

ENGINE CONTROL SYSTEM

SECTION **EC**

GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

RS

BT

HA

EL

IDX

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EGR Temperature Sensor.....	435	Inspection and Adjustment.....	540
TROUBLE DIAGNOSIS FOR DTC P1402	441		

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	
Unable to access ECM	—	—	EC-99	FRONT O2 SENSOR-B2	P0152	0414	EC-180
*COOLANT T SEN/CIRC	P0125	0908	EC-161	FRONT O2 SENSOR-B2	P0151	0415	EC-174
ABSL PRES SEN/CIRC	P0105	0803	EC-130	FRONT O2 SENSOR-B2	P0150	0303	EC-166
ABS/TCS C/U SIGNAL	—	0107	EC-498	FRONT O2 SENSOR-B2	P0154	0509	EC-196
ABS/TCS C/U SIGNAL	—	0207	EC-498	FUEL SYS LEAN/BK1	P0171	0115	EC-279
A/T 1ST GR FNCTN	P0731	1103	AT-96	FUEL SYS LEAN/BK2	P0174	0210	EC-279
A/T 2ND GR FNCTN	P0732	1104	AT-101	FUEL SYS RICH/BK1	P0172	0114	EC-285
A/T 3RD GR FNCTN	P0733	1105	AT-106	FUEL SYS RICH/BK2	P0175	0209	EC-285
A/T 4TH GR FNCTN	P0734	1106	AT-111	FUEL TEMP SEN/CIRC	P0180	0402	EC-291
A/T COMM LINE	P0600	0504	EC-381	IACV/AAC VLV/CIRC	P0505	0205	EC-369
A/T DIAG COMM LINE	P1605	0804	EC-381	IGN SIGNAL-PRIMARY	P1320	0201	EC-415
A/T TCC S/V FNCTN	P0744	1107	AT-123	PNP SW/CIRC	P0705	1101	AT-82
AIR TEMP SEN/CIRC	P0110	0401	EC-139	KNOCK SEN/CIRCUIT	P0325	0304	EC-300
ATF TEMP SEN/CIRC	P0710	1208	AT-86	L/PRESS SOL/CIRC	P0745	1205	AT-130
CAM POS SEN (PHASE)	P0340	0101	EC-311	MAF SEN/CIRCUIT*3	P0100	0102	EC-122
CLOSED LOOP-B1	P1148	0307	EC-408	MAP/BAR SW SOL/CIR	P1105	1302	EC-386
CLOSED LOOP-B2	P1168	0308	EC-408	MULTI CYL MISFIRE	P0300	0701	EC-295
CLOSED TP SW/CIRC	P0510	0203	EC-376	NATS MALFUNC	—	—	EC-68
COOLANT T SEN/CIRC	P0115	0103	EC-145	NO SELF-DIAGNOSTIC FAILURE INDICATED	No DTC	Flashing*5	EC-64
CRANK POS SEN (REF)*3	P1335	0407	EC-422	OVERHEAT	—	0208	EC-504
CRANK P/S (POS) COG	P1336	0905	EC-428	O/R CLTCH SOL/CIRC	P1760	1203	AT-148
CRANK POS SEN (POS)	P0335	0802	EC-304	P-N POS SW/CIRCUIT	P1706	1003	EC-493
CYL 1 MISFIRE	P0301	0608	EC-295	PURG VOLUME CONT/V	P1444	0214	EC-459
CYL 2 MISFIRE	P0302	0607	EC-295	PURG VOLUME CONT/V	P0443	1008	EC-348
CYL 3 MISFIRE	P0303	0606	EC-295	REAR O2 SENSOR	P0137	0511	EC-242
CYL 4 MISFIRE	P0304	0605	EC-295	REAR O2 SENSOR	P0140	0512	EC-263
CYL 5 MISFIRE	P0305	0604	EC-295	REAR O2 SENSOR	P0139	0707	EC-256
CYL 6 MISFIRE	P0306	0603	EC-295	REAR O2 SENSOR	P0138	0510	EC-249
ECM	P0605	0301	EC-384	REAR O2 SENSOR-B1	P0137	0511	EC-210
ECM-ABS/TCS COMM NG	—	0404	EC-501	REAR O2 SENSOR-B1	P0140	0512	EC-235
EGR SYSTEM	P0400	0302	EC-316	REAR O2 SENSOR-B1	P0139	0707	EC-227
EGR SYSTEM	P1402	0514	EC-441	REAR O2 SENSOR-B1	P0138	0510	EC-219
EGR TEMP SEN/CIRC	P1401	0305	EC-435	REAR O2 SENSOR-B2	P0157	0314	EC-210
EGR VOL CONV CIR	P0403	0515	EC-325	REAR O2 SENSOR-B2	P0158	0313	EC-219
ENGINE SPEED SIG	P0725	1207	AT-93	REAR O2 SENSOR-B2	P0159	0708	EC-227
EVAP PURG FLOW/ MON	P1447	0111	EC-471	REAR O2 SENSOR-B2	P0160	0315	EC-235
EVAPO SYS PRES SEN	P0450	0704	EC-359	RR O2 SEN HEATER	P0141	0902	EC-274
EVAP SMALL LEAK	P0440	0705	EC-338	RR O2 SE HEATER-B1	P0141	0902	EC-268
EVAP SMALL LEAK	P1440	0213	EC-449	RR O2 SE HEATER-B2	P0161	1002	EC-268
FR O2 SE HEATER-B1	P0135	0901	EC-204	SFT SOL A/CIRC*3	P0750	1108	AT-134
FR O2 SE HEATER-B2	P0155	1001	EC-204	SFT SOL B/CIRC*3	P0755	1201	AT-138
FRONT O2 SENSOR-B1	P0130	0503	EC-166	SWL CON VC SW	P1165	0112	EC-410
FRONT O2 SENSOR-B1	P0133	0409	EC-186	SWRL CONT S/V	P1130	1004	EC-395
FRONT O2 SENSOR-B1	P0132	0410	EC-180	TCC SOLENOID/CIRC	P0740	1204	AT-119
FRONT O2 SENSOR-B1	P0131	0411	EC-174	THRTL POS SEN/ CIRC*3	P0120	0403	EC-150
FRONT O2 SENSOR-B1	P0134	0412	EC-196	TP SEN/CIRC A/T*3	P1705	1206	AT-142
FRONT O2 SENSOR-B2	P0153	0413	EC-186				

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	
TW CATALYST SYS	P0420	0702	EC-334
TW CATALYST SYS-B1	P0420	0702	EC-331
TW CATALYST SYS-B2	P0430	0703	EC-331
VC CUT/V BYPASS/V	P1491	0311	EC-488
VC/V BYPASS/V	P1490	0801	EC-483
VEH SPD SEN/CIR AT*4	P0720	1102	AT-90
VEH SPEED SEN/ CIRC*4	P0500	0104	EC-365
VENT CONTROL VALVE	P1446	0215	EC-466
VENT CONTROL VALVE	P1448	0309	EC-477
VENT CONTROL VALVE	P0446	0903	EC-354

- *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: When engine is running.
 - *6: 1st trip DTC No. is the same as DTC No.
- NOTE: Regarding A32 models, "-B1" indicates right bank and "-B2" indicates left bank.

GI

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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-99	P0325	0304	KNOCK SEN/CIRCUIT	EC-300
—	—	NATS MALFUNC	EC-68	P0335	0802	CRANK POS SEN (POS)	EC-304
P0000	0505	NO SELF-DIAGNOSTIC FAILURE INDICATED	—	P0340	0101	CAM POS SEN (PHASE)	EC-311
No DTC	Flashing*5	NO SELF-DIAGNOSTIC FAILURE INDICATED	EC-64	P0400	0302	EGR SYSTEM	EC-316
P0100	0102	MAF SEN/CIRCUIT*3	EC-122	P0403	0515	EGR VOL CON/V CIR	EC-325
P0105	0803	ABSL PRES SEN/CIRC	EC-130	P0420	0702	TW CATALYST SYS	EC-334
P0110	0401	AIR TEMP SEN/CIRC	EC-139	P0420	0702	TW CATALYST SYS-B1	EC-331
P0115	0103	COOLANT T SEN/CIRC	EC-145	P0430	0703	TW CATALYST SYS-B2	EC-331
P0120	0403	THRTL POS SEN/ CIRC*3	EC-150	P0440	0705	EVAP SMALL LEAK	EC-338
P0125	0908	*COOLANT T SEN/CIRC	EC-161	P0443	1008	PURG VOLUME CONT/V	EC-348
P0130	0503	FRONT O2 SENSOR-B1	EC-166	P0446	0903	VENT CONTROL VALVE	EC-354
P0131	0411	FRONT O2 SENSOR-B1	EC-174	P0450	0704	EVAP SYS PRES SEN	EC-359
P0132	0410	FRONT O2 SENSOR-B1	EC-180	P0500	0104	VEH SPEED SEN/ CIRC*4	EC-365
P0133	0409	FRONT O2 SENSOR-B1	EC-186	P0505	0205	IACV/AAC VLV/CIRC	EC-369
P0134	0412	FRONT O2 SENSOR-B1	EC-196	P0510	0203	CLOSED TP SW/CIRC	EC-376
P0135	0901	FR O2 SE HEATER-B1	EC-204	P0600	0504	A/T COMM LINE	EC-381
P0137	0511	REAR O2 SENSOR	EC-242	P0605	0301	ECM	EC-384
P0137	0511	REAR O2 SENSOR-B1	EC-210	P0705	1101	PNP SW/CIRC	AT-82
P0138	0510	REAR O2 SENSOR	EC-249	P0710	1208	ATF TEMP SEN/CIRC	AT-86
P0138	0510	REAR O2 SENSOR-B1	EC-219	P0720	1102	VEH SPD SEN/CIR AT*4	AT-90
P0139	0707	REAR O2 SENSOR	EC-256	P0725	1207	ENGINE SPEED SIG	AT-93
P0139	0707	REAR O2 SENSOR-B1	EC-227	P0731	1103	A/T 1ST GR FNCTN	AT-96
P0140	0512	REAR O2 SENSOR	EC-263	P0732	1104	A/T 2ND GR FNCTN	AT-101
P0140	0512	REAR O2 SENSOR-B1	EC-235	P0733	1105	A/T 3RD GR FNCTN	AT-106
P0141	0902	RR O2 SEN HEATER	EC-274	P0734	1106	A/T 4TH GR FNCTN	AT-111
P0141	0902	RR O2 SE HEATER-B1	EC-268	P0740	1204	TCC SOLENOID/CIRC	AT-119
P0150	0303	FRONT O2 SENSOR-B2	EC-166	P0744	1107	A/T TCC S/V FNCTN	AT-123
P0151	0415	FRONT O2 SENSOR-B2	EC-174	P0745	1205	L/PRESS SOL/CIRC	AT-130
P0152	0414	FRONT O2 SENSOR-B2	EC-180	P0750	1108	SFT SOL A/CIRC*3	AT-134
P0153	0413	FRONT O2 SENSOR-B2	EC-186	P0755	1201	SFT SOL B/CIRC*3	AT-138
P0154	0509	FRONT O2 SENSOR-B2	EC-196	P1105	1302	MAP/BAR SW SOL/CIR	EC-386
P0155	1001	FR O2 SE HEATER-B2	EC-204	P1130	1004	SWRL CONT S/V	EC-395
P0157	0314	REAR O2 SENSOR-B2	EC-210	P1148	0307	CLOSED LOOP-B1	EC-408
P0158	0313	REAR O2 SENSOR-B2	EC-219	P1165	0112	SWL CON VC SW	EC-410
P0159	0708	REAR O2 SENSOR-B2	EC-227	P1168	0308	CLOSED LOOP-B2	EC-408
P0160	0315	REAR O2 SENSOR-B2	EC-235	P1320	0201	IGN SIGNAL-PRIMARY	EC-415
P0161	1002	RR O2 SE HEATER-B2	EC-268	P1335	0407	CRANK POS SEN (REF)*3	EC-422
P0171	0115	FUEL SYS LEAN/BK1	EC-279	P1336	0905	CRANK P/S (POS) COG	EC-428
P0172	0114	FUEL SYS RICH/BK1	EC-285	P1401	0305	EGR TEMP SEN/CIRC	EC-435
P0174	0210	FUEL SYS LEAN/BK2	EC-279	P1402	0514	EGR SYSTEM	EC-441
P0175	0209	FUEL SYS RICH/BK2	EC-285	P1440	0213	EVAP SMALL LEAK	EC-449
P0180	0402	FUEL TEMP SEN/CIRC	EC-291	P1444	0214	PURG VOLUME CONT/V	EC-459
P0300	0701	MULTI CYL MISFIRE	EC-295	P1446	0215	VENT CONTROL VALVE	EC-466
P0301	0608	CYL 1 MISFIRE	EC-295	P1447	0111	EVAP PURG FLOW/ MON	EC-471
P0302	0607	CYL 2 MISFIRE	EC-295	P1448	0309	VENT CONTROL VALVE	EC-477
P0303	0606	CYL 3 MISFIRE	EC-295	P1490	0801	VC/V BYPASS/V	EC-483
P0304	0605	CYL 4 MISFIRE	EC-295				
P0305	0604	CYL 5 MISFIRE	EC-295				
P0306	0603	CYL 6 MISFIRE	EC-295				

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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		
P1491	0311	VC CUT/V BYPASS/V	EC-488
P1605	0804	A/T DIAG COMM LINE	EC-381
P1705	1206	TP SEN/CIRC A/T*3	AT-142
P1706	1003	P-N POS SW/CIRCUIT	EC-493
P1760	1203	O/R CLTCH SOL/CIRC	AT-148
—	0107	ABS/TCS C/U SIGNAL	EC-498
—	0207	ABS/TCS C/U SIGNAL	EC-498
—	0404	ECM-ABS/TCS COMM NG	EC-501
—	0208	OVERHEAT	EC-504

- *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: When engine is running.
 - *6: 1st trip DTC No. is the same as DTC No.
- NOTE: Regarding A32 models, "-B1" indicates right bank and "-B2" indicates left bank.

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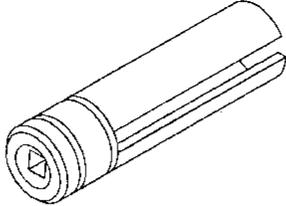
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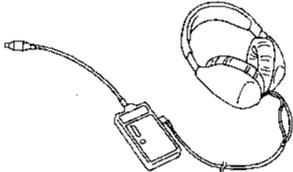
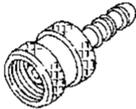
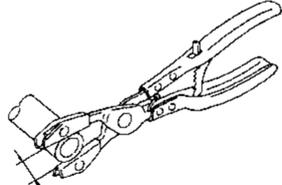
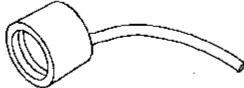
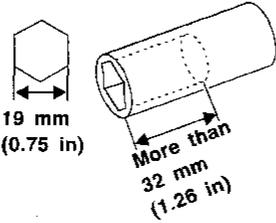
PRECAUTIONS AND PREPARATION

Special Service Tool

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

Tool number (Kent-Moore No.) Tool name	Description
(J36471-A) Front heated oxygen sensor wrench Rear heated oxygen sensor wrench	 <p>Loosening or tightening front and rear heated oxygen sensors</p> <p>NT379</p>

Commercial Service Tools

Tool name (Kent-Moore No.)	Description
Leak detector (J41416)	 <p>Locating EVAP leak</p> <p>NT703</p>
EVAP service port adapter (J41413-OBD)	 <p>Applying positive pressure through EVAP service port</p> <p>NT704</p>
Hose clipper	 <p>Clamping the EVAP purge hose between the fuel tank and EVAP canister applied to DTC P1440 [EVAP control system (EVAP small leak positive pressure)]</p> <p>NT720</p> <p>Approx. 20 mm (0.79 in)</p>
Fuel filler cap adapter	 <p>Checking fuel tank vacuum relief valve opening pressure</p> <p>NT653</p>
Socket wrench	 <p>Removing and installing engine coolant temperature sensor</p> <p>NT705</p>

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 NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses (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 type slide-locking type harness connector. For description and how to disconnect, refer to EL section, “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

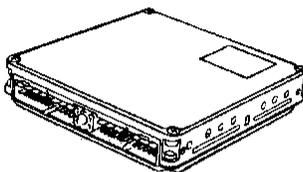
BATTERY

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

ECM

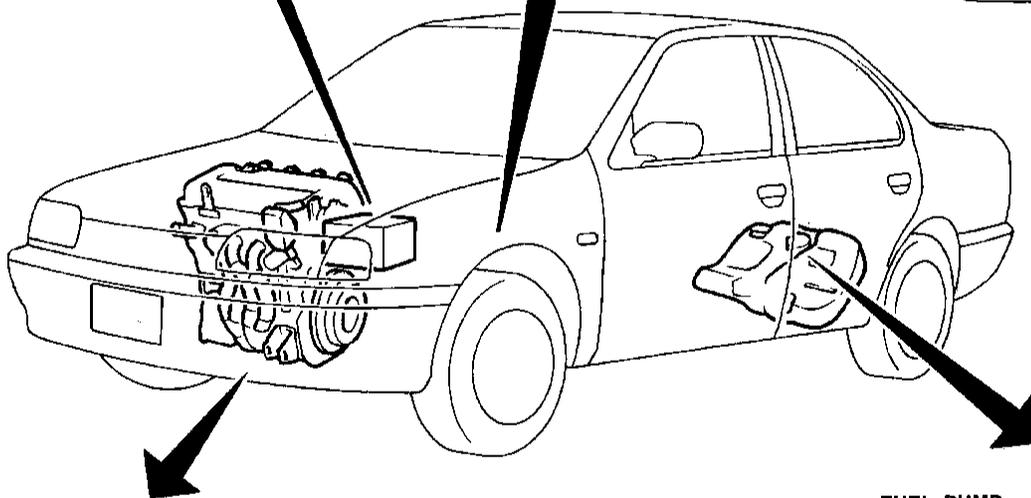
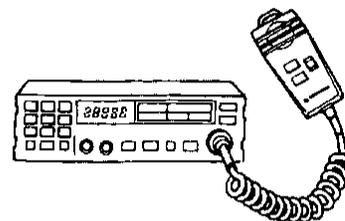
- Do not disassemble ECM.
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM value.

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



WIRELESS EQUIPMENT

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



ECCS PARTS HANDLING

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



FUEL PUMP

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

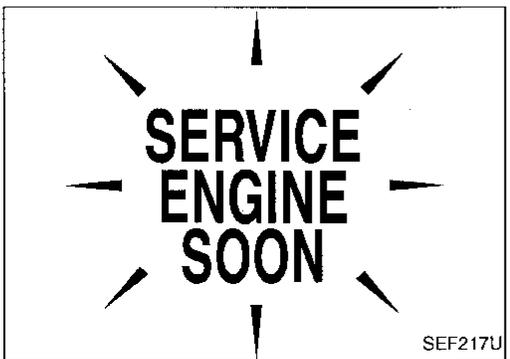
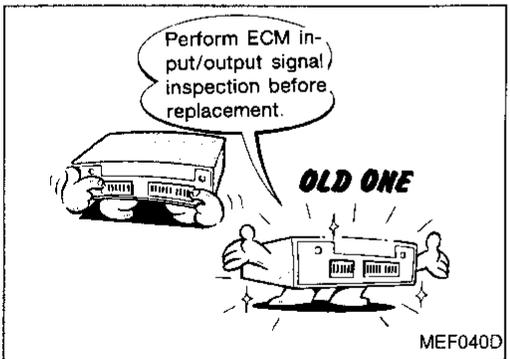
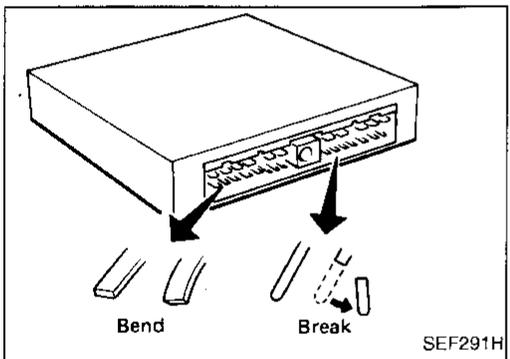
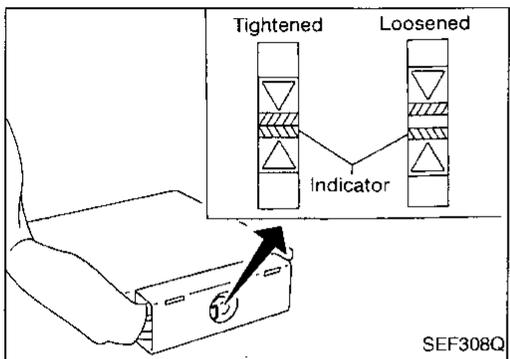
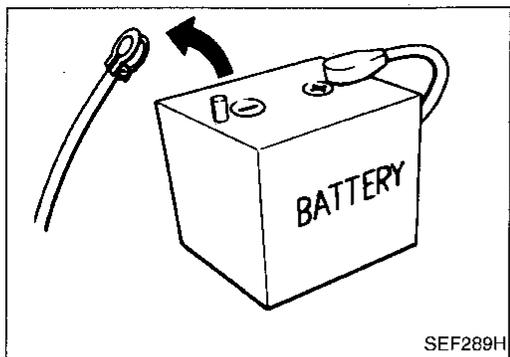
ECCS HARNESS HANDLING

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

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.

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-108.)

- 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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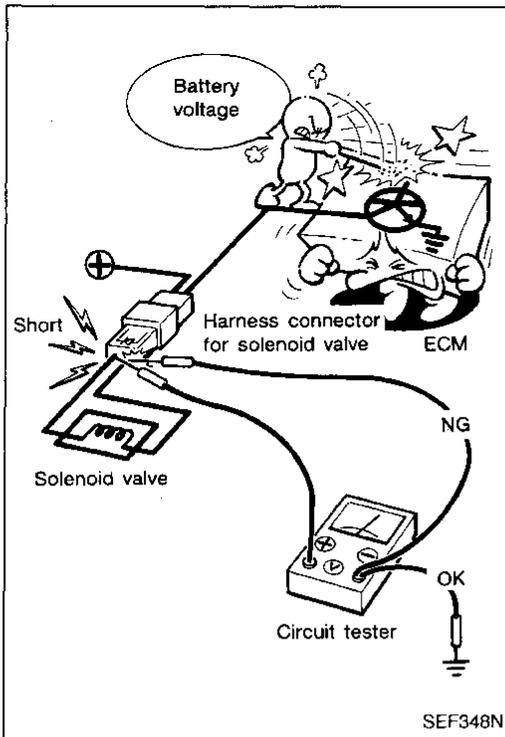
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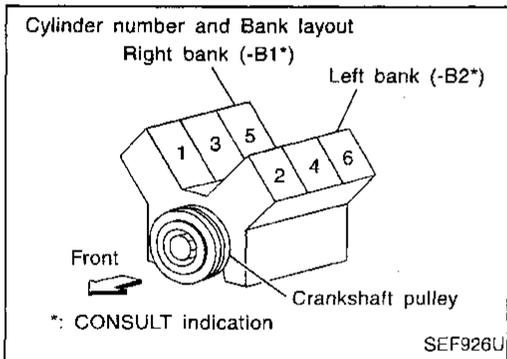
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PRECAUTIONS AND PREPARATION

Precautions (Cont'd)



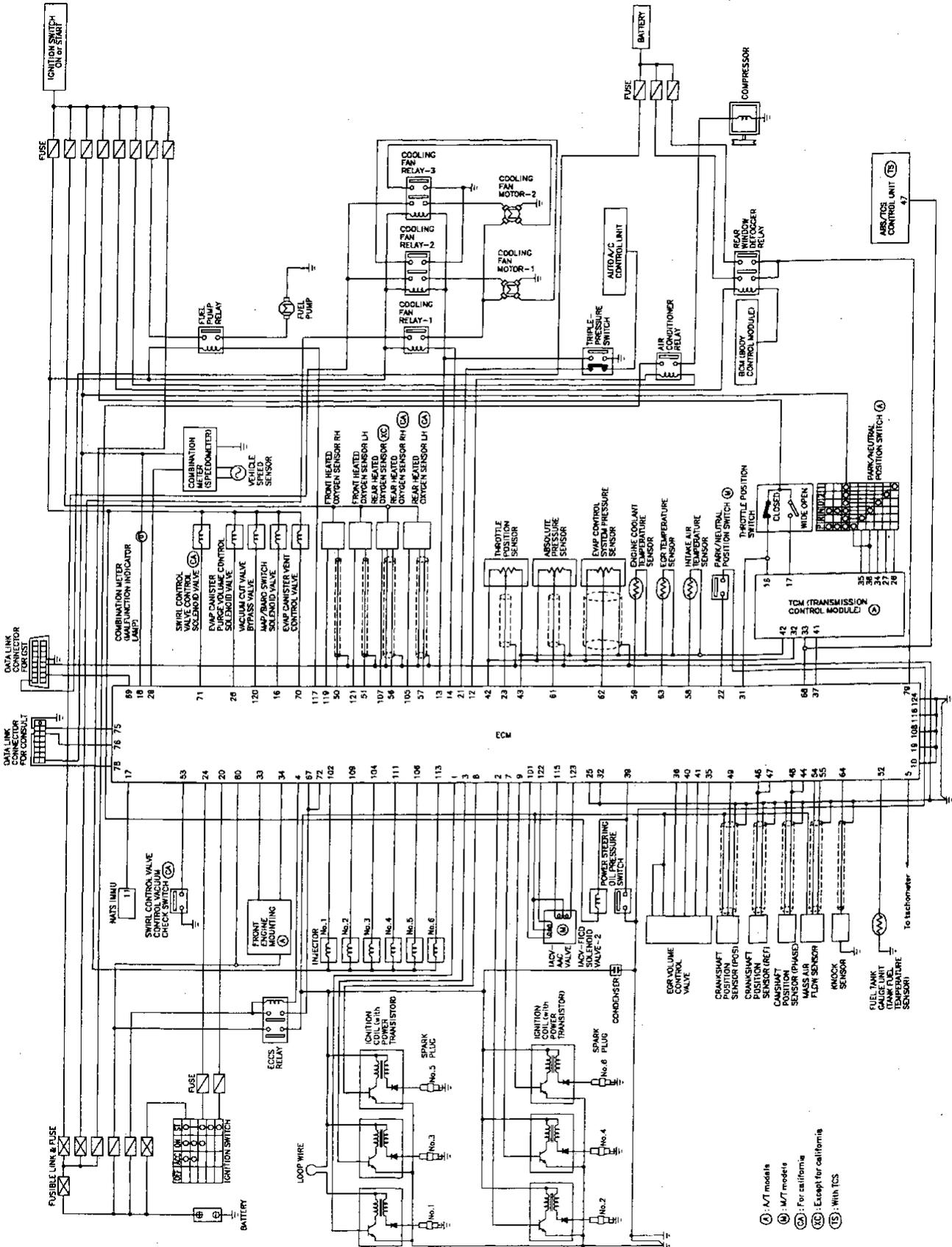
- When measuring ECM signals with a circuit tester, never bring the two tester probes into contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.



- Regarding model A32, “-B1” indicates the right bank and “-B2” indicates the left bank as shown in the figure.

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Circuit Diagram

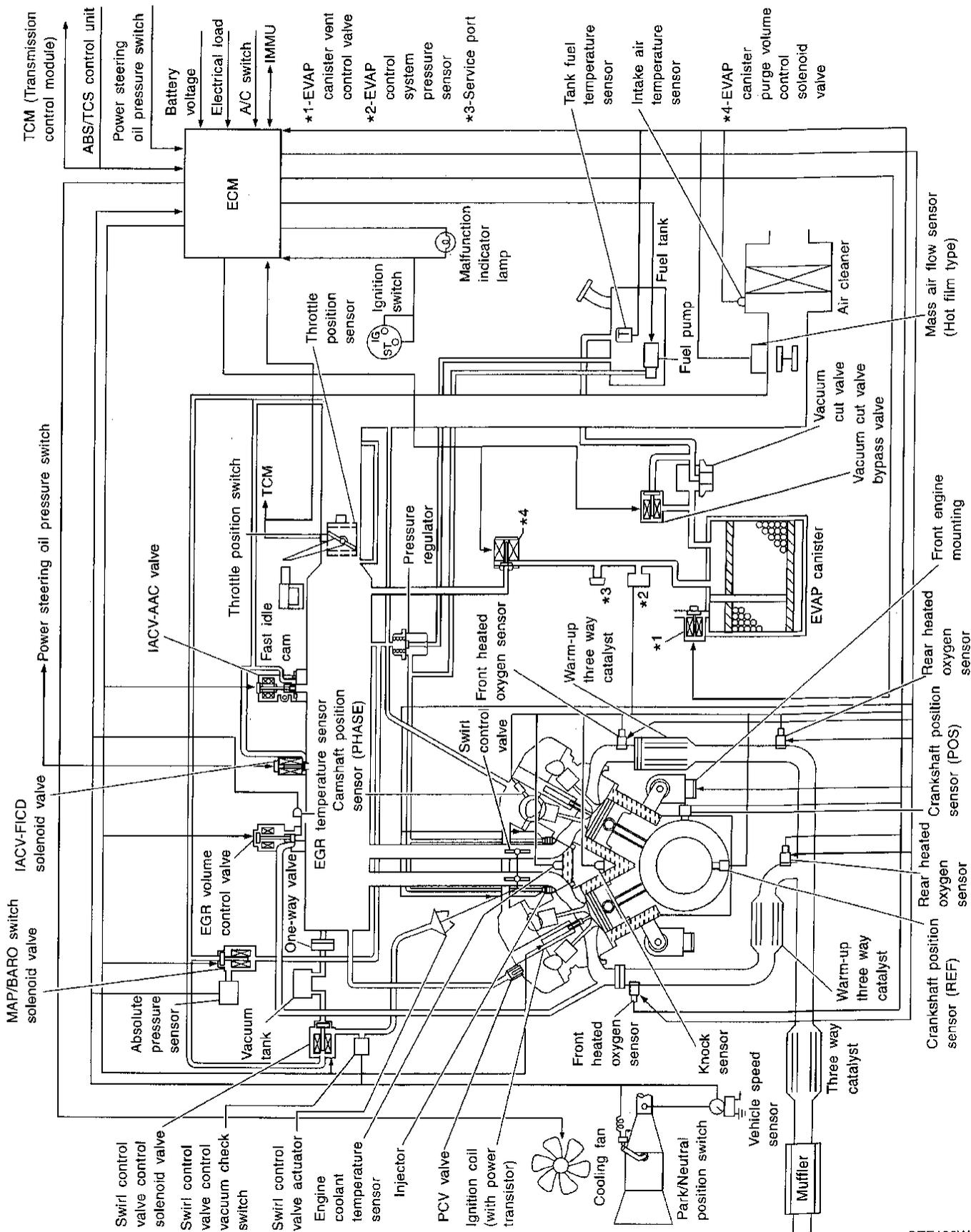


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ENGINE AND EMISSION CONTROL OVERALL SYSTEM

System Diagram

FOR CALIFORNIA MODELS

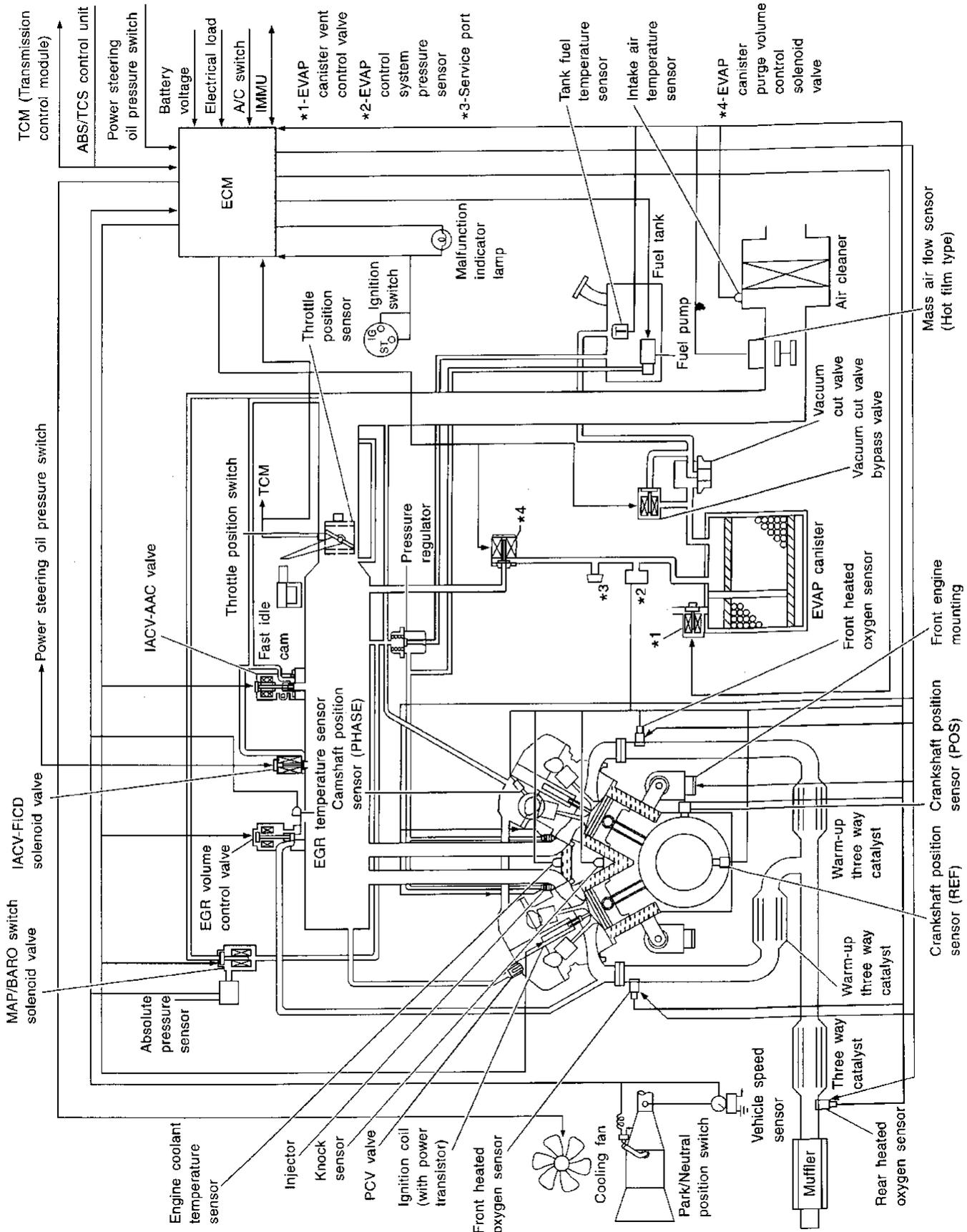


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ENGINE AND EMISSION CONTROL OVERALL SYSTEM

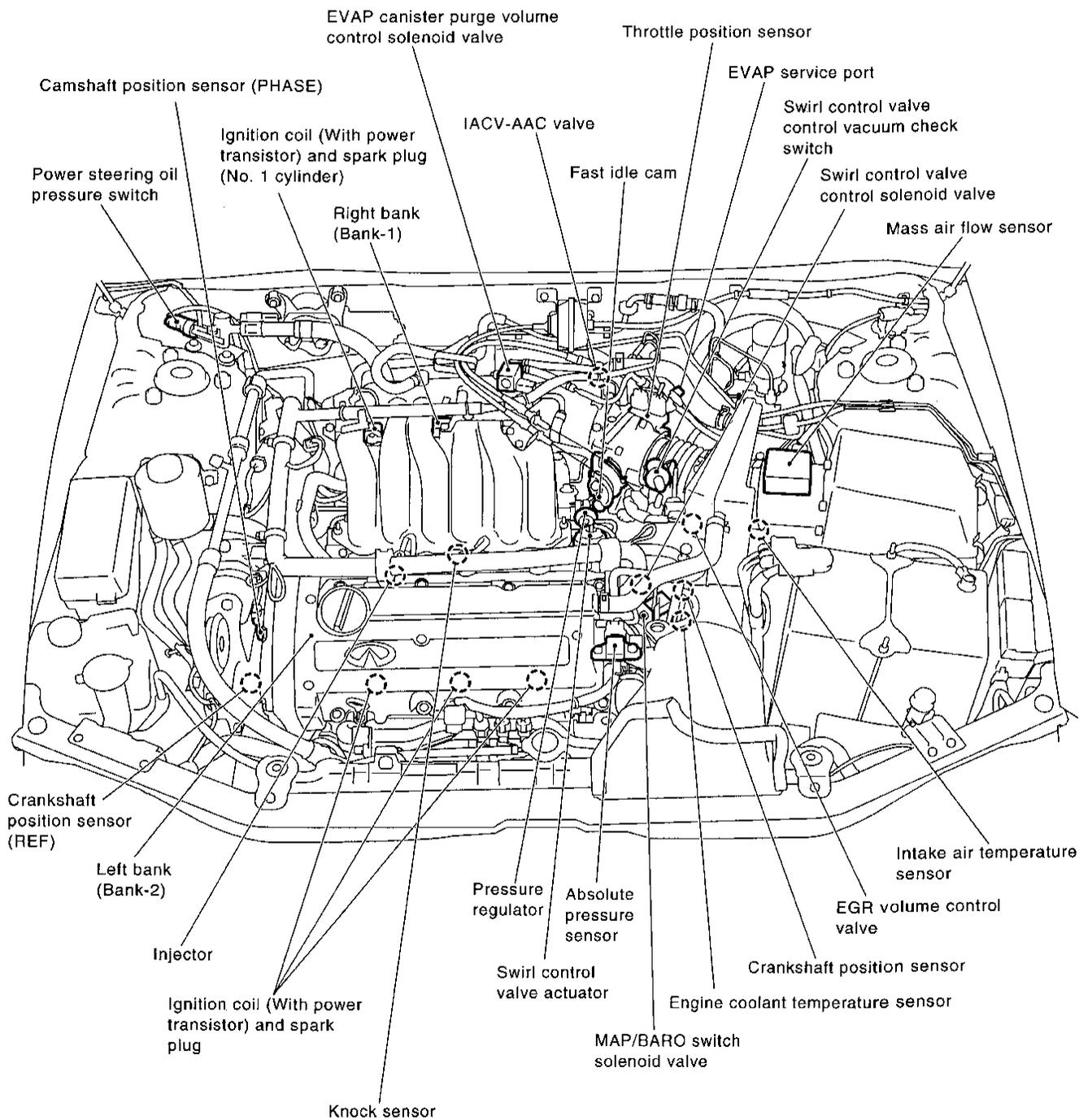
System Diagram (Cont'd)

EXCEPT FOR CALIFORNIA MODELS



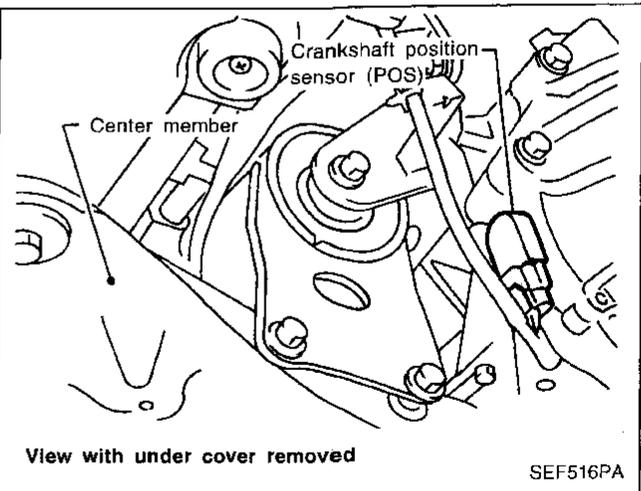
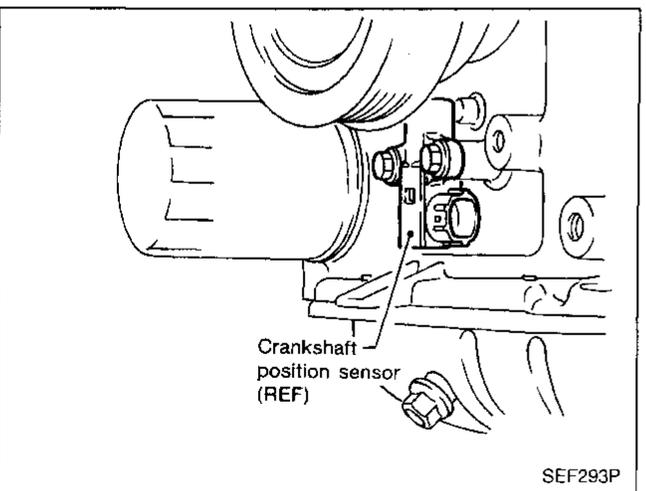
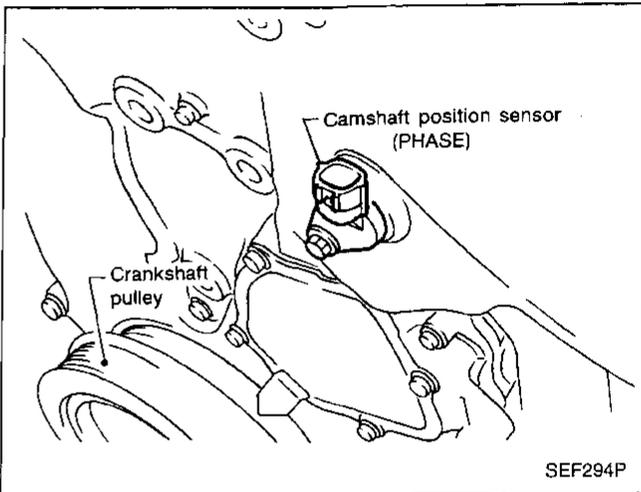
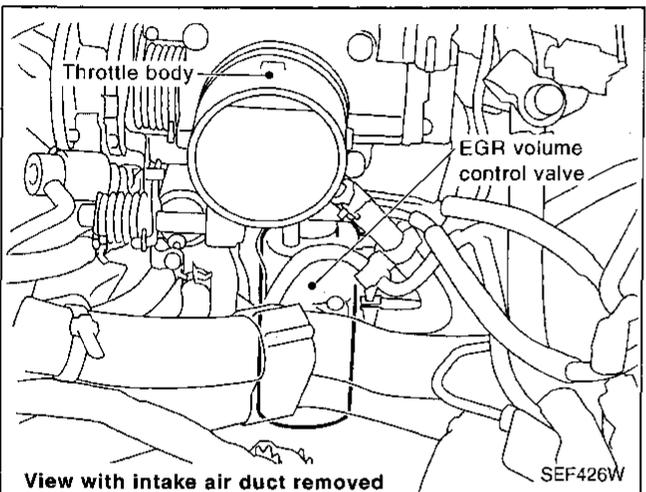
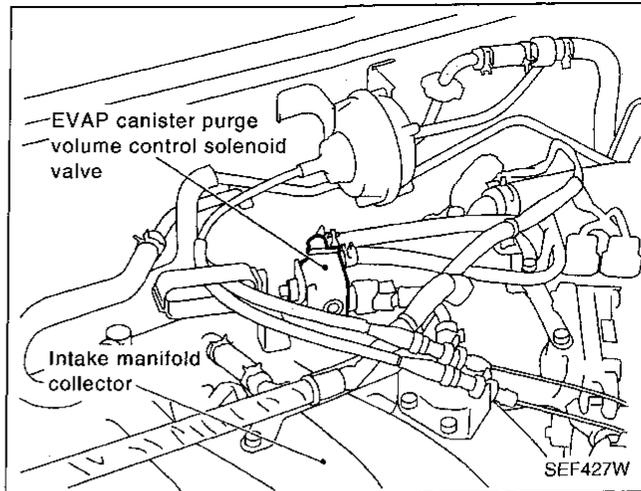
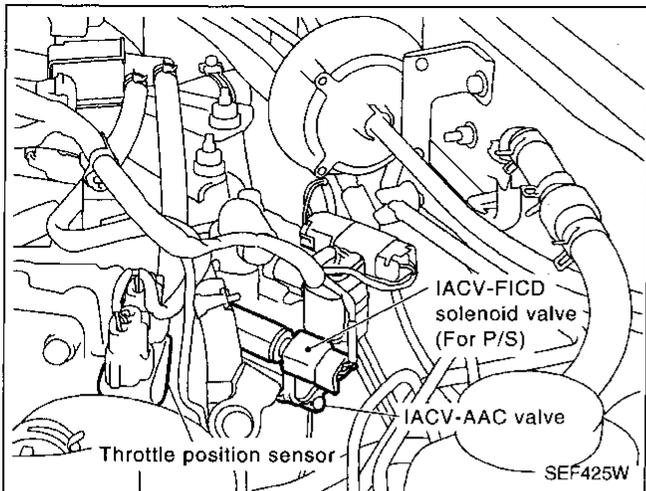
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Engine Control Component Parts Location



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

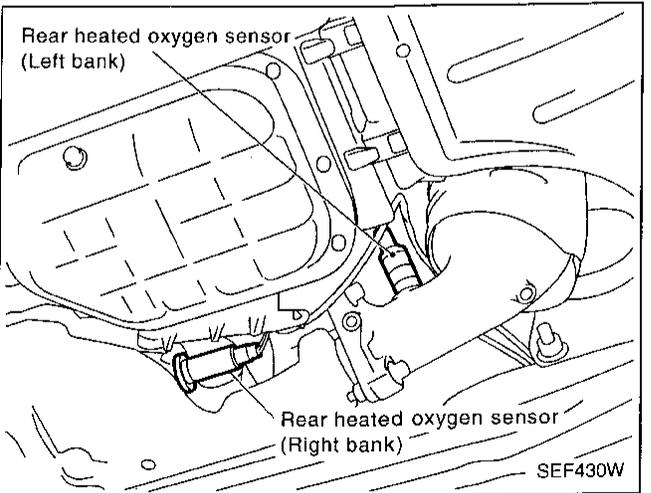
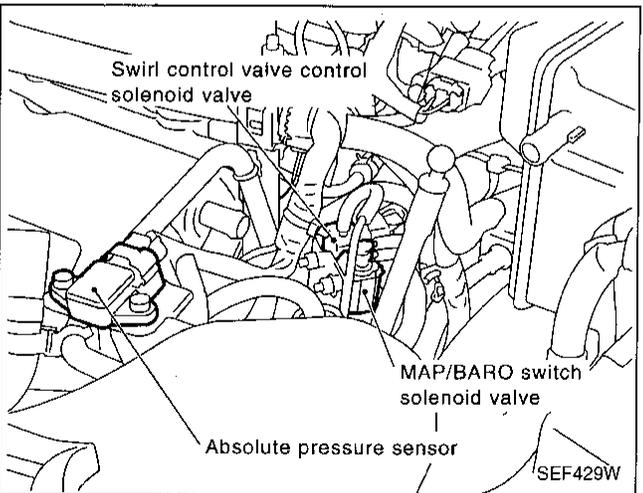
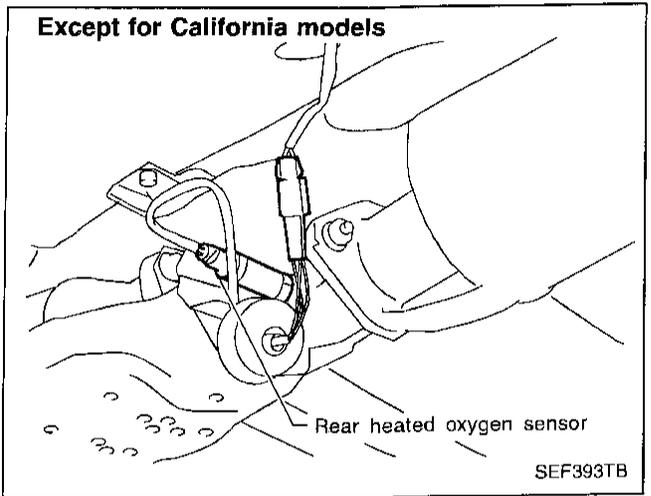
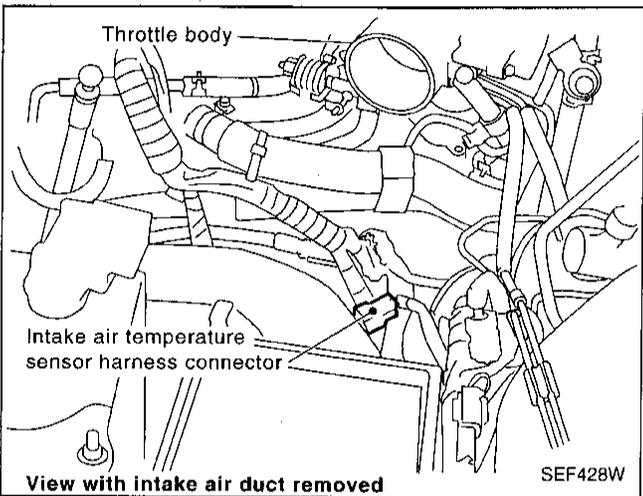
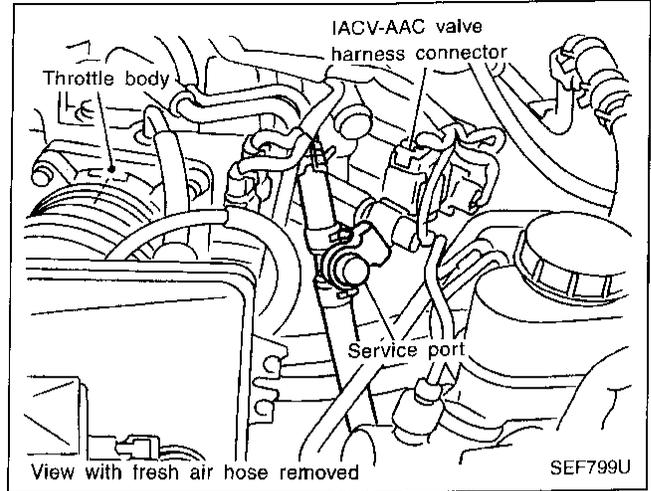
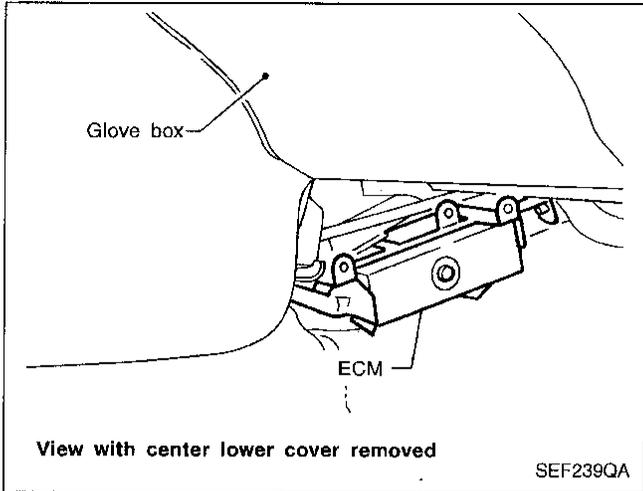
Engine Control Component Parts Location (Cont'd)



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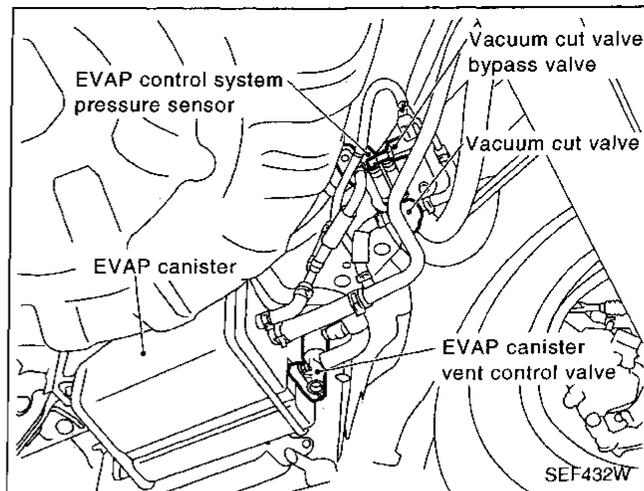
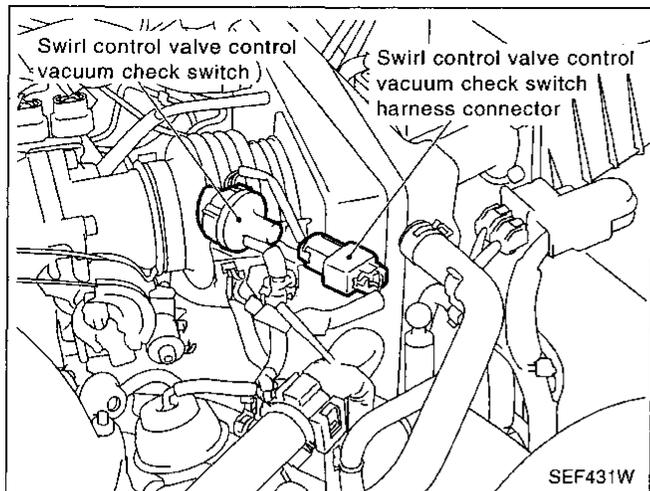
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Engine Control Component Parts Location (Cont'd)



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Engine Control Component Parts Location (Cont'd)



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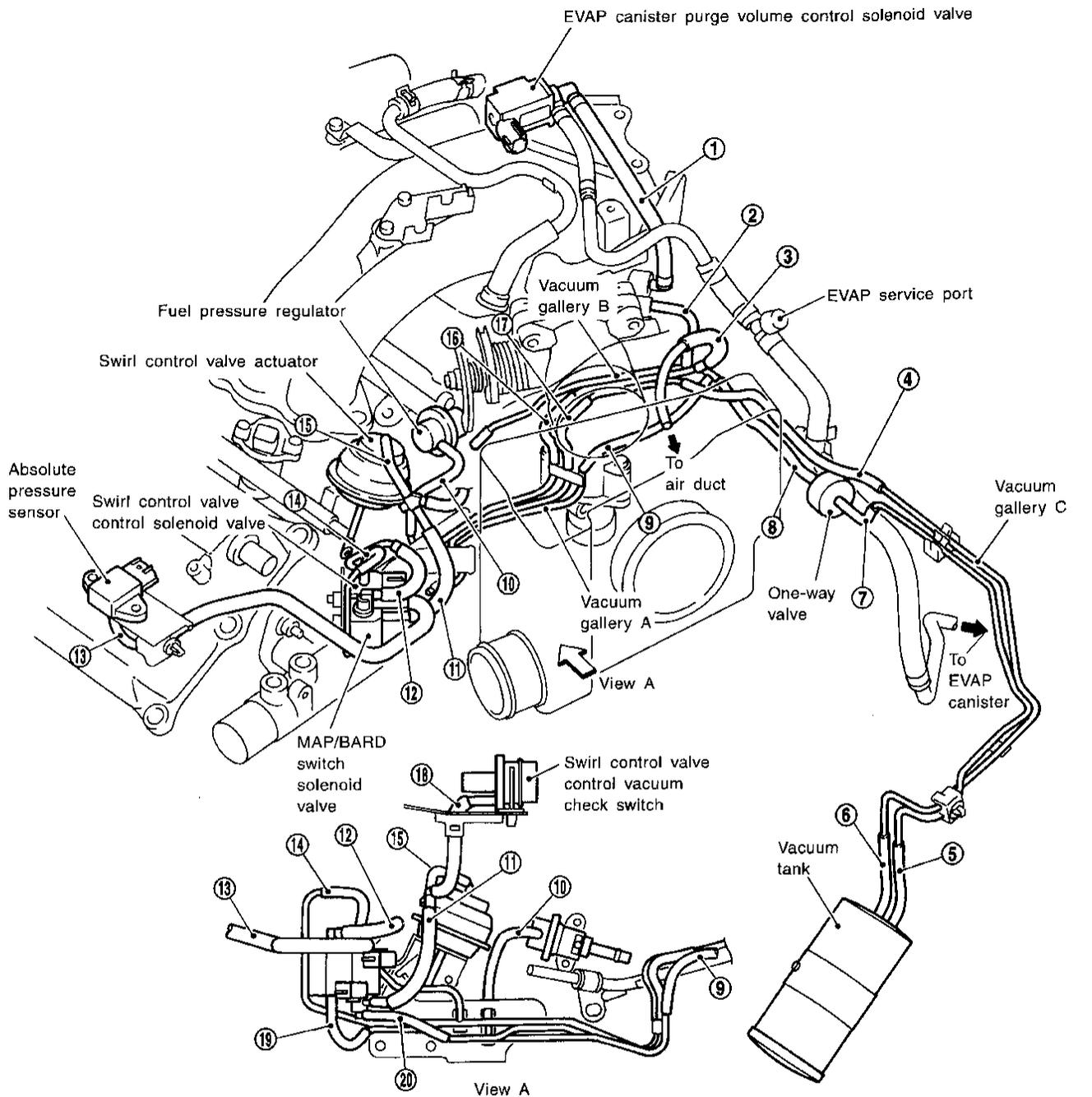
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Vacuum Hose Drawing

FOR CALIFORNIA MODELS



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- | | | |
|----------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------|
| ① EVAP canister purge volume control solenoid valve to intake manifold collector | ⑨ Vacuum gallery B to Vacuum gallery A | ⑮ 3-way connector to Swirl control valve actuator |
| ② Intake manifold collector to Vacuum gallery B | ⑩ Fuel pressure regulator to Vacuum gallery A | ⑯ Vacuum gallery A to Vacuum gallery B |
| ③ Vacuum gallery B to Air duct | ⑪ Swirl control valve control solenoid valve to 3-way connector | ⑰ Vacuum gallery A to Vacuum gallery B |
| ④ Vacuum gallery B to Vacuum gallery C | ⑫ MAP/BARO switch solenoid valve to Vacuum gallery A | ⑱ 3-way connector to Swirl control valve control vacuum check switch |
| ⑤ Vacuum gallery C to Vacuum tank | ⑬ MAP/BARO switch solenoid valve to Absolute pressure sensor | ⑲ MAP/BARO switch solenoid valve to Vacuum gallery A |
| ⑥ Vacuum tank to Vacuum gallery C | ⑭ Swirl control valve control solenoid valve to Vacuum gallery A | ⑳ Swirl control valve control solenoid valve to Vacuum gallery A |
| ⑦ Vacuum gallery C to One-way valve | | |
| ⑧ One-way valve to Vacuum gallery B | | |

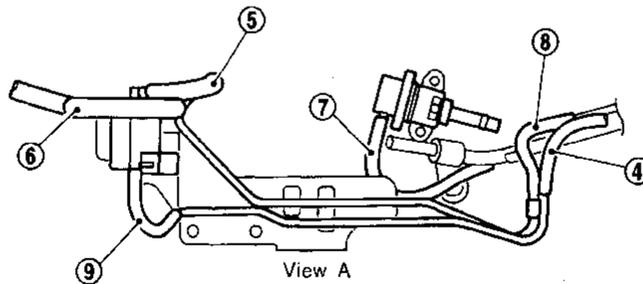
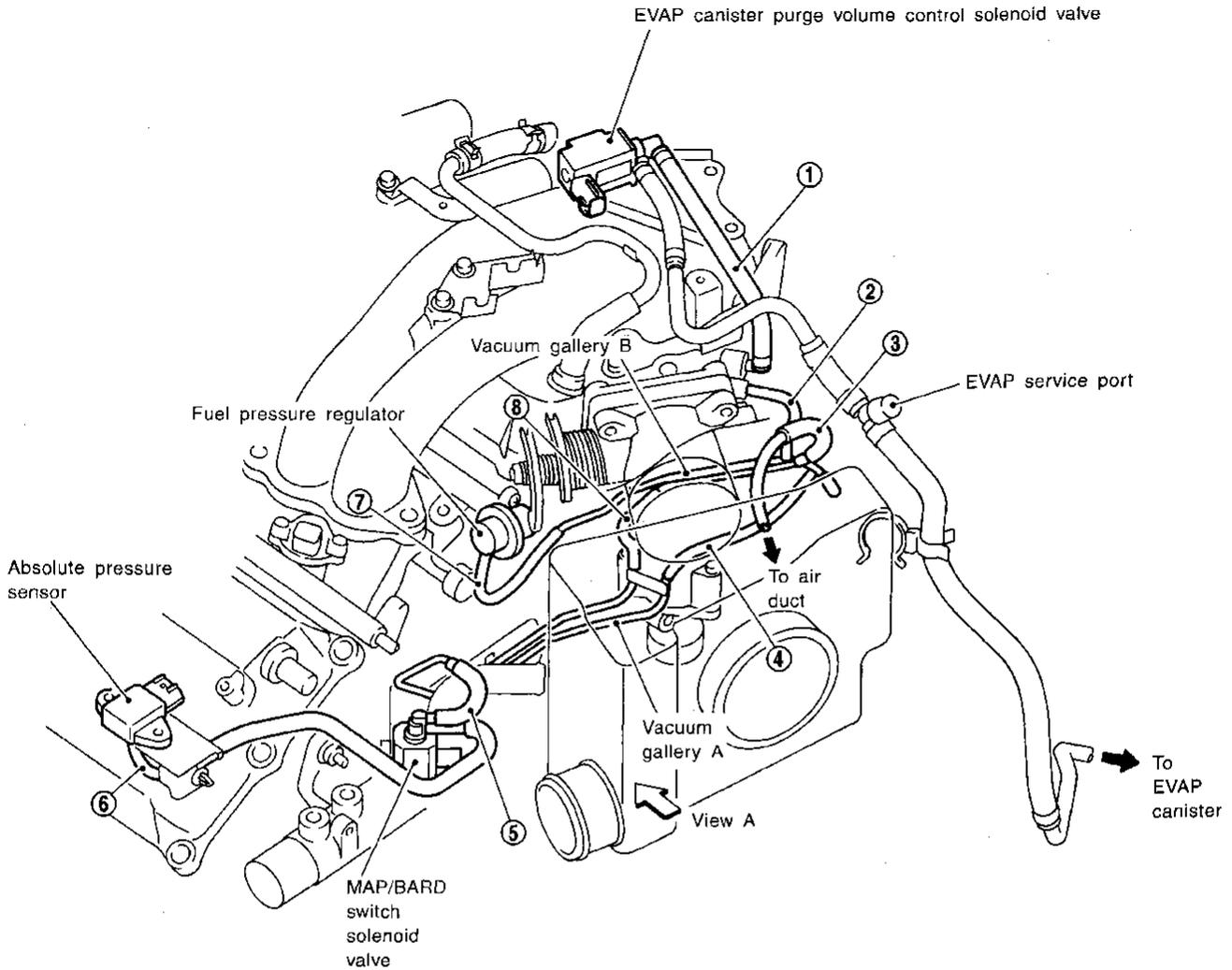
Refer to "System Diagram", EC-12, for vacuum control system.

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

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Vacuum Hose Drawing (Cont'd)

EXCEPT FOR CALIFORNIA MODELS



SEF139W

- | | | |
|----------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------|
| ① EVAP canister purge volume control solenoid valve to Intake manifold collector | ④ Vacuum gallery B to Vacuum gallery A | ⑦ Vacuum gallery B to Fuel pressure regulator |
| ② Intake manifold collector to Vacuum gallery B | ⑤ Vacuum gallery A to MAP/BARO switch solenoid valve | ⑧ Vacuum gallery B to Vacuum gallery A |
| ③ Vacuum gallery B to Air duct | ⑥ MAP/BARO switch solenoid valve to Absolute pressure sensor | ⑨ MAP/BARO switch solenoid valve to Vacuum gallery A |

Refer to "System Diagram", EC-12, for vacuum control system.

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

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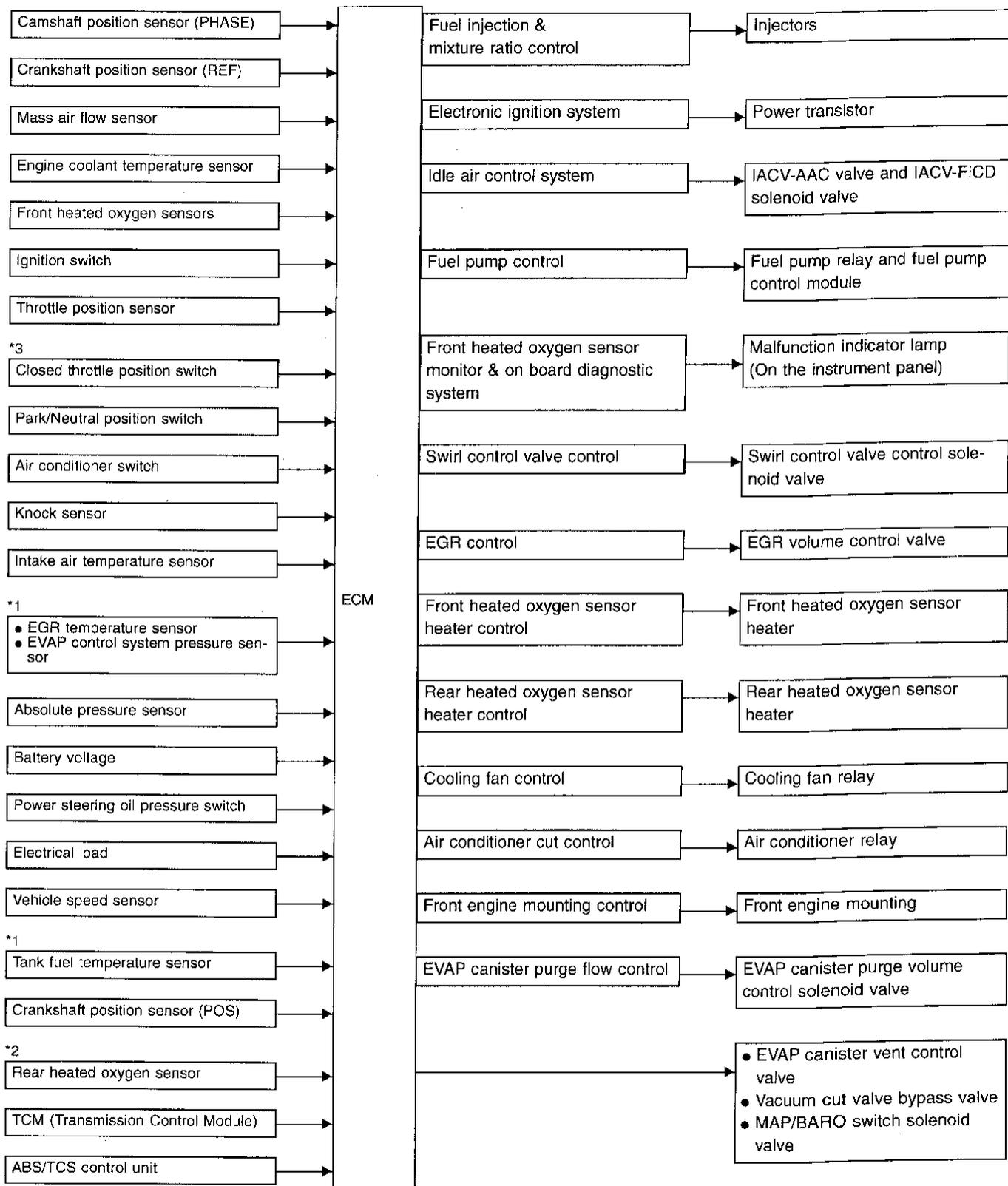
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System Chart



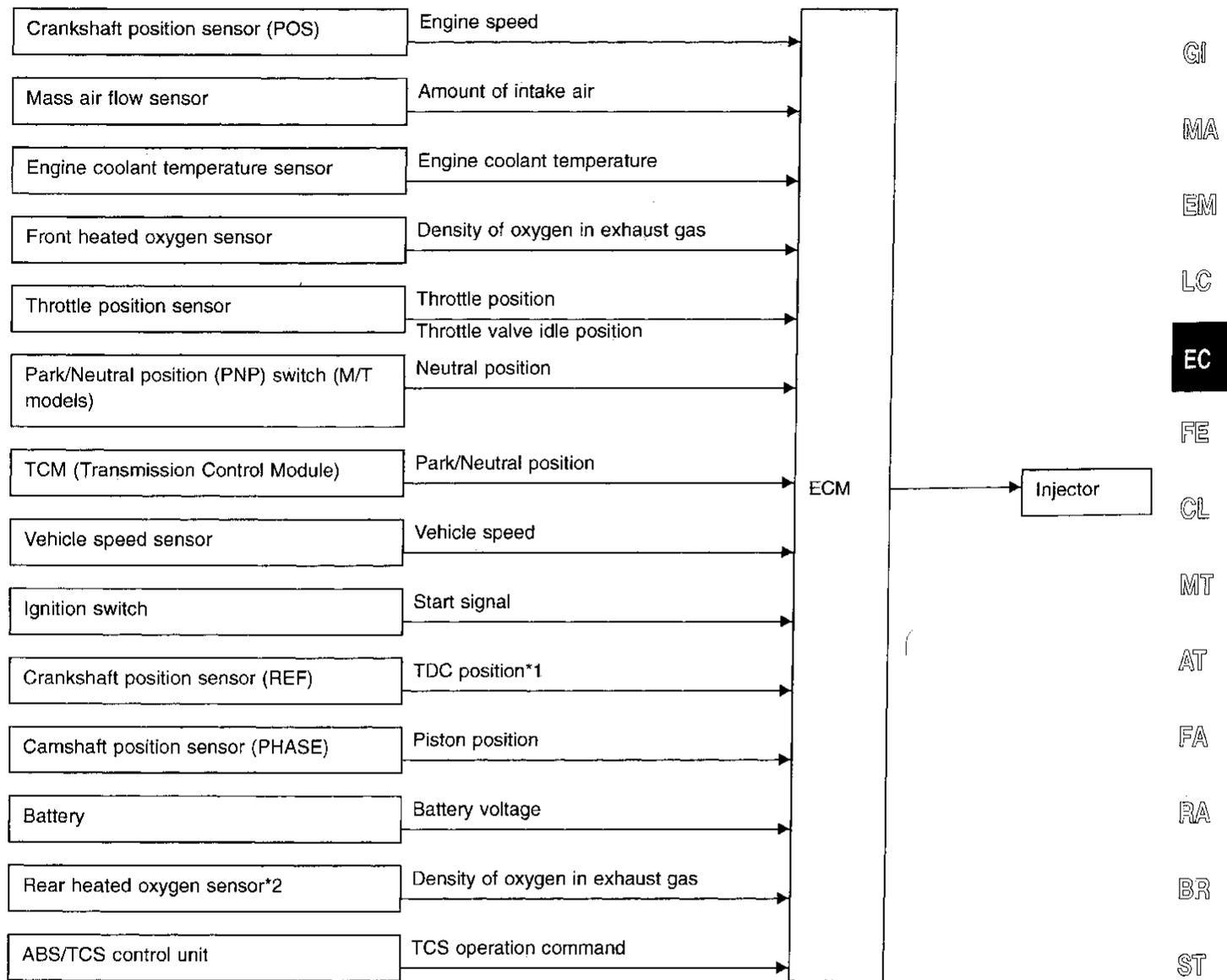
*1: These sensors are not directly used to control the engine system. They are used only for the on board diagnosis.

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

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

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



*1: Top Dead Center

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

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

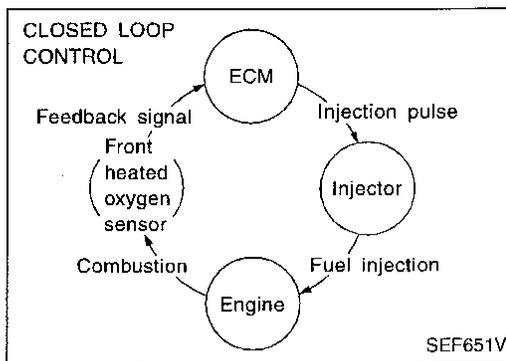
The amount of fuel injected is compensated for to improve engine performance. This will be made under various operating conditions as listed below.

<Fuel increase>

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

<Fuel decrease>

- During deceleration
- During high speed operation



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

MIXTURE RATIO FEEDBACK CONTROL

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a front heated oxygen sensor in the exhaust manifold to monitor if the engine is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about front heated oxygen sensor, refer to pages EC-166. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

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

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

MIXTURE RATIO SELF-LEARNING CONTROL

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

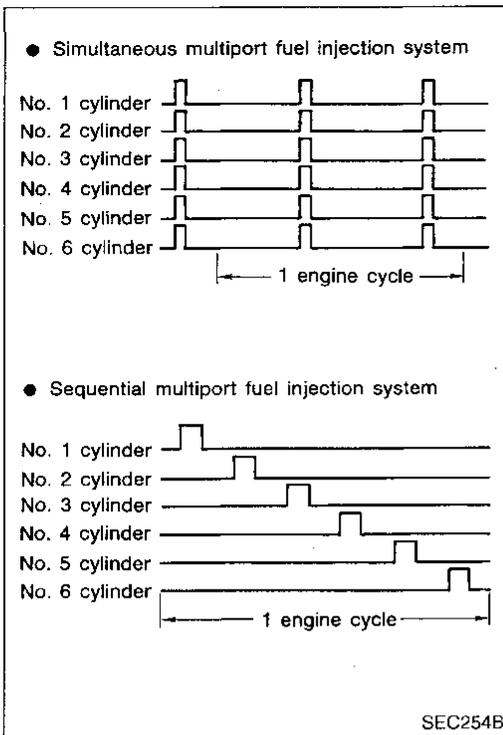
Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

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

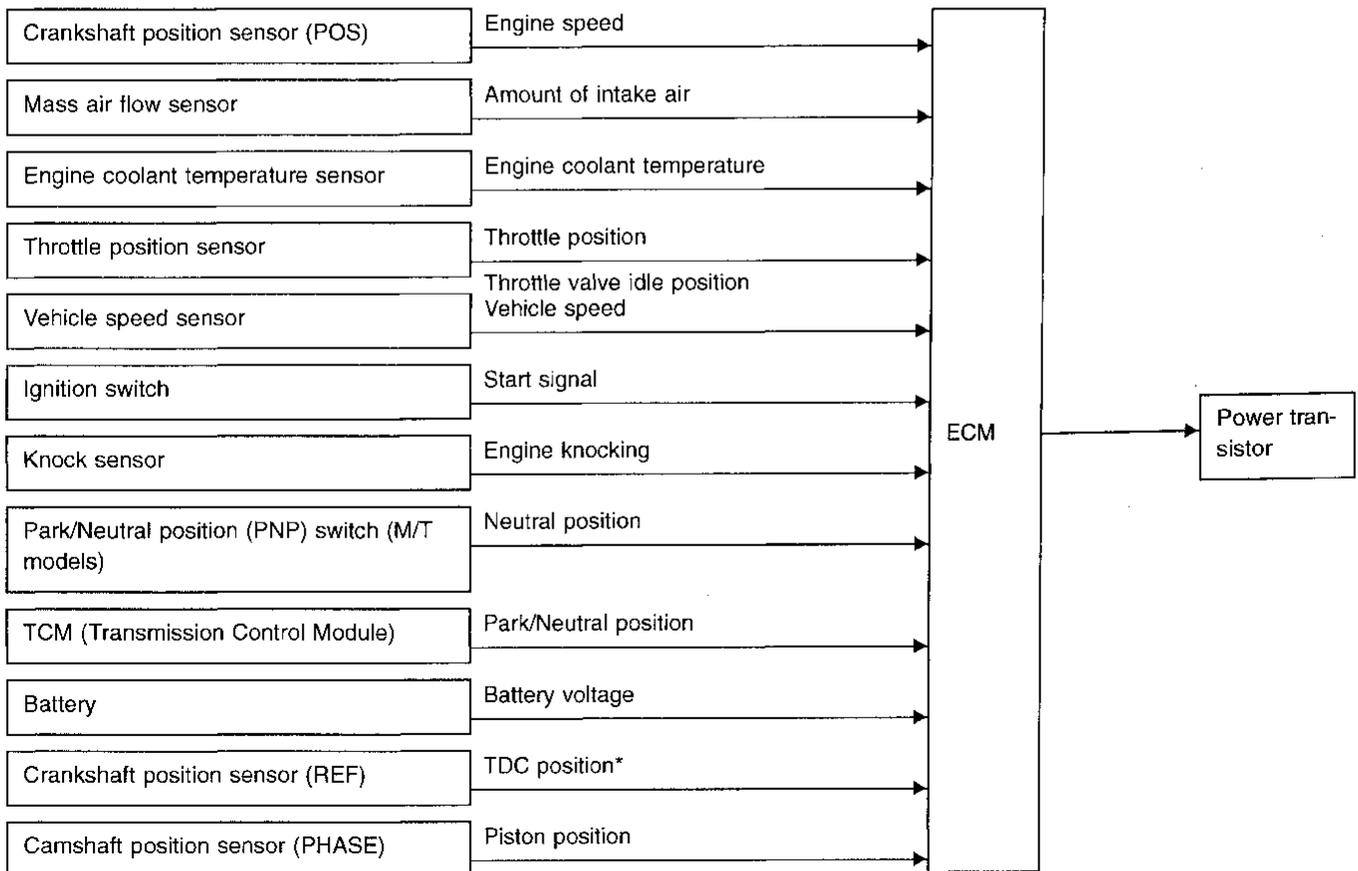
Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.



SEC254B

Electronic Ignition (EI) System

INPUT/OUTPUT SIGNAL LINE



*: Top Dead Center

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.

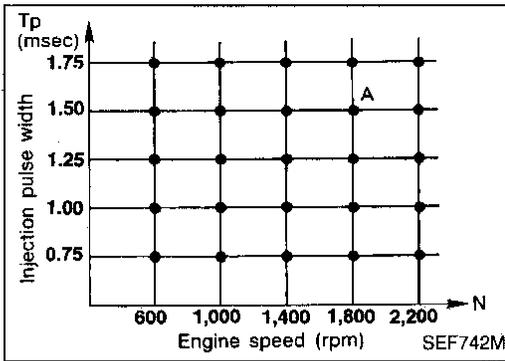
e.g. N: 1,800 rpm, Tp: 1.50 msec
A °BTDC

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

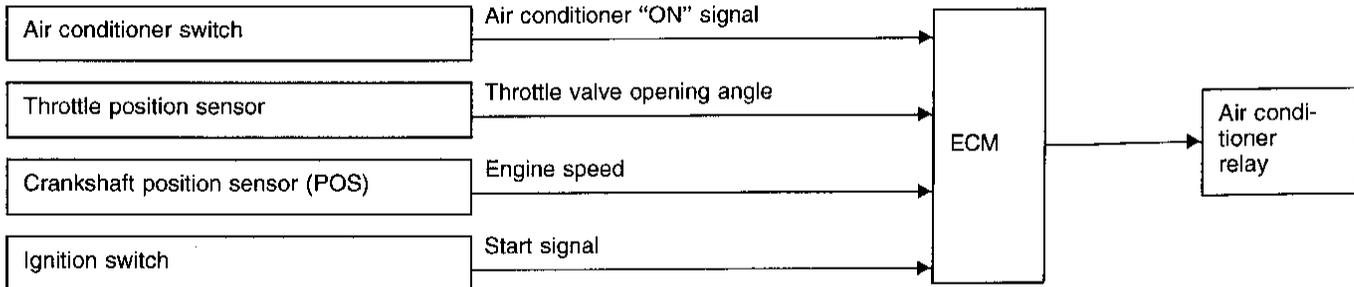
The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions.

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

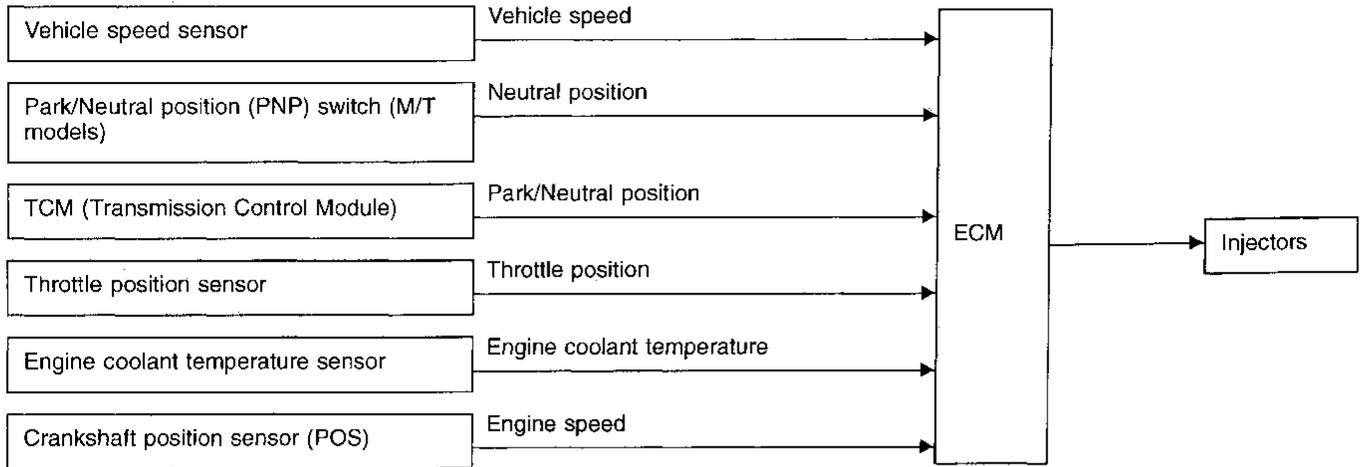
This system improves engine operation when the air conditioner is used.

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.

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

INPUT/OUTPUT SIGNAL LINE

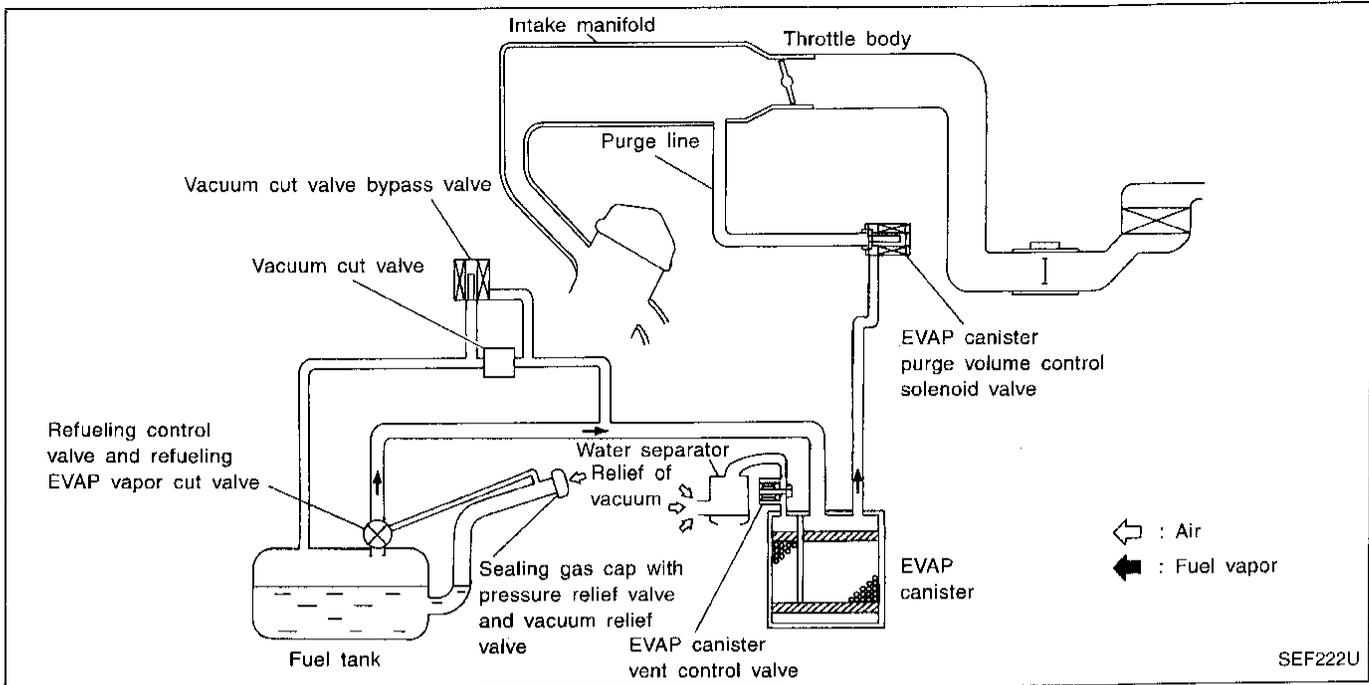


If the engine speed is above M/T: 1,800 A/T 2,700 rpm with no load (for example, in neutral and engine speed over M/T: 1,800 A/T 2,700 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches M/T: 1,500 A/T 2,200 rpm, then fuel cut is cancelled.

NOTE:

This function is different than deceleration control listed under multiport fuel injection on EC-21.

Description



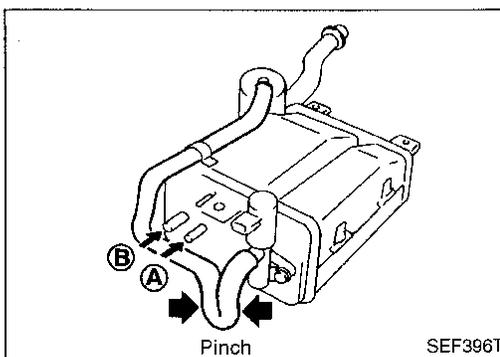
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

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

The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating.

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

EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.



Inspection

EVAP CANISTER

Check EVAP canister as follows:

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

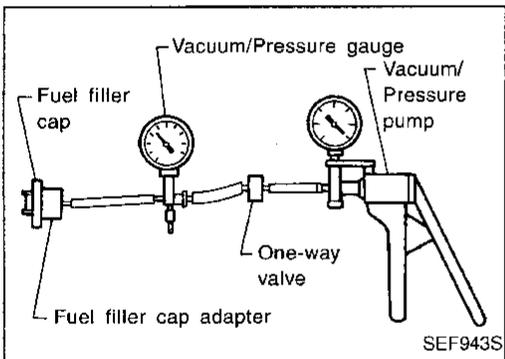
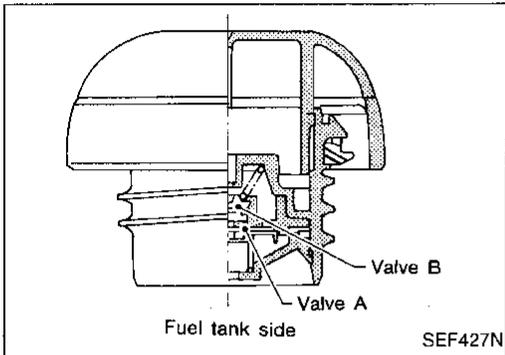
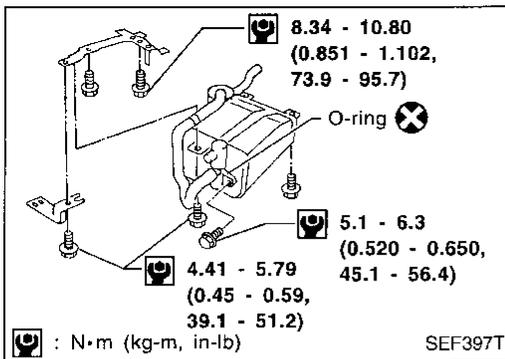
EVAPORATIVE EMISSION SYSTEM

Inspection (Cont'd)

TIGHTENING TORQUE

Tighten EVAP canister as shown in the figure.

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



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

1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.

Pressure:

15.3 - 20.0 kPa (0.156 - 0.204 kg/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.

VACUUM CUT VALVE AND VACUUM CUT VALVE BYPASS VALVE

Refer to EC-492.

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-459.

TANK FUEL TEMPERATURE SENSOR

Refer to EC-291.

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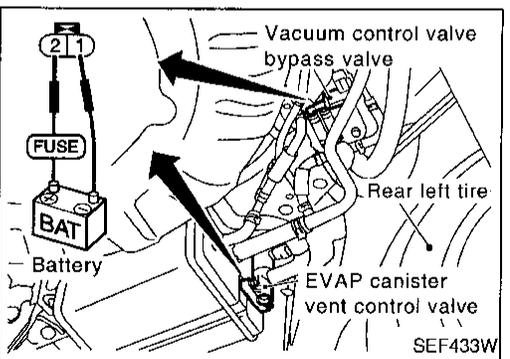
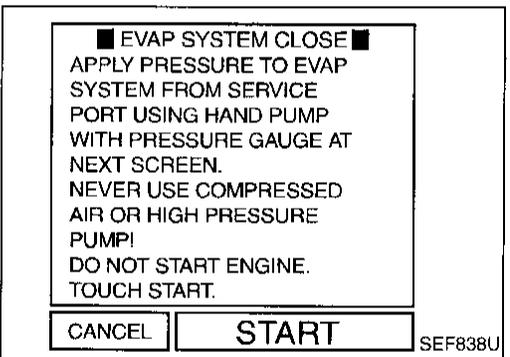
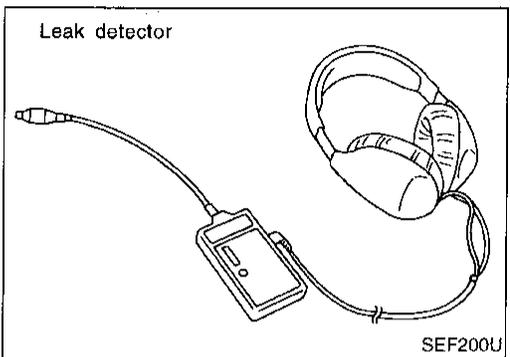
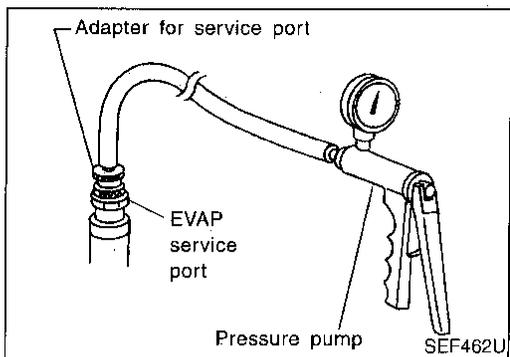
IDX

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 exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

NOTE:

- Do not start engine.
- Improper installation of adapter to the service port may cause a leak.



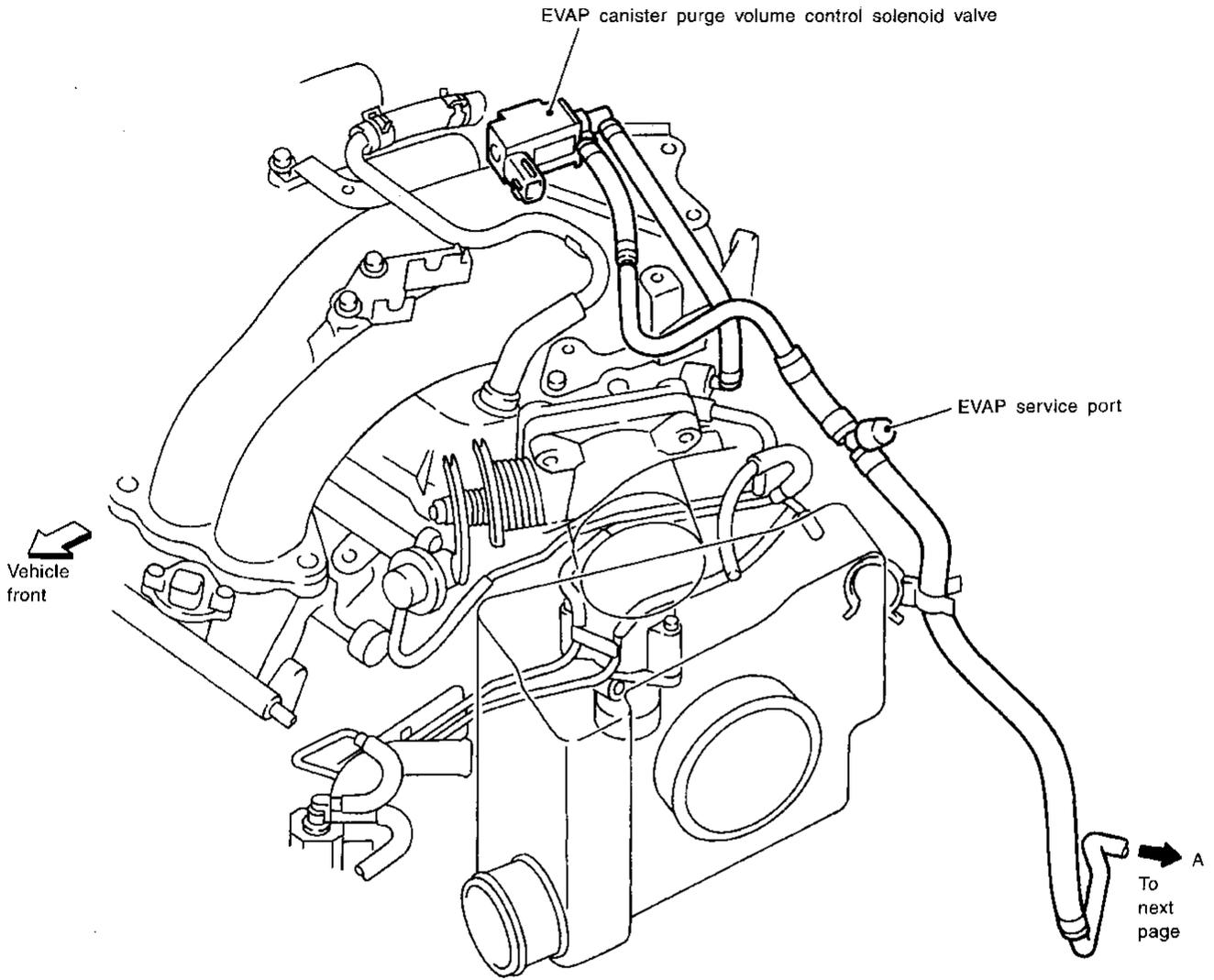
1. Attach the adapter securely to the EVAP SERVICE port securely.
2. Also attach the pressure pump and hose.
3. Turn ignition switch "ON".
4. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT MODE" with CONSULT.
5. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
6. Apply 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-29.

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-29.

Evaporative Emission Line Drawing



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

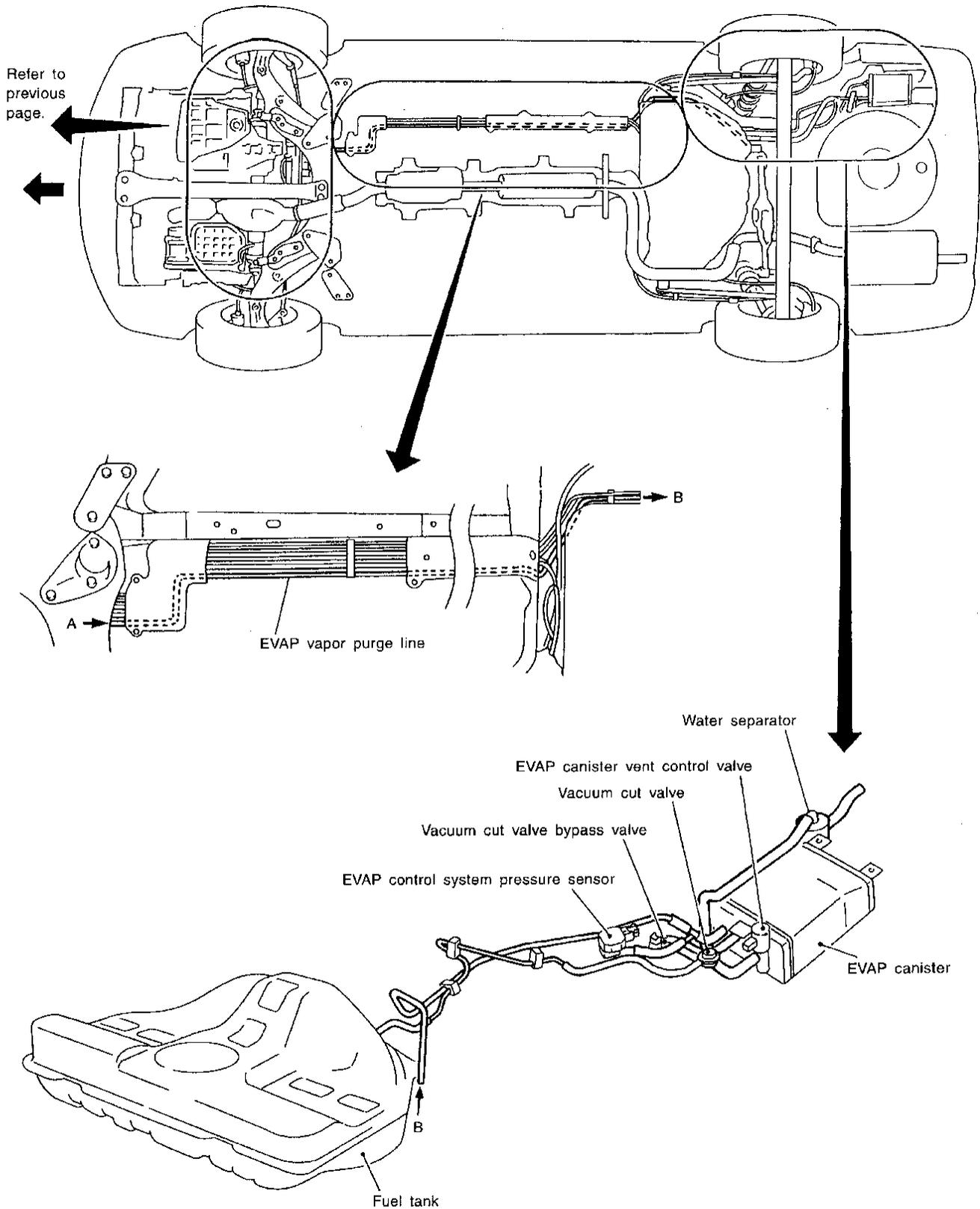
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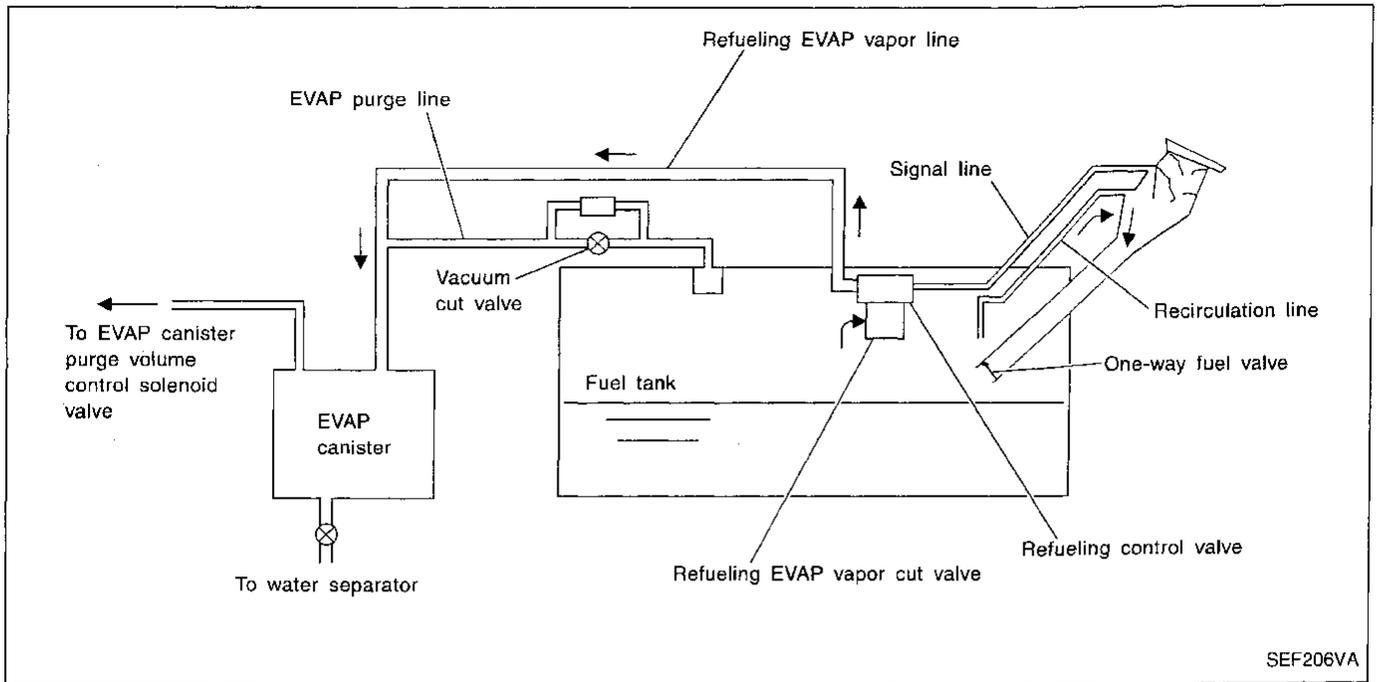
EVAPORATIVE EMISSION SYSTEM

Evaporative Emission Line Drawing (Cont'd)



EVAPORATIVE EMISSION SYSTEM

On Board Refueling Vapor Recovery (ORVR) SYSTEM DESCRIPTION



From the beginning of refueling, the fuel tank pressure goes up. When the pressure reaches the setting value of the refueling control valve (RCV) opening pressure, the RCV is opened. After RCV opens, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve, RCV and refueling vapor line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

The RCV is always closed during driving and the evaporative emission control system is operated the same as conventional system.

WARNING:

When conducting inspections below, be sure to observe the following:

- Put a "CAUTION: INFLAMMABLE" sign in workshop.
- Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to furnish the workshop with a CO₂ fire extinguisher.

CAUTION:

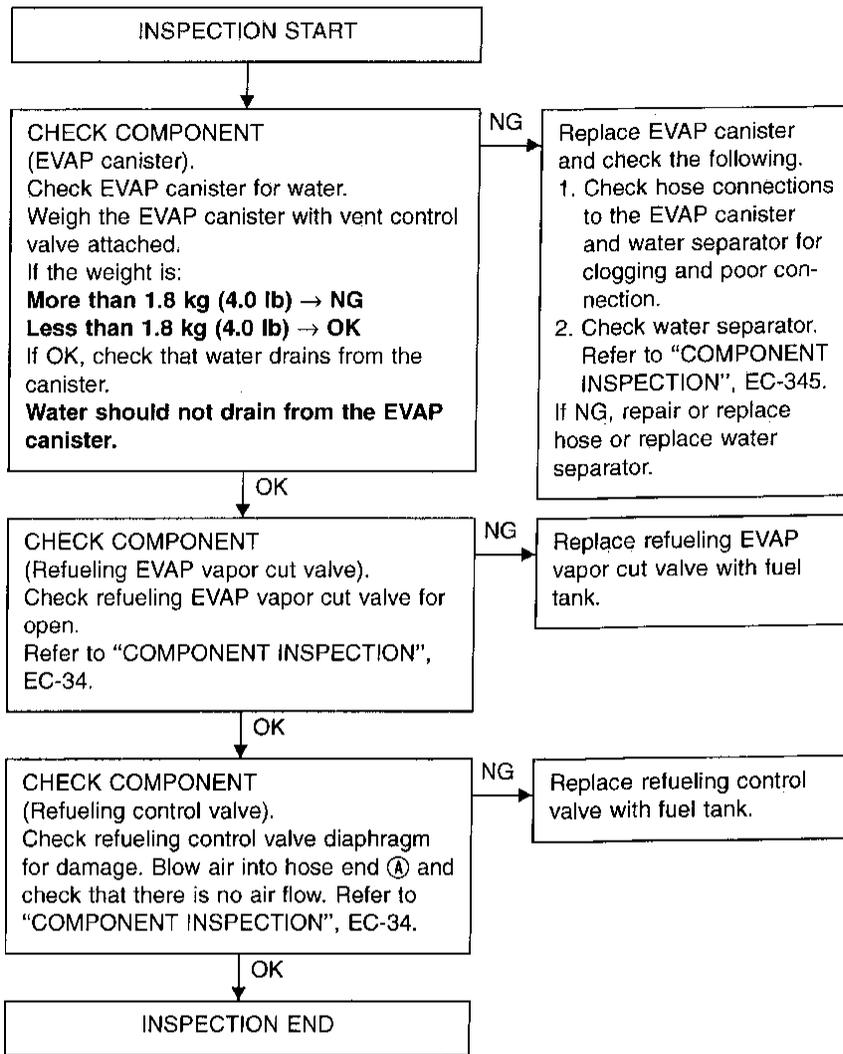
- Before removing fuel line parts, carry out the following procedures:
 - a. Put drained fuel in an explosion-proof container and put lid on securely.
 - b. Release fuel pressure from fuel line. Refer to "Fuel Pressure Release", EC-37.
 - c. Disconnect battery ground cable.
- Always replace O-ring when the fuel gauge retainer is removed.
- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose and clamps excessively to avoid damaging hoses.
- After installation, run engine and check for fuel leaks at connection.
- Do not attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.

EVAPORATIVE EMISSION SYSTEM

On Board Refueling Vapor Recovery (ORVR) (Cont'd)

DIAGNOSTIC PROCEDURE

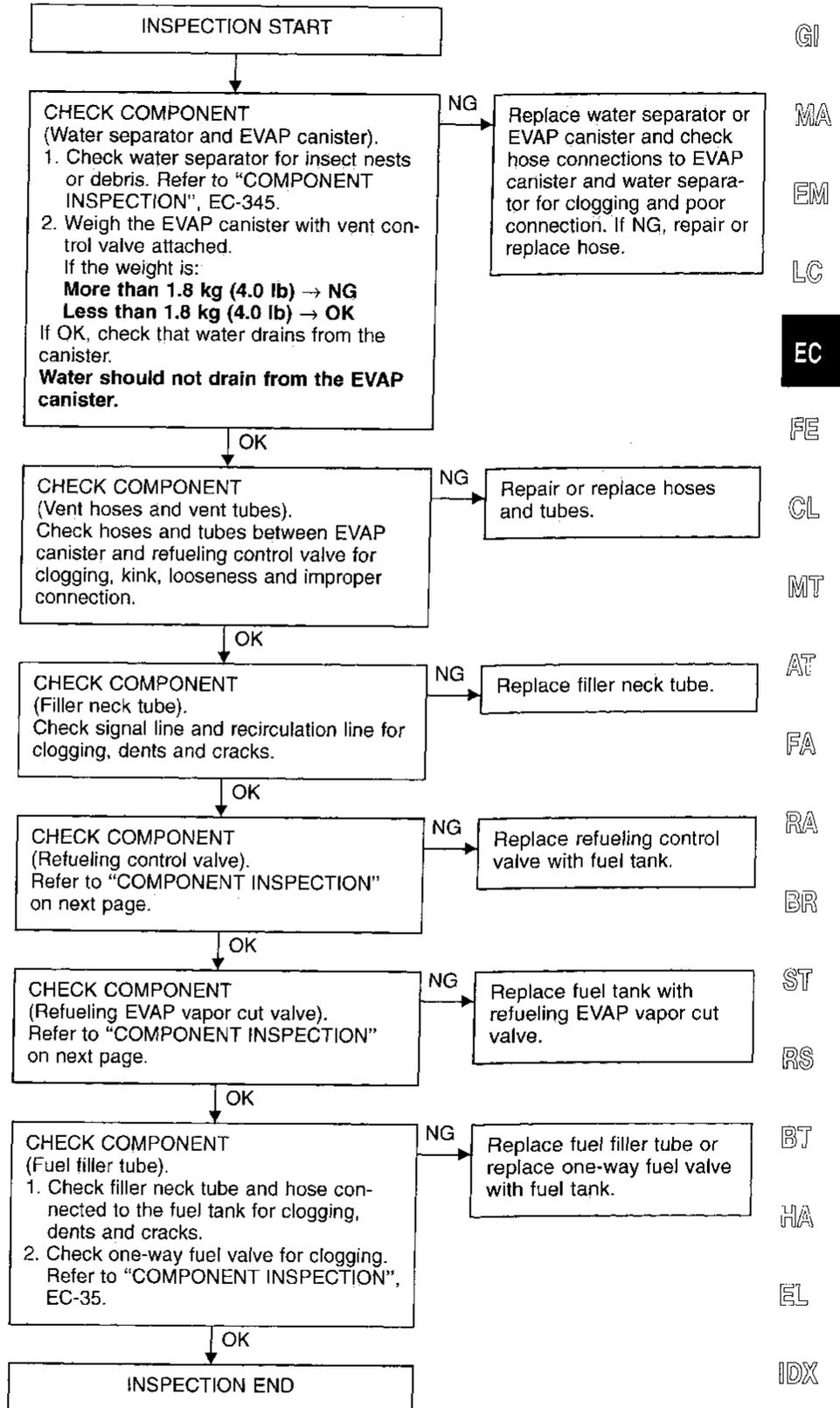
SYMPTOM: Fuel odor from EVAP canister is strong.



EVAPORATIVE EMISSION SYSTEM

On Board Refueling Vapor Recovery (ORVR) (Cont'd)

SYMPTOM: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.



EVAPORATIVE EMISSION SYSTEM

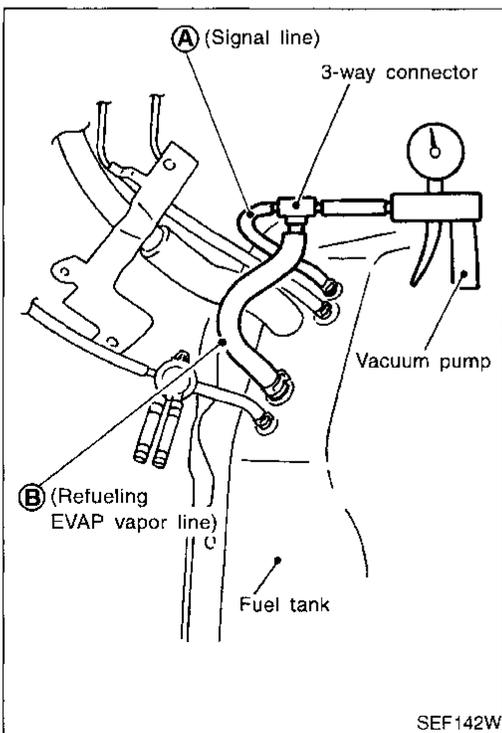
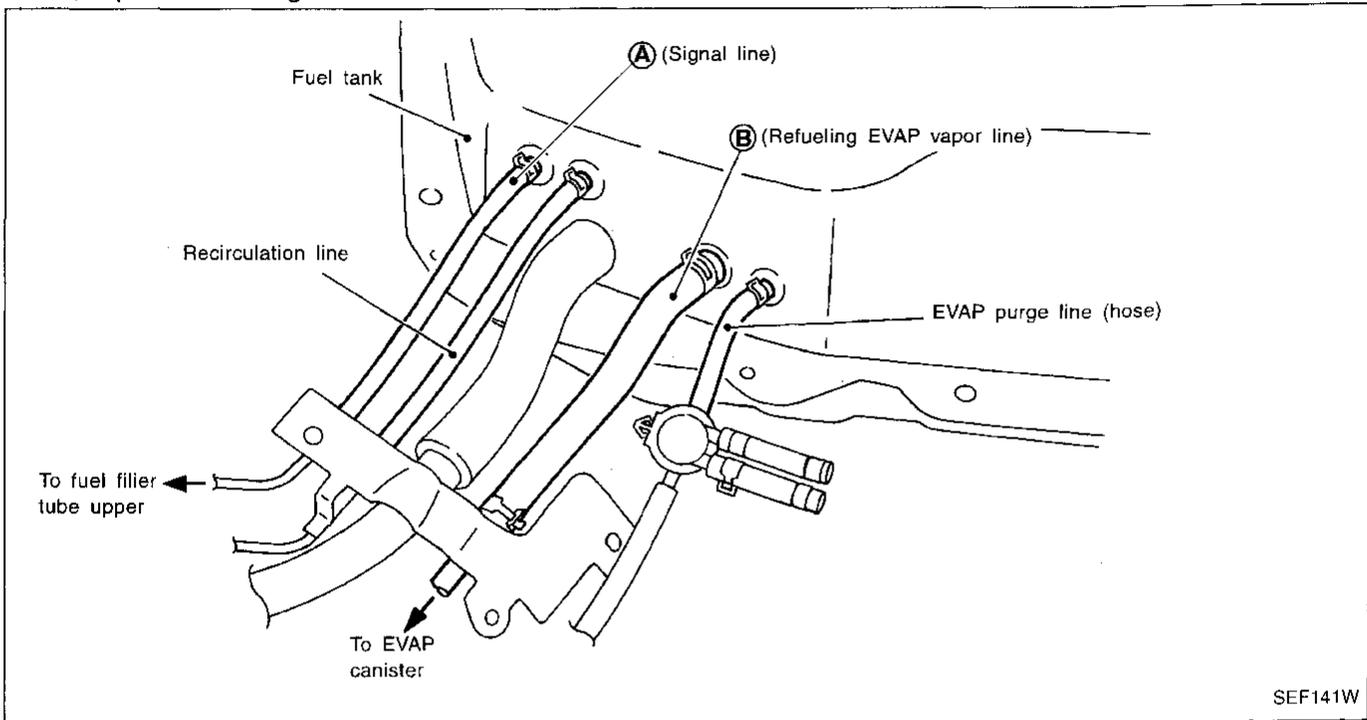
On Board Refueling Vapor Recovery (ORVR) (Cont'd)

COMPONENT INSPECTION

Refueling control valve

Check refueling control valve as follows:

1. Remove fuel filler cap.
 2. Check air continuity between hose ends (A) and (B).
Blow air into the hose end (B). Air should flow freely into the fuel tank.
 3. Blow air into hose end (A) and check there is no leakage.
 4. Apply pressure to both hose ends (A) and (B) [20 kPa (150 mmHg, 5.91 inHg)] using a pressure pump and a suitable 3-way connector. Check that there is no leakage.
- If NG, replace refueling control valve with fuel tank.



Refueling EVAP vapor cut valve

1. Remove fuel tank. Refer to "FUEL SYSTEM" in FE section.
Drain fuel from the tank as follows:
 - a. Remove fuel feed hose located on the fuel gauge retainer.
 - b. Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
 - c. Drain fuel using "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT.OR
 - a. Remove fuel gauge retainer.
 - b. Drain fuel from the tank using a hand pump into a fuel container.
2. Check refueling EVAP vapor cut valve for being stuck to close as follows.
Blow air into the refueling EVAP vapor cut valve (from hose end (B)), and check that the air flows freely into the tank.
3. Check EVAP vapor cut valve for being stuck to open as follows.
 - a. Connect vacuum pump to hose ends (A) and (B) using a suitable 3-way connector.
 - b. Remove fuel gauge retainer with fuel gauge unit.

EVAPORATIVE EMISSION SYSTEM

On Board Refueling Vapor Recovery (ORVR) (Cont'd)

Always replace O-ring with new one.

- c. Put fuel tank upside down.
- d. Apply vacuum pressure to both hose ends (A) and (B) [-13.3 kPa (-100 mmHg, -3.94 inHg)] with fuel gauge retainer remaining open and check that the pressure is applicable.
If NG, replace refueling EVAP vapor cut valve with fuel tank.

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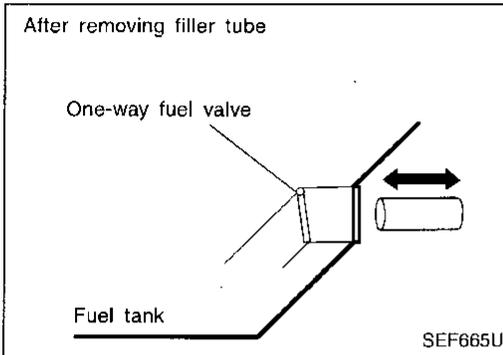
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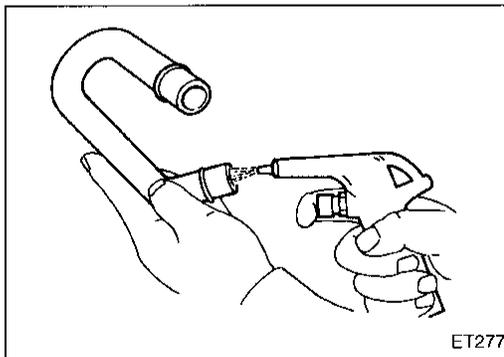
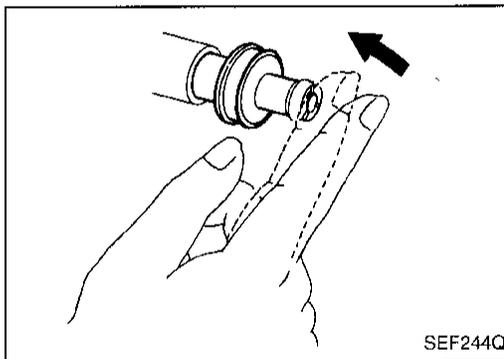
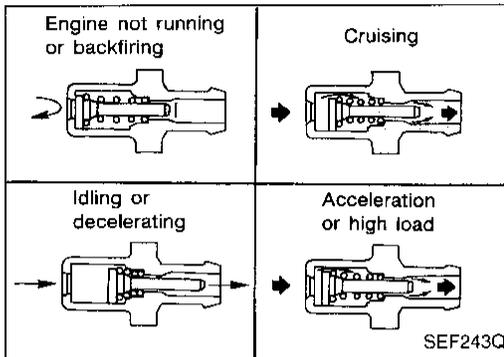
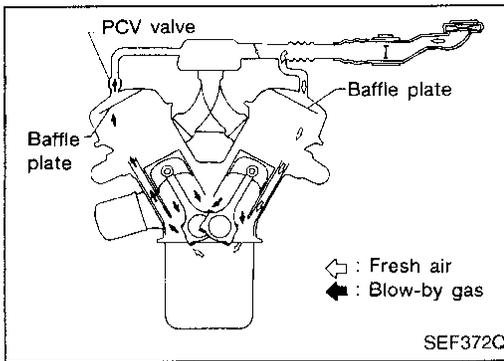
One-way fuel valve

1. Drain fuel from the tank.
Refer to "COMPONENT INSPECTION" of refueling EVAP vapor cut valve on previous page.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as follows.
When a stick is inserted, the valve should open, when removing stick it should close.

Do not drop any material into the tank.

If NG, replace one-way fuel valve with fuel tank.

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

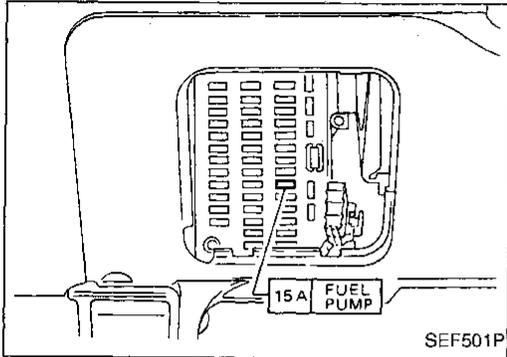
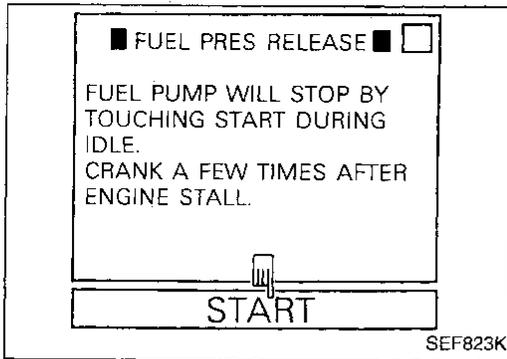
PCV (Positive Crankcase Ventilation) VALVE

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.

BASIC SERVICE PROCEDURE



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.

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.

Fuel Pressure Check

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

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

At idling:

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

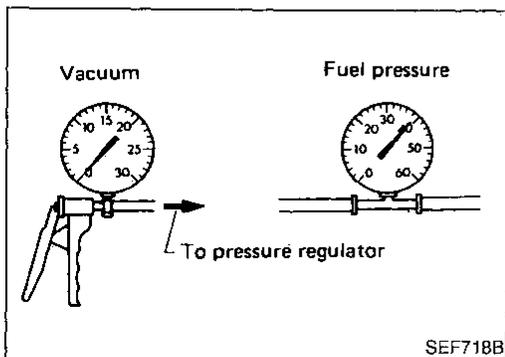
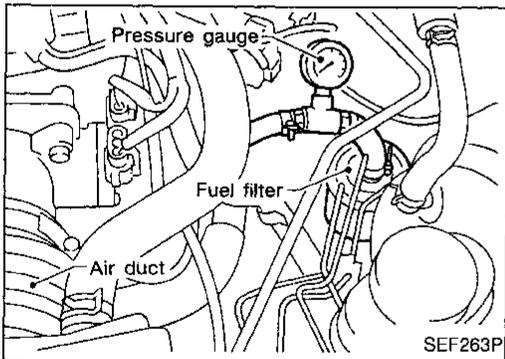
A few seconds after ignition switch is turned OFF to ON:

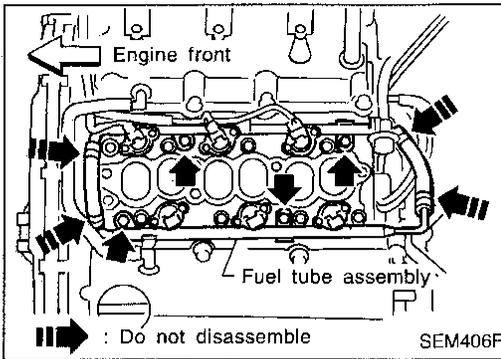
Approximately 294 kPa (3.0 kg/cm², 43 psi)

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.

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

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

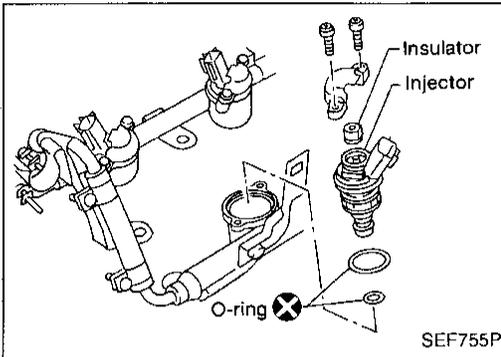




Injector Removal and Installation

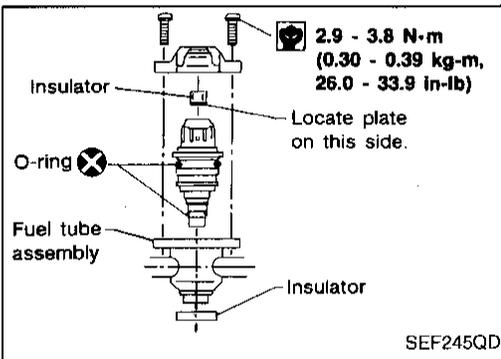
1. Release fuel pressure to zero.
2. Remove intake manifold collector (Refer to TIMING CHAIN in EM section).
3. Disconnect vacuum hose from pressure regulator.
4. Disconnect injector harness connectors.
5. Remove injectors with fuel tube assembly.

Do not disassemble fuel tube assembly.



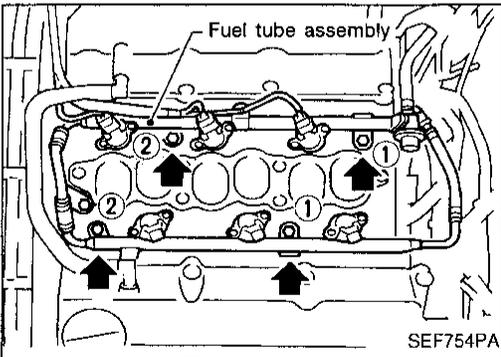
6. Push out any malfunctioning injector from fuel tube assembly.
7. Replace or clean injector as necessary.

Do not extract injector by pinching connector.



8. Install injector to fuel tube assembly.

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



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

Tighten in numerical order shown in the figure.

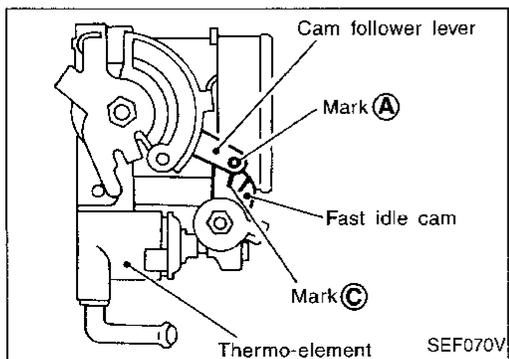
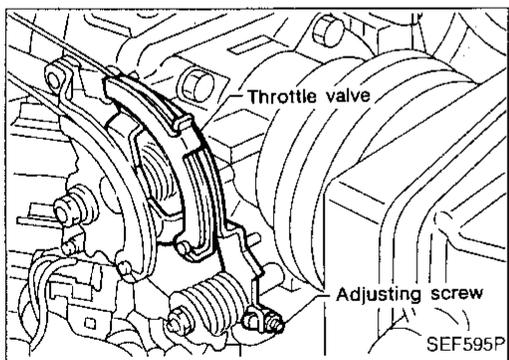
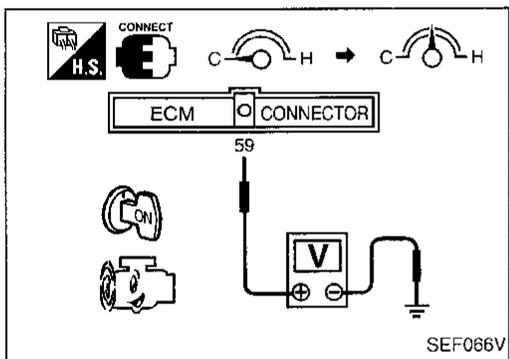
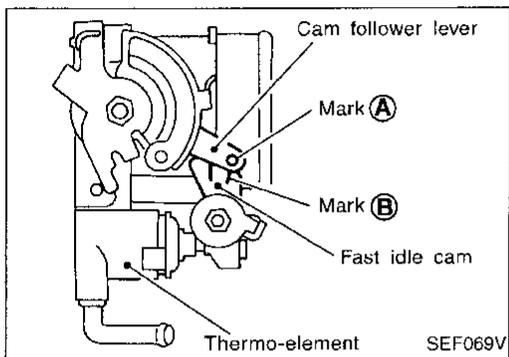
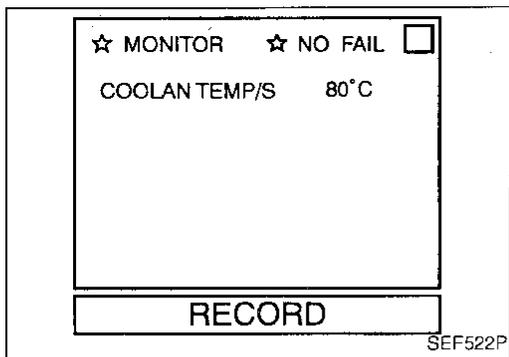
- a) First, tighten all bolts to 9.3 to 10.8 N·m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).
- b) Then, tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).

Lubricate fuel hoses with a smear of engine oil.

10. 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. Turn ignition switch "ON".
2. See "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
3. Start engine and warm it up. When engine temperature is $80 \pm 5^\circ\text{C}$ ($176 \pm 9^\circ\text{F}$), make sure that the center of mark (A) is aligned with mark (B) as shown in the figure.

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OR

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 59 (Engine coolant temperature sensor signal) and ground.
3. Start engine and warm it up.
4. When the voltage is between 1.10 to 1.36V, make sure that the center of mark (A) is aligned with mark (B) as shown in the figure.

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- If NG, adjust by turning adjusting screw.

Adjusting screw tightening torque:

0.98 - 1.96 N·m (10 - 20 kg·cm, 8.7 - 17.4 in·lb)

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4. Stop engine.
5. Turn ignition switch "ON" and see "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
6. When engine temperature is $25 \pm 5^\circ\text{C}$ ($77 \pm 9^\circ\text{F}$), make sure that the center of mark (A) is aligned with mark (C) as shown in the figure.

EL

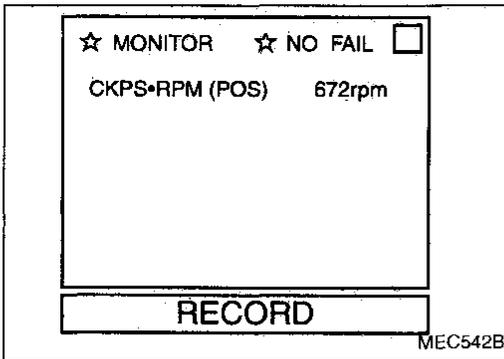
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OR

5. When the voltage between 3.12 to 3.52V, make sure that the center of mark (A) is aligned with mark (C) as shown in the figure.

- If NG, replace thermo-element and perform the above inspection and adjustment again.

BASIC SERVICE PROCEDURE

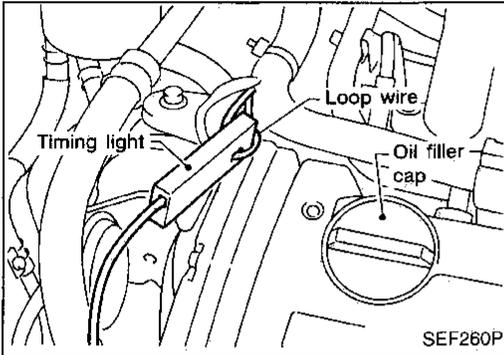


Direct Ignition System — How to Check Idle Speed and Ignition Timing

IDLE SPEED

- Using CONSULT

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

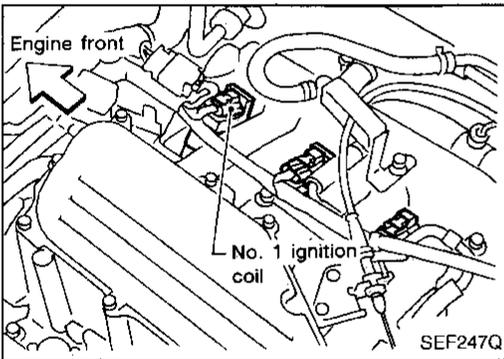


IGNITION TIMING

Any of following two methods may be used.

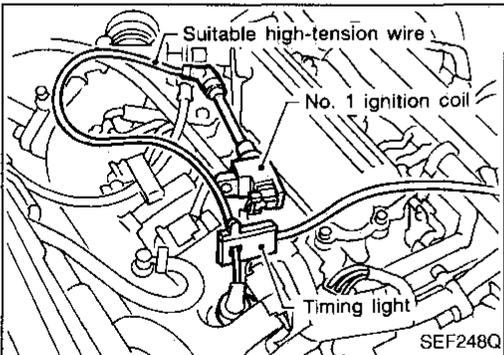
- Method A

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

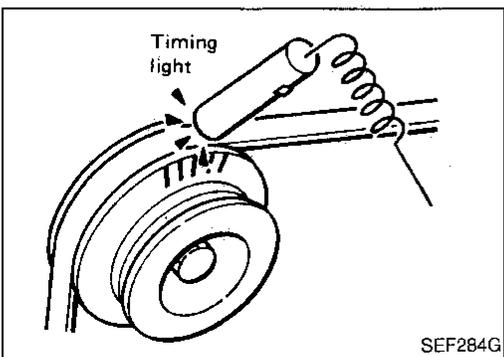


- Method B

1. Remove No. 1 ignition coil.

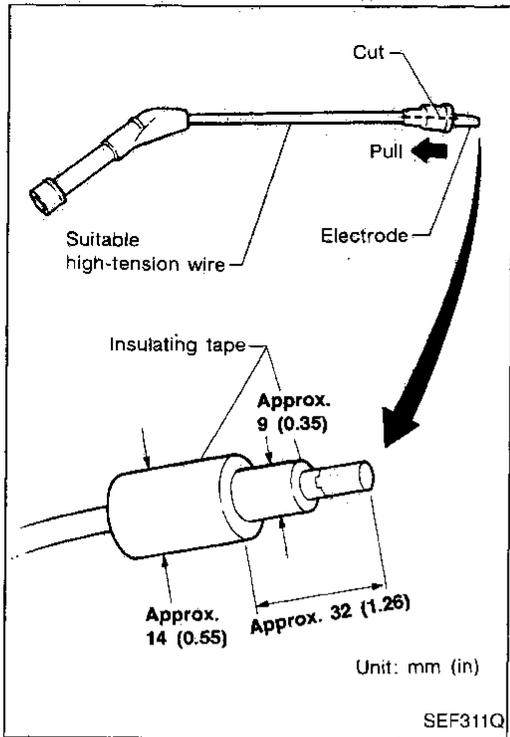


2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.
3. Check ignition timing.



BASIC SERVICE PROCEDURE

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



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Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

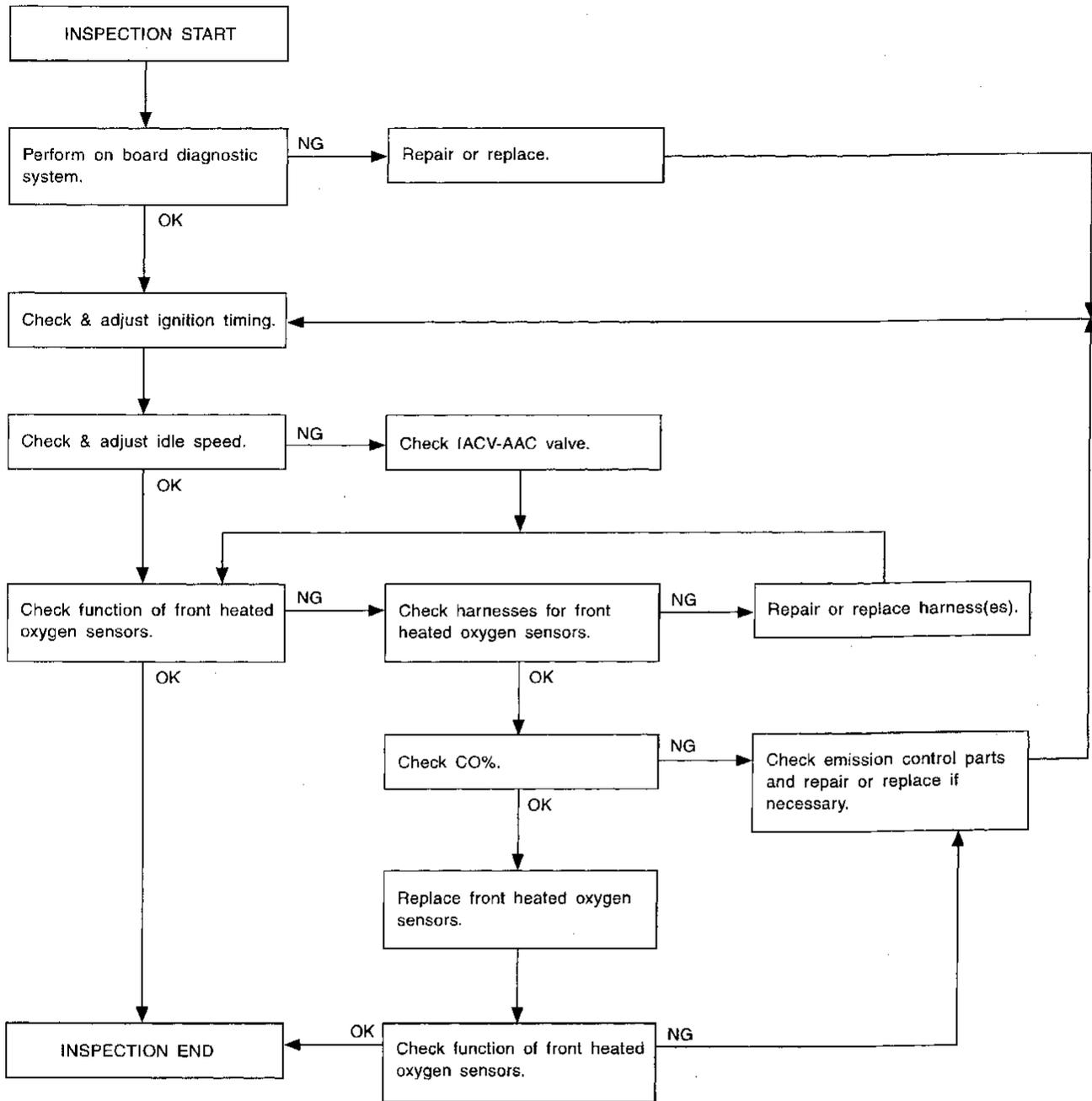
PREPARATION

- 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 volume control valve
 - (11) Throttle valve
 - (12) EVAP system
 - (13) Swirl control 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 defogger.
- Keep front wheels pointed straight ahead.
- Make the check after the cooling fan has stopped.

BASIC SERVICE PROCEDURE

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

Overall inspection sequence

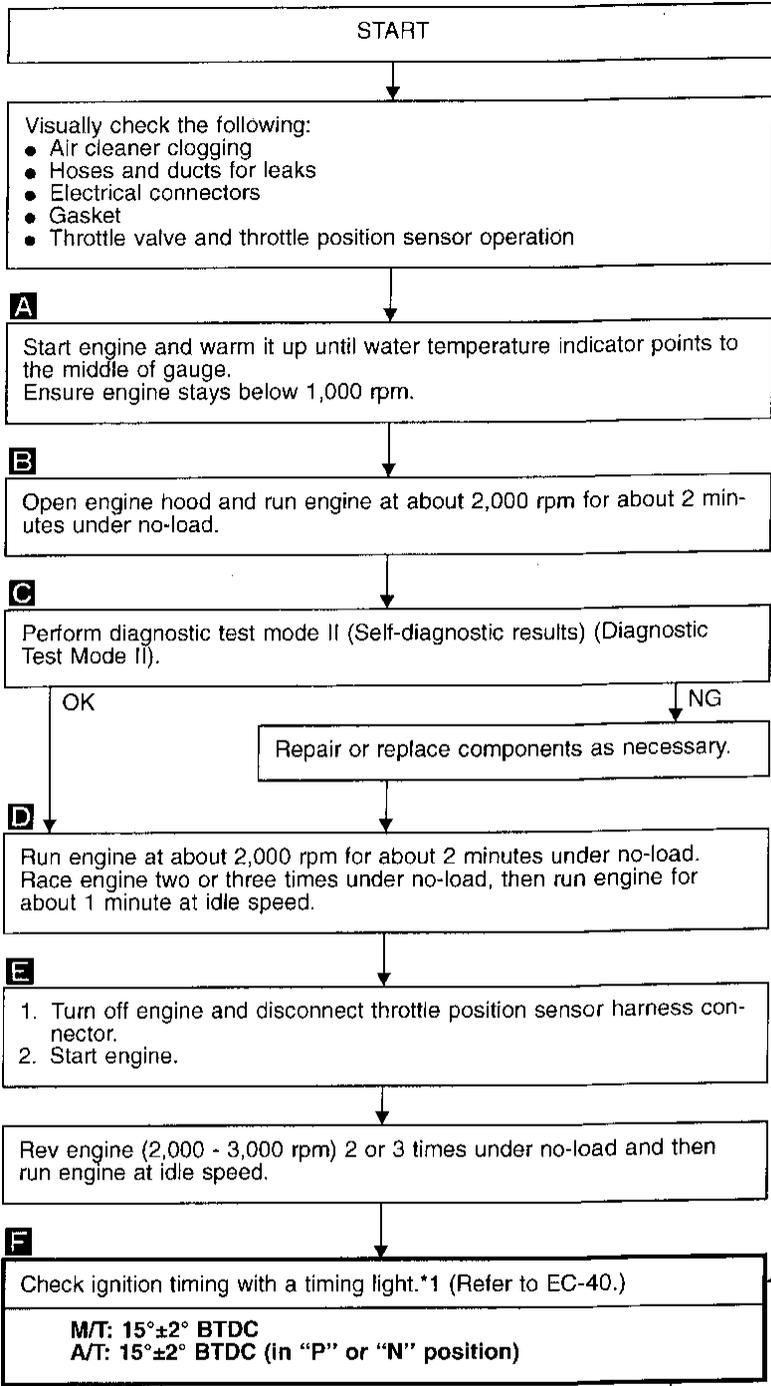
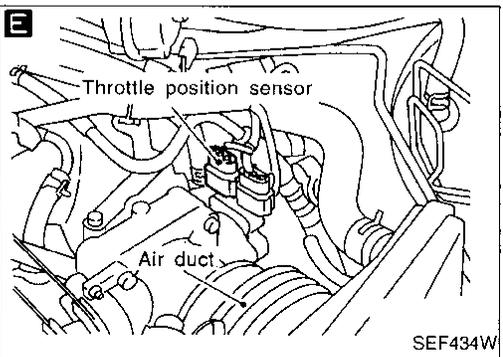
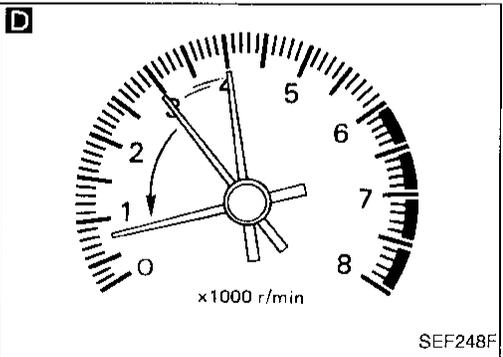
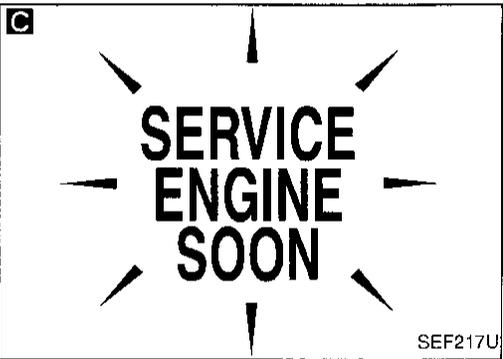
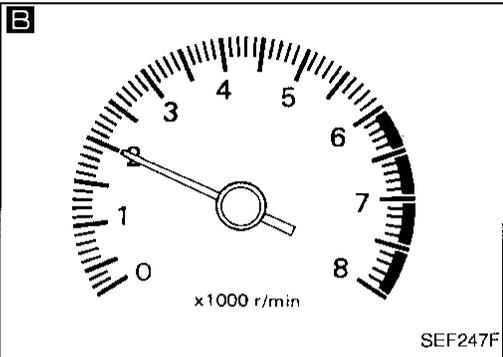
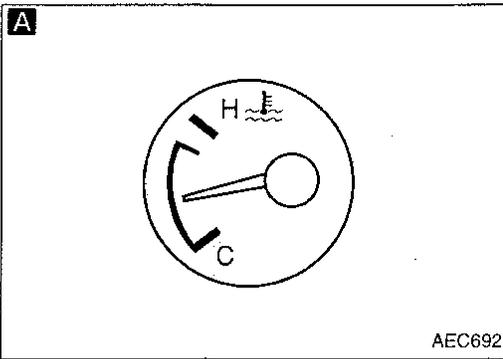


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BASIC SERVICE PROCEDURE

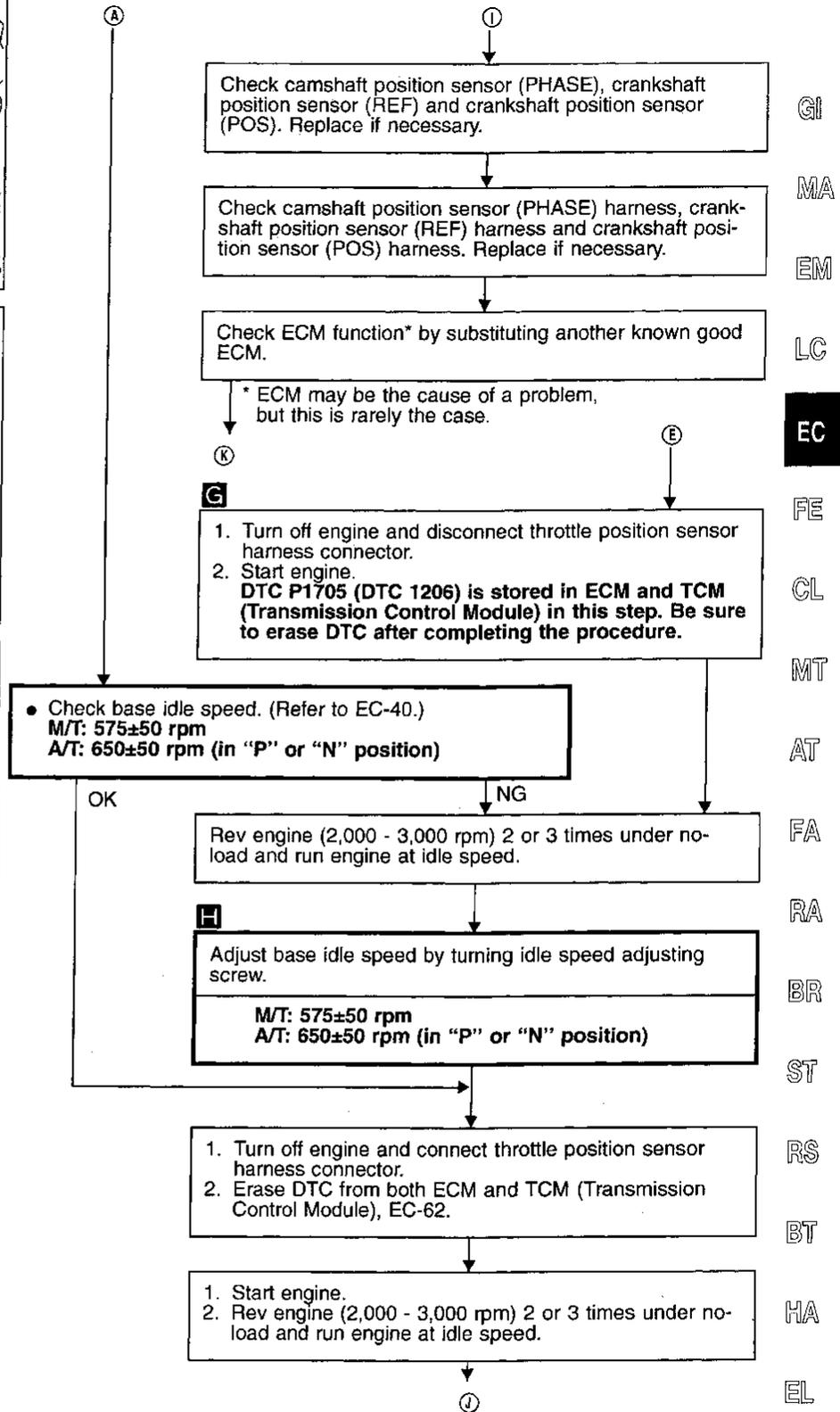
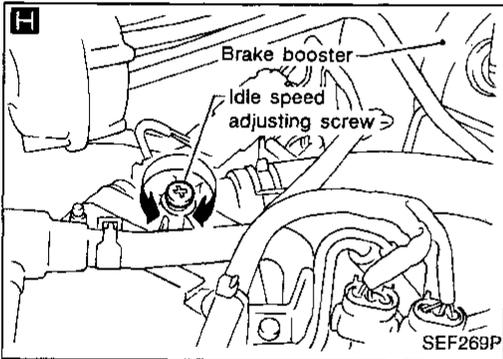
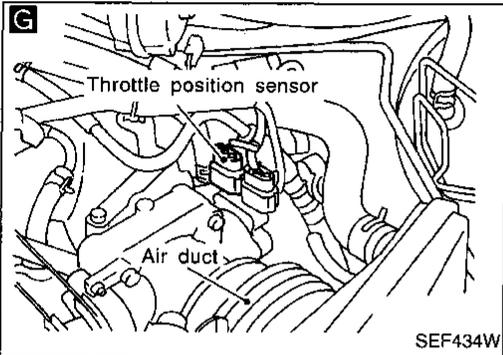
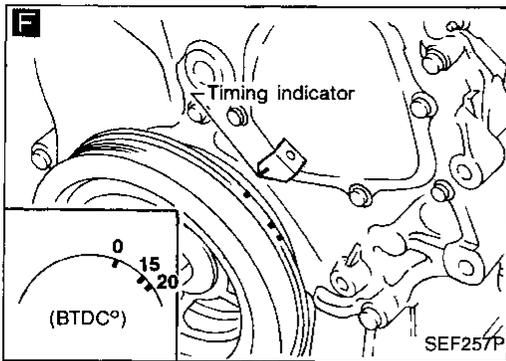
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



*1: Only check ignition timing as the timing is not adjustable.

BASIC SERVICE PROCEDURE

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



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BASIC SERVICE PROCEDURE

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

☆ MONITOR ☆ NO FAIL

CKPS•RPM (POS) 672rpm

RECORD

SEF588Q

①

I

Check target idle speed.

- Read idle speed in "DATA MONITOR" mode with CONSULT.
- OR
- Check idle speed.

M/T: 625±50 rpm
A/T: 700±50 rpm (in "P" or "N" position)

☆ MONITOR ☆ NO FAIL

CKPS•RPM (POS) 2000rpm

FR O2 MNTR-B1 RICH

FR O2 MNTR-B2 RICH

RECORD

SEF589Q

OK

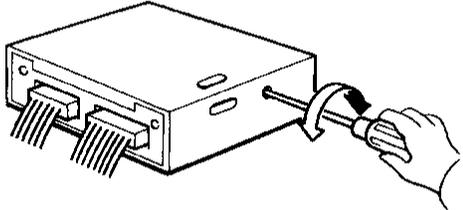
Check IACV-AAC valve and replace if necessary.

Check IACV-AAC valve harness and repair if necessary.

Check ECM function* by substituting another known good ECM.

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

K



SEF957D

J K L

Check front heated oxygen sensor signal (right and left banks).

- 1. See "FR O2 MNTR-B1" and "FR O2 MNTR-B2" in "Data monitor" mode.
- 2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
- 3. Maintain engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.). Check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.

1 cycle: RICH → LEAN → RICH
2 cycles: RICH → LEAN → RICH
OR
→LEAN → RICH

- 1. Set "Front heated oxygen sensor monitor" in the Diagnostic Test Mode II. (See page EC-65.)
- 2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
- 3. Maintain engine at 2,000 rpm under no-load. Check that the malfunction indicator lamp comes ON more than 5 times during 10 seconds, for each bank.

L

SERVICE ENGINE SOON

SEF217U

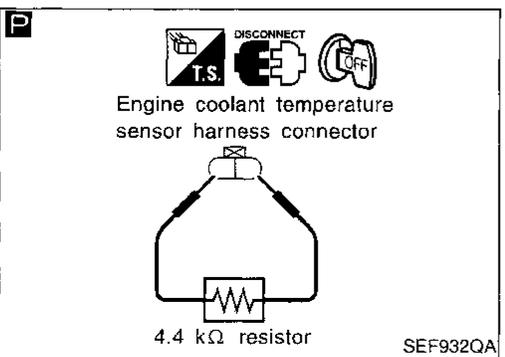
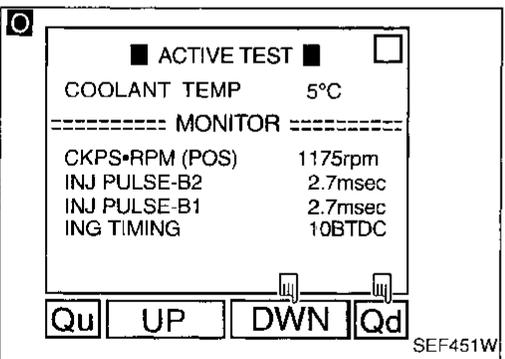
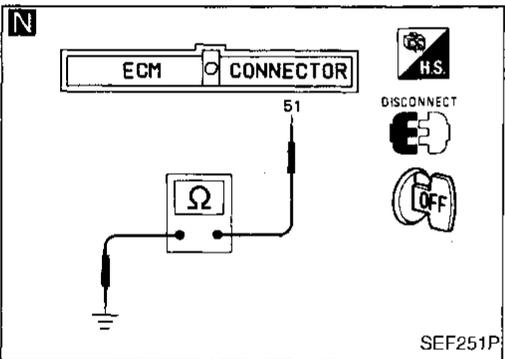
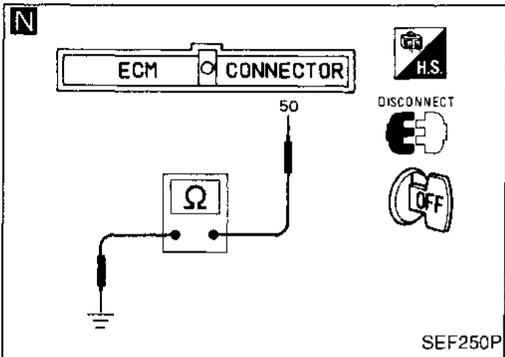
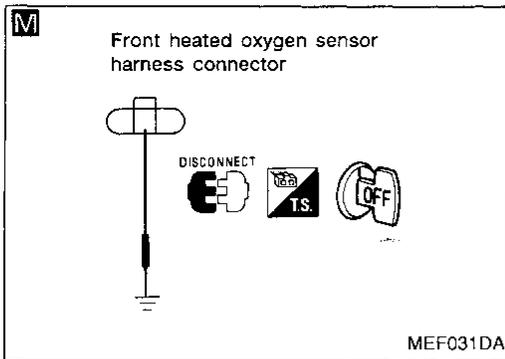
NG → ②

OK

END

BASIC SERVICE PROCEDURE

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



- C**
- M N**
- Check front heated oxygen sensor harnesses:
1. Turn off engine and disconnect battery ground cable.
 2. Disconnect ECM SMJ harness connector from ECM.
 3. Disconnect front heated oxygen sensor harness connectors. Then connect harness side terminals for front heated oxygen sensor to ground with a jumper wire.
 4. Check for continuity between terminal No. 50 of ECM SMJ harness connector and body ground.
 5. Check for continuity between terminal No. 51 of ECM connector and body ground.

Continuity existsOK
 Continuity does not exist.....NG

OK → Connect ECM SMJ harness connector to ECM.
 NG → Repair or replace harness. → **E**

Connect ECM SMJ harness connector to ECM.

- O P**
1. Connect battery ground cable.
 2. Select "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
 3. Set "COOLANT TEMP" to 5°C (41°F) by touching "Qu" and "Qd" and "UP", "DWN".
- OR
1. Disconnect engine coolant temperature sensor harness connector.
 2. Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.
 3. Connect battery ground cable.

Q

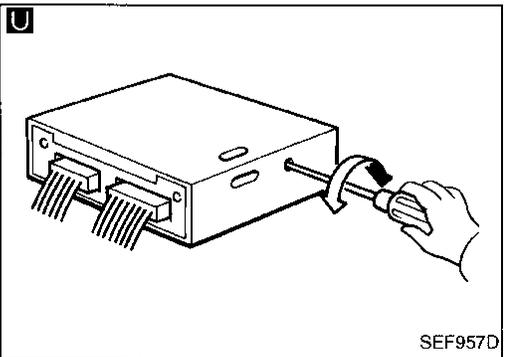
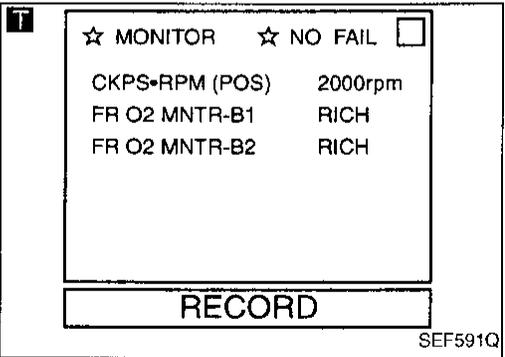
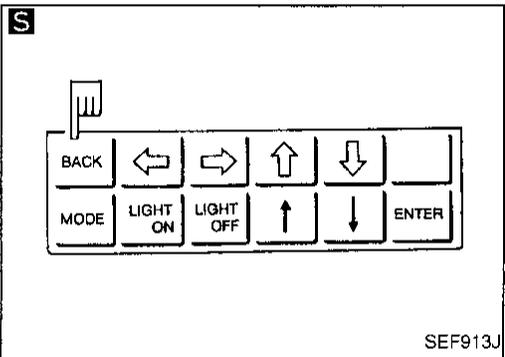
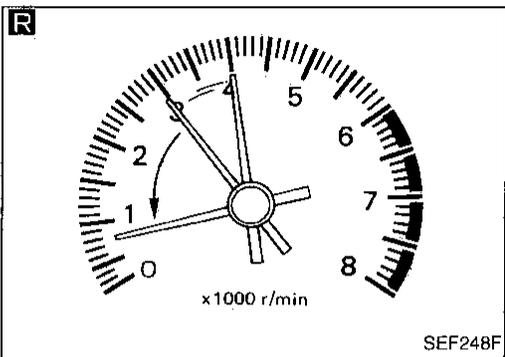
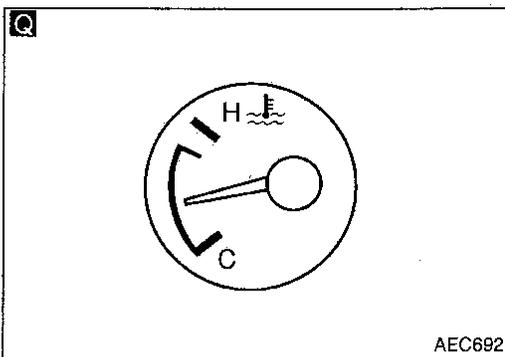
Start engine and warm it up until water temperature indicator points to middle of gauge.
 (Be sure to start engine after installing 4.4 kΩ resistor.)

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BASIC SERVICE PROCEDURE

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



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

S
Check "CO"%.
Idle CO: Less than 10% (with engine running smoothly)

After checking CO%,
Touch "BACK".

OR

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

NG
OK
Replace front heated oxygen sensor.

T U V

1. See "FR O2 MNTR-B1" and "FR O2 MNTR-B2" in "Data monitor" mode.
2. Maintain engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.). Check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
1 cycle: RICH → LEAN → RICH
2 cycles: RICH → LEAN → RICH → LEAN → RICH

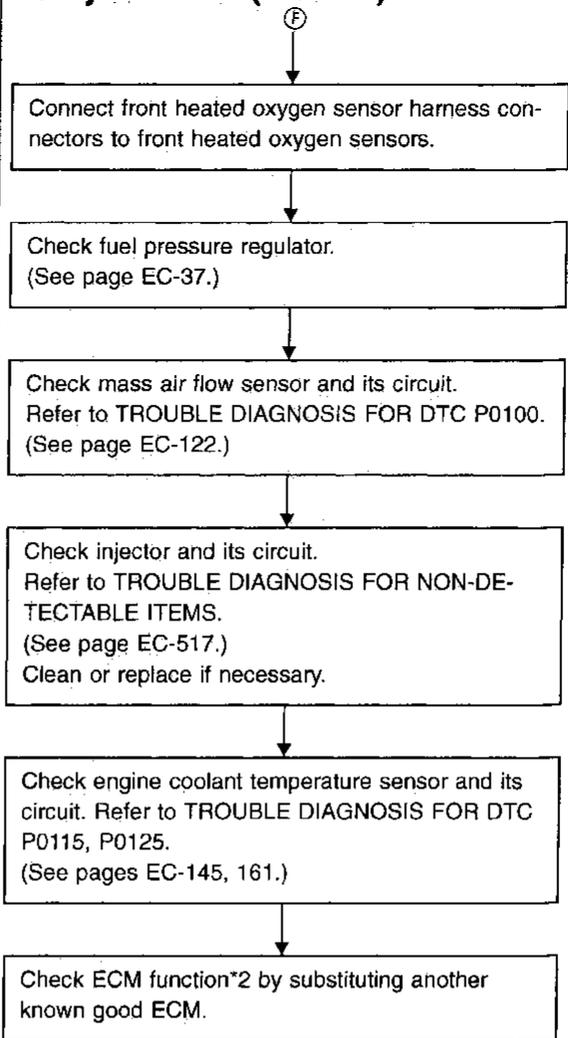
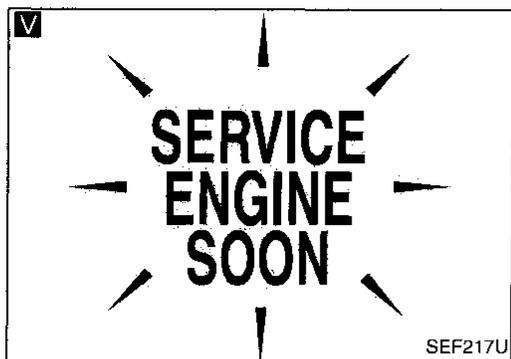
OR

1. Set "Front heated oxygen sensor monitor" in the Diagnostic Test Mode II. (See page EC-65.)
2. Maintain engine at 2,000 rpm under no-load. Check that the malfunction indicator lamp comes ON more than 5 times during 10 seconds.

NG
OK
F
E

BASIC SERVICE PROCEDURE

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



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

Ⓝ

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

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Introduction

The ECM has an on board diagnostic system, which detects malfunctions related to 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.

X: Applicable
—: Not applicable

	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-99.).

Two Trip Detection Logic

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

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

X: Applicable
—: Not applicable

Items	MIL			DTC		1st trip DTC	
	1st trip		2nd trip lighting up	1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up					
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 (0701, 0603 - 0608) is being detected	X	—	—	X	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 (0701, 0603 - 0608) has been detected	—	X	—	X	—	X	—
Closed loop control — DTC: P1148 (0307), P1168 (0308)	—	X	—	X	—	X	—
Fail-safe items (Refer to EC-99.)	—	X	—	X*1	—	X*1	—
Except above	—	—	X	—	X	X	X

*1: Except "ECM".

Emission-related Diagnostic Information

DTC AND 1ST TRIP DTC

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

Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-62.

For malfunctions in which 1st trip DTCs are displayed, refer to EC-59. 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-90. 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

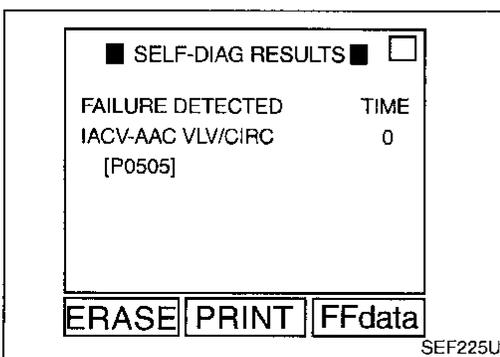
DTC and 1st trip DTC can be read by the following methods.

 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.)

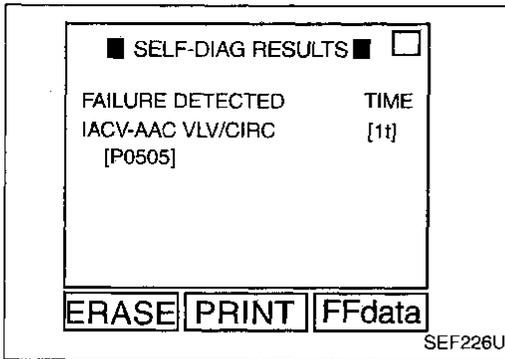
- **1st trip DTC No. is the same as DTC No.**
- **Output of the diagnostic trouble code indicates that the indicated circuit has a malfunction. However, in case of the Mode II and GST they do not indicate whether the malfunction is still occurring or occurred in the past and returned to normal. CONSULT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



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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)



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

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM has a memory function, which stores the driving condition 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 the ECM detects a malfunction.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data, and the data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen, not on the GST. For detail, refer to EC-76.

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

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0306 (0701, 0603 - 0608) Fuel Injection System Function — DTC: P0171 (0115), P0172 (0114), P0174 (0210), P0175 (0209)
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 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-62.

SYSTEM READINESS TEST (SRT) CODE

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

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

SRT codes are set after diagnosis has been performed one or more times. This occurs regardless of whether the diagnosis results in "OK" or "NG", and whether or not the diagnosis is performed in consecutive trips. The following table lists the 5 SRT items (20 diagnoses) for the ECM used in A32 models.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

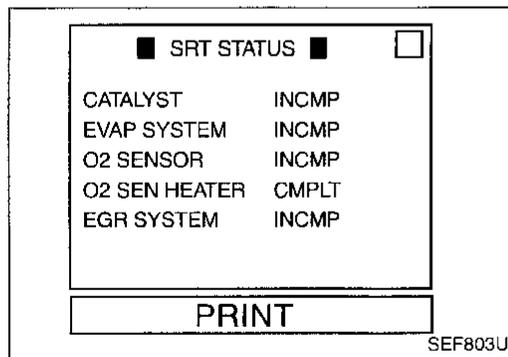
Emission-related Diagnostic Information (Cont'd)

SRT Items	Self-diagnostic test items
Catalyst monitoring	<ul style="list-style-type: none"> • Three way catalyst function P0420 (0702)
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)
Oxygen sensor monitoring	<ul style="list-style-type: none"> • Front heated oxygen sensor (Circuit) P0130 (0503), P0150 (0303) • Front heated oxygen sensor (Lean shift monitoring) P0131 (0411), P0151 (0415) • Front heated oxygen sensor (Rich shift monitoring) P0132 (0410), P0152 (0414) • Front heated oxygen sensor (Response monitoring) P0133 (0409), P0153 (0413) • Front heated oxygen sensor (High voltage) P0134 (0412), P0154 (0509) • Rear heated oxygen sensor (Min. voltage monitoring) P0137 (0511), P0157 (0314) • Rear heated oxygen sensor (Max. voltage monitoring) P0138 (0510), P0158 (0313) • Rear heated oxygen sensor (Response monitoring) P0139 (0707), P0159 (0708) • Rear heated oxygen sensor (High voltage) P0140 (0512), P0160 (0315)
Oxygen sensor heater monitoring	<ul style="list-style-type: none"> • Front heated oxygen sensor heater P0135 (0901), P0155 (1001) • Rear heated oxygen sensor heater P0141 (0902), P0161 (1002)
EGR system monitoring	<ul style="list-style-type: none"> • EGR function (Close) P0400 (0302) • EGR function (Open) P1402 (0514)

Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-62). In addition, after Engine control 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.

How to set SRT code

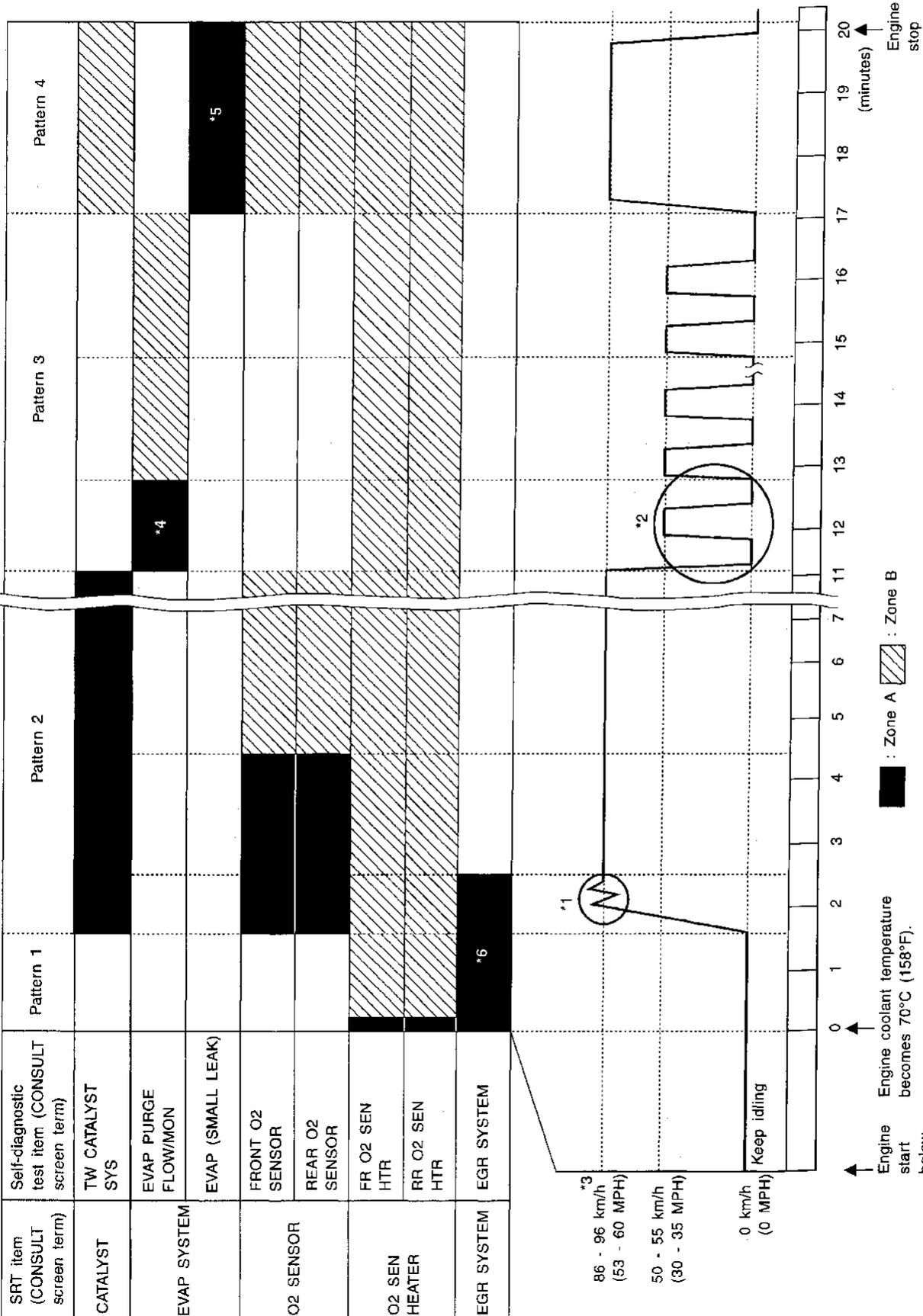
To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions. The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving 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 air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.

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

- Pattern 1:
- **The engine is started at the engine coolant temperature of -10 to 35°C (14 to 95°F) (where the voltage between the ECM terminals ⑨ and ④ is 3.0 - 4.3V).**
 - **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals ⑨ and ④ is lower than 1.4V).**
 - **The engine is started at the tank fuel temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal ⑤ and ground is less than 4.1V).**

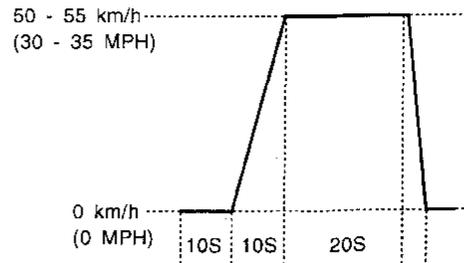
Pattern 2: • When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

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

Pattern 4: • Tests are performed after the engine has been operated for at least 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 engine 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 value of CONSULT should be between 0.8 to 1.2V.)**
3) Repeat steps 1 and 2 until the EGR system SRT is set.



SEF414S

- *3: 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 followings are performed using the "DTC WORK SUPPORT" mode with CONSULT.
- "EGR SYSTEM P0400"
 - "EGR SYSTEM P1402"

GI

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EM

LC

EC

FE

CL

MT

AT

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ST

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BT

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EL

IDX

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

Suggested transmission gear position for A/T models

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

Suggested upshift speeds for M/T models

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

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

Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)
1st to 2nd	21 (13)	21 (13)
2nd to 3rd	37 (23)	25 (16)
3rd to 4th	53 (33)	44 (27)
4th to 5th	63 (39)	58 (36)

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

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

Suggested maximum speed in each gear

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

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

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

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

The test value is a parameter used to determine whether diagnostic test is "OK" or "NG" while the ECM is monitored during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

Items for which these data (test value and test limit) are displayed are the same as SRT code items (11 test items).

These data (test value and 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 (Right bank) for California models	01H	01H	Max.	X
		02H	81H	Min.	X
	Three way catalyst function (Left bank) for California models	03H	02H	Max.	X
		02H	82H	Min.	X
	Three way catalyst function except for California models	01H	01H	Max.	X
		02H	81H	Min.	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 (Right bank)	09H	04H	Max.	X
		0AH	84H	Min.	X
		0BH	04H	Max.	X
		0CH	04H	Max.	X
		0DH	04H	Max.	X
	Front heated oxygen sensor (Left bank)	11H	05H	Max.	X
		12H	85H	Min.	X
		13H	05H	Max.	X
		14H	05H	Max.	X
		15H	05H	Max.	X
	Rear heated oxygen sensor (Right bank) for California models	19H	86H	Min.	X
		1AH	86H	Min.	X
		1BH	06H	Max.	X
		1CH	06H	Max.	X
	Rear heated oxygen sensor (Left bank) for California models	21H	87H	Min.	X
		22H	87H	Min.	X
		23H	07H	Max.	X
		24H	07H	Max.	X
Rear heated oxygen sensor for except California models	19H	86H	Min.	X	
	1AH	86H	Min.	X	
	1BH	06H	Max.	X	
		1CH	06H	Max.	X

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

X: Applicable
—: Not applicable

SRT item	Self-diagnostic test item	Test value		Test limit	Application
		TID	CID		
O2 SENSOR HEATER	Front heated oxygen sensor heater (Right bank)	29H	08H	Max.	X
		2AH	88H	Min.	X
	Front heated oxygen sensor heater (Left bank)	2BH	09H	Max.	X
		2CH	89H	Min.	X
	Rear heated oxygen sensor heater (Right bank) for California models	2DH	0AH	Max.	X
		2EH	8AH	Min.	X
	Rear heated oxygen sensor heater (Left bank) for California models	2FH	0BH	Max.	X
		30H	8BH	Min.	X
	Rear heated oxygen sensor heater for except California models	2DH	0AH	Max.	X
		2EH	8AH	Min.	X
EGR SYSTEM	EGR function	31H	8CH	Min.	X
		32H	8CH	Min.	X
		33H	8CH	Min.	X
		34H	8CH	Min.	X
		35H	0CH	Max.	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-122
ABSL PRES SEN/CIRC	P0105	0803	—	—	X	EC-130
AIR TEMP SEN/CIRC	P0110	0401	—	—	X	EC-139
COOLANT T SEN/CIRC	P0115	0103	—	—	X	EC-145
THRTL POS SEN/CIRC	P0120	0403	—	—	X	EC-150
*COOLAN T SEN/CIRC	P0125	0908	—	—	X	EC-161
FRONT O2 SENSOR-B1	P0130	0503	X	X	X*3	EC-166
FRONT O2 SENSOR-B1	P0131	0411	X	X	X*3	EC-174
FRONT O2 SENSOR-B1	P0132	0410	X	X	X*3	EC-180
FRONT O2 SENSOR-B1	P0133	0409	X	X	X*3	EC-186
FRONT O2 SENSOR-B1	P0134	0412	X	X	X*3	EC-196
FR O2 SE HEATER-B1	P0135	0901	X	X	X*3	EC-204
FRONT O2 SENSOR-B2	P0150	0303	X	X	X*3	EC-166
FRONT O2 SENSOR-B2	P0151	0415	X	X	X*3	EC-174
FRONT O2 SENSOR-B2	P0152	0414	X	X	X*3	EC-180
FRONT O2 SENSOR-B2	P0153	0413	X	X	X*3	EC-186
FRONT O2 SENSOR-B2	P0154	0509	X	X	X*3	EC-196
FR O2 SE HEATER-B2	P0155	1001	X	X	X*3	EC-204
REAR O2 SENSOR	P0137	0511	X	X	X*3	EC-242
REAR O2 SENSOR	P0138	0510	X	X	X*3	EC-249
REAR O2 SENSOR	P0139	0707	X	X	X*3	EC-256
REAR O2 SENSOR	P0140	0512	X	X	X*3	EC-263
RR O2 SEN HEATER	P0141	0902	X	X	X*3	EC-274
REAR O2 SENSOR-B1	P0137	0511	X	X	X*3	EC-348
REAR O2 SENSOR-B1	P0138	0510	X	X	X*3	EC-219
REAR O2 SENSOR-B1	P0139	0707	X	X	X*3	EC-227
REAR O2 SENSOR-B1	P0140	0512	X	X	X*3	EC-235
RR O2 SE HEATER-B1	P0141	0902	X	X	X*3	EC-268
REAR O2 SENSOR-B2	P0157	0314	X	X	X*3	EC-210
REAR O2 SENSOR-B2	P0158	0313	X	X	X*3	EC-219
REAR O2 SENSOR-B2	P0159	0708	X	X	X*3	EC-227
REAR O2 SENSOR-B2	P0160	0315	X	X	X*3	EC-235
RR O2 SE HEATER-B2	P0161	1002	X	X	X*3	EC-268
FUEL SYS-LEAN/BK1	P0171	0115	—	—	X	EC-279
FUEL SYS-RICH/BK1	P0172	0114	—	—	X	EC-285
FUEL SYS-LEAN/BK2	P0174	0210	—	—	X	EC-279
FUEL SYS-RICH/BK2	P0175	0209	—	—	X	EC-285
FUEL TEMP SEN/CIRC	P0180	0402	—	—	X	EC-291

*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				
MULTI CYL MISFIRE	P0300	0701	—	—	X	EC-295
CYL 1 MISFIRE	P0301	0608	—	—	X	EC-295
CYL 2 MISFIRE	P0302	0607	—	—	X	EC-295
CYL 3 MISFIRE	P0303	0606	—	—	X	EC-295
CYL 4 MISFIRE	P0304	0605	—	—	X	EC-295
CYL 5 MISFIRE	P0305	0604	—	—	X	EC-295
CYL 6 MISFIRE	P0306	0603	—	—	X	EC-295
KNOCK SEN/CIRCUIT	P0325	0304	—	—	X	EC-300
CPS/CIRCUIT (POS)	P0335	0802	—	—	X	EC-304
CAM PS/CIRC (PHS)	P0340	0101	—	—	X	EC-311
EGR SYSTEM	P0400	0302	X	X	X*3	EC-441
EGR VOL CON/V CIR	P0403	0515	—	—	X	EC-325
TW CATALYST SYSTEM	P0420	0702	X	X	X*3	EC-334
TW CATALYST SYS-B1	P0420	0702	X	X	X*3	EC-331
TW CATALYST SYS-B2	P0430	0703	X	X	X*3	EC-331
EVAP SMALL LEAK	P0440	0705	X	X	X*3	EC-338
PURG VOLUME CONT/V	P0443	1008	—	—	X	EC-348
VENT CONTROL VALVE	P0446	0903	—	—	X	EC-354
EVAPO SYS PRES SEN	P0450	0704	—	—	X	EC-359
VEH SPEED SEN/CIRC	P0500	0104	—	—	X	EC-365
IACV/AAC VLV/CIRC	P0505	0205	—	—	X	EC-369
CLOSED TP SW/CIRC	P0510	0203	—	—	X	EC-376
A/T COMM LINE	P0600	—	—	—	—	EC-0
ECM	P0605	0301	—	—	X	EC-384
PNP SW/CIRC	P0705	1101	—	—	X	AT-82
ATF TEMP SEN/CIRC	P0710	1208	—	—	X	AT-86
VEH SPD SEN/CIR AT	P0720	1102	—	—	X	AT-90
ENGINE SPEED SIG	P0725	1207	—	—	X	AT-93
A/T 1ST GR FNCTN	P0731	1103	—	—	X	AT-96
A/T 2ND GR FNCTN	P0732	1104	—	—	X	AT-101
A/T 3RD GR FNCTN	P0733	1105	—	—	X	AT-106
A/T 4TH GR FNCTN	P0734	1106	—	—	X	AT-111
TCC SOLENOID/CIRC	P0740	1204	—	—	X	AT-119
A/T TCC S/V FNCTN	P0744	1107	—	—	X	AT-123
L/PRESS SOL/CIRC	P0745	1205	—	—	X	AT-130
SFT SOL A/CIRC	P0750	1108	—	—	X	AT-134
SFT SOL B/CIRC	P0755	1201	—	—	X	AT-138
MAP/BAR SW SOL/CIR	P1105	1302	—	—	X	EC-386
SWRL CONT S/V	P1130	1004	—	—	X	EC-395
SWL CON VC SW	P1165	0112	—	—	X	EC-410

*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				
CLOSED LOOP-B1	P1148	0307	—	—	X	EC-408
CLOSED LOOP-B2	P1168	0308	—	—	X	EC-408
IGN SIGNAL-PRIMARY	P1320	0201	—	—	X	EC-415
CPS/CIRCUIT (REF)	P1335	0407	—	—	X	EC-422
CPS/CIRC (OBD) COG	P1336	0905	—	—	X	EC-428
EGR TEMP SEN/CIRC	P1401	0305	—	—	X	EC-435
EGR SYSTEM	P1402	0514	X	X	X*3	EC-441
EVAP SMALL LEAK	P1440	0213	X	X	X*3	EC-449
PURG VOLUME CONT/V	P1444	0214	—	—	X	EC-459
VENT CONTROL VALVE	P1446	0215	—	—	X	EC-466
EVAP PURG FLOW/MON	P1447	0111	X	X	X*3	EC-471
VENT CONTROL VALVE	P1448	0309	—	—	X	EC-477
VC/V BYPASS/V	P1490	0801	—	—	X	EC-483
VC CUT/V BYPASS/V	P1491	0311	—	—	X	EC-488
A/T DIAG COMM LINE	P1605	0804	—	—	X	EC-381
TP SEN/CIRC A/T	P1705	1206	—	—	X	AT-142
P-N POS SW/CIRCUIT	P1706	1003	—	—	X	EC-493
O/R CLTCH SOL/CIRC	P1760	1203	—	—	X	AT-148

*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.

