

ENGINE CONTROL SYSTEM

SECTION **EC**

GI

MA

EM

LC

EC

FE

AT

PD

FA

RA

BR

ST

RS

BT

HA

EL

IDX

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When you read wiring diagrams:

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

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

DIAGNOSTIC TROUBLE CODE INDEX

Alphabetical & P No. Index for DTC

ALPHABETICAL INDEX FOR DTC

Items (CONSULT screen terms)	DTC*6		Reference page	Items (CONSULT screen terms)	DTC*6		Reference page
	CONSULT GST*2	ECM*1			CONSULT GST*2	ECM*1	
*COOLAN T SEN/CIRC	P0125	0908	EC-154	FR O2 SE HEATER-B1	P0135	0901	EC-194
A/T 1ST GR FNCTN	P0731	1103	AT-93	FR O2 SE HEATER-B2	P0155	1001	EC-194
A/T 2ND GR FNCTN	P0732	1104	AT-98	FRONT O2 SENSOR-B1	P0130	0303	EC-159
A/T 3RD GR FNCTN	P0733	1105	AT-102	FRONT O2 SENSOR-B1	P0133	0409	EC-178
A/T 4TH GR FNCTN	P0734	1106	AT-106	FRONT O2 SENSOR-B1	P0132	0410	EC-172
A/T COMM LINE	P0600	0504	EC-333	FRONT O2 SENSOR-B1	P0131	0411	EC-166
A/T DIAG COMM LINE	P1605	0804	EC-333	FRONT O2 SENSOR-B1	P0134	0412	EC-187
A/T TCC SV FNCTN	P0744	1107	AT-118	FRONT O2 SENSOR-B2	P0153	0413	EC-178
ABS-TCS C/U SIGNAL	—	0107	EC-482	FRONT O2 SENSOR-B2	P0152	0414	EC-172
ABSL PRES SEN/CIRC	P0105	0803	EC-123	FRONT O2 SENSOR-B2	P0151	0415	EC-166
AIR TEMP SEN/CIRC	P0110	0401	EC-131	FRONT O2 SENSOR-B2	P0150	0503	EC-159
ATF TEMP SEN/CIRC	P0710	1208	AT-83	FRONT O2 SENSOR-B2	P0154	0509	EC-187
CAM POS SEN/CIR	P0340	0101	EC-265	FUEL SYS LEAN/BK1	P0171	0115	EC-235
CLOSED LOOP-B1	P1148	0307	EC-369	FUEL SYS LEAN/BK2	P0174	0210	EC-235
CLOSED LOOP-B2	P1168	0308	EC-369	FUEL SYS RICH/BK1	P0172	0114	EC-241
CLOSED TP SW/CIRC	P0510	0203	EC-327	FUEL SYS RICH/BK2	P0175	0209	EC-241
COOLANT T SEN/CIRC	P0115	0103	EC-137	FUEL TEMP SEN/CIRC	P0180	0402	EC-247
CPS/CIRC (OBD) COG	P1336	0905	EC-389	IACV/AAC VLV/CIRC	P0505	0205	EC-321
CPS/CIRCUIT (OBD)	P0335	0802	EC-260	IGN SIGNAL-PRIMARY	P1320	0201	EC-381
CYL 1 MISFIRE	P0301	0608	EC-252	INT/V TIM CONT-B1	P1110	0805	EC-348
CYL 2 MISFIRE	P0302	0607	EC-252	INT/V TIM CONT-B2	P1135	1301	EC-348
CYL 3 MISFIRE	P0303	0606	EC-252	INTK TIM S/CIRC-B1	P1140	1303	EC-363
CYL 4 MISFIRE	P0304	0605	EC-252	INTK TIM S/CIRC-B2	P1145	1304	EC-363
CYL 5 MISFIRE	P0305	0604	EC-252	KNOCK SEN/CIRC-B1	P0325	0304	EC-257
CYL 6 MISFIRE	P0306	0603	EC-252	KNOCK SEN/CIRC-B2	P0330	0212	EC-257
CYL 7 MISFIRE	P0307	0602	EC-252	L/PRESS SOL/CIRC	P0745	1205	AT-125
CYL 8 MISFIRE	P0308	0601	EC-252	MAF SEN/CIRCUIT*3	P0100	0102	EC-115
ECM	P0605	0301	EC-336	MAP/BAR SW SOL/CIR	P1105	1302	EC-339
ECM-ABSTCS COMM NG	—	0404	EC-482	MULTI CYL MISFIRE	P0300	0701	EC-252
EGR SYSTEM	P0400	0302	EC-271	NATS MALFUNC	—	—	EC-58
EGR SYSTEM	P1402	0514	EC-405	NO SELF DIAGNOSTIC FAILURE INDICATED	P0000	0505	—
EGR TEMP SEN/CIRC	P1401	0305	EC-399	NO SELF DIAGNOSTIC FAILURE INDICATED	No DTC	Flashing*5	EC-54
EGRC SOLENOID/V	P1400	1005	EC-394	O/R CLTCH SOL/CIRC	P1760	1203	AT-143
EGRC-BPT VALVE	P0402	0306	EC-280	OVER HEAT	—	0208	EC-485
ENGINE SPEED SIG	P0725	1207	AT-90	P-N POS SW/CIRCUIT	P1706	1003	EC-476
EVAP PURG FLOW/ MON	P1447	0111	EC-439	PNP SW/CIRC	P0705	1101	AT-79
EVAP SMALL LEAK	P1440	0213	EC-414	PURG CONT/V & S/V	P1493	0312	EC-469
EVAP SMALL LEAK	P0440	0705	EC-288	PURG CONT/V S/V	P1492	0807	EC-463
EVAPO SYS PRES SEN	P0450	0704	EC-310	PURG VOLUME CONT/V	P1444	0214	EC-426
FPCM/CIRCUIT	P1220	1305	EC-374				

DIAGNOSTIC TROUBLE CODE INDEX

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

Items (CONSULT screen terms)	DTC*6		Reference page
	CONSULT GST*2	ECM*1	
PURG VOLUME CONT/V	P0443	1008	EC-299
REAR O2 SENSOR-B1	P0137	0511	EC-200
REAR O2 SENSOR-B1	P0140	0512	EC-223
REAR O2 SENSOR-B1	P0139	0707	EC-216
REAR O2 SENSOR-B1	P0138	0510	EC-208
REAR O2 SENSOR-B2	P0158	0313	EC-208
REAR O2 SENSOR-B2	P0157	0314	EC-200
REAR O2 SENSOR-B2	P0160	0315	EC-223
REAR O2 SENSOR-B2	P0159	0708	EC-216
RR O2 SE HEATER-B1	P0141	0902	EC-229
RR O2 SE HEATER-B2	P0161	1002	EC-229
SFT SOL A/CIRC*3	P0750	1108	AT-129
SFT SOL B/CIRC*3	P0755	1201	AT-133
TACM SW SIGNALS	P1210	0106	EC-371
TANDEM TP SEN/CIRC	P1125	0110	EC-362
TCC SOLENOID/CIRC	P0740	1204	AT-114
THRTL POS SEN/ CIRC*3	P0120	0403	EC-142
TP SEN/CIRC A/T*3	P1705	1206	AT-137
TP SEN2/CIRCUIT	P1120	0406	EC-356
TW CATALYST SYS-B1	P0420	0702	EC-285
TW CATALYST SYS-B2	P0430	0703	EC-285
Unable to access ECM	—	—	EC-89
VC CUT/V BYPASS/V	P1491	0311	EC-457
VC/V BYPASS/V	P1490	0801	EC-452
VEH SPD SEN/CIR AT*4	P0720	1102	AT-87
VEH SPEED SEN/ CIRC*4	P0500	0104	EC-316
VENT CONTROL VALVE	P1446	0215	EC-434
VENT CONTROL VALVE	P1448	0309	EC-446
VENT CONTROL VALVE	P0446	0903	EC-305

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

*2: These numbers are prescribed by SAE J2012.

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

*4: The MIL illuminates when both the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

*5: While engine is running.

*6: 1st trip DTC No. is the same as DTC No.

NOTE: Regarding Y33 models, "-B1" indicates left bank and "-B2" indicates right bank.

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DIAGNOSTIC TROUBLE CODE INDEX

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

P NO. INDEX FOR DTC

DTC*6		Items (CONSULT screen terms)	Reference page	DTC*6		Items (CONSULT screen terms)	Reference page
CONSULT GST*2	ECM*1			CONSULT GST*2	ECM*1		
—	—	Unable to access ECM	EC-89	P0180	0402	FUEL TEMP SEN/CIRC	EC-247
—	0107	ABS-TCS C/U SIGNAL	EC-482	P0300	0701	MULTI CYL MISFIRE	EC-252
—	0208	OVER HEAT	EC-485	P0301	0608	CYL 1 MISFIRE	EC-252
—	0404	ECM-ABSTCS COMM NG	EC-482	P0302	0607	CYL 2 MISFIRE	EC-252
—	—	NATS MALFUNC	EC-58	P0303	0606	CYL 3 MISFIRE	EC-252
No DTC	Flashing*5	NO SELF DIAGNOSTIC FAILURE INDICATED	EC-54	P0304	0605	CYL 4 MISFIRE	EC-252
P0000	0505	NO SELF DIAGNOSTIC FAILURE INDICATED	—	P0305	0604	CYL 5 MISFIRE	EC-252
P0100	0102	MAF SEN/CIRCUIT*3	EC-115	P0306	0603	CYL 6 MISFIRE	EC-252
P0105	0803	ABSL PRES SEN/CIRC	EC-123	P0307	0602	CYL 7 MISFIRE	EC-252
P0110	0401	AIR TEMP SEN/CIRC	EC-131	P0308	0601	CYL 8 MISFIRE	EC-252
P0115	0103	COOLANT T SEN/CIRC	EC-137	P0325	0304	KNOCK SEN/CIRC-B1	EC-257
P0120	0403	THRTL POS SEN/ CIRC*3	EC-142	P0330	0212	KNOCK SEN/CIRC-B2	EC-257
P0125	0908	*COOLAN T SEN/CIRC	EC-154	P0335	0802	CPS/CIRCUIT (OBD)	EC-260
P0130	0303	FRONT O2 SENSOR-B1	EC-159	P0340	0101	CAM POS SEN/CIR	EC-265
P0131	0411	FRONT O2 SENSOR-B1	EC-166	P0400	0302	EGR SYSTEM	EC-271
P0132	0410	FRONT O2 SENSOR-B1	EC-172	P0402	0306	EGRC-BPT VALVE	EC-280
P0133	0409	FRONT O2 SENSOR-B1	EC-178	P0420	0702	TW CATALYST SYS-B1	EC-285
P0134	0412	FRONT O2 SENSOR-B1	EC-187	P0430	0703	TW CATALYST SYS-B2	EC-285
P0135	0901	FR O2 SE HEATER-B1	EC-194	P0440	0705	EVAP SMALL LEAK	EC-288
P0137	0511	REAR O2 SENSOR-B1	EC-200	P0443	1008	PURG VOLUME CONT/V	EC-299
P0138	0510	REAR O2 SENSOR-B1	EC-208	P0446	0903	VENT CONTROL VALVE	EC-305
P0139	0707	REAR O2 SENSOR-B1	EC-216	P0450	0704	EVAP SYS PRES SEN	EC-310
P0140	0512	REAR O2 SENSOR-B1	EC-223	P0500	0104	VEH SPEED SEN/ CIRC*4	EC-316
P0141	0902	RR O2 SE HEATER-B1	EC-229	P0505	0205	IACV/AAC VLV/CIRC	EC-321
P0150	0503	FRONT O2 SENSOR-B2	EC-159	P0510	0203	CLOSED TP SW/CIRC	EC-327
P0151	0415	FRONT O2 SENSOR-B2	EC-166	P0600	0504	A/T COMM LINE	EC-333
P0152	0414	FRONT O2 SENSOR-B2	EC-172	P0605	0301	ECM	EC-336
P0153	0413	FRONT O2 SENSOR-B2	EC-178	P0705	1101	PNP SW/CIRC	AT-79
P0154	0509	FRONT O2 SENSOR-B2	EC-187	P0710	1208	ATF TEMP SEN/CIRC	AT-83
P0155	1001	FR O2 SE HEATER-B2	EC-194	P0720	1102	VEH SPD SEN/CIR AT*4	AT-87
P0157	0314	REAR O2 SENSOR-B2	EC-200	P0725	1207	ENGINE SPEED SIG	AT-90
P0158	0313	REAR O2 SENSOR-B2	EC-208	P0731	1103	A/T 1ST GR FNCTN	AT-93
P0159	0708	REAR O2 SENSOR-B2	EC-216	P0732	1104	A/T 2ND GR FNCTN	AT-98
P0160	0315	REAR O2 SENSOR-B2	EC-223	P0733	1105	A/T 3RD GR FNCTN	AT-102
P0161	1002	RR O2 SE HEATER-B2	EC-229	P0734	1106	A/T 4TH GR FNCTN	AT-106
P0171	0115	FUEL SYS LEAN/BK1	EC-235	P0740	1204	TCC SOLENOID/CIRC	AT-114
P0172	0114	FUEL SYS RICH/BK1	EC-241	P0744	1107	A/T TCC S/V FNCTN	AT-118
P0174	0210	FUEL SYS LEAN/BK2	EC-235	P0745	1205	L/PRESS SOL/CIRC	AT-125
P0175	0209	FUEL SYS RICH/BK2	EC-241	P0750	1108	SFT SOL A/CIRC*3	AT-129
				P0755	1201	SFT SOL B/CIRC*3	AT-133
				P1105	1302	MAP/BAR SW SOL/CIR	EC-339

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

DTC*6		Items (CONSULT screen terms)	Reference page
CONSULT GST*2	ECM*1		
P1110	0805	INT/V TIM CONT-B1	EC-348
P1120	0406	TP SEN2/CIRCUIT	EC-356
P1125	0110	TANDEM TP SEN/CIRC	EC-362
P1135	1301	INT/V TIM CONT-B2	EC-348
P1140	1303	INTK TIM S/CIRC-B1	EC-363
P1145	1304	INTK TIM S/CIRC-B2	EC-363
P1148	0307	CLOSED LOOP-B1	EC-369
P1168	0308	CLOSED LOOP-B2	EC-369
P1210	0106	TACM SW SIGNALS	EC-371
P1220	1305	FPCM/CIRCUIT	EC-374
P1320	0201	IGN SIGNAL-PRIMARY	EC-381
P1336	0905	CPS/CIRC (OBD) COG	EC-389
P1400	1005	EGRC SOLENOID/V	EC-394
P1401	0305	EGR TEMP SEN/CIRC	EC-399
P1402	0514	EGR SYSTEM	EC-405
P1440	0213	EVAP SMALL LEAK	EC-414
P1444	0214	PURG VOLUME CONT/V	EC-426
P1446	0215	VENT CONTROL VALVE	EC-434
P1447	0111	EVAP PURG FLOW/ MON	EC-439
P1448	0309	VENT CONTROL VALVE	EC-446
P1490	0801	VC/V BYPASS/V	EC-452
P1491	0311	VC CUT/V BYPASS/V	EC-457
P1492	0807	PURG CONT/V S/V	EC-463
P1493	0312	PURG CONT/V & S/V	EC-469
P1605	0804	A/T DIAG COMM LINE	EC-333
P1705	1206	TP SEN/CIRC AT*3	AT-137
P1706	1003	P-N POS SW/CIRCUIT	EC-476
P1760	1203	O/R CLTCH SOL/CIRC	AT-143

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

*2: These numbers are prescribed by SAE J2012.

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

*4: The MIL illuminates when both the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

*5: While engine is running.

*6: 1st trip DTC No. is the same as DTC No.

NOTE: Regarding Y33 models, "-B1" indicates left bank and "-B2" indicates right bank.

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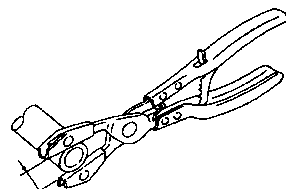
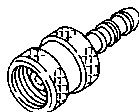
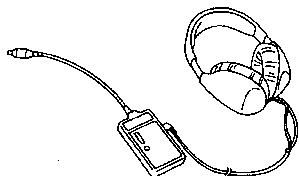
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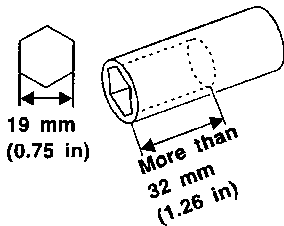
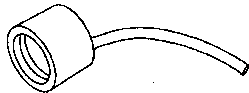
PRECAUTIONS AND PREPARATION

Commercial Service Tools

Tool name (Kent-Moore No.)	Description	
Leak detector (J41416)	NT703	Locating the EVAP leak
EVAP service port adapter (J41413-OBD)	NT704	Applying positive pressure through EVAP service port
Hose clipper	NT720	Clamping the EVAP purge hose between the fuel tank and EVAP canister applied to DTC P1440 [(EVAP small leak positive pressure)].
Fuel filler cap adapter	NT653	Checking fuel tank vacuum relief valve opening pressure
Socket wrench	NT705	Removing and installing engine coolant temperature sensor



Approx. 20 mm (0.79 in)



PRECAUTIONS AND PREPARATION

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

The Supplemental Restraint System “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.

In addition to the supplemental air bag modules for a frontal collision, the supplemental side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The supplemental side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (one of components of supplemental air bags for a frontal collision), wiring harness, warning lamp (one of components of supplemental air bags for a frontal collision). Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses (except “SEAT BELT PRE-TENSIONER” connector) can be identified with yellow harness connector (and with yellow harness protector or yellow insulation tape before the harness connectors).

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

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

CAUTION:

- Be sure to turn the ignition switch “OFF” and disconnect the negative battery terminal before the repair or inspection work. The open/short circuit of the related switches, sensors, solenoid valves, etc. will cause the MIL to light up.
- Be sure to connect and lock the connectors securely after the work. The loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure to connect the connector without water, grease, dirt, bent terminals, etc. in it.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to EL section, “Description”, “HARNESS CONNECTOR”.
- Be sure to route and clamp the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.
- Be sure to connect rubber tubes properly after the work. The misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the EGR system or the fuel injection system, etc.
- Be sure to erase the unnecessary (already fixed) malfunction information in the ECM and TCM (Transmission Control Module) before returning the vehicle to the customer.

Engine Fuel & Emission Control System

ECM

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

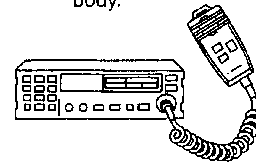
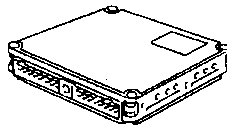
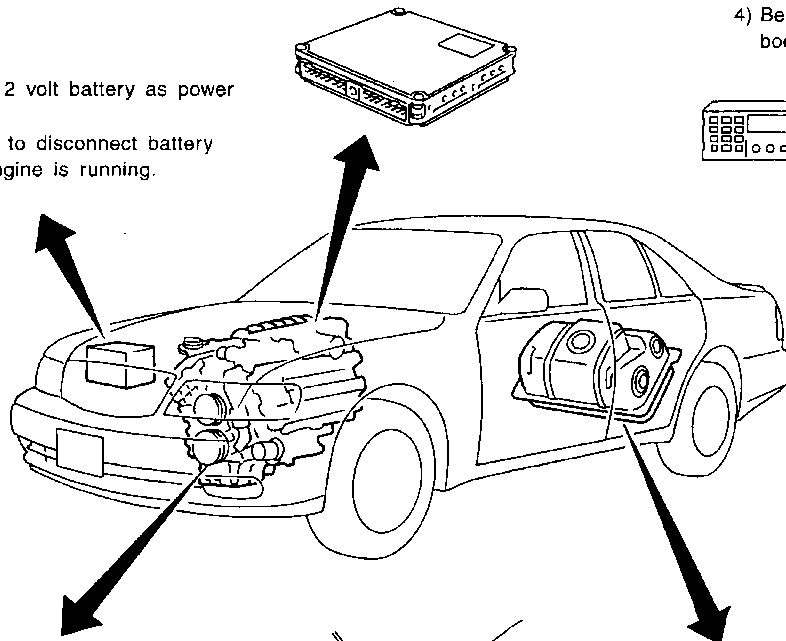
The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

WIRELESS EQUIPMENT

- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.
- 1) Keep the antenna as far away as possible from the electronic control units.
 - 2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
Do not let them run parallel for a long distance.
 - 3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
 - 4) Be sure to ground the radio to vehicle body.

BATTERY

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



ECMS PARTS HANDLING

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

WHEN STARTING

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

FUEL PUMP

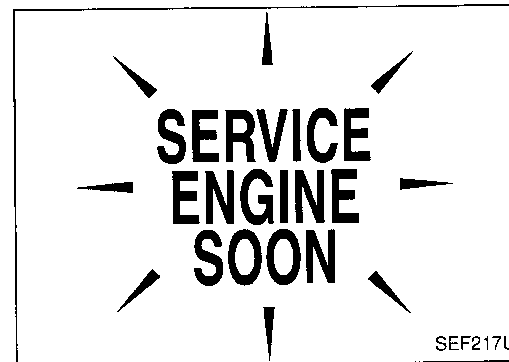
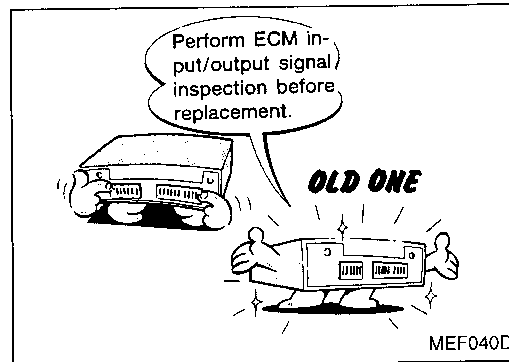
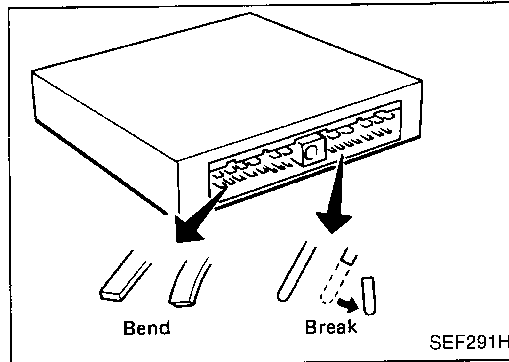
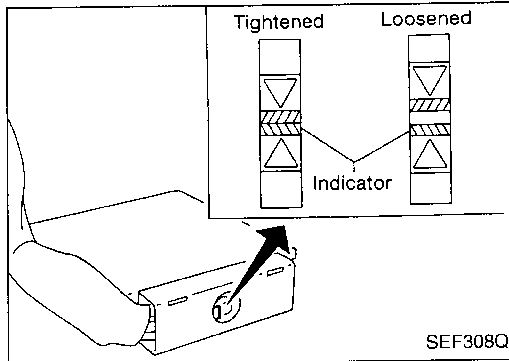
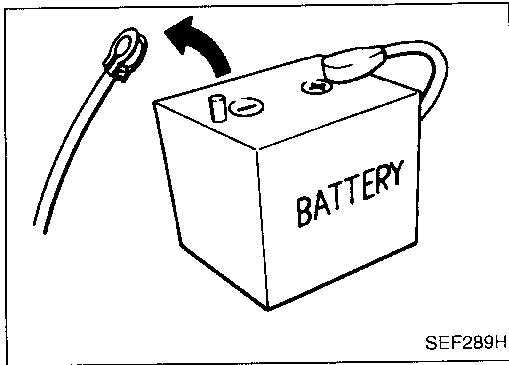
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.

ECM HARNESS HANDLING

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



PRECAUTIONS AND PREPARATION



Precautions

- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM. Because battery voltage is applied to ECM even if ignition switch is turned off.
- When connecting ECM harness connector, tighten securing bolt until the gap between the orange indicators disappears.
 ⚙️ : 3 - 5 N·m (0.3 - 0.5 kg·m, 26 - 43 in·lb)
- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break). Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EC-98.)
- 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.

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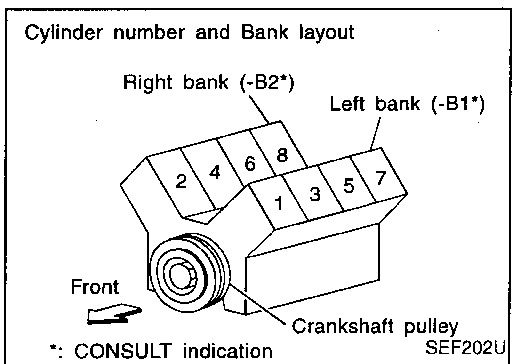
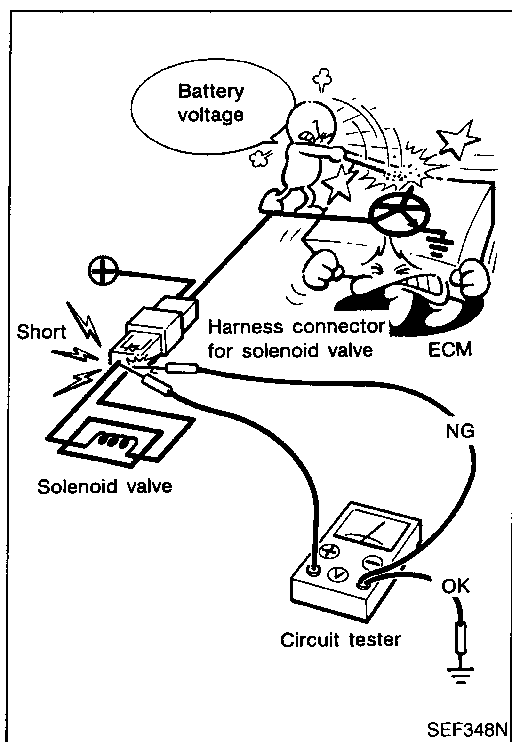
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PRECAUTIONS AND PREPARATION

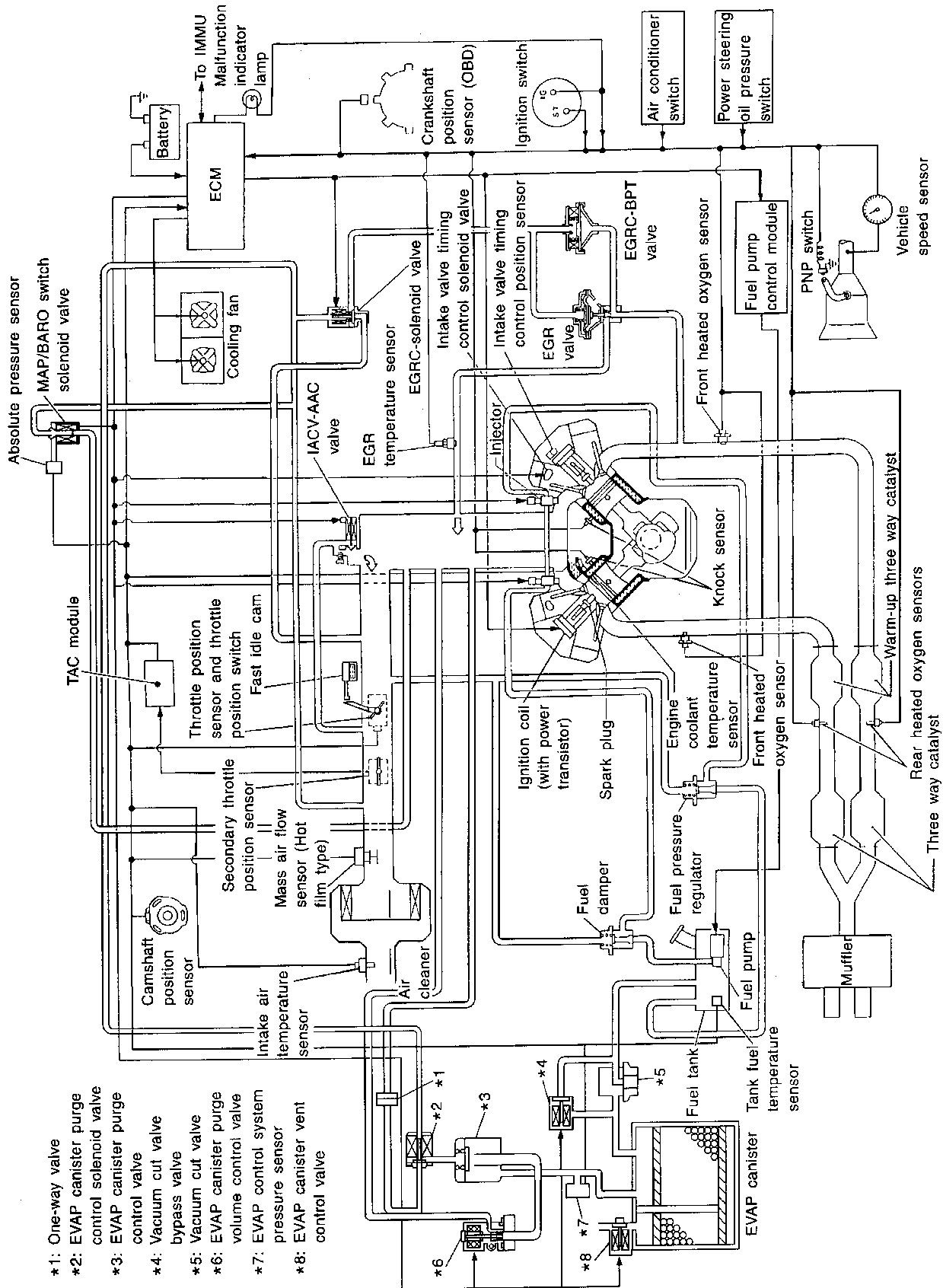
Precautions (Cont'd)

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



- Regarding model Y33, “-B1” indicates the left bank and “-B2” indicates the right bank as shown in the figure.

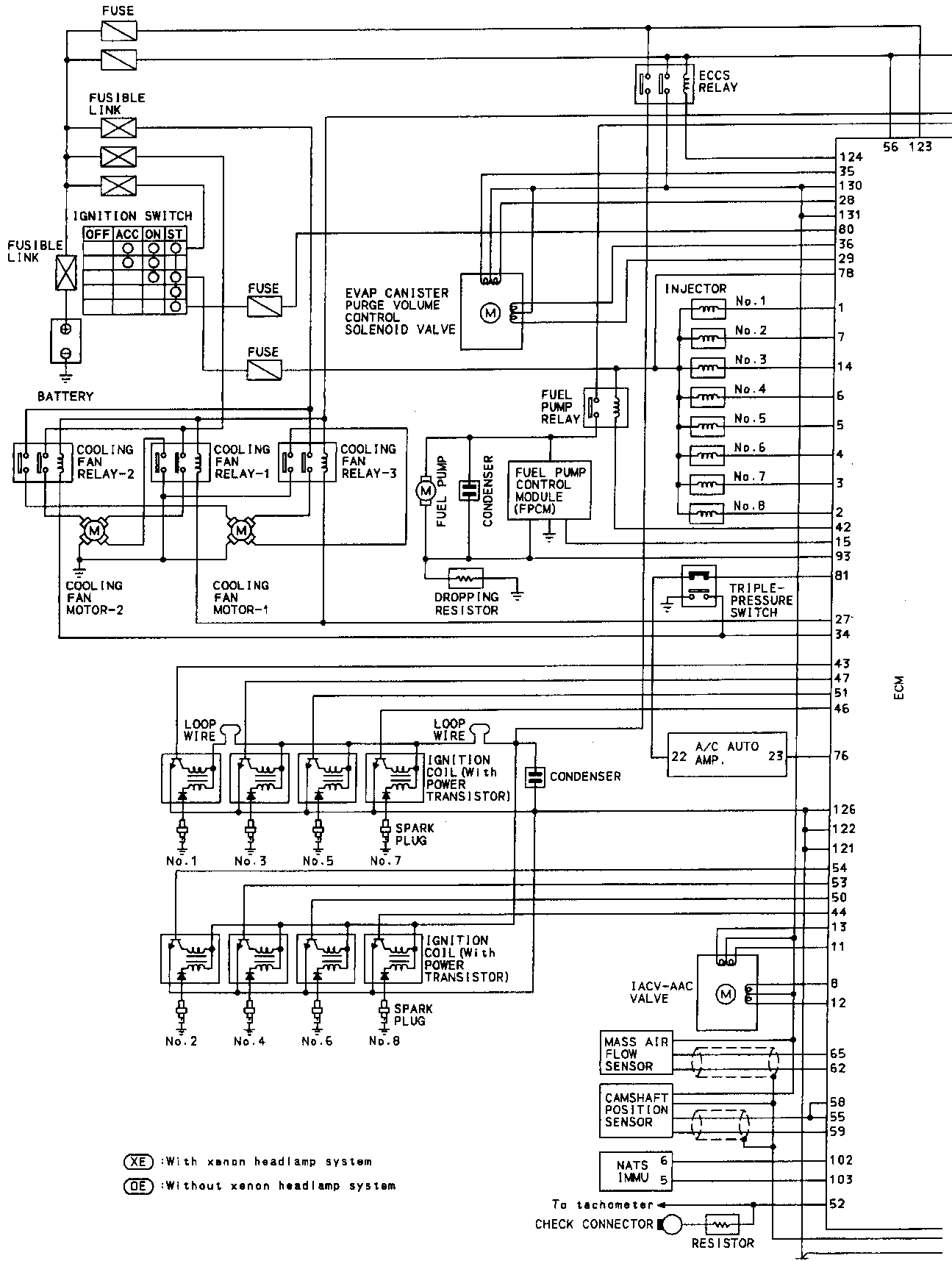
System Diagram



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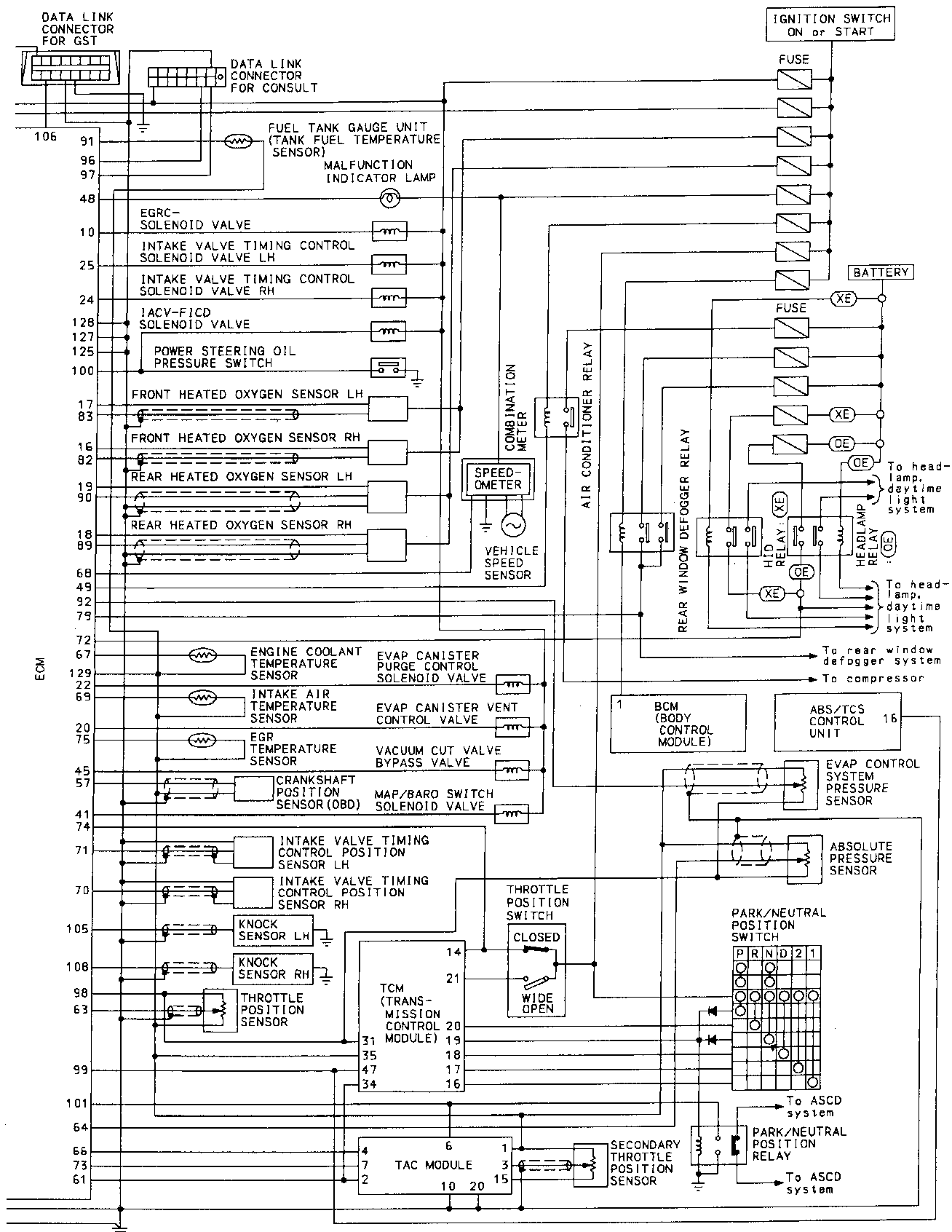
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Circuit Diagram



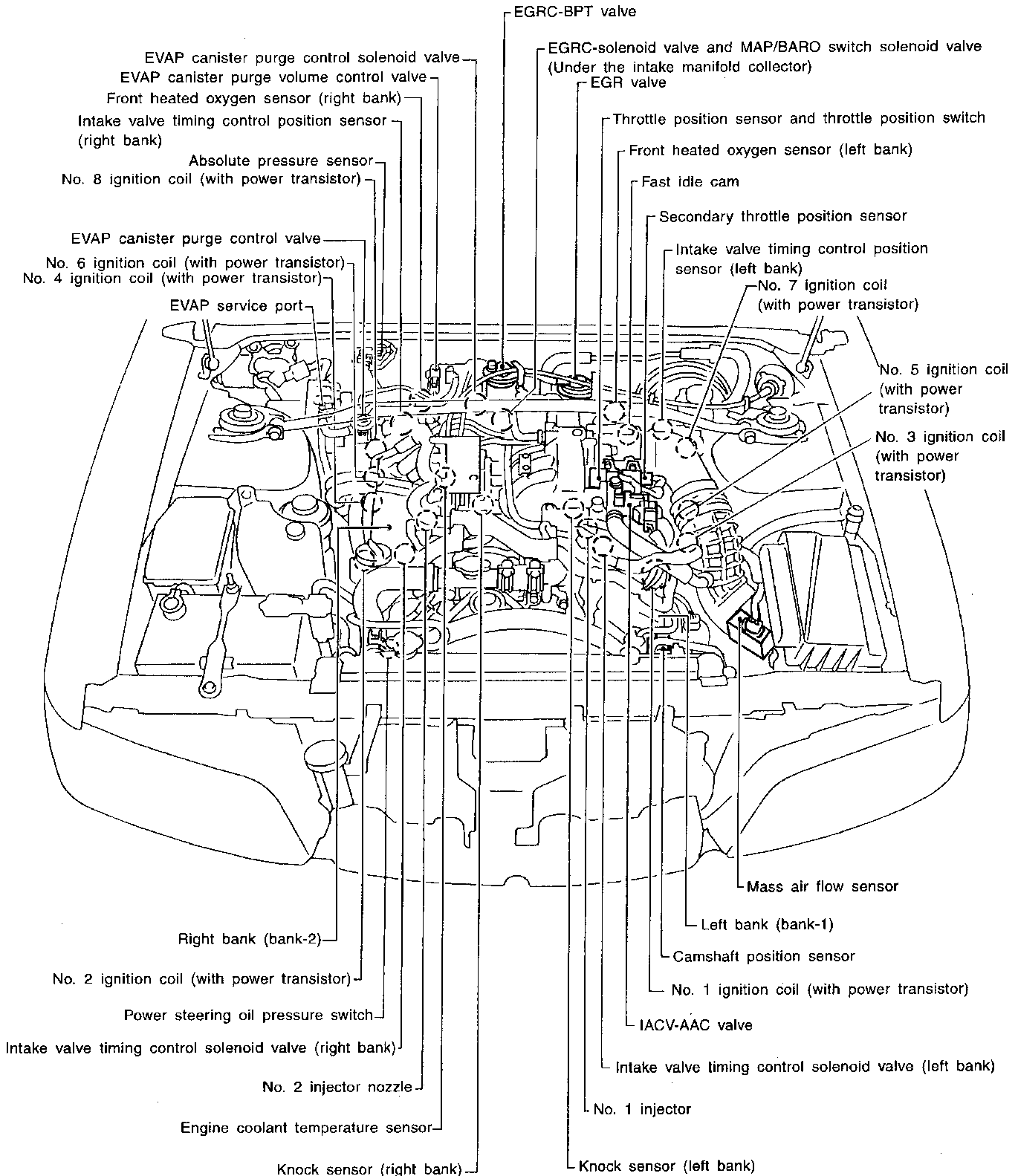
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Circuit Diagram (Cont'd)



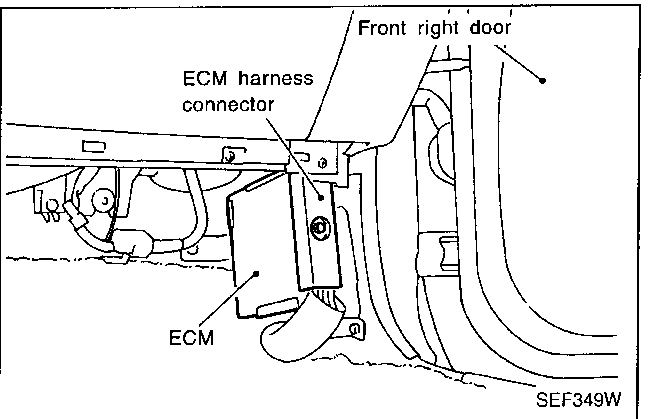
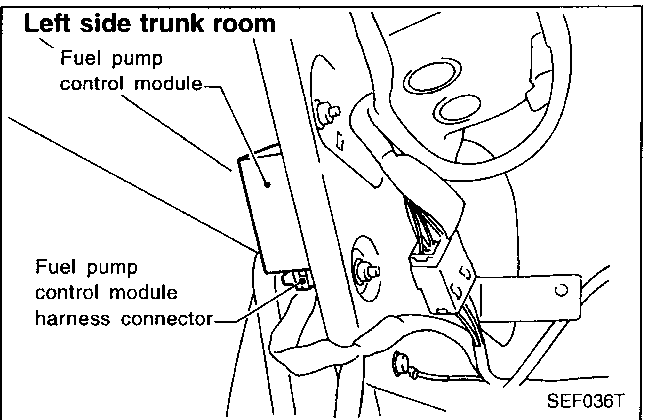
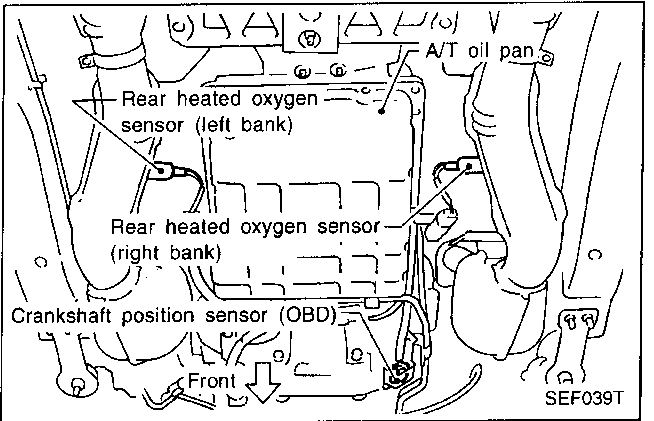
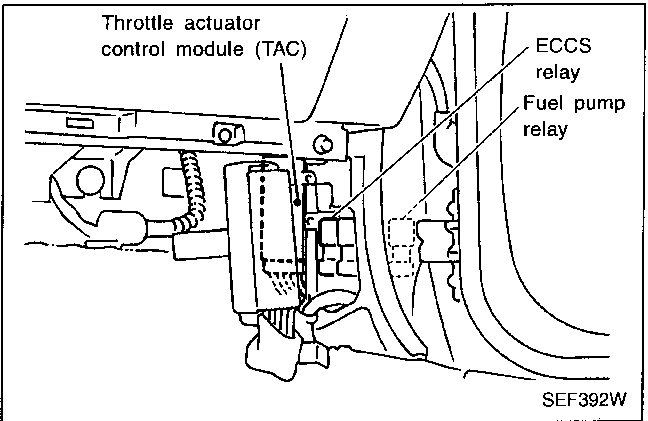
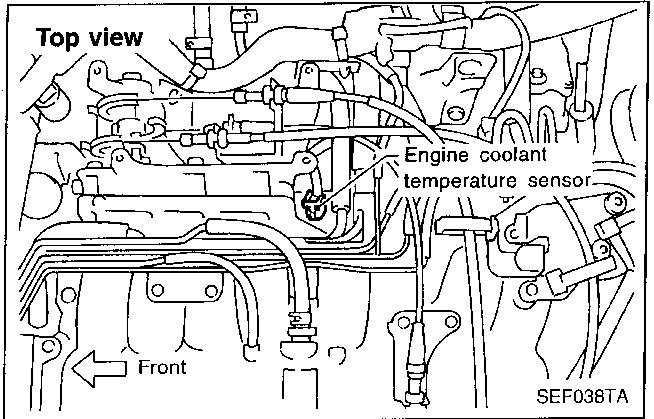
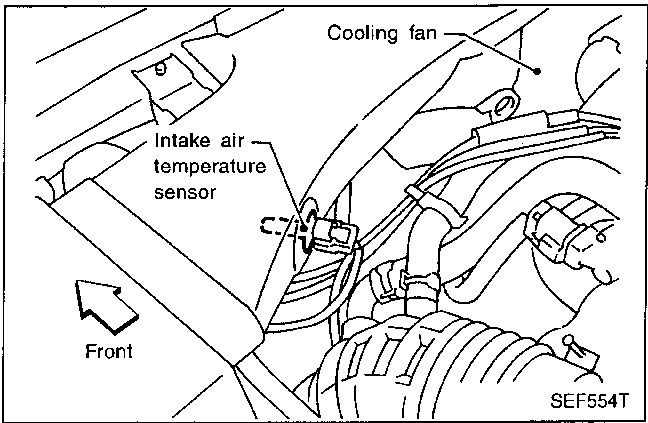
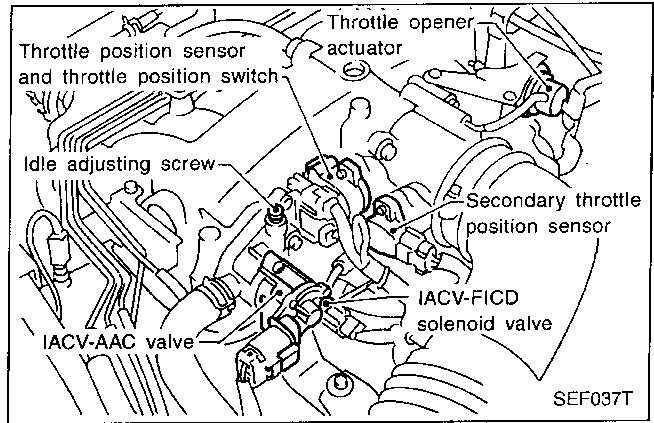
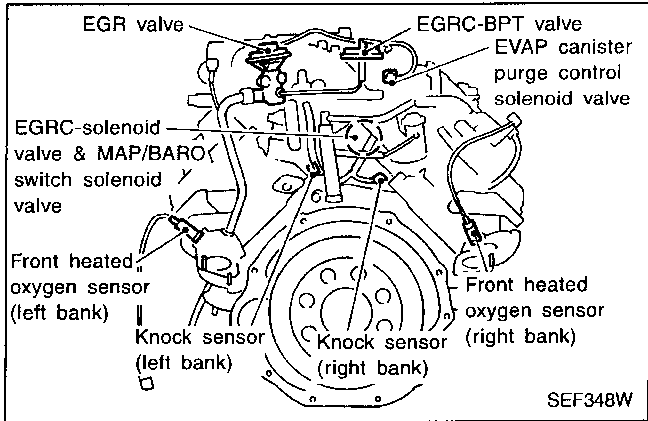
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Engine Control Component Parts Location



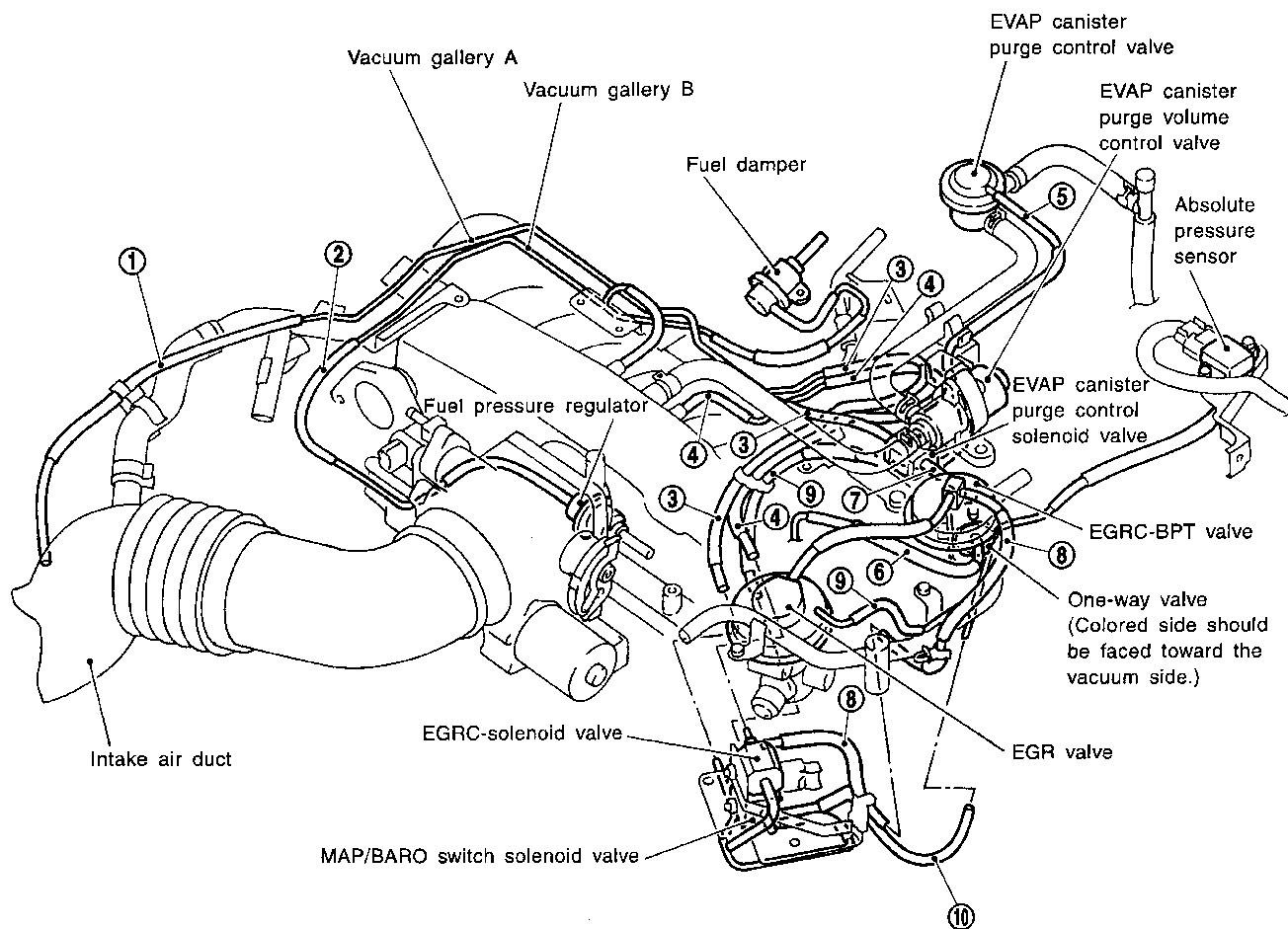
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Engine Control Component Parts Location (Cont'd)



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Vacuum Hose Drawing



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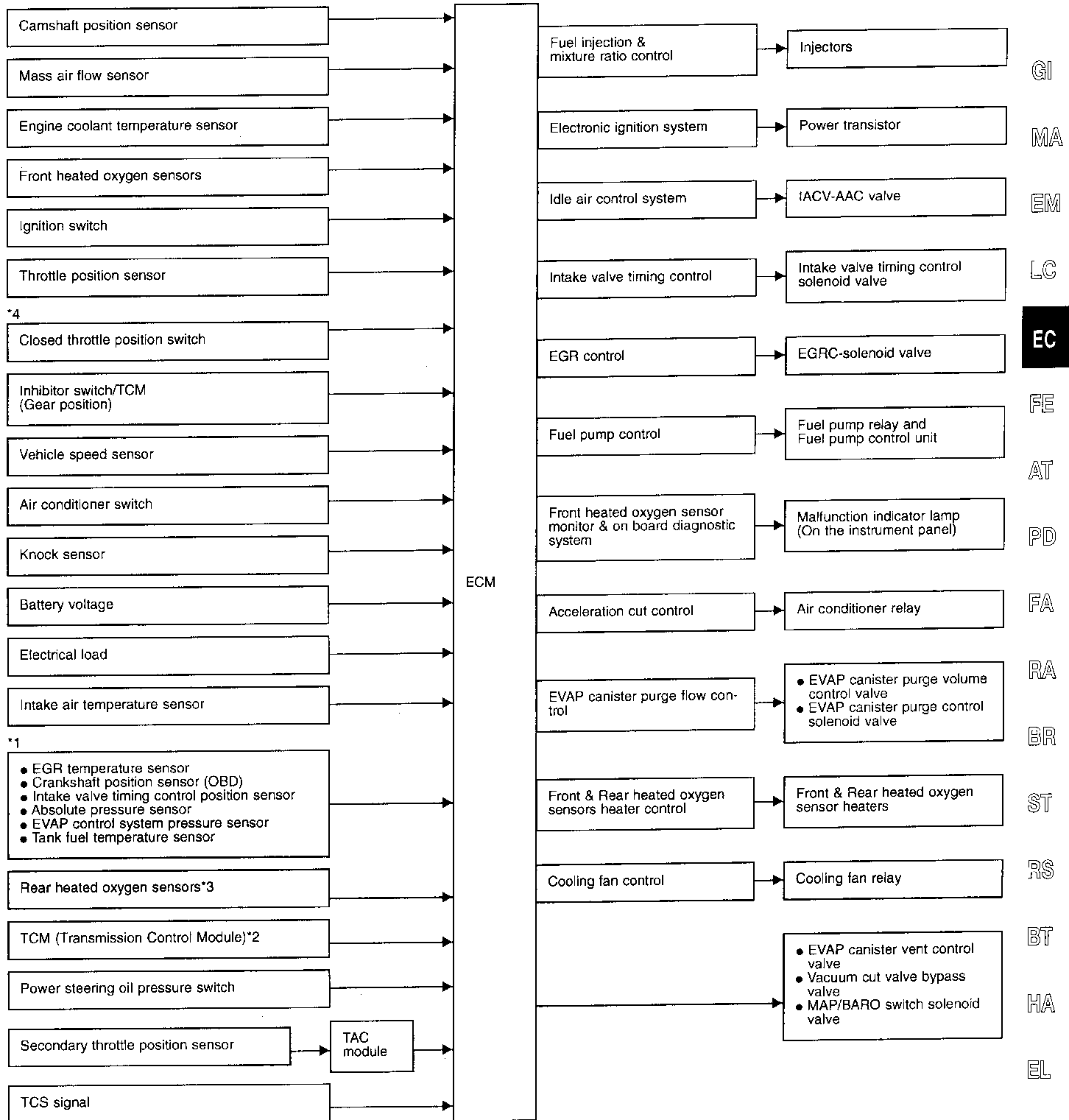
- | | |
|--|---|
| ① Intake air duct to vacuum gallery A | ⑥ Intake manifold collector to One-way valve |
| ② Fuel pressure regulator to vacuum gallery B | ⑦ One-way valve to EVAP canister purge control solenoid valve |
| ③ Vacuum gallery A to EGRC-solenoid valve, MAP/BARO switch solenoid valve and EVAP canister purge control solenoid valve | ⑧ EGRC-BPT valve to EGRC-solenoid valve |
| ④ Intake manifold collector to EGRC-solenoid valve | ⑨ Intake manifold collector to MAP/BARO switch solenoid valve |
| ⑤ EVAP canister purge control valve to EVAP canister purge control solenoid valve | ⑩ Absolute pressure sensor to MAP/BARO switch solenoid valve |

Refer to "System Diagram", EC-11, for vacuum control system.

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

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

System Chart



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

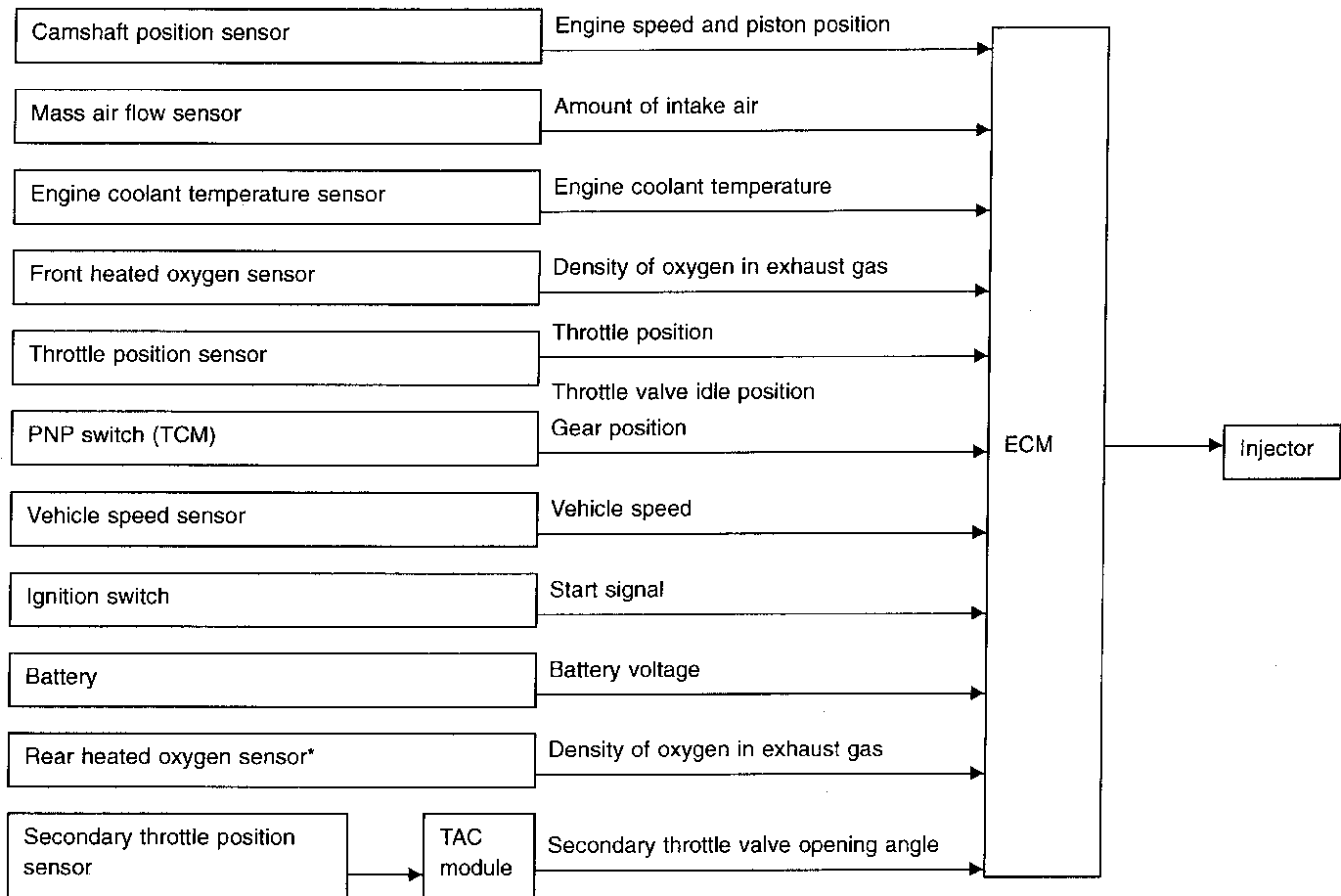
*2: The DTC related to A/T and gear position will be sent to ECM.

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

*4: This switch will operate in place of the throttle position sensor to control EVAP parts if the sensor malfunctions.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



*: Under normal conditions, this sensor is not used to control the engine system.

BASIC MULTIPOINT FUEL INJECTION SYSTEM

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

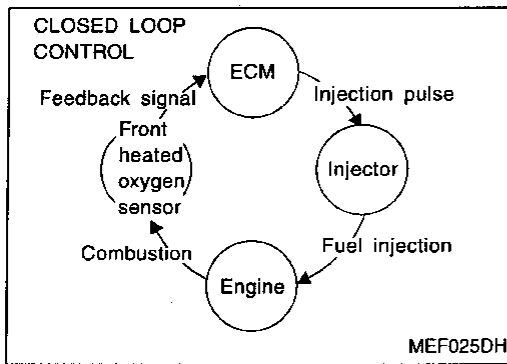
<Fuel increase>

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

<Fuel decrease>

- During deceleration
- During high speed operation
- Extremely high engine coolant temperature
- During TCS operation
- During high engine speed operation

ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION



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

MIXTURE RATIO FEEDBACK CONTROL

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a front heated oxygen sensor in the exhaust manifold to monitor if the engine is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about front heated oxygen sensor, refer to pages EC-159. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

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

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

OPEN LOOP CONTROL

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

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

MIXTURE RATIO SELF-LEARNING CONTROL

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

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

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

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

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

ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION

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

FUEL INJECTION SYSTEM

Two types of systems are used.

Sequential multiport fuel injection system

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

Simultaneous multiport fuel injection system

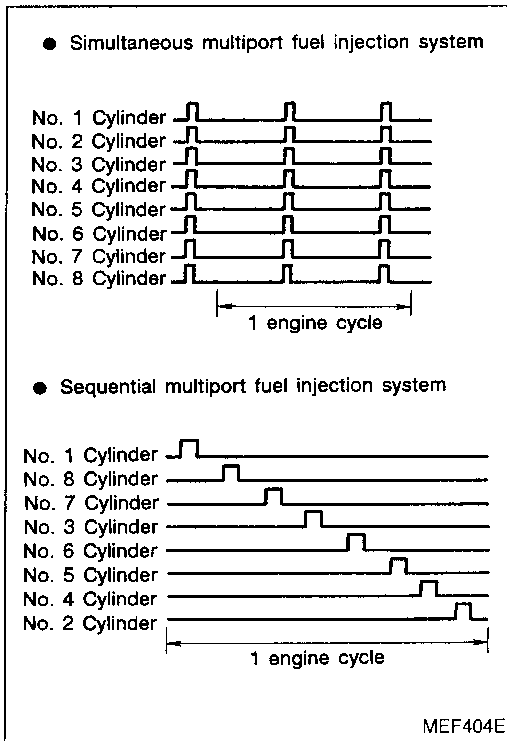
Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

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

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

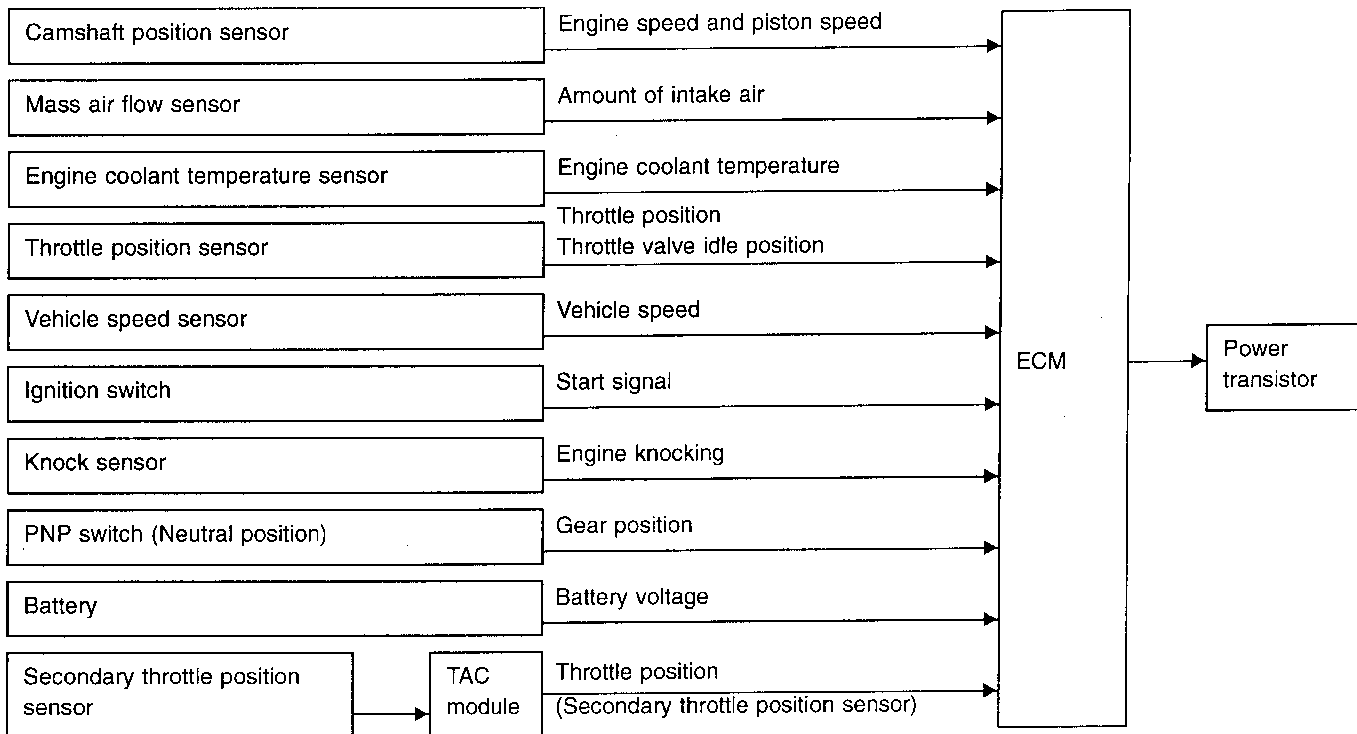
FUEL SHUT-OFF

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



Electronic Ignition (EI) System

INPUT/OUTPUT SIGNAL LINE



ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION

Electronic Ignition (EI) 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 below.

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

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

A °BTDC

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

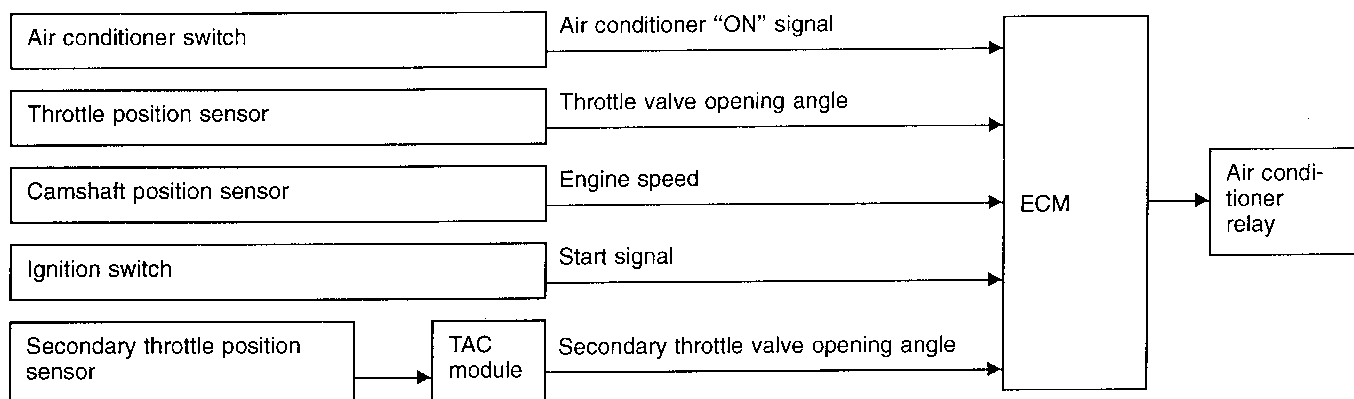
- 1 At starting
- 2 During warm-up
- 3 At idle
- 4 Hot engine operation
- 5 At acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions.

If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

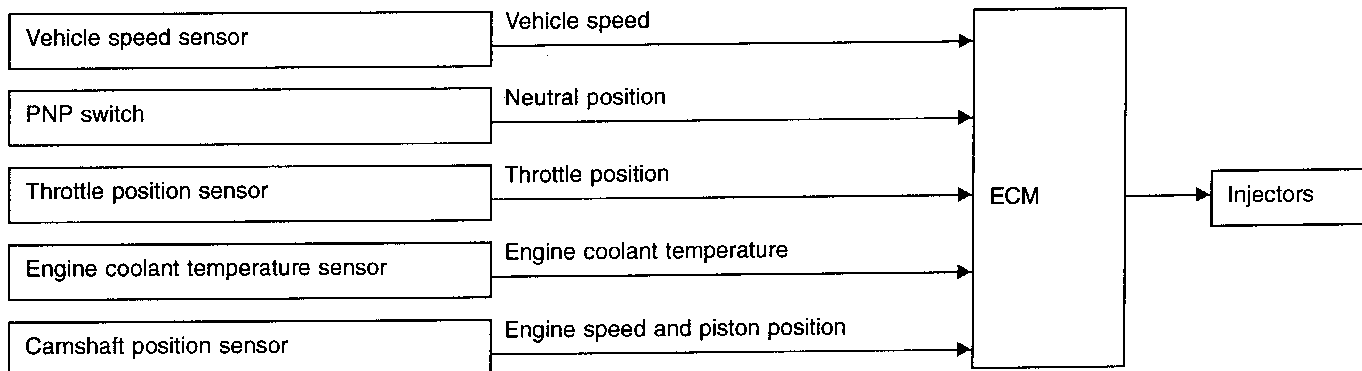
This system improves engine operation when the air conditioner is used.

Under the following conditions, the air conditioner is turned off.

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

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

INPUT/OUTPUT SIGNAL LINE



If the engine speed is above 1,400 rpm with no load (for example, in neutral and engine speed over 1,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

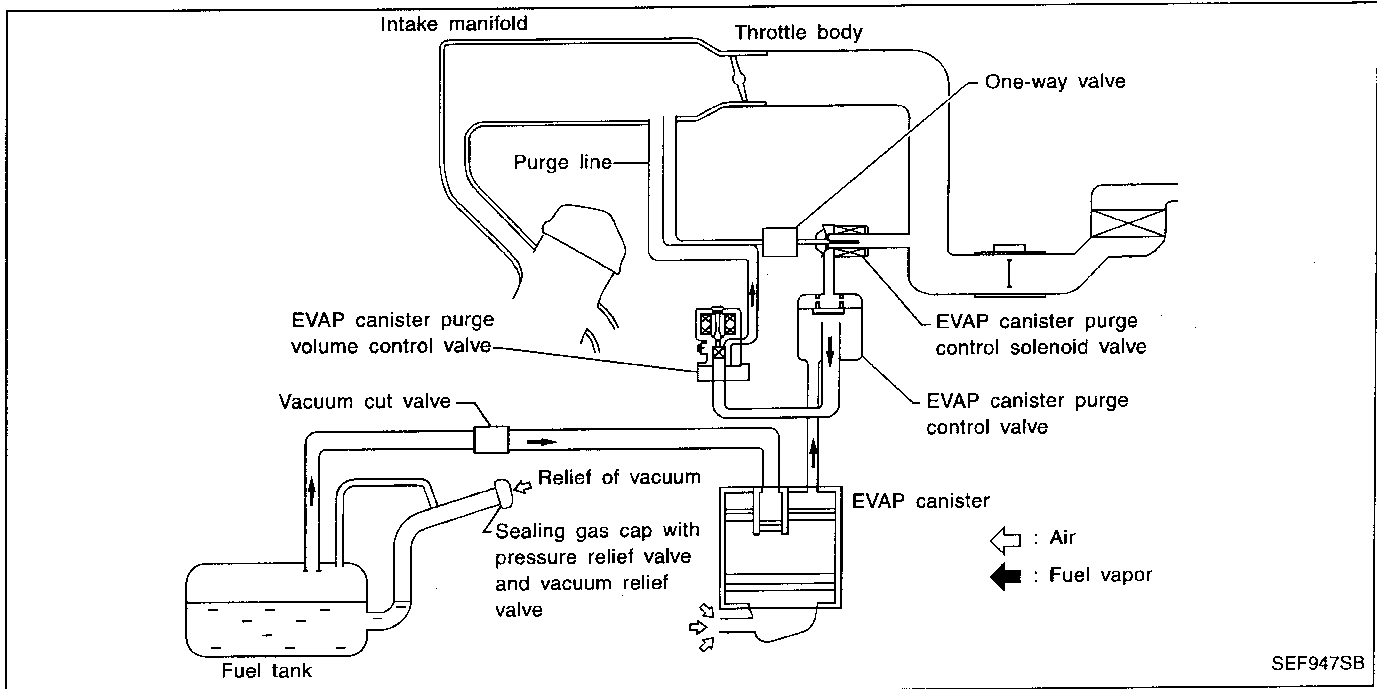
Fuel cut will operate until the engine speed reaches 1,000 rpm, then fuel cut is cancelled.

NOTE:

This function is different than deceleration control listed under multiport fuel injection on EC-18.

EVAPORATIVE EMISSION SYSTEM

Description



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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. This is where the vapor is stored when the engine is not operating.

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

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

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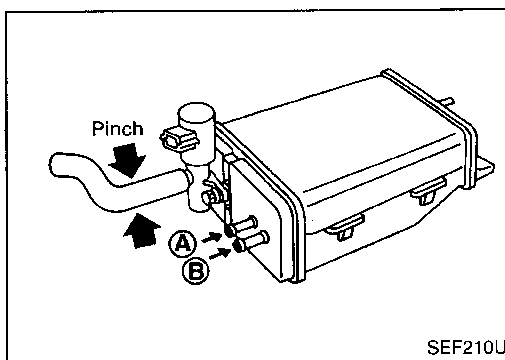
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Inspection

EVAP CANISTER

Check EVAP canister as follows:

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

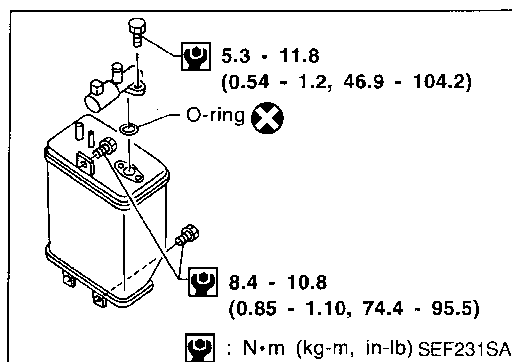
EVAPORATIVE EMISSION SYSTEM

Inspection (Cont'd)

TIGHTENING TORQUE

Tighten EVAP canister as shown in the figure.

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



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/cm², 2.22 - 2.90 psi)

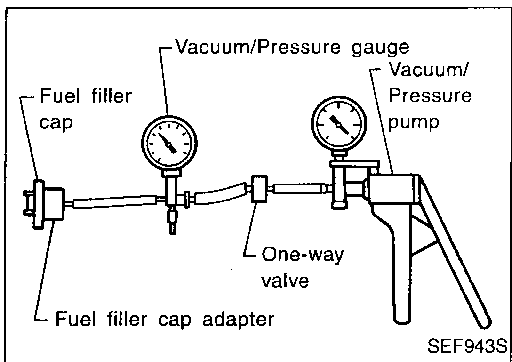
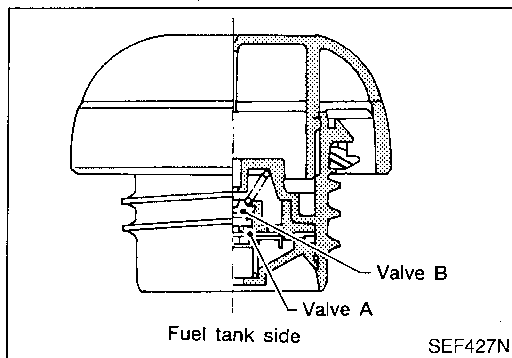
Vacuum:

-6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -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.



EGRC-SOLENOID VALVE

Refer to EC-394.

EVAP CANISTER PURGE CONTROL VALVE

Refer to EC-470.

VACUUM CUT VALVE AND VACUUM CUT VALVE BYPASS VALVE

Refer to EC-457.

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VOLUME CONTROL VALVE

Refer to EC-426.

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE CONTROL SOLENOID VALVE

Refer to EC-470.

TANK FUEL TEMPERATURE SENSOR

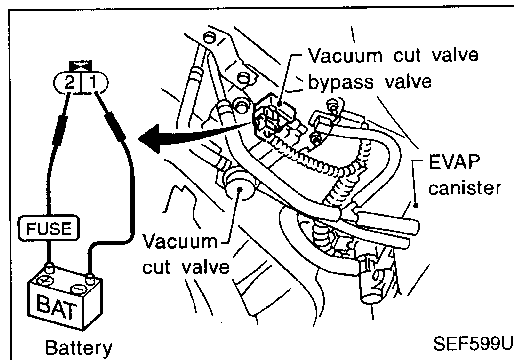
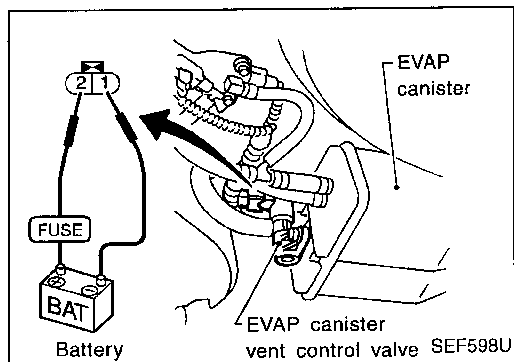
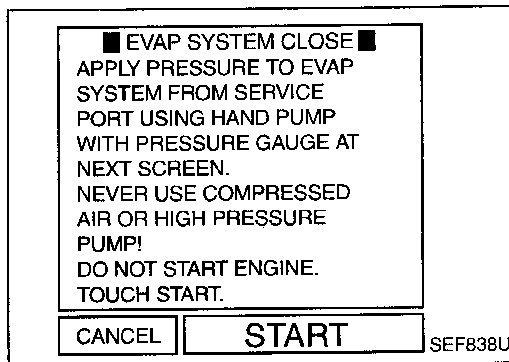
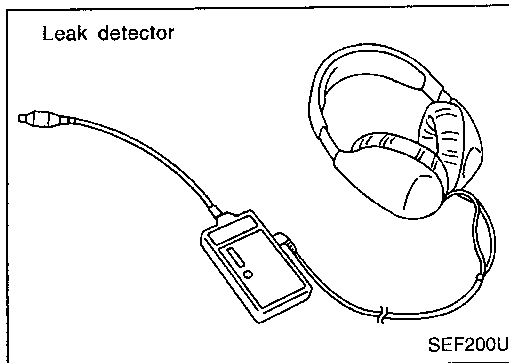
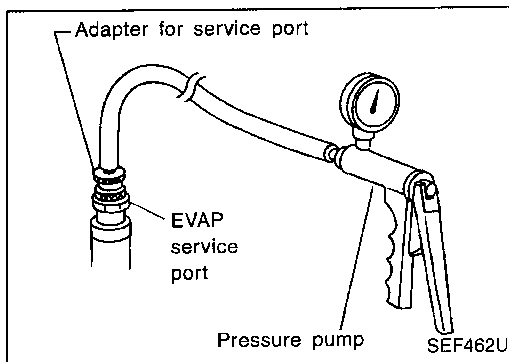
Refer to EC-247.

EVAPORATIVE EMISSION SYSTEM

Inspection (Cont'd)

EVAP SERVICE PORT

Positive pressure is delivered to the EVAP system through the EVAP service port. If fuel vapor leakage in the EVAP system occurs, use a leak detector to locate the leak.



HOW TO DETECT FUEL VAPOR LEAKAGE

CAUTION:

- Never use compressed air or a high pressure pump.
- Do not start engine.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

NOTE:

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



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

OR



1. Attach the adapter securely to the EVAP service port and pressure pump with pressure gauge to the EVAP service port.
2. Apply battery voltage to between the terminals of both EVAP canister vent control valve and vacuum cut valve bypass valve to make a closed EVAP system.
3. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 - 2.76 kPa (0.014 - 0.028 kg/cm², 0.2 - 0.4 psi).
4. Remove adapter and hose with pressure pump.
5. Locate the leak using a leak detector. Refer to "Evaporative Emission Line Drawing", EC-26.

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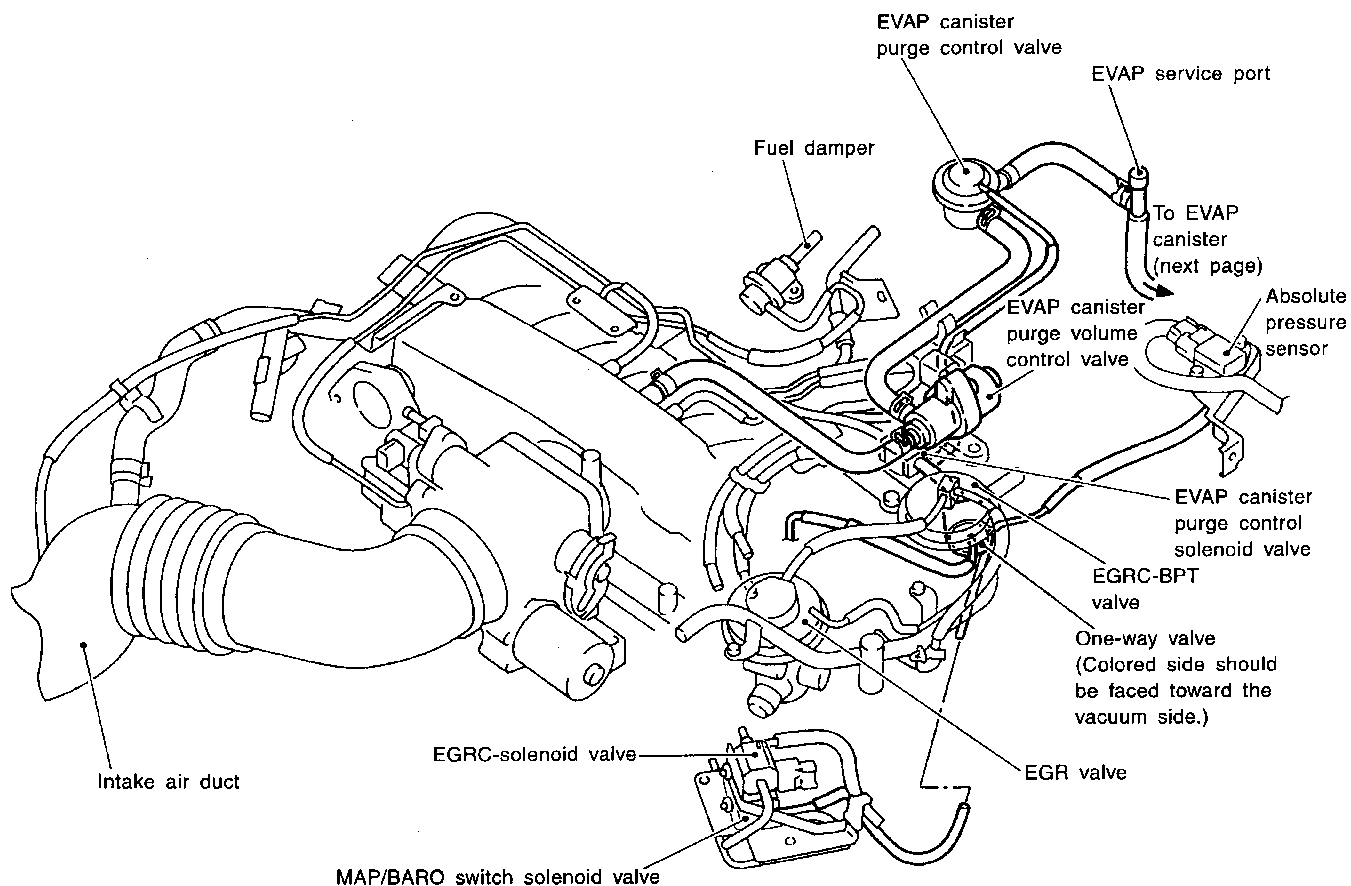
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EVAPORATIVE EMISSION SYSTEM

Evaporative Emission Line Drawing

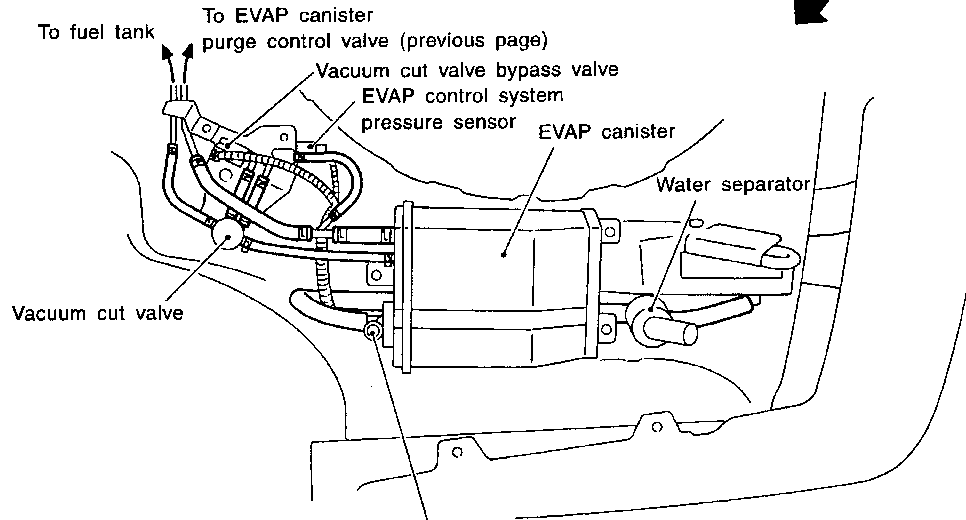
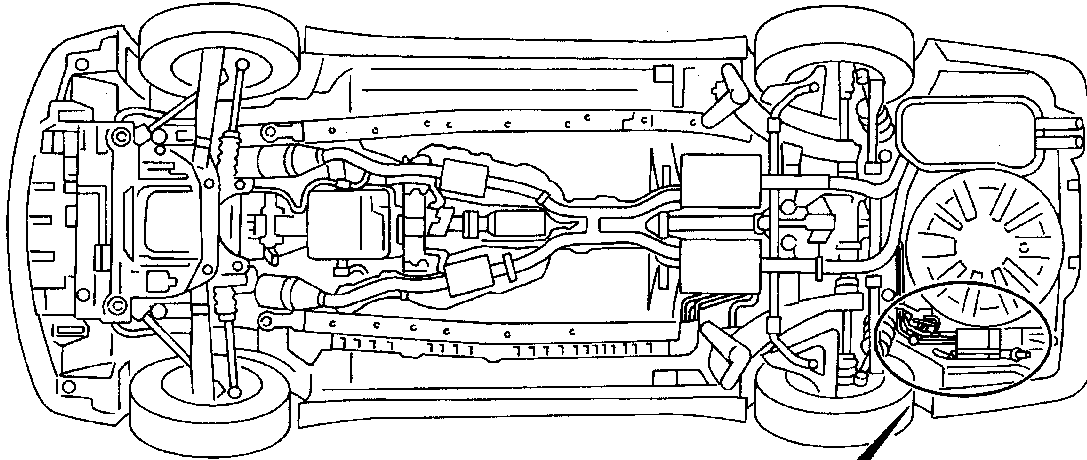


SEF211U

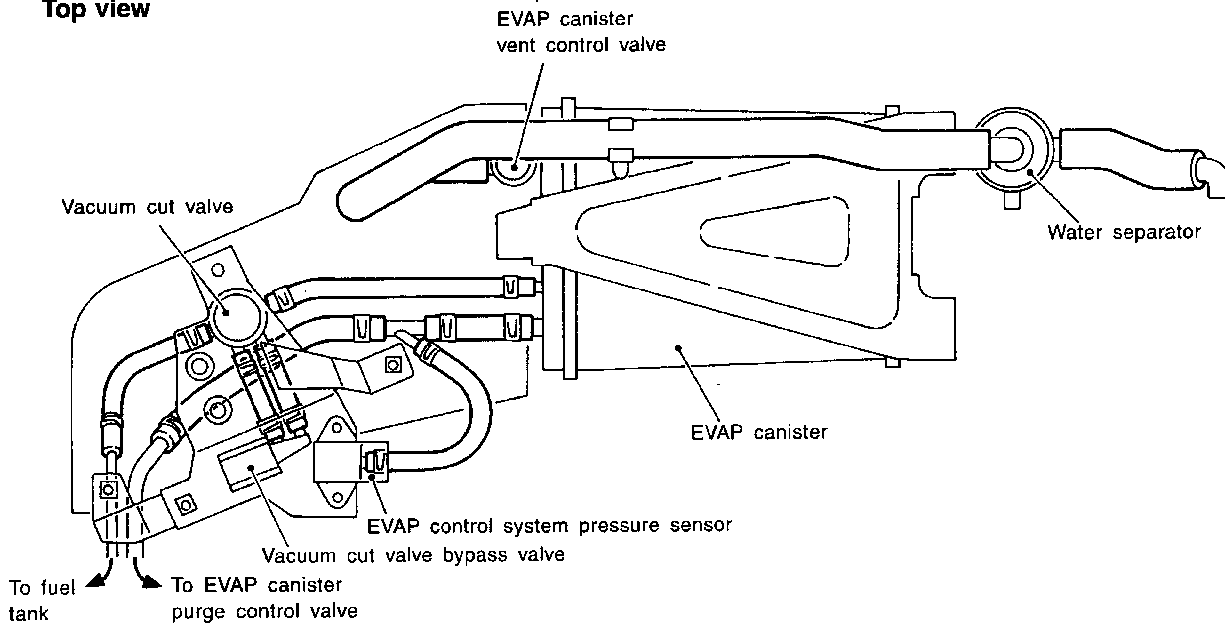
Note: Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

EVAPORATIVE EMISSION SYSTEM

Evaporative Emission Line Drawing (Cont'd)



Top view



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POSITIVE CRANKCASE VENTILATION

Description

This system returns blow-by gas to both the intake manifold and air cleaner.

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

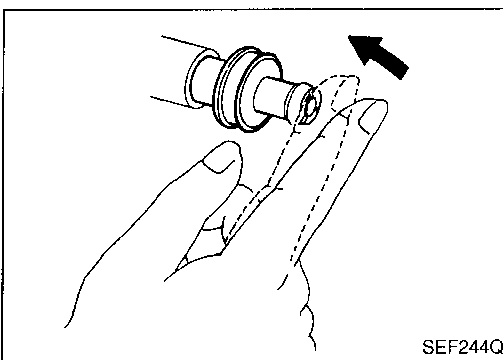
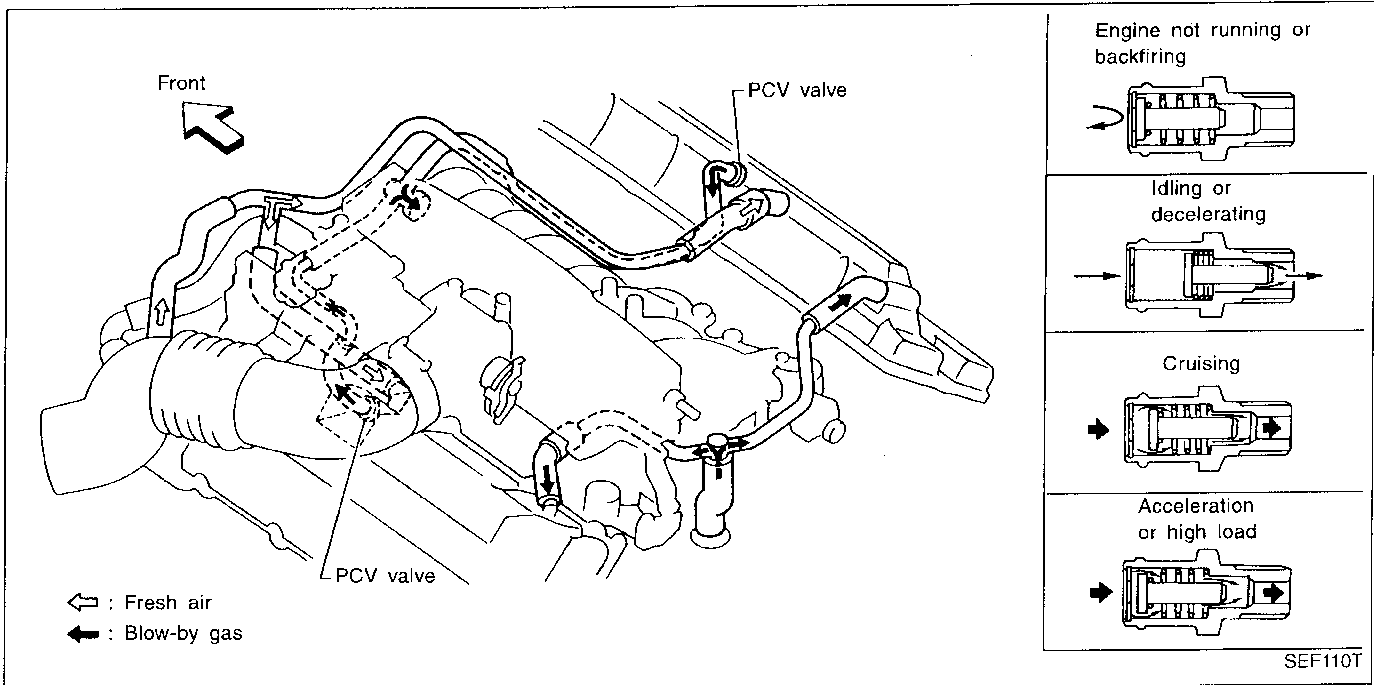
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

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

The ventilating air is then drawn from the air cleaner, through the hose connecting air cleaner to rocker cover, into the crankcase.

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

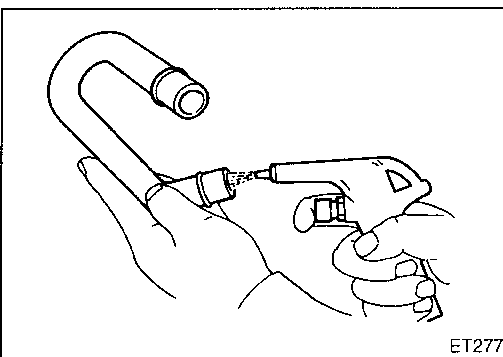
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.



Inspection

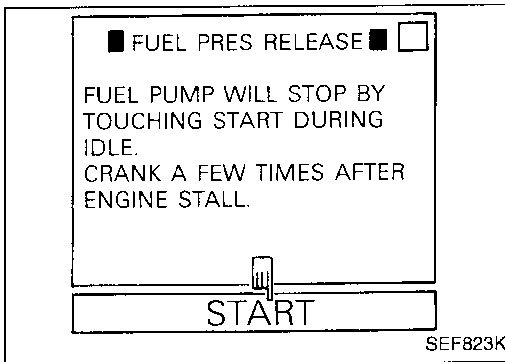
PCV (Positive Crankcase Ventilation) VALVE

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



PCV HOSE

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



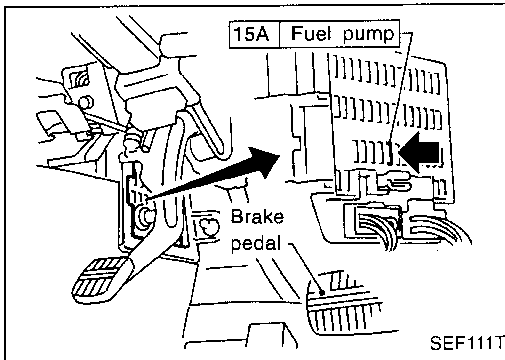
Fuel Pressure Release

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

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

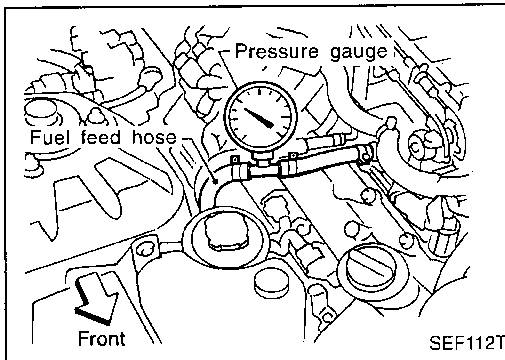
GI
MA
EM

OR



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

LC
EC



Fuel Pressure Check

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

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

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At idling:

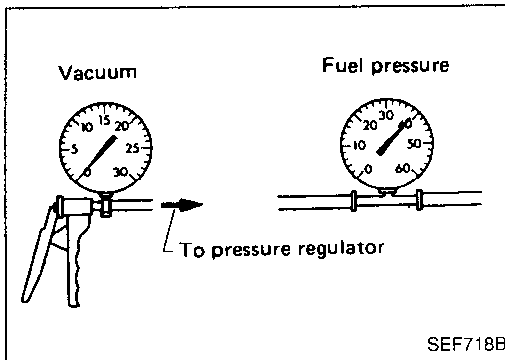
Approximately 235 kPa (2.4 kg/cm², 34 psi)

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

Approximately 294 kPa (3.0 kg/cm², 43 psi)

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

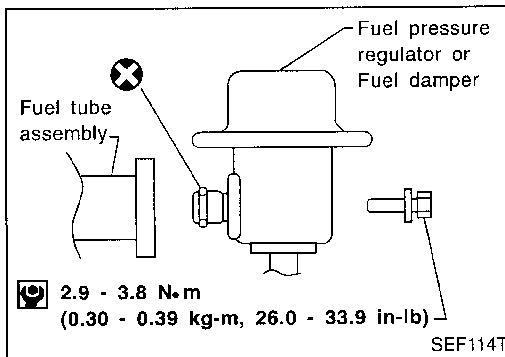
RS
BT
HA



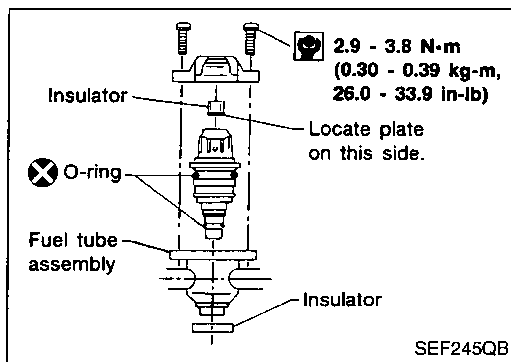
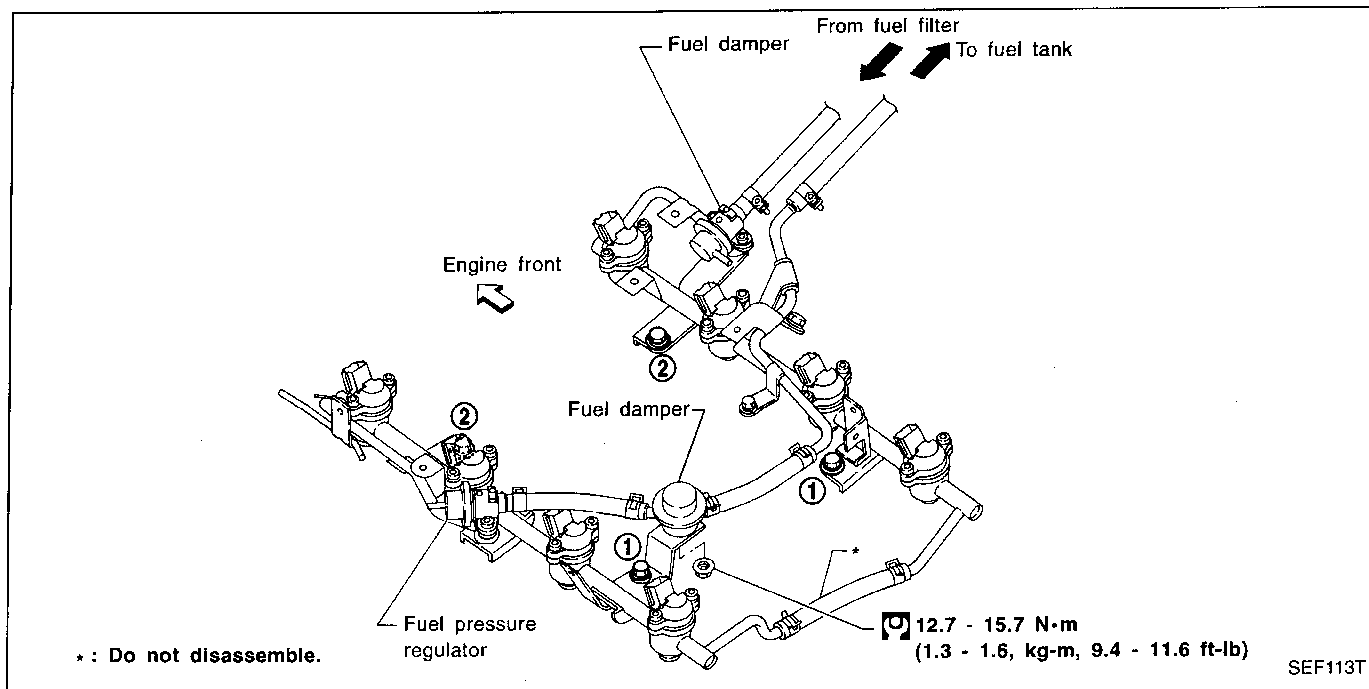
9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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

EL
IDX



Injector Removal and Installation



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

Tighten in numerical order shown in the figure.

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

CAUTION:

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

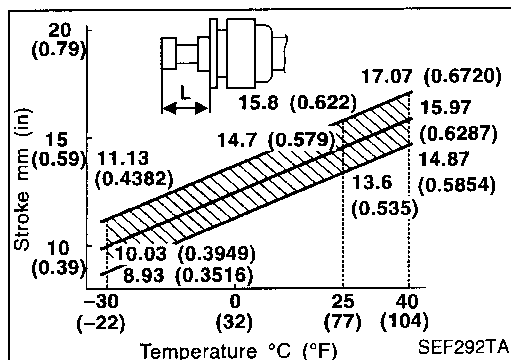
Fast Idle Cam (FIC) Inspection and Adjustment

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

GI

MA

EM



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

CAUTION:
Do not adjust TAS.

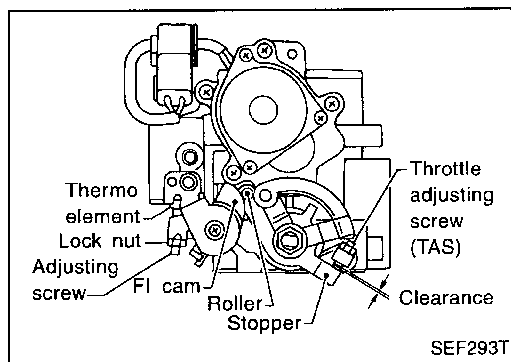
LC

EC

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

FE

AT



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

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

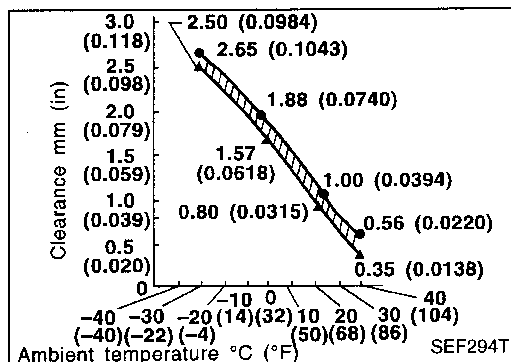
PD

FA

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

RA

BR



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☆ MONITOR ☆ NO FAIL

CMPS•RPM (POS) 650rpm

RECORD

SEF848Q

EL

IDX

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

IDLE SPEED

● Method A (Using CONSULT)

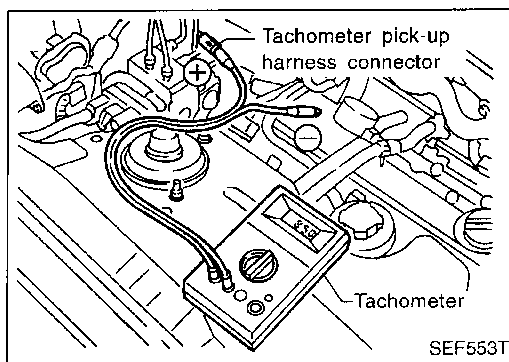
Check idle speed in "DATA MONITOR" mode with CONSULT.

BASIC SERVICE PROCEDURE

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

● Method B (Using check connector)

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

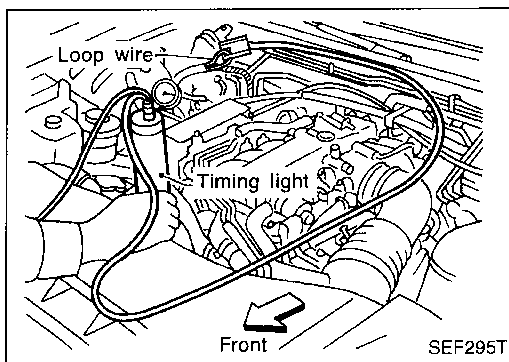


IGNITION TIMING

Any of the following two methods may be used.

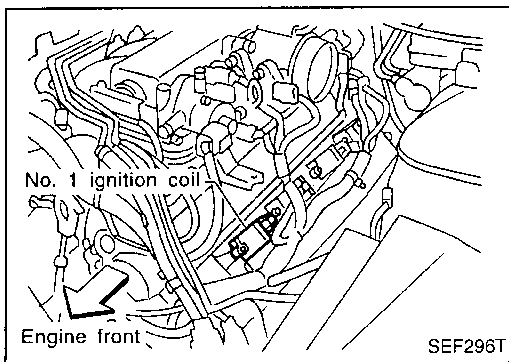
● Method A

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

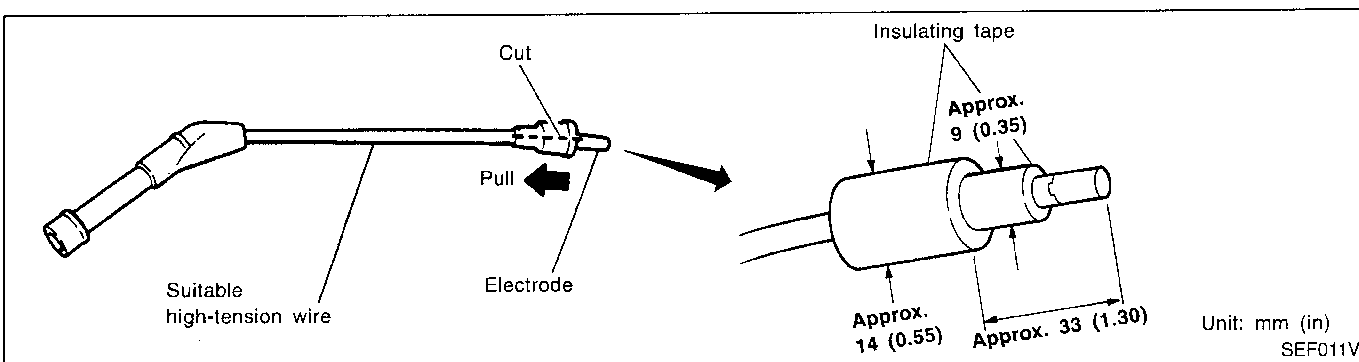
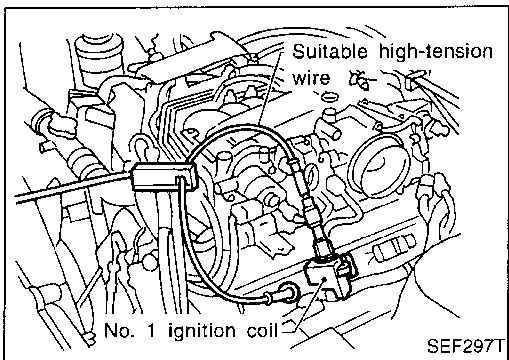


● Method B

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



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



Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

PREPARATION

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

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

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

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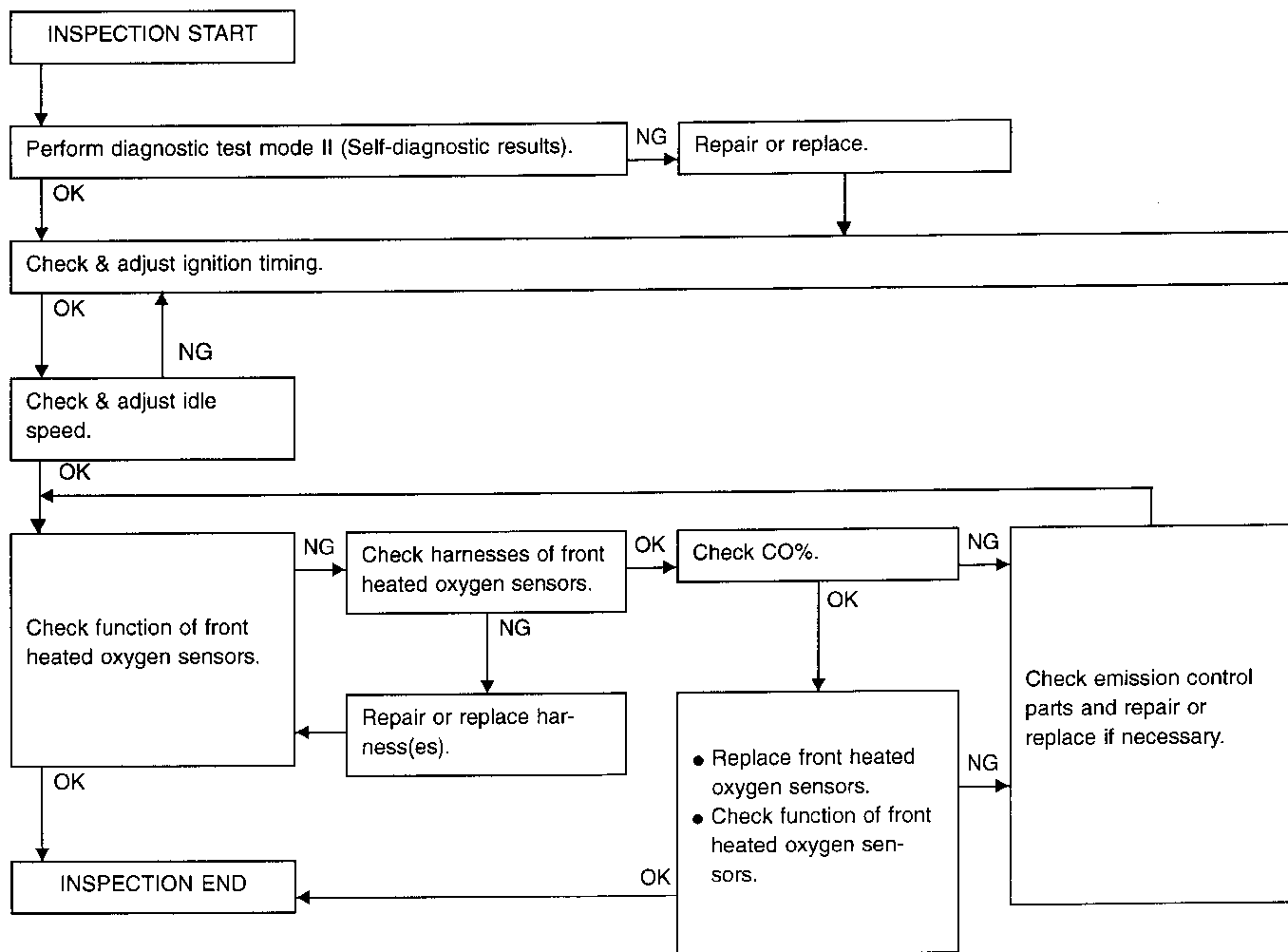
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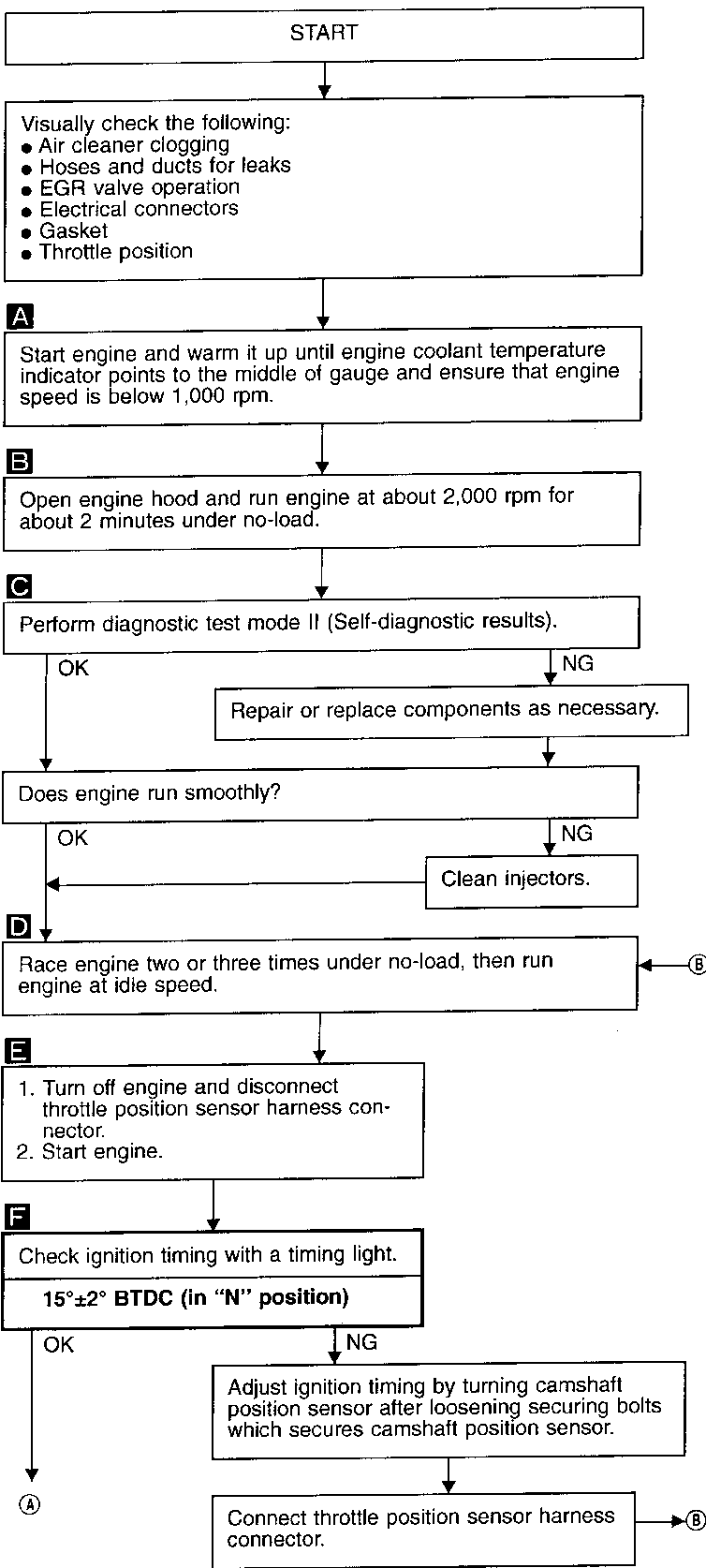
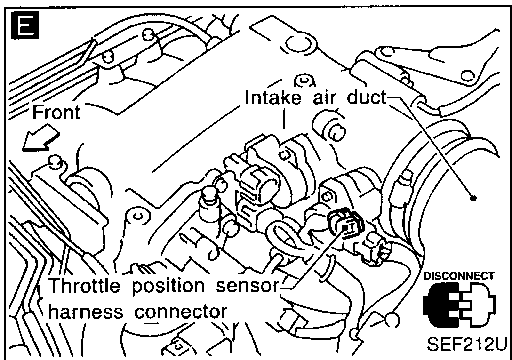
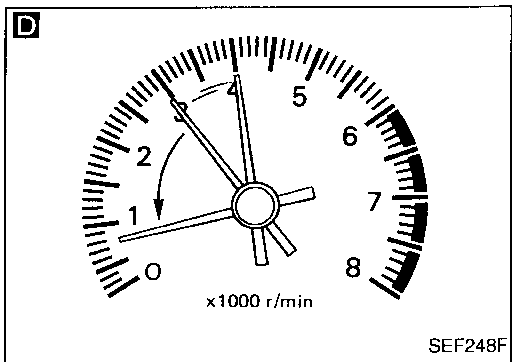
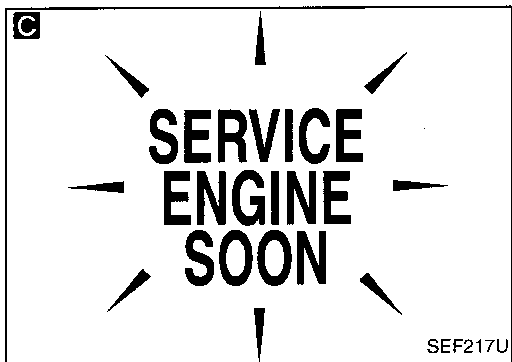
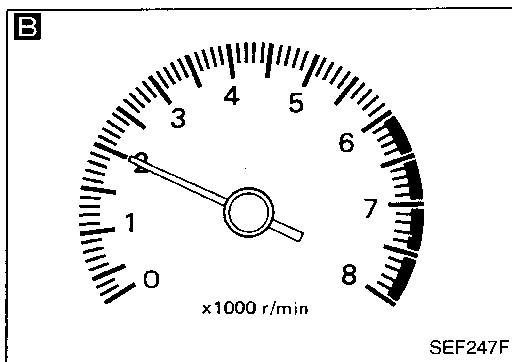
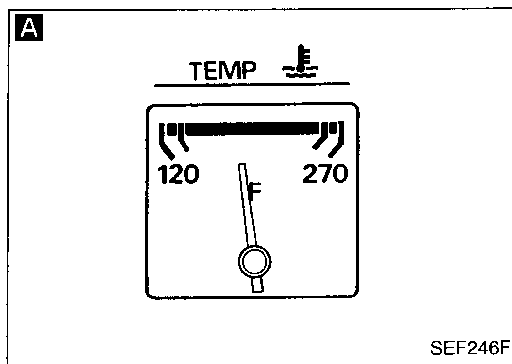
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Overall inspection sequence



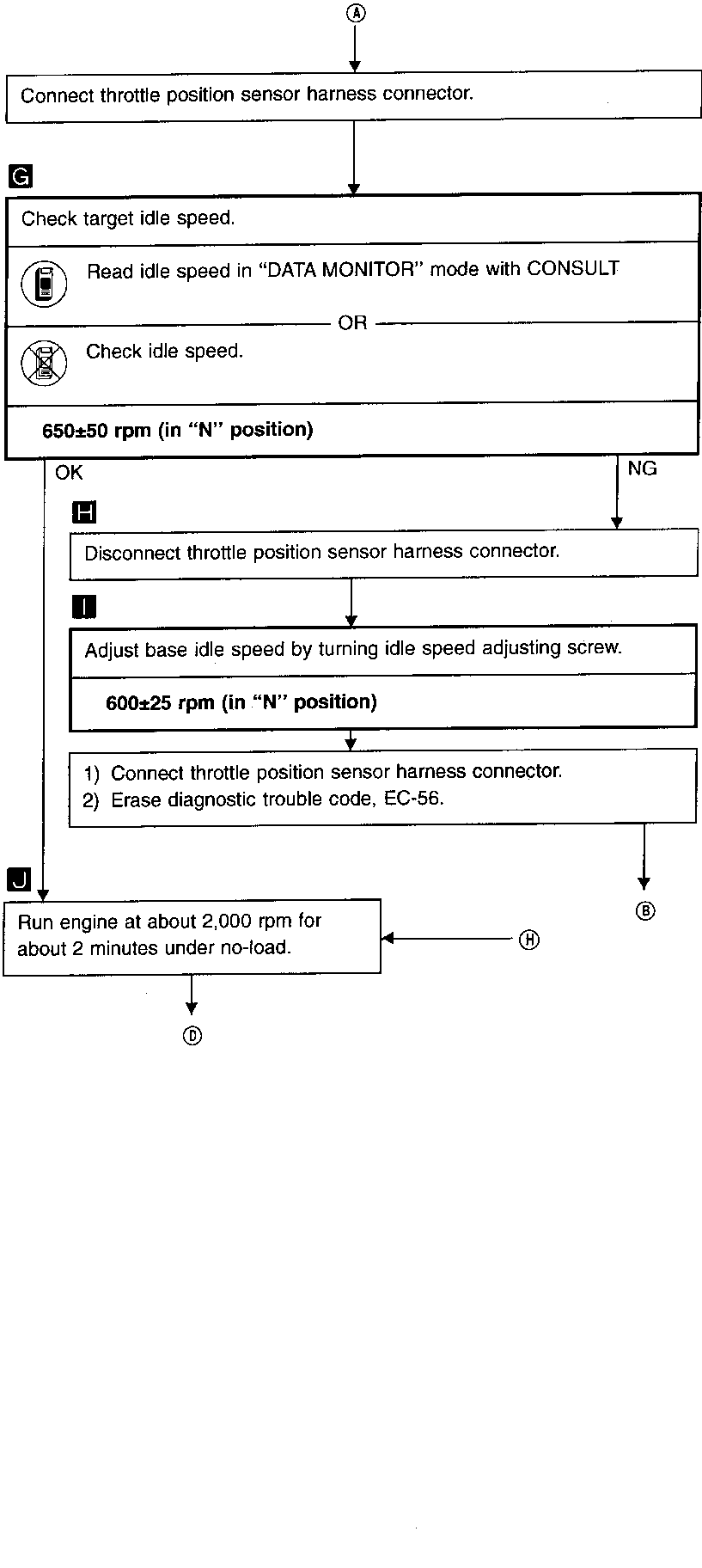
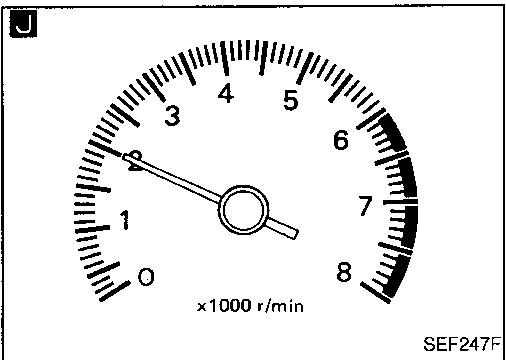
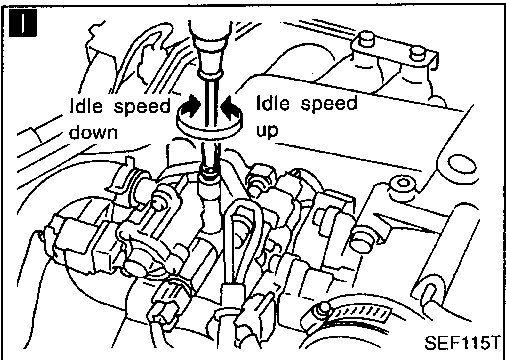
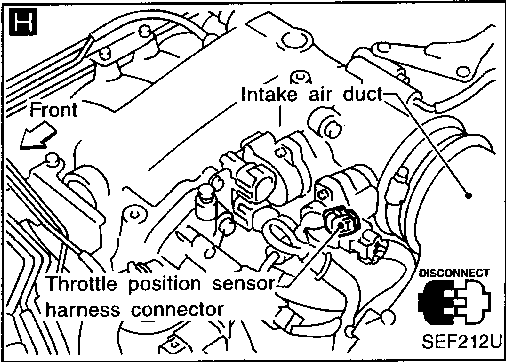
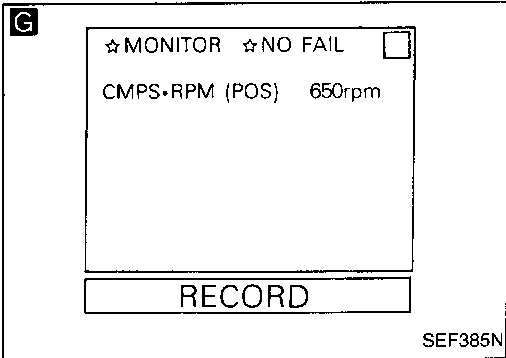
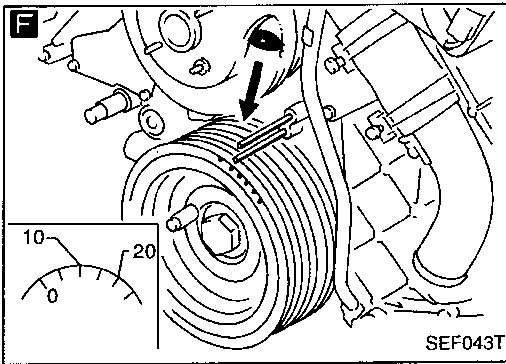
BASIC SERVICE PROCEDURE

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



BASIC SERVICE PROCEDURE

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



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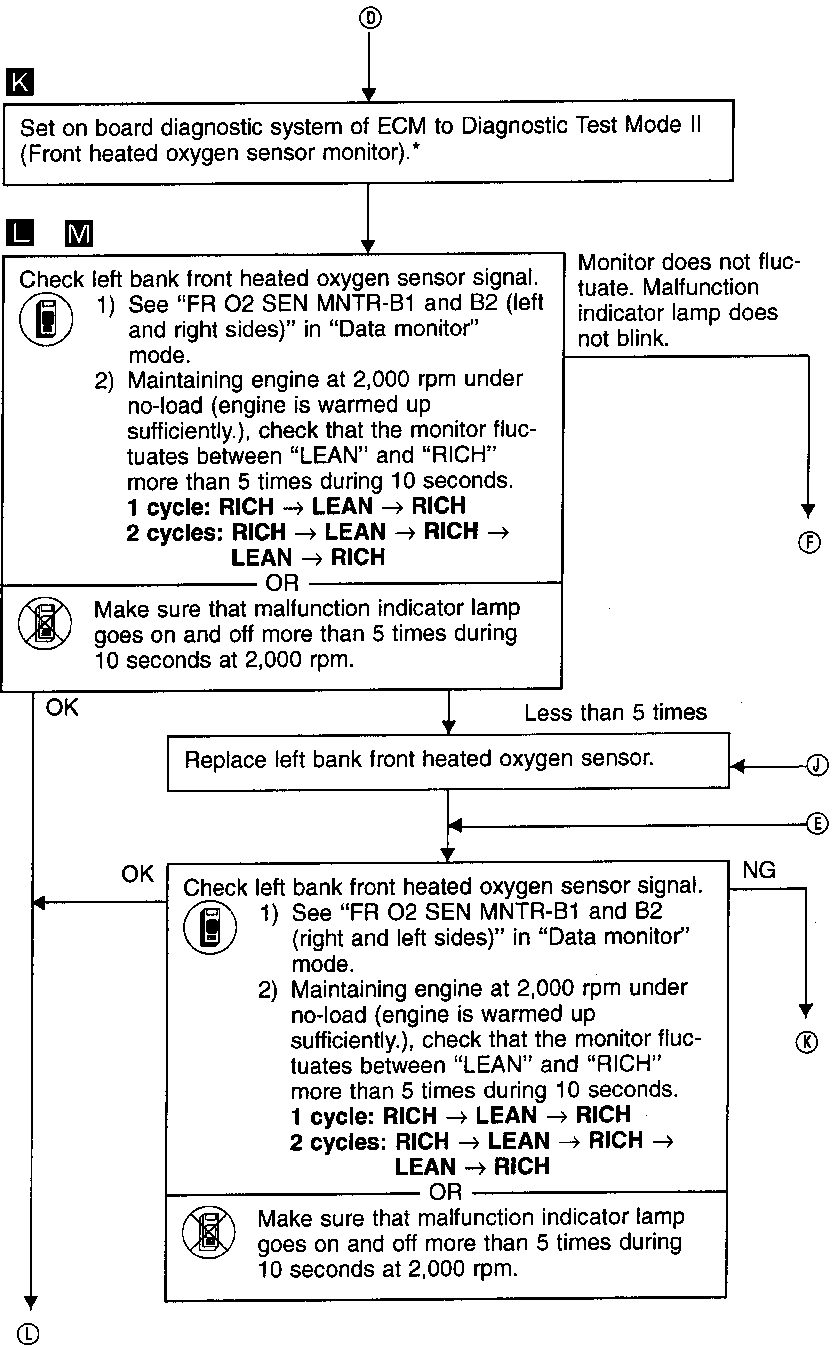
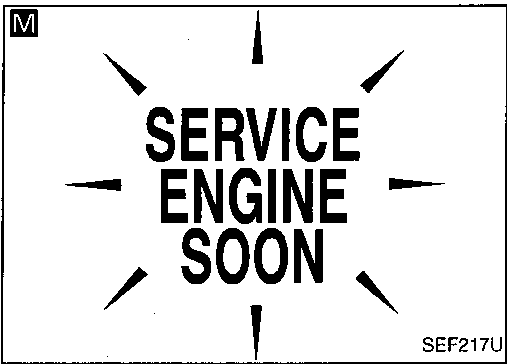
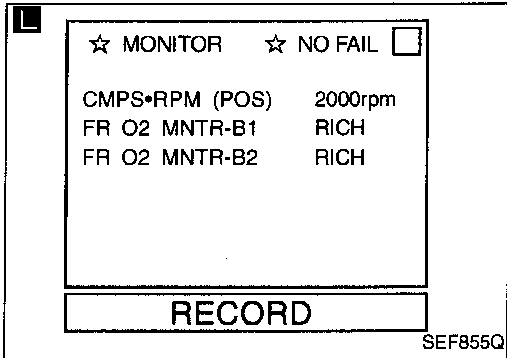
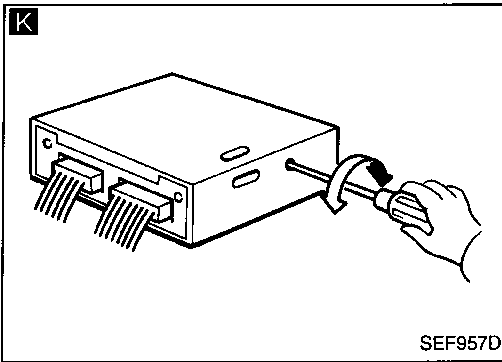
HA

EL

IDX

BASIC SERVICE PROCEDURE

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



*: If the battery is weak, front heated oxygen sensor monitor may not function properly. Use this function after fully charging battery.

BASIC SERVICE PROCEDURE

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

N

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM (POS)	2000rpm	
FR O2 MNTR-B1	RICH	
FR O2 MNTR-B2	RICH	

RECORD

SEF855Q

O

**SERVICE
ENGINE
SOON**

SEF217U

N **O**

Check right bank front heated oxygen sensor signal.

1) See "FR O2 SEN MNTR-B1 and -B2 (left and right sides)" in "Data monitor" mode.

2) Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.

1 cycle: RICH → LEAN → RICH

2 cycles: RICH → LEAN → RICH → LEAN → RICH

OR

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

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

OK

END

Replace right bank front heated oxygen sensor.

Check right bank front heated oxygen sensor signal.

1) See "FR O2 SEN MNTR-B1 and -B2 (left and right sides)" in "Data monitor" mode.

2) Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.

1 cycle: RICH → LEAN → RICH

2 cycles: RICH → LEAN → RICH → LEAN → RICH

OR

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

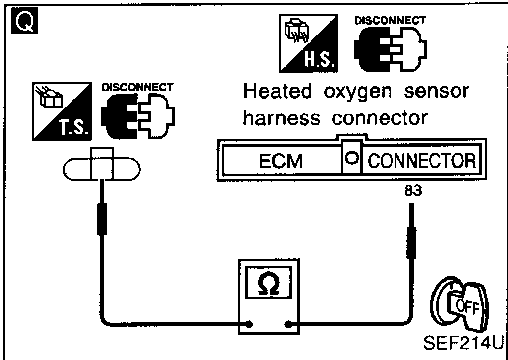
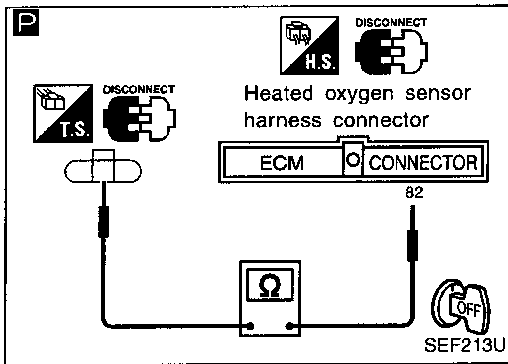
OK

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BASIC SERVICE PROCEDURE

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



P

- Check right bank front heated oxygen sensor harness:
- 1) Turn off engine and disconnect battery ground cable
 - 2) Disconnect ECM harness connector from ECM.
 - 3) Disconnect right bank front heated oxygen sensor harness connector.
 - 4) Check for continuity between terminal No. 82 of ECM harness connector and harness connector for front heated oxygen sensor.

Continuity existsOK
Continuity does not existNG

OK

Connect ECM harness connector to ECM.

Repair or replace ECM harness.

Q

- Check left bank front heated oxygen sensor harness:
- 1) Turn off engine and disconnect battery ground cable
 - 2) Disconnect ECM harness connector from ECM.
 - 3) Disconnect left bank front heated oxygen sensor harness connector.
 - 4) Check for continuity between terminal No. 83 of ECM harness connector and harness connector for front heated oxygen sensor.

Continuity existsOK
Continuity does not existNG

OK

Connect ECM harness connector to ECM.

Repair or replace ECM harness.

← (C)

(H)

(G)

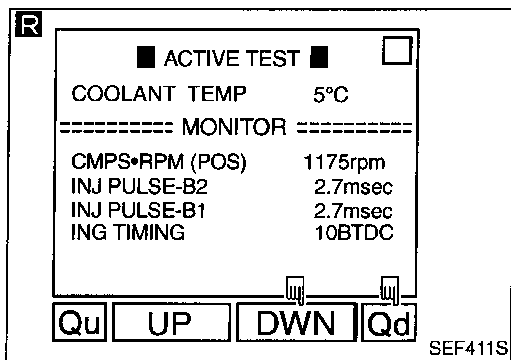
← (F)

(H)

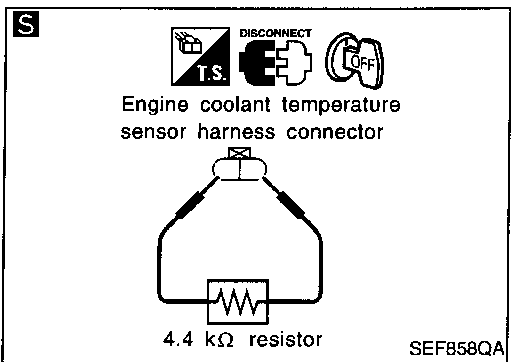
(G)

BASIC SERVICE PROCEDURE

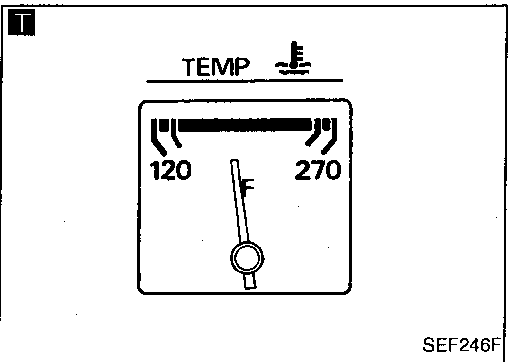
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



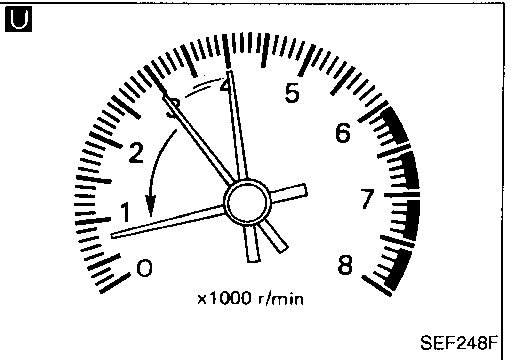
SEF411S



SEF858QA



SEF246F



SEF248F

R S



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

Ⓔ

OR



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

T

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

U

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

Check "CO" %.

Idle CO: 0.4 - 9.4% with engine running smoothly

After checking CO%,

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

OK

NG

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

Check fuel pressure regulator.

Ⓕ

Check mass air flow sensor.

Check injector.
Clean or replace if necessary.

Check engine coolant temperature sensor.

Ⓖ

Check ECM function* by substituting another known good ECM.

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

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Introduction

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

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

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

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

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

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

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode (Refer to EC-89.).

Two Trip Detection Logic

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not light up at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up at the same time when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

Items	MIL			DTC		1st trip DTC	
	1st trip		2nd trip lighting up	1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up					
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 (0701, 0608 - 0601) is being detected	X	—	—	X	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 (0701, 0608 - 0601) has been detected	—	X	—	X	—	X	—
Closed loop control — DTC: P1148 (0307), P1168 (0308)	—	X	—	X	—	X	—
Fail-safe items (Refer to EC-89.)	—	X		X*1	—	X*1	—
Except above	—	—	X		X	X	X

*1: Except “ECM”.

Emission-related Diagnostic Information

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the first trip DTC did not reoccur, the first trip DTC will not be displayed. If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the first trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a first trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory. Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-52.




For malfunctions in which 1st trip DTCs are displayed, refer to EC-49. 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.

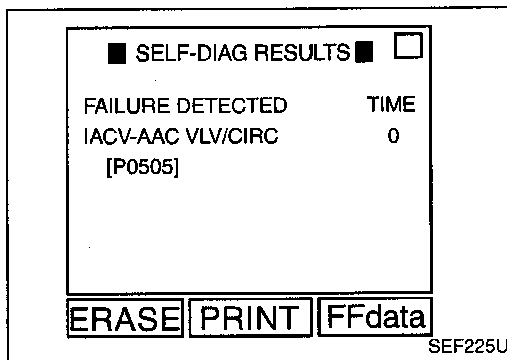
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in "Work Flow" procedure Step II, refer to page EC-80. Then perform "Diagnostic trouble code confirmation procedure" or "Overall function check" to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

How to read DTC and 1st trip DTC

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

1.  The number of blinks of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 0101, 0201, 1003, 1104, etc.
These DTCs are controlled by NISSAN.
2.  CONSULT or GST (Generic Scan Tool) Examples: P0340, P1320, P0705, P0750, etc.
These DTCs are prescribed by SAE J2012.
 (CONSULT also displays the malfunctioning component or system.)

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

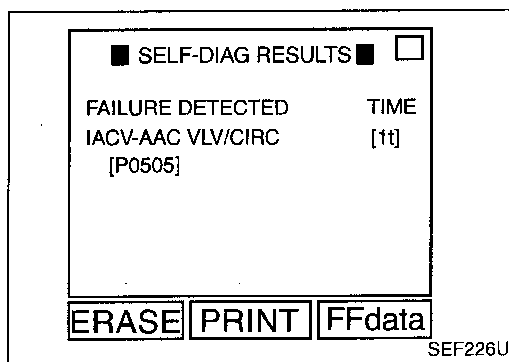


A sample of CONSULT display for DTC is shown at left. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT. Time data indicates how many times the vehicle was driven after the last detection of a DTC. If the DTC is being detected currently, the time data will be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

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)



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

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

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

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and are displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen, not on the GST. For details, see EC-66.

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

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0308 (0701, 0608 - 0601) Fuel Injection System Function — DTC: P0171 (0115), P0172 (0114)
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

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

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-52.

SYSTEM READINESS TEST (SRT) CODE

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

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

SRT codes are set after self-diagnosis has been performed 1 or more times. This occurs regardless of whether the diagnosis is in "OK" or "NG", and whether or not the diagnosis is performed in consecutive trips. The following table lists the 5 SRT items (30 test items) for the ECCS used in Y33 models.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

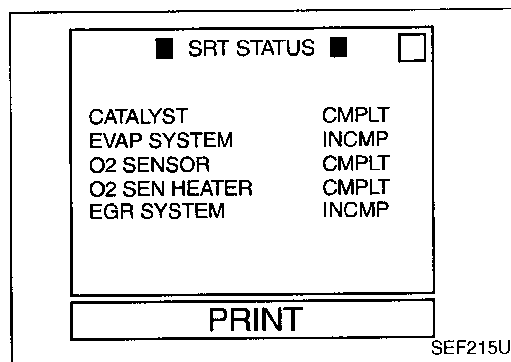
SRT items	Self-diagnostic test items	
Catalyst monitoring	<ul style="list-style-type: none"> ● Three way catalyst function (left bank) P0420 (0702) ● Three way catalyst function (right bank) P0430 (0703) 	GI
EVAP system monitoring	<ul style="list-style-type: none"> ● EVAP control system (Small leak — negative pressure) P0440 (0705) ● EVAP control system (Small leak — positive pressure) P1440 (0213) ● EVAP control system purge flow monitoring P1447 (0111) 	MA
Oxygen sensor monitoring	<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;">Left bank</div> <div style="width: 70%;"> <ul style="list-style-type: none"> ● Front heated oxygen sensor (Circuit) P0130 (0303) ● Front heated oxygen sensor (Lean shift monitoring) P0131 (0411) ● Front heated oxygen sensor (Rich shift monitoring) P0132 (0410) ● Front heated oxygen sensor (Response monitoring) P0133 (0409) ● Front heated oxygen sensor (High voltage) P0134 (0412) </div> <div style="width: 10%; text-align: right;">EM</div> </div>	LC
	<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;">Right bank</div> <div style="width: 70%;"> <ul style="list-style-type: none"> ● Front heated oxygen sensor (Circuit) P0150 (0503) ● Front heated oxygen sensor (Lean shift monitoring) P0151 (0415) ● Front heated oxygen sensor (Rich shift monitoring) P0152 (0414) ● Front heated oxygen sensor (Response monitoring) P0153 (0413) ● Front heated oxygen sensor (High voltage) P0154 (0509) </div> <div style="width: 10%; text-align: right;">EC</div></div>	

Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-56). In addition, if the ECCS components/system are repaired or if the battery terminals remain disconnected for more than 24 hours, all SRT codes may be cleared from the ECM memory.

How to display SRT code

1. Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT
 For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT screen; for items whose SRT codes are not set, "INCMP" is displayed.

2. Selecting Mode 1 with GST (Generic Scan Tool)



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.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

How to set SRT code

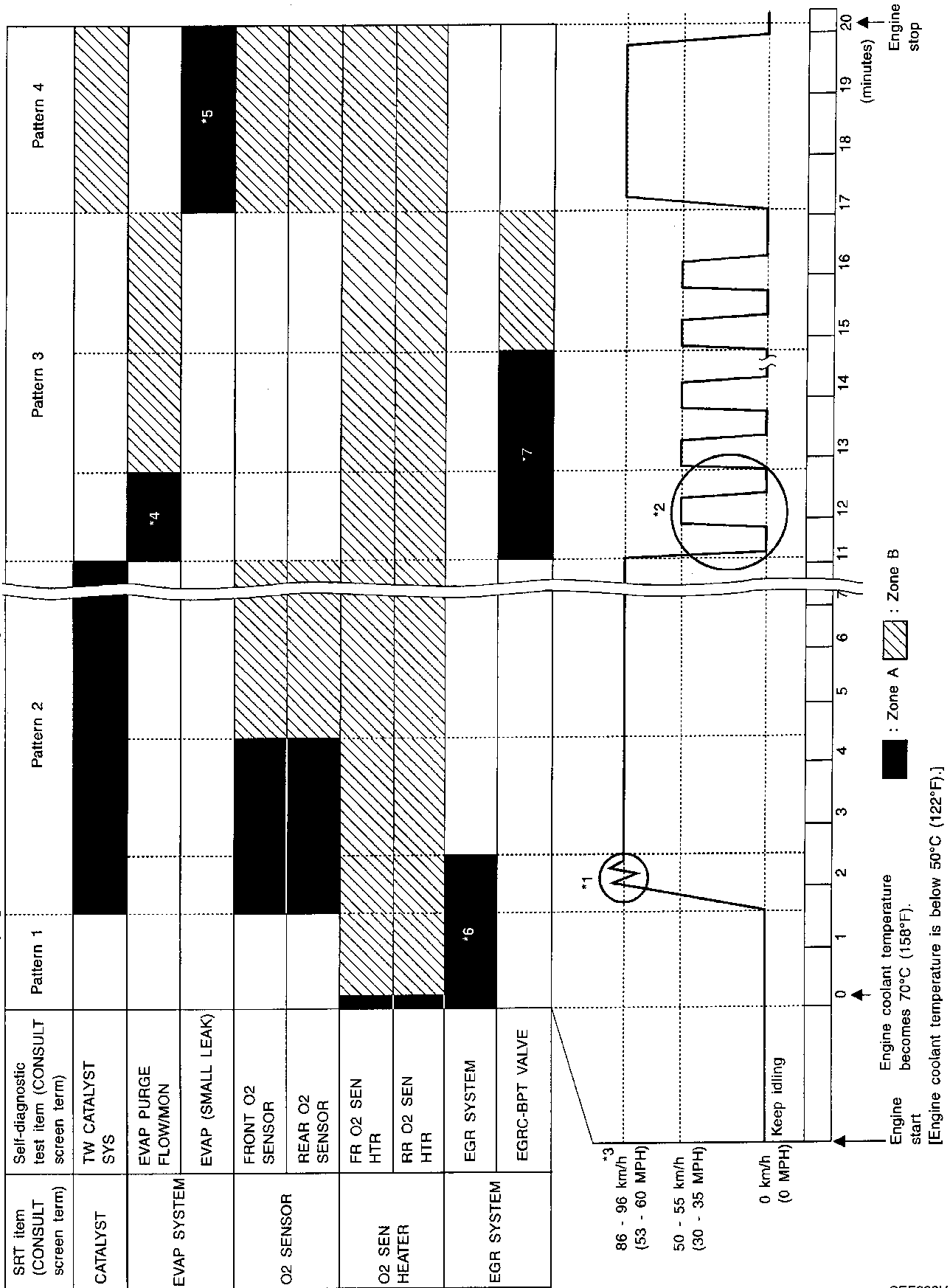
To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions. The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

Driving pattern

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



ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.

Zone A refers to the range where the time required, for the diagnosis under normal conditions*, is the shortest. Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

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

Under different conditions [For example: ambient temperature is other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1: • The engine is started at the engine coolant temperature of -10 to 35°C (14 to 95°F) (where the voltage between the ECM terminals ⑥⑦ and ⑫⑬ is 3.0 - 4.3 V.)

- The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals ⑥⑦ and ⑫⑬ is lower than 1.4 V.)
- The engine is started at a tank fuel temperature warmer than 0°C (32°F) (where the voltage between the ECM terminal ⑨ and ground is less than 4.1V).

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

Pattern 3: • The driving pattern outlined in *2 must be repeated at least 3 times.

Pattern 4: • Tests are performed after the engine has been operated for at least 17 minutes.

- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted all over again.

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

*2: Operate the vehicle in the following driving pattern.

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

- *3: Checking the vehicle speed with CONSULT or GST is advised.
- *4: The driving pattern may be omitted when "PURG FLOW P1447" is performed using the "DTC WORK SUPPORT" mode with CONSULT.
- *5: The driving pattern may be omitted when "EVAP SML LEAK P0440" is performed using the "DTC WORK SUPPORT" mode with CONSULT.
- *6: The driving pattern may be omitted when all the following are performed using the "DTC WORK SUPPORT" mode with CONSULT.
 - "EGR SYSTEM P0400"
 - "EGR SYSTEM P1402"
- *7: The driving pattern may be omitted when "EGRC-BPT/VLV P0402" is performed using the "DTC WORK SUPPORT" mode with CONSULT.

Suggested transmission gear position

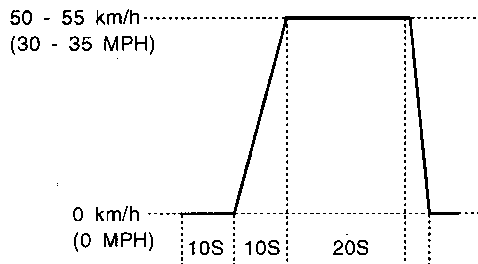
Set the selector lever in the "D" position with "OD" ON.

Suggested maximum speed in each gear

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

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

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



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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

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

The following is the information specified in Mode 6 of SAE J1979.

The test value is a parameter used to determine whether a system/circuit diagnostic test is "OK" or "NG" while being monitored by 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 (14 test items).

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

X: Applicable
—: Not applicable

SRT item	Self-diagnostic test item	Test value		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function (Left bank)	01H	01H	Max.	X
	Three way catalyst function (Right bank)	03H	02H	Max.	X
EVAP SYSTEM	EVAP control system (Small leak)	05H	03H	Max.	X
	EVAP control system purge flow monitoring	06H	83H	Min.	X
O2 SENSOR	Front heated oxygen sensor (Left bank)	09H	04H	Max.	X
		0AH	84H	Min.	X
		0BH	04H	Max.	X
		0CH	04H	Max.	X
	Front heated oxygen sensor (Right bank)	0DH	04H	Max.	X
		11H	05H	Max.	X
		12H	85H	Min.	X
		13H	05H	Max.	X
		14H	05H	Max.	X
	Rear heated oxygen sensor (Left bank)	15H	05H	Max.	X
		19H	86H	Min.	X
		1AH	86H	Min.	X
	Rear heated oxygen sensor (Right bank)	1BH	06H	Max.	X
		1CH	06H	Max.	X
		21H	87H	Min.	X
	Rear heated oxygen sensor (Right bank)	22H	87H	Min.	X
23H		07H	Max.	X	
24H		07H	Max.	X	

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

X: Applicable
—: Not applicable

Items (CONSULT screen terms)	DTC*4		SRT code	Test value/ Test limit (GST only)	1st trip DTC*4	Reference page
	CONSULT GST*2	ECM*1				
NO SELF DIAGNOSTIC FAILURE INDICATED	P0000	0505	—	—	—	—
MAF SEN/CIRCUIT	P0100	0102	—	—	X	EC-115
ABSL PRES SEN/CIRC	P0105	0803	—	—	X	EC-123
AIR TEMP SEN/CIRC	P0110	0401	—	—	X	EC-131
COOLANT T SEN/CIRC	P0115	0103	—	—	X	EC-137
THRTL POS SEN/CIRC	P0120	0403	—	—	X	EC-142
*COOLAN T SEN/CIRC	P0125	0908	—	—	X	EC-154
FRONT O2 SENSOR-B1	P0130	0303	X	X	X*3	EC-159
FRONT O2 SENSOR-B1	P0131	0411	X	X	X*3	EC-166
FRONT O2 SENSOR-B1	P0132	0410	X	X	X*3	EC-172
FRONT O2 SENSOR-B1	P0133	0409	X	X	X*3	EC-178
FRONT O2 SENSOR-B1	P0134	0412	X	X	X*3	EC-187
FR O2 SE HEATER-B1	P0135	0901	X	X	X*3	EC-194
REAR O2 SENSOR-B1	P0137	0511	X	X	X*3	EC-200
REAR O2 SENSOR-B1	P0138	0510	X	X	X*3	EC-208
REAR O2 SENSOR-B1	P0139	0707	X	X	X*3	EC-216
REAR O2 SENSOR-B1	P0140	0512	X	X	X*3	EC-223
RR O2 SE HEATER-B1	P0141	0902	X	X	X*3	EC-229
FRONT O2 SENSOR-B2	P0150	0503	X	X	X*3	EC-194
FRONT O2 SENSOR-B2	P0151	0415	X	X	X*3	EC-166
FRONT O2 SENSOR-B2	P0152	0414	X	X	X*3	EC-172
FRONT O2 SENSOR-B2	P0153	0413	X	X	X*3	EC-178
FRONT O2 SENSOR-B2	P0154	0509	X	X	X*3	EC-187
FR O2 SE HEATER-B2	P0155	1001	X	X	X*3	EC-194
REAR O2 SENSOR-B2	P0157	0314	X	X	X*3	EC-200
REAR O2 SENSOR-B2	P0158	0313	X	X	X*3	EC-208
REAR O2 SENSOR-B2	P0159	0708	X	X	X*3	EC-216
REAR O2 SENSOR-B2	P0160	0315	X	X	X*3	EC-223
RR O2 SE HEATER-B2	P0161	1002	X	X	X*3	EC-229
FUEL SYS LEAN/BK1	P0171	0115	—	—	X	EC-235
FUEL SYS RICH/BK1	P0172	0114	—	—	X	EC-241
FUEL SYS LEAN/BK2	P0174	0210	—	—	X	EC-235
FUEL SYS RICH/BK2	P0175	0209	—	—	X	EC-241
FUEL TEMP SEN/CIRC	P0180	0402	—	—	X	EC-247
MULTI CYL MISFIRE	P0300	0701	—	—	X	EC-252
CYL 1 MISFIRE	P0301	0608	—	—	X	EC-252
CYL 2 MISFIRE	P0302	0607	—	—	X	EC-252

*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.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

X: Applicable
—: Not applicable

Items (CONSULT screen terms)	DTC*4		SRT code	Test value/ Test limit (GST only)	1st trip DTC*4	Reference page
	CONSULT GST*2	ECM*1				
CYL 3 MISFIRE	P0303	0606	—	—	X	EC-252
CYL 4 MISFIRE	P0304	0605	—	—	X	EC-252
CYL 5 MISFIRE	P0305	0604	—	—	X	EC-252
CYL 6 MISFIRE	P0306	0603	—	—	X	EC-252
CYL 7 MISFIRE	P0307	0602	—	—	X	EC-252
CYL 8 MISFIRE	P0308	0601	—	—	X	EC-252
KNOCK SEN/CIRC-B1	P0325	0304	—	—	X	EC-257
KNOCK SEN/CIRC-B2	P0330	0212	—	—	X	EC-257
CPS/CIRCUIT (OBD)	P0335	0802	—	—	X	EC-260
CAM POS SEN/CIR	P0340	0101	—	—	X	EC-265
EGR SYSTEM	P0400	0302	X	X	X*3	EC-271
EGRC-BPT VALVE	P0402	0306	X	X	X*3	EC-280
TW CATALYST SYS-B1	P0420	0702	X	X	X*3	EC-285
TW CATALYST SYS-B2	P0430	0703	X	X	X*3	EC-285
EVAP SMALL LEAK	P0440	0705	X	X	X*3	EC-288
PURG VOLUME CONT/V	P0443	1008	—	—	X	EC-299
VENT CONTROL VALVE	P0446	0903	—	—	X	EC-305
EVAPO SYS PRES SEN	P0450	0704	—	—	X	EC-310
VEH SPEED SEN/CIRC	P0500	0104	—	—	X	EC-316
IACV/AAC VLV/CIRC	P0505	0205	—	—	X	EC-321
CLOSED TP SW/CIRC	P0510	0203	—	—	X	EC-327
A/T COMM LINE	P0600	0504	—	—	—	EC-333
ECM	P0605	0301	—	—	X	EC-336
PNP SW/CIRC	P0705	1101	—	—	X	AT-79
ATF TEMP SEN/CIRC	P0710	1208	—	—	X	AT-83
VEH SPD SEN/CIR AT	P0720	1102	—	—	X	AT-87
ENGINE SPEED SIG	P0725	1207	—	—	X	AT-90
A/T 1ST GR FNCTN	P0731	1103	—	—	X	AT-93
A/T 2ND GR FNCTN	P0732	1104	—	—	X	AT-98
A/T 3RD GR FNCTN	P0733	1105	—	—	X	AT-102
A/T 4TH GR FNCTN	P0734	1106	—	—	X	AT-106
TCC SOLENOID/CIRC	P0740	1204	—	—	X	AT-114
A/T TCC S/V FNCTN	P0744	1107	—	—	X	AT-118
L/PRESS SOL/CIRC	P0745	1205	—	—	X	AT-125
SFT SOL A/CIRC	P0750	1108	—	—	X	AT-129
SFT SOL B/CIRC	P0755	1201	—	—	X	AT-133
MAP/BAR SW SOL/CIR	P1105	1302	—	—	X	EC-339
INTV TIM CONT-B1	P1110	0805	—	—	X	EC-348

*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.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

X: Applicable
—: Not applicable

Items (CONSULT screen terms)	DTC*4		SRT code	Test value/ Test limit (GST only)	1st trip DTC*4	Reference page
	CONSULT GST*2	ECM*1				
TP SEN2/CIRCUIT	P1120	0406	—	—	X	EC-356
TANDEM TP SEN/CIRC	P1125	0110	—	—	X	EC-362
INTV TIM CONT-B2	P1135	1301	—	—	X	EC-348
INTK TIM S/CIRC-B1	P1140	1303	—	—	X	EC-363
INTK TIM S/CIRC-B2	P1145	1304	—	—	X	EC-363
CLOSED LOOP-B1	P1148	0307	—	—	X	EC-369
CLOSED LOOP-B2	P1168	0308	—	—	X	EC-369
TACM SW SIGNALS	P1210	0106	—	—	X	EC-371
FPCM/CIRCUIT	P1220	1305	—	—	X	EC-374
IGN SIGNAL-PRIMARY	P1320	0201	—	—	X	EC-381
CPS/CIRC (OBD) COG	P1336	0905	—	—	X	EC-389
EGRC SOLENOID/V	P1400	1005	—	—	X	EC-394
EGR TEMP SEN/CIRC	P1401	0305	—	—	X	EC-399
EGR SYSTEM	P1402	0514	X	X	X*3	EC-405
EVAP SMALL LEAK	P1440	0213	X	X	X	EC-414
PURG VOLUME CONT/V	P1444	0214	—	—	X	EC-426
VENT CONTROL VALVE	P1446	0215	—	—	X	EC-434
EVAP PURG FLOW/MON	P1447	0111	X	X	X*3	EC-439
VENT CONTROL VALVE	P1448	0309	—	—	X	EC-446
VC/V BYPASS/V	P1490	0801	—	—	X	EC-452
VC CUT/V BYPASS/V	P1491	0311	—	—	X	EC-457
PURG CONT/V S/V	P1492	0807	—	—	X	EC-463
PURG CONT/V & S/V	P1493	0312	—	—	X	EC-469
A/T DIAG COMM LINE	P1605	0804	—	—	X	EC-333
TP SEN/CIRC A/T	P1705	1206	—	—	X	AT-137
P-N POS SW/CIRCUIT	P1706	1003	—	—	X	EC-476
O/R CLTCH SOL/CIRC	P1760	1203	—	—	X	AT-143

*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.

GI

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

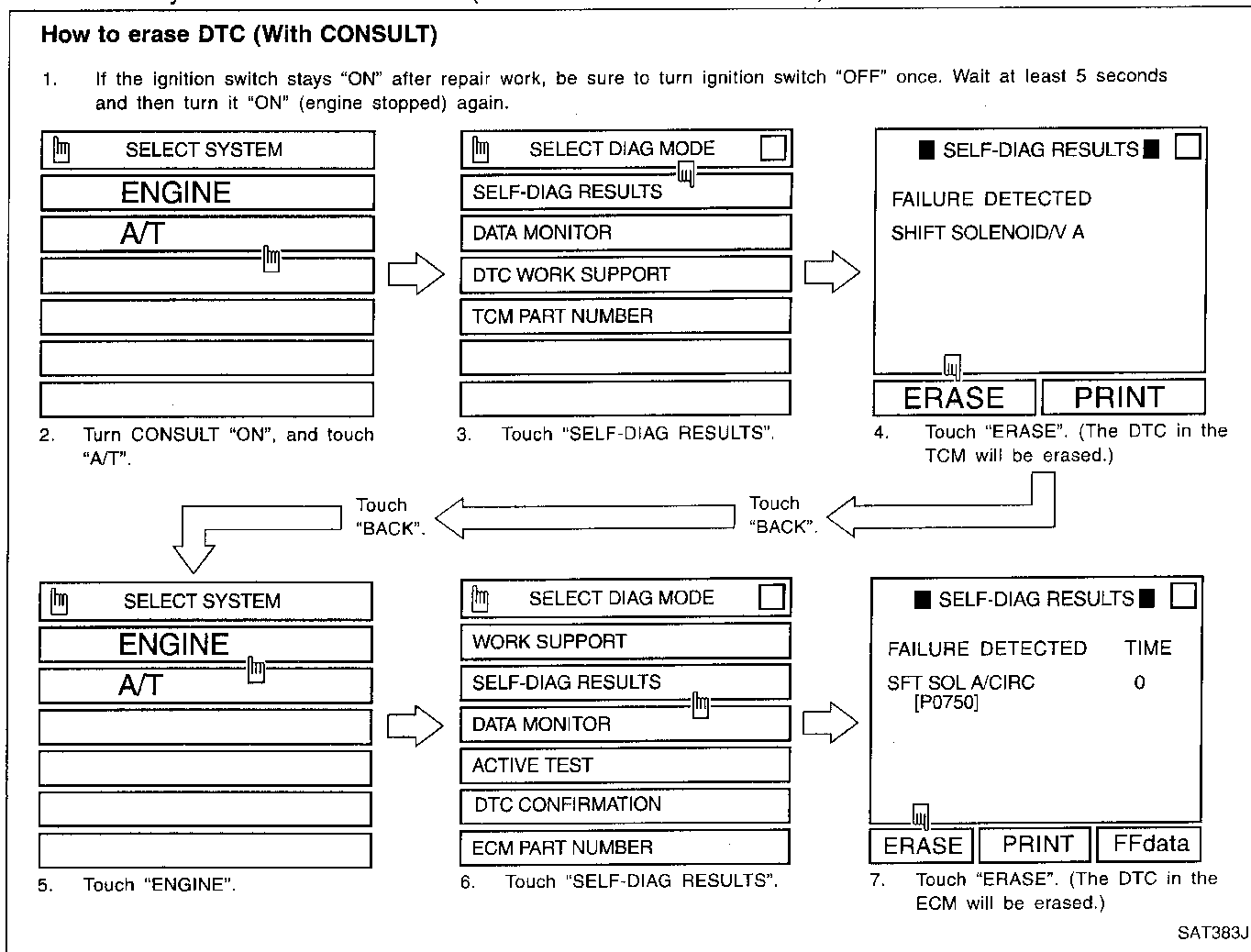
Emission-related Diagnostic Information (Cont'd)

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to erase DTC (With CONSULT)

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

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



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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)



How to erase DTC (With GST)

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

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



How to erase DTC (No Tools)

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

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" again. LC
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.) EC
3. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. (See EC-55.) FE

NOTE:

- If the battery terminal is disconnected, the emission-related diagnostic information will be lost within 24 hours. AT
- Erasing the emission-related diagnostic information, using CONSULT or GST is easier and quicker than switching the mode selector on the ECM. PD

The following data are cleared when the ECM memory is erased.

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

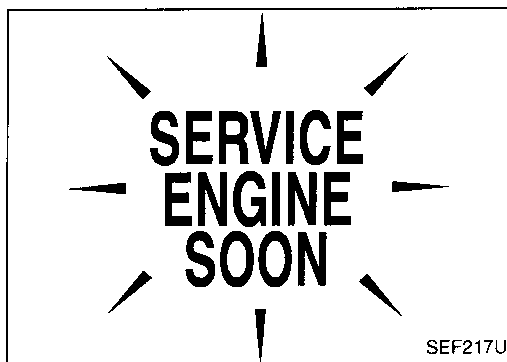
Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures. RS

BT

HA

EL

IDX



Malfunction Indicator Lamp (MIL)

The malfunction indicator lamp is located on the instrument panel.

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
 - If the malfunction indicator lamp does not light up, refer to EL section WARNING LAMPS or see EC-517.
2. When the engine is started, the malfunction indicator lamp should go off.
 - If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode I




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

Diagnostic Test Mode II

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

MIL Flashing without DTC

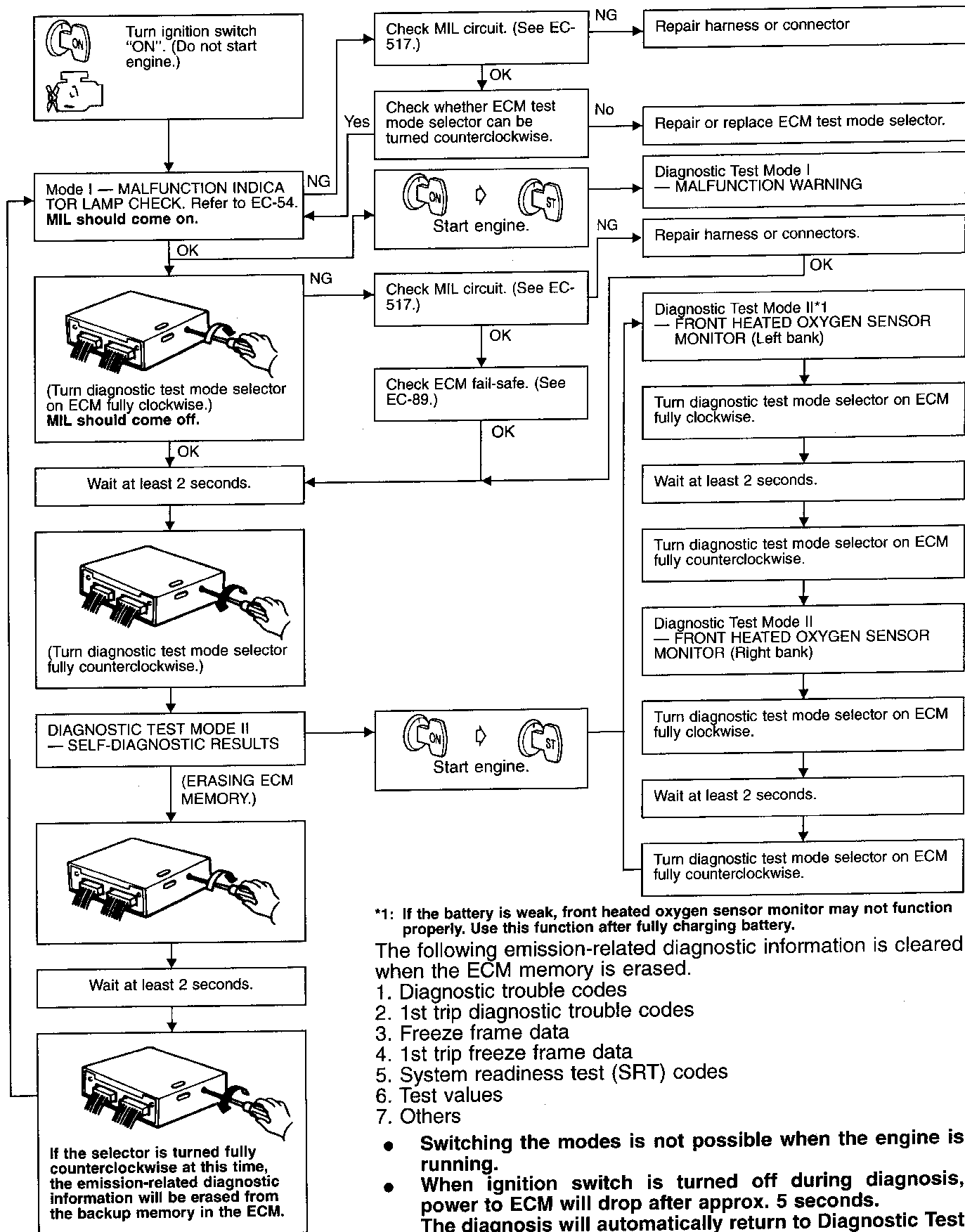
If the ECM is in Diagnostic Test Mode II, the MIL may flash when the engine is running. In this case, check ECM test mode selector following "HOW TO SWITCH DIAGNOSTIC TEST MODES" on next page. How to switch the diagnostic test (function) modes and details of the above functions are described later. (See page EC-55.)

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



*1: If the battery is weak, front heated oxygen sensor monitor may not function properly. Use this function after fully charging battery.

The following emission-related diagnostic information is cleared when the ECM memory is erased.

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

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE I—BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. (See the WARNING LAMPS in the EL section. Or see EC-517.)

DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

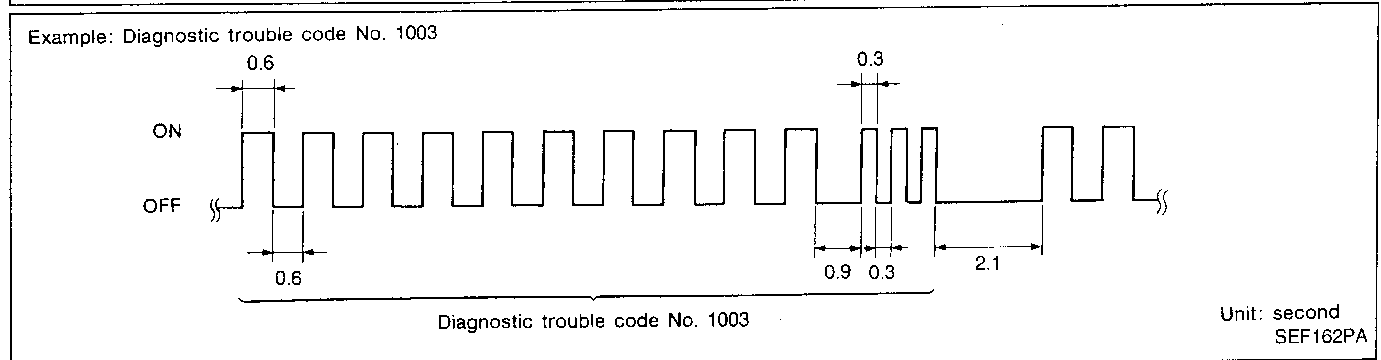
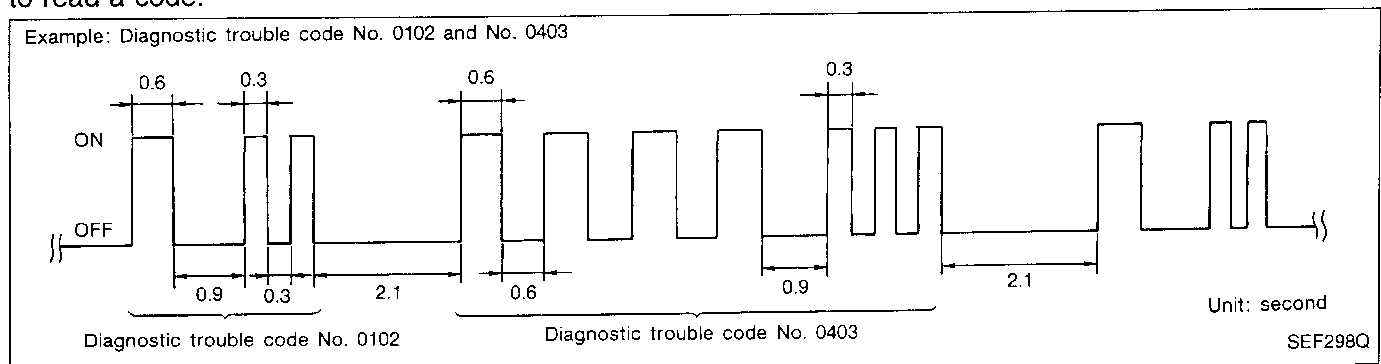
MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction

- 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 as shown below.

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



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

In this way, all the detected malfunctions are classified by their diagnostic trouble code numbers. The DTC "0505" refers to no malfunction. (See DIAGNOSTIC TROUBLE CODE INDEX, refer to page EC-2.)

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

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

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE II—FRONT HEATED OXYGEN SENSOR MONITOR

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

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

*: Maintains conditions just before switching to open loop.

To check the front heated oxygen sensor function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.

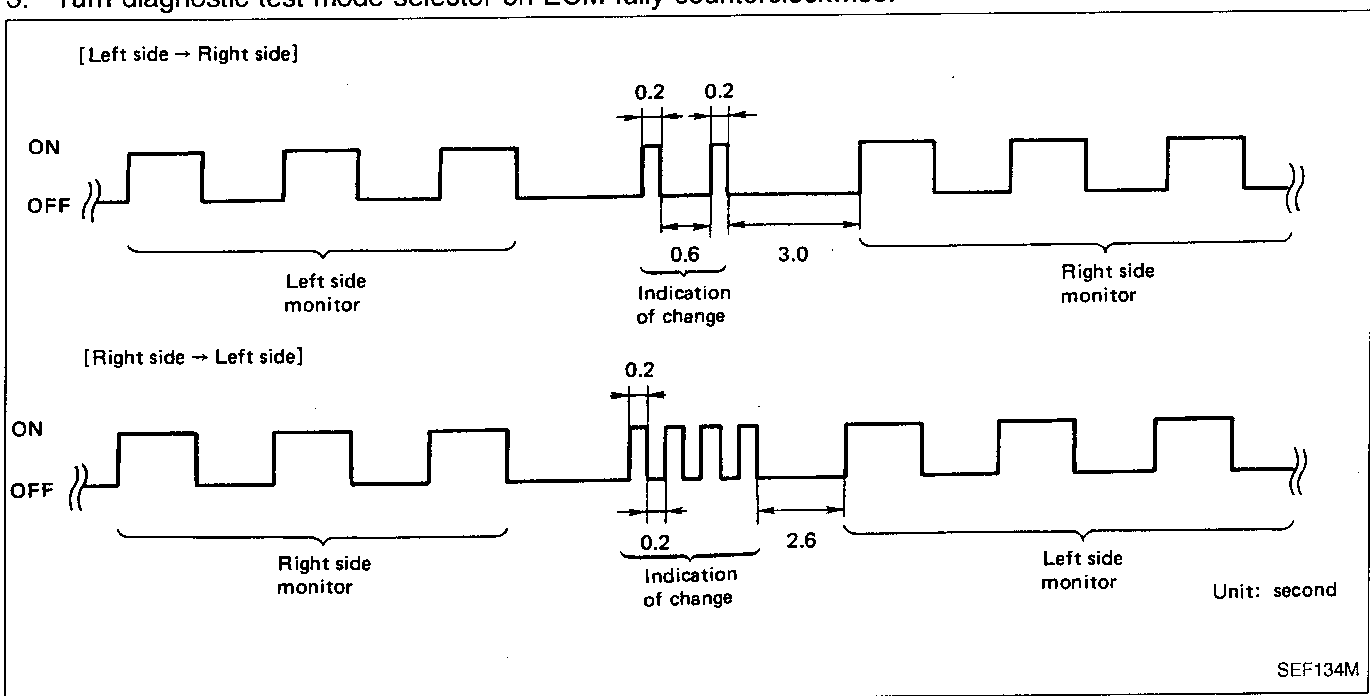
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MALFUNCTION INDICATOR LAMP comes ON more than 5 times every 10 seconds when measured at 2,000 rpm under no-load.

If the battery is weak, front heated oxygen sensor monitor may not function properly. Use this function after fully charging battery.

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

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

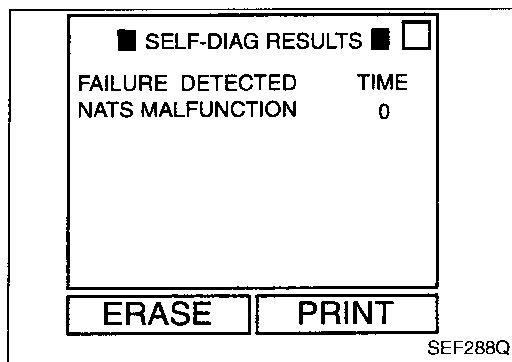
1. Turn diagnostic test mode selector on ECM fully clockwise.
2. Wait at least 2 seconds.
3. Turn diagnostic test mode selector on ECM fully counterclockwise.



ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

IVIS (Infiniti Vehicle Immobiliser System — NATS)



- If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT using NATS program card (NATS-E980U). Refer to "IVIS (Infiniti Vehicle Immobiliser System — NATS" in EL section.
- Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT.
- When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT using NATS program card (NATS-E980U).

Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT operation manual, NATS.

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-40.
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel injection system). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The "TIME" IN "SELF-DIAGNOSTIC RESULTS" mode of CONSULT will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in "OK" for the 2nd trip.

SUMMARY CHART

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

For details about patterns "B" and "C" under "Fuel Injection System" and "Misfire", see EC-60.

For details about patterns "A" and "B" under "Other", see EC-60.

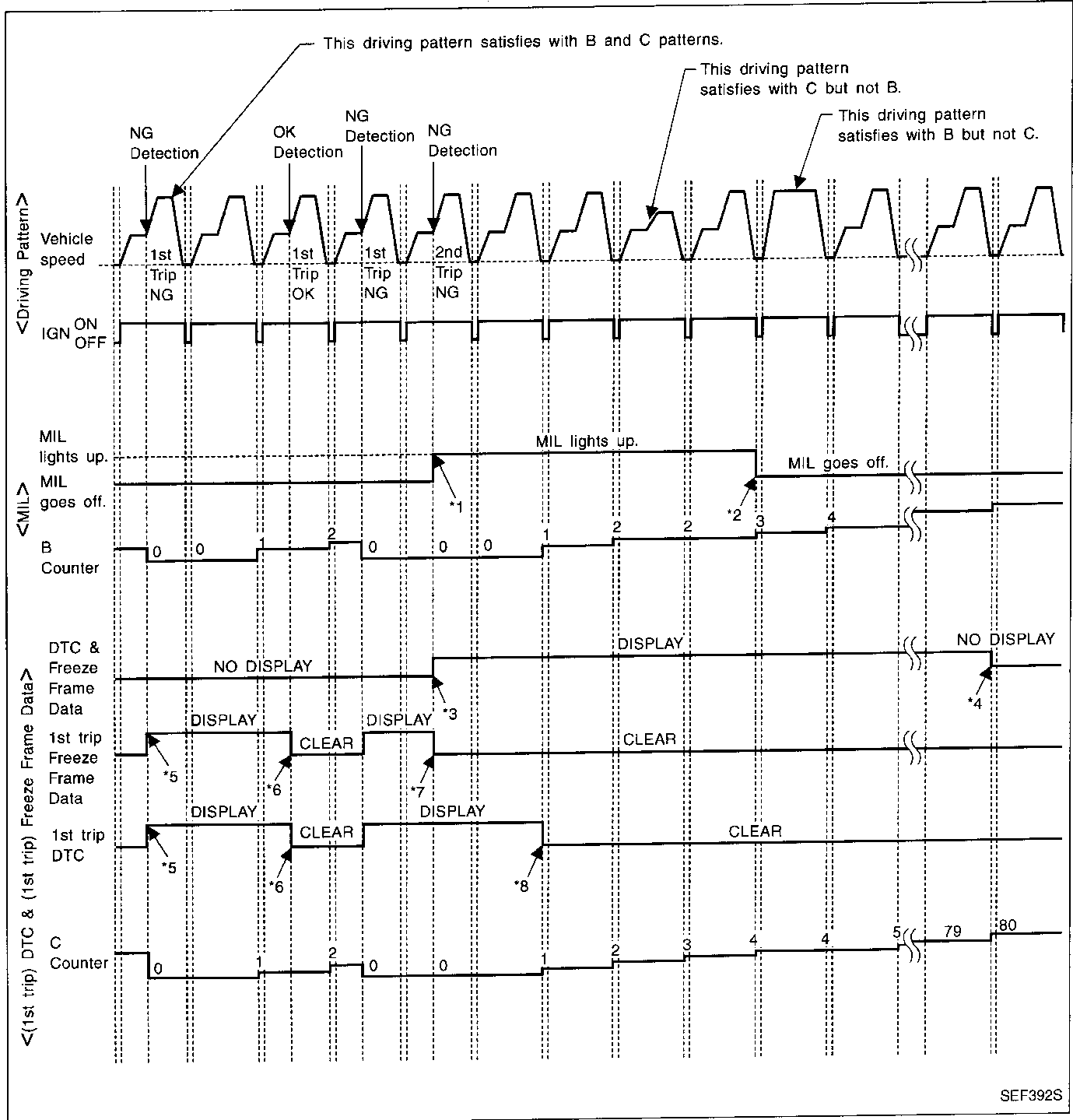
*1: Clear timing is at the moment OK is detected.

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

OBD System Operation Chart (Cont'd)

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



- *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.

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

OBD System Operation Chart (Cont'd)

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

<Driving pattern B>

Driving pattern B means the vehicle operation as follows:

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

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

<Driving pattern C>

Driving pattern C means the vehicle operation as follows:

(1) The following conditions should be satisfied at the same time:

Engine speed: (Engine speed in the freeze frame data) ± 375 rpm

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

Engine coolant temperature (T) condition:

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

Example:

If the stored freeze frame data is as follows:

Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

To be satisfied with driving pattern C, the vehicle should run under the following conditions:

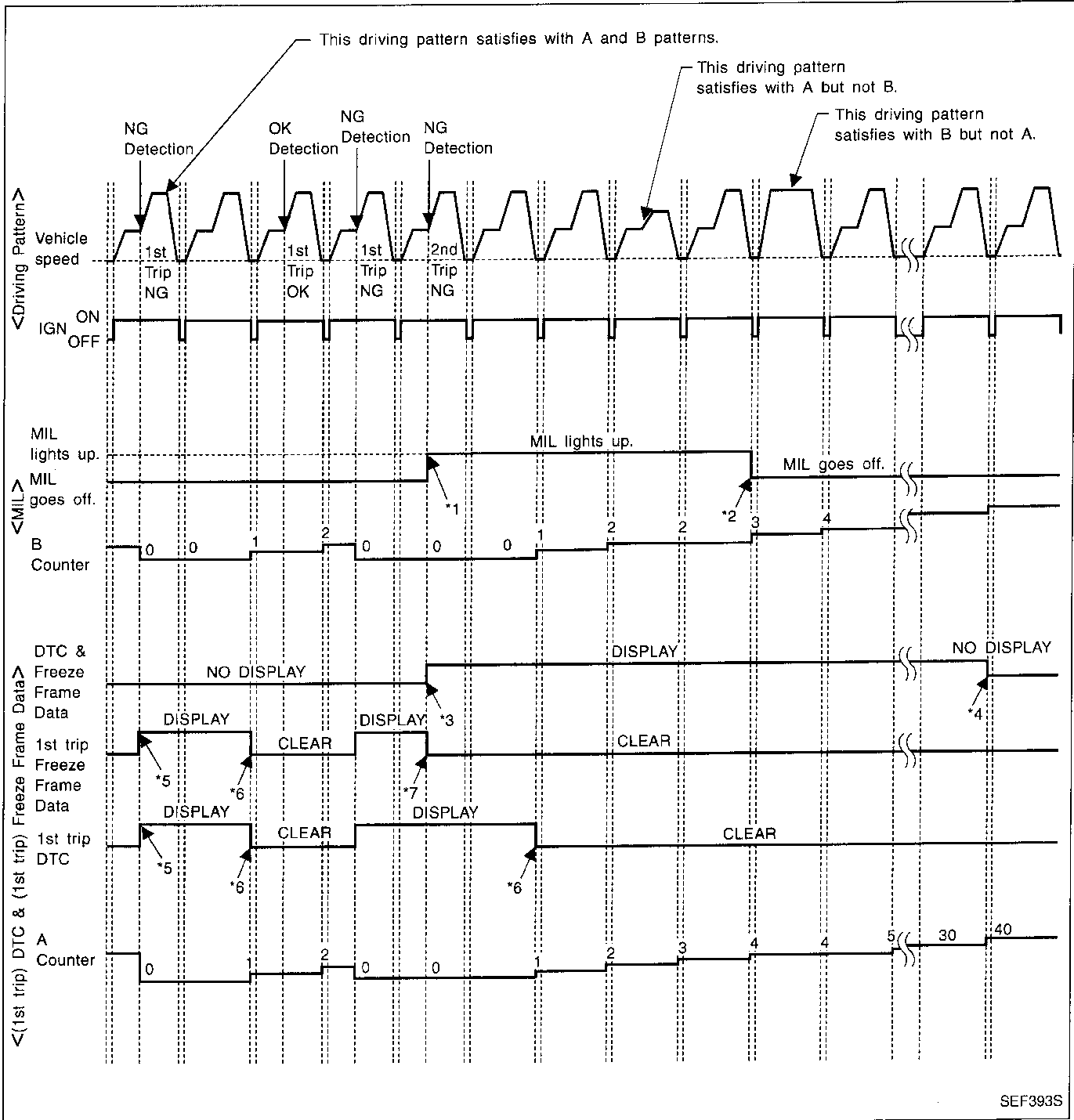
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- 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.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

OBD System Operation Chart (Cont'd)

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



- *1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- *2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- *3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- *4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

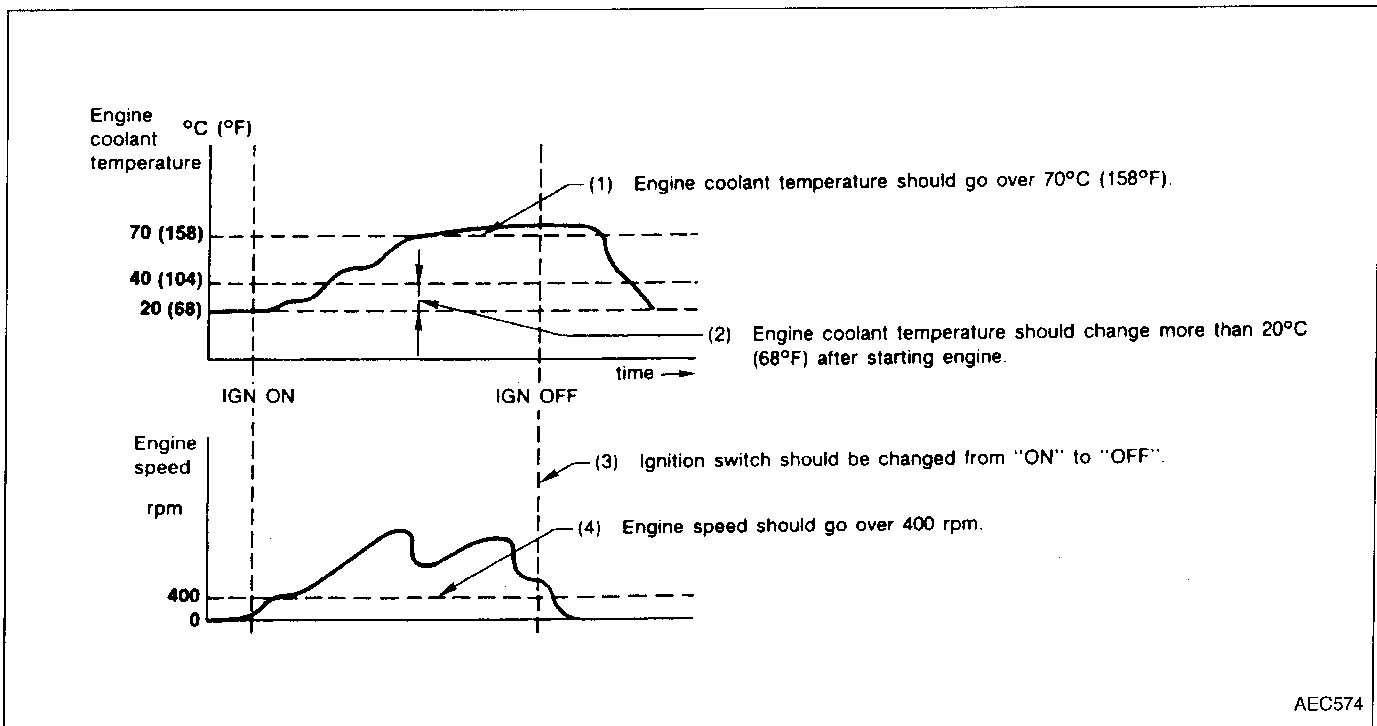
- *5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- *6: 1st trip DTC will be cleared after vehicle is driven a time (pattern A) without the same malfunction.
- *7: When the same malfunction is detected in the 2nd trip,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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

OBD System Operation Chart (Cont'd)

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

<Driving pattern A>



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

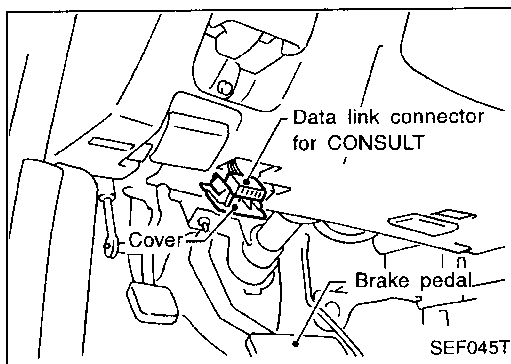
<Driving pattern B>

Driving pattern B means the vehicle operation as follows:

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

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION



CONSULT

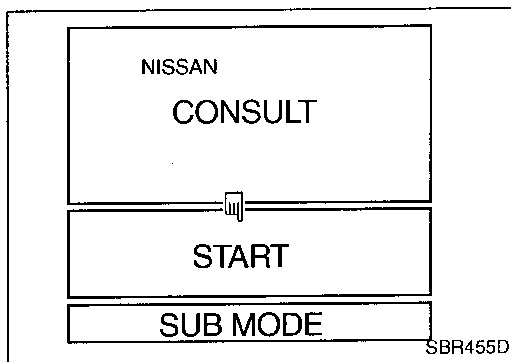
CONSULT INSPECTION PROCEDURE

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

GI

MA

EM



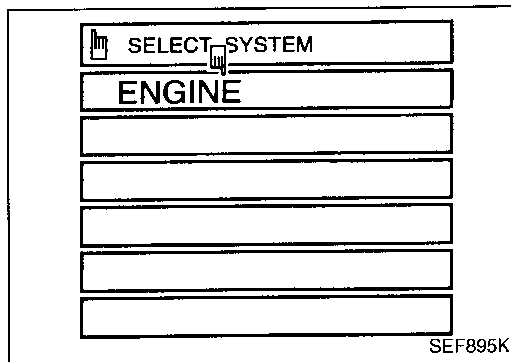
3. Turn on ignition switch.
4. Touch "START".

LC

EC

FE

AT



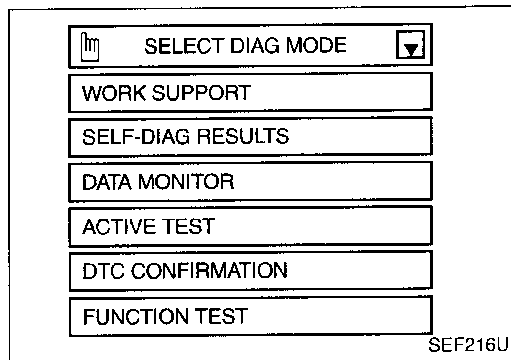
5. Touch "ENGINE".

PD

FA

RA

BR



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

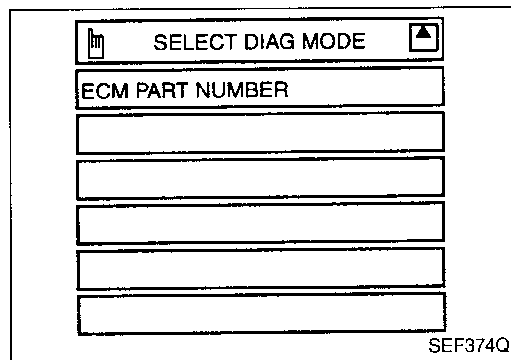
ST

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

RS

BT

HA



EL

IDX

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

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

X: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-42.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

FUNCTION

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

*1 The following emission-related diagnostic information is cleared when the ECM memory is erased.

