ENGINE CONTROL SYSTEM

SECTION EC

EC

MODIFICATION NOTICE:

GA engine

- The wiring diagram has been changed.

SR engine

- EGR system has been discontinued.
- EVAP canister purge volume control system has been adopted.
- IACV-Air regulator has been replaced with a fast idle cam.
- The wiring diagram has been changed.

CD engine

- The CD20 diesel engine has been replaced by the CD20E diesel engine featuring an electronically concentrated engine control system (ECCS-D).

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CD20E

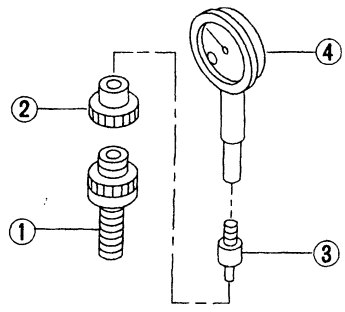
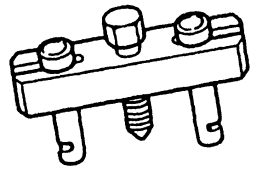
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EC

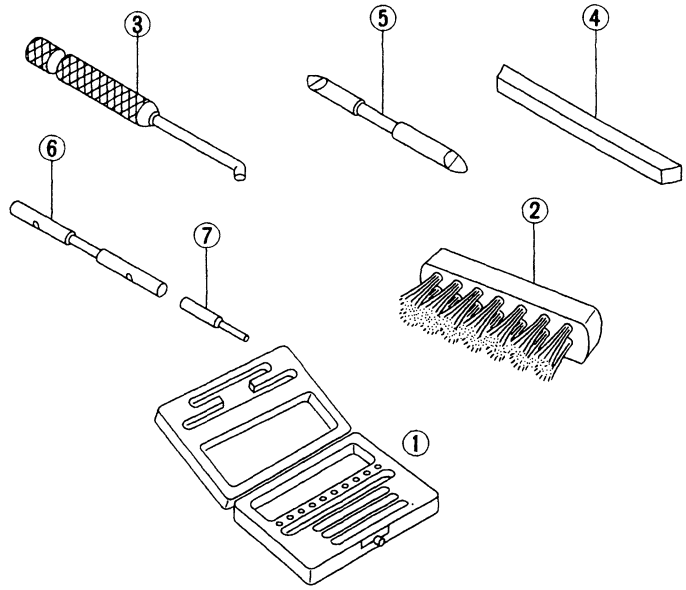
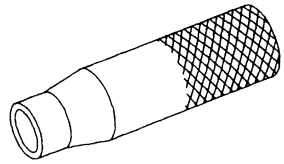
When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

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".

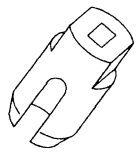
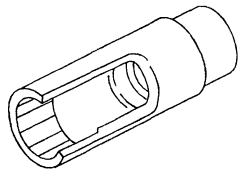
Special Service Tools

Tool number Tool name	Description
KV11229352 Measuring device ① KV11229350 Holder ② KV11229360 Nut ③ KV11229370 Pin ④ KV11254410 Dial gauge	Measuring set length of plunger spring  NT570
ST16540000 Pulley puller	Removing injection pump sprocket  NT647

FOR CD ENGINE INJECTION NOZZLE

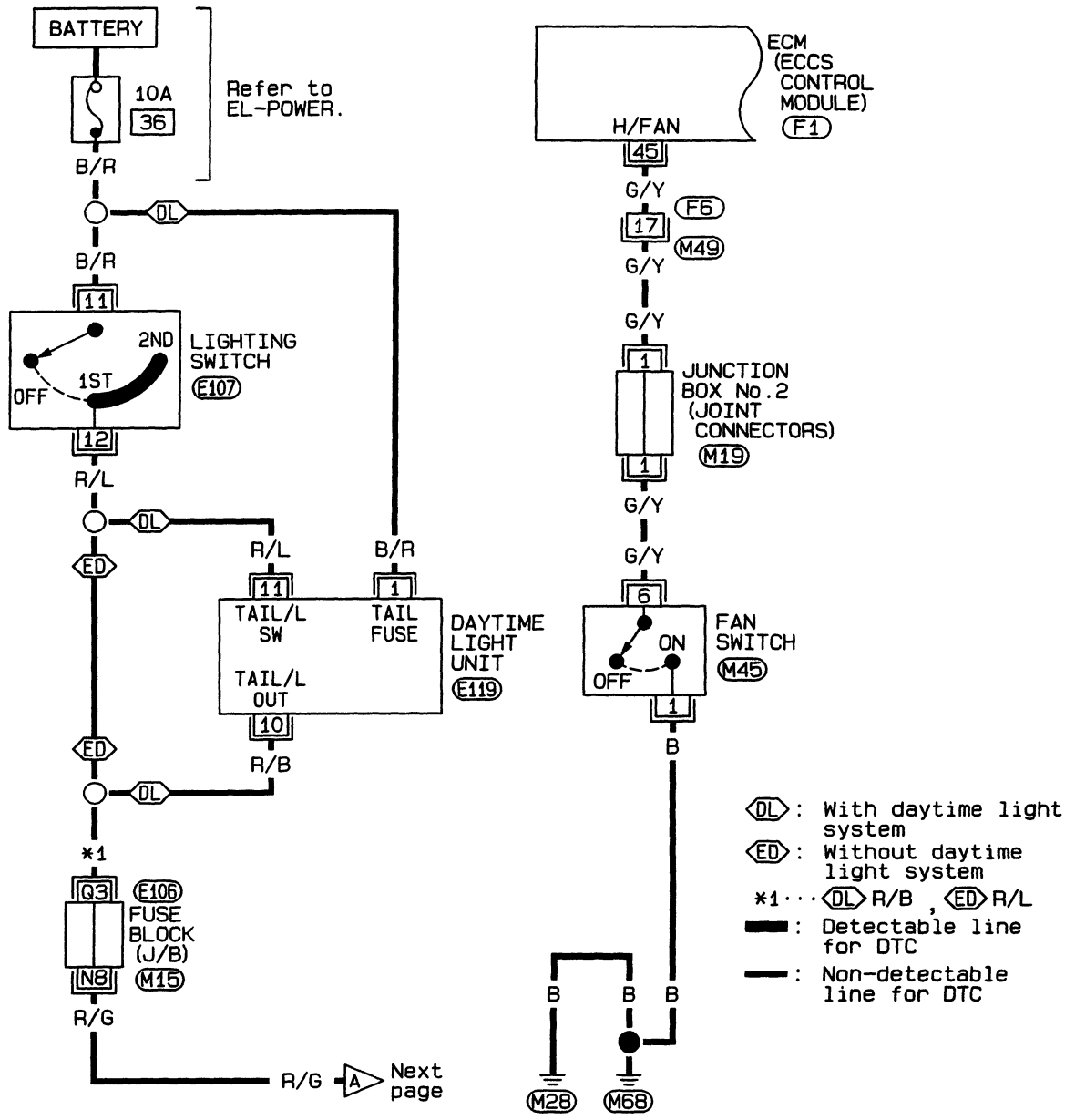
Tool number Tool name	Description
KV11289004 Nozzle cleaning kit ① KV11290012 Box ② KV11290110 Brush ③ KV11290122 Nozzle oil sump scraper ④ KV11290140 Nozzle needle tip cleaner ⑤ KV11290150 Nozzle seat scraper ⑥ KV11290210 Nozzle holder ⑦ KV11290220 Nozzle hole cleaning needle	 NT296
KV11292010 Nozzle centering device	 NT293

