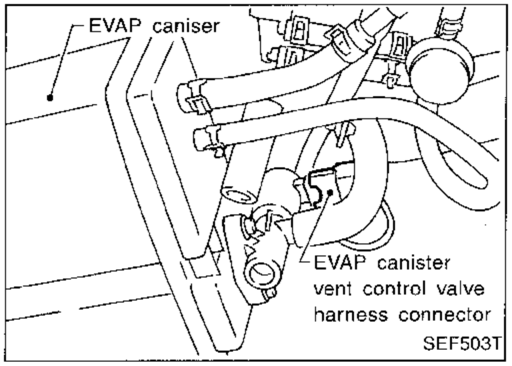
EC-VENT/V-01



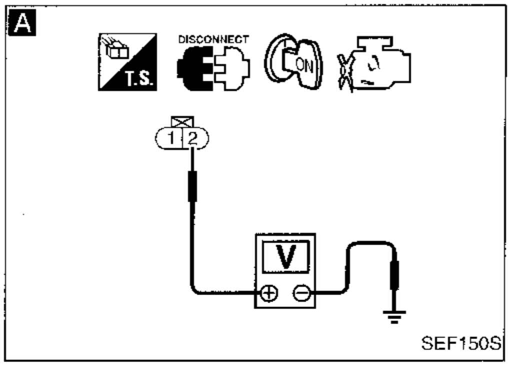
AEC233A

Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd)

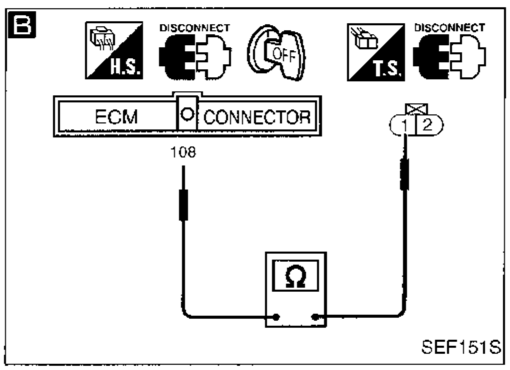
DIAGNOSTIC PROCEDURE



SEF503T



SEF150S



SEF151S

INSPECTION START

↓

A **CHECK POWER SUPPLY.**
1. Disconnect EVAP canister vent control 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 M33, F27, F34, M45, M12, B4, B19, T1
- 10A fuse
- Harness for open or short between EVAP canister vent control 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 (108) and terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors T1, B19, B4, M12, M45, F34
- Harness for open or short between EVAP canister vent control valve and ECM

If NG, repair harness or connectors.

↓ OK

CHECK RUBBER TUBE FOR CLOGGING.
Check obstructed rubber tube to EVAP canister vent control valve and clean the rubber tube using air blower.

↓ OK

CHECK COMPONENT
(EVAP canister vent control valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP canister vent control valve.

↓ OK

CHECK COMPONENT
(EVAP control system pressure sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP control system pressure sensor.

↓ OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

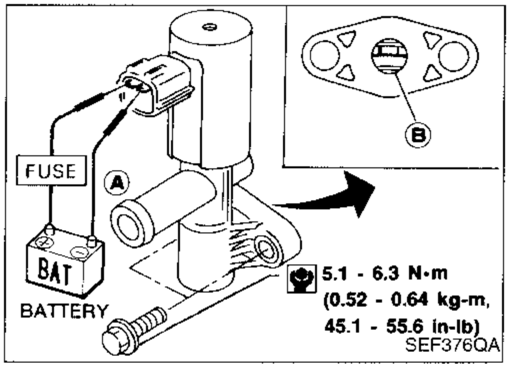
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd)

COMPONENT INSPECTION



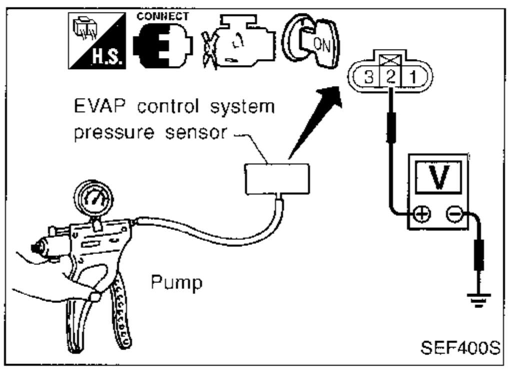
SEF376QA

EVAP canister vent control valve

Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	No
No supply	Yes

If NG, clean valve using air blower or replace as necessary.



SEF400S

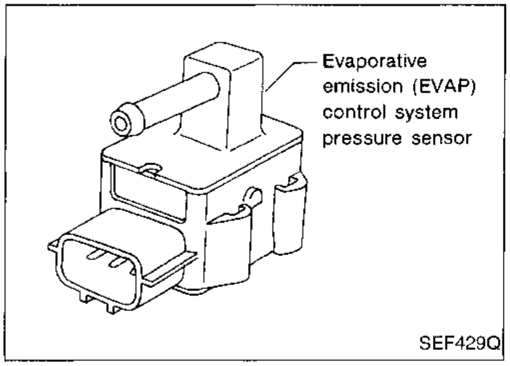
EVAP control system pressure sensor

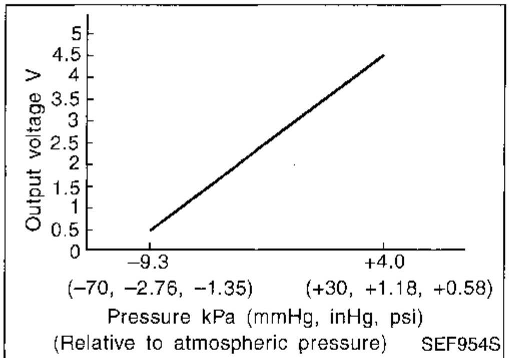
1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between terminal ② and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
−9.3 kPa (−70 mmHg, −2.76 inHg)	0.4 - 0.6

CAUTION:
Always calibrate the vacuum pump gauge when using it.

5. If NG, replace EVAP control system pressure sensor.





Evaporative Emission (EVAP) Control System Pressure Sensor

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on-board diagnosis.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	Approx. 3.4V

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (43) (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
49	P/L	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
50	B	Sensor's ground	Engine is running. (Warm-up condition) Idle speed	0.001 - 0.02V
67	W	EVAP control system pressure sensor	Ignition switch "ON"	Approximately 3.4V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0450 0704	● An improper voltage signal from EVAP control system pressure sensor is sent to ECM.	● Harness or connectors (The EVAP control system pressure sensor circuit is open or shorted.) ● EVAP control system pressure sensor ● EVAP canister vent control valve (The valve is stuck open.)

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Start engine and warm it up sufficiently.
2) Check that tank fuel temperature is above 0°C (32°F).
3) Turn ignition switch "OFF" and wait at least 5 seconds.
4) Turn ignition switch "ON".
5) Select "DATA MONITOR" mode with CONSULT.
6) Wait at least 3 seconds.

OR

1) Start engine and warm it up sufficiently.
2) Check that voltage between ECM terminal 63 and ground is less than 4.2V.
3) Turn ignition switch "OFF" and wait at least 5 seconds.
4) Turn ignition switch "ON" and wait at least 3 seconds.
5) Select "MODE 3" with GST.

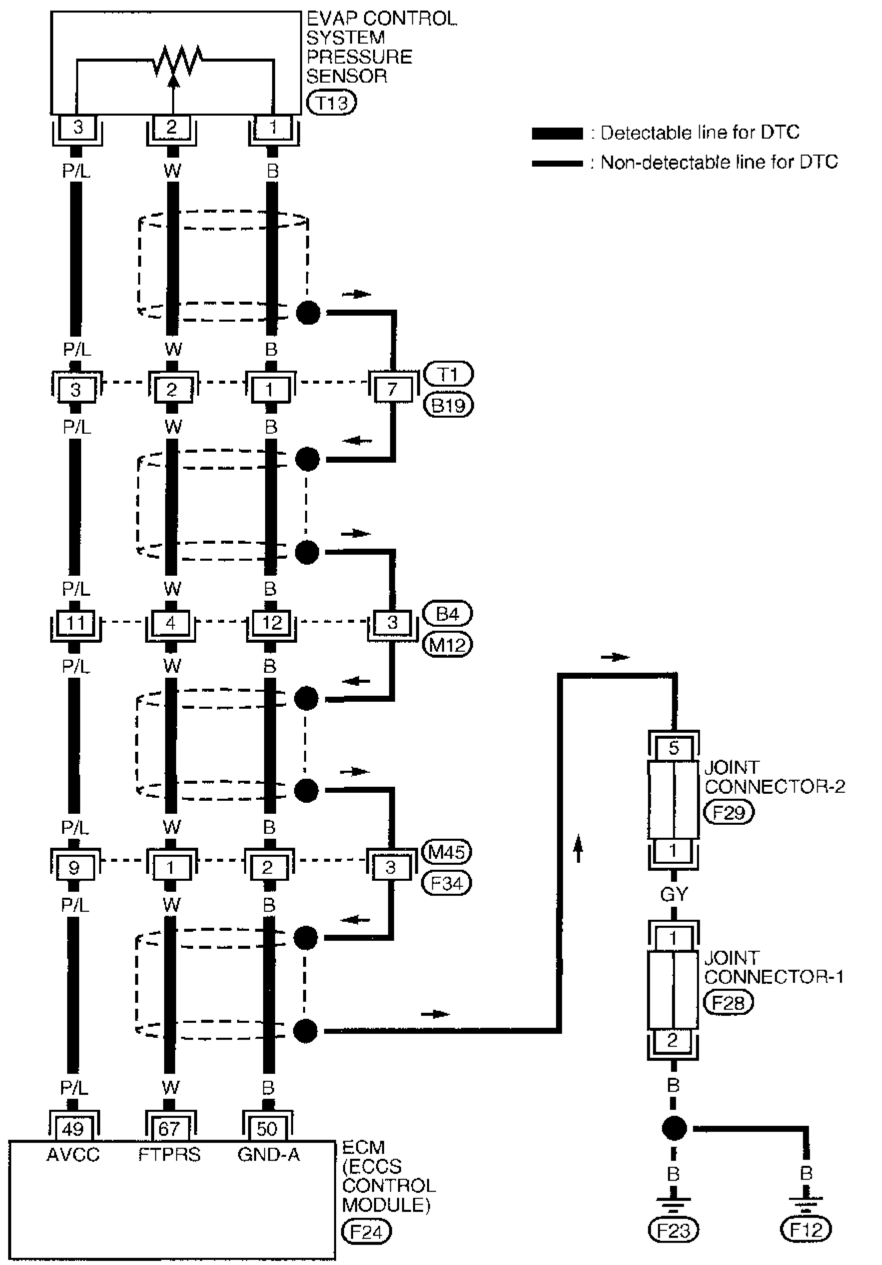
OR

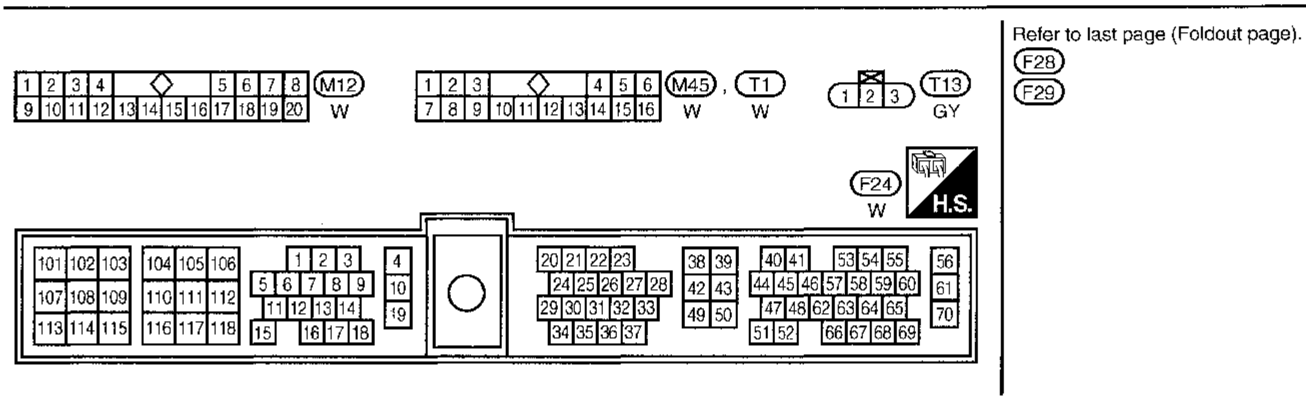
NO TOOLS

1) Start engine and warm it up sufficiently.
2) Check that voltage between ECM terminal 63 and ground is less than 4.2V.
3) Turn ignition switch "OFF" and wait at least 5 seconds.
4) Turn ignition switch "ON" and wait at least 3 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.

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

EC-PRE/SE-01

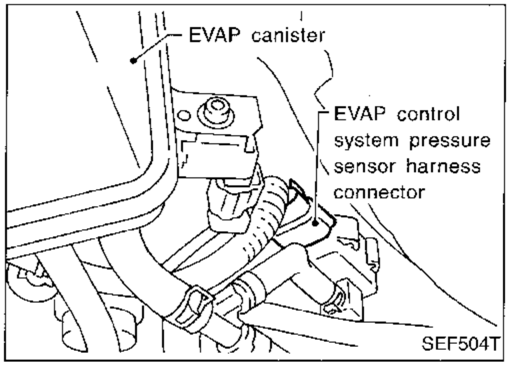




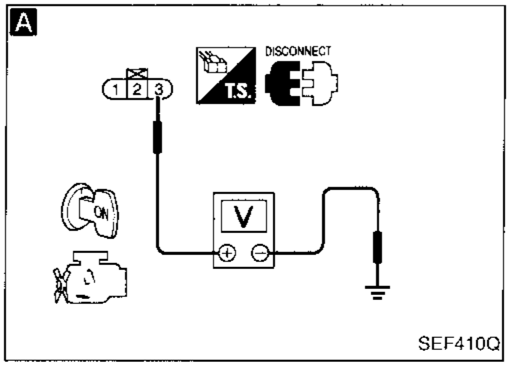
AEC235A

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

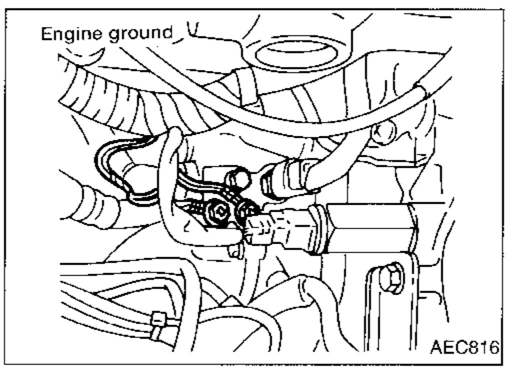
DIAGNOSTIC PROCEDURE



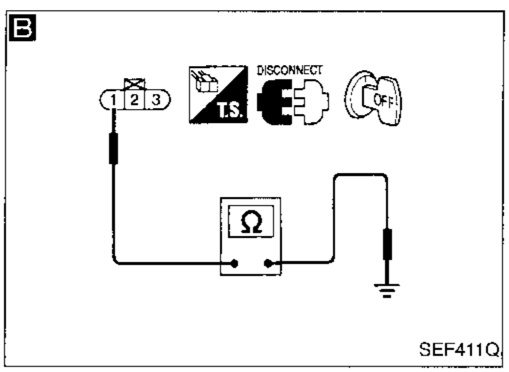
SEF504T



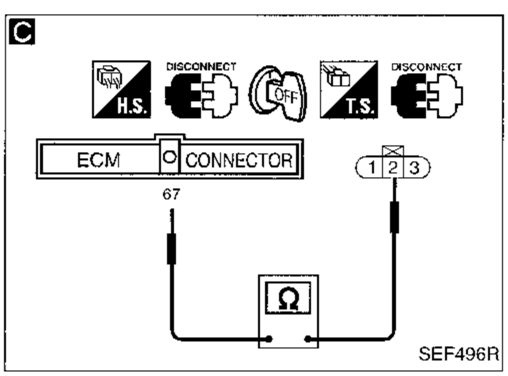
SEF410Q



AEC816



SEF411Q



SEF496R

INSPECTION START

↓

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect EVAP control system pressure sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ③ and engine ground with CONSULT or tester.
   Voltage: Approximately 5V

NG → Check the following.
- Harness connectors (T1), (B19), (B4), (M12), (M45), (F34)
- Harness for open or short between EVAP control system pressure sensor harness connector and ECM

If 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 ① and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (T1), (B19), (B4), (M12), (M45), (F34)
- Harness for open or short between ECM and EVAP control system pressure sensor

If NG, repair harness or connectors.

↓ OK

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑥⑦ and terminal ②.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (T1), (B19), (B4), (M12), (M45), (F34)
- Harness for open or short between ECM and EVAP control system pressure sensor

If NG, repair harness or connectors.

↓ OK

CHECK COMPONENT
(EVAP canister vent control valve).
Refer to "COMPONENT INSPECTION", EC-459.

↓ OK

Ⓐ

(Go to next page.)

GI
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IDX

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

Ⓐ

CHECK COMPONENT
(EVAP control system pressure sensor).
Refer to "COMPONENT INSPECTION" below.

NG → Replace EVAP control system pressure sensor.

OK ↓

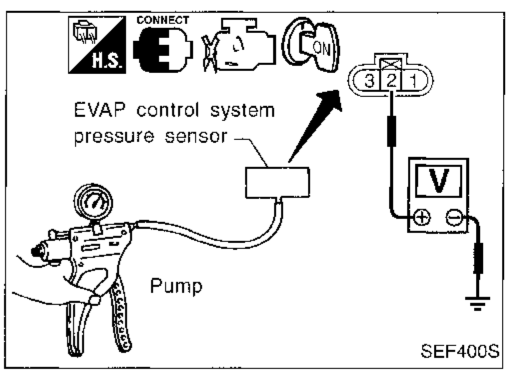
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ 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



SEF400S

COMPONENT INSPECTION

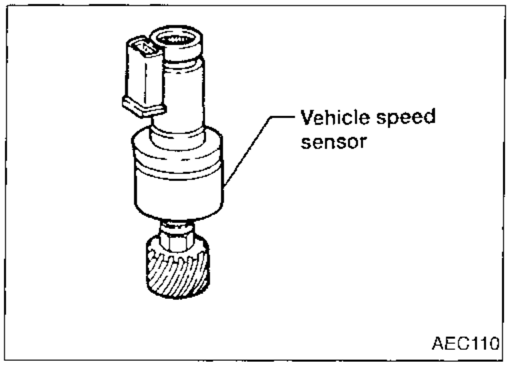
EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between terminal ② and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
–9.3 kPa (–70 mmHg, –2.76 inHg)	0.4 - 0.6

CAUTION:
Always calibrate the vacuum pump gauge when using it.

5. If NG, replace EVAP control system pressure sensor.



Vehicle Speed Sensor (VSS)

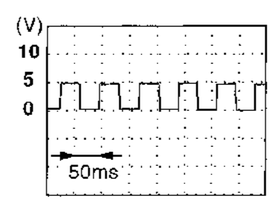
The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT value	Almost the same speed as the CONSULT value

ECM TERMINALS AND REFERENCE VALUE

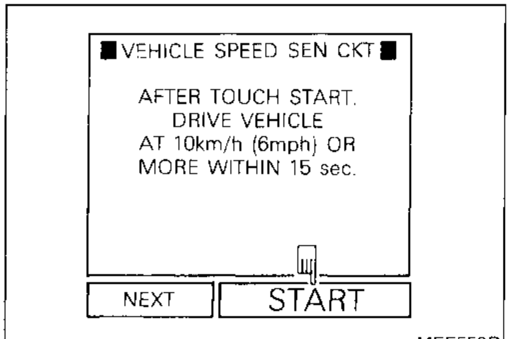
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
26	PU/R	Vehicle speed sensor	[Engine is running.] — Lift up the vehicle. — In 2nd gear position — Vehicle speed is 40 km/h (25 MPH).	0 - Approximately 4.2V  SEF194T

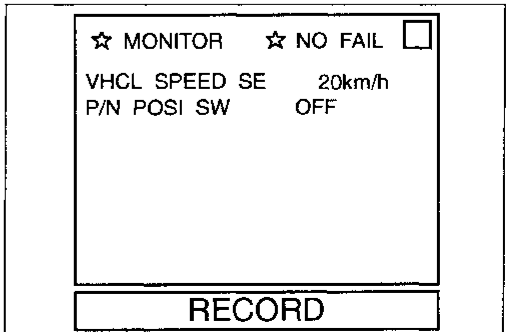
ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0500 0104	• The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	• Harness or connector (The vehicle speed sensor circuit is open or shorted.) • Vehicle speed sensor

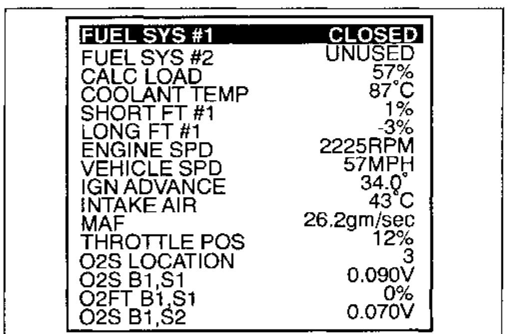
Vehicle Speed Sensor (VSS) (Cont'd)



MEF559D



SEF941N



SEF942N

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a DTC might not be confirmed.

1) Jack up drive wheels.
2) Start engine.
3) Perform "VEHICLE SPEED SEN CKT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Jack up drive wheels.
2) Start engine.
3) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.

The vehicle speed on CONSULT should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

OR

1) Jack up drive wheels.
2) Start engine.
3) Read vehicle speed sensor signal in "MODE 1" with GST.

The vehicle speed on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

OR

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

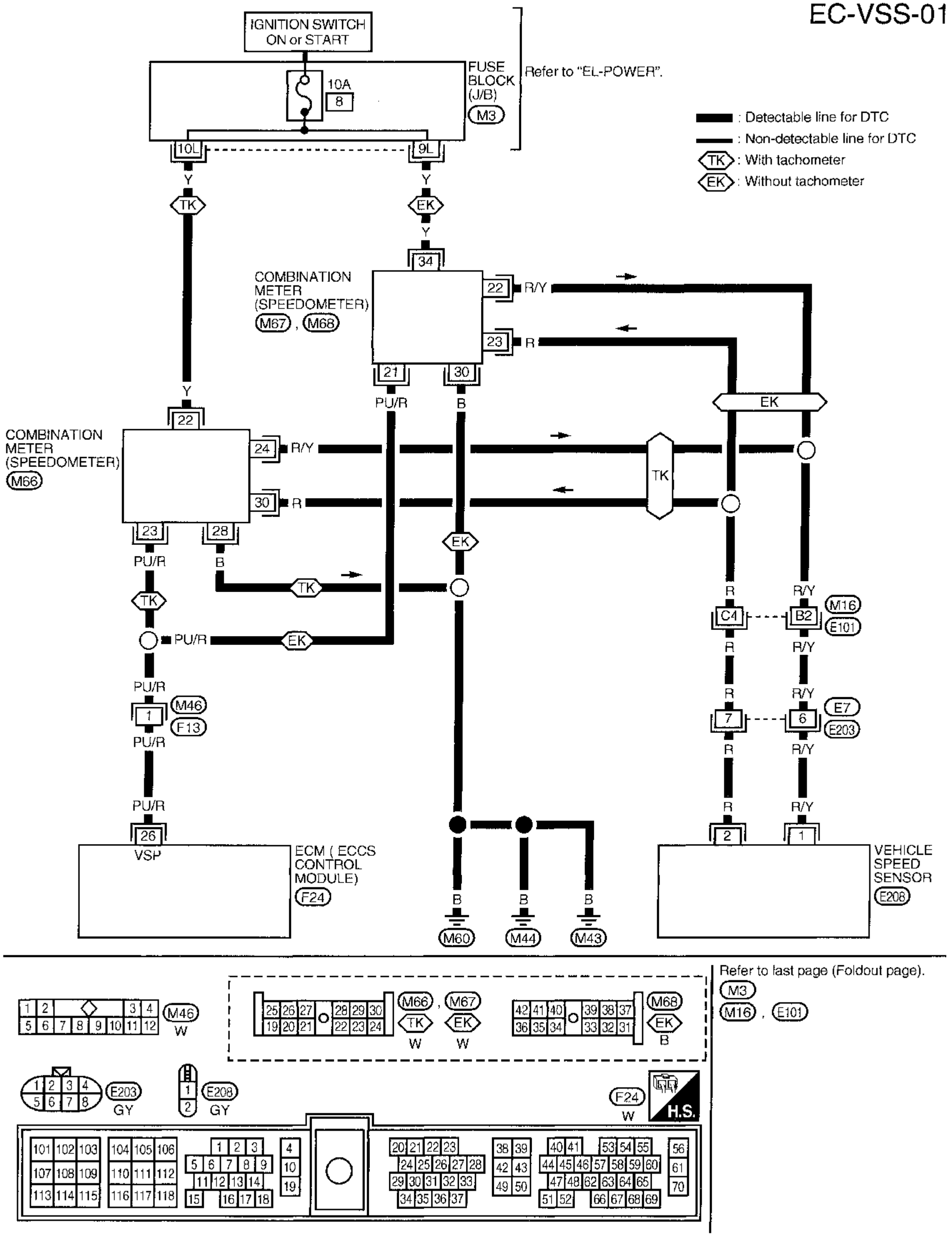
1) Start engine and warm it up sufficiently.
2) Perform test drive continuously under the following recommended condition.

Testing time	: (A/T models) at least 5 seconds (M/T models) at least 10 seconds
Engine speed	: (A/T models) 2,100 - 2,800 rpm (M/T models) 1,700 - 2,800 rpm
Intake manifold vacuum	: (A/T models) −46.7 to −20.0 kPa (−350 to −150 mmHg, −13.78 to −5.91 inHg) (M/T models) −46.7 to −33.3 kPa (−350 to −250 mmHg, −13.78 to −9.84 inHg)
Gear position	: Suitable position (except "N" or "P" 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.

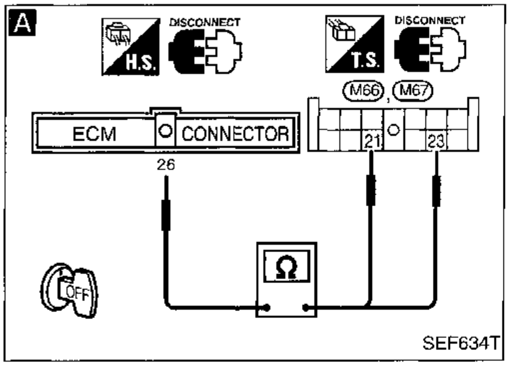
Even though Diagnostic Trouble Code is not detected, perform the above test drive at least one more time.

EC-VSS-01


IGNITION SWITCH ON or START
10A
8
FUSE BLOCK (J/B)
M3
10L
9L
Refer to "EL-POWER".
: Detectable line for DTC
: Non-detectable line for DTC
TK : With tachometer
EK : Without tachometer
COMBINATION METER (SPEEDOMETER)
M67 , M68
COMBINATION METER (SPEEDOMETER)
M66
ECM (ECCS CONTROL MODULE)
F24
VSP
VEHICLE SPEED SENSOR
E208
M60
M44
M43
M16
E101
E7
E203
M46
F13
Refer to last page (Foldout page).
M3
M16 , E101
H.S.

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE



SEF634T

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.

Model	Terminals	
	ECM	Meter
With tachometer	26	23
Without tachometer	26	21

Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors F13, M46
- Harness for open or short between ECM and combination meter

If NG, repair harness or connectors.

↓ OK

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check the following.
- Harness connectors M16, E101
- Harness connectors E7, E203
- Harness for open or short between combination meter and vehicle speed sensor

If NG, repair harness or connectors.
Check vehicle speed sensor and its circuit.
Refer to EL section.

↓ OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

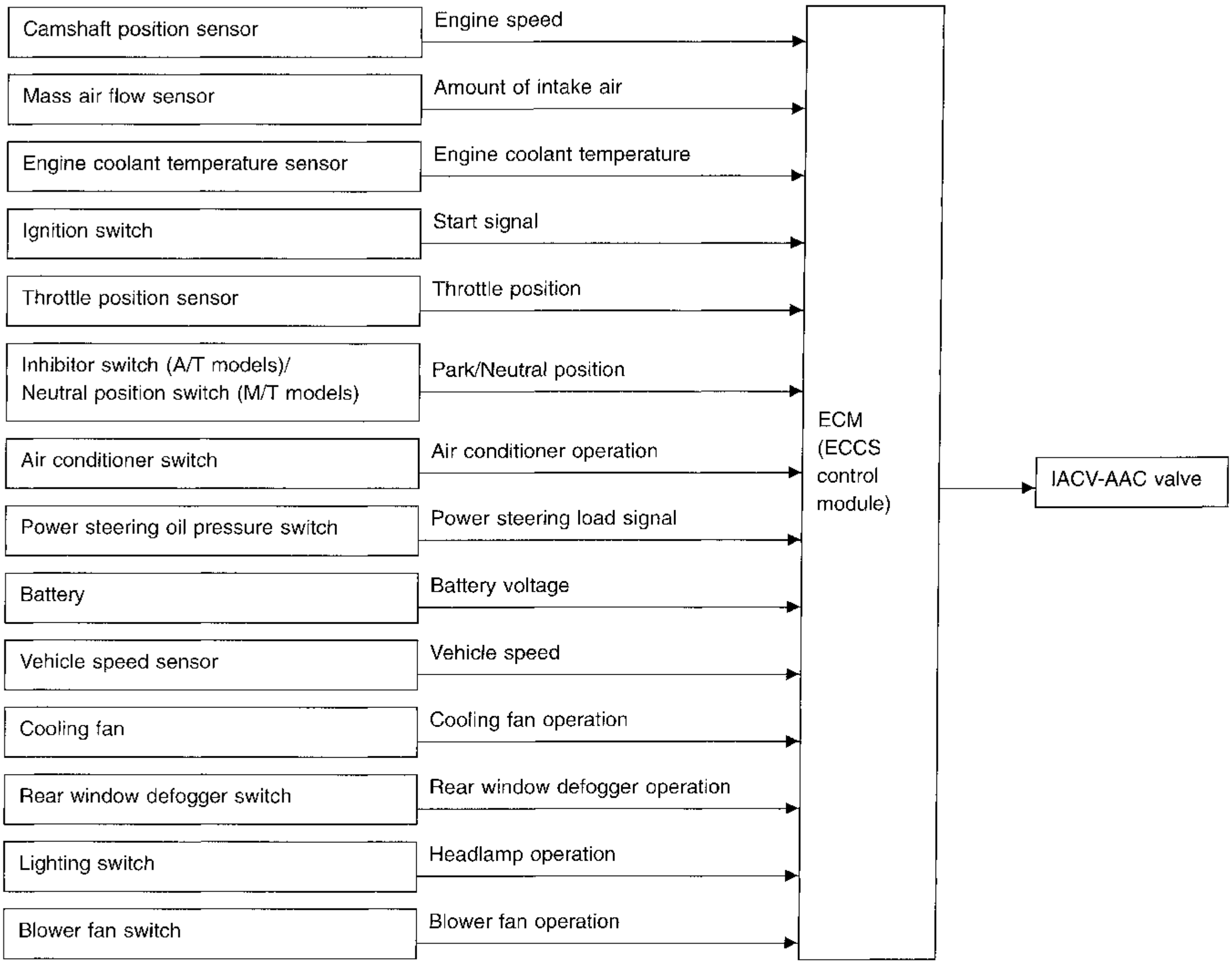
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

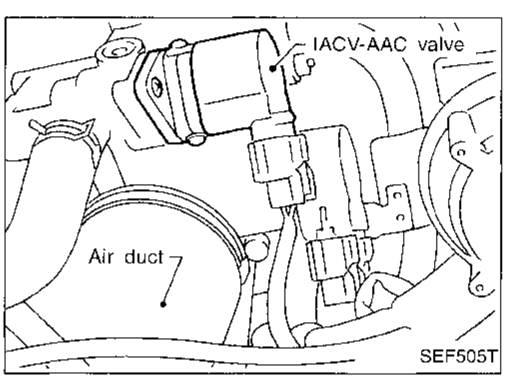
INSPECTION END

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve

SYSTEM DESCRIPTION



This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which bypasses the throttle valve via IACV-AAC valve. The IACV-AAC valve opens and closes according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the 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).



SEF505T

COMPONENT DESCRIPTION

IACV-AAC valve

The IACV-AAC valve is moved by open and close signals from the ECM. When the open signal is sent to the valve, the amount of air that will flow through the valve increases. The more air that flows through the valve, the higher the idle speed. When the close signal is sent to the valve, the amount of air decreases.

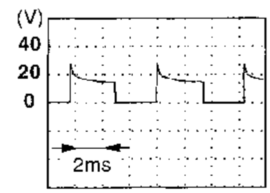
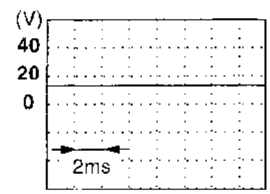
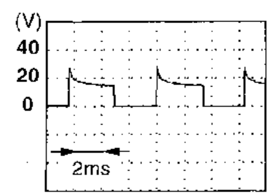
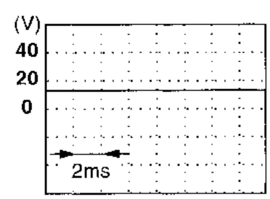
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	20 - 60%
		2,000 rpm	—

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
42	PU/W	IACV-AAC valve (Close)	Engine is running. (Warm-up condition) Idle speed	5 - 9V  SEF197T
			Engine is running. (Warm-up condition) Engine speed is 2,000 rpm	Approximately 13V  SEF198T
101	SB	IACV-AAC valve (Open)	Engine is running. (Warm-up condition) Idle speed	Approximately 10V  SEF197T
			Engine is running. (Warm-up condition) Engine speed is 2,000 rpm	Approximately 0V  SEF198T

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

Procedure for malfunction A

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and run it at idle at least 2 seconds.

OR

GST
1) Start engine and run it at idle for at least 2 seconds.
2) Select "MODE 3" with GST.

OR

NO TOOLS
1) Start engine and run it at idle at least 2 seconds.
2) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

Procedure for malfunction B

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
4) Start engine and run it at least 30 seconds at idle speed.

OR

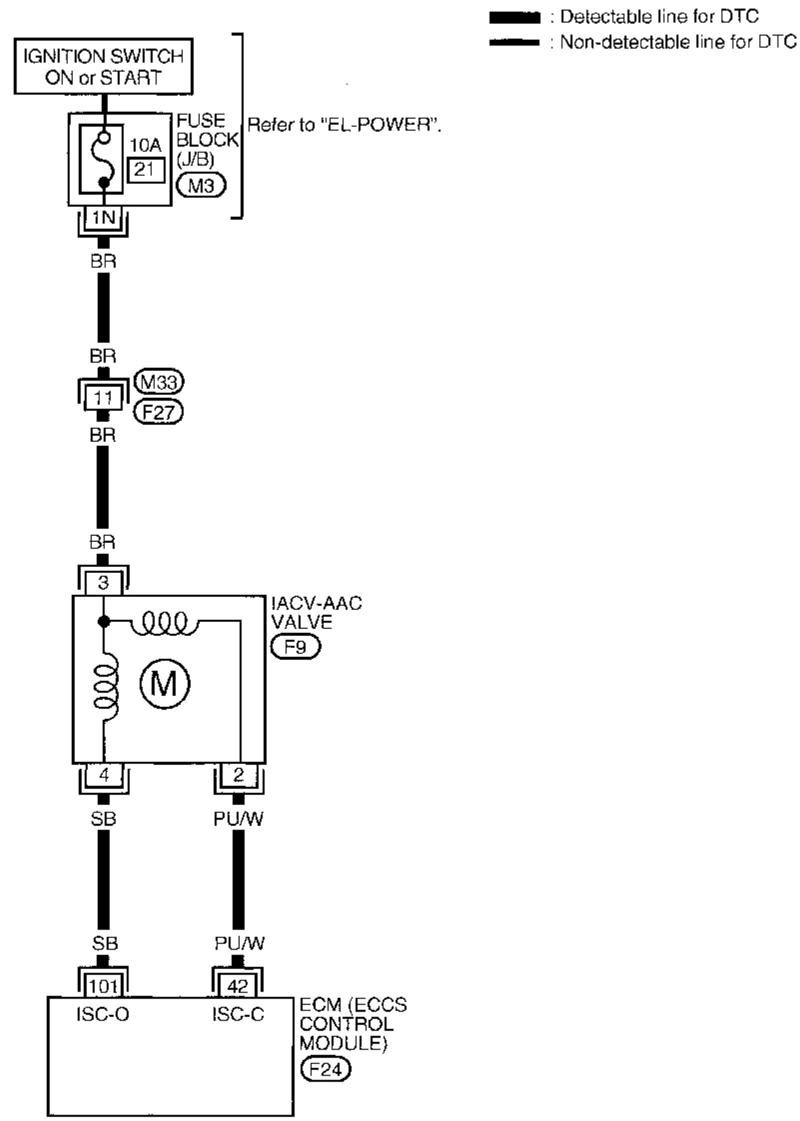
GST
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and run it at least 30 seconds at idle speed.
4) Select "MODE 3" with GST.

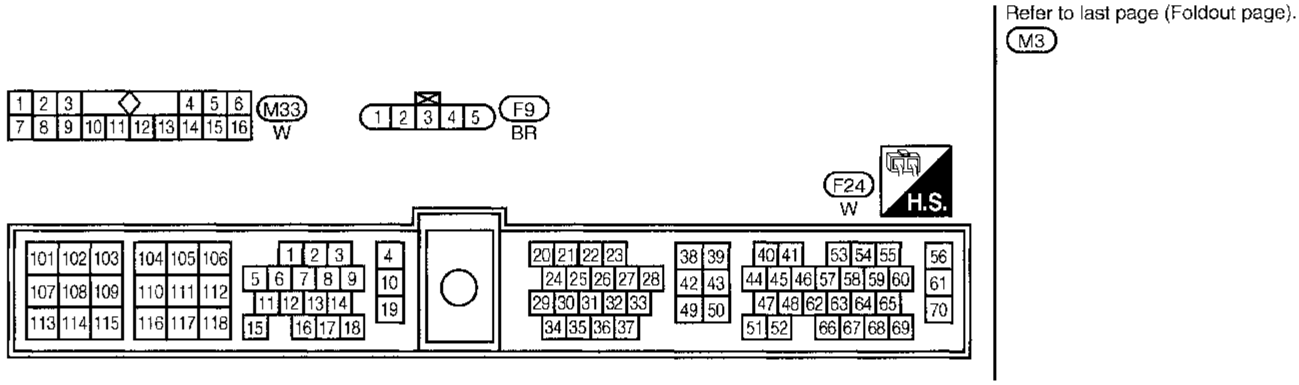
OR

NO TOOLS
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and run it at least 30 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.

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

EC-AAC/V-01

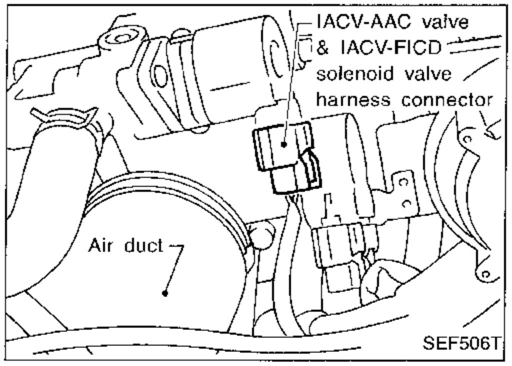




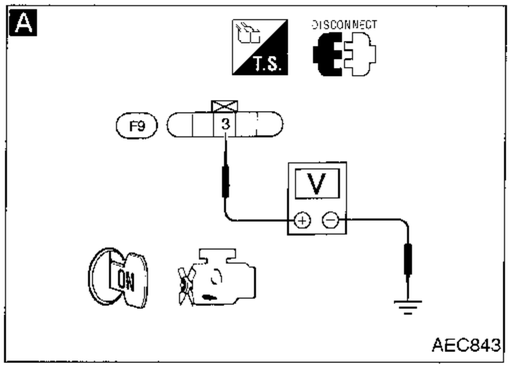
AEC254A

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

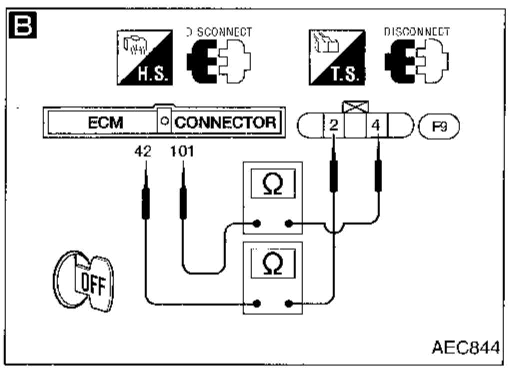
DIAGNOSTIC PROCEDURE



SEF506T



AEC843



AEC844

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 terminal ③ and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M33), (F27)
- 10A fuse
- Harness for open or short between IACV-AAC valve harness connector 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 (101) and terminal ④, ECM terminal ㊷ and terminal ②.

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.

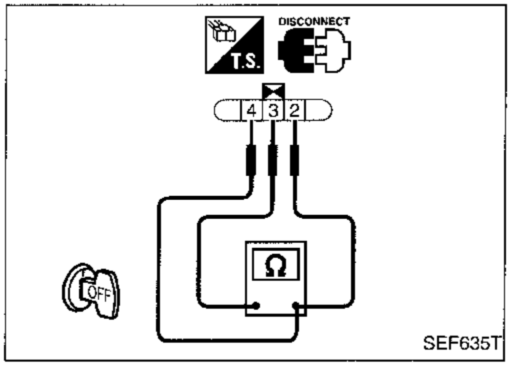
↓

INSPECTION END

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

COMPONENT INSPECTION



SEF635T

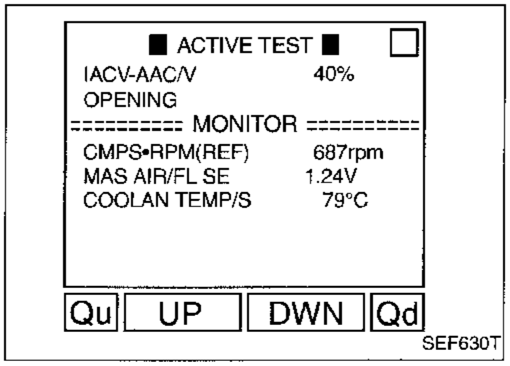
IACV-AAC valve

1. Disconnect IACV-AAC valve harness connector.
2. Check resistance between terminals ② and ③, ③ and ④.
   Resistance:
   50 - 100Ω [at 25°C (77°F)]
3. Reconnect IACV-AAC valve harness connector.
4. Start engine and warm it up sufficiently.
5. Perform "IACV-AAC/V OPENING" in "ACTIVE TEST" mode with CONSULT.
6. Check "MAS AIR/FL SE" value during changing the valve opening from 20% to 80%.