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

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

-  Selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT
 -  Selecting Mode 4 with GST (Generic Scan Tool)
 -  Changing the diagnostic test mode from Diagnostic Test Mode II to Mode I by turning the mode selector on the ECM (Refer to EC-65.)
- **If the battery terminal is disconnected, the emission-related diagnostic information will be lost within 24 hours.**
 - **When you erase the emission-related diagnostic information, using CONSULT or GST is easier and quicker than switching the mode selector on the ECM.**

The following data are cleared from the ECM memory in the mode obtained.

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

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

How to erase DTC (With CONSULT)

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 10 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).

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

How to erase DTC (With CONSULT)

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

SELECT SYSTEM
ENGINE
A/T

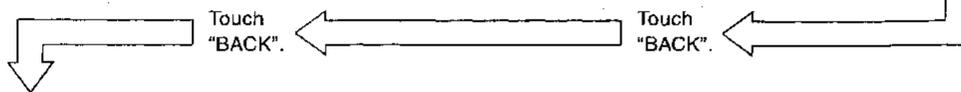
2. Turn CONSULT "ON", and touch "A/T".

SELECT DIAG MODE
SELF-DIAG RESULTS
DATA MONITOR
DTC WORK SUPPORT
TCM PART NUMBER

3. Touch "SELF-DIAG RESULTS".

SELF-DIAG RESULTS
FAILURE DETECTED
SHIFT SOLENOID/V A
ERASE
PRINT
FFdata

4. Touch "ERASE". (The DTC in the TCM will be erased.)



SELECT SYSTEM
ENGINE
A/T

5. Touch "ENGINE".

SELECT DIAG MODE
WORK SUPPORT
SELF-DIAG RESULTS
DATA MONITOR
ACTIVE TEST
DTC CONFIRMATION
ECM PART NUMBER

6. Touch "SELF-DIAG RESULTS".

SELF-DIAG RESULTS
FAILURE DETECTED
SFT SOL A/CIRC
[P0750]
TIME
0
ERASE
PRINT
FFdata

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

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How to erase DTC (With GST)

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

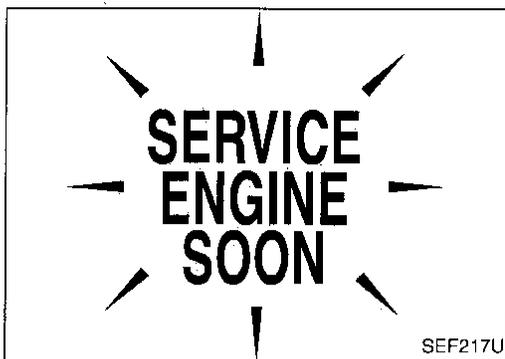
1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)" in AT section titled "TROUBLE DIAGNOSIS", "Self-diagnosis". (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with GST (Generic Scan Tool).

How to erase DTC (No Tools)

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

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)" in AT section titled "TROUBLE DIAGNOSIS", "Self-diagnosis". (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. (See EC-65.)

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Malfunction Indicator Lamp (MIL)

The MIL is located on the instrument panel.

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is for checking the blown lamp.
 - If the malfunction indicator lamp does not light up, refer to EL section "WARNING LAMPS". Or see EC-539.
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.). If the MIL does not come on, check MIL circuit and ECM test mode selector. (See next page.)
2. **MALFUNCTION WARNING** : This is a usual driving condition. When a malfunction is detected twice (2 trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected.

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" [except for crankshaft position sensor (REF) circuit]

Diagnostic Test Mode II

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

MIL flashing without DTC

If the ECM is in Diagnostic Test Mode II, MIL may flash when 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 next page.)

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

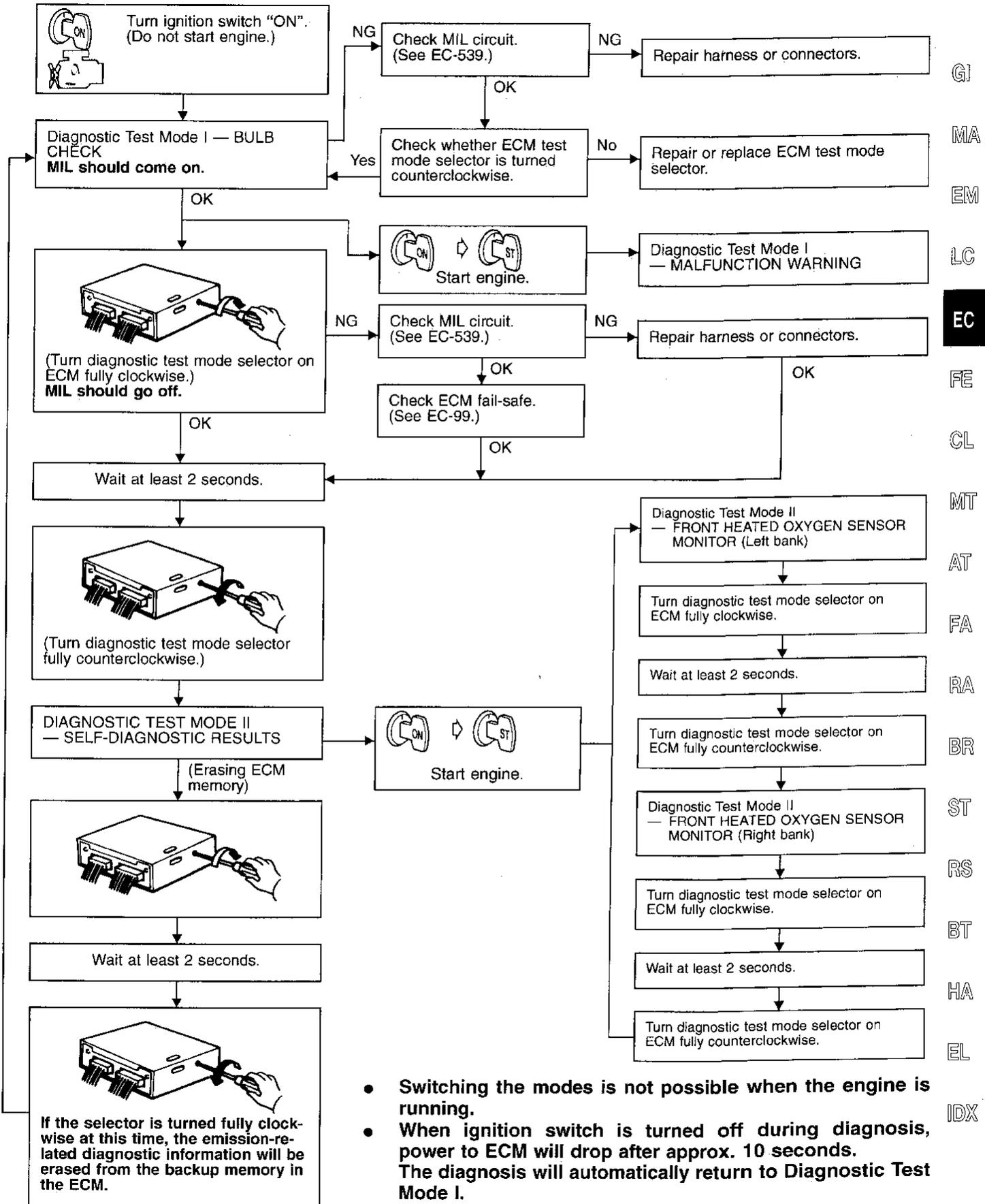
1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



- Switching the modes is not possible when the engine is running.
- When ignition switch is turned off during diagnosis, power to ECM will drop after approx. 10 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. (Refer to WARNING LAMPS AND CHIME in EL section or see EC-539.)

DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

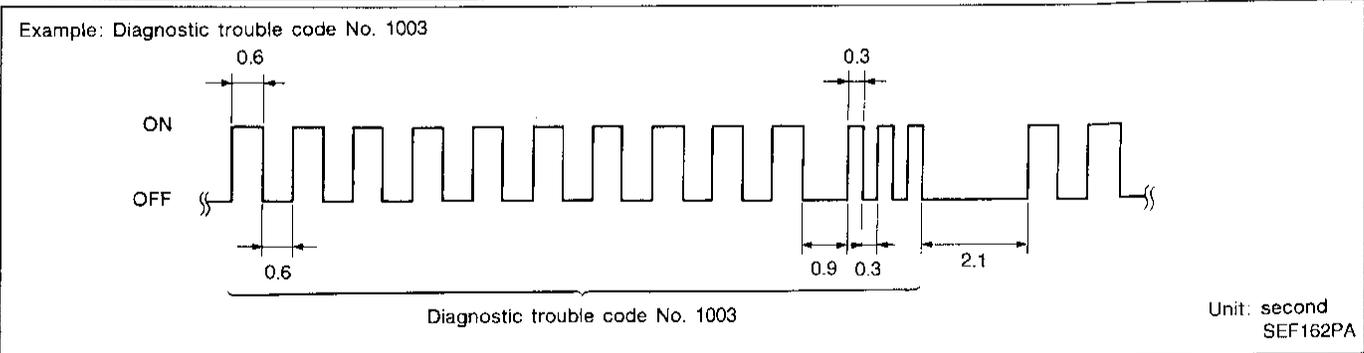
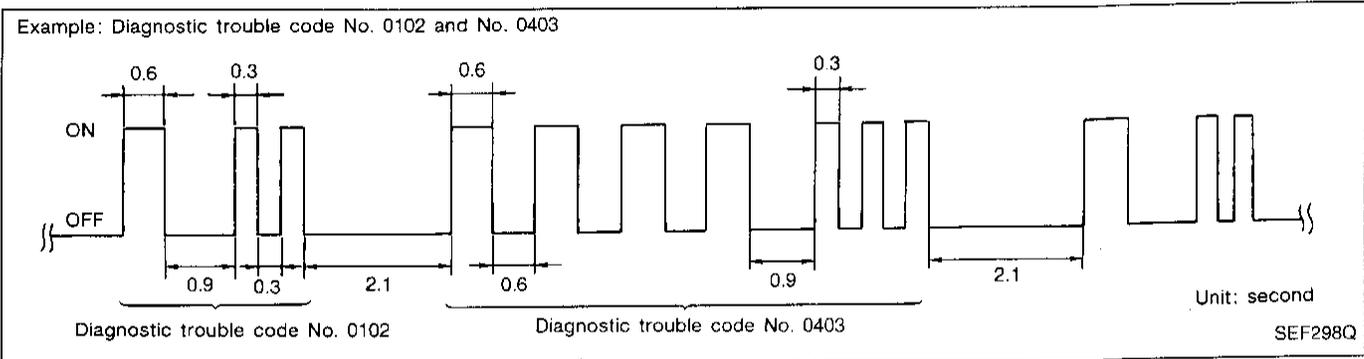
MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction

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

DIAGNOSTIC TEST MODE II—SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MALFUNCTION INDICATOR LAMP.

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



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

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

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

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

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

DIAGNOSTIC TEST MODE II—FRONT HEATED OXYGEN SENSOR MONITOR

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

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

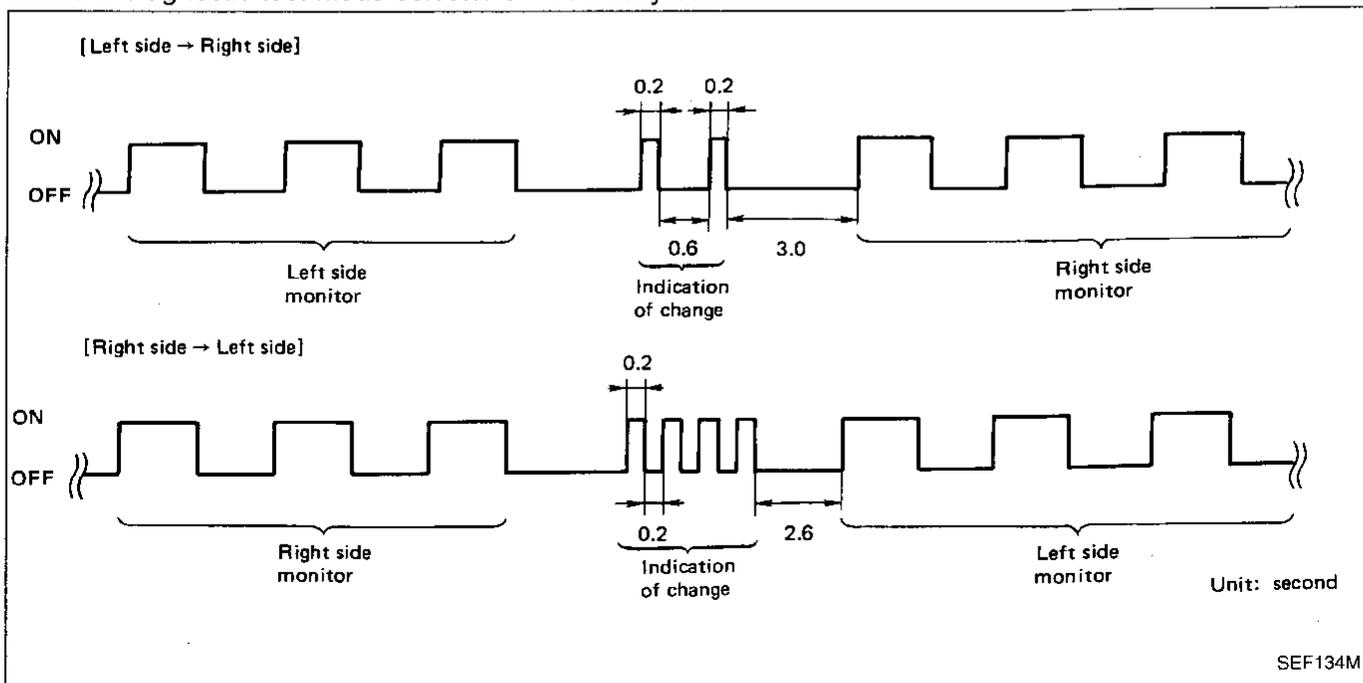
*: Maintains conditions just before switching to open loop.

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

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

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

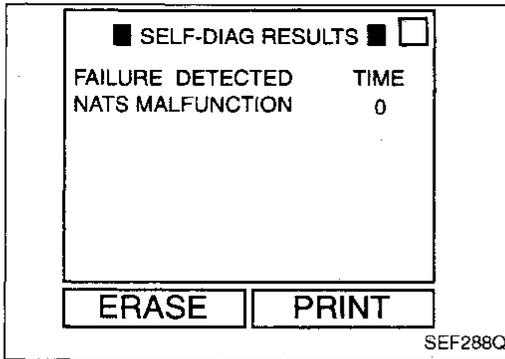
- The following procedure should be performed while the engine is running.
1. Turn diagnostic test mode selector on ECM fully clockwise.
 2. Wait at least 2 seconds.
 3. Turn diagnostic test mode selector on ECM fully counterclockwise.



ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

NVIS (NISSAN 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 "NVIS (NISSAN 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-50.
- 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 can be displayed 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 can be displayed 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 in response to the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in "OK" for the 2nd trip.

SUMMARY CHART

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

For details about patterns "B" and "C" under "Fuel Injection System" and "Misfire", see EC-70.
For details about patterns "A" and "B" under "Other", see EC-72.

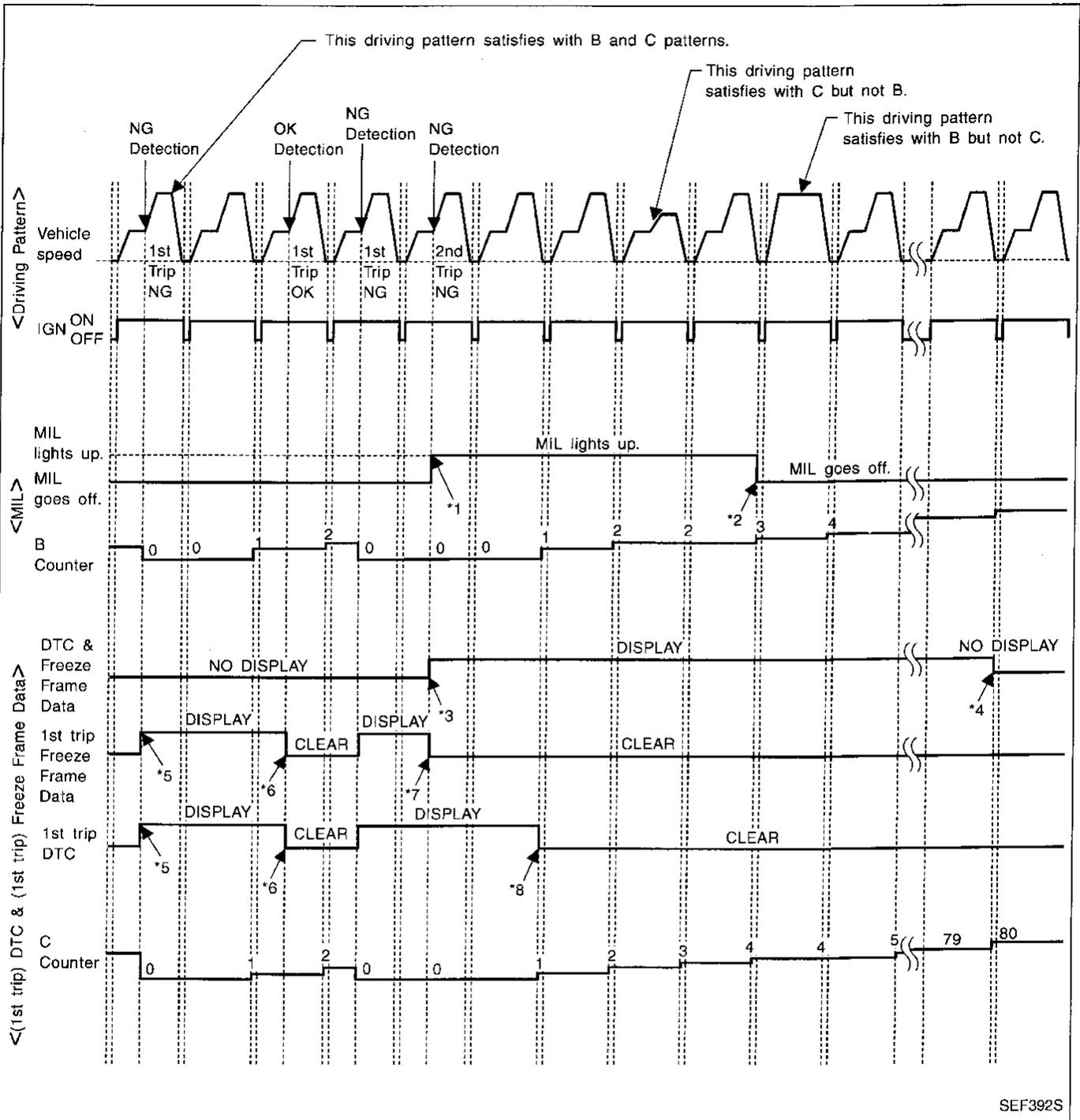
*1: Clear timing is at the moment OK is detected.

*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.

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 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 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:

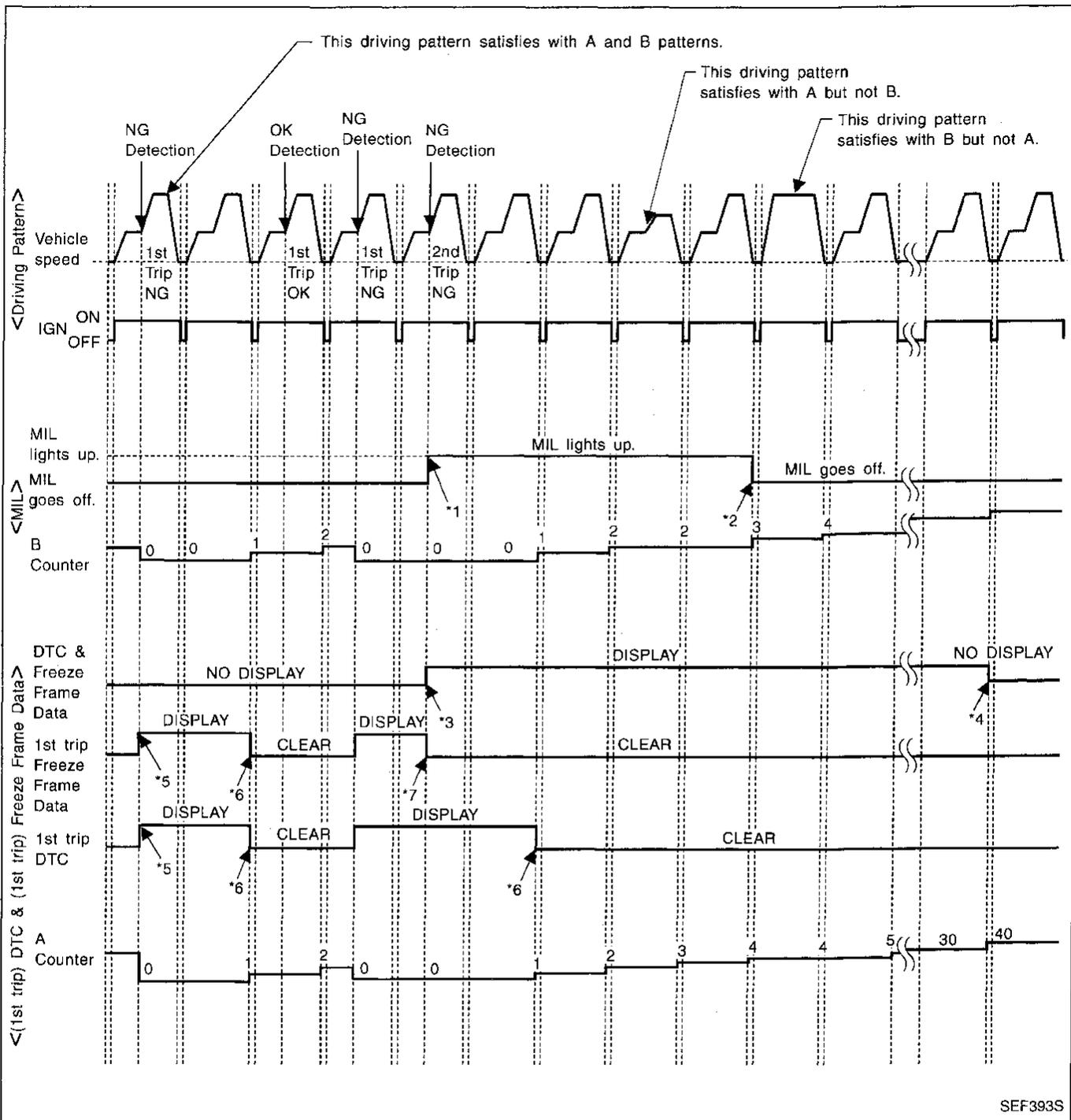
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- 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.)

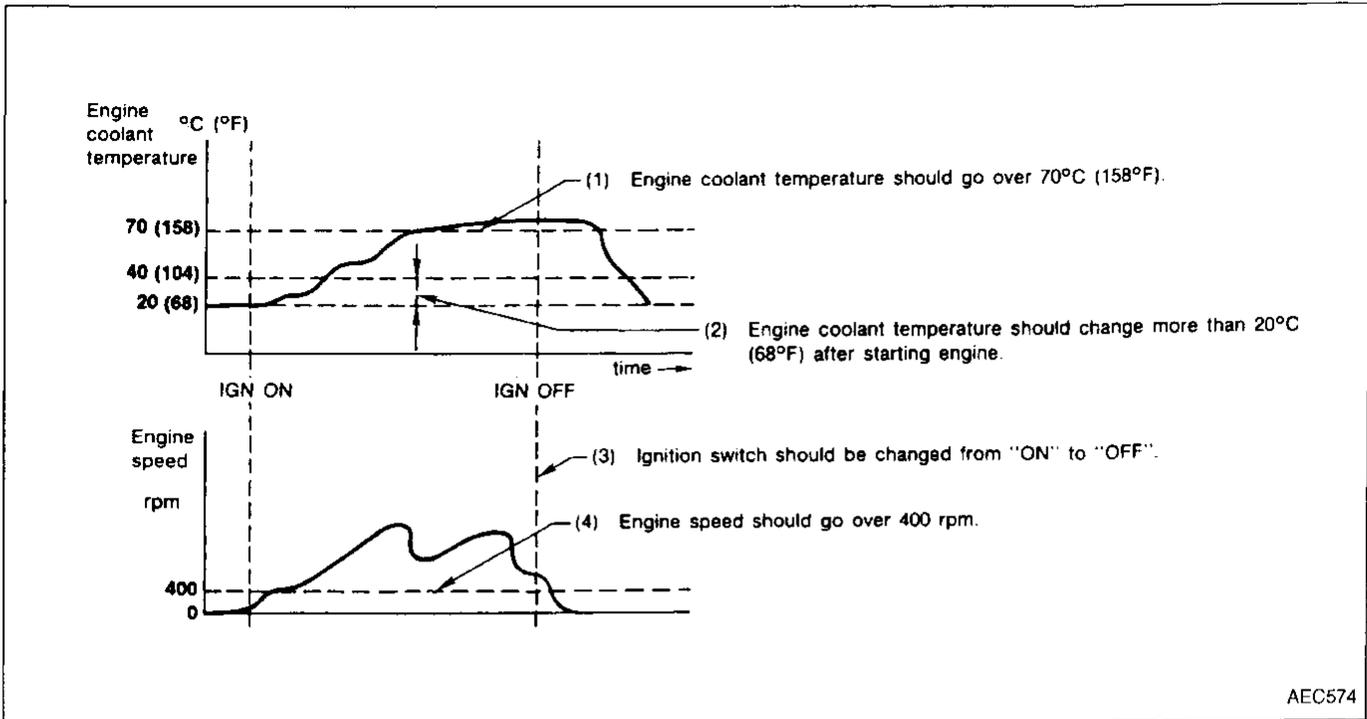
- *5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- *6: 1st trip DTC will be cleared after vehicle is driven a time (pattern B) without the same malfunction.
- *7: When the same malfunction is detected in the 2nd trip,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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

OBD System Operation Chart (Cont'd)

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

<Driving pattern A>



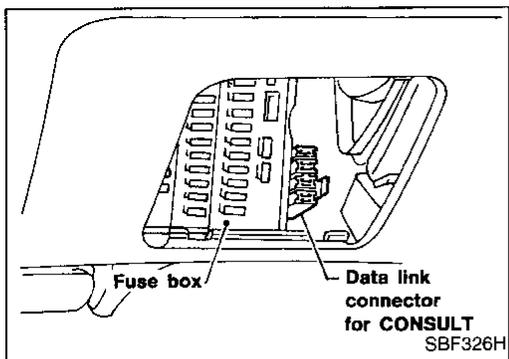
- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving pattern B>

Driving pattern B means the vehicle operation as follows:

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

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



CONSULT

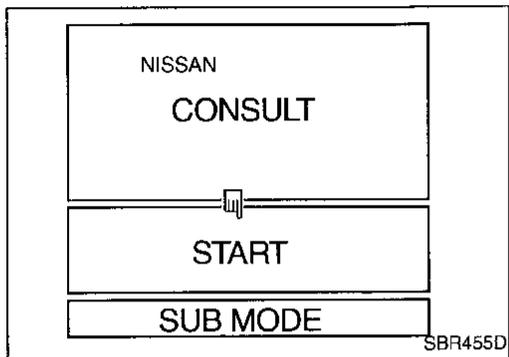
CONSULT INSPECTION PROCEDURE

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

GI

MA

EM

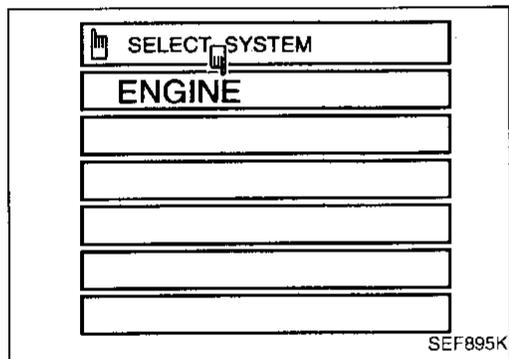


3. Turn ignition switch ON.
4. Touch "START".

LC

EC

FE



5. Touch "ENGINE".

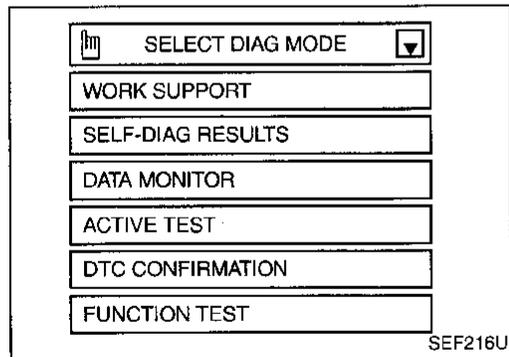
CL

MT

AT

FA

RA



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

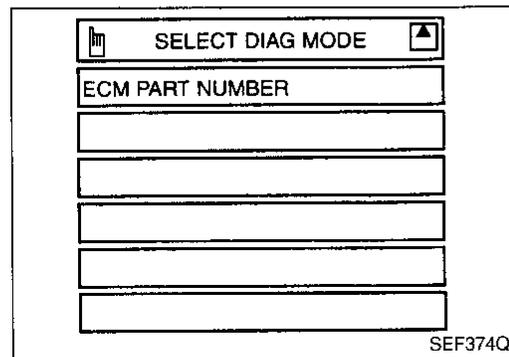
BR

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

ST

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	Crankshaft position sensor (POS)		X	X	X			
		Crankshaft position sensor (REF)		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			
		EVAP control system pressure sensor		X		X			
		Absolute pressure sensor		X	X	X			
		EGR temperature sensor		X		X			
		Intake air temperature sensor		X		X			
		Knock sensor		X					
		Start signal				X		X	
		Ignition switch				X			
		Closed throttle position switch		X					
		Closed throttle position switch (throttle position sensor signal)				X		X	
		Air conditioner switch				X			
		PNP switch		X		X		X	
	Power steering oil pressure switch				X		X		
	Battery voltage				X				
	Swirl control valve control vacuum check switch		X		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 solenoid valve			X		X	X		X	
Air conditioner relay					X				
Fuel pump relay		X			X	X	X		
EGR volume control valve			X		X	X	X	X	
Front heated oxygen sensor heater			X		X			X	
Rear heated oxygen sensor heater			X		X			X	
Cooling fan			X		X	X	X		
EVAP canister vent control valve			X		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				
Swirl control valve control solenoid valve			X		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-52.

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 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

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*2	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*1	<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*1	<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: Regarding A32 model, "B1" indicates right bank and "B2" indicates left bank.

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CKPS-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). 	
CKPS-RPM (REF) [rpm]	○		<ul style="list-style-type: none"> Indicates the engine speed computed from the REF signal (120° signal) of the crankshaft position sensor (REF). 	<ul style="list-style-type: none"> The accuracy of detection becomes poor if engine speed drops below the idle rpm. If the signal is interrupted while the engine is running, an abnormal value may be indicated.
POS COUNT	○	○	<ul style="list-style-type: none"> Indicates the number of signal plate (fly-wheel) cogs (tooth) during engine 1 revolution. 	
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.
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.
FR O2 SEN-B2 [V]	○	○	<ul style="list-style-type: none"> The signal voltage of the front heated oxygen sensor is displayed. 	
FR O2 SEN-B1 [V]	○			
RR O2 SEN-B1 (For California)	○	○	<ul style="list-style-type: none"> The signal voltage of the rear heated oxygen sensor is displayed. 	
RR O2 SEN-B2 (For California)	○			
RR O2 SENSOR [V] (Except for California)	○	○		
FR O2 MNTR-B2 [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.
FR O2 MNTR-B1 [RICH/LEAN]	○	○		
RR O2 MNTR-B1 (For California)	○		<ul style="list-style-type: none"> Display of rear heated oxygen sensor signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large. 	<ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated.
RR O2 MNTR-B2 (For California)	○	○		
RR O2 MNTR [RICH/LEAN] (Except for California)	○			
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. 	

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically. Regarding A32 model, "B1" indicates right bank and "B2" indicates left bank.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
BATTERY VOLT [V]	○	○	<ul style="list-style-type: none"> The power supply voltage of ECM is displayed. 	
THRTL POS SEN [V]	○	○	<ul style="list-style-type: none"> The throttle position sensor signal voltage is displayed. 	
FUEL TEMP SEN [°C] or [°F]	○		<ul style="list-style-type: none"> The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed. 	
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. 	
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 of the throttle position sensor. 	
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"> Indicates [ON/OFF] condition from the electrical load signal and/or lighting switch. ON ... rear defogger is operating and/or lighting switch is on. OFF ... rear defogger is not operating and lighting switch is not on. 	
IGNITION SW [ON/OFF]	○		<ul style="list-style-type: none"> Indicates [ON/OFF] condition from ignition switch. 	
SWL CON VC SW*			<ul style="list-style-type: none"> Indicates [ON/OFF] condition from the swirl control valve control vacuum check switch. ON ... Swirl control valve is not operational. OFF ... Swirl control valve is operational. 	
INJ PULSE-B2 [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-B1 [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/V control value computed by ECM according to the input signals. 	

NOTE:

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

Regarding A32 model, "B1" indicates right bank and "B2" indicates left bank.

*: If this item is not available in CONSULT, use "ECM Terminals and Reference Value", EC-108.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks	
PURG VOL C/V [%]			<ul style="list-style-type: none"> Indicates the EVAP canister purge volume control solenoid valve computed by the ECM according to the input signals. The opening becomes larger as the value increases. 		GI MA
ENGINE MOUNT [IDLE/TRVL]		○	<ul style="list-style-type: none"> The control condition of the front engine mounting (computed by the engine control module according to the input signals) is indicated. IDLE ... Idle condition TRVL ... Driving condition 		EM LC
A/F ALPHA-B2 [%]			<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. 	EC
A/F ALPHA-B1 [%]					
EVAP SYS PRES [V]			<ul style="list-style-type: none"> The signal voltage of EVAP control system pressure sensor is displayed. 		FE
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. 		CL
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. 		MT
SWRL CONT S/V [ON/OFF]			<ul style="list-style-type: none"> The control condition of the swirl control valve control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... Swirl control valve is closed. OFF ... Swirl control valve is opened. 		AT FA
COOLING FAN [HI/LOW/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 LOW ... Low speed operation OFF ... Stop 		RA BR
EGR VOL CON/V [step]			<ul style="list-style-type: none"> Indicates the EGR volume control valve computed by the ECM according to the input signals. The opening becomes larger as the value increases. 		ST RS
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 		BT HA

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically. Regarding A32 model, "B1" indicates right bank and "B2" indicates left bank.

GI

MA

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IDX

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
FR O2 SEN HTR-B1 [ON/OFF]			<ul style="list-style-type: none"> Indicates [ON/OFF] condition of heated oxygen sensor's heater determined by ECM according to the input signals. 	
FR O2 SEN HTR-B2 [ON/OFF]				
RR O2 SEN HTR-B1 [ON/OFF] (For Cali- fornia)				
RR O2 SEN HTR-B2 [ON/OFF] (For California)				
RR O2 SEN HEATER [ON/OFF] (Except for California)				
VC/V 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 	
CAL/LD VALUE [%]			<ul style="list-style-type: none"> "Calculated load value" indicates the value of the current airflow divided by peak airflow. 	
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. 	
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. 	
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.

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically. Regarding A32 model, "B1" indicates right bank and "B2" indicates left bank.

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 step.	<ul style="list-style-type: none"> Harness and connector IACV-AAC valve 	MA EM
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 	LC
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"> Camshaft position sensor (PHASE) Crankshaft position sensor (REF) Crankshaft position sensor (POS) 	EC FE
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 Power transistor Spark plugs Ignition coils 	CL MT
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 for operating sound. 	Fuel pump relay makes the operating sound.	<ul style="list-style-type: none"> Harness and connector Fuel pump relay 	FA RA
EGR VOLUME CONTROL VALVE	<ul style="list-style-type: none"> Engine: After warming up, idle the engine. Change the EGR volume control valve opening step using CONSULT. 	Engine speed changes according to the opening step.	<ul style="list-style-type: none"> Harness and connector EGR volume control valve 	BR
SWIRL CONT SOL VALVE	<ul style="list-style-type: none"> Ignition switch: ON Turn solenoid valve "ON" and "OFF" with CONSULT and listen for operating sound. 	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> Harness and connector Solenoid valve 	ST RS
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. 			
ENGINE MOUNTING	<ul style="list-style-type: none"> Engine: After warming up, run engine at idle speed. Gear position: "D" range (Vehicle stopped) Turn front engine mounting "IDLE" and "TRAVEL" with the CONSULT. 	Body vibration changes according to the front engine mounting condition.	<ul style="list-style-type: none"> Harness and connector Front engine mounting 	BT HA EL
PURG VOL CONT/V	<ul style="list-style-type: none"> Engine: After warming up, idle the engine. Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT. 	Engine speed changes according to the opening percent.	<ul style="list-style-type: none"> Harness and connector EVAP canister purge volume control solenoid valve 	IDX

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
VENT CONTROL/V	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn the EVAP canister vent control valve "ON" and "OFF" using CONSULT and listen for operating sound. 	EVAP canister vent control valve marks an operating sound.	<ul style="list-style-type: none"> Harness and connector EVAP canister vent control valve
VC/V BYPASS/V	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn the vacuum cut valve bypass valve "ON" and "OFF" using CONSULT and listen for operating sound. 	Vacuum cut valve bypass valve marks an operating sound.	<ul style="list-style-type: none"> Harness and connector Vacuum cut valve bypass valve
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

DTC CONFIRMATION MODE

SRT STATUS mode

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-52.

DTC WORK SUPPORT mode

TEST MODE	TEST ITEM	CONDITION	REFERENCE PAGE
EVAPORATIVE SYSTEM	PURGE FLOW P1447	Refer to corresponding trouble diagnosis for DTC.	EC-471
	VC CUT/V BP/V P1491		EC-488
	PURG VOL CN/V P1444		EC-459
	EVAP SML LEAK P0440		EC-338
	EVAP SML LEAK P1440		EC-449
FR O2 SENSOR	FR O2 SEN-B1 P0131		EC-174
	FR O2 SEN-B1 P0132		EC-180
	FR O2 SEN-B1 P0133		EC-186
	FR O2 SEN-B1 P0130		EC-166
	FR O2 SEN-B2 P0151		EC-174
	FR O2 SEN-B2 P0152		EC-180
	FR O2 SEN-B2 P0153		EC-186
	FR O2 SEN-B2 P0150		EC-166
RR O2 SENSOR	RR O2 SEN-B1 P0137		EC-210
	RR O2 SEN-B1 P0138		EC-219
	RR O2 SEN-B1 P0139		EC-227
	RR O2 SEN-B2 P0157		EC-210
	RR O2 SEN-B2 P0158		EC-219
	RR O2 SEN-B2 P0159		EC-227
	RR O2 SENSOR P0137		EC-242
	RR O2 SENSOR P0138	EC-249	
	RR O2 SENSOR P0139	EC-256	
EGR SYSTEM	EGR SYSTEM P0400	EC-441	
	EGR SYSTEM P1402	EC-441	

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 CL
PARK/NEUT POSI SW CKT	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) PNP switch circuit is tested when shift lever is manipulated. 	Out of N/P positions	OFF	<ul style="list-style-type: none"> Harness and connector PNP switch Linkage or PNP switch adjustment 	MT
		In N/P positions	ON		AT
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 	FA RA
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 	BR
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 	ST RS BT HA

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
PW/ST SIGNAL CIRCUIT	<ul style="list-style-type: none"> 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"> Camshaft position sensor (PHASE) Crankshaft position sensor (REF) Crankshaft position sensor (POS)
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, power transistor, ignition coil, harness or connector) VACUUM SYS (Intake air leaks) Front heated oxygen sensor circuit Front heated oxygen sensor operation Fuel pressure high or low Mass air flow sensor
POWER BALANCE	<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, power transistor, ignition coil, 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)

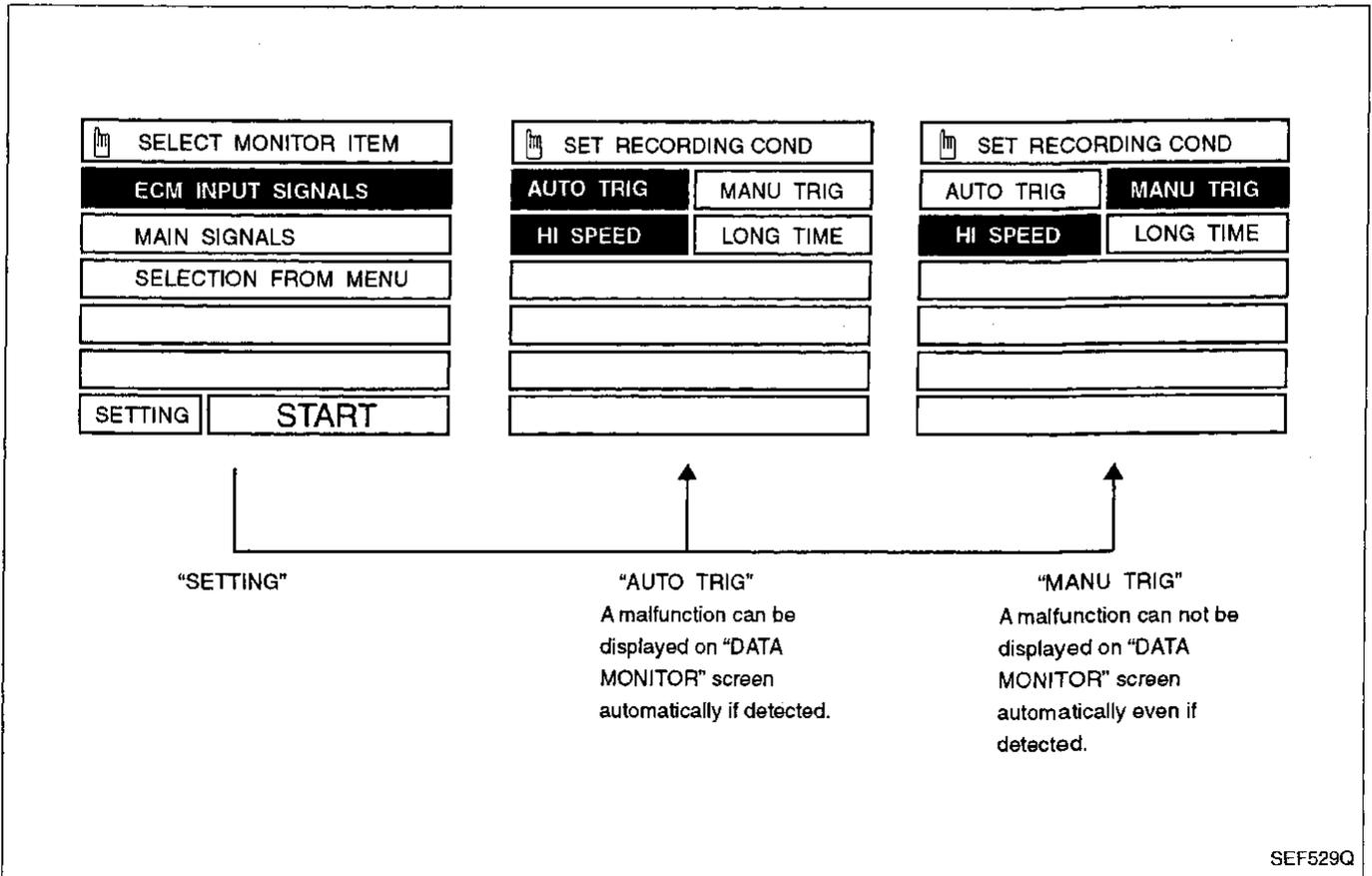
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (Recording vehicle data)

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

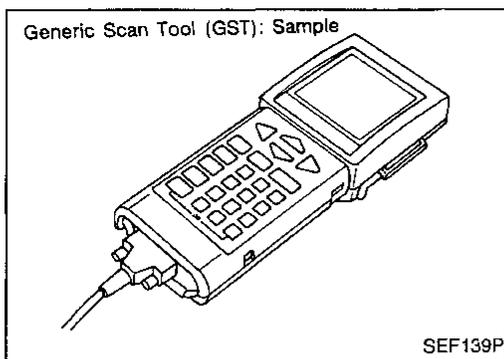
1. "AUTO TRIG" (Automatic trigger):
 - The malfunction will be identified on the CONSULT screen in real time. In other words, DTC/1st trip DTC and malfunction item will be displayed at the moment the malfunction is detected by ECM.
 - DATA MONITOR can be performed continuously until a malfunction is 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.



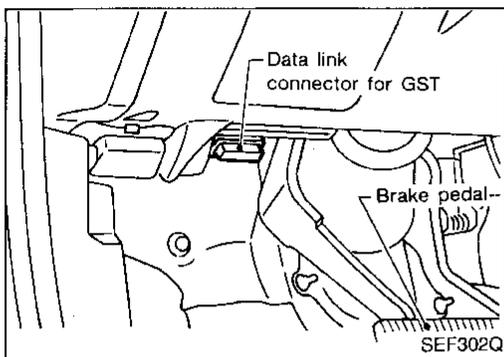
ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION



Generic Scan Tool (GST)

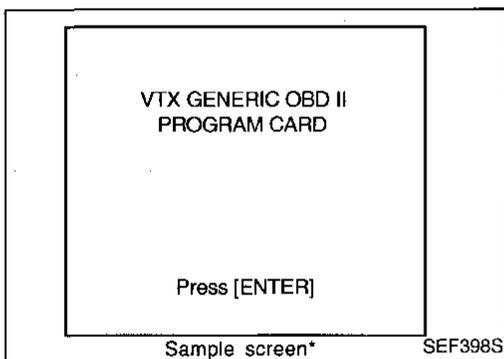
DESCRIPTION

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

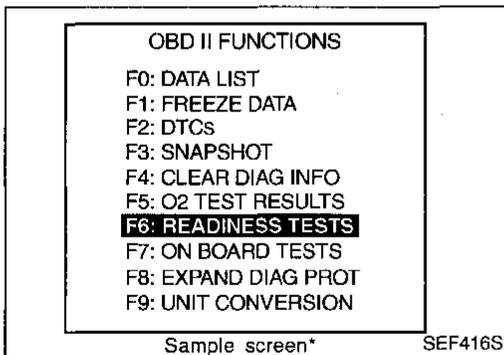


GST INSPECTION PROCEDURE

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



3. Turn ignition switch ON.
4. Enter the program according to instruction on the screen or in the operation manual.
(*: Regarding GST screens in this section, sample screens are shown.)



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

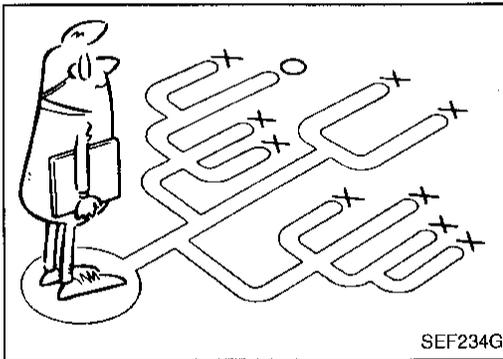
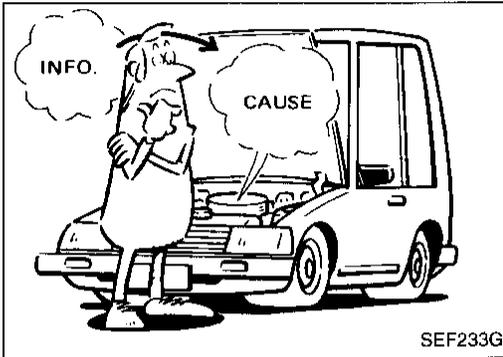
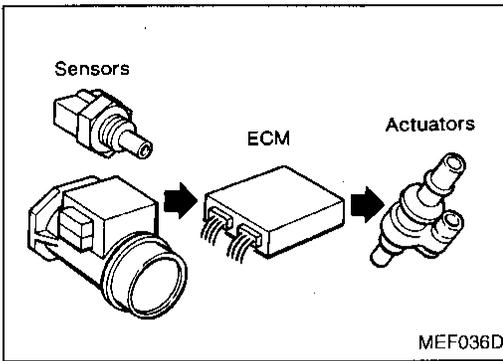
For further information, see the GST Operation Manual of the tool maker.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Generic Scan Tool (GST) (Cont'd)

FUNCTION

Diagnostic test mode		Function	
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.	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-76).]	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.	CL
MODE 8	—	This mode can close EVAP system in ignition switch "ON" position (Engine stopped). When this mode is performed, 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 	MT AT FA RA BR ST RS BT HA EL IDX



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", EC-90.

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 trouble-shooting 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 on next page in order to organize all the information for troubleshooting.

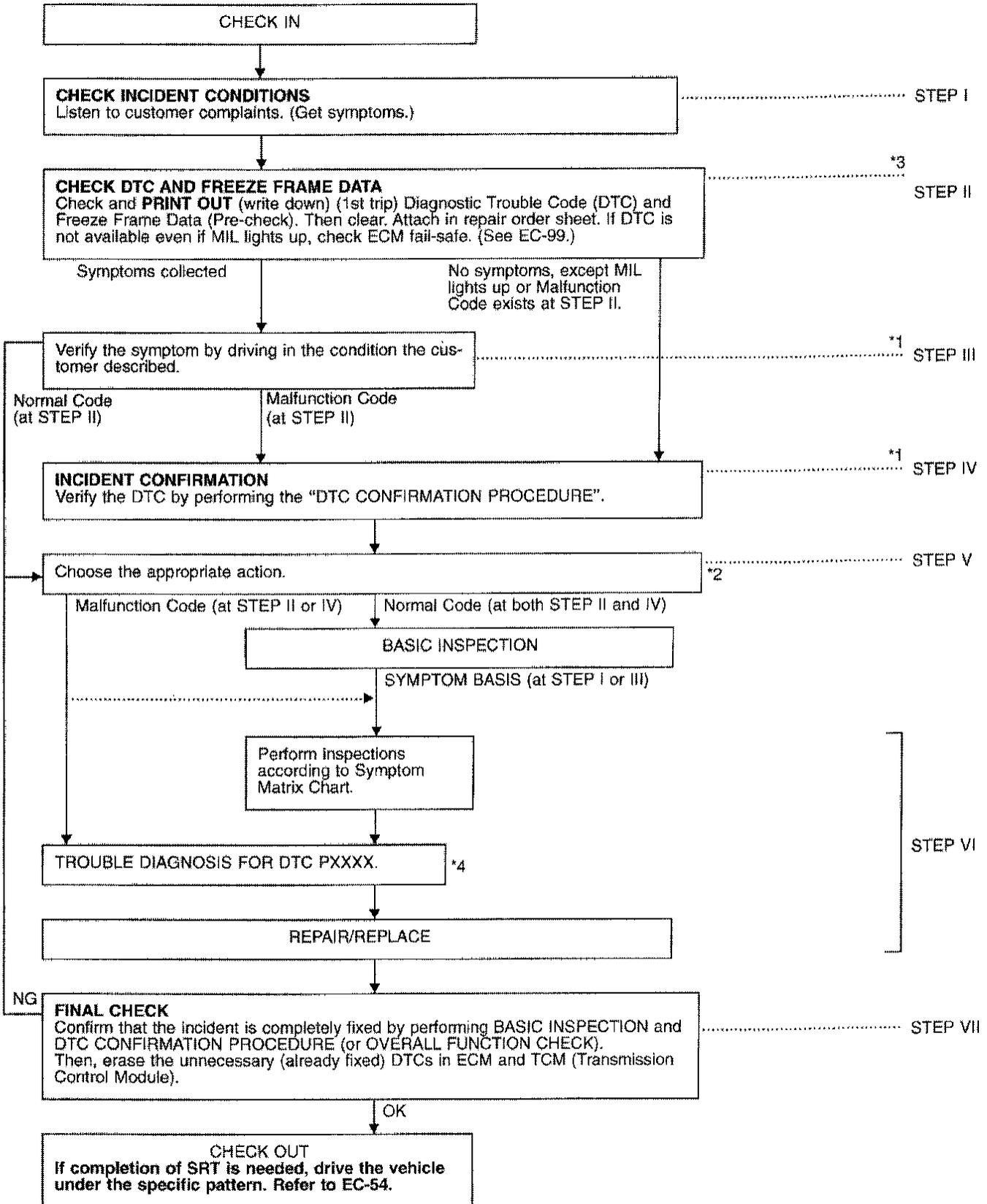
Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected.

Examples:

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

TROUBLE DIAGNOSIS — General Description

Work Flow



*1: If the incident cannot be duplicated, refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

*2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit (See TROUBLE DIAGNOSIS FOR POWER SUPPLY, EC-117).

*3: If time data of "SELF-DIAG RESULTS" is other than "0" or "1t", refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT", EC-116.

*4: If the malfunction part cannot be found, refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

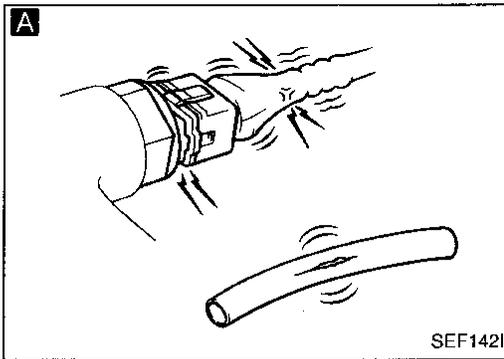
TROUBLE DIAGNOSIS — General Description

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" as shown on the next page.	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-62.) 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-100.)	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 Diagnostic Trouble Code (DTC) 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 CL MT
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-92.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-100.)	AT FA
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-103. 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.	RA BR ST
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-62.)	RS BT HA

EL

IDX

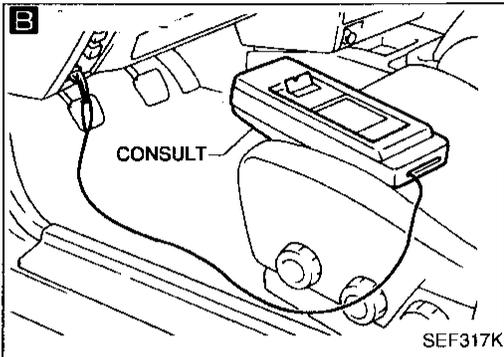


Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

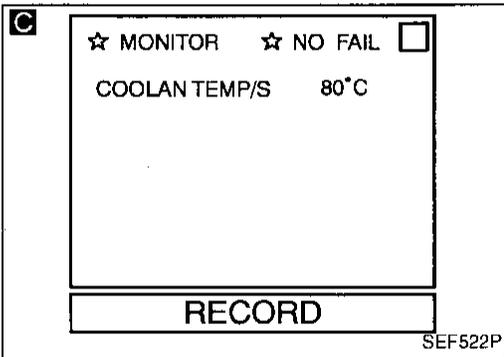
- Headlamp switch is OFF,
- Air conditioner switch is OFF,
- Rear window defogger switch is OFF,
- Steering wheel is in the straight-ahead position, etc.



A

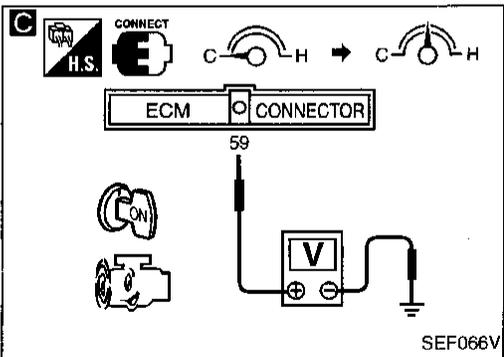
BEFORE STARTING

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 proper connections
 - Vacuum hoses for splits, kinks, and proper connections
 - Wiring for proper 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.



C

CHECK FI CAM FUNCTION

1. Warm up engine to 75°C (167°F).
2. Stop engine and wait at least 10 seconds then turn ignition switch "ON".
3. Select "COOLAN TEMP/S" in "DATA MONITOR MODE" with CONSULT.
4. Check the FI cam when the engine coolant temperature is 75 to 85°C (167 to 185°F). Make sure that the center of mark (A) is aligned with mark (B) as shown in the figure.

OR

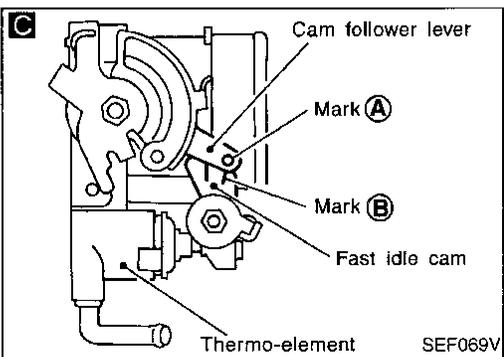
2. Stop engine and wait at least 10 seconds then turn ignition switch "ON".
3. Select "MODE 1" WITH GST.
4. Check the FI cam when the engine coolant temperature is 75 to 85°C (167 to 185°F). Make sure that the center of (A) is aligned with mark (B) as shown in the figure.

OR

NO TOOLS

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal (59) (Engine coolant temperature sensor signal) and ground.
3. Warm up engine until the voltage is 1.36V.
4. Turn ignition switch "OFF".
5. With the voltage between 1.10 to 1.36V, make sure that the center of mark (A) is aligned with mark (B) as shown in the figure.

NG → Check FI cam, refer to "Fast Idle Cam (FIC) Inspection and Adjustment" in "BASIC SERVICE PROCEDURE", EC-39.



OK

↓

(A)

TROUBLE DIAGNOSIS — General Description

Basic Inspection (Cont'd)

D

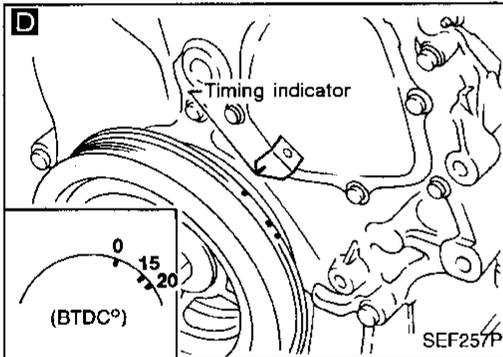
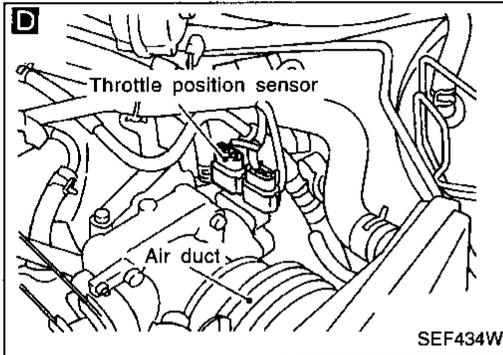
IACV-AAC/V ADJ

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*2:
15°±2° BTDC

OR

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

Ignition timing*2:
15°±2° BTDC

NG → Check camshaft position sensor (PHASE) (EC-311), crankshaft position sensor (REF) (EC-422), and crankshaft position sensor (POS) (EC-304).

*1 DTC P1705 (DTC 1206) is stored in ECM and TCM in this step. Be sure to erase DTC after completing the procedure.

*2 Only check ignition timing as the timing is not adjustable.

E

CHECK BASE IDLE SPEED.

1. Select "IACV-AAC/V ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine speed fall to

M/T: 575±50 rpm
A/T: 650±50 rpm
(in "P" or "N" position)?

OR

Does engine run at

M/T: 575±50 rpm
A/T: 650±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 "BASIC SERVICE PROCEDURE", EC-42.

OK

B

(Go to next page.)

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TROUBLE DIAGNOSIS — General Description

Basic Inspection (Cont'd)

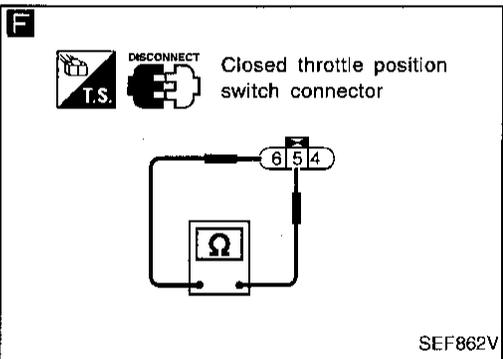
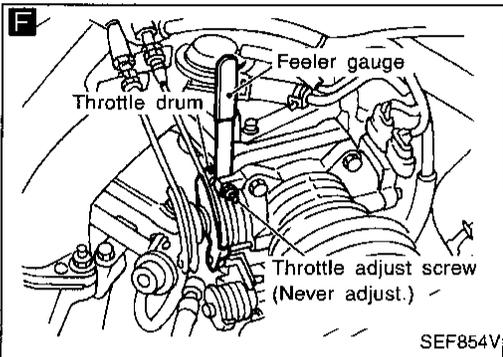
ⓑ

F

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CLSD THL/P SW	ON	

RECORD

SEF577W



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. Turn ignition switch "ON".
5. Select "DATA MONITOR" mode with CONSULT.
6. Select "CLSD THL/P SW" from the menu.
7. Read "CLSD THL/P SW" signal under the following conditions.

● Insert a 0.3 mm (0.012 in) and 0.4 mm (0.016 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 0.3 mm (0.012 in) feeler gauge.

"CLSD THL/P SW" signal should remain "OFF" while inserting 0.4 mm (0.016 in) feeler gauge.

OR



4. Disconnect closed throttle position switch harness connector.
5. Connect the tester probe to closed throttle position switch terminals ⑤ and ⑥.
6. Check harness continuity under the following conditions.

● Insert the 0.3 mm (0.012 in) and 0.4 mm (0.016 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 0.3 mm (0.012 in) feeler gauge.

"Continuity should not exist" while inserting 0.4 mm (0.016 in) feeler gauge.

NG

G

ADJUSTMENT

Refer to "THROTTLE POSITION SENSOR IDLE POSITION ADJUSTMENT".
Go to last page (after inspection end).

OK

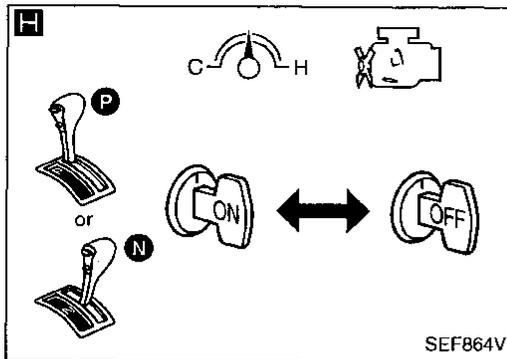
OK

Ⓒ

(Go to next page.)

TROUBLE DIAGNOSIS — General Description

Basic Inspection (Cont'd)



ⓐ

- ⓧ 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.

ⓑ

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 10 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.

CHECK TARGET IDLE SPEED.

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

M/T: 625±50 rpm
A/T: 700±50 rpm
 (in "P" or "N" position)

OR

ⓧ Check target idle speed.

M/T: 625±50 rpm
A/T: 700±50 rpm
 (in "P" or "N" position)

NG → Adjust idle speed. Refer to "Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment" in "BASIC SERVICE PROCEDURE", EC-42.

OK ↓

ⓧ **ERASE DTC MEMORY.**

After this inspection, unnecessary diagnostic trouble code No. might be stored or displayed. Erase the stored memory in ECM and TCM. Refer to "How to erase DTC" in "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" and A/T section ("Self-diagnosis", "TROUBLE DIAGNOSES").

INSPECTION END

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TROUBLE DIAGNOSIS — General Description

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.
4. Loosen throttle position sensor fixing bolts.



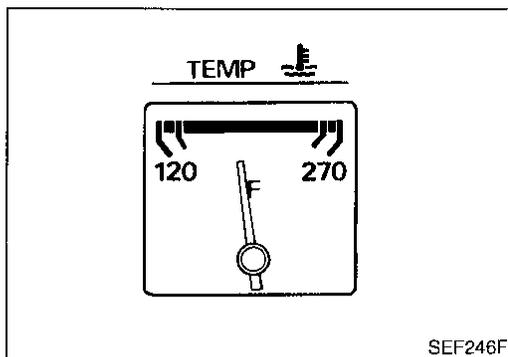
5. Turn ignition switch "ON".
6. Select "DATA MONITOR" mode with CONSULT.
7. Select "CLSD THL/P SW" from the menu.
8. Read "CLSD THL/P SW" signal under the following conditions.
 - Insert 0.3 mm (0.012 in) feeler gauge between throttle adjust screw and throttle drum as shown in the figure and check the 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".)
9. 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.**
10. Make sure the signal is "ON" when the throttle valve is closed and "OFF" when it is opened. Repeat it 2 or 3 times.
11. Remove 0.3 mm (0.012 in) feeler gauge then insert 0.4 mm (0.016 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.
12. Tighten throttle position sensor. Check that the "CLSD THL/P 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.

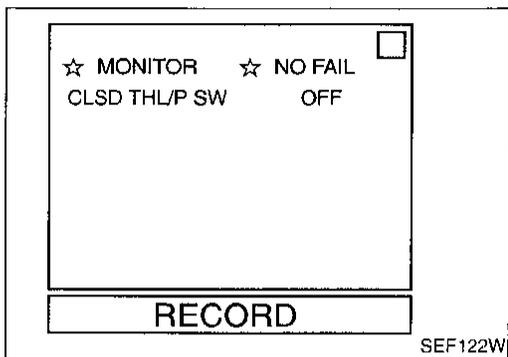
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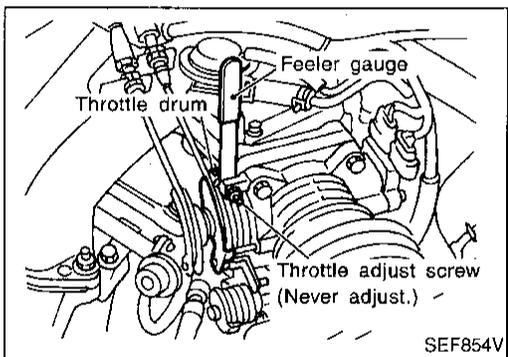
5. Disconnect closed throttle position sensor harness connector.
6. Connect tester probe to the closed throttle position switch terminals ⑤ and ⑥ and check continuity under the following conditions.
 - Insert the 0.3 mm (0.012 in) feeler gauge between the throttle adjust screw and throttle drum as shown 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.**
7. Temporarily tighten sensor body fixing bolts as follows.



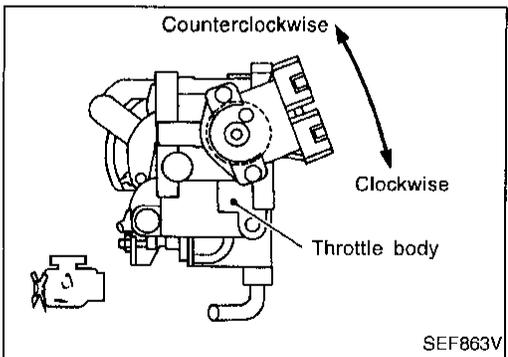
SEF246F



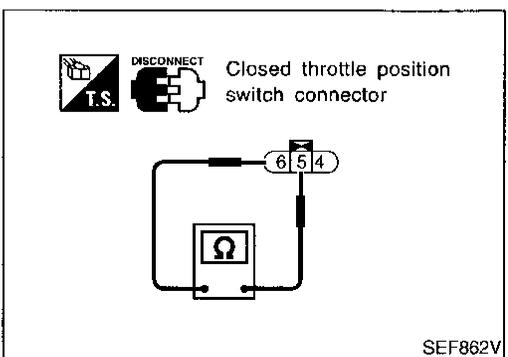
SEF122W



SEF854V



SEF863V



SEF862V

TROUBLE DIAGNOSIS — General Description

Basic Inspection (Cont'd)

- Gradually move the sensor body clockwise and stop it when the continuity comes to exist, then tighten sensor body fixing bolts.
- 8. 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.
- 9. Remove 0.3 mm (0.012 in) feeler gauge then insert 0.4 mm (0.016 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.
- 10. 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  RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY.**

GI

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IDX

TROUBLE DIAGNOSIS — General Description

Diagnostic Trouble Code (DTC) Inspection Priority Chart

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

Priority	Detected items (DTC)
1	<ul style="list-style-type: none"> ● P0100 Mass air flow sensor (0102) ● P0110 Intake air temperature sensor (0401) ● P0115 P0125 Engine coolant temperature sensor (0103) (0908) ● P0120 Throttle position sensor (0403) ● P0180 Tank fuel temperature sensor (0402) ● P0325 Knock sensor (0304) ● P0335 P1336 Crankshaft position sensor (POS) (0802) (0905) ● P0340 Camshaft position sensor (PHASE) circuit (0101) ● P0403 EGR volume control valve circuit (0515) ● P0500 Vehicle speed sensor (0104) ● P0605 ECM (0301) ● P1320 Ignition signal (0201) ● P1335 Crankshaft position sensor (REF) (0407) ● P1605 A/T diagnosis communication line (0804) ● P1706 Park/Neutral position switch (1003)
2	<ul style="list-style-type: none"> ● P0105 Absolute pressure sensor (0803) ● P0130-P0134, P0150-P0154 Front heated oxygen sensor (0413-0415) (0503) (0509), (0303) (0409-0412) ● P0135 P0155 Front heated oxygen sensor heater (0901) (1001) ● P0137-P0140, P0157-P0160 Rear heated oxygen sensor (0510-0512) (0707), (0313-0315) (0708) ● P0141 P0161 Rear heated oxygen sensor heater (0902) (1002) ● P0443 P1444 EVAP canister purge volume control solenoid valve (1008) (0214) ● P0446 P1446 P1448 EVAP canister vent control valve (0903) (0215) (0309) ● P0450 EVAP control system pressure sensor (0704) ● P0510 Closed throttle position switch (0203) ● P0705-P0755 P1705 P1760 A/T related sensors, solenoid valves and switches (1101-1201) (1206) (1203) ● P1105 MAP/BARO switch solenoid valve (1302) ● P1165 Swirl control valve control vacuum check switch (0112) ● P1401 EGR temperature sensor (0305) ● P1447 EVAP control system purge flow monitoring (0111) ● P1491 P1490 Vacuum cut valve bypass valve (0311) (0801)
3	<ul style="list-style-type: none"> ● P0130 P0150 Closed loop control (0307) (0308) ● P0171 P0172 P0174 P0175 Fuel injection system function (0115) (0114) (0210) (0209) ● P0306-P0300 Misfire (0603-0701) ● P0400 P1402 EGR function (0302) (0514) ● P0420 Three way catalyst function (0702) ● P0440 P1440 EVAP control system (small leak) (0705) (0213) ● P0505 IACV-AAC valve (0205) ● P0600 Signal circuit from TCM (Transmission Control Module) to ECM (0504) ● P0731-P0734 Improper shifting (1103-1106) ● P1130 Swirl control valve control solenoid valve (1004)

TROUBLE DIAGNOSIS — General Description

Fail-Safe Chart

The ECM enters fail-safe mode, if any of the following malfunctions is 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*1																
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	<p>Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START". CONSULT displays the engine coolant temperature decided by ECM.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Condition</th> <th style="text-align: center;">Engine coolant temperature decided (CONSULT display)</th> </tr> </thead> <tbody> <tr> <td>Just as ignition switch is turned ON or Start</td> <td style="text-align: center;">40°C (104°F)</td> </tr> <tr> <td>More than 4 minutes after Ignition ON or Start</td> <td style="text-align: center;">80°C (176°F)</td> </tr> <tr> <td>Except as shown above</td> <td style="text-align: center;">40 - 80°C (104 - 176°F) (Depends on the time)</td> </tr> </tbody> </table>	Condition	Engine coolant temperature decided (CONSULT display)	Just as ignition switch is turned ON or Start	40°C (104°F)	More than 4 minutes after Ignition ON or Start	80°C (176°F)	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)						
Condition	Engine coolant temperature decided (CONSULT display)																
Just as ignition switch is turned ON or Start	40°C (104°F)																
More than 4 minutes after Ignition ON or Start	80°C (176°F)																
Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)																
P0120	0403	Throttle position sensor circuit	<p>Throttle position will be determined based on the amount of mass air flow and the engine speed. Therefore, acceleration will be poor.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Driving condition</th> </tr> </thead> <tbody> <tr> <td>When engine is idling</td> <td style="text-align: center;">Normal</td> </tr> <tr> <td>When accelerating</td> <td style="text-align: center;">Poor acceleration</td> </tr> </tbody> </table>	Driving condition	When engine is idling	Normal	When accelerating	Poor acceleration									
Driving condition																	
When engine is idling	Normal																
When accelerating	Poor acceleration																
P0403	0515	EGR volume control valve circuit	Engine speed will not rise more than 2,800 rpm due to the fuel cut.														
P1335	0407	Crankshaft position sensor (REF) circuit	Compression TDC signal (120° signal) is controlled by camshaft position sensor (PHASE) signal and crankshaft position sensor (POS) signal. Ignition timing will be delayed 0° to 2°.														
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 ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">ECM fail-safe operation</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Engine speed</td> <td style="text-align: center;">Engine speed will not rise more than 3,000 rpm.</td> </tr> <tr> <td>Fuel injection</td> <td style="text-align: center;">Simultaneous multiport fuel injection system</td> </tr> <tr> <td>Ignition timing</td> <td style="text-align: center;">Ignition timing is fixed at the preset valve.</td> </tr> <tr> <td>Fuel pump</td> <td>Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.</td> </tr> <tr> <td>IACV-AAC valve</td> <td style="text-align: center;">Full open</td> </tr> <tr> <td>Cooling fans</td> <td>Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.</td> </tr> </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 valve.	Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.	IACV-AAC valve	Full open	Cooling fans	Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.
ECM fail-safe operation																	
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Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.																
IACV-AAC valve	Full open																
Cooling fans	Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.																

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

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-524
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-37
	Injector circuit	1	1	2	3	2		2	2			2			EC-517
	Evaporative emission system	3	3	4	4	4	4	4	4	4	4	4			EC-26
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-36
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-42
	IACV-AAC valve circuit	1	1	2	3	3	2	2	2	2		2		2	EC-369
	IACV-FICD solenoid valve circuit	2	2	3	3	3	3	3	3	3		3			EC-531
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-42
	Ignition circuit	1	1	2	2	2		2	2			2			EC-415
EGR	EGR volume control valve circuit		2	2	3	3						3			EC-325
	EGR system	2	1	2	3	3	3	2	2	3		3			EC-441
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3		2	EC-117
Air conditioner circuit		2	2	3	3	3	3	3	3	3		3		2	HA section

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

(continued on next page)

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	BATTERY DEAD (UNDER CHARGE)		
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA		
Engine control														EC-422	
Crankshaft position sensor (REF) circuit	2	2												EC-304, 428	
Crankshaft position sensor (POS) circuit	2	2												EC-311	
Camshaft position sensor (PHASE) circuit	3													EC-122	
Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-166	
Front heated oxygen sensor circuit		1	2	3	2		2	2			2			EC-145, 161	
Engine coolant temperature sensor circuit	1	1	2	3	2	3	2	2	3		2			EC-150	
Throttle position sensor circuit		1	2		2	2	2	2	2		2			EC-92	
Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-365	
Vehicle speed sensor circuit		2	3		3						3			EC-300	
Knock sensor circuit			2								3			EC-384, 99	
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-522	
Start signal circuit	2													EC-493	
Park/Neutral position switch circuit			3		3		3	3			3			EC-531	
Power steering oil pressure switch circuit		2					3	3						EC-528	
Front engine mounting control circuit							3	3						EC-536	
Electrical load signal circuit							3	3							

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

(continued on next page)

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

TROUBLE DIAGNOSIS — General Description

Symptom Matrix Chart (Cont'd)

SYSTEM		SYMPTOM														Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)		
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA		
Fuel	Fuel tank	5													FE section	
	Fuel piping			5	5	5		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															
	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					FE section	
	Air leakage from intake manifold/Collector/Gasket															
Cranking	Battery	1	1	1		1		1	1			1		1	EL section	
	Alternator circuit															
	Starter circuit	3													EM section	
	Flywheel/Drive plate	6													AT section	
	PNP switch	4														
Engine	Cylinder head	5	5	5	5	5		5	5			5	3			
	Cylinder head gasket										4					
	Cylinder block															
	Piston												4			
	Piston ring	6	6	6	6	6		6	6			6			EM section	
	Connecting rod															
	Bearing															
	Crankshaft															
Valve mechanism	Timing chain															
	Camshaft	5	5	5	5	5		5	5			5				
	Intake valve												3			
	Exhaust valve															
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5	5	5		5					FE section	
	Three way catalyst															
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			MA, EM, LC section	
	Oil level (Low)/Filthy oil															
Cooling	Radiator/Hose/Radiator filler cap															
	Thermostat										5				LC section	
	Water pump															
	Water gallery	5	5	5	5	5		5	5		4	5				
	Cooling fan														EC section	
	Coolant level (low)/Contaminated coolant														MA section	
NVIS (NISSAN Vehicle Immobiliser System — NATS)		1	1												EC-68 or EL section	
ABS/TCS control unit		2	2	2	2	2									EC-498 or BR 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 crankshaft position sensor (POS) and other ignition timing related sensors.
- If the real-time diagnosis results are NG and the on board diagnostic system results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

GI
 MA
 EM
 LC
EC
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 BT
 HA
 EL
 IDX

MONITOR ITEM	CONDITION		SPECIFICATION
CKPS-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.
CKPS-RPM (REF)			
POS COUNT	● Engine: Running		179 - 181
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	1.5 - 2.1V
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
FR O2 SEN-B2	<ul style="list-style-type: none"> ● Engine: After warming up 	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
FR O2 SEN-B1			
FR O2 MNTR-B2			LEAN ↔ RICH Changes more than 5 times during 10 seconds.
FR O2 MNTR-B1			
RR O2 SEN-B1	<ul style="list-style-type: none"> ● Engine: After warming up 	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
RR O2 SEN-B2			
RR O2 MNTR-B1			LEAN ↔ RICH
RR O2 MNTR-B2			
RR O2 SENSOR	<ul style="list-style-type: none"> ● Engine: After warming up 	Maintaining engine speed at 2,000 rpm	0 ↔ Approx. 1.0V
RR O2 MNTR			LEAN ↔ RICH
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
THRTL POS SEN	<ul style="list-style-type: none"> ● Engine: After warming up ● Ignition switch: ON (Engine stopped) 	Throttle valve: fully closed	0.35 - 0.65V
		Throttle valve: fully opened	Approx. 4.0V
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/P SW	<ul style="list-style-type: none"> ● Engine: After warming up ● Ignition switch: ON (Engine stopped) 	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
CLSD THL POS	<ul style="list-style-type: none"> ● Engine: After warming up ● Ignition switch: ON (Engine stopped) 	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

TROUBLE DIAGNOSIS — General Description

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

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Engine: Running	Rear window defogger "ON"	ON
		Except the above	OFF
IGNITION SW	● Ignition switch: ON → OFF		ON → OFF
SWL CON VC SW*	● Engine speed: Idle ● Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).		OFF
	● Engine speed: Idle ● Engine coolant temperature is above 55°C (131°F).		ON
INJ PULSE-B2	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	2.4 - 3.2 msec.
INJ PULSE-B1		2,000 rpm	1.9 - 2.8 msec.
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	1.0 - 1.6 msec.
		2,000 rpm	0.7 - 1.3 msec.
IGN TIMING	ditto	Idle	15° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V	ditto	Idle	2 - 10 step
		2,000 rpm	—
ENGINE MOUNT	● Engine: Running	Idle	"IDLE"
		2,000 rpm	"TRVL"
PURG VOL C/V	ditto	Vehicle stopped	0%
		Vehicle running	—
A/F ALPHA-B2 A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	54 - 155%
EVAP SYS PRES	● Ignition switch: ON		Approx. 3.4V
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 1 second) ● Engine running and cranking		ON
	Except as shown above		OFF
SWRL CONT S/V	● Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	ON
		Engine coolant temperature is above 55°C (131°F).	OFF
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: "OFF"	Engine coolant temperature is 94°C (201°F) or less.	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F).	LOW
		Engine coolant temperature is 105°C (221°F) or more.	HIGH
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step
VENT CONT/V	● Ignition switch: ON		OFF
FR O2 SEN HTR-B1	● Engine speed: Idle		ON
FR O2 SEN HTR-B2	● Engine speed: Above 3,600 rpm (A/T models) or 4,000 rpm (M/T models)		OFF
RR O2 SEN HTR-B1	● Engine speed: Idle [After driving 2 minutes at 70 km/h (43 MPH) or more]		ON
RR O2 SEN HTR-B2	● Engine speed: Above 3,600 rpm ● Ignition switch: ON (Engine stopped)		OFF
VC/V BYPASS/V	● Ignition switch: ON		OFF

* If this item is not available, use "ECM Terminals and Reference Value", EC-108.

TROUBLE DIAGNOSIS — General Description

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

MONITOR ITEM	CONDITION		SPECIFICATION	
CAL/LD VALUE	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load 	Idle	14.0 - 33.0%	GI
		2,500 rpm	12.0 - 25.0%	
ABSOL TH:P/S	<ul style="list-style-type: none"> ● Engine: After warming up ● Ignition switch: ON (Engine stopped) 	Throttle valve: fully closed	0.0%	MA
		Throttle valve: fully opened	Approx. 88%	
MASS AIRFLOW	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load 	Idle	2.0 - 6.0 g·m/s	EM
		2,500 rpm	7.0 - 20.0 g·m/s	
MAP/BARO SW/V	<ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) 	For 5 seconds after turning ignition switch "ON"	MAP	LC
		More than 5 seconds after turning ignition switch "ON"	BARO	EC
	<ul style="list-style-type: none"> ● Engine speed: idle 	For 5 seconds after starting engine	BARO	FE
		More than 5 seconds after starting engine	MAP	
ABSOL PRES/SE	<ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) 		Approx. 1.2V	CL
	<ul style="list-style-type: none"> ● Engine: After warming up ● Engine speed: idle 	For 5 seconds after starting engine	Approx. 4.4V	
		More than 5 seconds after starting engine	Approx. 1.2V	MT

GI

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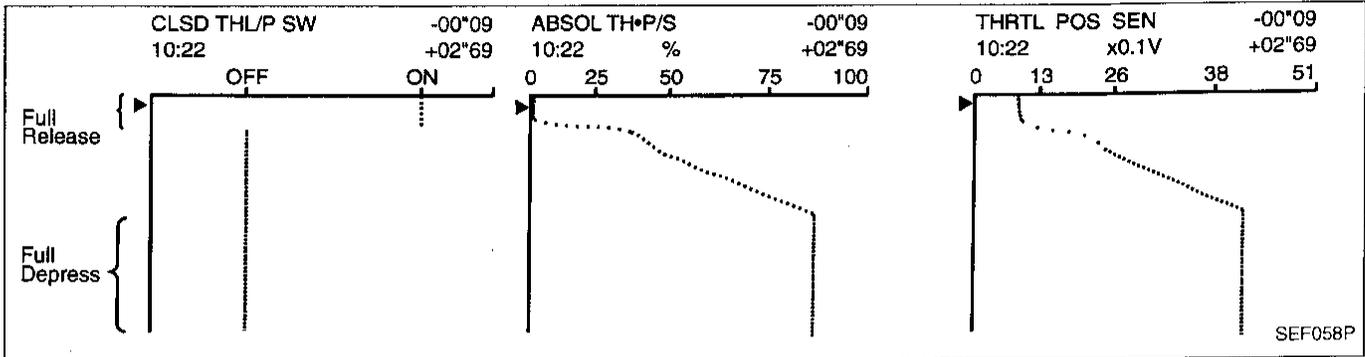
IDX

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.)

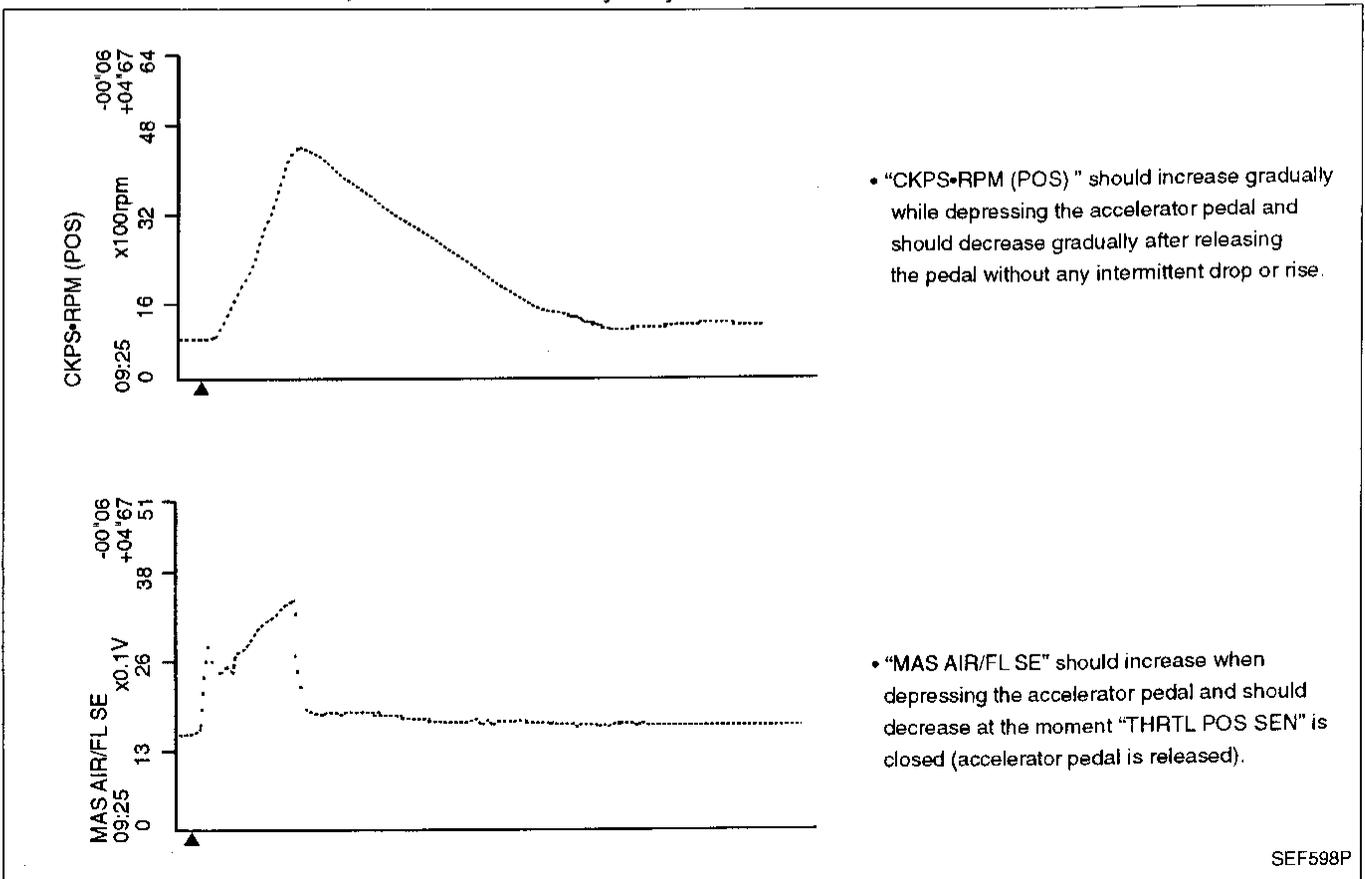
THRTL POS SEN, ABSOL TH·P/S, CLSD THL/P SW

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".



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

Below is the data for "CKPS·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)

GI

MA

EM

LC

EC

FE

CL

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AT

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ST

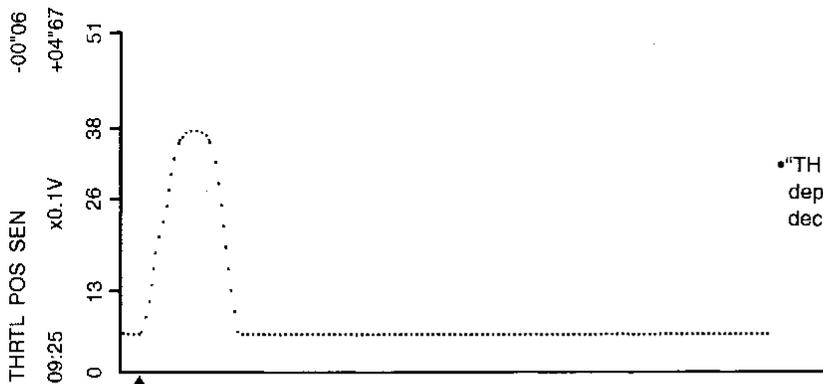
RS

BT

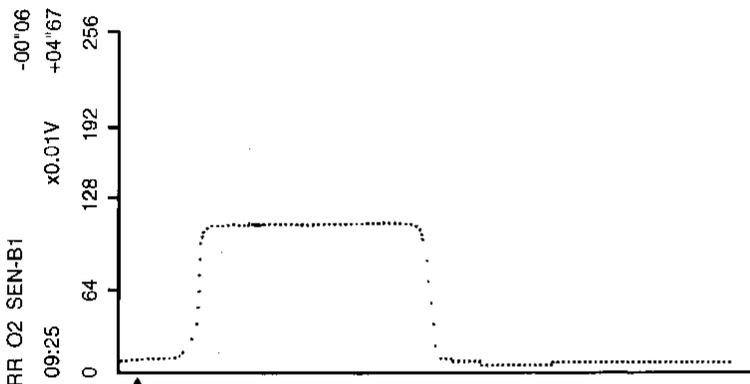
HA

EL

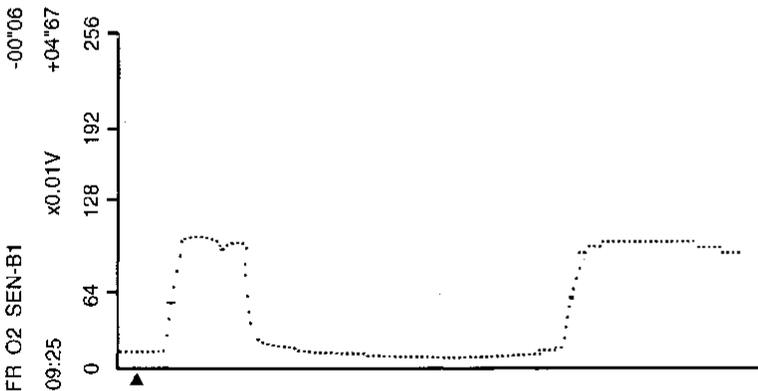
IDX



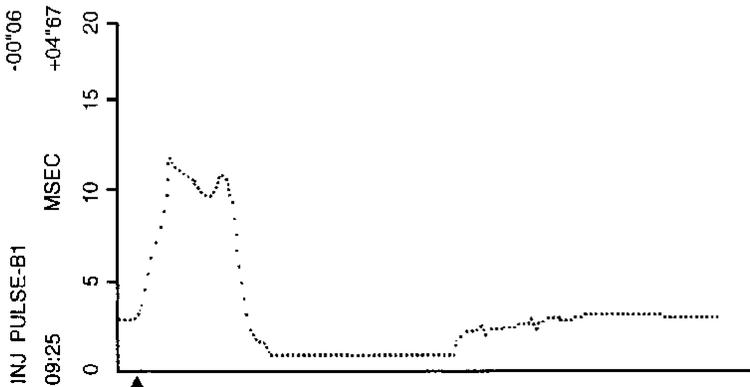
•"THRTL POS SEN" should increase while depressing the accelerator pedel and should decrease while releasing it.



•"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.

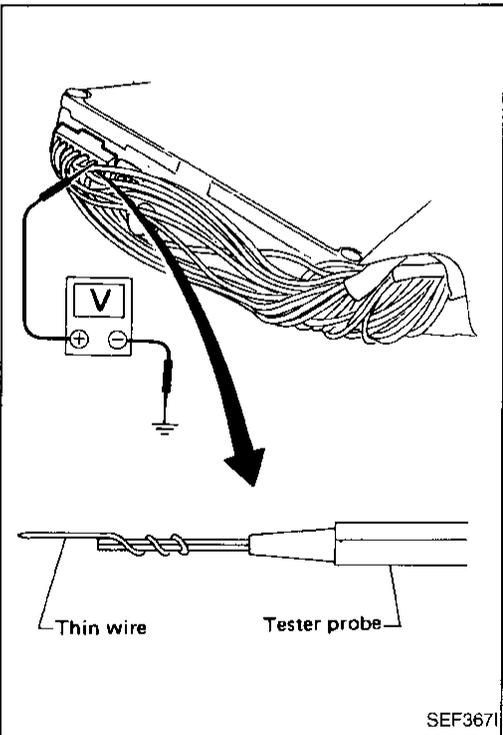
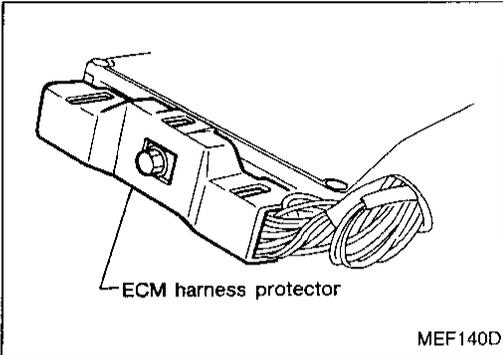
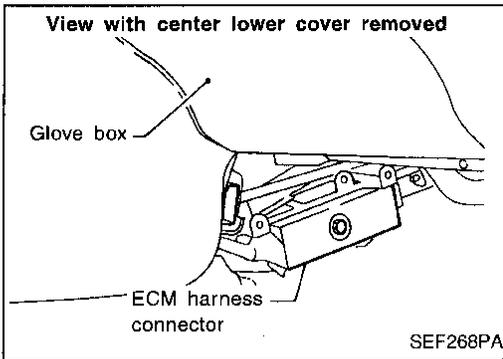


•"INJ PULSE-B1" should increase when depressing the accelerator pedel and should decrease when the pedel is released.

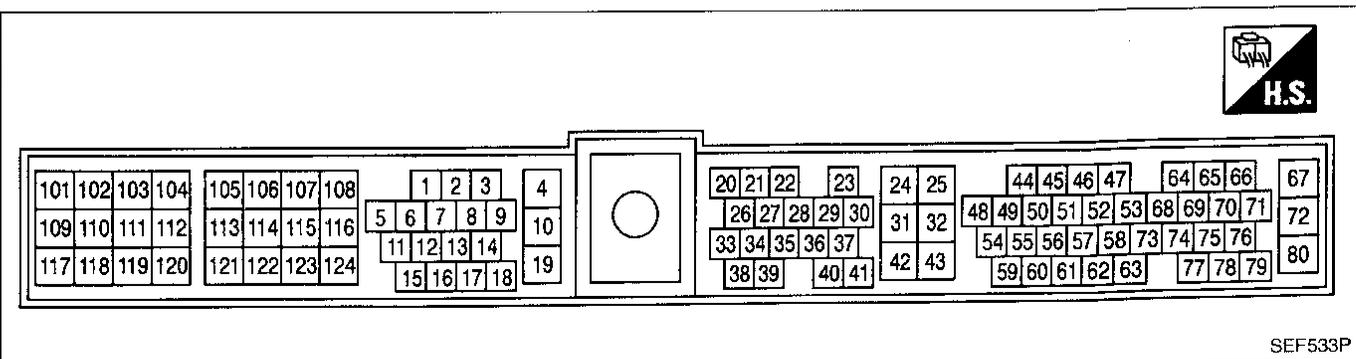
ECM Terminals and Reference Value

PREPARATION

1. ECM is located behind the center console panel. For this inspection, remove the center console under cover.
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 testing easier.
 - Use extreme care not to touch 2 pins at one time.
 - Data is for comparison and may not be exact.



ECM HARNESS CONNECTOR TERMINAL LAYOUT

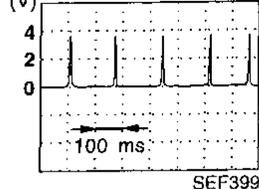
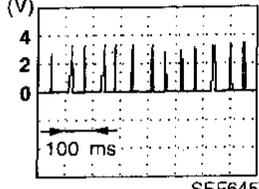
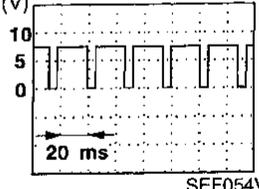


TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)	
1 2 3 7 8 9	Y/R G/R L/R GY PU/W GY/R	Ignition signal (No. 1) Ignition signal (No. 2) Ignition signal (No. 3) Ignition signal (No. 4) Ignition signal (No. 5) Ignition signal (No. 6)	Engine is running. (Warm-up condition) Idle speed	0 - 0.2V★ 	GI MA EM LC
			Engine is running. Engine speed is 2,500 rpm.	0.1 - 0.2V★ 	EC FE CL
4	W/B	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" For a few seconds after turning ignition switch "OFF"	0 - 1V	MT AT
			Ignition switch "OFF" A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)	FA
5	W/G	Tachometer	Engine is running. Idle speed	5.2 - 5.4V★ 	RA BR ST
10	B	ECM ground	Engine is running. Idle speed	Engine ground	RS
12	B/R	Air conditioner relay	Engine is running. Both air conditioner switch and blower switch are "ON".*	0 - 1V	BT HA
			Engine is running. Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)	EL
13 14	LG LG/R	Cooling fan relay (High) Cooling fan relay (Low)	Engine is running. Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)	IDX
			Engine is running. Cooling fan is operating.	0 - 1V	

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

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

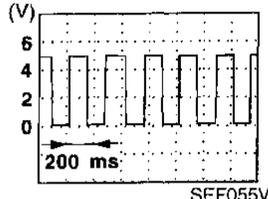
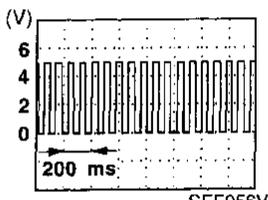
TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
16	OR/Y	MAP/BARO switch solenoid valve	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running. └ Idle speed └ For 5 seconds after starting engine	Approximately 0V
			Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON" Engine is running. └ Idle speed └ More than 5 seconds after starting engine	BATTERY VOLTAGE (11 - 14V)
18	LG/B	Malfunction indicator lamp	Ignition switch "ON"	Approximately 0.1V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
19	B	ECM ground	Engine is running. └ Idle speed	Engine ground
20	BR/W	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
21	G/B	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON". (Compressor operates.)	Approximately 0V
			Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
23	W	Throttle position sensor	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal fully released	0.35 - 0.65V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
24	R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
25	B	ECM ground	Engine is running. └ Idle speed	Engine ground
26	Y	EVAP canister purge volume control solenoid valve	Engine is running. └ Idle speed	BATTERY VOLTAGE

TROUBLE DIAGNOSIS — General Description

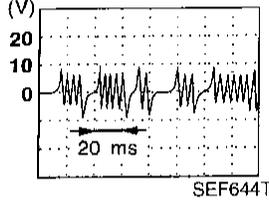
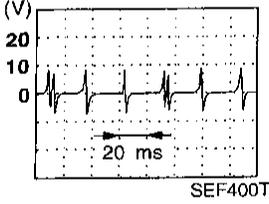
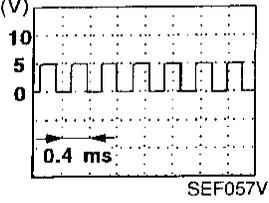
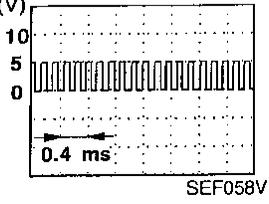
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)	
27	G/W (M/T models) R/G (A/T models)	PNP switch	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> <ul style="list-style-type: none"> └ Gear position is "Neutral position" (M/T models). └ Gear position is "N" or "P" (A/T models). 	Approximately 0V	GI MA
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> <ul style="list-style-type: none"> └ Except the above gear position 	Approximately 5V	EM
29	P/L	Vehicle speed sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> <ul style="list-style-type: none"> └ Jack up front wheels. └ In "1st" gear position └ 10 km/h (6 MPH) 	Approximately 5.2V★ 	LC EC
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> <ul style="list-style-type: none"> └ Jack up front wheels. └ In "2nd" gear position └ 30 km/h (19 MPH) 		FE CL MT AT
31	GY/L	Throttle position switch (Closed position)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> (Warm-up condition) <ul style="list-style-type: none"> └ Accelerator pedal released 	BATTERY VOLTAGE (11 - 14V)	FA
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> <ul style="list-style-type: none"> └ Accelerator pedal depressed 	Approximately 0V	RA BR
32	B	ECM ground	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> <ul style="list-style-type: none"> └ Idle speed 	Engine ground	ST
33 34	W/L W/R	Front engine mounting Front engine mounting	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> <ul style="list-style-type: none"> └ For 2 seconds after engine speed changes from 2,000 rpm to idle speed 	0 - 0.4V	RS
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> <ul style="list-style-type: none"> └ Except the above 	BATTERY VOLTAGE (11 - 14V)	BT
35 36	P G	EGR volume control valve	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) <ul style="list-style-type: none"> └ Idle speed 	0 - 1V	HA
37	L/W	Throttle position sensor signal	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> (Warm-up condition) <ul style="list-style-type: none"> └ Accelerator pedal released 	Approximately 0.4V	EL
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> <ul style="list-style-type: none"> └ Accelerator pedal fully depressed 	Approximately 3V	IDX

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

TROUBLE DIAGNOSIS — General Description

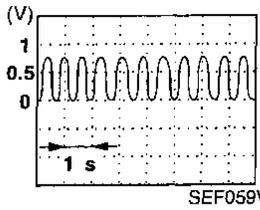
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
39	G	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0 - 1.5V
			Engine is running. └ Steering wheel is not being turned.	BATTERY VOLTAGE (11 - 14V)
40 41	G/B L/R	EGR volume control valve	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)
42	R	Sensor's power supply	Ignition switch "ON"	Approximately 5V
43	B	Sensor's ground	Engine is running. (Warm-up condition) └ Idle speed	0V
44 48	W W	Crankshaft position sensor (PHASE)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 4.2V★ (AC voltage) 
46 47	W W	Camshaft position sensor (REF)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.3V★ (AC voltage) 
49	W	Crankshaft position sensor (POS)	Engine is running. └ Idle speed	Approximately 2.5V★ 
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 2.4V★ 

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

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)	
50 51	W 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) 	GI MA EM LC
52	P/Y	Tank fuel temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with fuel temperature.	EC
53	PU	Swirl control valve control vacuum check switch	Engine is running. Engine coolant temperature is between 15°C (59°F) to 50°C (122°F). Idle speed	Approximately 5V	FE CL
			Engine is running. Engine coolant temperature is above 55°C (131°F). Idle speed	0 - 1V	MT AT
54	W	Mass air flow sensor	Engine is running. (Warm-up condition) Idle speed	1.0 - 1.7V	FA
			Engine is running. (Warm-up condition) Engine speed is 2,500 rpm.	1.5 - 2.1V	RA
55	B	Mass air flow sensor ground	Engine is running. (Warm-up condition) Idle speed	Approximately 0V	BR
56 57	W W	Rear heated oxygen sensor (Right bank) Rear 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	ST
58	SB	Intake air temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with intake air temperature.	RS BT
59	Y	Engine coolant temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.	HA EL IDX

TROUBLE DIAGNOSIS — General Description

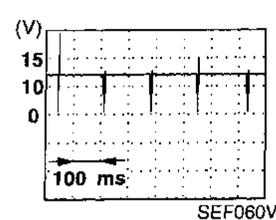
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
61	W	Absolute pressure sensor	Ignition switch "ON" Engine is running. Idle speed For 5 seconds after starting engine	Approximately 4.4V
			Engine is running. (Warm-up condition) Idle speed More than 5 seconds after starting engine	Approximately 1.2V
62	W	EVAP control system pressure sensor	Ignition switch "ON"	Approximately 3.4V
63	L/OR	EGR temperature sensor	Engine is running. (Warm-up condition) Idle speed	Less than 4.5V
			Engine is running. (Warm-up condition) EGR system is operating.	0 - 1.0V
64	W	Knock sensor	Engine is running. Idle speed	2.0 - 3.0V
67 72	R R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
68	W/L	A/T communication line (LAN)	Engine is running. Idle speed	Approximately 2V
69	G/B	Data link connector for GST	Ignition switch "ON" GST is disconnected.	6 - 10V
70	OR/L	EVAP canister vent control valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
71	L/Y	Swirl control valve control solenoid valve	Engine is running. Engine coolant temperature is between 15°C (59°F) to 50°C (122°F). Idle speed	0 - 1V
			Engine is running. Engine coolant temperature is above 55°C (131°F). Idle speed	BATTERY VOLTAGE (11 - 14V)
75	BR/Y	Data link connector for CONSULT	Engine is running.	Approximately 0.1V
76	P		Idle speed	Approximately 4 - 9V
78	LG		CONSULT is connected and turn "ON".	Approximately 3.5V
79	R/W	Electrical load signal	Engine is running. Idle speed (Electrical load: "OFF")	0V
			Engine is running. Idle speed (Rear window defogger: "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)	
80	W	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)	GI
101 115 122 123	PU/G GY/G Y GY/L	IACV-AAC valve	Engine is running. └ Idle speed	0.1 - 14V	MA
102	R/B	Injector No. 1	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)	EM
104	R/Y	Injector No. 3			
106	L/W	Injector No. 5			
109	R/G	Injector No. 2			
111	B/OR	Injector No. 4			
113	PU/R	Injector No. 6			
105 107	R R	Rear heated oxygen sensor heater (Left bank) Rear heated oxygen sensor heater (Right bank)	Engine is running. └ Idle speed [After driving 2 minutes at 70 km/h (43 MPH) or more]	0 - 1.0V	CL
			Ignition switch "ON" └ Engine stopped Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)	MT AT
108	B	ECM ground	Engine is running. └ Idle speed	Engine ground	FA
116	B	ECM ground	Engine is running. └ Idle speed	Engine ground	RA
117	B/P	Fuel pump relay	Ignition switch "ON" └ For 1 second after turning ignition switch "ON" Engine is running.	0 - 1.5V	BR
			Ignition switch "ON" └ 1 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)	ST
119 121	L/Y L	Front heated oxygen sensor heater (Right bank) Front heated oxygen sensor heater (Left bank)	Engine is running. └ Engine speed is below 3,600 rpm (A/T models) or 4,000 rpm (M/T models).	0 - 1.0V	RS
			Engine is running. └ Engine speed is above 3,600 rpm (A/T models) or 4,000 rpm (M/T models).	BATTERY VOLTAGE (11 - 14V)	BT HA
120	OR/G	Vacuum cut valve bypass valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)	EL
124	B	ECM ground	Engine is running. └ Idle speed	Engine ground	IDX



TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

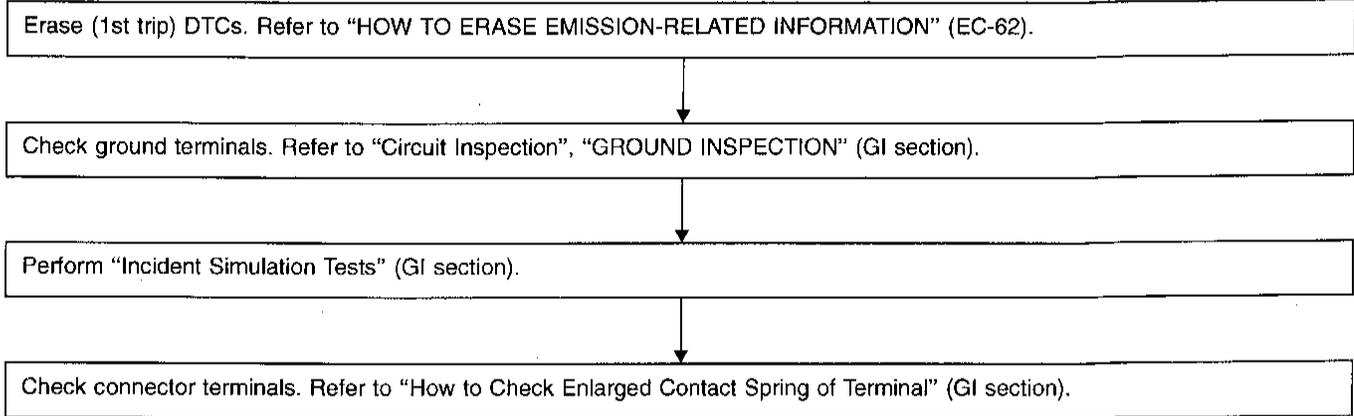
Description

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

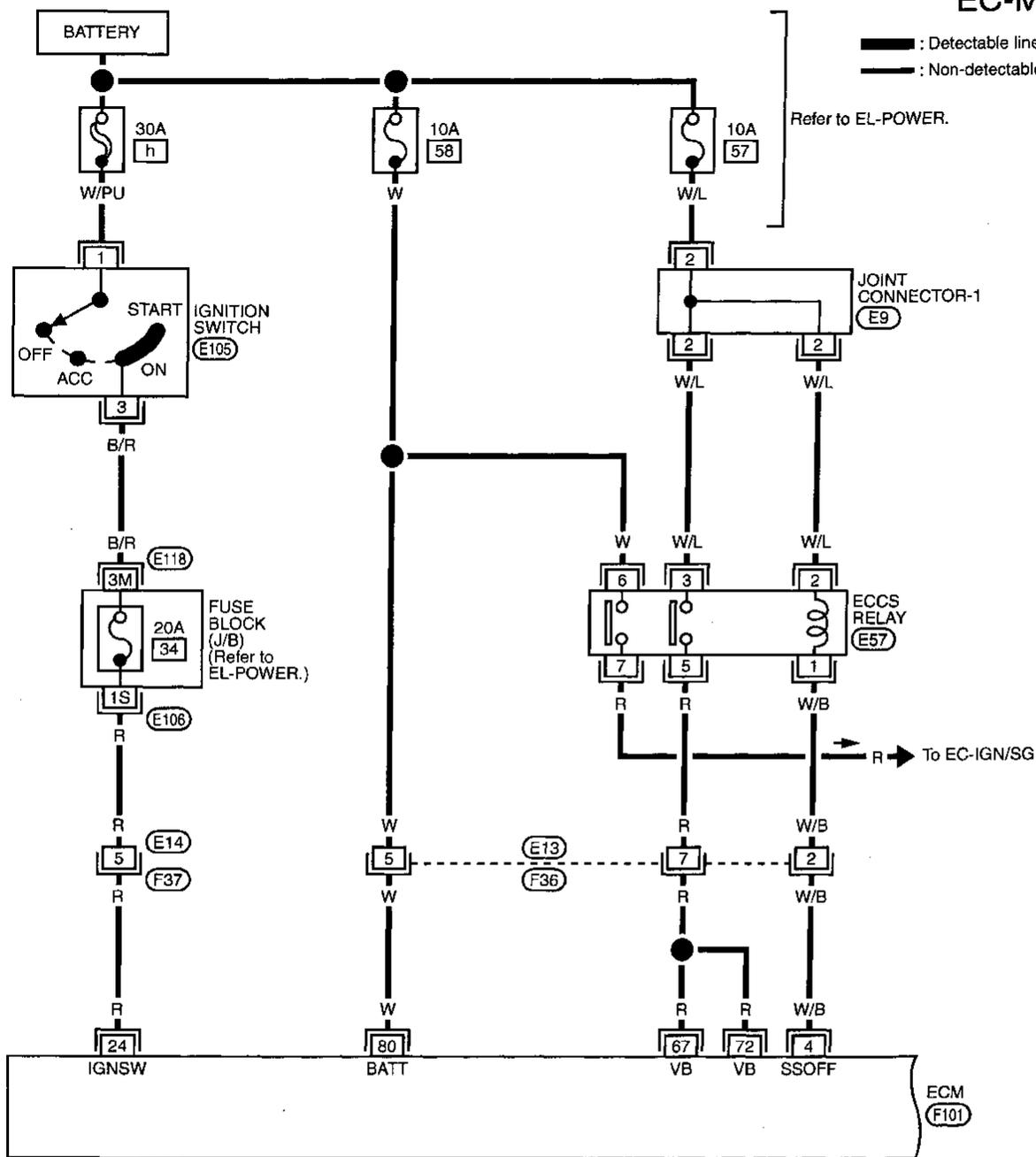
STEP in Work Flow	Situation
II	The CONSULT is used. The SELF-DIAG RESULTS screen shows time data other than "0" or "11".
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC data does not appear during the DTC CONFIRMATION PROCEDURE.
VI	The TROUBLE DIAGNOSIS for PXXXX does not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

Diagnostic Procedure



Main Power Supply and Ground Circuit

EC-MAIN-01



GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

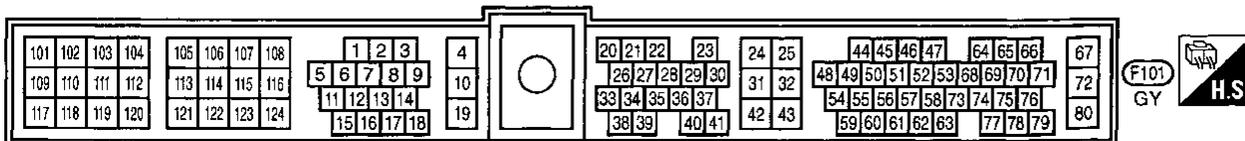
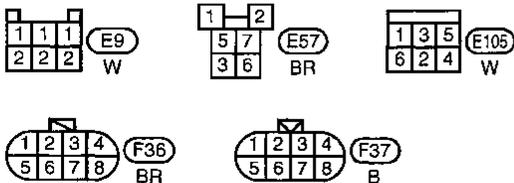
RS

BT

HA

EL

IDX

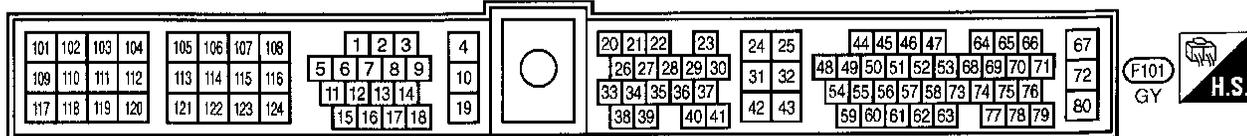
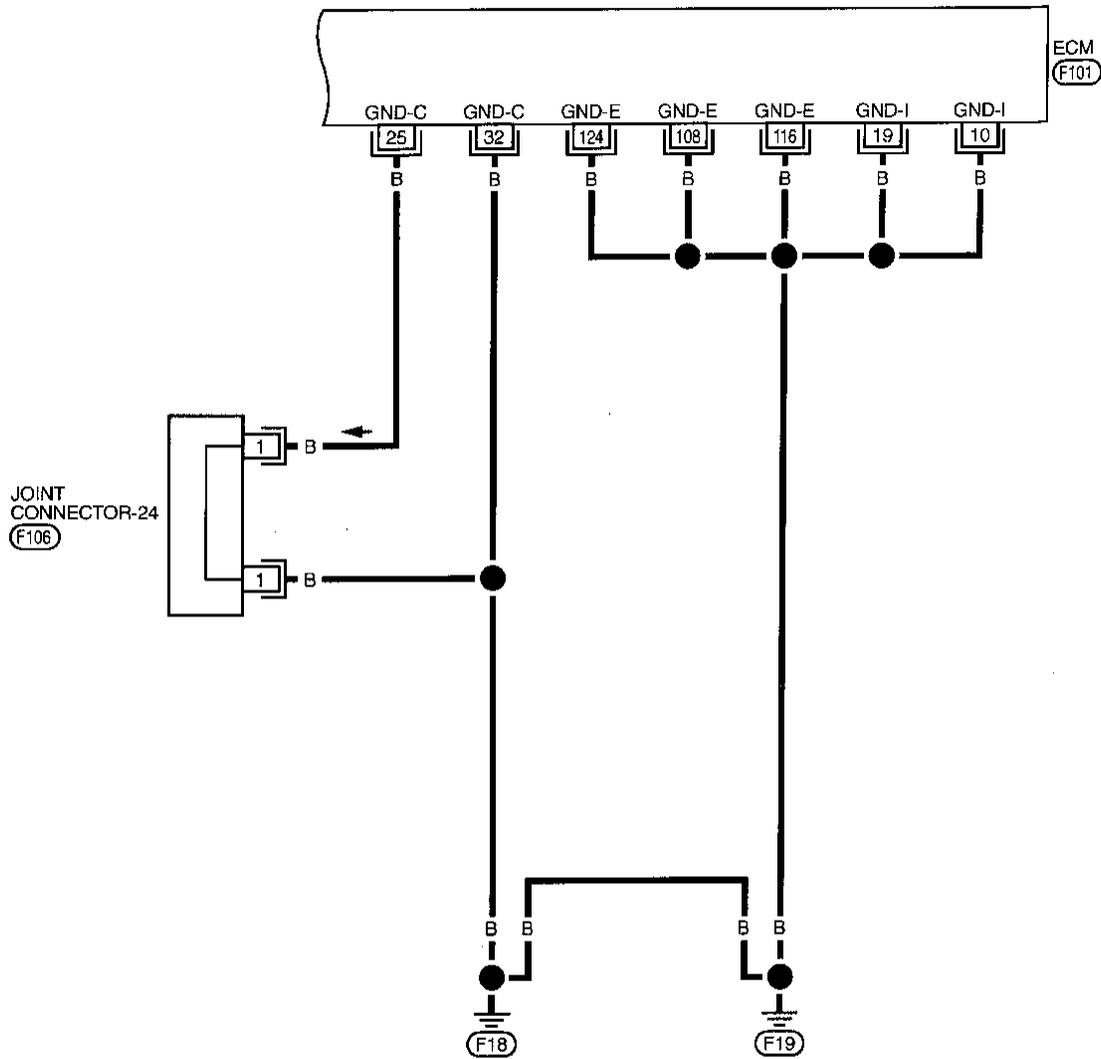


TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-02

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



TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
BATTERY VOLT	• Ignition switch: ON (Engine stopped)	11 - 14V

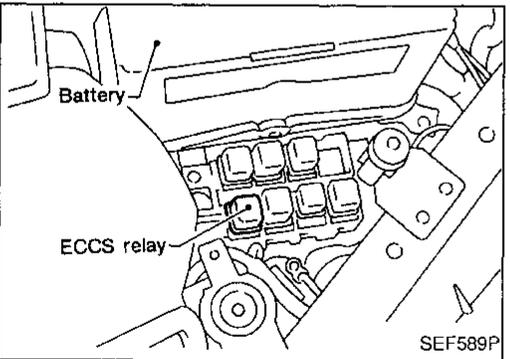
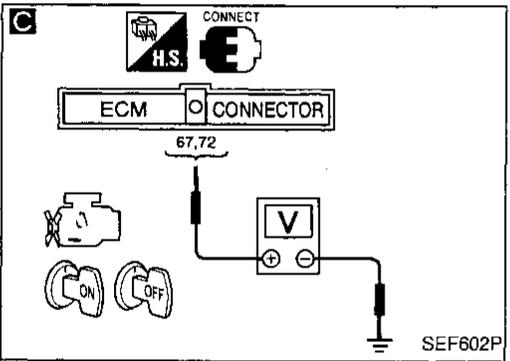
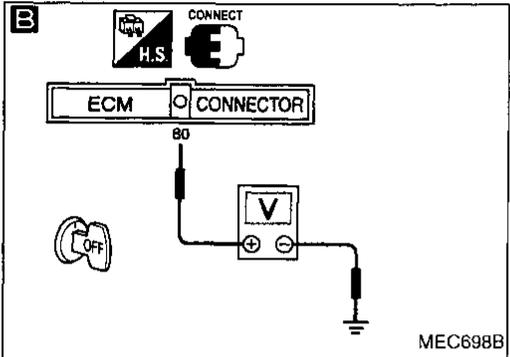
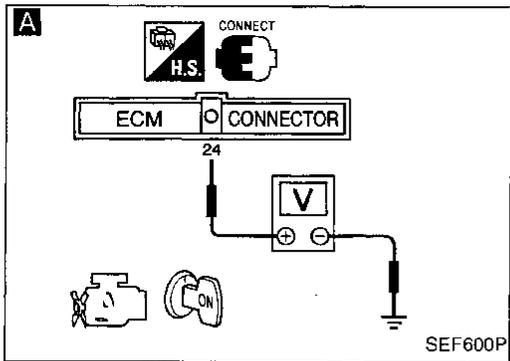
ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
4	W/B	ECCS relay (Self-shutoff)	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <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>	0 - 1V
			<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)
24	R	Ignition switch	<div style="border: 1px solid black; padding: 2px;">Ignition switch "OFF"</div>	0V
			<div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div>	BATTERY VOLTAGE (11 - 14V)
67 72	R R	Power supply for ECM	<div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div>	BATTERY VOLTAGE (11 - 14V)
80	W	Power supply (Back-up)	<div style="border: 1px solid black; padding: 2px;">Ignition switch "OFF"</div>	BATTERY VOLTAGE (11 - 14V)
10	B	ECM ground	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	Engine ground
19	B	ECM ground	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	Engine ground
25	B	ECM ground	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	Engine ground
32	B	ECM ground	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	Engine ground
108	B	ECM ground	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	Engine ground
116	B	ECM ground	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	Engine ground
124	B	ECM ground	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <div style="margin-left: 20px;">└ Idle speed</div>	Engine ground

TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)



INSPECTION START

Start engine.
Is engine running?

A
CHECK POWER SUPPLY-I.
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal ② and ground with CONSULT or tester.
Voltage: Battery voltage
If NG, check the following.
• Harness connectors (F37), (E14)
• Harness connectors (E106), (E118)
• Harness for open or short between ECM and ignition switch
If NG, repair harness or connectors.

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

B
CHECK POWER SUPPLY-II.
1. Stop engine.
2. Check voltage between ECM terminal ③ and ground with CONSULT or tester.
Voltage: Battery voltage

NG
Check the following.
• Harness connectors (E13), (F36)
• 10A fuse
• Harness for open or short between ECM and battery
If NG, repair harness or connectors.

C
CHECK POWER SUPPLY-III.
1. Turn ignition switch "ON" and then "OFF".
2. Check voltage between ECM terminals ⑥, ⑦ and ground with CONSULT or tester.
Voltage: After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

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

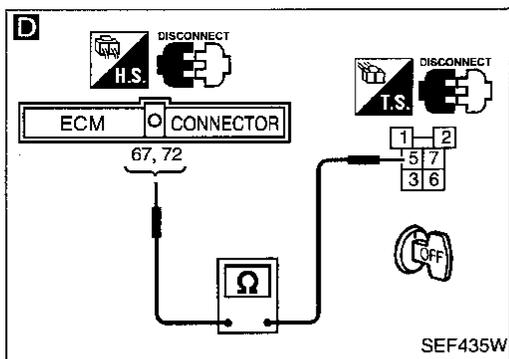
Case-1: Battery voltage does not exist.
Case-2: Battery voltage exists for more than a few seconds.

NG
Case-1
Case-2
Go to "CHECK ECCS RELAY" on next page.

Ⓐ
(Go to next page.)

TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)



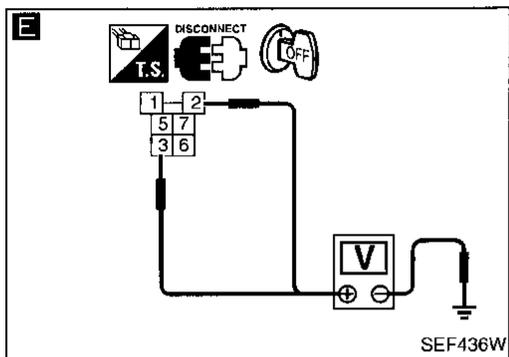
D

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.

1. Disconnect ECM harness connector.
2. Disconnect ECCS relay.
3. Check harness continuity between ECM terminals ⑥⑦, ⑦② and terminal ⑤.

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

NG → Check the following.
 • Harness for open or short between ECCS relay and ECM
 • Harness connectors (F36), (E13)
 If NG, repair open circuit, short to ground or short to power in harness or connectors.



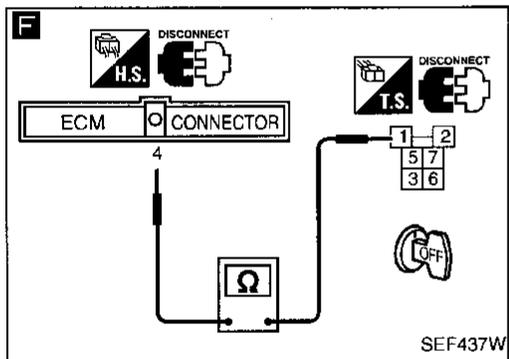
E

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.

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

Voltage: Battery voltage

NG → Check the following.
 • 10A fuse
 • Joint connector-1
 • Harness for open or short between ECCS relay and battery
 If NG, repair harness or connectors.



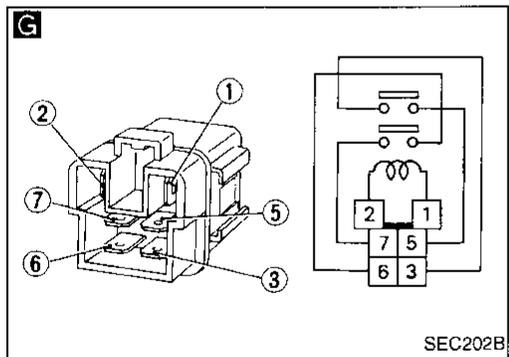
F

CHECK OUTPUT SIGNAL CIRCUIT.

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

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

NG → Check the following.
 • Harness for open or short between ECCS relay and ECM
 • Harness connectors (F36), (E13)
 If NG, repair open circuit, short to ground or short to power in harness or connectors.



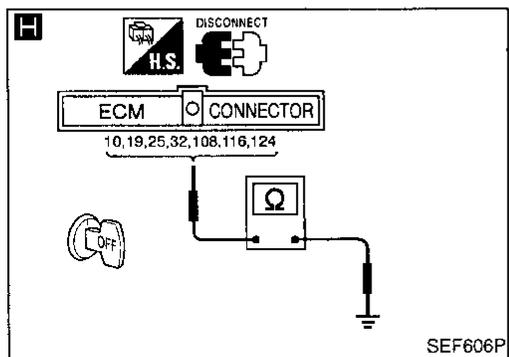
G

CHECK ECCS RELAY.

1. Apply 12V direct current between relay terminals ① and ②.
2. Check continuity between relay terminals ③ and ⑤.

12V (① - ②) applied:
Continuity exists.
No voltage applied:
No continuity

NG → Replace ECCS relay.



H

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminals ⑩, ⑱, ⑳, ㉓, ⑩⑧, ⑪⑥, ⑫④ and engine ground.

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

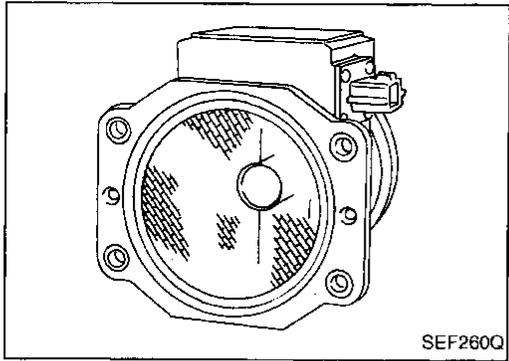
NG → Check the following.
 • Joint connector-24
 • Harness for open or short between ECM terminal ⑳ and engine ground
 If NG, repair open circuit, short to ground or short to power in harness or connectors.

OK → Check ECM pin terminals for damage or the connection of ECM harness connector.

INSPECTION END

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

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 wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the ECM must supply more electric current to the hot 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	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load 	Idle
		2,500 rpm
		1.0 - 1.7V
		1.5 - 2.1V

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and ② (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
54	W	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.0 - 1.7V
			Engine is running. (Warm-up condition) └ Engine speed is 2,500 rpm.	1.5 - 2.1V
55	B	Mass air flow sensor ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V
4	W/B	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
67 72	R R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSIS FOR DTC P0100

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

FAIL-SAFE MODE

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*1		
P0100	0102	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

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

ON BOARD DIAGNOSIS 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.	<ul style="list-style-type: none"> ● 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 condition.	
	B) An excessively low voltage from the sensor is sent to ECM* when engine is running.	<ul style="list-style-type: none"> ● 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 condition.	

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

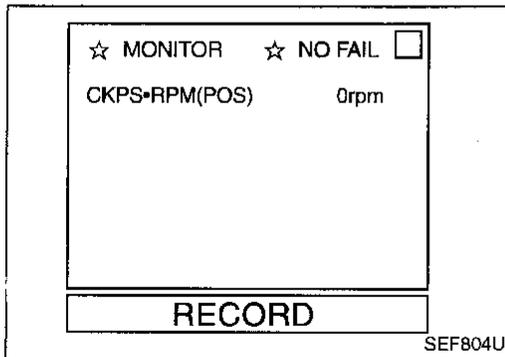
Perform "Procedure for malfunction A" first. If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B". If there is no problem on "Procedure for malfunction B", perform "Procedure for malfunction C". If there is no problem on "Procedure for malfunction C", perform "Procedure for 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 10 seconds before conducting the next test.



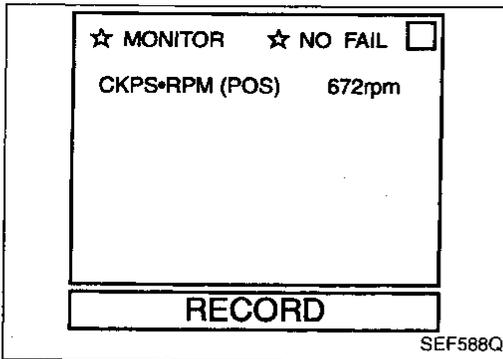
Procedure for malfunction A

- 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-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 10 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.

TROUBLE DIAGNOSIS FOR DTC P0100

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

Procedure for malfunction B



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait for 5 seconds at most.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-128.

OR



- 1) Turn ignition switch "ON".
- 2) Start engine and wait for 5 seconds at most.
- 3) Select "MODE 7" with GST.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-128.

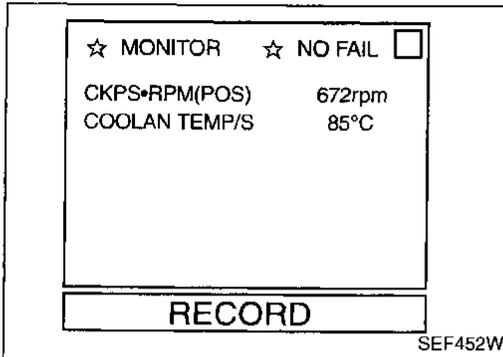
OR



- 1) Turn ignition switch "ON".
- 2) Start engine and wait for 5 seconds at most.
- 3) Turn ignition switch "OFF", wait at least 10 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-128.

NOTE:

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



Procedure for malfunction C

NOTE:

If engine will not start or stop soon, wait at least 10 seconds with engine stopped (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) Run engine for at least 10 seconds at idle speed.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-127.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Run engine for at least 10 seconds at idle speed.
- 3) Select "MODE 7" with GST.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-127.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Run engine for at least 10 seconds at idle speed.
- 3) Turn ignition switch "OFF", wait at least 10 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-127.

TROUBLE DIAGNOSIS FOR DTC P0100

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

Procedure for malfunction D



- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.

If engine cannot be started, go to "DIAGNOSTIC PROCEDURE", EC-128.

- 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-128.
If OK, go to following step.

- 7) Maintain the following conditions for at least 10 consecutive seconds.

CKPS·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-128.

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

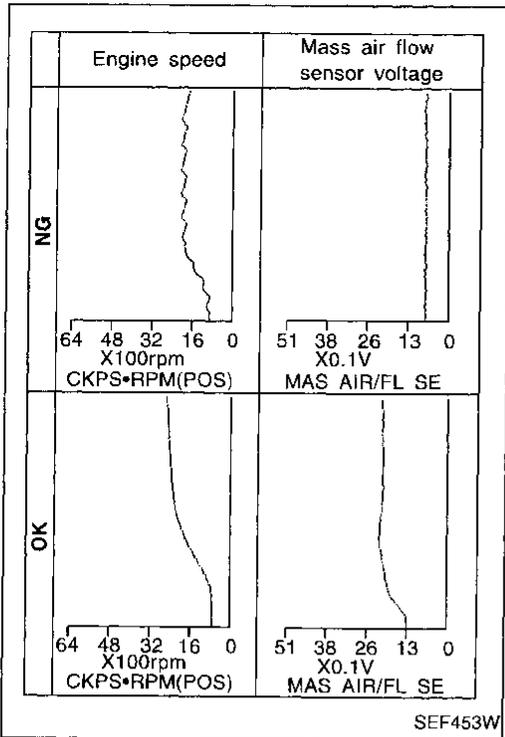


- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Select "MODE 1" with GST.
- 4) Check the mass air flow with "MODE 1".
- 5) Check for linear mass air flow rise in response to increases to about 4,000 rpm in engine speed.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-128.

OR



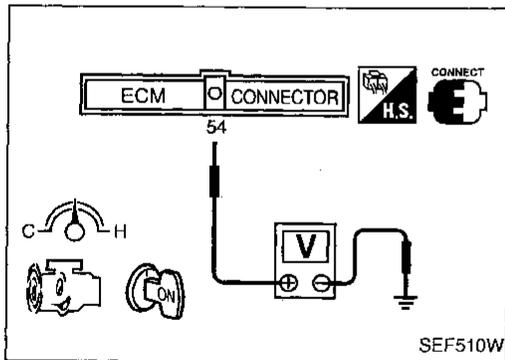
- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Check the voltage between ECM terminal ⑤ and ground.
- 4) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.
- 5) If NG, go to "DIAGNOSTIC PROCEDURE", EC-128.



SEF453W

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%

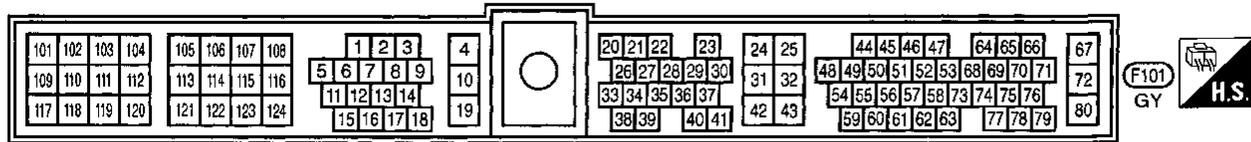
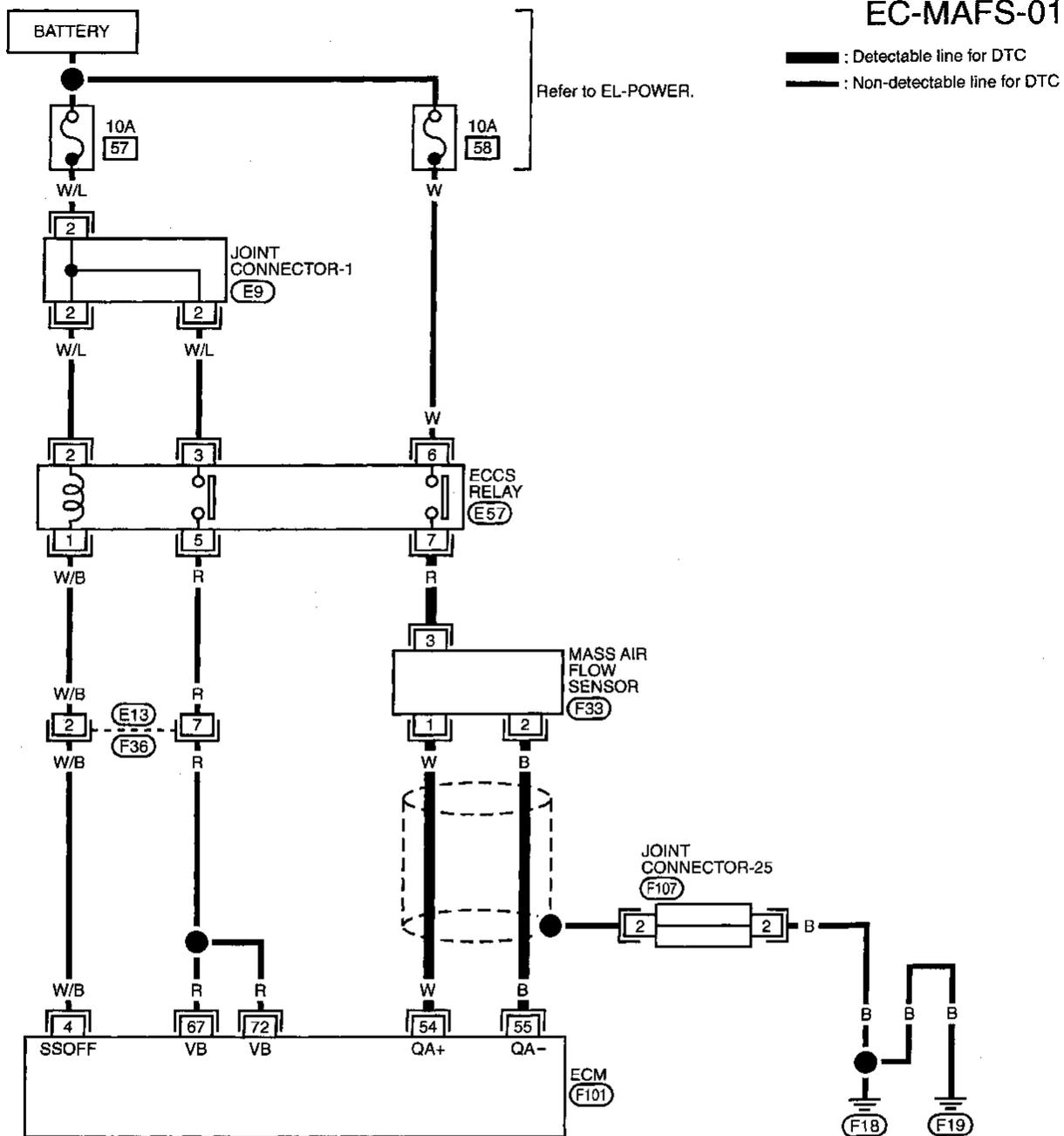
SEF534P



TROUBLE DIAGNOSIS FOR DTC P0100

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

EC-MAFS-01



TROUBLE DIAGNOSIS FOR DTC P0100

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

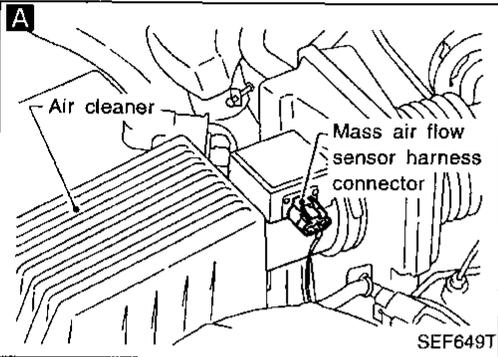
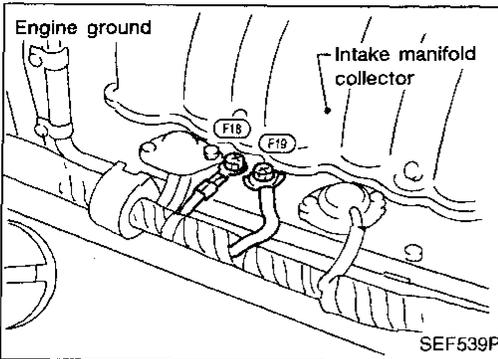
DIAGNOSTIC PROCEDURE

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.

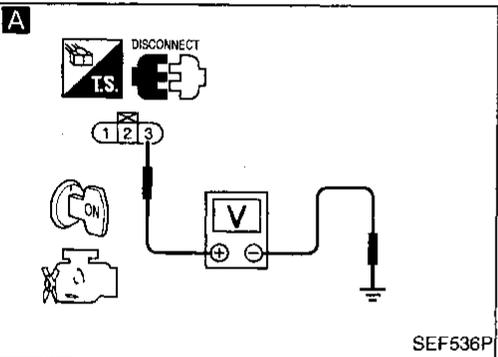


A
CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect mass air flow sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ③ and ground with CONSULT or tester.
Voltage: Battery positive voltage

- NG
- Check the following.
- Harness for open or short between mass air flow sensor and battery
 - ECCS relay
 - 10A fuse
- If NG, repair harness or connector.

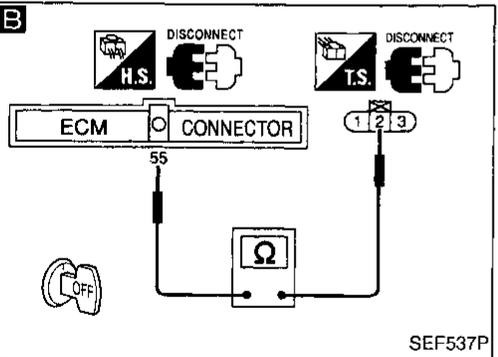
B
CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Loosen and retighten engine ground screws.
4. Check harness continuity between terminal ② and ECM terminal ③.
Continuity should exist.
If OK, check harness for short to ground and short to power.

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



C
CHECK INPUT SIGNAL CIRCUIT.
1. Check harness continuity between terminal ① and ECM terminal ④.
Continuity should exist.
If OK, check harness for short to ground and short to power.

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

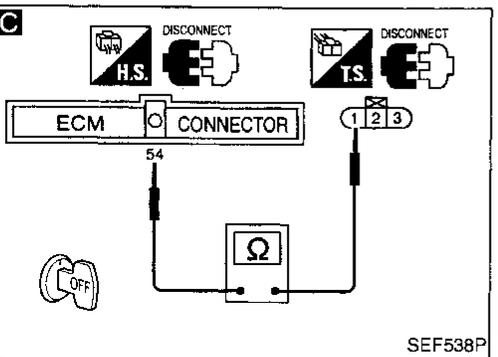


CHECK COMPONENT
(Mass air flow sensor).
Refer to "COMPONENT INSPECTION", EC-129.

- NG
- Replace mass air flow sensor.

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Remove joint connector-25.
3. Check the following.
• Continuity between joint connector terminal and ground
• Joint connector
(Refer to "HARNESS LAYOUT" in EL section.)
Continuity should exist.
If OK, check harness for short to ground and short to power. Then reconnect joint connector.

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



Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

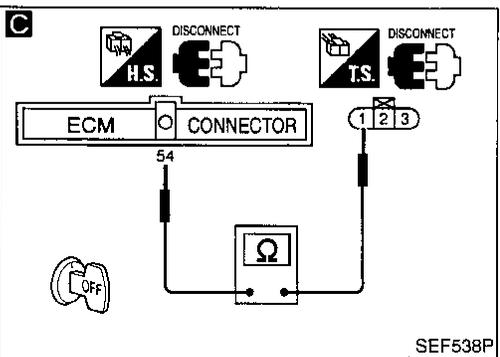
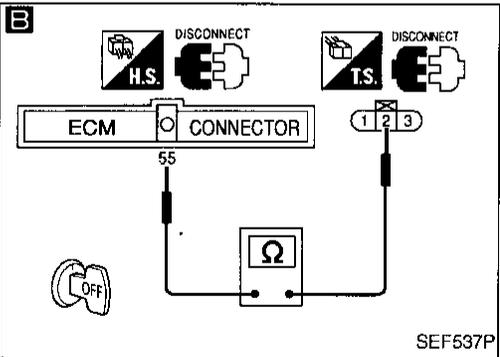
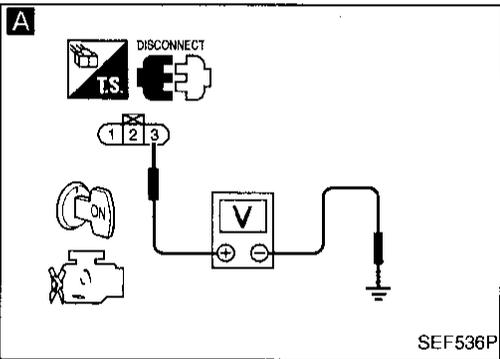
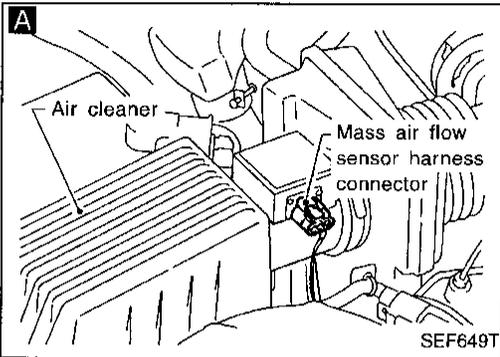
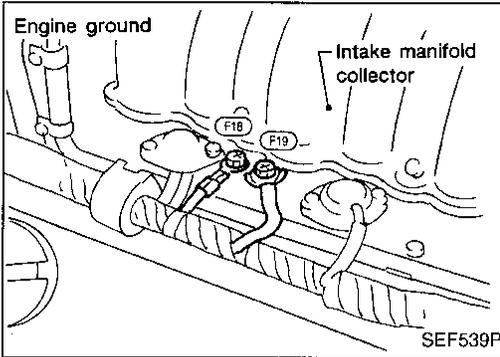
INSPECTION END

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

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 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. 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 battery
 • ECCS relay
 • 10A fuse
 If NG, repair harness or connector.

OK
B
CHECK GROUND CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Disconnect ECM harness connector.
 3. Loosen and retighten engine ground screws.
 4. Check harness continuity between terminal ② and ECM terminal ⑤.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

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

OK
C
CHECK INPUT SIGNAL CIRCUIT.
 1. Check harness continuity between terminal ① and ECM terminal ④.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

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

OK
CHECK COMPONENT
 (Mass air flow sensor).
 Refer to "COMPONENT INSPECTION", EC-129.

NG → Replace mass air flow sensor.

OK
CHECK SHIELD CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Remove joint connector-25.
 3. Check the following.
 • Continuity between joint connector terminal and ground
 • Joint connector
 (Refer to "HARNES LAYOUT" in EL section.)
Continuity should exist.
 If OK, check harness for short to ground and short to power. Then reconnect joint connector.

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

OK
 Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

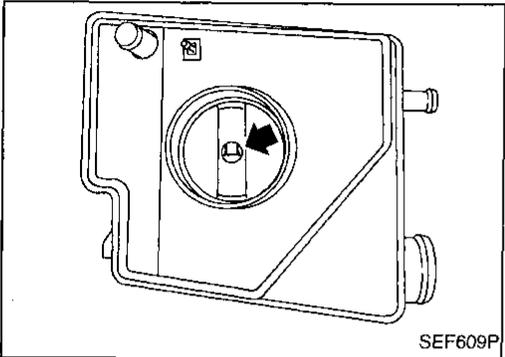
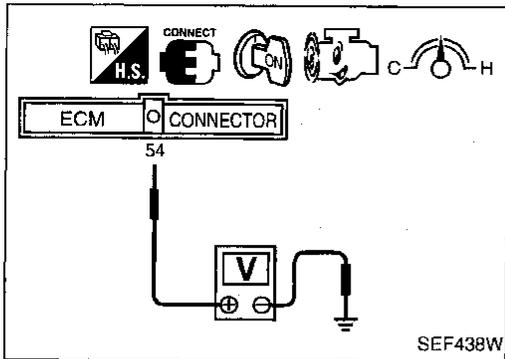
TROUBLE DIAGNOSIS FOR DTC P0100

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 ④ 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	1.5 - 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.

GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

RS

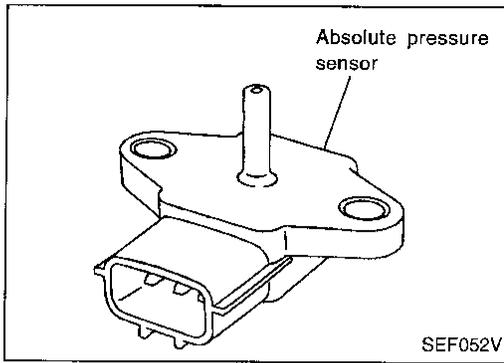
BT

HA

EL

IDX

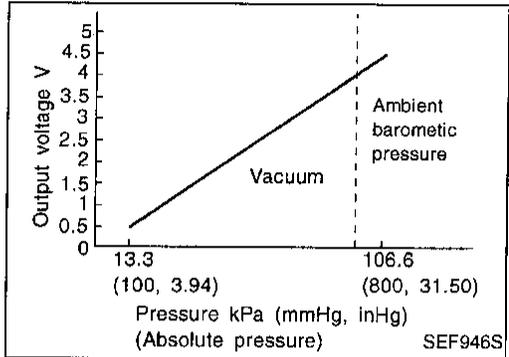
TROUBLE DIAGNOSIS FOR DTC P0105



Absolute Pressure Sensor

COMPONENT DESCRIPTION

The absolute pressure sensor is connected to the MAP/BARO switch solenoid valve by a hose. The sensor detects ambient barometric pressure and intake manifold pressure respectively, and modifies the voltage signal received from the ECM. The modified signal will then be returned to the ECM. As the pressure increases, the voltage rises.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ABSOL PRES/SE	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) 	Approx. 1.2V
	<ul style="list-style-type: none"> Engine: After warming up Engine speed: idle 	For 5 seconds after starting engine Approx. 4.4V
	More than 5 seconds after starting engine	Approx. 1.2V

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
61	W	Absolute pressure sensor	Ignition switch "ON" Engine is running. └ Idle speed └ For 5 seconds after starting engine	Approximately 4.4V
			Engine is running. (Warm-up condition) └ Idle speed └ More than 5 seconds after starting engine	Approximately 1.2V
42	R	Sensor's power supply	Ignition switch "ON"	Approximately 5V
43	B	Sensor's ground	Engine is running. (Warm-up condition) └ Idle speed	0V

TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

ON BOARD DIAGNOSIS LOGIC

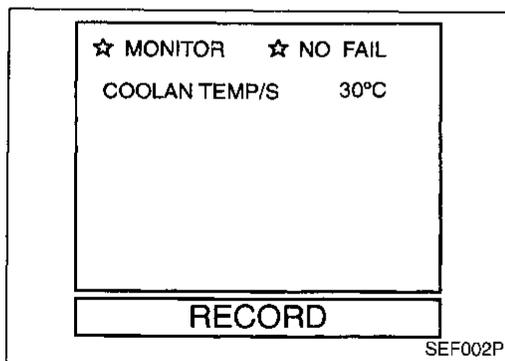
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0105 0803	A) An excessively low or high voltage from the sensor is sent to ECM.	<ul style="list-style-type: none"> • Harness or connectors (Absolute pressure sensor circuit is open or shorted.) • Absolute pressure 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

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".

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.



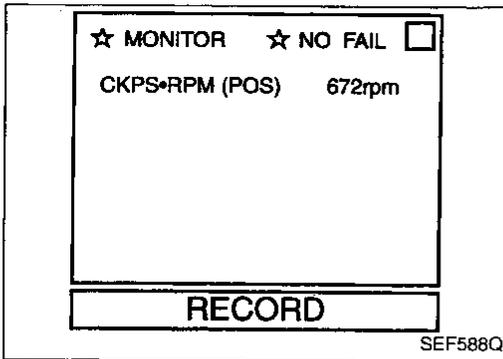
Procedure for malfunction A

- 1) Turn ignition switch "ON".
 - 2) Select "DATA MONITOR" mode with CONSULT.
 - 3) Wait at least 10 seconds.
 - 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-135.
- OR
- 1) Turn ignition switch "ON" and wait at least 10 seconds.
 - 2) Select "MODE 7" with GST.
 - 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-135.
- OR
- 1) Turn ignition switch "ON" and wait at least 10 seconds.
 - 2) Turn ignition switch "OFF", wait at least 10 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.

TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

Procedure for malfunction B



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 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-135.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 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-135.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine.
- 4) Let engine idle and wait at least 15 seconds.
- 5) Turn ignition switch "OFF", wait at least 10 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-135.

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. GI
- The voltage of "ABSOL PRES/SE" should be more than 1.74 [V].

If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-135. MA

If the check result is OK, go to following step. EM

- 3) Start engine and warm it up to normal operating temperature. EM
- 4) Turn ignition switch "OFF" and wait at least 10 seconds. LC
- 5) Start engine and let it idle for at least 15 seconds. LC
- 6) Select "DATA MONITOR" mode with CONSULT. EC
- 7) Drive the vehicle at least 3 consecutive seconds under the following conditions, EC

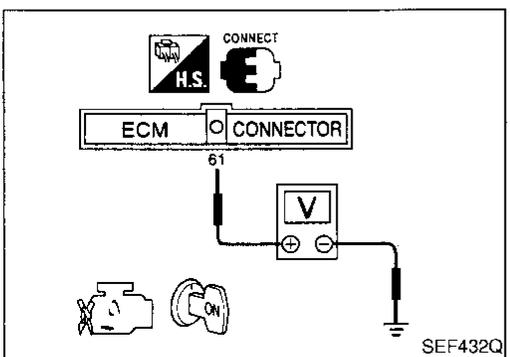
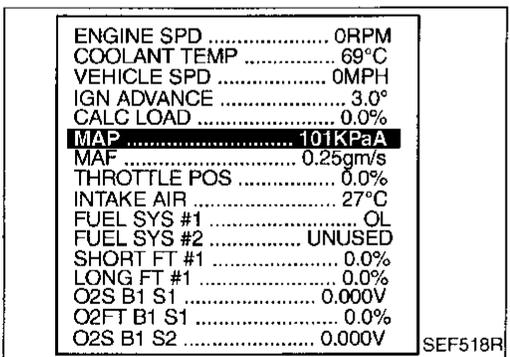
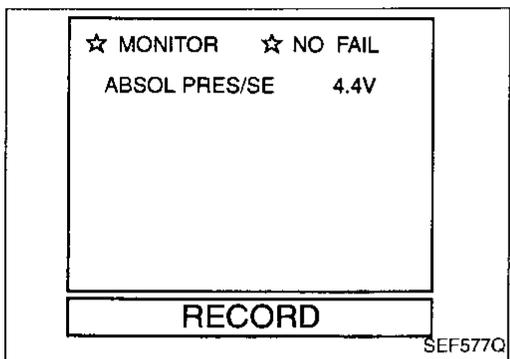
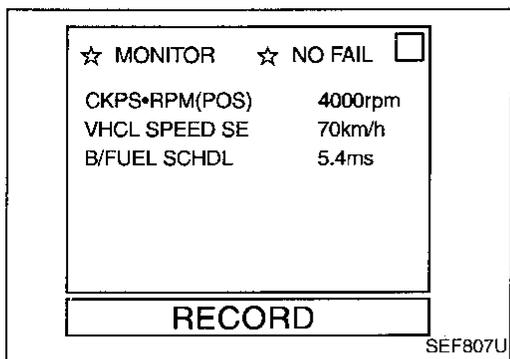
B/FUEL SCHDL: More than 5.2 ms

CKPS-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. FE

- 8) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-137. CL



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. BR

Procedure for malfunction C



- 1) Turn ignition switch "ON".
- 2) Select "MAP" in "MODE 1" with GST. ST
- 3) Make sure that the pressure of "MAP" is more than 46 kPa (0.47 kg/cm², 6.7 psi). RS
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-137. BT



- 1) Turn ignition switch "ON".
- 2) Make sure that the voltage between ECM terminal 61 and engine ground is more than 1.74 [V]. HA
- 3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-137. OR



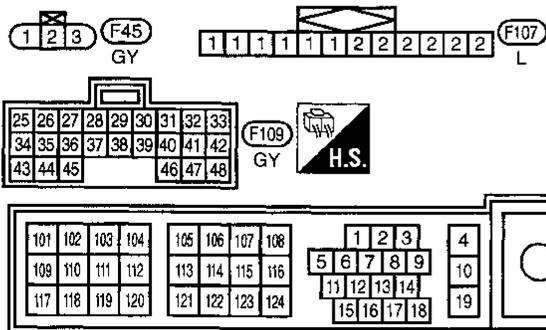
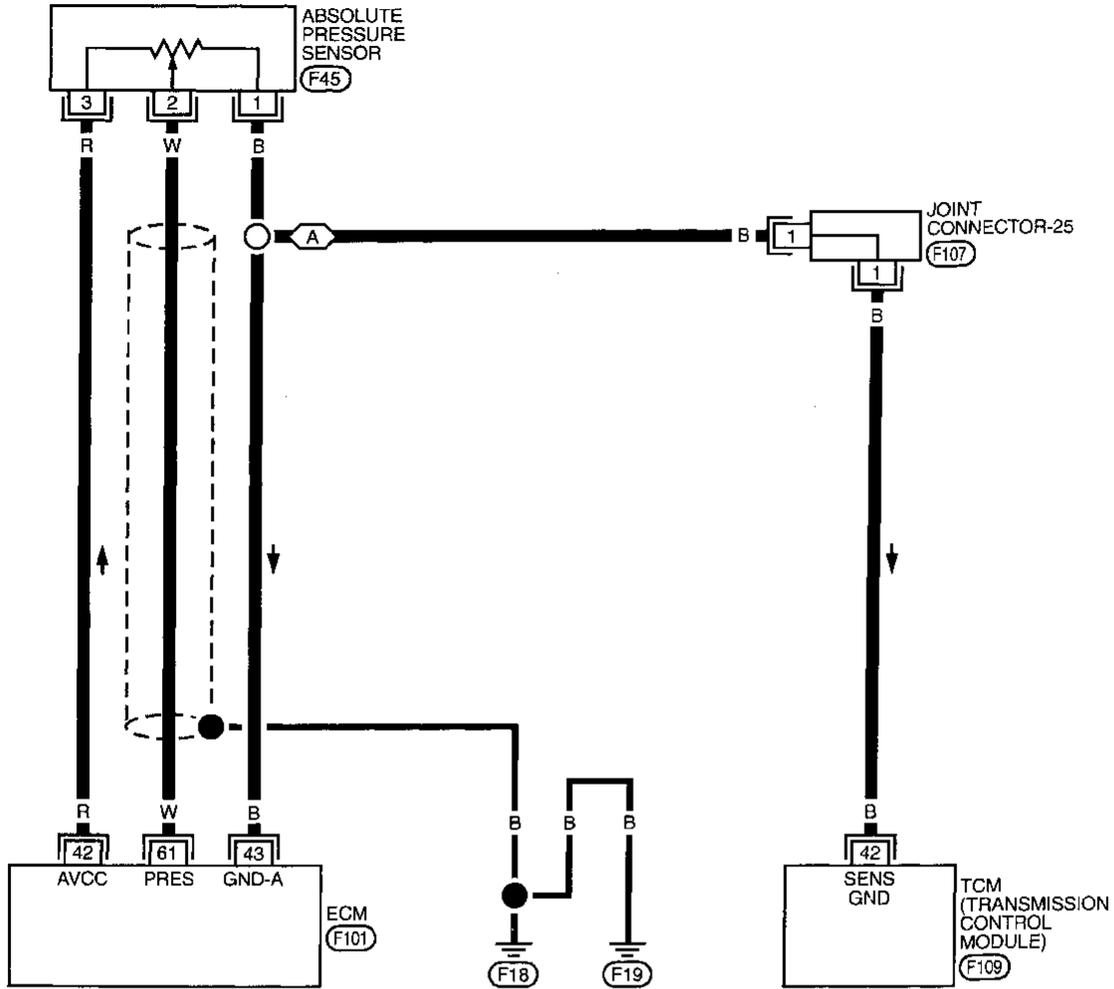
- 1) Turn ignition switch "ON".
- 2) Make sure that the voltage between ECM terminal 61 and engine ground is more than 1.74 [V]. EL
- 3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-137. IDX

TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

EC-AP/SEN-01

-  : Detectable line for DTC
-  : Non-detectable line for DTC
-  : A/T models



TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

DIAGNOSTIC PROCEDURE

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

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 → 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.

- Joint connector-25 (F107)
- 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

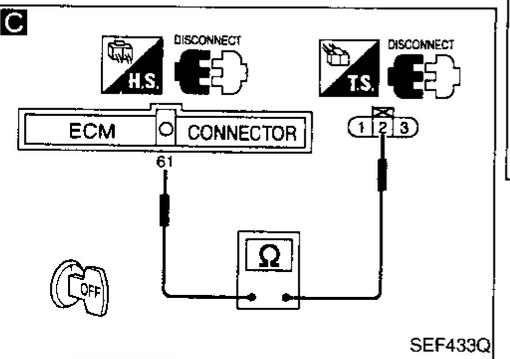
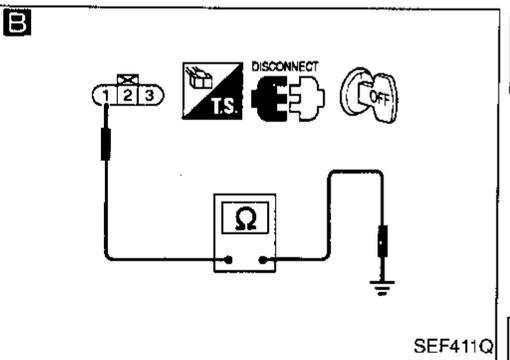
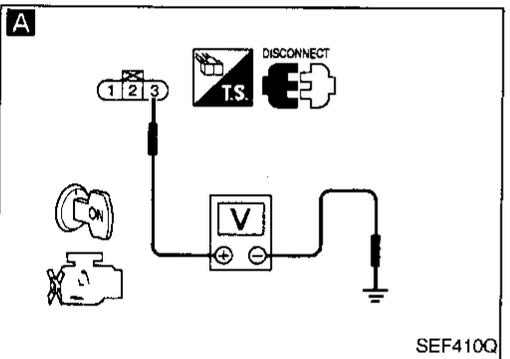
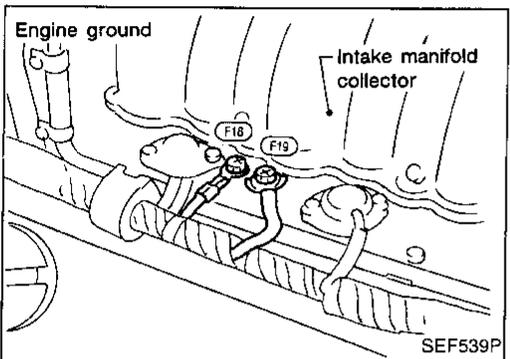
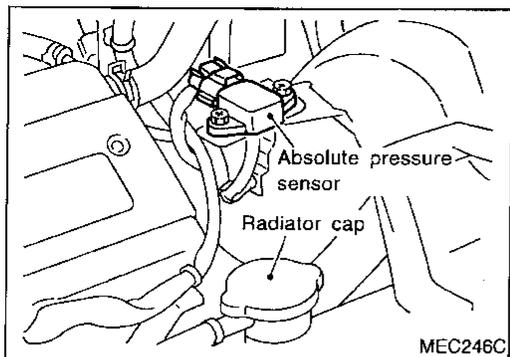
If NG, repair open circuit, short to ground or short to power in harness or connectors.

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

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

OK

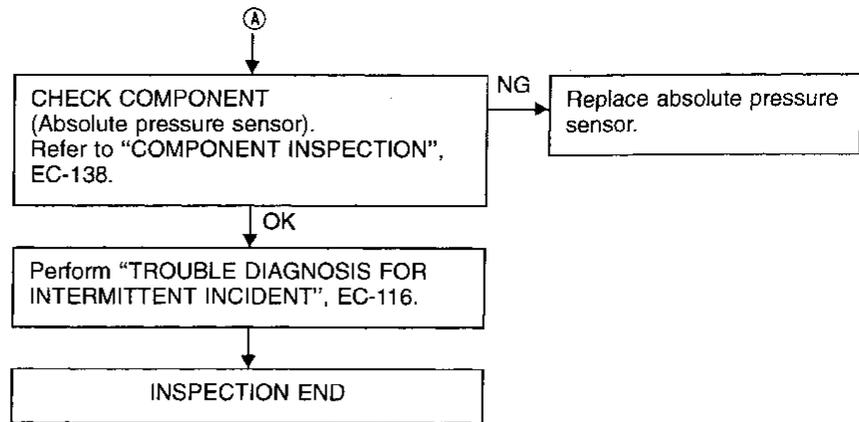
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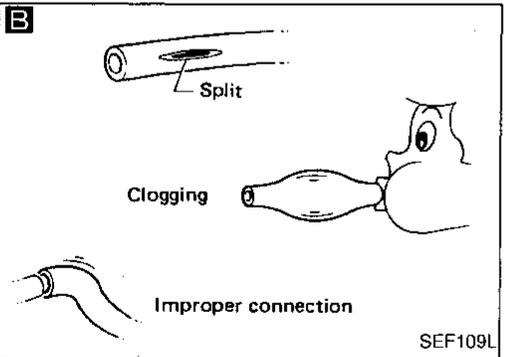
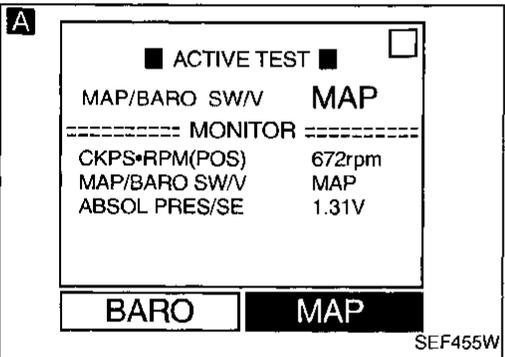
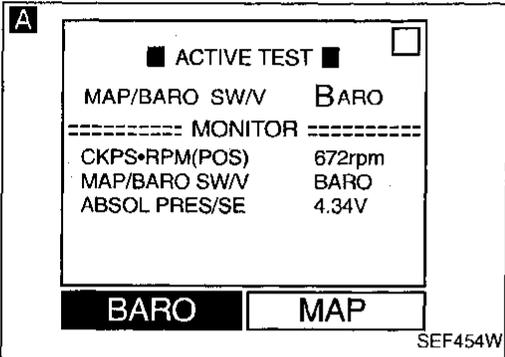
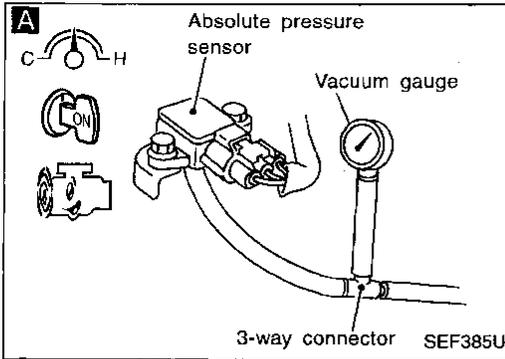
TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)



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 let it idle.
6. Check for vacuum.
For 5 seconds after 5 minutes from starting engine:
Vacuum should not exist.
For 5 minutes after starting engine:
Vacuum should exist.

OK

B

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

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

OK

CHECK COMPONENT (Absolute pressure sensor). Refer to "COMPONENT INSPECTION", EC-138.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

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", EC-394.

OK

NG

Replace MAP/BARO switch solenoid valve.

OK

CHECK INTAKE SYSTEM. Check intake system for air leaks.

NG

Repair or reconnect hose.

OK

NG

Replace absolute pressure sensor.

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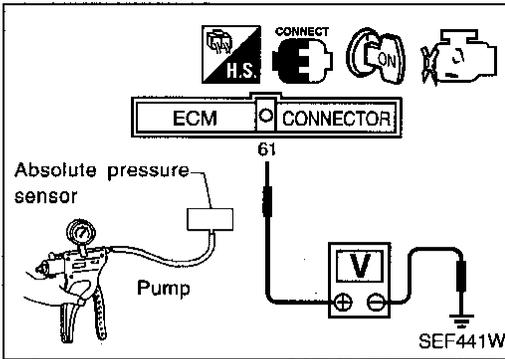
TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

COMPONENT INSPECTION

Absolute pressure sensor

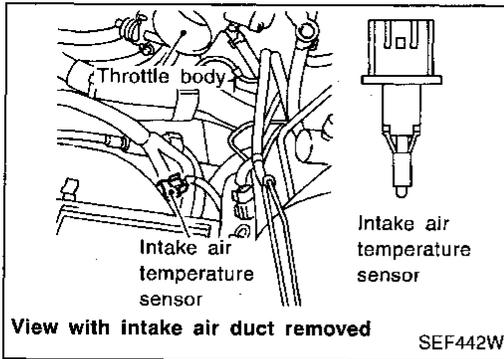
1. Remove absolute pressure sensor from bracket with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Turn ignition switch "ON".
4. Apply vacuum and barometric pressure to absolute pressure sensor as shown in figure.
5. Check output voltage between ECM terminal ⑥1 and ground.



Pressure (Absolute pressure)	Voltage (V)
Ambient barometric pressure	3.2 - 4.8V
-26.7 kPa (-200 mmHg, -7.87 inHg)	1.0 - 1.4V

CAUTION:

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

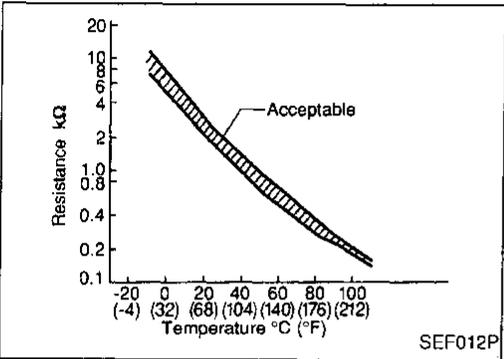


Intake Air Temperature Sensor

COMPONENT DESCRIPTION

The intake air temperature sensor is mounted to the air duct, detects intake air temperature and transmits a signal to the ECM. The temperature sensing unit uses a thermistor, which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

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



<Reference data>

Intake air temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
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 ⑤ (Intake air temperature sensor) and ECM terminal ④ (Sensor's 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 entered to ECM. B) Rationally incorrect voltage from the sensor is entered 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 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 10 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-143.

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-143.

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 10 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-143.

☆ MONITOR	☆ NO FAIL
COOLAN TEMP/S	30°C
RECORD	

SEF002P

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

SEF233U

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.
- 5) Hold vehicle speed more than 70 km/h (43 MPH) for 105 consecutive seconds.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-143.

OR

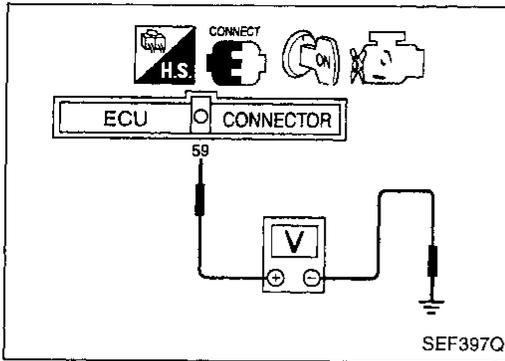


- 1) Wait until engine coolant temperature is less than 90°C (194°F).
 - (a) Turn ignition switch "ON".
 - (b) Select MODE 1 with GST.
 - (c) Check the engine coolant temperature.
 - (d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before engine coolant temperature is above 90°C (194°F).
- 2) Start engine.
- 3) Hold vehicle speed more than 70 km/h (43 MPH) for 105 consecutive seconds.
- 4) Select MODE 7 with GST.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-143.

TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

OR



NO TOOLS

- 1) Wait until engine coolant temperature is less than 90°C (194°F).
 - (a) Turn ignition switch "ON".
 - (b) Check voltage between ECM terminal 59 and ground.
Voltage: More than 1.0 (V)
 - (c) If the voltage is not more than 1.0 (V), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before the voltage is below 1.0V.
- 2) Start engine.
- 3) Hold vehicle speed more than 70 km/h (43 MPH) for 105 consecutive seconds.
- 4) Turn ignition switch "OFF", wait at least 10 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-143.