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

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THRTL POS SEN ADJ	CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED 	When adjusting throttle position sensor initial position
IACV-AAC VALVE ADJ	SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● ENGINE WARMED UP ● NO-LOAD 	When adjusting ignition timing and idle speed
FUEL PRESSURE RELEASE	<ul style="list-style-type: none"> ● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
EVAP SYSTEM CLOSE	OPEN THE VACUUM CUT VALVE BYPASS VALVE AND CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE THE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● IGN SW "ON" ● ENGINE NOT RUNNING ● AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). ● NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM ● TANK FUEL TEMP. IS MORE THAN 0°C (32°F). ● WITHIN 10 MINUTES AFTER STARTING "EVAP SYSTEM CLOSE" 	When detecting EVAP vapor leak point of EVAP system

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

DTC and 1st trip DTC

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

Freeze frame data and 1st trip freeze frame data

Freeze frame data item*1	Description
DIAG TROUBLE CODE [PXXXX]	<ul style="list-style-type: none"> ● Engine control component part/control system has a trouble code, it is displayed as "PXXXX". [Refer to "Alphabetical & P No. Index for DTC (EC-2)."]
FUEL SYS-B1*2	<ul style="list-style-type: none"> ● "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
FUEL SYS-B2*2	<ul style="list-style-type: none"> ● "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 [%]	<ul style="list-style-type: none"> ● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	<ul style="list-style-type: none"> ● The engine coolant temperature at the moment a malfunction is detected is displayed.
S-FUEL TRM-B1 [%]	<ul style="list-style-type: none"> ● "Short-term fuel trim" at the moment a malfunction is detected is displayed.
S-FUEL TRM-B2 [%]	<ul style="list-style-type: none"> ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
L-FUEL TRM-B1 [%]	<ul style="list-style-type: none"> ● "Long-term fuel trim" at the moment a malfunction is detected is displayed.
L-FUEL TRM-B2 [%]	<ul style="list-style-type: none"> ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
ENGINE SPEED [rpm]	<ul style="list-style-type: none"> ● The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	<ul style="list-style-type: none"> ● The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL PRESS [kPa] or [kg/cm ²] or [psi]	<ul style="list-style-type: none"> ● The absolute pressure at the moment a malfunction is detected is displayed.

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

*2: Regarding model Y33, "-B1" indicates left bank and "-B2" indicates right bank.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks	
CMPS-RPM (POS) [rpm]	○	○	<ul style="list-style-type: none"> Indicates the engine speed computed from the POS signal (1° signal) of the crankshaft position sensor (POS). 		GI
MAS AIR/FL SE [V]	○	○	<ul style="list-style-type: none"> The signal voltage of the mass air flow sensor is displayed. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. 	MA
COOLAN TEMP/S [°C] or [°F]	○	○	<ul style="list-style-type: none"> The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. 	<ul style="list-style-type: none"> 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. 	EM LC
FR O2 SEN-B1 [V]	○	○	<ul style="list-style-type: none"> The signal voltage of the front heated oxygen sensor is displayed. 		EC
FR O2 SEN-B2 [V]	○				
RR O2 SEN-B1 [V]	○	○	<ul style="list-style-type: none"> The signal voltage of the rear heated oxygen sensor is displayed. 		FE
RR O2 SEN-B2 [V]	○				
FR O2 MNTR-B1 [RICH/LEAN]	○	○	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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. 	AT
FR O2 MNTR-B2 [RICH/LEAN]	○	○			PD
RR O2 MNTR-B1 [RICH/LEAN]	○		<ul style="list-style-type: none"> Display of rear heated oxygen sensor signal during air-fuel ratio feedback control: RICH ... means the amount of oxygen after three way catalyst is relatively large. LEAN ... means the amount of oxygen after three way catalyst is relatively small. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. 	RA
RR O2 MNTR-B2 [RICH/LEAN]	○	○			BR
VHCL SPEED SE [km/h] or [mph]	○	○	<ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed sensor signal is displayed. 		ST
BATTERY VOLT [V]	○	○	<ul style="list-style-type: none"> The power supply voltage of ECM is displayed. 		RS
THRTL POS SEN [V]	○	○	<ul style="list-style-type: none"> The throttle position sensor signal voltage is displayed. 		BT
THRTL/P SEN2 [V]	○		<ul style="list-style-type: none"> Secondary throttle position sensor signal voltage is displayed. 		HA
TANK F/TMP SE [°C] or [°F]	○		<ul style="list-style-type: none"> The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed. 		EL
EGR TEMP SEN [V]	○		<ul style="list-style-type: none"> The signal voltage of the EGR temperature sensor is displayed. 		
INT/A TEMP SE [°C] or [°F]	○		<ul style="list-style-type: none"> The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated. 		IDX

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
Regarding Y33 model, "-B1" indicates left bank and "-B2" indicates right bank.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
START SIGNAL [ON/ OFF]	○	○	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the starter signal. 	<ul style="list-style-type: none"> After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL/P SW [ON/OFF]			<ul style="list-style-type: none"> Indicates mechanical contact [ON/OFF] condition from the closed throttle position switch signal. 	
CLSD THL POS [ON/ OFF]	○	○	<ul style="list-style-type: none"> Indicates idle position [ON/OFF] computed by ECM according to the throttle position sensor signal. 	
AIR COND SIG [ON/ OFF]	○	○	<ul style="list-style-type: none"> Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. 	
P/N POSI SW [ON/ OFF]	○	○	<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the park/neutral position switch signal. 	
PW/ST SIGNAL [ON/ OFF]	○	○	<ul style="list-style-type: none"> [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated. 	
LOAD SIGNAL [ON/ OFF]	○	○	<ul style="list-style-type: none"> Indicate [ON/OFF] condition from the electrical load signal and/or lighting switch. ON ... rear defogger is operating. OFF ... rear defogger is not operating. 	
AMB TEMP SW [ON/ OFF]	○	○	<ul style="list-style-type: none"> Indicate [ON/OFF] condition from the ambient temperature signal. ON ... When the ambient temperature is lower than specified value. OFF ... When the ambient temperature is higher than specified value. 	
IGNITION SW [ON/ OFF]	○		<ul style="list-style-type: none"> Indicates [ON/OFF] condition from ignition switch. 	
A/C PRESS SW [ON/ OFF]	○		<ul style="list-style-type: none"> Indicate [ON/OFF] condition of air conditioner pressure switch signal. ON ... A/C pressure is higher than specified value. OFF ... A/C pressure is lower than specified value. 	
INJ PULSE-B1 [msec]		○	<ul style="list-style-type: none"> Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. 	<ul style="list-style-type: none"> When the engine is stopped, a certain computed value is indicated.
INJ PULSE-B2 [msec]				
B/FUEL SCHDL [msec]		○	<ul style="list-style-type: none"> "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. 	
IGN TIMING [BTDC]		○	<ul style="list-style-type: none"> Indicates the ignition timing computed by ECM according to the input signals. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated.
IACV-AAC/V [step]		○	<ul style="list-style-type: none"> Indicates the IACV-AAC valve control value computed by ECM according to the input signals. 	
PURG VOL C/V [step]		○	<ul style="list-style-type: none"> 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-B1 [%]			<ul style="list-style-type: none"> The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2 [%]				
EVAP SYS PRES [V]			<ul style="list-style-type: none"> The signal voltage of EVAP control system pressure sensor is displayed. 	

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
AIR COND RLY [ON/ OFF]			<ul style="list-style-type: none"> The air conditioner relay control condition (determined by ECM according to the input signal) is indicated. 	GI
FUEL PUMP RLY [ON/OFF]			<ul style="list-style-type: none"> Indicates the fuel pump relay control condition determined by ECM according to the input signals. 	MA
INT/V SOL-B1 INT/V SOL-B2 [ON/OFF]			<ul style="list-style-type: none"> The control condition of the intake valve timing control solenoid valve is indicated. ON ... Intake valve timing control is operating. OFF ... Intake valve timing control is not operating. 	EM
INT/V TIM-B1 INT/V TIM-B2 [deg]			<ul style="list-style-type: none"> Indicate [deg] of intake camshaft advanced angle. 	LC
COOLING FAN [HI/ OFF]			<ul style="list-style-type: none"> The control condition of the cooling fan (determined by ECM according to the input signal) is indicated. HI ... High speed operation OFF ... Stop 	EC
EGRC SOL/V [ON/ OFF] (flow/cut)			<ul style="list-style-type: none"> The control condition of the EGRC-solenoid valve (determined by ECM according to the input signal) is indicated. OFF ... EGR is cut-off ON ... EGR is operational 	FE
VENT CONT/V [ON/ OFF]			<ul style="list-style-type: none"> The control condition of the EVAP canister vent control valve (determined by ECM according to the input signal) is indicated. ON ... Closed OFF ... Open 	AT
FR O2 HTR-B1 [ON/ OFF]			<ul style="list-style-type: none"> Indicates [ON/OFF] condition of front heated oxygen sensor's heater determined by ECM according to the input signals. 	PD
FR O2 HTR-B2 [ON/ OFF]				FA
RR O2 HTR-B1 [ON/ OFF]			<ul style="list-style-type: none"> Indicates [ON/OFF] condition of rear heated oxygen sensor's heater determined by ECM according to the input signals. 	RA
RR O2 HTR-B2 [ON/ OFF]				BR
VCV BYPASS/V [ON/ OFF]			<ul style="list-style-type: none"> The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signal) is indicated. ON ... Open OFF ... Closed 	ST
PURG CONT S/V [ON/OFF]			<ul style="list-style-type: none"> The control condition of the EVAP canister purge control solenoid valve (computed by the engine control module according to the input signals) is indicated. ON ... Canister purge is operational OFF ... Canister purge operation is cut-off 	RS
CAL/LD VALUE [%]			<ul style="list-style-type: none"> "Calculated load value" indicates the value of the current airflow divided by peak airflow. 	BT
ABSOL TH-P/S [%]			<ul style="list-style-type: none"> "Absolute throttle position sensor" indicates the throttle opening computed by ECM according to the signal voltage of the throttle position sensor. 	HA
MASS AIRFLOW [g·m/s]			<ul style="list-style-type: none"> Indicates the mass airflow computed by ECM according to the signal voltage of the mass airflow sensor. 	EL
FPCM DR VOLT [V]			<ul style="list-style-type: none"> The voltage between fuel pump and FPCM is displayed. 	IDX

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
FPCM [LOW/HI]			<ul style="list-style-type: none"> ● The control condition of the fuel pump control module (FPCM) (determined by ECM according to the input signal) is indicated. LOW ... Low amount of fuel flow HI ... High amount of fuel flow 	
MAP/BARO SW/V [MAP/BARO]			<ul style="list-style-type: none"> ● 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]			<ul style="list-style-type: none"> ● The signal voltage of the absolute pressure sensor is displayed. 	
VOLTAGE [V]			<ul style="list-style-type: none"> ● Voltage measured by the voltage probe. 	
PULSE [msec] or [Hz] or [%]			<ul style="list-style-type: none"> ● Pulse width, frequency or duty cycle measured by the pulse probe. 	<ul style="list-style-type: none"> ● 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.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)	
FUEL INJECTION	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the amount of fuel injection using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connector Fuel injectors Front heated oxygen sensor 	GI
IACV-AAC/V OPENING	<ul style="list-style-type: none"> Engine: After warming up, idle the engine. Change the IACV-AAC valve opening step using CONSULT. 	Engine speed changes according to the opening percent.	<ul style="list-style-type: none"> Harness and connector IACV-AAC valve 	MA
ENG COOLANT TEMP	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the engine coolant temperature using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connector Engine coolant temperature sensor Fuel injectors 	EM
IGNITION TIMING	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Timing light: Set Retard the ignition timing using CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Adjust ignition timing (by moving camshaft position sensor) 	LC
POWER BALANCE	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Harness and connector Compression Injectors Ignition coil with power transistor Spark plugs 	EC
COOLING FAN	<ul style="list-style-type: none"> Ignition switch: ON Turn the cooling fan "ON" and "OFF" using CONSULT. 	Cooling fan moves and stops.	<ul style="list-style-type: none"> Harness and connector Cooling fan motor 	AT
FUEL PUMP RELAY	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Harness and connector Fuel pump relay 	PD
EGRC SOLENOID VALVE	<ul style="list-style-type: none"> Ignition switch: ON Turn solenoid valve "ON" and "OFF" with CONSULT and listen to operating sound. 	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> Harness and connector EGRC-solenoid valve 	FA
VALVE TIMING SOL	<ul style="list-style-type: none"> Ignition switch: ON Turn solenoid valve "ON" and "OFF" with CONSULT and listen to operating sound. 	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> Harness and connector Intake valve timing control solenoid valve 	RA
SELF-LEARNING CONT	<ul style="list-style-type: none"> In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen. 			BR
PURG VOL CONT/V	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Harness and connector EVAP canister purge volume control valve 	ST
TANK F/TEMP SEN	<ul style="list-style-type: none"> Change the tank fuel temperature using CONSULT. 			RS
VENT CONT/V	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn the VENT CONT/V "ON and OFF" with CONSULT and listen for operating sound. 	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> Harness or connector EVAP canister vent control valve 	BT
VC/V BYPASS/V	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn the VC/V BYPASS/V "ON and OFF" with CONSULT and listen for operating sound. 	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> Harness or connector Vacuum cut bypass valve 	HA
PURG CONT S/V	<ul style="list-style-type: none"> Engine: Run engine at 2,000 rpm. 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.	<ul style="list-style-type: none"> Harness and connector EVAP canister purge control solenoid valve Vacuum hose 	EL
MAP/BARO SW/V	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Harness and connector MAP/BARO switch solenoid valve 	IDX
FPCM	<ul style="list-style-type: none"> Ignition switch: ON Select "LOW" and "HI" with CONSULT and check that "FPCM D/R VOLT" of CONSULT changes. 	"FPCM D/R VOLT" of CONSULT changes as follows; LOW ... Approx. 4.7V HI ... Approx. 0.4V	<ul style="list-style-type: none"> Harness and connector FPCM 	

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

DTC CONFIRMATION MODE

SRT STATUS mode

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-42.

DTC WORK SUPPORT mode

Test mode	Test item	Condition	Reference page
EVAPORATIVE SYSTEM	PURGE FLOW P1447	Refer to corresponding trouble diagnosis for DTC.	EC-439
	VC CUT/V BP/V P1491		EC-457
	PURG CN/V & S/V P1493		EC-470
	PURG VOL CN/V P1444		EC-426
	EVAP SML LEAK P0440		EC-288
	EVAP SML LEAK P1440		EC-414
FR O2 SENSOR	FR O2 SEN-B1 P0131		EC-166
	FR O2 SEN-B1 P0132		EC-172
	FR O2 SEN-B1 P0133		EC-178
	FR O2 SEN-B1 P0130		EC-159
	FR O2 SEN-B2 P0151		EC-166
	FR O2 SEN-B2 P0152		EC-172
	FR O2 SEN-B2 P0153		EC-178
	FR O2 SEN-B2 P0150		EC-159
RR O2 SENSOR	RR O2 SEN-B1 P0137		EC-200
	RR O2 SEN-B1 P0138		EC-208
	RR O2 SEN-B1 P0139		EC-216
	RR O2 SEN-B2 P0157		EC-200
	RR O2 SEN-B2 P0158		EC-208
	RR O2 SEN-B2 P0159		EC-216
EGR SYSTEM	EGR SYSTEM P0400		EC-271
	EGRC-BPT/VLV P0402	EC-280	
	EGR SYSTEM P1402	EC-405	

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

FUNCTION TEST MODE

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)	
SELF-DIAG RESULTS	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Displays the results of on board diagnostic system. 	—		Objective system	GI MA
CLOSED THROTTLE POSI	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Throttle position sensor circuit is tested when throttle is opened and closed fully. ("IDLE POSITION" is the test item name for the vehicles in which idle is selected by throttle position sensor.) 	Throttle valve: opened	OFF	<ul style="list-style-type: none"> Harness and connector Throttle position sensor (Closed throttle position) Throttle position sensor (Closed throttle position) adjustment Throttle linkage Verify operation in DATA MONITOR mode. 	EM LC
		Throttle valve: closed	ON		EC
THROTTLE POSI SEN CKT	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Harness and connector Throttle position sensor Throttle position sensor adjustment Throttle linkage Verify operation in DATA MONITOR mode. 	FE AT
PARK/NEUT POSI SW CKT	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Inhibitor circuit is tested when shift lever is manipulated. 	Out of N/P positions	OFF	<ul style="list-style-type: none"> Harness and connector Inhibitor switch Park/Neutral position relay Linkage or Inhibitor switch adjustment 	PD FA
		In N/P positions	ON		EC
FUEL PUMP CIRCUIT	<ul style="list-style-type: none"> 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.		<ul style="list-style-type: none"> Harness and connector Fuel pump Fuel pump relay Fuel filter clogging Fuel level 	RA BR
VALVE TIMING S/V CIRCUIT	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Intake valve timing control solenoid circuit is tested by checking solenoid valve operating noise. 	The solenoid valve makes an operating sound every 3 seconds.		<ul style="list-style-type: none"> Harness and connector Intake valve timing control solenoid. 	ST RS
EGRC SOL/V CIRCUIT	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) EGRC-solenoid valve circuit is tested by checking solenoid valve operating noise. 	The solenoid valve makes an operating sound every 3 seconds.		<ul style="list-style-type: none"> Harness and connector EGRC-solenoid valve 	BT HA
COOLING FAN CIRCUIT	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Cooling fan circuit is tested when cooling fan is rotated. 	The cooling fan rotates and stops every 3 seconds.		<ul style="list-style-type: none"> Harness and connector Cooling fan motor Cooling fan relay 	EL IDX

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
START SIGNAL CIRCUIT	<ul style="list-style-type: none"> Ignition switch: ON → START Start signal circuit is tested when engine is started by operating the starter. Battery voltage and water temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed. 	Start signal: OFF → ON		<ul style="list-style-type: none"> Harness and connector Ignition switch
PW/ST SIGNAL CIRCUIT	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Harness and connector Power steering oil pressure switch Power steering oil pump
		Neutral position	OFF	
VEHICLE SPEED SEN CKT	<ul style="list-style-type: none"> 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)		<ul style="list-style-type: none"> Harness and connector Vehicle speed sensor Electric speedometer
IGN TIMING ADJ	<ul style="list-style-type: none"> After warming up, idle the engine. Ignition timing is checked by reading ignition timing with a timing light and checking whether it agrees with specifications. 	The timing light indicates the same value on the screen.		<ul style="list-style-type: none"> Adjust ignition timing (by moving camshaft position sensor) Camshaft position sensor drive mechanism
MIXTURE RATIO TEST	<ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> INJECTION SYS (Injector, fuel pressure regulator, harness or connector) IGNITION SYS (Spark plug, ignition coil with power transistor harness or connector) VACUUM SYS (Intake air leaks) Front heated oxygen sensor circuit Front heated oxygen sensor operation Fuel pressure high or low Mass air flow sensor
POWER BALANCE	<ul style="list-style-type: none"> 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 multipoint fuel injection system is used.) 	Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder.		<ul style="list-style-type: none"> Injector circuit (Injector, harness or connector) Ignition circuit (Spark plug, ignition coil with power transistor harness or connector) Compression Valve timing
IACV-AAC/V SYSTEM	<ul style="list-style-type: none"> After warming up, idle the engine. IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 1 step, 25 steps and 102 steps. 	Difference in engine speed is greater than 150 rpm between when valve opening is at 102 steps and at 25 steps.		<ul style="list-style-type: none"> Harness and connector IACV-AAC valve Air passage restriction between air inlet and IACV-AAC valve IAS (Idle adjusting screw) adjustment

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

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

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

1. "AUTO TRIG" (Automatic trigger):

- The malfunction will be identified on the CONSULT screen in real time. In other words, DTC/1st trip DTC and malfunction item will be displayed at the moment the malfunction is detected by ECM.

DATA MONITOR can be performed continuously until a malfunction is detected. However, DATA MONITOR cannot continue any longer after the malfunction detection.

2. "MANU TRIG" (Manual trigger):

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

DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:

1. "AUTO TRIG"

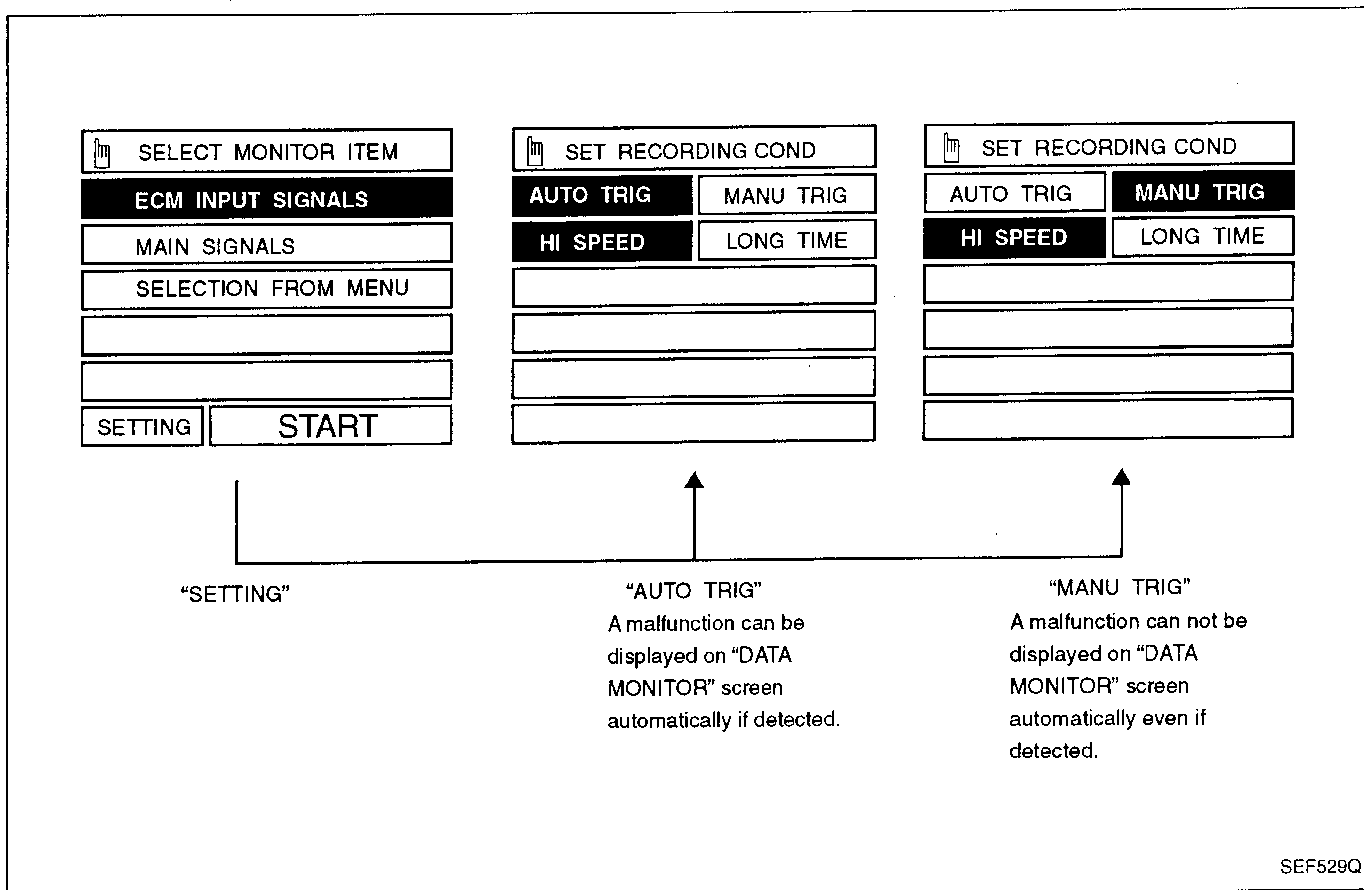
- While trying to detect the DTC/1st trip DTC by performing the "DTC CONFIRMATION PROCEDURE", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.

- 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"

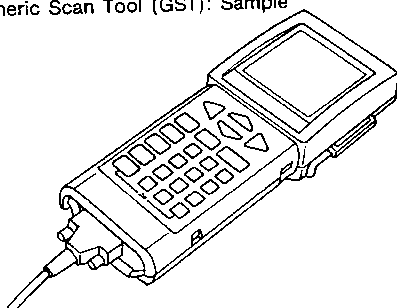
- If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.



SEF529Q

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Generic Scan Tool (GST): Sample

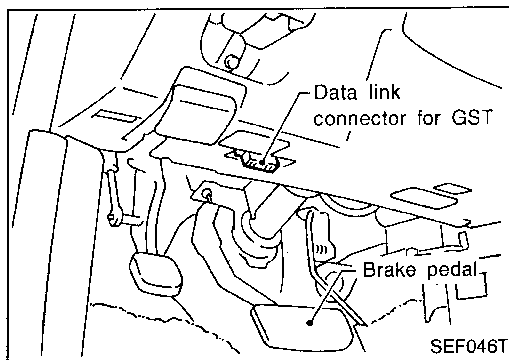


SEF139P

Generic Scan Tool (GST)

DESCRIPTION

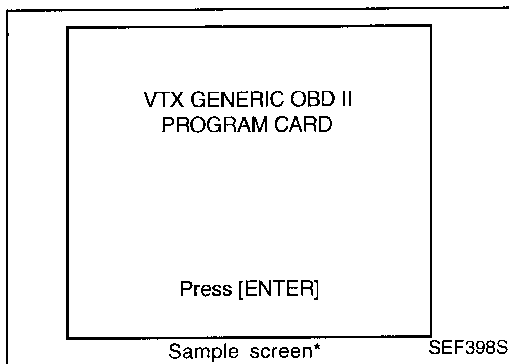
Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 7 different functions explained on the next page. ISO9141 is used as the protocol. The name "GST" or "Generic Scan Tool" is used in this service manual.



SEF046T

GST INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect "GST" to data link connector for GST. (Data link connector for GST is located under LH dash panel near the hood lock release handle.)

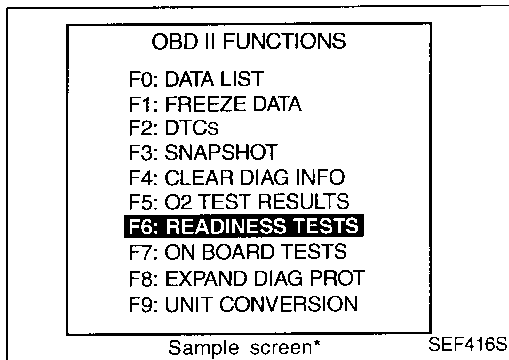


Sample screen*

SEF398S

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*

SEF416S

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

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Generic Scan Tool (GST) (Cont'd)

FUNCTION

Diagnostic test mode		Function	
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.	GI
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-66).]	MA
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.	EM
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: <ul style="list-style-type: none"> ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7) 	LC EC
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.	FE
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.	AT
MODE 8	—	This mode can close EVAP system in ignition switch "ON" position (Engine stopped). When this mode is performed, the following parts can be opened or closed. <ul style="list-style-type: none"> ● EVAP canister vent control open ● Vacuum cut valve bypass valve closed In the following conditions, this mode cannot function. <ul style="list-style-type: none"> ● Low ambient temperature ● Low battery voltage ● Engine running ● Ignition switch "OFF" ● Low fuel temperature ● Too much pressure is applied to EVAP system 	PD FA RA BR

ST

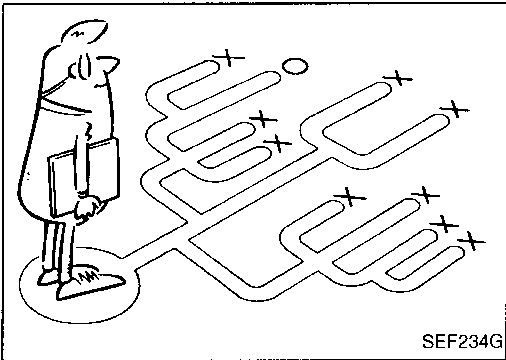
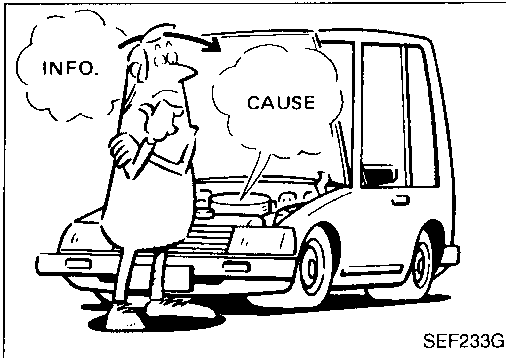
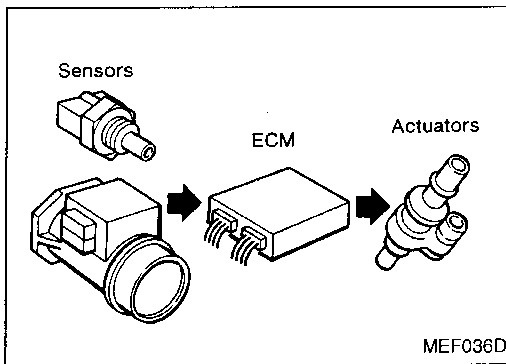
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KEY POINTS	
WHAT	Vehicle & engine model
WHEN	Date, Frequencies
WHERE	Road conditions
HOW	Operating conditions, Weather conditions, Symptoms

SEF907L

Introduction

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

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

A visual check only may not find the cause of the problems. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the "Work Flow" on EC-80.

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

Diagnostic Worksheet

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

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

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

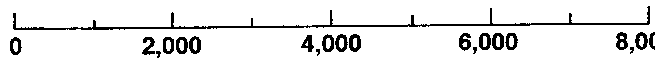
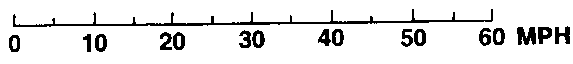
Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected. Examples:

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

TROUBLE DIAGNOSIS — Introduction

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		<input type="checkbox"/> Vehicle ran out of fuel causing misfire. <input type="checkbox"/> Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	<input type="checkbox"/> Startability	<input type="checkbox"/> Impossible to start <input type="checkbox"/> No combustion <input type="checkbox"/> Partial combustion <input type="checkbox"/> Partial combustion affected by throttle position <input type="checkbox"/> Partial combustion NOT affected by throttle position <input type="checkbox"/> Possible but hard to start <input type="checkbox"/> Others []	
	<input type="checkbox"/> Idling	<input type="checkbox"/> No fast idle <input type="checkbox"/> Unstable <input type="checkbox"/> High idle <input type="checkbox"/> Low idle <input type="checkbox"/> Others []	
	<input type="checkbox"/> Driveability	<input type="checkbox"/> Stumble <input type="checkbox"/> Surge <input type="checkbox"/> Knock <input type="checkbox"/> Lack of power <input type="checkbox"/> Intake backfire <input type="checkbox"/> Exhaust backfire <input type="checkbox"/> Others []	
	<input type="checkbox"/> Engine stall	<input type="checkbox"/> At the time of start <input type="checkbox"/> While idling <input type="checkbox"/> While accelerating <input type="checkbox"/> While decelerating <input type="checkbox"/> Just after stopping <input type="checkbox"/> While loading	
Incident occurrence		<input type="checkbox"/> Just after delivery <input type="checkbox"/> Recently <input type="checkbox"/> In the morning <input type="checkbox"/> At night <input type="checkbox"/> In the daytime	
Frequency		<input type="checkbox"/> All the time <input type="checkbox"/> Under certain conditions <input type="checkbox"/> Sometimes	
Weather conditions		<input type="checkbox"/> Not affected	
Weather		<input type="checkbox"/> Fine <input type="checkbox"/> Raining <input type="checkbox"/> Snowing <input type="checkbox"/> Others []	
Temperature		<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold <input type="checkbox"/> Humid °F	
Engine conditions		<input type="checkbox"/> Cold <input type="checkbox"/> During warm-up <input type="checkbox"/> After warm-up Engine speed 	
Road conditions		<input type="checkbox"/> In town <input type="checkbox"/> In suburbs <input type="checkbox"/> Highway <input type="checkbox"/> Off road (up/down)	
Driving conditions		<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH) Vehicle speed 	
Malfunction indicator lamp		<input type="checkbox"/> Turned on <input type="checkbox"/> Not turned on	

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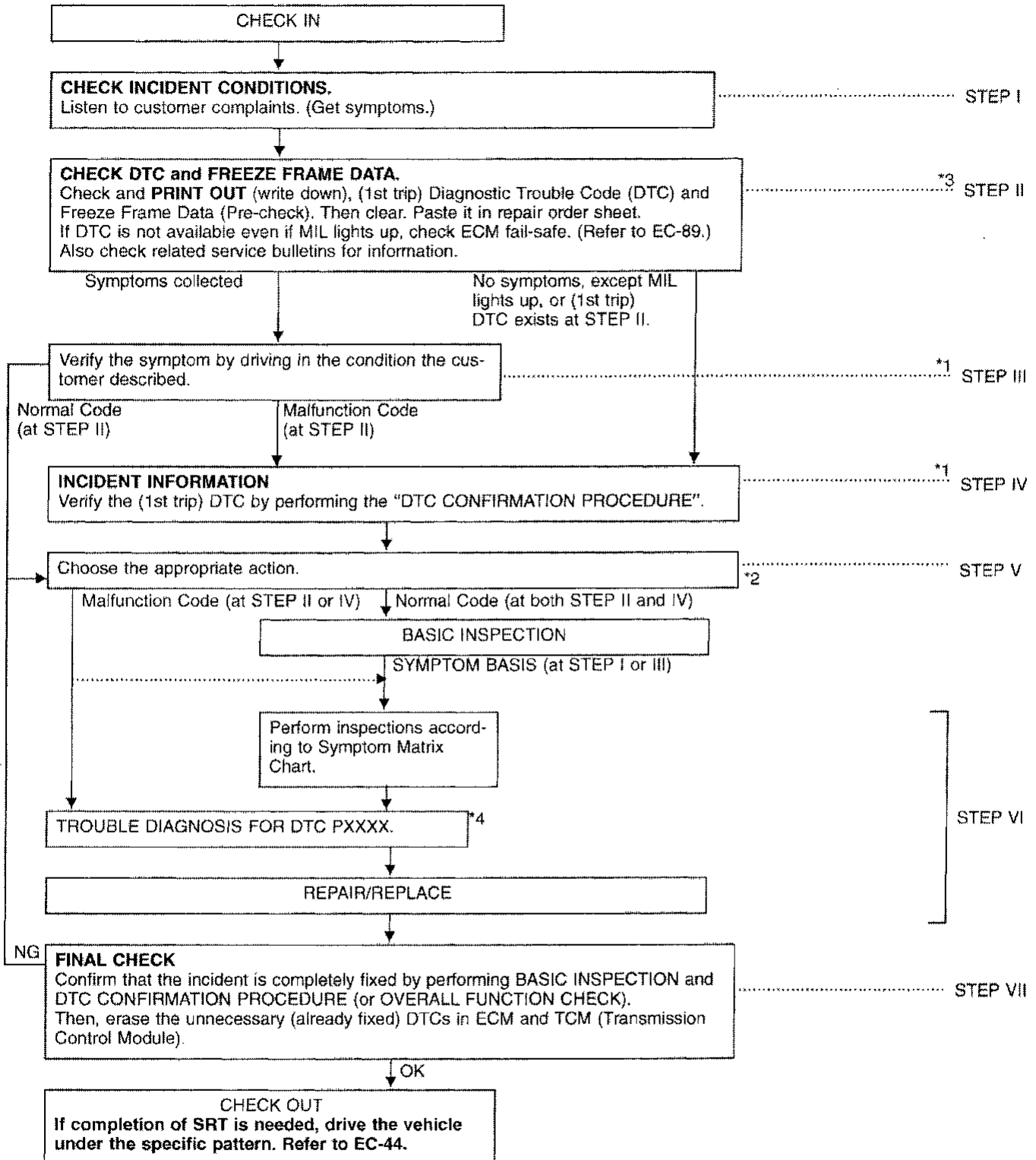
HA

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TROUBLE DIAGNOSIS — Work Flow

Work Flow



*1: If the incident cannot be duplicated, see "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

*2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit (See TROUBLE DIAGNOSIS FOR POWER SUPPLY, EC-109).

*3: If time data of "SELF-DIAG RESULTS" is other than "0" or "1t" refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT", EC-108.

*4: If the malfunction part cannot be found, refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

TROUBLE DIAGNOSIS — Work Flow

Description for Work Flow

STEP	DESCRIPTION	
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-78.	GI
STEP II	Before confirming the concern, check and write down (print out using CONSULT or Generic Scan Tool) the Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-52.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. See page EC-90.) Also check related service bulletins for information.	MA EM
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.	LC EC
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.	FE AT PD FA
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION on next page. Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-90.)	RA
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-93. 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.	BR ST RS BT
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 TCM (Transmission Control Module). (Refer to EC-52.)	HA EL

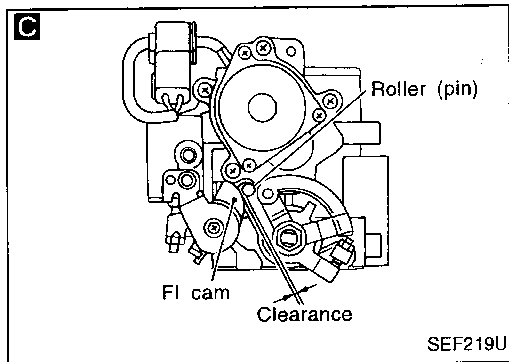
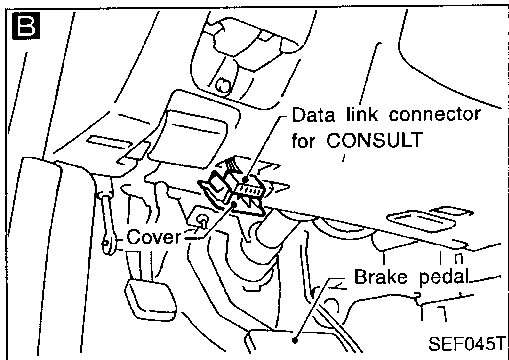
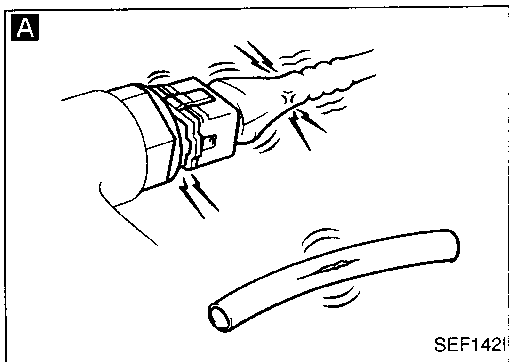
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Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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



A

BEFORE STARTING

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

B

CONNECT CONSULT TO THE VEHICLE.

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. (Refer to page EC-63.)

C

CHECK FI CAM.

Warm up engine to normal operating temperature and make sure there is clearance between FI cam and roller (pin).

NG

Check FI cam, refer to EC-31.

OK

A

(Go to next page.)

TROUBLE DIAGNOSIS — Basic Inspection

Basic Inspection (Cont'd)

D

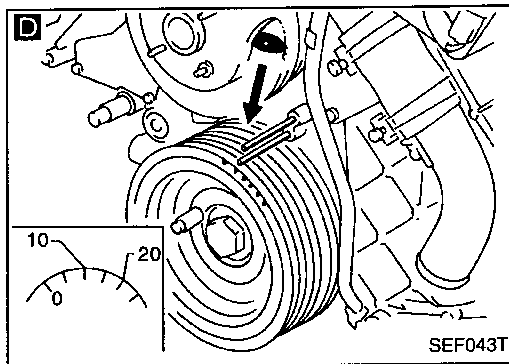
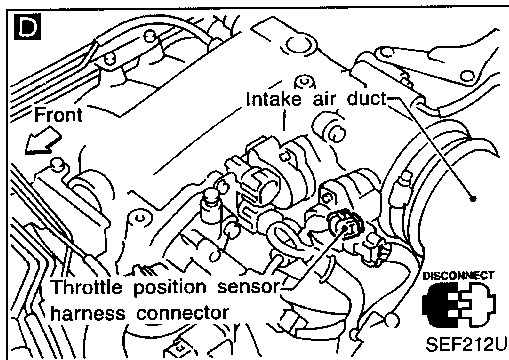
■ IACV-AAC/V ADJ ■ □

SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITION

- ENG WARMED UP
- NO LOAD

START

MEF657D



E

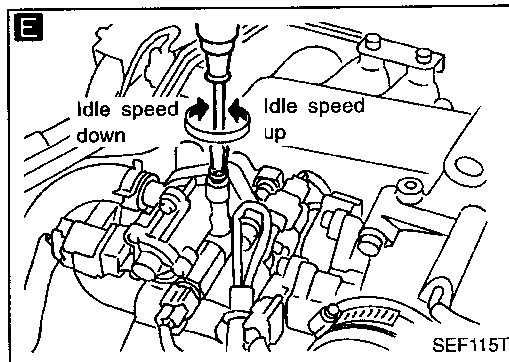
■ IACV-AAC/V ADJ ■ □

SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITION

- ENG WARMED UP
- NO LOAD

START

MEF657D



D

CHECK IGNITION TIMING.

1. Warm up engine to normal operating temperature.

2. Select "IACV-AAC/V ADJ" in "WORK SUPPORT" mode.

3. Touch "START".

4. Check ignition timing at idle using timing light.

Ignition timing:
 $15^{\circ} \pm 2^{\circ}$ BTDC

OR

1. Warm up engine to normal operating temperature.

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

3. Start engine.

4. Check ignition timing at idle using timing light.

Ignition timing:
 $15^{\circ} \pm 2^{\circ}$ BTDC

NG → Adjust ignition timing by turning camshaft position sensor. Refer to EC-33.

E

CHECK BASE IDLE SPEED.

1. Select "IACV-AAC/V ADJ" in "WORK SUPPORT" mode.

2. When touching "START", does engine speed fall to 600 ± 50 rpm (in "P" or "N" position)?

OR

Does engine run at 600 ± 50 rpm (in "P" or "N" position)?

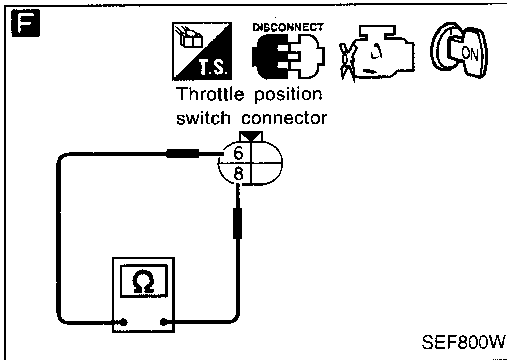
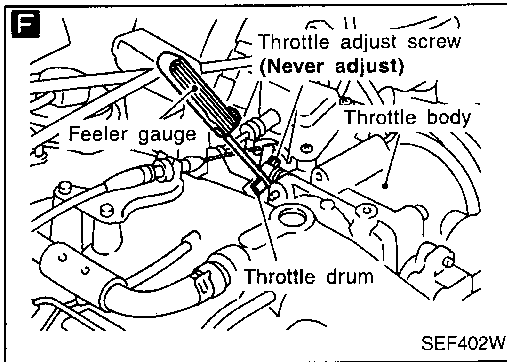
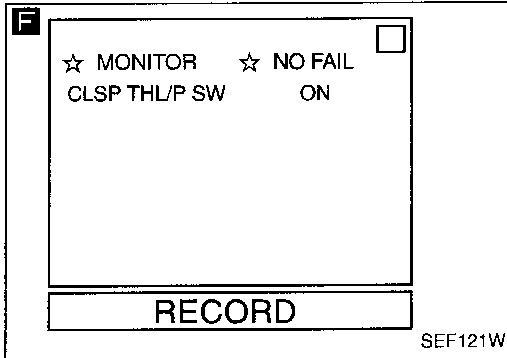
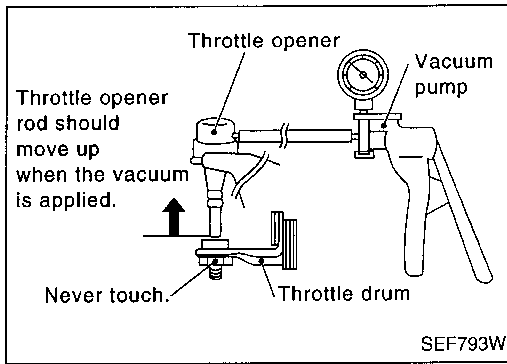
NG → Adjust base idle speed by turning idle speed adjusting screw. Refer to "Idle Speed/ Ignition Timing/Idle Mixture Ratio Adjustment" in EC-33.

OK

(Go to next page.)

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Basic Inspection (Cont'd)



F **CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION. (Check throttle position sensor idle position.)**
 ● **Always check ignition timing and base idle speed before performing the followings.**

1. Warm up engine to normal operating temperature.
2. Check FI cam, refer to procedure **C**.
3. Stop engine.
4. Remove the vacuum hose connected to the throttle opener.
5. Connect suitable vacuum hose to the vacuum pump and the throttle opener as shown in the figure.
6. Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum become free from the rod of the throttle opener. During the TPS adjustment, the vacuum should be applied (Until step **H**).
7. Turn ignition switch "ON".
8. Select "DATA MONITOR" mode with CONSULT.
9. Select "CLSD THL/P SW" from the menu.
10. Read "CLSD THL/P SW" signal under the following conditions.

● Insert a 0.2 mm (0.008 in) and 0.3 mm (0.012 in) feeler gauge alternately between the throttle adjust screw (TAS) and throttle drum as shown in the figure and check the signal.

"CLSD THL/P SW" signal should remain "ON" while inserting 0.2 mm (0.008 in) feeler gauge.

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

OR

7. Disconnect closed throttle position switch harness connector.
8. Connect the tester probe to closed throttle position switch terminals **6** and **8**.
9. Check harness continuity under the following conditions.

● Insert the 0.2 mm (0.008 in) and 0.3 mm (0.012 in) feeler gauge alternately between the throttle adjust screw (TAS) and throttle drum as shown in the figure and check continuity.

"Continuity should exist" while inserting 0.2 mm (0.008 in) feeler gauge.

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

C **ADJUSTMENT**
 Refer to "THROTTLE POSITION SENSOR IDLE POSITION ADJUSTMENT".
 Go to EC-86.

OK

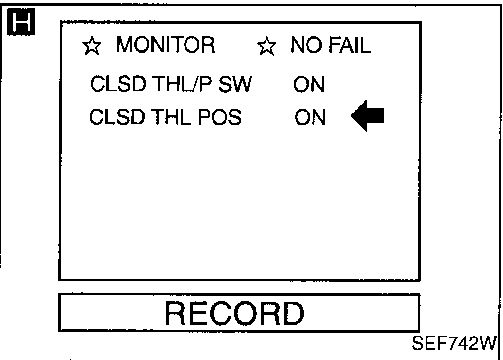
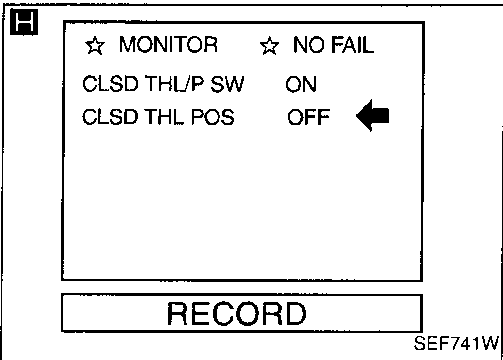
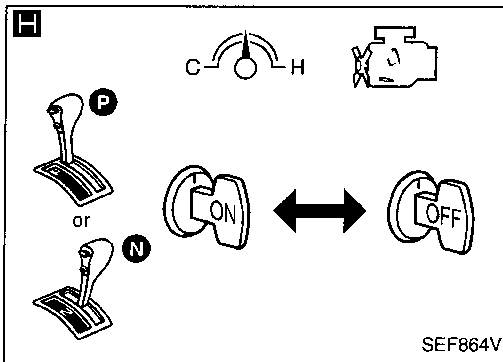
● Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.

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

D
 (Go to next page.)

TROUBLE DIAGNOSIS — Basic Inspection

Basic Inspection (Cont'd)



RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY.
Note: Always warm up engine to normal operating temperature. If engine is cool, the throttle position sensor idle position memory will not be reset correctly.

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

OR

7. Repeat steps 5 and 6, 20 times.

Stop engine, release vacuum then remove the vacuum hose and handy vacuum pump from the throttle opener. Reinstall the original vacuum hose to the throttle opener securely.

CHECK TARGET IDLE SPEED.

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

OR

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

Adjust idle speed. Refer to "Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment" in EC-33.

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

- Erase the stored memory in ECM and TCM (Transmission Control Module). Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" (EC-52) and "HOW TO ERASE DTC" in AT section.
- Erase the store memory in ABS/TCS control unit. Refer to "TROUBLE DIAGNOSIS FOR ABS/TCS C/U SIGNAL", EC-481 or refer to ("TROUBLE DIAGNOSIS", HOW TO ERASE SELF-DIAGNOSTIC RESULTS") in BR section.

INSPECTION END

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TROUBLE DIAGNOSIS — Basic Inspection

Basic Inspection (Cont'd)

ⓐ THROTTLE POSITION SENSOR IDLE POSITION ADJUSTMENT

Note:

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

1. Warm engine up to normal operating temperature.
2. Check FI cam. Refer to procedure ⓐ.
3. Stop engine.

Note: If handy vacuum pump is already set, go to step 7.

4. Remove the vacuum hose connected to the throttle opener.
5. Connect suitable vacuum hose to the vacuum pump and the throttle opener as shown in the figure.
6. Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum become free from the rod of the throttle opener. During the TPS adjustment the vacuum should be applied.
7. Loosen throttle position sensor fixing bolts.



8. Turn ignition switch "ON".
9. Select "DATA MONITOR" mode with CONSULT.
10. Select "CLSD THL/P SW" from the menu.
11. Read "CLSD THL/P SW" signal under the following conditions.

- Insert 0.2 mm (0.008 in) feeler gauge between throttle adjust screw and throttle drum as shown in the figure and check the following.

- **Open throttle valve and then close.**
- **"CLSD THL/P SW" signal should remain "OFF" when the throttle valve is closed. (If signal is "ON", turn throttle position sensor body counterclockwise until the signal switches to "OFF".)**

12. Temporarily tighten sensor body fixing bolts as follows.
 - **Gradually move the sensor body clockwise and stop it when "CLSD THL/P SW" signal switches from "OFF" to "ON", then tighten sensor body fixing bolts.**

13. Make sure the signal is "ON" when the throttle valve is closed and "OFF" when it is opened. Repeat it 2 or 3 times.

14. Remove 0.2 mm (0.008 in) feeler gauge then insert 0.3 mm (0.012 in) feeler gauge and check the following. Make sure the signal remains "OFF" when the throttle valve is closed. Repeat it 2 or 3 times.

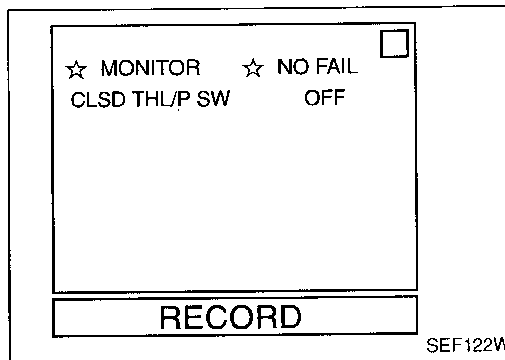
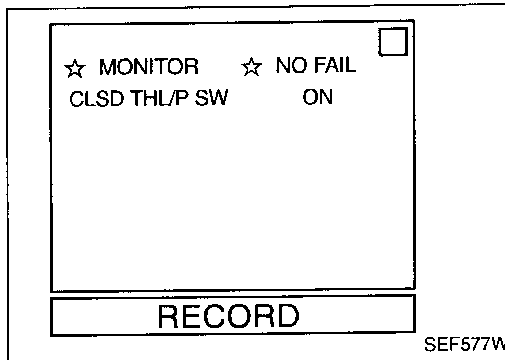
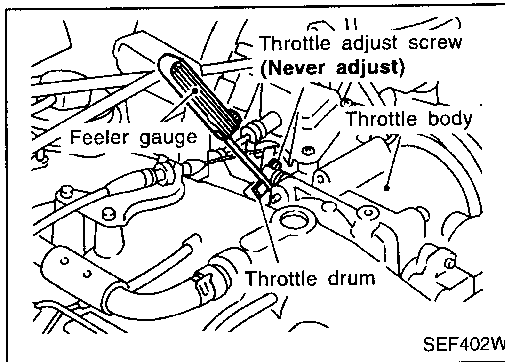
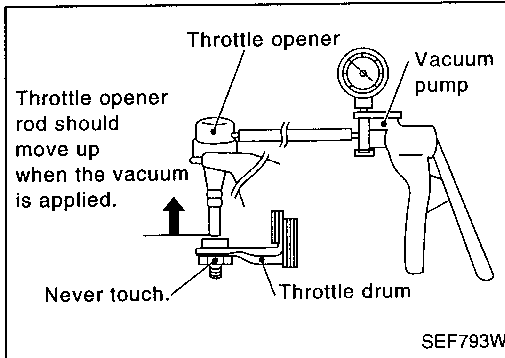
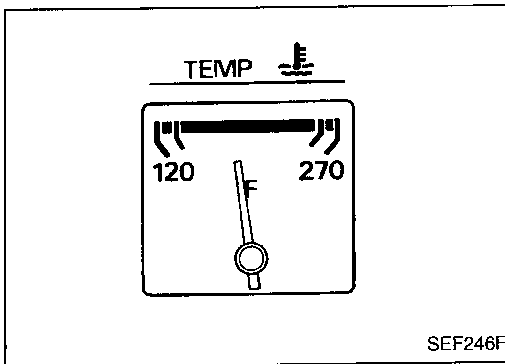
15. Tighten throttle position sensor. Check that the "CLOSED THL/SW" signal remains "OFF" while closing throttle valve. If NG, repeat from the step 4.

After this adjustment, go to procedure ⓑ RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY.

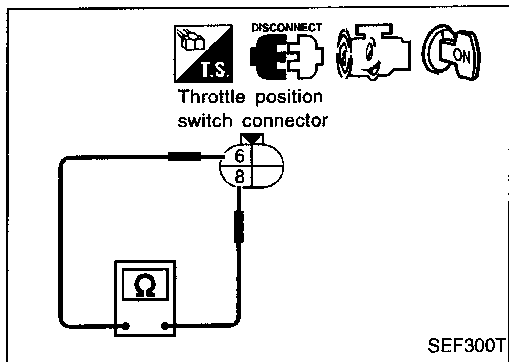
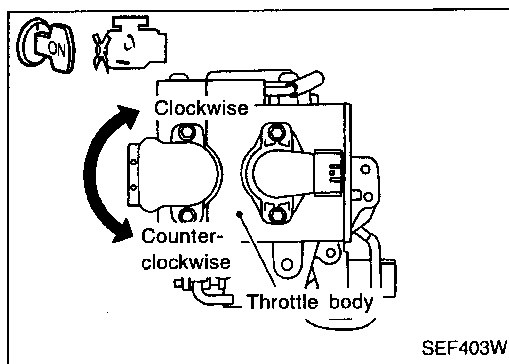
OR



8. Disconnect closed throttle position sensor harness connector.
9. Connect tester probe to the closed throttle position switch terminals ⓐ and ⓑ and check continuity under the following conditions.



Basic Inspection (Cont'd)



- Insert the 0.2 mm (0.008 in) feeler gauge between the throttle adjust screw and throttle drum as shown in the figure and check the following.
 - **Open throttle valve then close.**
 - **The continuity should not exist while closing the throttle valve. If the continuity exists, turn throttle position sensor body counterclockwise until the continuity does not exist.**
10. Temporarily tighten sensor body fixing bolts as follows.
 - **Gradually move the sensor body clockwise and stop it when the continuity comes to exist, then tighten sensor body fixing bolts.**
 11. Make sure the continuity exists when the throttle valve is closed and continuity does not exist when it is opened. Repeat it 2 or 3 times.
 12. Remove 0.2 mm (0.008 in) feeler gauge then insert 0.3 mm (0.012 in) feeler gauge and check the following. Make sure the continuity does not exist when the throttle valve is closed. Repeat it 2 or 3 times.
 13. Tighten throttle position sensor. Check that the continuity does not exist while closing the throttle valve. If NG, repeat from the step 5. **After this adjustment, go to procedure **EC** RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY.**

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Diagnostic Trouble Code (DTC) Inspection Priority Chart

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

Priority	Detected items (DTC)		
1	<ul style="list-style-type: none"> ● ECM (P0605, 0301) ● Mass air flow sensor (P0100, 0102) ● Throttle position sensor (P0120, 0403) ● EGRC-solenoid (P1400, 1005) ● A/T communication line (P0600, 0504), (P1605, 0804) 	<ul style="list-style-type: none"> ● Vehicle speed sensor (P0500, 0104) ● Intake air temperature sensor (P0110, 0401) ● Knock sensor (P0325, 0304), (P0330, 0212) ● Crankshaft position sensor (OBD) circuit (P0335, 0802) (P1336, 0905) ● Tank fuel temperature sensor (P0180, 0402) 	<ul style="list-style-type: none"> ● Engine coolant temperature sensor (P0115, 0103) (P0125, 0908) ● Ignition signal circuit (P1320, 0201) ● Park/Neutral position switch (P1706, 1003) ● Camshaft position sensor (P0340, 0101)
2	<ul style="list-style-type: none"> ● EGR temperature sensor (P1401, 0305) ● A/T related sensors, solenoid valves and switches (P0705 - P0725, 1101 - 1208) (P0740, 1108 - 1206) ● Absolute pressure sensor (P0105, 0803) ● MAP/BARO switch solenoid valve (P1105, 1302) ● Tandem throttle position sensor (P1125, 0110) ● Secondary throttle position sensor (P1120, 0406) 	<ul style="list-style-type: none"> ● Rear heated oxygen sensor (P0137 - P0140) (0150 - 0152, 0707), (P0157 - P0160) (0313 - 0315, 0708) ● Front heated oxygen sensor's heater (P0135, 0901) (P0155, 1001) ● Closed throttle position switch (P0510, 0203) ● Intake valve timing control position sensor circuit (P1140, 1303), (P1145, 1304) ● Front heated oxygen sensor (P0130 - P0134, 0303, 0409 - 0412) (P0150 - P0154, 0413 - 0415, 0503, 0509) ● Rear heated oxygen sensors heater (P0141, 0902), (P0161, 1002) 	<ul style="list-style-type: none"> ● EVAP control system pressure sensor (P0450, 0704) ● Vacuum cut valve bypass valve (P1491, 0311) (P1490, 0807) ● EVAP canister vent control valve (P0446, 0903) (P1446, 0215) (P1448, 0309) ● EVAP canister purge volume control valve (P1444, 0214) (P0443, 1008) ● EVAP control system purge flow monitoring (P1447, 0111) ● EVAP canister purge control valve/solenoid valve (P1493, 0312), (P1492, 0807)
3	<ul style="list-style-type: none"> ● EGR function (P0400, 0302) (P1402, 0514) ● EVAP control system (SMALL LEAK) (P0440, 0705) (P1440, 0213) ● EGRC-BPT valve function (P0402, 0306) ● IACV-AAC valve (P0505, 0205) 	<ul style="list-style-type: none"> ● TCS signal (P1210, 0106) ● Misfire (P0300 - P0308, 0701 - 0601) ● Closed loop control (P1148, 0307) (P1168, 0308) ● A/T function (P0731 - P0734, 1103 - 1106) (P0744, 1107) 	<ul style="list-style-type: none"> ● Fuel pump control module (FPCM) (P1220, 1305) ● Fuel injection system function (P0172, 0114), (P0171, 0115), (P0175, 0209), (P0174, 0210) ● Three way catalyst function (P0420, 0702) (P0430, 0703) ● Intake valve timing control function (P1110, 0805), (P1135, 1301)

TROUBLE DIAGNOSIS — General Description

Fail-Safe Chart

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

When the ECM enters the fail-safe mode, the MIL illuminates.

DTC No.		Detected items	Engine operating condition in fail-safe mode	
CONSULT GST	ECM*			
P0100	0102	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.	
P0115	0103	Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START". CONSULT displays the engine coolant temperature decided by ECM.	
			Condition	Engine coolant temperature decided (CONSULT display)
			Just as ignition switch is turned ON or Start	40°C (104°F)
			More than 4 minutes after ignition Start	80°C (176°F)
			Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
P0120	0403	Throttle position sensor circuit	Throttle position will be determined based on the amount of mass air flow and the engine speed. Therefore, acceleration will be poor.	
				Driving condition
			When engine is idling	Normal
			When accelerating	Poor acceleration
P1210	0106	TCS signal circuit	TCS does not operate. For details, refer to BR section ("TROUBLE DIAGNOSIS FOR TCS").	
Unable to access ECM	Unable to access Diagnostic Test Mode II	ECM	ECM fail-safe activating condition The computing function of the ECM was judged to be malfunctioning. When the fail-safe system activates, i.e. if the ECM detects a malfunction condition in the CPU of ECM, the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver. However, it is not possible to access ECM and DTC cannot be confirmed. Engine control with ECM fail-safe When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.	
				ECM fail-safe operation
			Engine speed	Engine speed will not rise more than 3,000 rpm.
			Fuel injection	Simultaneous multiport fuel injection system
			Ignition timing	Ignition timing is fixed at the preset value.
			Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.
			Cooling fans	Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.
			Replace ECM, if ECM fail-safe condition is confirmed.	

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

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TROUBLE DIAGNOSIS — General Description

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM														Reference page	
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	OVERCOOLS	OVERCHARGING		BATTERY DEAD (UNDER CHARGE)
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	1P	1X	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		3	3			3				2	EC-505
	Fuel pressure regulator system	2	3	4	4	4	4	4	4	4		4					EC-29
	Injector circuit	1	1	2	2	2	2	2	2			2					EC-497
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4					EC-23
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1				EC-28
	Incorrect idle speed adjustment	3	3				1	1	1	1		1					EC-33
	IACV-AAC valve circuit	1	1	2	2	2	2	2	2	2		2					EC-321
	IACV-FICD solenoid circuit		3				2	3	3	2							EC-509
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1					EC-33
	Ignition circuit	1	1	2	3	2		2	3			2					EC-381
EGR	EGRC-solenoid valve	2	3	3	3	3		3				3					EC-394
	EGR system	2	1	2	3	3	3	2	3	3		3					EC-405
Main power supply and ground circuit		2	3	3	3	3		2	2		3	3				3	EC-109
Cooling	Cooling fan circuit	3	3	3	3	3	3	3	3	3	1	2		1		3	EC-485
Air conditioner circuit		3	3	3	3	3	3	3	3	3		3				3	HA section

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

TROUBLE DIAGNOSIS — General Description

Symptom Matrix Chart (Cont'd)

SYSTEM — Engine control system	SYMPTOM														Reference page	
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	OVERCOOLS	OVERCHARGING		BATTERY DEAD (UNDER CHARGE)
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	1P	1X	HA	
Engine control																EC-265
Camshaft position sensor circuit	2	2	2	2	2	3	3	3								EC-115
Mass air flow sensor circuit	1	1	2	3	2	2	2	2	2		2					EC-187, 159
Front heated oxygen sensor circuit	2	1	2	3	2		2	3			2					EC-137, 154
Engine coolant temperature sensor circuit	1	1	3	3	3	3	2	3	3	2	3					EC-142
Throttle position sensor circuit		1	2		2	3	2	2	3		2					
Incorrect throttle position sensor adjustment		2	3		3	1	3	3	1		3					EC-82
Intake valve timing control system		3	3		3		3				3					EC-348, 363
Vehicle speed sensor circuit		3	3		3						3					EC-316
Knock sensor circuit	2	3	2	2	2	3	2				3					EC-257
ECM	3	3	3	3	3	3	3	3	3	3	3					EC-336, 89
Start signal circuit	2															EC-503
Park/Neutral position switch circuit			3		3		3	3			3					EC-476
FPCM	2	2	2		2		2									EC-374
Power steering oil pressure switch circuit		2						3	3							EC-509

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

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TROUBLE DIAGNOSIS — General Description

Symptom Matrix Chart (Cont'd)

SYSTEM — Engine mechanical & other		SYMPTOM														Reference page			
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	OVERCOOLS	OVERCHARGING		BATTERY DEAD (UNDER CHARGE)		
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	1P	1X	HA			
Fuel	Fuel tank	5															FE section		
	Fuel piping	2		5	5	2		5	5			5					—		
	Vapor lock		5																
	Valve deposit																		
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5							
Air	Air duct	5																—	
	Air cleaner																		
	Air leakage from air duct (Mass air flow sensor — throttle body)		5	5		5		5	5			5							
	Throttle body, Throttle wire	5			5		5			5	5						FE section		
	Air leakage from intake manifold/Collector/Gasket																—		
Cranking	Battery	1	1	1		1		1	1			1			1	1	—		
	Alternator circuit																	EL section	
	Starter circuit	3																—	
	Theft warning circuit																		
	PNP switch	4																	AT section
	Drive plate	6																	EM section
Engine	Cylinder head																—		
	Cylinder head gasket										4								
	Cylinder block												6						
	Piston	6	6	6	6	6		6	6			6							
	Piston ring																		
	Connecting rod																		
	Bearing																		
	Crankshaft													6					
Valve mechanism	Timing chain	6	6	6	6	6		6	6			6	6				—		
	Camshaft	5	5	5	5	5		5	5			5							
	Intake valve																		
	Exhaust valve	6	6	6	6	6		6	6			6	6						
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5	5	5			5						—		
	Three way catalytic converter																		
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5			5	5				5	—		
	Oil level (Low)/Filthy oil																		
Cooling	Radiator/Hose/Radiator filler cap																—		
	Thermostat						5			5				2					
	Water pump	5	5	5	5	5					4	5							
	Water gallery																		
	Cooling fan						5			5					2				
	Coolant level (low)/Contaminated coolant																		
IVIS (Infiniti Vehicle Immobiliser System — NATS)		1	1														EC-58 or EL section		

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

TROUBLE DIAGNOSIS — General Description

CONSULT Reference Value in Data Monitor Mode

Remarks:

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

MONITOR ITEM	CONDITION		SPECIFICATION
CMPS-RPM (POS)	<ul style="list-style-type: none"> ● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT value. 		Almost the same speed as the CONSULT value.
MAS AIR/FL SE	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load 	Idle	1.0 - 1.7V
		2,500 rpm	Approx. 2.1V
COOLAN TEMP/S	<ul style="list-style-type: none"> ● Engine: After warming up 		More than 82°C (180°F)
FR O2 SEN-B1	<ul style="list-style-type: none"> ● Engine: After warming up 	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 SEN-B2			LEAN ↔ RICH Changes more than 5 times during 10 seconds.
FR O2 MNTR-B1			
FR O2 MNTR-B2			
RR O2 SEN-B1	<ul style="list-style-type: none"> ● Engine: After warming up 	Revsing engine from idle to 2,000 rpm quickly	0 - 0.3V ↔ 0.6 - 1.0V
RR O2 SEN-B2			LEAN ↔ RICH
RR O2 MNTR-B1			
RR O2 MNTR-B2			
VHCL SPEED SE	<ul style="list-style-type: none"> ● Turn drive wheels and compare speedometer indication with the CONSULT value 		Almost the same speed as the CONSULT value
BATTERY VOLT	<ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) 		11 - 14V
THRTL POS SEN	<ul style="list-style-type: none"> ● Engine: After warming up ● Ignition switch: ON (Engine stopped) ● More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump. 	Throttle valve: fully closed	0.35 - 0.65V
		Throttle valve: fully opened	Approx. 4.0V
THRTL/P SEN2	<ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) 	Throttle valve: fully closed	0.60 - 1.15V
		Throttle valve: fully open	4.3 - 4.7V
EGR TEMP SEN	<ul style="list-style-type: none"> ● Engine: After warming up 		Less than 4.5V
START SIGNAL	<ul style="list-style-type: none"> ● Ignition switch: ON → START → ON 		OFF → ON → OFF
CLSD THL/P SW	<ul style="list-style-type: none"> ● Engine: After warming up ● Ignition switch: ON (Engine stopped) ● More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump. 	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	<ul style="list-style-type: none"> ● Engine: After warming up, idle the engine 	Air conditioner switch: "OFF"	OFF
		Air conditioner switch: "ON" (Compressor operates.)	ON
P/N POSI SW	<ul style="list-style-type: none"> ● Ignition switch: ON 	Shift lever: "P" or "N"	ON
		Except above	OFF
PW/ST SIGNAL	<ul style="list-style-type: none"> ● Engine: After warming up, idle the engine 	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
AMB TEMP SW	<ul style="list-style-type: none"> ● Engine: Running 	Ambient air temperature more than 23.5°C	ON
		Ambient air temperature less than 20.5°C	OFF
LOAD SIGNAL	<ul style="list-style-type: none"> ● Engine: Running 	Rear window defogger or headlamp "ON"	ON
		Except above	OFF
A/C PRESS SW	<ul style="list-style-type: none"> ● Engine: Running 	A/C pressure is more than 1,422 - 1,618 kPa (14.5 - 16.5 kg/cm ² , 206 - 235 psi)	ON
		A/C pressure is less than 1,128 - 1,422 kPa (11.5 - 14.5 kg/cm ² , 164 - 206 psi)	OFF

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

TROUBLE DIAGNOSIS — General Description

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

MONITOR ITEM	CONDITION	SPECIFICATION
IGNITION SW	● Ignition switch: ON → OFF	ON → OFF
INJ PULSE-B1 INJ PULSE-B2	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle 2,000 rpm
B/FUEL SCHDL	ditto	Idle 2,000 rpm
IGN TIMING	ditto	Idle 2,000 rpm
IACV-AAC/V	ditto	Idle 2,000 rpm
A/F ALPHA-B1 A/F ALPHA-B2	● Engine: After warming up	Maintaining engine speed at 2,000 rpm
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 1 second) ● Engine running and cranking	ON
	Except as shown above	OFF
INT/V SOL-B1 INT/V SOL-B2	● Engine is running ● Engine speed is more than 2,000 rpm ● Quickly depressed accelerator pedal. ● Vehicle speed is more than 4 km/h (2 MPH)	OFF → ON (Using "INT/V TIM-B1(-2)", the difference of degree between "OFF" and "ON" is approximately 20 deg.)
INT/V TIM-B1 INT/V TIM-B2	● Engine is running	Advanced angle (degree signal) of the intake camshaft should be displayed.
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: "OFF"	Engine coolant temperature is 94°C (201°F) or less
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F) at vehicle speed less than 80 km/h (50 MPH)
		Engine coolant temperature is 105°C (221°F) or more
EGRC SOL/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "D" ● No-load	Idle Reving engine up from idle to 3,000 rpm
VENT CONT/V	● Ignition switch: ON	OFF
FR O2 HTR-B1 FR O2 HTR-B2	● Engine speed: Idle ● Engine speed: Above 3,200 rpm	ON OFF
RR O2 HTR-B1 RR O2 HTR-B2	● Engine speed: Idle [after driving 2 minutes at 70 km/h (43 MPH) or more] ● Engine speed: Above 3,600 rpm ● Ignition switch: ON (Engine stopped)	ON OFF
VC/V BYPASS/V	● Ignition switch: ON	OFF
PURG CONT S/V	● Engine: After warming up	Idle 2,000 rpm
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle 2,500 rpm
ABSOL TH-P/S	● Engine: After warming up ● Ignition switch: ON (Engine stopped) ● More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump.	Throttle valve fully closed
		Throttle valve fully opened

TROUBLE DIAGNOSIS — General Description

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

MONITOR ITEM	CONDITION	SPECIFICATION
MASS AIRFLOW	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load 	Idle 3.0 - 6.0 g·m/s
	2,500 rpm	12.9 - 25.3 g·m/s
FPCM	<ul style="list-style-type: none"> ● Within 16 seconds after starting engine, when engine coolant temperature is more than 100°C (212°F) 	HIGH → LOW
FPCM D/R VOLT	<ul style="list-style-type: none"> ● Within 16 seconds after starting engine, when engine coolant temperature is more than 100°C (212°F) 	Approx. 5V → Approx. 0.4V
MAP/BARO SW/V	<ul style="list-style-type: none"> ● For 5 seconds after starting engine 	BARO
	<ul style="list-style-type: none"> ● More than 5 seconds after turning ignition switch "ON" ● More than 5 seconds after starting engine 	MAP
ABSOL PRES/SE	<ul style="list-style-type: none"> ● Engine: After warming up 	For 5 seconds after starting engine Approx. 4.4V
		More than 5 seconds after starting engine Approx. 1.2V

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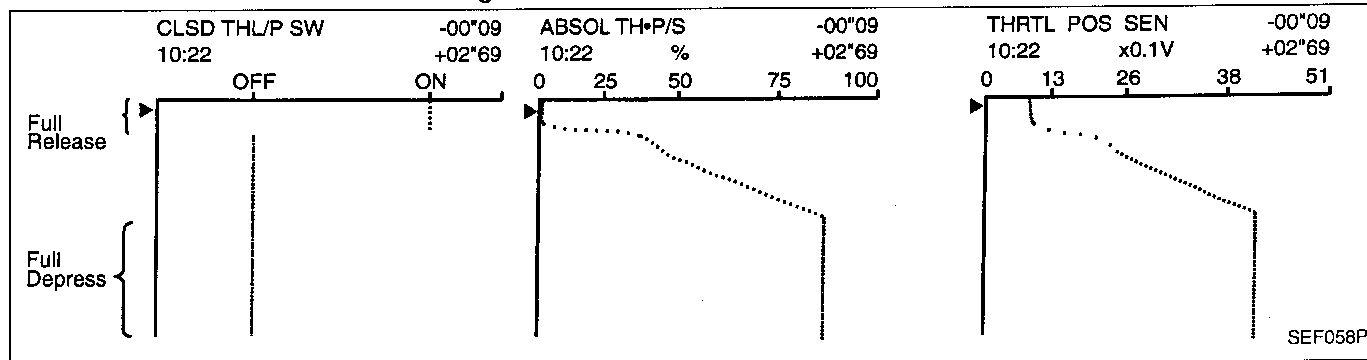
Major Sensor Reference Graph in Data Monitor Mode

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

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

Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL/P SW" when depressing the accelerator pedal with the ignition switch "ON".

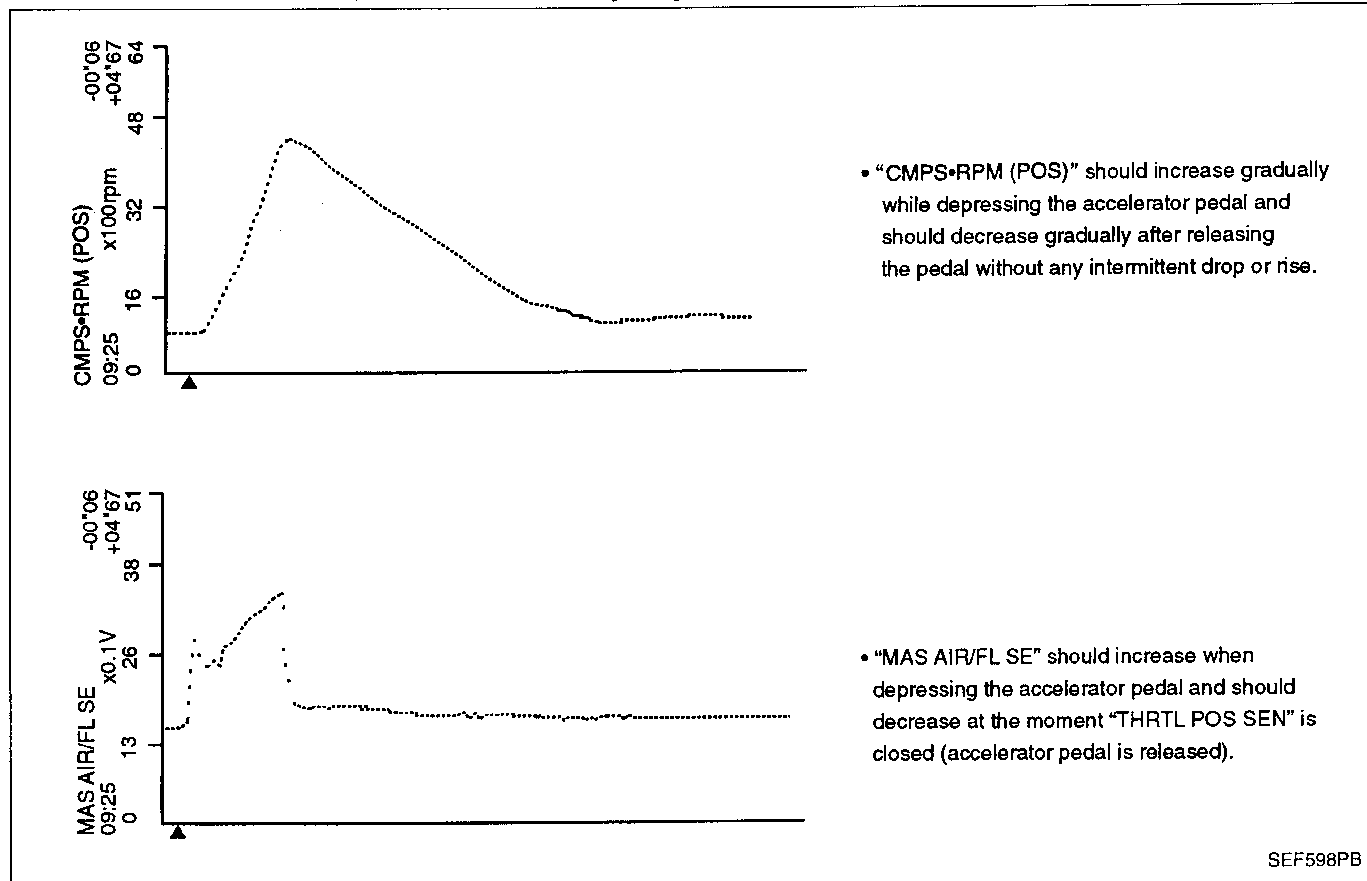
The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL/P SW" is changed from "ON" to "OFF".



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

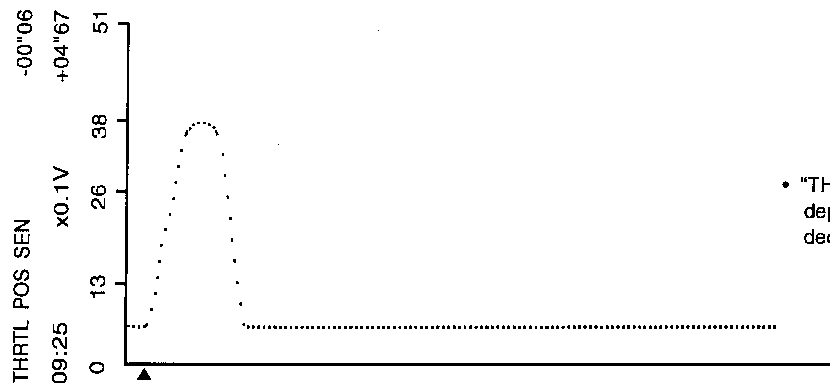
Below is the data for "CMPS·RPM (POS)", "MAS AIR/FL SE", "THRTL POS SEN", "RR O2 SENSOR", "FR O2 SENSOR" and "INJ PULSE" when revving engine quickly up to 4,800 rpm under no load after warming up engine to normal operating temperature.

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

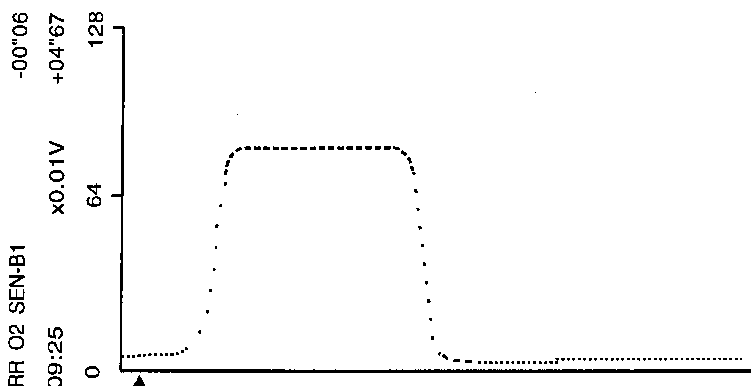


TROUBLE DIAGNOSIS — General Description

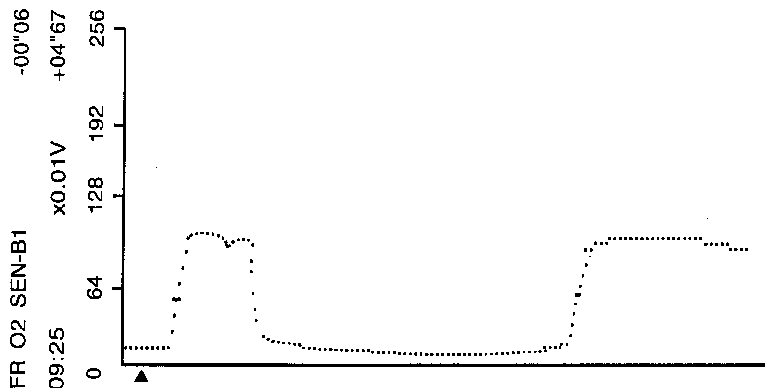
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



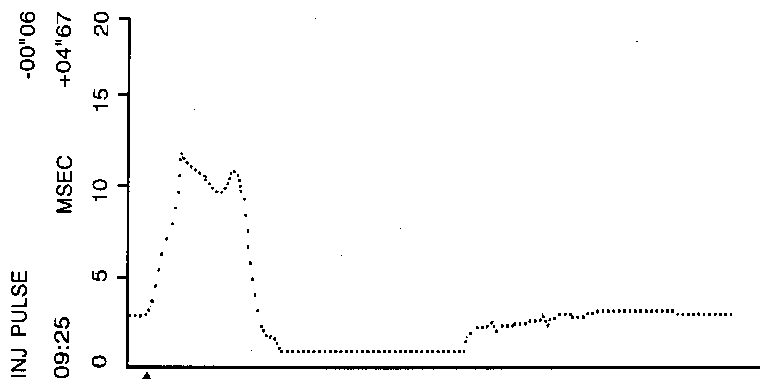
- "THRTL POS SEN" should increase while depressing the accelerator pedel and should decrease while releasing it.



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



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



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

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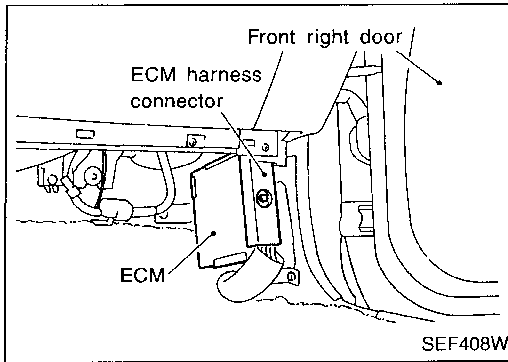
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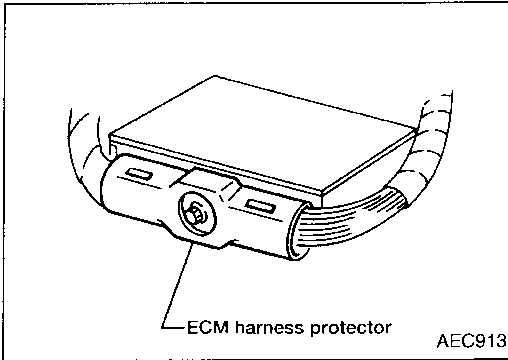
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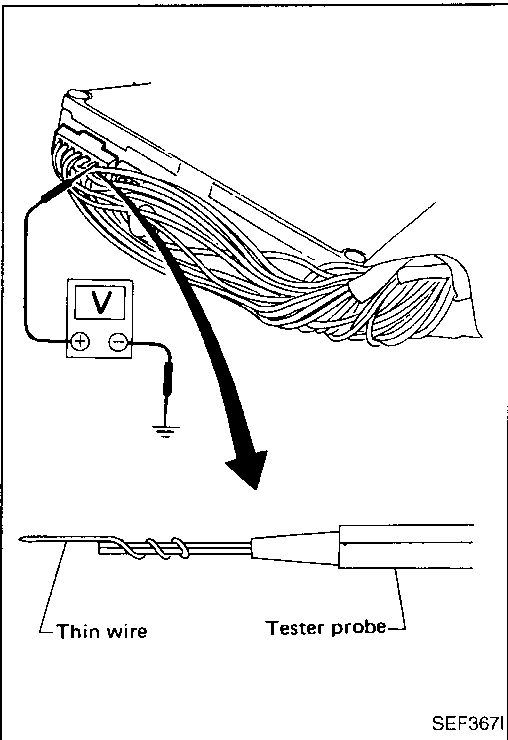
ECM Terminals and Reference Value

PREPARATION

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



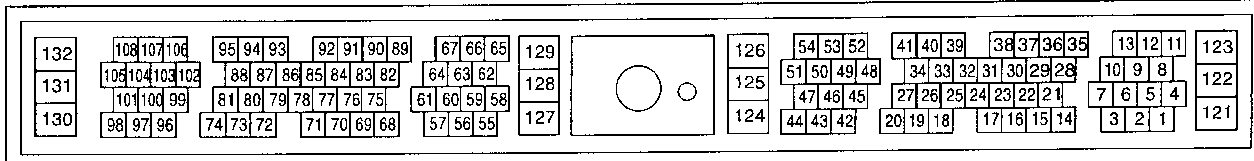
2. Remove ECM harness protector.



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

- Open harness securing clip to make resting easier.
- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.

ECM HARNESS CONNECTOR TERMINAL LAYOUT



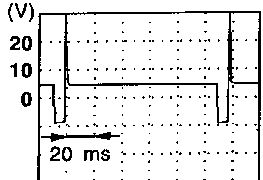
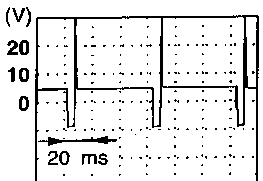
SEF218U

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

Specification data are reference values, and are measured between each terminal and (12B) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)	
1 2 3 14 4 5 6 7	R/B R/W R/Y R/L W/R PU/R GY/L LG	Injector No. 1 Injector No. 8 Injector No. 7 Injector No. 3 Injector No. 6 Injector No. 5 Injector No. 4 Injector No. 2	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V) (V) 20 10 0  20 ms SEF549T	GI MA EM LC
			Engine is running. └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V) (V) 20 10 0  20 ms SEF550T	EC FE AT PD
			Engine is running. (Warm-up condition) └ Lift up drive wheels and rev engine from idle to 3,000 rpm in "D" position.	0 - 0.7V	FA RA
			Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)	BR
			Engine is running. └ Idle speed	0.1 - 14V	ST
			Engine is cranking.	Approximately 0.4V	RS
			Engine is running. └ Idle speed	Approximately 10V	BT
16 17	L/Y G/W	Front heated oxygen sensor heater (right bank)	Engine is running. └ Engine speed is below 3,200 rpm.	0 - 0.5V	HA
		Front heated oxygen sensor heater (left bank)	Engine is running. └ Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)	EL
18 19	Y/R L	Rear heated oxygen sensor heater (right bank)	Engine is running. └ At idle [after driving 2 minutes at 70 km/h (43 MPH) or more]	0 - 0.5V	IDX
		Rear heated oxygen sensor heater (left bank)	Ignition switch "ON" └ Engine stopped Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)	

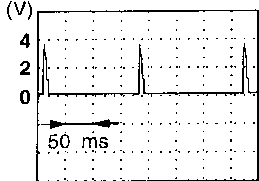
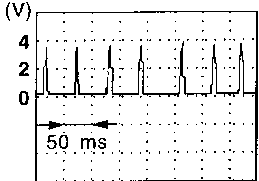
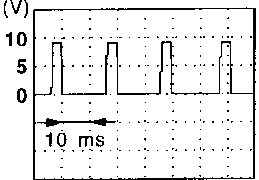
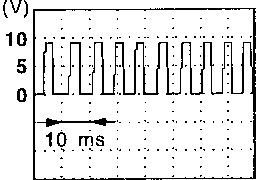
TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
20	P/B	EVAP canister vent control valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
22	Y	EVAP canister purge control solenoid valve	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0V
24 25	BR/Y BR	Intake valve timing control solenoid valve (right bank) Intake valve timing control solenoid valve (left bank)	Engine is running. └ Intake valve timing control solenoid is operating.	Approximately 0V
			Engine is running. └ Intake valve timing control solenoid is not operating.	Battery voltage
34 27	LG LG/R	Cooling fan relay-2 Cooling fan relay-1 and -3	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating.	0 - 1V
28 29 35 36	BR/Y G G/OR L/B	EVAP canister purge volume control valve	Engine is running. └ Idle speed	0 - 0.4V or BATTERY VOLTAGE (11 - 14V)
41	W	MAP/BARO switch solenoid valve	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON"	Approximately 0V
			Engine is running └ For 5 seconds after starting engine	
41	W	MAP/BARO switch solenoid valve	Engine is running. └ Idle speed (For 5 minutes after starting engine) └ More than 5 seconds after starting engine	BATTERY VOLTAGE (11 - 14V)
			42	B/P
Engine is running.				
42	B/P	Fuel pump relay	Ignition switch "ON" └ 5 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
43 44 46 47 50 51 53 54	Y/R G/R L/R GY PU/W GY/R W/R R/L	Ignition signal (No. 1) Ignition signal (No. 8) Ignition signal (No. 7) Ignition signal (No. 3) Ignition signal (No. 6) Ignition signal (No. 5) Ignition signal (No. 4) Ignition signal (No. 2)	Engine is running. └ Idle speed	Approximately 0.38V 
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.55V 
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON"	Approximately 0.1V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Both air conditioner switch and blower switch are "ON".	0 - 1V
			Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
52	W/G	Tachometer	Engine is running. └ Idle speed	Approximately 7V 
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0 - 14V 

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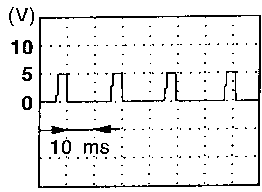
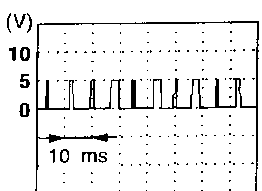
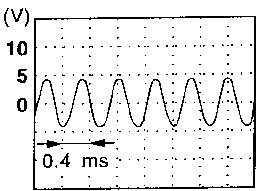
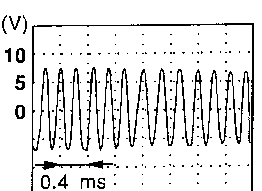
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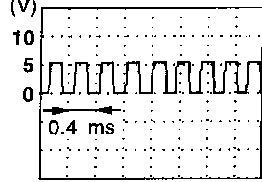
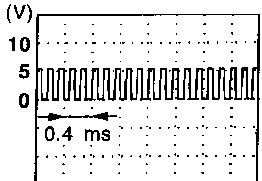
TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
55 58	P	Crankshaft position sensor (REF)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Idle speed	Approximately 0.6 - 1.0V  SEF046V
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0.8 - 0.9V  SEF544T
56	W/L	Power supply (Back-up)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "OFF"</div>	BATTERY VOLTAGE (11 - 14V)
57	B/R	Crankshaft position sensor (OBD)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Idle speed	Approximately 1.7V  SEF545T
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0V  SEF546T

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

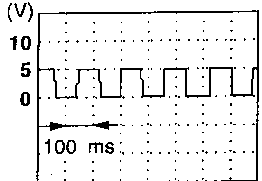
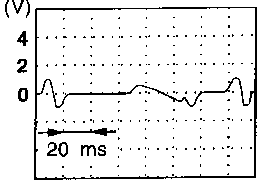
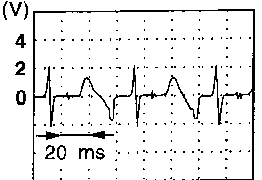
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
59	L	Camshaft position sensor (POS)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Idle speed	Approximately 2.5V 
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 2.4V 
61	L/W	Throttle position sensor signal	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> (Warm-up condition)* └ Accelerator pedal released	Approximately 0.5V
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> (Warm-up condition)* └ Accelerator pedal fully depressed	Approximately 4.2V
62	B	Mass air flow sensor ground	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Idle speed	Approximately 0V
63	G	Throttle position sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> (Warm-up condition)* └ Accelerator pedal fully released	0.35 - 0.65V
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> (Warm-up condition)* └ Accelerator pedal fully depressed	Approximately 4V
64	W	Absolute pressure sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> └ For 5 seconds after turning ignition switch "ON" <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running</div> └ For 5 seconds after starting engine	Approximately 4.4V
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ More than 5 seconds after starting engine	Approximately 1.2V
65	W	Mass air flow sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Idle speed	1.0 - 1.4V
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Engine speed is 2,500 rpm.	Approximately 2.1V

*: More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump.

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TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
66	L	Secondary throttle position sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> ↳ Approximately 3 seconds after ignition switch "ON" and thereafter	Approximately 3.4V
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> ↳ Disconnect throttle motor harness connector. ↳ Fully close secondary throttle valve by hand.	Approximately 0.4V
67	Y/B	Engine coolant temperature sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div>	0 - 4.8V Output voltage varies with engine coolant temperature.
68	P/L	Vehicle speed sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> ↳ Jack up rear wheels and run engine at idle in "D" position.	Approximately 5.2V  SEF542T
69	W/PU	Intake air temperature sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div>	0 - 4.8V Output voltage varies with intake air temperature.
70 71	R/L L/W	Intake valve timing control position sensor (right bank)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> ↳ Idle speed	Approximately 0V  SEF551T
		Intake valve timing control position sensor (left bank)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> ↳ Engine speed is 2,000 rpm.	Approximately 0V  SEF552T
72	R/Y	Headlamp switch	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> ↳ Headlamp switch is "OFF".	0V
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> ↳ Headlamp switch is "ON".	Battery voltage

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)	
73	R	TCS signal	Ignition switch "ON"	Approximately 5V	GI
			Ignition switch "ON" └ Disconnect throttle motor harness connector. └ Fully close secondary throttle valve by hand.	Approximately 0V	MA
74	GY/L	Closed throttle position switch	Ignition switch "ON" (Warm-up condition)* └ Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)	EM
			Ignition switch "ON" (Warm-up condition)* └ Accelerator pedal depressed	Approximately 0V	LC
75	W	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V	EC
			Engine is running. (Warm-up condition) └ EGR system is operating.	0 - 1.0V	FE
76	L/R	Ambient air temperature switch	Engine is running. └ Ambient air temperature is more than 23.5°C (74°C)	Approximately 5V	AT
			Engine is running. └ Ambient air temperature is less than 20.5°C (69°F)	0V	PD FA
78	W	Ignition switch	Ignition switch "OFF"	0V	RA
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)	
79	L/R	Electrical load signal	Engine is running. └ Rear window defogger switch is "OFF". └ Headlamp switch is "OFF".	0V	BR
			Engine is running. └ Rear window defogger switch is "ON". └ Headlamp switch is "ON".	Battery voltage	ST RS
80	SB	Start signal	Ignition switch "ON"	Approximately 0V	
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)	BT
81	G/B	Air conditioner pressure switch	Engine is running. └ At idle speed	Approximately 5V	HA
82 83	R W	Front heated oxygen sensor (Right bank) Front heated oxygen sensor (Left bank)	Engine is running. └ After warming up to normal operating temperature and engine speed is 2,000 rpm.	0 - Approximately 1.0V (periodically change)	EL
89 90	W Y	Rear heated oxygen sensor (RH) Rear heated oxygen sensor (LH)	Engine is running. └ After warming up to normal operating temperature and engine speed is 2,000 rpm.	0 - Approximately 1.0V	IDX

*: More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump.

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
91	R/L	Tank fuel temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with fuel temperature.
92	LG	EVAP control system pressure sensor	Ignition switch "ON"	Approximately 3.4V
93	G/R	Fuel pump control module (FPCM) check	When cranking the engine	Approximately 0V
			After starting the engine	Approximately 5V
96 97	P BR/Y	Data link connector for CONSULT	Engine is running. └ Idle speed └ Connect CONSULT and select DATA MONITOR mode.	Approximately 4 - 6V Approximately 0V
98	BR/W	Sensor's power supply	Ignition switch "ON"	Approximately 5V
99	R/L	A/T communication line (LAN)	Engine is running. └ Idle speed	Approximately 2V
100	G	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0 - 1.5V
			Engine is running. └ Steering wheel is not being turned.	BATTERY VOLTAGE (11 - 14V)
101	G/OR	PNP switch	Ignition switch "ON" └ Gear position is "N" or "P".	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	Approximately 5V
105 108	W W	Knock sensor (LH) Knock sensor (RH)	Engine is running. └ Idle speed	2.0 - 3.0V
106	R	Data link connector for GST	Ignition switch "ON" └ GST is disconnected.	6 - 10V
121 122	B B	ECM ground	Engine is running. └ Idle speed	Engine ground
123	W	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
124	W/B	ECM 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)
125 126	B	ECM ground	Engine is running. └ Idle speed	Engine ground
127 128	B	ECM ground	Engine is running. └ Idle speed	Engine ground

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
129	B	Sensor's ground	<div style="border: 1px solid black; display: inline-block; padding: 2px;">Engine is running.</div> (Warm-up condition) └ Idle speed	0V
130 131	R/G	Power supply for ECM	<div style="border: 1px solid black; display: inline-block; padding: 2px;">Ignition switch "ON"</div>	BATTERY VOLTAGE (11 - 14V)

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TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

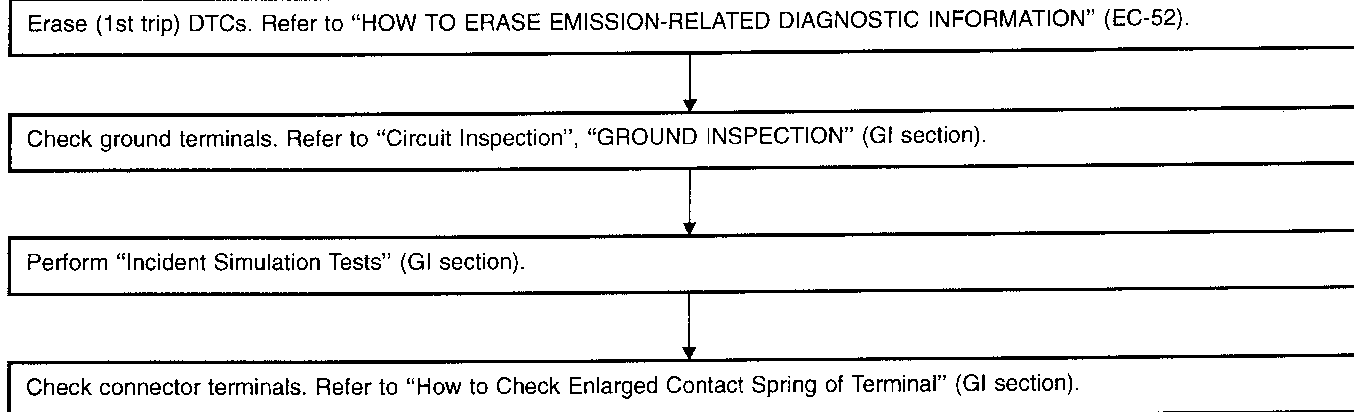
Description

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

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT is used. The SELF-DIAG RESULTS screen shows time data other than "0" or "11".
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC data does not appear during the DTC CONFIRMATION PROCEDURE.
VI	The TROUBLE DIAGNOSIS for PXXXX does not indicate the problem area.

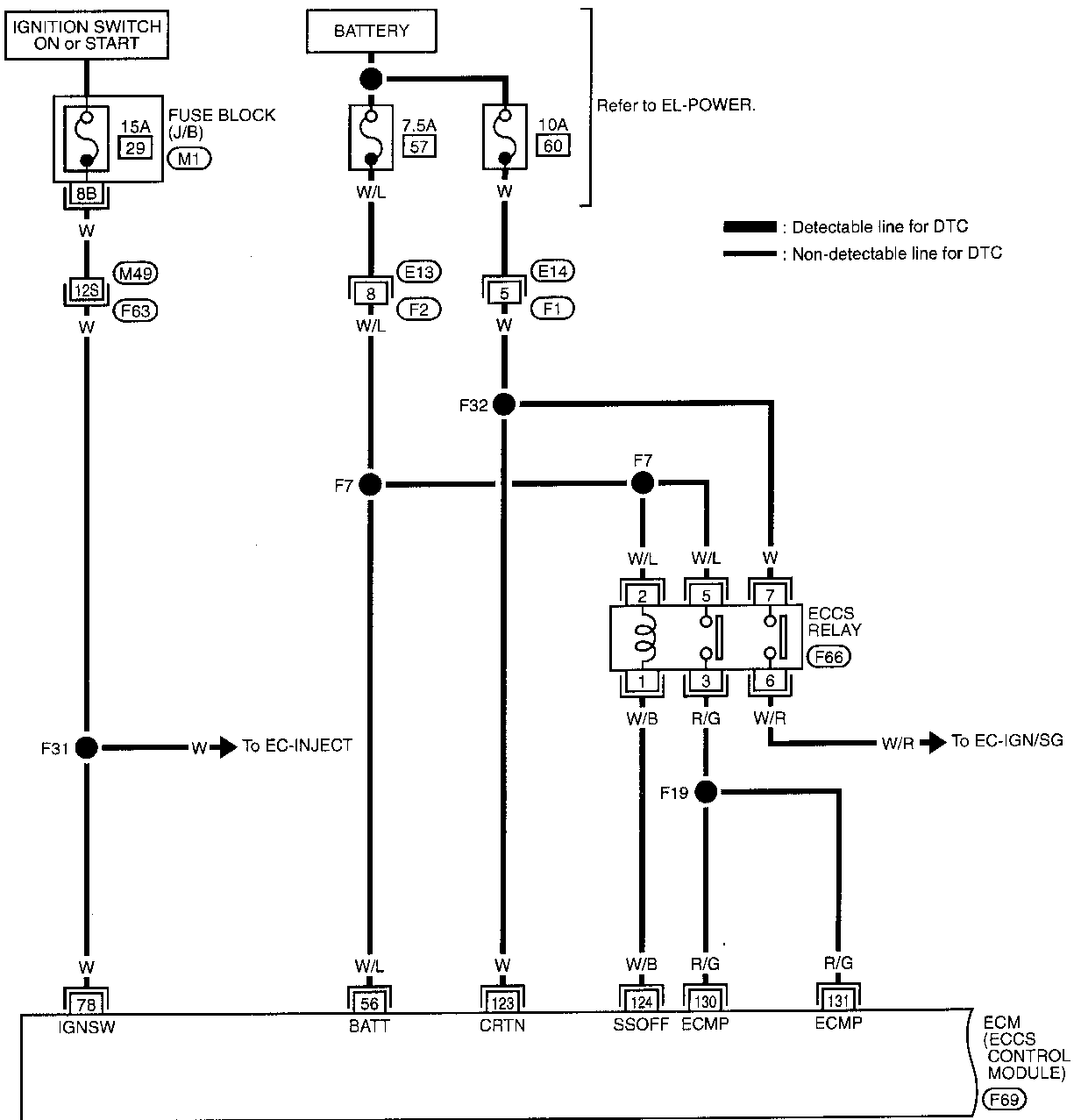
Diagnostic Procedure



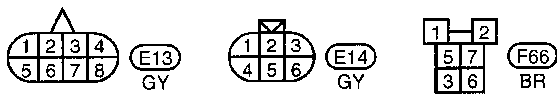
TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit

EC-MAIN-01

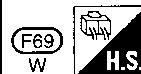
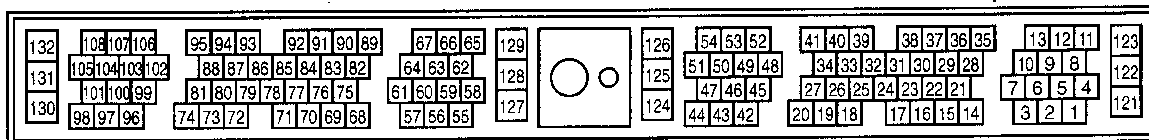


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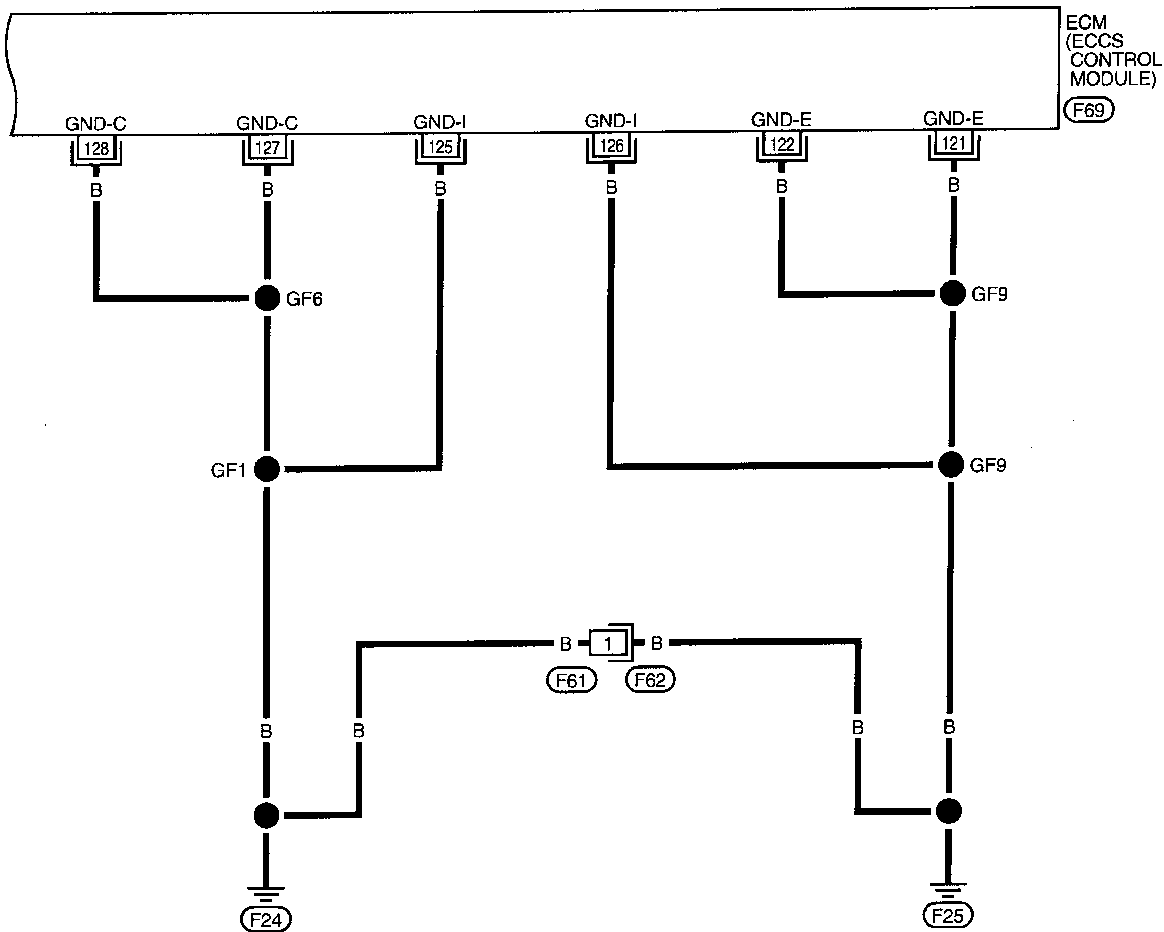


TROUBLE DIAGNOSIS FOR POWER SUPPLY

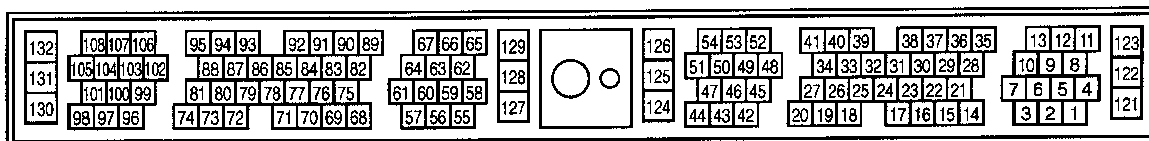
Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-02

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



1 F62
W



F69
W H.S.

TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
56	W/L	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
121	B	ECM ground	Engine is running. └ Idle speed	Engine ground
122	B	ECM ground	Engine is running. └ Idle speed	Engine ground
123	W	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
124	W/B	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
125	B	ECM ground	Engine is running. └ Idle speed	Engine ground
127	B	ECM ground	Engine is running. └ Idle speed	Engine ground
128	B	ECM ground	Engine is running. └ Idle speed	Engine ground
130 131	R/G	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

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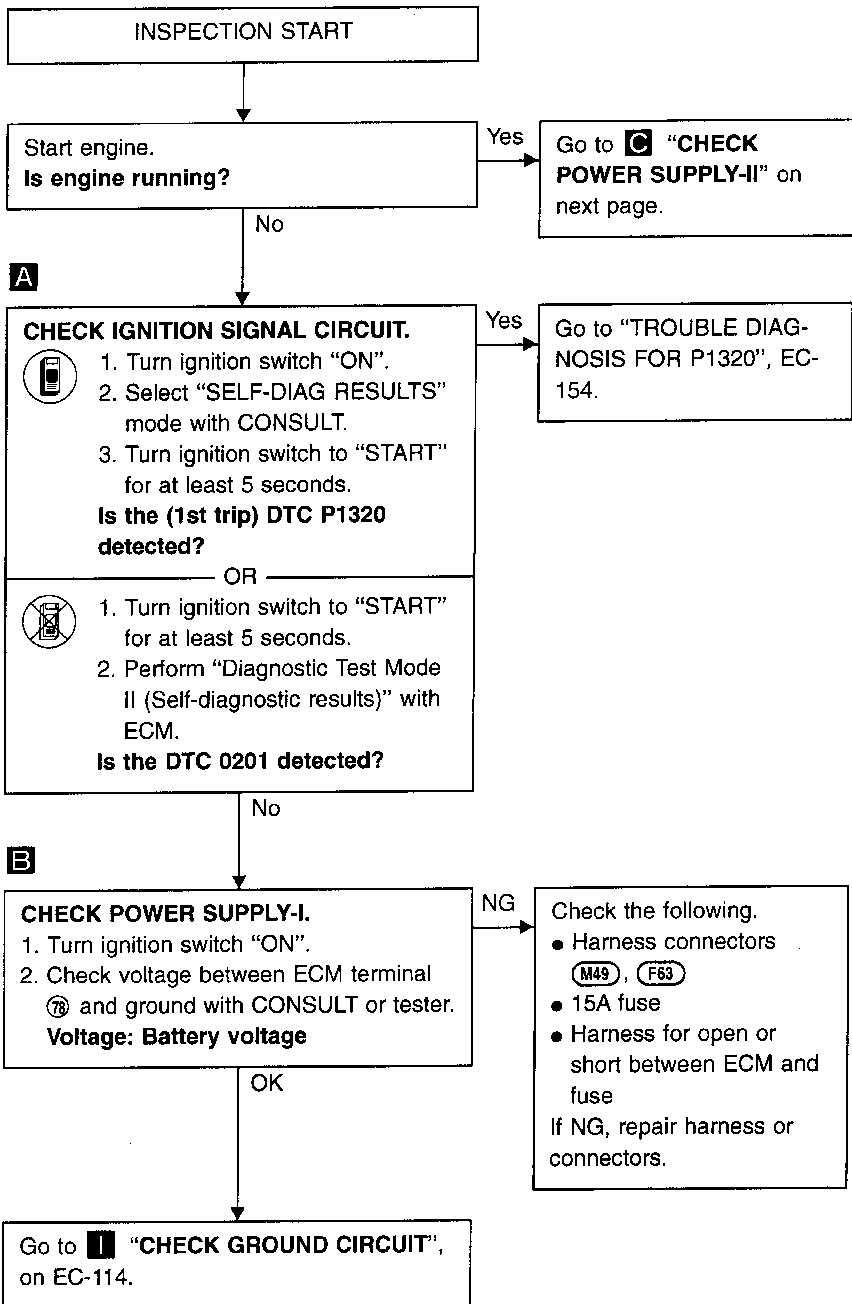
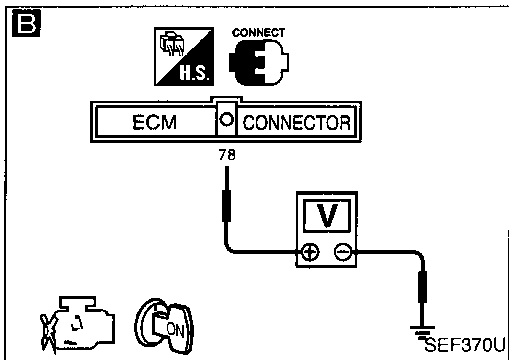
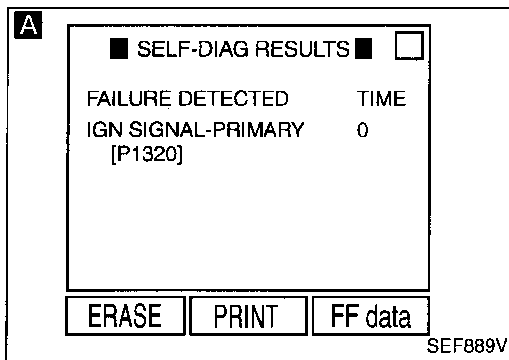
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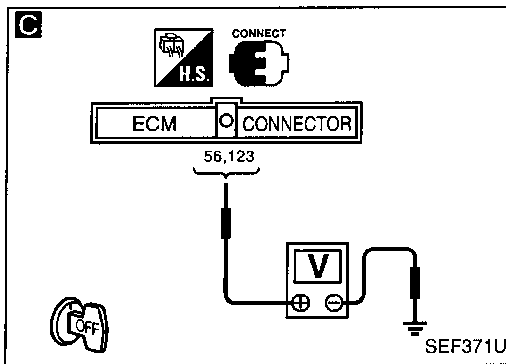
TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)



TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)



C

CHECK POWER SUPPLY-II.

1. Stop engine.
2. Check voltage between ECM terminals (56), (123) and ground with CONSULT or tester.

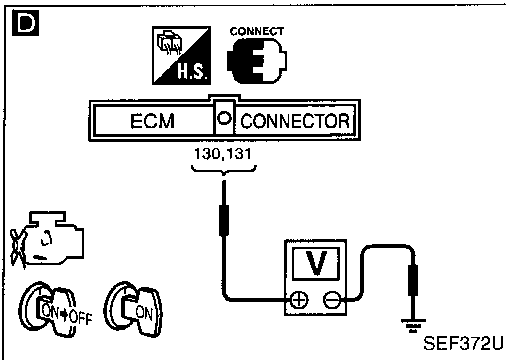
Voltage: Battery voltage

NG

Check the following.

- Harness connectors (F2), (E13)
- Harness connectors (F1), (E14)
- 7.5A fuse
- 10A fuse
- Harness for open or short between ECM and battery

If NG, repair harness or connectors.



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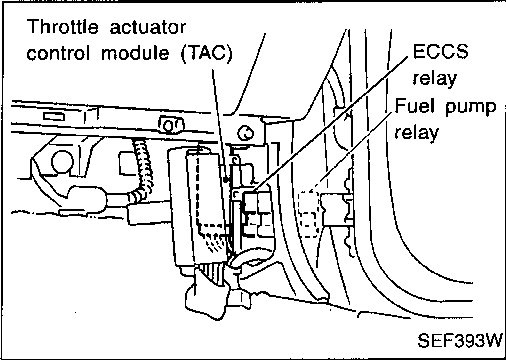
CHECK POWER SUPPLY-III.

1. Turn ignition switch "ON" and then turn "OFF".
2. Check voltage between ECM terminals (130), (131) 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 ECCS RELAY" on next page.



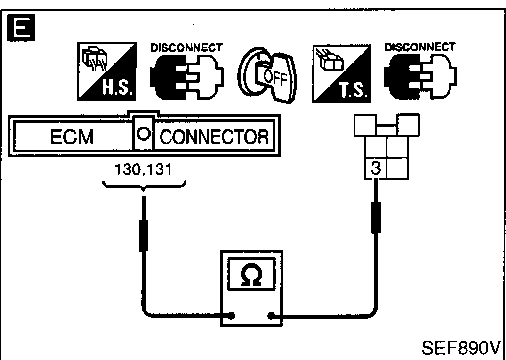
Case-1: Battery voltage does not exist.
Case-2: Battery voltage exists for more than a few seconds.

NG

Case-1

Case-2

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



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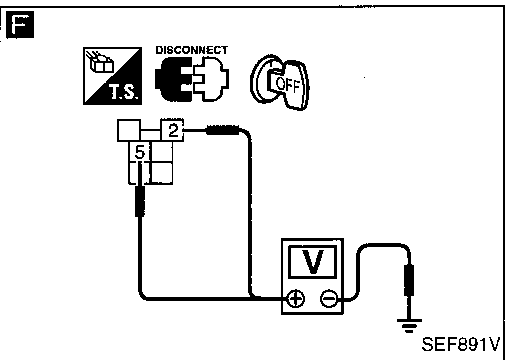
CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.

1. Disconnect ECM harness connector.
2. Disconnect ECCS relay.
3. Check harness continuity between ECM terminals (130), (131) and terminal (3).

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

NG

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



F

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.

1. Check voltage between terminals (2), (5) and ground with CONSULT or tester.

Voltage: Battery voltage

NG

Check the following.

- Harness for open or short between ECCS relay and harness connector (F2)

If NG, repair harness or connectors.

OK

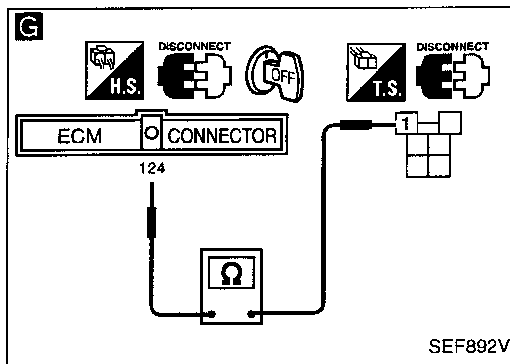
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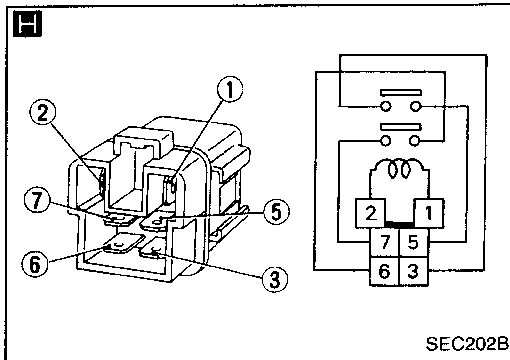
TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)



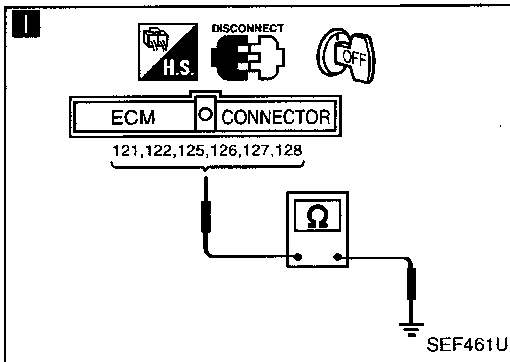
CHECK OUTPUT SIGNAL CIRCUIT.
 1. Check harness continuity between ECM terminal (124) and relay terminal (1).
Continuity should exist.
 If OK, check harness for short to ground and short to power.

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



CHECK ECCS RELAY.
 1. Apply 12V direct current between relay terminals (1) and (2).
 2. Check continuity between relay terminals (3) and (5), (6) and (7).
12V (1 - 2) applied:
Continuity exists.
No voltage applied:
No continuity

NG → Replace ECCS relay.



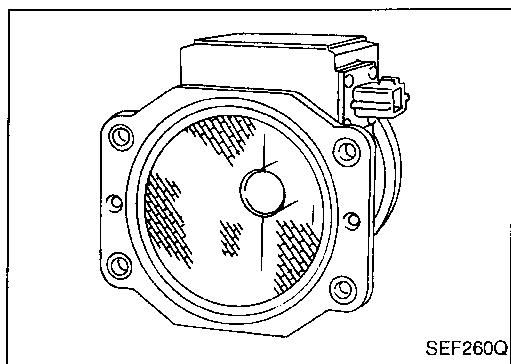
CHECK GROUND CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Loosen and retighten engine ground screws.
 3. Disconnect ECM harness connector.
 4. Check harness continuity between ECM terminals (121), (122), (125), (126), (127), (128) and engine ground.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

NG → Check the following.
 • Harness connectors (F61), (F62)
 • Harness for open or short between engine grounds (F24) and (F25)
 If NG, repair open circuit or short to ground or short to power in harness or connectors.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0100



Mass Air Flow Sensor (MAFS)

COMPONENT DESCRIPTION

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

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

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

ON BOARD DIAGNOSTIC LOGIC

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

*: When the malfunction is detected, the ECM enters fail-safe mode and the MIL lights up. (Refer to EC-89.)

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,400 rpm due to the fuel cut.
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TROUBLE DIAGNOSIS FOR DTC P0100

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first.

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

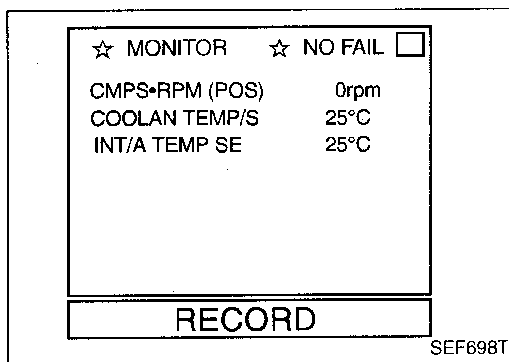
If there is problem in "Procedure for malfunction B", perform "Procedure for malfunction C". If there is no problem on "Procedure for malfunction C", perform "Procedure for malfunction D".

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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



Procedure for malfunction A

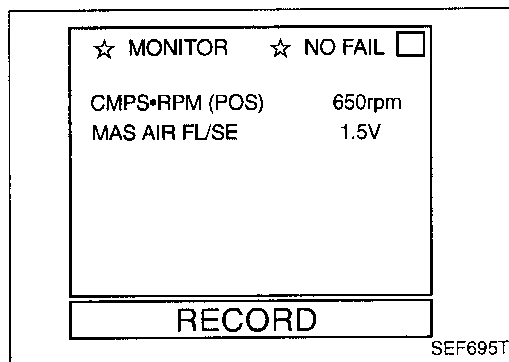
- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 6 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-120.

OR

- 1) Turn ignition switch "ON", and wait at least 6 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-120.

OR

- 1) Turn ignition switch "ON", and wait at least 6 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-120.



Procedure for malfunction B

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait 5 seconds at most.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-120.

OR

- 1) Turn ignition switch "ON".
- 2) Start engine and wait 5 seconds at most.
- 3) Select "MODE 7" with GST.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-120.

OR

- 1) Turn ignition switch "ON".
- 2) Start engine and wait 5 seconds at most.
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-120.

NOTE:

If 1st trip DTC is detected after more than 5 seconds, there may be a malfunction.

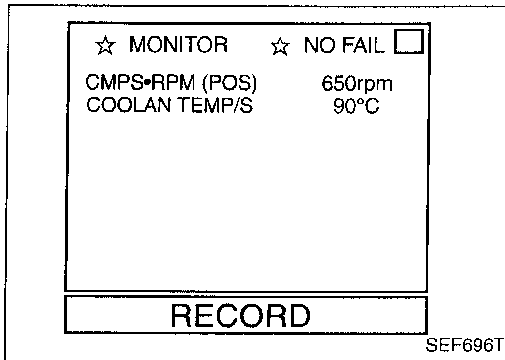
TROUBLE DIAGNOSIS FOR DTC P0100

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

Procedure for malfunction C

NOTE:

If the engine will not start or stop soon, wait at least 10 seconds with engine off (ignition switch "ON"), instead of running engine at idle speed.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and warm it up to normal operating temperature.
- 4) Wait at least 10 seconds at idle speed.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-121.

GI

MA

EM

OR



- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Wait at least 10 seconds at idle speed.
- 4) Select "MODE 7" with GST.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-121.

LC

EC

FE

OR



- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Wait at least 10 seconds at idle speed.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-121.

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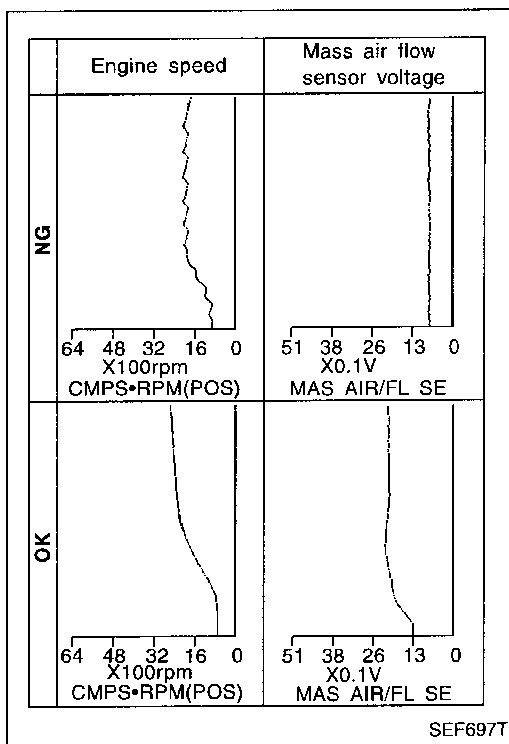
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TROUBLE DIAGNOSIS FOR DTC P0100

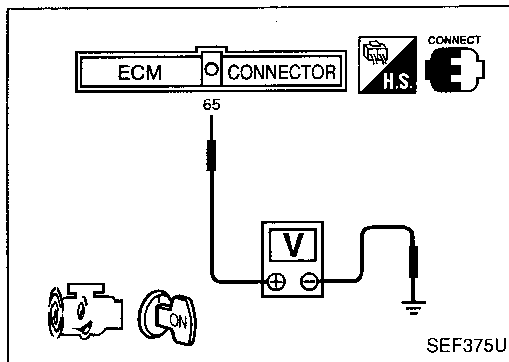
Mass Air Flow Sensor (MAFS) (Cont'd)

Procedure for malfunction D



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

SEF534P



- 1) Turn ignition switch "ON".
- 2) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
If engine cannot be started, go to "DIAGNOSTIC PROCEDURE, EC-120."
- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Check the voltage of MAS AIR/FL SE with "DATA MONITOR".
- 5) Increases engine speed to about 4,000 rpm.
- 6) Monitor the linear voltage rise in response to engine speed increases.
If NG, go to "DIAGNOSTIC PROCEDURE", EC-120.
If OK, go to following step.
- 7) Maintain the following conditions for at least 10 consecutive seconds.
CMPS•RPM (POS): More than 2,000 rpm
THRTL POS SEN: More than 3V
Selector lever: Suitable position
Driving location: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.
- 8) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-121.

OR

OVERALL FUNCTION CHECK

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

Procedure for malfunction D



- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Select "MODE 1" with GST.
- 4) Check the mass air flow with "MODE 1".
- 5) Check for linear mass air flow rise in response to increases to about 4,000 rpm in engine speed.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-121.

OR

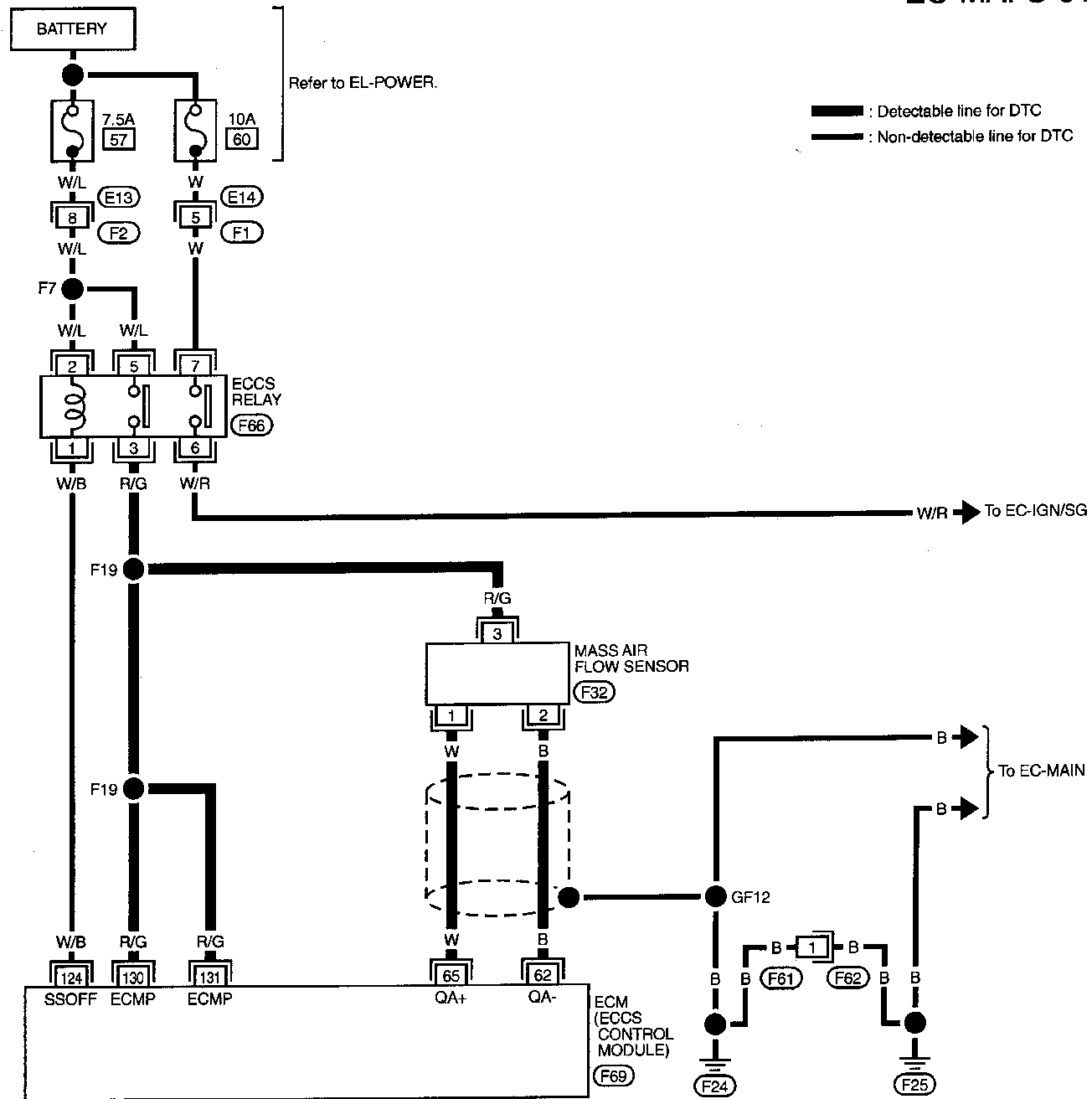


- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Check the voltage between ECM terminal 65 and ground.
- 4) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.
- 5) If NG, go to "DIAGNOSTIC PROCEDURE", EC-121.

TROUBLE DIAGNOSIS FOR DTC P0100

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

EC-MAFS-01



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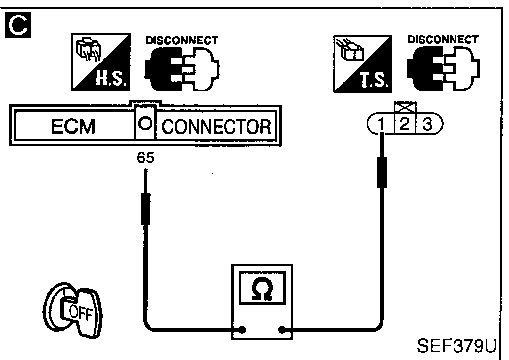
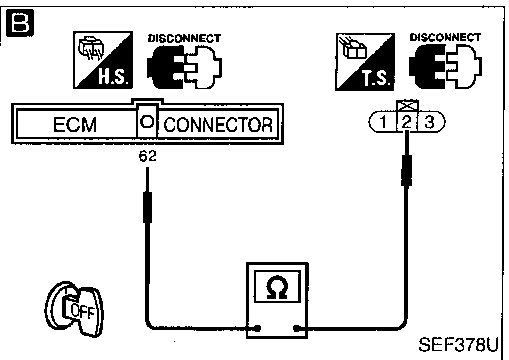
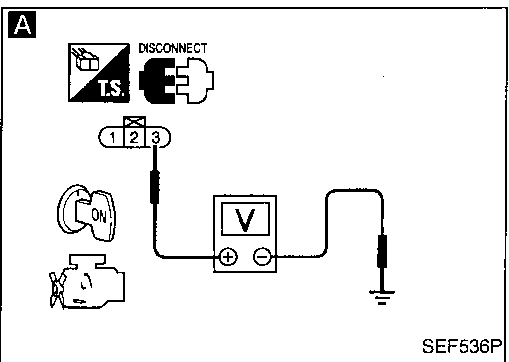
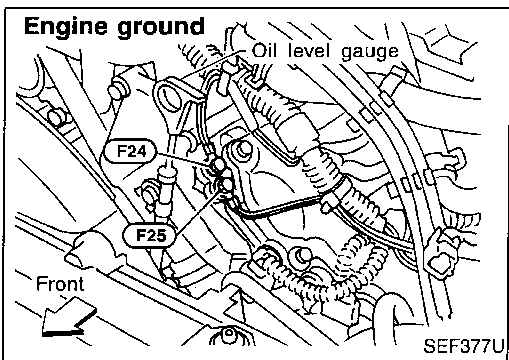
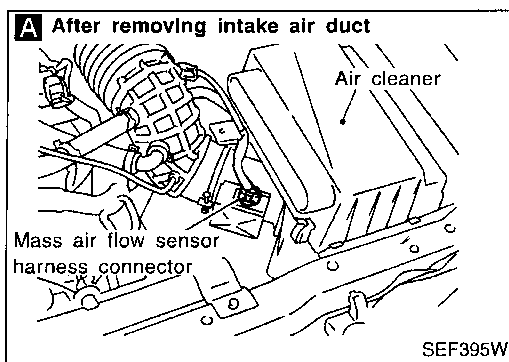
TROUBLE DIAGNOSIS FOR DTC P0100

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

DIAGNOSTIC PROCEDURE

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

Procedure A



INSPECTION START

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

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

NG → Check the following.
 • Harness for open or short between mass air flow sensor and ECM
 • Harness for open or short between mass air flow sensor and ECCS relay
 If NG, repair harness or connector.

OK ↓
B
CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ② and ECM terminal ⑥.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair harness or connectors.

OK ↓
C
CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between terminal ① and ECM terminal ⑤.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair harness or connectors.

OK ↓
CHECK COMPONENT
(Mass air flow sensor).
Refer to "COMPONENT INSPECTION", EC-122.

NG → Replace mass air flow sensor.

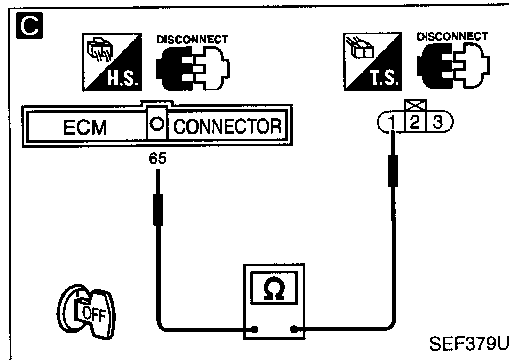
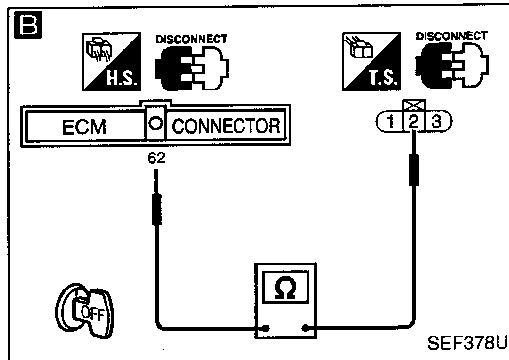
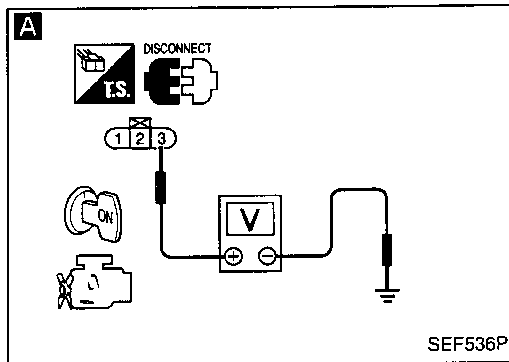
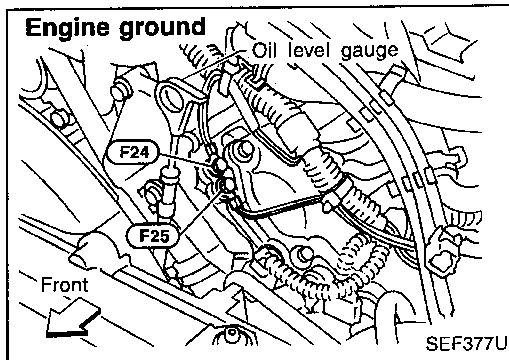
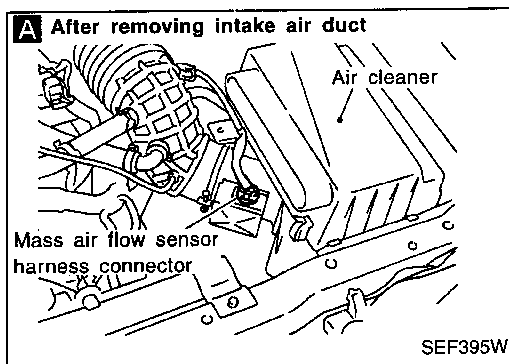
OK ↓
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0100

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

Procedure B



INSPECTION START

CHECK INTAKE SYSTEM
Check the followings for connection.

- Air duct
- Vacuum hoses
- Intake air passage between intake air duct to collector

If disconnected, reconnect the parts or repair.

NG → Reconnect or repair.

OK

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

A

CHECK POWER SUPPLY.

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

Voltage: Battery positive voltage

NG → Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECCS relay

If NG, repair harness or connector.

OK

B

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ② and ECM terminal ⑥.

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

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between terminal ① and ECM terminal ⑥.
Continuity should exist.
If OK, check harness for short to ground and short to power.

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

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

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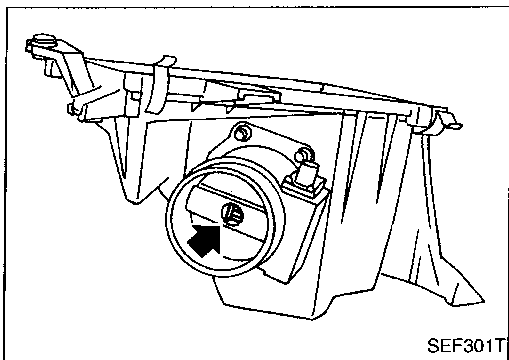
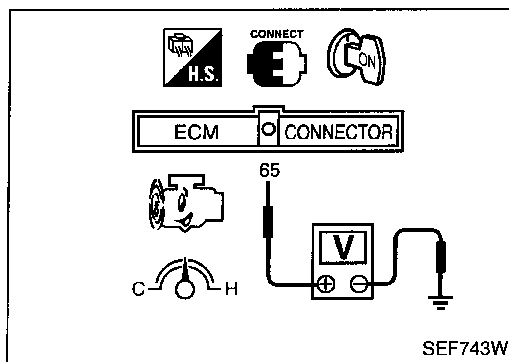
TROUBLE DIAGNOSIS FOR DTC P0100

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

COMPONENT INSPECTION

Mass air flow sensor

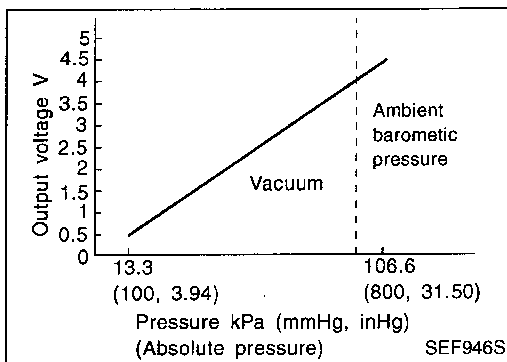
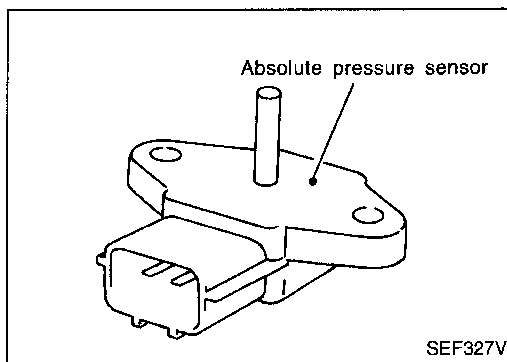
1. Turn ignition switch "ON".
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 65 and ground.



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

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

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



Absolute Pressure Sensor

COMPONENT DESCRIPTION

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

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ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0105 0803	A) An excessively low or high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> ● Harness or connectors (Absolute pressure sensor circuit is open or shorted.) ● Absolute pressure sensor
	B) A high voltage from the sensor is sent to ECM under light load driving conditions.	<ul style="list-style-type: none"> ● Hoses (Hoses between the intake manifold and absolute pressure sensor are disconnected or clogged.) ● Intake air leaks ● MAP/BARO switch solenoid valve ● Absolute pressure sensor
	C) A low voltage from the sensor is sent to ECM under heavy load driving conditions.	<ul style="list-style-type: none"> ● Absolute pressure sensor

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DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

HA

EL

NOTE:

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

IDX

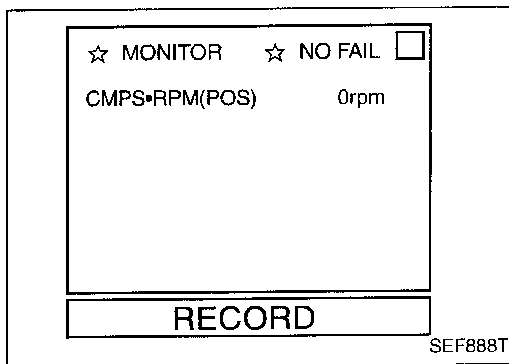
CAUTION:

Always drive vehicle at a safe speed.

TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

Procedure for malfunction A



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 6 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-127.

OR

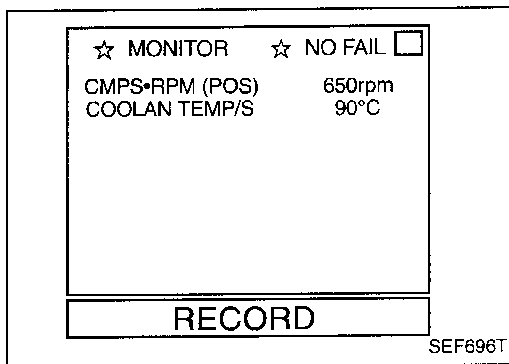


- 1) Turn ignition switch "ON" and wait at least 6 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-127.

OR



- 1) Turn ignition switch "ON" and wait at least 6 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-127.



Procedure for malfunction B



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Start engine and let it idle.
- 5) Wait at least 15 seconds.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-129.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine.
- 4) Let engine idle and wait at least 15 seconds.
- 5) Select "MODE 7" with GST.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-129.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine.
- 4) Let engine idle and 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.
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-129.

TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

Procedure for malfunction C

CAUTION:

Always drive vehicle at a safe speed.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT. The voltage of "ABSOL PRES/SE" should be more than 1.74 [V].

If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-127. If the check result is OK, go to following step.

- 3) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Start engine and let it idle for at least 13 seconds.
- 6) Select "DATA MONITOR" mode with CONSULT.
- 7) Drive the vehicle at least 3 consecutive seconds under the following conditions,

B/FUEL SCHDL: More than 5.6 ms

CMPS-RPM (POS): 3,000 - 4,800 rpm

Selector lever: Suitable position

Driving location: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

- 8) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-129.

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM(POS)	3000rpm	
VHCL SPEED SE	75km/h	
B/FUEL SCHDL	6ms	
ABSOL PRES/SE	4.4V	
RECORD		

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

SEF518R

OR

OVERALL FUNCTION CHECK

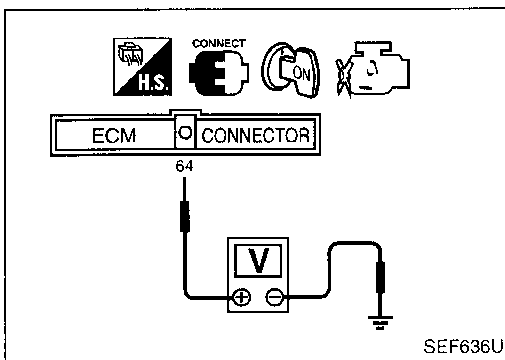
Use this procedure to check the overall function of the absolute pressure sensor circuit. During this check, a 1st trip DTC might not be confirmed.



- 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/cm², 6.7 psi).
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-129.



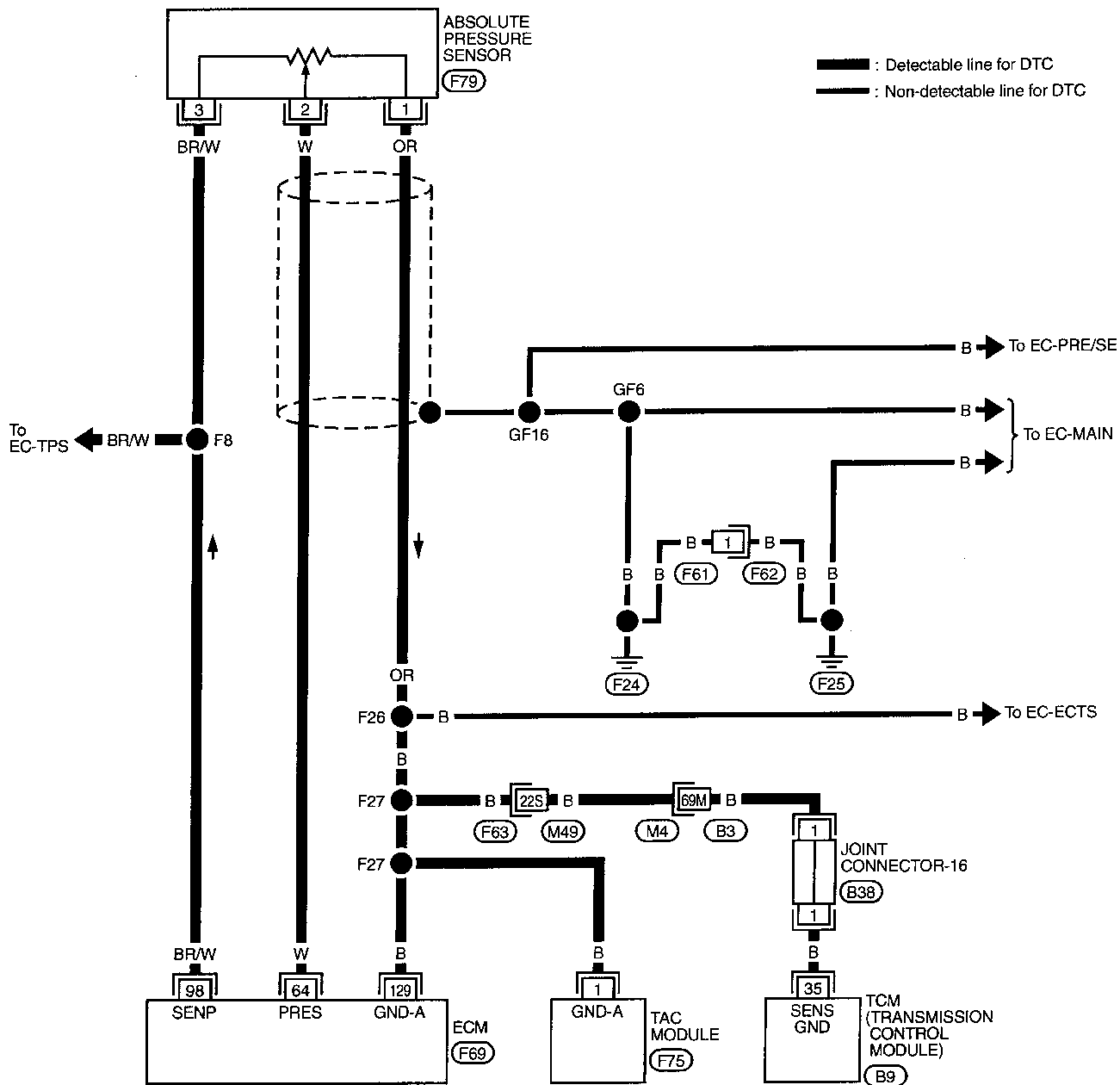
- 1) Turn ignition switch "ON".
- 2) Make sure that the voltage between ECM terminal 64 and engine ground is more than 1.74 [V].
- 3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-129.



TROUBLE DIAGNOSIS FOR DTC P0105

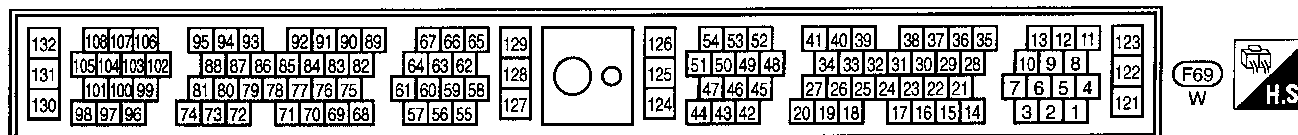
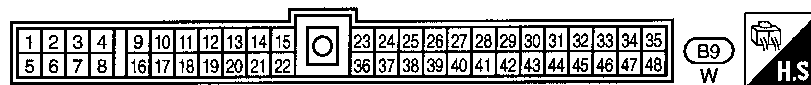
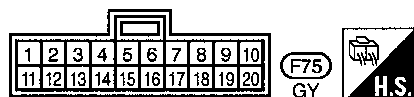
Absolute Pressure Sensor (Cont'd)

EC-AP/SEN-01



Refer to last page (Foldout page).

M4, B3
M49, F63



TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

DIAGNOSTIC PROCEDURE

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

Procedure A

INSPECTION START

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

A

CHECK POWER SUPPLY.

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

NG

Check the following.

- Harness for open or short between ECM and absolute pressure sensor

If NG, repair or replace harness or connectors.

OK

B

CHECK GROUND CIRCUIT.

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

NG

Check the following.

- Harness connectors (F63, M49)
- Harness connectors (M4, B3)
- Joint connector-16
- Harness for open or short between ECM and absolute pressure sensor
- Harness for open or short between TCM (Transmission control module) and absolute pressure sensor
- Harness for open or short between absolute pressure sensor and TAC module

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

OK

C

CHECK INPUT SIGNAL CIRCUIT.

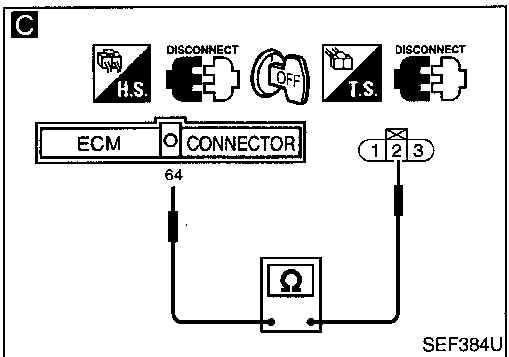
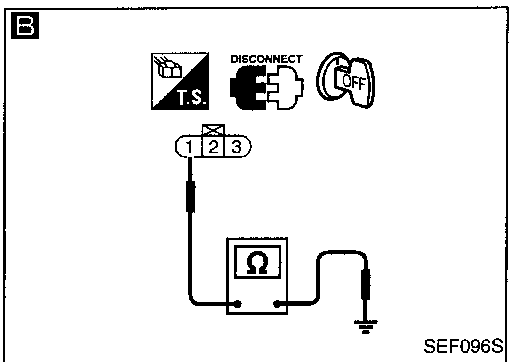
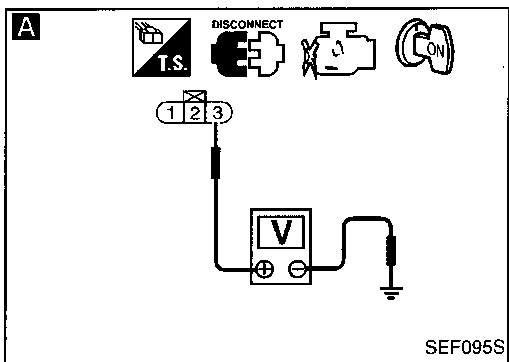
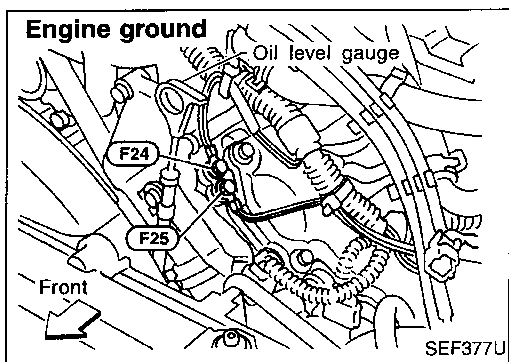
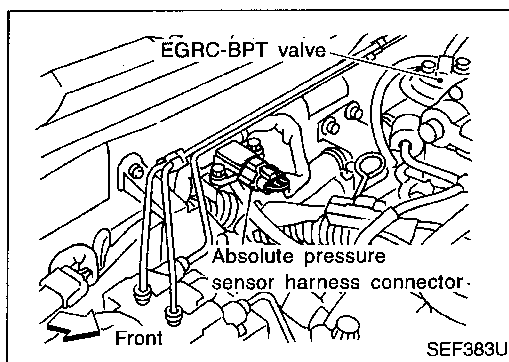
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ④ and terminal ②. **Continuity should exist.** If OK, check harness for short to ground and short to power.

NG

Repair harness or connectors.

OK

(Go to next page.)



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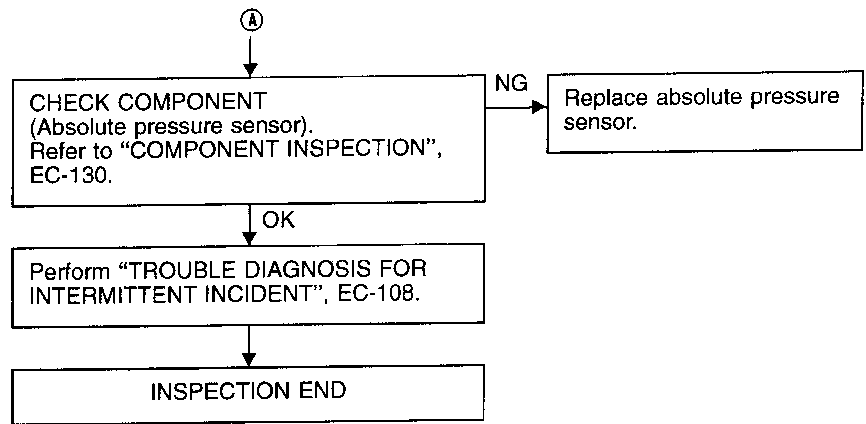
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TROUBLE DIAGNOSIS FOR DTC P0105

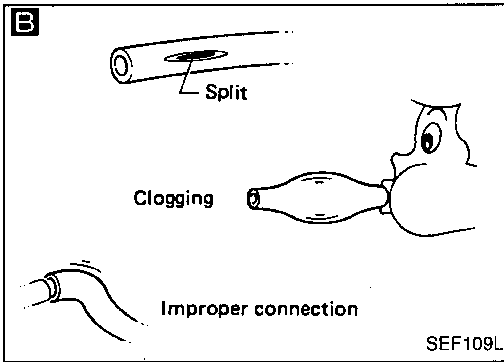
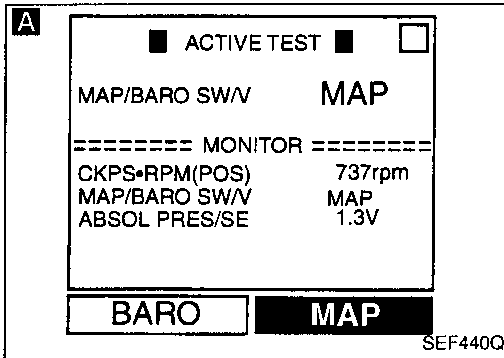
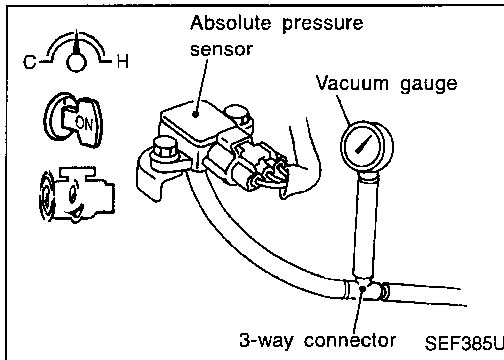
Absolute Pressure Sensor (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

Procedure B



INSPECTION START

A

CHECK VACUUM SOURCE TO ABSOLUTE PRESSURE SENSOR.

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

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

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

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

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

OK → CHECK COMPONENT (MAP/BARO switch solenoid valve). Refer to "COMPONENT INSPECTION" of "TROUBLE DIAGNOSIS FOR DTC P1105", EC-339.

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

NG → Replace MAP/BARO switch solenoid valve.

B

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

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

NG → Repair or reconnect hose.

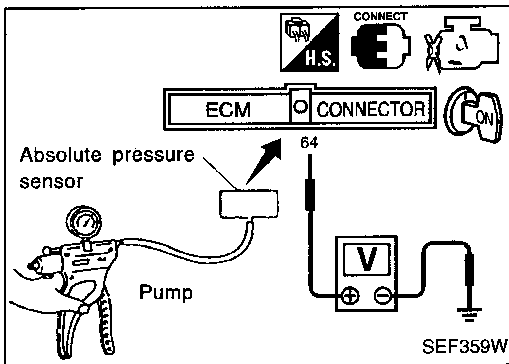
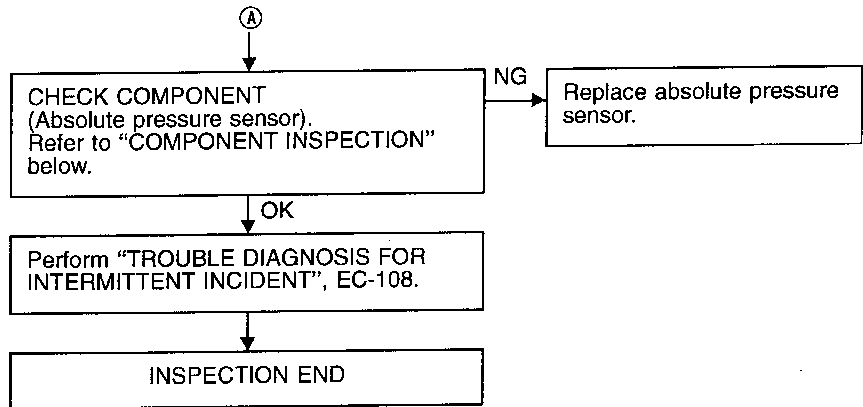
OK →

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TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)



COMPONENT INSPECTION

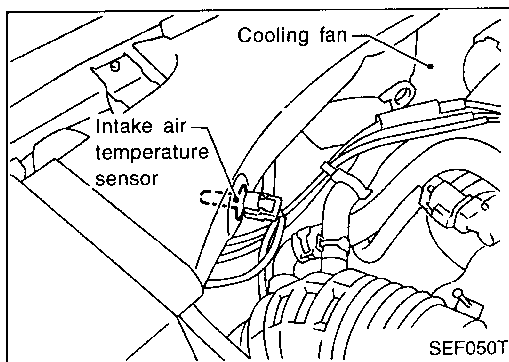
Absolute pressure sensor

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 64 and engine ground.
The voltage should be 3.2 to 4.8V.
4. Use pump to apply vacuum of -26.7 kPa (-200 mmHg, -7.87 inHg) to absolute pressure sensor as shown in figure and check the output voltage.
The voltage should be 1.0 to 1.4V lower than the value measured in step 3.

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.
5. If NG, replace absolute pressure sensor.

TROUBLE DIAGNOSIS FOR DTC P0110

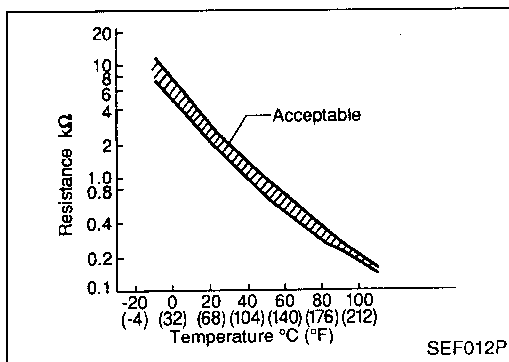


Intake Air Temperature Sensor

COMPONENT DESCRIPTION

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

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



<Reference data>

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

* These data are reference values and are measured between ECM terminal ⑥ (Intake air temperature sensor) and ECM terminal ⑫ (ECM ground).

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0110 0401	A) An excessively low or high voltage from the sensor is sent to ECM. B) Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	<ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor

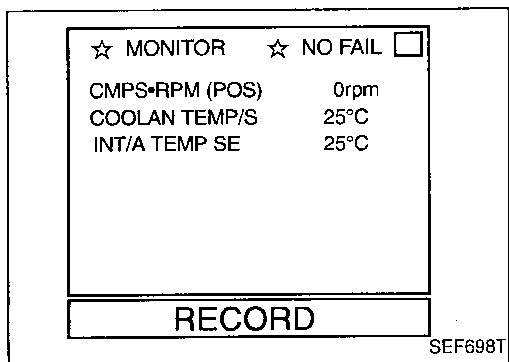
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first.

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

NOTE:

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



Procedure for malfunction A

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-135.

OR

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select MODE 7 with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-135.

TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

OR



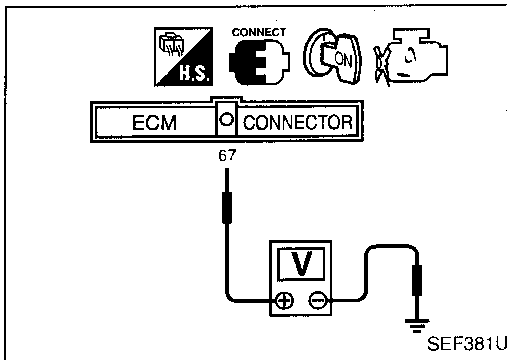
- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform diagnostic test mode II (Self-diagnostic results) with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-135.

☆ MONITOR	☆ NO FAIL
COOLANT TEMP/S	30°C
VHCL SPEED SE	75km/h
RECORD	

SEF629U

FUEL SYS #1	OPEN
FUEL SYS #2	OPEN
CALC LOAD	0%
COOLANT TEMP	31°C
SHORT FT #1	0%
LONG FT #1	0%
SHORT FT #2	0%
LONG FT #2	0%
ENGINE SPD	0RPM
VEHICLE SPD	0MPH
IGN ADVANCE	1.0°
INTAKE AIR	25°C

SEF549P



Procedure for malfunction B

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

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



- 1) Wait until engine coolant temperature is less than 90°C (194°F).
 - (a) Turn ignition switch "ON".
 - (b) Select "DATA MONITOR" mode with CONSULT.
 - (c) Check the engine coolant temperature.
 - (d) If the engine coolant temperature is 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).
- 2) Turn ignition switch "ON".
- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Start engine and turn TCS switch "OFF".
- 5) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-135.

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.
- Perform the following steps before engine coolant temperature is above 90°C (194°F).
- 2) Start engine and turn TCS switch "OFF".
- 3) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
- 4) Select MODE 7 with GST.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-135.

OR



- 1) Wait until engine coolant temperature is less than 90°C (194°F).
 - (a) Turn ignition switch "ON".
 - (b) Check voltage between ECM terminal 67 and ground.

TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

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.
 - 2) Start engine and turn TCS switch "OFF".
 - 3) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
 - 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
 - 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
 - 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-135.

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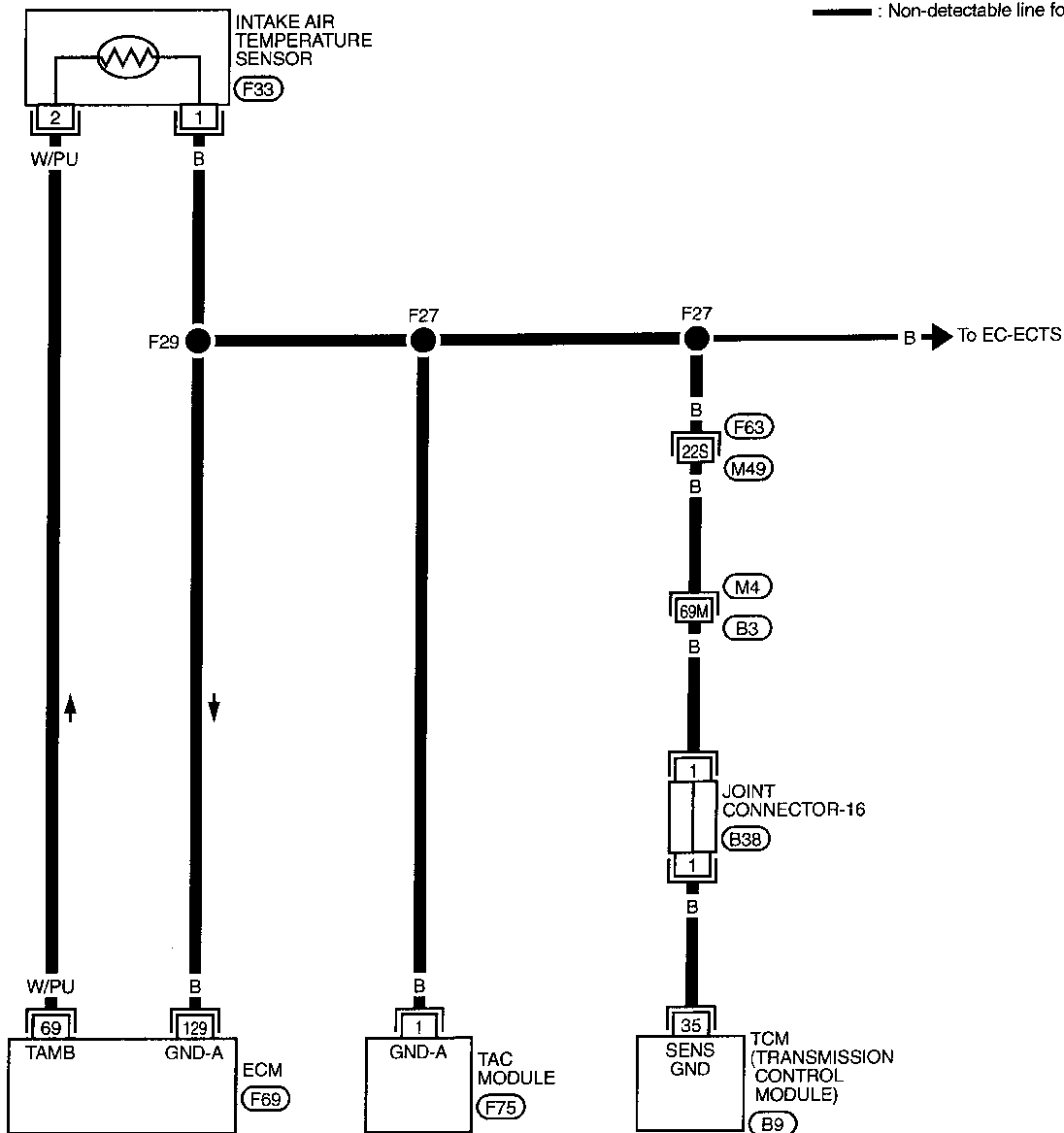
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TROUBLE DIAGNOSIS FOR DTC P0110

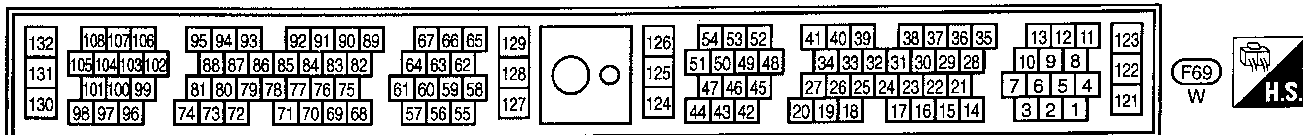
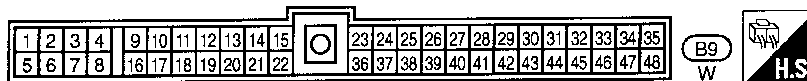
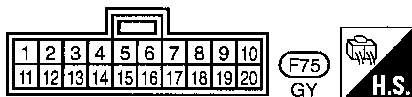
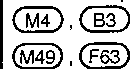
Intake Air Temperature Sensor (Cont'd)

EC-IATS-01

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



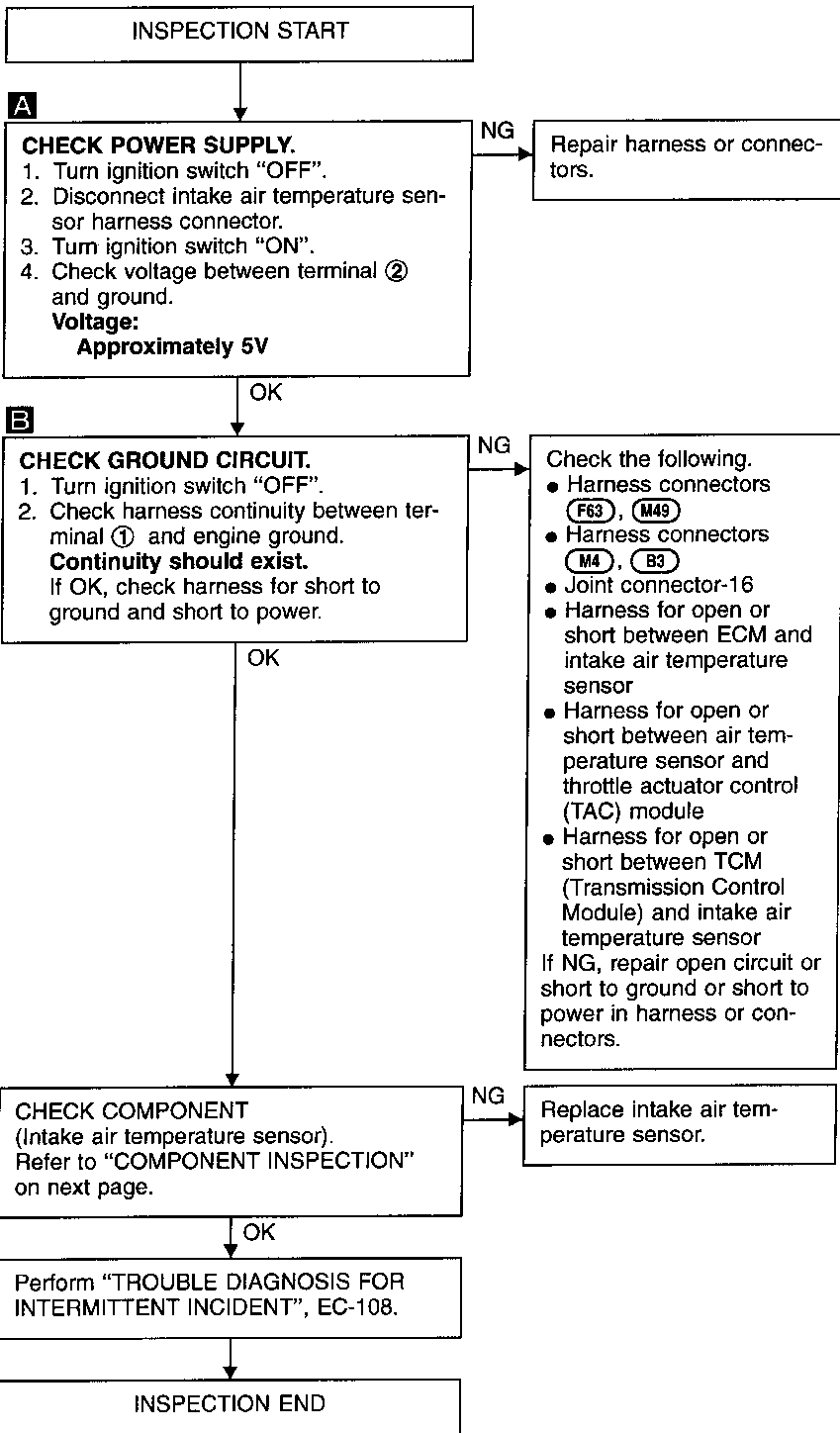
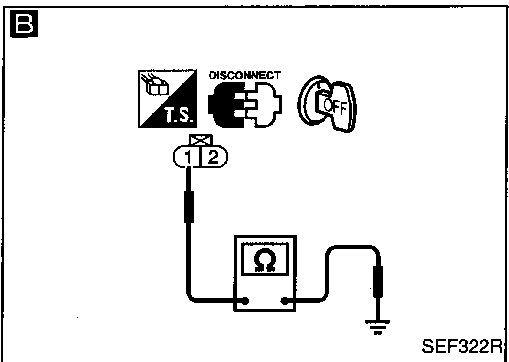
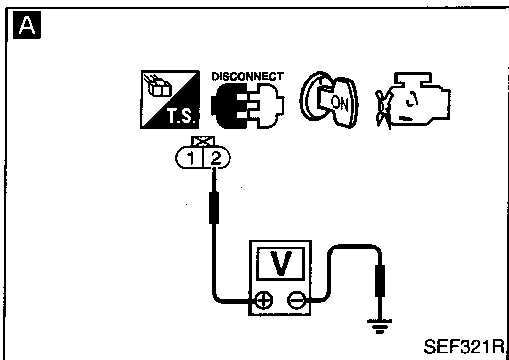
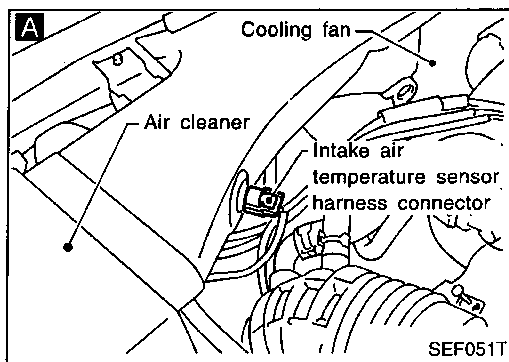
Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



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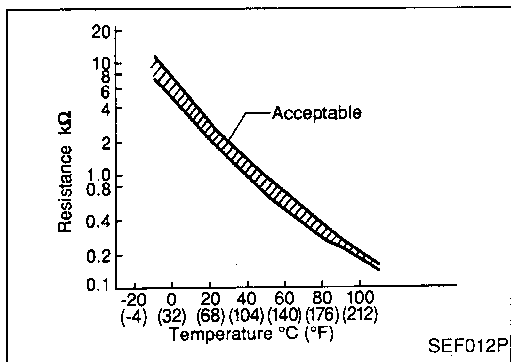
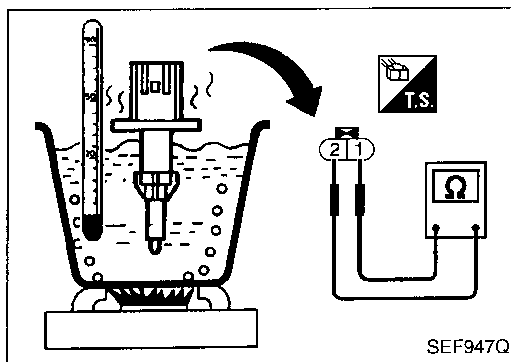
TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

COMPONENT INSPECTION

Intake air temperature sensor

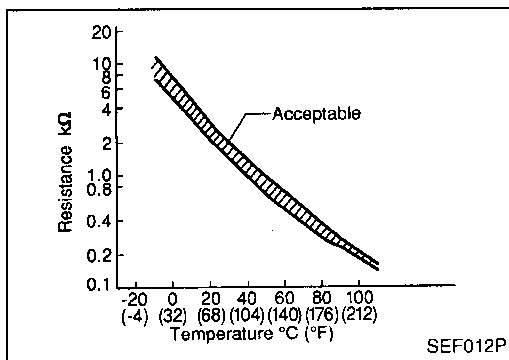
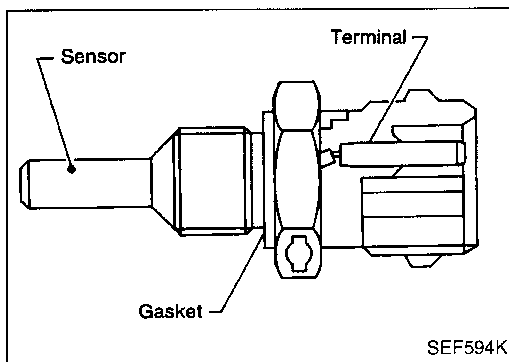
Check resistance as shown in the figure.



<Reference data>

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

If NG, replace intake air temperature sensor.



Engine Coolant Temperature Sensor (ECTS)

COMPONENT DESCRIPTION

The engine coolant temperature sensor is located near the No. 2 injector. The sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

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

*: These data are reference values and are measured between ECM terminal ⑥7 (Engine coolant temperature sensor) and ECM terminal ⑫8 (ECM ground).

ON BOARD DIAGNOSIS LOGIC

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

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

Engine operating condition in fail-safe mode	Condition	Engine coolant temperature decided (CONSULT DISPLAY)
Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START". CONSULT displays the engine coolant temperature decided by ECM.	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than 4 minutes after ignition Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)

TROUBLE DIAGNOSIS FOR DTC P0115

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS-RPM (POS)	0rpm	
COOLAN TEMP/S	25°C	
INT/A TEMP SE	25°C	
RECORD		

SEF698T



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-140.

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-140.

OR

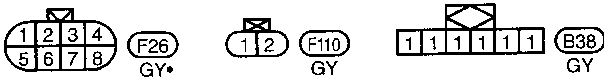
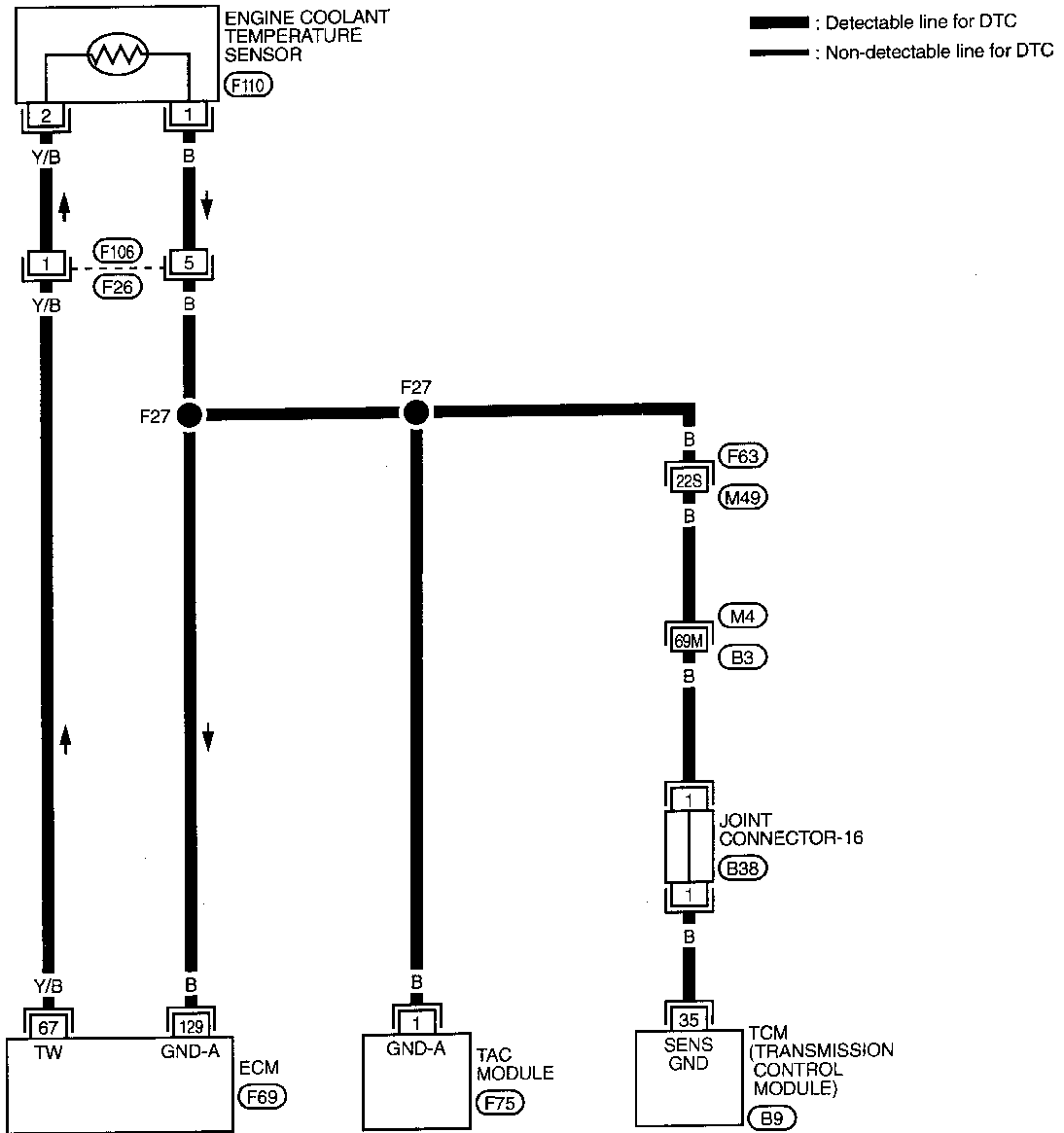


- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-140.

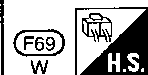
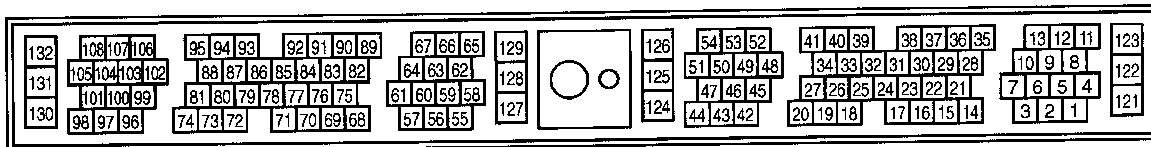
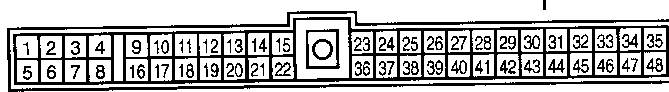
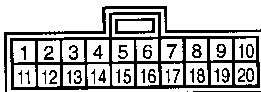
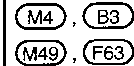
TROUBLE DIAGNOSIS FOR DTC P0115

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

EC-ECTS-01



Refer to last page (Foldout page).



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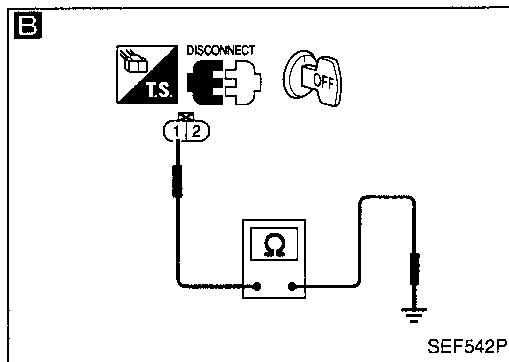
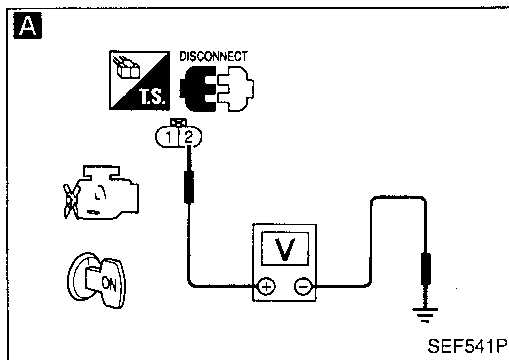
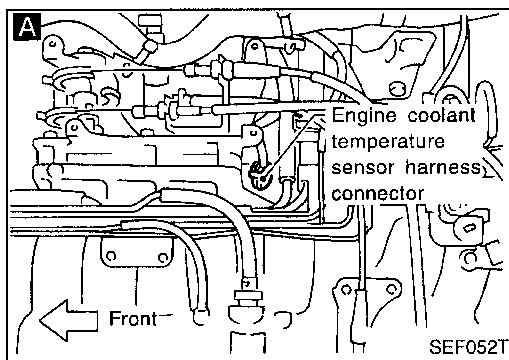
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TROUBLE DIAGNOSIS FOR DTC P0115

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

DIAGNOSTIC PROCEDURE



INSPECTION START

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

NG →
Check the following.
● Harness connectors
● F26, F106
● Harness for open or short between ECM and engine coolant temperature sensor
If NG, repair harness or connectors.

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

NG →
Check the following.
● Harness connectors
● F26, F106
● Harness connectors
● F63, M49
● Harness connectors
● M4, B3
● Joint connector-16
● Harness for open or short between ECM and engine coolant temperature sensor
● Harness for open or short between TCM (Transmission Control Module) and engine coolant temperature sensor
● Harness for open or short between engine coolant temperature sensor and throttle actuator control (TAC) module
If NG, repair open circuit or short to ground or short to power in harness or connectors.

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

NG →
Replace engine coolant temperature sensor.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

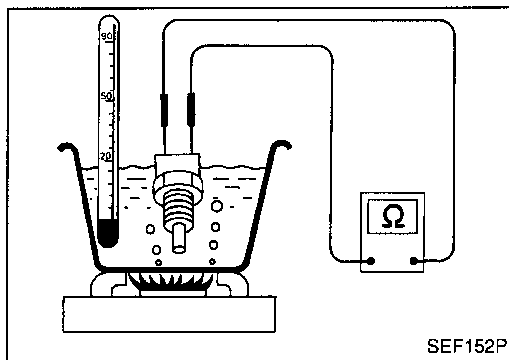
TROUBLE DIAGNOSIS FOR DTC P0115

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

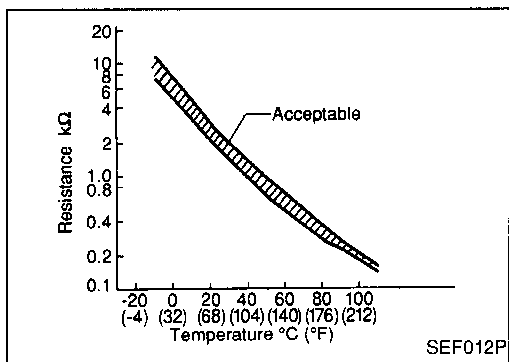
COMPONENT INSPECTION

Engine coolant temperature sensor

Check resistance as shown in the figure.



SEF152P



SEF012P

<Reference data>

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

If NG, replace engine coolant temperature sensor.

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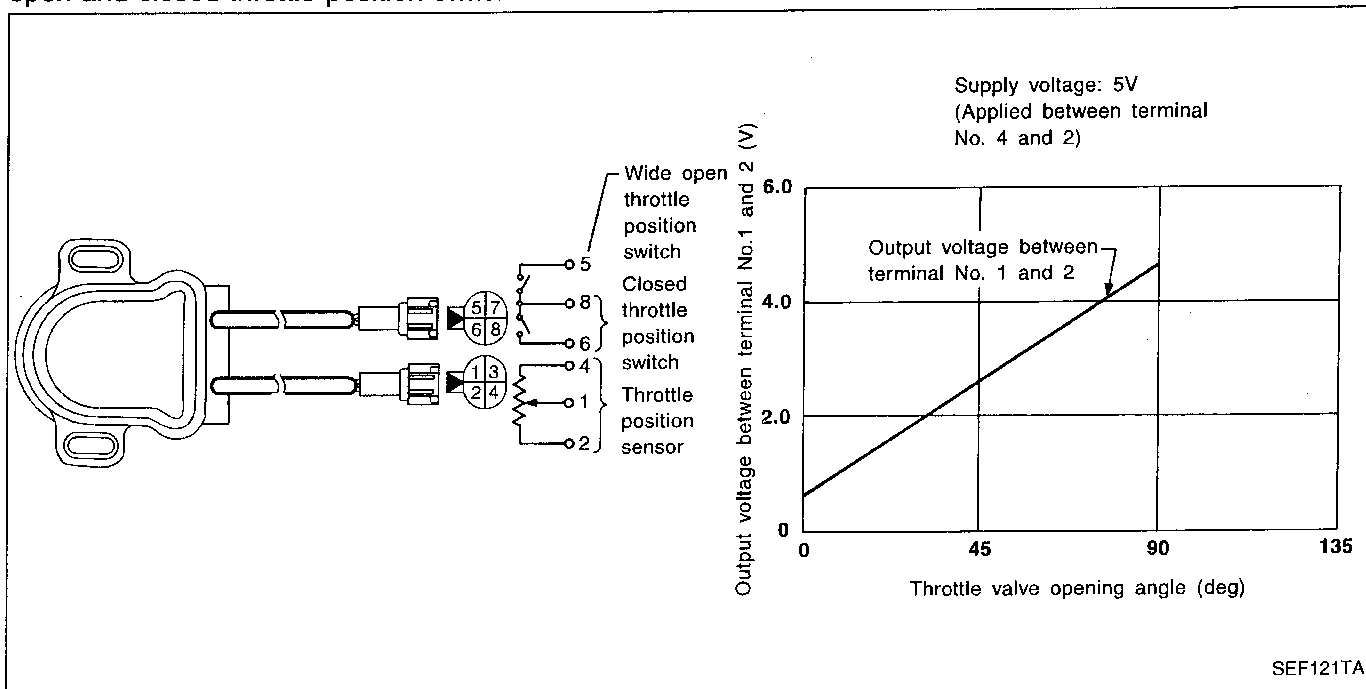
Throttle Position Sensor

NOTE: If DTC P0510 (0203) is displayed with DTC P0120, perform TROUBLE DIAGNOSIS FOR DTC P0510 first (See EC-327.).

COMPONENT DESCRIPTION

The throttle position sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.

Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This one controls engine operation such as fuel cut. The throttle position sensor unit has a built-in "Wide open and closed throttle position switch".



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL POS SEN	<ul style="list-style-type: none"> Engine: After warming up Ignition switch: ON (Engine stopped) More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump. Throttle valve: fully closed	0.35 - 0.65V
	Throttle valve: fully opened	Approx. 4.0V
ABSOL TH-P/S	<ul style="list-style-type: none"> Engine: After warming up Ignition switch: ON (Engine stopped) More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump. Throttle valve fully closed	0.0%
	Throttle valve fully opened	Approx. 88%

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

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

*: More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	A) An excessively low or high voltage from the sensor is sent to ECM.*	<ul style="list-style-type: none"> ● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Throttle position sensor
	B) A high voltage from the sensor is sent to ECM under light load driving condition.	<ul style="list-style-type: none"> ● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Throttle position sensor ● Fuel injector ● Camshaft position sensor ● Mass air flow sensor
	C) A low voltage from the sensor is sent to ECM under heavy load driving condition.	<ul style="list-style-type: none"> ● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Intake air leaks ● Throttle position sensor

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

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

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

Procedure for malfunction A

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 10V at idle.
- This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM(POS)	650rpm	
MAS AIR/FL SE	1.31V	
COOLAN TEMP/S	84°C	
VHCL SPEED SE	6km/h	
THRTL POS SEN	0.50V	
B/FUEL SCHDL	1.0msec	
RECORD		

SEF604U



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and maintain the following conditions for at least 5 consecutive seconds.
VHCL SPEED SE: More than 4 km/h (2 MPH)
Selector lever: Suitable position except "P" or "N" position
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-148.

OR



- 1) Start engine and maintain the following conditions for at least 5 consecutive seconds.
Vehicle speed: More than 4 km/h (2 MPH)
Selector lever: Suitable position except "P" or "N" position
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-148.