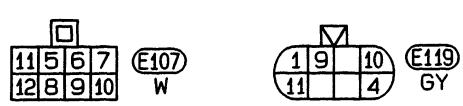
Special Service Tools (Cont'd)

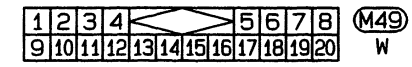
Tool number Tool name	Description
KV11100300 Nozzle holder socket (For No. 2 - 4 injection nozzles)	 NT563
KV119E0010 No. 1 injection nozzle holder socket	 NT648

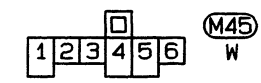
Electrical Load Signal

EC-LOAD-01





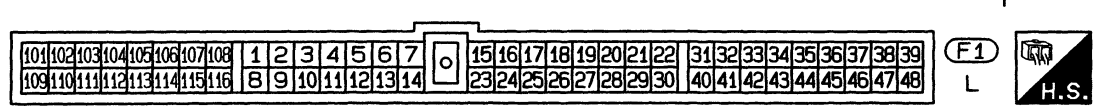




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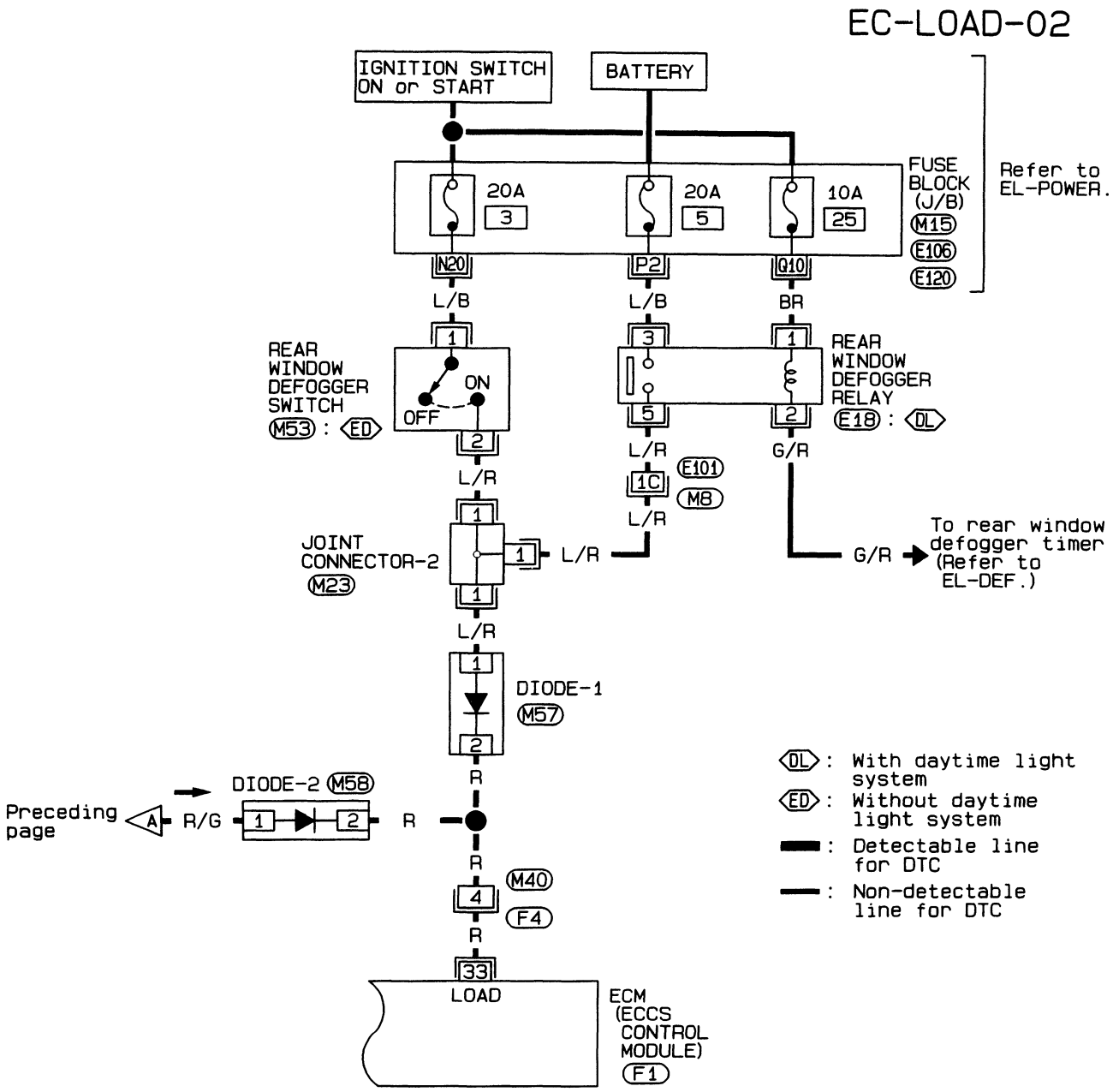
M15 , E106

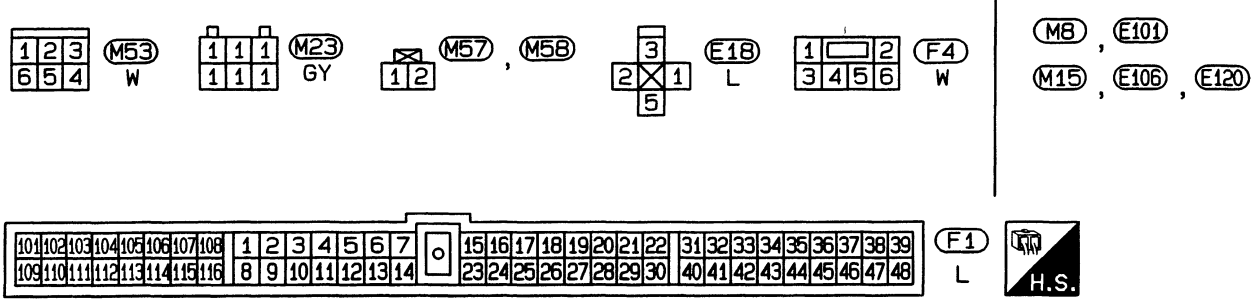
M19



HEC270

Electrical Load Signal (Cont'd)