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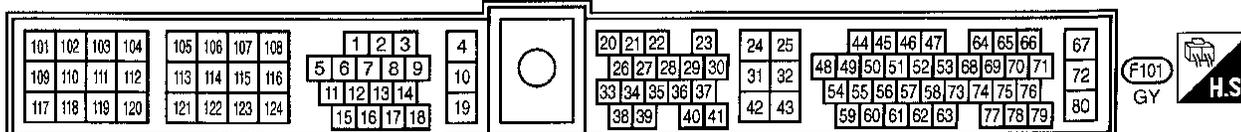
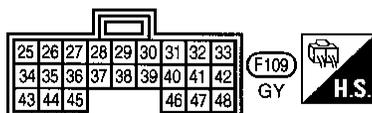
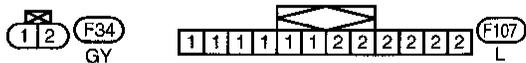
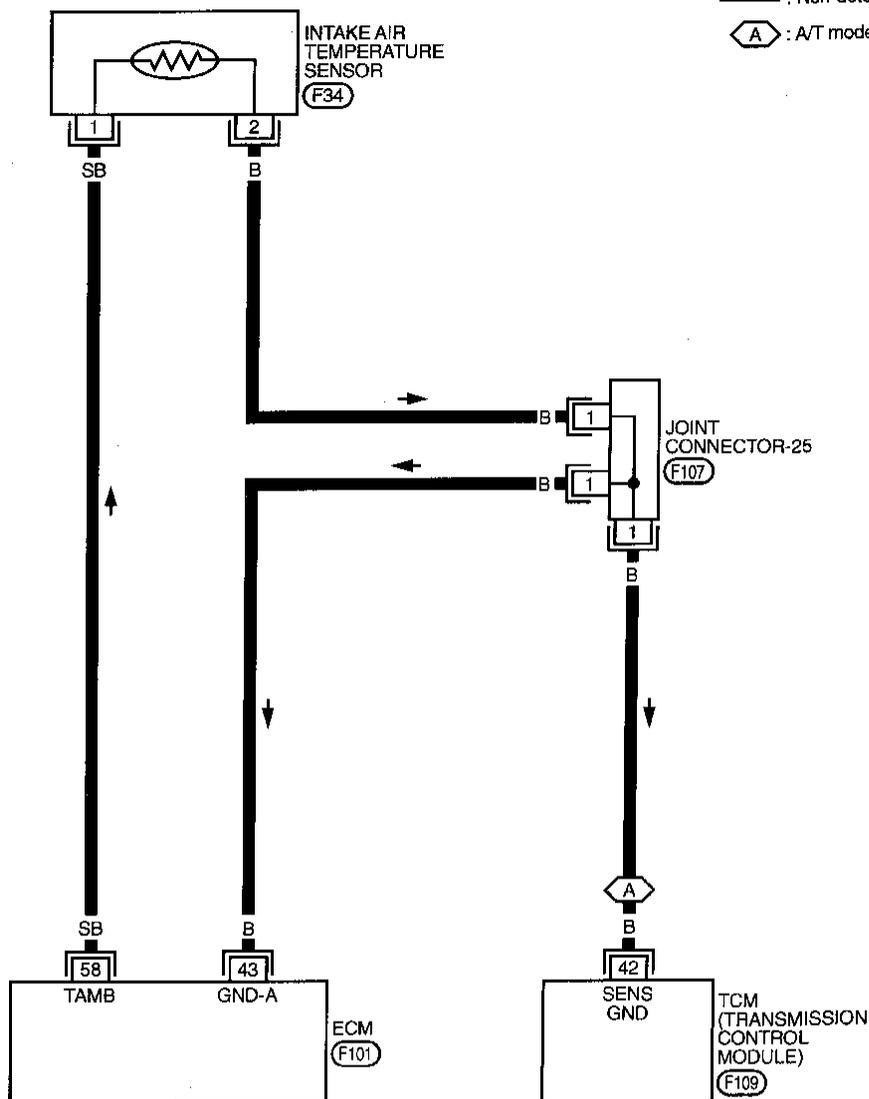
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TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

EC-IATS-01

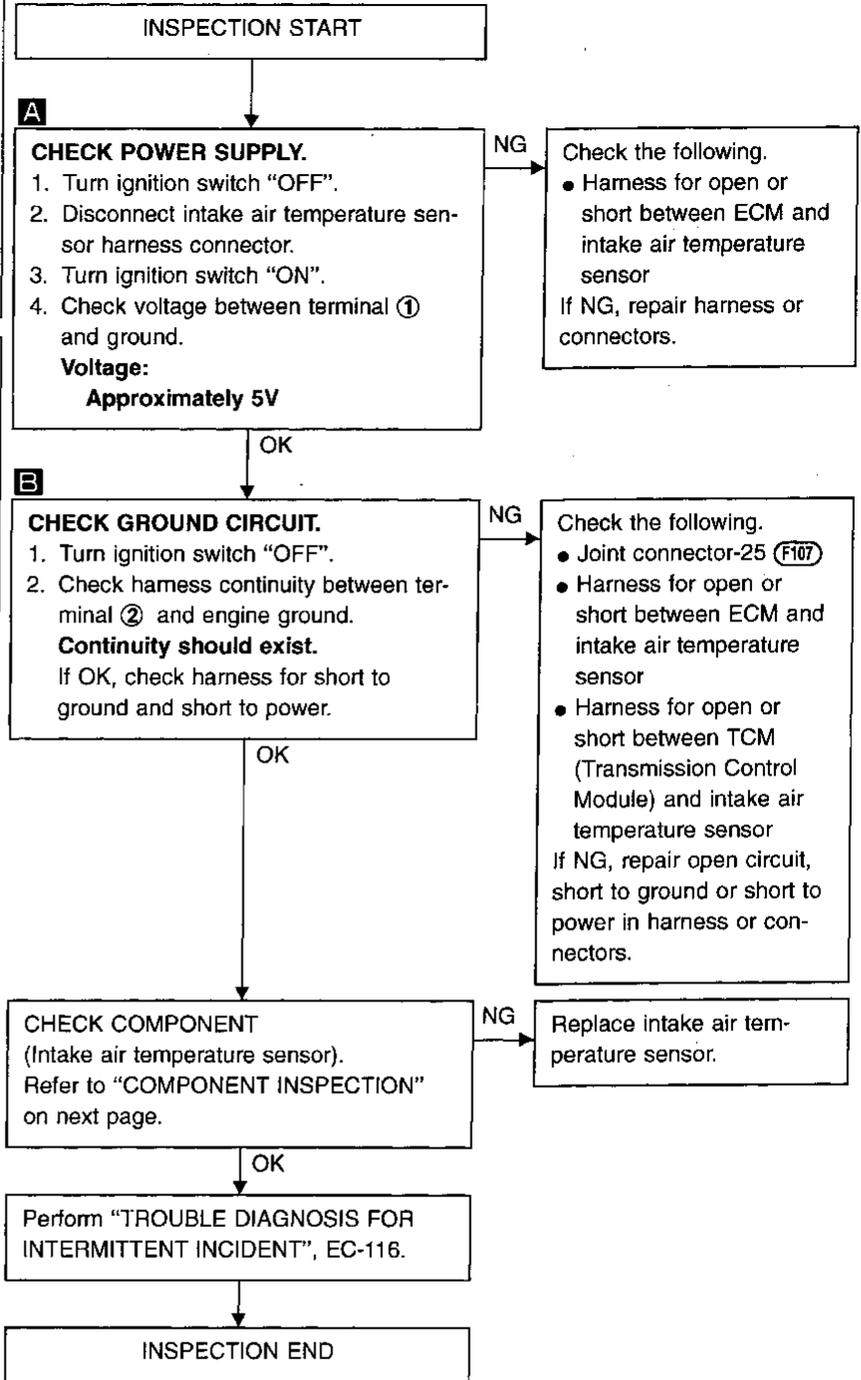
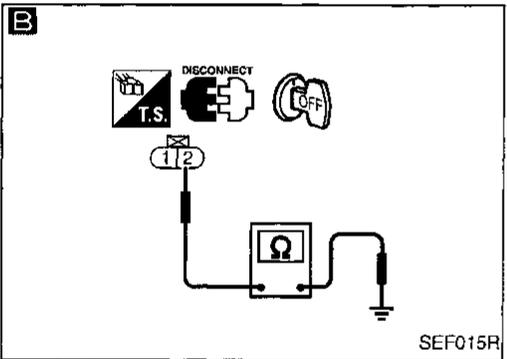
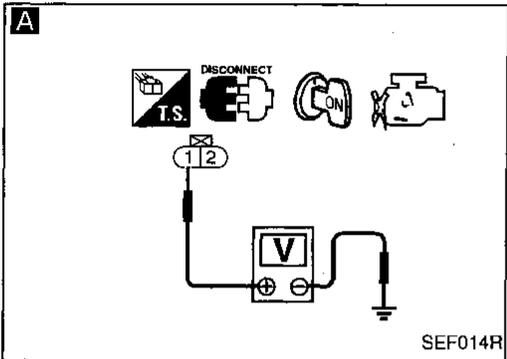
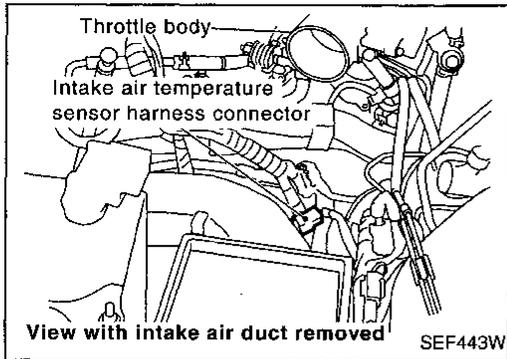
-  : Detectable line for DTC
-  : Non-detectable line for DTC
-  : A/T models



TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



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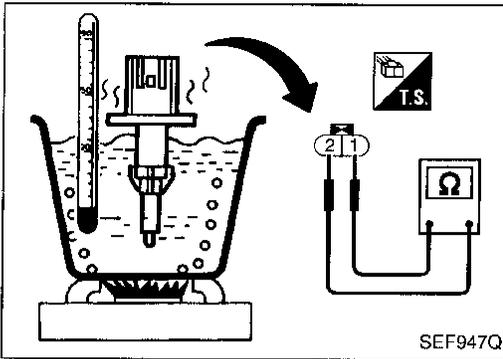
TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

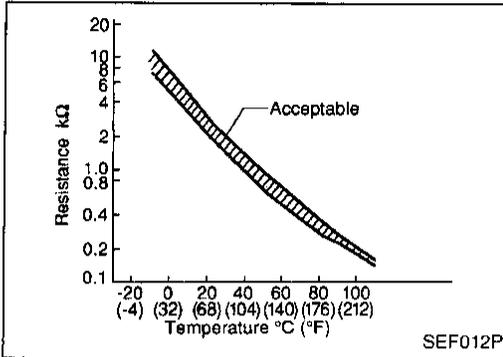
COMPONENT INSPECTION

Intake air temperature sensor

Check resistance as shown in the figure.



SEF947Q

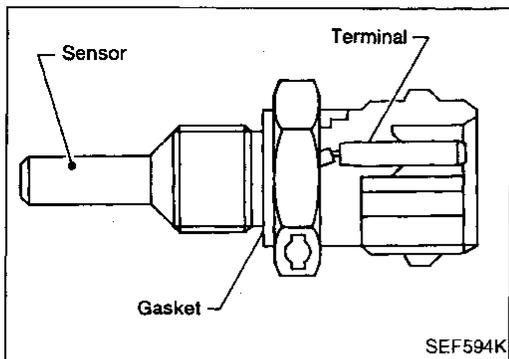


SEF012P

<Reference data>

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

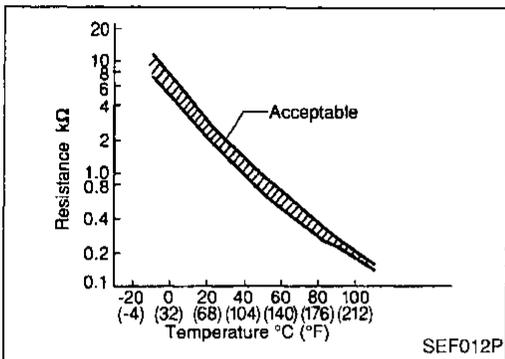
If NG, replace intake air temperature sensor.



Engine Coolant Temperature Sensor (ECTS)

COMPONENT DESCRIPTION

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



<Reference data>

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

*: These data are reference values and are measured between ECM terminal ⑤ (Engine coolant temperature sensor) and ECM terminal ④ (Sensor's ground).

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
COOLAN TEMP/S	● Engine: After warming up	More than 70°C (158°F)

ON BOARD DIAGNOSIS LOGIC

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

FAIL-SAFE MODE

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*1										
P0115	0103	Engine coolant temperature sensor circuit	<p>Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START". CONSULT displays the engine coolant temperature decided by ECM.</p> <table border="1"> <thead> <tr> <th>Condition</th> <th>Engine coolant temperature decided (CONSULT display)</th> </tr> </thead> <tbody> <tr> <td>Just as ignition switch is turned ON or Start</td> <td>40°C (104°F)</td> </tr> <tr> <td>More than 4 minutes after ignition ON or Start</td> <td>80°C (176°F)</td> </tr> <tr> <td>Except as shown above</td> <td>40 - 80°C (104 - 176°F) (Depends on the time)</td> </tr> </tbody> </table>	Condition	Engine coolant temperature decided (CONSULT display)	Just as ignition switch is turned ON or Start	40°C (104°F)	More than 4 minutes after ignition ON or Start	80°C (176°F)	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
Condition	Engine coolant temperature decided (CONSULT display)										
Just as ignition switch is turned ON or Start	40°C (104°F)										
More than 4 minutes after ignition ON or Start	80°C (176°F)										
Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)										

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

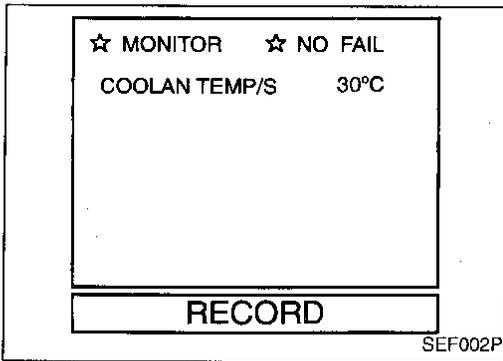
TROUBLE DIAGNOSIS FOR DTC P0115

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 10 seconds before conducting the next test.



- 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-148.

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-148.

OR



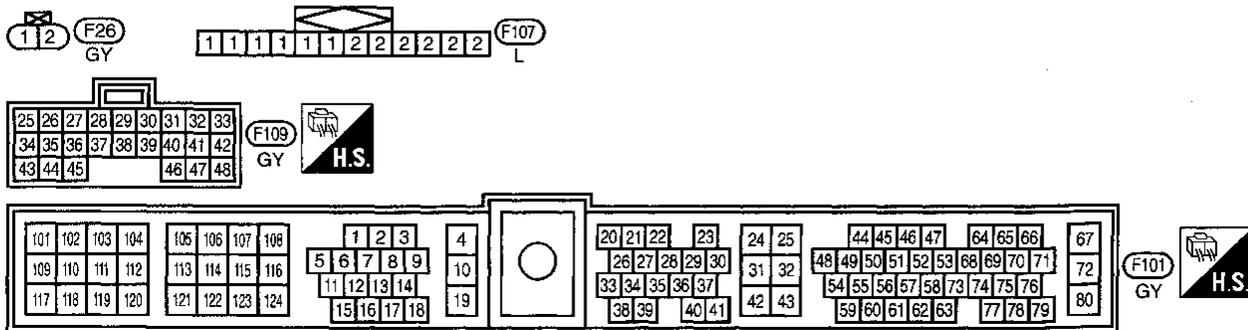
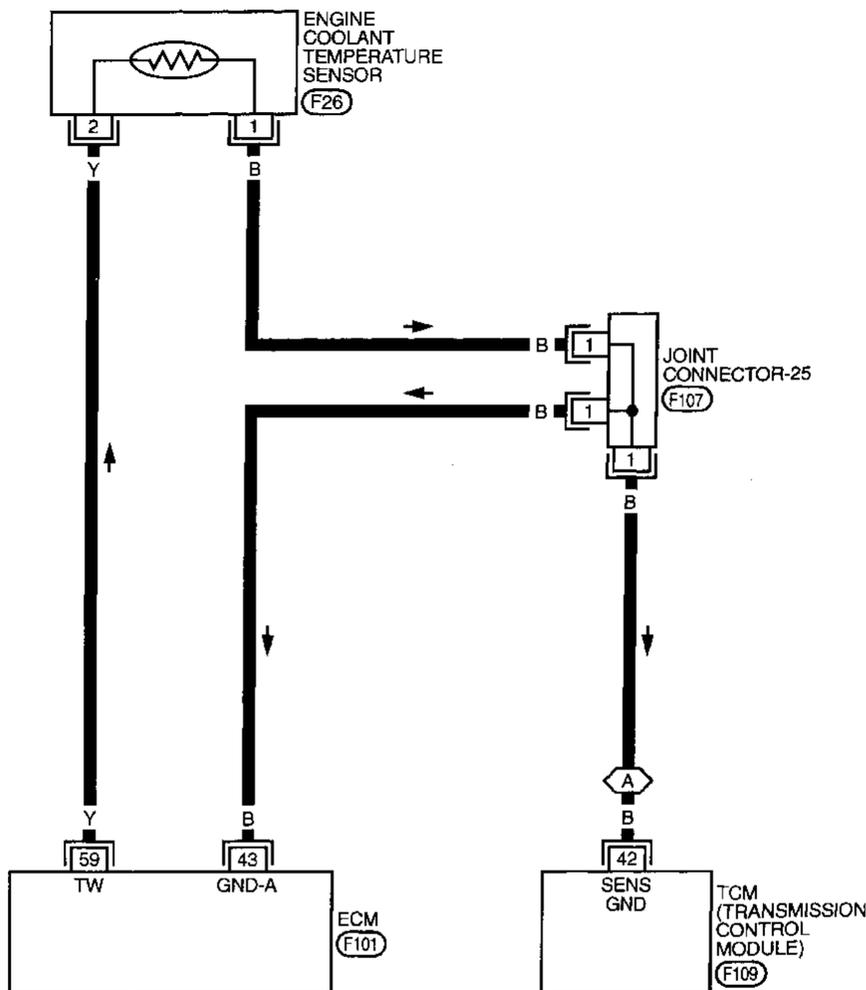
- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-148.

TROUBLE DIAGNOSIS FOR DTC P0115

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

EC-ECTS-01

-  : Detectable line for DTC
-  : Non-detectable line for DTC
-  : A/T models



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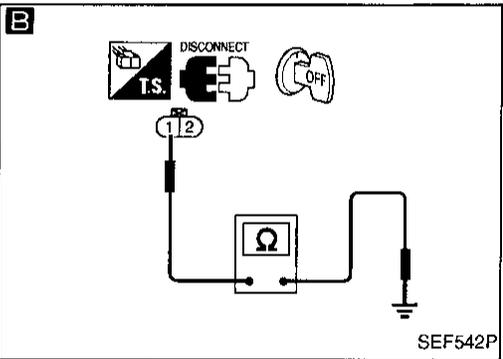
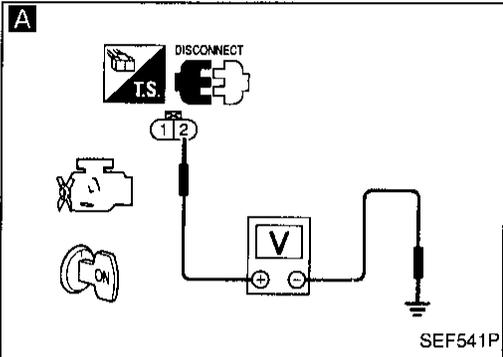
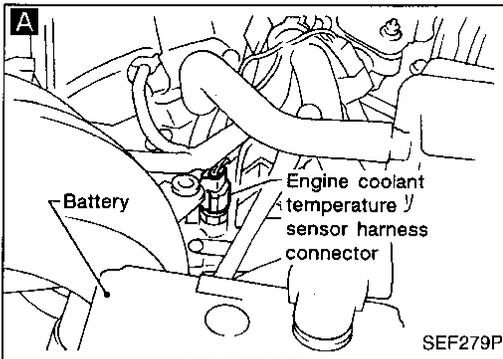
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TROUBLE DIAGNOSIS FOR DTC P0115

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 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.
• Joint connector-25 (F107)
• 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
If NG, repair open circuit, 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-116.

INSPECTION END

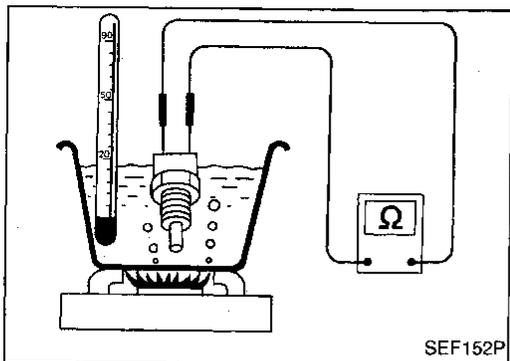
TROUBLE DIAGNOSIS FOR DTC P0115

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

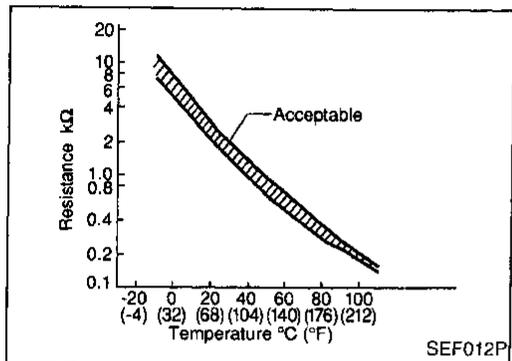
COMPONENT INSPECTION

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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TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor

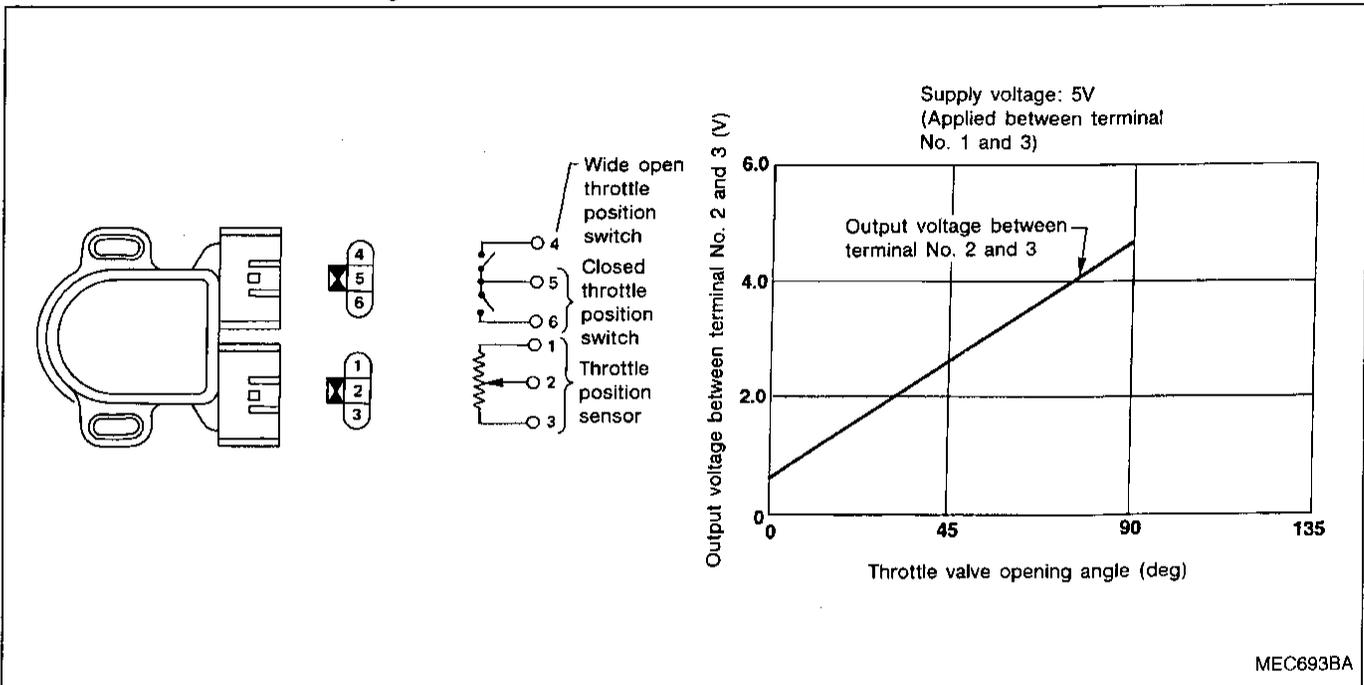
NOTE: If DTC P0120 (0403) is displayed with DTC P0510 (0203), perform TROUBLE DIAGNOSIS FOR DTC P0510 first (See EC-376.).

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.

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



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) 	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) 	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 Ⓧ (ECM ground).

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	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.

FAIL-SAFE MODE

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*1								
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. <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th colspan="2">Driving condition</th> </tr> </thead> <tbody> <tr> <td>When engine is idling</td> <td>Normal</td> </tr> <tr> <td>When accelerating</td> <td>Poor acceleration</td> </tr> </tbody> </table>	Driving condition		When engine is idling	Normal	When accelerating	Poor acceleration
Driving condition									
When engine is idling	Normal								
When accelerating	Poor acceleration								

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

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

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 10 seconds before conducting the next test.

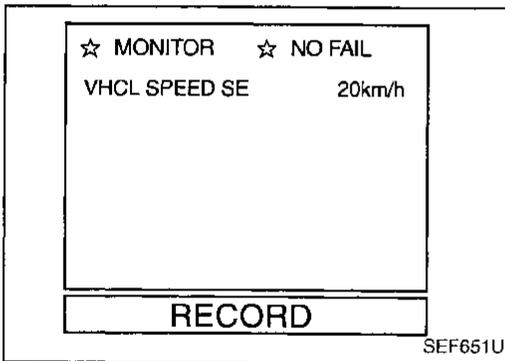
Procedure for malfunction A

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.



- 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-157.

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-157.

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 10 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-157.

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

Procedure for malfunction B

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CKPS•RPM(POS)	672rpm	
COOLAN TEMP/S	85°C	
RECORD		

SEF452W

-  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 1,000 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,000 rpm.
- A/T model**
Selector lever: Suitable position except "P" or "N"
Brake pedal: Depressed
Vehicle speed: 0 km/h (0 MPH)
- M/T model**
Selector lever: Suitable position except "N"
(Higher gear position such as 3rd or 4th position is better to keep engine rpm low.)
- Accelerator pedal: Released**
Vehicle speed: As slow as possible
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-158.
-
-  1) Start engine and let it idle for at least 10 seconds.
If idle speed is over 1,000 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,000 rpm.
- A/T model**
Selector lever: Suitable position except "P" or "N"
Brake pedal: Depressed
Vehicle speed: 0 km/h (0 MPH)
- M/T model**
Selector lever: Suitable position except "N"
(Higher gear position such as 3rd or 4th position is better to keep engine rpm low.)
- Accelerator pedal: Released**
Vehicle speed: As slow as possible
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-158.
-
-  1) Start engine and let it idle for at least 10 seconds.
If idle speed is over 1,000 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,000 rpm.
- A/T model**
Selector lever: Suitable position except "P" or "N"
Brake pedal: Depressed
Vehicle speed: 0 km/h (0 MPH)
- M/T model**
Selector lever: Suitable position except "N"
(Higher gear position such as 3rd or 4th position is better to keep engine rpm low.)
- Accelerator pedal: Released**
Vehicle speed: As slow as possible
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-158.

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

Procedure for malfunction C

CAUTION:

Always drive vehicle at a safe speed.



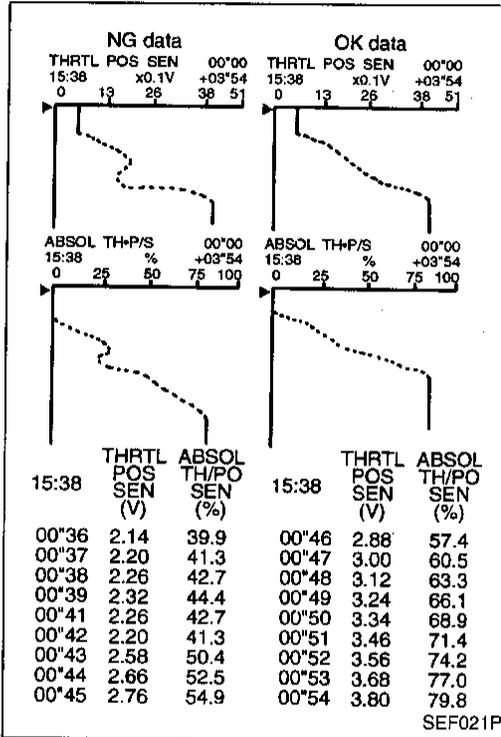
- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
- 5) Select "THRTL POS SEN" and "ABSOL TH·P/S" in "DATA MONITOR" mode with CONSULT.
- 6) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.
- 7) Print out the recorded 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-157.
 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.
 - CKPS-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-159.

☆ MONITOR ☆ NO FAIL

THRTL POS SEN 0.48V
ABSOL TH·P/S 0.0%

RECORD

SEF024P



☆ MONITOR ☆ NO FAIL

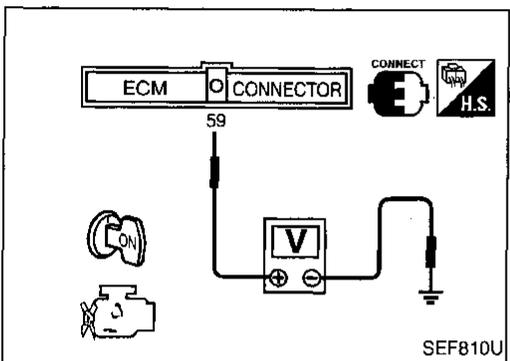
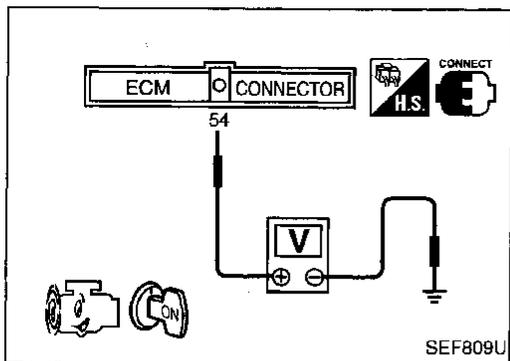
CKPS·RPM(POS) 2137rpm
MAS AIR/FL SE 3.07V
COOLAN TEMP/S 84°C

RECORD

SEF808U

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)



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 54 and ground:
More than 3V**

**Voltage between ECM terminal 59 and ground:
Less than 1.5V**

- 2) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-159.

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 54 and ground:
More than 3V**

**Voltage between ECM terminal 59 and ground:
Less than 1.5V**

- 2) Stop the vehicle, turn ignition switch "OFF", wait at least 10 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-159.

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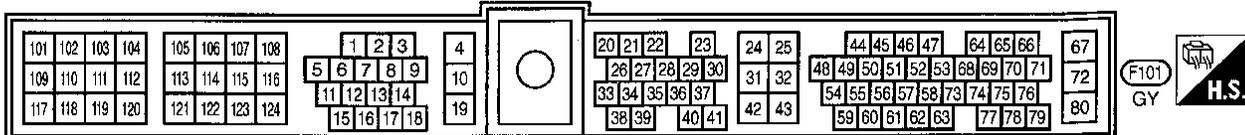
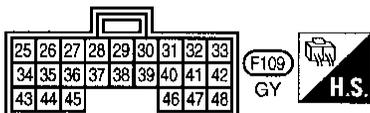
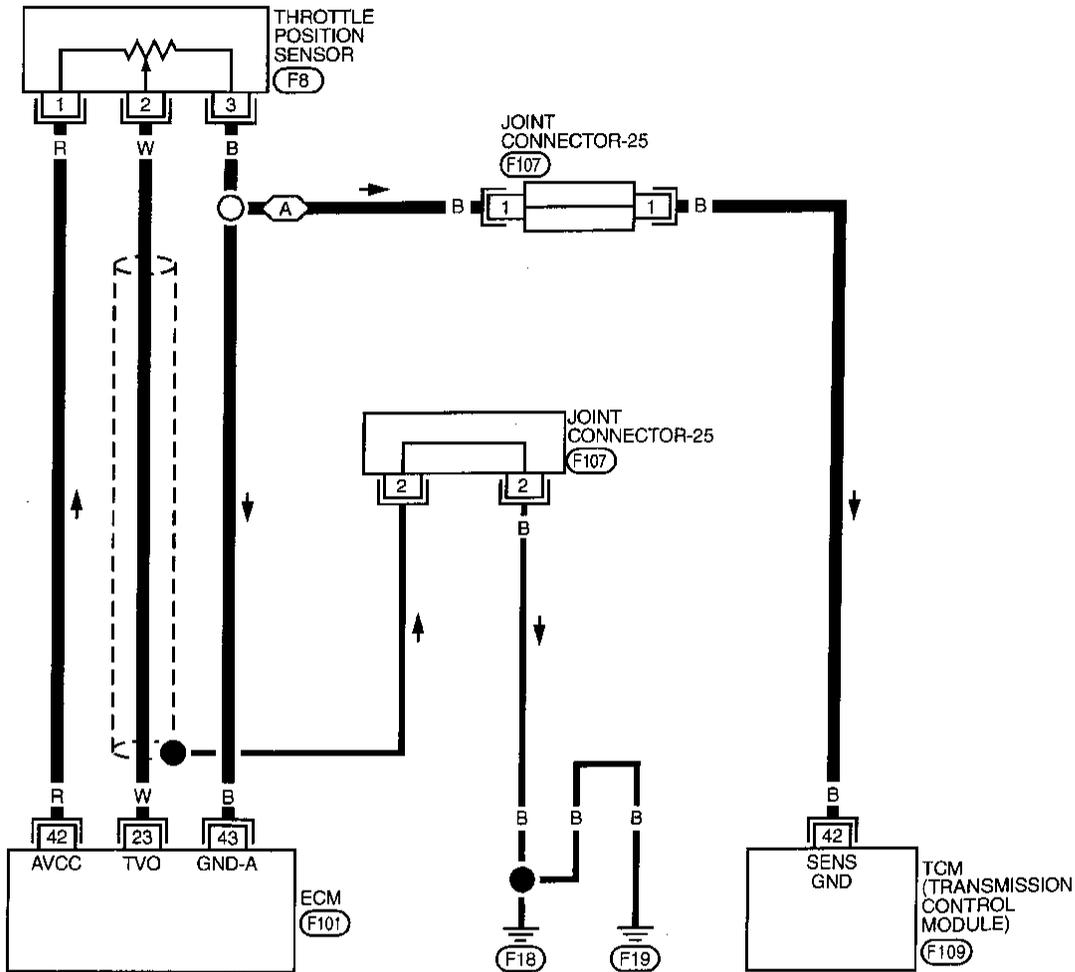
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TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

EC-TPS-01

- : Detectable line for DTC
- : Non-detectable line for DTC
- A : A/T models

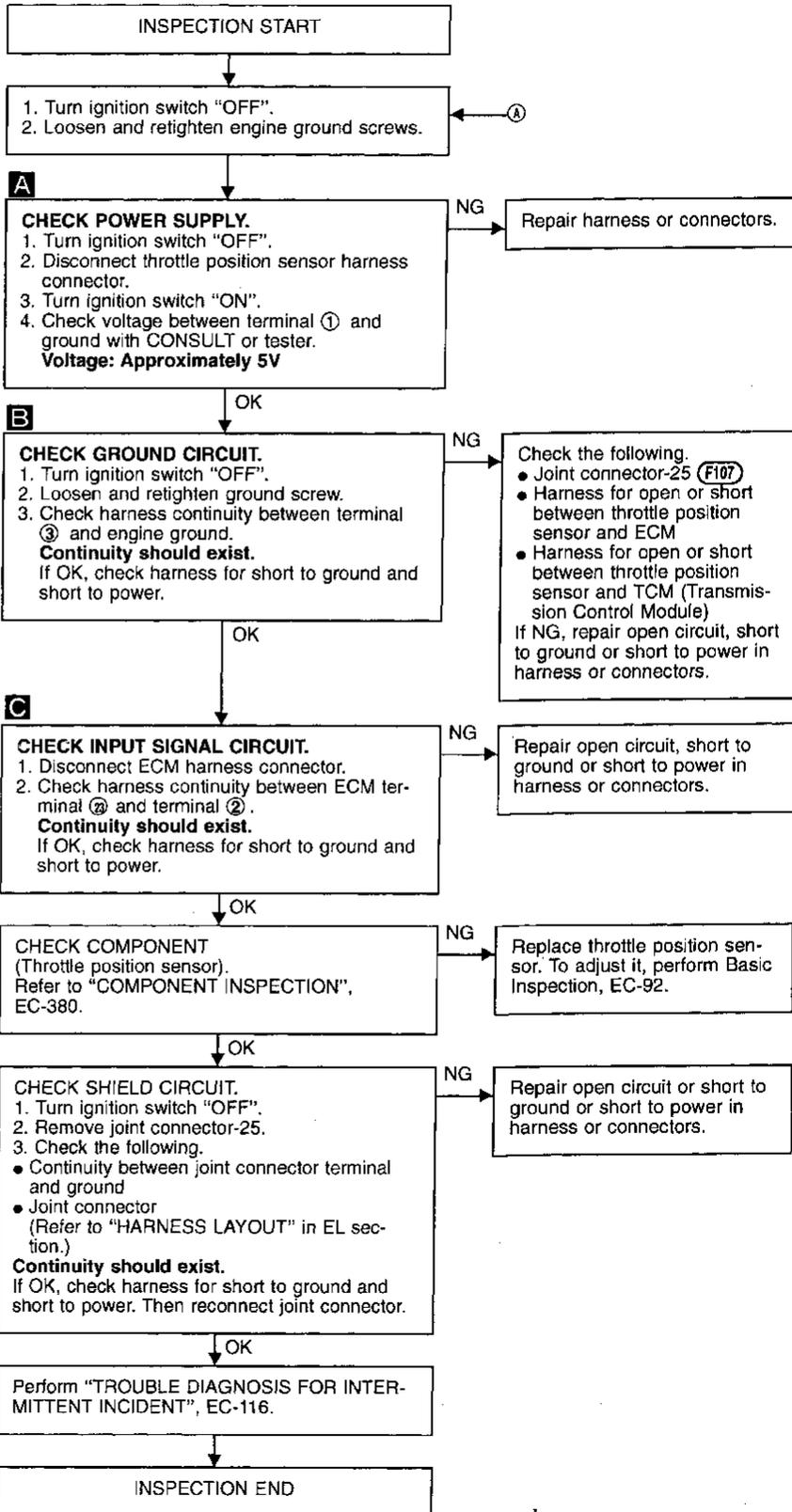
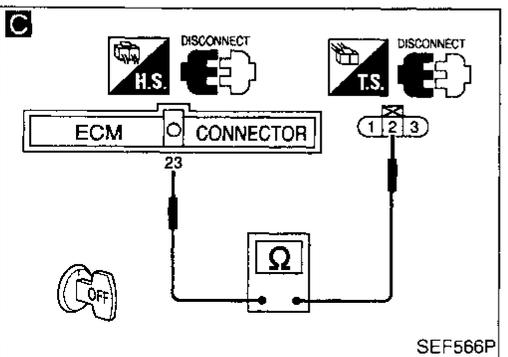
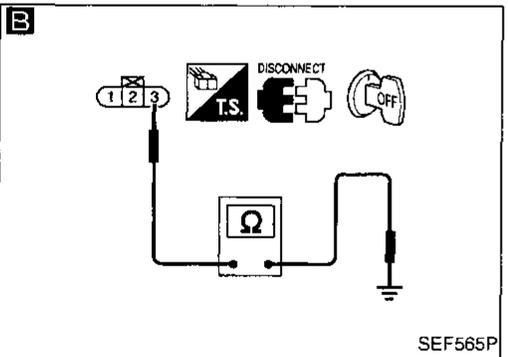
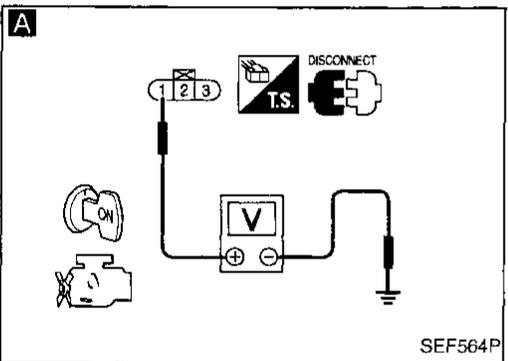
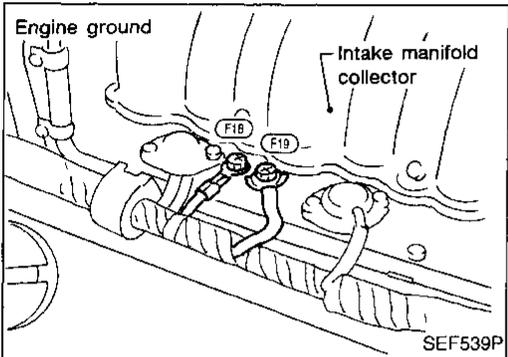
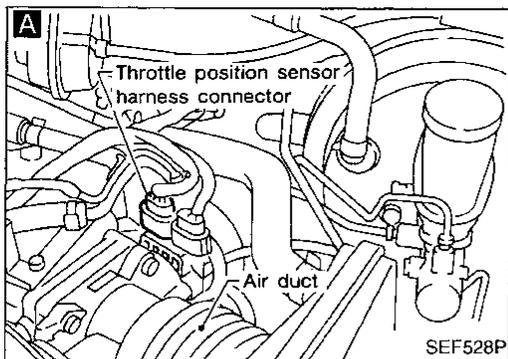


Throttle Position Sensor (Cont'd)

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 next page. If the trouble is duplicated after "Procedure for malfunction C", perform "Procedure C" on EC-159.

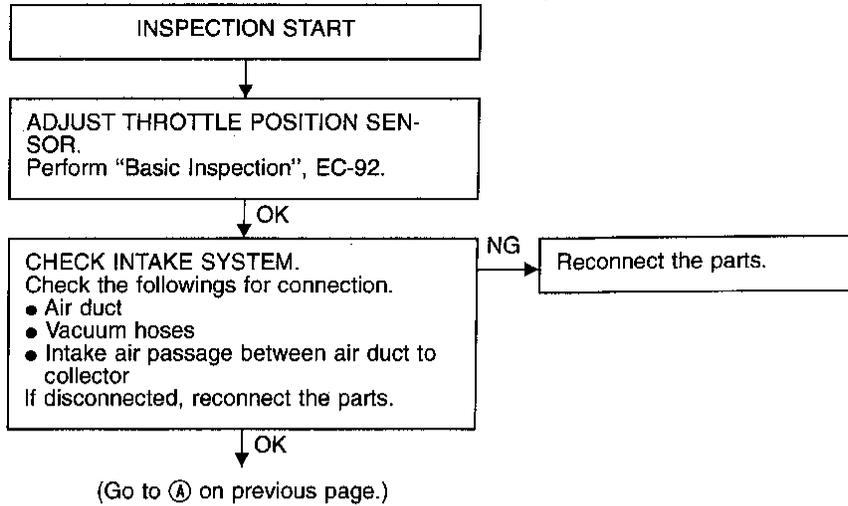
Procedure A



TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

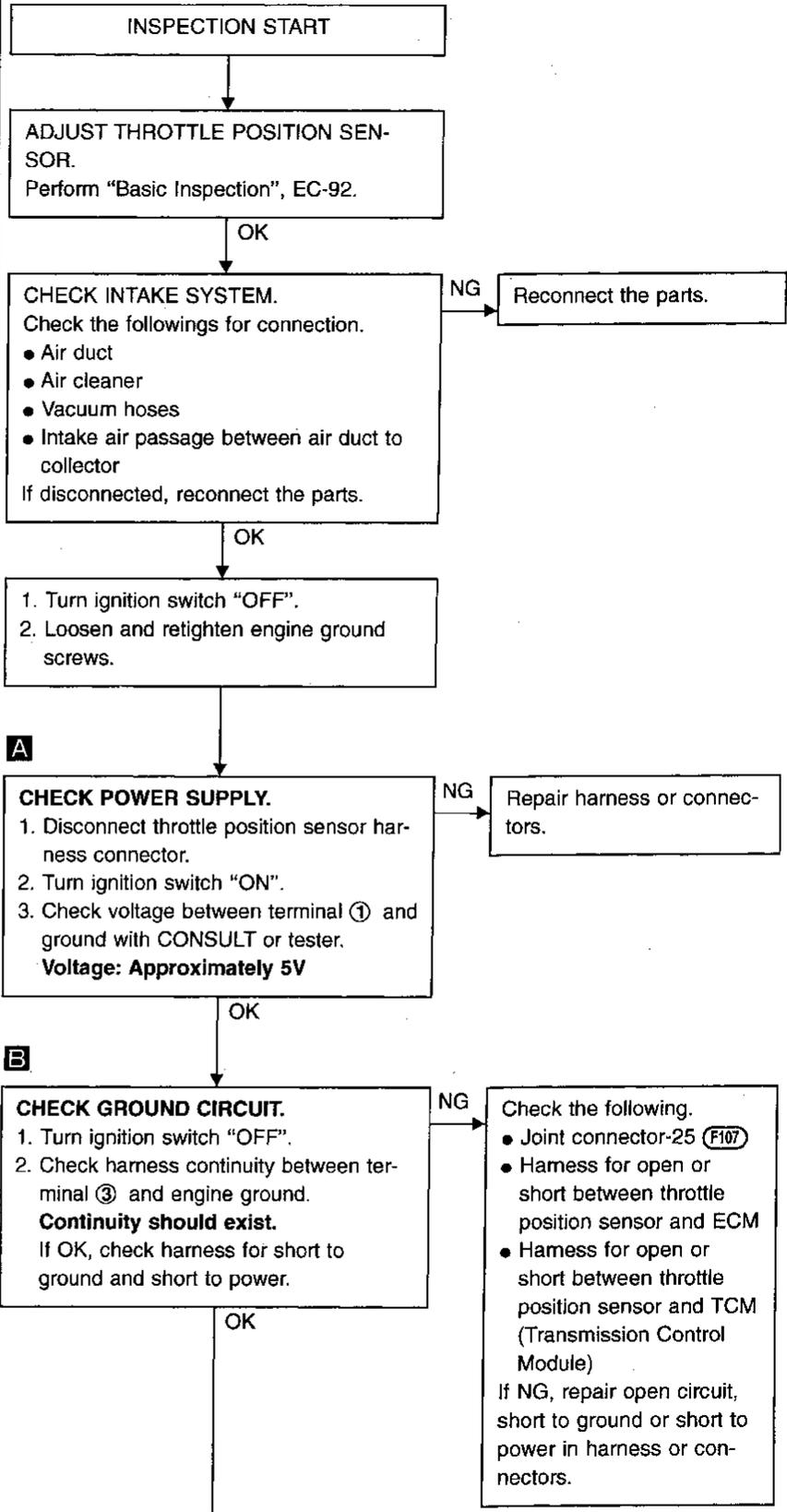
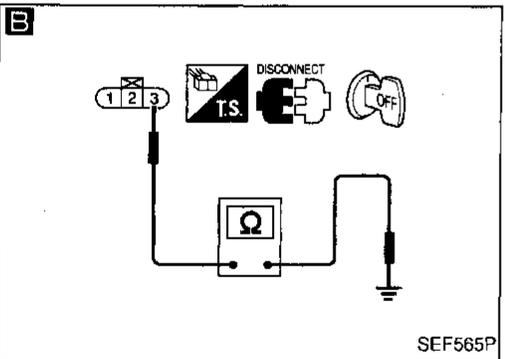
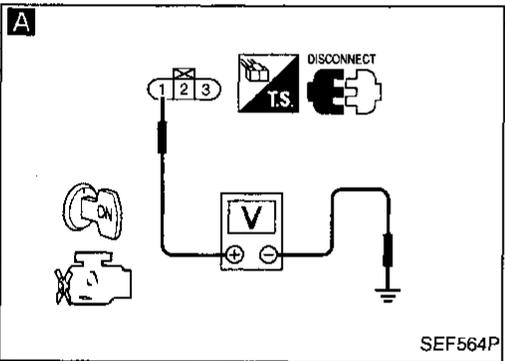
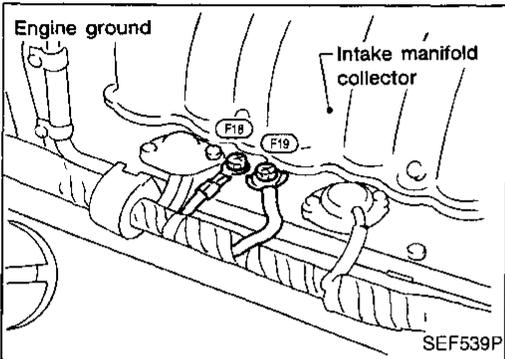
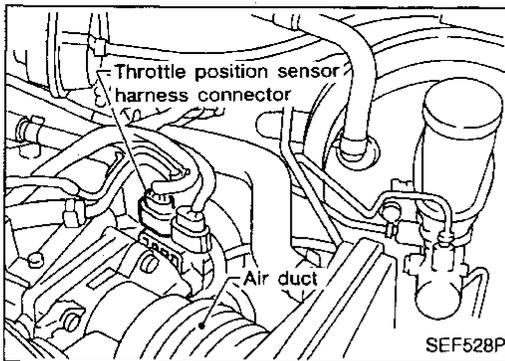
Procedure B



TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

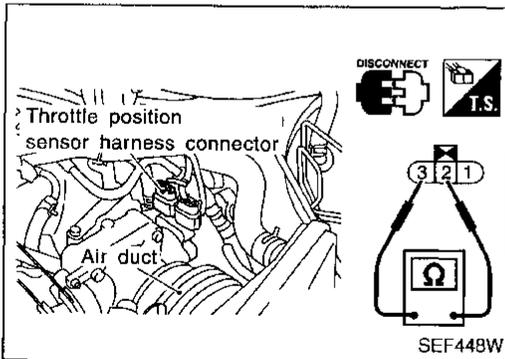
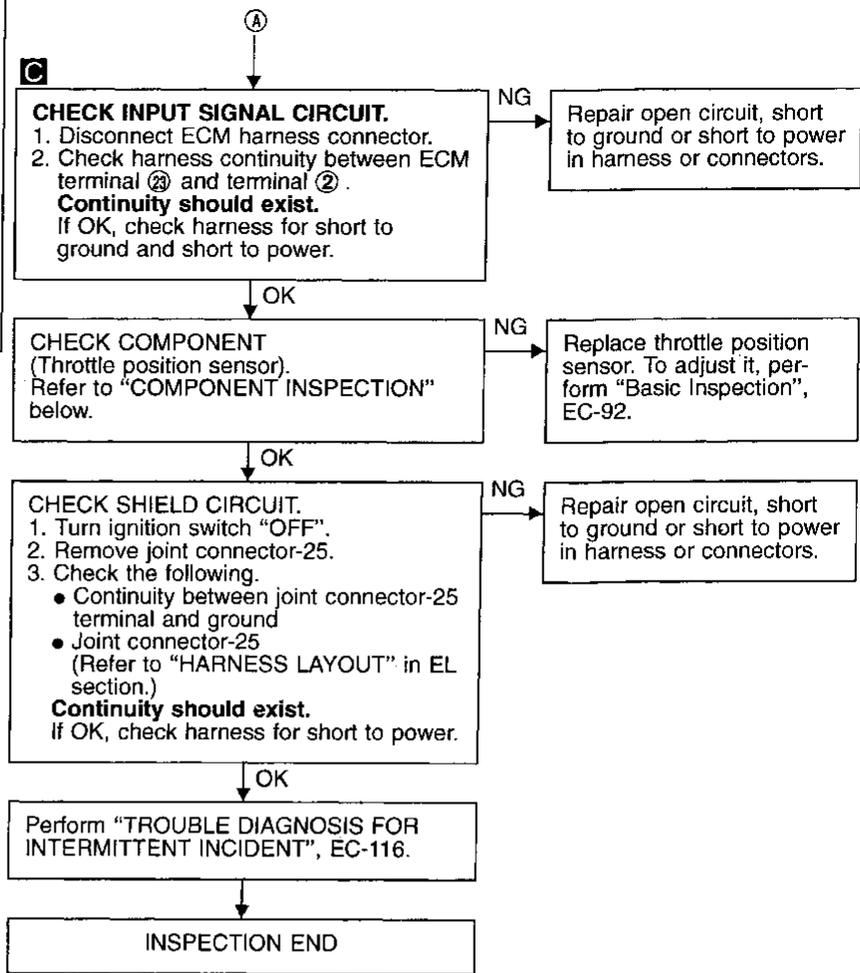
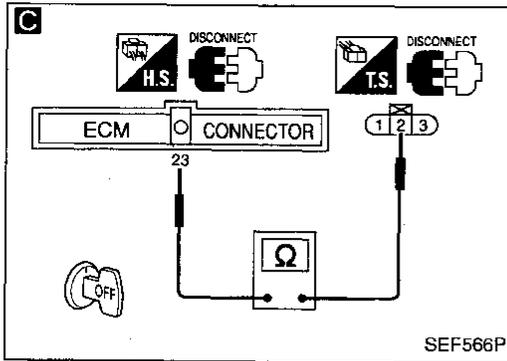
Procedure C



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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. Turn ignition switch "OFF".
3. Disconnect throttle position sensor harness connector.
4. Make sure that resistance between terminals ② and ③ changes when opening throttle valve manually.

NOTE:

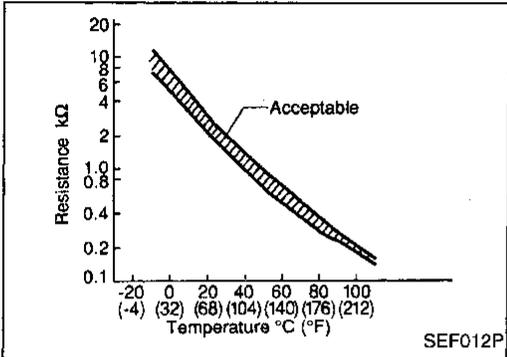
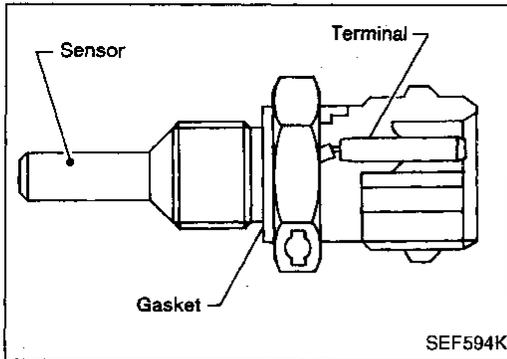
Resistance measurement must be made with throttle position sensor installed in vehicle.

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

If NG, replace throttle position sensor.

To adjust throttle position sensor, perform "Basic Inspection". (See page EC-92.)

TROUBLE DIAGNOSIS FOR DTC P0125



Engine Coolant Temperature Sensor (ECTS)

COMPONENT DESCRIPTION

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

<Reference data>

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

*: These data are reference values and are measured between ECM terminal 59 (Engine coolant temperature sensor) and ECM terminal 4 (Sensor's ground).

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

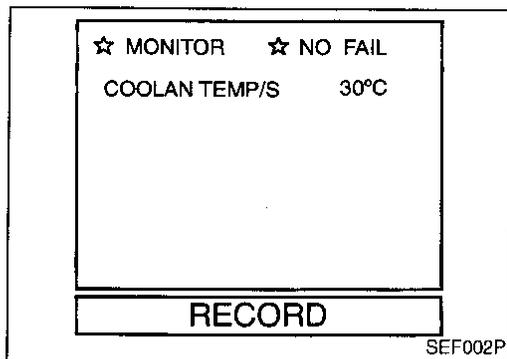
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
COOLAN TEMP/S	● Engine: After warming up	More than 70°C (158°F)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0125 0908	<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 Sensor (ECTS) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Be careful not to overheat engine.

NOTE:

- If DTC P0125 (0908) is displayed with P0115 (0103), first perform "TROUBLE DIAGNOSIS FOR DTC P0115". Refer to EC-145.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and run it for 65 minutes at idle speed.

If "COOLAN TEMP/S" increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.

- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-164.

OR



- 1) Start engine and run it for 65 minutes at idle speed.

If "COOLAN TEMP/S" increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.

- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-164.

OR



- 1) Start engine and run it for 65 minutes at idle speed.

If voltage between ECM terminal ⑤ and ground decreases to less than 3.8V within 65 minutes, stop engine because the test result will be OK.

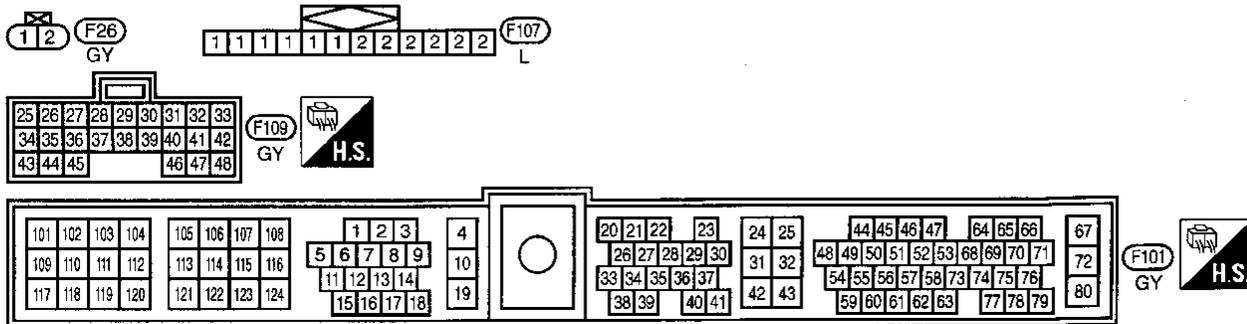
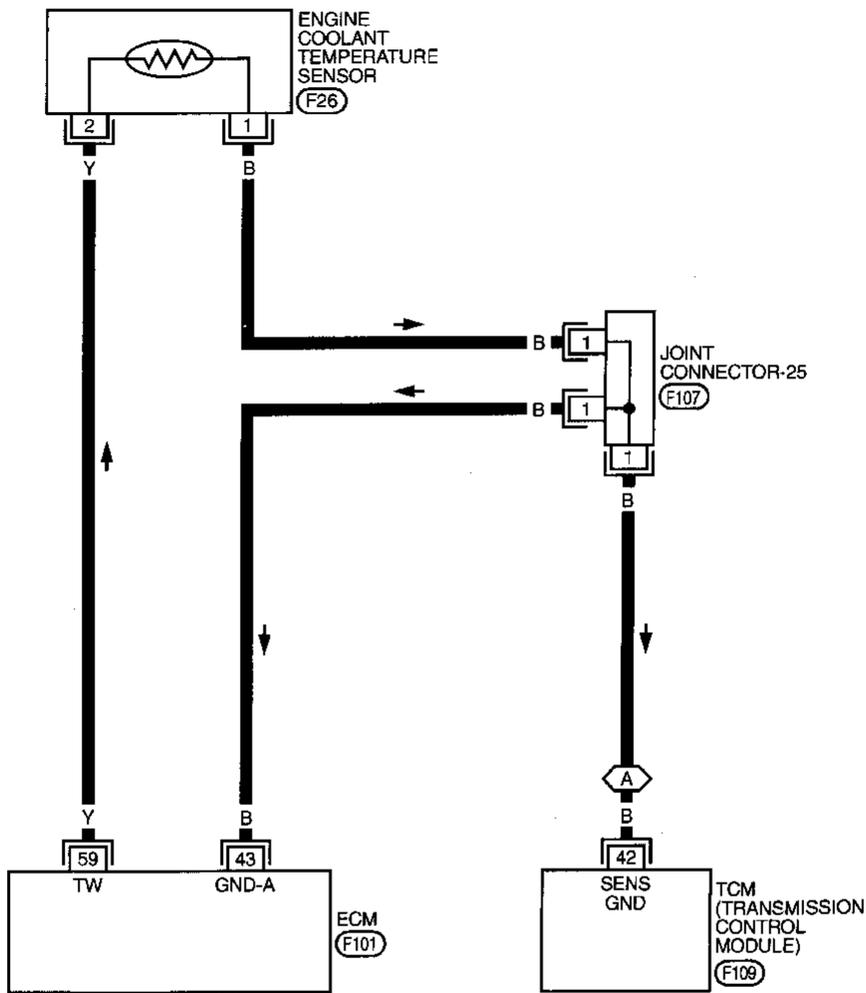
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-164.

TROUBLE DIAGNOSIS FOR DTC P0125

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

EC-ECTS-01

-  : Detectable line for DTC
-  : Non-detectable line for DTC
-  : A/T models

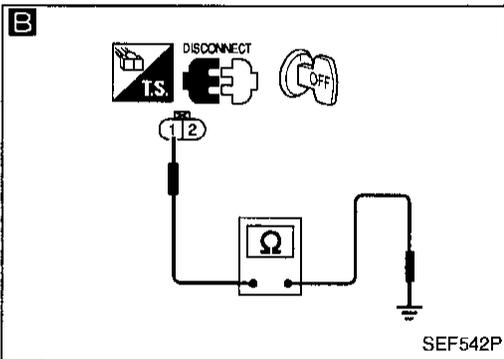
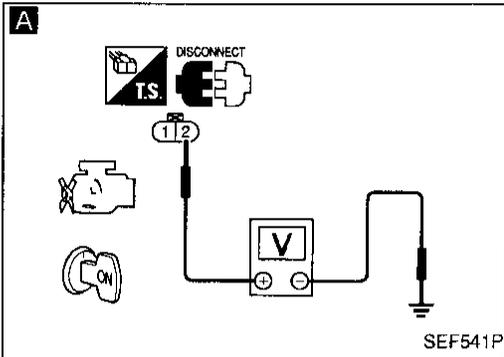
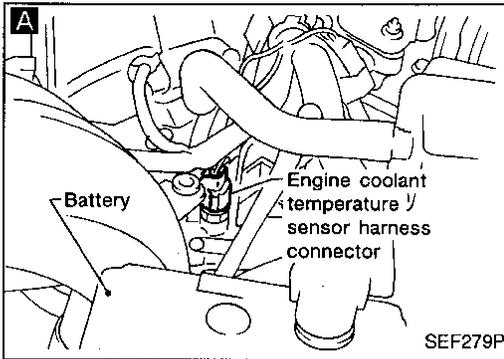


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- EL
- IDX

TROUBLE DIAGNOSIS FOR DTC P0125

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

DIAGNOSTIC PROCEDURE



INSPECTION START

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

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

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.
 • Joint connector-25 (F107)
 • 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
 If NG, repair open circuit, 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.

CHECK THERMOSTAT OPERATION.
 When the engine is cold [lower than 80°C (176°F)], grasp lower radiator hose and confirm the engine coolant does not flow.

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

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

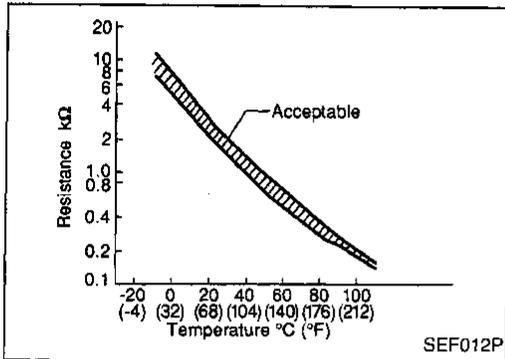
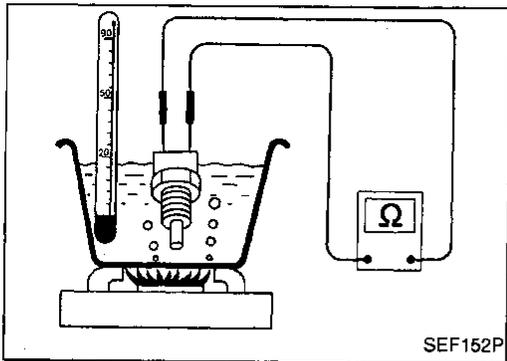
TROUBLE DIAGNOSIS FOR DTC P0125

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

COMPONENT INSPECTION

Engine coolant temperature sensor

Check resistance as shown in the figure.



<Reference data>

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

If NG, replace engine coolant temperature sensor.

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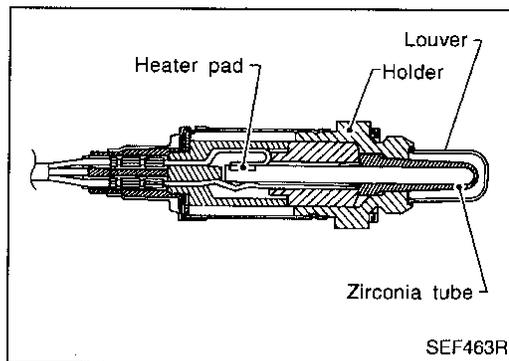
BT

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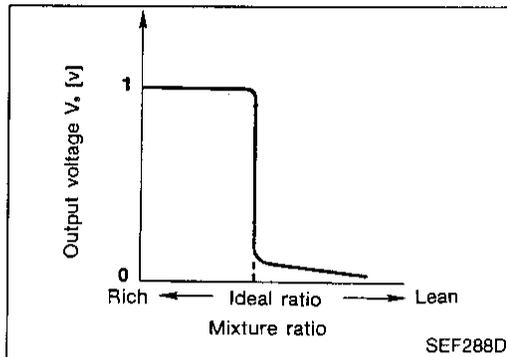
IDX

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



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

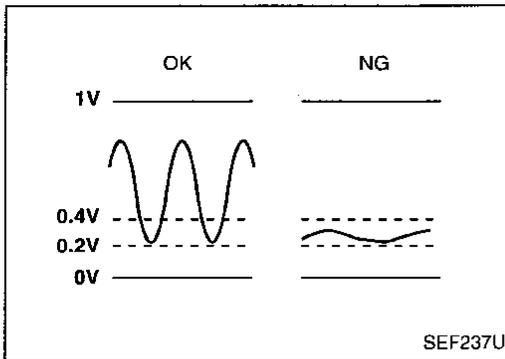
ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50 51	W 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)

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

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



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.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130, 0503 (Right 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, 0303 (Left bank)		

SEF456W

SEF457W

SEF526U

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 10 seconds before conducting the next test.

TESTING CONDITION:

- Never raise engine speed above 3,600 rpm (A/T), 4,000 rpm (M/T) during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 4).
- 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.
- Select "FR O2 SEN-B1 (-B2) P0130 (P0150)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Let it idle for at least 3 minutes.
- 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.)

CKPS-RPM (POS): 1,400 - 2,400 rpm (A/T models)
1,600 - 2,600 rpm (M/T models)

Vehicle speed: 70 - 100 km/h (43 - 62 MPH)

B/FUEL SCHDL: 1 - 5 ms

Selector lever: Suitable position

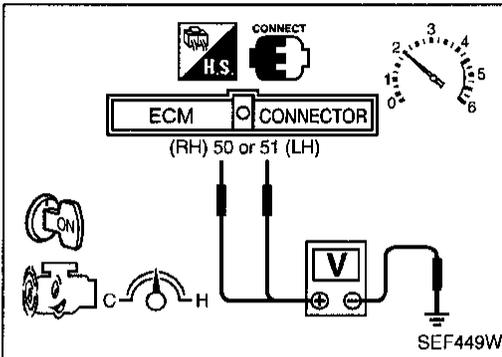
If "TESTING" is not displayed after 5 minutes, retry from step 2).

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

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

- 6) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-171.

During this test, P1148 may be stored in ECM.



OR OVERALL FUNCTION CHECK

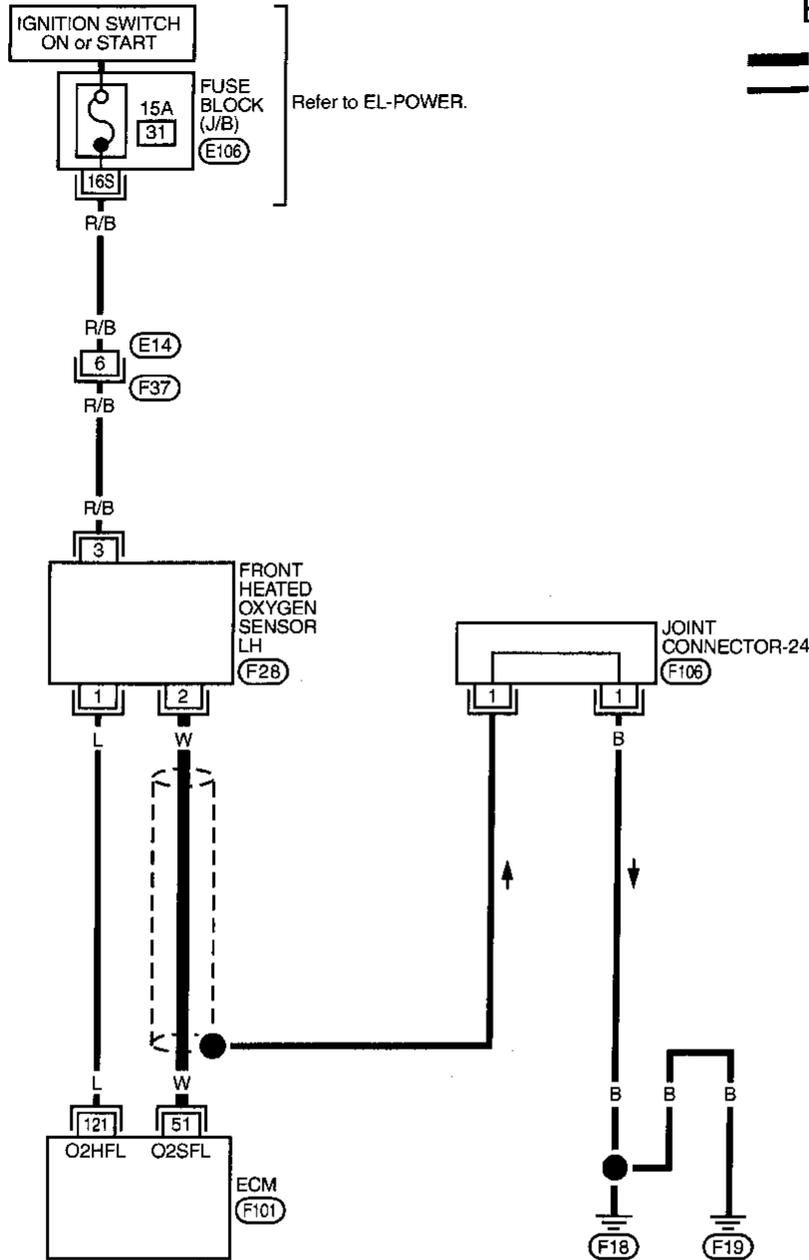
Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑤① RH, ⑤① 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-171.

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

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

LEFT BANK



EC-FRO2LH-01

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

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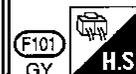
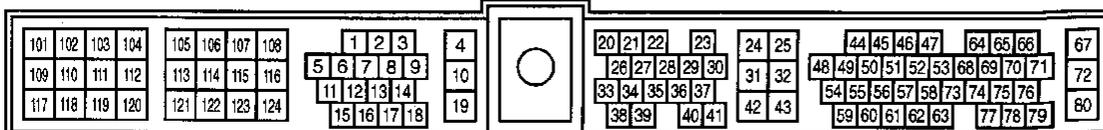
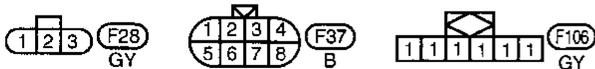
HA

EL

IDX

Refer to last page (Foldout page).

(E106)

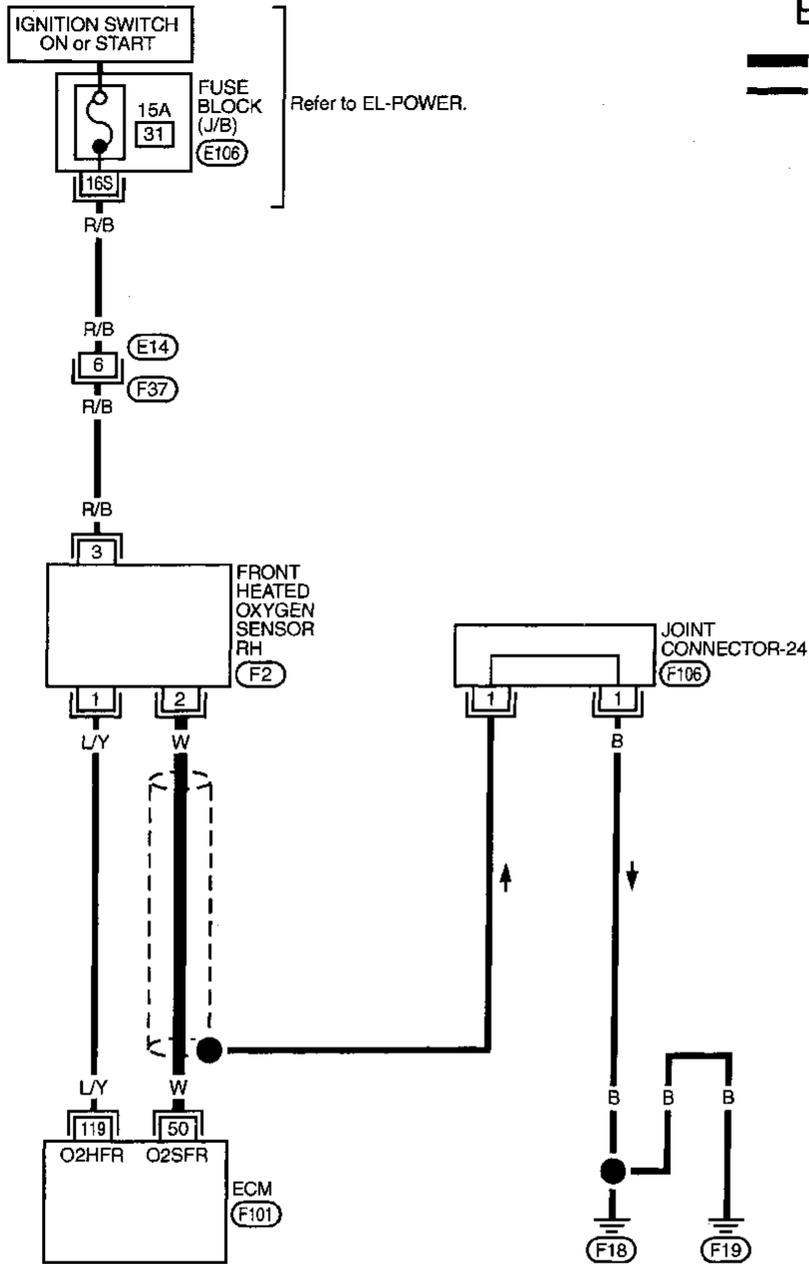


MEC483C

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

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

RIGHT BANK



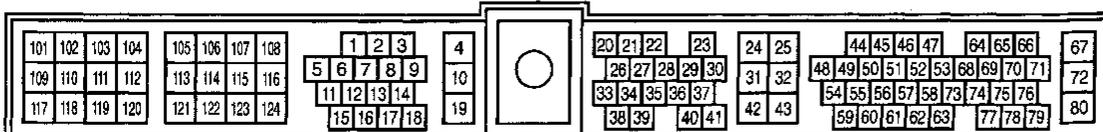
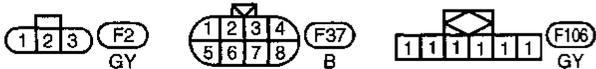
EC-FRO2RH-01

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

Refer to EL-POWER.

Refer to last page (Foldout page).

E106



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

Front Heated Oxygen Sensors (Front HO2S) (P0130: Right bank) (P0150: Left bank) (Circuit) (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	50	2	RH (Black)
P0150	51	2	LH (Blue)

Continuity should exist.

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

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	ground	
P0130	50 or 2	ground	RH (Black)
P0150	51 or 2	ground	LH (Blue)

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

OK

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

OK

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Remove joint connector-24.
3. Check the following.
 - Continuity between joint connector terminal and ground
 - Joint connector (Refer to "HARNES LAYOUT" in EL section.)

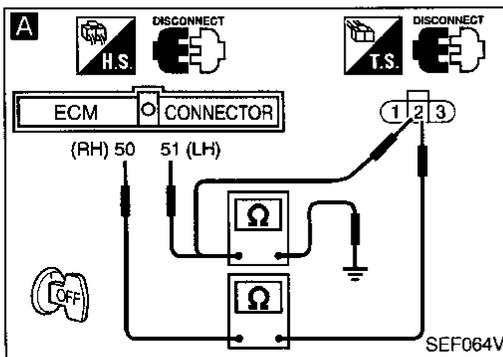
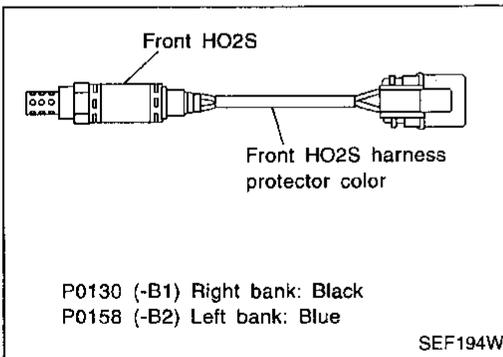
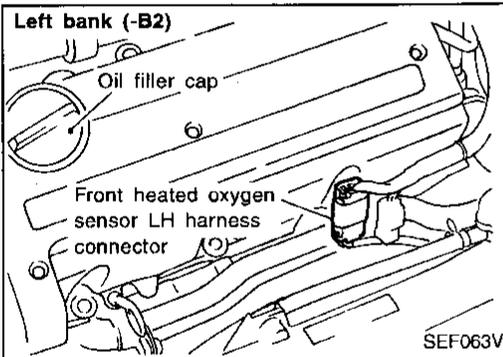
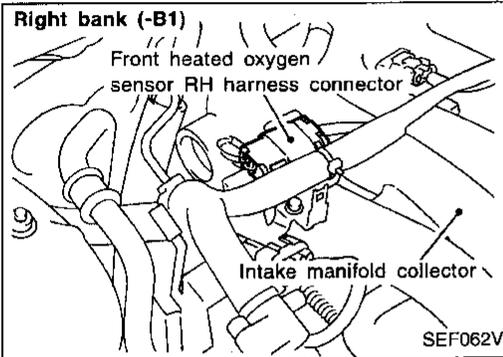
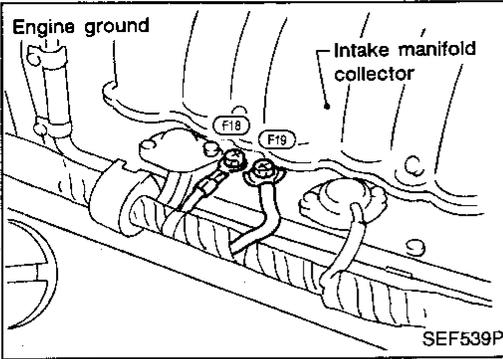
Continuity should exist.

If OK, check harness for short to ground and short to power. Then reconnect joint connector.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END



NG → Repair harness or connectors.

NG → REPLACE FRONT HEATED OXYGEN SENSOR.
1. Check front heated oxygen sensor harness protector color.
Black: Right bank (-B1)
Blue: Left bank (-B2)
2. Replace malfunctioning front heated oxygen sensor.

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

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

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

COMPONENT INSPECTION

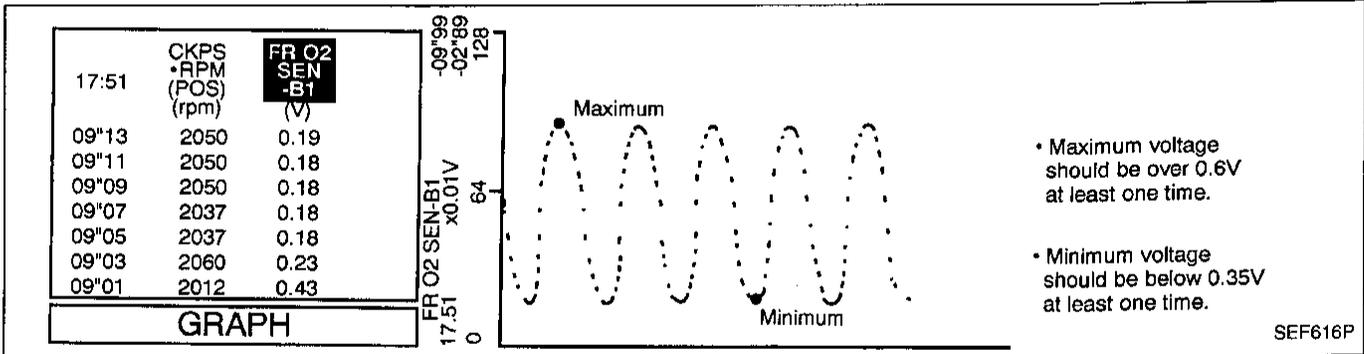
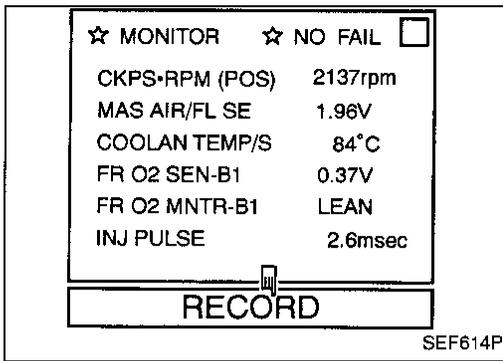
Front heated oxygen sensor

- 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-L-R

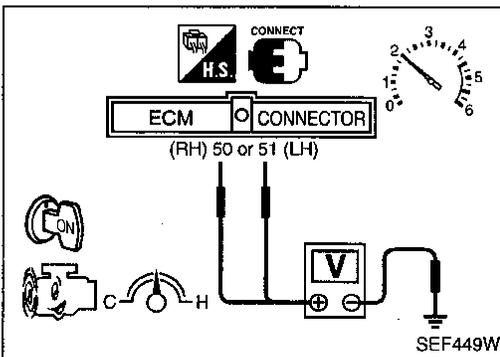
R = "FR O2 MNTR-B1 (-B2)", "RICH"
L = "FR O2 MNTR-B1 (-B2)", "LEAN"

- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.35V 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.



OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal 50 RH, 51 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).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.

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

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

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.

GI

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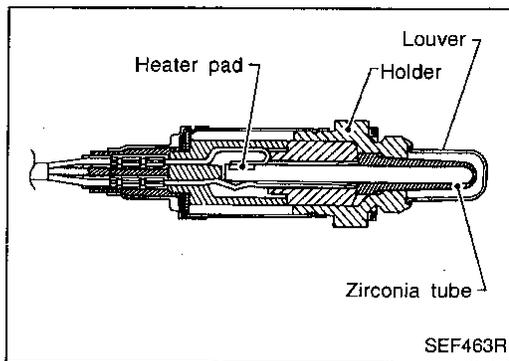
BT

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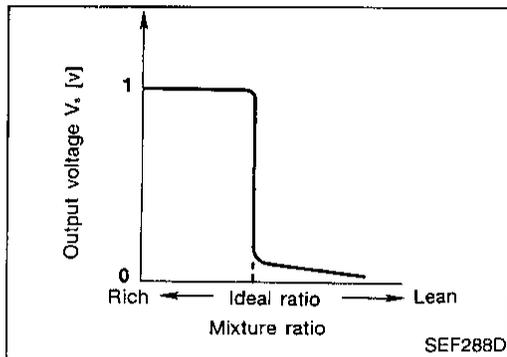
TROUBLE DIAGNOSIS FOR DTC P0131 (-B1), P0151 (-B2)



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

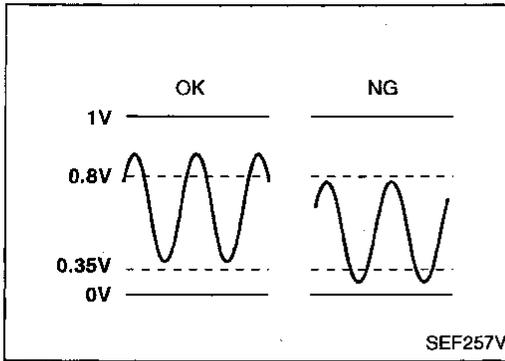
ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50 51	W 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)

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

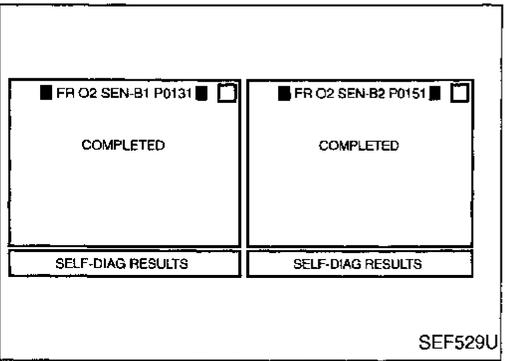
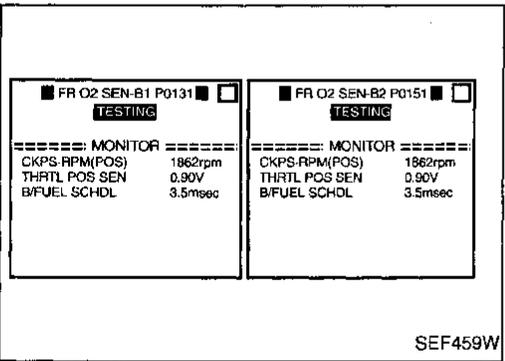
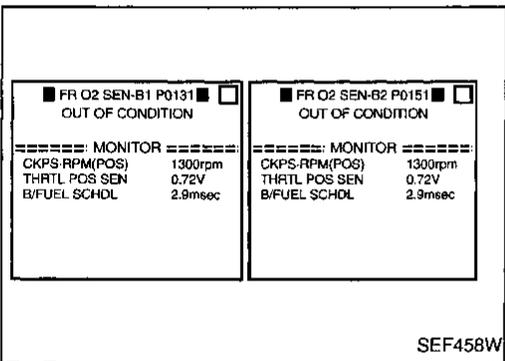
Front Heated Oxygen Sensor (Lean shift monitoring) (Front HO2S) (P0131: Right bank), (P0151: Left bank) (Cont'd)



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.

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



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has just been completed, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- Always perform the test at a temperature above -10°C (14°F).
- Before performing following procedure, confirm that battery voltage is more than 11V at idle.
- Never raise engine speed above 3,600 rpm (A/T), 4,000 rpm (M/T) during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 5).



- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 10 seconds.
- Start engine and select "FR O2 SEN-B1 (-B2) P0131 (P0151)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Let engine idle for at least 3 minutes.
- 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 approximately 50 seconds.)

CKPS-RPM (POS): 1,200 - 2,400 rpm (A/T models)
1,800 - 2,600 rpm (M/T models)

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

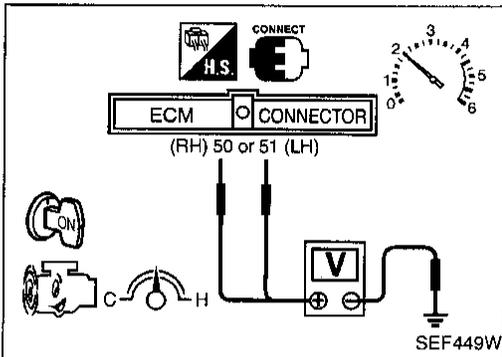
Front Heated Oxygen Sensor (Lean shift monitoring) (Front HO2S) (P0131: Right bank), (P0151: Left bank) (Cont'd)

Vehicle speed: 80 - 100 km/h (50 - 62 MPH)
B/FUEL SCHDL: 1.5 - 4.5 msec (A/T models)
1.3 - 4.5 msec (M/T models)

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-177.



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 ⑤⑩ LH, ⑤⑪ 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-177.

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

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

DIAGNOSTIC PROCEDURE

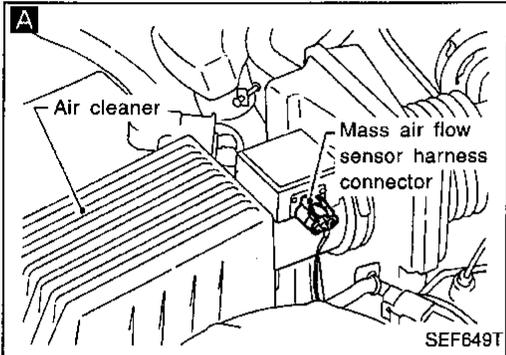
A

■ ACTIVE TEST ■	
SELF-LEARN CONTROL	B1 :100% B2 :100%
----- MONITOR -----	
CKPS•RPM (POS)	0rpm
COOLAN TEMP/S	93°C
FR O2 SEN-B1	0.90V
FR O2 SEN-B2	0.90V
A/F ALPHA-B1	100%
A/F ALPHA-B2	100%
CLEAR	

SEF460W

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

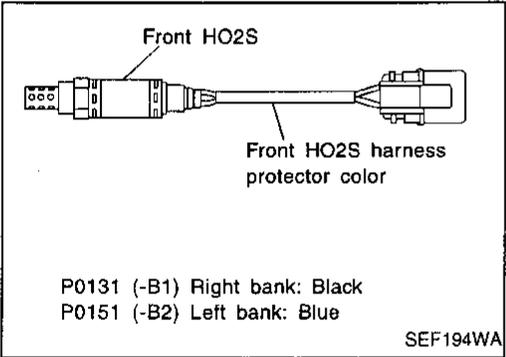
CLEAR THE SELF-LEARNING DATA

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

OR

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

Yes
 Go to "TROUBLE DIAGNOSIS FOR DTC P0171, P0174", EC-279.



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

NG
REPLACE FRONT HEATED OXYGEN SENSOR.
 1. Check front heated oxygen sensor harness protector color.
Black: Right bank (-B1)
Blue: Left bank (-B2)
 2. Replace malfunctioning front heated oxygen sensor.

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

NG
REPLACE FRONT HEATED OXYGEN SENSOR.
 1. Check front heated oxygen sensor harness protector color.
Black: Right bank (-B1)
Blue: Left bank (-B2)
 2. Replace malfunctioning front heated oxygen sensor.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.
 Refer to "TROUBLE DIAGNOSIS FOR DTC P0130 (-B1), P0150 (-B2)" for circuit, EC-166.

INSPECTION END

GI
 MA
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 ST
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 EL
 IDX

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

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

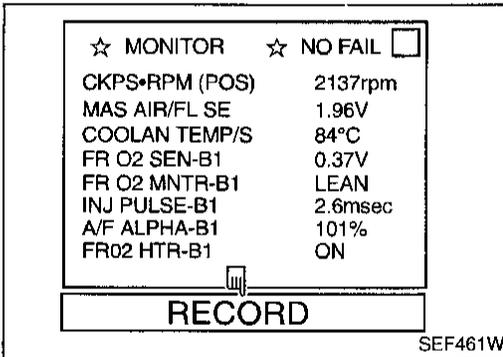
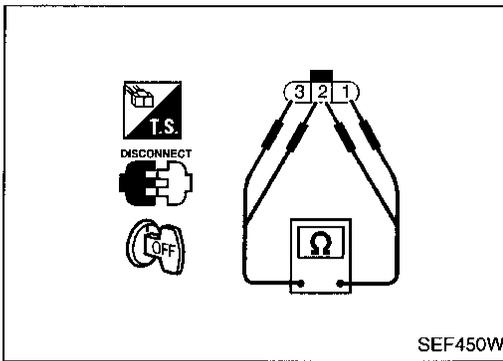
Check continuity between terminals ② and ①, ③ and ②.

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-L-R

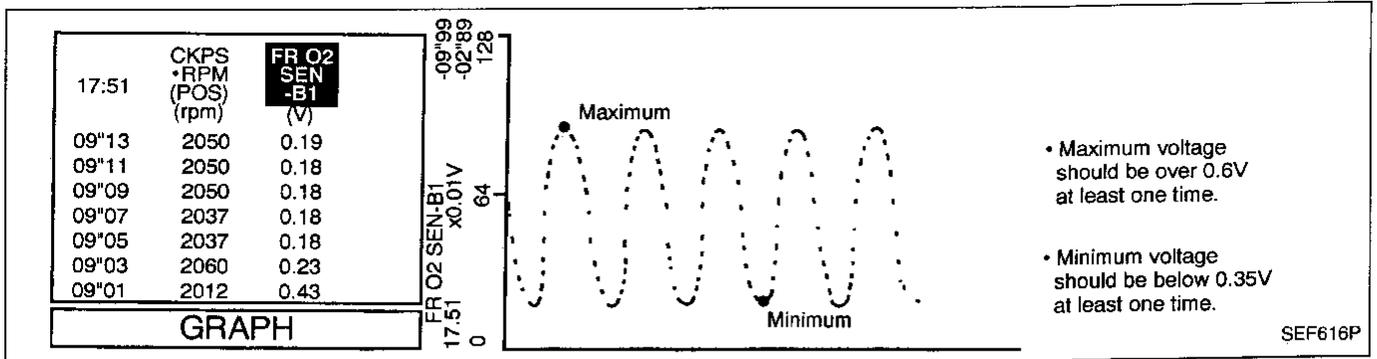
R = "FR O2 MNTR-B1 (-B2)", "RICH"

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 0.35V at least once.
- The voltage never exceeds 1.0V.

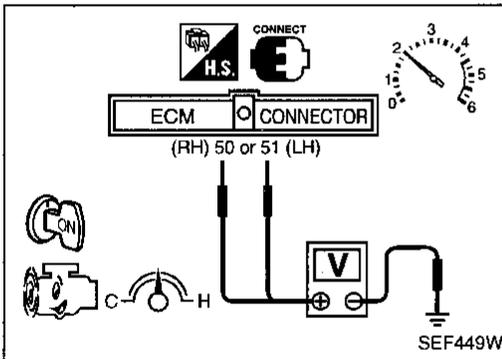
TROUBLE DIAGNOSIS FOR DTC P0131 (-B1), P0151 (-B2)

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



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

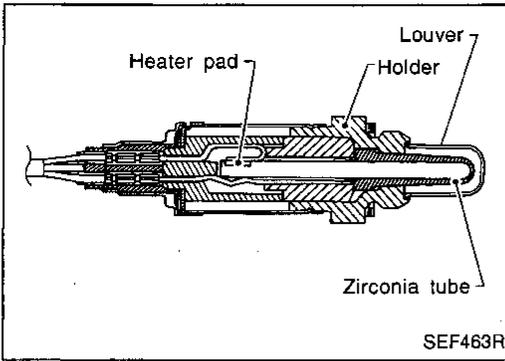


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal 50 RH, 51 LH (sensor signal) and ground.
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.

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 P0132 (-B1), P0152 (-B2)

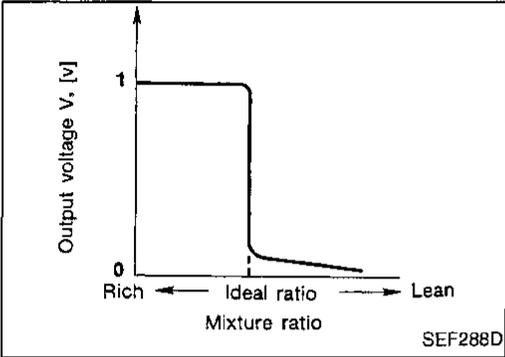


SEF463R

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

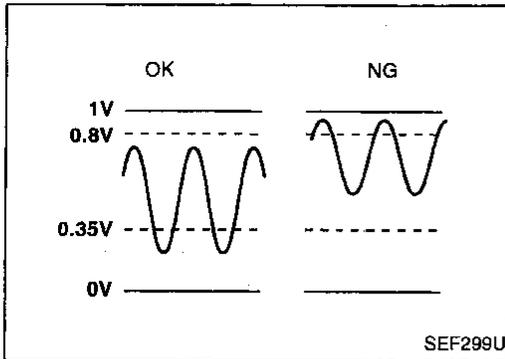
ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50 51	W 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) SEF059V

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

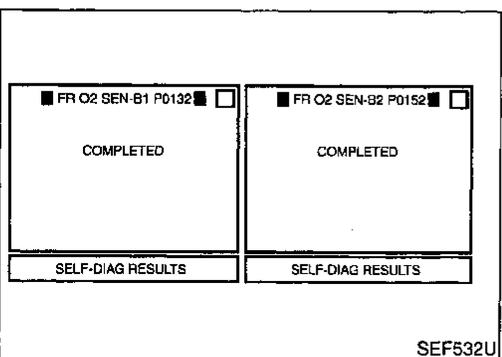
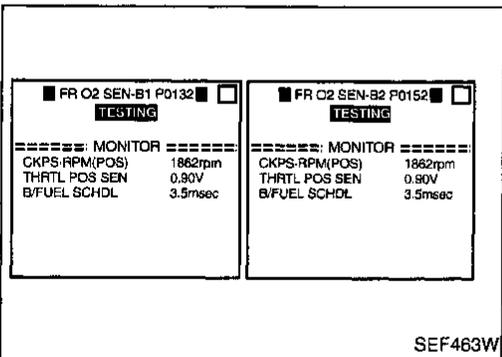
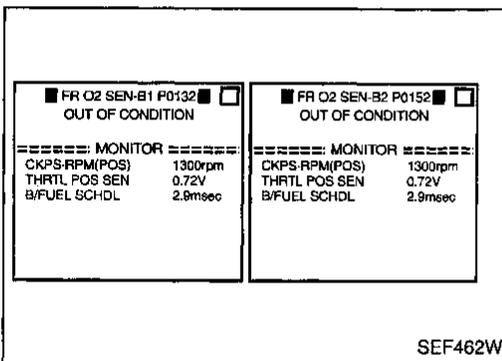
Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Right bank), (P0152: Left bank) (Cont'd)



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.

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



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has just been completed, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- Always perform the test at a temperature above -10°C (14°F).
- Before performing following procedure, confirm that battery voltage is more than 11V at idle.
- Never raise engine speed above 3,600 rpm (A/T), 4,000 rpm (M/T) during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 5).



- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 10 seconds.
- Start engine and select "FR O2 SEN-B1 (-B2) P0132 (P0152)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Let it idle for at least 3 minutes.
- 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 approximately 50 seconds.)

CKPS-RPM (POS): 1,200 - 2,400 rpm (A/T models)
1,800 - 2,600 rpm (M/T models)

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

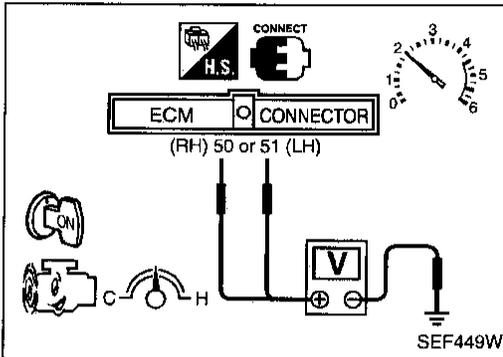
Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Right bank), (P0152: Left bank) (Cont'd)

Vehicle speed: 80 - 100 km/h (50 - 62 MPH)
B/FUEL SCHDL: 1.5 - 4.5 msec (A/T models)
1.3 - 4.5 msec (M/T models)

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-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 ⑤① RH, ⑤① 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-183.

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

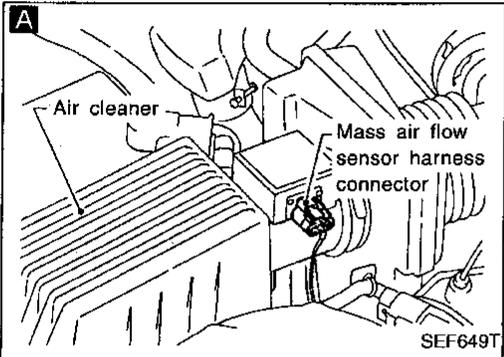
Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Right bank), (P0152: Left bank) (Cont'd)

DIAGNOSTIC PROCEDURE

A

■ ACTIVE TEST ■ □	
SELF-LEARN CONTROL	B1 :100% B2 :100%
----- MONITOR -----	
CKPS•RPM (POS)	0rpm
COOLAN TEMP/S	93°C
FR O2 SEN-B1	0.90V
FR O2 SEN-B2	0.90V
A/F ALPHA-B1	100%
A/F ALPHA-B2	100%
CLEAR	

SEF460W



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

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?

OR

Yes
Go to "TROUBLE DIAGNOSIS FOR DTC P0172, P0175", EC-285.

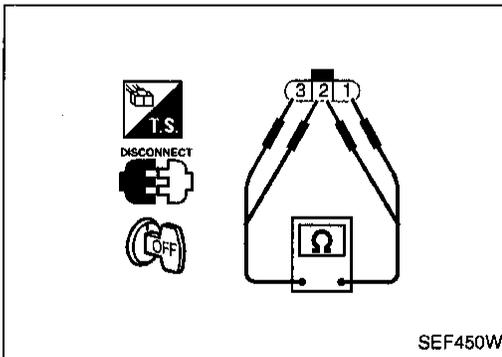
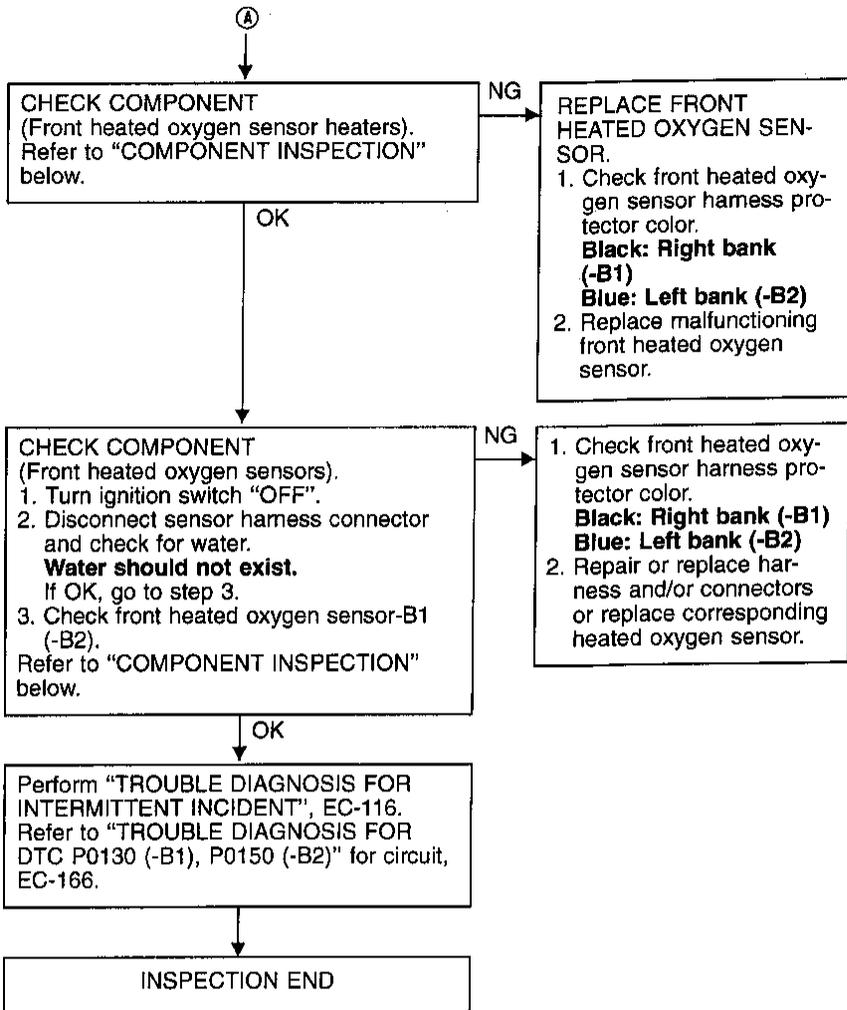
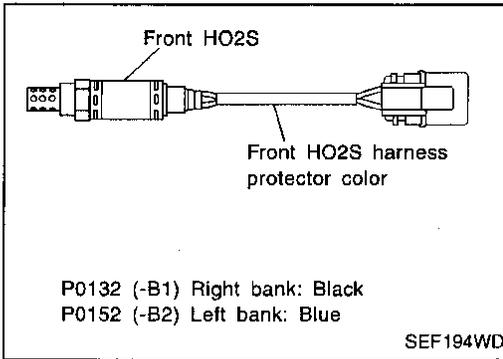
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode 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
A

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

Front Heated Oxygen Sensor (Rich shift monitoring) (Front HO2S) (P0132: Right bank), (P0152: Left 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"/>
CKPS-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%	
FR02 HTR-B1	ON	

RECORD

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

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

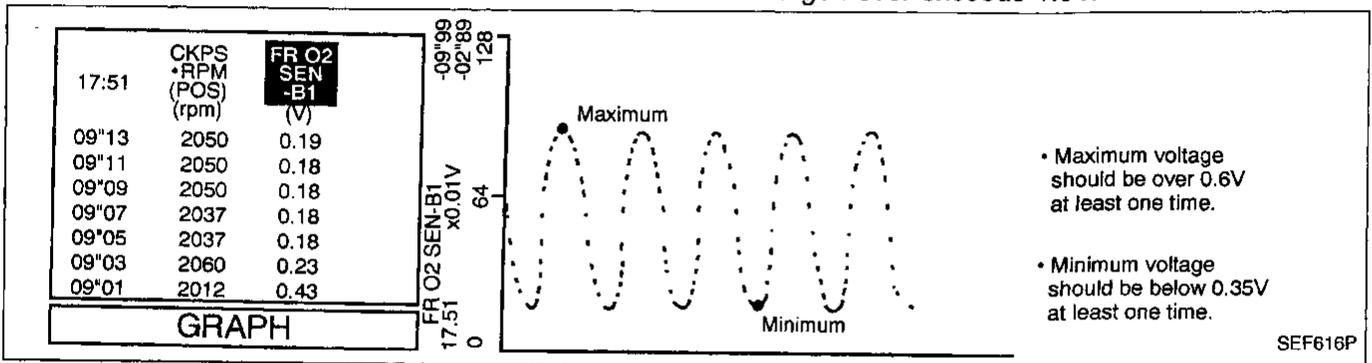
- 5) Check the following.
- "FR O2 MNTR-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

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-L-R

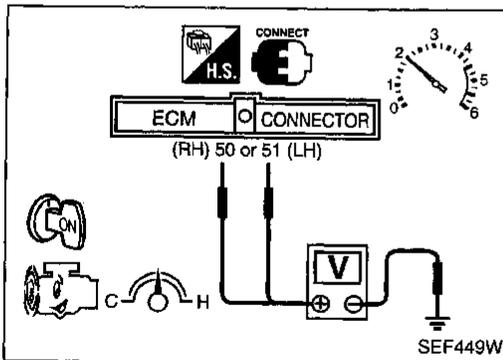
R = "FR O2 MNTR-B1 (-B2)", "RICH"
L = "FR O2 MNTR-B1 (-B2)", "LEAN"

- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.35V 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.

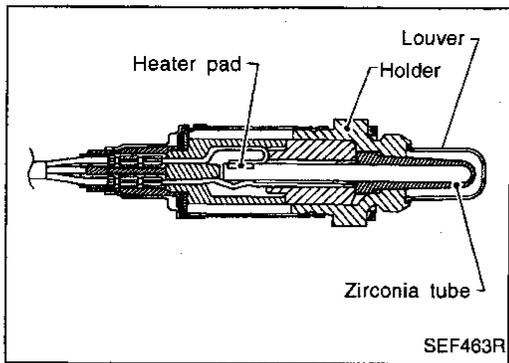


- OR
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Set voltmeter probes between ECM terminal ⑤① RH, ⑤① LH (sensor signal) and ground.
 - 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.

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.

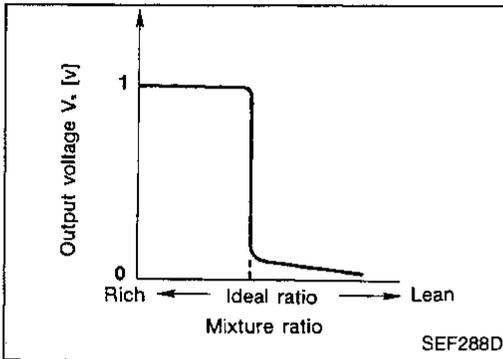
TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)



Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Right bank), (P0153: Left 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			0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR-B1 FR O2 MNTR-B2	<ul style="list-style-type: none"> Engine: After warming up 	Maintaining engine speed at 2,000 rpm	LEAN ↔ RICH Changes more than 5 times during 10 seconds.

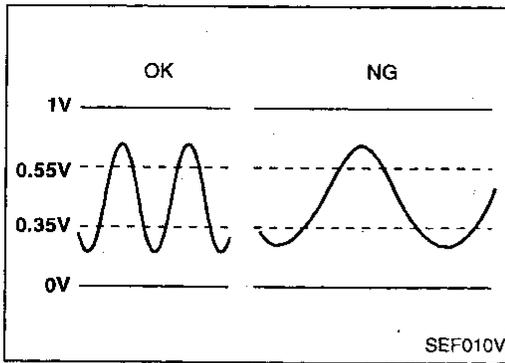
ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50 51	W W	Front heated oxygen sensor (Right bank) Front heated oxygen sensor (Left bank)	<p>Engine is running.</p> <p>After warming up to normal operating temperature and engine speed is 2,000 rpm.</p>	<p>0 - Approximately 1.0V (periodically change)</p> <p>SEF059V</p>

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

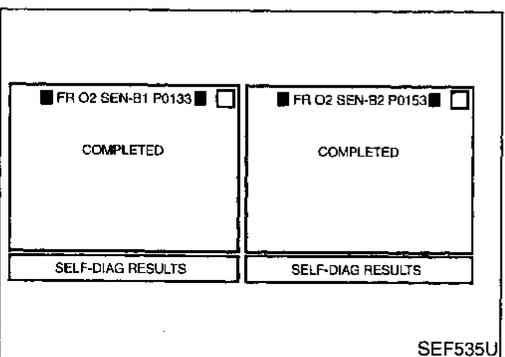
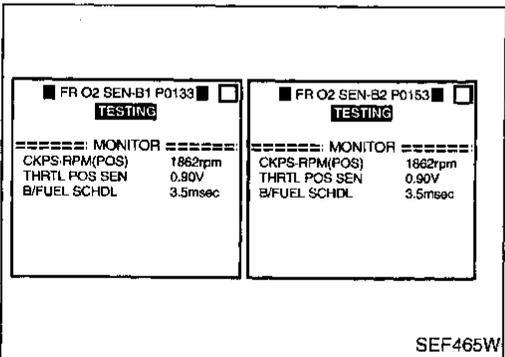
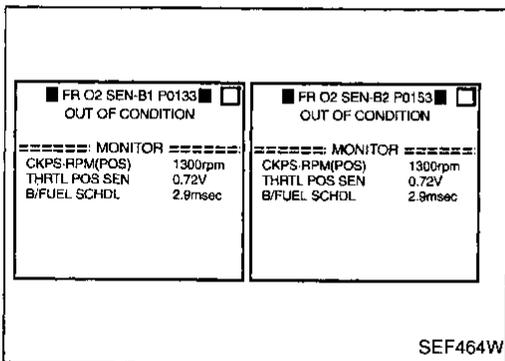
Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Right bank), (P0153: Left bank) (Cont'd)



ON BOARD DIAGNOSIS LOGIC

To judge the malfunction of front heated oxygen sensor, this diagnosis measures response time of 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.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0133 0409 (Right 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 (Left bank)		



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has just been completed, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- Always perform the test at a temperature above -10°C (14°F).
- Before performing following procedure, confirm that battery voltage is more than 11V at idle.
- Never raise engine speed above 3,600 rpm (A/T), 4,000 rpm (M/T) during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 5).



- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 10 seconds.
- Start engine and select "FR O2 SEN-B1 (-B2) P0133 (P0153)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Let it idle for at least 3 minutes.
- 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 approximately 20 seconds.)

Engine speed: 1,200 - 2,800 rpm (A/T models)

1,800 - 3,100 rpm (M/T models)

Vehicle speed: 80 - 120 km/h (50 - 75 MPH)

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

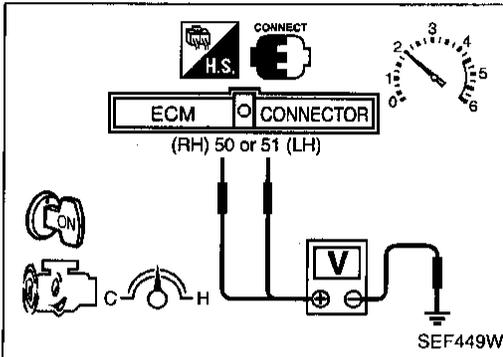
Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Right bank), (P0153: Left bank) (Cont'd)

B/FUEL SCHDL: 1.5 - 4.5 msec (A/T models)
1.3 - 4.5 msec (M/T models)

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-191.



OR

OVERALL FUNCTION CHECK

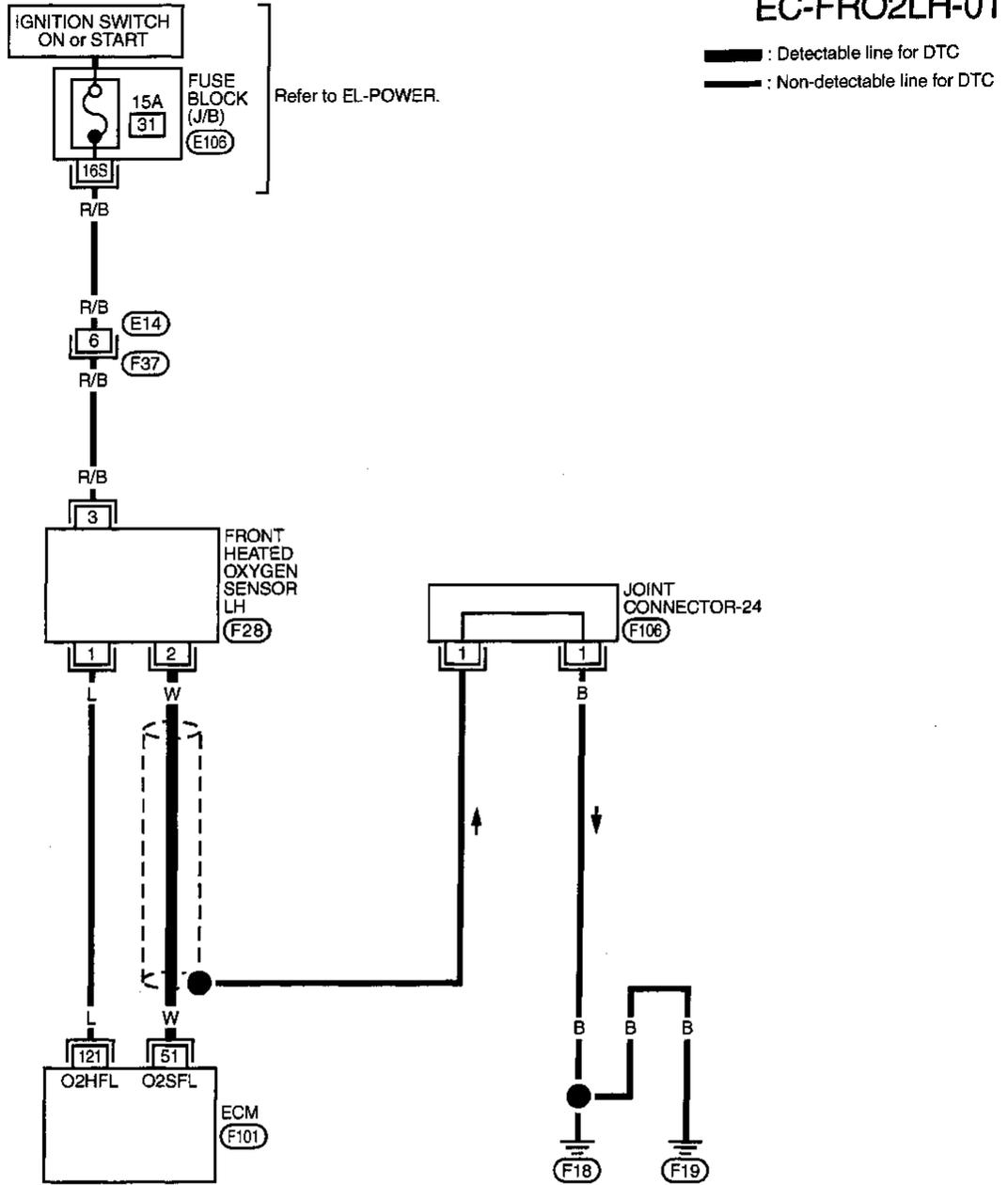
Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑤① RH, ⑤① 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).
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-191.

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

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

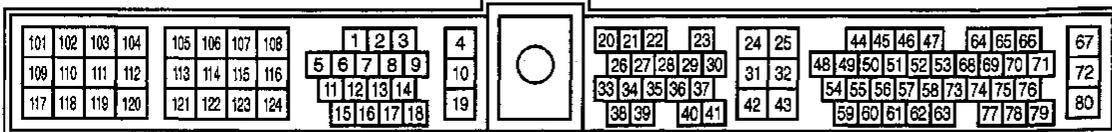
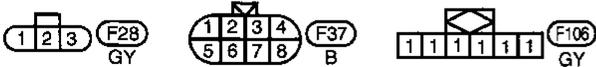
LEFT BANK



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Refer to last page (Foldout page).

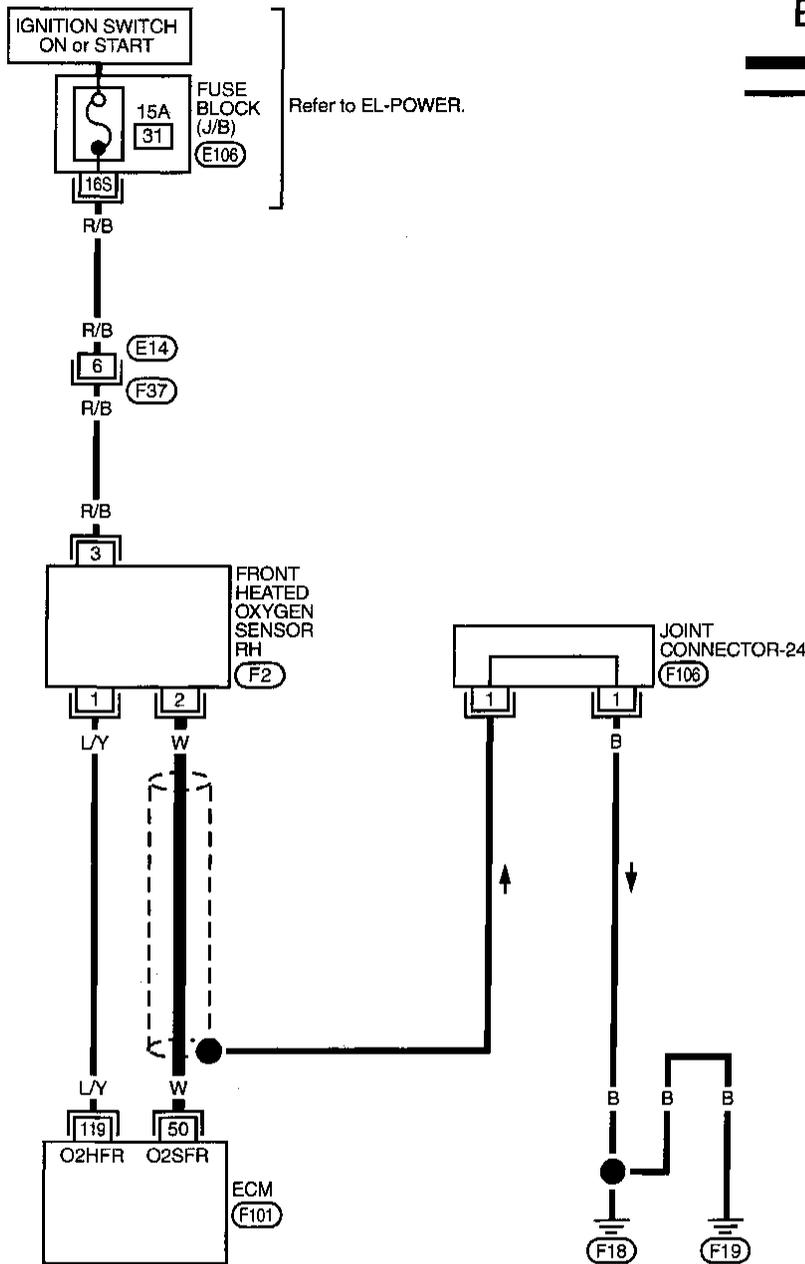
(E106)



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

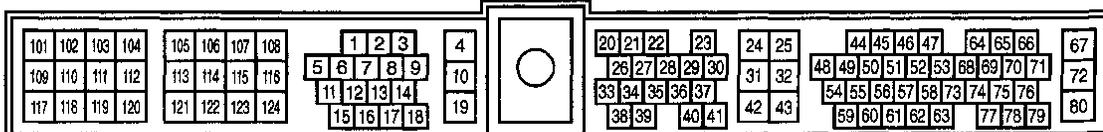
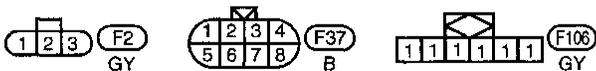
Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Right bank), (P0153: Left bank) (Cont'd)

RIGHT BANK



Refer to last page (Foldout page).

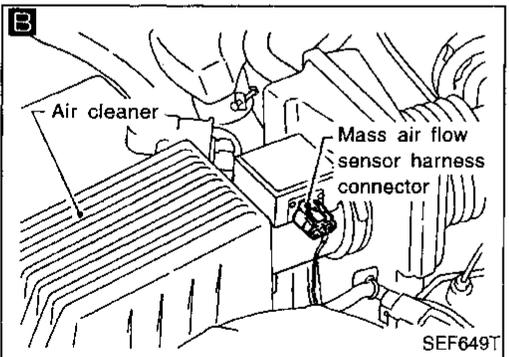
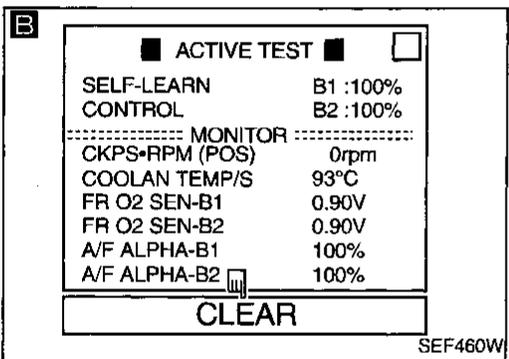
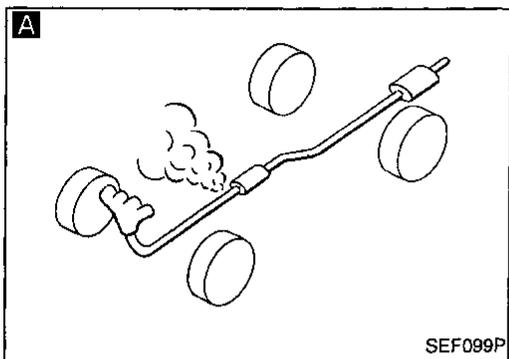
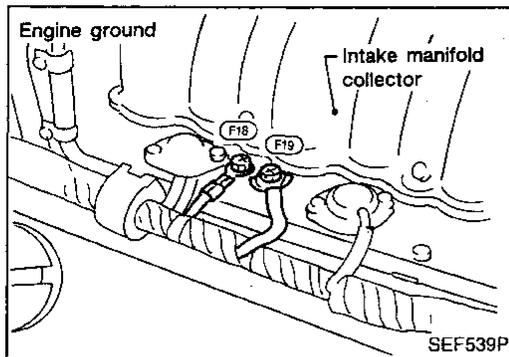
(E106)



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

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

DIAGNOSTIC PROCEDURE



INSPECTION START

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

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, P0174 or P0172, P0175", EC-279, 285.

- 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 0114, 0209 detected? Is it difficult to start engine?

No

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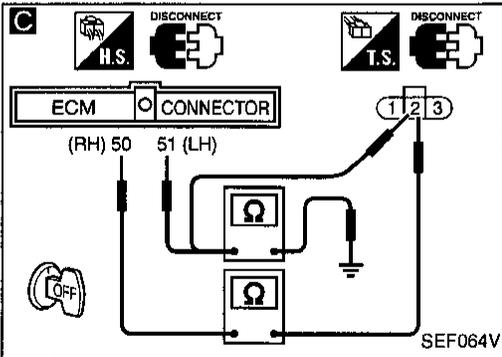
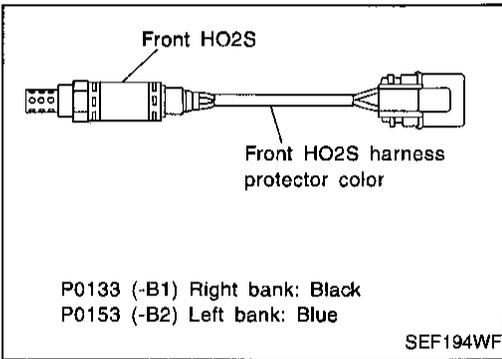
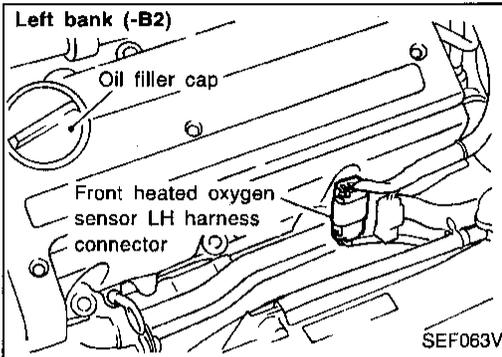
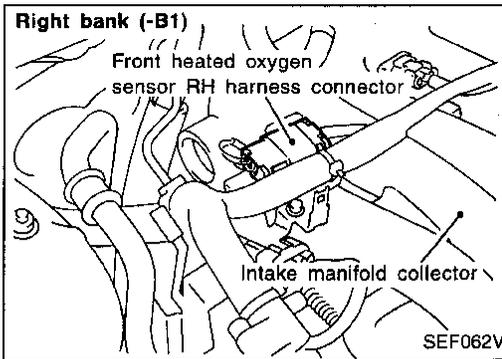
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TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

Front Heated Oxygen Sensor (Response monitoring) (Front HO2S) (P0133: Right bank), (P0153: Left 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	50	2	RH (Black)
P0153	51	2	LH (Blue)

Continuity should exist.
4. Check harness continuity between ECM or sensor and ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	ground	
P0133	50 or 2	ground	RH (Black)
P0153	51 or 2	ground	LH (Blue)

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

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Front heated oxygen sensor heaters).
Refer to "COMPONENT INSPECTION", EC-194.

NG → **REPLACE FRONT HEATED OXYGEN SENSOR.**
1. Check front heated oxygen sensor harness protector color.
Black: Right bank (-B1)
Blue: Left bank (-B2)
2. Replace malfunctioning front heated oxygen sensor.

OK ↓

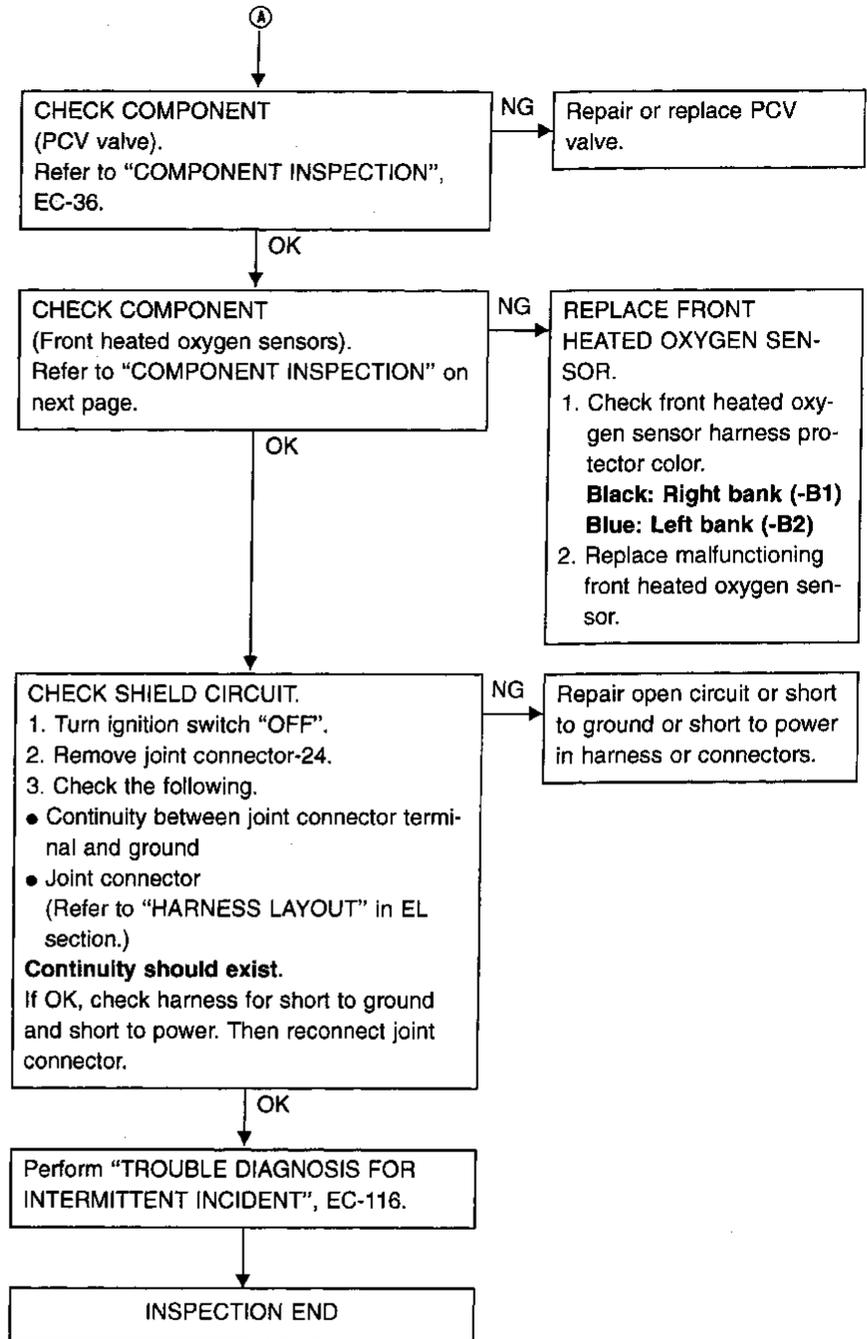
CHECK COMPONENT
(Mass air flow sensor).
Refer to "COMPONENT INSPECTION", EC-122.

NG → Replace mass air flow sensor.

OK ↓
A

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

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



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

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

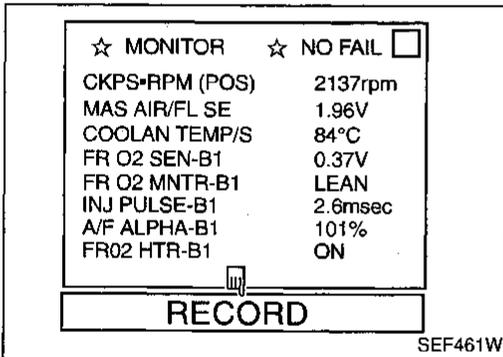
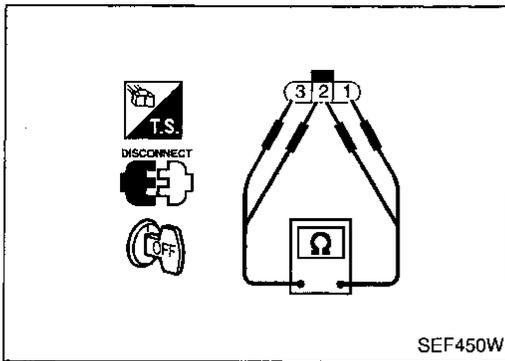
Check continuity between terminals ② and ①, ③ and ②.

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

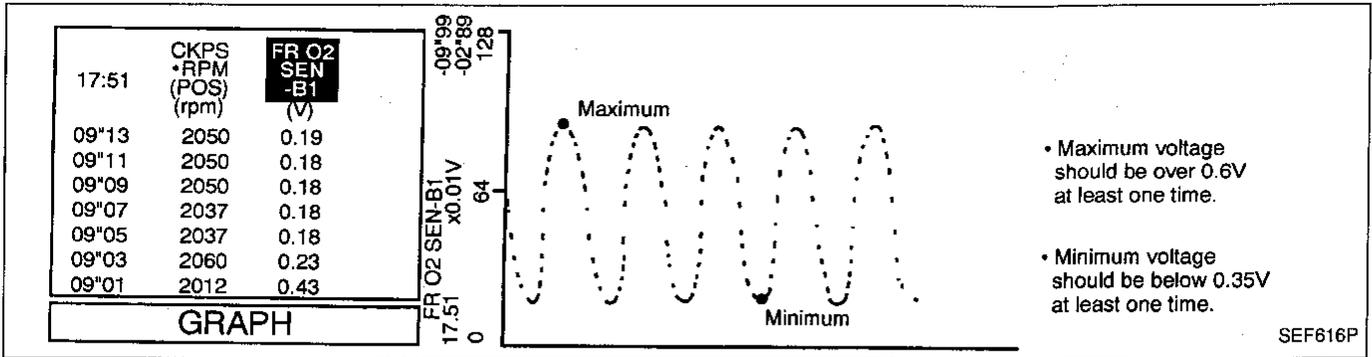
R = "FR O2 MNTR-B1 (-B2)", "RICH"

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 0.35V at least once.
- The voltage never exceeds 1.0V.

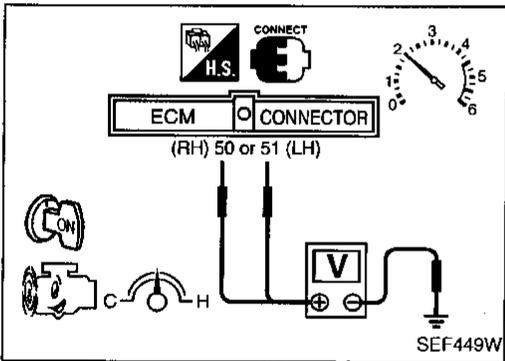
TROUBLE DIAGNOSIS FOR DTC P0133 (-B1), P0153 (-B2)

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



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

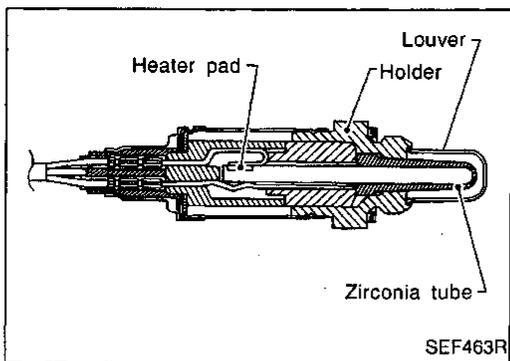


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ⑤⑩ RH, ⑤⑪ LH (sensor signal) and ground.
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.

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.

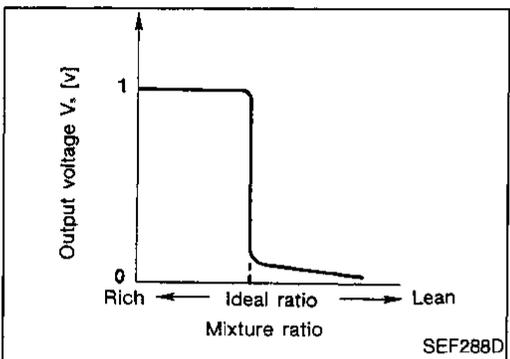
TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)



Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Right bank), (P0154: Left 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.

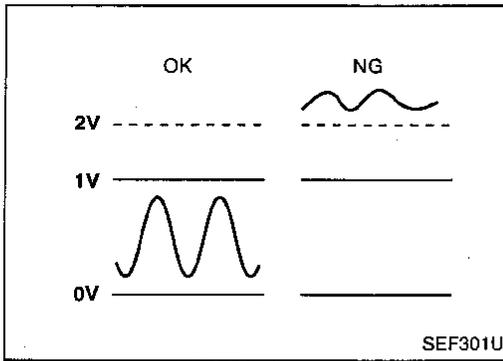
ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50 51	W 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)

TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

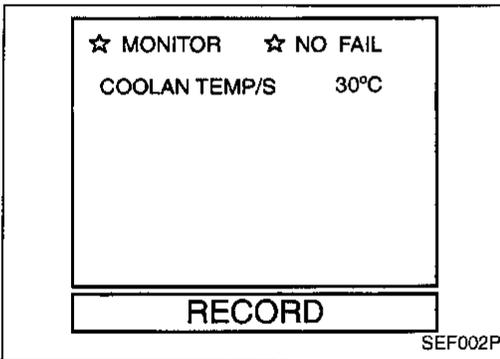
Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Right bank), (P0154: Left bank) (Cont'd)



ON BOARD DIAGNOSIS LOGIC

To judge the malfunction, the diagnosis checks that the front heated oxygen sensor output is not inordinately high.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0134 0142 (Right bank)	<ul style="list-style-type: none"> An excessively 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.) Front heated oxygen sensor
P0154 0509 (Left 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 10 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 10 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "DATA MONITOR" mode with CONSULT.
- 5) Restart engine and let it idle for 25 seconds.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-201.

OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Restart engine and let it idle for 25 seconds.
- 4) Turn ignition switch "OFF" and wait at least 10 seconds.
- 5) Restart engine and let it idle for 25 seconds.
- 6) Select "MODE 3" with GST.
- 7) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-201.

OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Restart engine and let it idle for 25 seconds.
- 4) Turn ignition switch "OFF", wait at least 10 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-201.

TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

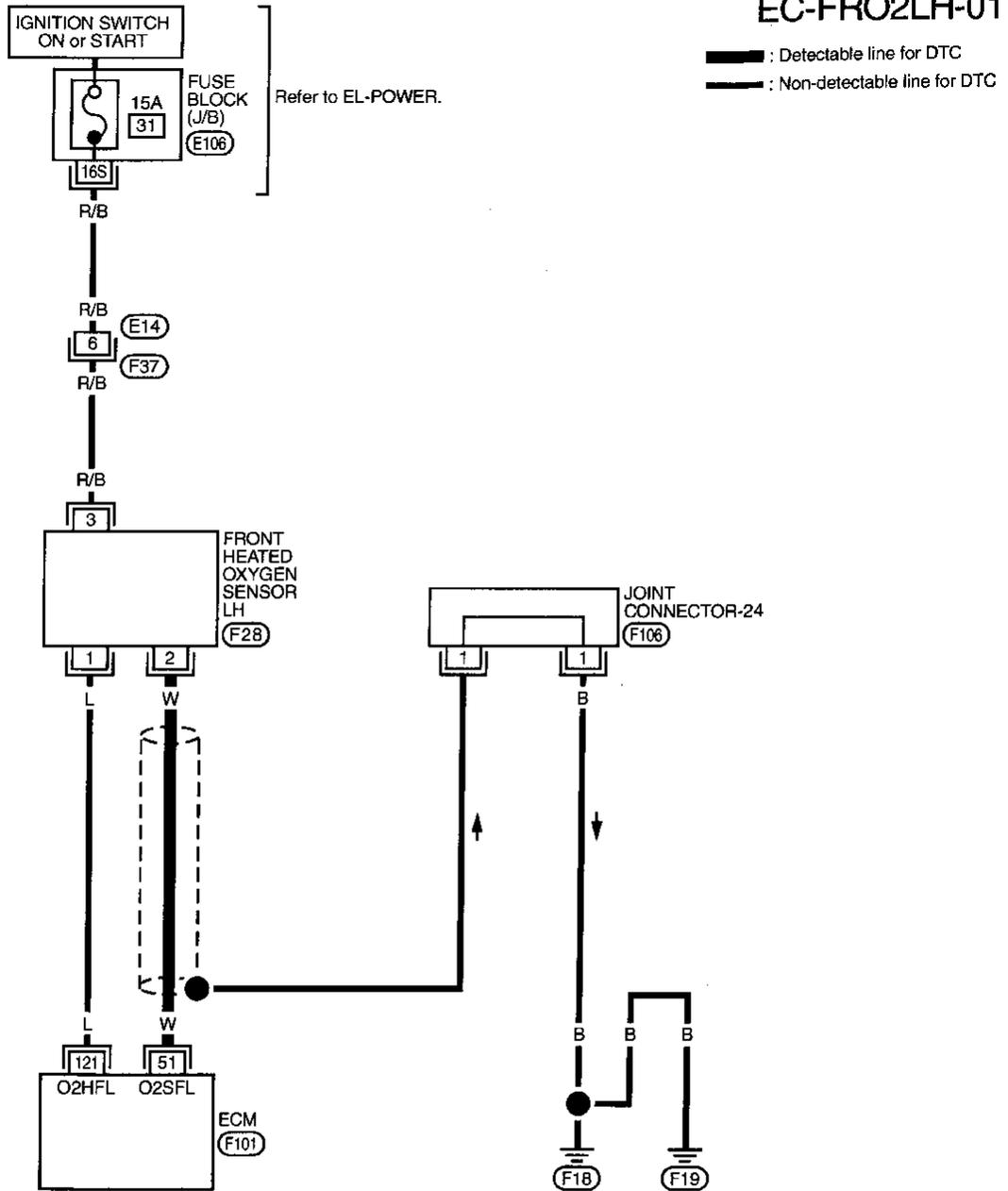
Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Right bank), (P0154: Left bank) (Cont'd)

- 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.

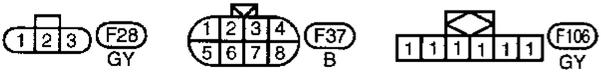
TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Right bank), (P0154: Left bank) (Cont'd)

LEFT BANK

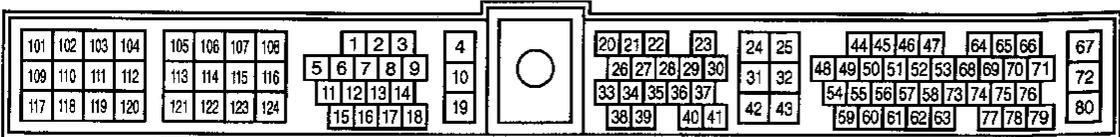


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Refer to last page (Foldout page).

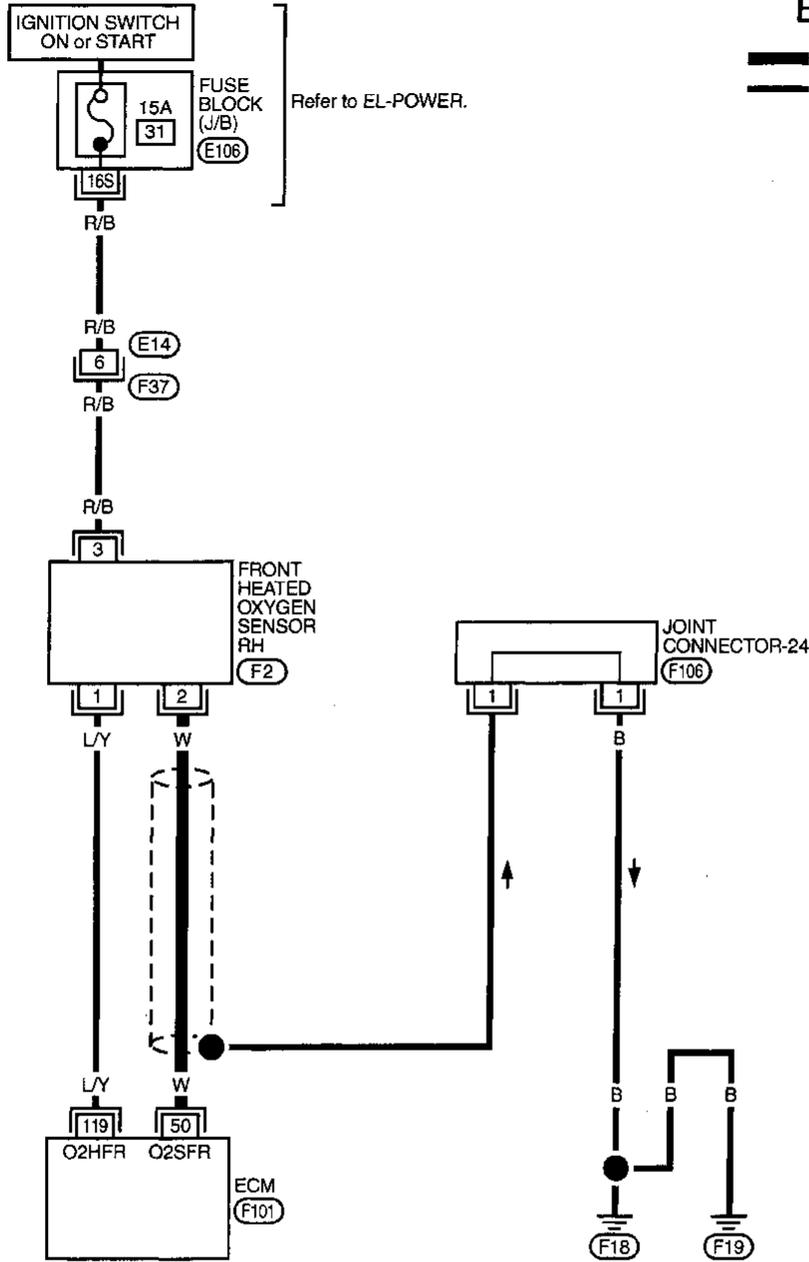
(E106)



TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Right bank), (P0154: Left bank) (Cont'd)

RIGHT BANK



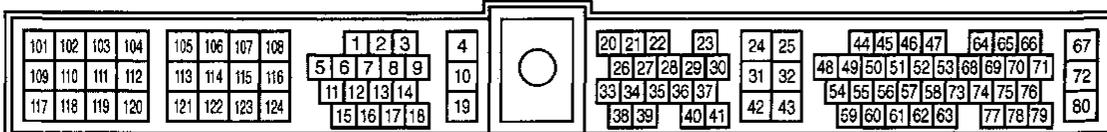
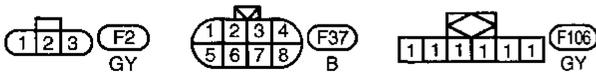
EC-FRO2RH-01

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

Refer to EL-POWER.

Refer to last page (Foldout page).

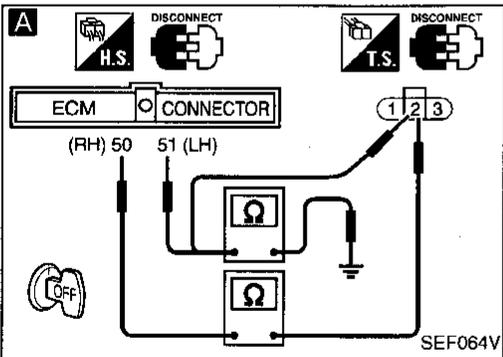
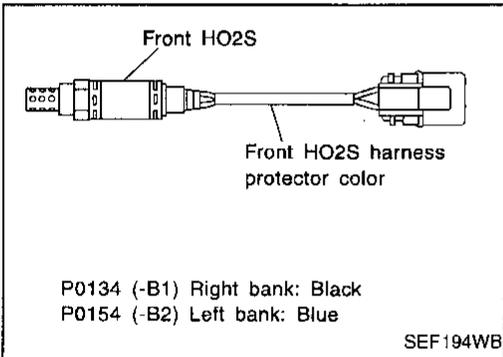
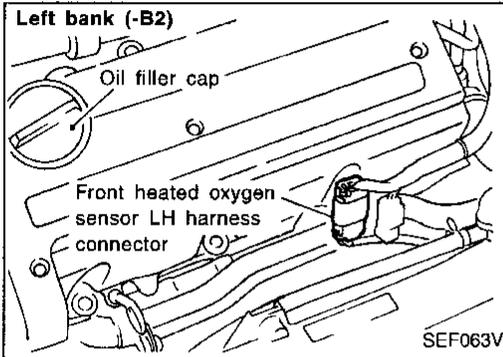
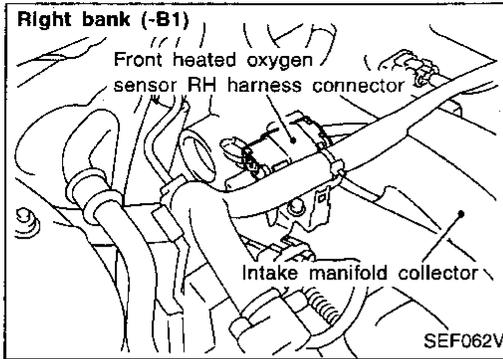
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TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Right bank), (P0154: Left 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.

P code	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0133	50	2	RH (Black)
P0153	51	2	LH (Blue)

Continuity should exist.
4. Check harness continuity between ECM or sensor and ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	ground	
P0133	50 or 2	ground	RH (Black)
P0153	51 or 2	ground	LH (Blue)

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

CHECK COMPONENT
(Front 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 front heated oxygen sensor. Refer to "COMPONENT INSPECTION" on next page.

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Remove joint connector-24.
3. Check the following.
• Continuity between joint connector terminal and ground
• Joint connector (Refer to "HARNES LAYOUT" in EL section.)
Continuity should exist.
If OK, check harness for short to ground and short to power. Then reconnect joint connector.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

NG → Repair harness or connectors.

NG → 1. Check front heated oxygen sensor harness protector color.
Black: Right bank (-B1)
Blue: Left bank (-B2)
2. Repair or replace harness and/or connectors or replace corresponding front heated oxygen sensor.

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

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TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Right bank), (P0154: Left 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:

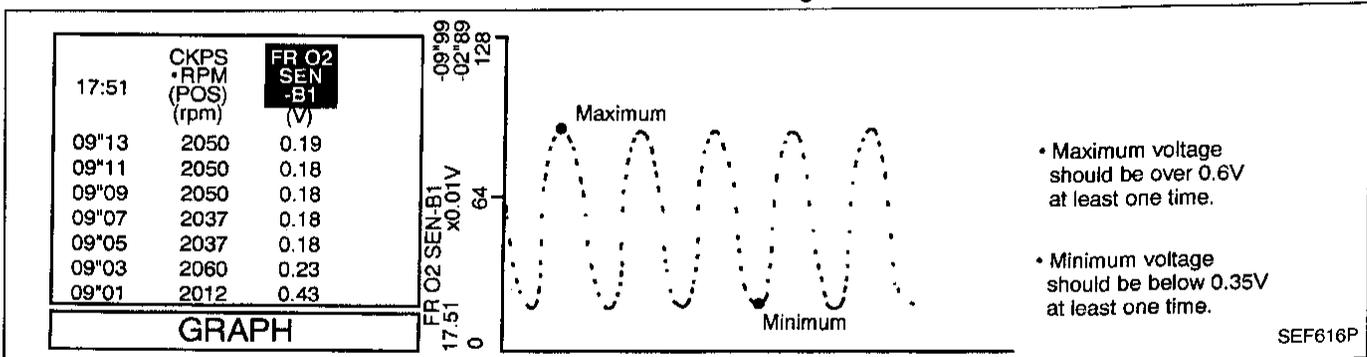
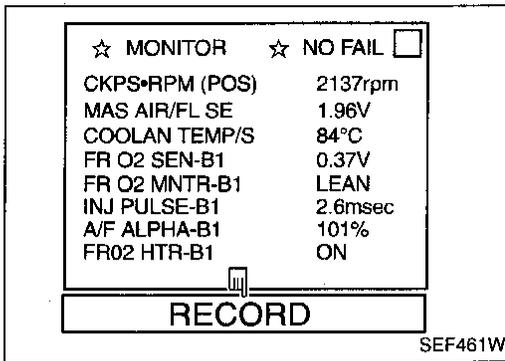
cycle | 1 | 2 | 3 | 4 | 5 |

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"

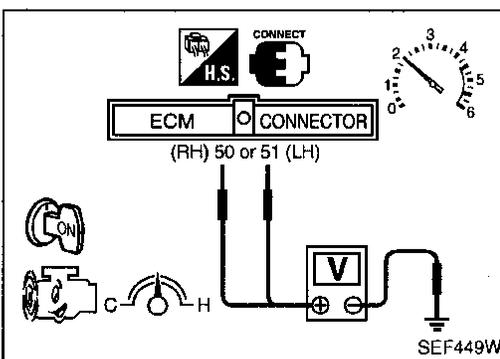
- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.35V at least once.
- The voltage never exceeds 1.0V.



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 ⑤① RH, ⑤① 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).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.

TROUBLE DIAGNOSIS FOR DTC P0134 (-B1), P0154 (-B2)

Front Heated Oxygen Sensor (High voltage) (Front HO2S) (P0134: Right bank), (P0154: Left bank) (Cont'd)

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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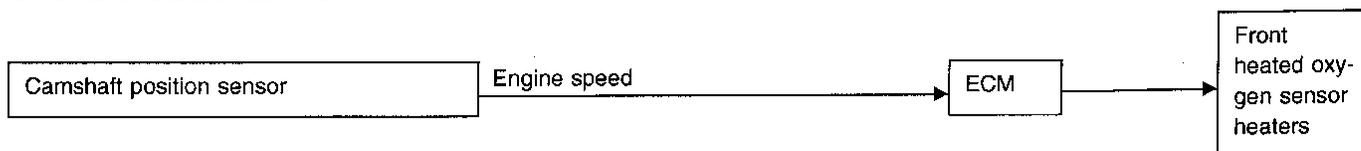
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TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

Front Heated Oxygen Sensor Heater (P0135: Right bank), (P0155: Left bank)

SYSTEM DESCRIPTION



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

OPERATION

Engine speed rpm	Front heated oxygen sensor heaters
Above 3,600 (A/T models), 4,000 (M/T models)	OFF
Below 3,600 (A/T models), 4,000 (M/T models)	ON

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 HTR-B1 FR O2 HTR-B2	<ul style="list-style-type: none"> Engine speed: Idle 	ON
	<ul style="list-style-type: none"> Engine speed: Above 3,600 rpm (A/T models), 4,000 rpm (M/T models) 	OFF

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
119 121	L/Y L	Front heated oxygen sensor heater (Right bank)	Engine is running. Engine speed is below 3,600 rpm (A/T models) or 4,000 rpm (M/T models).	0 - 1.0V
		Front heated oxygen sensor heater (Left bank)	Engine is running. Engine speed is above 3,600 rpm (A/T models) or 4,000 rpm (M/T models).	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0135 0901 (Right bank)	<ul style="list-style-type: none"> 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.) 	<ul style="list-style-type: none"> Harness or connectors (The front heated oxygen sensor heater circuit is open or shorted.) Front heated oxygen sensor heater
P0155 1001 (Left bank)		

TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CKPS•RPM (POS)	672rpm	
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		

SEF466W

Front Heated Oxygen Sensor Heater (P0135: Right bank), (P0155: Left 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 10 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 6 seconds at idle speed.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-208.

OR

- 1) Start engine and run it for at least 6 seconds at idle speed.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine and run it for at least 6 seconds at idle speed.
- 4) Select "MODE 3" with GST.
- 5) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-208.

OR

- 1) Start engine and run it for at least 6 seconds in idle condition.
- 2) Turn ignition switch "OFF", wait at least 10 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-208.

- 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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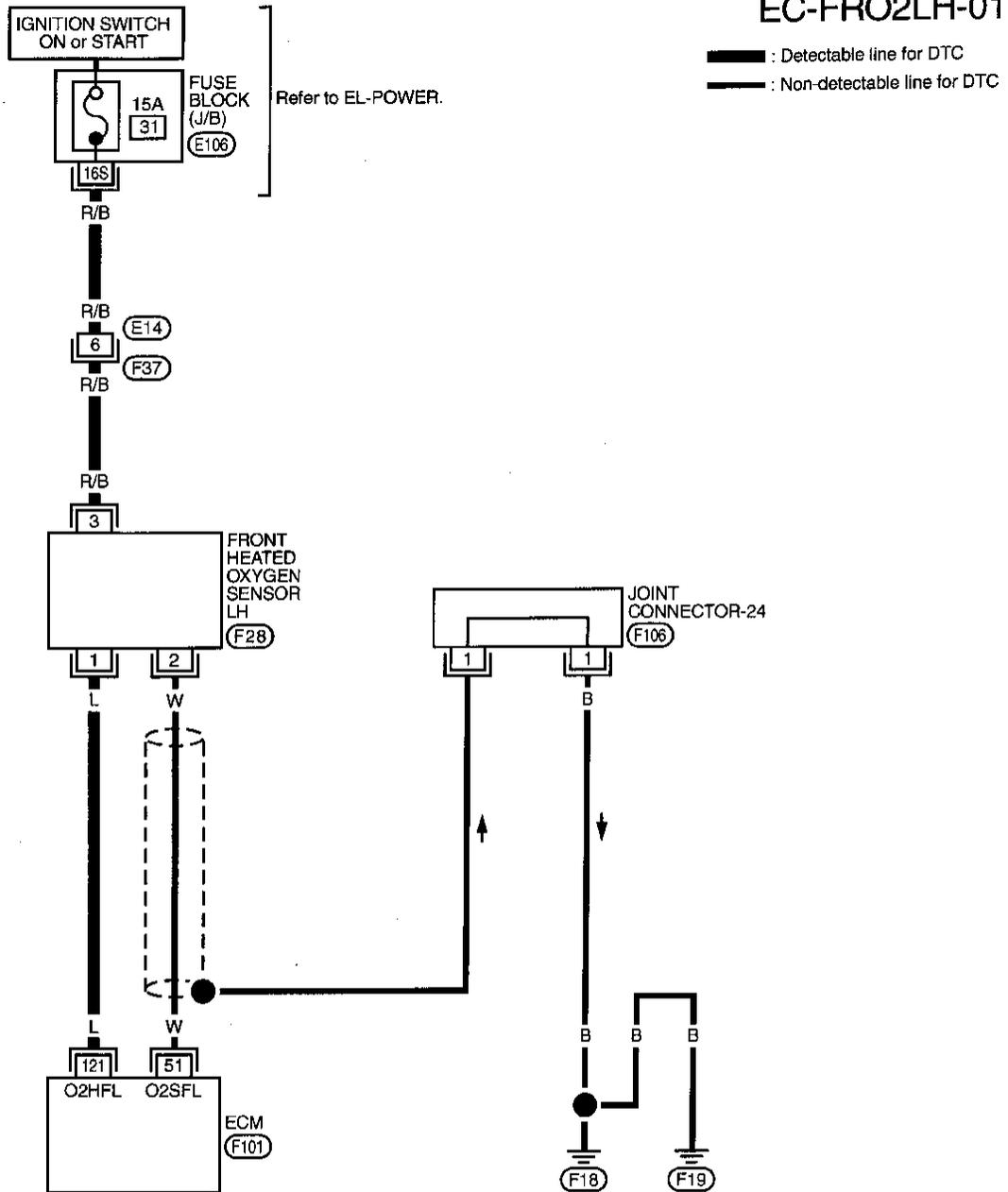
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TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

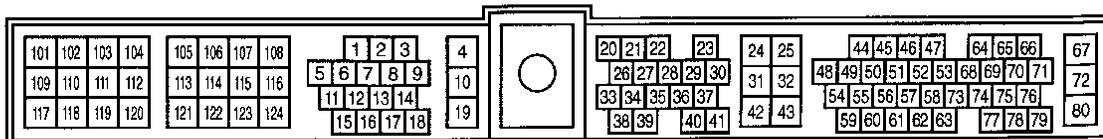
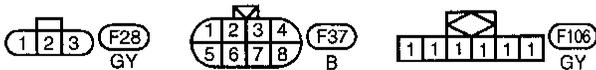
Front Heated Oxygen Sensor Heater (P0135: Right bank), (P0155: Left bank) (Cont'd)

LEFT BANK



Refer to last page (Foldout page).

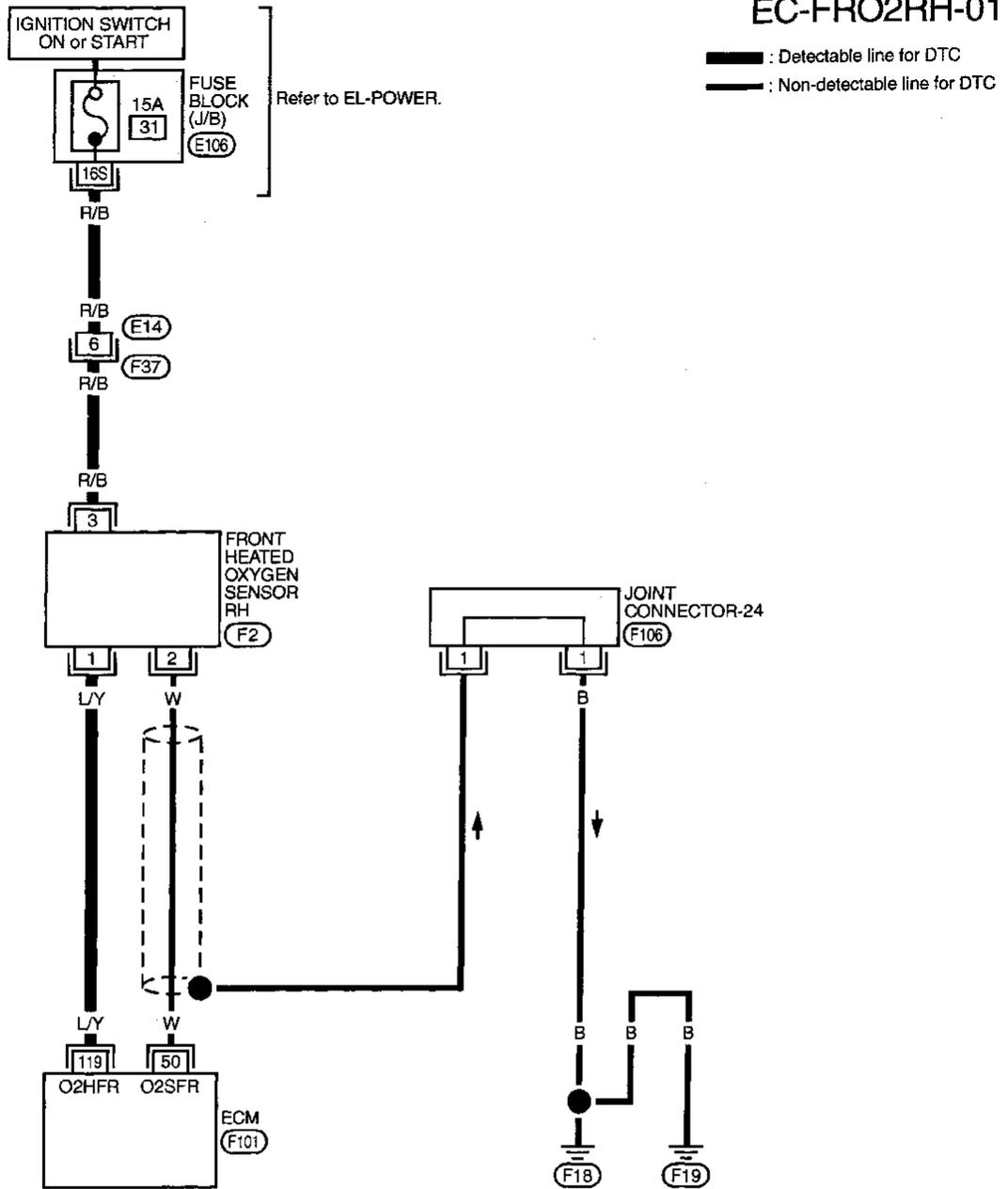
(E106)



TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

Front Heated Oxygen Sensor Heater (P0135: Right bank), (P0155: Left bank) (Cont'd)

RIGHT BANK

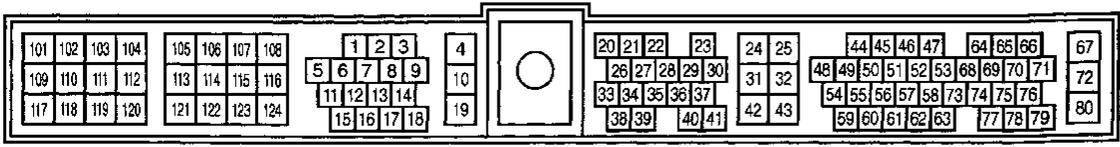
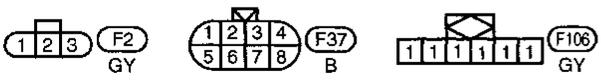


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Refer to last page (Foldout page).

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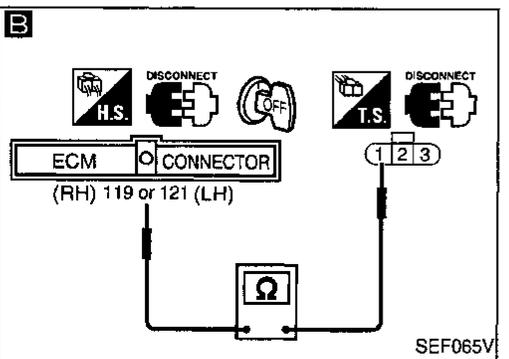
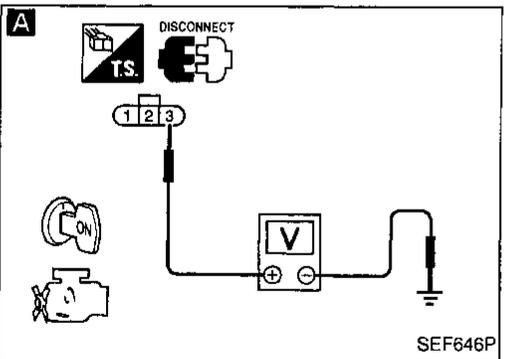
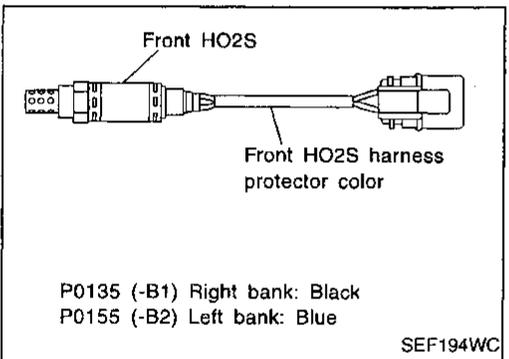
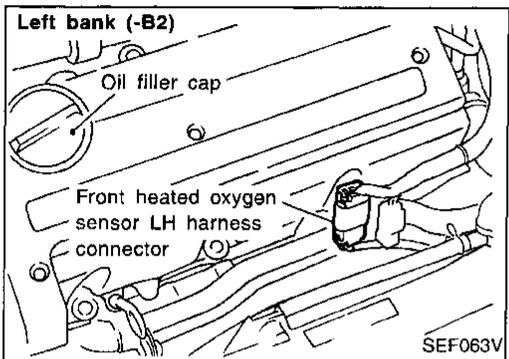
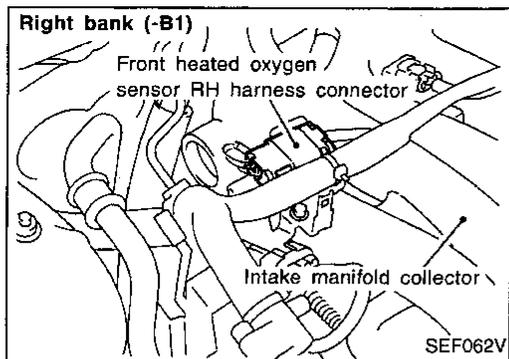


MEC486C

TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

Front Heated Oxygen Sensor Heater (P0135: Right bank), (P0155: Left 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
• 15A fuse
• F37, E14
• 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)
	CM	Sensor	
P0135	119	1	RH (Black)
P0155	121	1	LH (Blue)

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

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

NG
REPLACE FRONT HEATED OXYGEN SENSOR.
1. Check front heated oxygen sensor harness protector color.
Black: Right bank (-B1)
Blue: Left bank (-B2)
2. Replace malfunctioning front heated oxygen sensor.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0135 (-B1), P0155 (-B2)

Front Heated Oxygen Sensor Heater (P0135: Right bank), (P0155: Left 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)

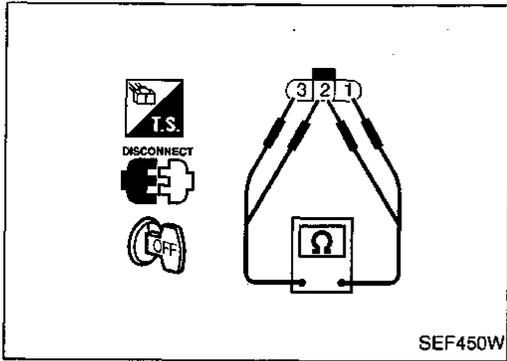
Check continuity between terminals ② and ①, ③ and ②.

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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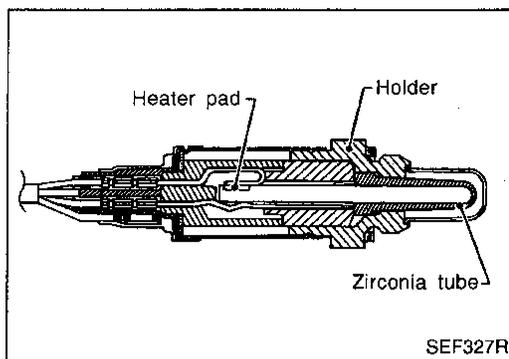
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TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2) FOR CALIFORNIA



Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Right bank), (P0157: Left 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

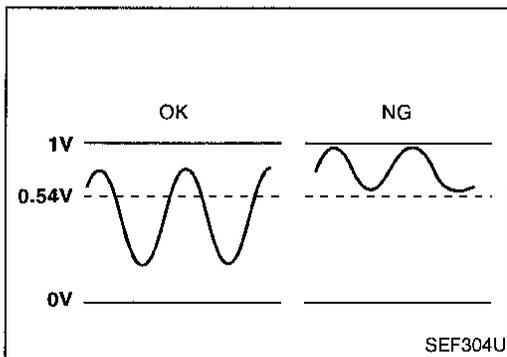
Specification data are reference values.

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 25 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
56 57	W W	Rear heated oxygen sensor (Right bank) Rear heated oxygen sensor (Left bank)	Engine is running. └ After warming up to normal operating temperature and revving engine from idle up to 2,000 rpm.	0 - Approximately 1.0V



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors 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 (Right 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 (Left bank)		

TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Right bank), (P0157: Left 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 10 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 10 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 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.)

CKPS-RPM (POS): 1,400 - 2,800 rpm (A/T models)
1,400 - 3,100 rpm (M/T models)

Vehicle speed: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 0.5 - 5.0 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 (A/T models only) from the above condition (step 7) 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 9).

Procedure for COND3

<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p>COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-RPM(POS) 672rpm 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>CKPS-RPM(POS) 672rpm THRRTL POS SEN 0.46V B/FUEL SCHDL 1.5msec</p>
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SEF468W

<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p>COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 1975rpm THRRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF469W

<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p>COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 1975rpm THRRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p>COND1: COMPLETED COND2: COMPLETED COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 1050rpm THRRTL POS SEN 0.51V B/FUEL SCHDL 1.0msec</p>
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SEF471W

<p>■ RR O2 SEN-B1 P0137 ■ □</p> <p>COMPLETED</p> <p>SELF-DIAG RESULTS</p>	<p>■ RR O2 SEN-B2 P0157 ■ □</p> <p>COMPLETED</p> <p>SELF-DIAG RESULTS</p>
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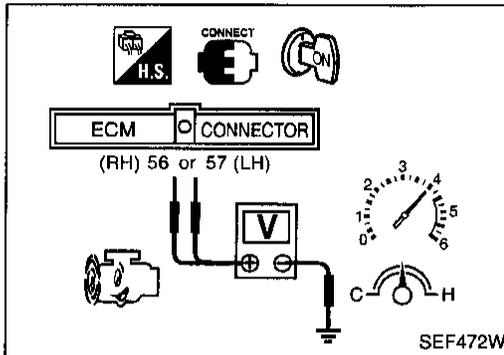
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TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Right bank), (P0157: Left bank) (Cont'd)

- 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-215.



OR OVERALL FUNCTION CHECK

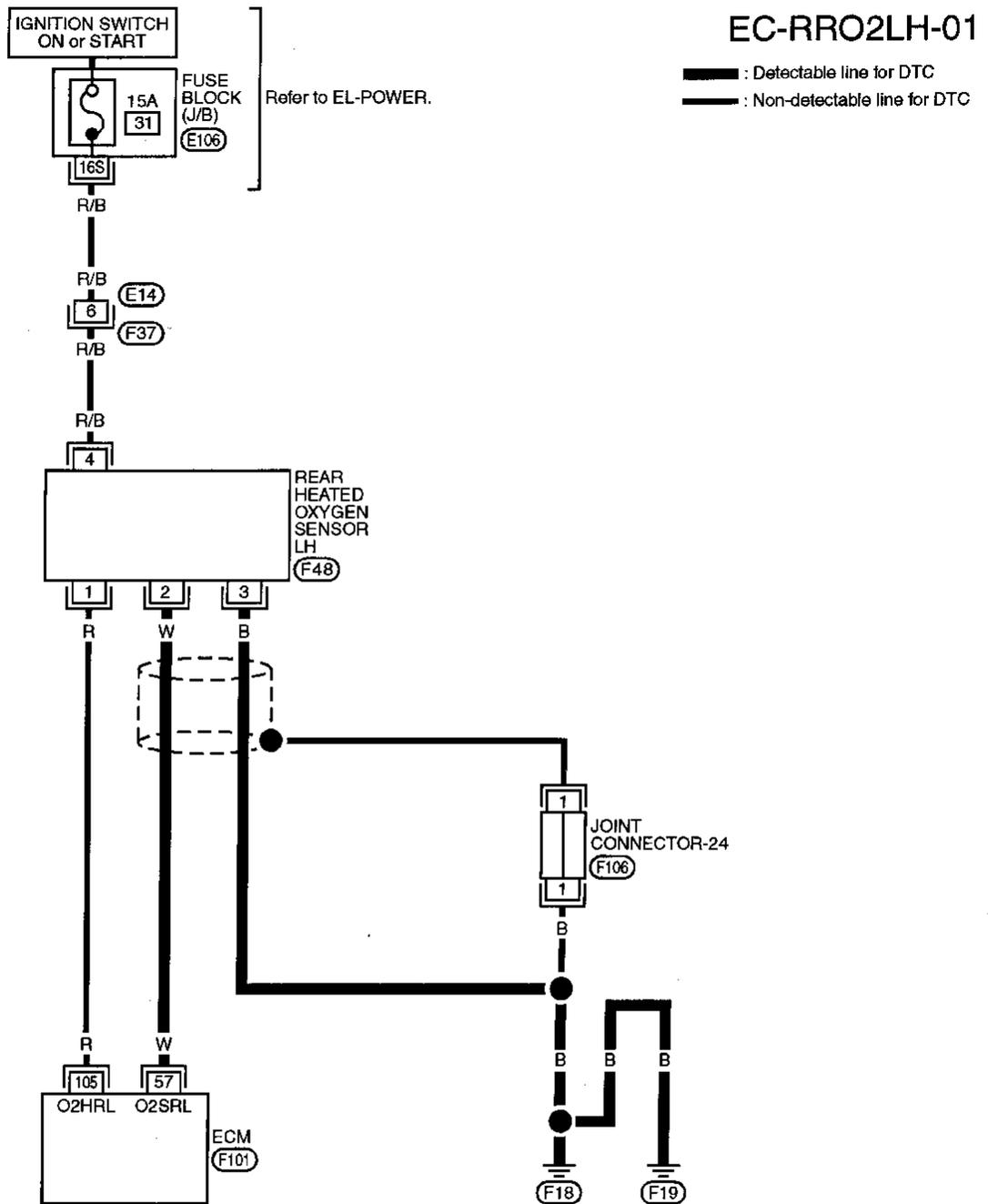
Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

- 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 ⑤⑥ (RH), ⑤⑦ (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 3rd gear position (M/T), D position with "OD" OFF (A/T).
The voltage should be below 0.43V at least once during this procedure.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-215.

TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2) FOR CALIFORNIA

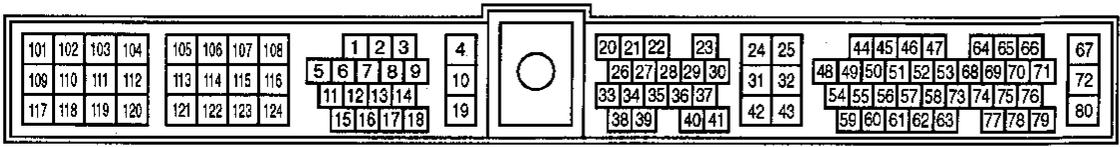
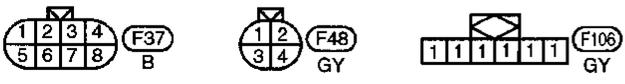
Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Right bank), (P0157: Left bank) (Cont'd)

LEFT BANK



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Refer to last page (Foldout page).
(E106)

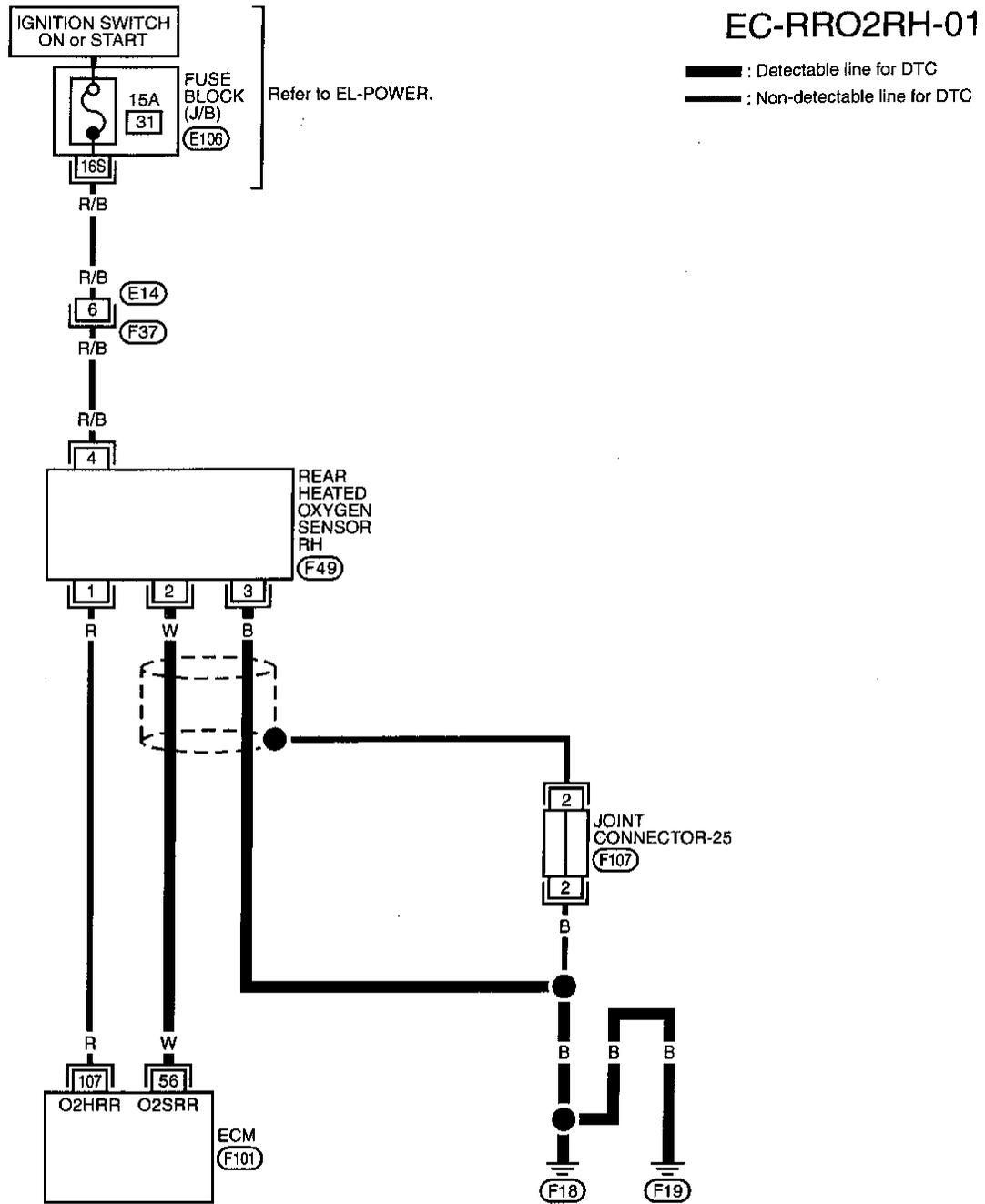


MEC488C

TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2) FOR CALIFORNIA

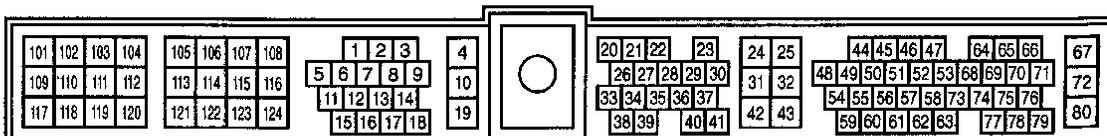
Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Right bank), (P0157: Left bank) (Cont'd)

RIGHT BANK



Refer to last page (Foldout page).

E106

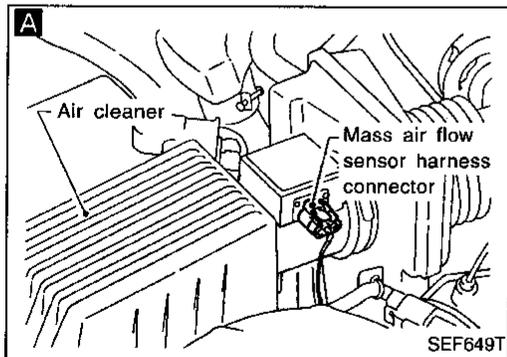
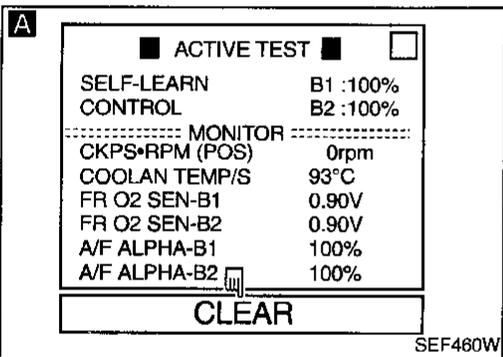
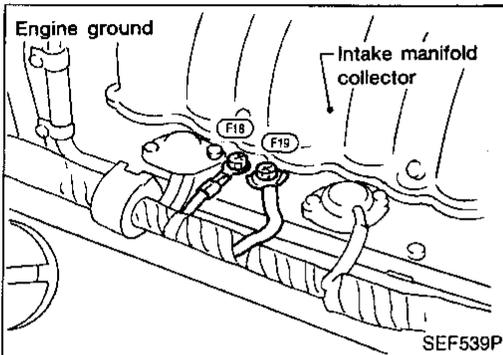
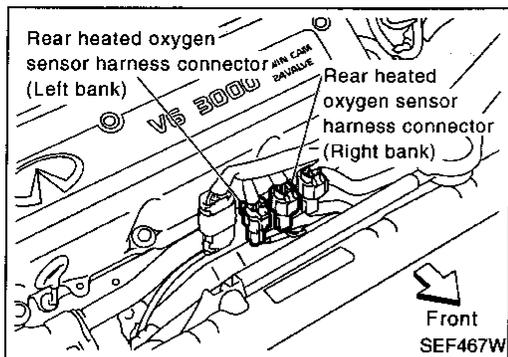


MEC489C

TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Right bank), (P0157: Left 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-285.