OR

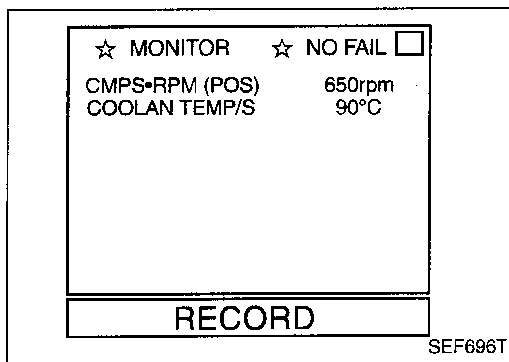


- 1) Start engine and maintain the following conditions for at least 5 consecutive seconds.
Vehicle speed: More than 4 km/h (2 MPH)
Selector lever: Suitable position except "P" or "N" position
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and perform "Diagnostic Test Mode (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-148.

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

Procedure for malfunction B



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and let it idle for at least 10 seconds. If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.

Selector lever: Suitable position except "P" or "N"

Brake pedal: depressed

Vehicle speed: 0 km/h (0 MPH)

- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-149.

OR



- 1) Start engine and let it idle for at least 10 seconds. If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.

Selector lever: Suitable position except "P" or "N"

Brake pedal: depressed

Vehicle speed: 0 km/h (0 MPH)

- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-149.

OR



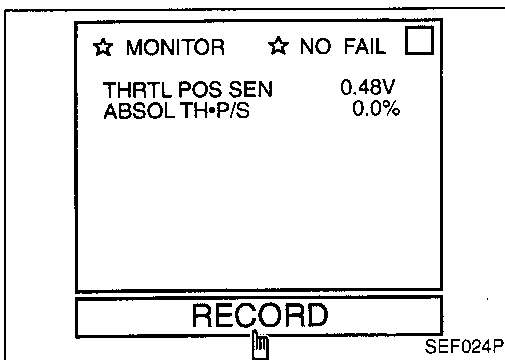
- 1) Start engine and let it idle for at least 10 seconds. If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.

Selector lever: Suitable position except "P" or "N"

Brake pedal: depressed

Vehicle speed: 0 km/h (0 MPH)

- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and perform "Diagnostic Test Mode (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-149.



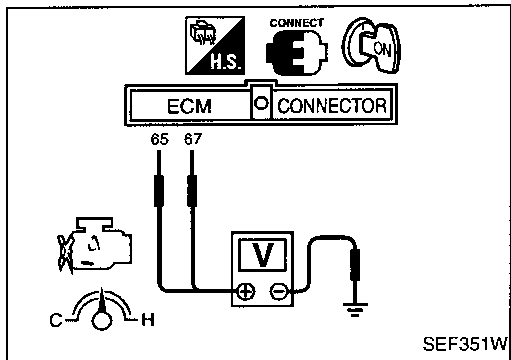
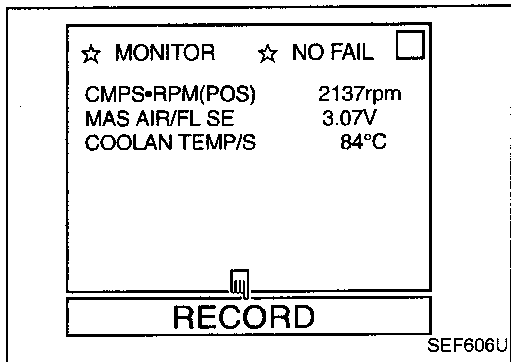
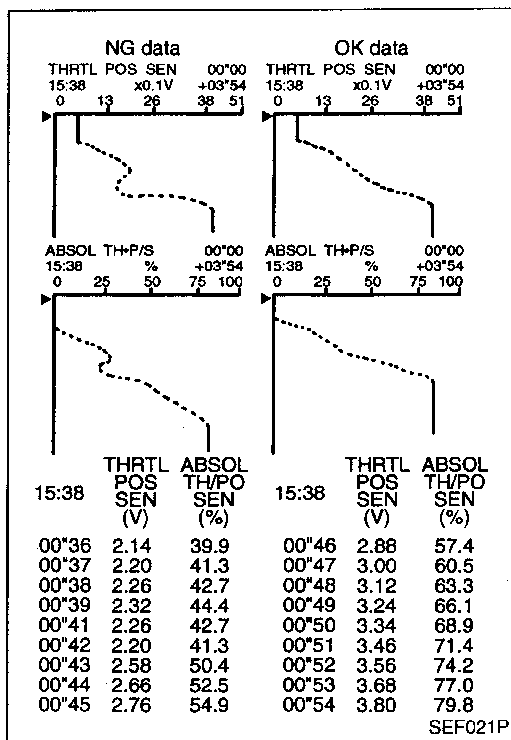
Procedure for malfunction C



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
- 5) Select "THRTL POS SEN" and "ABSOL TH-P/S" in "DATA MONITOR" mode with CONSULT.

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)



- 6) Press RECORD on CONSULT screen at the same time accelerator pedal is depressed.
- 7) Print out the recorded graph and check the following:
 - The voltage rise is linear in response to accelerator pedal depression.
 - The voltage when accelerator pedal is fully depressed is approximately 4V.
 If NG, go to "DIAGNOSTIC PROCEDURE", EC-148.
 If OK, go to following step.
- 8) Select "AUTO TRIG" in "DATA MONITOR" mode with CONSULT.
- 9) Maintain the following conditions for at least 10 consecutive seconds.
 - CMPS-RPM (POS): More than 2,000 rpm**
 - MAS AIR/FL SE: More than 3V**
 - COOLAN TEMP/S: More than 70°C (158°F)**
 - Selector lever: Suitable position**
 - Driving location: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.**
- 10) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-151.

OR



- 1) Maintain the following conditions for at least 10 consecutive seconds.
 - Gear position: Suitable position**
 - Engine speed: More than 2,000 rpm**
 - Voltage between ECM terminal 65 and 128 (ECM ground):**
 - More than 3V**
 - COOLAN TEMP/S: More than 70°C (158°F)**
- 2) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-151.

OR

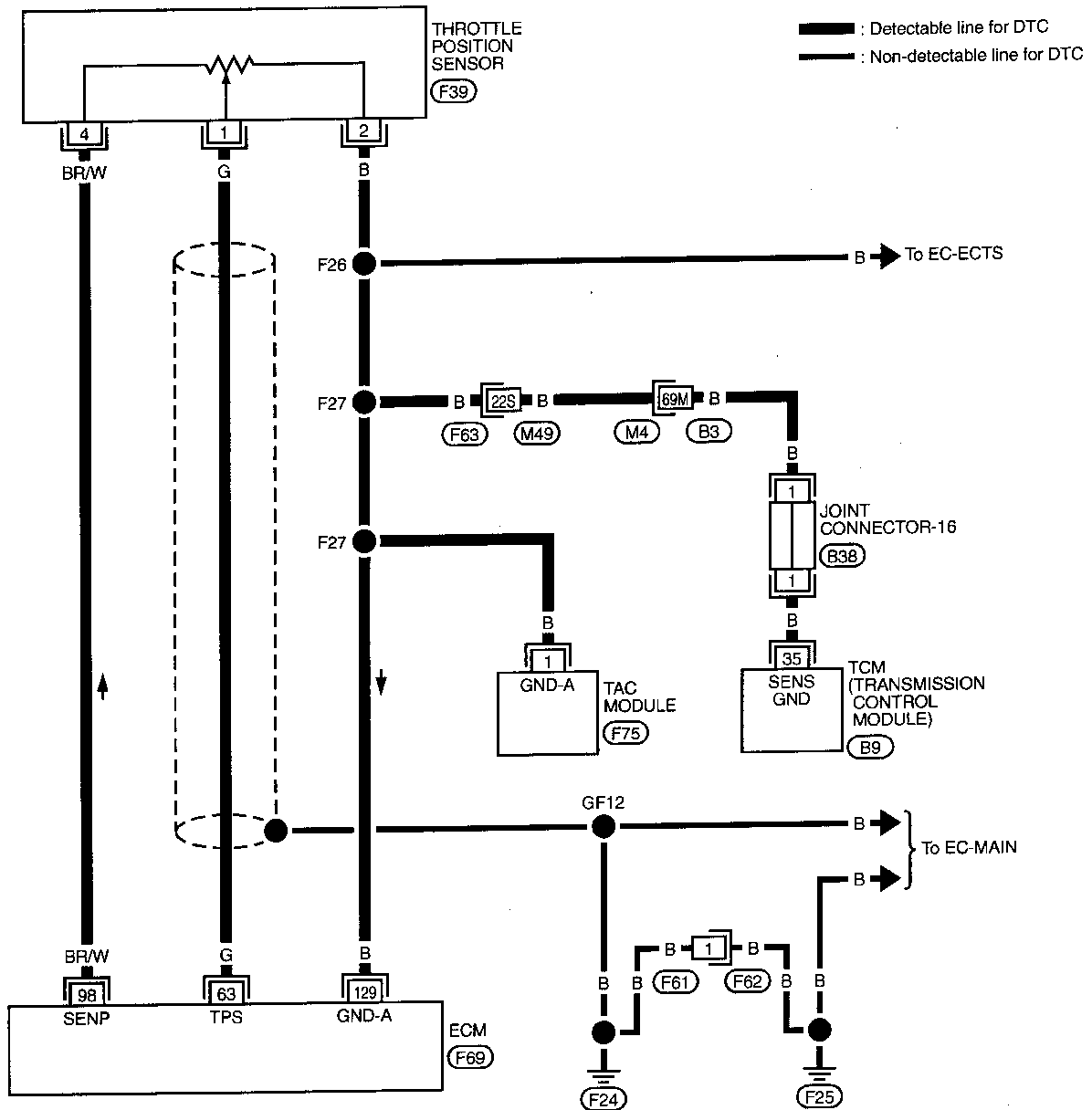


- 1) Maintain the following conditions for at least 10 consecutive seconds.
 - Gear position: Suitable position**
 - Engine speed: More than 2,000 rpm**
 - Voltage between ECM terminal 65 and 128 (ECM ground):**
 - More than 3V**
 - Voltage between ECM terminal 67 and 128 (ECM ground):**
 - Less than 1.5V**
- 2) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "DIAGNOSTIC TEST MODE (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-151.

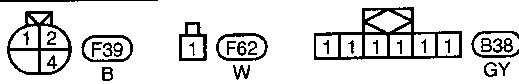
TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

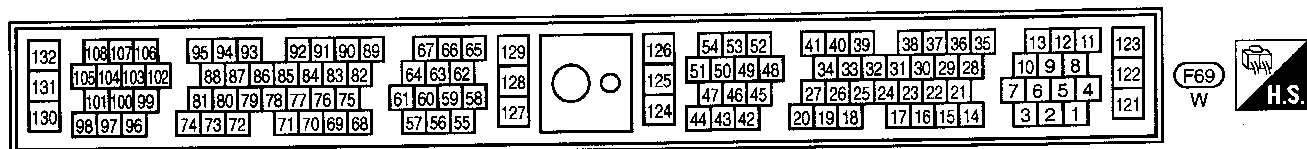
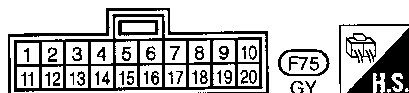
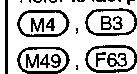
EC-TPS-01



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Refer to last page (Foldout page).



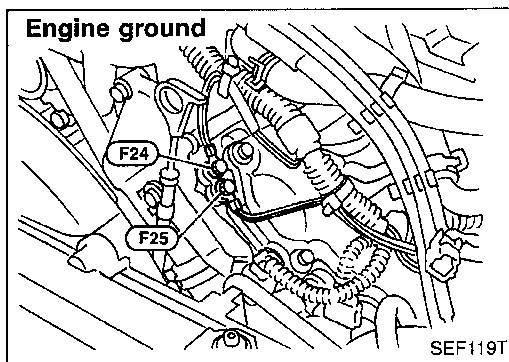
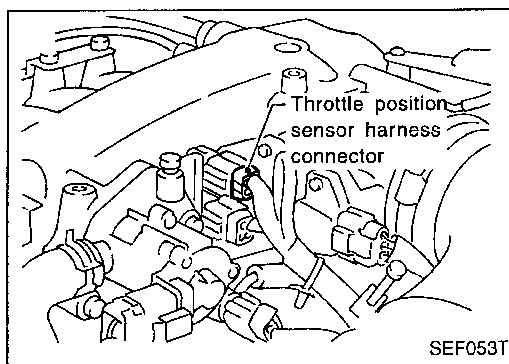
TEC643

Throttle Position Sensor (Cont'd)

DIAGNOSTIC PROCEDURE

If the trouble is duplicated after "Procedure for malfunction A", perform "Procedure A" below. If the trouble is duplicated after "Procedure for malfunction B", perform "Procedure B" on the next page. If the trouble is duplicated after "Procedure for malfunction C", perform "Procedure C" on EC-151.

Procedure A



INSPECTION START

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

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect throttle position sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ④ and ground with CONSULT or tester.

Voltage: Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.

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

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

NG → Check the following.

- Harness connectors (F63, M49)
- Harness connectors (M4, B3)
- Joint connector-16
- Harness for open or short between throttle position sensor and ECM
- Harness for open or short between throttle position sensor and TCM (Transmission Control Module)
- Harness for open or short between throttle position sensor and throttle actuator control (TAC) module

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

OK

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ③ and terminal ①.

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

NG → Repair harness or connectors.

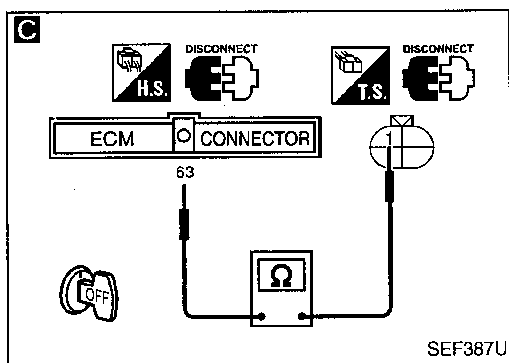
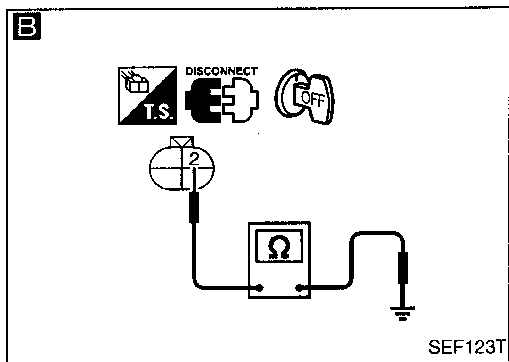
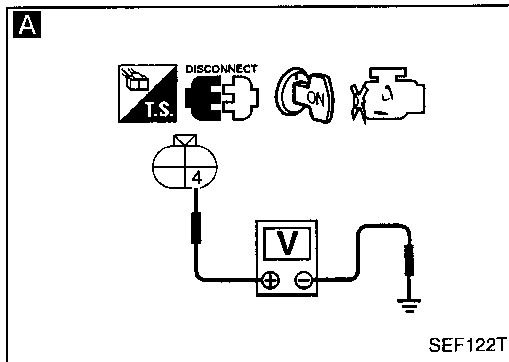
OK

CHECK COMPONENT
(Throttle position sensor).
Refer to "COMPONENT INSPECTION", EC-152.

NG → Replace throttle position sensor. To adjust it, perform "BASIC INSPECTION", EC-82.

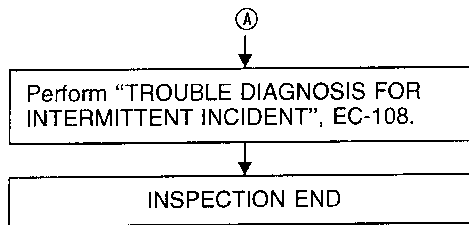
OK

(Go to next page.)



TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)



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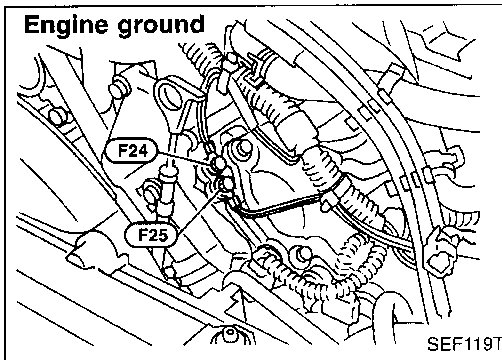
RS

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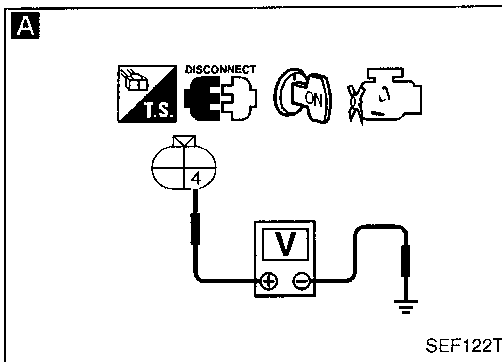
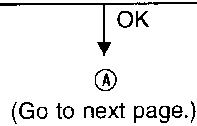
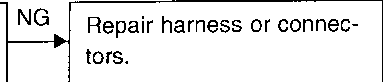
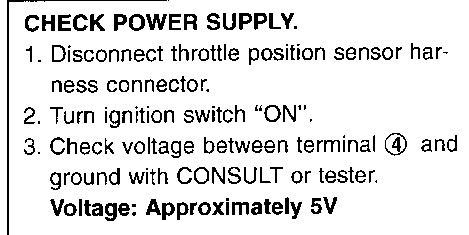
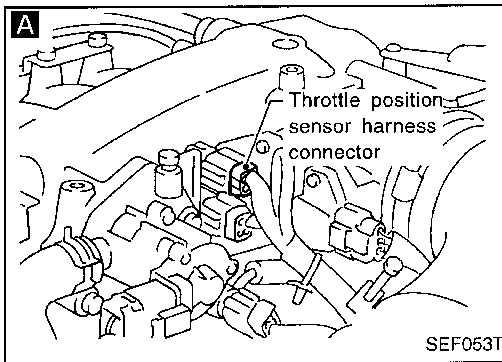
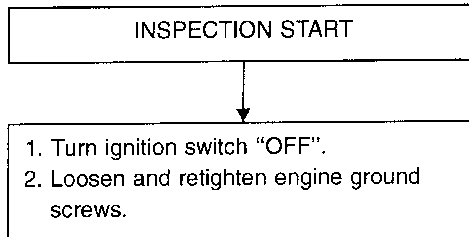
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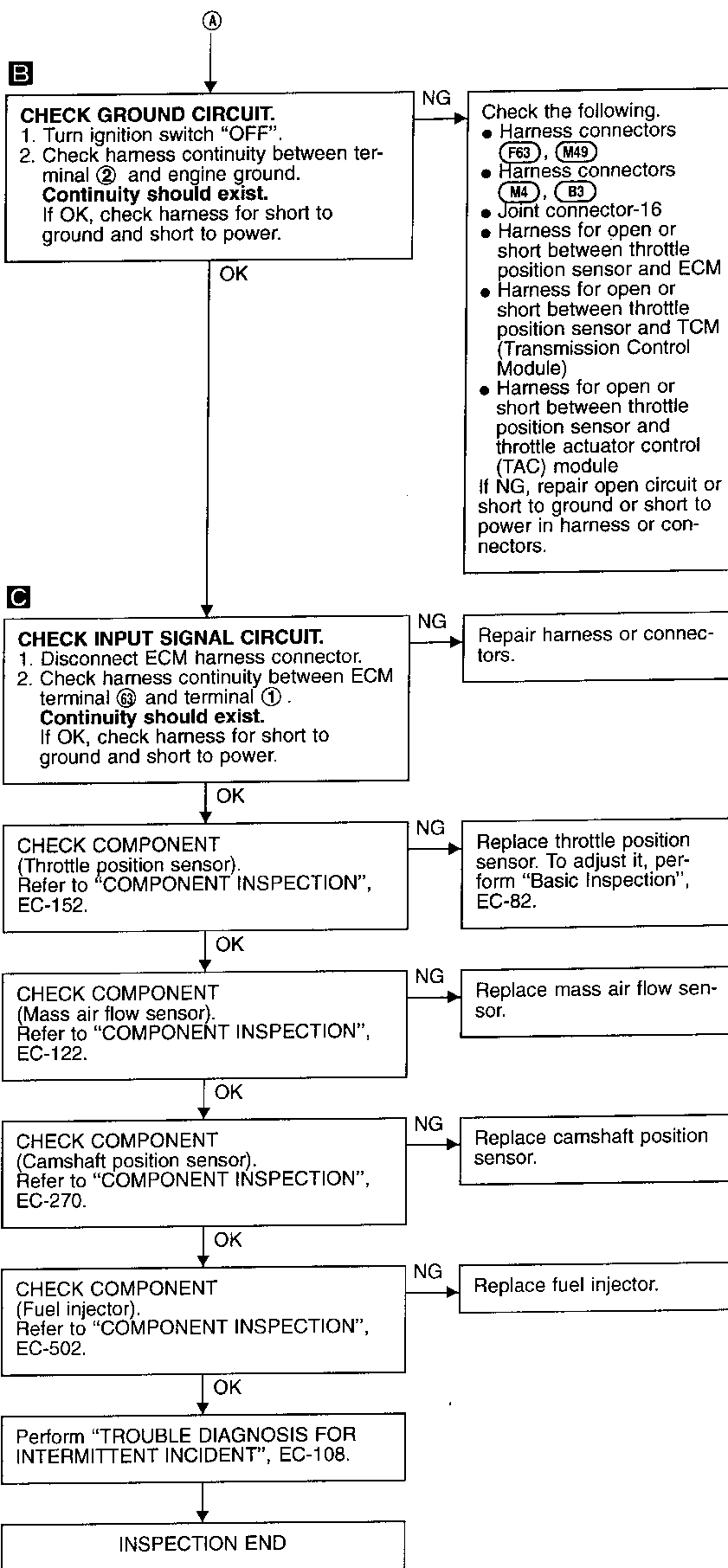
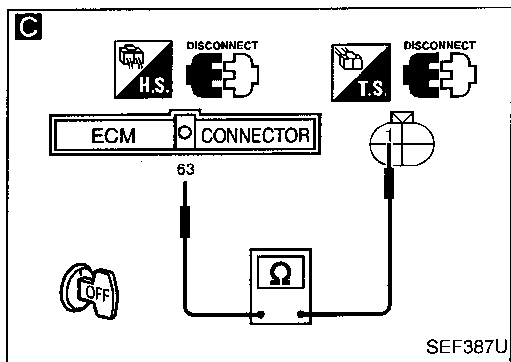
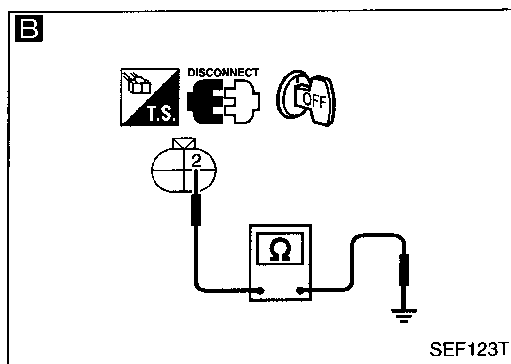


Procedure B



TROUBLE DIAGNOSIS FOR DTC P0120

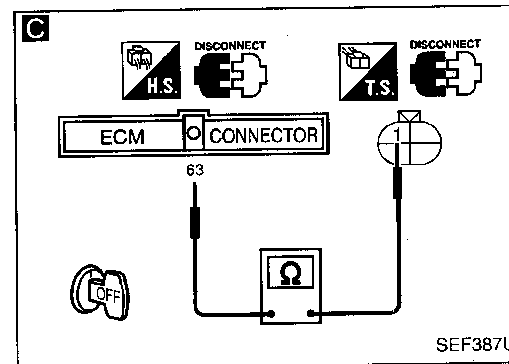
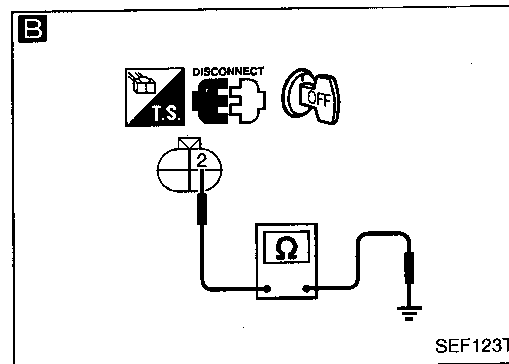
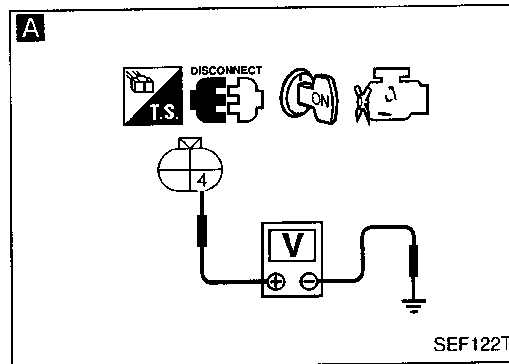
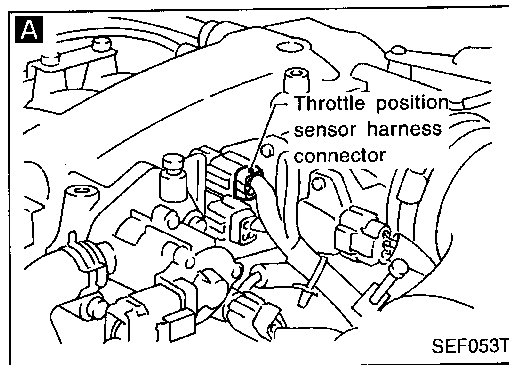
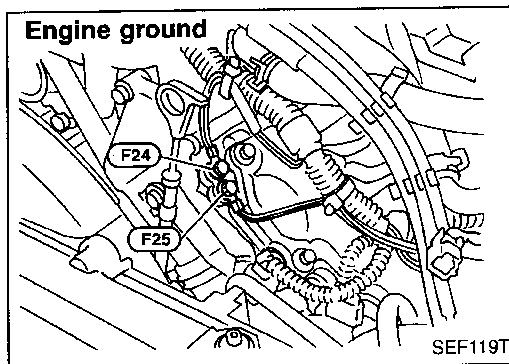
Throttle Position Sensor (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

Procedure C



INSPECTION START

ADJUST THROTTLE POSITION SENSOR.
Perform "Basic Inspection", EC-82.

OK

CHECK INTAKE SYSTEM.
Check the followings for connection.
• Air duct
• Vacuum hoses
• Intake air passage between air duct to collector
If disconnected, reconnect the parts.

NG

Reconnect the parts.

OK

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

A

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

NG

Repair harness or connectors.

OK

B

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

NG

Check the following.
• Harness connectors
⑥3, ④49
• Harness connectors
④4, ②3
• Joint connector-16
• Harness for open or short between throttle position sensor and ECM
• Harness for open or short between throttle position sensor and TCM (Transmission Control Module)
• Harness for open or short between throttle position sensor and throttle actuator control (TAC) module
If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑥ and terminal ①.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Repair harness or connectors.

OK

(Go to next page.)

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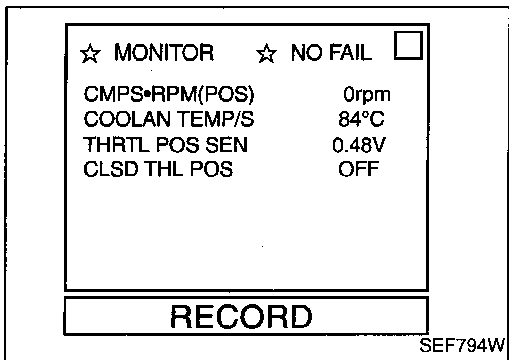
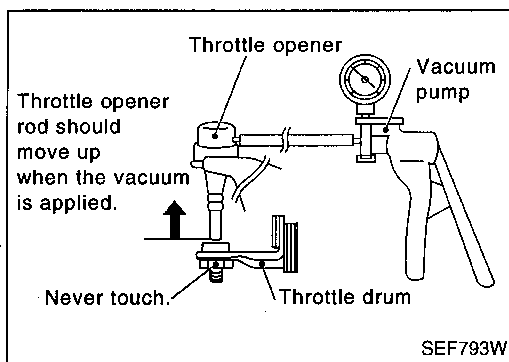
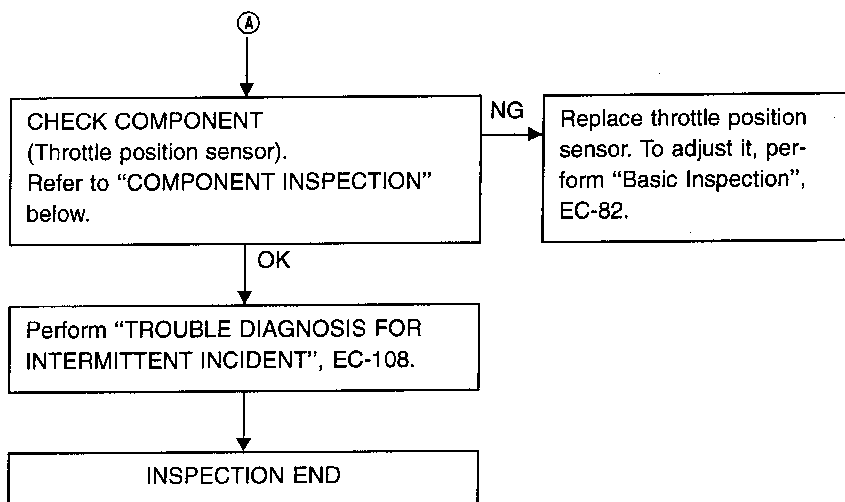
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TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)



COMPONENT INSPECTION

Throttle position sensor

1. Start engine and warm it up to normal operating temperature.
2. Stop engine (Ignition switch "OFF").
3. Remove the vacuum hose connected to the throttle opener.
4. Connect suitable vacuum hose to the vacuum pump and the opener.
5. Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
6. Turn ignition switch "ON".
7. Select "DATA MONITOR" mode with CONSULT.
8. Check voltage of "THRTL POS SEN".
Voltage measurement must be made with throttle position sensor installed in vehicle.

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

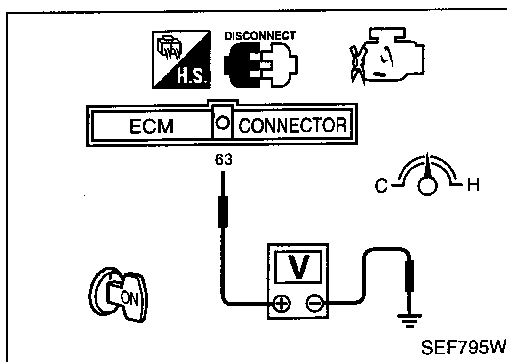
If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-82.

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

OR

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)



7. Check voltage between ECM terminal 63 (Throttle position sensor signal) and ground.

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

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

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-82.

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

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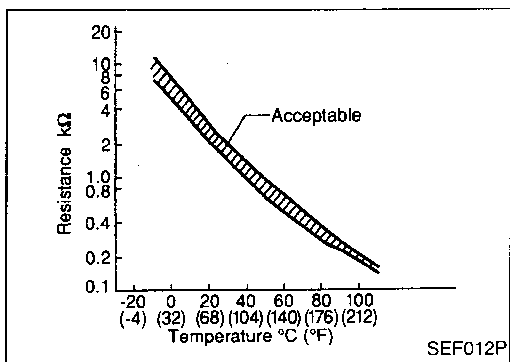
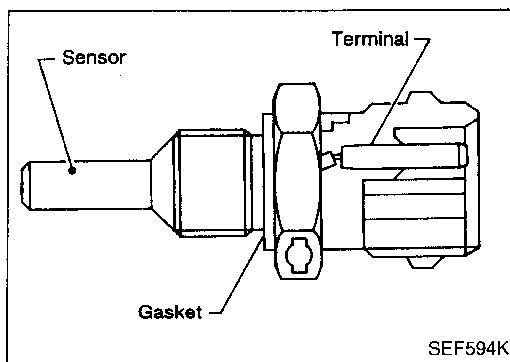
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TROUBLE DIAGNOSIS FOR DTC P0125

Engine Coolant Temperature (ECT) Sensor

COMPONENT DESCRIPTION

The engine coolant temperature sensor is located near the No. 2 injector. The sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

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

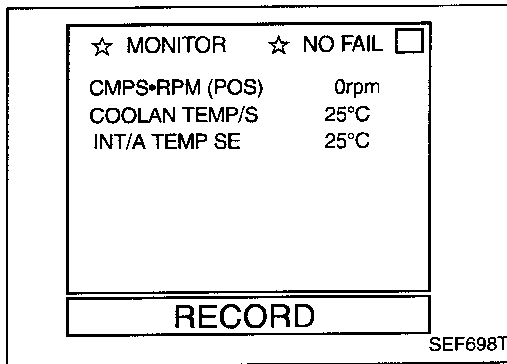
*: These data are reference values and are measured between ECM terminal ⑦ (Engine coolant temperature sensor) and ECM terminal ⑫ (ECM ground).

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0125 0908	<ul style="list-style-type: none"> ● 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. 	<ul style="list-style-type: none"> ● Harness or connectors (High resistance in the circuit) ● Engine coolant temperature sensor ● Thermostat

TROUBLE DIAGNOSIS FOR DTC P0125

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



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Do not overheat engine.

NOTE:

- If DTC P0115 (0103) is displayed with P0125 (0908), first perform TROUBLE DIAGNOSIS FOR DTC P0115, EC-137.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
- 3) Start engine and run it for 20 minutes at idle speed. If "COOLAN TEMP/S" increases to more than 10°C (50°F) within 20 minutes, stop engine because the test result will be OK.
- 4) If 1st DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-157.

OR



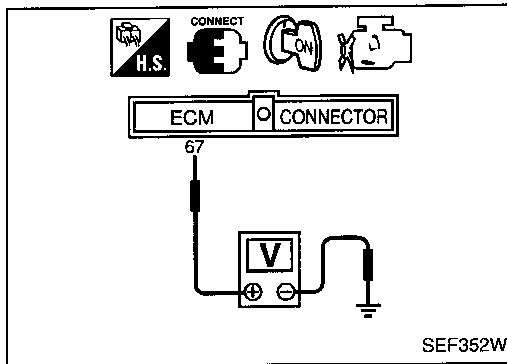
- 1) Start engine and run it for 20 minutes at idle speed.
- 2) Select "MODE 7" with GST. If "COOLAN TEMP/S" increases to more than 10°C (50°F) within 20 minutes, stop engine because the test result will be OK.
- 3) If 1st DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-157.

OR



- 1) Start engine and run it for 20 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 result)" with ECM.
- 4) If 1st DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-157.

If voltage between ECM terminals ⑥7 and ground decreases to less than 3.8V within 20 minutes, stop engine because the test result will be OK.



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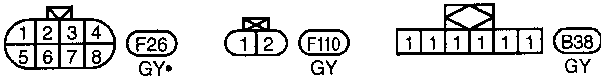
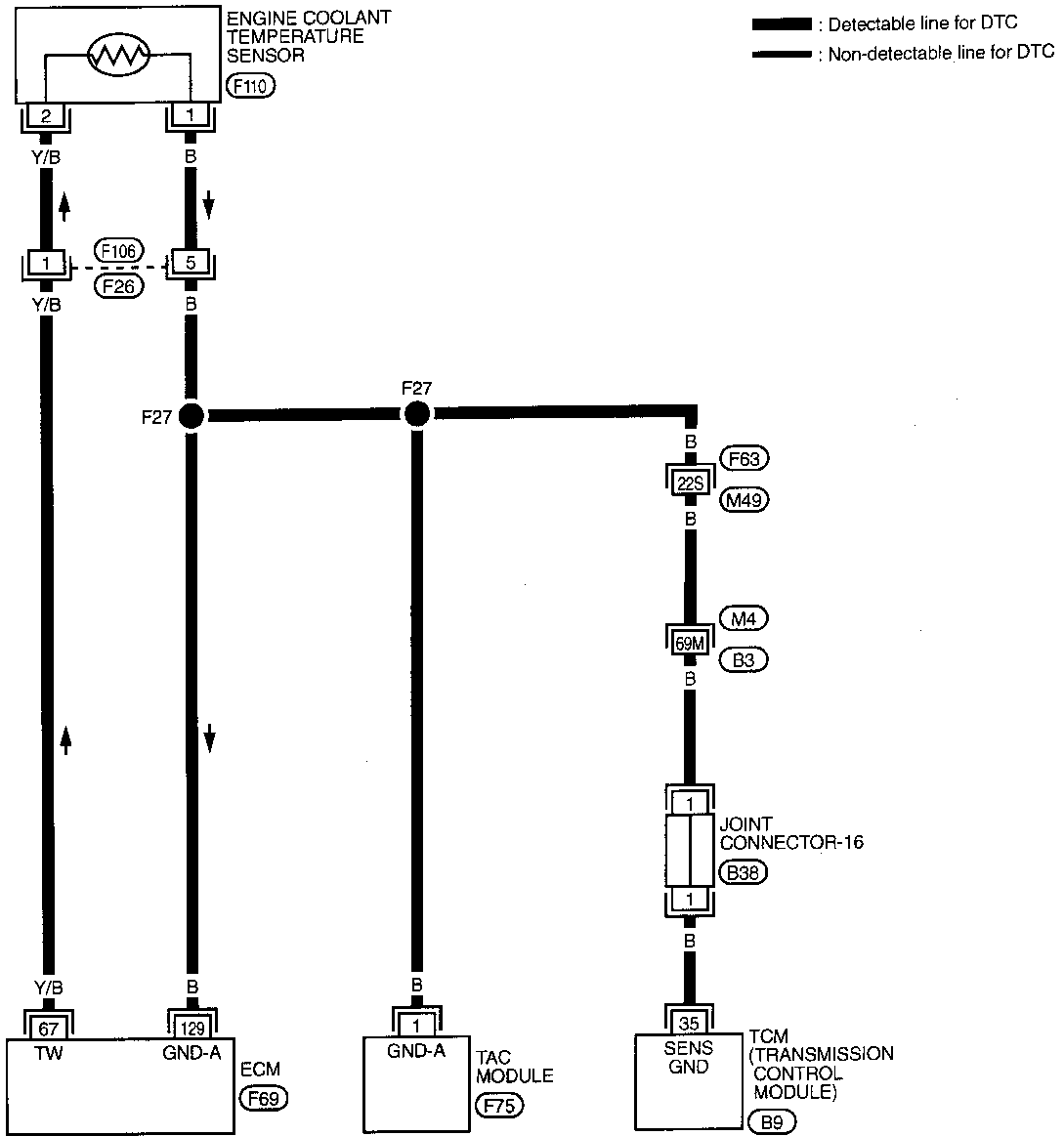
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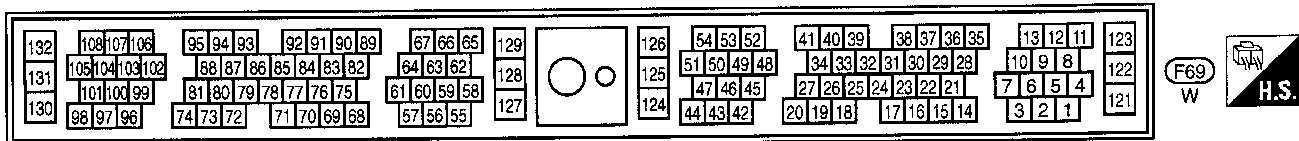
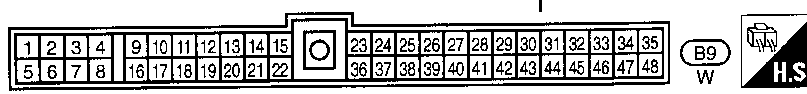
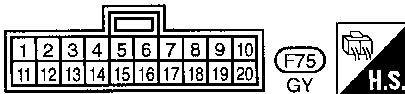
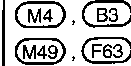
TROUBLE DIAGNOSIS FOR DTC P0125

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

EC-ECTS-01



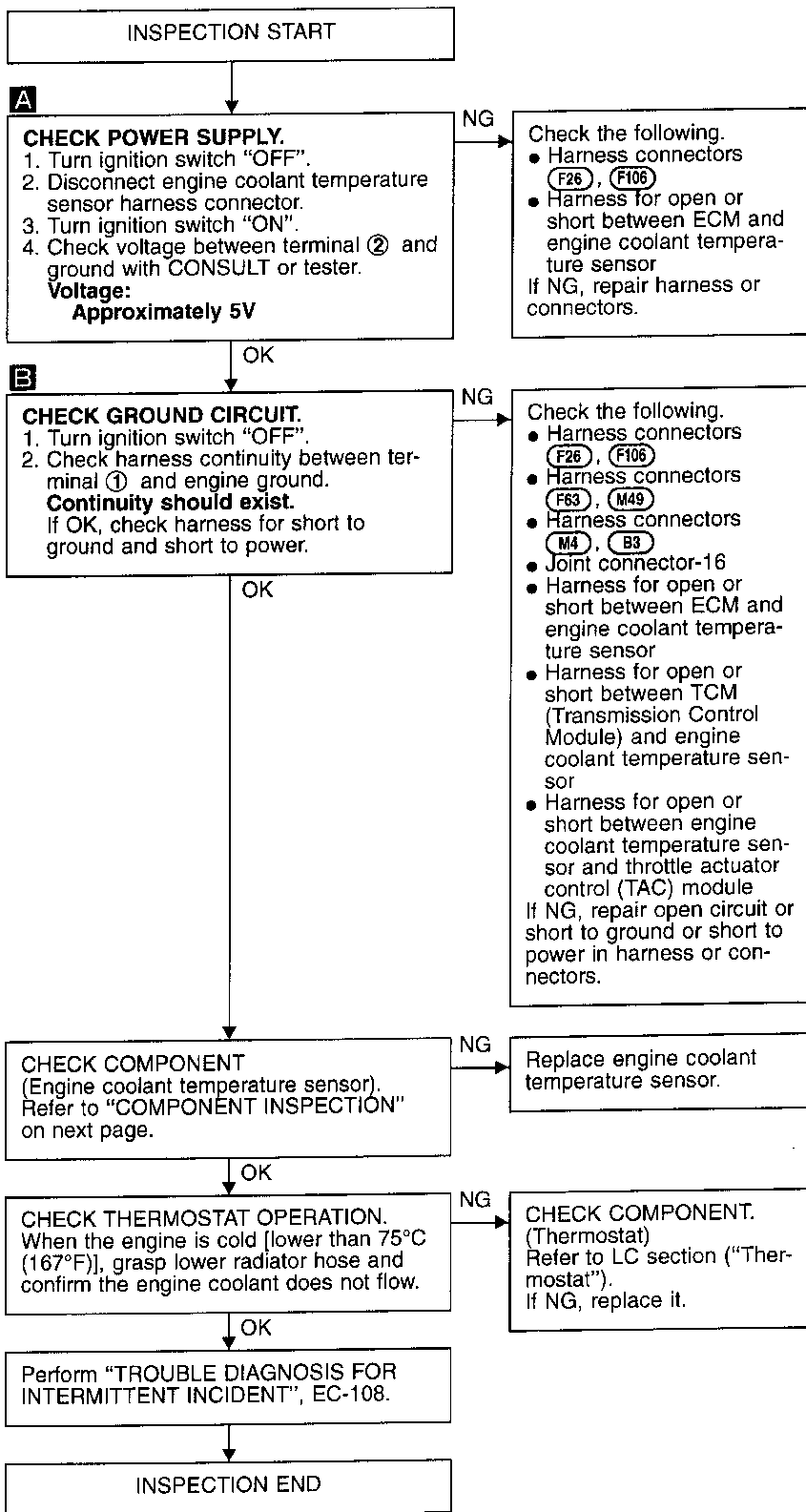
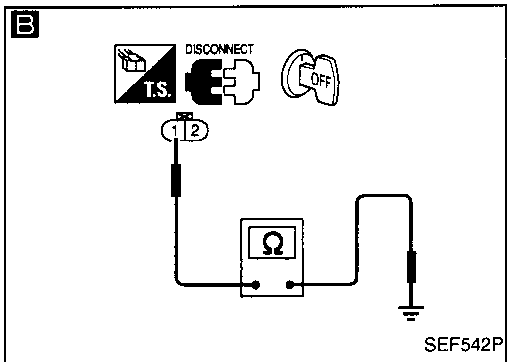
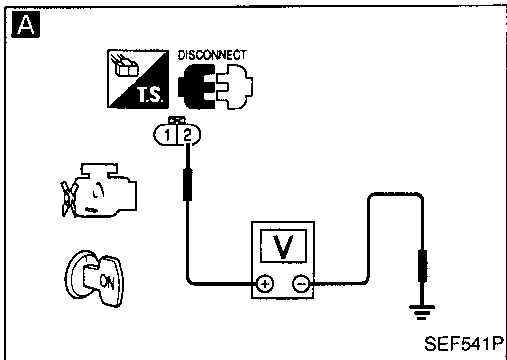
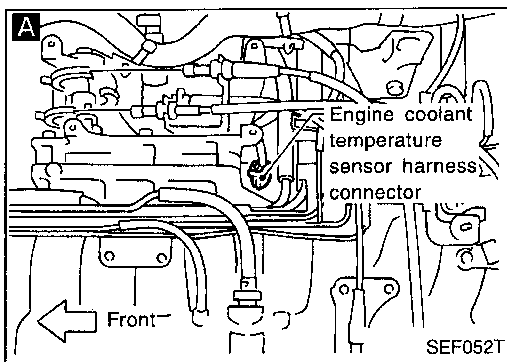
Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR DTC P0125

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

DIAGNOSTIC PROCEDURE



GI

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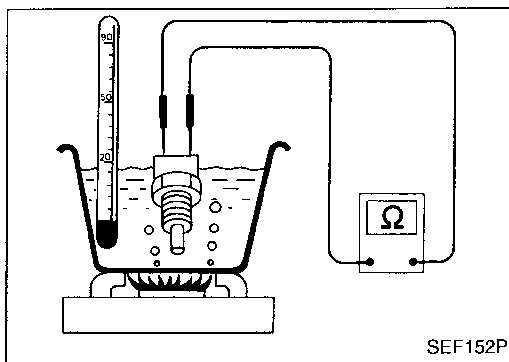
TROUBLE DIAGNOSIS FOR DTC P0125

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

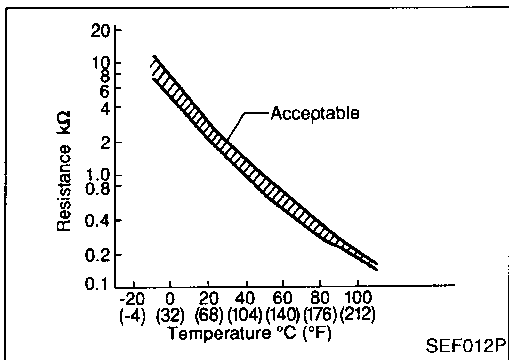
COMPONENT INSPECTION

Engine coolant temperature sensor

Check resistance as shown in the figure.



SEF152P

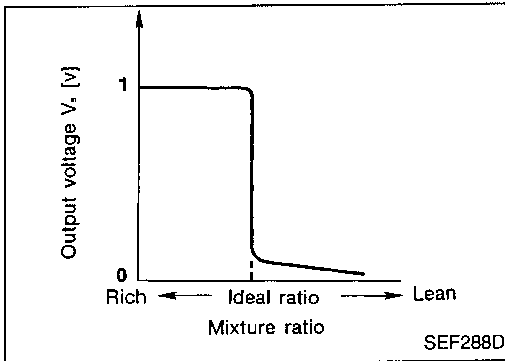
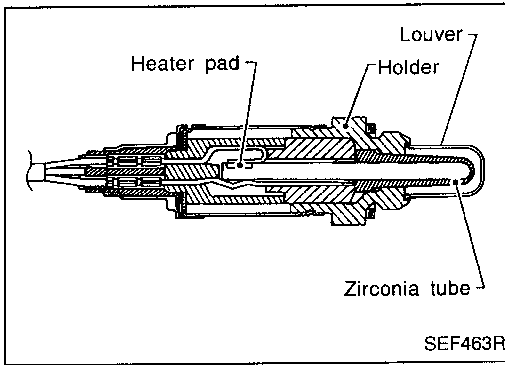


SEF012P

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.

TROUBLE DIAGNOSIS FOR DTC P0130 (-B1), P0150 (-B2)



Front Heated Oxygen Sensors (Front HO2S) (Circuit) (P0130: Left bank), (P0150: Right bank)

COMPONENT DESCRIPTION

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

GI

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CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 SEN-B1 FR O2 SEN-B2	● Engine: After warming up Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR-B1 FR O2 MNTR-B2		LEAN ↔ RICH Changes more than 5 times during 10 seconds.

FA

RA

BR

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

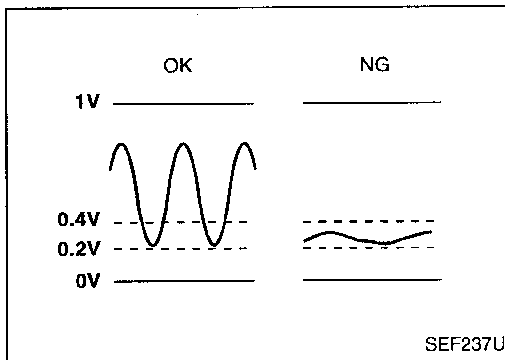
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
82 (RH)	R	Front heated oxygen sensors	Engine is running.	0 - Approximately 1.0V (periodically change)
83 (LH)	W		After warming up to normal operating temperature and engine speed is 2,000 rpm.	

ST

RS

BT

HA



ON BOARD DIAGNOSIS LOGIC

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

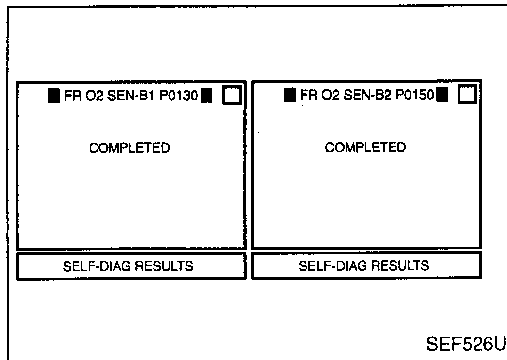
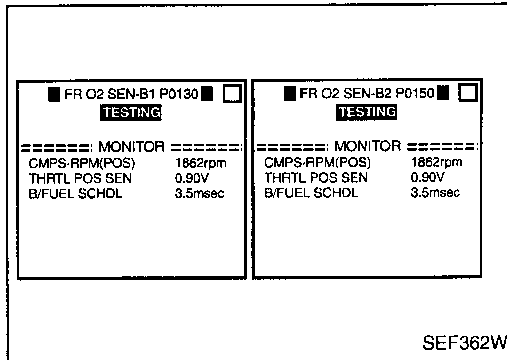
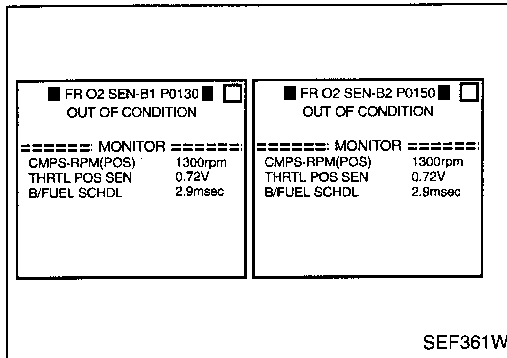
EL

IDX

TROUBLE DIAGNOSIS FOR DTC P0130 (-B1), P0150 (-B2)

Front Heated Oxygen Sensors (Front HO2S) (Circuit) (P0130: Left bank), (P0150: Right bank) (Cont'd)

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130, 0303 (Left bank)	<ul style="list-style-type: none"> The voltage from the sensor is constantly approx. 0.3V. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Front heated oxygen sensor
P0150, 0503 (Right bank)		



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

- Always drive vehicle at temperature of more than -10°C (14°F).
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.



- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "FR O2 SEN-B1 (-B2) P0130 (P0150)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine (TCS switch "OFF") and let it idle for at least 3 minutes.

NOTE:

Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5).

- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 10 to 60 seconds.)

CMPS-RPM (POS): 1,600 - 2,200 rpm
Vehicle speed: 70 - 100 km/h (43 - 62 MPH)
B/FUEL SCHDL: 1.4 - 5 msec
Selector lever: Suitable position

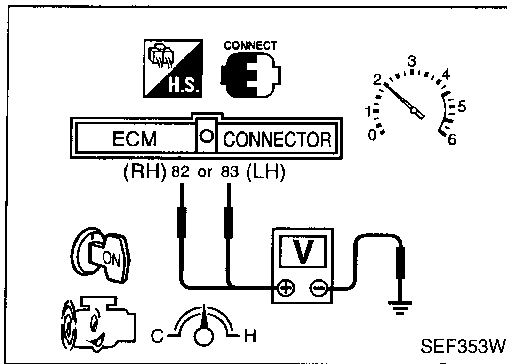
If "TESTING" is not displayed after 5 minutes, retry from step 2).

- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-164.

During this test, P1148 may be stored in ECM.

TROUBLE DIAGNOSIS FOR DTC P0130 (-B1), P0150 (-B2)

Front Heated Oxygen Sensors (Front HO2S) (Circuit) (P0130: Left bank), (P0150: Right bank) (Cont'd)



OR OVERALL FUNCTION CHECK

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



- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal 82 RH, 83 LH (sensor signal) and ground.
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - The voltage does not remain in the range of 0.2 - 0.4V.
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-164.

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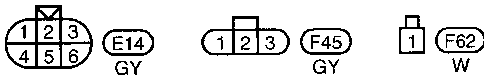
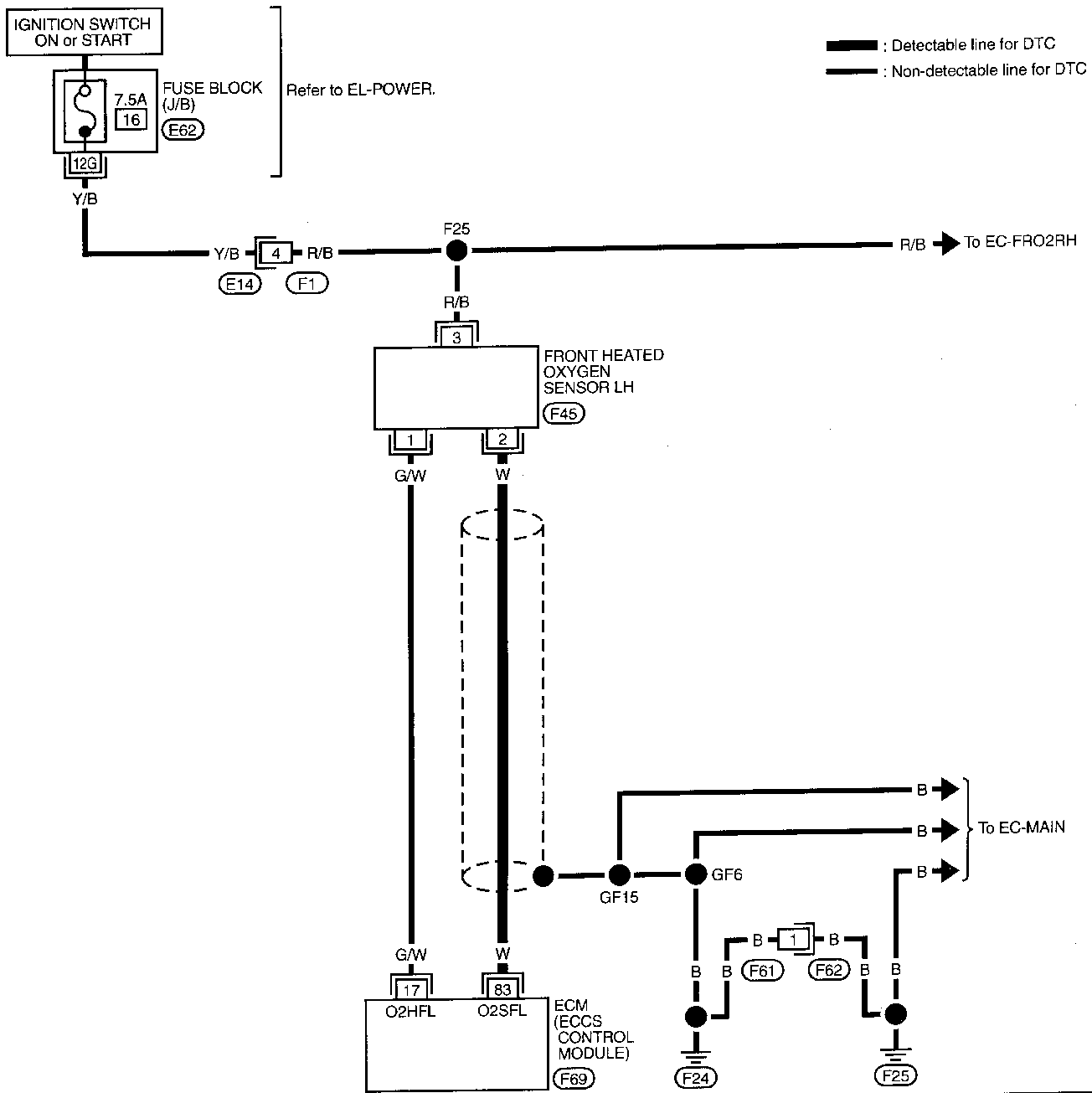
IDX

TROUBLE DIAGNOSIS FOR DTC P0130 (-B1), P0150 (-B2)

Front Heated Oxygen Sensors (Front HO2S) (Circuit) (P0130: Left bank), (P0150: Right bank) (Cont'd)

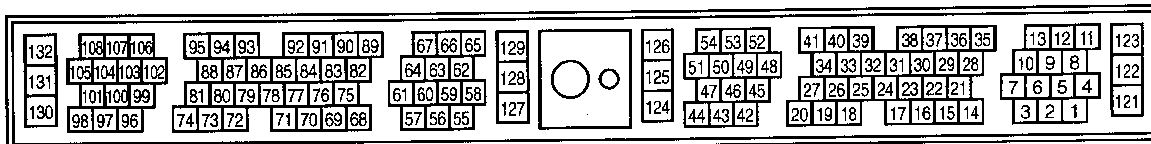
LEFT BANK

EC-FRO2LH-01



Refer to last page (Foldout page).

E62

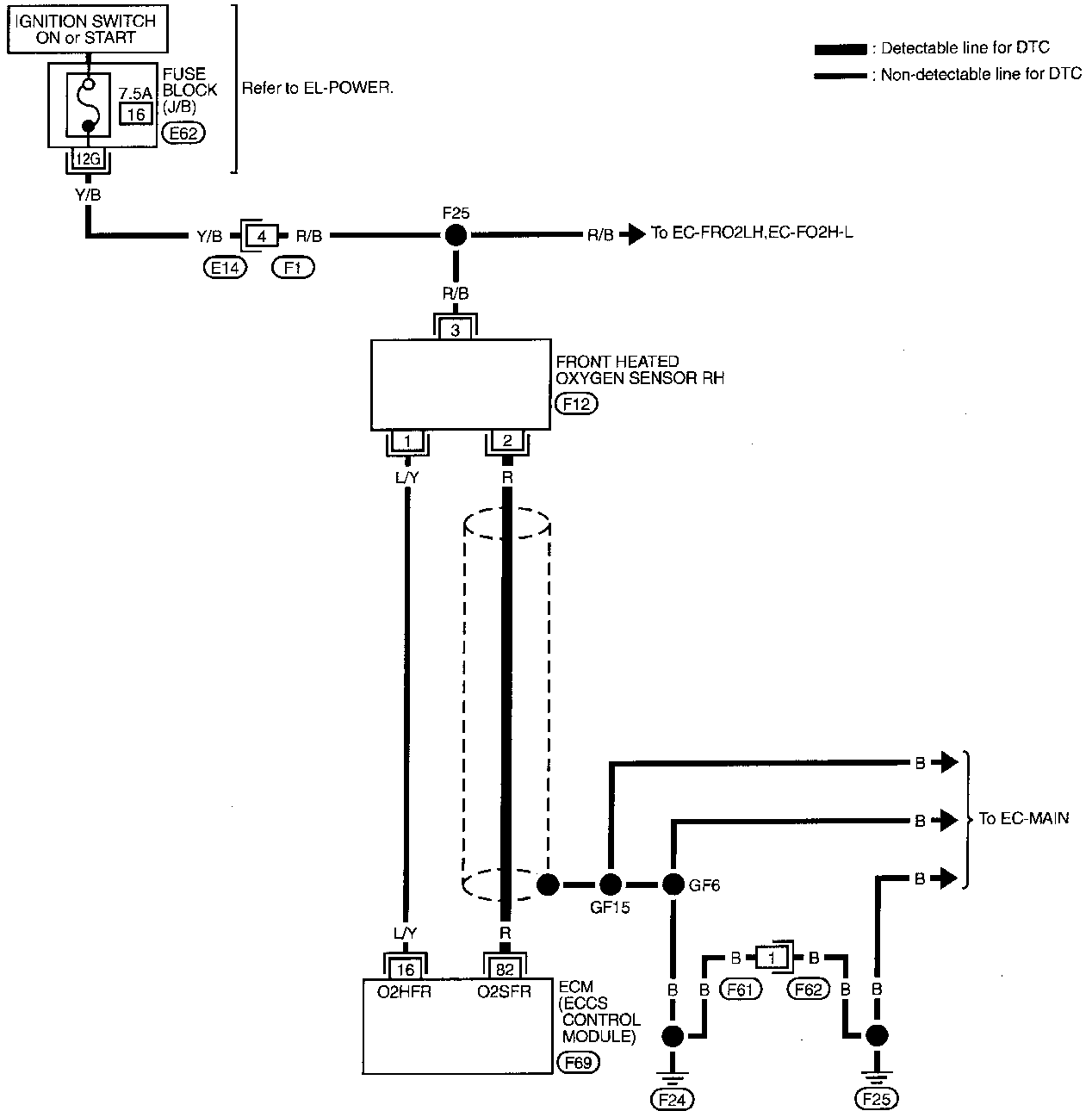


TROUBLE DIAGNOSIS FOR DTC P0130 (-B1), P0150 (-B2)

Front Heated Oxygen Sensors (Front HO2S) (Circuit) (P0130: Left bank), (P0150: Right bank) (Cont'd)

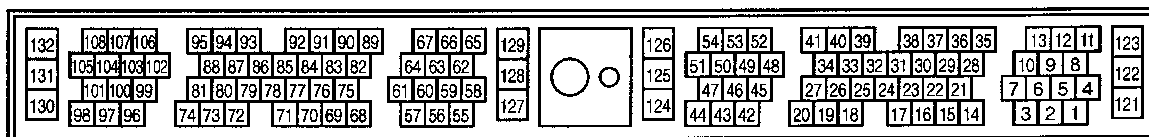
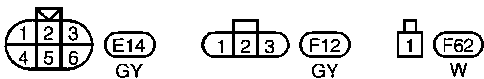
RIGHT BANK

EC-FRO2RH-01



Refer to last page (Foldout page).

(E62)

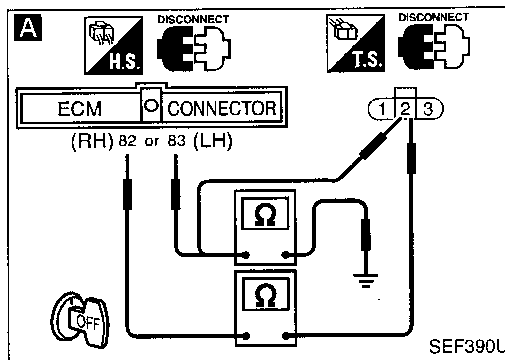
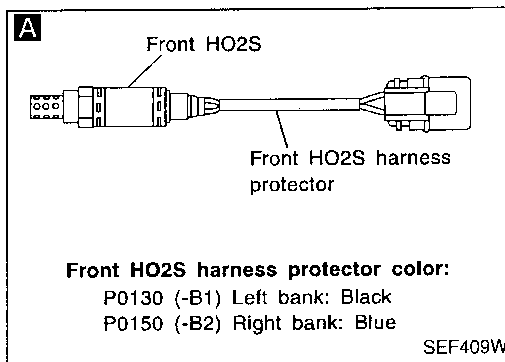
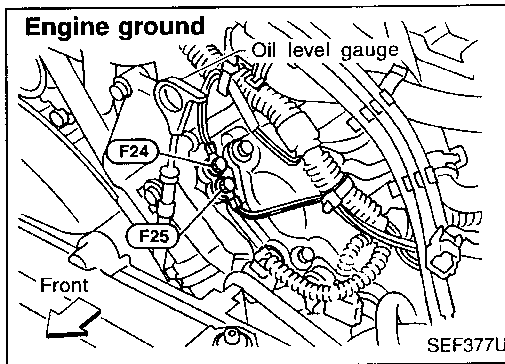
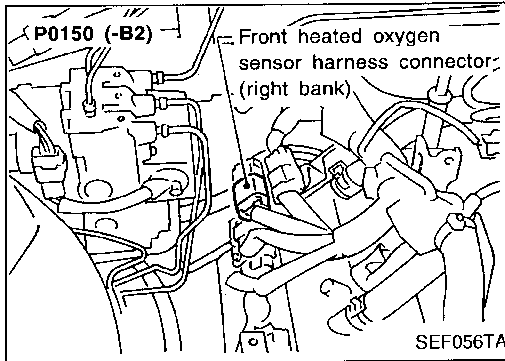
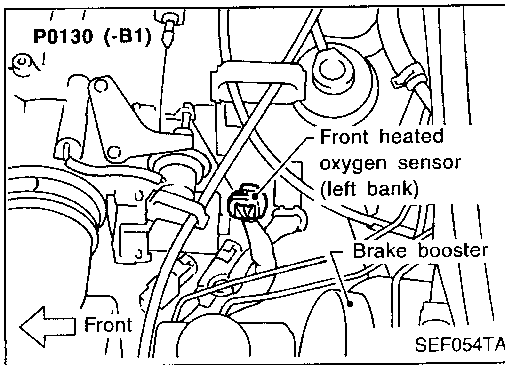


TEC247

TROUBLE DIAGNOSIS FOR DTC P0130 (-B1), P0150 (-B2)

Front Heated Oxygen Sensors (Front HO2S) (Circuit) (P0130: Left bank), (P0150: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

- A**
- CHECK INPUT SIGNAL CIRCUIT.**
1. Turn ignition switch "OFF".
 2. Disconnect corresponding front heated oxygen sensor harness connector and ECM harness connector.
 3. Check harness continuity between ECM and sensor terminals.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0130	83	2	LH (Black)
P0150	82	2	RH (Blue)

Continuity should exist.

4. Check harness continuity between ECM and sensor or ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	Ground	
P0130	83 or 2	Ground	LH (Black)
P0150	82 or 2	Ground	RH (Blue)

Continuity should not exist.

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

OK

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

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

NG → Repair harness or connectors.

NG → REPLACE FRONT HO2S.
1. Check front HO2S harness protector color.
Black: Left bank (-B1)
Blue: Right bank (-B2)
2. Replace malfunctioning front HO2S.

TROUBLE DIAGNOSIS FOR DTC P0130 (-B1), P0150 (-B2)

Front Heated Oxygen Sensors (Front HO2S) (Circuit) (P0130: Left bank), (P0150: Right bank) (Cont'd)

COMPONENT INSPECTION

Front heated oxygen sensor

- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.
- 5) Check the following.
 - "FR O2 MNTR-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
 5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |
FR O2 MNTR-B1 R-L-R-L-R-L-R-L-R

- R = "FR O2 MNTR-B1 (-B2)", "RICH"
- L = "FR O2 MNTR-B1 (-B2)", "LEAN"
- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.30V at least once.
- "FR O2 SEN-B1 (-B2)" voltage never exceeds 1.0V.

CAUTION:

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

☆ MONITOR
☆ NO FAIL

CMPS•RPM (POS)	2137rpm
MAS AIR/FL SE	1.96V
COOLAN TEMP/S	84°C
FR O2 SEN-B1	0.37V
FR O2 MNTR-B1	LEAN
INJ PULSE-B1	2.6msec
A/F ALPHA-B1	101%
O2SEN HTR-B1	ON

RECORD

SEF700T

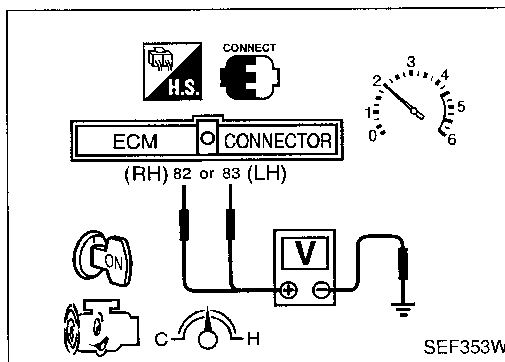
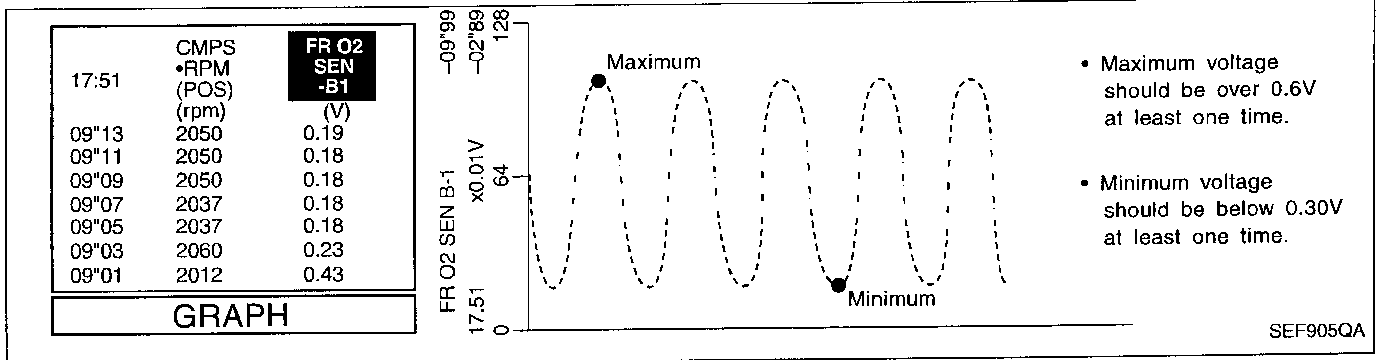
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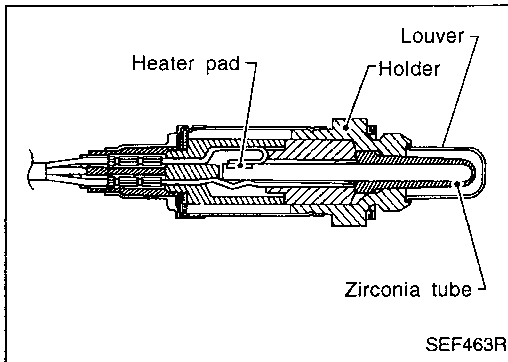
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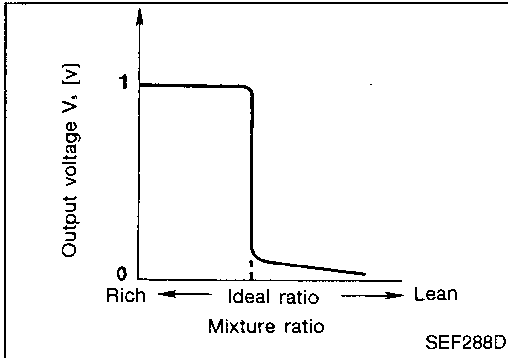


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑧ RH, ⑩ LH (sensor signal) and ground.
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR, EC-57).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.30V at least one time.
 - The voltage never exceeds 1.0V.

TROUBLE DIAGNOSIS FOR DTC P0131 (-B1), P0151 (-B2)



SEF463R



SEF288D

Front Heated Oxygen Sensor (Lean shift monitoring) (Front HO2S) (P0131: Left bank), (P0151: Right bank)

COMPONENT DESCRIPTION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

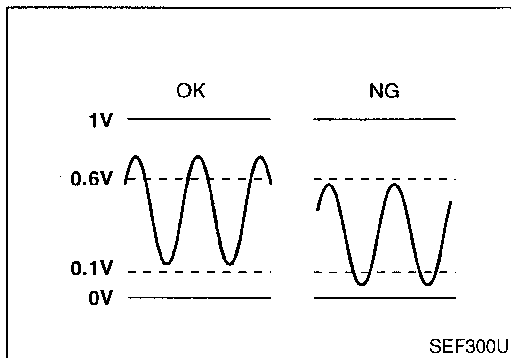
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 SEN-B1 FR O2 SEN-B2	<ul style="list-style-type: none"> Engine: After warming up Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR-B1 FR O2 MNTR-B2		LEAN ↔ RICH Changes more than 5 times during 10 seconds.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
82 (RH)	R	Front heated oxygen sensor	Engine is running.	0 - Approximately 1.0V (periodically change)
83 (LH)	W		After warming up to normal operating temperature and engine speed is 2,000 rpm.	



SEF300U

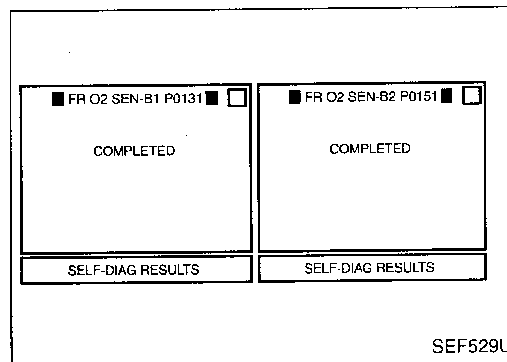
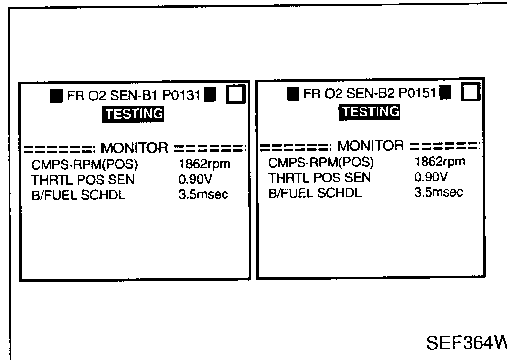
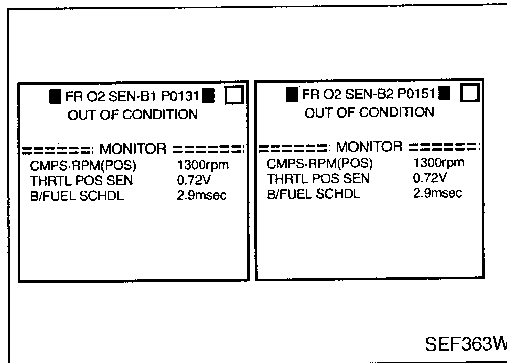
ON BOARD DIAGNOSIS LOGIC

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

TROUBLE DIAGNOSIS FOR DTC P0131 (-B1), P0151 (-B2)

Front Heated Oxygen Sensor (Lean shift monitoring) (Front HO2S) (P0131: Left bank), (P0151: Right bank) (Cont'd)

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0131 0411 (Left bank)	<ul style="list-style-type: none"> The maximum voltage from the sensor is not reached to the specified voltage. 	<ul style="list-style-type: none"> Front heated oxygen sensor Front heated oxygen sensor heater Fuel pressure Injectors Intake air leaks
P0151 0415 (Right bank)		



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

- Always perform at a temperature above -10°C (14°F).
- Before performing following procedure, confirm that battery voltage is more than 11V at idle.



- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "FR O2 SEN-B1 (-B2) P0131 (P0151)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine (TCS switch "OFF") and let it idle for at least 3 minutes.

NOTE:

Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5).

- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds.)

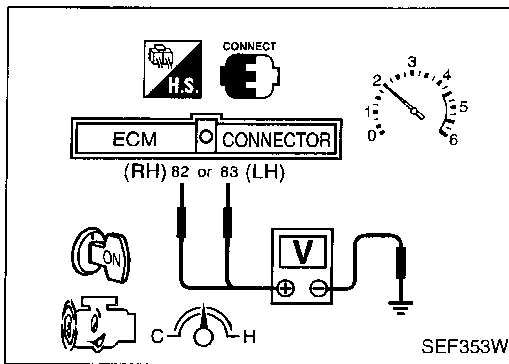
CMPS-RPM (POS): 1,200 - 2,200 rpm
 Vehicle speed: 50 - 100 km/h (31 - 62 MPH)
 B/FUEL SCHDL: 1.4 - 5.0 ms
 Selector lever: Suitable position

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

- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-169.

TROUBLE DIAGNOSIS FOR DTC P0131 (-B1), P0151 (-B2)

Front Heated Oxygen Sensor (Lean shift monitoring) (Front HO2S) (P0131: Left bank), (P0151: Right bank) (Cont'd)



OR

OVERALL FUNCTION CHECK

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

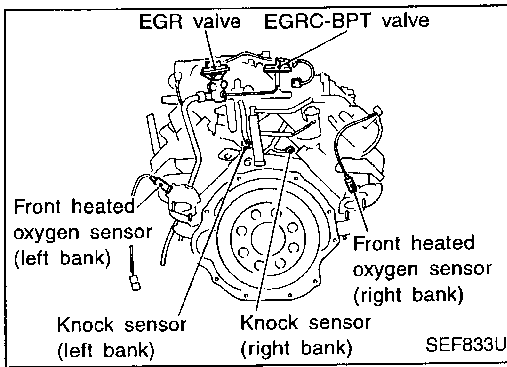


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑧ LH, ⑧ RH (sensor signal) and ground.
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.1V at least one time.
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-169.

TROUBLE DIAGNOSIS FOR DTC P0131 (-B1), P0151 (-B2)

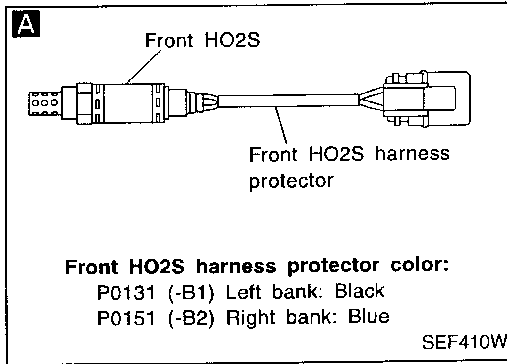
Front Heated Oxygen Sensor (Lean shift monitoring) (Front HO2S) (P0131: Left bank), (P0151: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

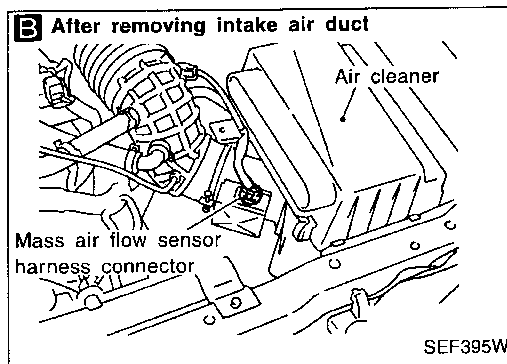
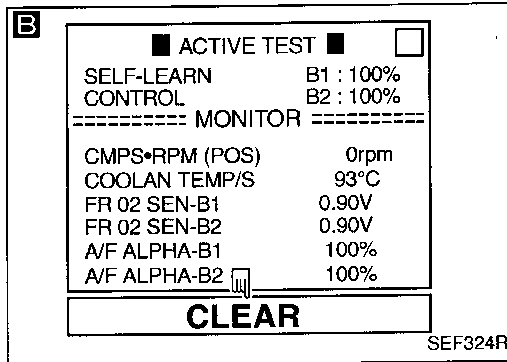
A
Loosen and retighten front heated oxygen sensor.
Tightening torque:
40 - 50 N·m
(4.1 - 5.1 kg-m, 30 - 37 ft-lb)



B
CLEAR THE SELF-LEARNING DATA
1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.
Are the 1st trip DTCs P0171, P0174 detected? Is it difficult to start engine?

Yes
Go to "TROUBLE DIAGNOSIS FOR DTC P0171, P0174", EC-235.

OR
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
7. Run engine for at least 10 minutes at idle speed.
Are the 1st trip DTCs 0115, 0210 detected? Is it difficult to start engine?



No
CHECK COMPONENT
(Front heated oxygen sensor heaters). Refer to "COMPONENT INSPECTION" on next page.

NG
REPLACE FRONT HO2S.
1. Check front HO2S harness protector color.
Black: Left bank (-B1)
Blue: Right bank (-B2)
2. Replace malfunctioning front HO2S.

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

NG
Replace corresponding heated oxygen sensor.

OK
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108. Refer to "TROUBLE DIAGNOSIS FOR DTC P0130 (-B1), P0150 (-B2)" for circuit, EC-159.

INSPECTION END

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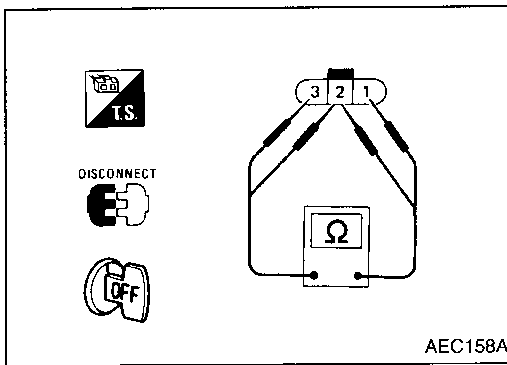
HA

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IDX

TROUBLE DIAGNOSIS FOR DTC P0131 (-B1), P0151 (-B2)

Front Heated Oxygen Sensor (Lean shift monitoring) (Front HO2S) (P0131: Left bank), (P0151: Right bank) (Cont'd)



COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

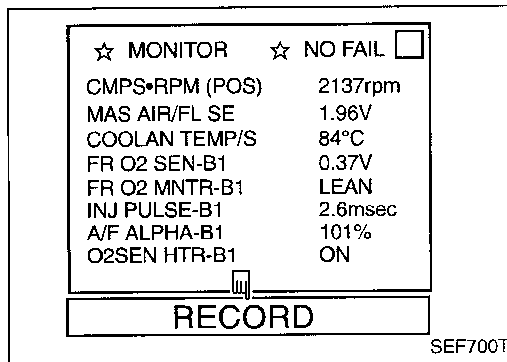
Check continuity between terminals ② and ①, ③ and ②.

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

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



Front heated oxygen sensor



- 1) Start engine and warm it up to normal operating temperature.
 - 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
 - 3) Hold engine speed at 2,000 rpm under no load during the following steps.
 - 4) Touch "RECORD" on CONSULT screen.
 - 5) Check the following.
 - "FR O2 MNTR-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
- 5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |

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

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

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

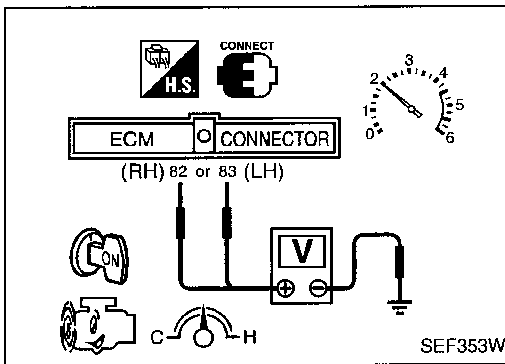
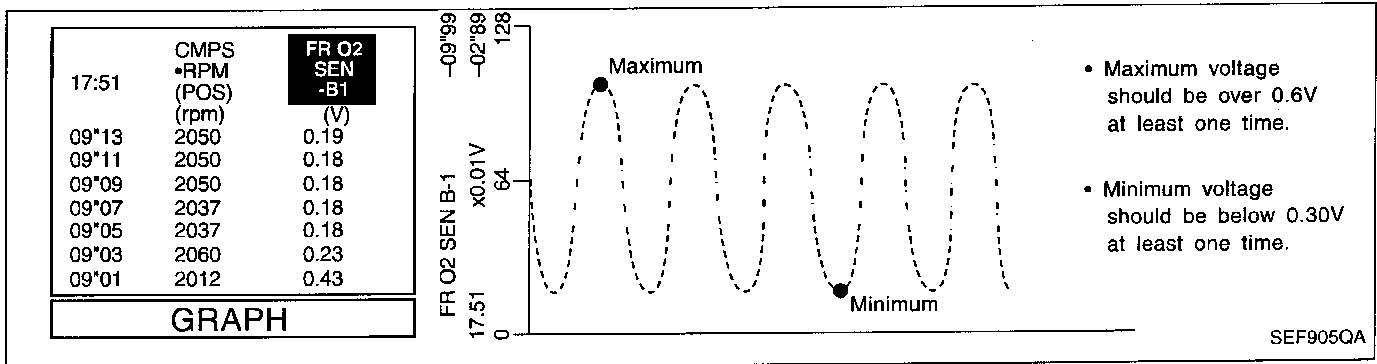
- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.30V at least once.
- The voltage never exceeds 1.0V.

CAUTION:

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

TROUBLE DIAGNOSIS FOR DTC P0131 (-B1), P0151 (-B2)

Front Heated Oxygen Sensor (Lean shift monitoring) (Front HO2S) (P0131: Left bank), (P0151: Right bank) (Cont'd)



OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑧2 RH, ⑧3 LH (sensor signal) and 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). See EC-57.
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.30V at least one time.
 - The voltage never exceeds 1.0V.

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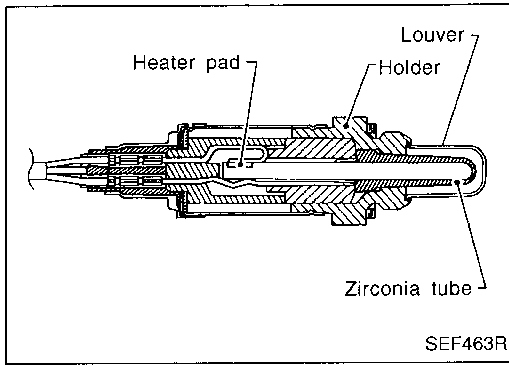
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TROUBLE DIAGNOSIS FOR DTC P0132 (-B1), P0152 (-B2)

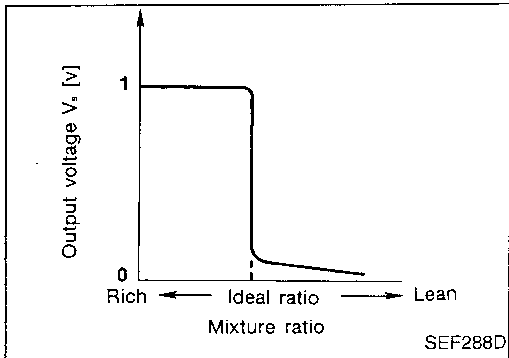


SEF463R

Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Left bank), (P0152: Right bank)

COMPONENT DESCRIPTION

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



SEF288D

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

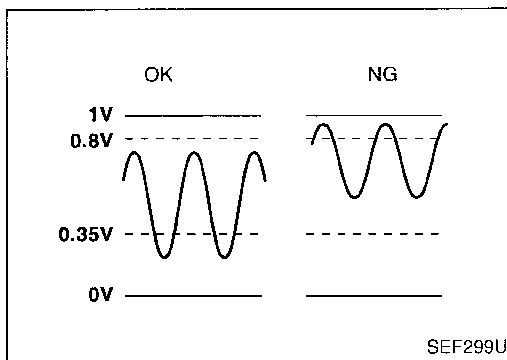
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 SEN-B1 FR O2 SEN-B2		0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR-B1 FR O2 MNTR-B2	● Engine: After warming up Maintaining engine speed at 2,000 rpm	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 (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
82 (RH)	R	Front heated oxygen sensors	Engine is running.	0 - Approximately 1.0V (periodically change)
83 (LH)	W		After warming up to normal operating temperature and engine speed is 2,000 rpm.	



SEF299U

ON BOARD DIAGNOSIS LOGIC

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

TROUBLE DIAGNOSIS FOR DTC P0132 (-B1), P0152 (-B2)

Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Left bank), (P0152: Right bank) (Cont'd)

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0132 0410 (Left bank)	<ul style="list-style-type: none"> The maximum and minimum voltages from the sensor are not around the specified voltages. 	<ul style="list-style-type: none"> Front heated oxygen sensor Front heated oxygen sensor heater Fuel pressure Injectors
P0152 0414 (Right bank)		

GI
MA
EM

■ FR O2 SEN-B1 P0132 ■ □

OUT OF CONDITION

===== MONITOR =====

CMPS-RPM(POS) 1300rpm
THRTL POS SEN 0.72V
B/FUEL SCHDL 2.9msec

■ FR O2 SEN-B2 P0152 ■ □

OUT OF CONDITION

===== MONITOR =====

CMPS-RPM(POS) 1300rpm
THRTL POS SEN 0.72V
B/FUEL SCHDL 2.9msec

SEF365W

LC

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

- Always perform at a temperature above -10°C (14°F).
- Before performing following procedure, confirm that battery voltage is more than 11V at idle.

EC

■ FR O2 SEN-B1 P0132 ■ □

TESTING

===== MONITOR =====

CMPS-RPM(POS) 1862rpm
THRTL POS SEN 0.90V
B/FUEL SCHDL 3.5msec

■ FR O2 SEN-B2 P0152 ■ □

TESTING

===== MONITOR =====

CMPS-RPM(POS) 1862rpm
THRTL POS SEN 0.90V
B/FUEL SCHDL 3.5msec

SEF366W

FE



- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "FR O2 SEN-B1 (-B2) P0132 (P0152)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine (TCS switch "OFF") and let it idle for at least 3 minutes.

AT

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NOTE:

Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5).

ST

When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds.)

RS

BT

- CMPS-RPM (POS): 1,200 - 2,200 rpm
- Vehicle speed: 50 - 100 km/h (31 - 62 MPH)
- B/FUEL SCHDL: 1.4 - 5.0 ms
- Selector lever: Suitable position

HA

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

EL

- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-175.

IDX

■ FR O2 SEN-B1 P0132 ■ □

COMPLETED

SELF-DIAG RESULTS

■ FR O2 SEN-B2 P0152 ■ □

COMPLETED

SELF-DIAG RESULTS

SEF532U

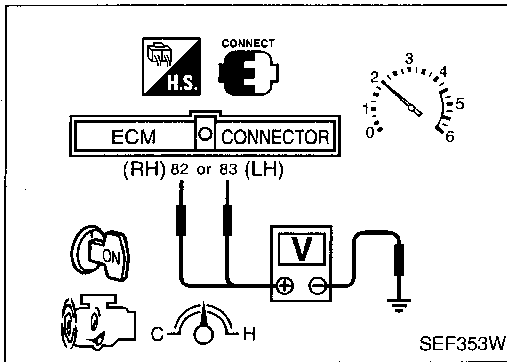
TROUBLE DIAGNOSIS FOR DTC P0132 (-B1), P0152 (-B2)

Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Left bank), (P0152: Right bank) (Cont'd)

OR

OVERALL FUNCTION CHECK

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

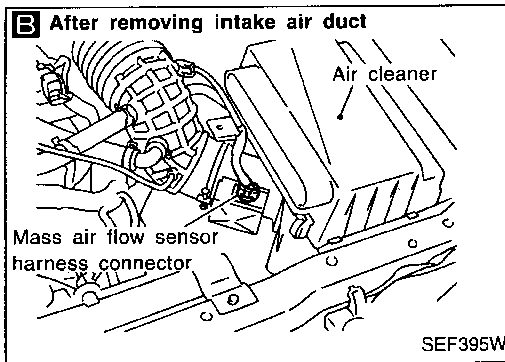
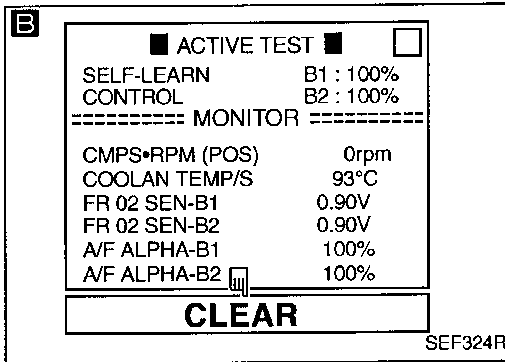
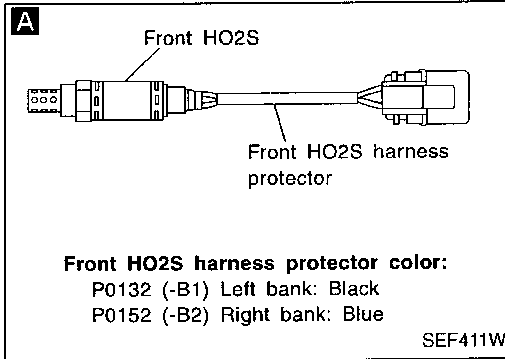
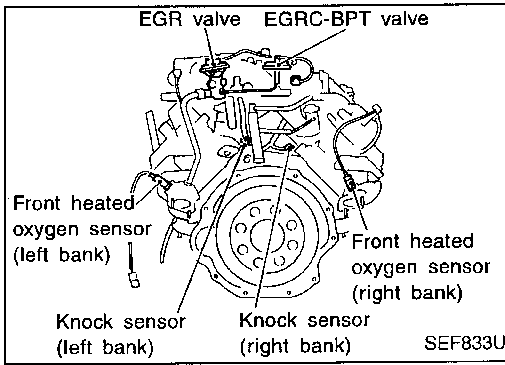


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑧② RH, ⑧③ LH (sensor signal) and ground.
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - The maximum voltage is over 0.8V at least one time.
 - The minimum voltage is below 0.35V at least one time.
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-175.

TROUBLE DIAGNOSIS FOR DTC P0132 (-B1), P0152 (-B2)

Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Left bank), (P0152: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A
 Loosen and retighten front heated oxygen sensor.
Tightening torque:
 40 - 50 N·m (4.1 - 5.1 kg·m, 30 - 37 ft·lb)

B

CLEAR THE SELF-LEARNING DATA
 1. Start engine and warm it up to normal operating temperature.
 2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
 3. Clear the self-learning control coefficient by touching "CLEAR".
 4. Run engine for at least 10 minutes at idle speed.
Are the 1st trip DTCs P0172, P0175 detected? Is it difficult to start engine?

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0172, P0175", EC-241.

OR

2. Turn ignition switch "OFF".
 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
 4. Stop engine and reconnect mass air flow sensor harness connector.
 5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
 6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
 7. Run engine for at least 10 minutes at idle speed.
Are the 1st trip DTCs 0114, 0209 detected? Is it difficult to start engine?

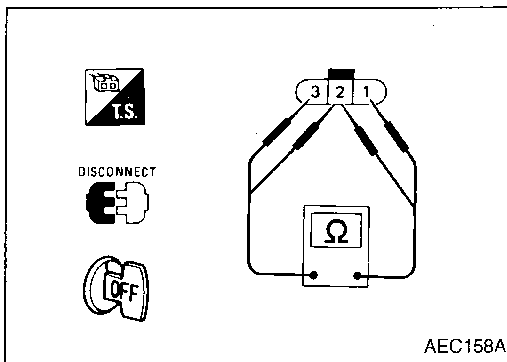
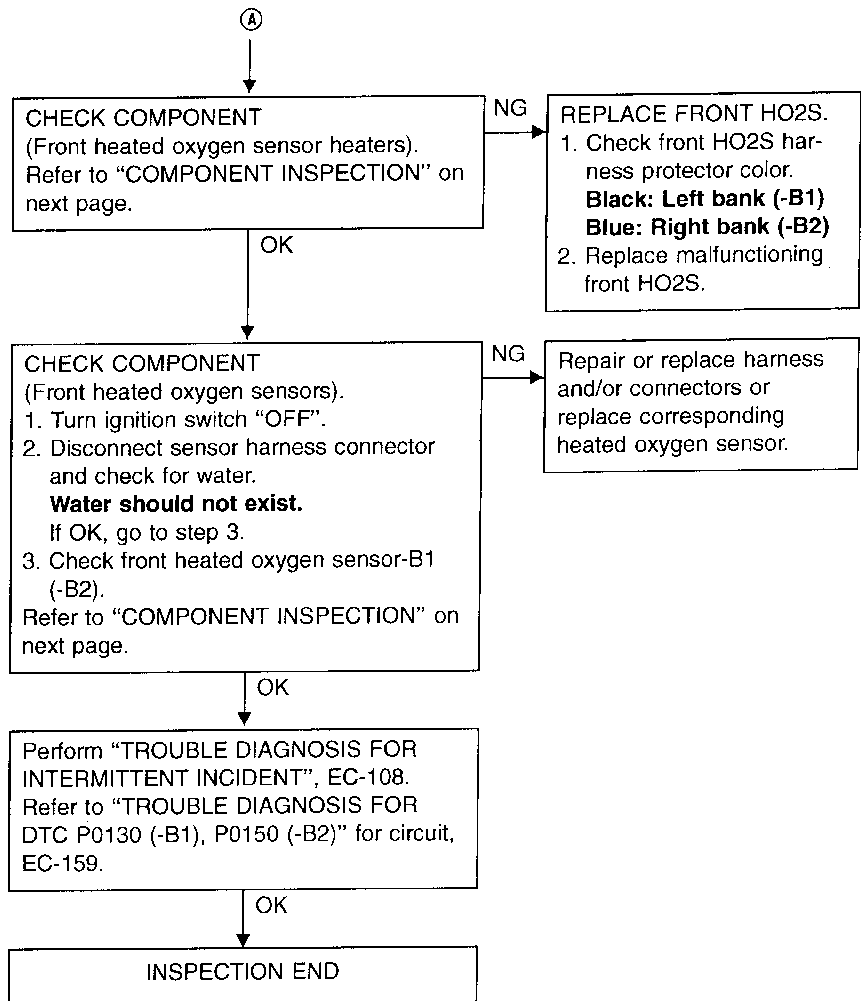
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TROUBLE DIAGNOSIS FOR DTC P0132 (-B1), P0152 (-B2)

Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Left bank), (P0152: Right bank) (Cont'd)



COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

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

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

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

Front heated oxygen sensor



- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM (POS)	2137rpm	
MAS AIR/FL SE	1.96V	
COOLAN TEMP/S	84°C	
FR O2 SEN-B1	0.37V	
FR O2 MNTR-B1	LEAN	
INJ PULSE-B1	2.6msec	
A/F ALPHA-B1	101%	
O2SEN HTR-B1	ON	
RECORD		

SEF700T

TROUBLE DIAGNOSIS FOR DTC P0132 (-B1), P0152 (-B2)

Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Left bank), (P0152: Right bank) (Cont'd)

- 5) Check the following.
- "FR O2 MNTR-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |

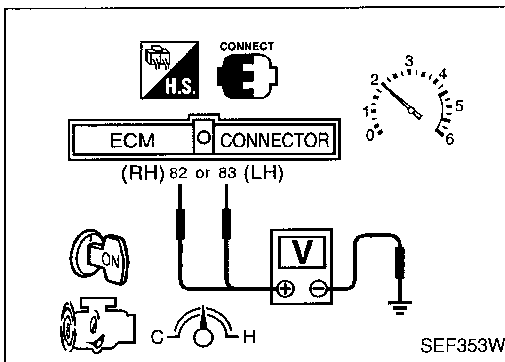
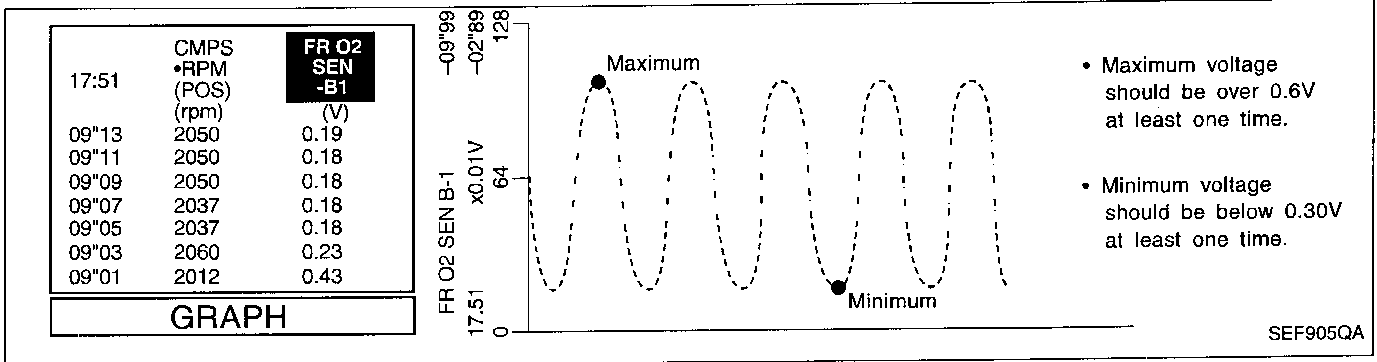
FR O2 MNTR-B1 R-L-R-L-R-L-R-L-R

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

- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.30V at least once.
- The voltage never exceeds 1.0V.

CAUTION:

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

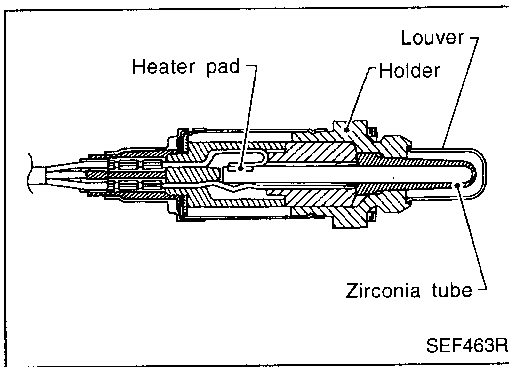


OR

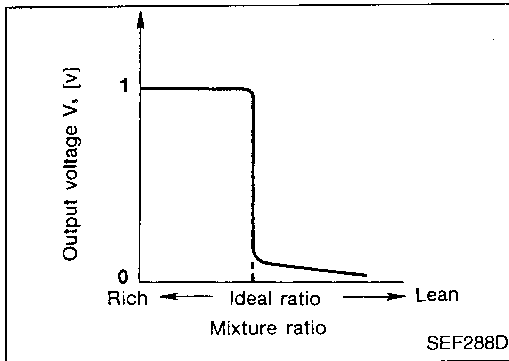


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal 82 RH, 83 LH (sensor signal) and ground.
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR). See EC-57.
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.30V at least one time.
 - The voltage never exceeds 1.0V.

TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)



SEF463R



SEF288D

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Left bank), (P0153: Right bank)

COMPONENT DESCRIPTION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

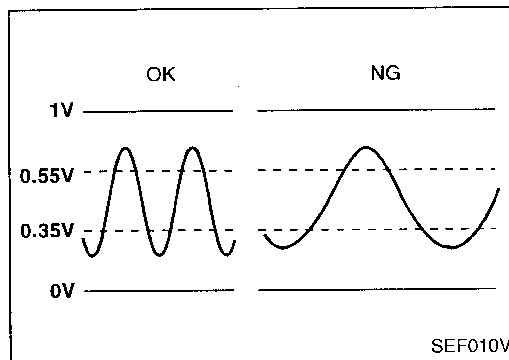
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 SEN-B1 FR O2 SEN-B2	● Engine: After warming up Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR-B1 FR O2 MNTR-B2		LEAN ↔ RICH Changes more than 5 times during 10 seconds.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
82 (RH)	R	Front heated oxygen sensor	Engine is running.	0 - Approximately 1.0V (periodically change)
83 (LH)	W		After warming up to normal operating temperature and engine speed is 2,000 rpm.	



SEF010V

ON BOARD DIAGNOSIS LOGIC

To judge the malfunction of front heated oxygen sensor, this diagnosis measures response time of the front heated oxygen sensor signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and front heated oxygen sensor temperature index. Judgment is based on whether the compensated time (front heated oxygen sensor cycling time index) is inordinately long or not.

TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Left bank), (P0153: Right bank) (Cont'd)

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0133 0409 (Left bank)	<ul style="list-style-type: none"> The response of the voltage signal from the sensor takes more than the specified time. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Front heated oxygen sensor Front heated oxygen sensor heater Fuel pressure injectors Intake air leaks Exhaust gas leaks PCV Mass air flow sensor
P0153 0413 (Right bank)		

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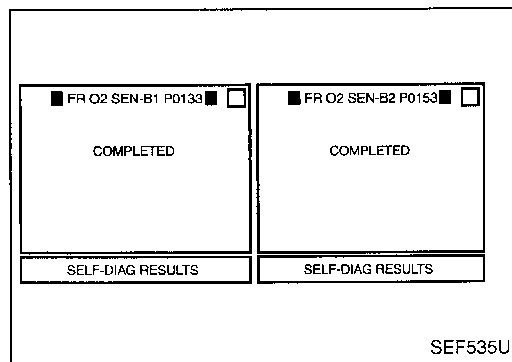
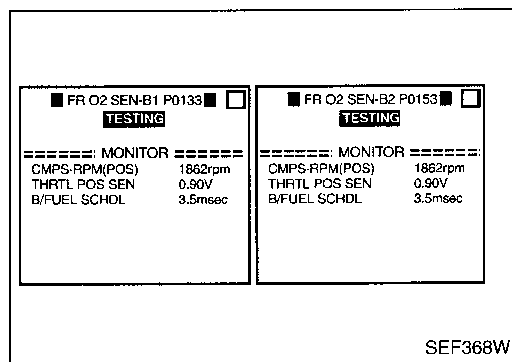
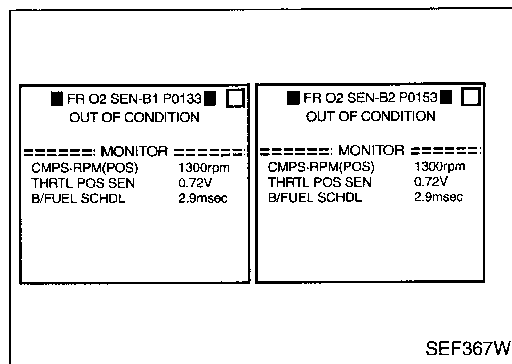
RS

BT

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DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

- Always perform at a temperature of above -10°C (14°F).
- Before performing following procedure, confirm that battery voltage is more than 11V at idle.



- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "FR O2 SEN-B1 (-B2) P0133 (P0153)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine (TCS switch "OFF") and let it idle for at least 3 minutes.

NOTE:

Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5).

- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 40 to 50 seconds.)

Engine speed: 1,700 - 2,500 rpm

Vehicle speed: 78 - 120 km/h (48 - 75 MPH)

B/FUEL SCHDL: 2.2 - 5.0 msec

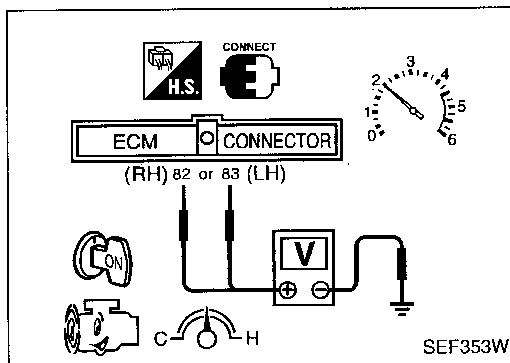
Selector lever: Suitable position

TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Left bank), (P0153: Right bank) (Cont'd)

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

- 7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-183.



OR

OVERALL FUNCTION CHECK

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



- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑧② RH, ⑧③ LH (sensor signal) and 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). See EC-57.
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-183.

TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Left bank), (P0153: Right bank) (Cont'd)

LEFT BANK

EC-FRO2LH-01

GI

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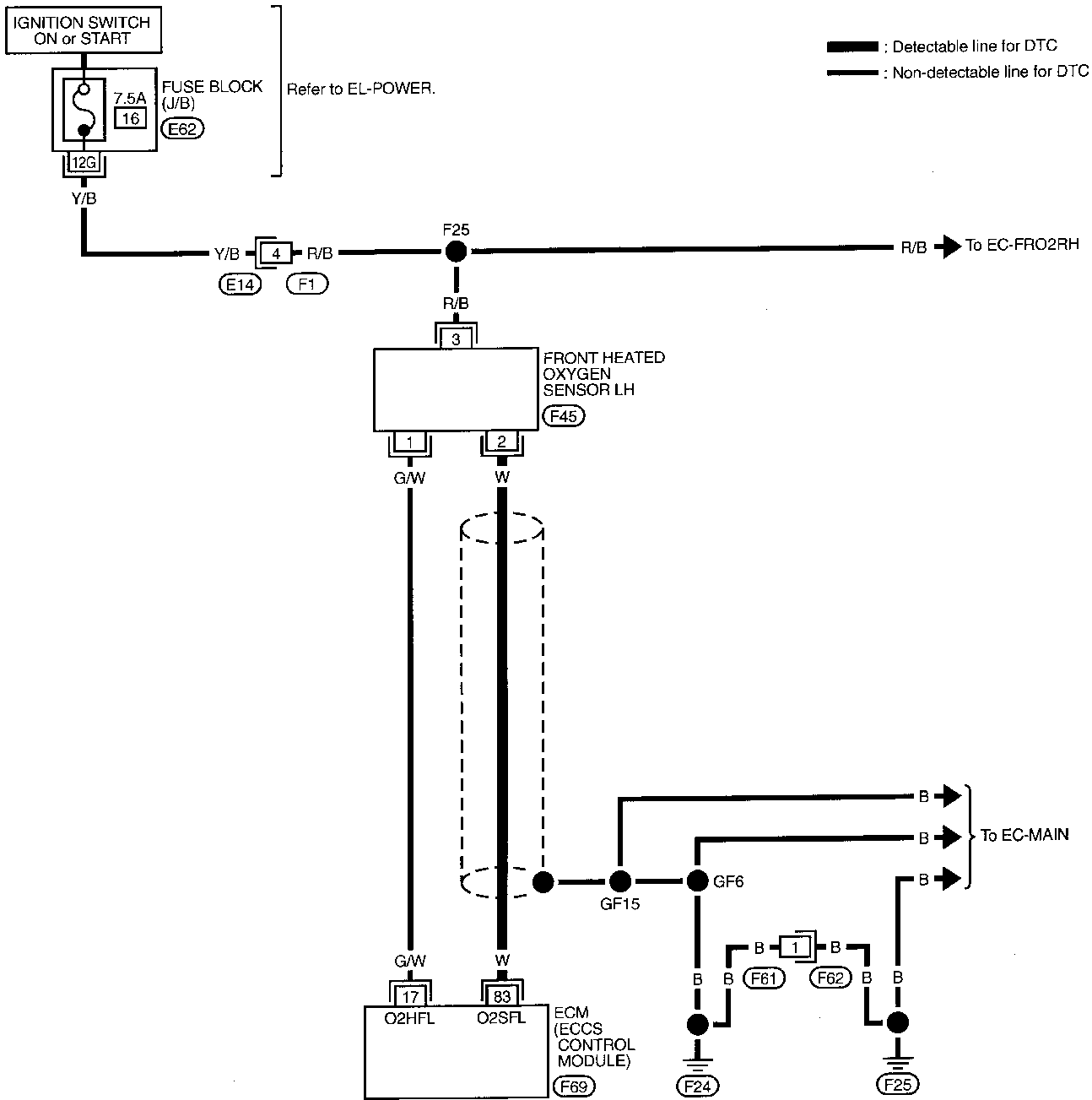
RS

BT

HA

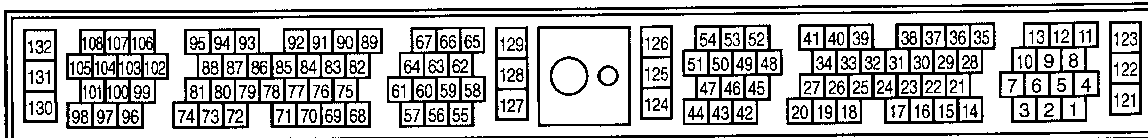
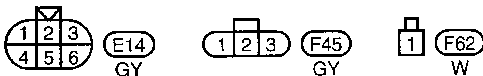
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Refer to last page (Foldout page).

(E62)

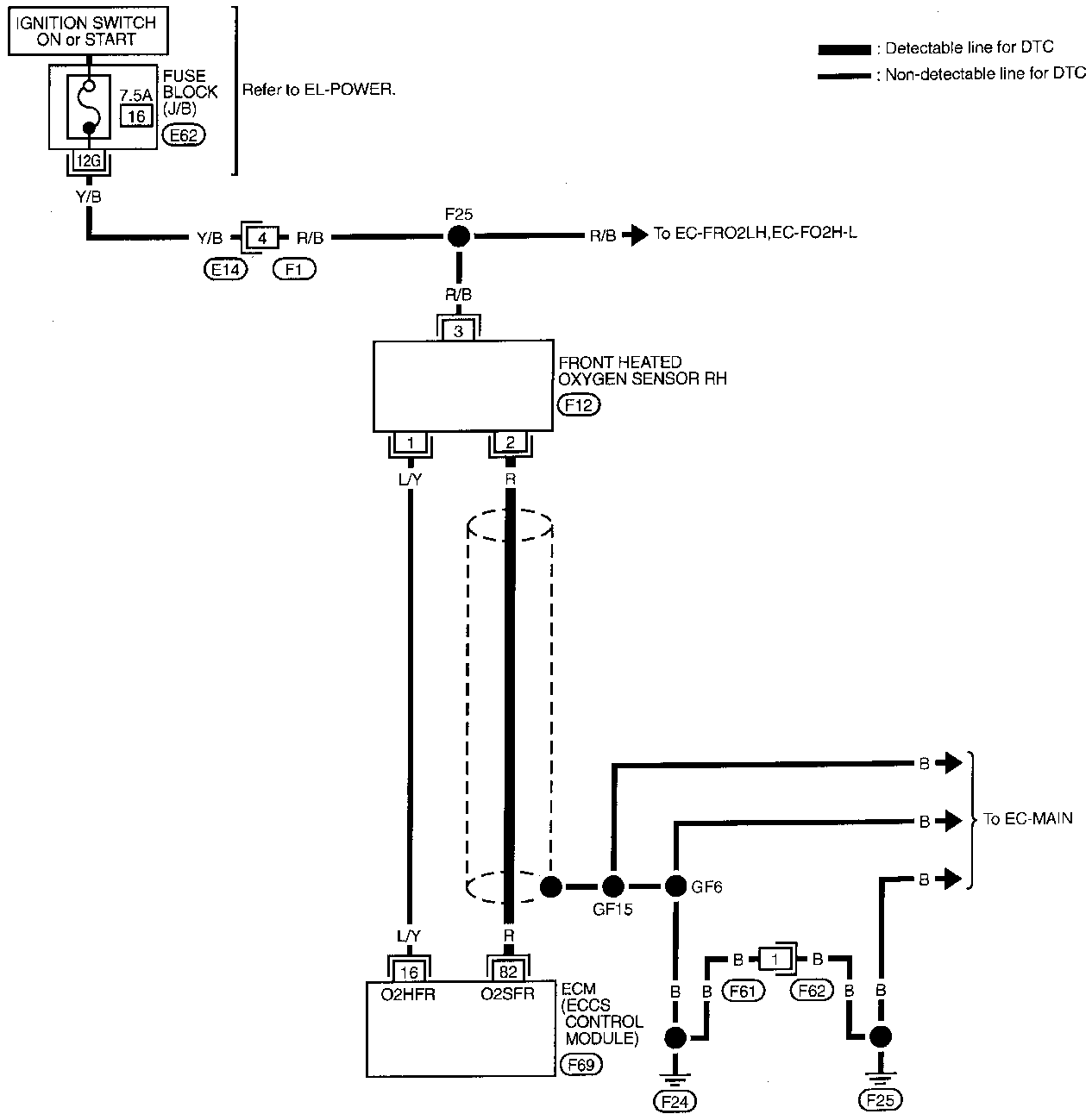


TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Left bank), (P0153: Right bank) (Cont'd)

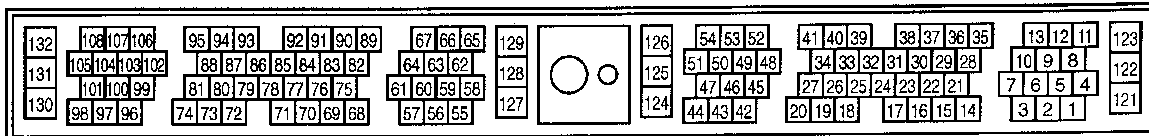
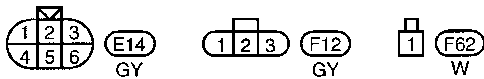
RIGHT BANK

EC-FRO2RH-01



Refer to last page (Foldout page).

(E62)

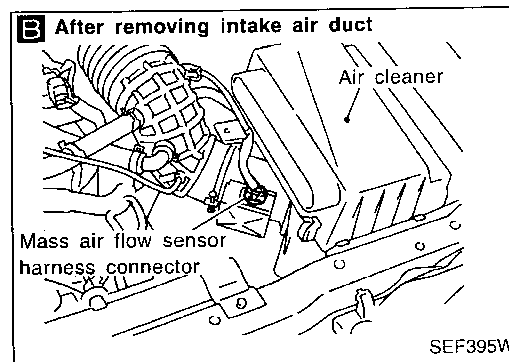
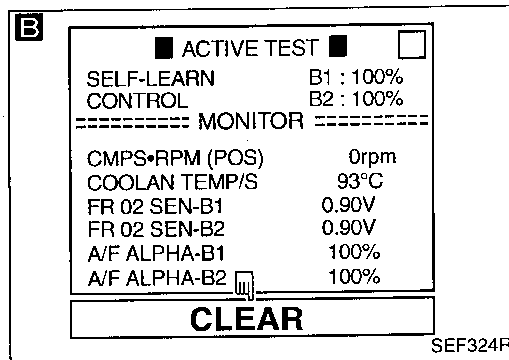
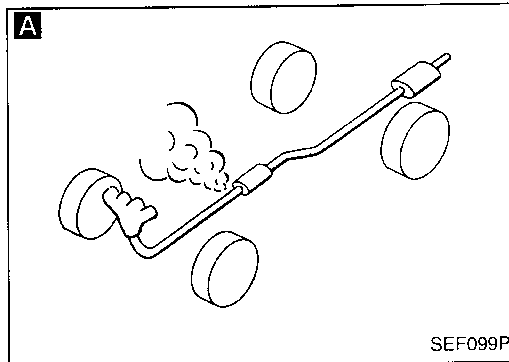
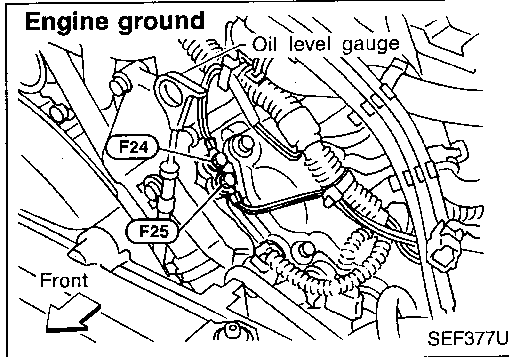
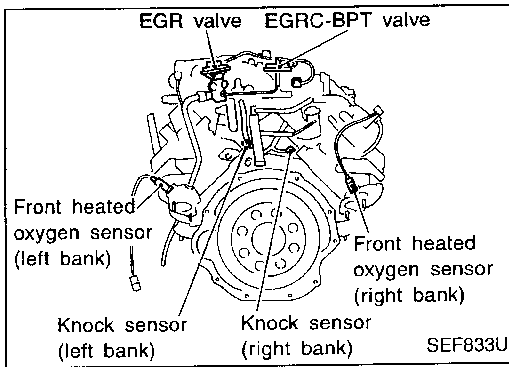


TEC247

TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Left bank), (P0153: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

Loosen and retighten front heated oxygen sensor.
Tightening torque:
40 - 50 N·m (4.1 - 5.1 kg·m, 30 - 37 ft·lb)

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

NG → Repair or replace.

OK
CHECK FOR INTAKE AIR LEAK.
Start engine and run it at idle. Listen for an intake air leak between the mass air flow sensor and the intake manifold.

NG → Repair or replace.

B
CLEAR THE SELF-LEARNING DATA
1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.
Are the 1st trip DTCs P0171, P0174 or P0172, P0175 detected? Is it difficult to start engine?

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0171, P0172", P0174, P0175, EC-235, 241.

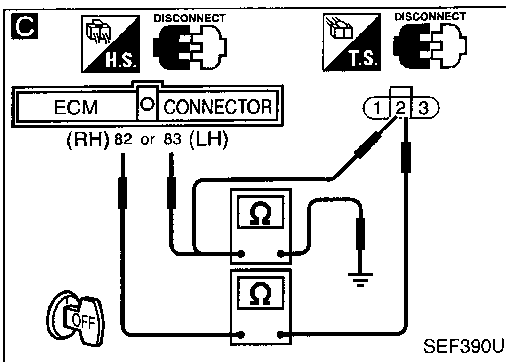
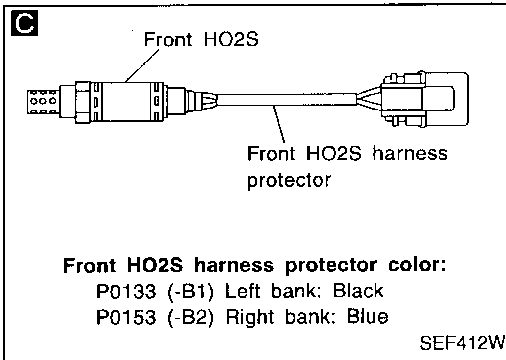
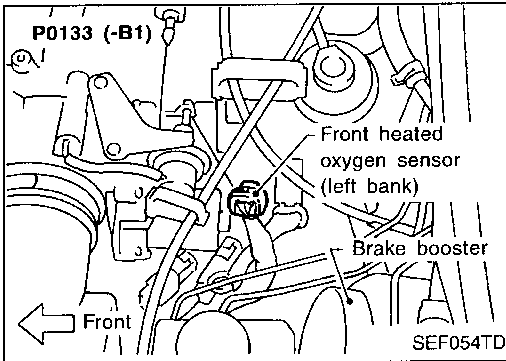
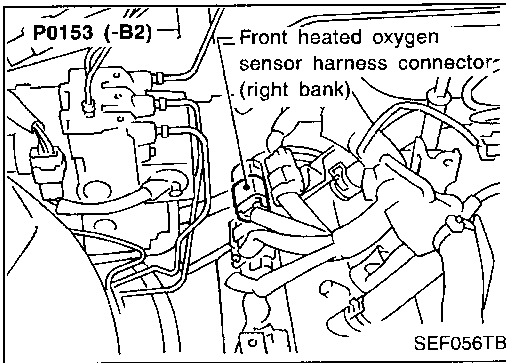
OR
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
7. Run engine for at least 10 minutes at idle speed.
Are the 1st trip DTCs 0115, 0210 or D114, 0209 detected? Is it difficult to start engine?

No
A
(Go to next page.)

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TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Left bank), (P0153: Right bank) (Cont'd)



C

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect corresponding front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM and sensor terminals.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0133	83	2	LH (Black)
P0153	82	2	RH (Blue)

Continuity should exist.

4. Check harness continuity between ECM and sensor or ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	Ground	
P0133	83 or 2	Ground	LH (Black)
P0153	82 or 2	Ground	RH (Blue)

Continuity should not exist.
If OK, check harness for short to ground and short to power.

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

REPLACE FRONT HO2S.
1. Check front HO2S harness protector color.
Black: Left bank (-B1)
Blue: Right bank (-B2)
2. Replace malfunctioning front HO2S.

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

REPLACE FRONT HO2S.
1. Check front HO2S harness protector color.
Black: Left bank (-B1)
Blue: Right bank (-B2)
2. Replace malfunctioning front HO2S.

CHECK COMPONENT (Mass air flow sensor). Refer to "COMPONENT INSPECTION", EC-122.

Replace mass air flow sensor.

CHECK COMPONENT (PCV valve). Refer to "COMPONENT INSPECTION", EC-28.

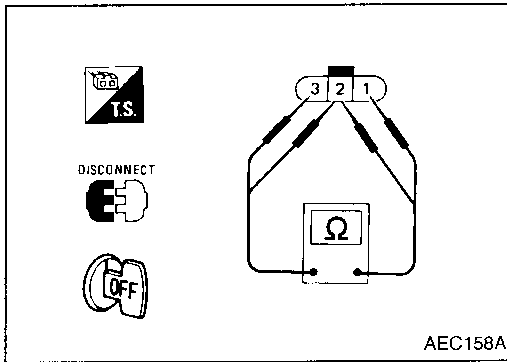
Repair or replace PCV valve.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Left bank), (P0153: Right bank) (Cont'd)



COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

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

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

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

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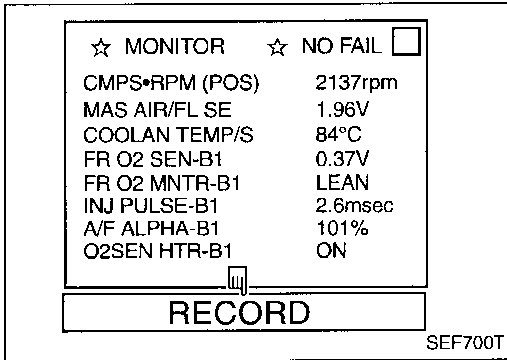
RS

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Front heated oxygen sensor



- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.
- 5) Check the following.

- "FR O2 MNTR-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |

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

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

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

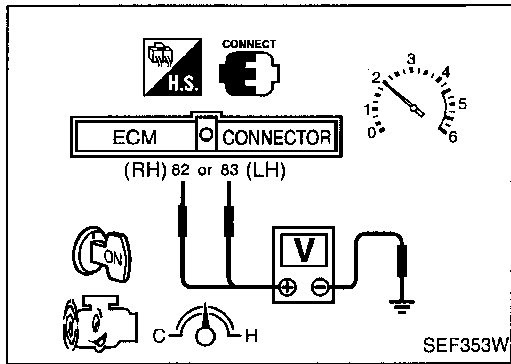
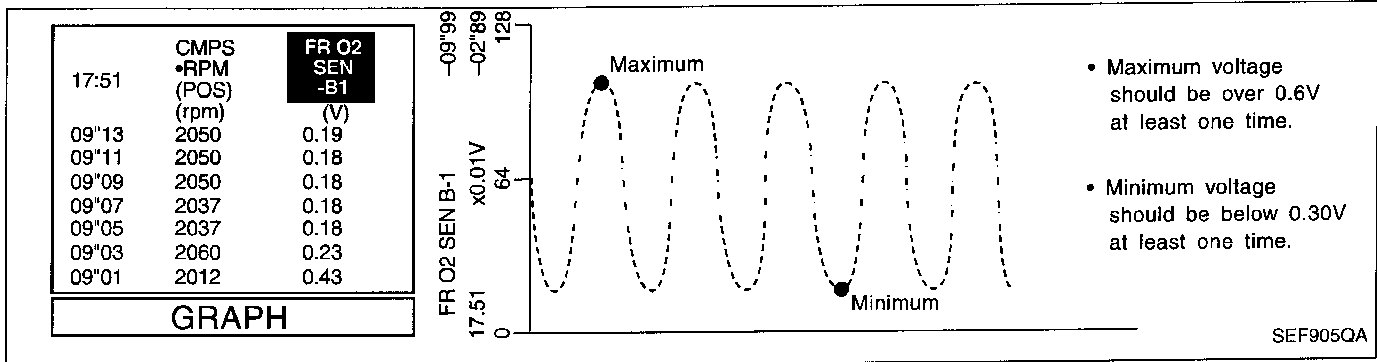
- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.30V at least once.
- The voltage never exceeds 1.0V.

CAUTION:

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

TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Left bank), (P0153: Right bank) (Cont'd)

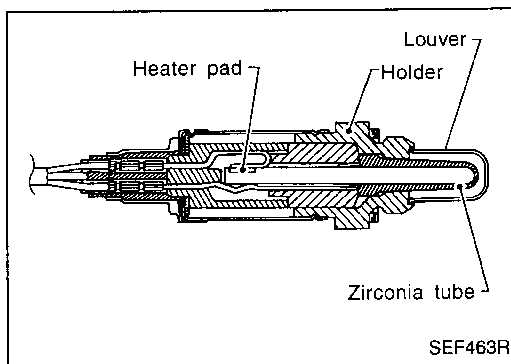


OR

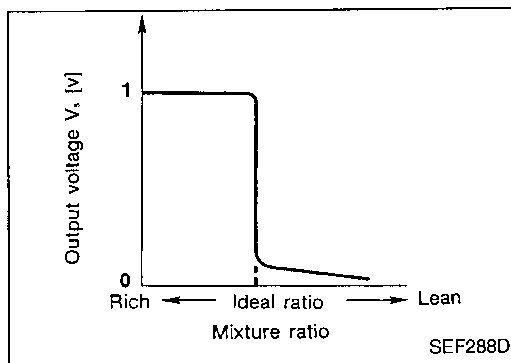


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑧2 RH, ⑧3 LH (sensor signal) and ground.
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR). See EC-57.
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.30V at least one time.
 - The voltage never exceeds 1.0V.

TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)



SEF463R



SEF288D

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Left bank), (P0154: Right bank)

COMPONENT DESCRIPTION

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

GI
MA
EM
LC
EC

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 SEN-B1 FR O2 SEN-B2	● Engine: After warming up Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR-B1 FR O2 MNTR-B2		LEAN ↔ RICH Changes more than 5 times during 10 seconds.

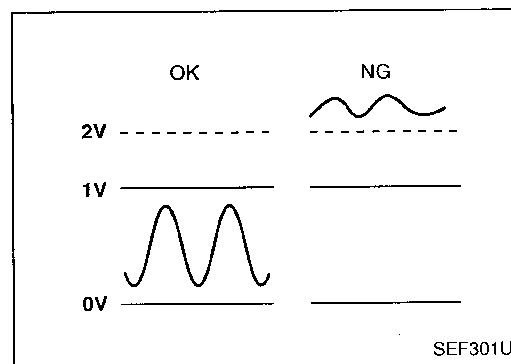
FE
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ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
82 (RH)	R	Front heated oxygen sensor	Engine is running.	0 - Approximately 1.0V (periodically change)
83 (LH)	W		After warming up to normal operating temperature and engine speed is 2,000 rpm.	

ST
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SEF301U

ON BOARD DIAGNOSIS LOGIC

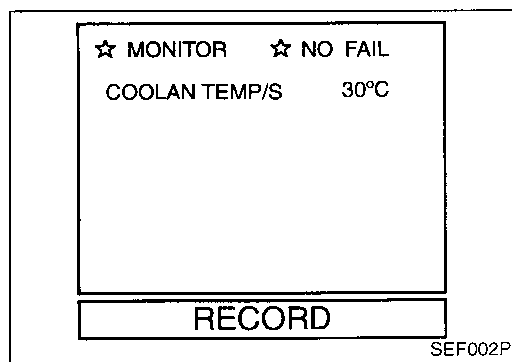
To judge the malfunction, the diagnosis checks that the front heated oxygen sensor output is not inordinately high.

EL
IDX

TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Left bank), (P0154: Right bank) (Cont'd)

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0134 0142 (Left bank)	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Front heated oxygen sensor
P0154 0509 (Right bank)		



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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



With CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "DATA MONITOR" mode with CONSULT.
- 5) Restart engine and let it idle for 32 seconds.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-191.

OR



With GST

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Restart engine and let it idle for 32 seconds.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Restart engine and let it idle for 32 seconds.
- 6) Select "MODE 3" with GST.
- 7) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-191.

OR



Not Tools

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Restart engine and let it idle for 32 seconds.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-191.

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

TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Left bank), (P0154: Right bank) (Cont'd)

LEFT BANK

EC-FRO2LH-01

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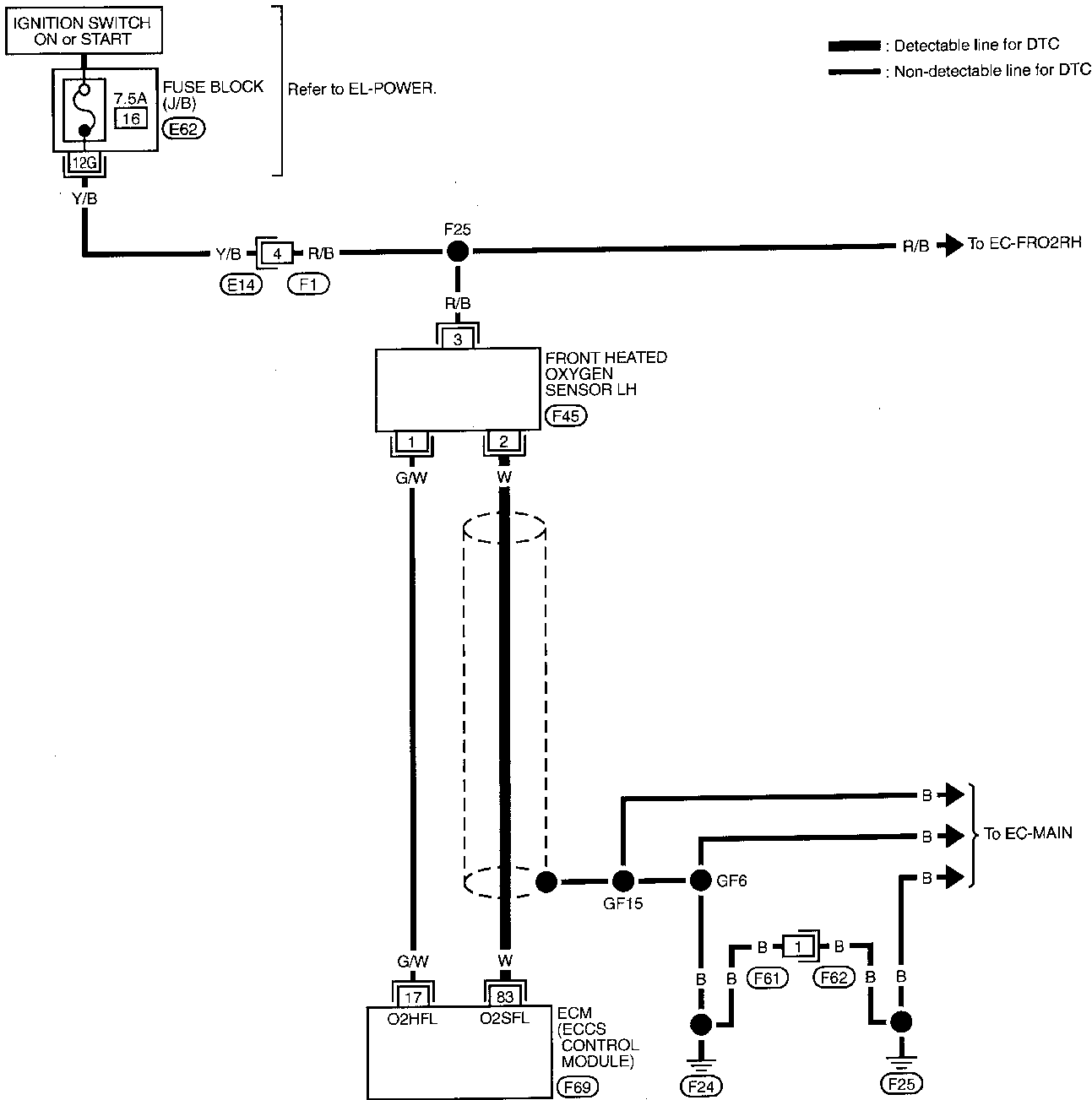
RS

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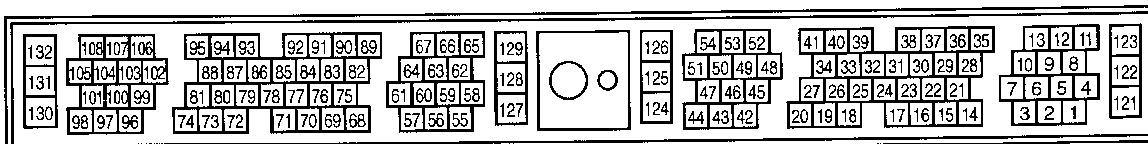
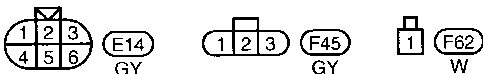
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IDX



Refer to last page (Foldout page).

E62

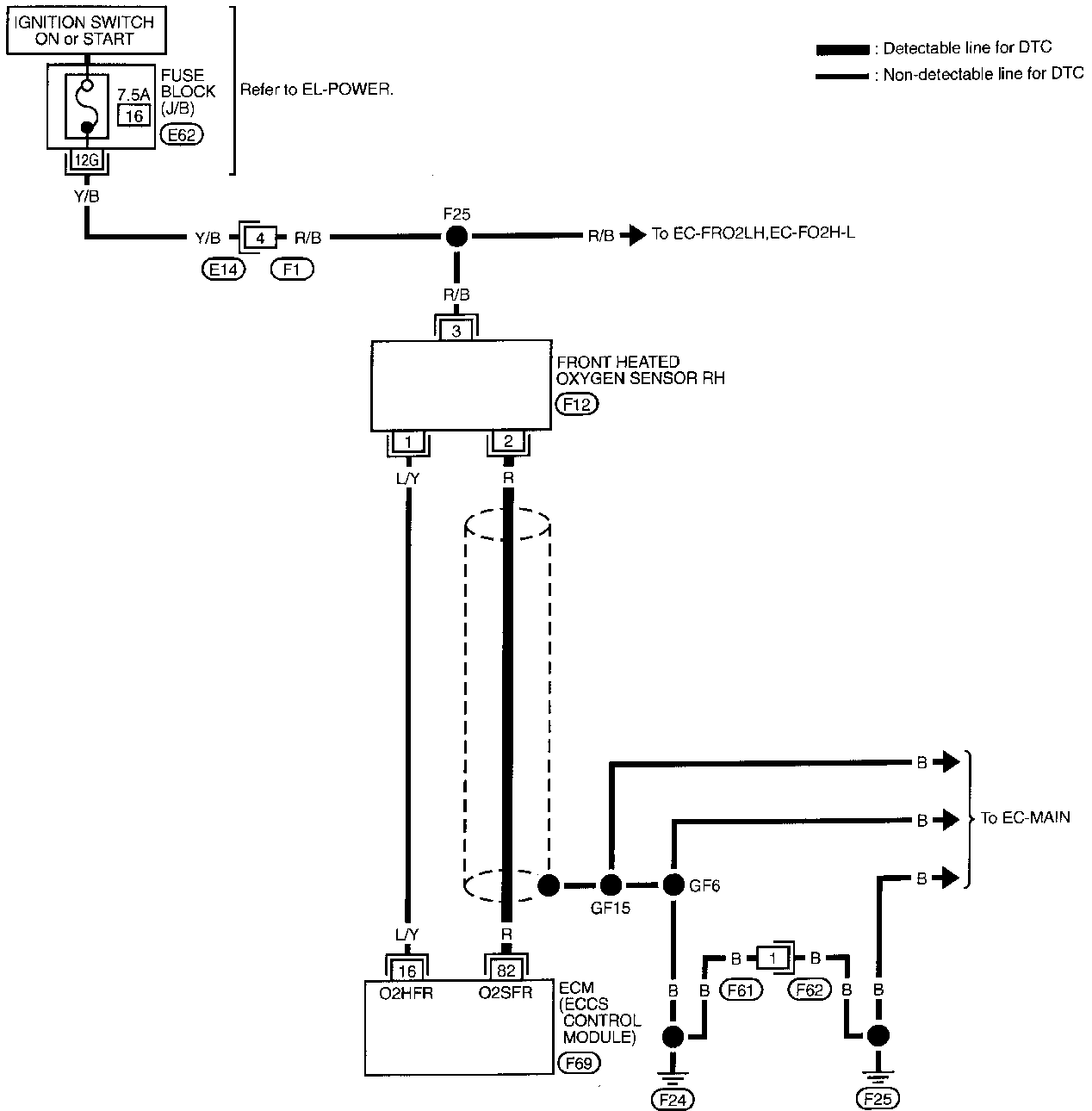


TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Left bank), (P0154: Right bank) (Cont'd)

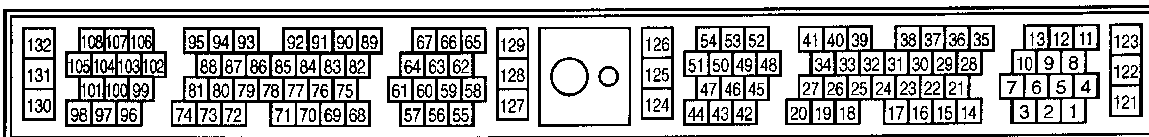
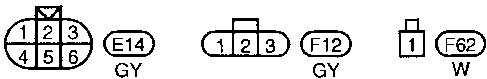
RIGHT BANK

EC-FRO2RH-01



Refer to last page (Foldout page).

(E62)



TEC247

TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Left bank), (P0154: Right bank) (Cont'd)

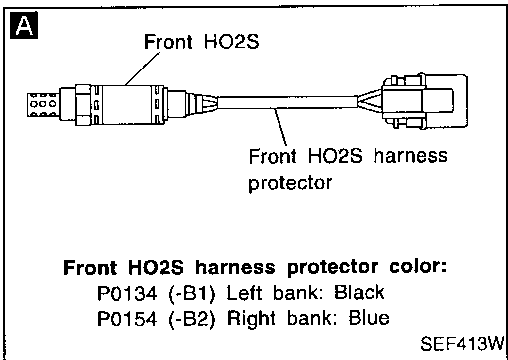
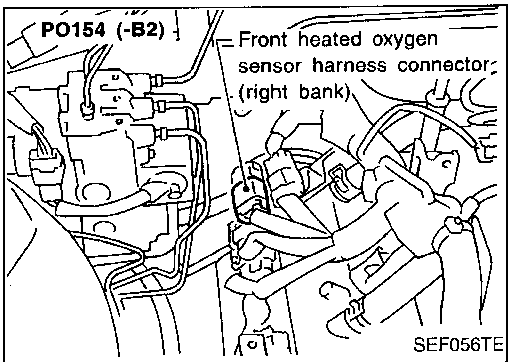
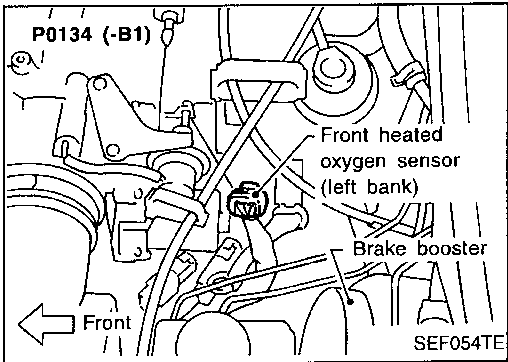
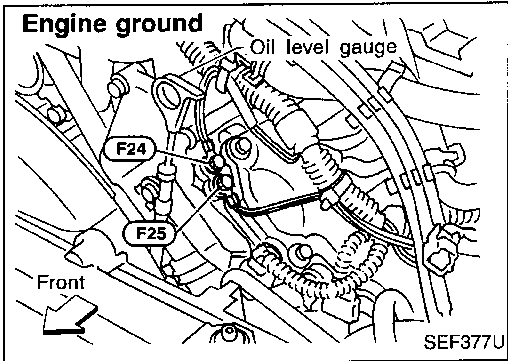
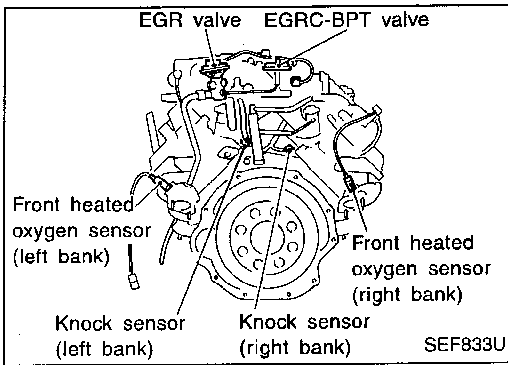
DIAGNOSTIC PROCEDURE

INSPECTION START

Loosen and retighten front heated oxygen sensor.

Tightening torque:

40 - 50 N·m (4.1 - 5.1 kg·m, 30 - 37 ft·lb)



A

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect corresponding front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM and sensor terminals.

NG

Repair harness or connectors.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0134	83	2	LH (Black)
P0154	82	2	RH (Blue)

Continuity should exist.

4. Check harness continuity between ECM and sensor or ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	Ground	
P0134	83 or 2	Ground	LH (Black)
P0154	82 or 2	Ground	RH (Blue)

Continuity should not exist.

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

OK

A

(Go to next page.)

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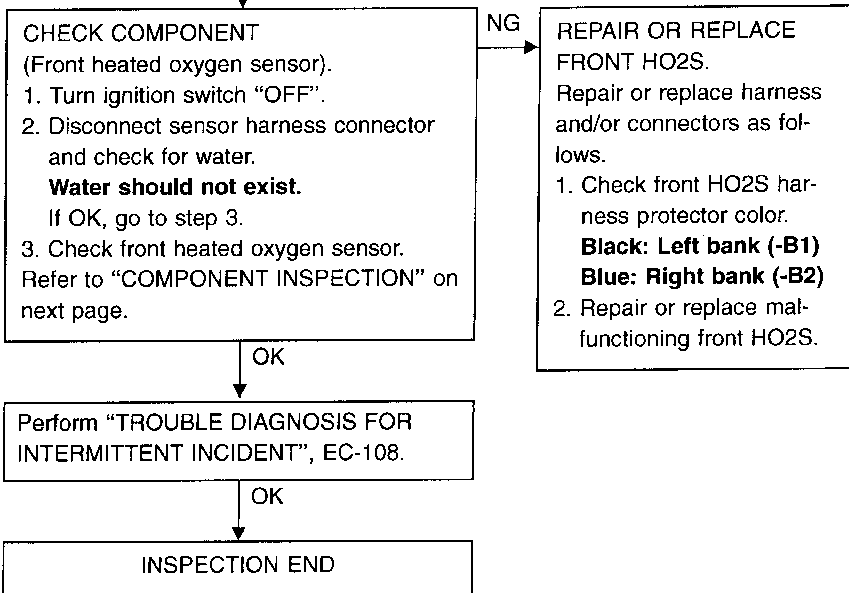
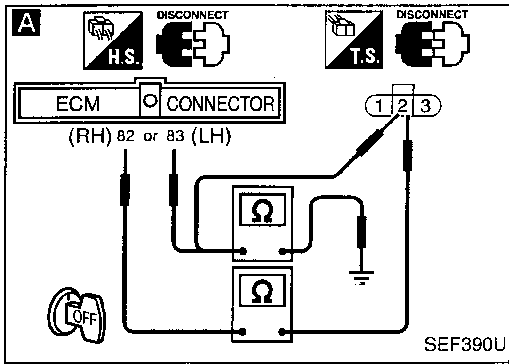
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TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Left bank), (P0154: Right bank) (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Left bank), (P0154: Right bank) (Cont'd)

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM (POS)	2137rpm	
MAS AIR/FL SE	1.96V	
COOLAN TEMP/S	84°C	
FR O2 SEN-B1	0.37V	
FR O2 MNTR-B1	LEAN	
INJ PULSE-B1	2.6msec	
A/F ALPHA-B1	101%	
O2SEN HTR-B1	ON	
RECORD		

SEF700T

COMPONENT INSPECTION

Front heated oxygen sensor

- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.
- 5) Check the following.
 - "FR O2 MNTR-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |

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

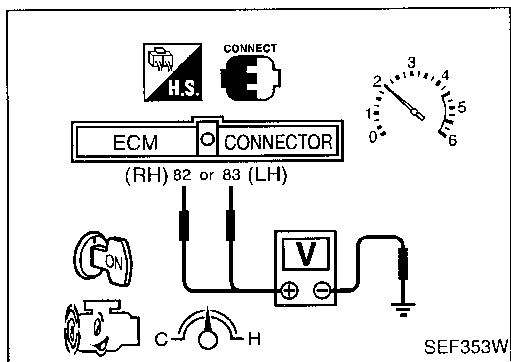
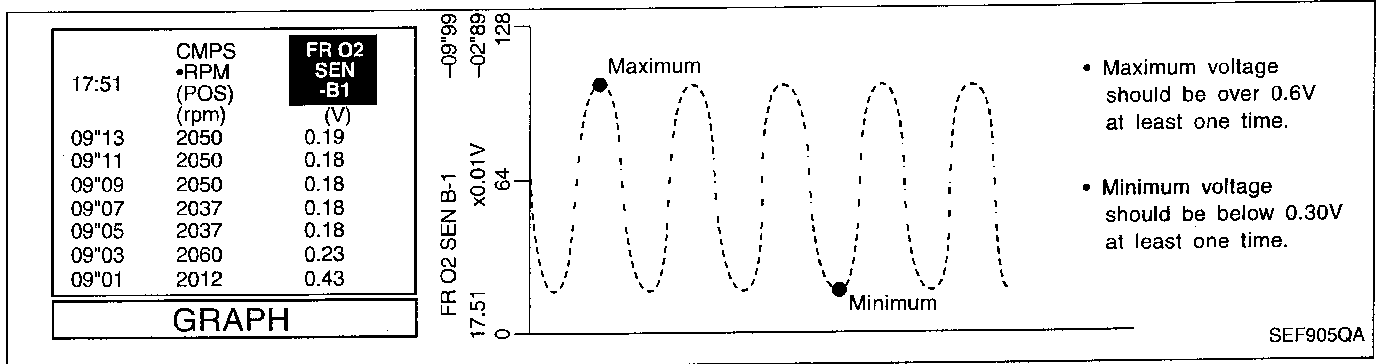
R = "FR O2 MNTR-B1 (-B2)", "RICH"

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

- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.30V at least once.
- The voltage never exceeds 1.0V.

CAUTION:

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



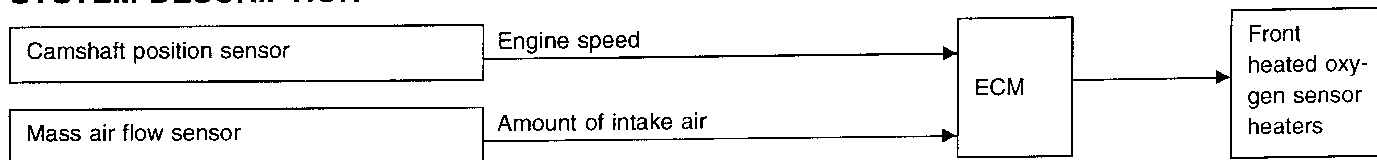
OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑧2 RH, ⑧3 LH (sensor signal) and 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). See EC-57.
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.30V at least one time.
 - The voltage never exceeds 1.0V.

TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

Front Heated Oxygen Sensor Heater (P0135: Left bank), (P0155: Right bank)

SYSTEM DESCRIPTION



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

OPERATION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
O2 SEN HTR-B1	• Engine speed: Idle	ON
O2 SEN HTR-B2	• Engine speed: Above 3,200	OFF

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (12B) (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
17 (LH)	G/W	Front heated oxygen sensor heaters (left bank)	Engine is running. └ Engine speed is below 3,200 rpm.	0 - 0.5V
16 (RH)	L/Y		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 (Left bank)	• The current amperage in the front heated oxygen sensor heater circuit is out of the normal range. (The improper voltage drop signal is sent to ECM through the front heated oxygen sensor heater.)	• Harness or connectors (The front heated oxygen sensor heater circuit is open or shorted.) • Front heated oxygen sensor heater
P0155 1001 (Right bank)		

TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM (POS)	650rpm	
MAS AIR/FL SE	1.28V	
COOLANT TEMP/S	90°C	
FR O2 SEN-B1	0.04V	
FR O2 SEN-B2	0.04V	
FR O2 MNTR-B1	LEAN	
FR O2 MNTR-B2	LEAN	
FR O2 HTR-B1	ON	
FR O2 HTR-B2	ON	
RECORD		

SEF630U

Front Heated Oxygen Sensor Heater (P0135: Left bank), (P0155: Right bank) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

TESTING CONDITION:

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



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 6 seconds at idle speed.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-198.

OR



- 1) Start engine and run it for at least 6 seconds at idle speed.
- 2) Select "MODE 3" with GST.
- 3) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-198.

OR



- 1) Start engine and run it for at least 6 seconds in idle condition.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-198.

- 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.

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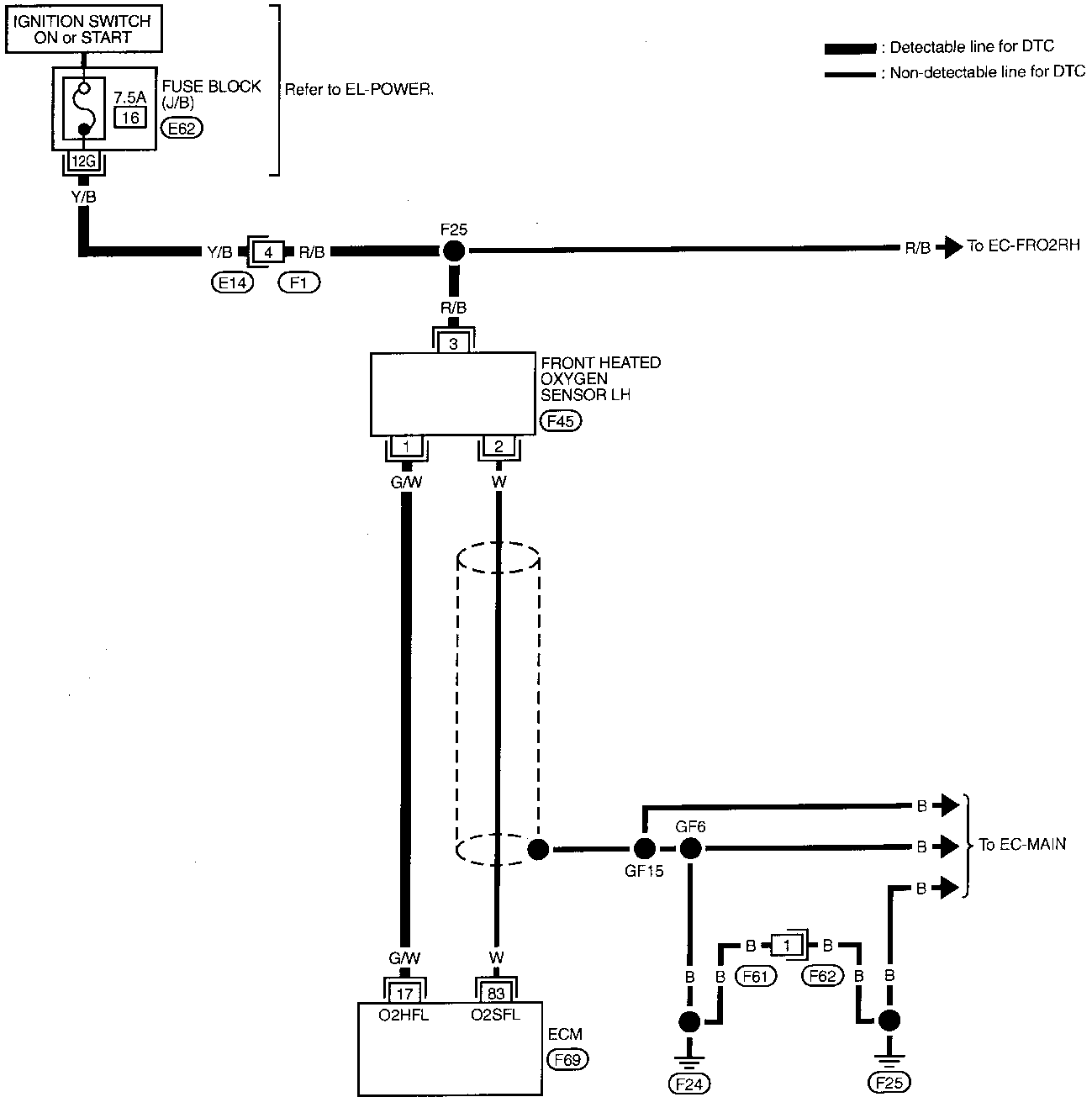
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TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

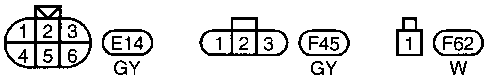
Front Heated Oxygen Sensor Heater (P0135: Left bank), (P0155: Right bank) (Cont'd)

LEFT BANK

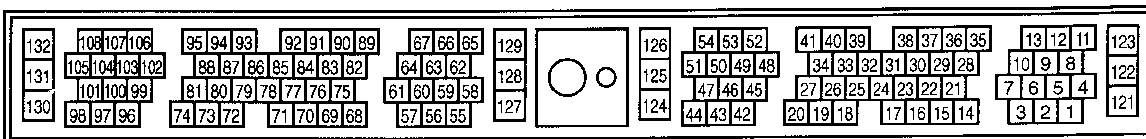
EC-FO2H-L-01



Refer to last page (Foldout page).



E62

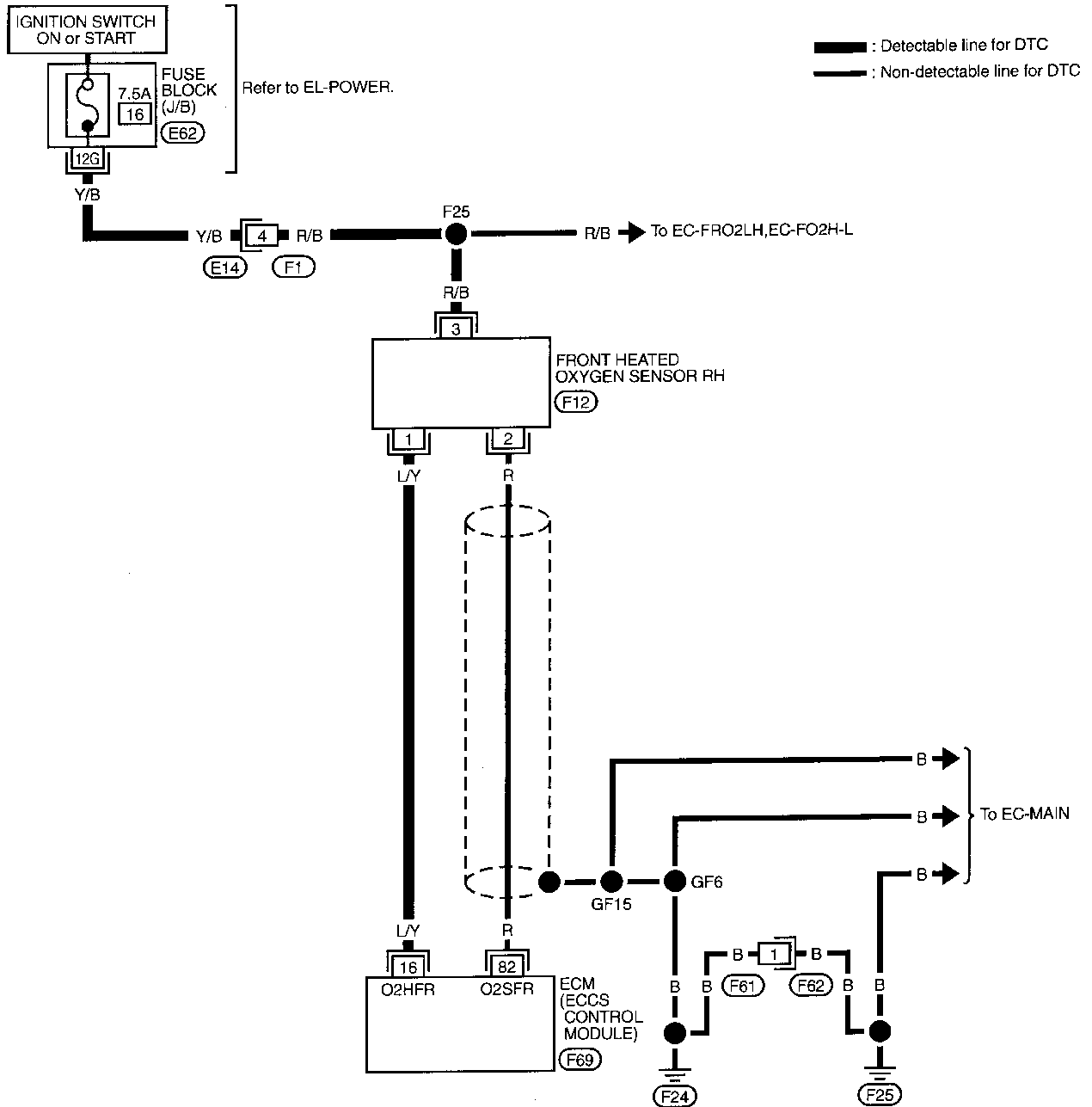


TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

Front Heated Oxygen Sensor Heater (P0135: Left bank), (P0155: Right bank) (Cont'd)

RIGHT BANK

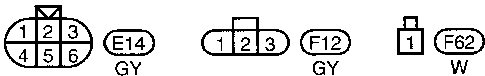
EC-FO2H-R-01



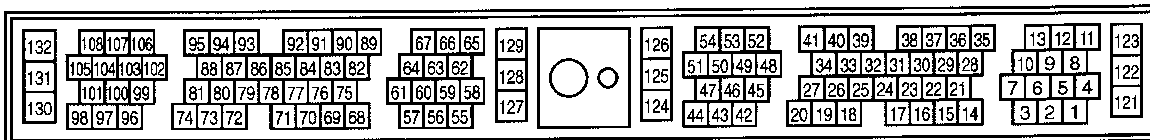
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Refer to last page (Foldout page).

(E62)



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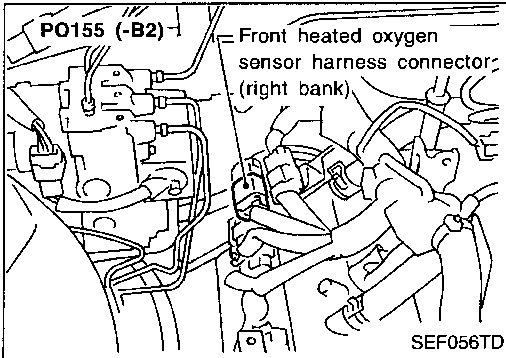
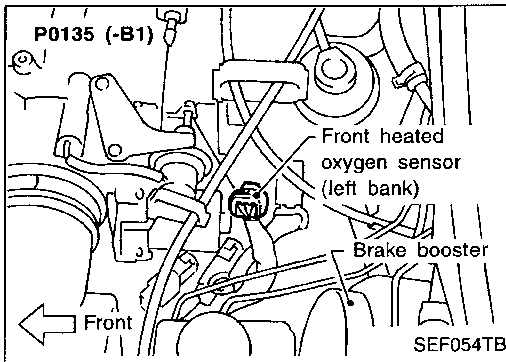


TEC250

TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

Front Heated Oxygen Sensor Heater (P0135: Left bank), (P0155: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect corresponding front heated oxygen sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ③ and ground.

Voltage: Battery voltage

NG

Check the following.

- Harness connectors
- F1, E14
- 7.5A fuse
- Harness for open or short between front heated oxygen sensor and fuse

If NG, repair harness or connectors.

B

CHECK GROUND CIRCUIT.

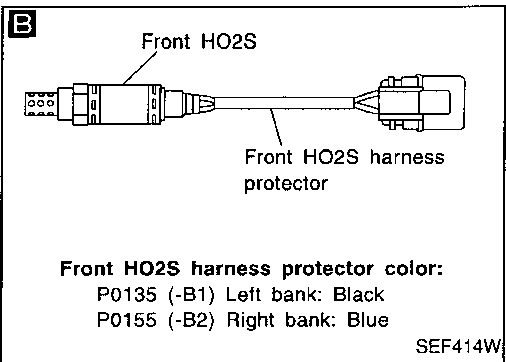
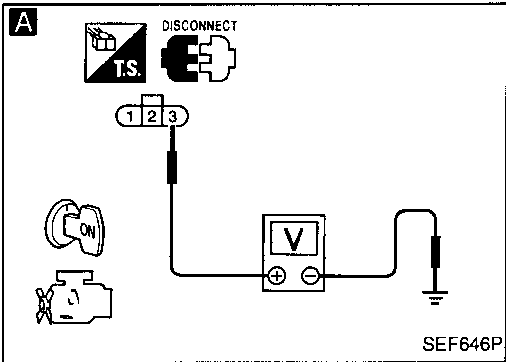
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal and sensor.

NG

Repair harness or connectors.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0135	17	1	LH (Black)
P0155	16	1	RH (Blue)

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



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

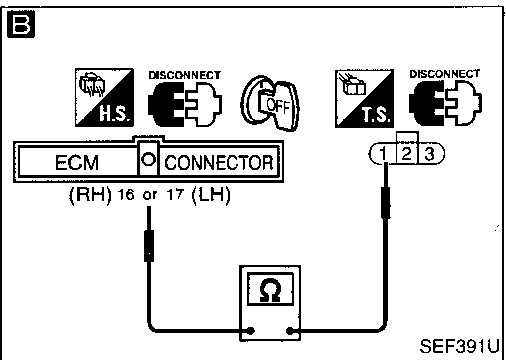
NG

REPLACE FRONT HO2S.

1. Check front HO2S harness protector color.
Black: Left bank (-B1)
Blue: Right bank (-B2)
2. Replace malfunctioning front HO2S.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END



TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

Front Heated Oxygen Sensor Heater (P0135: Left bank), (P0155: Right bank) (Cont'd)

COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

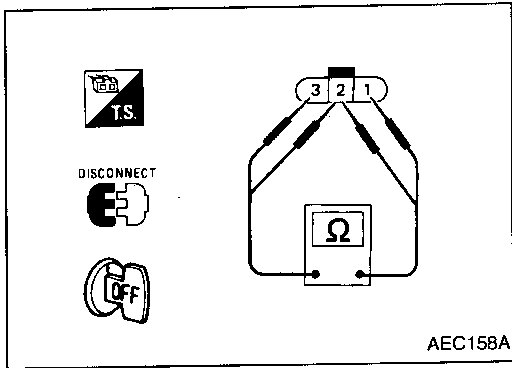
Check continuity between terminals ② and ①, ③ and ②.

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

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



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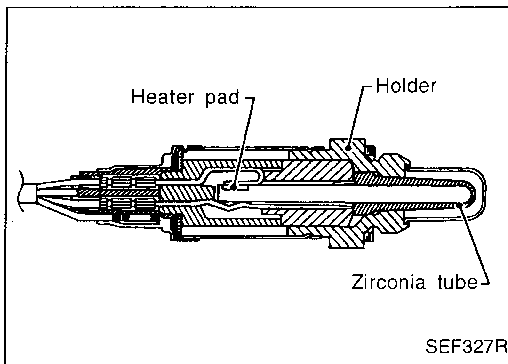
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TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2)



Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Left bank), (P0157: Right bank)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

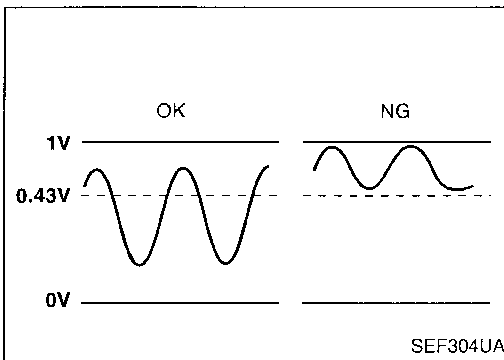
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 SEN-B1 RR O2 SEN-B2	● Engine: After warming up Revsing engine from idle up to 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
89 (RH)	W	Rear heated oxygen sensors	Engine is running.	0 - Approximately 1.0V
90 (LH)	Y		After warming up to normal operating temperature and revving engine from idle up to 2,000 rpm.	



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 whether the minimum voltage of the sensor is sufficiently low during the various driving condition such as fuel-cut.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0137 0511 (Left bank)	● The minimum voltage from the sensor is not reached to the specified voltage.	<ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open.) ● Rear heated oxygen sensors ● Fuel pressure ● Injectors
P0517 0314 (Right bank)		

TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2)

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Left bank), (P0157: Right bank) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- "COMPLETED" will appear on CONSULT screen when all tests "COND1", "COND2" and "COND3" are completed.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Never stop engine during this test. If the engine is stopped, reperform this test from step 2).



Procedure for COND1

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "RR O2 SEN-B1 (-B2) P0137 (P0157)" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine (TCS switch "OFF") and let it idle for at least 30 seconds.
- 6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load. If "COMPLETED" appears on CONSULT screen, go to step 10). If "COMPLETED" does not appear on CONSULT screen, go to the following step.
- 7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 8) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED" (It will take approximately 60 seconds.)

CMPS-RPM (POS): 1,400 - 2,200 rpm
Vehicle speed: 78 - 100 km/h (48 - 62 MPH)
B/FUEL SCHDL: 1.0 - 4.5 msec
Selector lever: Suitable position

NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 9).

Procedure for COND2

- 9) While driving release accelerator pedal completely with "OD" OFF from the above condition (step 8) until "INCOMPLETE" at "COND2" on CONSULT screen has turned to "COMPLETED". (It will take approximately 4 seconds.)
- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 10).

<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p>COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 925rpm THRRTL POS SEN 0.46V B/FUEL SCHDL 1.5msec</p>	<p>■ RR O2 SEN-B2 P0157 ■ □</p> <p>COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 925rpm THRRTL POS SEN 0.46V B/FUEL SCHDL 1.5msec</p>
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<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p>COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>	<p>■ RR O2 SEN-B2 P0157 ■ □</p> <p>COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF370W

<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p>COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>	<p>■ RR O2 SEN-B2 P0157 ■ □</p> <p>COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF371W

<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p>COND1: COMPLETED COND2: COMPLETED COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1050rpm THRRTL POS SEN 0.51V B/FUEL SCHDL 1.0msec</p>	<p>■ RR O2 SEN-B2 P0157 ■ □</p> <p>COND1: COMPLETED COND2: COMPLETED COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1050rpm THRRTL POS SEN 0.51V B/FUEL SCHDL 1.0msec</p>
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SEF372W

<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p style="text-align: center;">COMPLETED</p> <p>SELF-DIAG RESULTS</p>	<p>■ RR O2 SEN-B2 P0157 ■ □</p> <p style="text-align: center;">COMPLETED</p> <p>SELF-DIAG RESULTS</p>
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TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2)

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Left bank), (P0157: Right bank) (Cont'd)

Procedure for COND3

- 10) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
- 11) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-205.

OR

OVERALL FUNCTION CHECK

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

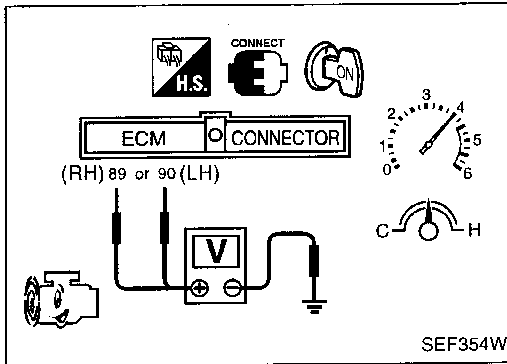


- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑧⑧ (RH), ⑨⑨ (LH) (sensor signal) and ground.
- 4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
(depress and release accelerator pedal as soon as possible)

The voltage should be below 0.43V at least once during this procedure.

If the voltage can be confirmed in step 4, step 5 is not necessary.

- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.
The voltage should be below 0.43V at least once during this procedure.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-205.



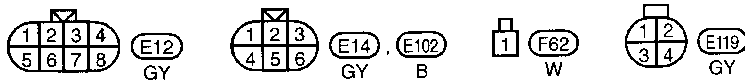
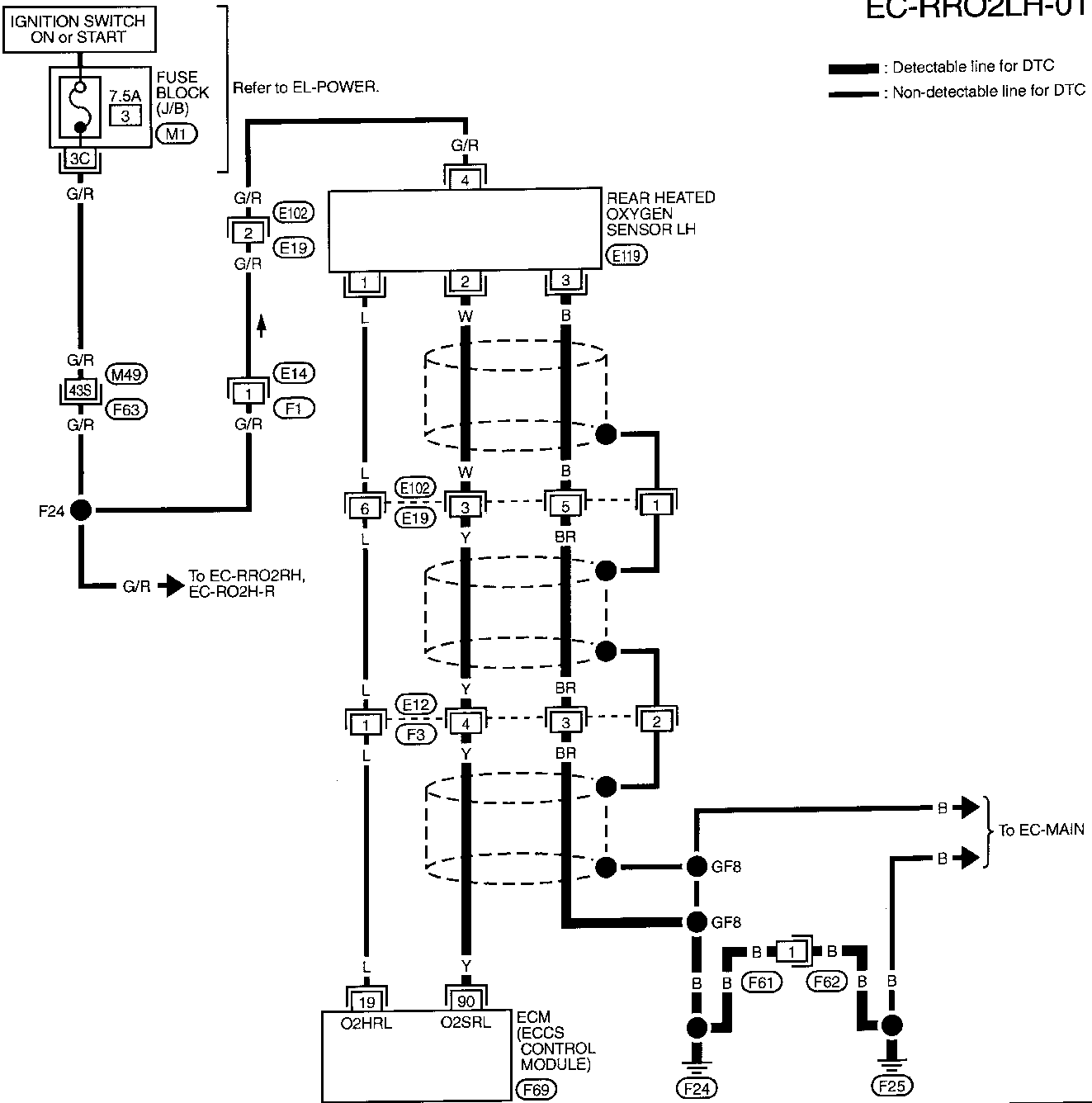
TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2)

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Left bank), (P0157: Right bank) (Cont'd)

LEFT BANK

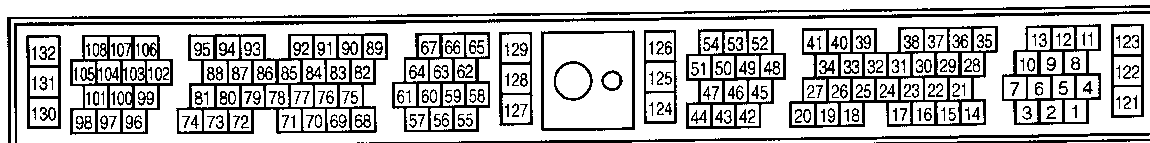
EC-RRO2LH-01

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



Refer to last page (Foldout page).

M49, F63
 M1



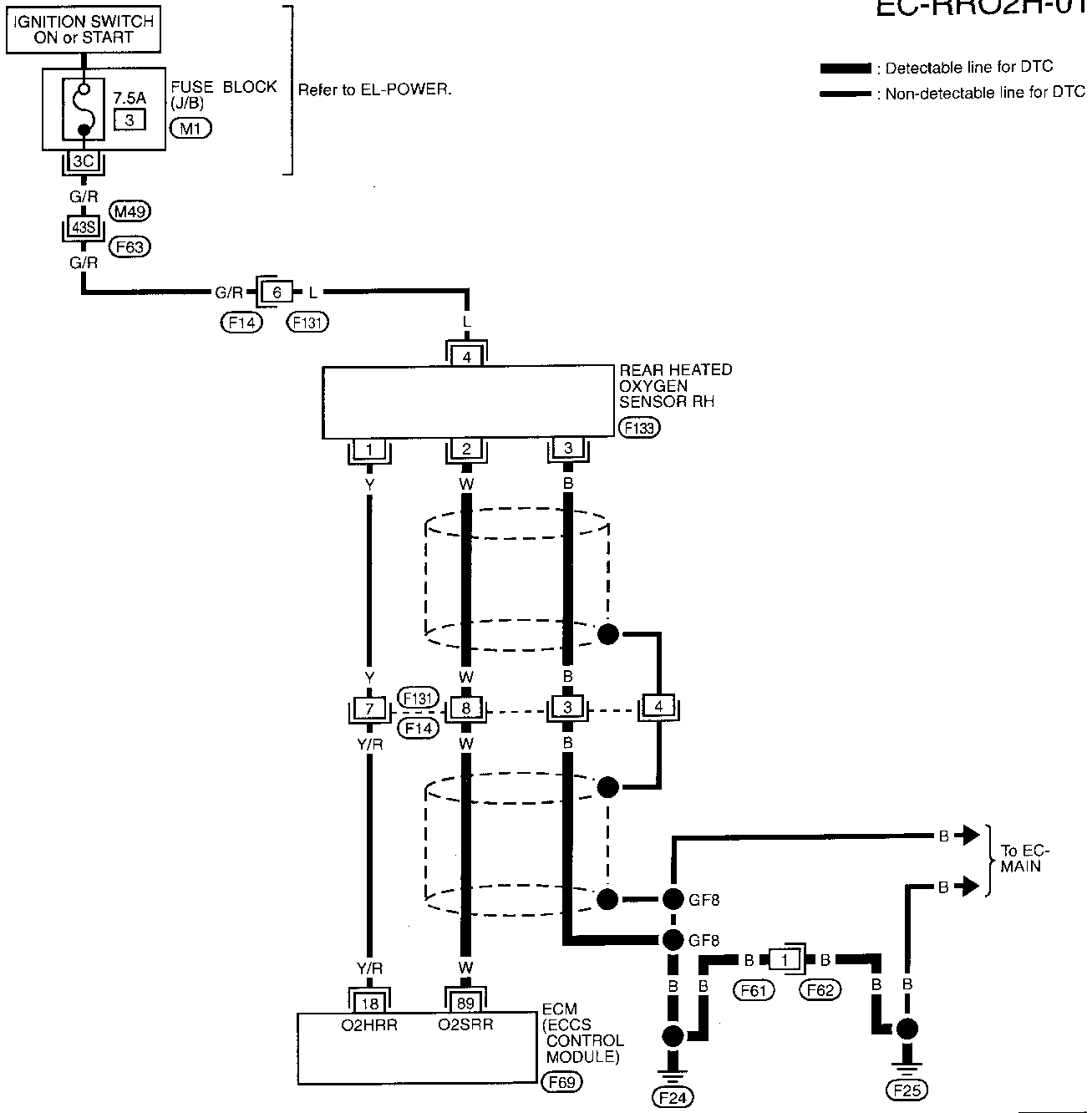
TEC245

TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2)

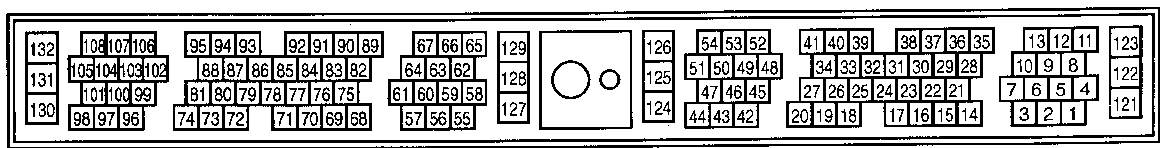
Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Left bank), (P0157: Right bank) (Cont'd)

RIGHT BANK

EC-RRO2H-01



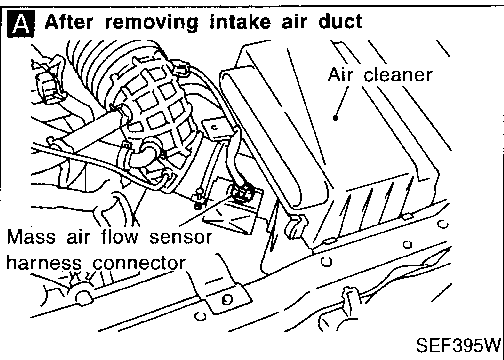
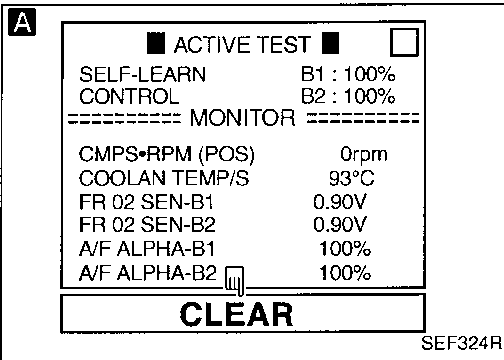
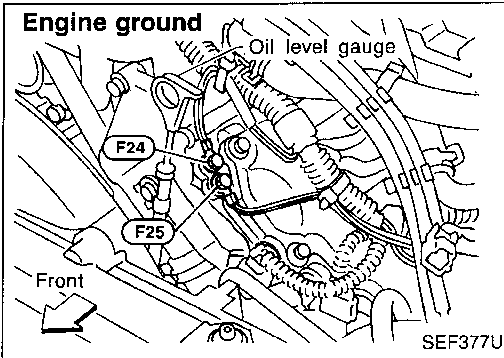
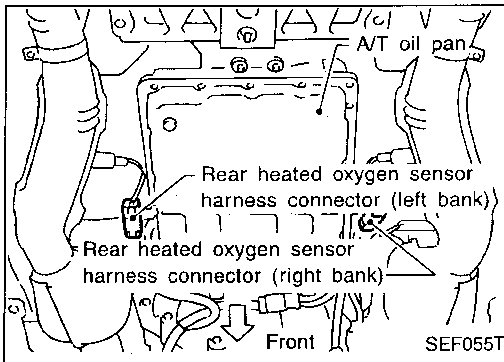
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TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2)

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Left bank), (P0157: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

A

CLEAR THE SELF-LEARNING DATA

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.

Are the 1st trip DTCs P0172, P0175 detected? Is it difficult to start engine?

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0172, P0175", EC-241.

OR

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

Are the 1st trip DTCs 0114, 0209 detected? Is it difficult to start engine?

No ↓

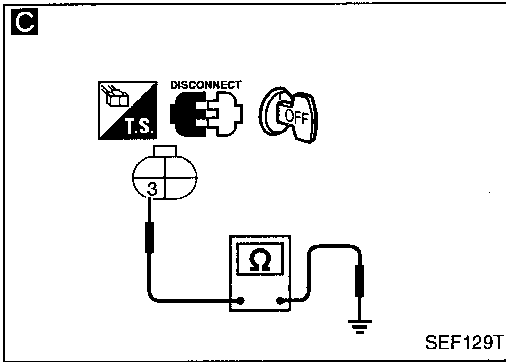
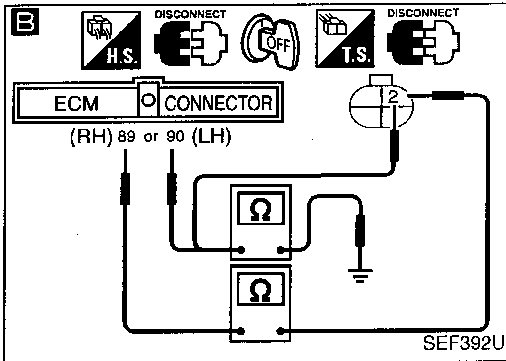
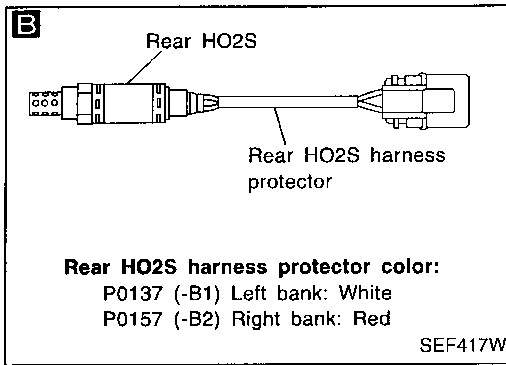
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TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2)

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Left bank), (P0157: Right bank) (Cont'd)



B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect corresponding rear heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminals and sensor.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0137	90	2	LH (White)
P0157	89	2	RH (Red)

Continuity should exist.

4. Check harness continuity between ECM and sensor or ground terminals.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	Ground	
P0137	90 or 2	Ground	LH (White)
P0157	89 or 2	Ground	RH (Red)

Continuity should not exist.
 If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (F3, E12) (LH) or (F14, F131) (RH)
- Harness connectors (E19, E102) (LH)

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

C

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Loosen and retighten ground screws.
3. Check harness continuity between terminal ③ and engine ground.

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

NG

Check the following.

- Harness connectors (F3, E12) (LH) or (F14, F131) (RH)
- Harness connectors (E19, E102) (LH)
- Harness connectors (F62, F61)
- Harness for open or short between rear heated oxygen sensor and engine ground

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

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

NG

REPLACE REAR HO2S.

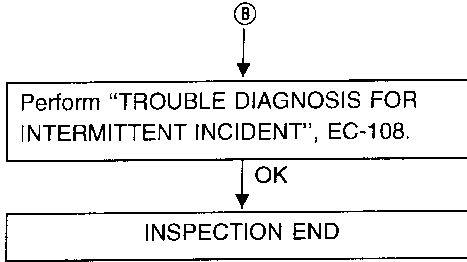
1. Check rear HO2S harness protector color.
White: Left bank (-B1)
Red: Right bank (-B2)
2. Replace malfunctioning rear HO2S.

OK

ⓑ
 (Go to next page.)

TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2)

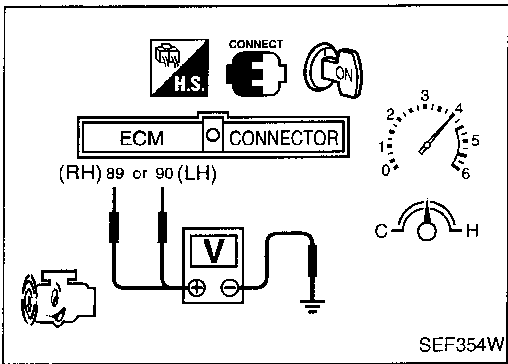
Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Left bank), (P0157: Right bank) (Cont'd)



ACTIVE TEST	
FUEL INJECTION	25%
----- MONITOR -----	
CMPS-RPM (POS)	725rpm
FR O2 SEN-B1	0.84V
FR O2 SEN-B2	0.94V
RR O2 SEN-B1	0.94V
RR O2 SEN-B2	0.84V

Qu UP DOWN Qd

SEF631U



COMPONENT INSPECTION

Rear heated oxygen sensor

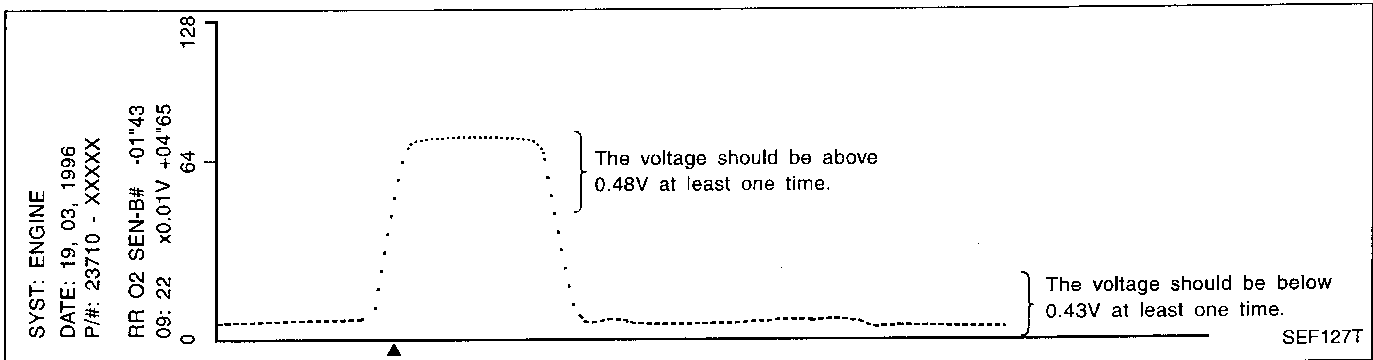
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CONSULT.
- 4) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
 "RR O2 SEN-B1 (-B2)" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.
 "RR O2 SEN-B1 (-B2)" should be below 0.43V at least once when the "FUEL INJECTION" is -25%.

OR

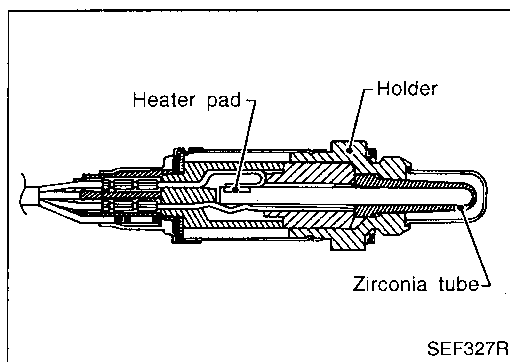
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals 89 (RH), 90 (LH) (sensor signal) and ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load 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 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.
The voltage should be below 0.43V at least once.

CAUTION:

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



TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2)



Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Left bank), (P0158: Right bank)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

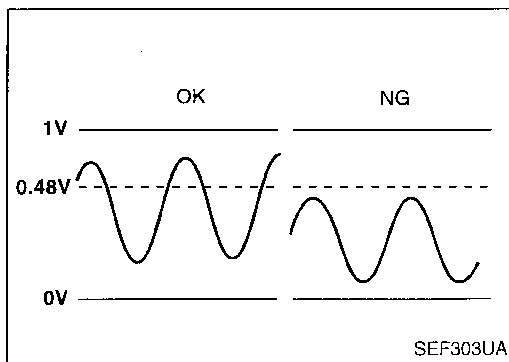
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 SEN-B1 RR O2 SEN-B2	<ul style="list-style-type: none"> Engine: After warming up 	Reving engine from idle up to 2,000 rpm 0 - 0.3V ↔ 0.6 - 1.0V

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
90 (LH)	Y	Rear heated oxygen sensor	Engine is running.	0 - Approximately 1.0V
89 (RH)	W		<ul style="list-style-type: none"> After warming up to normal operating temperature and revving engine from idle up to 2,000 rpm. 	