"MAS AIR/FL SE" value should be increased more than 0.15V.

7. If NG, replace IACV-AAC valve.

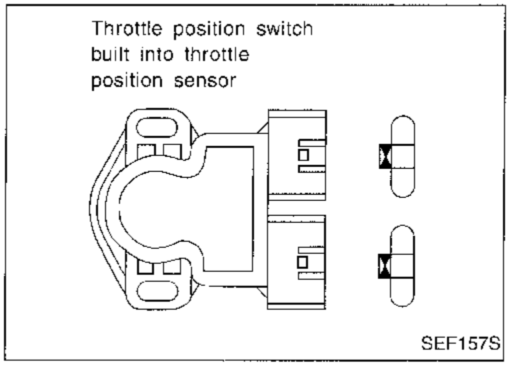
Note: Do not use "FUNCTION TEST" mode with CONSULT.



SEF630T

OR

1. Disconnect IACV-AAC valve harness connector.
2. Check resistance between terminals ② and ③, ③ and ④.
   Resistance:
   50 - 100Ω [at 25°C (77°F)]
3. If NG, replace IACV-AAC valve.



SEF157S

Closed Throttle Position Switch

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. The wide open throttle position switch is used only for A/T control.
When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge control valve when the throttle position sensor is malfunctioning.

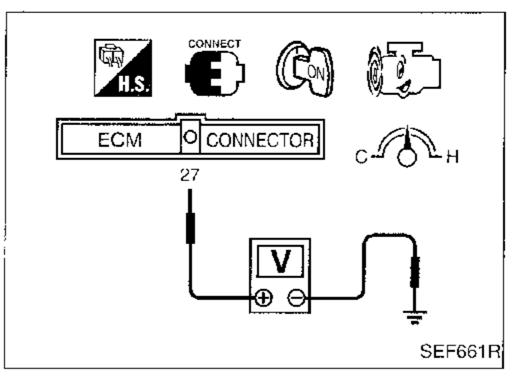
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
27	LG	Throttle position switch (Closed position)	Ignition switch "ON" (Warm-up condition) — Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" — Accelerator pedal depressed	Approximately 0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0510 0203	● Battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened.	● Harness or connectors (The closed throttle position switch circuit is shorted.) ● Closed throttle position switch



SEF661R

OVERALL FUNCTION CHECK

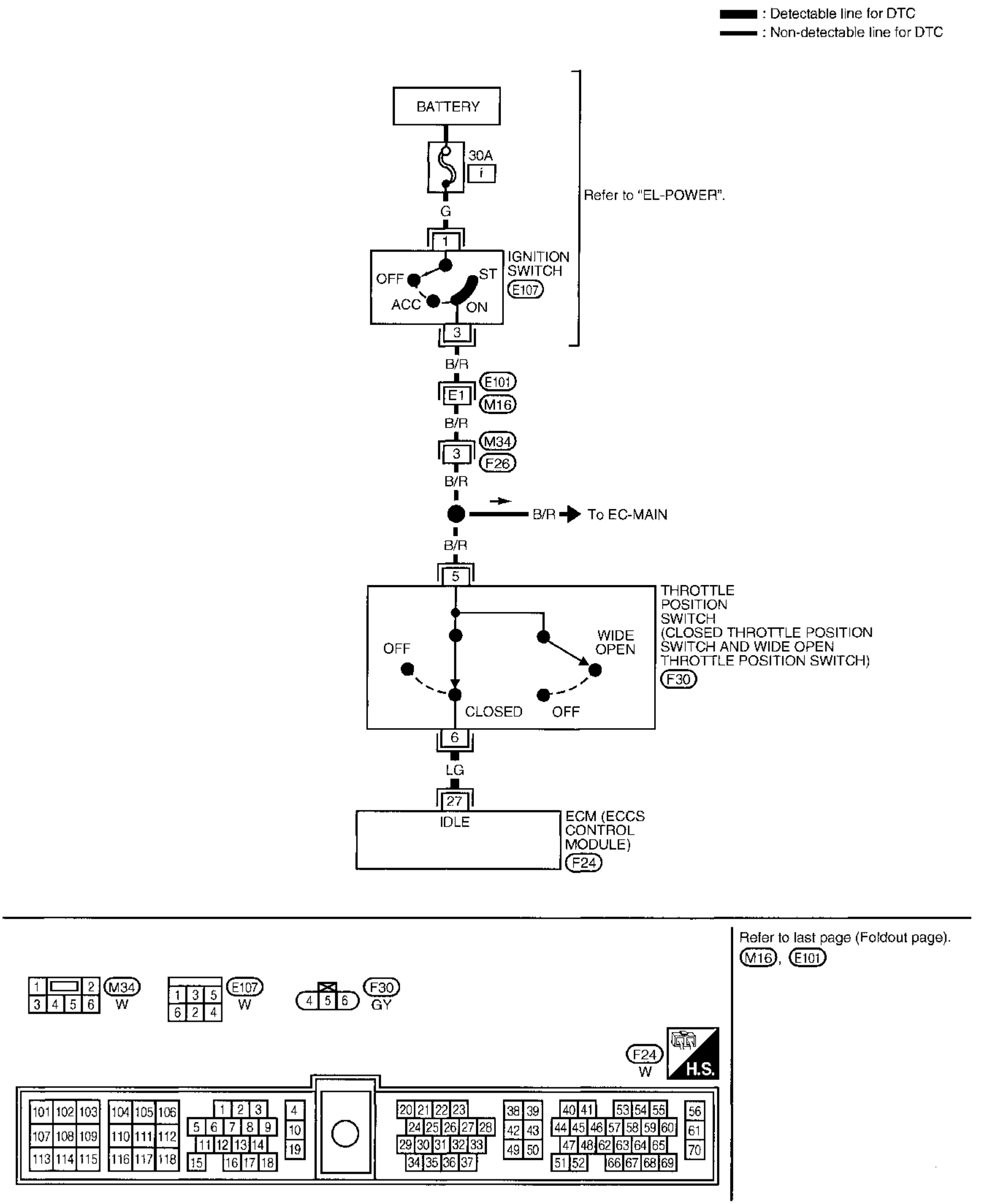
Use this procedure to check the overall function of the closed throttle position switch circuit. During this check, a DTC might not be confirmed.

NO TOOLS

1) Start engine and warm it up sufficiently.
2) Check the voltage between ECM terminal ㉗ and ground under the following conditions.
   At idle: Battery voltage
   At 2,000 rpm: Approximately 0V

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

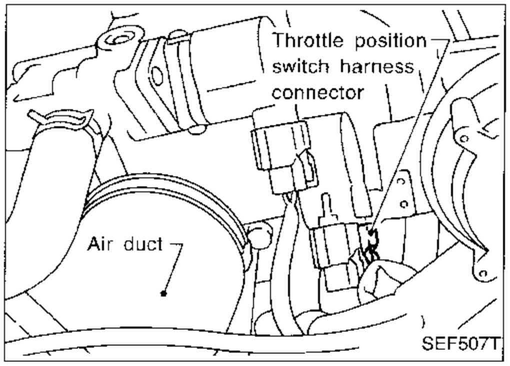
EC-TP/SW-01

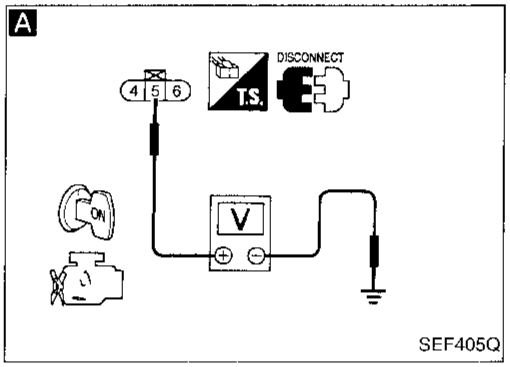


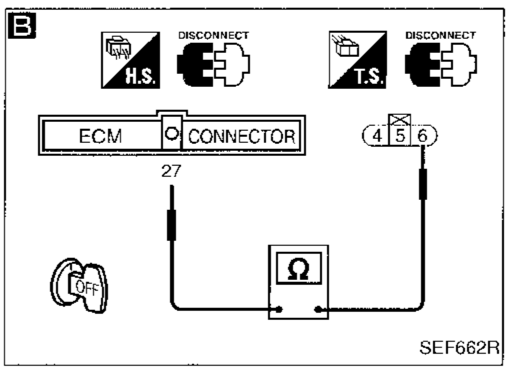
AEC238A

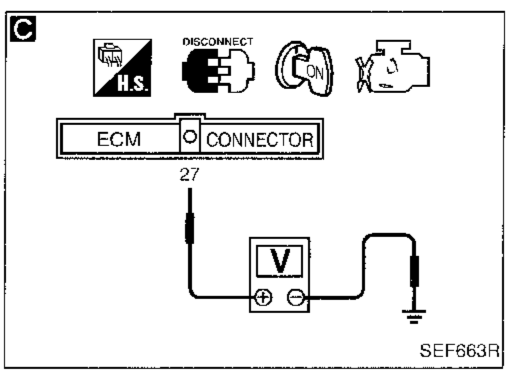
Closed Throttle Position Switch (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect throttle position switch harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ⑤ and engine ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.
- 30A fuse
- Harness connector E101, M16, M34, F26
- Harness for open or short between throttle position switch and fuse

↓ OK

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ㉗ and terminal ⑥.

Continuity should exist.

NG → Repair harness or connectors.

↓ OK

C

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal ㉗ and engine ground.

Voltage: Approx. 0V

NG → Repair harness or connectors.

↓ OK

ADJUST THROTTLE POSITION SWITCH.
Perform BASIC INSPECTION, EC-310.

↓ OK

CHECK COMPONENT
(Closed throttle position switch).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace throttle position switch.

↓ OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

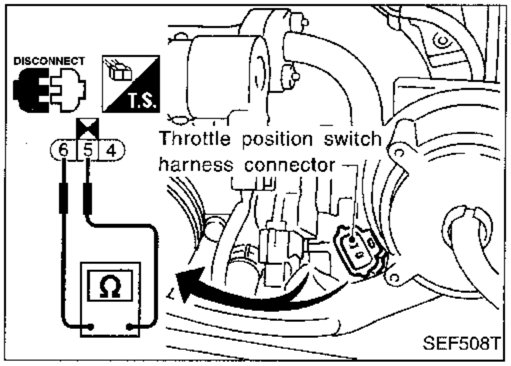
Check ECM pin terminals for damage and check the connection of ECM harness connector.
Reconnect ECM harness connector and retest.

↓

INSPECTION END

Closed Throttle Position Switch (Cont'd)

COMPONENT INSPECTION



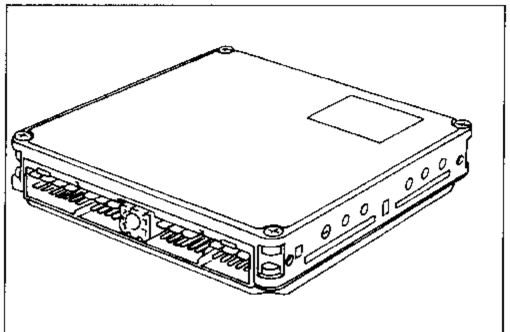
SEF508T

Closed throttle position switch

1. Start engine and warm it up sufficiently.
2. Turn ignition switch "OFF".
3. Disconnect throttle position switch harness connector.
4. Check continuity between terminals ⑤ and ⑥ while opening throttle valve manually.

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

If NG, replace throttle position sensor.


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.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Item (Possible Cause)
P0605 0301	● ECM calculation function is malfunctioning.	● ECM (ECCS control module)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and run it at least 30 seconds at idle speed.

OR

1) Turn ignition switch "ON".
2) Select "Mode 3" with GST.
3) Start engine and run it at least 30 seconds at idle speed.

OR

NO TOOLS

1) Turn ignition switch "ON".
2) Start engine and run it at least 30 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.

GI
MA
EM
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MT
AT
FA
RA
BR
ST
RS
BT
HA
EL
IDX

Engine Control Module (ECM)-ECCS Control Module (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

↓

1) Turn ignition switch "ON".
2) Select "SELF DIAG RESULTS" mode with CONSULT.
3) Touch "ERASE".

OR

1) Turn ignition switch "ON".
2) Select MODE 4 with GST.
3) Touch "ERASE".

OR

1) Turn ignition switch "ON".
2) Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. Refer to EC-282.

↓

PERFORM DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE.
See previous page.

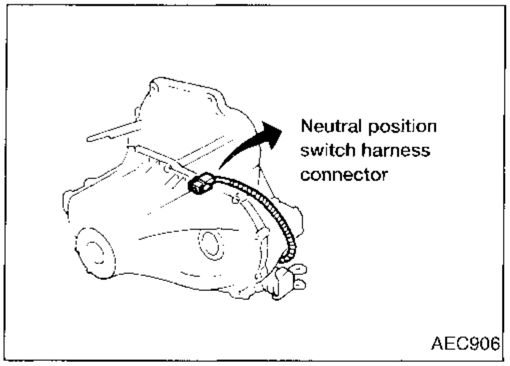
↓

Is the P0605 (DTC 0301) displayed again?

Yes → Replace ECM.

No ↓

INSPECTION END



Park/Neutral Position Switch

When the gear position is "P" (A/T models only) or "N", park/neutral position switch is "ON".
ECM detects the park/neutral position when continuity with ground exists.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever "P" or "N"	ON
		Except above	OFF

ECM TERMINALS AND REFERENCE VALUE

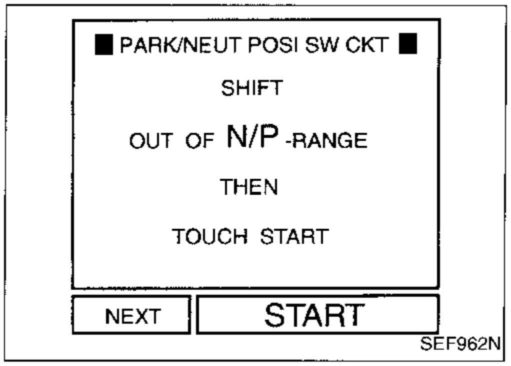
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
22	G/OR	Neutral position switch (M/T models) Inhibitor switch (A/T models)	Ignition switch "ON" — Gear position is "Neutral position" (M/T models) — Gear position is "N" or "P" (A/T models)	Approximately 0V
			Ignition switch "ON" — Except the above gear position	A/T models: BATTERY VOLTAGE (11 - 14V) M/T models: Approximately 5V

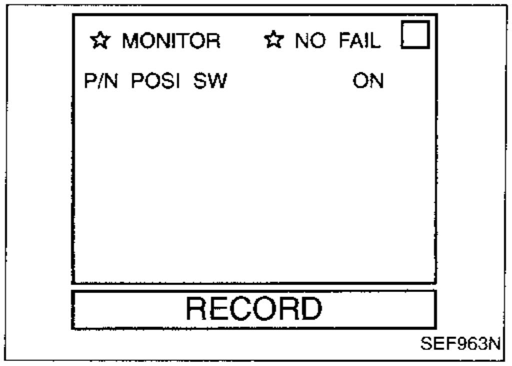
ON BOARD DIAGNOSIS LOGIC

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 neutral position switch or inhibitor switch circuit is open or shorted.) ● Neutral position switch (M/T models) ● Inhibitor switch (A/T models)

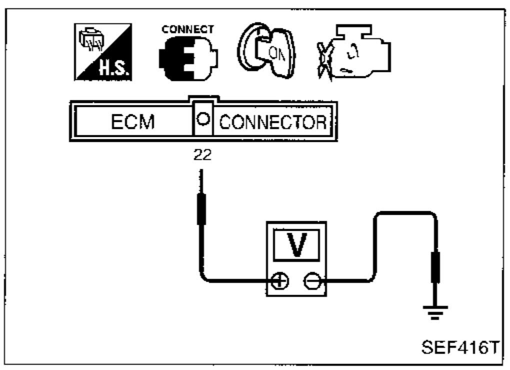
Park/Neutral Position Switch (Cont'd)



SEF962N



SEF963N



SEF416T

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the park/neutral position switch circuit. During this check, a DTC might not be confirmed.

1) Turn ignition switch "ON".
2) Perform "PARK/NEUT POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.

OR

2) Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT.
3) Check the "P/N POSI SW" signal under the following conditions.

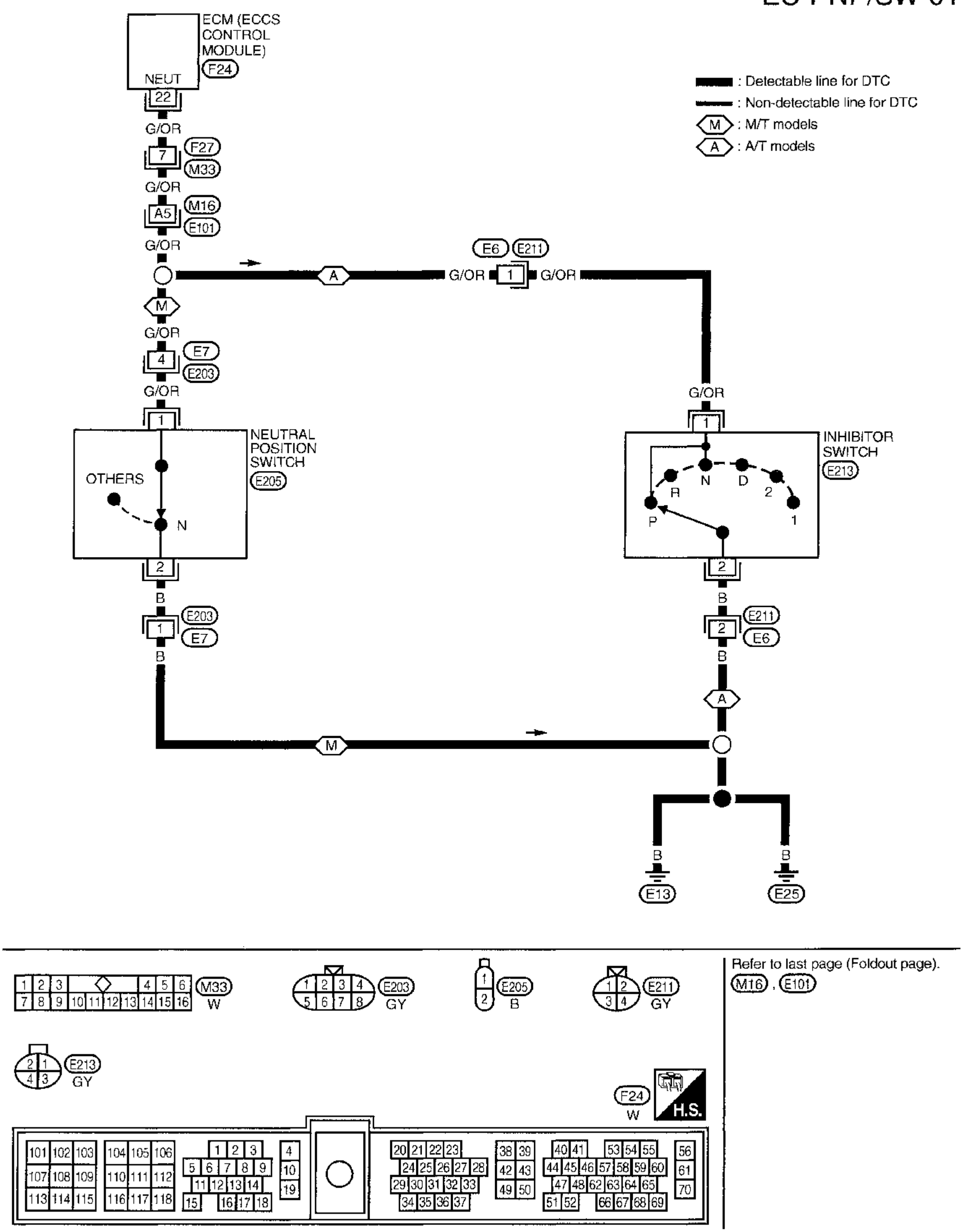
Condition (Gear position)	Signal
"P" (A/T only) and "N" position	ON
Except the above position	OFF

OR

1) Turn ignition switch "ON".
2) Check voltage between ECM terminal 22 and body ground under the following conditions.

Condition (Gear position)	Voltage (V)
"P" (A/T only) and "N" position	Approx. 0
Except the above position	M/T models: Approx. 5 A/T models: Battery voltage

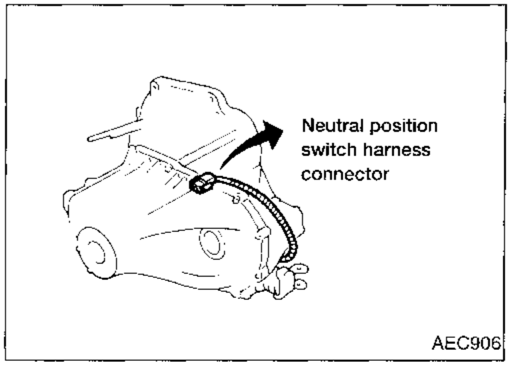
EC-PNP/SW-01



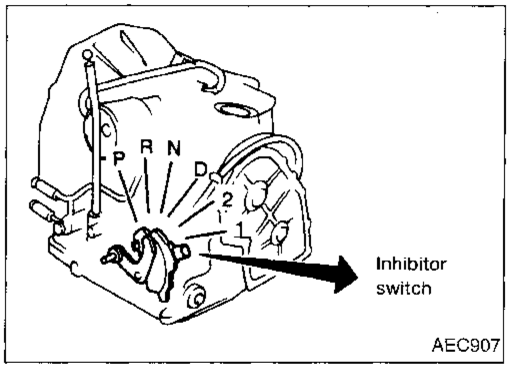
AEC255A

Park/Neutral Position Switch (Cont'd)

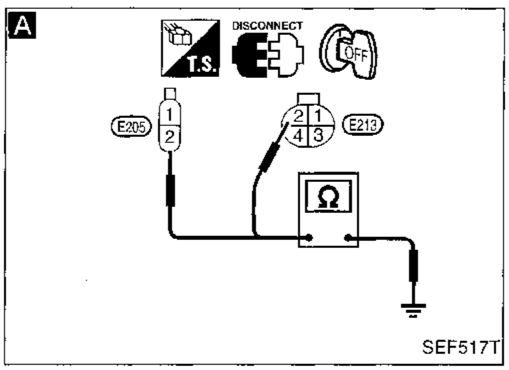
DIAGNOSTIC PROCEDURE



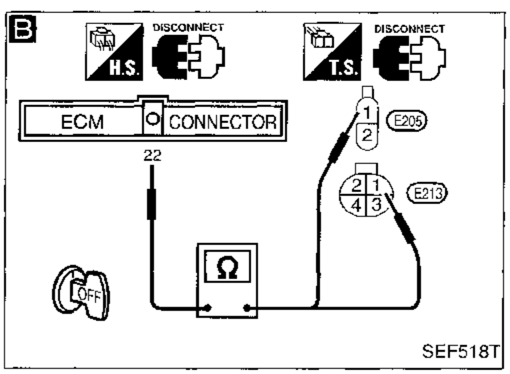
AEC906



AEC907



SEF517T



SEF518T

INSPECTION START

↓

A

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect neutral position switch harness connector.
3. Check harness continuity between terminals ② and body ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M/T models) E203, E7 (A/T models) E211, E6
- Harness for open or short between neutral position switch and body ground

If NG, repair harness or connectors.

↓ OK

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ㉒ and terminals ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors F27, M33, M16, E101
- Harness connectors (M/T models) E7, E203 (A/T models) E6, E211
- Harness for open or short between ECM and neutral position switch

If NG, repair harness or connectors.

↓ OK

CHECK COMPONENTS
(Neutral position switch/inhibitor switch).
Refer to MT section or AT section.

NG → Replace neutral position switch.

↓ OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

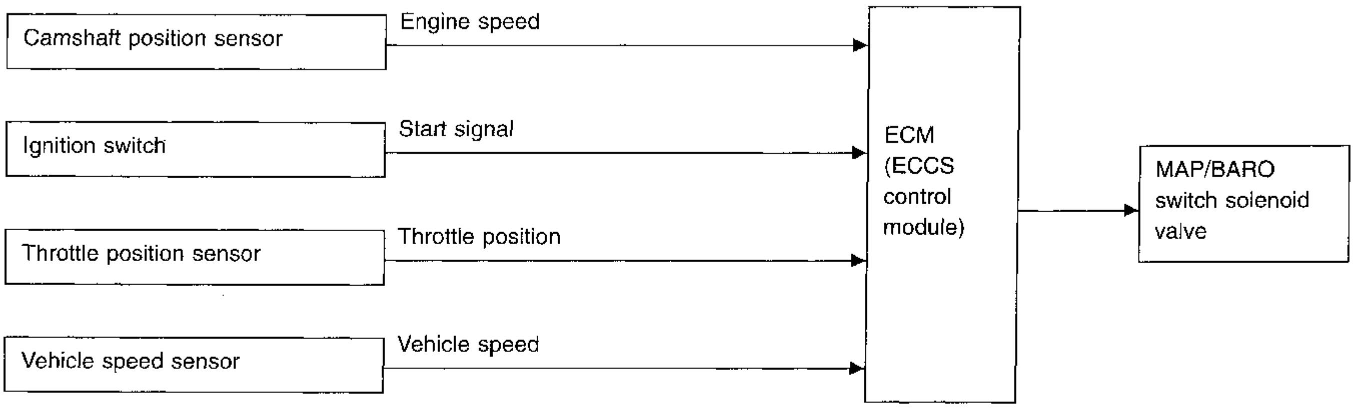
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

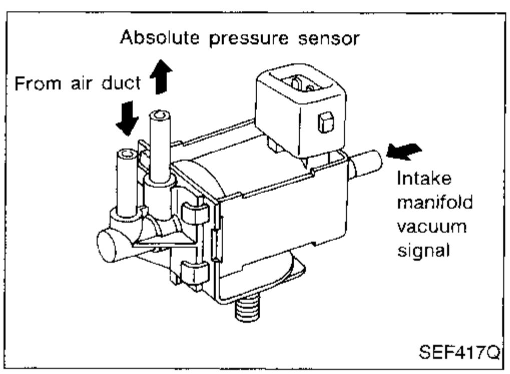
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve

SYSTEM DESCRIPTION



This system allows the absolute pressure sensor to monitor either ambient barometric pressure or intake manifold pressure. The MAP/BARO switch solenoid valve switches between two passages by ON-OFF pulse signals from the ECM. (One passage is from the intake air duct, the other is from the intake manifold.) Either ambient barometric pressure or intake manifold pressure is applied to the absolute pressure sensor.

Solenoid	Conditions
ON	● Immediately after ignition switch is turned on. or ● More than 5 minutes after the solenoid valve shuts OFF. and ● Throttle valve is shut or almost fully shut for more than 5 second and ● Vehicle speed is less than 100 km/h (62 MPH).



COMPONENT DESCRIPTION

The MAP/BARO switch solenoid valve switches its air flow passage according to the voltage signal sent from the ECM. When voltage is supplied from the ECM, the MAP/BARO switch solenoid turns "ON". Then, the absolute pressure sensor can monitor the ambient barometric pressure. When voltage is not supplied from the ECM, the MAP/BARO switch solenoid valve turns "OFF". Then, the sensor monitors intake manifold pressure.

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
MAP/BARO SW/V	Engine is not running	BARO
	Idle (5 seconds after starting engine)	MAP

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
69	GY/R	MAP/BARO switch solenoid valve	[Ignition switch "ON"] └ Engine is not running.	BATTERY VOLTAGE (11 - 14V)
			[Engine is running.] └ Idle speed (5 seconds after starting engine)	Approximately 0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1105 1302	● MAP/BARO switch solenoid valve receives the voltage supplied though ECM does not supply the voltage to the valve. ● There is little difference between MAP/BARO switch solenoid valve input voltage at ambient barometric pressure and voltage at intake manifold pressure.	● Harness or connectors (MAP/BARO switch solenoid valve circuit is open or shorted.) ● Hoses (Hoses are clogged or disconnected.) ● Absolute pressure sensor ● MAP/BARO switch solenoid valve

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
4) Start engine and let it idle.
5) Wait at least 15 seconds.

OR

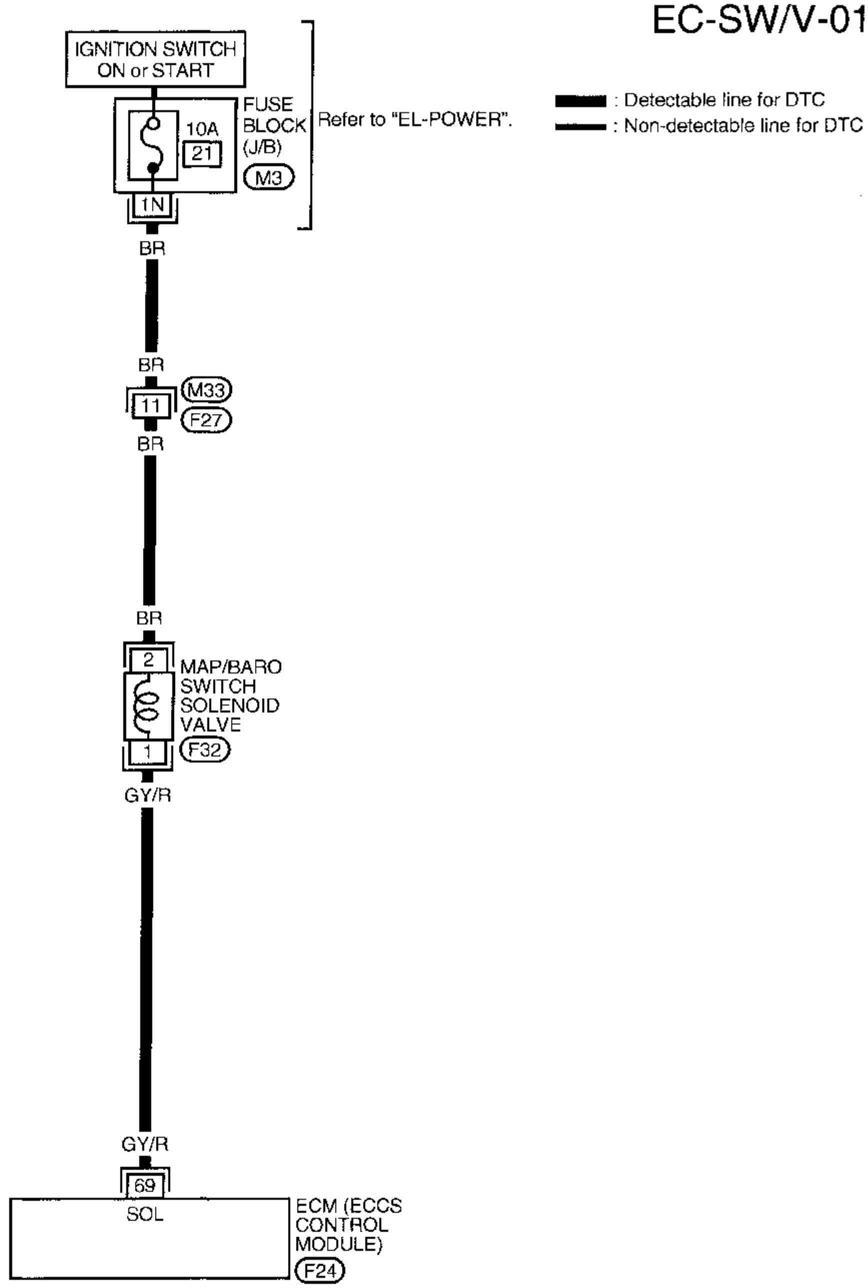
GST
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine and let it idle.
4) Wait at least 15 seconds.
5) Select "MODE 3" with GST.

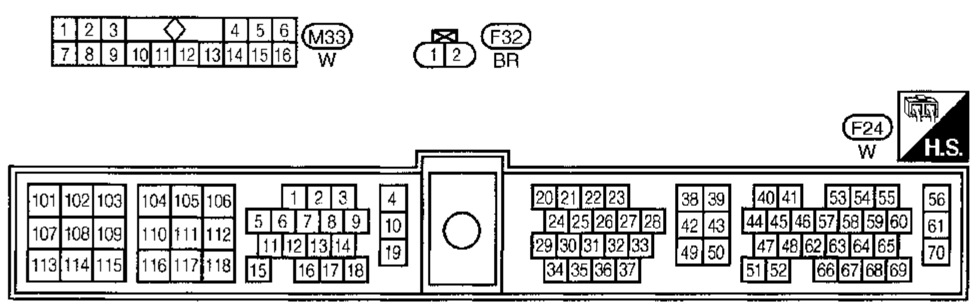
OR

NO TOOLS
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) Wait at least 15 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.

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

EC-SW/V-01



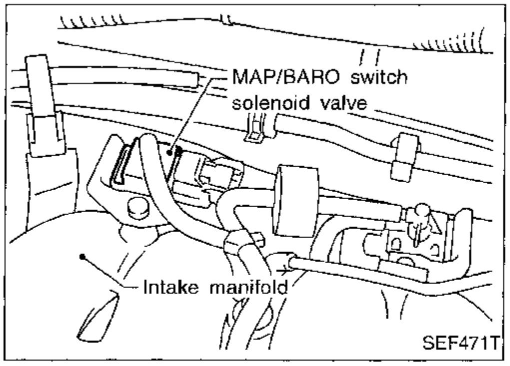


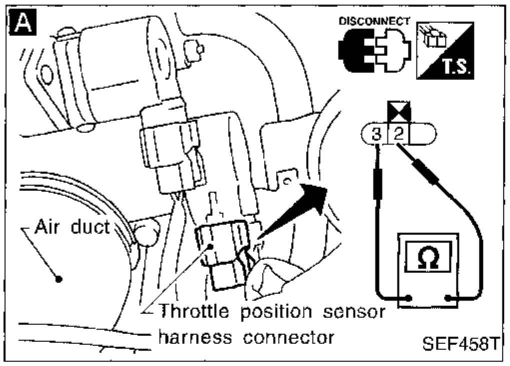
Refer to last page (Foldout page).
M3

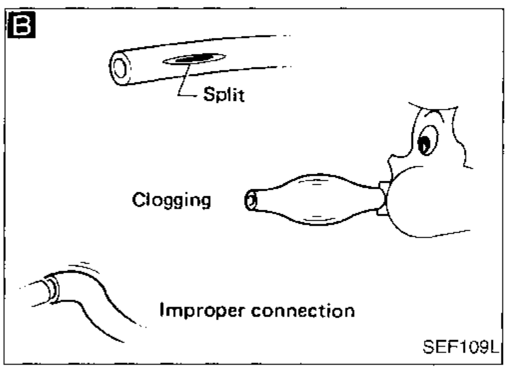
AEC234A

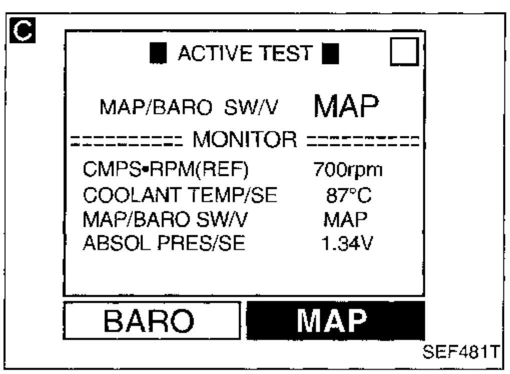
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

↓

A

CHECK VACUUM SOURCE TO MAP/ BARO SWITCH SOLENOID VALVE.
1. Start engine and warm it up sufficiently.
2. Disconnect vacuum hose connected to MAP/BARO switch solenoid valve.
3. Check the vacuum pressure with vacuum gauge at idle speed.
   Vacuum pressure:
   Approx. −66.7 kPa
   (−500 mmHg, −19.69 inHg)

NG → CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connection.
If NG, repair or replace the hose.

↓ OK

CHECK INTAKE SYSTEM.
Check the intake system for air leaks.

OK ↓

B

CHECK HOSE BETWEEN ABSOLUTE PRESSURE SENSOR AND MAP/BARO SWITCH SOLENOID VALVE.
1. Turn ignition switch "OFF".
2. Check hose for clogging, cracks or improper connection.

NG → Repair or reconnect the hose.

OK (without CONSULT) → B (Go to next page.)

OK (with CONSULT) ↓

C

CHECK POWER SUPPLY AND OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "ON".
2) Select "MAP/ BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3) Touch "MAP" and "BARO" alternatively.
4) Check for operating sound.

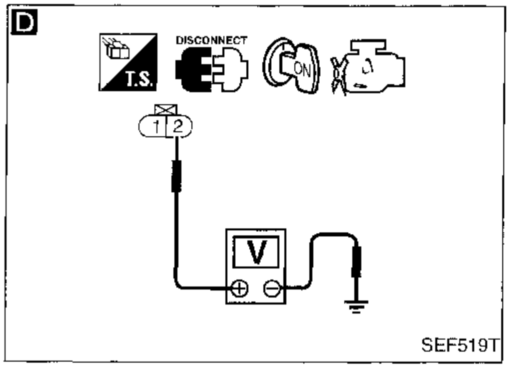
NG → B (Go to next page.)

↓ OK

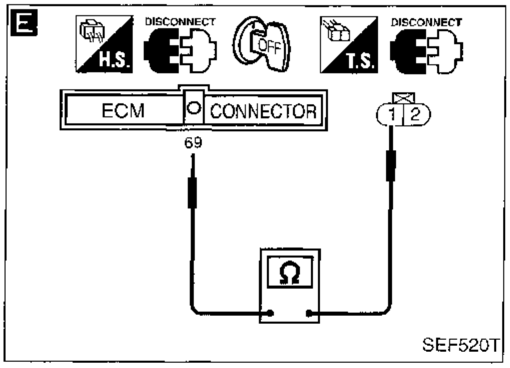
A
(Go to next page.)

Ⓑ
(Go to next page.)

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



SEF519T



SEF520T

(B)

D

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect MAP/BARO switch solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal (2) and engine ground with CONSULT or tester.
   Voltage: Battery voltage
   If OK, check harness for short.

NG → Check the following.
- 10A fuse
- Harness connectors (M33), (F27)
- Harness for open or short between MAP/BARO switch solenoid valve and fuse

OK ↓

E

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (69) and terminal (1) with CONSULT or tester.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓ (A)

CHECK COMPONENT
(Absolute pressure sensor).
Refer to "COMPONENT INSPECTION" of "TROUBLE DIAGNOSIS FOR DTC P0105", EC-348.

NG → Replace absolute pressure sensor.

OK ↓

CHECK COMPONENT
(MAP/BARO switch solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace MAP/BARO switch solenoid valve.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

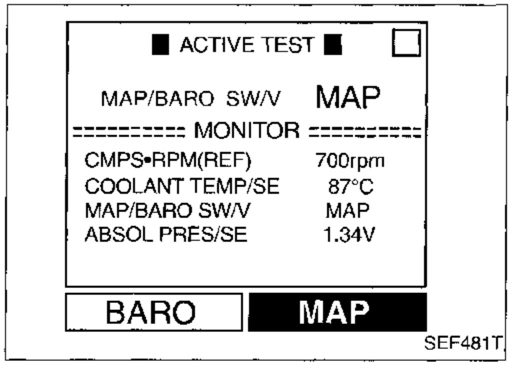
↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX



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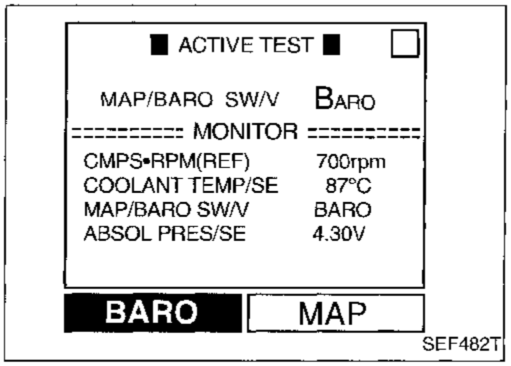
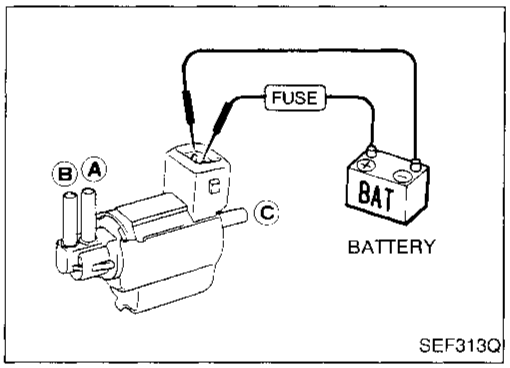


SEF482T



SEF313Q

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

COMPONENT INSPECTION

MAP/BARO switch solenoid valve

1. Start engine and warm it up sufficiently.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
   - When "MAP" is selected, "ABSOL PRES/SE" indicates approximately 1.3V.
   - When "BARO" is selected, "ABSOL PRES/SE" indicates approximately 4.3V.
4. If NG, replace solenoid valve.