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.

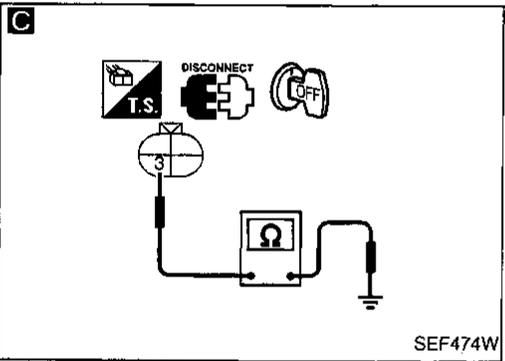
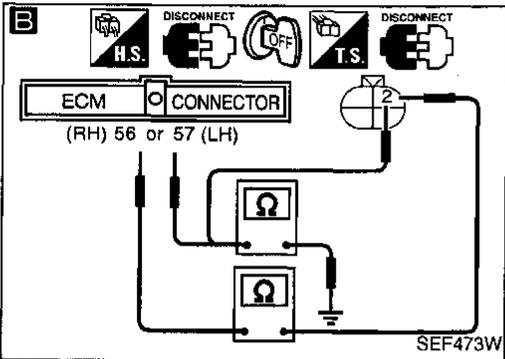
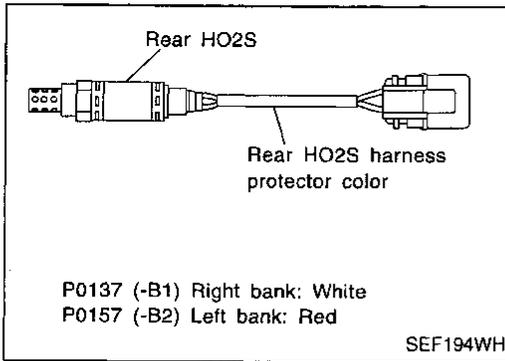
Are the 1st trip DTCs 0114, 0209 detected? Is it difficult to start engine?

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TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Right bank), (P0157: Left 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	56	2	RH (White)
P0157	57	2	LH (Red)

Continuity should exist.

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

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	ground	
P0137	56 or 2	ground	RH (White)
P0157	57 or 2	ground	LH (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.

NG → Repair harness or connectors.

NG → Repair harness or connectors.

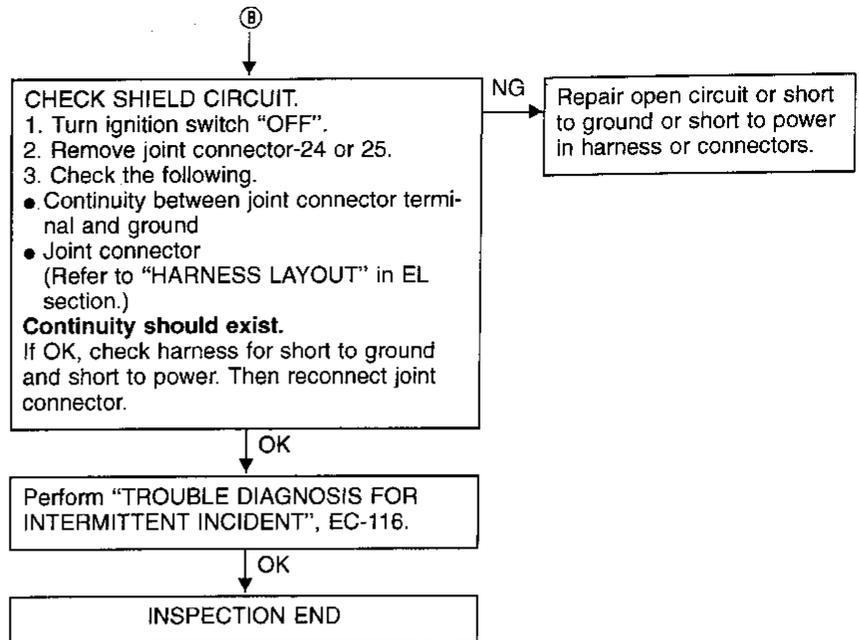
NG → **REPLACE REAR HEATED OXYGEN SENSOR.**

1. Check rear heated oxygen sensor harness protector color.
White: Right bank (-B1)
Red: Left bank (-B2)
2. Replace malfunctioning rear heated oxygen sensor.

OK → **B**

TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Right bank), (P0157: Left bank) (Cont'd)



■ ACTIVE TEST ■	
FUEL INJECTION	25%
----- MONITOR -----	
CKPS•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

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SEF475W

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%.

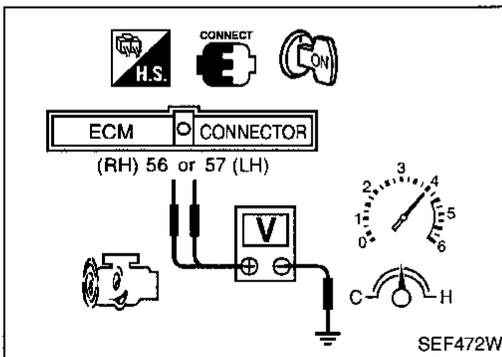
CAUTION:

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 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 ⓐ (RH), ⓑ (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.



TROUBLE DIAGNOSIS FOR DTC P0137 (-B1), P0157 (-B2) FOR CALIFORNIA

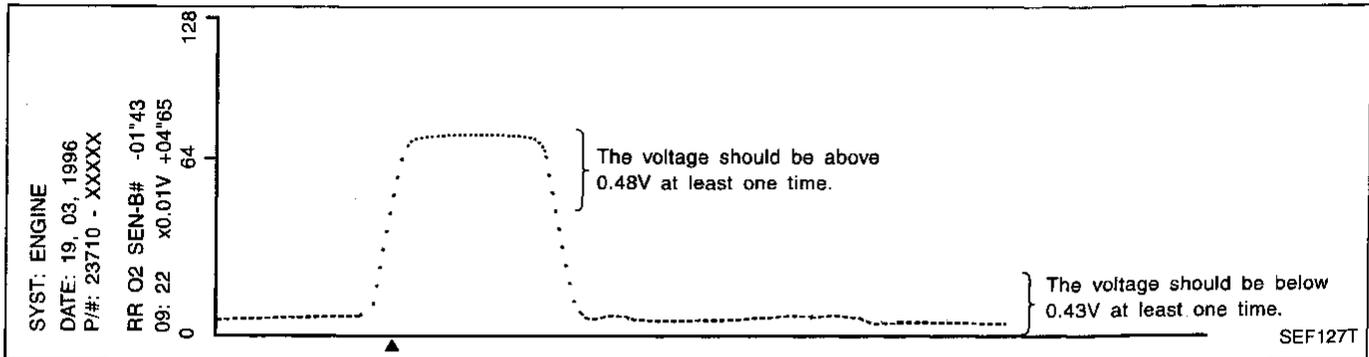
Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (P0137: Right bank), (P0157: Left bank) (Cont'd)

- 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 3rd gear position (M/T), D position with "OD" OFF (A/T).

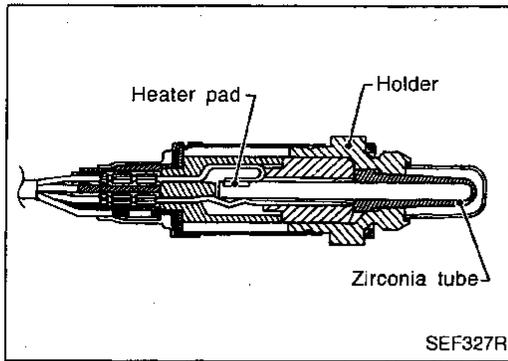
The voltage should be below 0.43V at least once.

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) FOR CALIFORNIA



Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Right bank), (P0158: Left 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

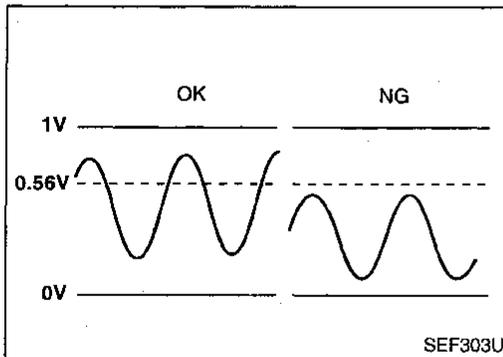
Specification data are reference values.

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 Ⓧ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
56 57	W W	Rear heated oxygen sensor (Right bank) Rear heated oxygen sensor (Left bank)	Engine is running. After warming up to normal operating temperature and revving engine from idle up to 2,000 rpm.	0 - Approximately 1.0V



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors 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 (Right bank)	● 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 (Left bank)		

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Right bank), (P0158: Left bank) (Cont'd)

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p>COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-RPM(POS) 672rpm 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>CKPS-RPM(POS) 672rpm THRTL POS SEN 0.46V B/FUEL SCHDL 1.5msec</p>
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SEF476W

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p>COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF477W

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p>COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF478W

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p>COND1: COMPLETED COND2: COMPLETED COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 1050rpm THRTL POS SEN 0.51V B/FUEL SCHDL 1.0msec</p>
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SEF479W

<p>■ RR O2 SEN-B1 P0138 ■ □</p> <p>COMPLETED</p> <p>SELF-DIAG RESULTS</p>	<p>■ RR O2 SEN-B2 P0158 ■ □</p> <p>COMPLETED</p> <p>SELF-DIAG RESULTS</p>
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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 10 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 10 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 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.)

**CKPS-RPM (POS): 1,400 - 2,800 rpm (A/T models)
1,400 - 3,100 rpm (M/T models)**

Vehicle speed: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 0.5 - 5.0 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 (A/T models only) from the above condition [step 7] until "INCOMPLETE" at "COND2" on CONSULT screen is turned to "COMPLETED". (It will take approximately 4 seconds.)

NOTE:

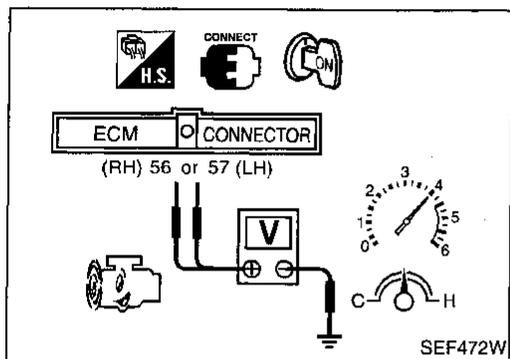
If "COMPLETED" is already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 9).

Procedure for COND3

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Right bank), (P0158: Left bank) (Cont'd)

- 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-224.



OR OVERALL FUNCTION CHECK

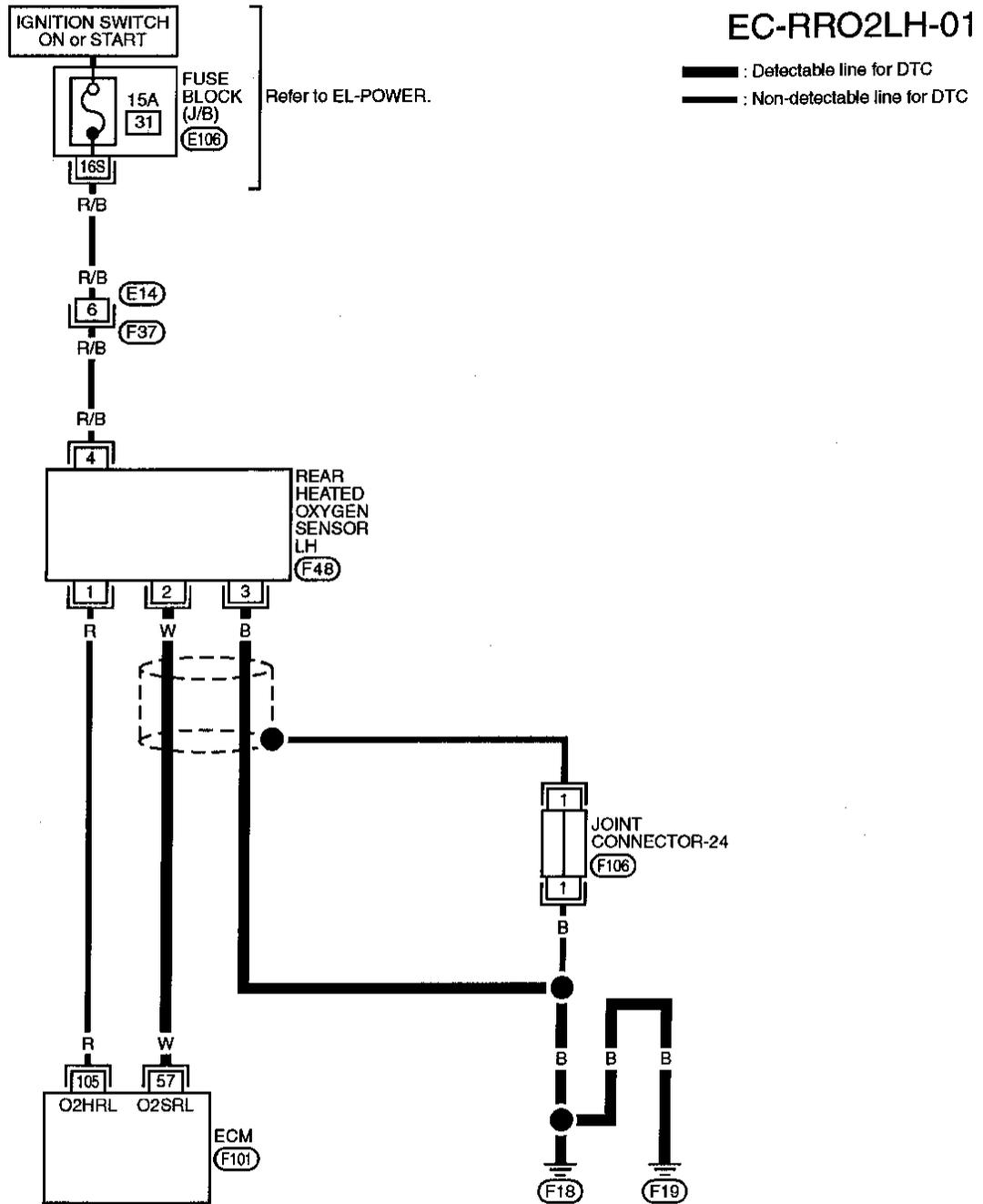
Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

- 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 ⑤⑥ (RH), ⑤⑦ (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 3rd gear position (M/T), D position with "OD" OFF (A/T).
The voltage should be above 0.48V at least once during this procedure.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-224.

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2) FOR CALIFORNIA

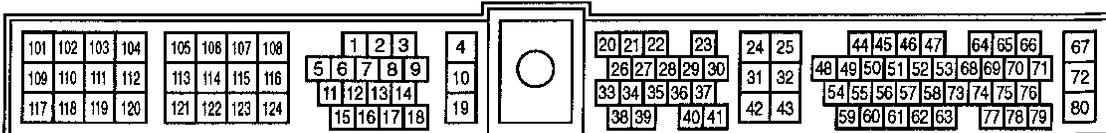
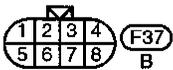
Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Right bank), (P0158: Left bank) (Cont'd)

LEFT BANK



Refer to last page (Foldout page).

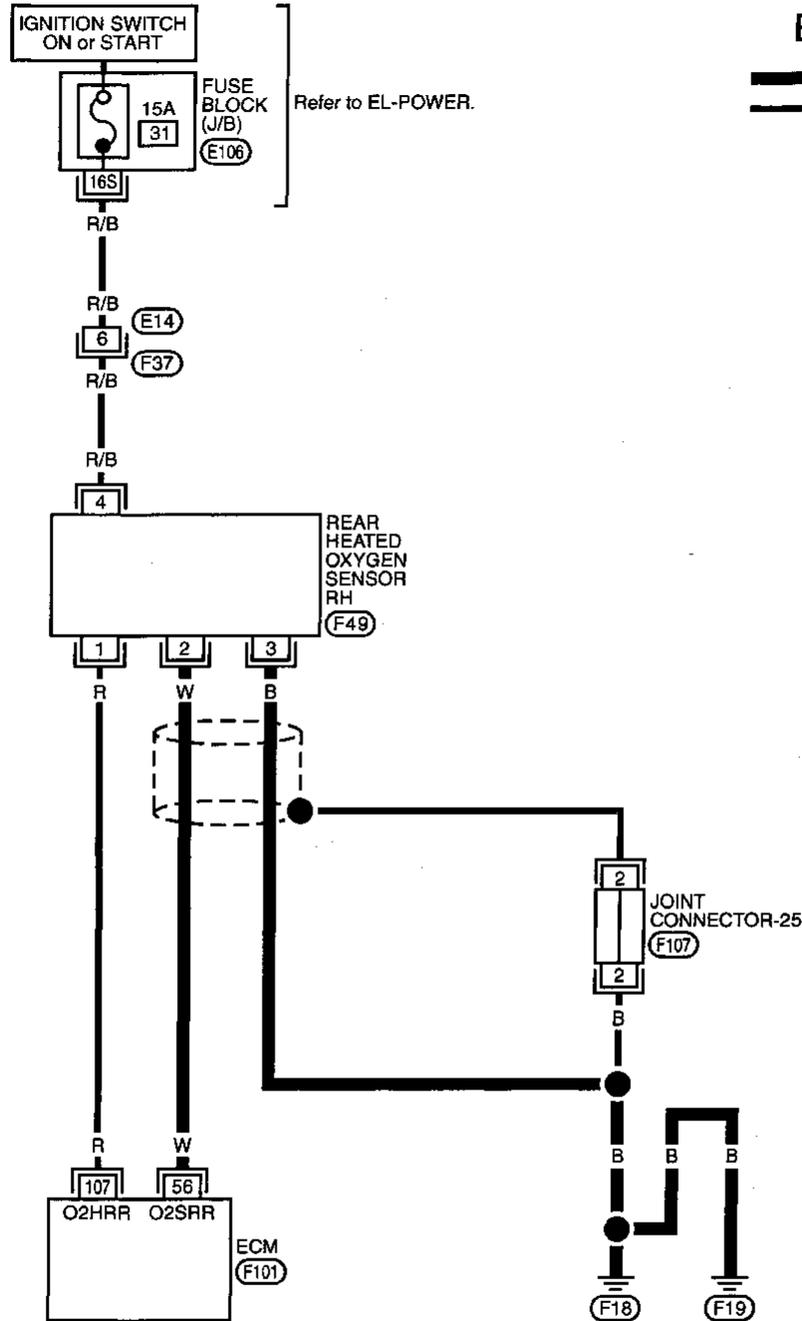
(E106)



TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Right bank), (P0158: Left bank) (Cont'd)

RIGHT BANK



EC-RRO2RH-01

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

GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

RS

BT

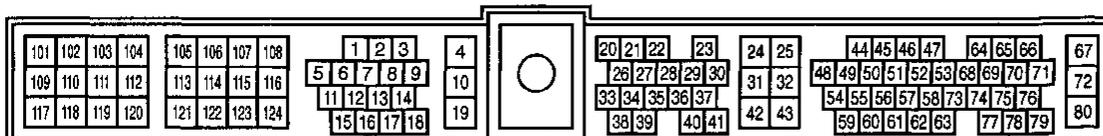
HA

EL

IDX

Refer to last page (Foldout page).

(E106)

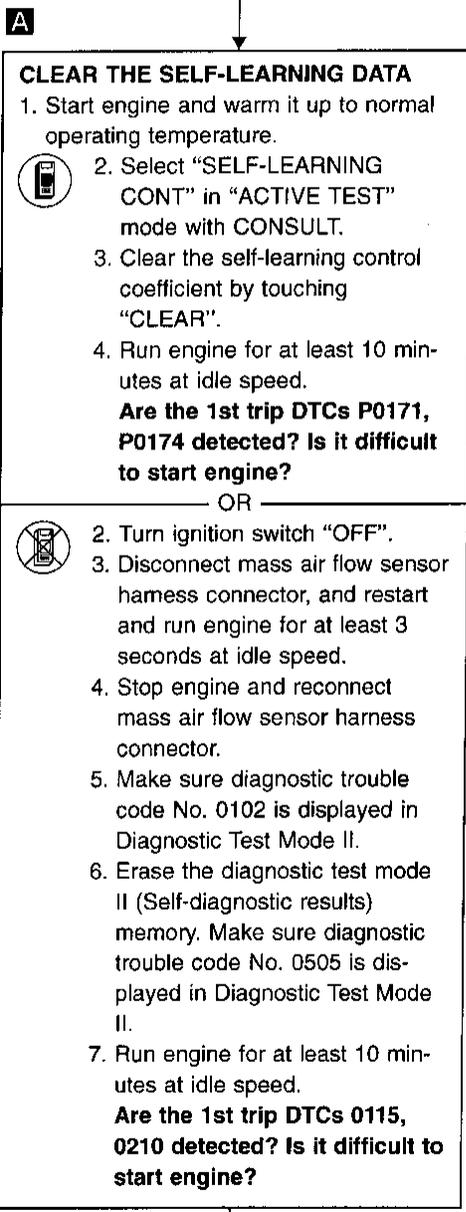
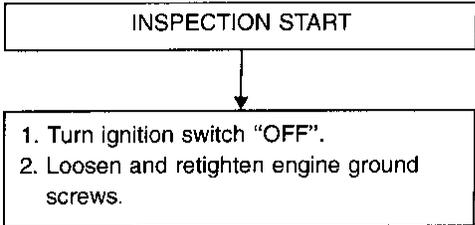
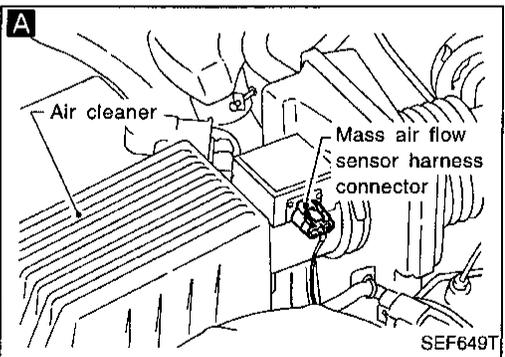
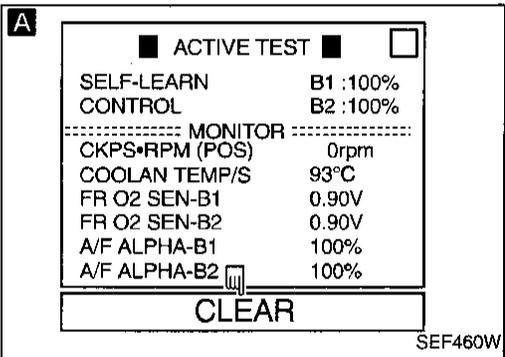
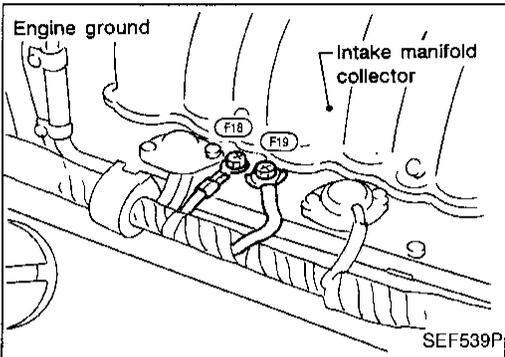
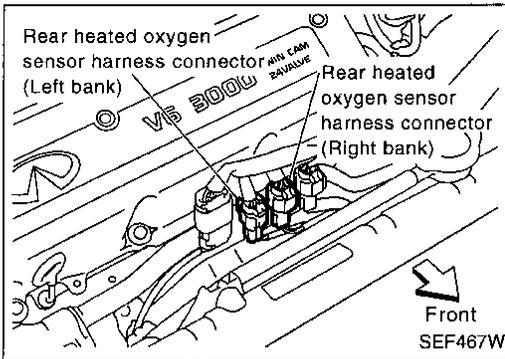


MEC489C

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Right bank), (P0158: Left bank) (Cont'd)

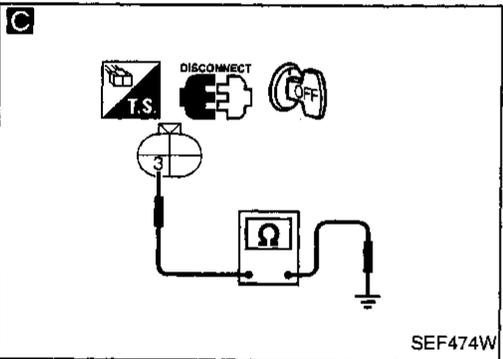
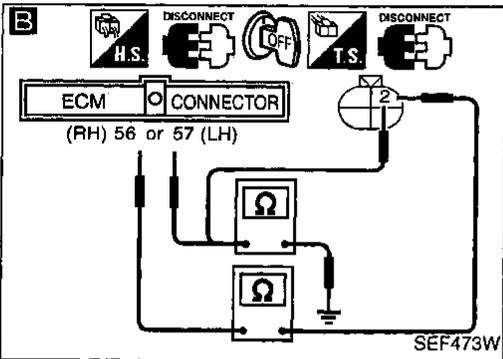
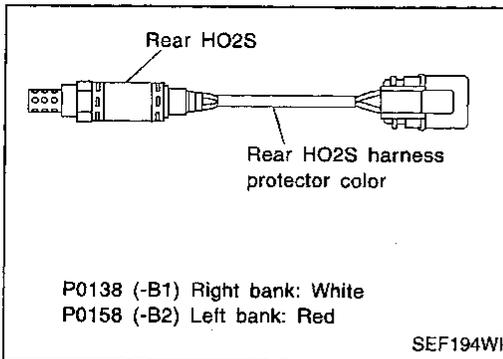
DIAGNOSTIC PROCEDURE



Go to "TROUBLE DIAGNOSIS FOR DTC P0171, P0174", EC-279.

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Right bank), (P0158: Left 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	56	2	RH (White)
P0158	57	2	LH (Red)

Continuity should exist.

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

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	ground	
P0138	56 or 2	ground	RH (White)
P0158	57 or 2	ground	LH (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.

NG → Repair harness or connectors.

NG → Repair harness or connectors.

NG → **REPLACE REAR HEATED OXYGEN SENSOR.**

1. Check rear heated oxygen sensor harness protector color.
White: Right bank (-B1)
Red: Left bank (-B2)
2. Replace malfunctioning rear heated oxygen sensor.

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

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Remove joint connector-24 or 25.
3. Check the following.
 - Continuity between joint connector terminal and ground
 - Joint connector (Refer to "HARNESS LAYOUT" in EL section.)

Continuity should exist.

If OK, check harness for short to ground and short to power. Then reconnect joint connector.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

RS

BT

HA

EL

IDX

TROUBLE DIAGNOSIS FOR DTC P0138 (-B1), P0158 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (P0138: Right bank), (P0158: Left 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 seconds.
- 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%.

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 drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive seconds.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑤⑥ (RH), ⑤⑦ (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.

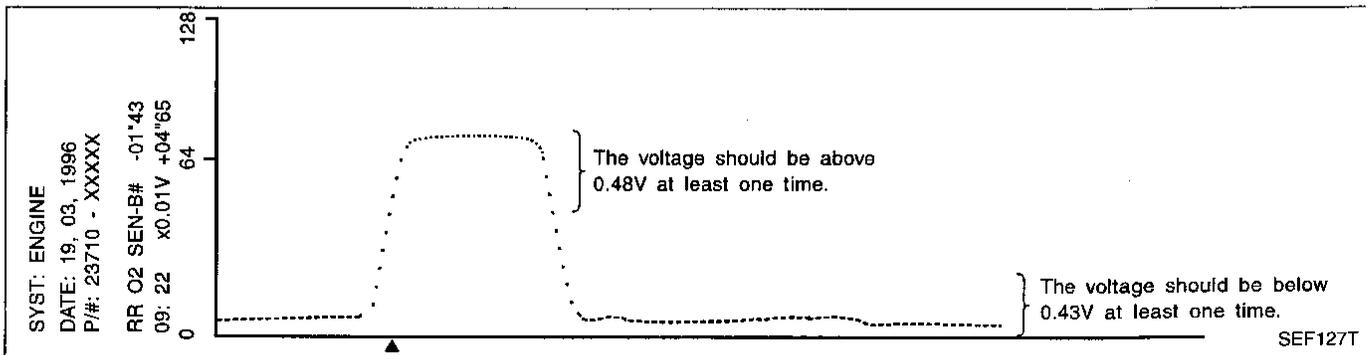
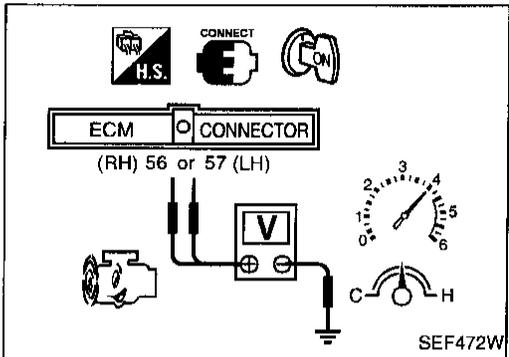
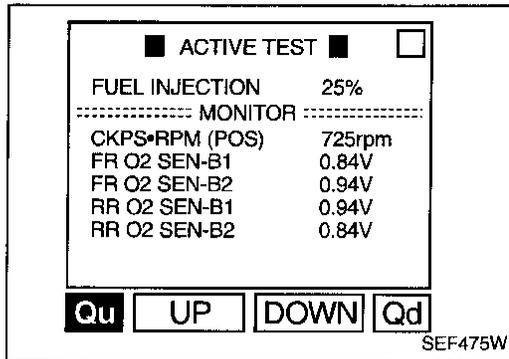
If the voltage is above 0.48V at step 4, step 5 is not necessary.

- 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 3rd gear position (M/T), D position with "OD" OFF (A/T).

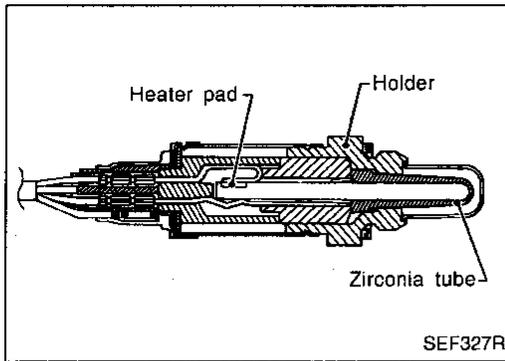
The voltage should be below 0.43V at least once.

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) FOR CALIFORNIA



Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Right bank), (P0159: Left bank)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas on left 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

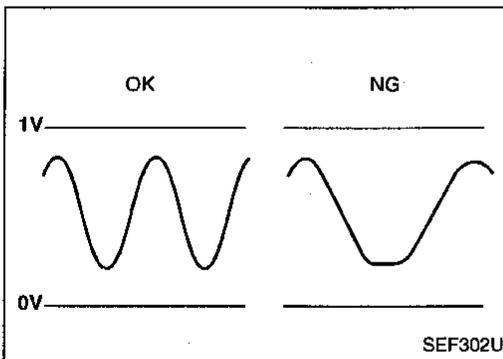
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 SEN-B1 RR O2 SEN-B2	● Engine: After warming up Revving 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 Ⓣ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
56 57	W W	Rear heated oxygen sensor (Right bank) Rear heated oxygen sensor (Left bank)	Engine is running. After warming up to normal operating temperature and revving engine from idle up to 2,000 rpm.	0 - Approximately 1.0V



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors 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 (Right 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 (Left bank)		

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Right bank), (P0159: Left 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 10 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 10 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 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.)

**CKPS RPM (POS): 1,400 - 2,800 rpm (A/T models)
1,400 - 3,100 rpm (M/T models)**

Vehicle speed: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 0.5 - 5.0 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 (A/T models only) from the above condition [step 7)] 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 9).

Procedure for COND3

EC-228

<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 925rpm THRTL POS SEN 0.46V B/FUEL SCHDL 1.5msec</p>
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SEF480W

<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF481W

<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 1975rpm THRTL POS SEN 1.10V B/FUEL SCHDL 4.4msec</p>
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SEF482W

<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COND1: COMPLETED COND2: COMPLETED COND3: INCOMPLETE</p> <p>===== MONITOR =====</p> <p>CKPS-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>CKPS-RPM(POS) 1050rpm THRTL POS SEN 0.51V B/FUEL SCHDL 1.0msec</p>
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SEF483W

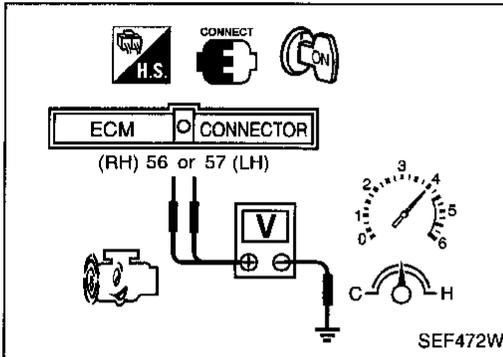
<p>■ RR O2 SEN-B1 P0139 ■ □</p> <p>COMPLETED</p> <p>SELF-DIAG RESULTS</p>	<p>■ RR O2 SEN-B2 P0159 ■ □</p> <p>COMPLETED</p> <p>SELF-DIAG RESULTS</p>
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SEF565U

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Right bank), (P0159: Left bank) (Cont'd)

- 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-232.



OR OVERALL FUNCTION CHECK

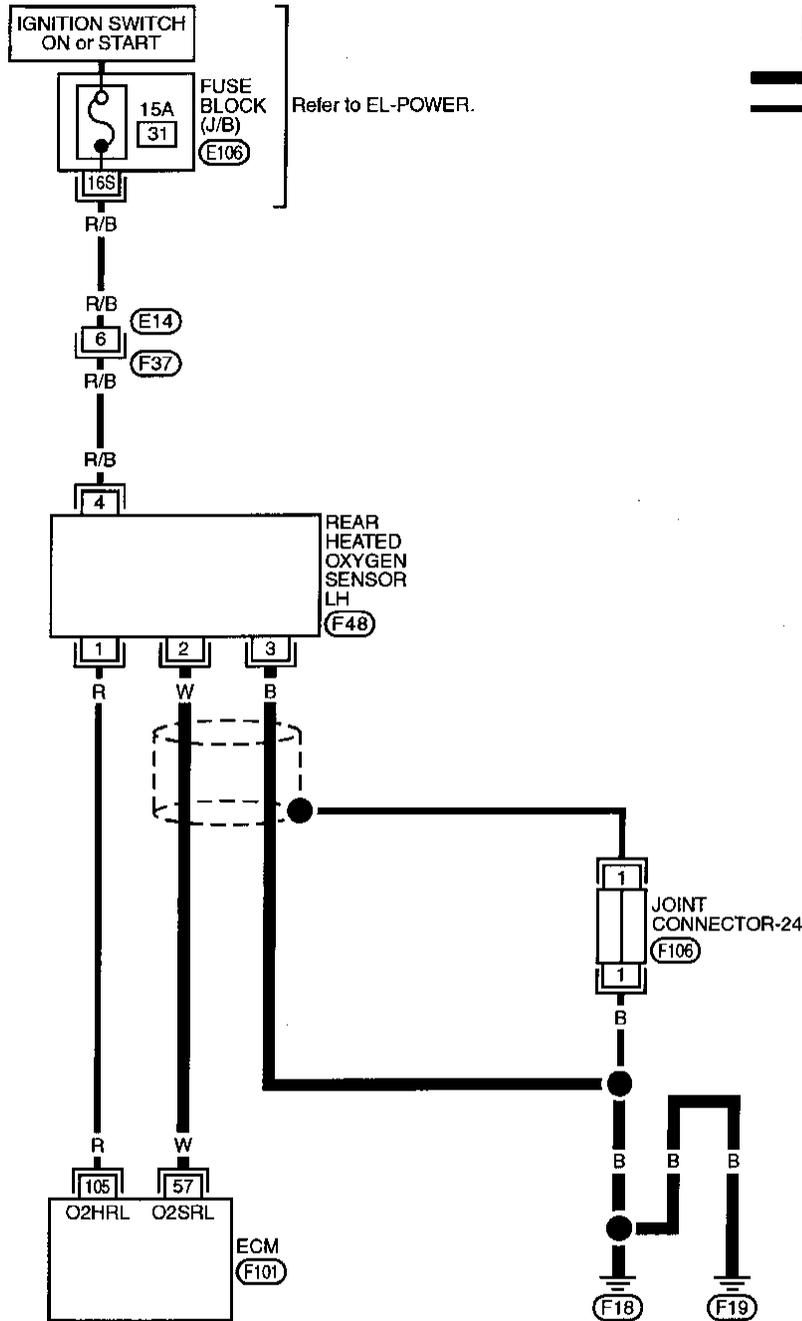
Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive seconds.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑤⑥ (RH), ⑤⑦ (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 3rd gear position (M/T), D position with "OD" OFF (A/T).
The voltage should be changed at more than 0.06V for 1 second during this procedure.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-232.

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Right bank), (P0159: Left bank) (Cont'd)

LEFT BANK



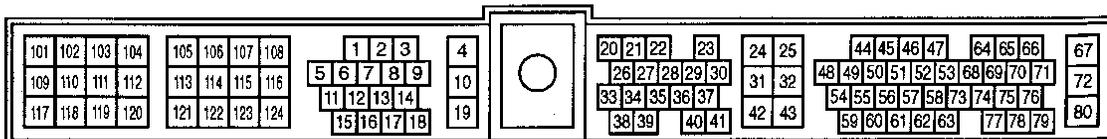
EC-RRO2LH-01

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

Refer to EL-POWER.

Refer to last page (Foldout page).

(E106)

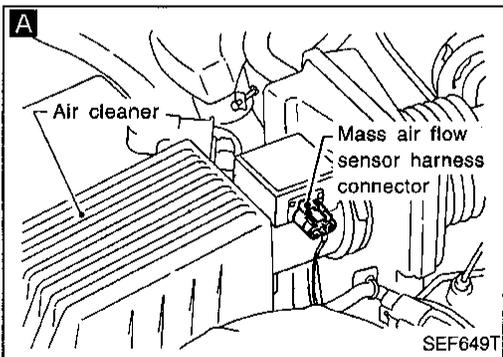
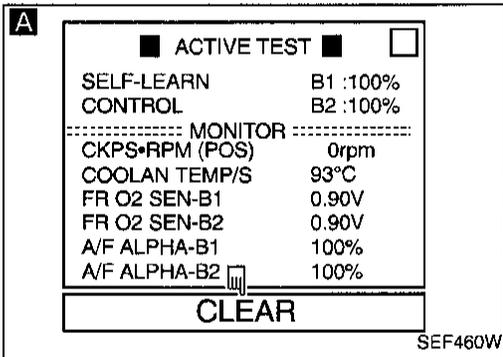
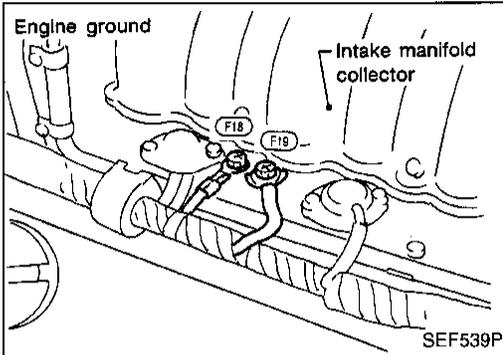
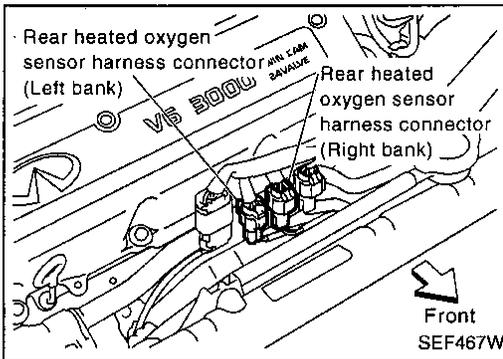


MEC488C

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Right bank), (P0159: Left 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 or P0172, P0175 detected? Is it difficult to start engine?**
- OR

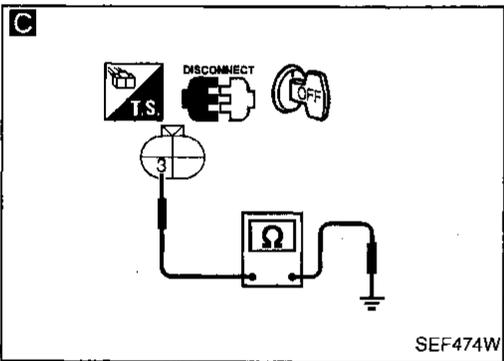
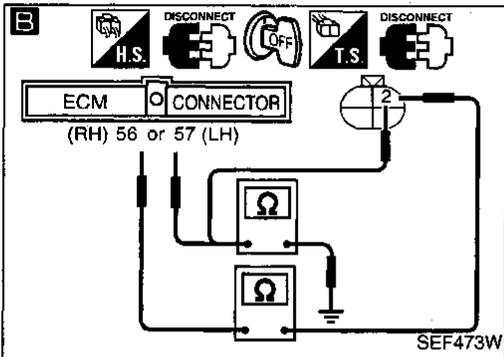
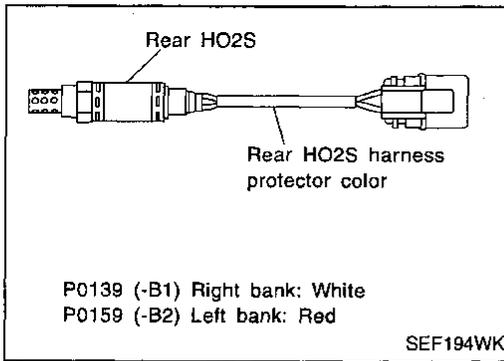
Yes
Go to "TROUBLE DIAGNOSIS FOR DTC P0171, P0174 or P0172, P0175", EC-279, 285.

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 0114, 0209 detected? Is it difficult to start engine?**

No
A

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Right bank), (P0159: Left bank) (Cont'd)



A

B

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.

Pcode	Terminals		Bank (Harness protector color)
	ECM	Sensor	
P0139	56	2	RH (White)
P0159	57	2	LH (Red)

Continuity should exist.
3. Check harness continuity between ECM or sensor and ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	ground	
P0139	56 or 2	ground	RH (White)
P0159	57 or 2	ground	LH (Red)

Continuity should not exist.
If OK, check harness for short to ground and short to power.

C

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 HEATED OXYGEN SENSOR.
1. Check rear heated oxygen sensor harness protector color.
White: Right bank (-B1)
Red: Left bank (-B2)
2. Replace malfunctioning rear heated oxygen sensor.

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Remove joint connector-24 or 25.
3. Check the following.
• Continuity between joint connector terminal and ground
• Joint connector
(Refer to "HARNES LAYOUT" in EL section.)
Continuity should exist.
If OK, check harness for short to ground and short to power. Then reconnect joint connector.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

NG: Repair harness or connectors.

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

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

TROUBLE DIAGNOSIS FOR DTC P0139 (-B1), P0159 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (P0139: Right bank), (P0159: Left 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%.

CAUTION:

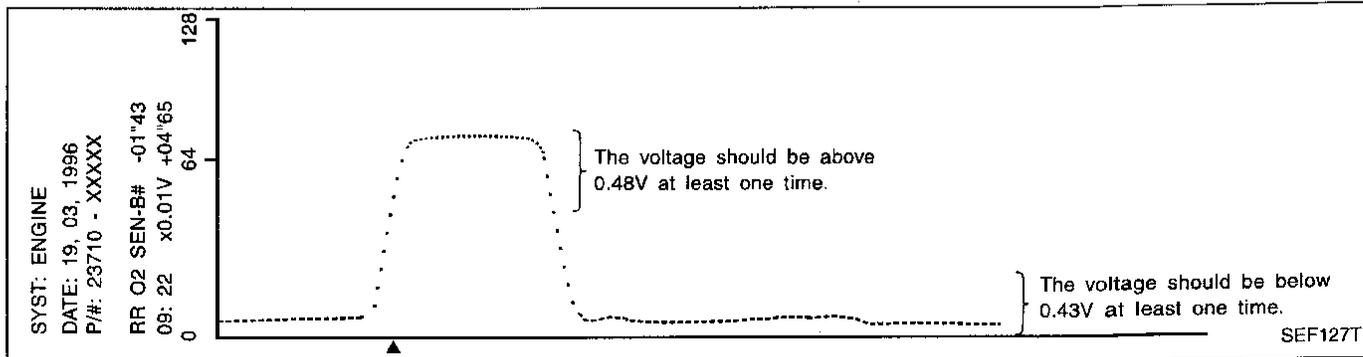
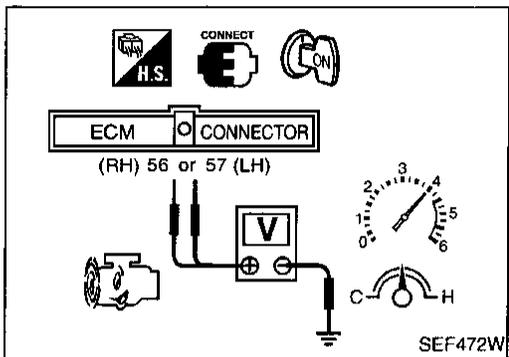
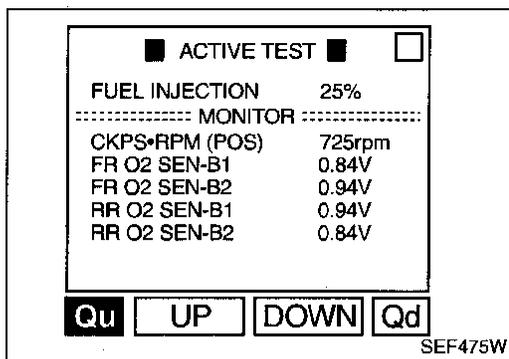
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OR

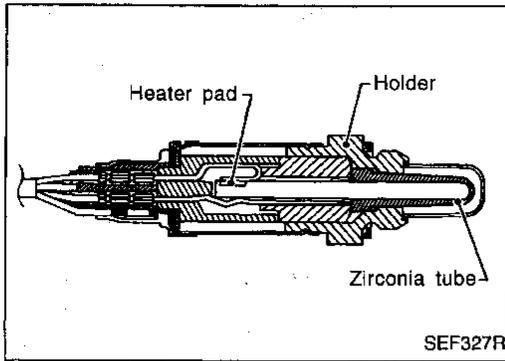
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑤⑥ (RH), ⑤⑦ (LH) (sensor signal) and ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load 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 3rd gear position (M/T), D position with "OD" OFF (A/T).
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 P0140 (-B1), P0160 (-B2) FOR CALIFORNIA



Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Right bank), (P0160: Left 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

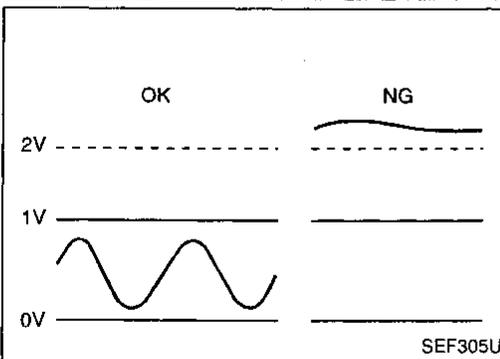
Specification data are reference values.

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 Ⓧ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
56 57	W W	Rear heated oxygen sensor (Right bank) Rear heated oxygen sensor (Left bank)	Engine is running. After warming up to normal operating temperature and revving engine from idle up to 2,000 rpm.	0 - Approximately 1.0V



ON BOARD DIAGNOSIS LOGIC

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

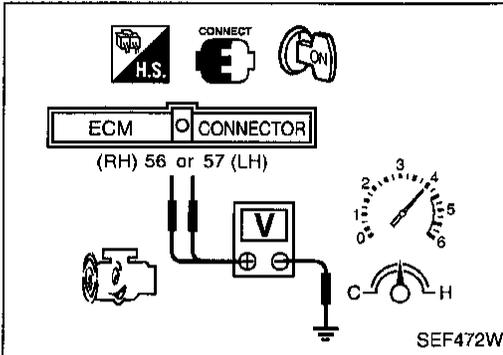
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0140 0512 (Right bank)	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open.) ● Rear heated oxygen sensor
P0160 0315 (Left bank)		

TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Right bank), (P0160: Left bank) (Cont'd)

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CKPS•RPM(POS)	2040rpm	
COOLAN TEMP/S	82°C	
VHCL SPEED SE	76km/h	
B/FUEL SCHDL	2.5msec	
RECORD		

SEF484W



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 10 seconds before conducting the next test.



- 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 - 2,800 rpm (A/T models)
1,400 - 3,100 rpm (M/T models)**

VHCL SPEED SE: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 0.5 - 5.0 msec

COOLAN TEMP/S: 70 - 100°C (158 - 212°F)

Selector lever: Suitable position

- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-239.

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.

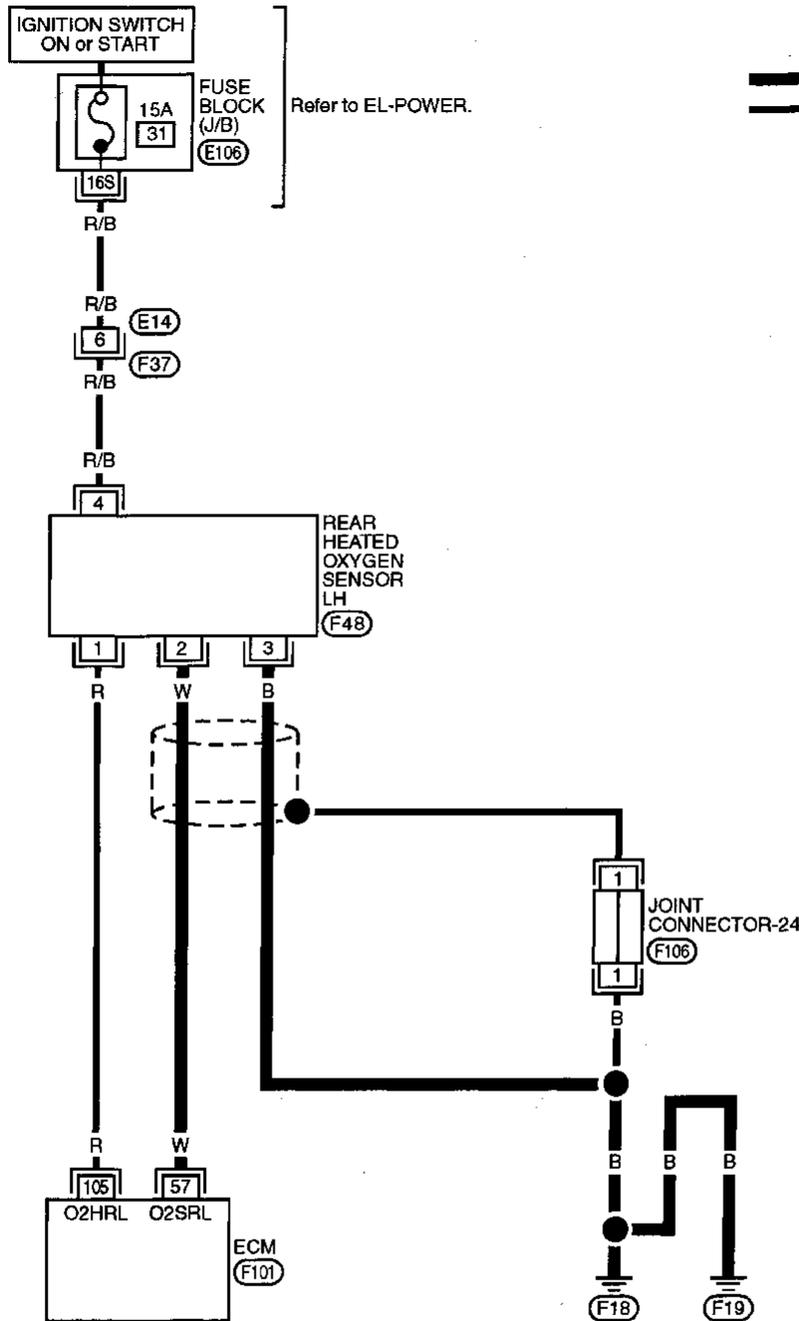


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑥ (RH), ⑤⑦ (LH) (sensor signal) and ground.
- 3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(depress and release accelerator pedal as soon as possible)
The voltage should be below 2V during this procedure.
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-239.

TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Right bank), (P0160: Left bank) (Cont'd)

LEFT BANK



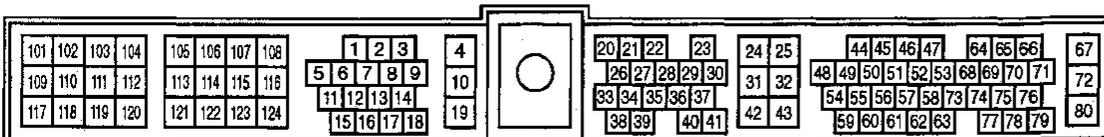
EC-RRO2LH-01

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

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

Refer to last page (Foldout page).

E106

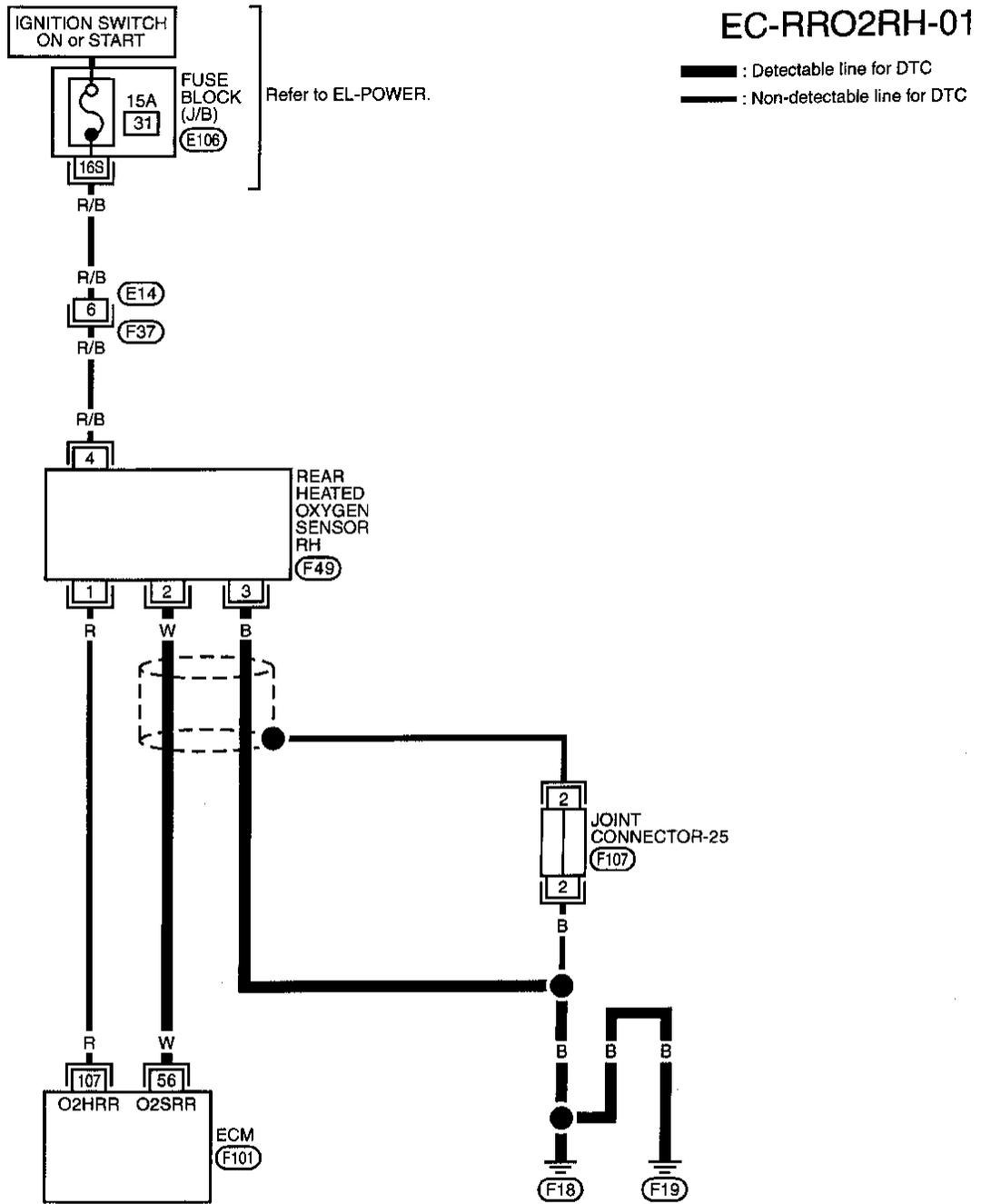


MEC488C

TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2) FOR CALIFORNIA

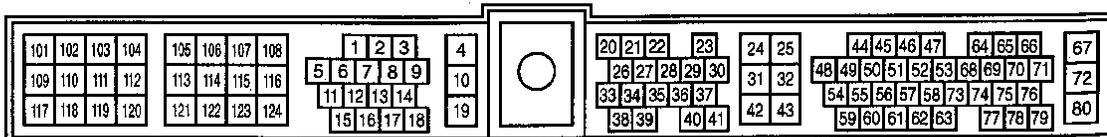
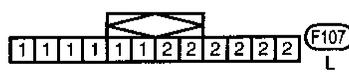
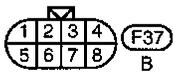
Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Right bank), (P0160: Left bank) (Cont'd)

RIGHT BANK



Refer to last page (Foldout page).

(E106)

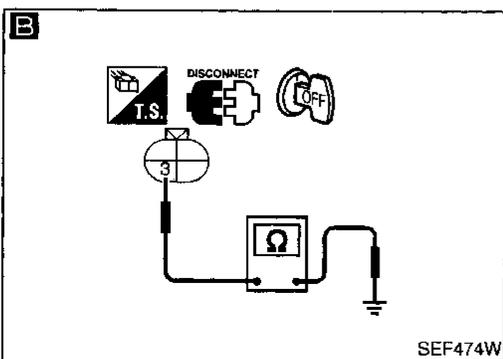
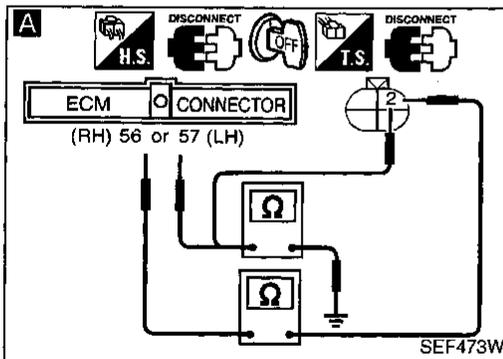
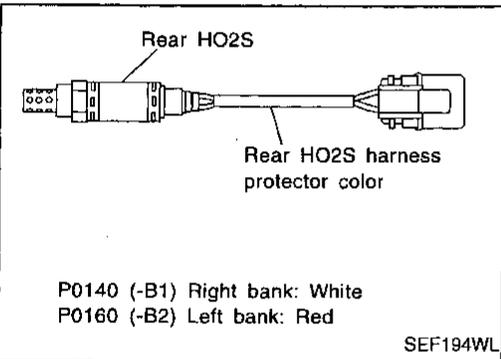
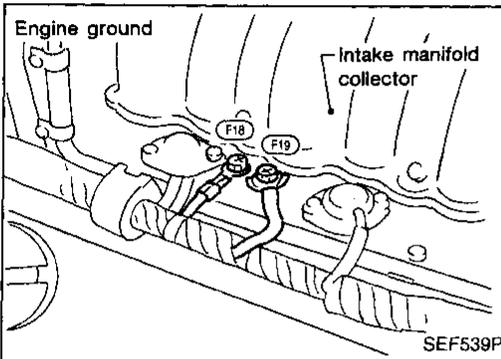
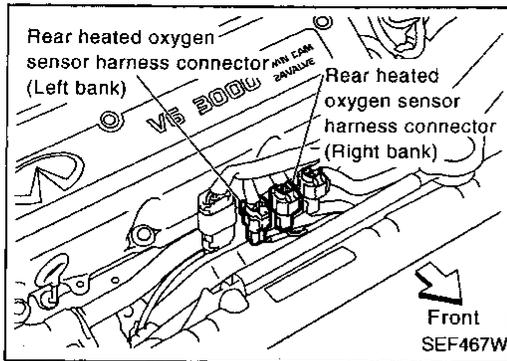


MEC489C

TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Right bank), (P0160: Left 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	56	2	RH (White)
P0160	57	2	LH (Red)

- Continuity should exist.**
3. Check harness continuity between ECM or sensor and ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	ground	
P0140	56 or 2	ground	RH (White)
P0160	57 or 2	ground	LH (Red)

- Continuity should not exist.**
- If OK, check harness for short to ground and short to power.

OK

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.

OK

CHECK COMPONENT (Rear heated oxygen sensor).

1. Turn ignition switch "OFF".
2. Disconnect sensor harness connector and check for water.
3. Check rear heated oxygen sensor. Refer to "COMPONENT INSPECTION" on next page.

OK

NG Repair harness or connectors.

NG Repair harness or connectors.

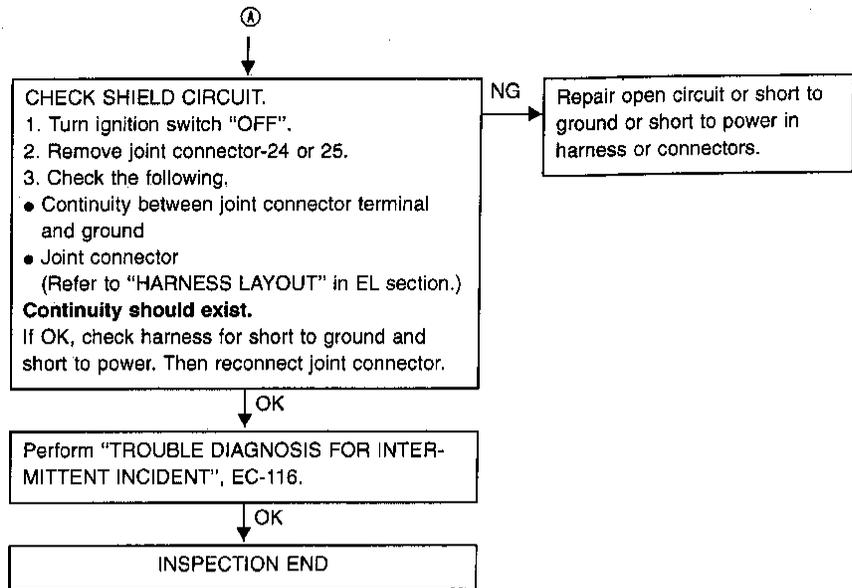
NG REPLACE REAR HEATED OXYGEN SENSOR.

1. Check rear heated oxygen sensor harness protector color.
White: Right bank (-B1)
Red: Left bank (-B2)
2. Replace malfunctioning rear heated oxygen sensor.

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

TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Right bank), (P0160: Left bank) (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P0140 (-B1), P0160 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor (High voltage) (Rear HO2S) (P0140: Right bank), (P0160: Left 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%.

CAUTION:

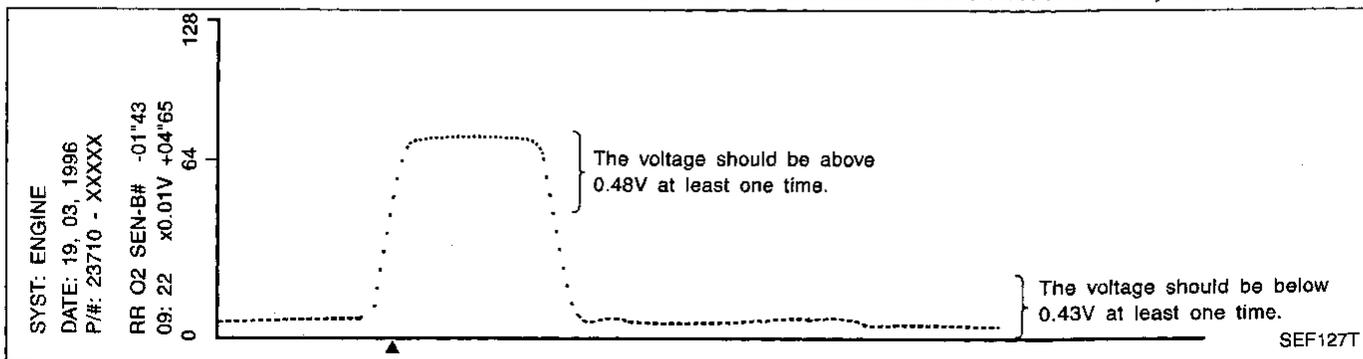
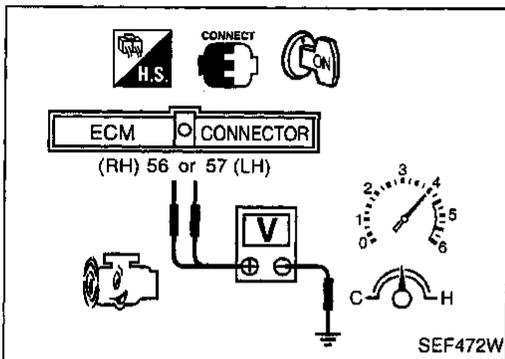
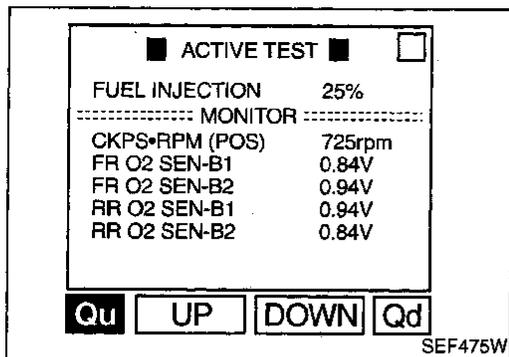
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OR

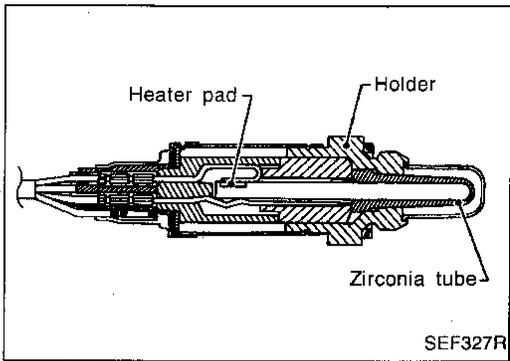
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑤⑥ (RH), ⑤⑦ (LH) (sensor signal) and ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load 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 3rd gear position (M/T), D position with "OD" OFF (A/T).
 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 P0137 EXCEPT FOR CALIFORNIA



Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S)

COMPONENT DESCRIPTION

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

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

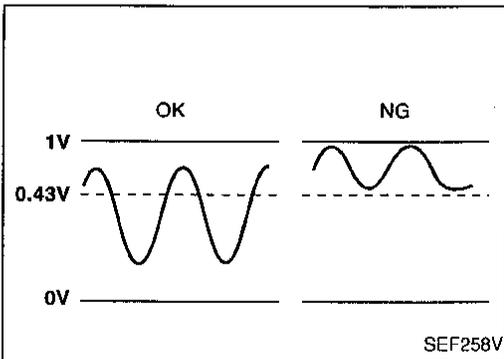
Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

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



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors 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	<ul style="list-style-type: none"> ● 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 or shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors

TROUBLE DIAGNOSIS FOR DTC P0137 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (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 10 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 10 seconds.
- 3) Turn ignition switch "ON" and select "RR O2 SENSOR P0137" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 10 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.)

CKPS-RPM (POS): 1,400 - 2,800 rpm (A/T models)

1,400 - 3,100 rpm (M/T models)

Vehicle speed: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 0.5 - 5.0 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 (A/T models only) from the above condition [step 7] until "INCOMPLETED" 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 9).

Procedure for COND3

■ RR O2 SEN P0137 ■ □	
COND1: OUT OF COND	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS•RPM(POS)	672rpm
THRTL POS SEN	0.51V
B/FUEL SCHDL	1.0msec

SEF488W

■ RR O2 SEN P0137 ■ □	
COND1: TESTING	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS•RPM(POS)	2000rpm
THRTL POS SEN	0.94V
B/FUEL SCHDL	3.6msec

SEF489W

■ RR O2 SEN P0137 ■ □	
COND1: COMPLETED	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS•RPM(POS)	2000rpm
THRTL POS SEN	0.94V
B/FUEL SCHDL	3.6msec

SEF490W

■ RR O2 SEN P0137 ■ □	
COND1: COMPLETED	
COND2: COMPLETED	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS•RPM(POS)	672rpm
THRTL POS SEN	0.51V
B/FUEL SCHDL	1.0msec

SEF491W

■ RR O2 SENSOR P0137 ■ □	
COMPLETED	
SELF-DIAG RESULTS	

SEF281U

GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

RS

BT

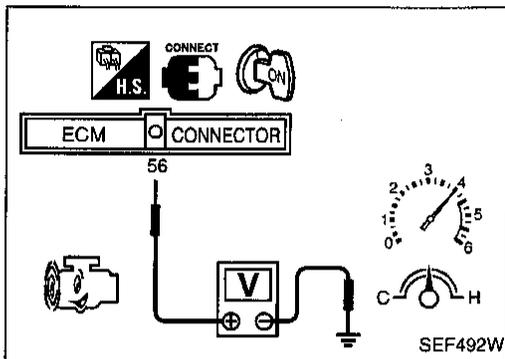
HA

EL

IDX

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)

- 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-246.



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 56 (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.

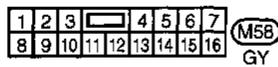
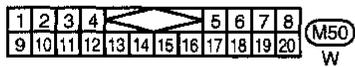
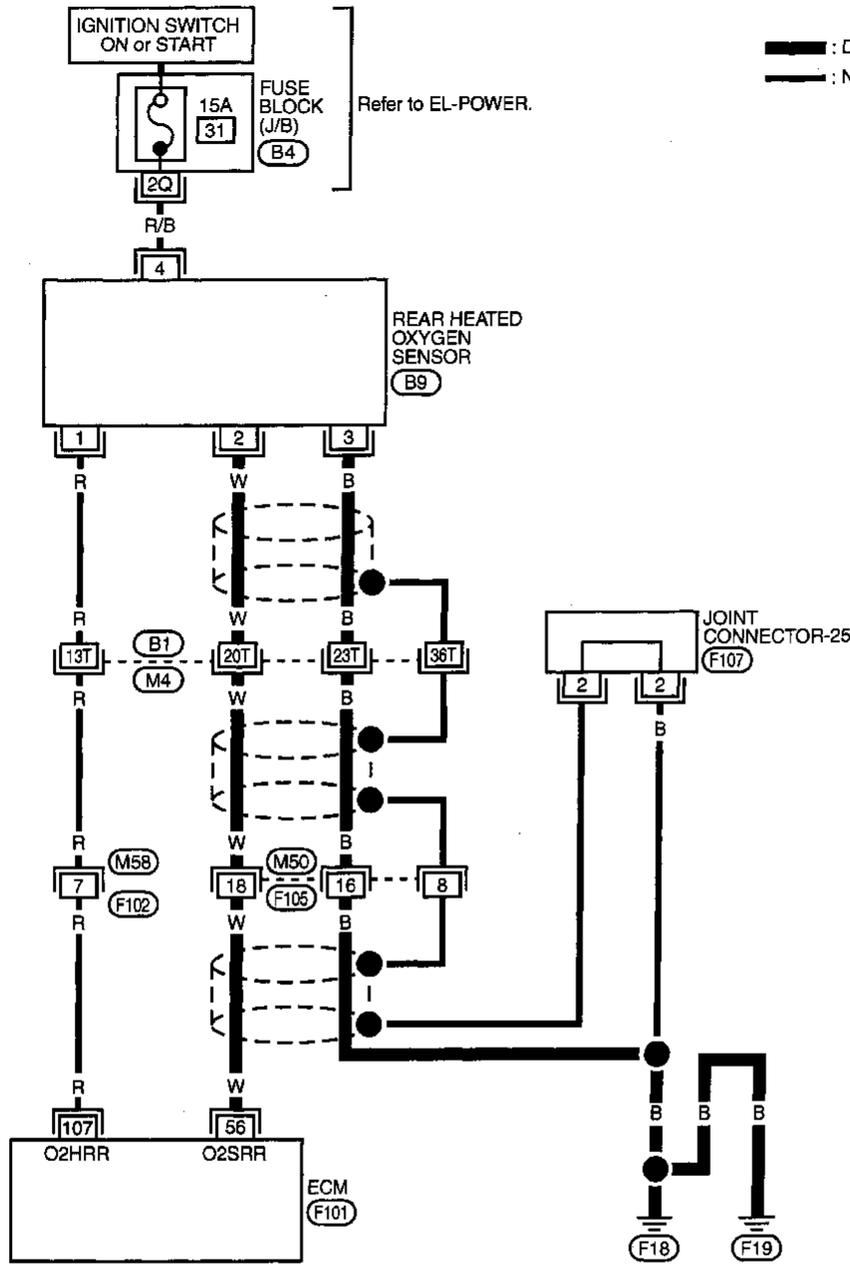
If the voltage can be confirmed in step 4, step 5 is not necessary.

- 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 3rd gear position (M/T), D position with "OD" OFF (A/T).
The voltage should be below 0.43V at least once during this procedure.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-246.

TROUBLE DIAGNOSIS FOR DTC P0137 EXCEPT FOR CALIFORNIA

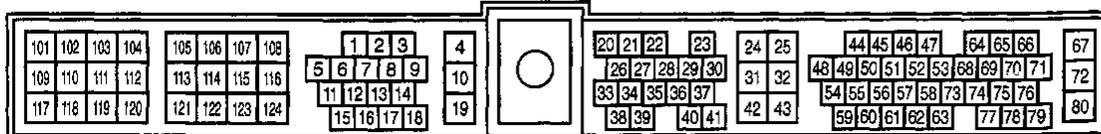
Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)

EC-RRO2-01



Refer to last page (Foldout page).

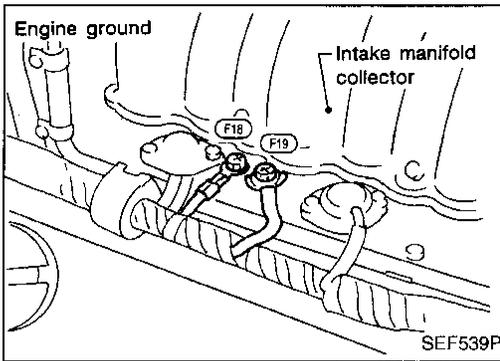
B1, M4
B4



TROUBLE DIAGNOSIS FOR DTC P0137 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)

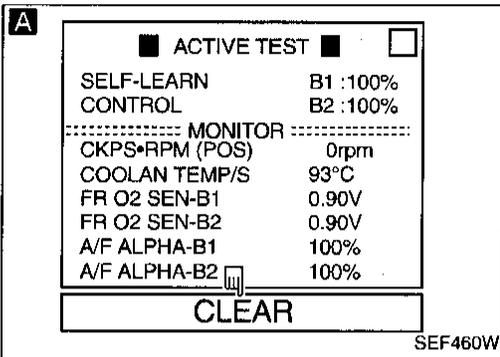
DIAGNOSTIC PROCEDURE



INSPECTION START

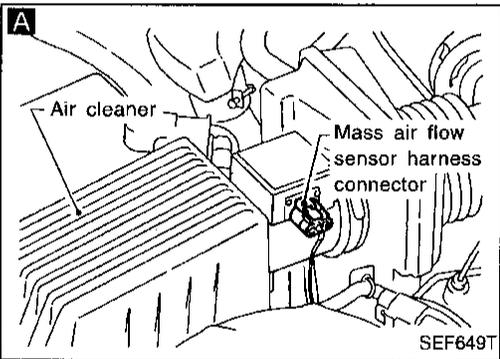
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

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?**
- OR

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0172, P0175", EC-285.

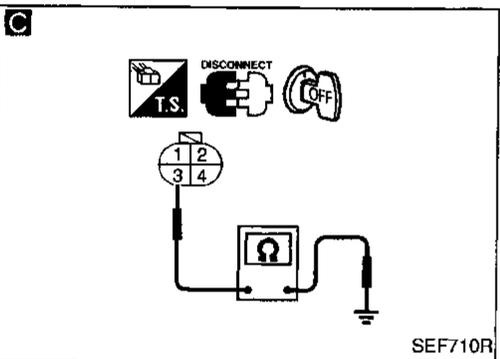
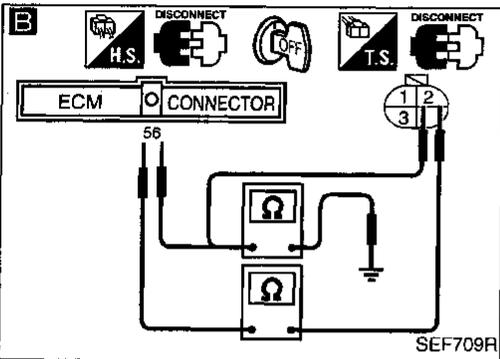
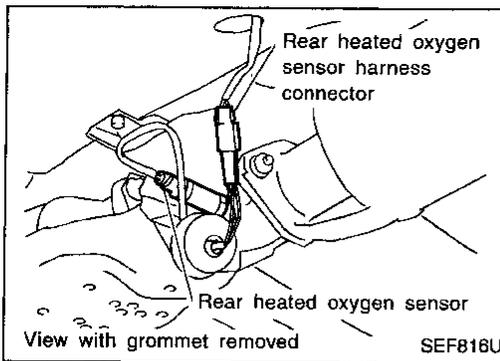


2. Turn ignition switch "OFF".
 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
 4. Stop engine and reconnect mass air flow sensor harness connector.
 5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode 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
A

TROUBLE DIAGNOSIS FOR DTC P0137 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (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 terminal ⑤ and terminal ②.

Continuity should exist.

4. Check harness continuity between ECM terminal ⑤ (or terminal ②) and ground.

Continuity should not exist.

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

NG

Check the following.

- Harness connectors (F105), (M50)
- Harness connectors (M4), (B1)
- Harness for open or short between rear heated oxygen sensor and ECM

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

C

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
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 (F105), (M50)
- Harness connectors (M4), (B1)
- Harness for open or short between rear heated oxygen sensor and ECM

If NG, repair open circuit, 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 heated oxygen sensor.

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect harness connectors (B1), (M4).
3. Check harness continuity between terminal (36T) and engine ground.

Continuity should exist.

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

NG

Check the following.

- Harness connectors (B1), (M4)
- Harness connectors (M50), (F105)
- Joint connector-25 (Refer to "HARNESS LAYOUT" in EL section.)
- Harness for open or short between harness connector (M4) and engine ground

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

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

GI
MA
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IDX

TROUBLE DIAGNOSIS FOR DTC P0137 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (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 SENSOR" as the monitor item with CONSULT.
- 4) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
 "RR O2 SENSOR" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.
 "RR O2 SENSOR" should be below 0.43V at least once when the "FUEL INJECTION" is -25%.

CAUTION:

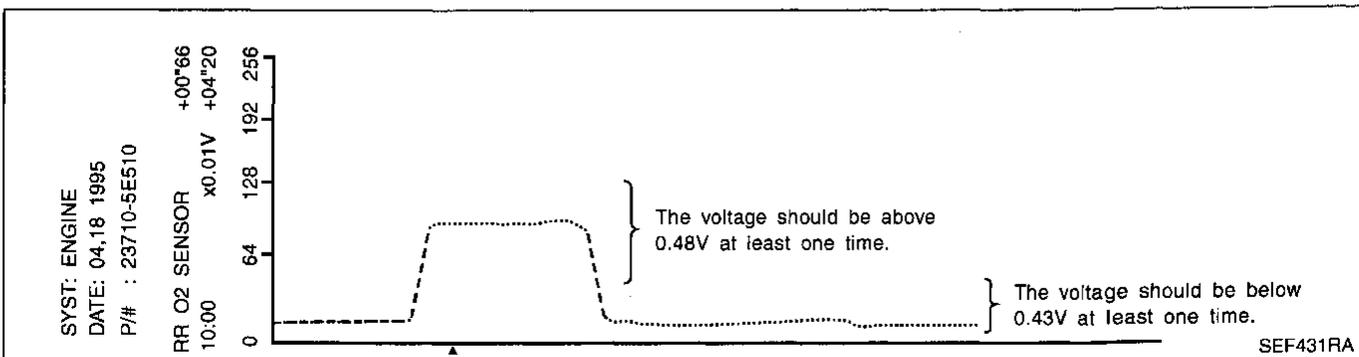
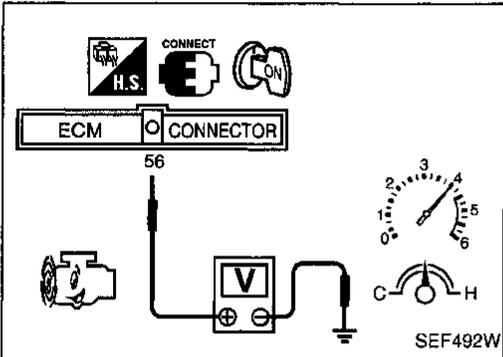
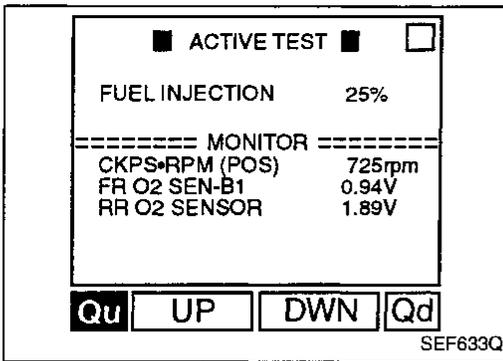
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OR

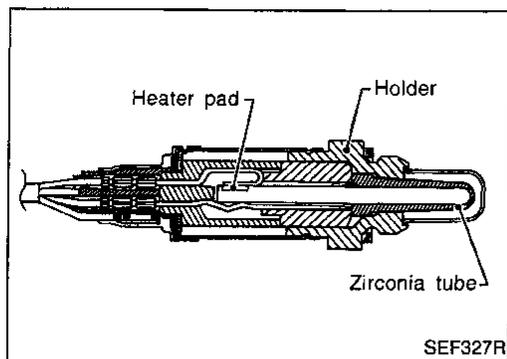
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals 56 (sensor signal) and ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
 (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 3rd gear position (M/T), D position with "OD" OFF (A/T).
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 EXCEPT FOR CALIFORNIA



Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S)

COMPONENT DESCRIPTION

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

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

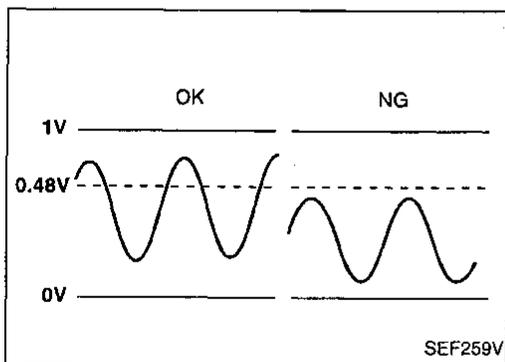
Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
56	W	Rear heated oxygen sensor	Engine is running. After warming up to normal operating temperature and revving engine from idle to 2,000 rpm	0 - Approximately 1.0V



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors 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 0510	● 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

TROUBLE DIAGNOSIS FOR DTC P0138 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (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 10 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 10 seconds.
- 3) Turn ignition switch "ON" and select "RR O2 SENSOR P0138" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 10 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.)

**CKPS-RPM (POS): 1,400 - 2,800 rpm (A/T models)
1,400 - 3,100 rpm (M/T models)**

Vehicle speed: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 0.5 - 5.0 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 (A/T models only) from the above condition [step 7] until "INCOMPLETE" at "COND2" on CONSULT screen is 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 9).

Procedure for COND3

■ RR O2 SENSOR P0138 ■ <input type="checkbox"/>	
COND1: OUT OF COND	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS-RPM(POS)	672rpm
THRTL POS SEN	0.51V
B/FUEL SCHDL	1.0msec

SEF493W

■ RR O2 SENSOR P0138 ■ <input type="checkbox"/>	
COND1: TESTING	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS-RPM(POS)	2000rpm
THRTL POS SEN	0.94V
B/FUEL SCHDL	3.6msec

SEF494W

■ RR O2 SENSOR P0138 ■ <input type="checkbox"/>	
COND1: COMPLETED	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS-RPM(POS)	2000rpm
THRTL POS SEN	0.94V
B/FUEL SCHDL	3.6msec

SEF495W

■ RR O2 SENSOR P0138 ■ <input type="checkbox"/>	
COND1: COMPLETED	
COND2: COMPLETED	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS-RPM(POS)	672rpm
THRTL POS SEN	0.51V
B/FUEL SCHDL	1.0msec

SEF496W

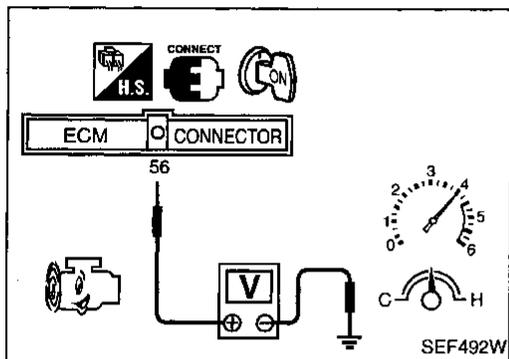
■ RR O2 SENSOR P0138 ■ <input type="checkbox"/>	
COMPLETED	
SELF-DIAG RESULTS	

SEF287U

TROUBLE DIAGNOSIS FOR DTC P0138 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)

- 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-253.



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.

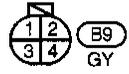
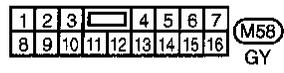
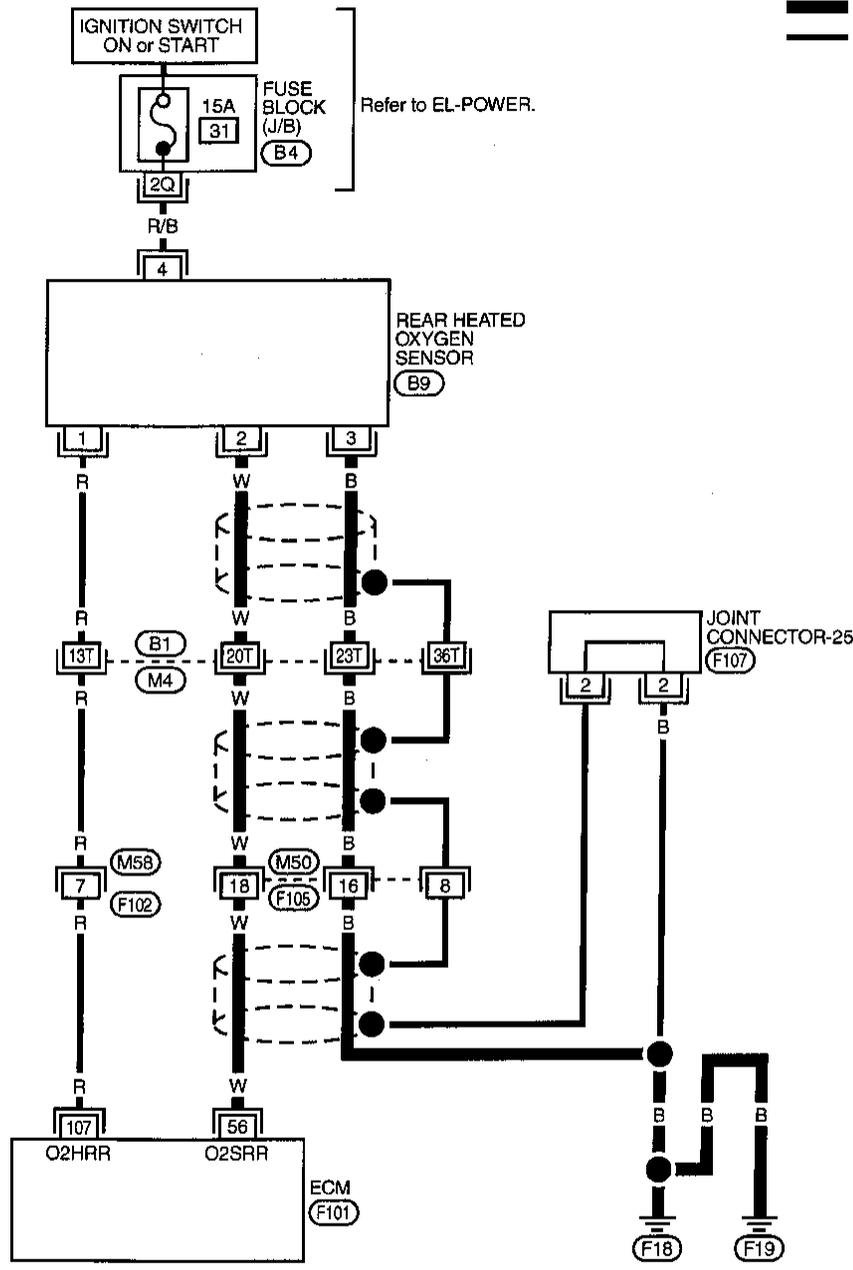
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals 56 (sensor signal) and ground.
- 4) Check the voltage when revving engine up to 4,000 rpm under no load at least 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 3rd gear position (M/T), D position with "OD" OFF (A/T).
The voltage should be above 0.48V at least once during this procedure.
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-253.

TROUBLE DIAGNOSIS FOR DTC P0138 EXCEPT FOR CALIFORNIA

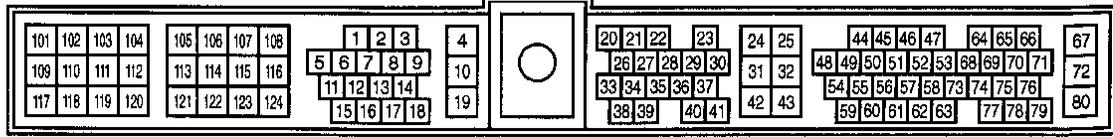
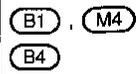
Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)

EC-RRO2-01

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

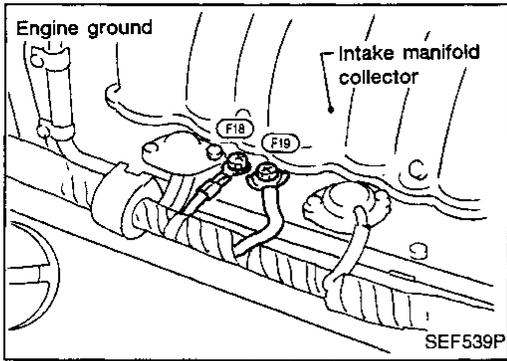


Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR DTC P0138 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)



DIAGNOSTIC PROCEDURE

INSPECTION START

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

A

ACTIVE TEST	
SELF-LEARN	B1 :100%
CONTROL	B2 :100%
----- MONITOR -----	
CKPS•RPM (POS)	0rpm
COOLAN TEMP/S	93°C
FR O2 SEN-B1	0.90V
FR O2 SEN-B2	0.90V
A/F ALPHA-B1	100%
A/F ALPHA-B2	100%
CLEAR	

SEF460W

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.
- Is the 1st trip DTC P0171, P0174 detected? Is it difficult to start engine?**

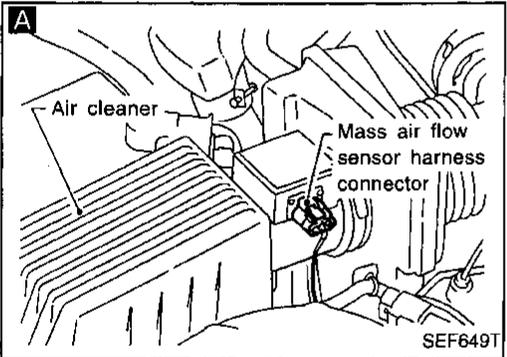
Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0171, P0174", EC-279.

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.
- Is the 1st trip DTC 0115, 0210 detected? Is it difficult to start engine?**

No ↓

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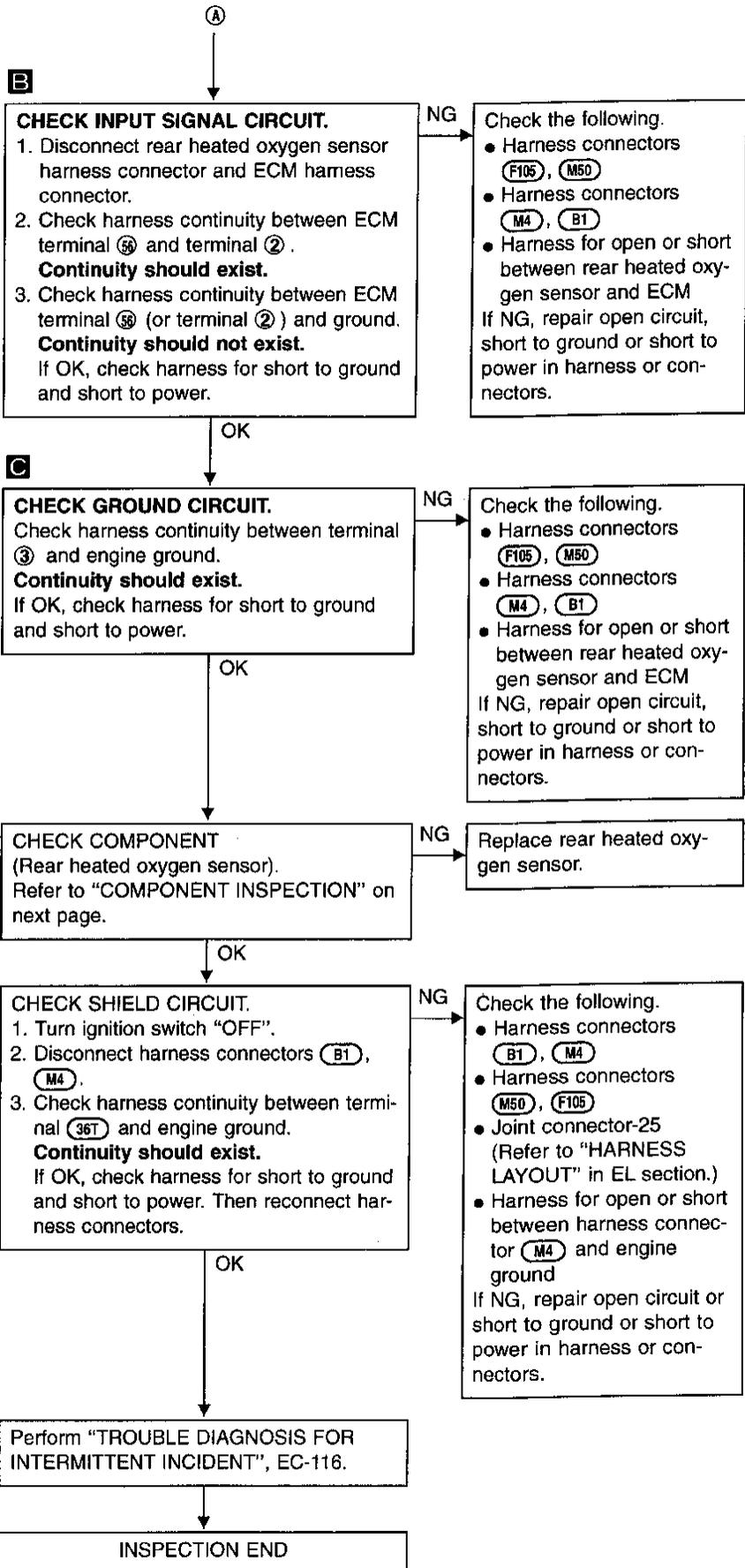
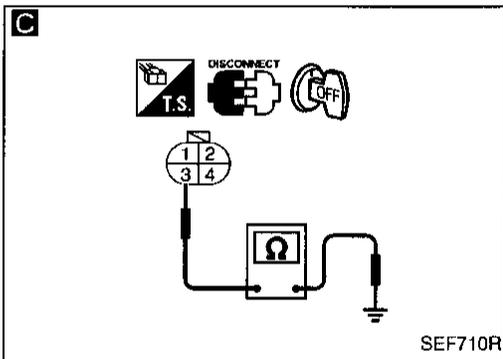
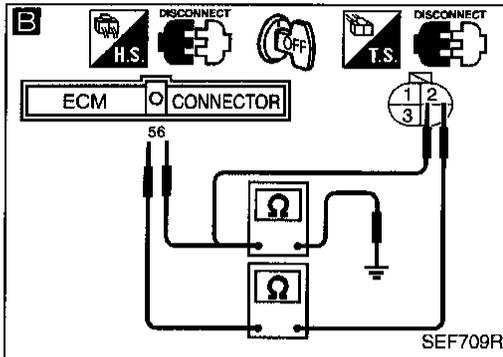
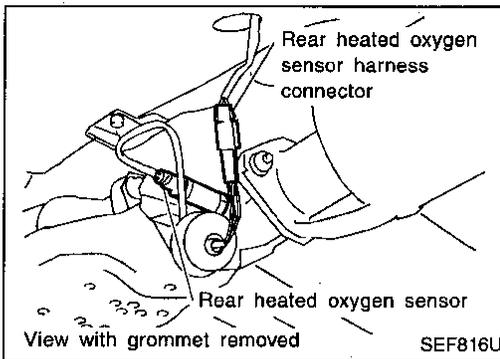
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TROUBLE DIAGNOSIS FOR DTC P0138 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P0138 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (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 SENSOR" as the monitor item with CONSULT.
- 4) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
 "RR O2 SENSOR" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.
 "RR O2 SENSOR" should be below 0.43V at least once when the "FUEL INJECTION" is -25%.

CAUTION:

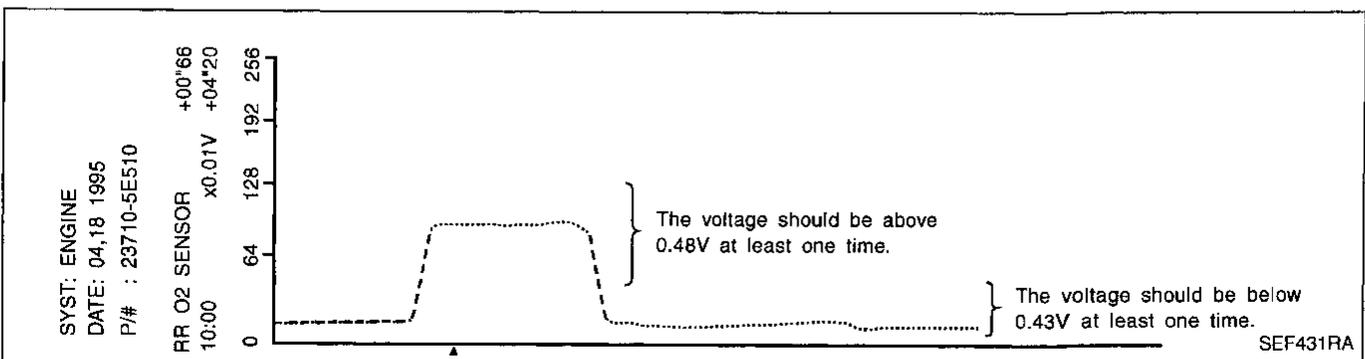
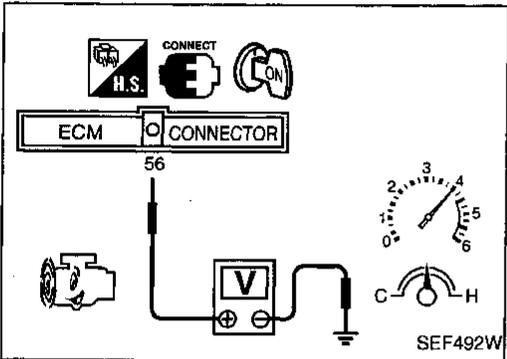
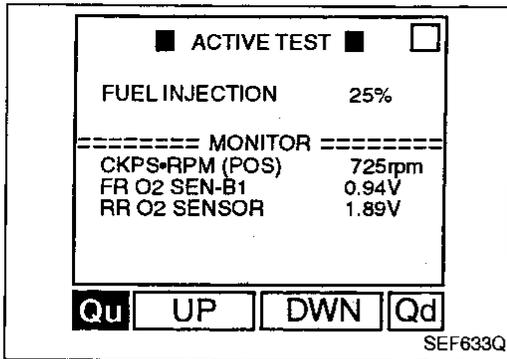
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OR

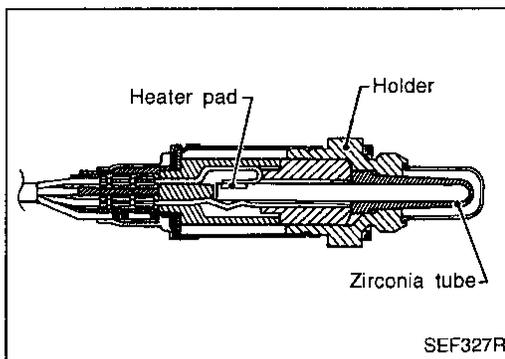
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals 56 (sensor signal) and ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
 (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 3rd gear position (M/T), D position with "OD" OFF (A/T).
 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 EXCEPT FOR CALIFORNIA



Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S)

COMPONENT DESCRIPTION

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

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

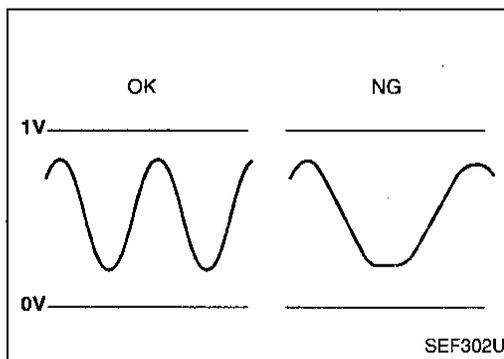
Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (25) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
56	W	Rear heated oxygen sensor	Engine is running. After warming up to normal operating temperature and revving engine from idle to 2,000 rpm	0 - Approximately 1.0V



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors 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	● 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

TROUBLE DIAGNOSIS FOR DTC P0139 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (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 10 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 10 seconds.
- 3) Turn ignition switch "ON" and select "RR O2 SENSOR P0139" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 10 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.)

**CKPS-RPM (POS): 1,400 - 2,800 rpm (A/T models)
1,400 - 3,100 rpm (M/T models)**

Vehicle speed: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 0.5 - 5.0 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 (A/T models only) from the above condition [step 7] 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 9).

Procedure for COND3

■ RR O2 SENSOR P0139 ■ <input type="checkbox"/>	
COND1: OUT OF COND	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS-RPM(POS)	672rpm
THRTL POS SEN	0.51V
B/FUEL SCHDL	1.0msec

SEF497W

■ RR O2 SENSOR P0139 ■ <input type="checkbox"/>	
COND1: TESTING	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS-RPM(POS)	2000rpm
THRTL POS SEN	0.94V
B/FUEL SCHDL	3.6msec

SEF498W

■ RR O2 SENSOR P0139 ■ <input type="checkbox"/>	
COND1: COMPLETED	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS-RPM(POS)	2000rpm
THRTL POS SEN	0.94V
B/FUEL SCHDL	3.6msec

SEF499W

■ RR O2 SENSOR P0139 ■ <input type="checkbox"/>	
COND1: COMPLETED	
COND2: COMPLETED	
COND3: INCOMPLETE	
===== MONITOR =====	
CKPS-RPM(POS)	672rpm
THRTL POS SEN	0.51V
B/FUEL SCHDL	1.0msec

SEF500W

■ RR O2 SENSOR P0139 ■ <input type="checkbox"/>	
COMPLETED	
SELF-DIAG RESULTS	

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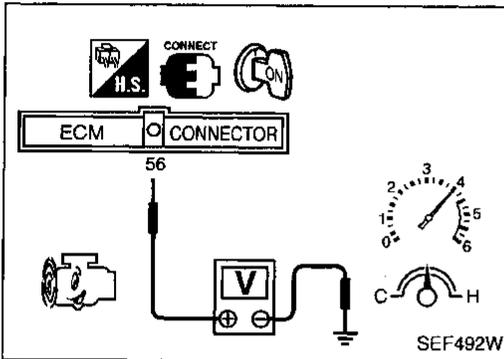
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Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (Cont'd)

- 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-260.



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 56 (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 change 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 3rd gear position (M/T), D position with "OD" OFF (A/T).

The voltage should change at more than 0.06V for 1 second during this procedure.

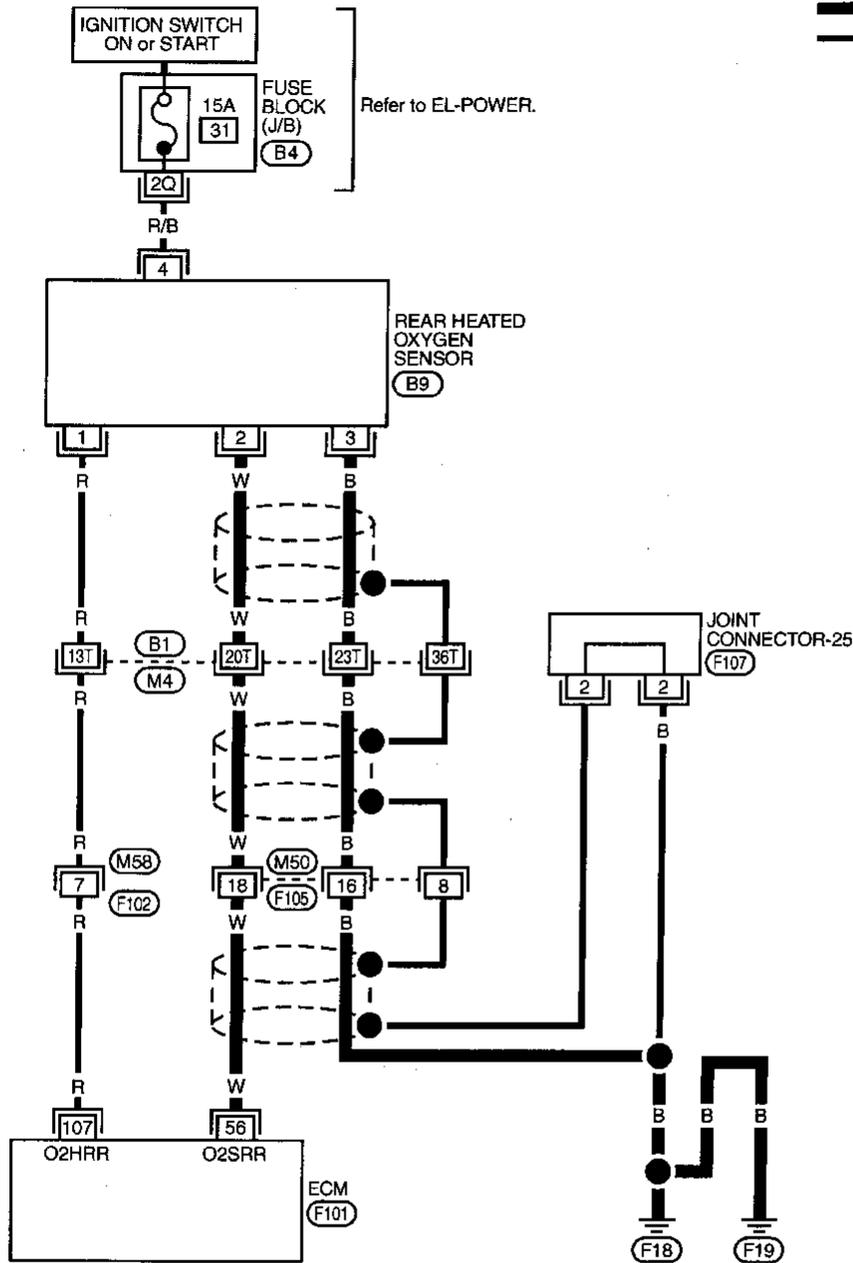
- 6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-260.

TROUBLE DIAGNOSIS FOR DTC P0139 EXCEPT FOR CALIFORNIA

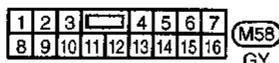
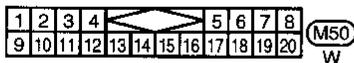
Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (Cont'd)

EC-RRO2-01

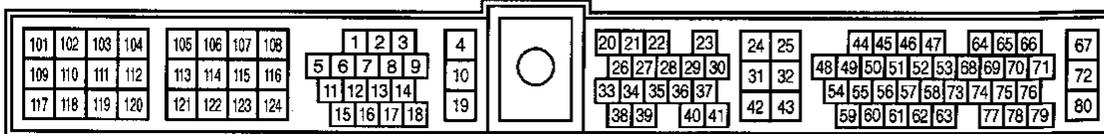
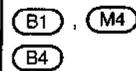
— : Detectable line for DTC
— : Non-detectable line for DTC



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Refer to last page (Foldout page).

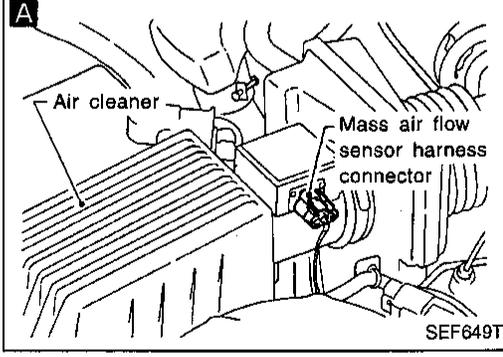
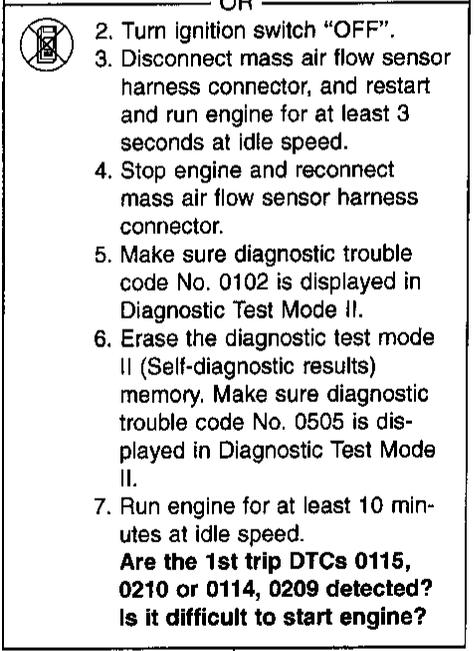
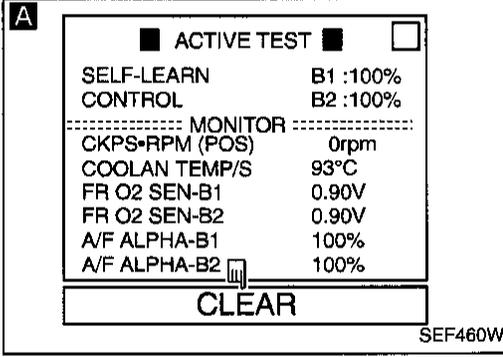
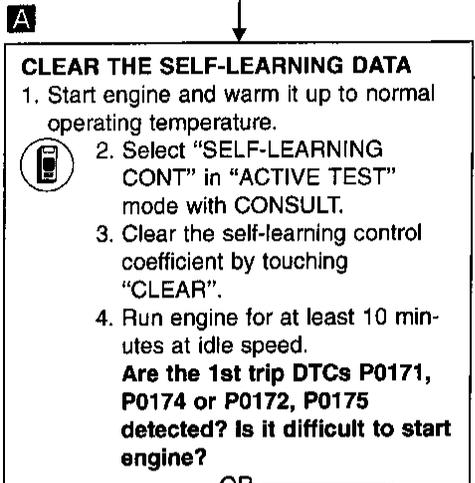
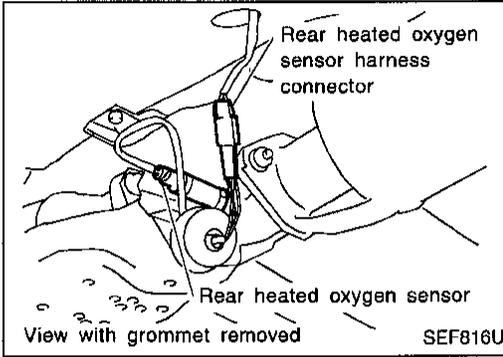
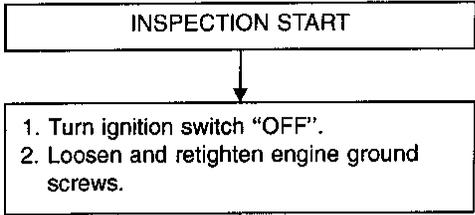
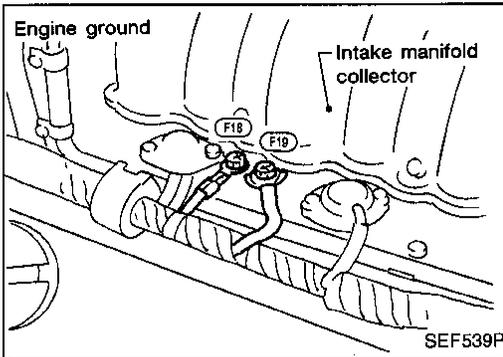


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TROUBLE DIAGNOSIS FOR DTC P0139 EXCEPT FOR CALIFORNIA

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

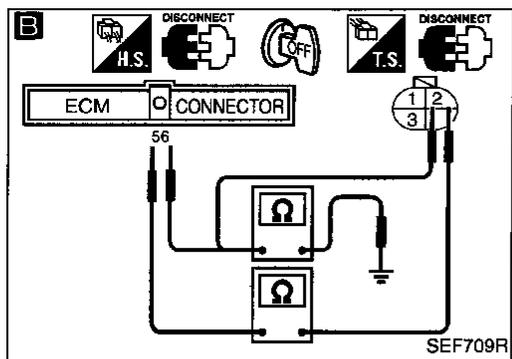
DIAGNOSTIC PROCEDURE



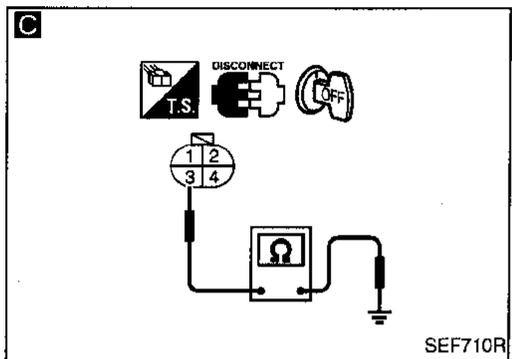
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TROUBLE DIAGNOSIS FOR DTC P0139 EXCEPT FOR CALIFORNIA

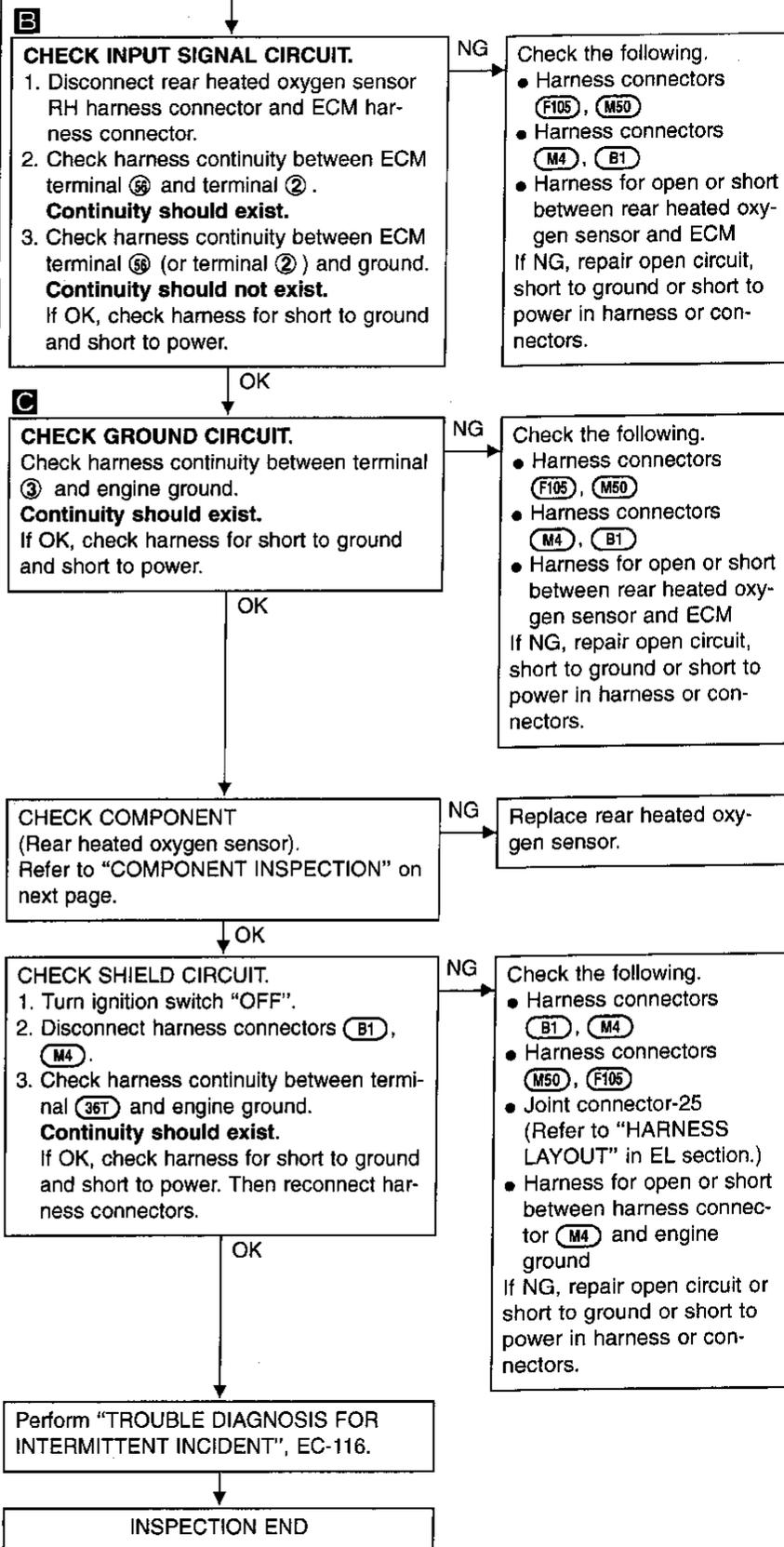
Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (Cont'd)



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SEF710R



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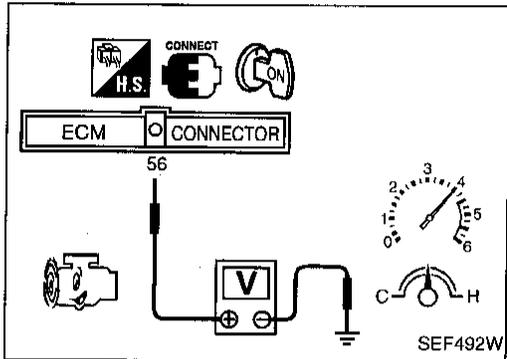
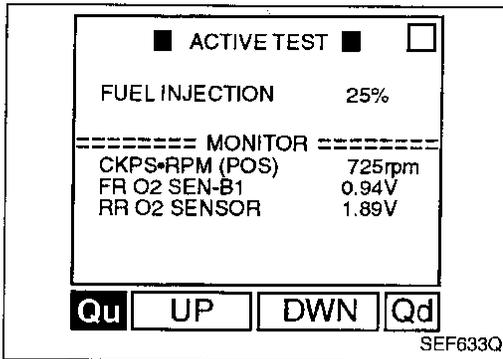
IDX

TROUBLE DIAGNOSIS FOR DTC P0139 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (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 SENSOR" as the monitor item with CONSULT.
- 4) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
"RR O2 SENSOR" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.
"RR O2 SENSOR" should be below 0.43V at least once when the "FUEL INJECTION" is -25%.

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.

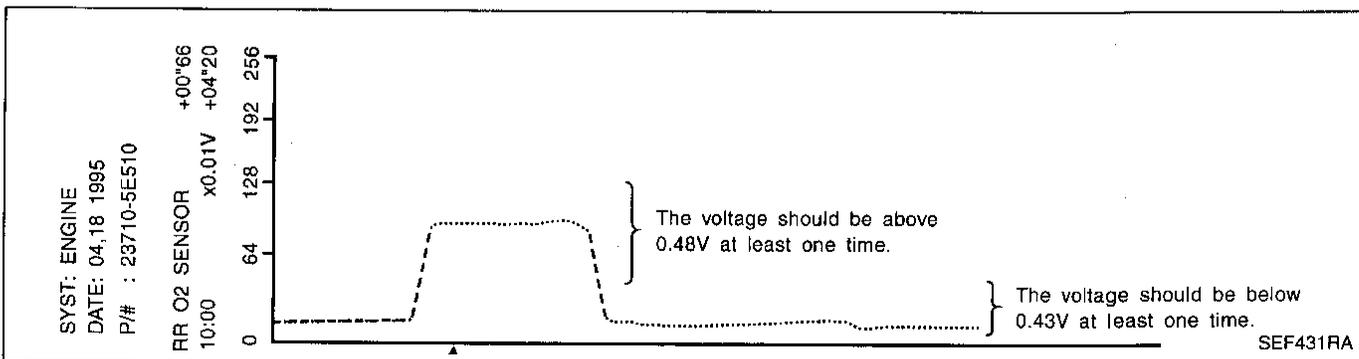
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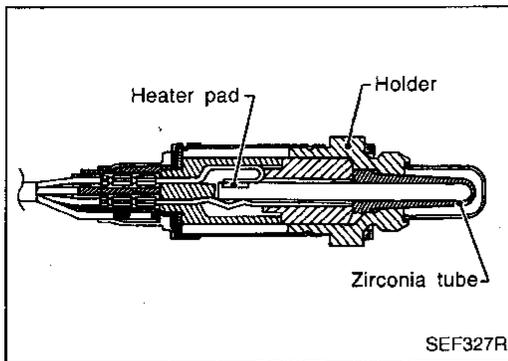
- 1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 3) Set voltmeter probes between ECM terminals ⑤⑥ (sensor signal) and ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(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) Check the voltage when racing up to 6,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), D position with "OD" OFF (A/T).
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 P0140 EXCEPT FOR CALIFORNIA



Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S)

COMPONENT DESCRIPTION

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

GI
MA
EM
LC

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

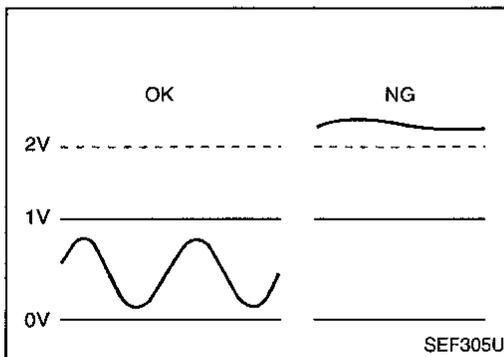
EC
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ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
56	W	Rear heated oxygen sensor	Engine is running. After warming up to normal operating temperature and revving engine from idle to 2,000 rpm	0 - Approximately 1.0V

MT
AT
FA
RA



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 or not the voltage is too high during the various driving condition such as fuel-cut.

BR
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RS
BT
HA

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0140 0512	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor

EL
IDX

TROUBLE DIAGNOSIS FOR DTC P0140 EXCEPT FOR CALIFORNIA

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

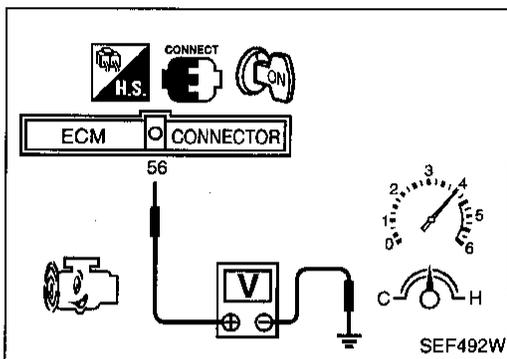
Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CKPS-RPM(POS)	2040rpm	
COOLAN TEMP/S	82°C	
VHCL SPEED SE	82km/h	
B/FUEL SCHDL	2.5ms	
RECORD		

SEF827U



- 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.

**CKPS-RPM (POS): 1,400 - 2,800 rpm (A/T models)
1,400 - 3,100 rpm (M/T models)**

VHCL SPEED SE: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 0.5 - 5.0 msec

COOLAN TEMP/S: 70 - 100°C (158 - 212°F)

Selector lever: Suitable position

- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-266.

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.



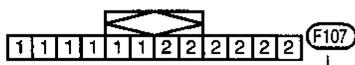
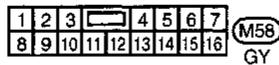
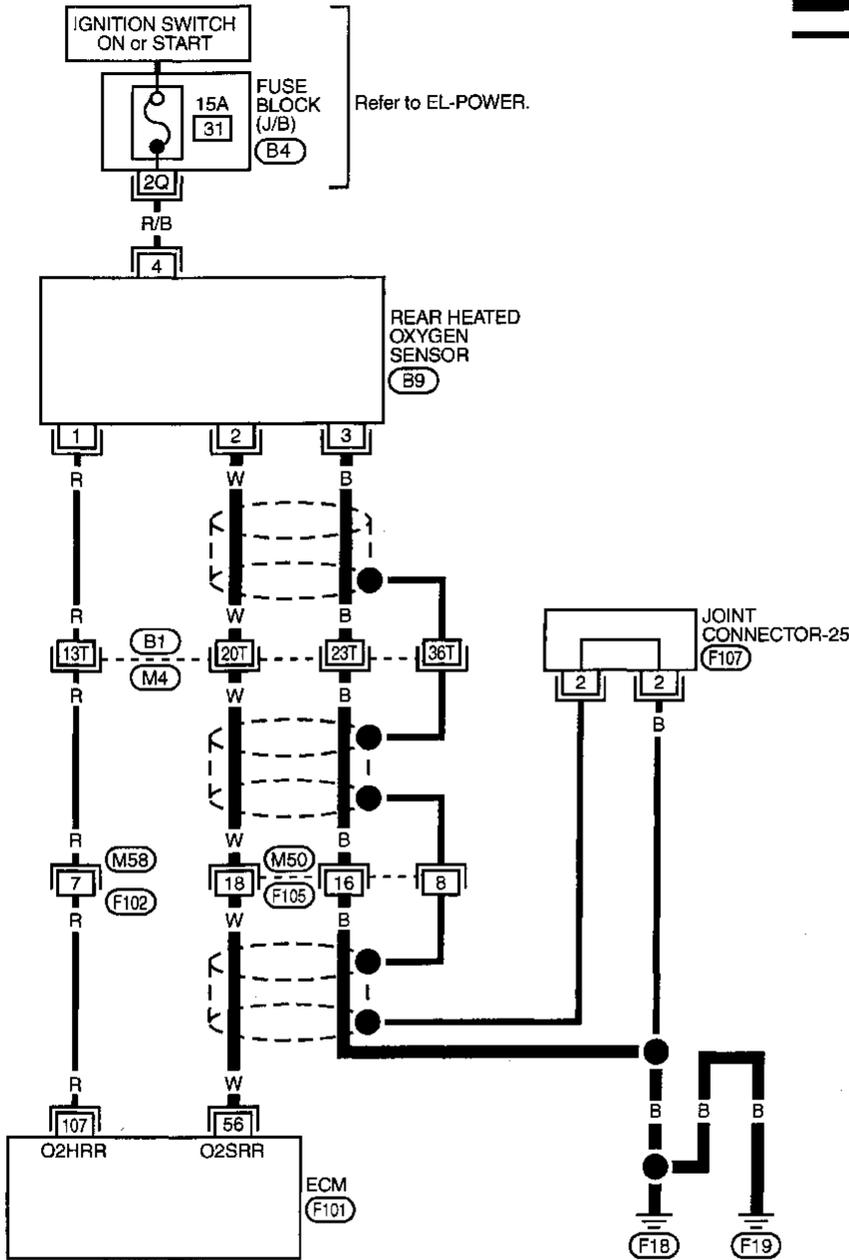
- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals 56 (sensor signal) and ground.
- 3) Check the voltage after racing up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be below 2V during this procedure.
- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-266.

TROUBLE DIAGNOSIS FOR DTC P0140 EXCEPT FOR CALIFORNIA

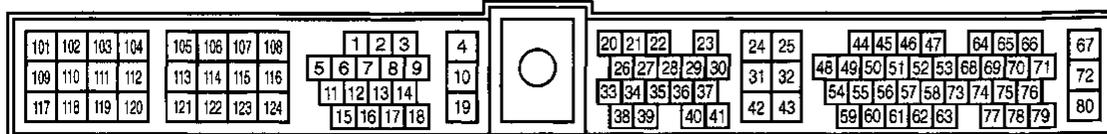
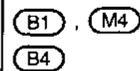
Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S) (Cont'd)

EC-RRO2-01

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



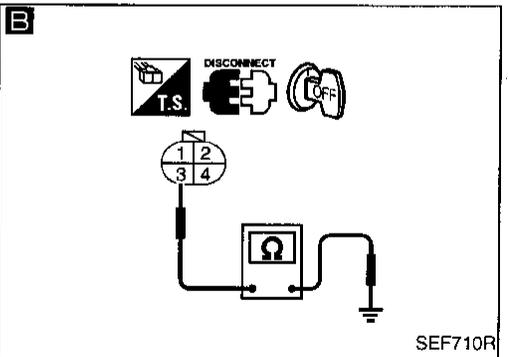
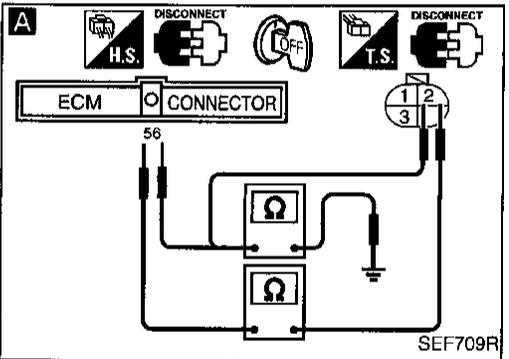
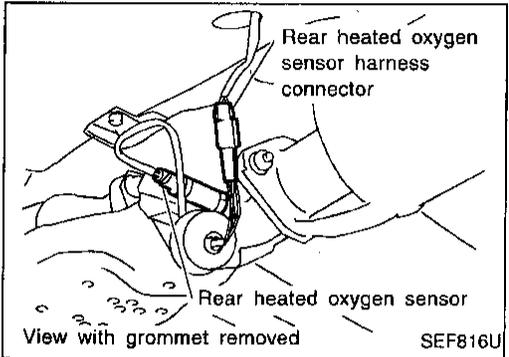
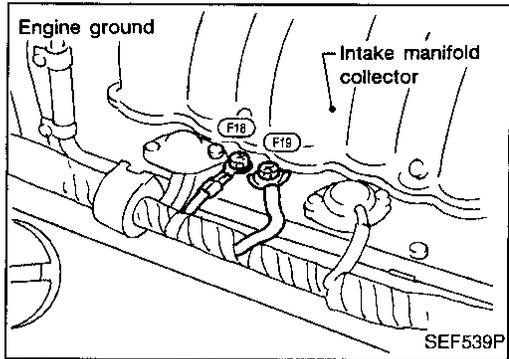
Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR DTC P0140 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S) (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 RH harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal ③ and terminal ②.
Continuity should exist.
3. Check harness continuity between ECM terminal ③ (or terminal ②) and ground.
Continuity should not exist.
If OK, check harness for short to ground and short to power.

- NG
- Check the following.
- Harness connectors (F105), (M50)
 - Harness connectors (M4), (B1)
 - Harness for open or short between rear heated oxygen sensor and ECM
- If NG, repair open circuit, 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 (F105), (M50)
 - Harness connectors (M4), (B1)
 - Harness for open or short between rear heated oxygen sensor and ECM
- If NG, repair open circuit, 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
- Replace rear heated oxygen sensor.

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect harness connectors (B1), (M4).
3. Check harness continuity between terminal (36T) and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power. Then reconnect harness connectors.

- NG
- Check the following.
- Harness connectors (B1), (M4)
 - Harness connectors (M50), (F105)
 - Joint connector-25 (Refer to "HARNES LAYOUT" in EL section.)
 - Harness for open or short between harness connector (M4) and engine ground
- If NG, repair open circuit or short to ground or short to power in harness or connectors.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0140 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S) (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 SENSOR" as the monitor item with CONSULT.
- 4) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.

"RR O2 SENSOR" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.

"RR O2 SENSOR" should be below 0.43V at least once when the "FUEL INJECTION" is -25%.

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 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 ⑤ (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.

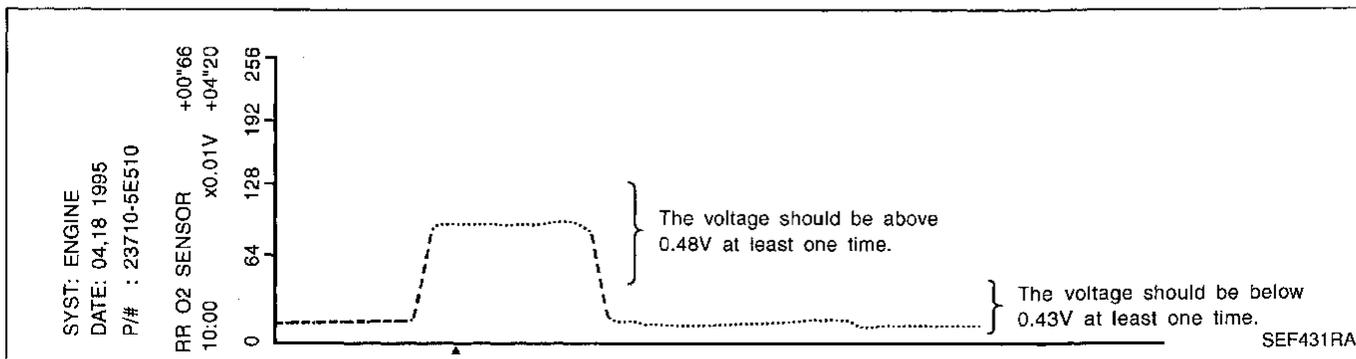
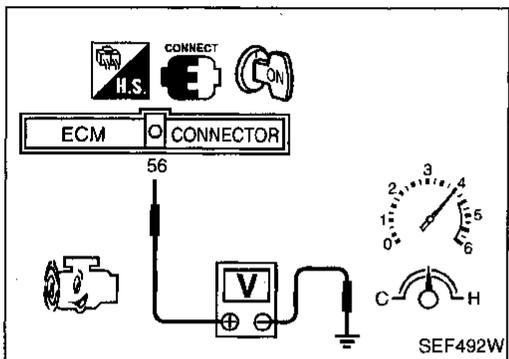
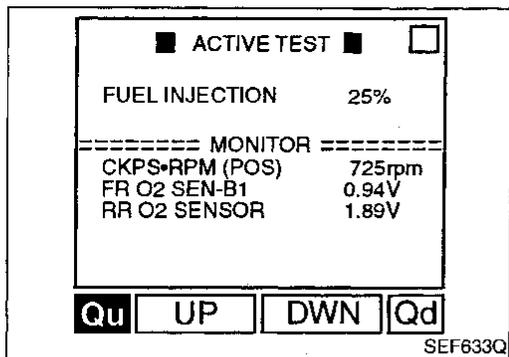
If the voltage is above 0.48V at step 4, step 5 is not necessary.

- 5) Check the voltage when racing up to 6,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), D position with "OD" OFF (A/T).

The voltage should be below 0.43V at least once.

CAUTION:

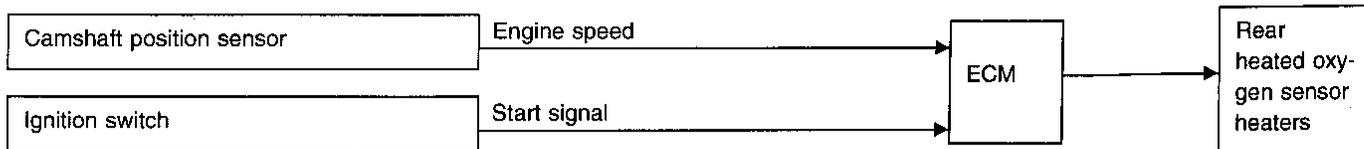
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor Heaters (P0141: Right bank), (P0161: Left bank)

SYSTEM DESCRIPTION



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

OPERATION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 SEN HTR-B1	<ul style="list-style-type: none"> Engine speed: Idle [After driving 2 minutes at 70 km/h (43 MPH) or more] 	ON
RR O2 SEN HTR-B2	<ul style="list-style-type: none"> Engine speed: Above 3,600 rpm Ignition switch: ON (Engine stopped) 	OFF

ECM TERMINALS AND REFERENCE VALUE

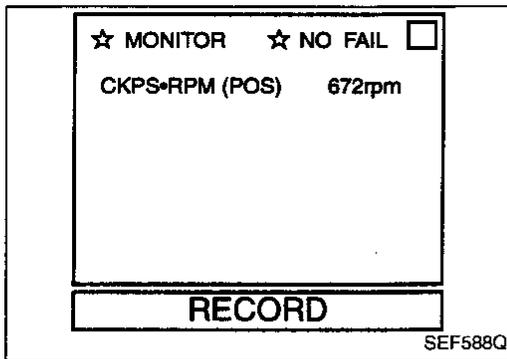
Specification data are reference values, and are measured between each terminal and Ⓜ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
105	R	Rear heated oxygen sensor heater (Left bank)	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> Idle speed [After driving 2 minutes at 70 km/h (43 MPH) or more] 	0 - 1.0V
107	R	Rear heated oxygen sensor heater (Right bank)	<div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div> <ul style="list-style-type: none"> Engine stopped <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> 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 (Right 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 (Left bank)		

TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2) FOR CALIFORNIA



Rear Heated Oxygen Sensor Heaters (P0141: Right bank), (P0161: Left 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 10 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 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-272.

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" and wait at least 10 seconds.
3) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
4) Select "MODE 3" with GST.
5) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-272.

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 10 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-272.

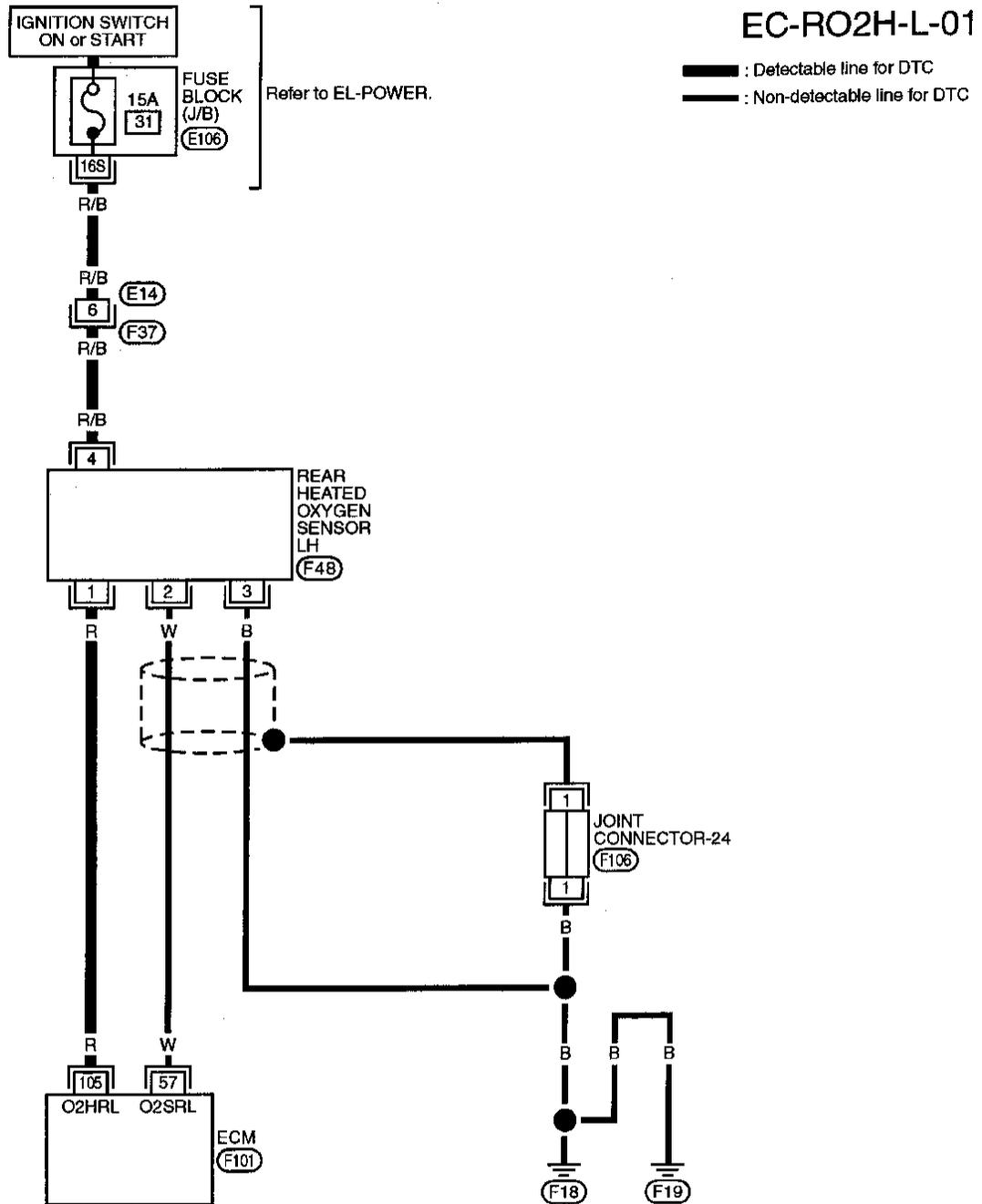
When using GST, "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.

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TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2) FOR CALIFORNIA

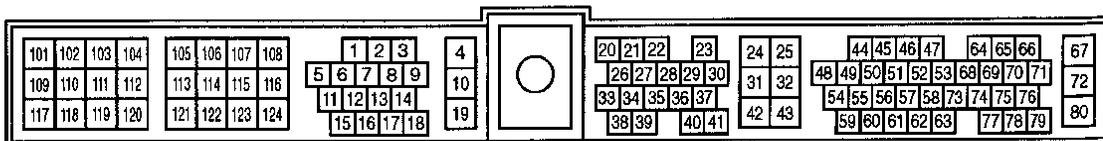
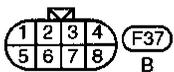
Rear Heated Oxygen Sensor Heaters (P0141: Right bank), (P0161: Left bank) (Cont'd)

LEFT BANK



Refer to last page (Foldout page).

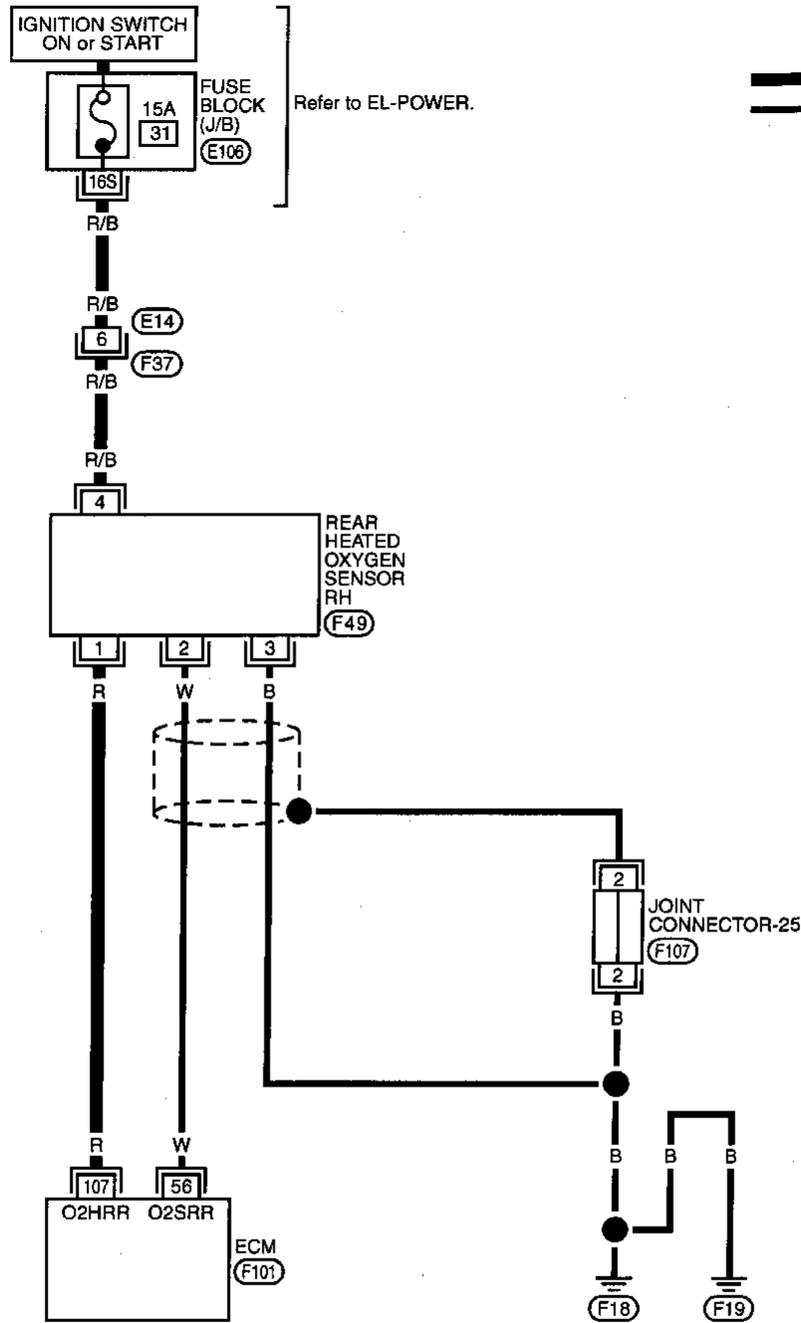
E106



TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor Heaters (P0141: Right bank), (P0161: Left bank) (Cont'd)

RIGHT BANK



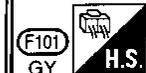
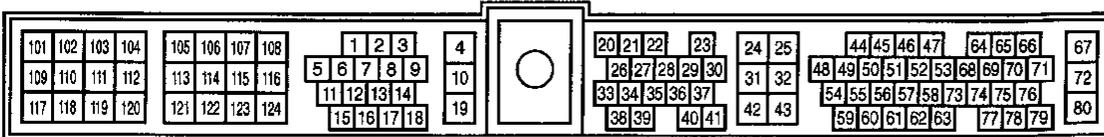
EC-RO2H-R-01

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

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Refer to last page (Foldout page).

(E106)

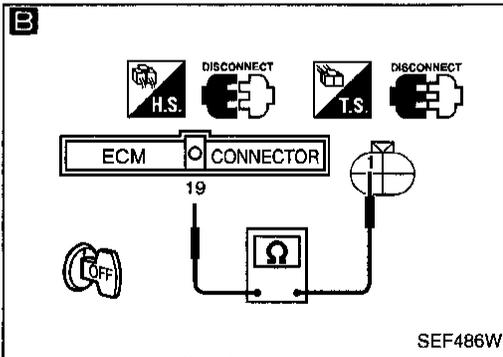
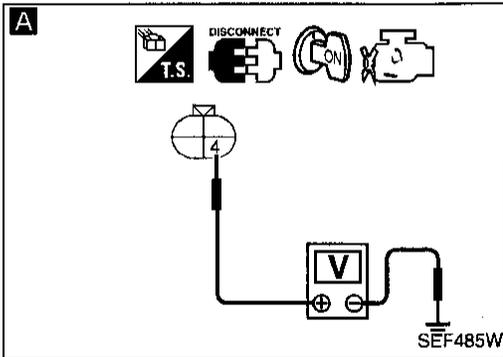
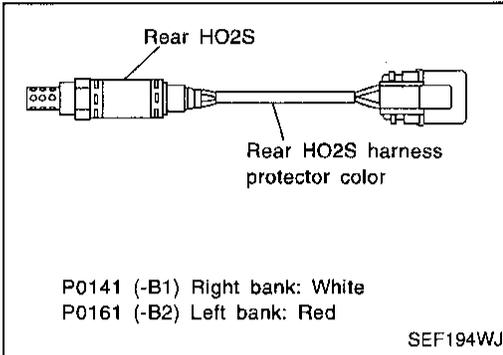
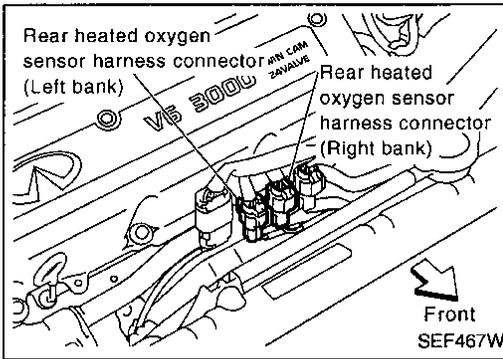


MEC525C

TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2) FOR CALIFORNIA

Rear Heated Oxygen Sensor Heaters (P0141: Right bank), (P0161: Left 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
 ● **E14**, **F37**
 ● 15A 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	
P0141	107	1	RH (White)
P0161	105	1	LH (Red)

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

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

NG → **REPLACE REAR HEATED OXYGEN SENSOR.**
 1. Check rear heated oxygen sensor harness protector color.
White: Right bank (-B1)
Red: Left bank (-B2)
 2. Replace malfunctioning rear heated oxygen sensor.

OK → Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0141 (-B1), P0161 (-B2) FOR CALIFORNIA

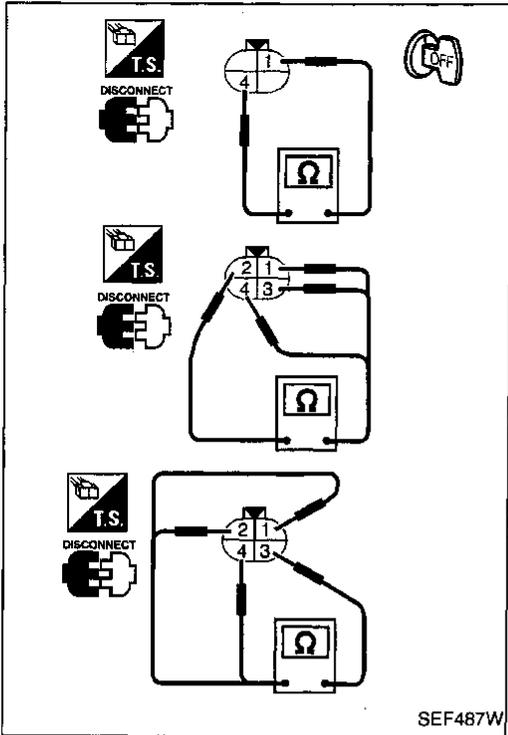
Rear Heated Oxygen Sensor Heaters (P0141: Right bank), (P0161: Left bank) (Cont'd)

COMPONENT INSPECTION

Rear heated oxygen sensor heater

Check the following.

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



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

If NG, replace the front heated oxygen sensor.

CAUTION:

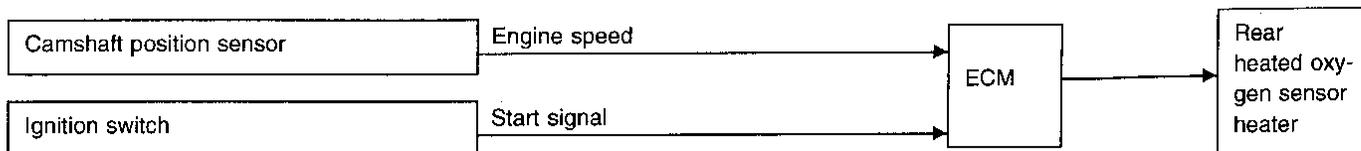
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

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TROUBLE DIAGNOSIS FOR DTC P0141 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION



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

OPERATION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 HEATER	<ul style="list-style-type: none"> Engine speed: Idle [After driving 2 minutes at 70 km/h (43 MPH) or more] 	ON
	<ul style="list-style-type: none"> Engine speed: Above 3,600 rpm Ignition switch: ON (Engine stopped) 	OFF

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
107	R	Rear heated oxygen sensor heater	Engine is running. └ Idle speed [After driving 2 minutes at 70 km/h (43 MPH) or more]	0 - 1.0V
			Ignition switch "ON" └ Engine stopped Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

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

TROUBLE DIAGNOSIS FOR DTC P0141 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor Heater (Cont'd)

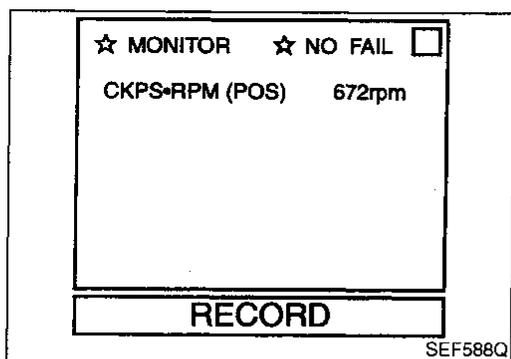
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 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 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-277.

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" and wait at least 10 seconds.
- 3) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 4) Select "Mode 3" with GST.
- 5) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-277.

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 10 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-277.

- 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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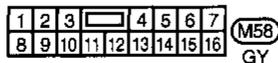
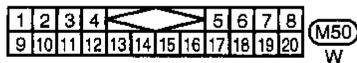
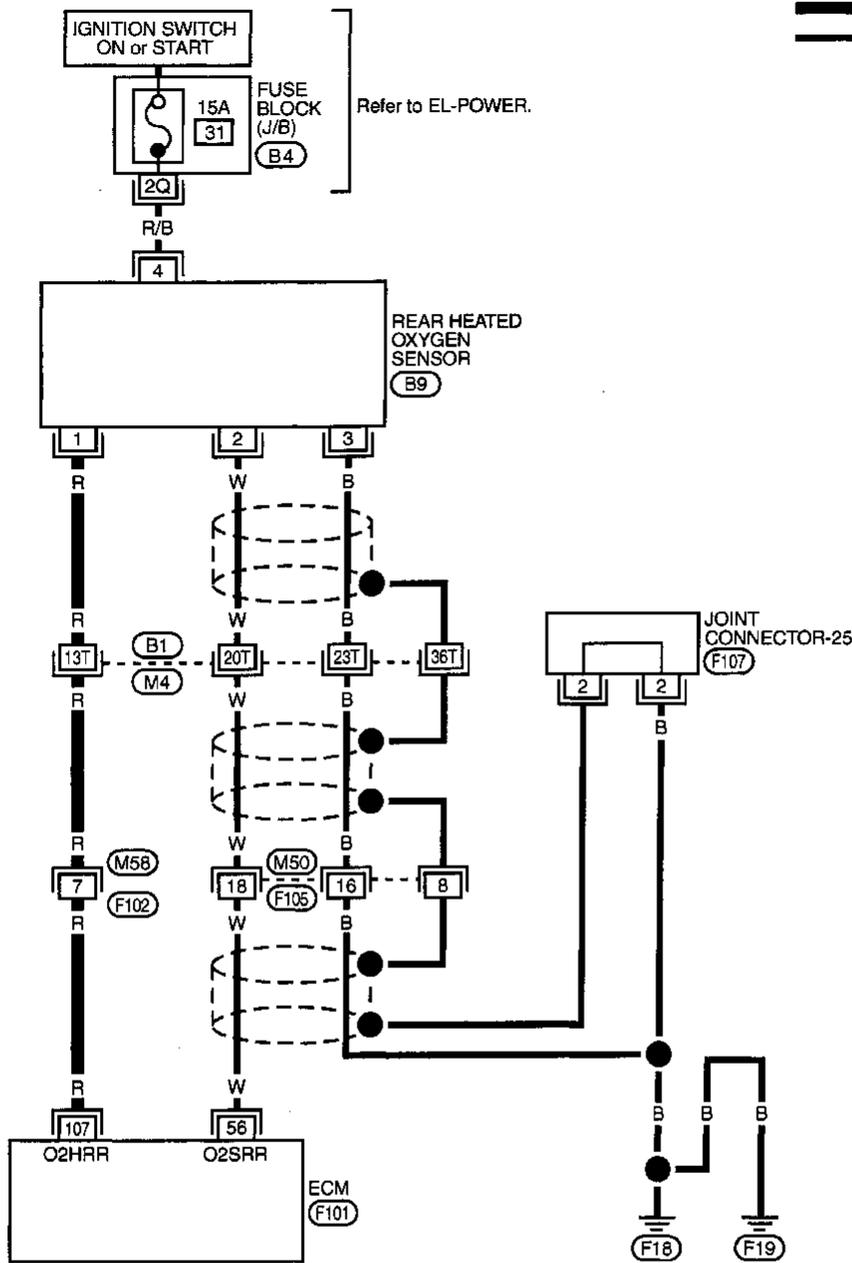
IDX

TROUBLE DIAGNOSIS FOR DTC P0141 EXCEPT FOR CALIFORNIA

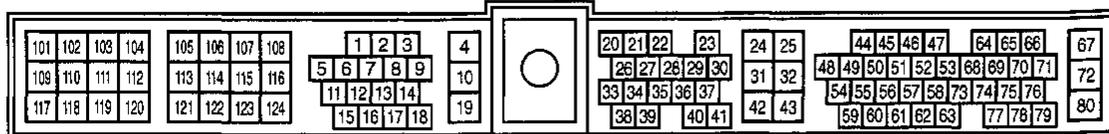
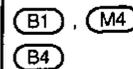
Rear Heated Oxygen Sensor Heater (Cont'd)

EC-RRO2/H-01

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



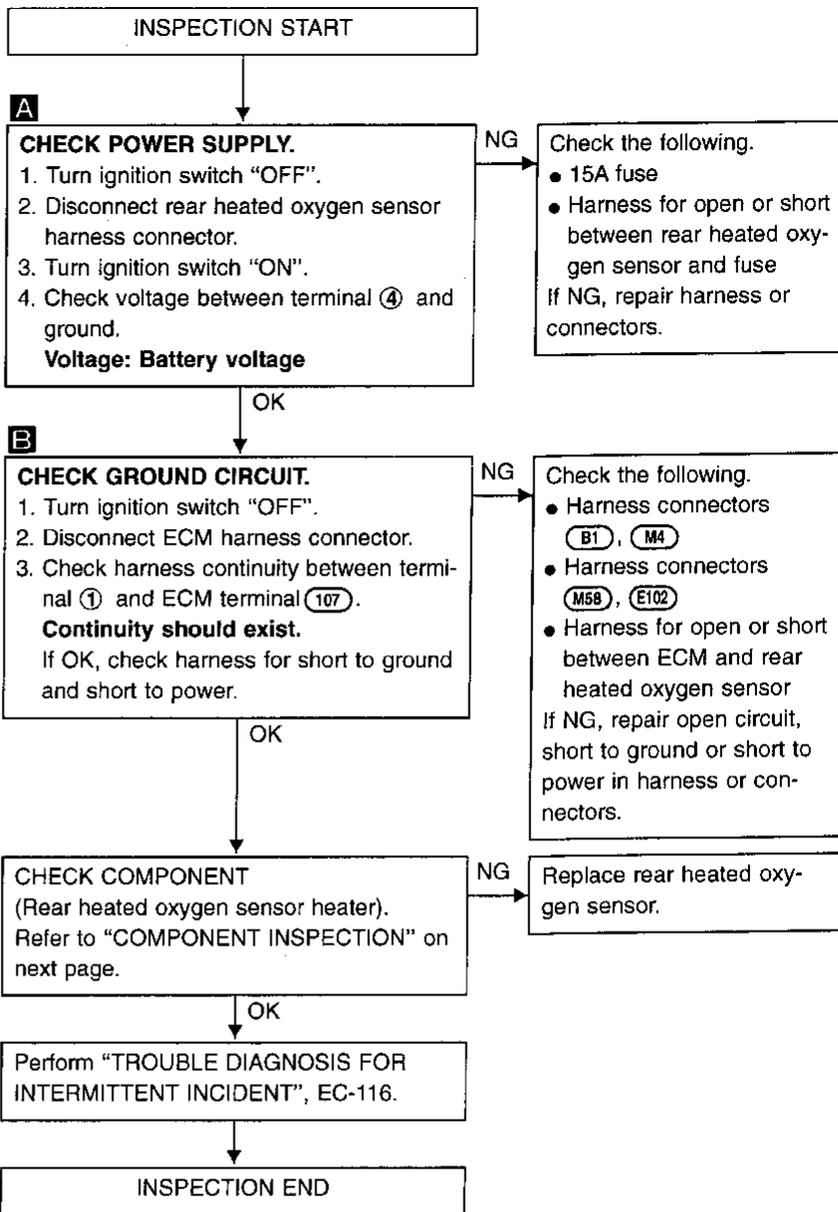
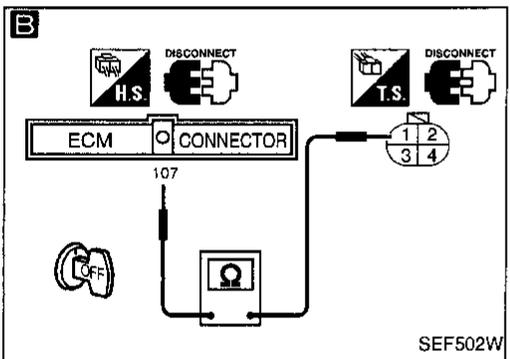
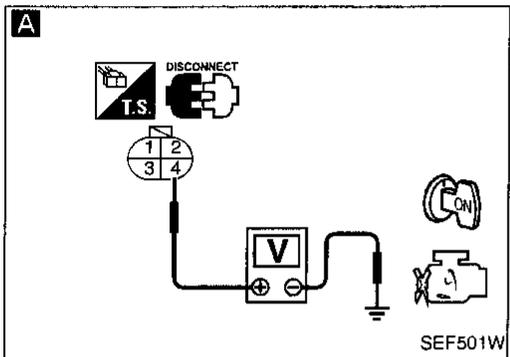
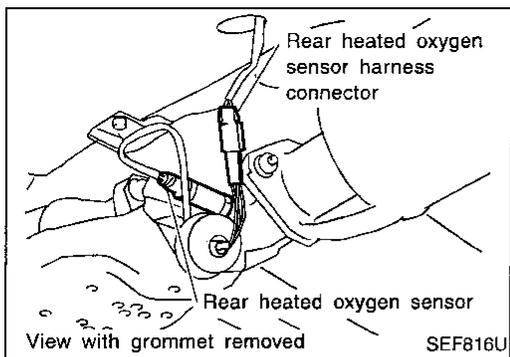
Refer to last page (Foldout page).



TROUBLE DIAGNOSIS FOR DTC P0141 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor Heater (Cont'd)

DIAGNOSTIC PROCEDURE



GI
MA
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TROUBLE DIAGNOSIS FOR DTC P0141 EXCEPT FOR CALIFORNIA

Rear Heated Oxygen Sensor Heater (Cont'd)

COMPONENT INSPECTION

Rear heated oxygen sensor heater

Check the following.

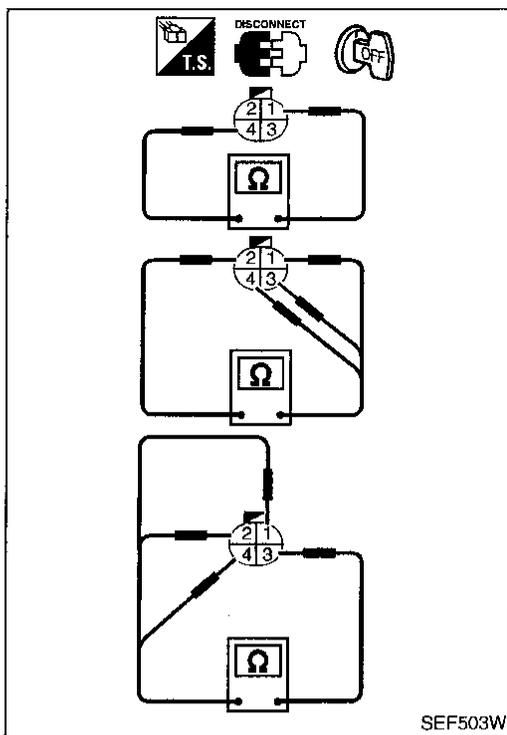
1. Check resistance between terminals ④ and ①.
Resistance: 2.3 - 4.3Ω at 25°C (77°F)
2. Check continuity.

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

If NG, replace the rear heated oxygen sensor.

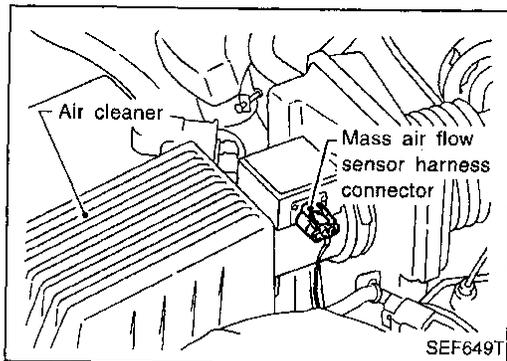
CAUTION:

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



TROUBLE DIAGNOSIS FOR DTC P0171 (-B1), P0174 (-B2)

Fuel Injection System Function (Lean side) (P0171: Right bank), (P0174: Left bank) (Cont'd)



OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 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, P0174 should be detected at this stage, if a malfunction exists.
- 9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
- 10) Crank engine while depressing accelerator pedal. If 1st trip DTC is detected and engine starts, go to "DIAGNOSTIC PROCEDURE", EC-283. 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 10 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, 0210 should be detected at this stage, if a malfunction exists.
- 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 1st trip DTC is detected and engine starts, go to "DIAGNOSTIC PROCEDURE", EC-283. If the engine does not start, visually check for exhaust and intake air leak.

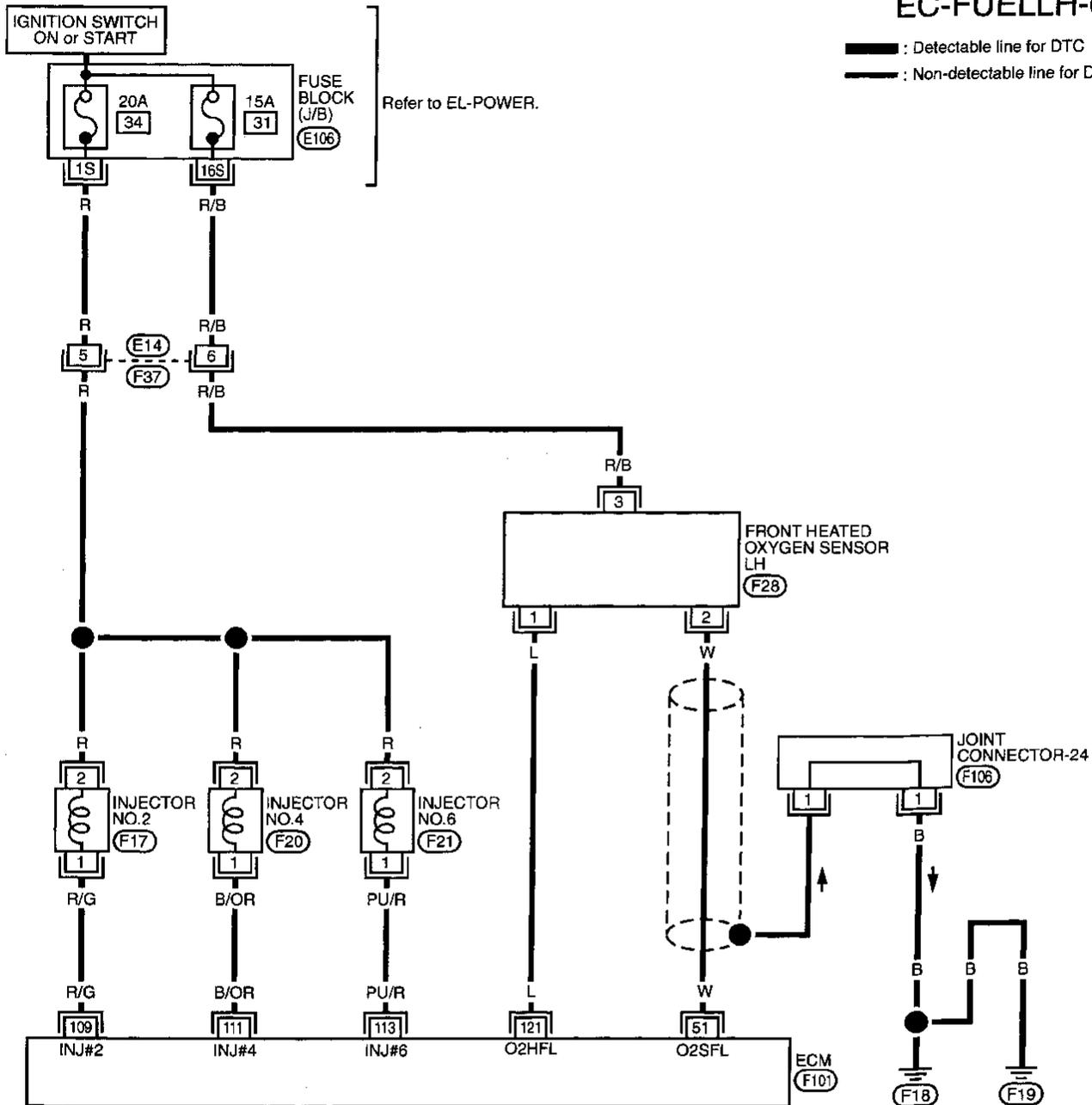
TROUBLE DIAGNOSIS FOR DTC P0171 (-B1), P0174 (-B2)

Fuel Injection System Function (Lean side) (P0171: Right bank), (P0174: Left bank) (Cont'd)

LEFT BANK

EC-FUELLH-01

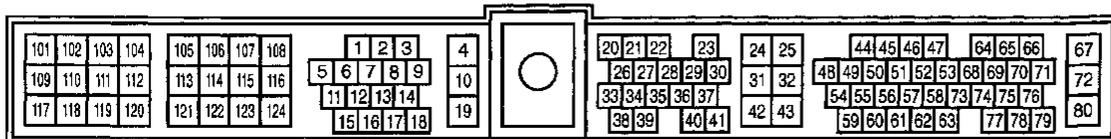
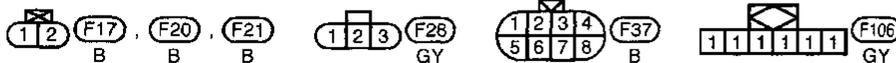
: Detectable line for DTC
 : Non-detectable line for DTC



Refer to EL-POWER.

Refer to last page (Foldout page).

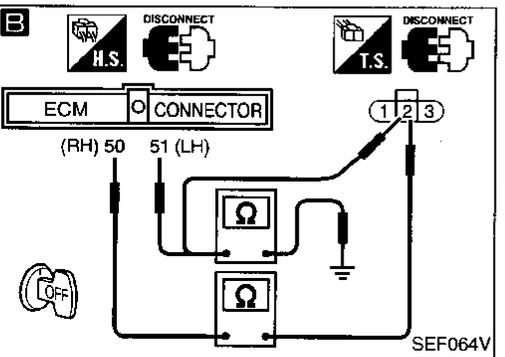
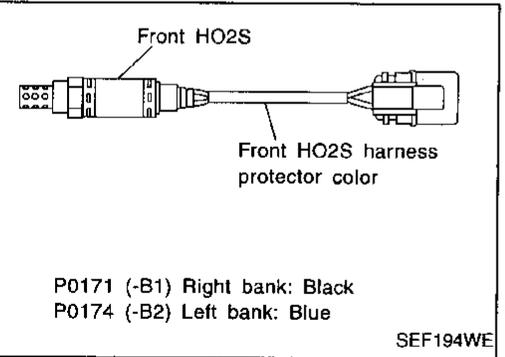
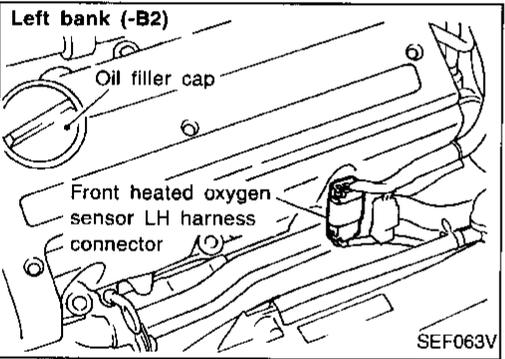
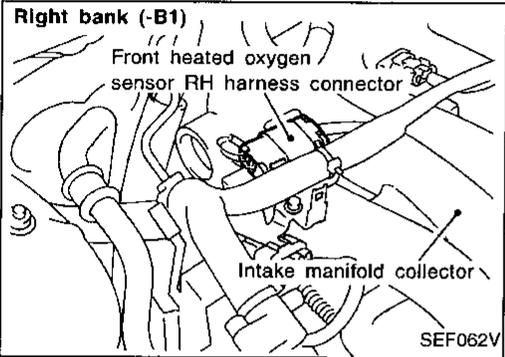
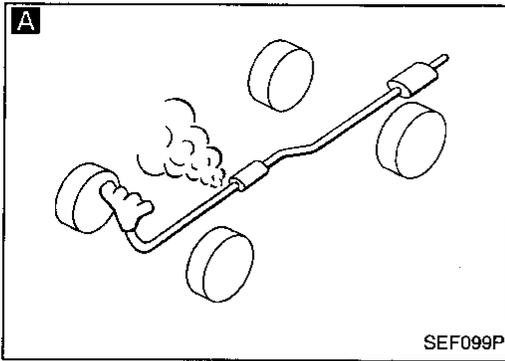
(E106)



TROUBLE DIAGNOSIS FOR DTC P0171 (-B1), P0174 (-B2)

Fuel Injection System Function (Lean side) (P0171: Right bank), (P0174: Left 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	
P0130	50	2	RH (Black)
P0150	51	2	LH (Blue)

Continuity should exist.
4. Check harness continuity between ECM or sensor and ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	ground	
P0130	50 or 2	ground	RH (Black)
P0150	51 or 2	ground	LH (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-37.
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)

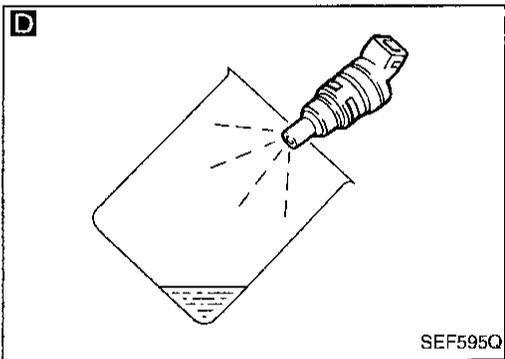
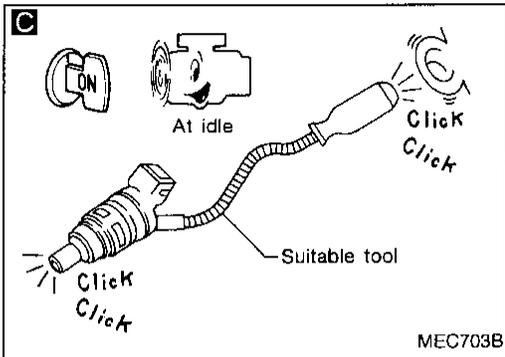
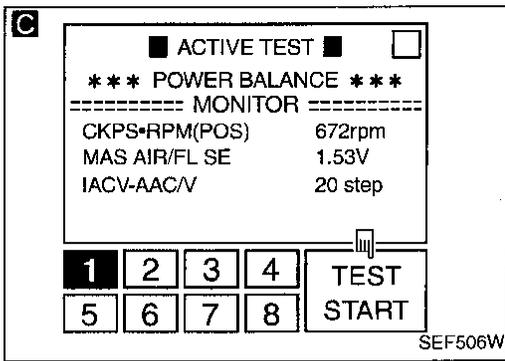
NG → Check the following.
• Fuel pump and circuit Refer to EC-524.
• Fuel pressure regulator Refer to EC-37.
• Fuel lines Refer to "ENGINE MAINTENANCE" in MA section.
• Fuel filter for clogging
If NG, repair or replace.

OK
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IDX

TROUBLE DIAGNOSIS FOR DTC P0171 (-B1), P0174 (-B2)

Fuel Injection System Function (Lean side) (P0171: Right bank), (P0174: Left bank) (Cont'd)



CHECK MASS AIR FLOW SENSOR.
 Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
2.0 - 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.
2.0 - 6.0 g m/sec: at idling
7.0 - 20.0 g m/sec: at 2,500 rpm
 OR
 Check mass air flow sensor output voltage, refer to EC-122.
1.7 - 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-122.

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-517. Repair harness or connectors.

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

1. Turn ignition switch "OFF".
2. Disconnect injector harness connectors on left bank (right bank).
3. Remove injector gallery assembly. Refer to EC-38. Keep fuel hose and all injectors connected to injector gallery. The injector harness connectors on right (Left bank) bank should remain connected.

D

1. Disconnect all ignition coil harness connectors.
2. Place pan or saucer under each injector.
3. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.
Fuel should be sprayed evenly for each cylinder.

NG → Replace injectors from which fuel does not spray out. Always replace O-ring with new one.

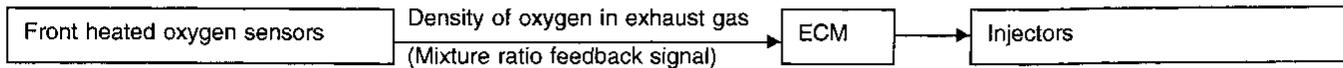
OK → Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

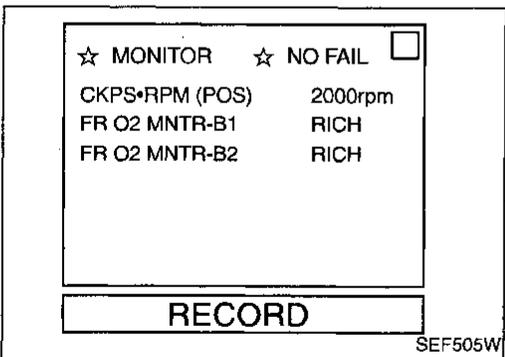
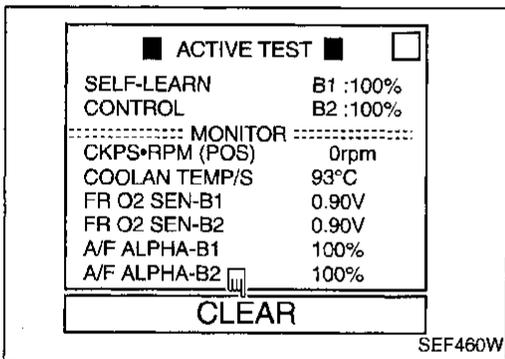
Fuel Injection System Function (Rich side) (P0172: Right bank), (P0175: Left bank)

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 (Right 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 (Left bank)		



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

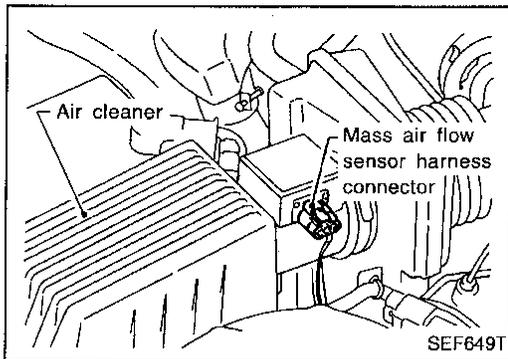
NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 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 10 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, P0175 should be detected at this stage, if a malfunction exists.
- 7) If it is difficult to start engine at step 6), the fuel injection system has a malfunction.
- 8) Crank engine while depressing accelerator pedal. If 1st trip DTC is detected and engine starts, go to "DIAGNOSTIC PROCEDURE", EC-289. 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: Right bank), (P0175: Left bank) (Cont'd)



OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 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, P0175 should be detected at this stage, if a malfunction exists.
- 9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
- 10) Crank engine while depressing accelerator pedal. If 1st trip DTC is detected and engine starts, go to "DIAGNOSTIC PROCEDURE", EC-289. If engine does not start, remove ignition plugs and check for fouling, etc.