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 whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0138 (-B1) 0510 (Left bank)	<ul style="list-style-type: none"> The maximum voltage from the sensor is not reached to the specified voltage. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Rear heated oxygen sensor Fuel pressure Injectors Intake air leaks
P0158 (-B2) 0313 (Right bank)		

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2)

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Left bank), (P0158: Right bank) (Cont'd)

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p>COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 925rpm THRTL POS SEN 0.46V B/FUEL SCHDL 1.5msec</p>	<p>■ RR O2 SEN-B2 P0158 ■ □</p> <p>COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 925rpm THRTL POS SEN 0.46V B/FUEL SCHDL 1.5msec</p>
---	---

SEF373W

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p>COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>	<p>■ RR O2 SEN-B2 P0158 ■ □</p> <p>COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF374W

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p>COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>	<p>■ RR O2 SEN-B2 P0158 ■ □</p> <p>COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF375W

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p>COND1: COMPLETED COND2: COMPLETED COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1050rpm THRTL POS SEN 0.51V B/FUEL SCHDL 1.0msec</p>	<p>■ RR O2 SEN-B2 P0158 ■ □</p> <p>COND1: COMPLETED COND2: COMPLETED COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1050rpm THRTL POS SEN 0.51V B/FUEL SCHDL 1.0msec</p>
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SEF376W

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p style="text-align: center;">COMPLETED</p> <p>SELF-DIAG RESULTS</p>	<p>■ RR O2 SEN-B2 P0158 ■ □</p> <p style="text-align: center;">COMPLETED</p> <p>SELF-DIAG RESULTS</p>
---	---

SEF559U

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- "COMPLETED" will appear on CONSULT screen when all tests "COND1", "COND2" and "COND3" are completed.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Never stop engine during this test. If the engine is stopped, reperform this test from step 2).



Procedure for COND1

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "RR O2 SEN-B1 (-B2) P0138 (P0158)" of "RR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine (TCS switch "OFF") and let it idle for at least 30 seconds.
- 6) Rev engine to 2,000 rpm 2 or 3 times quickly under no load.

If "COMPLETED" appears on CONSULT screen, go to step 10).

If "COMPLETED" does not appear on CONSULT screen, go to the following step.

- 7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 8) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

CMPS-RPM (POS): 1,400 - 2,200 rpm

Vehicle speed: 78 - 100 km/h (48 - 62 MPH)

B/FUEL SCHDL: 1.0 - 4.5 msec

Selector lever: Suitable position

NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 9).

Procedure for COND2

- 9) While driving, release accelerator pedal completely with "OD" OFF from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT screen is turned to "COMPLETED". (It will take approximately 4 seconds.)

NOTE:

If "COMPLETED" is already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 10).

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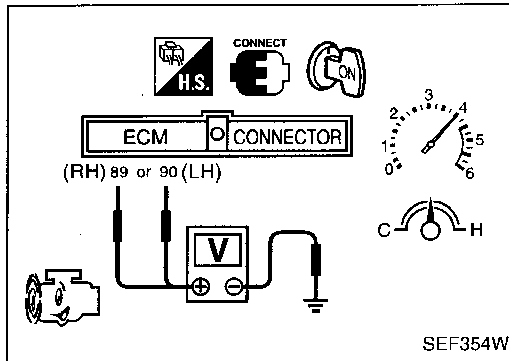
IDX

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2)

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Left bank), (P0158: Right bank) (Cont'd)

Procedure for COND3

- 10) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take maximum of approximately 6 minutes.)
- 11) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-213.



OR

OVERALL FUNCTION CHECK

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



- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑧⑨ RH, ⑩ LH (sensor signal) and ground.
- 4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
(depress and release accelerator pedal as soon as possible)

The voltage should be above 0.48V at least once during this procedure.

If the voltage can be confirmed in step 4, step 5 is not necessary.

- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.

The voltage should be above 0.48V at least once during this procedure.

- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-213.

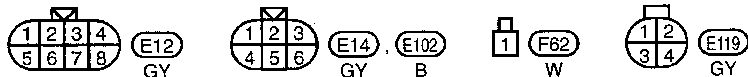
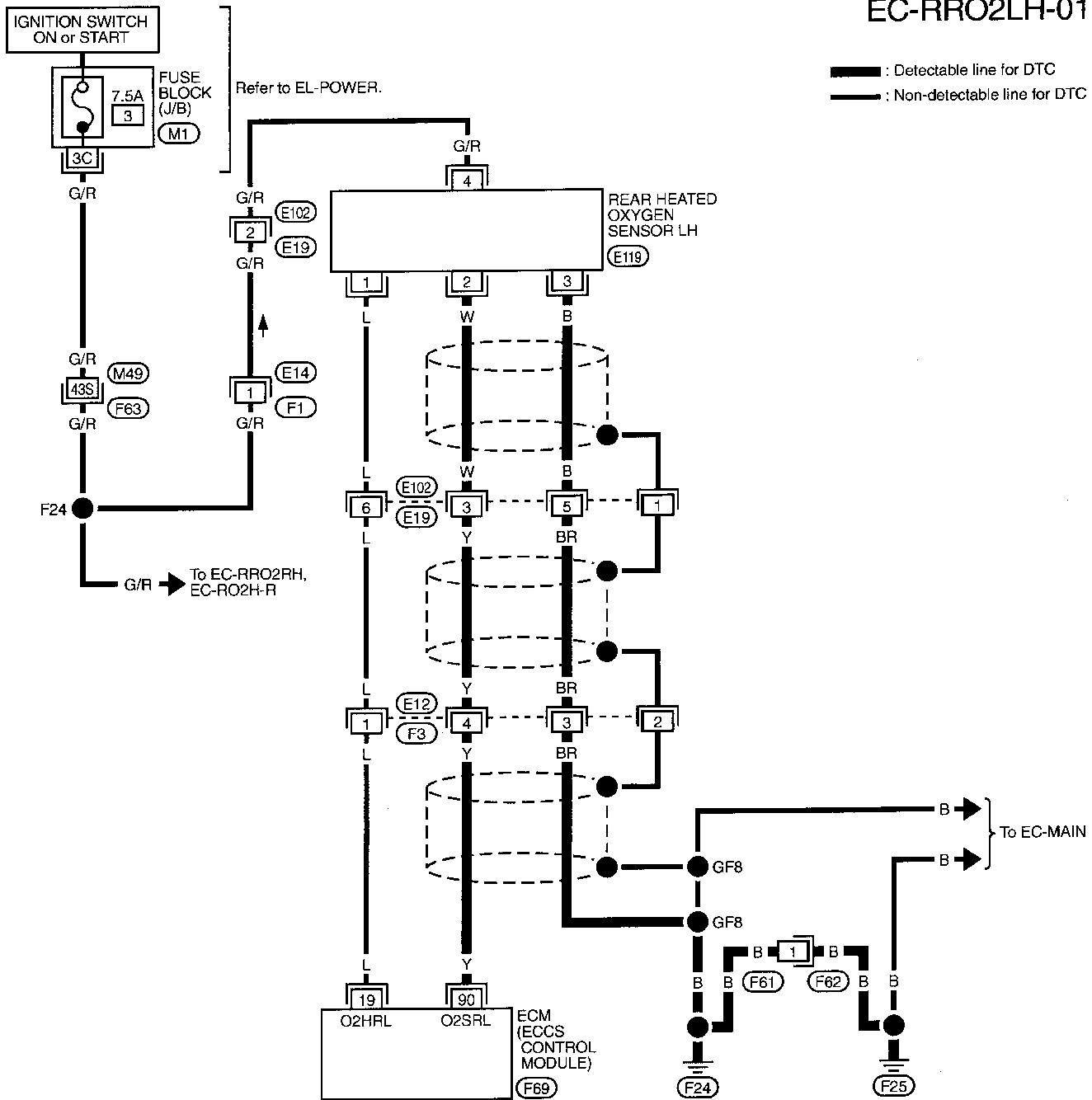
TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2)

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Left bank), (P0158: Right bank) (Cont'd)

LEFT BANK

EC-RRO2LH-01

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



Refer to last page (Foldout page).

(M49), (F63)
(M1)

132	108	107	106	95	94	93	92	91	90	89	67	66	65	129	126	54	53	52	41	40	39	38	37	36	35	13	12	11	123		
131	105	104	103	102	88	87	86	85	84	83	82	64	63	62	128	125	51	50	49	48	34	33	32	31	30	29	28	10	9	8	122
130	101	100	99	81	80	79	78	77	76	75	61	60	59	58	127	124	47	46	45	27	26	25	24	23	22	21	7	6	5	4	121
	98	97	96	74	73	72	71	70	69	68	57	56	55			44	43	42	20	19	18	17	16	15	14	3	2	1			

(F69) W



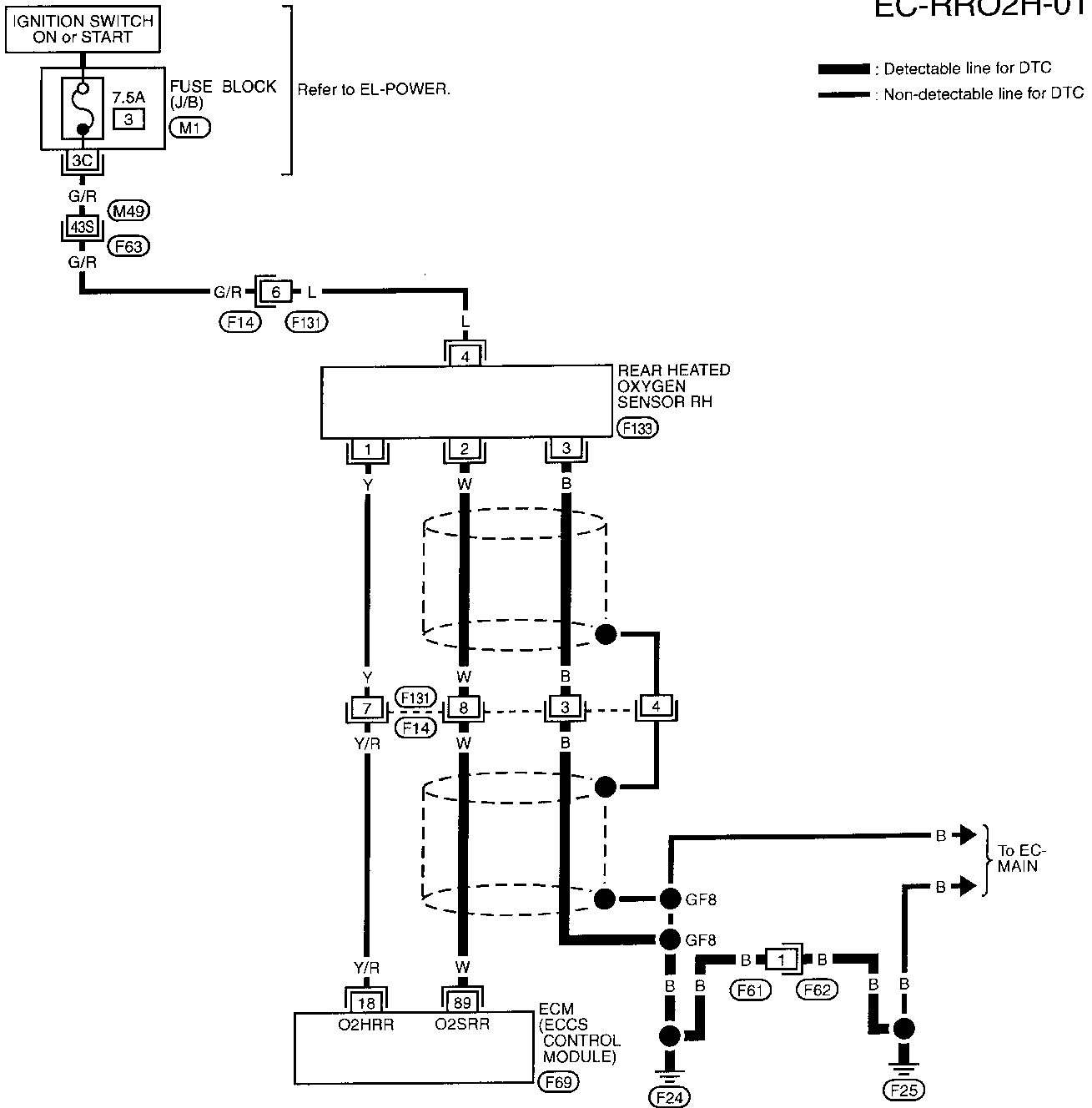
TEC245

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2)

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Left bank), (P0158: Right bank) (Cont'd)

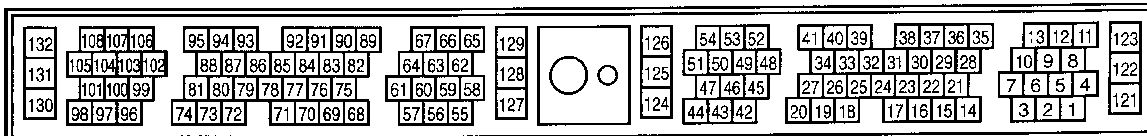
RIGHT BANK

EC-RRO2H-01



Refer to last page (Foldout page).

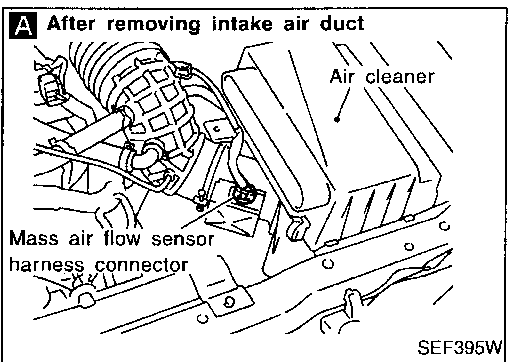
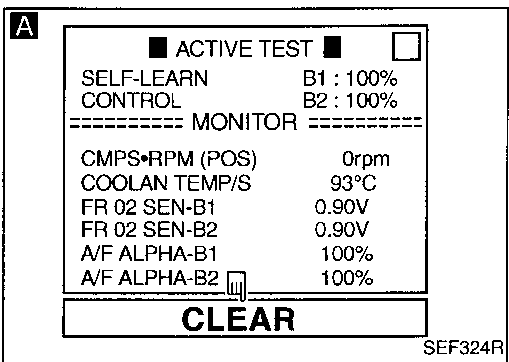
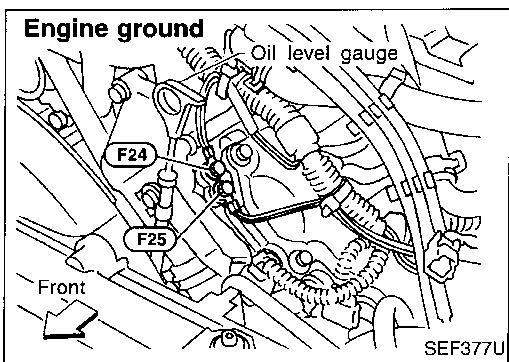
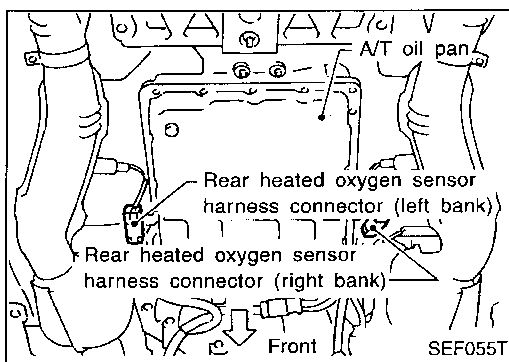
(M49), (F63)
(M1)



TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2)

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Left bank), (P0158: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

A

CLEAR THE SELF-LEARNING DATA

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.

Are the 1st trip DTCs P0171, P0174 detected? Is it difficult to start engine?

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0171, P0174", EC-235.

OR

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

Are the 1st trip DTCs 0115, 0210 detected? Is it difficult to start engine?

No

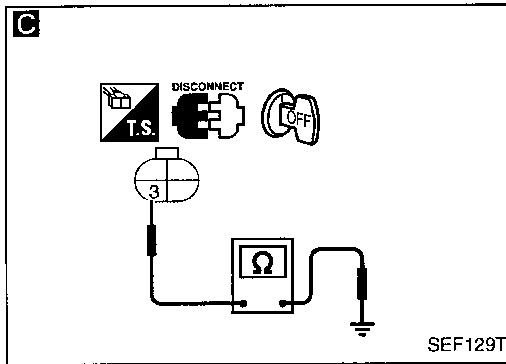
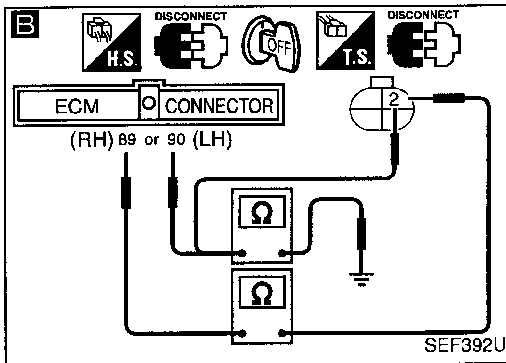
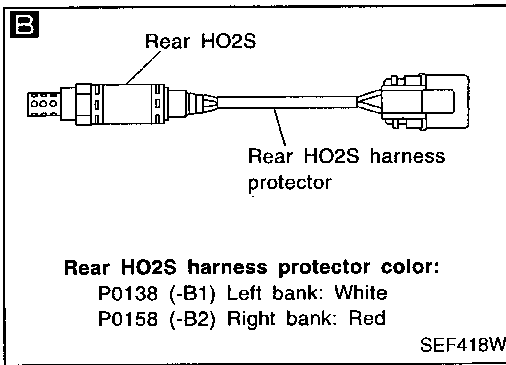
A

(Go to next page.)

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TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2)

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Left bank), (P0158: Right bank) (Cont'd)



- B**
- 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 terminals and sensor.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0138	90	2	LH (White)
P0158	89	2	RH (Red)

- Continuity should exist.**
4. Check harness continuity between ECM and sensor or ground terminals.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	Ground	
P0138	90 or 2	Ground	LH (White)
P0158	89 or 2	Ground	RH (Red)

- Continuity should not exist.**
- If OK, check harness for short to ground and short to power.

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

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

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

- NG
- Check the following.
- Harness connectors (F3, E12) (LH) or (F14, F131) (RH)
 - Harness connectors (E19, E102) (LH)
- If OK, check harness for short to ground and short to power.

- NG
- Check the following.
- Harness connectors (F3, E12) (LH) or (F14, F131) (RH)
 - Harness connectors (E19, E102) (LH)
 - Harness connectors (F62, F61)
 - Harness for open or short between rear heated oxygen sensor and engine ground
- If OK, check harness for short to ground and short to power.

- NG
- REPLACE REAR HO2S.**
1. Check rear HO2S harness protector color.
White: Left bank (-B1)
Red: Right bank (-B2)
 2. Replace malfunctioning rear HO2S.

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2)

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Left bank), (P0158: Right bank) (Cont'd)

COMPONENT INSPECTION

Rear heated oxygen sensor

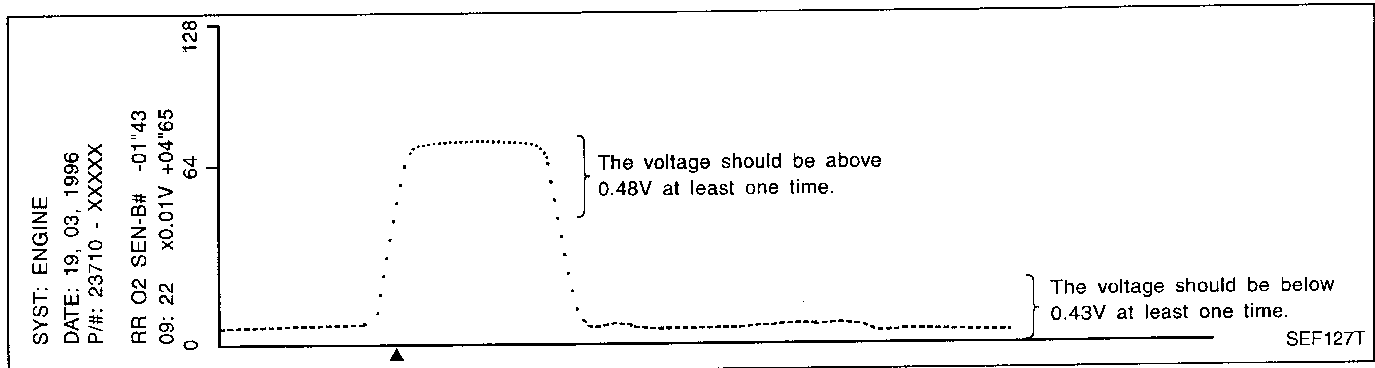
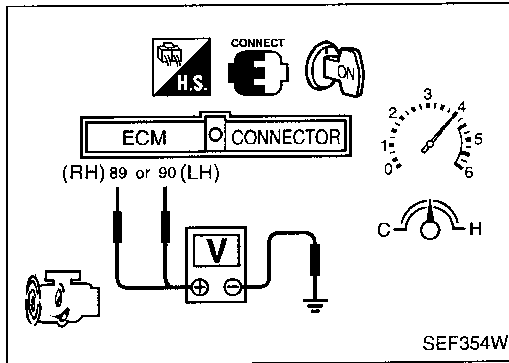
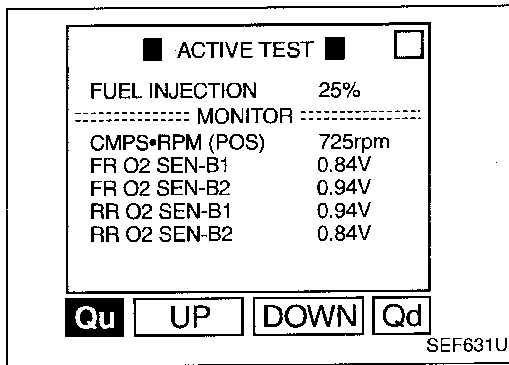
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CONSULT.
- 4) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
 "RR O2 SEN-B1 (-B2)" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.
 "RR O2 SEN-B1 (-B2)" should be below 0.43V at least once when the "FUEL INJECTION" is -25%.

OR

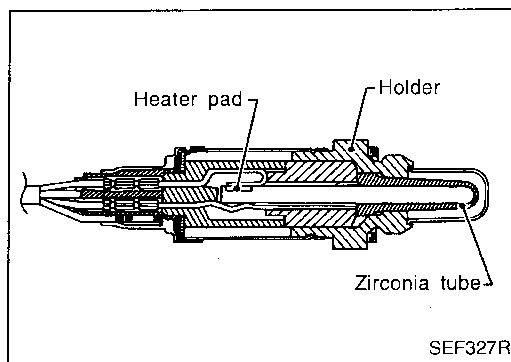
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑧9 (RH), ⑨0 (LH) (sensor signal) and ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load 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 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.
The voltage should be below 0.43V at least once.

CAUTION:

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



TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2)



Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Left bank), (P0159: Right bank)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas on left and right bank.

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the each rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

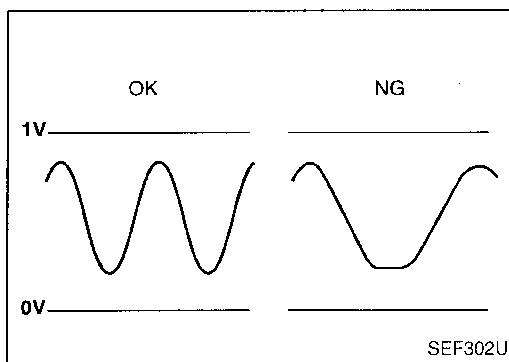
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 SEN-B1 RR O2 SEN-B2	● Engine: After warming up Revsing engine from idle up to 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
RR O2 MNTR-B1 RR O2 MNTR-B2		LEAN ↔ RICH

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (12B) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
89 (RH)	W	Rear heated oxygen sensors	Engine is running.	0 - Approximately 1.0V
90 (LH)	Y		After warming up to normal operating temperature and revving engine from idle up to 2,000 rpm.	



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 whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0139 0707 (Left bank)	● It takes more time for the sensor to respond between rich and lean than the specified time.	<ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks
P0159 0708 (Right bank)		

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2)

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Left bank), (P0159: Right bank) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- "COMPLETED" will appear on CONSULT screen when all tests "COND1", "COND2" and "COND3" are completed.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Never stop engine during this test. If the engine is stopped, reperform this test from step 2).



Procedure for COND1

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "RR O2 SEN-B1 (-B2) P0139 (P0159)" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine (TCS switch "OFF") and let it idle for at least 30 seconds.
- 6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
 - If "COMPLETED" appears on CONSULT screen, go to the following step.
- 7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 8) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

CMPS-RPM (POS): 1,400 - 2,200 rpm
Vehicle speed: 78 - 100 km/h (48 - 62 MPH)
B/FUEL SCHDL: 1.0 - 4.5 msec
Selector lever: Suitable position

NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 9).

Procedure for COND2

- 9) While driving, release accelerator pedal completely with "OD" OFF from the above condition [step 8)] until "INCOMPLETE" at "COND2" on CONSULT screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

NOTE:

- If "COMPLETED" already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 10).

<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 925rpm THRTL POS SEN 0.46V B/FUEL SCHDL 1.5msec</p>	<p>■ RR O2 SEN-B2 P0159 ■ □</p> <p>COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 925rpm THRTL POS SEN 0.46V B/FUEL SCHDL 1.5msec</p>
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SEF377W

<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>	<p>■ RR O2 SEN-B2 P0159 ■ □</p> <p>COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF378W

<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>	<p>■ RR O2 SEN-B2 P0159 ■ □</p> <p>COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF379W

<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COND1: COMPLETED COND2: COMPLETED COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1050rpm THRTL POS SEN 0.51V B/FUEL SCHDL 1.0msec</p>	<p>■ RR O2 SEN-B2 P0159 ■ □</p> <p>COND1: COMPLETED COND2: COMPLETED COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CMPS-RPM(POS) 1050rpm THRTL POS SEN 0.51V B/FUEL SCHDL 1.0msec</p>
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SEF380W

<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COMPLETED</p> <p>SELF-DIAG RESULTS</p>	<p>■ RR O2 SEN-B2 P0159 ■ □</p> <p>COMPLETED</p> <p>SELF-DIAG RESULTS</p>
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SEF565U

GI

MA

EM

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AT

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RA

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ST

RS

BT

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IDX

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2)

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Left bank), (P0159: Right bank) (Cont'd)

Procedure for COND3

- 10) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
- 11) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-221.

OR

OVERALL FUNCTION CHECK

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

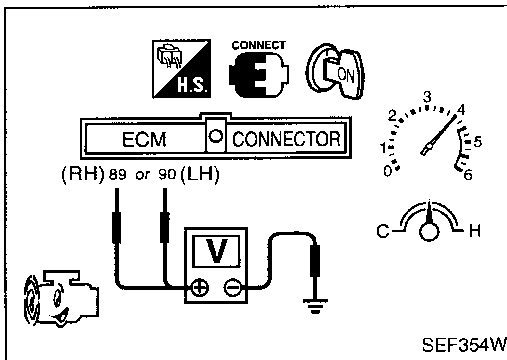


- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑧⑨ RH, ⑨⑩ LH (sensor signal) and ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(depress and release accelerator pedal as soon as possible)

The voltage should be changed at more than 0.06V for 1 second during this procedure.

If the voltage can be confirmed in step 4, step 5 is not necessary.

- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.
The voltage should be changed at more than 0.06V for 1 second during this procedure.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-221.

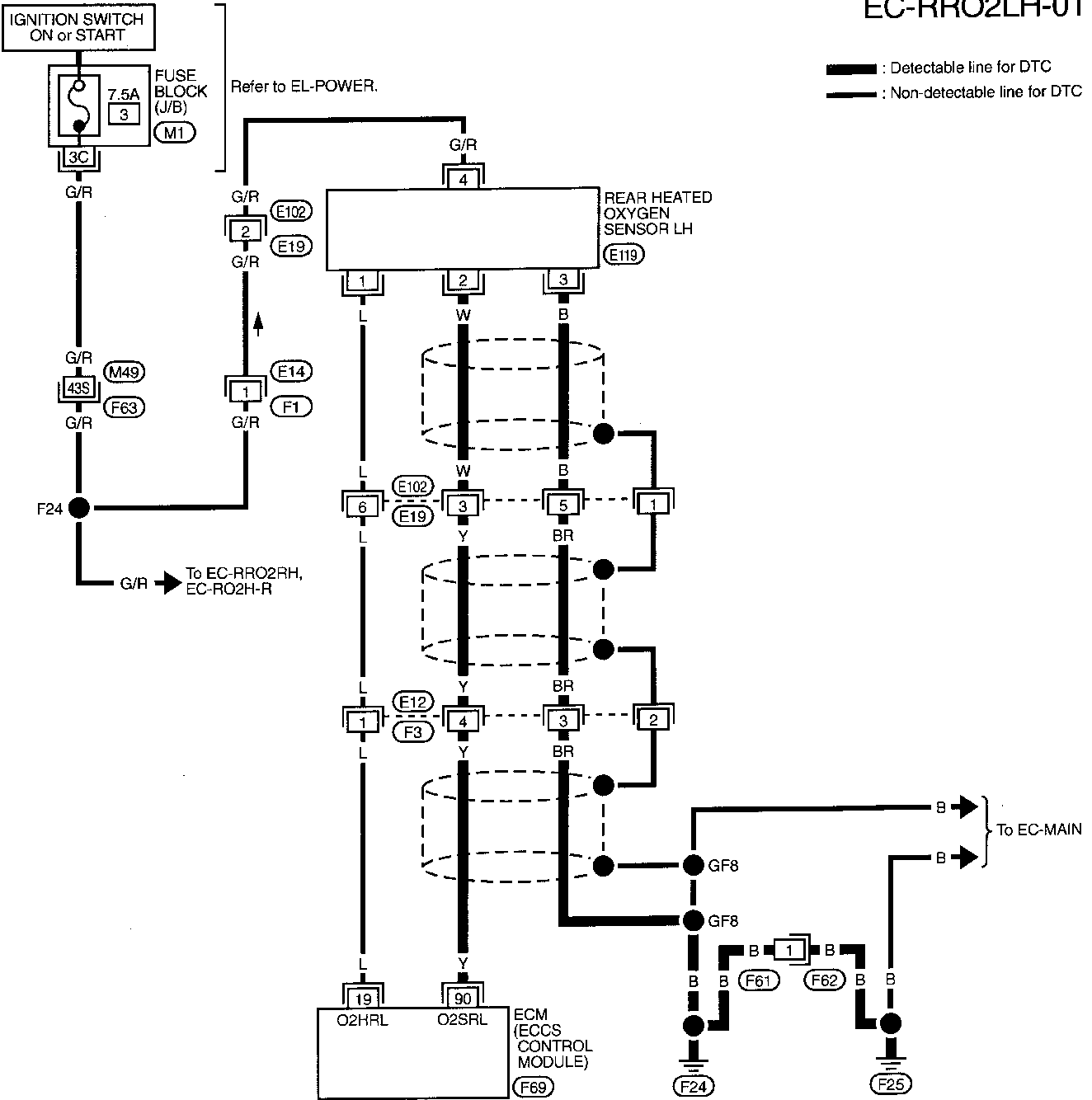


TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2)

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Left bank), (P0159: Right bank) (Cont'd)

LEFT BANK

EC-RRO2LH-01



GI

MA

EM

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FA

RA

BR

ST

RS

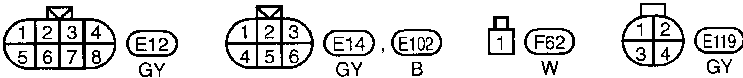
BT

HA

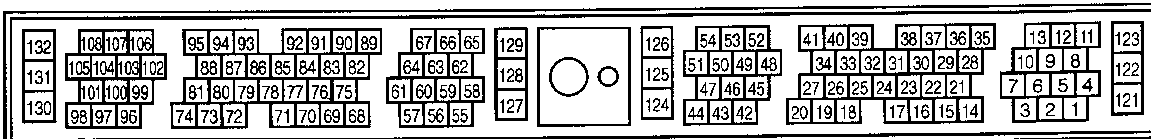
EL

IDX

Refer to last page (Foldout page).



M49, F63
M1



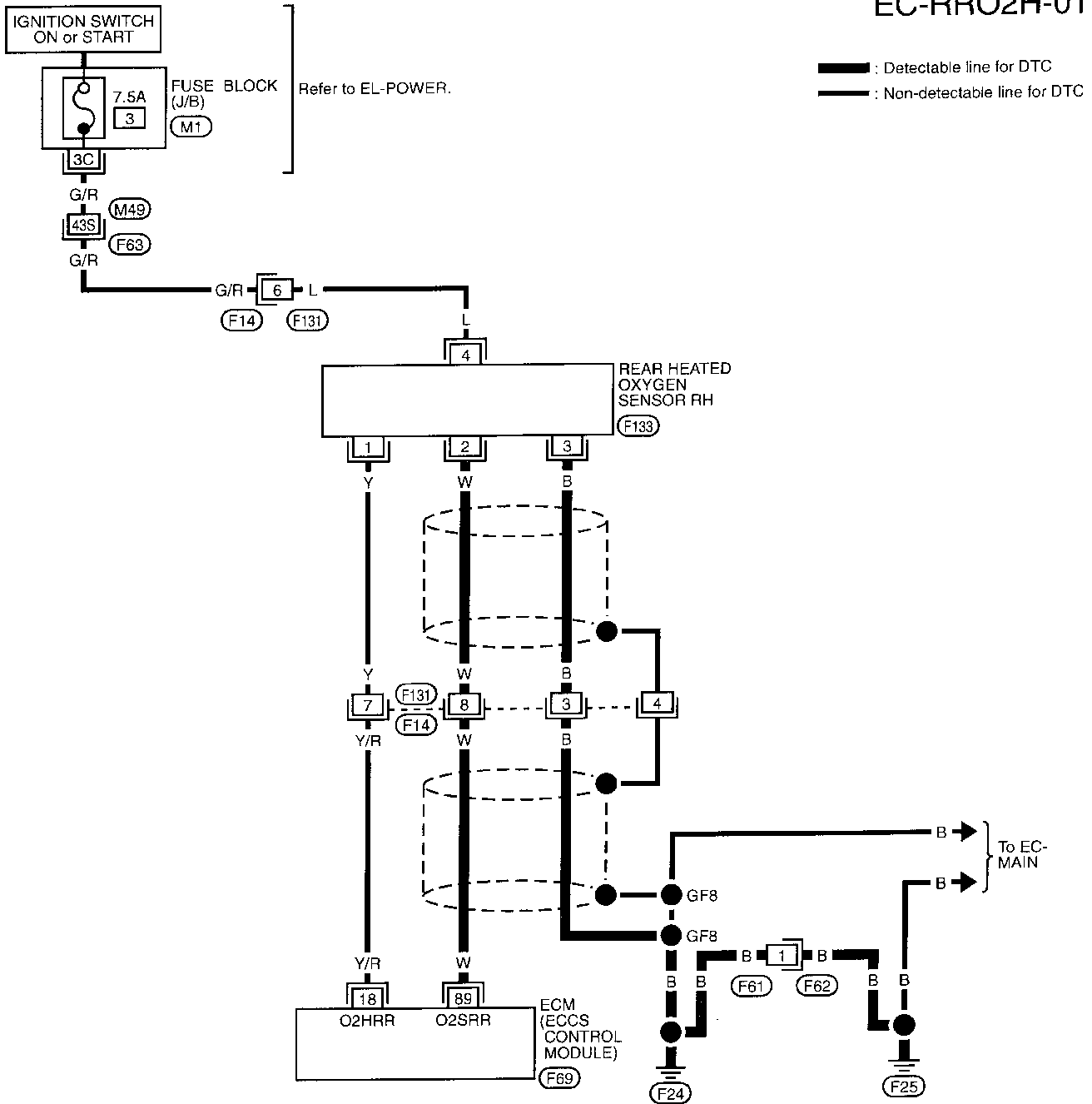
TEC245

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2)

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Left bank), (P0159: Right bank) (Cont'd)

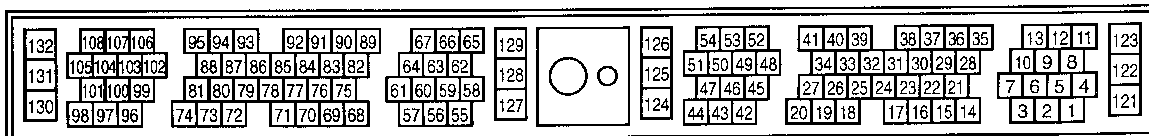
RIGHT BANK

EC-RRO2H-01



Refer to last page (Foldout page).

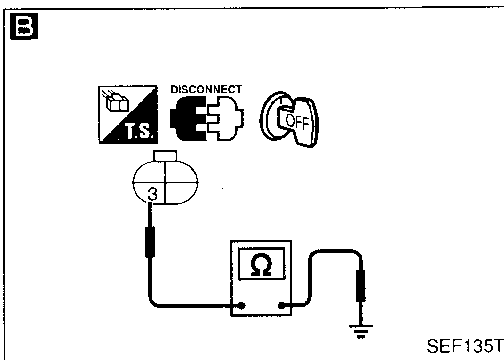
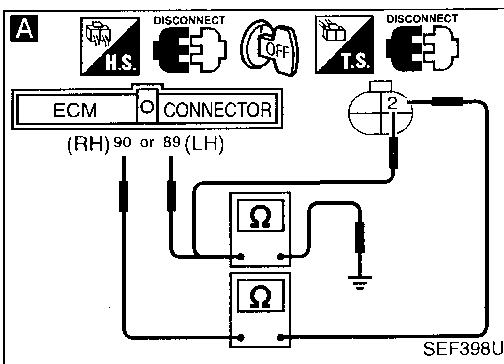
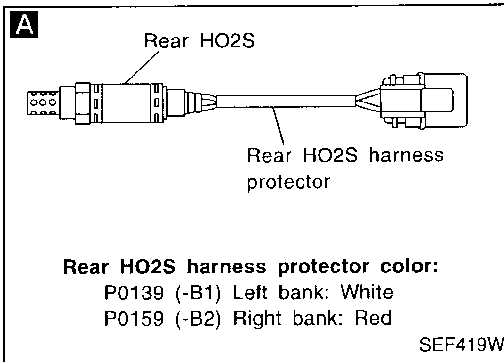
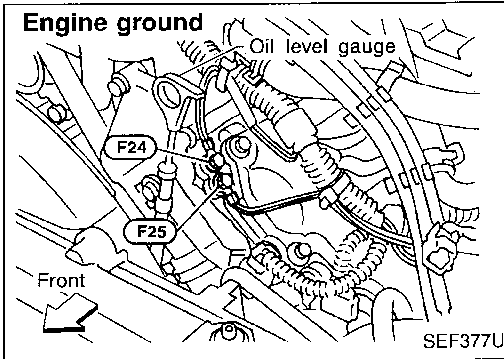
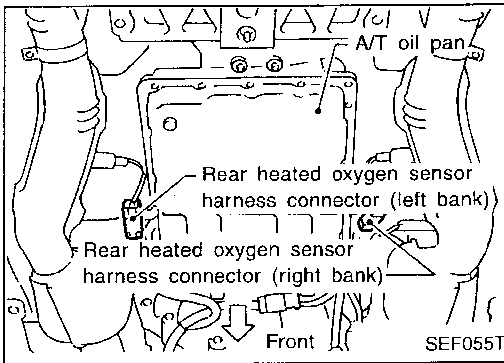
(M49), (F63)
(M1)



TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2)

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Left bank), (P0159: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

A

- CHECK INPUT SIGNAL CIRCUIT.**
1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
 2. Check harness continuity between ECM and sensor terminals.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0139	90	2	LH (White)
P0159	89	2	RH (Red)

- Continuity should exist.**
3. Check harness continuity between ECM sensor or ground terminals.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	Ground	
P0139	90 or 2	Ground	LH (White)
P0159	89 or 2	Ground	RH (Red)

- Continuity should not exist.**
- If OK, check harness for short to ground and short to power.

B

- CHECK GROUND CIRCUIT.**
- Check harness continuity between terminal ③ and engine ground.
- Continuity should exist.**
- If OK, check harness for short to ground and short to power.

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

- REPLACE REAR HO2S.**
1. Check rear HO2S harness protector color.
White: Left bank (-B1)
Red: Right bank (-B2)
 2. Replace malfunctioning rear HO2S.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

NG

Check the following.

- Harness connectors
 - (F3), (E12) (LH) or (F14), (F131) (RH)
- Harness connectors
 - (E19), (E102) (LH)

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

NG

Check the following.

- Harness connectors
 - (F3), (E12) (LH) or (F14), (F131) (RH)
- Harness connectors
 - (E19), (E102) (LH)
 - (F62), (F61)
- Harness for open or short between rear heated oxygen sensor and engine ground

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

NG

REPLACE REAR HO2S.

1. Check rear HO2S harness protector color.
White: Left bank (-B1)
Red: Right bank (-B2)
2. Replace malfunctioning rear HO2S.

GI
 MA
 EM
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EC
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 BR
 ST
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 BT
 HA
 EL
 IDX

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2)

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Left bank), (P0159: Right bank) (Cont'd)

COMPONENT INSPECTION

Rear heated oxygen sensor

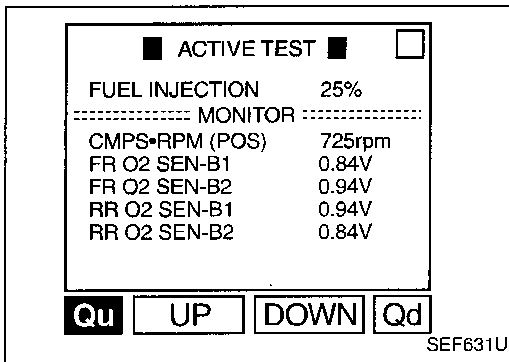
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CONSULT.
- 4) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
 "RR O2 SEN-B1 (-B2)" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.
 "RR O2 SEN-B1 (-B2)" should be below 0.43V at least once when the "FUEL INJECTION" is -25%.

OR

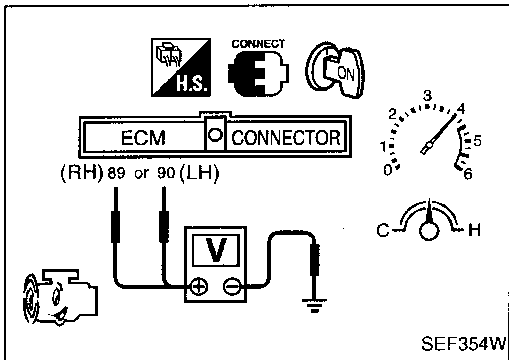
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑧ (RH), ⑨ (LH) (sensor signal) and ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load at 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 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position.
The voltage should be below 0.43V at least once.

CAUTION:

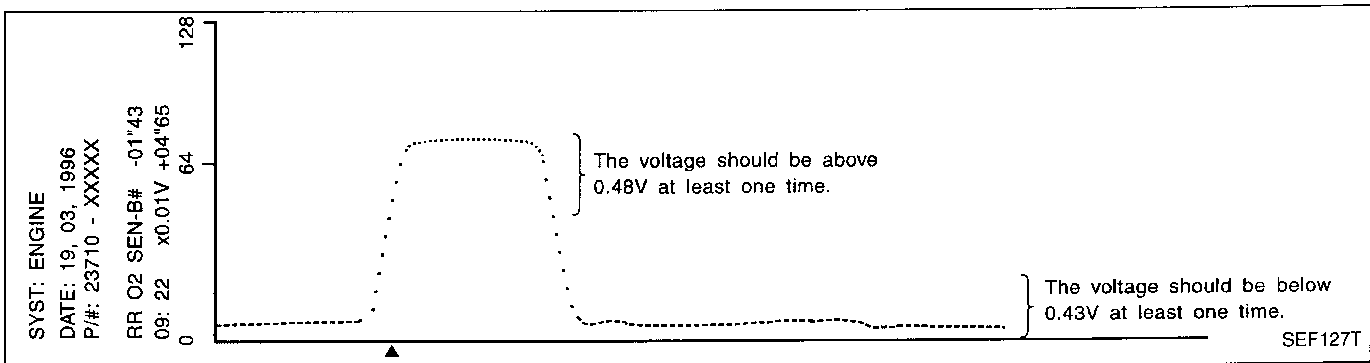
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



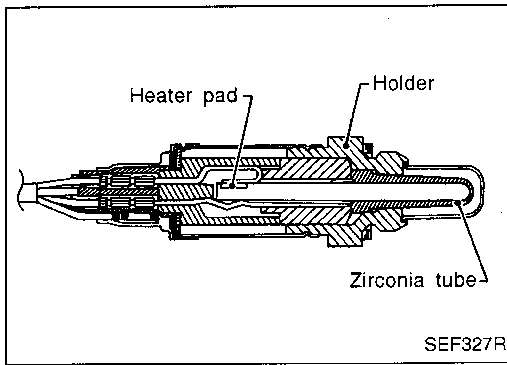
SEF631U



SEF354W



TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2)



Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Left bank), (P0160: Right bank)

COMPONENT DESCRIPTION

The rear heated oxygen sensors (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas on left and right bank.

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the each rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

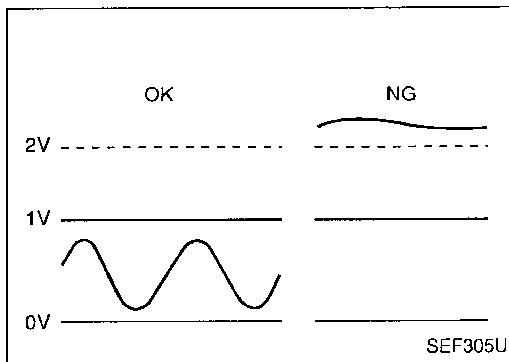
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 SEN-B1 RR O2 SEN-B2	● Engine: After warming up Revsing engine from idle up to 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
RR O2 MNTR-B1 RR O2 MNTR-B2		LEAN ↔ RICH

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
89 (RH)	W	Rear heated oxygen sensors	Engine is running.	0 - Approximately 1.0V
90 (LH)	Y		After warming up to normal operating temperature and revving engine from idle up to 2,000 rpm.	



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 whether the voltage is unusually high during the various driving condition such as fuel-cut.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0140 0512 (Left bank)	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open.) ● Rear heated oxygen sensor
P0160 0315 (Right bank)		

TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2)

Rear Heated Oxygen Sensor (High voltage) (Rear HO₂S) (P0140: Left bank), (P0160: Right bank) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

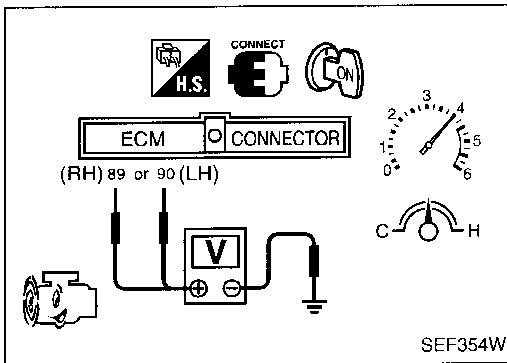
Always drive vehicle at a safe speed.

NOTE:

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

☆ MONITOR	☆ NO FAIL <input type="checkbox"/>
CMPS•RPM(POS)	2040rpm
COOLAN TEMP/S	82°C
VHCL SPEED SE	76km/h
B/FUEL SCHDL	2.5ms
RECORD	

SEF635U



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 3) Maintain the following conditions for at least 5 consecutive seconds.
CMPS-RPM (POS): 1,400 - 2,200 rpm
VHCL SPEED SE: 78 - 100 km/h (48 - 62 MPH)
B/FUEL SCHDL: 1.0 - 4.5 msec
COOLAN TEMP/S: 70 - 100°C (158 - 212°F)
Selector lever: Suitable position
- 4) Stop vehicle with engine running.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-227.

OR

OVERALL FUNCTION CHECK

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

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑧⑨ RH, ⑩⑩ LH (sensor signal) and 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 below 2V during this procedure.
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-227.

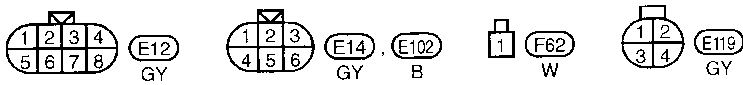
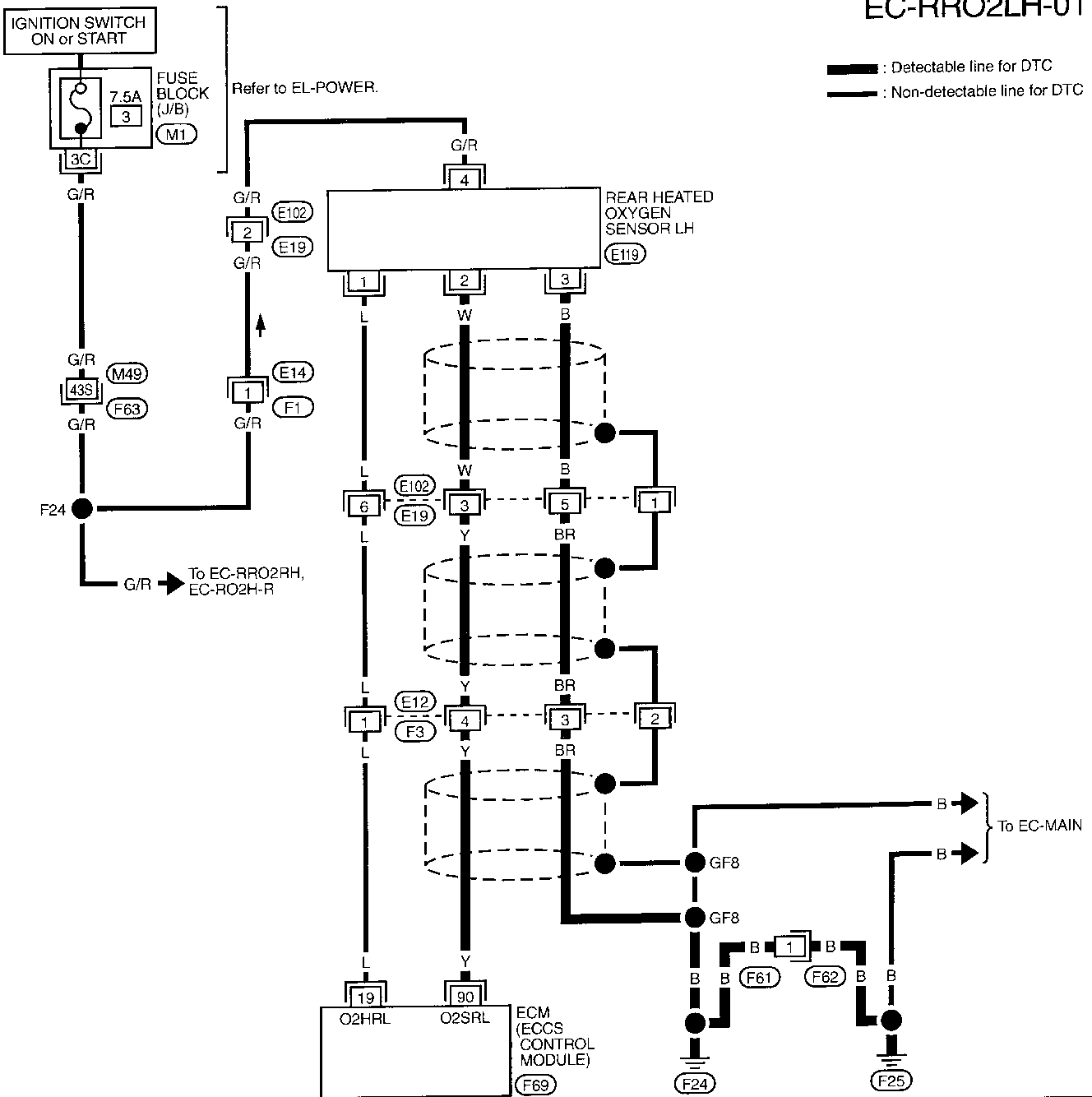
TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2)

Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Left bank), (P0160: Right bank) (Cont'd)

LEFT BANK

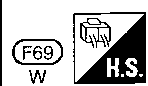
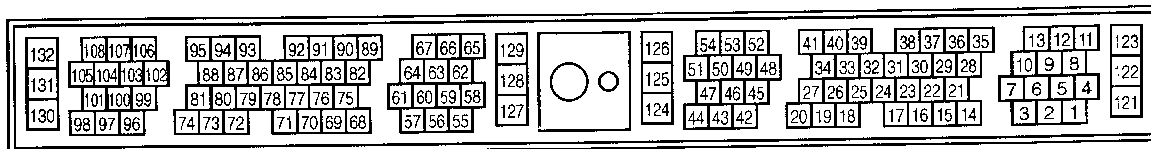
EC-RRO2LH-01

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



Refer to last page (Foldout page).

M49, F63, M1



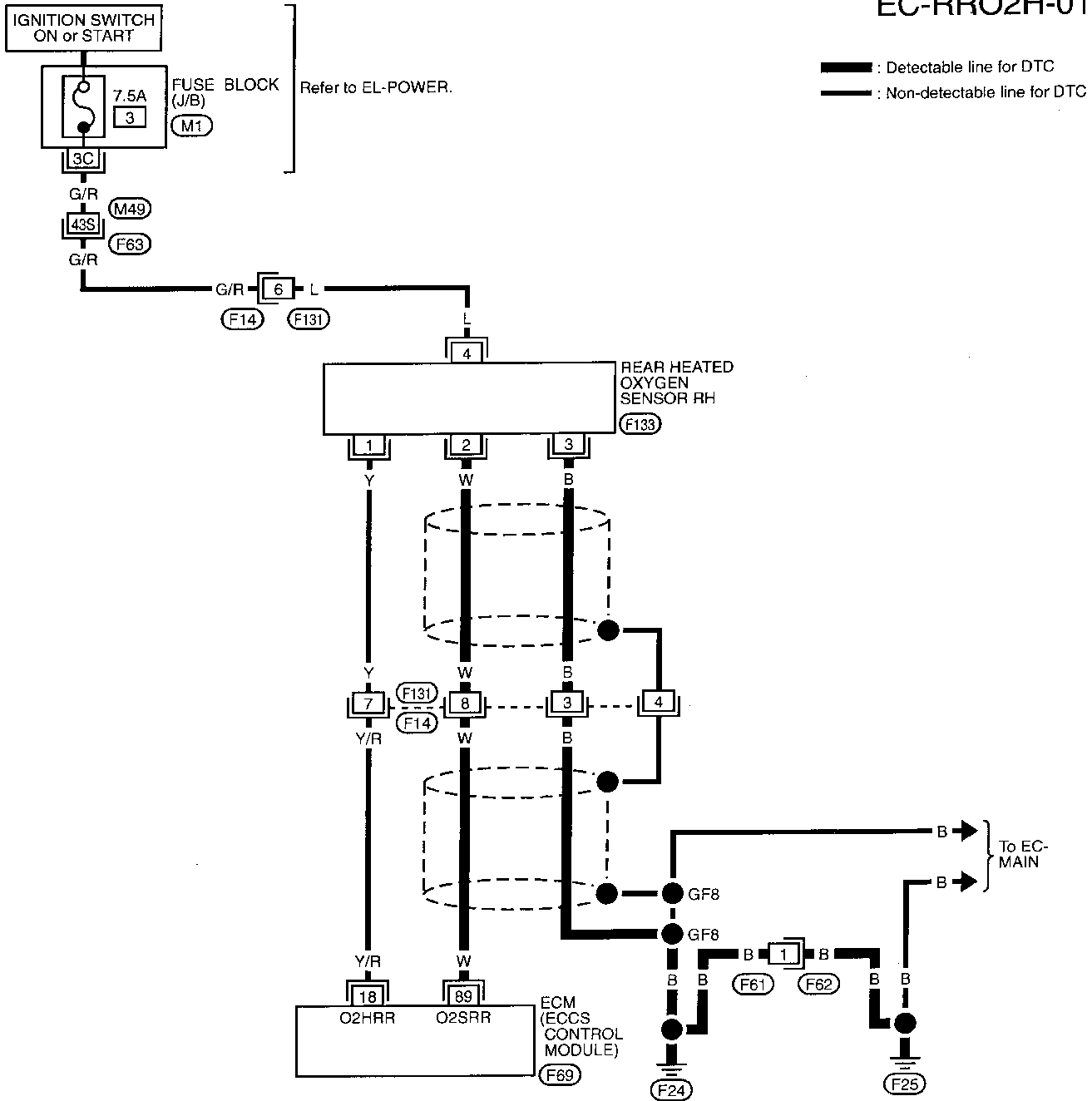
TEC245

TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2)

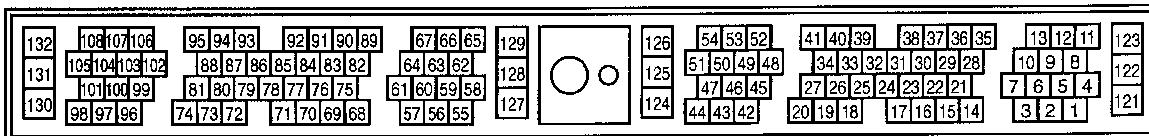
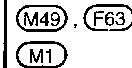
Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Left bank), (P0160: Right bank) (Cont'd)

RIGHT BANK

EC-RRO2H-01



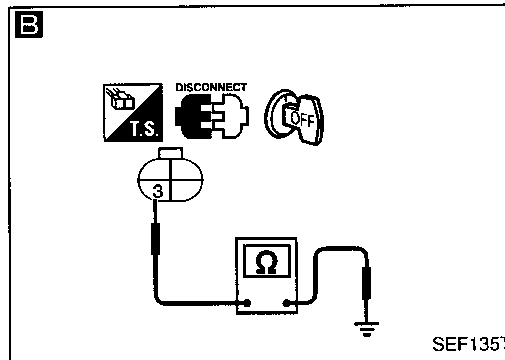
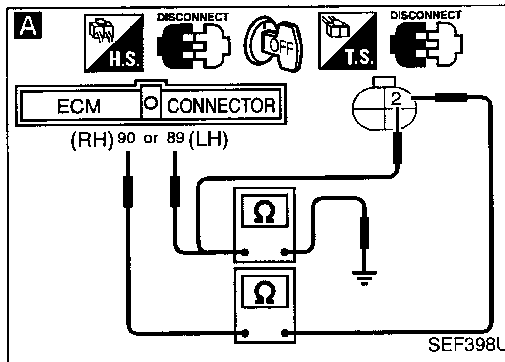
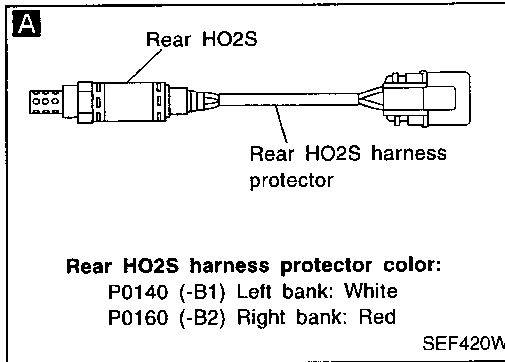
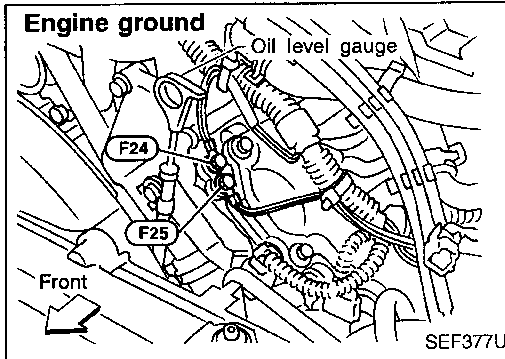
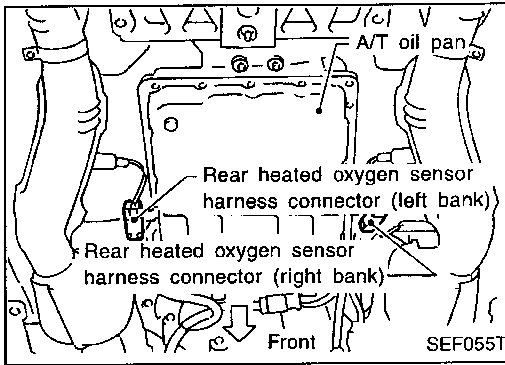
Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2)

Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Left bank), (P0160: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

A

- CHECK INPUT SIGNAL CIRCUIT.**
1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
 2. Check harness continuity between ECM and sensor terminals.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0140	90	2	LH (White)
P0160	89	2	RH (Red)

- Continuity should exist.**
3. Check harness continuity between ECM sensor or ground terminals.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	Ground	
P0140	90 or 2	Ground	LH (White)
P0160	89 or 2	Ground	RH (Red)

- Continuity should not exist.**
 If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors
 - F3, ○ E12 (LH) or ○ F14, ○ F131 (RH)
- Harness connectors
 - E19, ○ E102 (LH)

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

B

- CHECK GROUND CIRCUIT.**
 Check harness continuity between terminal ③ and engine ground.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors
 - F3, ○ E12 (LH) or ○ F14, ○ F131 (RH)
- Harness connectors
 - E19, ○ E102 (LH)
- Harness connectors
 - F62, ○ F61

• Harness for open or short between rear heated oxygen sensor and engine ground
 If NG, repair open circuit or short to ground or short to power in harness or connectors.

- CHECK COMPONENT**
 (Rear heated oxygen sensor).
1. Turn ignition switch "OFF".
 2. Disconnect sensor harness connector and check for water.
Water should not exist.
 If OK, go to step 3.
 3. Check rear heated oxygen sensor. Refer to "COMPONENT INSPECTION" on next page.

NG

Repair or replace harness and/or connectors or replace corresponding heated oxygen sensor.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

GI
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TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2)

Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Left bank), (P0160: Right bank) (Cont'd)

COMPONENT INSPECTION

Rear heated oxygen sensor

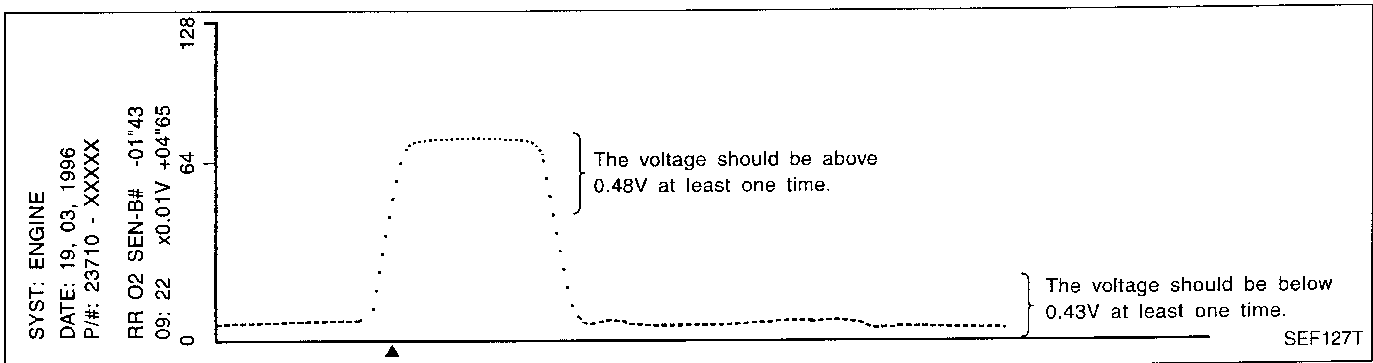
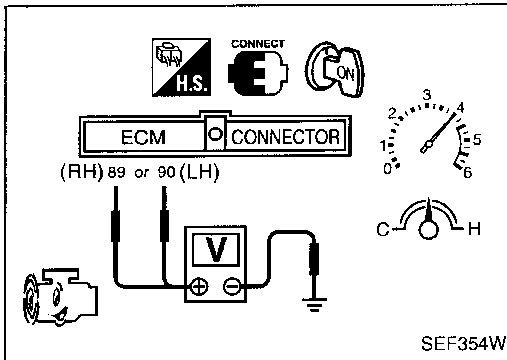
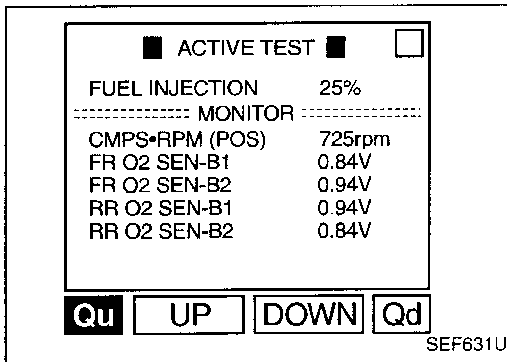
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CONSULT.
- 4) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
 "RR O2 SEN-B1 (-B2)" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.
 "RR O2 SEN-B1 (-B2)" should be below 0.43V at least once when the "FUEL INJECTION" is -25%.

OR

- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑧⑧ (RH), ⑧⑨ (LH) (sensor signal) and ground.
- 4) 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 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in D position with "OD" OFF.
The voltage should be below 0.43V at least once.

CAUTION:

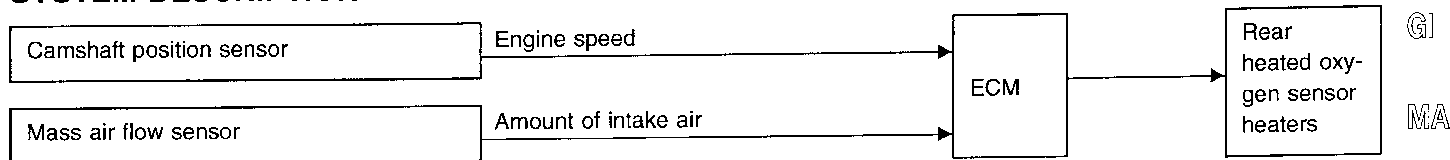
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2)

Rear Heated Oxygen Sensor Heaters (P0141: Left bank), (P0161: Right bank)

SYSTEM DESCRIPTION



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

OPERATION

Engine speed rpm	Rear heated oxygen sensor heaters
Ignition switch "ON" (Engine stopped)	OFF
At idle [after driving for 2 minutes at a speed of more than 70 km/h (43 MPH)]	ON

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
O2 SEN HTR-B1 O2 SEN HTR-B2	<ul style="list-style-type: none"> Engine speed: At idle [after driving for 2 minutes at a speed of more than 70 km/h (43 MPH)] 	ON
	<ul style="list-style-type: none"> Engine speed: Above 3,600 rpm Ignition "ON" with engine stopped 	OFF

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
18 19	Y/R L	Rear heated oxygen sensor heater (right bank) Rear heated oxygen sensor heater (left bank)	Engine is running. <input type="checkbox"/> At idle [after driving 2 minutes at 70 km/h (43 MPH) or more]	0 - 0.5V
			Ignition switch "ON" <input type="checkbox"/> Engine stopped <input type="checkbox"/> Engine is running. <input type="checkbox"/> Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0141 0902 (Left bank)	<ul style="list-style-type: none"> The current amperage in the rear heated oxygen sensor heater circuit is out of the normal range. (The improper voltage drop signal is sent to ECM through the rear heated oxygen sensor heater.) 	<ul style="list-style-type: none"> Harness or connectors (The rear heated oxygen sensor heater circuit is open or shorted.) Rear heated oxygen sensor heater
P0161 1002 (Right bank)		

TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2)

☆ MONITOR	☆ NO FAIL <input type="checkbox"/>
CMPS•RPM (POS)	650rpm
COOLAN TEMP/S	90°C
RECORD	

SEF696T

Rear Heated Oxygen Sensor Heaters (P0141: Left bank), (P0161: Right bank) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

TESTING CONDITION:

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



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-233.

OR



- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Select "MODE 3" with GST.
- 3) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-233.

OR



- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-233.

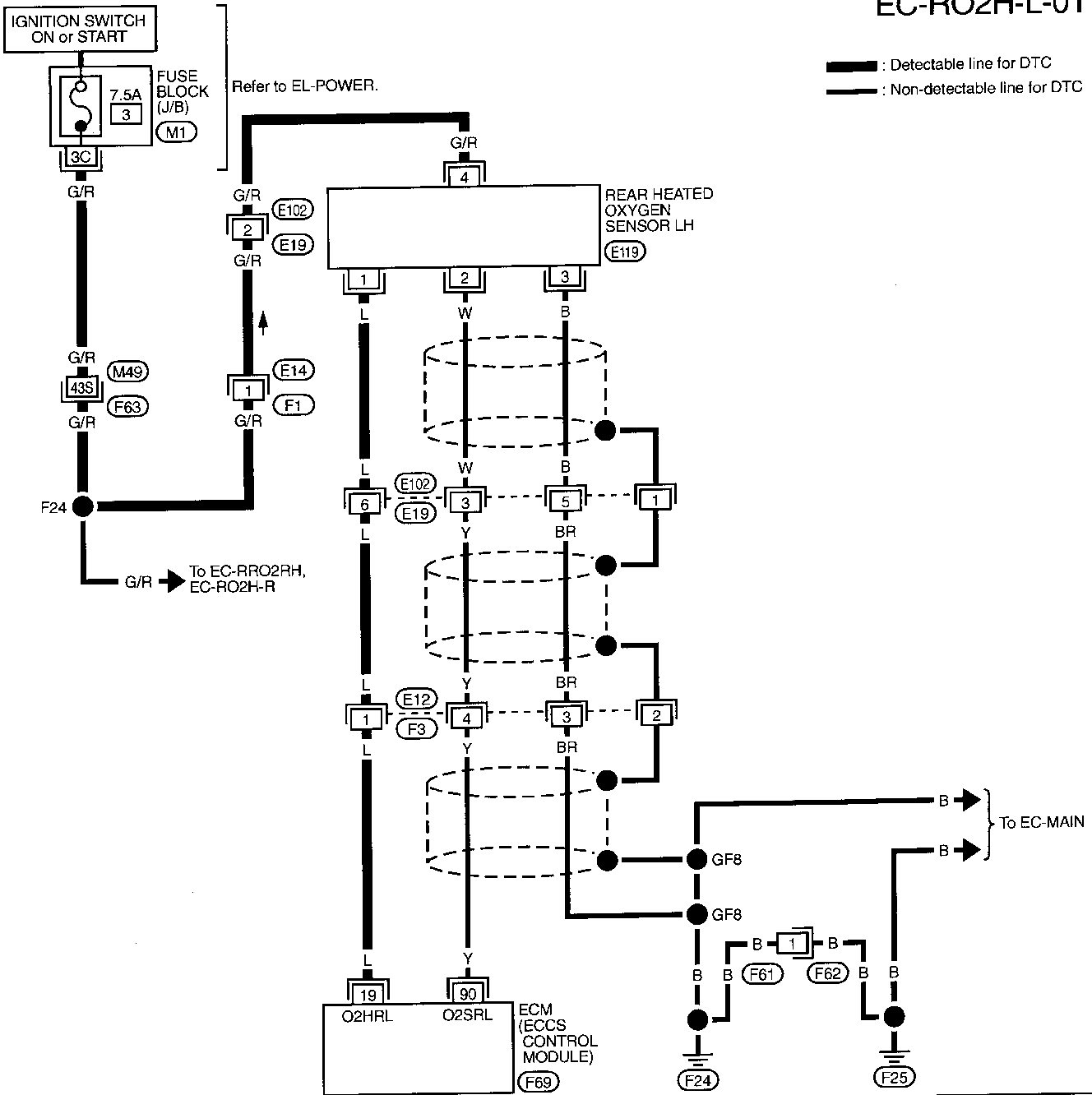
When using GST, "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.

TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2)

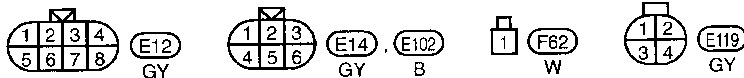
Rear Heated Oxygen Sensor Heaters (P0141: Left bank), (P0161: Right bank) (Cont'd)

LEFT BANK

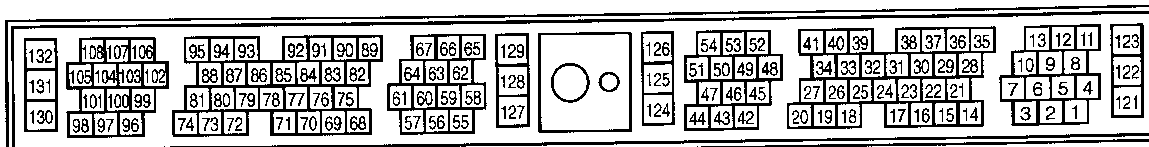
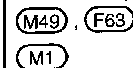
EC-RO2H-L-01



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Refer to last page (Foldout page).



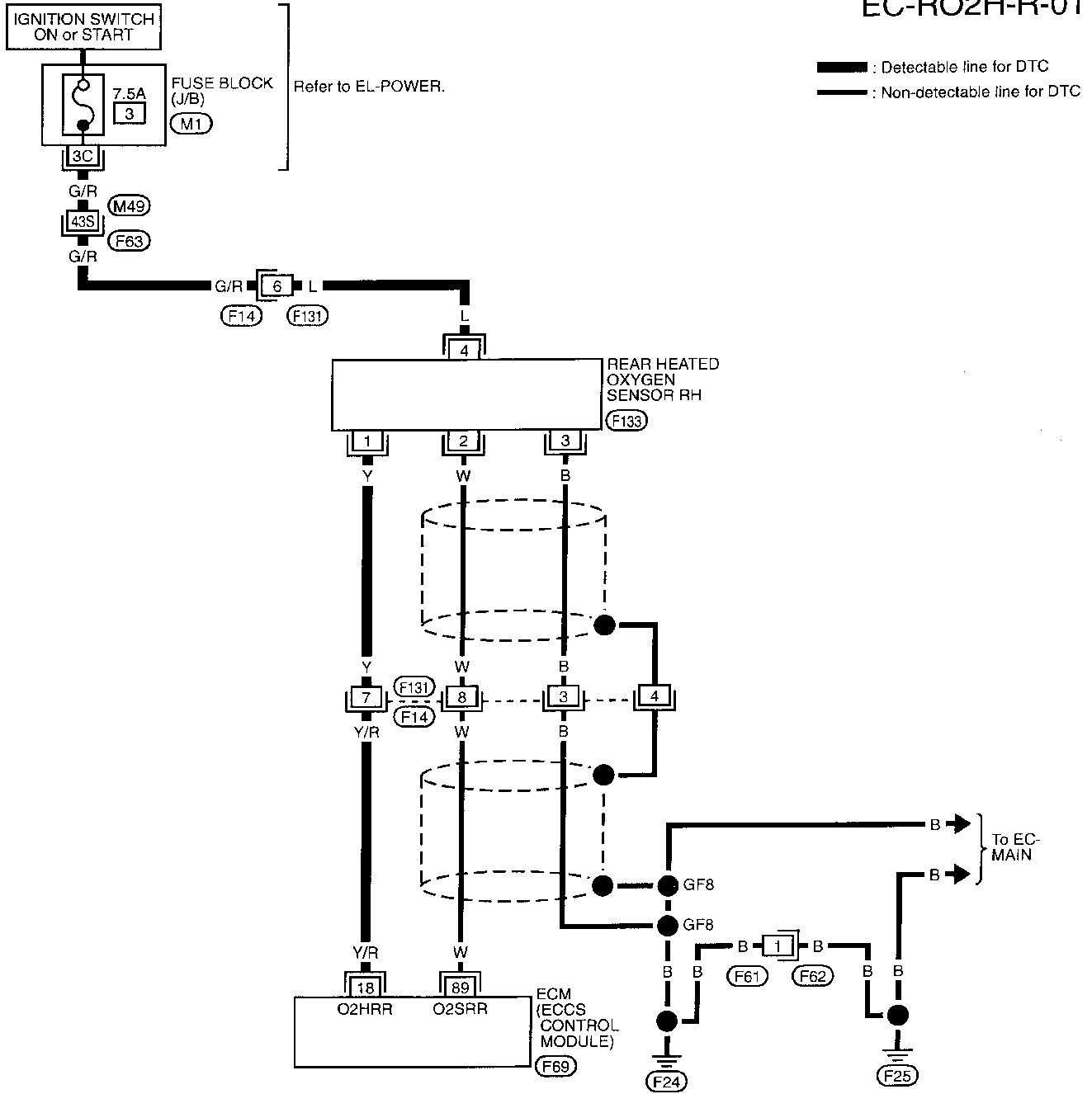
TEC246

TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2)

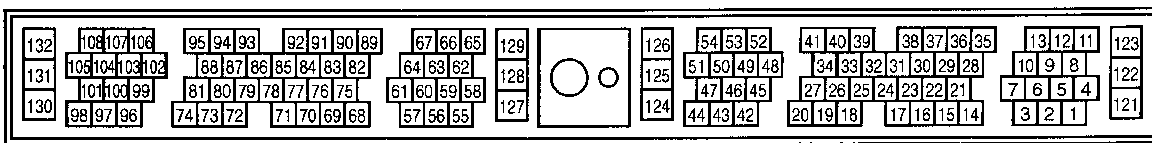
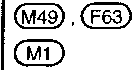
Rear Heated Oxygen Sensor Heaters (P0141: Left bank), (P0161: Right bank) (Cont'd)

RIGHT BANK

EC-RO2H-R-01



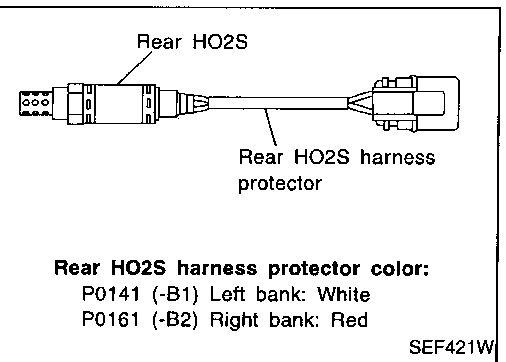
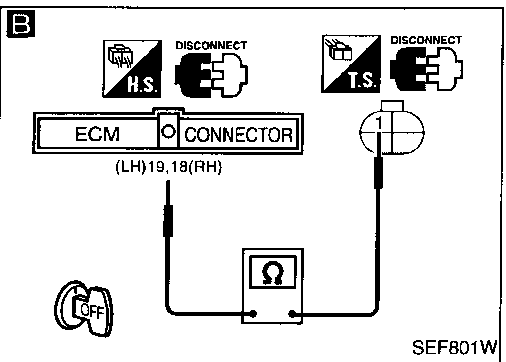
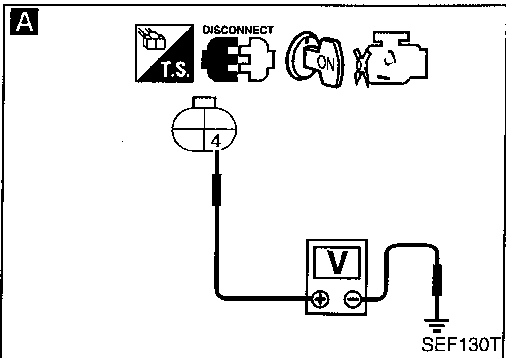
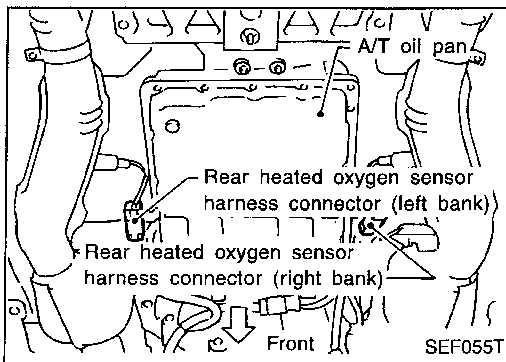
Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2)

Rear Heated Oxygen Sensor Heaters (P0141: Left bank), (P0161: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

NG

Check the following.

- Harness connectors (E102, E19) (LH) or (F14, F131) (RH)
- Harness connectors (E14, F1) (LH)
- Harness connectors (F63, M49)
- 7.5A fuse
- Harness for open or short between front heated oxygen sensor and fuse

If NG, repair harness or connectors.

OK

B
CHECK GROUND CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Disconnect ECM harness connector.
 3. Check harness continuity between terminal ① and ECM terminals ⑱ (LH), ⑲ (RH).
Continuity should exist.
 If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (F3, E12) (LH) or (F14, F131) (RH)
- Harness connectors (E19, E102) (LH)
- Harness connectors (F62, F61)
- Harness for open or short between sensor and ECM.

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

OK

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

NG

REPLACE REAR HO2S.

1. Check rear HO2S harness protector color.
White: Left bank (-B1)
Red: Right bank (-B2)
2. Replace malfunctioning rear HO2S.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

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TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2)

Rear Heated Oxygen Sensor Heaters (P0141: Left bank), (P0161: Right bank) (Cont'd)

COMPONENT INSPECTION

Rear heated oxygen sensor heater

Check the following.

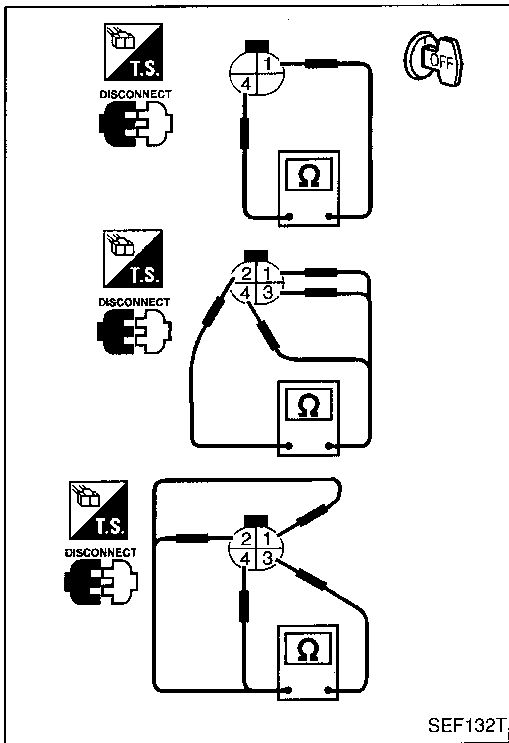
1. Check resistance between terminals ④ and ①.
Resistance: 2.3 - 4.3Ω at 25°C (77°F)
2. Check continuity.

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

If NG, replace the front heated oxygen sensor.

CAUTION:

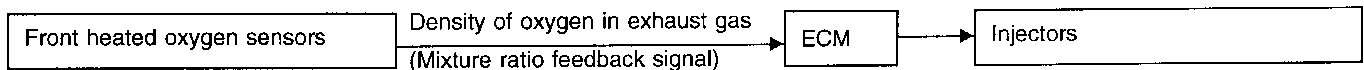
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



Fuel Injection System Function (Lean side) (P0171: Left bank), (P0174: Right bank)

ON BOARD DIAGNOSIS LOGIC

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



Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0171 0115 (Left bank)	<ul style="list-style-type: none"> Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) 	<ul style="list-style-type: none"> Intake air leaks Front heated oxygen sensor Injectors Exhaust gas leaks Incorrect fuel pressure Lack of fuel Mass air flow sensor
P0174 0210 (Right bank)		

ACTIVE TEST

SELF-LEARN B1 : 100%
 CONTROL B2 : 100%

===== MONITOR =====

CMPS•RPM (POS) 0rpm
 COOLAN TEMP/S 93°C
 FR O2 SEN-B1 0.01V
 FR O2 SEN-B2 0.01V
 A/F ALPHA-B1 100%
 A/F ALPHA-B2 100%

CLEAR

SEF329R

MONITOR NO FAIL

CMPS•RPM (POS) 2000rpm
 FR O2 MNTR-B1 RICH
 FR O2 MNTR-B2 RICH

RECORD

SEF855Q

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 4) Clear the self-learning control coefficient by touching "CLEAR".
- 5) Select "DATA MONITOR" mode with CONSULT.
- 6) Start engine again and let it idle for at least 10 minutes. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to "DIAGNOSTIC PROCEDURE", EC-239.
- 7) If it is difficult to start engine at step 6), the fuel injection system has a malfunction.
- 8) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-239. If engine does not start, visually check for exhaust and intake air leak.

OR

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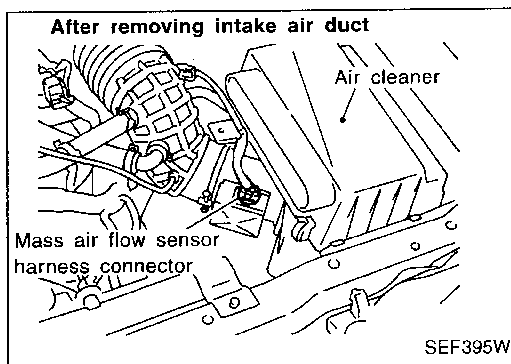
HA

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TROUBLE DIAGNOSIS FOR DTC P0171 (-B1), P0174 (-B2)

Fuel Injection System Function (Lean side) (P0171: Left bank), (P0174: Right bank) (Cont'd)



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
- 4) Stop engine and reconnect mass air flow sensor harness connector.
- 5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
- 6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
- 7) Start engine again and run it for at least 10 minutes at idle speed.
- 8) Select "MODE 7" with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to "DIAGNOSTIC PROCEDURE", EC-239.
- 9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
- 10) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-239.

If the engine does not start, visually check for exhaust and intake air leak.

OR



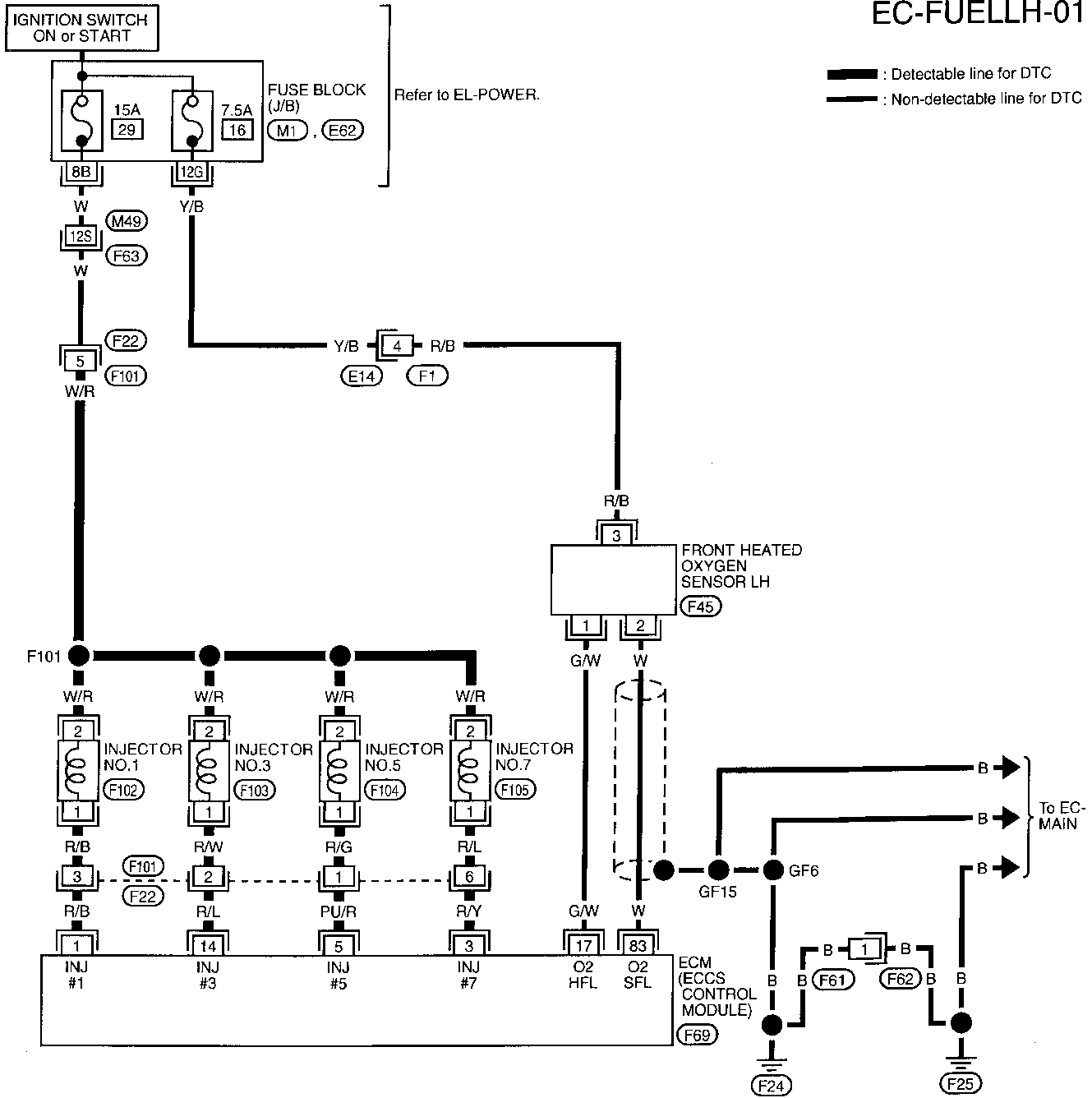
- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Disconnect mass air flow sensor harness connector. Then restart engine and run it at least 3 seconds at idle speed.
- 4) Stop engine and reconnect mass air flow sensor harness connector.
- 5) Turn ignition switch "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0102 is detected.
- 7) Erase the DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
- 8) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0505 is detected.
- 9) Start engine again and run it for at least 10 minutes at idle speed. The DTC 0115 should be detected at this stage, if a malfunction exists. If so, go to "DIAGNOSTIC PROCEDURE", EC-239.
- 10) If it is difficult to start engine at step 9, the fuel injection system also has a malfunction.
- 11) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-239. If the engine does not start, visually check for exhaust and intake air leak.

TROUBLE DIAGNOSIS FOR DTC P0171 (-B1), P0174 (-B2)

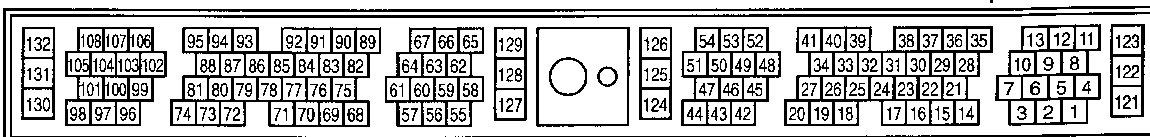
Fuel Injection System Function (Lean side) (P0171: Left bank), (P0174: Right bank) (Cont'd)

LEFT BANK

EC-FUELLH-01



Refer to last page (Foldout page).

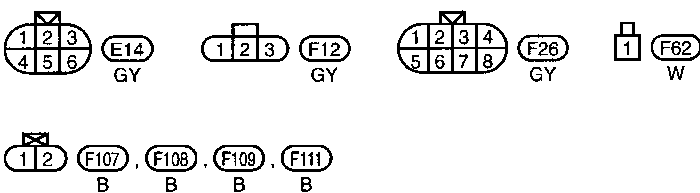
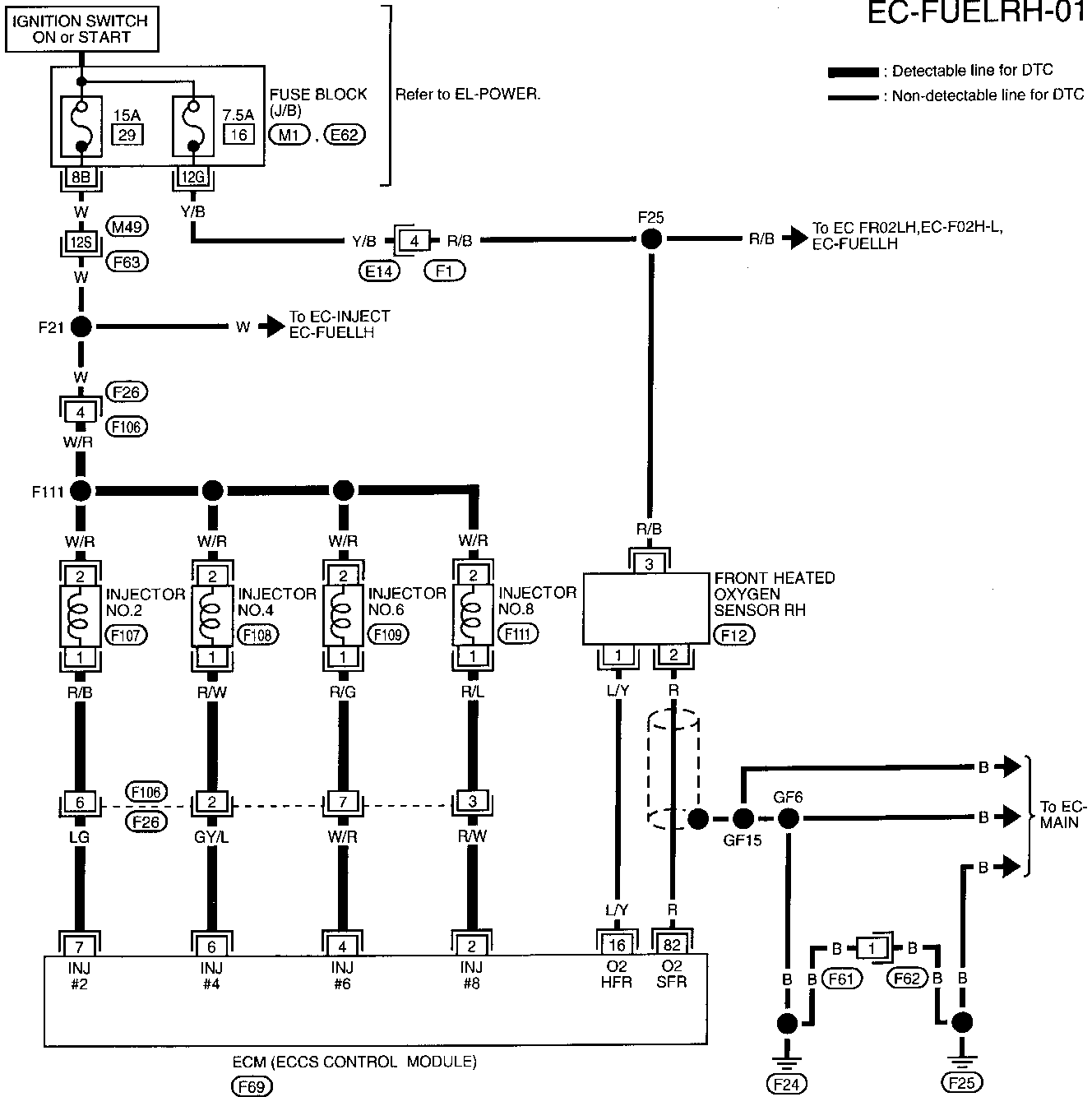


TROUBLE DIAGNOSIS FOR DTC P0171 (-B1), P0174 (-B2)

Fuel Injection System Function (Lean side) (P0171: Left bank), (P0174: Right bank) (Cont'd)

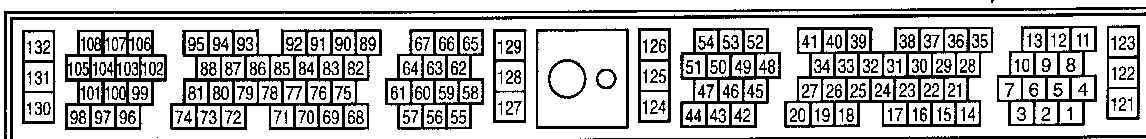
RIGHT BANK

EC-FUELRH-01



Refer to last page (Foldout page).

- (M49) (F63)
- (E62)
- (M1)

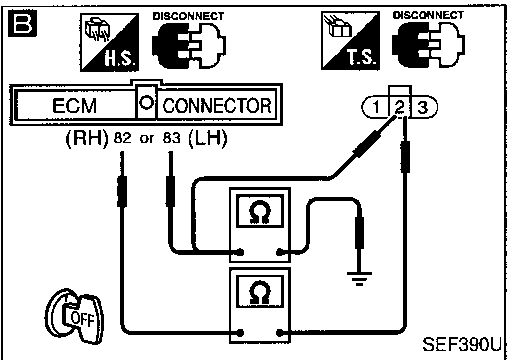
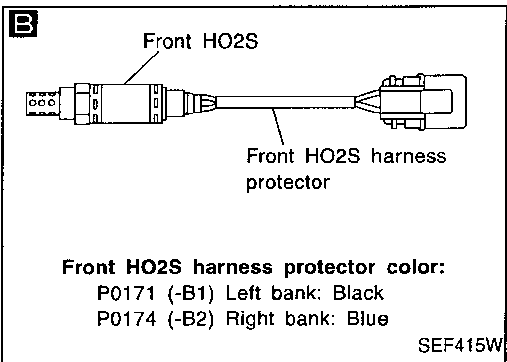
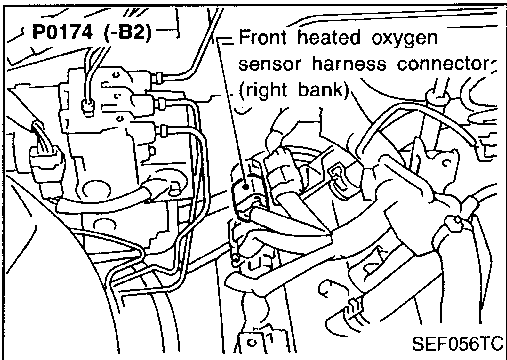
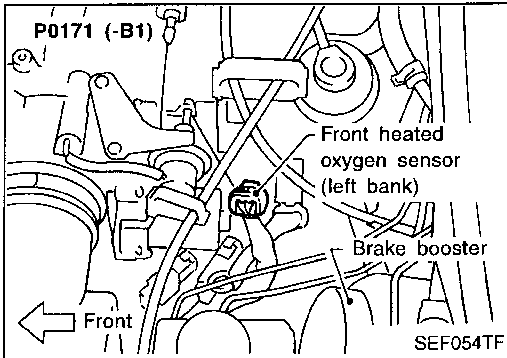
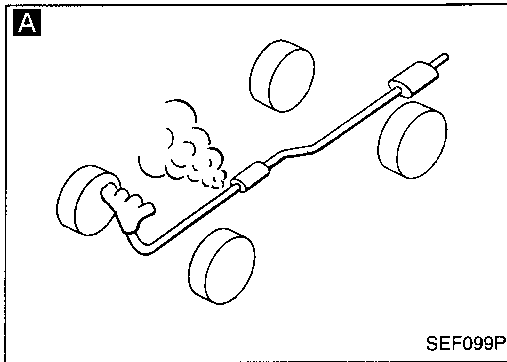


TEC254

TROUBLE DIAGNOSIS FOR DTC P0171 (-B1), P0174 (-B2)

Fuel Injection System Function (Lean side) (P0171: Left bank), (P0174: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

NG → Repair or replace.

OK
CHECK FOR INTAKE AIR LEAK.
Start engine and run it at idle. Listen for an intake air leak between the mass air flow sensor and the intake manifold.

NG → Repair or replace.

B
CHECK FRONT HEATED OXYGEN SENSOR.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM and sensor terminals.

NG → Repair harness or connectors.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0171	83	2	LH (Black)
P0174	82	2	RH (Blue)

Continuity should exist.
4. Check harness continuity between ECM and sensor or ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	Ground	
P0171	83 or 2	Ground	LH (Black)
P0174	82 or 2	Ground	RH (Blue)

Continuity should not exist.
If OK, check harness for short to ground and short to power.

OK
CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-29.
2. Install fuel pressure gauge and check fuel pressure.
At idle:
Approx. 235 kPa (2.4 kg/cm², 34 psi)
A few seconds after ignition switch is turned OFF to ON:
Approx. 294 kPa (3.0 kg/cm², 43 psi)

NG → Check the following.
• Fuel pump and circuit Refer to EC-505.
• Fuel pressure regulator Refer to EC-29.
• Fuel lines Refer to EC-30.
• Fuel lines Refer to "ENGINE MAINTENANCE" in MA section.
• Fuel filter for clogging If NG, repair or replace.

OK
CHECK MASS AIR FLOW SENSOR.
 Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm
OR
 Check "mass air flow" in MODE 1 with GST.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm
OR
 Check mass air flow sensor output voltage, refer to EC-122.
Approximately 2.1V: at 2,500 rpm

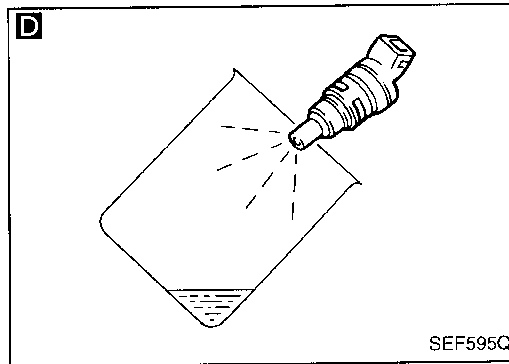
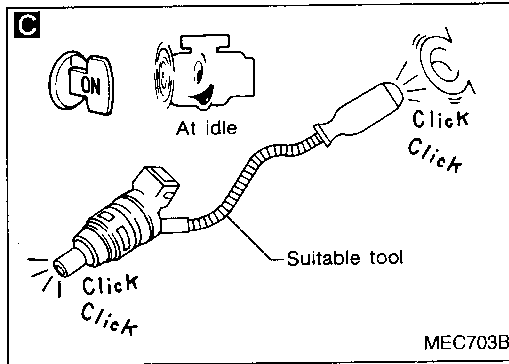
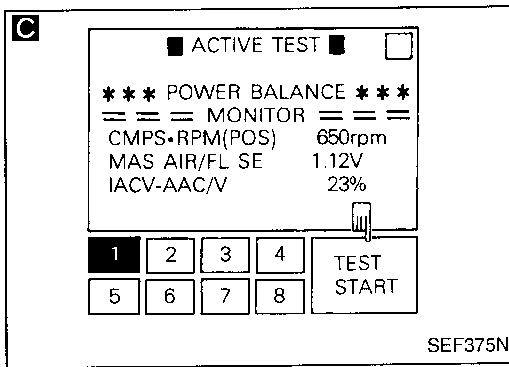
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-115.

OK
A
(Go to next page.)

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TROUBLE DIAGNOSIS FOR DTC P0171 (-B1), P0174 (-B2)

Fuel Injection System Function (Lean side) (P0171: Left bank), (P0174: Right bank) (Cont'd)



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.

OK

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

1. Turn ignition switch "OFF".
2. Remove injector gallery assembly. Refer to EC-30. Keep fuel hose and all injectors connected to injector gallery. The injector harness connectors should remain connected.

D

1. Disconnect all ignition coil harness connectors.
2. Place pans or saucers under each injector.
3. Crank engine for about 3 seconds. Make sure that fuel sprays out vigorously from injectors.
Fuel should be sprayed evenly for each cylinder.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

NG

Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-497. Repair harness or connectors.

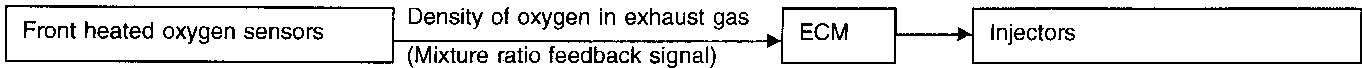
NG

Replace injectors from which fuel does not spray out. Always replace O-ring with new one.

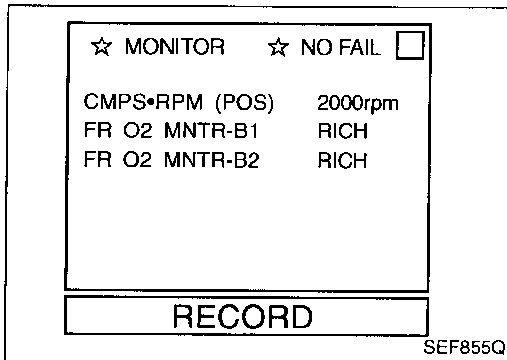
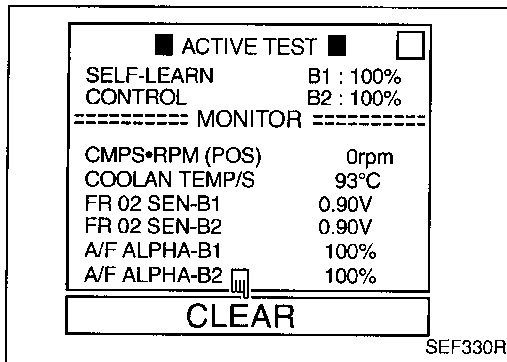
Fuel Injection System Function (Rich side) (P0172: Left bank), (P0175: Right bank)

ON BOARD DIAGNOSIS LOGIC

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



Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0172 0114 (Left bank)	<ul style="list-style-type: none"> Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) 	<ul style="list-style-type: none"> Front heated oxygen sensor Injectors Exhaust gas leaks Incorrect fuel pressure Mass air flow sensor
P0175 0209 (Right bank)		



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

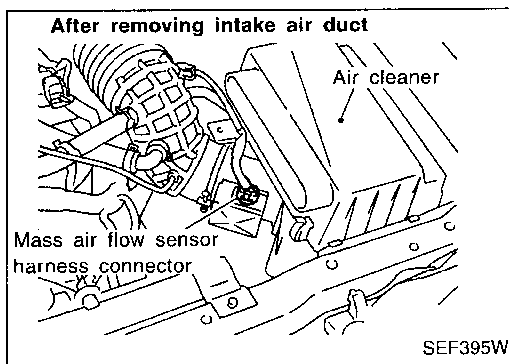


- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 4) Clear the self-learning control coefficient by touching "CLEAR".
- 5) Select "DATA MONITOR" mode with CONSULT.
- 6) Start engine again and let it idle for at least 10 minutes. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to "DIAGNOSTIC PROCEDURE", EC-245.
- 7) If it is difficult to start engine at step 6), the fuel injection system has a malfunction.
- 8) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-245. If engine does not start, remove ignition plugs and check for fouling, etc.

OR

TROUBLE DIAGNOSIS FOR DTC P0172 (-B1), P0175 (-B2)

Fuel Injection System Function (Rich side) (P0172: Left bank), (P0175: Right bank) (Cont'd)



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
- 4) Stop engine and reconnect mass air flow sensor harness connector.
- 5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
- 6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
- 7) Start engine again and run it for at least 10 minutes at idle speed.
- 8) Select "MODE 7" with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to "DIAGNOSTIC PROCEDURE", EC-245.
- 9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
- 10) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-245. If engine does not start, remove ignition plugs and check for fouling, etc.

OR



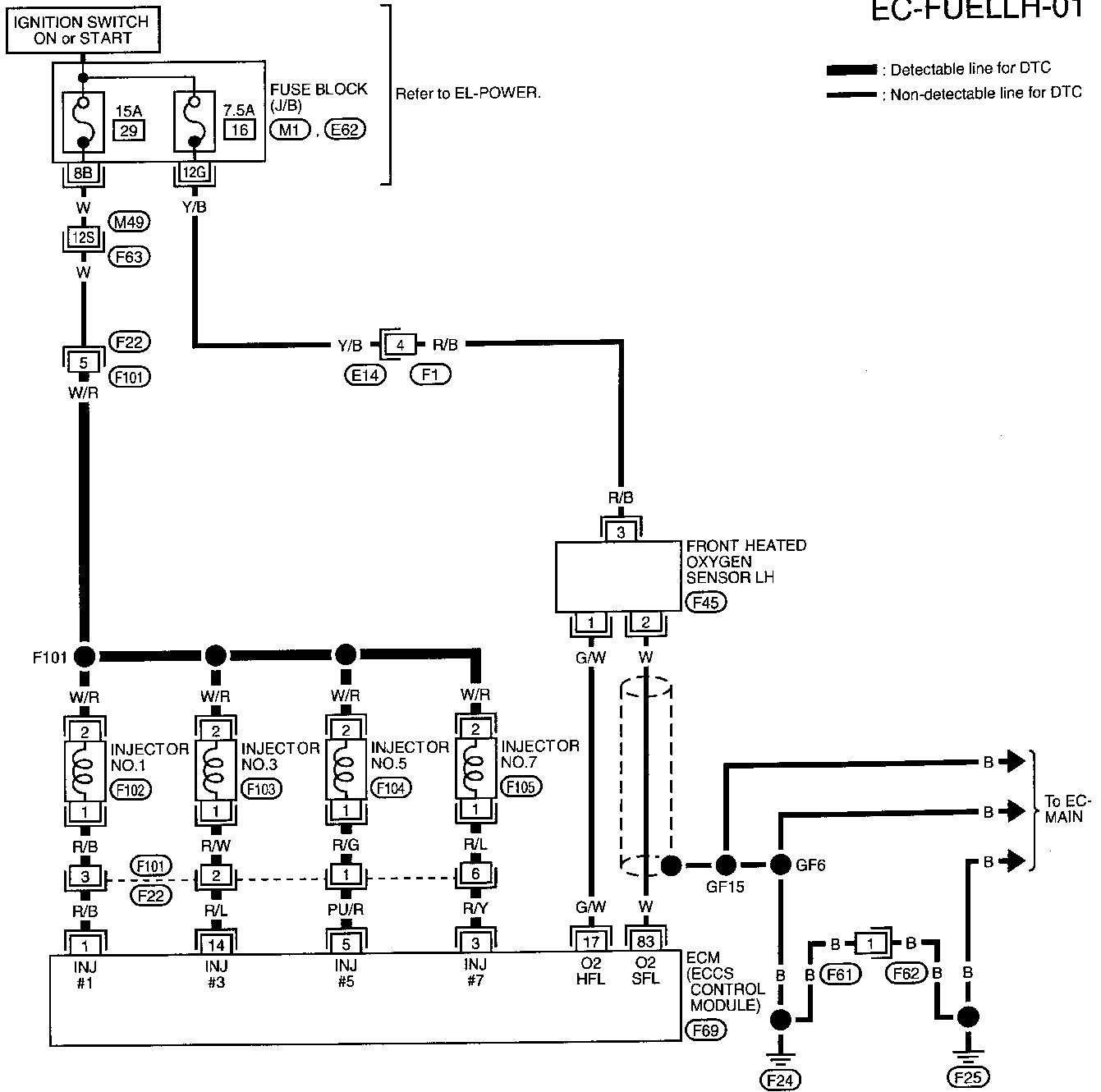
- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Disconnect mass air flow sensor harness connector.
- 4) Then restart engine and run it for at least 3 seconds at idle speed.
- 5) Stop engine and reconnect mass air flow sensor harness connector.
- 6) Turn ignition switch "ON".
- 7) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0102 is detected.
- 8) Erase the DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
- 9) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0505 is detected.
- 10) Start engine again and run it for at least 10 minutes at idle speed.
The DTC 0114 should be detected at this stage, if a malfunction exists. If so, go to "DIAGNOSTIC PROCEDURE", EC-245.
- 11) If it is difficult to start engine at step 10, the fuel injection system also has a malfunction.
- 12) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-245. If engine does not start, remove ignition plugs and check for fouling, etc.

TROUBLE DIAGNOSIS FOR DTC P0172 (-B1), P0175 (-B2)

Fuel Injection System Function (Rich side) (P0172: Left bank), (P0175: Right bank) (Cont'd)

LEFT BANK

EC-FUELLH-01



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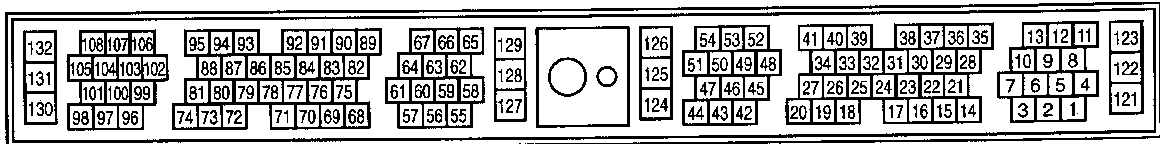
EL

IDX



Refer to last page (Foldout page).

- (M49), (F63)
- (M1)
- (E62)

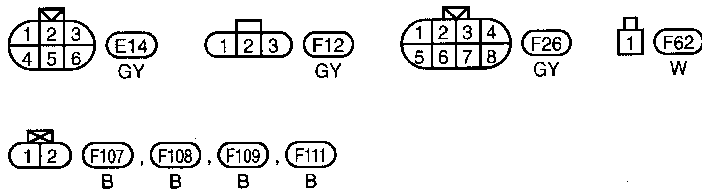
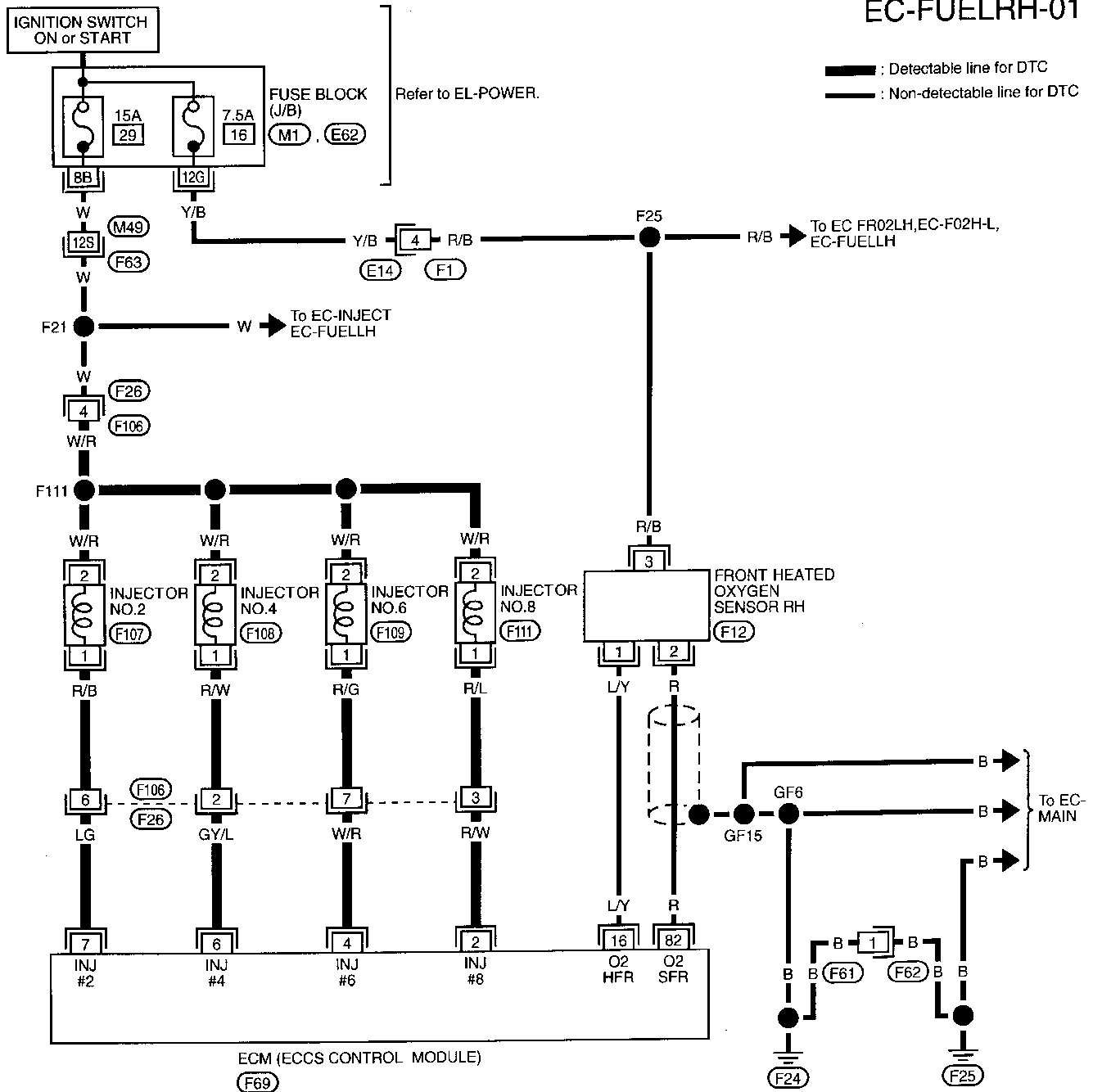


TROUBLE DIAGNOSIS FOR DTC P0172 (-B1), P0175 (-B2)

Fuel Injection System Function (Rich side) (P0172: Left bank), (P0175: Right bank) (Cont'd)

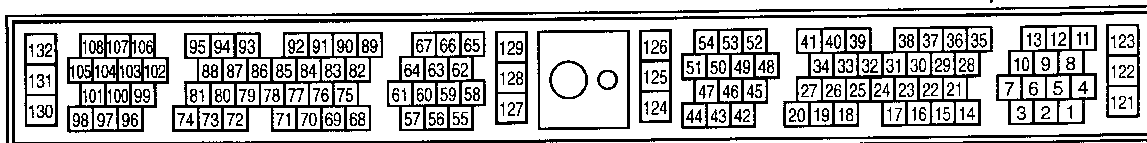
RIGHT BANK

EC-FUEL RH-01



Refer to last page (Foldout page).

- (M49), (F63)
- (E62)
- (M1)



TROUBLE DIAGNOSIS FOR DTC P0172 (-B1), P0175 (-B2)

Fuel Injection System Function (Rich side) (P0172: Left bank), (P0175: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

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

NG → Repair or replace.

OK

B
CHECK FRONT HEATED OXYGEN SENSOR.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM and sensor terminals.

NG → Repair harness or connectors.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0172	83	2	LH (Black)
P0175	82	2	RH (Blue)

Continuity should exist.
4. Check harness continuity between ECM and sensor or ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	Ground	
P0172	83 or 2	Ground	LH (Black)
P0175	82 or 2	Ground	RH (Blue)

Continuity should not exist.
If OK, check harness for short to ground and short to power.

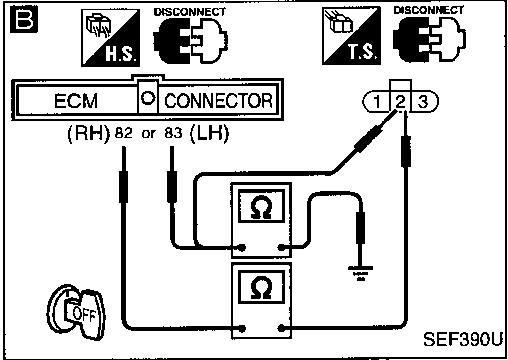
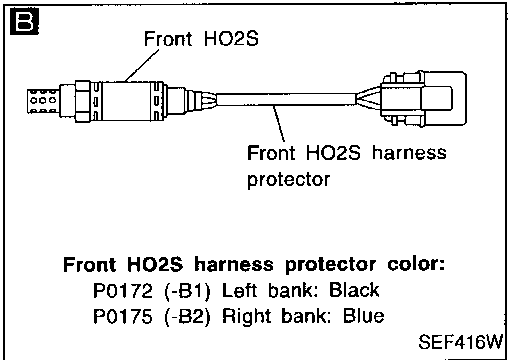
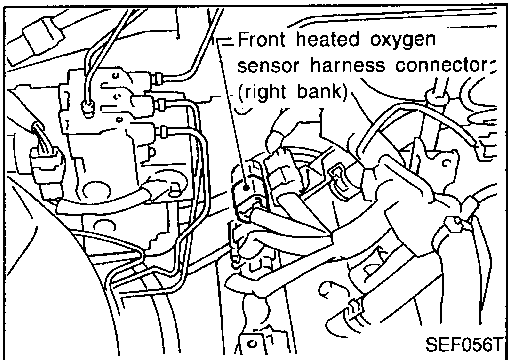
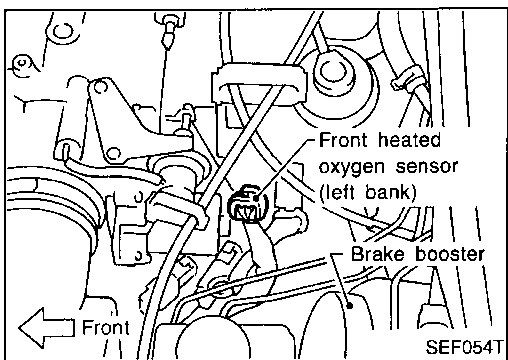
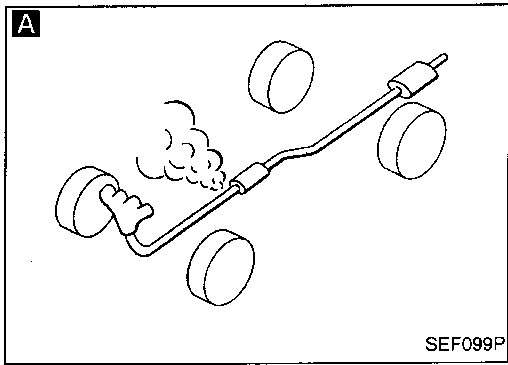
OK

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-29.
2. Install fuel pressure gauge and check fuel pressure.
At idle:
Approx. 235 kPa
(2.4 kg/cm², 34 psi)
A few seconds after ignition switch is turned OFF to ON:
Approx. 294 kPa
(3.0 kg/cm², 43 psi)

NG → Check the following.
• Fuel pump and circuit Refer to EC-505.
• Fuel pressure regulator Refer to EC-29.
If NG, repair or replace.

OK

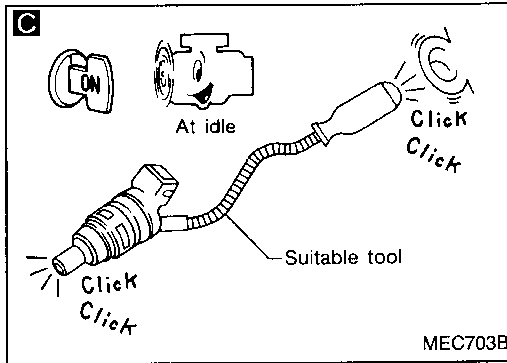
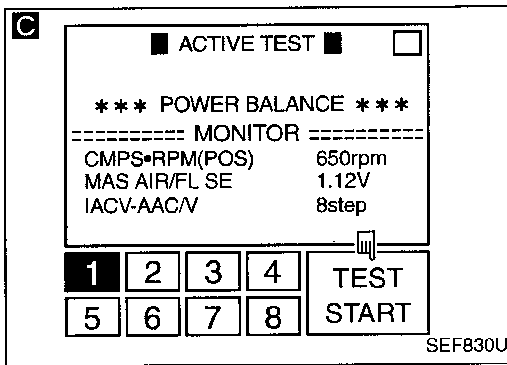
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TROUBLE DIAGNOSIS FOR DTC P0172 (-B1), P0175 (-B2)

Fuel Injection System Function (Rich side) (P0172: Left bank), (P0175: Right bank) (Cont'd)



CHECK MASS AIR FLOW SENSOR.
 Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm
 OR
 Check "mass air flow" in MODE 1 with GST.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm
 OR
 Check mass air flow sensor output voltage, refer to EC-122.
Approximately 2.1V: at 2,500 rpm

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-115.

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-497. Repair harness or connectors.

1. Remove injector assembly.
 2. Refer to EC-30.
 Keep fuel hose, all injectors and injector harness connectors connected to injector gallery.

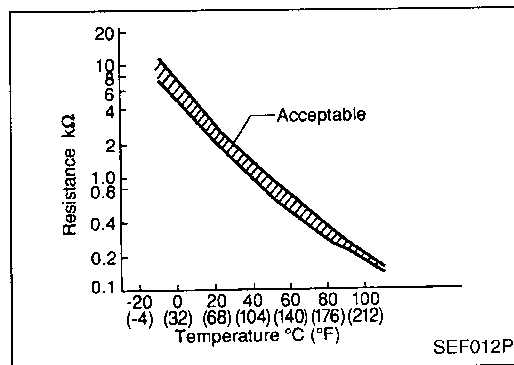
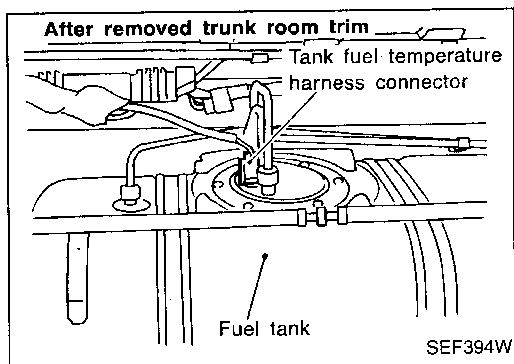
Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

1. Disconnect all injector harness connectors.
 2. Place pans or saucers under each injector.
 3. Disconnect all ignition coil harness connectors.
 4. 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.
 Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END



Tank Fuel Temperature Sensor

COMPONENT DESCRIPTION

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

GI
MA
EM

<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

LC
EC

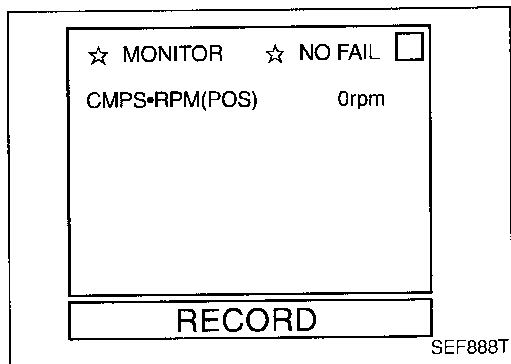
*: These data are reference values and are measured between ECM terminal ⑨ (Tank fuel temperature sensor) and ECM terminal ⑫ (ECM ground).

FE
AT

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Causes)
P0180 0402	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Tank fuel temperature sensor

PD
FA
RA
BR



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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



- Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- Wait at least 10 seconds.
If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-250.
If the result is OK, go to following step.

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HA
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NOTE:

If "COOLAN TEMP/S" is already less than 90°C (194°F) before step 4), the result will be OK.

If "COOLAN TEMP/S" is above 90°C (194°F), go to the following step.

- Cool engine down until "COOLAN TEMP/S" is less than 90°C (194°F).
- Wait at least 10 seconds.
- If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-250.

IDX

TROUBLE DIAGNOSIS FOR DTC P0180

Tank Fuel Temperature Sensor (Cont'd)

OR

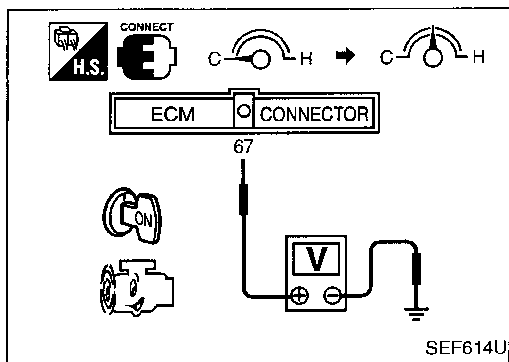


- 1) Turn ignition switch "ON" and wait at least 10 seconds.
- 2) Select "MODE 7" with GST.
If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-250.
If the result is OK, go to following step.
- 3) Select "MODE 1" with GST and check for the engine coolant temperature.
- 4) Cool engine down until the engine coolant temperature is less than 90°C (194°F). If the temperature is already less than 90°C (194°F) before step 4), the result will be OK.
- 5) Wait at least 10 seconds.
- 6) Select "MODE 7" with GST.
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-250.

OR



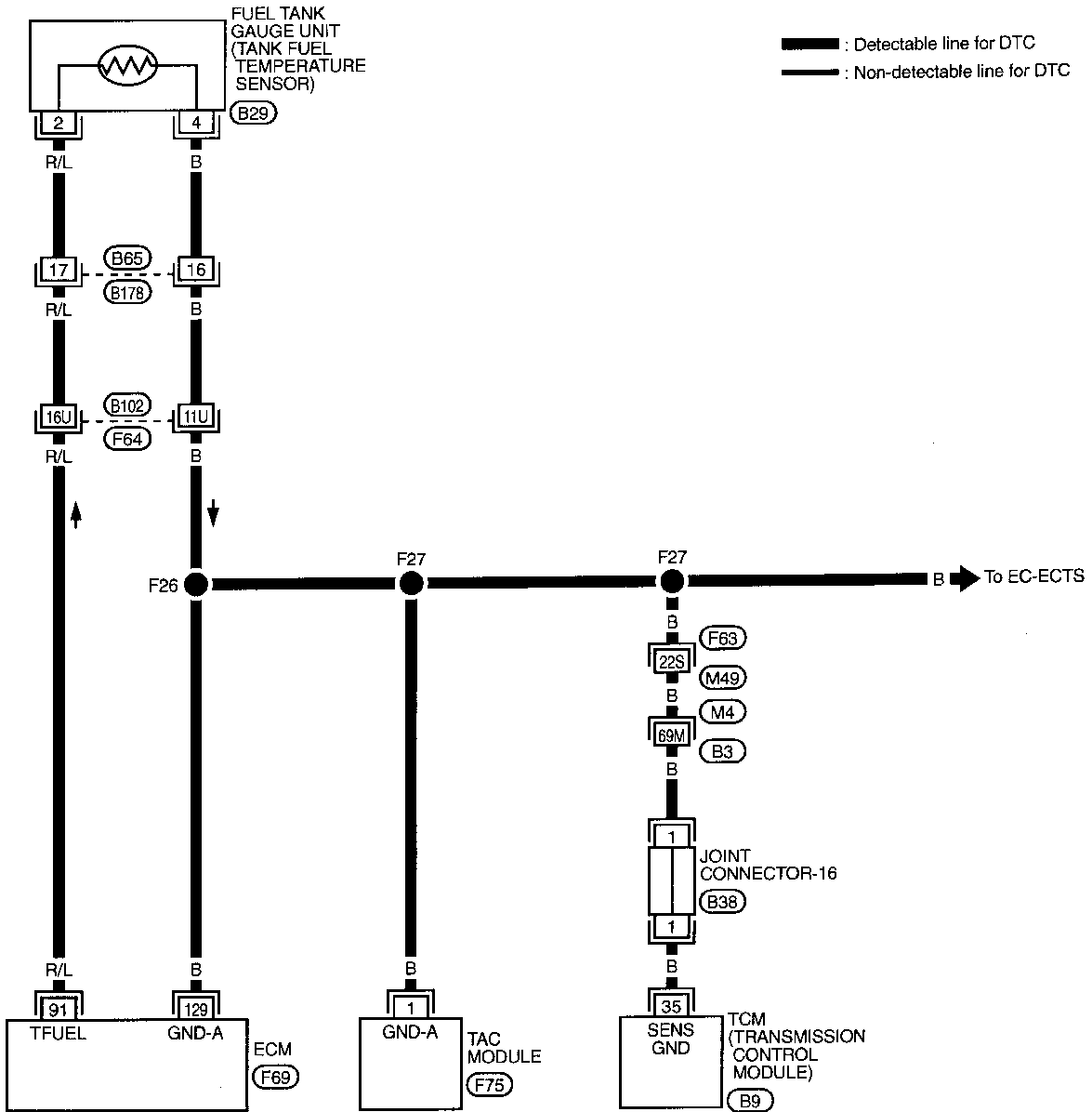
- 1) Turn ignition switch "ON" and wait at least 10 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-250.
If the result is OK, go to following step.
- 4) Cool engine down until the voltage between ECM terminal 67 (Engine coolant temperature) and ground becomes more than 1.0V.
If the voltage is already more than 1.0V before step 4), the result will be OK.
- 5) Wait at least 10 seconds.
- 6) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 7) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 8) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-250.



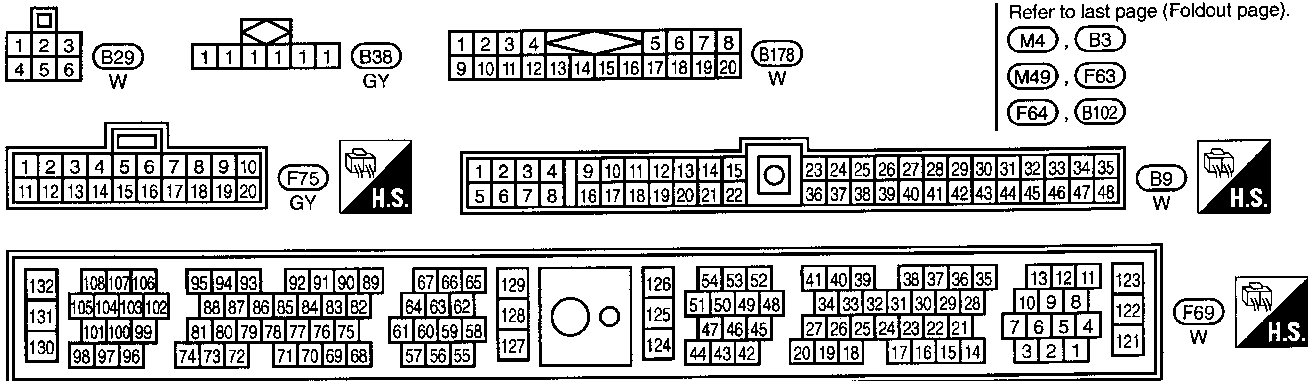
TROUBLE DIAGNOSIS FOR DTC P0180

Tank Fuel Temperature Sensor (Cont'd)

EC-TFTS-01

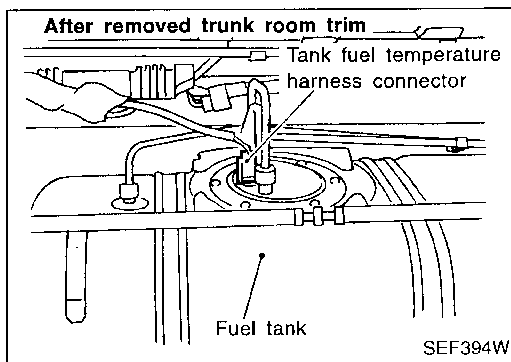


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Tank Fuel Temperature Sensor (Cont'd)

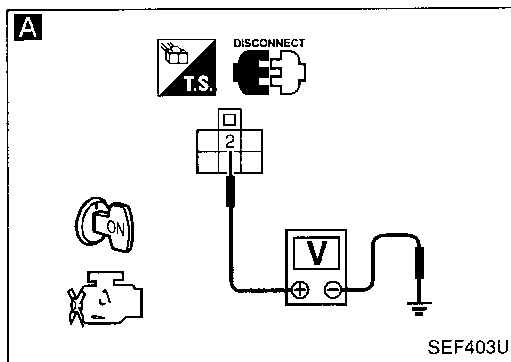
DIAGNOSTIC PROCEDURE



INSPECTION START

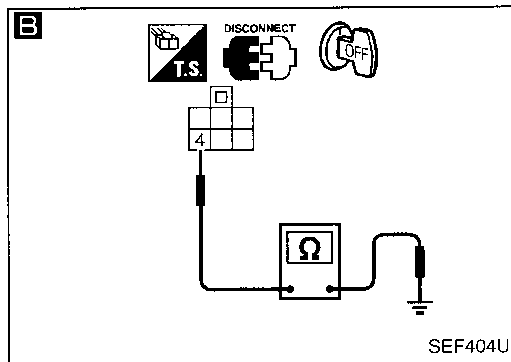
A
CHECK POWER SUPPLY.
 1. Turn ignition switch "OFF".
 2. Disconnect tank fuel temperature sensor harness connector.
 3. Turn ignition switch "ON".
 4. Check voltage between terminal ② and ground with CONSULT or tester.
Voltage: Approximately 5V

NG → Check the following.
 • Harness connectors (B65), (B178)
 • Harness connectors (B102), (F64)
 • Harness for open or short between ECM and tank fuel temperature sensor
 If NG, repair harness or connector.



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

NG → Check the following.
 • Harness connectors (F64), (B102)
 • Harness connectors (B178), (B65)
 • Harness connectors (F63), (M49), (M4), (B3)
 • Joint connector-16
 • Harness for open or short between ECM and sensor
 • Harness for open or short between TCM (Transmission control module) and sensor
 • Harness for open or short between tank fuel temperature sensor and throttle actuator control (TAC) module
 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 → Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

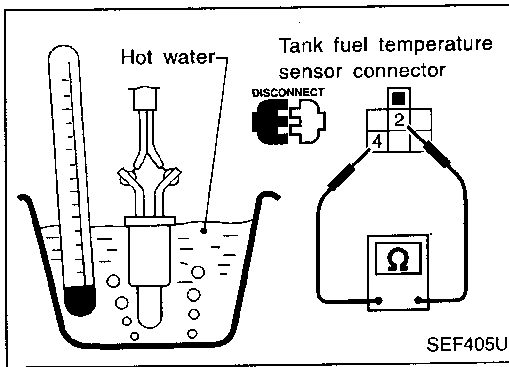
TROUBLE DIAGNOSIS FOR DTC P0180

Tank Fuel Temperature Sensor (Cont'd)

COMPONENT INSPECTION

Tank fuel temperature sensor

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



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

If NG, replace tank fuel temperature sensor.

GI

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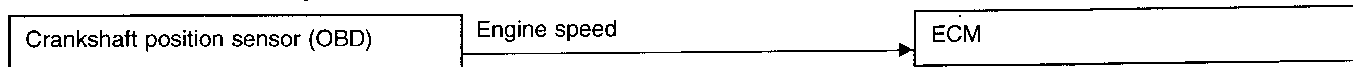
IDX

No. 1 - 8 Cylinder Misfire, Multiple Cylinder Misfire

ON BOARD DIAGNOSIS LOGIC

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

The misfire detection logic consists of the following two conditions.



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

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

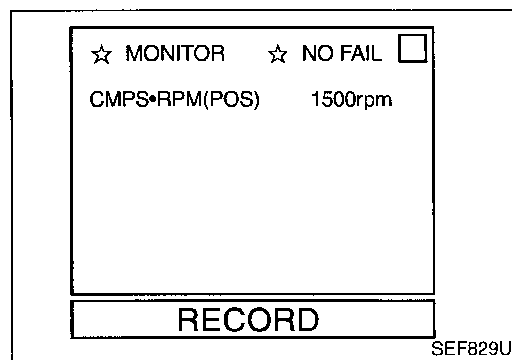
If the misfire frequency decreases to a level that will not damage the three way catalyst, the MIL will change from blinking to lighting up.

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

2. Two Trip Detection Logic (Exhaust quality deterioration)

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

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0300 (0701)	● Multiple cylinders misfire.	<ul style="list-style-type: none"> ● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● EGR valve ● The injector circuit is open or shorted. ● Injectors ● Intake air leaks ● The ignition secondary circuit is open or shorted. ● Lack of fuel ● Magnetized signal plate (drive plate) ● Front heated oxygen sensor
P0301 (0608)	● No. 1 cylinder misfires.	
P0302 (0607)	● No. 2 cylinder misfires.	
P0303 (0606)	● No. 3 cylinder misfires.	
P0304 (0605)	● No. 4 cylinder misfires.	
P0305 (0604)	● No. 5 cylinder misfires.	
P0306 (0603)	● No. 6 cylinder misfires.	
P0307 (0602)	● No. 7 cylinder misfires.	
P0308 (0601)	● No. 8 cylinder misfires.	



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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



- 1) Turn ignition switch "ON", and select "DATA MONITOR" mode with CONSULT.

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

- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
Hold the accelerator pedal as steady as possible during driving.

GI
MA

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

- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-254.

EM

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
Hold the accelerator pedal as steady as possible during driving.

LC

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FE

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

- 4) Select "MODE 3" with GST.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-254.

AT

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OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
Hold the accelerator pedal as steady as possible during driving.
- 4) Turn ignition switch "OFF", wait at least 5 seconds, and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-254.

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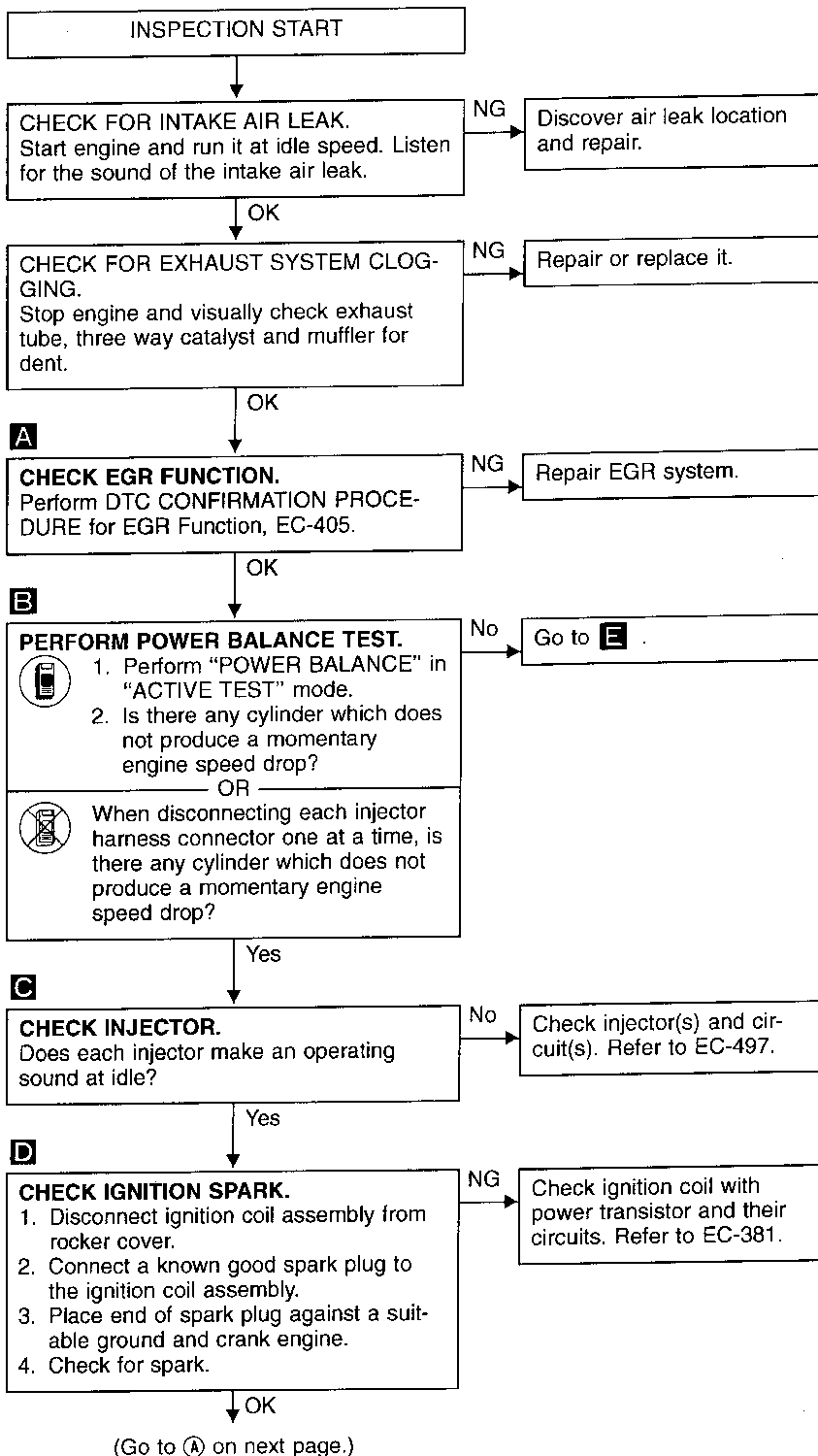
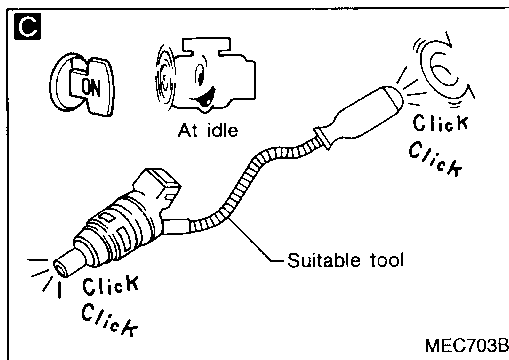
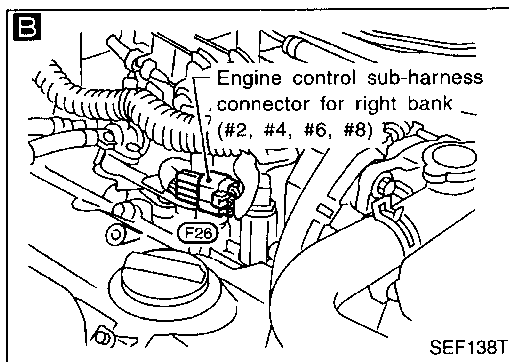
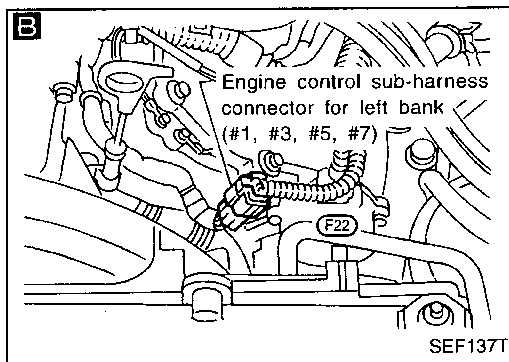
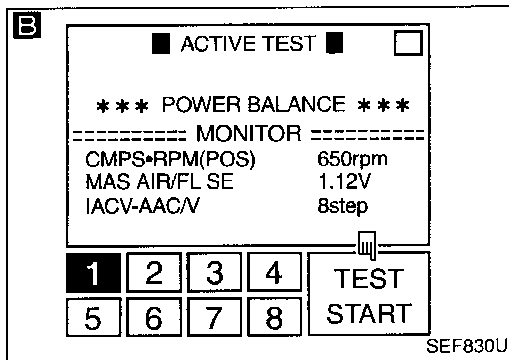
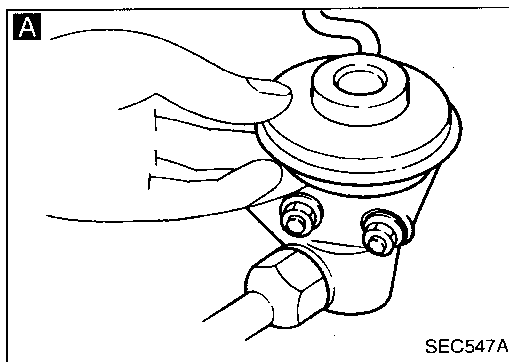
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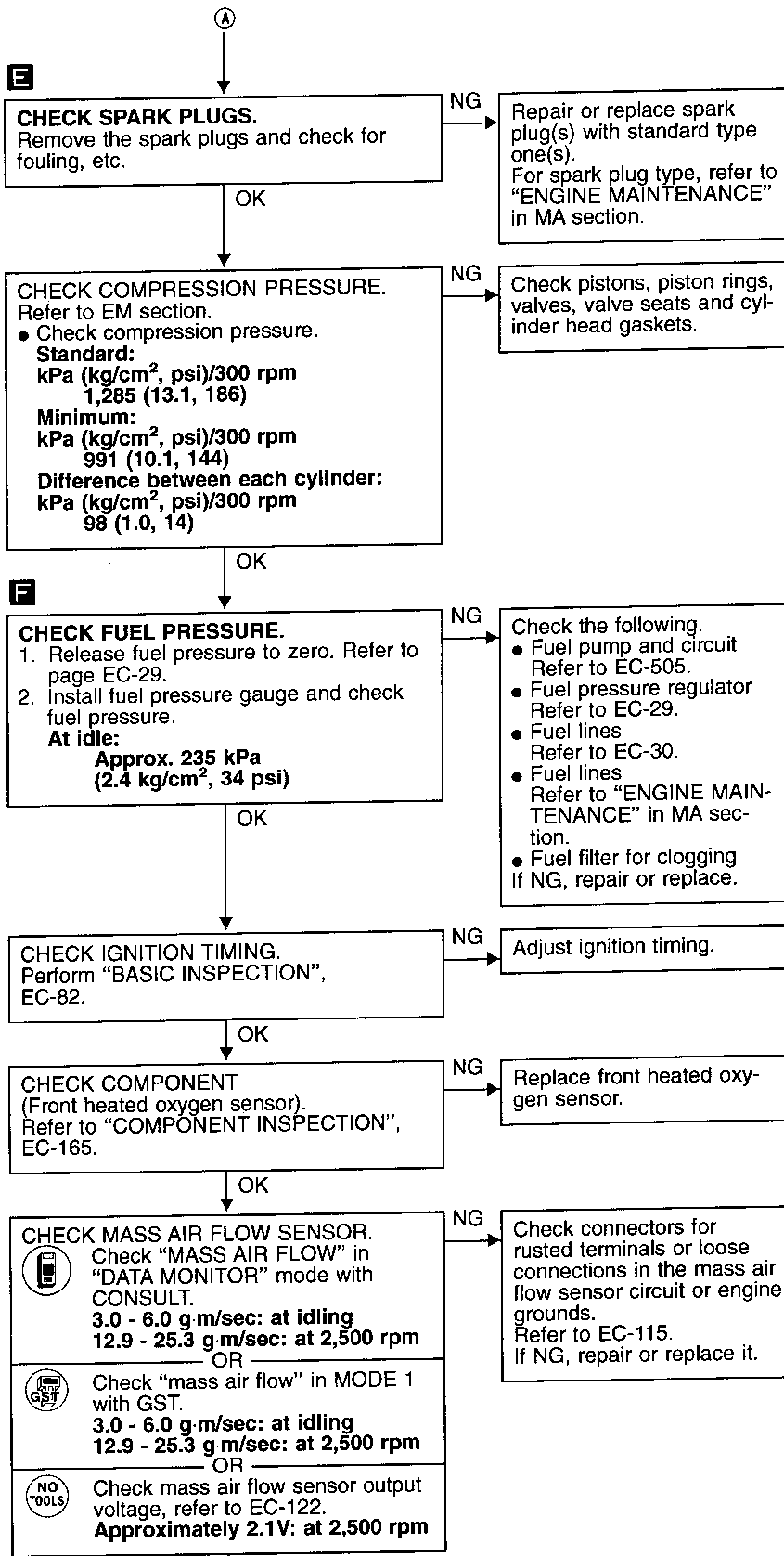
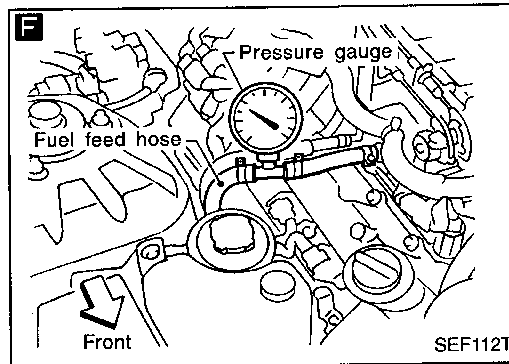
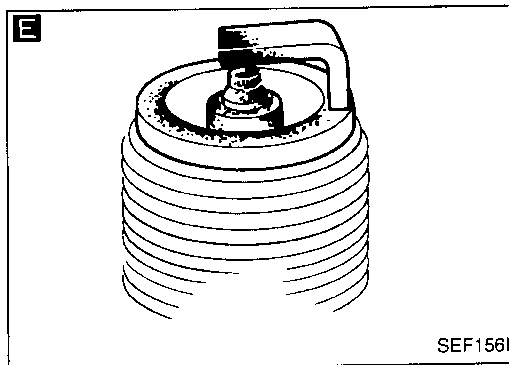
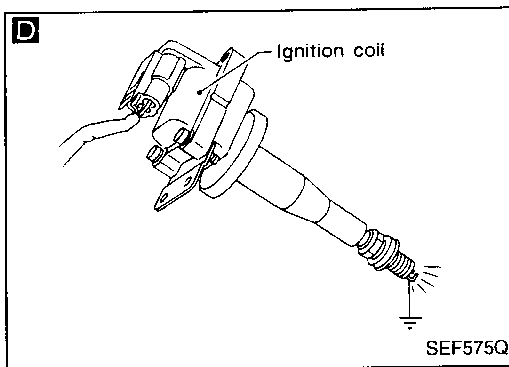
TROUBLE DIAGNOSIS FOR DTC P0300 - P0308

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

DIAGNOSTIC PROCEDURE



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

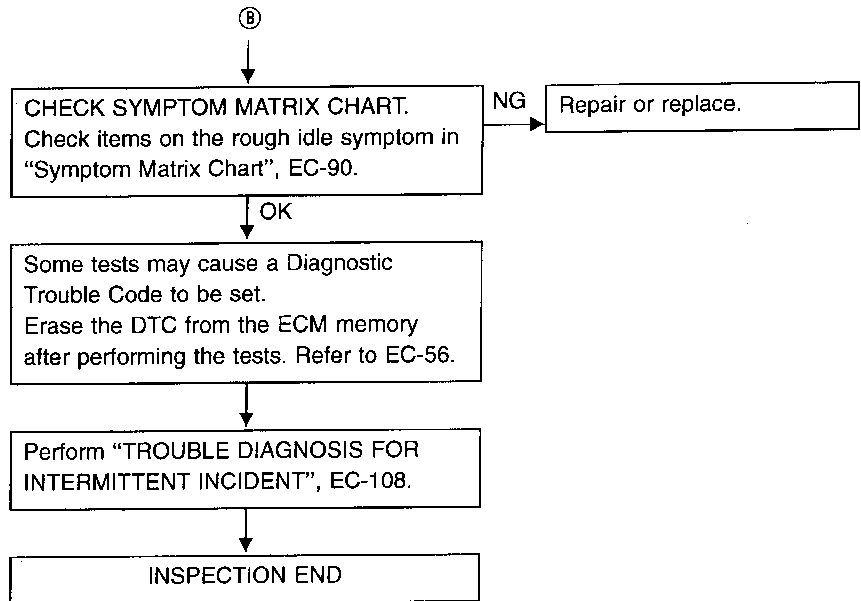


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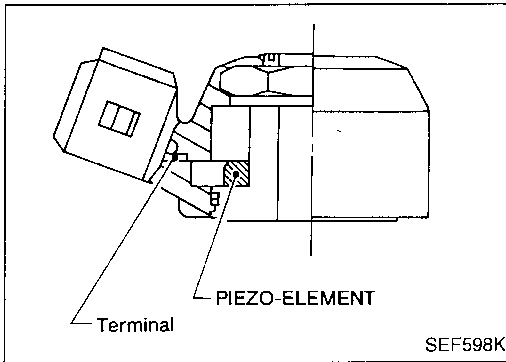
(Go to ⑧ on next page.)

TROUBLE DIAGNOSIS FOR DTC P0300 - P0308

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



TROUBLE DIAGNOSIS FOR DTC P0325 (-B1), P0330 (-B2)



Knock Sensor (KS) (P0325: Left bank), (P0330: Right bank)

COMPONENT DESCRIPTION

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

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

LC

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

EC

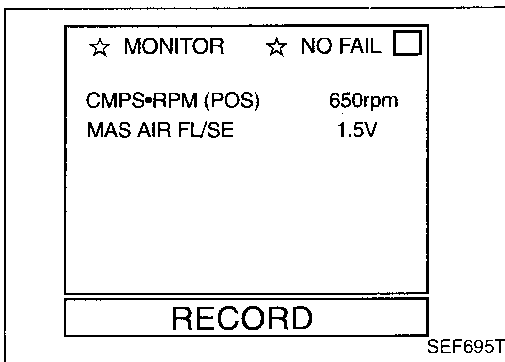
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
105	W	Knock sensor (RH)	Engine is running.	2.0 - 3.0V
108	W	Knock sensor (LH)	Idle speed	

FE
AT

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0325 0304 (Left bank)	<ul style="list-style-type: none"> An excessively low or high voltage from the knock sensor is sent to ECM. 	<ul style="list-style-type: none"> Harness or connectors (The knock sensor circuit is open or shorted.) Knock sensor
P0330 0212 (Right bank)		

PD
FA
RA
BR



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

Before performing the following procedure, confirm that battery voltage is more than 10V.

- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 5 seconds at idle speed.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-259.

ST
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OR

- 1) Start engine and run it for at least 5 seconds at idle speed.
- 2) Select "MODE 3" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-259.

EL
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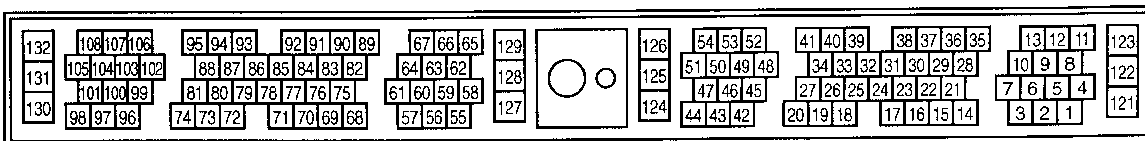
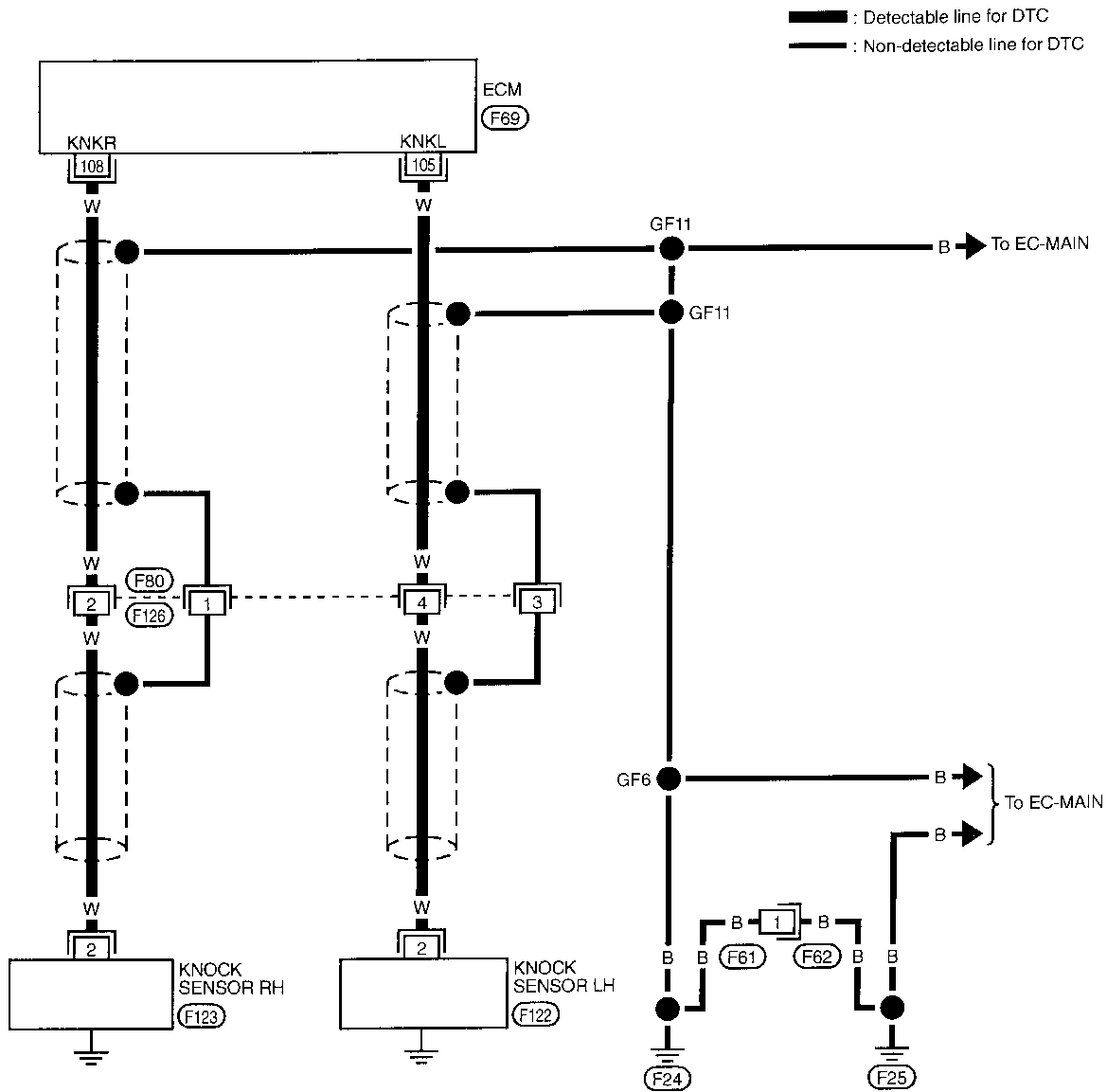
OR

- 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.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-259.

TROUBLE DIAGNOSIS FOR DTC P0325 (-B1), P0330 (-B2)

Knock Sensor (KS) (P0325: Left bank), (P0330: Right bank) (Cont'd)

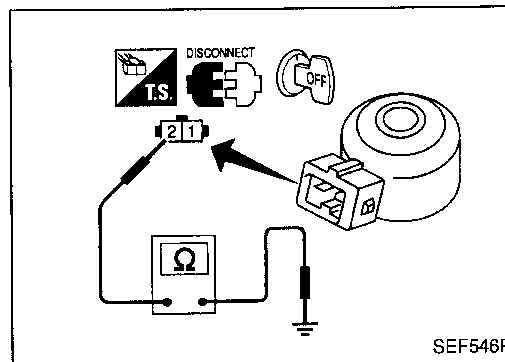
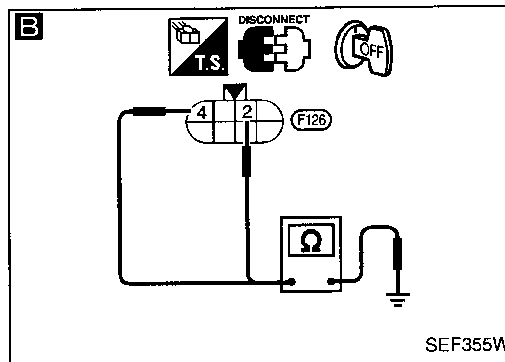
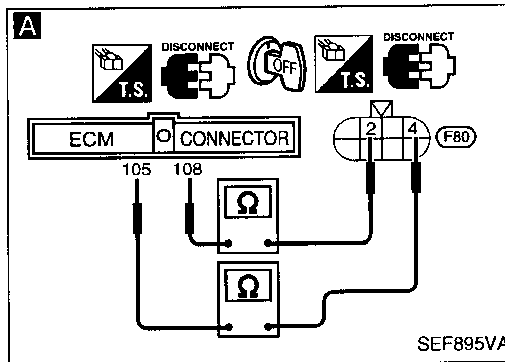
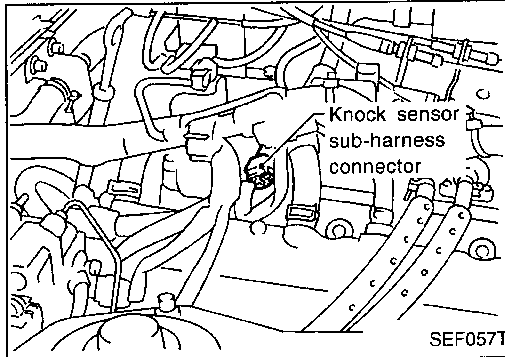
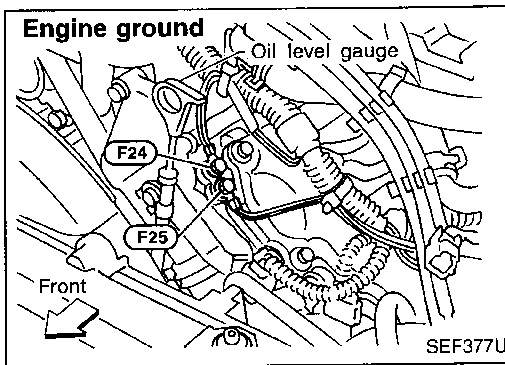
EC-KS-01



TROUBLE DIAGNOSIS FOR DTC P0325 (-B1), P0330 (-B2)

Knock Sensor (KS) (P0325: Left bank), (P0330: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

A
CHECK INPUT SIGNAL CIRCUIT-1.
1. Disconnect ECM harness connector and knock sensor sub-harness connector.
2. Check harness continuity between terminal ④ (left bank), ② (right bank) and ECM terminal ⑩⑤ (left bank), ⑩⑧ (right bank).
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair harness or connectors.

B
CHECK INPUT SIGNAL CIRCUIT-2.
Check harness continuity between terminal ④ (left bank), ② (right bank) and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

NG → Check the following.
• Harness for open or short between knock sensor sub-harness connector-2 and knock sensor
If NG, repair open circuit or short to ground or short to power in harness or connectors.
• As for knock sensor (COMPONENT INSPECTION), refer to below.
If NG, replace knock sensor.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

COMPONENT INSPECTION

Knock sensor

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

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

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

CAUTION:

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

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Crankshaft Position Sensor (CKPS) (OBD)

COMPONENT DESCRIPTION

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

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

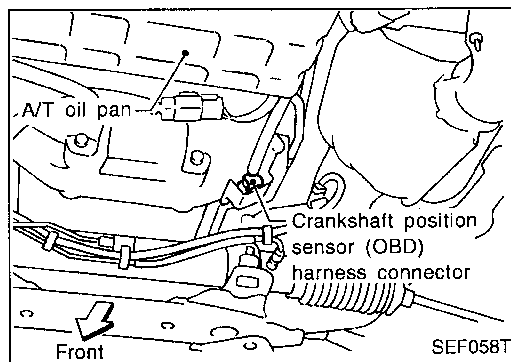
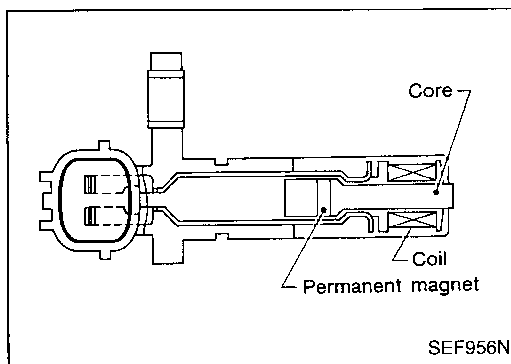
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

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 (128) (ECM ground).

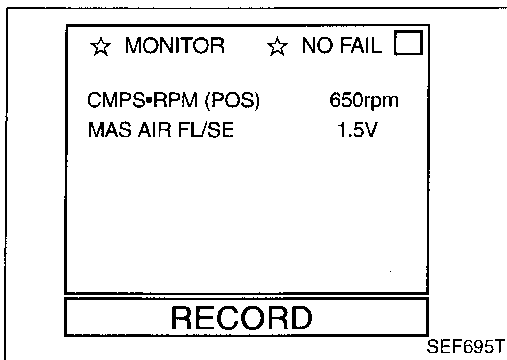
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
57	B/R	Crankshaft position sensor (OBD)	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) └ Idle speed	Approximately 1.7V SEF545T
			<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0V SEF546T

TROUBLE DIAGNOSIS FOR DTC P0335

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

ON BOARD DIAGNOSIS LOGIC

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



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 15 seconds at idle speed.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-269.

OR



- 1) Start engine and run it for at least 15 seconds at idle speed.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-269.

OR



- 1) Start engine and run it for at least 15 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-263.

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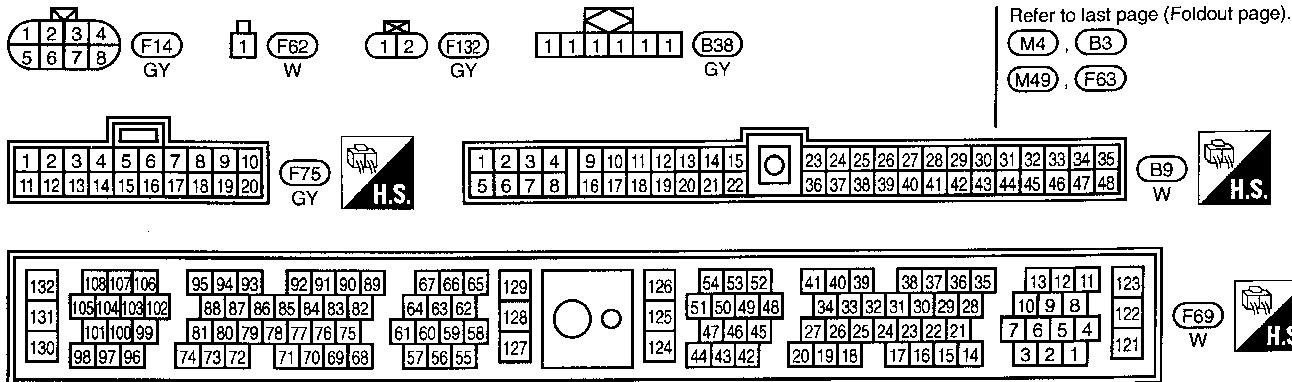
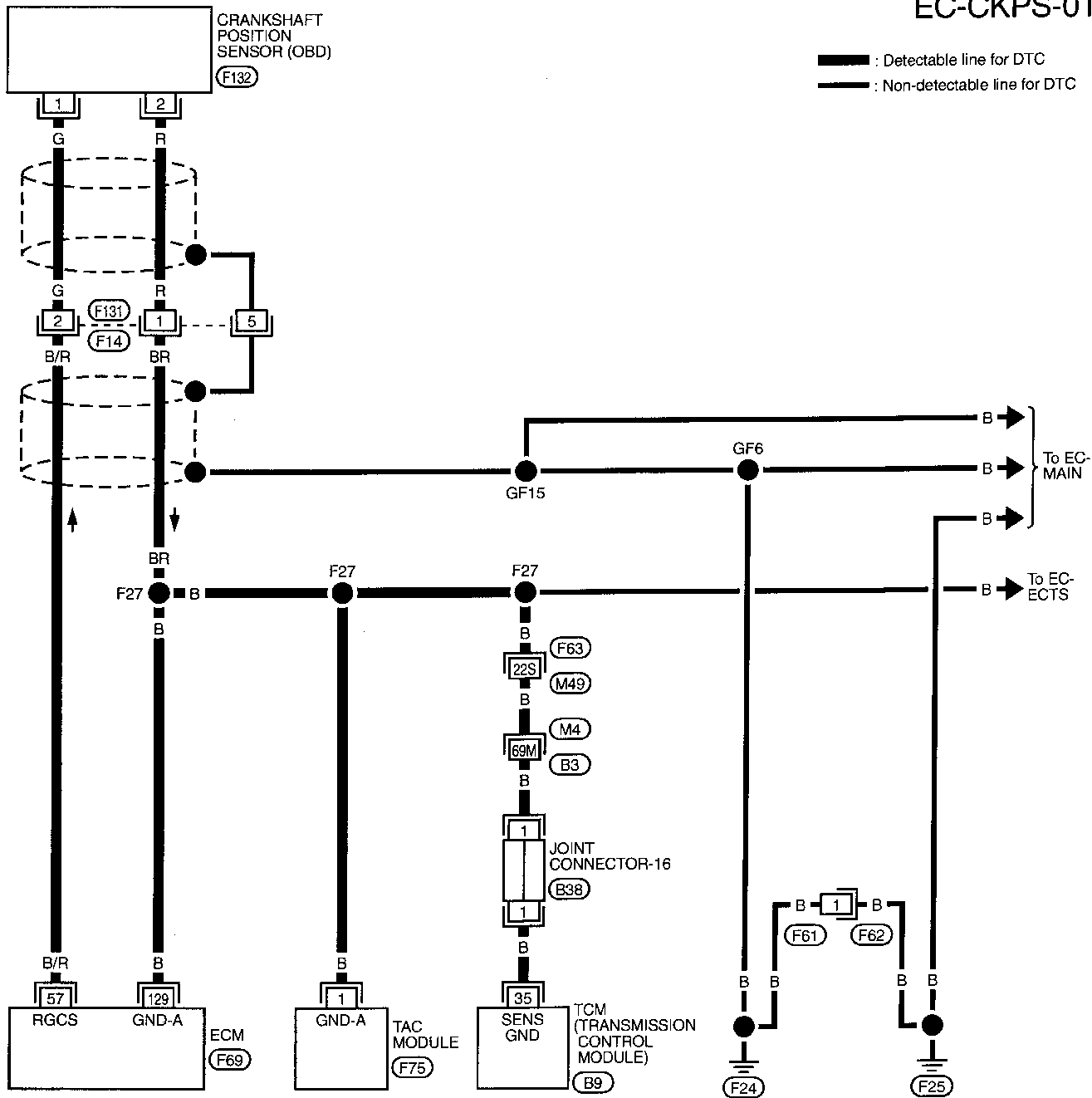
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TROUBLE DIAGNOSIS FOR DTC P0335

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

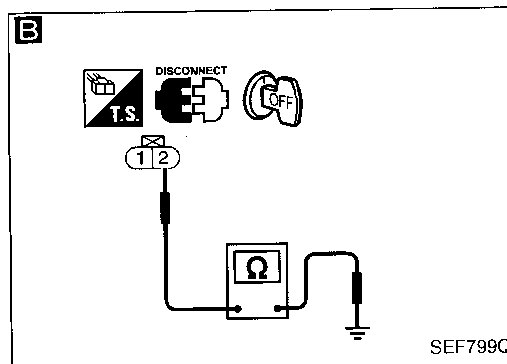
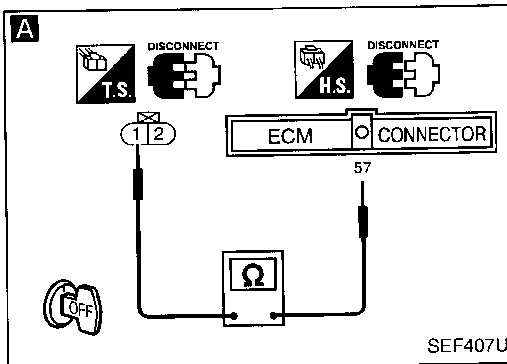
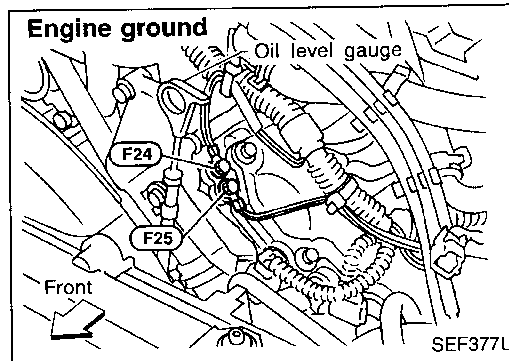
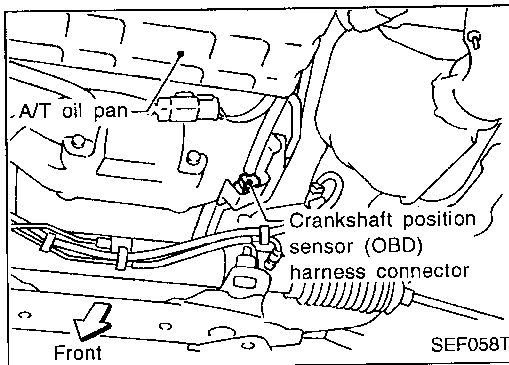
EC-CKPS-01



TROUBLE DIAGNOSIS FOR DTC P0335

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

DIAGNOSTIC PROCEDURE



INSPECTION START

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

A
CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect crankshaft position sensor (OBD) harness connector and ECM harness connector.
2. Check continuity between sensor terminal ① and ECM terminal ⑤ with CONSULT or tester.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG
Check the following.
• Harness connectors (F14), (F31)
• Harness for open or short between crankshaft position sensor (OBD) and ECM
If NG, repair open circuit or short to ground or short to power in harness or connectors.

B
CHECK GROUND CIRCUIT.
Check harness continuity between terminal ② and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG
Check the following.
• Harness connectors (F14), (F31)
• Harness connectors (F63), (M69)
• Harness connectors (M4), (B3)
• Joint connector-16
• Harness for open or short between crankshaft position sensor (OBD) harness connector and ECM
• Harness for open or short between crankshaft position sensor (OBD) and throttle actuator control module (TAC)
• Harness for open or short between crankshaft position sensor and TCM (Transmission Control Module)
If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

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

NG
Replace crankshaft position sensor (OBD).

OK
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

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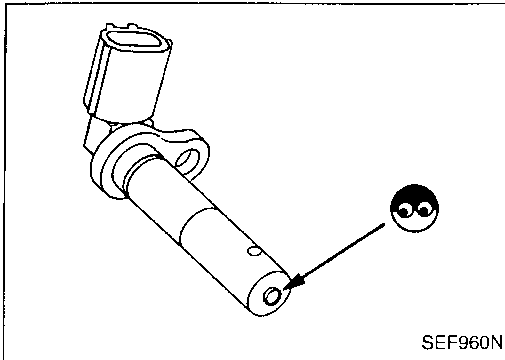
TROUBLE DIAGNOSIS FOR DTC P0335

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

COMPONENT INSPECTION

Crankshaft position sensor (OBD)

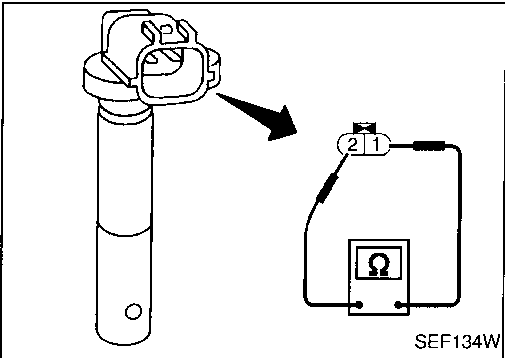
1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.

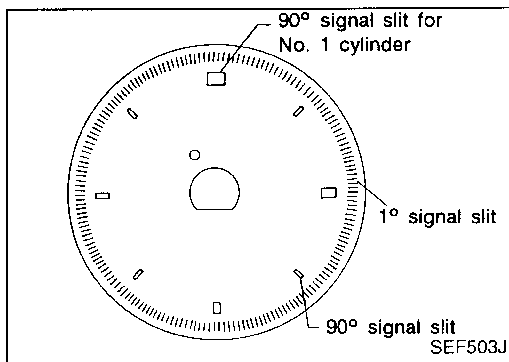
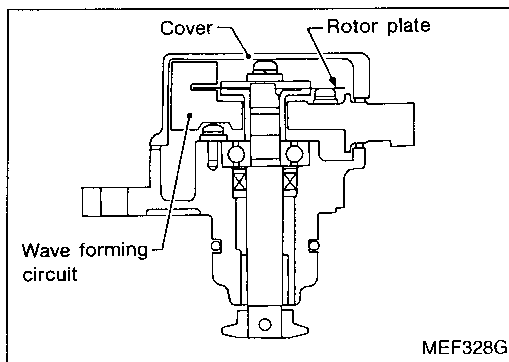


5. Check resistance as shown in the figure.

Resistance:

Approximately $166.5 - 203.5\Omega$ [at 20°C (68°F)]





Camshaft Position Sensor (CMPS)

COMPONENT DESCRIPTION

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

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

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

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

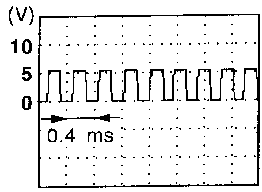
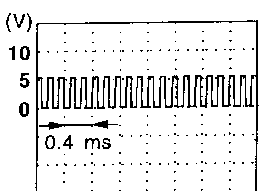
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
124	W/B	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
55 58	P	Crankshaft position sensor (REF)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.6 - 1.0V
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0.8 - 0.9V

TROUBLE DIAGNOSIS FOR DTC P0340

Camshaft Position Sensor (CMPS) (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
59	L	Camshaft position sensor (POS)	<div style="border: 1px solid black; display: inline-block; padding: 2px;">Engine is running.</div> (Warm-up condition) ↳ Idle speed	Approximately 2.5V  SEF547T
			<div style="border: 1px solid black; display: inline-block; padding: 2px;">Engine is running.</div> (Warm-up condition) ↳ Engine speed is 2,000 rpm.	Approximately 2.4V  SEF548T
130 131	R/G	Power supply for ECM	<div style="border: 1px solid black; display: inline-block; padding: 2px;">Ignition switch "ON"</div>	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0340 0101	A) Either 1° or 90° signal is not sent to ECM for the first few seconds during engine cranking. B) Either 1° or 90° signal is not sent to ECM during engine running. C) Either 1° or 90° signal is not in the normal pattern during engine running.	<ul style="list-style-type: none"> ● Harness or connectors (The camshaft position sensor circuit is open or shorted.) ● Camshaft position sensor ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.) ● Dead (Weak) battery

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

NOTE:

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

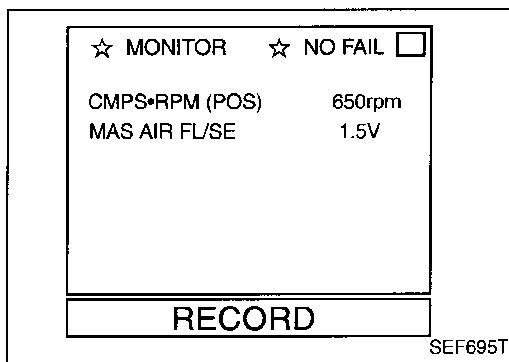
TESTING CONDITION:

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

TROUBLE DIAGNOSIS FOR DTC P0340

Camshaft Position Sensor (CMPS) (Cont'd)

Procedure for malfunction A



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-269.

GI

MA

OR



- 1) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-269.

EM

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OR



- 1) Start engine and run it for at least 2 seconds at idle speed.
(If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-269.

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Procedure for malfunction B and C



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and run it for at least 2 seconds at idle speed.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-269.

RA

BR

OR



- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-269.

ST

RS

OR



- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-269.

BT

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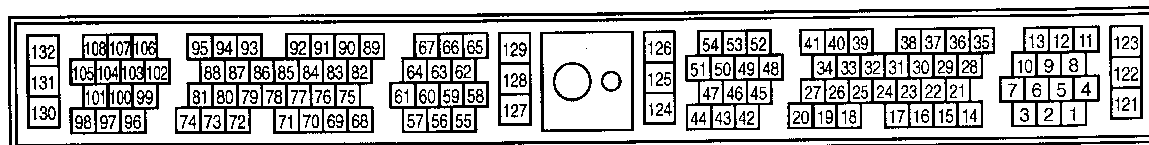
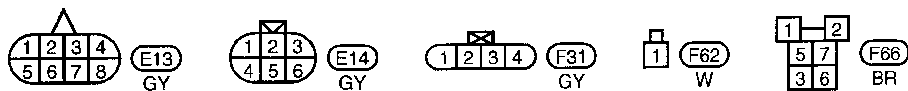
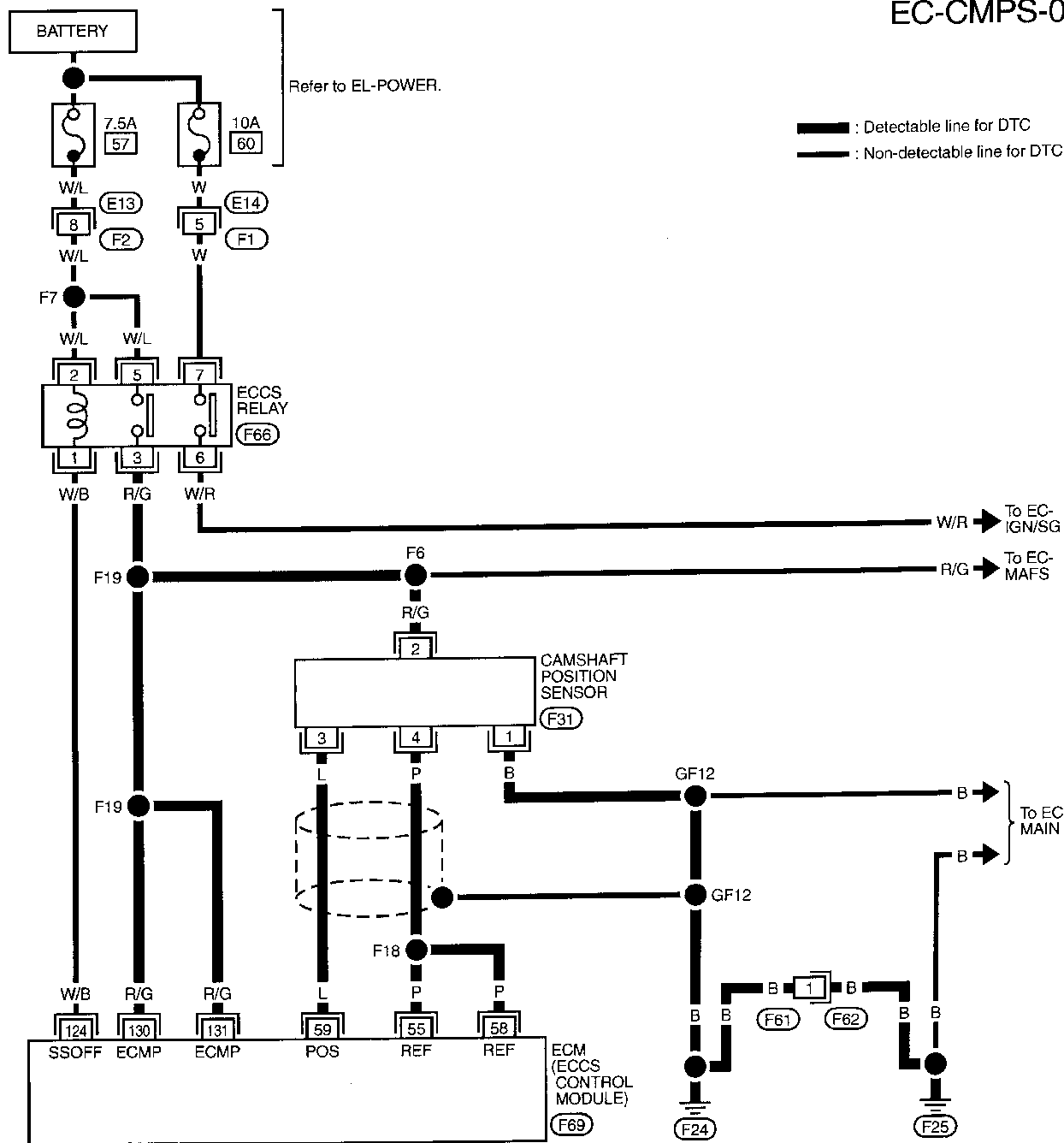
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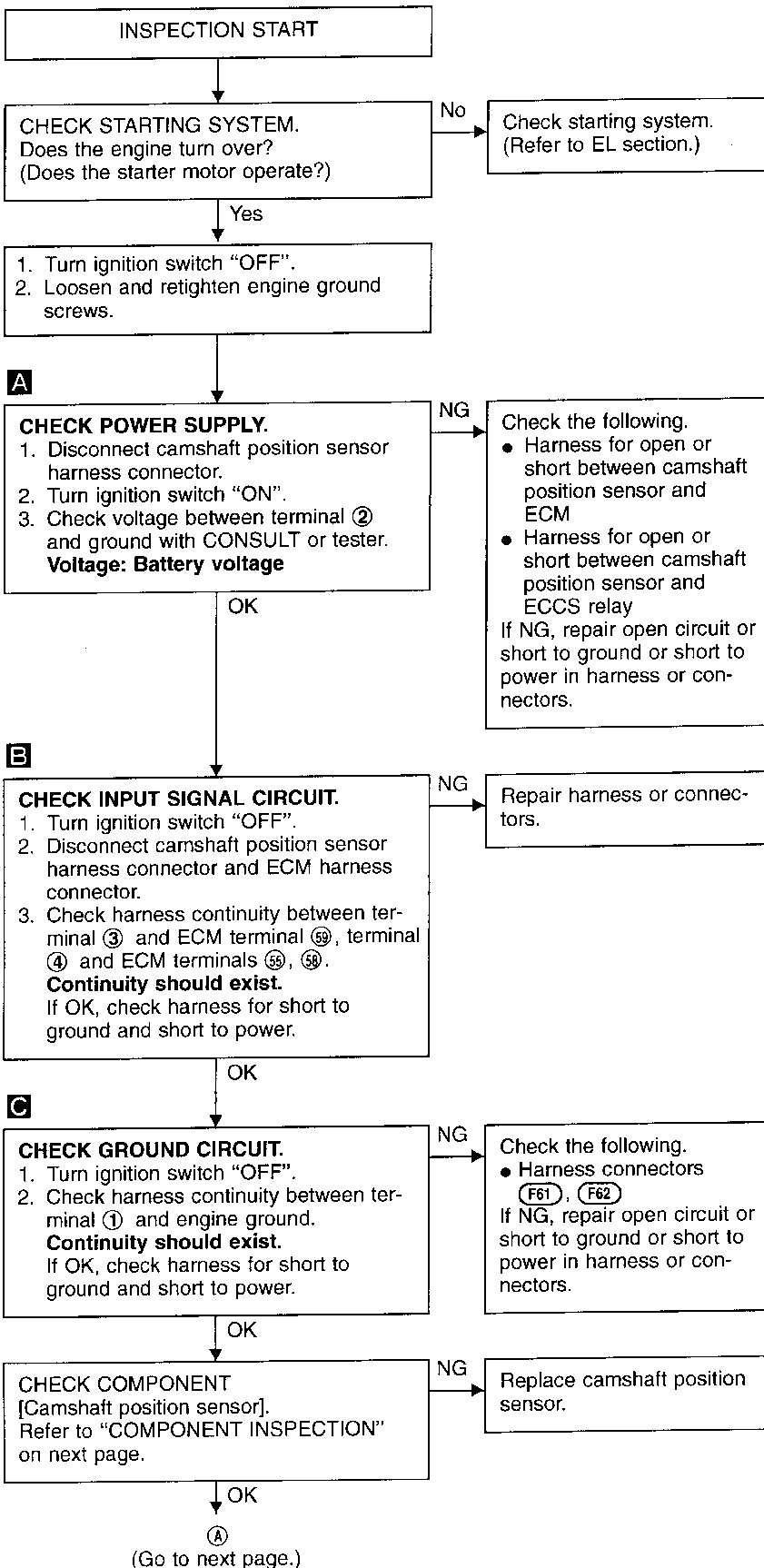
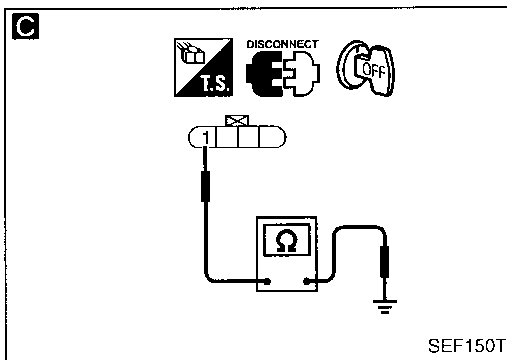
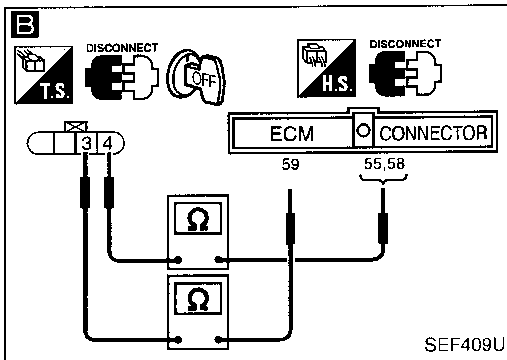
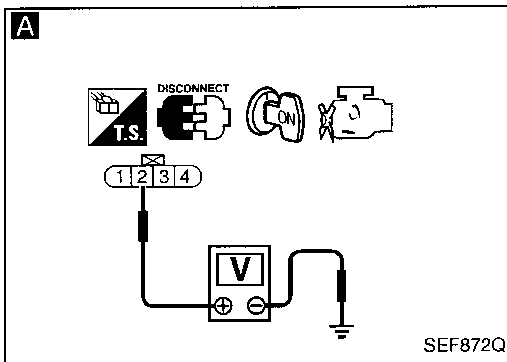
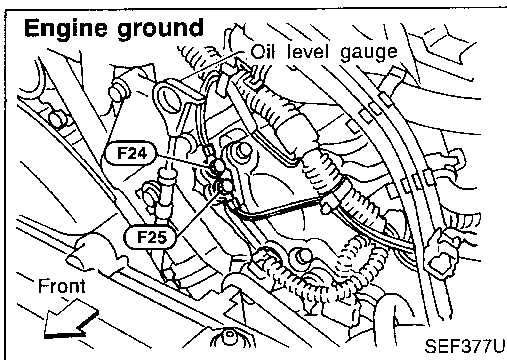
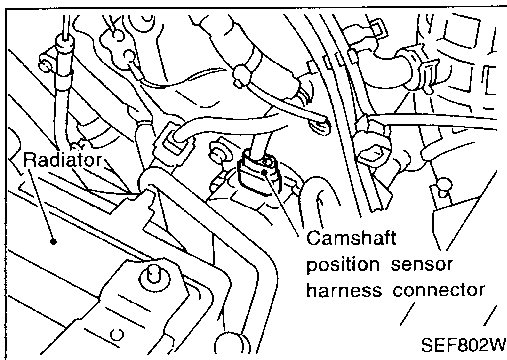
TROUBLE DIAGNOSIS FOR DTC P0340

Camshaft Position Sensor (CMPS) (Cont'd)

EC-CMPS-01



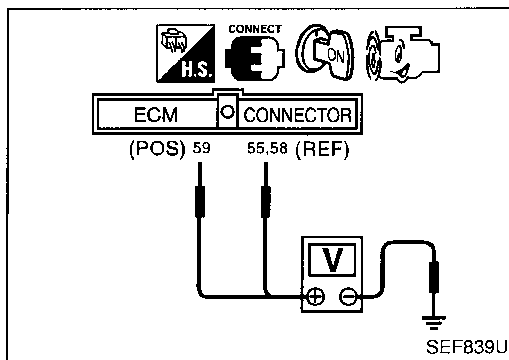
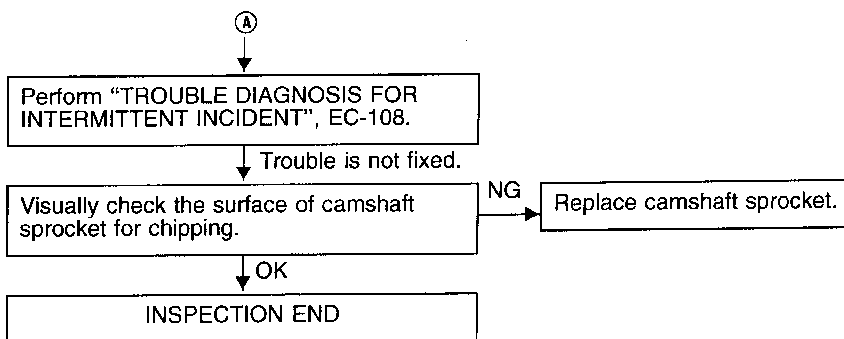
Camshaft Position Sensor (CMPS) (Cont'd)
DIAGNOSTIC PROCEDURE



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TROUBLE DIAGNOSIS FOR DTC P0340

Camshaft Position Sensor (CMPS) (Cont'd)



COMPONENT INSPECTION

Camshaft position sensor

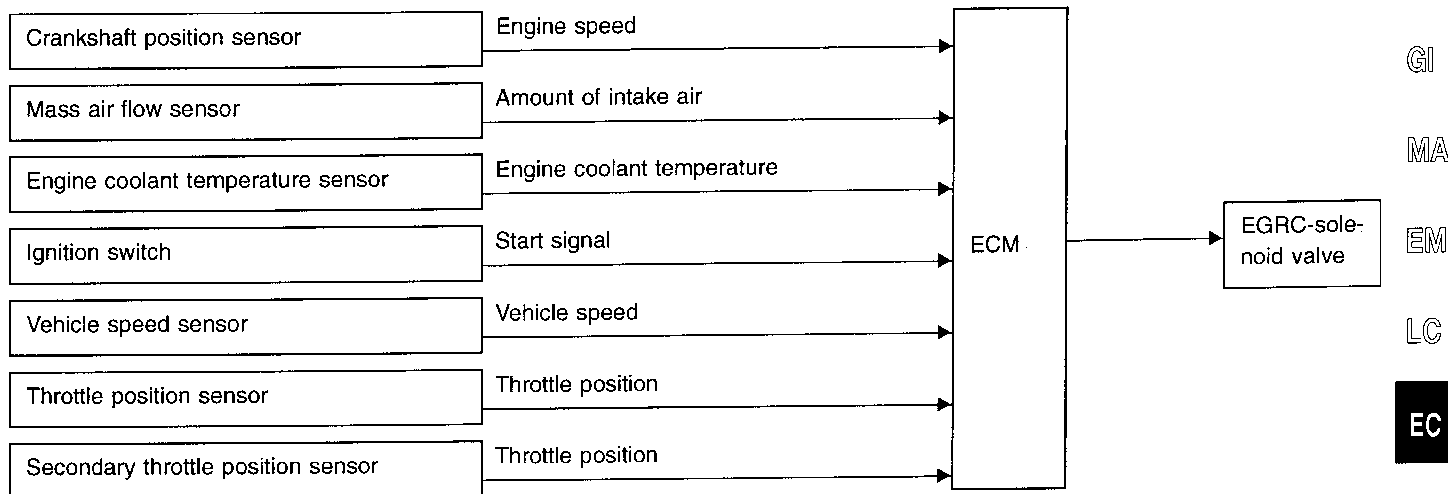
1. Start engine and warm it up to the normal operating temperature.
2. Check voltage between ECM terminals ⑤⑨ (POS) or ⑤⑤, ⑤⑧ (REF) (ECM terminal) and ground with DC range.