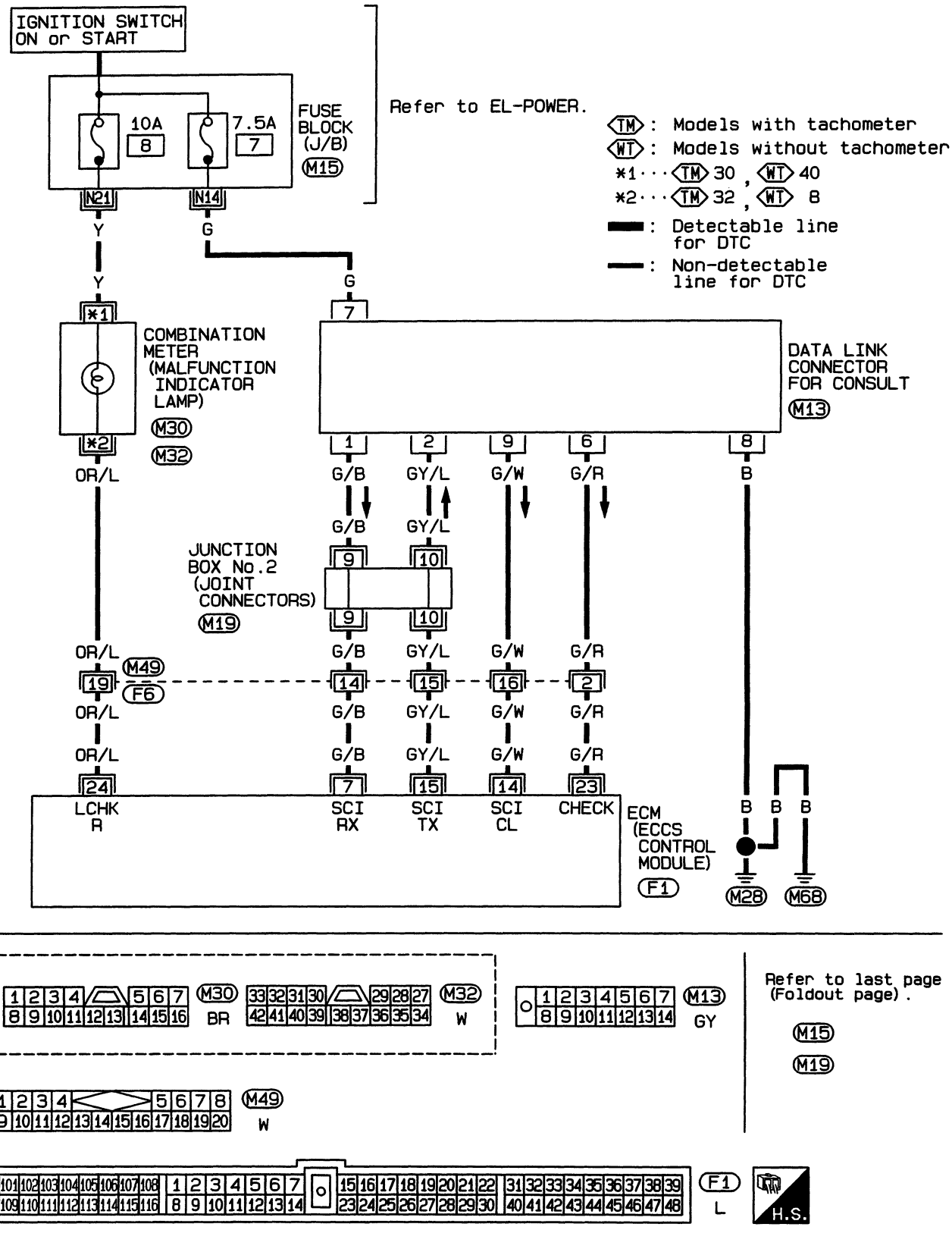


HEC055

MIL & Data Link Connectors

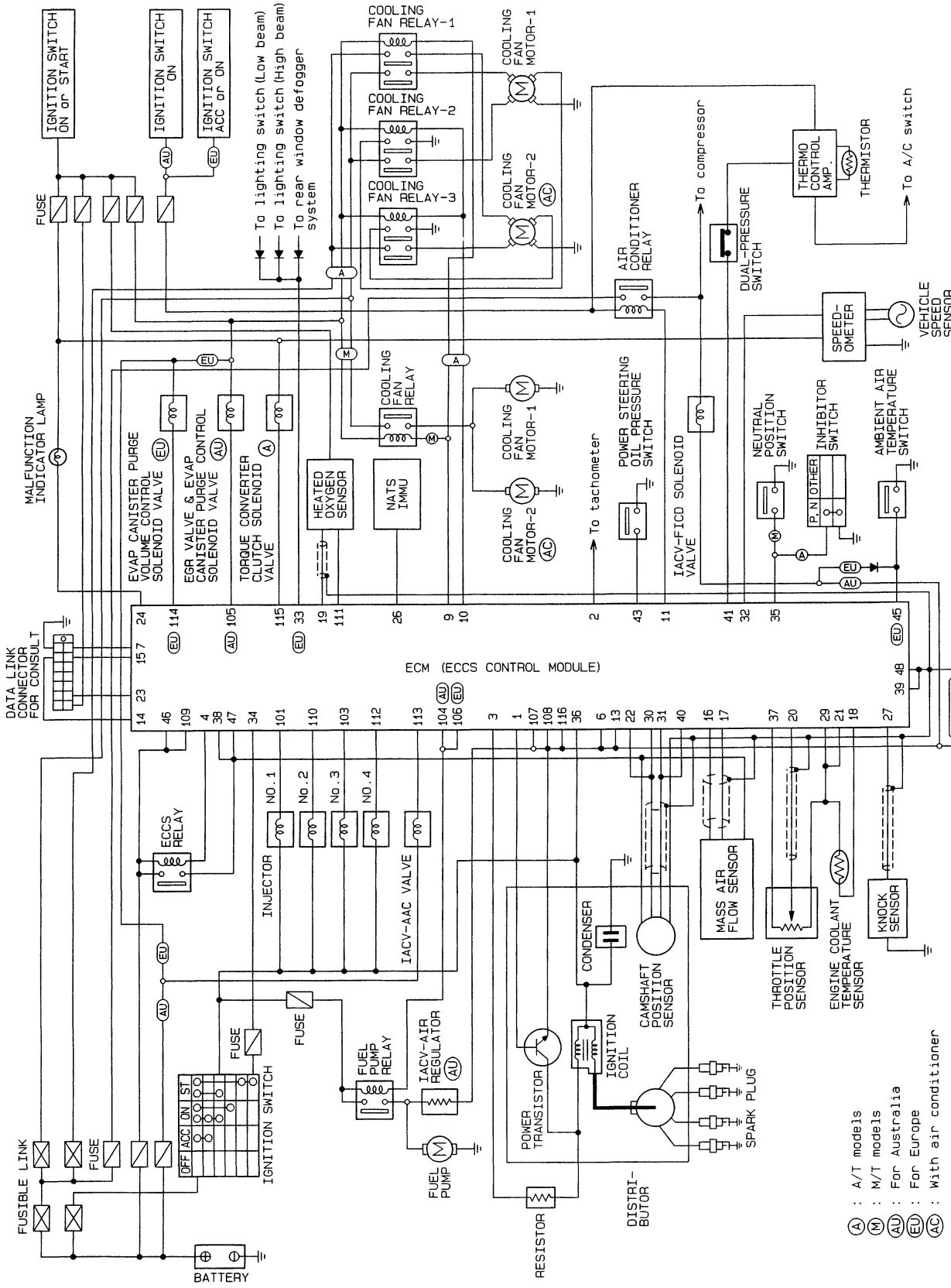
LHD models

EC-MIL-01



HEC269

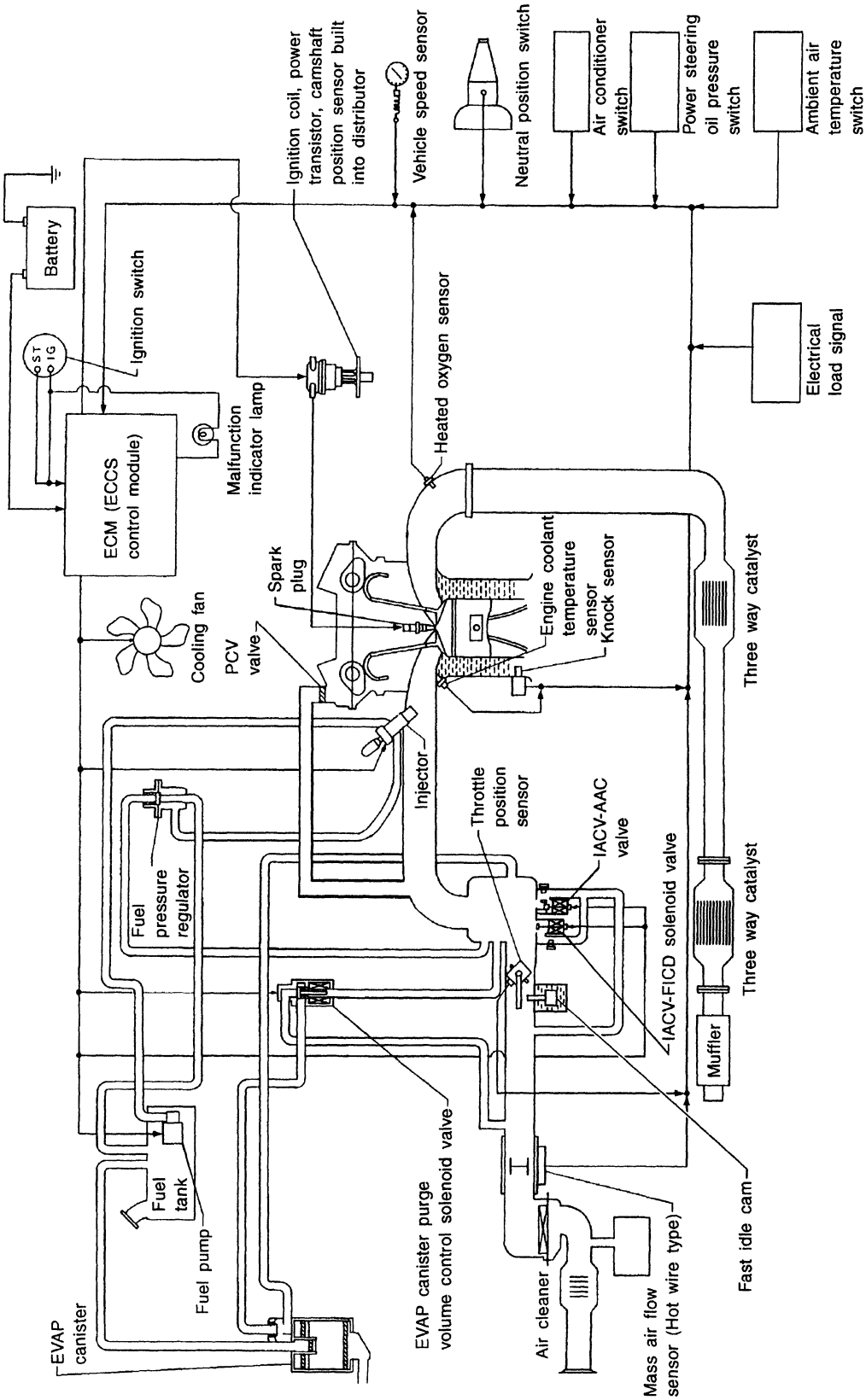
Circuit Diagram