OR

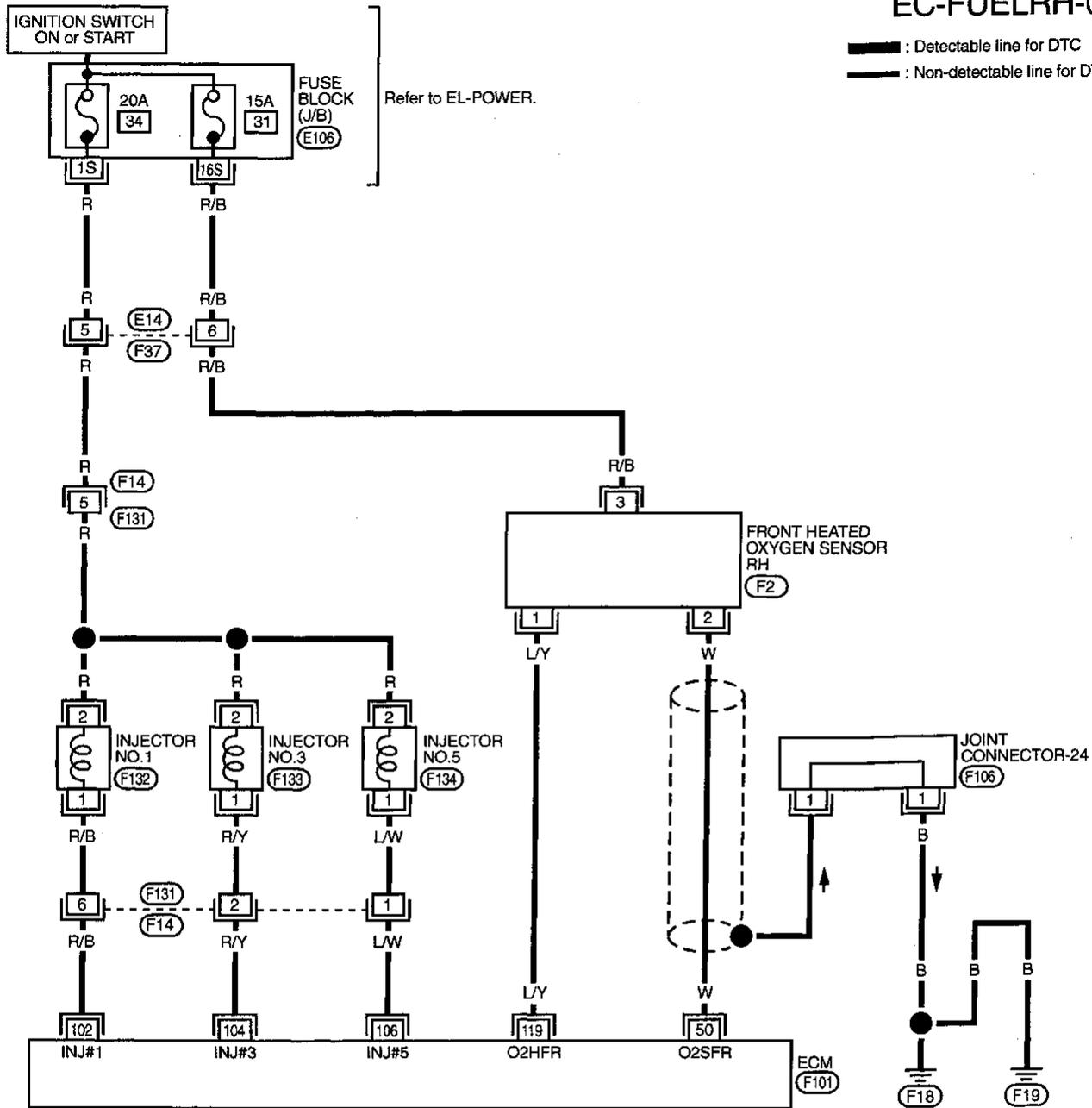


- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Disconnect mass air flow sensor harness connector.
- 4) Then restart engine and run it for at least 3 seconds at idle speed.
- 5) Stop engine and reconnect mass air flow 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, 0209 should be detected at this stage, if a malfunction exists.
- 11) If it is difficult to start engine at step 10, the fuel injection system also has a malfunction.
- 12) Crank engine while depressing accelerator pedal. If 1st trip DTC is detected and engine starts, go to "DIAGNOSTIC PROCEDURE", EC-289. 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: Right bank), (P0175: Left bank) (Cont'd)

RIGHT BANK

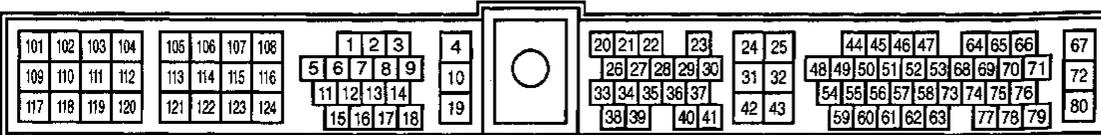
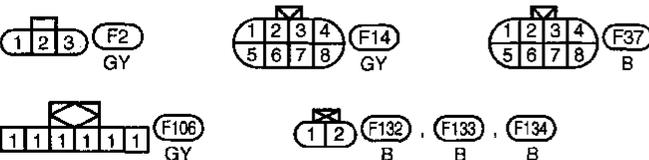


EC-FUEL RH-01

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

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Refer to last page (Foldout page).



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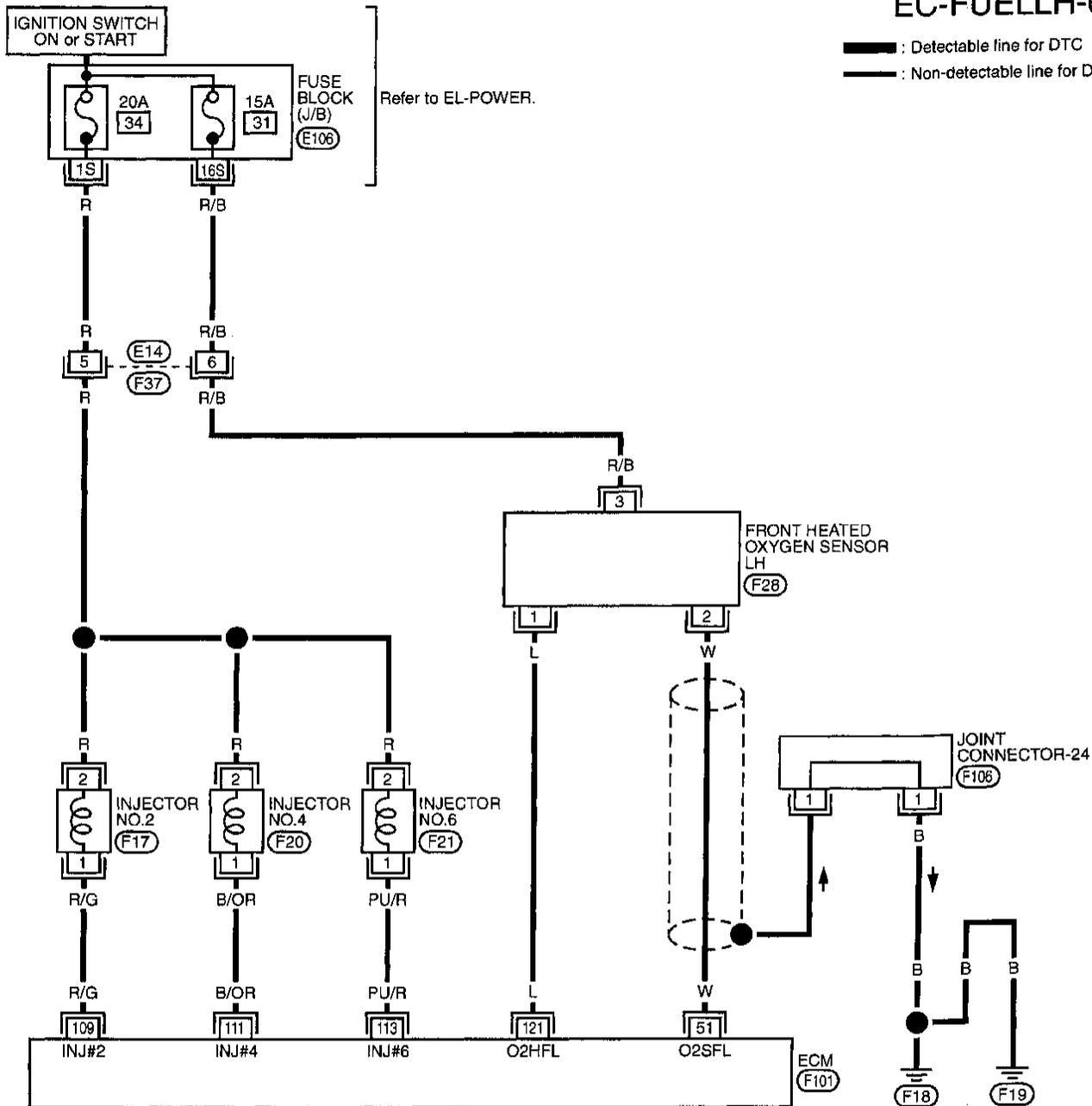
TROUBLE DIAGNOSIS FOR DTC P0172 (-B1), P0175 (-B2)

Fuel Injection System Function (Rich side) (P0172: Right bank), (P0175: Left bank) (Cont'd)

LEFT BANK

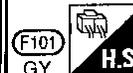
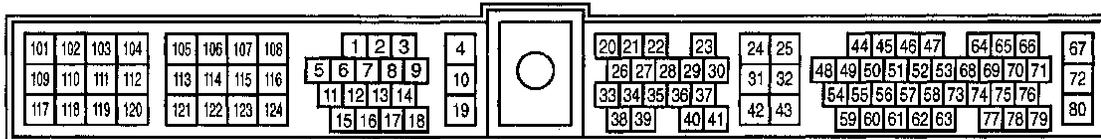
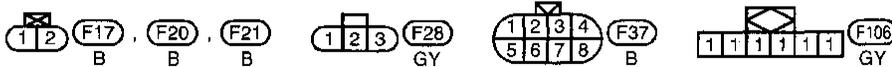
EC-FUELLH-01

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



Refer to last page (Foldout page).

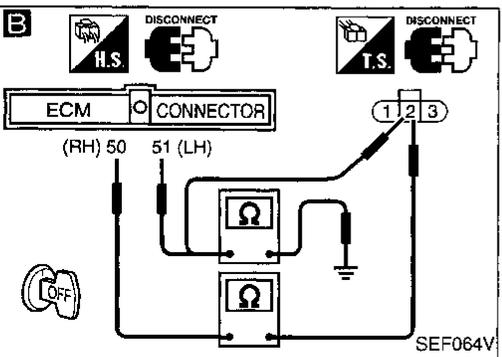
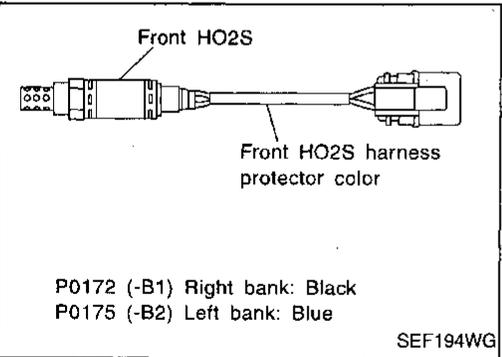
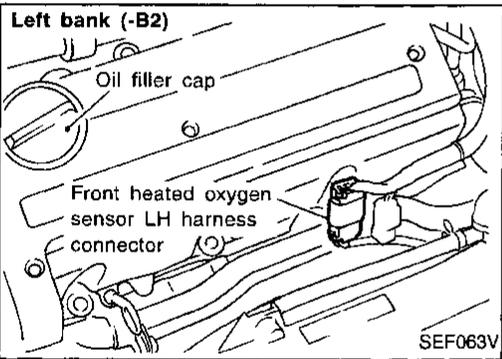
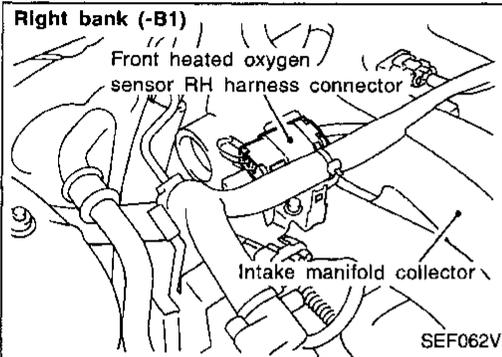
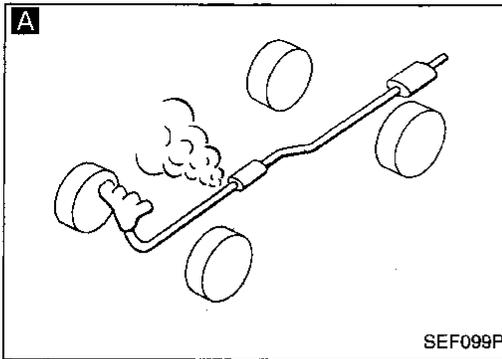
E106



TROUBLE DIAGNOSIS FOR DTC P0172 (-B1), P0175 (-B2)

Fuel Injection System Function (Rich side) (P0172: Right bank), (P0175: Left 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	
P0130	50	2	RH (Black)
P0150	51	2	LH (Blue)

Continuity should exist.
4. Check harness continuity between ECM or sensor and ground.

P code	Terminals		Bank (Harness protector color)
	ECM or sensor	ground	
P0130	50 or 2	ground	RH (Black)
P0150	51 or 2	ground	LH (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-37.
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-524.
• Fuel pressure regulator Refer to EC-37.
If NG, repair or replace.

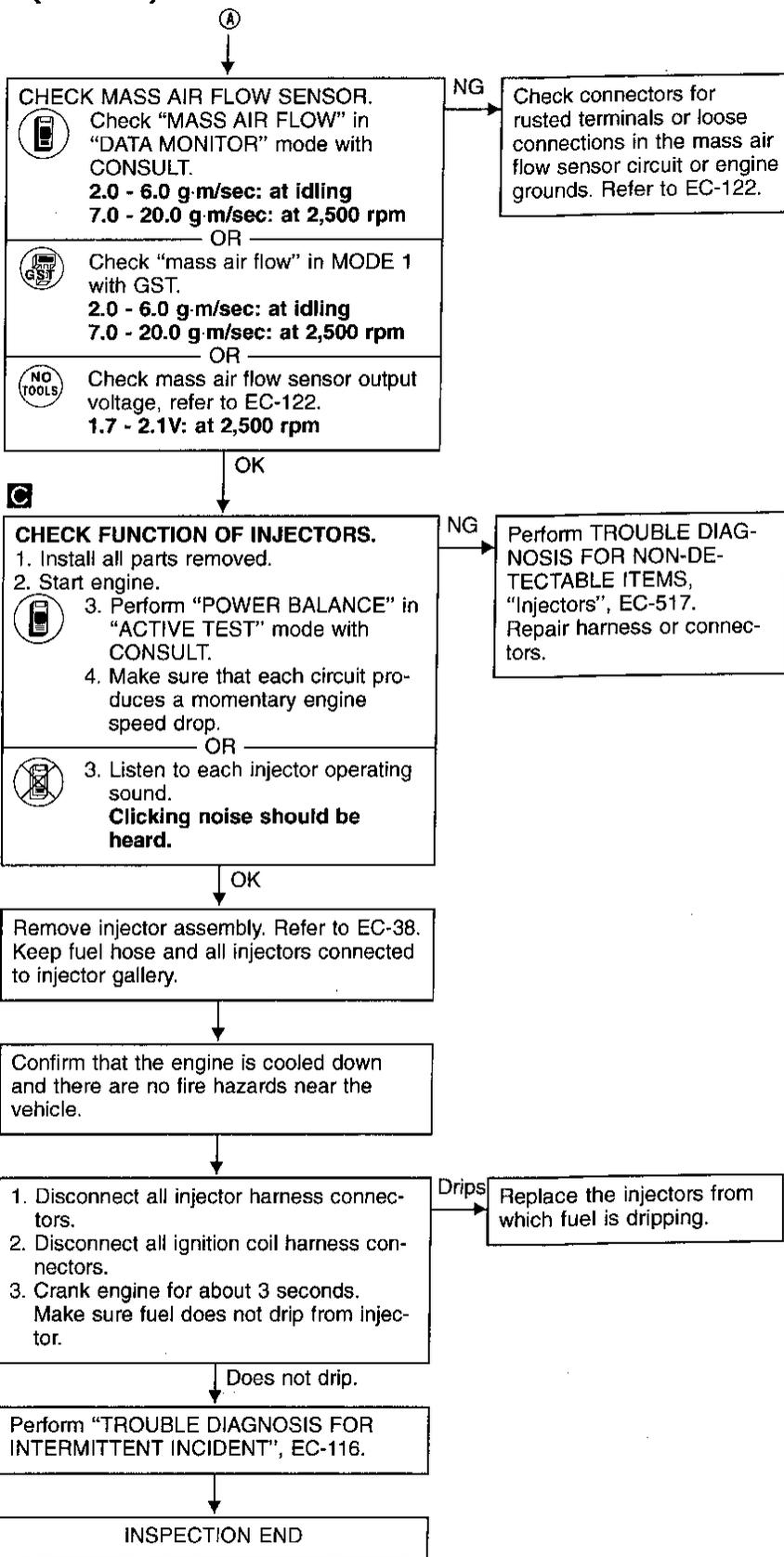
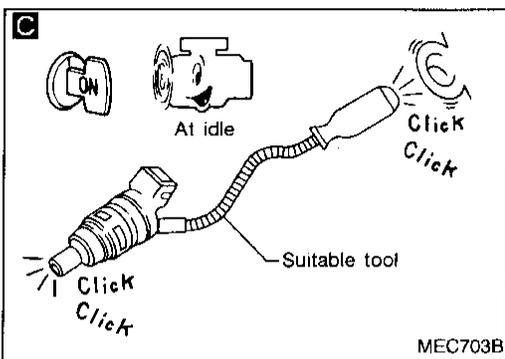
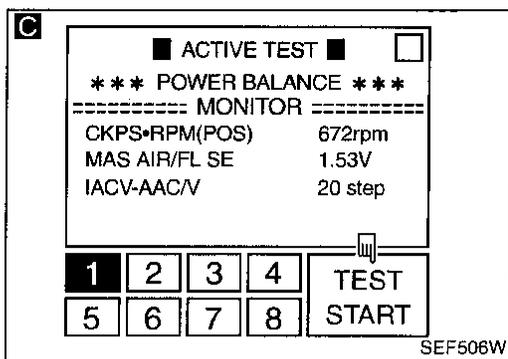
OK

Ⓐ

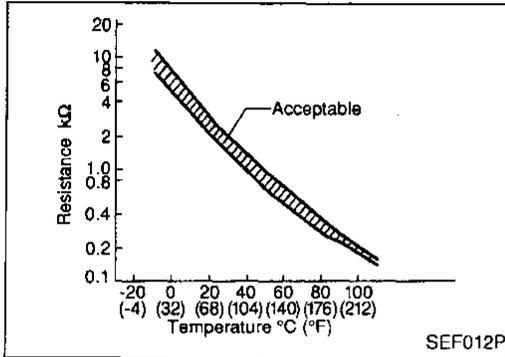
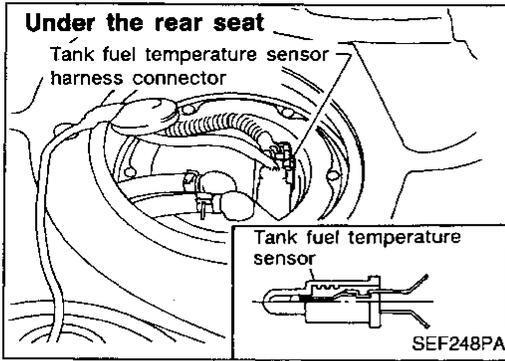
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TROUBLE DIAGNOSIS FOR DTC P0172 (-B1), P0175 (-B2)

Fuel Injection System Function (Rich side) (P0172: Right bank), (P0175: Left bank) (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P0180



Tank Fuel Temperature Sensor

COMPONENT DESCRIPTION

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

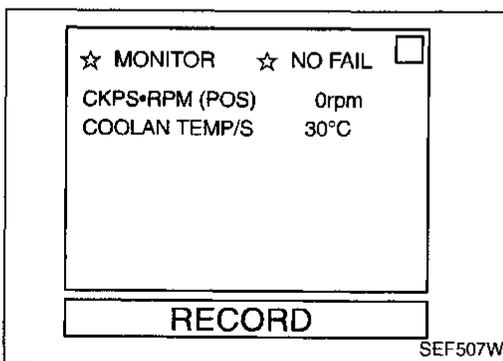
<Reference data>

Fluid temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal ② (Tank fuel temperature sensor) and ECM terminal ④ (ECM ground).

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Causes)
P0180 0402	<ul style="list-style-type: none"> An excessively high or low voltage is entered to ECM. Rationally incorrect voltage is entered 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



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 10 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-294.
If the result is OK, go to following step.

NOTE:

If "COOLAN TEMP/S" is already less than 60°C (140°F) before step 4, the result will be OK.

If "COOLAN TEMP/S" is above 60°C (140°F), go to the following step.

- Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).
- Wait at least 10 seconds.
- If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-294.

Tank Fuel Temperature Sensor (Cont'd)

OR



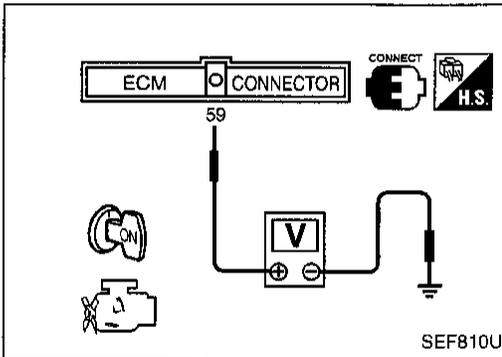
- 1) Turn ignition switch "ON" and wait at least 10 seconds.
- 2) Select "MODE 7" with GST.
If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-294.
If the result is OK, go to following step.
- 3) Select "MODE 1" with GST and check for the engine coolant temperature.

NOTE:

If the temperature is already less than 60°C (140°F) before step 4), the result will be OK.

If the temperature is above 60°C (140°F), go to the following step.

- 4) Cool engine down until the engine coolant temperature is less than 60°C (140°F).
- 5) Wait at least 10 seconds.
- 6) Select "MODE 7" with GST.
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-294.



OR



- 1) Turn ignition switch "ON" and wait at least 10 seconds.
- 2) Turn ignition switch "OFF", wait at least 10 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-294.
If the result is OK, go to following step.
- 4) Check the voltage between ECM terminal 59 (Engine coolant temperature sensor signal) and ground.

NOTE:

If the voltage is already more than 1.88V before step 5), the result will be OK.

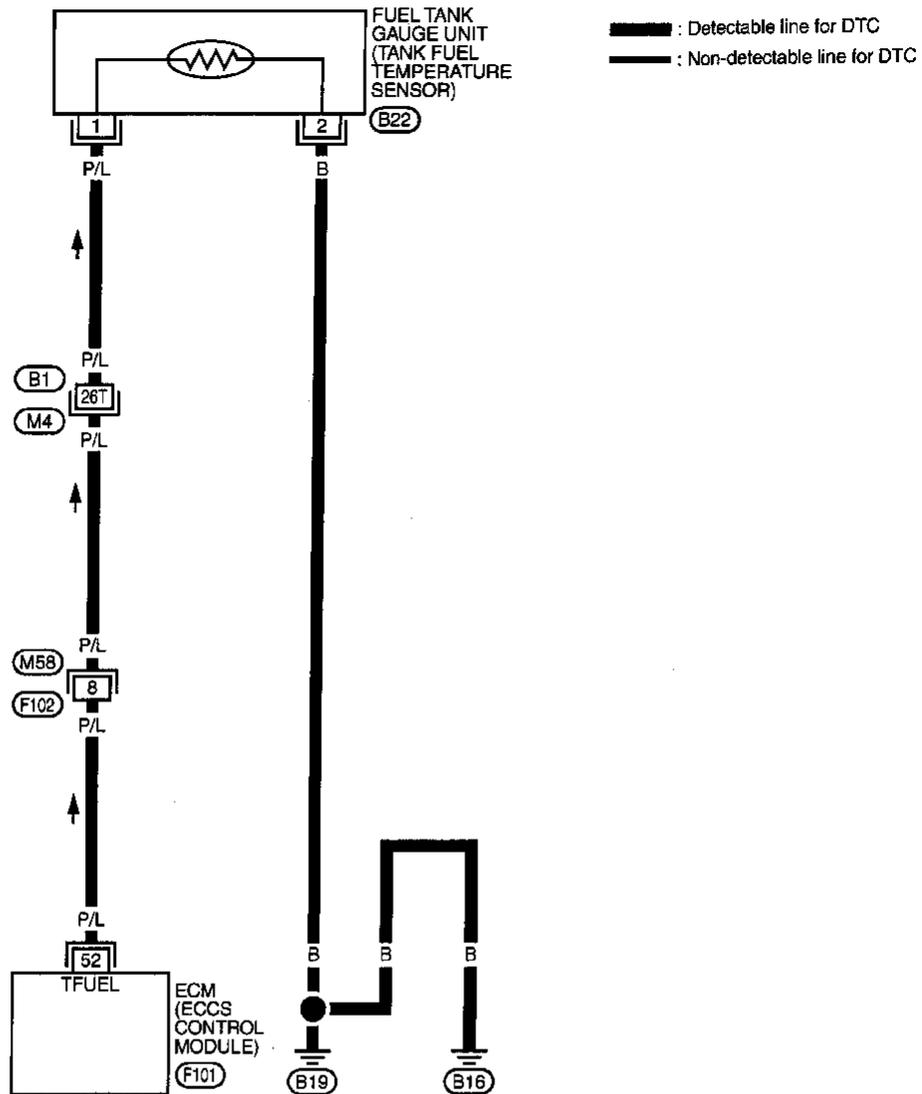
If the voltage is less than 1.88V, go to the following step.

- 5) Cool engine down until the voltage becomes more than 1.88V.
- 6) Wait at least 10 seconds.
- 7) Turn ignition switch "OFF", wait at least 10 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-294.

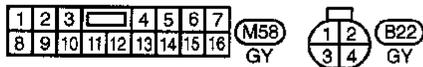
TROUBLE DIAGNOSIS FOR DTC P0180

Tank Fuel Temperature Sensor (Cont'd)

EC-TFTS-01

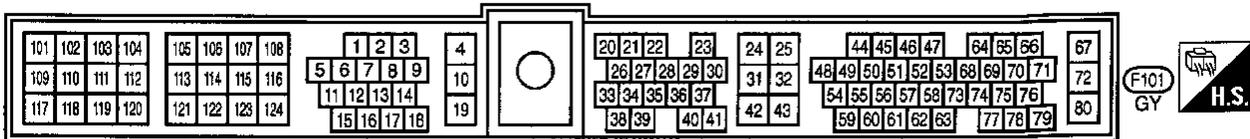


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Refer to last page (Foldout page).

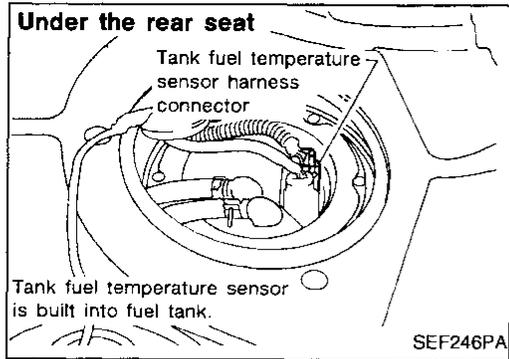
(M4), (B1)



TROUBLE DIAGNOSIS FOR DTC P0180

Tank Fuel Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK POWER SUPPLY.

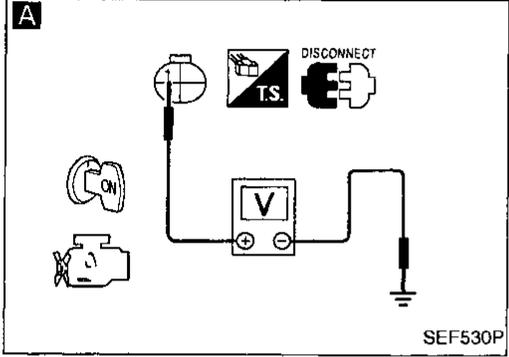
1. Disconnect tank fuel temperature sensor harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal ① and ground with CONSULT or tester.

Voltage: Approximately 5V

NG → Check the following.

- Harness connectors (B1, M4)
- Harness connectors (M58, F102)
- Harness for open or short between ECM and tank fuel temperature sensor

If NG, repair harness or connector.



OK

B

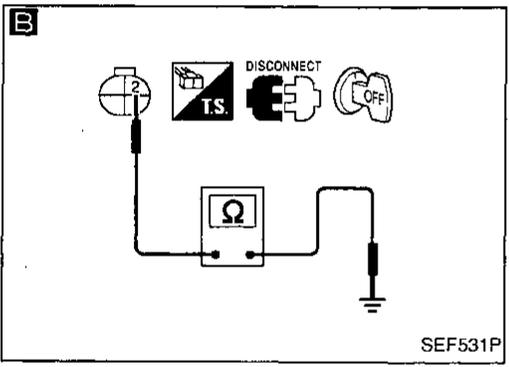
CHECK GROUND CIRCUIT.

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

Continuity should exist.

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

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



OK

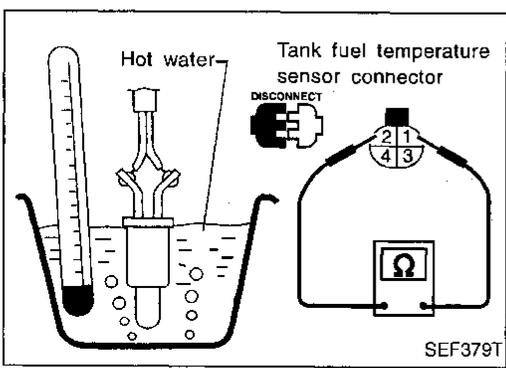
CHECK COMPONENT
(Tank fuel temperature sensor).
Refer to "COMPONENT INSPECTION" below.

NG → Replace tank fuel temperature sensor.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END



COMPONENT INSPECTION

Tank fuel temperature sensor

Check resistance as shown in the figure.

<Reference data>

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

If NG, replace tank fuel temperature sensor.

EC-294

No. 6 - 1 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 (POS), 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)
P0306 (0603)	● No. 6 cylinder misfires.	● Improper spark plug ● Insufficient compression
P0305 (0604)	● No. 5 cylinder misfires.	● Incorrect fuel pressure ● EGR volume control valve
P0304 (0605)	● No. 4 cylinder misfires.	● The injector circuit is open or shorted. ● Injectors
P0303 (0606)	● No. 3 cylinder misfires.	● Intake air leaks ● The ignition secondary circuit is open or shorted.
P0302 (0607)	● No. 2 cylinder misfires.	● Lack of fuel ● Magnetized signal plate (flywheel or drive plate)
P0301 (0608)	● No. 1 cylinder misfires.	● Front heated oxygen sensors
P0300 (0701)	● Multiple cylinders misfire.	

☆ MONITOR ☆ NO FAIL

CKPS•RPM (POS) 2040rpm

COOLAN TEMP/S 82°C

VHCL SPEED SE 82km/h

B/FUEL SCHDL 2.5msec

RECORD

SEF508W

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 10 seconds before conducting the next test.

- 1) Turn ignition switch "ON", and select "DATA MONITOR" mode with CONSULT.

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No. 6 - 1 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 10 seconds.
- 4) Start engine again and drive at 1,500 to 3,000 rpm at least 3 minutes.
Hold the accelerator pedal as steady as possible during driving.

NOTE:

Refer to the freeze frame data for the test driving condition.

- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-297.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.
Hold the accelerator pedal as steady as possible during driving.

NOTE:

Refer to the freeze frame data for the test driving condition.

- 4) Select "MODE 7" with GST.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-297.

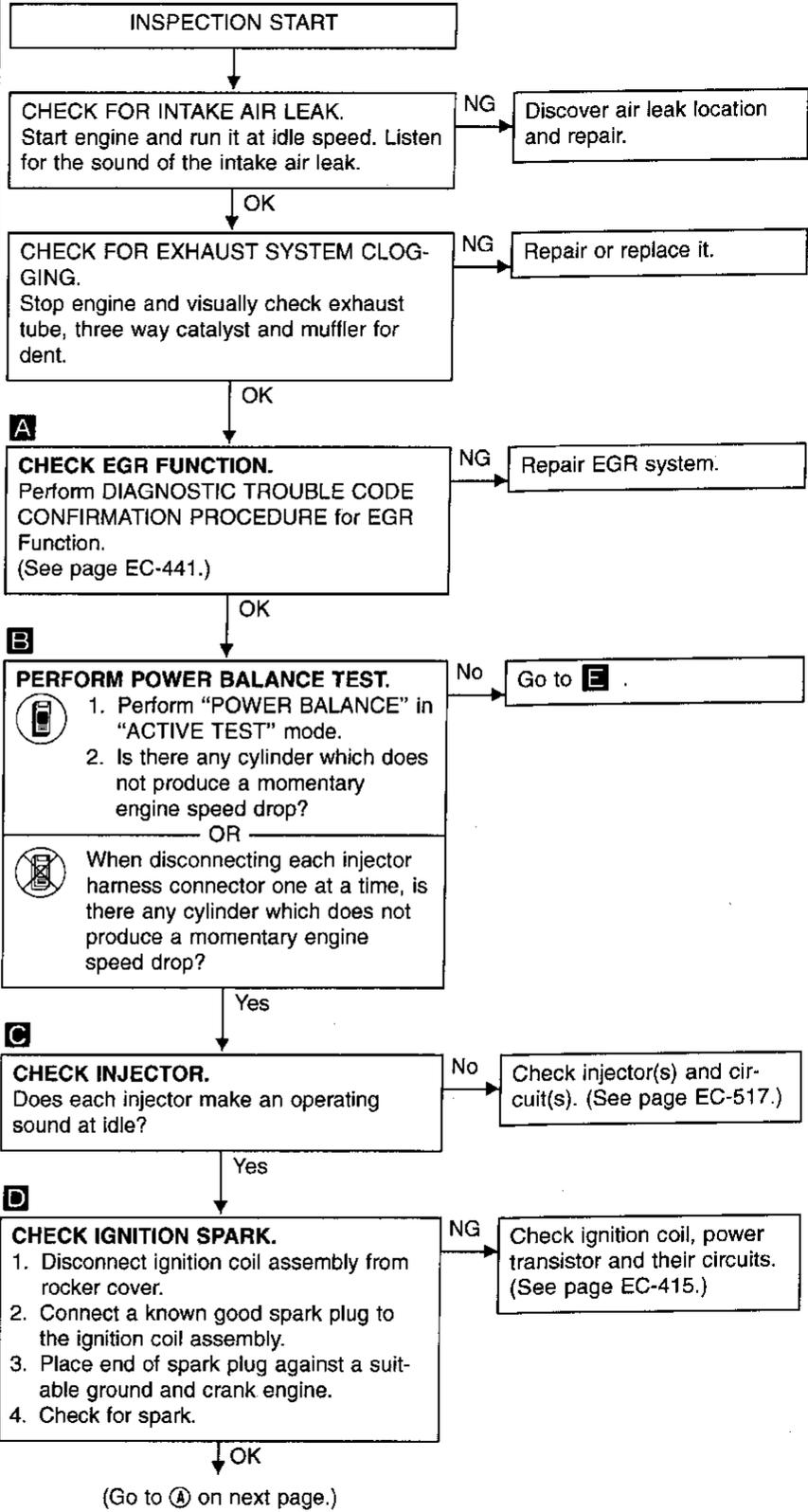
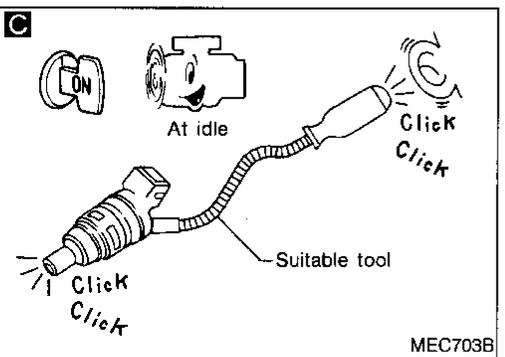
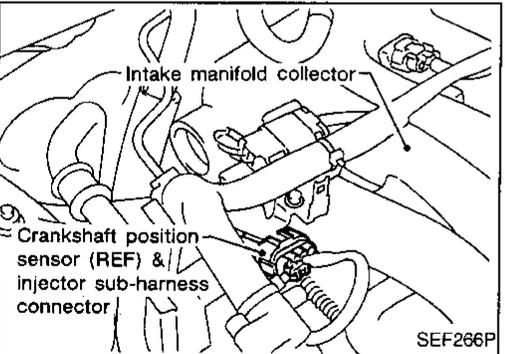
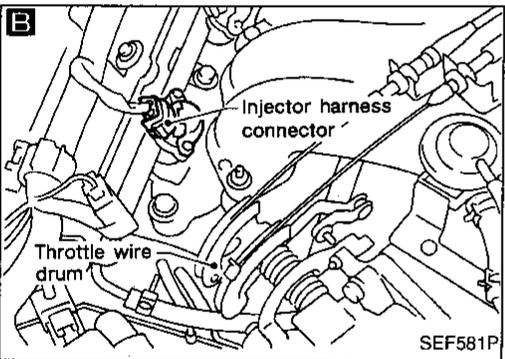
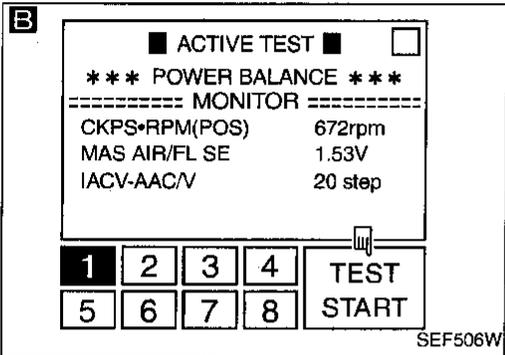
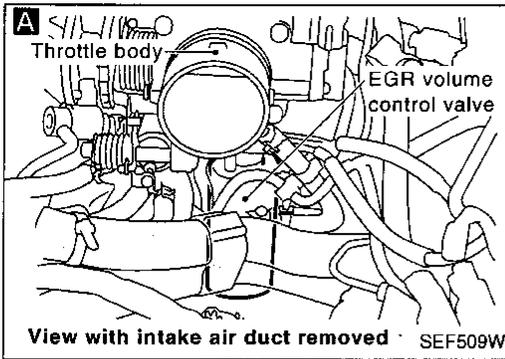
OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine again and drive at 1,500 to 3,000 rpm at least 3 minutes.
Hold the accelerator pedal as steady as possible during driving.
- 4) Turn ignition switch "OFF", wait at least 10 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-297.

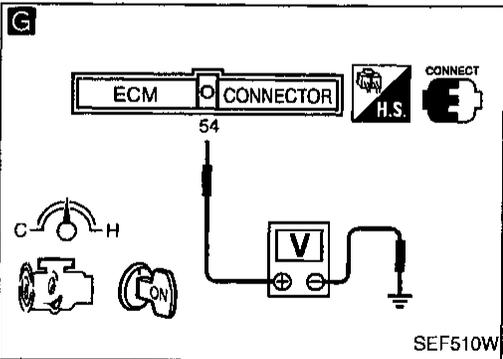
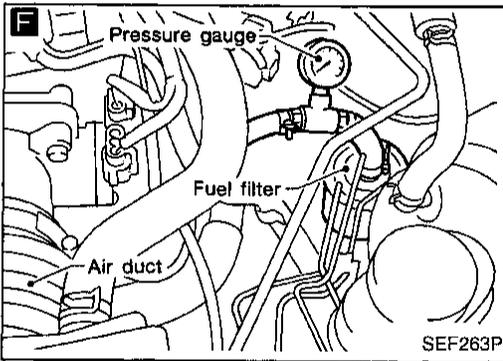
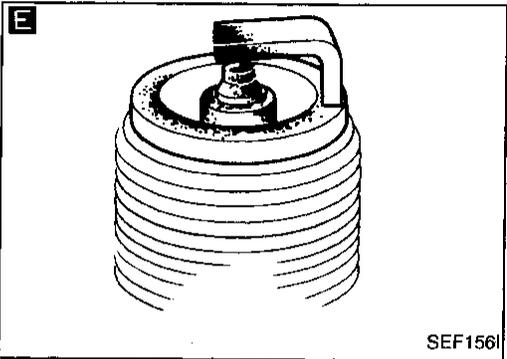
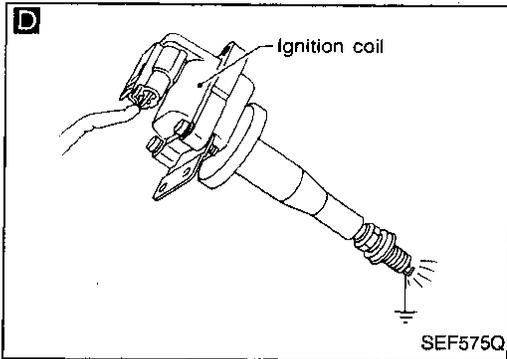
No. 6 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

DIAGNOSTIC PROCEDURE



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



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

NG → Repair or replace spark plug(s) with standard type one(s).
For spark plug type, refer to "ENGINE MAINTENANCE" in MA section.

F
CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EC-37.)
2. Install fuel pressure gauge and check fuel pressure.
At idle:
Approx. 235 kPa (2.4 kg/cm², 34 psi)

NG → Check the following.
• Fuel pump and circuit Refer to EC-524.
• Fuel pressure regulator Refer to EC-37.
• Fuel lines Refer to "ENGINE MAINTENANCE" in MA section.
If NG, repair or replace.

CHECK COMPRESSION PRESSURE.
• Check compression pressure.
Standard:
1,275 kPa (13.0 kg/cm², 185 psi)/300 rpm
Minimum:
981 kPa (10.0 kg/cm², 142 psi)/300 rpm
Difference between each cylinder:
98 kPa (1.0 kg/cm², 14 psi)/300 rpm

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

CHECK IGNITION TIMING.
Perform BASIC INSPECTION, EC-92.

NG → Adjust ignition timing.

CHECK COMPONENT
(Front heated oxygen sensor).
Refer to "COMPONENT INSPECTION", EC-194.

NG → Replace corresponding front heated oxygen sensor.

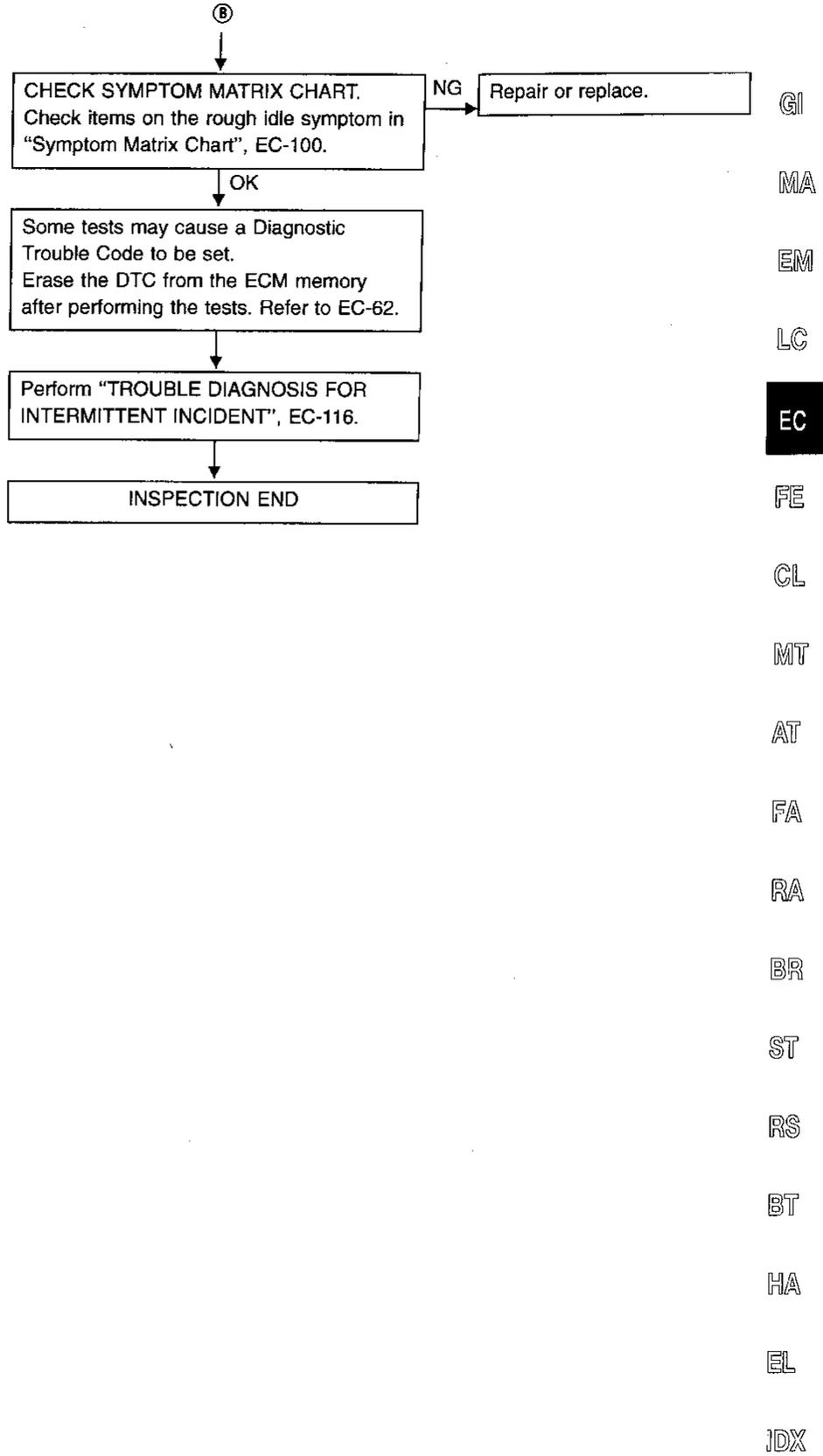
CHECK MASS AIR FLOW SENSOR.
 (M) Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
 2.0 - 6.0 g·m/sec: at idling
 7.0 - 20.0 g·m/sec: at 2,500 rpm
 OR
 (GST) Check "Mass air flow" in MODE 1 with GST.
 2.0 - 6.0 g·m/sec: at idling
 7.0 - 20.0 g·m/sec: at 2,500 rpm
 OR
 (NO TOOLS) Check voltage between ECM terminal (54) and ground.
 (Engine is warmed up to normal operating temperature.)
 1.0 - 1.7V: at idling
 1.5 - 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.
(See page EC-122.)
If NG, repair or replace it.

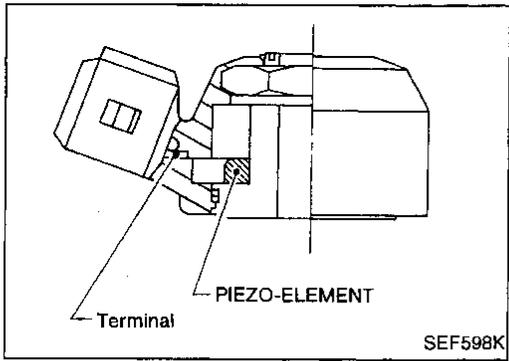
OK
(Go to (B) on next page.)

TROUBLE DIAGNOSIS FOR DTC P0306 - P0300

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



TROUBLE DIAGNOSIS FOR DTC P0325



Knock Sensor (KS)

COMPONENT DESCRIPTION

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

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and ② (ECM ground).

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

ON BOARD DIAGNOSIS LOGIC

* Freeze frame data is not stored in the ECM for the knock sensor.

The MIL will not light for knock sensor malfunction. The knock sensor has one trip detection logic.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0325 0304	<ul style="list-style-type: none"> An excessively low or high voltage from the knock sensor is entered to ECM. 	<ul style="list-style-type: none"> Harness or connectors (The knock sensor circuit is open or shorted.) Knock sensor

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 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it at least 5 seconds at idle speed.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-302.

OR

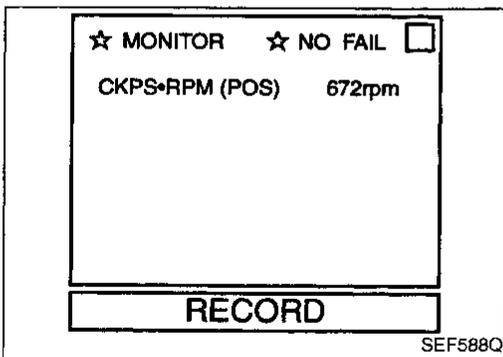


- 1) Start engine and run it at least 5 seconds at idle speed.
- 2) Select "MODE 3" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-302.

OR



- 1) Start engine and run it at least 5 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 10 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-302.



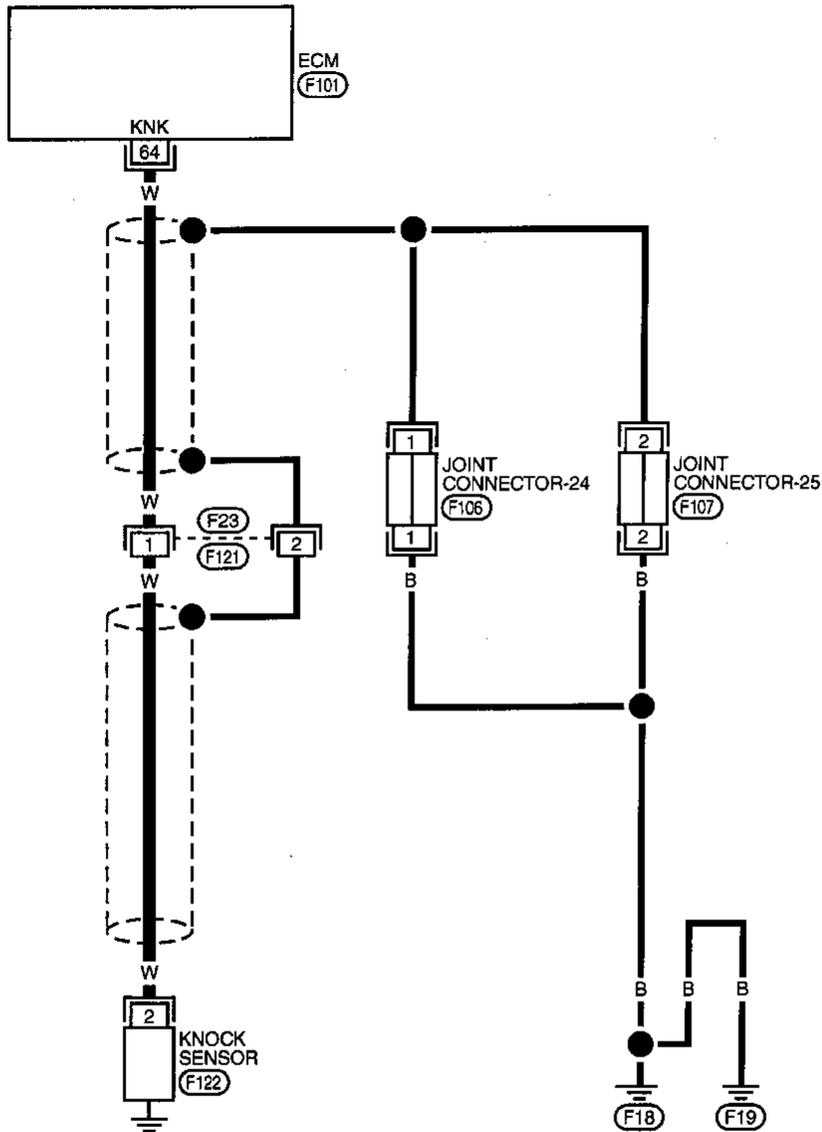
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TROUBLE DIAGNOSIS FOR DTC P0325

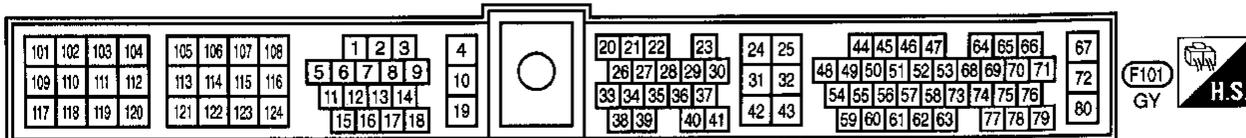
Knock Sensor (KS) (Cont'd)

EC-KS-01

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



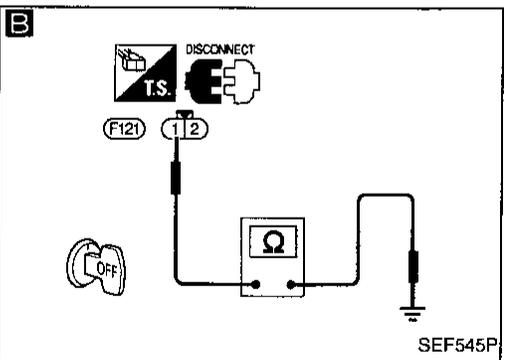
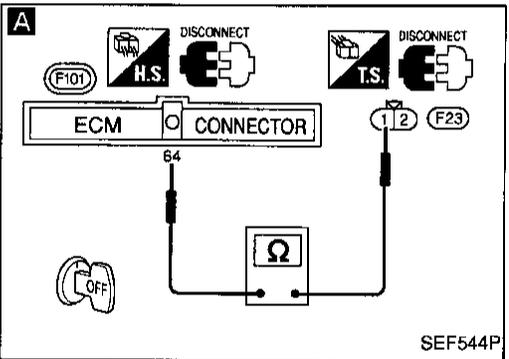
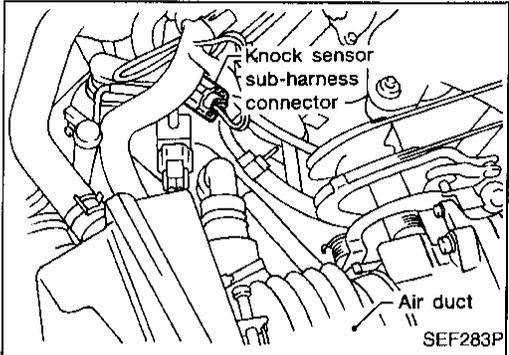
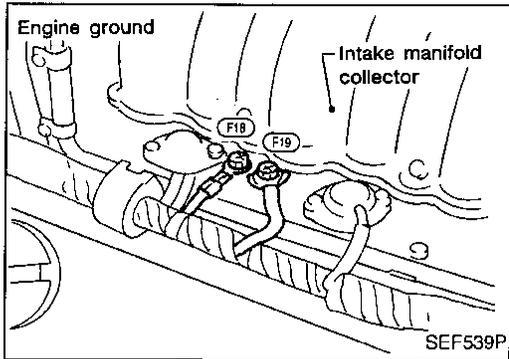
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TROUBLE DIAGNOSIS FOR DTC P0325

Knock Sensor (KS) (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. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and knock sensor sub-harness connector.
3. Check harness continuity between terminal ① and ECM terminal ④.
Continuity should exist.
If OK, check harness for short to ground and short to power.

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

B
CHECK INPUT SIGNAL CIRCUIT-2.
Check resistance between terminal ① and engine ground.
Resistance:
Approximately 500 - 620 kΩ
If OK, check harness for short.
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

NG
Check the following.
• Harness for open or short between knock sensor sub-harness connector and knock sensor
If NG, repair open circuit, short to ground or short to power in harness or connectors.
• Knock sensor (Refer to "COMPONENT INSPECTION" on next page.)
If NG, replace knock sensor.

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect harness connectors (F23), (F121).
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. Then reconnect harness connectors.

NG
Check the following.
• Harness connectors (F23), (F121)
• Joint connector-24, 25 (Refer to "HARNES LAYOUT" in EL section.)
• Harness for open or short between harness connector (F23) and engine ground
If NG, repair open circuit or short to ground or short to power in harness or connectors.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0325

Knock Sensor (KS) (Cont'd)

COMPONENT INSPECTION

Knock sensor

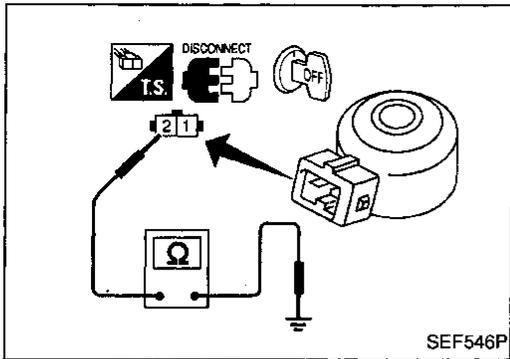
1. Disconnect knock sensor harness connector.
2. Check resistance between terminal ② and ground.

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

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

CAUTION:

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



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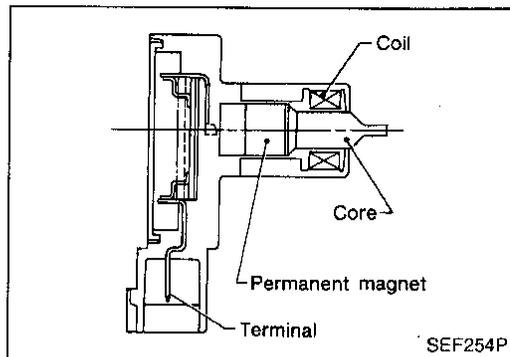
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Crankshaft Position Sensor (CKPS) (POS)

COMPONENT DESCRIPTION

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).

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

When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS-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.
CKPS-RPM (REF)		

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and 25 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
49	W	Crankshaft position sensor (POS)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.5V★ SEF057V
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 2.4V★ SEF058V
4	W/B	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
67 72	R R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSIS FOR DTC P0335

Crankshaft Position Sensor (CKPS) (POS) (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"> ● 1° signal is not entered to ECM for the first few seconds during engine cranking. ● 1° signal is not entered to ECM during engine running. 	<ul style="list-style-type: none"> ● Harness or connectors (The crankshaft position sensor (POS) circuit is open or shorted.) ● Crankshaft position sensor (POS) ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.) ● 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 10 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) Crank engine at least 2 seconds.
 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-307.

OR

-  1) Crank engine at least 2 seconds.
 2) Select "MODE 7" with GST.
 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-307.

OR

-  1) Crank engine at least 2 seconds.
 2) Turn ignition switch "OFF", wait at least 10 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-307.

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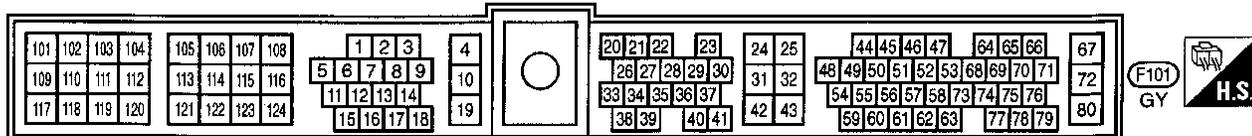
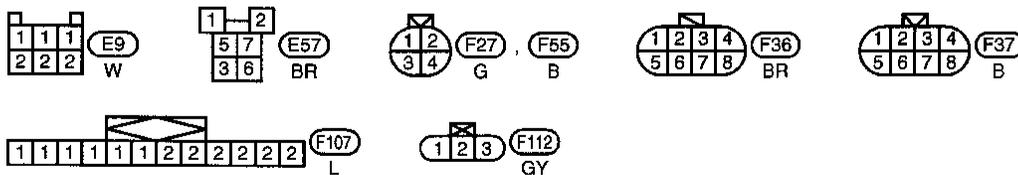
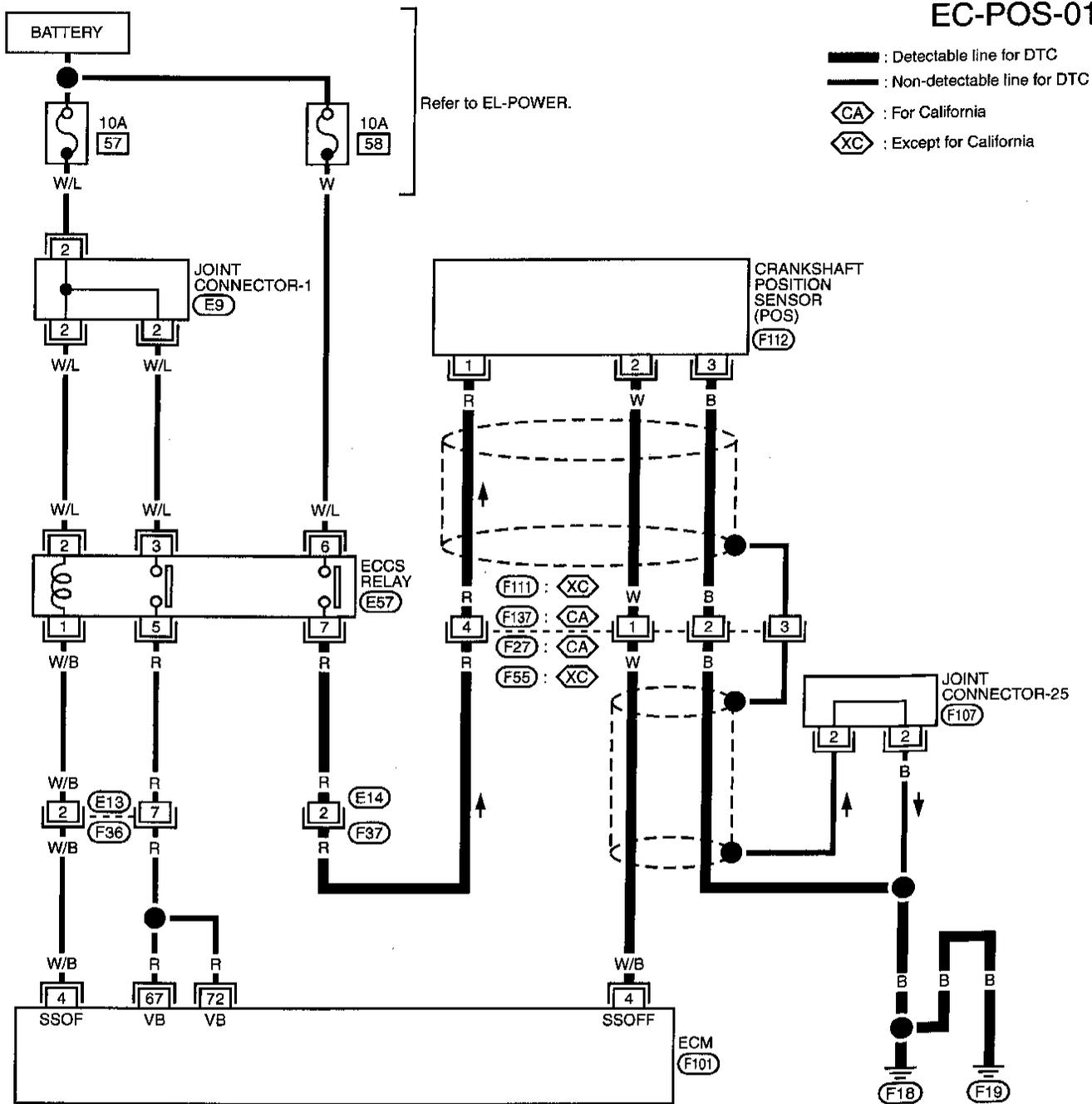
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TROUBLE DIAGNOSIS FOR DTC P0335

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

EC-POS-01



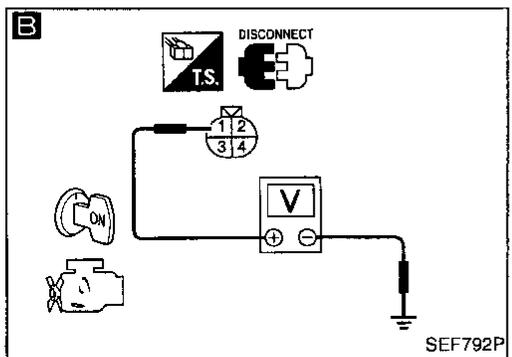
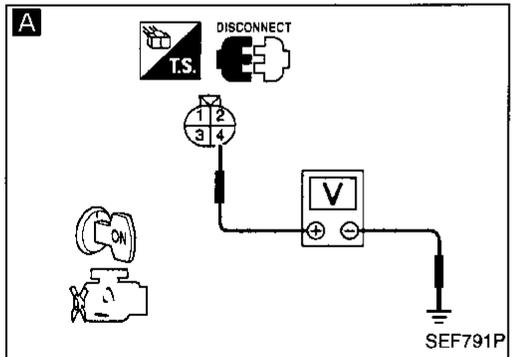
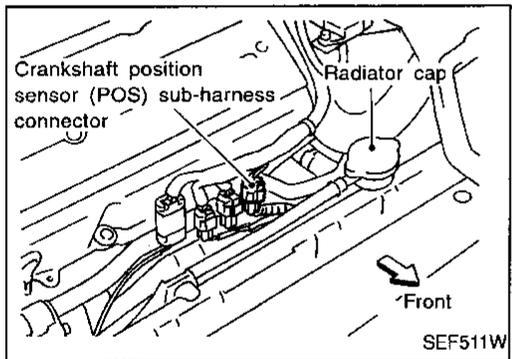
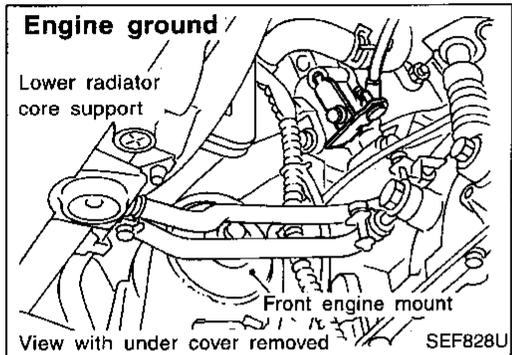
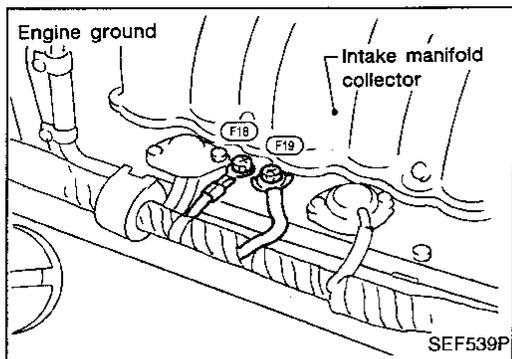
TROUBLE DIAGNOSIS FOR DTC P0335

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

DIAGNOSTIC PROCEDURE

INSPECTION START

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



A

CHECK POWER SUPPLY-I.

1. Turn ignition switch "OFF".
2. Disconnect crankshaft position sensor (POS) sub-harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ④ and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.

- Harness connectors (F37, E14)
- Harness for open or short between crankshaft position sensor (POS) sub-harness connector and ECCS relay

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

B

CHECK POWER SUPPLY-II.

Check voltage between terminal ① and ground with CONSULT or tester.
Voltage: Approximately 5V

NG → Repair harness or connectors.

C

CHECK GROUND CIRCUIT-I.

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.
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 → Repair open circuit, short to ground or short to power in harness or connectors.

D

CHECK INSTALLATION.

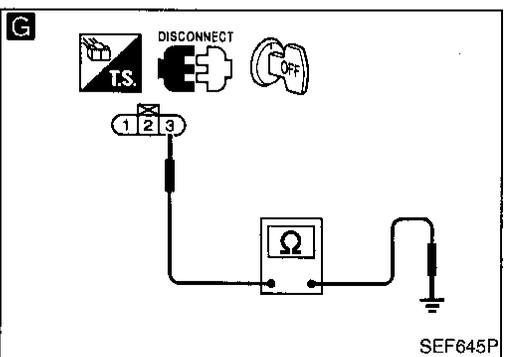
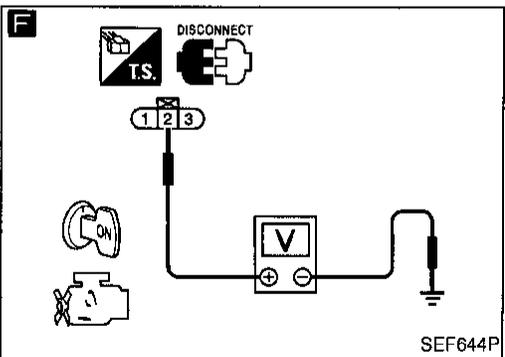
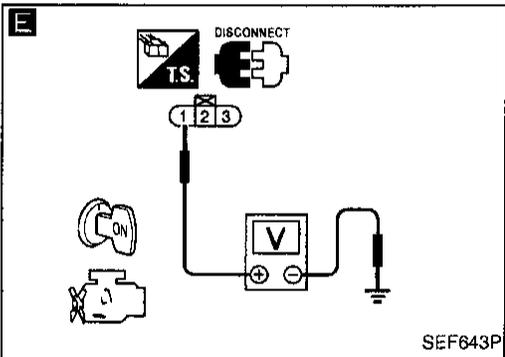
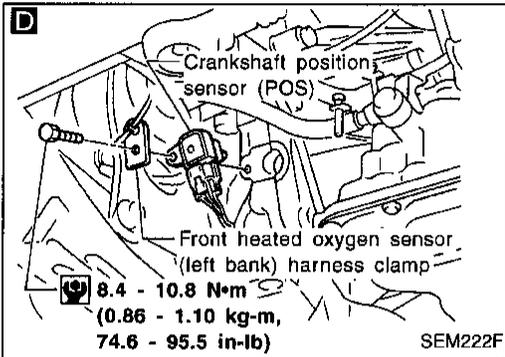
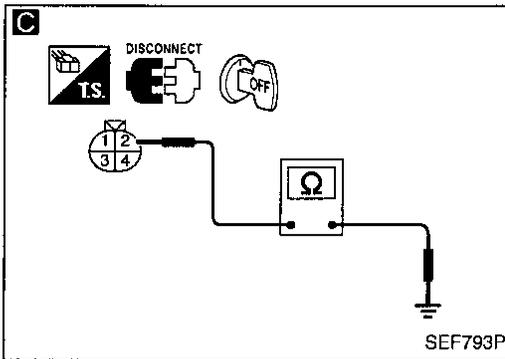
Check that crankshaft position sensor (POS) and front heated oxygen sensor (left bank) harness clamp are installed correctly, as shown in figure.

→ A

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TROUBLE DIAGNOSIS FOR DTC P0335

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



E

CHECK POWER SUPPLY-III.

1. Reconnect crankshaft position sensor (POS) sub-harness connector.
2. Disconnect crankshaft position sensor (POS) 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 (except for California) (F111, F55)
- Harness connectors (for California) (F137, F27)
- Harness for open or short between crankshaft position sensor (POS) and crankshaft position sensor (POS) sub-harness connector

If NG, repair harness or connectors.

F

CHECK POWER SUPPLY-IV.

Check voltage between terminal ② and ground with CONSULT or tester.

Voltage: Approximately 5V

NG

If NG, repair harness or connectors.

G

CHECK GROUND CIRCUIT-II.

1. Turn ignition switch "OFF".
2. 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 (except for California) (F111, F55)
- Harness connectors (for California) (F137, F27)
- Harness for open or short between crankshaft position sensor (POS) and crankshaft position sensor (POS) sub-harness connector

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

CHECK COMPONENT

[Crankshaft position sensor (POS)].

Refer to "COMPONENT INSPECTION", EC-310.

NG

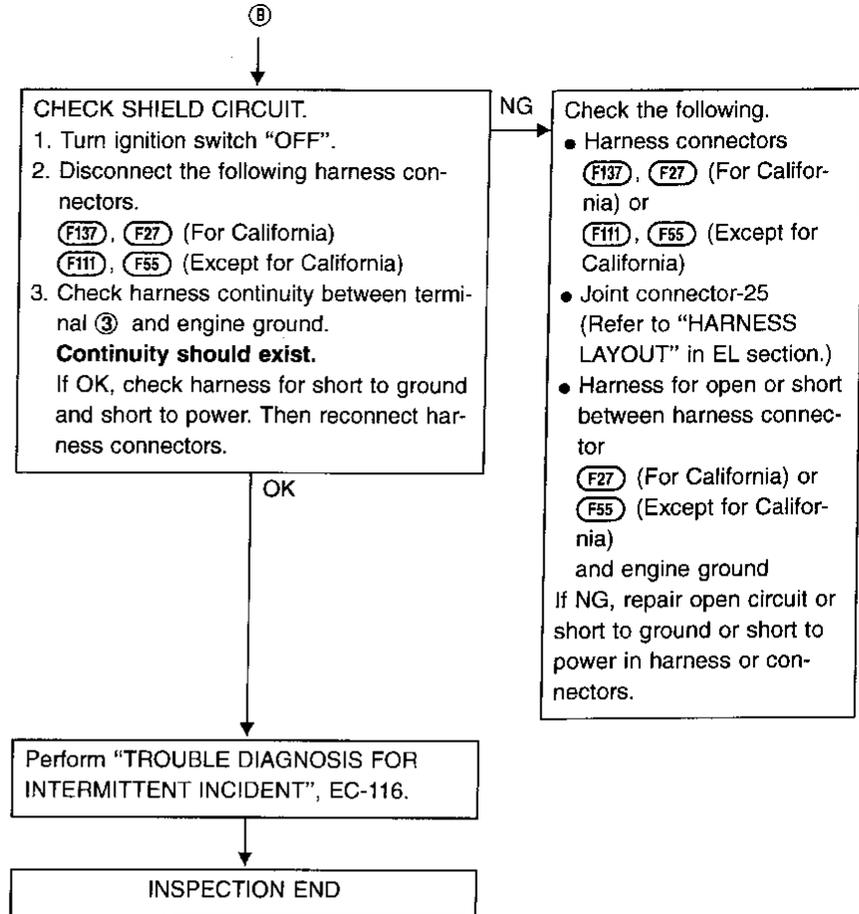
Replace crankshaft position sensor (POS).

OK

②

TROUBLE DIAGNOSIS FOR DTC P0335

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



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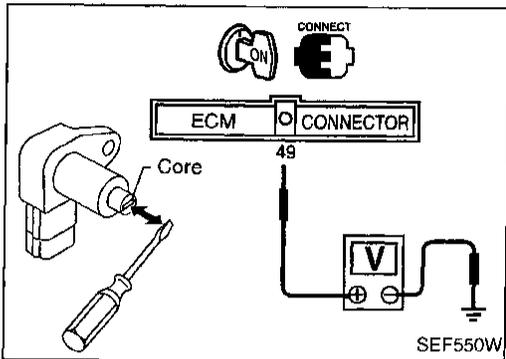
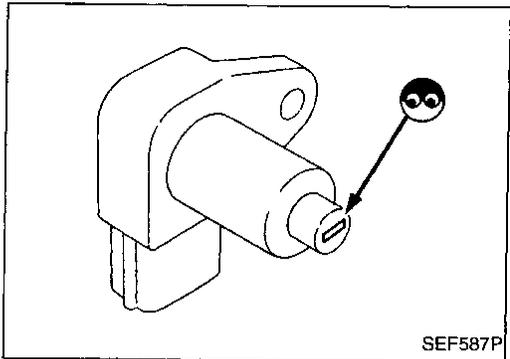
TROUBLE DIAGNOSIS FOR DTC P0335

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

COMPONENT INSPECTION

Crankshaft position sensor (POS)

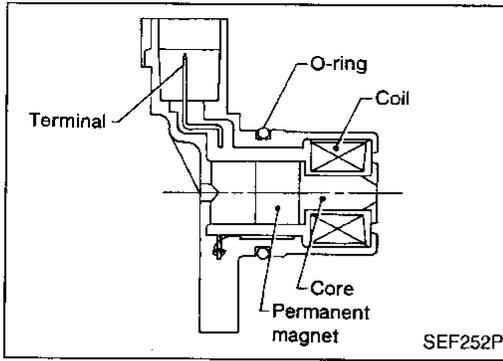
1. Disconnect crankshaft position sensor (POS) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Reconnect crankshaft position sensor (POS) harness connector.
6. Turn ignition switch "ON".
7. Check voltage between ECM terminals ④ and ground when bringing a screwdriver into contact with, and quickly pulling away from the sensor core.



ECM terminal	Condition	Voltage
④	Contacted	Approximately 5V
	Pulled away	Approximately 0V

There should be a steady 5V as the screwdriver is drawn away slowly.
If NG, replace crankshaft position sensor (POS).

TROUBLE DIAGNOSIS FOR DTC P0340



Camshaft Position Sensor (CMPS) (PHASE)

COMPONENT DESCRIPTION

The camshaft position sensor (PHASE) is located on the engine front cover facing the camshaft sprocket. It detects the cylinder No. signal.

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

When engine is running, the gap between the sensor and the camshaft sprocket will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the cylinder No. signal.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and (25) (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
44 48	W W	Camshaft position sensor (PHASE)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 4.2V★ (AC voltage)

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0340 0101	A) The cylinder No. signal is not entered to ECM for the first few seconds during engine cranking. B) The cylinder No. signal is not entered to ECM during engine running. C) The cylinder No. signal is not in the normal pattern during engine running.	<ul style="list-style-type: none"> ● Harness or connectors (The camshaft position sensor (PHASE) circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.)

**Camshaft Position Sensor (CMPS) (PHASE)
(Cont'd)**

**DIAGNOSTIC TROUBLE CODE CONFIRMATION
PROCEDURE**

Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "Procedure for malfunction B and C".

Procedure malfunction A

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 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) Crank engine at least 2 seconds.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-314.

OR

- 1) Crank engine at least 2 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-314.

OR

- 1) Crank engine at least 2 seconds.
- 2) Turn ignition switch "OFF", wait at least 10 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-314.

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 10 seconds before conducting the next test.

TESTING CONDITION:

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

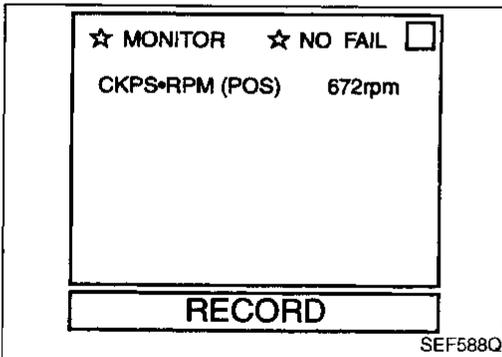
- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and run it for at least 2 seconds at idle speed.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-314.

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-314.

OR

- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 10 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-314.

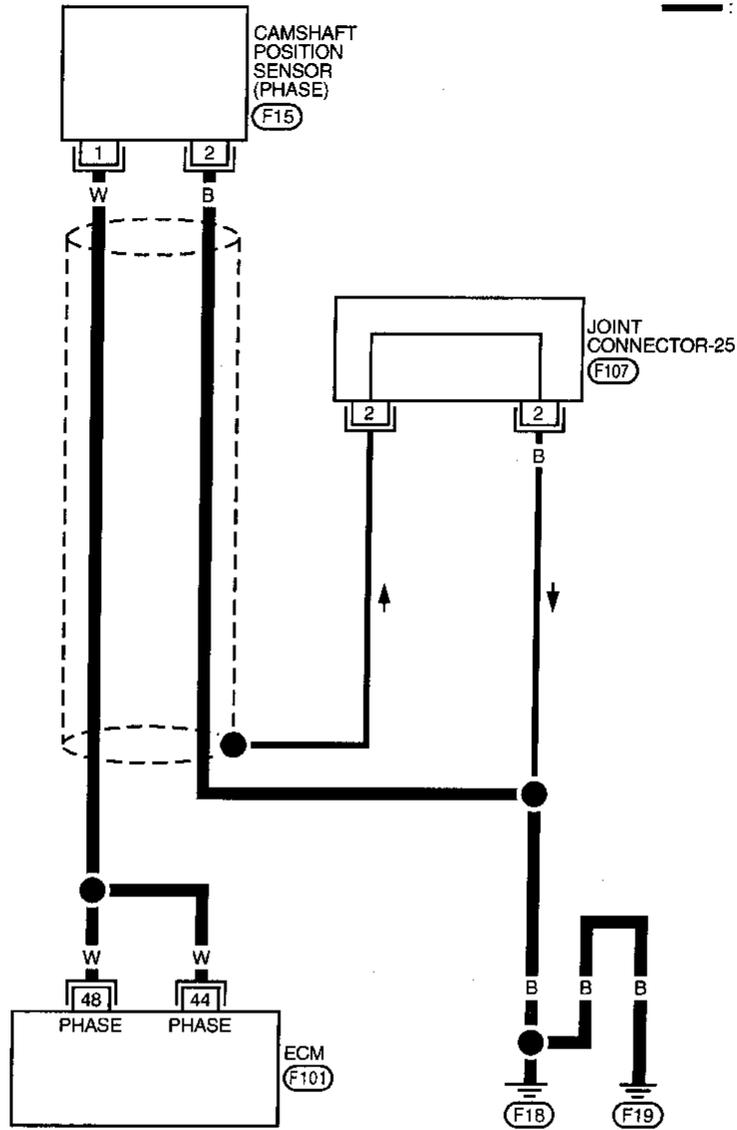


TROUBLE DIAGNOSIS FOR DTC P0340

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

EC-PHASE-01

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



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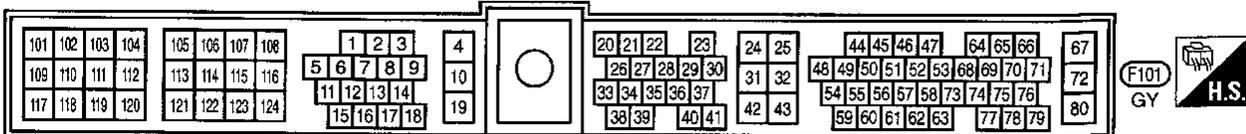
RS

BT

HA

EL

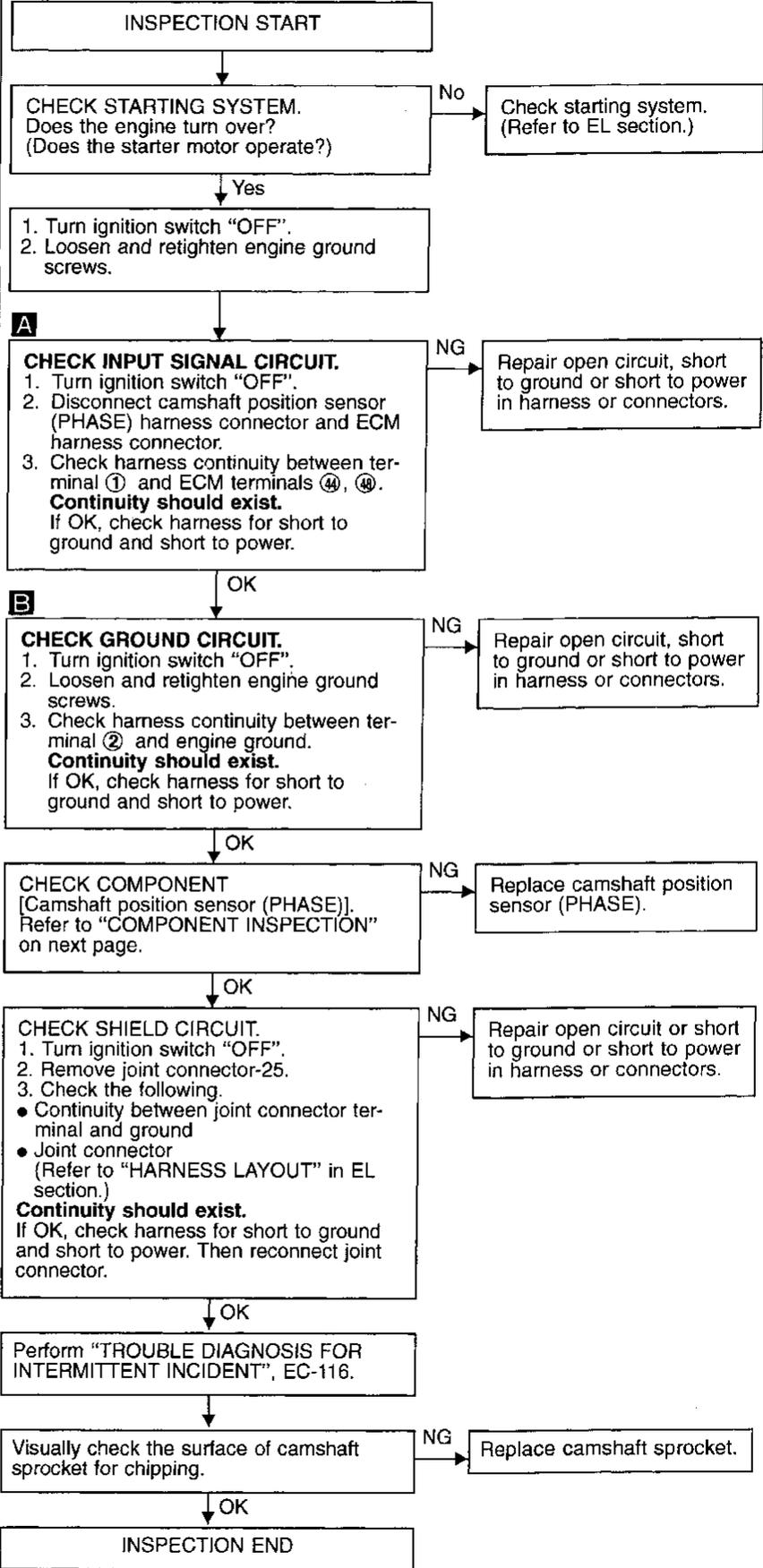
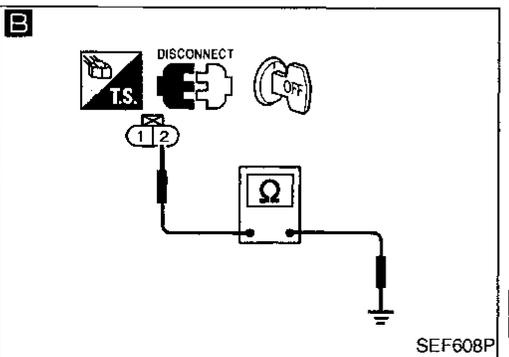
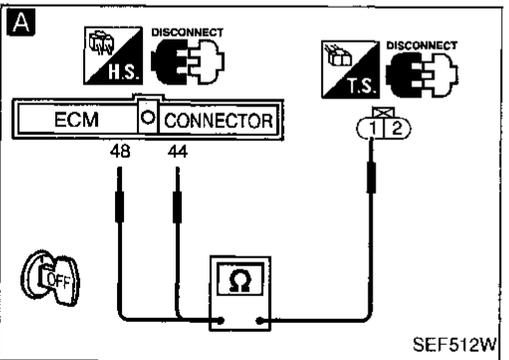
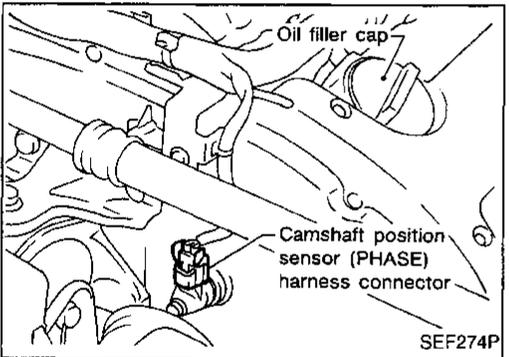
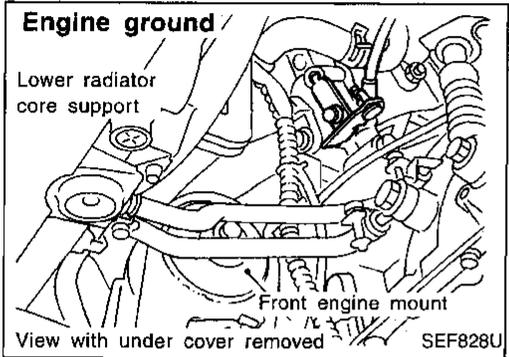
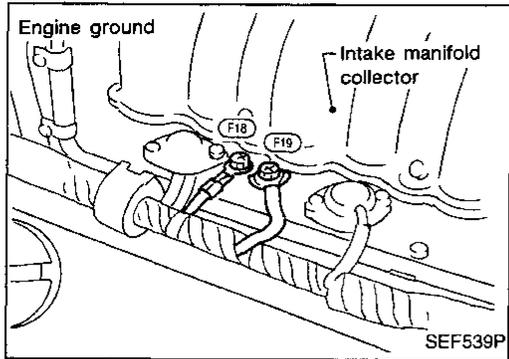
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TROUBLE DIAGNOSIS FOR DTC P0340

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

DIAGNOSTIC PROCEDURE

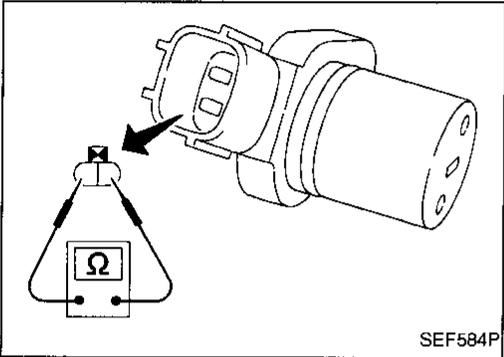
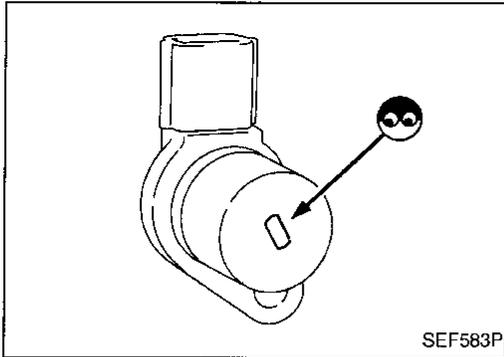


TROUBLE DIAGNOSIS FOR DTC P0340

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

COMPONENT INSPECTION

Camshaft position sensor (PHASE)



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

GI

MA

EM

5. Check resistance as shown in the figure.

Resistance:

Approximately 1,440 - 1,760 Ω at 20°C (68°F)
(HITACHI make)

Approximately 2,090 - 2,550 Ω at 20°C (68°F)
(MITSUBISHI make)

LC

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6. If NG, replace camshaft position sensor (PHASE).

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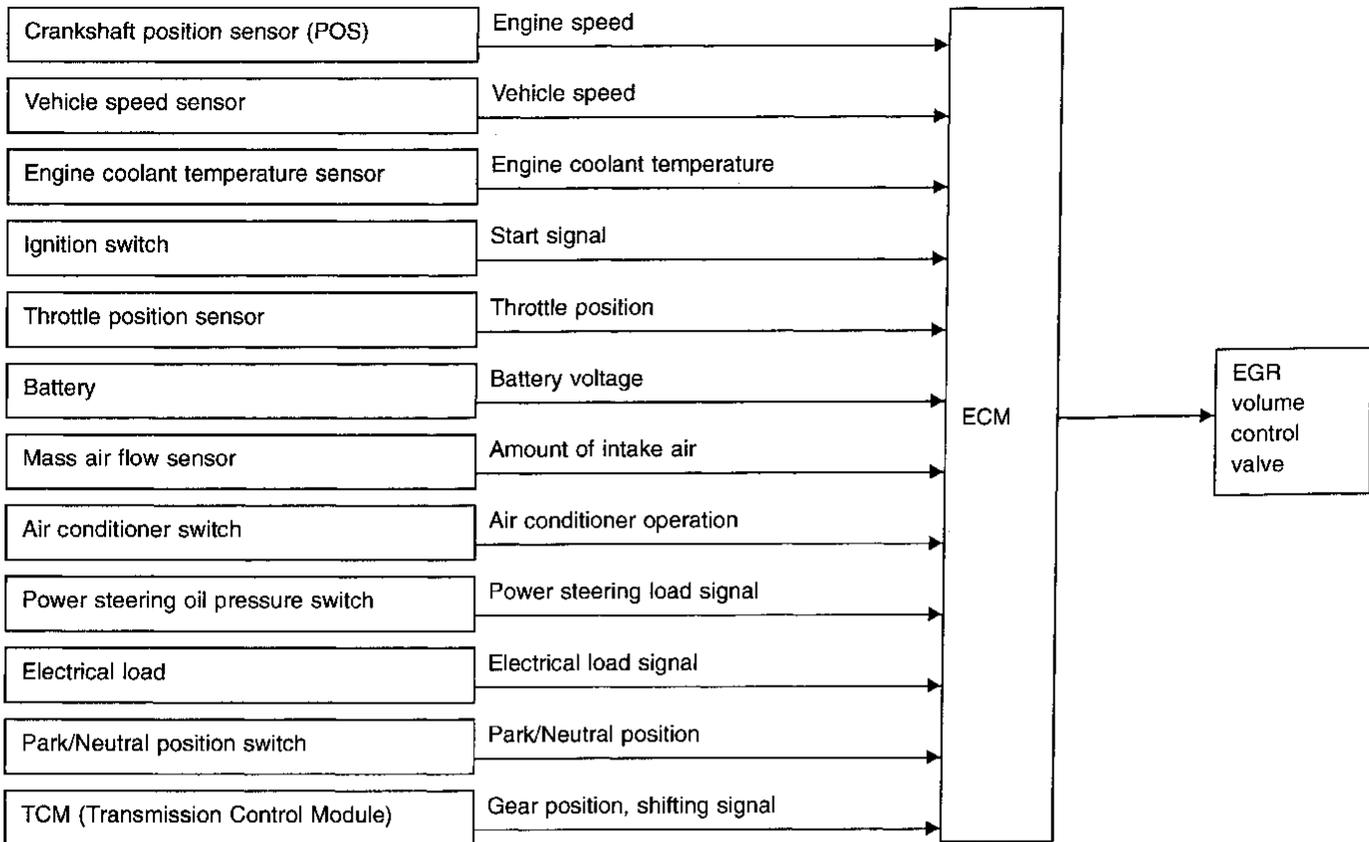
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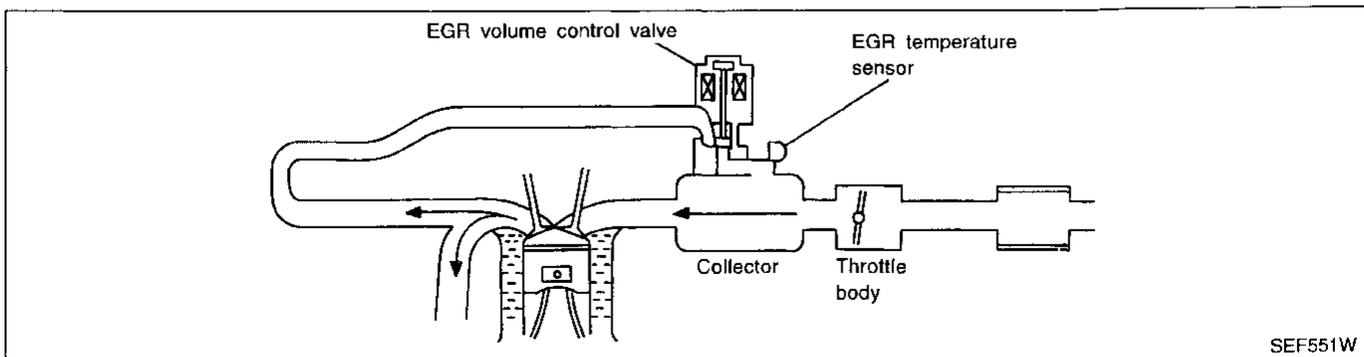
EGR Function (Close)

SYSTEM DESCRIPTION



This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR 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. The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle
- Low battery voltage



SEF551W

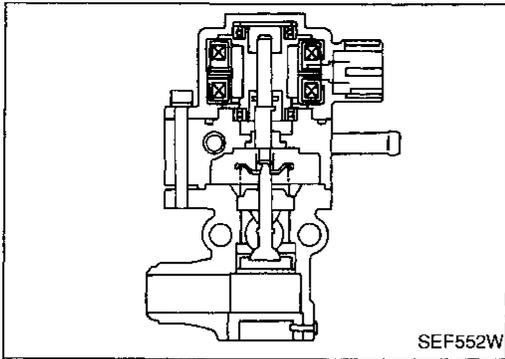
TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

COMPONENT DESCRIPTION

EGR volume control valve

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. 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.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

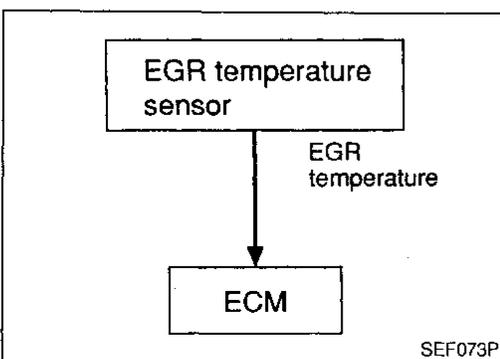
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EGR TEMP SEN	● Engine: After warming up	Less than 4.5V
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle 0 step
	Revvng engine up to 3,000 rpm quickly	10 - 55 step

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
43	B	Sensor's ground	Engine is running. (Warm-up condition) └ Idle speed	0V
63	L/OR	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V
			Engine is running. (Warm-up condition) └ EGR system is operating.	0 - 1V
35 36	P G	EGR volume control valve	Engine is running. (Warm-up condition) └ Idle speed	0 - 1V
40 41	G/B L/R	EGR volume control valve	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)



ON BOARD DIAGNOSIS LOGIC

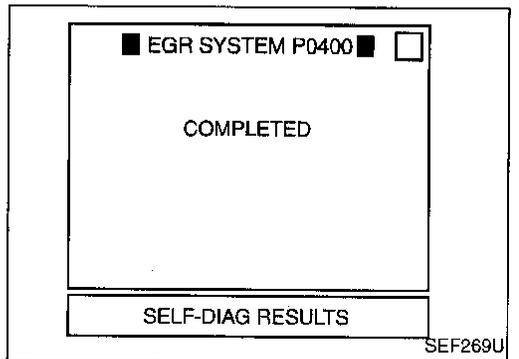
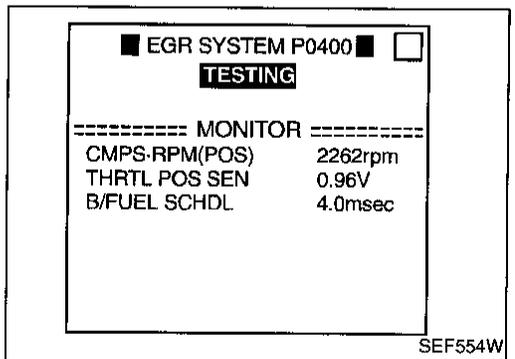
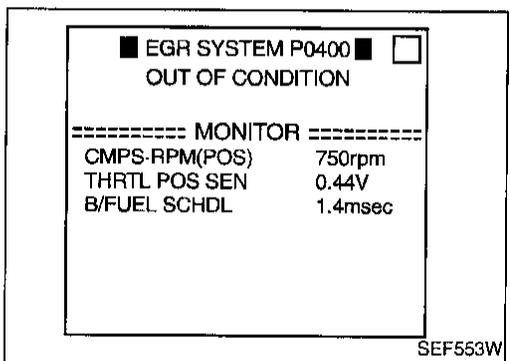
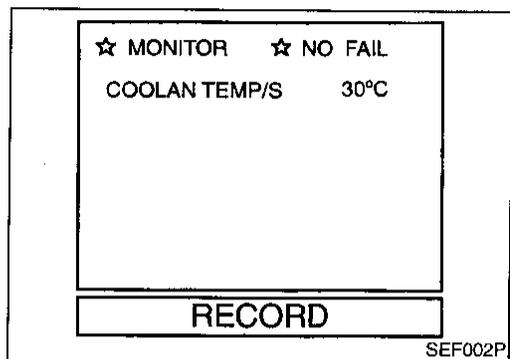
If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.

If EGR temperature sensor detects EGR flow under the condition that does not call 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"> Harness or connectors (The valve circuit is open or shorted.) EGR valve stuck closed Dead (Weak) battery EGR passage clogged EGR temperature sensor and circuit Exhaust gas leak



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 10 seconds before conducting the next test.
- During the test, P0400 will not be stored in ECM even though "NG" is displayed on the CONSULT screen.

TESTING CONDITION:

- Before performing the following procedure, confirm battery voltage is more than 10V at idle, then stop engine immediately.
- It will be better to perform the test at a temperature above 5°C (41°F).



- Turn ignition switch "OFF" and wait at least 10 seconds.
- 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.

COOLAN 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.

- Start engine and let it idle monitoring the value of "COOLAN TEMP/S". When the engine coolant temperature reaches 60°C (140°F), immediately go to the next step.
- Select "EGR SYSTEM P0400" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- 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.
- 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.)

CKPS-RPM (POS): 1,800 - 2,800 rpm

TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

Vehicle speed: Suitable speed

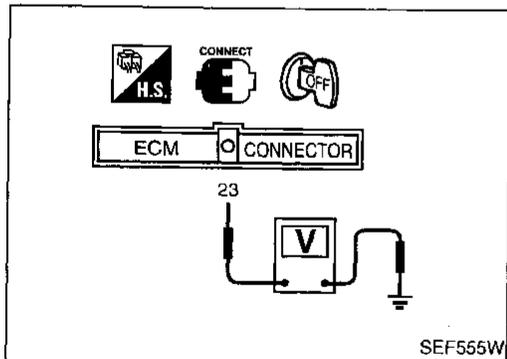
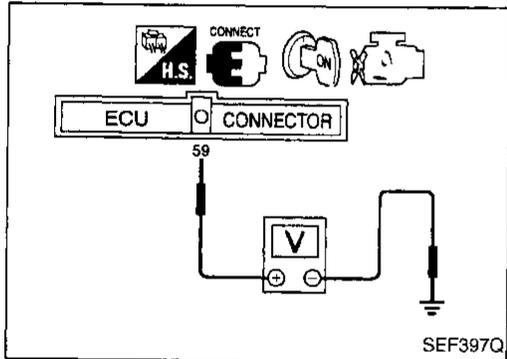
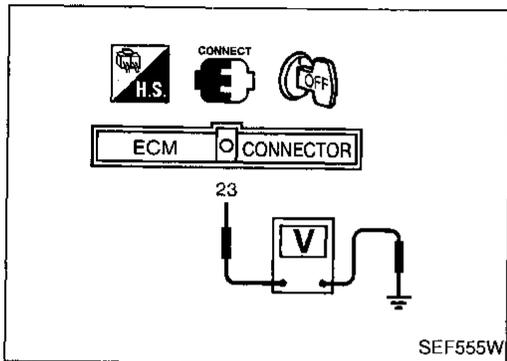
B/FUEL SCHDL: More than 3.5 msec

THRTL POS SEN: 0.65 - 1.08V

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-322.



OR



- 1) Turn ignition switch "OFF" and wait at least 10 seconds.
- 2) Turn ignition switch "ON".
- 3) Check engine coolant temperature in MODE 1 with GST.

Engine coolant temperature: 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.

- 4) Start engine and let it idle monitoring the value of "COOLAN TEMP/S". When the engine coolant temperature reaches 60°C (140°F), immediately go to the next step.
- 5) Maintain the following conditions for at least 1 minute.

Engine speed: 1,800 - 2,800 rpm

Vehicle speed: Suitable speed

Voltage between ECM terminal 23 and ground: 0.65 - 1.08V

Selector lever: Suitable position

- 6) Stop vehicle.
- 7) Turn ignition switch "OFF" and wait at least 10 seconds, then turn "ON".
- 8) Repeat step 3 to 5.
- 9) Select "MODE 3" with GST.
- 10) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-322.

- 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.

OR



- 1) Turn ignition switch "OFF" and wait at least 10 seconds.
- 2) Turn ignition switch "ON".
- 3) Check voltage between ECM terminal 59 (engine coolant temperature sensor) and ground.

Voltage: More than 2.7V

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.

TROUBLE DIAGNOSIS FOR DTC P0400

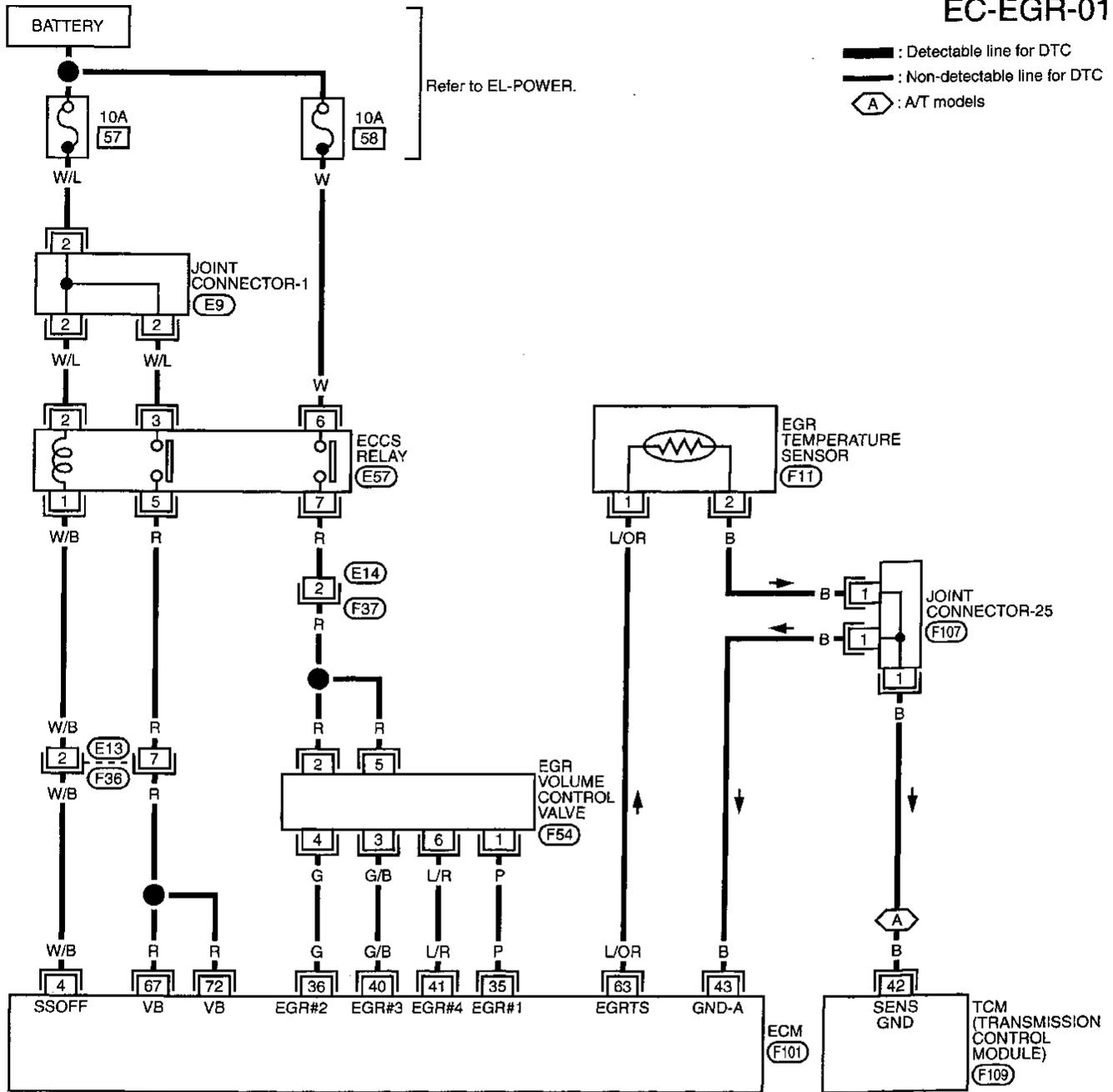
EGR Function (Close) (Cont'd)

- 4) Start engine and let it idle monitoring the voltage between ECM terminal ⑤⑨ (engine coolant temperature sensor) and ground. When the voltage becomes less than 1.8V, immediately go to the next step.
- 5) Maintain the following conditions for at least 1 minute.
Engine speed: 1,800 - 2,800 rpm
Vehicle speed: Suitable speed
Voltage between ECM terminal ②③ and ground: 0.65 - 1.08V
Selector lever: Suitable position
- 6) Stop vehicle.
- 7) Turn ignition switch "OFF" and wait at least 10 seconds, 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-322.

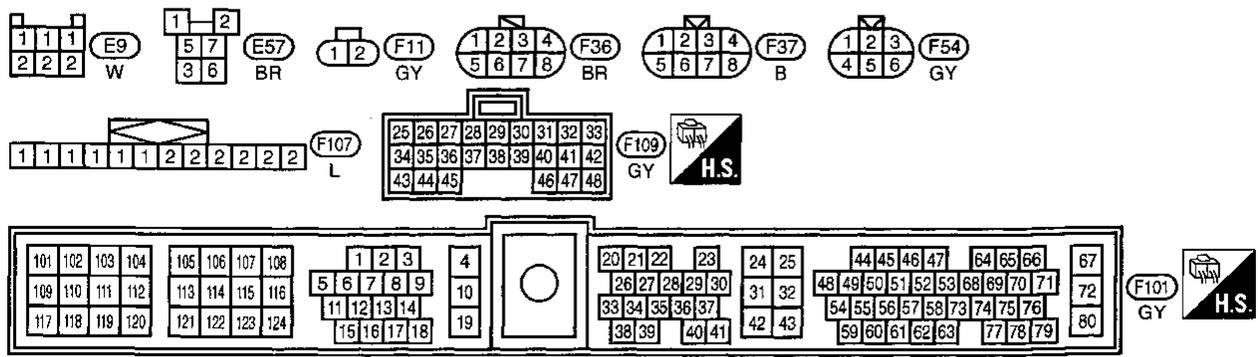
TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

EC-EGR-01



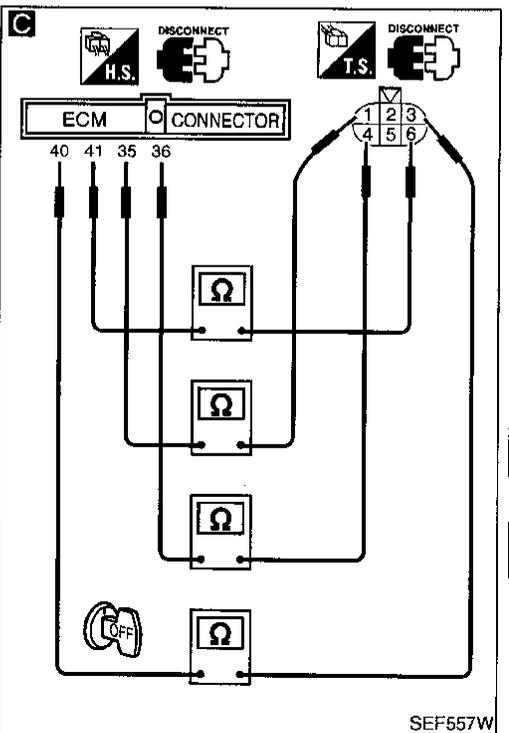
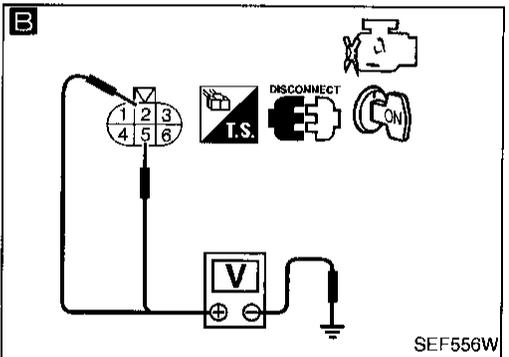
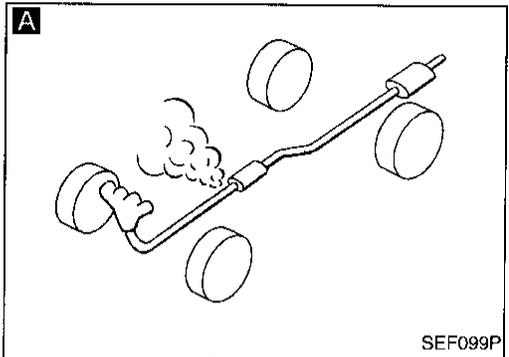
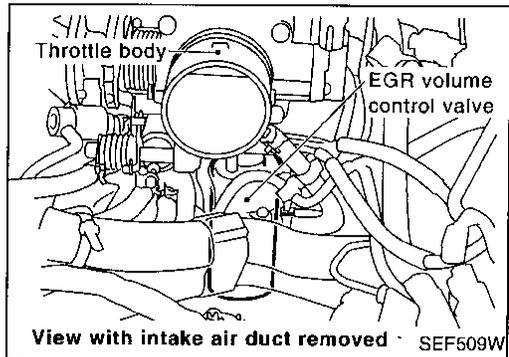
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TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A
CHECK EXHAUST SYSTEM.
Check exhaust pipes and muffler for leaks.

NG → Repair or replace exhaust system.

B
CHECK POWER SUPPLY.
1. Disconnect EGR volume control valve harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminals ②, ⑤ and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.
• Harness or connectors (E14), (F37)
• Harness for open or short between EGR volume control valve and ECCS relay
If NG, repair harness or connectors.

C
CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ③ and terminal ①, ECM terminal ⑤ and terminal ④, ECM terminal ⑥ and terminal ③, ECM terminal ④ and terminal ⑥.
Continuity should exist.
If OK, check harness for short to ground and short to power.

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

CHECK EGR PASSAGE.
Check EGR passage for clogging and cracks.

NG → Repair or replace EGR passage.

CHECK COMPONENT AND CIRCUIT.
(EGR temperature sensor)
Refer to "TROUBLE DIAGNOSIS FOR DTC P1401", EC-435.

NG → Replace EGR temperature sensor.

CHECK COMPONENT
(EGR volume control valve).
Refer to "COMPONENT INSPECTION", EC-324.

NG → Replace EGR volume control valve.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

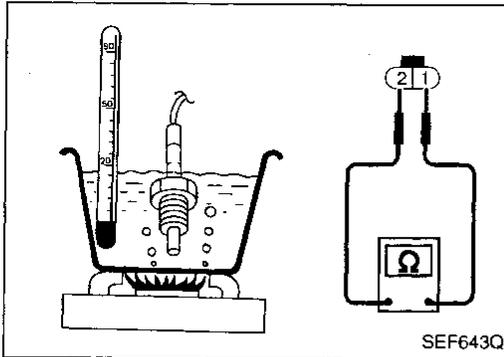
TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

COMPONENT INSPECTION

EGR temperature sensor

Check resistance change and resistance value.

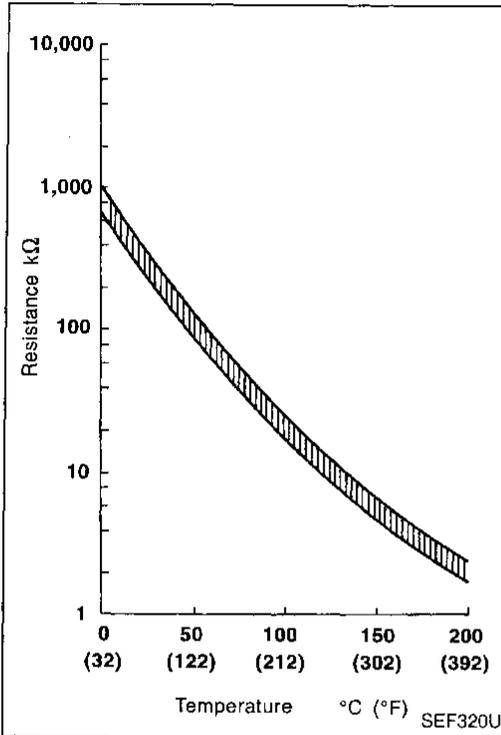


SEF643Q

<Reference data>

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.



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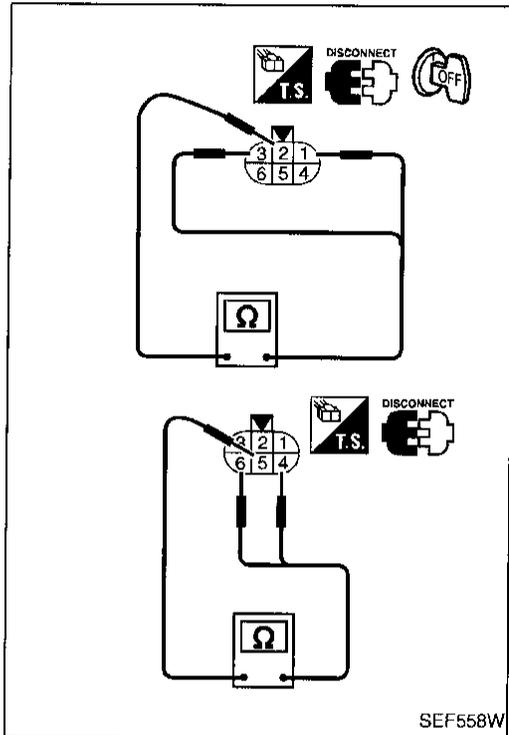
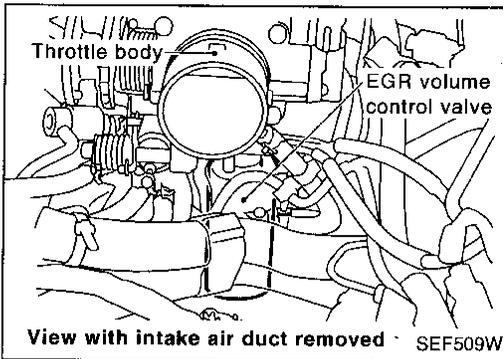
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TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

EGR volume control valve



1. Disconnect EGR 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:

20.9 - 23.1Ω [At 20°C (68°F)]

3. Reconnect EGR volume control valve harness connector.
4. Remove air duct.
5. Remove EGR volume control valve from intake manifold collector.
(The EGR volume control valve harness connector should remain connected.)
6. Turn ignition switch "ON".
7. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.

If NG, replace the EGR volume control valve.

OR

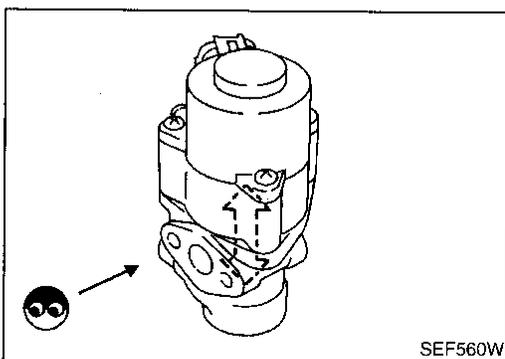
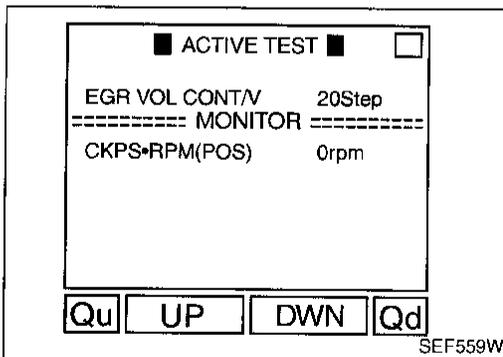


1. Disconnect EGR volume control valve harness connector.
2. Check resistance between the following terminals.
terminal ② and terminals ①, ③
terminal ⑤ and terminals ④, ⑥

Resistance:

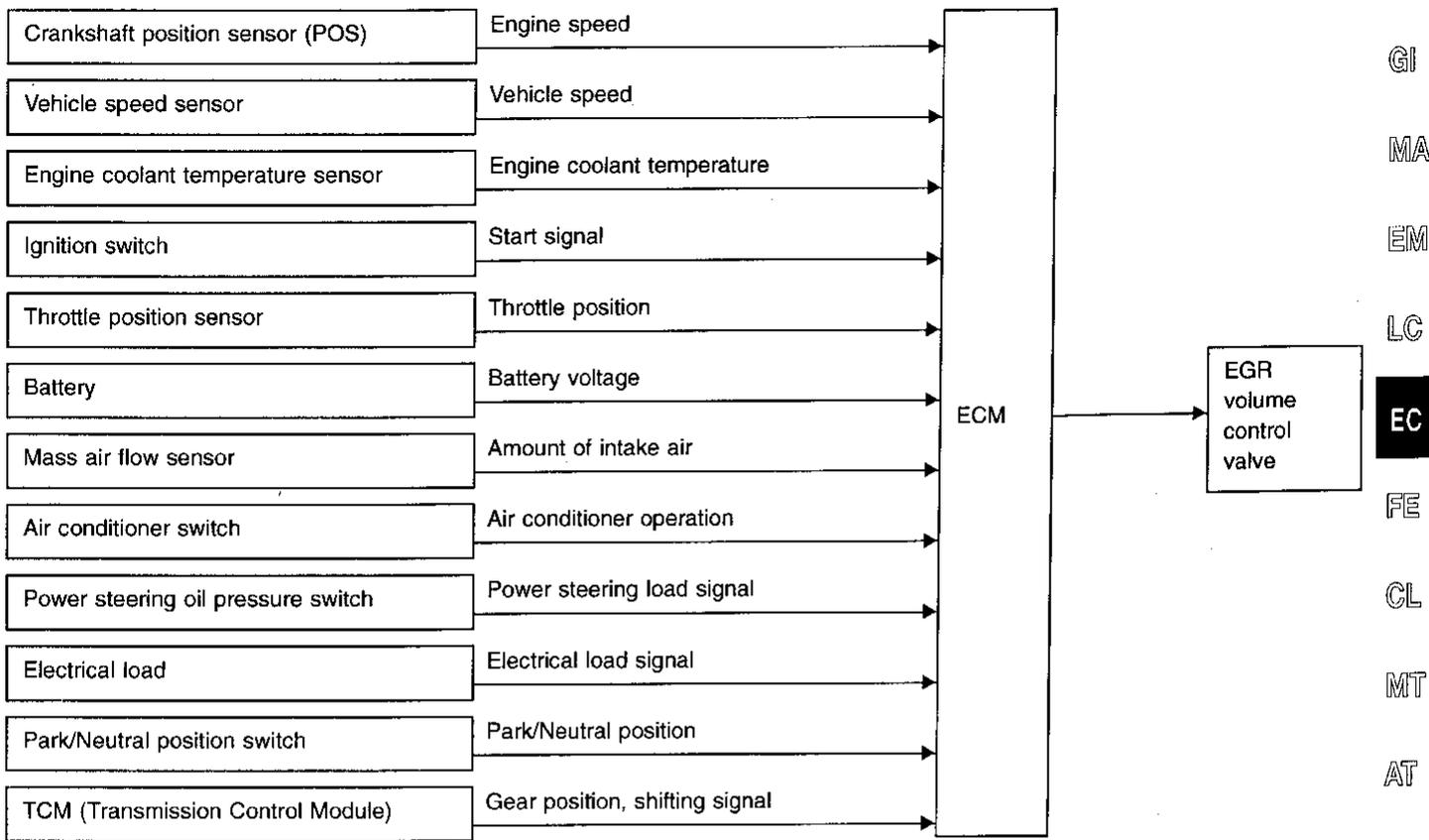
20.9 - 23.1Ω [At 20°C (68°F)]

3. Turn ignition switch "ON" and "OFF". Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
If NG, replace the EGR volume control valve.



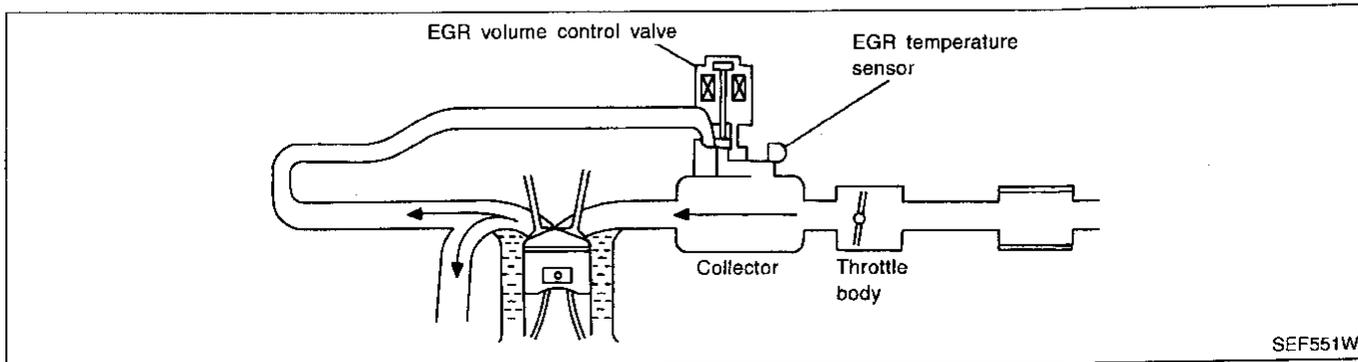
EGR Volume Control Valve (Circuit)

SYSTEM DESCRIPTION



This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR 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. The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle
- Low battery voltage



SEF551W

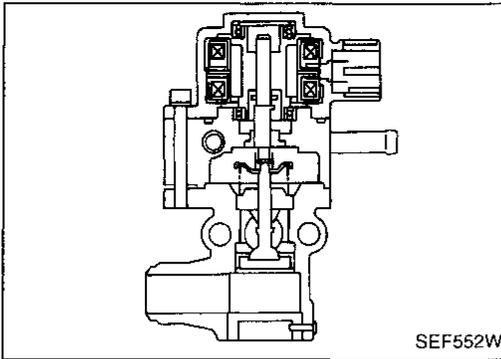
TROUBLE DIAGNOSIS FOR DTC P0403

EGR Volume Control Valve (Circuit) (Cont'd)

COMPONENT DESCRIPTION

EGR volume control valve

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. 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.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EGR VOL CON/V	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load 	Idle 0 step
	Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
35 36	P G	EGR volume control valve	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) └ Idle speed	0 - 1V
40 41	G/B L/R	EGR volume control valve	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)

FAIL-SAFE MODE

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*1		
P0403	0515	EGR volume control valve circuit	Engine speed will not rise more than 2,800 rpm due to the fuel cut.

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0403 0515	<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 EGR volume control valve circuit is open or shorted.) ● EGR volume control valve

TROUBLE DIAGNOSIS FOR DTC P0403

EGR Volume Control Valve (Circuit) (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 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CKPS•RPM(POS)	725rpm	
COOLAN TEMP/S	90°C	
EGR VOL CON/V	0step	
RECORD		

SEF561W



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Rev engine from idle to 2,000 rpm 10 times.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-329.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Rev engine from idle to 2,000 rpm 10 times.
- 3) Select "MODE 3" with GST.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-329.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Rev engine from idle to 2,000 rpm 10 times.
- 3) Turn ignition switch "OFF", wait at least 10 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-329.

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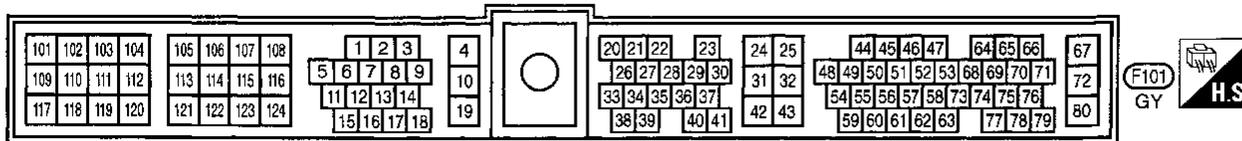
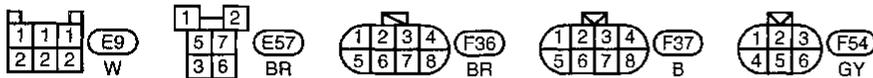
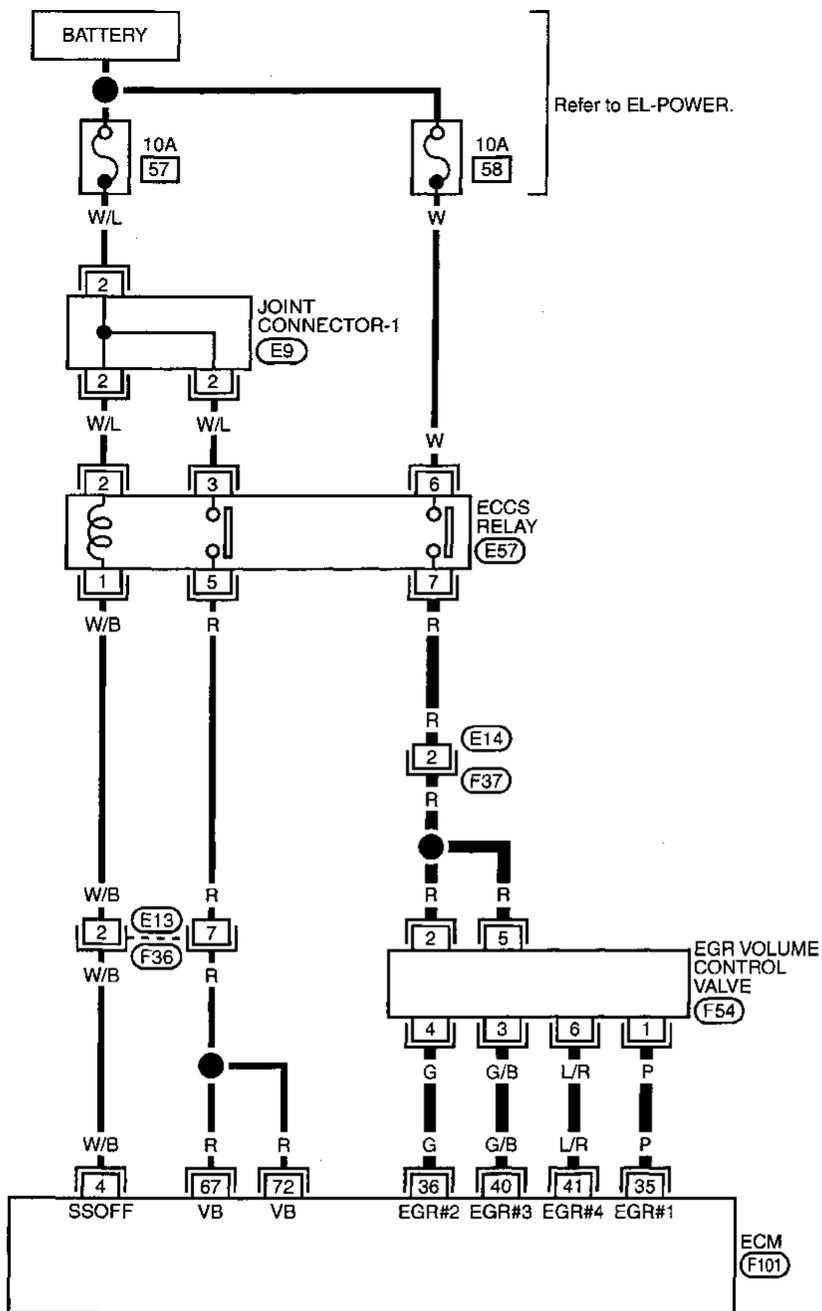
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TROUBLE DIAGNOSIS FOR DTC P0403

EGR Volume Control Valve (Circuit) (Cont'd)

EC-EGVC/V-01

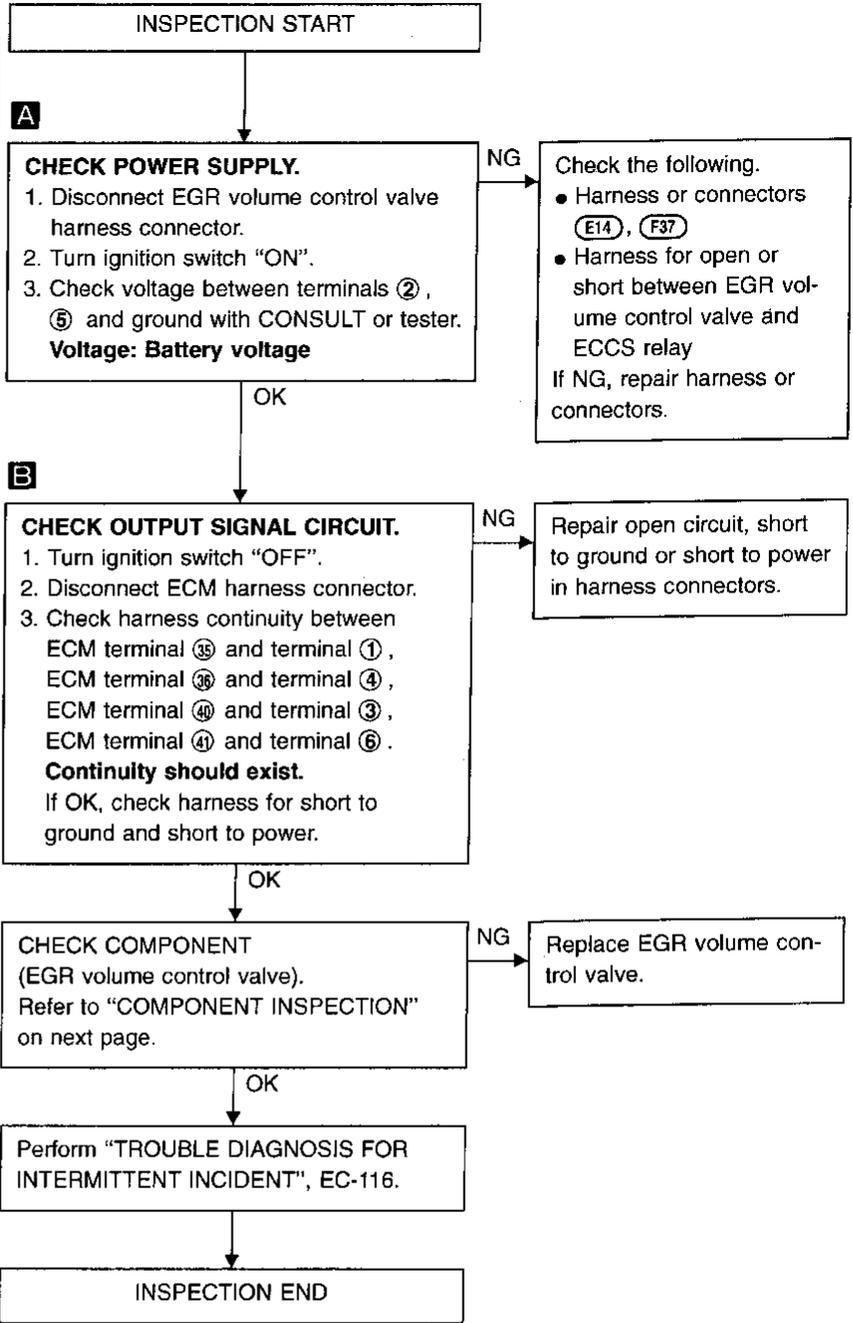
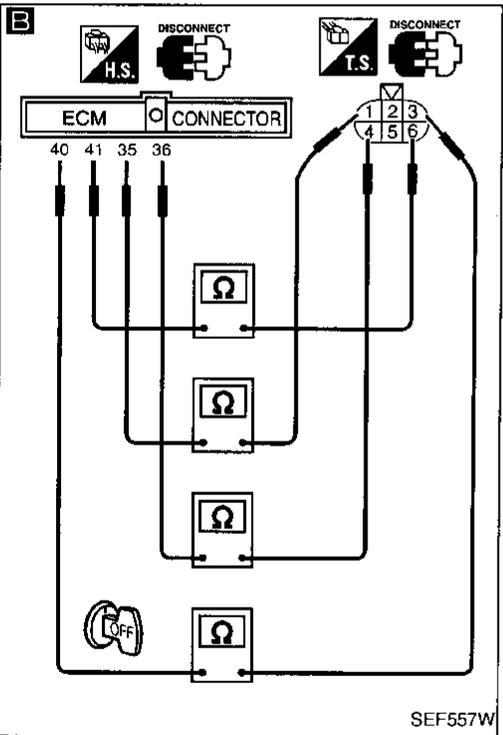
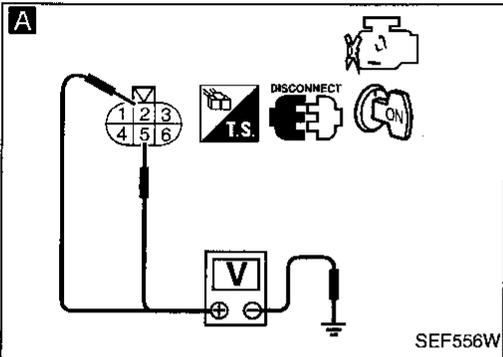
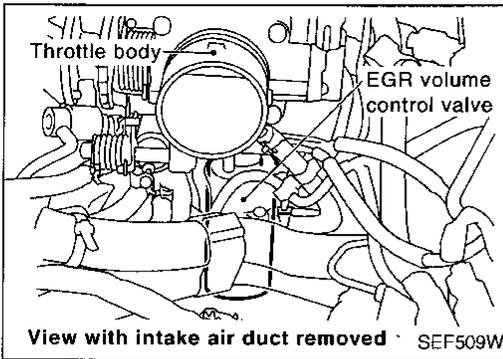
— : Detectable line for DTC
 — : Non-detectable line for DTC



TROUBLE DIAGNOSIS FOR DTC P0403

EGR Volume Control Valve (Circuit) (Cont'd)

DIAGNOSTIC PROCEDURE

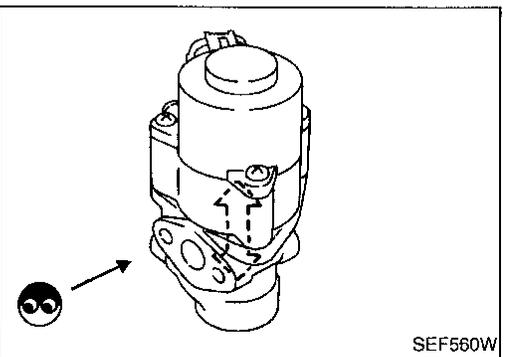
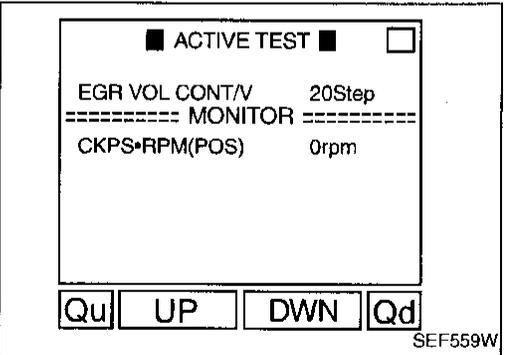
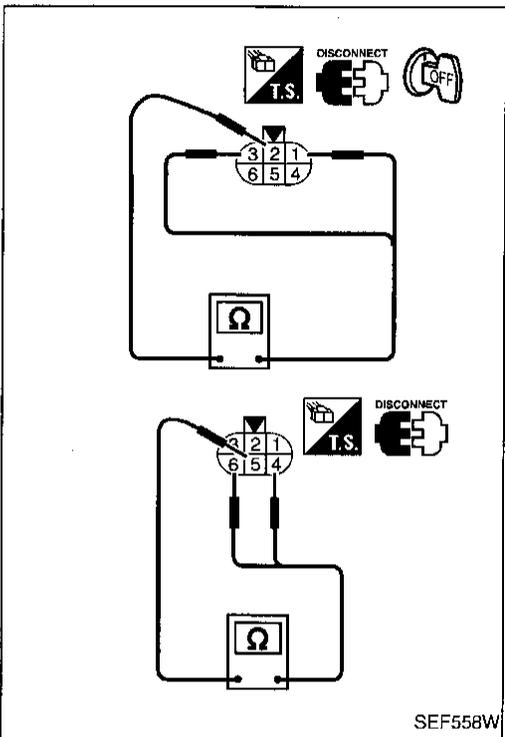
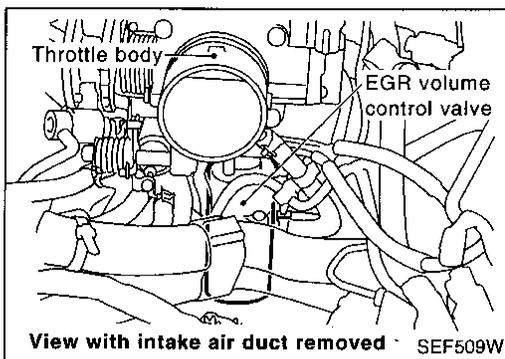


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TROUBLE DIAGNOSIS FOR DTC P0403

EGR Volume Control Valve (Circuit) (Cont'd) COMPONENT INSPECTION

EGR volume control valve

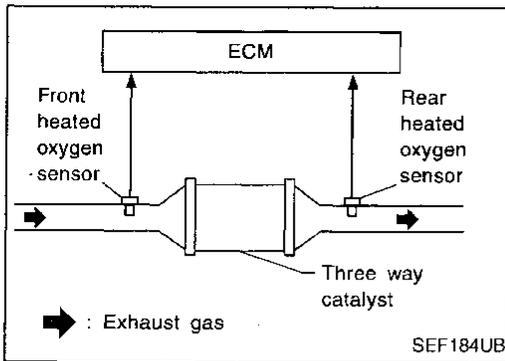


1. Disconnect EGR volume control valve harness connector.
2. Check resistance between the following terminals.
terminal ② and terminals ①, ③
terminal ⑤ and terminals ④, ⑥
Resistance:
20.9 - 23.1Ω [At 20°C (68°F)]
3. Reconnect EGR volume control valve harness connector.
4. Remove air duct.
5. Remove EGR volume control valve from intake manifold collector.
(The EGR volume control valve harness connector should remain connected.)
6. Turn ignition switch "ON".
7. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.
If NG, replace the EGR volume control valve.

OR

1. Disconnect EGR 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:
20.9 - 23.1Ω [At 20°C (68°F)]
3. Turn ignition switch "ON" and "OFF". Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
If NG, replace the EGR volume control valve.

TROUBLE DIAGNOSIS FOR DTC P0420 (-B1), P0430 (-B2) FOR CALIFORNIA



Three Way Catalyst Function (P0420: Right bank), (P0430: Left bank)

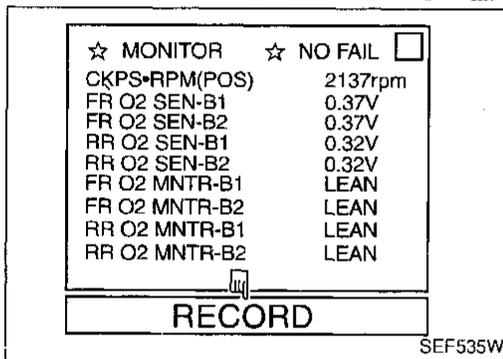
ON BOARD DIAGNOSIS LOGIC

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 (Right 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 (Left 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 10 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 =

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

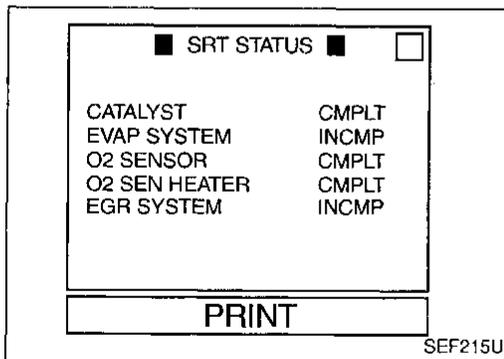
This ratio should be less than 0.75.

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

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-333.

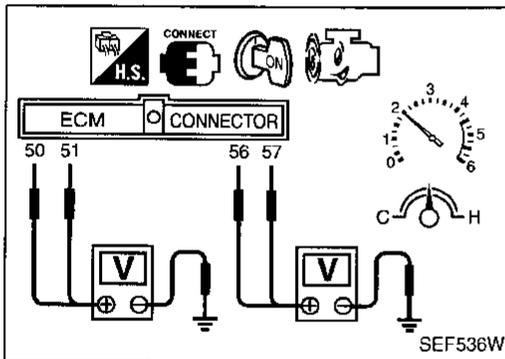
If the result is OK, go to following step.



TROUBLE DIAGNOSIS FOR DTC P0420 (-B1), P0430 (-B2) FOR CALIFORNIA

Three Way Catalyst Function (P0420: Right bank), (P0430: Left 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 the following for at least 10 consecutive minutes.
(Drive the vehicle in an area where vehicle speed and accelerator pressure can be held steady and constant.)
M/T: 5th position
A/T: D position ("OD" ON)
If the result is NG, go to "DIAGNOSTIC PROCEDURE" on next page.
- 8) Select "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT.
- 9) Verify that "CATALYST" is "CMPLT".
If not "CMPLT", repeat the test from step 6).



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 ⑤⑩ (RH), ⑤⑪ (LH) (sensor signal front) and ground. ⑤⑬ (RH), ⑤⑭ (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 terminal ⑤⑬ and ground is much less than that of ECM terminal ⑤⑩ and ground (right bank). Or ⑤⑭ and ground is much less than that of the terminal ⑤⑪ 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. Go to "DIAGNOSTIC PROCEDURE" on next page.

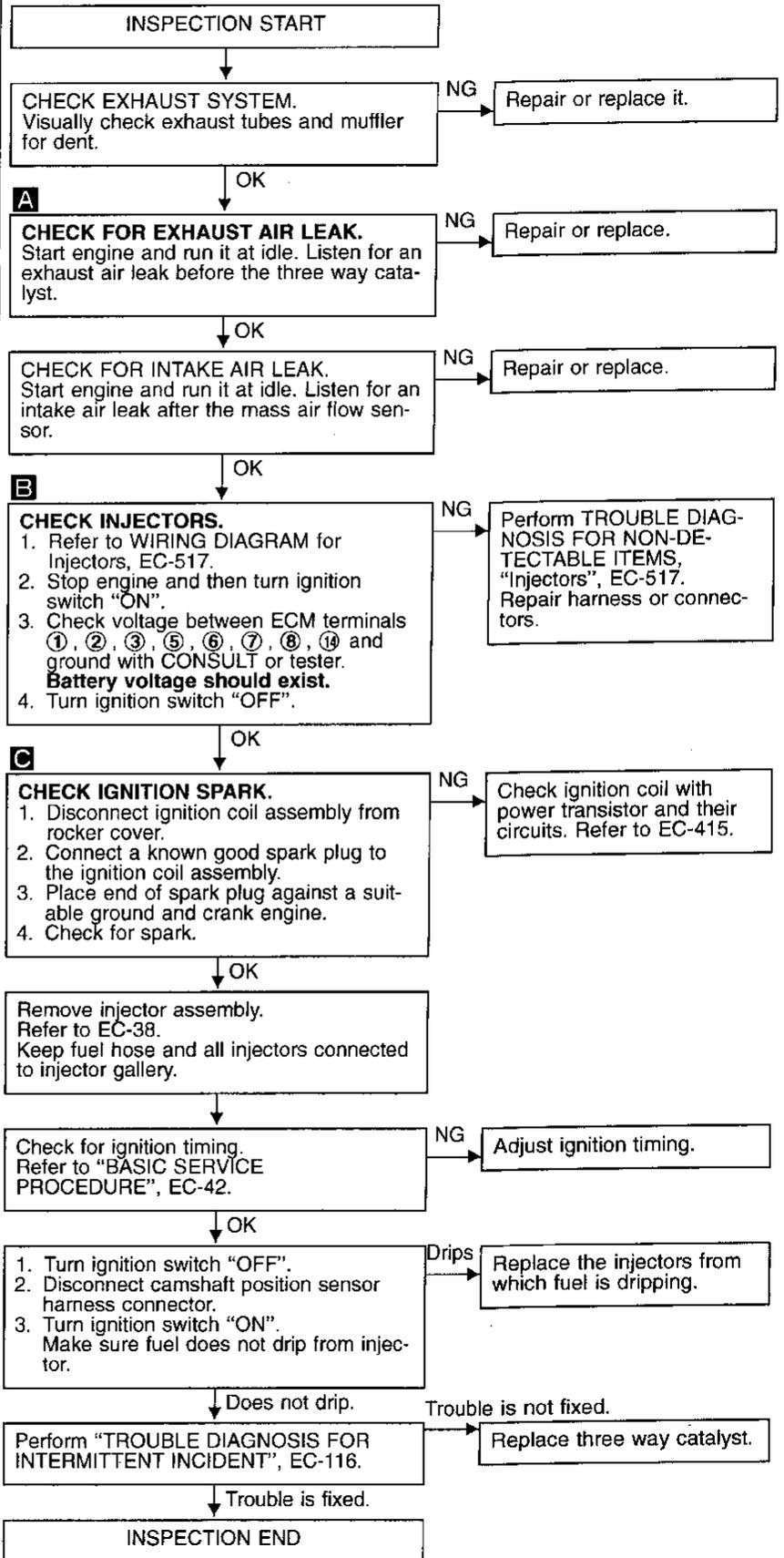
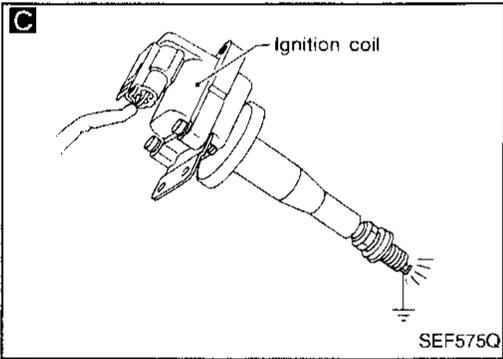
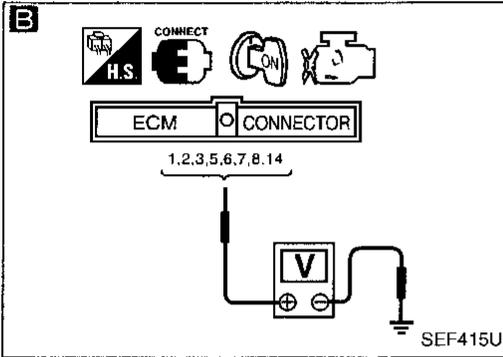
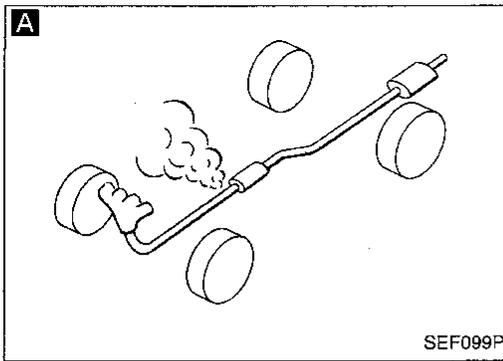
NOTE:

If the voltage at terminal ⑤⑩ or ⑤⑪ does not switch periodically more than 5 times within 10 seconds at step 4, perform TROUBLE DIAGNOSIS FOR DTC P0130 or P0150 first, EC-166.

TROUBLE DIAGNOSIS FOR DTC P0420 (-B1), P0430 (-B2) FOR CALIFORNIA

Three Way Catalyst Function (P0420: Right bank), (P0430: Left bank) (Cont'd)

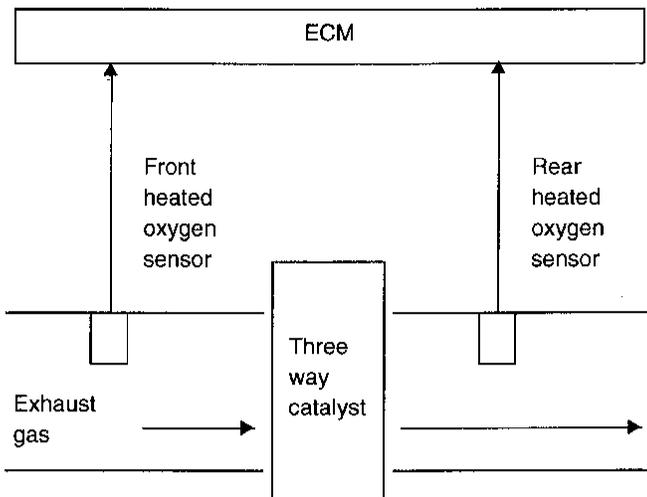
DIAGNOSTIC PROCEDURE



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Three Way Catalyst Function

ON BOARD DIAGNOSIS LOGIC



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

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

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

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0420 0702	<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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

- Always drive vehicle at a safe speed.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 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", "FR O2 SEN-B2", "RR O2 SENSOR", "FR O2 MNTR-B2", "FR O2 MNTR-B1", "RR O2 MNTR" in "DATA MONITOR" mode with CONSULT.
- 4) Touch "RECORD" on CONSULT screen with engine speed held at 2,000 rpm constant under no load.
- 5) Make sure that the switching frequency between "RICH" and "LEAN" of "RR O2 SENSOR" is very less than that of "FR O2 SEN-B1" or "FR O2 SEN-B2" as shown below.

Switching frequency ratio =

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

This ratio should be less than 0.75.

If the ratio is greater than 0.75, the three way catalyst EC-334

☆ MONITOR ☆ NO FAIL

CKPS•RPM (POS)	2137rpm
FR O2 SEN-B2	0.37V
FR O2 MNTR-B2	LEAN
FR O2 SEN-B1	0.37V
FR O2 MNTR-B1	LEAN
RR O2 SENSOR	1.30V
RR O2 MNTR	RICH

RECORD

SEF631P

■ SRT STATUS

CATALYST	INCMP
EVAP SYSTEM	INCMP
O2 SENSOR	INCMP
O2 SEN HEATER	CMLPT
EGR SYSTEM	INCMP

PRINT

SEF803U

TROUBLE DIAGNOSIS FOR DTC P0420 EXCEPT FOR CALIFORNIA

Three Way Catalyst Function (Cont'd)

is not operating properly.

If the "FR O2 MNTR" 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-336.

If the result is OK, go to following step.

- 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 the following for at least 10 consecutive minutes.

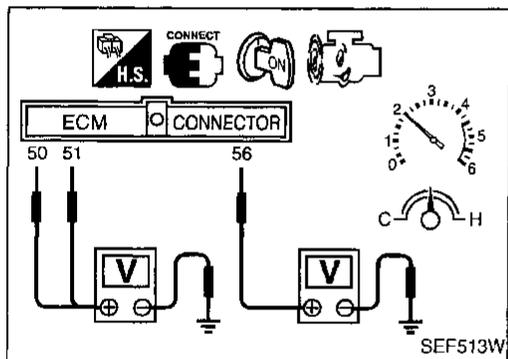
(Drive the vehicle in an area where vehicle speed and accelerator pressure can be held steady and constant.)

M/T: 5th position

A/T: D position ("OD" ON)

If the result is NG, go to "DIAGNOSTIC PROCEDURE" on next page.

- 8) Select "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT.
- 9) Verify that "CATALYST" is "CMPLT".
If not "CMPLT", repeat the test from step 6).



OR OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the three way catalyst.

During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and 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 50 [front heated oxygen sensor (right bank) signal], 51 [front heated oxygen sensor (left bank) signal] and ground, and ECM terminals 56 (rear heated oxygen sensor signal) 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 terminal 56 and ground is very less than that of ECM terminal 50 and ground, or 51 and ground.

Switching frequency ratio =

Rear heated oxygen sensor voltage switching frequency

Front heated oxygen sensor voltage switching frequency

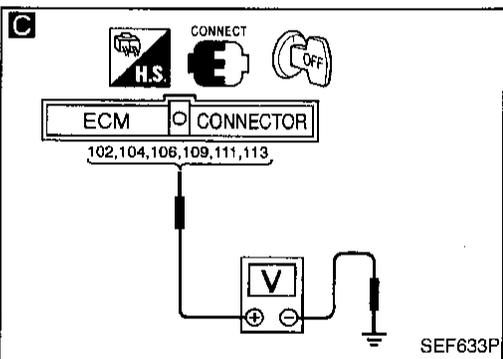
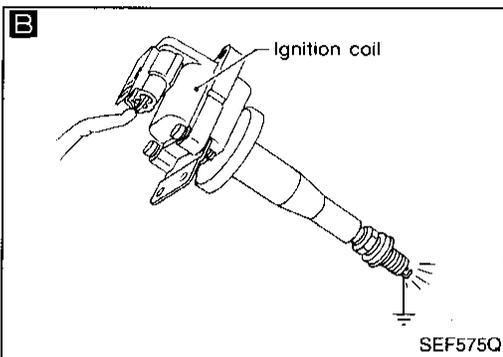
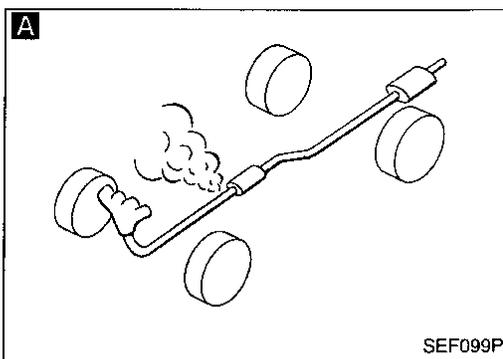
This ratio should be less than 0.75.

If the ratio is greater than 0.75, it means three way catalyst does not operate properly. Go to "DIAGNOSTIC PROCEDURE" on next page.

Note: If the voltage at terminal 50 or 51 does not switch periodically more than 5 times within 10 seconds at step 4, perform TROUBLE DIAGNOSIS FOR DTC P0130 or P0150 (0503 or 0303) first. (See page EC-196.)

Three Way Catalyst Function (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

NG → Repair or replace it.

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.

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

NG → Repair or replace.

Check for ignition timing.
Refer to "BASIC SERVICE PROCEDURE", EC-42.

NG → Adjust ignition timing.

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

NG → Check ignition coil with power transistors and their circuits. Refer to EC-421.

CHECK INJECTORS.
1. Refer to WIRING DIAGRAM for Injectors. (Refer to EC-517.)
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between each ECM terminal (102), (104), (106), (109), (111) or (113) and ground with CONSULT or tester.
Battery voltage should exist.

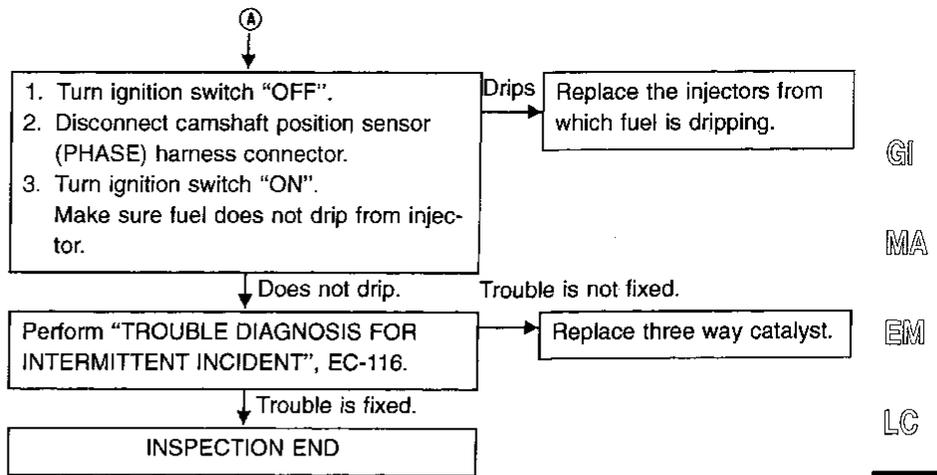
NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors". (See page EC-517.) Repair harness or connectors.

1. Turn ignition switch "OFF".
2. Remove injector assembly. (See page EC-38.)
Keep fuel hose and all injectors connected to injector gallery.

Ⓐ

TROUBLE DIAGNOSIS FOR DTC P0420 EXCEPT FOR CALIFORNIA

Three Way Catalyst Function (Cont'd)



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TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure)

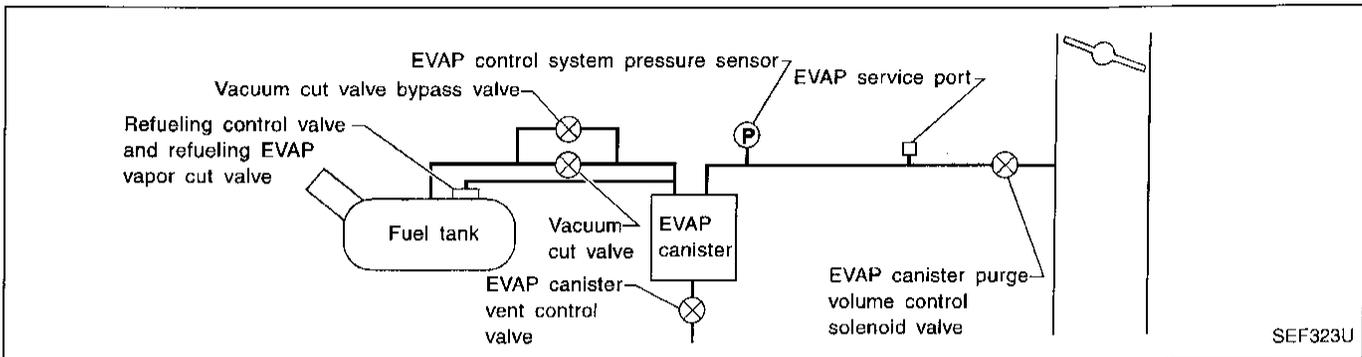
Note: If both DTC P0440 and P1448 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P1448 first.
(See EC-466.)

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 volume control solenoid 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 volume control solenoid valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve is opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid 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 volume 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 volume control solenoid valve and the circuit ● 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 ● Refueling EVAP vapor cut valve ● ORVR system leaks

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 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-477.)
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 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 flat level surface.
- Always perform test at a temperature of 0 to 30°C (32 to 86°F).
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.
- It is better that the fuel level is low.

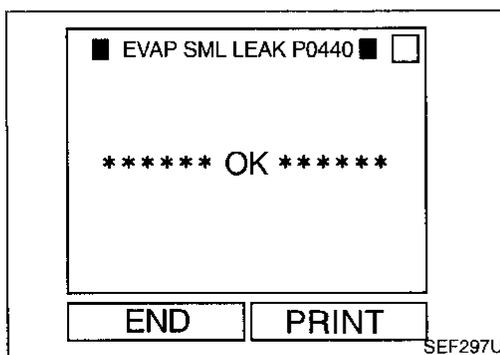
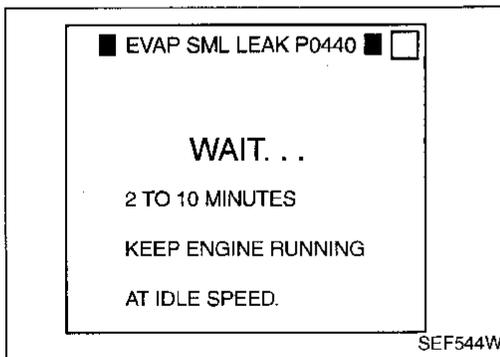
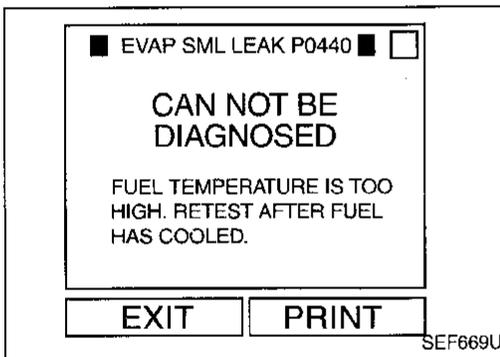
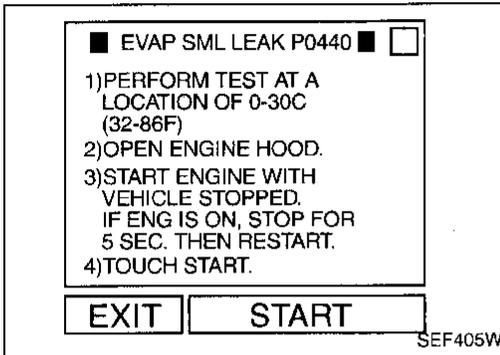
- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Make sure that the following conditions are met.
COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
INT/A TEMP SE: 0 - 60°C (32 - 140°F)
- 5) Select "EVAP SML LEAK P0440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.

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 "FUEL TEMP SEN" 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 displayed on CONSULT screen, go to "Basic Inspection", EC-92.
- The engine idle portion of this test (See illustration at left.) will take approximately 5 minutes.
- 6) Make sure that "OK" is displayed. If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-341.

NOTE:

- Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.



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TROUBLE DIAGNOSIS FOR DTC P0440

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

OR

NOTE:

Be sure to read the explanation of "Driving pattern" on EC-54 before driving vehicle.



- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-54.
- 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 10 seconds.
- 6) Start engine.

It is not necessary to cool engine down before driving.

- 7) Drive vehicle again according to the "Driving pattern", EC-54.
- 8) Stop vehicle.
- 9) Select "MODE 3" with GST.
 - If P1447 is displayed on the screen, go to "TROUBLE DIAGNOSIS FOR DTC P1447", EC-471.
 - If P0440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE", EC-341.
 - If P1440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE" in "TROUBLE DIAGNOSIS FOR DTC P1440", EC-452.
 - If P0440, P1440 and P1447 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-54 before driving vehicle.
- It is better that the fuel level is low.

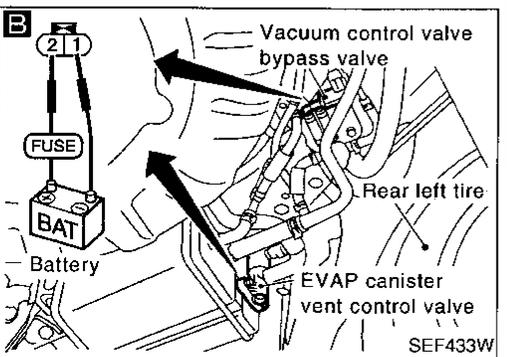
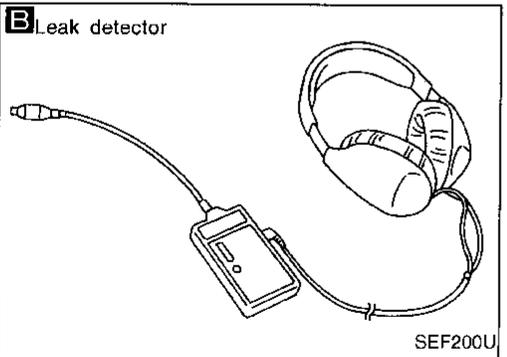
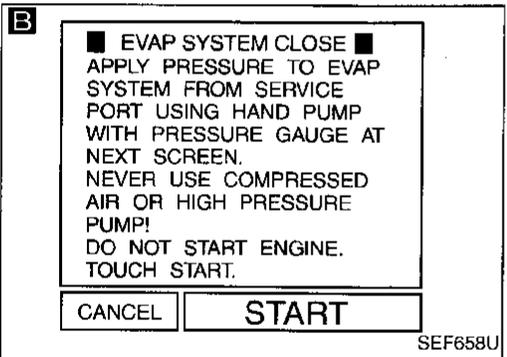
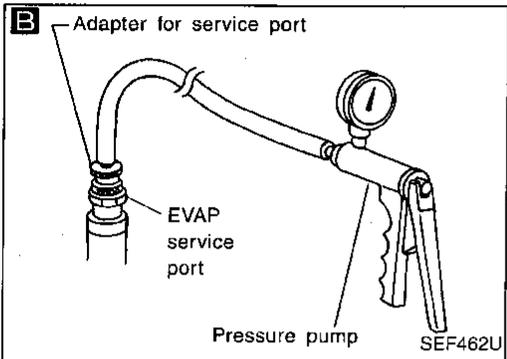
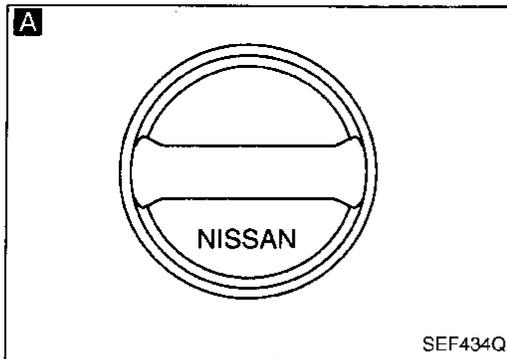


- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-54.
- 3) Stop vehicle.
- 4) Turn ignition switch "OFF" and wait at least 10 seconds.
- 5) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE" on next page.

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. 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-26.
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 filler cap is not used, replace with genuine fuel filler cap.

B
CHECK FOR EVAP LEAK.
• Never use compressed air or high pressure pump.
• Improper installation of service port may cause leaking.
• Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.
To locate EVAP leak portion, proceed with the following steps.
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 vacuum into the EVAP line until the pressure indicator reaches the middle of bar graph.
4. Using EVAP leak detector, locate the leak portion. For the leak detector, refer to instruction manual for more details. Refer to "Evaporative Emission Line Drawing", EC-29.
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 12 volts 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).
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-29.

NG
Repair or replace.

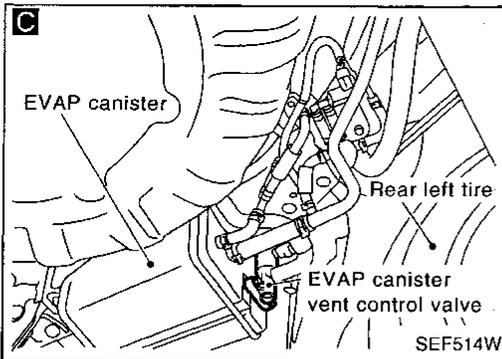
OK



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TROUBLE DIAGNOSIS FOR DTC P0440

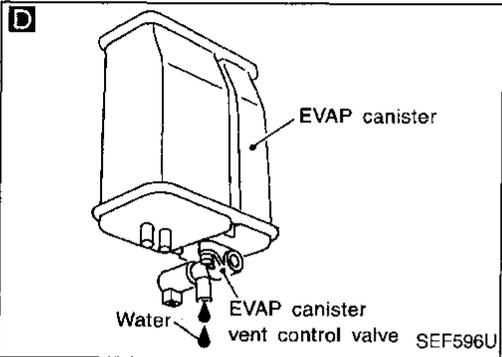
Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)



C

CHECK COMPONENT AND CIRCUIT (EVAP canister vent control valve, O-ring and water separator). Refer to "TROUBLE DIAGNOSIS FOR DTC P0446" for circuit, EC-354 and "COMPONENT INSPECTION", EC-358.

NG → Repair or replace EVAP canister vent control valve and O-ring or harness/connector.



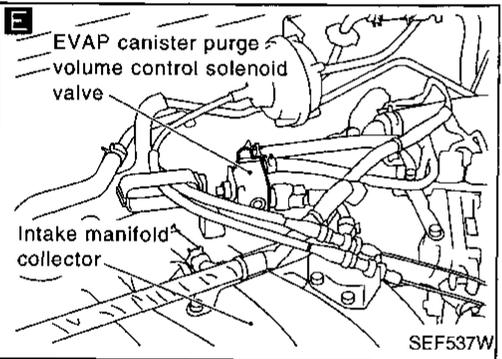
D

CHECK IF EVAP CANISTER 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-345. If NG, repair or replace hose or replace water separator.



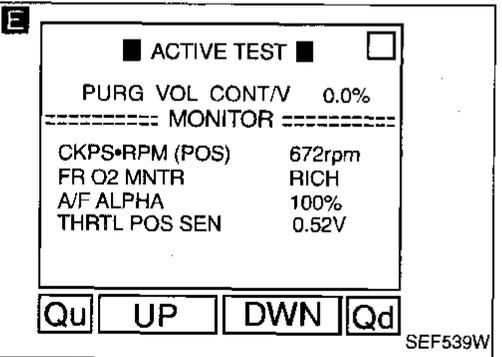
E

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

1. Disconnect EVAP hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100.0%.
5. Check EVAP hose for vacuum. **Vacuum should exist.**

NG → Check the following.

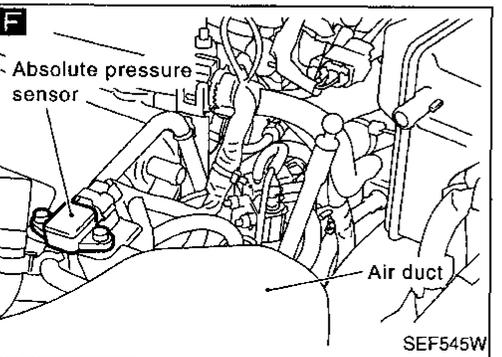
- EVAP canister purge volume control solenoid valve. Refer to "COMPONENT INSPECTION", EC-344.
- Vacuum hoses for clogging or disconnection. Refer to "Vacuum Hose Drawing", EC-18.



OR

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect EVAP hose to EVAP canister purge volume control solenoid valve.
4. Start engine and let it idle for at least 60 seconds.
5. Check EVAP hose for vacuum. **Vacuum should exist.**

OK →



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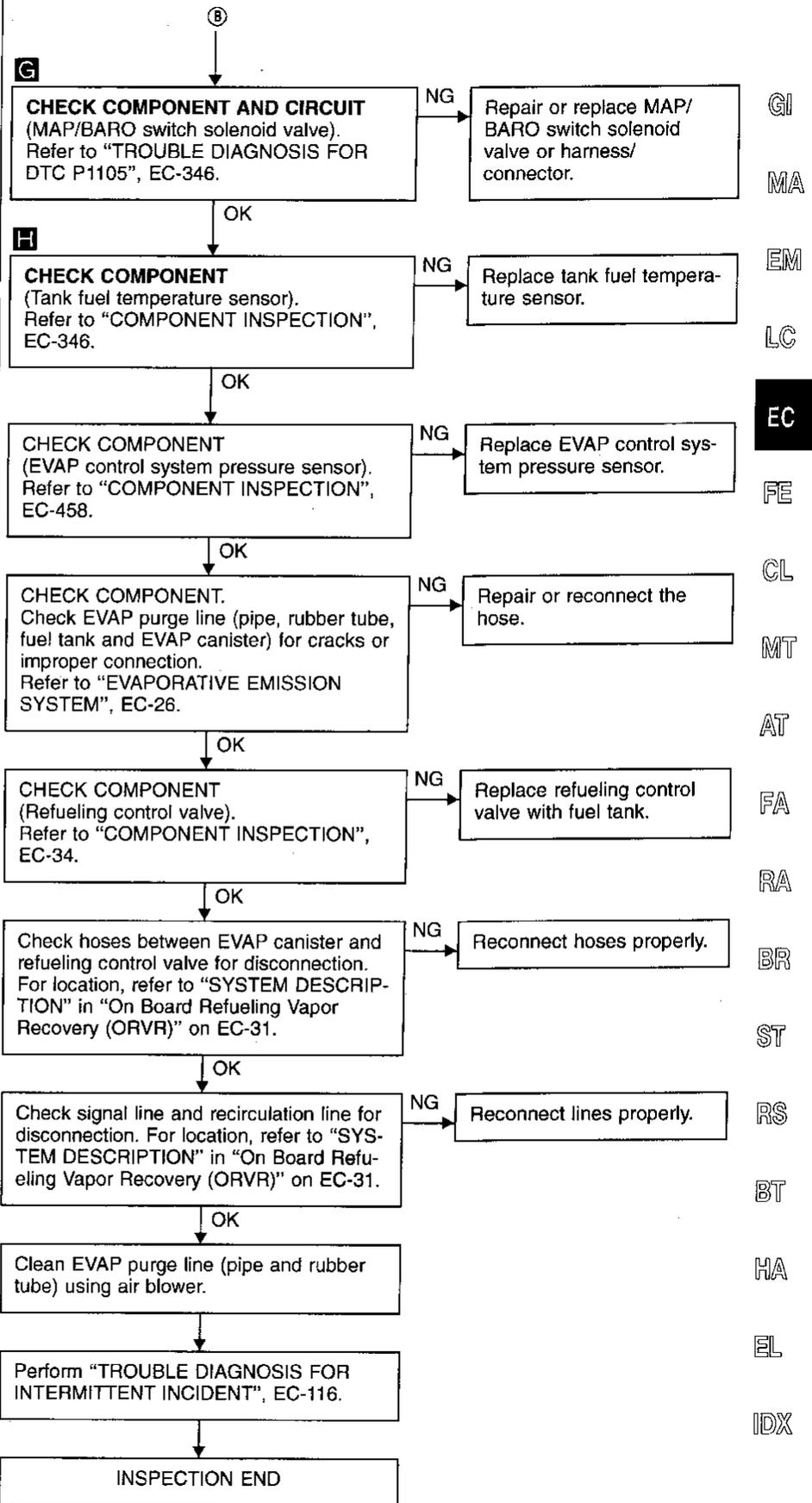
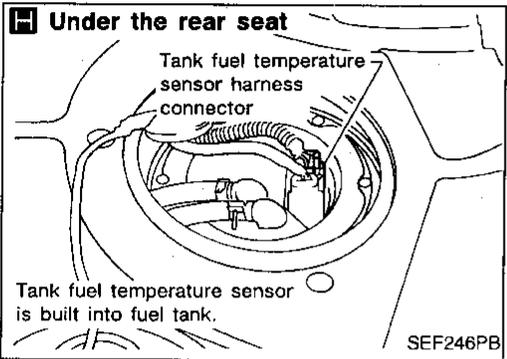
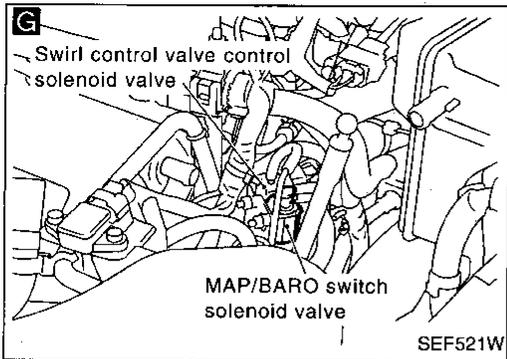
CHECK COMPONENT (Absolute pressure sensor). Refer to "COMPONENT INSPECTION", EC-345.