Condition	Terminals	Voltage
Engine running at idle	⑤⑨ and ground (POS)	Approx. 2.5V
	⑤⑤, ⑤⑧ and ground (REF)	Approx. 0.7 - 1.2V
Engine at 2,000 rpm	⑤⑨ and ground (POS)	
	⑤⑤, ⑤⑧ and ground (REF)	

If NG, replace camshaft position sensor.

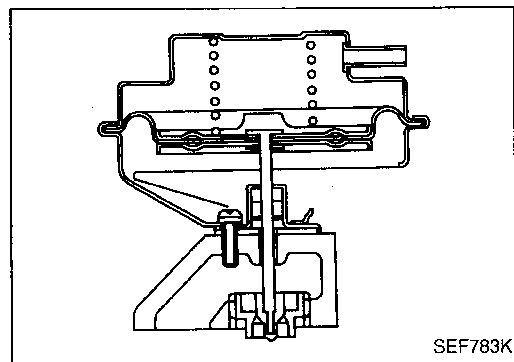
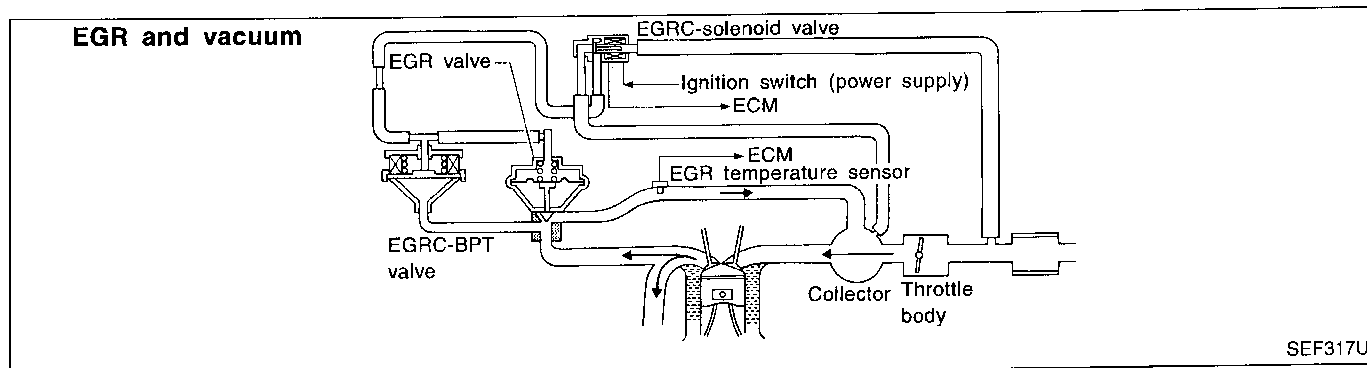
EGR Function (Close)

SYSTEM DESCRIPTION



This system cuts and controls vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGRC-solenoid valve. When the ECM detects any of the following conditions, current does not flow through the solenoid valve. This causes the port vacuum to be discharged into the atmosphere. The EGR valve remain closed.

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



COMPONENT DESCRIPTION

Exhaust gas recirculation (EGR) valve

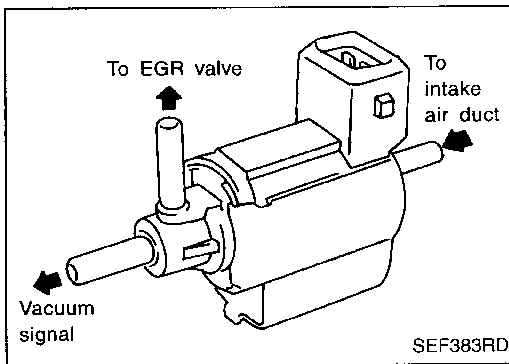
The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

EGRC-solenoid valve

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. The signal reaches to the EGR valve. When the ECM sends an OFF signal, a plunger will then move to cut the vacuum signal from the intake manifold collector to the EGR valve.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
EGRC SOL/V	● Lift up drive wheels ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "D" ● No-load	Idle	OFF
		Revving engine up from idle to 3,000 rpm	ON

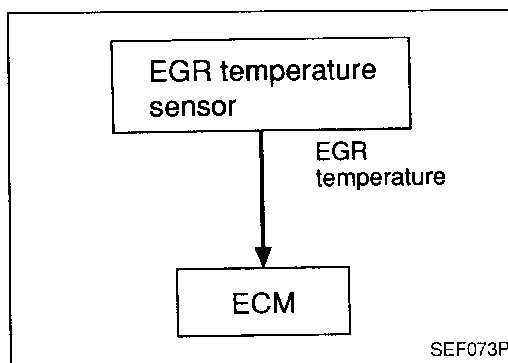
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
75	W	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V
			Engine is running. (Warm-up condition) └ EGR system is operating.	0 - 1.0V
10	L/Y	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Lift up drive wheels and rev engine up from idle to 3,000 rpm in "D" position.	0 - 0.7V
			Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

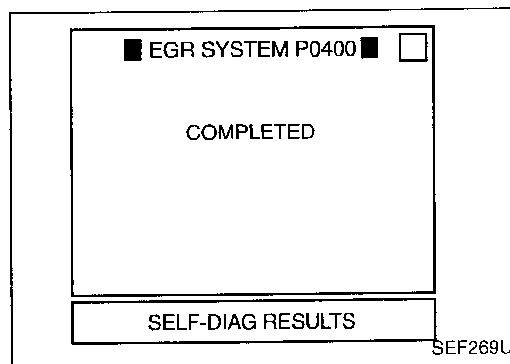
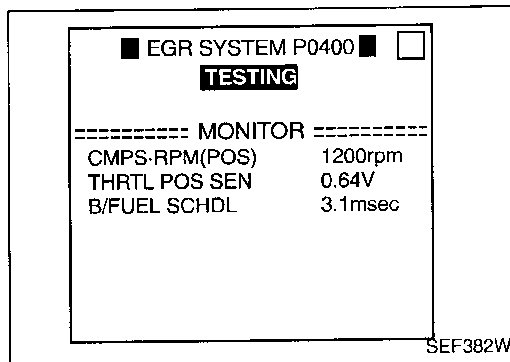
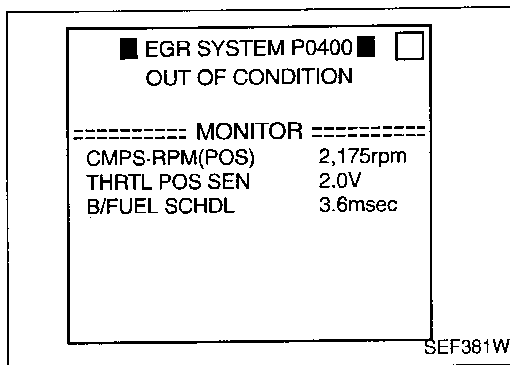
If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.



TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0400 0302	<ul style="list-style-type: none"> No EGR flow is detected under conditions that call for EGR. 	<ul style="list-style-type: none"> EGR valve stuck closed EGRC-BPT valve Vacuum hose EGRC-solenoid valve EGR passage EGR temperature sensor Exhaust gas leaks



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- P0400 will not be displayed in the "SELF-DIAG RESULTS" mode with CONSULT even though the DTC work support test result is "NG".

TESTING CONDITION:

For best results, perform at a temperature above 5°C (41°F).



- Turn ignition switch "ON"
- Check "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT. Confirm COOLAN TEMP/S value is within the range listed below.

COOLANT TEMP/S: Less than 40°C (104°F)

If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

- Select "EGR SYSTEM P0400" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine (TCS switch "OFF") and let it idle. When the engine coolant temperature reaches 70°C (158°F), immediately go to the next step.
- Accelerate vehicle to a speed of 40 km/h (25 MPH) once and then stop vehicle. If "COMPLETED" with "OK" appears on CONSULT screen, go to step 9). If "COMPLETED" does not appear on CONSULT screen, go to the following step.
- Check the output voltage of "THRTL POS SEN" at closed throttle position.
- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions until "TESTING" changes to "COMPLETED". (It will take approximately 30 seconds or more.)

CMPS-RPM (POS): 1,200 - 2,200 rpm

Vehicle speed: 10 km/h (6 MPH) or more

B/FUEL SCHDL: 2.3 - 3.2 msec

TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

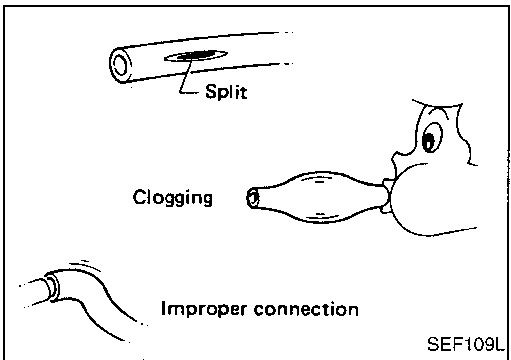
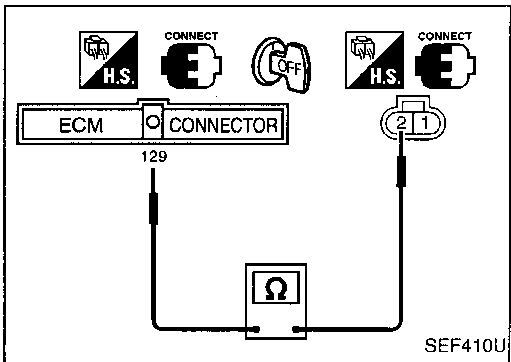
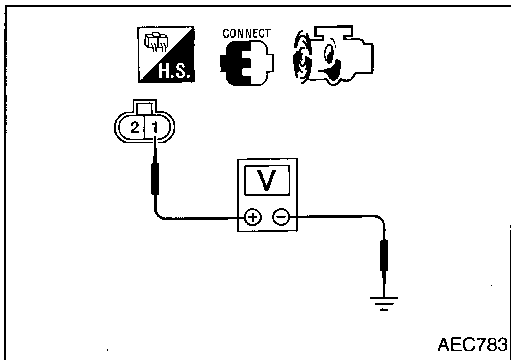
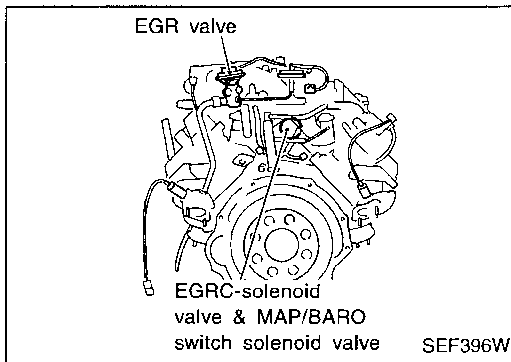
THRTL POS SEN: $X - (X + 0.53) V$

$X =$ Voltage value measured at step 7)

Selector lever: Suitable position

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

9) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-276.

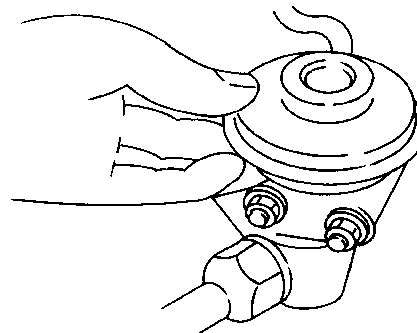
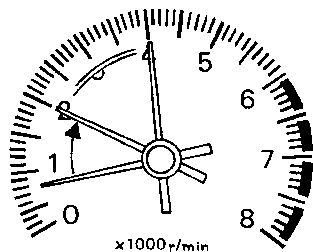


OVERALL FUNCTION CHECK

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

- 1) Lift up drive wheels.
Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
- 2) Shift to "D" position.
- 3) Check the EGR valve lifting when revving engine from idle up to 3,000 rpm.
EGR valve should lift up and down without sticking.
- 4) Check voltage between EGR temperature sensor harness connector terminal ① and ground at idle speed.
Less than 4.5V should exist.
- 5) Turn ignition switch "OFF".
- 6) Check harness continuity between EGR temperature sensor harness connector terminal ② and ECM terminal ⑫9.
Continuity should exist.
- 7) Perform "COMPONENTS INSPECTION", "EGR temperature sensor". Refer to EC-279.
- 8) If NG, go to "DIAGNOSTIC PROCEDURE", EC-276.

Overall function check



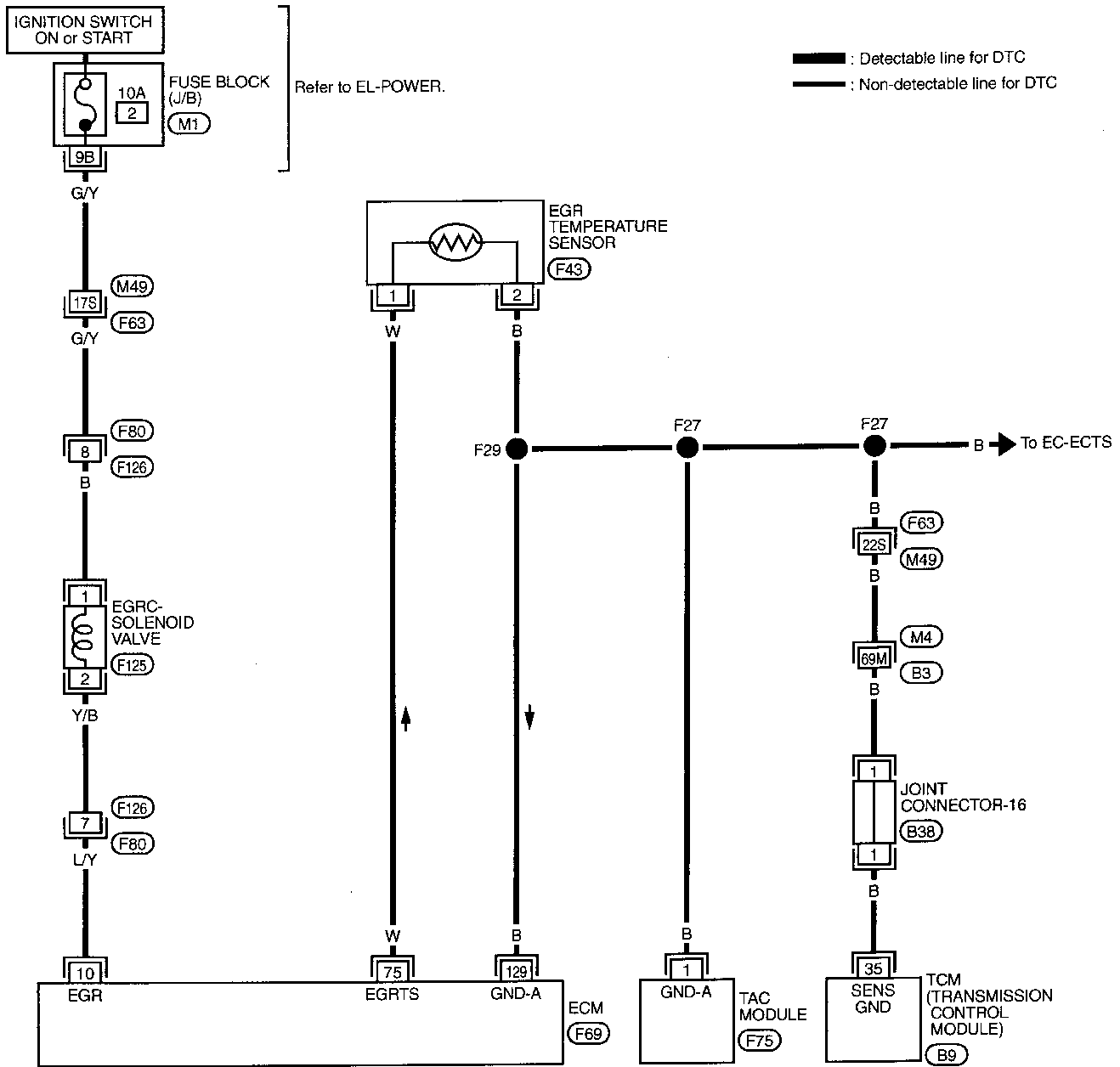
Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm.

SEF642Q

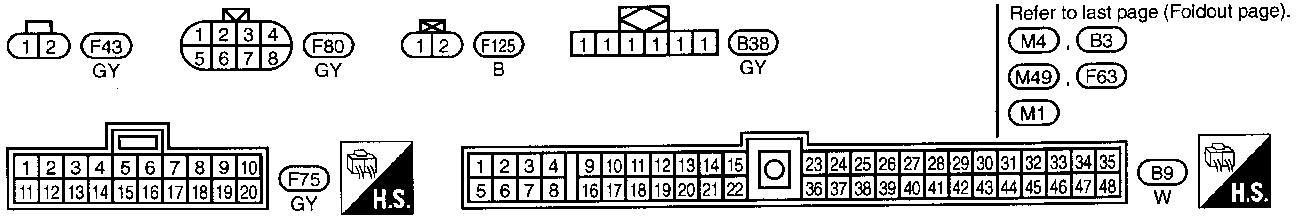
TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

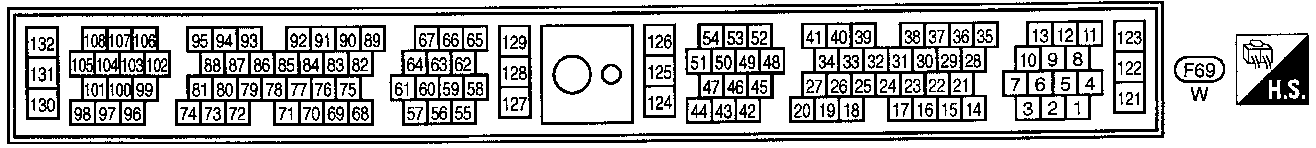
EC-EGRC1-01



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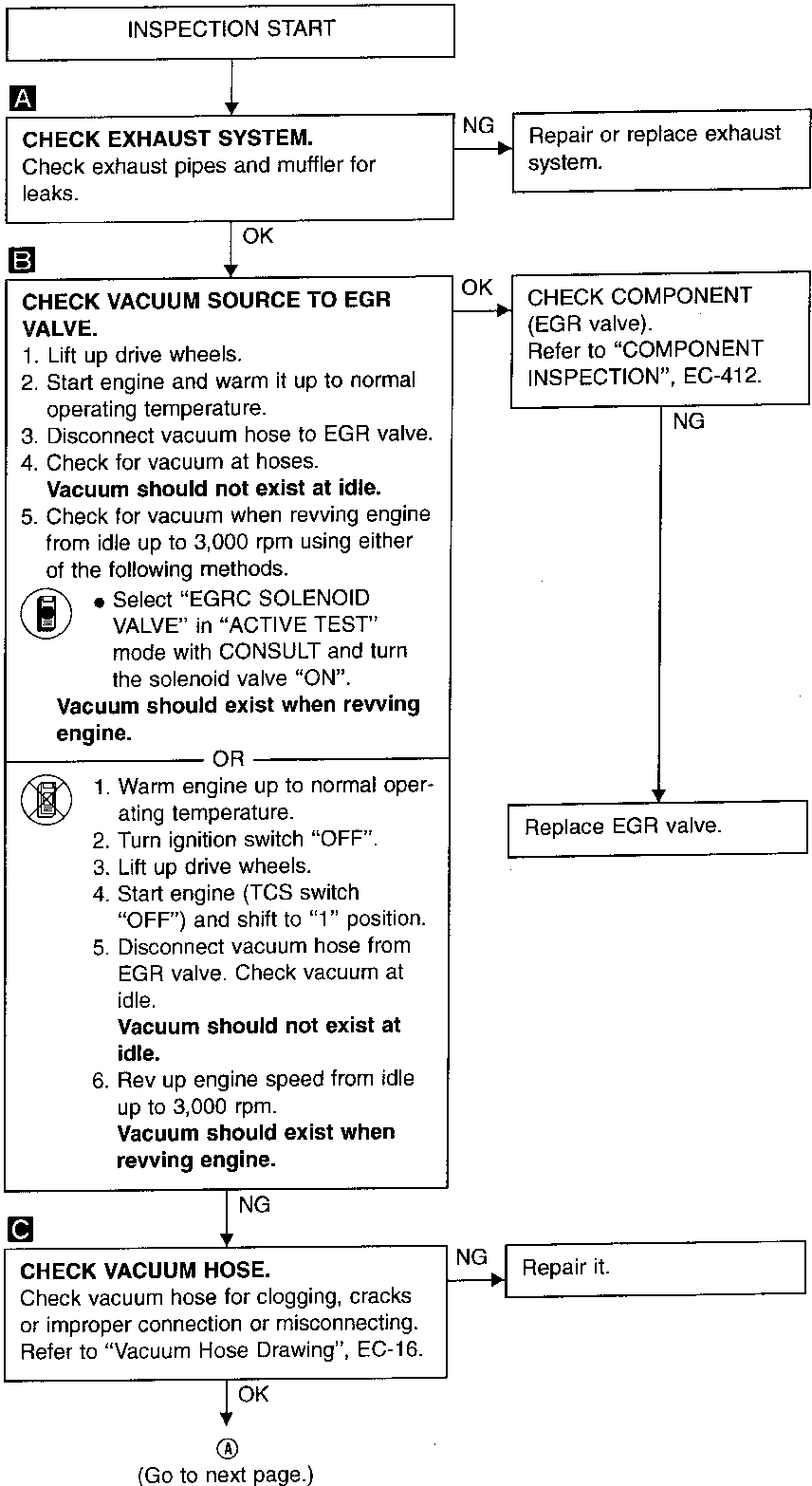
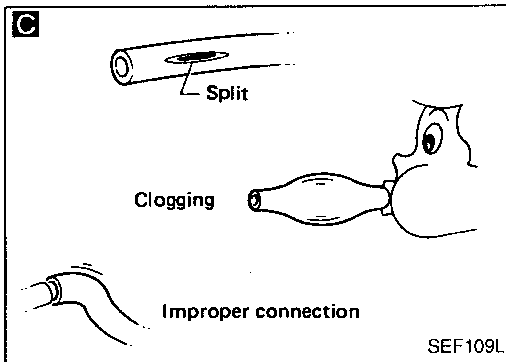
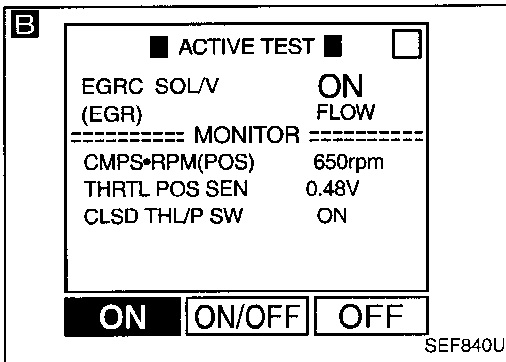
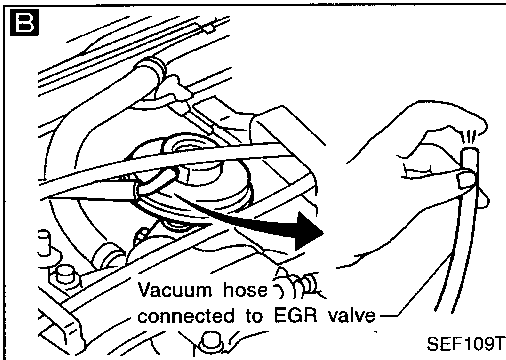
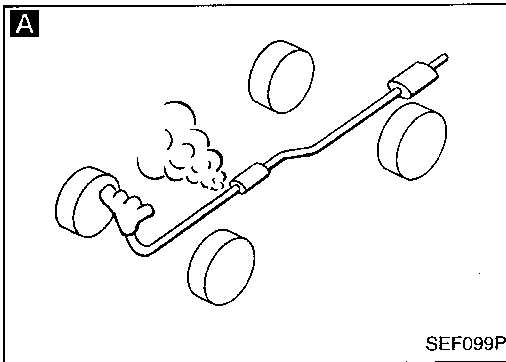
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TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

D

■ EGRC SOL/V CIRCUIT ■

DOES THE SOLENOID VALVE MAKE AN OPERATING SOUND EVERY 3 SECONDS?

NEXT NO YES

MEF957D

D

■ ACTIVE TEST ■

EGRC SOL/V (EGR)	ON FLOW
----- MONITOR -----	
CMPS•RPM (POS)	0rpm
THRTL POS SEN	0.58V
CLSD THL/P SW	ON

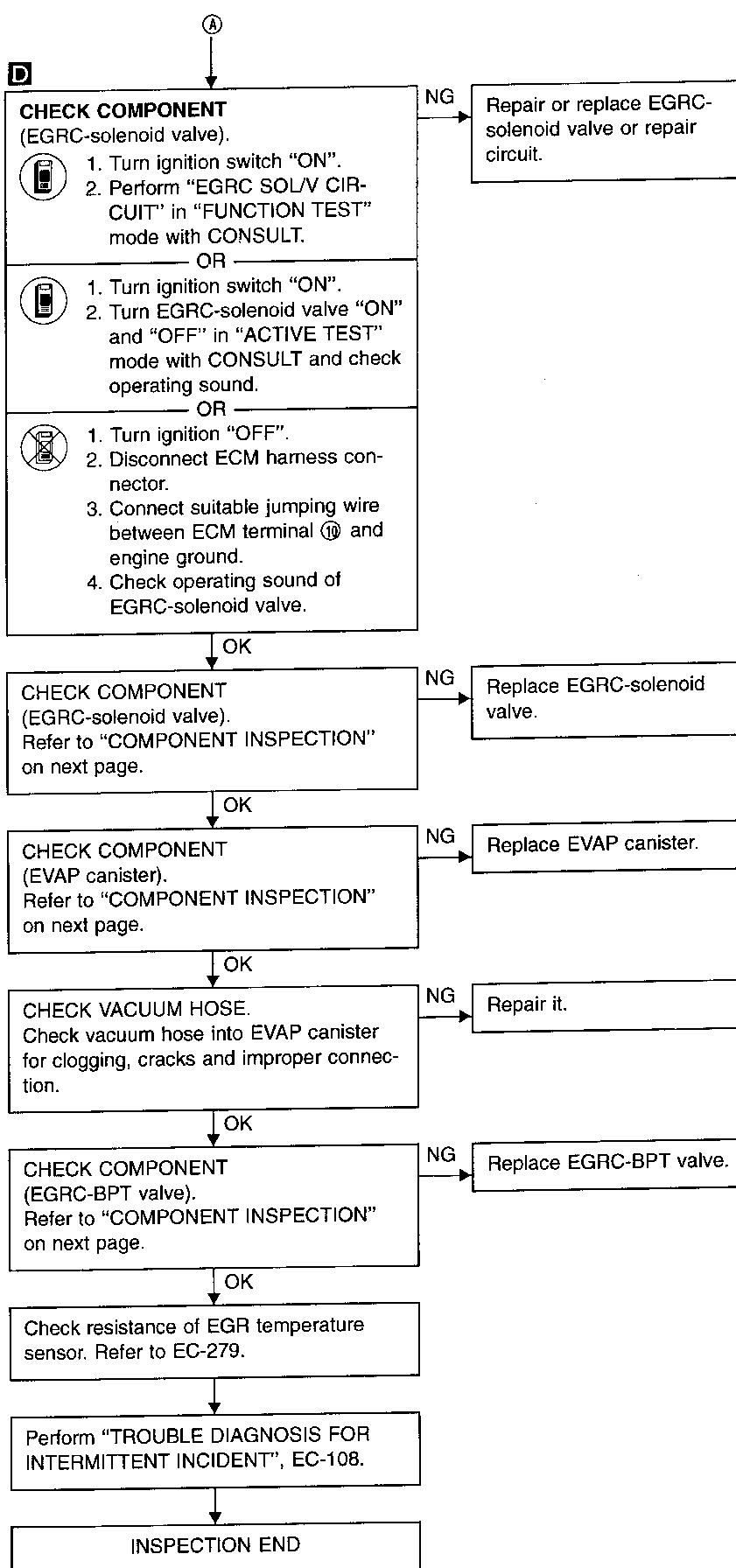
ON ON/OFF OFF

SEF633U

D

Suitable jumping wire

SEF358W



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TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

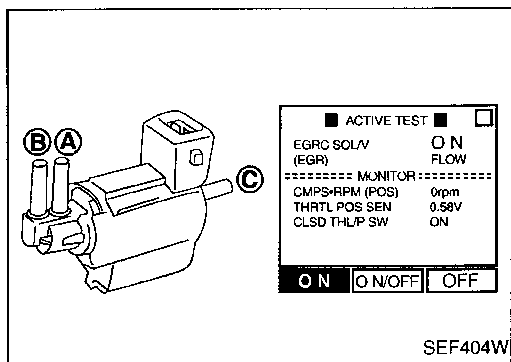
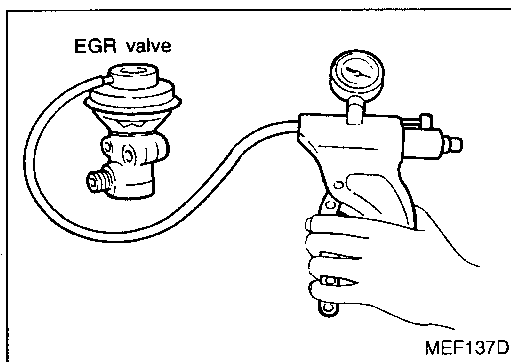
COMPONENT INSPECTION

EGR valve

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

EGR valve spring should lift.

- Check for sticking.
If NG, repair or replace EGR valve.



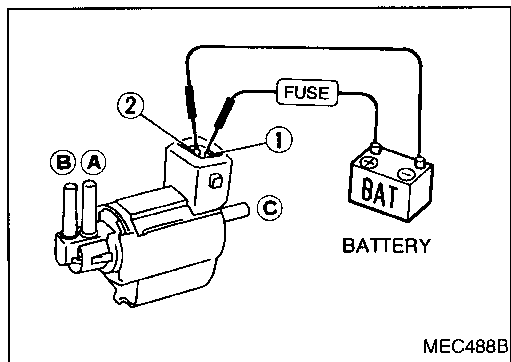
EGRC-solenoid valve

Check air passage continuity.

- Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.

Condition EGRC SOLENOID VALVE	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
ON	Yes	No
OFF	No	Yes

OR



Check solenoid valve, following the table as shown below:

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

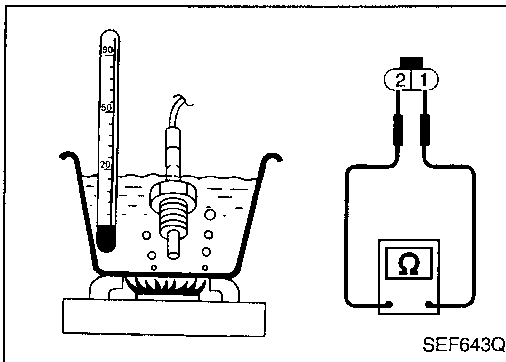
If NG or operation takes more than 1 second, replace the solenoid valve.

TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

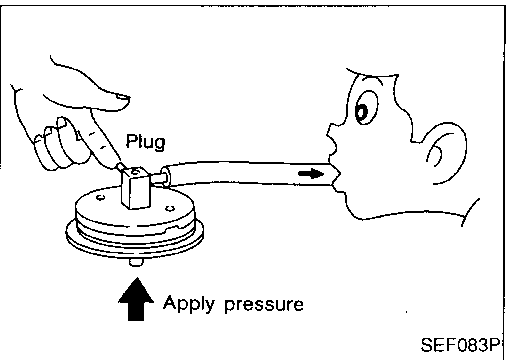
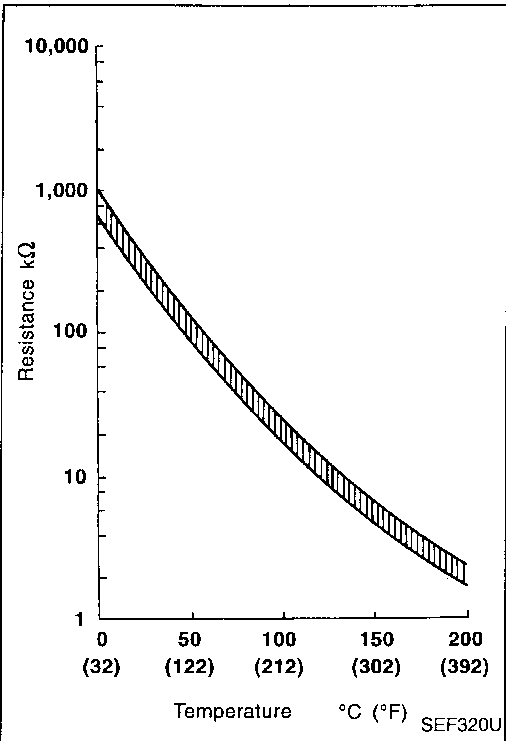
EGR temperature sensor

Check resistance change and resistance value.



EGR temperature °C (°F)	Voltage* (V)	Resistance (MΩ)
0 (32)	4.61	0.68 - 1.11
50 (122)	2.53	0.09 - 0.12
100 (212)	0.87	0.017 - 0.024

If NG, replace EGR temperature sensor.



EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH₂O, 3.94 inH₂O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

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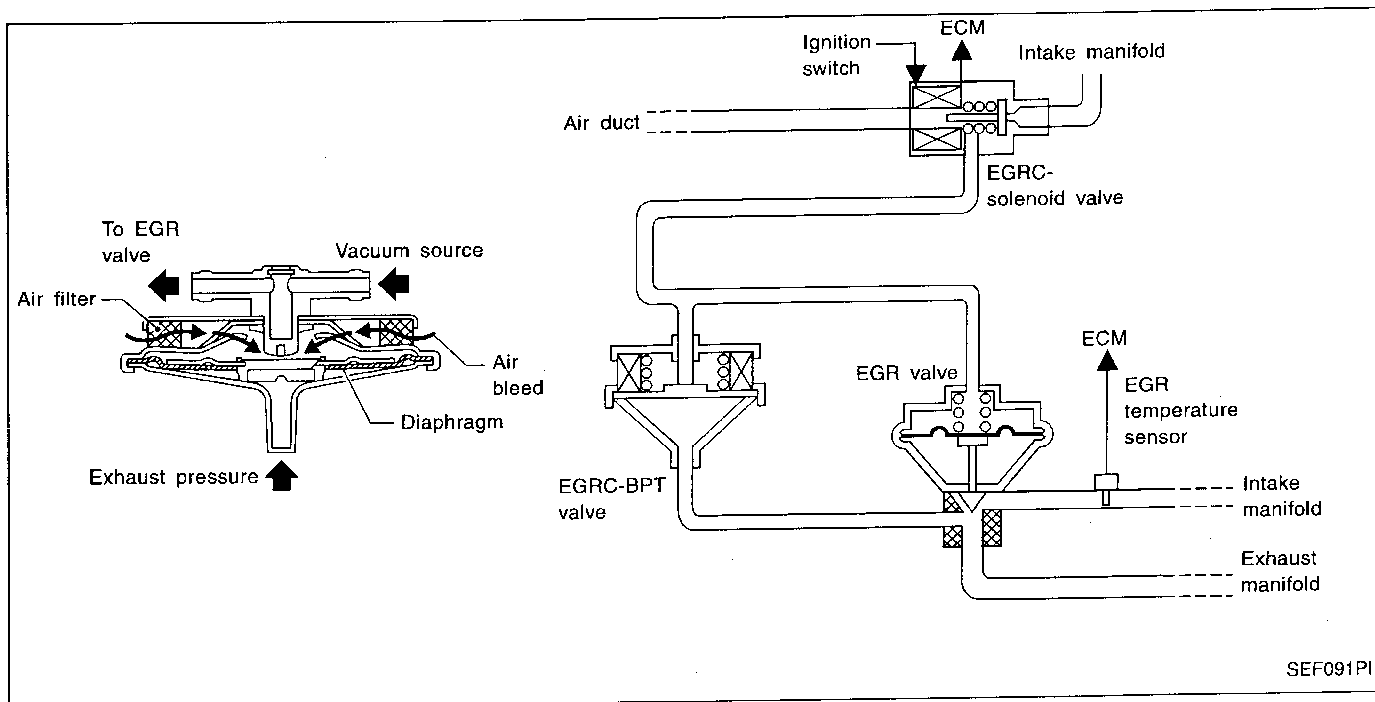
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EGRC-BPT Valve Function



SEF091PI

SYSTEM DESCRIPTION

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

ON BOARD DIAGNOSIS LOGIC

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

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0402 0306	<ul style="list-style-type: none"> ● The EGRC-BPT valve does not operate properly. 	<ul style="list-style-type: none"> ● EGRC-BPT valve ● EGR valve ● Loose or disconnected rubber tube ● Blocked rubber tube ● Camshaft position sensor ● Blocked exhaust system ● Orifice ● Mass air flow sensor ● EGRC-solenoid valve

TROUBLE DIAGNOSIS FOR DTC P0402

EGRC-BPT Valve Function (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

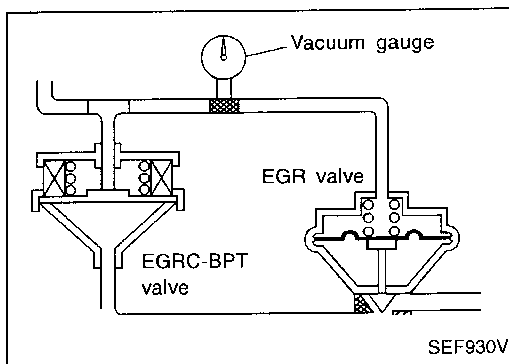
Always drive vehicle at a safe speed.

NOTE:

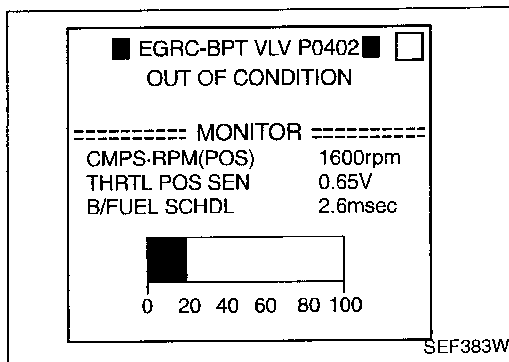
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

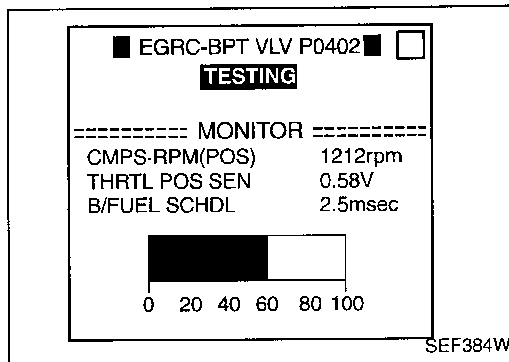
- For best results, perform the test at temperature above 5°C (41°F) or higher.
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.



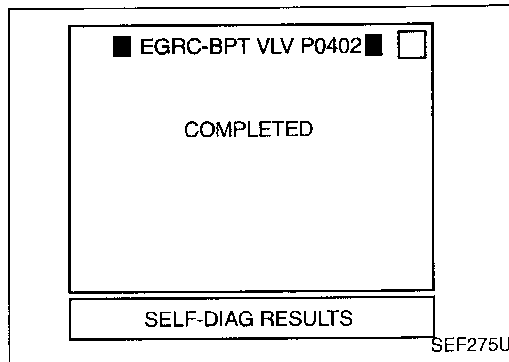
SEF930V



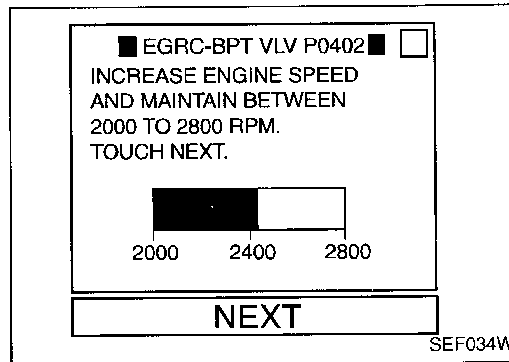
SEF383W



SEF384W



SEF275U



SEF034W

- Install vacuum gauge between EGRC-BPT valve and EGR valve as shown in the figure.
- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "EGRC-BPT/V P0402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Start engine (TCS switch "OFF") and let it idle.
- Touch "START".
- Check the output voltage of "THRTL POS SEN" at closed throttle position and open throttle position.
- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen and the bar chart may increase. Maintain the conditions many times until "COMPLETED" appears.

Selector lever: Suitable position

CMPS-RPM (POS): 1,200 - 1,400 rpm

Vehicle speed: 30 - 56 km/h (19 - 35 MPH)

B/FUEL SCHDL: 2.3 - 3.2 msec

THRTL POS SEN: X - (X + 0.44) V

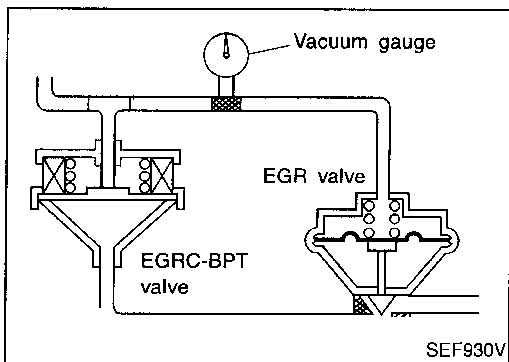
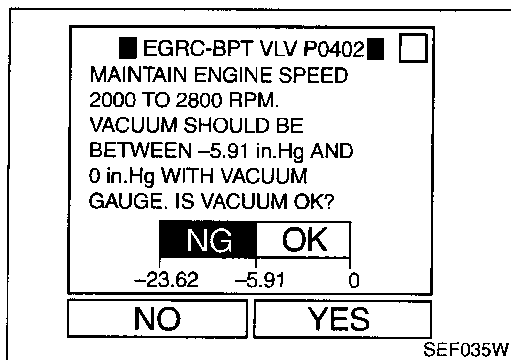
X = Voltage value measured at step 7)

- The bar chart on CONSULT screen indicates the status of this test. However, the test may be finished before the bar chart becomes full scale.
- If the bar chart indication does not continue to progress, completely release accelerator pedal once and try to meet the conditions again.
- If "TESTING" does not appear on CONSULT screen, retry from step 4).
If NG, go to "DIAGNOSTIC PROCEDURE", EC-283.
If OK, go to next step.
- Open engine hood.
- Raise engine speed to 2,400±400 rpm under no-load and hold it. Then touch "NEXT" of the CONSULT screen.
- Check vacuum gauge while keeping engine speed 2,400±400 rpm.
Vacuum should be 0 to -20.0 kPa (0 to -150 mmHg, 0 to -5.91 inHg).
If NG, go to "DIAGNOSTIC PROCEDURE", EC-283.
If OK, touch "YES" in the CONSULT screen.

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TROUBLE DIAGNOSIS FOR DTC P0402

EGRC-BPT Valve Function (Cont'd)



- 12) Check the rubber tube between intake manifold collector, EGR valve and EGRC-BPT valve for misconnection, cracks, blockages or twisting.
If NG, repair.
If OK, touch "YES" in the CONSULT screen.
- 13) If CONSULT instructs to carry out "OVERALL FUNCTION CHECK", go to next step. If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-283.

OR

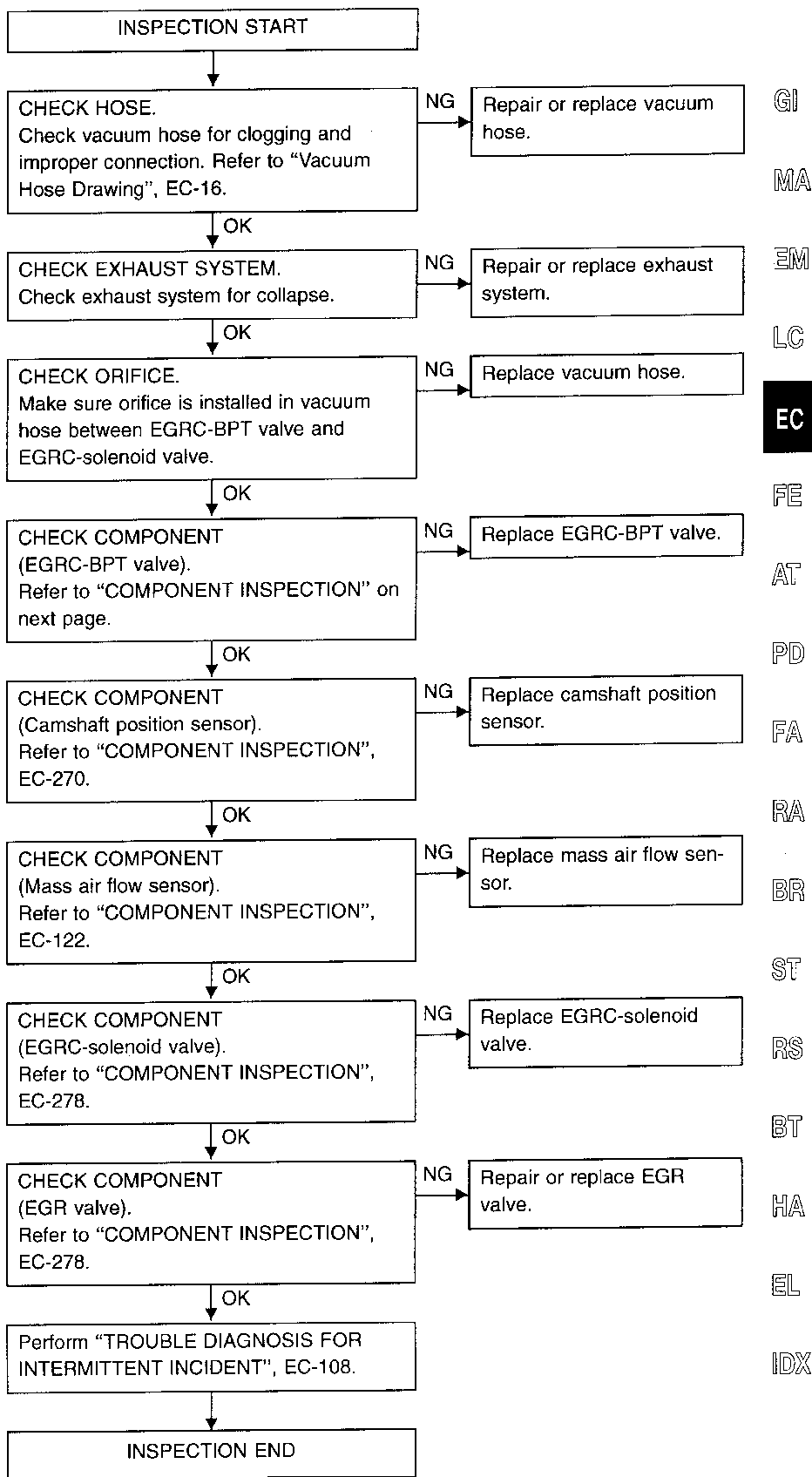
OVERALL FUNCTION CHECK

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

- 1) Install vacuum gauge between EGRC-BPT valve and EGR valve as shown in the figure.
- 2) Lift up vehicle.
- 3) Connect the intake manifold collector and the EGRC-BPT valve with a rubber tube that has 0.5 mm (0.020 in) dia. orifice. (The intake manifold vacuum will be directly applied to the EGRC-BPT valve.)
- 4) Start engine and shift to 1st position.
- 5) Check vacuum gauge while keeping engine speed 2,400±400 rpm.
Vacuum should be 0 to -20.0 kPa (0 to -150 mmHg, 0 to -5.91 inHg).
If NG, go to "DIAGNOSTIC PROCEDURE", EC-283.
If OK, go to next step.
- 6) Check rubber tube between the intake manifold collector, EGRC-solenoid valve and EGRC-BPT valve for misconnection, cracks, blockages or twisting.
- 7) If NG, repair or replace.

TROUBLE DIAGNOSIS FOR DTC P0402

EGRC-BPT Valve Function (Cont'd) DIAGNOSTIC PROCEDURE



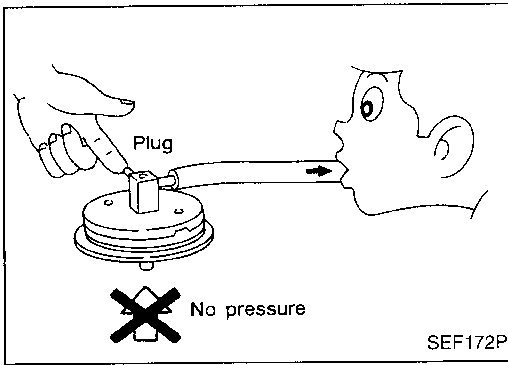
TROUBLE DIAGNOSIS FOR DTC P0402

EGRC-BPT Valve Function (Cont'd)

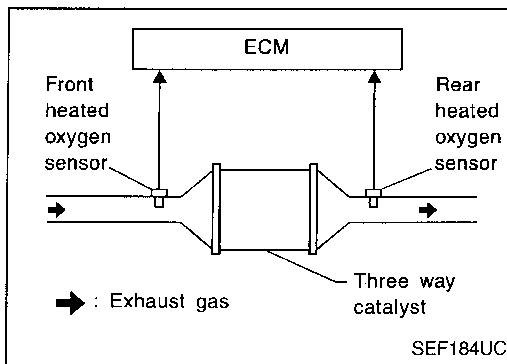
COMPONENT INSPECTION

EGRC-BPT valve

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



TROUBLE DIAGNOSIS FOR DTC P0420 (-B1), P0430 (-B2)



Three Way Catalyst Function (P0420: Left bank), (P0430: Right bank)

ON BOARD DIAGNOSIS LOGIC

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

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

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

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0420 0702 (Left bank)	<ul style="list-style-type: none"> • Three way catalyst does not operate properly. • Three way catalyst does not have enough oxygen storage capacity. 	<ul style="list-style-type: none"> • Three way catalyst • Exhaust tube • Intake air leaks • Injectors • Injector leaks • Spark plug • Improper ignition timing
P0430 0703 (Right bank)		

☆ MONITOR ☆ NO FAIL

CMPS • RPM (POS)	2137rpm
FR O2 SEN-B1	0.37V
FR O2 SEN-B2	0.37V
RR O2 SEN-B1	0.32V
RR O2 SEN-B2	0.32V
FR O2 MNTR-B1	LEAN
FR O2 MNTR-B2	LEAN
RR O2 MNTR-B1	LEAN
RR O2 MNTR-B2	LEAN

RECORD

SEF907Q

■ SRT STATUS ■

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

PRINT

SEF215J

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set "MANU TRIG" and "HI SPEED", then select "FR O2 SEN-B1 (-B2)", "RR O2 SEN-B1 (-B2)", "FR O2 MNTR-B1 (-B2)", "RR O2 MNTR-B1 (-B2)" in "DATA MONITOR" mode with CONSULT.
- 4) Touch "RECORD" on CONSULT screen with engine speed held at 2,000 rpm constantly under no load.
- 5) Make sure that the switching frequency between "RICH" and "LEAN" of "RR O2 MNTR-B1 (-B2)" is much less than that of "FR O2 MNTR-B1 (-B2)" as shown below.

Switching frequency ratio =

Rear heated oxygen sensor switching frequency

Front heated oxygen sensor switching frequency

This ratio should be less than 0.75.

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

If the "FR O2 MNTR-B1 (-B2)" does not indicate "RICH" and "LEAN" periodically more than 5 times within 10 seconds at step 4), perform TROUBLE DIAGNOSES FOR DTC P0133 first.

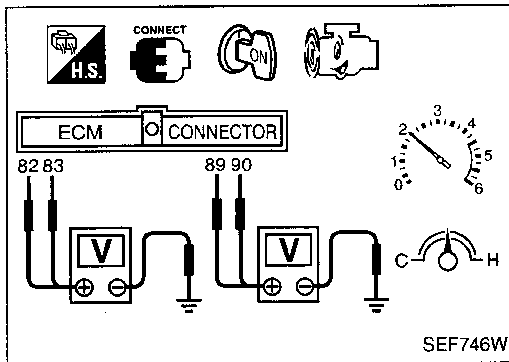
If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-287.

If the result is OK, go to following step.

TROUBLE DIAGNOSIS FOR DTC P0420 (-B1), P0430 (-B2)

Three Way Catalyst Function (P0420: Left bank), (P0430: Right bank) (Cont'd)

- 6) Select "AUTO TRIG" in "DATA MONITOR" mode with CONSULT.
- 7) Drive vehicle at a speed of approximately 84 to 96 km/h (52 to 60 MPH) with D position ("OD" ON) for at least 10 consecutive minutes.
(Drive the vehicle in an area where vehicle speed and accelerator pressure can be held steady and constant.)
If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-287.
- 8) Select "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT.
- 9) Verify that "CATALYST" is "CMPLT".
If not "CMPLT", repeat the test from step 3).
- 10) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-287.



OR

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 drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeters probes between ECM terminals ⑧② RH, ⑧③ LH (sensor signal front) and ground. ⑧⑨ RH, ⑨① LH (sensor signal rear) and ground.
- 4) Keep engine speed at 2,000 rpm constant under no load.
- 5) Make sure that the voltage switching frequency (high & low) between ECM terminals ⑧⑨ and ground is much less than that of ECM terminals ⑧② and ground (right bank). Or ⑨① and ground is much less than that of the terminals ⑧③ and ground (left bank).

Switching frequency ratio =

Rear heated oxygen sensor voltage switching frequency

Front heated oxygen sensor voltage switching frequency

This ratio should be less than 0.75.

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

NOTE:

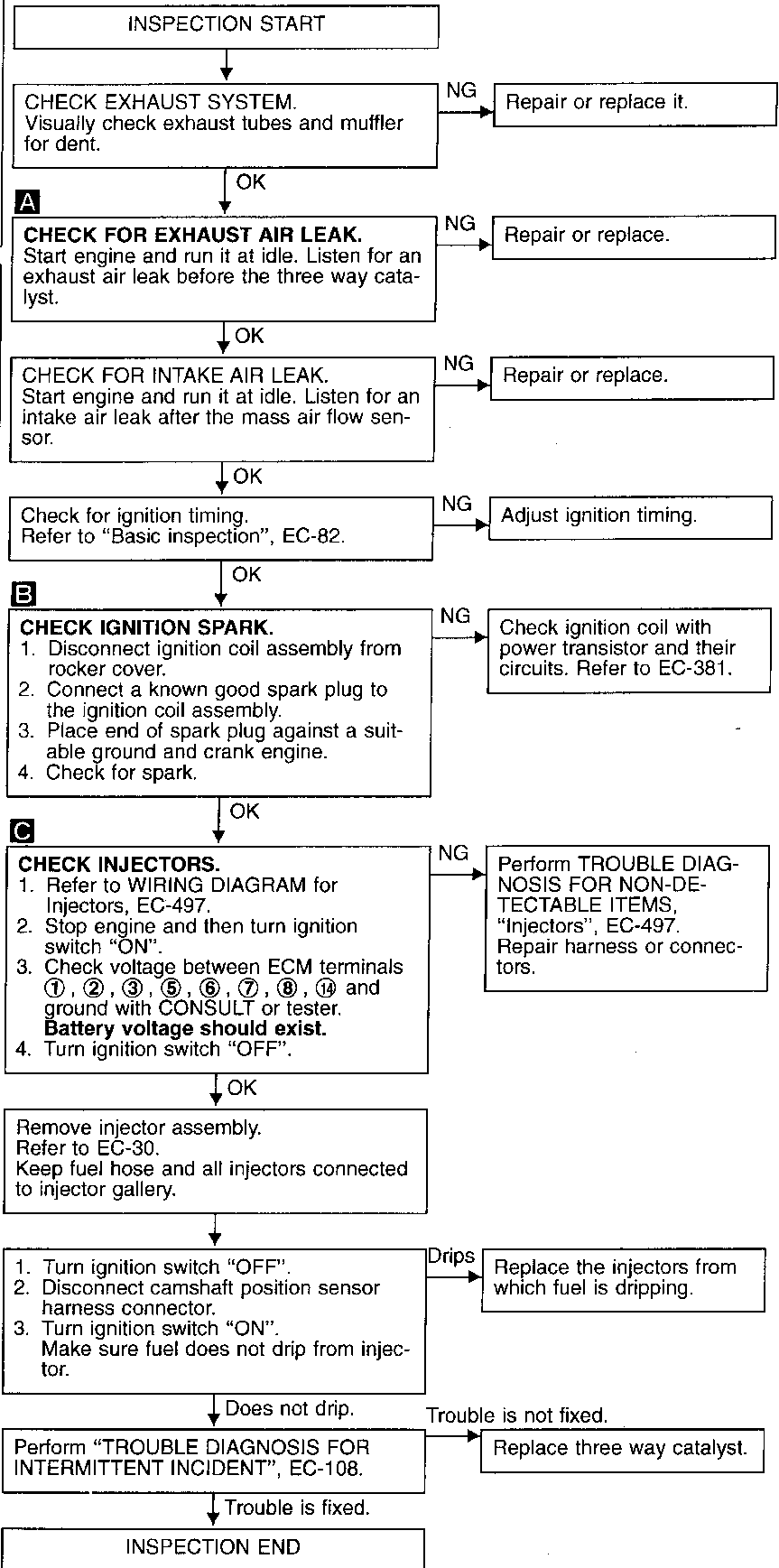
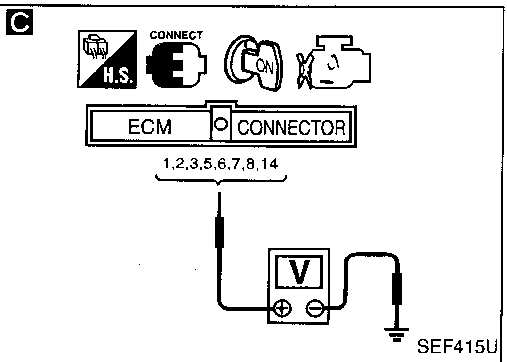
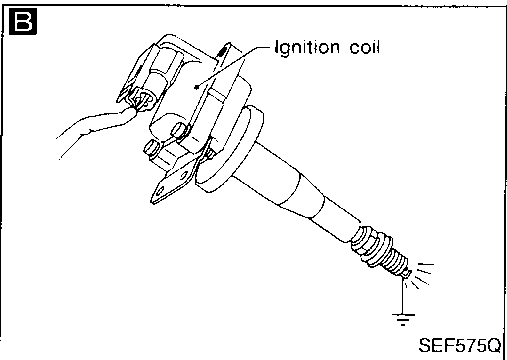
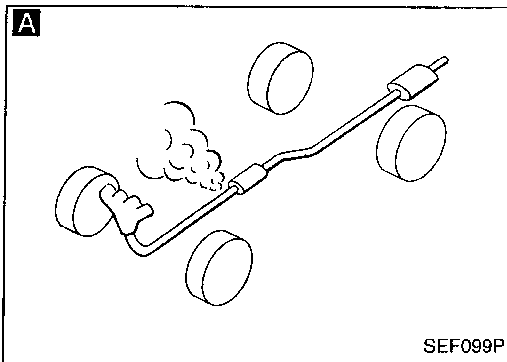
If the voltage at terminal ⑧② or ⑧③ does not switch periodically more than 5 times within 10 seconds at step 4, perform TROUBLE DIAGNOSIS FOR DTC P0130 or P0150 first, EC-159.

- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-287.

TROUBLE DIAGNOSIS FOR DTC P0420 (-B1), P0430 (-B2)

Three Way Catalyst Function (P0420: Left bank), (P0430: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



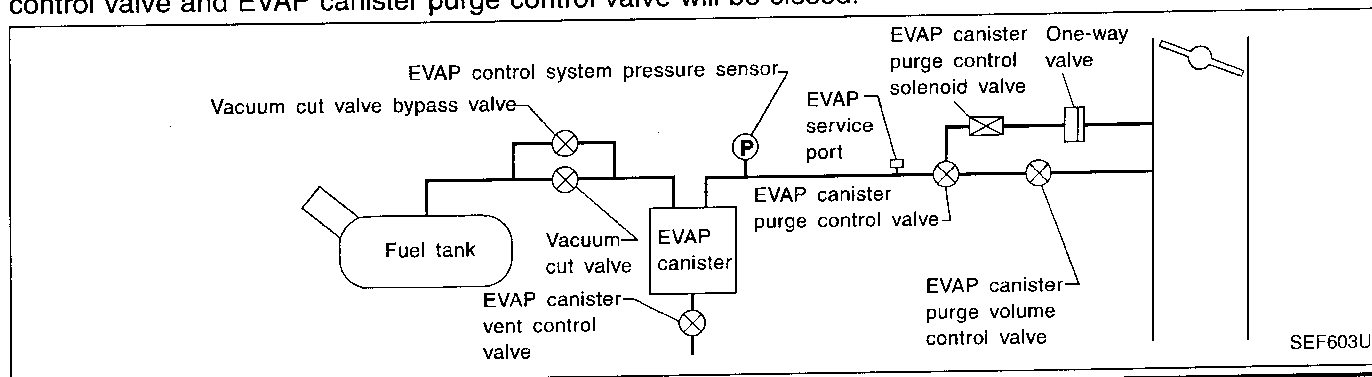
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Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure)

Note: If DTC P1448 is displayed with P0440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-446.)

ON BOARD DIAGNOSIS LOGIC

This diagnosis detects leaks in the EVAP purge line using of engine intake manifold vacuum. If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge 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 volume control valve and EVAP canister purge control valve will be closed.



Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0440 0705	<ul style="list-style-type: none"> ● EVAP control system has a leak. ● EVAP control system does not operate properly. 	<ul style="list-style-type: none"> ● 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 vent control valve and the circuit ● EVAP canister purge control valve ● EVAP canister purge volume control valve and the circuit ● EVAP canister purge control solenoid valve ● Absolute pressure sensor ● Tank fuel temperature sensor ● MAP/BARO switch solenoid valve and the circuit ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve ● O-ring of EVAP canister vent control valve is missing or damaged. ● Water separator ● EVAP canister is saturated with water. ● EVAP control system pressure sensor

CAUTION:

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

TROUBLE DIAGNOSIS FOR DTC P0440

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

- If DTC P1448 is displayed with P0440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-446.)
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Perform "DTC WORK SUPPORT" when the fuel level is less than 3/4 full and vehicle is placed on the flat level surface.
- It is better that fuel level is low.
- Always perform test at a temperature of 0 to 30°C (32 to 86°F).
- Battery voltage is more than 11V at idle.



- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Check that the following conditions are met.
COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
INT/A TEMP SE: 0 - 60°C (32 - 140°F)
- 5) Select "EVAP SML LEAK P0440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
 Follow the instruction displayed.

NOTE:

- If the CONSULT screen shown at left is displayed, stop the engine and stabilize the vehicle temperature at 25°C (77°F) or cooler. After "TANK F/TMP SE" becomes less than 30°C (86°F), retest. (Use a fan to reduce the stabilization time.)
- 6) Make sure that "OK" is displayed.
 If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-291.

OR

NOTE:

- Be sure to read the explanation of "Driving pattern" on EC-45 before driving vehicle.
- It is better that the fuel level is low.
- Always perform test at a temperature of 0 to 30°C (32 to 86°F).



- 1) Start engine (TCS switch "OFF").
- 2) Drive vehicle according to "Driving pattern", EC-45.
- 3) Stop vehicle.
- 4) Select "MODE 1" with GST.
 - If SRT of EVAP system is not set yet, go to the following step.
 - If SRT of EVAP system is set, the result will be OK.
- 5) Turn ignition switch "OFF" and wait at least 5 seconds.
- 6) Start engine.

It is not necessary to cool engine down before the driving.

- 7) Drive vehicle again according to the "Driving pattern", EC-45.
- 8) Stop vehicle.

■ EVAP SML LEAK P0440 ■

1)PERFORM TEST AT A LOCATION OF 0-30C (32-86F)
 2)OPEN ENGINE HOOD.
 3)START ENGINE WITH VEHICLE STOPPED. IF ENG IS ON, STOP FOR 5 SEC. THEN RESTART.
 4)TOUCH START.

EXIT START

SEF405W

■ EVAP SML LEAK P0440 ■

CAN NOT BE DIAGNOSED

FUEL TEMPERATURE IS TOO HIGH. RETEST AFTER FUEL HAS COOLED.

EXIT PRINT

SEF669U

■ EVAP SML LEAK P0440 ■

WAIT. . .

KEEP ENGINE RUNNING AT IDLE SPEED.

SEF551V

■ EVAP SML LEAK P0440 ■

***** OK *****

END PRINT

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

- 9) Select "MODE 3" with GST.
 - If P1447 is displayed on the screen, go to "TROUBLE DIAGNOSIS FOR DTC P1447", EC-439.
 - If P0440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE", EC-291.
 - If P1440 is displayed on the screen, go to "TROUBLE DIAGNOSIS FOR DTC P1440", EC-414.
 - If P0440 and P1440 are not displayed on the screen, go to the following step.
- 10) Select "MODE 1" with GST.
 - If SRT of EVAP system is set, the result will be OK.
 - If SRT of EVAP system is not set, go to step 6).

OR

NOTE:

- Be sure to read the explanation of "Driving pattern" on EC-45 before driving vehicle.
- It is better that the fuel level is low.
- Always perform test at a temperature of 0 to 30°C (32 to 86°F).

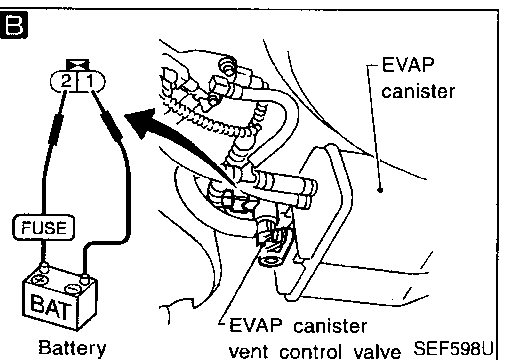
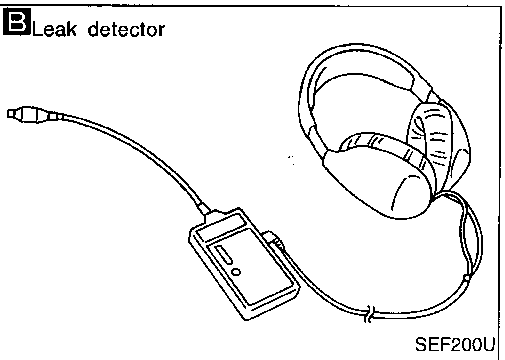
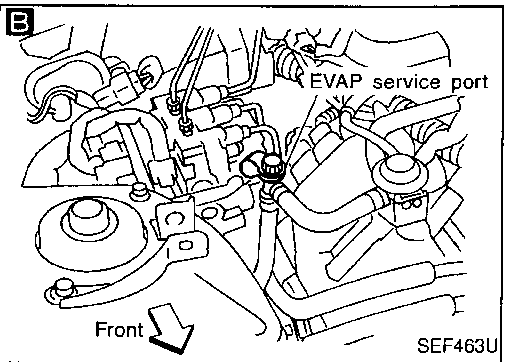
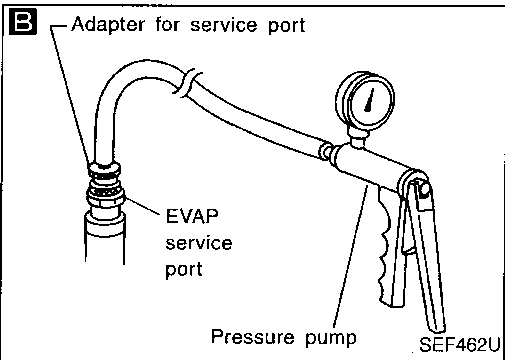
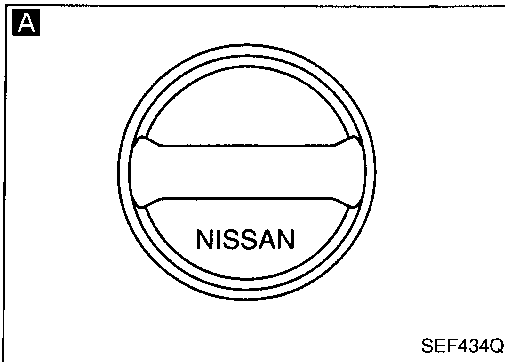


- 1) Start engine (TCS switch "OFF").
- 2) Drive vehicle according to "Driving pattern", EC-45.
- 3) Stop vehicle.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Turn ignition switch "ON" and perform "Diagnostic Test Mode (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-291.

TROUBLE DIAGNOSIS FOR DTC P0440

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

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK FUEL FILLER CAP.

1. Turn ignition switch "OFF".
2. Check for genuine NISSAN fuel filler cap design.
3. Check for air releasing sound while opening the fuel filler cap. If the air releasing sound is heard, go to **B**.

If the air releasing sound is not heard, check the following.

Was the cap tightened properly?

If Yes, check fuel filler cap vacuum relief valve. Refer to "EVAPORATIVE EMISSION SYSTEM", EC-24.

If No, open fuel filler cap, then clean cap and filler neck thread using air blower. Retighten until ratcheting sound is heard.

NG

If genuine NISSAN fuel filler cap is not used, replace with NISSAN fuel filler cap.

OK

B

CHECK FOR EVAP LEAK.

- Never use compressed air or a high pressure pump.
- Improper installation of adapter to the service port may cause a leak.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

To locate the EVAP leak, do the following.

1. Install the EVAP service port adapter and the pressure pump securely.
2. Turn ignition switch "ON". Select "EVAP SYSTEM CLOSE" or "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure to the EVAP line until the pressure indicator reaches the middle of the bar graph.
4. Using EVAP leak detector, locate the leak. Refer to the instruction manual for more details about the leak detector. Refer to "Evaporative Emission Line Drawing", EC-26.

NG

Repair or replace.

OR

2. Turn ignition switch "OFF".
3. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
4. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)
5. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and service port adapter.
6. Locate the leak using a leak detector. Refer to the instruction manual for more details about the leak detector. Refer to "Evaporative Emission Line Drawing", EC-26.

OK

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(Go to next page.)

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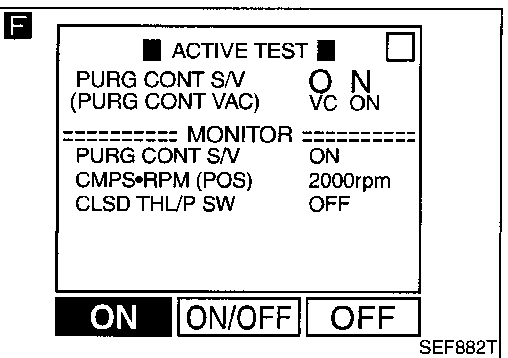
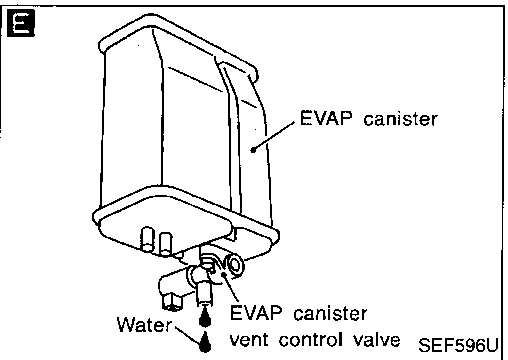
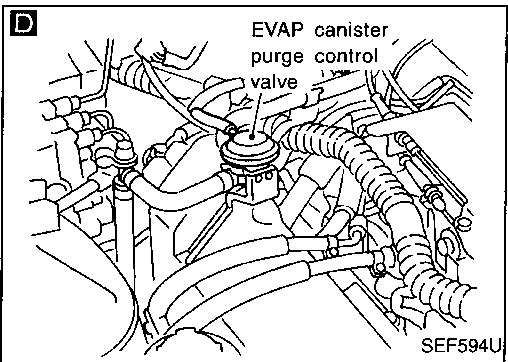
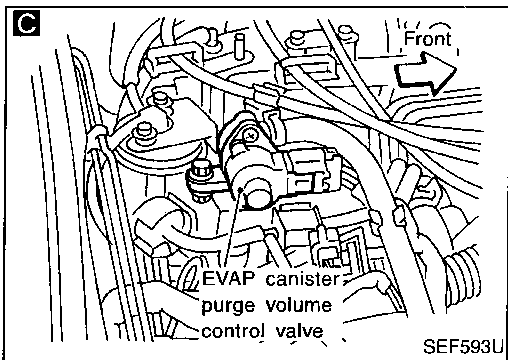
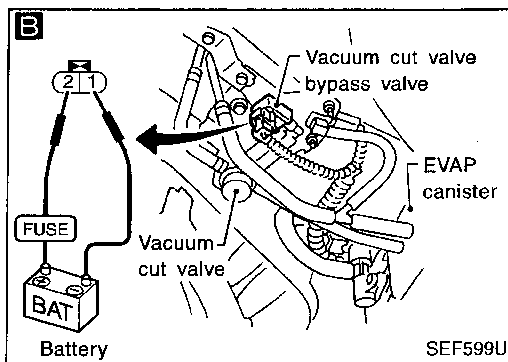
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TROUBLE DIAGNOSIS FOR DTC P0440

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



A

C

CHECK COMPONENT (EVAP canister purge volume control valve). Refer to "COMPONENT INSPECTION", EC-294.

NG → Replace EVAP canister purge volume control valve.

OK

D

CHECK COMPONENT (EVAP canister purge control valve). Refer to "COMPONENT INSPECTION", EC-474.

NG → Replace EVAP canister purge control valve.

OK

CHECK COMPONENT AND CIRCUIT (EVAP canister vent control valve, O-ring and water separator). Refer to "TROUBLE DIAGNOSIS FOR P0446" for circuit, EC-305 and "COMPONENT INSPECTION", EC-296.

NG → Repair or replace EVAP canister vent control valve and O-ring or harness/connectors.

OK

E

CHECK IF EVAP CANISTER IS SATURATED WITH WATER.

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister. If it will, weigh the EVAP canister with the vent control valve attached. If the weight is:
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

NG → Replace EVAP canister and check the following.
 1. Check hose connections to the EVAP canister and water separator for clogging and poor connection.
 2. Check water separator. Refer to "COMPONENT INSPECTION", EC-296.

OK

F

CHECK COMPONENT (EVAP canister purge control solenoid valve).

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

OR

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge control solenoid valve.
4. Start engine and let it idle for at least 60 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
Vacuum should exist.

NG → Check the following.
 • EVAP canister purge control solenoid valve. Refer to "COMPONENTS INSPECTION", EC-295 and "P1492 EVAP canister purge control solenoid valve" for circuit, EC-295.
 • Vacuum hoses for clogging or disconnection. Refer to "Vacuum Hose Drawing", EC-16.

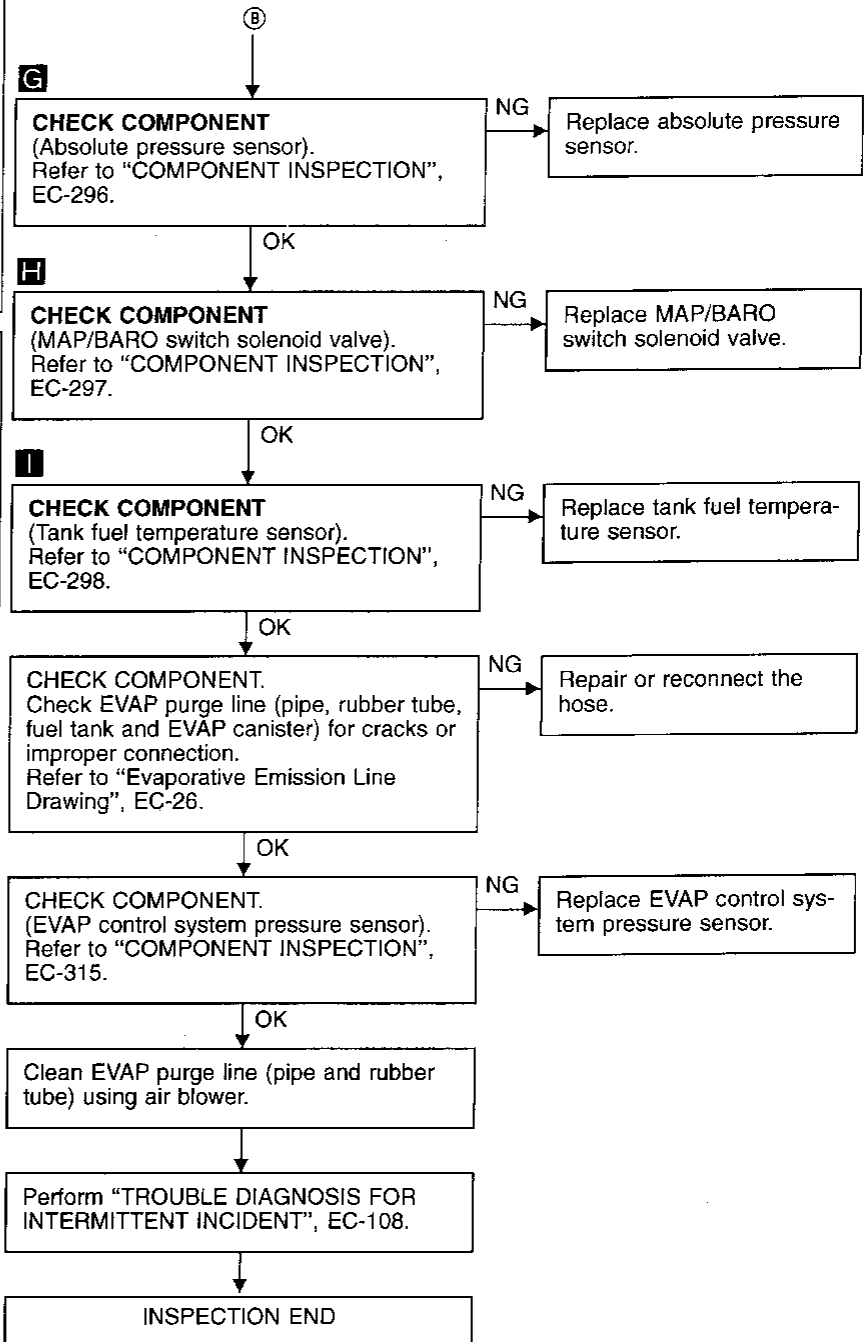
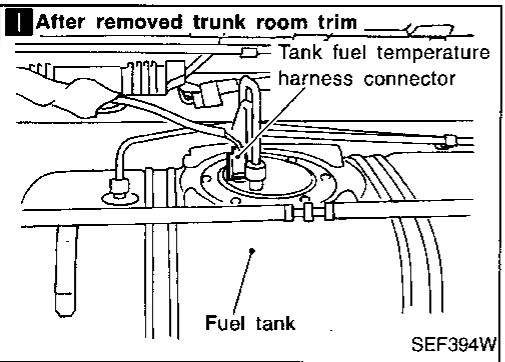
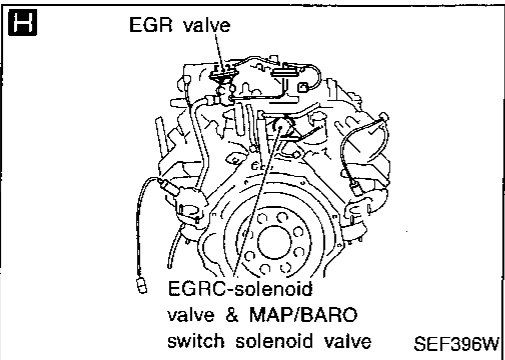
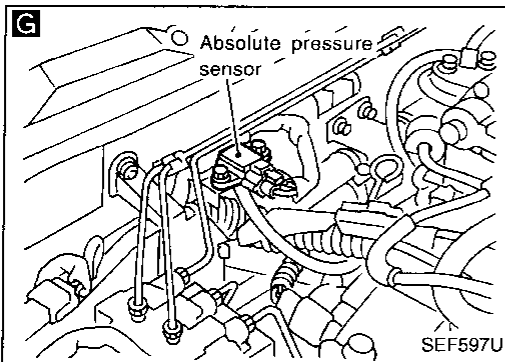
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(Go to next page.)

TROUBLE DIAGNOSIS FOR DTC P0440

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



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TROUBLE DIAGNOSIS FOR DTC P0440

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

COMPONENT INSPECTION

EVAP canister purge volume control valve

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

Resistance:

Approximately 35 - 43Ω [At 25°C (77°F)]

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

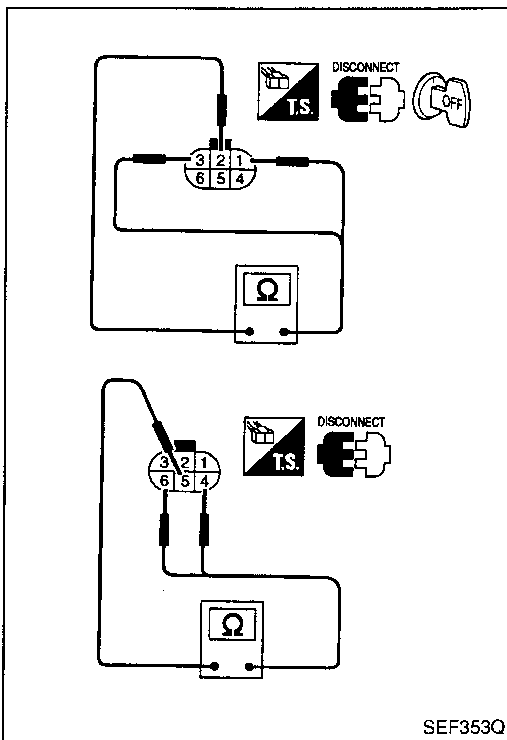
OR

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

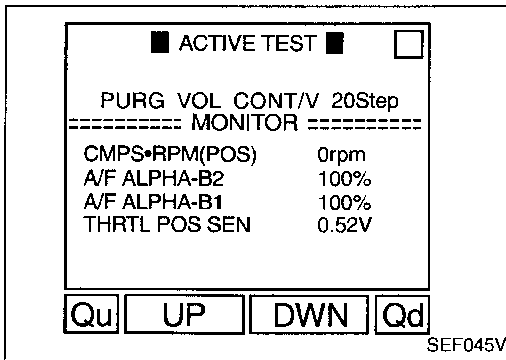
Resistance:

Approximately 35 - 43Ω [At 25°C (77°F)]

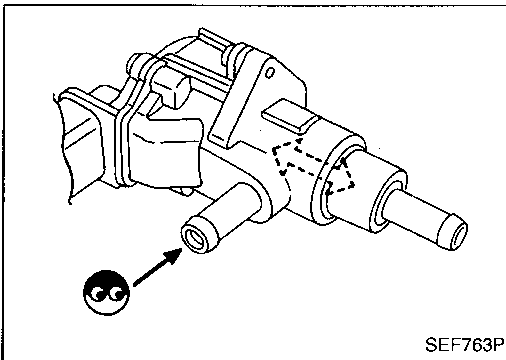
3. Reconnect EVAP canister purge volume control valve harness connector.
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)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



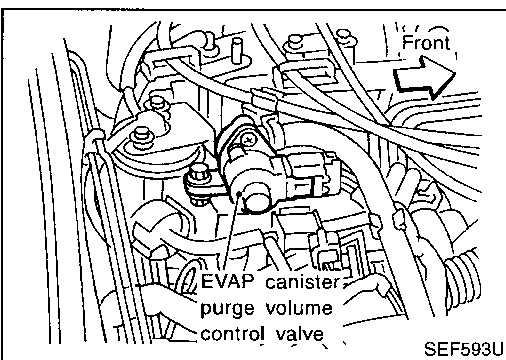
SEF353Q



SEF045V



SEF763P



SEF593U

TROUBLE DIAGNOSIS FOR DTC P0440

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

EVAP canister purge control solenoid valve

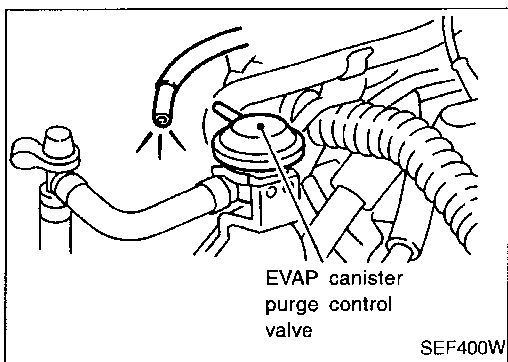
1. Turn ignition switch "ON".
2. Select "PURG CONT S/V" of "ACTIVE TEST" mode with CONSULT.
3. Start engine and warm it up to normal operating temperature.
4. Disconnect vacuum hose at EVAP canister purge control valve.
5. Touch "ON" and "OFF" and check for vacuum passing through the hose.

GI
MA
EM

■ ACTIVE TEST ■ □

PURG CONT S/V (PURG CONT VAC)	O N	N
	VC ON	
----- MONITOR -----		
PURG CONT S/V	ON	
CMPS•RPM(POS)	2000rpm	
CLSD THL/P SW	OFF	
COOLANT TEMP/S	84°C	
<div style="display: flex; justify-content: space-around; margin-top: 5px;"> ON ON/OFF OFF </div>		

SEF399W



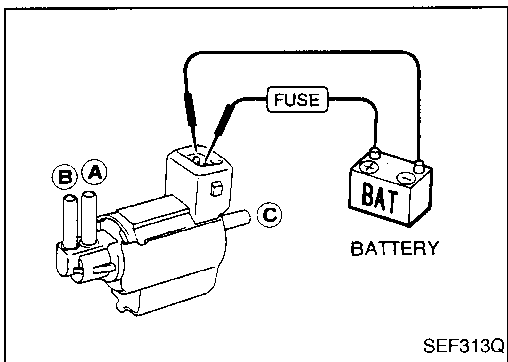
Condition	Vacuum
Idle	Not exist
2,000 rpm	Exist

LC
EC

OR

1. Check air passage continuity.

FE

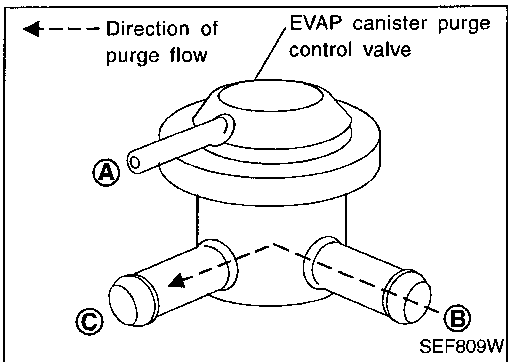


Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals	Yes	No
No supply	No	Yes

AT
PD
FA

If NG or operation takes more than 1 second, replace solenoid valve.

RA
BR



EVAP canister purge control valve

Check EVAP canister purge control valve as follows:

1. Blow air in port (A) and (C), then ensure that there is no leakage.
2. Blow air in port (B), then ensure that there is a resistance to flow out of port (C).
3. Apply vacuum to port (A). [Approximately -13.3 to -20.0 kPa (-100 to -150 mmHg, -3.94 to -5.91 inHg)]
Blow air in port (C) and ensure free flow out of port (B).

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HA
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IDX

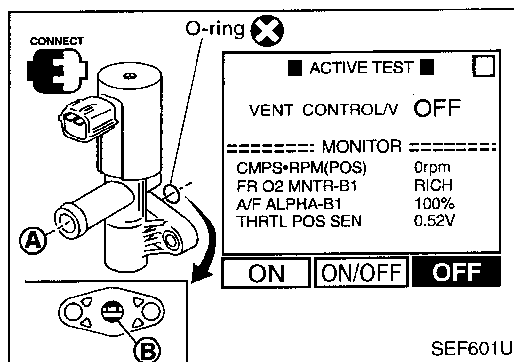
TROUBLE DIAGNOSIS FOR DTC P0440

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

EVAP canister vent control valve

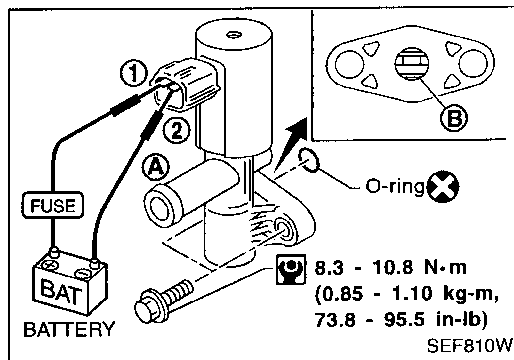
Check air passage continuity.

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.



Condition	Air passage continuity between (A) and (B)
VENT CONTROL/V	
ON	No
OFF	Yes

OR

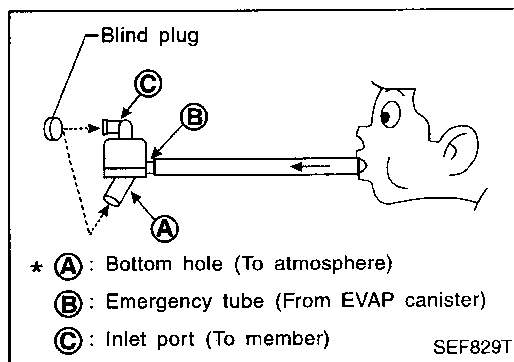


Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals ① and ②	No
No supply	Yes

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If the portion (B) is rusted, replace control valve.

Make sure new O-ring is installed properly.

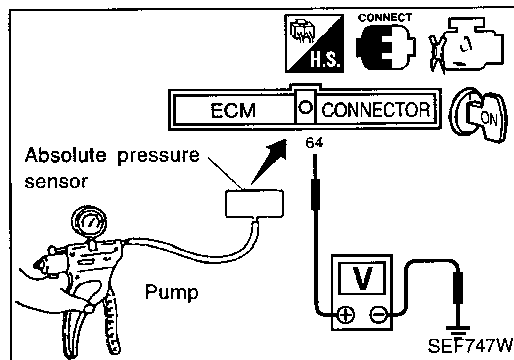


Water separator

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that (A) and (C) are not clogged by blowing air into (B) with (A), and then (C) plugged.
5. In case of NG in items 2 - 4, replace the parts.

NOTE:

Do not disassemble water separator.



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 64 and ground.
The voltage should be 3.2 to 4.8V.

TROUBLE DIAGNOSIS FOR DTC P0440

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

- Use pump to apply vacuum of -26.7 kPa (-200 mmHg, -7.87 inHg) to absolute pressure sensor as shown in figure and check the output voltage.
The voltage should be **1.0 to 1.4 V** lower than the value measured in step 3.

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply below -93.3 kPa (-700 mmHg, -27.56 inHg) or over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure. Doing so will damage the absolute pressure sensor.
- If NG, replace absolute pressure sensor.

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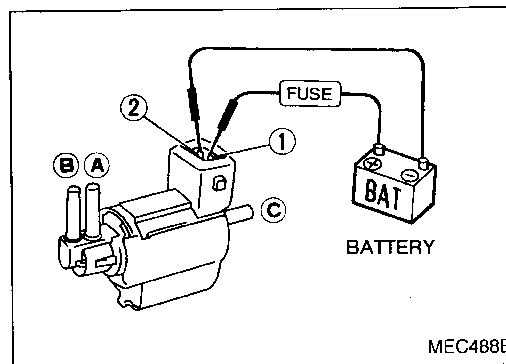
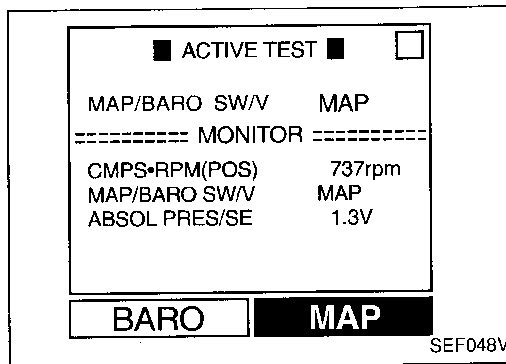
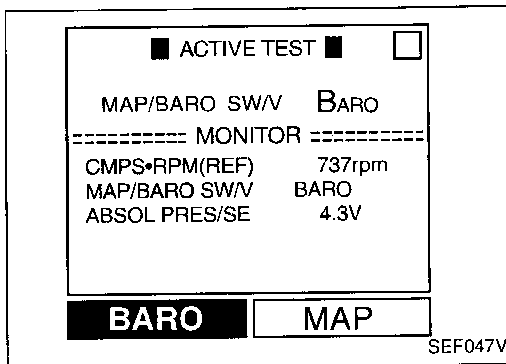
RS

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MAP/BARO switch solenoid valve

- Start engine and warm it up to normal operating temperature.
- Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
- Check the following.
 - Condition: At idle under no-load.
 - CONSULT display

MAP/BARO SW/V	ABSOL PRES/SE (Voltage)
BARO	More than 2.6V
MAP	Less than the voltage at BARO

- Time for voltage to change

MAP/BARO SW/V	Required time to switch
BARO to MAP	Less than 1 second
MAP to BARO	

- If NG, check solenoid valve as shown below.

OR

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

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

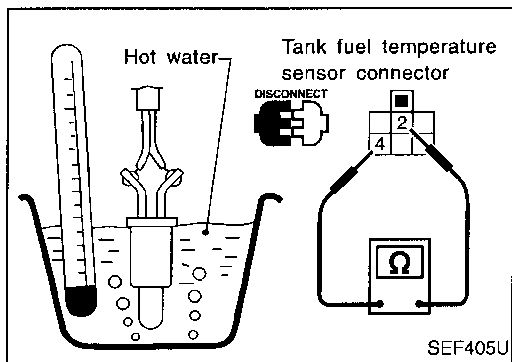
- If NG or operation takes more than 1 second, replace solenoid valve.

TROUBLE DIAGNOSIS FOR DTC P0440

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

Tank fuel temperature sensor

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

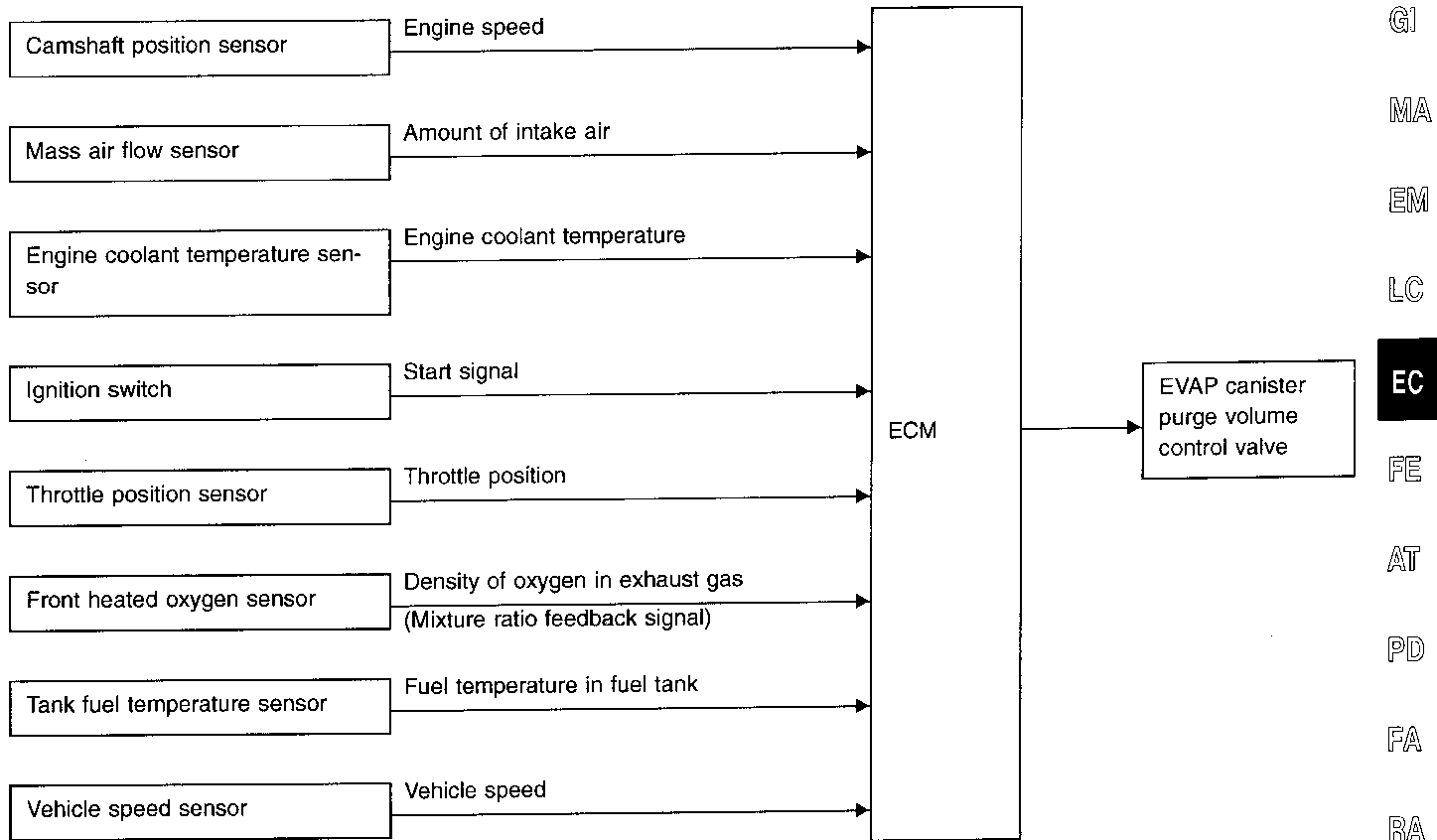


Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

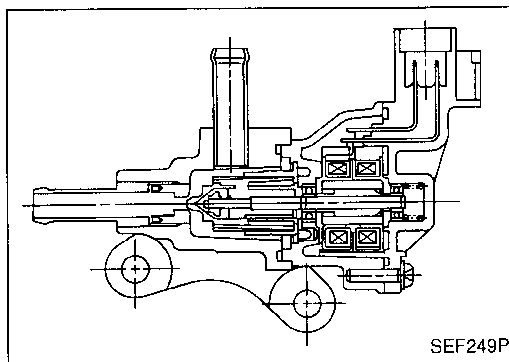
If NG, replace tank fuel temperature sensor.

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Circuit)

SYSTEM DESCRIPTION



This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control 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.



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.

TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Circuit) (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
PURG VOL C/V	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch "OFF" 	Idle
		Vehicle running (Shift lever "1")
		0 step
		—

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
124	W/B	ECCS relay (Self-shutoff)	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div>	0 - 1V
			<div style="border: 1px solid black; padding: 2px;">Ignition switch "OFF"</div> <div style="margin-left: 20px;">└ For a few seconds after turning ignition switch "OFF"</div>	
			<div style="border: 1px solid black; padding: 2px;">Ignition switch "OFF"</div> <div style="margin-left: 20px;">└ A few seconds passed after turning ignition switch "OFF"</div>	BATTERY VOLTAGE (11 - 14V)
130	R/G	Power supply for ECM	<div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div>	BATTERY VOLTAGE (11 - 14V)
131				
123	W/L	Current return	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	BATTERY VOLTAGE (11 - 14V)
28	BR/Y	EVAP canister purge volume control valve	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	0 - 0.4V or BATTERY VOLTAGE (11 - 14V)
29	G			
35	G/OR	EVAP canister purge volume control valve	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	0 - 0.4V or BATTERY VOLTAGE (11 - 14V)
36	L/B			

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0443 1008	<ul style="list-style-type: none"> ● An improper voltage signal is sent to ECM through the valve. 	<ul style="list-style-type: none"> ● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister purge volume control valve

TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Circuit) (Cont'd)

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS-RPM(POS)	700rpm	
COOLAN TEMP/S	85°C	
PURG VOL C/V	0step	
RECORD		

SEF416U


DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:


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

TESTING CONDITION:


Before performing the following procedure, confirm that battery voltage is more than 11V at ignition switch "ON".

-  1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-303.

OR

-  1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-303.

OR

-  1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Perform "Diagnostic Test Mode II (Self-diagnostic results) with ECM.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-303.

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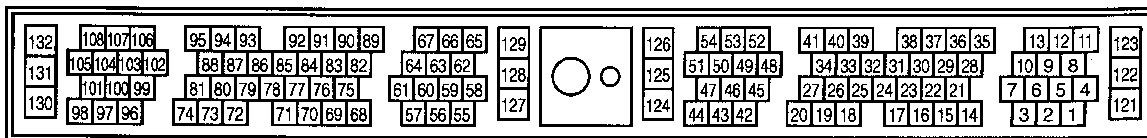
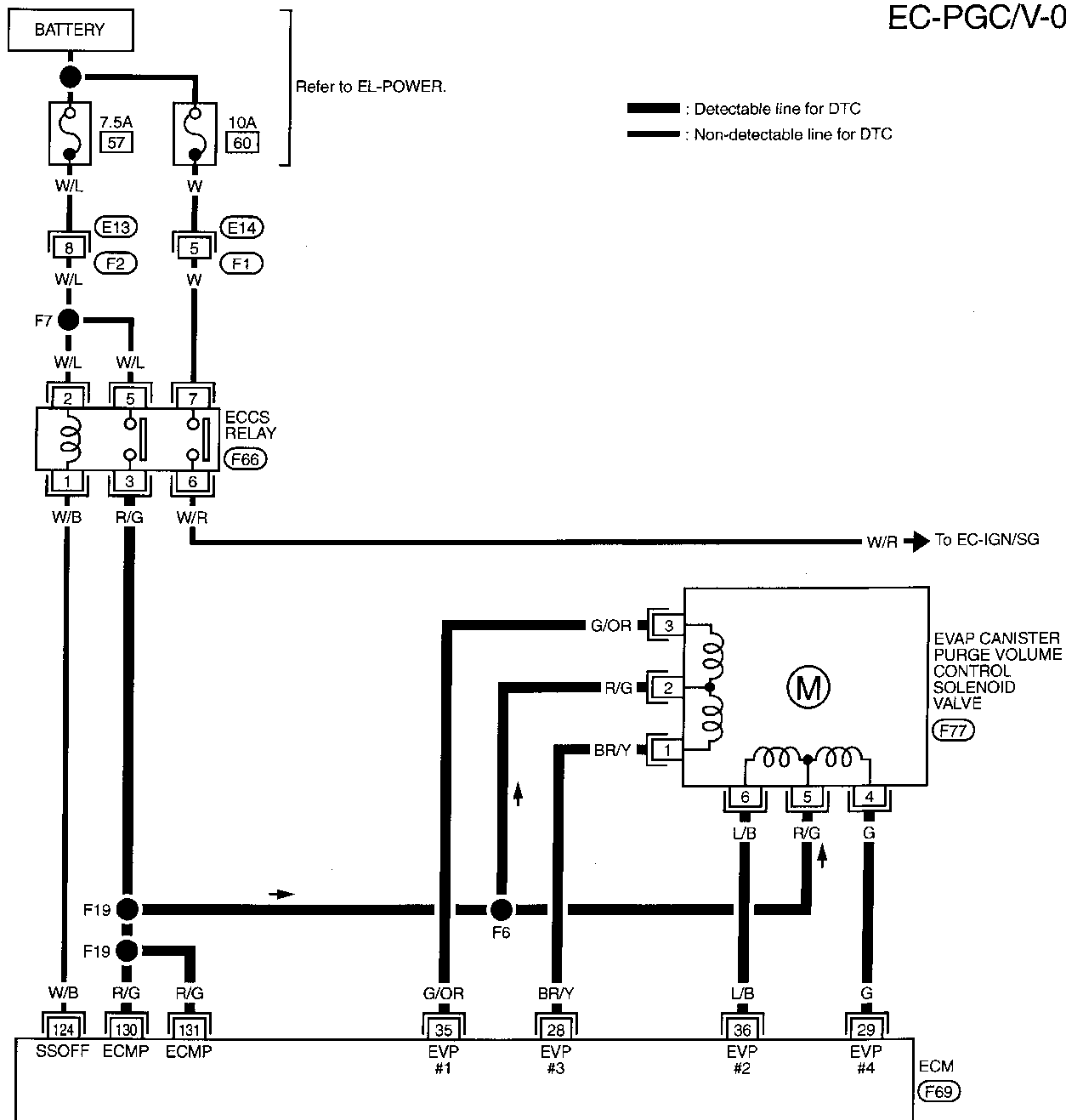
EL

IDX

TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Circuit) (Cont'd)

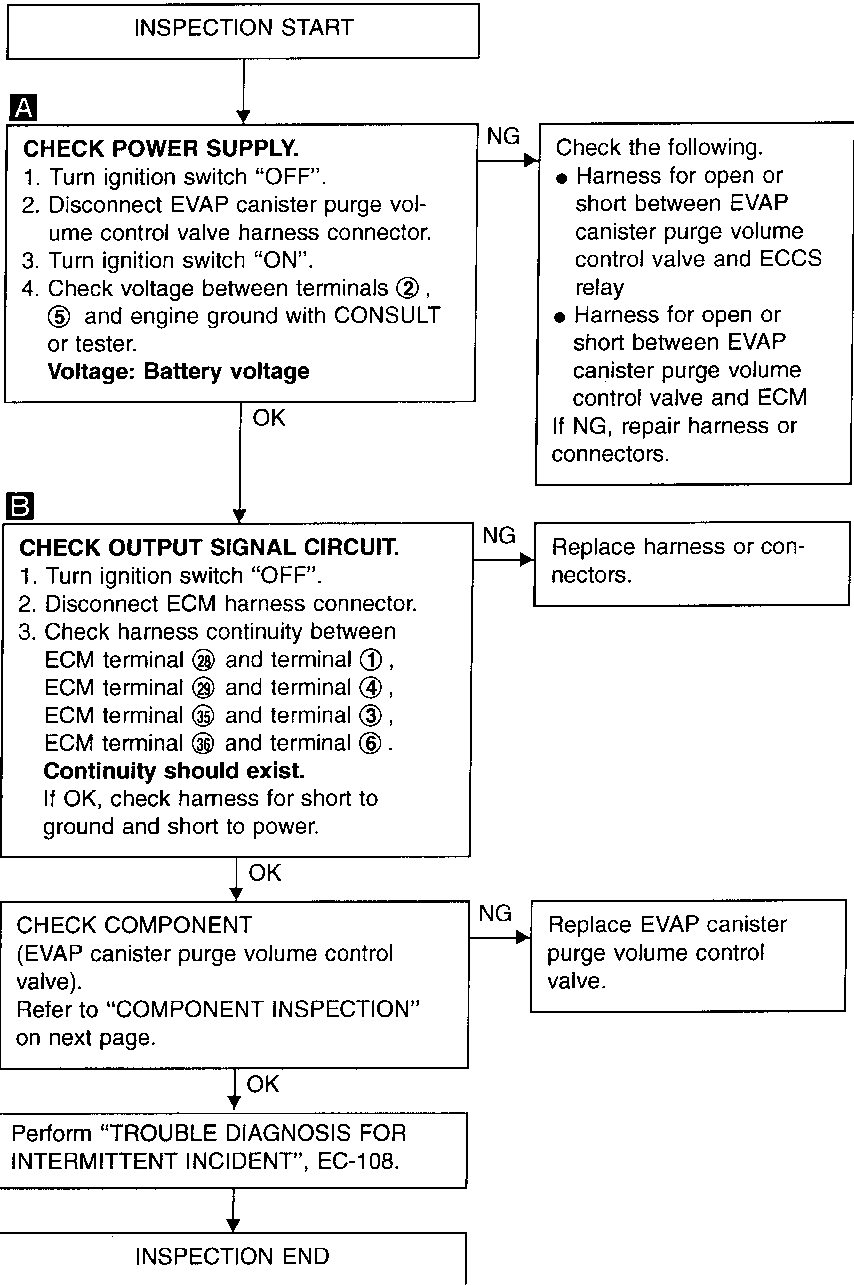
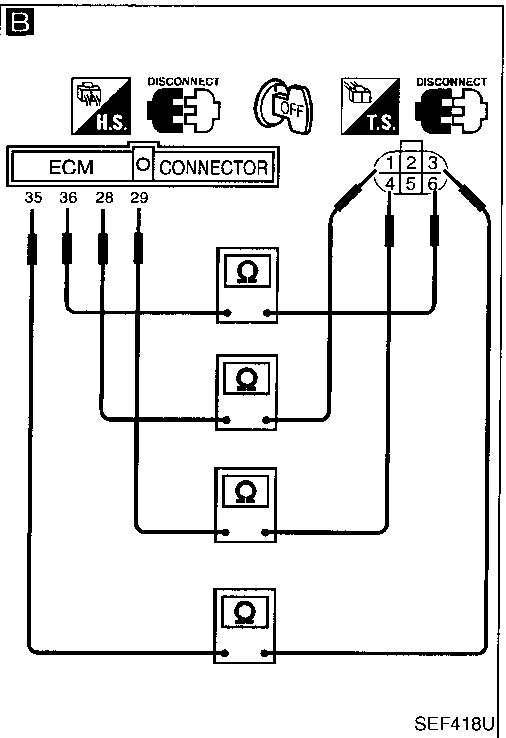
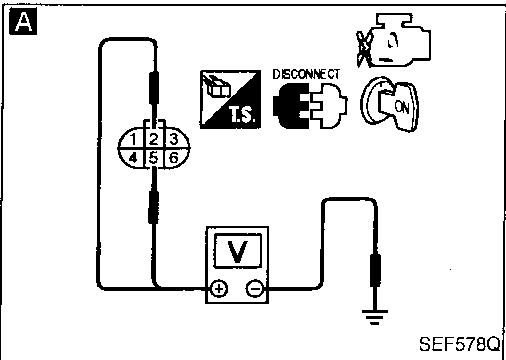
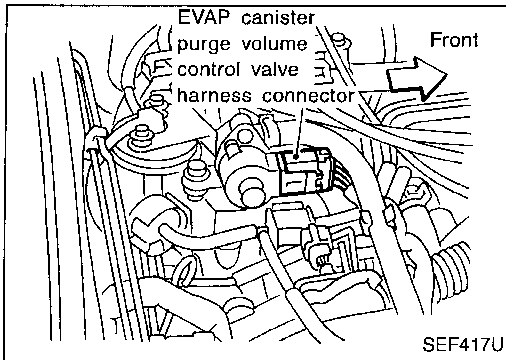
EC-PGC/V-01



TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Circuit) (Cont'd)

DIAGNOSTIC PROCEDURE



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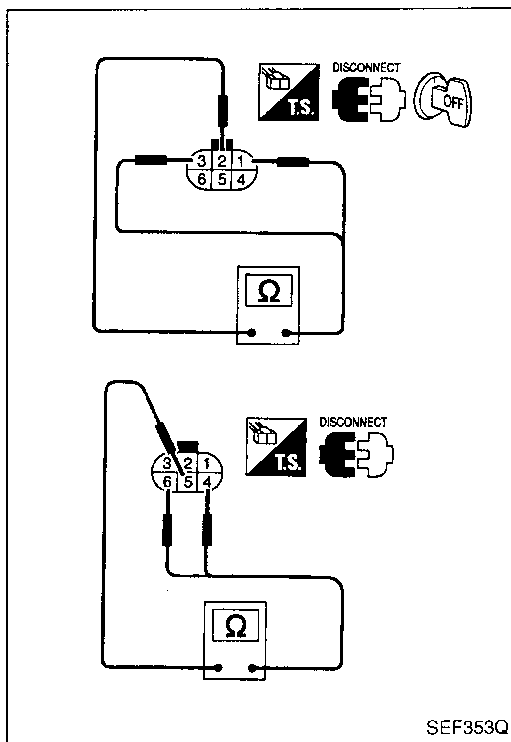
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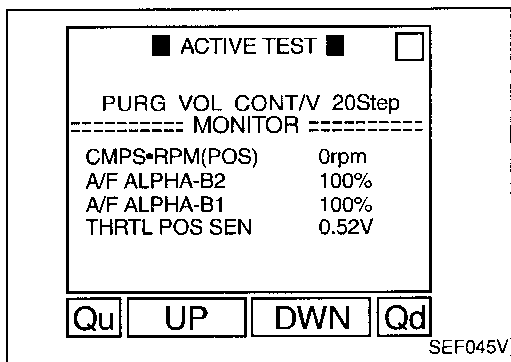
Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

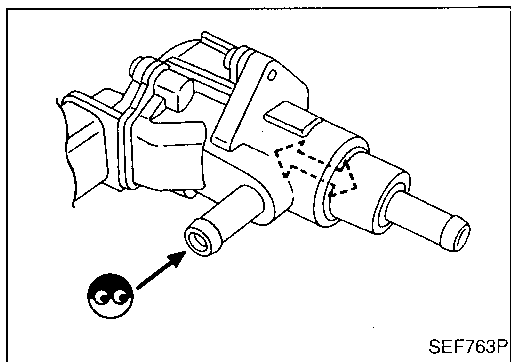
EVAP canister purge volume control valve



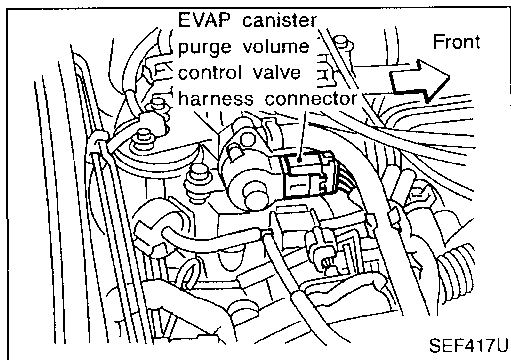
SEF353Q



SEF045V



SEF763P



SEF417U

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 35 - 43Ω [At 25°C (77°F)]

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

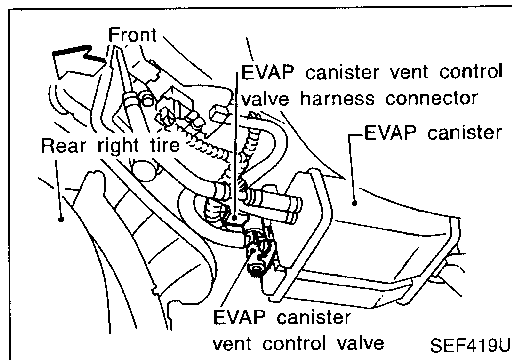
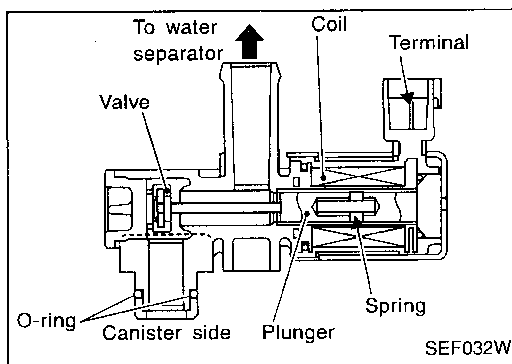
OR

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

Resistance:

Approximately 35 - 43Ω [At 25°C (77°F)]

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



Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit)

COMPONENT DESCRIPTION

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

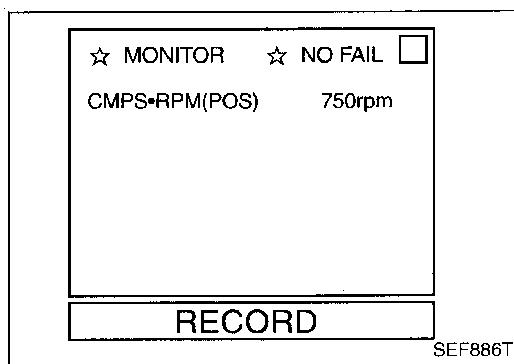
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
20	P/B	EVAP canister vent control valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0446 0903	● An improper voltage signal is sent to ECM through EVAP canister vent control valve.	<ul style="list-style-type: none"> ● Harness or connectors (EVAP canister vent control valve circuit is open or shorted.) ● EVAP canister vent control valve

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TROUBLE DIAGNOSIS FOR DTC P0446



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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

TESTING CONDITION:

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



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 8 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-308.

OR



- 1) Start engine and wait at least 8 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-308.

OR

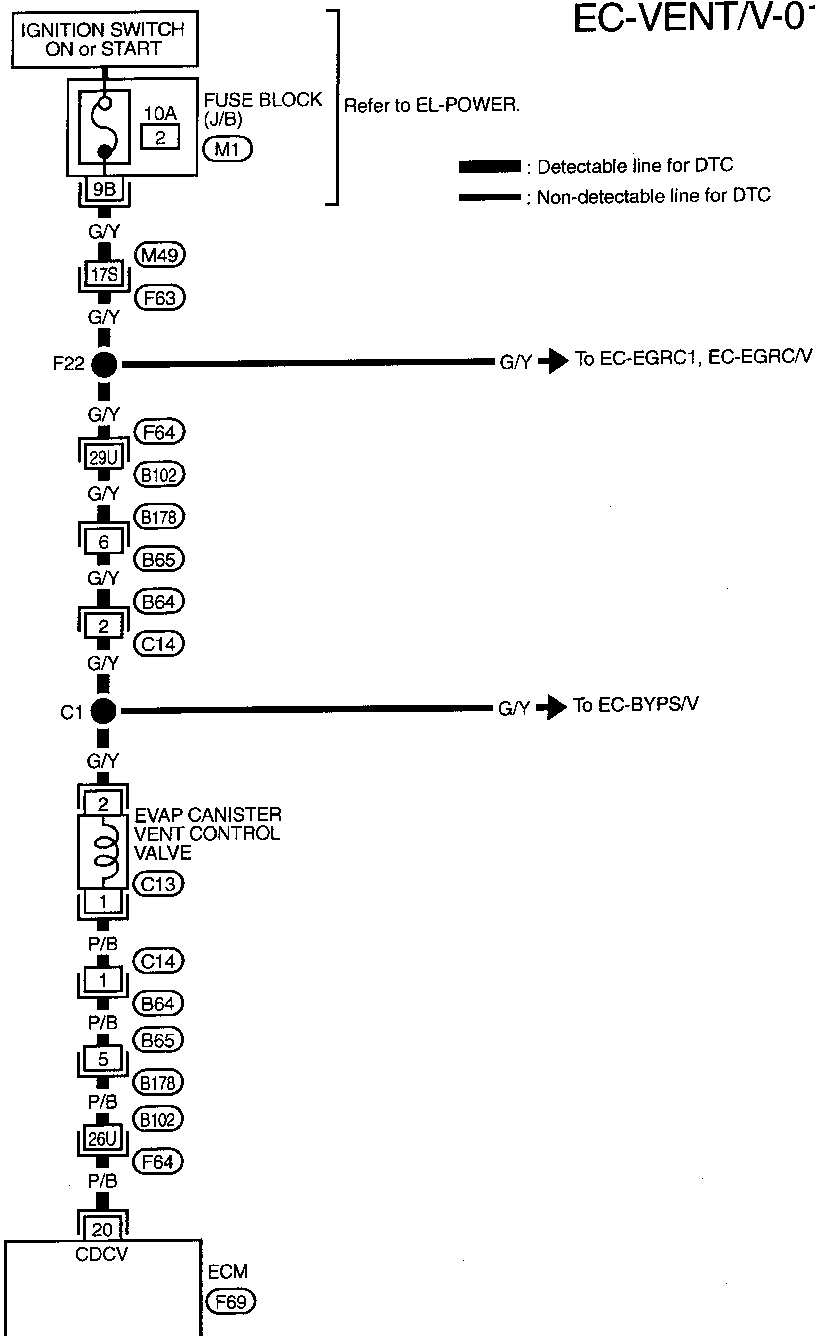


- 1) Start engine and wait at least 8 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-308.

TROUBLE DIAGNOSIS FOR DTC P0446

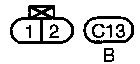
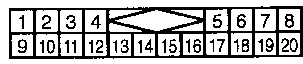
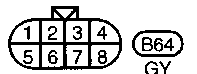
Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)

EC-VENT/V-01

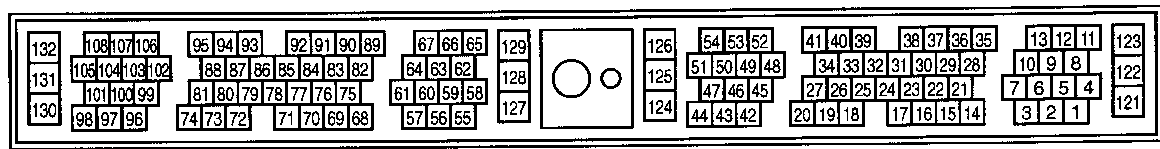


- GI
- MA
- EM
- LC
- EC**
- FE
- AT
- PD
- FA
- RA
- BR
- ST
- RS
- BT
- HA

Refer to EL-POWER.
 — : Detectable line for DTC
 — : Non-detectable line for DTC



Refer to last page (Foldout page).
 M49, F63
 F64, B102
 M1

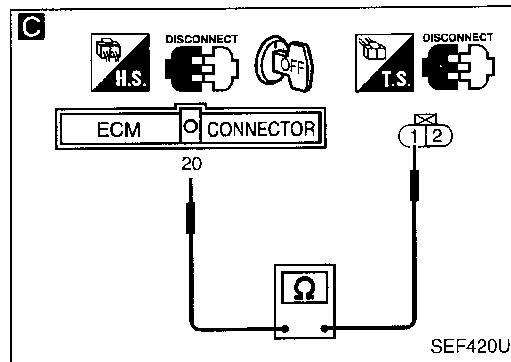
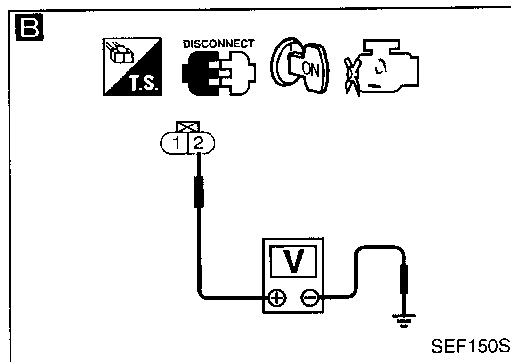
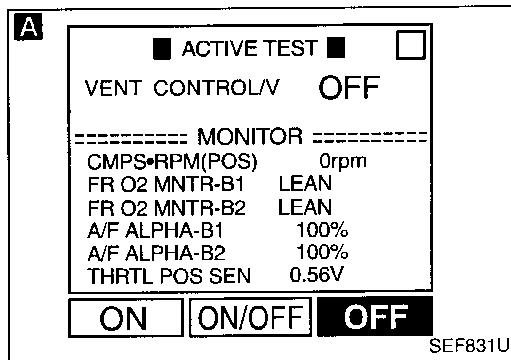
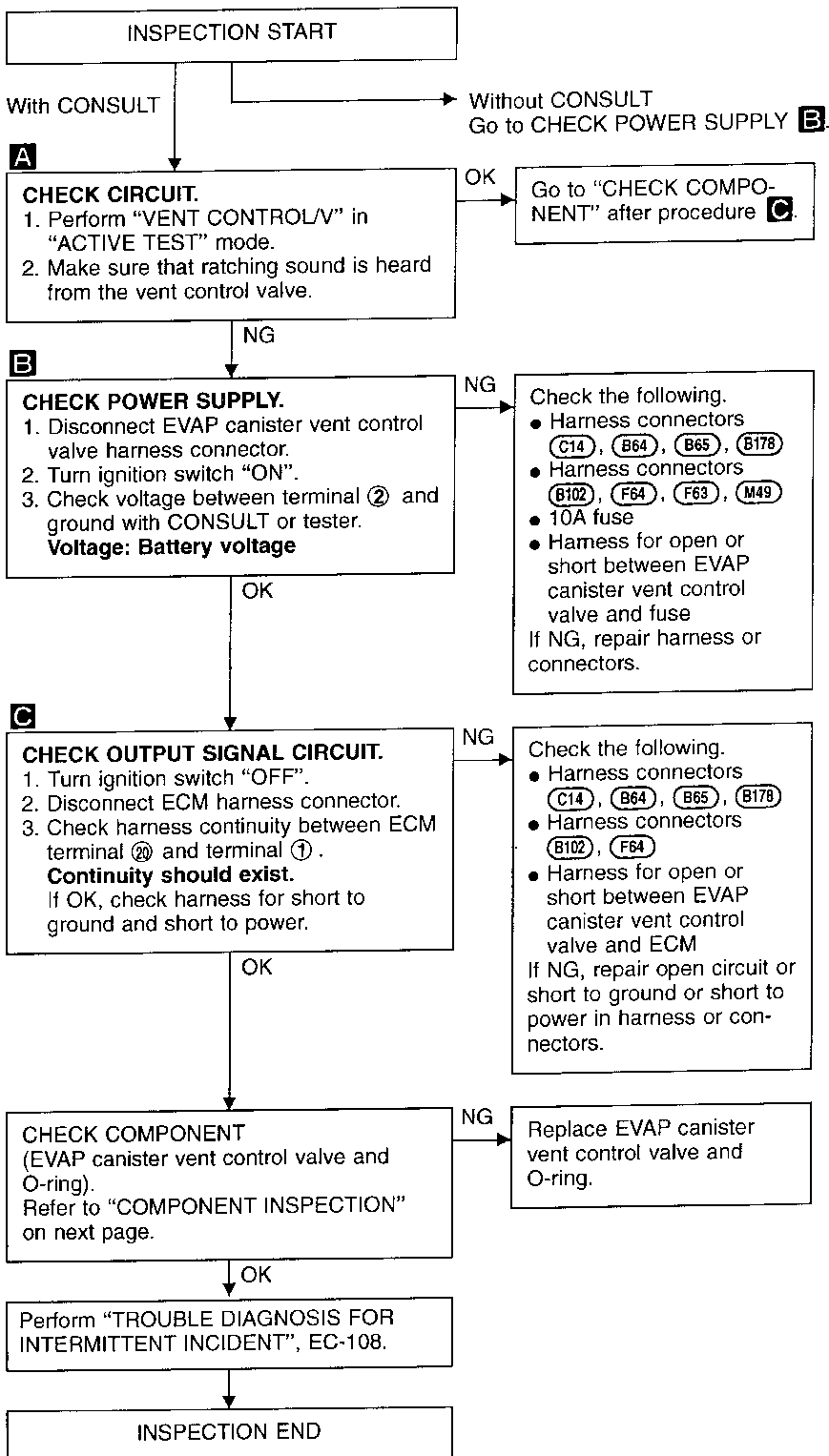
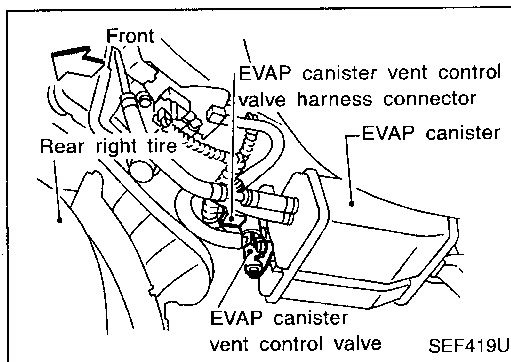


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TROUBLE DIAGNOSIS FOR DTC P0446

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

DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P0446

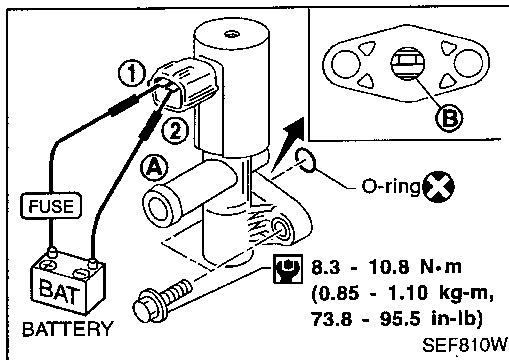
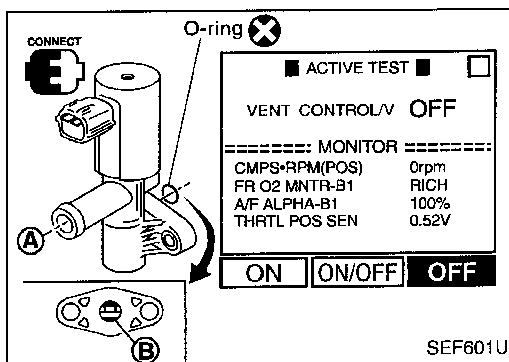
Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

EVAP canister vent control valve


Check air passage continuity.

 Perform "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.



Condition VENT CONTROL/V	Air passage continuity between ① and ②
ON	No
OFF	Yes

OR



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

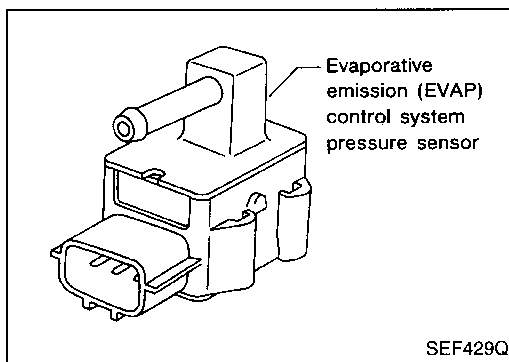
If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If portion ② is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.

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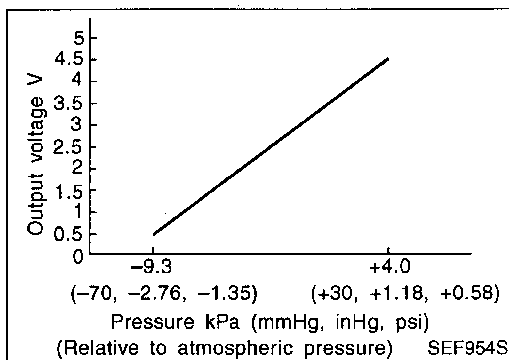
TROUBLE DIAGNOSIS FOR DTC P0450



Evaporative Emission (EVAP) Control System Pressure Sensor

COMPONENT DESCRIPTION

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on board diagnosis.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

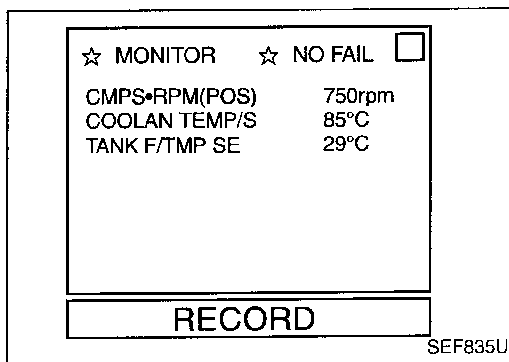
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
98	BR/W	Sensors' power supply	Ignition switch "ON"	Approximately 5V
92	W/R	EVAP control system pressure sensor	Ignition switch "ON"	Approximately 3.4V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0450 0704	<ul style="list-style-type: none"> An improper voltage signal from EVAP control system pressure sensor is sent to ECM. 	<ul style="list-style-type: none"> Harness or connectors (The EVAP control system pressure sensor circuit is open or shorted.) Rubber hose to EVAP control system pressure sensor is clogged, bent, kinked, disconnected or not corrected properly. EVAP control system pressure sensor EVAP canister vent control valve (The valve is stuck open.) EVAP canister purge volume control valve EVAP canister Rubber hose from EVAP canister vent control valve to water separator

TROUBLE DIAGNOSIS FOR DTC P0450

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



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

TESTING CONDITION:

- Always perform test at a temperature above 5°C (41°F).
- Before performing the following procedure, confirm that battery voltage is more than 10V at idle.



- 1) Start engine and warm it at idle up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "DATA MONITOR" mode with CONSULT.
- 5) Make sure that "TANK F/TEMP SE" is more than 0°C (32°F).
- 6) Start engine and wait at least 12 seconds.
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-313.

OR

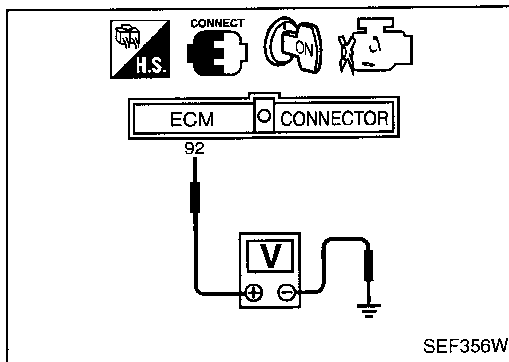


- 1) Start engine and warm it up to normal operating temperature.
- 2) Check that voltage between ECM terminal ⑨ and ground is less than 4.2V.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine and wait at least 12 seconds.
- 5) Select "MODE 7" with GST.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-313.

OR



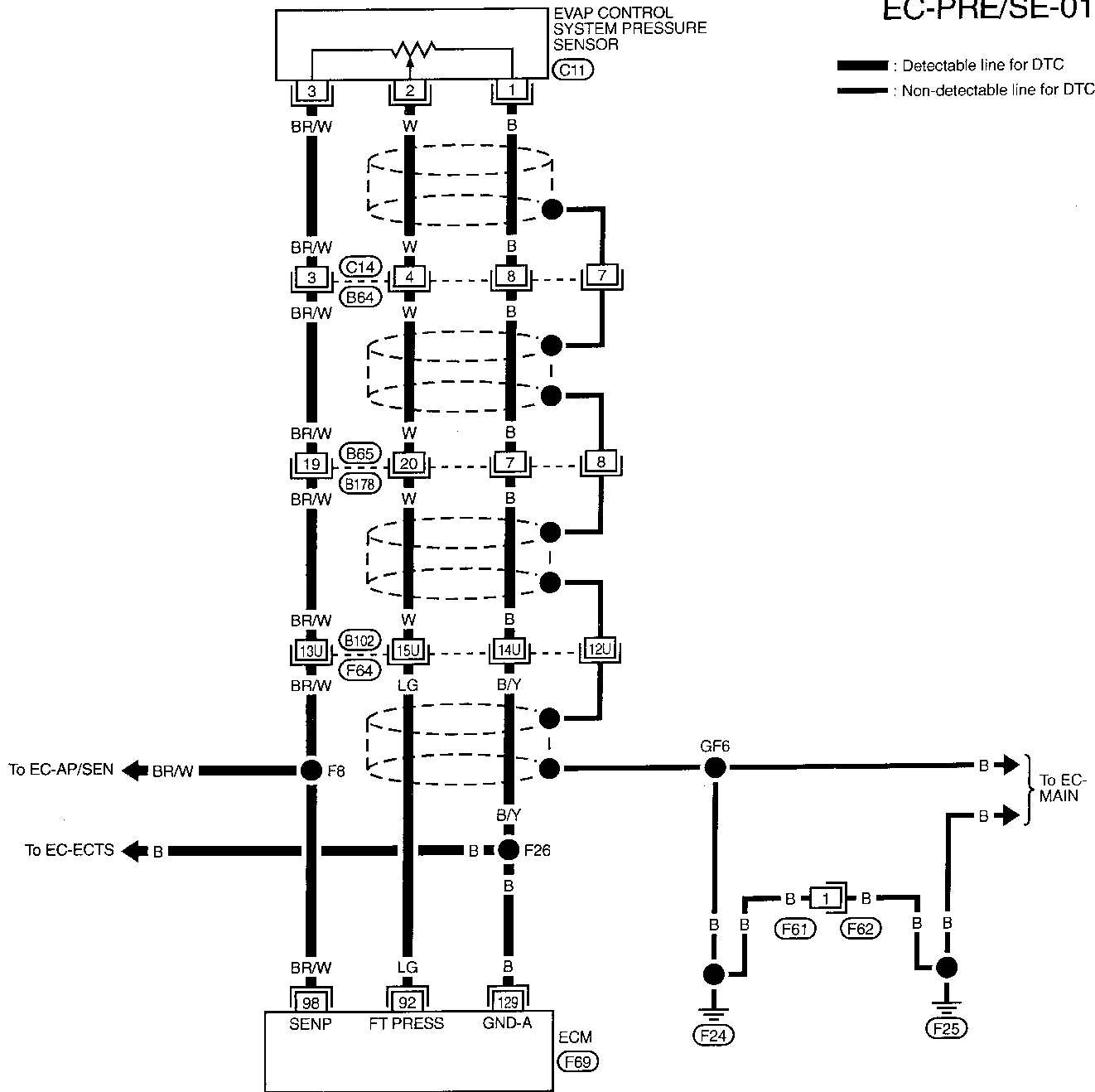
- 1) Start engine and warm it up to normal operating temperature.
- 2) Check that voltage between ECM terminal ⑨ and ground is less than 4.2V.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine and wait at least 12 seconds.
- 5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-313.



TROUBLE DIAGNOSIS FOR DTC P0450

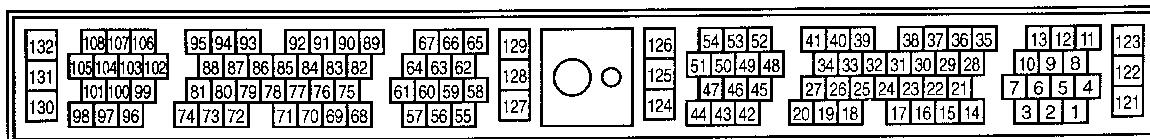
Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

EC-PRE/SE-01



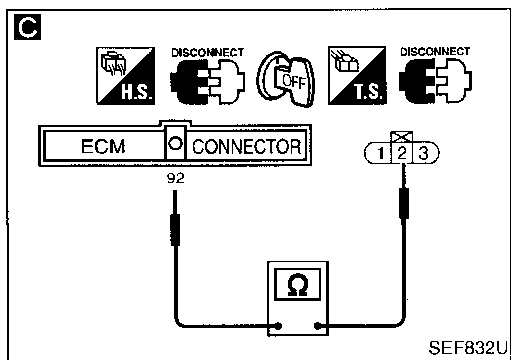
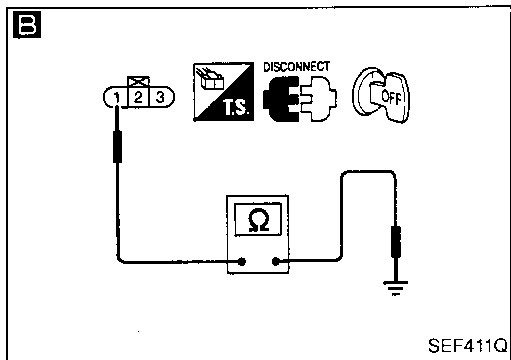
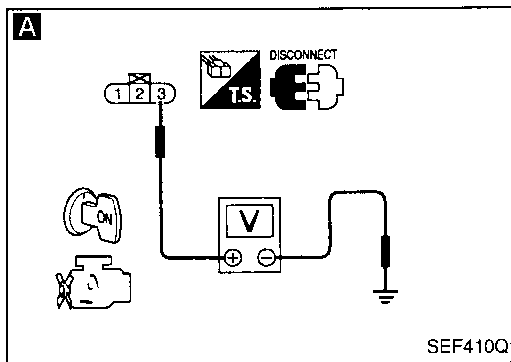
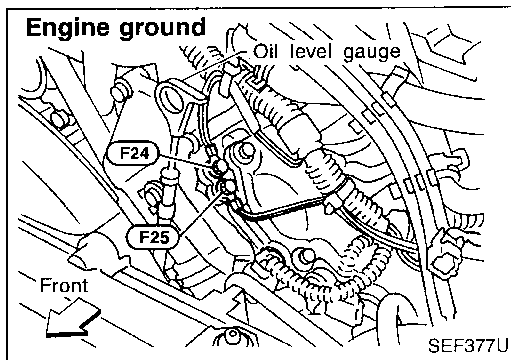
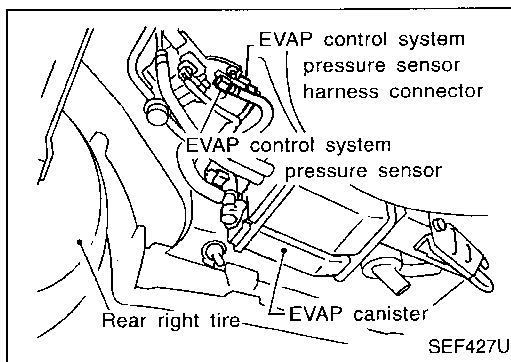
Refer to last page (Foldout page).

F64, B102



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

DIAGNOSTIC PROCEDURE



INSPECTION START

CHECK RUBBER TUBE CONNECTED TO THE SENSOR.
Check rubber tube for clogging, bending, kinking, disconnection or improper connection.

NG → Reconnect, repair or replace.

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

A
CHECK POWER SUPPLY.
1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.
Water should not exist.
If OK, go to step 3. If NG, repair or replace harness or connectors.
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 or connectors (F64), (B102)
- Harness or connectors (B178), (B65)
- Harness connectors (B64), (C14)
- Harness for open or short between EVAP control system pressure sensor and ECM

 If NG, repair harness or connectors.

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

NG → Check the following.

- Harness or connectors (F64), (B102)
- Harness or connectors (B178), (B65)
- Harness connectors (B64), (C14)
- Harness for open or short between EVAP control system pressure sensor and ECM

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

OK

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

NG → Check the following.

- Harness connectors (F64), (B102)
- Harness or connectors (B178), (B65)
- Harness connectors (B64), (C14)
- Harness for open or short between ECM and EVAP control system pressure sensor

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

OK

(Go to next page.)

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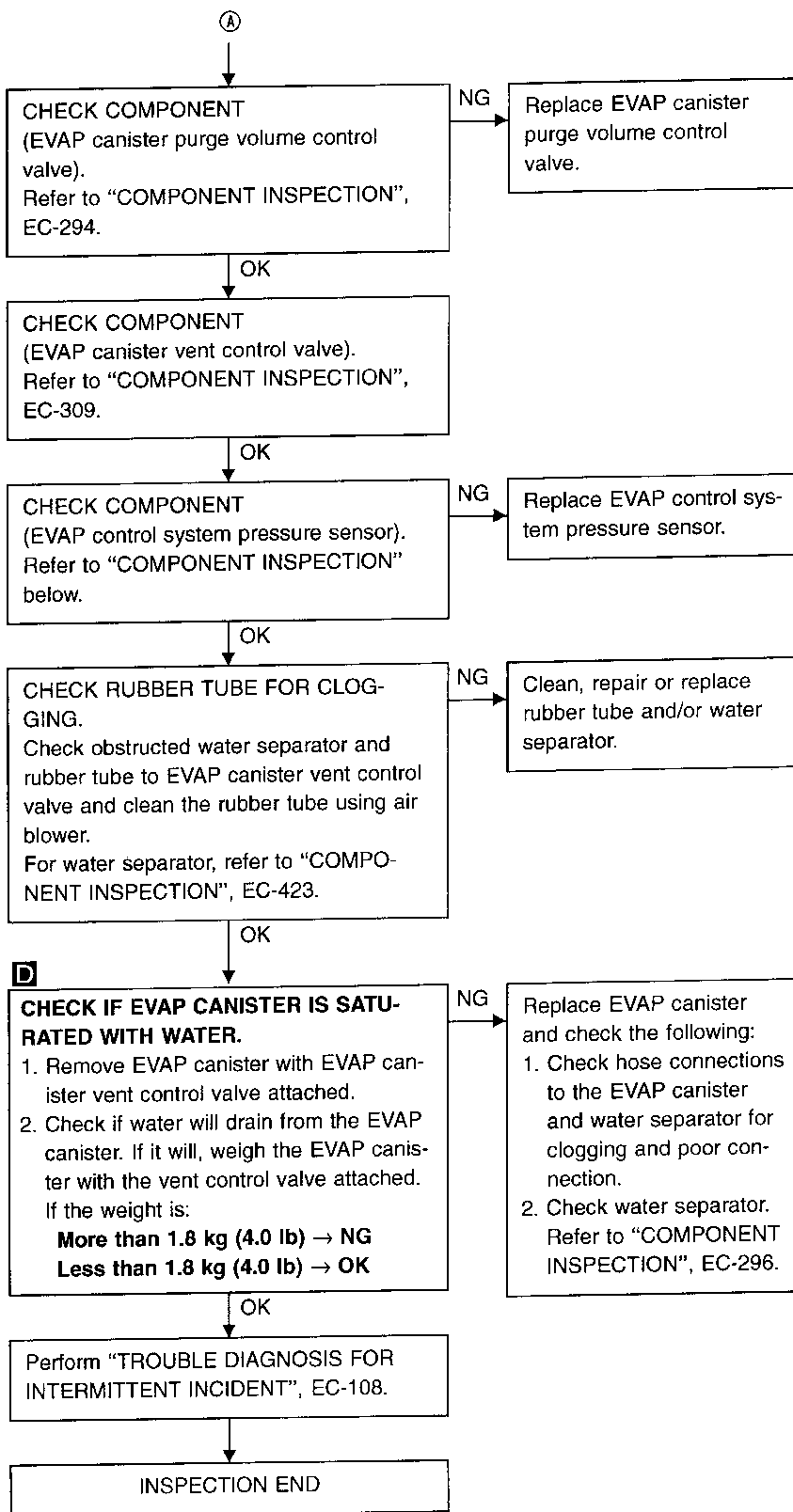
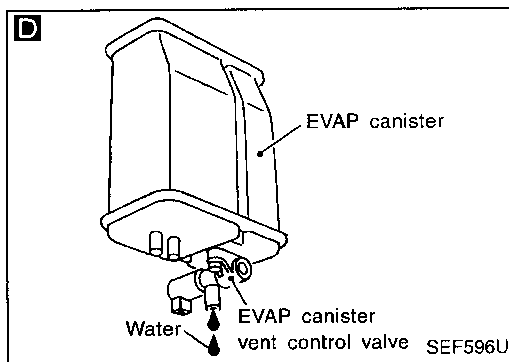
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TROUBLE DIAGNOSIS FOR DTC P0450

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

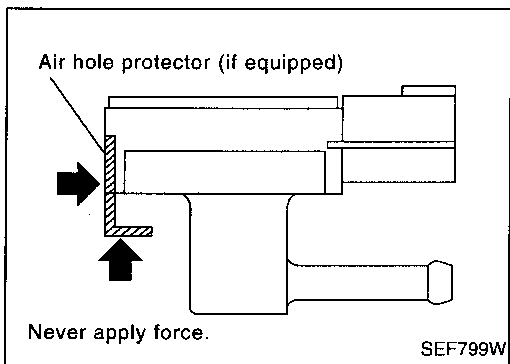
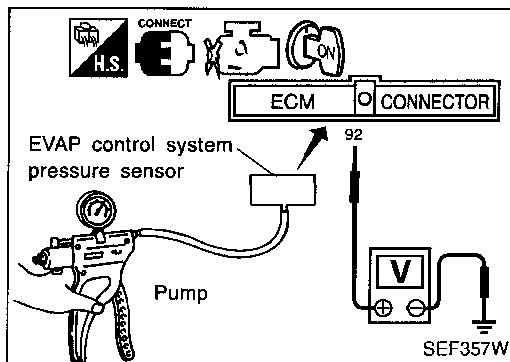


TROUBLE DIAGNOSIS FOR DTC P0450

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

COMPONENT INSPECTION

EVAP control system pressure sensor



1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
5. Check output voltage between ECM terminal 92 and ground.

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

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -20 kPa (-150 mmHg, -5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.
- 6. If NG, replace EVAP control system pressure sensor.
- Never apply force to the air hole protector of the sensor, if equipped.
- Discard any EVAP control system pressure sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

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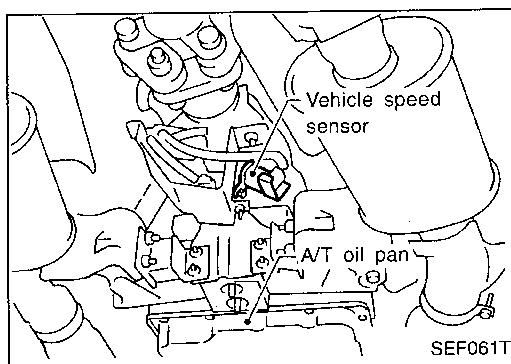
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TROUBLE DIAGNOSIS FOR DTC P0500



Vehicle Speed Sensor (VSS)

COMPONENT DESCRIPTION

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
68	P/L	Vehicle speed sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> Lift up drive wheels and run engine at idle in "D" position.	Approximately 5.2V

ON BOARD DIAGNOSIS LOGIC

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

TROUBLE DIAGNOSIS FOR DTC P0500

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

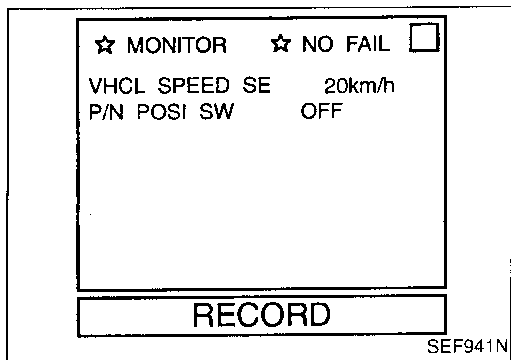
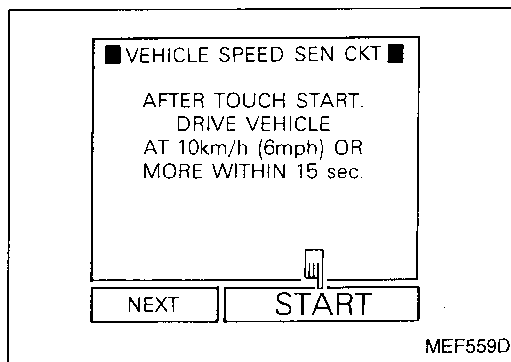
Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Step 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.



- 1) Start engine.
- 2) Perform "VEHICLE SPEED SEN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.
- 3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-320.
If OK, go to following step.

OR

- 1) Start engine.
- 2) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT. The vehicle speed on CONSULT should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
If NG, go to "DIAGNOSTIC PROCEDURE", EC-320.
If OK, go to following step.
- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Warm engine up to normal operating temperature.
- 5) Maintain the following conditions for at least 10 consecutive seconds with TCS switch "OFF".
CMPS-RPM (POS): 1,600 - 2,250 rpm
COOLAN TEMP/S: More than 70°C (158°F)
B/FUEL SCHDL: 2.0 - 3.5 msec
Selector lever: Suitable position
PW/ST SIGNAL: OFF
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-320.

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TROUBLE DIAGNOSIS FOR DTC P0500

Vehicle Speed Sensor (VSS) (Cont'd)

OR

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) Lift up drive wheels.
- 2) Start engine (TCS switch "OFF").
- 3) Read vehicle speed sensor signal in "MODE 1" with GST.

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

- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-320.

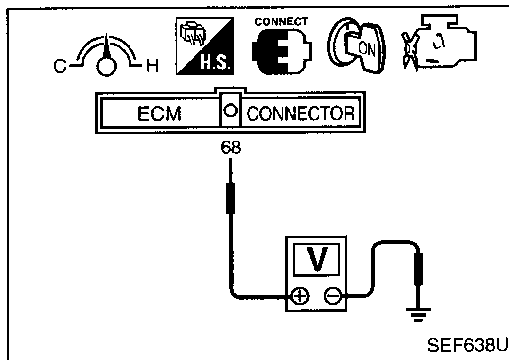
OR



- 1) Lift up drive wheels.
- 2) Start engine (TCS switch "OFF").
- 3) Read the voltage signal between ECM terminal 68 (Vehicle speed sensor signal) and ground with oscilloscope.
- 4) Verify that the oscilloscope screen shows the signal wave as shown at "ECM TERMINALS AND REFERENCE VALUE" on previous page.
- 5) If NG, go to "DIAGNOSTIC PROCEDURE", EC-320.

FUEL SYS #1	CLOSED
FUEL SYS #2	CLOSED
CALC LOAD	19%
COOLANT TEMP	93°C
SHORT FT #1	1%
LONG FT #1	0%
SHORT FT #2	3%
LONG FT #2	0%
ENGINE SPD	2037RPM
VEHICLE SPD	12MPH
IGN ADVANCE	38.0°
INTAKE AIR	43°C

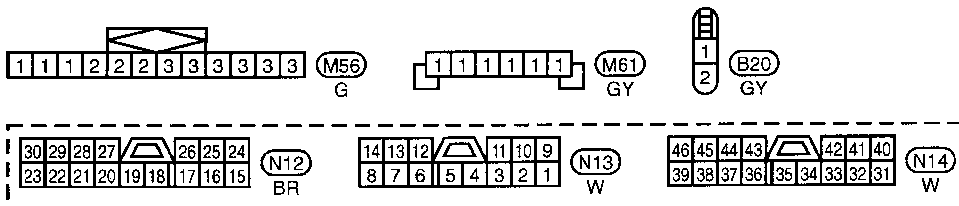
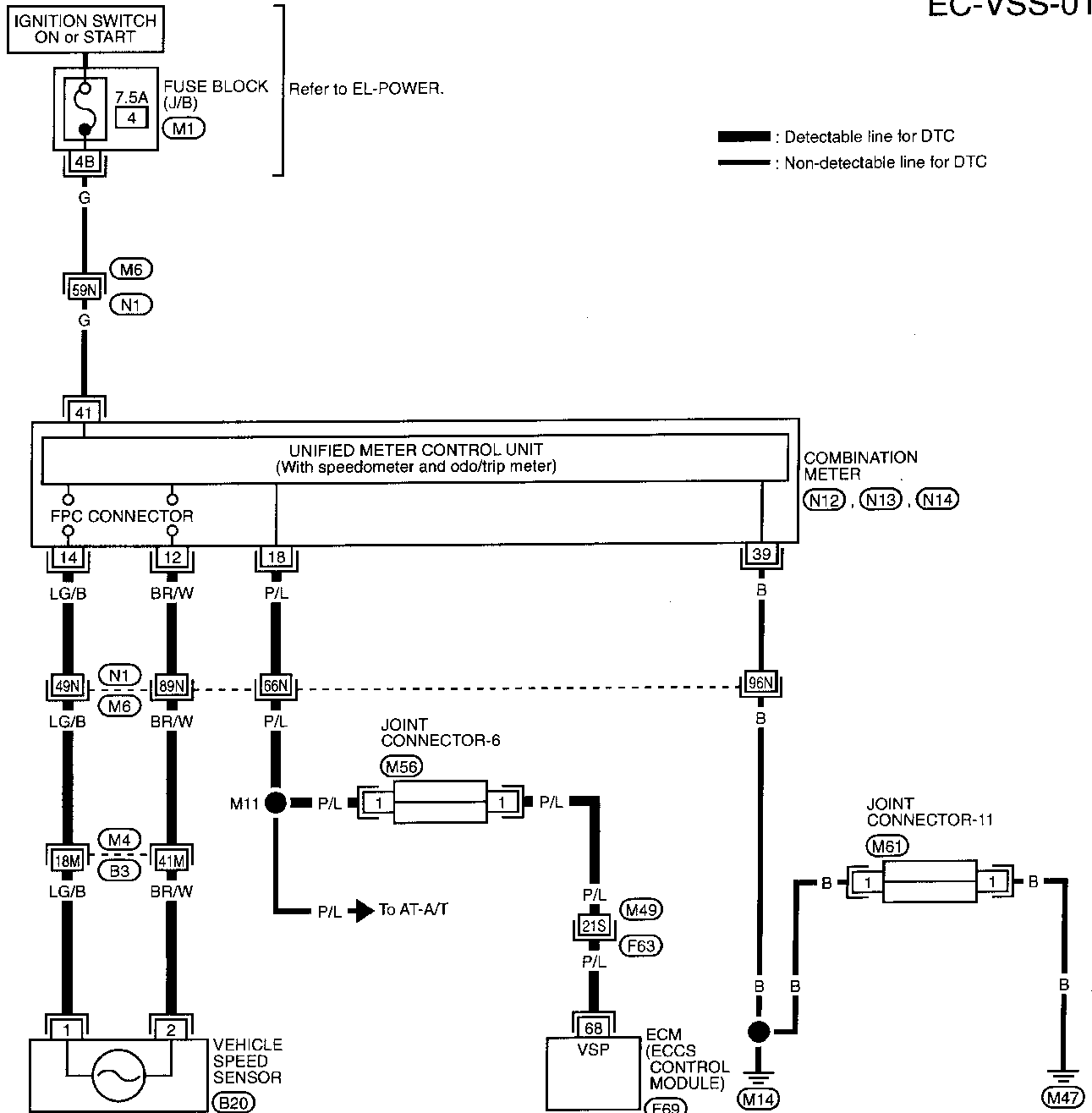
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TROUBLE DIAGNOSIS FOR DTC P0500

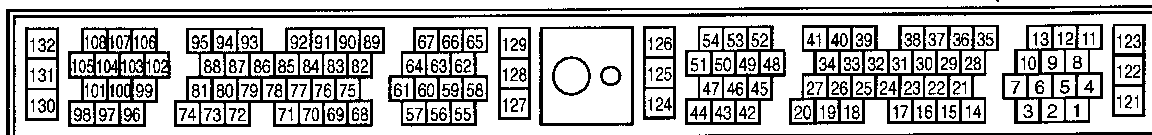
Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01



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- (M4), (B3)
- (M6), (N1)
- (M49), (F63)
- (M1)

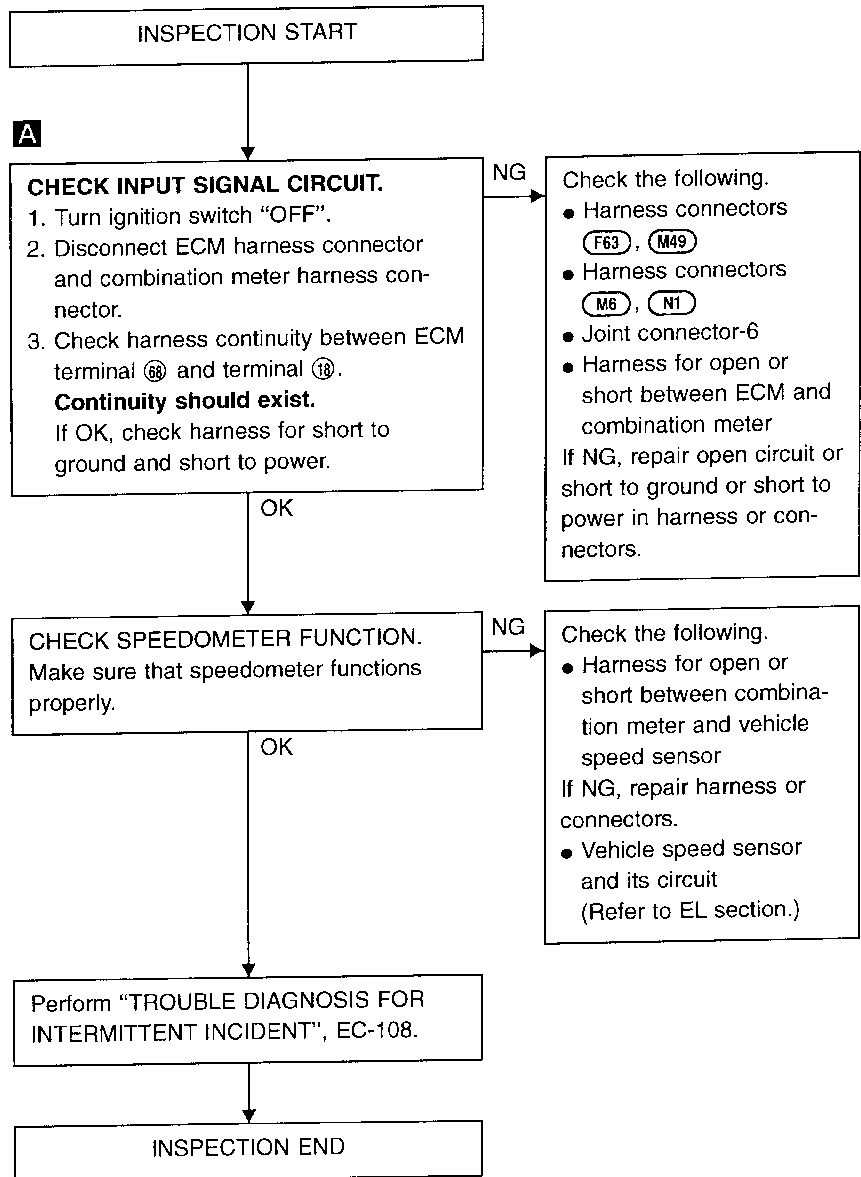
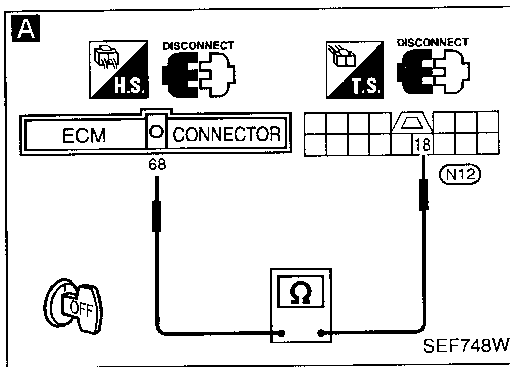


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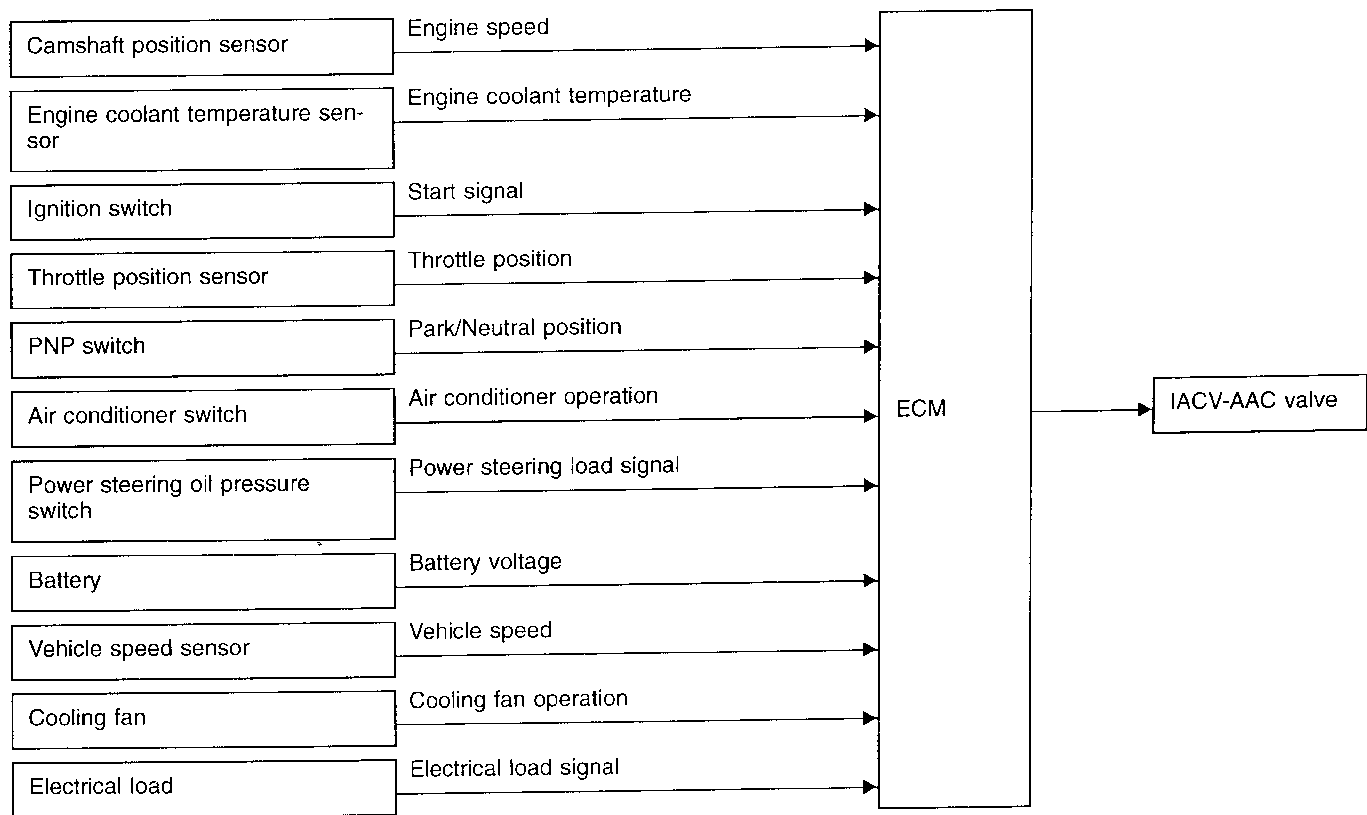
Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE

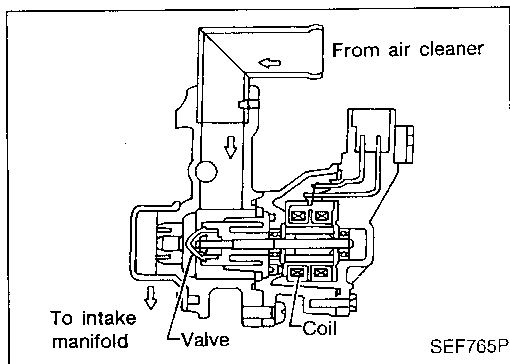


Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve

SYSTEM DESCRIPTION



This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the step position of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering and cooling fan operation).



COMPONENT DESCRIPTION

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

TROUBLE DIAGNOSIS FOR DTC P0505

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
IACV-AAC/V	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load 	Idle
		2,000 rpm
		20 - 10 step
		—

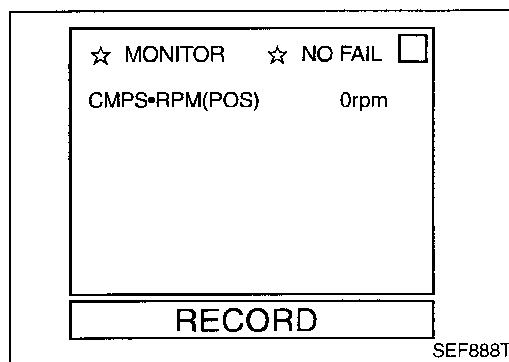
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (12B) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
13	Y	IACV-AAC valve	Engine is running.	0.1 - 14V
8	GY/L		└ Idle speed	
11	PU	IACV-AAC valve	Engine is running.	0.1 - 14V
12	G/Y		└ Idle speed	

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0505 0205	A) The IACV-AAC valve does not operate properly.	<ul style="list-style-type: none"> ● Harness or connectors (The IACV-AAC valve circuit is open.) ● IACV-AAC valve
	B) The IACV-AAC valve does not operate properly.	<ul style="list-style-type: none"> ● Harness or connectors (The IACV-AAC valve circuit is shorted.) ● IACV-AAC valve



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- Perform "Procedure for malfunction A" first. If a 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B".

TESTING CONDITION:

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

Procedure for malfunction A

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and let it idle.
- 4) Keep engine speed at 2,500 rpm for 3 seconds, then let it idle for 3 seconds.
Do not rev engine up to speeds more than 3,000 rpm.
- 5) Perform step 4 once more.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-325.

TROUBLE DIAGNOSIS FOR DTC P0505

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

OR



- 1) Start engine and let it idle.
- 2) Keep engine speed at 2,500 rpm for 3 seconds, then let it idle for 3 seconds.
Do not rev engine up to speeds more than 3,000 rpm.
- 3) Perform step 2 once more.
- 4) Select "MODE 7" with GST.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-325.

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- 1) Start engine and let it idle.
- 2) Keep engine speed at 2,500 rpm for 3 seconds, then let it idle for 3 seconds.
Do not rev engine up to speeds more than 3,000 rpm.
- 3) Perform step 2 once more.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-325.

LC

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Procedure for malfunction B



- 1) Open engine hood.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
- 5) Start engine and run it for at least 1 minute at idle speed. (Headlamp switch, rear defogger switch: OFF)
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-325.

PD

FA

RA

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OR



- 1) Open engine hood.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine again and run it for at least 1 minute at idle speed. (Headlamp switch, rear defogger switch: OFF)
- 5) Select "MODE 7" with GST.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-325.

ST

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OR



- 1) Open engine hood.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine again and run it for at least 1 minute at idle speed. (Headlamp switch, rear defogger switch: OFF)
- 5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-325.

EL

IDX

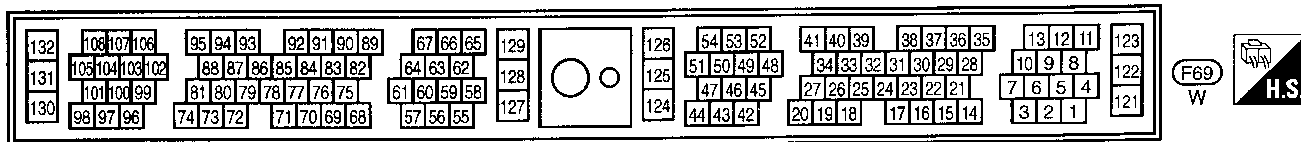
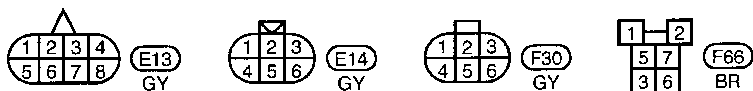
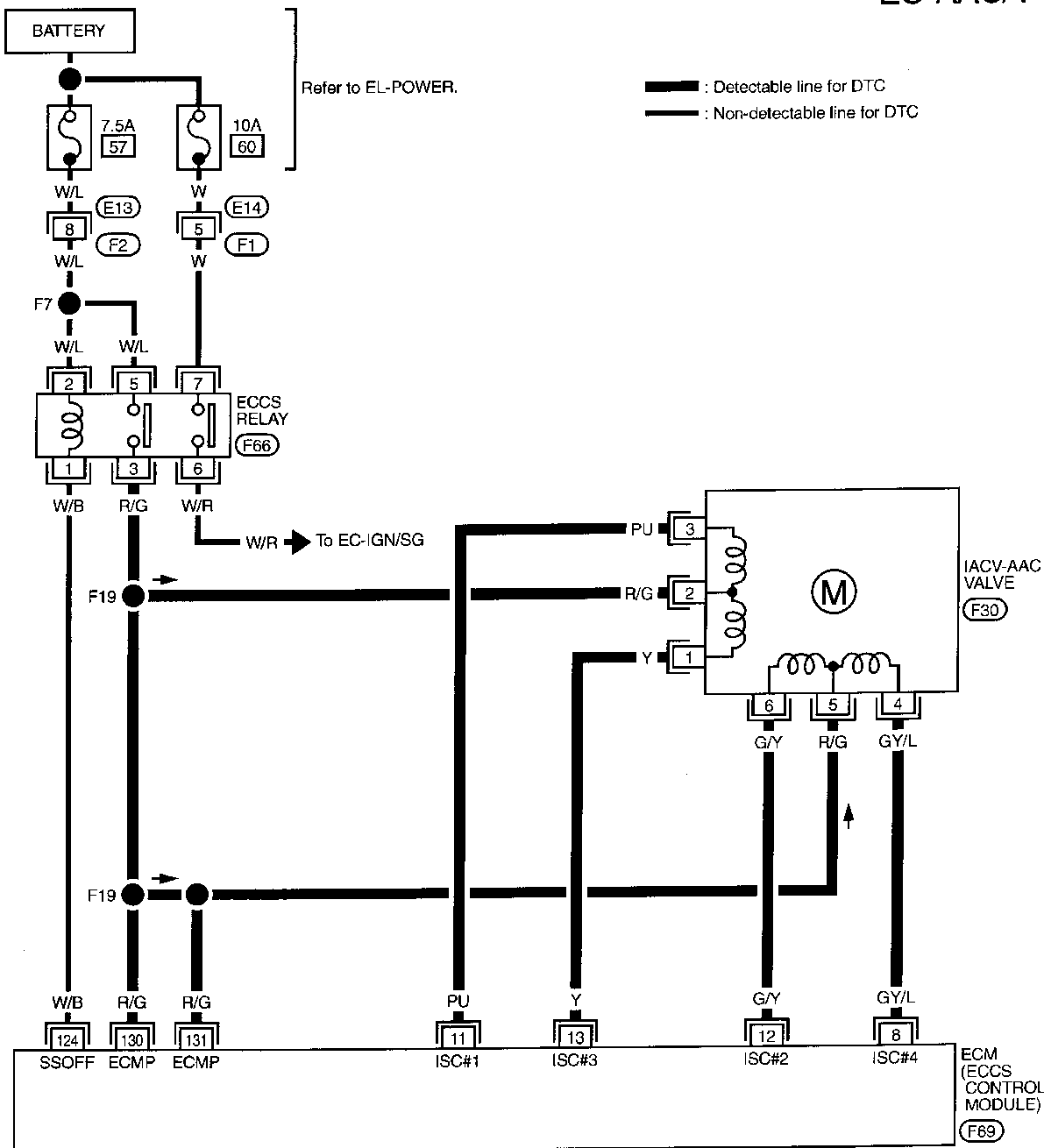
☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM(POS)	750rpm	
COOLAN TEMP/S	85°C	
RECORD		

SEF887T

TROUBLE DIAGNOSIS FOR DTC P0505

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

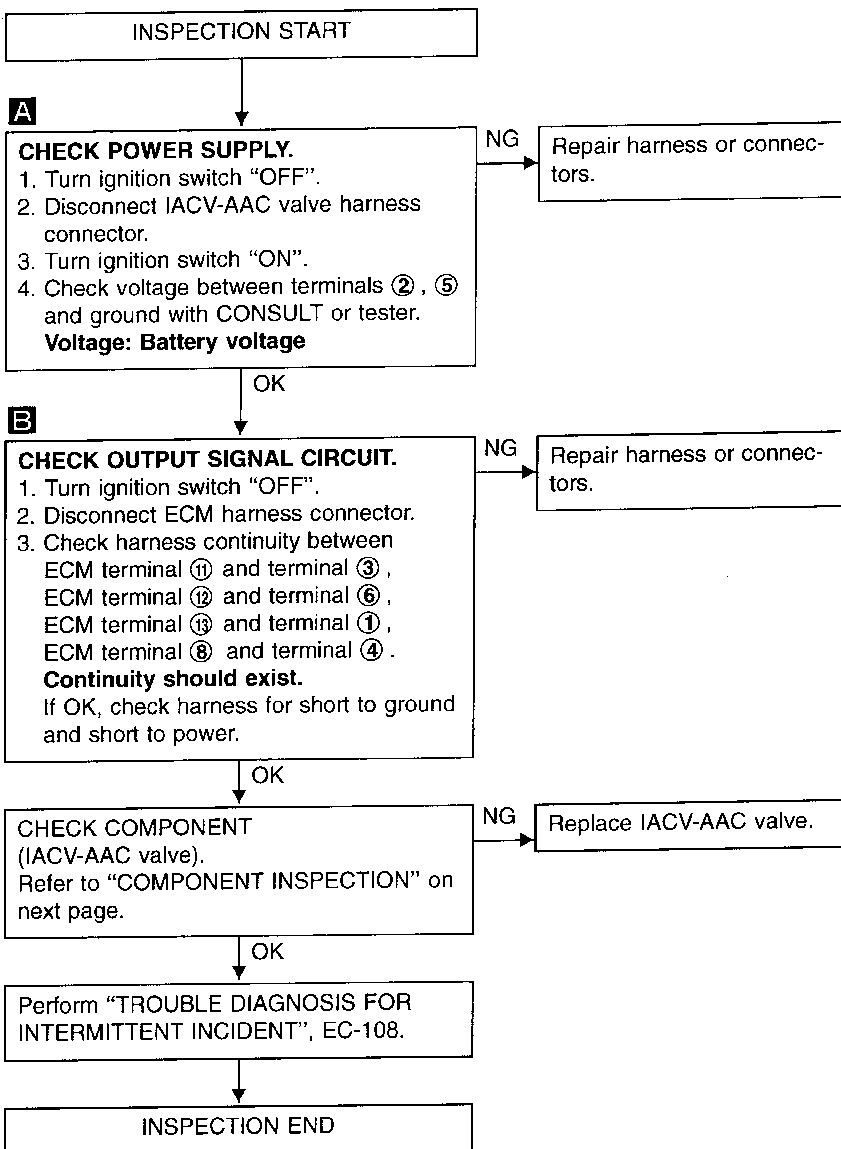
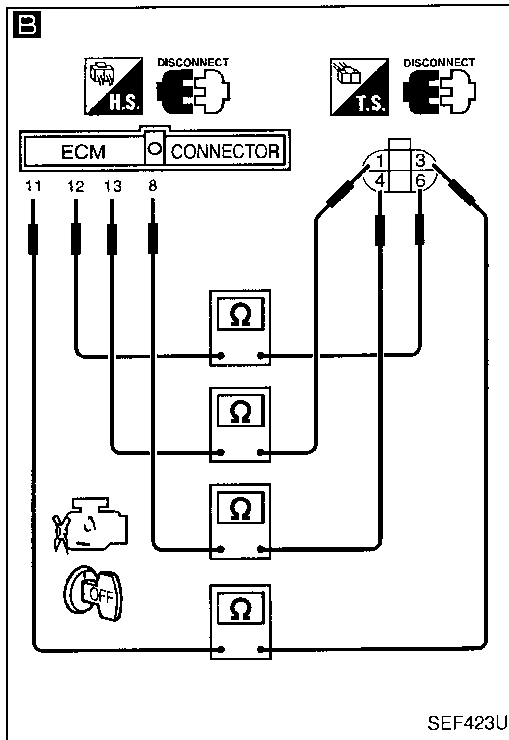
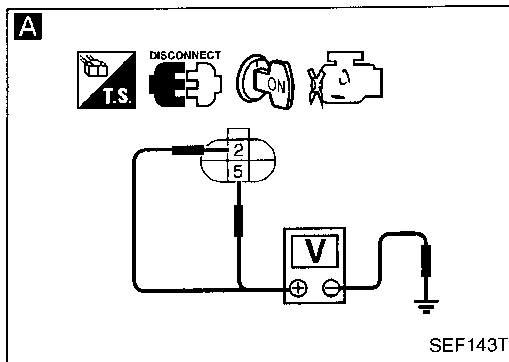
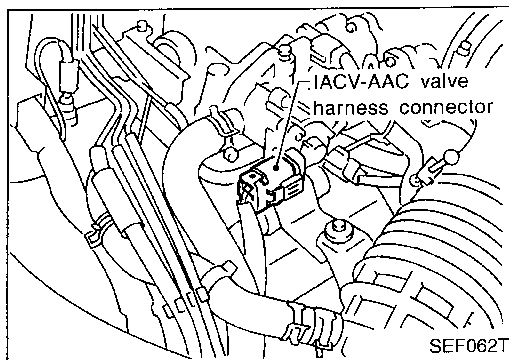
EC-AAC/V-01



TROUBLE DIAGNOSIS FOR DTC P0505

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

DIAGNOSTIC PROCEDURE



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TROUBLE DIAGNOSIS FOR DTC P0505

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

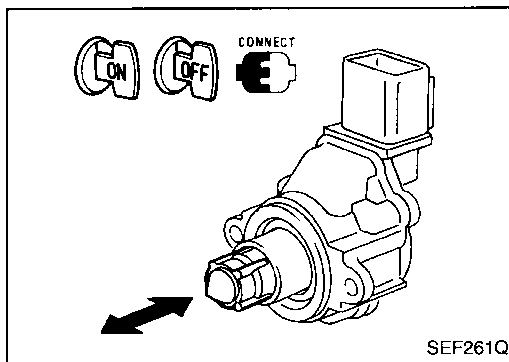
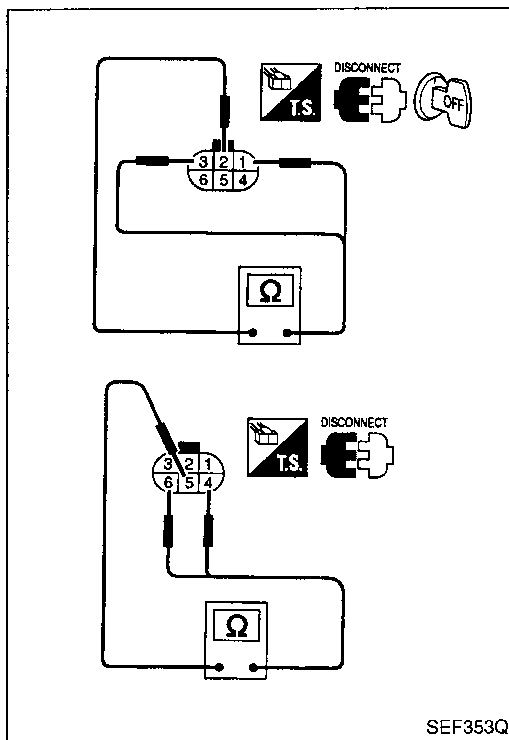
COMPONENT INSPECTION

IACV-AAC valve

1. Disconnect IACV-AAC valve harness connector.
2. Check resistance between the following terminals.
terminal ② and terminals ①, ③
terminal ⑤ and terminals ④, ⑥

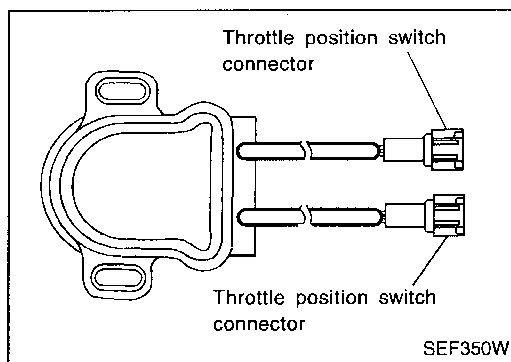
Resistance:

Approximately 30Ω [at 20°C (68°F)]



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

TROUBLE DIAGNOSIS FOR DTC P0510



Closed Throttle Position Switch

COMPONENT DESCRIPTION

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. The wide open throttle position switch is used only for A/T control.

When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge control valve when the throttle position sensor is malfunctioning.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CLSD THL/P SW	<ul style="list-style-type: none"> Engine: After warming up Ignition switch: ON (Engine stopped) More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump. Throttle valve: Idle position	ON
	Throttle valve: Slightly open	OFF

ECM TERMINALS AND REFERENCE VALUE

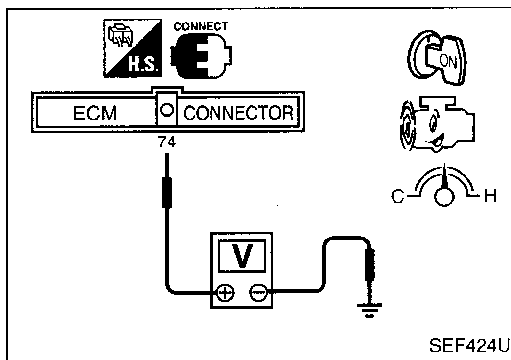
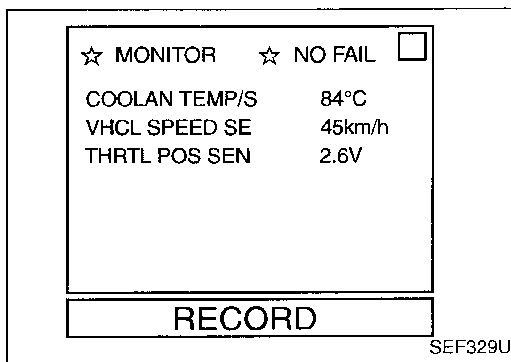
Specification data are reference values and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74	GY/L	Throttle position switch (Closed position)	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0510 0203	<ul style="list-style-type: none"> Battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened. 	<ul style="list-style-type: none"> Harness or connectors (The closed throttle position switch circuit is shorted.) Closed throttle position switch Throttle position sensor

TROUBLE DIAGNOSIS FOR DTC P0510



Closed Throttle Position Switch (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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



- 1) Start engine and warm it up to normal operating temperature.
- 2) Check voltage between ECM terminal ⑦④ and ground under the following conditions.

At idle: Battery voltage

At 2,000 rpm: 0 - 1V

If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-330.

If OK, go to following step.

- 3) Select "DATA MONITOR" mode with CONSULT at the start of the test.
- 4) Drive the vehicle for at least 5 consecutive seconds under the following condition.

THRTL POS SEN: More than 1.8V

VHCL SPEED SE: More than 4 km/h (2 MPH)

Selector lever: Suitable position

Driving pattern: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-330.

OR

OVERALL FUNCTION CHECK

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



- 1) Start engine and warm it up to normal operating temperature.
- 2) Check the voltage between ECM terminal ⑦④ and ground under the following conditions.

At idle: Battery voltage

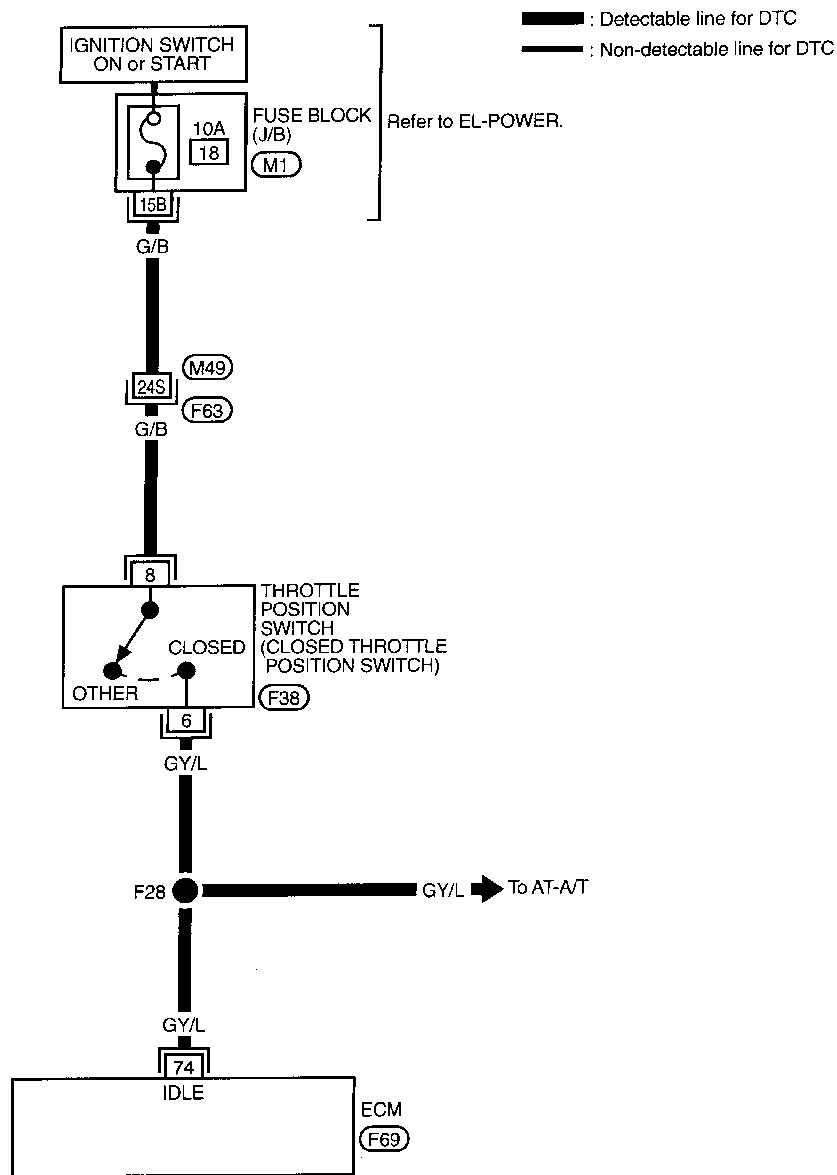
At 2,000 rpm: Approximately 0V

- 3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-330.