OR

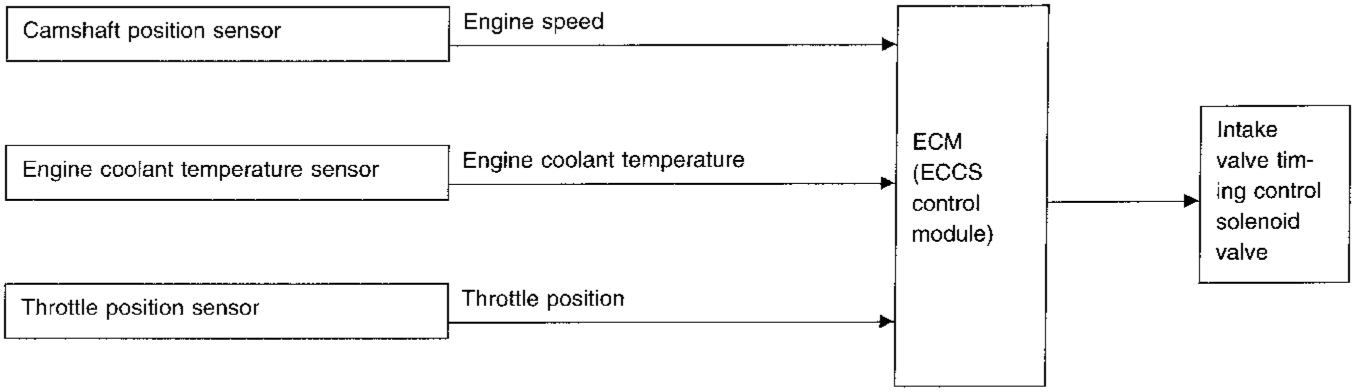
1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals	Yes	No
No supply	No	Yes

3. If NG, replace solenoid valve.

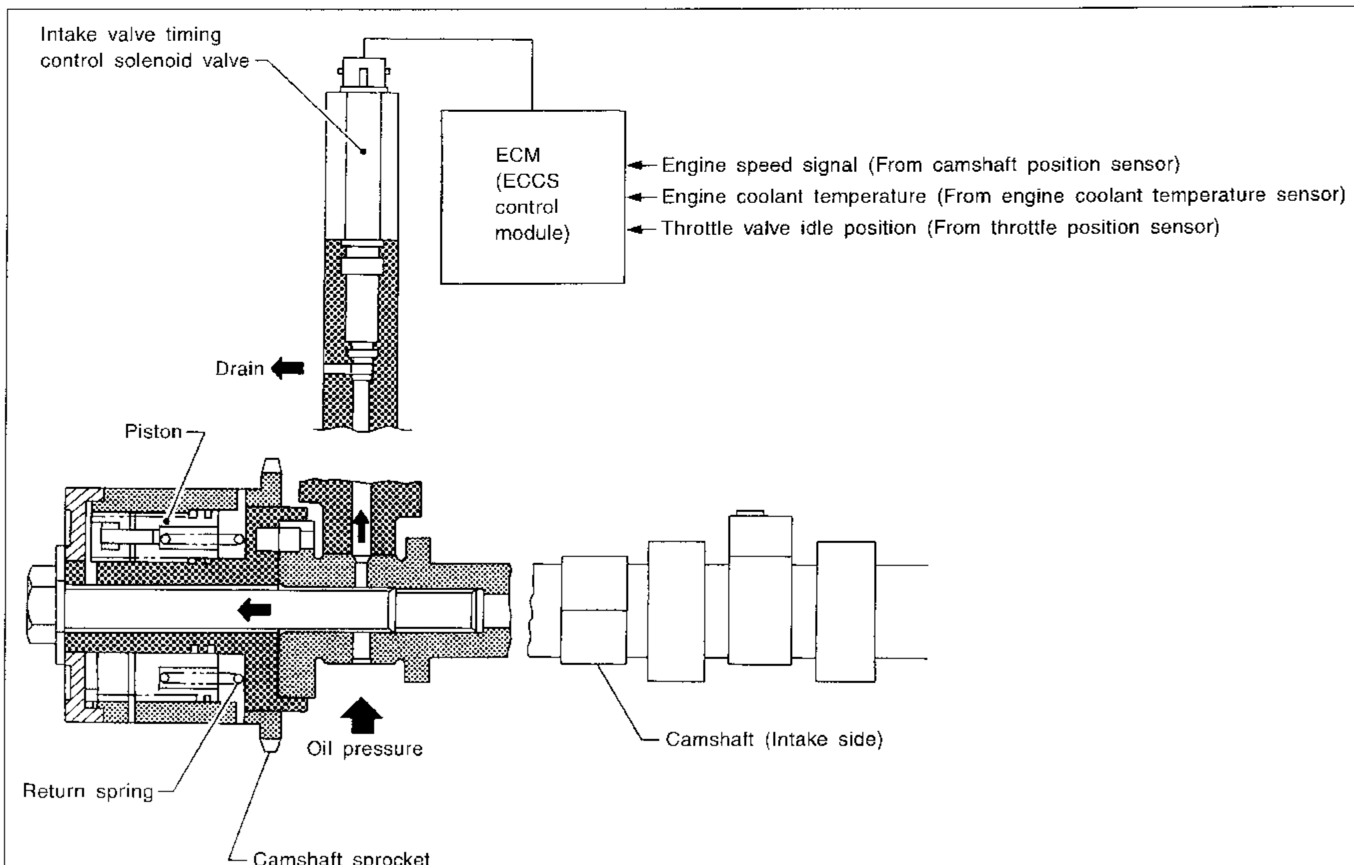
Intake Valve Timing Control

SYSTEM DESCRIPTION



The valve timing control system is utilized to control intake valve opening and closing timing. Engine coolant temperature signals, engine 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.

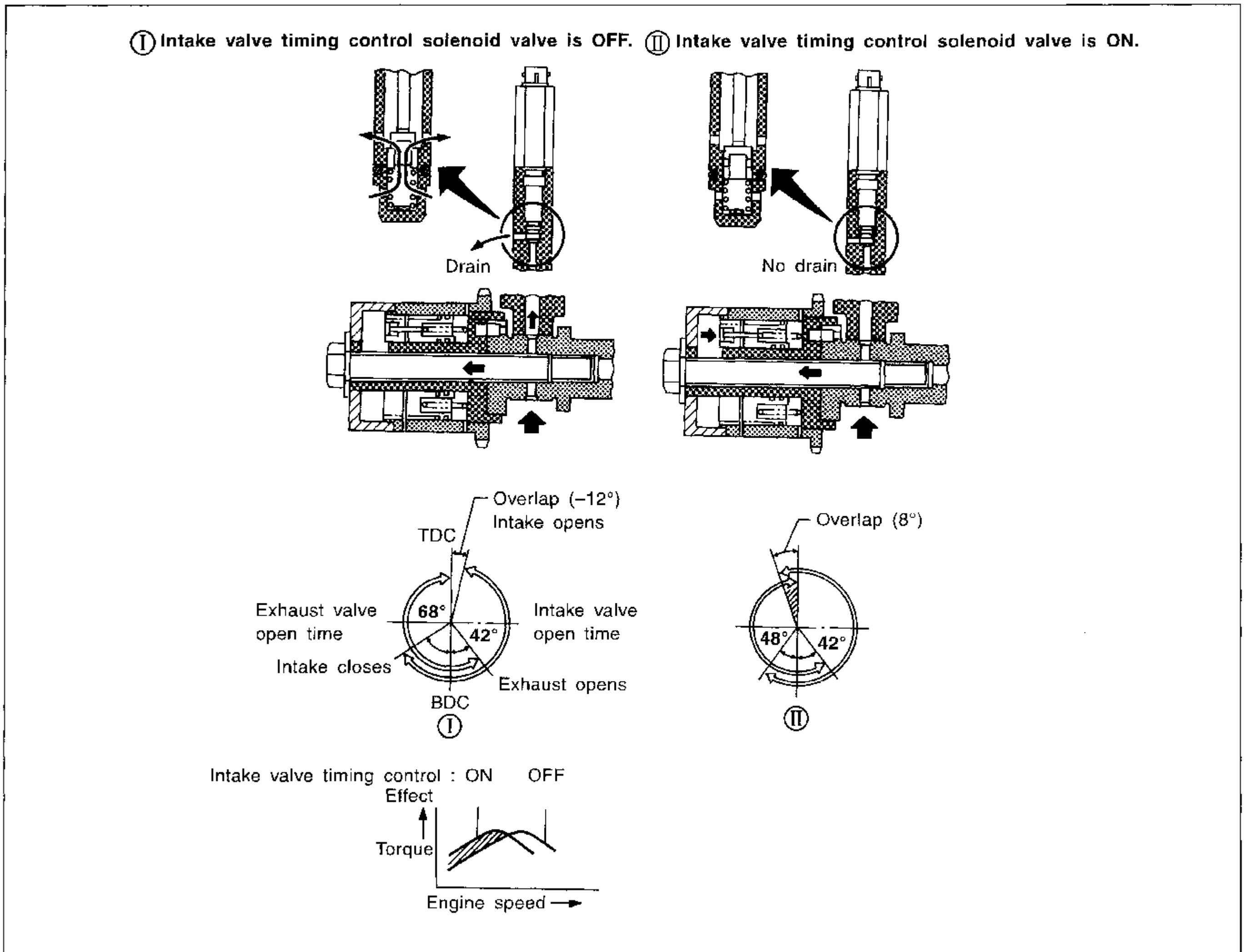
When ECM sends ON signal to intake valve timing control solenoid valve, oil pressure is transmitted to camshaft sprocket. Then, intake side camshaft is advanced.



SEF521T

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 70°C (158°F) or more. • Engine speed is between 1,150 rpm and 5,400 rpm.	ON	Advance	Increased	(II)
• Engine speed is 6,600 rpm or more.				
Those other than above	OFF	Normal	Normal	(I)



SEF522T

Intake Valve Timing Control (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM SOL	• Engine: After warming up	Idle	OFF
		2,000 rpm	ON

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
114	Y/R	Intake valve timing control solenoid valve	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1110 0805	A) An improper voltage signal is entered to ECM through intake valve timing control solenoid valve.	• Harness or connectors (The intake valve timing control solenoid valve circuit is open or shorted.) • Intake valve timing control solenoid valve
	B) The basic injection pulse width does not change when intake valve timing control solenoid valve is activated to ON under the specified conditions.	• Harness or connectors (The intake valve timing control solenoid valve circuit is open.) • Intake valve timing control • Engine oil (The oil is deteriorated.) • Intake air system • Intake valve timing control solenoid valve

DIAGNOSTIC TRUE CODE CONFIRMATION PROCEDURE

Procedure for malfunction A

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

OR

1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select "MODE 3" with GST.

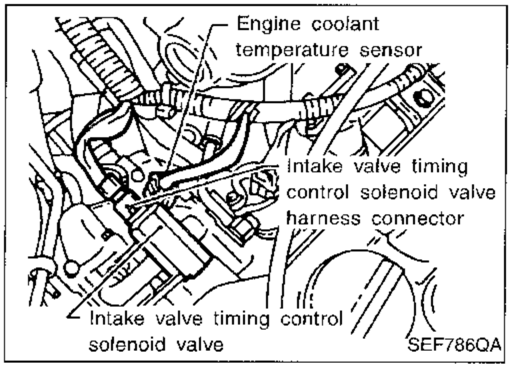
OR

1) Turn ignition switch "ON", wait at least 5 seconds.
2) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

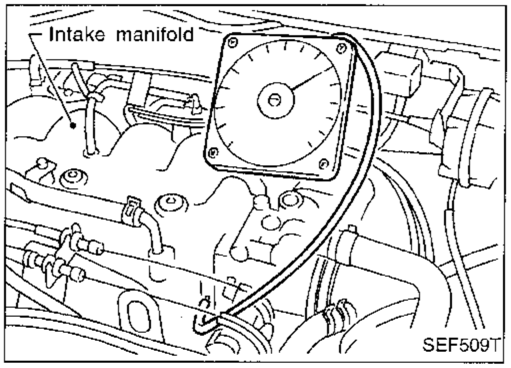
Intake Valve Timing Control (Cont'd)

OVERALL FUNCTION CHECK

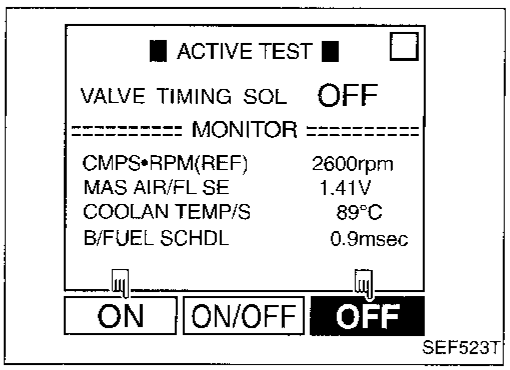
Use this procedure to check the overall function of the VTC. During this check, a DTC might not be confirmed.



SEF786QA



SEF509T



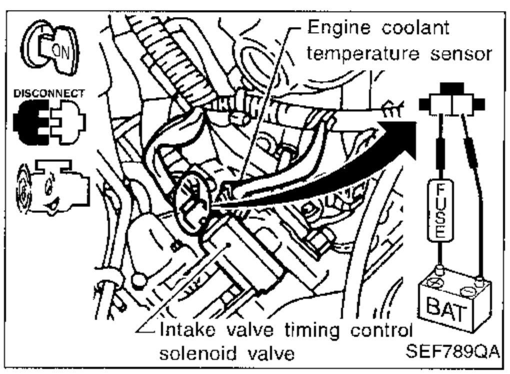
SEF523T

Procedure for malfunction B

1) Disconnect vacuum hose from fuel pressure regulator and then connect the hose to vacuum gauge.
2) Turn ignition switch "ON" and select "VALVE TIMING SOL" in "ACTIVE TEST" mode with CONSULT.
3) Start engine and warm it up sufficiently.
4) Keep engine speed at approximately 3,000 rpm and make sure vacuum gauge indicator becomes stable.
5) Make sure that the difference of vacuum pressure is approximately 1.3 kPa (10 mmHg, 0.39 inHg) when alternating "ON" and "OFF" with CONSULT.

   Reference value
   - VTC "ON":
     Approximately –73.3 kPa (–550 mmHg, –21.65 inHg)
   - VTC "OFF":
     Approximately –72.0 kPa (–540 mmHg, –21.26 inHg)

--- OR ---



SEF789QA

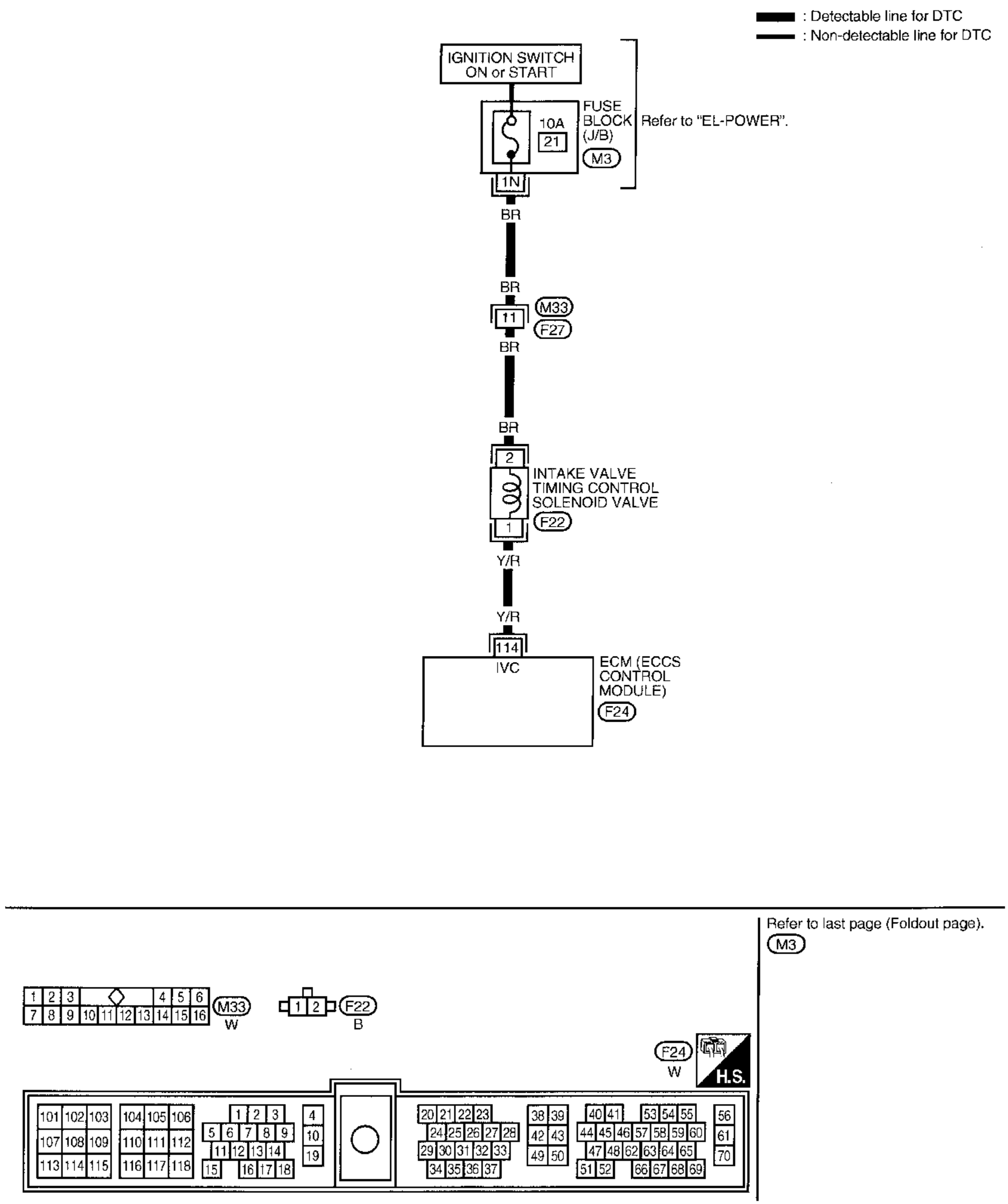
1) Disconnect vacuum hose from fuel pressure regulator and then connect the hose to vacuum gauge.
2) Disconnect VTC solenoid valve harness connector.
3) Start engine and warm it up sufficiently.
4) Keep engine speed at approximately 3,000 rpm and make sure vacuum gauge indicator becomes stable.
5) Make sure that the vacuum pressure changes more than 1.3 kPa (10 mmHg, 0.39 inHg) when supplying the solenoid valve terminals with battery voltage.

   Reference value
   - Battery voltage supplied:
     Approx. –73.3 kPa (–550 mmHg, –21.65 inHg)
   - No battery voltage supplied:
     Approx. –72.0 kPa (–540 mmHg, –21.26 inHg)

Note: DTC 0805 may be stored in ECM during "OVERALL FUNCTION CHECK". Ignore it.

Intake Valve Timing Control (Cont'd)

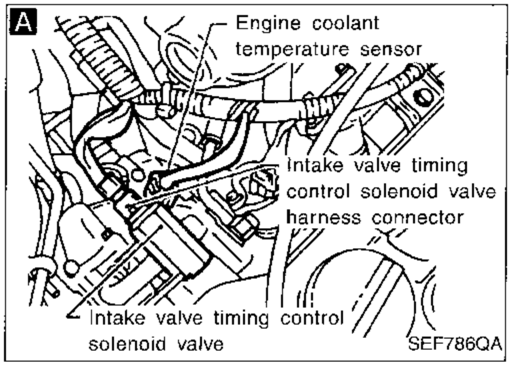
EC-IVC-01

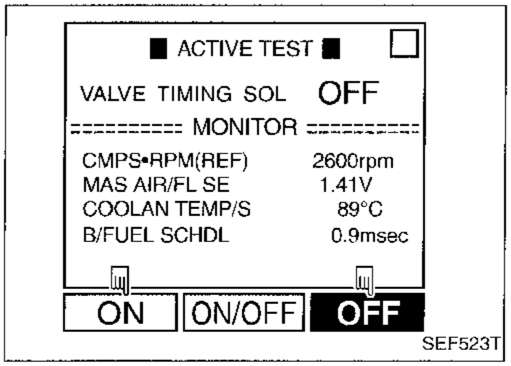


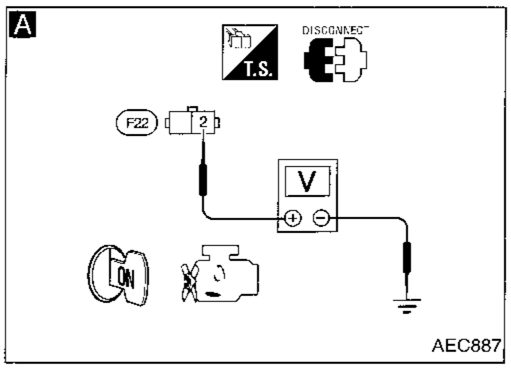
AEC256A

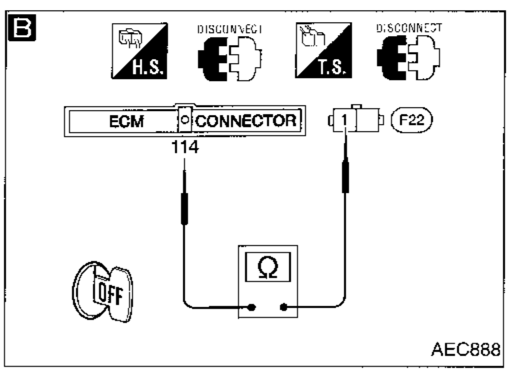
Intake Valve Timing Control (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

↓

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Turn ignition switch "ON".
3. Select "VALVE TIMING SOL" in "ACTIVE TEST" mode with CONSULT.
4. Touch "ON" and "OFF" alternately and check for operating sound.

Operating sound should exist.

OR

1. Stop engine.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and ground.

Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F27), (M33)
- 10A fuse
- Harness for open or short between ECM and fuse (With CONSULT)
- Harness for open or short between the intake valve timing control solenoid valve and fuse (Without CONSULT)

If NG, repair harness or connectors.

OK (without CONSULT) ↓ OK (With CONSULT) → Ⓐ

B

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (114) and solenoid valve terminal ①.
   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 → Check oil passage and oil pump for oil leak. If NG, repair or replace oil passage or oil pump.

↓ OK Ⓐ

CHECK INTAKE AIR SYSTEM.
Check intake air system for leaks.

NG → Repair intake air system.

↓ OK

Ⓑ

(Go to next page.)

Intake Valve Timing Control (Cont'd)

Ⓑ

↓

CHECK COMPONENT
(Intake valve timing control solenoid valve).
Refer to "COMPONENT INSPECTION" below.

NG → Replace intake valve timing control solenoid valve.

↓ OK

Replace intake valve timing control.

↓

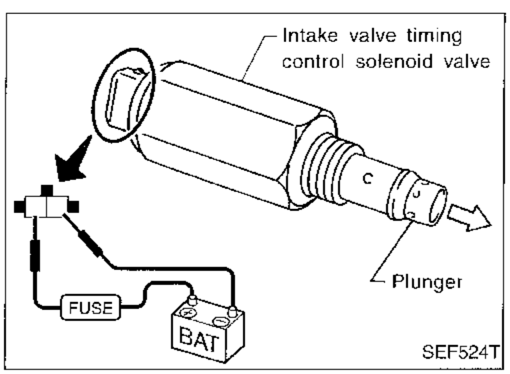
Disconnect and reconnect harness connectors in the circuit, and retest.

↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

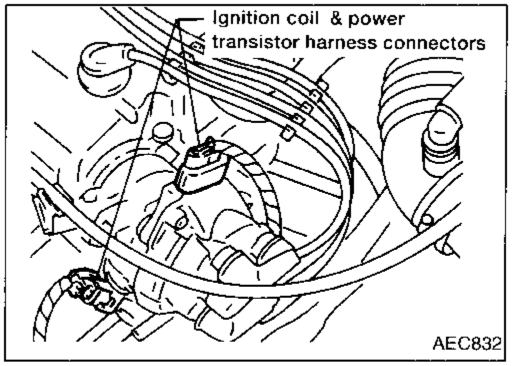
INSPECTION END



COMPONENT INSPECTION

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.



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor (Built into distributor)

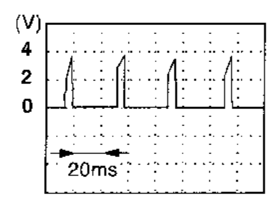
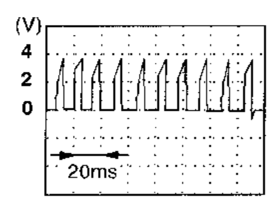
The ignition coil is built into distributor. The ignition signal from the ECM is sent to the power transistor. The power transistor switches on and off the ignition coil primary circuit. As the primary circuit is turned on and off, the proper high voltage is induced in the coil secondary circuit.
The distributor is not repairable and must be replaced as an assembly except distributor cap.

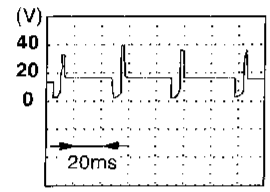
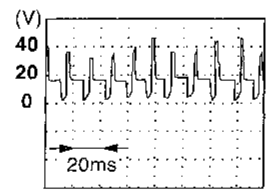
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
IGN TIMING	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	0 - 10° BTDC
		2,000 rpm	More than 25° BTDC

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and 43 (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
1	W/B	Ignition signal	Engine is running. (Warm-up condition) └ Idle speed	0.2 - 0.6V  SEF186T
			Engine is running. └ Engine speed is 2,000 rpm	0.7 - 0.9V  SEF187T

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
2	W	Ignition check	Engine is running. (Warm-up condition) └ Idle speed	Approximately 13V  SEF188T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 13V  SEF189T

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1320 0201	● The ignition signal in the primary circuit is not sent to ECM during engine cranking or running.	● Harness or connectors (The ignition primary circuit is open or shorted.) ● Power transistor unit. ● Resistor ● Camshaft position sensor ● Camshaft position sensor circuit

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC P0340 (0101) and P1320 (0201) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340 first. Refer to EC-418.

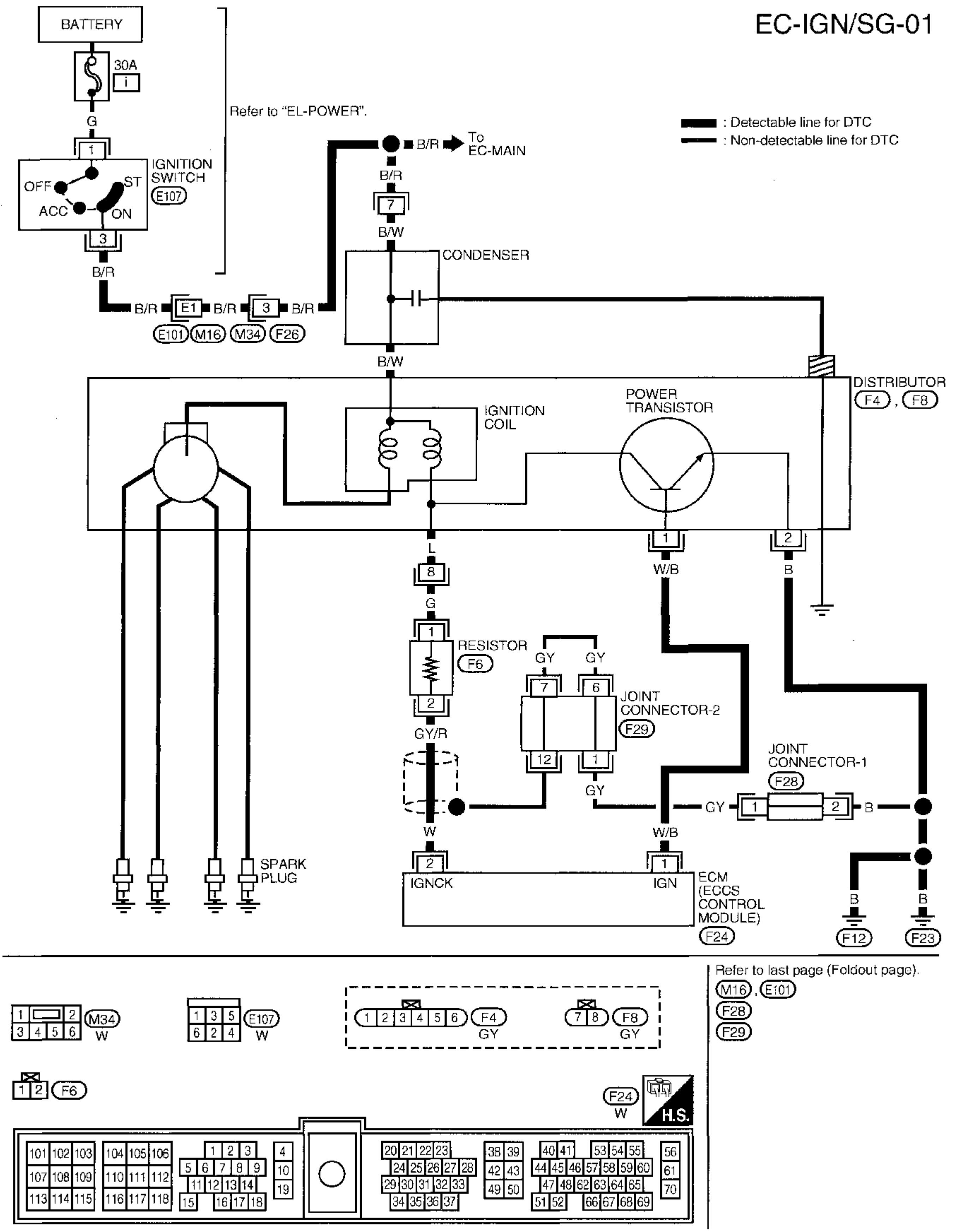
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)

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" at least 5 seconds.)
3) Select MODE 3 with GST.

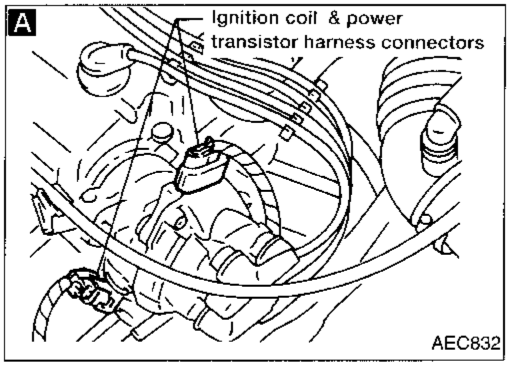
OR

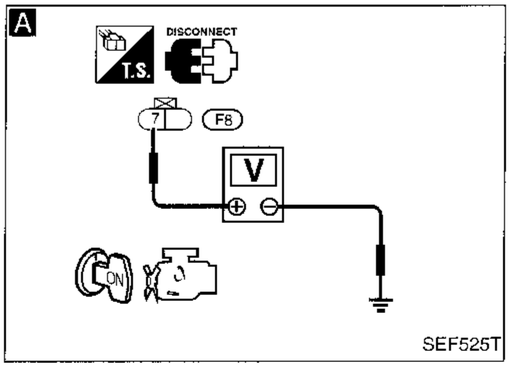
1) Turn ignition switch "ON".
2) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)
3) Turn ignition switch "OFF" and wait at least 5 seconds, and then turn "ON".
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

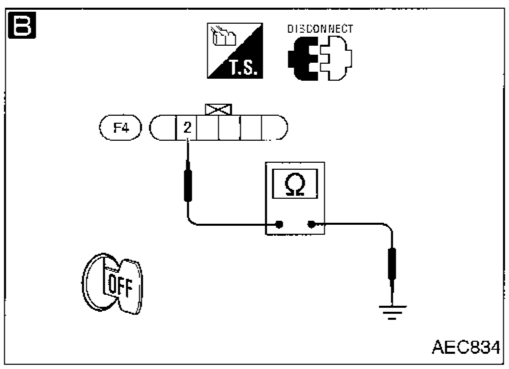

EC-IGN/SG-01
BATTERY
30A
Refer to "EL-POWER".
IGNITION SWITCH
E107
OFF
ACC
ST
ON
B/R
To EC-MAIN
: Detectable line for DTC
: Non-detectable line for DTC
B/W
CONDENSER
E101
M16
M34
F26
DISTRIBUTOR
F4
F8
IGNITION COIL
POWER TRANSISTOR
W/B
RESISTOR
F6
GY
GY/R
JOINT CONNECTOR-2
F29
JOINT CONNECTOR-1
F28
SPARK PLUG
IGNCK
IGN
ECM (ECCS CONTROL MODULE)
F24
F12
F23
Refer to last page (Foldout page).
M16, E101
F28
F29
H.S.
AEC257A

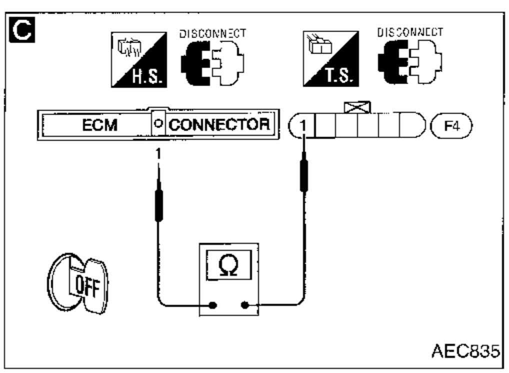
Ignition Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

↓

Turn ignition switch "OFF", and restart engine.
Is engine running?

- Yes → Ⓐ (Go to next page.)
- No ↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect ignition coil harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ⑦ and ground with CONSULT or tester.
   Voltage: Battery voltage

- NG → Check the following.
  - Harness connectors E101, M16
  - Harness connectors M34, F26
  - Harness for open or short between ignition coil and ignition switch

  If NG, repair harness or connectors.
- OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect power transistor harness connector.
3. Check harness continuity between terminal ② and engine ground.
   Continuity should exist.
   If OK, check harness for short.

- NG → Repair harness or connectors.
- OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ① and power transistor terminal ①.
   Continuity should exist.
   If OK, check harness for short.

- NG → Repair harness or connectors.
- OK ↓

CHECK COMPONENTS
(Ignition coil, power transistor).
Refer to "COMPONENT INSPECTION", EC-503.

- NG → Replace malfunctioning component(s).
- OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

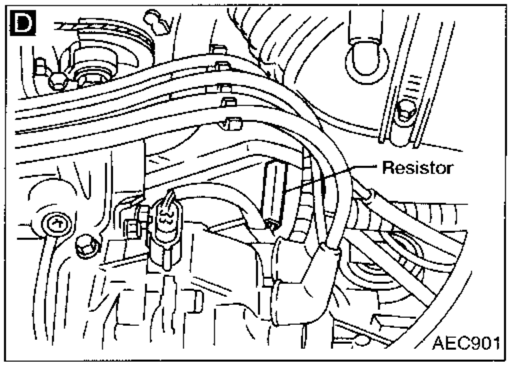
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

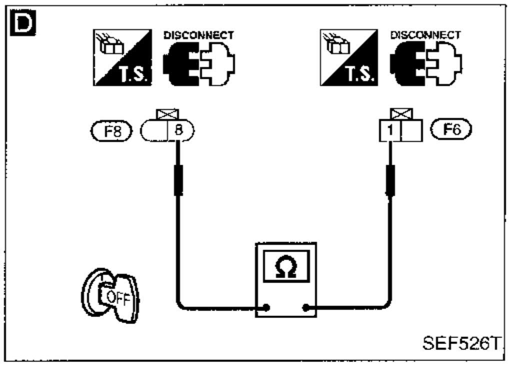
INSPECTION END

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

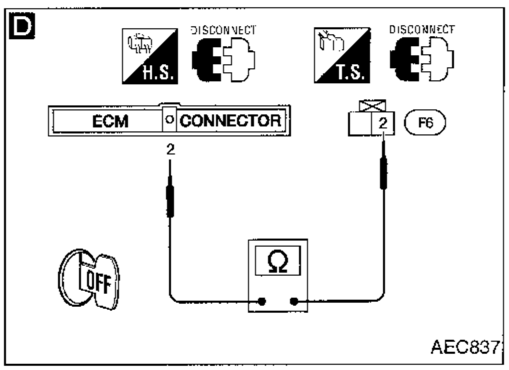
Ignition Signal (Cont'd)



AEC901



SEF526T



AEC837

Ⓐ

D

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ignition coil harness connector.
3. Strip tape covering resistor and disconnect the connector.
4. Disconnect ECM harness connector.
5. Check harness continuity between ignition coil terminal ⑧ and resistor terminal ①, resistor terminal ② and ECM terminal ②.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENTS
(Resistor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace resistor.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

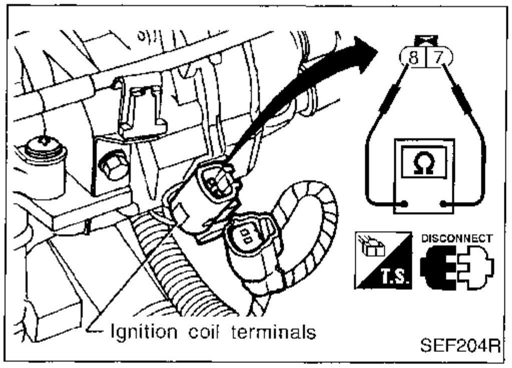
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Ignition Signal (Cont'd)

COMPONENT INSPECTION



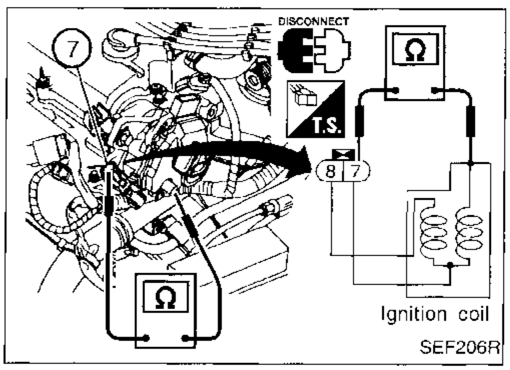
SEF204R

Ignition coil

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

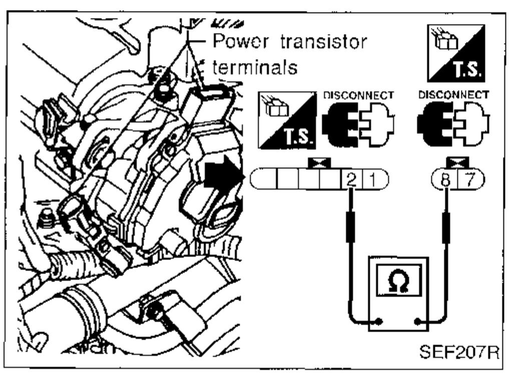
Terminal	Resistance [at 25°C (77°F)]
⑦ - ⑧ (Primary coil)	Approximately 1 Ω
⑦ - secondary terminal on distributor head (Secondary coil)	Approximately 10 kΩ

If NG, replace ignition coil.



SEF206R

3. For checking secondary coil, remove distributor cap.
4. Check resistance between ignition coil harness connector terminal ⑦ and the secondary terminal on the distributor head.
   If NG, replace distributor.



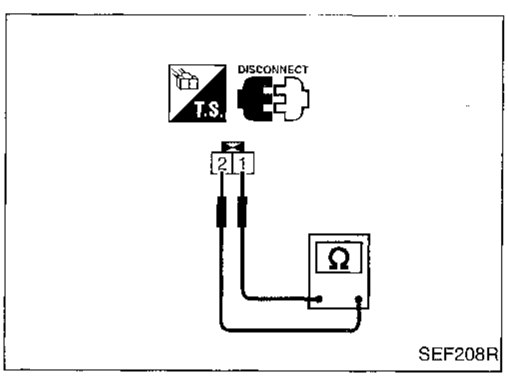
SEF207R

Power transistor

1. Disconnect power transistor harness connector.
2. Check power transistor resistance between terminals ② and ⑧.

Terminals	Resistance	Result
② and ⑧	Except 0Ω	OK
	0Ω	NG

If NG, replace distributor.



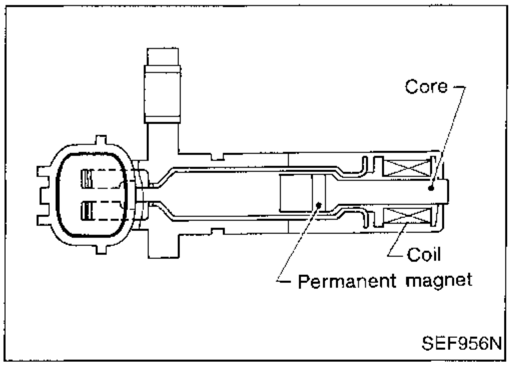
SEF208R

Resistor

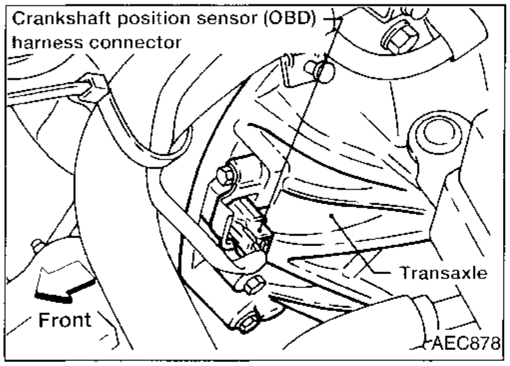
1. Disconnect resistor harness connector.
2. Check resistance between terminals ① and ②.
   Resistance: Approximately 2.2 kΩ [at 25°C (77°F)]
   If NG, replace resistor.

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

Crankshaft Position Sensor (CKPS) (OBD) (COG)



SEF956N

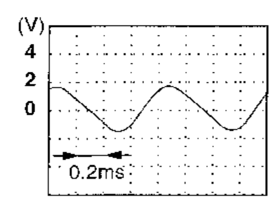
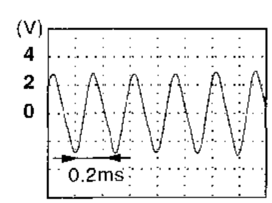


AEC878

The crankshaft position sensor (OBD) is located on the transmission housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
This sensor is not used to control the engine system.
It is used only for the on-board diagnosis of misfire.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50	B	Sensor's ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V
53	W	Crankshaft position sensor (OBD)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.03V  SEF202T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.03V  SEF203T

Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1336 0905	• A chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM.	• Harness or connectors • Crankshaft position sensor (OBD) • Flywheel (Drive plate) • Dead (Weak) battery

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 at least 4 minutes at idle speed.