NG → Replace absolute pressure sensor.

OK → **B**

TROUBLE DIAGNOSIS FOR DTC P0440

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



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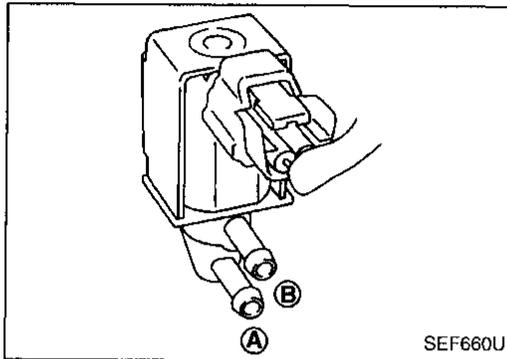
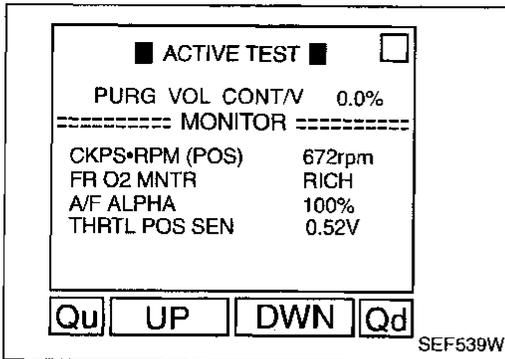
TROUBLE DIAGNOSIS FOR DTC P0440

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

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening. If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.

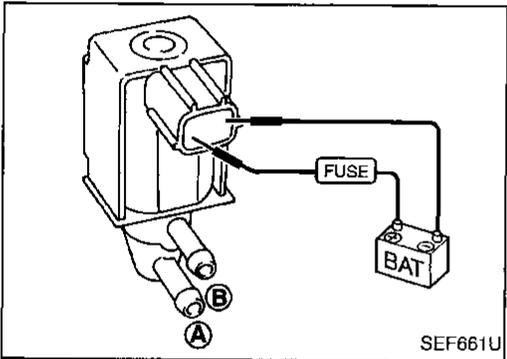


Condition PURG VOL CONT/V value	Air passage continuity between (A) and (B)
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

OR

- ⊗ Check air passage continuity.



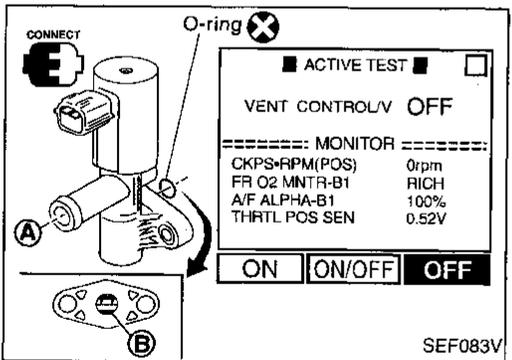
Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace solenoid valve.

EVAP canister vent control valve

Check air passage continuity.

- ⊗ Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

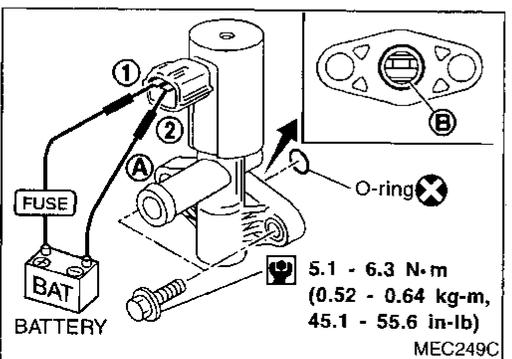
OR

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.

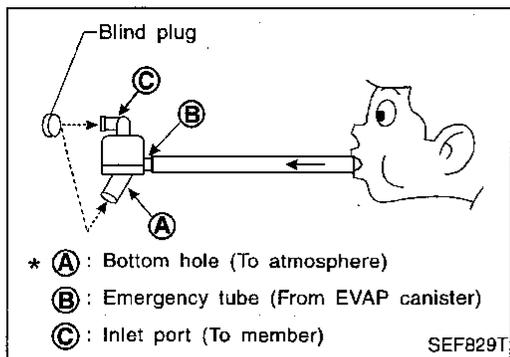
If portion (B) is rusted, replace control valve.

Make sure new O-ring is installed properly.



TROUBLE DIAGNOSIS FOR DTC P0440

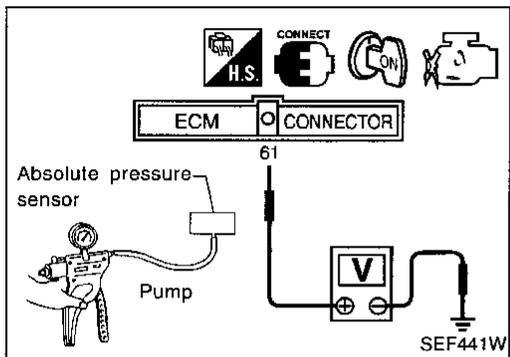
Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)



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.

- **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 ECM terminal (61) 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 vacuum below -93.3 kPa (-700 mmHg , -27.56 inHg) or pressure over 101.3 kPa (760 mmHg , 29.92 inHg).**
5. If NG, replace absolute pressure sensor.

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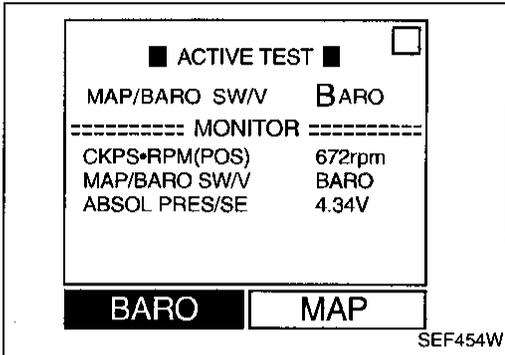
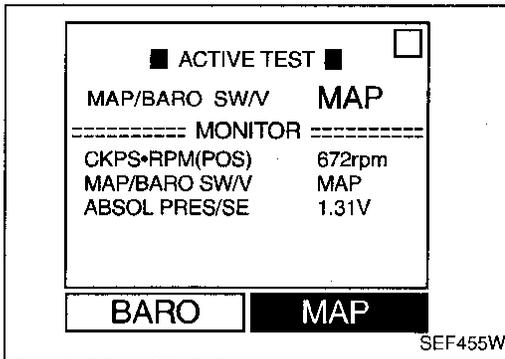
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TROUBLE DIAGNOSIS FOR DTC P0440

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

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



MAP/BARO	ABSOL PRES/SE (Voltage)
BARO	More than 2.6V
MAP	Less than the voltage at BARO

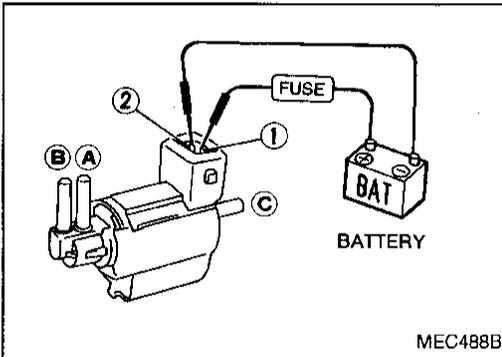
- Time for voltage to change

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.

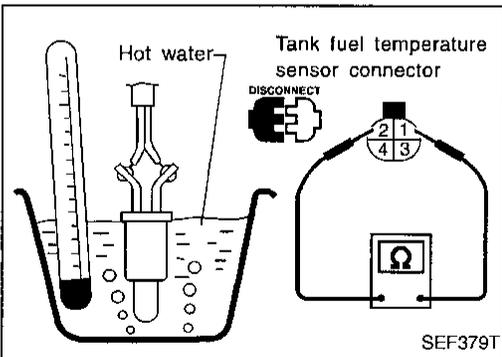


Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

3. If NG or operation takes more than 1 second, replace solenoid valve.

Tank fuel temperature sensor

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



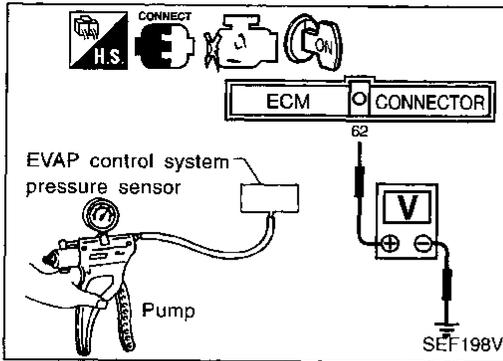
Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace tank fuel temperature sensor.

TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (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. GI
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal 62 and engine ground. MA

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

CAUTION:

- Always calibrate the vacuum pump gauge when using it. EC
- Do not apply vacuum below -20 kPa (-150 mmHg, -5.91 inHg) or pressure over 20 kPa (150 mmHg, 5.91 inHg).
- 5. If NG, replace EVAP control system pressure sensor. FE

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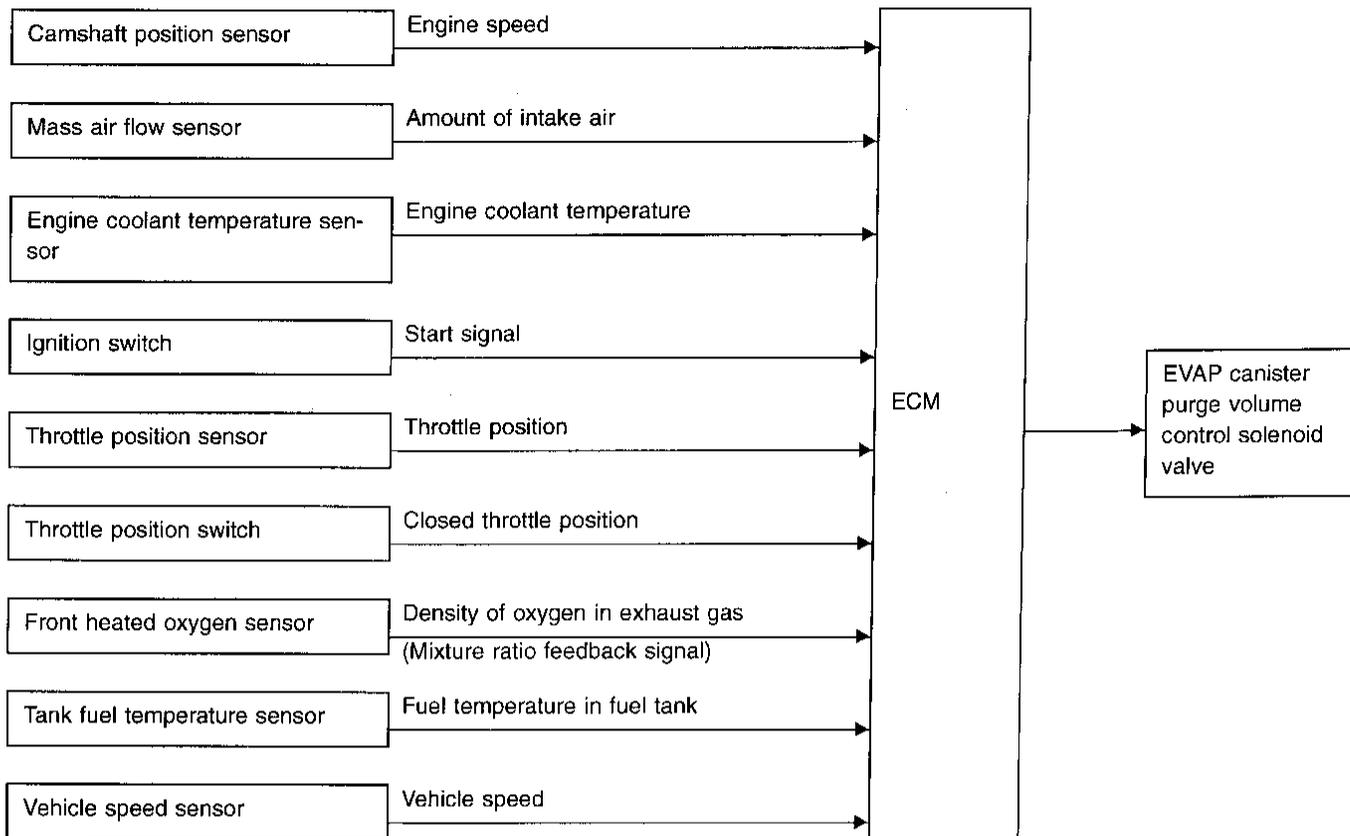
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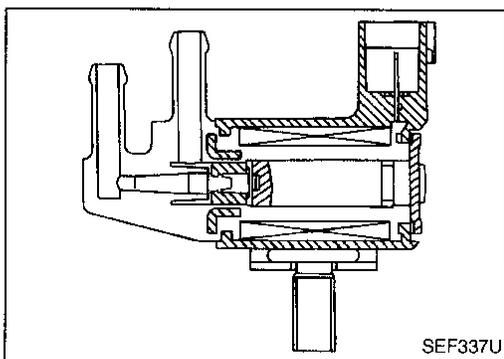
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Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit)

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 solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. 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 solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
PURG VOL C/V	Idle	0%
	<ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch "OFF" ● No-load Vehicle running (Shift lever "1") 2,000 rpm (90 seconds after starting engine)	—

ECM TERMINALS AND REFERENCE VALUE

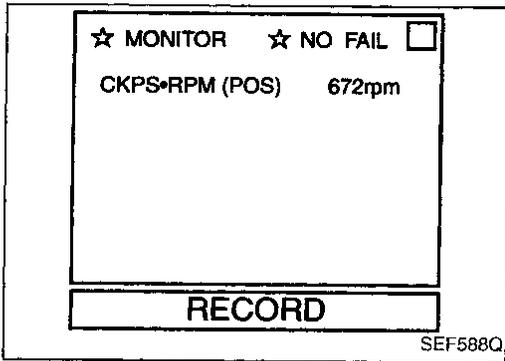
Specification data are reference values and are measured between each terminal and Ⓟ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	W/B	ECCS relay (Self-shutoff)	Engine is running.	0 - 1V
			Ignition switch "OFF"	
			└ For a few seconds after turning ignition switch "OFF"	
26	Y	EVAP canister purge volume control solenoid valve	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
			└ A few seconds passed after turning ignition switch "OFF"	
67	R	Power supply for ECM	Engine is running.	BATTERY VOLTAGE (11 - 14V)
72	R		Ignition switch "ON"	

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 solenoid valve

TROUBLE DIAGNOSIS FOR DTC P0443



Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (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 10 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 let it idle for at least 13 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-352.

OR



- 1) Start engine and let it idle for at least 13 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-352.

OR

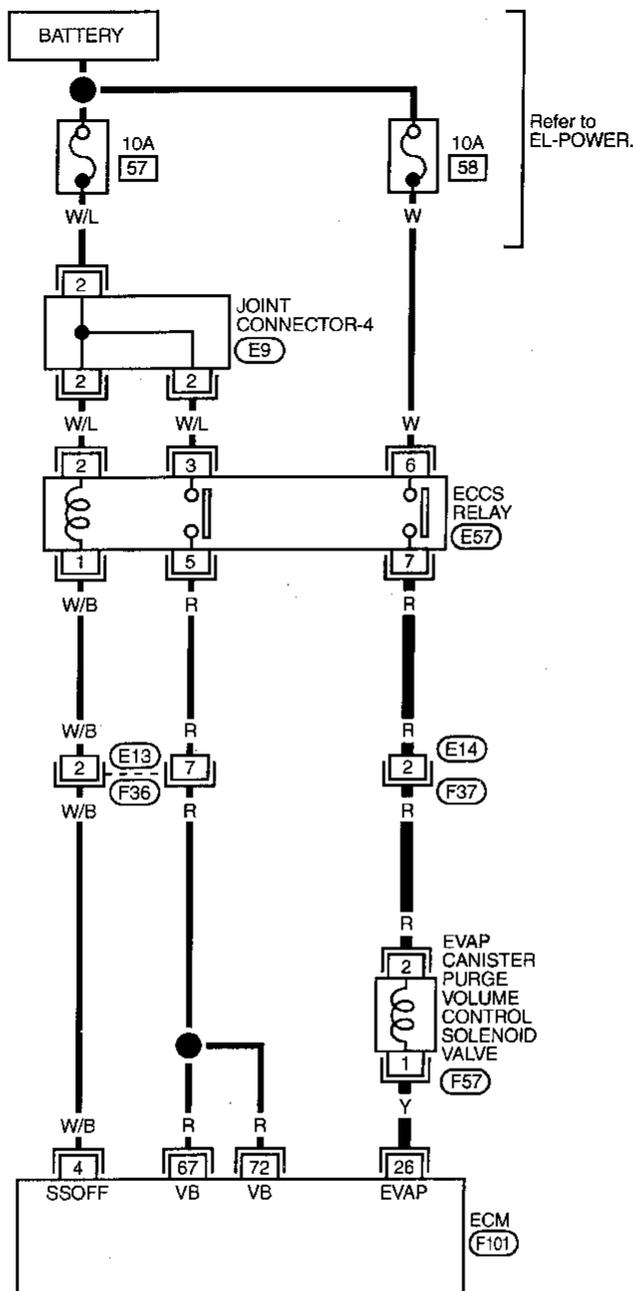


- 1) Start engine and let it idle for at least 13 seconds.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Turn ignition switch "ON" and perform "Diagnostic Test Mode (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-352.

TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

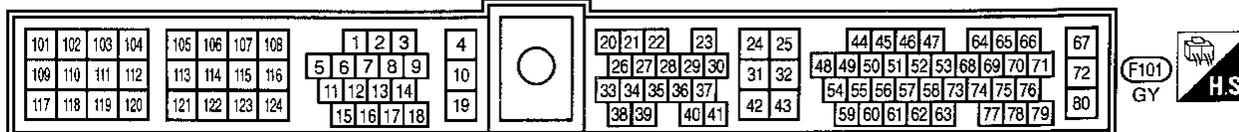
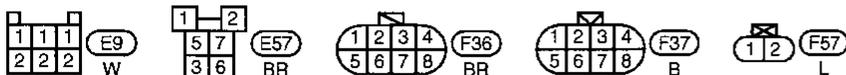
EC-PGC/V-01



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

Refer to EL-POWER.

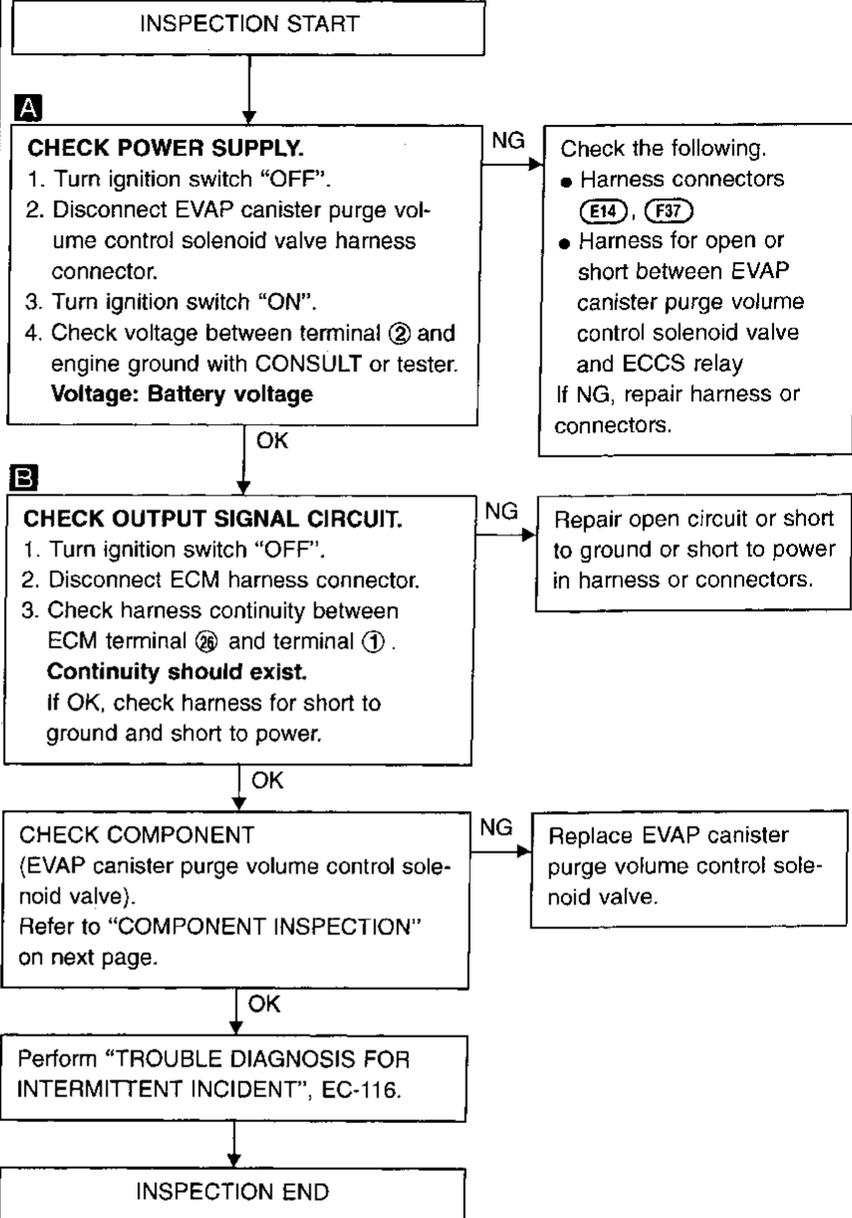
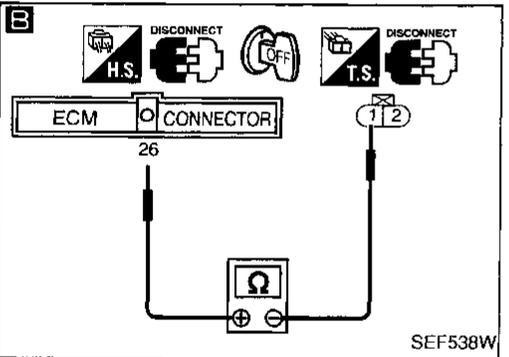
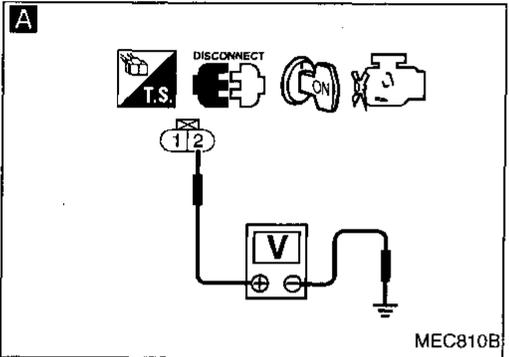
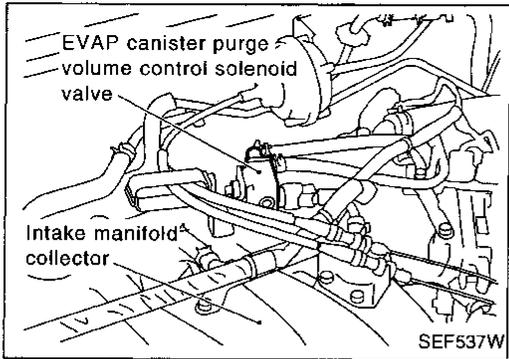
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TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

DIAGNOSTIC PROCEDURE



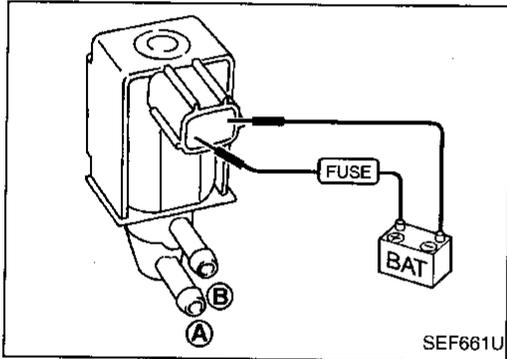
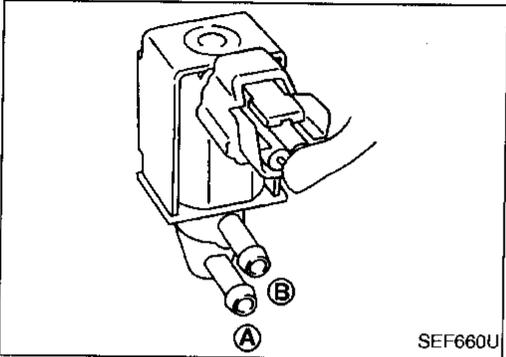
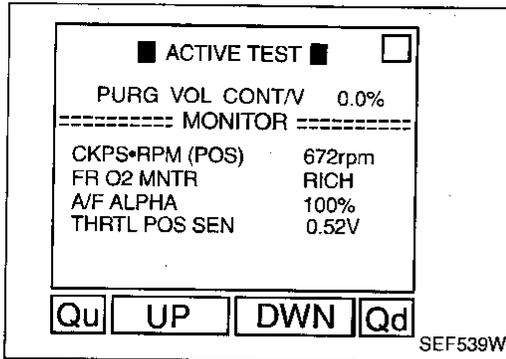
TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening. If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



Condition (PURG VOL CONT/V valve)	Air passage continuity between (A) and (B)
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

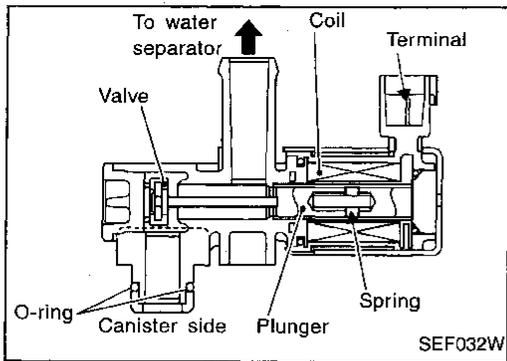
OR

- ⊗ Check air passage continuity.

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 solenoid valve.

TROUBLE DIAGNOSIS FOR DTC P0446



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.

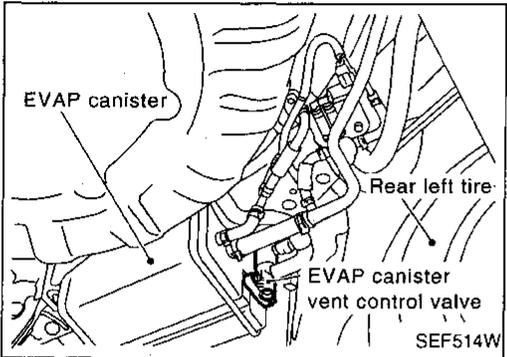
This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

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 a necessary part of the diagnosis algorithms for other evaporative loss system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative loss system is depressurized allowing "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 ②5 (ECM ground).

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0446 0903	A) An improper voltage signal is entered into 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

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 been previously conducted, always turn ignition switch "OFF" and wait at least 10 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 5 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-357.

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-357.

OR



- 1) Start engine and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 10 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-357.

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CKPS•RPM (POS)	672rpm	
RECORD		

SEF588Q

GI

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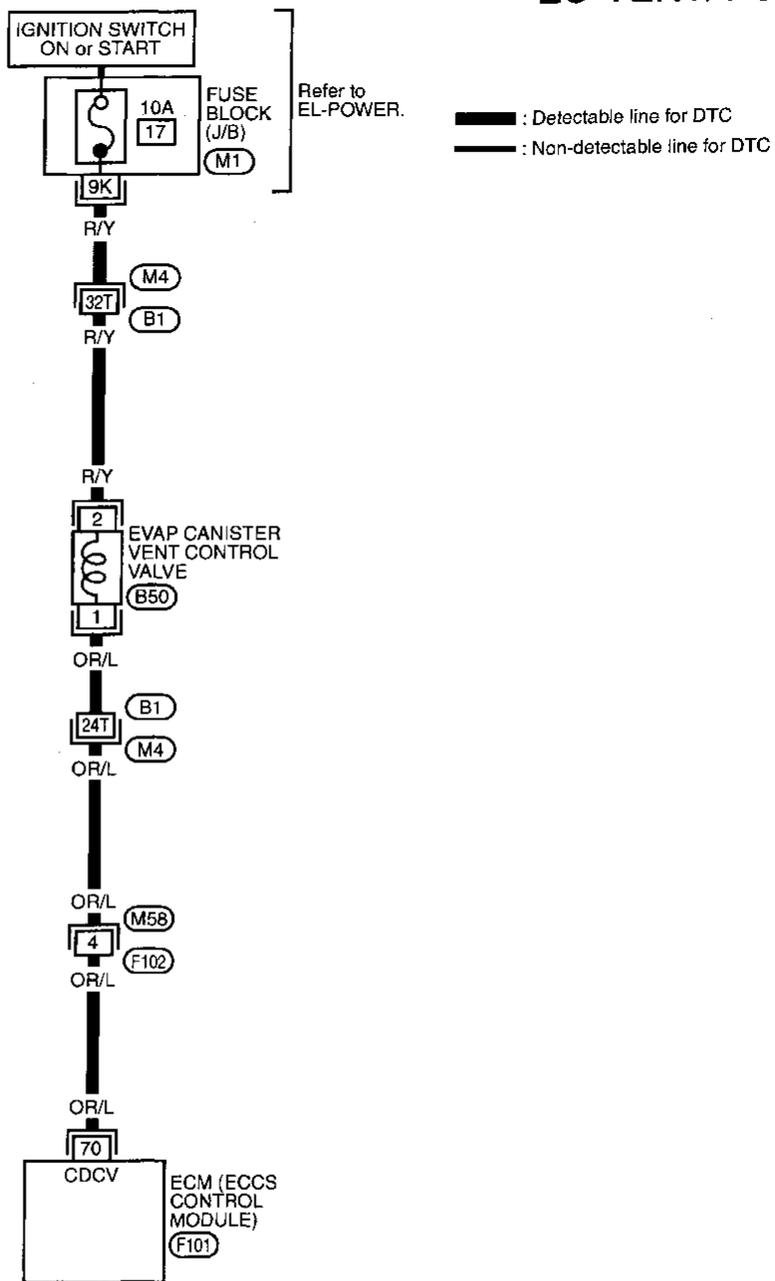
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TROUBLE DIAGNOSIS FOR DTC P0446

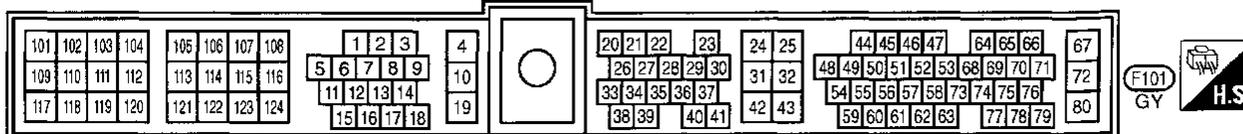
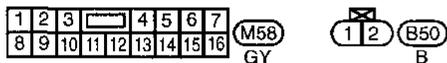
Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)

EC-VENT/V-01



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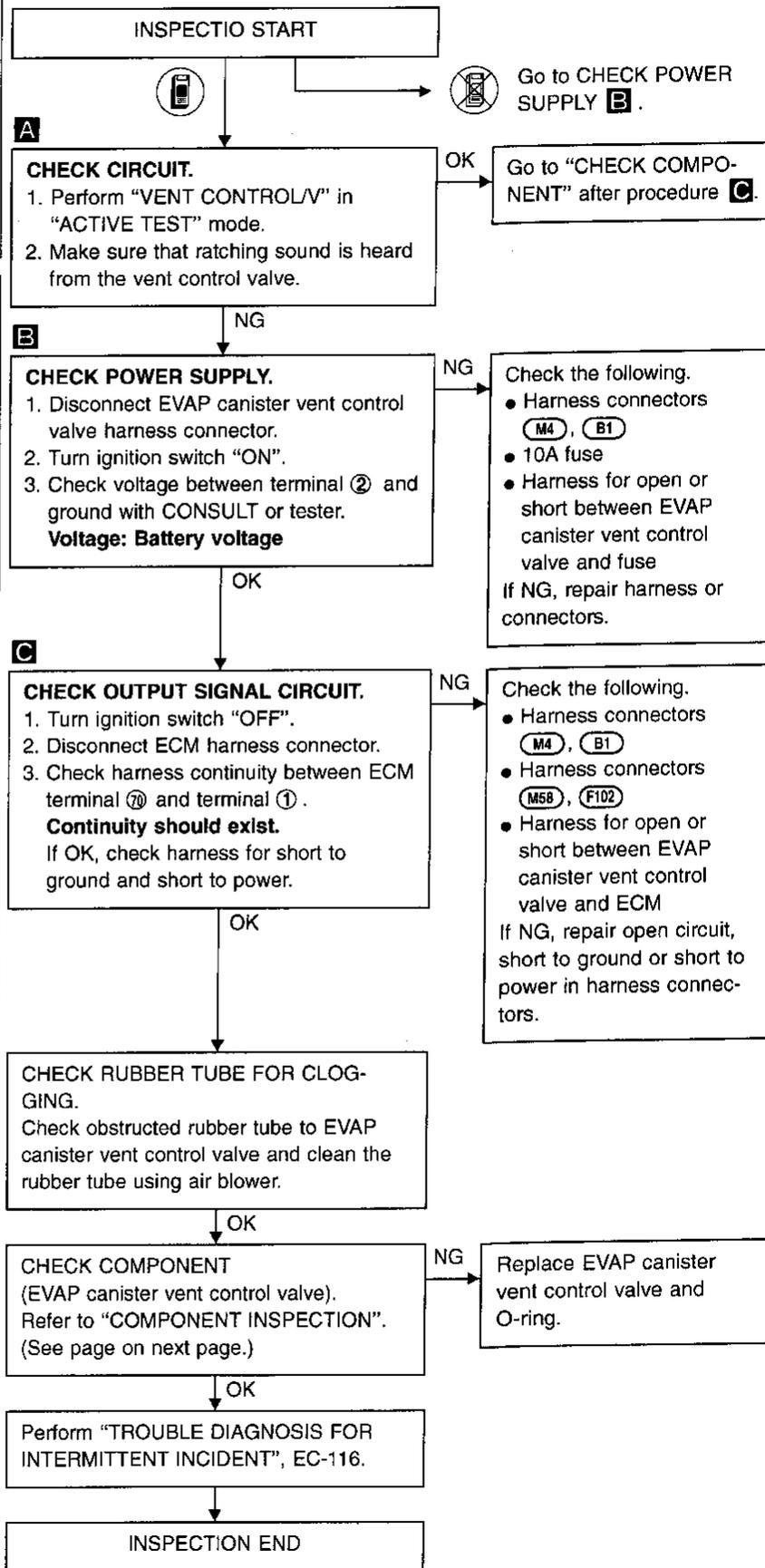
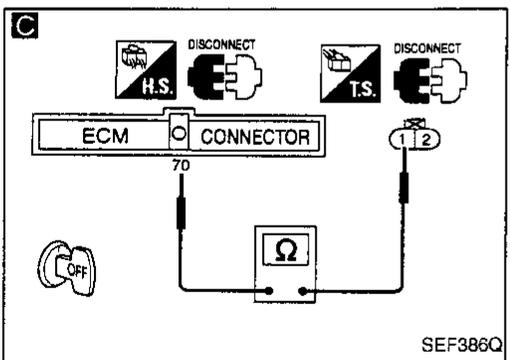
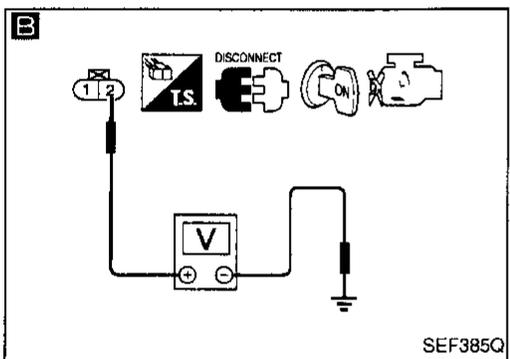
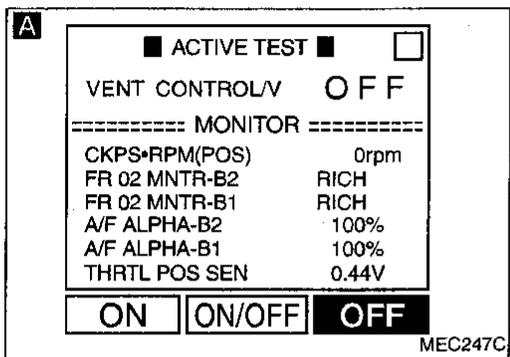
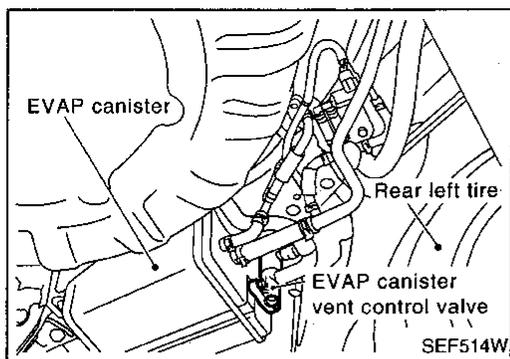
M1
M4, B1



TROUBLE DIAGNOSIS FOR DTC P0446

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

DIAGNOSTIC PROCEDURE



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TROUBLE DIAGNOSIS FOR DTC P0446

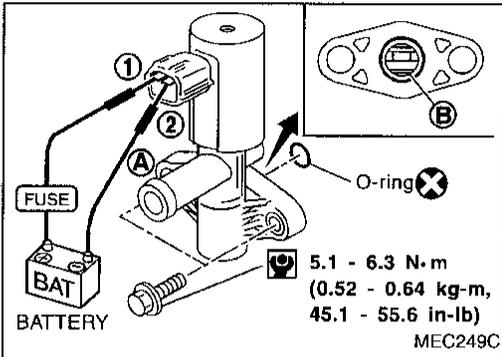
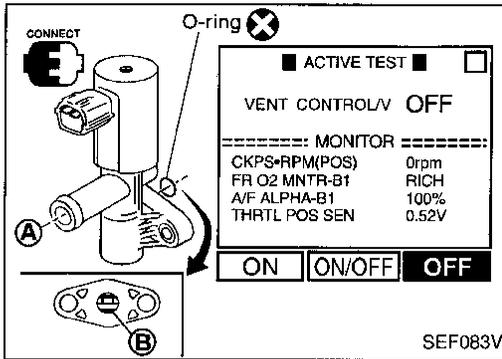
Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

EVAP canister vent control valve

Check air passage continuity.

- 1) Remove EVAP vent control valve from EVAP canister with its harness connector connected.
- 2) Disconnect fresh air vent hose from EVAP vent control valve.
- 3) Turn ignition switch "ON".
- 4) 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

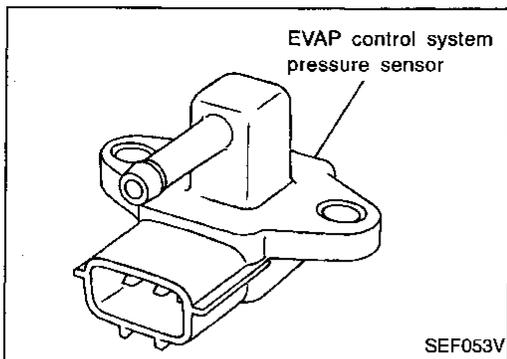
- 1) Remove EVAP vent control valve from EVAP canister.
- 2) Disconnect harness connector and fresh air vent hose from EVAP vent control valve.
- 3) Check valve operation as shown in figure.

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.

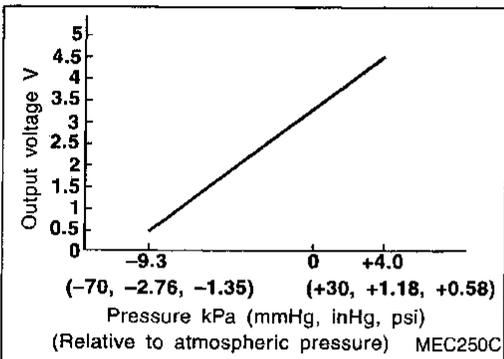
Make sure new O-ring is installed properly.



Evaporative Emission (EVAP) Control System Pressure Sensor

COMPONENT DESCRIPTION

The EVAP control system pressure sensor is installed in the purge line. The sensor detects the pressure inside the purge line and modifies the voltage signal sent from the ECM. The modified signal will then be returned to the ECM as an input voltage signal. As the pressure increases, the voltage rises. The EVAP control system pressure sensor is not directly 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 25 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
62	W	EVAP control system pressure sensor	Ignition switch "ON"	Approximately 3.4V
42	R	Sensor's power supply	Ignition switch "ON"	Approximately 5V
43	B	Sensor's ground	Engine is running. (Warm-up condition) └ Idle speed	0V

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TROUBLE DIAGNOSIS FOR DTC P0450

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

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 entered into ECM. 	<ul style="list-style-type: none"> Harness or connectors (The EVAP control system pressure sensor circuit is open or shorted.) EVAP control system pressure sensor EVAP canister vent control valve (The valve is stuck open.) Rubber hose to EVAP control system pressure is clogged, vent, kinked, disconnected or improper connection. EVAP canister Rubber hose from EVAP canister vent control valve to water separator EVAP canister purge volume control solenoid 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 10 seconds before conducting the next test.

TESTING CONDITION:

Always perform the test at a temperature above 5°C (41°F).

☆ MONITOR ☆ NO FAIL

CKPS•RPM(POS)	0rpm
COOLAN TEMP/S	82°C
FUEL TEMP SEN	29°C

RECORD

SEF515W

- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Make sure that "FUEL TEMP SEN" is more than 0°C (32°F).
- 4) Turn ignition switch "OFF" and wait at least 10 seconds.
- 5) Turn ignition switch "ON".
- 6) Wait at least 20 seconds.
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-362.

OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Check that voltage between ECM terminal ⑤ (tank fuel temperature) and ground is less than 4.2V.
- 3) Turn ignition switch "OFF" and wait at least 10 seconds.
- 4) Turn ignition switch "ON" and wait at least 20 seconds.
- 5) Select "MODE 7" with GST.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-362.

OR

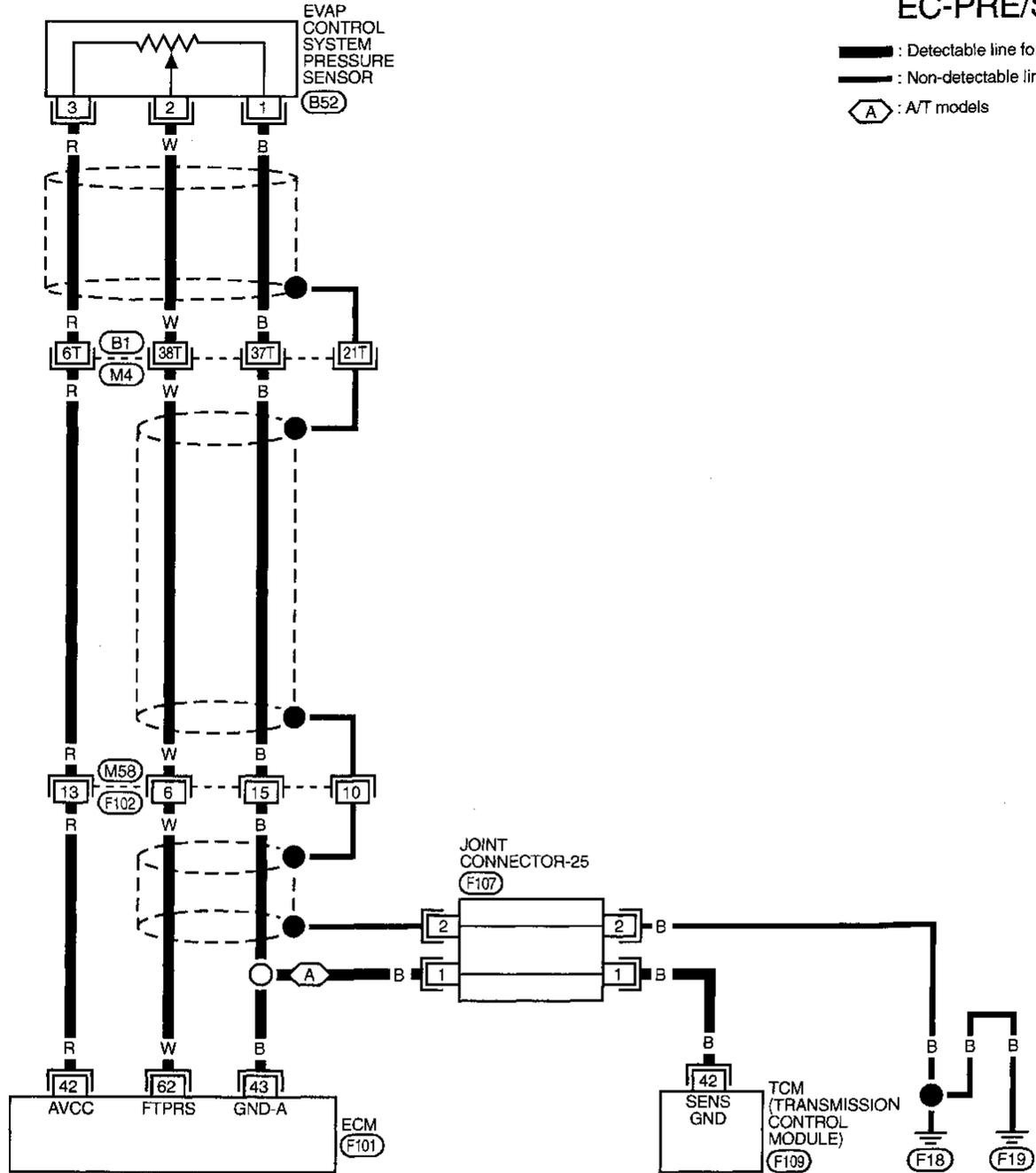
- 1) Start engine and warm it up to normal operating temperature.
- 2) Check that voltage between ECM terminal ⑤ (tank fuel temperature) and ground is less than 4.2V.
- 3) Turn ignition switch "OFF" and wait at least 10 seconds.
- 4) Turn ignition switch "ON" and wait at least 10 seconds.
- 5) Turn ignition switch "OFF", wait at least 20 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-362.

TROUBLE DIAGNOSIS FOR DTC P0450

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

EC-PRE/SE-01

-  : Detectable line for DTC
-  : Non-detectable line for DTC
-  : A/T models



1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

(M58) GY

1	2	3
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(B52) GY

1	1	1	1	1	2	2	2	2	2
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(F107) L

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25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42
43	44	45	46	47	48			

(F109) GY



101	102	103	104	105	106	107	108	1	2	3	4	20	21	22	23	24	25	44	45	46	47	64	65	66	67										
109	110	111	112	113	114	115	116	5	6	7	8	9	10	26	27	28	29	30	31	32	48	49	50	51	52	53	68	69	70	71	72				
117	118	119	120	121	122	123	124	11	12	13	14	33	34	35	36	37	42	43	54	55	56	57	58	59	60	61	62	63	74	75	76	77	78	79	80

(F101) GY

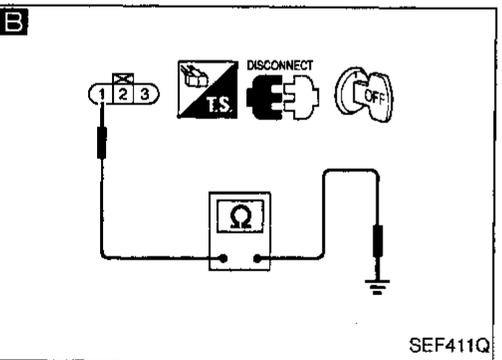
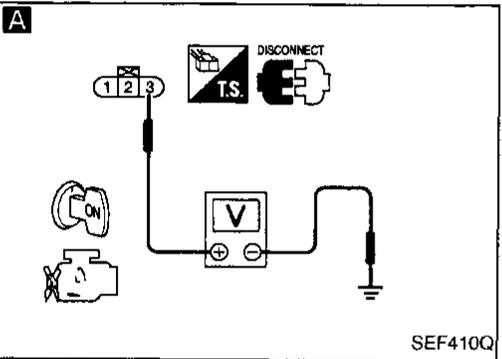
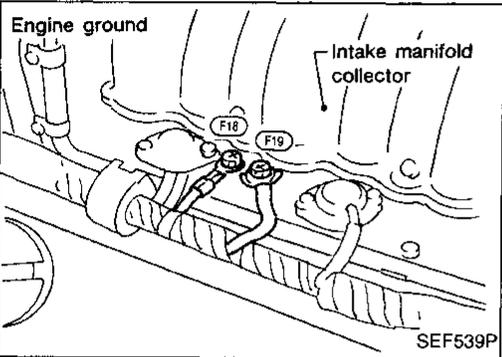
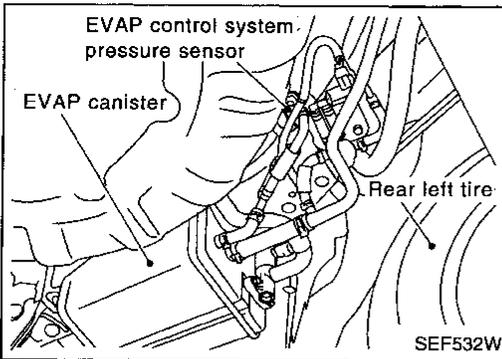


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- EL
- IDX

TROUBLE DIAGNOSIS FOR DTC P0450

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. Turn ignition switch "OFF".
2. Disconnect EVAP control system pressure sensor harness connector.
3. Check sensor harness 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

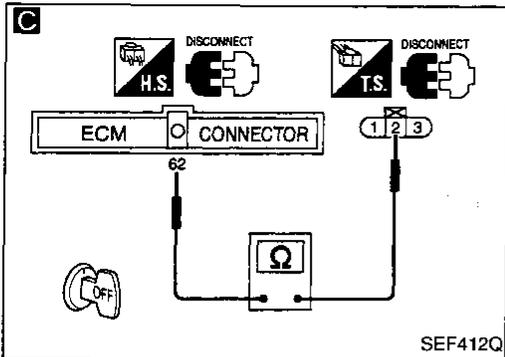
NG → Check the following.
● Harness connectors (B1), (M4)
● Harness connectors (M5B), (F102)
● Harness for open or short between EVAP control system pressure sensor and ECM
If NG, repair harness or connectors.

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

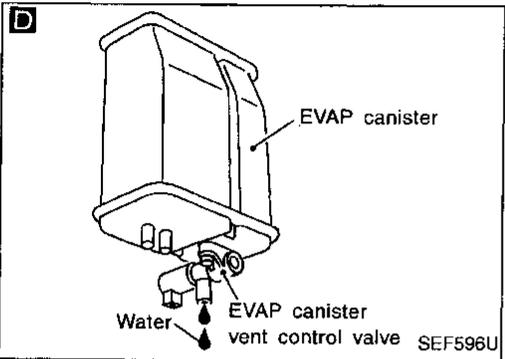
NG → Check the following.
● Harness connectors (B1), (M4)
● Harness connectors (M5B), (F102)
● Joint connector-25
● Harness for open or short between ECM and EVAP control system pressure sensor
● Harness for open or short between TCM (Transmission Control Module) and EVAP control system pressure sensor
If NG, repair open circuit, short to ground or short to power in harness connectors.

OK
A

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



SEF412Q



SEF596U

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
 • (B1), (M4)
 • Harness connectors
 • (M5B), (F102)
 • Harness for open or short between ECM and EVAP control system pressure sensor
 If NG, repair open circuit, short to ground or short to power in harness connectors.

OK →

C

CHECK COMPONENT
 (EVAP canister purge volume control solenoid valve).
 Refer to "COMPONENT INSPECTION", EC-353.

NG → Replace EVAP canister purge volume control solenoid valve.

OK →

CHECK COMPONENT
 (EVAP canister vent control valve).
 Refer to "COMPONENT INSPECTION", EC-358.

OK →

CHECK COMPONENT
 (EVAP control system pressure sensor).
 Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP control system pressure sensor.

OK →

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", EC-470.

NG → Clean, repair or replace rubber tube and/or water separator.

OK →

D

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-470.
 If NG, repair or replace hose or replace water separator.

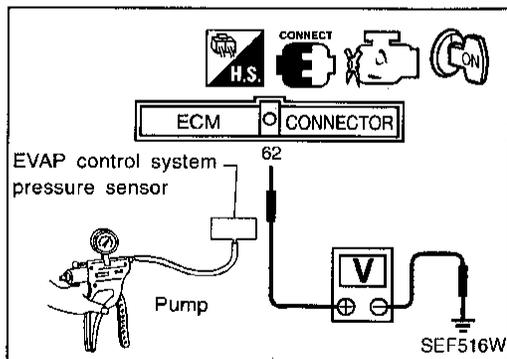
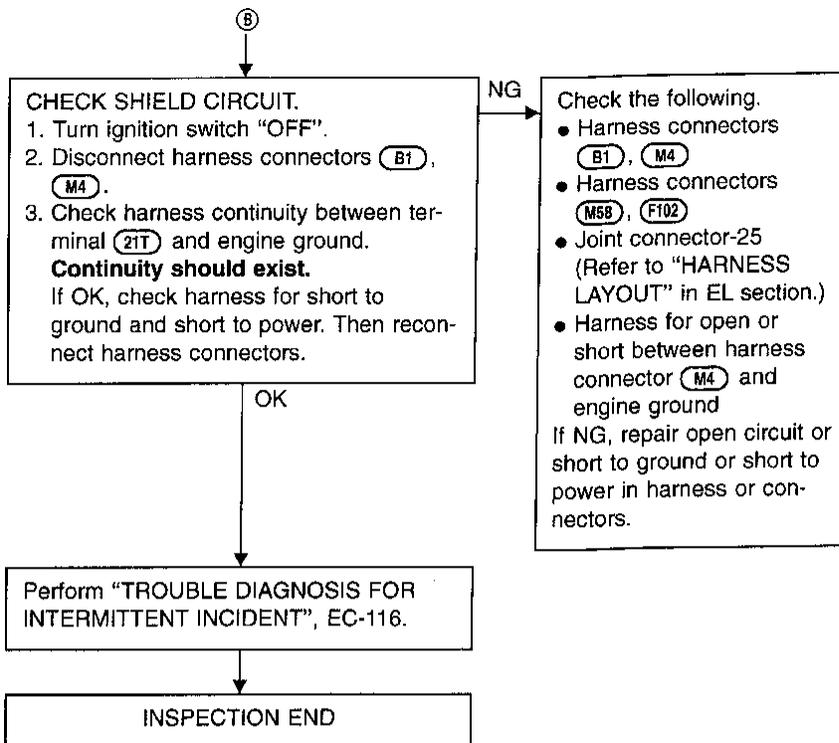
OK →

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TROUBLE DIAGNOSIS FOR DTC P0450

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



COMPONENT INSPECTION

EVAP control system pressure sensor

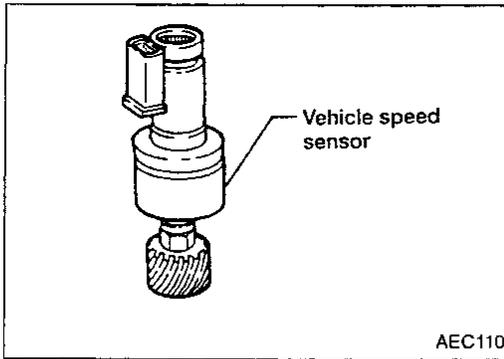
1. Remove EVAP control system pressure sensor from bracket with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Apply vacuum and pressure to EVAP control system pressure sensor with pump as shown in figure.
4. Check output voltage between terminal (62) and 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.
5. If NG, replace EVAP control system pressure sensor.

TROUBLE DIAGNOSIS FOR DTC P0500



Vehicle Speed Sensor (VSS)

COMPONENT DESCRIPTION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
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

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
29	P/L	Vehicle speed sensor	Engine is running. — Lift up front wheels. — In "1st" gear position — 10 km/h (6 MPH)	Approximately 5.2V★ SEF055V
			Engine is running. — Lift up front wheels. — In "2nd" gear position — 30 km/h (19 MPH)	SEF056V

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0500 0104	<ul style="list-style-type: none"> The almost 0 km/h (0 MPH) signal from the vehicle speed sensor is entered 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 10 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 (TCS switch "OFF").
- 2) Perform "VEHICLE SPEED SEN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR



- 1) Start engine (TCS switch "OFF").
- 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-368. 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.

CKPS-RPM (POS): 1,400 - 1,900 rpm (A/T)

1,700 - 2,000 rpm (M/T)

COOLAN TEMP/S: More than 70°C (158°F)

B/FUEL SCHDL: 2 - 3 msec (A/T)

1.8 - 4.2 msec (M/T)

Selector lever: Suitable position

PW/ST SIGNAL: OFF

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) Lift up drive wheels.
- 2) Start engine (TCS switch "OFF").
- 3) Read vehicle speed sensor signal in "MODE 1" with GST.

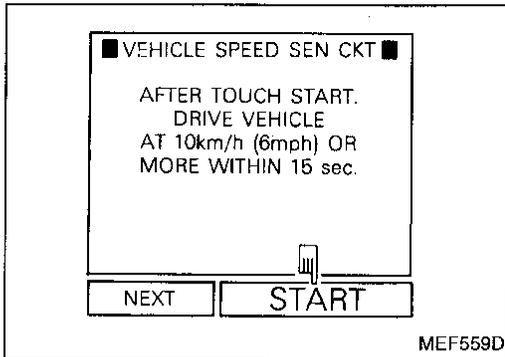
The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

- 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-368.

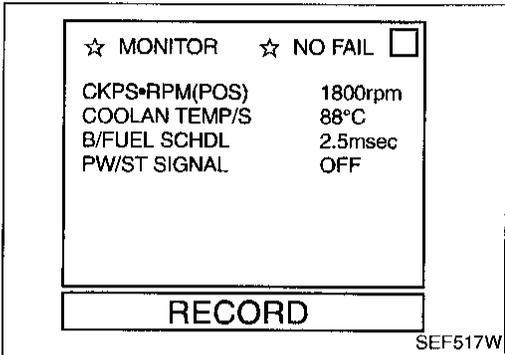
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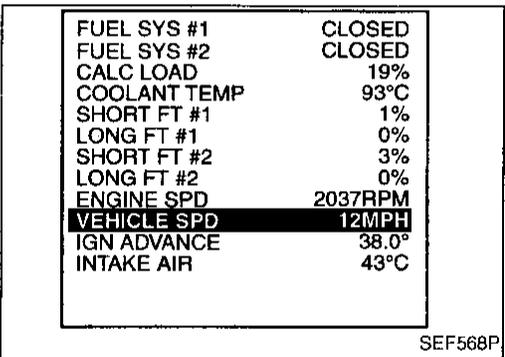
- 1) Lift up drive wheels.
- 2) Start engine (TCS switch "OFF").
- 3) Read the voltage signal between ECM terminal 29 (Vehicle speed sensor signal) and ground with oscilloscope should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
- 4) Verify that the oscilloscope screen shows the signal wave as shown in figure.
- 5) If NG, go to "DIAGNOSTIC PROCEDURE", EC-368.



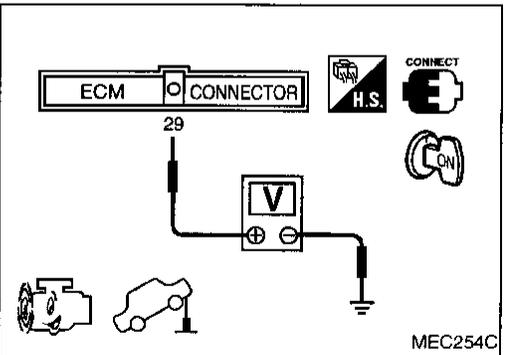
MEF559D



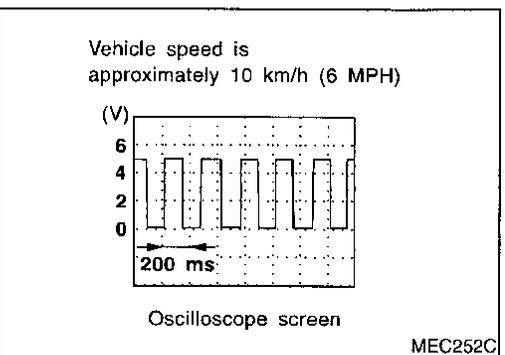
SEF517W



SEF568P



MEC254C

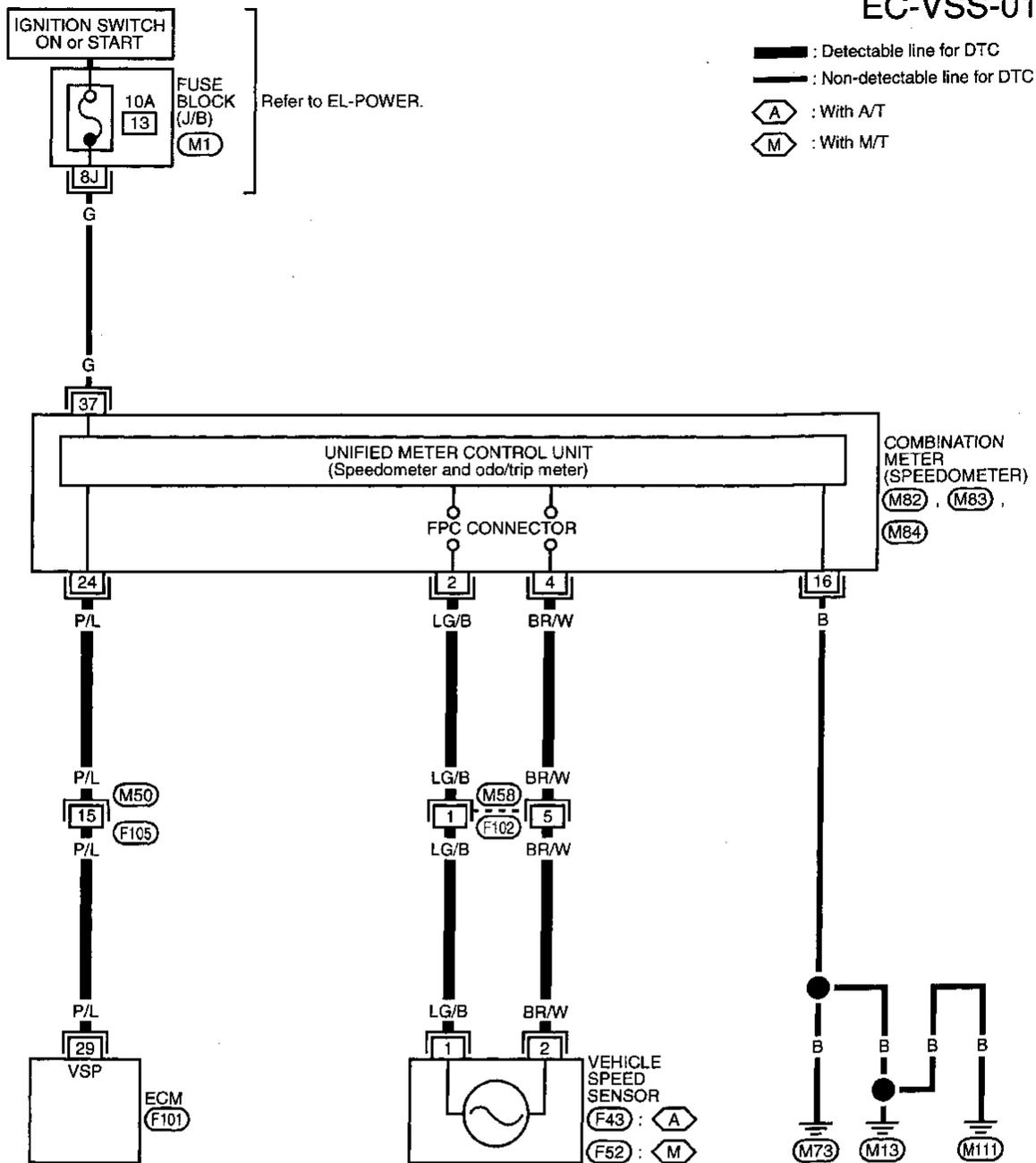


MEC252C

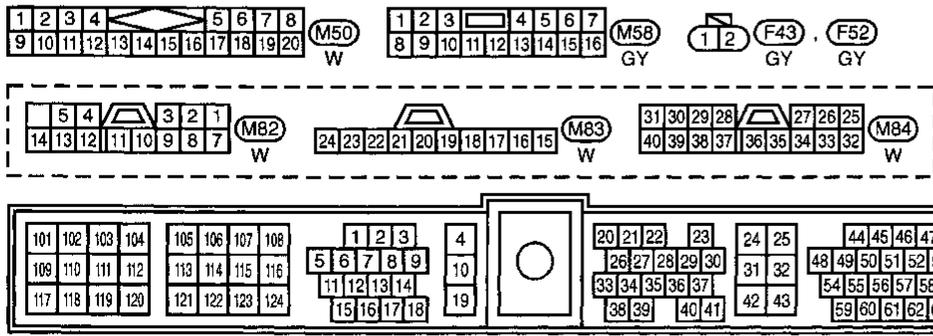
TROUBLE DIAGNOSIS FOR DTC P0500

Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01



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Refer to last page (Foldout page).

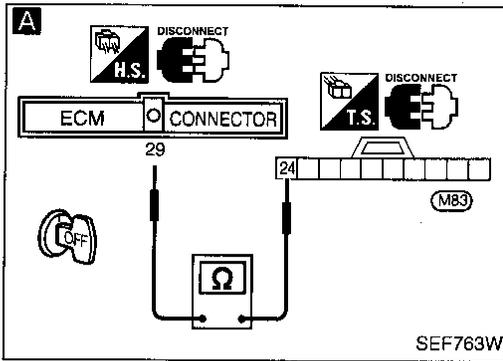
(M1)

BT
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IDX

TROUBLE DIAGNOSIS FOR DTC P0500

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM terminal ② and terminal ④.

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

NG

Check the following.

- Harness connectors (F105), (M50)
- Harness for open or short between ECM and combination meter

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

OK

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG

Check the following.

- Harness connectors (F102), (M58)
- Harness for open or short between combination meter and vehicle speed sensor

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

- Vehicle speed sensor and its circuit (Refer to EL section.)

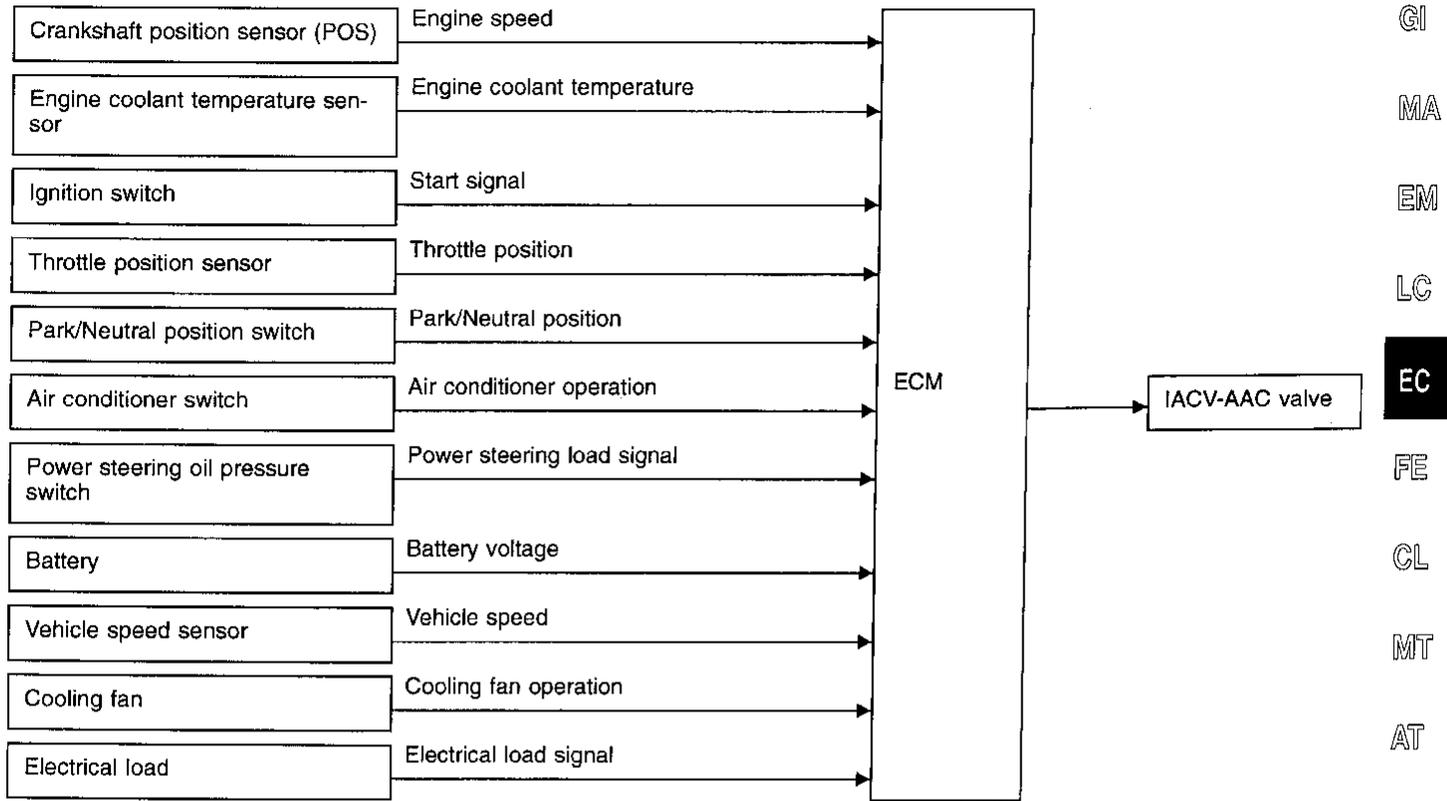
OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

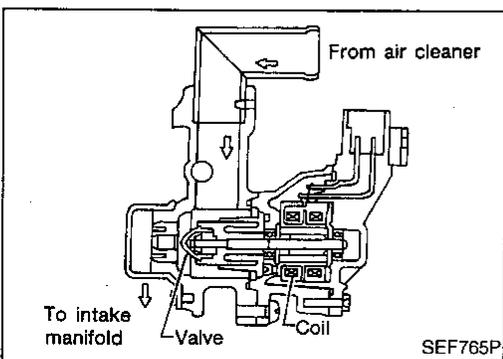
INSPECTION END

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

SYSTEM DESCRIPTION



This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) 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
		2 - 10 step
		—

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
101	PU/G	IACV-AAC valve	Engine is running. └ Idle speed	0.1 - 14V
115	GY/G			
122	Y			
123	GY/L			

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

Perform "Procedure for malfunction A" first. If the 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 10 seconds before conducting the next test.

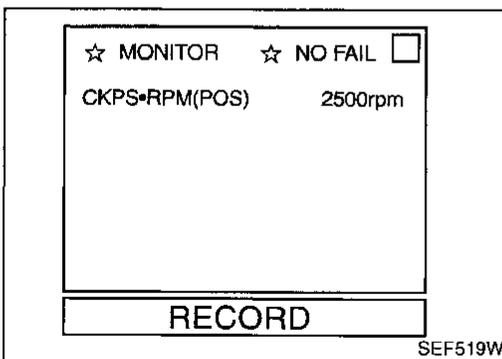
Procedure for malfunction A

TESTING CONDITION:

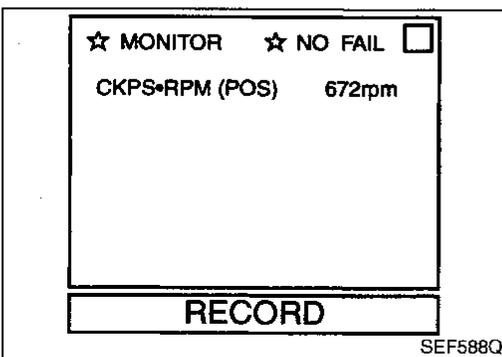
Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

- 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-374.

OR



SEF519W



SEF588Q

TROUBLE DIAGNOSIS FOR DTC P0505

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



- 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-374.

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) Turn ignition switch "OFF". Wait at least 10 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-374.

Procedure for malfunction B

TESTING CONDITION:

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



- 1) Open engine hood.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 10 seconds.
- 4) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
- 5) Start engine and run it 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-374.

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 10 seconds.
- 4) Start engine again and run it 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-374.

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 10 seconds.
- 4) Start engine again and run it at least 1 minute at idle speed. (Headlamp switch, rear defogger switch: OFF)
- 5) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CKPS•RPM(POS)	672rpm	
COOLAN TEMP/S	85°C	
RECORD		

SEF452W

TROUBLE DIAGNOSIS FOR DTC P0505

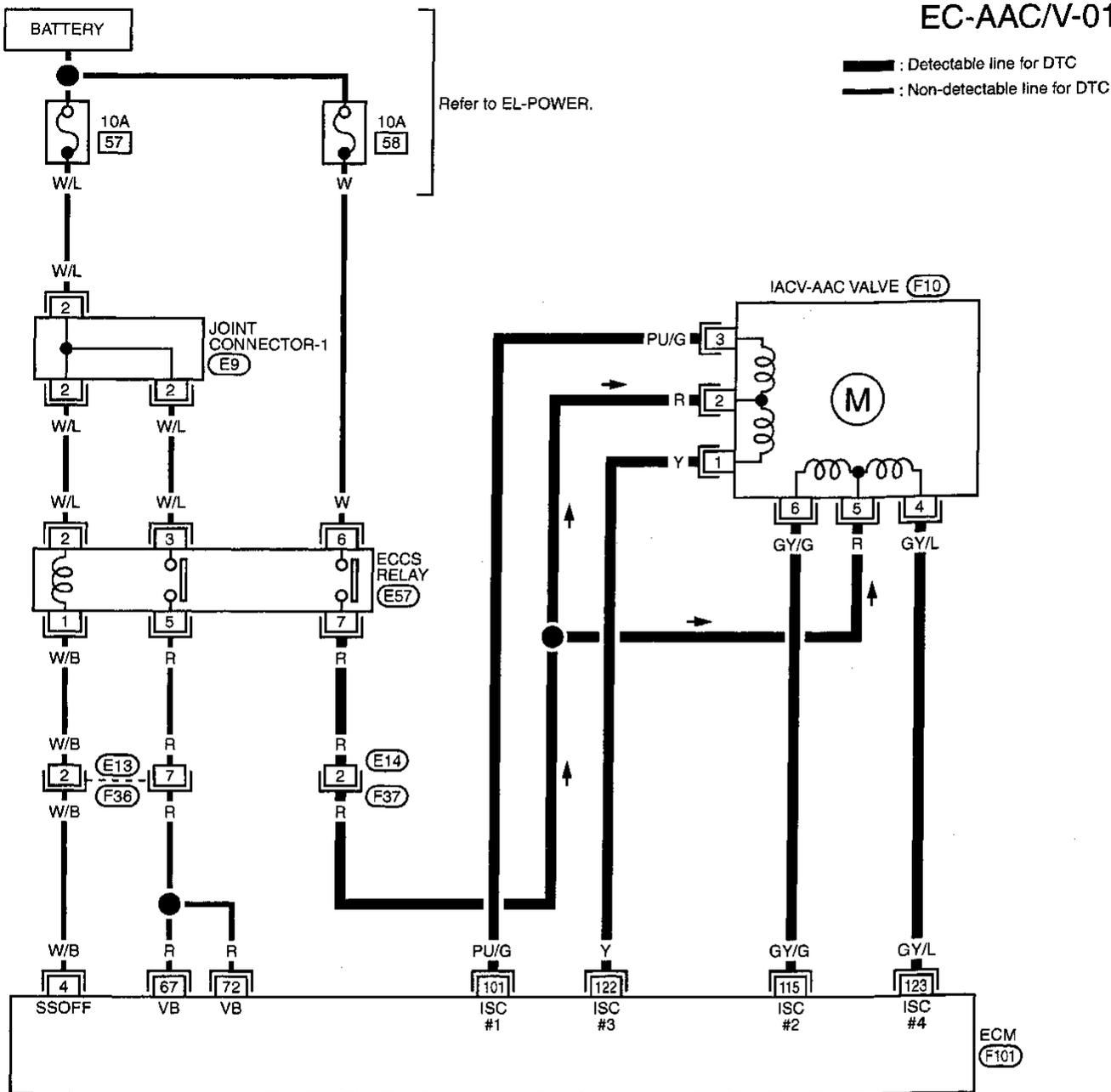
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-374.

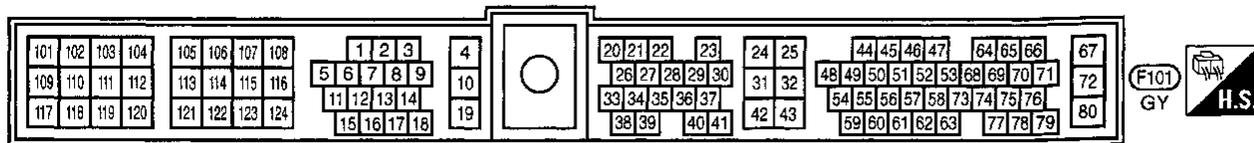
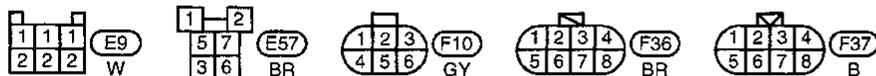
TROUBLE DIAGNOSIS FOR DTC P0505

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

EC-AAC/V-01



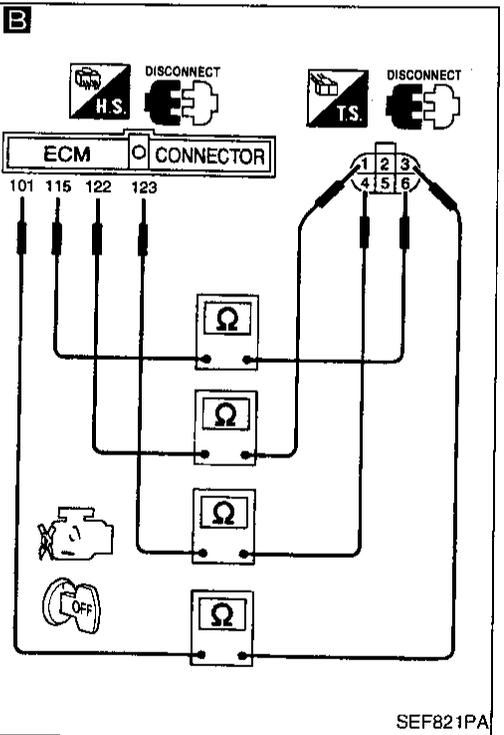
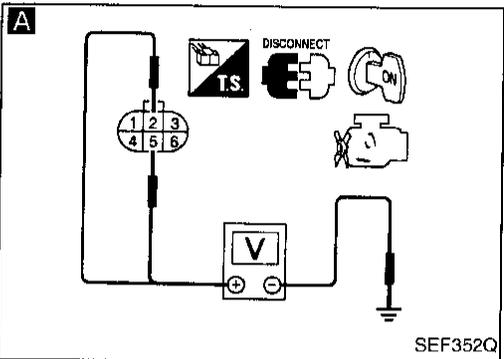
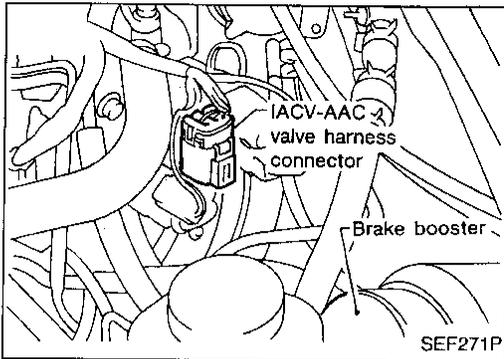
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TROUBLE DIAGNOSIS FOR DTC P0505

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

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK POWER SUPPLY.

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

Voltage: Battery voltage

NG

Check the following.

- Harness connectors (F37), (E14)
- Harness for open or short between IACV-AAC valve and ECCS relay

If NG, repair harness or connectors.

B

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ⑩① and terminal ③, ECM terminal ⑩⑤ and terminal ⑥, ECM terminal ⑩② and terminal ①, ECM terminal ⑩③ and terminal ④.

Continuity should exist.

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

NG

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

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

NG

Replace IACV-AAC valve.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0505

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

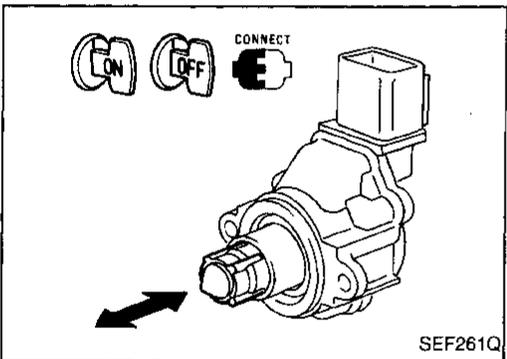
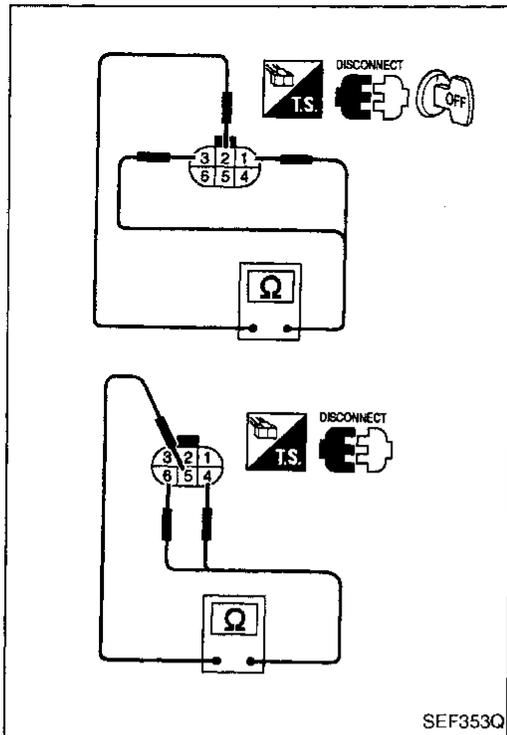
COMPONENT INSPECTION

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.

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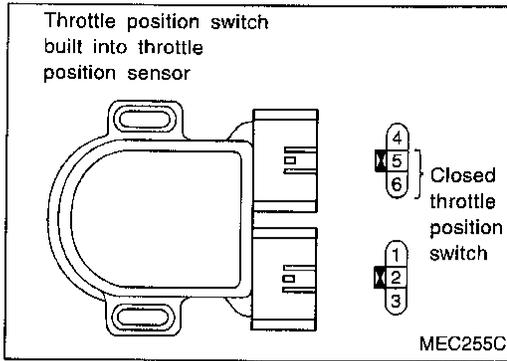
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TROUBLE DIAGNOSIS FOR DTC P0510



Closed Throttle Position Switch

COMPONENT DESCRIPTION

The throttle position switch, built into the throttle position sensor unit, consists of a closed throttle position switch and wide open throttle position switch. The closed throttle position switch detects the throttle valve position, i.e. whether it is in the idle position or not. The detected position will then be sent to the ECM as a voltage signal. The ECM 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	• Ignition switch: ON (Engine stopped)	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 25 (ECM ground).

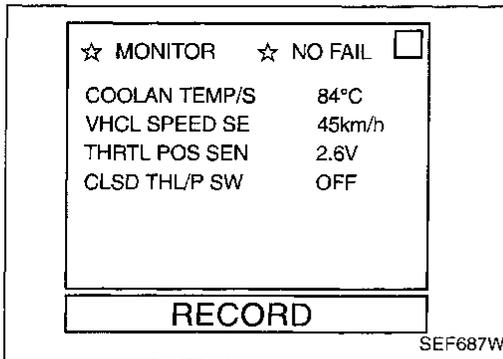
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
31	GY/L	Throttle position switch (Closed position)	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0510 0203	<ul style="list-style-type: none"> Battery voltage from the closed throttle position switch is entered into 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)



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 10 seconds before conducting the next test.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Check "CLSD THL/P SW" under the following conditions.

At idle: ON

At 2,000 rpm: OFF

If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-379.

If OK, go to following step.

- 4) Drive the vehicle for at least 5 consecutive seconds under the following condition.

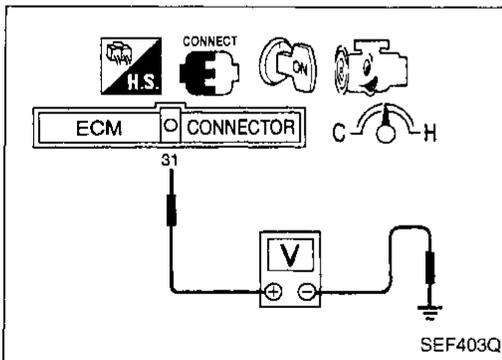
THRTL POS SEN: More than 2.5V

VHCL SPEED SE: More than 4 km/h (2 MPH)

Selector lever: Suitable position

Driving location: 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-379.



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 ③① and ground under the following conditions.

At idle: Battery voltage

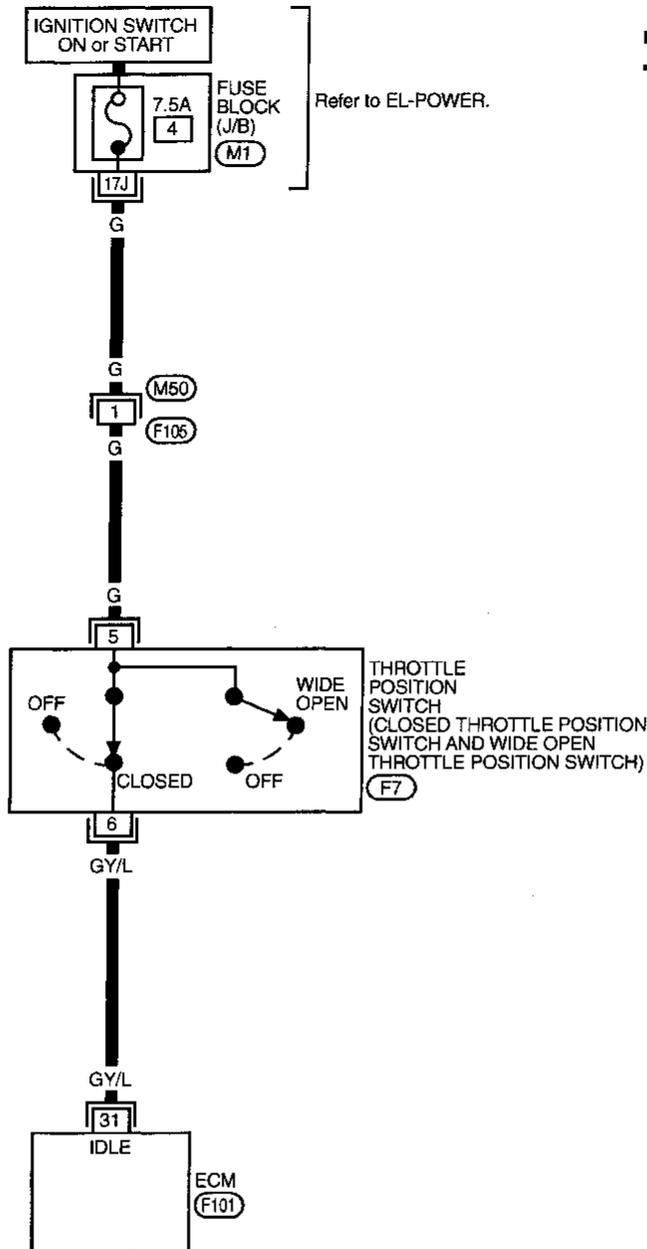
At 2,000 rpm: Approximately 0V

- 3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-379.

TROUBLE DIAGNOSIS FOR DTC P0510

Closed Throttle Position Switch (Cont'd)

EC-TP/SW-01



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

Refer to last page (Foldout page).

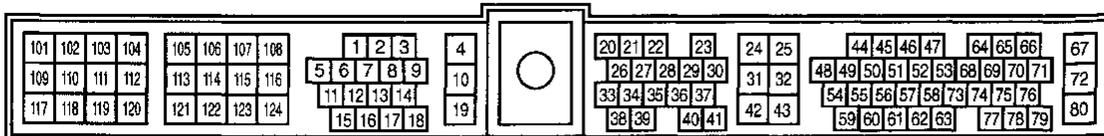
(M1)



(M50)
W

4 5 6

(F7)
GY



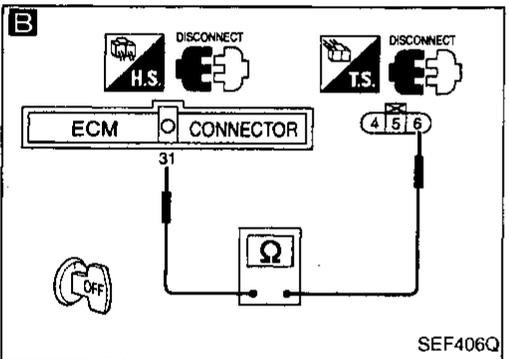
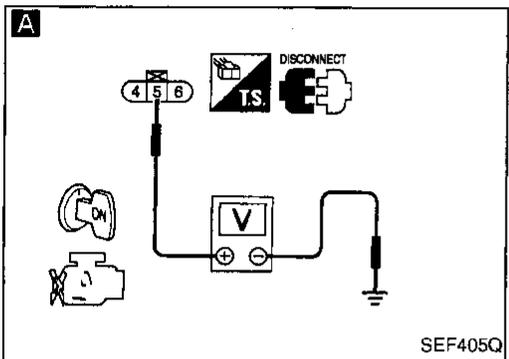
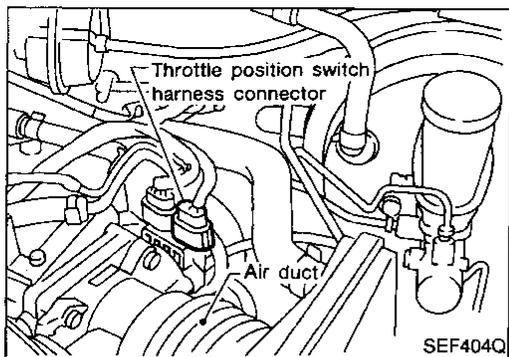
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GY



TROUBLE DIAGNOSIS FOR DTC P0510

Closed Throttle Position Switch (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

CHECK FIC.
Perform "Fast Idle Cam (FIC) Inspection and Adjustment", EC-39.

A

CHECK POWER SUPPLY.

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

NG

Check the following.

- Harness connectors
- 7.5A fuse
- F105, M50
- Harness for open or short between throttle position switch and fuse

If NG, repair harness or connectors.

B

CHECK INPUT SIGNAL CIRCUIT.

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

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

NG

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

OK

ADJUST THROTTLE POSITION SWITCH.
Perform BASIC INSPECTION, EC-92.

OK

CHECK COMPONENT
(Closed throttle position switch).
Refer to "COMPONENT INSPECTION" on next page.

NG

Replace throttle position switch.

OK

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

NG

Replace throttle position sensor.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

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TROUBLE DIAGNOSIS FOR DTC P0510

Closed Throttle Position Switch (Cont'd)

COMPONENT INSPECTION

Closed throttle position switch

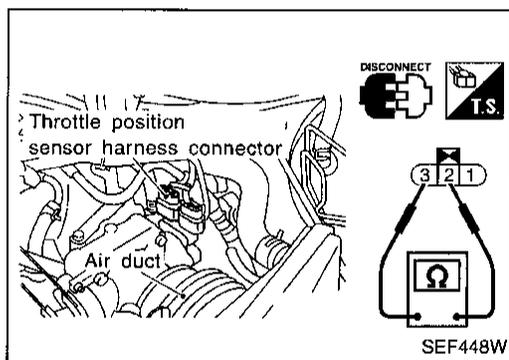
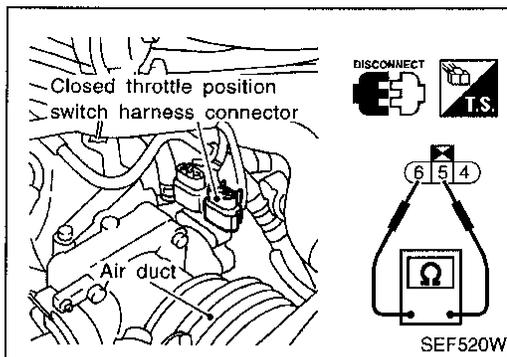
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect throttle position switch harness connector.
4. Check continuity between terminals ⑤ and ⑥.

NOTE:

Resistance measurement must be made with closed throttle position switch installed in vehicle.

Accelerator pedal conditions	Continuity
Completely released	Yes
Partially released or completely depressed	No

If NG, replace throttle position switch.



Throttle position sensor

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

NOTE:

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

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

If NG, replace throttle position sensor.

To adjust throttle position sensor, perform "Basic Inspection".
(See page EC-92.)

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.

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.)
P1605 0804	<ul style="list-style-type: none"> Signal from TCM is not sent to ECM. 	<ul style="list-style-type: none"> TCM 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 10 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".
 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 NG, go to "DIAGNOSTIC PROCEDURE", EC-383.

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 NG, go to "DIAGNOSTIC PROCEDURE", EC-383.

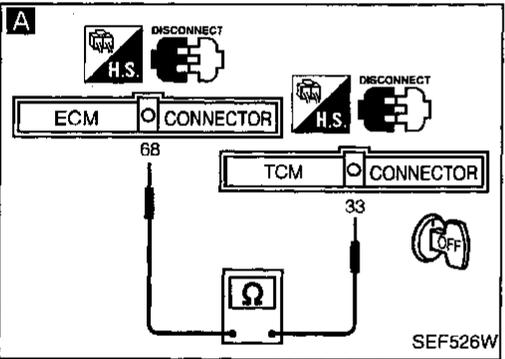
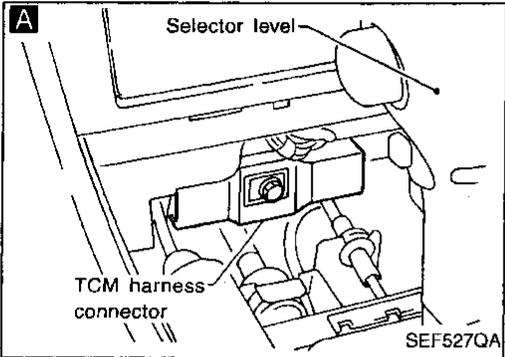
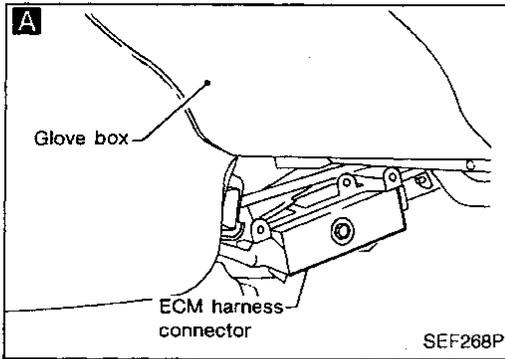
OR

-  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 10 seconds and then turn "ON".
 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
 4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-383.

TROUBLE DIAGNOSIS FOR DTC P0600, P1605

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

DIAGNOSTIC PROCEDURE



INSPECTION START

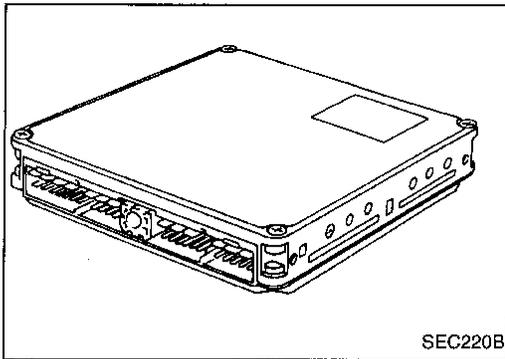
A
CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and TCM (Transmission Control Module) harness connector.
3. Check harness continuity between ECM terminal ⑥ and terminal ③.
Continuity should exist.
If OK, check harness for short to ground and short to power.

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

OK
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

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Engine Control Module (ECM)

The ECM consists of a microcomputer, a diagnostic test mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Item (Possible Cause)
P0605 0301	● ECM calculation function is malfunctioning.	● ECM

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 30 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-385.

OR



- 1) Turn ignition switch "ON".
- 2) Start engine and wait at least 30 seconds.
- 3) Select "Mode 7" with GST.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-385.

OR



- 1) Turn ignition switch "ON".
- 2) Start engine and wait at least 30 seconds.
- 3) Turn ignition switch "OFF" and wait at least 10 seconds.
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-385.

TROUBLE DIAGNOSIS FOR DTC P0605

Engine Control Module (ECM) (Cont'd)

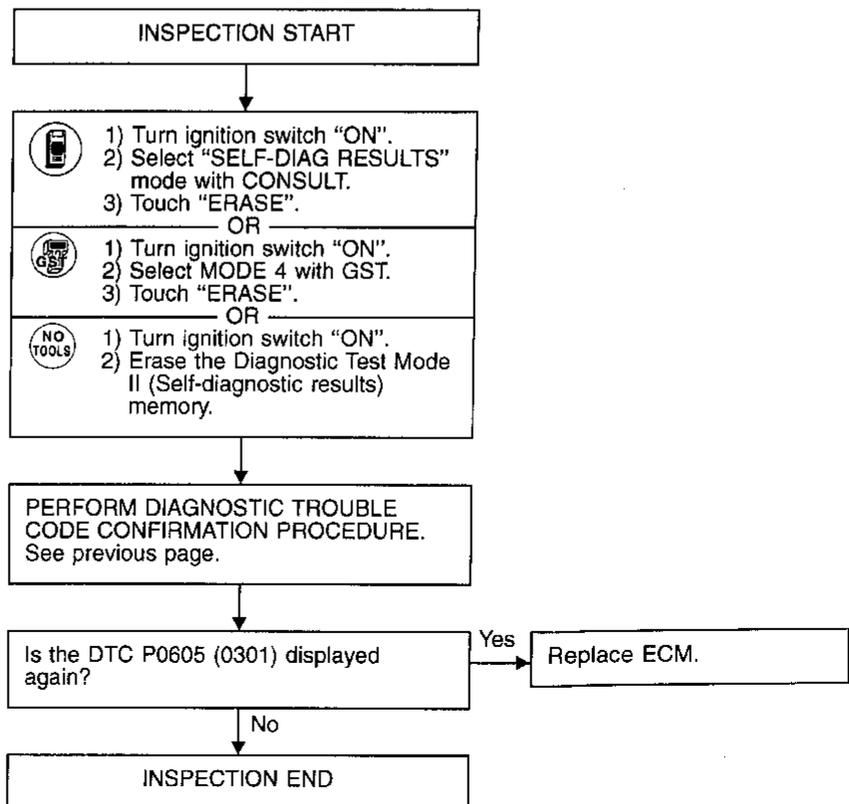
FAIL-SAFE MODE

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*1																
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 ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.</p> <table border="1"> <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 multipoint 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>IACV-AAC valve</td> <td>Full open</td> </tr> <tr> <td>Cooling fans</td> <td>Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.</td> </tr> </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 multipoint fuel injection system	Ignition timing	Ignition timing is fixed at the preset value.	Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.	IACV-AAC valve	Full open	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 multipoint fuel injection system																
Ignition timing	Ignition timing is fixed at the preset value.																
Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.																
IACV-AAC valve	Full open																
Cooling fans	Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.																

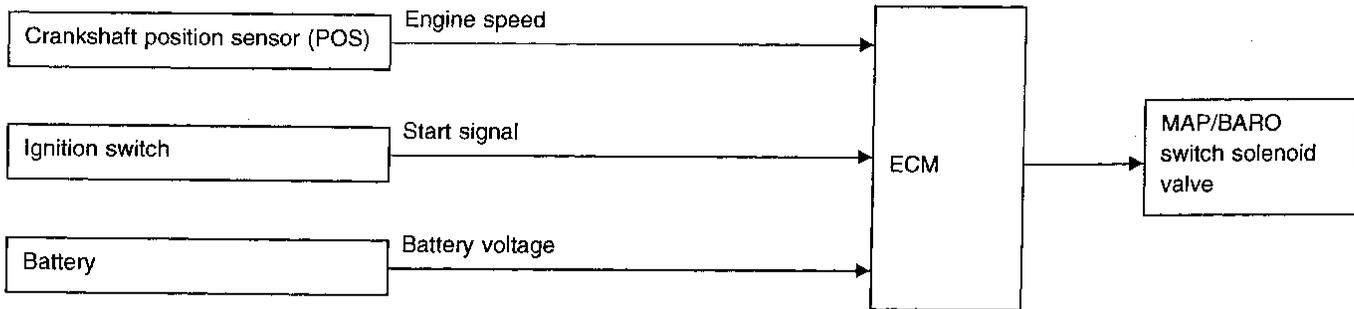
*1: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

DIAGNOSTIC PROCEDURE



Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve

SYSTEM DESCRIPTION

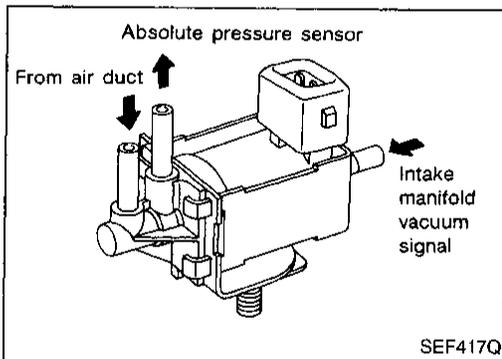


This system provides the absolute pressure sensor with either ambient barometric pressure or intake manifold pressure for monitoring.

The MAP/BARO switch solenoid valve switches between two passages (one is from the air duct, the other is from the intake manifold) by ON-OFF operation. When the MAP/BARO switch solenoid valve is activated ON or OFF by the ECM, either ambient barometric pressure or intake manifold pressure is applied to the absolute pressure sensor.

The solenoid valve is almost always OFF under normal conditions.

Solenoid	Conditions
ON	<ul style="list-style-type: none"> ● For 5 seconds after turning ignition switch "ON"
	OR
	<ul style="list-style-type: none"> ● For 5 seconds after starting engine
	OR
	<ul style="list-style-type: none"> ● More than 5 minutes after the solenoid valve shuts OFF.
	and
	<ul style="list-style-type: none"> ● Engine running



COMPONENT DESCRIPTION

The MAP/BARO switch solenoid valve switches between ambient barometric pressure and intake manifold pressure according to the voltage signal sent from the ECM. When the MAP/BARO switch solenoid valve is supplied with a voltage by the ECM, it turns "ON" so that the MAP/BARO switch solenoid valve monitors the ambient barometric pressure. When the MAP/BARO switch solenoid valve is not supplied the voltage, it goes "OFF" and the sensor monitors the intake manifold pressure.

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAP/BARO SW/V	<ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) 	For 5 seconds after turning ignition switch "ON"	MAP
		More than 5 seconds after turning ignition switch "ON"	BARO
	<ul style="list-style-type: none"> ● Engine speed: idle 	For 5 seconds after starting engine	BARO
		More than 5 seconds after starting engine	MAP

ECM TERMINALS AND REFERENCE VALUE

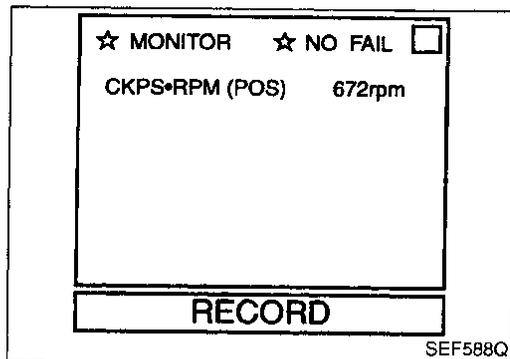
Specification data are reference values, and are measured between each terminal and Ⓧ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
16	OR/Y	MAP/BARO switch solenoid valve	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> └ For 5 seconds after turning ignition switch "ON"	Approximately 0V
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed └ For 5 seconds after starting engine	
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> └ More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed └ More than 5 seconds after starting engine	

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. B) There is little difference between MAP/BARO switch solenoid valve input voltage at ambient barometric pressure and that 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 or disconnected.) ● Absolute pressure sensor ● MAP/BARO switch solenoid valve

TROUBLE DIAGNOSIS FOR DTC P1105



Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (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 10 seconds before conducting the next test.

Procedure 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-391.

OR

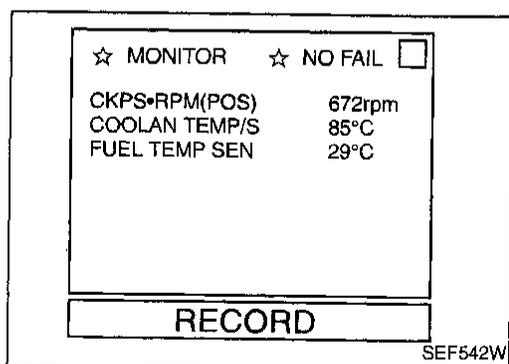


- 1) Start engine and let it idle.
- 2) Wait at least 10 seconds.
- 3) Select "MODE 7" with GST.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-391.

OR



- 1) Start engine and let it idle.
- 2) Wait at least 10 seconds.
- 3) Turn ignition switch "OFF", wait at least 10 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-391.



Procedure for malfunction B

TESTING CONDITION:

Always perform the test at a temperature of 5°C (41°F) or higher.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
- 4) Make sure that "FUEL TEMP SEN" 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-392.

OR



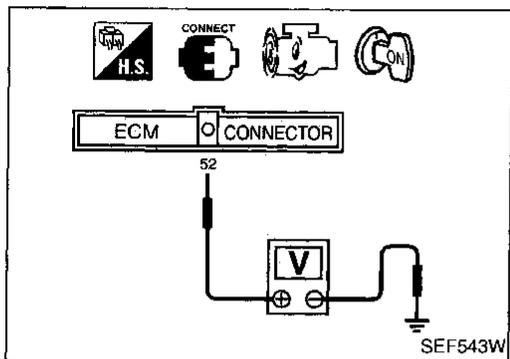
- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Turn ignition switch "ON".
- 4) Check that voltage between ECM terminal ⑤ and ground is less than 4.2V.
- 5) Start engine and let it idle for at least 10 seconds.
- 6) Select "MODE 7" with GST.

EC-388

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-392.

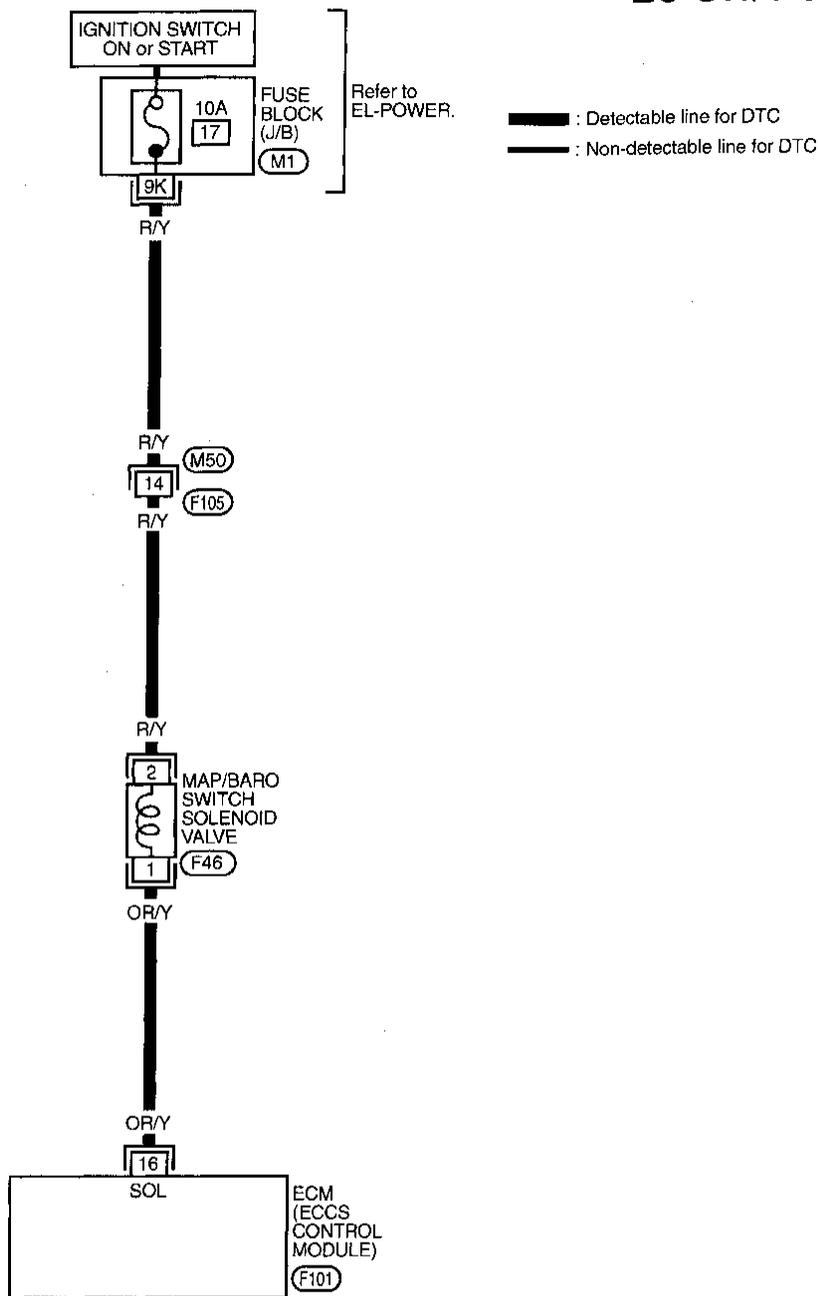


- OR
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Turn ignition switch "OFF" and wait at least 10 seconds.
 - 3) Turn ignition switch "ON".
 - 4) Check that voltage between ECM terminal 52 and ground is less than 4.2V.
 - 5) Start engine and let it idle for at least 10 seconds.
 - 6) Turn ignition switch "OFF", wait at least 10 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-392.

TROUBLE DIAGNOSIS FOR DTC P1105

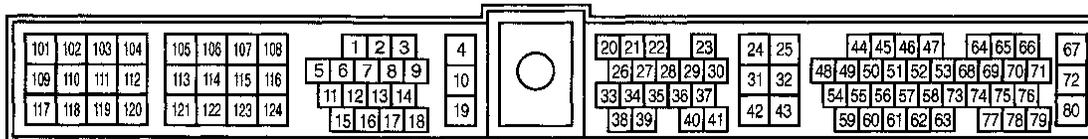
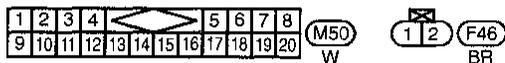
Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

EC-SW/V-01



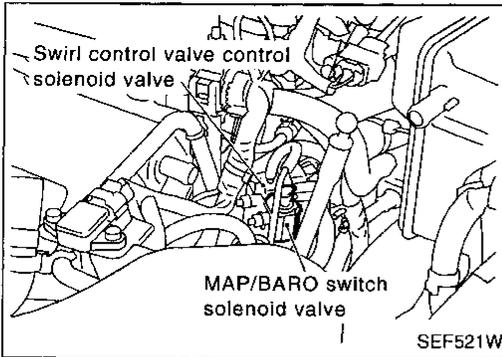
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(M1)



TROUBLE DIAGNOSIS FOR DTC P1105

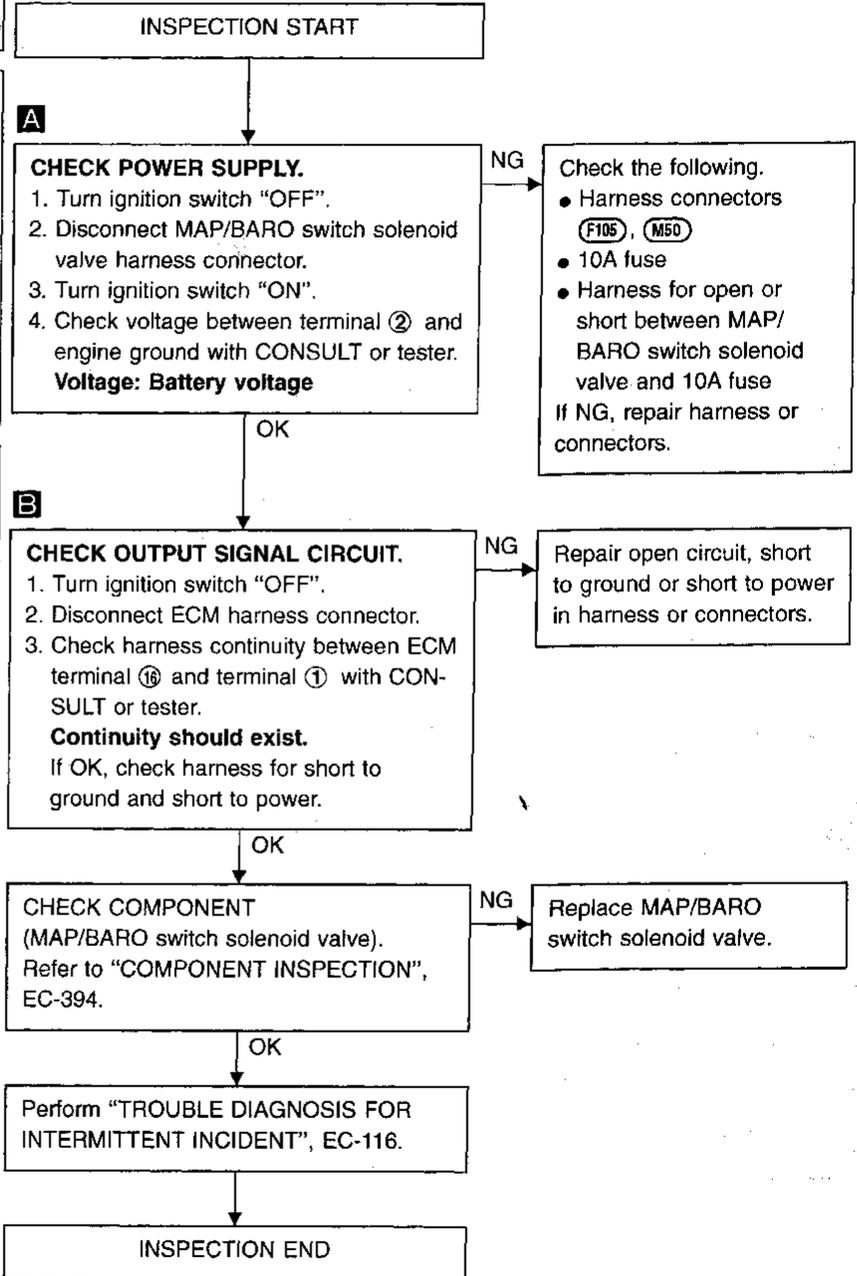
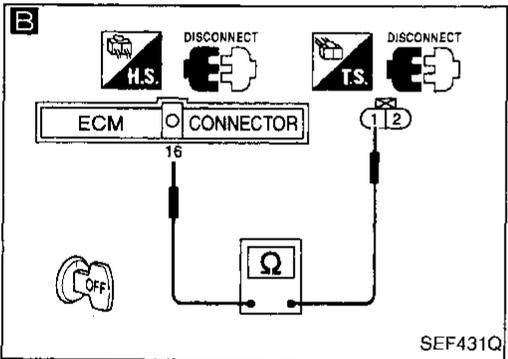
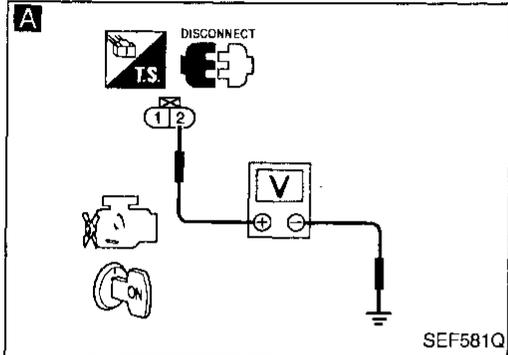
Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



DIAGNOSTIC PROCEDURE

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

Procedure A

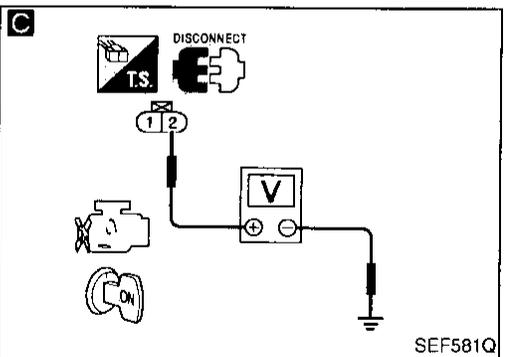
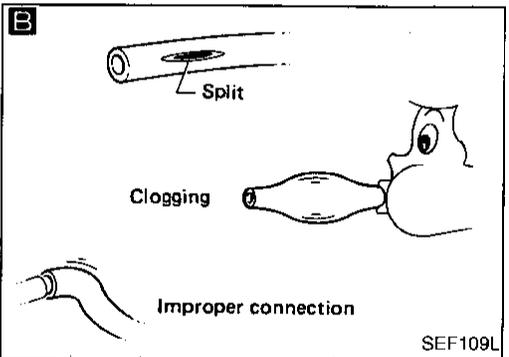
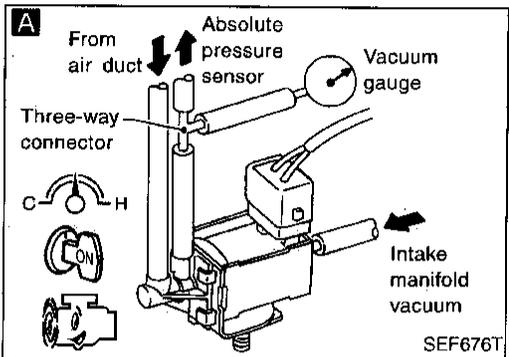
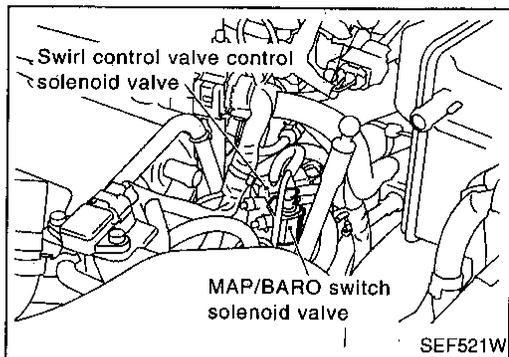


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TROUBLE DIAGNOSIS FOR DTC P1105

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 MAP/BARO switch solenoid valve and absolute pressure sensor with a rubber tube that has vacuum gauge.

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

OR

4. Turn ignition switch "ON".
5. Start engine and let it idle.
6. Check for vacuum.

For 5 seconds after starting engine:
Vacuum should not exist.

For 5 minutes after starting engine:
Vacuum should exist.

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 connectors for water.

Water should not exist.
Refer to "COMPONENT INSPECTION" of "TROUBLE DIAGNOSIS FOR DTC P0105", EC-138.

NG

Repair (disconnection) or replace absolute pressure sensor or harness connectors.

Go to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

NG

B

CHECK HOSE.

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

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.

OK

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 ② and engine ground with CONSULT or tester.

Voltage: Battery voltage
If OK, check harness for short.

NG

Check the following.

- Harness connectors
- **F105**, **M50**
- 10A fuse
- Harness for open or short between MAP/BARO switch solenoid valve and fuse

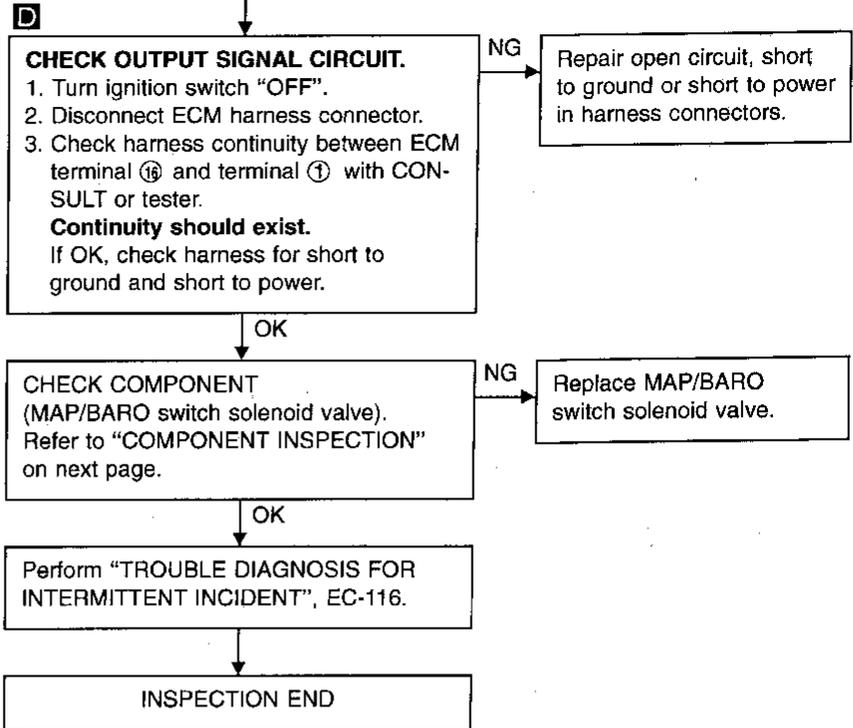
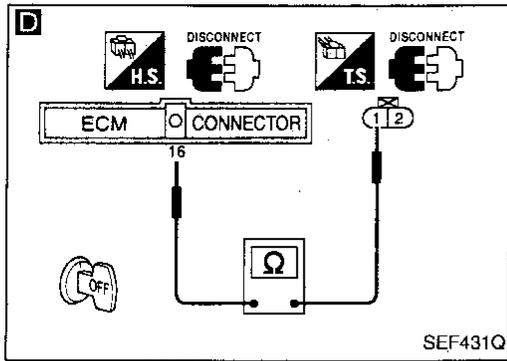
If NG, repair harness or connectors.

OK

Ⓐ

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



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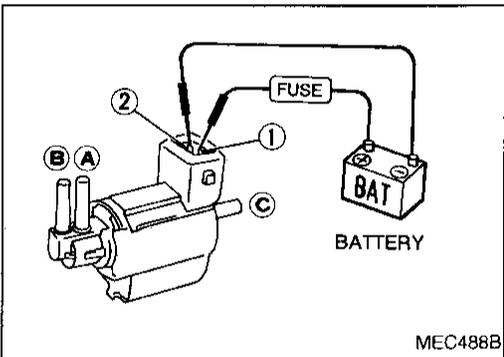
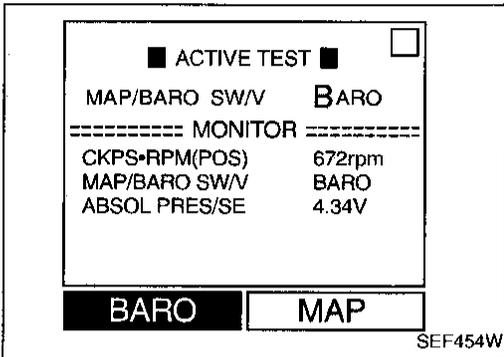
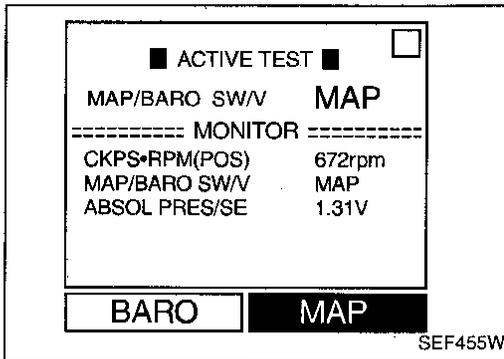
TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

COMPONENT INSPECTION

MAP/BARO switch solenoid valve

1. Start engine and warm it up 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



MAP/BARO	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

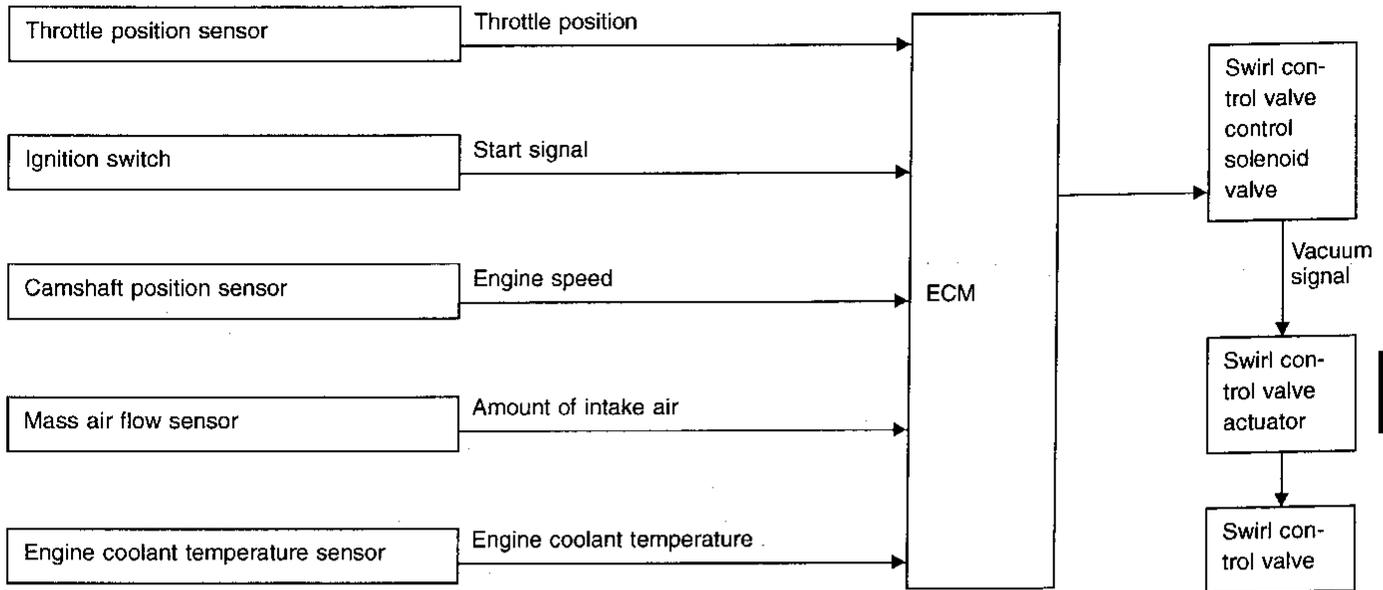
1. Turn ignition switch "OFF" and remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.

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

3. Check the time required for the solenoid valve to switch. It should be less than 1 second.
4. If NG or operation takes more than 1 second, replace solenoid valve.

Swirl Control Valve Control Solenoid Valve (Only for California)

SYSTEM DESCRIPTION



This system has a swirl control valve in the intake passage of each cylinder.

While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.

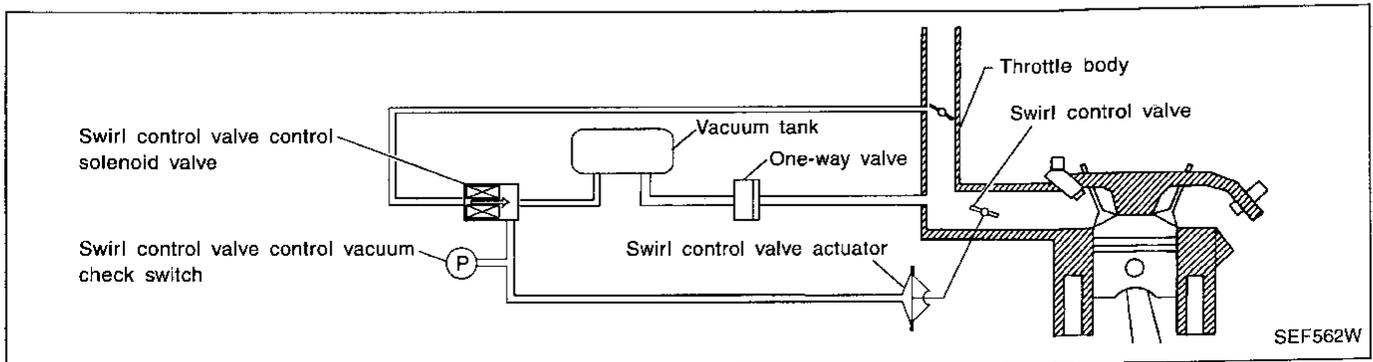
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.

Also, except when idling and during low engine speed operation, this system opens the swirl control valve. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.

The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

Throttle position sensor (Idle position)	Engine speed	Swirl control valve control solenoid valve	Swirl control valve
ON	Below 3,200 rpm	ON	Closed
OFF	Less than 3,200 rpm	ON	Closed
	More than 3,600 rpm	OFF	Open

When engine coolant temperature is below 10°C (50°F) and above 55°C (131°F), swirl control valve is kept open regardless of above condition.



TROUBLE DIAGNOSIS FOR DTC P1130

Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

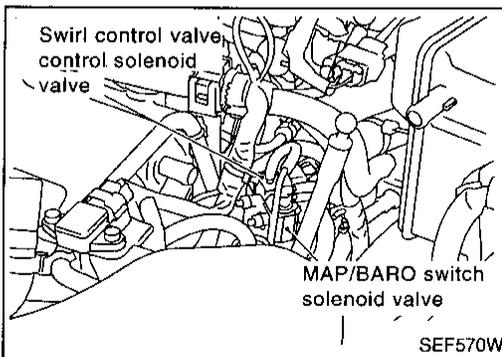
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
SWRL CONT S/V	<ul style="list-style-type: none"> ● Engine speed: Idle 	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F). ON
		Engine coolant temperature is above 55°C (131°F). OFF

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
71	L/Y	Swirl control valve control solenoid valve	Engine is running. — Engine coolant temperature is between 15°C (59°F) to 50°C (122°F). — Idle speed	0 - 1V
			Engine is running. — Engine coolant temperature is above 55°C (131°F). — Idle speed	BATTERY VOLTAGE (11 - 14V)



COMPONENT DESCRIPTION

Swirl control valve control solenoid valve

The swirl control valve control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the solenoid valve is bypassed to apply intake manifold vacuum to the swirl control valve actuator. This operation closes the swirl control valve. When the ECM sends an OFF signal, the vacuum signal is cut and the swirl control valve opens.

TROUBLE DIAGNOSIS FOR DTC P1130

Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)	
P1130 1004	A) An improper voltage signal is sent to ECM through swirl control valve control solenoid valve.	<ul style="list-style-type: none"> ● Harness or connectors (The swirl control valve control solenoid valve circuit is open or shorted.) ● Swirl control valve control solenoid valve 	GI MA EM
	B) The vacuum signal is not sent to swirl control valve under specified driving conditions, even though swirl control valve control solenoid valve is ON.	<ul style="list-style-type: none"> ● Harness or connector (The swirl control valve control solenoid valve circuit is open.) ● Swirl control valve control solenoid valve ● Intake system (Intake air leaks) ● Hoses and tubes between intake manifold, vacuum tank and swirl control valve actuator ● Swirl control valve actuator ● Swirl control valve control vacuum check switch ● One-way valve ● Vacuum tank ● Mass air flow sensor ● Crankshaft position sensor (REF) ● Throttle position sensor 	LC EC FE CL MT
	C) The vacuum signal is sent to swirl control valve even though swirl control valve control solenoid valve is OFF.	<ul style="list-style-type: none"> ● Harness or connector (The swirl control valve control solenoid valve circuit is shorted.) ● Swirl control valve control vacuum check switch ● Crankshaft position sensor (REF) ● Throttle position sensor ● Hoses and tubes between air cleaner and swirl control valve control vacuum check switch ● Swirl control valve control solenoid valve 	AT FA RA

Note: If DTC P1130 (1004) and P1165 (0112) are displayed, first perform TROUBLE DIAGNOSIS FOR DTC P1165 (0112). (See EC-410.)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

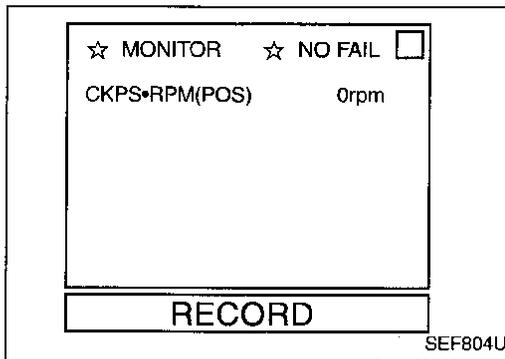
Perform "Procedure for malfunction A" first. If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B and C". If the 1st trip DTC is not confirmed on "Procedure for malfunction B", perform "Procedure for malfunction C".

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

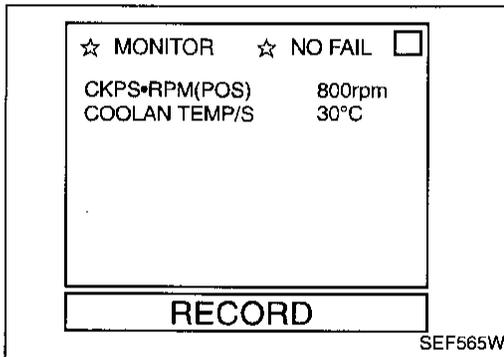
TROUBLE DIAGNOSIS FOR DTC P1130

Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)



Procedure for malfunction A

- 1) Turn ignition switch "ON".
 - 2) Select "DATA MONITOR" mode with CONSULT.
 - 3) Wait at least 5 seconds.
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-402.
- OR
- 1) Turn ignition switch "ON" and wait at least 5 seconds.
 - 2) Select "MODE 7" with GST.
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-402.
- OR
- 1) Turn ignition switch "ON" and wait at least 5 seconds.
 - 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
 - 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-402.



Procedure for malfunction B

TESTING CONDITION:

- Always perform the test at a temperature above 5°C (41°F).
- Before performing the following procedure, confirm that battery voltage is more than 10V at idle, then stop engine immediately.

- 1) Turn ignition switch "OFF" and wait at least 10 seconds.
 - 2) Turn ignition switch "ON".
 - 3) Check "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
 - 4) Confirm COOLAN TEMP/S value is 40°C (104°F) or less.
If the value is more than 40°C (104°F), park the vehicle in a cool place and retry from step 1.
 - 5) Start engine and wait until COOLAN TEMP/S value increases to more than 55°C (131°F).
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-402.
- OR
- 1) Turn ignition switch "OFF" and wait at least 10 seconds.
 - 2) Turn ignition switch "ON".
 - 3) Check engine coolant temperature in "MODE 1" with GST.
 - 4) Confirm engine coolant temperature is 40°C (104°F) or less.
If the value is more than 40°C (104°F), park the vehicle in a cool place and retry from step 1.
 - 5) Start engine and wait until the engine coolant temperature increases to more than 55°C (131°F).
 - 6) Select "MODE 3" with GST.
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-402.

- OR
- 1) Turn ignition switch "OFF" and wait at least 10 seconds.
 - 2) Turn ignition switch "ON".

**Swirl Control Valve Control Solenoid Valve
(Only for California) (Cont'd)**

- 3) Confirm voltage between ⑨ (Engine coolant temperature sensor) and ground is 2.7V or more.
If the value is less than 2.7V, park the vehicle in a cool place and retry from step 1.
- 4) Start engine and wait until the voltage decreases to less than 2.1V.
- 5) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-402.

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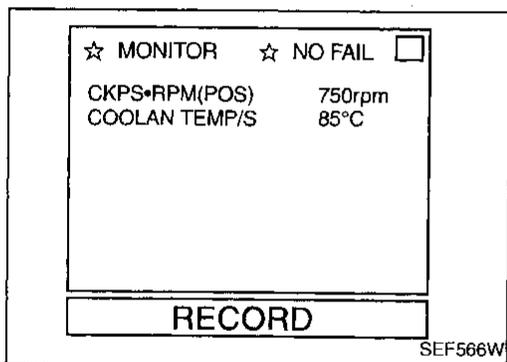
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Procedure for malfunction C

TESTING CONDITION:

- Always perform the 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
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Turn ignition switch "OFF" and wait at least 10 seconds.
 - 3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
 - 4) Start engine and let it idle for at least 20 seconds.
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-402.

OR

- ②
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Turn ignition switch "OFF" and wait at least 10 seconds.
 - 3) Start engine and let it idle for at least 20 seconds.
 - 4) Select "MODE 7" with GST.
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-402.

OR

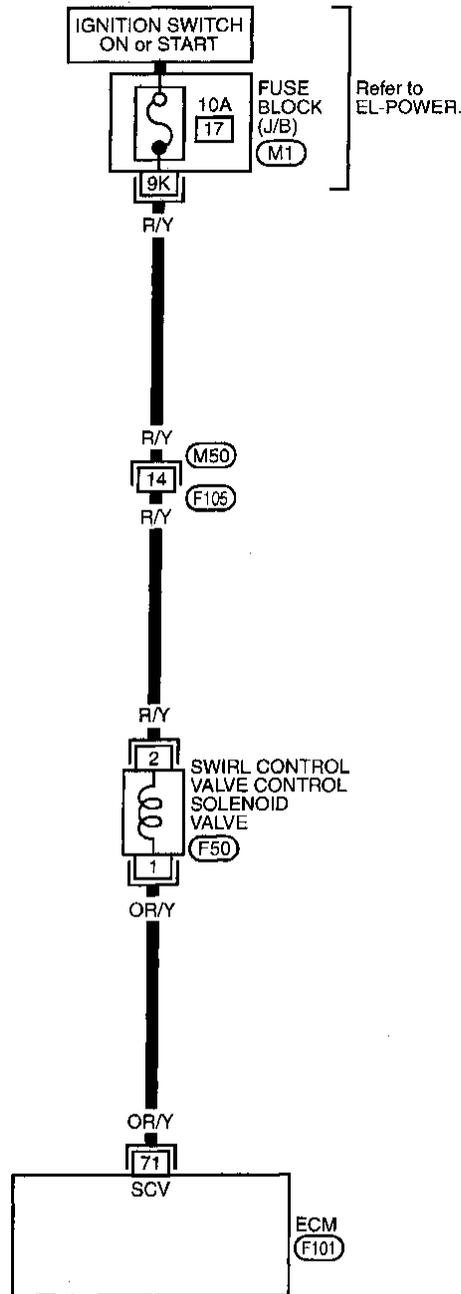
- ③
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Turn ignition switch "OFF" and wait at least 10 seconds.
 - 3) Start engine and let it idle for at least 20 seconds.
 - 4) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
 - 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-402.

TROUBLE DIAGNOSIS FOR DTC P1130

Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)

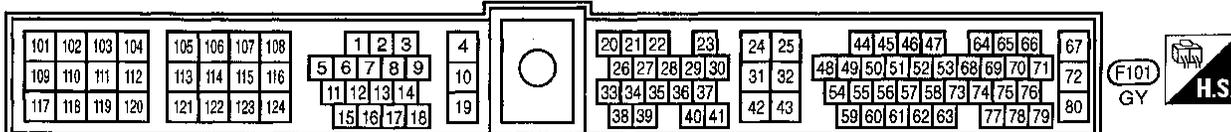
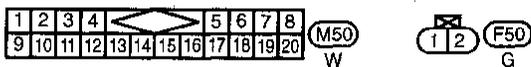
EC-SWL/V-01

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



Refer to last page (Foldout page).

(M1)

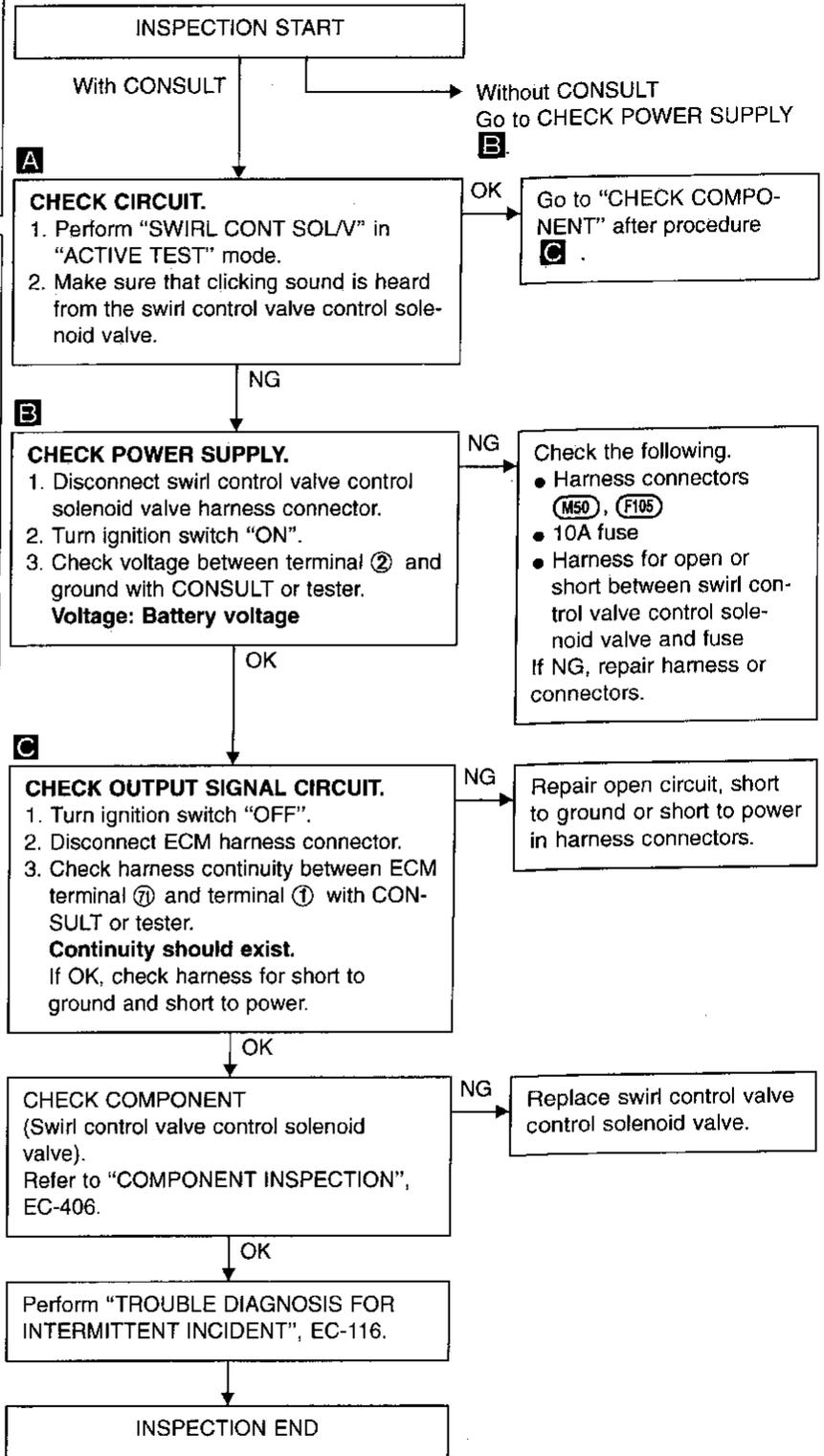
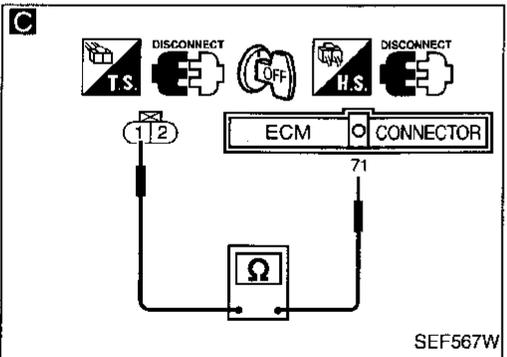
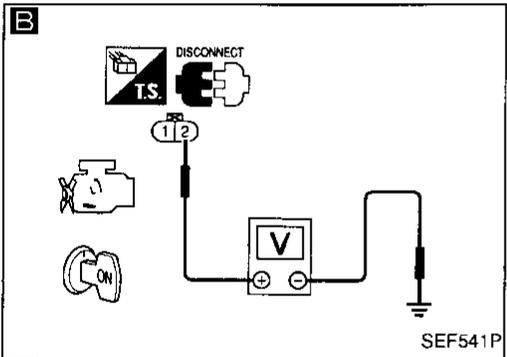
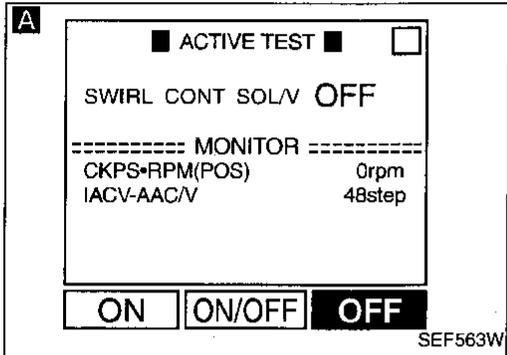
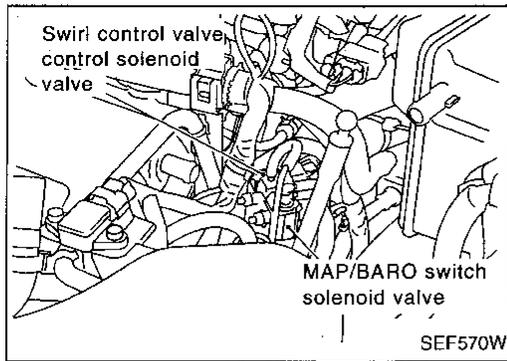


TROUBLE DIAGNOSIS FOR DTC P1130

Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)

DIAGNOSTIC PROCEDURE

Procedure A



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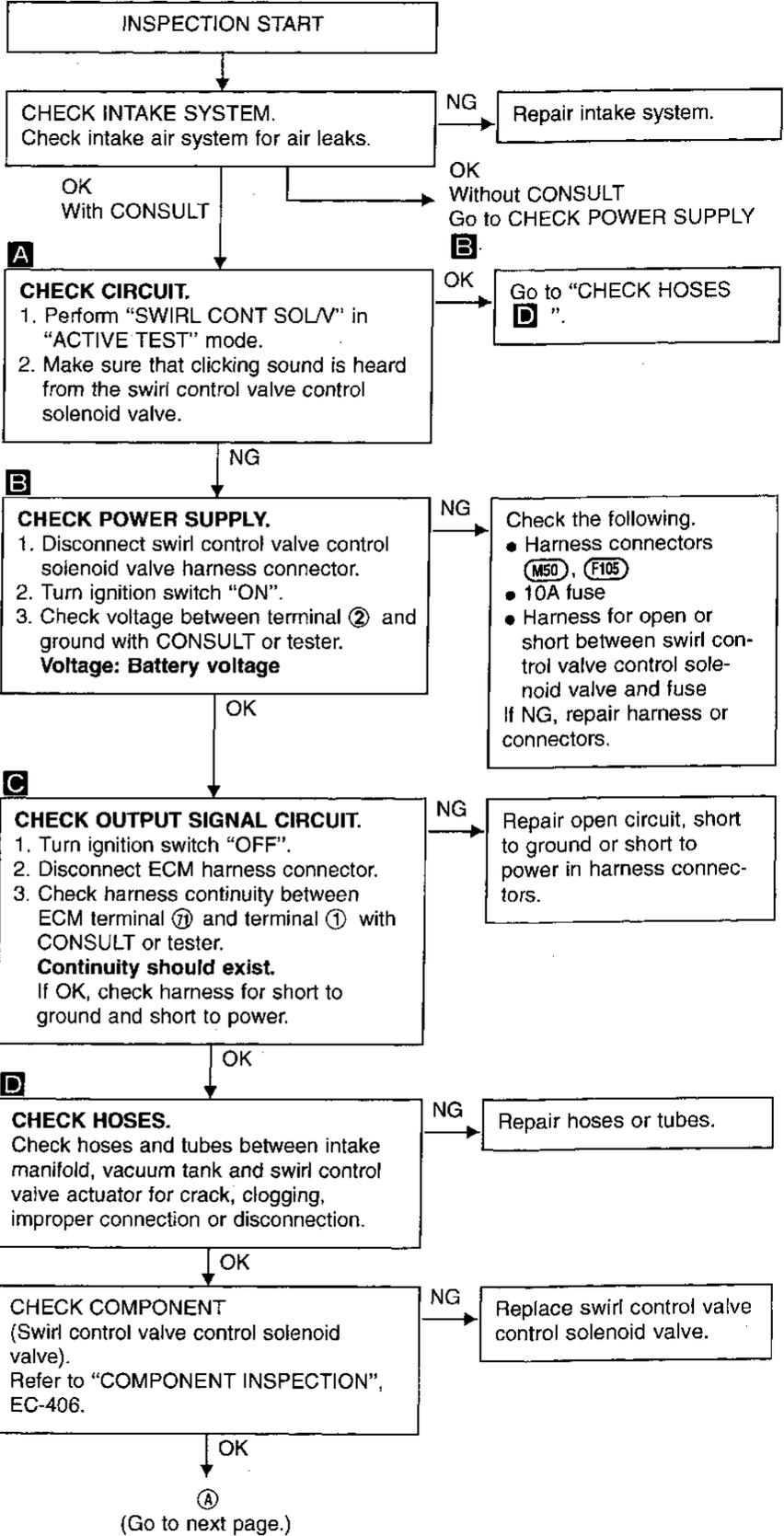
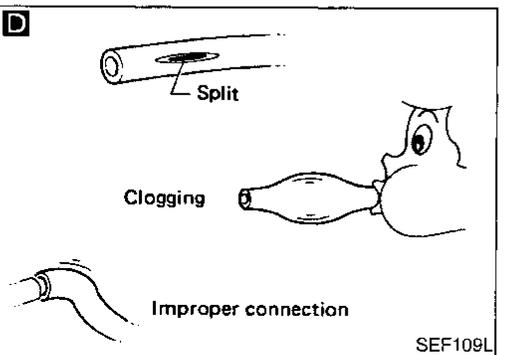
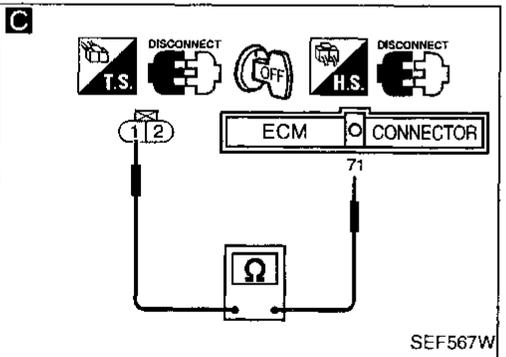
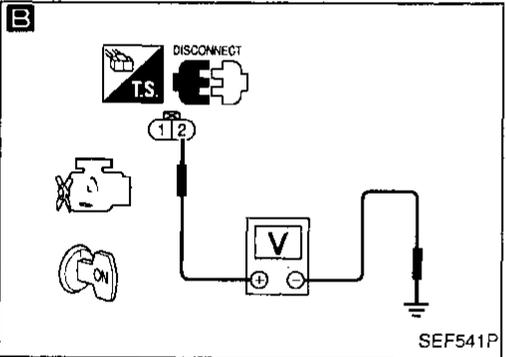
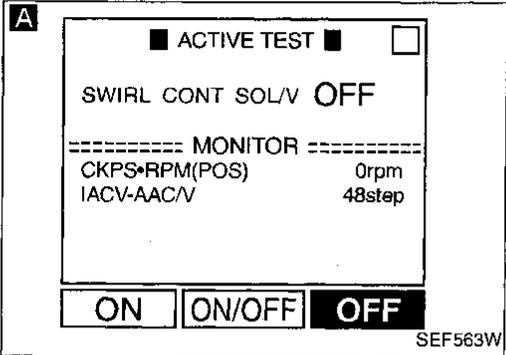
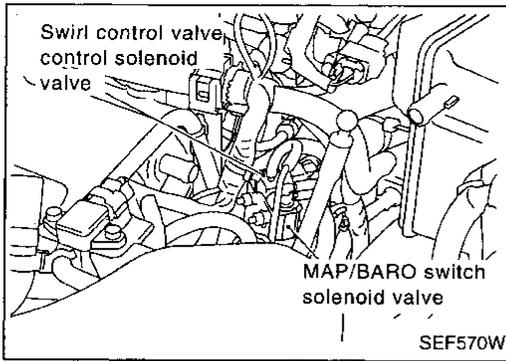
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TROUBLE DIAGNOSIS FOR DTC P1130

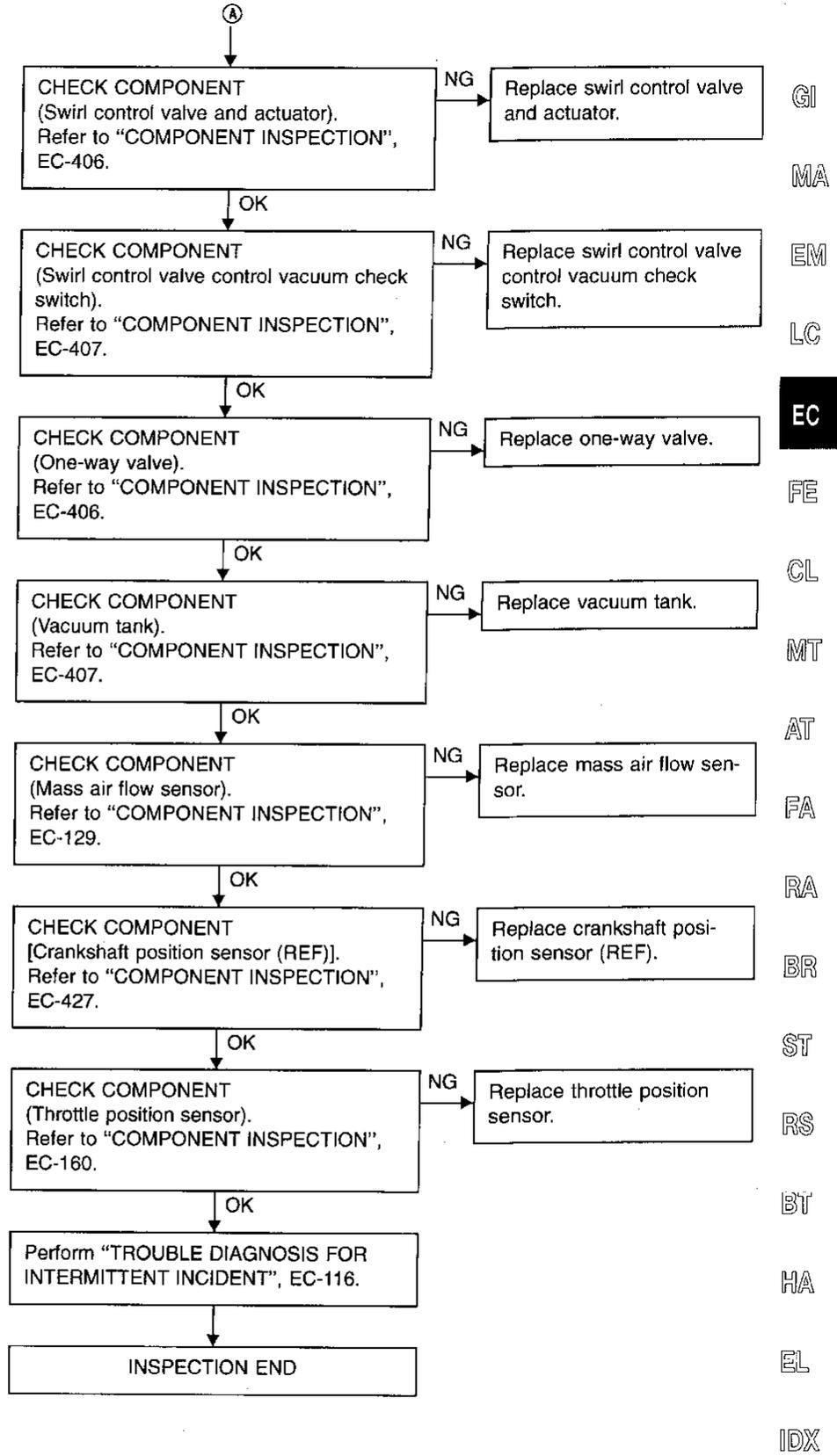
Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)

Procedure B



TROUBLE DIAGNOSIS FOR DTC P1130

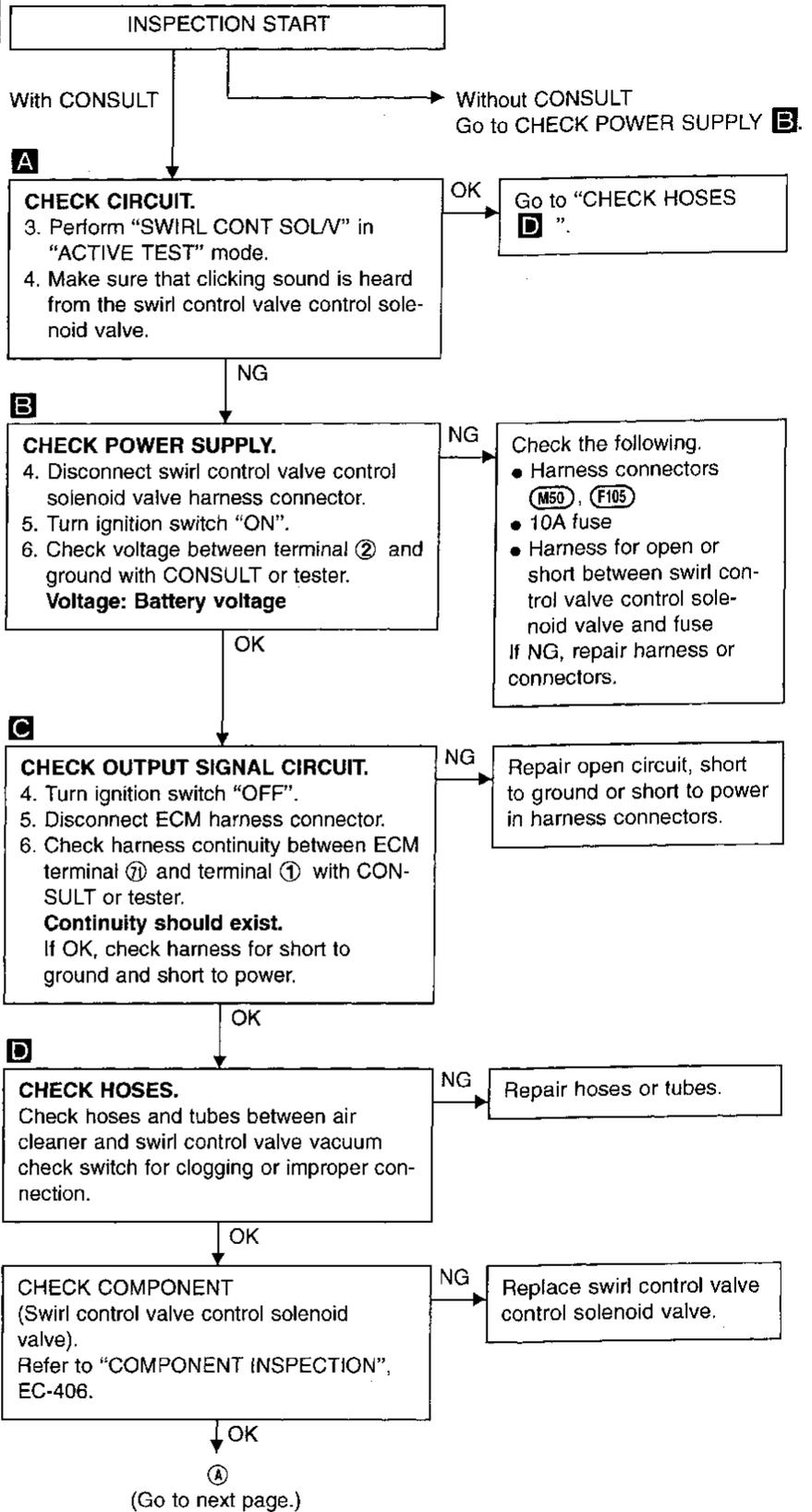
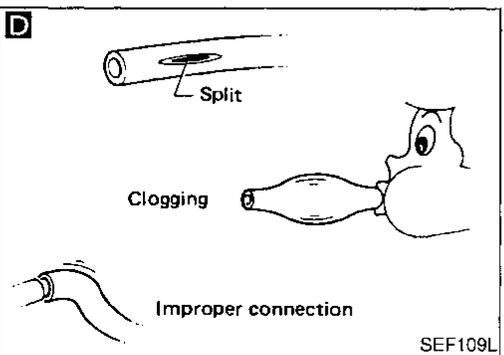
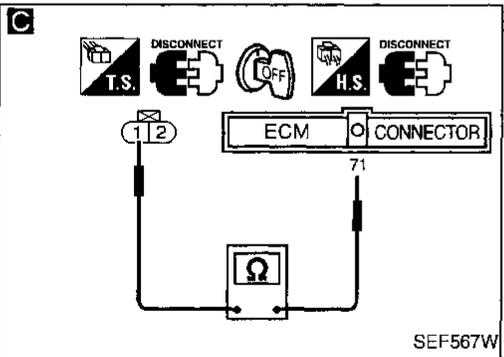
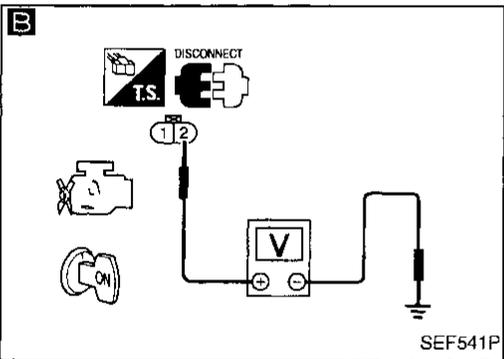
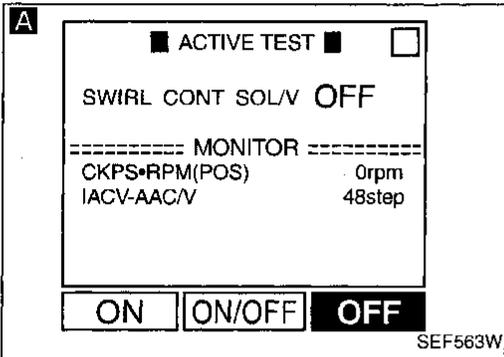
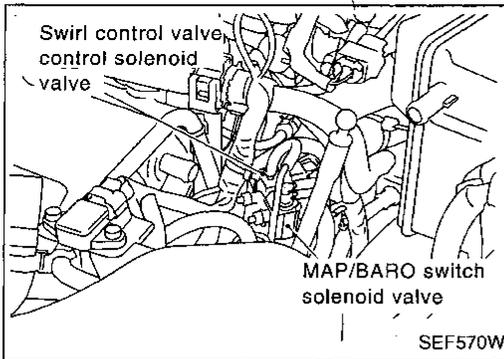
Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P1130

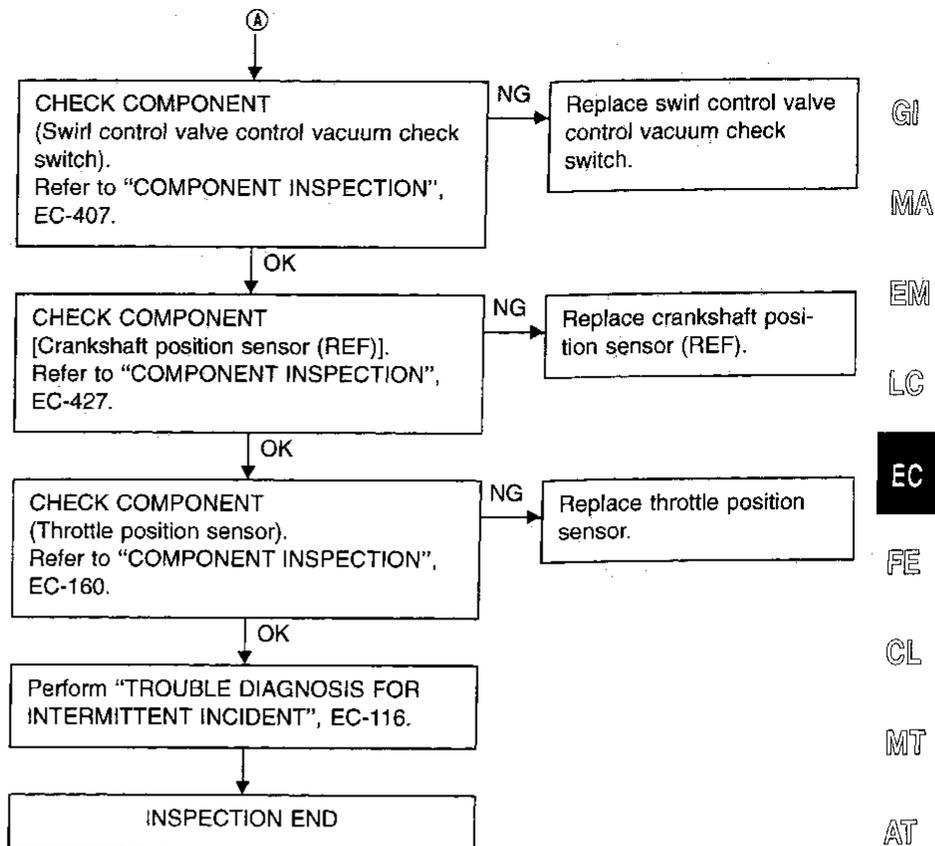
Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)

Procedure C



TROUBLE DIAGNOSIS FOR DTC P1130

Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)



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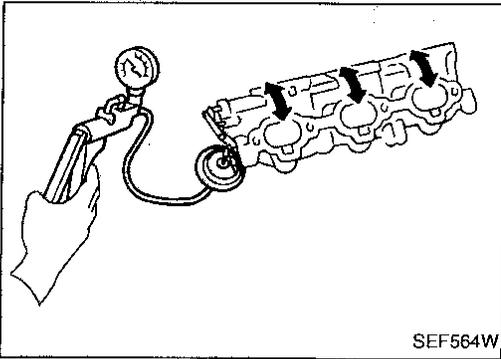
TROUBLE DIAGNOSIS FOR DTC P1130

Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)

COMPONENT INSPECTION

Swirl control valve and actuator

Supply vacuum to actuator and check swirl control valve operation.

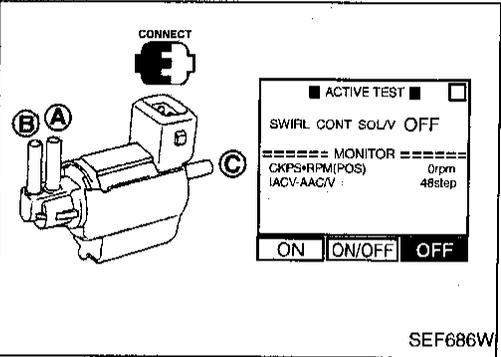


If NG, replace swirl control valve and actuator.

Swirl control valve control solenoid valve

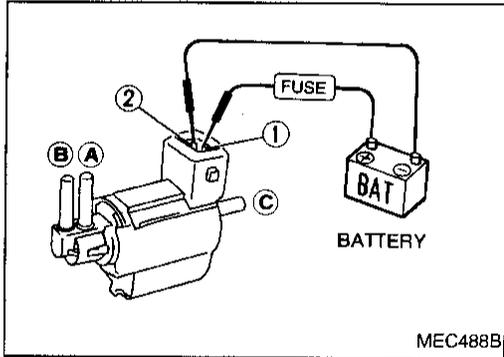
Check solenoid valve air passage continuity.

Turn ignition switch "ON" and perform "SWIRL CONT SOLV" in "ACTIVE TEST" mode.



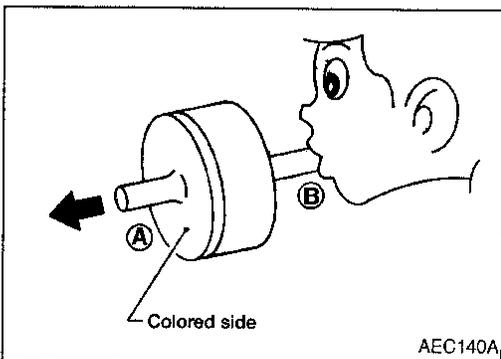
Condition SWIRL CONT SOLV	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
ON	Yes	No
OFF	No	Yes

OR



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.



One-way valve

Check one-way valve air passage continuity.

Condition	Air passage continuity
Blow air from side B to A	Yes
Blow air from side A to B	No

If NG, replace one-way valve.

TROUBLE DIAGNOSIS FOR DTC P1130

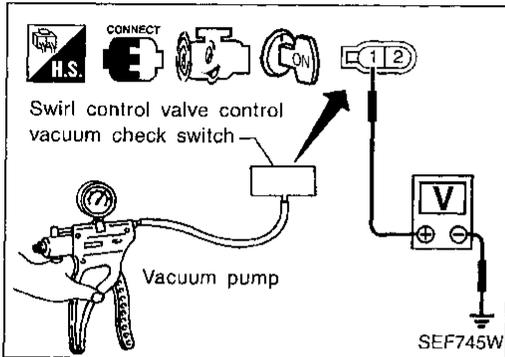
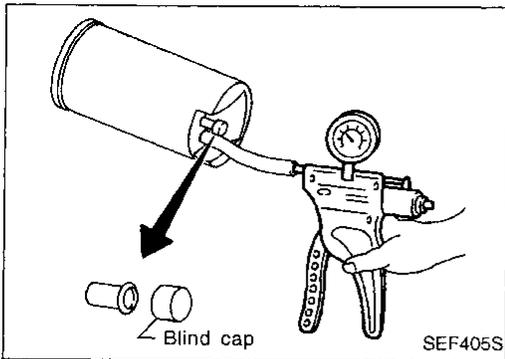
Swirl Control Valve Control Solenoid Valve (Only for California) (Cont'd)

Vacuum tank

Check vacuum tank leakage.

Apply vacuum -80.0 kPa (-600 mmHg, -23.62 inHg, -11.60 psi).
Then keep it for 10 seconds and check there is no leakage.

If NG, replace vacuum tank.



Swirl control valve control vacuum check switch

1. Disconnect swirl control valve control vacuum check switch harness connector.
2. Use vacuum pump to apply vacuum to swirl control valve control vacuum check switch as shown in figure.
3. Start engine.
4. Check voltage between terminal ① and engine ground with CONSULT or tester.

Pressure	Voltage (V)
More than -20.0 kPa (-150 mmHg, -5.91 inHg)	Engine ground
-20.0 to -23.0 kPa (-150 to -172 mmHg, -5.91 to -6.77 inHg)	Engine ground or Approx. 4.8
Less than -23.0 kPa (-172 mmHg, -6.77 inHg)	Approx. 4.8

5. If NG, replace swirl control valve control vacuum check switch.

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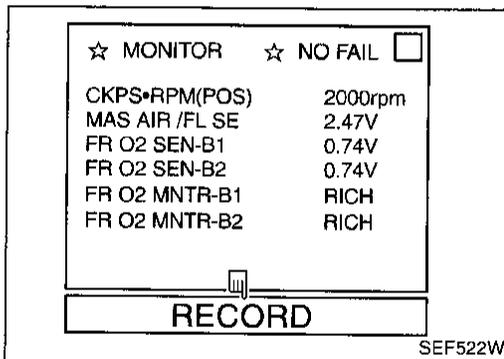
TROUBLE DIAGNOSIS FOR DTC P1148 (-B1), P1168 (-B2)

Closed Loop Control

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
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)	<ul style="list-style-type: none"> The closed loop control function for right 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



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 10 seconds before conducting the next test.

TESTING CONDITION:

- Before performing following procedure, confirm that battery voltage is more than 11V at idle.
- Never raise engine speed above 3,600 rpm (A/T), 4,000 rpm (M/T) during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 2).



- Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 10 seconds.
- Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
- Start engine and hold engine speed at 2,000 rpm.
- 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-191. If the check result is OK, perform the following step.
- Let engine idle at least 3 minutes.
- Maintain the following condition at least 50 consecutive seconds.

B/FUEL SCHDL: 1.5 msec or more

EC-408

TROUBLE DIAGNOSIS FOR DTC P1148 (-B1), P1168 (-B2)

Closed Loop Control (Cont'd)

CKPS RPM (POS): 1,800 - 3,000 rpm

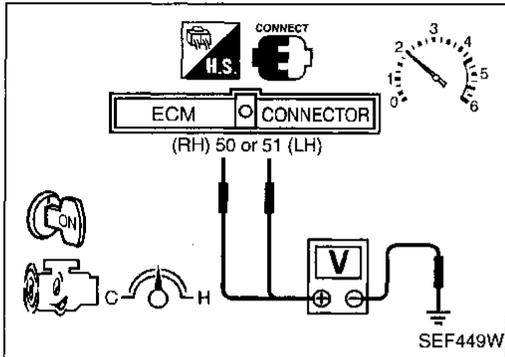
Selector lever: Suitable position

VHCL SPEED SE: More than 70 km/h (43 MPH)

- 8) If DTC is detected, go to "DIAGNOSTIC PROCEDURE" below.

During this test, P0130 and/or P0150 may be displayed on CONSULT screen.

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 terminal LH, ⑤ RH, ⑤① (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" below.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0130, P0150, EC-166.

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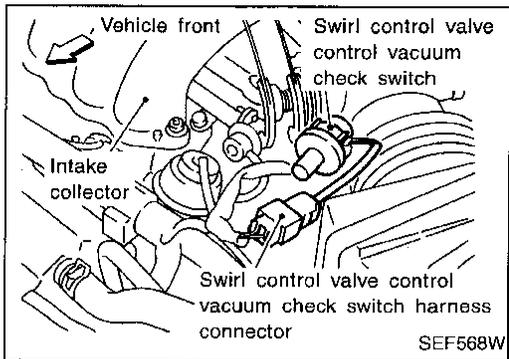
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TROUBLE DIAGNOSIS FOR DTC P1165



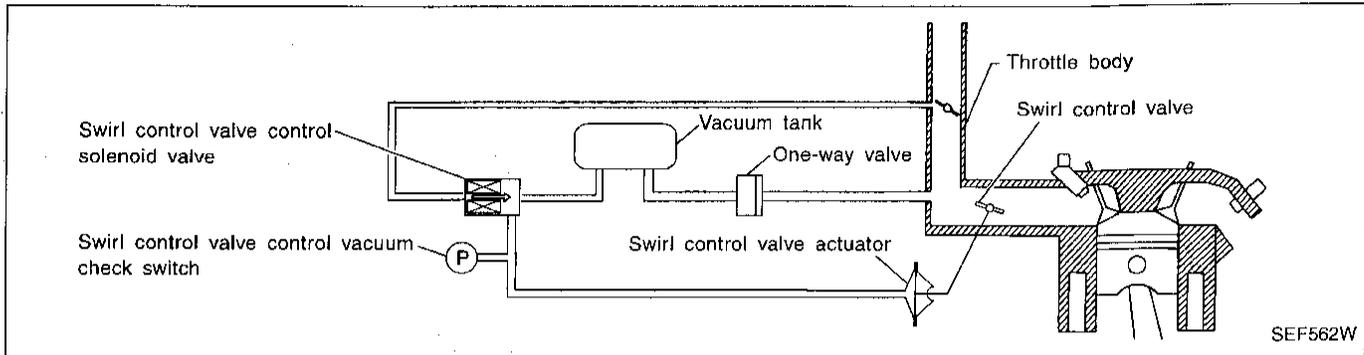
Swirl Control Valve Control Vacuum Check Switch (Only for California)

COMPONENT DESCRIPTION

The swirl control valve control vacuum check switch detects vacuum signal to the swirl control valve, and sends "ON" or "OFF" signal to the ECM.

When vacuum is supplied to the valve, the swirl control valve control vacuum check switch sends "OFF" signal to the ECM.

The swirl control valve control vacuum check switch is not used to control the engine system, it is used for on board diagnosis.



CONSULT REFERENCE VALVE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
* SWL CON VC SW	<ul style="list-style-type: none"> Engine speed: Idle Engine coolant temperature is between 15°C (59°F) to 50°C (122°F). 	OFF
	<ul style="list-style-type: none"> Engine speed: Idle Engine coolant temperature is above 55°C (131°F). 	ON

*: If this item is not available in CONSULT, use "ECM TERMINALS AND REFERENCE VALUE" below.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and 25 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
53	PU	Swirl control valve control vacuum check switch	Engine is running. — Engine coolant temperature is between 15°C (59°F) to 50°C (122°F). — Idle speed	Approximately 5V
			Engine is running. — Engine coolant temperature is above 55°C (131°F). — Idle speed	0 - 1V

TROUBLE DIAGNOSIS FOR DTC P1165

Swirl Control Valve Control Vacuum Check Switch (Only for California) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
P1165 0112	The swirl control valve control vacuum check switch remains "OFF" under specified engine conditions.	<ul style="list-style-type: none"> ● Harness or connectors (Swirl control valve control vacuum check switch circuit is open.) ● Hoses (Hoses are clogged or connected incorrectly.) ● Swirl control valve control solenoid valve ● Swirl control valve control vacuum check switch

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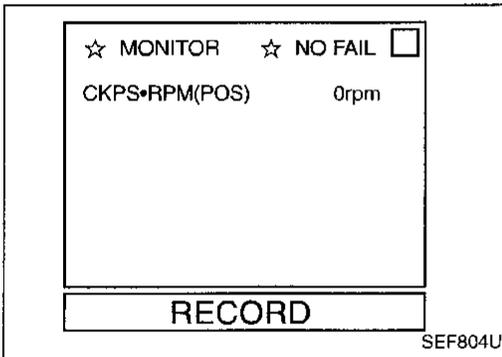
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DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Always perform the test at a temperature above 5°C (41°F).

-  1) Turn ignition switch "OFF" and wait at least 10 seconds.
 2) Turn ignition switch "ON".
 3) Select "DATA MONITOR" mode with CONSULT and wait at least 5 seconds.
 If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-413.

OR

-  1) Turn ignition switch "OFF" and wait at least 10 seconds.
 2) Turn ignition switch "ON" and wait at least 5 seconds.
 3) Select "MODE 3" with GST.
 If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-413.