TROUBLE DIAGNOSIS FOR DTC P0510

Closed Throttle Position Switch (Cont'd)

EC-TP/SW-01



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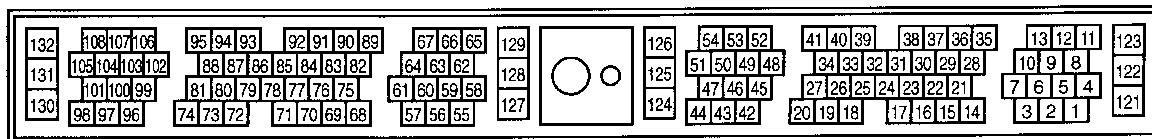
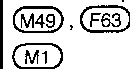
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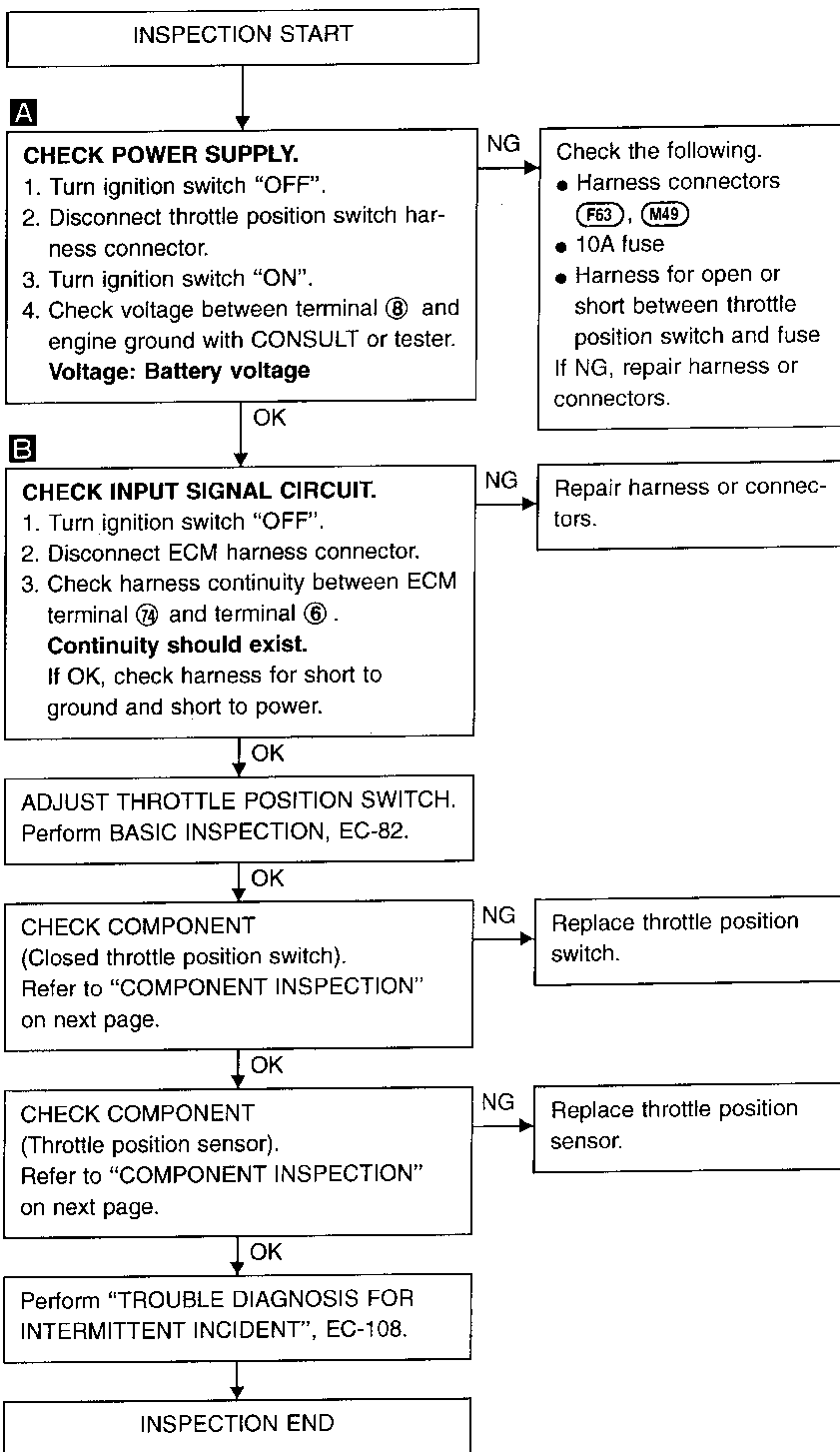
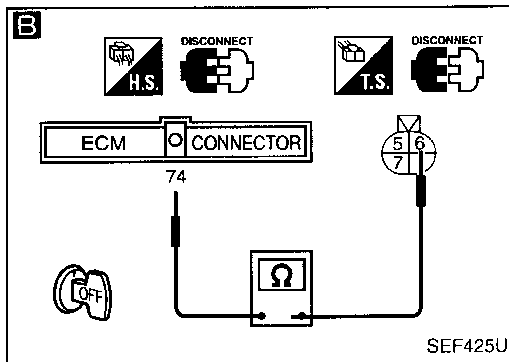
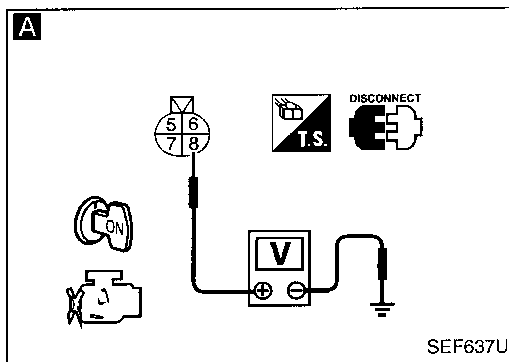
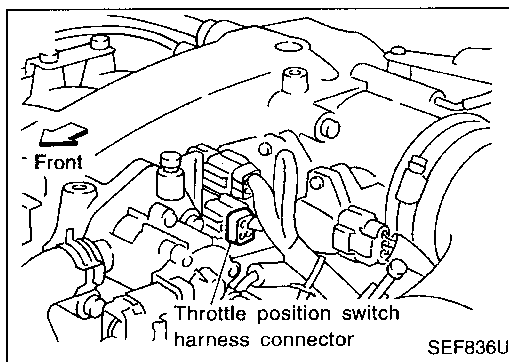
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TROUBLE DIAGNOSIS FOR DTC P0510

Closed Throttle Position Switch (Cont'd)

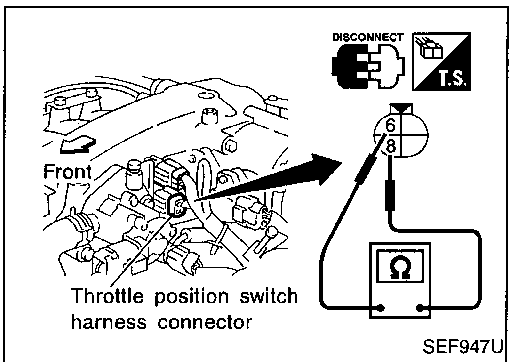
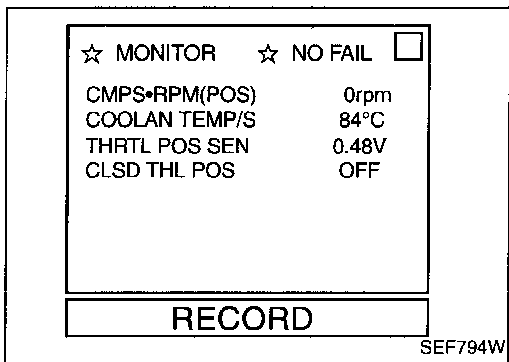
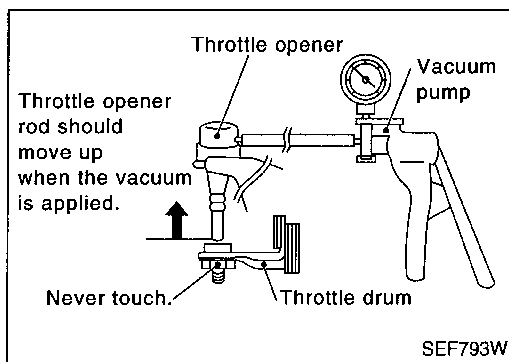
DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P0510

Closed Throttle Position Switch (Cont'd) COMPONENT INSPECTION

Closed throttle position switch (Built in throttle position sensor)



1. Start engine and warm it up to normal operating temperature.
2. Stop engine (Ignition switch "OFF").
3. Remove the vacuum hose connected to the throttle opener.
4. Connect suitable vacuum hose to the vacuum pump and the opener.
5. Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
6. Turn ignition switch "ON".



7. Select "DATA MONITOR" mode with CONSULT.
8. Check indication of "CLSD THL/P SW".

Measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-82.

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

OR



6. Disconnect closed throttle position switch harness connector.
7. Check continuity between closed throttle position switch terminals ⑥ and ⑧.

Resistance measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-82.

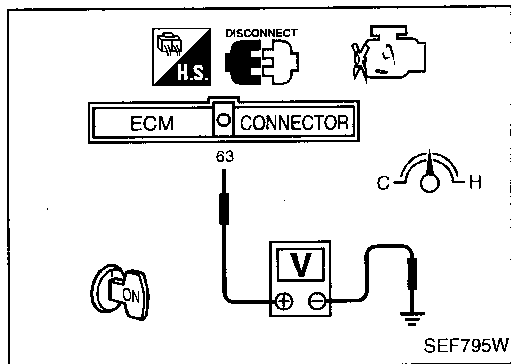
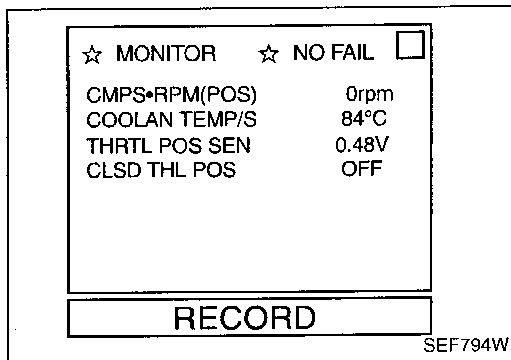
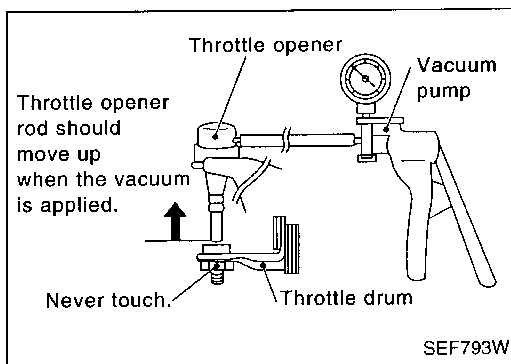
8. If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

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TROUBLE DIAGNOSIS FOR DTC P0510

Closed Throttle Position Switch (Cont'd)

Throttle position sensor



1. Start engine and warm it up to normal operating temperature.
2. Stop engine (Ignition switch "OFF").
3. Remove the vacuum hose connected to the throttle opener.
4. Connect suitable vacuum hose to the vacuum pump and the opener.
5. Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
6. Turn ignition switch "ON".
7. Select "DATA MONITOR" mode with CONSULT.
8. Check voltage of "THRTL POS SEN".

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

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

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-82.

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

OR

7. Check voltage between ECM terminal 63 (Throttle position sensor signal) and ground.

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

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

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-82.

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

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

This circuit line (LAN) controls the smooth shifting up and down of A/T during the hard acceleration/deceleration. Pulse signals are exchanged between ECM and TCM (P0600).

This circuit line is also used to communicate malfunction information related to A/T (Automatic Transmission) is transferred through the line (LAN circuit) from TCM to ECM (P1605).

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

GI

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ON BOARD DIAGNOSIS LOGIC

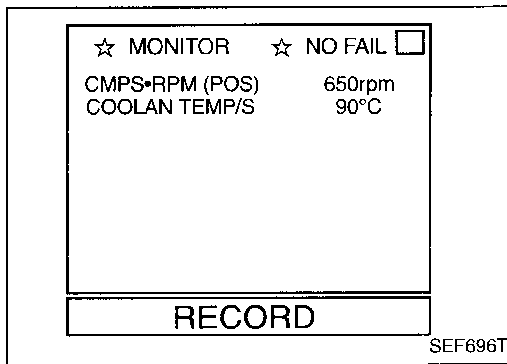
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0600 0504	<ul style="list-style-type: none"> ECM receives incorrect voltage from TCM continuously. 	<ul style="list-style-type: none"> Harness or connectors (The communication line circuit between ECM and TCM is open or shorted.) TCM Dead (Weak) battery
P1605 0804	<ul style="list-style-type: none"> Signal from TCM is not sent to ECM. 	

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DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE

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

TESTING CONDITION:

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

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and let it idle for at least 2 seconds (P0600) and 40 seconds (P1605).
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-335.

OR

- 1) Start engine and let it idle for at least 2 seconds (P0600) and 40 seconds (P1605).
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-335.

OR

- 1) Start engine and let it idle for at least 2 seconds (0504) and 40 seconds (0804).
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-335.

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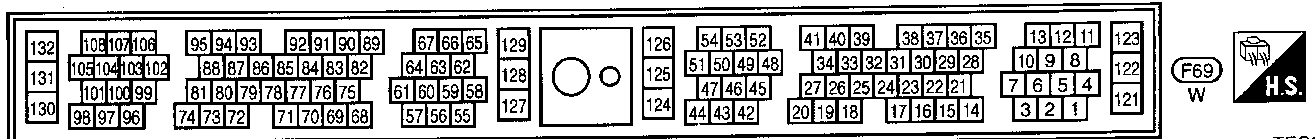
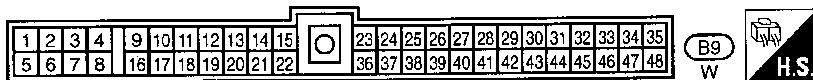
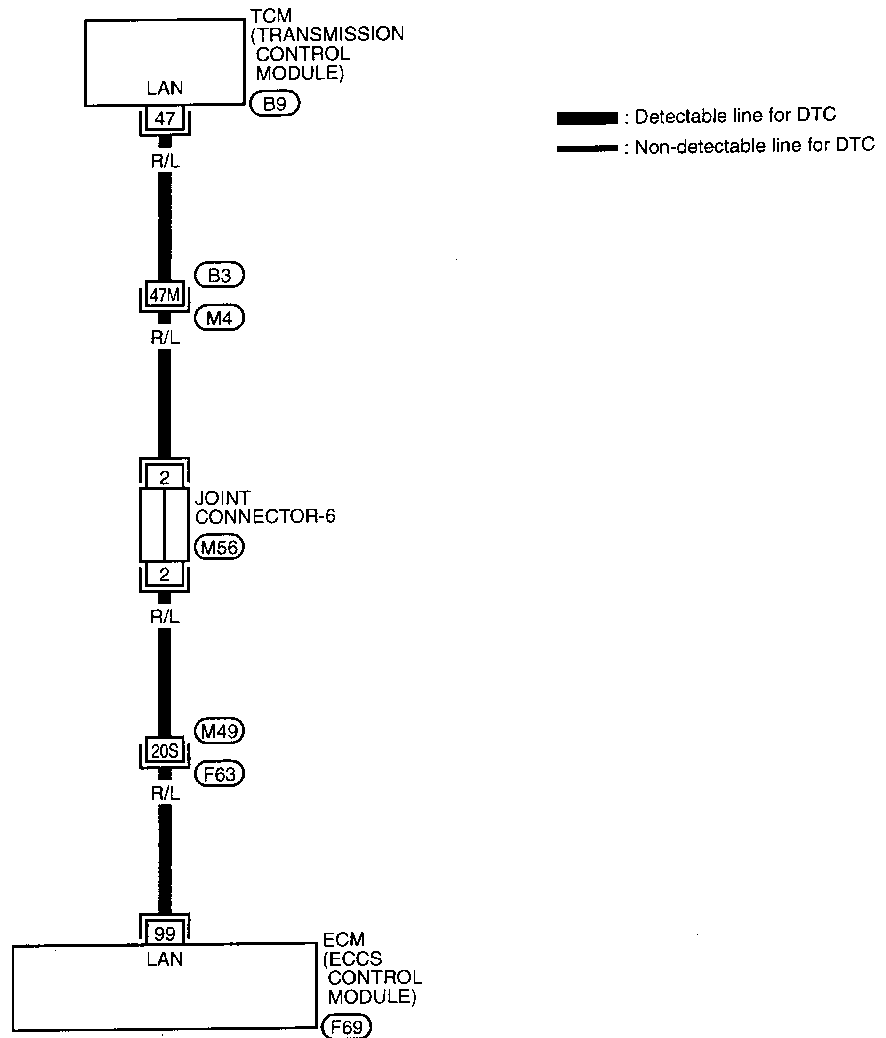
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TROUBLE DIAGNOSIS FOR DTC P0600, P1605

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

EC-AT/C-01



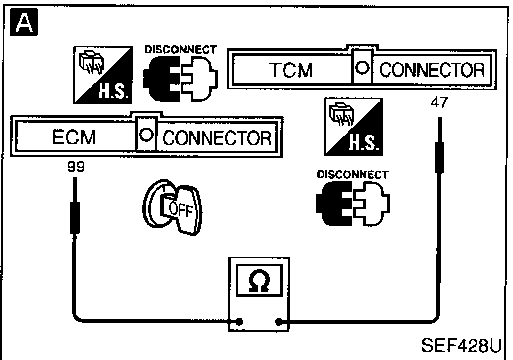
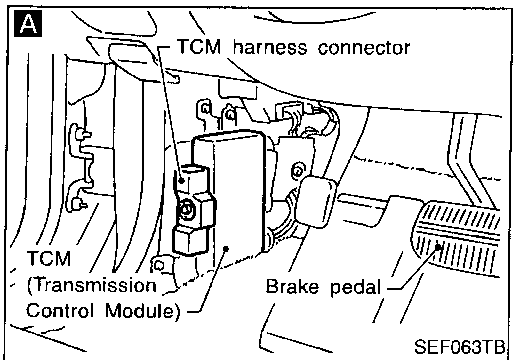
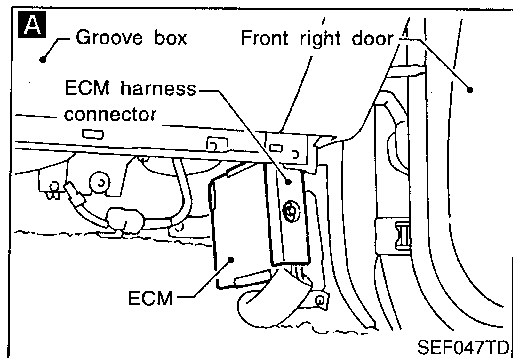
Refer to last page (Foldout page).

(M4), (B3)
(M49), (F63)

TROUBLE DIAGNOSIS FOR DTC P0600, P1605

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

DIAGNOSTIC PROCEDURE



INSPECTION START

A
CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and TCM harness connector.
3. Check harness continuity between ECM terminal 99 and terminal 47.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors
- Harness connectors (M4), (B3)
- Harness connectors (F63), (M49)
- Joint connector-6
- Check harness for open or short between ECM and TCM.

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

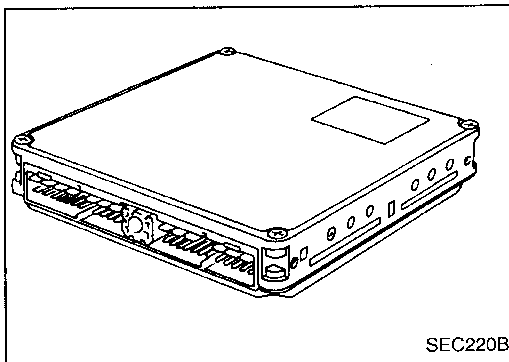
OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

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TROUBLE DIAGNOSIS FOR DTC P0605



Engine Control Module (ECM)

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	<ul style="list-style-type: none"> ECM calculation function is malfunctioning. 	<ul style="list-style-type: none"> ECM

DTC No.		Detected items	Engine operating condition in fail-safe mode												
CONSULT GST	ECM*														
Unable to access ECM	Unable to access Diagnostic Test Mode II	ECM	<p>ECM fail-safe activating condition The computing function of the ECM was judged to be malfunctioning. When the fail-safe system activates, i.e. if the ECM detects a malfunction condition in the CPU of ECM, the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver. However, it is not possible to access ECM and DTC cannot be confirmed.</p> <p>Engine control with ECM fail-safe When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th colspan="2">ECM fail-safe operation</th> </tr> </thead> <tbody> <tr> <td>Engine speed</td> <td>Engine speed will not rise more than 3,000 rpm.</td> </tr> <tr> <td>Fuel injection</td> <td>Simultaneous multiport fuel injection system</td> </tr> <tr> <td>Ignition timing</td> <td>Ignition timing is fixed at the preset value.</td> </tr> <tr> <td>Fuel pump</td> <td>Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.</td> </tr> <tr> <td>Cooling fans</td> <td>Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.</td> </tr> </tbody> </table> <p>Replace ECM, if ECM fail-safe condition is confirmed.</p>	ECM fail-safe operation		Engine speed	Engine speed will not rise more than 3,000 rpm.	Fuel injection	Simultaneous multiport fuel injection system	Ignition timing	Ignition timing is fixed at the preset value.	Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.	Cooling fans	Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.
ECM fail-safe operation															
Engine speed	Engine speed will not rise more than 3,000 rpm.														
Fuel injection	Simultaneous multiport fuel injection system														
Ignition timing	Ignition timing is fixed at the preset value.														
Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.														
Cooling fans	Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.														

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

TROUBLE DIAGNOSIS FOR DTC P0605

Engine Control Module (ECM) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

☆ MONITOR	☆ NO FAIL <input type="checkbox"/>
CMPS•RPM (POS)	650rpm
MAS AIR FL/SE	1.5V
RECORD	

SEF695T



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and run it for at least 2 seconds at idle speed.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-338.

OR



- 1) Turn ignition switch "ON".
- 2) Select "Mode 7" with GST.
- 3) Start engine and run it for at least 2 seconds at idle speed.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-338.

OR



- 1) Turn ignition switch "ON".
- 2) Start engine and run it for at least 2 seconds at idle speed.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-338.

GI

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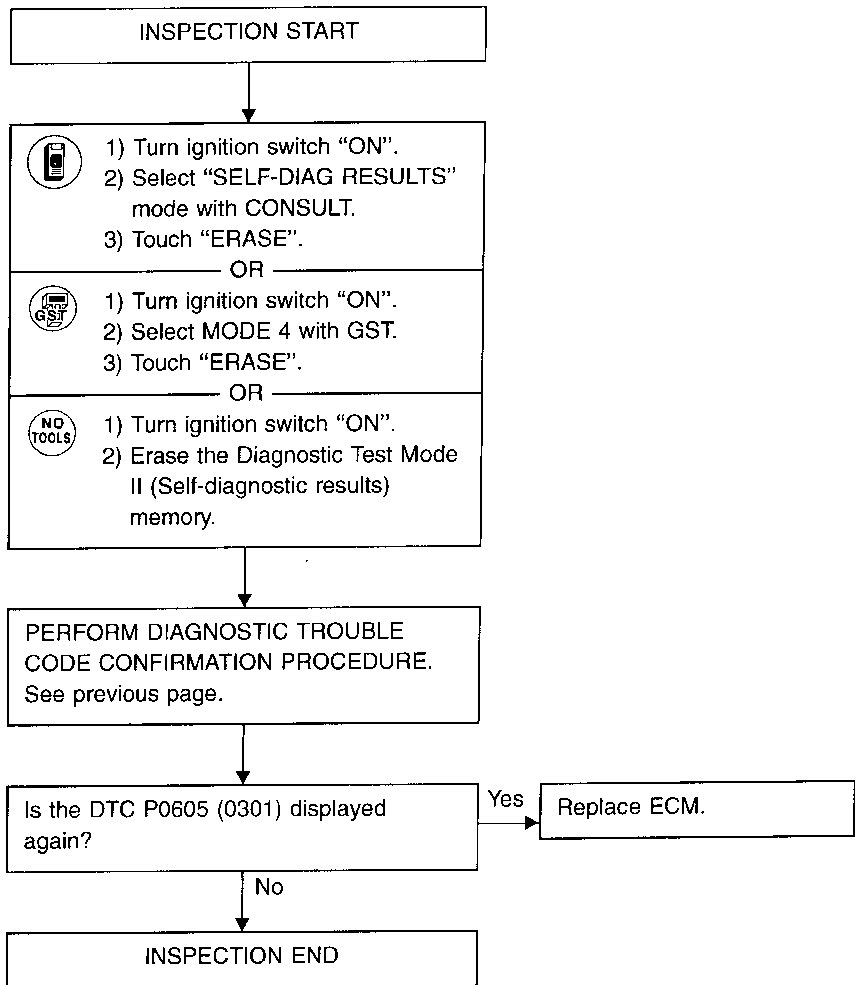
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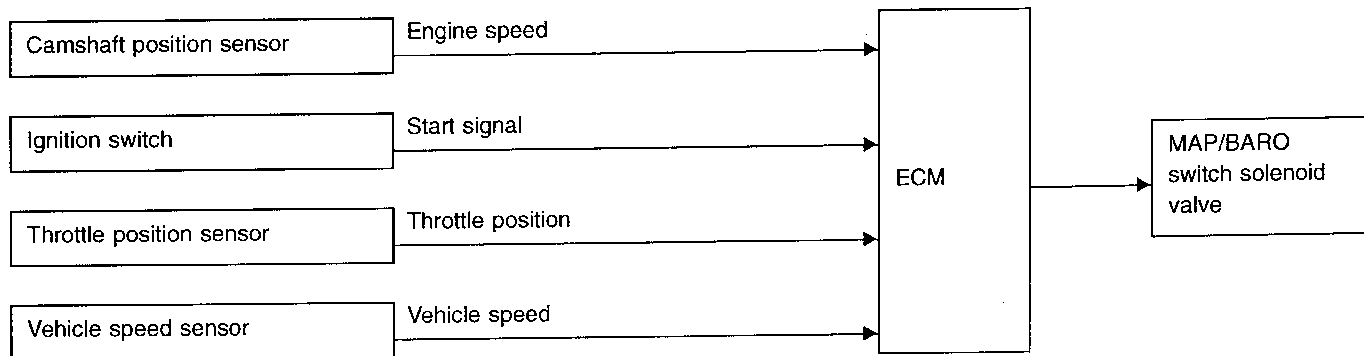
TROUBLE DIAGNOSIS FOR DTC P0605

Engine Control Module (ECM) (Cont'd) DIAGNOSTIC PROCEDURE



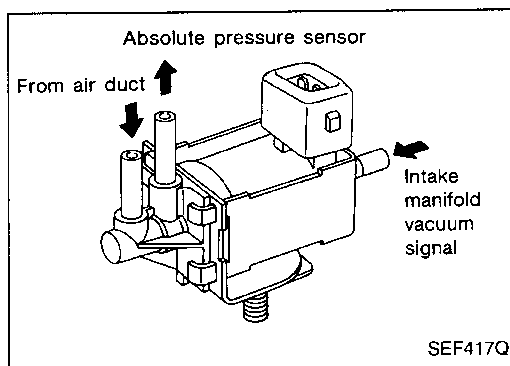
Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve

SYSTEM DESCRIPTION



This system allows the absolute pressure sensor to monitor either ambient barometric pressure or intake manifold pressure. The MAP/BARO switch solenoid valve switches between two passages by ON-OFF pulse signals from the ECM. (One passage is from the intake air duct, the other is from the intake manifold.) Either ambient barometric pressure or intake manifold pressure is applied to the absolute pressure sensor.

Solenoid	Conditions
ON	<ul style="list-style-type: none"> • For 5 seconds after turning ignition switch "ON" _____ OR _____ • For 5 seconds after starting engine _____ OR _____ • More than 5 minutes after the solenoid valve shuts OFF. _____ and _____ • Throttle valve is shut or almost fully shut for more than 5 seconds _____ 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.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
MAP/BARO SW/V	• For 5 seconds after turning ignition switch "ON"	BARO
	• For 5 seconds after starting engine	
	• More than 5 seconds after starting engine	MAP

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
41	W	MAP/BARO switch solenoid valve	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running └ For 5 seconds after starting engine.	Approximately 0V
			Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON" Engine is running └ More than 5 seconds after starting engine	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1105 1302	A) MAP/BARO switch solenoid valve receives the voltage supplied though ECM does not supply the voltage to the valve.	<ul style="list-style-type: none"> ● Harness or connectors (MAP/BARO switch solenoid valve circuit is open or shorted.) ● MAP/BARO switch solenoid valve
	B) There is little difference between MAP/BARO switch solenoid valve input voltage at ambient barometric pressure and voltage at intake manifold pressure.	<ul style="list-style-type: none"> ● Harness or connectors (MAP/BARO switch solenoid valve circuit is open or shorted.) ● Hoses (Hoses are clogged, bent, kinked, disconnected, not connected properly.) ● Absolute pressure sensor ● MAP/BARO switch solenoid valve

<div style="display: flex; justify-content: space-between; align-items: center;"> ☆ MONITOR ☆ NO FAIL <input type="checkbox"/> </div> <div style="margin-top: 5px;"> <table style="width: 100%; border: none;"> <tr> <td style="border: none;">CMPS•RPM(POS)</td> <td style="border: none; text-align: right;">750rpm</td> </tr> <tr> <td style="border: none;">COOLAN TEMP/S</td> <td style="border: none; text-align: right;">85°C</td> </tr> </table> </div> <div style="text-align: center; margin-top: 10px; border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">RECORD</div>	CMPS•RPM(POS)	750rpm	COOLAN TEMP/S	85°C
CMPS•RPM(POS)	750rpm			
COOLAN TEMP/S	85°C			

SEF887T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

NOTE:

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


TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)


Procedure for malfunction A

TESTING CONDITION:


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

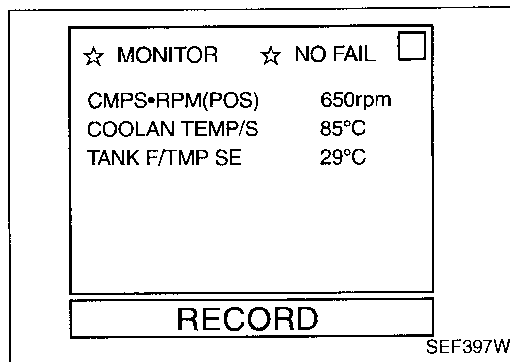
-  1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT. 2) Start engine and let it idle. 3) Wait at least 10 seconds. 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-345.

OR


-  1) Start engine and let it idle. 2) Wait at least 10 seconds. 3) Select "MODE 7" with GST. 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-345.

OR


-  1) Start engine and let it idle. 2) Wait at least 10 seconds. 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON". 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-345.



Procedure for malfunction B

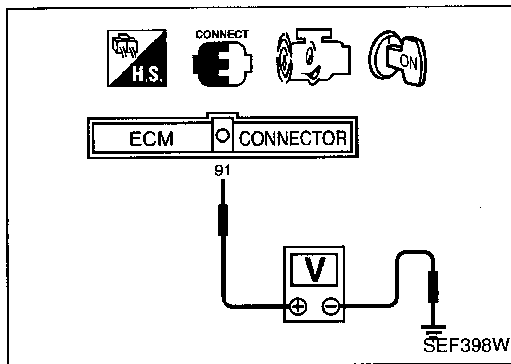
-  1) Start engine and warm it up to normal operating temperature. 2) Turn ignition switch "OFF" and wait at least 5 seconds. 3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT. 4) Make sure that "TANK/F/TEMP SE" is more than 0°C (32°F). 5) Start engine and let it idle for at least 10 seconds. 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-295.

OR

-  1) Start engine and warm it up to normal operating temperature. 2) Turn ignition switch "OFF" and wait at least 5 seconds. 3) Turn ignition switch "ON". 4) Check that voltage between ECM terminal ⑨1 and ground is less than 4.2V. 5) Start engine and let it idle for at least 10 seconds. 6) Select "MODE 7" with GST. 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-295.

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Check that voltage between ECM terminal ⑨① and ground is less than 4.2V.
- 5) Start engine and let it idle for at least 10 seconds.
- 6) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 7) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 8) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-295.

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

EC-SW/V-01

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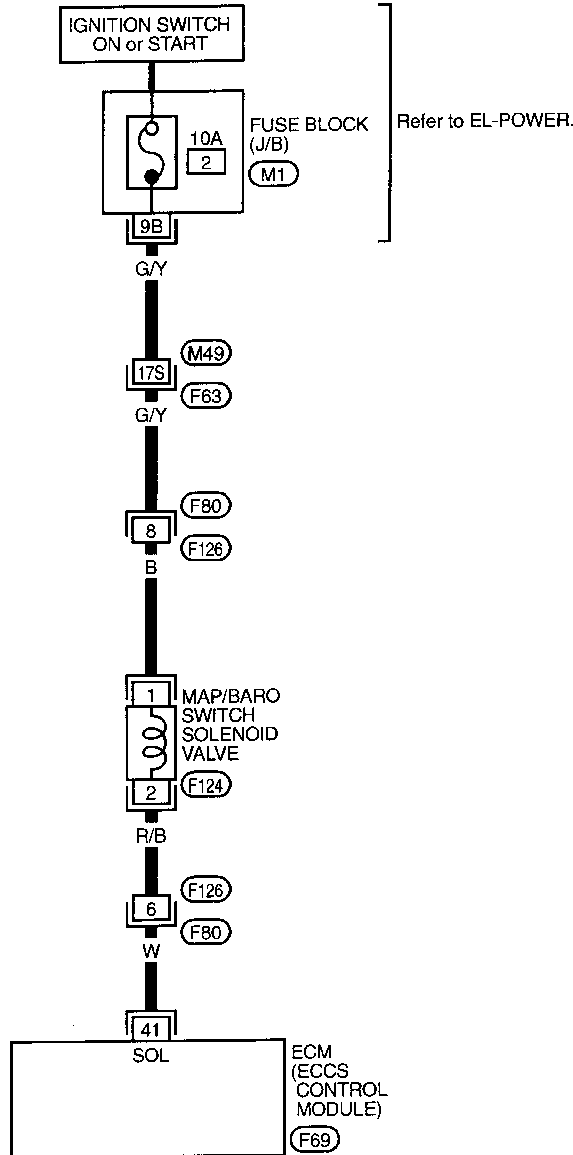
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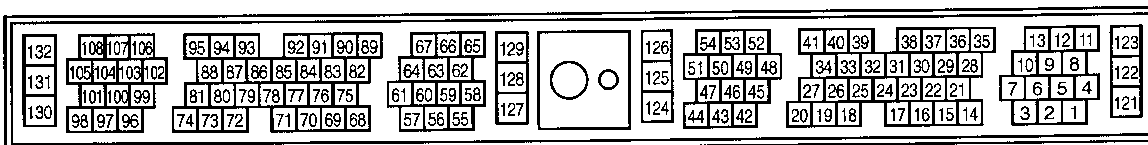
— : Detectable line for DTC
 — : Non-detectable line for DTC



Refer to last page (Foldout page).

M49, F63

M1



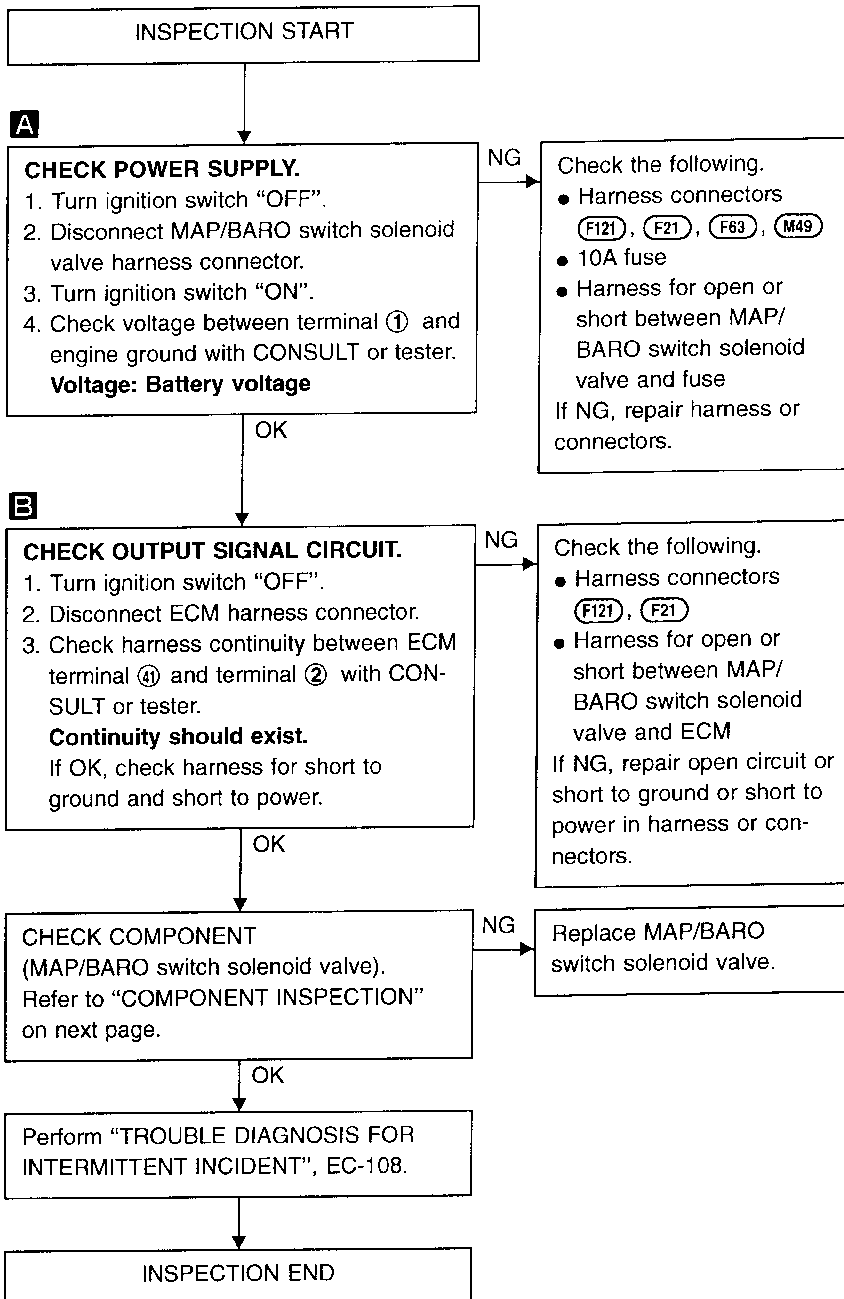
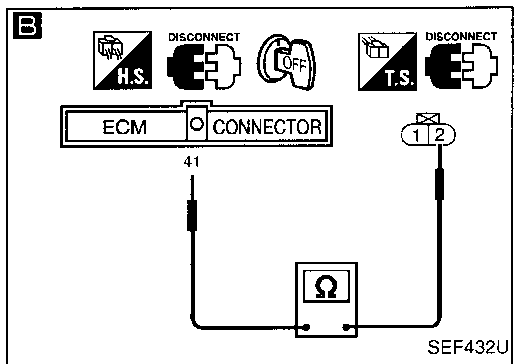
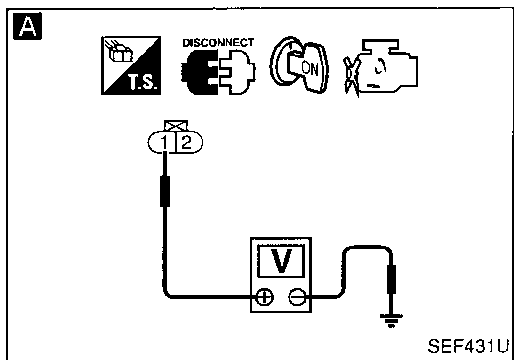
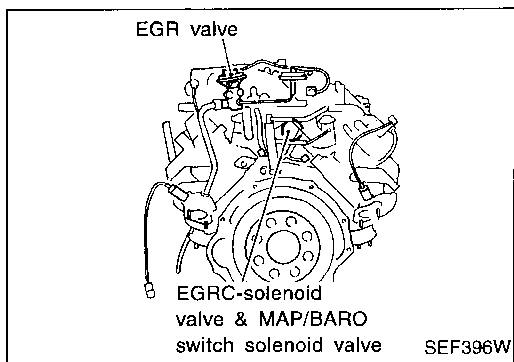
TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE

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

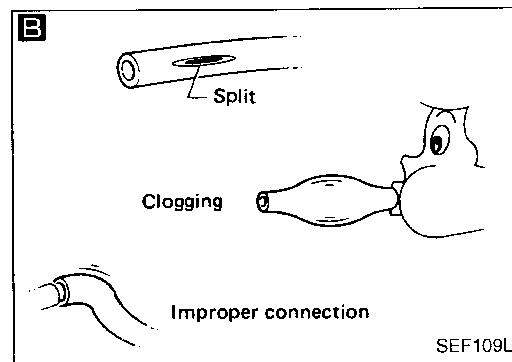
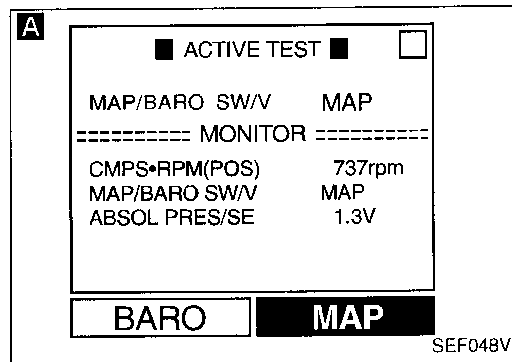
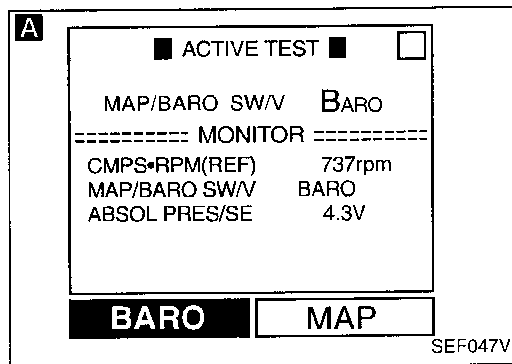
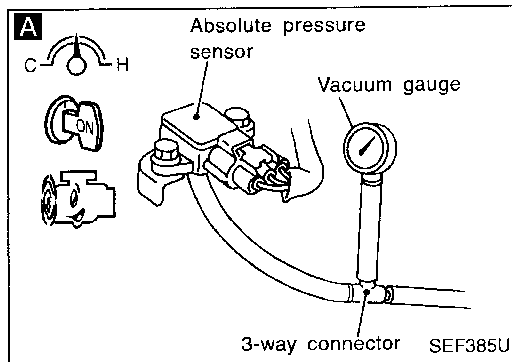
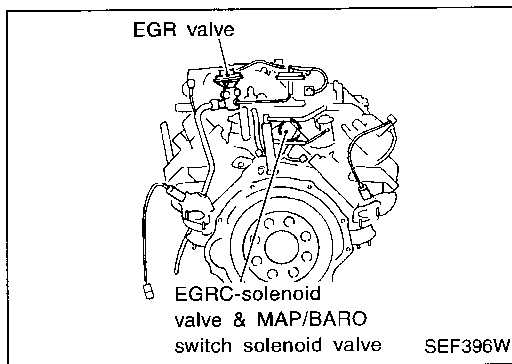
Procedure A



TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

Procedure B



INSPECTION START

A
CHECK VACUUM SOURCE AND CIRCUIT TO MAP/BARO SWITCH SOLENOID VALVE.

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

MAP/BARO SW/S	Vacuum
BARO	Should not exist.
MAP	Should exist.

- OR
4. Turn ignition switch "ON".
 5. Check vacuum gauge within 5 seconds after turning ignition switch "ON".
Vacuum should not exist.
 6. Start engine and let it idle.
 7. Check vacuum gauge.
Vacuum should exist.

B
CHECK HOSE.

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

OK
CHECK COMPONENT
(Absolute pressure sensor).

1. Check for disconnection of vacuum hose connected to the sensor.
2. Disconnect sensor's connector and check sensor harness connector for water.

Water should not exist. Refer to "COMPONENT INSPECTION" of "TROUBLE DIAGNOSIS FOR DTC P0105", EC-130.

NG
Repair (disconnection) or replace absolute pressure sensor or harness connectors.

OK
Go to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" in EC-108.

NG
Clean, repair or reconnect the hose.
If NG, check vacuum port for clogging.

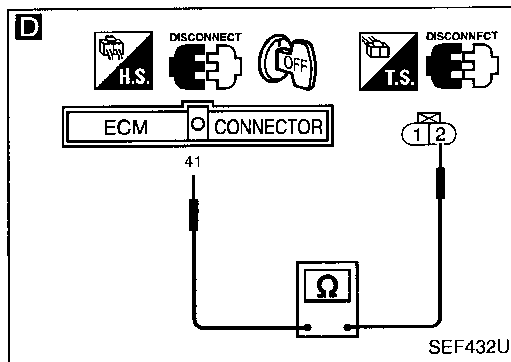
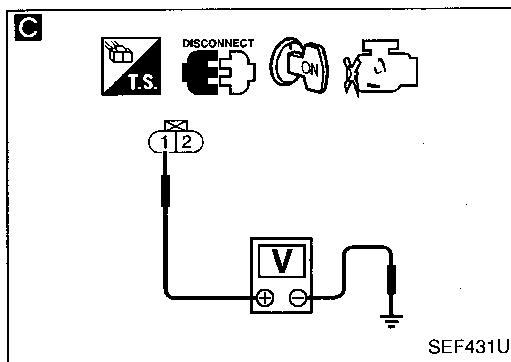
OK
CHECK INTAKE SYSTEM.
Check the intake system for air leaks.

(Go to next page.)

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TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



C

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect MAP/BARO switch solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and engine ground with CONSULT or tester.

Voltage: Battery voltage

NG

Check the following.

- Harness connectors (F121), (F21), (F63), (M49)
- 10A fuse
- Harness for open or short between MAP/BARO switch solenoid valve and fuse

If NG, repair harness or connectors.

D

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ④ and terminal ② with CONSULT or tester.

Continuity should exist.

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

NG

Check the following.

- Harness connectors (F121), (F21)
- Harness for open or short between MAP/BARO switch solenoid valve and ECM

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

CHECK COMPONENT (Absolute pressure sensor).

1. Check for disconnection of vacuum hose connected to the sensor.
2. Disconnect sensor's connector and check sensor harness connectors for water.

Water should not exist.

Refer to "COMPONENT INSPECTION" of "TROUBLE DIAGNOSIS FOR DTC P0105", EC-123.

NG

Repair (disconnection) or replace harness connectors or replace absolute pressure sensor.

CHECK COMPONENT (MAP/BARO switch solenoid valve).

Refer to "COMPONENT INSPECTION" on next page.

NG

Replace MAP/BARO switch solenoid valve.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P1105

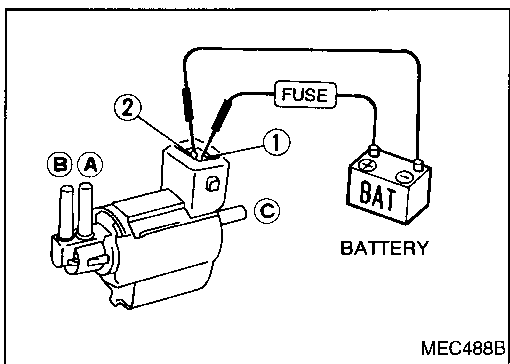
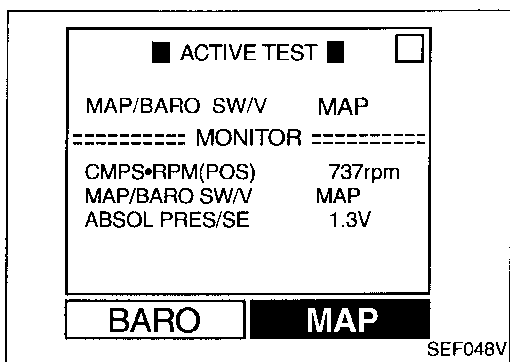
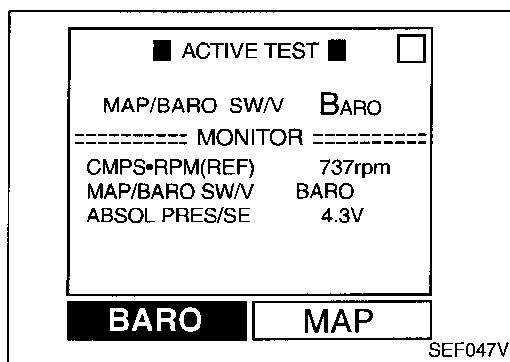
Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

COMPONENT INSPECTION

MAP/BARO switch solenoid valve

1. Start engine and warm it up to normal operating temperature.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
 - Condition: At idle under no-load
 - CONSULT display

GI
MA
EM



MAP/BARO SW/V	ABSOL PRES/SE (Voltage)
BARO	More than 2.6V
MAP	Less than the voltage at BARO

LC
EC

- Time for voltage to change

MAP/BARO SW/V	Required time to switch
BARO to MAP	Less than 1 second
MAP to BARO	

FE
AT

4. If NG, check solenoid valve as shown below.

OR

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

PD
FA

Condition	Air passage continuity between ① and ②	Air passage continuity between ① and ③
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

RA
BR

3. Check the time required for the solenoid valve to switch. It should be less than 1 second.
4. If NG, replace solenoid valve.
5. If OK, check "Absolute pressure sensor". Refer to "COMPONENT INSPECTION", EC-130.

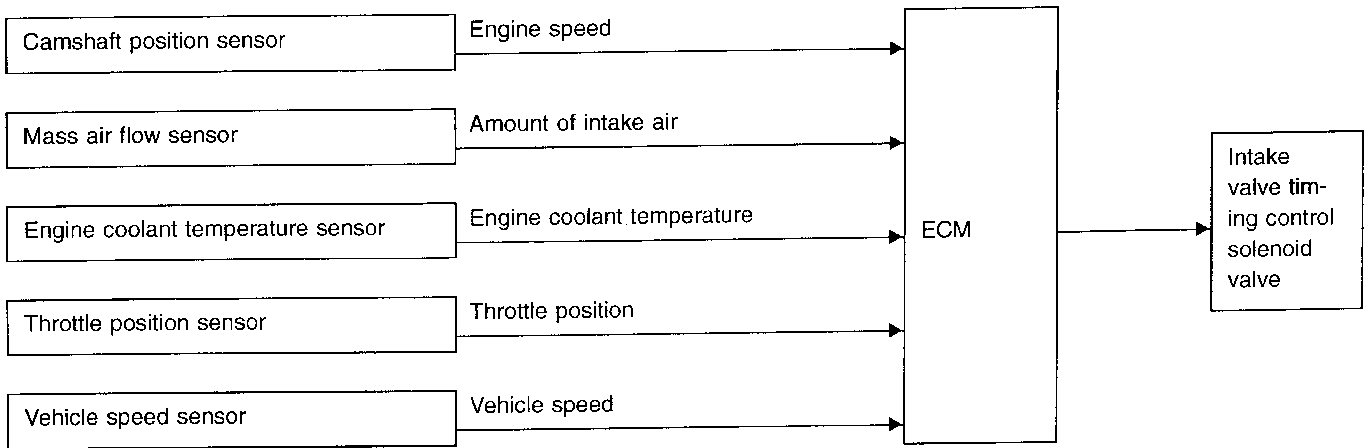
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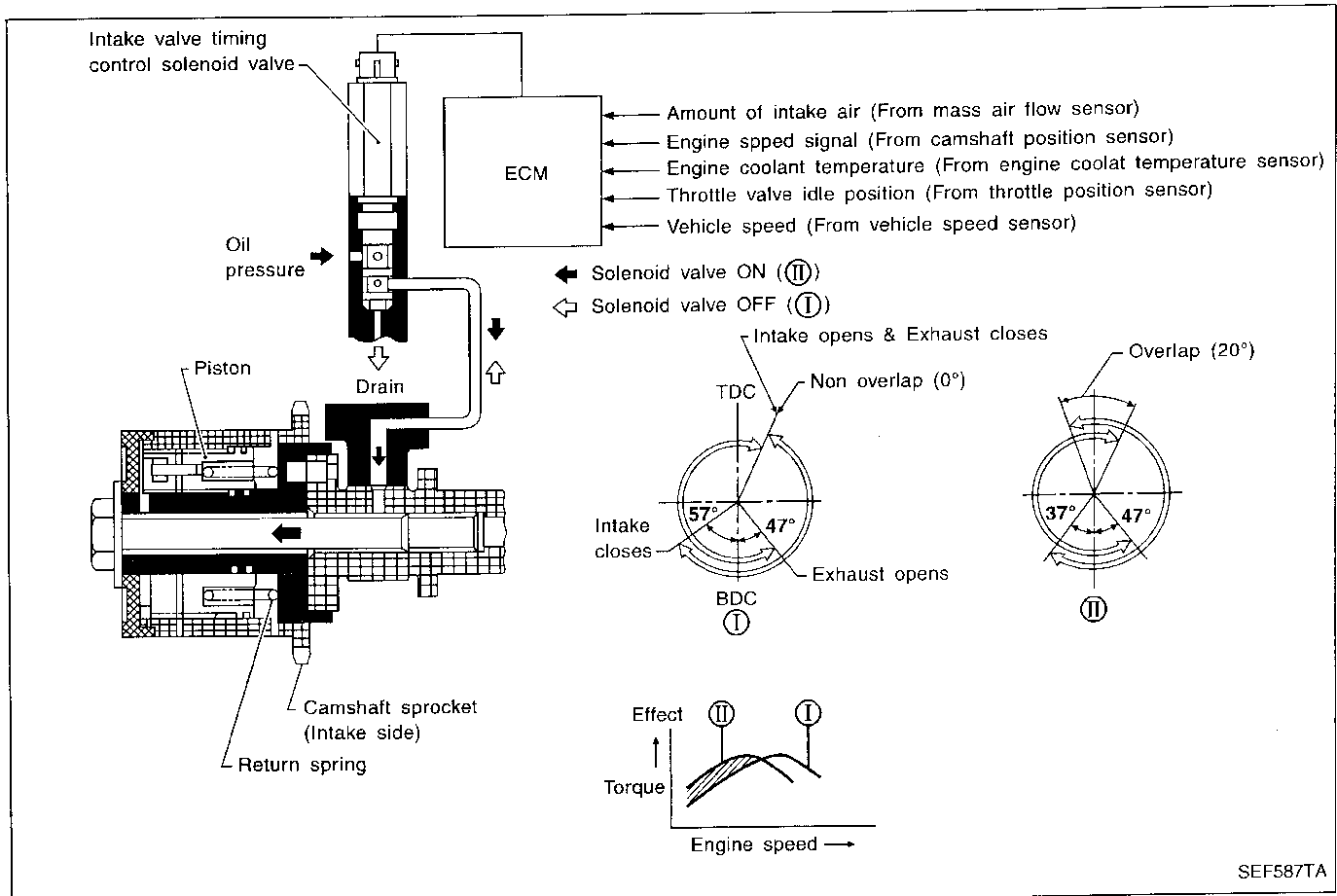
Intake Valve Timing Control (P1110: Left bank), (P1135: Right bank)

SYSTEM DESCRIPTION



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

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



SEF587TA

TROUBLE DIAGNOSIS FOR DTC P1110 (-B1), P1135 (-B2)

Intake Valve Timing Control (P1110: Left bank), (P1135: Right bank) (Cont'd)

OPERATION

Engine operating condition	Intake valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap	Engine valve timing
<ul style="list-style-type: none"> Engine coolant temperature is between 15°C (59°F) to 110°C (230°F) and engine speed is between 1,100 rpm and 4,600 rpm. During high load condition Vehicle speed is more than 4 km/h (2 MPH). 	ON	Advance	Increased	①
Those other than above	OFF	Normal	Normal	①

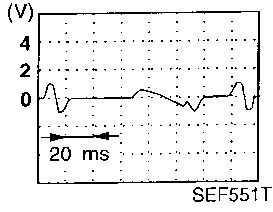
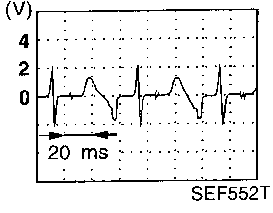
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
INT/V SOL-B1 INT/V SOL-B2	<ul style="list-style-type: none"> Engine is in warm up condition. Engine speed is more than 2,000 rpm. Quickly depressed accelerator pedal Vehicle speed is more than 4 km/h (2 MPH). 	OFF → ON (Using "INT/V TIM-B1 (-B2)" in "DATA MONITOR", the difference of degree between "OFF" and "ON" is approximately 20 deg.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
24 (RH)	BR/Y	Intake valve timing control solenoid valves	Engine is running. └ Intake valve timing control solenoid is operating.	Approximately 0V
25 (LH)	BR		Engine is running. └ Intake valve timing control solenoid is not operating.	Battery voltage
70 (RH)	R/L	Intake valve timing control position sensors	Engine is running. └ Idle speed	Approximately 0V 
71 (LH)	LW		Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0V 

TROUBLE DIAGNOSIS FOR DTC P1110 (-B1), P1135 (-B2)

Intake Valve Timing Control (P1110: Left bank), (P1135: Right bank) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1110 0805 (Left bank)	Comparing the intake valve timing position when the intake valve timing solenoid is ON with that when the solenoid is OFF, the difference does not exceed a certain limit.	<ul style="list-style-type: none"> • Harness or connectors (The left bank intake valve timing control position sensor circuit is open.) • Intake valve timing control position sensor • Accumulation of debris to the signal pick-up portion of the camshaft
P1135 1301 (Right bank)		

☆ MONITOR
☆ NO FAIL

CMPS•RPM (POS)	1200rpm
MAS AIR/FL SE	1.9V
COOLANT TEMP/S	92°C
VHCL SPEED SE	24km/h
B/FUEL SCHDL	2.0msec
INT/V SOL-B1	OFF
INT/V TIM-B1	97deg

RECORD

SEF592T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive at safe speed.

NOTE:

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



- 1) Warm up engine to normal operating temperature [more than 82°C (180°F)].
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Restart engine and wait at least 30 seconds.
- 5) Turn TCS switch "OFF".
- 6) Shift A/T selector lever to "2nd" position.
- 7) Gradually raise engine speed and keep it between 1,100 rpm and 1,500 rpm for at least 20 seconds. (Test is completed when "INT/V SOL - B1" in "DATA MONITOR" with CONSULT remains "OFF". If indication is "ON", repeat 7.)
- 8) Quickly raise engine speed to more than 2,500 rpm and keep it there for at least 6 seconds. (Test is completed when "INT/V SOL - B1" in "DATA MONITOR" with CONSULT remains "ON". If indication is "OFF", repeat 8.)
- 9) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-354.

OR



- 1) Warm up engine to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Restart engine and wait at least 30 second.
- 4) Turn TCS switch "OFF".
- 5) Shift A/T selector lever to "2nd" positions.
- 6) Gradually raise engine speed and keep it between 1,000 rpm and 1,500 rpm for at least 12 seconds.
- 7) Quickly raise engine speed to more than 2,500 rpm and keep it there for at least 6 seconds.
- 8) Select "MODE 7" with GST.
- 9) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-354.

OR



- 1) Warm up engine to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Restart engine and wait at least 30 seconds.
- 4) Turn TCS switch "OFF".
- 5) Shift A/T selector lever to "D" position.

EC-350

TROUBLE DIAGNOSIS FOR DTC P1110 (-B1), P1135 (-B2)

Intake Valve Timing Control (P1110: Left bank), (P1135: Right bank) (Cont'd)

- 6) Gradually raise engine speed and keep it between 1,000 rpm and 1,500 rpm for at least 12 seconds.
- 7) Quickly raise engine speed to more than 2,500 rpm and keep it there for at least 6 seconds. GI
- 8) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 9) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. MA
- 10) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-354. EM

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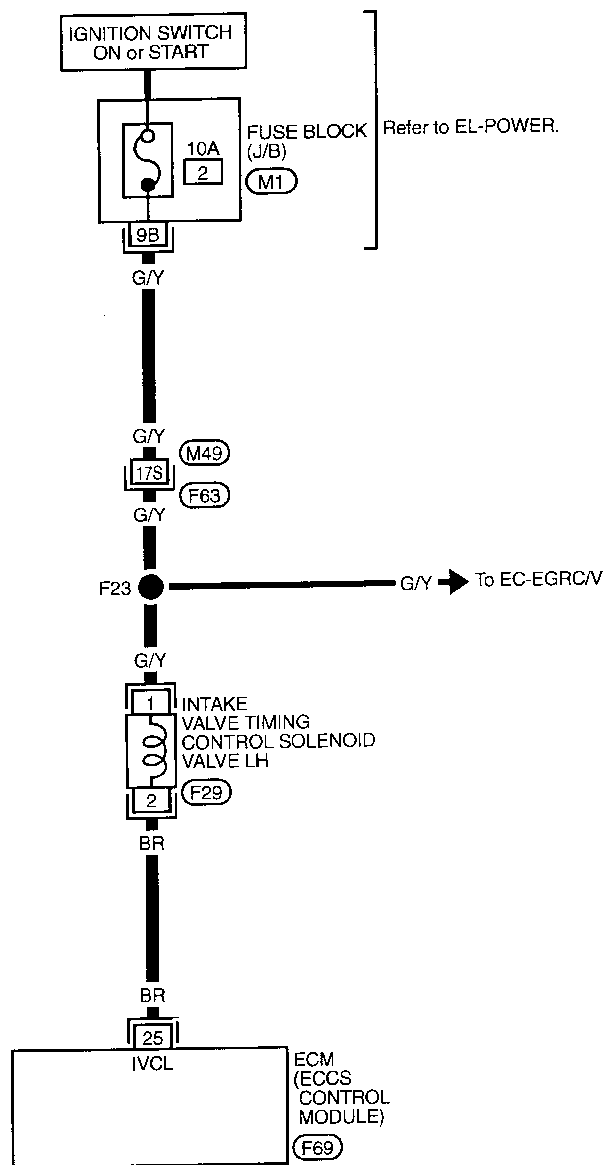
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TROUBLE DIAGNOSIS FOR DTC P1110 (-B1), P1135 (-B2)

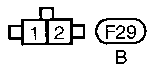
Intake Valve Timing Control (P1110: Left bank), (P1135: Right bank) (Cont'd)

LEFT BANK

EC-IVC-L-01

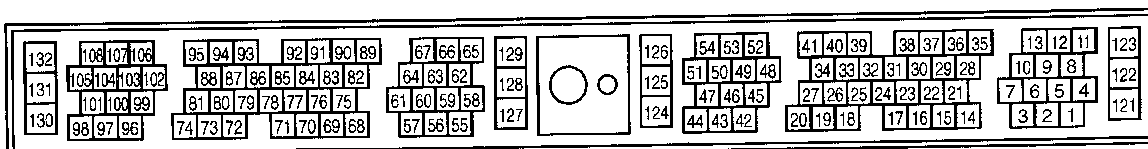


: Detectable line for DTC
 : Non-detectable line for DTC



Refer to last page (Foldout page).

M49 , F63
M1

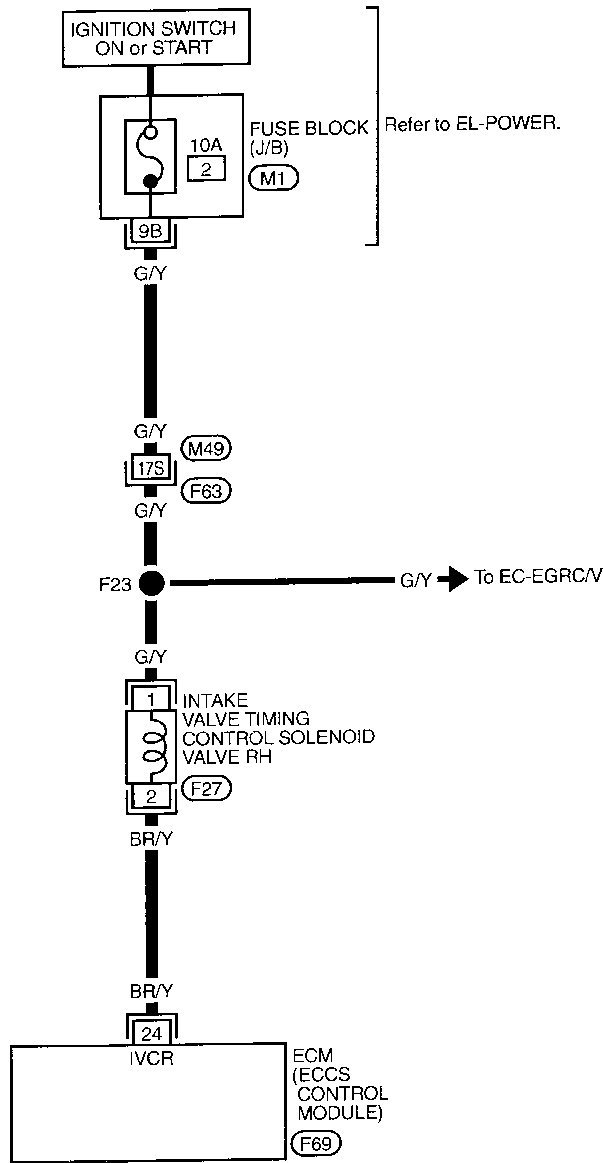


TROUBLE DIAGNOSIS FOR DTC P1110 (-B1), P1135 (-B2)

Intake Valve Timing Control (P1110: Left bank), (P1135: Right bank) (Cont'd)

RIGHT BANK

EC-IVC-R-01



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

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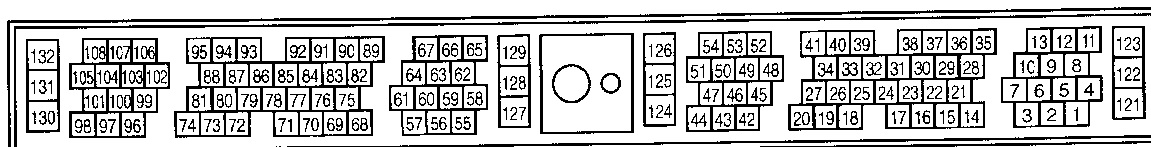
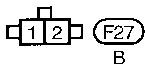
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(M49) (F63)
 (M1)

EL

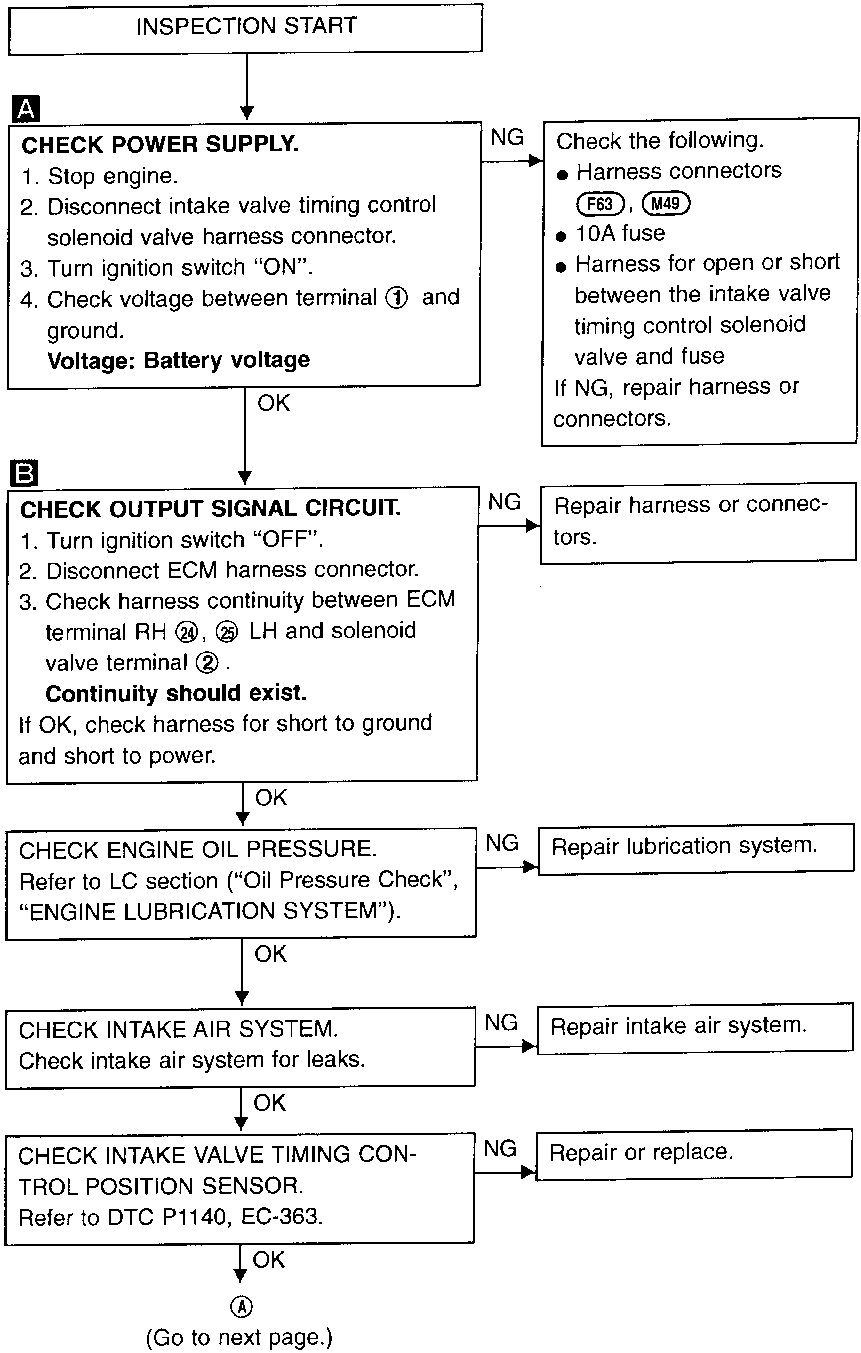
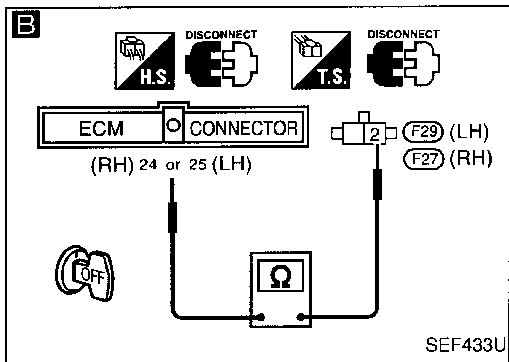
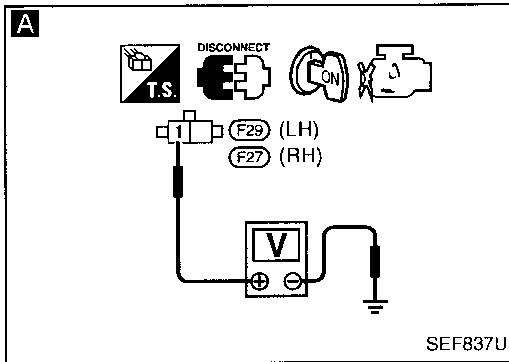
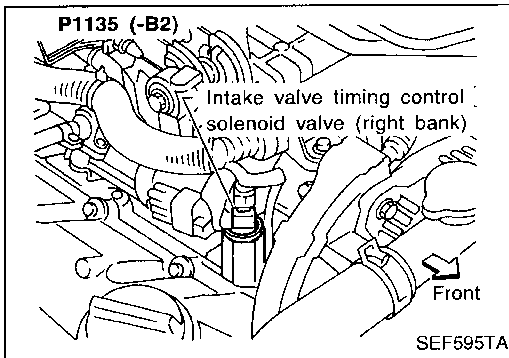
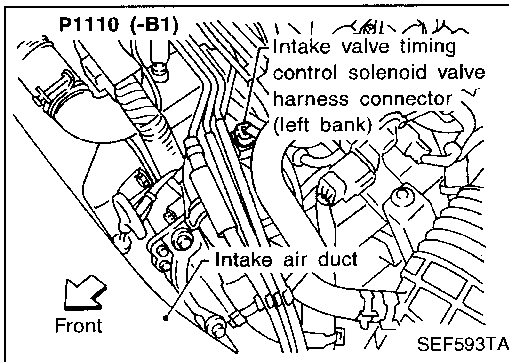
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TROUBLE DIAGNOSIS FOR DTC P1110 (-B1), P1135 (-B2)

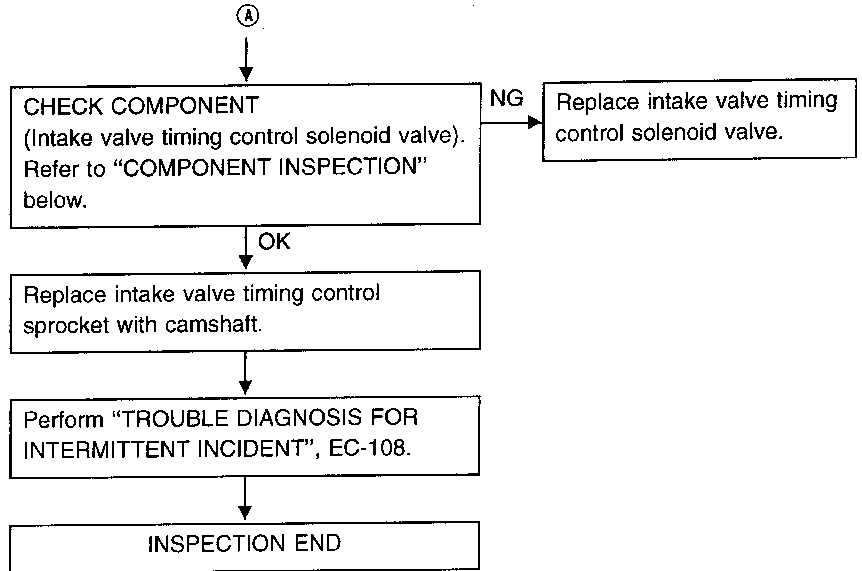
Intake Valve Timing Control (P1110: Left bank), (P1135: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P1110 (-B1), P1135 (-B2)

Intake Valve Timing Control (P1110: Left bank), (P1135: Right bank) (Cont'd)



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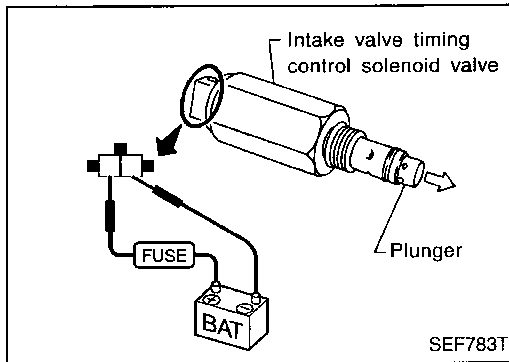
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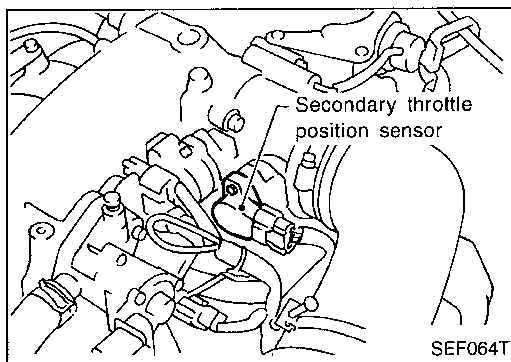
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COMPONENT INSPECTION

Intake valve timing control solenoid valve

1. Check oil passage visually for any metal debris.
2. Supply intake valve timing control solenoid valve terminals with battery voltage.
3. Make sure that inside plunger protrudes.
If NG, replace intake valve timing control solenoid valve.



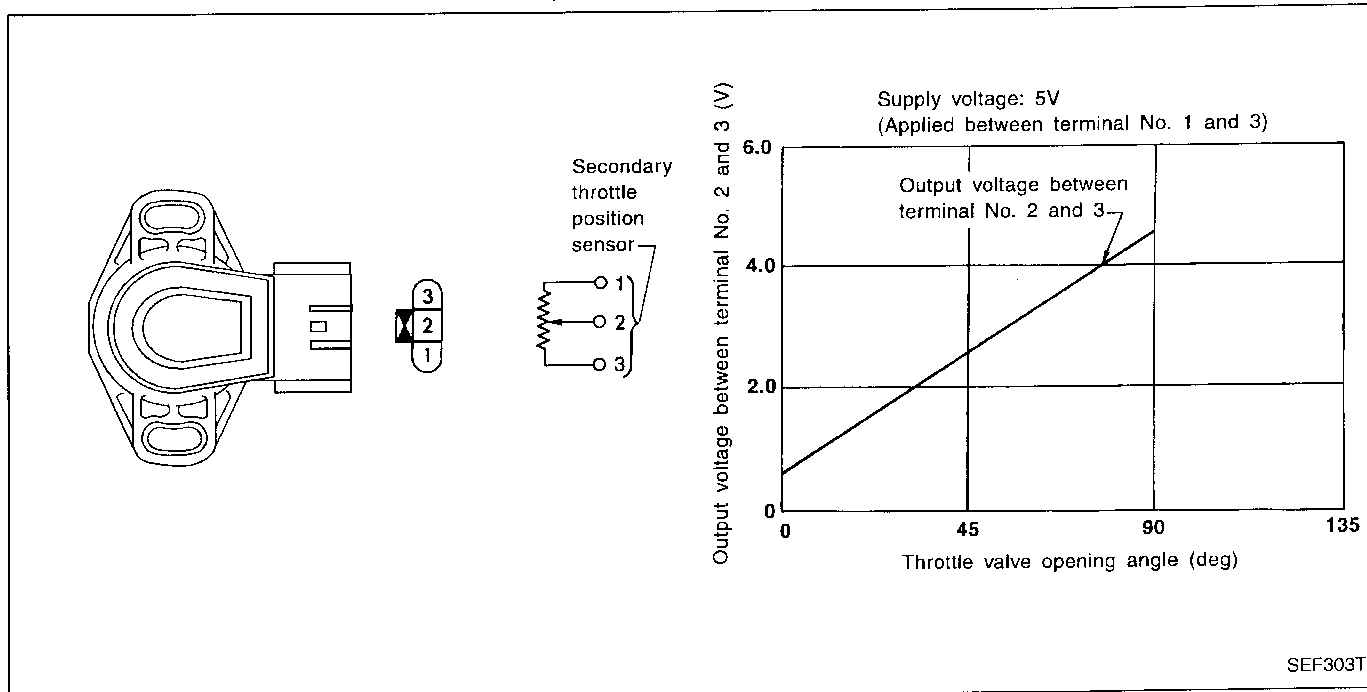
Secondary Throttle Position Sensor (STPS)

COMPONENT DESCRIPTION

The secondary throttle position sensor responds to the movement of the throttle motor which is controlled by the TAC module.

This sensor is a kind of potentiometer which transforms the secondary throttle position into output voltage, and emits the voltage signal to the TAC module. In addition, the sensor detects the opening and closing speed and position of the secondary throttle valve and feeds the voltage signal to the TAC module.

Another case is when the secondary throttle valve opening becomes smaller than the ordinary throttle valve opening due to TCS operation. In this case, the signal from the secondary throttle valve is used for engine control. This replaces the signal from the ordinary throttle position sensor. The signal of the secondary throttle valve first enters the TAC module, from where it is sent to the ECM.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL/P SEN2	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) 	Throttle valve: fully closed
		Throttle valve: fully open

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
66	L	Secondary throttle position sensor	Ignition switch "ON" └ Approximately 3 seconds after ignition switch "ON" and thereafter	Approximately 3.4V
			Ignition switch "ON" └ Disconnect throttle motor harness connector. └ Fully close secondary throttle valve by hand.	Approximately 0.4V

TROUBLE DIAGNOSIS FOR DTC P1120

Secondary Throttle Position Sensor (STPS) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

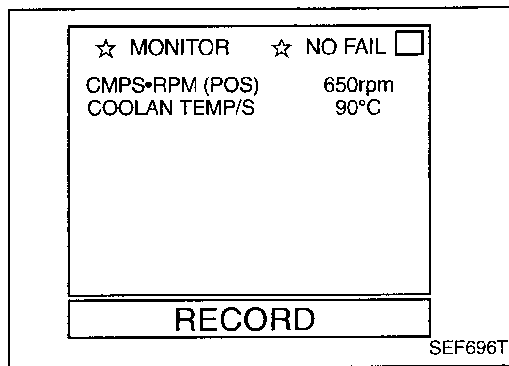
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1120 0406	A) An excessively low or high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open or shorted.)
	B) Rationally incorrect voltage is sent to ECM compared with the signals from mass air flow sensor, camshaft position sensor and IACV-AAC valve.	<ul style="list-style-type: none"> ● Harness or connectors ● Secondary throttle position sensor ● TCM

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

NOTE:

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



Procedure for malfunction A

- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and wait at least 5 seconds.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-360.

OR

- 1) Start engine and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-360.

OR

- 1) Start engine and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-360.

TROUBLE DIAGNOSIS FOR DTC P1120

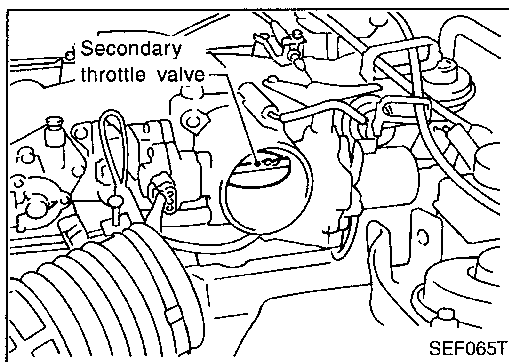
Secondary Throttle Position Sensor (STPS) (Cont'd)

OVERALL FUNCTION CHECK

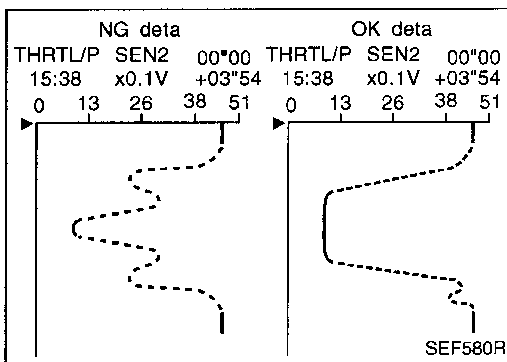
Use this procedure to check the overall function of the secondary throttle position sensor circuit. During this check, a DTC might not be confirmed.

WARNING:

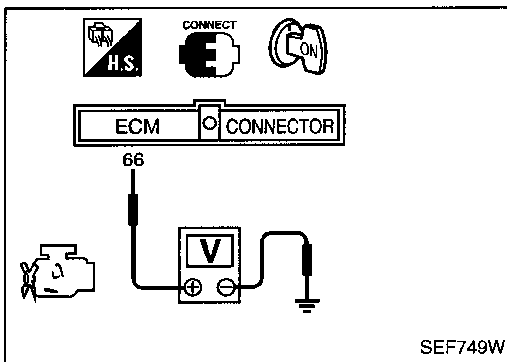
Before touching the secondary throttle valve, be sure to disconnect the throttle motor harness connector. Failure to do so may cause injury due to accidental actuation of the valve.



SEF065T



SEF580R



SEF749W



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and disconnect throttle motor harness connector.
- 3) Remove intake air duct.
- 4) Turn ignition switch "ON".
- 5) Select "MANUAL TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
- 6) Select "THRTL/P SEN2" in "DATA MONITOR" mode with CONSULT.
- 7) Press RECORD on CONSULT SCREEN at the same time close the secondary throttle valve by hand.
- 8) Print out the recorded data and check the following:
 - The voltage when secondary throttle valve is closed by hand is approximately 0.60 - 1.15V.
 - The voltage decrease is linear in response to secondary throttle valve closing.
 - The voltage when secondary throttle valve is fully opened is approximately 4.3 - 4.7V.
- 9) If NG, go to "DIAGNOSTIC PROCEDURE", EC-360.

OR

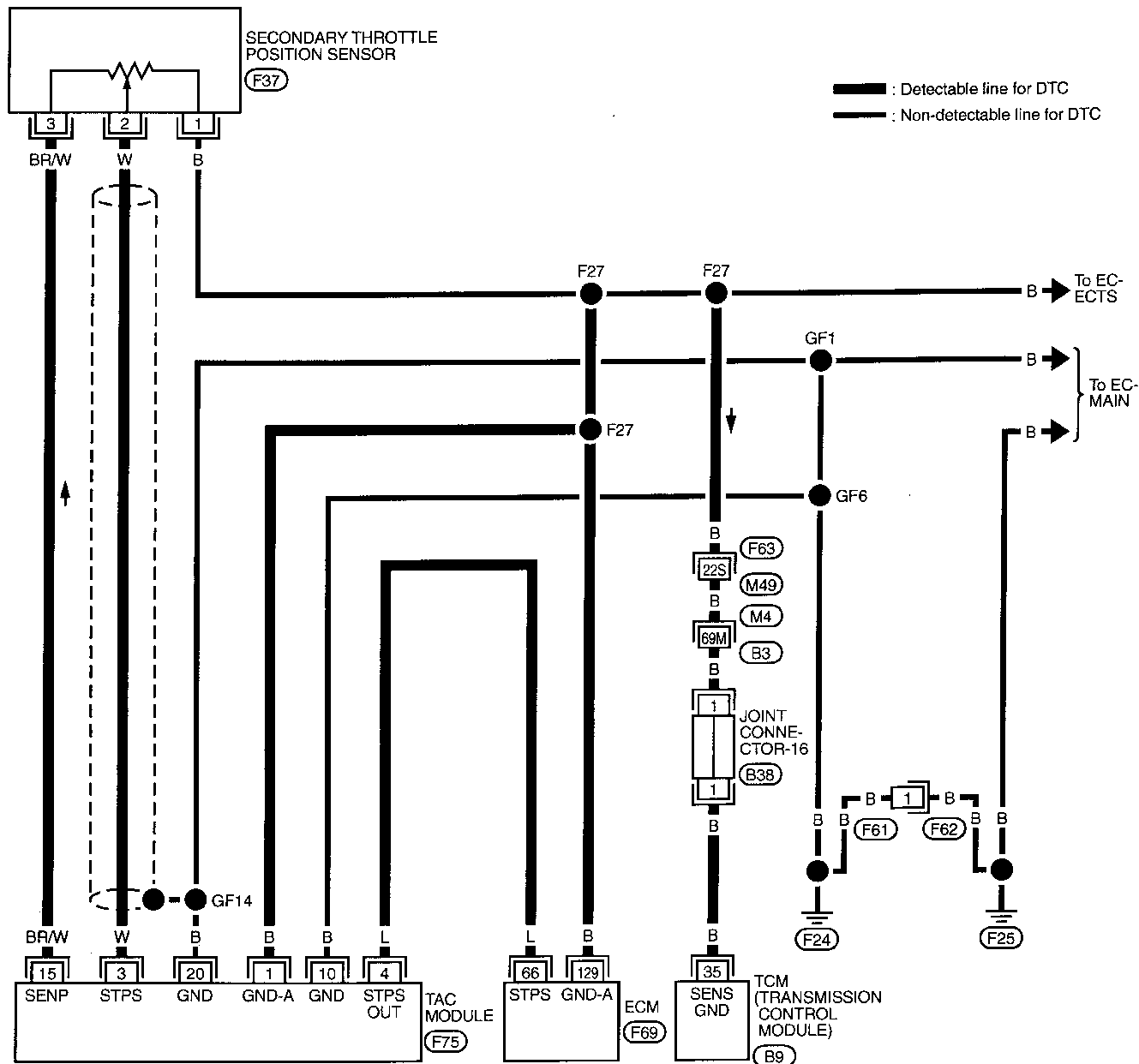


- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and disconnect throttle motor harness connector.
- 3) Remove intake air duct.
- 4) Turn ignition switch "ON".
- 5) Check the voltage between ECM terminal 66 and ground, then check the following:
 - The voltage when secondary throttle valve is closed by hand is approximately 0.4 - 0.86V.
 - The voltage decrease is linear in response to secondary throttle valve closing.
 - The voltage when secondary throttle valve is fully opened is approximately 3.3 - 3.5V.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-360.

TROUBLE DIAGNOSIS FOR DTC P1120

Secondary Throttle Position Sensor (STPS) (Cont'd)

EC-STPS-01



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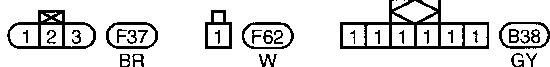
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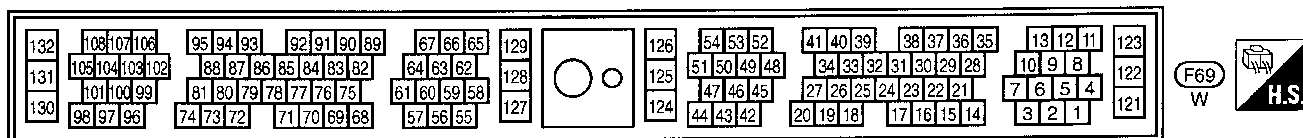
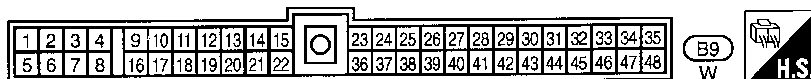
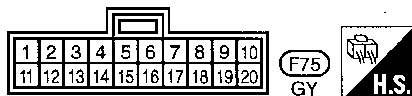
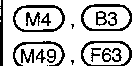
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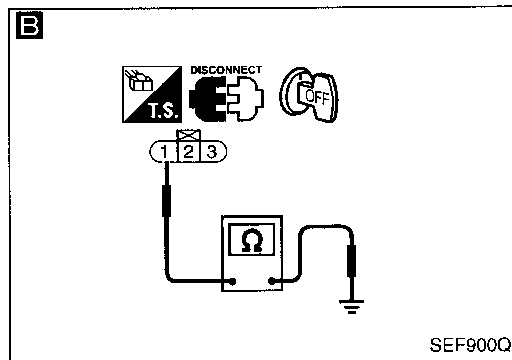
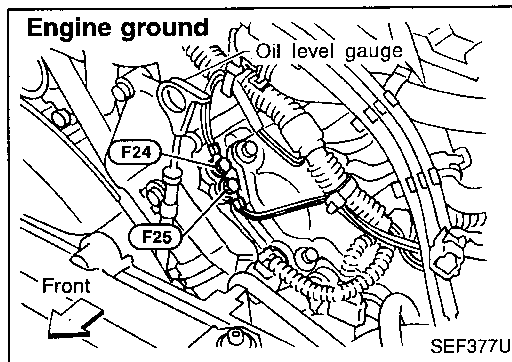
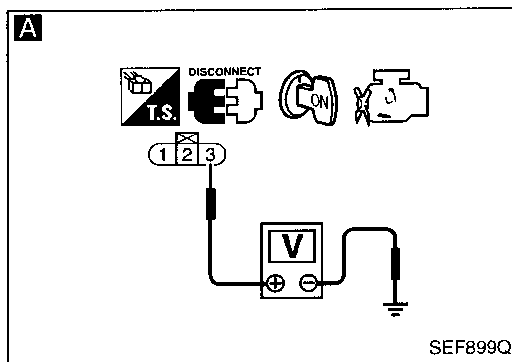
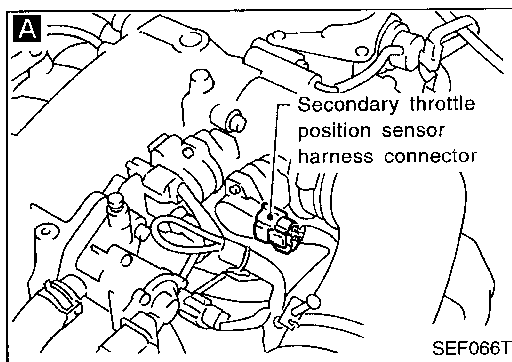


TEC652

TROUBLE DIAGNOSIS FOR DTC P1120

Secondary Throttle Position Sensor (STPS) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect secondary throttle position sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ③ and ground with CONSULT or tester.

Voltage: Approximately 5V

NG → Repair harness or connectors.

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 to ground and short to power.

NG → Check the following.

- Harness connectors (F63), (M49)
- Harness connectors (M4), (B3)
- Harness connectors (F62), (F61)
- Joint connector-16
- Harness for open or short between sensor and throttle actuator control (TAC) module
- Harness for open or short between secondary throttle position sensor and ECM
- Harness for open or short between secondary throttle position sensor and TCM (Transmission Control Module)

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

OK

↓

OK

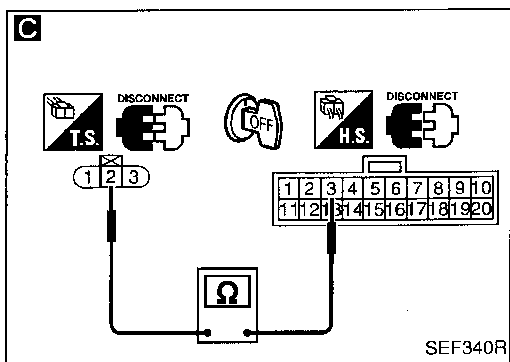
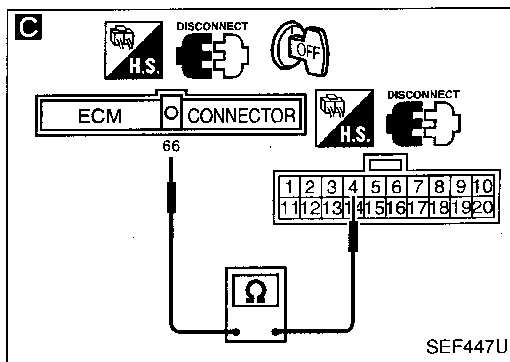
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TROUBLE DIAGNOSIS FOR DTC P1120

Secondary Throttle Position Sensor (STPS) (Cont'd)



CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector and throttle actuator control module harness connector.
2. Check harness continuity between ECM terminal ⑥ and throttle actuator control module terminal ④, sensor terminal ② and throttle actuator control module terminal ③.

Continuity should exist.
If NG, repair open circuit or short to ground or short to power in harness or connectors.

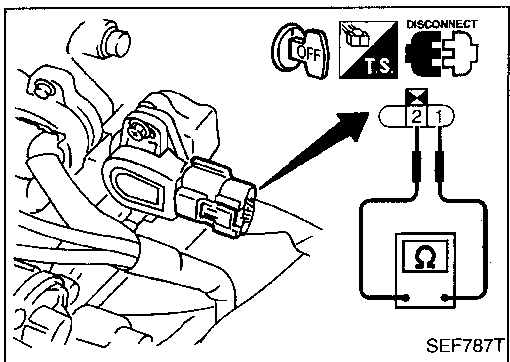
CHECK COMPONENT
(Secondary throttle position sensor). Refer to "COMPONENT INSPECTION" below.
Refer to BR section ("Adjustment for Secondary Throttle Position", "TRACTION CONTROL SYSTEM — TCS —") for adjustment.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

NG → Repair harness or connectors.

NG → Replace secondary throttle position sensor. Refer to BR section.



COMPONENT INSPECTION

Secondary throttle position sensor

WARNING:

Before touching the secondary throttle valve, be sure to disconnect the throttle motor harness connector. Failure to do so may cause injury due to accidental actuation of the valve.

1. Turn ignition switch "OFF".
2. Disconnect secondary throttle position sensor harness connector.
3. Disconnect throttle motor harness connector.
4. Remove intake air duct.
5. Make sure that resistance between terminals ② and ① changes when opening secondary throttle valve manually.

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

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Tandem Throttle Position Sensor

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1125 1502	<ul style="list-style-type: none"> ● Rationally incorrect voltage is entered to ECM compared with the signals from mass air flow sensor, camshaft position sensor and IACV-AAC valve. 	<ul style="list-style-type: none"> ● Harness or connectors (The sensor circuits are open or shorted.) ● Throttle position sensor or secondary throttle position sensor ● Throttle actuator control (TAC) module

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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



- 1) Start engine and warm it up to normal operating temperature.
- 2) Stop engine and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "DATA MONITOR" mode with CONSULT.
- 5) Start engine and run it for 15 seconds.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Stop engine and wait at least 5 seconds.
- 3) Start engine and run it for 15 seconds.
- 4) Select "MODE 7" with GST.

OR

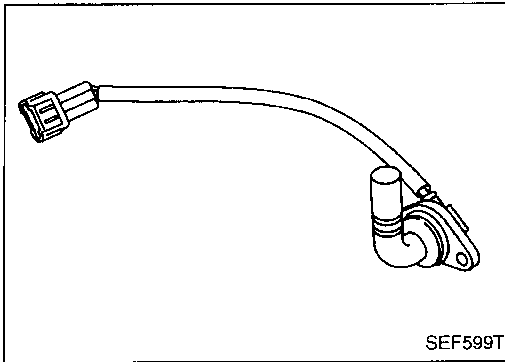


- 1) Start engine and warm it up to normal operating temperature.
- 2) Stop engine and wait at least 5 seconds.
- 3) Start engine and run it for 15 seconds.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with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

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0120, EC-142 OR Refer to TROUBLE DIAGNOSIS FOR DTC P1120, EC-356.

TROUBLE DIAGNOSIS FOR DTC P1140 (-B1), P1145 (-B2)



Intake Valve Timing Control Position Sensor (P1140: Left bank), (P1145: Right bank)

COMPONENT DESCRIPTION

The intake valve timing control position sensor is located rearmost of the left-bank cylinder head. This sensor detects a signal (intake valve position) generated by the cutout portion of camshaft and sends it to the ECM. This sensor is not used to control the engine system. It is used only for the on board diagnosis of intake valve timing control.

GI
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CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
INT/V TIM-B1 INT/V TIM-B2	<ul style="list-style-type: none"> Engine is running. 	Advanced angle (degree) of the intake camshaft should be displayed.

LC
EC

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
70 (RH)	R/L	Intake valve timing control position sensors	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> Idle speed 	Approximately 0V
71 (LH)	L/W		<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> Engine speed is 2,000 rpm. 	Approximately 0V

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ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1140 1303 (Left bank)	The proper pulse signal from the intake valve timing control position sensors is not sent to ECM while the engine is running at the specified engine speed.	<ul style="list-style-type: none"> Harness or connectors (The left bank intake valve timing control position sensor circuit is open.) Intake valve timing control position sensor Accumulation of debris to the signal pick-up portion of the camshaft
P1145 1304 (Right bank)		

EL
IDX

TROUBLE DIAGNOSIS FOR DTC P1140 (-B1), P1145 (-B2)

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM (POS)	2000rpm	
MAS AIR/FL SE	2.05V	
B/FUEL SCHDL	3.0msec	
INT/V SOL-B1	OFF	
INT/V TIM-B1	97deg	
RECORD		

SEF600T

Intake Valve Timing Control Position Sensor (P1140: Left bank), (P1145: Right bank) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and keep the engine speed at 2,000 rpm and wait at least 15 seconds.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-367.

OR



- 1) Start engine and keep the engine speed at 2,000 rpm and wait at least 15 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-367.

OR



- 1) Start engine and keep the engine speed at 2,000 rpm and wait at least 15 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-367.

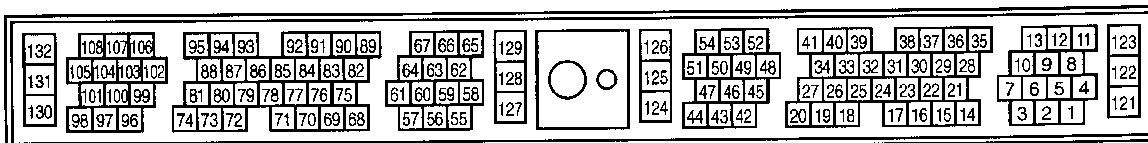
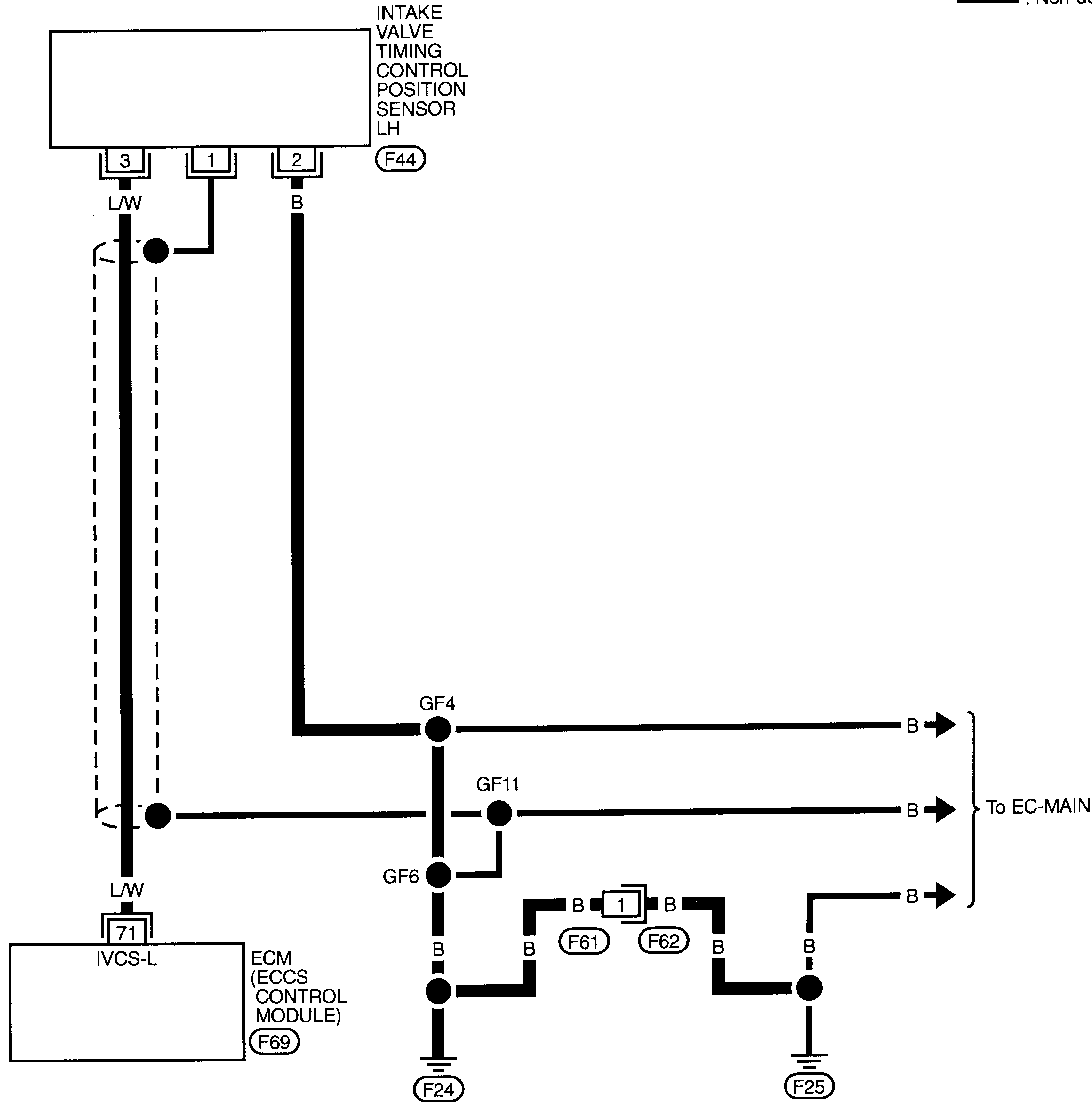
TROUBLE DIAGNOSIS FOR DTC P1140 (-B1), P1145 (-B2)

Intake Valve Timing Control Position Sensor (P1140: Left bank), (P1145: Right bank) (Cont'd)

LEFT BANK

EC-IVCS-L-01

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



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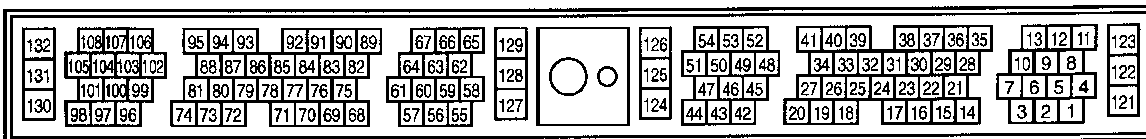
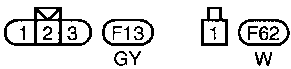
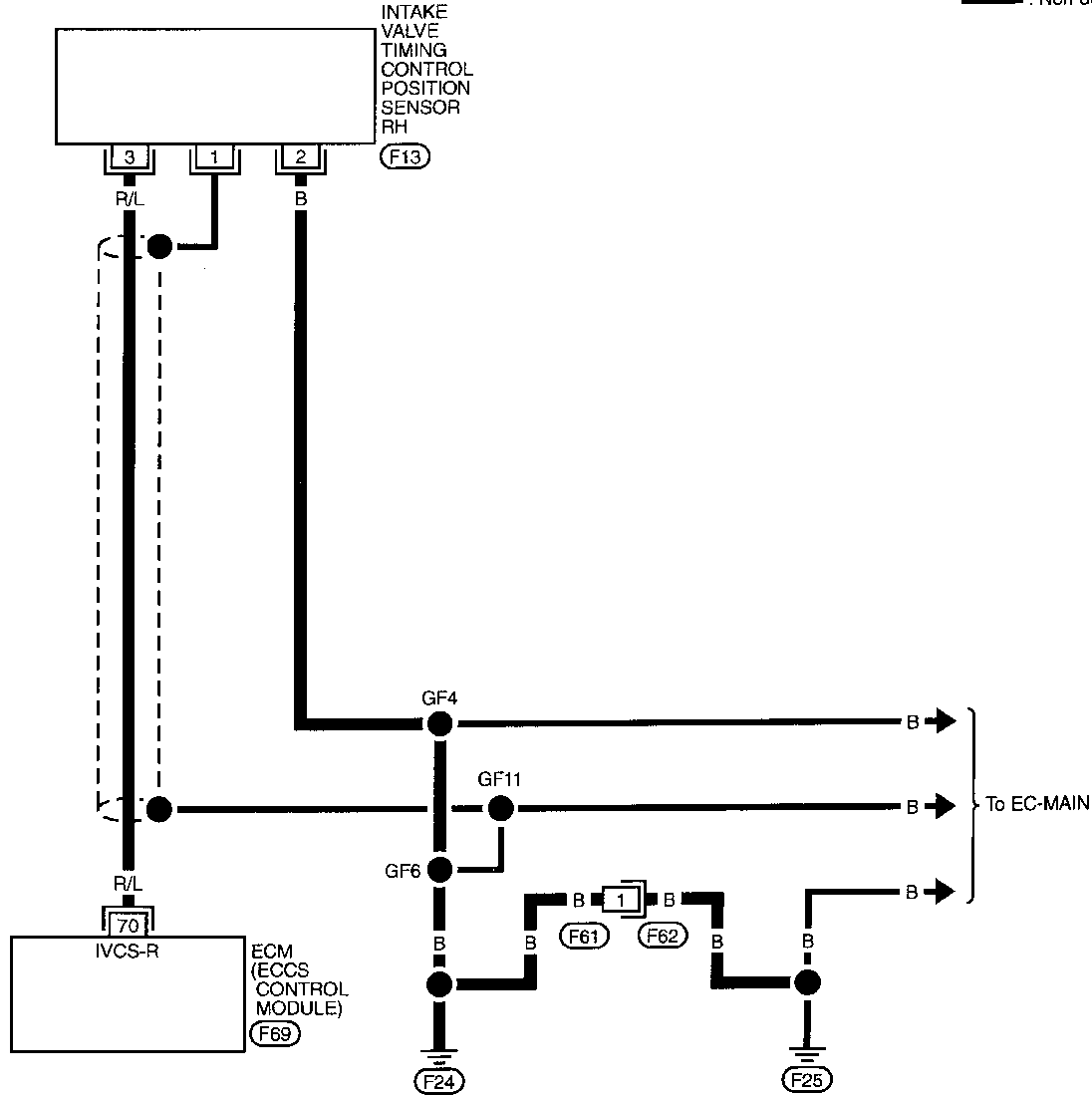
TROUBLE DIAGNOSIS FOR DTC P1140 (-B1), P1145 (-B2)

Intake Valve Timing Control Position Sensor (P1140: Left bank), (P1145: Right bank) (Cont'd)

RIGHT BANK

EC-IVCS-R-01

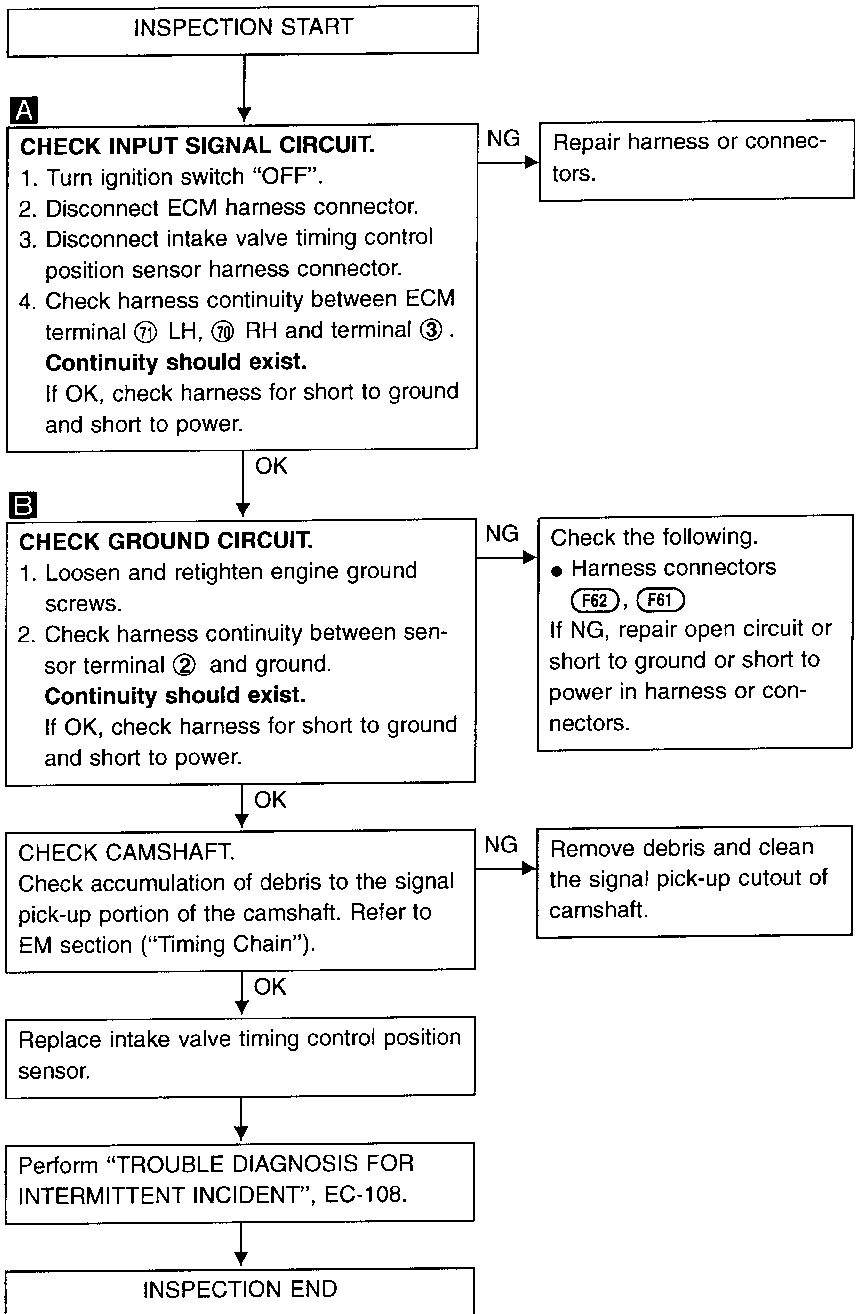
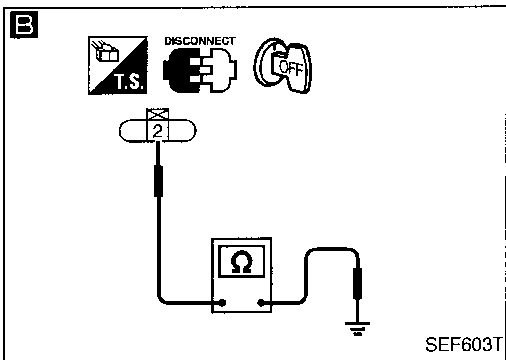
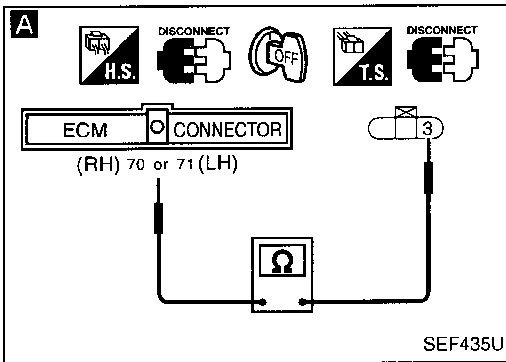
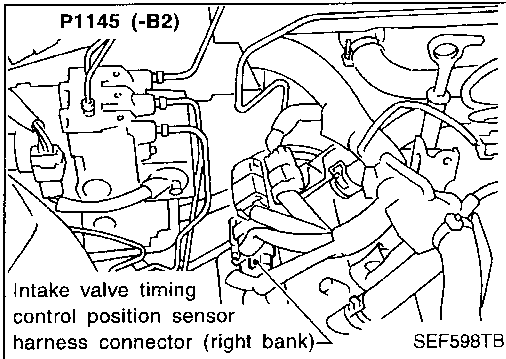
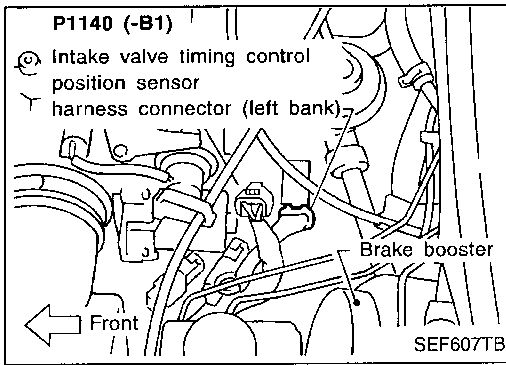
— : Detectable line for DTC
 - - - : Non-detectable line for DTC



TROUBLE DIAGNOSIS FOR DTC P1140 (-B1), P1145 (-B2)

Intake Valve Timing Control Position Sensor (P1140: Left bank), (P1145: Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE



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TROUBLE DIAGNOSIS FOR DTC P1140 (-B1), P1145 (-B2)

Intake Valve Timing Control Position Sensor (P1140: Left bank), (P1145: Right bank) (Cont'd)

COMPONENT INSPECTION

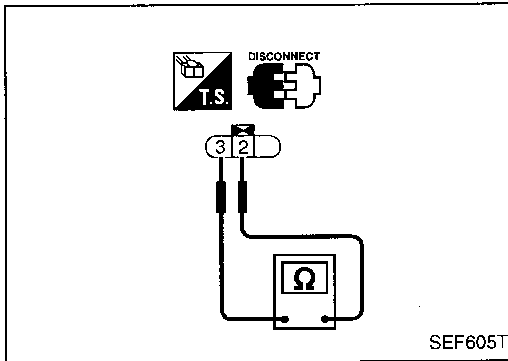
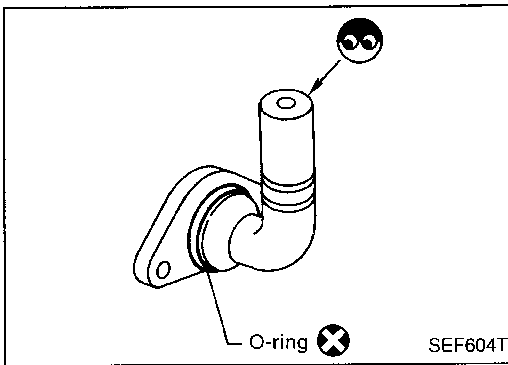
Intake valve timing control position sensor

1. Disconnect intake valve timing control position sensor harness connector.
2. Loosen fixing bolt of the sensor.
3. Visually check the sensor for chipping.
4. Check resistance between terminals ② and ③.

Resistance:

600 - 740 Ω [at 20°C (68°F)]

If NG, replace intake valve timing control position sensor.



TROUBLE DIAGNOSIS FOR DTC P1148 (-B1), P1168 (-B2)

Closed Loop Control (P1148: Left bank), (P1168: Right bank)

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1148 0307 (Left bank)	<ul style="list-style-type: none"> The closed loop control function for left bank does not operate even when vehicle is driving in the specified condition. 	<ul style="list-style-type: none"> The front heated oxygen sensor circuit is open or shorted. Front heated oxygen sensor Front heated oxygen sensor heater
P1168 0308 (Right bank)		

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☆ MONITOR
☆ NO FAIL

CMPS•RPM (POS)	2000rpm
MAS AIR/FL SE	2.47V
FR O2 SEN-B1	0.74V
FR O2 SEN-B2	0.74V
FR O2 MNTR-B1	RICH
FR O2 MNTR-B2	RICH

RECORD

SEF701T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

- Never raise engine speed above 3,200 rpm during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 2).
- Before performing the following procedure, confirm that battery voltage is more than 11V.



- Start engine and warm it up to normal operating temperature.
- Select "DATA MONITOR" mode with CONSULT.
- Hold engine speed at 2,000 rpm and check the following.

- "FR O2 SENSOR" voltage should go above 0.70V at least once.

OR

- "FR O2 SENSOR" voltage should go below 0.21V at least once.

If the check result is NG, perform "DIAGNOSIS PROCEDURE", EC-183.

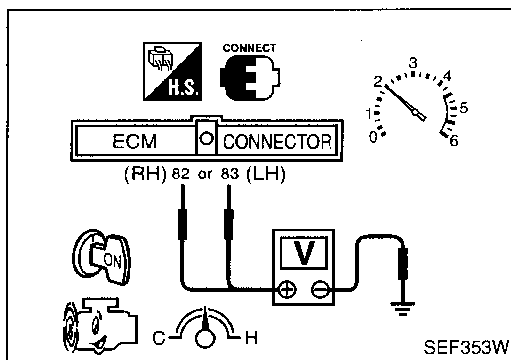
If the check result is OK, perform the following step.

- Let engine idle at least 3 minutes.

TROUBLE DIAGNOSIS FOR DTC P1148 (-B1), P1168 (-B2)

Closed Loop Control (P1148: Left bank), (P1168: Right bank) (Cont'd)

- 5) Maintain the following condition at least 50 consecutive seconds.
B/FUEL SCHDL: 2.5 ms or more
CMPS-RPM (POS): 2,000 - 3,000 rpm
Selector lever: Suitable position
VHCL SPEED SE: More than 70 km/h (43 MPH)
During this test P0130 may be displayed on the CONSULT screen.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-178.



OR

OVERALL FUNCTION CHECK

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

- 1) Start engine and warm it up to normal operating temperature.
 - 2) Set voltmeter probes between ECM terminals ② RH, ③ LH (sensor) and ground.
 - 3) Check the following with engine speed held at 2,000 rpm constant under no-load.
 - The voltage should go above 0.70V at least once.
- OR
- The voltage should go below 0.21V at least once.
 - 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-178.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2), EC-178.

Traction Control System (TCS) Signal Circuit

The ECM uses this circuit line for checking the TCS operation. Voltage signals are sent and received between the ECM and the throttle actuator control module.

★ Freeze frame data is not stored in the ECM for the TCS signal circuit.
The MIL will not light for TCS signal circuit malfunction.

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1210 0106	<ul style="list-style-type: none"> ● An excessively low or high voltage from the throttle actuator control (TAC) module is sent to ECM. 	<ul style="list-style-type: none"> ● Harness or connectors (The circuit is open or shorted.) ● Throttle actuator control (TAC) module

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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



- 1) Turn ignition switch "ON" and TCS switch "ON", then start engine.
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Run engine for at least 3 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-373.

OR



- 1) Turn ignition switch "ON" and TCS switch "ON", then start engine.
- 2) Run engine for at least 3 seconds at idle speed.
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-373.

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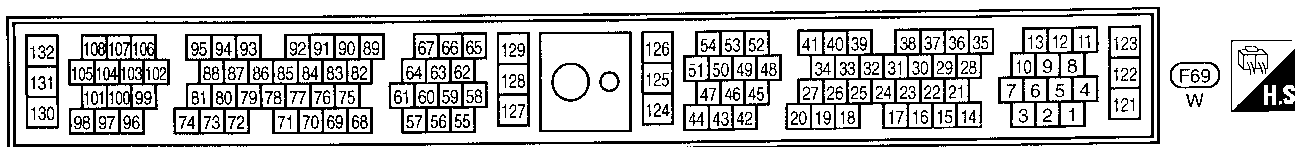
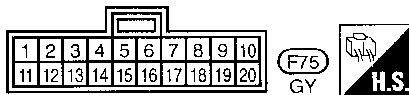
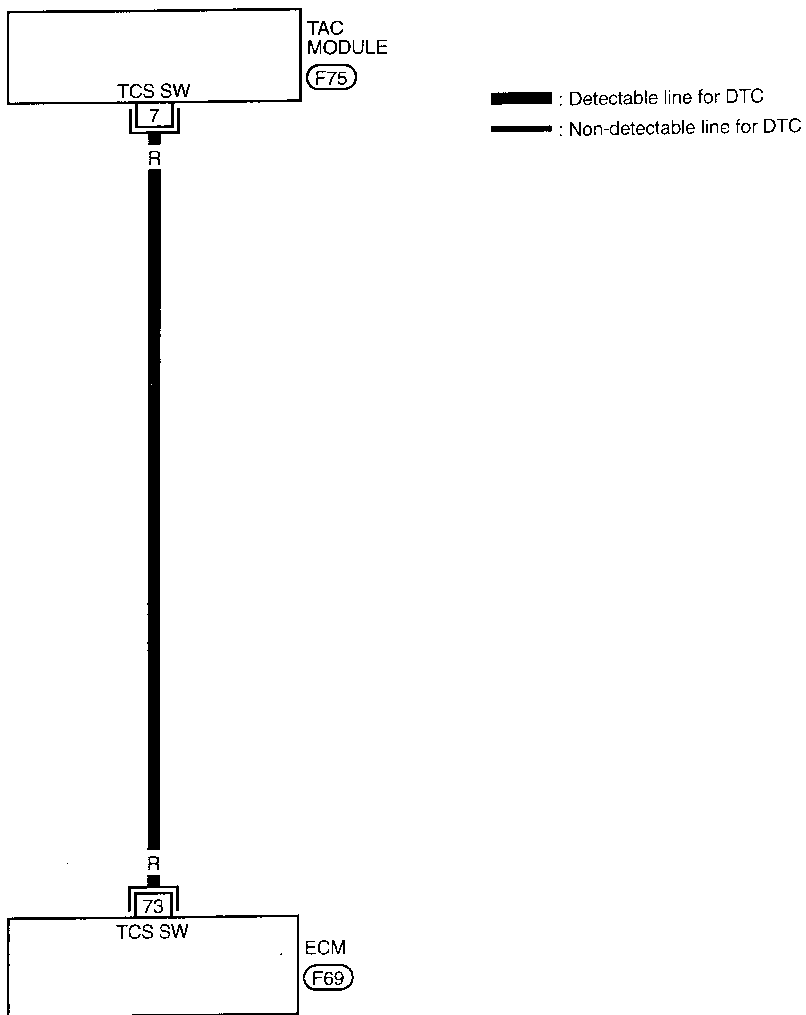
EL

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TROUBLE DIAGNOSIS FOR DTC P1210

Traction Control System (TCS) Signal Circuit (Cont'd)

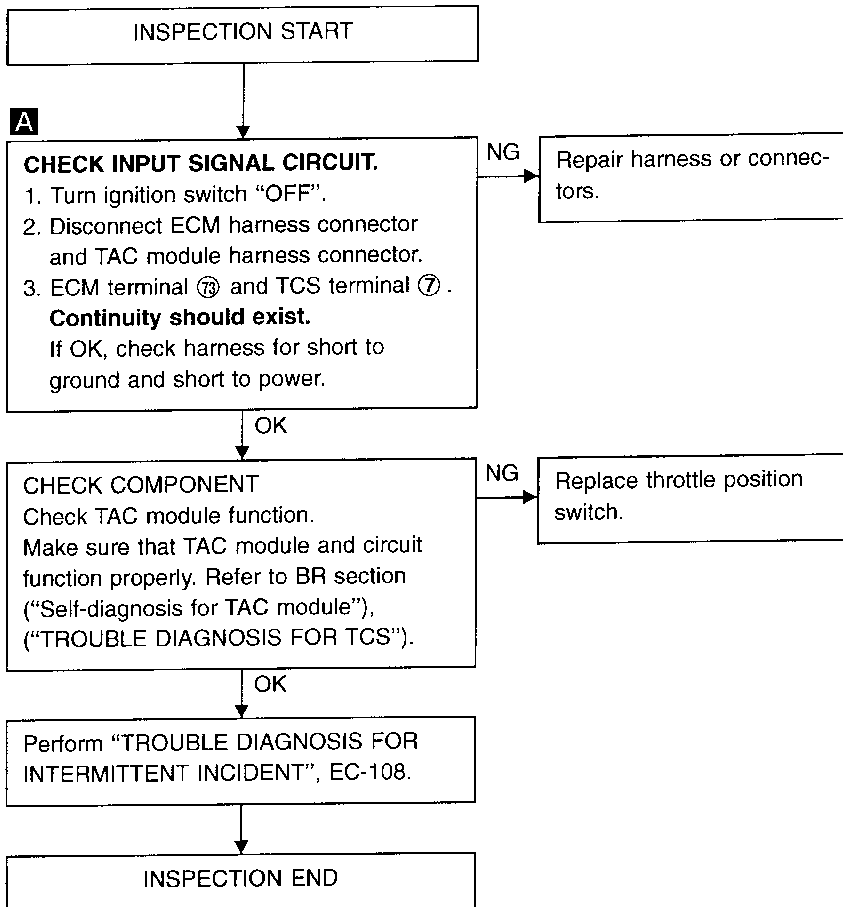
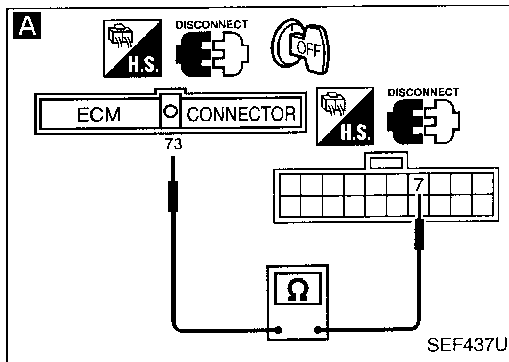
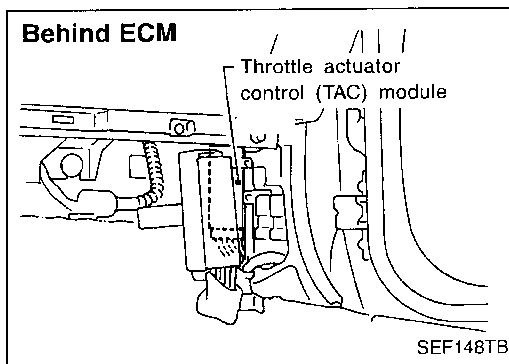
EC-TCS/SW-01



TROUBLE DIAGNOSIS FOR DTC P1210

Traction Control System (TCS) Signal Circuit (Cont'd)

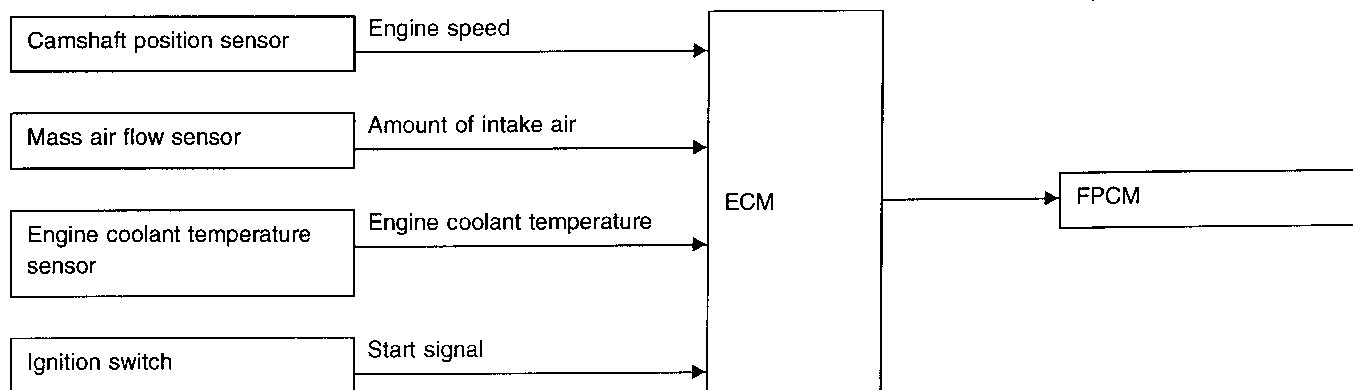
DIAGNOSTIC PROCEDURE



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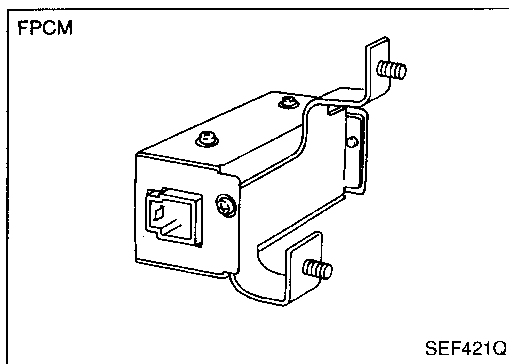
Fuel Pump Control Module (FPCM)

SYSTEM DESCRIPTION



This system controls the fuel pump operation. The amount of fuel flow delivered from the fuel pump is altered between two flow rates by the FPCM operation. The FPCM determines the voltage supplied to the fuel pump (and therefore fuel flow) according to the following conditions.

Conditions	Amount of fuel flow	Supplied voltage
<ul style="list-style-type: none"> • Engine cranking • Within 16 seconds after starting engine [above 100°C (212°F)] • Engine is running under heavy load and high speed conditions 	high	Battery voltage (11 - 14V)
Except the above	low	Approximately 7V



COMPONENT DESCRIPTION

The FPCM adjusts the voltage supplied to the fuel pump to control the amount of fuel flow. When the FPCM increases the voltage supplied to the fuel pump, the fuel flow is increased. When the FPCM decreases the voltage, the fuel flow is decreased.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FPCM	<ul style="list-style-type: none"> • Within 16 seconds after starting the engine, when engine coolant temperature is more than 100°C (212°F) 	HIGH → LOW
FPCM D/R VOLT	<ul style="list-style-type: none"> • Within 16 seconds after starting the engine, when engine coolant temperature is more than 100°C (212°F) 	Approx. 5.0V → Approx. 0.4V

TROUBLE DIAGNOSIS FOR DTC P1220

Fuel Pump Control Module (FPCM) (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
15	R/L	Fuel pump control module	Engine is cranking.	Approximately 0.4V
			Engine is running. └ Idle speed	Approximately 10V
93	G/R	Fuel pump control module (FPCM) check	When cranking the engine	Approximately 0V
			After starting the engine	Approximately 5V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1220 1305	<ul style="list-style-type: none"> An improper voltage signal from the FPCM, which is supplied to a point between the fuel pump and the dropping resistor, is detected by ECM. 	<ul style="list-style-type: none"> Harness or connectors (FPCM circuit is open or shorted.) Dropping resistor FPCM

☆ MONITOR ☆ NO FAIL

CMPS-RPM (POS)	650rpm
MAS AIR/FL SE	1.19V
COOLANT TEMP/S	91°C
VHCL SPEED SE	4km/h
B/FUEL SCHDL	1.2msec
FPCM DR VOLT	4.4V
FPCM	LOW

RECORD

SEF613T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:
Always drive at a safe speed.

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

- 1) Lift up vehicle.
 2) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
 3) Start engine (TCS switch "OFF").
 4) Shift A/T selector lever to "D" position.
 5) Hold vehicle speed at 70 to 100 km/h (43 to 62 MPH) for 12 seconds.
 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-378.

OR

- 1) Lift up vehicle.
 2) Start engine (TCS switch "OFF").
 3) Shift A/T selector lever to "D" position.
 4) Hold vehicle speed at 70 to 100 km/h (43 to 62 MPH) for 12 seconds.
 5) Select "MODE 7" with GST.
 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-378.

OR

- 1) Lift up vehicle.
 2) Start engine (TCS switch "OFF").
 3) Shift A/T selector lever to "D" position.
 4) Hold vehicle speed at 70 to 100 km/h (43 to 62 MPH) for 12 seconds.
 5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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TROUBLE DIAGNOSIS FOR DTC P1220

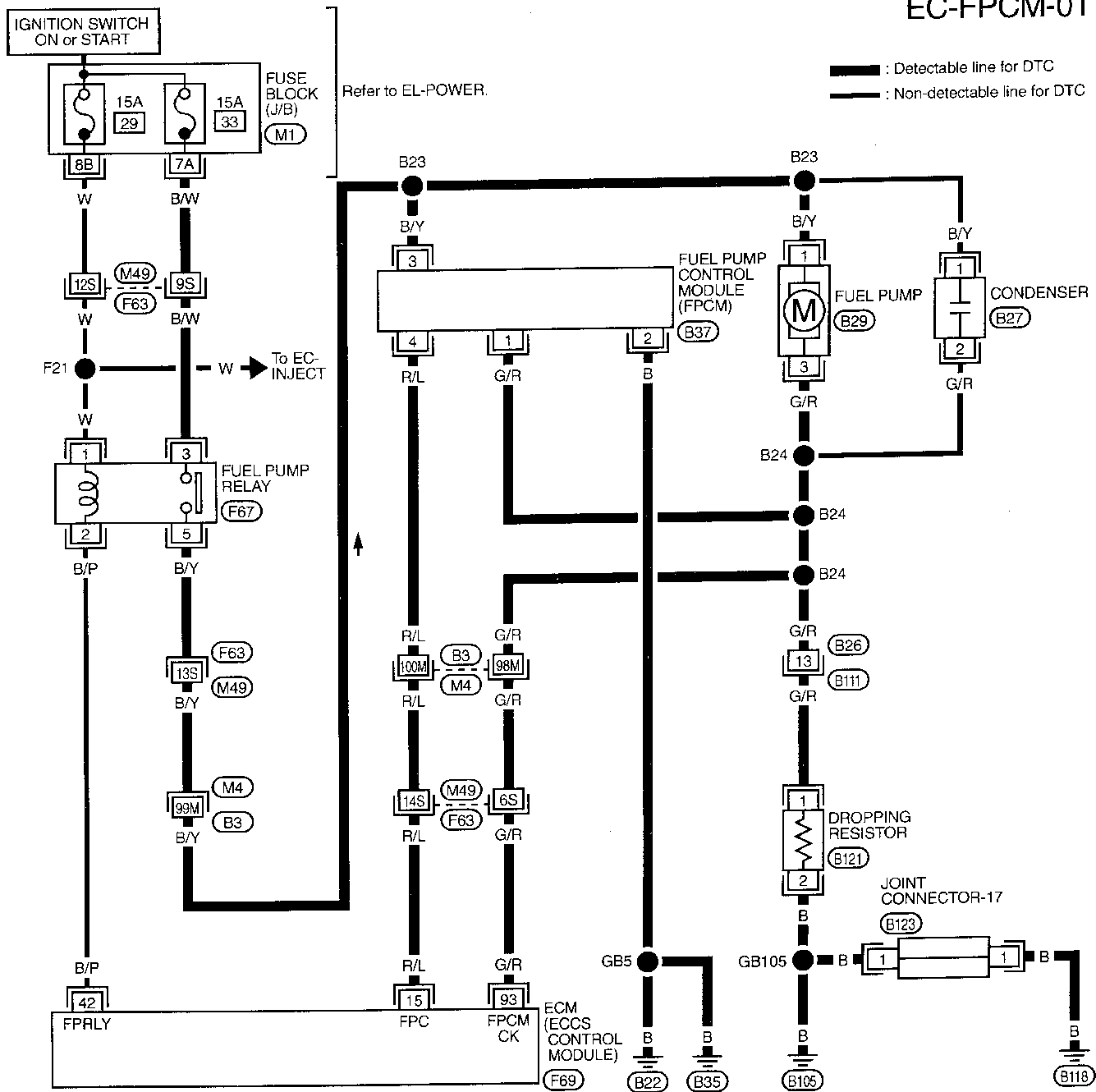
Fuel Pump Control Module (FPCM) (Cont'd)

- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-378.

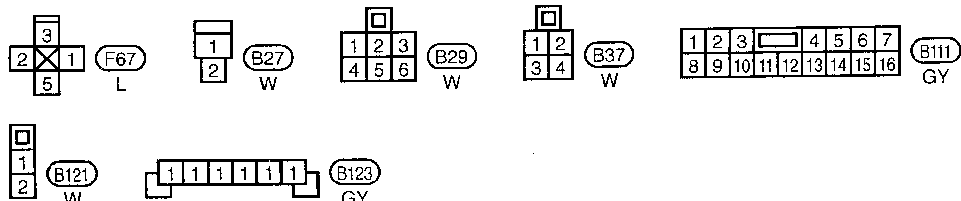
TROUBLE DIAGNOSIS FOR DTC P1220

Fuel Pump Control Module (FPCM) (Cont'd)

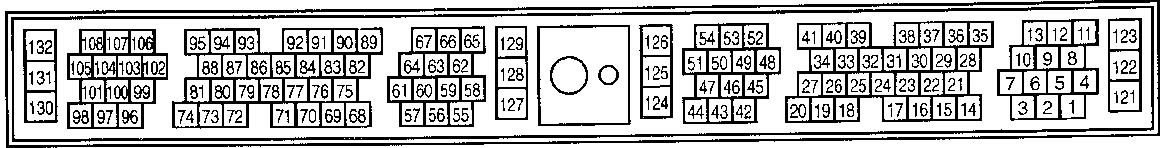
EC-FPCM-01



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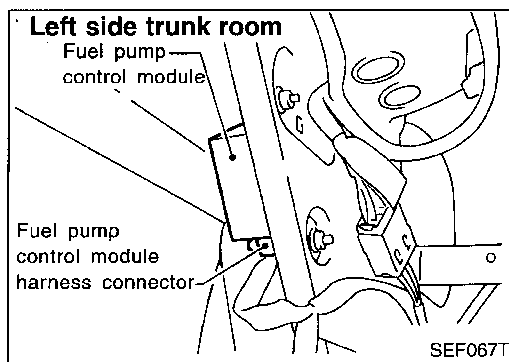
Refer to last page (Foldout page).
 (M4) (B3)
 (M49) (F63)
 (M1)



TROUBLE DIAGNOSIS FOR DTC P1220

Fuel Pump Control Module (FPCM) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect FPCM harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ③ and ground with CONSULT or tester.

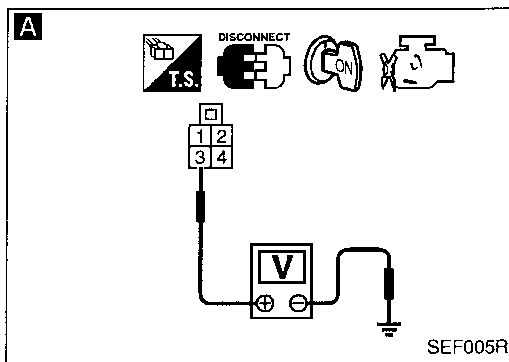
Voltage: Battery voltage

NG

Check the following.

- Harness connectors (F63), (M49)
- Harness for open or short between FPCM and fuel pump relay

If NG, repair harness or connectors.



B

CHECK GROUND CIRCUIT-I.

1. Turn ignition switch "OFF".
2. Disconnect dropping resistor harness connector.
3. Check harness continuity between FPCM and dropping resistor terminal ② and engine ground.

Continuity should exist.

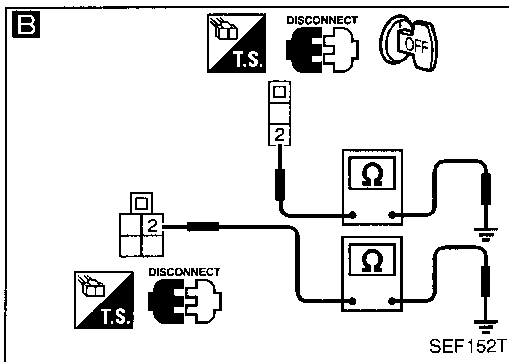
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connector (B123)

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



C

CHECK GROUND CIRCUIT-II.

1. Disconnect fuel pump harness connector.
2. Check harness continuity between fuel pump terminal ③ and dropping resistor terminal ①, resistor terminal ① and FPCM terminal ①.
3. Check harness continuity between FPCM terminal ① and engine ground, terminal ③ and engine ground.

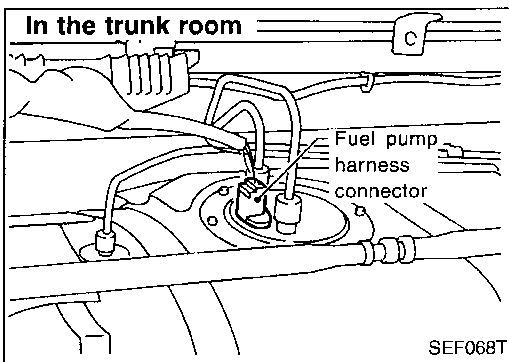
Continuity should exist.

Continuity should not exist.

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

NG

Repair harness or connectors.



D

CHECK OUTPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑬ and terminal ④.

Continuity should exist.

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

NG

Check the following.

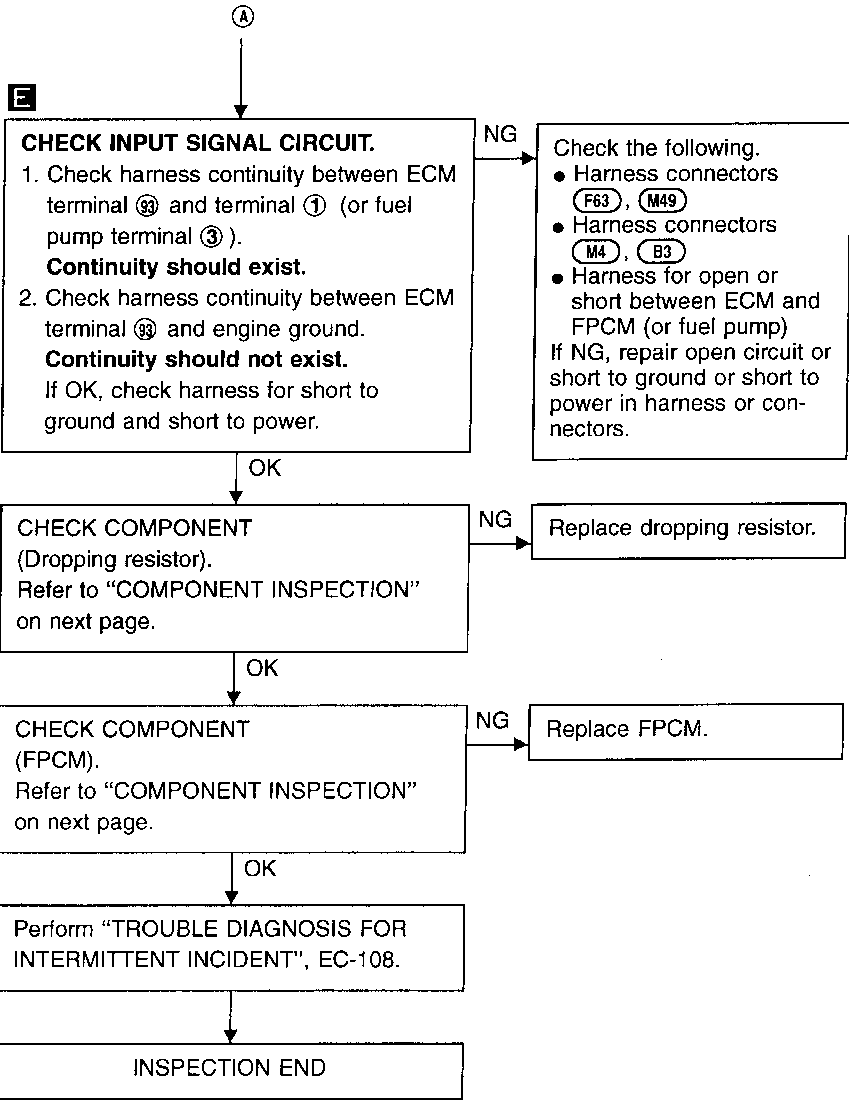
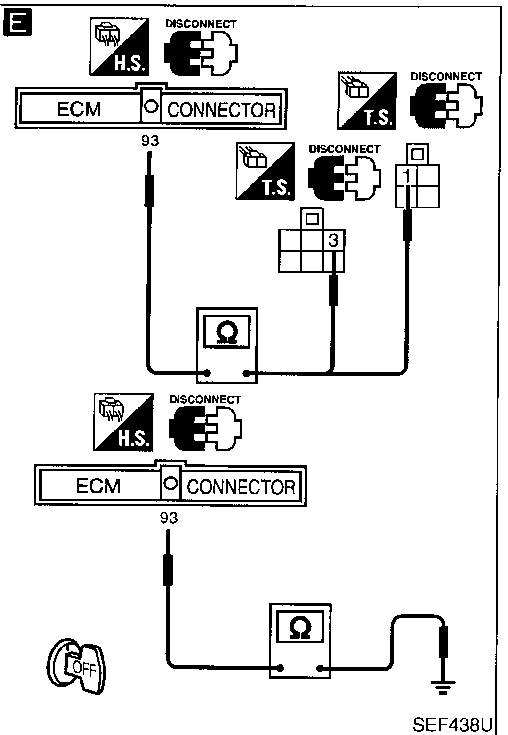
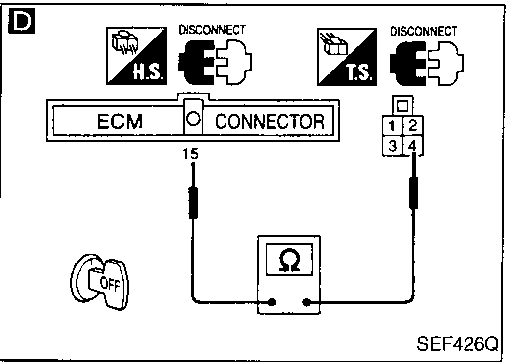
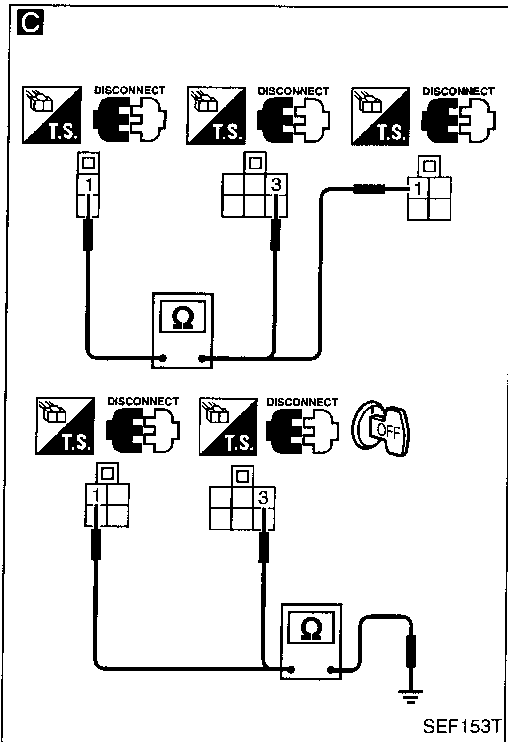
- Harness connectors (F63), (M49)
- Harness connectors (M4), (B3)
- Harness for open or short between ECM and FPCM

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

Ⓐ
(Go to next page.)

TROUBLE DIAGNOSIS FOR DTC P1220

Fuel Pump Control Module (FPCM) (Cont'd)



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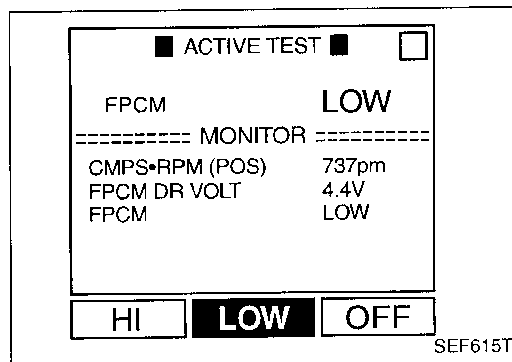
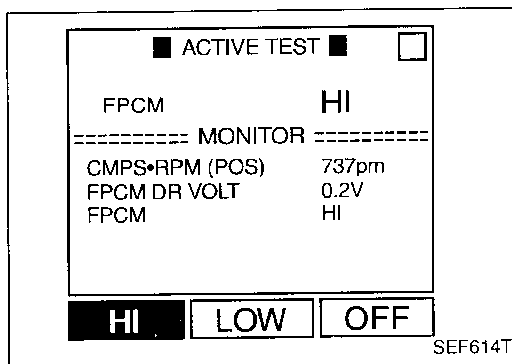
IDX

TROUBLE DIAGNOSIS FOR DTC P1220

Fuel Pump Control Module (FPCM) (Cont'd)

COMPONENT INSPECTION

FPCM

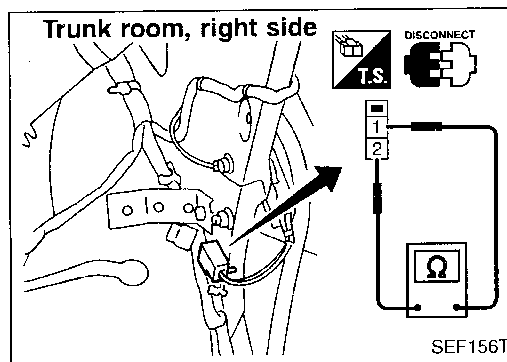
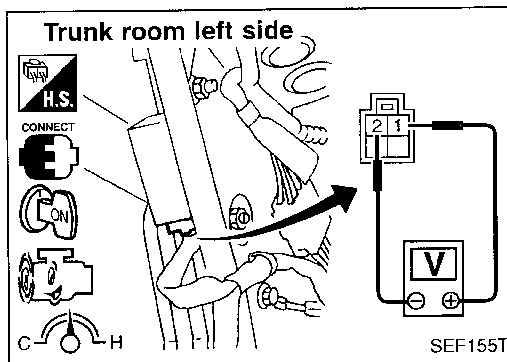


1. Start engine and let it idle.
2. Perform "FPCM" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
 - When selecting "HI", "FPCM DR VOLT" indicates approximately 0V.
 - When selecting "LOW", "FPCM DR VOLT" indicates approximately 4.4V.
4. If NG, replace FPCM.

OR



1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 5 seconds.
3. Start engine and let it idle.
4. Check voltage between terminals ① and ② .
Within 30 seconds of starting engine:
 Approximately 0V
More than 30 seconds after starting engine:
 Approximately 4.4V
5. If NG, replace FPCM.

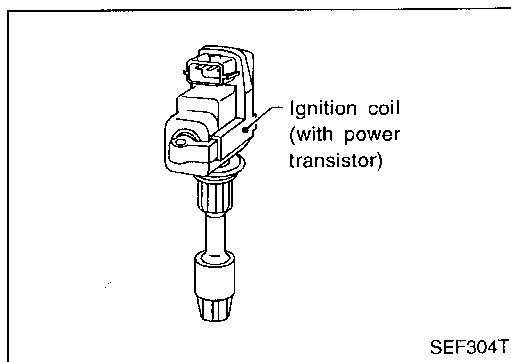


Dropping resistor

Check resistance between terminals ① and ② .

Resistance: Approximately 0.8Ω at 25°C (77°F)

TROUBLE DIAGNOSIS FOR DTC P1320



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

GI
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CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
IGN TIMING	<ul style="list-style-type: none"> Engine: After warming up Air conditioner switch: "OFF" Shift lever: "N" No-load Idle	15° BTDC
	2,000 rpm	More than 25° BTDC

LC
EC
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ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
43	Y/R	Ignition signal (No. 1)	Engine is running. (Warm-up condition) Idle speed	Approximately 0.38V SEF538T
44	G/R	Ignition signal (No. 8)		
46	L/R	Ignition signal (No. 7)	Engine is running. (Warm-up condition) Engine speed is 2,000 rpm.	Approximately 0.55V SEF539T
47	GY	Ignition signal (No. 3)		
50	PU/W	Ignition signal (No. 6)		
51	GY/R	Ignition signal (No. 5)		
53	W/R	Ignition signal (No. 4)		
54	R/L	Ignition signal (No. 2)		

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ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1320 0201	<ul style="list-style-type: none"> The ignition signal in the primary circuit is not sent during engine cranking or running. 	<ul style="list-style-type: none"> Harness or connectors (The ignition primary circuit is open or shorted.) Power transistor unit built into ignition coil Camshaft position sensor Camshaft position sensor circuit

IDX

TROUBLE DIAGNOSIS FOR DTC P1320

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM (POS)	650rpm	
MAS AIR FL/SE	1.5V	
RECORD		

SEF695T

Ignition Signal (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- If both DTC P1320 (0201) and DTC P0340 (0101), P0335 (0802) or P1336 (0905) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340, P0335 or P1336 first. (See EC-260, 265 or 389.)



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-386.

OR



- 1) Turn ignition switch "ON".
- 2) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
- 3) Select MODE 7 with GST.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-386.

OR

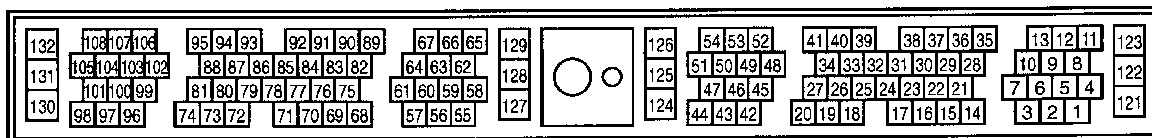
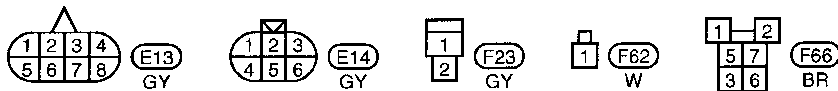
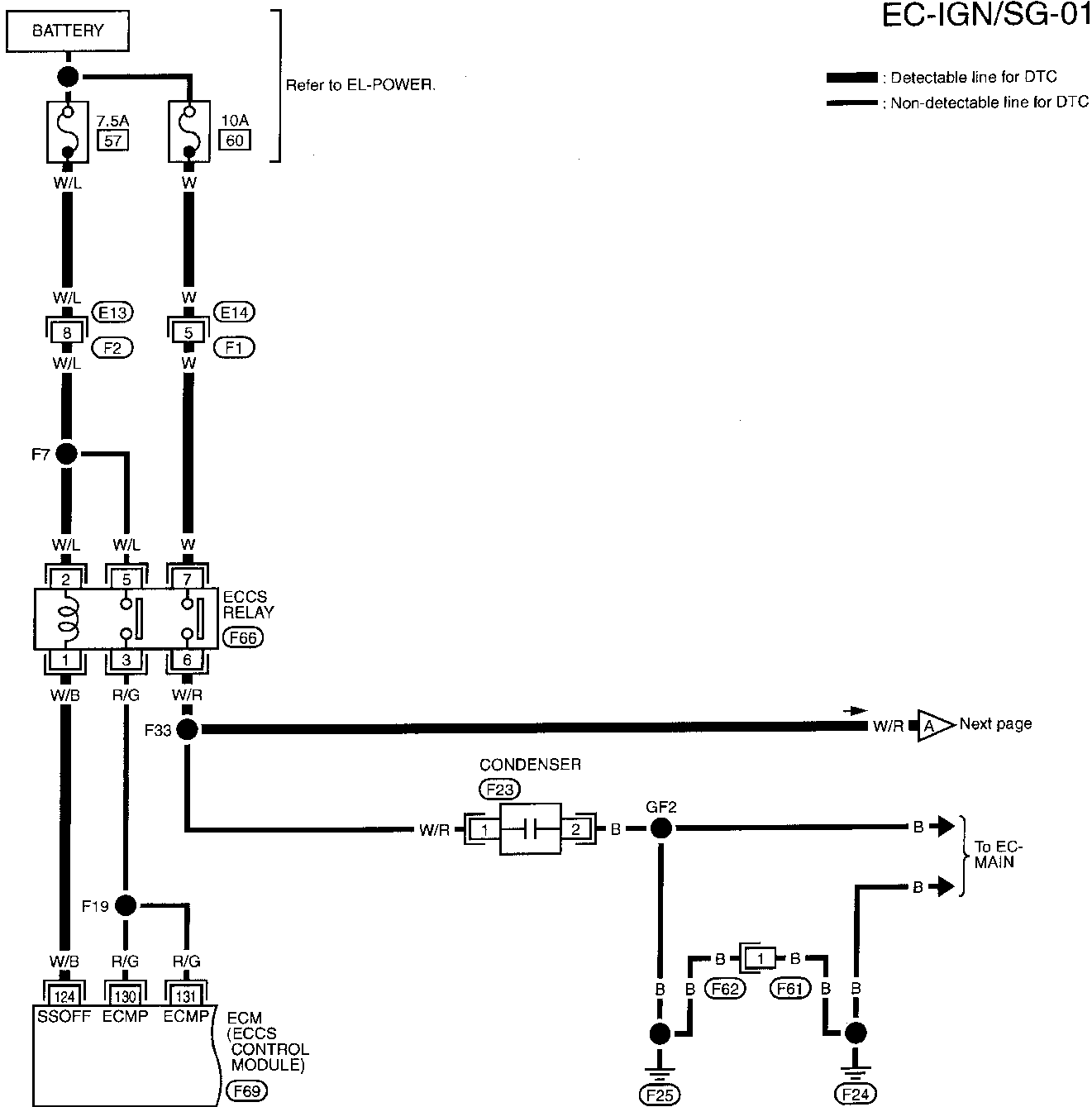


- 1) Turn ignition switch "ON".
- 2) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-386.

TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)

EC-IGN/SG-01

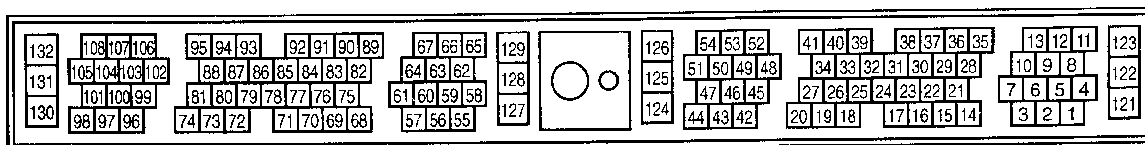
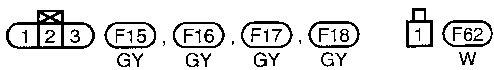
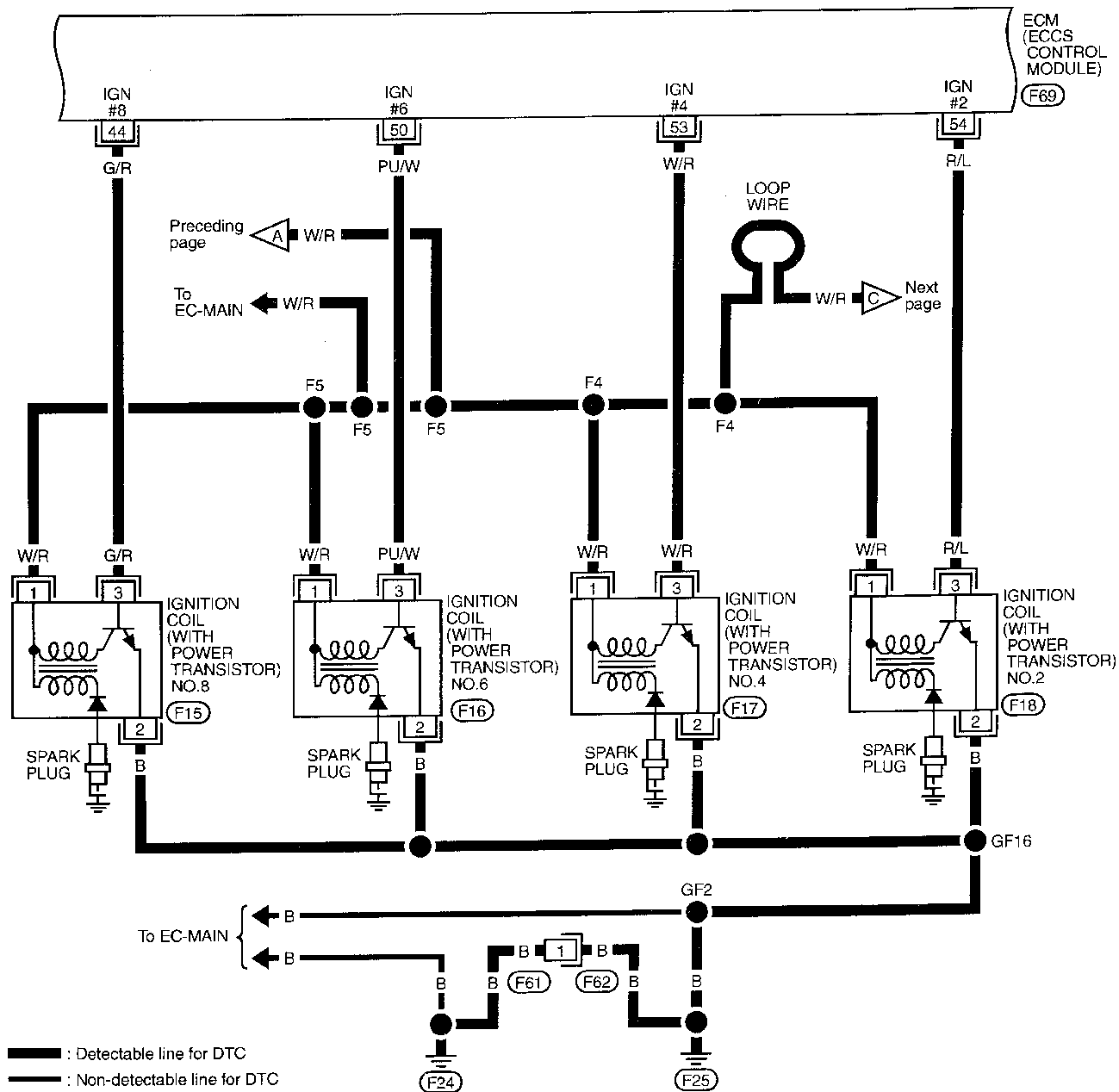


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TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)

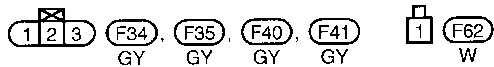
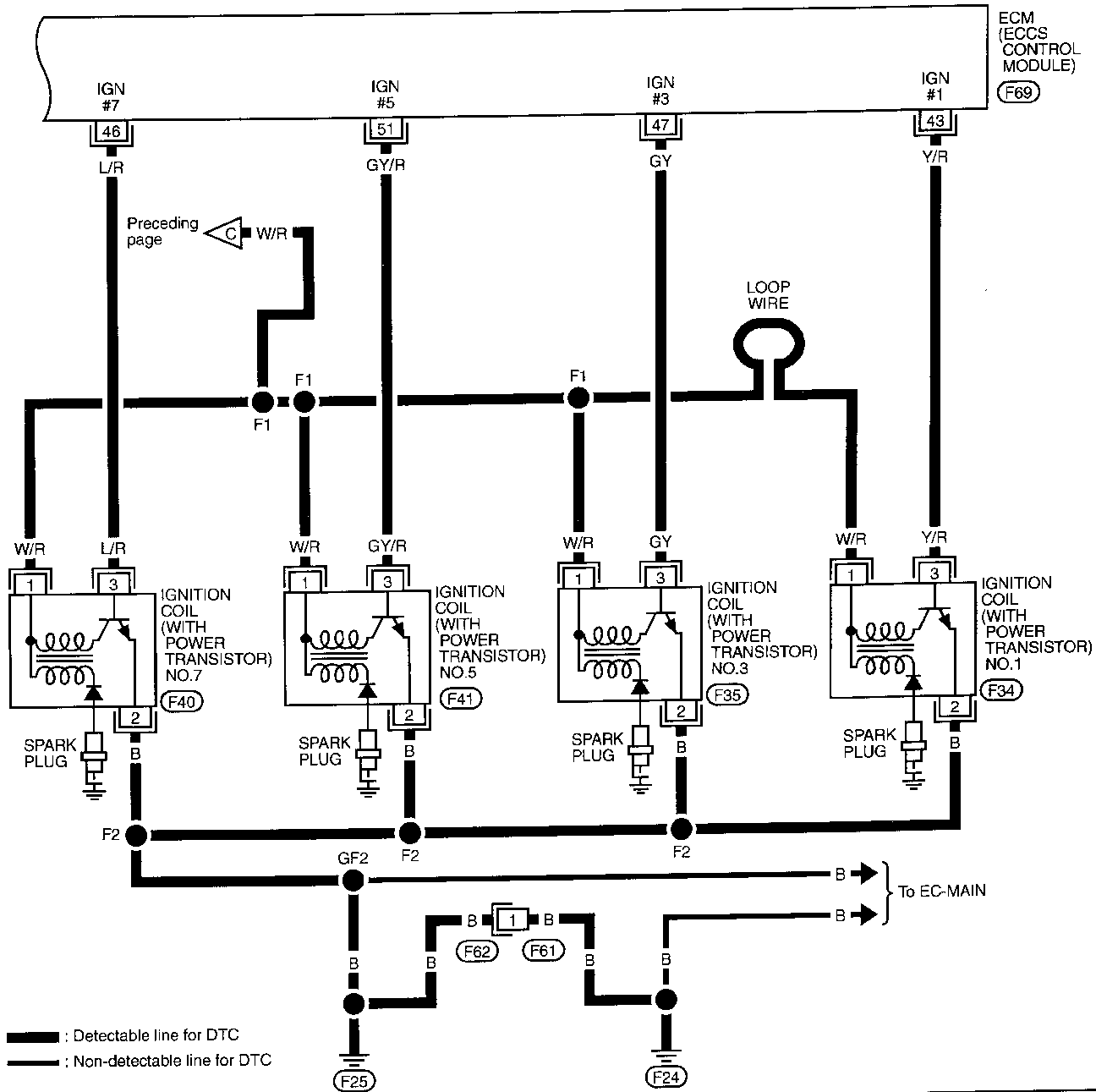
EC-IGN/SG-02



TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)

EC-IGN/SG-03

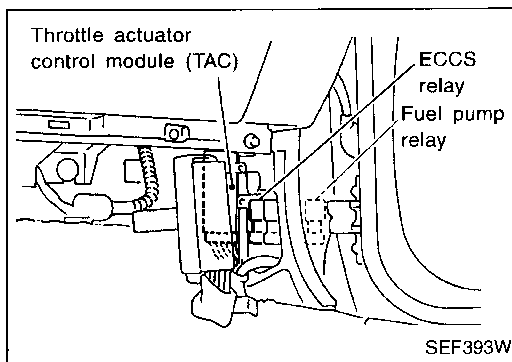


132	108	107	106	95	94	93	92	91	90	89	67	66	65	129	54	53	52	41	40	39	38	37	36	35	13	12	11	123		
131	103	104	103	102	88	87	86	85	84	83	82	64	63	62	126	51	50	49	48	34	33	32	31	30	29	28	10	9	8	122
130	98	97	96	74	73	72	71	70	69	68	61	60	59	58	125	47	46	45	27	26	25	24	23	22	21	7	6	5	4	
											57	56	55	127	124	44	43	42	20	19	18	17	16	15	14	3	2	1	121	



TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd) DIAGNOSTIC PROCEDURE



INSPECTION START

Start engine.
Is engine running?

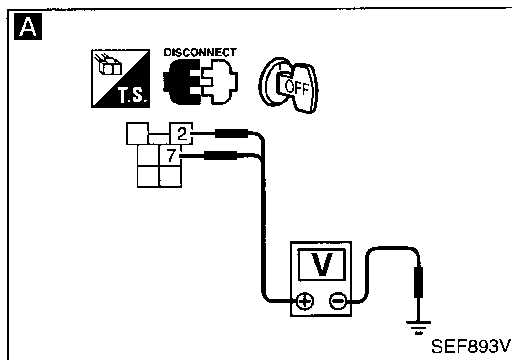
Yes → Go to **D** "SEARCH FOR MALFUNCTIONING CIRCUIT" on next page.

A
CHECK POWER SUPPLY-1.
1. Turn ignition switch "OFF".
2. Disconnect ECCS relay.
3. Check voltage between terminals ②, ⑦ and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.

- Harness connectors (F1), (E14)
- Harness connectors (F2), (E13)
- 10A fuse
- 7.5A fuse
- Harness for open or short between battery and ECCS relay

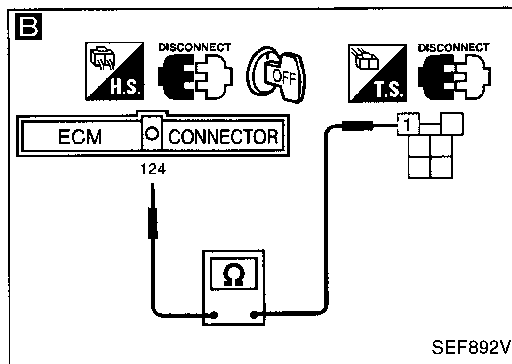
 If NG, repair harness or connectors.



OK →

B
CHECK OUTPUT SIGNAL CIRCUIT-1.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑫ and terminal ①.
Continuity should exist.
If OK, check harness for short to ground and short to power.

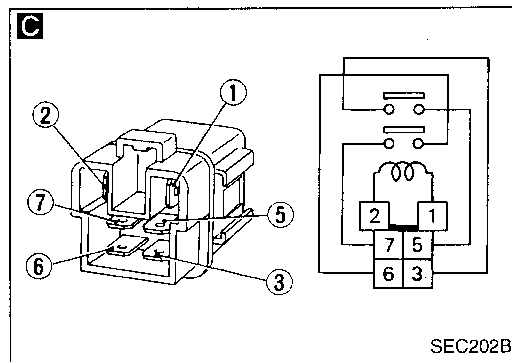
NG → Repair open circuit or short to ground or short to power in harness or connectors.



OK →

C
CHECK ECCS RELAY.
1. Apply 12V direct current between relay terminals ① and ②.
2. Check continuity between relay terminals ③ and ⑤, ⑦ and ⑥.
12V (① - ②) applied:
Continuity exists.
No voltage applied:
No continuity

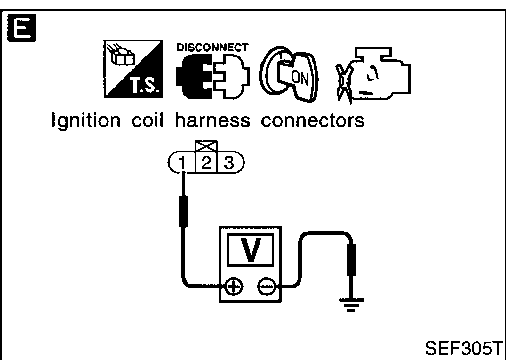
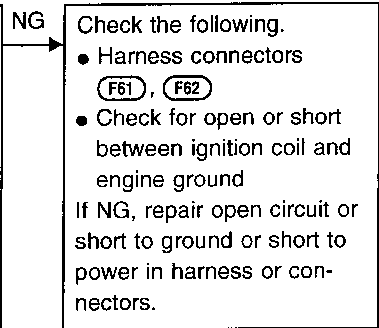
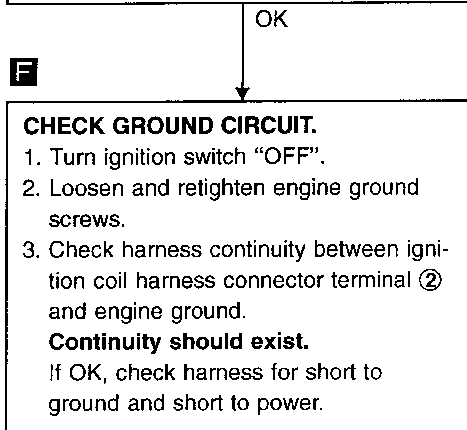
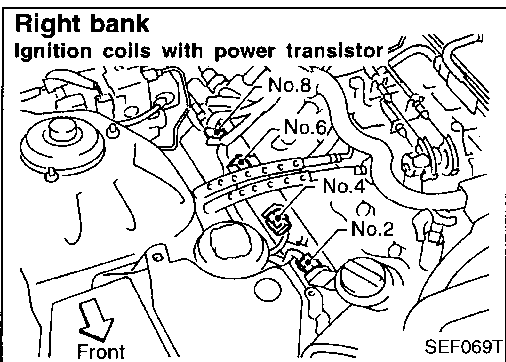
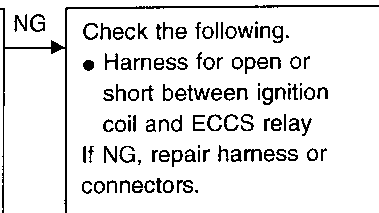
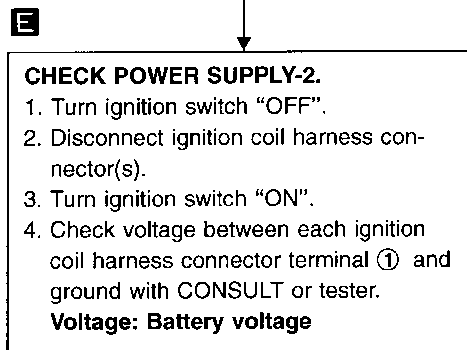
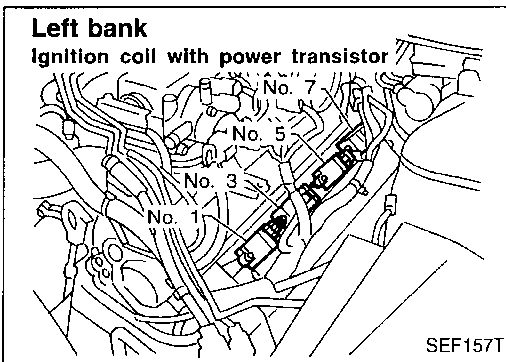
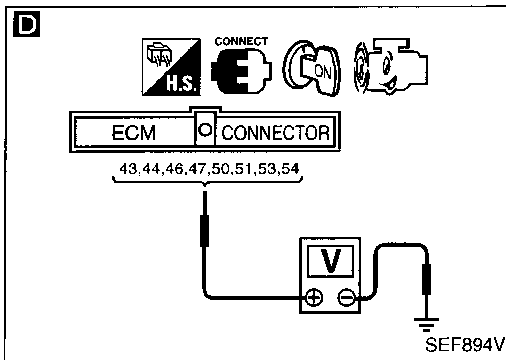
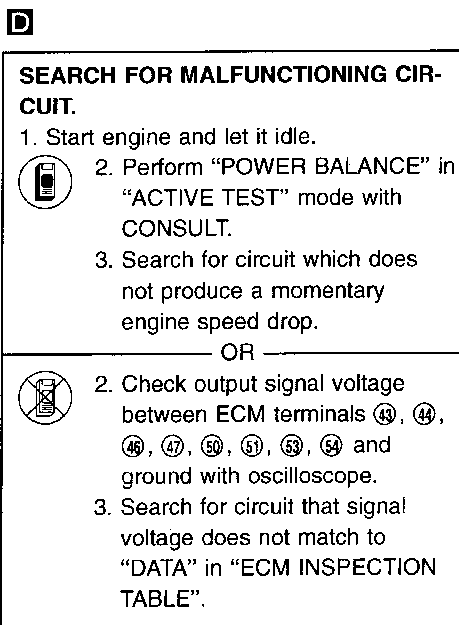
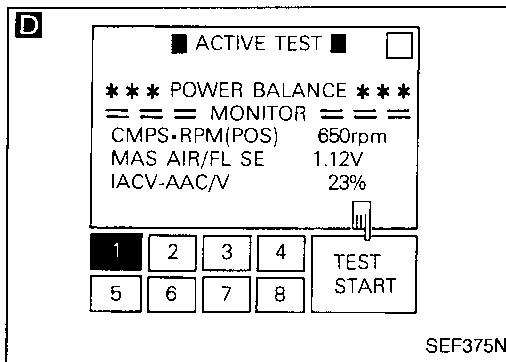
NG → Replace ECCS relay.



OK →

1. Reconnect ECCS relay and ECM harness connector.
2. Go to **E** "CHECK POWER SUPPLY-2" on next page.

Ignition Signal (Cont'd)



OK

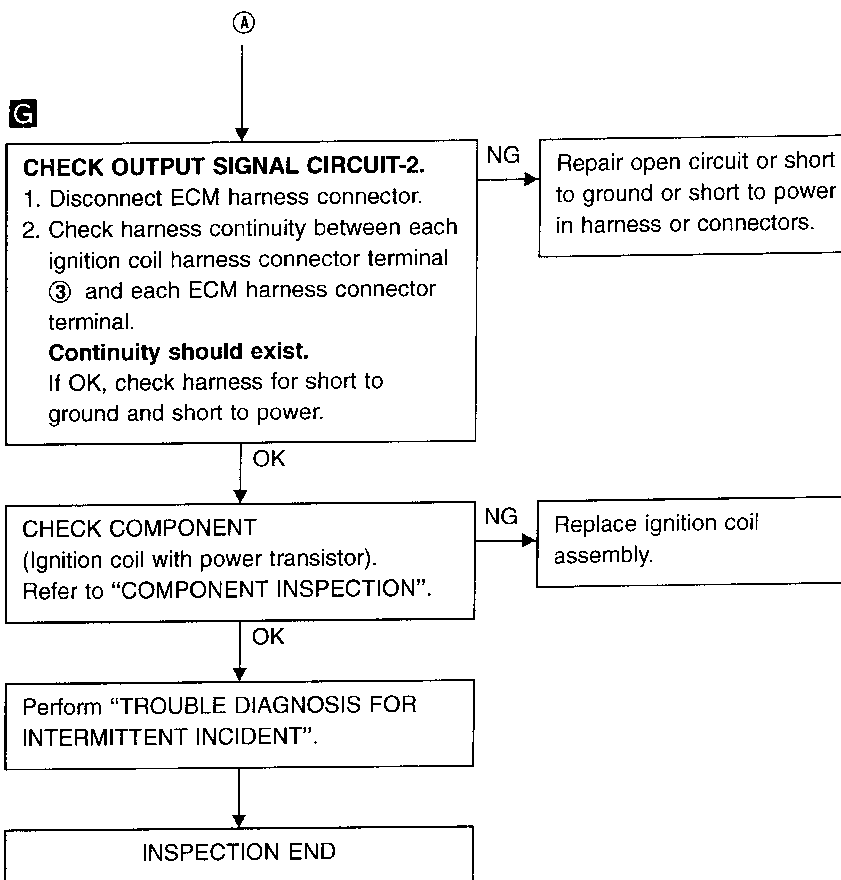
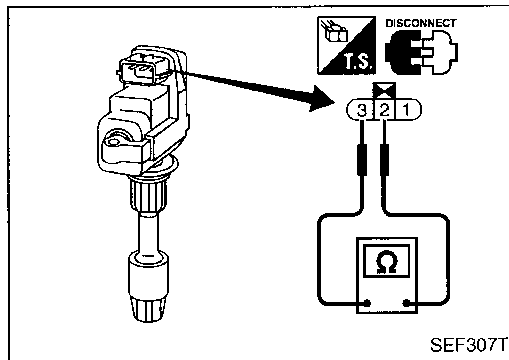
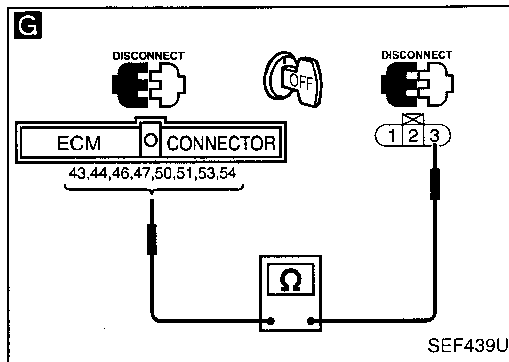
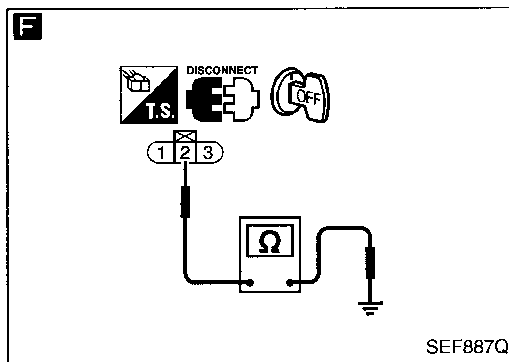
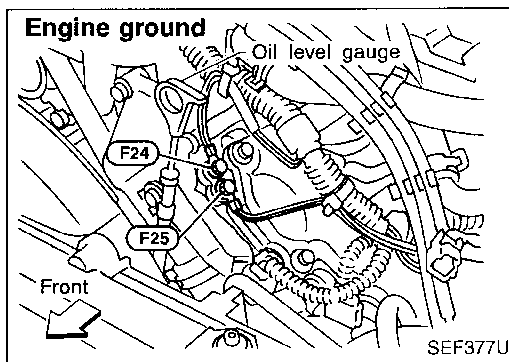
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TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)



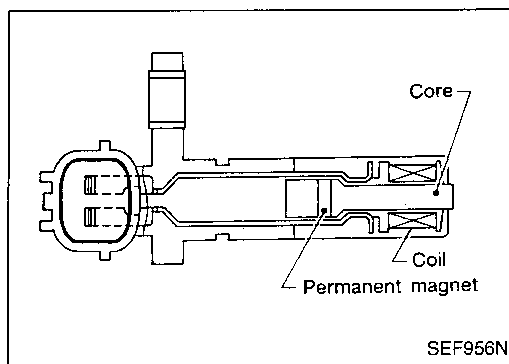
COMPONENT INSPECTION

Ignition coil with power transistor

1. Disconnect ignition coil with power transistor harness connector.
2. Check ignition coil with power transistor for resistance between terminals ③ and ②.

Terminals	Resistance	Result
③ and ②	Not 0Ω	OK
	0Ω	NG

If NG, replace ignition coil with power transistor assembly.



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

COMPONENT DESCRIPTION

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

The sensor consists of a permanent magnet, core and coil. When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

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

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

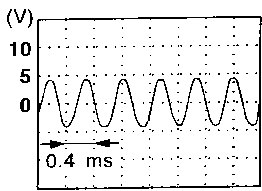
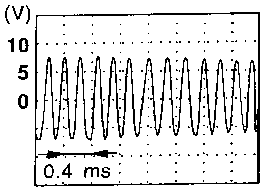
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

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

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ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
57	B/R	Crankshaft position sensor (OBD)	<p>Engine is running. (Warm-up condition)</p> <p>└ Idle speed</p>	<p>Approximately 1.7V</p> 
			<p>Engine is running. (Warm-up condition)</p> <p>└ Engine speed is 2,000 rpm.</p>	<p>Approximately 0V</p> 

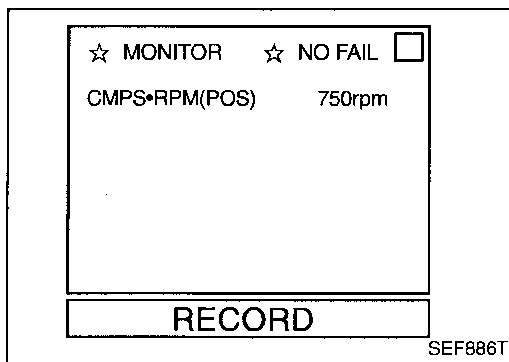
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ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1336 0905	<ul style="list-style-type: none"> Chipping of the signal plate (on drive plate) gear teeth (cogs) is detected by the ECM. 	<ul style="list-style-type: none"> Harness or connectors Crankshaft position sensor (POS) Signal plate (drive plate) Dead (Weak) battery

EL
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TROUBLE DIAGNOSIS FOR DTC P1336



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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

TESTING CONDITION:

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



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 3 minutes at idle speed.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-392.

OR



- 1) Start engine and run it for at least 3 minutes at idle speed.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-392.

OR

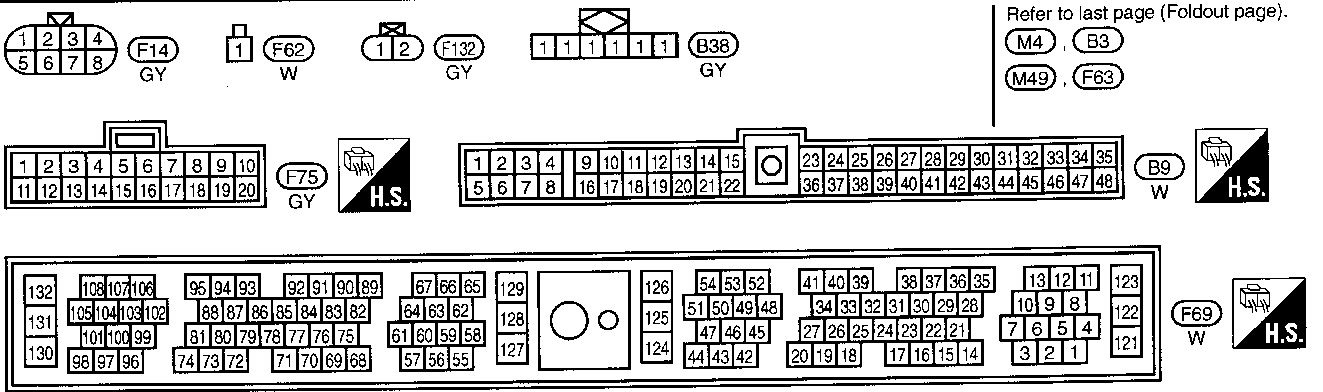
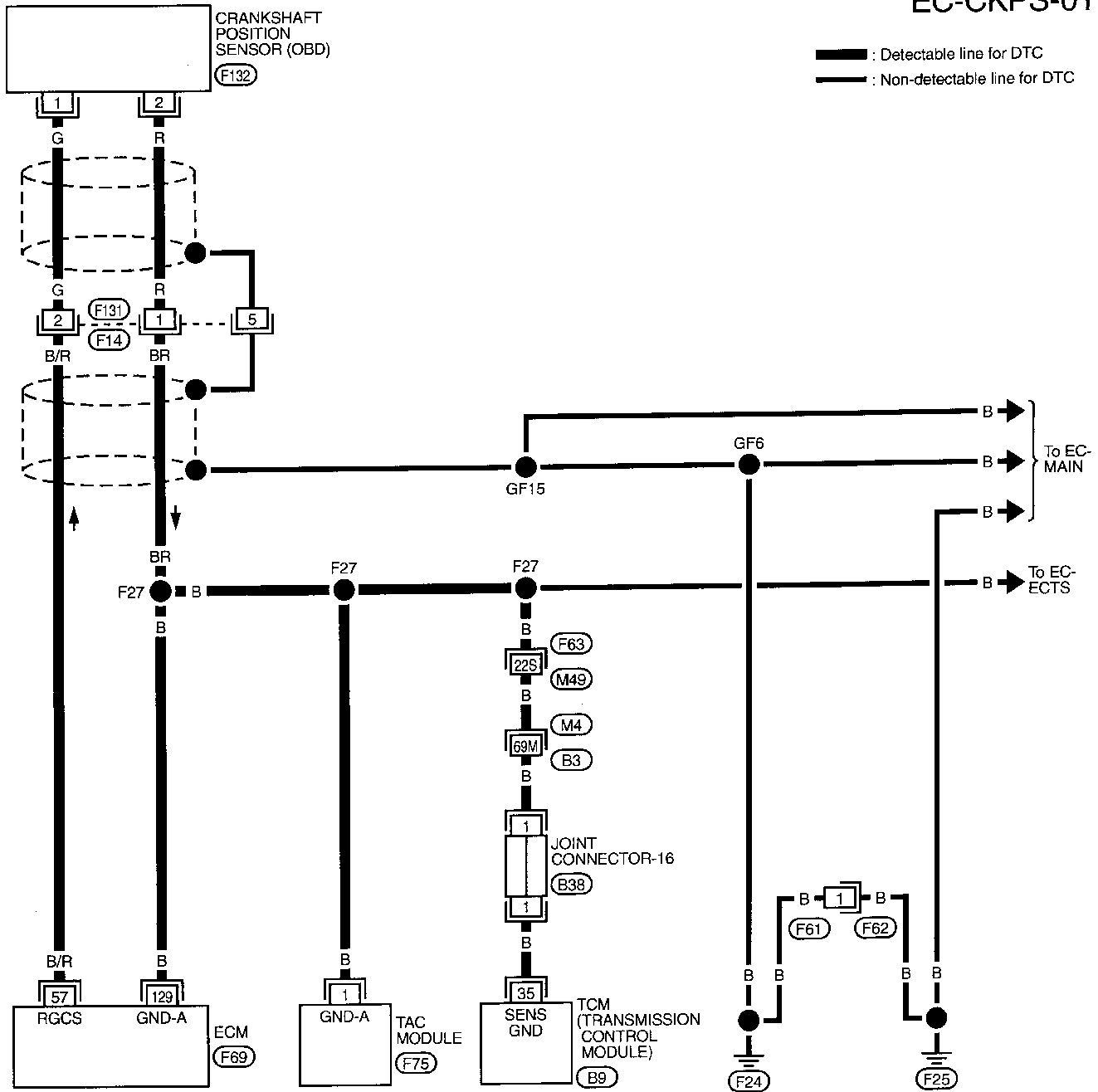


- 1) Start engine and run it for at least 3 minutes at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-392.

TROUBLE DIAGNOSIS FOR DTC P1336

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

EC-CKPS-01

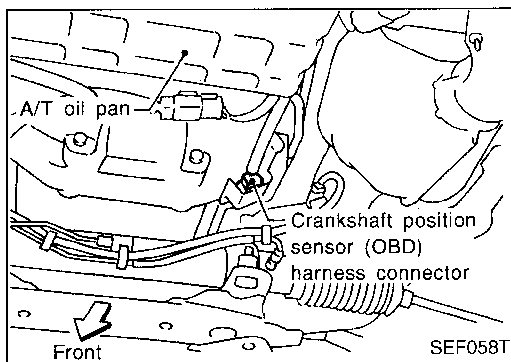


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TROUBLE DIAGNOSIS FOR DTC P1336

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

DIAGNOSTIC PROCEDURE



INSPECTION START

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

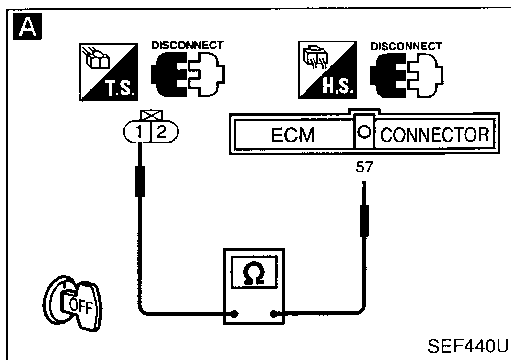
A

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 ⑦ with CONSULT or tester.

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

- NG
- Check the following.
- Harness connectors (F14), (F131)
 - Harness for open or short between crankshaft position sensor (OBD) and ECM
- If NG, repair open circuit or short to ground or short to power in harness or connectors.



OK

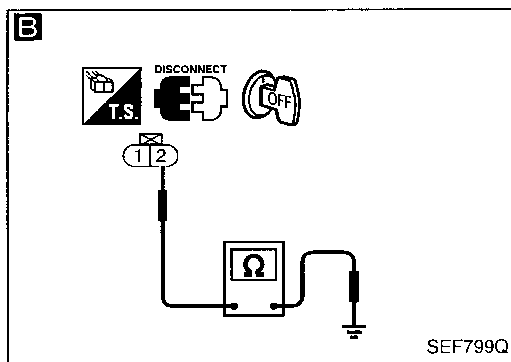
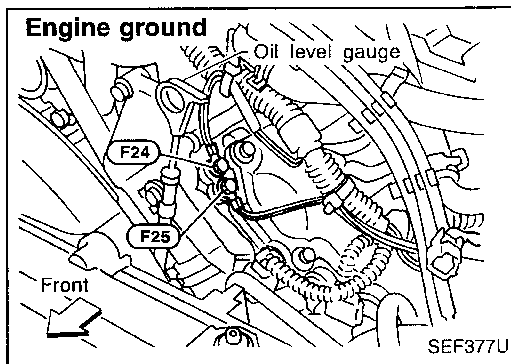
B

CHECK GROUND CIRCUIT.