OR

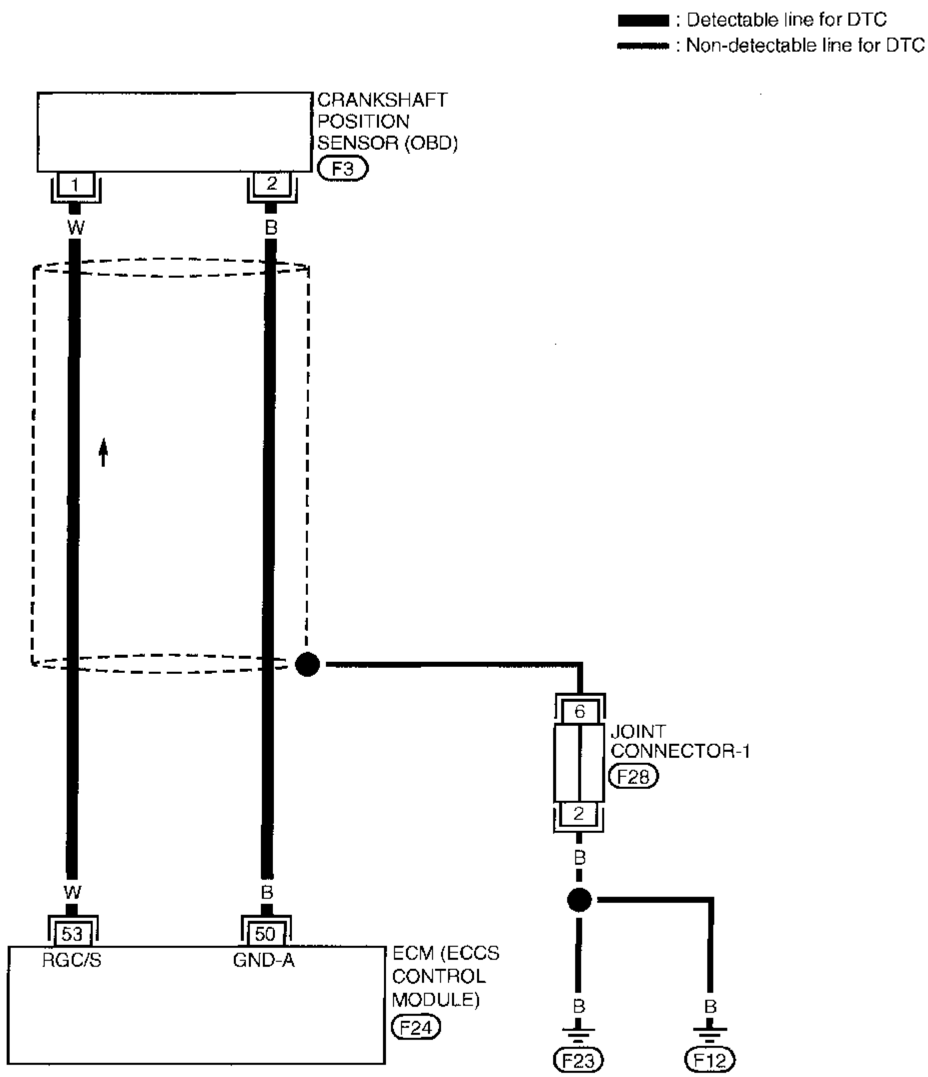
1) Start engine and run it at least 4 minutes at idle speed.
2) Select "MODE 3" with GST.

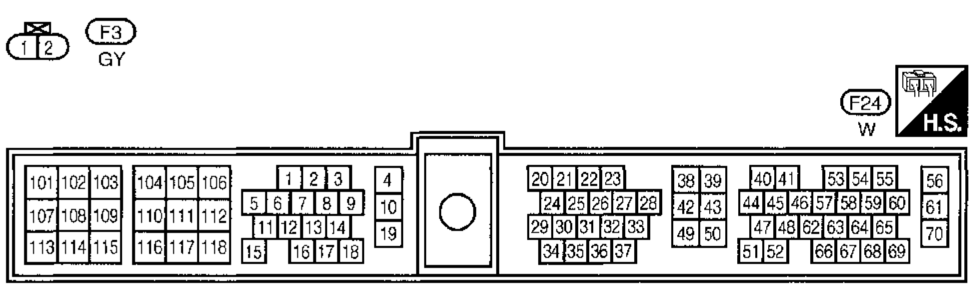
OR

NO TOOLS

1) Start engine and run it at least 4 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.

EC-CKPS-01

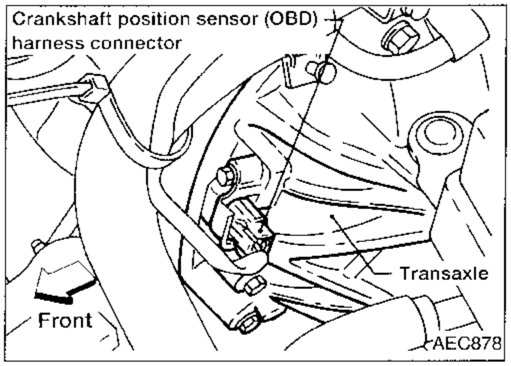




Refer to last page (Foldout page).
F28

AEC250A

Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)



DIAGNOSTIC PROCEDURE

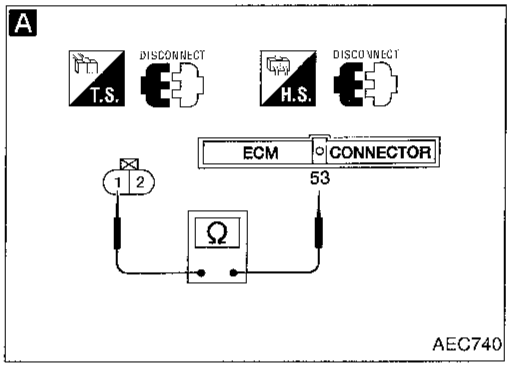
INSPECTION START

↓

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect crankshaft position sensor (OBD) harness connector and ECM connector.
3. Check continuity between sensor terminal ① and ECM terminal ⑸③ with CONSULT or tester.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.



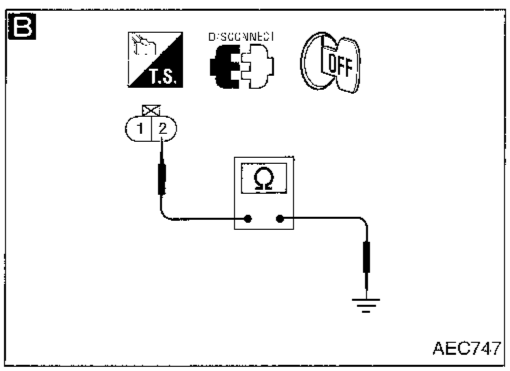
↓ OK

B

CHECK GROUND CIRCUIT.
1. Connect ECM harness connector.
2. Check harness continuity between terminal ② and engine ground.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness for open or short between ECM and crankshaft position sensor (OBD) harness connector

If NG, repair harness or connectors.



↓ OK

Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD). Then retest.

↓ Trouble is not fixed.

CHECK COMPONENT
[Crankshaft position sensor (OBD)].
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace crankshaft position sensor (OBD).

↓ OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓ Trouble is not fixed.

Visually check for chipping flywheel or drive plate ring gear tooth (cog).

NG → Replace the flywheel or drive plate.

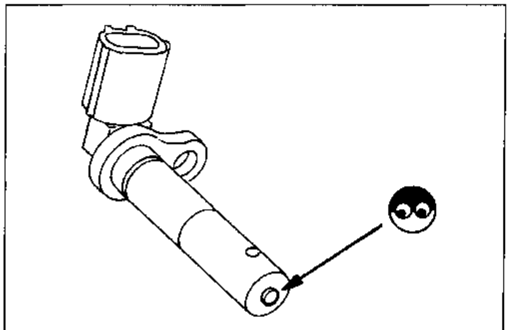
↓ OK

INSPECTION END

Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)

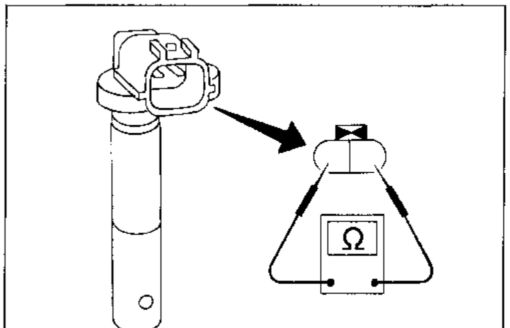
COMPONENT INSPECTION

Crankshaft position sensor (OBD)



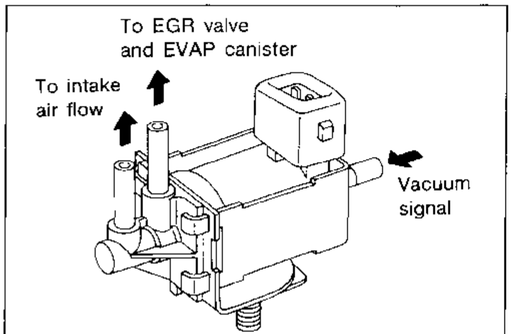
SEF960N

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



SEF151P

5. Check resistance as shown in the figure.
   Resistance:
   M/T models
   432 - 528Ω [at 25°C (77°F)]
   A/T models
   166.5 - 203.5Ω [at 25°C (77°F)]



SEF240PE

EGRC-Solenoid Valve

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to cut the vacuum signal from the throttle body to the EGR valve.
When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
EGRC SOL/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load ● M/T models: Jack up drive wheels and shift to 1st gear position	Idle	ON
		A/T models: 2,000 rpm M/T models: 2,000 rpm and more than 16 km/h (10 mph)	OFF

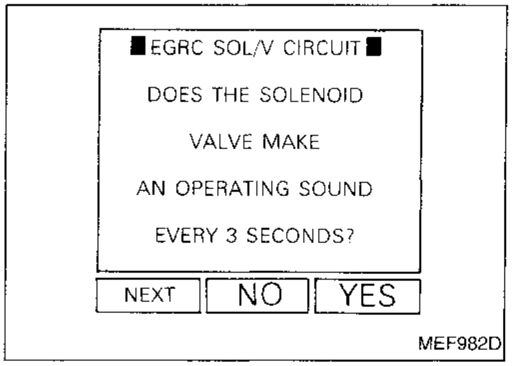
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

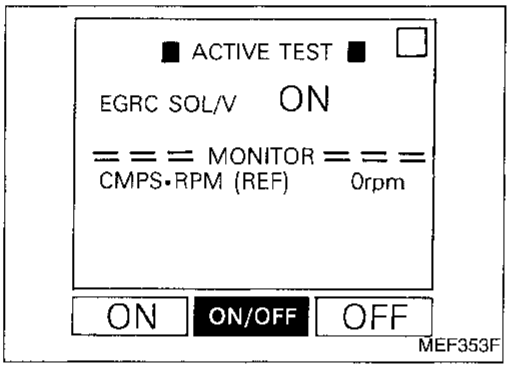
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
103	P	EGRC-solenoid valve	Engine is running. (Warm-up condition) — M/T models: Jack up front wheels and drive wheels at 16 km/h (10 MPH) — Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) — Idle speed	Approximately 0V

ON BOARD DIAGNOSIS LOGIC

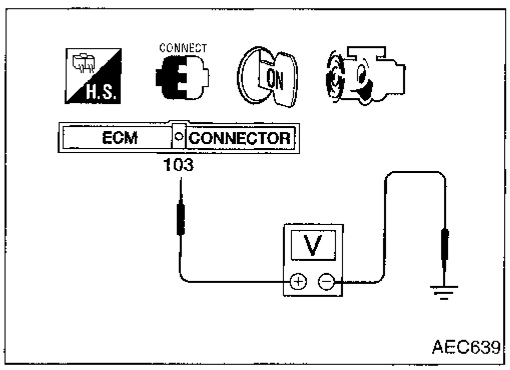
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1400 1005	● An improper voltage signal is sent to ECM through EGRC-solenoid valve.	● Harness or connectors (The EGRC-solenoid valve circuit is open or shorted.) ● EGRC-solenoid valve



MEF982D



MEF353F



AEC639

EGRC-Solenoid Valve (Cont'd)

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGRC-solenoid valve circuit. During this check, a DTC might not be confirmed.

1) Turn ignition switch "ON".
2) Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

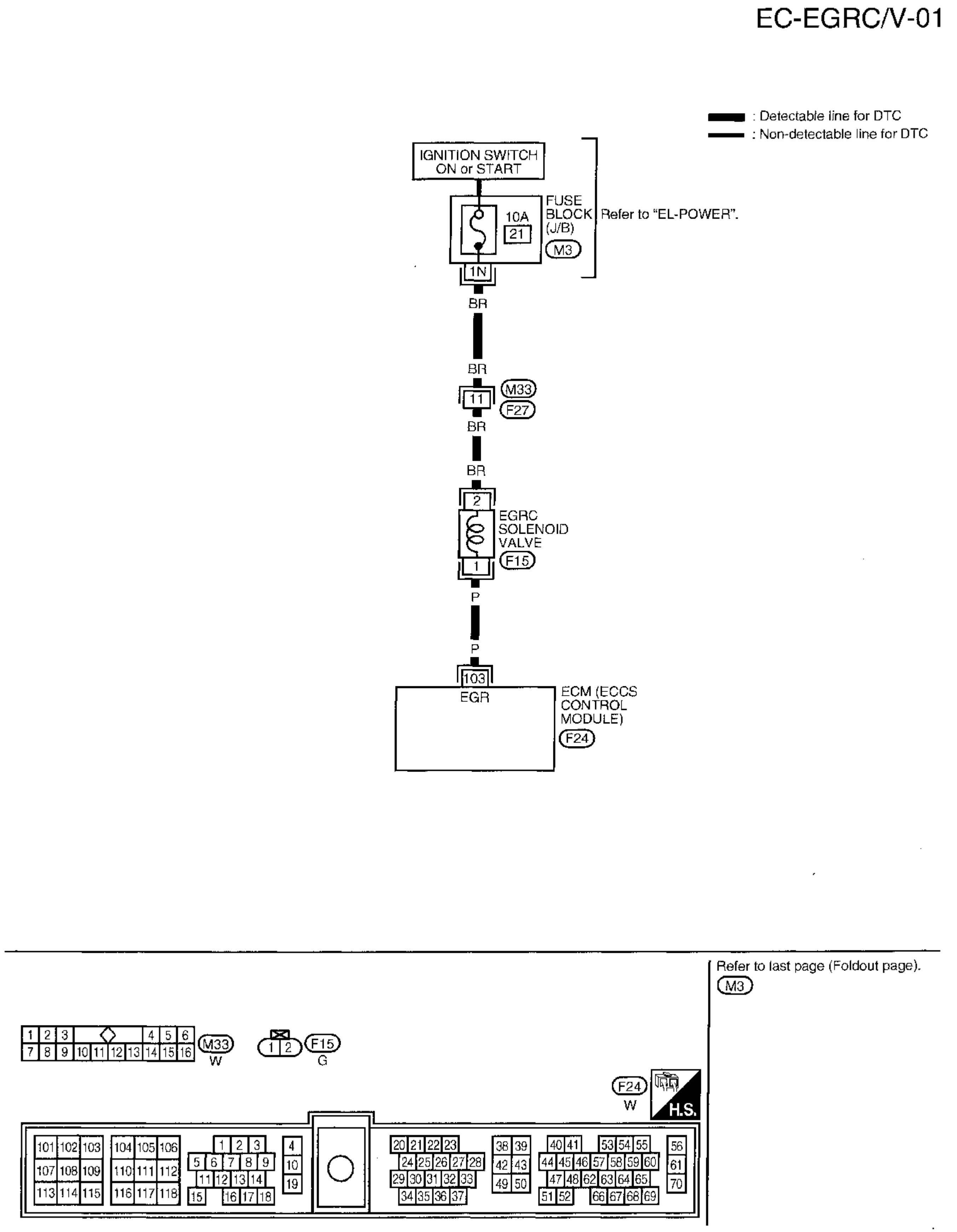
1) Turn ignition switch "ON".
2) Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and check the operating sound, according to ON/OFF switching.

OR

NO TOOLS

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) For M/T models, jack up front wheels.
   Start engine again.
4) Check the voltage between ECM terminal 103 and ground at idle speed.
   Voltage: 0.04 - 0.08V
5) For M/T models, shift into 1st gear.
   Check that the voltage changes to battery voltage and returns to 0.04 - 0.08V when the engine speed increases to about 2,500 rpm.

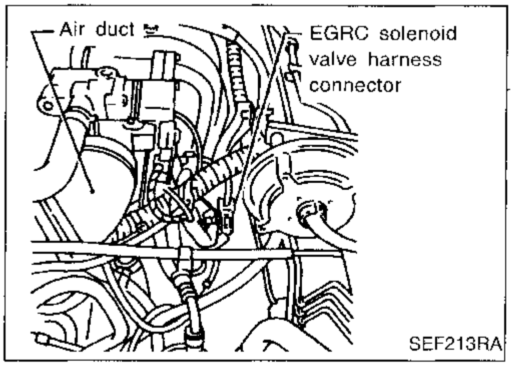
EGRC-Solenoid Valve (Cont'd)

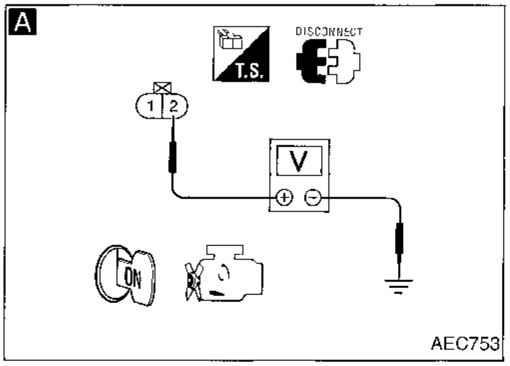


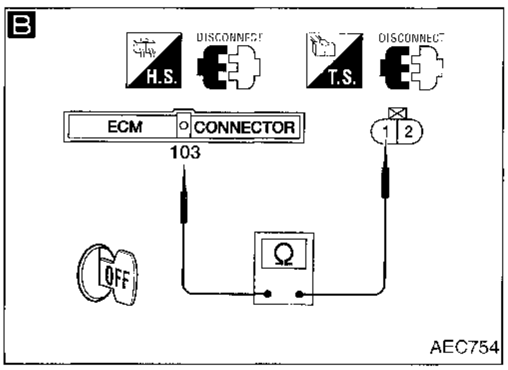
AEC258A

EGRC-Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

A

CHECK POWER SUPPLY.
1. Disconnect EGRC-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 M33, F27
- 10A fuse
- Harness continuity between EGRC-solenoid valve sub-harness connector and fuse

If NG, repair harness or connectors.

OK ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (103) and terminal ①.

Continuity should exist.

If OK, check harness for short.

NG → Check the following.
- Harness continuity between EGRC-solenoid valve sub-harness connector and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (EGRC-solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGRC-solenoid valve.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

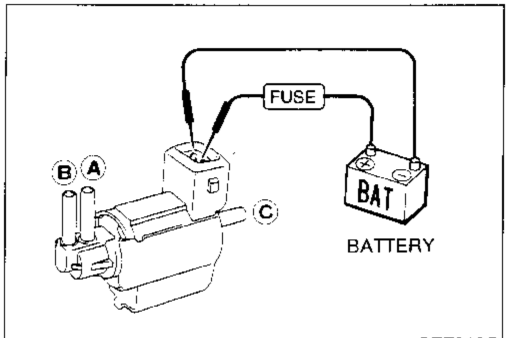
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

EGRC-Solenoid Valve (Cont'd)

COMPONENT INSPECTION



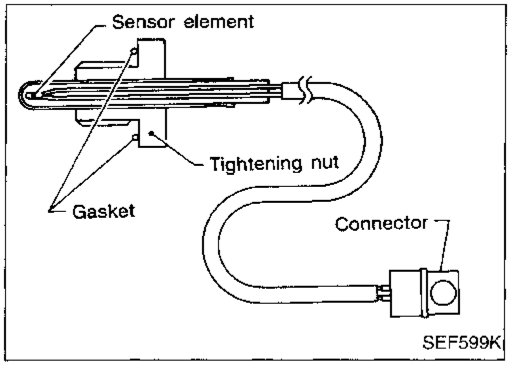
SEF313Q

EGRC-solenoid valve

Check air passage continuity.

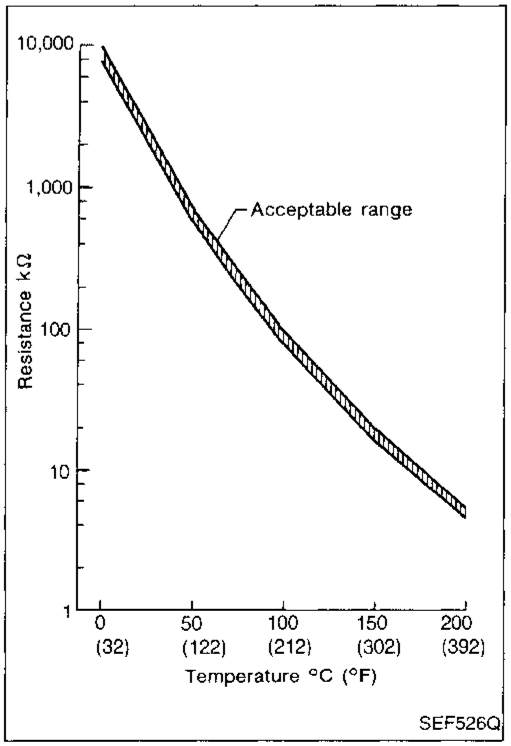
Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.



EGR Temperature Sensor

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.



⟨Reference data⟩

EGR temperature °C (°F)	Voltage* (V)	Resistance (MΩ)
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

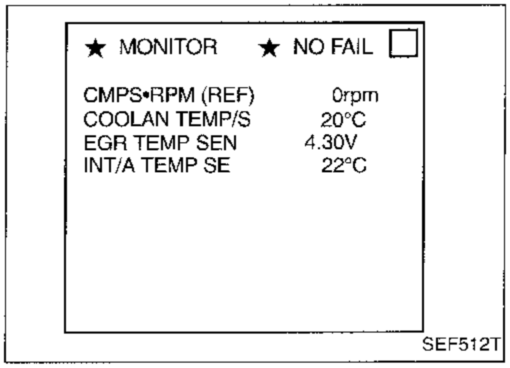
*: These data are reference values and are measured between ECM terminal 62 (EGR temperature sensor) and ECM terminal 43 (ECCS ground).

When EGR system is operating
Voltage: 0 - 1.5V

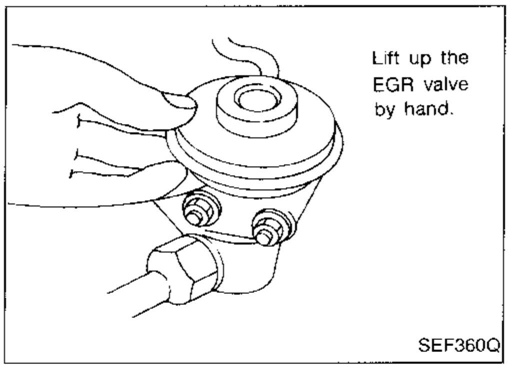
ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1401 0305	A) An excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low.	• Harness or connectors (The EGR temperature sensor circuit is shorted.) • EGR temperature sensor • Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve
	B) An excessively high voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is high.	• Harness or connectors (The EGR temperature sensor circuit is open.) • EGR temperature sensor • Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve

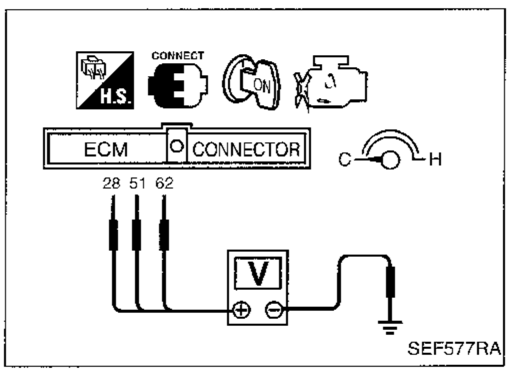
EGR Temperature Sensor (Cont'd)



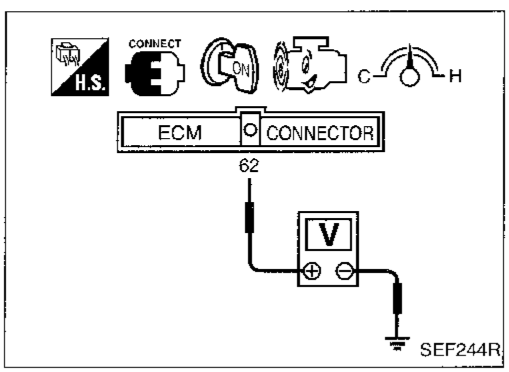
SEF512T



SEF360Q



SEF577RA



SEF244R

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGR temperature sensor. During this check, a 1st trip DTC might not be confirmed.

Procedure for malfunction A and B

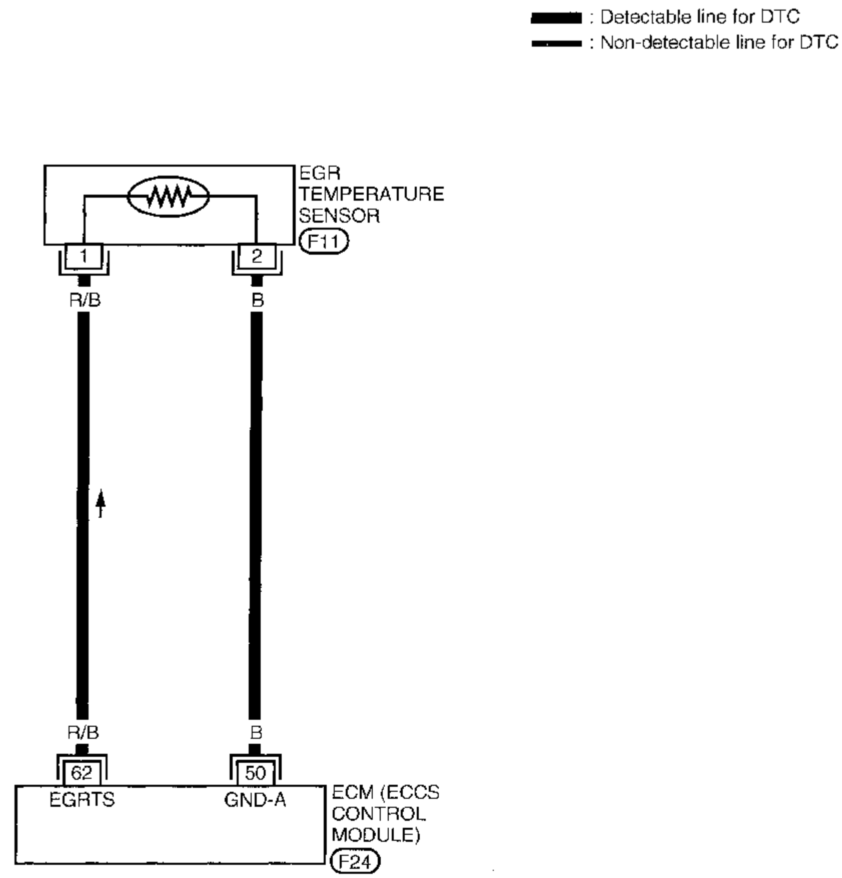
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Confirm that engine coolant temperature and intake air temperature are lower than 40°C (104°F). (If necessary, wait until the temperatures equal atmospheric temperature.)
3) Confirm that "EGR TEMP SEN" reading is between 3.45V and 5.0V.
4) Start engine and warm it up sufficiently.
5) Run engine at idle for at least 2 minutes.
6) Confirm that EGR valve is not lifting. If NG, go to TROUBLE DIAGNOSES FOR DTC P0400 and P0402. (See pages EC-424 and 432.)
7) Read "EGR TEMP SEN" at about 2,500 rpm with EGR valve lifted up to the full position by hand.
   Voltage should decrease to less than 1.0V.
8) If step 7 is OK, perform TROUBLE DIAGNOSES FOR DTC P0400, P0402 and P1400. (See pages EC-424, 432 and 509.)

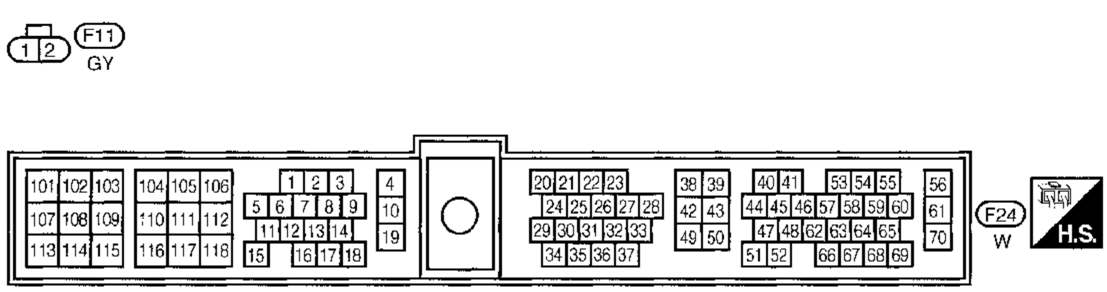
OR

1) Turn ignition switch "ON".
2) Confirm that voltage between ECM terminals 51, 28 and ground are more than 2.72V. (If necessary, wait until engine coolant temperature and intake air temperature equal atmospheric temperature.)
3) Confirm that voltage between ECM terminal 62 and ground is between 3.45V and 5.0V.
4) Start engine and warm it up sufficiently.
5) Run engine at idle for at least 2 minutes.
6) Confirm that EGR valve is not lifting. If NG, go to TROUBLE DIAGNOSES FOR DTC 0302 (P0400) and P0402. (See pages EC-424 and 432.)
7) Check voltage between ECM terminal 62 and ground at about 2,500 rpm with EGR valve lifted up to the full position by hand.
   Voltage should decrease to less than 1.0V.
8) If step 7 is OK, perform TROUBLE DIAGNOSES FOR DTC P0400, P0402 and P1400. (See pages EC-424, 432 and 509.)

EGR Temperature Sensor (Cont'd)

EC-EGR/TS-01

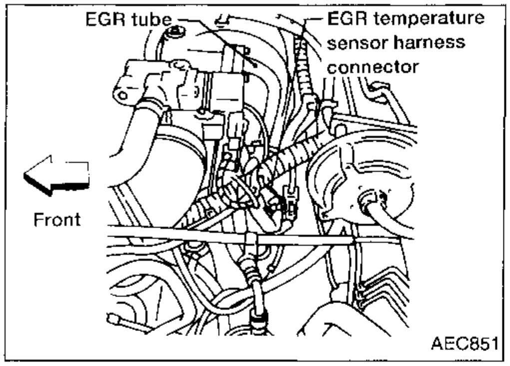


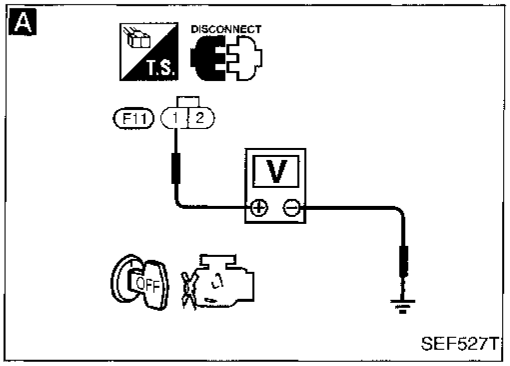


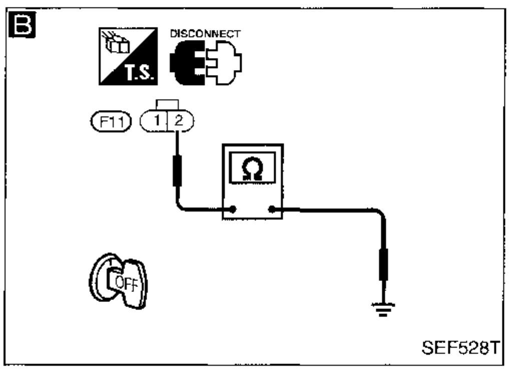
AEC259A

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 for open or short between ECM and EGR temperature sensor harness connector

If NG, repair harness or connector.

↓ OK

CHECK COMPONENT (EGR temperature sensor).
Refer to "COMPONENT INSPECTION" below.

NG → Replace EGR temperature sensor.

↓ OK

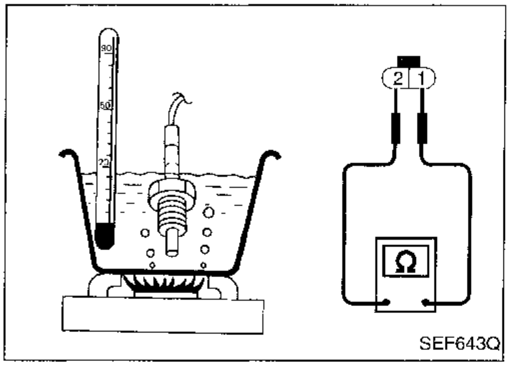
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

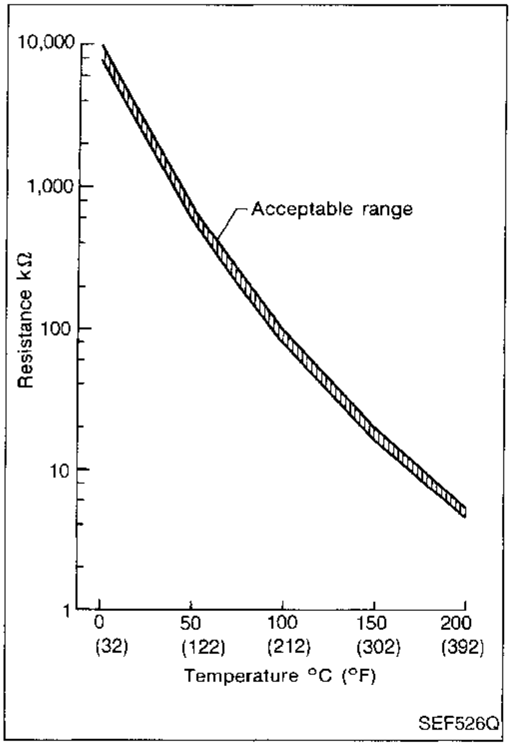
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END



SEF643Q



SEF526Q

EGR Temperature Sensor (Cont'd)

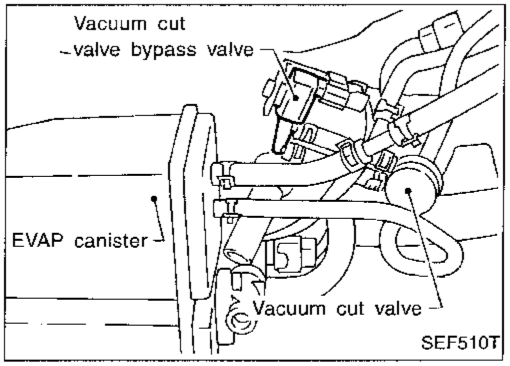
COMPONENT INSPECTION

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

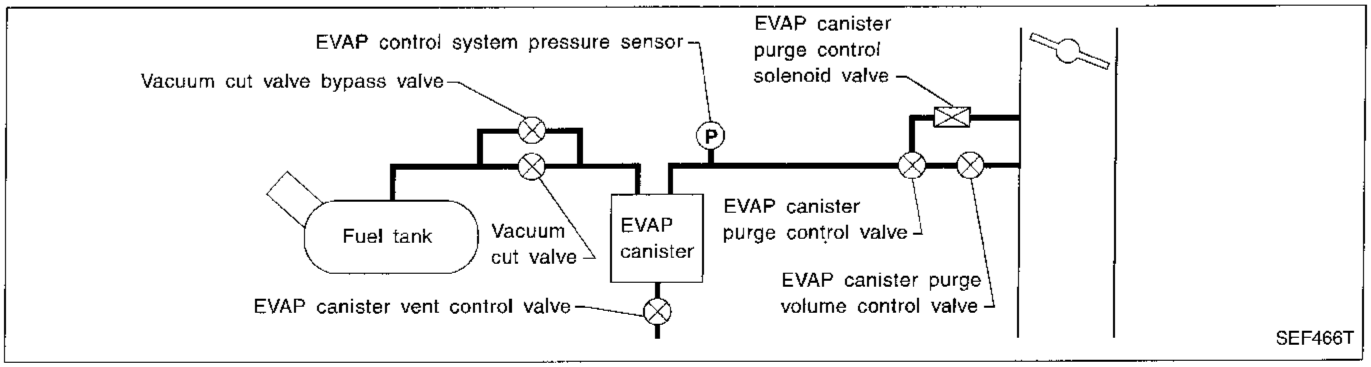
If NG, replace EGR temperature sensor.



Vacuum Cut Valve Bypass Valve

The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.
The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.
The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.
The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPASS/V	● Ignition switch: ON	OFF

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
117	PU/R	Vacuum cut valve bypass valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1441 0801	A) An improper voltage signal is sent to ECM through vacuum cut valve bypass valve.	● Harness or connectors (The vacuum cut valve bypass valve circuit is open or shorted.) ● Vacuum cut valve bypass valve
	B) Vacuum cut valve bypass valve does not operate properly.	● Vacuum cut valve bypass valve ● Vacuum cut valve ● Bypass hoses for clogging ● EVAP control system pressure sensor

GI MA EM LC **EC** FE CL MT AT FA RA BR ST RS BT HA EL IDX

Vacuum Cut Valve Bypass Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "OVERALL FUNCTION CHECK", "Procedure for malfunction B".

Procedure for malfunction A

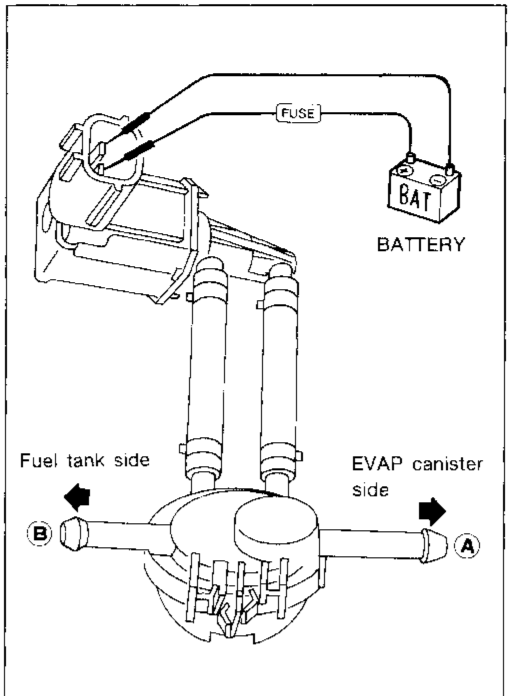
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 5 seconds.

OR

GST
1) Start engine and wait at least 5 seconds.
2) Select "MODE 3" with GST.

OR

NO TOOLS
1) Start engine and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

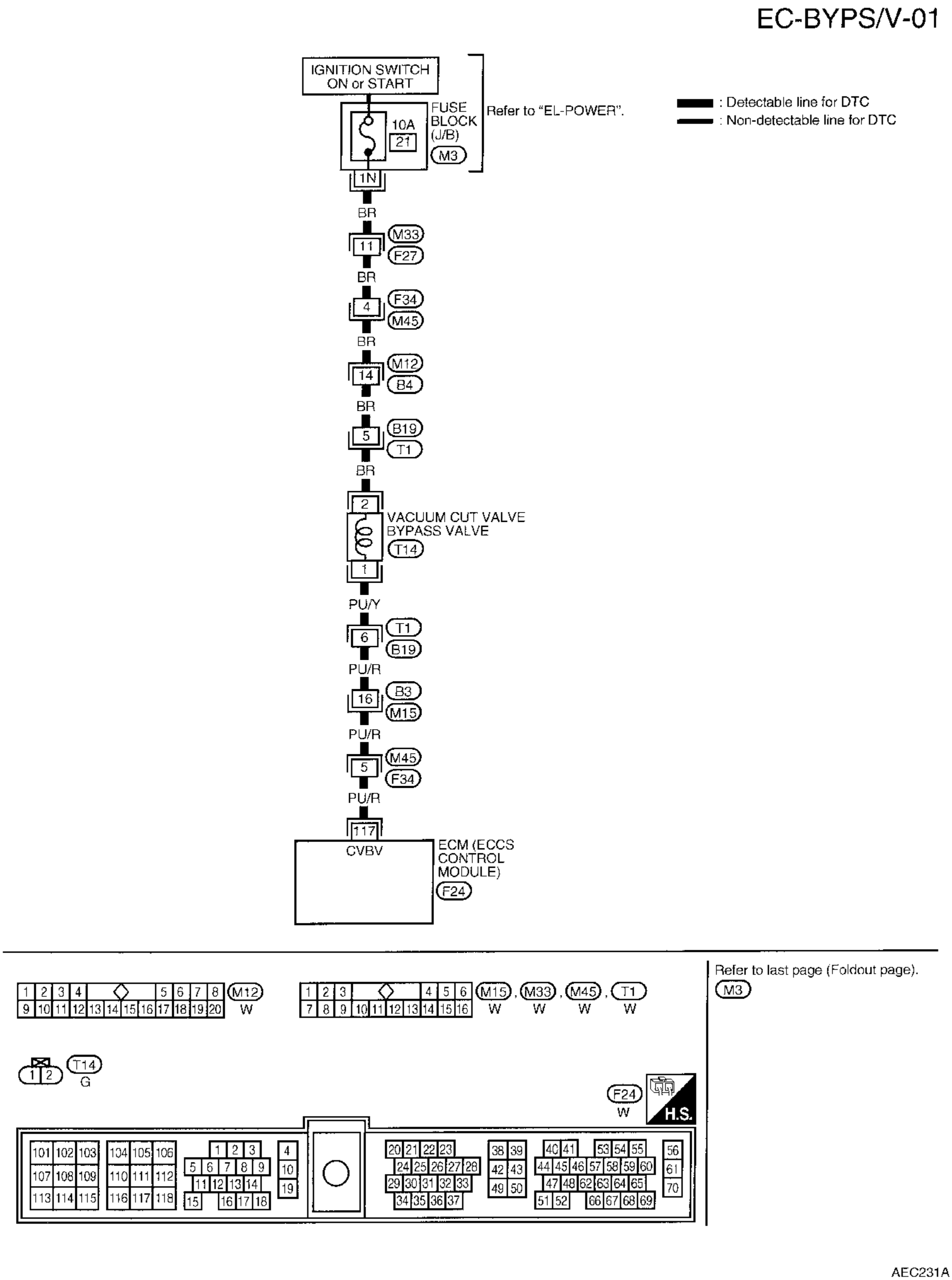


SEF530Q

OVERALL FUNCTION CHECK

Procedure for malfunction B

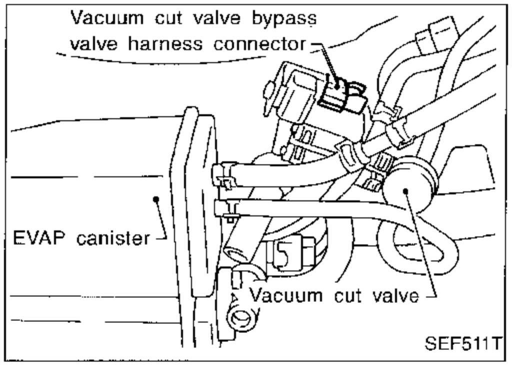
1) Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
2) Apply vacuum to port Ⓐ and check that there is no suction from port Ⓑ.
3) Apply vacuum to port Ⓑ and check that there is suction from port Ⓐ.
4) Blow air in port Ⓑ and check that there is a resistance to flow out of port Ⓐ.
5) Supply battery voltage to the terminal.
6) Blow air in port Ⓐ and check that air flows freely out of port Ⓑ.
7) Blow air in port Ⓑ and check that air flows freely out of port Ⓐ.