OR

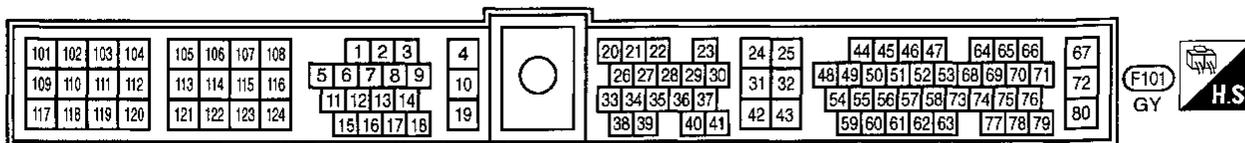
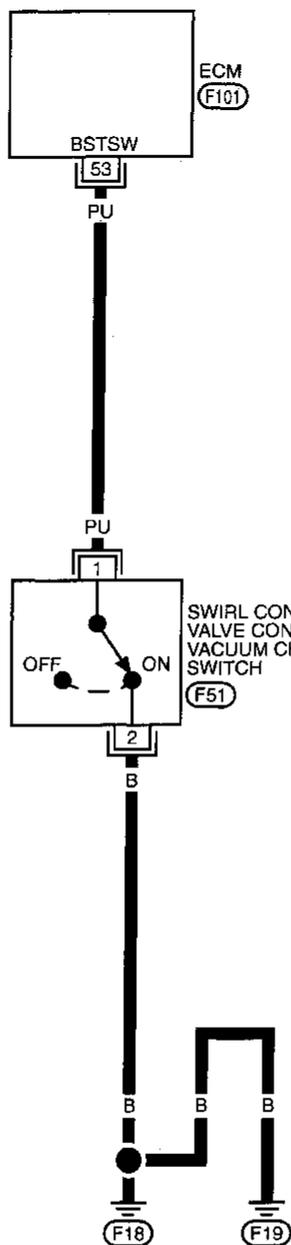
-  1) Turn ignition switch "OFF" and wait at least 10 seconds.
 2) Turn ignition switch "ON" and wait at least 5 seconds.
 3) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
 If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-413.

TROUBLE DIAGNOSIS FOR DTC P1165

Swirl Control Valve Control Vacuum Check Switch (Only for California) (Cont'd)

EC-S/VCSW-01

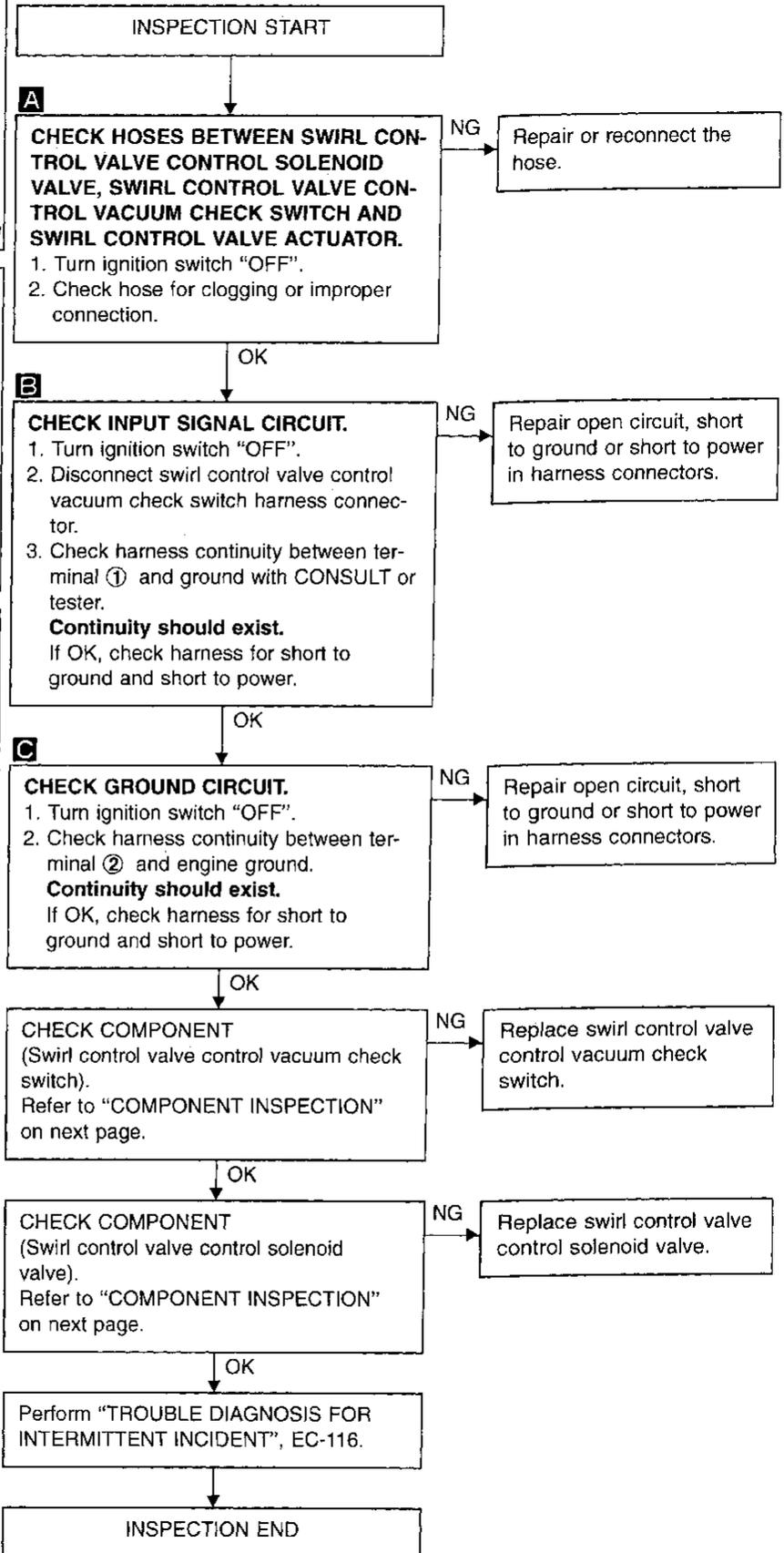
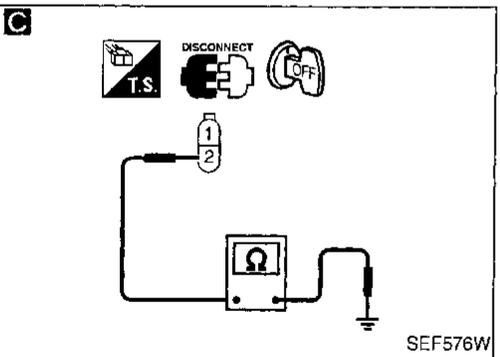
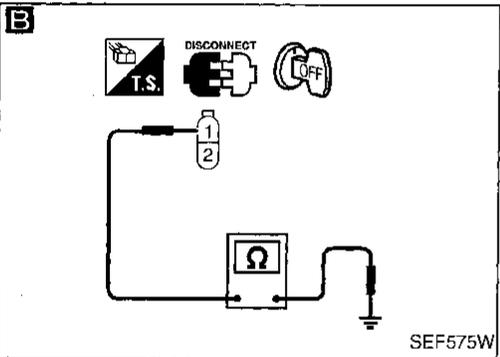
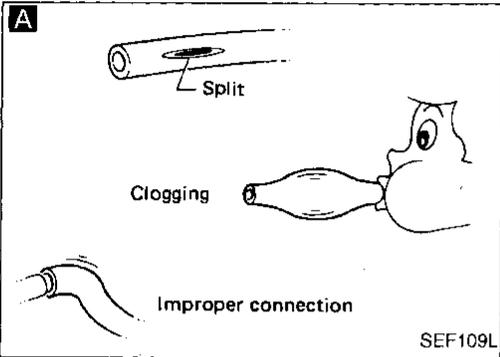
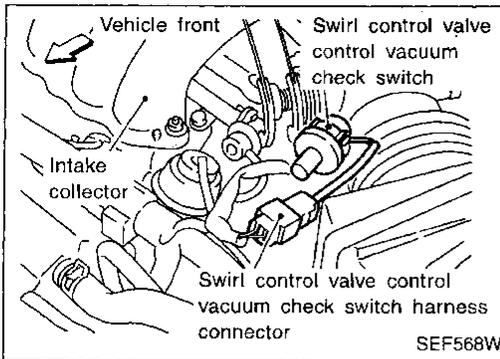
 : Detectable line for DTC
 : Non-detectable line for DTC



TROUBLE DIAGNOSIS FOR DTC P1165

Swirl Control Valve Control Vacuum Check Switch (Only for California) (Cont'd)

DIAGNOSTIC PROCEDURE



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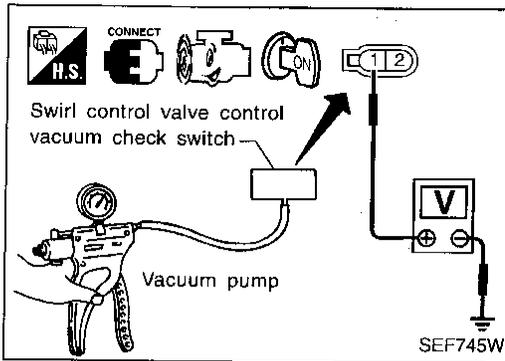
TROUBLE DIAGNOSIS FOR DTC P1165

Swirl Control Valve Control Vacuum Check Switch (Only for California) (Cont'd)

COMPONENT INSPECTION

Swirl control valve control vacuum check switch

1. Disconnect swirl control valve control vacuum check switch harness connector.
2. Use vacuum pump to apply vacuum to swirl control valve control vacuum check switch as shown in figure.
3. Start engine.
4. Check voltage between terminal ① and engine ground with CONSULT or tester.



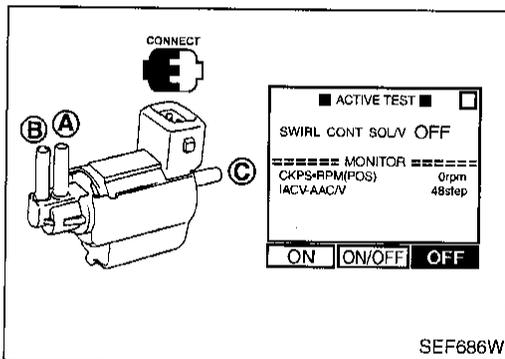
Pressure	Voltage (V)
More than -20.0 kPa (-150 mmHg, -5.91 inHg)	Engine ground
-20.0 to -23.0 kPa (-150 to -172 mmHg, -5.91 to -6.77 inHg)	Engine ground or Approx. 4.8
Less than -23.0 kPa (-172 mmHg, -6.77 inHg)	Approx. 4.8

5. If NG, replace swirl control valve control vacuum check switch.

Swirl control valve control solenoid valve

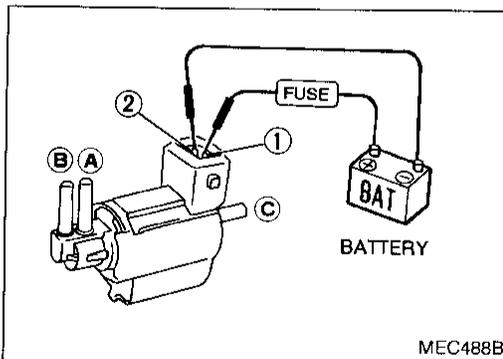
Check solenoid valve air passage continuity.

- ① Turn ignition switch "ON" and perform "SWIRL CONT SOL/V" in "ACTIVE TEST" mode.



Condition SWIRL CONT SOLV	Air passage continuity between ① and ②	Air passage continuity between ① and ③
ON	Yes	No
OFF	No	Yes

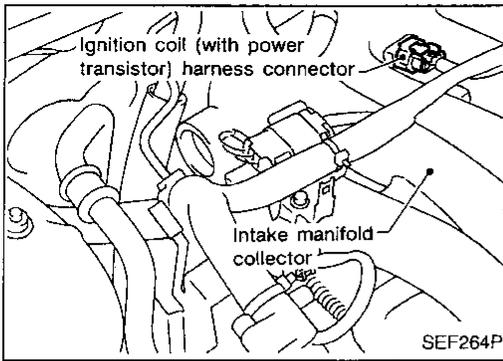
OR



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

If NG or operation takes more than 1 second, replace solenoid valve.

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.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

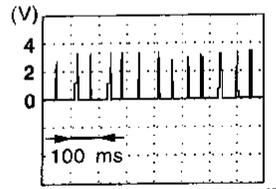
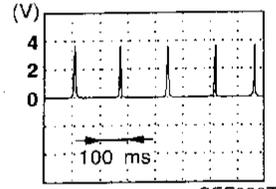
Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
1	Y/R	Ignition signal (No. 1)	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) └ Idle speed	0 - 0.2V★
2	G/R	Ignition signal (No. 2)		
3	L/R	Ignition signal (No. 3)		
7	GY	Ignition signal (No. 4)		
8	PU/W	Ignition signal (No. 5)		
9	GY/R	Ignition signal (No. 6)		
			<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> └ Engine speed is 2,500 rpm.	0.1 - 0.2V★



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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1320 0201	● The ignition signal in the primary circuit is not entered 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 ● Condenser ● Crankshaft position sensor (REF) ● Crankshaft position sensor (REF) circuit

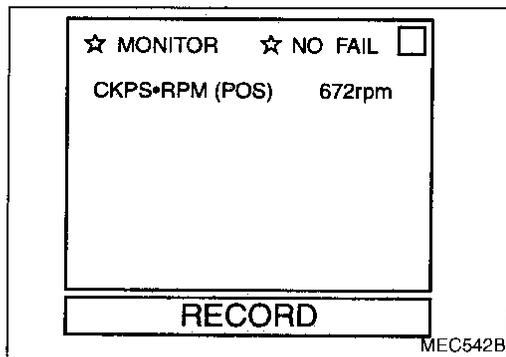
TROUBLE DIAGNOSIS FOR DTC P1320

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 10 seconds before conducting the next test.
- If both DTC P1320 (0201) and DTC P0340 (0101), P1335 (0407), P0335 (0802) or P1336 (0905) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340, P1335, P0335 or P1336 first. (See EC-311, 422, 304, or 428.)



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-420.

OR



- 1) Turn ignition switch "ON".
- 2) Start engine. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)
- 3) Select MODE 7 with GST.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-420.

OR

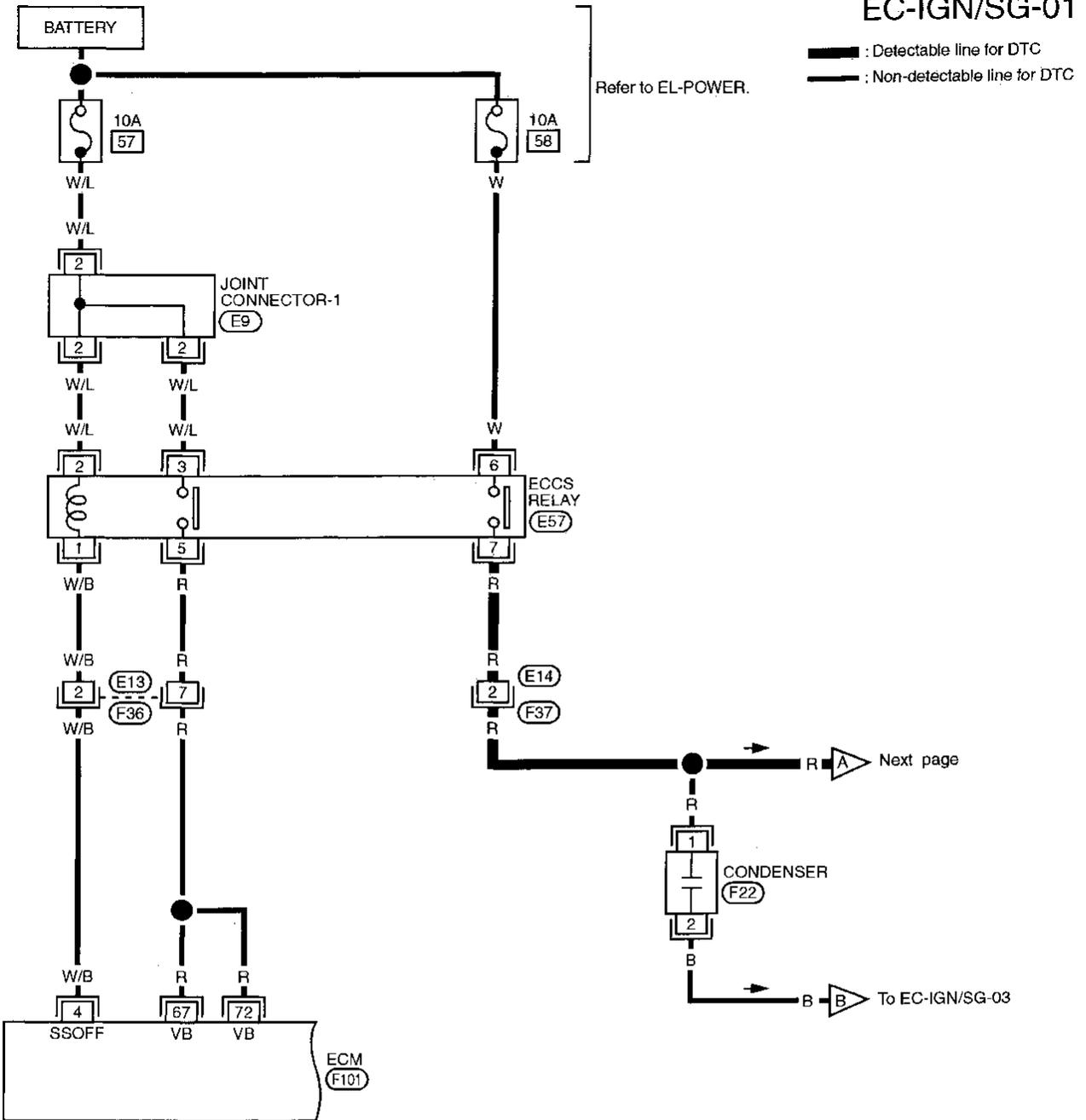


- 1) Turn ignition switch "ON".
- 2) Start engine. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)
- 3) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-420.

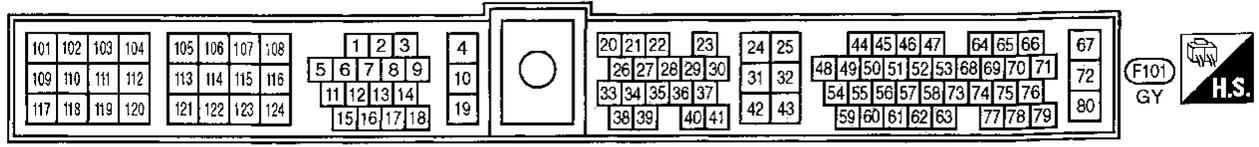
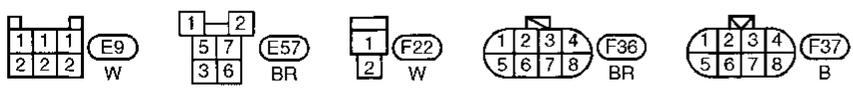
TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)

EC-IGN/SG-01



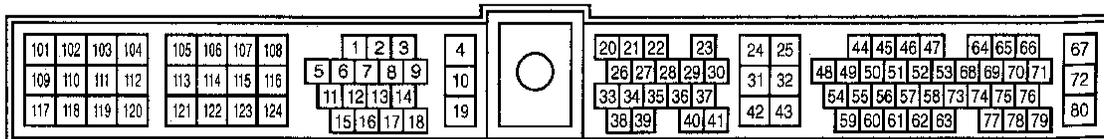
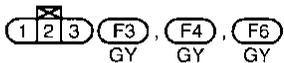
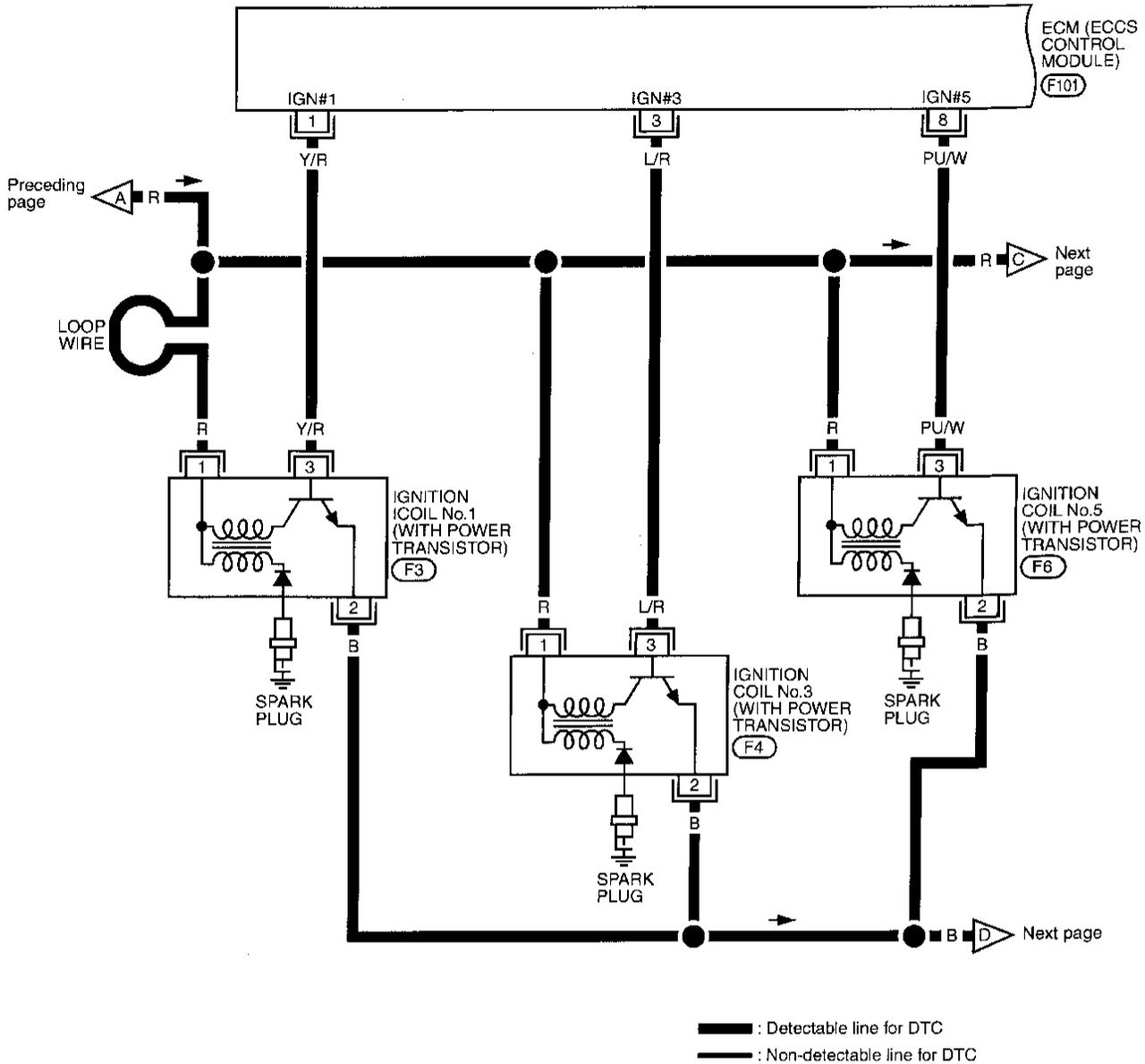
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TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)

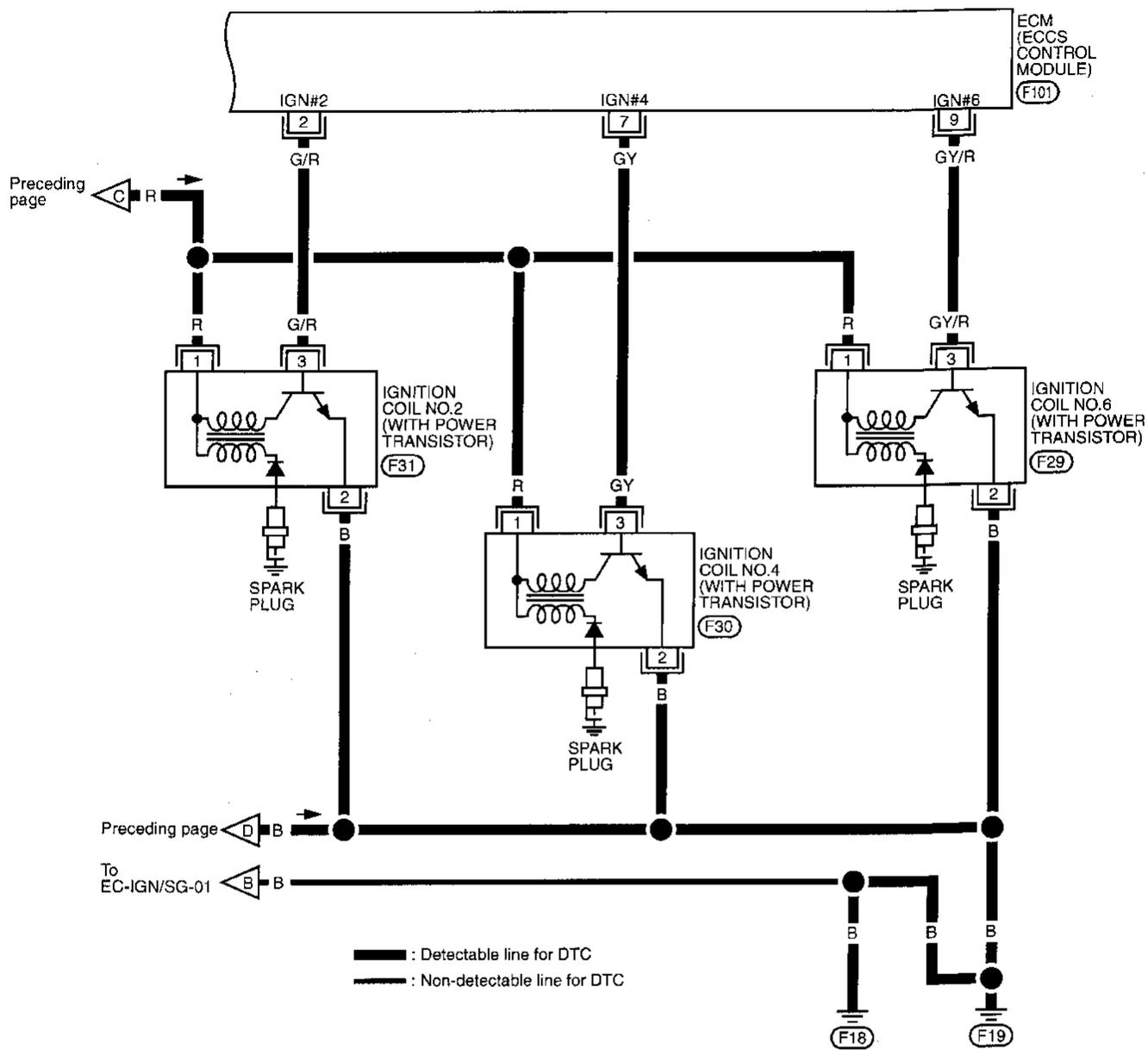
EC-IGN/SG-02



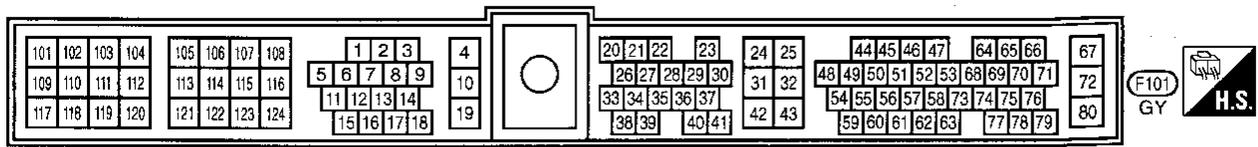
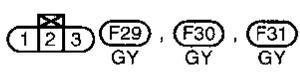
TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)

EC-IGN/SG-03

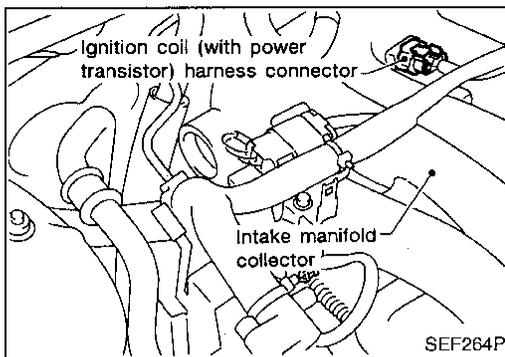


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MEC231C

Ignition Signal (Cont'd)
DIAGNOSTIC PROCEDURE



INSPECTION START

Does engine start?

No

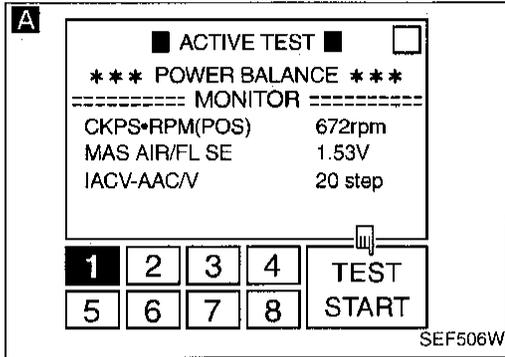
Yes

B

SEARCH FOR MALFUNCTIONING CIRCUIT.

1. Turn ignition switch "ON".
2. Check voltage between ECM terminals ①, ②, ③, ⑦, ⑧, ⑨ and ground.

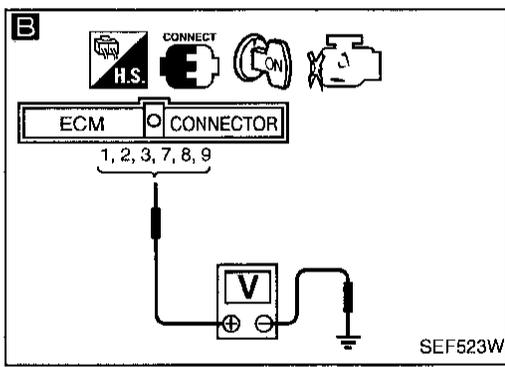
Voltage: 0.01 - 0.1V



A

SEARCH FOR MALFUNCTIONING CIRCUIT.

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Search for circuit which does not produce a momentary engine speed drop.



C

CHECK POWER SUPPLY.

1. Disconnect each ignition harness connector and condenser harness connector.
2. Turn ignition switch "ON".
3. Check voltage between each ignition coil harness connector terminal ① and ground, condenser harness connector terminal ① and ground.

Voltage: Battery voltage

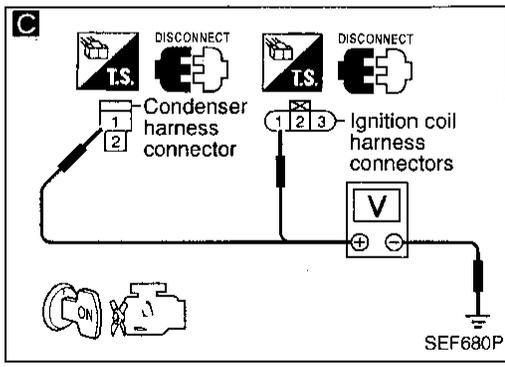
NG

Check the following.

- Harness connectors (E14), (F37)
- Harness for open or short between ECCS relay and ignition coils or condenser
- Condenser

Refer to "COMPONENT INSPECTION". (See on next page.)

If NG, repair harness, connectors or component.



D

CHECK GROUND CIRCUIT.

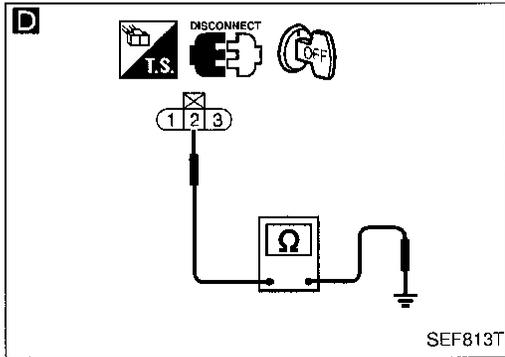
1. Disconnect each ignition coil harness connector.
2. Check harness continuity between each ignition coil harness connector terminal ② and engine ground.

Continuity should exist.

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

NG

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



E

CHECK OUTPUT SIGNAL CIRCUIT.

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

Continuity should exist.

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

NG

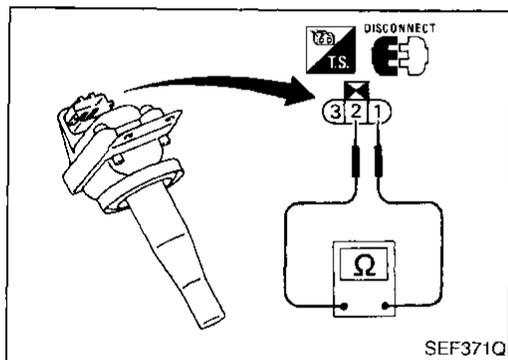
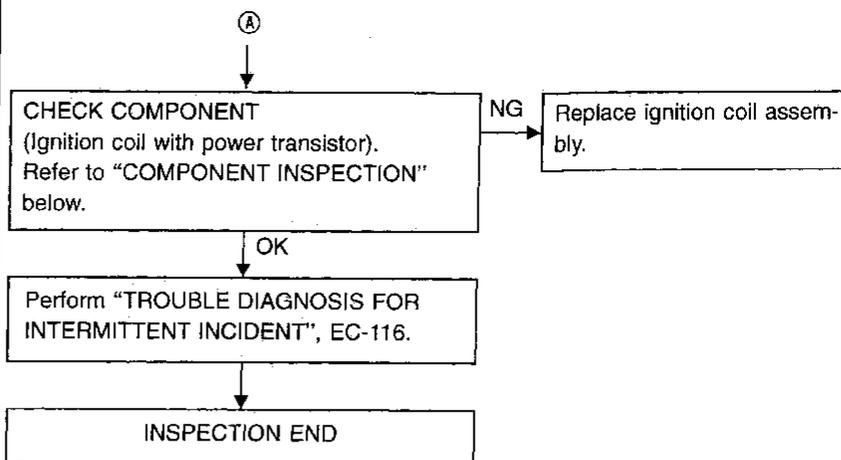
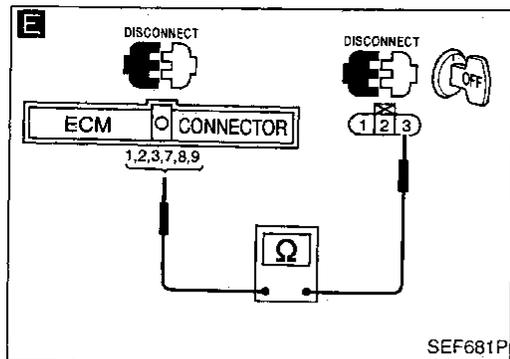
Repair open circuit, short to ground or short to power in harness connectors.

OK

A

TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)



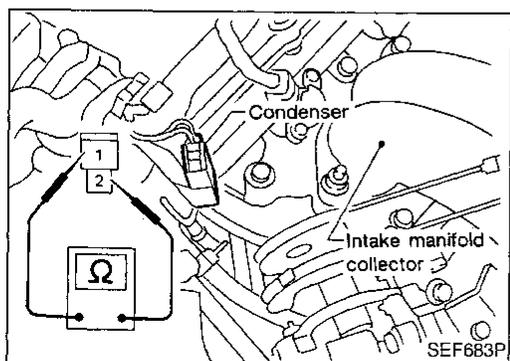
COMPONENT INSPECTION

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 ① and ②.

Terminals	Resistance	Result
① and ②	Not 0Ω	OK
	0Ω	NG

If NG, replace ignition coil with power transistor assembly.



Condenser

1. Disconnect condenser harness connector.
2. Check condenser continuity between terminals ① and ②.
Resistance: Above 1 MΩ at 25°C (77°F)

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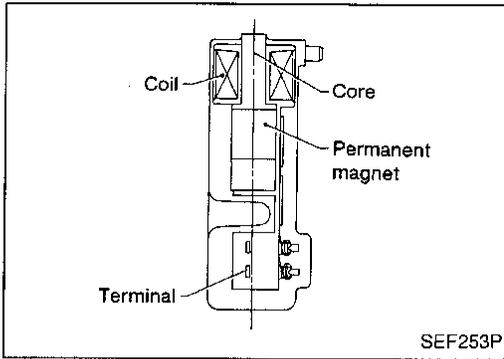
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TROUBLE DIAGNOSIS FOR DTC P1335



Crankshaft Position Sensor (CKPS) (REF)

COMPONENT DESCRIPTION

The crankshaft position sensor (REF) is located on the oil pan (upper) facing the crankshaft pulley. It detects the TDC (Top Dead Center) signal (120° signal).

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

When engine is running, the gap between the sensor and the crankshaft pulley will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the TDC signal (120° signal).

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS-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.
CKPS-RPM (REF)		

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and ②⑤ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
46 47	W W	Crankshaft position sensor (REF)	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) ↳ Idle speed	Approximately 2.3V★ (AC voltage)

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1335 0407	A) 120° signal is not entered to ECM for the first few seconds during engine cranking. B) 120° signal is not entered to ECM during engine running. C) 120° signal cycle excessively changes during engine running.	<ul style="list-style-type: none"> • Harness or connectors (The crankshaft position sensor (REF) circuit is open or shorted.) • Crankshaft position sensor (REF) • Starter motor (Refer to EL section.) • Starting system circuit (Refer to EL section.)

TROUBLE DIAGNOSIS FOR DTC P1335

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

FAIL-SAFE MODE

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*1		
P1335	0407	Crankshaft position sensor (REF) circuit	Compression TDC signal (120° signal) is controlled by camshaft position sensor (PHASE) signal and crankshaft position sensor (POS) signal. Ignition timing will be delayed 0° to 2°.

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "Procedure for malfunction B and C".

Procedure malfunction A

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 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) Crank engine for at least 2 seconds.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-426.

OR

-  1) Crank engine for at least 2 seconds.
2) Select "MODE 7" with GST.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-426.

OR

-  1) Crank engine for at least 2 seconds.
2) Turn ignition switch "OFF", wait at least 10 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-426.

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 10 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".
2) Select "DATA MONITOR" mode with CONSULT.

EC-423

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CKPS•RPM (POS)	672rpm	
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TROUBLE DIAGNOSIS FOR DTC P1335

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

- 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-314.

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-314.

OR



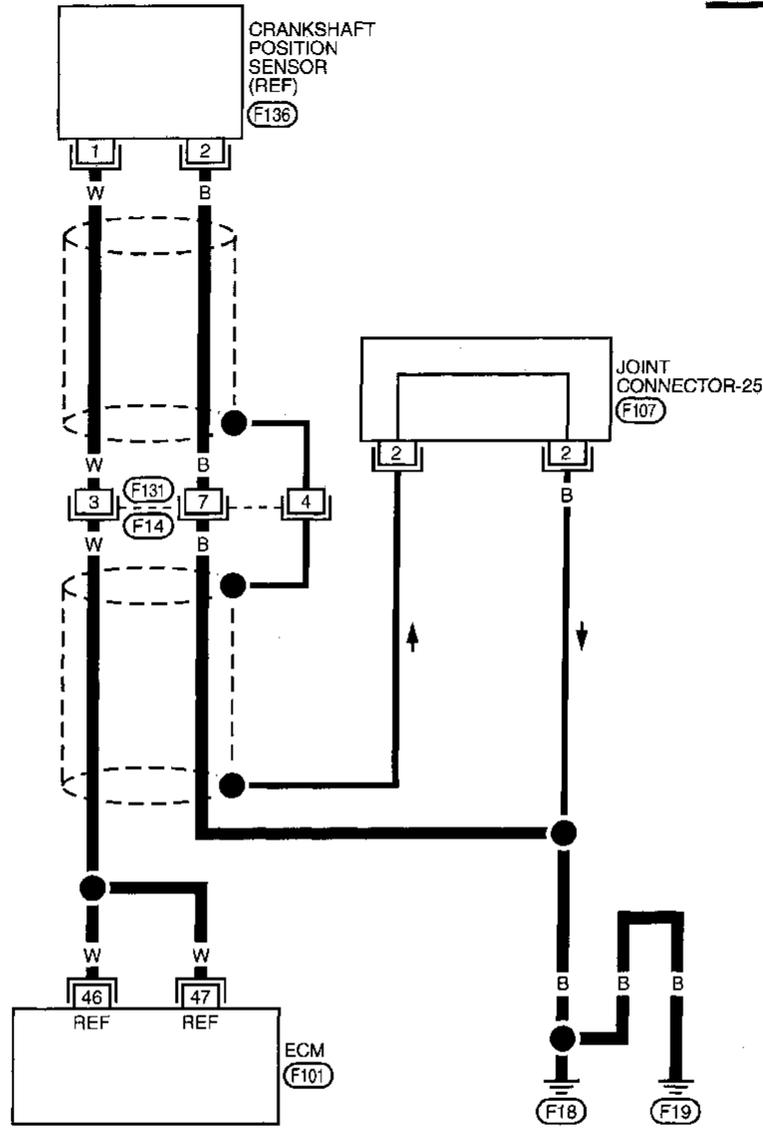
- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-314.

TROUBLE DIAGNOSIS FOR DTC P1335

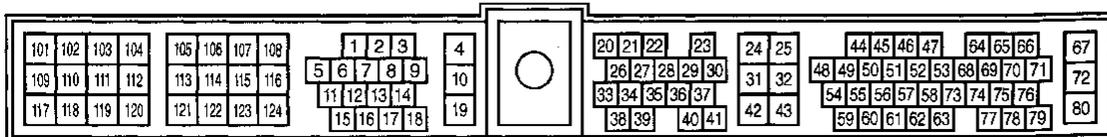
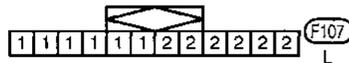
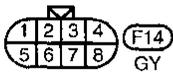
Crankshaft Position Sensor (CKPS) (REF) (Cont'd)

EC-REF-01

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



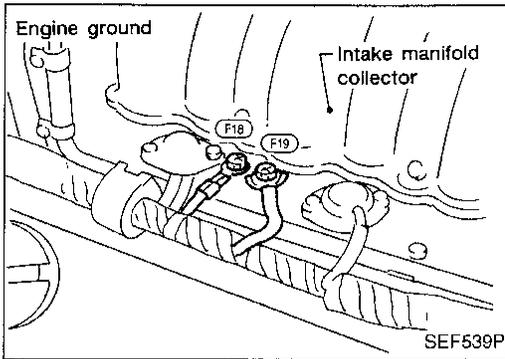
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TROUBLE DIAGNOSIS FOR DTC P1335

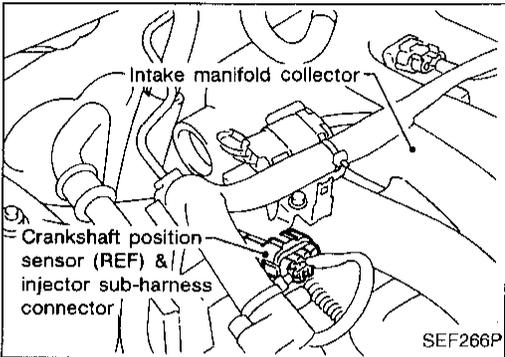
Crankshaft Position Sensor (CKPS) (REF) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

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

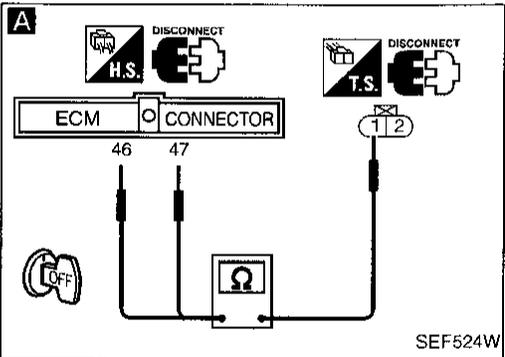


A
CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect crankshaft position sensor (REF) harness connector and ECM harness connector.
3. Check harness continuity between terminal ① and ECM terminals ④⑥, ④⑦.
Continuity should exist.
If OK, check harness for short to ground and short to power.

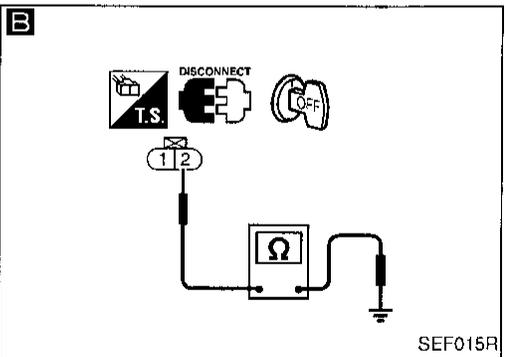
NG
Check the following.

- Harness connectors (F14), (F131)
- Harness for open or short between crankshaft position sensor (REF) harness connector and crankshaft position sensor (REF) harness connector
- Harness for open or short between crankshaft position sensor (REF) harness connector and ECM

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



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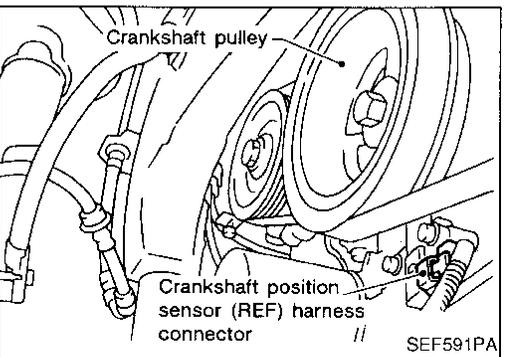


B
CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.
3. Check harness continuity between terminal ② and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG
Check the following.

- Harness connectors (F14), (F131)
- Harness for open or short between crankshaft position sensor (REF) harness connector and crankshaft position sensor (REF) harness connector
- Harness for open or short between crankshaft position sensor (REF) harness connector and engine ground

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



OK

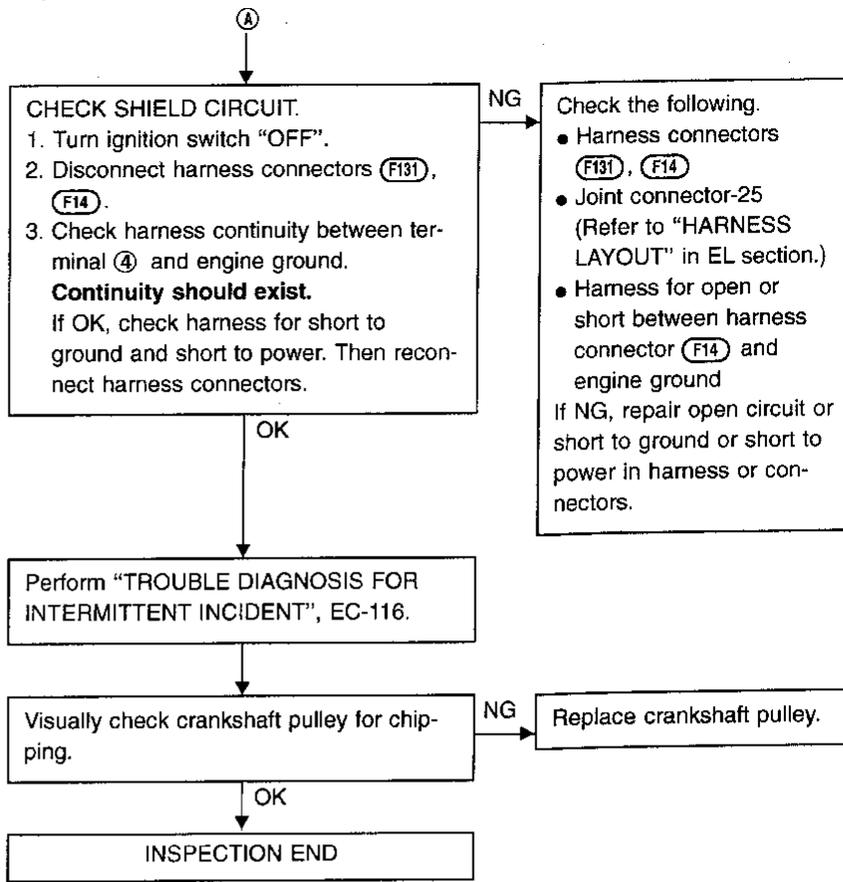
CHECK COMPONENT
[Crankshaft position sensor (REF)].
Refer to "COMPONENT INSPECTION" on next page.

NG
Replace crankshaft position sensor (REF).

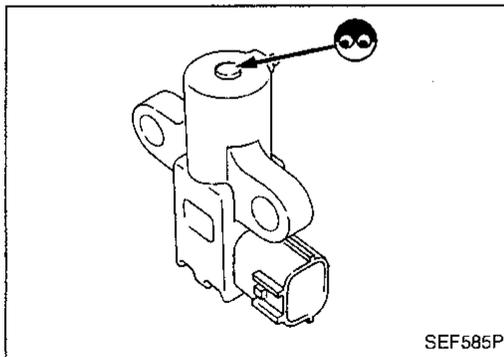
OK
A

TROUBLE DIAGNOSIS FOR DTC P1335

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



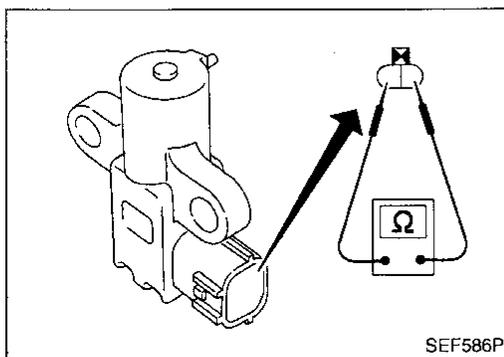
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COMPONENT INSPECTION

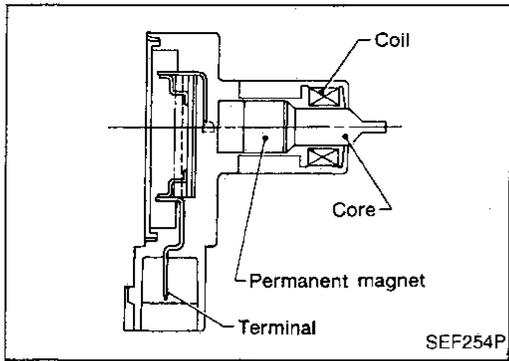
Crankshaft position sensor (REF)

1. Disconnect crankshaft position sensor (REF) 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 470 - 570Ω [At 20°C (68°F)]
6. If NG, replace crankshaft position sensor (REF).

TROUBLE DIAGNOSIS FOR DTC P1336



Crankshaft Position Sensor (CKPS) (POS) (COG)

COMPONENT DESCRIPTION

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).

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

When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS-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.
CKPS-RPM (REF)		

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
49	W	Crankshaft position sensor (POS)	Engine is running. ↳ Idle speed	Approximately 2.5V★
			Engine is running. ↳ Engine speed is 2,000 rpm.	Approximately 2.4V★
4	W/B	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" ↳ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" ↳ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
67 72	R R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

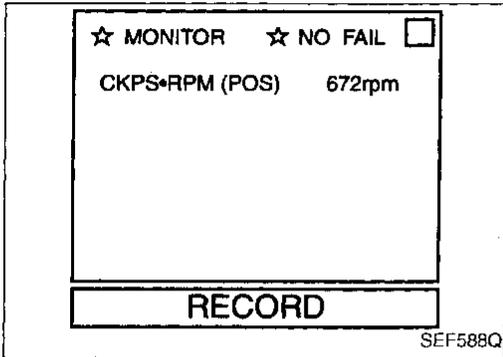
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

TROUBLE DIAGNOSIS FOR DTC P1336

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

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 flywheel) 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/Flywheel)



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 10 seconds before conducting the next test.
- 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 at least 1 minute and 10 seconds at idle speed.
 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-431.

OR

- 1) Start engine and run it at least 1 minute and 10 seconds at idle speed.
 2) Select "MODE 7" with GST.
 3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-431.

OR

- 1) Start engine and run it at least 1 minute and 10 seconds at idle speed.
 2) Turn ignition switch "OFF", wait at least 10 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-431.

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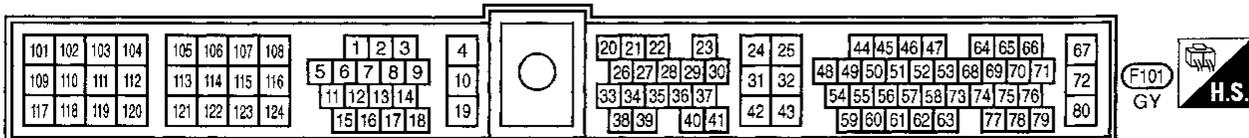
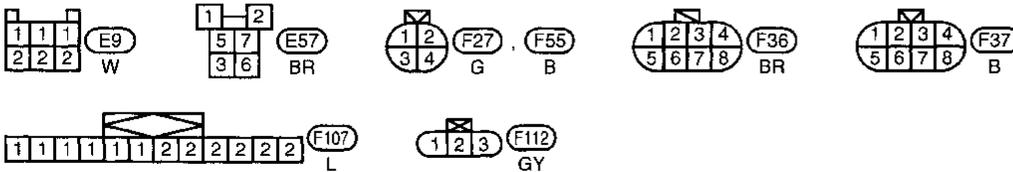
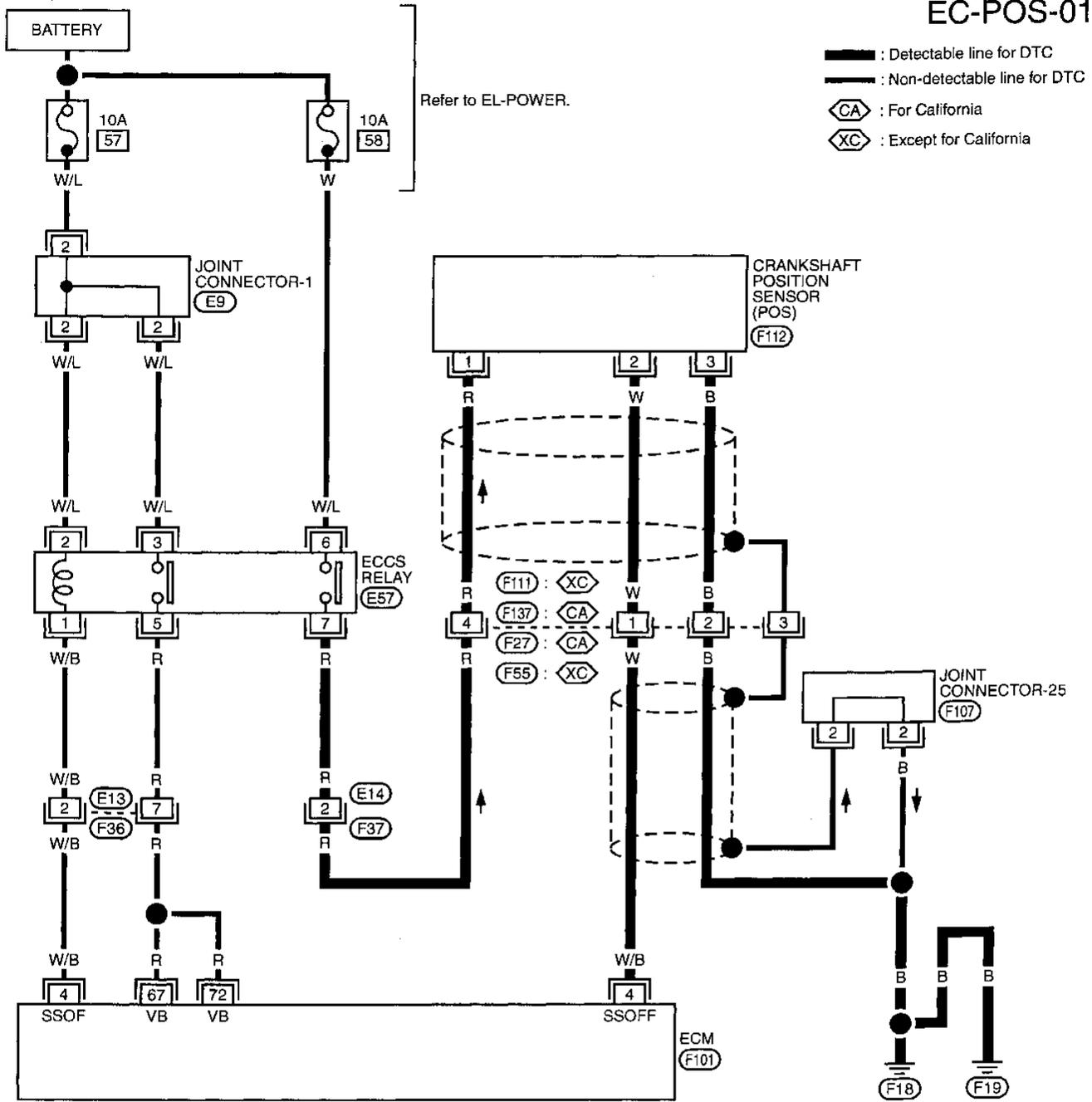
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TROUBLE DIAGNOSIS FOR DTC P1336

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

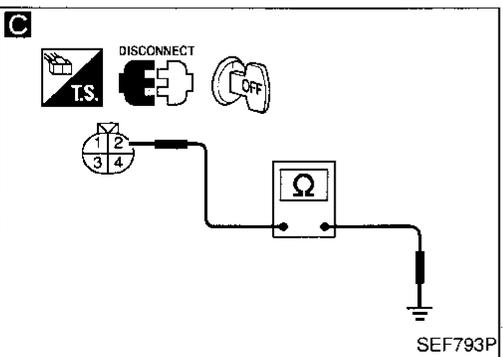
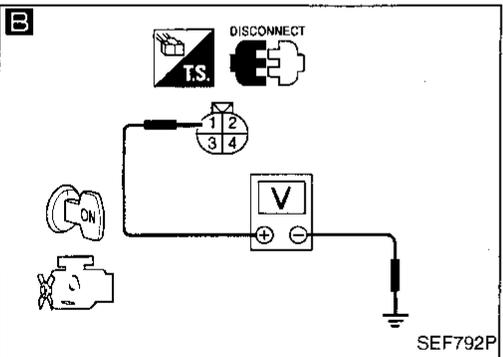
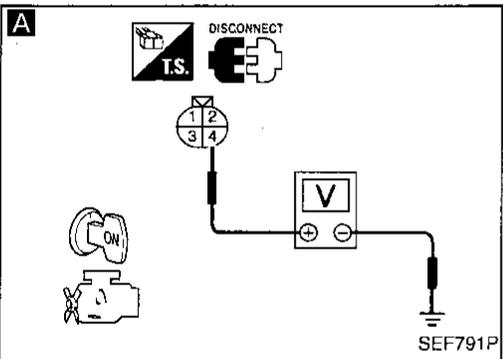
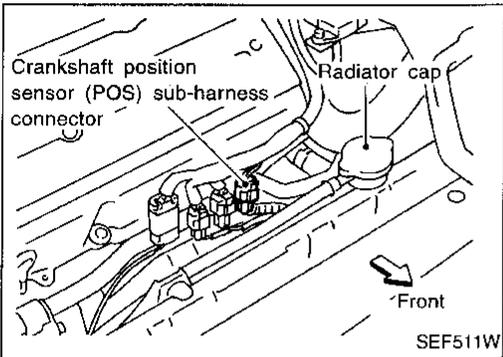
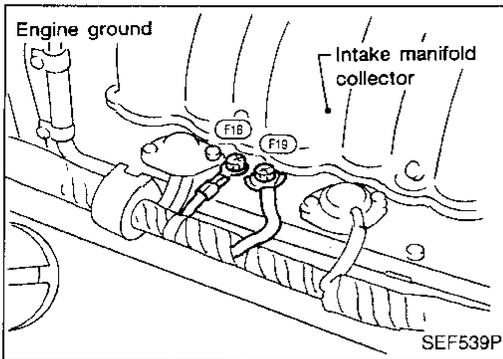
EC-POS-01



TROUBLE DIAGNOSIS FOR DTC P1336

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

DIAGNOSTIC PROCEDURE



INSPECTION START

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

A

CHECK POWER SUPPLY-I.

1. Turn ignition switch "OFF".
2. Disconnect crankshaft position sensor (POS) sub-harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ④ and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.

- Harness connectors (F37), (E14)
- Harness for open or short between crankshaft position sensor (POS) sub-harness connector and ECCS relay

If NG, repair harness or connectors.

OK →

B

CHECK POWER SUPPLY-II.

Check voltage between terminal ① and ground with CONSULT or tester.
Voltage: Approximately 5V

NG → Repair harness or connectors.

OK →

C

CHECK GROUND CIRCUIT-I.

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.
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 → Repair open circuit, short to ground or short to power in harness connectors.

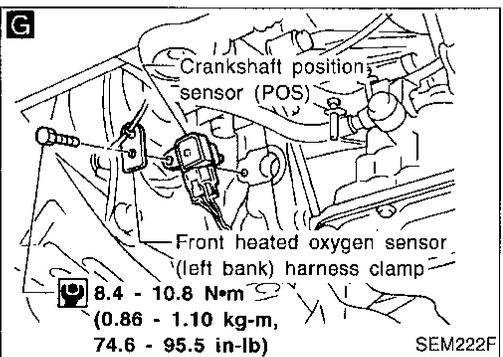
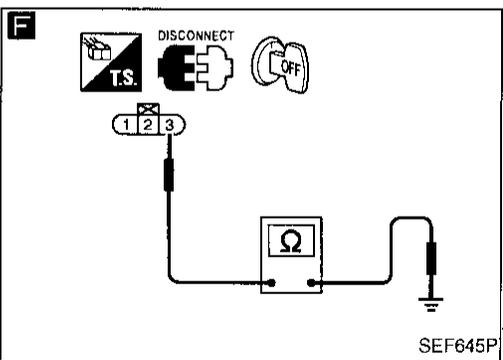
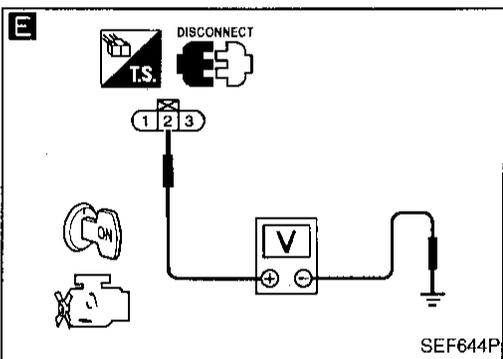
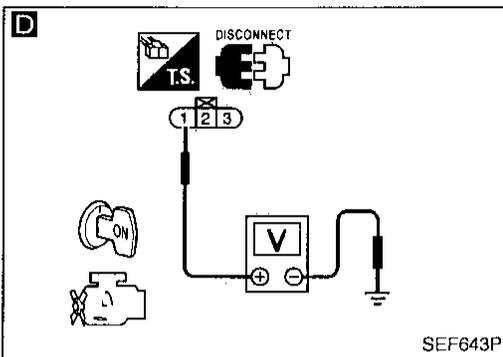
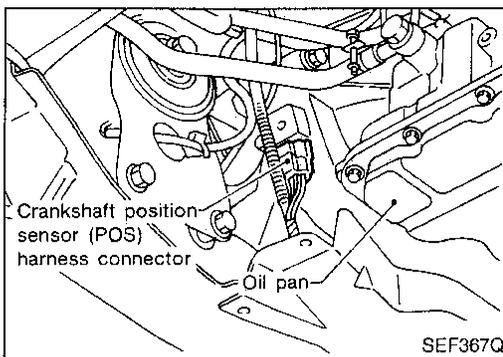
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TROUBLE DIAGNOSIS FOR DTC P1336

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



D

CHECK POWER SUPPLY-III.

1. Reconnect crankshaft position sensor (POS) sub-harness connector.
2. Disconnect crankshaft position sensor (POS) 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 (except for California) (F11), (F55)
- Harness connectors (for California) (F137), (F27)
- Harness for open or short between crankshaft position sensor (POS) and crankshaft position sensor (POS) sub-harness connector

If NG, repair harness or connectors.

OK

E

CHECK POWER SUPPLY-IV.

Check voltage between terminal ② and ground with CONSULT or tester.

Voltage: Approximately 5V

NG

Check the following.

- Harness connectors (except for California) (F11), (F55)
- Harness connectors (for California) (F137), (F27)
- Harness for open or short between crankshaft position sensor (POS) and crankshaft position sensor (POS) sub-harness connector

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

OK

F

CHECK GROUND CIRCUIT-II.

1. Turn ignition switch "OFF".
2. 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 (except for California) (F11), (F55)
- Harness connectors (for California) (F137), (F27)
- Harness for open or short between crankshaft position sensor (POS) and crankshaft position sensor (POS) sub-harness connector

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

OK

G

CHECK INSTALLATION.

Check that crankshaft position sensor (POS) and front heated oxygen sensor (left bank) harness clamp are installed correctly, as shown in figure.

OK

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

Trouble is not fixed.

CHECK COMPONENT

[Crankshaft position sensor (POS)]. Refer to "COMPONENT INSPECTION", EC-434.

NG

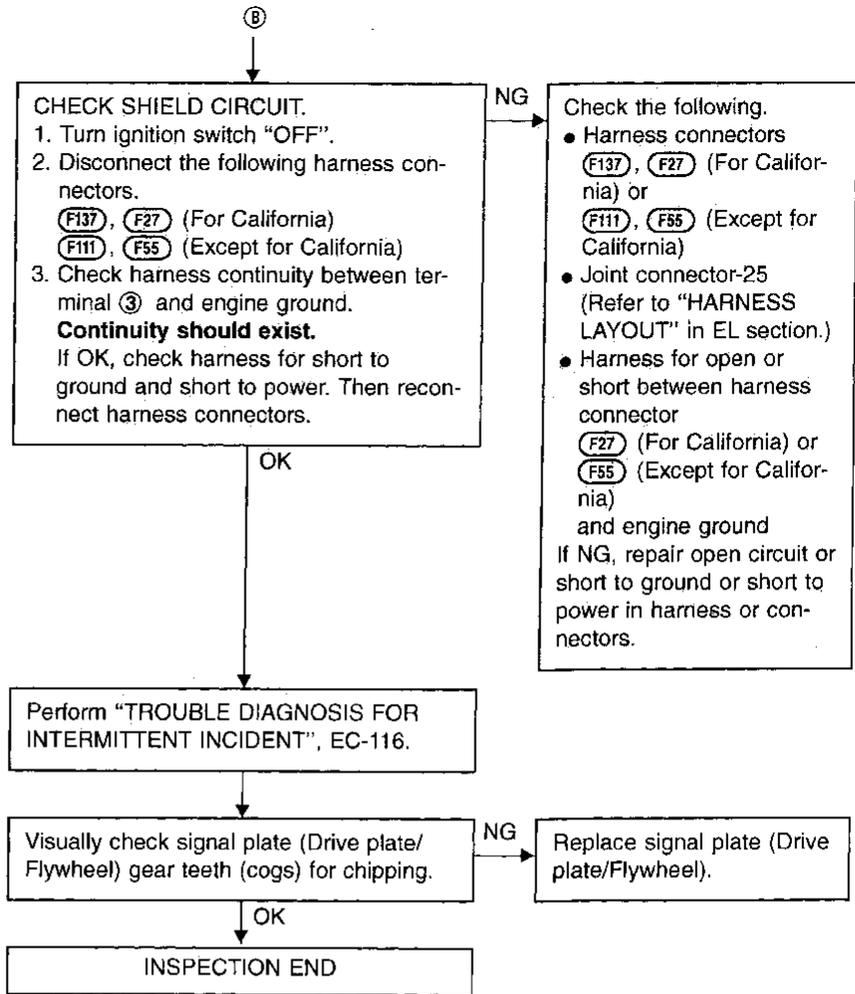
Replace crankshaft position sensor (POS).

OK

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TROUBLE DIAGNOSIS FOR DTC P1336

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



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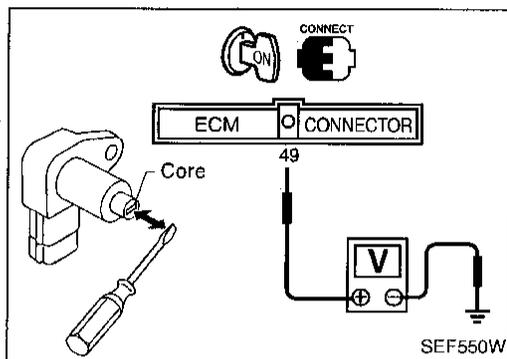
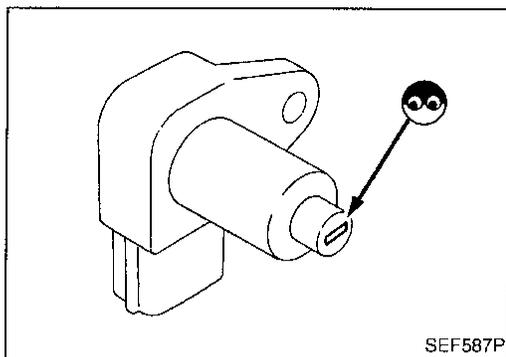
TROUBLE DIAGNOSIS FOR DTC P1336

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

COMPONENT INSPECTION

Crankshaft position sensor (POS)

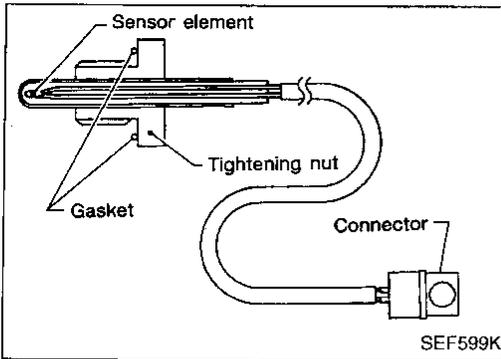
1. Disconnect crankshaft position sensor (POS) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Reconnect crankshaft position sensor (POS) harness connector.
6. Turn ignition switch "ON".
7. Check voltage between ECM terminals ④⁹ and ground when bringing a screwdriver into contact with, and quickly pulling away from the sensor core.



ECM terminal	Condition	Voltage
④ ⁹	Contacted	Approximately 5V
	Pulled away	Approximately 0V

There should be a steady 5V as the screwdriver is drawn away slowly.

If NG, replace crankshaft position sensor (POS).



EGR Temperature Sensor

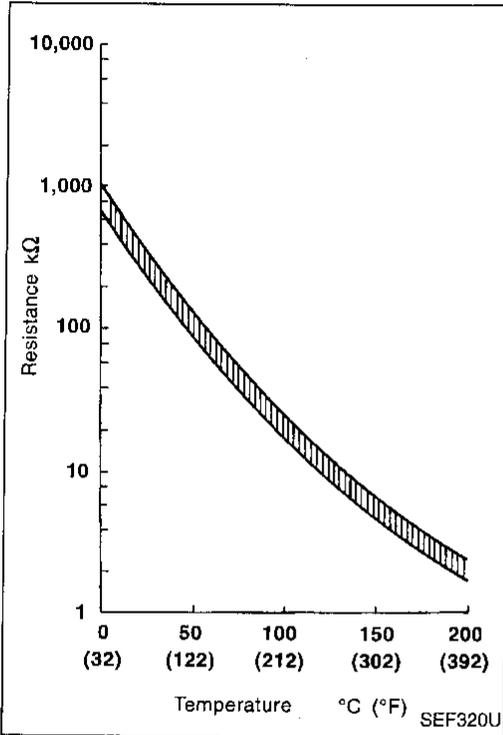
COMPONENT DESCRIPTION

The EGR temperature sensor detects temperature changes in the EGR passage way. When the EGR volume control 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.

<Reference data>

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

*: These data are reference values and are measured between ECM terminal ⑥ (EGR temperature sensor) and ECM terminal ④ (ECM ground).



ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1401 0305	A) An excessively low voltage from the EGR temperature sensor is entered 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
	B) An excessively high voltage from the EGR temperature sensor is entered 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

TROUBLE DIAGNOSIS FOR DTC P1401

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 10 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-439.

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.

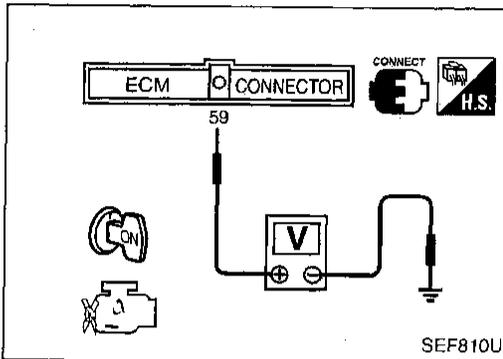
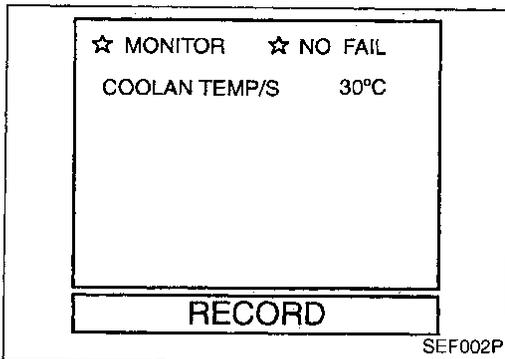
- 4) Start engine and let it idle for at least 8 seconds.
- 5) Select "MODE 7" with GST.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-439.

OR

- 1) Turn ignition switch "ON".
- 2) Verify that voltage between ECM terminal 59 (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 10 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-439.



TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

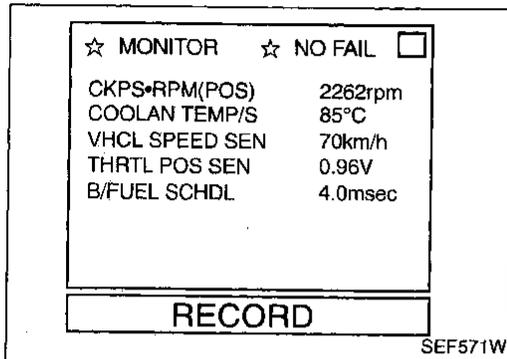
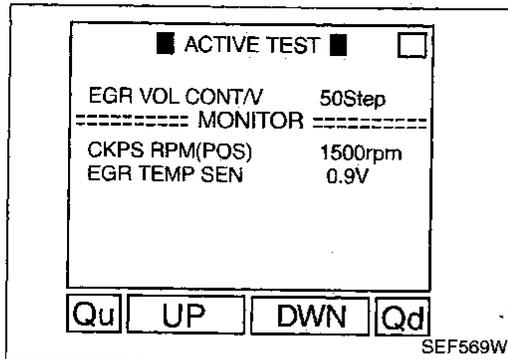
Procedure for malfunction B

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

Always perform the test at a temperature above -10°C (14°F).



- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
- 3) Hold engine speed at 1,500 rpm.
- 4) Touch "Qu" and set the EGR volume control valve opening to 50 step and check EGR TEMP SEN. EGR TEMP SEN should decrease to less than 1.0V. If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-439.

If the check result is OK, go to the following step.

- 5) Turn ignition switch "OFF" and wait at least 10 seconds.
- 6) Start engine and maintain the following conditions for at least 5 consecutive seconds.

CKPS-RPM (POS): 1,800 - 2,800 rpm

VHCL SPEED SE: 10 km/h (6 MPH) or more

B/FUEL SCHDL: More than 3.5 msec

THRTL POS SEN: 0.65 - 1.08V

Selector lever: Suitable position

- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-439.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds, then turn "ON".
- 3) Select "MODE 1" with GST and maintain the following conditions for at least 5 consecutive seconds.

Engine speed: 1,800 - 2,800 rpm

Vehicle speed: 10 km/h (6 MPH) or more

Voltage between ECM terminal ② and ground: 0.65 - 1.08V

Selector lever: Suitable position

- 4) Select "MODE 3" with GST.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-439.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds, then turn "ON".
- 3) Select "MODE 1" with GST and maintain the following conditions for at least 5 consecutive seconds.

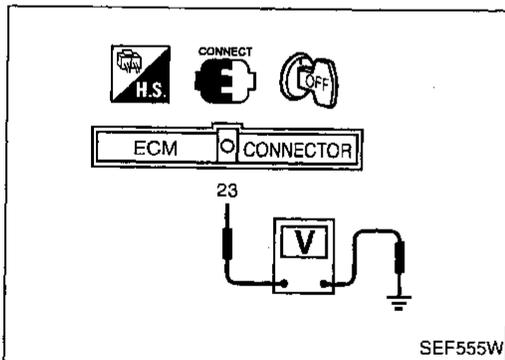
Engine speed: 1,800 - 2,800 rpm

Vehicle speed: 10 km/h (6 MPH) or more

Voltage between ECM terminal ② and ground: 0.65 - 1.08V

Selector lever: Suitable position

- 4) Turn ignition switch "OFF" and wait at least 10 seconds, 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-439.

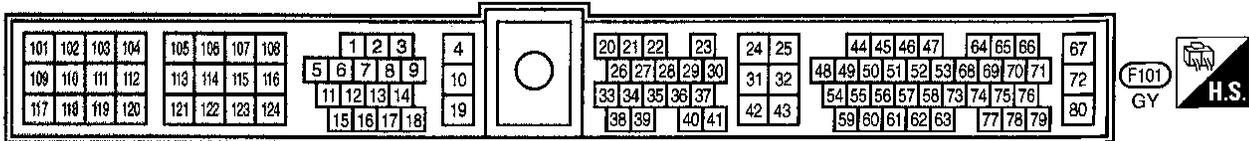
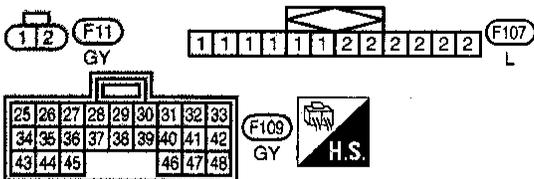
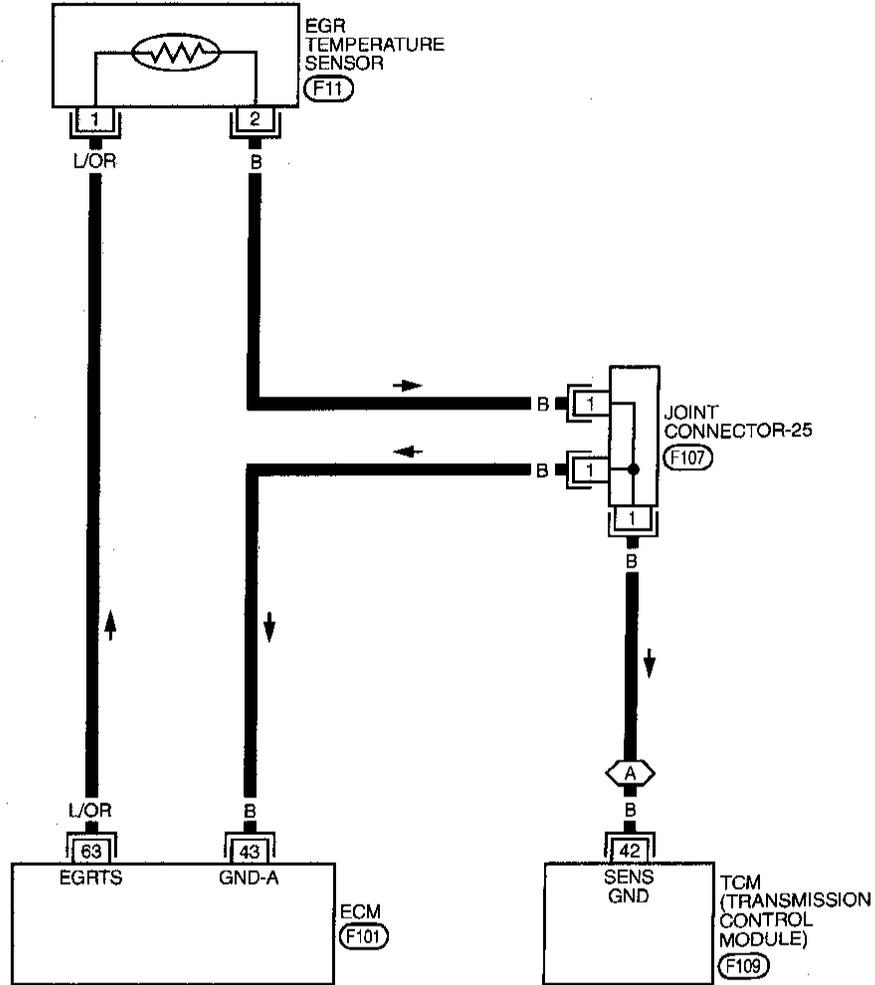


TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

EC-EGR/TS-01

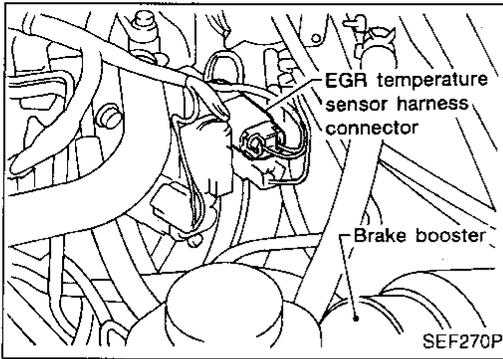
-  : Detectable line for DTC
-  : Non-detectable line for DTC
-  : A/T models



TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

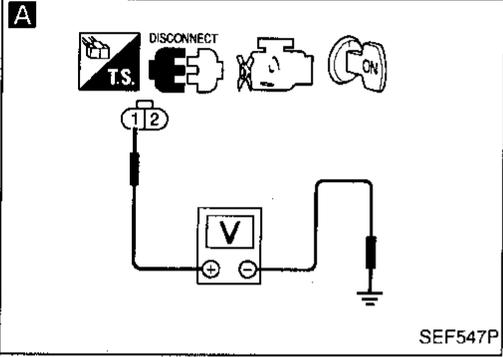
A

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.



B

CHECK GROUND CIRCUIT.

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

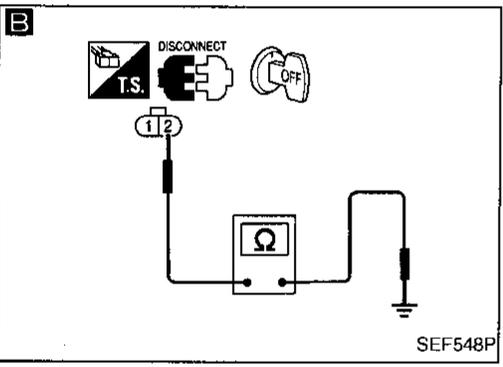
Continuity should exist.

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

NG → Check the following.

- Joint connector-25 (F107)
- Harness for open or short between ECM and EGR temperature sensor
- Harness for open or short between TCM (Transmission Control Module) and EGR temperature sensor

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



CHECK COMPONENT (EGR temperature sensor).

Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGR temperature sensor.

CHECK COMPONENT (EGR volume control valve).

Refer to "COMPONENT INSPECTION", EC-448.

NG → Replace EGR volume control valve.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

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TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

COMPONENT INSPECTION

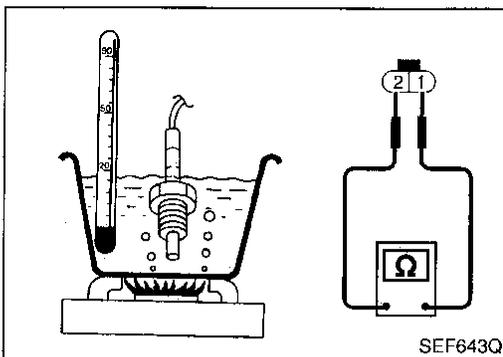
EGR temperature sensor

Check resistance change and resistance value.

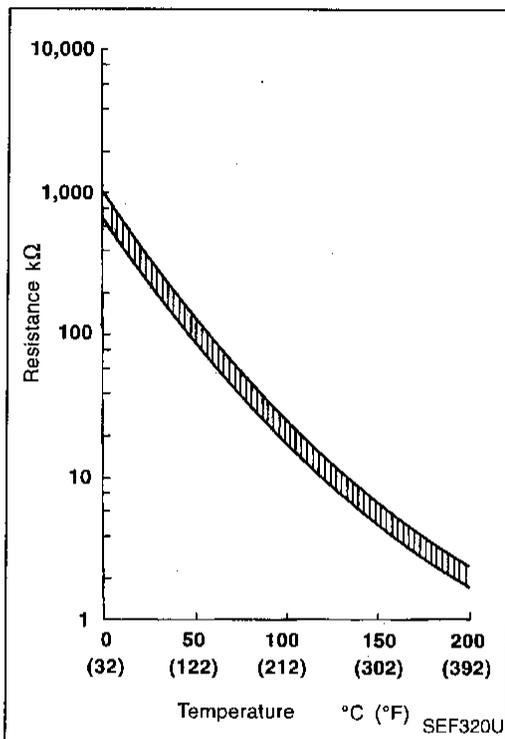
<Reference data>

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.



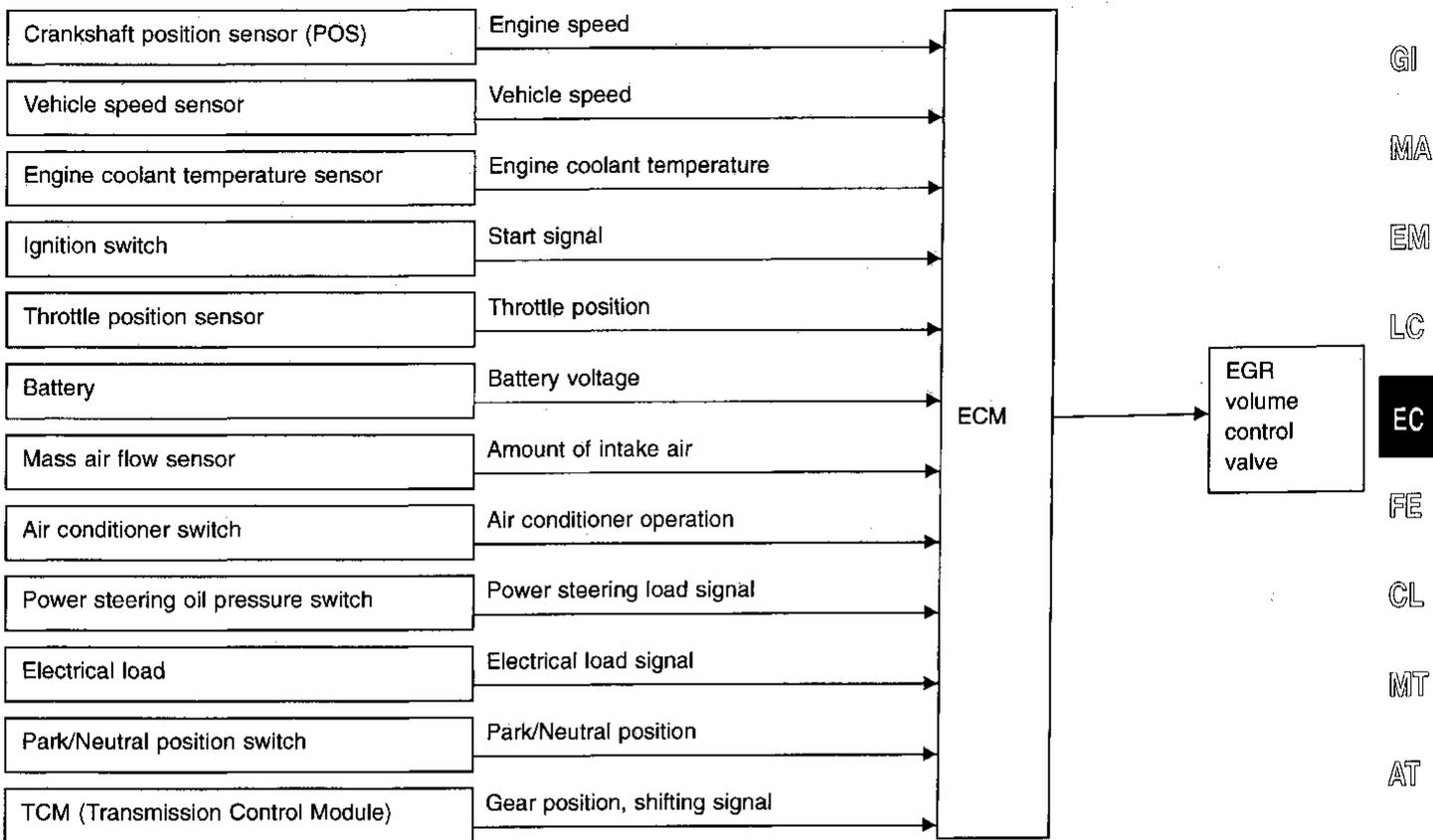
SEF643Q



SEF320U

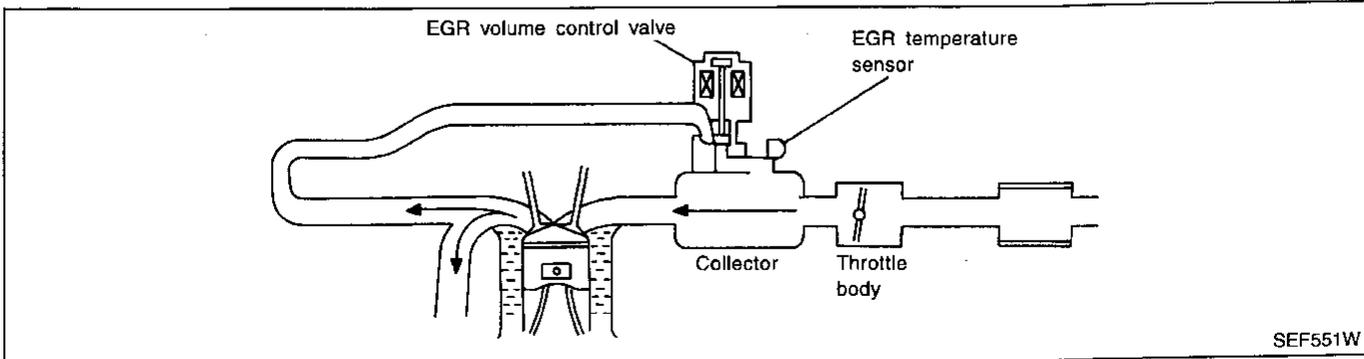
EGR Function (Open)

SYSTEM DESCRIPTION



This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR 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. The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle
- Low battery voltage



SEF551W

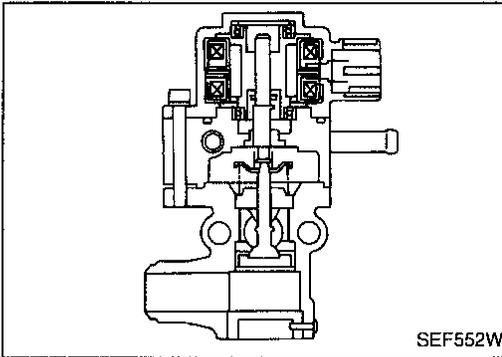
TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

COMPONENT DESCRIPTION

EGR volume control valve

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. 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.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

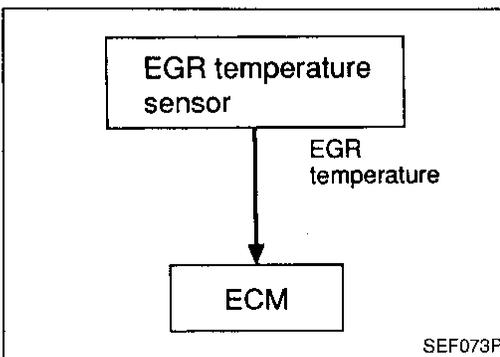
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EGR TEMP SEN	● Engine: After warming up	Less than 4.5V
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle 0 step
	Reving engine up to 3,000 rpm quickly	10 - 55 step

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
43	B	Sensor's ground	Engine is running. (Warm-up condition) └ Idle speed	0V
63	L/OR	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V
			Engine is running. (Warm-up condition) └ EGR system is operating.	0 - 1.0V
35 36	P G	EGR volume control valve	Engine is running. (Warm-up condition) └ Idle speed	0 - 1V
40 41	G/B L/R	EGR volume control valve	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.

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"> Harness or connectors (The valve circuit is open or shorted.) EGR volume control valve leaking or stuck open EGR temperature sensor

☆ MONITOR ☆ NO FAIL

COOLAN TEMP/S 30°C
EGR TEMP SEN 4.2V

RECORD

SEF347U

■ EGR SYSTEM P1402 ■

OUT OF CONDITION

===== MONITOR =====

CKPS-RPM(POS) 0rpm
THRTL POS SEN 0.56V
B/FUEL SCHDL 0.0ms

SEF572W

■ EGR SYSTEM P1402 ■

TESTING

===== MONITOR =====

CKPS-RPM(POS) 737rpm
THRTL POS SEN 0.56V
B/FUEL SCHDL 1.1ms

SEF573W

■ EGR SYSTEM P1402 ■

COMPLETED

SELF-DIAG RESULTS

SEF272U

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 a 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 35°C (14 to 95°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.

*: Although CONSULT screen displays "-10 to 40°C (14 to 104°F)" as a range of coolant temperature condition, ignore it.



- Turn ignition switch "ON".
- Select "EGR SYSTEM P1402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine and let it idle until "TESTING" on CONSULT screen is turned to "COMPLETED". (It will take 80 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 35°C (14 to 95°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-446.

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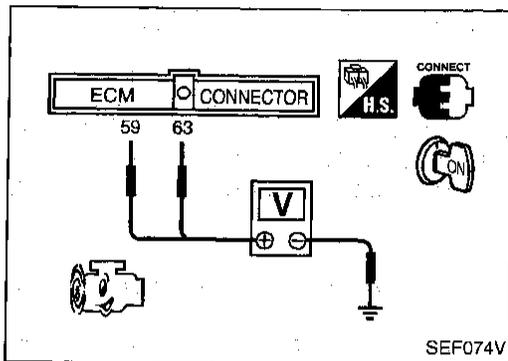
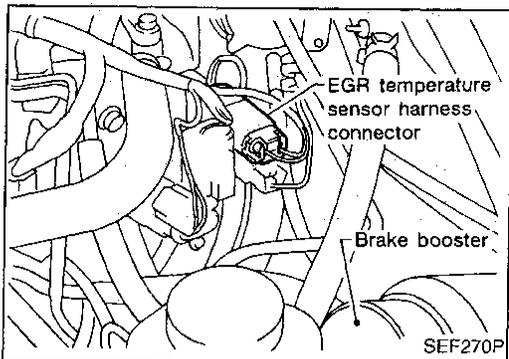
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TROUBLE DIAGNOSIS FOR DTC P1402

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 35°C (14 to 95°F).
 - 3) Check that voltage between ECM terminal ⑥③ (EGR temperature) and ground is less than 4.8V .
 - 4) Start engine and let it idle for at least 80 seconds.
 - 5) Stop engine.
 - 6) Perform from step 1) to 4).
 - 7) Select "MODE 3" with GST.
 - 8) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-446.
- 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.

OR

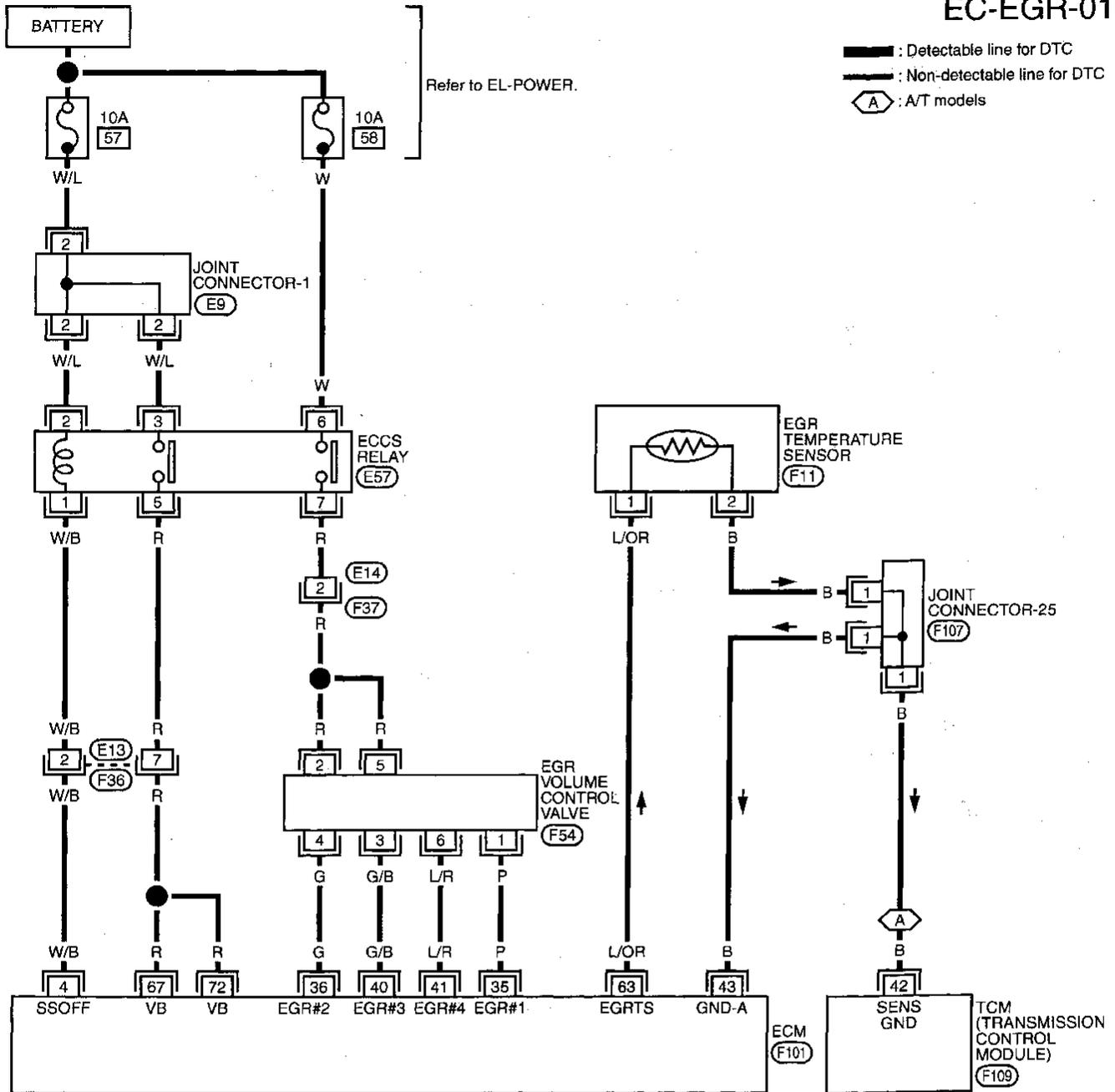


- 1) Turn ignition switch "ON".
- 2) Check the following voltages.
ECM terminal ⑥⑤ (engine coolant temperature) and ground:
1.5 - 4.4V
ECM terminal ⑥③ (EGR temperature) and ground:
Less than 4.8V
- 3) Start engine and let it idle for at least 80 seconds.
- 4) Turn ignition switch "OFF", wait at least 10 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-446.

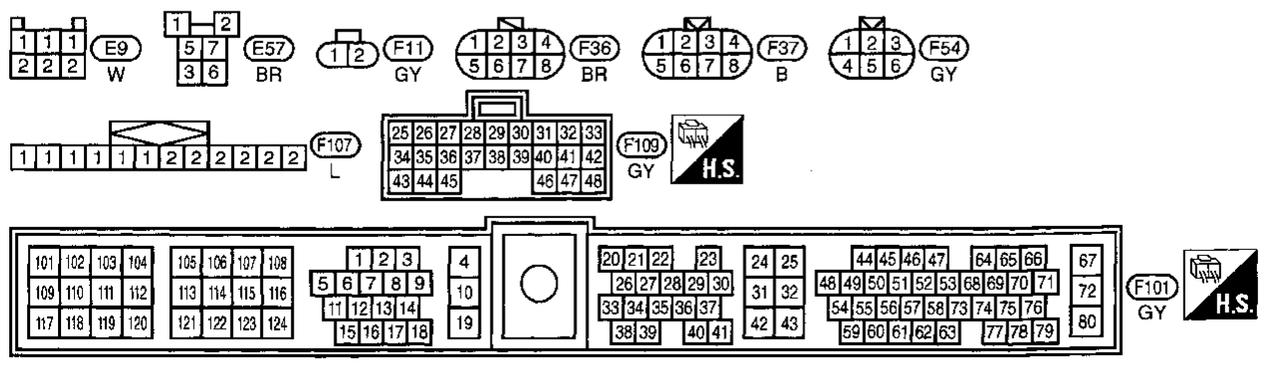
TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

EC-EGR-01



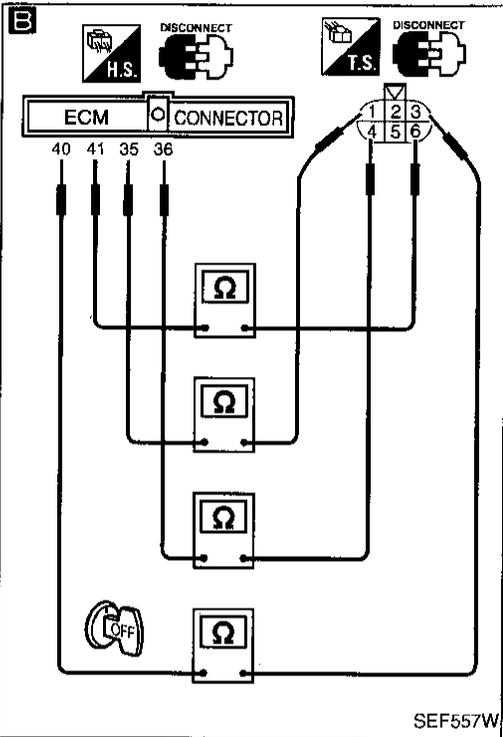
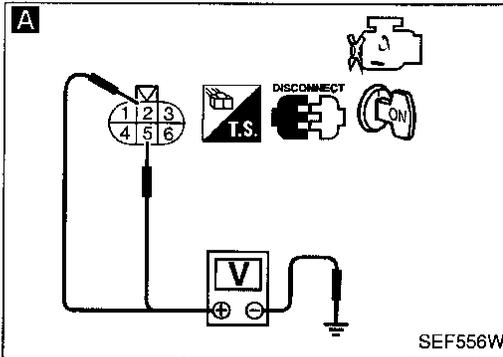
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TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A
CHECK POWER SUPPLY.
 1. Disconnect EGR volume control valve harness connector.
 2. Turn ignition switch "ON".
 3. Check voltage between terminals ②, ⑤ and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.
 • Harness or connectors (E14), (F37)
 • Harness for open or short between EGR volume control valve and ECCS relay
 If NG, repair harness or connectors.

OK
B
CHECK OUTPUT SIGNAL CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Disconnect ECM harness connector.
 3. Check harness continuity between ECM terminal ③⑤ and terminal ①, ECM terminal ③⑥ and terminal ④, ECM terminal ④① and terminal ③, ECM terminal ④① and terminal ⑥.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

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

OK
CHECK COMPONENT
 (EGR temperature sensor).
 Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGR temperature sensor.

OK
CHECK COMPONENT
 (EGR volume control valve).
 Refer to "COMPONENT INSPECTION", EC-448.

NG → Replace EGR volume control valve.

OK
 Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

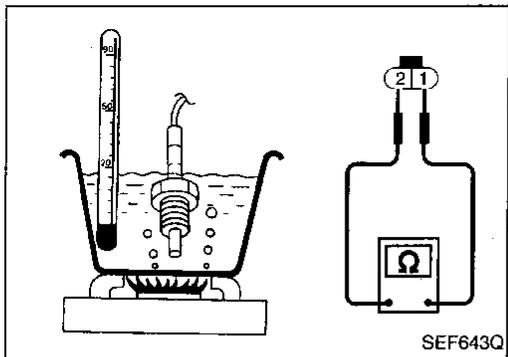
TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

COMPONENT INSPECTION

EGR temperature sensor

Check resistance change and resistance value.

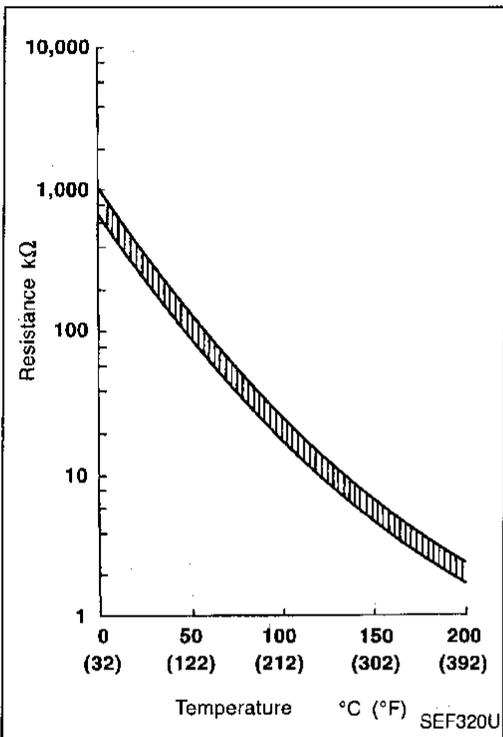


SEF643Q

<Reference data>

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.



SEF320U

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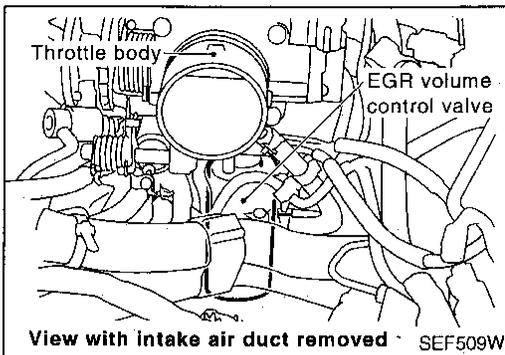
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TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

EGR volume control valve



1. Disconnect EGR 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:

20.9 - 23.1Ω [At 20°C (68°F)]

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

OR

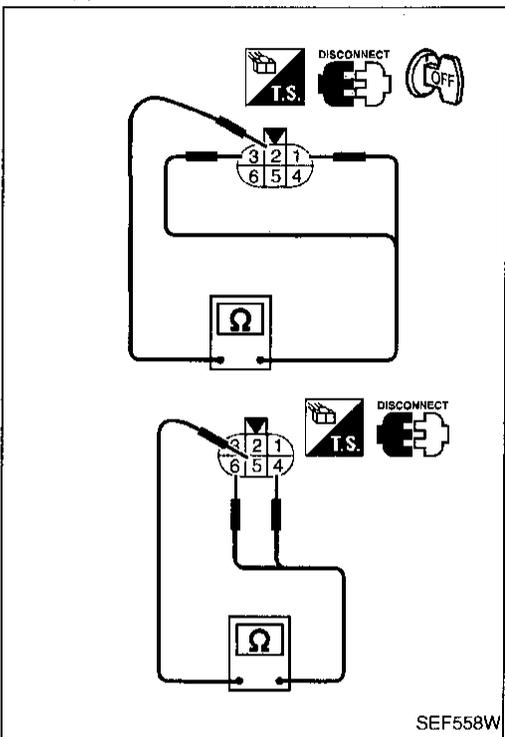


1. Disconnect EGR volume control valve harness connector.
2. Check resistance between the following terminals.
terminal ② and terminals ①, ③
terminal ⑤ and terminals ④, ⑥

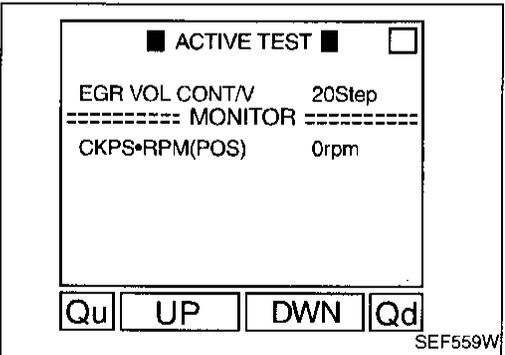
Resistance:

20.9 - 23.1Ω [At 20°C (68°F)]

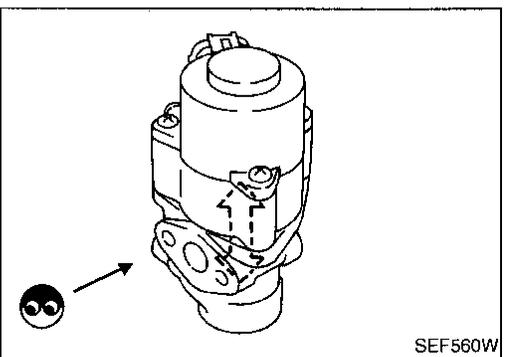
3. Turn ignition switch "ON" and "OFF". Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
If NG, replace the EGR volume control valve.



SEF558W



SEF559W



SEF560W

TROUBLE DIAGNOSIS FOR DTC P1440

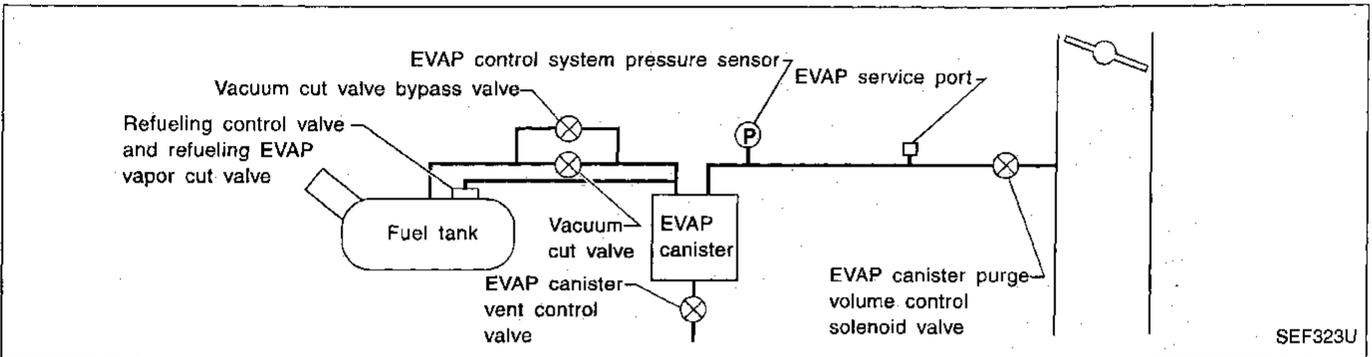
Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure)

Note: If both DTC P1440 and P1448 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P1448 first.
(See EC-477.)

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 volume control solenoid 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 volume control solenoid 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 volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent. ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister purge control valve ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume 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. ● Refueling EVAP vapor cut valve

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 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 10 seconds before conducting the next test.
- Always remove service port adapter from service port when applying air up to 0.69 to 1.38 kPa (5.14 to 10.34 mmHg, 0.202 to 0.407 inHg).
- During the test, clamp the EVAP hose tightly as shown at left.
- If DTC P1448 is displayed with P1440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-477.)

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.



- 1) Turn ignition switch "OFF".
- 2) Clamp 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-452.

OR

NOTE:

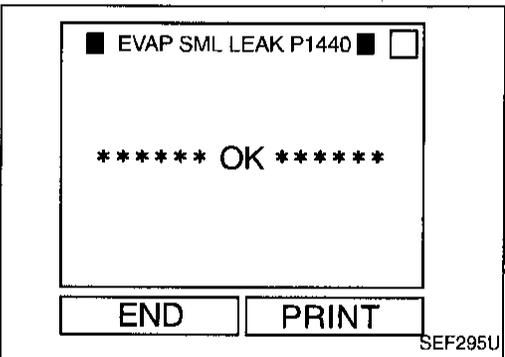
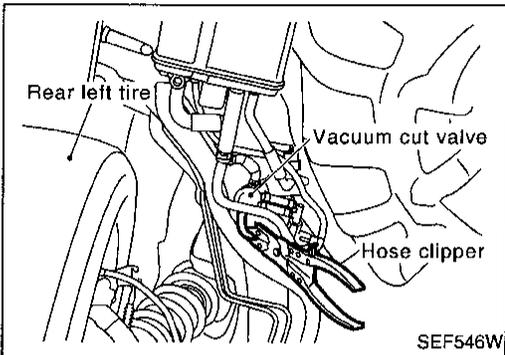
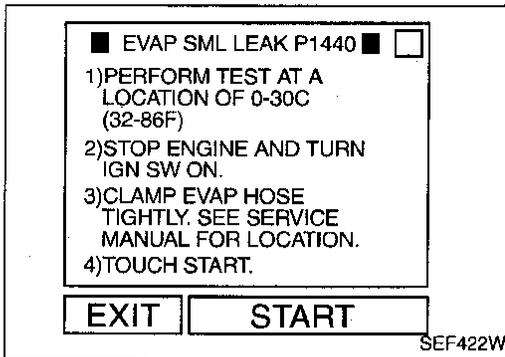
Be sure to read the explanation of "Driving pattern" on EC-54 before driving vehicle.



- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-54.
- 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 10 seconds.
- 6) Start engine.

It is not necessary to cool engine down before driving.

- 7) Drive vehicle again according to the "Driving pattern", EC-54.
- 8) Stop vehicle.
- 9) Select "MODE 3" with GST.
 - If P1447 is displayed on the screen, go to "TROUBLE DIAGNOSIS FOR DTC P1447", EC-471.
 - If P0440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE", EC-341.
 - If P1440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE" in "TROUBLE DIAGNOSIS FOR DTC P1440", EC-452.



TROUBLE DIAGNOSIS FOR DTC P1440

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

- If P0440, P1440 and P1447 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 5).

OR

NOTE:

- Be sure to read the explanation of "Driving pattern" on EC-54 before driving vehicle.
- It is better that the fuel level is low.



- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-54.
- 3) Stop vehicle.
- 4) Turn ignition switch "OFF" and wait at least 10 seconds.
- 5) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE" on next page.

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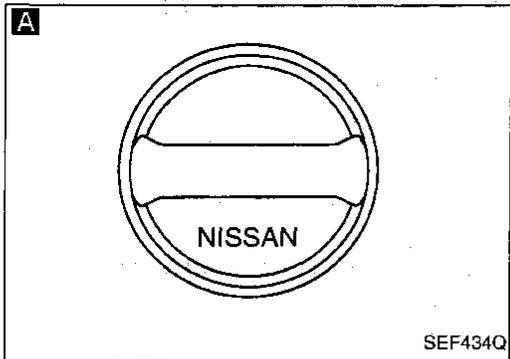
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TROUBLE DIAGNOSIS FOR DTC P1440

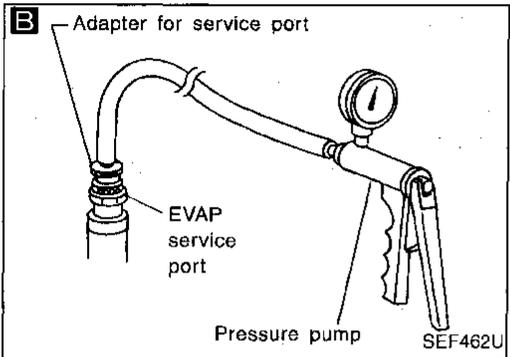
Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

DIAGNOSTIC PROCEDURE

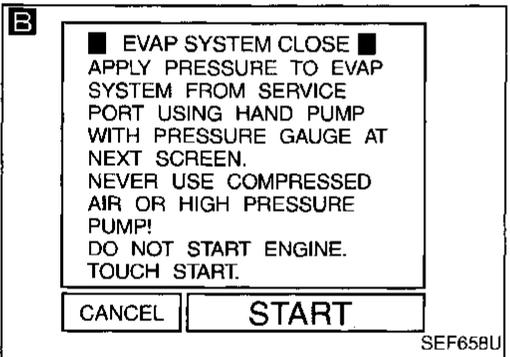
INSPECTION START



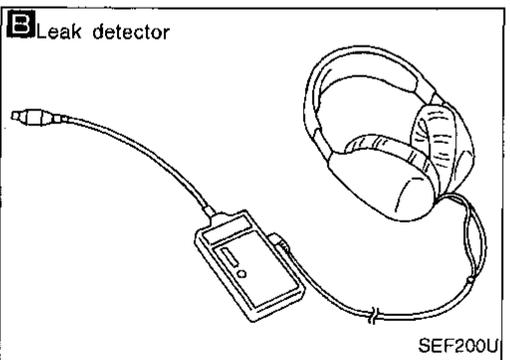
SEF434Q



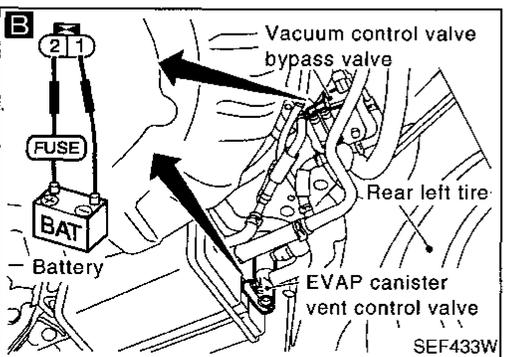
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SEF658U



SEF200U



SEF433W

A CHECK FUEL FILLER CAP.

1. Check for genuine 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-26.

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 filler cap is not used, replace with genuine fuel filler cap.

OK

B CHECK FOR EVAP LEAK.

- Never use compressed air or high pressure pump.
- Improper installation of service port may cause leaking.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

To locate EVAP leak portion, proceed with the following steps.

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 vacuum into the EVAP line until the pressure indicator reaches the middle of bar graph.
4. Using EVAP leak detector, locate the leak portion. For the leak detector, refer to instruction manual for more details. Refer to "Evaporative Emission Line Drawing", EC-29.



NG

Repair or replace.

OR



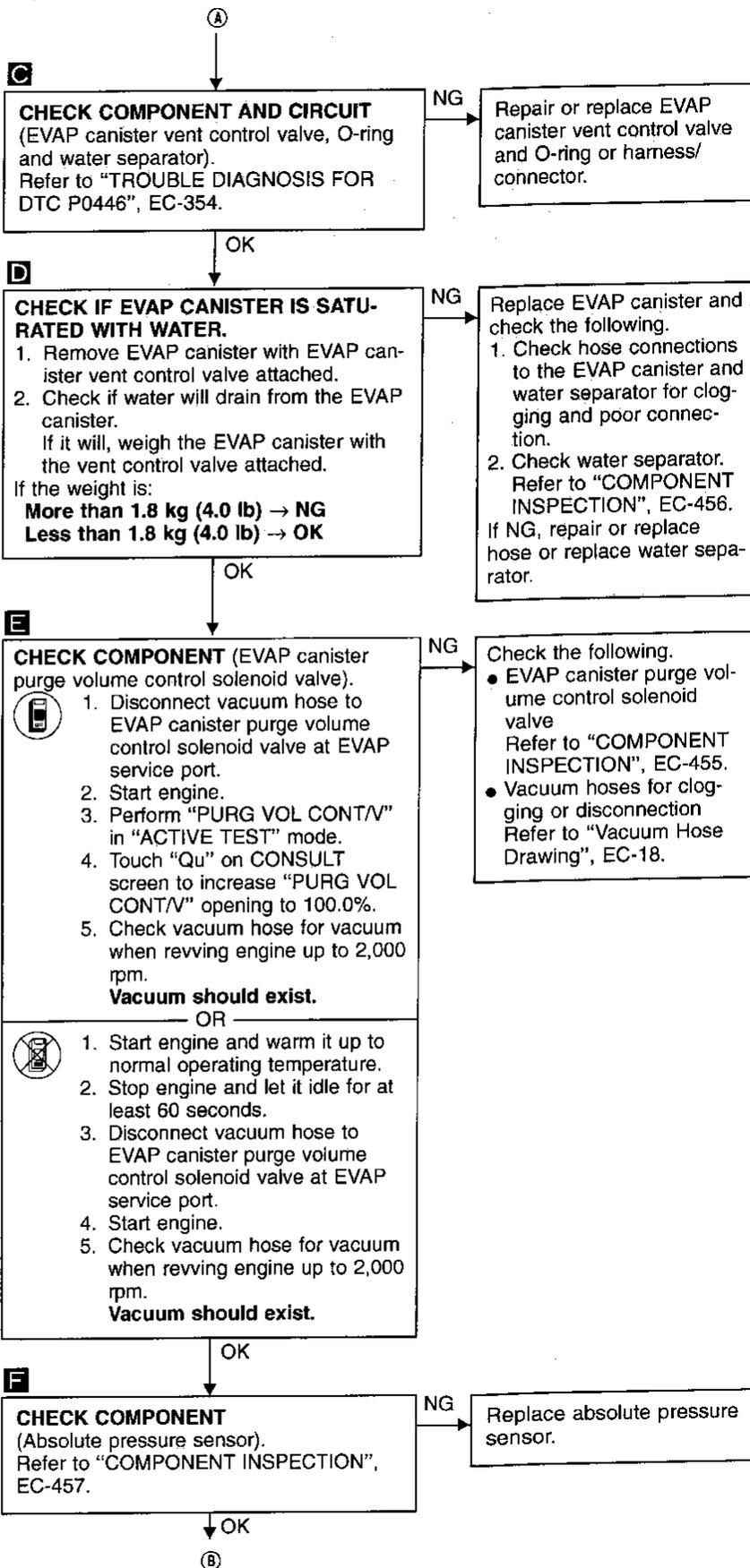
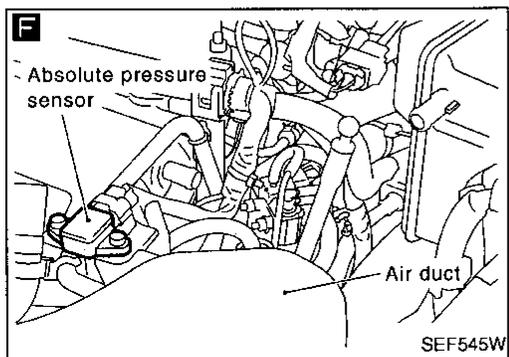
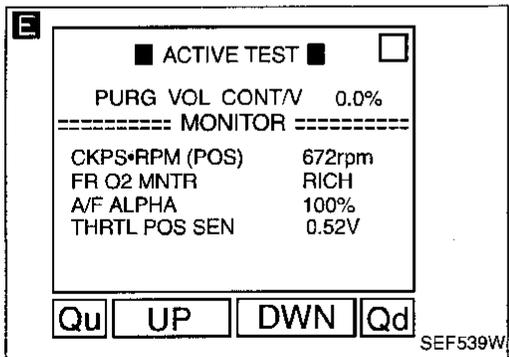
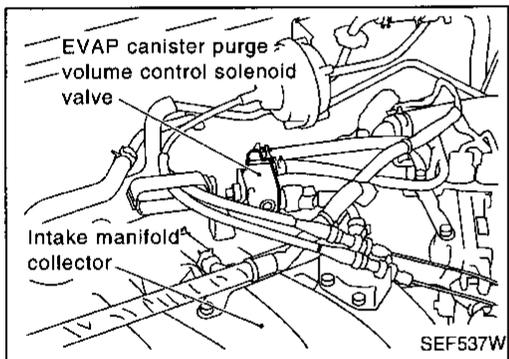
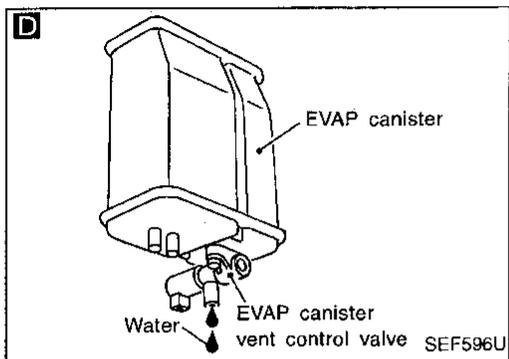
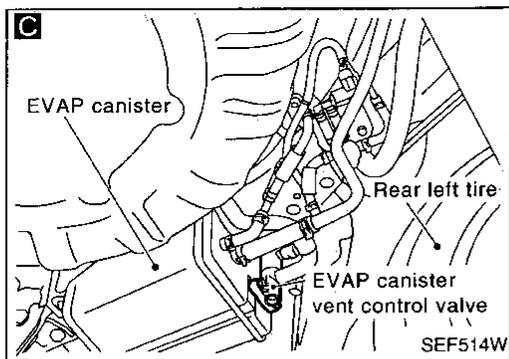
2. Turn ignition switch "OFF".
3. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
4. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12 volts until the end of test.)
5. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg).
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-29.

OK

A

TROUBLE DIAGNOSIS FOR DTC P1440

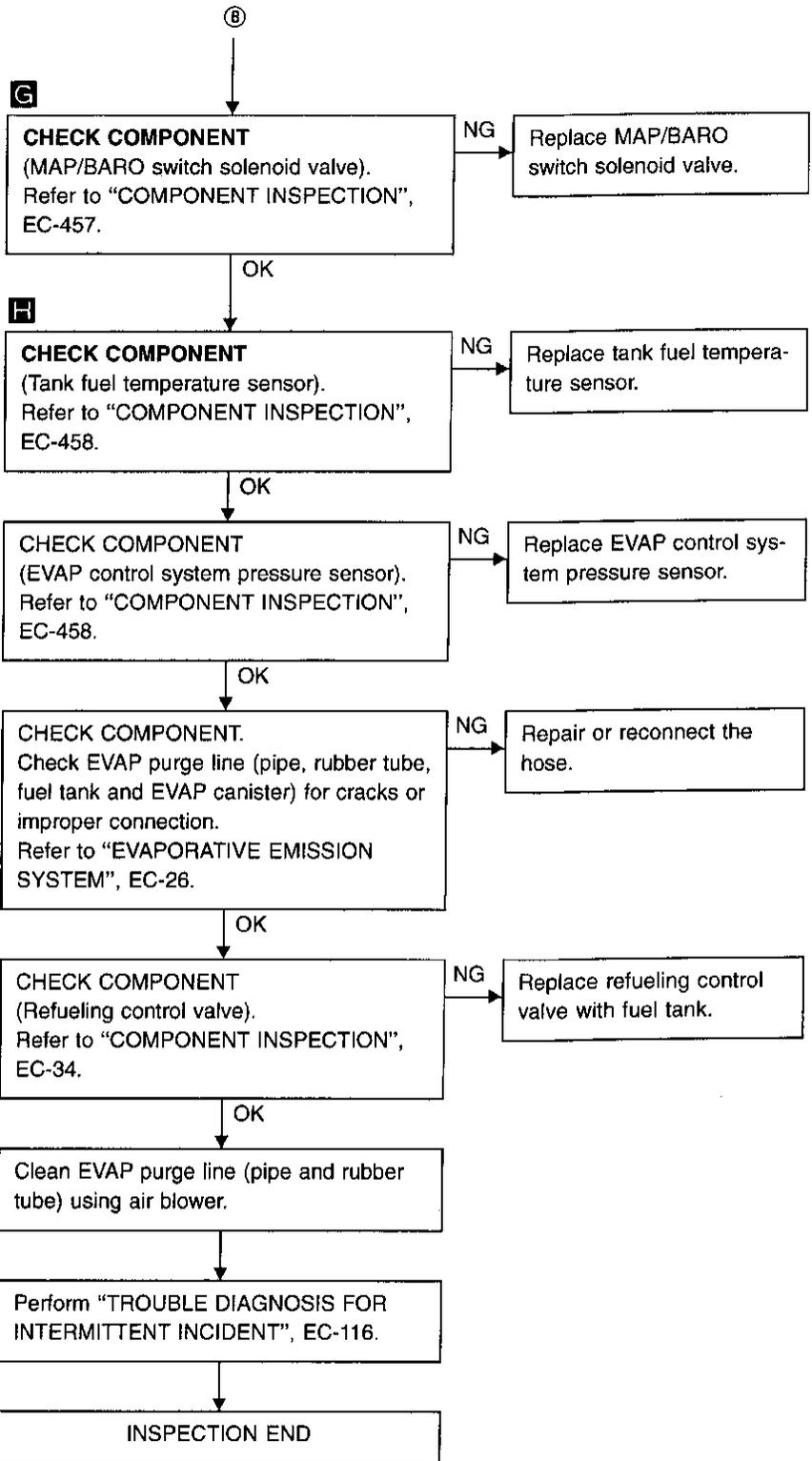
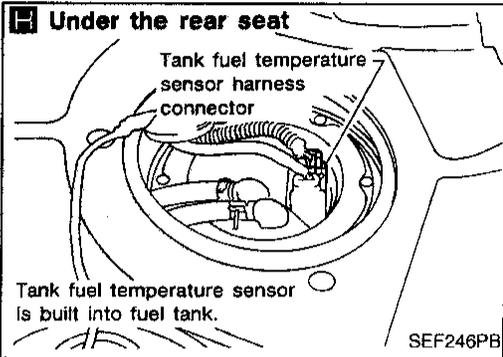
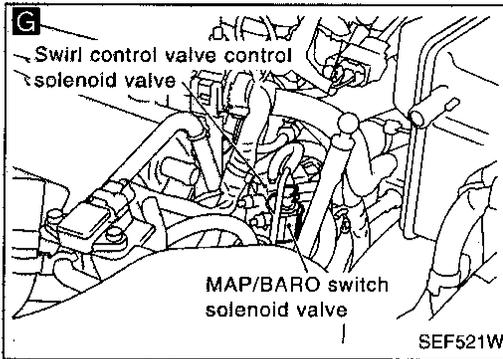
Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)



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TROUBLE DIAGNOSIS FOR DTC P1440

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



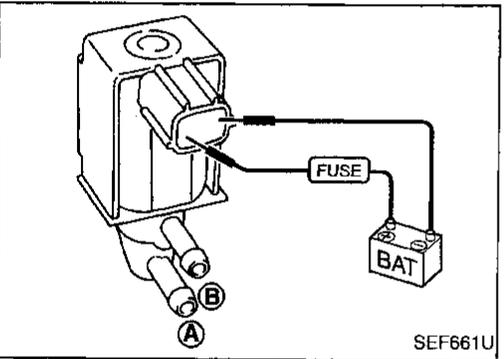
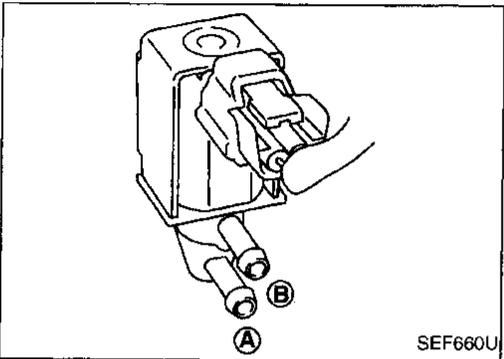
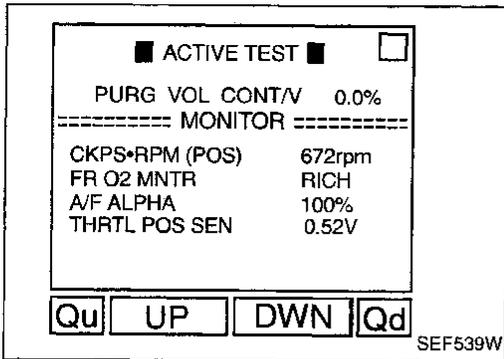
TROUBLE DIAGNOSIS FOR DTC P1440

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

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening. If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



Condition PURG VOL CONT/V value	Air passage continuity between (A) and (B)
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

_____ OR _____

- Check air passage continuity.

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 solenoid valve.

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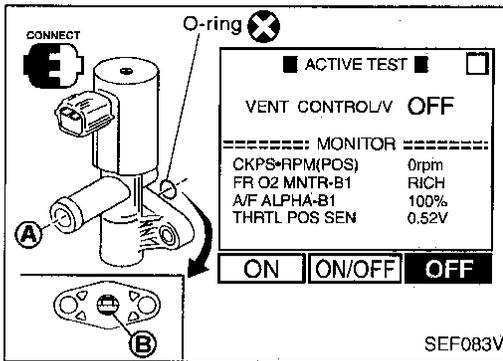
TROUBLE DIAGNOSIS FOR DTC P1440

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

EVAP canister vent control valve

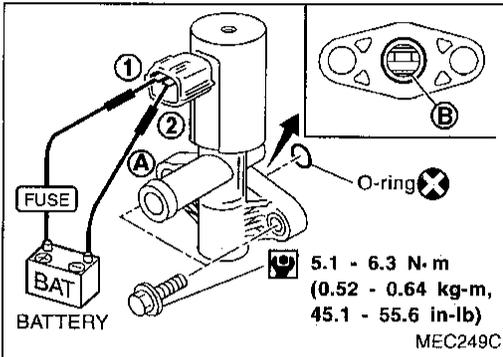
Check air passage continuity.

 Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

OR

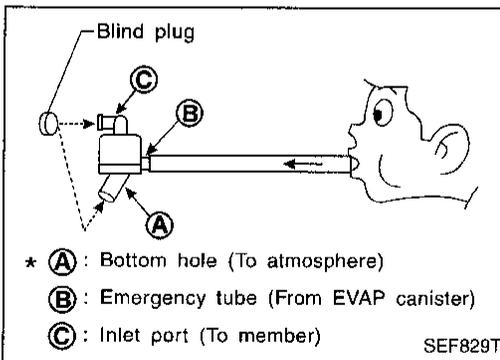


Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals ① and ②	No
No supply	Yes

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.

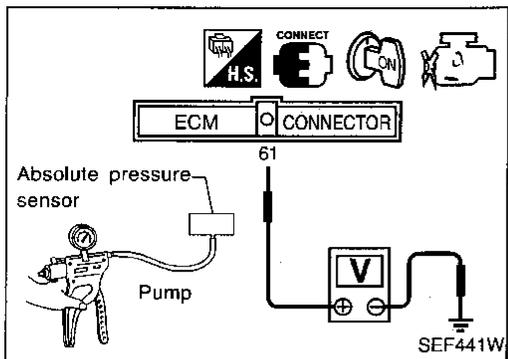


Water separator

1. Check visually for insect 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.
- **Do not disassemble water separator.**

TROUBLE DIAGNOSIS FOR DTC P1440

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

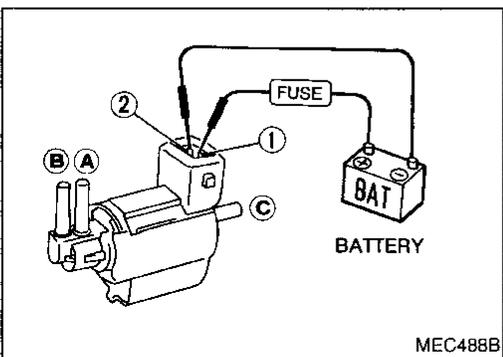
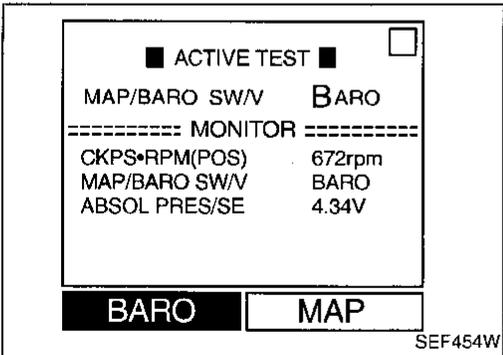
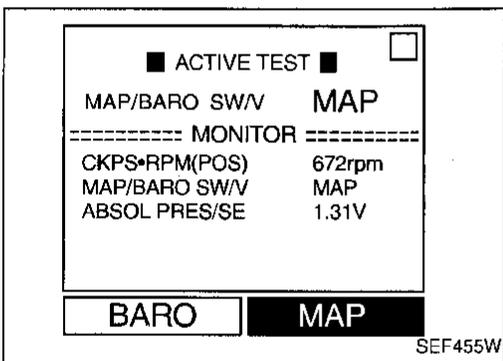


Absolute pressure sensor

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 ECM terminal ⑥1 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 vacuum below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).
5. If NG, replace absolute pressure sensor.



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

MAP/BARO	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

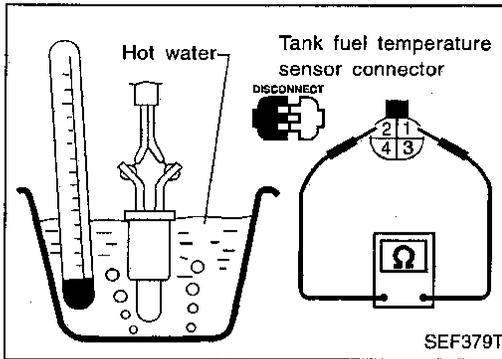
3. If NG or operation takes more than 1 second, replace solenoid valve.

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.

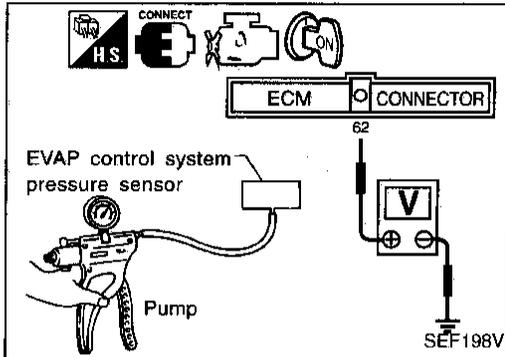


Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace tank fuel temperature sensor.

EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal ⑥2 and engine ground.



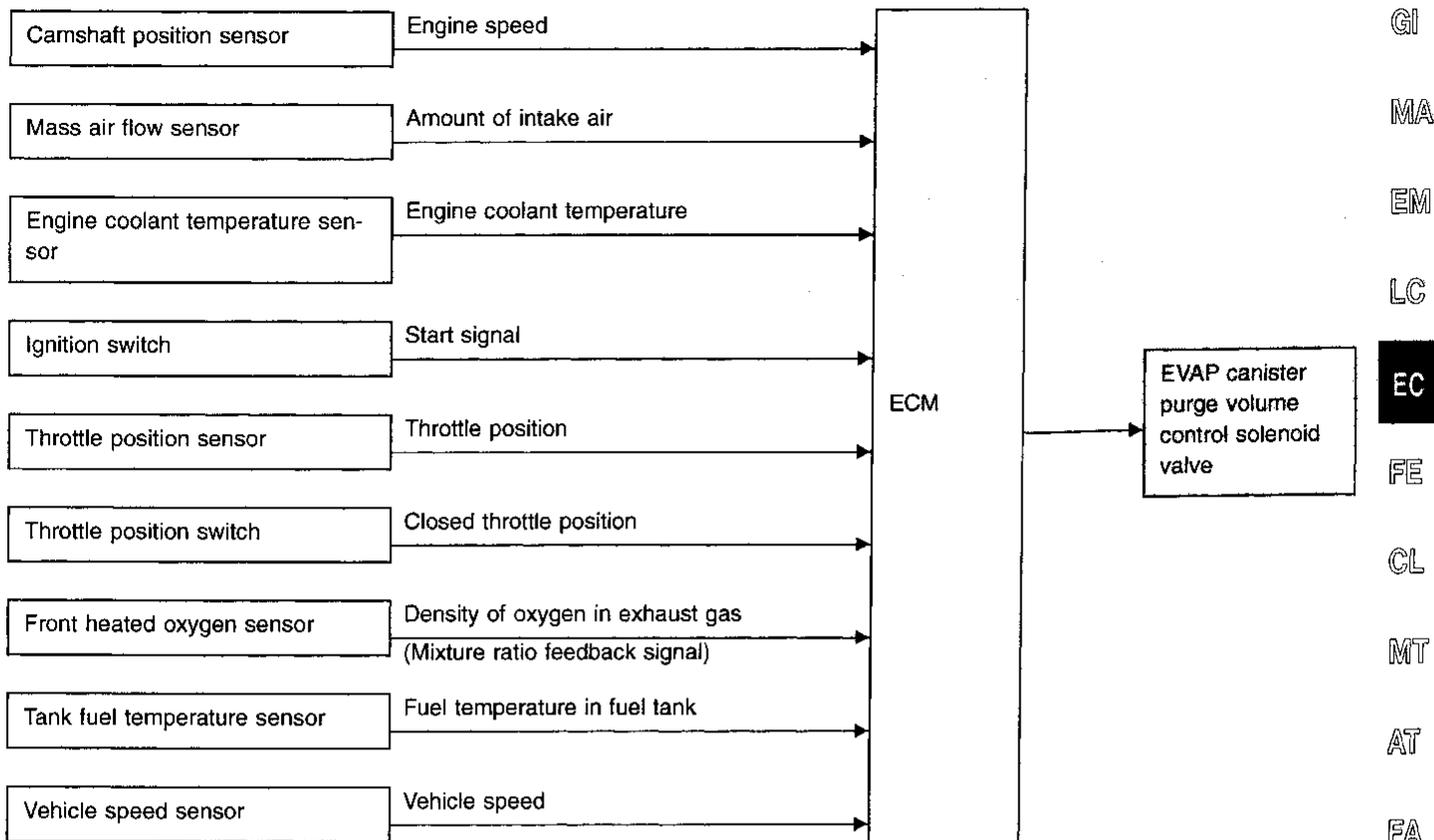
Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
-9.3 kPa (-70 mmHg, -2.76 inHg)	0.4 - 0.6

CAUTION:

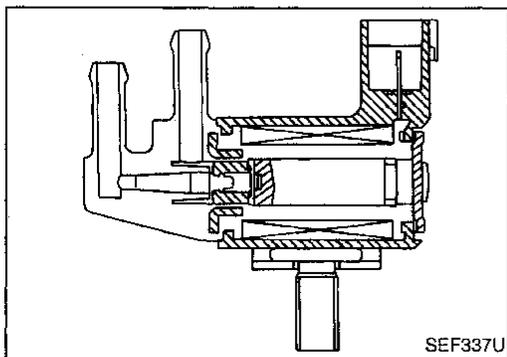
- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -20 kPa (-150 mmHg, -5.91 inHg) or pressure over 20 kPa (150 mmHg, 5.91 inHg).
5. If NG, replace EVAP control system pressure sensor.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid 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 solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. 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 solenoid valve uses ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

TROUBLE DIAGNOSIS FOR DTC P1444

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch "OFF" ● No-load	0 step
	Idle Vehicle running (Shift lever "1") 2,000 rpm (90 seconds after starting engine)	—

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	W/B	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
26	Y	EVAP canister purge volume control solenoid valve	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
67	R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
72	R			

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 solenoid valve is completely closed. 	<ul style="list-style-type: none"> EVAP control system pressure sensor EVAP canister purge volume control solenoid valve (The valve is stuck open.) EVAP canister vent control valve EVAP canister Hoses (Hoses are connected incorrectly or clogged.)

TROUBLE DIAGNOSIS FOR DTC P1444

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

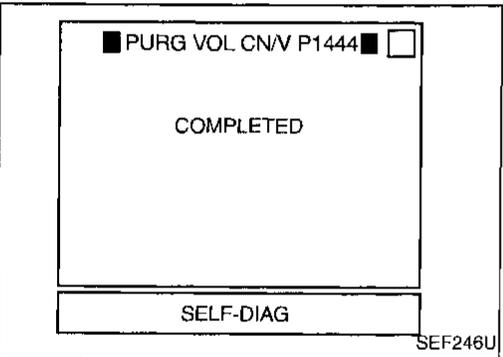
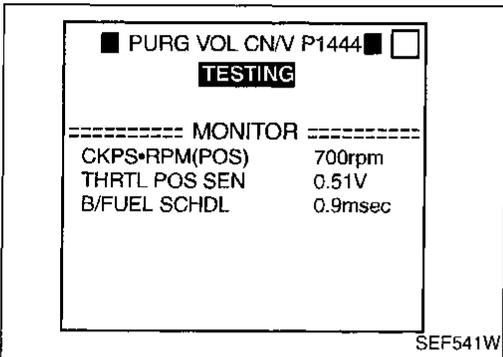
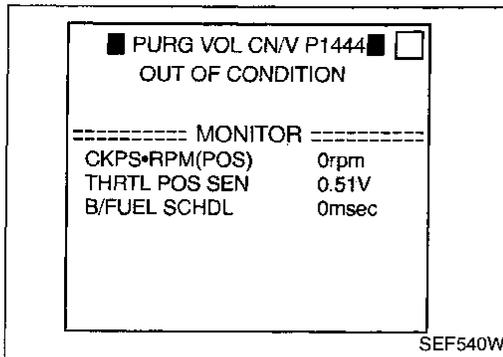
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Always perform the test at a 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 10 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "PURG VOL C/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 5) Touch "START".
- 6) Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take for at least 10 seconds.)

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".)

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine and let it idle for at least 10 seconds.
- 4) Select "MODE 7" with GST.
- 5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-463.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine and let it idle for at least 10 seconds.
- 4) Turn ignition switch "OFF" and wait at least 10 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-463.

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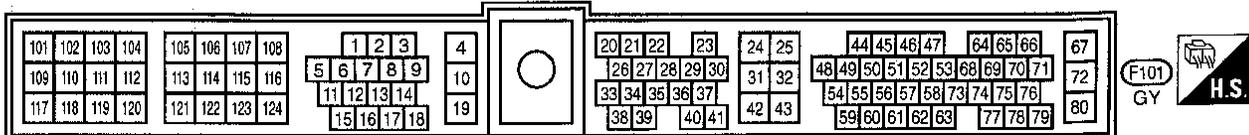
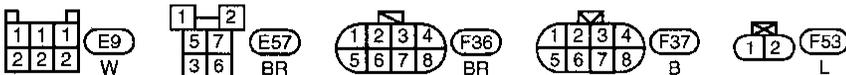
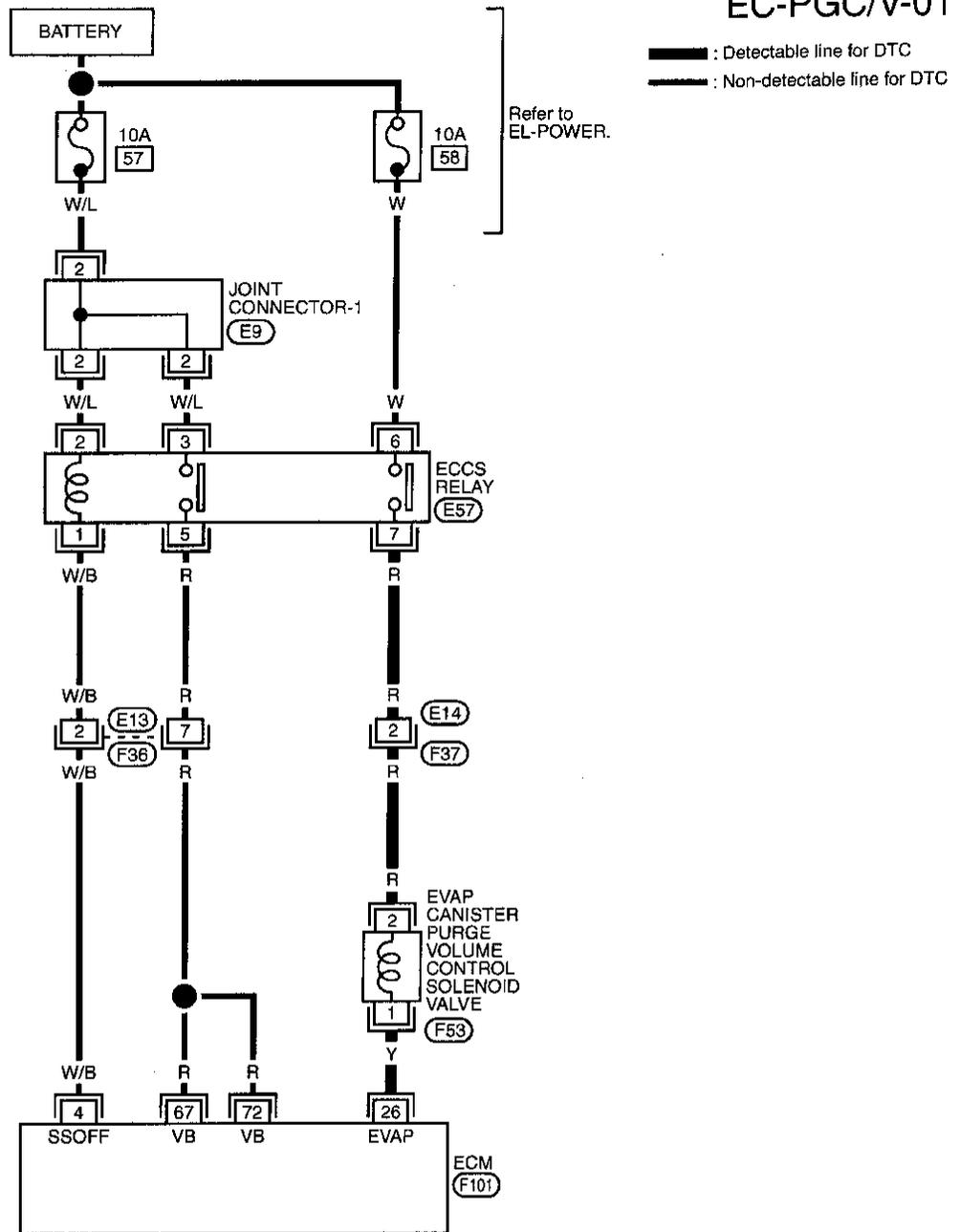
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TROUBLE DIAGNOSIS FOR DTC P1444

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

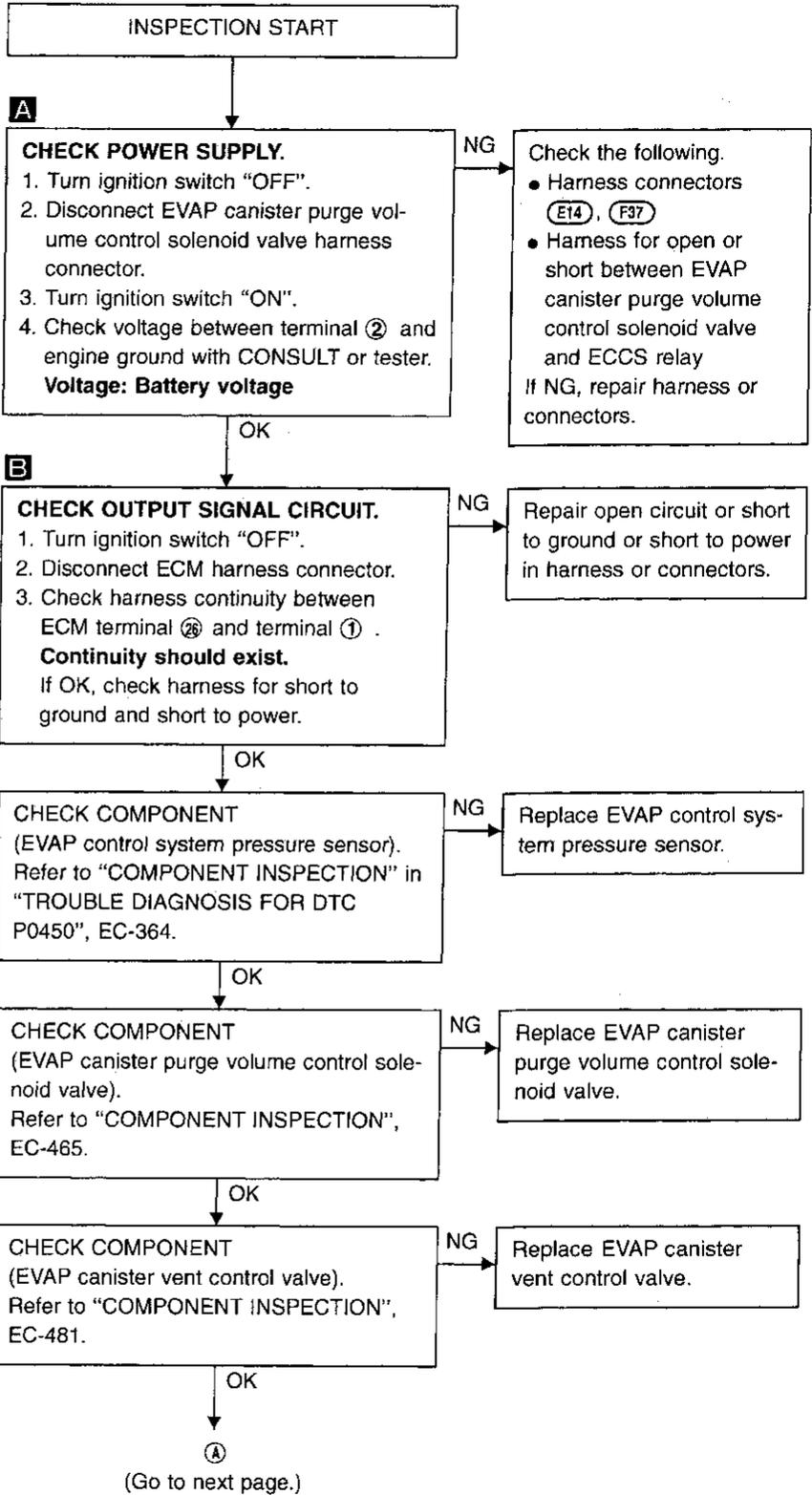
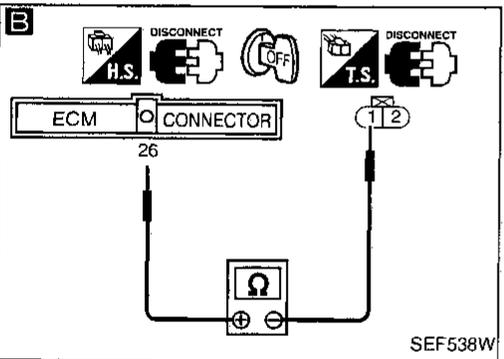
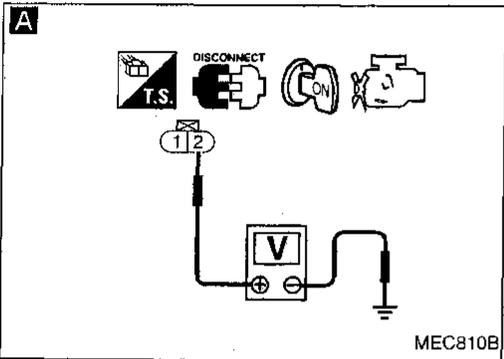
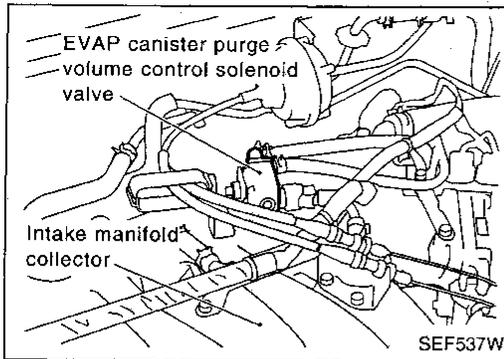
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TROUBLE DIAGNOSIS FOR DTC P1444

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

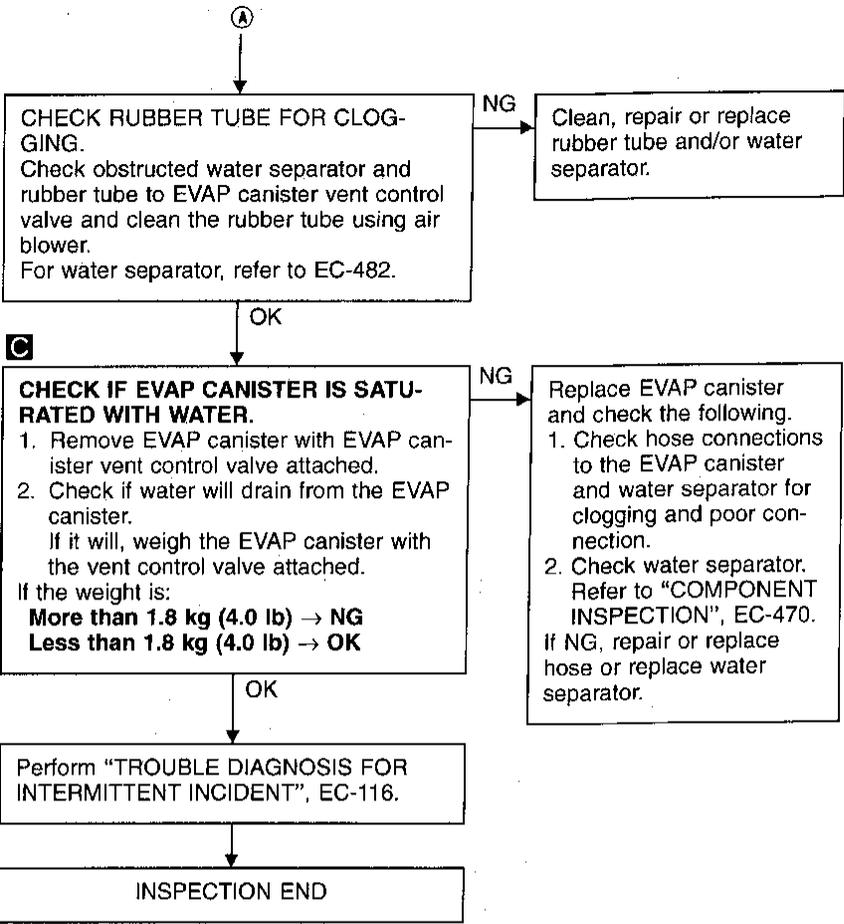
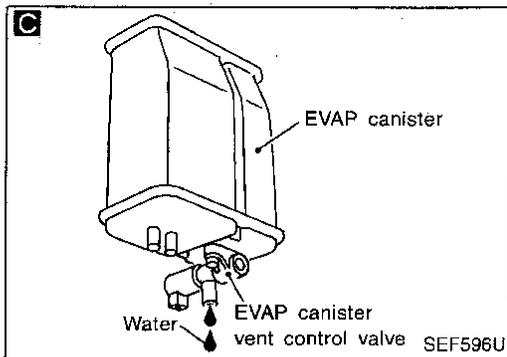
DIAGNOSTIC PROCEDURE



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TROUBLE DIAGNOSIS FOR DTC P1444

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



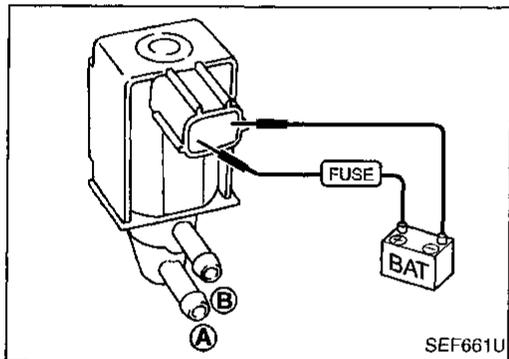
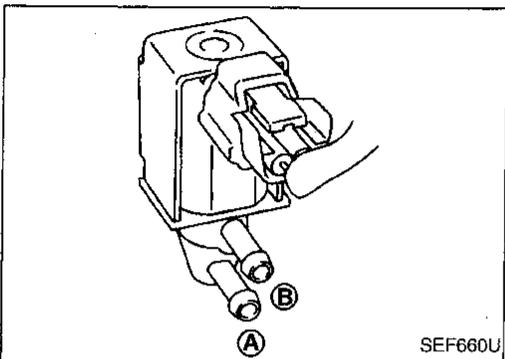
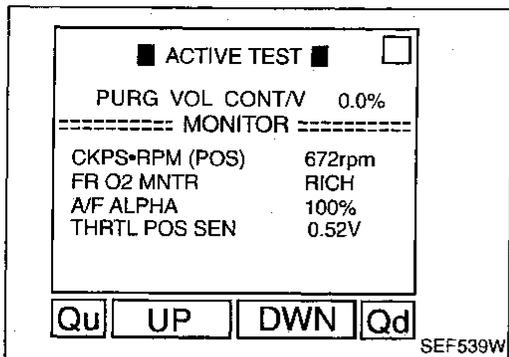
TROUBLE DIAGNOSIS FOR DTC P1444

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

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening. If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



Condition (PURG VOL CONT/V valve)	Air passage continuity between (A) and (B)
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

OR

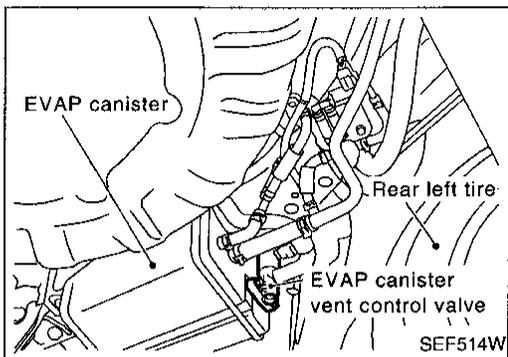
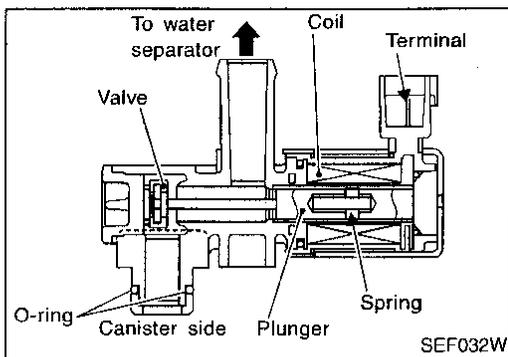
- ⊗ Check air passage continuity.

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 solenoid valve.

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TROUBLE DIAGNOSIS FOR DTC P1446



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 25 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
70	OR/L	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 10 seconds before conducting the next test.

TESTING CONDITION:

Always perform the test at a temperature above 5°C (41°F).

- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 10 seconds, then turn "ON".
- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Make sure that "FUEL TEMP SEN" is more than 0°C (32°F).
- 5) Start engine.
- 6) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for a maximum of 15 minutes.

NOTE:

If a malfunction exists, NG result may be displayed quicker.

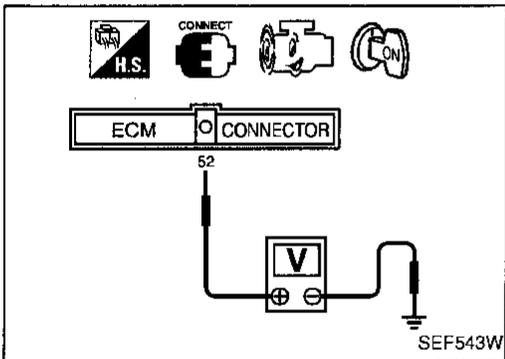
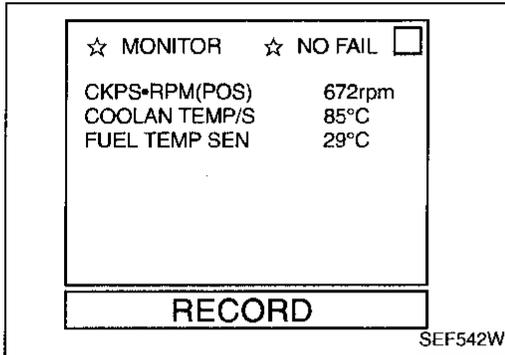
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-468.

OR

- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine.
- 4) Check that voltage between ECM terminal 52 and ground is less than 4.2V.
- 5) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for 15 minutes.
- 6) Select "MODE 7" with GST.
- 7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-468.

OR

- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine.
- 4) Check that voltage between ECM terminal 52 and ground is less than 4.2V.
- 5) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for 15 minutes.
- 6) Turn ignition switch "OFF" and wait at least 10 seconds.
- 7) Turn ignition switch "ON" and perform "DIAGNOSTIC TEST MODE (Self-diagnostic results)" with ECM.
- 8) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-468.



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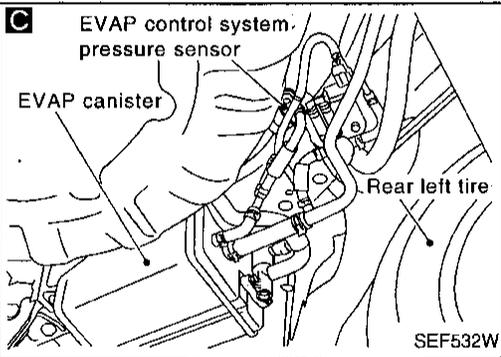
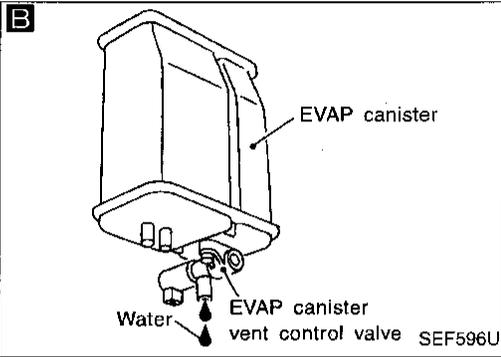
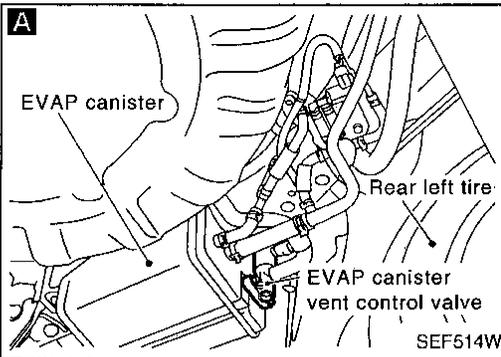
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TROUBLE DIAGNOSIS FOR DTC P1446

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", EC-470.

NG → Clean, repair or replace rubber tube and/or water separator.

OK

A
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

B
CHECK IF EVAP CANISTER IS SATURATED WITH WATER.
1. Remove EVAP canister with the 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-470.
If NG, repair or replace hose or replace water separator.

OK

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 step 3.
3. Check EVAP control system pressure sensor.
Refer to "COMPONENT INSPECTION" on next page.

NG → Repair or replace harness and/or connectors or replace EVAP control system pressure sensor.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P1446

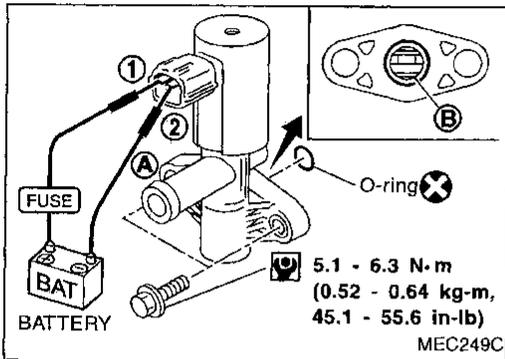
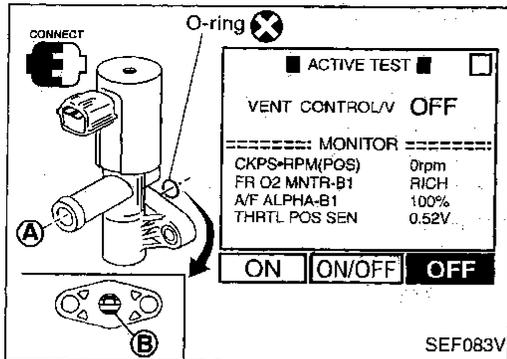
Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

COMPONENT INSPECTION

EVAP canister vent control valve

Check air passage continuity.

- ① Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

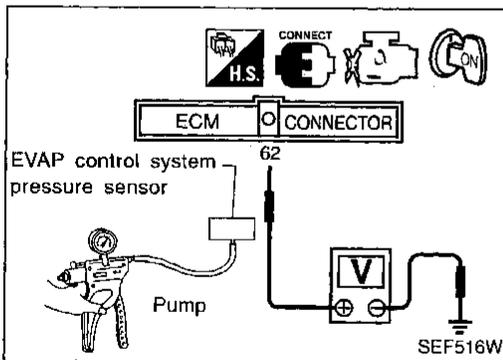
OR

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.



EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal (62) and ground.

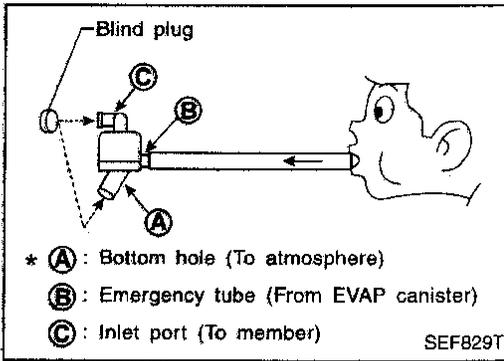
Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
-9.3 kPa (-70 mmHg, -2.76 inHg)	0.4 - 0.6

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

TROUBLE DIAGNOSIS FOR DTC P1446

Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (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.
- **Do not disassemble water separator.**

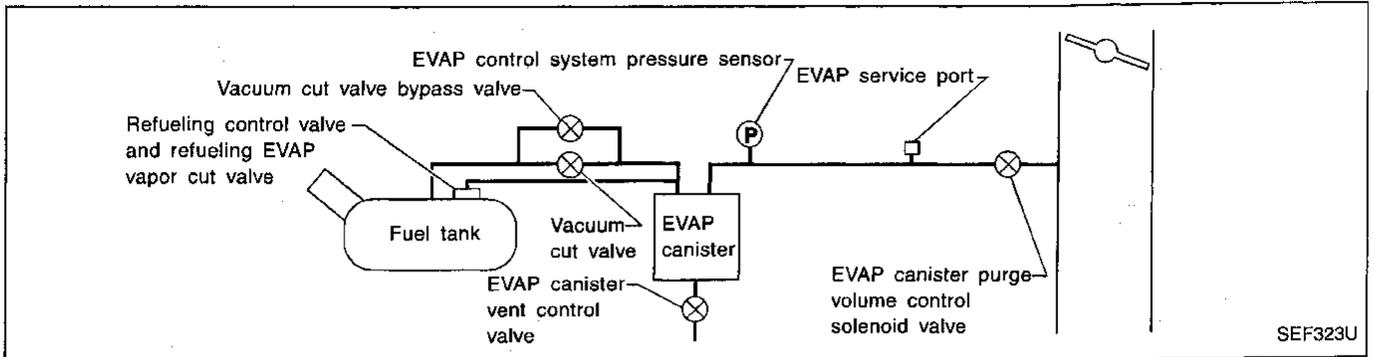
TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring

NOTE:

If both DTC P0510 and P1447 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0510 first. (See EC-376.)

EVAPORATIVE EMISSION SYSTEM DIAGRAM



SYSTEM DESCRIPTION

In this evaporative emission (EVAP) control system, purge volume is related to air intake volume and occurs during non-closed throttle conditions. In normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve and EVAP canister purge control solenoid valve are open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

ON BOARD DIAGNOSIS LOGIC

In normal conditions (non-closed throttle), if the sensor output does not show the appropriate pressure drop in the EVAP purge line, lack of purge flow is indicated, and 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 in line between intake manifold and EVAP control system pressure sensor. 	<ul style="list-style-type: none"> ● EVAP canister purge volume control solenoid valve stuck closed ● EVAP control system pressure sensor and the circuit ● Loose or disconnected or improper connection of rubber tube ● Blocked rubber tube ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve ● Cracked EVAP canister ● EVAP canister purge volume control solenoid valve ● Closed throttle position switch ● Improper connection of one-way valve ● Blocked purge port ● EVAP canister vent control valve

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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 10 seconds before conducting the next test.

TESTING CONDITION:

- Always perform the test at a temperature above 5°C (41°F).
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Start engine and let it idle for at least 1 minute.
- 4) Select "PURG FLOW P1447" of "EVAPORATIVE SYSTEM" in "DTC CONFIRMATION" 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 20 seconds.)

Selector lever: Suitable position

Vehicle speed: 32 - 100 km/h (20 - 62 MPH)

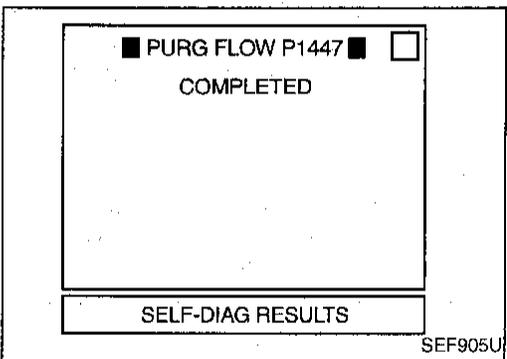
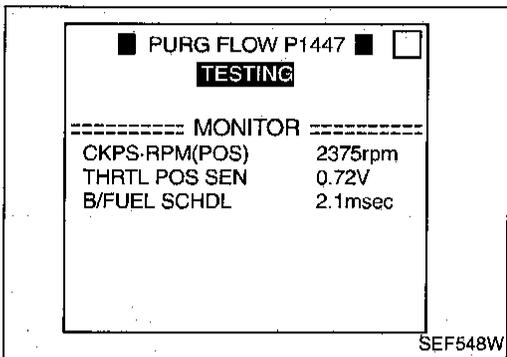
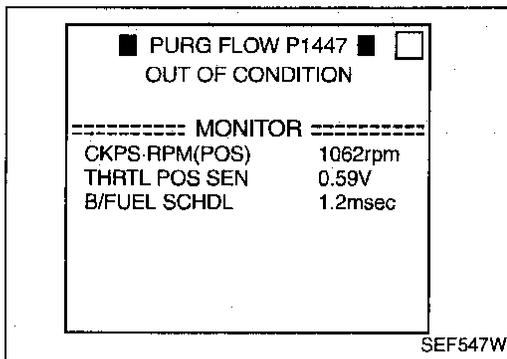
CKPS RPM (REF): 500 - 3,100 rpm

B/FUEL SCHDL: 1.6 - 3.5 ms

Engine coolant temperature: 70 - 100°C (158 - 212°F)

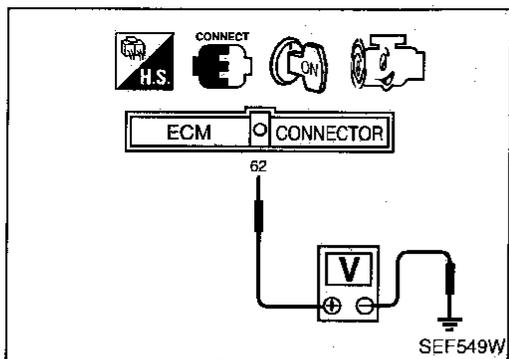
If "TESTING" is not changed for a long time, retry from step 2).

- 7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-474.



TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall monitoring function of the EVAP control system purge flow. During this check, a 1st trip DTC might not be confirmed.

- 1) Lift up drive wheels.
- 2) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF", wait at least 10 seconds.
- 4) Start engine and wait at least 60 seconds.
- 5) Set voltmeter probes to ECM terminals 62 (EVAP control system pressure sensor signal) and ground.
- 6) Check EVAP control system pressure sensor value at idle speed.
- 7) Establish and maintain the following conditions for at least 1 minute.

Air conditioner switch: ON

Steering wheel: Fully turned

Headlamp switch: ON

Engine speed: Approx. 3,000 rpm

Gear position:

M/T models

Any position other than "Neutral" or "Reverse"

A/T models

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.

- 8) If NG, go to "DIAGNOSTIC PROCEDURE" on next page.