1. Reconnect ECM harness connector.
2. Check harness continuity between terminal ② and engine ground.

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

- NG
- Check the following.
- Harness connectors (F14), (F131)
 - Harness connectors (F63), (M69)
 - Harness connectors (M4), (B3)
 - Joint connector-16
 - Harness for open or short between crankshaft position sensor (OBD) harness connector and ECM
 - Harness for open or short between crankshaft position sensor (OBD) and throttle actuator control (TAC) module
 - Harness for open or short between crankshaft position sensor and TCM
- If NG, repair open circuit or short to ground or short to power in harness or connectors.



OK

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

NG

Replace crankshaft position sensor (OBD).

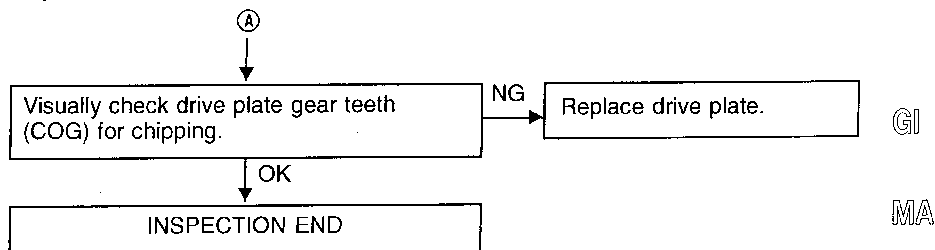
OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

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TROUBLE DIAGNOSIS FOR DTC P1336

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



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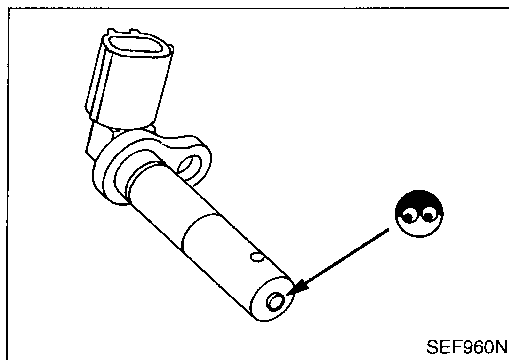
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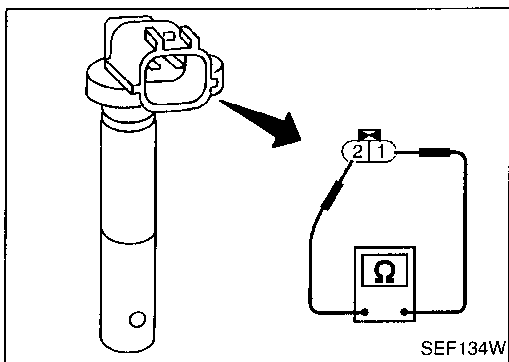
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COMPONENT INSPECTION

Crankshaft position sensor (OBD)

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

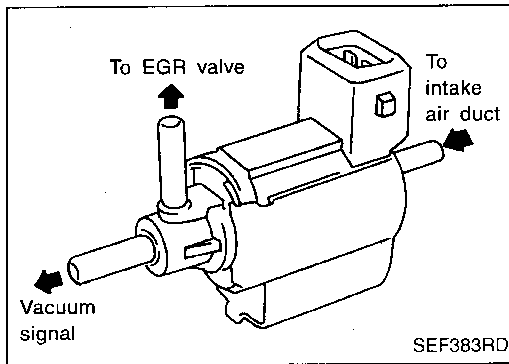


5. Check resistance as shown in the figure.

Resistance:

Approximately 166.5 - 203.5Ω [at 20°C (68°F)]

TROUBLE DIAGNOSIS FOR DTC P1400



EGRC-solenoid Valve

COMPONENT DESCRIPTION

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to flow the vacuum signal (from the intake manifold collector to the EGR valve.)

The vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve. When the ECM sends an OFF signal, the plunger is returned by the spring and cut the vacuum signal.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGRC SOL/V	<ul style="list-style-type: none"> Engine: After warming up Air conditioner switch: "OFF" Shift lever: "D" No-load 	Idle	OFF
		Revvng engine up from idle to 3,000 rpm	ON

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
10	LY	EGRC-solenoid valve	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) <ul style="list-style-type: none"> Lift up drive wheels and rev engine up from idle to 3,000 rpm in "1st" position. 	0 - 0.7V
			<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) <ul style="list-style-type: none"> Idle speed 	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1400 1005	<ul style="list-style-type: none"> The improper voltage signal is sent to ECM through EGRC-solenoid valve. 	<ul style="list-style-type: none"> Harness or connectors (The EGRC-solenoid valve circuit is open or shorted.) EGRC-solenoid valve

TROUBLE DIAGNOSIS FOR DTC P1400

EGRC-solenoid Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

TESTING CONDITION:

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

GI



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT and wait at least 5 seconds.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-397.

MA

EM

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-397.

LC

EC

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and perform "Diagnostic Test Mode (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-397.

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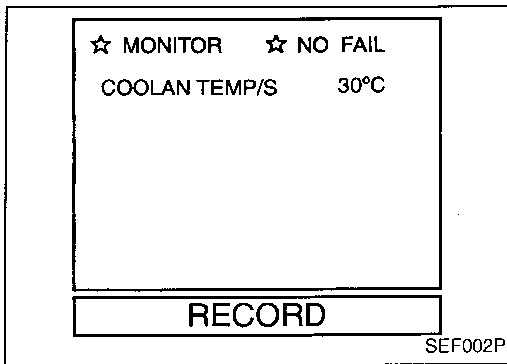
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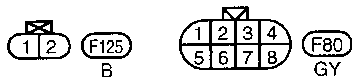
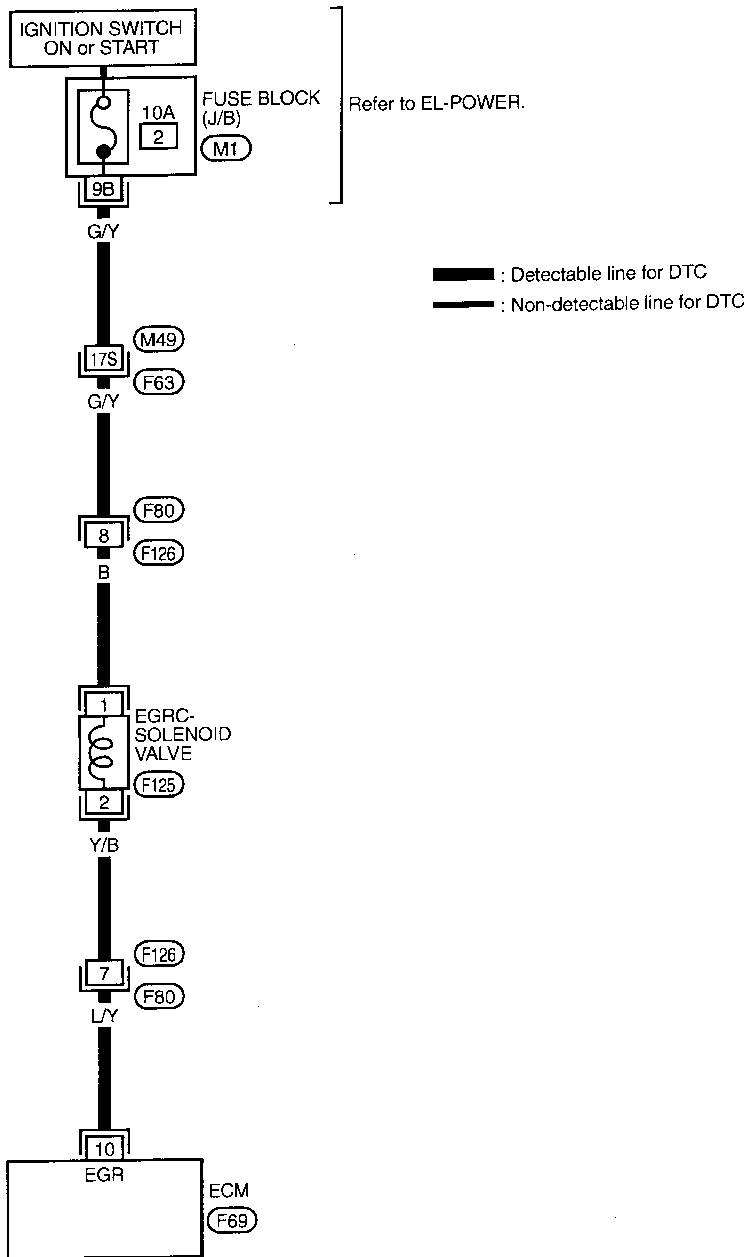
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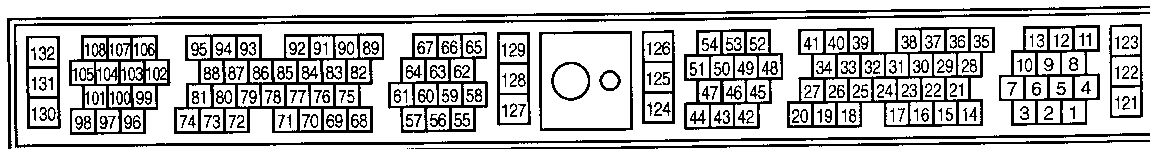
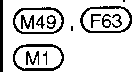
TROUBLE DIAGNOSIS FOR DTC P1400

EGRC-solenoid Valve (Cont'd)

EC-EGRC/V-01



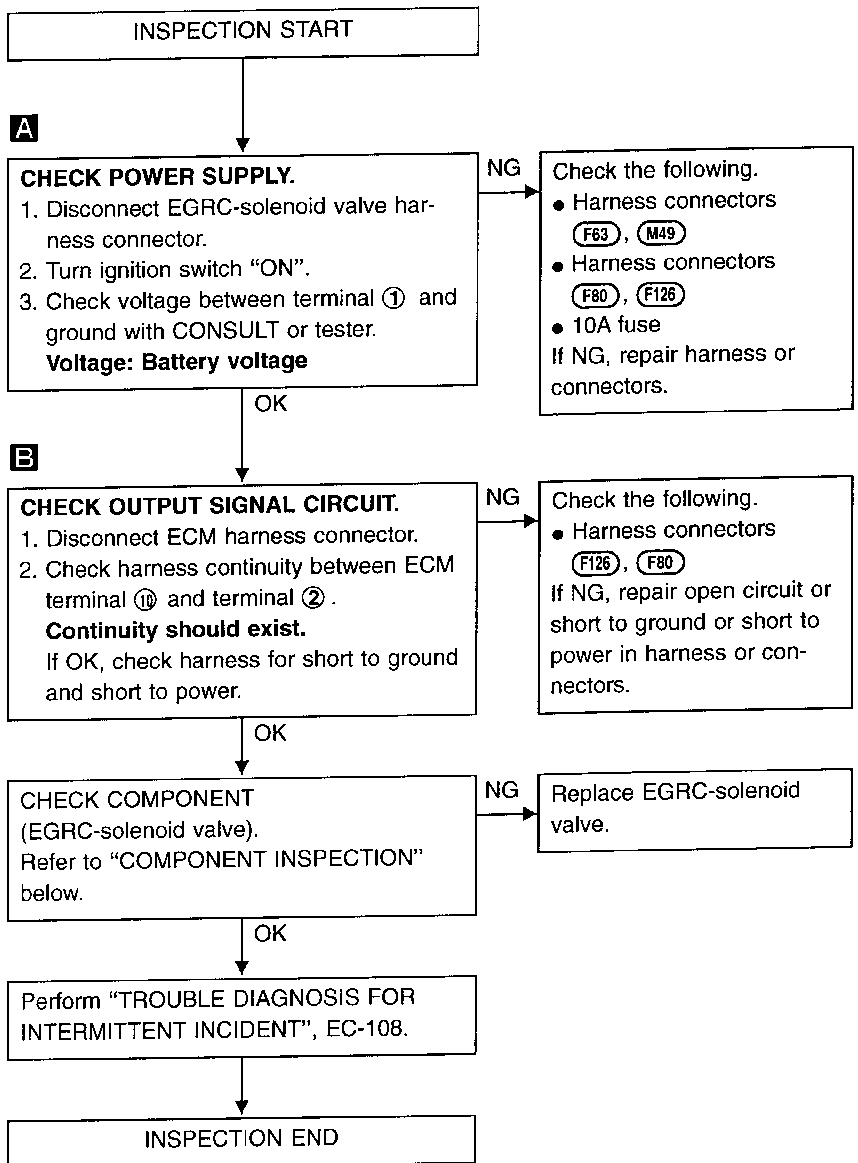
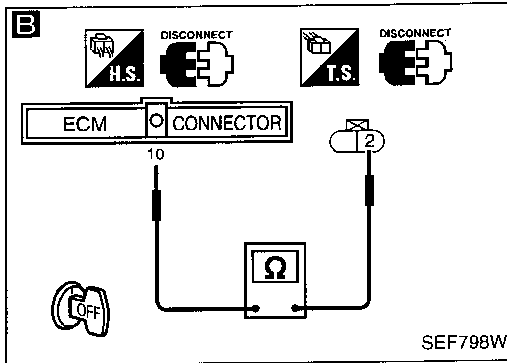
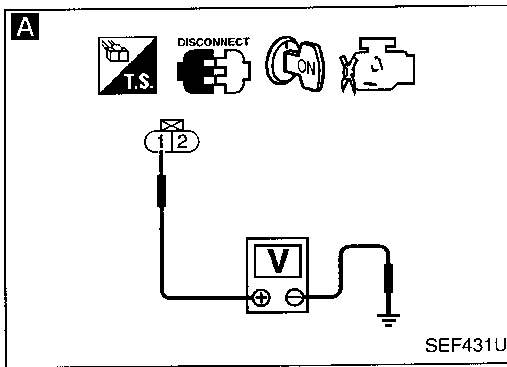
Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR DTC P1400

EGRC-solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE



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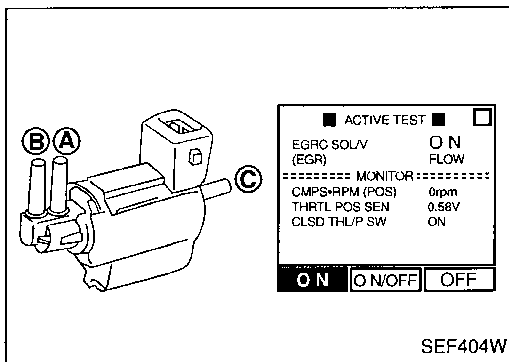
TROUBLE DIAGNOSIS FOR DTC P1400

EGRC-solenoid Valve (Cont'd)

EGRC-solenoid valve

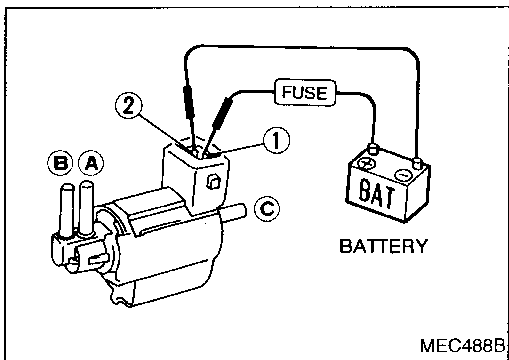
Check air passage continuity.

 Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.



Condition EGRC SOLENOID VALVE	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
ON	Yes	No
OFF	No	Yes

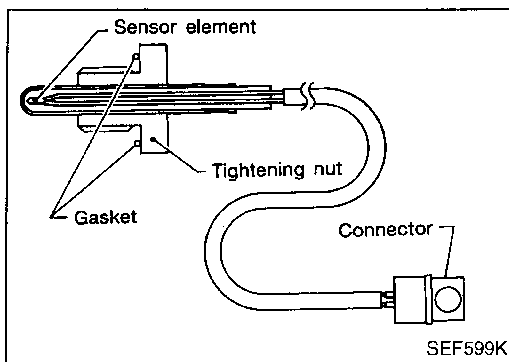
OR



Check solenoid valve, following the table as shown below:

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

If NG or operation takes more than 1 second, replace the solenoid valve.

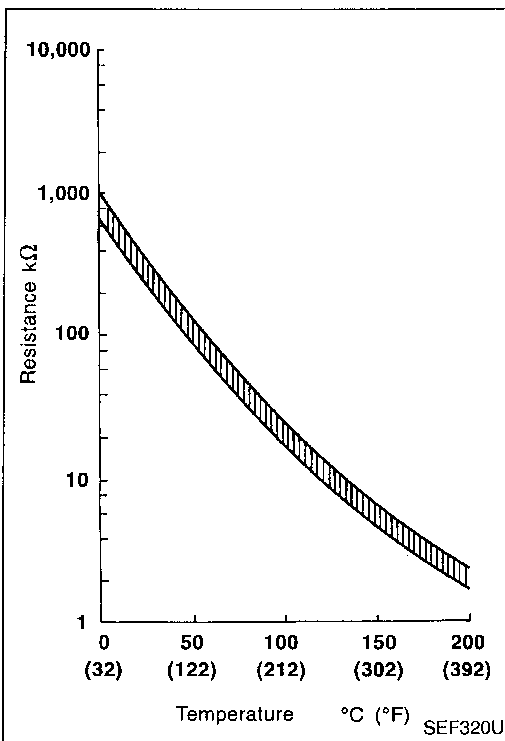


EGR Temperature Sensor

COMPONENT DESCRIPTION

The EGR temperature sensor detects temperature changes in the EGR passage way. When the EGR valve opens, hot exhaust gases flow, and the temperature in the passage way changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases.

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



EGR temperature °C (°F)	Voltage* (V)	Resistance (MΩ)
0 (32)	4.61	0.68 - 1.11
50 (122)	2.53	0.092 - 0.12
100 (212)	0.87	0.017 - 0.024

*: These data are reference values and measured between ECM terminal ③ (EGR temperature sensor) and ECM terminal ⑫ (ECM ground).

When EGR system is operating:
Voltage: 0 - 1.5V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1401 0305	A) An excessively low voltage from the EGR temperature sensor is sent to ECM, even when engine coolant temperature is low.	<ul style="list-style-type: none"> ● 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.	<ul style="list-style-type: none"> ● Harness or connectors (The EGR temperature sensor circuit is open.) ● EGR temperature sensor ● Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve

TROUBLE DIAGNOSIS FOR DTC P1401

★ MONITOR	★ NO FAIL	<input type="checkbox"/>
CMPS•RPM (POS)	0rpm	
COOLAN TEMP/S	20°C	
EGR TEMP SEN	4.3V	
INT/A TEMP SE	22°C	

SEF334R

EGR Temperature Sensor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

NOTE:

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

Procedure for malfunction A



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Verify that engine coolant temperature is less than 40°C (104°F).

If the engine coolant temperature is above the range, cool the engine down.

- 4) Start engine and let it idle for at least 8 seconds.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-403.

OR



- 1) Turn ignition switch "ON".
- 2) Select "MODE 1" with GST.
- 3) Verify that engine coolant temperature is less than 40°C (104°F).

If the engine coolant temperature is above the range, cool the engine down.

- 4) Start engine and let it idle for at least 8 seconds.
- 5) Select "MODE 7" with GST.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-403.

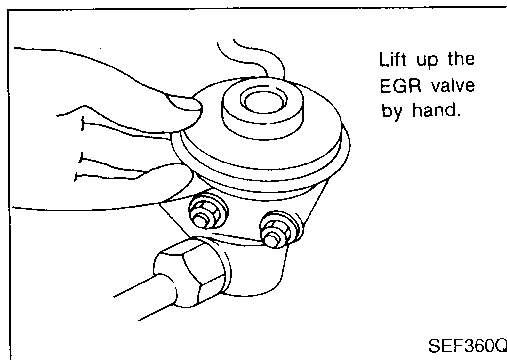
OR



- 1) Turn ignition switch "ON".
- 2) Verify that voltage between ECM terminal ⑥7 (engine coolant temperature) is more 2.7V.

If the voltage is below the range, cool the engine down.

- 3) Start engine and let it idle for at least 8 seconds.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Turn ignition switch "ON" and perform "Diagnostic Test Mode (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-403.



Procedure for malfunction B

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

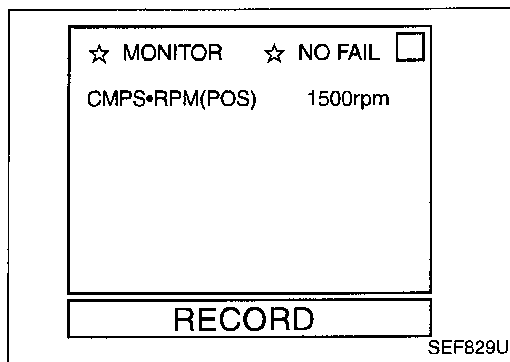
Always perform the test at temperature above -10°C (14°F).



- 1) Start engine and warm it up to normal operating temperature.
- 2) Run engine at idle for at least 2 minutes.

TROUBLE DIAGNOSIS FOR DTC P1401

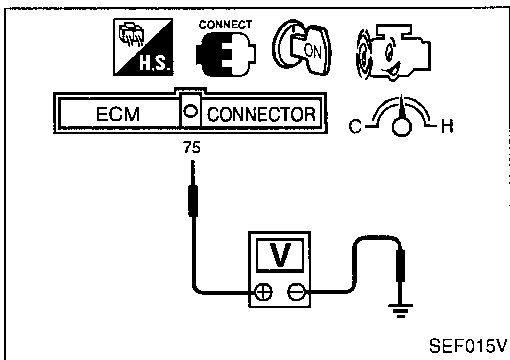
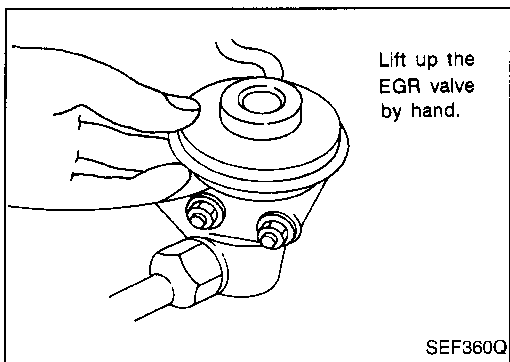
EGR Temperature Sensor (Cont'd)



- 3) Confirm that EGR valve is not lifting.
 If the check result is NG, go to "TROUBLE DIAGNOSES FOR DTC P0400, P0402 and P1402". (See pages EC-271, 280 and 405.)
- 4) Select "DATA MONITOR" mode with CONSULT.
- 5) Read "EGR TEMP SEN" at about 1,500 rpm while holding the EGR valve in full open position by hand.
Voltage should decrease to less than 1.0V.
 If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-403.
 If the check result is OK, go to following step.
- 6) Turn ignition switch "OFF" and wait at least 5 seconds.
- 7) Turn ignition switch "ON".
- 8) Check the output voltage of "THRTL POS SEN" at closed throttle position and note it.
- 9) Start engine (TCS switch "OFF").
- 10) Maintain the following conditions for at least 5 consecutive seconds.
CMPS-RPM (POS): 1,200 - 2,200 rpm
VHCL SPEED SE: 10 km/h (6 MPH) or more
B/FUEL SCHDL: 2.2 - 3.2 msec
THRTL POS SEN: X - (X + 0.52) V
X = Voltage value measured at step 7)
Selector lever: Suitable position
- 11) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-403.

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OR

OVERALL FUNCTION CHECK

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

- 1) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
- 2) Run engine at idle for at least 2 minutes.
- 3) Confirm that EGR valve is not lifting. If NG, go to TROUBLE DIAGNOSES FOR DTC P1402, EC-405.
- 4) Check voltage between ECM terminal 75 and ground at about 1,500 rpm with EGR valve lifted up to the full position by hand.
Voltage should decrease to less than 1.0V.
- 5) If step 4 is OK, perform TROUBLE DIAGNOSES FOR DTC P0400 and P1400, EC-276, 397.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-403.

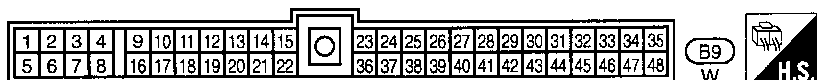
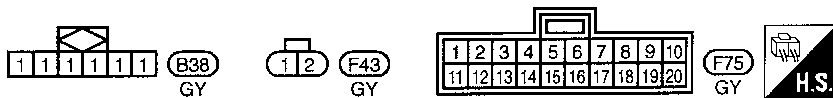
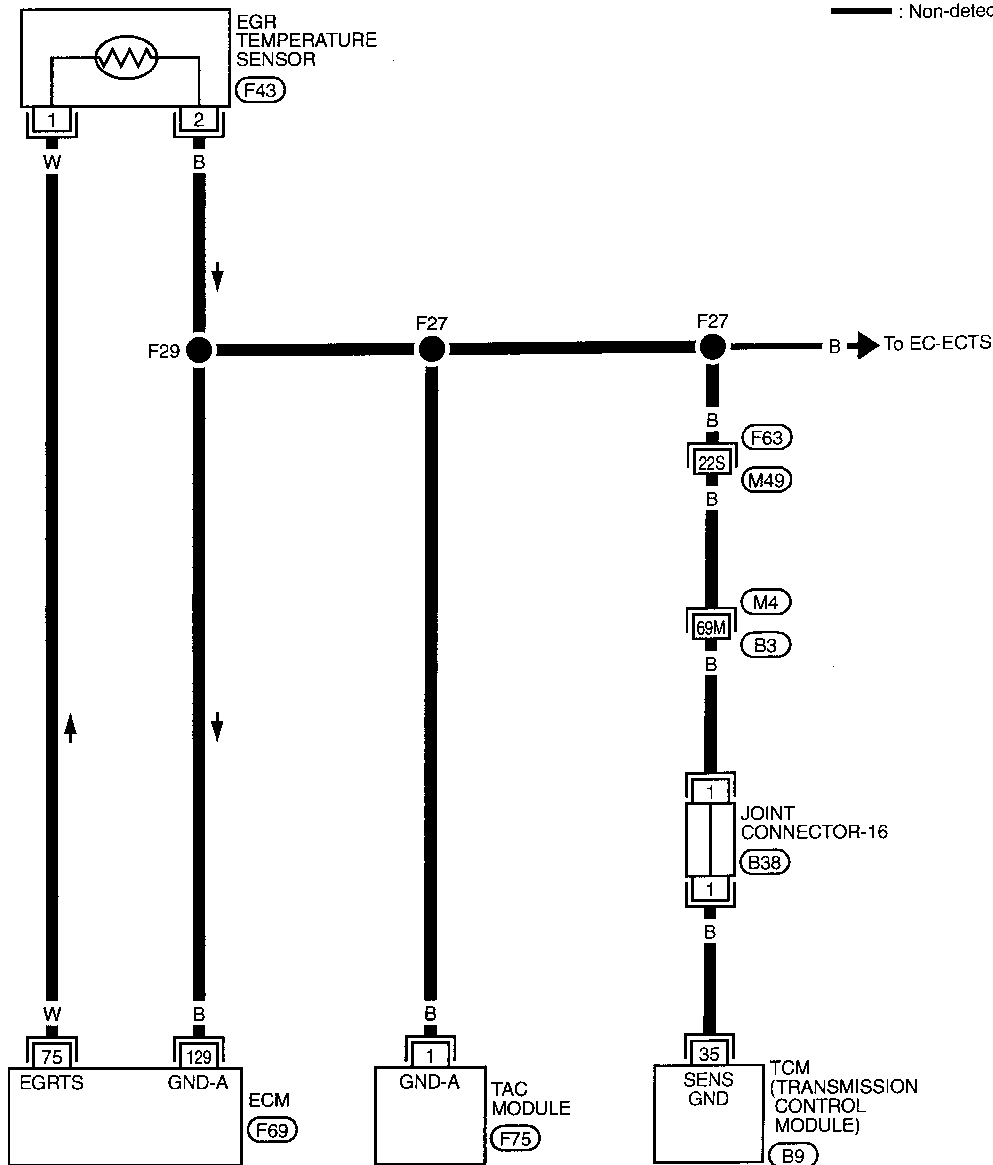
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TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

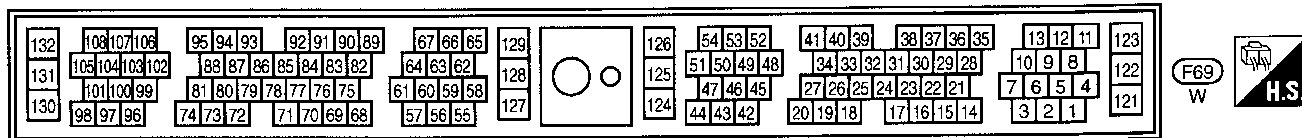
EC-EGR/TS-01

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



Refer to last page (Foldout page).

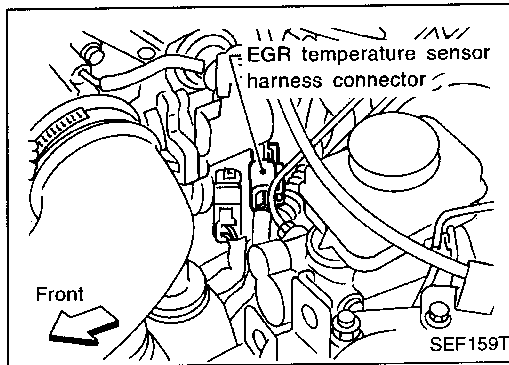
(M4), (B3)
 (M49), (F63)



TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

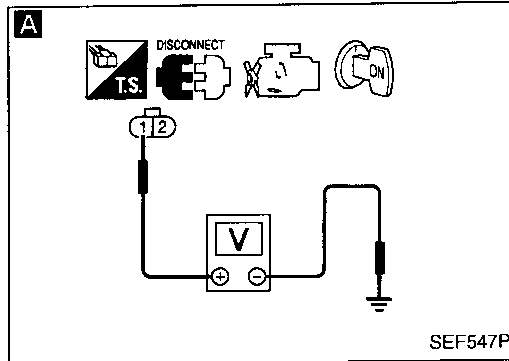
A
CHECK POWER SUPPLY.
 1. Disconnect EGR temperature sensor harness connector.
 2. Turn ignition switch "ON".
 3. Check voltage between terminal ① and ground with CONSULT or tester.
Voltage: Approximately 5V

NG → Repair harness or connectors.

GI

MA

EM



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

NG → Check the following.
 ● Harness connectors (F63, M49)
 ● Harness connectors (M4, B3)
 ● Joint connector-16
 ● Harness for open or short between ECM and EGR temperature sensor
 ● Harness for open or short between EGR temperature sensor and throttle actuator control (TAC) module
 ● Harness for open or short between TCM and EGR temperature sensor
 If NG, repair open circuit or short to ground or short to power in harness or connectors.

LC

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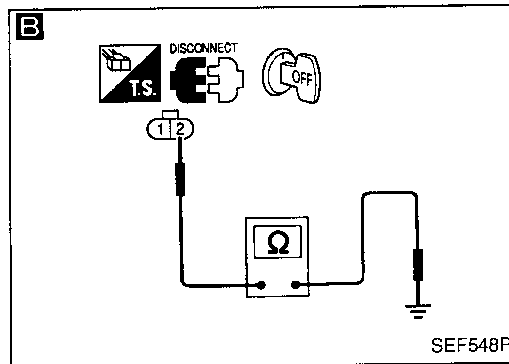
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CHECK COMPONENT
 (EGR temperature sensor).
 Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGR temperature sensor.

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Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

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INSPECTION END

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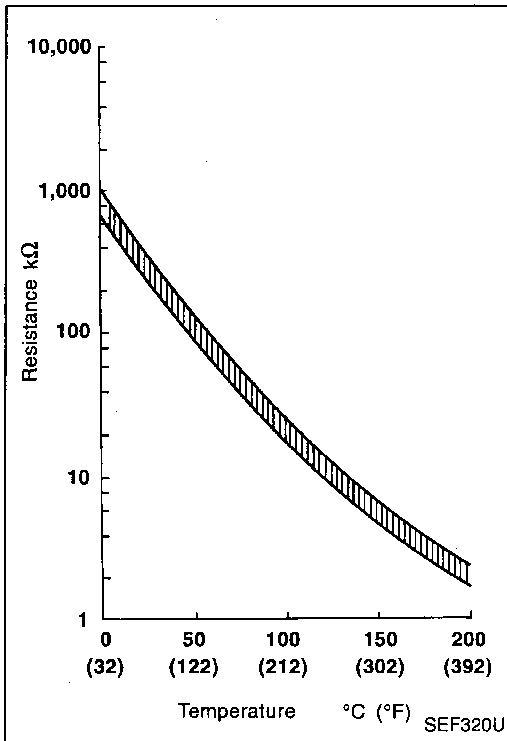
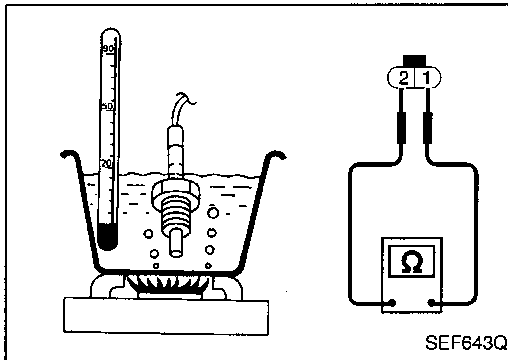
TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

COMPONENT INSPECTION

EGR temperature sensor

Check resistance change and resistance value.

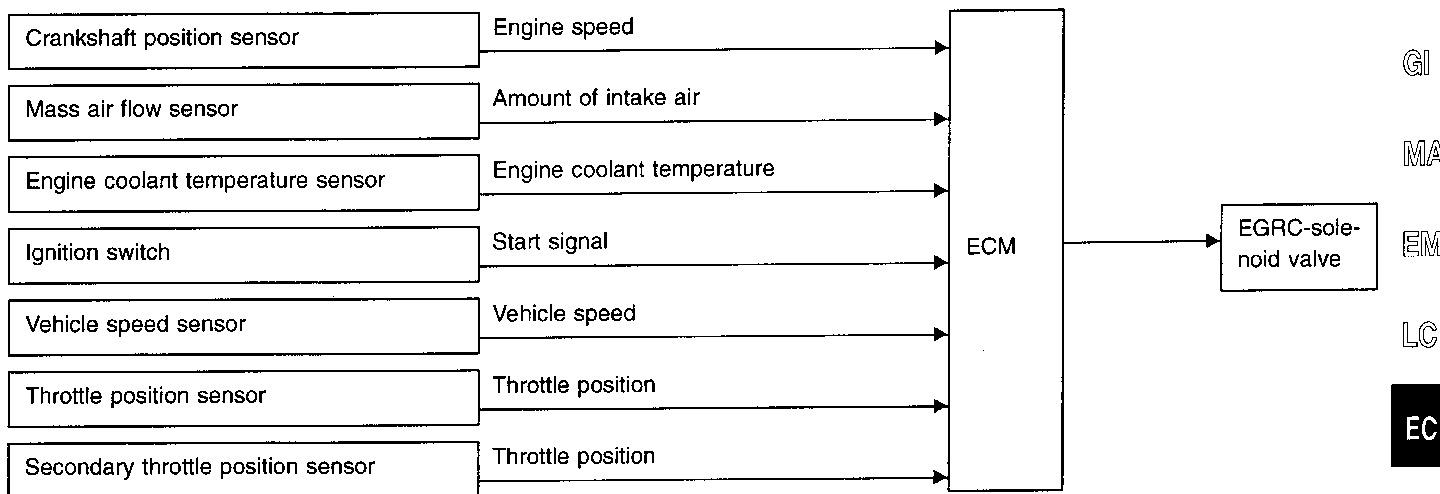


EGR temperature °C (°F)	Voltage* (V)	Resistance (MΩ)
0 (32)	4.61	0.68 - 1.11
50 (122)	2.53	0.092 - 0.12
100 (212)	0.87	0.017 - 0.024

If NG, replace EGR temperature sensor.

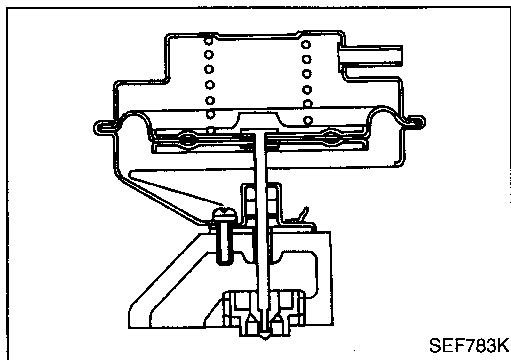
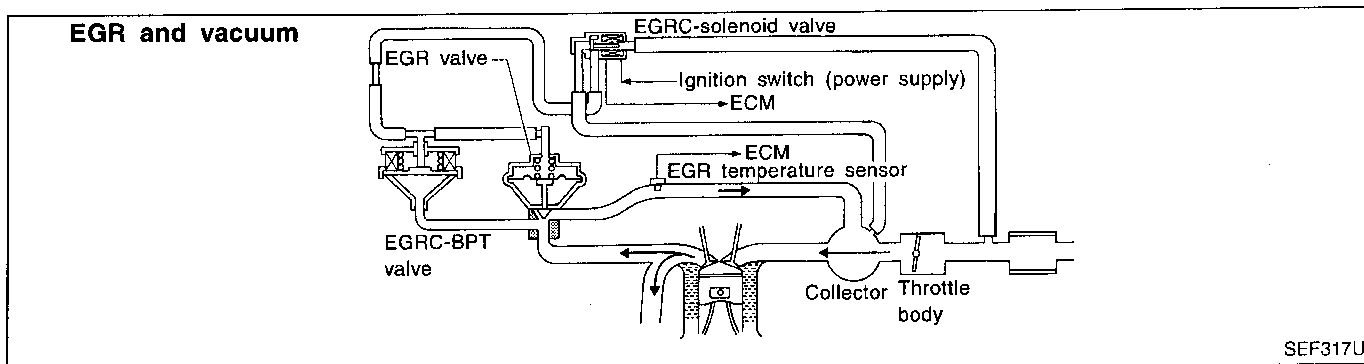
EGR Function (Open)

SYSTEM DESCRIPTION



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

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



COMPONENT DESCRIPTION

Exhaust gas recirculation (EGR) valve

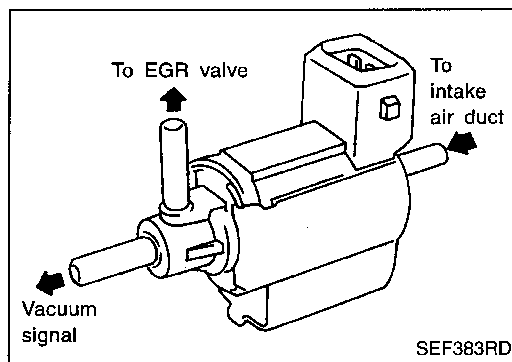
The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

EGRC-solenoid valve

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. The signal reaches to the EGR valve. When the ECM sends an OFF signal, a plunger will then move to cut the vacuum signal from the intake manifold collector to the EGR valve.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

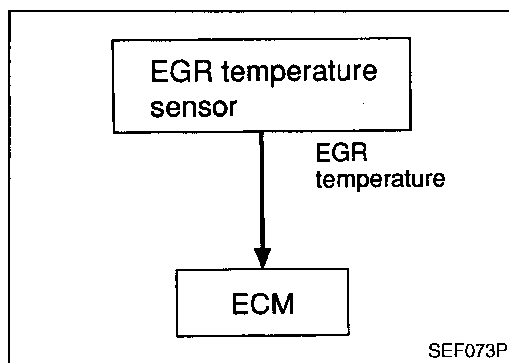
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EGR TEMP SEN	<ul style="list-style-type: none"> Engine: After warming up 	Less than 4.5V
EGRC SOL/V	<ul style="list-style-type: none"> Engine: After warming up Air conditioner switch: "OFF" Shift lever: "N" No-load Idle	OFF
	Revving engine up from idle to 3,000 rpm	ON

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
75	W	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V
			Engine is running. (Warm-up condition) └ EGR system is operating.	0 - 1.0V
10	L/Y	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Lift up drive wheels and rev engine up from idle to 3,000 rpm in "D" position.	0 - 0.7V
			Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)



ON BOARD DIAGNOSIS LOGIC

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

NOTE:

Diagnosis for this DTC will end when engine coolant temperature is approx. 50 to 60°C (122 to 140°F). Ignition switch must be turned "ON" (engine start) with engine coolant temperature below 40°C (104°F) when starting DTC confirmation procedure.

TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1402 0514	<ul style="list-style-type: none"> EGR flow is detected under conditions that do not call for EGR. 	<ul style="list-style-type: none"> EGRC-solenoid valve EGR valve leaking or stuck open EGR temperature sensor EGRC-BPT valve

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■ EGR SYSTEM P1402 ■

CHECK ENGINE COOLANT TEMP WITH DATA MONITOR. IS COOLANT TEMP BETWEEN -10°C - 40°C (14°F - 104°F)?

NO YES

SEF803W

★ MONITOR ★ NO FAIL

CMPS•RPM (POS)	0rpm
COOLAN TEMP/S	20°C
EGR TEMP SEN	4.3V
INT/A TEMP SE	22°C

SEF334R

■ EGR SYSTEM P1402 ■

OUT OF CONDITION

===== MONITOR =====

CMPS-RPM(POS)	0rpm
THRTL POS SEN	0.40V
B/FUEL SCHDL	1.9msec

SEF385W

■ EGR SYSTEM P1402 ■

TESTING

===== MONITOR =====

CMPS-RPM(POS)	737rpm
THRTL POS SEN	0.50V
B/FUEL SCHDL	3.0msec

SEF386W

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

TESTING CONDITION:

- Always perform the test at temperature above -10°C (14°F).

- Engine coolant temperature and EGR temperature must be verified in "DATA MONITOR" mode with CONSULT before starting DTC WORK SUPPORT test. If it is out of range below, the test cannot be conducted.

COOLAN TEMP/S: -10 to 40°C (14 to 104°F)

EGR TEMP SEN: Less than 4.8V

If the values are out of the ranges indicated above, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to reduce the coolant or EGR temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.



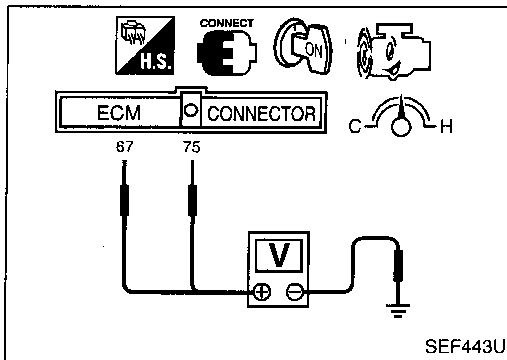
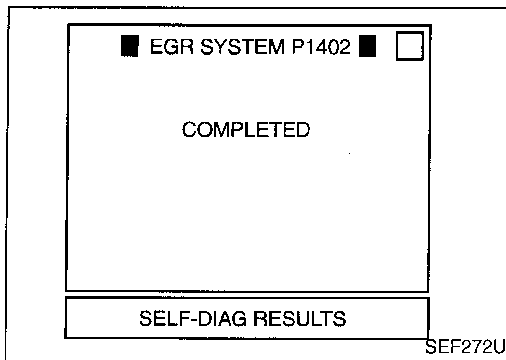
- Turn ignition switch "OFF" and wait at least 5 seconds. Then turn ignition switch "ON".
- Select "EGR SYSTEM P1402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Follow instruction of CONSULT.
- Start engine and let it idle until "TESTING" on CONSULT screen is turned to "COMPLETED". (It will take 70 seconds or more.)

If "TESTING" is not displayed after 5 minutes, turn ignition "OFF" and cool the engine coolant temperature to the range of -10 to 40°C (14 to 104°F). Retry from step 1).

- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-410.

TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)



OR



- 1) Turn ignition switch "ON" and select "MODE 1" with GST.
- 2) Check that engine coolant temperature is within the range of -10 to 40°C (14 to 104°F).
- 3) Check that voltage between ECM terminal 75 (EGR temperature) and ground is less than 4.8V.
- 4) Start engine (TCS switch "OFF") and let it idle for at least 70 seconds.
- 5) Stop engine.
- 6) Perform the step 1) to 4) again.
- 7) Select "MODE 3" with GST.
- 8) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-410.

OR



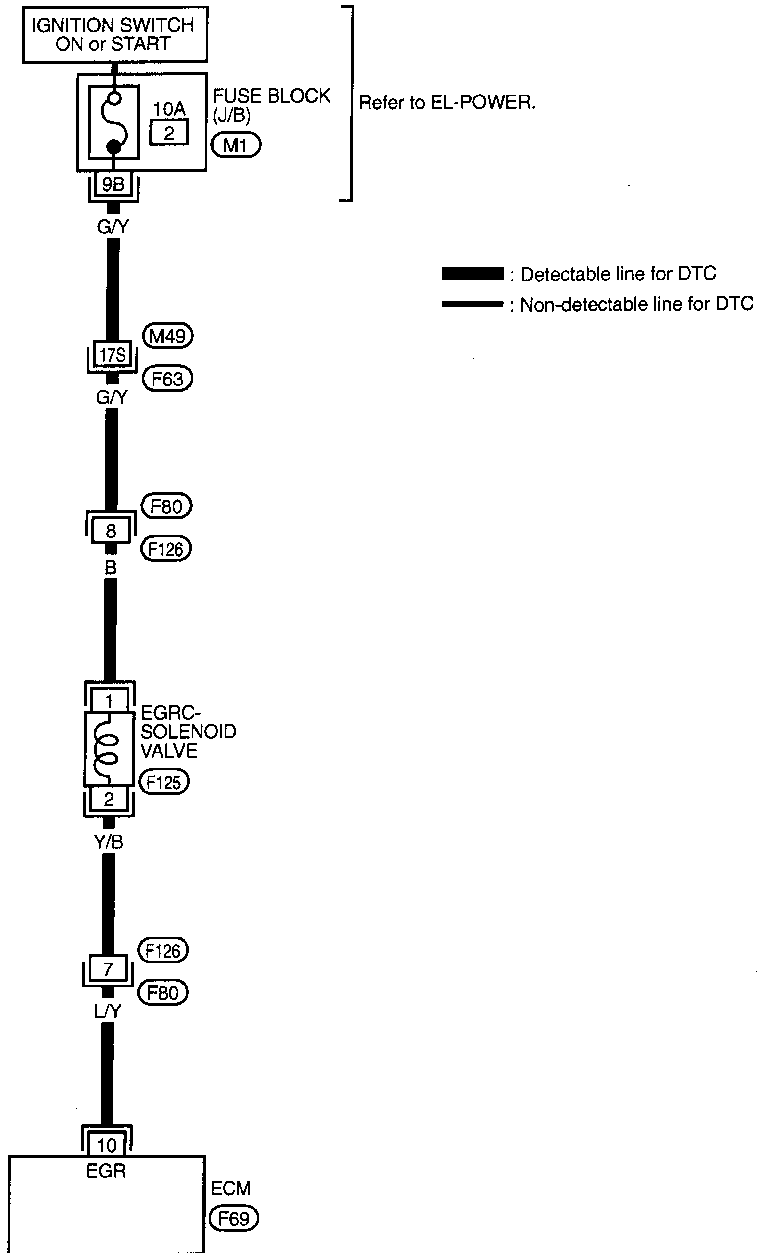
- 1) Turn ignition switch "ON".
- 2) Check the following voltages.
ECM terminal 67 (Engine coolant temperature) and ground:
2.7 - 4.4V
ECM terminal 75 (EGR temperature) and ground:
Less than 4.8V
- 3) Start engine and let it idle for at least 70 seconds.
- 4) Turn ignition "OFF" and wait at least 5 seconds.
- 5) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-410.

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 MODE7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.

TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

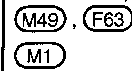
EC-EGRC/V-01



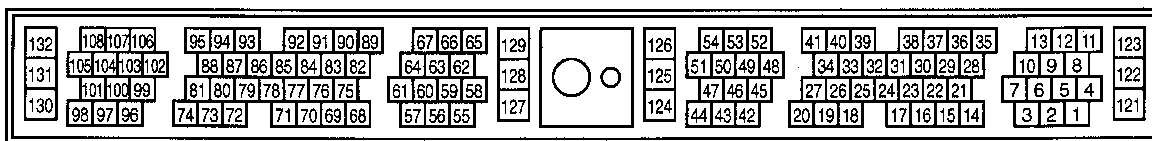
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Refer to last page (Foldout page).



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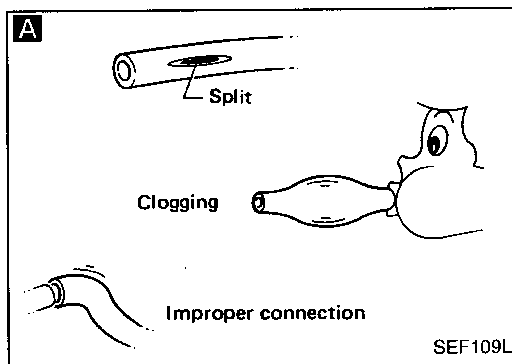


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TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A
CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connection or misconnecting. Refer to "Vacuum Hose Drawing", EC-16.

NG → Repair it.

OK

B
CHECK COMPONENT
(EGRC-solenoid valve).

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

NG → Repair or replace EGRC-solenoid valve or repair circuit.

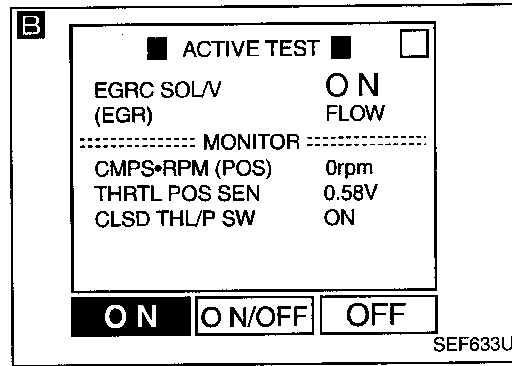
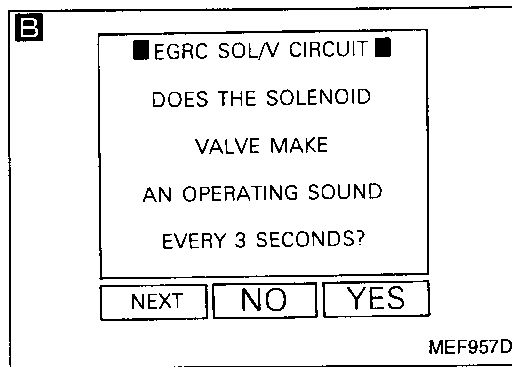
OR

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 "OFF".
2. Disconnect ECM harness connector.
3. Turn ignition switch "ON".
4. Connect a suitable jumper wire between ECM terminal ⑩ and engine ground.
5. Check operating sound of the solenoid valve when disconnecting and reconnecting the jumper wire.

OK



CHECK COMPONENT
(EGRC-solenoid valve).
Refer to "COMPONENT INSPECTION", EC-412.

NG → Replace EGRC-solenoid valve.

OK

CHECK COMPONENT
(EVAP canister).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP canister.

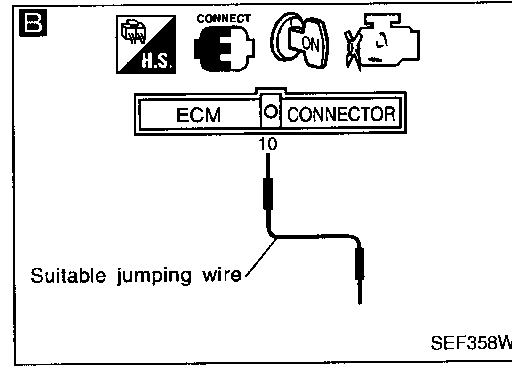
OK

CHECK VACUUM HOSE.
Check vacuum hose into EVAP canister for clogging, cracks and improper connection.

NG → Repair it.

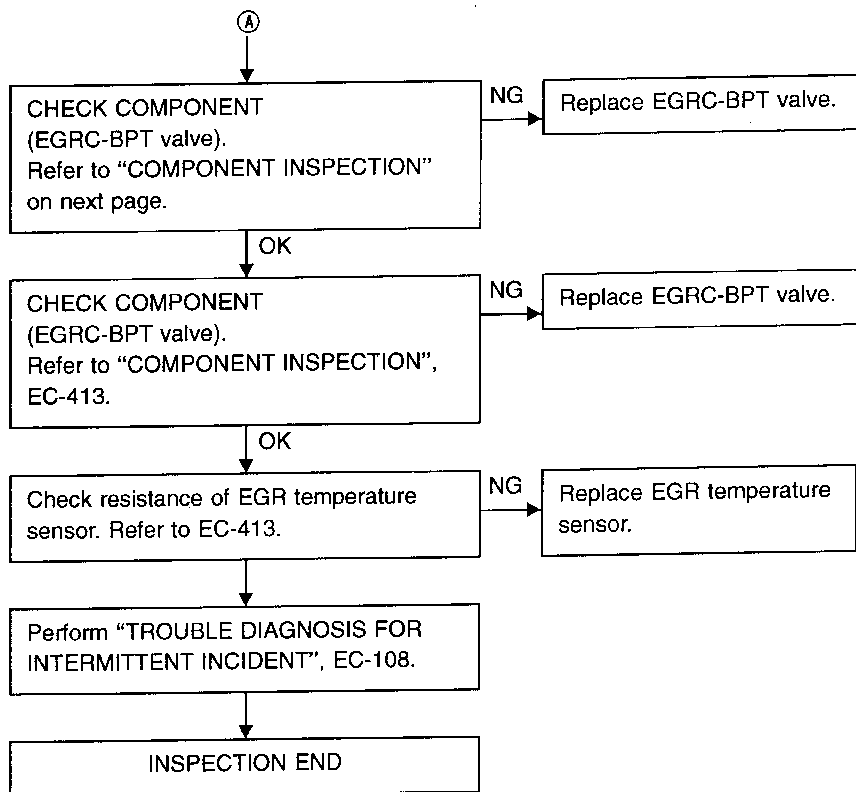
OK

Ⓐ
(Go to next page.)



TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)



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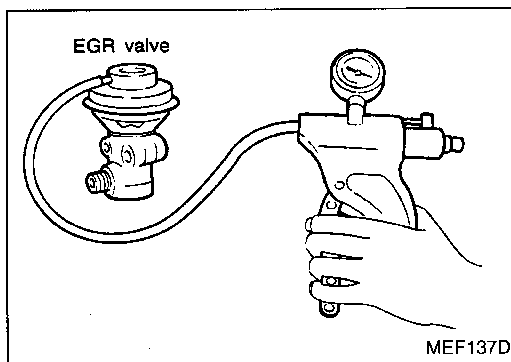
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TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

COMPONENT INSPECTION



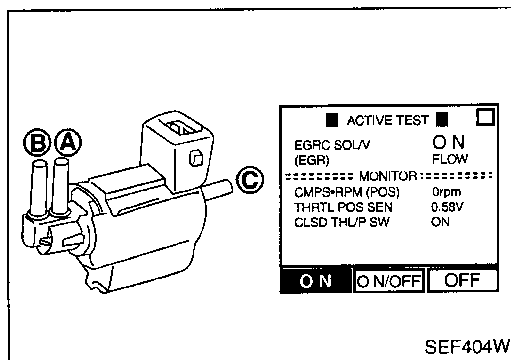
EGR valve

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

EGR valve spring should lift.

- Check for sticking.

If NG, repair or replace EGR valve.



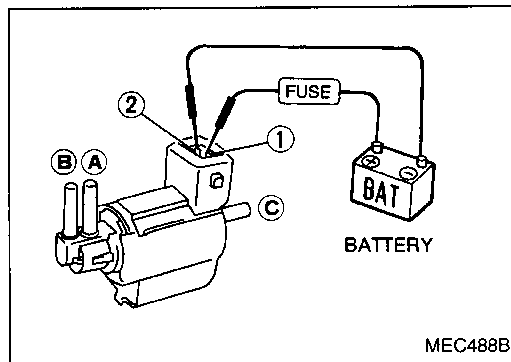
EGRC-solenoid valve

Check air passage continuity.

- Ⓢ Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.

Condition EGRC SOLENOID VALVE	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
ON	Yes	No
OFF	No	Yes

OR



Check solenoid valve, following the table as shown below:

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

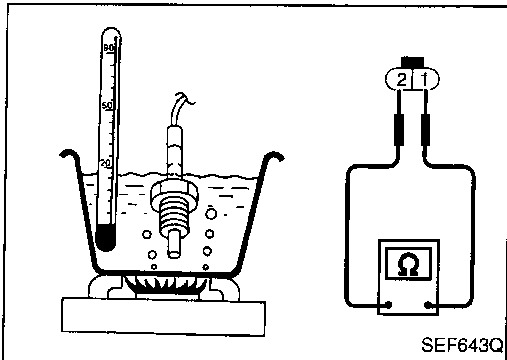
If NG or operation takes more than 1 second, replace the solenoid valve.

TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

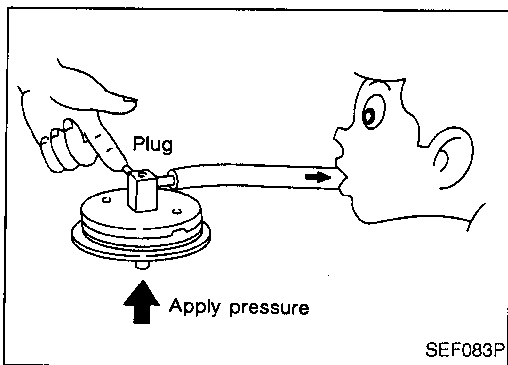
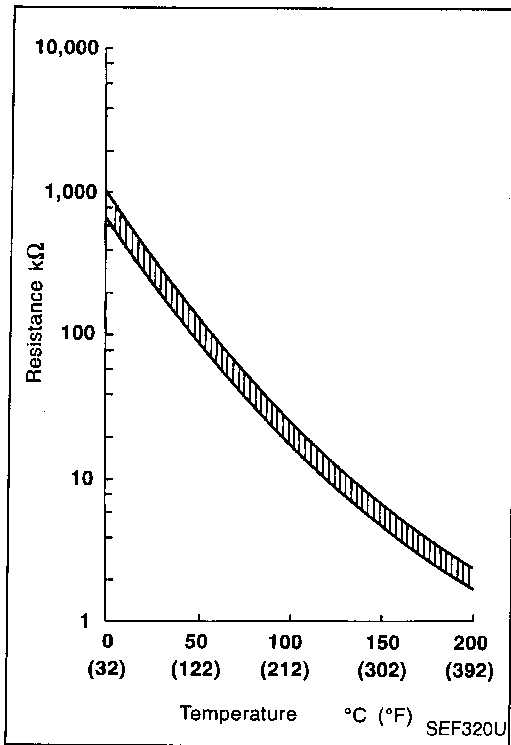
EGR temperature sensor

Check resistance change and resistance value.



EGR temperature °C (°F)	Voltage* (V)	Resistance (MΩ)
0 (32)	4.61	0.68 - 1.11
50 (122)	2.53	0.092 - 0.12
100 (212)	0.87	0.017 - 0.024

If NG, replace EGR temperature sensor.



EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH₂O, 3.94 inH₂O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

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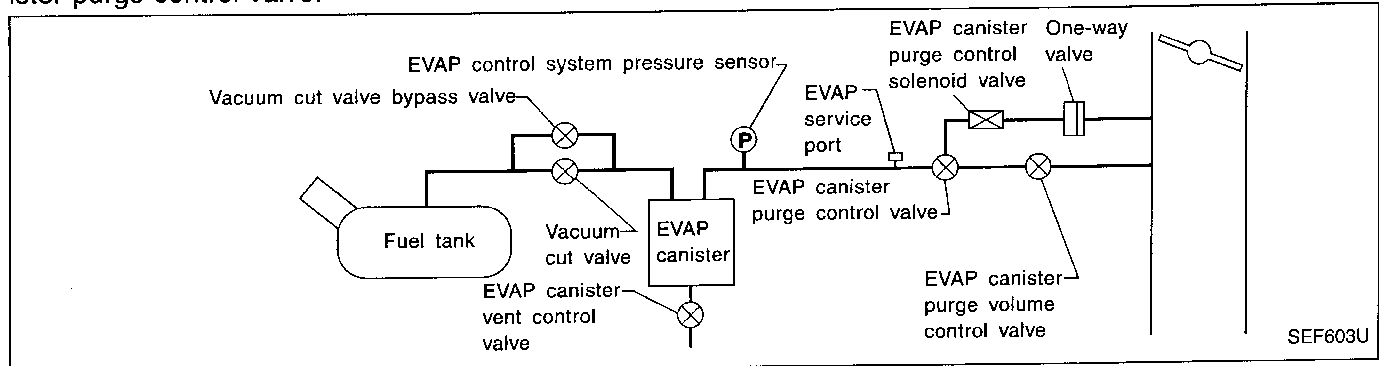
TROUBLE DIAGNOSIS FOR DTC P1440

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure)

Note: If DTC P1448 is displayed with P1440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-446.)

ON BOARD DIAGNOSIS LOGIC

This diagnosis detects leaks in the EVAP purge line using of vapor pressure in the fuel tank. The EVAP canister vent control valve is closed to shut the EVAP purge line. The vacuum cut valve bypass valve will then be opened to clear the line between the fuel tank and the EVAP canister purge 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.



ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1440 0213	<ul style="list-style-type: none"> ● EVAP control system has a leak. ● EVAP control system does not operate properly. 	<ul style="list-style-type: none"> ● 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 ● EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● 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 or damaged. ● Water separator ● EVAP canister is saturated with water.

CAUTION:

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

TROUBLE DIAGNOSIS FOR DTC P1440

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

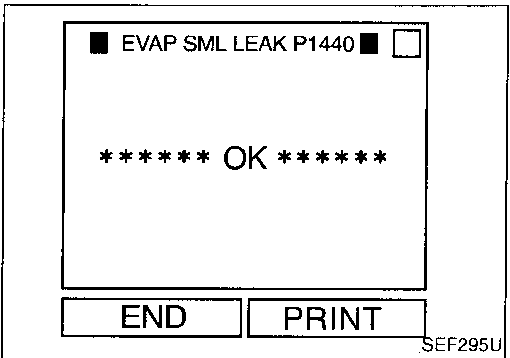
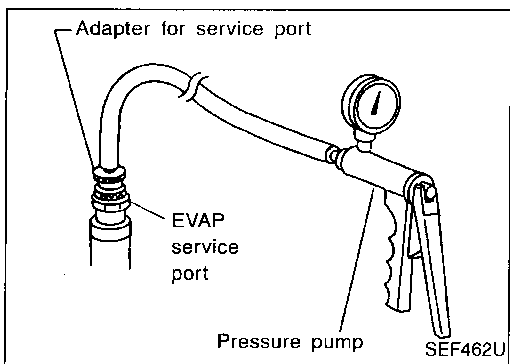
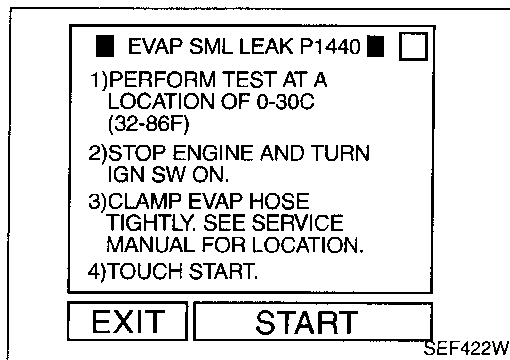
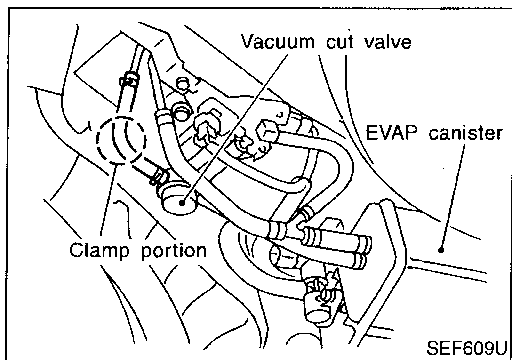
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

- Never use compressed air or high pressure pump. Otherwise, EVAP system may be damaged.
- Do not start the engine.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

NOTE:

- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- Always remove service port adapter from service port after applying air up to 0.69 to 1.38 kPa (5.17 to 10.34 mmHg, 0.20 to 0.41 inHg).
- During the test, clamp the EVAP hose tightly as shown at left.
- When clamping the hose, do not clamp other than middle of the hose to prevent loose or damage of the hose.
- If DTC P1448 is displayed with P1440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-446.)



- 1) Turn ignition switch "OFF".
- 2) Clamp the EVAP hose as shown left.
- 3) Turn ignition switch "ON".
- 4) Select "EVAP SML LEAK P1440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT. Follow the instruction displayed.
- 5) Make sure that "OK" is displayed. If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-417.

OR

- Be sure to read the explanation of "Driving pattern" on EC-45 before driving vehicle.
- It is better that the fuel level is low.



- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-45.
- 3) Stop vehicle.
- 4) Select "MODE 1" with GST.
 - If SRT of EVAP system is not set yet, go to the following step.
 - If SRT of EVAP system is set, the result will be OK.
- 5) Turn ignition switch "OFF" and wait at least 5 seconds.
- 6) Start engine.

It is not necessary to cool engine down before driving.

- 7) Drive vehicle again according to the "Driving pattern", EC-45.
- 8) Stop vehicle.
- 9) Select "MODE 3" with GST.
 - If P1447 is displayed on the screen, go to "TROUBLE DIAGNOSIS FOR DTC P1447", EC-439.
 - If P0440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE", EC-291.
 - If P1440 is displayed on the screen, go to "TROUBLE DIAGNOSIS FOR DTC P1440", EC-417.
 - If P0440 and P1440 are not displayed on the screen, go to the following step.

TROUBLE DIAGNOSIS FOR DTC P1440

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

10) Select "MODE 1" with GST.

- If SRT of EVAP system is set, the result will be OK.
- If SRT of EVAP system is not set, go to step 6).

OR

- Be sure to read the explanation of "Driving pattern" on EC-45 before driving vehicle.
- It is better that the fuel level is low.

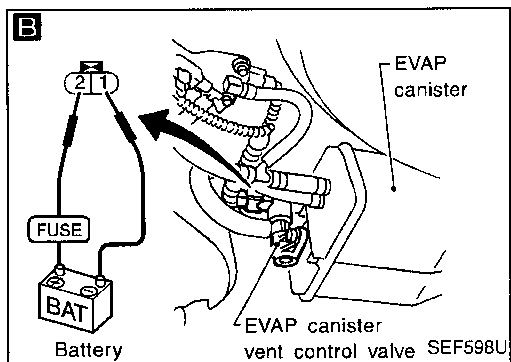
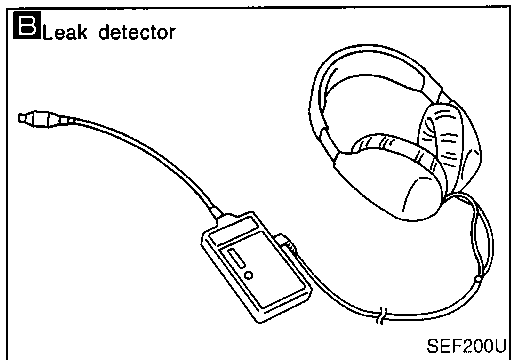
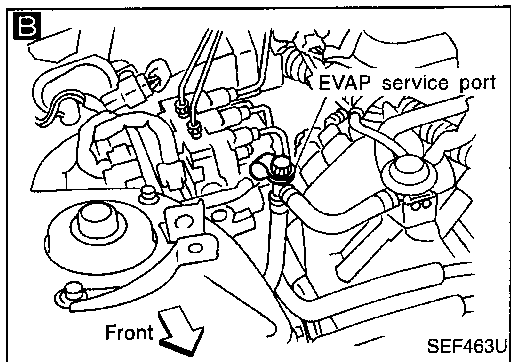
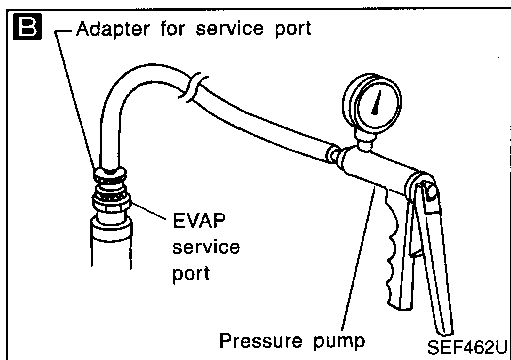
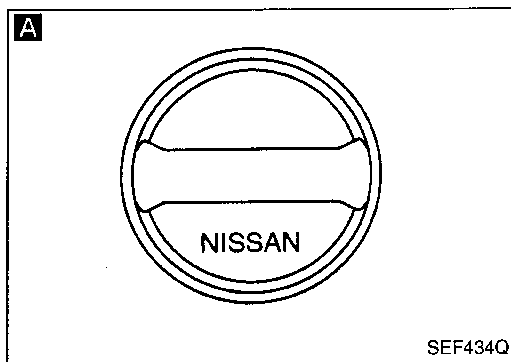


- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-45.
- 3) Stop vehicle.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Turn ignition switch "ON" and perform "Diagnostic Test Mode (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-417.

TROUBLE DIAGNOSIS FOR DTC P1440

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

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK FUEL FILLER CAP.

1. Check for genuine NISSAN fuel filler cap design.
2. Check for air releasing sound while opening the fuel filler cap. If the air releasing sound is heard, go to **B**. If the air releasing sound is not heard, check the following.
Was the cap tightened properly?
If Yes, check fuel filler cap vacuum relief valve. Refer to "EVAPORATIVE EMISSION SYSTEM", EC-24.
If No, open fuel filler cap, then clean cap and filler neck thread using air blower. Retighten until ratcheting sound is heard.

NG

If genuine NISSAN fuel filler cap is not used, replace with genuine NISSAN fuel filler cap.

OK

B

CHECK FOR EVAP LEAK.

- Never use compressed air or a high pressure pump.
- Improper installation of service port may cause a leak.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

To locate the EVAP leak, do the following.

1. Install the EVAP service port adapter and the pressure pump securely.
2. Turn ignition switch "ON". Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply positive pressure to the EVAP line.
4. Using EVAP leak detector, locate the leak. Refer to the instruction manual for more details about the leak detector. Refer to "Evaporative Emission Line Drawing", EC-26.

NG

Repair or replace.

OR

2. Turn ignition switch "OFF".
3. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
4. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)
5. Pressurize the EVAP line using pressure gauge with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and service port adapter.
6. Locate the leak using a leak detector. Refer to the instruction manual for more details about the leak detector. Refer to "Evaporative Emission Line Drawing", EC-26.

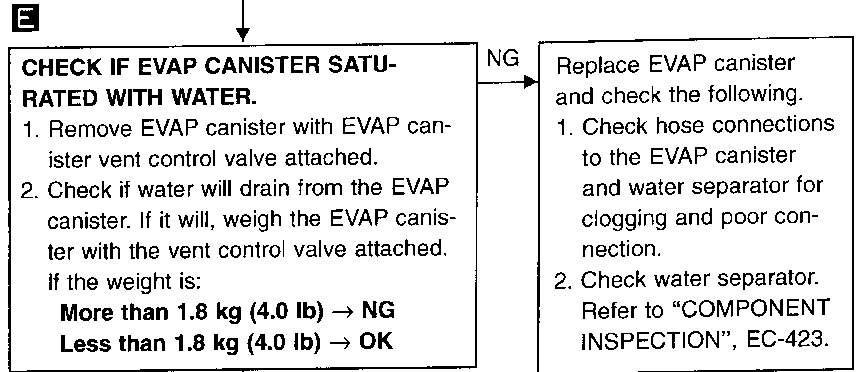
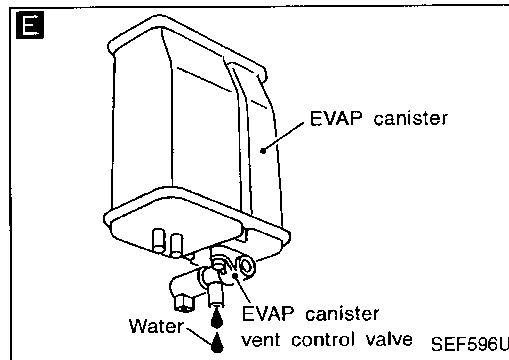
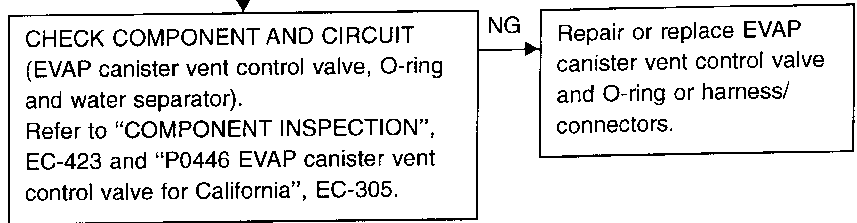
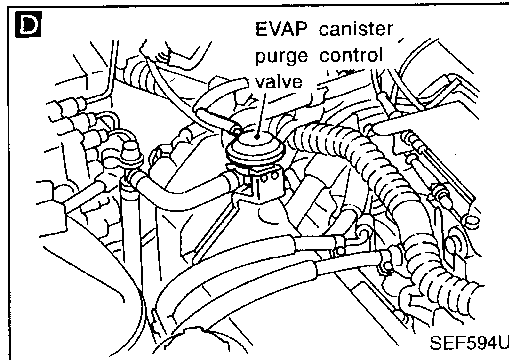
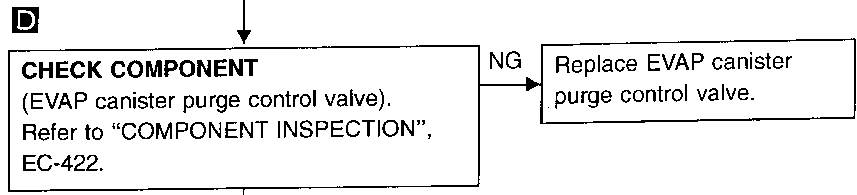
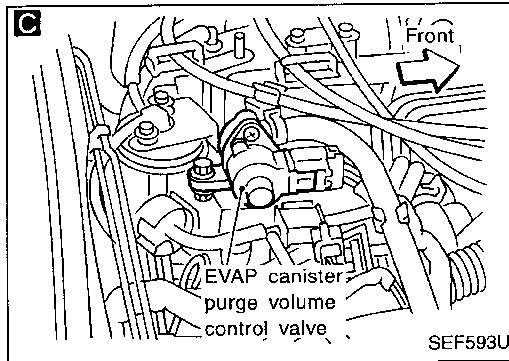
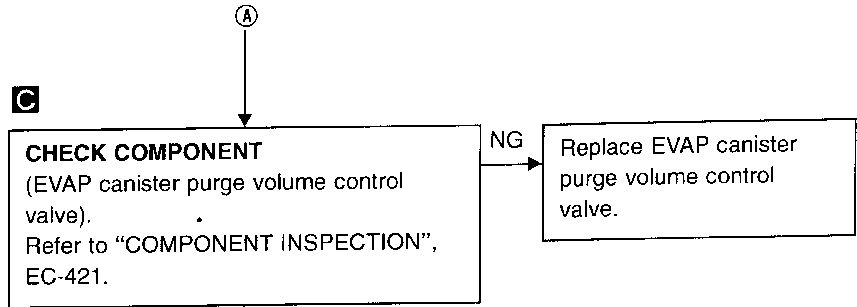
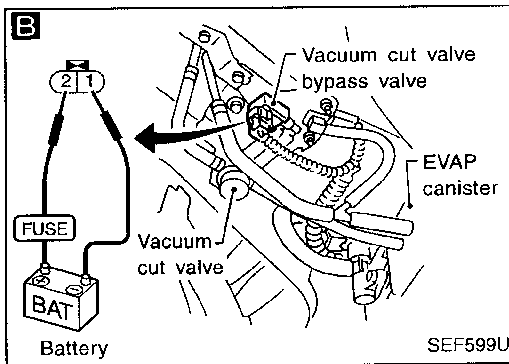
OK

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TROUBLE DIAGNOSIS FOR DTC P1440

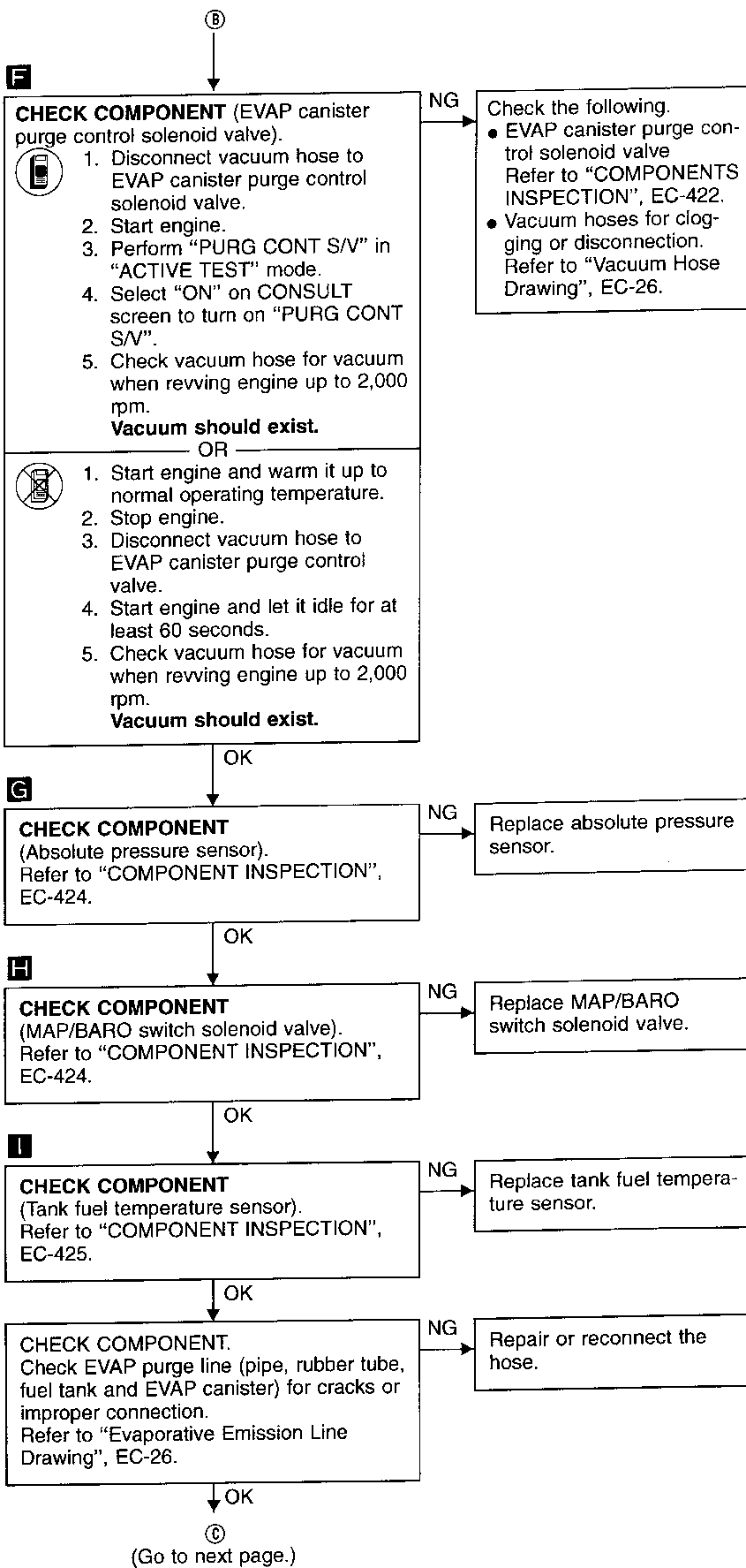
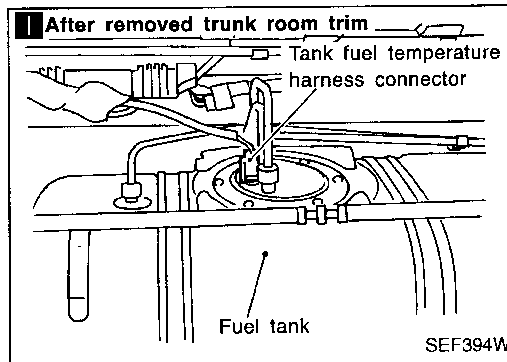
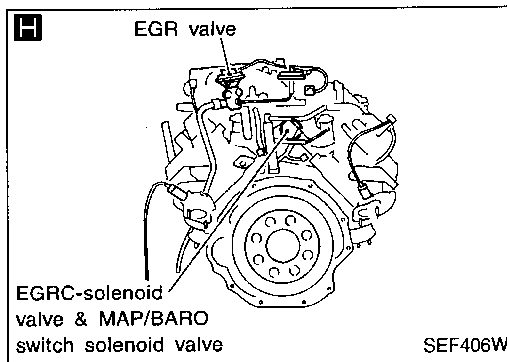
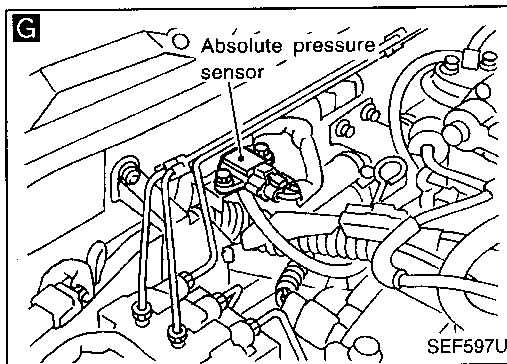
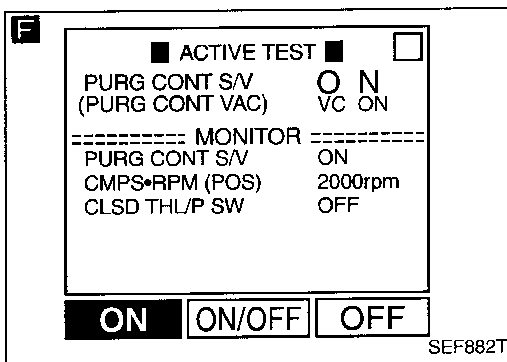
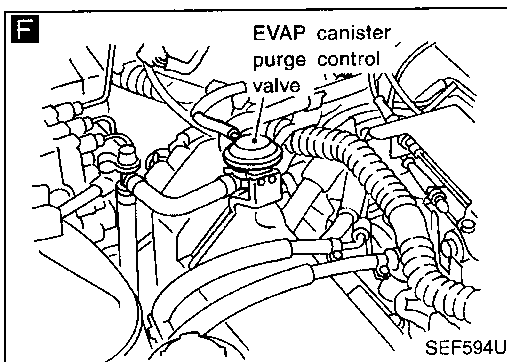
Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)



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TROUBLE DIAGNOSIS FOR DTC P1440

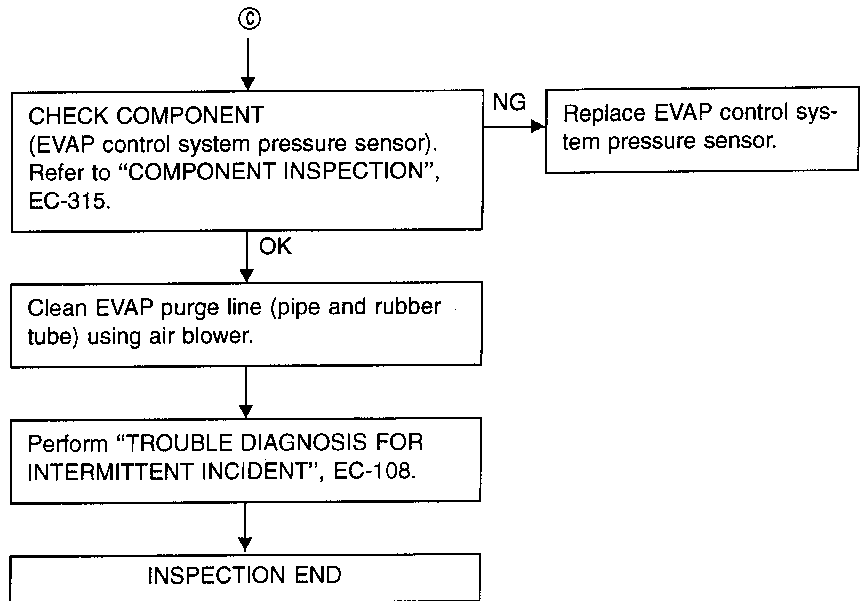
Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)



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TROUBLE DIAGNOSIS FOR DTC P1440

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

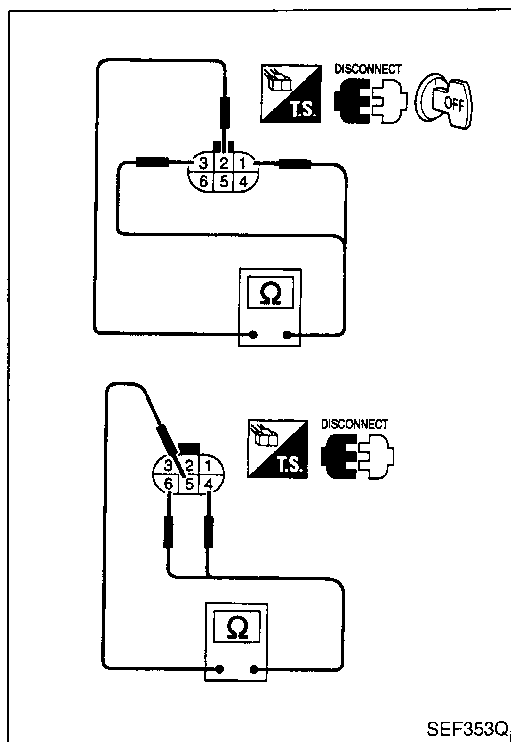


TROUBLE DIAGNOSIS FOR DTC P1440

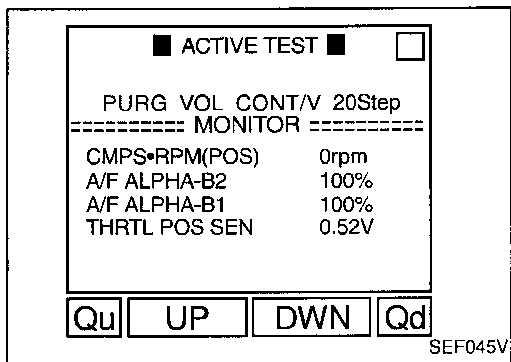
Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

COMPONENT INSPECTION

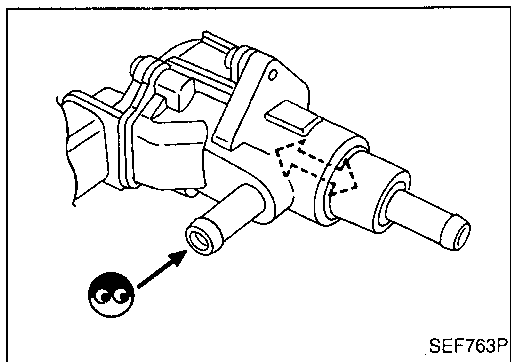
EVAP canister purge volume control valve



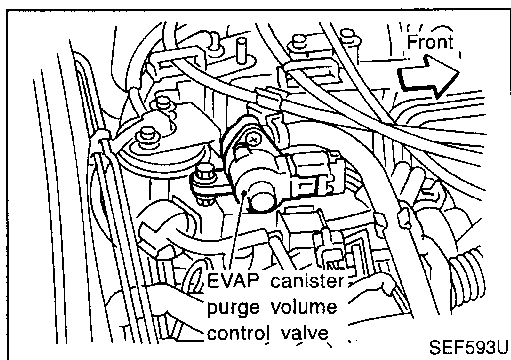
SEF353Q



SEF045V



SEF763P



SEF593U

1. Disconnect EVAP canister purge volume control valve harness connector. GI
2. Check resistance between the following terminals. MA
terminal ② and terminals ①, ③
terminal ⑤ and terminals ④, ⑥
Resistance: EM
Approximately 35 - 43Ω [At 25°C (77°F)]
3. Reconnect EVAP canister purge volume control valve harness connector. LC
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve. EC
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5. Turn ignition switch "ON". FE
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. AT
If NG, replace the EVAP canister purge volume control valve. PD

OR

1. Disconnect EVAP canister purge volume control valve harness connector. FA
2. Check resistance between the following terminals. RA
terminal ② and terminals ①, ③
terminal ⑤ and terminals ④, ⑥
Resistance: BR
Approximately 35 - 43Ω [At 25°C (77°F)]
3. Reconnect EVAP canister purge volume control valve harness connector. ST
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve. RS
(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. BT
If NG, replace the EVAP canister purge volume control valve. HA

EL

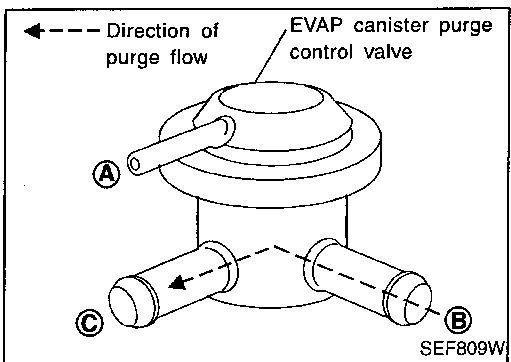
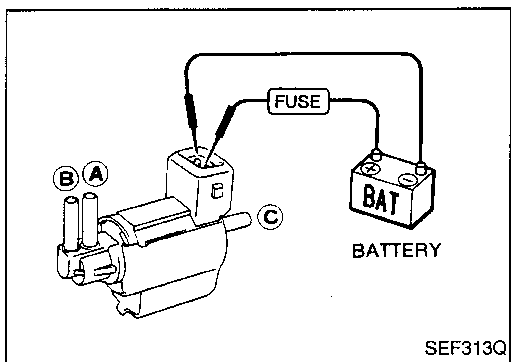
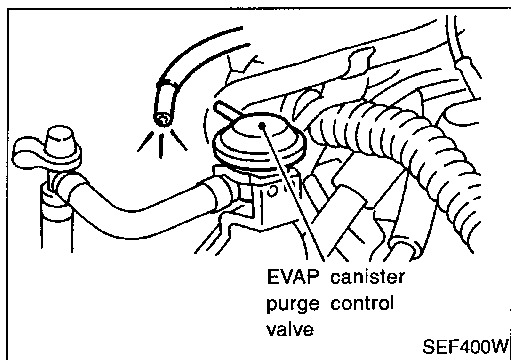
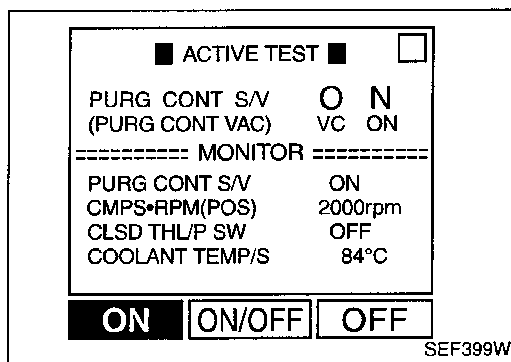
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TROUBLE DIAGNOSIS FOR DTC P1440

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

EVAP canister purge control solenoid valve

1. Turn ignition switch "ON".
2. Select "PURG CONT S/V" of "ACTIVE TEST" mode with CONSULT.
3. Start engine and warm it up to normal operating temperature.
4. Disconnect vacuum hose at EVAP canister purge control valve.
5. Touch "ON" and "OFF" and check for vacuum passing through the hose.



Condition	Vacuum
Idle	Not exist
2,000 rpm	Exist

OR

1. Check air passage continuity.

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

If NG or operation takes more than 1 second, replace solenoid valve.

EVAP canister purge control valve

Check EVAP canister purge control valve as follows:

1. Blow air in port (A) and (C), then ensure that there is no leakage.
2. Blow air in port (B), then ensure that there is a resistance to flow out of port (C).
3. Apply vacuum to port (A). [Approximately -13.3 to -20.0 kPa (-100 to -150 mmHg, -3.94 to -5.91 inHg)]
Blow air in port (C) and ensure free flow out of port (B).

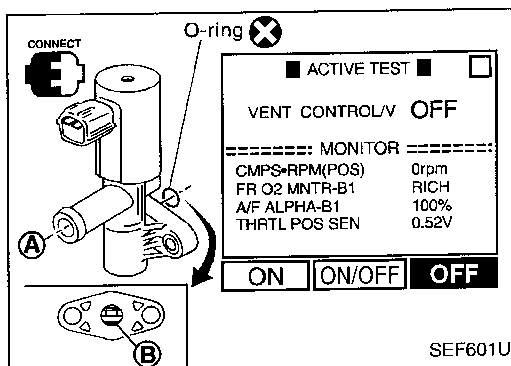
TROUBLE DIAGNOSIS FOR DTC P1440

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

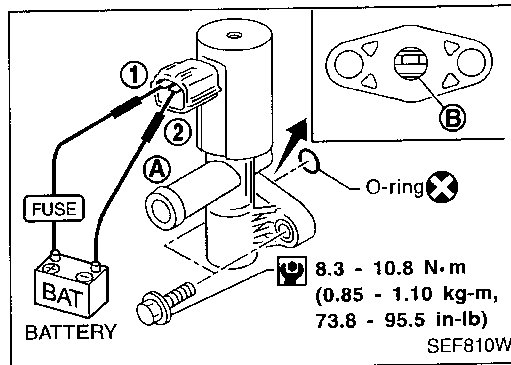
EVAP canister vent control valve

Check air passage continuity.

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.



SEF601U



SEF810W

Condition	Air passage continuity between (A) and (B)
VENT CONTROL/V ON	No
VENT CONTROL/V OFF	Yes

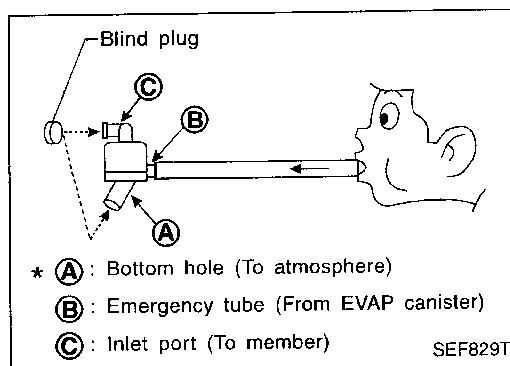
OR

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

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If the portion (B) is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.



- * (A) : Bottom hole (To atmosphere)
- (B) : Emergency tube (From EVAP canister)
- (C) : Inlet port (To member)

SEF829T

Water separator

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that (A) and (C) are not clogged by blowing air into (B) with (A), and then (C) plugged.
5. In case of NG in items 2 - 4, replace the parts.

NOTE:

Do not disassemble water separator.

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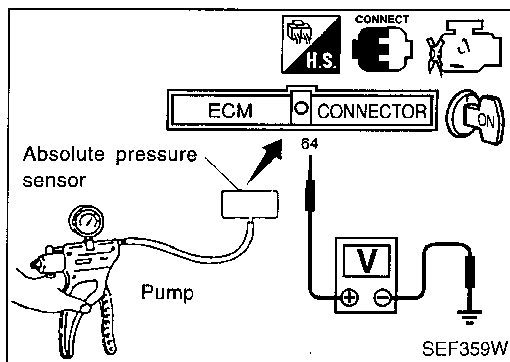
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TROUBLE DIAGNOSIS FOR DTC P1440

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

Absolute pressure sensor



1. Remove absolute pressure sensor with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Turn ignition switch "ON" and check output voltage between terminal ⑥ and ground.

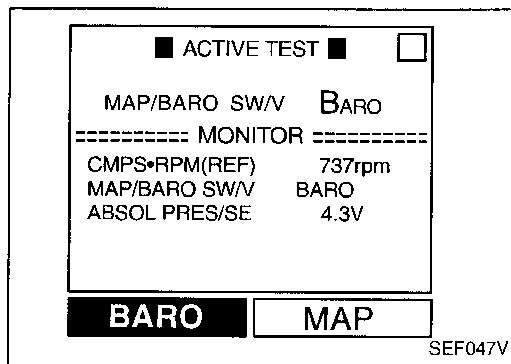
The voltage should be 3.2 to 4.8V.

4. Use pump to apply vacuum of -26.7 kPa (-200 mmHg , -7.87 inHg) to absolute pressure sensor as shown in figure and check the output voltage.

The voltage should be 1.0 to 1.4V lower than the value measured in step 3.

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply below -93.3 kPa (-700 mmHg , -27.56 inHg) or over 101.3 kPa (760 mmHg , 29.92 inHg) of pressure.
5. If NG, replace absolute pressure sensor.



MAP/BARO switch solenoid valve

1. Start engine and warm it up sufficiently.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
 - Condition: At idle under no-load
 - CONSULT display

MAP/BARO SW/V	ABSOL PRES/SE (Voltage)
BARO	More than 2.6V
MAP	Less than the voltage at BARO

- Time for voltage to change

MAP/BARO SW/V	Required time to switch
BARO to MAP	Less than 1 second
MAP to BARO	

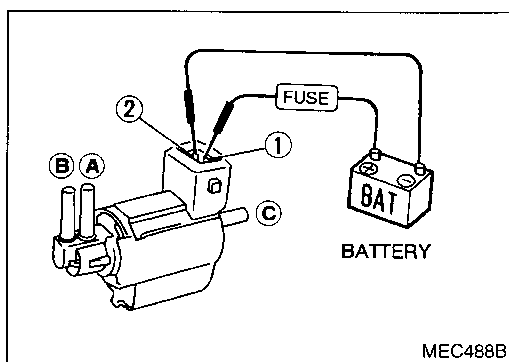
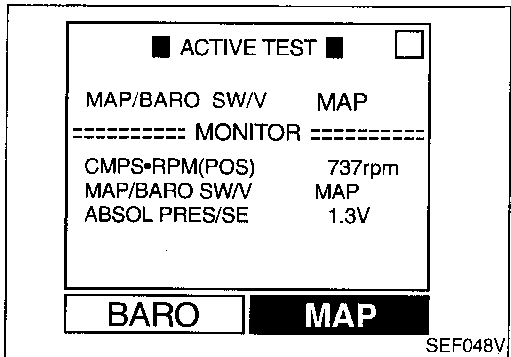
4. If NG, check solenoid valve as shown below.

OR

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

Condition	Air passage continuity between ① and ②	Air passage continuity between ① and ③
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

3. If NG or operation takes more than 1 second, replace solenoid valve.

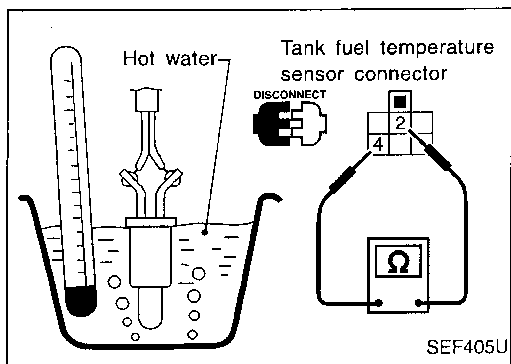


TROUBLE DIAGNOSIS FOR DTC P1440

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

Tank fuel temperature sensor

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



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

If NG, replace tank fuel temperature sensor.

GI

MA

EM

LC

EC

FE

AT

PD

FA

RA

BR

ST

RS

BT

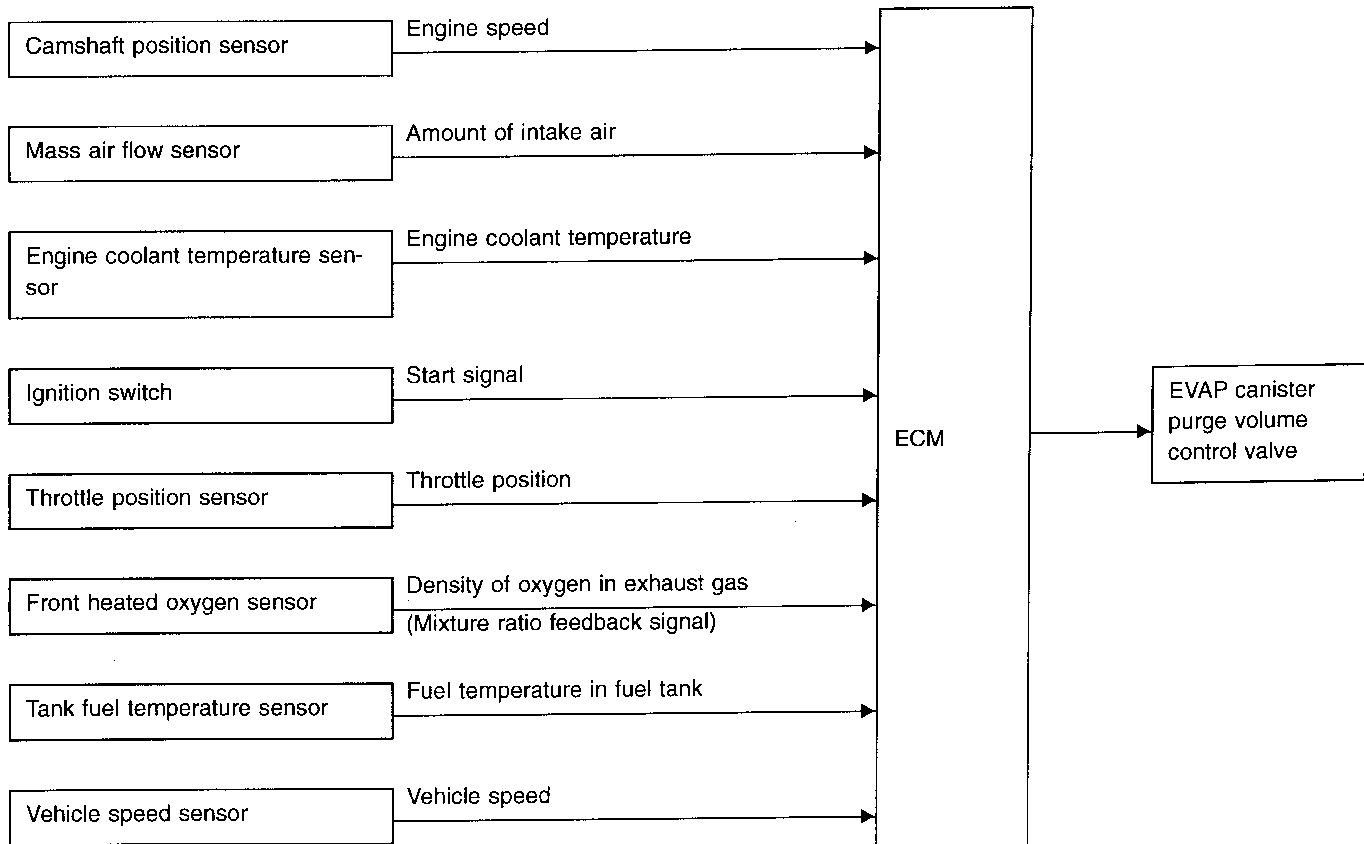
HA

EL

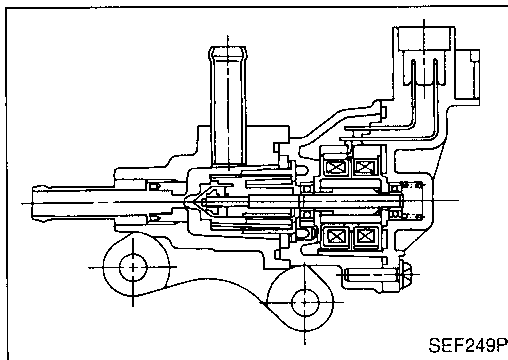
IDX

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.



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.

TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
PURG VOL C/V	Idle	0 step
	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch "OFF" Vehicle running (Shift lever "1")	—

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
124	W/B	ECCS relay (Self-shutoff)	Engine is running.	0 - 1V
			Ignition switch "OFF"	
			└ For a few seconds after turning ignition switch "OFF"	
130 131	R/G	Power supply for ECM	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
			└ A few seconds passed after turning ignition switch "OFF"	
123	W/L	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
28	BR/Y	EVAP canister purge volume control valve	Engine is running.	0 - 0.4V or BATTERY VOLTAGE (11 - 14V)
29	G		└ Idle speed	
35	G/OR	EVAP canister purge volume control valve	Engine is running.	0 - 0.4V or BATTERY VOLTAGE (11 - 14V)
36	L/B		└ Idle speed	

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1444 0214	<ul style="list-style-type: none"> ● The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control valve is completely closed. 	<ul style="list-style-type: none"> ● 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 or clogged.) ● EVAP canister vent control valve

TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Always perform test at temperature above 5°C (41°F).



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "PURG CN/V & S/V P1493" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 5) Touch "START".
- 6) Start engine (TCS switch "OFF") and let it idle for at least 90 seconds.
- 7) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take for at least 30 seconds.)
Selector lever: Suitable position
Vehicle speed: 40 - 120 km/h (25 - 75 MPH)
CMPS-RPM (POS): 1,000 - 6,300 rpm
B/FUEL SCHDL: 2 - 4.8 msec
- 8) Stop vehicle with engine running.
- 9) Select "PURG VOL C/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 10) Touch "START".

If "COMPLETED" is displayed, go to step 12).

- 11) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take for at least 20 seconds.)
Selector lever: Suitable position
Vehicle speed: 40 - 120 km/h (25 - 75 MPH)
CMPS-RPM (POS): 1,000 - 6,300 rpm
B/FUEL SCHDL: 2 - 4.8 msec

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

12) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-430.

■ PURG CN/V&S/V P1493 ■

THIS SUPPORT FUNCTION IS FOR DTC P1493. SEE THE SERVICE MANUAL ABOUT THE OPERATING CONDITION FOR THIS DIAGNOSIS.

EXIT
START

SEF610U

■ PURG CN/V&S/V P1493 ■

***** OK *****

■ SELF-DIAG RESULTS ■

**** NO FAILURE ****

END
PRINT

SEF611U

■ PURG VOL CN/V P1444 ■

THIS SUPPORT FUNCTION IS FOR DTC P1447. SEE THE SERVICE MANUAL ABOUT THE OPERATING CONDITION FOR THIS DIAGNOSIS.

EXIT
START

SEF612U

■ PURG VOL CN/V P1444 ■

***** OK *****

■ SELF-DIAG RESULTS ■

**** NO FAILURE ****

END
PRINT

SEF613U

TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

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

SEF519R



- OR
- 1) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
 - 2) Select "MODE 1" with GST.
 - 3) Check coolant temperature.

Coolant temperature: 40 - 100°C (104 - 212°F)

Be sure that water temperature does not exceed 100°C (212°F). If it becomes higher than 100°C (212°F), cool down the engine and perform the procedure again from the beginning.

- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Turn ignition switch "ON" and wait at least 15 seconds.
- 6) Restart engine and let it idle for at least 80 seconds.
- 7) Maintain the following conditions for at least 80 seconds.

Gear position: Suitable gear position

Vehicle speed: 40 - 120 km/h (25 - 75 MPH)

Engine speed: 1,000 - 6,300 rpm

Coolant temperature: 40 - 100°C (104 - 212°F)

- 8) Select "MODE 7" with GST.
- 9) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-430.

NOTE:

- Hold the accelerator pedal as steady as possible during driving in steps 7.
- If the driving conditions are not satisfied in steps 7, restart the procedure.
- It is better that the fuel level is low.

OR



- 1) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
- 2) Check voltage between ECM terminal ⑥7 and ground
Voltage: 0.8 - 1.5V

Perform the following procedure before the voltage drops below 0.8V. If the voltage drops below 0.8V, cool down the engine and perform the entire procedure all over again.

- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Turn ignition switch "ON" and wait at least 15 seconds.
- 5) Restart engine and let it idle for at least 80 seconds.
- 6) Maintain the following conditions for at least 80 seconds.

Gear position: Suitable gear position

Vehicle speed: 40 - 120 km/h (25 - 75 MPH)

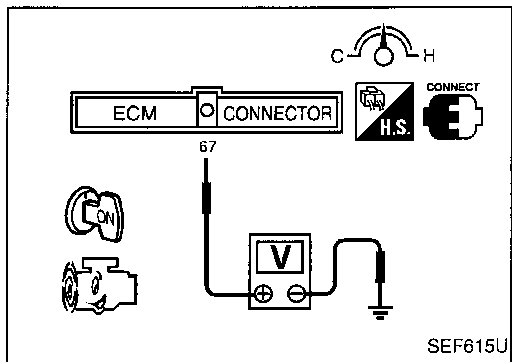
Engine speed: 1,000 - 6,300 rpm

Check voltage between ECM terminal ⑥7 and ground: 0.8 - 1.5V

- 7) Turn ignition switch "OFF", wait at least 5 seconds, and then turn "ON".
- 8) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 9) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-430.

NOTE:

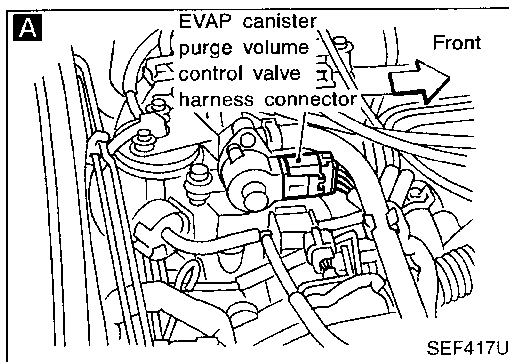
- Hold the accelerator pedal as steady as possible during driving in steps 6.
- If the driving conditions are not satisfied in steps 6, restart the procedure.
- It is better that the fuel level is low.



TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

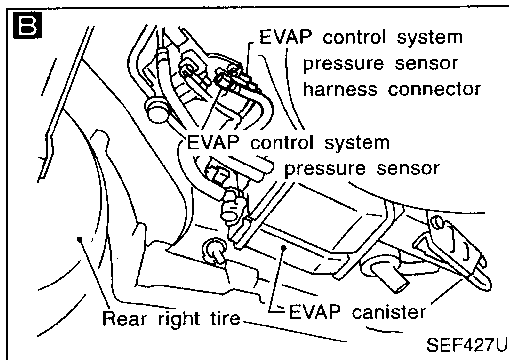
DIAGNOSTIC PROCEDURE



INSPECTION START

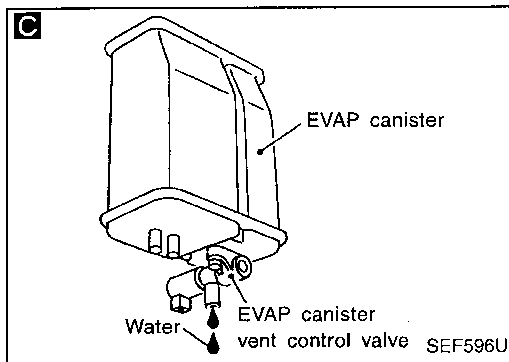
A
CHECK COMPONENT
(EVAP canister purge volume control valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP canister purge volume control valve.



B
CHECK COMPONENT
(EVAP control system pressure sensor).
1. Check disconnection of hose connected to the sensor.
2. Check sensor harness connector for water.
Water should not exist.
If OK, go to step 3.
3. Check EVAP control system pressure sensor.
Refer to "COMPONENT INSPECTION", EC-432.

NG → Replace EVAP control system pressure sensor and repair or replace harness and connector.



CHECK COMPONENT
(EVAP canister vent control valve).
Refer to "COMPONENT INSPECTION", EC-432.

NG → Replace EVAP canister vent control valve.

CHECK RUBBER TUBE FOR CLOGGING.
Check obstructed water separator, improper connection of hose and rubber tube to EVAP canister vent control valve and clean the rubber tube using air blower.
For water separator, refer to "COMPONENT INSPECTION", EC-437.

NG → Clean, repair or replace rubber tube and/or water separator.

C
CHECK IF EVAP CANISTER IS SATURATED WITH WATER.
1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister. If it will, weigh the EVAP canister with the vent control valve attached.
If the weight is:
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

NG → Replace EVAP canister and check the following.
1. Check hose connections to the EVAP canister and water separator for clogging and poor connection.
2. Check water separator.
Refer to "COMPONENT INSPECTION", EC-423.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

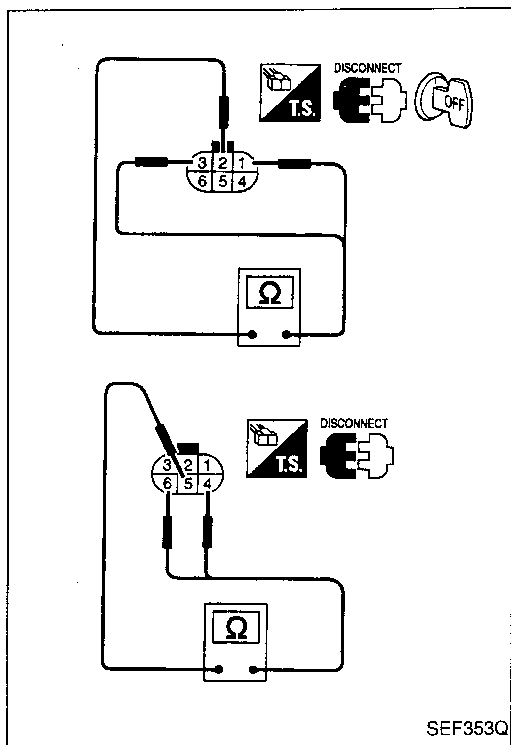
INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P1444

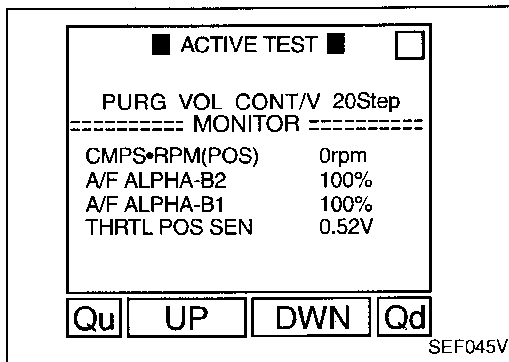
Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

COMPONENT INSPECTION

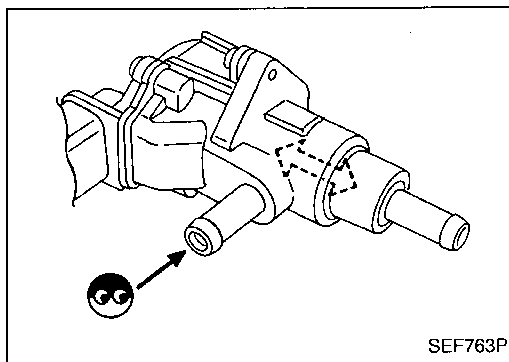
EVAP canister purge volume control valve



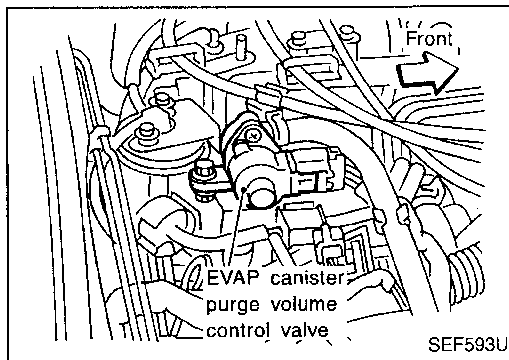
SEF353Q



SEF045V



SEF763P



SEF593U

1. Disconnect EVAP canister purge volume control valve harness connector. GI

2. Check resistance between the following terminals. MA
 terminal ② and terminals ①, ③
 terminal ⑤ and terminals ④, ⑥

Resistance:

Approximately 35 - 43Ω [At 25°C (77°F)] EM

3. Reconnect EVAP canister purge volume control valve harness connector. LC

4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve. EC

(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)

5. Turn ignition switch "ON". FE

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. AT

If NG, replace the EVAP canister purge volume control valve. PD

OR

1. Disconnect EVAP canister purge volume control valve harness connector. FA

2. Check resistance between the following terminals. RA
 terminal ② and terminals ①, ③
 terminal ⑤ and terminals ④, ⑥

Resistance:

Approximately 35 - 43Ω [At 25°C (77°F)] BR

3. Reconnect EVAP canister purge volume control valve harness connector. ST

4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve. RS

(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. BT

If NG, replace the EVAP canister purge volume control valve. HA

EL

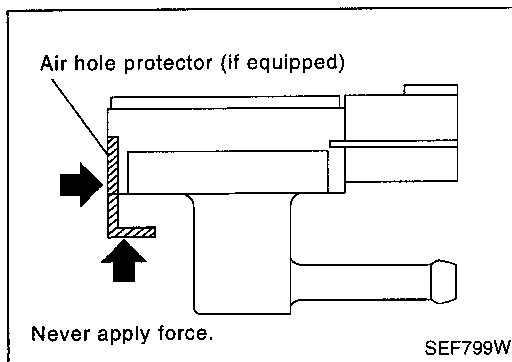
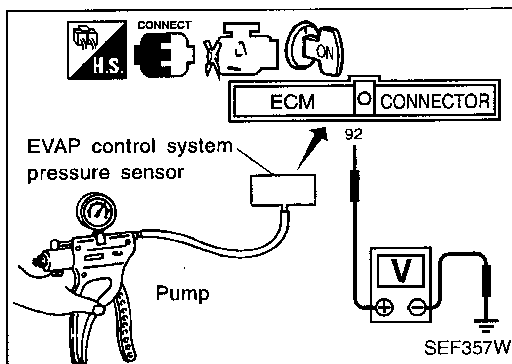
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TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

COMPONENT INSPECTION

EVAP control system pressure sensor

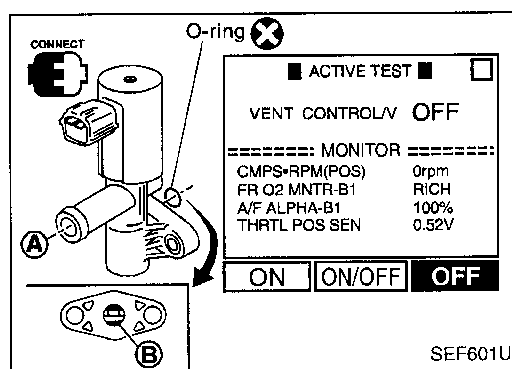


1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
5. Check output voltage between ECM terminal 92 and ground.

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

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -20 kPa (-150 mmHg, -5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.
- 6. If NG, replace EVAP control system pressure sensor.
- Never apply force to the air hole protector of the sensor, if equipped.
- Discard any EVAP control system pressure sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



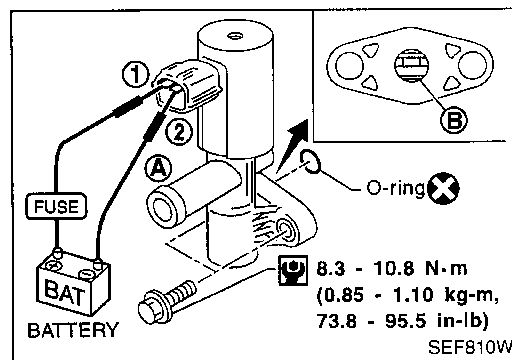
EVAP canister vent control valve

Check air passage continuity.

- Perform "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.

Condition	Air passage continuity between (A) and (B)
VENT CONTROL/V ON	No
VENT CONTROL/V OFF	Yes

OR



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

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

If the portion ⑧ is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.

GI

MA

EM

LC

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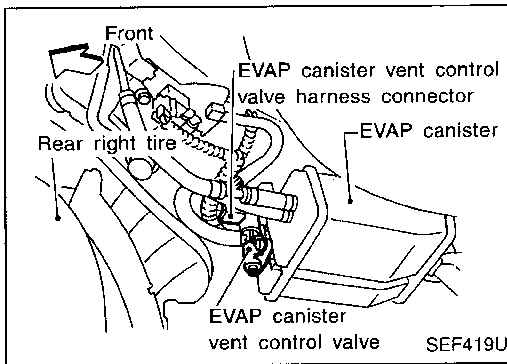
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Evaporative Emission (EVAP) Canister Vent Control Valve (Close)

COMPONENT DESCRIPTION

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
20	P/B	EVAP canister vent control valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1446 0215	● EVAP canister vent control valve remains closed under specified driving conditions.	<ul style="list-style-type: none"> ● EVAP canister vent control valve ● EVAP control system pressure sensor and the circuit ● Blocked rubber tube to EVAP canister vent control valve ● Water separator ● EVAP canister is saturated with water.

TROUBLE DIAGNOSIS FOR DTC P1446

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS-RPM(POS)	650rpm	
MAS AIR/FL SE	1.31V	
COOLAN TEMP/S	84°C	
VHCL SPEED SE	6km/h	
THRTL POS SEN	0.50V	
B/FUEL SCHDL	1.0msec	
RECORD		

SEF604J



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine (TCS switch "OFF").
- 4) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for a maximum of 15 minutes.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-436.

NOTE:

If a malfunction exists, NG result may be displayed quicker.

OR



- 1) Start engine (TCS switch "OFF").
- 2) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for 15 minutes.
- 3) Select "MODE7" with GST.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-436.

OR



- 1) Start engine (TCS switch "OFF").
- 2) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for 15 minutes.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Turn ignition switch "ON" and perform "Diagnostic Test Mode (Self-diagnostic results)" with ECM.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-436.

GI

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EM

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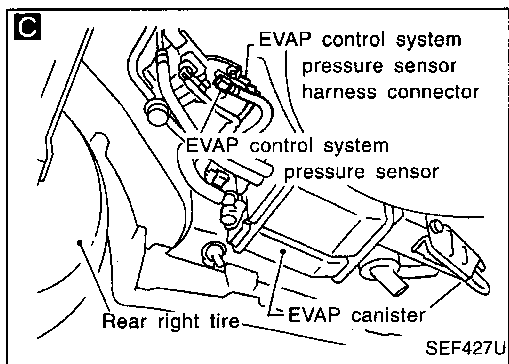
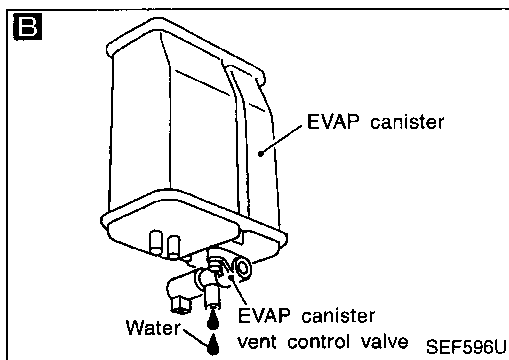
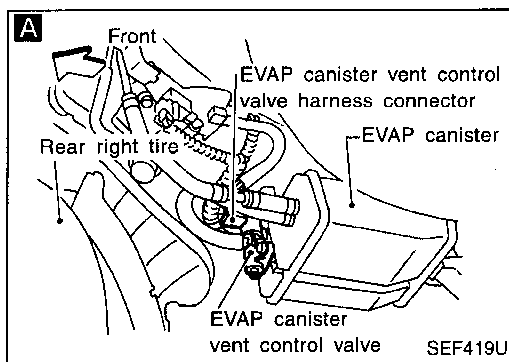
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Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

CHECK RUBBER TUBE FOR CLOGGING.
Check obstructed water separator and rubber tube to EVAP canister vent control valve and clean the rubber tube using air blower.
For water separator, refer to "COMPONENT INSPECTION" on next page.

NG → Clean, repair or replace rubber tube and/or water separator.

OK

CHECK COMPONENT
(EVAP canister vent control valve and O-ring).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP canister vent control valve and O-ring.

OK

CHECK IF EVAP CANISTER IS SATURATED WITH WATER.
1. Remove EVAP canister with the vent control valve attached.
2. Check if water will drain from the EVAP canister.
If it will, weigh the EVAP canister with the vent control valve attached.
If the weight is:
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

NG → Replace EVAP canister and check the following.
1. Check hose connections to the EVAP canister and water separator for clogging and poor connection.
2. Check water separator. Refer to "COMPONENT INSPECTION", EC-437.

OK

CHECK COMPONENT
(EVAP control system pressure sensor).
1. Check for disconnection of hose connected to the sensor.
2. Check sensors harness connector for water.
Water should not exist.
If OK, go to step 3.
3. Check EVAP control system pressure sensor.
Refer to "COMPONENT INSPECTION", EC-438.

NG → Replace EVAP control system pressure sensor and repair or replace harness and connector.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P1446

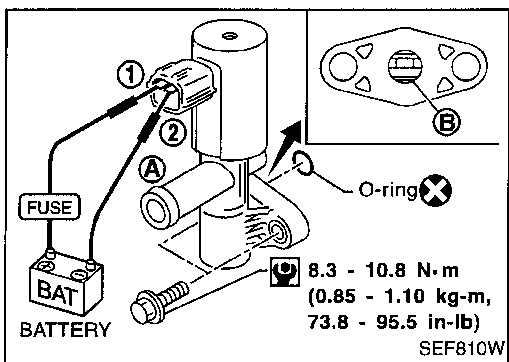
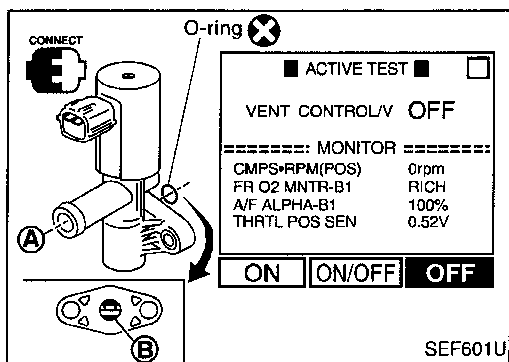
Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

COMPONENT INSPECTION

EVAP canister vent control valve

Check air passage continuity.

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.



Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

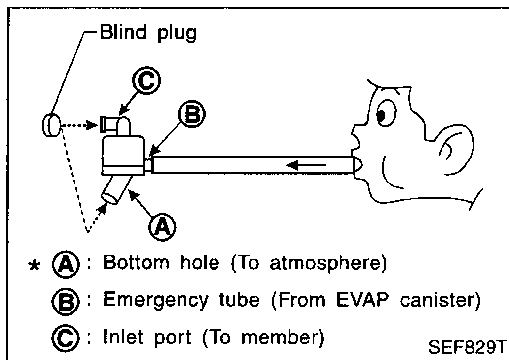
OR

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

If NG, clean valve using air blower or replace as necessary.

If the portion (B) is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.



Water separator

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that (A) and (C) are not clogged by blowing air into (B) with (A), and then (C) plugged.
5. In case of NG in items 2 - 4, replace the parts.

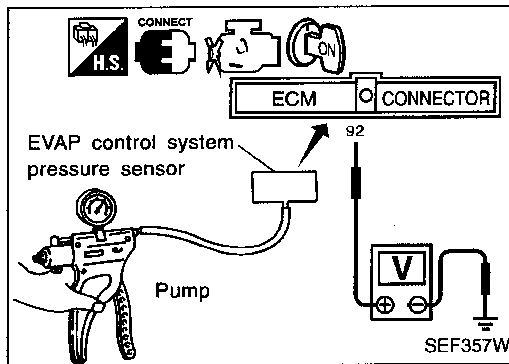
NOTE:

Do not disassemble water separator.

TROUBLE DIAGNOSIS FOR DTC P1446

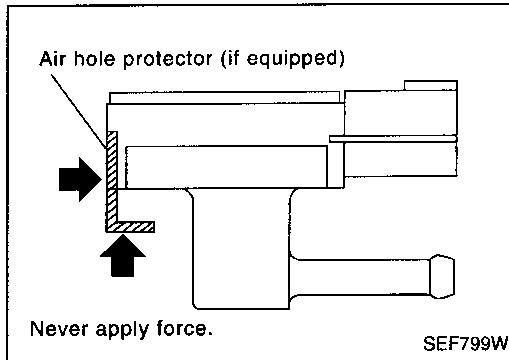
Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

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. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
5. Check output voltage between ECM terminal 92 and ground.

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

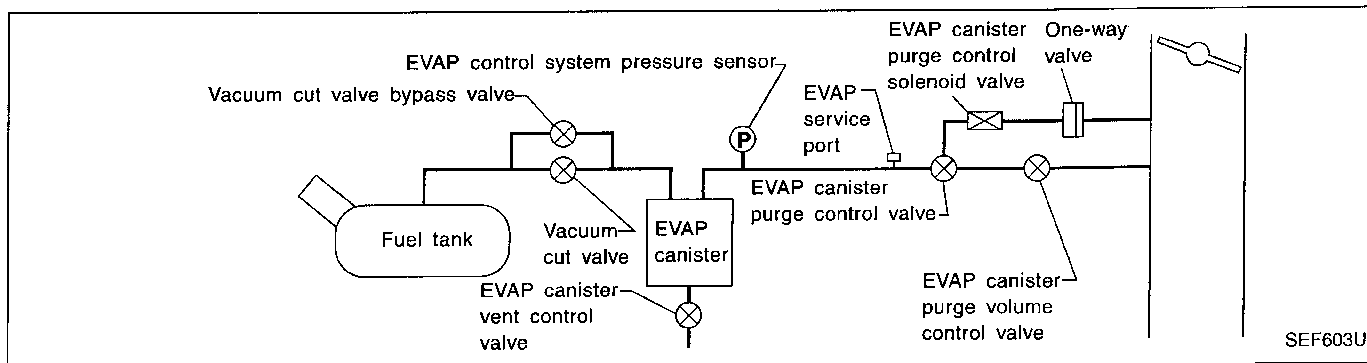


CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -20 kPa (-150 mmHg, -5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.
- 6. If NG, replace EVAP control system pressure sensor.
- Never apply force to the air hole protector of the sensor, if equipped.
- Discard any EVAP control system pressure sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

**Evaporative Emission (EVAP) Control System
Purge Flow Monitoring**

NOTE: If DTC P1447 is displayed with P0510, perform TROUBLE DIAGNOSIS FOR DTC P0510 first. (See EC-327.)



SYSTEM DESCRIPTION

In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control valve and EVAP canister purge control valve are open. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

ON BOARD DIAGNOSIS LOGIC

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a fault is determined.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1447 0111	<ul style="list-style-type: none"> ● EVAP control system does not operate properly. ● EVAP control system has a leak between intake manifold and EVAP control system pressure sensor. 	<ul style="list-style-type: none"> ● EVAP canister purge volume control valve stuck closed ● EVAP canister purge control valve stuck closed ● EVAP control system pressure sensor ● Loose, disconnected or improper connection of 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 ● EVAP canister purge volume control valve ● Closed throttle position switch ● Improper connection of one-way valve ● Blocked purge port ● EVAP canister vent control valve

TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

- Always perform test at temperature above 5°C (41°F).



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine (TCS switch "OFF") and let it idle for at least 90 seconds.
- 4) Select "PURG CN/V & S/V P1493" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 5) Touch "START".
- 6) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 30 seconds.)

CMPS-RPM (POS): 1,000 - 6,300 rpm
Vehicle speed: 40 - 120 km/h (25 - 75 MPH)
B/FUEL SCHDL: 2 - 4.8 msec
Selector lever: Suitable position

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

- 7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-473.
- 8) Select "PURG VOL C/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 9) Touch "START".

If "COMPLETED" is displayed, go to 11).

- 10) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 20 seconds.)
- CMPS-RPM (POS): 1,000 - 6,300 rpm**
Vehicle speed: 40 - 120 km/h (25 - 75 MPH)
B/FUEL SCHDL: 2 - 4.8 msec
Selector lever: Suitable position

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

- 11) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE" of "TROUBLE DIAGNOSIS FOR DTC P1444", EC-430.

- 12) Select "PURG FLOW P1447" of "EVAPORATIVE SYSTEM" in "DTC CONFIRMATION" mode with CONSULT.
- 13) Touch "START".

- 14) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to

■ PURG CN/V&S/V P1493 ■

THIS SUPPORT FUNCTION
IS FOR
DTC P1493.
SEE THE SERVICE MANUAL
ABOUT THE OPERATING
CONDITION FOR THIS
DIAGNOSIS.

EXIT
START

SEF610U

■ PURG CN/V&S/V P1493 ■

***** OK *****

■ SELF-DIAG RESULTS ■

**** NO FAILURE ****

END
PRINT

SEF611U

■ PURG VOL CN/V P1444 ■

THIS SUPPORT FUNCTION
IS FOR
DTC P1447.
SEE THE SERVICE MANUAL
ABOUT THE OPERATING
CONDITION FOR THIS
DIAGNOSIS.

EXIT
START

SEF612U

■ PURG VOL CN/V P1444 ■

***** OK *****

■ SELF-DIAG RESULTS ■

**** NO FAILURE ****

END
PRINT

SEF613U

■ PURG FLOW P1447 ■

OUT OF CONDITION

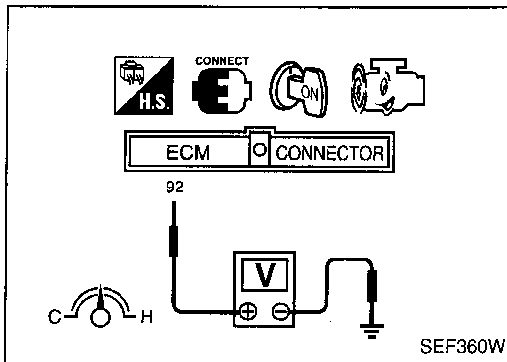
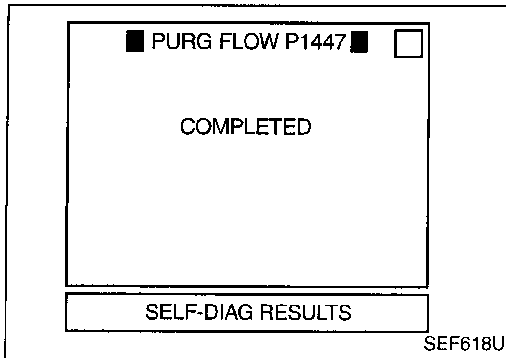
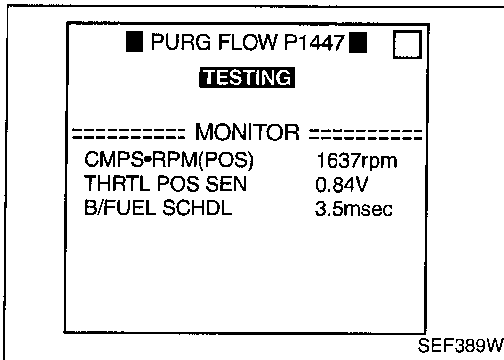
===== MONITOR =====

CMPS-RPM(POS)	1100rpm
THRTL POS SEN	0.64V
B/FUEL SCHDL	3.0msec

SEF387W

TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



"COMPLETED". (It will take at least 35 seconds.)

CMPS-RPM (POS): 1,000 - 6,300 rpm

Vehicle speed: 40 - 120 km/h (25 - 75 MPH)

Selector lever: Suitable position

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

15) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-442.

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OVERALL FUNCTION CHECK

Use this procedure to check the overall monitoring function of the EVAP control system purge flow. During this check, a 1st trip DTC might not be confirmed.



- 1) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF", wait at least 5 seconds.
- 3) Start engine and wait at least 70 seconds.
- 4) Set voltmeter probes to ECM terminals ⑨② (EVAP control system pressure sensor signal) and ⑫⑧ (ECM ground).
- 5) Check EVAP control system pressure sensor value at idle speed.
- 6) Establish and maintain the following conditions for at least 1 minute.

Air conditioner switch: ON

Steering wheel: Fully turned

Headlamp switch: ON

Rear window defogger switch: ON

Engine speed: Approx. 3,000 rpm

Gear position:

Any position other than "P", "N" or "R"

Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed for at least 1 second.

- 7) If NG, go to "DIAGNOSTIC PROCEDURE", EC-442.

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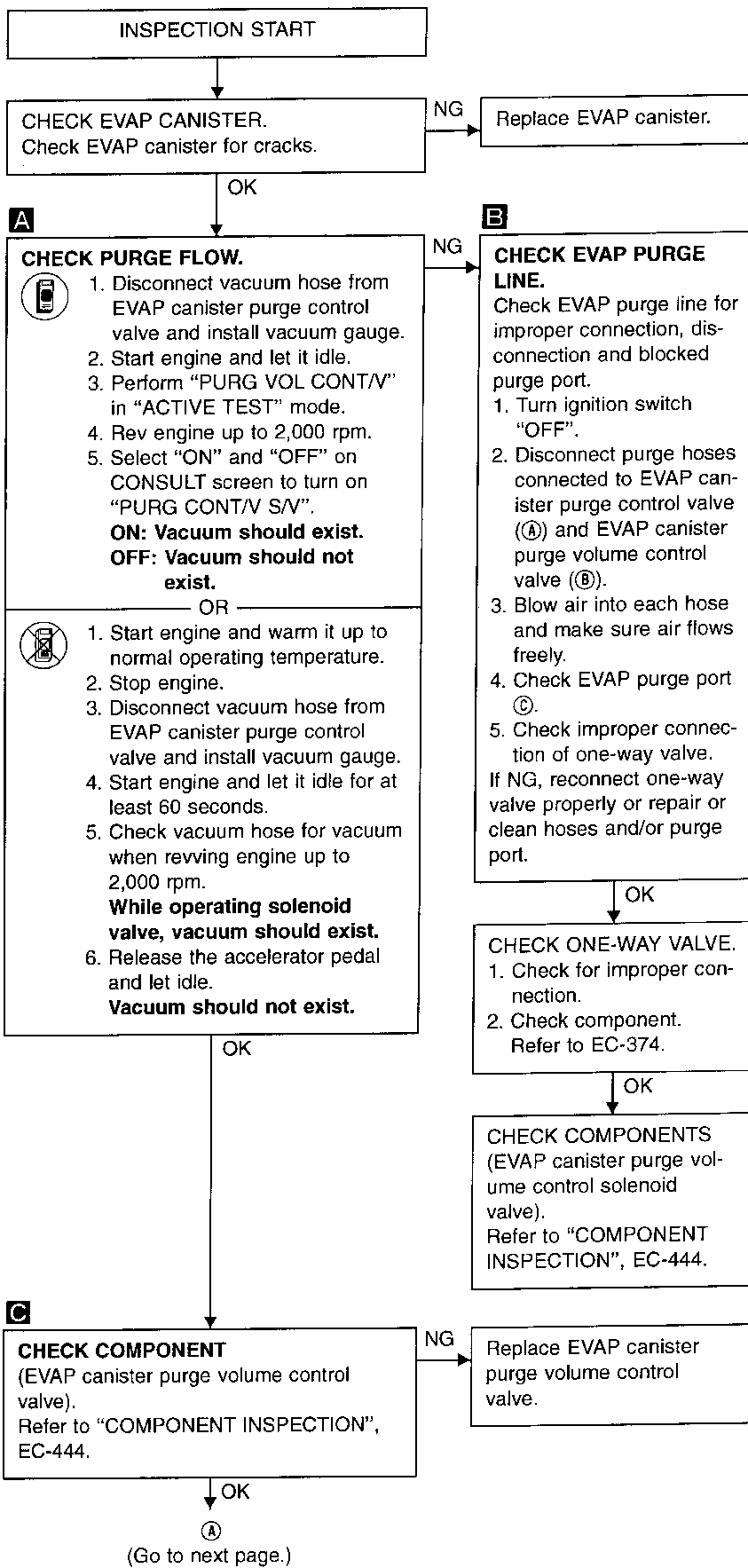
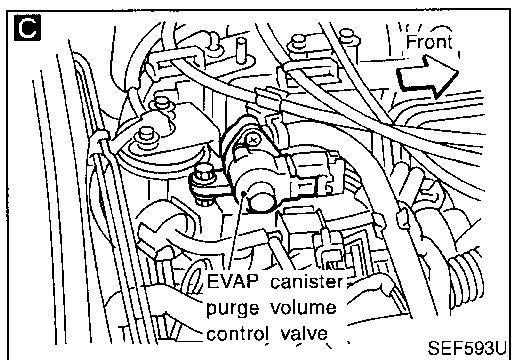
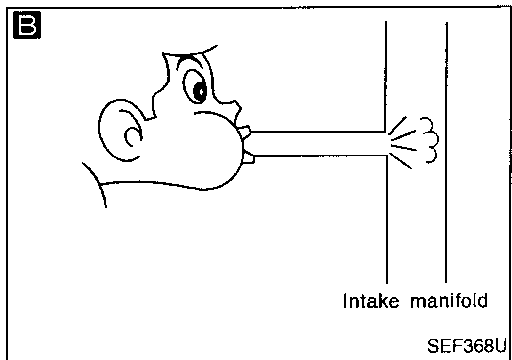
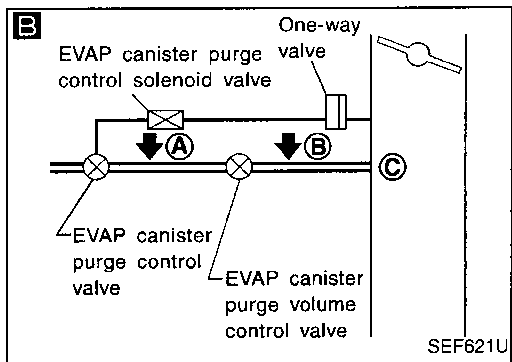
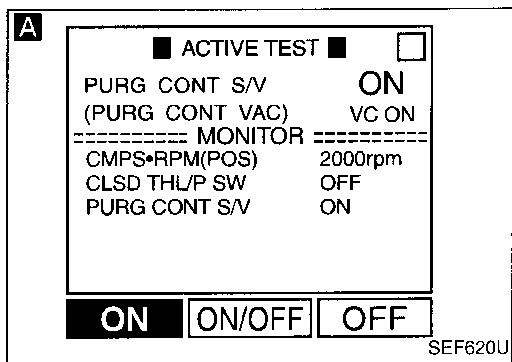
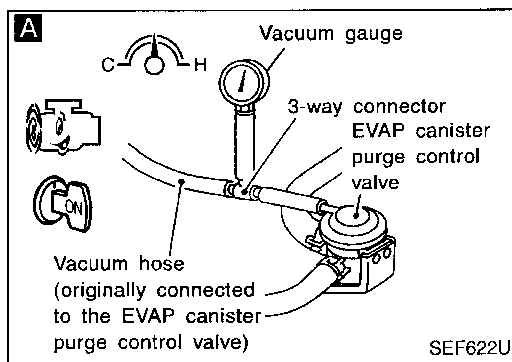
EL

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TROUBLE DIAGNOSIS FOR DTC P1447

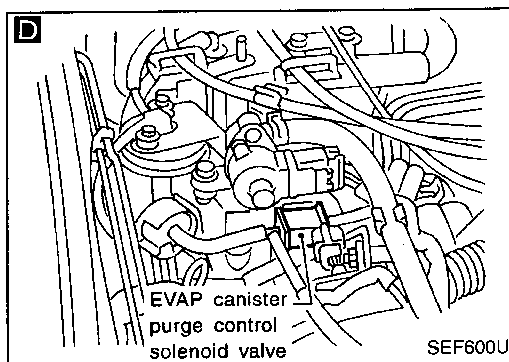
Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

DIAGNOSTIC PROCEDURE



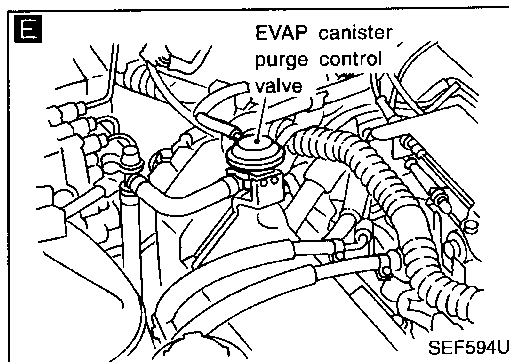
TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



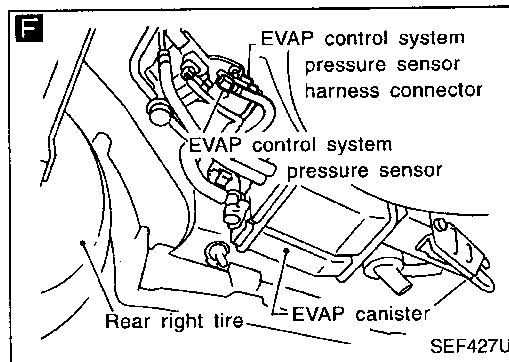
D
CHECK COMPONENT
(EVAP canister purge control solenoid valve).
Refer to "COMPONENT INSPECTION", EC-445.

NG → Replace EVAP canister purge control solenoid valve.



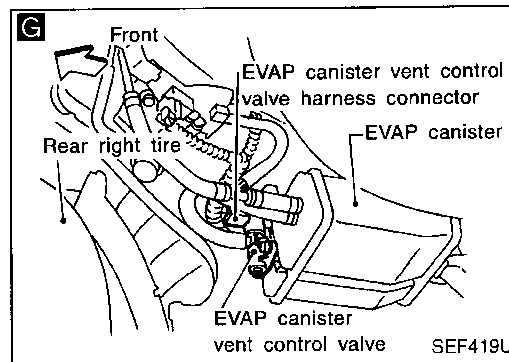
E
CHECK COMPONENT
(EVAP canister purge control valve).
Refer to "COMPONENT INSPECTION", EC-445.

NG → Replace EVAP canister purge control valve.



F
CHECK COMPONENT AND CIRCUIT
(EVAP control system pressure sensor).
1. Check disconnection of hose connected to the sensor.
2. Check sensor harness connector for water.
Water should not exist.
If OK, go to step 3.
3. Check EVAP control system pressure sensor. Refer to "COMPONENT INSPECTION", EC-310.

NG → Replace EVAP control system pressure sensor and repair or replace harness and connector.



G
CHECK COMPONENT
(EVAP canister vent control valve and O-ring).
Refer to "COMPONENT INSPECTION", EC-437.

NG → Replace EVAP canister vent control valve and O-ring.

CHECK EVAP PURGE LINE.
Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.

NG → Replace it.

OK → Clean EVAP purge line (pipe and rubber tube) using air blower.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

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TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control valve

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

Resistance:

Approximately 35 - 43Ω [At 25°C (77°F)]

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

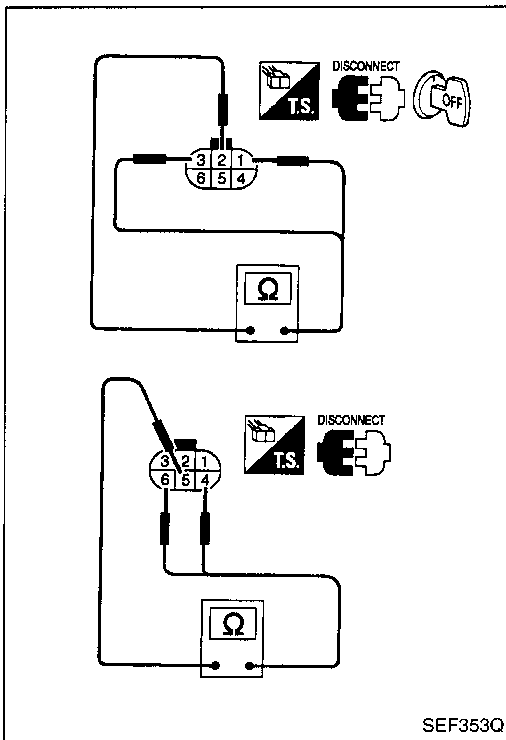
OR

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

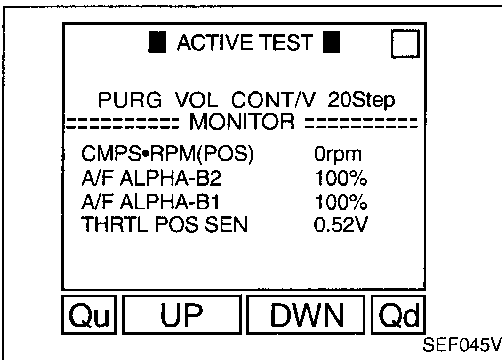
Resistance:

Approximately 35 - 43Ω [At 25°C (77°F)]

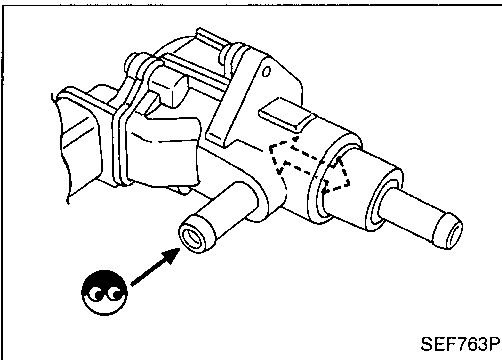
- 3) Reconnect EVAP canister purge volume control valve harness connector.
- 4) Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)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



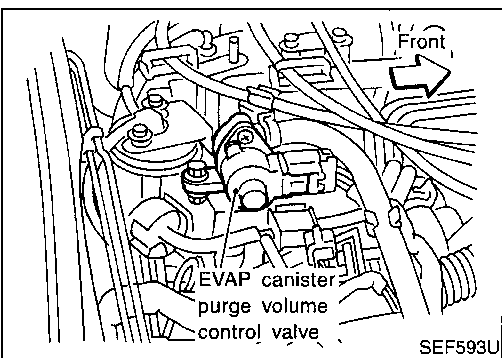
SEF353Q



SEF045V



SEF763P



SEF593U

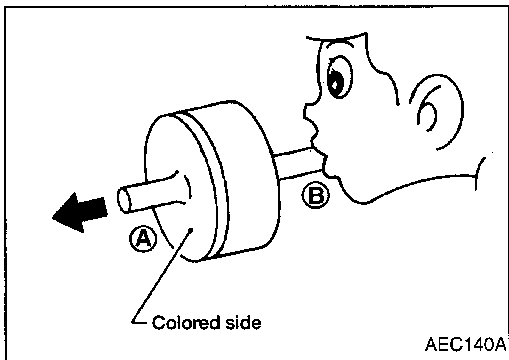
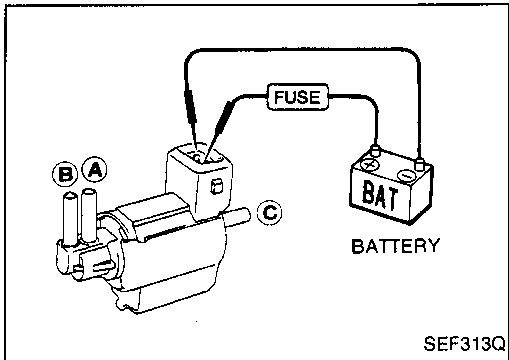
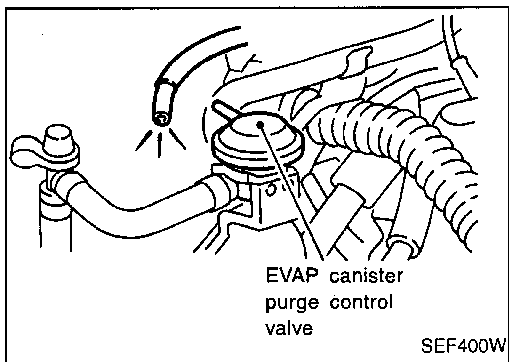
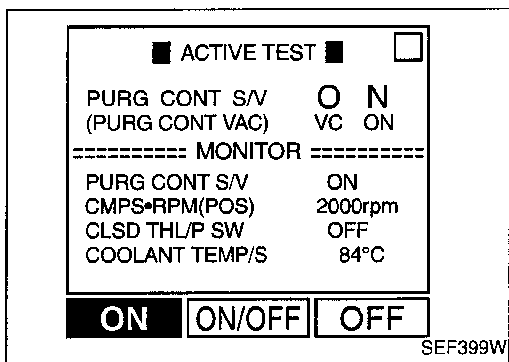
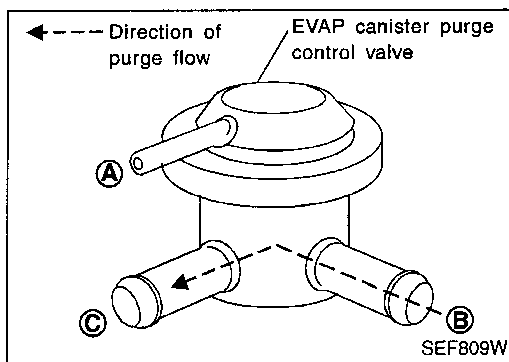
TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

EVAP canister purge control valve

Check EVAP canister purge control valve as follows:

1. Blow air in port (A) and (C), then ensure that there is no leakage.
2. Blow air in port (B), then ensure that there is a resistance to flow out of port (C).
3. Apply vacuum to port (A). [Approximately -13.3 to -20.0 kPa (-100 to -150 mmHg, -3.94 to -5.91 inHg)]
Blow air in port (C) and ensure free flow out of port (B).



EVAP canister purge control solenoid valve

1. Turn ignition switch "ON".
2. Select "PURG CONT S/V" of "ACTIVE TEST" mode with CONSULT.
3. Start engine and warm it up to normal operating temperature.
4. Disconnect vacuum hose at EVAP canister purge control valve.
5. Touch "ON" and "OFF" and check for vacuum passing through the hose.

Condition	Vacuum
Idle	Not exist
2,000 rpm	Exist

OR

1. Check air passage continuity.

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

If NG or operation takes more 1 second, replace solenoid valve.

One-way valve

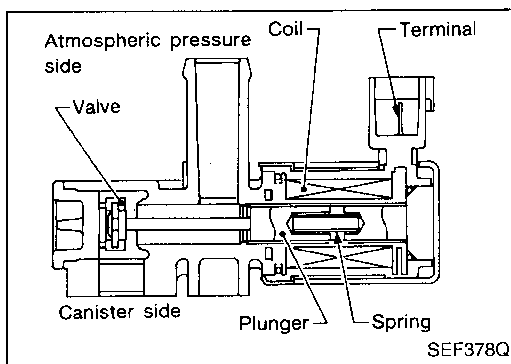
Check one-way valve air passage continuity.

Condition	Air passage continuity
Blow air into side B to A	Yes
Blow air into side A to B	No

If NG, replace one-way valve.

Make sure to install one-way valve with the colored side facing the vacuum.

TROUBLE DIAGNOSIS FOR DTC P1448



Evaporative Emission (EVAP) Canister Vent Control Valve (Open)

COMPONENT DESCRIPTION

NOTE:

If DTC P1448 is displayed with P0440, P1440, perform **TRUBLE DIAGNOSIS FOR DTC P1448** first.

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

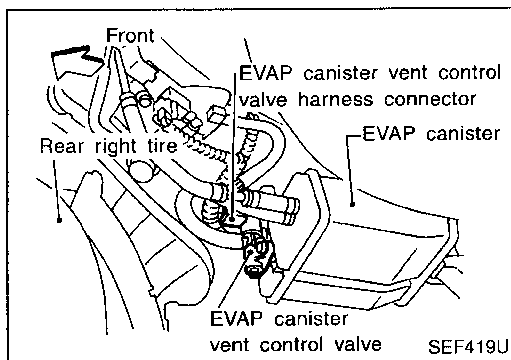
This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
20	P/B	EVAP canister vent control valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1448 0309	● EVAP canister vent control valve remains opened under specified driving conditions.	<ul style="list-style-type: none"> ● EVAP canister vent control valve ● EVAP control system pressure sensor ● Blocked rubber tube to EVAP canister vent control valve ● Water separator ● EVAP canister is saturated with water. ● Vacuum cut valve

TROUBLE DIAGNOSIS FOR DTC P1448

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

- If DTC P1448 is displayed with P0440, P1440, perform **TROUBLE DIAGNOSIS FOR DTC P1448** first.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Perform "DTC WORK SUPPORT" when the fuel level is less than 3/4 full. And vehicle is placed on a flat level surface.
- Always perform test at temperature of 0 to 30°C (32 to 86°F).
- It is better that fuel level is low.



- 1) Turn ignition switch "ON".
- 2) Select "EVAP SML LEAK P0440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT. Follow the instruction displayed.
- 3) Make sure that "OK" is displayed. If "NG" is displayed, go to following step.

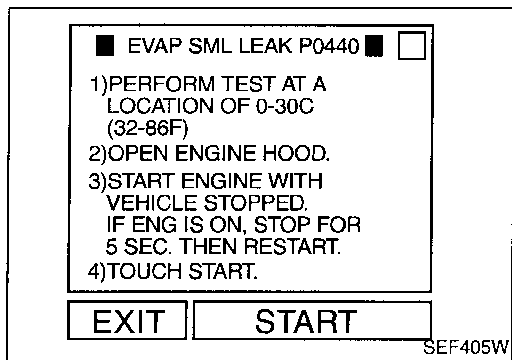
NOTE:

- If the CONSULT screen shown at left ("CAN NOT BE DIAGNOSED") is displayed, stop the engine and stabilize the vehicle temperature at 25°C (77°F) or cooler. After "TANK F/TMP SE" becomes less than 30°C (86°F), retest. (Use a fan to reduce the stabilization time.)
 - If the engine speed cannot be maintained within the range on the CONSULT screen, go to "BASIC INSPECTION", EC-82.
- 4) Disconnect hose from water separator.
 - 5) Select "VENT CONTROL/V" of "ACTIVE TEST" mode with CONSULT.
 - 6) Touch "ON" and "OFF" alternately.
 - 7) Make sure the following.

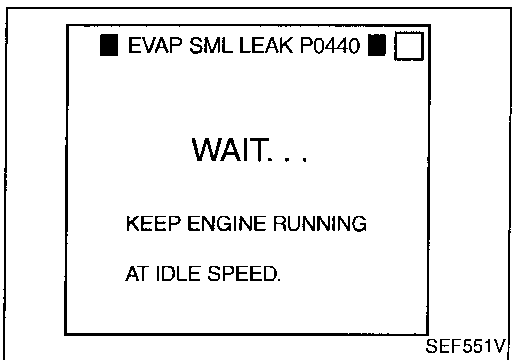
Condition	Air passage continuity between (A) and (B)
VENT CONTROL/V	
ON	No
OFF	Yes

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-449.

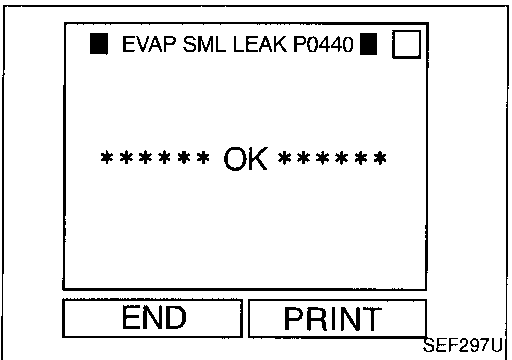
If the result is OK, go to "DIAGNOSTIC PROCEDURE" for "TROUBLE DIAGNOSIS FOR DTC P0440", EC-288.



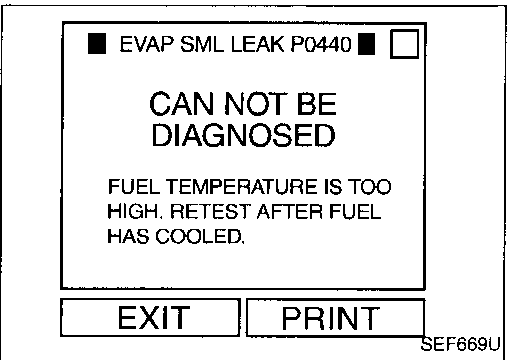
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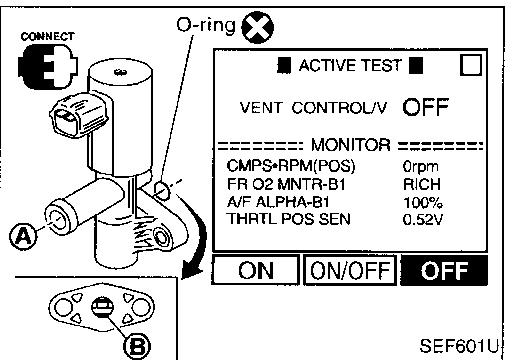
SEF551V



SEF297U



SEF669U



SEF601U

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TROUBLE DIAGNOSIS FOR DTC P1448

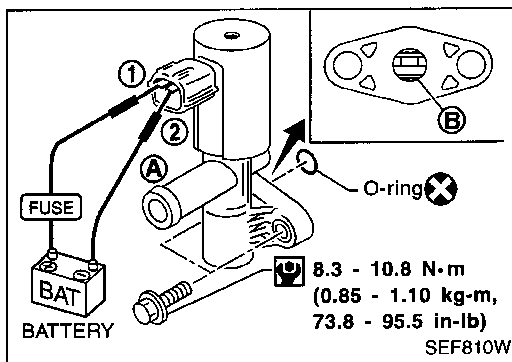
Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)

OR

OVERALL FUNCTION CHECK

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

- 1) Disconnect hose from water separator.
- 2) Disconnect EVAP canister vent control valve harness connector.
- 3) Verify the following.



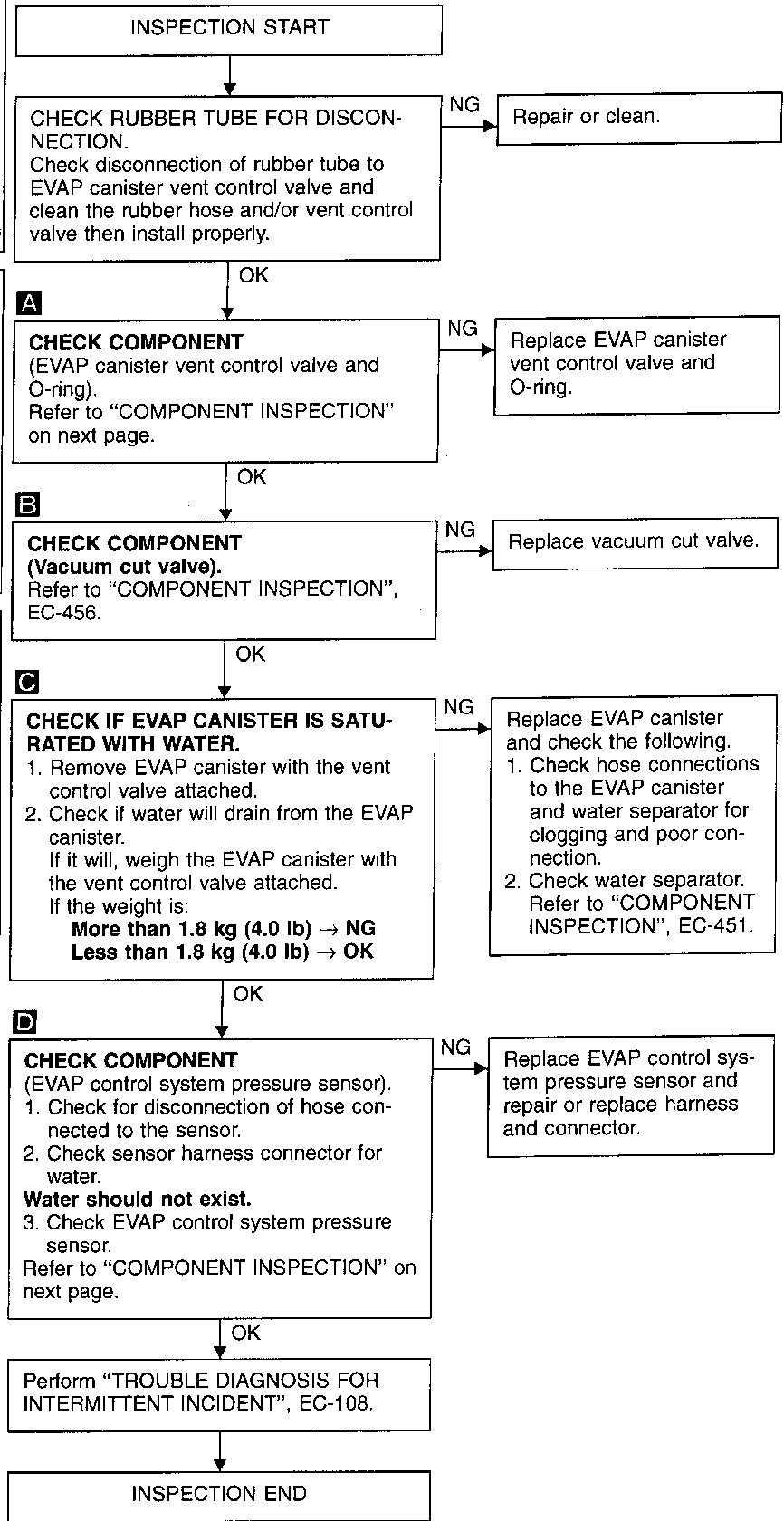
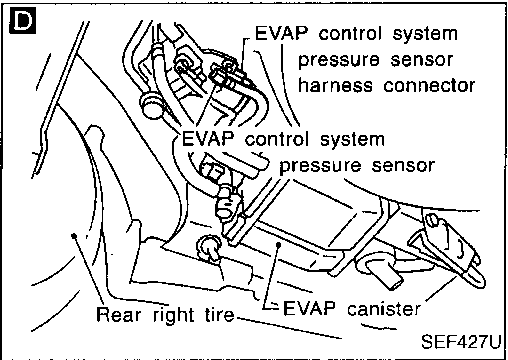
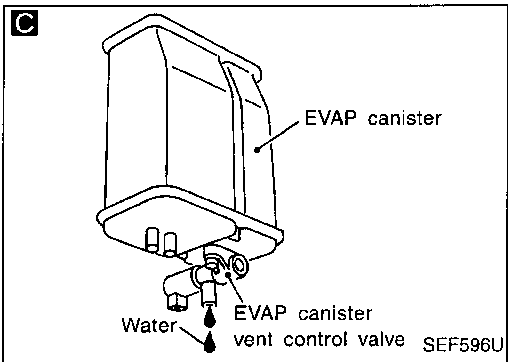
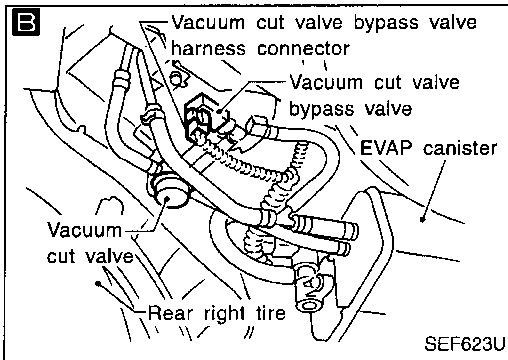
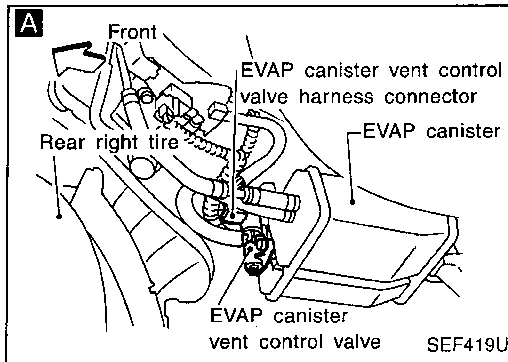
Condition	Air passage continuity
12V direct current supply between terminals ① and ②	No
No supply	Yes

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-449.

If the result is OK, go to "TROUBLE DIAGNOSIS FOR DTC P0440", EC-288.

TROUBLE DIAGNOSIS FOR DTC P1448

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



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TROUBLE DIAGNOSIS FOR DTC P1448

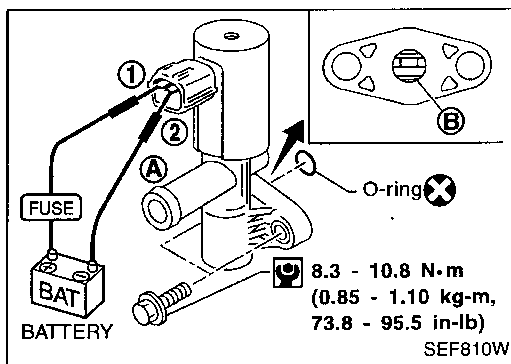
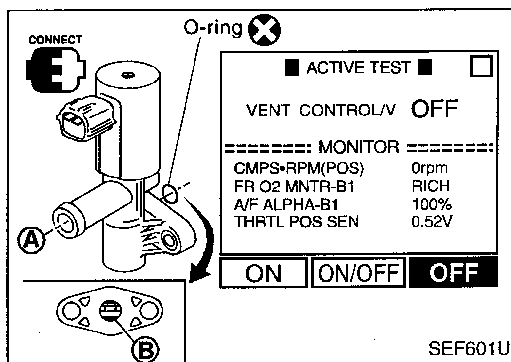
Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)

COMPONENT INSPECTION

EVAP canister vent control valve

Check air passage continuity.

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.



Condition	Air passage continuity between (A) and (B)
VENT CONTROL/V ON	No
VENT CONTROL/V OFF	Yes

OR

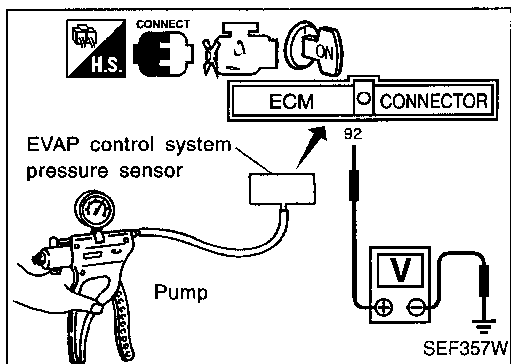


Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals ① and ②	No
No supply	Yes

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If the portion (B) is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.



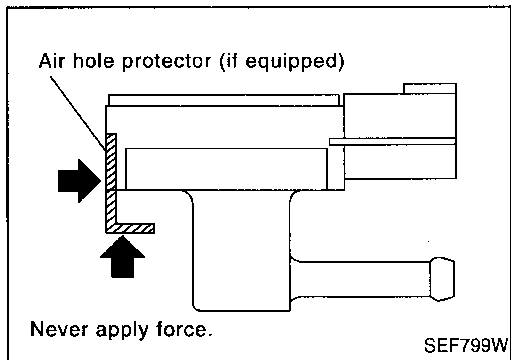
EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
5. Check output voltage between ECM terminal ⑨② and ground.

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

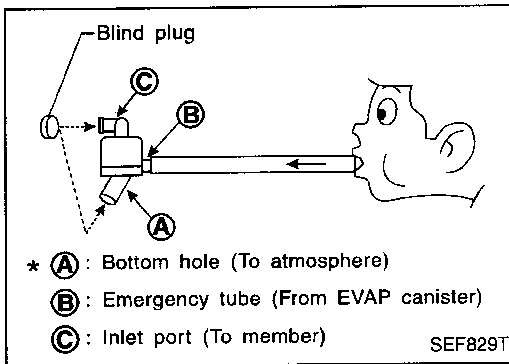
CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -20 kPa (-150 mmHg, -5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.
- If NG, replace EVAP control system pressure sensor.
- Never apply force to the air hole protector of the sensor, if equipped.
- Discard any EVAP control system pressure sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



TROUBLE DIAGNOSIS FOR DTC P1448

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



Water separator

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that (A) and (C) are not clogged by blowing air into (B) with (A), and then (C) plugged.
5. In case of NG in items 2 - 4, replace the parts.

NOTE:

Do not disassemble water separator.

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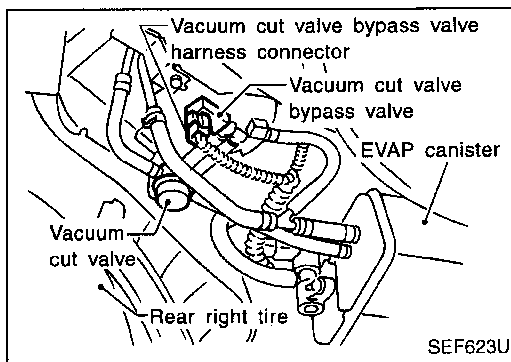
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TROUBLE DIAGNOSIS FOR DTC P1490



Vacuum Cut Valve Bypass Valve (Circuit)

COMPONENT DESCRIPTION

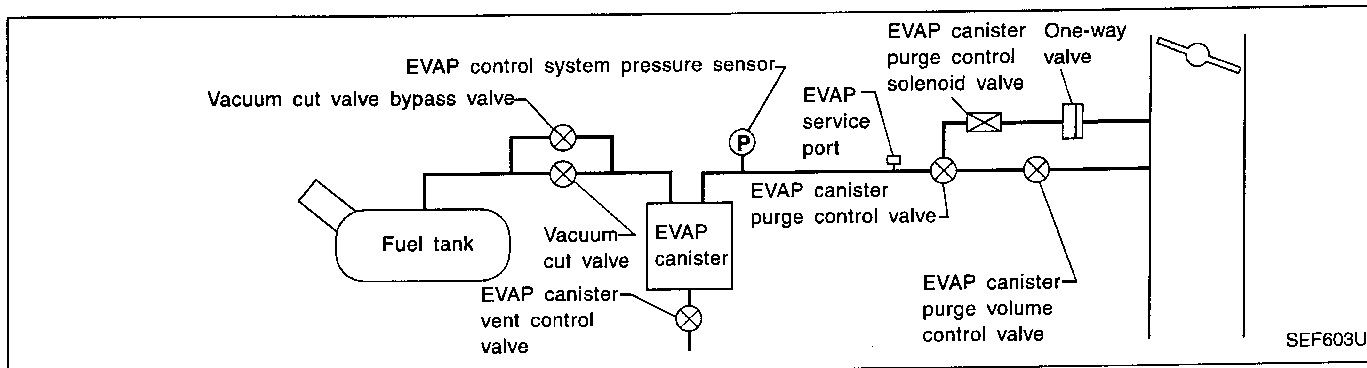
The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.

The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.

The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.

The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPASS/V	● Ignition switch: ON	OFF

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

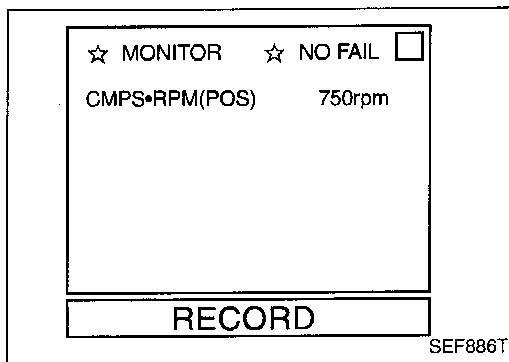
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	LG/B	Vacuum cut valve bypass valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1490 0801	● An improper voltage signal is sent to ECM through vacuum cut valve bypass valve.	● Harness or connectors (The vacuum cut valve bypass valve circuit is open or shorted.) ● Vacuum cut valve bypass valve

TROUBLE DIAGNOSIS FOR DTC P1490

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 5 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-455.

OR



- 1) Start engine and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-455.

OR



- 1) Start engine and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-455.

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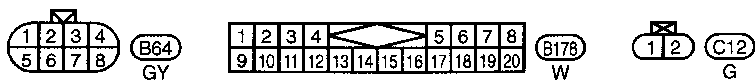
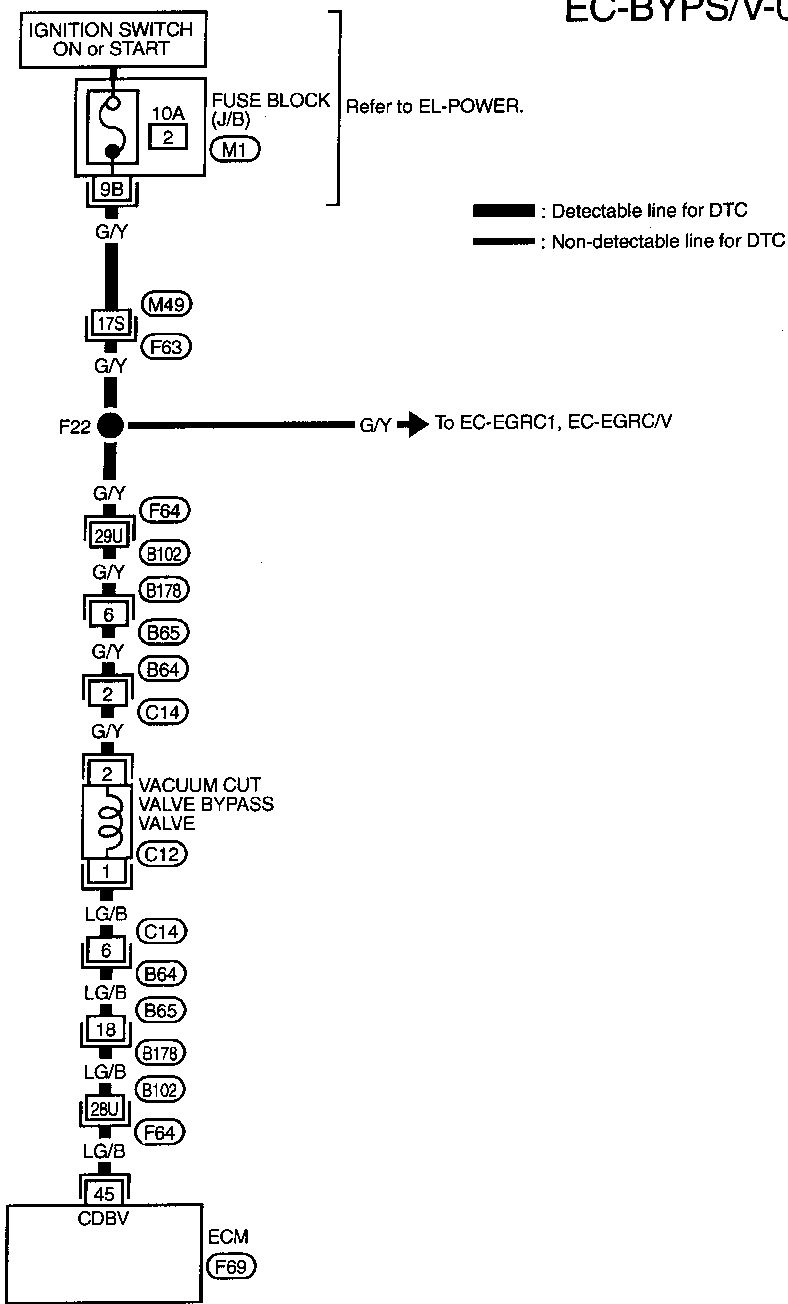
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TROUBLE DIAGNOSIS FOR DTC P1490

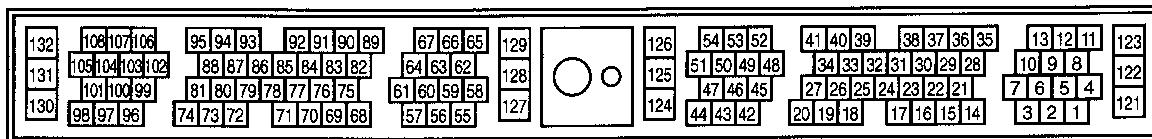
Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

EC-BYPS/V-01



Refer to last page (Foldout page).

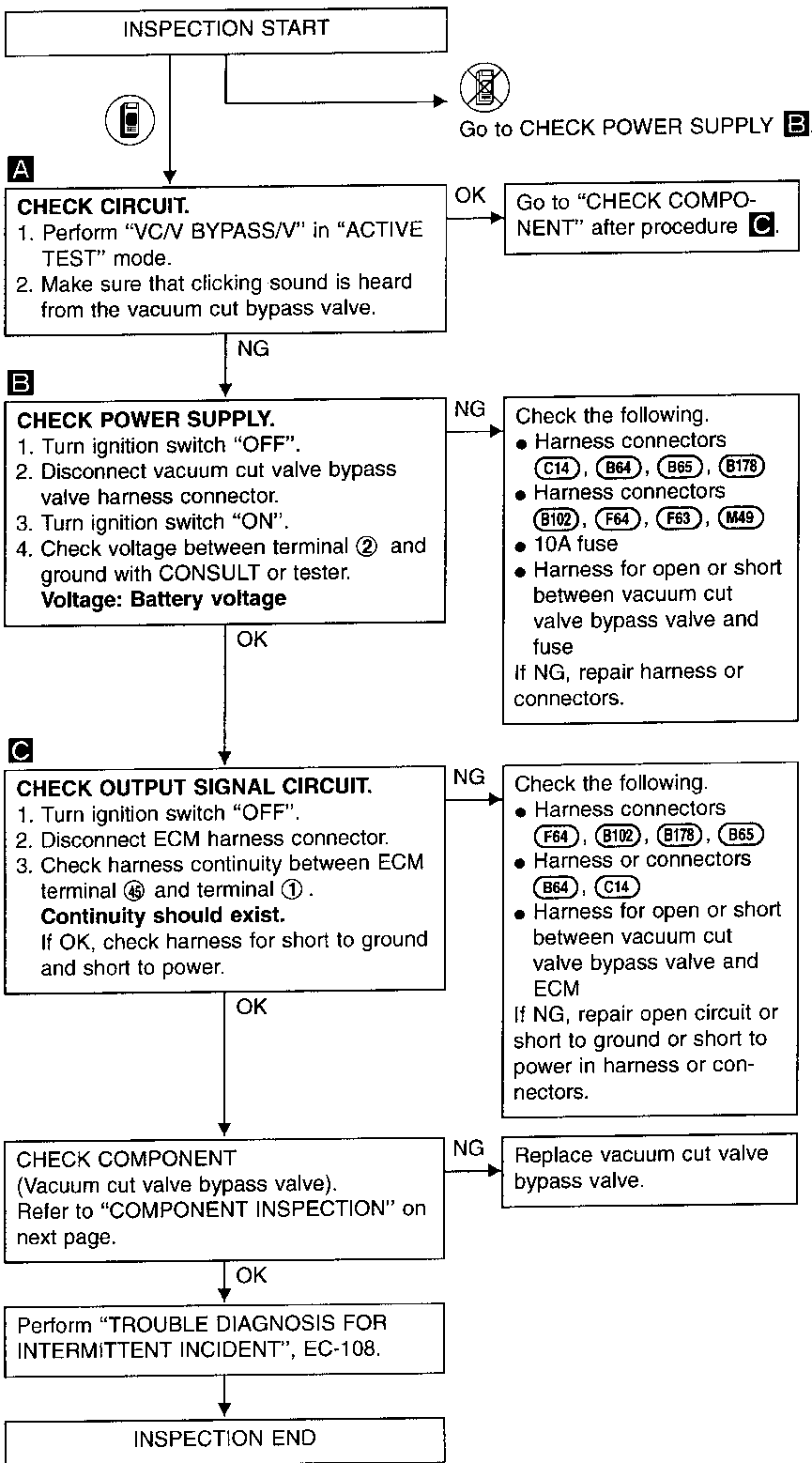
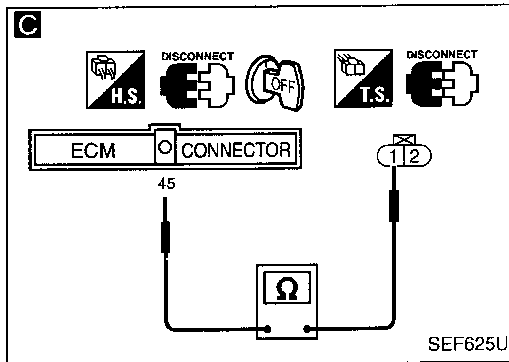
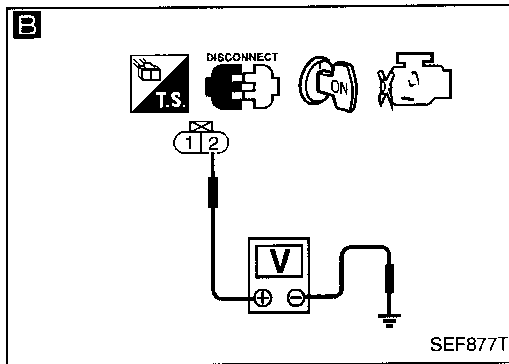
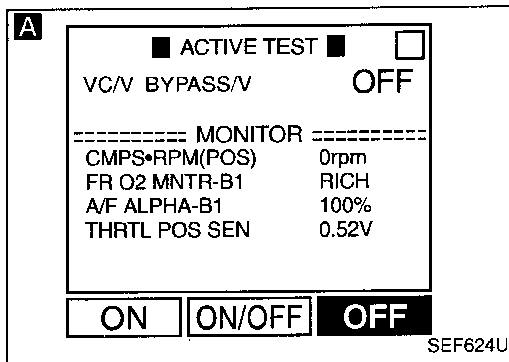
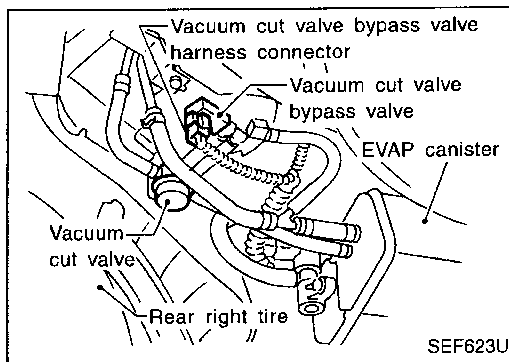
- (M49), (F63)
- (F64), (B102)
- (M1)



TROUBLE DIAGNOSIS FOR DTC P1490

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

DIAGNOSTIC PROCEDURE



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TROUBLE DIAGNOSIS FOR DTC P1490

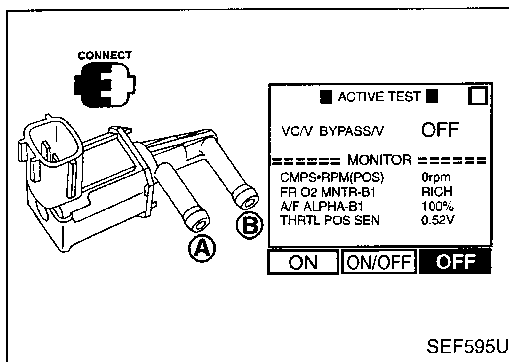
Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

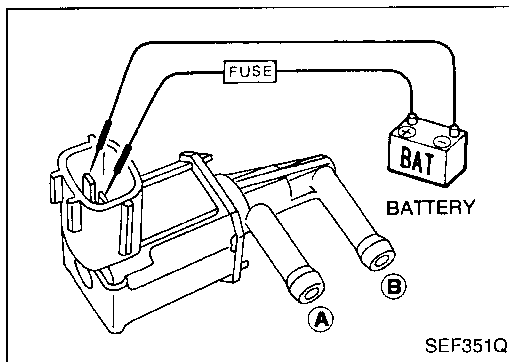
Vacuum cut valve bypass valve

Check air passage continuity.

 Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.




SEF595U



SEF351Q

Condition VC/V BYPASS/V	Air passage continuity between (A) and (B)
ON	Yes
OFF	No

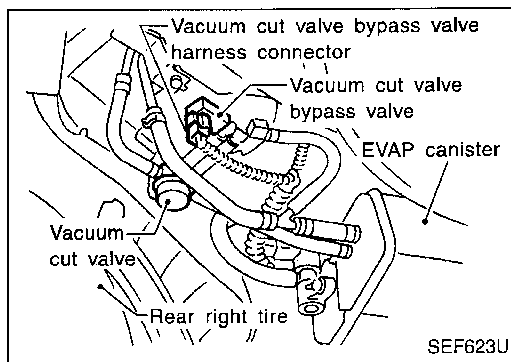
OR



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

If NG or operation takes more than 1 second, replace vacuum cut valve bypass valve.

TROUBLE DIAGNOSIS FOR DTC P1491



Vacuum Cut Valve Bypass Valve

COMPONENT DESCRIPTION

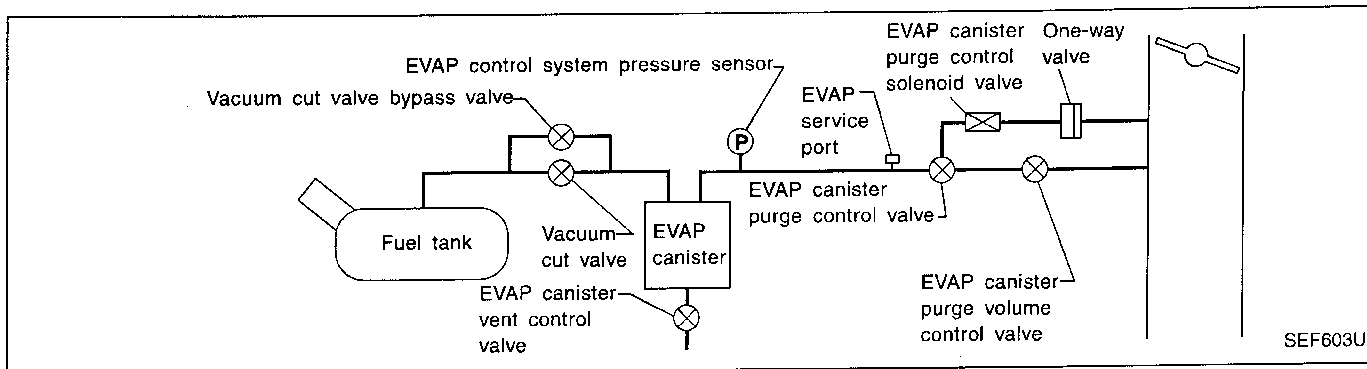
The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.

The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.

The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.

The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPASS/V	● Ignition switch: ON	OFF

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	LG/B	Vacuum cut valve bypass valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1491 0311	<ul style="list-style-type: none"> ● Vacuum cut valve bypass valve does not operate properly. 	<ul style="list-style-type: none"> ● Vacuum cut valve bypass valve ● Vacuum cut valve ● Bypass hoses for clogging ● EVAP control system pressure sensor ● EVAP canister vent control valve ● Hose between fuel tank and vacuum cut valve clogged ● Hose between vacuum cut valve and EVAP canister clogged ● EVAP canister ● EVAP purge port of fuel tank for clogging

TROUBLE DIAGNOSIS FOR DTC P1491

Vacuum Cut Valve Bypass Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

- Always perform test at temperature of 5 to 30°C (41 to 86°F).



- Turn ignition switch "ON".
- Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Start engine (TCS switch "OFF") and let it idle for at least 90 seconds.
- Select "PURG CN/V & S/V P1493" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 30 seconds.)
CMPS-RPM (POS): 1,000 - 6,300 rpm
Vehicle speed: 40 - 120 km/h (25 - 75 MPH)
B/FUEL SCHDL: 2 - 4.8 msec
Selector lever: Suitable position
 If "TESTING" is not displayed after 5 minutes, retry from step 3).
- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "TROUBLE DIAGNOSIS FOR DTC P1493", EC-470.
- Select "PURG VOL C/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
 If "COMPLETED" is displayed on CONSULT screen, go to step 12).
- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 20 seconds.)
CMPS-RPM (POS): 1,000 - 6,300 rpm
Vehicle speed: 40 - 120 km/h (25 - 75 MPH)
B/FUEL SCHDL: 2 - 4.8 msec
Selector lever: Suitable position
 If "TESTING" is not displayed after 5 minutes, retry from step 3).
- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "TROUBLE DIAGNOSIS FOR DTC P1444", EC-426.
- Select "VC CUT/V BP/V P1491" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the

■ PURG CN/V&S/V P1493 ■

THIS SUPPORT FUNCTION IS FOR DTC P1493. SEE THE SERVICE MANUAL ABOUT THE OPERATING CONDITION FOR THIS DIAGNOSIS.

EXIT
START

SEF610U

■ PURG VOL CN/V P1444 ■

THIS SUPPORT FUNCTION IS FOR DTC P1444. SEE THE SERVICE MANUAL ABOUT THE OPERATING CONDITION FOR THIS DIAGNOSIS.

EXIT
START

SEF612U

■ PURG FLOW P1447 ■

TESTING

MONITOR

CMPS•RPM(POS)	1637rpm
THRTL POS SEN	0.84V
B/FUEL SCHDL	3.5msec

SEF389W

■ VC CUT/V BP/V P1491 ■

OUT OF CONDITION

MONITOR

CMPS•RPM(POS)	1600rpm
THRTL POS SEN	0.7V
B/FUEL SCHDL	2.5msec

SEF390W

■ VC CUT/V BP/V P1491 ■

COMPLETED

SELF-DIAG RESULTS

MEC087C

TROUBLE DIAGNOSIS FOR DTC P1491

Vacuum Cut Valve Bypass Valve (Cont'd)

conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 30 seconds.)