HEC211

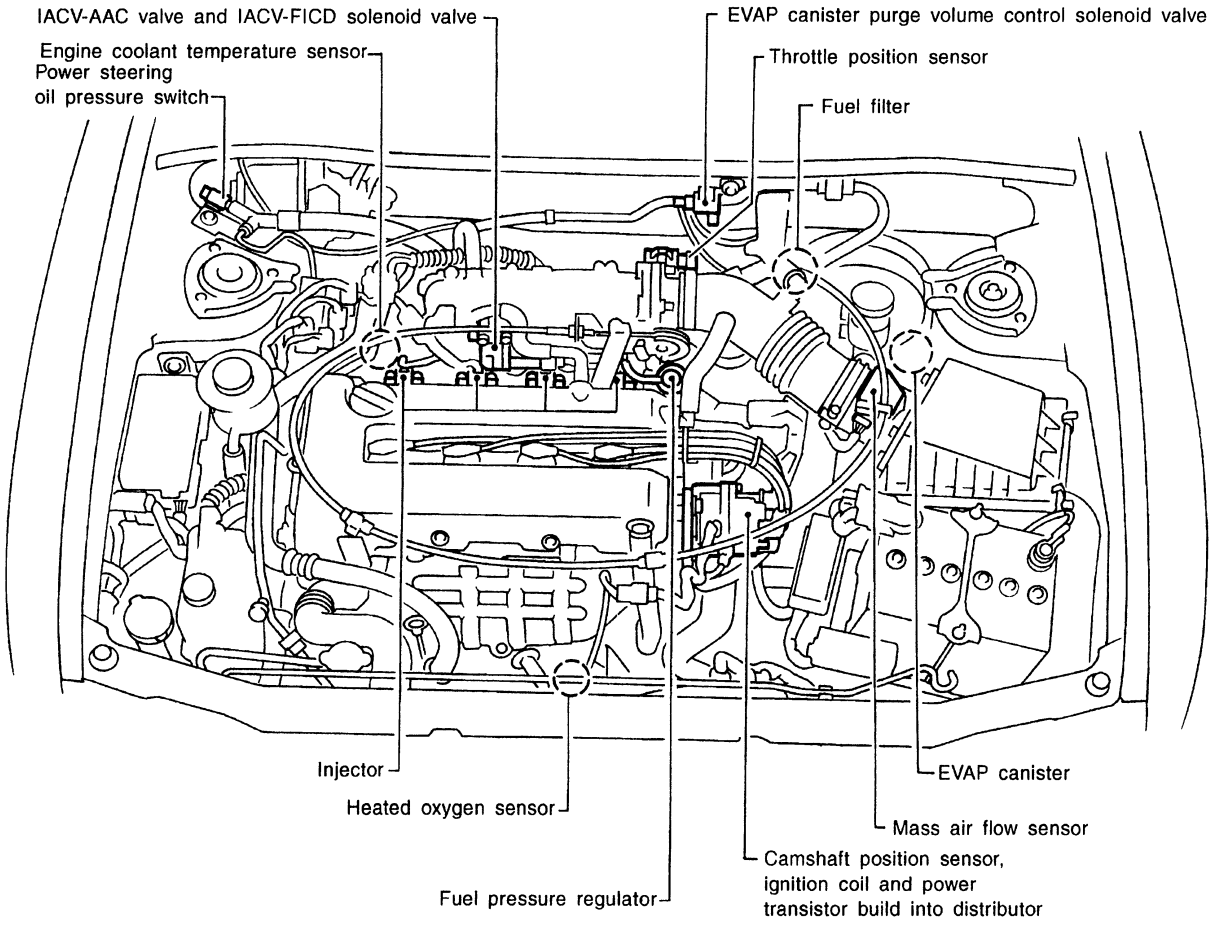
EC

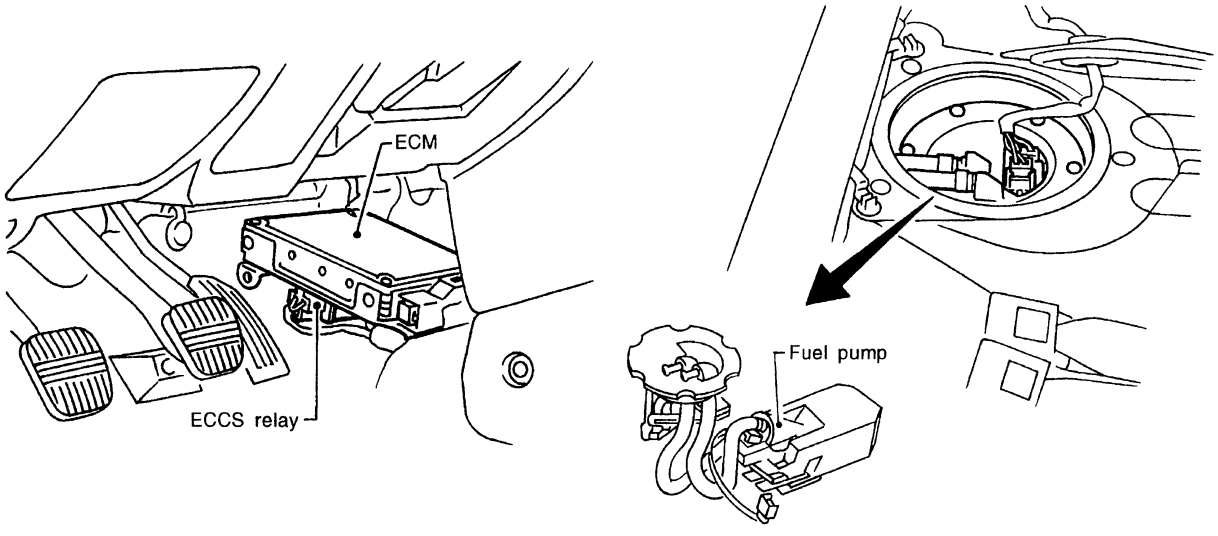
System Diagram



SEF496S

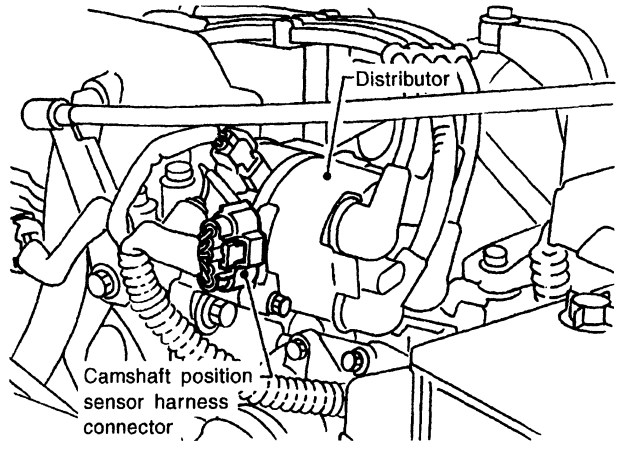
ECCS Component Parts Location