EC-BYPS/V-01
IGNITION SWITCH ON or START
10A
21
FUSE BLOCK (J/B)
M3
Refer to "EL-POWER".
: Detectable line for DTC
: Non-detectable line for DTC
1N
BR
11
M33
F27
4
F34
M45
14
M12
B4
5
B19
T1
2
VACUUM CUT VALVE BYPASS VALVE
T14
1
PU/Y
6
PU/R
16
B3
M15
117
CVBV
ECM (ECCS CONTROL MODULE)
F24
M12 W
M15, M33, M45, T1
W W W W
T14
G
F24
W
H.S.
Refer to last page (Foldout page).
M3
AEC231A

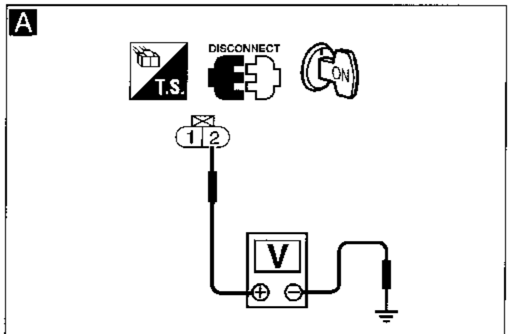
Vacuum Cut Valve Bypass Valve (Cont'd)

DIAGNOSTIC PROCEDURE

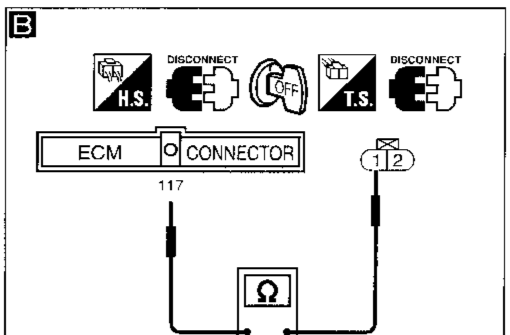
Procedure for malfunction A



SEF511T



SEF529T



SEF530T

INSPECTION START

↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect vacuum cut valve bypass valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors M33, F27, F34, M45, M12, B4, B19, T1
- 10A fuse
- Harness for open or short between vacuum cut valve bypass 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 (117) and terminal ①.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors T1, B19, B3, M15, M45, F34
- Harness for open or short between vacuum cut valve bypass valve and ECM.

If NG, repair harness or connectors.

↓ OK

CHECK COMPONENT
(Vacuum cut valve bypass valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace vacuum cut valve bypass valve.

↓ OK

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

Vacuum Cut Valve Bypass Valve (Cont'd)

DIAGNOSTIC PROCEDURE

Procedure for malfunction B

INSPECTION START

↓

Perform "OVERALL FUNCTION CHECK", EC-520.

- OK → Check EVAP purge line between EVAP canister and fuel tank for clogging or disconnection. Refer to "Evaporative Emission Line Drawing", EC-257.
- NG ↓

CHECK COMPONENT (Vacuum cut valve, vacuum cut valve bypass valve). Refer to "COMPONENT INSPECTION" below.

- NG → Replace malfunctioning parts.
- OK ↓

Check bypass hoses for clogging.

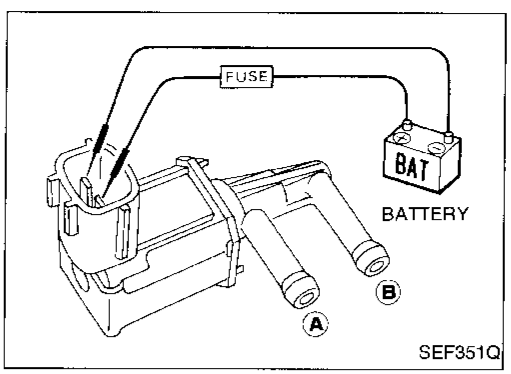
- NG → Repair or replace hoses.
- OK ↓

Go to "TROUBLE DIAGNOSIS FOR DTC P0450", "EVAP Control System Pressure Sensor", EC-460.

- OK ↓

INSPECTION END

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX



SEF351Q

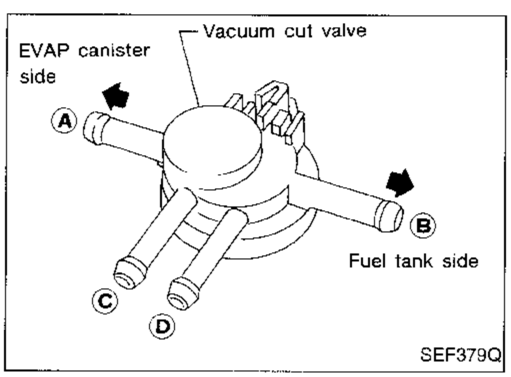
COMPONENT INSPECTION

Vacuum cut valve bypass valve

Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	Yes
No supply	No

If NG, replace vacuum cut valve bypass valve.



SEF379Q

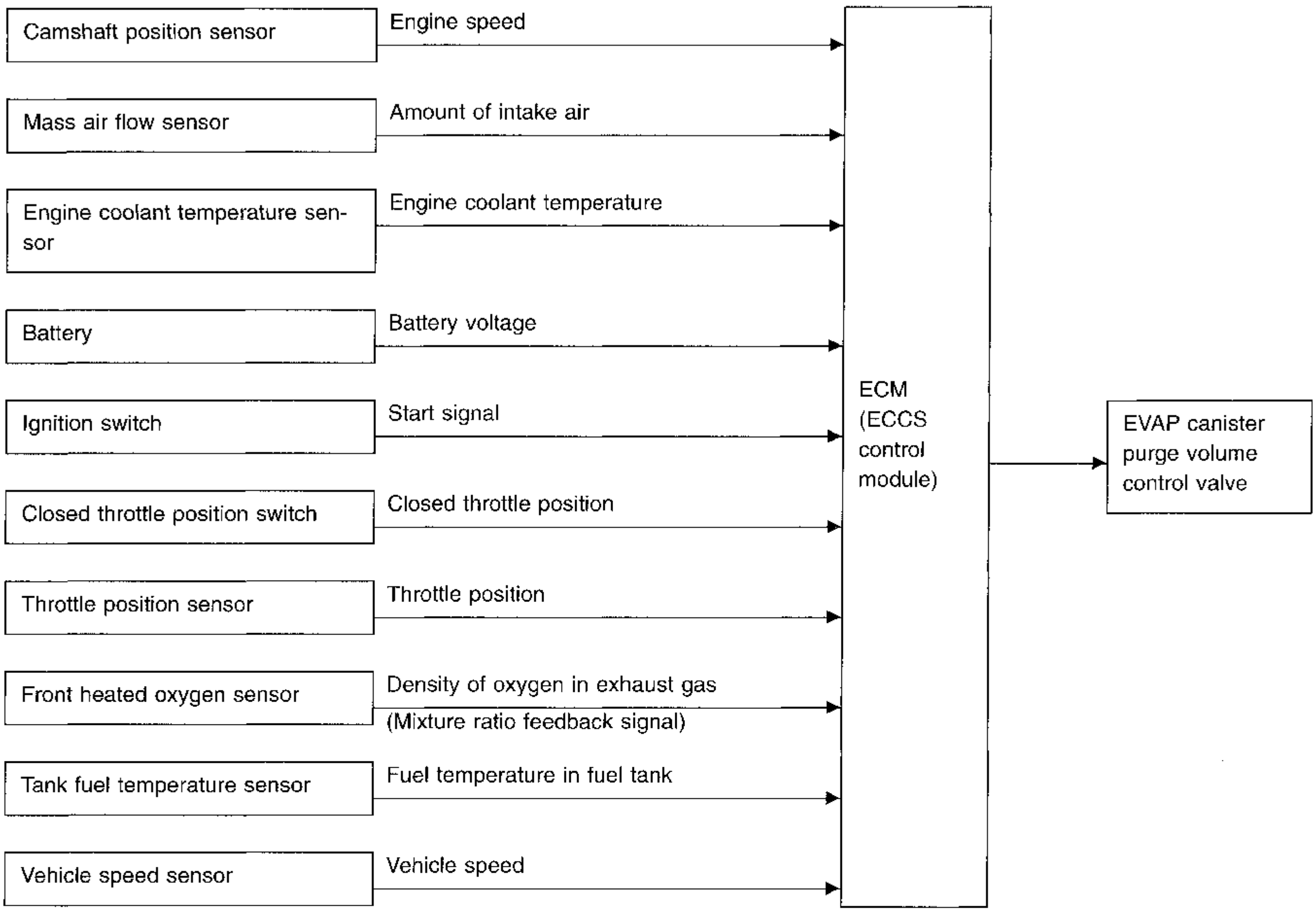
Vacuum cut valve

Check vacuum cut valve as follows:

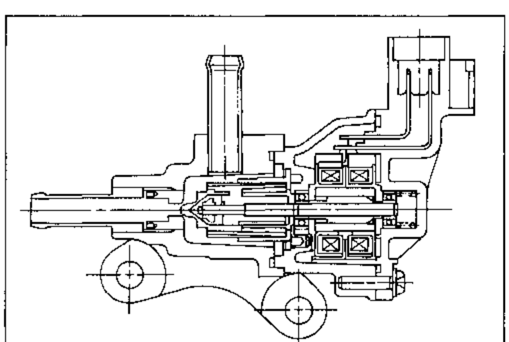
1. Plug port Ⓒ and Ⓓ with fingers.
2. Apply vacuum to port Ⓐ and check that there is no suction from port Ⓑ.
3. Apply vacuum to port Ⓑ and check that there is suction from port Ⓐ.
4. Blow air in port Ⓑ and check that there is a resistance to flow out of port Ⓐ.
5. Open port Ⓒ and Ⓓ.
6. Blow air in port Ⓐ check that air flows freely out of port Ⓒ.
7. Blow air in port Ⓑ check that air flows freely out of port Ⓓ.

Evaporative Emission (EVAP) Canister Purge Volume Control Valve

SYSTEM DESCRIPTION



This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.


SEF249P

COMPONENT DESCRIPTION

The EVAP canister purge volume control valve uses a step motor to control the flow rate of fuel vapor from the EVAP canister. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● No-load ● M/T models: Jack up drive wheels and shift to 1st gear position.	Idle	0 step
		A/T models: 2,000 rpm M/T models: 2,000 rpm and more than 16 km/h (10 MPH)	—

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
5	L	EVAP canister purge volume control valve	Engine is running. (Warm-up condition) └ Idle speed	0 - 0.4V
6	G			
16	Y	EVAP canister purge volume control valve	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
17	OR			
56 61	W/R W/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1445 1008	A) An improper voltage signal is sent to ECM through the valve.	● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister purge volume control valve
	B) The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control valve is completely closed.	● EVAP control system pressure sensor ● EVAP canister purge volume control valve (The valve is stuck open.) ● EVAP canister purge control valve ● Hoses (Hoses are connected incorrectly.)

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the DTC cannot be confirmed, perform "Procedure for malfunction B".

Procedure for malfunction A

1) Jack up drive wheels (M/T models).
2) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
3) Start engine and let it idle at least 90 seconds.
4) Move selector/gearshift lever to "1st" gear (M/T models).
5) Rev engine from idle to 2,000 to 3,000 rpm more than 10 times.

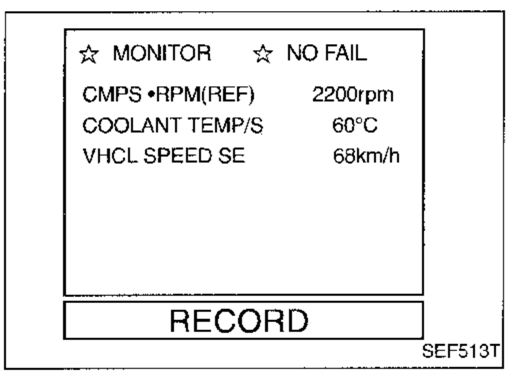
OR

1) Jack up drive wheels (M/T models).
2) Start engine and let it idle at least 90 seconds.
3) Move selector/gearshift lever to "1st" gear (M/T models).
4) Rev engine from idle to 2,000 to 3,000 rpm more than 10 times.
5) Select "MODE 3" with GST.

OR

NO TOOLS

1) Jack up drive wheels (M/T models).
2) Start engine and let it idle at least 90 seconds.
3) Move selector/gearshift lever to "1st" gear (M/T models).
4) Rev engine from idle to 2,000 to 3,000 rpm more than 10 times.
5) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
6) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.



SEF513T

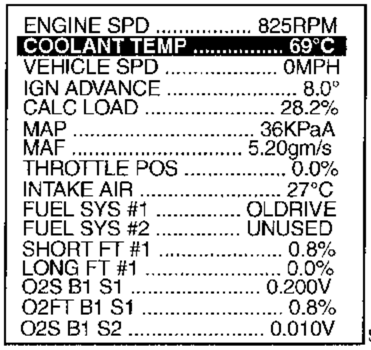
Procedure for malfunction B

1) Jack up drive wheels.
2) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
3) Start engine and warm it up sufficiently.
4) Check that tank fuel temperature is above 0°C (32°F).
5) Turn ignition switch "OFF" and wait at least 5 seconds.
6) Start engine and let it idle at least 70 seconds.
7) Maintain the following conditions at least 25 seconds.

Gear position:
"2" or "D" range (A/T)
"4th" gear (M/T)
Vehicle speed:
50 - 80 km/h (31 - 50 MPH)
Engine speed:
2,000 - 2,500 rpm
Coolant temperature:
Less than 100°C (212°F)

OR

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

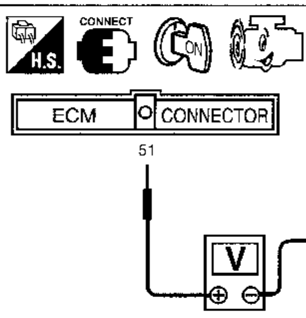


SEF519R

GST

1) Jack up drive wheels.
2) Turn ignition switch "ON" and select "MODE 1" mode with GST.
3) Start engine and warm it up sufficiently.
4) Check that voltage between ECM terminal 63 and ground is less than 4.2V.
5) Turn ignition switch "OFF" and wait at least 5 seconds.
6) Start engine and let it idle at least 70 seconds.
7) Maintain the following conditions at least 25 seconds.
   Gear position:
   "2" or "D" range (A/T)
   "4th" gear (M/T)
   Vehicle speed:
   50 - 80 km/h (31 - 50 MPH)
   Engine speed:
   2,000 - 2,500 rpm
   Coolant temperature:
   Less than 100°C (212°F)
8) Select "MODE 3" with GST.

OR



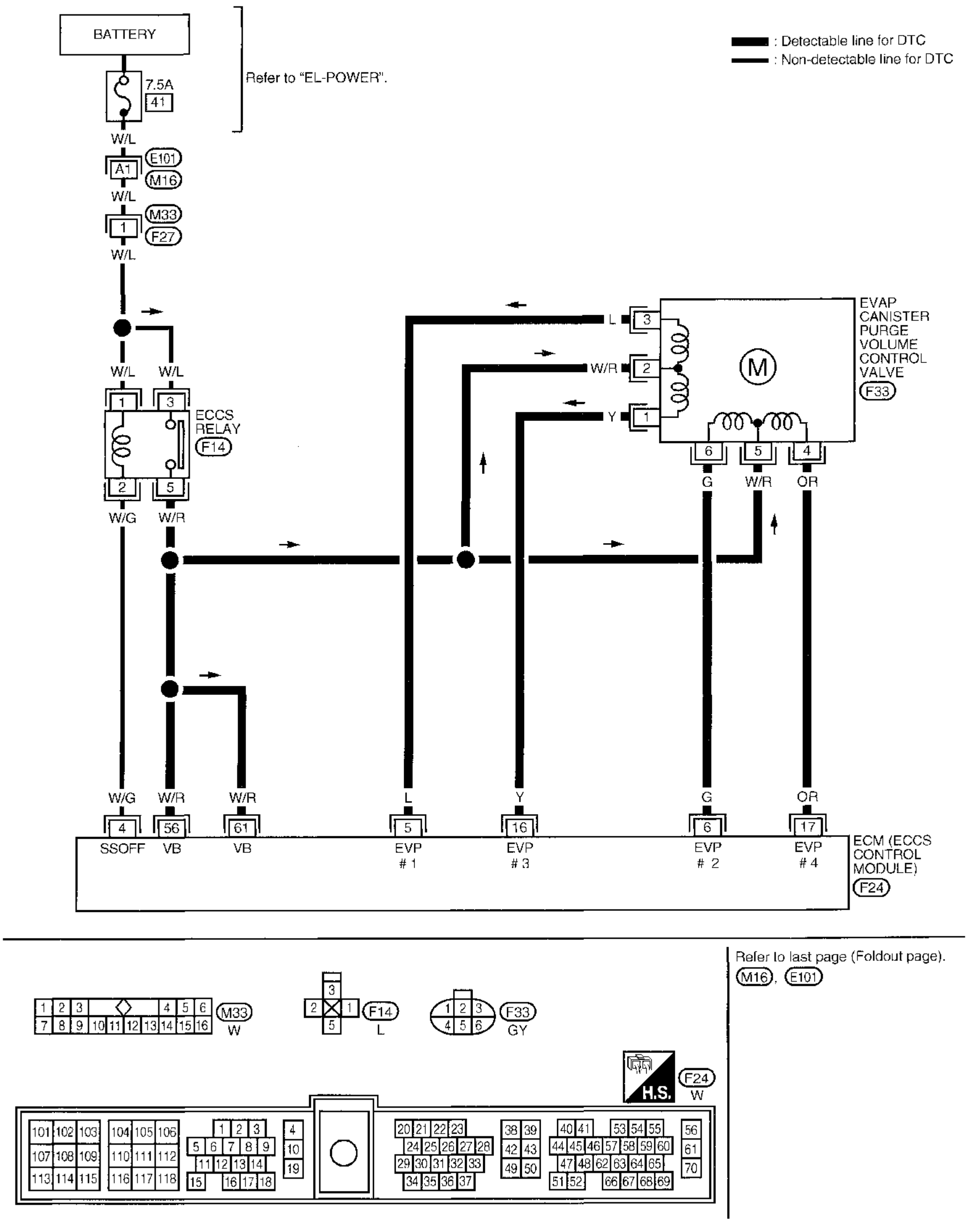
SEF487R

NO TOOLS

1) Jack up drive wheels.
2) Turn ignition switch "ON".
3) Start engine and warm it up sufficiently.
4) Check that voltage between ECM terminal 63 and ground is less than 4.2V.
5) Turn ignition switch "OFF" and wait at least 5 seconds.
6) Start engine and let it idle at least 70 seconds.
7) Maintain the following conditions at least 25 seconds.
   Gear position:
   "2" or "D" range (A/T)
   "4th" gear (M/T)
   Vehicle speed:
   50 - 80 km/h (31 - 50 MPH)
   Engine speed:
   2,000 - 2,500 rpm
   Voltage between ECM terminal 51 and ground:
   More than 0.8V
8) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
9) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

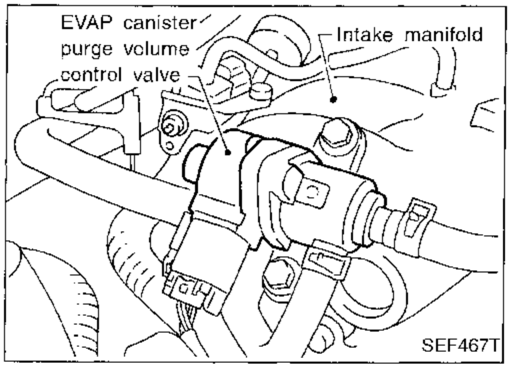
EC-PGC/V-01



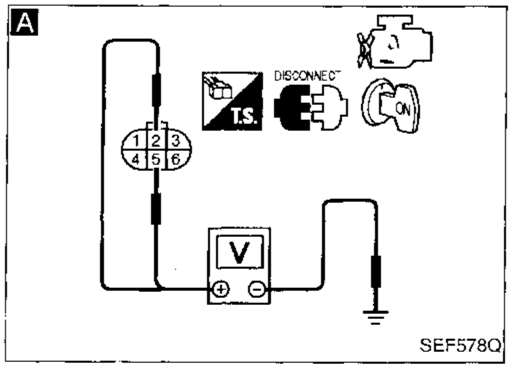
AEC239A

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

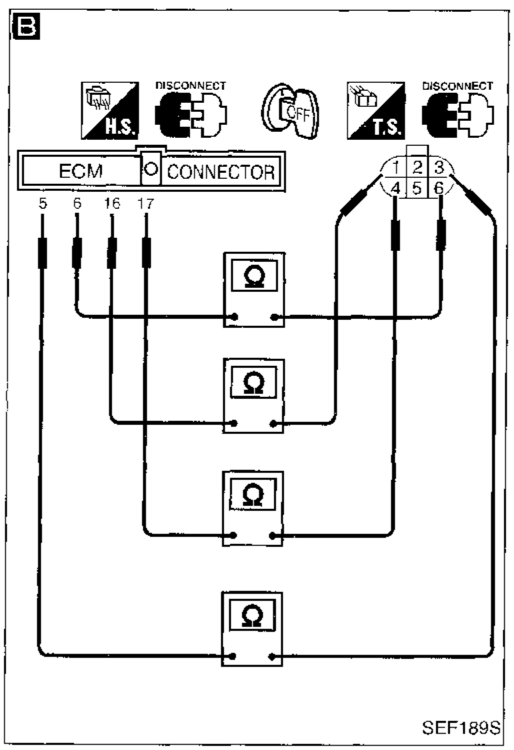
DIAGNOSTIC PROCEDURE



SEF467T



SEF578Q



SEF189S

INSPECTION START

↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect EVAP canister purge volume control valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminals ②, ⑤ and engine ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- ECCS relay
- 7.5A fuse
- Harness connectors E101, M16, M33, F27
- Harness for open or short between EVAP canister purge volume control valve and fuse
- Harness for open or short between EVAP canister purge volume control valve and ECM

If NG, repair harness or connectors.

↓ OK

B

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal ⑯ and terminal ①,
   ECM terminal ⑰ and terminal ④,
   ECM terminal ⑤ and terminal ③,
   ECM terminal ⑥ and terminal ⑥.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

CHECK COMPONENT
(EVAP control system pressure sensor).
(For malfunction B) only.)
Refer to "COMPONENT INSPECTION" in "TROUBLE DIAGNOSIS FOR DTC P0450", EC-464.

NG → Replace EVAP control system pressure sensor.

↓ OK

CHECK COMPONENT
(EVAP canister purge volume control valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP canister purge volume control valve.

↓ OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

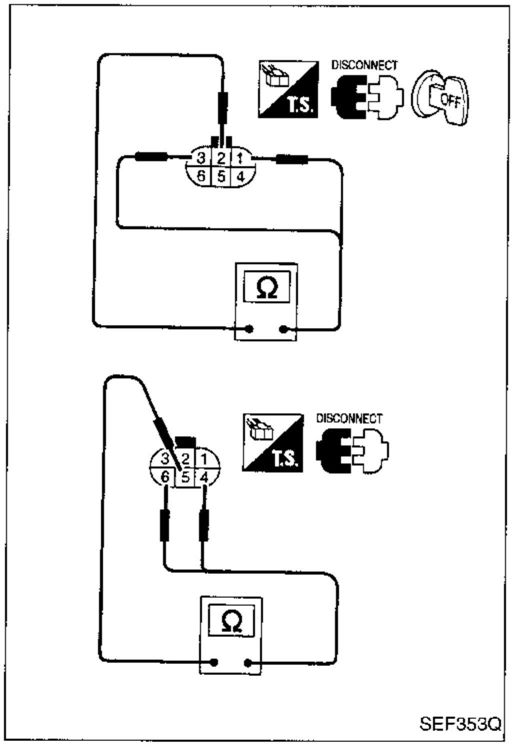
↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

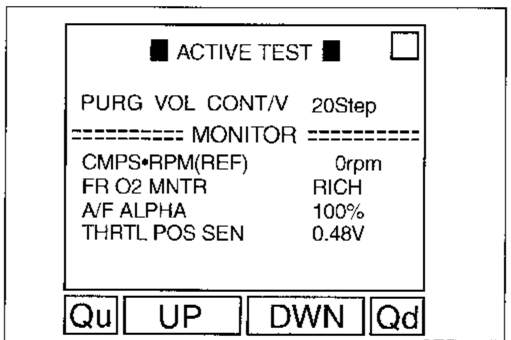


SEF353Q

COMPONENT INSPECTION

EVAP canister purge volume control valve

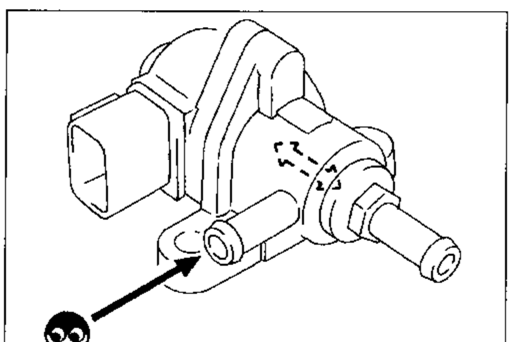
1. Disconnect EVAP canister purge volume control valve harness connector.
2. Check resistance between the following terminals.
   terminal ② and terminals ①, ③
   terminal ⑤ and terminals ④, ⑥
   Resistance:
   Approximately 41Ω [At 20°C (68°F)]
3. Reconnect EVAP canister purge volume control valve harness connector.
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
   (Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5. Turn ignition switch "ON".
6. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the valve opening.
   If NG, replace the EVAP canister purge volume control valve.

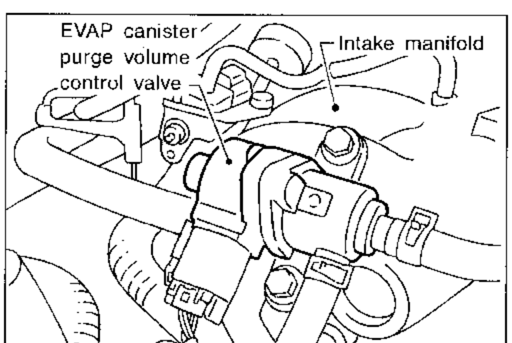


SEF507R

OR

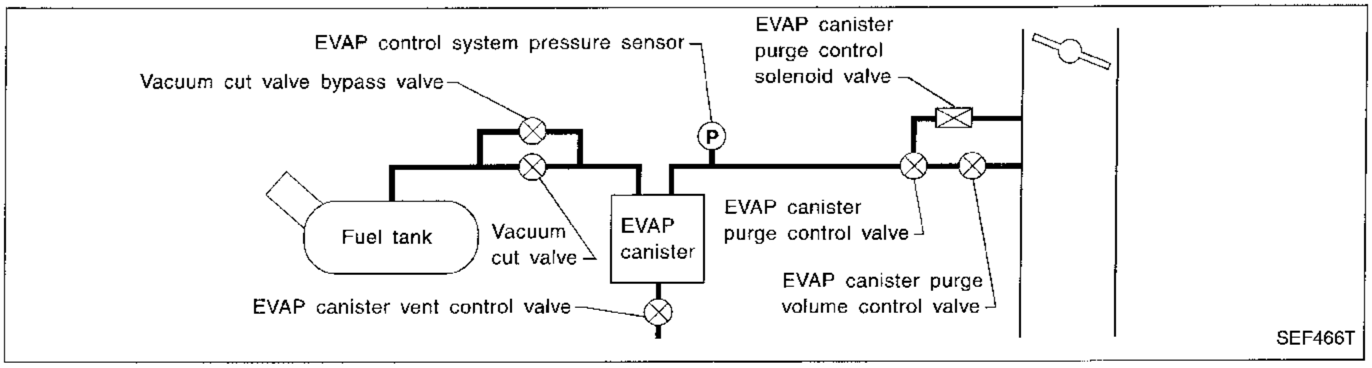
1. Disconnect EVAP canister purge volume control valve harness connector.
2. Check resistance between the following terminals.
   terminal ② and terminals ①, ③
   terminal ⑤ and terminals ④, ⑥
   Resistance:
   Approximately 41Ω [At 20°C (68°F)]
3. Reconnect EVAP canister purge volume control valve harness connector.
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
   (Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5. Turn ignition switch "ON" and "OFF". Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EVAP canister purge volume control valve.


SEF474T



SEF467T

Evaporative Emission (EVAP) Control System Purge Flow Monitoring



SYSTEM DESCRIPTION

In this evaporative emission (EVAP) control system, purge flow occurs during non-vehicle stopped conditions (M/T models) and non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control valve and EVAP canister purge control valve are open. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

ON BOARD DIAGNOSIS LOGIC

Under normal conditions [non-vehicle stopped conditions (M/T models) and non-closed throttle], sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a fault is determined.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1447 0111	● EVAP control system does not operate properly. ● EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	● EVAP canister purge volume control valve stuck closed ● EVAP canister purge control valve stuck closed ● EVAP control system pressure sensor ● Loose or disconnected rubber tube ● Blocked rubber tube ● EVAP canister purge control solenoid valve ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve ● Cracked EVAP canister ● Absolute pressure sensor ● MAP/BARO switch solenoid valve

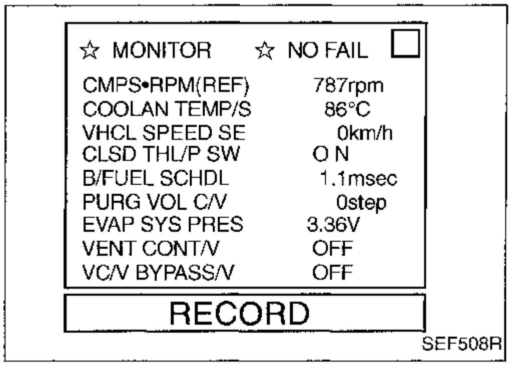
Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

OVERALL FUNCTION CHECK

Use this procedure to check the overall monitoring function of the EVAP control system purge flow. During this check, a DTC might not be confirmed.

1) Lift up drive wheels (M/T models).
2) Start engine.
3) Select "EVAP SYS PRES" in "DATA MONITOR" mode with CONSULT.
4) Check EVAP control system pressure sensor value at idle speed.
5) Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT and set "PURG VOL CONT/V" to 20 steps by touching "UP" or "Qu".
6) Maintain the following conditions for at least 30 seconds. Verify that EVAP control system pressure sensor value ("EVAP SYS PRES") stays 0.04V less than the value at idle speed for at least 2 seconds.
   Engine speed:
   Approx. 2,000 rpm
   Gear position (for M/T models):
   Any position other than "Neutral" or "Reverse"

CAUTION:
Do not run vehicle at speeds greater than 80 km/h (50 MPH).



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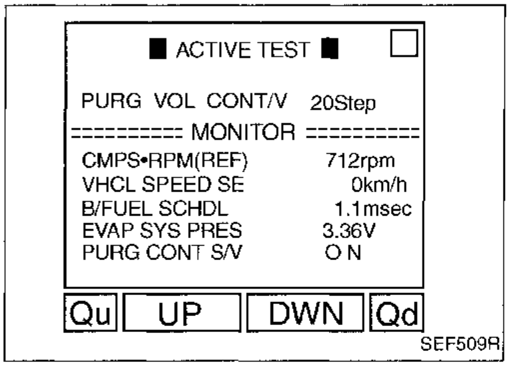
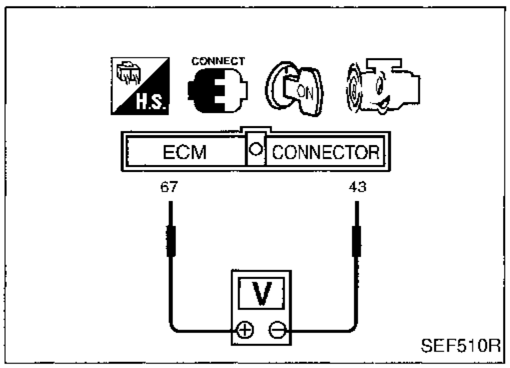


SEF509R

OR

1) Lift up drive wheels.
2) Start engine and warm it up sufficiently.
3) Turn ignition switch "OFF", wait at least 5 seconds.
4) Start engine and wait at least 70 seconds.
5) Set voltmeter probes to ECM terminals 67 (EVAP control system pressure sensor signal) and 43 (ground).
6) Check EVAP control system pressure sensor value at idle speed.
7) Establish and maintain the following conditions for at least 30 seconds.
   Air conditioner switch: ON
   Blower fan switch: ON
   Steering wheel: Fully turned
   Headlamp switch: ON
   Rear window defogger switch: ON
   Engine speed: Approx. 3,500 rpm
   Intake manifold vacuum:
   −73.3 to −60.0 kPa (−550 to −450 mmHg, −21.65 to −17.72 inHg)
   Gear position:
   M/T models
   Any position other than "Neutral" or "Reverse"
   A/T models
   Any position other than "P", "N" or "R".

   Return all conditions to normal. Repeat this procedure at least 5 times.
   Verify that EVAP control system pressure sensor value stays 0.04V less than the value at idle speed for at least 2 seconds.

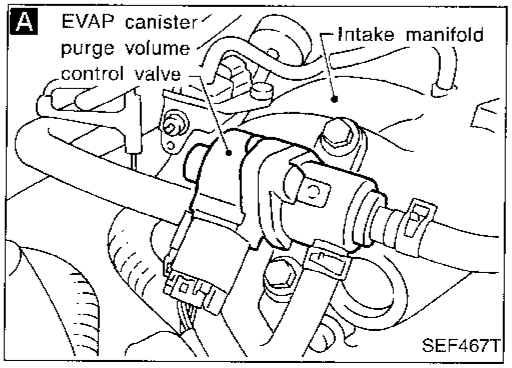


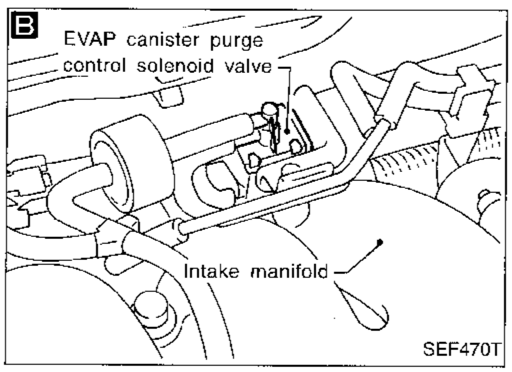
SEF510R

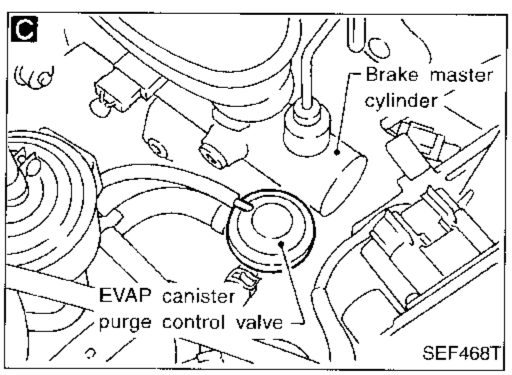
Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

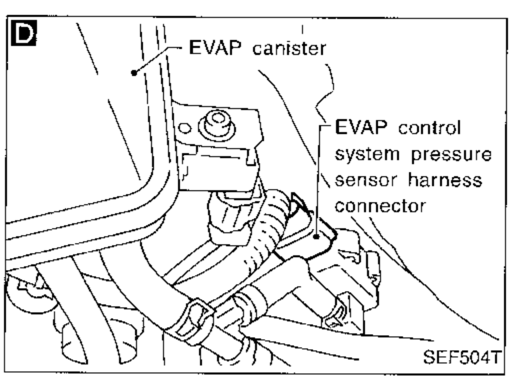
CAUTION:
Do not run vehicle at speeds greater than 80 km/h (50 MPH).

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX









DIAGNOSTIC PROCEDURE

INSPECTION START

↓

CHECK EVAP CANISTER.
Check EVAP canister for cracks.
— NG → Replace EVAP canister.

↓ OK

CHECK EVAP PURGE LINE.
Check EVAP purge line for improper connection.
Refer to "EVAPORATIVE EMISSION SYSTEM", EC-257.
— NG → Repair it.

↓ OK

A

CHECK COMPONENT
(EVAP canister purge volume control valve).
Refer to "COMPONENT INSPECTION", EC-535.
— NG → Replace EVAP canister purge volume control valve.

↓ OK

B

CHECK COMPONENT
(EVAP canister purge control solenoid valve).
Refer to "COMPONENT INSPECTION", EC-536.
— NG → Replace EVAP canister purge control solenoid valve.

↓ OK

C

CHECK COMPONENT
(EVAP canister purge control valve).
Refer to "COMPONENT INSPECTION", EC-536.
— NG → Replace EVAP canister purge control valve.

↓ OK

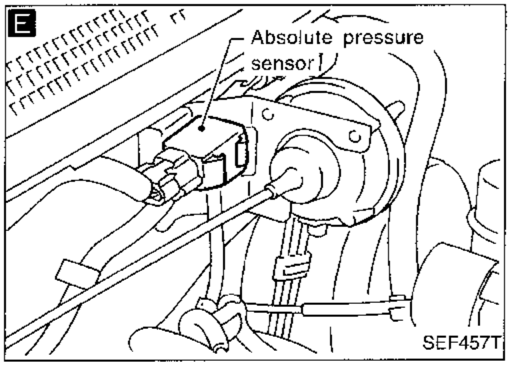
D

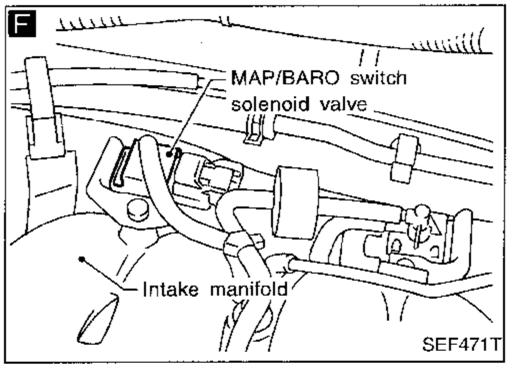
CHECK COMPONENT
(EVAP control system pressure sensor).
Refer to "COMPONENT INSPECTION", EC-537.
— NG → Replace EVAP control system pressure sensor.

↓ OK

Ⓐ
(Go to next page.)

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)





A

E

CHECK COMPONENT
(Absolute pressure sensor).
Refer to "COMPONENT INSPECTION", EC-537.

NG → Replace absolute pressure sensor.

OK

F

CHECK COMPONENT
(MAP/BARO switch solenoid valve).
Refer to "COMPONENT INSPECTION", EC-538.

NG → Replace MAP/BARO switch solenoid valve.

OK

CHECK EVAP PURGE LINE.
Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.

NG → Replace it.

OK

Clean EVAP purge line (pipe and rubber tube) using air blower.

↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

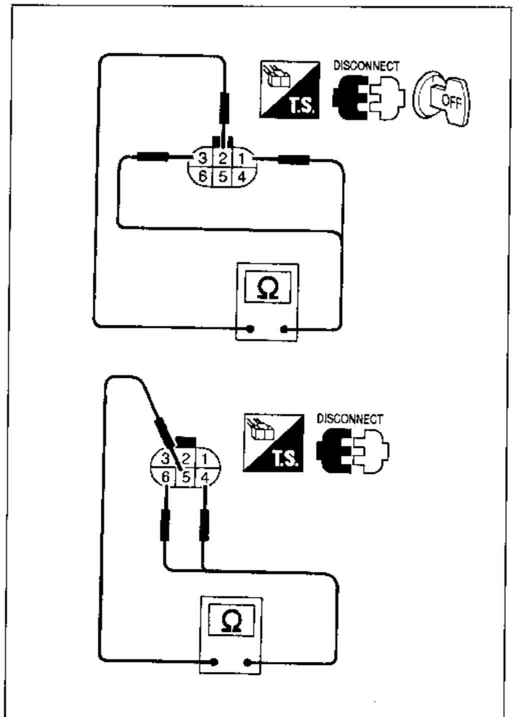
Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

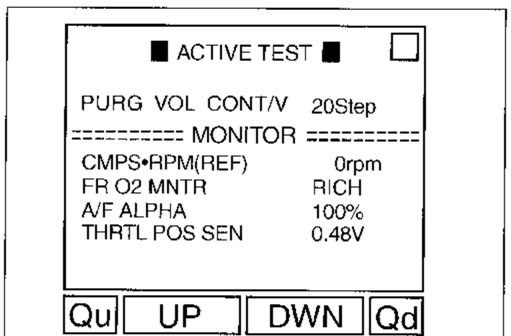


SEF353Q

COMPONENT INSPECTION

EVAP canister purge volume control valve

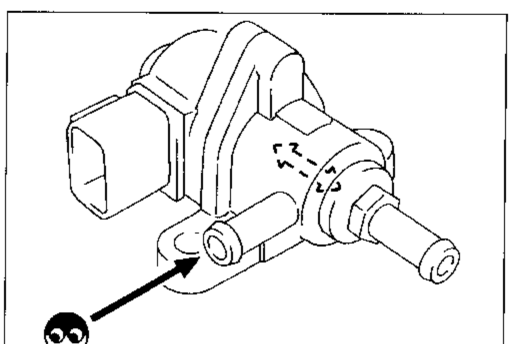
1) Disconnect EVAP canister purge volume control valve harness connector.
2) Check resistance between the following terminals.
terminal ② and terminals ①, ③
terminal ⑤ and terminals ④, ⑥
Resistance:
Approximately 41Ω [At 20°C (68°F)]
3) Reconnect EVAP canister purge volume control valve harness connector.
4) Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON".
6) Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the valve opening.
If NG, replace the EVAP canister purge volume control valve.