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TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

DIAGNOSTIC PROCEDURE

A

■ ACTIVE TEST ■ □

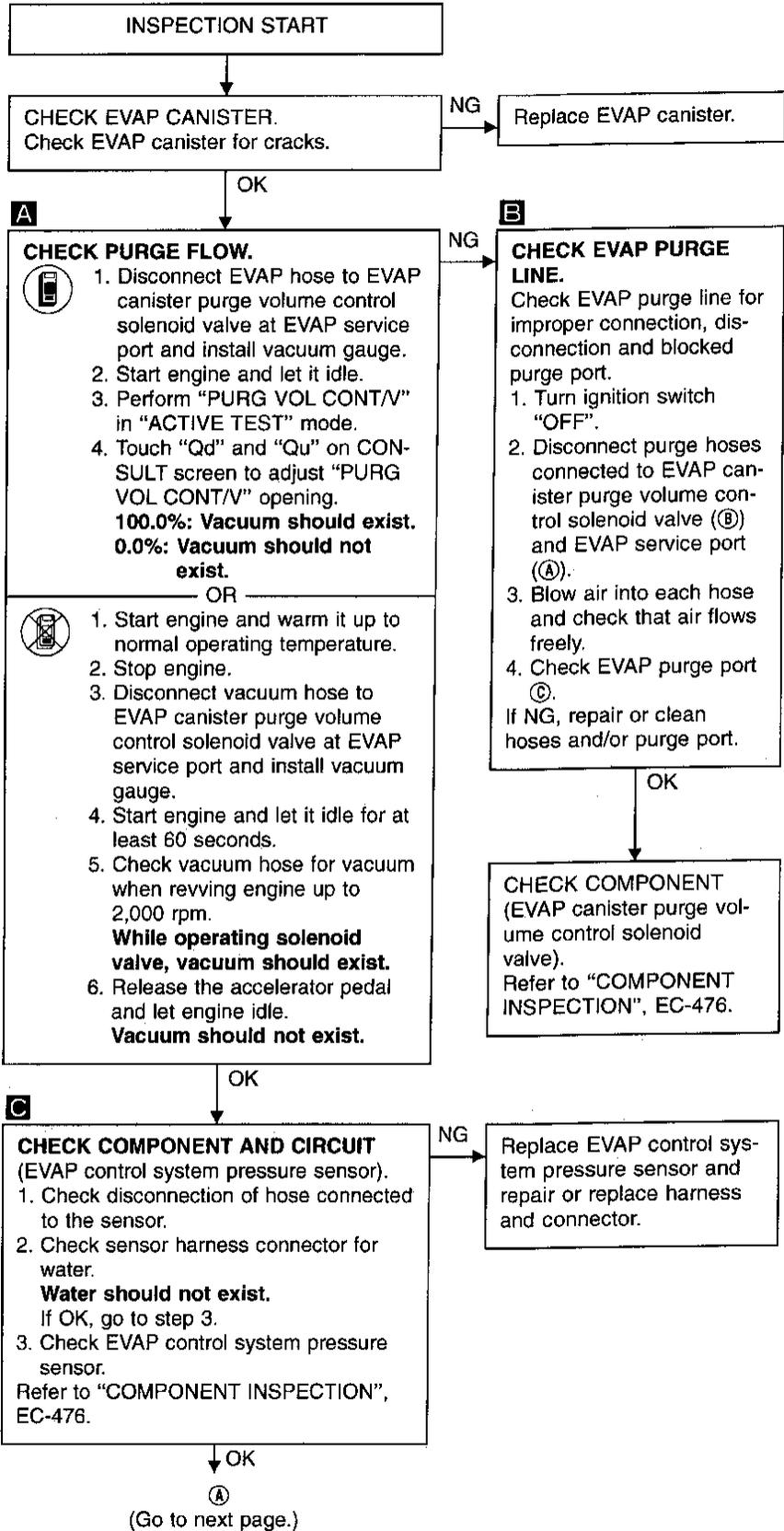
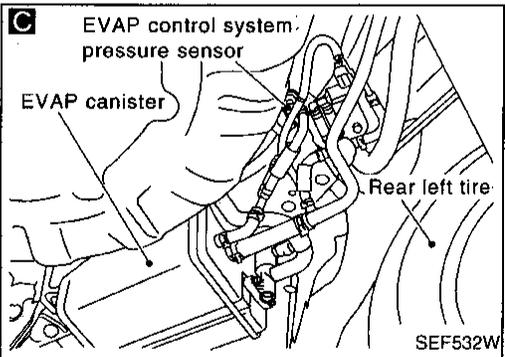
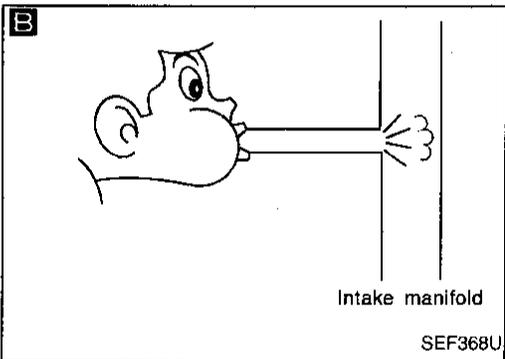
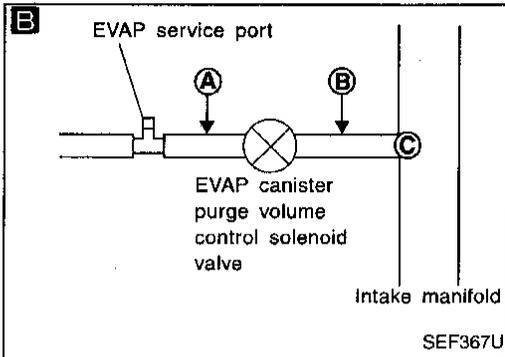
PURG VOL CONT/V 0.0%

----- MONITOR -----

CKPS•RPM (POS)	672rpm
FR O2 MNTR	RICH
A/F ALPHA	100%
THRTL POS SEN	0.52V

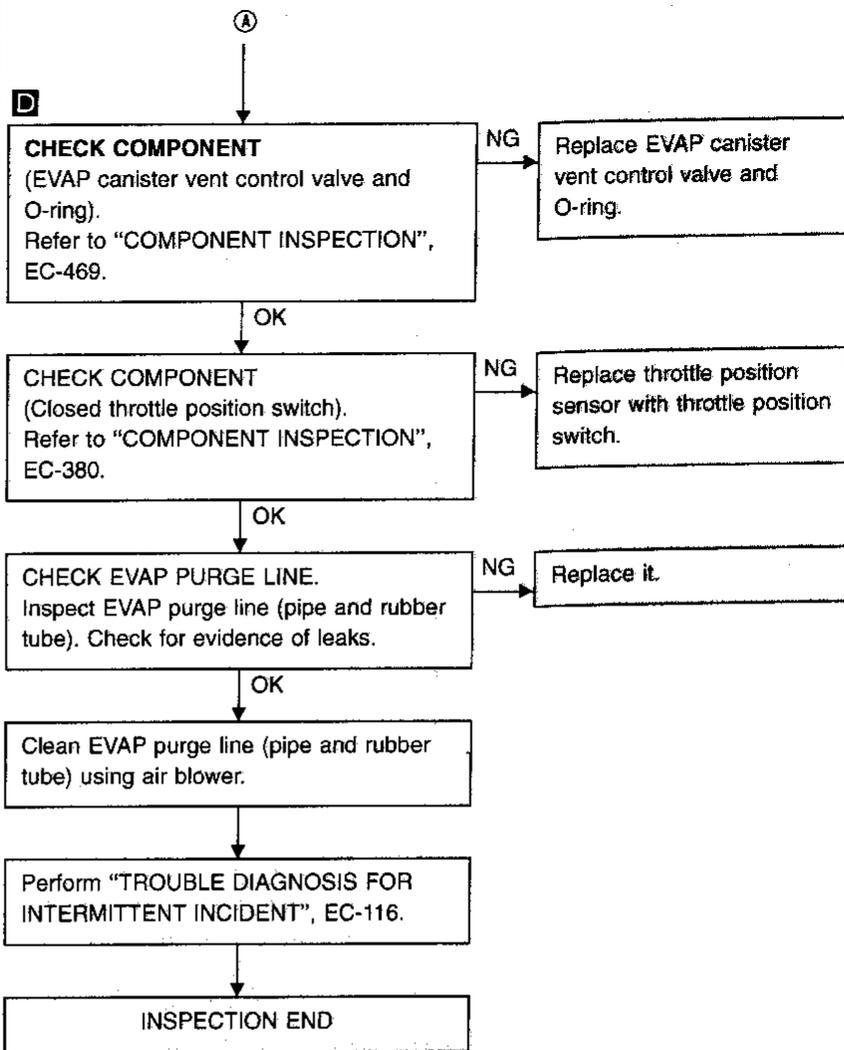
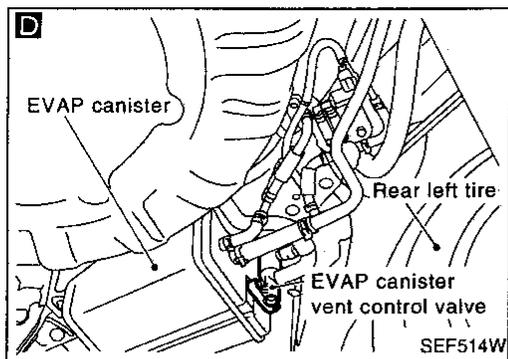
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TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



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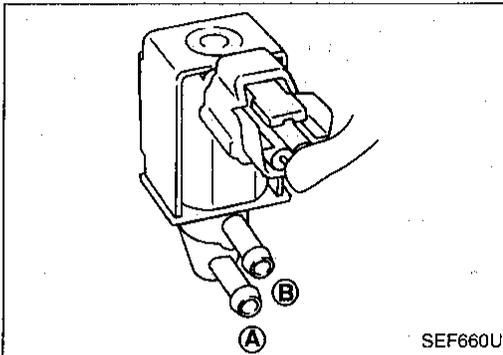
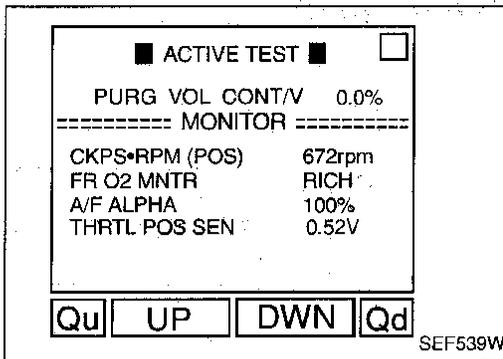
TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.
If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.

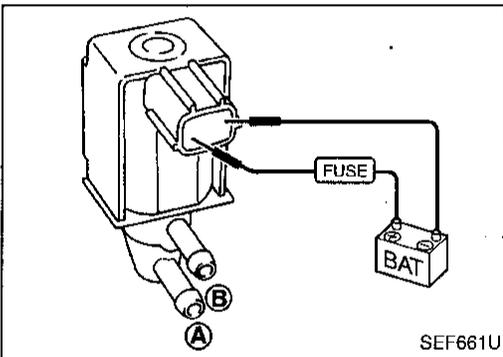


Condition PURG VOL CONT/V value	Air passage continuity between (A) and (B)
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

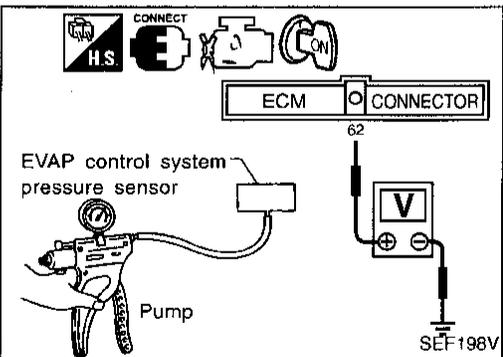
OR

1. Check air passage continuity.



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 solenoid valve.



EVAP control system pressure sensor

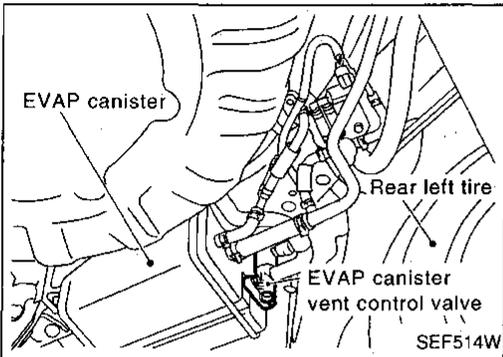
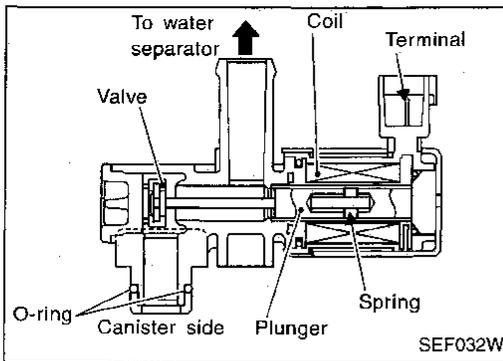
1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal 62 and engine ground.

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

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -20 kPa (-150 mmHg, -5.91 inHg) or pressure over 20 kPa (150 mmHg, 5.91 inHg).
5. If NG, replace EVAP control system pressure sensor.

TROUBLE DIAGNOSIS FOR DTC P1448



Evaporative Emission (EVAP) Canister Vent Control Valve (Open)

COMPONENT DESCRIPTION

NOTE:

If DTC P1448 is displayed with P0440 or P1440, perform TROUBLE 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 ②⑤ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
70	OR/L	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 or 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 10 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 flat level surface.
- Always perform test at a temperature of 0 to 30°C (32 to 86°F).
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.
- It is better that the fuel level is low.



- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 10 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Make sure 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 "FUEL TEMP SEN" becomes less than 30°C (86°F), retest. (Use a fan to reduce the stabilization time.)
 - The engine idle portion of this test (See illustration at left.) will take approximately 5 minutes.
- 6) Make sure that "OK" is displayed.
If "NG" is displayed, go to the following step.

NOTE:

Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

- 7) Stop engine and wait at least 5 seconds, then turn "ON".
- 8) Disconnect hose from water separator.
- 9) Select "VENT CONTROL/V" of "ACTIVE TEST" mode with CONSULT.
- 10) Touch "ON" and "OFF" alternately.

■ 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. . .

2 TO 10 MINUTES

KEEP ENGINE RUNNING AT IDLE SPEED.

SEF544W

■ EVAP SML LEAK P0440 ■

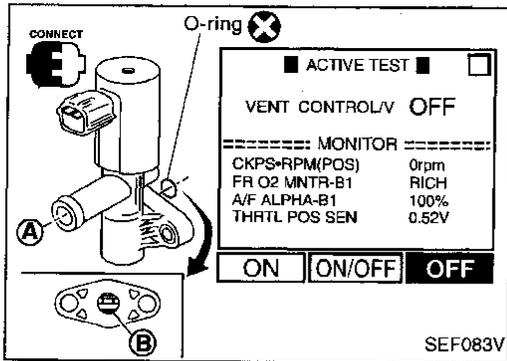
***** OK *****

END PRINT

SEF297U

TROUBLE DIAGNOSIS FOR DTC P1448

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

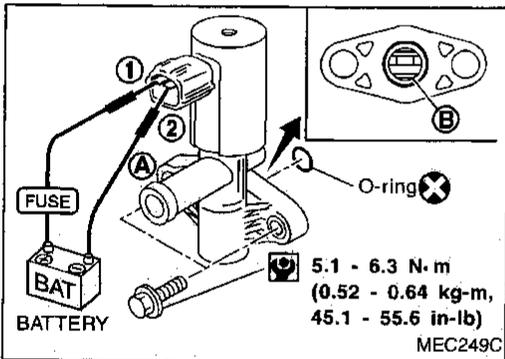


11) Make sure the following.

Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-480.

If the result is OK, go to "DIAGNOSTIC PROCEDURE" for "TROUBLE DIAGNOSIS FOR DTC P0440", EC-338.



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

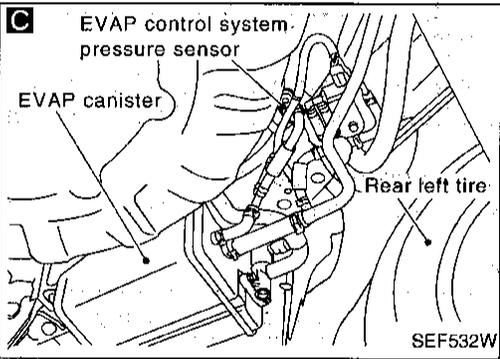
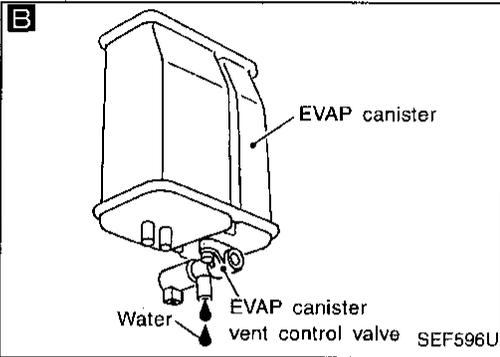
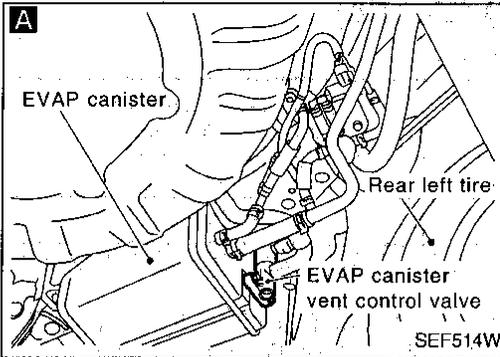
If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-480.

If the result is OK, go to "TROUBLE DIAGNOSIS FOR DTC P0440", EC-338.

TROUBLE DIAGNOSIS FOR DTC P1448

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

DIAGNOSTIC PROCEDURE



INSPECTION START

CHECK RUBBER TUBE FOR DISCONNECTION.
Check disconnection of rubber tube to EVAP canister vent control valve and clean the rubber hose and/or vent control valve then install properly.

OK

A
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 COMPONENT
(Vacuum cut valve). Refer to "COMPONENT INSPECTION", EC-492.

NG

Replace vacuum cut valve.

OK

B
CHECK IF EVAP CANISTER IS SATURATED WITH WATER.
1. Remove EVAP canister with the 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-482.
If NG, repair or replace hose or replace water separator.

OK

C
CHECK COMPONENT
(EVAP control system pressure sensor).
1. Check for disconnection of hose connected to the sensor.
2. Check harness connector for water in the sensor connectors.
3. Check EVAP control system pressure sensor.
Refer to "COMPONENT INSPECTION" on next page.

NG

Repair or replace harness and/or connectors or replace EVAP control system pressure sensor.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P1448

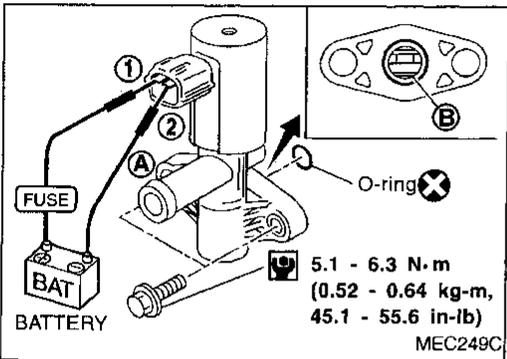
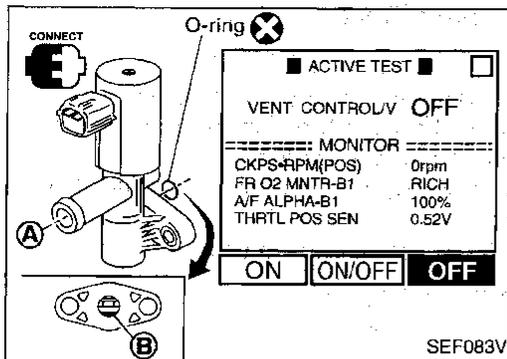
Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)

COMPONENT INSPECTION

EVAP canister vent control valve

Check air passage continuity.

ⓘ Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



Condition VENT CONTROL/V	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

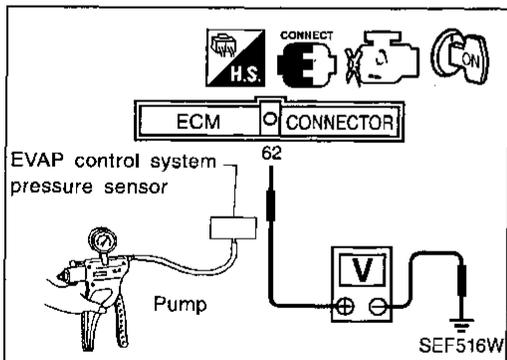
OR

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.



EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between terminal (62) and ground.

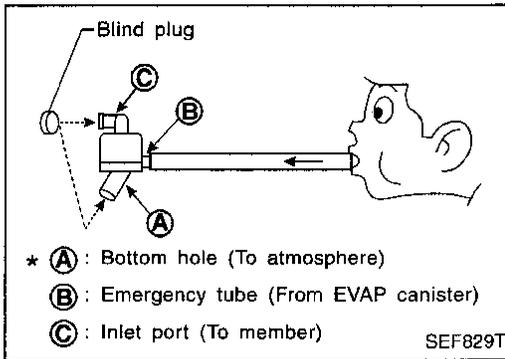
Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
-9.3 kPa (-70 mmHg, -2.76 inHg)	0.4 - 0.6

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

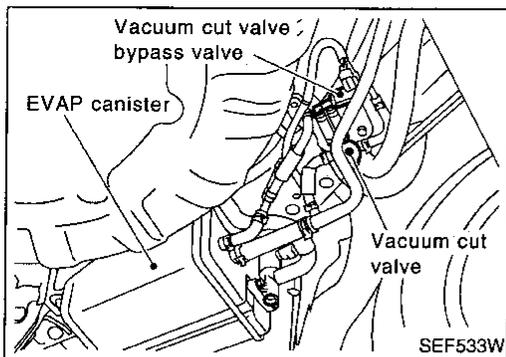
TROUBLE DIAGNOSIS FOR DTC P1448

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



Water separator

1. Check visually for insect nests in 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.
- **Do not disassemble water separator.**



Vacuum Cut Valve Bypass Valve (Circuit)

COMPONENT DESCRIPTION

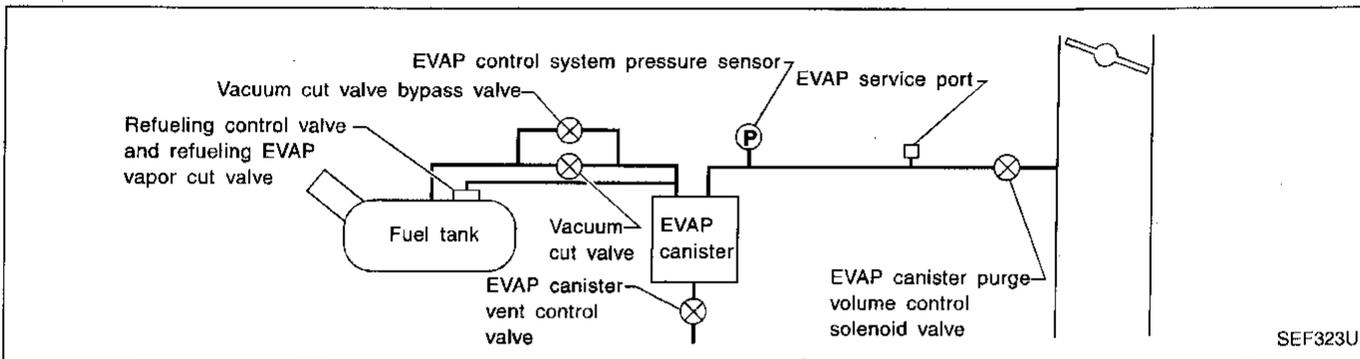
The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.

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 25 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
120	OR/G	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

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TROUBLE DIAGNOSIS FOR DTC P1490

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

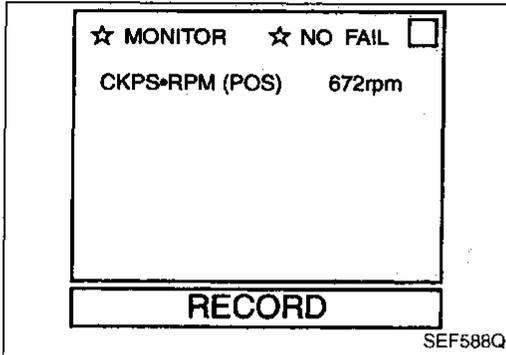
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that 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 5 seconds.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-486.

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-486.

OR

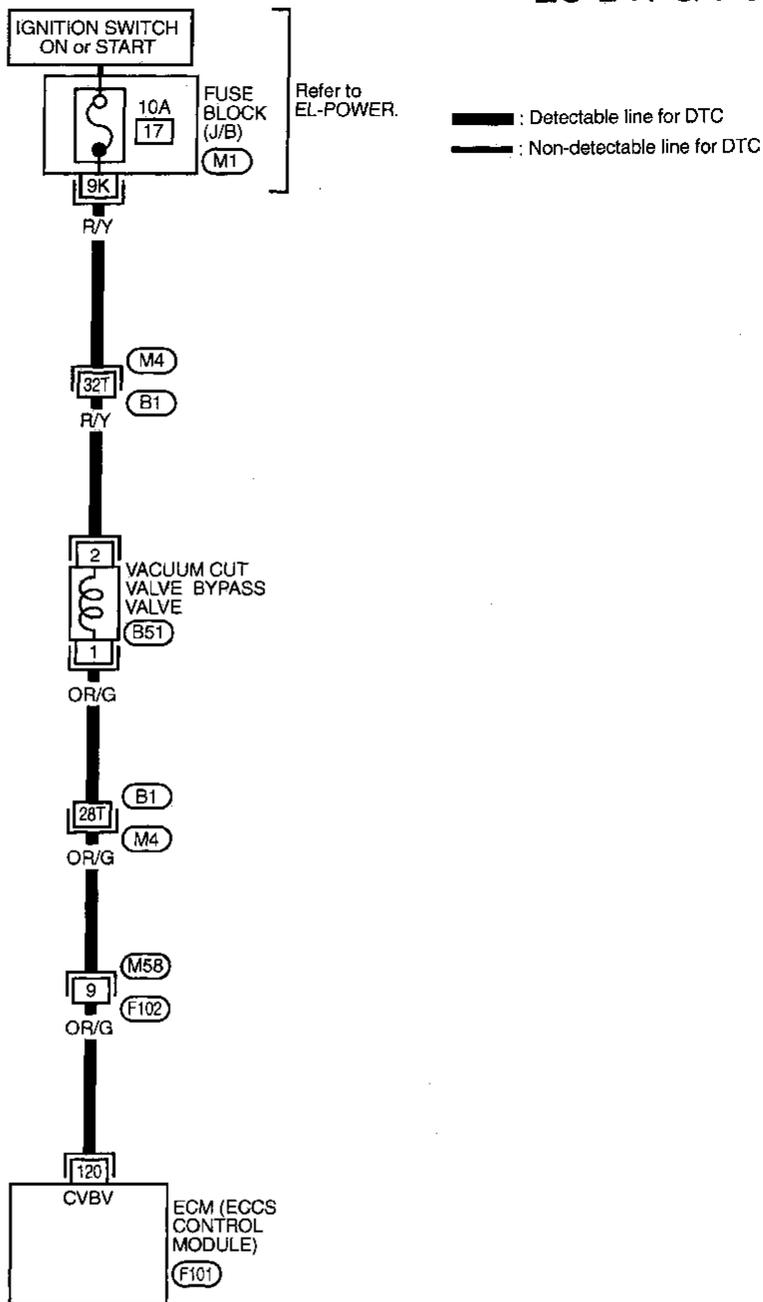


- 1) Start engine and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-486.

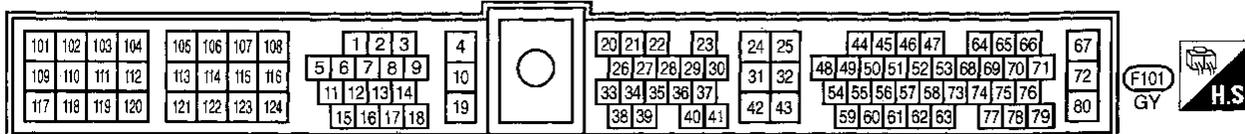
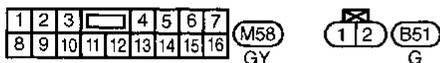
TROUBLE DIAGNOSIS FOR DTC P1490

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

EC-BYPS/V-01



Refer to last page (Foldout page).

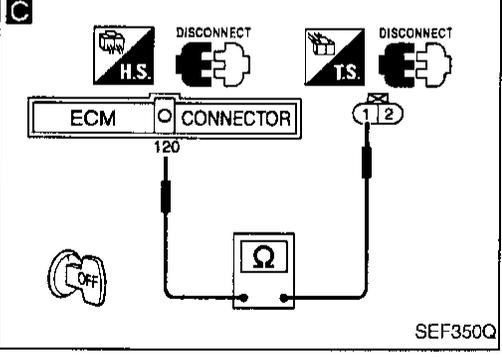
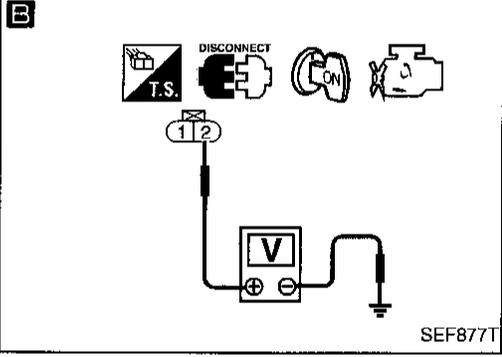
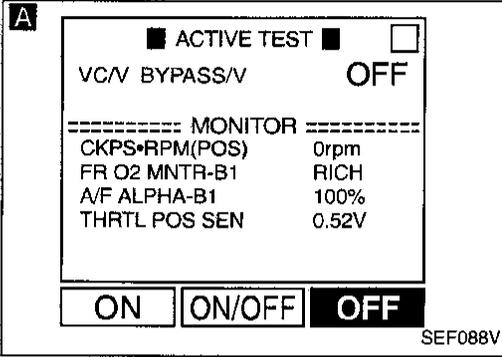
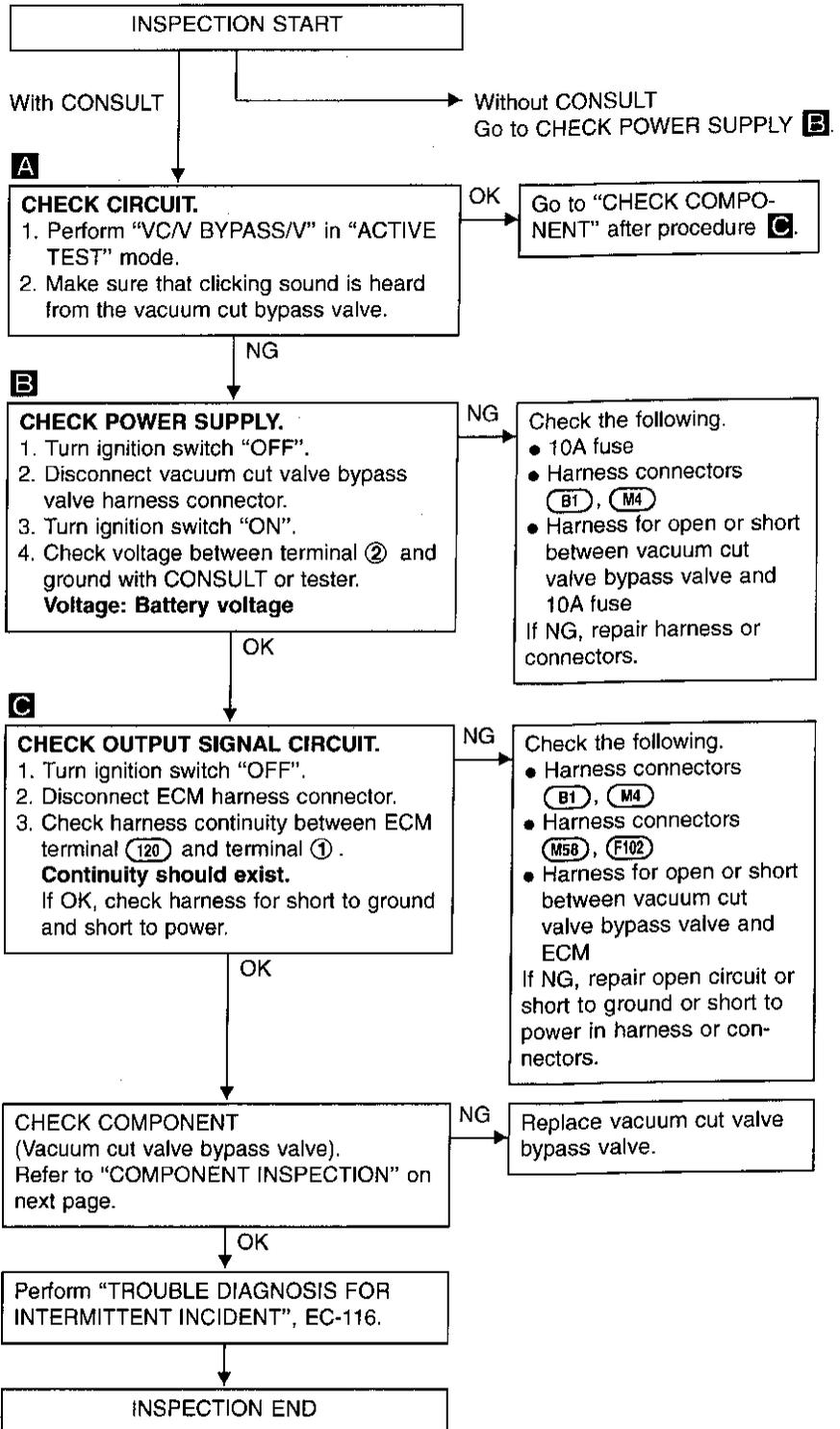
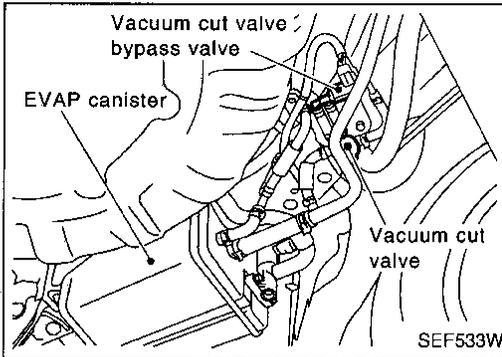


- GI
- MA
- EM
- LC
- EC**
- FE
- CL
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- AT
- FA
- RA
- BR
- ST
- RS
- BT
- HA
- EL
- IDX

TROUBLE DIAGNOSIS FOR DTC P1490

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P1490

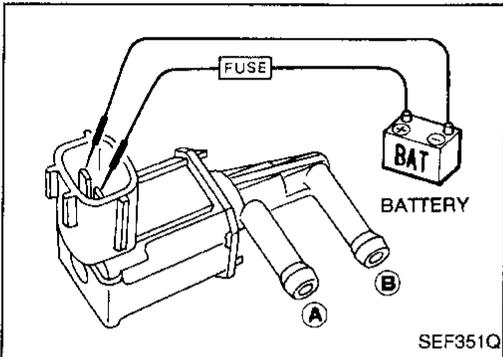
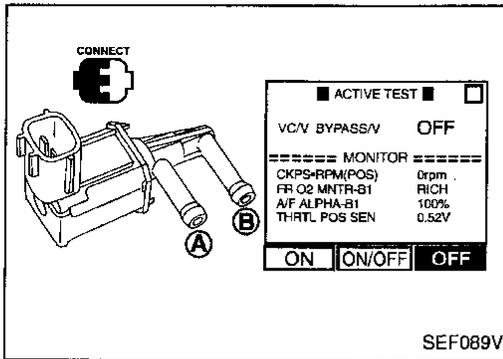
Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

Vacuum cut valve bypass valve

Check air passage continuity.

 Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.



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.

GI

MA

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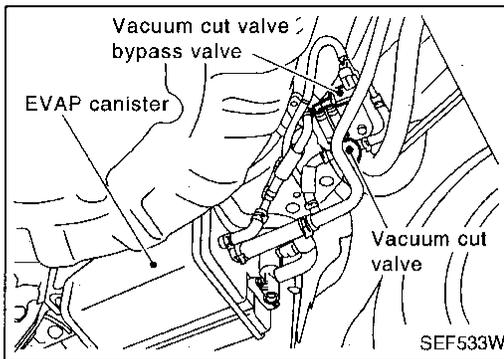
BT

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TROUBLE DIAGNOSIS FOR DTC P1491



Vacuum Cut Valve Bypass Valve

COMPONENT DESCRIPTION

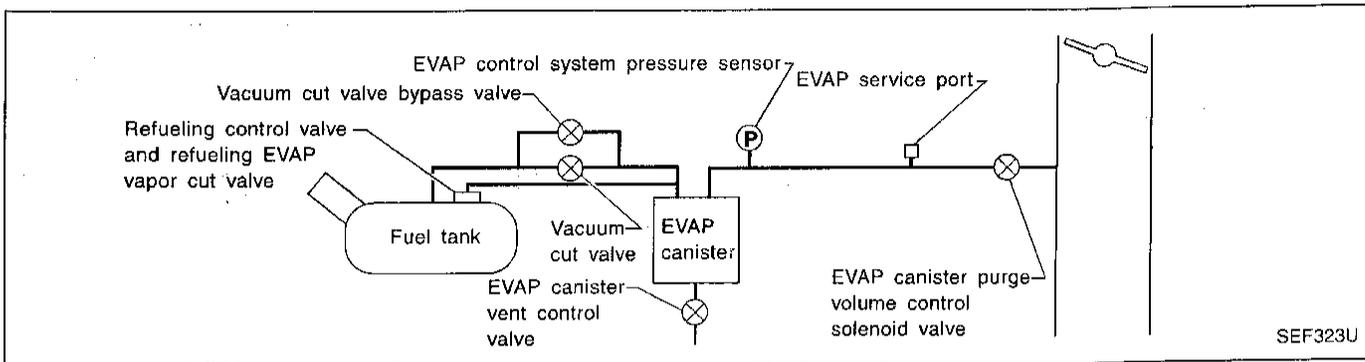
The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.

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 Ⓧ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
120	OR/G	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	● 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

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 10 seconds before conducting the next test.

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.
- Always perform test at a temperature of 5 to 30°C (41 to 86°F).
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.



- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 10 seconds.
- 4) Start engine and let it idle for at least 50 seconds.
- 5) Select "VC CUT/V BP/V P1491" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 6) Touch "START".
- 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 at least 30 seconds.)
CKPS-RPM (POS): 1,000 - 3,000 rpm
Vehicle speed: 30 - 120 km/h (19 - 75 MPH)
B/FUEL SCHDL: 0.7 - 4.5 msec
Selector lever: Suitable position

If "TESTING" is not displayed after 5 minutes, retry from step 3).

- 8) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE" on next page.

■ VC CUT/V BP/V P1491 ■

OUT OF CONDITION

===== MONITOR =====

CKPS•RPM(POS)	672rpm
THRTL POS SEN	0.46V
B/FUEL SCHDL	1.3msec

SEF525W

■ VC CUT/V BP/V P1491 ■

TESTING

===== MONITOR =====

CKPS•RPM(POS)	1475rpm
THRTL POS SEN	0.7V
B/FUEL SCHDL	2.6ms

SEF091V

■ VC CUT/V BP/V P1491 ■

COMPLETED

SELF-DIAG RESULTS

MEC087C

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TROUBLE DIAGNOSIS FOR DTC P1491

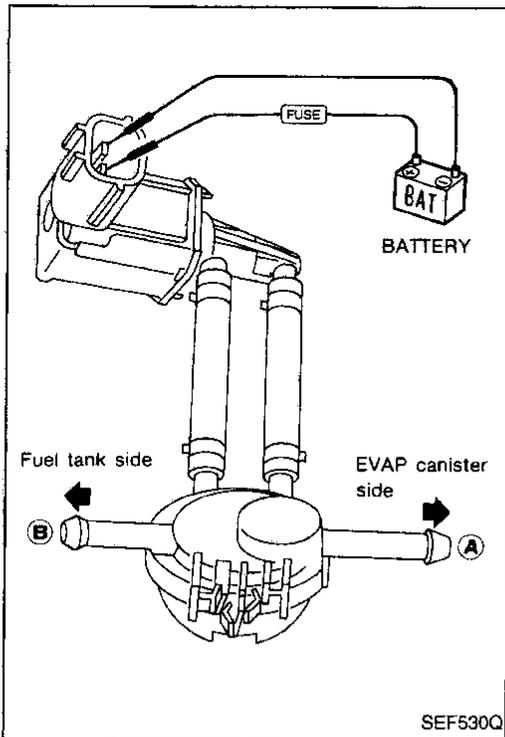
Vacuum Cut Valve Bypass Valve (Cont'd)

OR

OVERALL FUNCTION CHECK

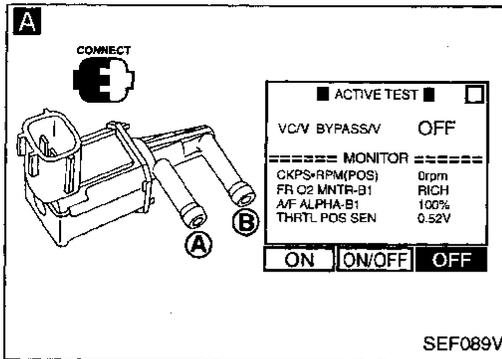


- 1) Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
- 2) Apply vacuum to port (A) and check that there is no suction from port (B).
- 3) Apply vacuum to port (B) and check that there is suction from port (A).
- 4) Blow air in port (B) and check that there is a resistance to 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" on next page.

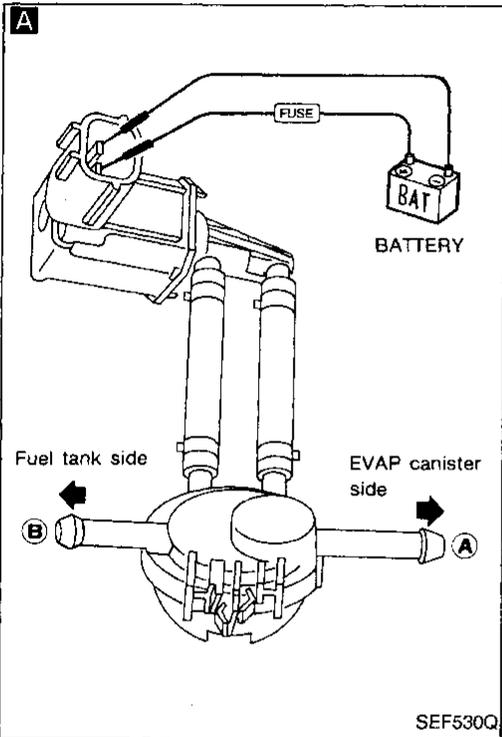


Vacuum Cut Valve Bypass Valve (Cont'd)

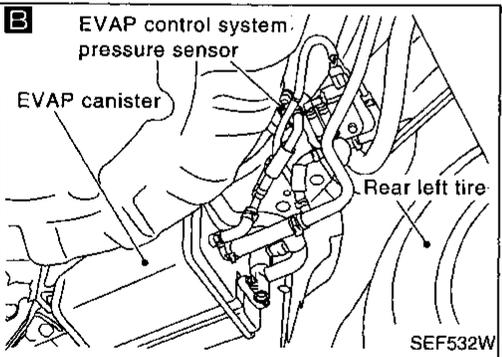
DIAGNOSTIC PROCEDURE



SEF089V



SEF530Q



SEF532W

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).

NG
Check bypass hoses for clogging.

B
CHECK COMPONENT
(Vacuum cut valve, vacuum cut valve bypass valve).
Refer to "COMPONENT INSPECTION" on next page.

B
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", EC-362.

OK

CHECK COMPONENT
(EVAP canister vent control valve).
Refer to "COMPONENT INSPECTION", EC-481.

INSPECTION END

OK
Check the following.
• EVAP purge line between EVAP canister and fuel tank for clogging or disconnection
• EVAP canister, refer to EC-26.
• EVAP purge port of fuel tank for clogging
If NG, repair or replace.

OK
Go to **B** "CHECK COMPONENT (EVAP control system pressure sensor)" below.

NG
Repair or replace hoses.

NG
Replace malfunctioning parts.

NG
Repair or replace harness, connectors and/or replace EVAP control system pressure sensor.

NG
Repair or replace EVAP canister vent control valve.

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TROUBLE DIAGNOSIS FOR DTC P1491

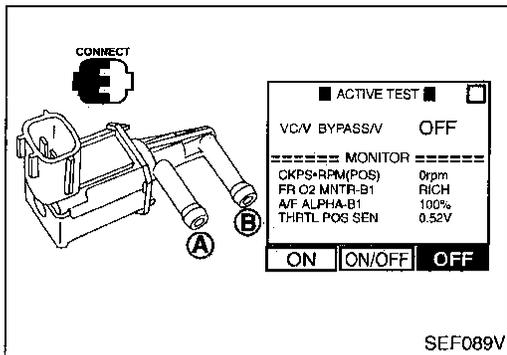
Vacuum Cut Valve Bypass Valve (Cont'd)

COMPONENT INSPECTION

Vacuum cut valve bypass valve

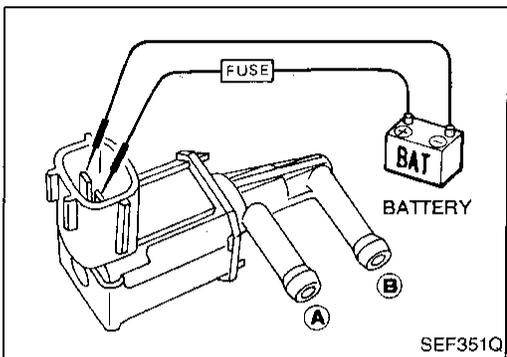
Check air passage continuity.

 Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.



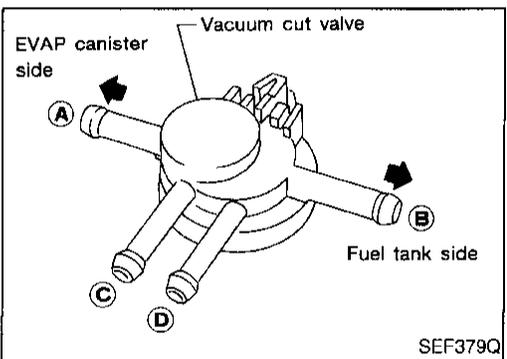
Condition VC/V BYPASS/V	Air passage continuity between (A) and (B)
ON	Yes
OFF	No

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.



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).
8. If NG, replace vacuum cut valve.

TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position (PNP) Switch

COMPONENT DESCRIPTION

When the gear position is in "P" (A/T models only) or "N", park/neutral position (PNP) switch is "ON". ECM detects the position because the continuity of the line (the "ON" signal) exists.
 For A/T models, the PNP switch assembly also includes a transmission range switch to detect 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 Ⓧ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
27	G/W (M/T models) R/G (A/T models)	PNP switch	Ignition switch "ON" ├ Gear position is "Neutral position" (M/T models). └ Gear position is "N" or "P" (A/T models).	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	Approximately 5V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0705 1003	• The signal of the park/neutral position switch is not changed in the process of engine starting and driving.	<ul style="list-style-type: none"> • Harness or connectors <ul style="list-style-type: none"> a. The PNP switch circuit is open or shorted. b. The circuit between ECM and TCM (Transmission Control Module) is open or shorted. • PNP switch • TCM (Transmission Control Module) (A/T models)

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 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 9V at idle.

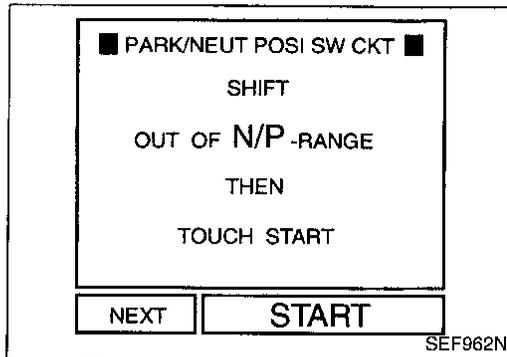
1) Turn ignition switch "ON".



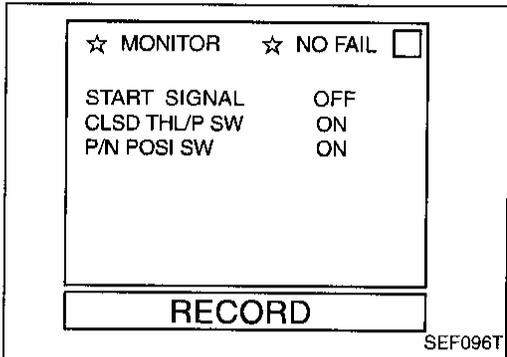
2) Perform "PARK/NEUT POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.
If NG, go to "DIAGNOSTIC PROCEDURE", EC-496, 497.
If OK, go to following step.

OR

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



SEF962N



SEF096T

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

If NG, go to "DIAGNOSTIC PROCEDURE", EC-496, 497.

If OK, go to following step.

- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Start engine and warm it up to normal operating temperature.
- 5) Maintain the following conditions for at least 50 consecutive seconds.

CKPS-RPM (POS): 1,800 - 2,600 (M/T)

1,600 - 2,400 (A/T)

COOLAN TEMP/S: More than 70°C (158°F)

B/FUEL SCHDL: 1 - 5 msec

VHCL SPEED SE: 70 - 100 km/h (43 - 62 MPH)

Selector lever: Suitable position

OR

OVERALL FUNCTION CHECK

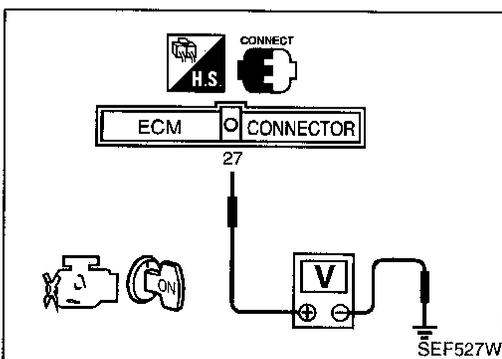
This procedure can be used for checking the overall function of the park/neutral position switch circuit. During this check, a DTC might not be confirmed.



1) Turn ignition switch "ON".

2) Check voltage between ECM terminal ⑳ and body ground in the following conditions.

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

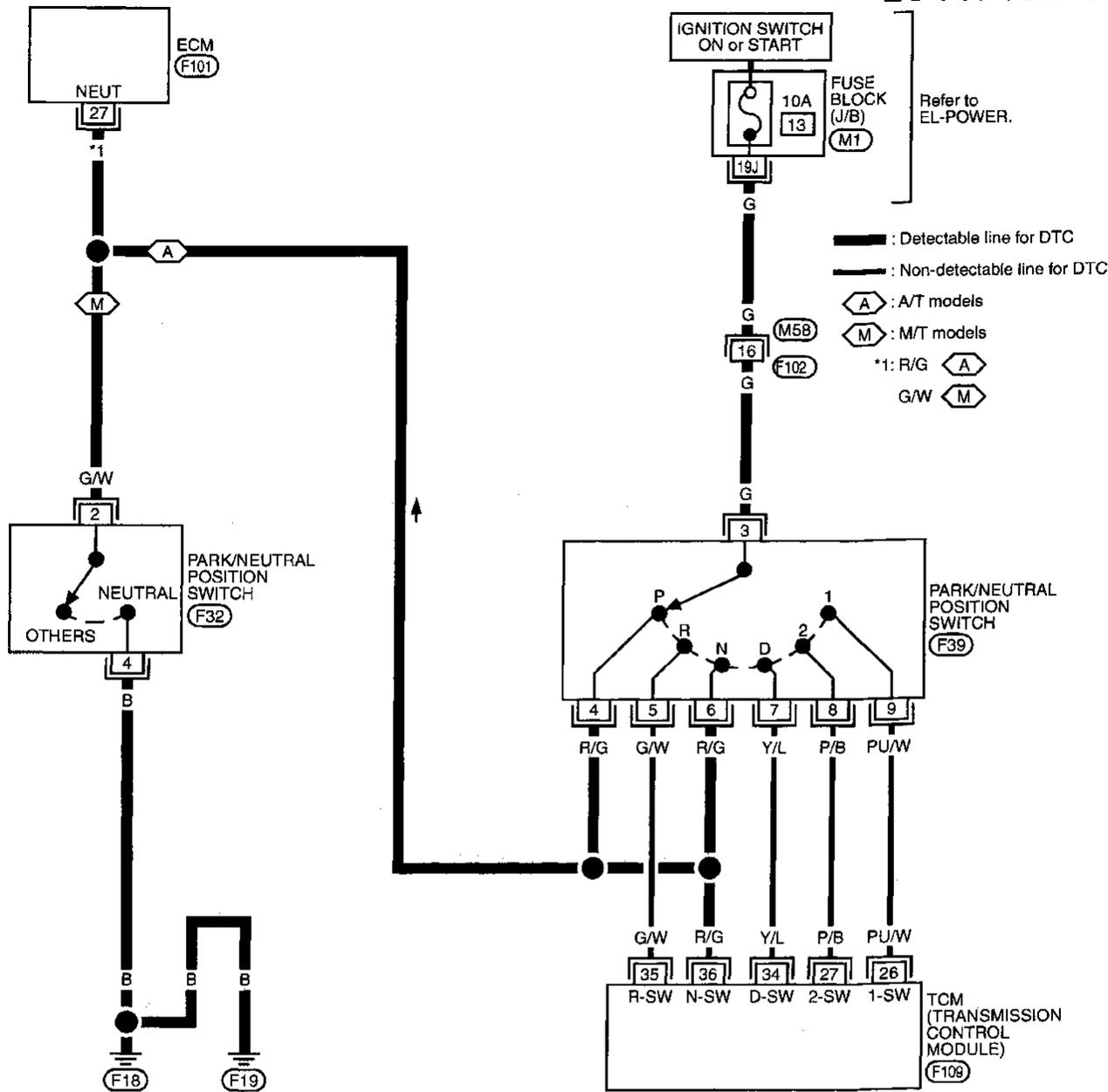


SEF527W

TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position (PNP) Switch (Cont'd)

EC-PNP/SW-01



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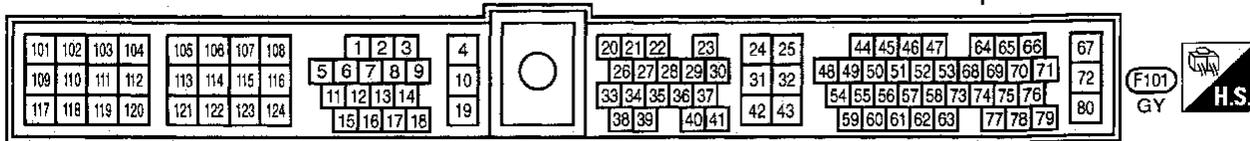
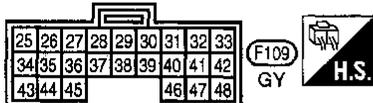
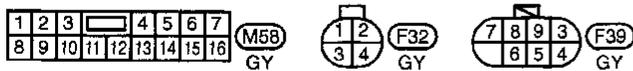
RS

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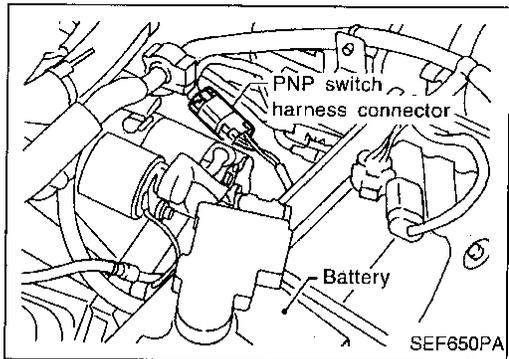
Refer to last page (Foldout page).

M1

TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position (PNP) Switch (Cont'd)

DIAGNOSTIC PROCEDURE



PNP switch (M/T models)

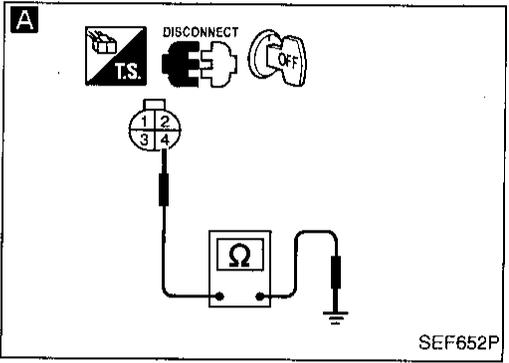
INSPECTION START

A

CHECK GROUND CIRCUIT.

1. Disconnect PNP switch harness connector.
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 → Repair open circuit, short to ground or short to power in harness connectors.

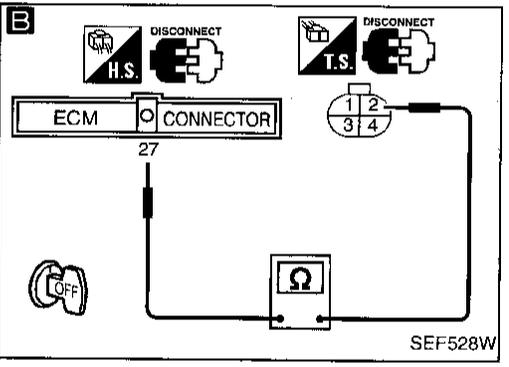


B

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑳ and terminal ②.
Continuity should exist.
If OK, check harness for short to ground and short to power.

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



CHECK COMPONENT (PNP switch). Refer to MT section.

NG → Replace PNP switch.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position (PNP) Switch (Cont'd)

DIAGNOSTIC PROCEDURE

PNP switch (A/T models)

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.

- Harness connectors
 (F102), (M58)
 - 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. Disconnect TCM (Transmission Control Module) harness connector.
 2. Check harness continuity between TCM (Transmission Control Module) terminal ③ and terminals ④, ⑥.
Continuity should exist.
- If OK, check harness for short to ground and short to power.

NG

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

OK

C

CHECK OUTPUT SIGNAL CIRCUIT-II.

1. Disconnect ECM harness connector.
 2. Check harness continuity between ECM terminal ⑦ and terminals ④, ⑥.
Continuity should exist.
- If OK, check harness for short to ground and short to power.

NG

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

OK

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

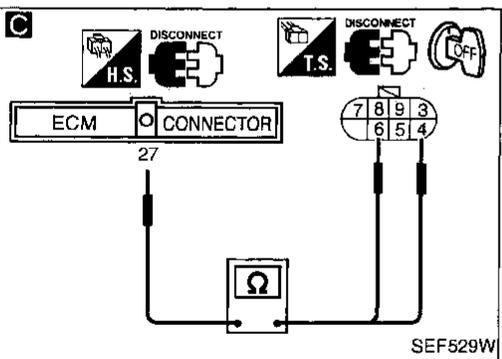
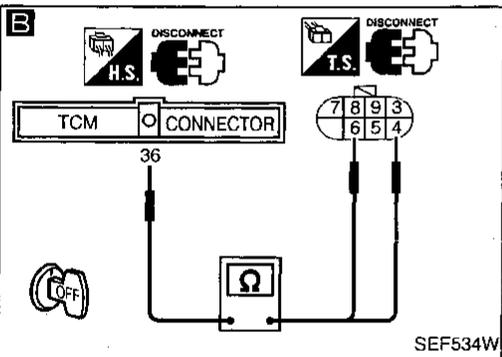
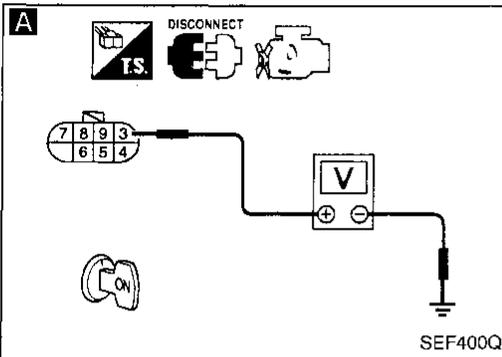
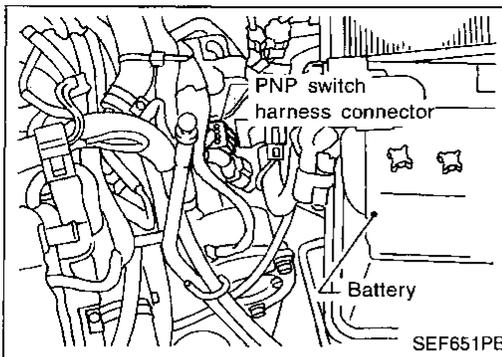
NG

Replace PNP switch.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END



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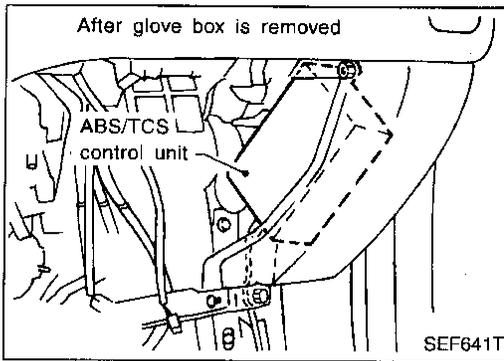
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TROUBLE DIAGNOSIS FOR ABS/TCS C/U SIGNAL



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.

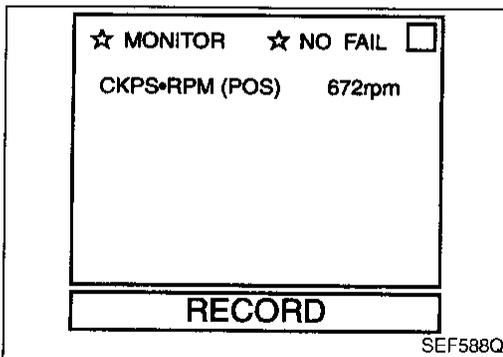
ECM TERMINALS AND REFERENCE VALUE

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
68	W/L	A/T communication line (LAN)	Engine is running. └ Idle speed	Approximately 2V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
—* 0107	A) ECM receives incorrect voltage from ABS/TCS control unit continuously.	<ul style="list-style-type: none"> • ABS/TCS control unit • TCS related parts (Refer to BR section.)
—* 0207	B) TCS operation (Fuel cut) continues for an abnormally long time.	

*: SAE J2012 number is not applicable



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the DTC cannot be confirmed, perform "OVERALL FUNCTION CHECK", "Procedure for malfunction B".

Procedure for malfunction A (DTC: 0107)

TESTING CONDITION:

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



- 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 malfunction is detected, go to "DIAGNOSTIC PROCEDURE" of "TROUBLE DIAGNOSIS FOR ECM — ABSTCS COMM NG", EC-503.

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 DTC is detected, go to "DIAGNOSTIC PROCEDURE" of "TROUBLE DIAGNOSIS FOR ECM — ABSTCS COMM NG", EC-503.

TROUBLE DIAGNOSIS FOR ABS/TCS C/U SIGNAL

ABS/TCS Control Unit (Cont'd)

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) Select "ABS" and touch "SELF-DIAG RESULTS".
- 4) Touch "ERASE".
- 5) Touch "BACK" then erase malfunction code which has been stored in the TCM or ECM.

GI

MA

OVERALL FUNCTION CHECK

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

EM

Procedure for malfunction B (DTC: 0207)

LC

- 1) Lift up driving wheels.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Place TCS OFF switch in "ON" position.
- 4) Drive vehicle with "D" position (OD "ON" or "OFF") and check engine running conditions as follows.

EC

FE

Engine speed ("D" position)	Engine running condition
Idle	Normal
More than 1,600 rpm	Rough

CL

- 5) If NG, go to "DIAGNOSTIC PROCEDURE" on next page.

MT

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) Select "ABS" and touch "SELF-DIAG RESULTS".
- 4) Touch "ERASE".
- 5) Touch "BACK" then erase malfunction code which has been stored in the TCM or ECM.

AT

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TROUBLE DIAGNOSIS FOR ABS/TCS C/U SIGNAL

ABS/TCS Control Unit (Cont'd)

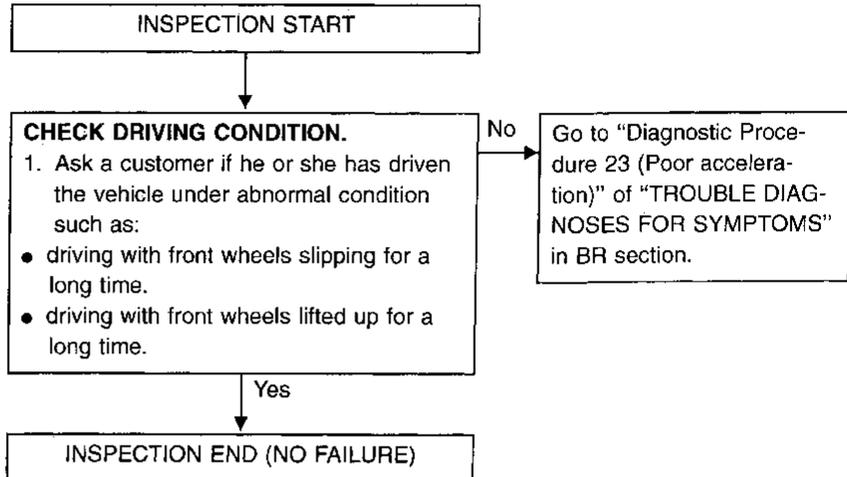
DIAGNOSTIC PROCEDURE

If the trouble is duplicated after "Procedure for malfunction A", perform "Procedure A". If the trouble is duplicated after "Procedure for malfunction B", perform "Procedure B".

Procedure A

Go to "SELF-DIAGNOSIS PROCEDURE" of "TROUBLE DIAGNOSES" in BR section.

Procedure B



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.

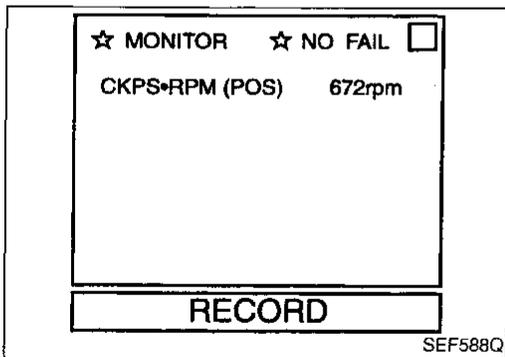
ECM TERMINALS AND REFERENCE VALUE

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
68	W/L	A/T communication line (LAN)	Engine is running. └ Idle speed	Approximately 2V

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

TESTING CONDITION:

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

- 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 malfunction is detected, go to "DIAGNOSTIC PROCEDURE", EC-503.

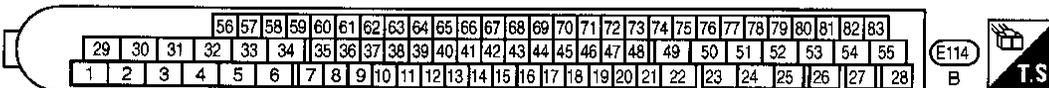
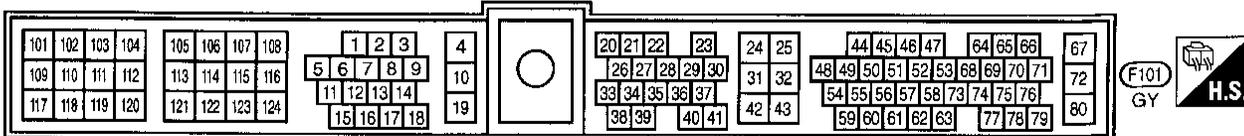
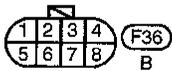
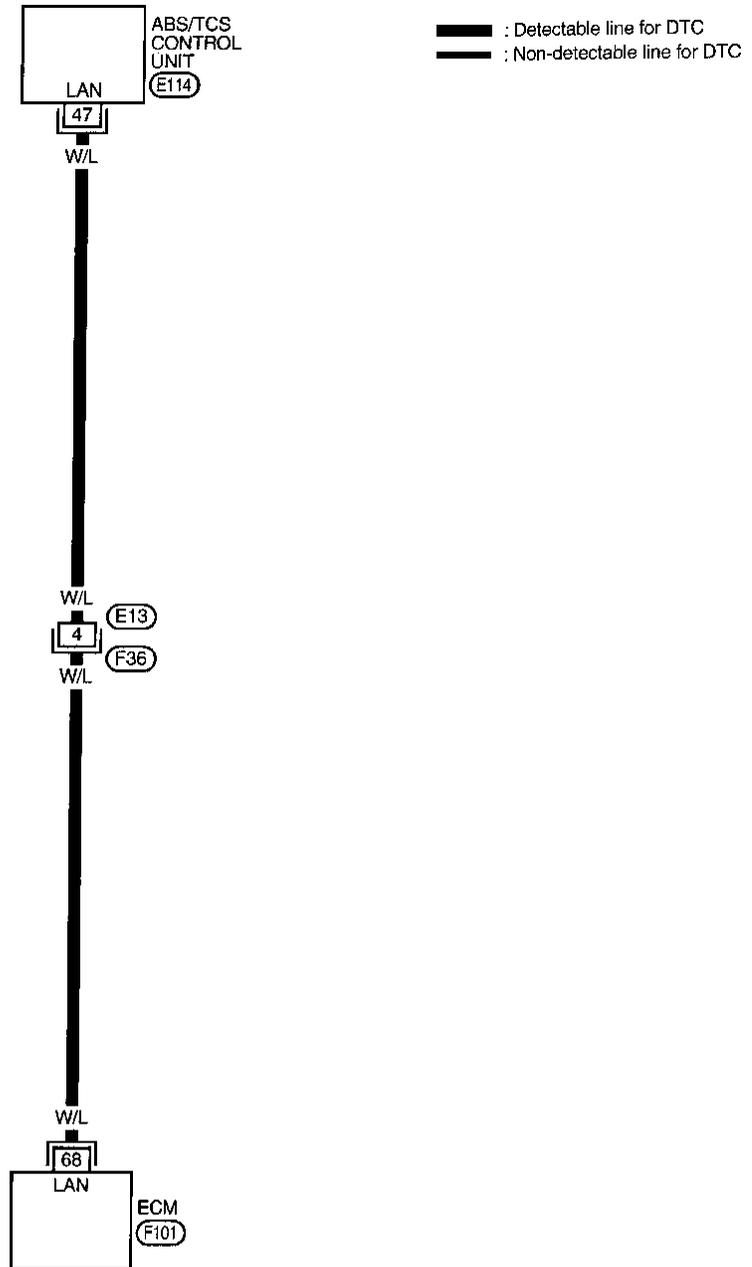
OR

- 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 DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-503.

TROUBLE DIAGNOSIS FOR ECM — ABS/TCS COMM NG

ABS/TCS Communication Line (Cont'd)

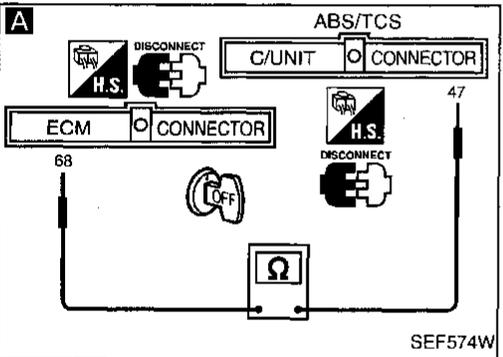
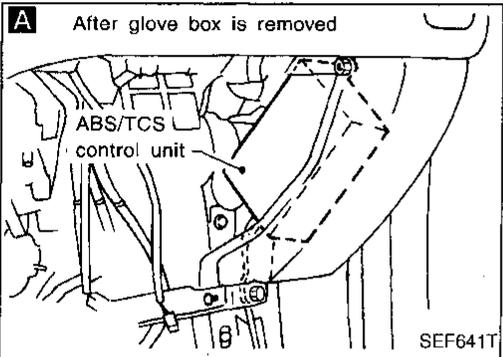
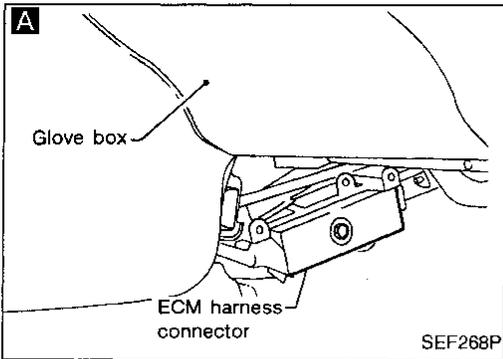
EC-TCS-01



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 ⑥ and ABS/TCS control unit terminal ④.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

NG
 Check the following.
 • Harness connectors
 (E14), (F37)
 • 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-116.

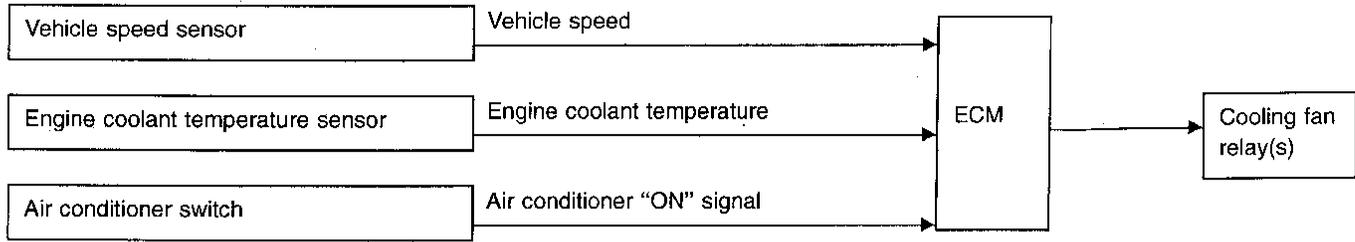
INSPECTION END

GI
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TROUBLE DIAGNOSIS FOR OVERHEAT

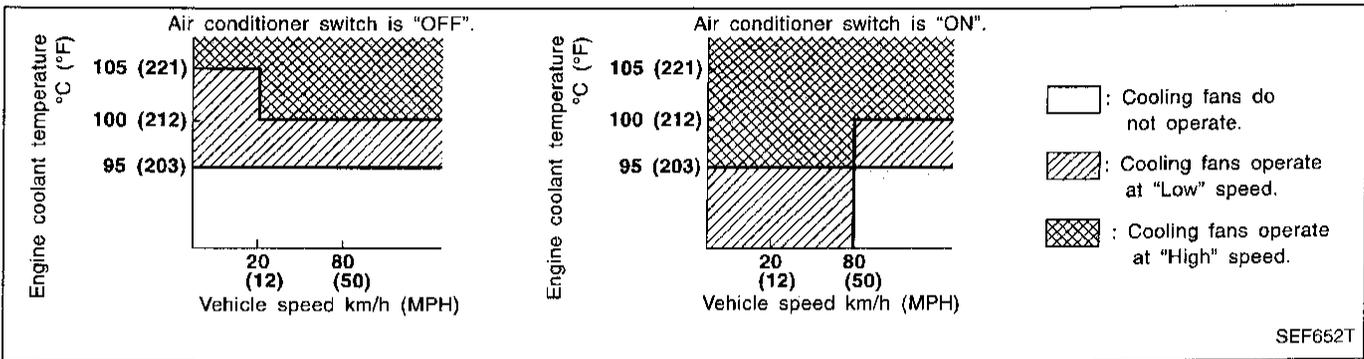
Overheat

SYSTEM DESCRIPTION



The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

Operation



ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
13 14	LG LG/R	Cooling fan relay (High) Cooling fan relay (Low)	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating.	0 - 1V

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

ON BOARD DIAGNOSIS LOGIC

If the cooling fan or another component in the cooling system malfunctions, the engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Diagnostic trouble code No.	Malfunction is detected when ...	Check Items (Possible Cause)
OVERHEAT 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-515).</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.

GI

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TROUBLE DIAGNOSIS FOR OVERHEAT

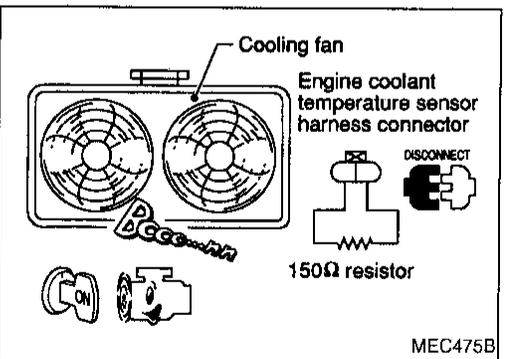
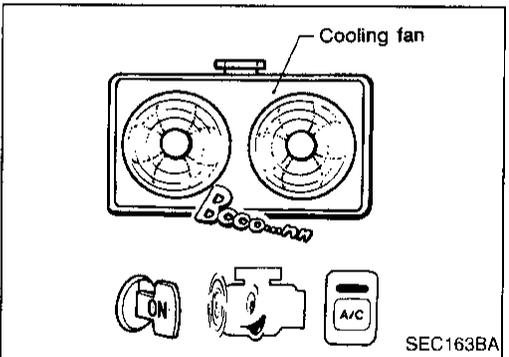
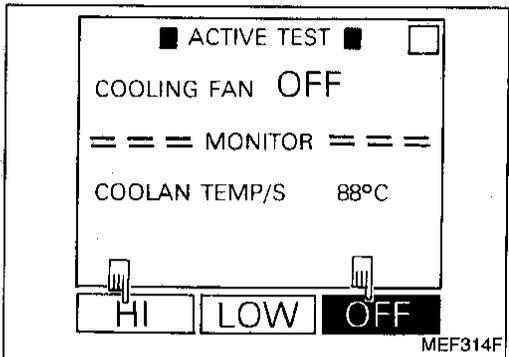
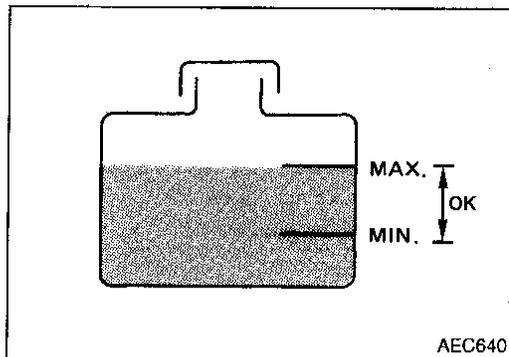
Overheat (Cont'd)

OVERALL FUNCTION CHECK

WARNING:

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

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



- 1) Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-509.
- 2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-509.



- 3) Turn ignition switch "ON".
- 4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT (LOW speed and HI speed).
- 5) If NG, go to "DIAGNOSTIC PROCEDURE", EC-509.

OR



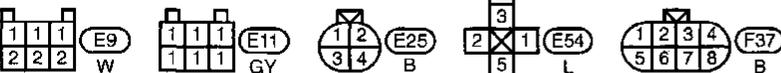
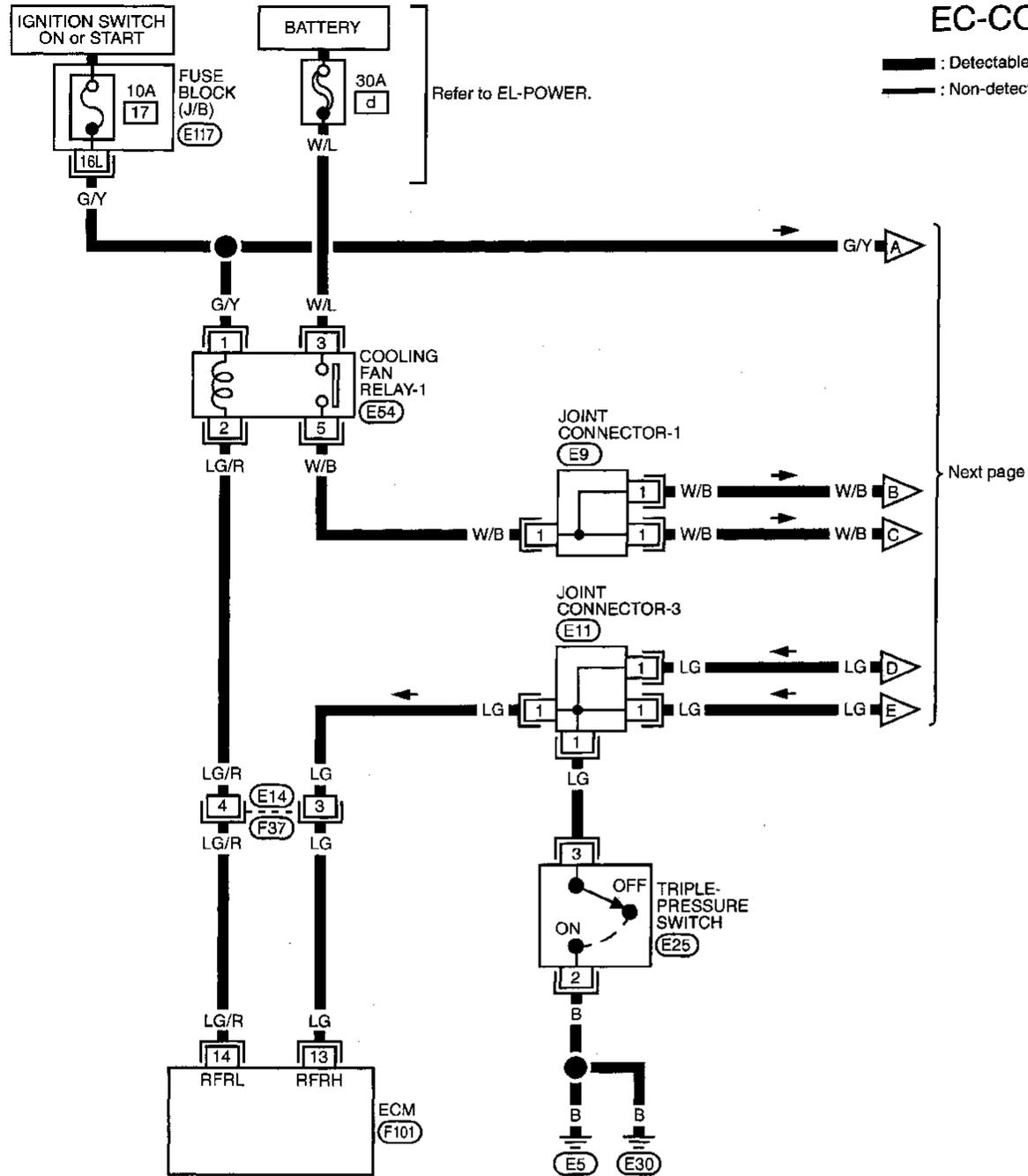
- 3) Start engine.
Be careful not to overheat engine.
- 4) Set temperature control lever to full cold position.
- 5) Turn air conditioner switch "ON".
- 6) Turn blower fan switch "ON".
- 7) Run engine at idle for a few minutes with air conditioner operating.
Be careful not to overheat engine.
- 8) Make sure that cooling fan operates at low speed.
- 9) Turn ignition switch "OFF".
- 10) Turn air conditioner switch and blower fan switch "OFF".
- 11) Disconnect engine coolant temperature sensor harness connector.
- 12) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
- 13) Restart engine and make sure that cooling fan operates at higher speed than low speed.
Be careful not to overheat engine.
- 14) If NG, go to "DIAGNOSTIC PROCEDURE", EC-509.

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

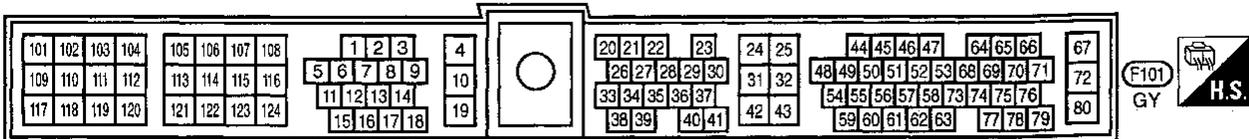
EC-COOL/F-01

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



Refer to last page (Foldout page).

E117



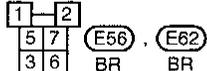
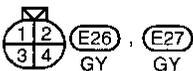
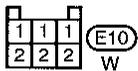
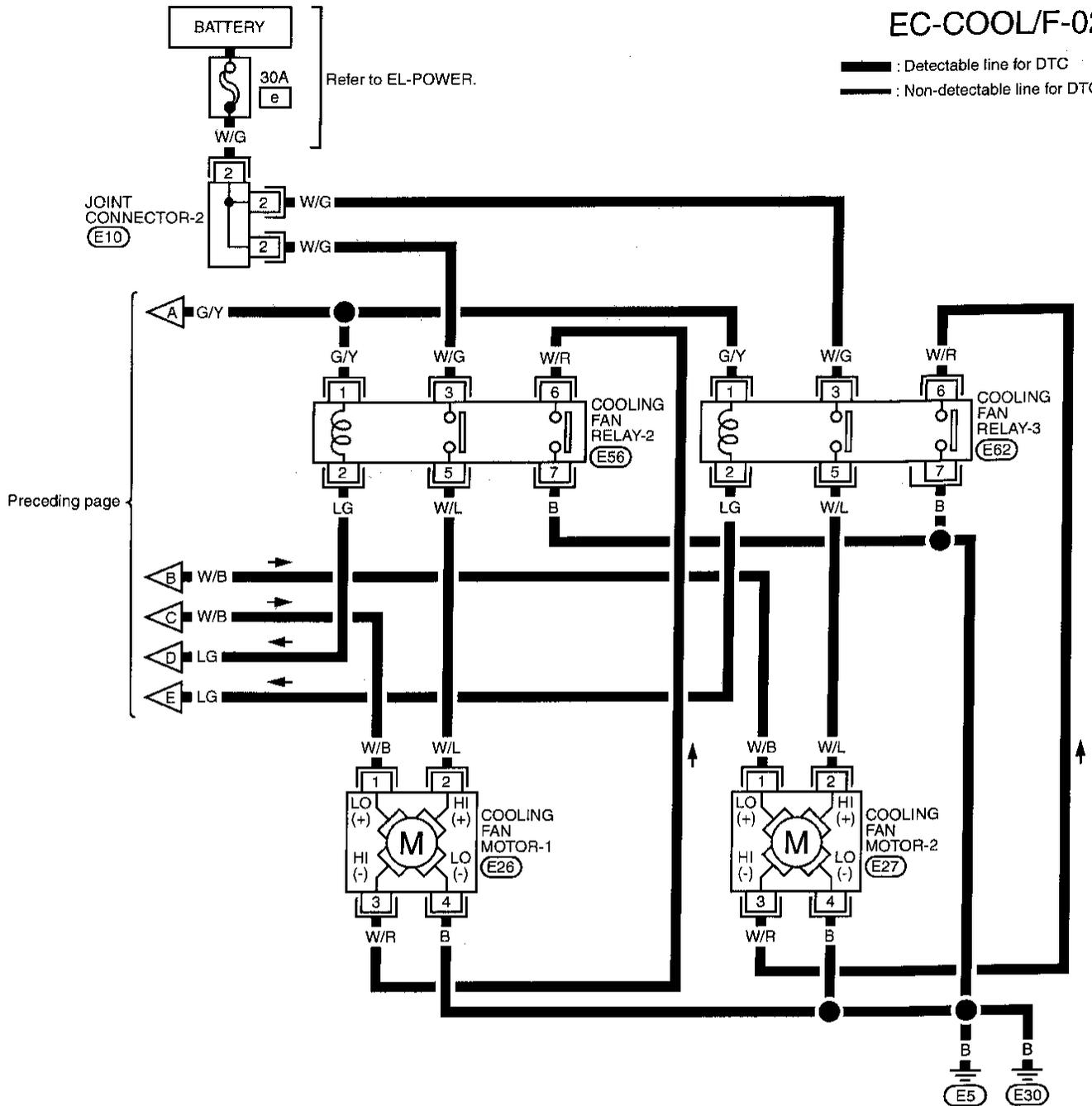
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TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

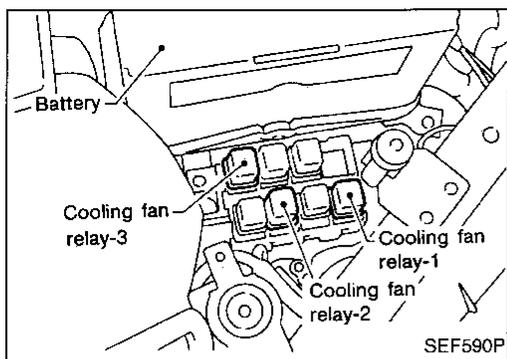
EC-COOL/F-02

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



TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd) DIAGNOSTIC PROCEDURE



INSPECTION START

A **CHECK COOLING FAN LOW SPEED OPERATION.**

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

OR

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

OR

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

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

A ■ COOLING FAN CIRCUIT ■

DOES COOLING FAN ROTATE AND STOP EVERY 3 SECONDS ?

NEXT NO YES
MEF311F

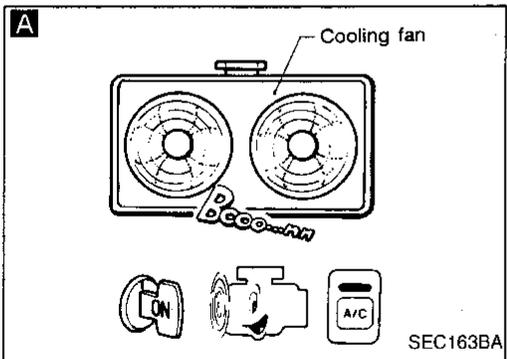
A ■ ACTIVE TEST ■

COOLING FAN OFF

== MONITOR ==

COOLAN TEMP/S 88°C

HI LOW OFF
MEF313F



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OK
A

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 ■

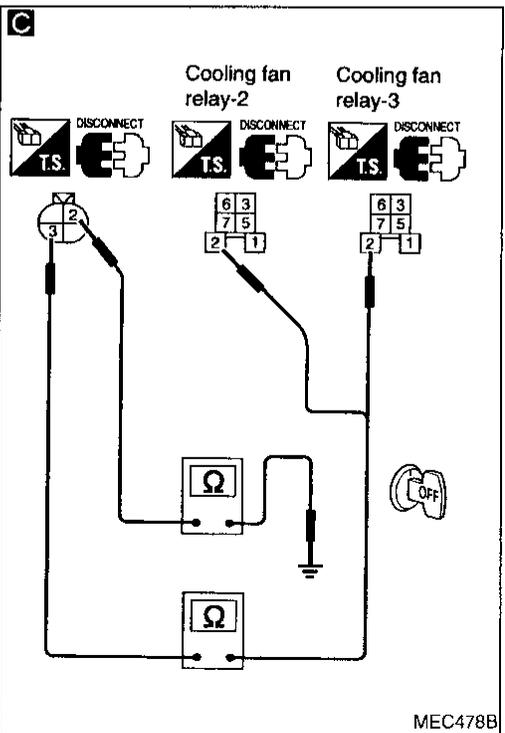
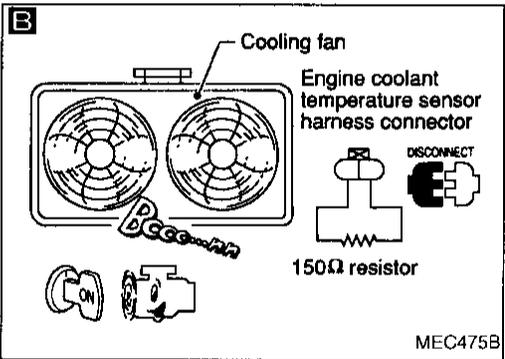
COOLING FAN OFF

== == MONITOR == ==

COOLANT TEMP/S 88°C

HI LOW OFF

MEF314F



B

CHECK COOLING FAN HIGH SPEED OPERATION.

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

OR

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

OR

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

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

C

CHECK HARNESS CONTINUITY BETWEEN COOLING FAN RELAYS-2, 3 AND GROUND.

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relays-2, 3.
3. Disconnect triple-pressure switch harness connector.
4. Check harness continuity between terminal ② and terminal ③, terminal ② and body ground.

Continuity should exist.

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

NG → Check the following.

- Joint connector-3 (E11)
- Harness for open or short between cooling fan relays-2, 3 and triple-pressure switch
- Harness for open or short between triple-pressure switch and body ground

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

CHECK COMPONENT (Triple-pressure switch).

Refer to HA section ("Electrical Components Inspection", "TROUBLE DIAGNOSES").

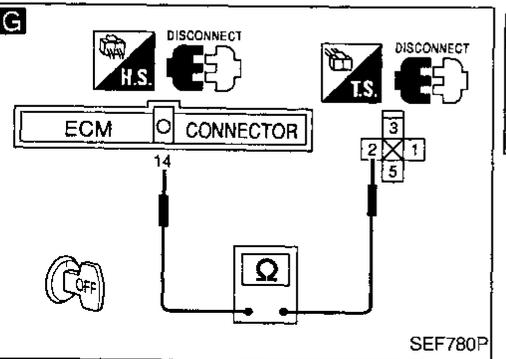
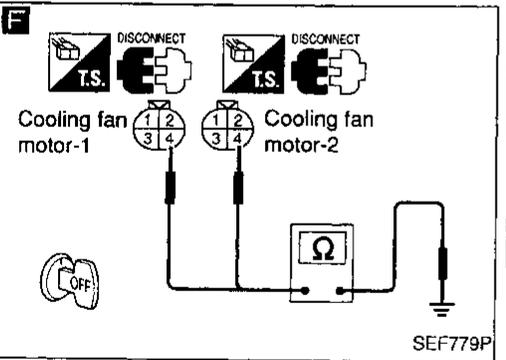
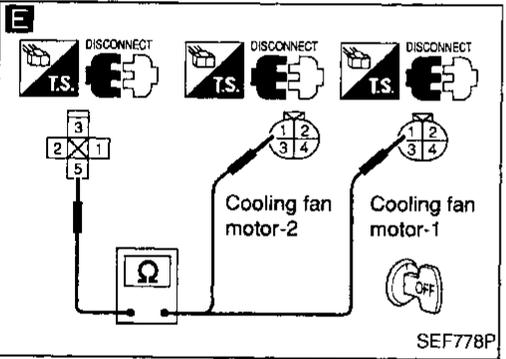
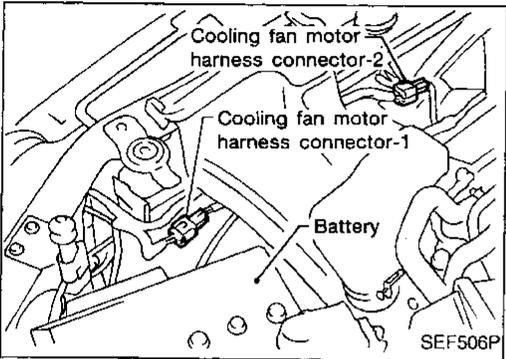
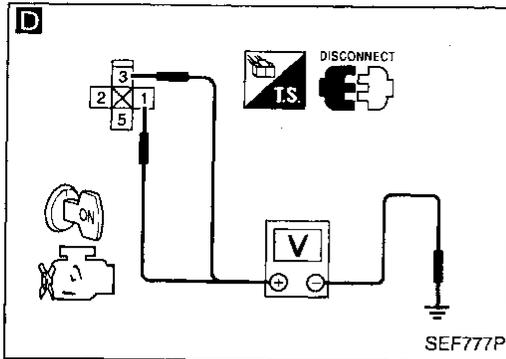
NG → Replace triple-pressure switch.

OK → **B**
(Go to EC-514.)

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

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PROCEDURE A

INSPECTION START

D

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-1.
3. Turn ignition switch "ON".
4. Check voltage between terminals ①, ③ and ground with CONSULT or tester.

Voltage: Battery voltage

NG

Check the following.

- 10A fuse
- 30A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.

E 3. Check harness continuity between terminal ⑤ and terminal ①. **Continuity should exist.**

If OK, check harness for short.

F 4. 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.

- Joint connector-1 (E9)
- Harness for open or short between cooling fan relay-1 and cooling fan motors

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

OK

G

CHECK OUTPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
 2. Check harness continuity between ECM terminal ⑭ and terminal ②. **Continuity should exist.**
- If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (F37), (E14)
- Harness for open or short between cooling fan relay-1 and ECM

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

OK

CHECK COMPONENT

(Cooling fan relay-1). Refer to "COMPONENT INSPECTION", EC-516.

NG

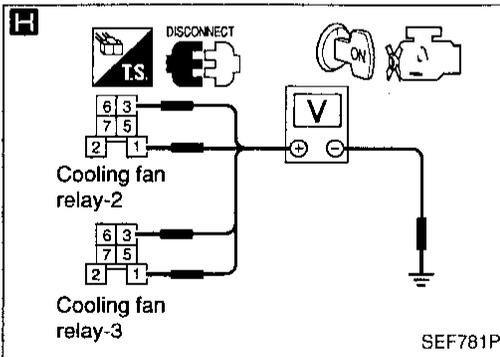
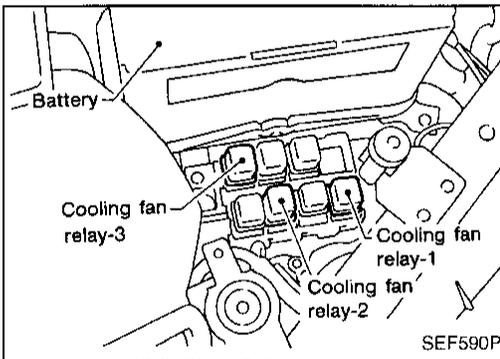
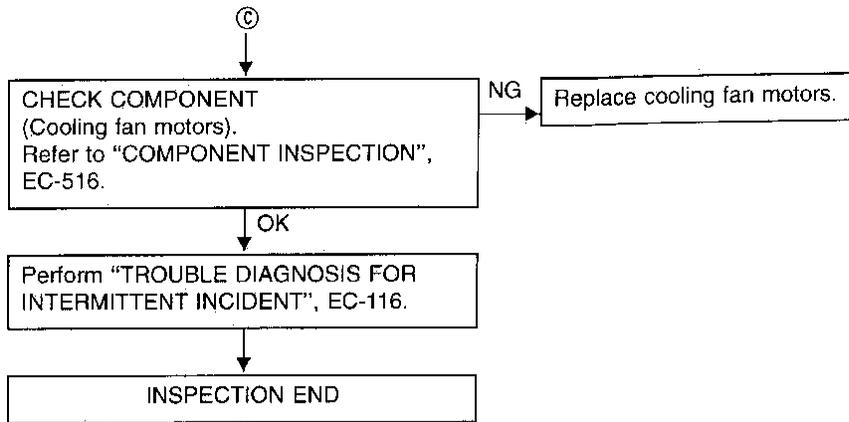
Replace cooling fan relay.

OK

Ⓒ

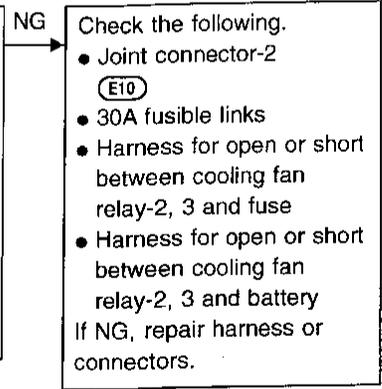
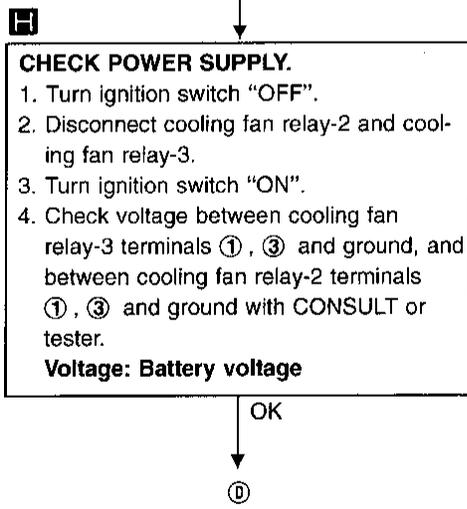
TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)



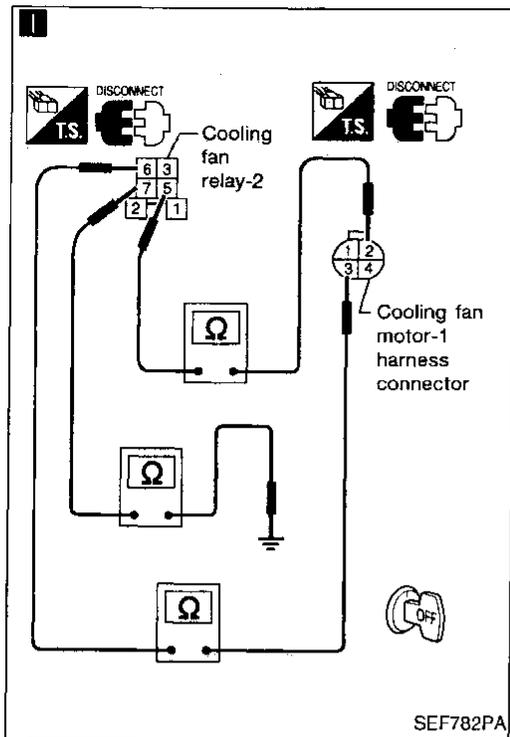
PROCEDURE B

INSPECTION START



TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)



ⓑ

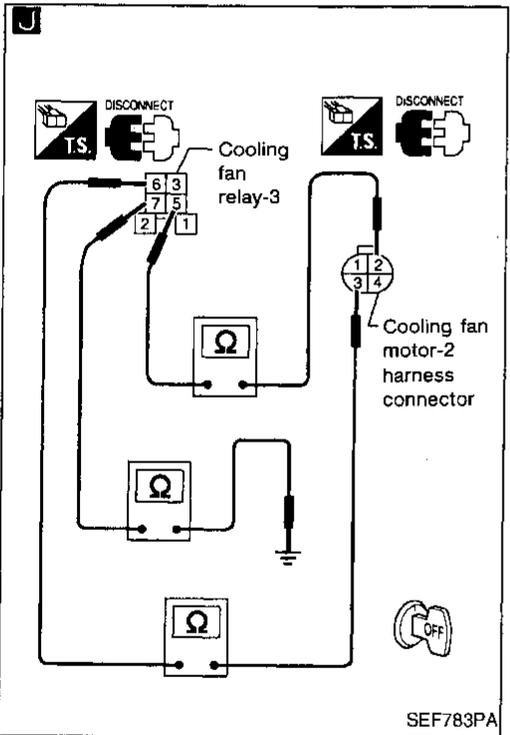
CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.

I 3. Check harness continuity between terminal ⑤ and terminal ②, terminal ⑥ and terminal ③, terminal ⑦ and body ground. **Continuity should exist.**
If OK, check harness for short.

J 4. Check harness continuity between terminal ⑤ and terminal ②, terminal ⑥ and terminal ③, terminal ⑦ and body ground. **Continuity should exist.**
If OK, check harness for short to ground and short to power.

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



K

CHECK OUTPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑬ and terminal ②. **Continuity should exist.**
If OK, check harness for short to ground and short to power.

NG → Check the following.
 • Harness connectors
 • Joint connector-3 (F37), (E14)
 • (E1)
 • Harness for open or short between cooling fan relay-2, 3 and ECM
 If NG, repair open circuit, short to ground or short to power in harness connectors.

CHECK COMPONENT (Cooling fan relay-2, 3).
Refer to "COMPONENT INSPECTION", EC-516.

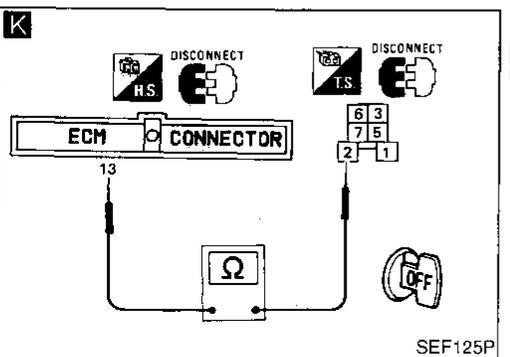
NG → Replace cooling fan relays.

CHECK COMPONENTS (Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-516.

NG → Replace cooling fan motors.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

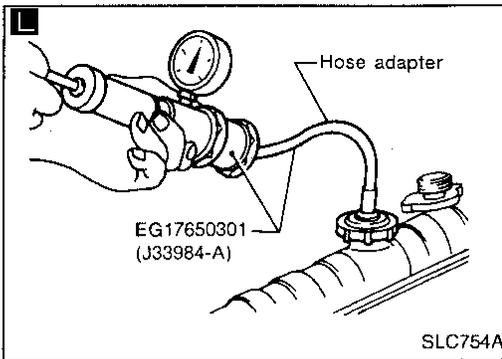
INSPECTION END



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TROUBLE DIAGNOSIS FOR OVERHEAT

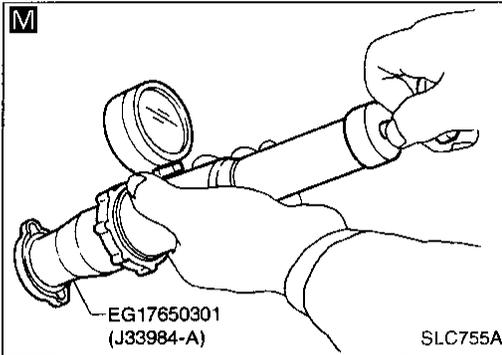
Overheat (Cont'd)



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.

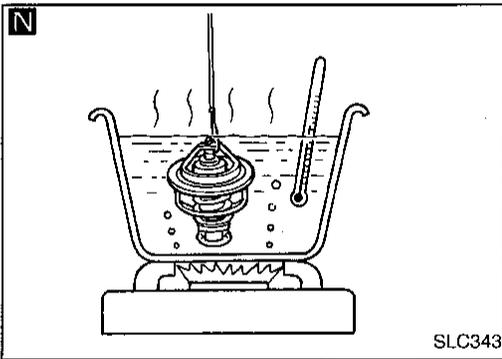
NG → Check the following for leak.
● Hose
● Radiator
● Water pump
(Refer to "Water Pump" in LC section.)



M

CHECK RADIATOR CAP.
Apply pressure to cap with a tester.
Radiator cap relief pressure:
78 - 98 kPa (0.8 - 1.0 kg/cm², 11 - 14 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:
76.5°C (170°F) [standard]
Maximum valve lift:
10 mm/90°C (0.39 in/194°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to "Thermostat" in LC section.

NG → Replace thermostat.

OK → Check engine coolant temperature sensor. Refer to "COMPONENT INSPECTION", EC-149.

NG → Replace engine coolant temperature sensor.

OK → If the cause can not be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-515.

INSPECTION END

Perform FINAL CHECK by the following procedure after repair is completed.

1. Warm up engine. Run the vehicle 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	78 - 98 kPa (0.8 - 1.0 kg/cm ² , 11 - 14 psi) 59 - 98 kPa (0.6 - 1.0 kg/cm ² , 9 - 14 psi) (Limit)	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	5	● Coolant leaks	● Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section
ON*1	7	● Cooling fan	● CONSULT	Operating	See "TROUBLE DIAGNOSIS FOR OVERHEAT" (EC-504)
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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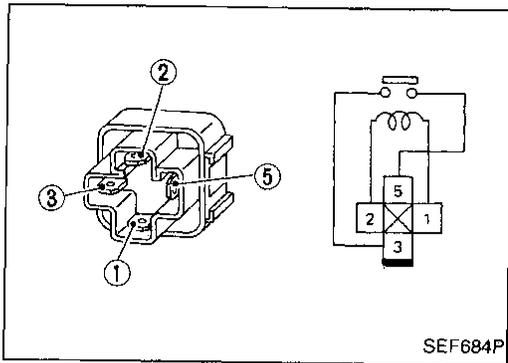
TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

COMPONENT INSPECTION

Cooling fan relay-1

Check continuity between terminals ③ and ⑤.

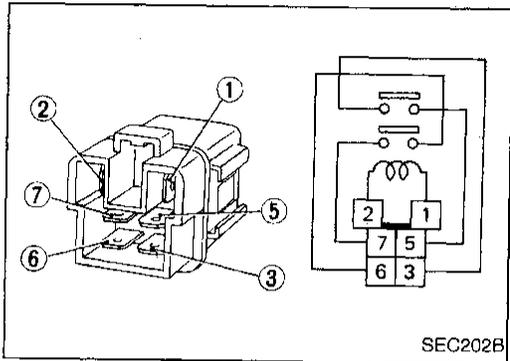


Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.

Cooling fan relays-2 and -3

Check continuity between terminals ③ and ⑤, ⑥ and ⑦.

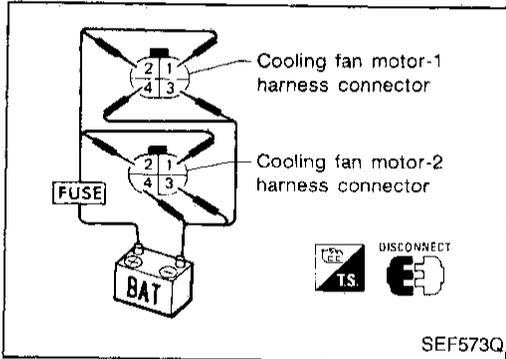


Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.

Cooling fan motors-1 and -2

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



	Speed	Terminals	
		(⊕)	(⊖)
Cooling fan motor-1	Low	①	④
	High	①, ②	③, ④
Cooling fan motor-2	Low	①	④
	High	①, ②	③, ④

Cooling fan motor should operate.

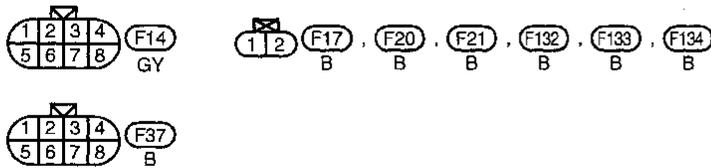
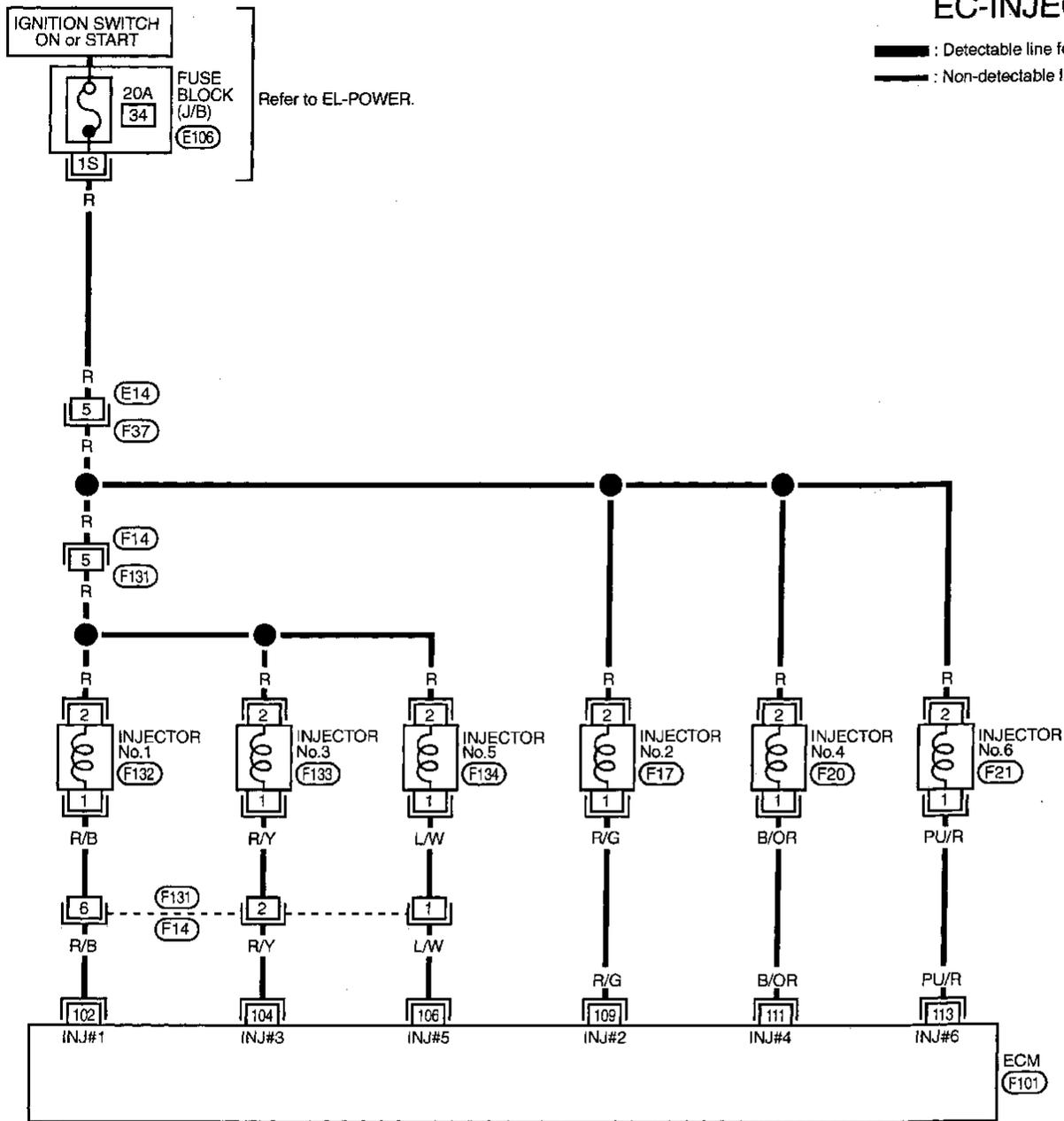
If NG, replace cooling fan motor.

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector

EC-INJECT-01

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



Refer to last page (Foldout page).
E106

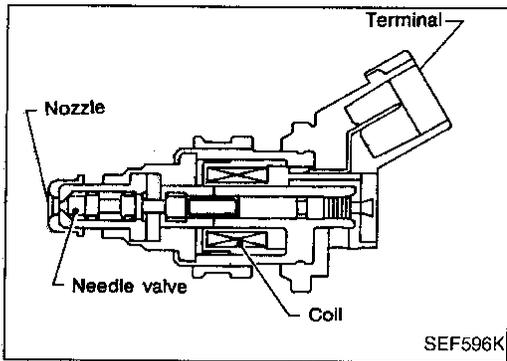


TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

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.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
INJ PULSE-B2	<ul style="list-style-type: none"> • Engine: After warming up • Air conditioner switch: "OFF" Idle	2.4 - 3.2 msec.
INJ PULSE-B1	<ul style="list-style-type: none"> • Shift lever: "N" • No-load 2,000 rpm	1.9 - 2.8 msec.

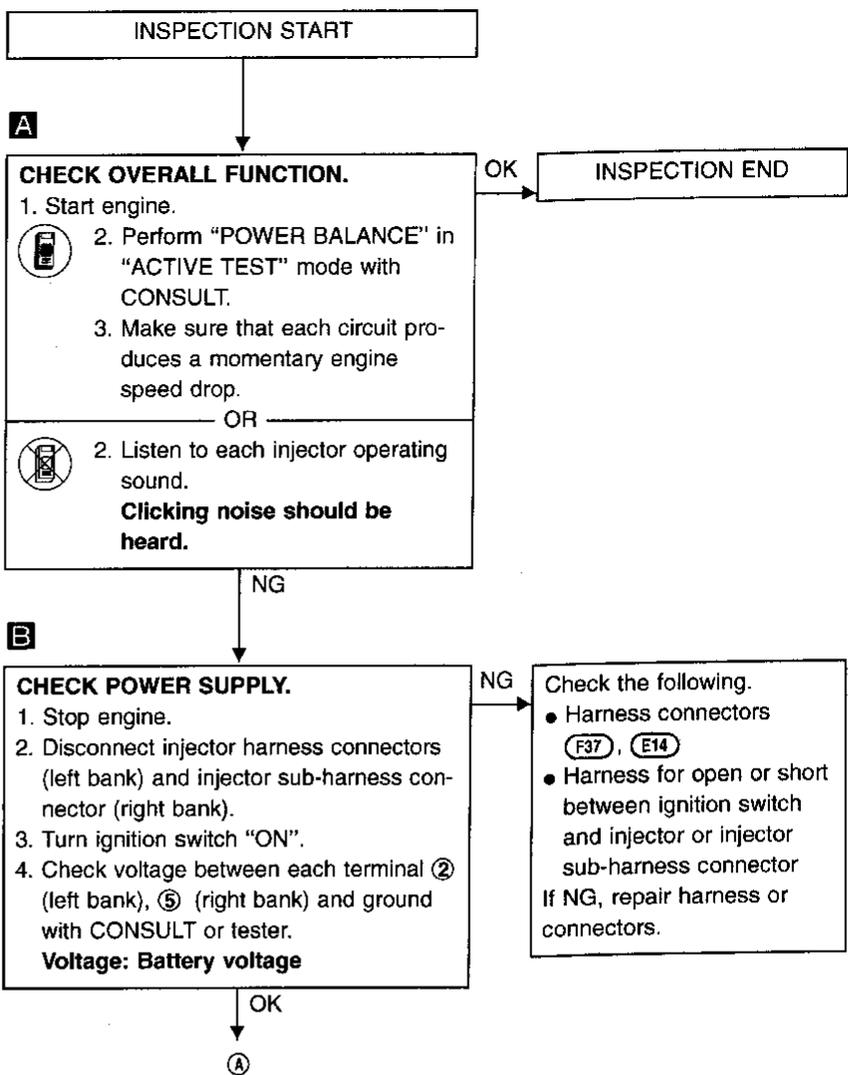
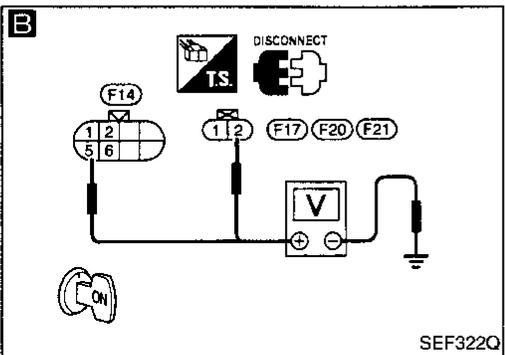
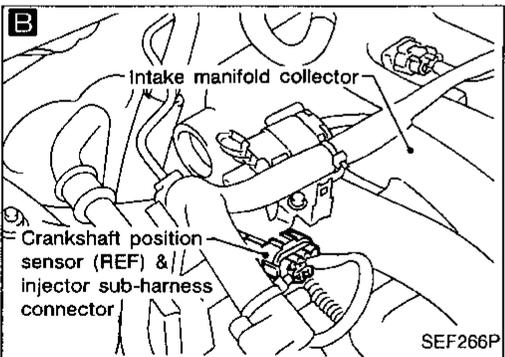
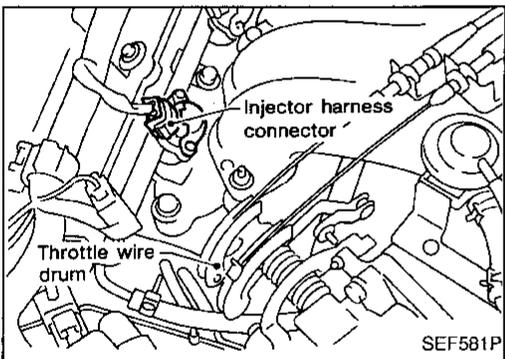
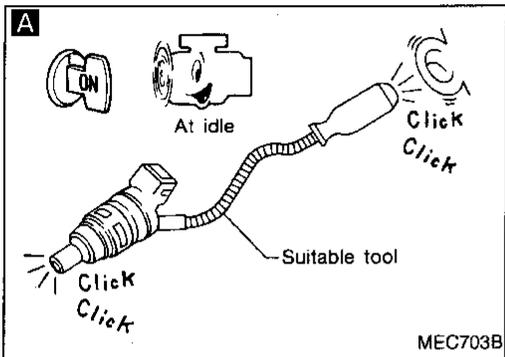
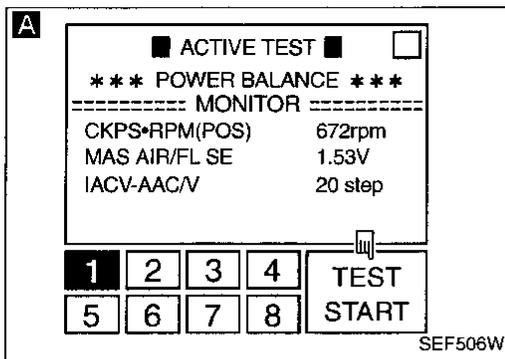
ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
102	R/B	Injector No. 1	Engine is running. (Warm-up condition) Idle speed	BATTERY VOLTAGE (11 - 14V)
104	R/Y	Injector No. 3		
106	L/W	Injector No. 5		
109	R/G	Injector No. 2		
111	B/OR	Injector No. 4		
113	PU/R	Injector No. 6		

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

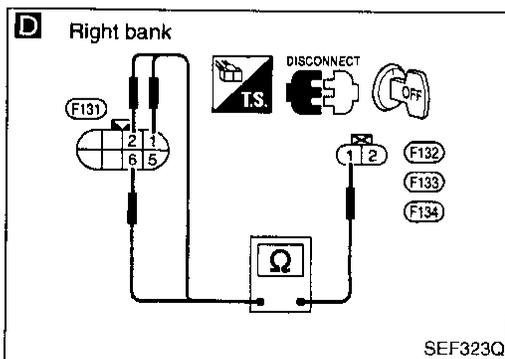
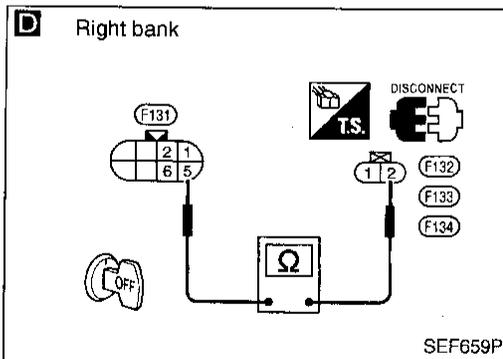
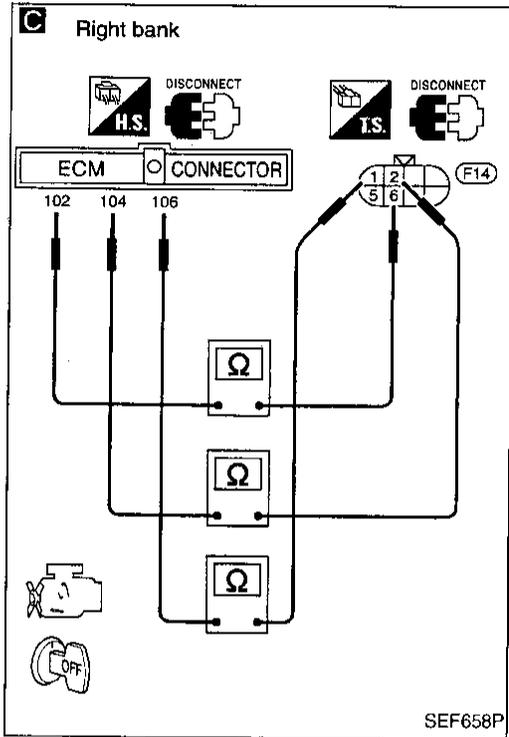
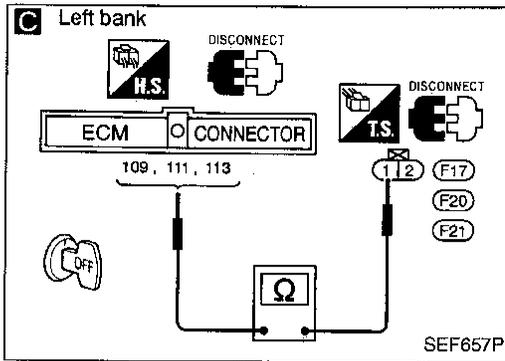
Injector (Cont'd)



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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector (Cont'd)



C CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between the following terminals and ECM terminals.

Left bank:
 ① and ⑩⑨, ⑪①, ⑫③

Right bank:
 ⑥ and ⑩②,
 ② and ⑩④,
 ① and ⑩⑥

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

NG → Check the following.

- Harness connectors (F14, F131) (Right bank)
- Harness for open or short between each injector terminal and ECM

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

D CHECK POWER SUPPLY CIRCUIT AND OUTPUT SIGNAL CIRCUIT (FOR RIGHT BANK).

1. Remove intake manifold collector.
2. Disconnect injector sub-harness connector.
3. Check harness continuity between terminal ⑤ and each terminal ②.

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

4. Check harness continuity between each terminal ① and terminals ①, ②, ⑥.

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

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

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

NG → Replace injector.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

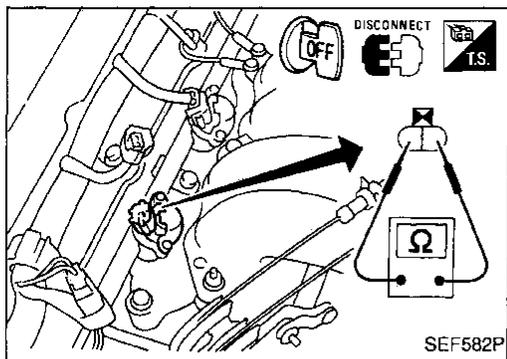
TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector (Cont'd)

COMPONENT INSPECTION

Injector

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



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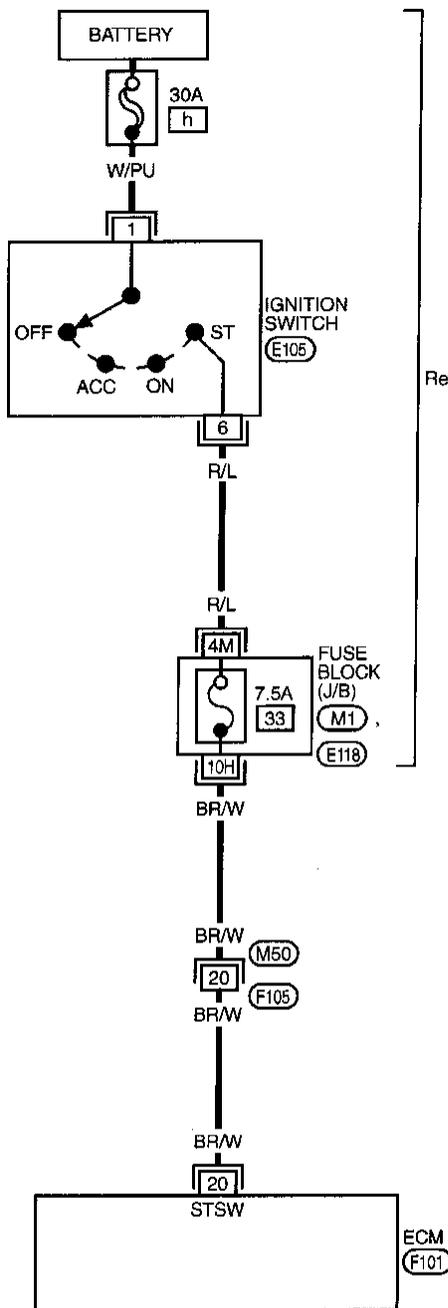
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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Start Signal

EC-S/SIG-01

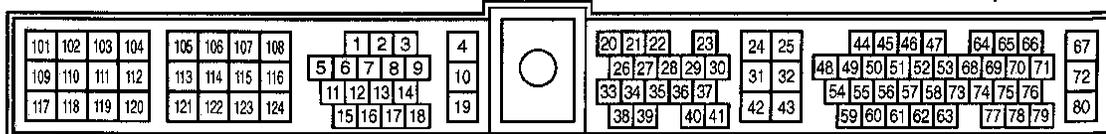
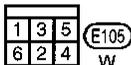
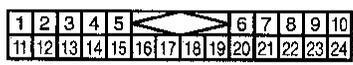
— : Detectable line for DTC
 — : Non-detectable line for DTC



Refer to EL-POWER.

Refer to last page (Foldout page).

(M1)
 (E118)



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Start Signal (Cont'd)

A

■ START SIGNAL CKT ■

1. CLOSE THROTTLE, SHIFT TO P OR N RANGE.
2. TOUCH START AND START ENGINE IMMEDIATELY.

NEXT START

SEF191L

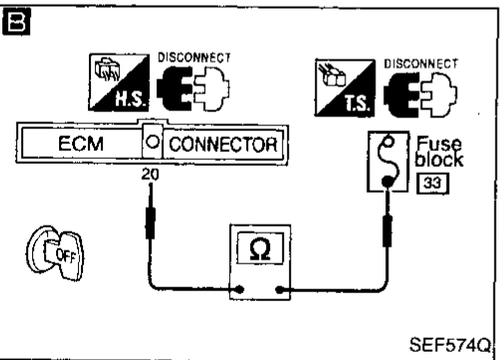
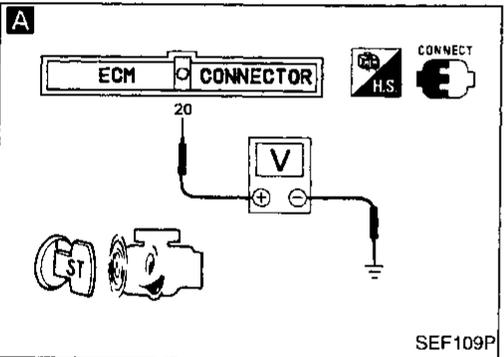
A

☆ MONITOR ☆ NO FAIL

START SIGNAL	OFF
CLSD TH/P SW	ON
AIR COND SIG	OFF
P/N POSI SW	ON

RECORD

SEF111P



INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "START SIGNAL CKT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1. Turn ignition switch to "START".
2. Check voltage between ECM terminal ② and ground.

Voltage:

Ignition switch "START" Battery voltage

Except above Approximately 0V

OK → INSPECTION END

NG → Check if 7.5A fuse is OK.

NG → Replace 7.5A fuse.

OK →

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and 7.5A fuse.
3. Check harness continuity between ECM terminal ② and fuse block.

Continuity should exist.

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

NG → Check the following.

- Harness connectors
- Harness for open or short between ECM and fuse block

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

OK → Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

INSPECTION END

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EC

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HA

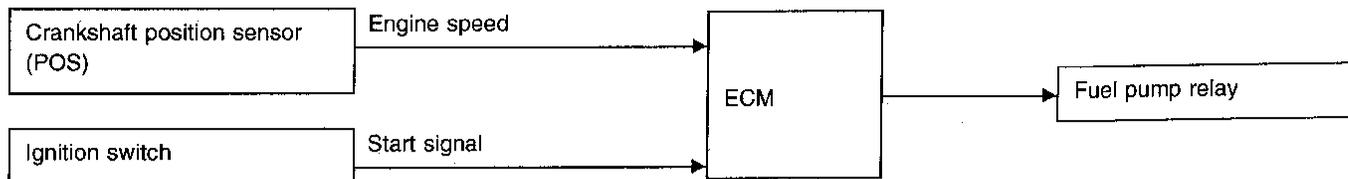
EL

IDX

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 crankshaft position sensor (POS), 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 1 second
Engine running and cranking	Operates
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 Ⓣ (ECM ground).

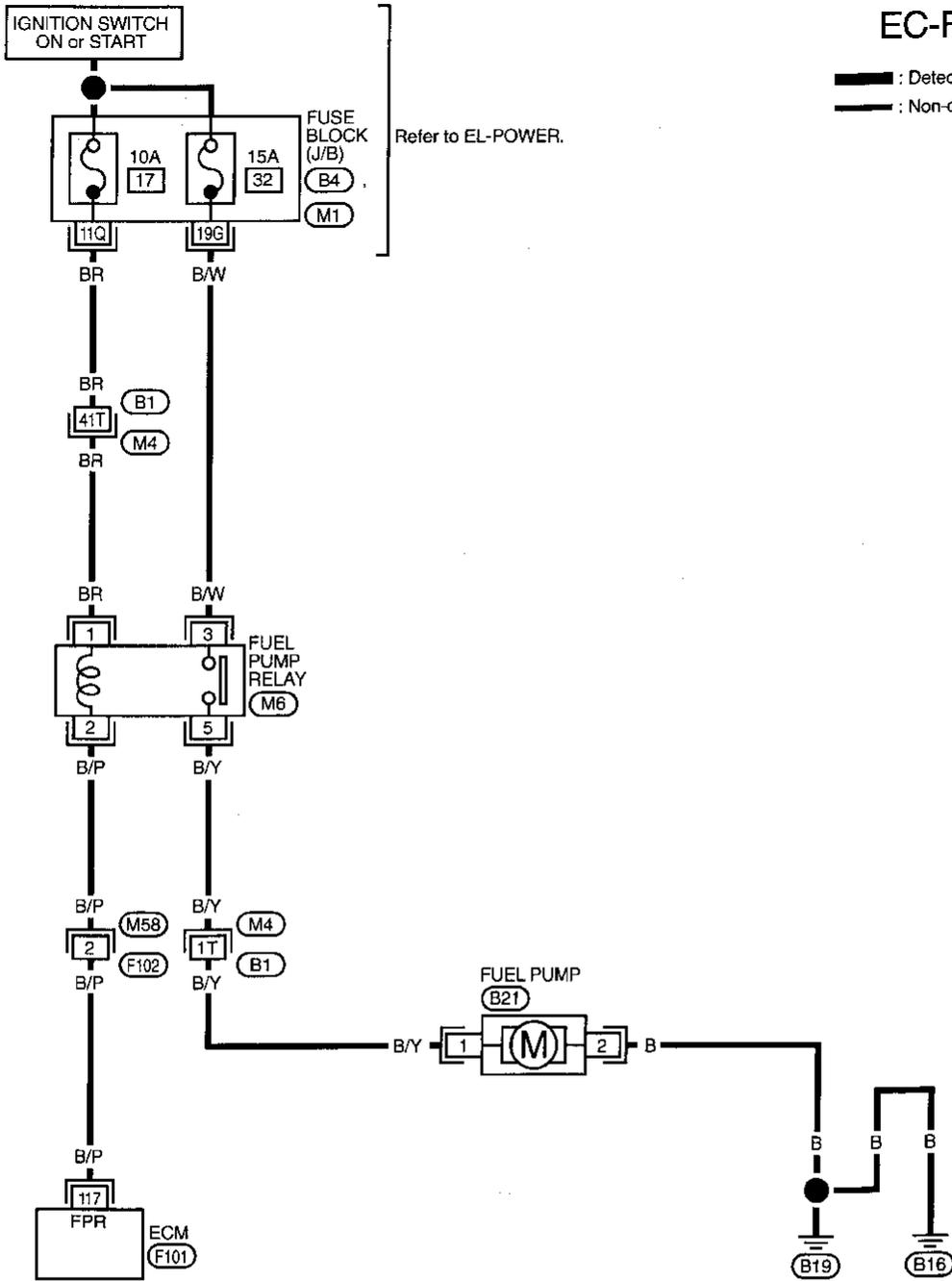
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
117	B/P	Fuel pump relay	Ignition switch "ON" └ For 1 second after turning ignition switch "ON" Engine is running.	0 - 1V
			Ignition switch "ON" └ 1 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Fuel Pump Control (Cont'd)

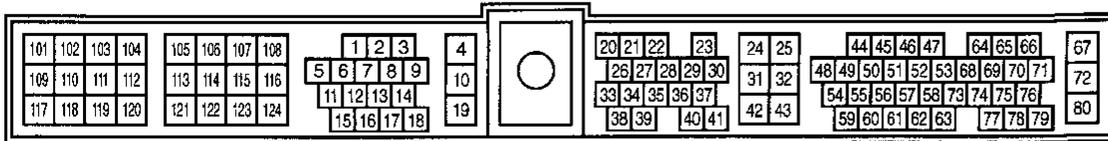
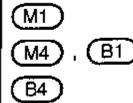
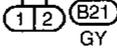
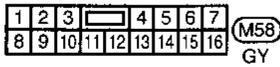
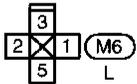
EC-F/PUMP-01

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



Refer to EL-POWER.

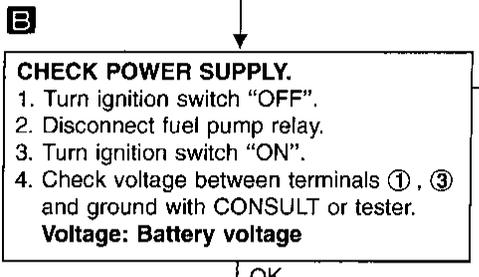
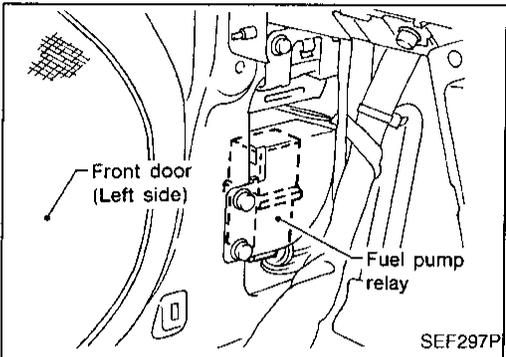
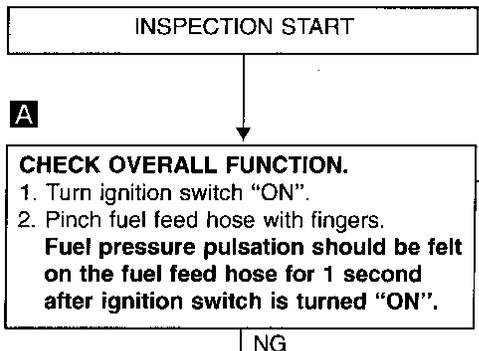
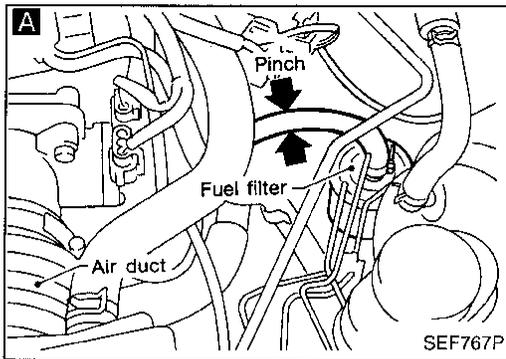
Refer to last page (Foldout page).



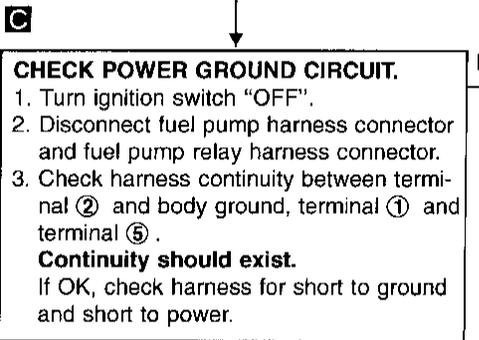
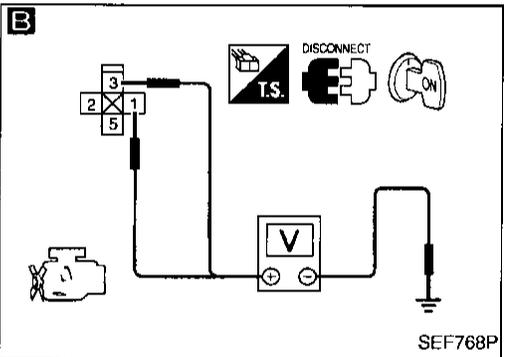
- GI
- MA
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- BT
- HA
- EL
- IDX

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

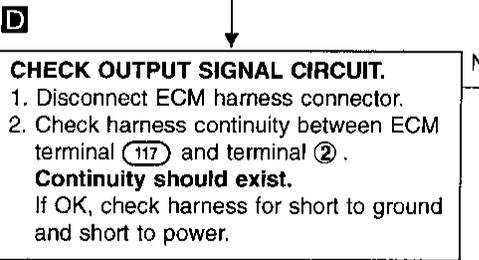
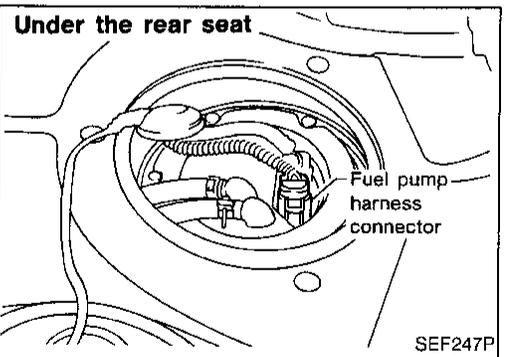
Fuel Pump Control (Cont'd)



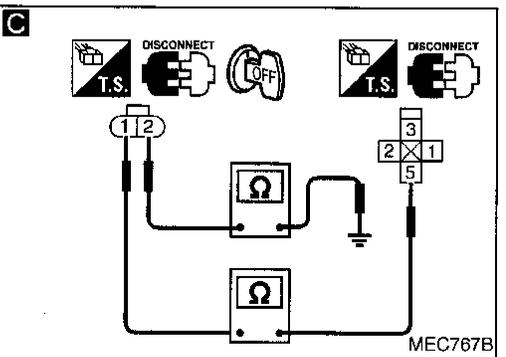
- Check the following.
- Harness connectors (M4, B1)
 - 15A fuse
 - Harness for open or short between fuse and fuel pump relay
- If NG, repair harness or connectors.



- Check the following.
- Harness connectors (M4, B1)
 - Harness for open or short between fuel pump relay and fuel pump
 - Harness for open or short between fuel pump and body ground
- If NG, repair open circuit, short to ground or short to power in harness connectors.

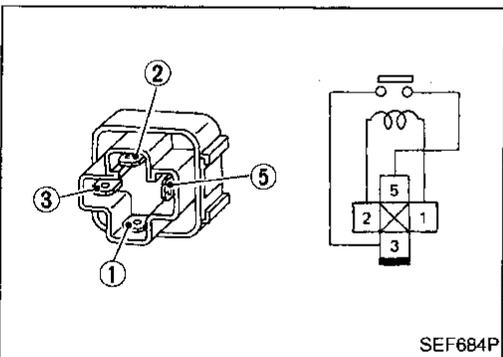
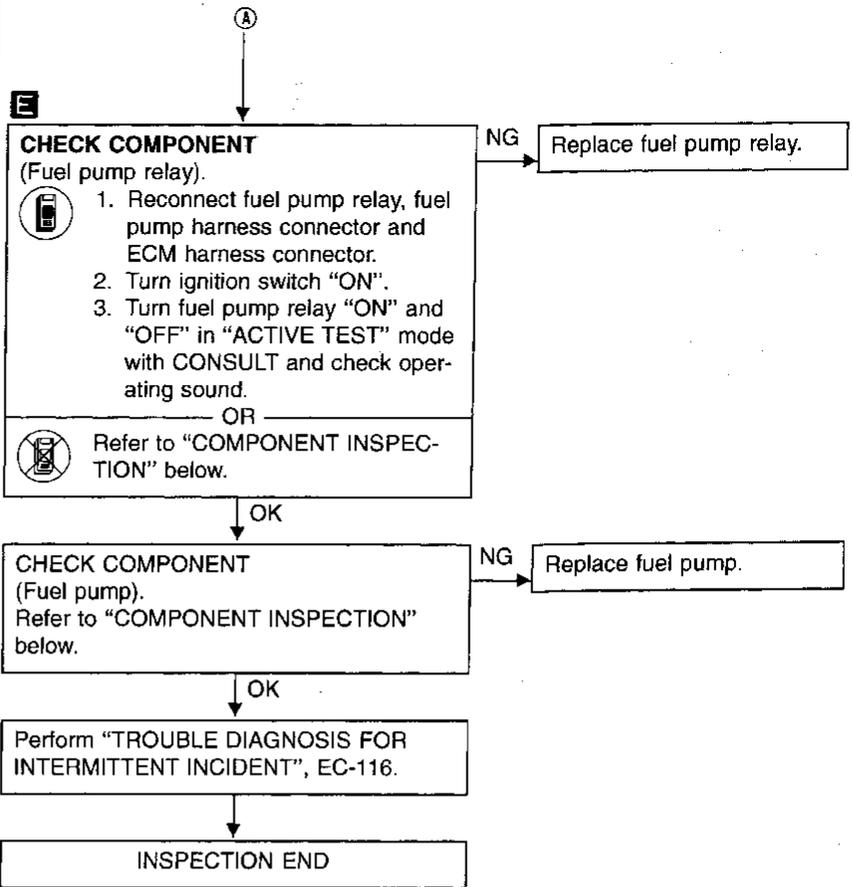
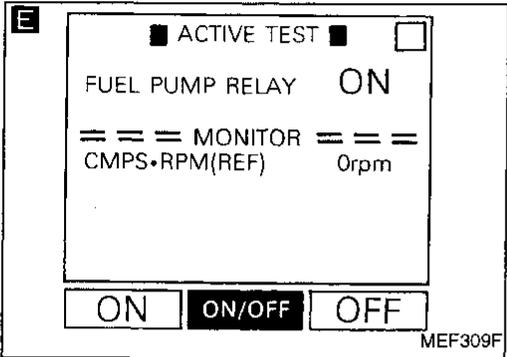
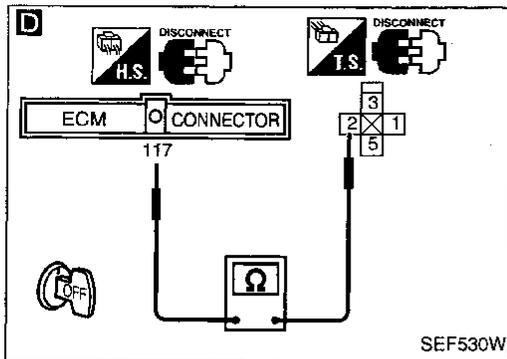


- Check the following.
- Harness connectors (F102, M58)
 - Harness for open or short between fuel pump relay and ECM
- If NG, repair open circuit, short to ground or short to power in harness connectors.



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Fuel Pump Control (Cont'd)



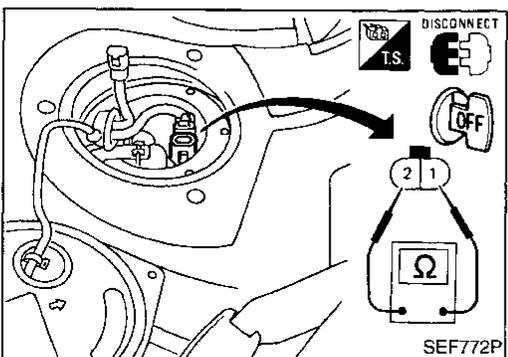
COMPONENT INSPECTION

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.



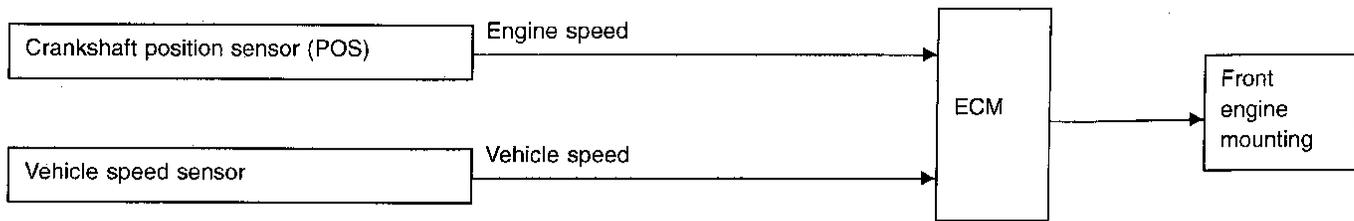
Fuel pump

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ① and ②.
Resistance: 0.2 - 5.0Ω at 20°C (68°F)
If NG, replace fuel pump.

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Front Engine Mounting Control

SYSTEM DESCRIPTION



The ECM controls the front engine mounting operation corresponding to the engine speed and the vehicle speed. The control system has 2-step control [soft/hard].

Front engine mounting control

Vehicle condition	Front engine mounting control
Idle (with vehicle stopped)	Soft
Driving	Hard

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENGINE MOUNT	● Engine: Running	Idle
		2,000 rpm
		"IDLE"
		"TRVL"

ECM TERMINALS AND REFERENCE VALUE

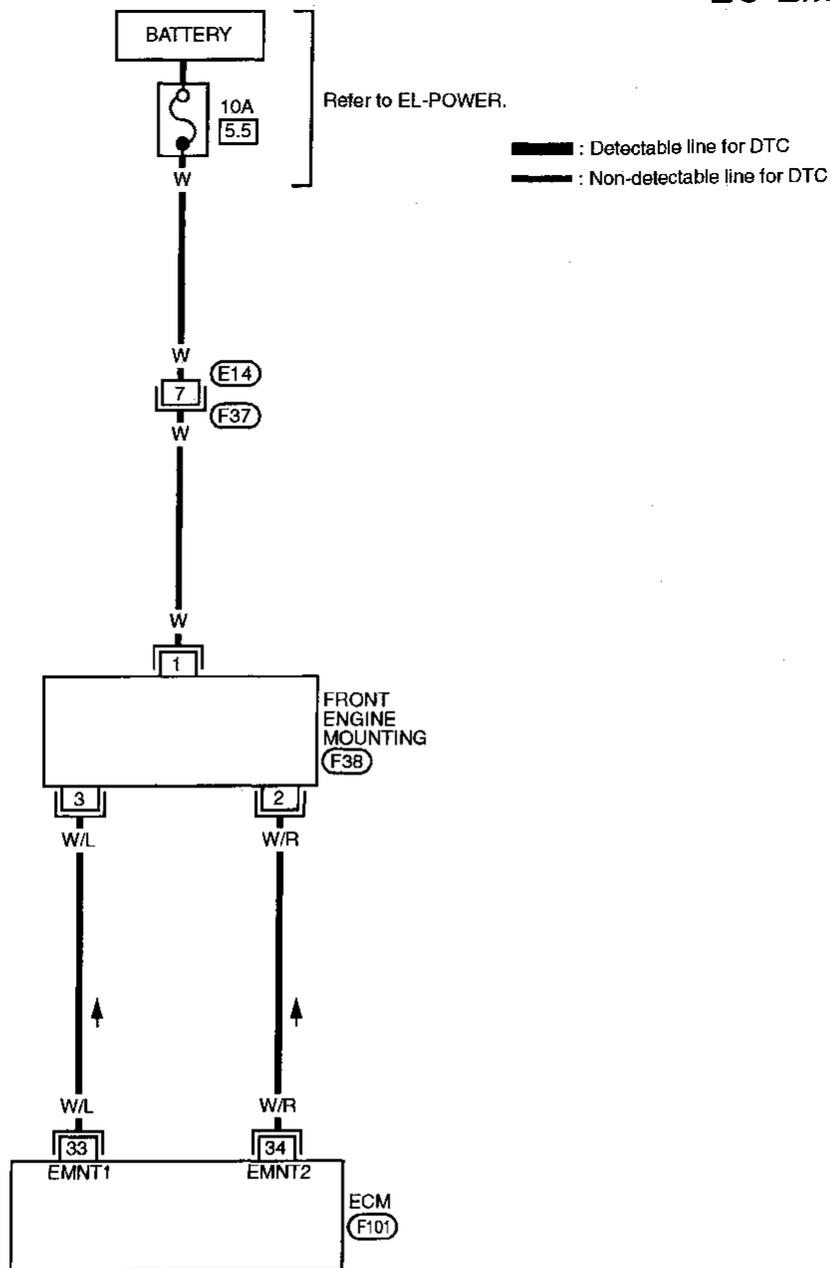
Specification data are reference values, and are measured between each terminal and ②5 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
33	W/L	Front engine mounting	Engine is running. └ For 2 seconds after engine speed changes from 2,000 rpm to idle speed	0 - 0.4V
			Engine is running. └ Except the above	BATTERY VOLTAGE (11 - 14V)
34	W/R	Front engine mounting	Engine is running. └ For 2 seconds after engine speed changes from idle speed to 2,000 rpm	0 - 0.4V
			Engine is running. └ Except the above	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Front Engine Mounting Control (Cont'd)

EC-EMNT-01



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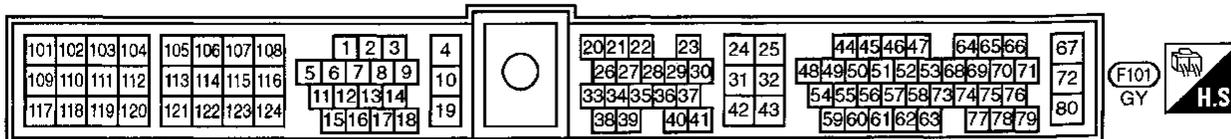
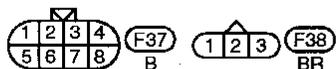
RS

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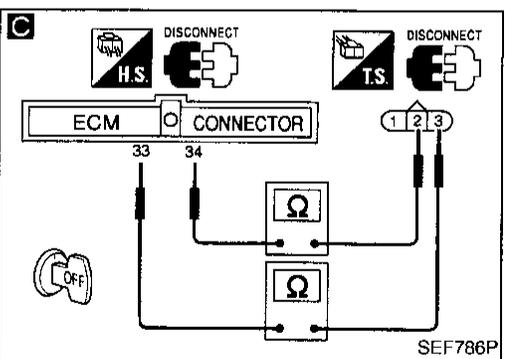
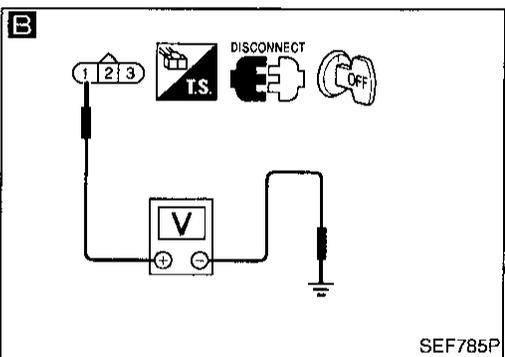
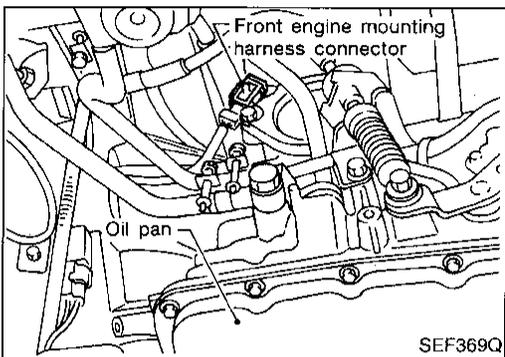
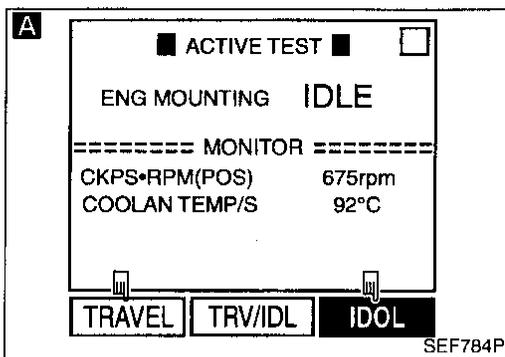
EL

IDX



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Front Engine Mounting Control (Cont'd)



INSPECTION START

A

CHECK THE OVERALL FUNCTION.

1. After warming up engine, run it at idle speed.
2. Shift selector lever to "D" range while depressing the brake pedal and pulling the parking brake control lever.
3. Perform "ENGINE MOUNTING" in "ACTIVE TEST" mode with CONSULT and check that the body vibration changes according to switching the condition (With vehicle stopped).

OR

3. Disconnect front engine mounting harness connector when engine speed is more than 1,000 rpm.
4. When returning engine speed to idle speed, check that the body vibration increases, compared with the condition of the above step 2 (With vehicle stopped).

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect front engine mounting harness connector.
3. Check voltage between terminal ① and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.

- Harness connectors (F37), (E14)
- 10A fuse
- Harness for open or short between front engine mounting and battery

If NG, repair harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ③ and terminal ③, ECM terminal ④ and terminal ②.

Continuity should exist.

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

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

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-116.

Visually check front engine mounting.

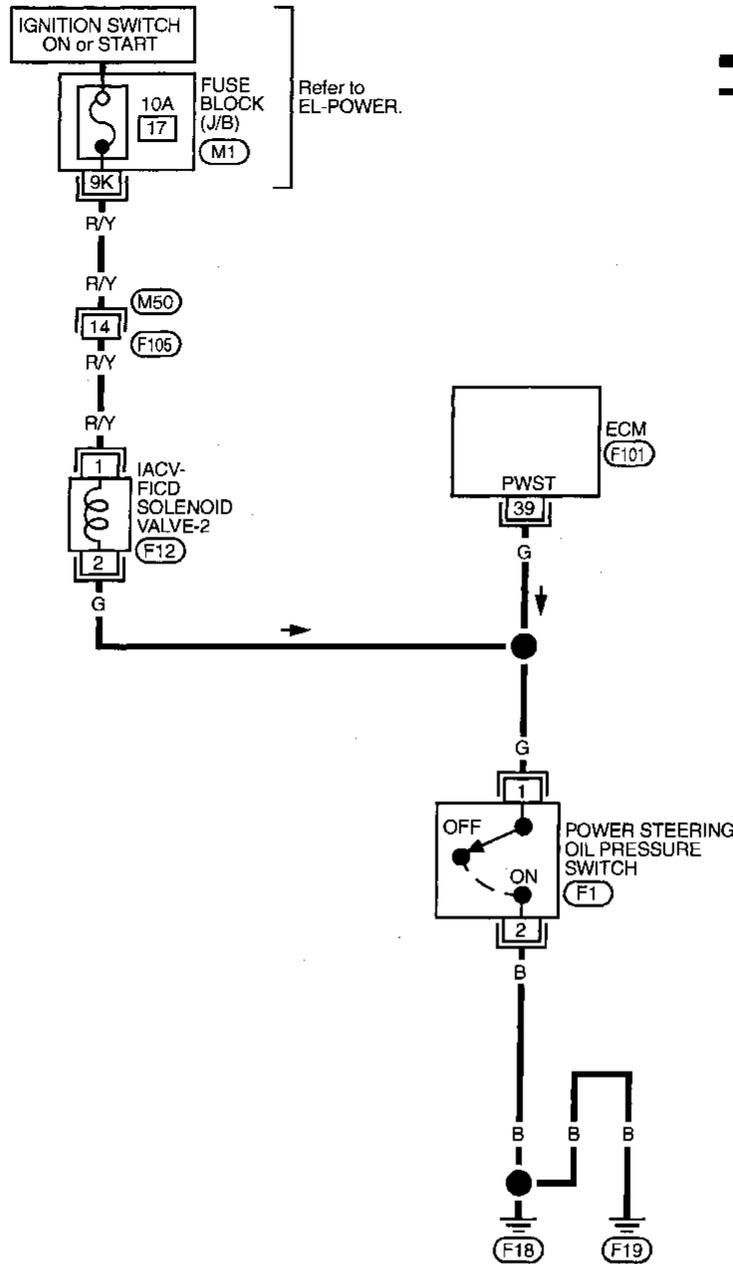
NG → Replace front engine mounting assembly.

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Power Steering Oil Pressure Switch

EC-PST/SW-01

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



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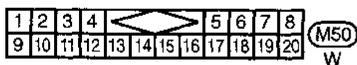
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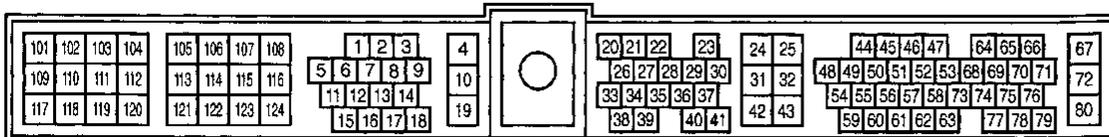
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Refer to last page (Foldout page).

(M1)

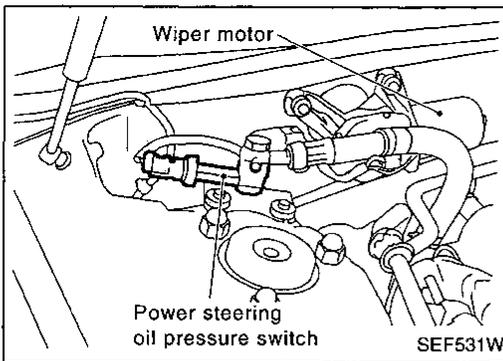


TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

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-AAC valve to increase the idle speed and adjust for the increased load.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
PW/ST SIGNAL	<ul style="list-style-type: none"> • Engine: After warming up, idle the engine 	Steering wheel in neutral position (forward direction)
		The steering wheel is fully turned
		OFF
		ON

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
39	G	Power steering oil pressure switch	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Steering wheel is fully being turned.	0 - 1.5V
			<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Steering wheel is not being turned.	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Power Steering Oil Pressure Switch (Cont'd)

A

■ PW/ST SIGNAL CIRCUIT ■

HOLD STEERING WHEEL
IN A FULL
LOCKED POSITION
THEN
TOUCH START

NEXT START

MEF023E

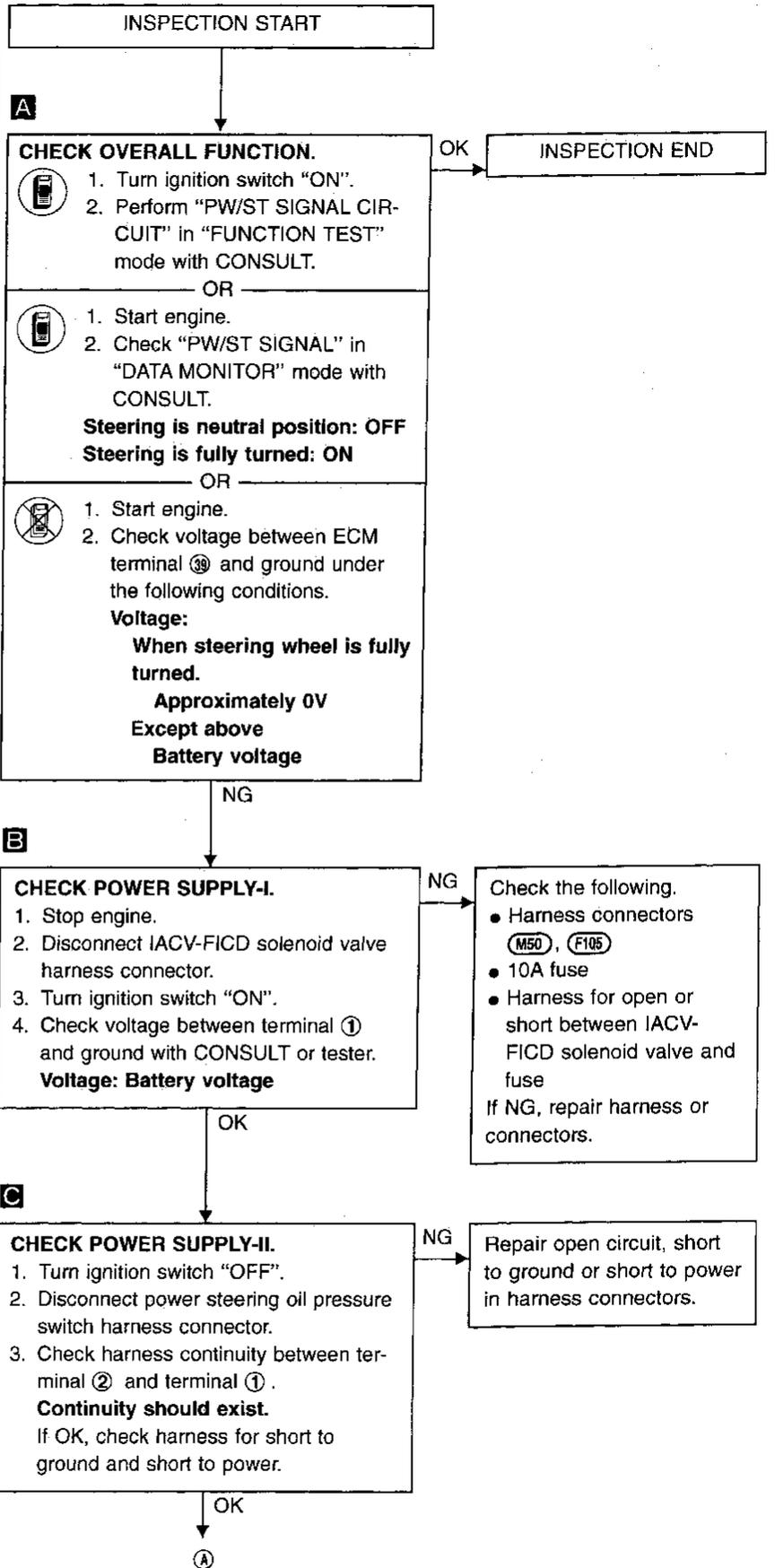
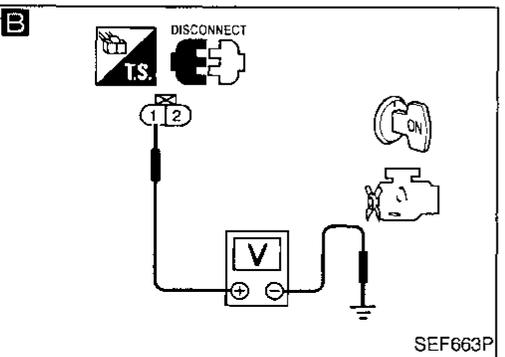
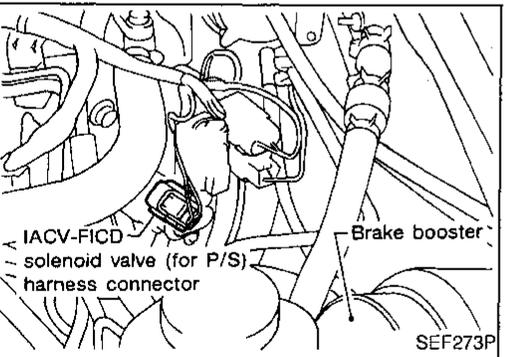
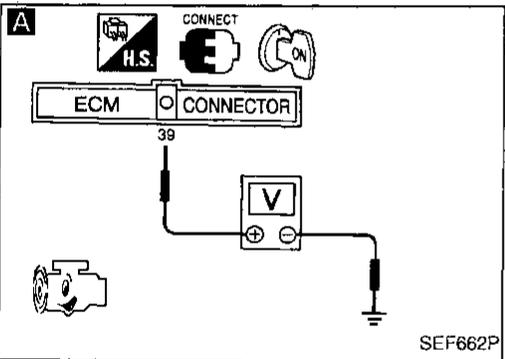
A

☆ MONITOR ☆ NO FAIL

PW/ST SIGNAL OFF

RECORD

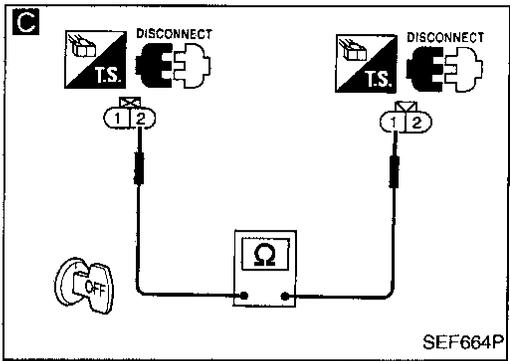
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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

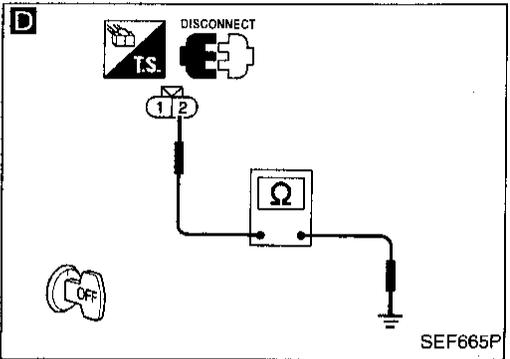
Power Steering Oil Pressure Switch (Cont'd)



D

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

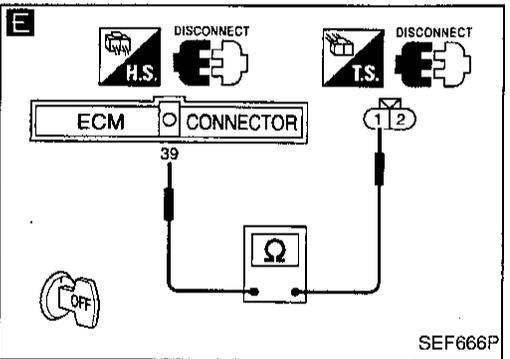
NG → Repair open circuit, short to ground or short to power in harness connectors.



E

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 open circuit, short to ground or short to power in harness 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-116.

INSPECTION END

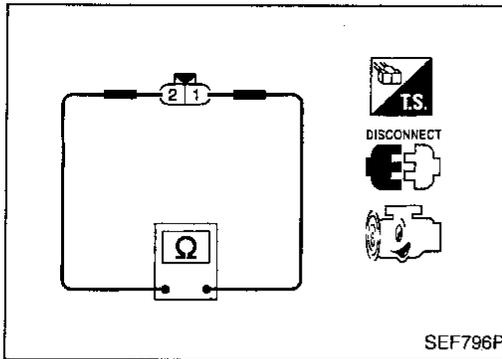
TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Power Steering Oil Pressure Switch (Cont'd)

COMPONENT INSPECTION

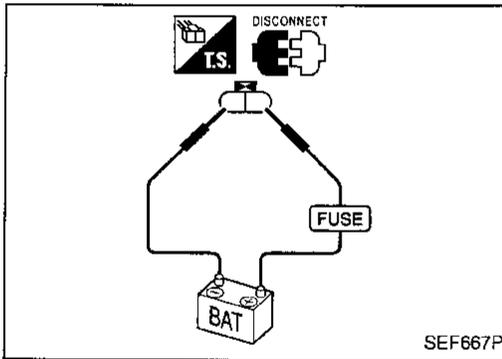
Power steering oil pressure switch

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

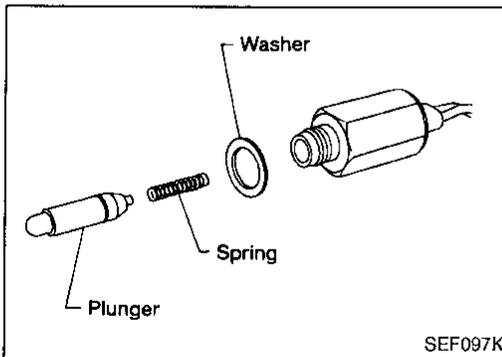
If NG, replace power steering oil pressure switch.



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.

GI

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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Electrical Load Signal (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

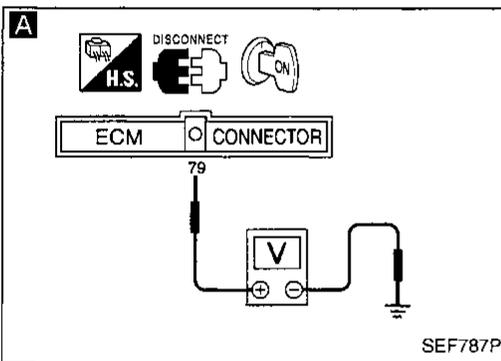
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	• Engine: Running	Rear window defogger "ON"	ON
		Except the above	OFF

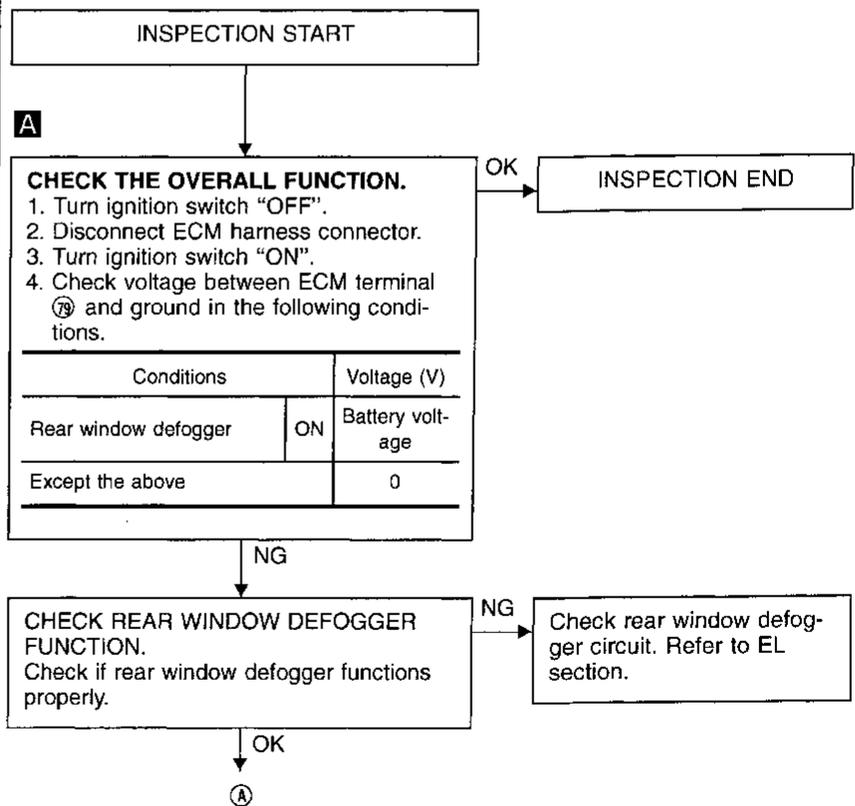
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values, and are measured between each terminal and ②5 (ECM ground):

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
79	R/W	Electrical load signal	Engine is running. └ Idle speed (Electrical load: "OFF")	0V
			Engine is running. └ Idle speed (Rear window defogger: "ON")	BATTERY VOLTAGE (11 - 14V)

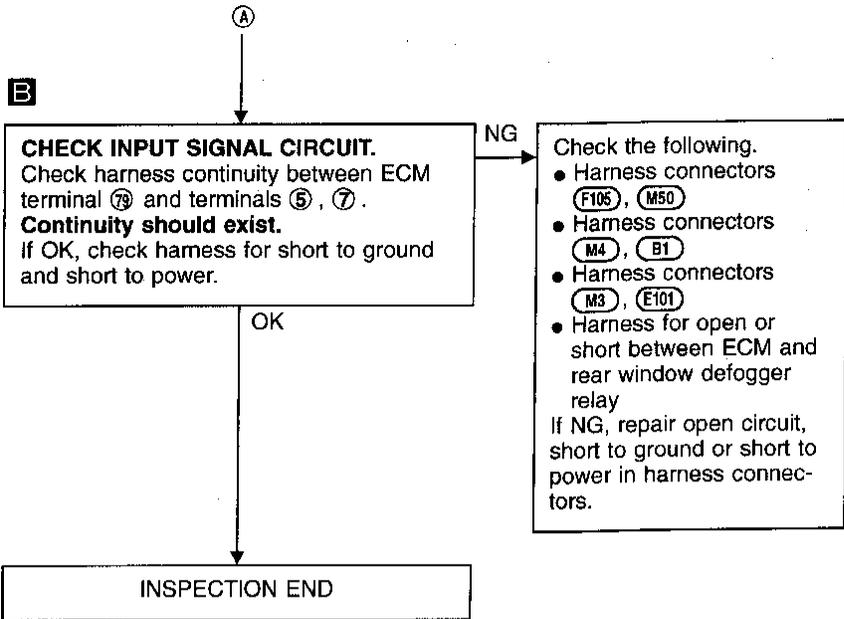
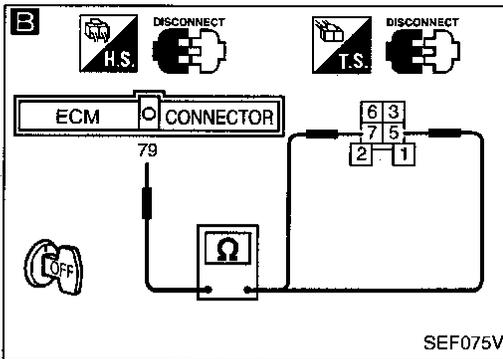


DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

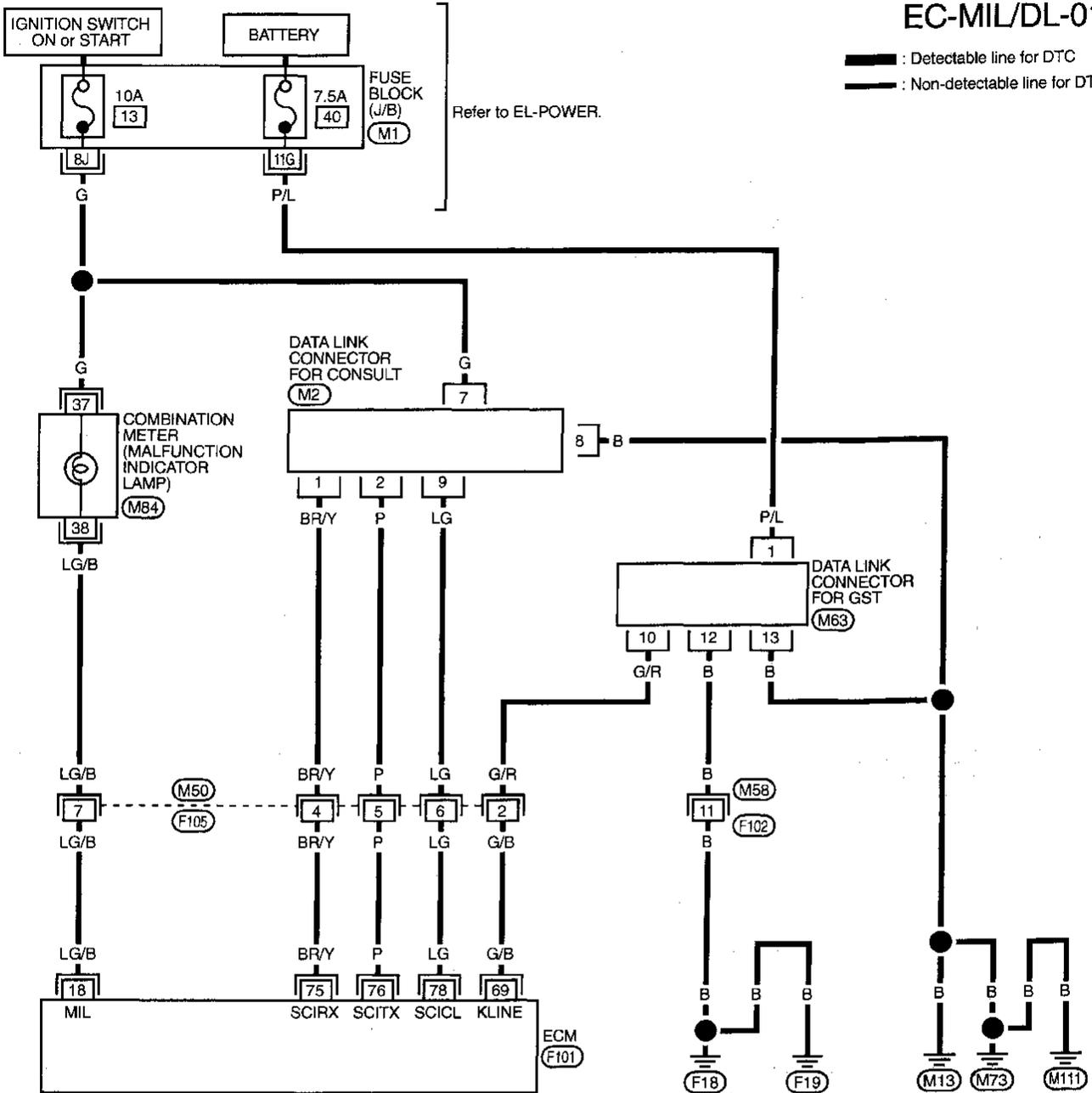
Electrical Load Signal (Cont'd)



MIL & Data Link Connectors

EC-MIL/DL-01

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



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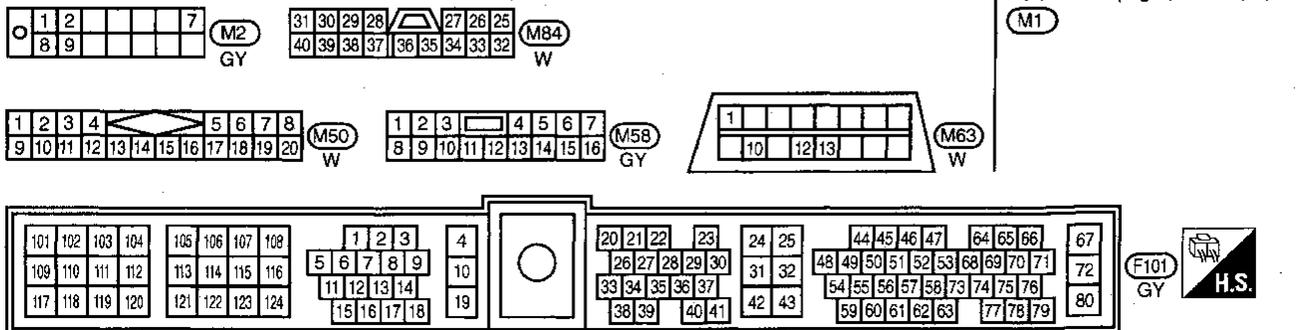
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SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

PRESSURE REGULATOR	
Fuel pressure at idling kPa (kg/cm ² , psi)	
Vacuum hose is connected	Approximately 235 (2.4, 34)
Vacuum hose is disconnected	Approximately 294 (3.0, 43)

Inspection and Adjustment

Target idle speed*1	rpm	
No-load*3 (in "N" position)		M/T: 625±50 A/T: 700±50 (in "N" position)
Base idle speed*2	rpm	
No-load*3 (in "N" position)		M/T: 575±50 A/T: 650±50 (in "N" position)
Ignition timing		15°±2° BTDC

*1: Throttle position sensor harness connector connected.

*2: Throttle position sensor harness connector disconnected or using CONSULT "WORK SUPPORT".

*3: Under the following conditions:
 • Air conditioner switch: OFF
 • Electric load: OFF (Heater, fan & rear window defogger)

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage	V	1.0 - 1.7 at idle* 1.5 - 2.1 at 2,500 rpm*
Mass air flow (Using CONSULT or GST)	g-m/sec	2.0 - 6.0 at idle* 7.0 - 20.0 at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

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

EGR TEMPERATURE SENSOR

EGR temperature °C (°F)	Resistance (MΩ)
0 (32)	0.68 - 1.11
50 (122)	0.09 - 0.12
100 (212)	0.017 - 0.024

FRONT HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3
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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
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INJECTOR

Resistance [at 25°C (77°F)]	Ω	10 - 14
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THROTTLE POSITION SENSOR

Accelerator pedal conditions	Resistance [at 25°C (77°F)]
Completely released	Approximately 0.5 kΩ
Partially released	0.5 - 4.0 kΩ
Completely depressed	Approximately 4.0 kΩ

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

CALCULATED LOAD VALUE

	Calculated load value % (Using CONSULT or GST)
At idle	14.0 - 33.0
At 2,500 rpm	12.0 - 25.0

INTAKE AIR TEMPERATURE SENSOR

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

REAR HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3
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CAMSHAFT POSITION SENSOR (PHASE)

Resistance	Ω	HITACHI make	1,440 - 1,760 [at 20°C (68°F)]
		MITSUBISHI make	2,090 - 2,550 [at 20°C (68°F)]

CRANKSHAFT POSITION SENSOR (REF)

Resistance [at 25°C (77°F)]	Ω	470 - 570
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