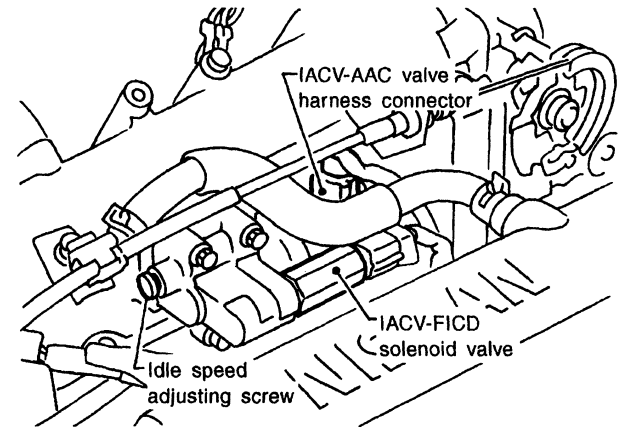


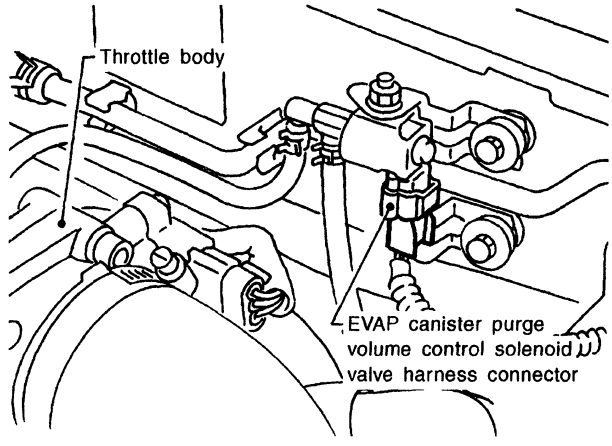


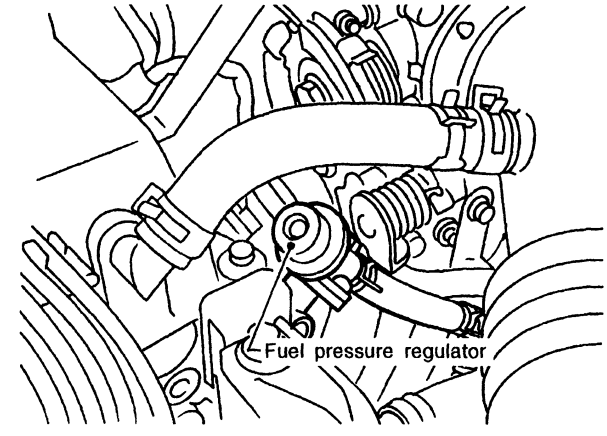
SEF497S

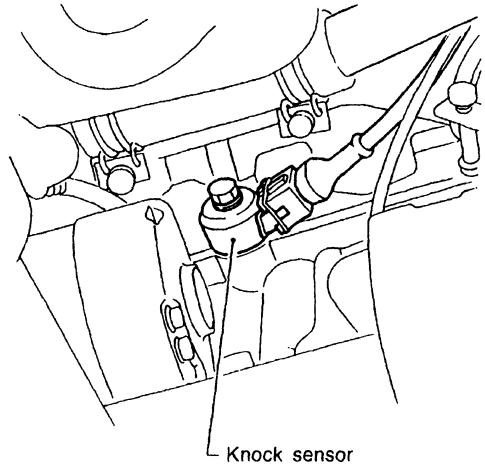
ECCS Component Parts Location (Cont'd)