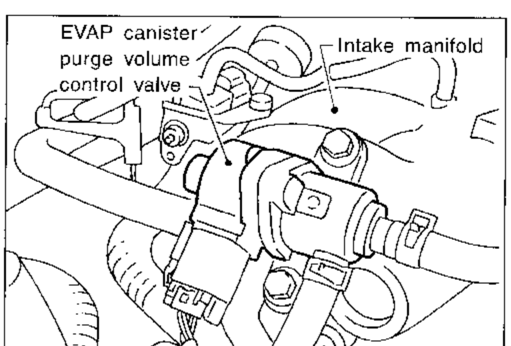


SEF507R

OR

1) Disconnect EVAP canister purge volume control valve harness connector.
2) Check resistance between the following terminals.
terminal ② and terminals ①, ③
terminal ⑤ and terminals ④, ⑥
Resistance:
Approximately 41Ω [At 20°C (68°F)]
3) Reconnect EVAP canister purge volume control valve harness connector.
4) Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5) Turn ignition switch "ON" and "OFF". Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
If NG, replace the EVAP canister purge volume control valve.

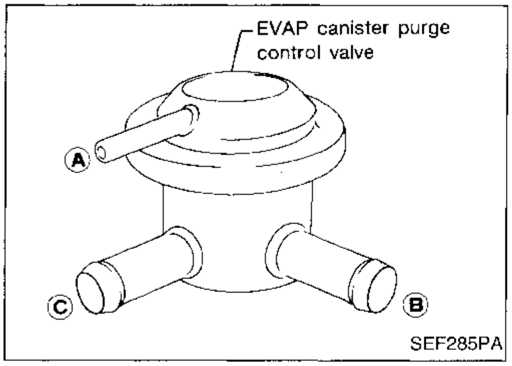

SEF474T



SEF467T

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

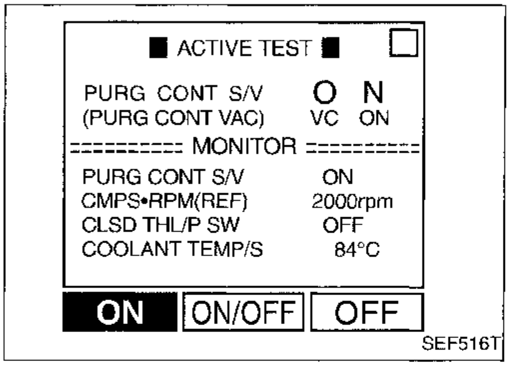


SEF285PA

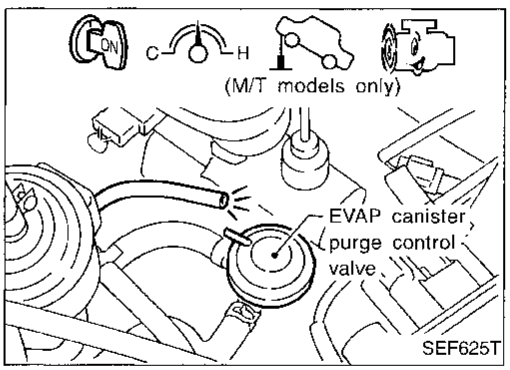
EVAP canister purge control valve

Check EVAP canister purge control valve as follows:

1. Plug the port Ⓑ.
2. Apply pressure [80.0 kPa (600 mmHg, 23.62 inHg)] to port Ⓐ. Then keep it for 15 seconds, and check there is no leakage.
3. Repeat step 2 for port Ⓒ.



SEF516T



SEF625T

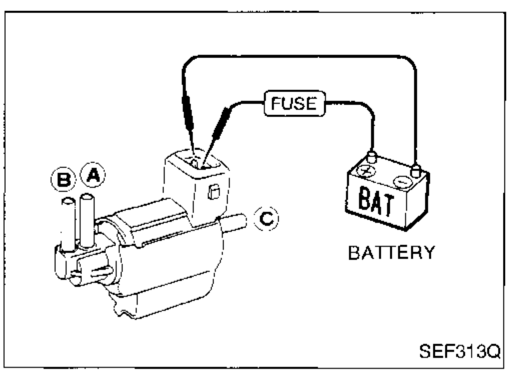
EVAP canister purge control solenoid valve

1. Jack up driving wheels (M/T models only).
2. Turn ignition switch "ON".
3. Select "PURG CONT S/V" of "ACTIVE TEST" mode with CONSULT.
4. Start engine and warm it up sufficiently.
5. Disconnect vacuum hose at EVAP canister purge control valve.
6. Touch "ON" and "OFF" and check for vacuum passing through the hose.

Condition	Vacuum
Idle	Not exist
2,000 rpm (A/T models) 2,000 rpm with 1 gear position (M/T models)	Exist

OR

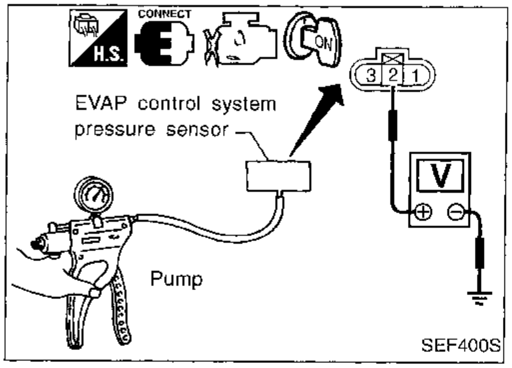
Check air passage continuity.



SEF313Q

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.



SEF400S

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

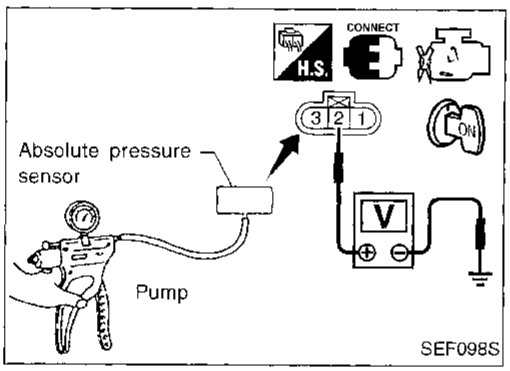
EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between terminal ② and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
-9.3 kPa (-70 mmHg, -2.76 inHg)	0.4 - 0.6

CAUTION:
Always calibrate the vacuum pump gauge when using it.

5. If NG, replace EVAP control system pressure sensor.



SEF098S

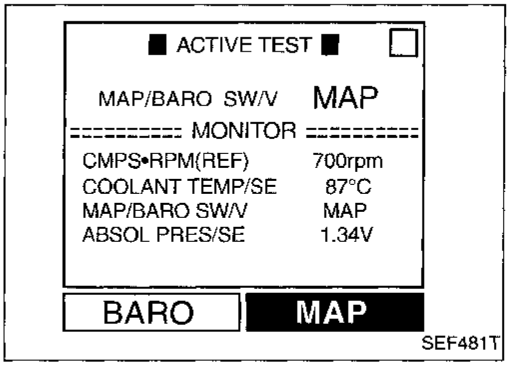
Absolute pressure sensor

1. Remove absolute pressure sensor with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Turn ignition switch "ON" and check output voltage between terminal ② and engine ground.
   The voltage should be 3.2 to 4.8 V.
4. Use pump to apply vacuum of –26.7 kPa (–200 mmHg, –7.87 inHg) to absolute pressure sensor as shown in figure and check the output voltage.
   The voltage should be 1.0 to 1.4 V lower than the value measured in step 3.

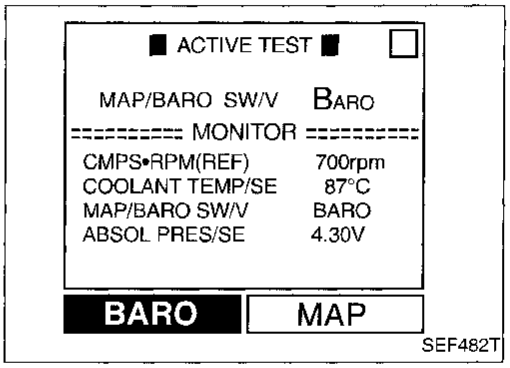
CAUTION:
Always calibrate the vacuum pump gauge when using it.

5. If NG, replace absolute pressure sensor.

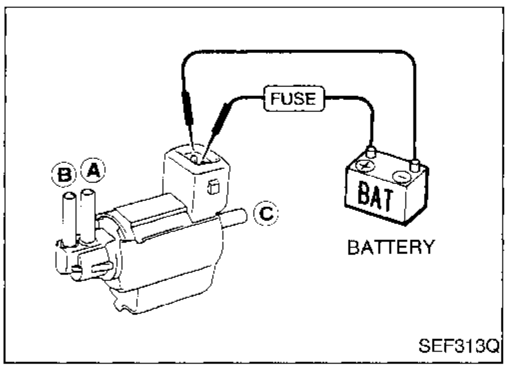
Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



SEF481T



SEF482T



SEF313Q

MAP/BARO switch solenoid valve

1. Start engine and warm it up sufficiently.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
   - When "MAP" is selected, "ABSOL PRES/SE" indicates approximately 1.3V.
   - When "BARO" is selected, "ABSOL PRES/SE" indicates approximately 4.3V.
4. If NG, replace solenoid valve.

OR

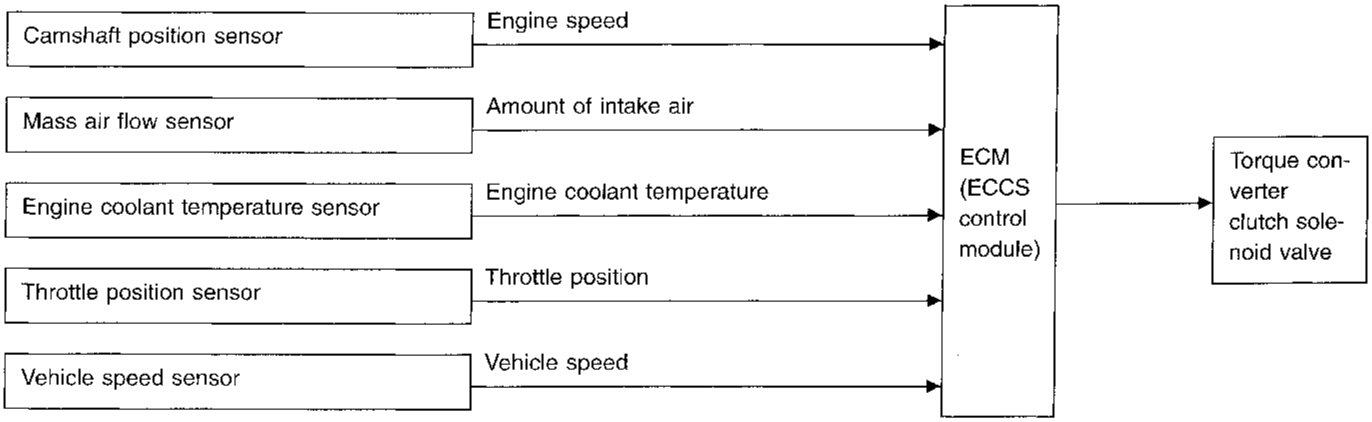
1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.

Condition	Air passage continuity between A and B	Air passage continuity between A and C
12V direct current supply between terminals	Yes	No
No supply	No	Yes

3. If NG, replace solenoid valve.

Torque Converter Clutch Solenoid Valve

SYSTEM DESCRIPTION



The ECM controls torque converter clutch solenoid valve to cancel the lock-up condition of A/T. When the solenoid valve is turned on, lock-up is cancelled. When the solenoid valve is turned off, A/T lock-up is operational.

Conditions for lock-up cancel:

- Throttle valve is fully closed (idling or deceleration)
- Engine coolant temperature is below 60°C (140°F)
- Vehicle speed is less than 64 km/h (40 MPH)
- During high-load operation

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
TCC SOL/V	● Engine: After warming up	Idle	ON
		Vehicle speed is 64 km/h (40 MPH) or more in "D" position	OFF

ECM TERMINALS AND REFERENCE VALUE

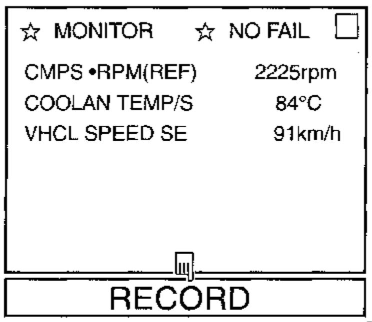
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
30	P/B	Torque converter clutch solenoid valve (A/T models only)	Engine is running Idle speed	Approximately 0V
			Engine is running (Warm-up condition) Vehicle speed is 64 km/h (40 MPH) or more in "D" position	BATTERY VOLTAGE (11 - 14V)

Torque Converter Clutch Solenoid Valve (Cont'd)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1550 0904	● An excessively low voltage from the solenoid is sent to ECM. ● A/T torque converter slip is occurred in lock-up condition.	● Harness or connectors (The circuit is open or shorted.) ● Torque converter clutch solenoid valve ● A/T hydraulic control system ● Torque converter



SEF533T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and warm it up sufficiently.
4) Perform test drive in "D" position at least 20 seconds continuously under the following conditions.
   Engine speed: 1900 - 2500 rpm
   Vehicle speed: 76 - 100 km/h (47 - 62 MPH)

OR

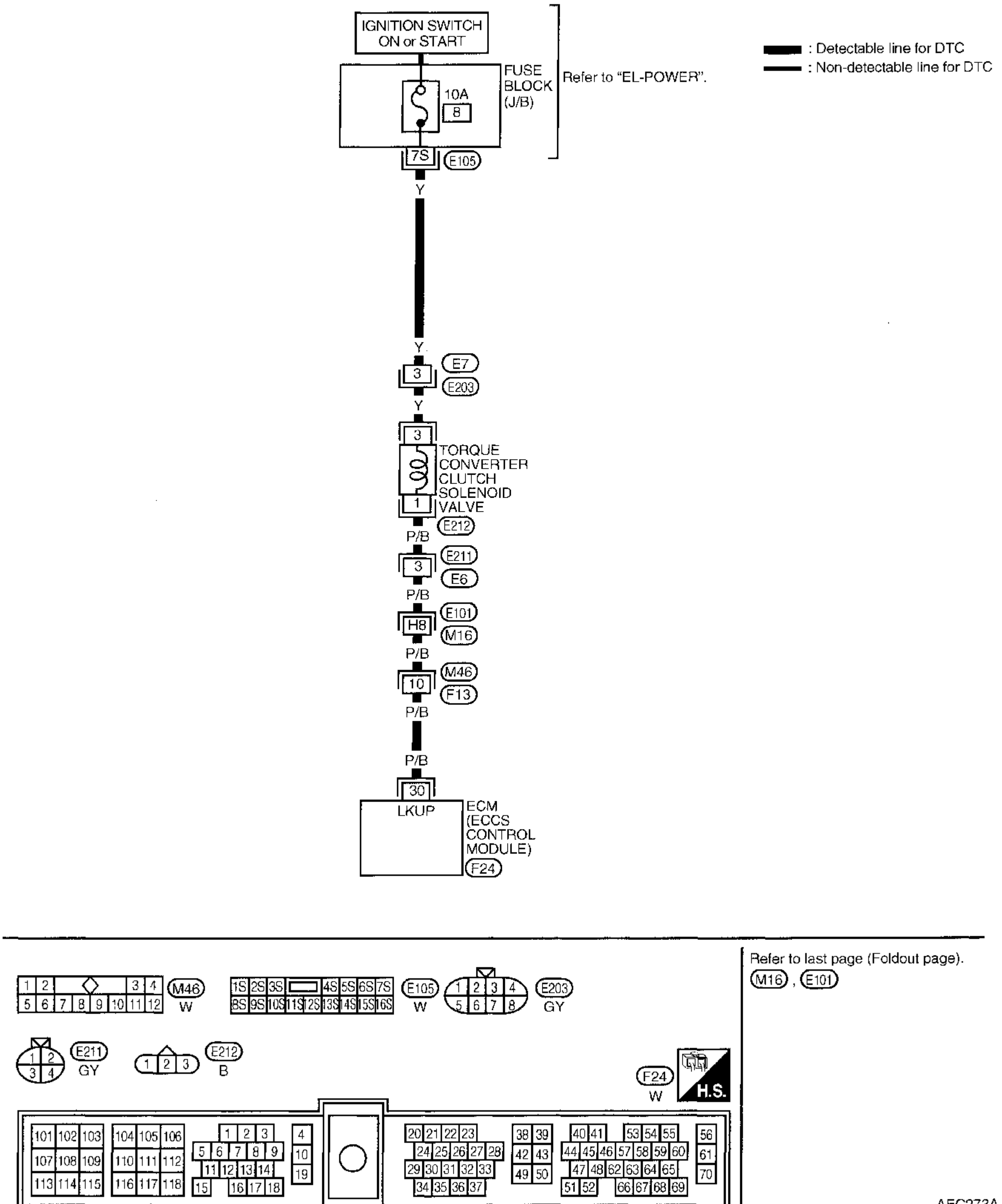
1) Start engine and warm it up sufficiently.
2) Select MODE 3 with GST.
3) Perform test drive in "D" position at least 20 seconds continuously under the following conditions.
   Engine speed: 1900 - 2500 rpm
   Vehicle speed: 76 - 100 km/h (47 - 62 MPH)

OR

1) Start engine and warm it up sufficiently.
2) Perform test drive in "D" position at least 20 seconds continuously under the following conditions.
   Engine speed: 1900 - 2500 rpm
   Vehicle speed: 76 - 100 km/h (47 - 62 MPH)
3) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

Torque Converter Clutch Solenoid Valve (Cont'd)

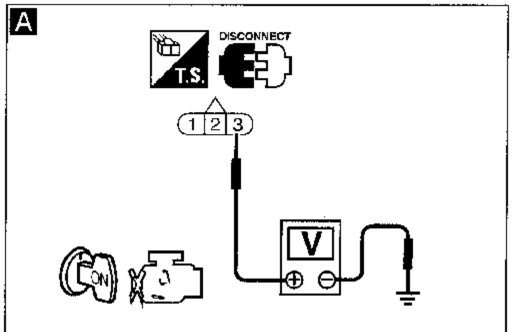
EC-LKUP-01



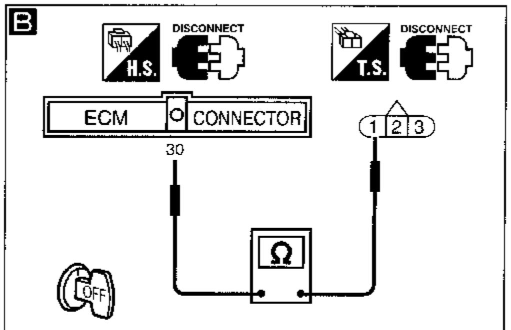
AEC273A

Torque Converter Clutch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE



SEF534T



SEF535T

INSPECTION START

↓

A

CHECK POWER SUPPLY.
1. Disconnect torque converter clutch solenoid valve 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 followings.
- Harness connectors (E7), (E203)
- 10A fuse
- Harness continuity between torque converter clutch solenoid valve and fuse

If NG, repair harness or connectors.

OK ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (30) and terminal (1).

Continuity should exist.
If OK, check harness for short.

NG → Check the followings.
- Harness connectors (E211), (E6), (E101), (M16), (M46), (F13)
- Harness continuity between torque converter clutch solenoid valve and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Torque converter clutch solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace torque converter clutch solenoid valve.

OK ↓

CHECK COMPONENT
(Torque converter clutch control valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace torque converter clutch control valve.

OK ↓

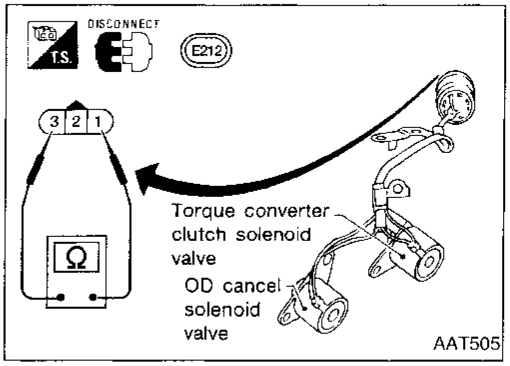
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

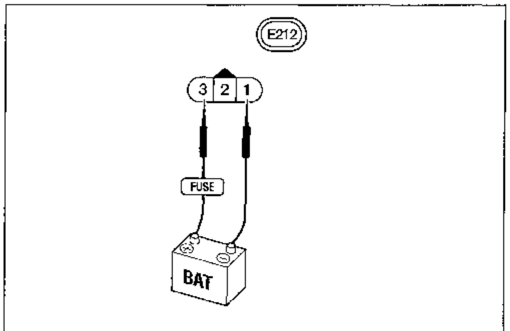
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

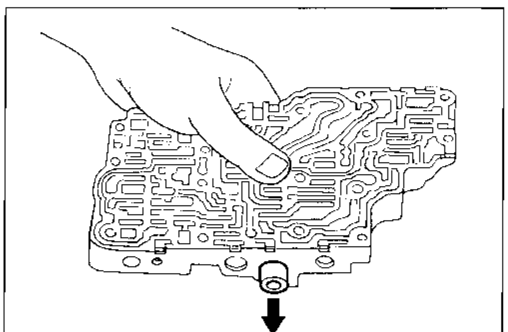
INSPECTION END



AAT505



AAT506


SAT740H

Torque Converter Clutch Solenoid Valve (Cont'd)

COMPONENT INSPECTION

Torque converter clutch solenoid valve

1. Check resistance between torque converter clutch solenoid valve terminals ① and ③.
   Resistance: Approximately 25Ω [at 25°C (77°F)]
2. Remove torque converter clutch solenoid valve. Refer to "ON-VEHICLE SERVICE" in AT section.
3. Supply the solenoid valve terminals ① and ③ with battery voltage and check the solenoid valve operation.
   Torque converter clutch solenoid valve should be operated.
4. If NG, replace torque converter clutch solenoid valve.

Torque converter clutch control valve

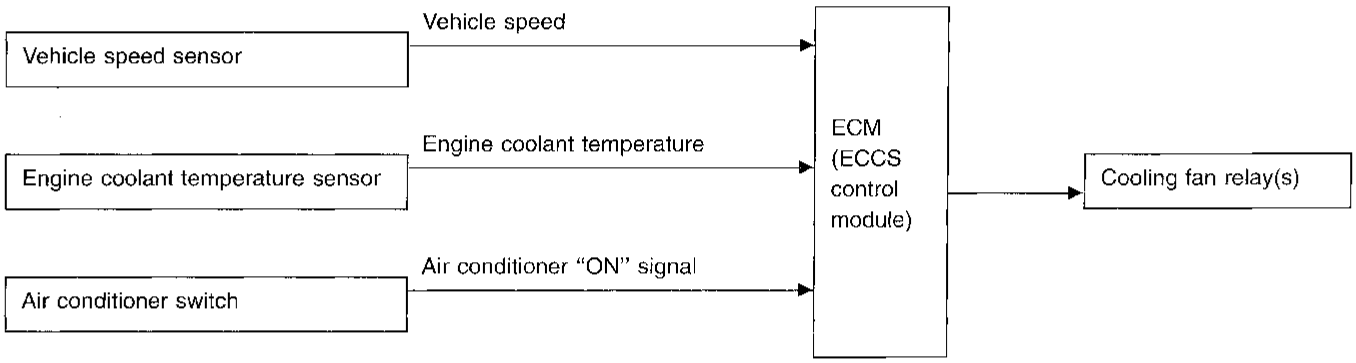
1. Disassemble torque converter clutch control valve assembly. Refer to "REPAIR FOR COMPONENT PARTS" on AT section.
2. Check torque converter clutch control valve.
   - Valve, and sleeve slide along valve bore under their own weight.
   - Valve, and sleeve are free from burrs, dents and scratches.
   - Control valve springs are free from damage, deformation and fatigue.
   - Hydraulic line is free from obstacles.
3. If NG, replace torque converter clutch control valve.

Cooling Fan (Overheat)

Note: Since this diagnosis does not meet P1900 of SAE J2012, it is indicated only by CONSULT.

SYSTEM DESCRIPTION

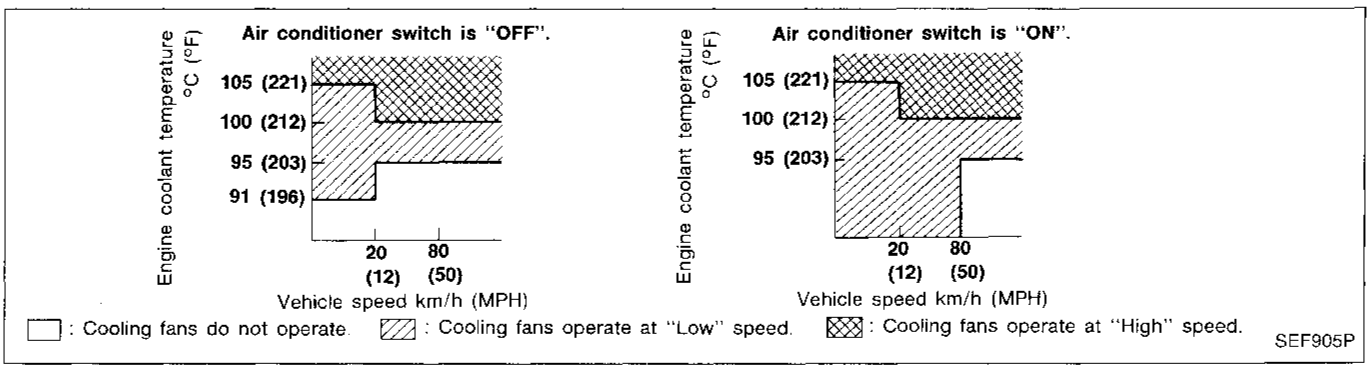
Cooling fan control



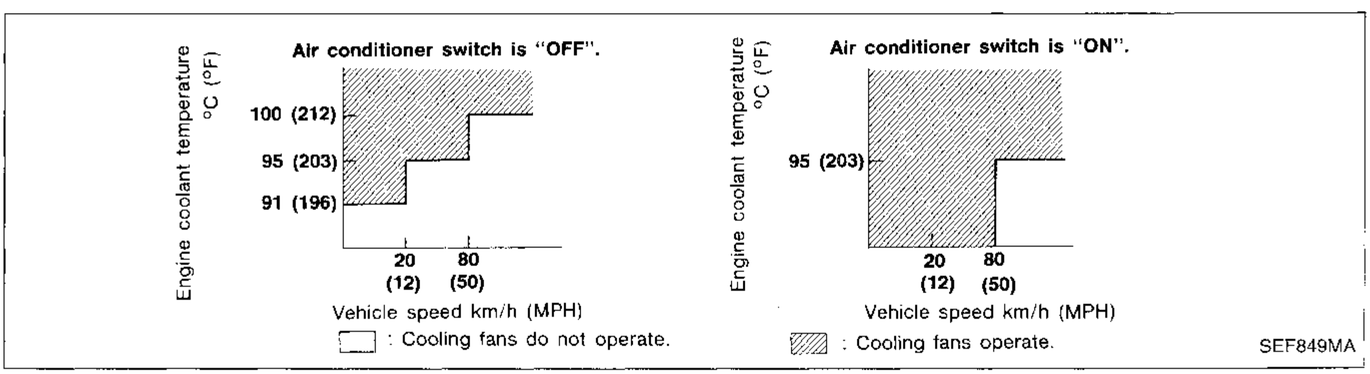
The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF] on A/T models and 2-step control [HIGH/OFF] on M/T models.

Operation

For A/T models



For M/T models



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 90°C (194°F) or less	OFF
		Engine coolant temperature is 91°C (196°F) or more	ON

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and 43 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
13	LG (A/T models)	Cooling fan relay (High)	Engine is running. Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. Cooling fan (High) is operating	0.07 - 0.10V
14	LG/R	Cooling fan relay	Engine is running. Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. Cooling fan is operating	0.07 - 0.30V

ON BOARD DIAGNOSIS LOGIC

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1900 1308 P1900* 0208	● 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-555.

*: Since this diagnosis does not meet P1900 of SAEJ2012, 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. 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)

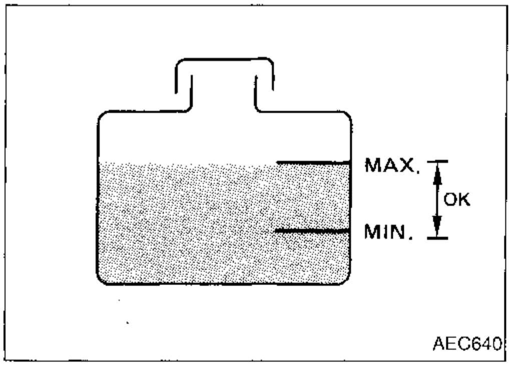
OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

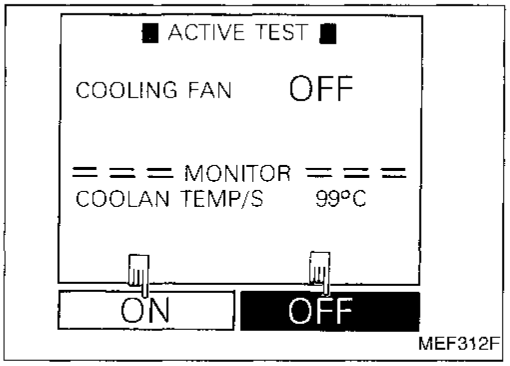
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

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.



AEC640

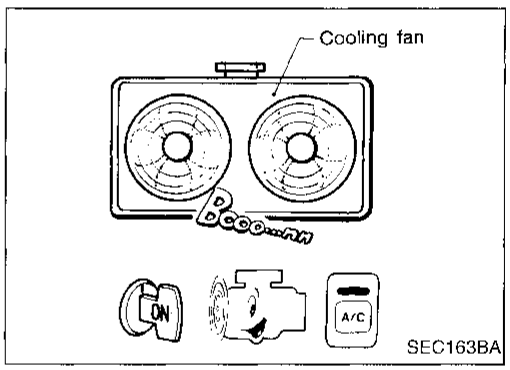
1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "DIAGNOSTIC PROCEDURE" (EC-549).
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE" (EC-549).



MEF312F

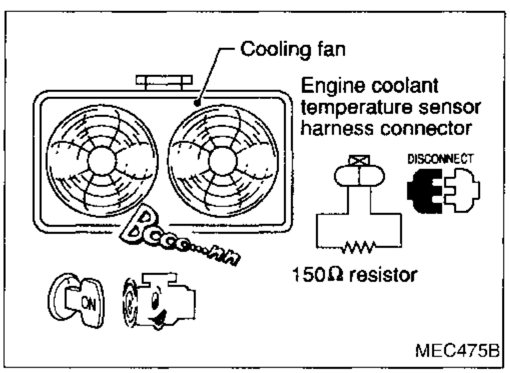
3) Turn ignition switch "ON".
4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR



SEC163BA

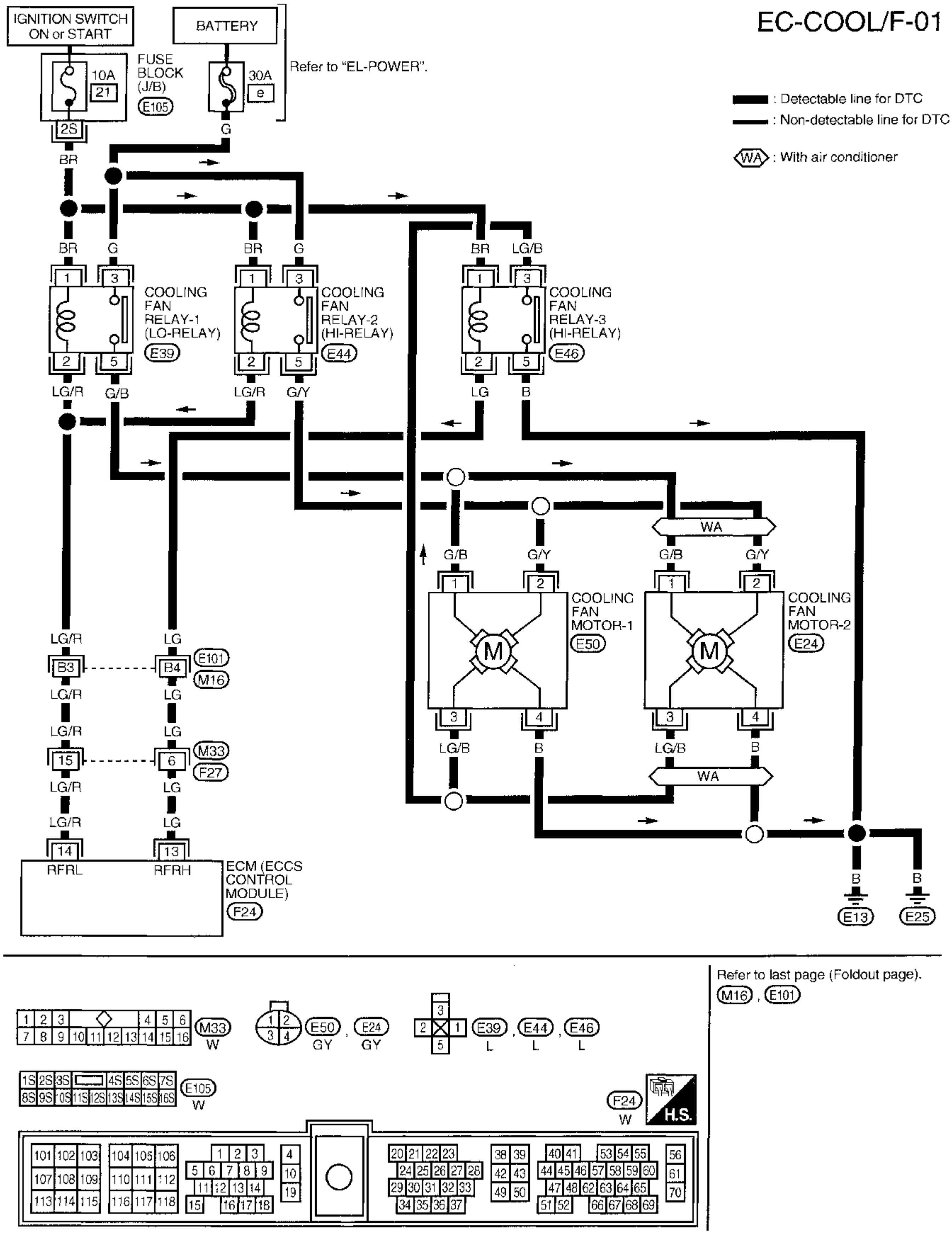
3) Start engine.
   Be careful not to overheat engine.
4) Turn air conditioner switch "ON".
5) Turn blower fan switch "ON".
6) Make sure that cooling fan operates.
7) Turn ignition switch "OFF".
8) Turn air conditioner switch and blower fan switch "OFF".



MEC475B

9) Disconnect engine coolant temperature sensor harness connector.
10) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
11) Restart engine and make sure that cooling fan operates.
    Be careful not to overheat engine.

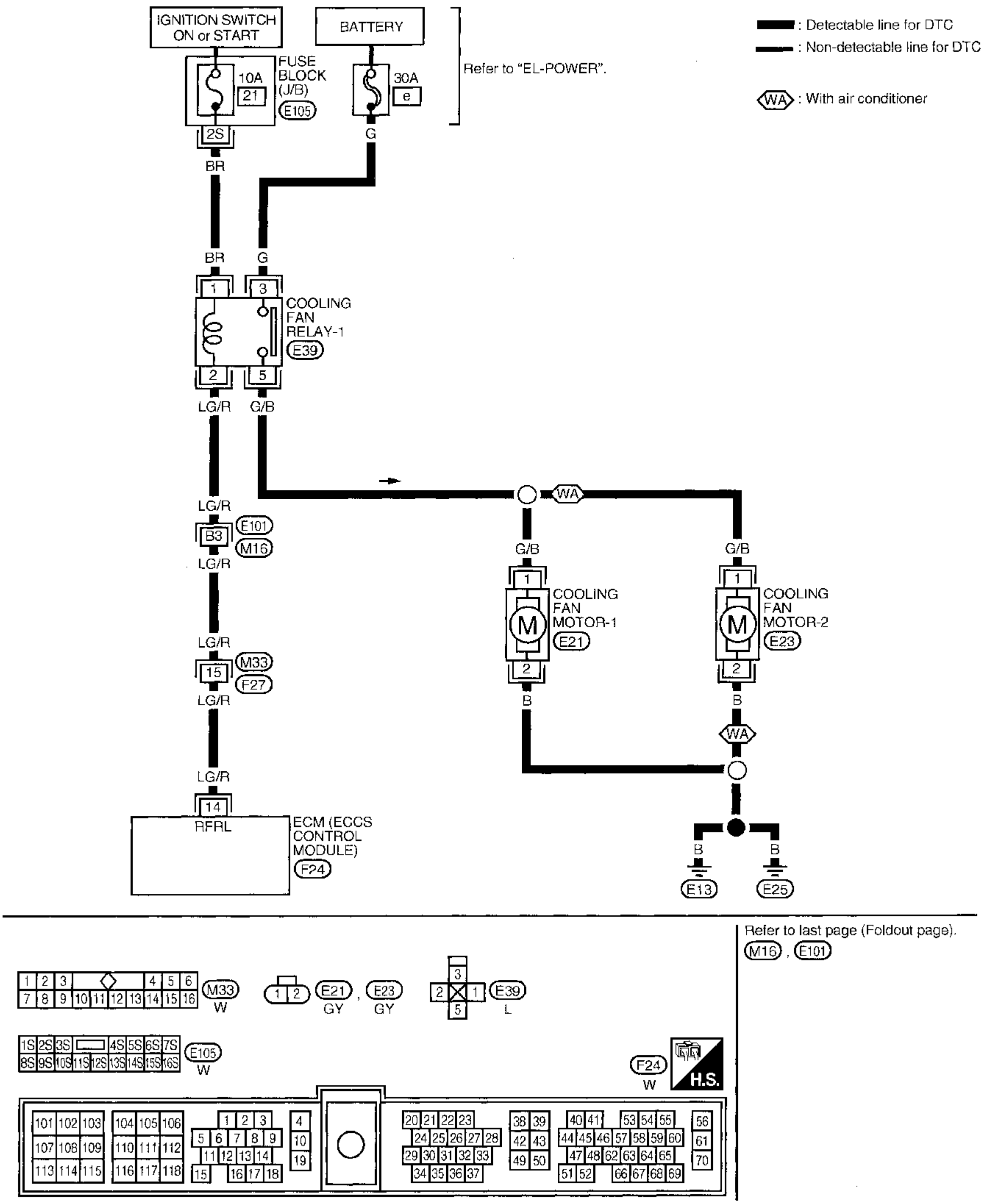
For A/T models



AEC260A

For M/T models

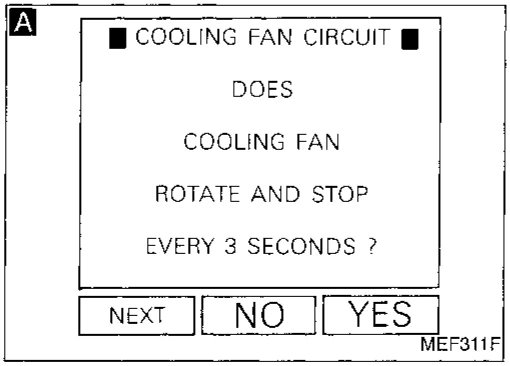
EC-COOL/F-02

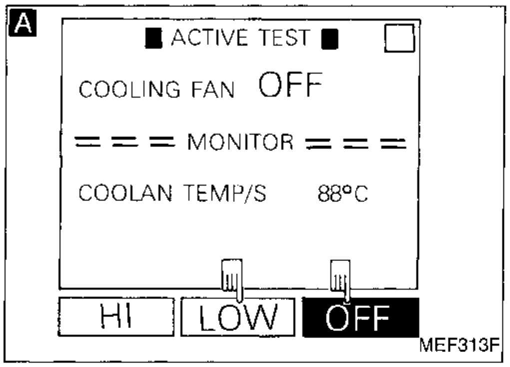


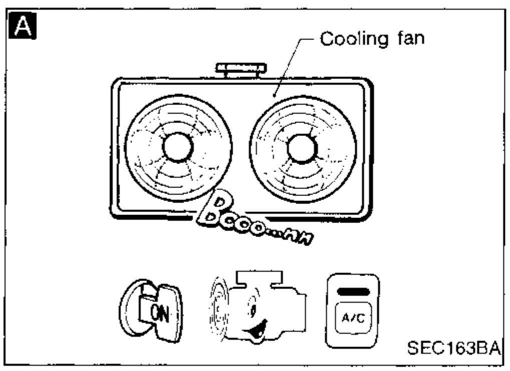
AEC281A

Cooling Fan (Overheat) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

A

CHECK COOLING FAN LOW SPEED OPERATION (A/T MODELS) AND HIGH SPEED OPERATION (M/T MODELS).

1. Disconnect cooling fan relays-2 and -3 for A/T models.
2. Turn ignition switch "ON".
3. Perform "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

2. Turn ignition switch "ON".
3. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

2. Start engine.
3. Set temperature lever at full cold position.
4. Turn air conditioner switch "ON".
5. Turn blower fan switch "ON".
6. Run engine at idle for a few minutes with air conditioner operating.
7. Make sure that cooling fan operates at low speed for A/T models and at high speed for M/T models.