CMPS-RPM (POS): 500 - 6,300 rpm

Vehicle speed: 40 - 120 km/h (25 - 75 MPH)

B/FUEL SCHDL: 0.5 - 4.8 msec

Selector lever: Suitable position

If "TESTING" is not displayed after 5 minutes, retry from step 3).

16) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-460.

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OVERALL FUNCTION CHECK

LC



- 1) Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
- 2) Apply vacuum to port (A) and check that there is no suction from port (B).
- 3) Apply vacuum to port (B) and check that there is suction from port (A).
- 4) Blow air in port (B) and check that there is a resistance to flow out of port (A).
- 5) Supply battery voltage to the terminal.
- 6) Blow air in port (A) and check that air flows freely out of port (B).
- 7) Blow air in port (B) and check that air flows freely out of port (A).
- 8) If NG, go to "DIAGNOSTIC PROCEDURE", EC-460.

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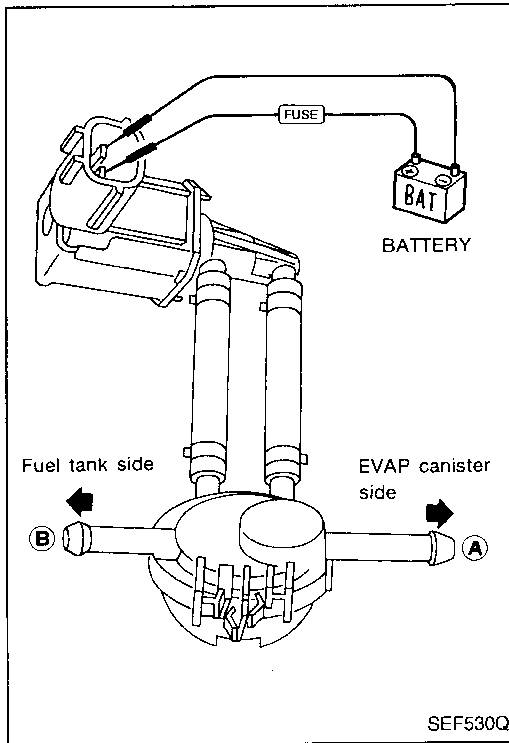
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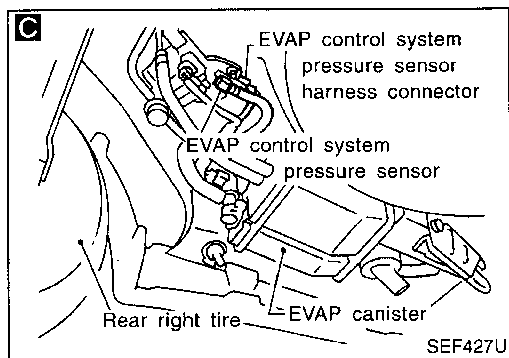
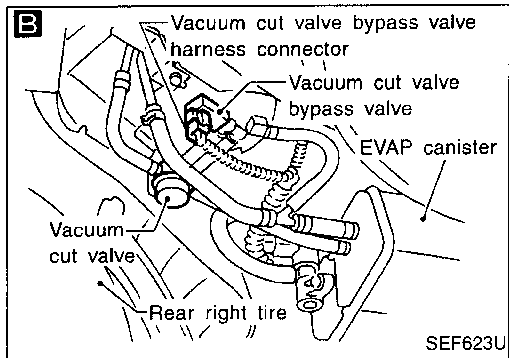
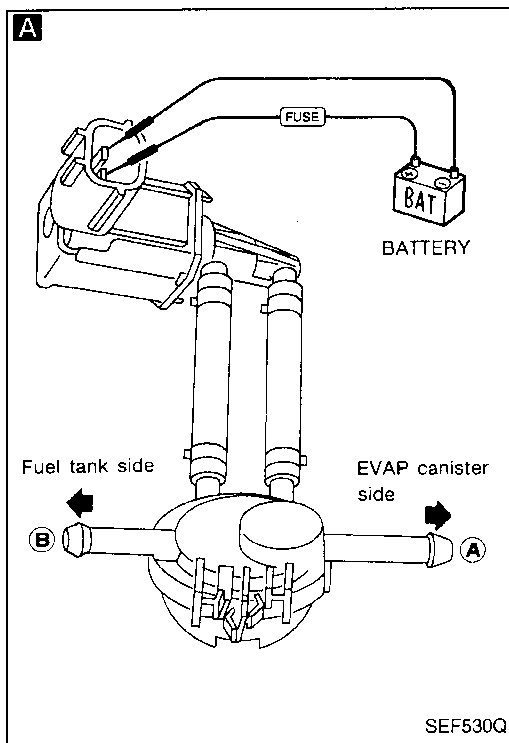
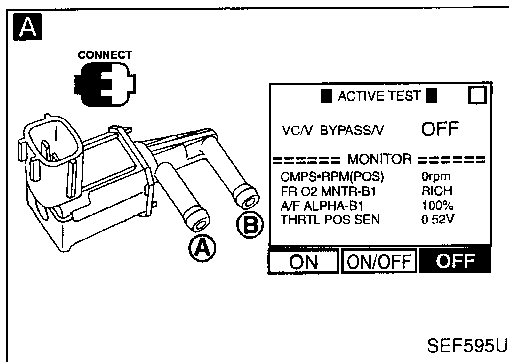
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TROUBLE DIAGNOSIS FOR DTC P1491

Vacuum Cut Valve Bypass Valve (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK COMPONENT.

1. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
2. Apply vacuum to port (A) and check that there is no suction from port (B).
3. Apply vacuum to port (B) and check that there is suction from port (A).
4. Blow air in port (B) and check that there is a resistance to flow out of port (A).
5. Select "VC/V BYPASS/V" in "ACTIVE TEST" mode with CONSULT and touch "ON".

OR

5. Supply battery voltage to the terminal.

6. Blow air in port (A) and check that air flows freely out of port (B).
7. Blow air in port (B) and check that air flows freely out of port (A).

OK

Check the following.

- EVAP purge line between EVAP canister and fuel tank for clogging or disconnection.
- EVAP canister Refer to EC-23.
- EVAP purge port of fuel tank for clogging

If NG, repair or replace.

OK

Go to **C** below.

NG

Check bypass hoses for clogging.

NG

Repair or replace hoses.

B

CHECK COMPONENT
(Vacuum cut valve, vacuum cut valve bypass valve).
Refer to "COMPONENT INSPECTION" on next page.

NG

Replace malfunctioning parts.

C

CHECK COMPONENT
(EVAP control system pressure sensor).

1. Check for disconnection of hose connected to the sensor.
2. Check sensor harness connector for water.
Water should not exist.
If OK, go to the following step.
3. Check EVAP control system pressure sensor.
Refer to "COMPONENT INSPECTION" on next page.

NG

Repair or replace harness, connectors and/or replace EVAP control system pressure sensor.

OK

CHECK COMPONENT
(EVAP canister vent control valve).
Refer to "COMPONENT INSPECTION", EC-462.

NG

Repair or replace.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P1491

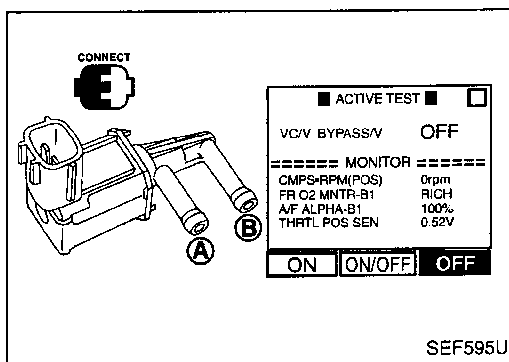
Vacuum Cut Valve Bypass Valve (Cont'd)

COMPONENT INSPECTION

Vacuum cut valve bypass valve

Check air passage continuity.

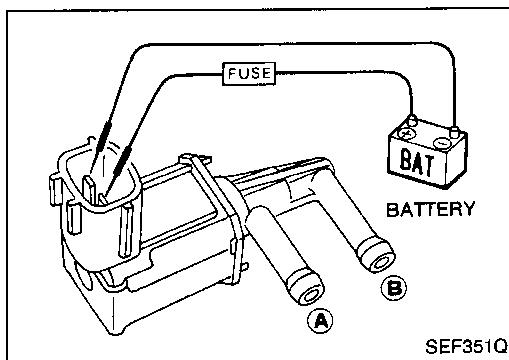
① Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.



SEF595U

Condition VC/V BYPASS/V	Air passage continuity between (A) and (B)
ON	Yes
OFF	No

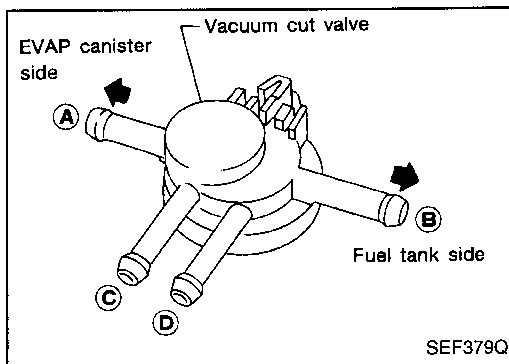
OR



SEF351Q

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

If NG or operation takes more than 1 second, replace vacuum cut valve bypass valve.



SEF379Q

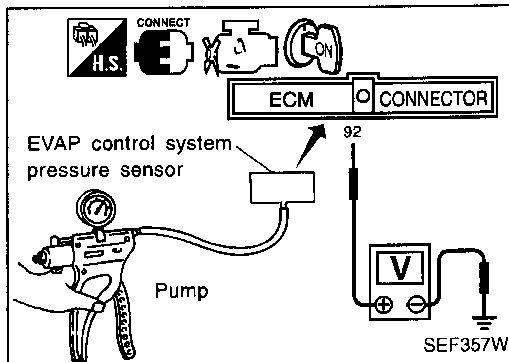
Vacuum cut valve

Check vacuum cut valve as follows:

1. Plug port (C) and (D) with fingers.
2. Apply vacuum to port (A) and check that there is no suction from port (B).
3. Apply vacuum to port (B) and check that there is suction from port (A).
4. Blow air in port (B) and check that there is a resistance to flow out of port (A).
5. Open port (C) and (D).
6. Blow air in port (A) check that air flows freely out of port (C).
7. Blow air in port (B) check that air flows freely out of port (D).

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. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
5. Check output voltage between ECM terminal 92 and ground.

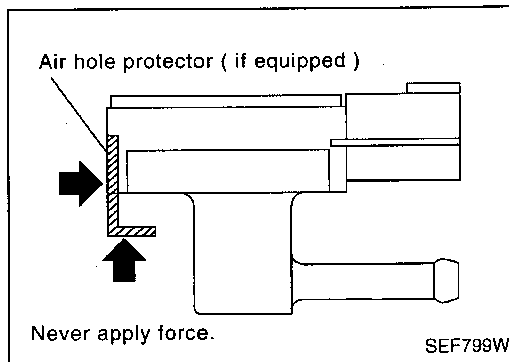


SEF357W

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

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Do not apply below -20 kPa (-150 mmHg, -5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.
- If NG, replace EVAP control system pressure sensor.
- Never apply force to the air hole protector of the sensor, if equipped.
- Discard any EVAP control system pressure sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



SEF799W

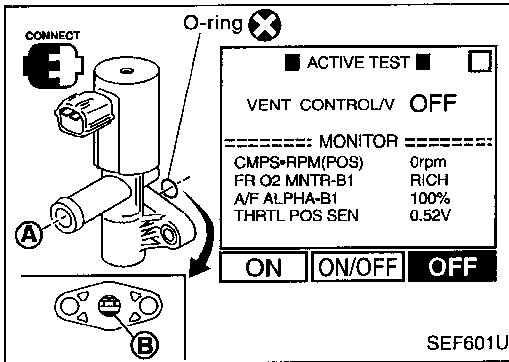
TROUBLE DIAGNOSIS FOR DTC P1491

Vacuum Cut Valve Bypass Valve (Cont'd)

EVAP canister vent control valve

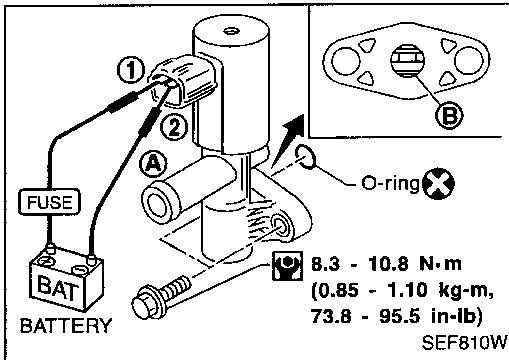
Check air passage continuity.


 Perform "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.



Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

OR





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

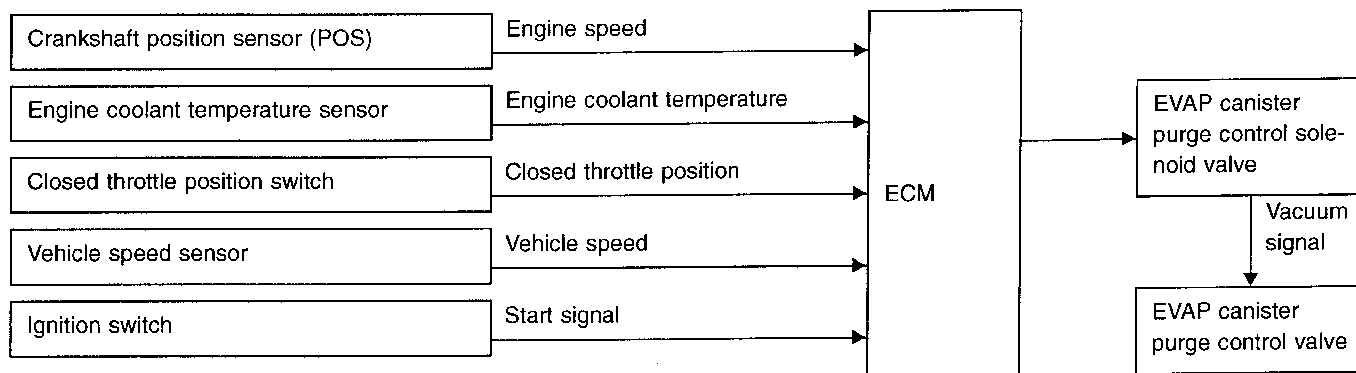
If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If the portion (B) is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.

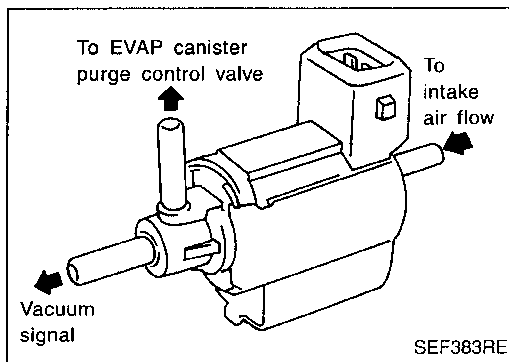
Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Circuit)

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.

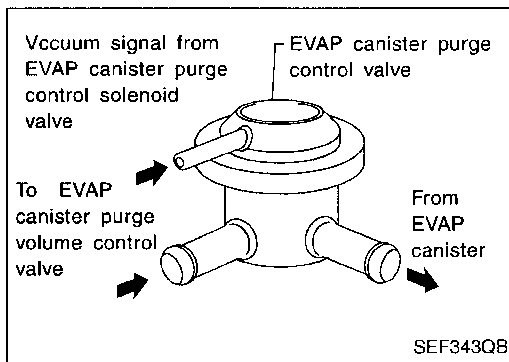
- Start switch "ON"
- Closed throttle position
- Low or high engine coolant temperature
- During deceleration
- Engine stopped
- For 60 seconds after starting engine (After warming up to normal operating temperature)



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 reaches the EVAP canister purge control valve.



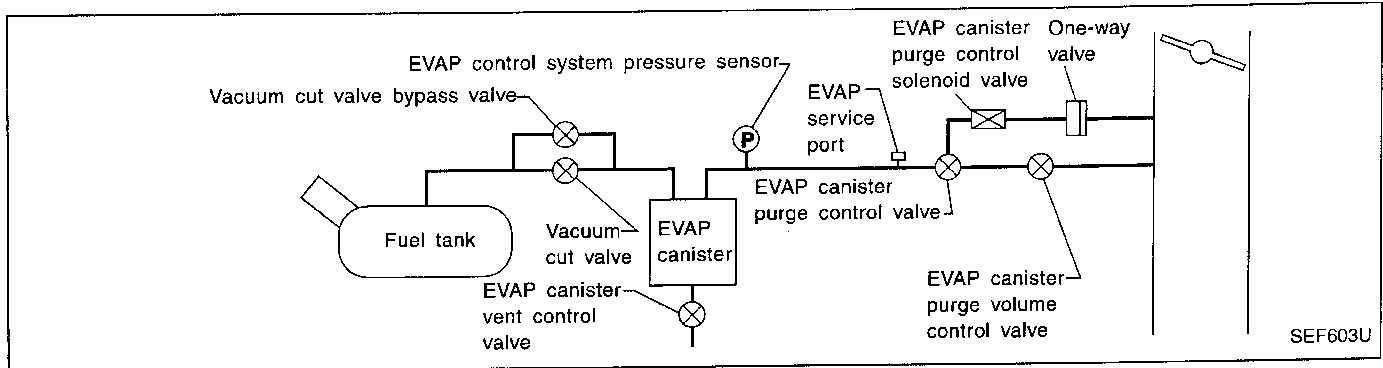
EVAP canister purge control valve

When the vacuum signal is cut by EVAP canister purge control solenoid valve, EVAP canister purge control valve shuts off the EVAP purge line.

TROUBLE DIAGNOSIS FOR DTC P1492

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

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22	Y	EVAP canister purge 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)
P1492 0807	<ul style="list-style-type: none"> The improper voltage signal is sent to ECM through EVAP canister purge control solenoid valve. 	<ul style="list-style-type: none"> Harness or connectors (The EVAP canister purge control solenoid valve circuit is open or shorted.) EVAP canister purge control solenoid valve

TROUBLE DIAGNOSIS FOR DTC P1492

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

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM(POS)	0rpm	
RECORD		

SEF888T

NOTE:

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-467.

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-467.

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-467.

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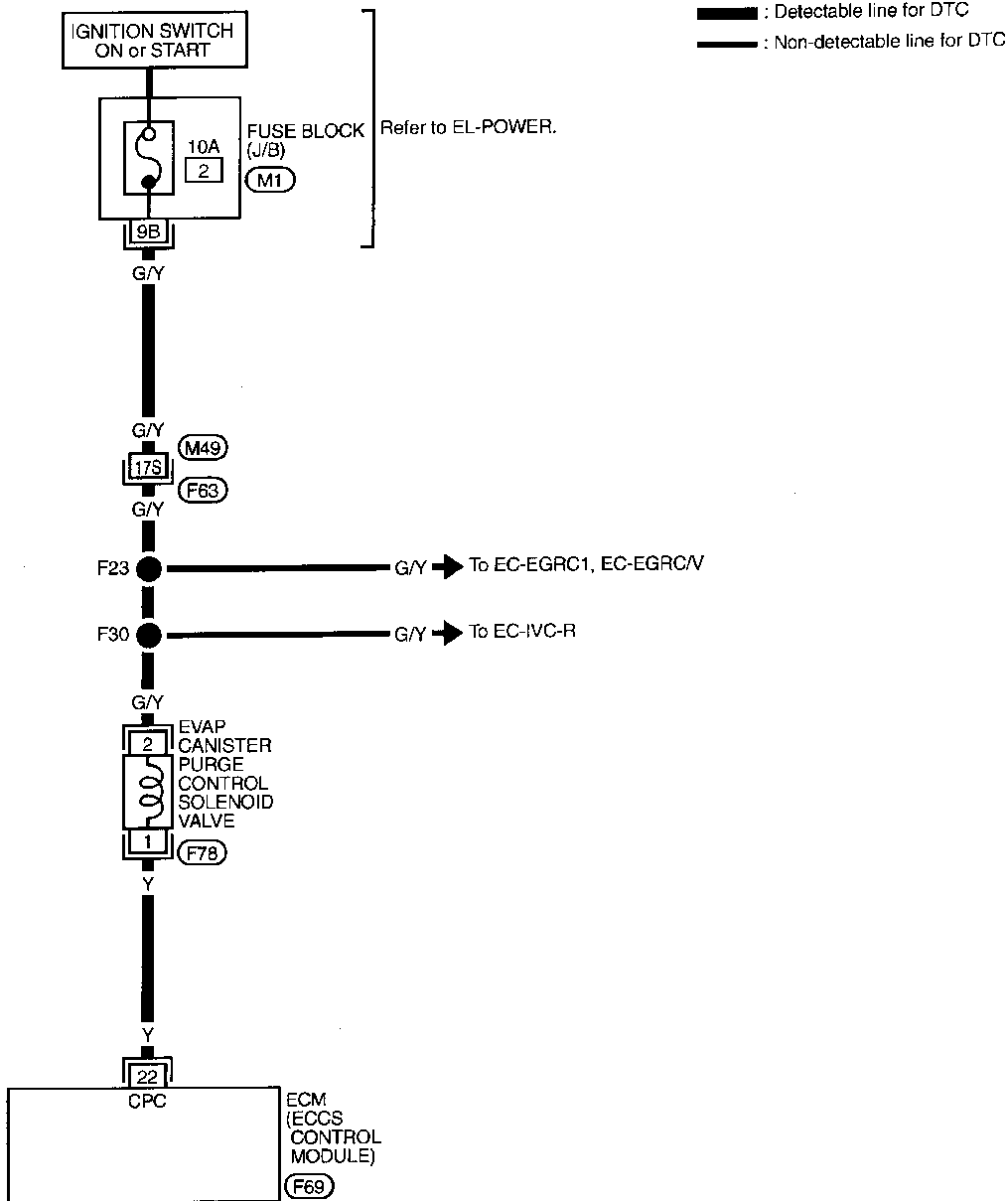
EL

IDX

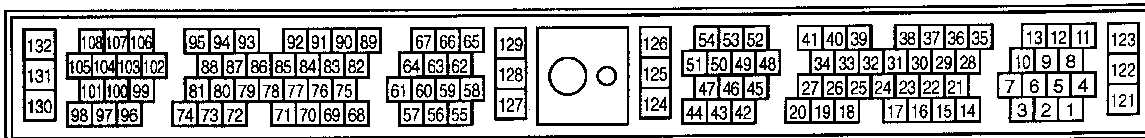
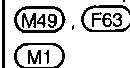
TROUBLE DIAGNOSIS FOR DTC P1492

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

EC-CAN/IV-01



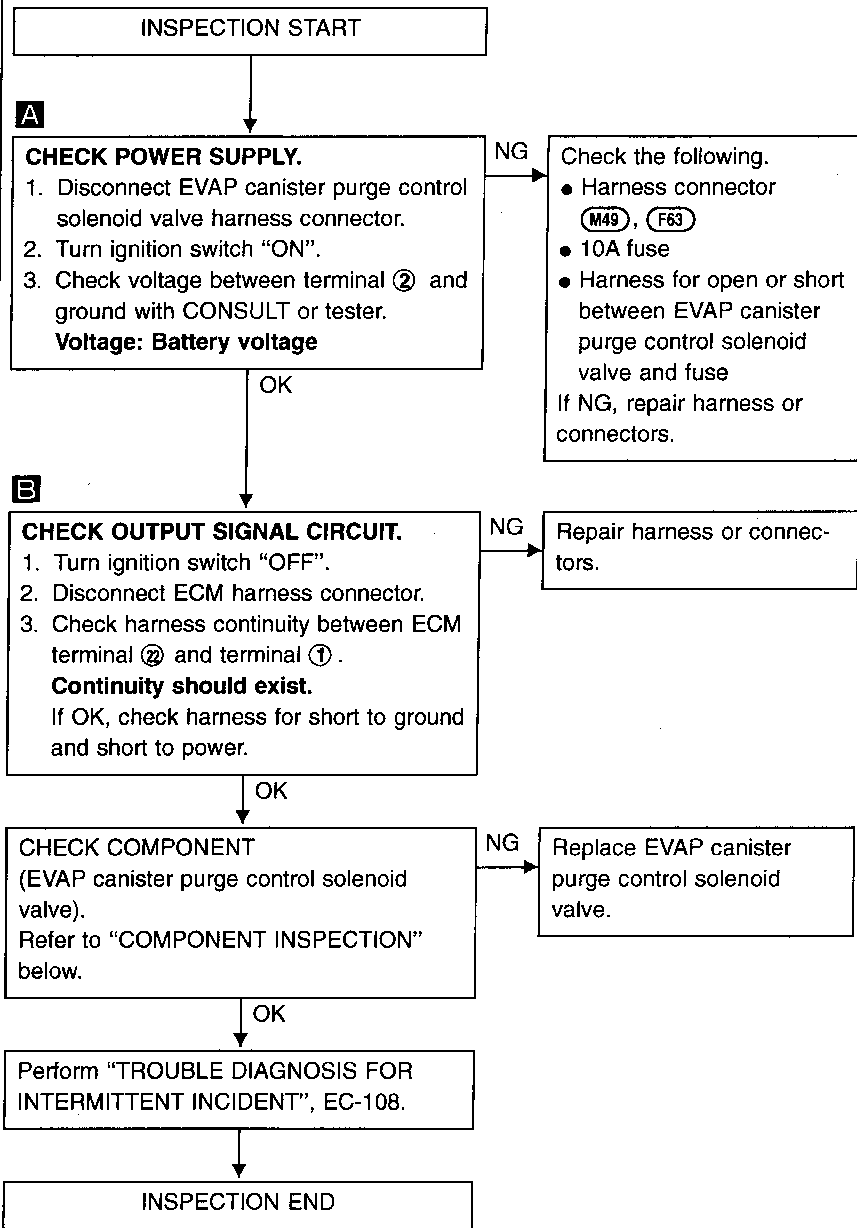
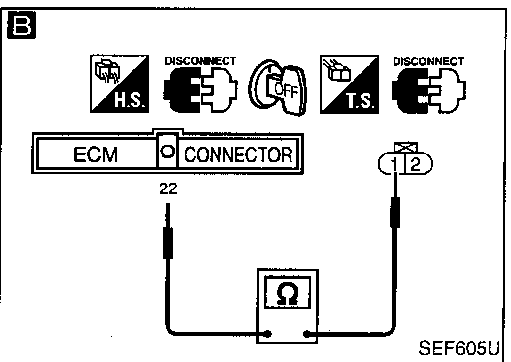
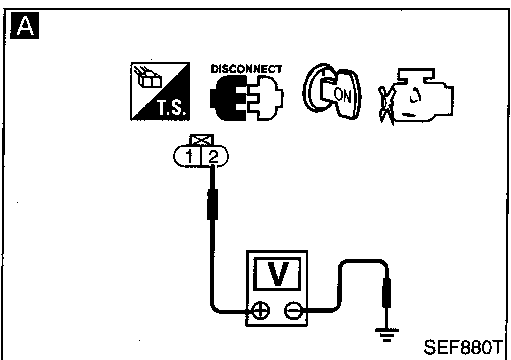
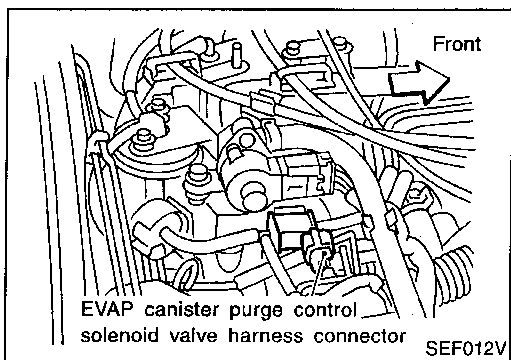
Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR DTC P1492

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

DIAGNOSTIC PROCEDURE



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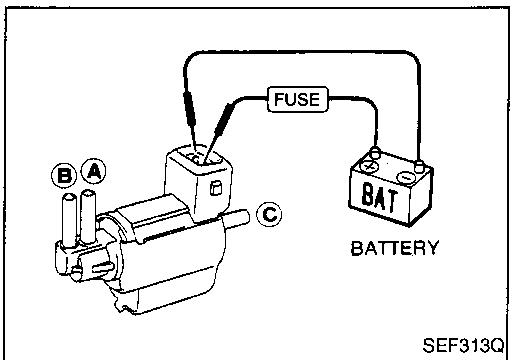
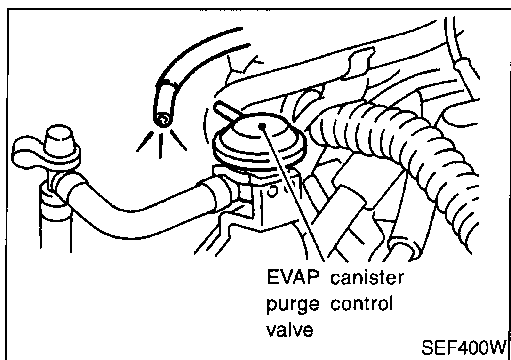
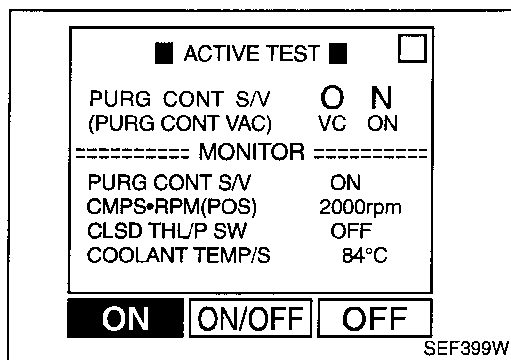
TROUBLE DIAGNOSIS FOR DTC P1492

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

COMPONENT INSPECTION

EVAP canister purge control solenoid valve

1. Turn ignition switch "ON".
2. Select "PURG CONT S/V" of "ACTIVE TEST" mode with CONSULT.
3. Start engine and warm it up to normal operating temperature.
4. Disconnect vacuum hose at EVAP canister purge control valve.
5. Touch "ON" and "OFF" and check for vacuum passing through the hose.



Condition	Vacuum
Idle	Not exist
2,000 rpm	Exist

OR

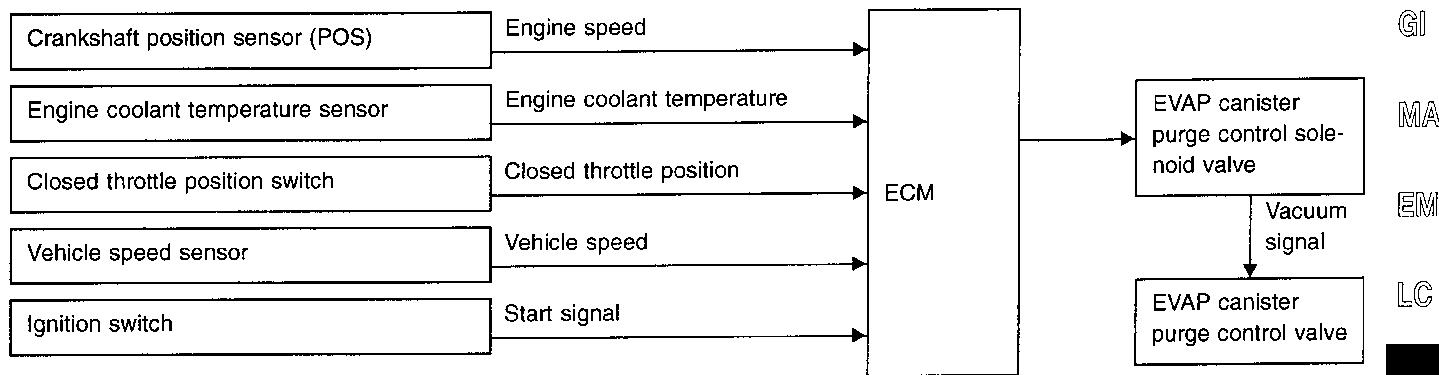
1. Check air passage continuity.

Condition	Air passage continuity between ① and ②	Air passage continuity between ① and ③
12V direct current supply between terminals	Yes	No
No supply	No	Yes

If NG or operation takes more than 1 second, replace solenoid valve.

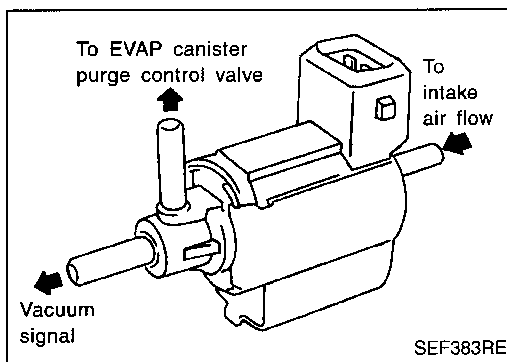
Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve

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.

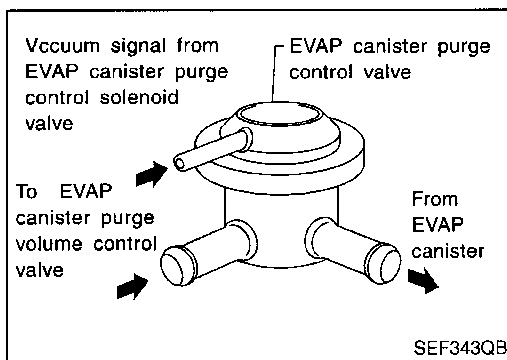
- Start switch "ON"
- Closed throttle position
- Low or high engine coolant temperature
- During deceleration
- Engine stopped
- For 60 seconds after starting engine (After warming up to normal operating temperature)



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 reaches the EVAP canister purge control valve.



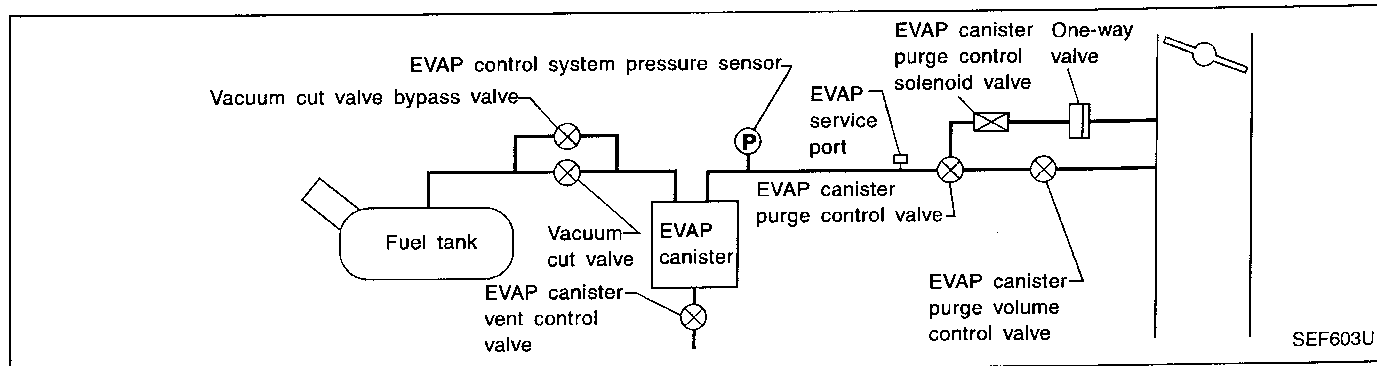
EVAP canister purge control valve

When the vacuum signal is cut by EVAP canister purge control solenoid valve, EVAP canister purge control valve shuts off the EVAP purge line.

TROUBLE DIAGNOSIS FOR DTC P1493

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

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22	Y	EVAP canister purge 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)
P1493 0312	● EVAP canister purge control valve does not operate properly (stuck open).	<ul style="list-style-type: none"> ● EVAP canister purge control valve ● EVAP canister purge control solenoid valve ● Vacuum hoses for clogging or disconnection ● EVAP control system pressure sensor ● EVAP canister vent control valve ● Water separator ● EVAP canister saturated with water

TROUBLE DIAGNOSIS FOR DTC P1493

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- If DTC P1492 is displayed with P1493, first perform "TROUBLE DIAGNOSIS FOR DTC P1492". Refer to EC-464.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "PURG CN/V & S/V P1493" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 5) Touch "START".
- 6) Start engine (TCS switch "OFF") and let it idle for at least 90 seconds.
- 7) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 30 seconds.)

Vehicle speed: 40 - 120 km/h (25 - 75 MPH)

CMPS-RPM (POS): 1,000 - 6,300 rpm

B/FUEL SCHDL: 2 - 4.8 msec

Selector lever: Suitable position

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

- 8) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-473.

■ PURG CN/V&S/V P1493 ■

THIS SUPPORT FUNCTION IS FOR DTC P1493. SEE THE SERVICE MANUAL ABOUT THE OPERATING CONDITION FOR THIS DIAGNOSIS.

EXIT START

SEF610U

■ PURG CN/V&S/V P1493 ■

***** OK *****

■ SELF-DIAG RESULTS ■

**** NO FAILURE ****

END PRINT

SEF611U

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

SEF519R



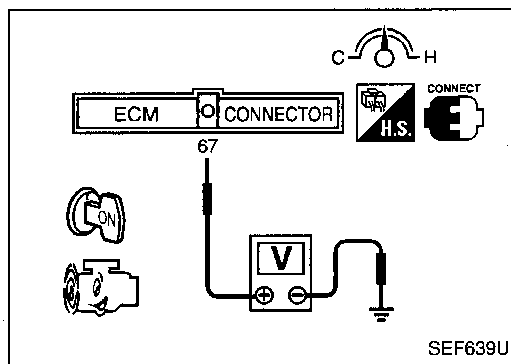
- OR
- 1) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
 - 2) Select "MODE 1" with GST.
 - 3) Check coolant temperature.
Coolant temperature: 30 - 100°C (86 - 212°F)
Be sure that water temperature does not exceed 100°C. If it becomes higher than 100°C, cool down the engine and perform the procedure again from the beginning.
 - 4) Turn ignition switch "OFF" and wait at least 5 seconds.
 - 5) Turn ignition switch "ON" and wait at least 15 seconds.

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

- 6) Restart engine and let it idle for at least 90 seconds.
- 7) Maintain the following conditions for at least 30 seconds.
Vehicle speed: 40 - 120 km/h (25 - 75 MPH)
Engine speed: 1,000 - 6,300 rpm
Gear position: Suitable gear position
Coolant temperature: 30 - 100°C (86 - 212°F)
- 8) Select "MODE 7" with GST.
- 9) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-473.

NOTE:

- Hold the accelerator pedal as steady as possible during driving in steps 7.
- If the driving conditions are not satisfied in steps 7, restart the procedure.
- It is better that the fuel level is low.



OR

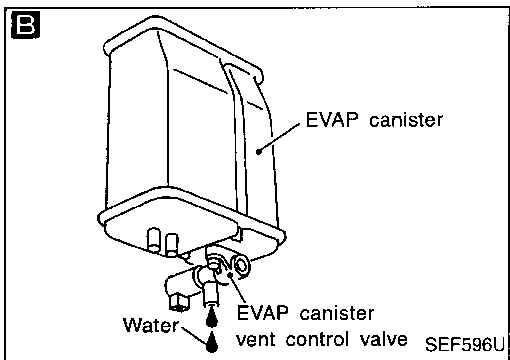
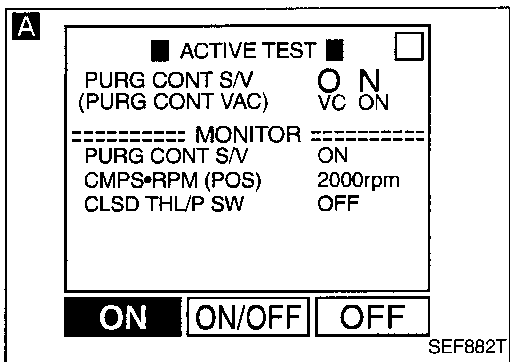
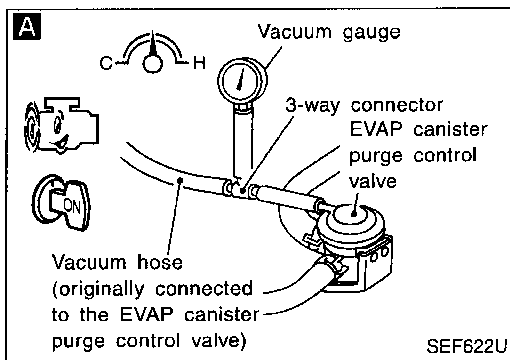
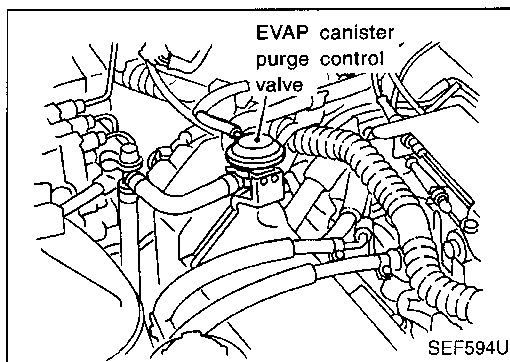
- 1) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
- 2) Check voltage between ECM terminal 67 and ground
Voltage: 3.12 - 0.8V
 Perform the following procedure before the voltage drops below 0.8V. If the voltage drops below 0.8V, cool down the engine and perform the entire procedure all over again.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Turn ignition switch "ON" and wait at least 15 seconds.
- 5) Restart engine and let it idle for at least 90 seconds.
- 6) Maintain the following conditions for at least 30 seconds.
Vehicle speed: 40 - 120 km/h (25 - 75 MPH)
Engine speed: 1,000 - 2,100 rpm
Gear position: Suitable gear position
Check voltage between ECM terminal 67 and ground: 3.12 - 0.8V
- 7) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds, and then turn "ON".
- 8) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 9) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-473.

NOTE:

- Hold the accelerator pedal as steady as possible during driving in steps 6.
- If the driving conditions are not satisfied in steps 6, restart the procedure.
- It is better that the fuel level is low.

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

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK VACUUM SIGNAL.

1. Disconnect vacuum hose to EVAP canister purge control valve and install vacuum gauge.
2. Start engine.
3. Perform "PURG CONT S/V" in "ACTIVE TEST" mode.
4. Select "ON" and "OFF" on CONSULT screen to turn on "PURG CONT S/V".
5. Check vacuum hose for vacuum while revving engine up to 2,000 rpm.

ON: Vacuum should exist.
OFF: Vacuum should not exist.

OR

1. Start engine and warm it up sufficiently.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge control valve.
4. Install vacuum gauge and start engine.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

ON: Vacuum should exist.
OFF: Vacuum should not exist.

NG → CHECK COMPONENTS (EVAP canister purge control solenoid valve). Refer to "COMPONENTS INSPECTION" on next page.

OK → Check vacuum hoses for improper connection, clogging or disconnection. Refer to Vacuum Hose Drawing", EC-16.

OK → CHECK COMPONENT (EVAP canister vent control valve). Refer to "COMPONENTS INSPECTION", EC-475.

NG → Replace EVAP canister vent control valve and/or water separator.

B

CHECK IF EVAP CANISTER IS SATURATED WITH WATER.

1. Remove EVAP canister with vent control valve attached.
2. Check if water drains from the EVAP canister.

If it will, weigh the EVAP canister with the vent control valve attached.

If the weight is:

More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

NG → Replace EVAP canister and check the following.

1. Check hose connections to the EVAP canister and water separator for clogging and poor connection.
2. Check water separator. Refer to "COMPONENT INSPECTION", EC-475.

OK → CHECK COMPONENT (EVAP canister purge control valve). Refer to "COMPONENT INSPECTION", EC-475.

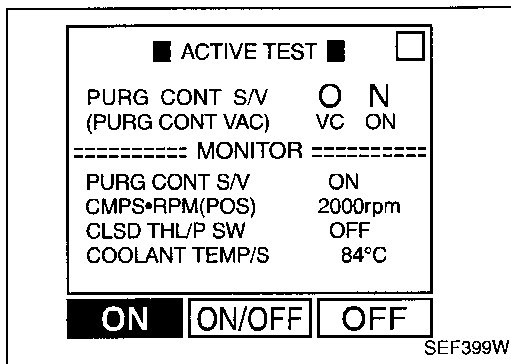
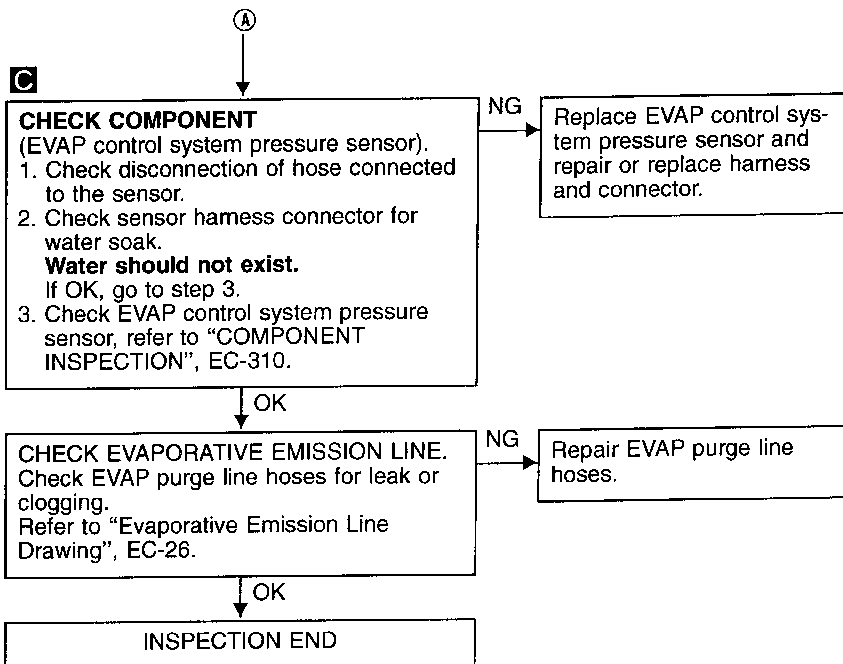
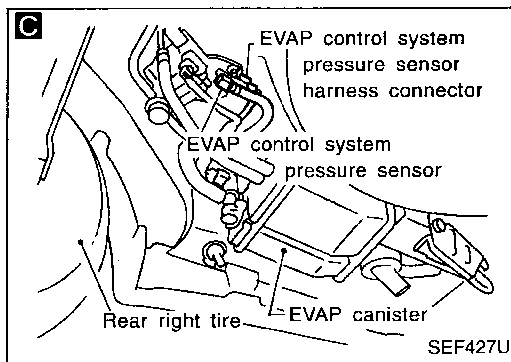
NG → Replace EVAP canister purge control valve.

OK → (Go to next page.)

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TROUBLE DIAGNOSIS FOR DTC P1493

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



COMPONENT INSPECTION

EVAP canister purge control solenoid valve

- Turn ignition switch "ON".
- Select "PURG CONT S/V" of "ACTIVE TEST" mode with CONSULT.
- Start engine and warm it up to normal operating temperature.
- Disconnect vacuum hose at EVAP canister purge control valve.
- Touch "ON" and "OFF" and check for vacuum passing through the hose.

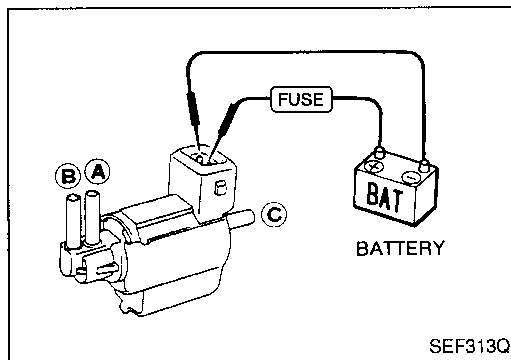
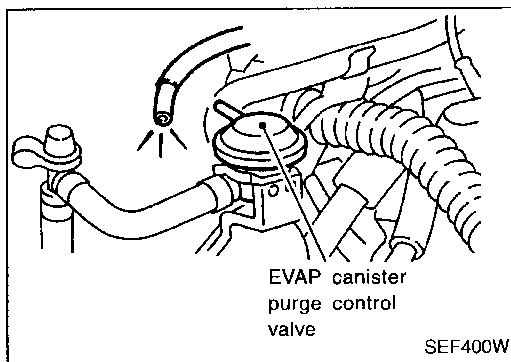
Condition	Vacuum
Idle	Not exist
2,000 rpm	Exist

OR

- ⓧ 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 or operation takes more than 1 second, replace solenoid valve.



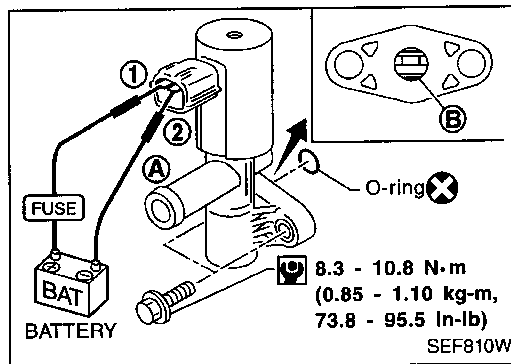
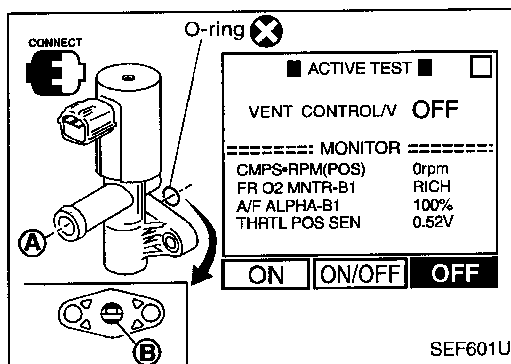
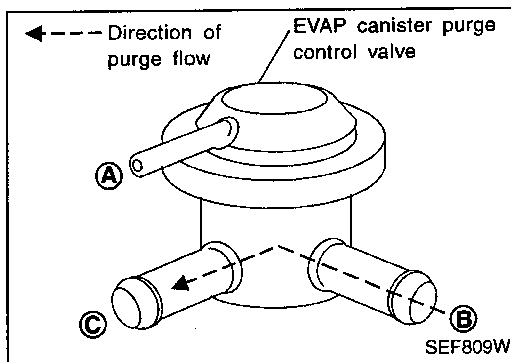
TROUBLE DIAGNOSIS FOR DTC P1493

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

EVAP canister purge control valve

Check EVAP canister purge control valve as follows:

1. Blow air in port (A) and (C), then ensure that there is no leakage.
2. Blow air in port (B), then ensure that there is a resistance to flow out of port (C).
3. Apply vacuum to port (A). [Approximately -13.3 to -20.0 kPa (-100 to -150 mmHg, -3.94 to -5.91 inHg)]
Blow air in port (C) and ensure free flow out of port (B).



EVAP canister vent control valve

Check air passage continuity.

- Perform "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.

Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

OR

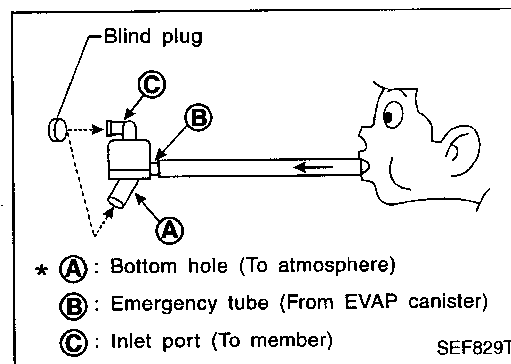


Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals (1) and (2)	No
No supply	Yes

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If the portion (B) is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.



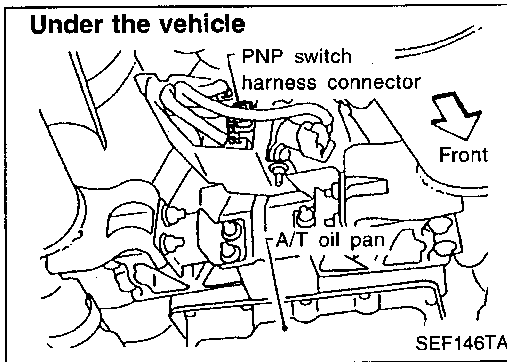
Water separator

1. Check visually for insect's nest in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that (A) and (C) are not clogged by blowing air into (B) with (A), and then (C) plugged.
5. In case of NG in items 2 - 4, replace the parts.

NOTE:

Do not disassemble water separator.

TROUBLE DIAGNOSIS FOR DTC P1706



Park/Neutral Position (PNP) Switch

COMPONENT DESCRIPTION

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

The PNP switch assembly also includes a transmission range switch to detect the selector lever position.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1706 1003	● The signal of the park/neutral position switch is not changed in the process of engine starting and driving.	<ul style="list-style-type: none"> ● Harness or connectors (The PNP switch circuit is open or shorted.) ● Harness or connectors (The park/neutral position relay circuit is open or shorted.) ● PNP switch ● Park/neutral position relay

TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position (PNP) Switch (Cont'd)

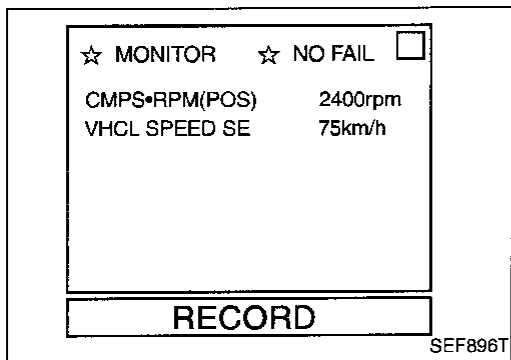
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

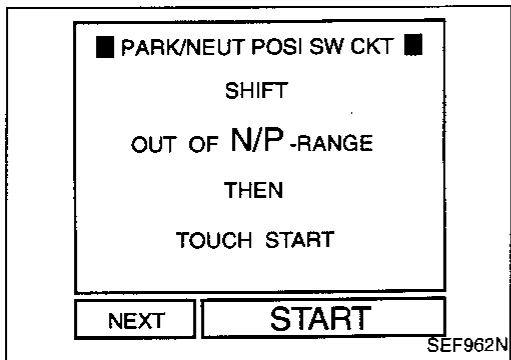
Always drive vehicle at a safe speed.

NOTE:

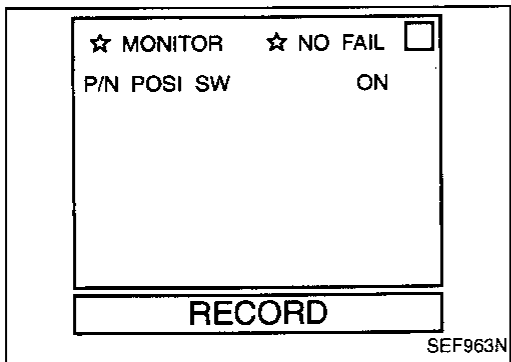
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



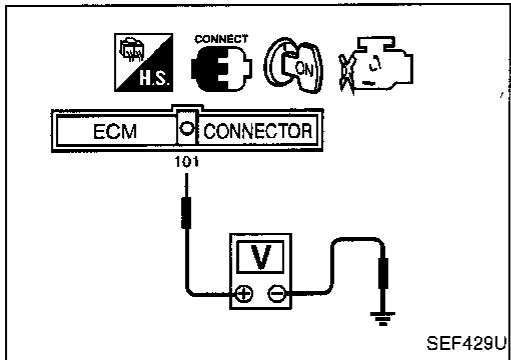
SEF896T



SEF962N



SEF963N



SEF429U

- 1) Turn ignition switch "ON".
 - 2) Perform "PARK/NEUT POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.
 - 3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-479.
- OR
- 2) Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT. Then check the "P/N POSI SW" signal under the following conditions.

Position (Selector lever)	Known good signal
"N" and "P" positions	ON
Except the above position	OFF

If NG, go to "DIAGNOSTIC PROCEDURE", EC-479.
If OK, go to following step.

- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
- 5) Maintain the following conditions for at least 60 consecutive seconds.
 - CMPS•RPM (REF): 1,500 - 2,200 rpm
 - COOLAN TEMP/S: More than 70°C (158°F)
 - B/FUEL SCHDL: 1.4 - 5.8 msec
 - VHCL SPEED SE: 70 - 100 km/h (43 - 62 MPH)
 - Selector lever: Suitable position
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-479

OR

OVERALL FUNCTION CHECK

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

- 1) Turn ignition switch "ON".
- 2) Check voltage between ECM terminal (101) and body ground under the following conditions.

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

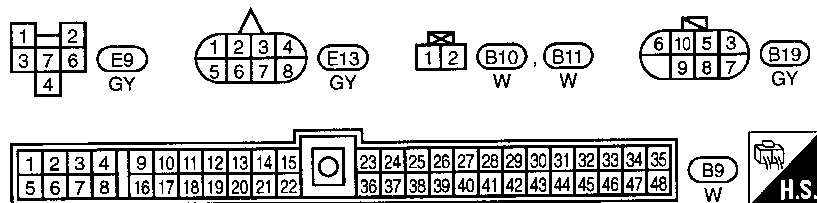
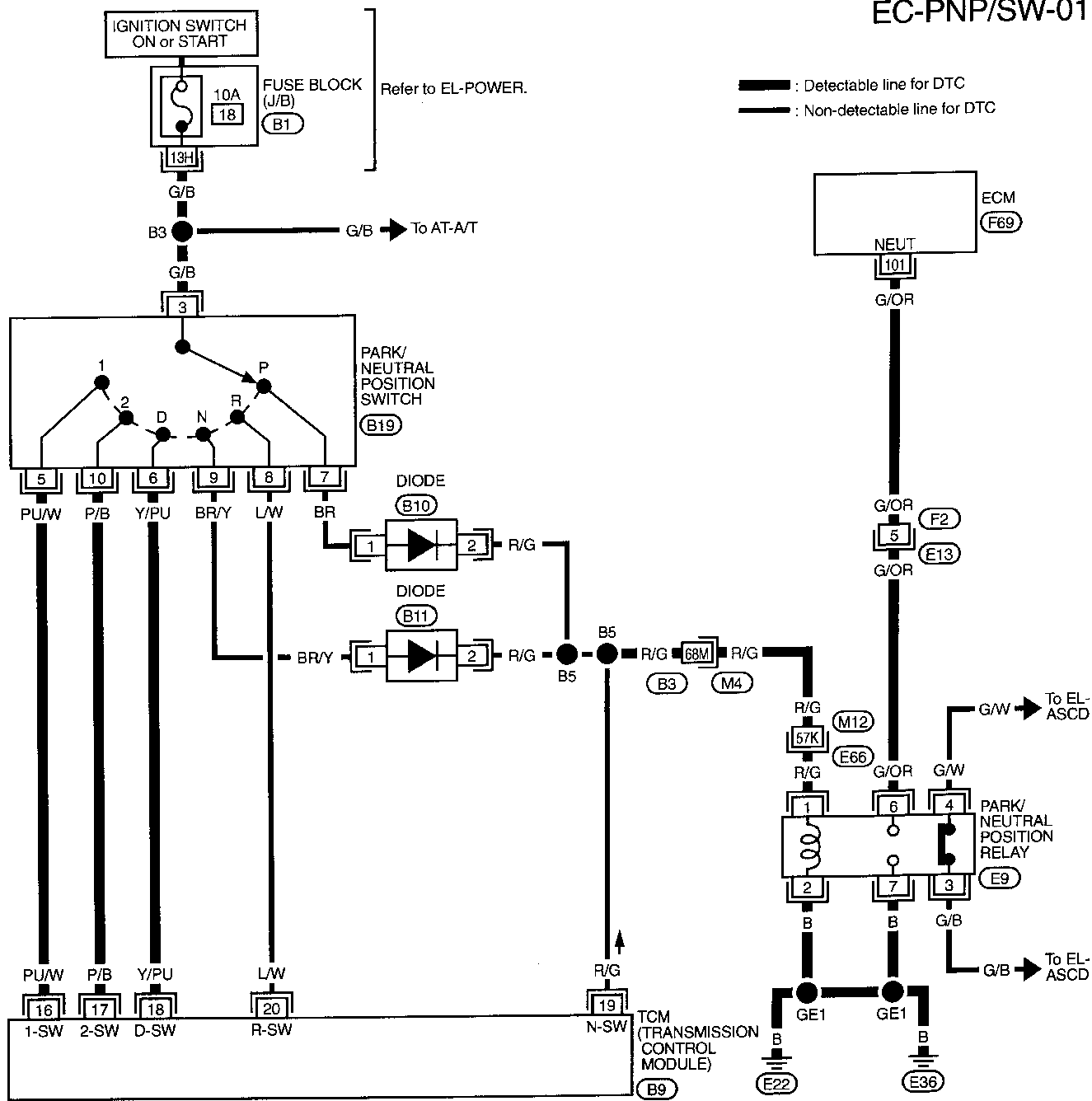
- 3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-479.

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TROUBLE DIAGNOSIS FOR DTC P1706

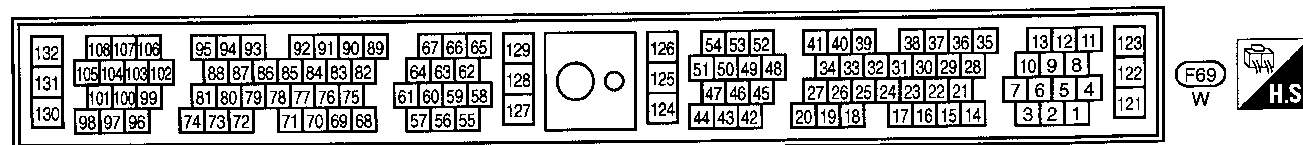
Park/Neutral Position (PNP) Switch (Cont'd)

EC-PNP/SW-01



Refer to last page (Foldout page).

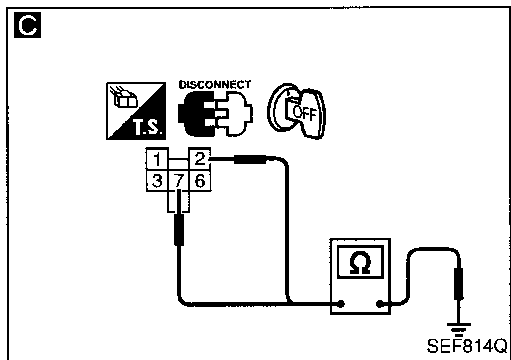
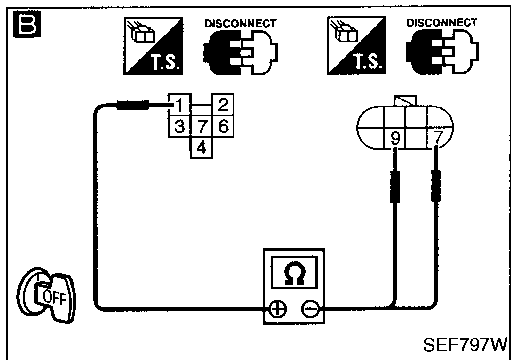
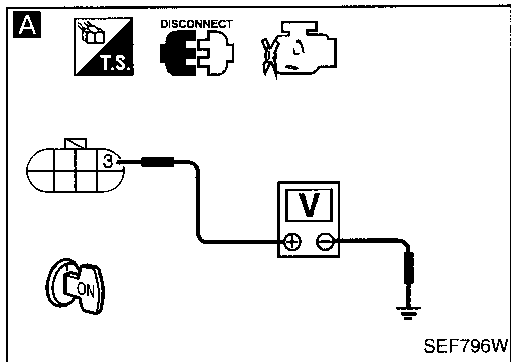
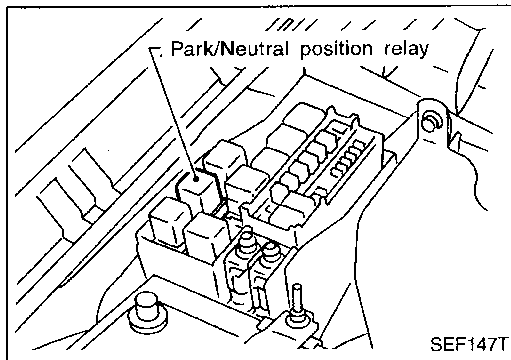
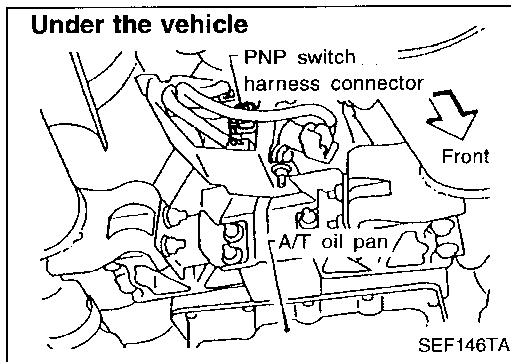
- (E66)
- (M12)
- (M4)
- (B3)
- (B1)



TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position (PNP) Switch (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK POWER SUPPLY.

1. Disconnect PNP switch harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal ③ and ground with CONSULT or tester.

Voltage: Battery voltage

NG

Check the following.

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

If NG, repair harness or connectors.

OK

B

CHECK OUTPUT SIGNAL CIRCUIT-I.

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position relay harness connector.
3. Check harness continuity between relay terminal ① and PNP switch terminals ⑦, ⑨.

Continuity should exist.

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

NG

Check the following.

- Harness connectors (E66, M12)
- Harness connectors (M4, B3)
- Harness connectors (diodes) (B10, B11)
- Harness for open or short between PNP switch and relay

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

OK

C

CHECK GROUND CIRCUIT.

1. Check harness continuity between relay terminals ②, ⑦ and engine ground.

Continuity should exist.

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

NG

Repair harness or connectors.

OK

D

CHECK OUTPUT SIGNAL CIRCUIT-II.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑩ and relay terminal ⑥.

Continuity should exist.

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

NG

Check the following.

- Harness connectors (E13, F2)
- Harness for open or short between ECM and relay

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

OK

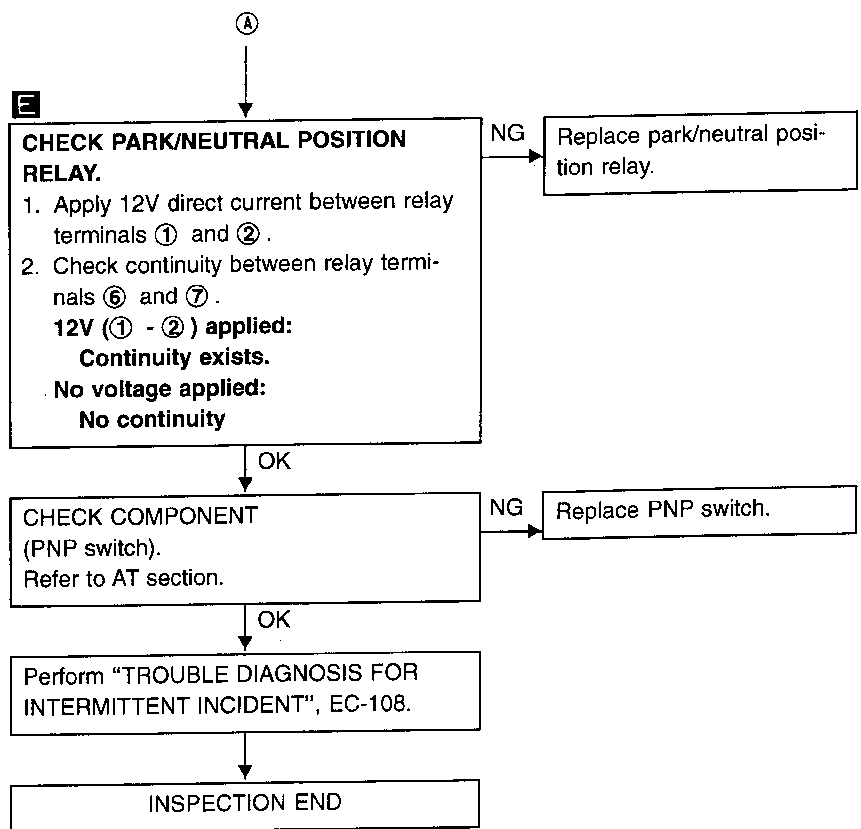
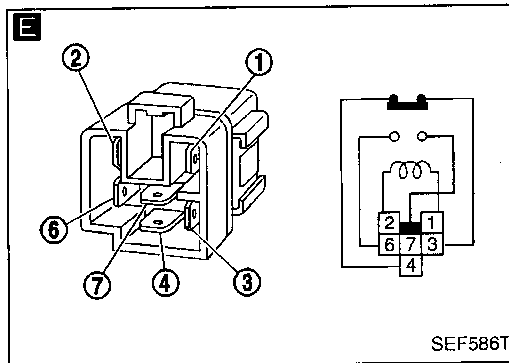
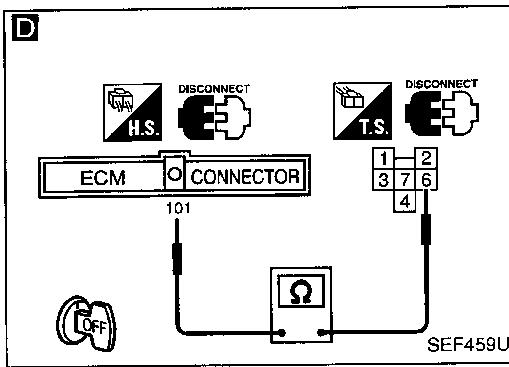
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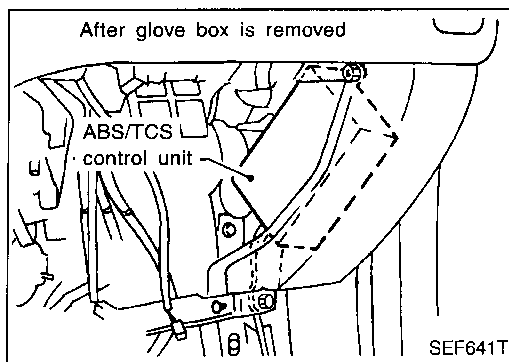
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TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position (PNP) Switch (Cont'd)



TROUBLE DIAGNOSIS FOR ABS/TCS C/U SIGNAL



ABS/TCS Control Unit

The malfunction information related to ABS/TCS control unit is transferred through the line (LAN) from ABS/TCS control unit to ECM.

Be sure to erase the malfunction information such as DTC not only for ABS/TCS control unit but also for ECM after the ABS/TCS related repair.

Freeze frame data is not stored in the ECM for the ABS/TCS control unit. The MIL will not light up for ABS/TCS control unit.

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
—* 0107	<ul style="list-style-type: none"> ECM receives incorrect voltage from ABS/TCS control unit continuously. 	<ul style="list-style-type: none"> Harness or connectors (The circuit between ECM and ABS/TCS control unit is open or shorted.) ABS/TCS control unit

*: SAE J2012 number is not applicable

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and let it idle for at least 40 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-484.

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.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-484.

DTC erasing procedure for ABS/TCS related repair

Erase DTC code by following procedure:

- 1) Turn ignition switch "OFF" and then turn it "ON".
- 2) Connect CONSULT and select "ABS".
- 3) Insert UE990 card and install it.
- 4) Select "ABS" and touch "SELF-DIAG RESULTS".
- 5) Touch "ERASE".
- 6) Touch "BACK" then erase malfunction code which has been stored in the TCM or ECM.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR 0404, EC-482.

ABS/TCS Communication Line

This circuit line is used to control the smooth engine operation of ABS/TCS during the TCS operation. Pulse signals are exchanged between ECM and ABS/TCS control unit.

Be sure to erase the malfunction information such as DTC not only in ABS/TCS control unit but also ECM after the ABS/TCS related repair. Refer to BR section (Self-diagnosis for ABS/TCS control unit, "HOW TO ERASE SELF DIAGNOSTIC RESULTS").

Freeze frame data is not stored in the ECM for the ABS/TCS communication line. The MIL will not light up for the ABS/TCS communication line.


ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
—* 0404	<ul style="list-style-type: none"> ● ECM receives incorrect voltage from ABS/TCS control unit continuously. 	<ul style="list-style-type: none"> ● Harness or connectors (The communication line circuit between ECM and ABS/TCS control unit is open or shorted.) ● ABS/TCS control unit ● Dead (Weak) battery


*: SAE J2012 number is not applicable.

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

-  1) Turn ignition switch "ON".
 2) Select "DATA MONITOR" mode with CONSULT.
 3) Start engine and let it idle for at least 3 seconds.
 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-484.

OR

-  1) Start engine and let it idle for at least 3 seconds.
 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-484.

TROUBLE DIAGNOSIS FOR ECM — ABS/TCS COMM NG

ABS/TCS Communication Line (Cont'd)

EC-TCS-01

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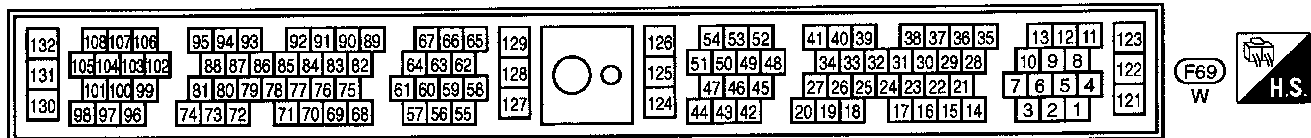
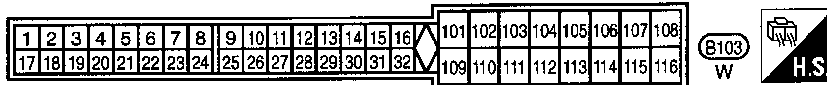
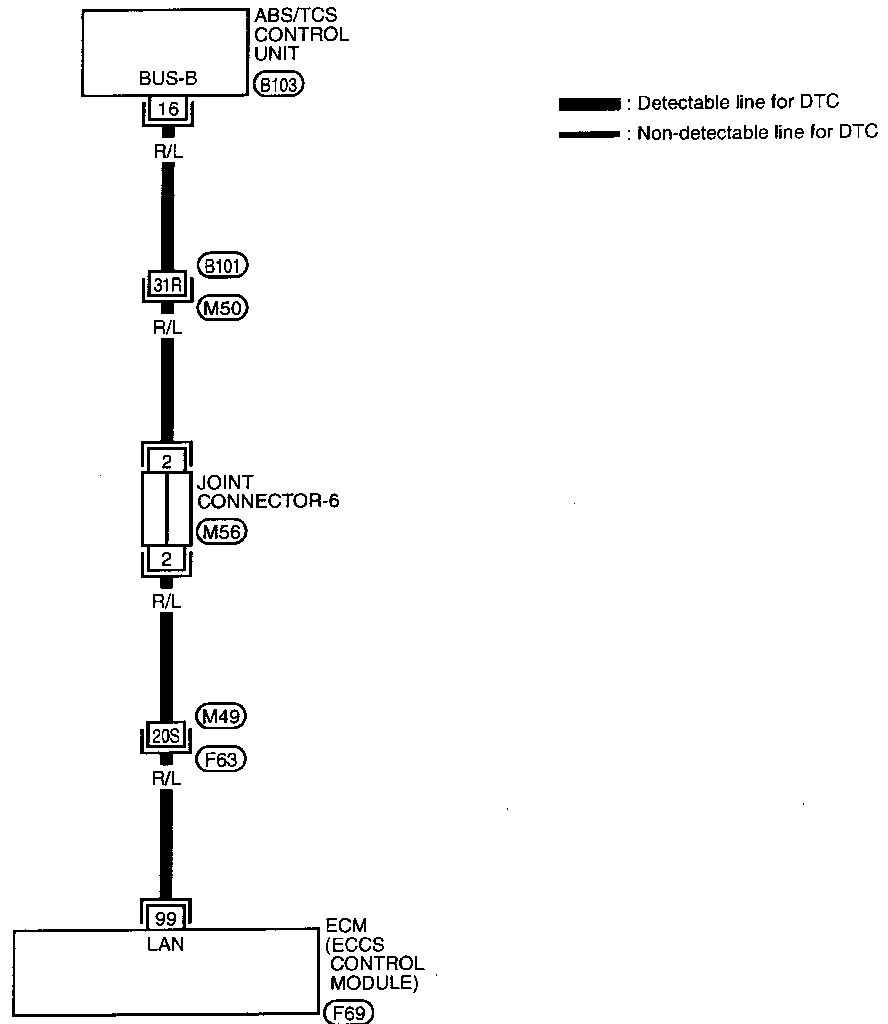
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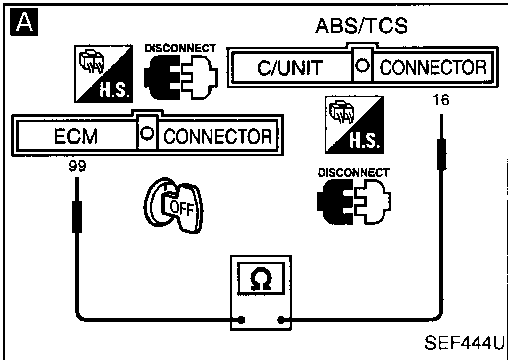
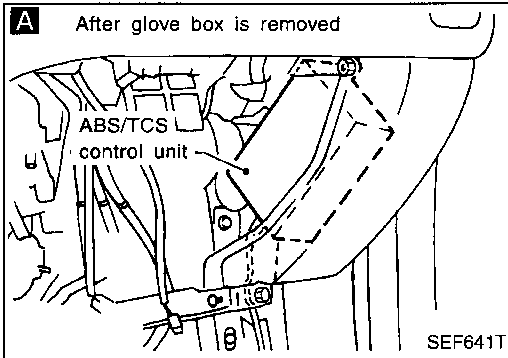
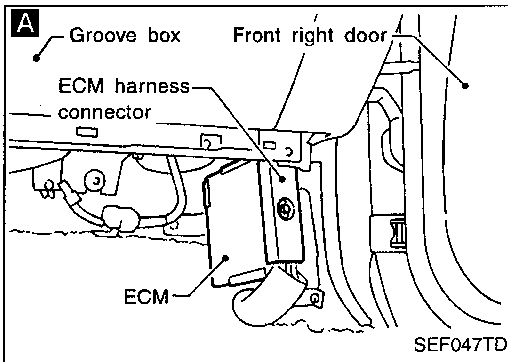
Refer to last page (Foldout page).

M49, F63
M50, B101

TROUBLE DIAGNOSIS FOR ECM — ABS/TCS COMM NG

ABS/TCS Communication Line (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A
CHECK INPUT SIGNAL CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Disconnect ECM harness connector and ABS/TCS control unit harness connector.
 3. Check harness continuity between ECM terminal 99 and terminal 16.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

NG → Check the following.

- Harness connectors (M50), (B101)
- Harness connectors (F63), (M49)
- Joint connector-6
- Check harness for open or short between ECM and ABS/TCS control unit.

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

OK
 Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

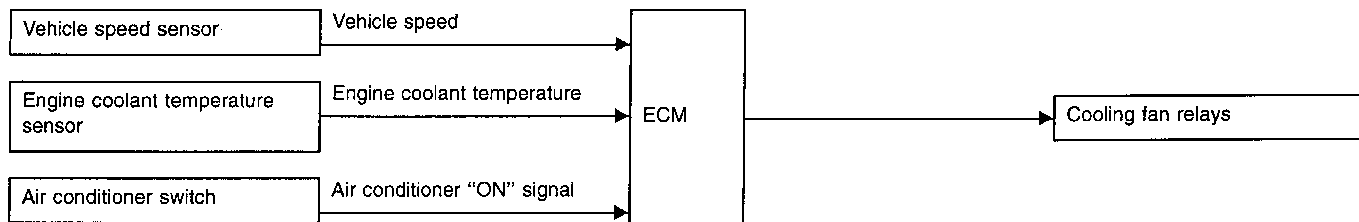
INSPECTION END

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat

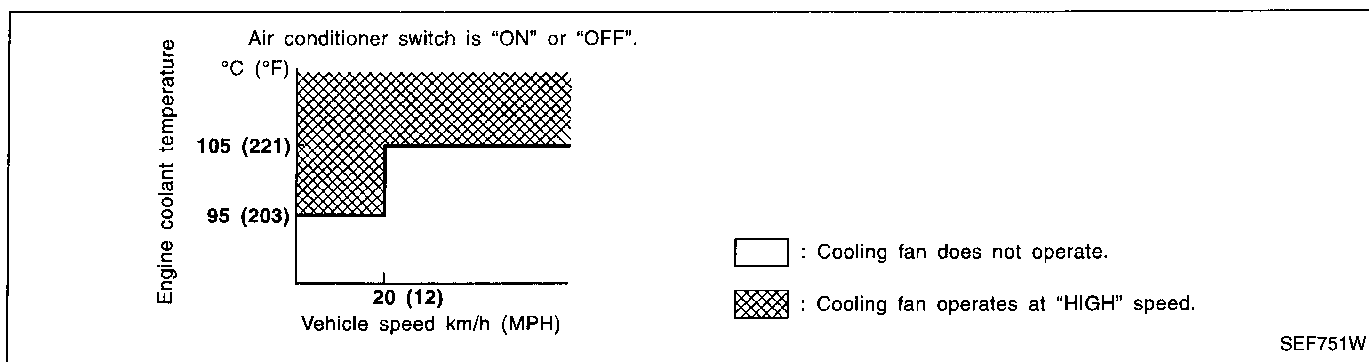
SYSTEM DESCRIPTION

Input/output signal line



The ECM controls the cooling fan corresponding to vehicle speed, engine coolant temperature and air conditioner ON signal.

Operation



- The cooling fan operates at HIGH if diagnostic test mode II (self-diagnostic results) for engine coolant temperature sensor is "NG" or when the ECM fail-safe is activating.
- When A/C line pressure reaches the specified value, the triple-pressure switch turns on to operate cooling fans at low speed.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
COOLING FAN	<ul style="list-style-type: none"> • After warming up engine, idle the engine. • Air conditioner switch: "OFF" 	Engine coolant temperature is 94°C (201°F) or less OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F) at vehicle speeds less than 80 km/h HIGH
		Engine coolant temperature is 105°C (221°F) or more HIGH

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
34 27	LG LG/R	Cooling fan relay-1 (High) Cooling fan relay-2 (High)	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> Cooling fan is operating.	0 - 1V

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION	
AIR COND SIG	<ul style="list-style-type: none"> ● Engine: After warming up, idle the engine 	Air conditioner switch: "OFF"	OFF
		Air conditioner switch: "ON" (Compressor operates.)	ON
COOLING FAN	<ul style="list-style-type: none"> ● After warming up engine, idle the engine. ● Air conditioner switch: "OFF" 	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F) at vehicle speed less than 20 km/h (12 MPH)	HIGH
		Engine coolant temperature is 105°C (221°F) or more	

ON BOARD DIAGNOSIS LOGIC

This diagnosis continuously monitors the engine coolant temperature.

If the cooling fan or another component in the cooling system malfunctions, the engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Diagnostic trouble code No.	Malfunction is detected when ...	Check Items (Possible Cause)
OVERHEAT 0208	<ul style="list-style-type: none"> ● Engine coolant reaches an abnormally high temperature. 	<ul style="list-style-type: none"> ● Harness or connectors. (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat <p>For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", (EC-495).</p>

CAUTION:

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

- a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant by kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").
- b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

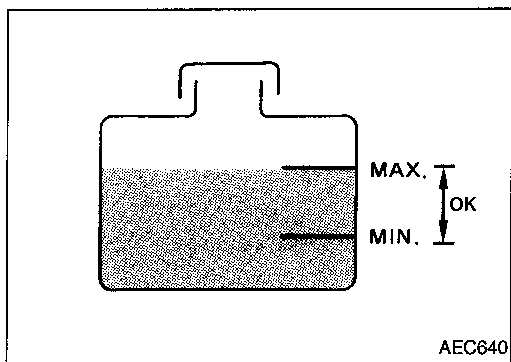
OVERALL FUNCTION CHECK

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

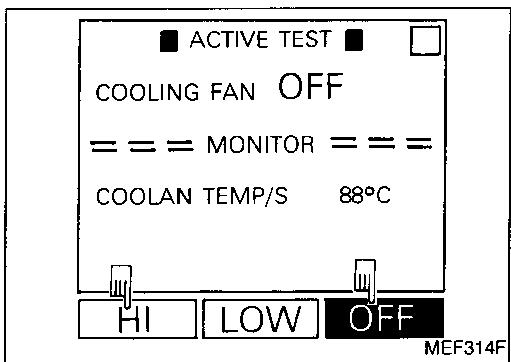
WARNING:

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

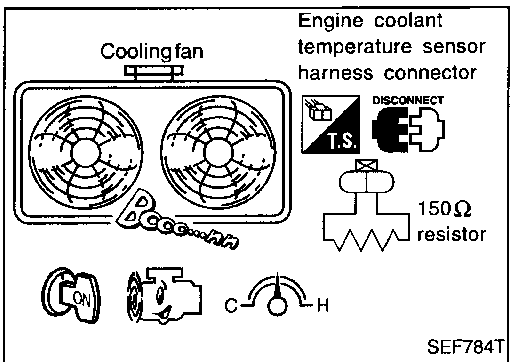
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.



AEC640



MEF314F



SEF784T

- 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-489.

- 2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-489.

- 3) Turn ignition switch "ON".
- 4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.
- 5) If NG, go to "DIAGNOSTIC PROCEDURE", EC-489.

OR

- 3) Disconnect engine coolant temperature sensor harness connector.
- 4) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
- 5) Start engine and make sure that cooling fan operates. **Be careful not to overheat engine.**
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-489.

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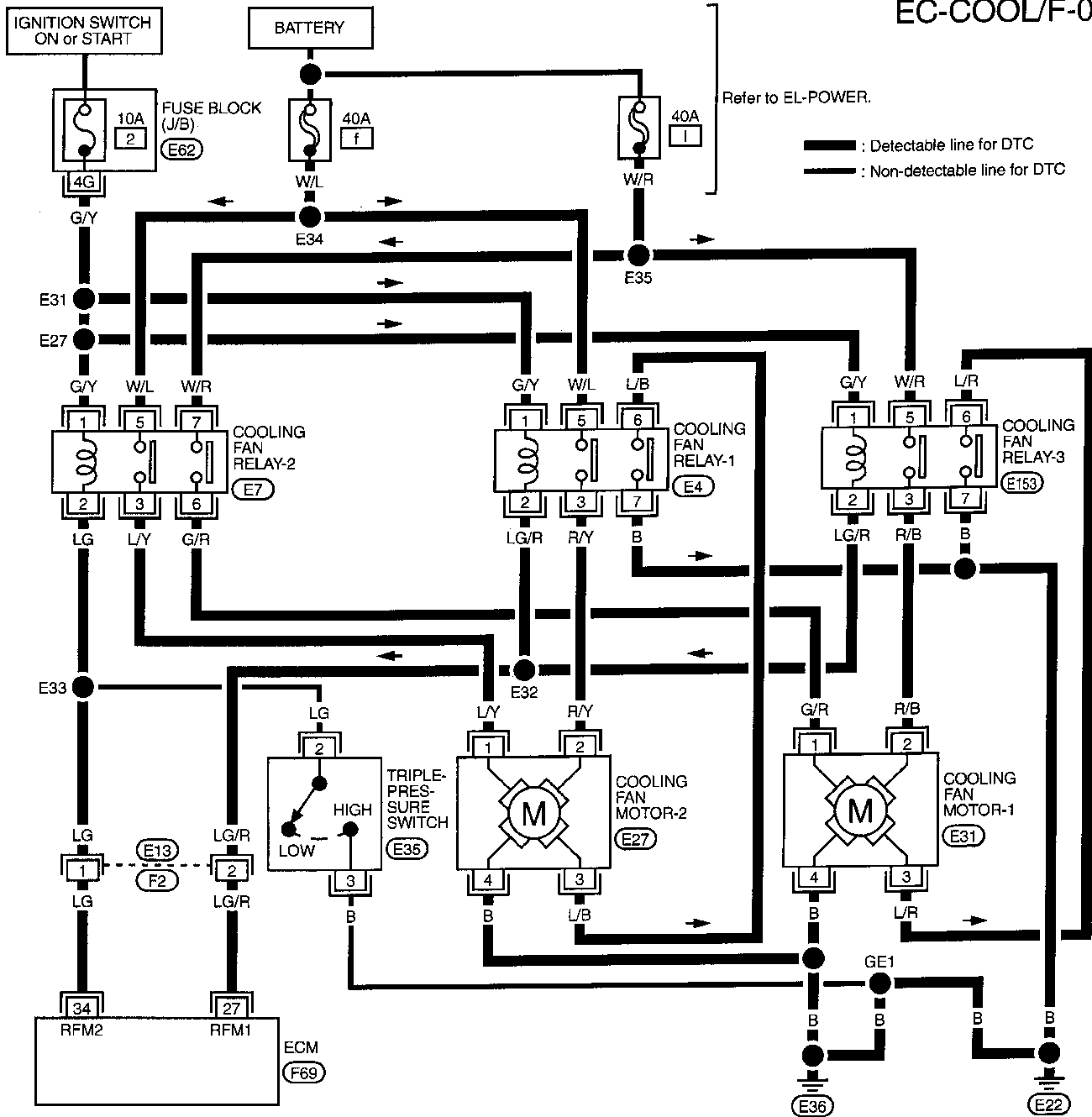
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TROUBLE DIAGNOSIS FOR OVERHEAT

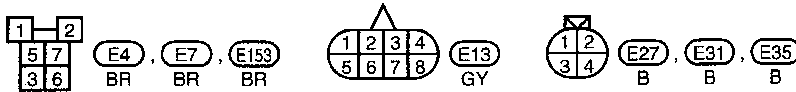
Overheat (Cont'd)

EC-COOL/F-01

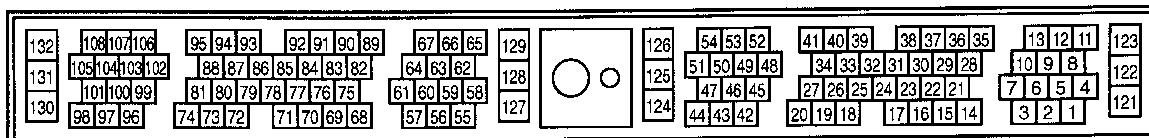


Refer to EL-POWER.

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

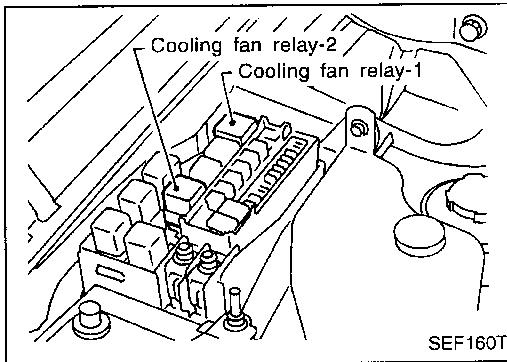


Refer to last page (Foldout page).
E62



TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd) DIAGNOSTIC PROCEDURE



INSPECTION START

A
CHECK COOLING FAN MOTOR OPERATION-I.
1. Disconnect cooling fan relay-1 and -3.
2. Turn ignition switch "ON".
3. Perform "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

NG → Check cooling fan motor-speed control circuit.
(Go to **PROCEDURE A**.)

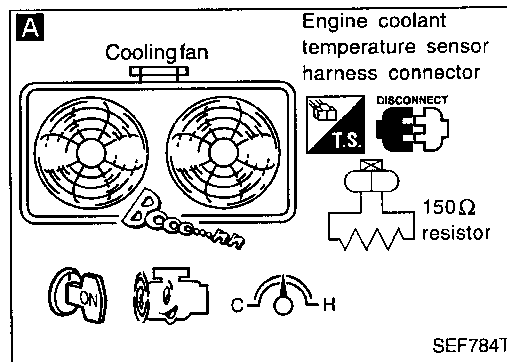
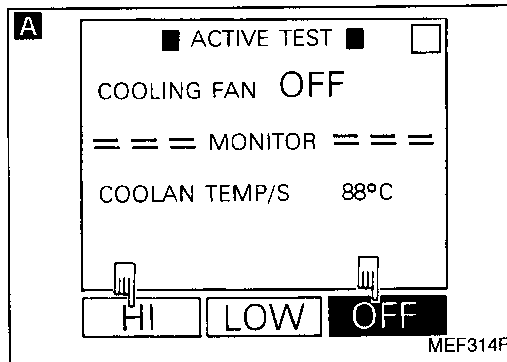
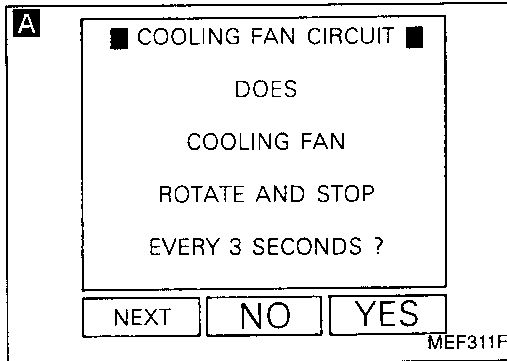
OR
2. Turn ignition switch "ON".
3. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.
Cooling fans should operate.

OR
2. Disconnect engine coolant temperature sensor harness connector.
3. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
4. Start engine and wait at least 15 seconds.
5. Make sure that cooling fan motors operate.
Be careful not to overheat engine.

OK

A

(Go to next page.)



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TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

B

■ COOLING FAN CIRCUIT ■

DOES
COOLING FAN
ROTATE AND STOP
EVERY 3 SECONDS ?

NEXT NO YES

MEF311F

B

■ ACTIVE TEST ■

COOLING FAN OFF

== == MONITOR == ==

COOLAN TEMP/S 88°C

HI LOW OFF

MEF314F

B

Coolingfan

Engine coolant temperature sensor harness connector

DISCONNECT T.S.

150Ω resistor

ON C H

SEF784T

Cooling fan relay-2

Cooling fan relay-1

SEF160T

C

DISCONNECT T.S.

1 5 7

V

SEF753W

B

CHECK COOLING FAN MOTOR OPERATION-II.

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

Cooling fans should operate.

OR

4. Restart engine and wait at least 15 seconds.
5. Make sure that cooling fan motors operate.

Be careful not to overheat engine.

NG

Check cooling fan motor-II control circuit.
(Go to **PROCEDURE B**.)

CHECK COMPONENT
(Triple-pressure switch).
Refer to HA section ("Electrical Components Inspection", "TROUBLE DIAGNOSES").

NG

Replace triple-pressure switch.

OK

B

(Go to EC-494.)

PROCEDURE A

INSPECTION START

C

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-2.
3. Turn ignition switch "ON".
4. Check voltage between terminals ①, ⑤, ⑦ and ground with CONSULT or tester.

Voltage: Battery voltage

NG

Check the following.

- 10A fuse
- 40A fusible links
- Harness for open or short between cooling fan relay-2 and fuse
- Harness for open or short between cooling fan relay-2 and battery

If NG, repair harness or connectors.

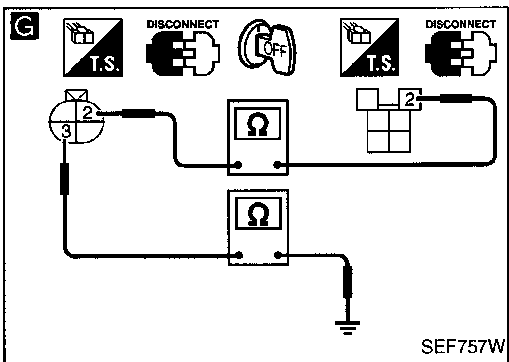
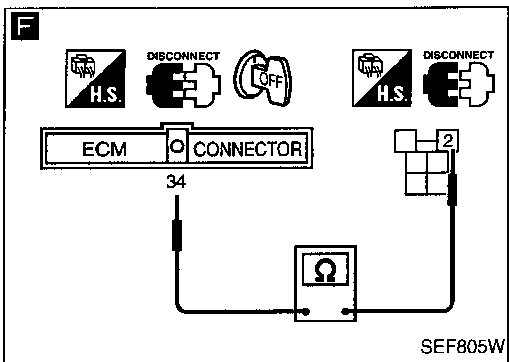
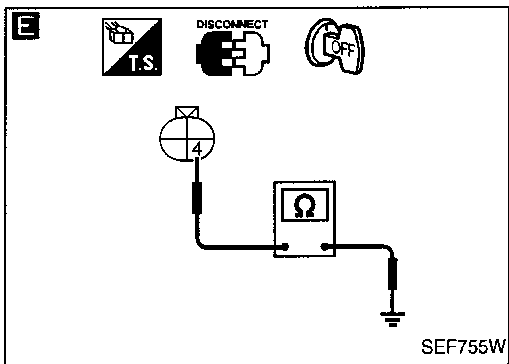
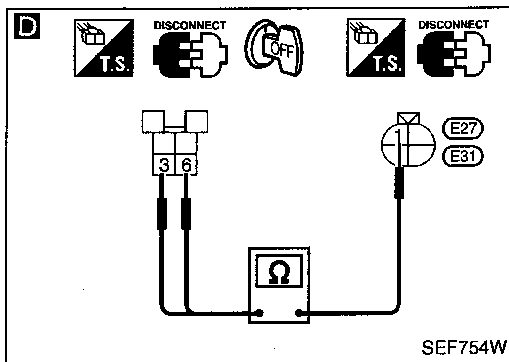
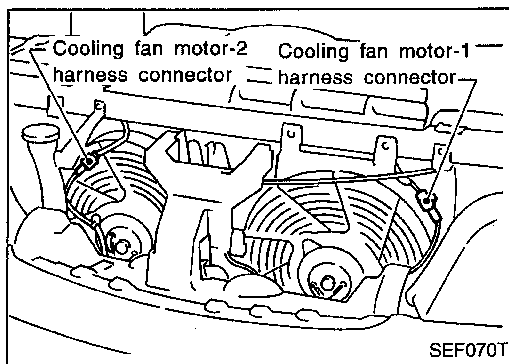
OK

A

(Go to next page.)

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)



A

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor harness connector.

D 3. Check harness continuity between relay terminals ③, ⑥ and cooling fan motor terminal ①.
Continuity should exist.
If OK, check harness for short.

E 4. Check harness continuity between fan motor terminal ④ and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair harness or connectors.

OK

F

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ③④ and relay-2 terminal ②.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Check the following.
• Harness connectors (F2), (E13)
• Harness for open or short between cooling fan relay-2 and ECM
If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

G

CHECK HARNESS CONTINUITY BETWEEN COOLING FAN RELAY-2 AND GROUND.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-2.
3. Disconnect triple-pressure switch harness connector.
4. Check harness continuity between relay-2 terminal ② and switch terminal ③, switch terminal ③ and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Check harness for open or short between triple-pressure switch and relay-2 or ground.
If NG, repair open circuit or short to power in harness or connectors.

OK

CHECK COMPONENT (Triple-pressure switch).
Refer to "Magnet Clutch Circuit" in HA section.

NG → Replace triple-pressure switch.

OK

CHECK COMPONENT (Cooling fan relay-2).
Refer to "COMPONENT INSPECTION", EC-496.

NG → Replace cooling fan relay.

OK

CHECK COMPONENT (Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-496.

NG → Replace cooling fan motors.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

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TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

PROCEDURE B

INSPECTION START

H

CHECK POWER SUPPLY.

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

NG

Check the following.

- 40A fusible links
 - 10A fuse
 - Harness continuity between cooling fan relay-1 and -3 and fuse
 - Harness continuity between cooling fan relay-1 and -3 and battery
- If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 and -2 harness connectors.
3. Check harness continuity between relay-1 and -3 terminal ③ and cooling fan motor-1 and -2 terminal ②. **Continuity should exist.**
If OK, check harness for short.
4. Check harness continuity between relay-1, -3 terminal ⑥ and fan motor-1 and -2 terminal ③. **Continuity should exist.**
If OK, check harness for short to ground and short to power.
5. Check harness continuity between relay -1, -3 terminal ⑦ and engine ground. **Continuity should exist.**
If OK, check harness for short to ground and short to power.

NG

Repair harness or connectors.

OK

CHECK OUTPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑳ and fan relay-1, -3 terminal ②. **Continuity should exist.**
If OK, check harness for short to ground and short to power.

NG

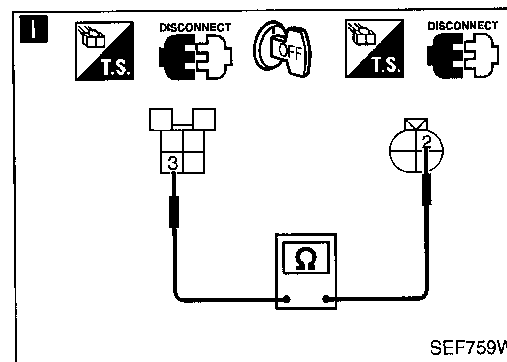
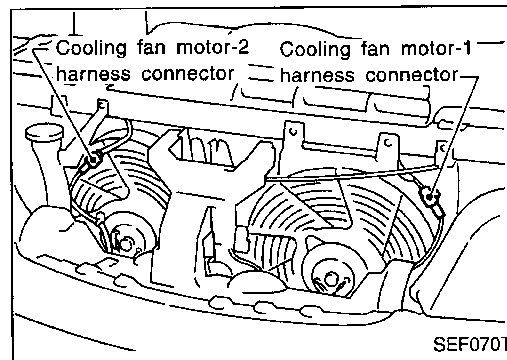
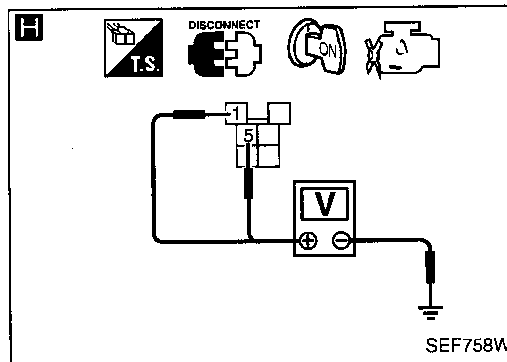
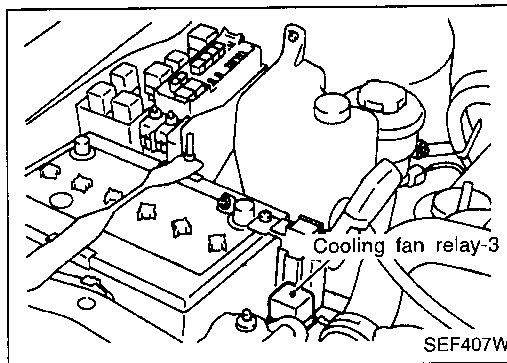
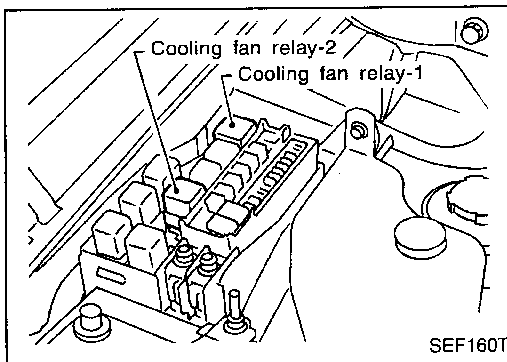
Check the following.

- Harness connectors (F2), (E13)
 - Harness for open or short between cooling fan relay-1, -3 and ECM
- If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

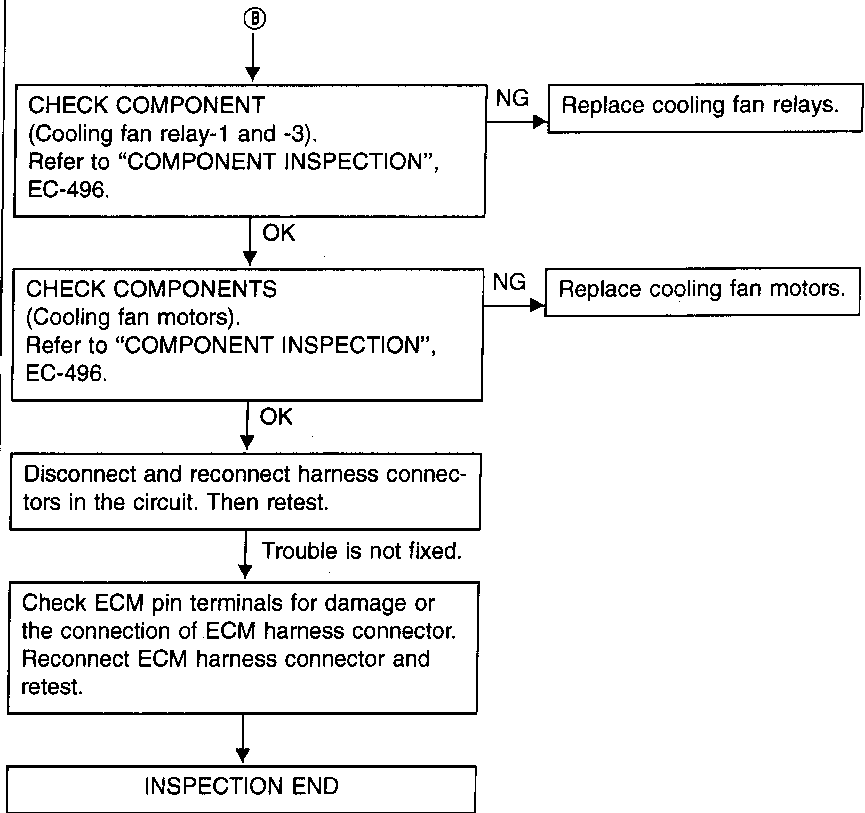
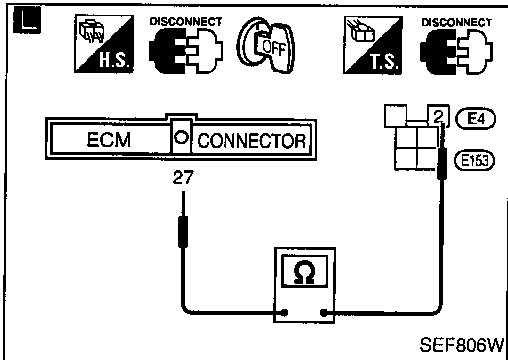
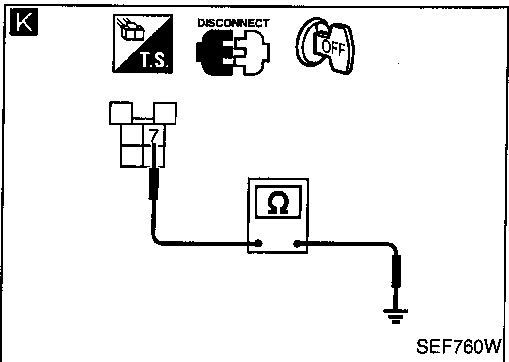
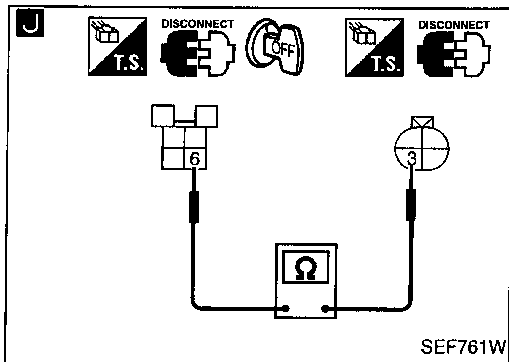
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TROUBLE DIAGNOSIS FOR OVERHEAT

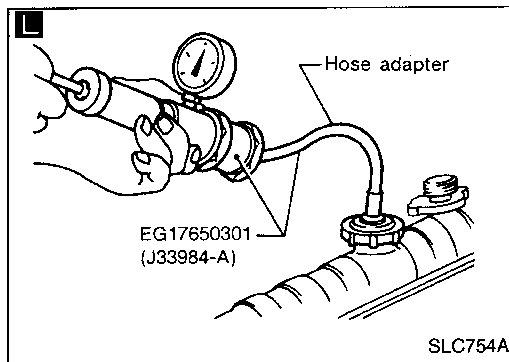
Overheat (Cont'd)



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TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)



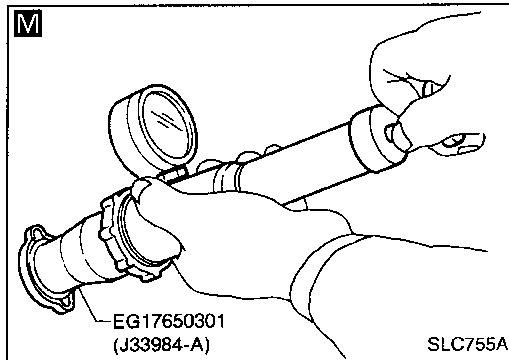
L

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

NG → Check the following for leak.

- Hose
- Radiator
- Water pump

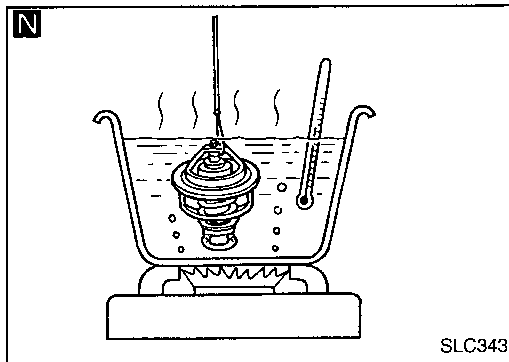
Refer to LC section ("Water Pump").



M

CHECK RADIATOR CAP.
Apply pressure to cap with a tester.
Radiator cap relief pressure:
Standard
98 - 118 kPa (1.0 - 1.2 kg/cm², 14 - 17 psi)
Limit
59 - 118 kPa (0.6 - 1.2 kg/cm², 9 - 17 psi)

NG → Replace radiator cap.



N

CHECK THERMOSTAT.

1. Check valve seating condition at normal room temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.
Valve opening temperature:
82°C (180°F) [standard]
Maximum valve lift:
More than 8.6 mm/95°C (0.339 in/203°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

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

NG → Replace thermostat.

OK → Check engine coolant temperature sensor. Refer to "COMPONENT INSPECTION", EC-141.

NG → Replace engine coolant temperature sensor.

OK → If the cause can not be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-495.

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".

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

MAIN 12 CAUSES OF OVERHEATING

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	<ul style="list-style-type: none"> ● 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	98 - 118 kPa (1.0 - 1.2 kg/cm ² , 14 - 17 psi) 59 - 118 kPa (0.6 - 1.2 kg/cm ² , 9 - 17 psi) (Limit)	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	5	● Coolant leaks	● Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section
ON*1	7	● Cooling fan	● CONSULT	Operating	See "TROUBLE DIAGNOSIS FOR DTC P1900" (EC-485)
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.

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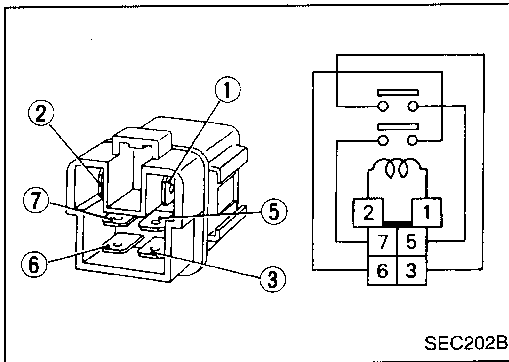
TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

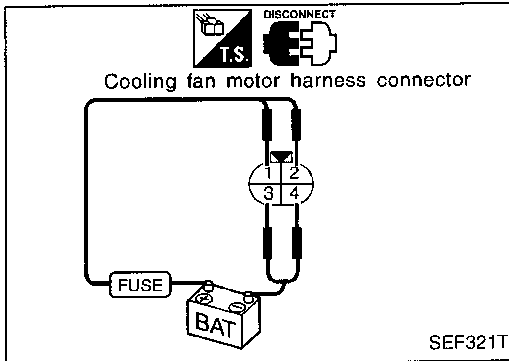
COMPONENT INSPECTION

Cooling fan relays-1 and -2, -3

Check continuity between terminals ③ and ⑤, ⑥ and ⑦.



Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No



Cooling fan motor

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation as shown in the figure.

Conditions	Cooling fan motor
12V direct current supply between terminal ①, ② and ③, ④ (Ground)	Cooling fan operates at high speed

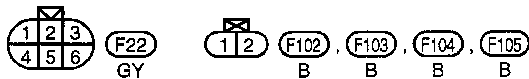
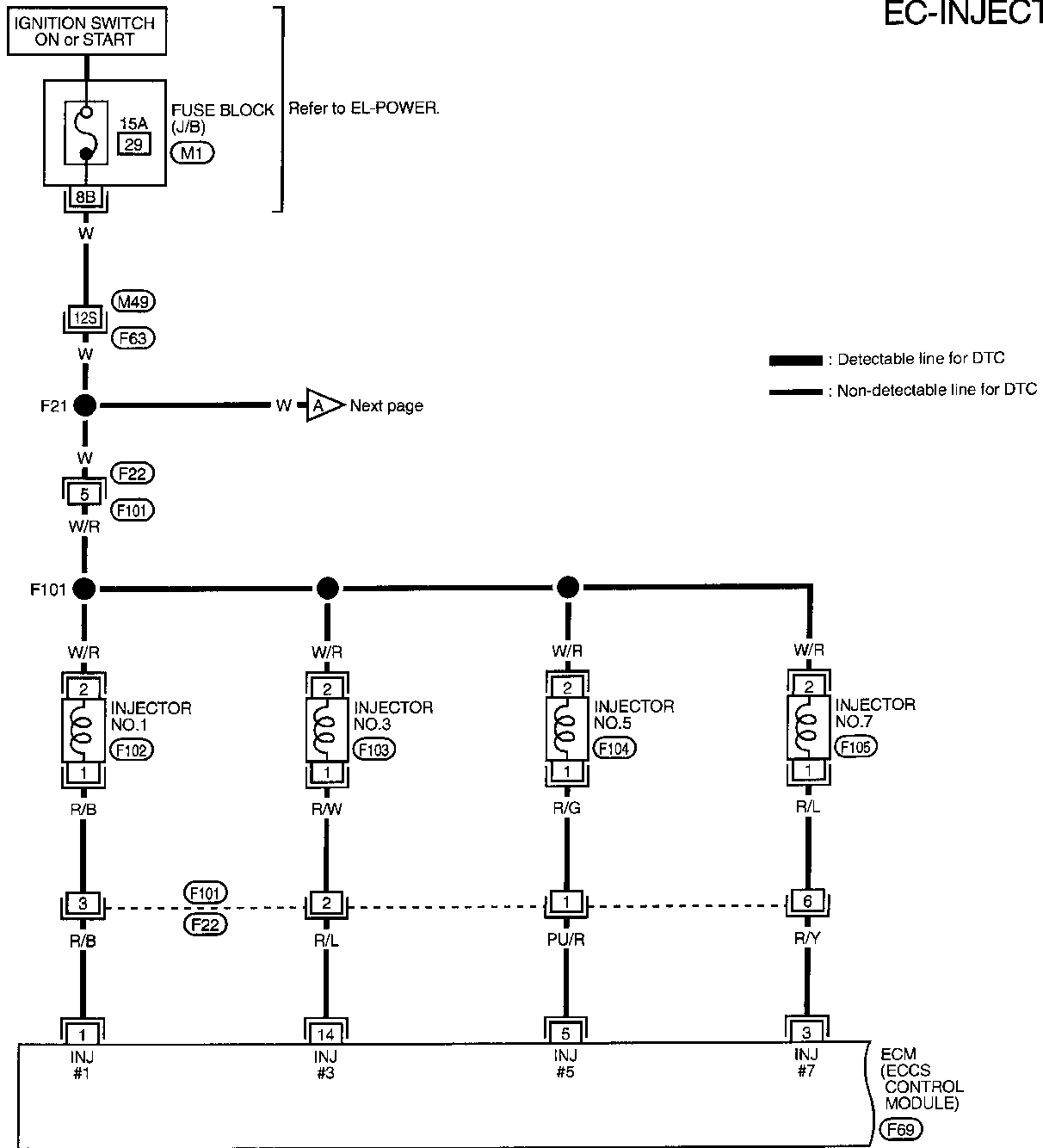
If NG, replace cooling fan motor.

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

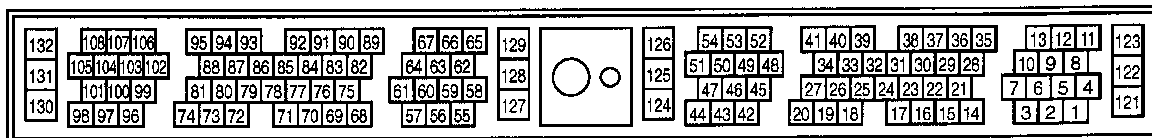
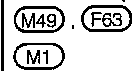
Injector

LEFT BANK

EC-INJECT-01



Refer to last page (Foldout page).

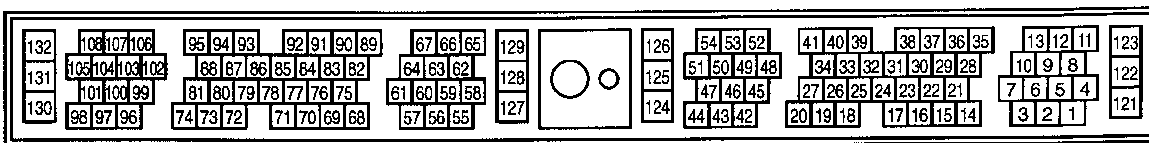
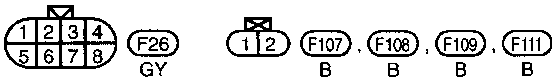
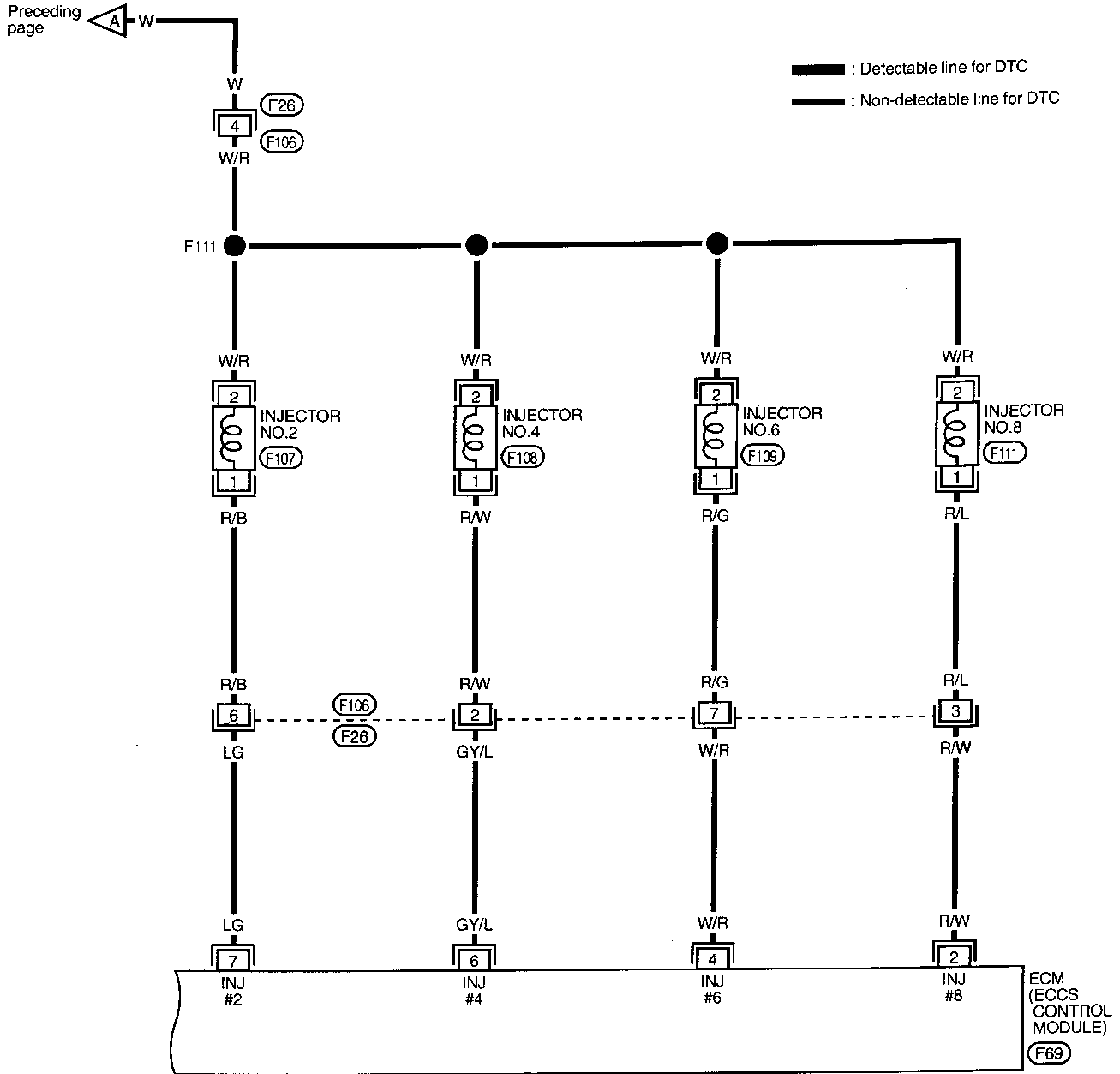


TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector (Cont'd)

RIGHT BANK

EC-INJECT-02

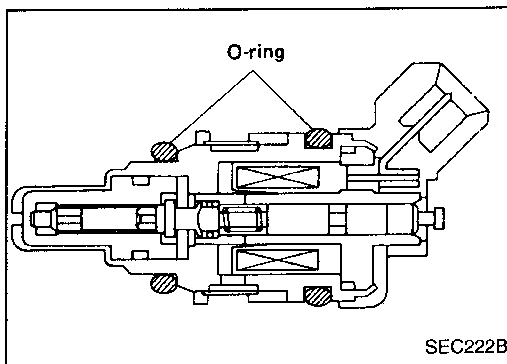


TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector (Cont'd)

COMPONENT DESCRIPTION

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



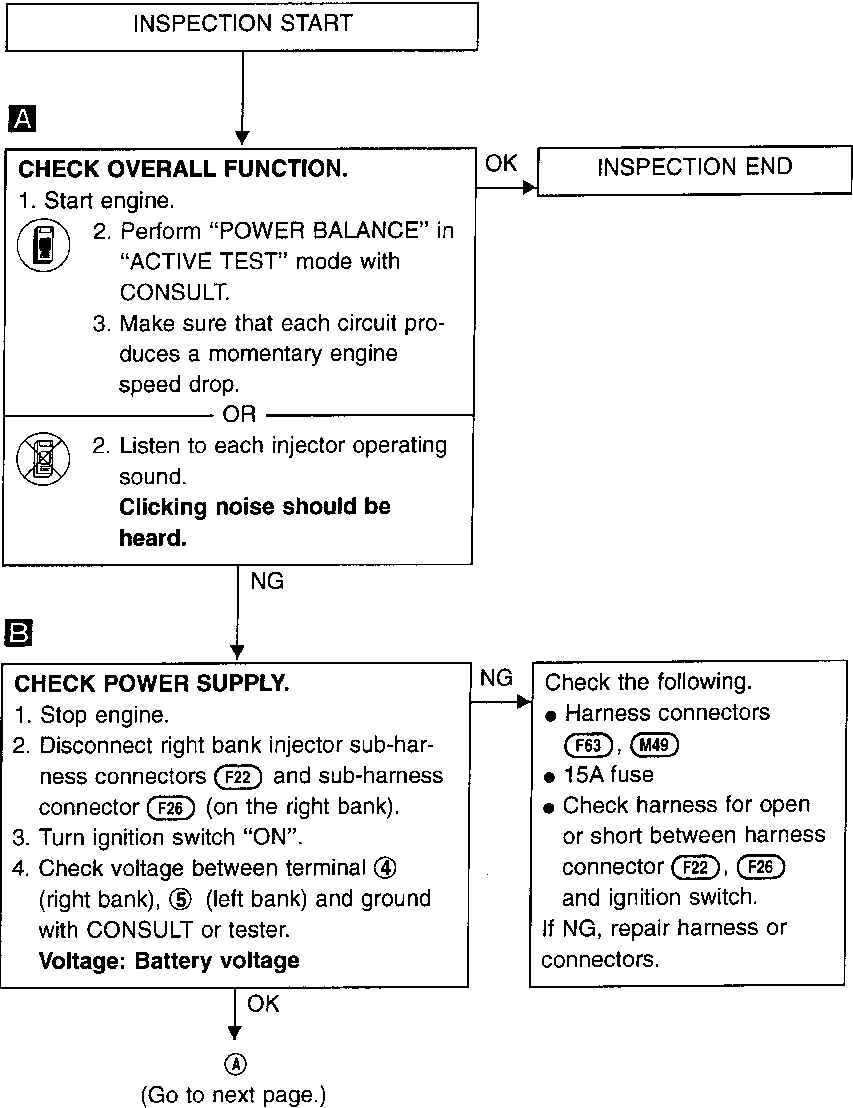
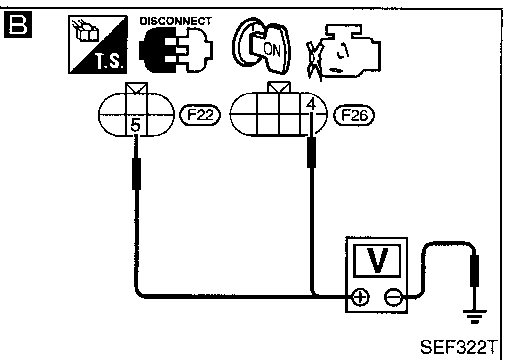
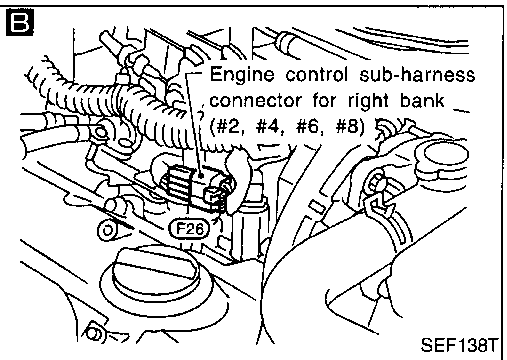
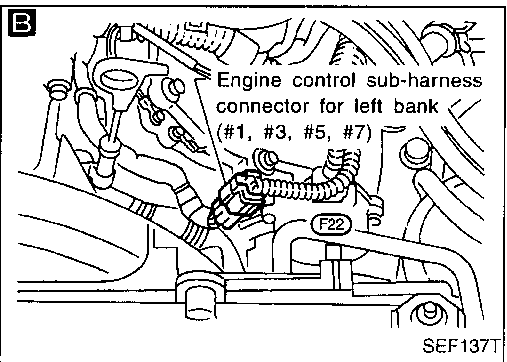
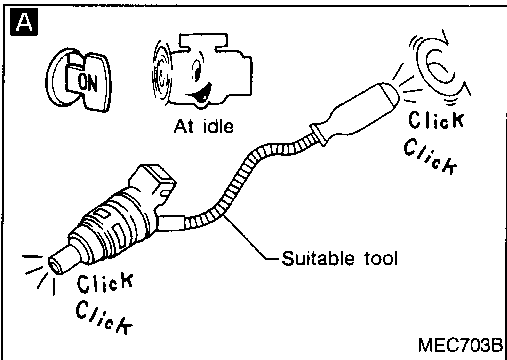
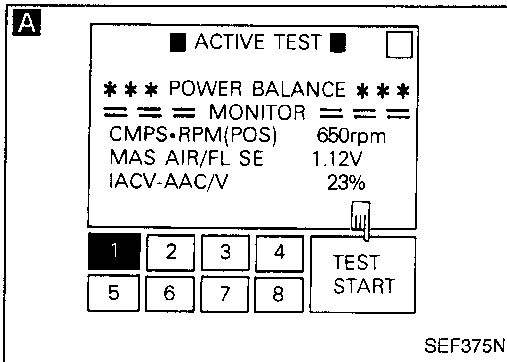
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)	
1	R/B	Injector No. 1	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) Idle speed	BATTERY VOLTAGE (11 - 14V)	
2	R/W	Injector No. 8		<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> Engine speed is 2,000 rpm.	
3	R/Y	Injector No. 7			
14	R/L	Injector No. 3			SEF549T BATTERY VOLTAGE (11 - 14V)
4	W/R	Injector No. 6			
5	PU/R	Injector No. 5		SEF550T BATTERY VOLTAGE (11 - 14V)	
6	GY/L	Injector No. 4			
7	L/G	Injector No. 2		SEF550T BATTERY VOLTAGE (11 - 14V)	

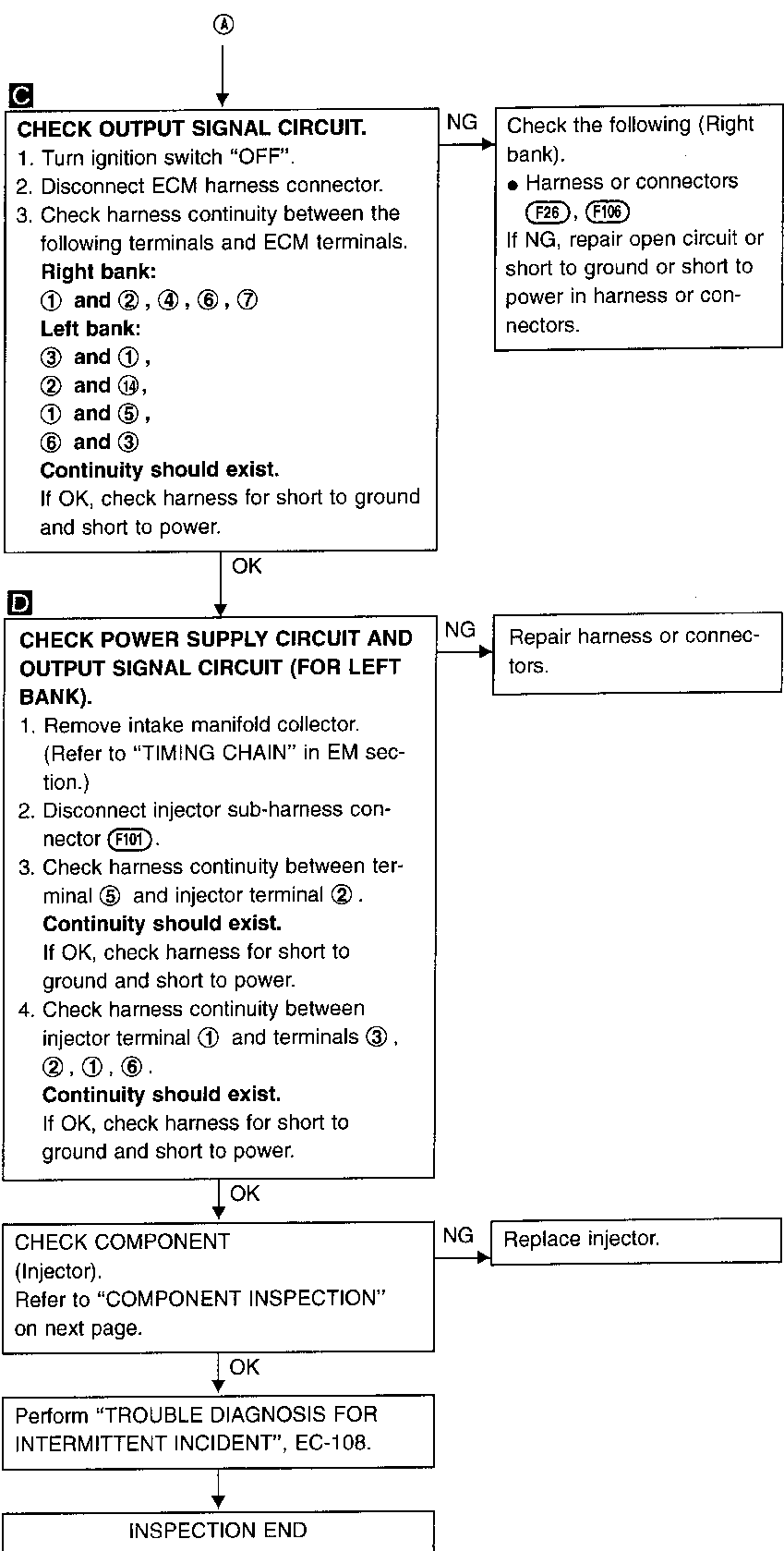
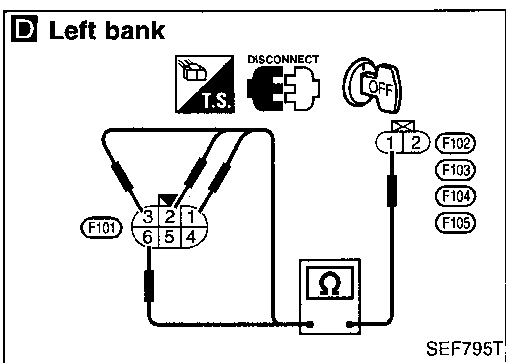
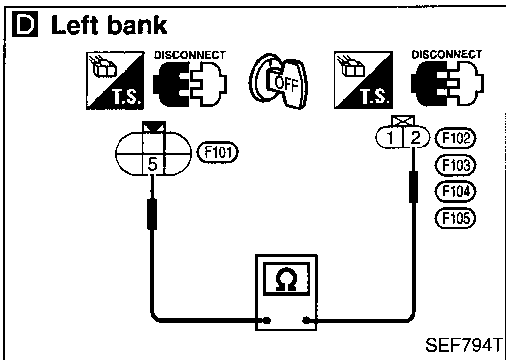
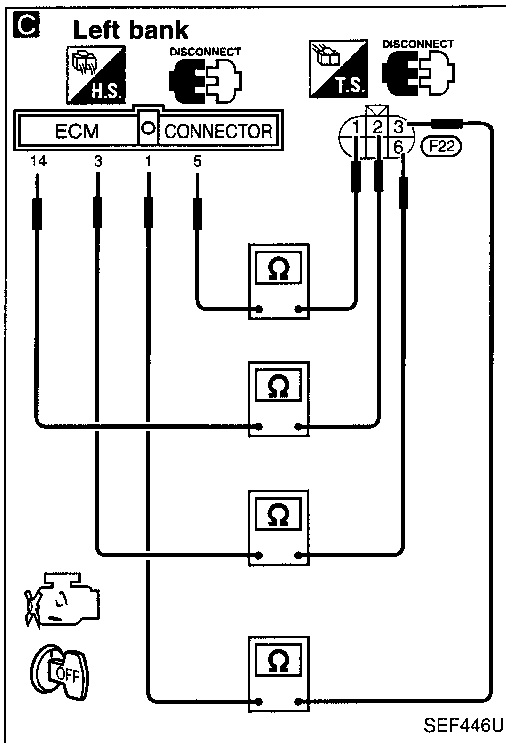
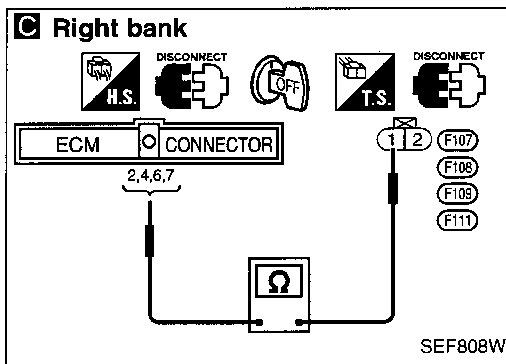
TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector (Cont'd) DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector (Cont'd)



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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector (Cont'd)

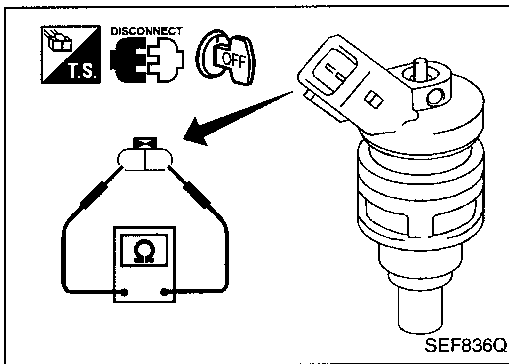
COMPONENT INSPECTION

Injector

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 10 - 14 Ω at 25°C (77°F)

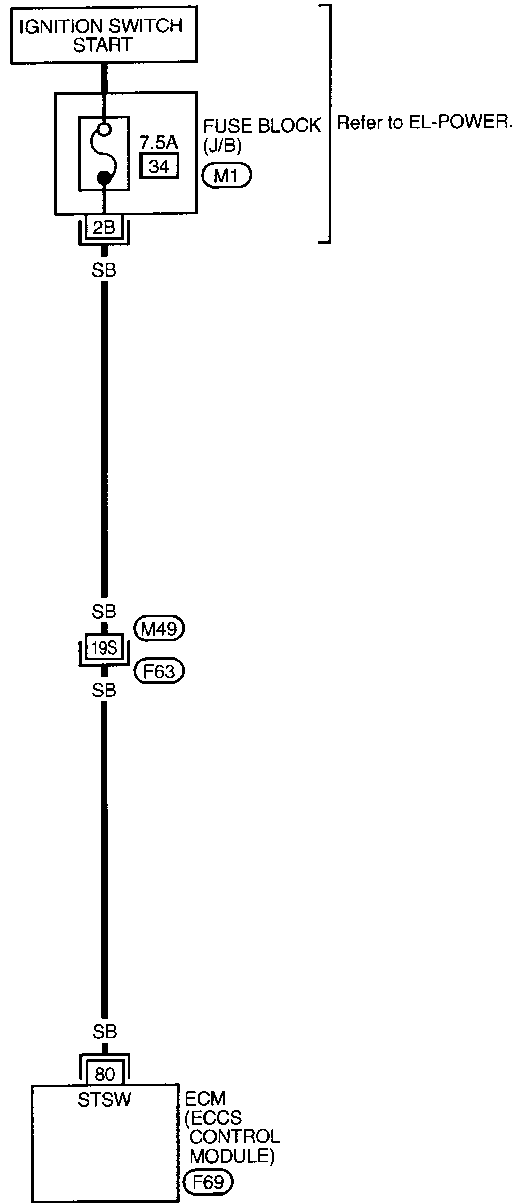
If NG, replace injector.



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Start Signal

EC-S/SIG-01



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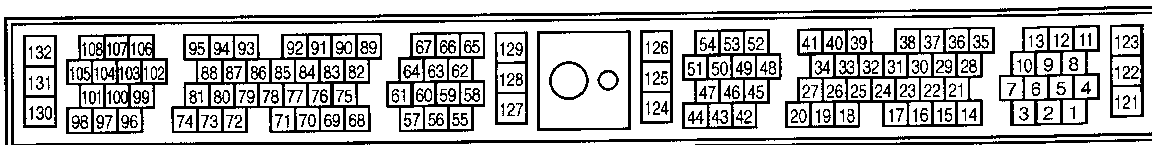
EL

IDX

Refer to last page (Foldout page).

M49, F63

M1



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Start Signal (Cont'd) DIAGNOSTIC PROCEDURE

A

■ START SIGNAL CKT ■

1. CLOSE THROTTLE. SHIFT TO P OR N RANGE.
2. TOUCH START AND START ENGINE IMMEDIATELY.

NEXT
START

SEF191L

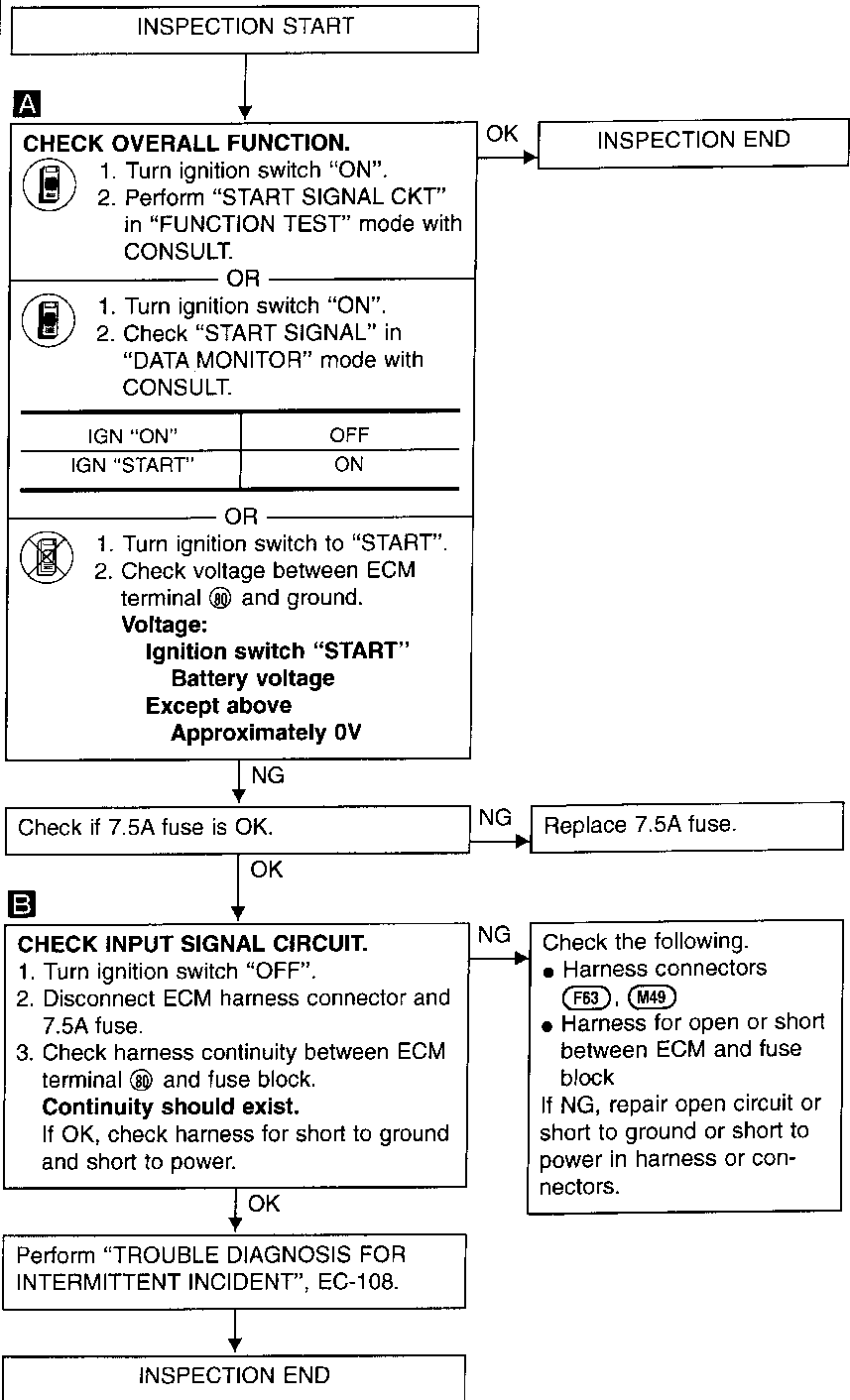
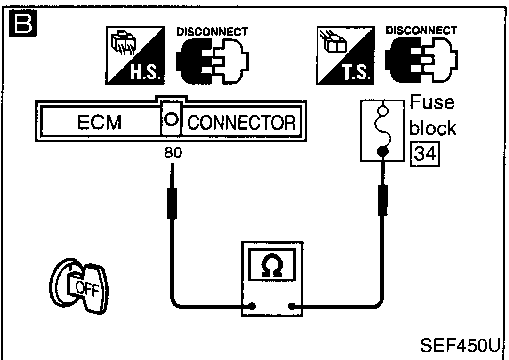
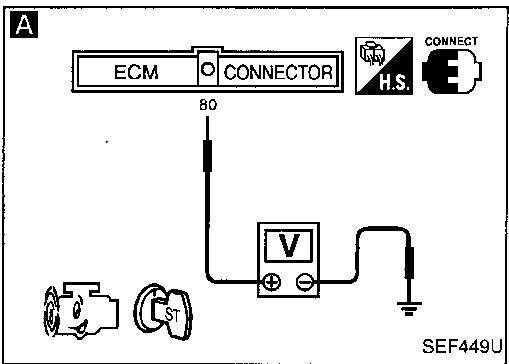
A

☆ MONITOR ☆ NO FAIL

START SIGNAL	OFF
CLSD TH/P SW	ON
AIR COND SIG	OFF
P/N POSI SW	ON

RECORD

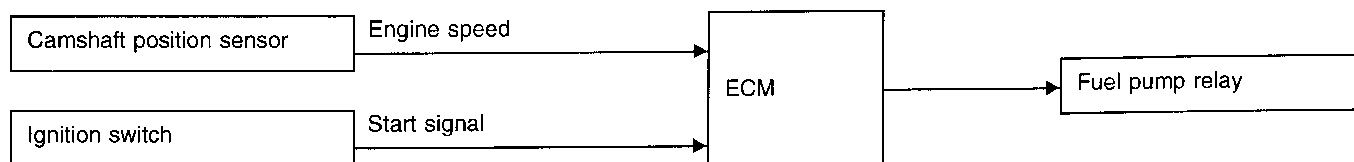
SEF111P



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Fuel Pump Control

SYSTEM DESCRIPTION



Fuel pump ON-OFF control

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine start-up. If the ECM receives a 1° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to activate. If the 1° signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents the battery from discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds
Engine is running and cranking	Operates
When engine is stopped	Stops for 1.5 seconds
Except as shown above	Stops

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	<ul style="list-style-type: none"> Ignition switch is turned to ON (Operates for 1 second) Engine running and cranking 	ON
	Except as shown above	OFF

ECM TERMINALS AND REFERENCE VALUE

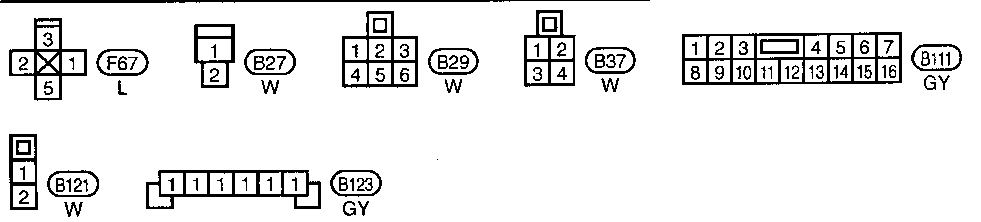
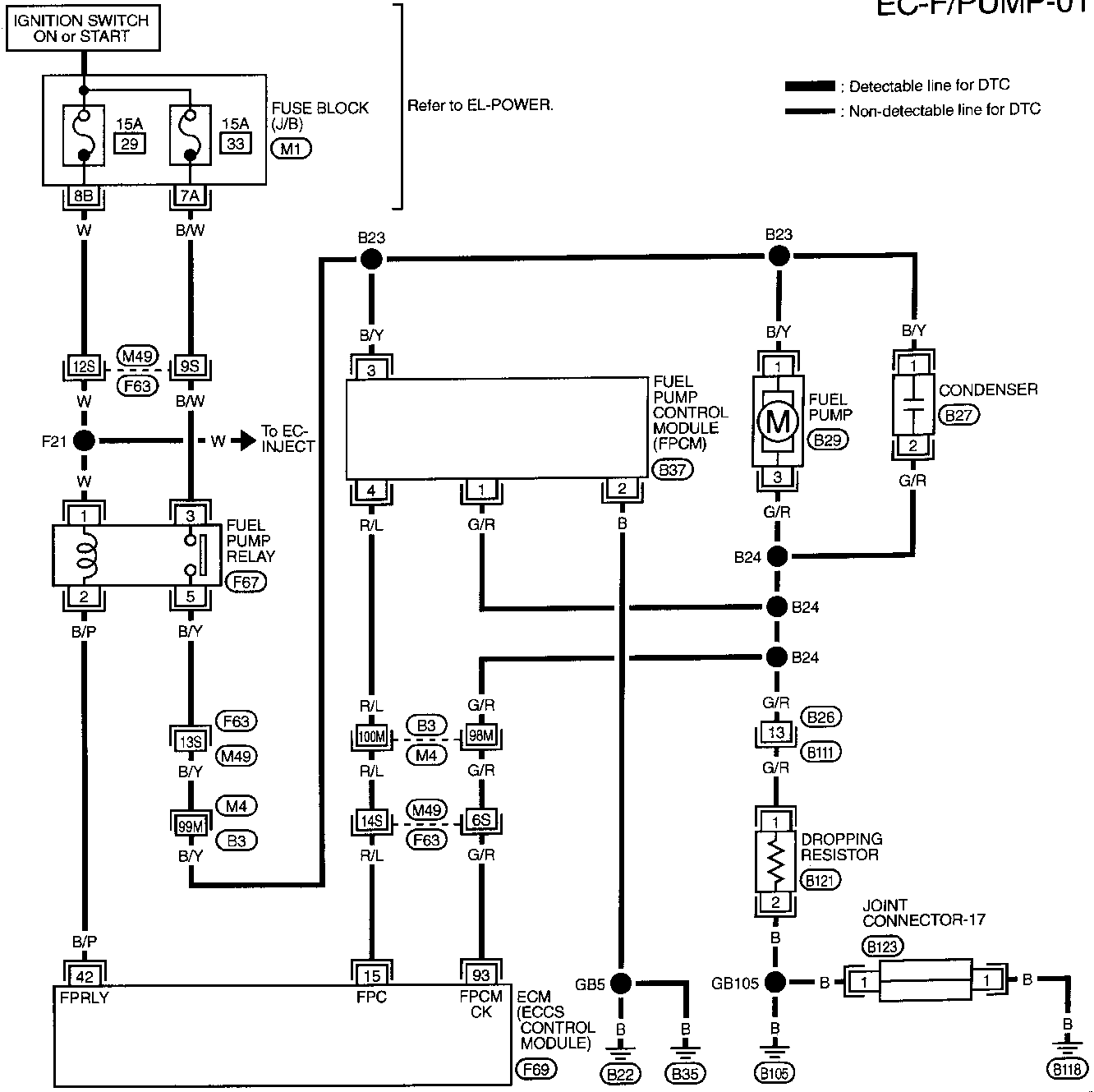
Specification data are reference values, and are measured between each terminal and (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
11	PU	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0 - 1V
			Ignition switch "ON" └ 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

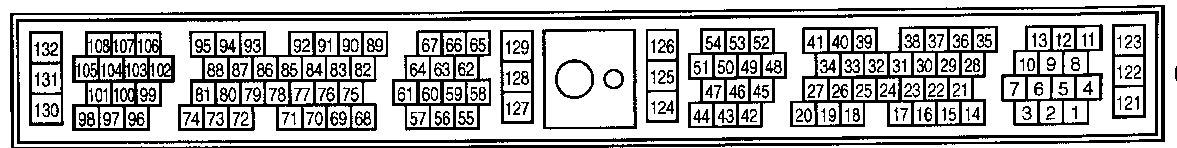
Fuel Pump Control (Cont'd)

EC-F/PUMP-01



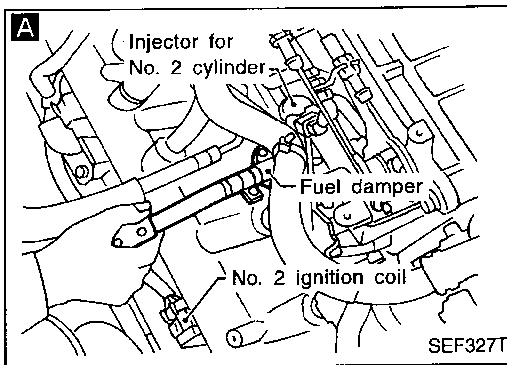
Refer to last page (Foldout page).

- M4, B3
- M49, F63
- M1



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Fuel Pump Control (Cont'd) DIAGNOSTIC PROCEDURE



INSPECTION START

A

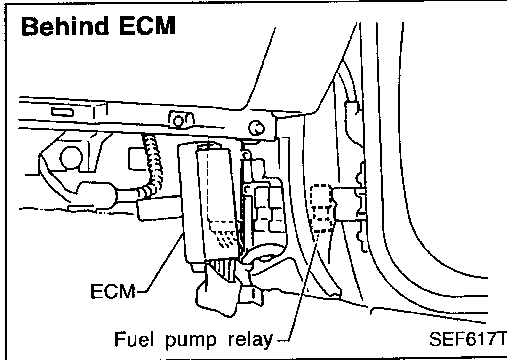
CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".

OK → INSPECTION END

NG → B



B

CHECK POWER SUPPLY.

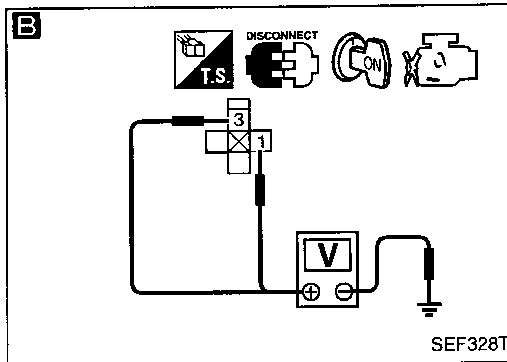
1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".
4. Check voltage between terminals ①, ③ and ground with CONSULT or tester.

Voltage: Battery voltage

OK → C

NG → Check the following:

- Harness connectors (F63), (M49)
 - 15A fuse
 - Harness continuity between fuel pump relay and ignition switch
- If NG, repair harness or connectors.



C

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector and dropping resistor harness connector.
3. Check harness continuity between relay terminal ⑤ and terminal ①, FPCM terminal ③ and terminal ①, terminal ② and body ground.

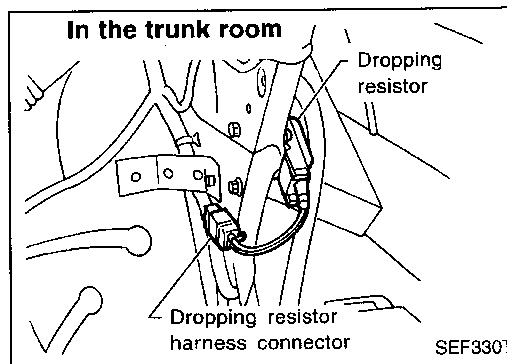
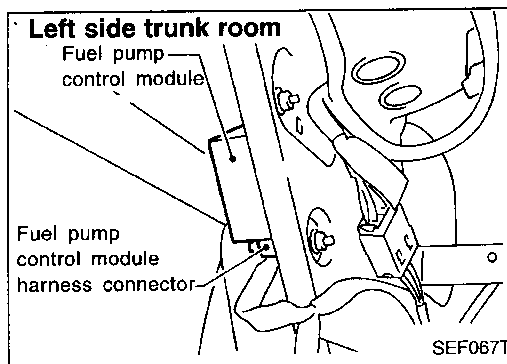
Continuity should exist.

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

OK → A

NG → Check the following:

- Harness connectors (B3), (M4)
 - Harness connectors (M49), (F63)
 - Harness connectors (B11), (B26)
 - Joint connector-17
 - Harness for open or short between fuel pump relay and fuel pump
 - Harness for open or short between fuel pump and dropping resistor
 - Harness for open or short between dropping resistor and body ground
- If NG, repair open circuit or short to ground or short to power in harness or connectors.



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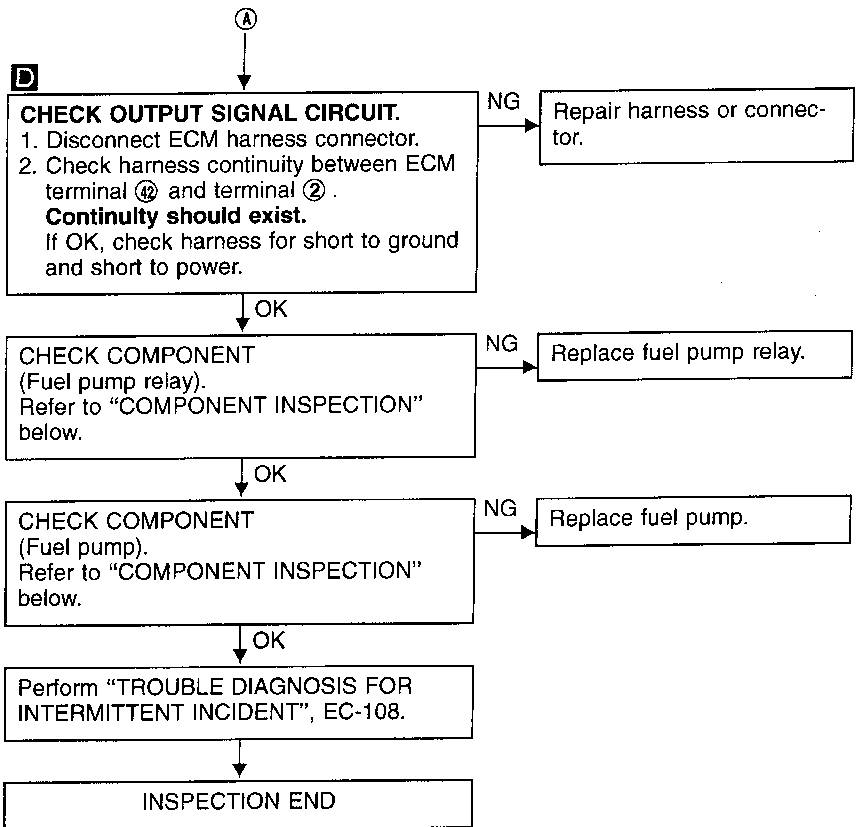
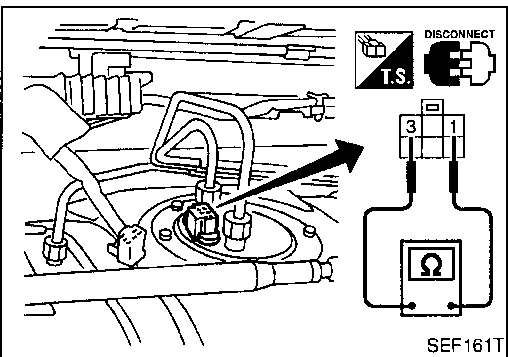
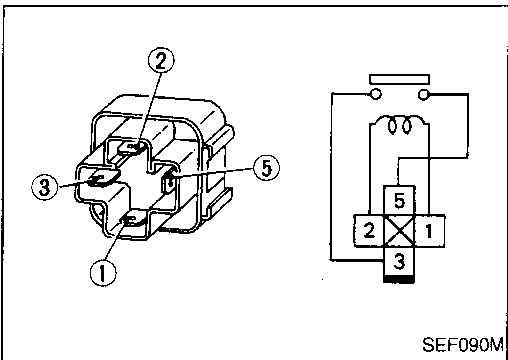
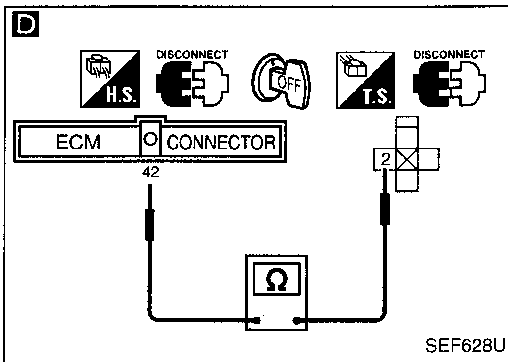
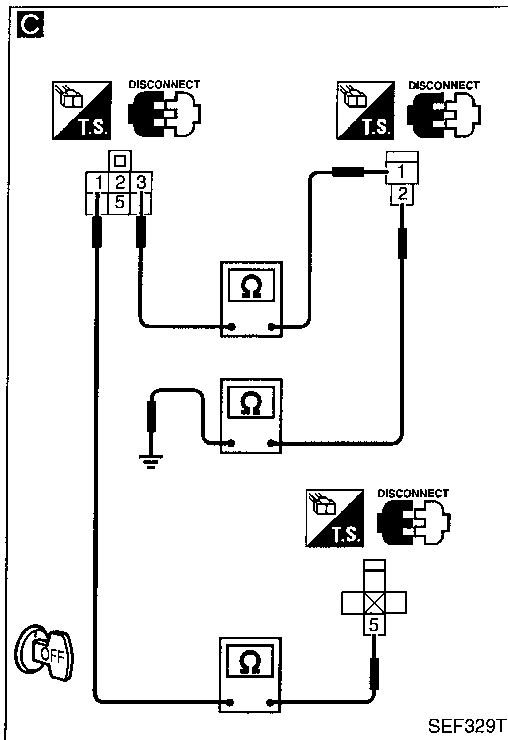
HA

EL

IDX

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Fuel Pump Control (Cont'd)



COMPONENT INSPECTION

Fuel pump relay

Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.

Fuel pump

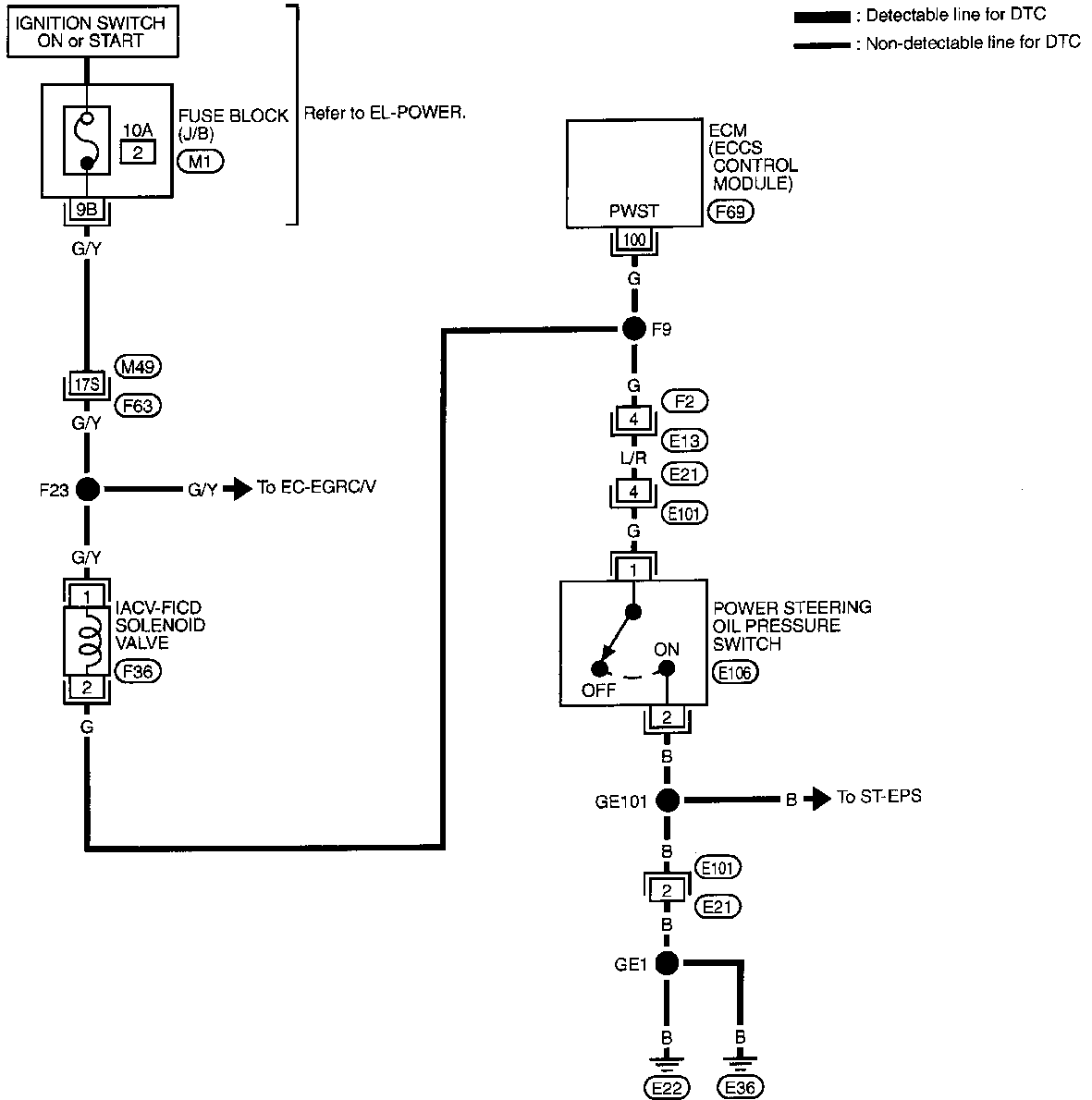
1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ① and ③.

Resistance: 0.2 - 5.0Ω at 25°C (77°F)

If NG, replace fuel pump.

Power Steering Oil Pressure Switch

EC-PST/SW-01



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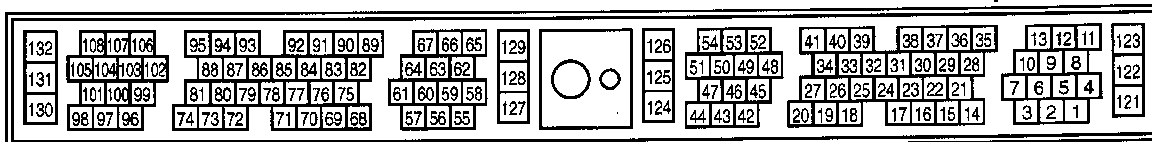
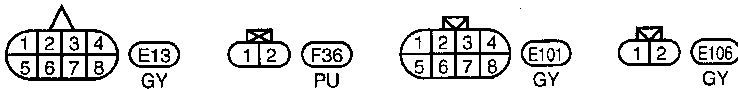
EL

IDX

Refer to last page (Foldout page).

(M49), (F63)

(M1)

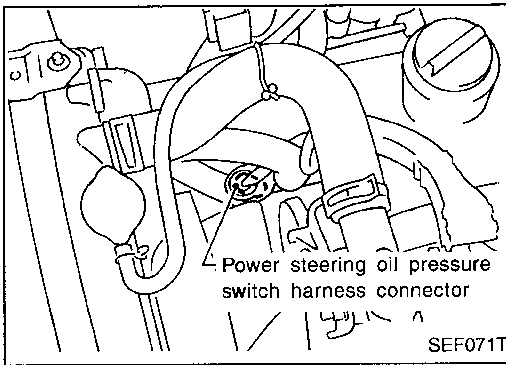


TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Power Steering Oil Pressure Switch (Cont'd)

COMPONENT DESCRIPTION

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-FICD solenoid 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	<ul style="list-style-type: none"> 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 (128) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
100	G	Power steering oil pressure switch	Engine is running. Steering wheel is being turned.	0 - 1.5V
			Engine is running. Steering wheel is not being turned.	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Power Steering Oil Pressure Switch (Cont'd) DIAGNOSTIC PROCEDURE

A

■ PW/ST SIGNAL CIRCUIT ■

HOLD STEERING WHEEL
IN A FULL
LOCKED POSITION
THEN
TOUCH START

NEXT START

MEF023E

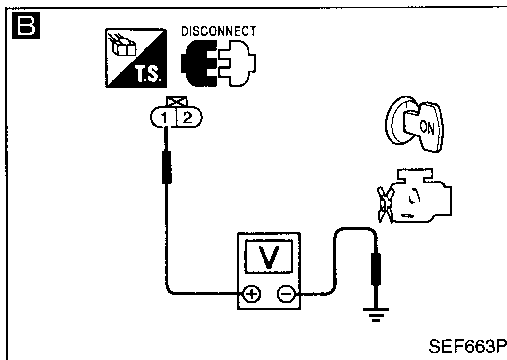
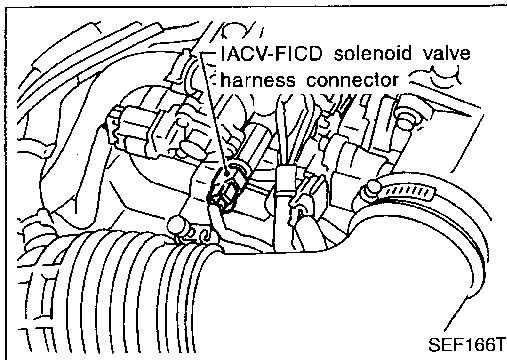
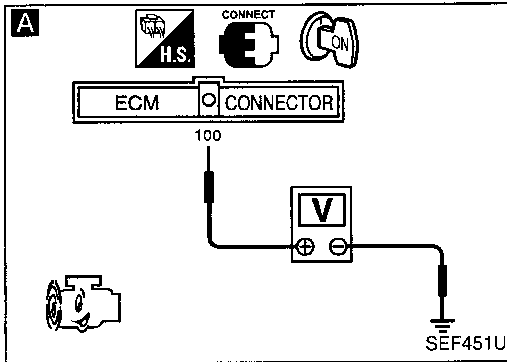
A

☆ MONITOR ☆ NO FAIL □

PW/ST SIGNAL OFF

RECORD

SEF591I



INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Start engine.
2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT.

Steering is neutral position: OFF
Steering is turned: ON

OR

1. Start engine.
2. Check voltage between ECM terminal (100) and ground under the following conditions.

Voltage:
When steering wheel is turned quickly.
Approximately 0V
Except above Battery voltage

OK → INSPECTION END

B

CHECK POWER SUPPLY-I.

1. Stop engine.
2. Disconnect IACV-FICD solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.
• Harness connectors
• F63, M49
• 10A fuse
• Harness for open or short between IACV-FICD solenoid valve and fuse

C

CHECK POWER SUPPLY-II.

1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch harness connector.
3. Check voltage terminal ① (or ECM terminal (100) and ground.

Voltage: Battery voltage

NG → Repair harness or connectors.

OK → (Go to next page.)

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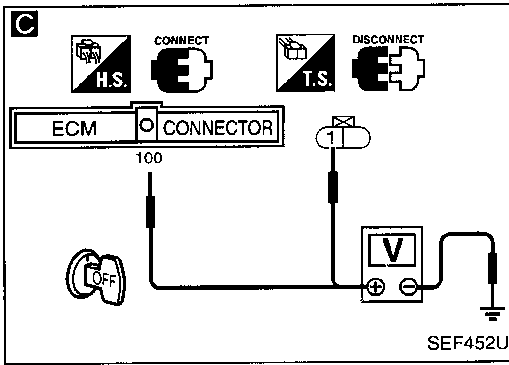
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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Power Steering Oil Pressure Switch (Cont'd)



D

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch harness connector.
3. Check harness continuity between terminal ② and engine ground.

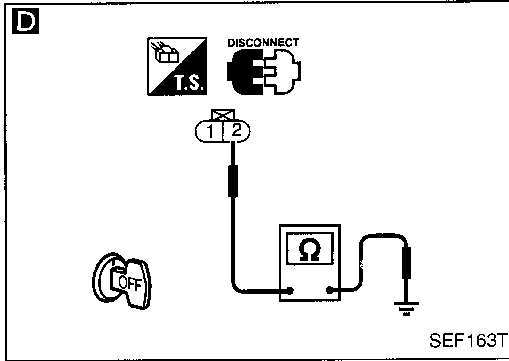
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (E101, E21)
- Harness for open or short between power steering pressure switch and ground

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



E

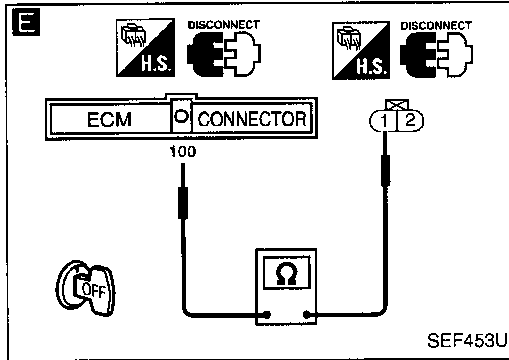
CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑩ and terminal ①.

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

NG

Repair harness or connectors.



CHECK COMPONENTS
(Power steering oil pressure switch and IACV-FICD solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG

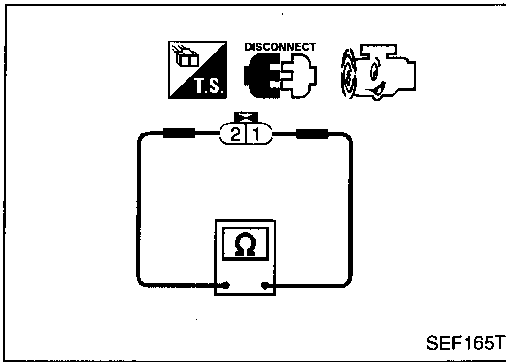
Replace power steering oil pressure switch or IACV-FICD solenoid valve.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Power Steering Oil Pressure Switch (Cont'd) COMPONENT INSPECTION

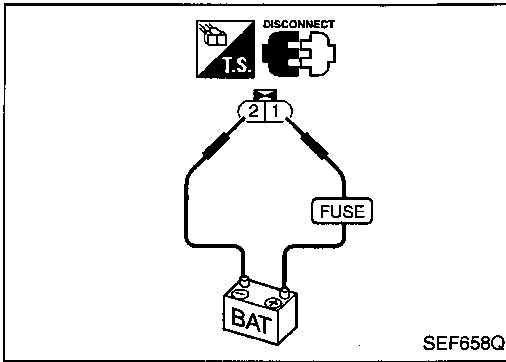


Power steering oil pressure switch

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals ① and ②.

Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

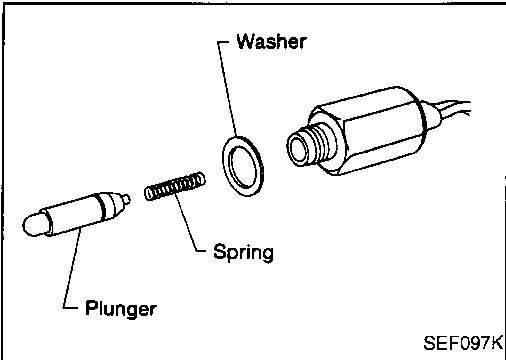
If NG, replace power steering oil pressure switch.



IACV-FICD solenoid valve

Disconnect IACV-FICD solenoid valve harness connector.

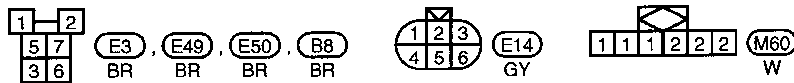
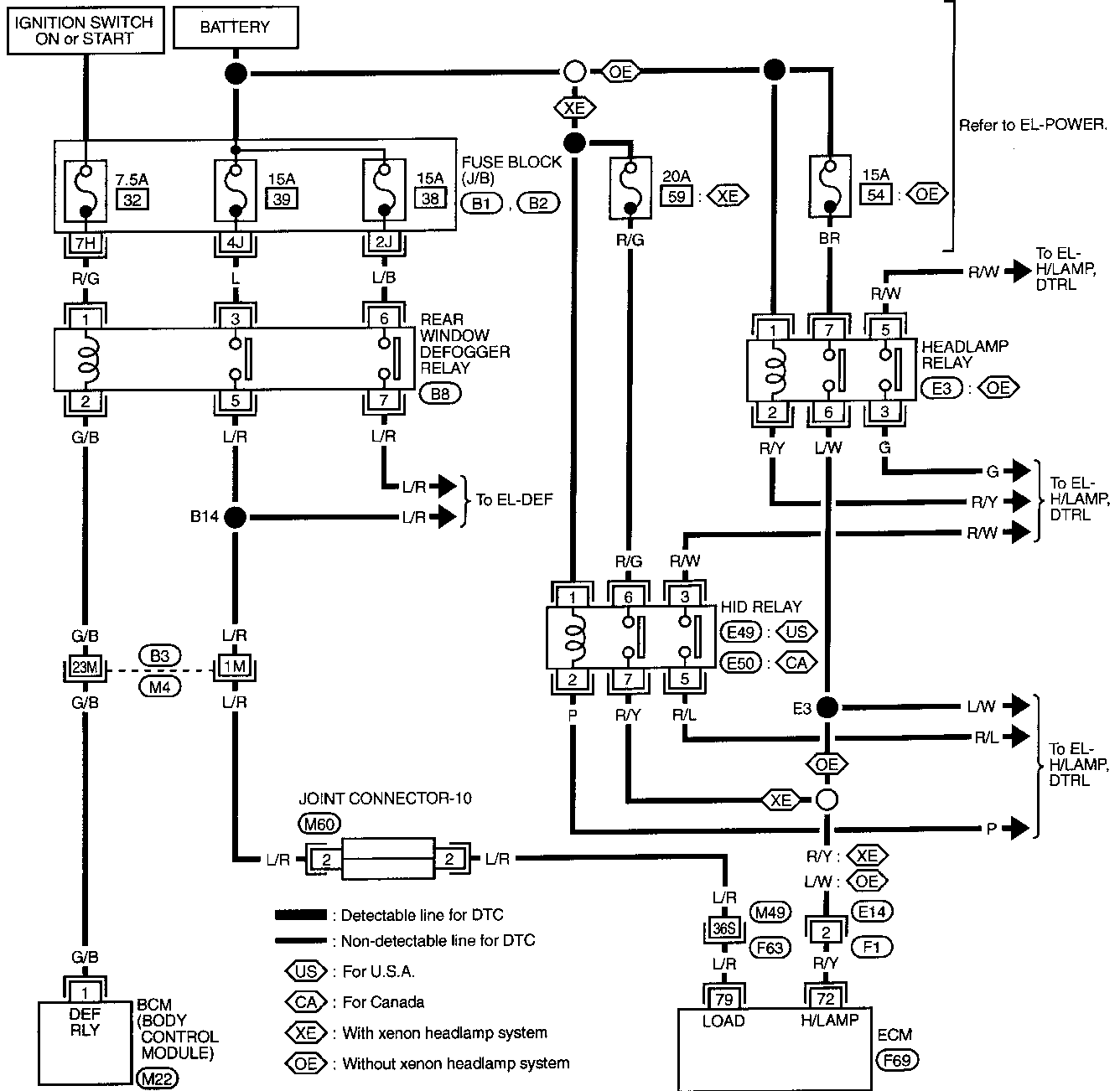
- Check for clicking sound when applying 12V direct current to terminals.



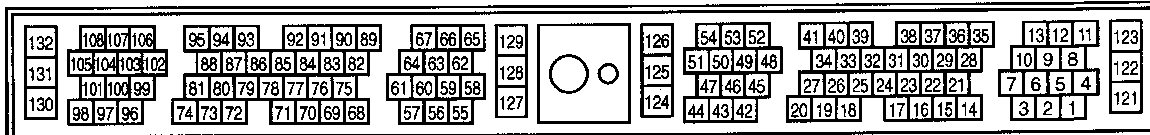
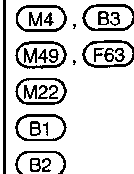
- Check plunger for seizing or sticking.
- Check for broken spring.

Electrical Load Signal

EC-LOAD-01



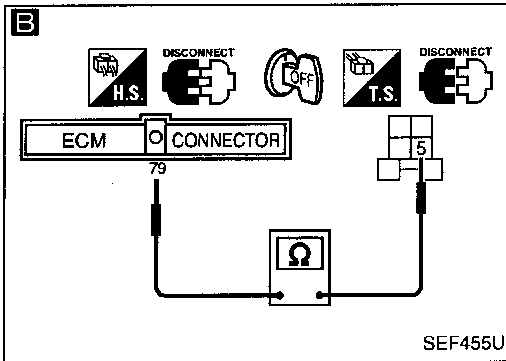
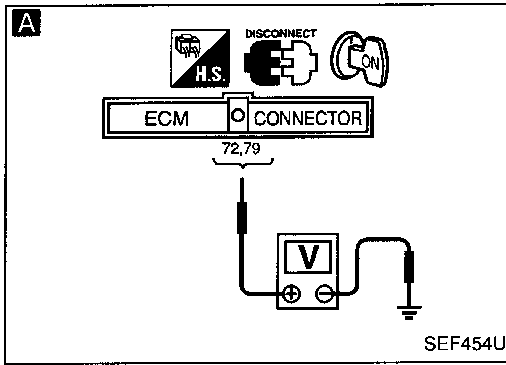
Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Electrical Load Signal (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK THE OVERALL FUNCTION.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Turn ignition switch "ON".
4. Check voltage between ECM terminal ⑦, ⑧ and ground in the following conditions.

Conditions	ECM terminal No.	Voltage (V)
Rear window defogger switch "ON"*1	⑧	Battery voltage
Headlamp "ON" at 2nd position with low beam*2	⑦	
Except the above*1		0

OK → INSPECTION END

NG(*1) ↓ NG(*2)
 (A)
 (Go to next page.)

CHECK REAR WINDOW DEFOGGER FUNCTION.

1. Start engine.
2. Turn "ON" the rear defogger switch.
3. Check the rear windshield. Is the rear windshield heated up?

NG → Refer to EL section (RR window defogger).

B

CHECK INPUT SIGNAL CIRCUIT FOR RR/DEF.

Check harness continuity between ECM terminal ⑦ and terminal ⑤.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

NG → Check the following.

- Harness connectors (F63), (M49)
- Joint connector-10 (M60)
- Harness connectors (M4), (B3)

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

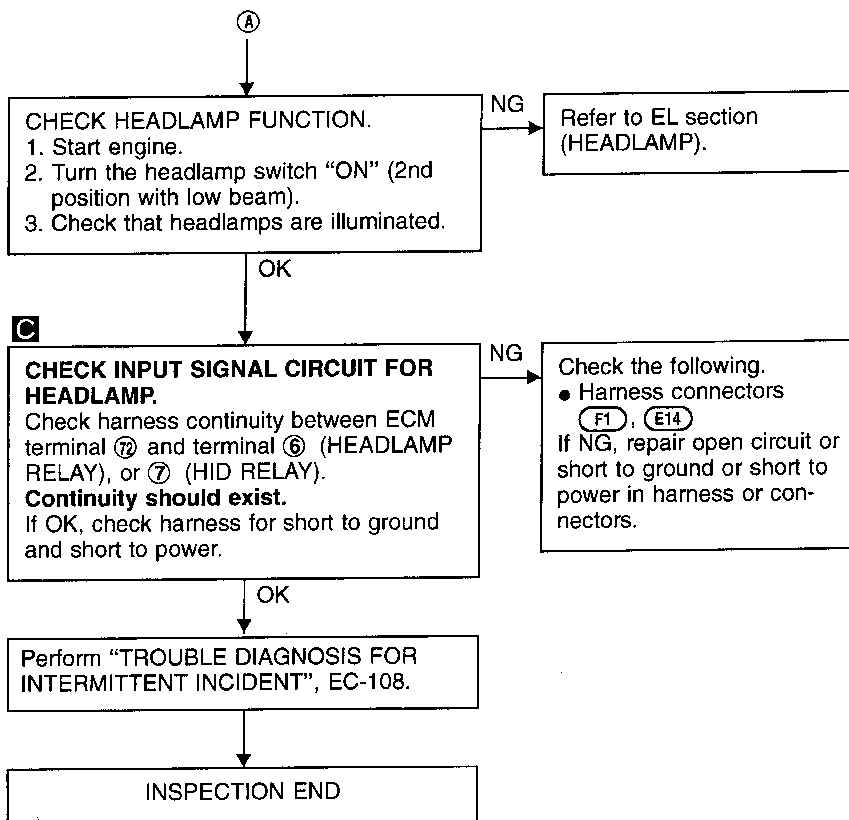
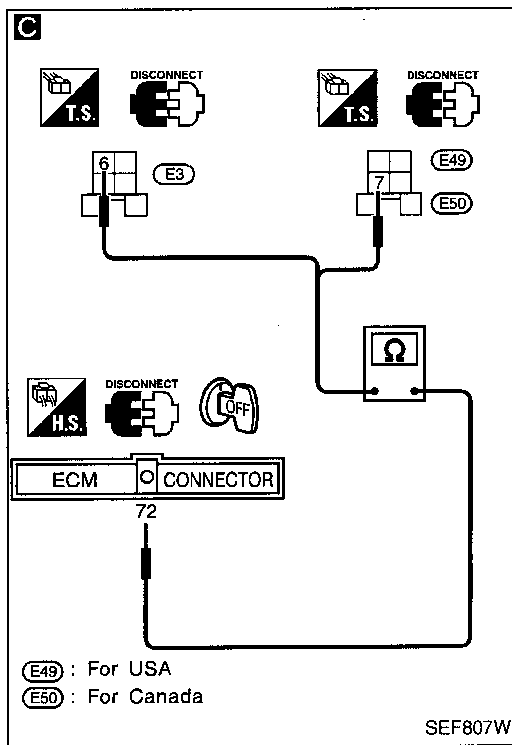
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-108.

INSPECTION END

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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

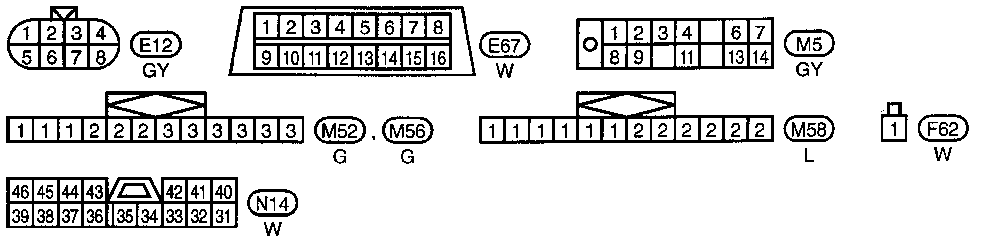
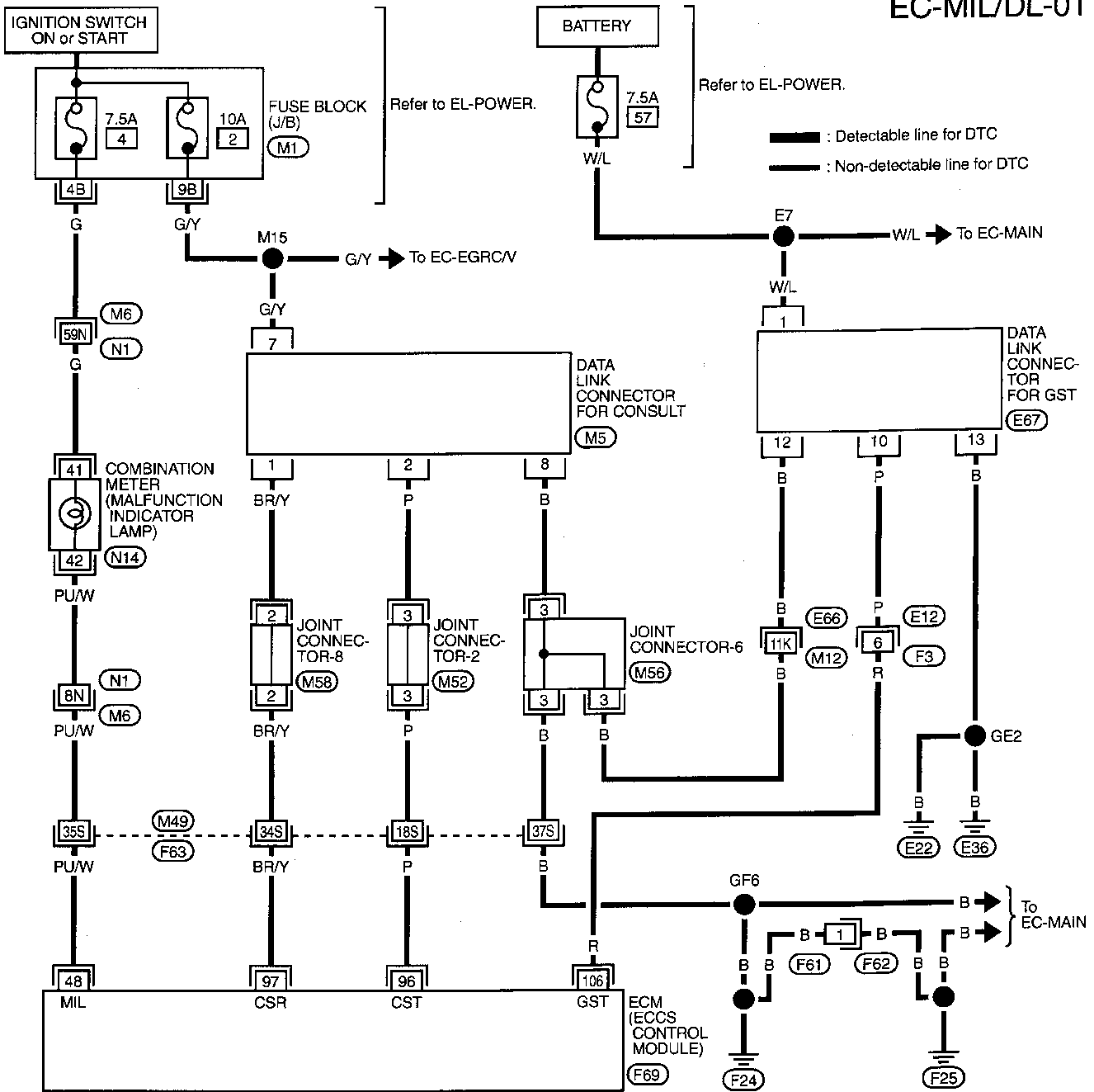
Electrical Load Signal (Cont'd)



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

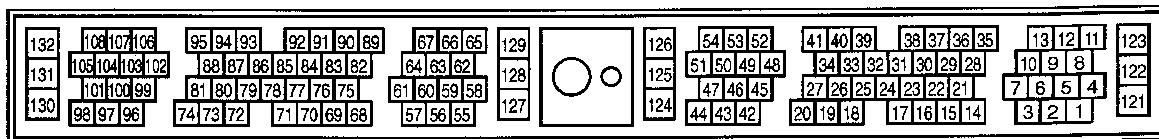
MIL & Data Link Connectors

EC-MIL/DL-01



Refer to last page (Foldout page).

- (E66), (M12)
- (M6), (N1)
- (M49), (F63)
- (M1)



General Specifications

PRESSURE REGULATOR

Fuel pressure	kPa (kg/cm ² , psi)	
At idle		Approximately 235 (2.4, 34)
A few seconds after ignition switch is turned OFF to ON		Approximately 294 (3.0, 43)

Inspection and Adjustment

Target idle speed*1	rpm	
No-load*3		650±50 (in "P" or "N" position)
Base idle speed*2	rpm	
No-load*3		600±50 (in "P" or "N" position)
Air conditioner: ON (in "N" position)		More than 700 rpm
Ignition timing		15°±2° BTDC

*1: TPS harness connector connected.

*2: Using CONSULT "WORK SUPPORT" or TPS harness connector disconnected.

*3: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater, fan & rear defogger)

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage	V	1.0 - 1.7 at idle* Approximately 2.1 at 2,500
Mass air flow (Using CONSULT or GST)	g·m/sec	3.0 - 6.0 at idle* 12.9 - 25.3 at 2,500 rpm*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance (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)	4.61	0.68 - 1.11
50 (122)	2.53	0.09 - 0.12
100 (212)	0.87	0.017 - 0.024

FRONT HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3
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REAR HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3
-----------------------------	---	-----------

FUEL PUMP

Resistance [at 25°C (77°F)]	Ω	0.2 - 5.0
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IACV-AAC VALVE (Step motor type)

Resistance [at 25°C (77°F)]	Ω	Approximately 30
-----------------------------	---	------------------

INJECTOR

Resistance [at 25°C (77°F)]	Ω	10 - 14
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THROTTLE POSITION SENSOR

Accelerator pedal conditions	Voltage*
Completely released (a)	0.15 - 0.85
Partially released	Between (a) and (b)
Completely depressed (b)	3.5 - 4.7

*: Measured with vacuum applied to the throttle opener using a vacuum pump.

CALCULATED LOAD VALUE

	Calculated load value % (Using CONSULT or GST)
At idle	13.0 - 32
At 2,500 rpm	13.0 - 25.5

INTAKE AIR TEMPERATURE SENSOR

Temperature °C (°F)	Resistance
20 (68)	2.1 - 2.9 kΩ
80 (176)	0.68 - 1.00 kΩ

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

DROPPING RESISTOR

Resistance [at 25°C (77°F)]	Ω	Approximately 0.8
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CRANKSHAFT POSITION SENSOR (OBD)

Resistance	Ω	166.5 - 203.5 [at 25°C (77°F)]
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EVAP CANISTER PURGE VOLUME CONTROL VALVE

Resistance [at 25°C (77°F)]	Ω	35 - 43
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INTAKE VALVE TIMING CONTROL POSITION SENSOR

Resistance [at 25°C (77°F)]	Ω	600 - 740
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GI

MA

EM

LC

EC

FE

AT

PD

FA

RA

BR

ST

RS

BT

HA

EL

IDX