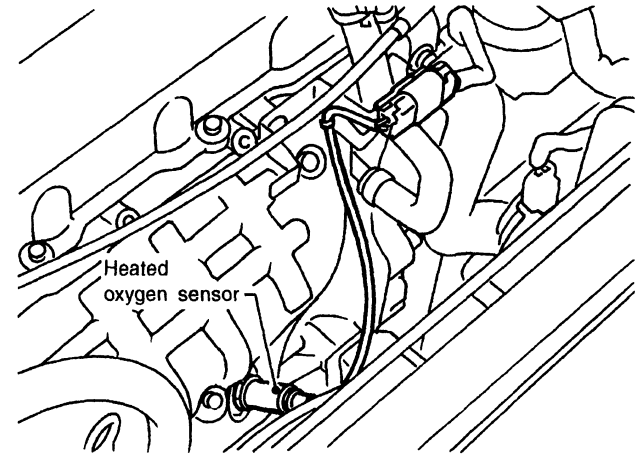






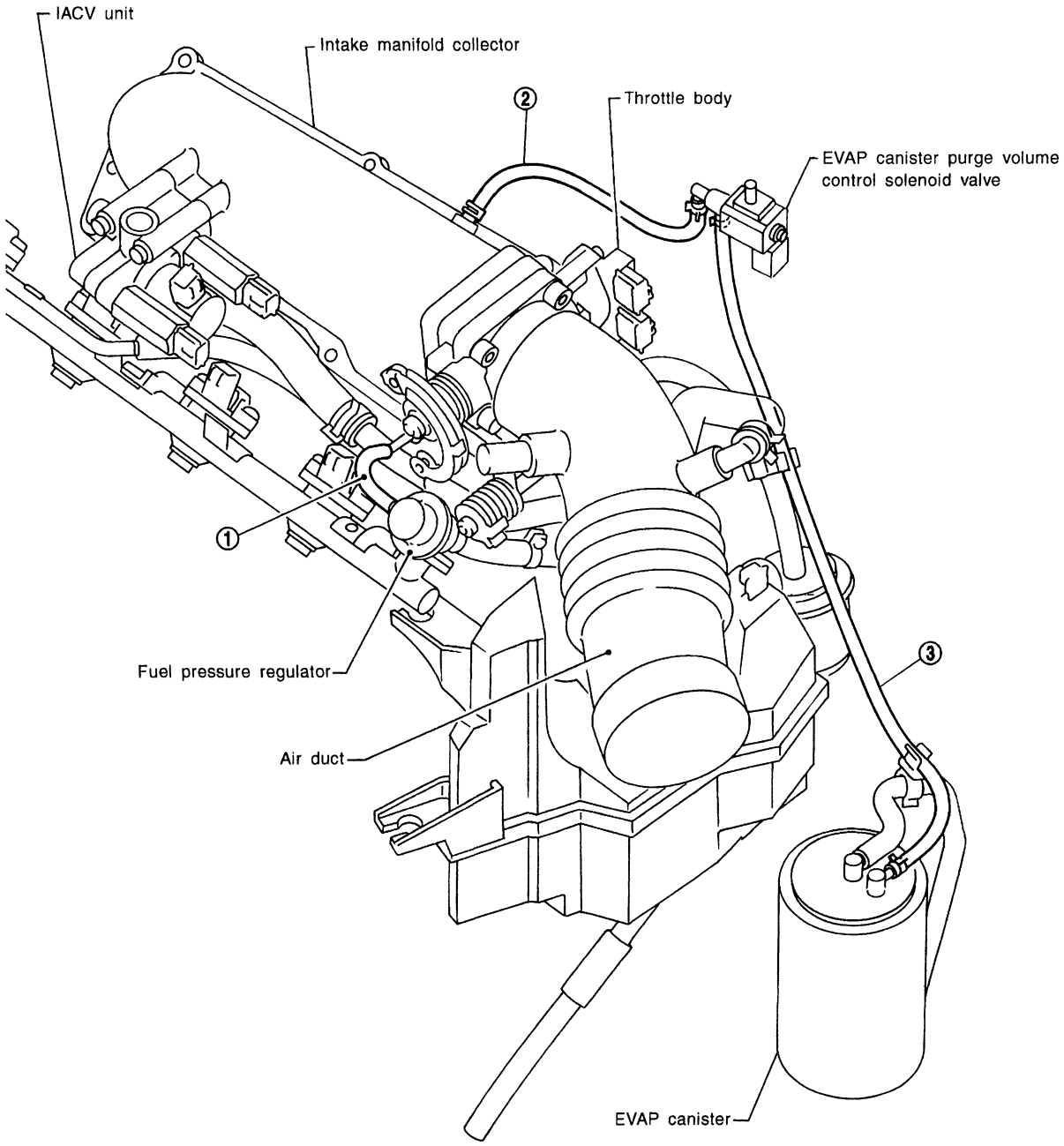






SEF498S

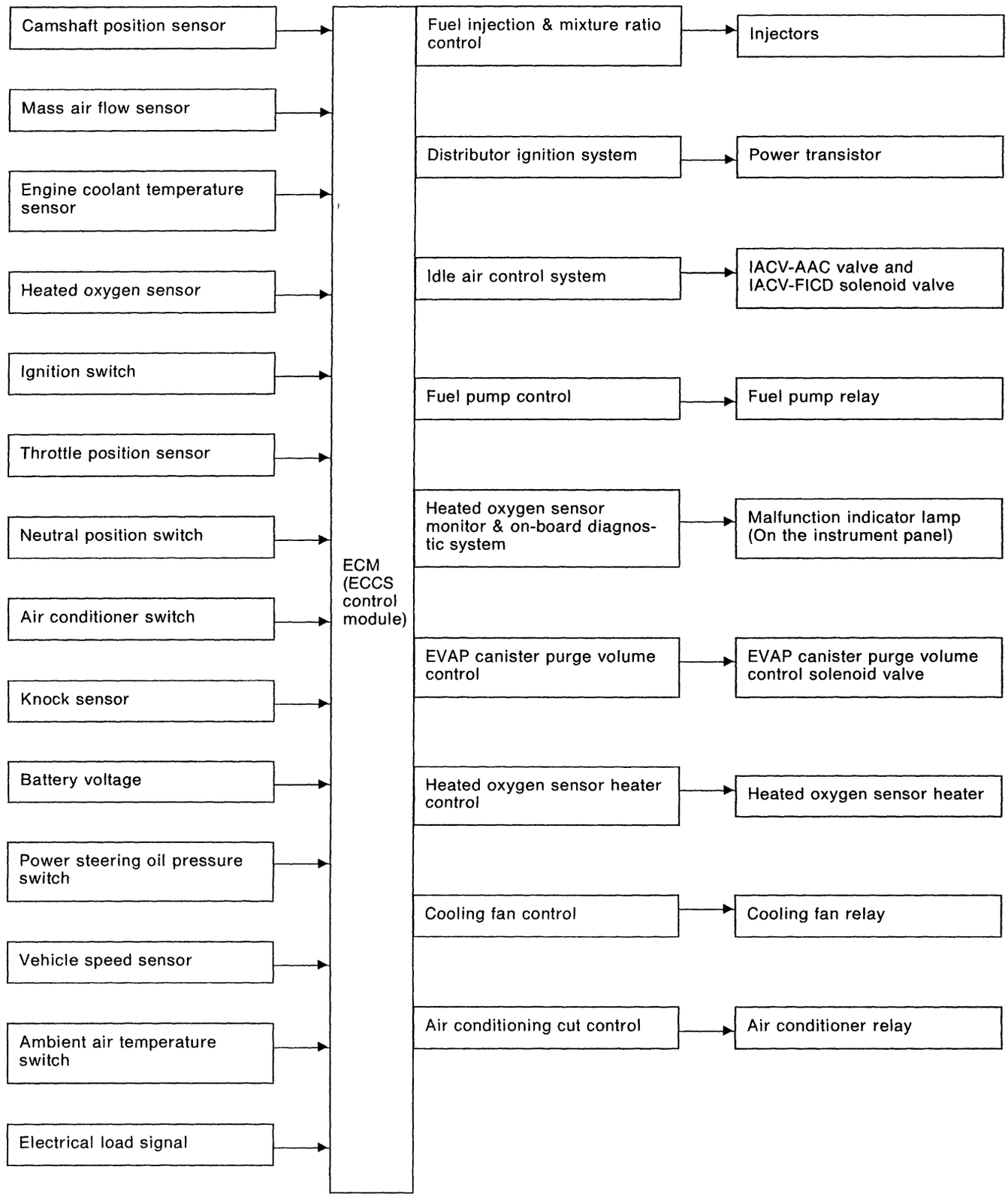
Vacuum Hose Drawing



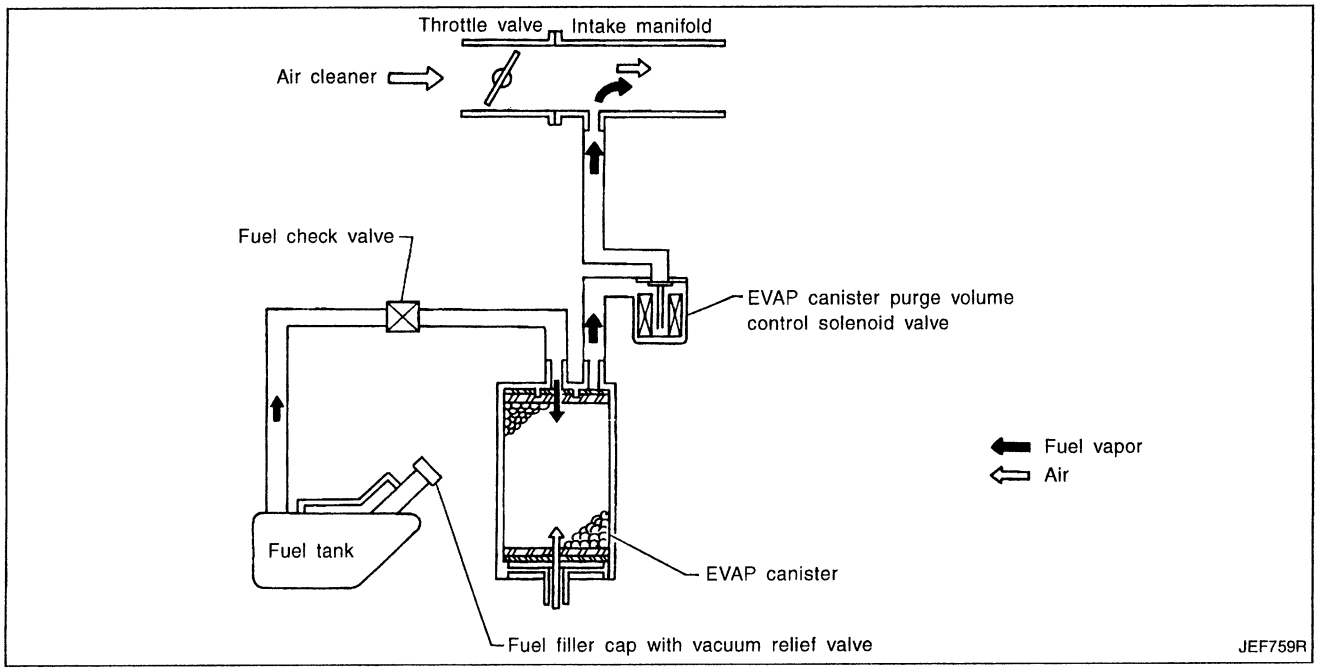
SEF645S

① Fuel pressure regulator to intake manifold collector
② EVAP canister purge volume control solenoid valve to intake manifold collector
③ EVAP canister purge volume control solenoid valve to EVAP canister