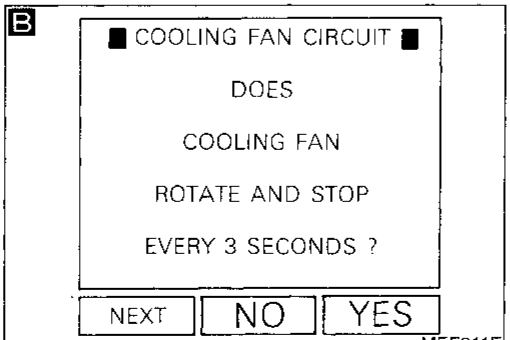
NG → Check cooling fan low speed control circuit (A/T models) and high speed control circuit (M/T models). (Go to PROCEDURE A.)

↓ OK

Ⓐ

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

Cooling Fan (Overheat) (Cont'd)



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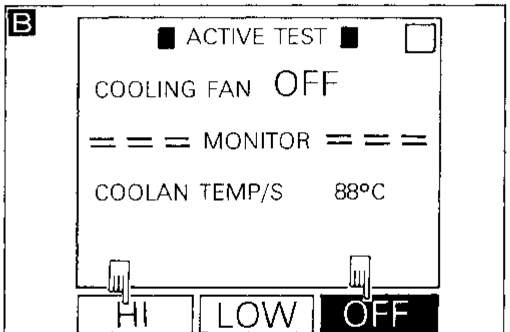

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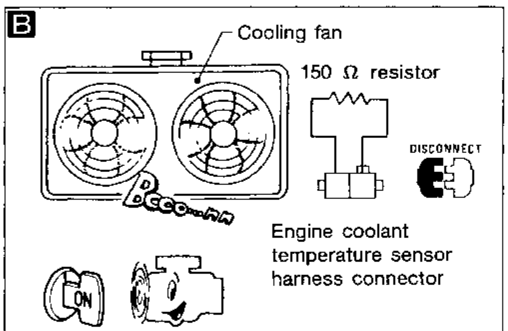


MEF613EA

Ⓐ

B

CHECK COOLING FAN HIGH SPEED OPERATION (A/T MODELS).

1. Turn ignition switch "OFF".
2. Reconnect cooling fan relays-2 and -3.
3. Disconnect cooling fan relay-1.
4. Turn ignition switch "ON".
5. Perform "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

4. Turn ignition switch "ON".
5. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

4. Turn air conditioner switch and blower fan switch "OFF".
5. Disconnect engine coolant temperature sensor harness connector.
6. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
7. Restart engine and make sure that cooling fan operates at higher speed than low speed.

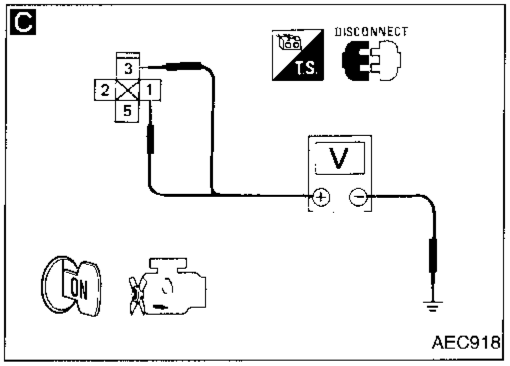
NG → Check cooling fan high speed control circuit. (Go to PROCEDURE B.)

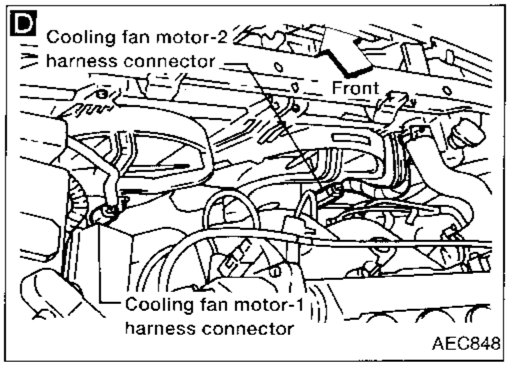
OK ↓

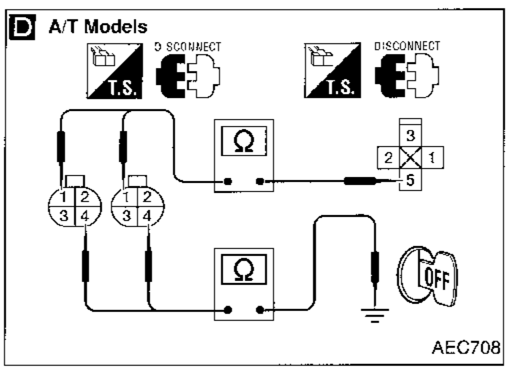
Ⓑ

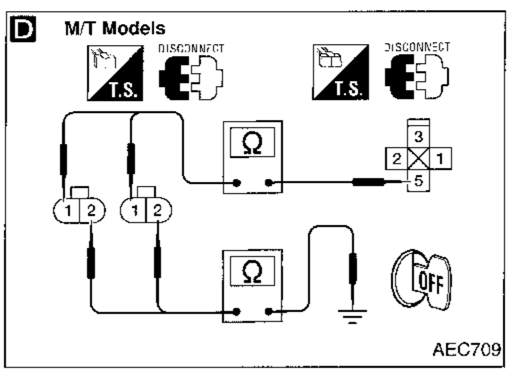
(Go to EC-554).

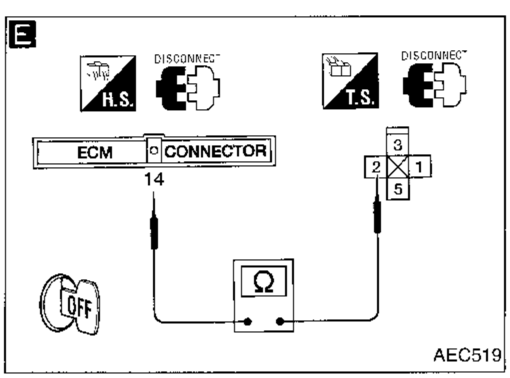
Cooling Fan (Overheat) (Cont'd)











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 link
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

If NG, repair harness or connectors.

OK ↓

D

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between terminal ① and terminal ⑤ .
Continuity should exist.
If OK, check harness for short.
4. Check harness continuity between terminal ④ (A/T models), ② (M/T models) and body ground.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

E

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑭ and terminal ②.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors M16, E101
- Harness connectors F27, M33
- Harness for open or short between cooling fan relay-1 and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-1).
Refer to "COMPONENT INSPECTION", EC-216.

NG → Replace cooling fan relay.

OK ↓

Ⓒ

(Go to next page.)

Cooling Fan (Overheat) (Cont'd)

Ⓒ

CHECK COMPONENT (Cooling fan motors-1 and -2). Refer to "COMPONENT INSPECTION", EC-216.	NG →	Replace cooling fan motors.

↓ OK

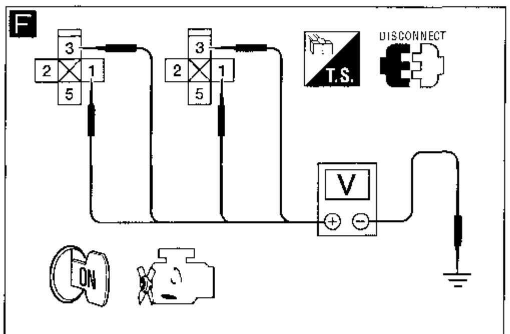
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END



AEC711

PROCEDURE B (For A/T models)

INSPECTION START

↓

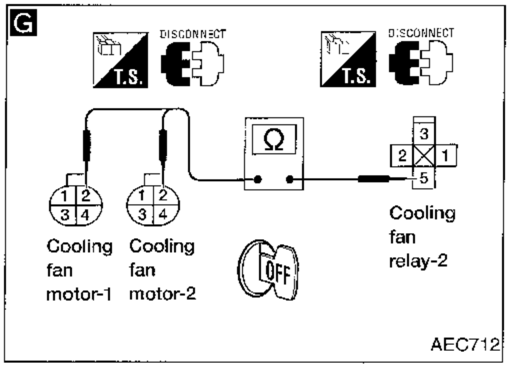
F

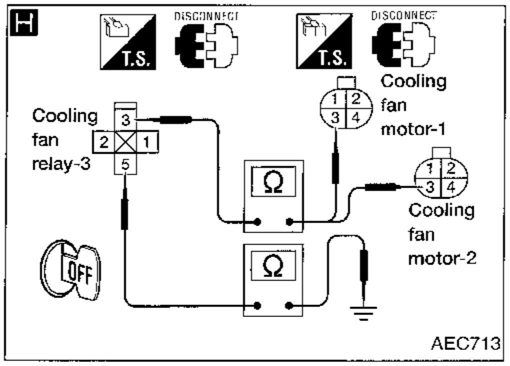
CHECK POWER SUPPLY. 1. Turn ignition switch "OFF". 2. Disconnect cooling fan relays-2 and -3. 3. Turn ignition switch "ON". 4. Check voltage between cooling fan relays-2 and -3 terminals ①, ③ and ground with CONSULT or tester. **Voltage: Battery voltage**	NG →	Check the following. ● 10A fuse ● 30A fusible link ● Harness for open or short between cooling fan relays-2 and -3 and fuse ● Harness for open or short between cooling fan relays-2 and -3 and battery If NG, repair harness or connectors.

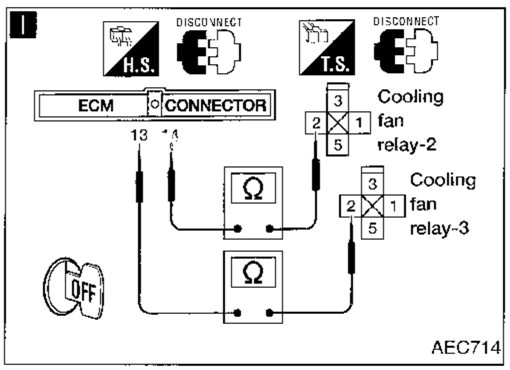
↓ OK

Ⓓ

(Go to next page.)







Ⓓ

CHECK POWER AND GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motors-1 and -2 harness connectors.
G 3. Check harness continuity between cooling fan relay-2 terminal ⑤ and cooling fan motors-1 and -2 terminal ②.
Continuity should exist.
If OK, check harness for short.
H 4. Check harness continuity between cooling fan relay-3 terminal ③ and cooling fan motors-1 and -2 terminal ③, cooling fan relay-3 terminal ⑤ and body ground.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

I

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑬ and cooling fan relay-3 terminal ②, ECM terminal ⑭ and cooling fan relay-2 terminal ②.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors (M16), (E101)
- Harness connectors (F27), (M33)
- Harness for open or short between cooling fan relays-2 and -3 and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENTS
(Cooling fan relays-2 and -3).
Refer to "COMPONENT INSPECTION", EC-216.

NG → Replace cooling fan relays.

OK ↓

CHECK COMPONENTS
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-216.

NG → Replace cooling fan motors.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

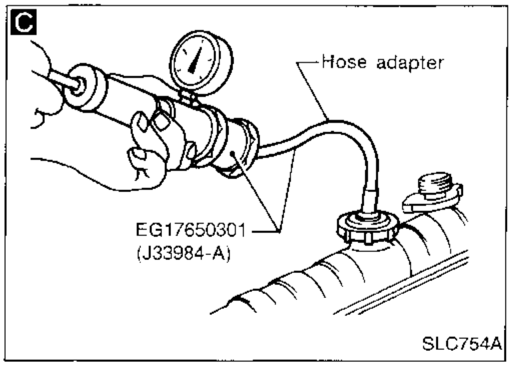
↓ Trouble is not fixed.

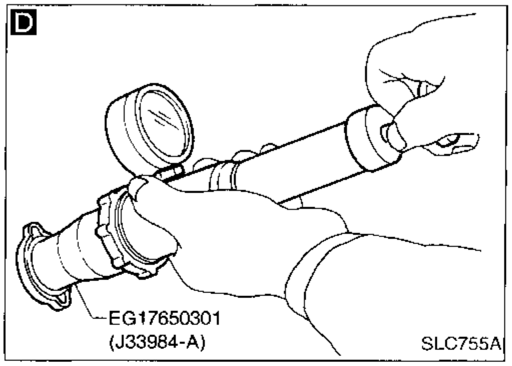
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

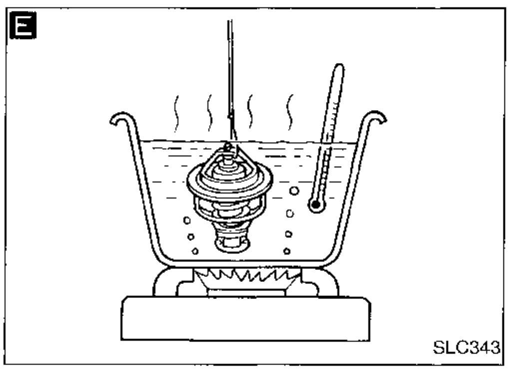
↓

INSPECTION END

Cooling Fan (Overheat) (Cont'd)







Ⓑ

C

CHECK COOLING SYSTEM FOR LEAK.
Apply pressure to the cooling system with a tester, and check if the pressure drops.
Testing pressure:
157 kPa (1.6 kg/cm^2, 23 psi)
Pressure should not drop.
CAUTION:
Higher than the specified pressure may cause radiator damage.

NG → Check the following for leak.
- Hose
- Radiator
- Water pump

Refer to LC section ("Water Pump").

OK ↓

D

CHECK RADIATOR CAP.
Apply pressure to cap with a tester.
Radiator cap relief pressure:
59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi)

NG → Replace radiator cap.

OK ↓

E

CHECK THERMOSTAT.
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.
   Valve opening temperature:
   76.5°C (170°F) [standard]
   Valve lift:
   More than 8.0 mm/90°C (0.31 in/194°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC section ("Thermostat").

NG → Replace thermostat

OK ↓

Check engine coolant temperature sensor. Refer to "COMPONENT INSPECTION", EC-216.

NG → Replace engine coolant temperature sensor.

↓

If the cause can not be isolated, go to "MAIN 12 CAUSES OF OVERHEATING" on next page.

↓

INSPECTION END

Perform FINAL CHECK by the following procedure after repair is completed.

1. Warm up engine. Run the vehicle for at least 20 minutes. Pay attention to engine coolant temperature gauge on the instrument panel. If the reading shows an abnormally high temperature, another part may be malfunctioning.
2. Stop vehicle and let engine idle. Check the intake and exhaust systems for leaks by listening for noise or visually inspecting the components.
3. Allow engine to cool and visually check for oil and coolant leaks. Then, perform "OVERALL FUNCTION CHECK".

Cooling Fan (Overheat) (Cont'd)

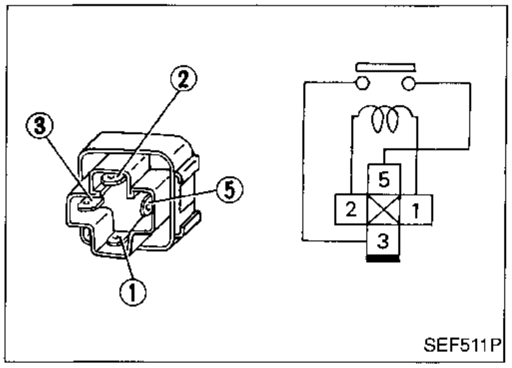
MAIN 12 CAUSES OF OVERHEATING

Engine	Step	Inspection item	Equipment	Condition	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi)	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	5	● Coolant leaks	● Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section
ON*1	7	● Cooling fan	● CONSULT	Operating	See "TROUBLE DIAGNOSIS FOR DTC P1900" (EC-544)
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

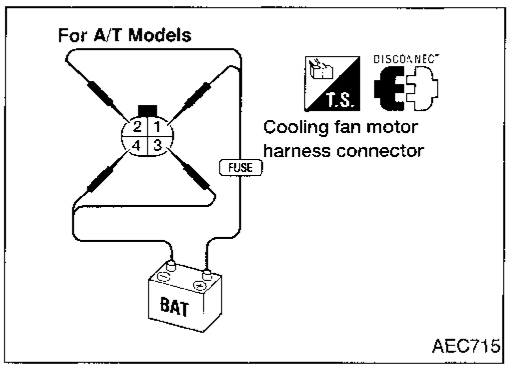


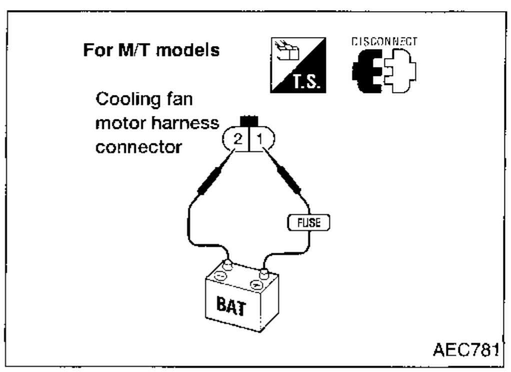
Cooling fan relays-1, -2 and -3

Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.





Cooling fan motors-1 and -2

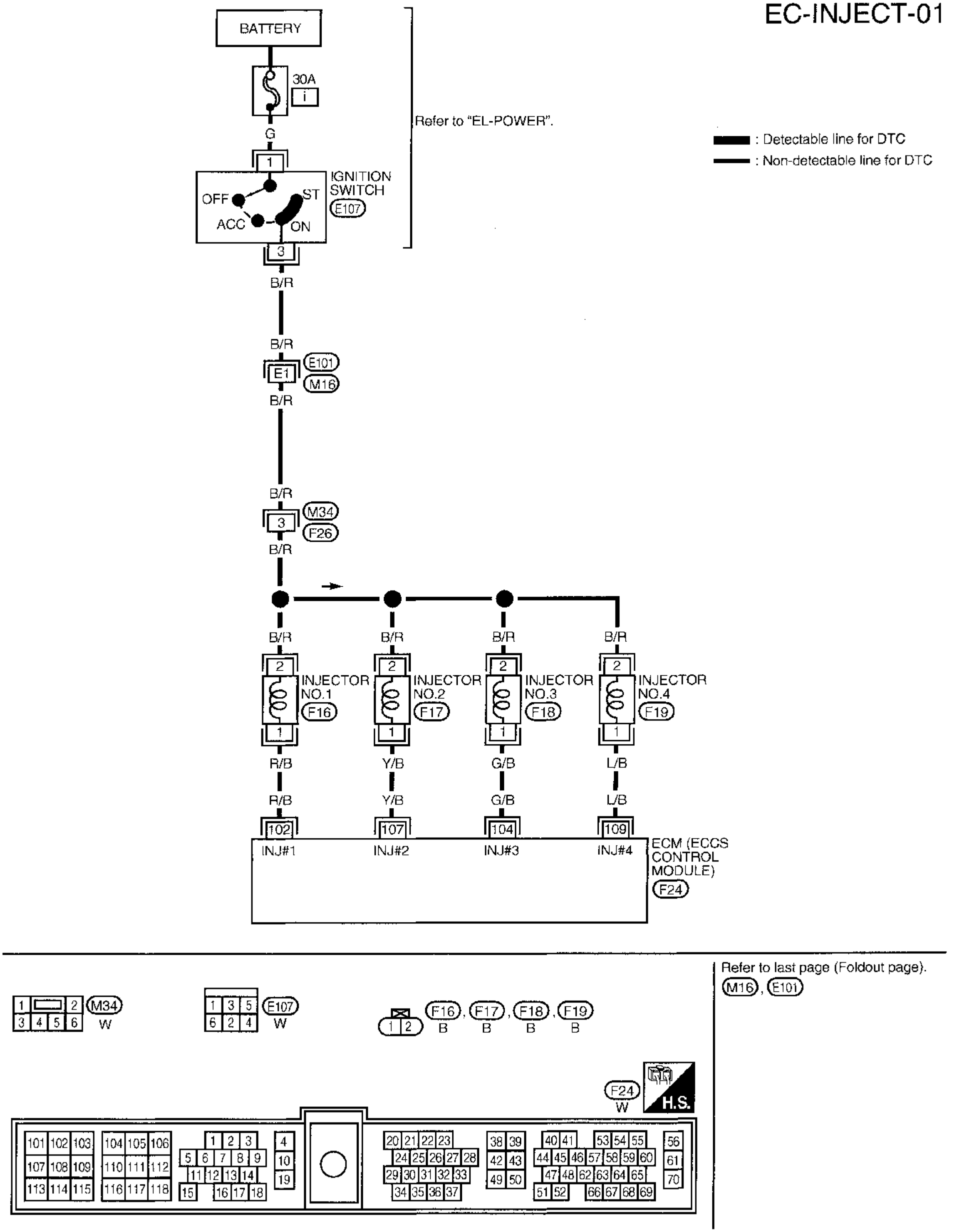
1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(⊕)	(⊖)
Cooling fan motor	Low (A/T models)	①	④
	High (A/T models)	②	③
	High (M/T models)	①	②

Cooling fan motor should operate.

If NG, replace cooling fan motor.

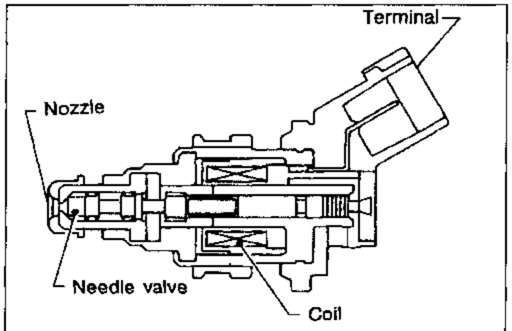
Injector



AEC261A

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

Injector (Cont'd)



SEF596K

COMPONENT DESCRIPTION

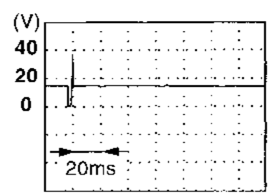
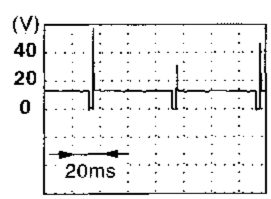
The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends 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.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	2.4 - 3.2 msec.
		2,000 rpm	1.9 - 3.2 msec.
B/FUEL SCHDL	ditto	Idle	0.7 - 1.5 msec
		2,000 rpm	0.7 - 1.5 msec

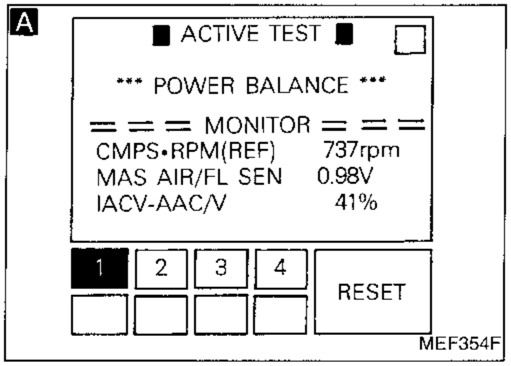
ECM TERMINALS AND REFERENCE VALUE

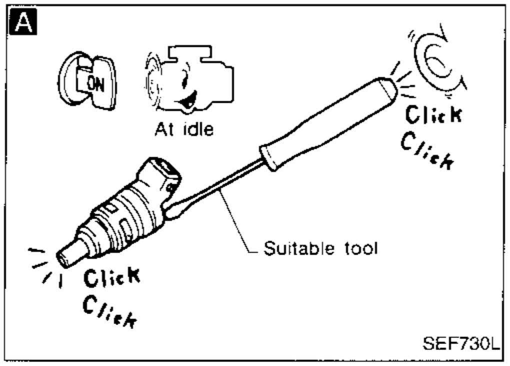
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

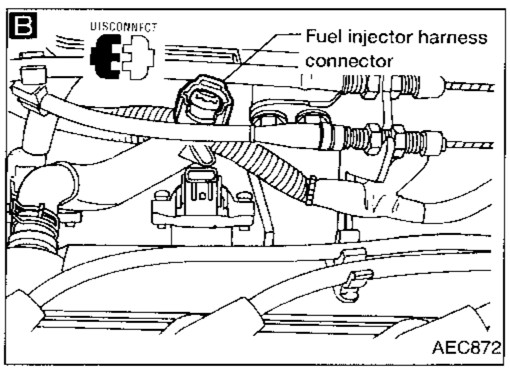
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
102	R/B	Injector No. 1	[Engine is running.] (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF204T
104	G/B	Injector No. 3		
107	Y/B	Injector No. 2	[Engine is running.] (Warm-up condition) └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)  SEF205T
109	L/B	Injector No. 4		

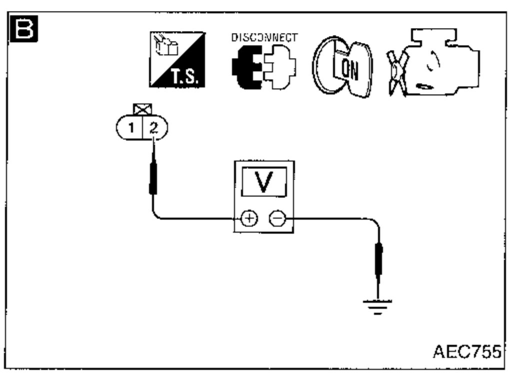
Injector (Cont'd)

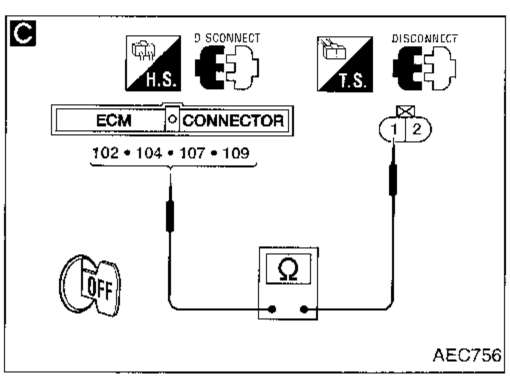
DIAGNOSTIC PROCEDURE











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

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.

OK → INSPECTION END

NG ↓

B

CHECK POWER SUPPLY.

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminals ② and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.
- Harness connectors (E101), (M16)
- Harness connectors (M34), (F26)
- Harness for open or short between injector and ignition switch

If NG, repair harness or connectors.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminal ① and ECM terminals (102), (104), (107), (109).

Continuity should exist.

NG → Check the following.
- Harness for open or short between ECM and injector

If 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

GI
MA
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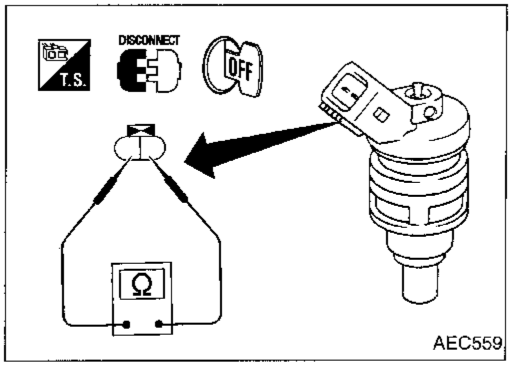


Injector (Cont'd)

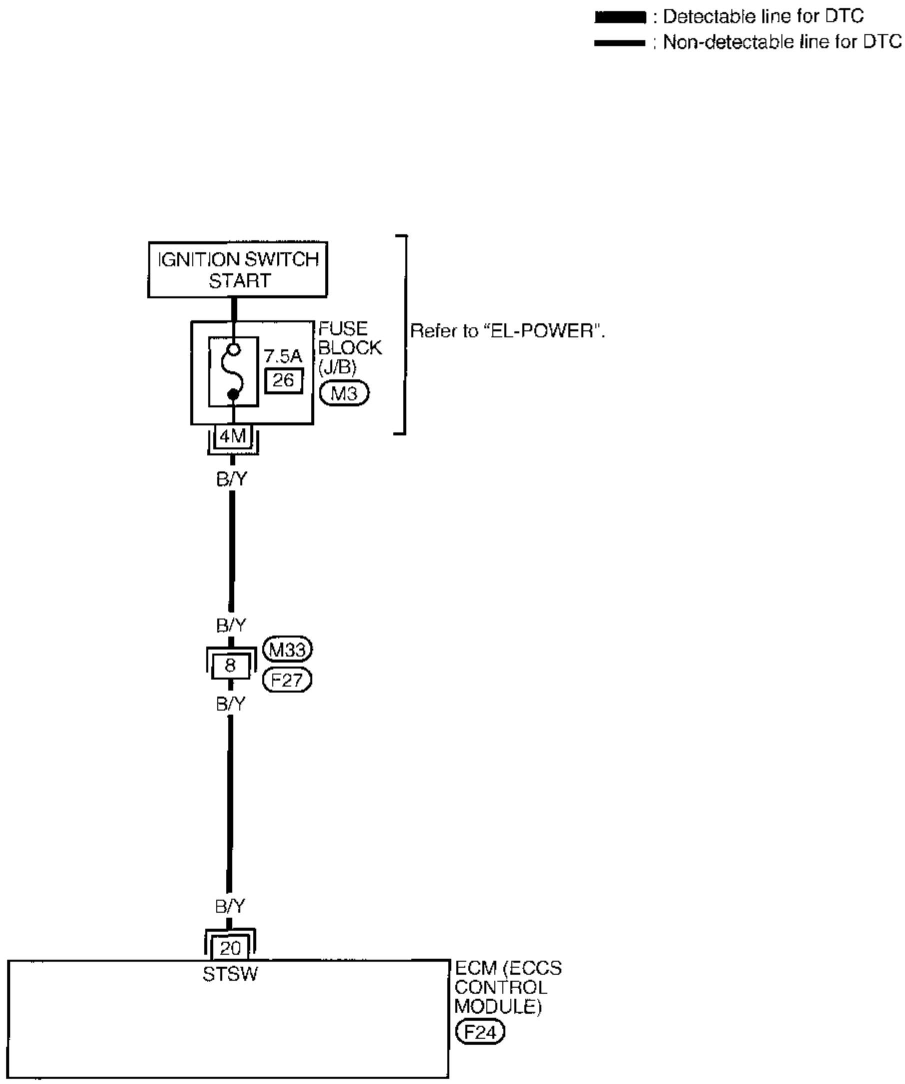
COMPONENT INSPECTION

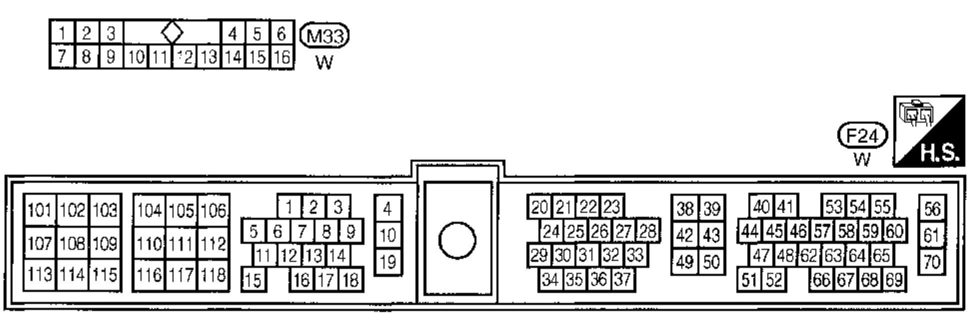
Injector

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.

Start Signal

EC-S/SIG-01





Refer to last page (Foldout page).
M3

AEC262A

Start Signal (Cont'd)

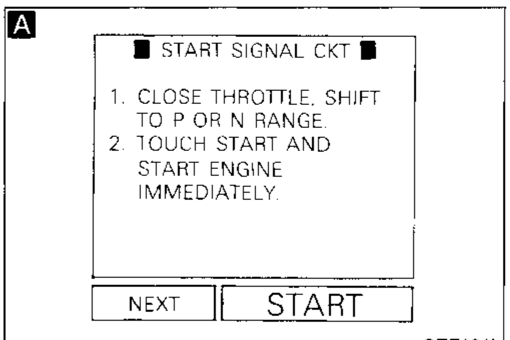
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

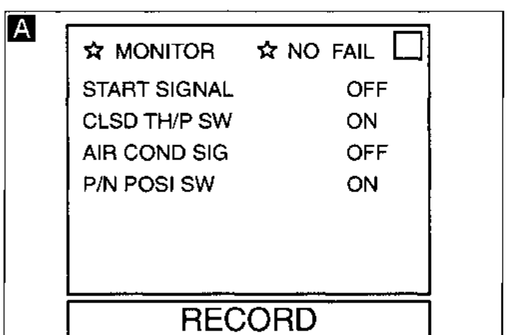
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and 43 (ECCS ground).

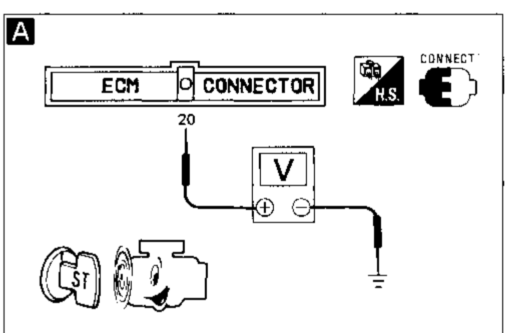
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
20	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)



SEF191L



SEF111P



SEF109P

DIAGNOSTIC PROCEDURE

INSPECTION START

↓

A **CHECK OVERALL FUNCTION.**

1. Turn ignition switch "ON".
2. Perform "START SIGNAL CKT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1. Turn ignition switch to "START".
2. Check voltage between ECM terminal 20 and ground.

Voltage:
Ignition switch "START"
Battery voltage
Except above
Approximately 0V

OK → INSPECTION END

↓ NG

A (Go to next page.)

Start Signal (Cont'd)

Ⓐ

↓

Check the following.
- Harness connectors (M33), (F27)
- 7.5A fuse
- Harness for open or short between ECM harness connector and ignition switch

If NG, repair harness or connectors.

↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

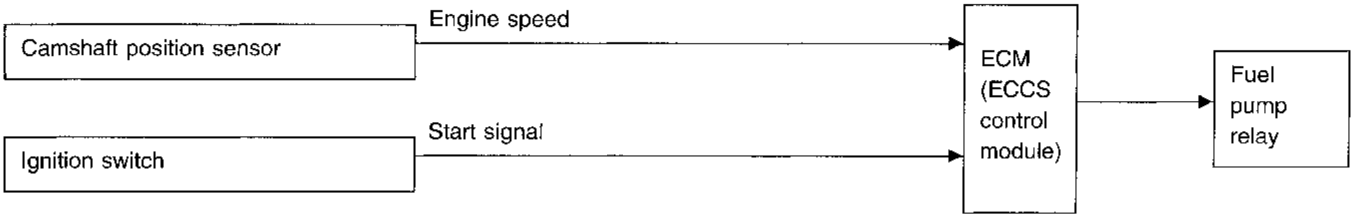
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

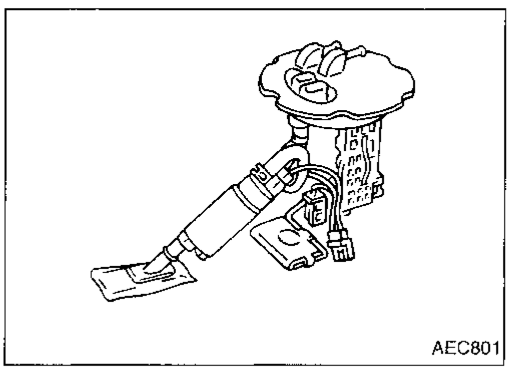
Fuel Pump

SYSTEM DESCRIPTION



The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 180° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops



COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (stops in 1.0 seconds)	ON
	● Except as shown above	OFF

Fuel Pump (Cont'd)

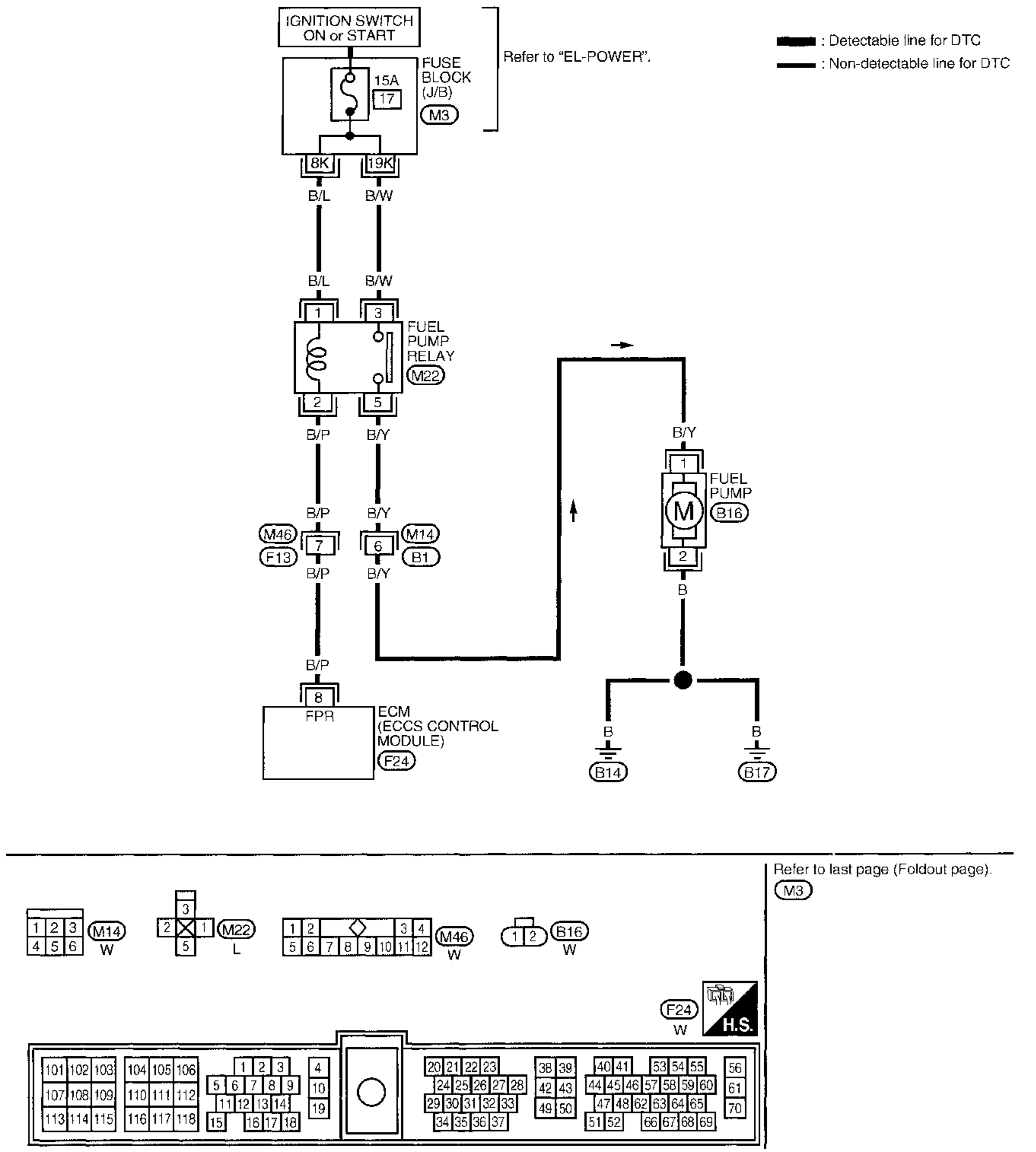
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and 43 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
8	B/P	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0 - 1V
			Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

Fuel Pump (Cont'd)

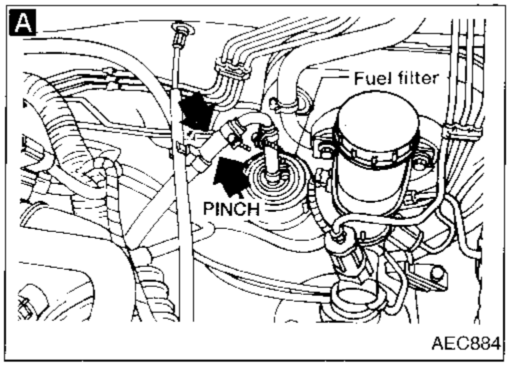
EC-F/PUMP-01

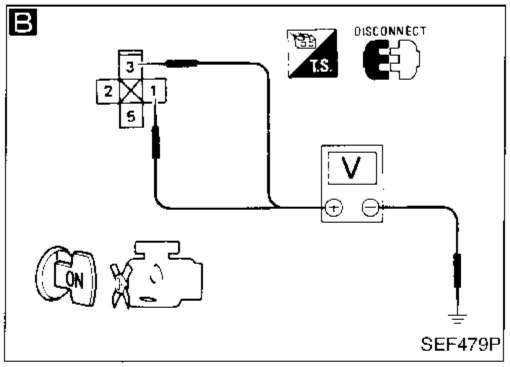


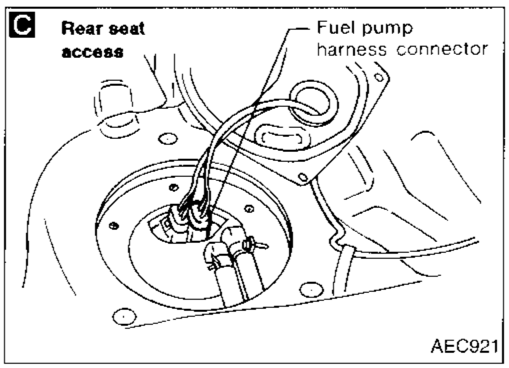
AEC263A

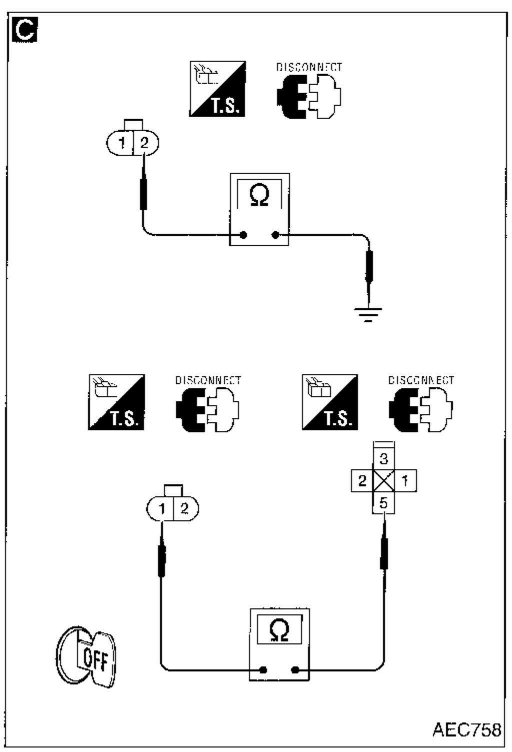
Fuel Pump (Cont'd)

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 from relay box.
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.
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

If NG, repair harness or connectors.

OK ↓

C

CHECK POWER GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.
3. Check harness continuity between terminal 2 and body ground, terminal 1 and fuel pump relay connector terminal 5.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors M14, B1
- Harness for open or short between fuel pump and body ground
- Harness for open or short between fuel pump and fuel pump relay

If NG, repair harness or connectors.

OK ↓

D

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 8 and fuel pump relay connector terminal 2.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors M46, F13
- Harness for open or short between ECM and fuel pump relay

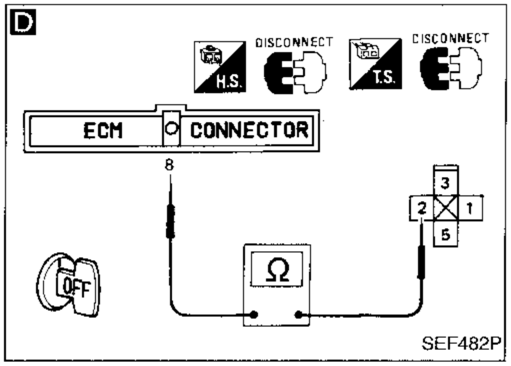
If NG, repair harness or connectors.

OK ↓

A

(Go to next page.)

Fuel Pump (Cont'd)



SEF482P

Ⓐ

↓

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

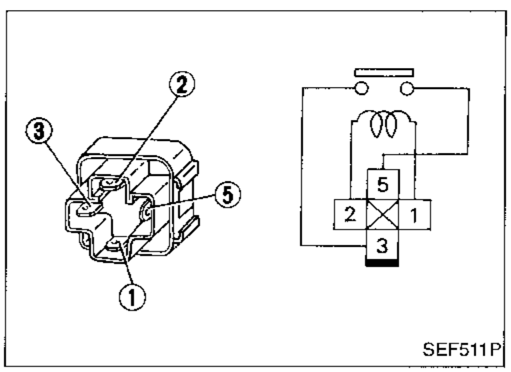
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ 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



SEF511P

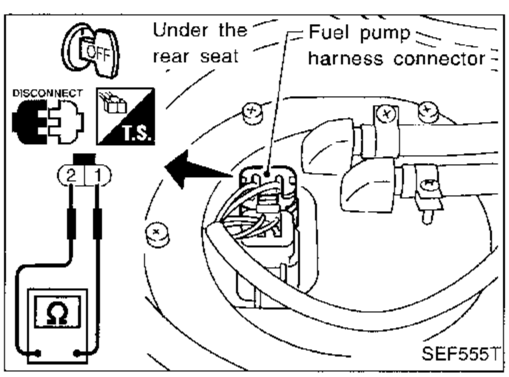
COMPONENT INSPECTION

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.



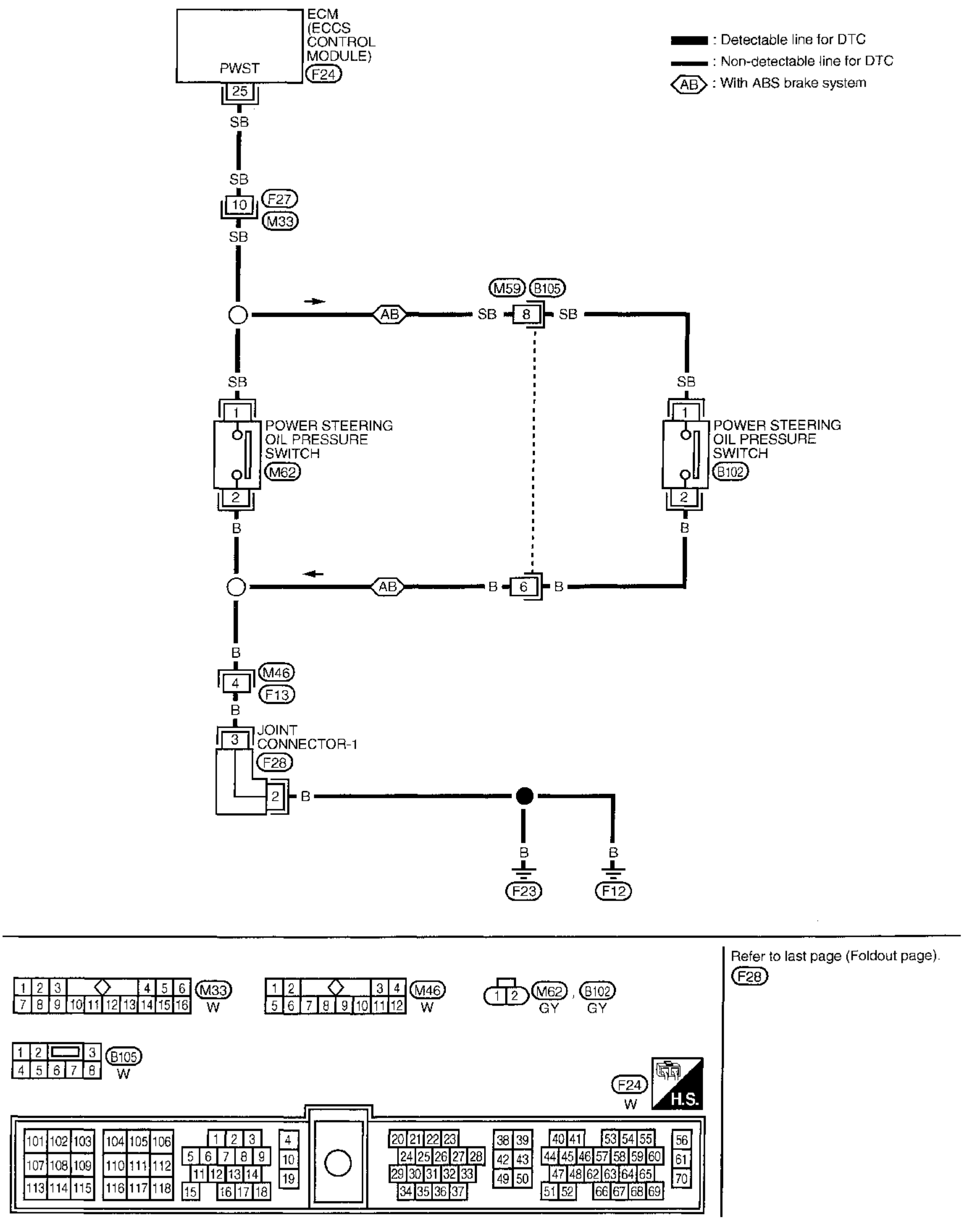
SEF555T

Fuel pump

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ① and ②.
   Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]
   If NG, replace fuel pump.

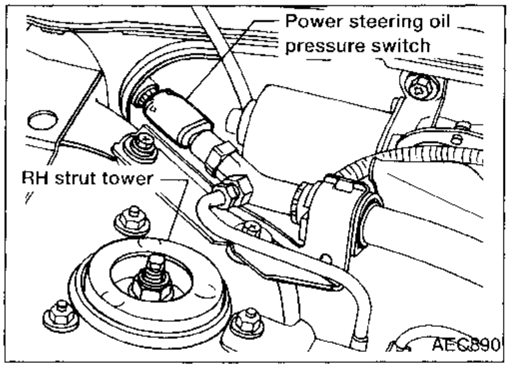
Power Steering Oil Pressure Switch

EC-PST/SW-01



AEC264A

Power Steering Oil Pressure Switch (Cont'd)



COMPONENT DESCRIPTION

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

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

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
25	SB	Power steering oil pressure switch	[Engine is running.] └ Steering wheel is being turned	Approximately 0V
			[Engine is running.] └ Steering wheel is not being turned	Approximately 5V

Power Steering Oil Pressure Switch (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

↓

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Start engine.
2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT.
   Steering is in neutral position:
   OFF
   Steering is turned:
   ON

OR

1. Start engine.
2. Check voltage between ECM terminal ㉕ and ground.
   Voltage:
   When steering wheel is turned quickly.
   Approximately 0V
   Except above
   Approximately 5V

OK → INSPECTION END

NG ↓

B

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch harness connector.
3. Check harness continuity between terminal ② and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F13), (M46) (and (M59), (B105) for ABS models)
- Joint connector-1
- Harness for open or short between power steering oil pressure switch and ground

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉕ and terminal ①.
   Continuity should exist.
   If OK, check harness for short.

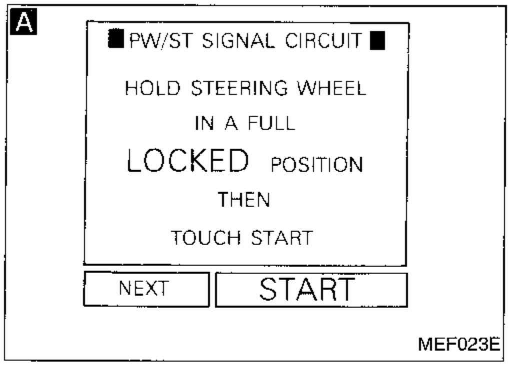
NG → Check the following.
- Harness connectors (F27), (M33) (and (M59), (B105) for ABS models)
- Harness for open or short between ECM and power steering oil pressure switch

If NG, repair harness or connectors.

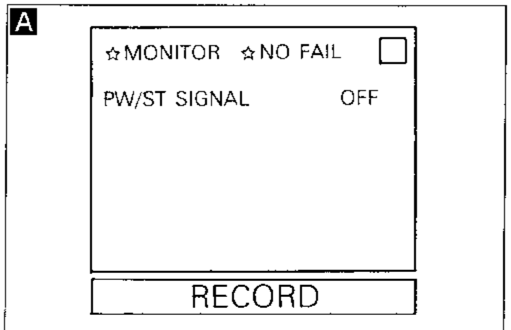
OK ↓

Ⓐ

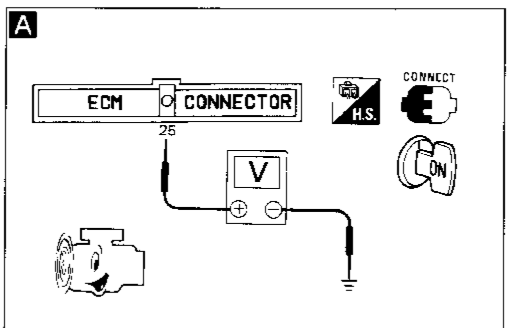
(Go to next page.)



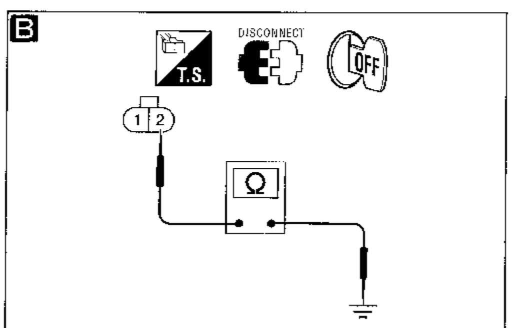
MEF023E



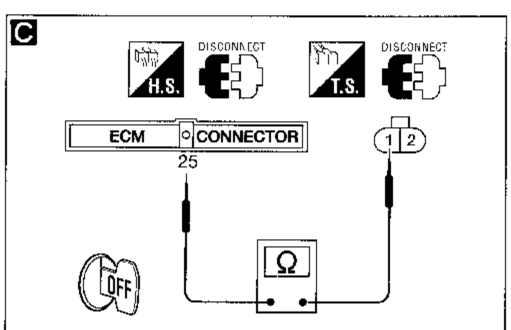
SEF591I



SEF126P



AEC760



AEC761

Power Steering Oil Pressure Switch (Cont'd)

Ⓐ

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "COMPONENT INSPECTION" below.

NG → Replace power steering oil pressure switch.

↓ OK

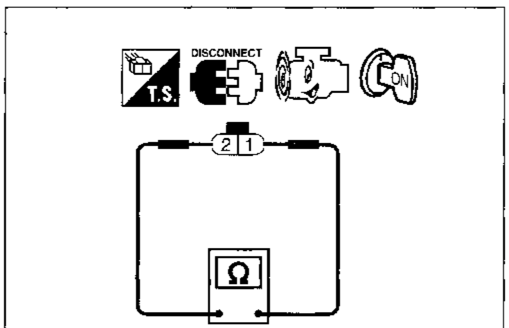
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ 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



SEF419T

COMPONENT INSPECTION

Power steering oil pressure switch

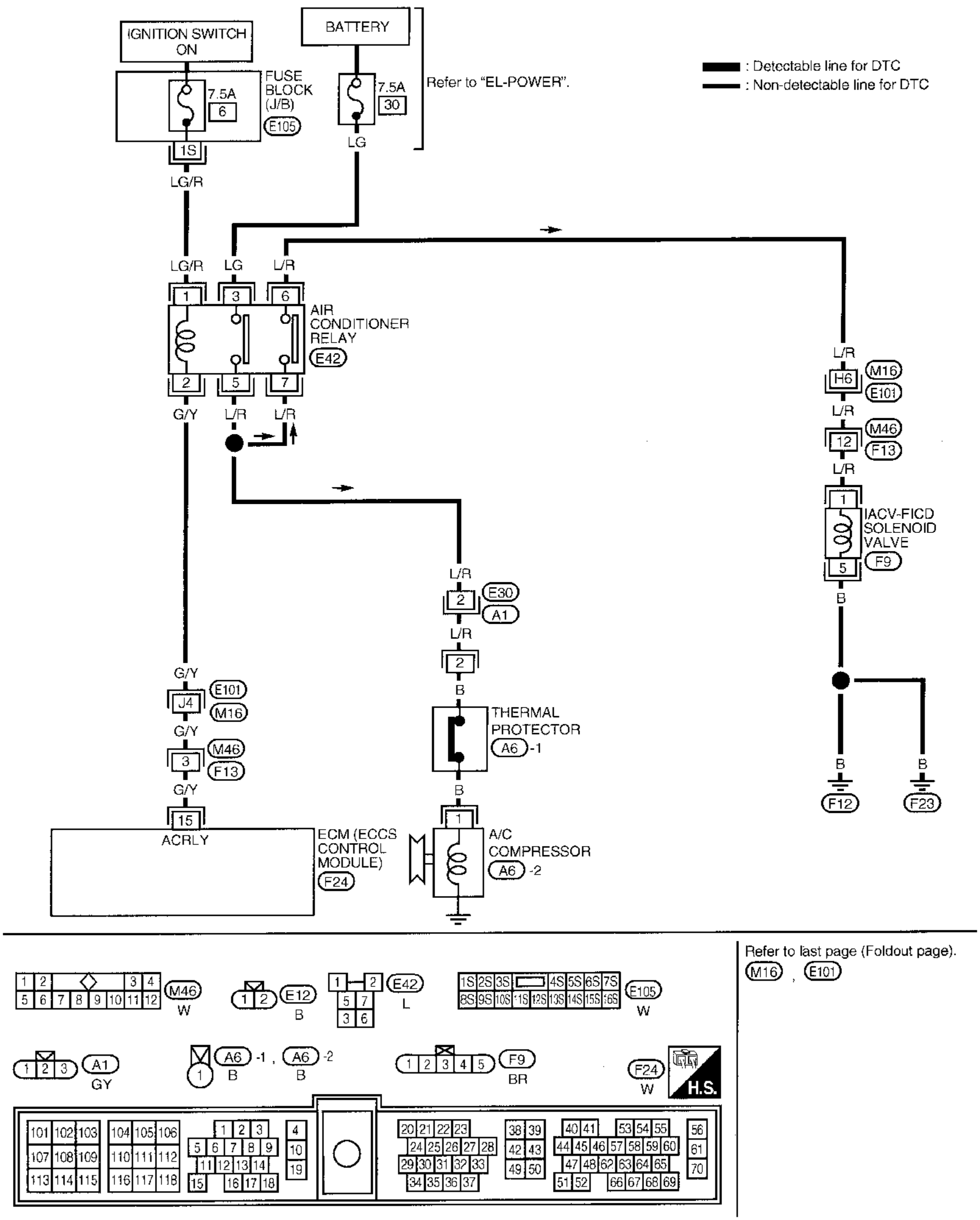
1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals ① and ②.

Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If NG, replace power steering oil pressure switch.

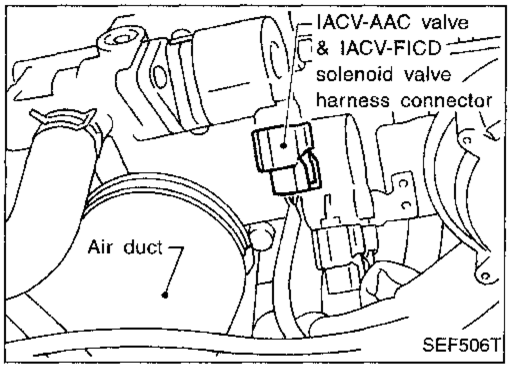
IACV-FICD Solenoid Valve

EC-FICD-01



AEC265A

IACV-FICD Solenoid Valve (Cont'd)



COMPONENT DESCRIPTION

The IACV-FICD solenoid valve is built into the IACV-AAC valve body. When the air conditioner is on, the IACV-FICD solenoid valve supplies additional air to adjust to the increased load.

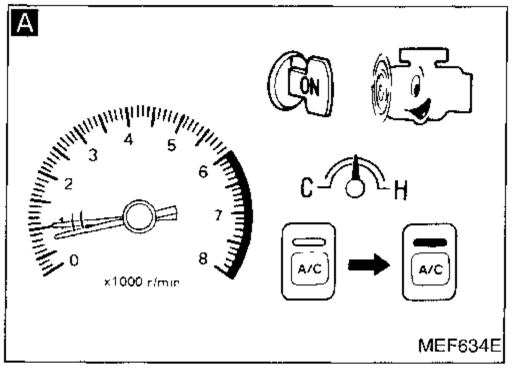
ECM TERMINALS AND REFERENCE VALUE

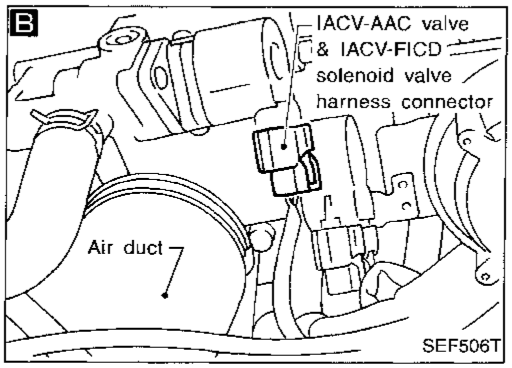
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

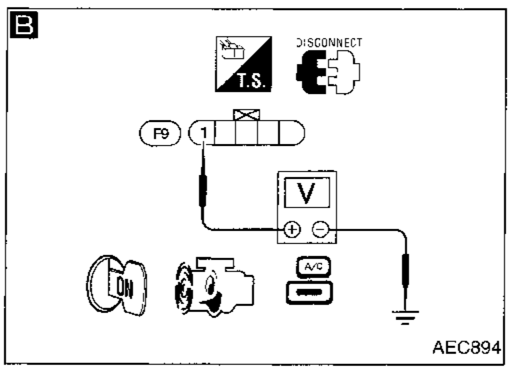
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
15	G/Y	Air conditioner relay	[Engine is running.] └ Both A/C switch and blower switch are "ON"	0 - 0.3V
			[Engine is running.] └ A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)

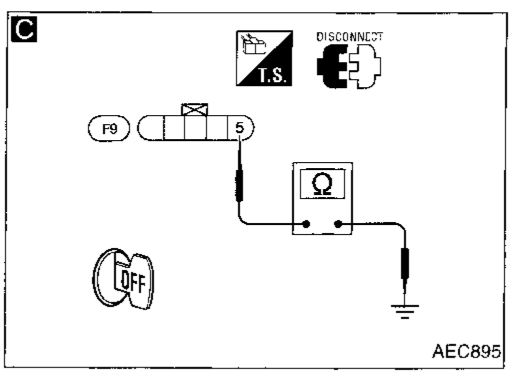
IACV-FICD Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

↓

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up sufficiently.
2. Check idle speed.
   M/T models except for Canada:
   675±50 rpm
   M/T models for Canada:
   750±50 rpm
   A/T models:
   800±50 (in "N" position)
   If NG, adjust idle speed.
3. Turn air conditioner switch and blower fan switch "ON".
4. Recheck idle speed.
   900 rpm or more (A/T in "N" position)

OK → INSPECTION END

NG ↓

Check if air conditioner compressor functions normally.

NG → Refer to HA section ("TROUBLE DIAGNOSES").

OK ↓

B

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect IACV-AAC valve & IACV-FICD solenoid valve harness connector.
3. Start engine, then turn air conditioner switch and blower fan switch "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors E101, M16, M46, F13
- Harness for open or short between IACV-AAC valve & IACV-FICD solenoid valve harness connector and air conditioner relay

If NG, repair harness or connectors.

OK ↓

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ⑤ and body ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

Ⓐ

(Go to next page.)

IACV-FICD Solenoid Valve (Cont'd)

Ⓐ

↓

CHECK COMPONENT
(IACV-AAC valve & IACV-FICD solenoid valve).
Refer to "COMPONENT INSPECTION" below.

→ NG → Replace IACV-AAC valve & IACV-FICD solenoid valve.

↓ OK

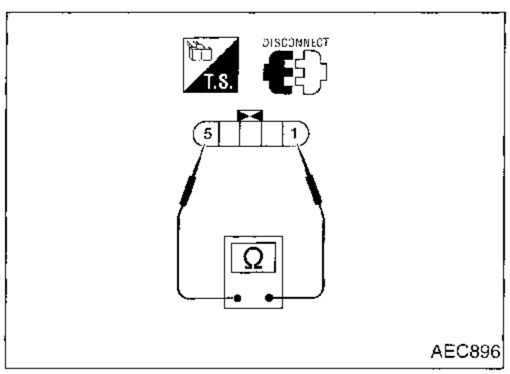
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector. Then retest.

↓

INSPECTION END

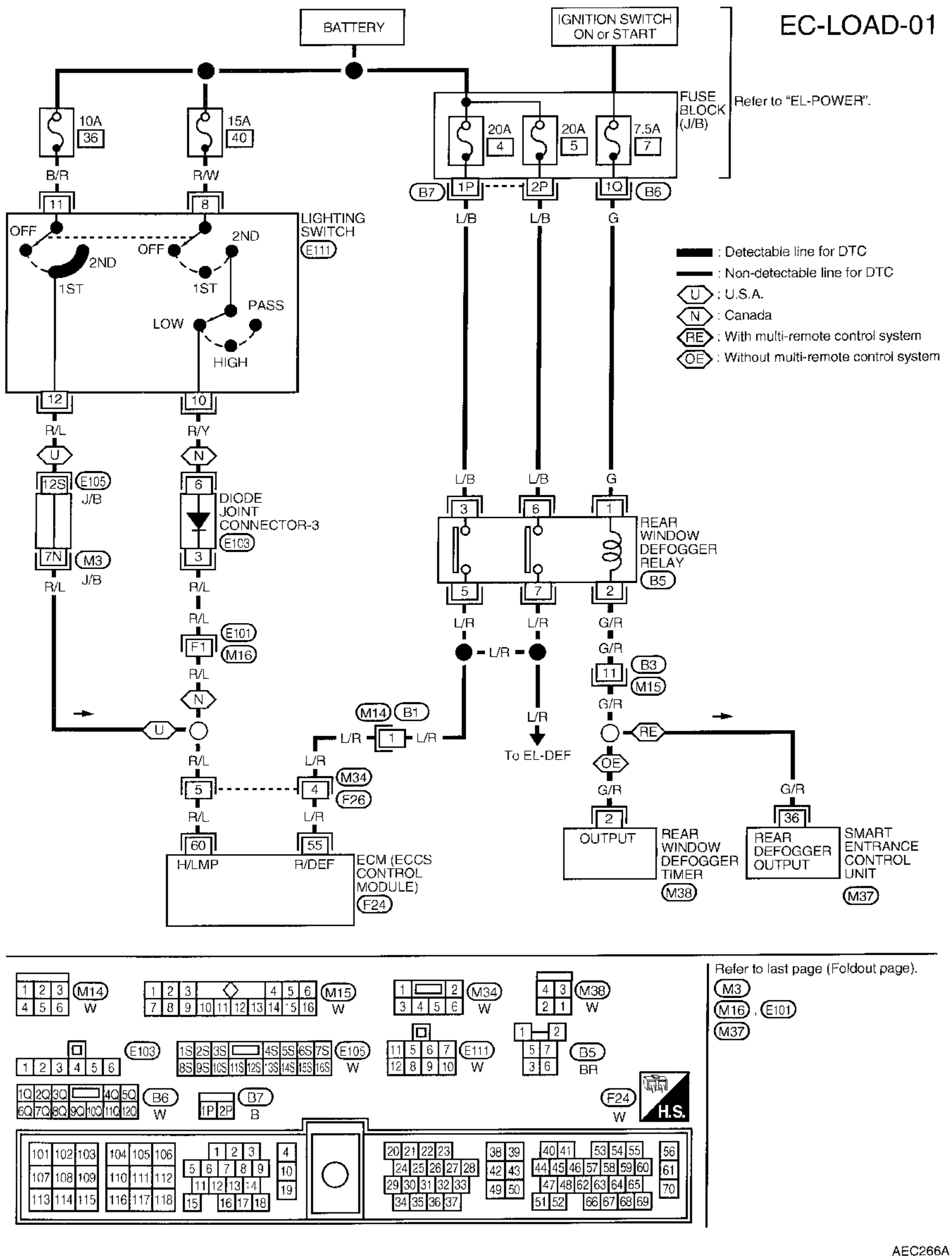


COMPONENT INSPECTION

IACV-FICD solenoid valve

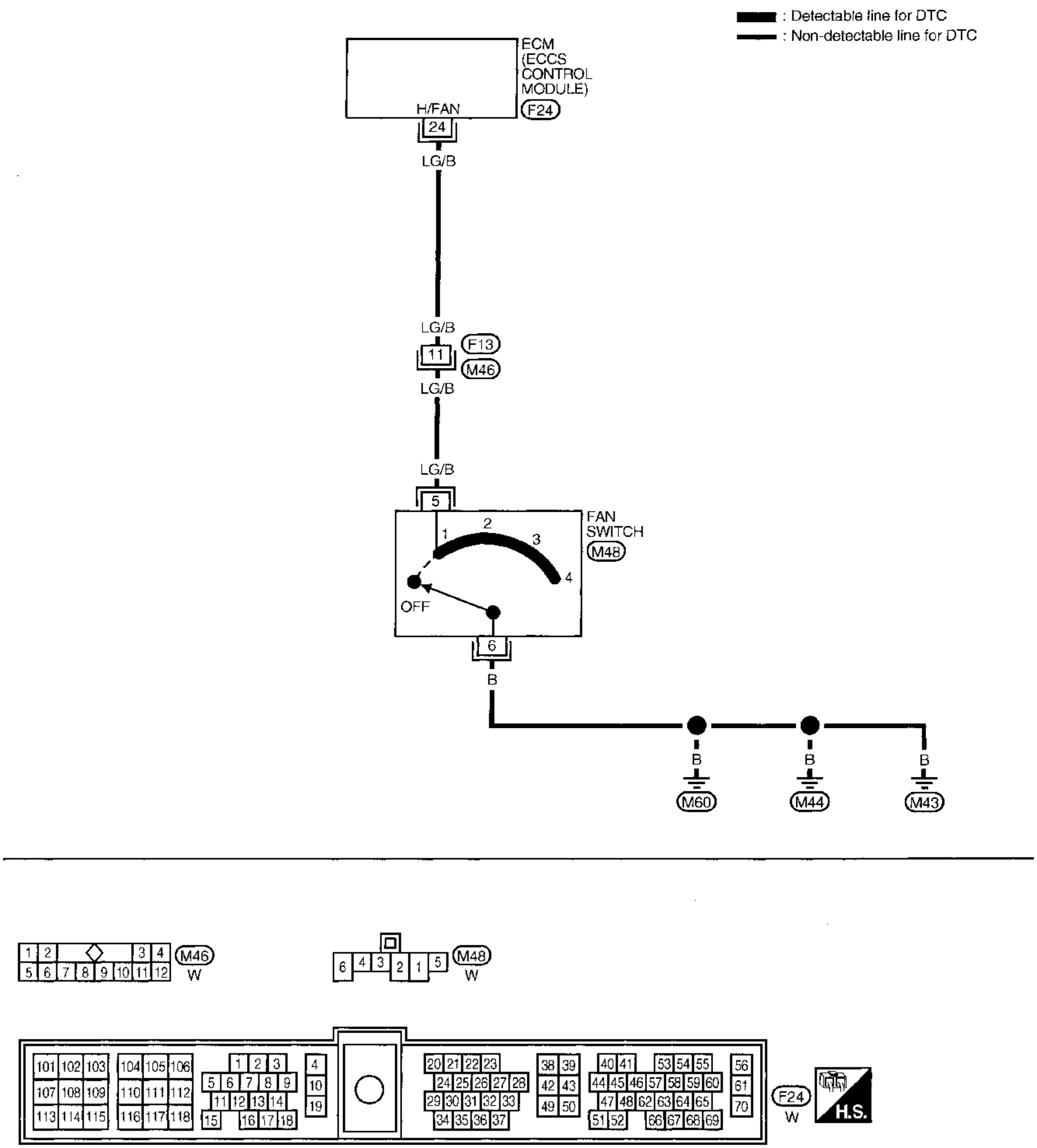
1. Disconnect IACV-AAC valve & IACV-FICD solenoid valve harness connector.
2. Check resistance between terminals ① and ⑤.
   Resistance: 75 - 125Ω [at 25°C (77°F)]
   If NG, replace IACV-AAC valve & IACV-FICD solenoid valve.

Electrical Load Signal



Electrical Load Signal (Cont'd)

EC-LOAD-02



AEC267A

Electrical Load Signal (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger is operating and/or lighting switch* is on	ON
		Rear window defogger is not operating and lighting switch is not on	OFF

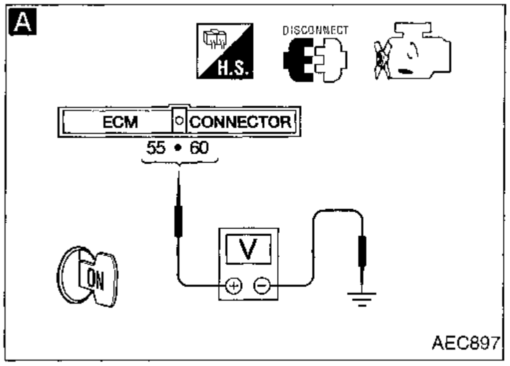
ECM TERMINALS AND REFERENCE VALUE

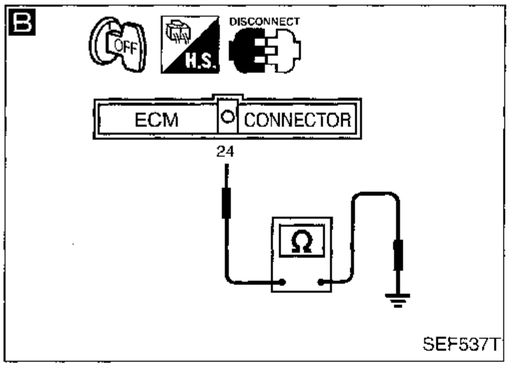
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
24	LG/B	Blower fan switch	[Ignition switch "ON"] — Blower fan switch is "ON"	Approximately 0V
55	L/R	Rear defogger relay	[Ignition switch "ON"] — Rear defogger is "OFF"	Approximately 0V
			[Ignition switch "ON"] — Rear defogger is "ON"	BATTERY VOLTAGE (11 - 14V)
60	R/L	Headlamp switch	[Lighting switch "ON"]	BATTERY VOLTAGE (11 - 14V)
			[Lighting switch "OFF"]	Approximately 0V

Electrical Load Signal (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START

↓

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Turn ignition switch "ON".
4. Check voltage between ECM terminal (55), (60) and ground with CONSULT or tester.

Voltage between (55) and ground:
Rear window defogger "ON"
Battery positive voltage
Rear window defogger "OFF"
0V
Voltage between (60) and ground:
Lighting switch "ON" or daytime running light "ON"
Battery positive voltage
Lighting switch "OFF" or daytime running light "OFF"
0V

NG → Check the following.
For terminal (55)
- Harness connectors M34, F26, M14, B1
- Harness for open or short between ECM and rear window defogger relay
- Harness for open or short between timer and rear window defogger relay Refer to EL section ("REAR WINDOW DEFOGGER")

For terminal (60)
- Harness connectors M34, F26
- Harness connectors For U.S.A.: M3, E105 For Canada: M16, E101
- Harness continuity between ECM and lighting switch
- Diode joint connector-3 E103 for Canada models

If NG, repair harness or connectors.

OK ↓

B

CHECK POWER AND GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check continuity between ECM terminal (24) and ground.

Blower fan switch "ON"
Continuity should exist.
Blower fan switch "OFF"
Continuity should not exist.

NG → Check the following.
- Harness connectors M46, F13
- Harness for open or short between ECM and fan switch, fan switch and ground

If NG, repair harness or connectors.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

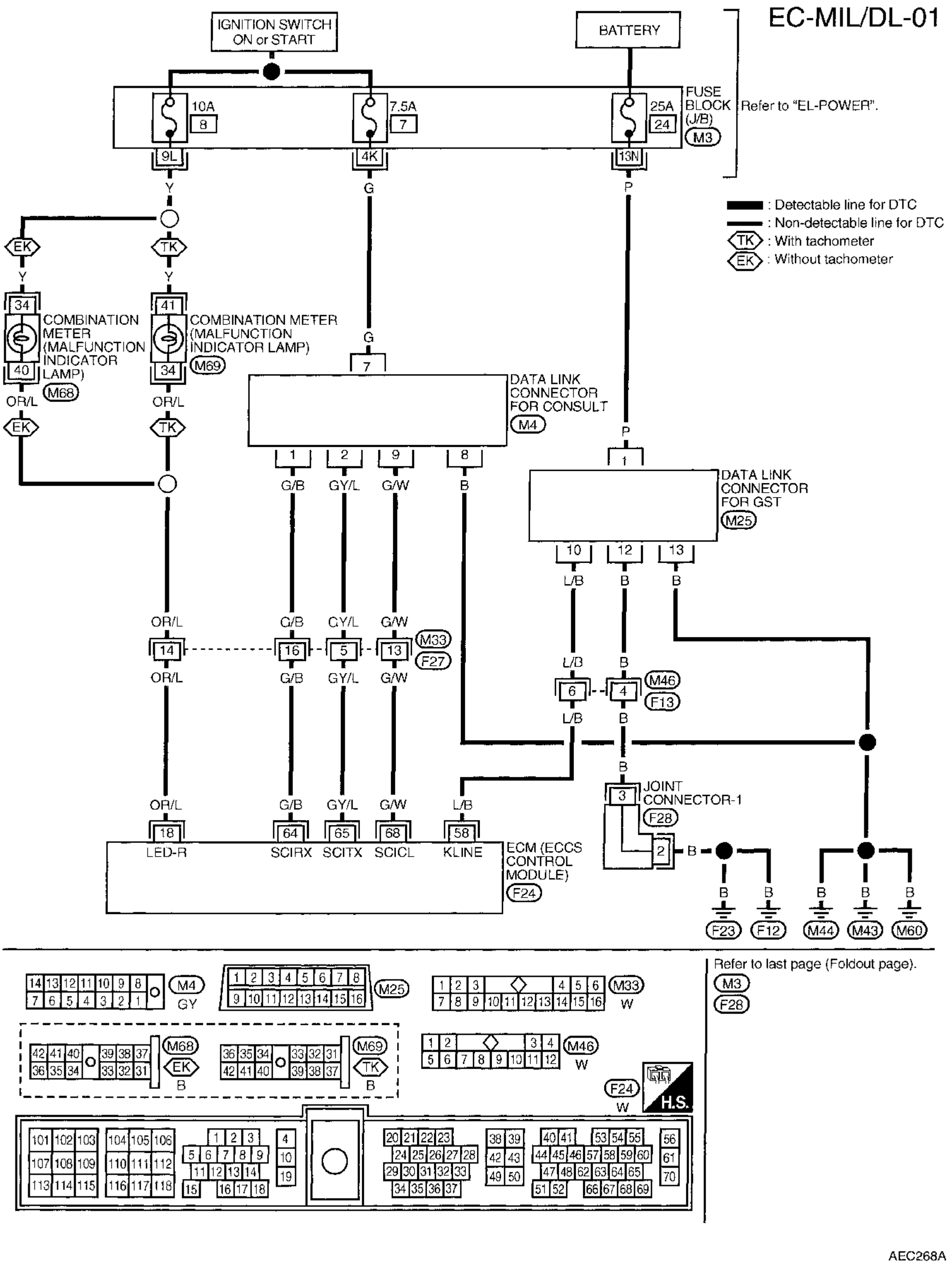
↓ Trouble is not fixed.

Check ECM pin terminals for damage and check loose connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

MIL & Data Link Connectors



GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

MIL & Data Link Connectors (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
18	OR/L	Malfunction indicator lamp	Ignition switch "ON"	Approximately 0.1V
			Engine is running. — Idle speed	BATTERY VOLTAGE (11 - 14V)
58	L/B	Data link connector for GST	Engine is running. — Idle speed (GST is disconnected)	6 - 10V
64	G/B	Data link connector for CONSULT	Engine is running. — Idle speed (CONSULT is connected and turned on)	Approximately 0V
65	GY/L			Approximately 4 - 9V
68	G/W			Approximately 3.5V

General Specifications

PRESSURE REGULATOR Fuel pressure at idling kPa (kg/cm^2, psi)	
Vacuum hose is connected	Approximately 235 (2.4, 34)
Vacuum hose is disconnected	Approximately 294 (3.0, 43)

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

Inspection and Adjustment

Idle speed*1 rpm	
No-load*2 (in "N" position)	800±50
Air conditioner: ON (in "N" position)	850 or more
Ignition timing	15°±2° BTDC
Throttle position sensor idle position V	0.35 - 0.65

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear defogger)

IGNITION COIL

Primary voltage V	12
Primary resistance [at 20°C (68°F)] Ω	0.5 - 1.0
Secondary resistance [at 20°C (68°F)] kΩ	Approximately 25

MASS AIR FLOW SENSOR

Supply voltage V	Battery voltage (11 - 14)
Output voltage V	1.3 - 1.7*
Mass air flow (Using CONSULT or GST) g·m/sec	2.5 - 5.0 at idle* 7.1 - 12.5 at 2,500 rpm*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

EGR TEMPERATURE SENSOR

EGR temperature °C (°F)	Voltage (V)	Resistance (MΩ)
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

FRONT HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)] Ω	3.3 - 6.3

FUEL PUMP

Resistance [at 25°C (77°F)] Ω	Approximately 0.2 - 5.0

IACV-AAC VALVE

Resistance [at 25°C (77°F)] Ω	Approximately 10.0

INJECTOR

Resistance [at 25°C (77°F)] Ω	10 - 14

RESISTOR

Resistance [at 25°C (77°F)] kΩ	Approximately 2.2

THROTTLE POSITION SENSOR

Throttle valve conditions	Resistance kΩ [at 25°C (77°F)]
Completely closed	Approximately 1
Partially open	1 - 10
Completely open	Approximately 10

CALCULATED LOAD VALUE

	Calculated load value % (Using CONSULT or GST)
At idle	20.0 - 35.5
At 2,500 rpm	17.0 - 30.0

INTAKE AIR TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

REAR HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)] Ω	5.2 - 8.2

CRANKSHAFT POSITION SENSOR (OBD)

Resistance [at 25°C (77°F)] Ω	166 - 204

General Specifications

PRESSURE REGULATOR Fuel pressure at idling kPa (kg/cm², psi)	
Vacuum hose is connected	Approximately 235 (2.4, 34)
Vacuum hose is disconnected	Approximately 294 (3.0, 43)

Inspection and Adjustment

Idle speed*1 rpm	
No-load*2 (in "N" position)	M/T models except for Canada: 675±50 rpm M/T models for Canada: 750±50 rpm A/T models: 800±50 (in "N" position)
Air conditioner: ON (in "N" position)	900 or more
Ignition timing	8°±2° BTDC
Throttle position sensor idle position V	0.35 - 0.65

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear defogger)

IGNITION COIL

Primary voltage V	Battery voltage (11 - 14)
Primary resistance [at 25°C (77°F)] Ω	Approximately 1.0
Secondary resistance [at 25°C (77°F)] kΩ	Approximately 10.0

MASS AIR FLOW SENSOR

Supply voltage V	Battery voltage (11 - 14)
Output voltage V	1.0 - 1.7
Mass air flow (Using CONSULT or GST) g·m/sec	1.0 - 4.0 at idle* 5.0 - 10.0 at 2,500 rpm*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

EGR TEMPERATURE SENSOR

EGR temperature °C (°F)	Voltage (V)	Resistance (MΩ)
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

FUEL PUMP

Resistance [at 25°C (77°F)] Ω	0.2 - 5.0

IACV-AAC VALVE

Resistance [at 25°C (77°F)] Ω	50 - 100

INJECTOR

Resistance [at 25°C (77°F)] Ω	10 - 14

RESISTOR

Resistance [at 25°C (77°F)] kΩ	Approximately 2.2

THROTTLE POSITION SENSOR

Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 0.6 kΩ
Partially open	0.6 - 4.0 kΩ
Completely open	Approximately 4.0 kΩ

FRONT HEATED OXYGEN SENSOR HEATER

Resistance [at 23°C (73°F)] Ω	2.3 - 4.3

GI MA EM LC EC FE CL MT AT FA RA BR ST RS BT HA EL IDX

CALCULATED LOAD VALUE

	Calculated load value % (Using CONSULT or GST)
At idle	15.0 - 30.0
At 2,500 rpm	13.0 - 28.0

INTAKE AIR TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

EVAP CANISTER PURGE VOLUME CONTROL VALVE

Resistance [at 20°C (68°F)] Ω	Approximately 41

TORQUE CONVERTER CLUTCH SOLENOID VALVE

Resistance [at 25°C (77°F)] Ω	Approximately 30

REAR HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

CRANKSHAFT POSITION SENSOR (OBD)

Resistance [at 25°C (77°F)] Ω	M/T	432 - 528
	A/T	166.5 - 203.5

TANK FUEL TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90