System Chart

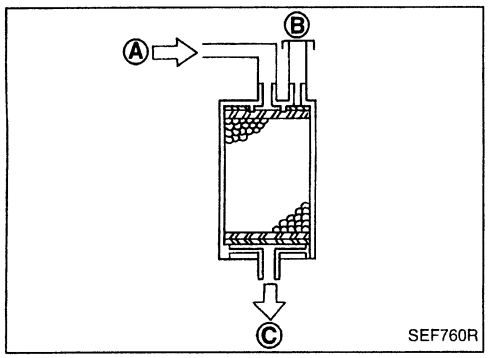


Description



EC

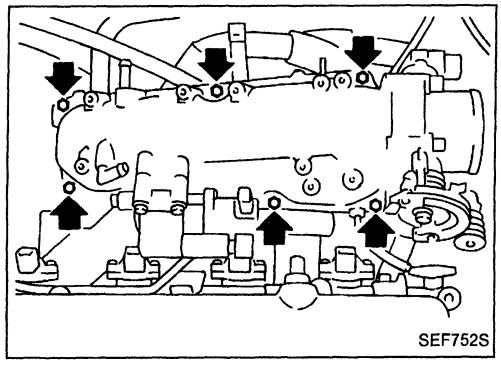
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor from sealed fuel tank is led into the EVAP canister when the engine is off. The fuel vapor is then stored in the EVAP canister. The EVAP canister retains the fuel vapor until the EVAP canister is purged by air.
EVAP canister purge volume control solenoid valve is controlled by ECM. 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.



Inspection

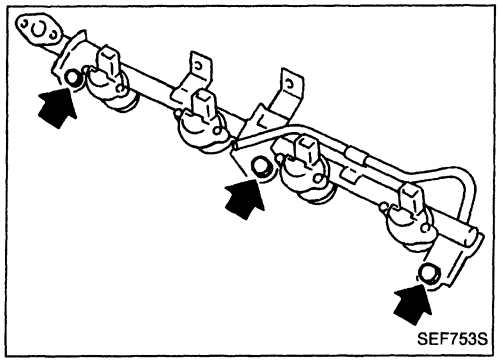
EVAP CANISTER

Check EVAP canister as follows:
1. Cover port Ⓑ with hand.
2. Blow air in port Ⓐ and ensure free flow out of port Ⓒ.

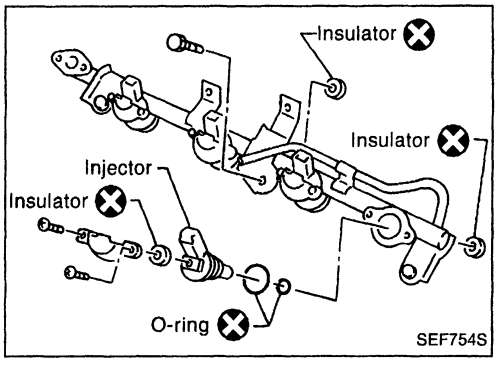

SEF752S

Injector Removal and Installation

1. Release fuel pressure to zero.
2. Disconnect all harness connectors, hoses and air duct around intake manifold collector and throttle body.
3. Loosen all fixing bolts of intake manifold collector.
4. Remove intake manifold collector with throttle body.


SEF753S

5. Disconnect injector harness connectors.
6. Disconnect fuel hoses from fuel tube assembly.
7. Remove injectors with fuel tube assembly.

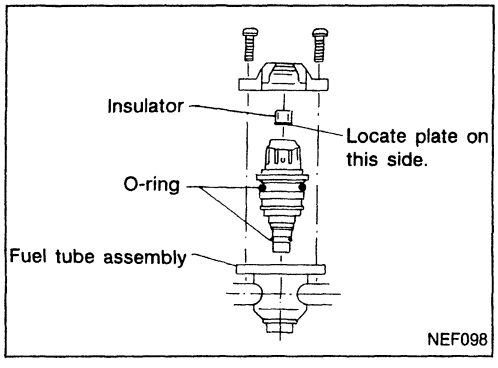


SEF754S

8. Push out any malfunctioning injector from fuel tube assembly.

Do not extract injector by pinching connector.

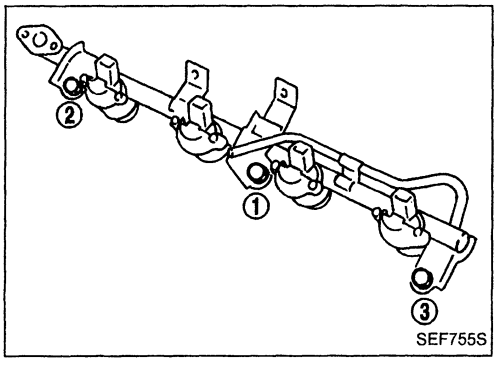
9. Replace or clean injector as necessary.



NEF098

10. Install injector to fuel tube assembly.

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

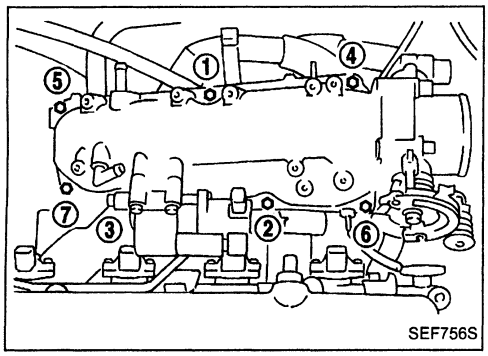


SEF755S

11. Install injectors with fuel tube assembly to intake manifold. Tighten fuel tube bolts to the specified torque.
    Tightening procedure:
    1) **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).**
    2) **Tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).**
12. Install fuel hoses to fuel tube assembly.

Lubricate fuel hoses with a smear of silicone oil.
Insert fuel hoses more than 28 mm (1.10 in) from tube end.

Injector Removal and Installation (Cont'd)



13. Install intake manifold collector with throttle body.
    Tighten bolts (① to ⑦) to the specified torque (See EM section for the torque).

14. Reinstall any parts removed in reverse order of removal.

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

EC

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

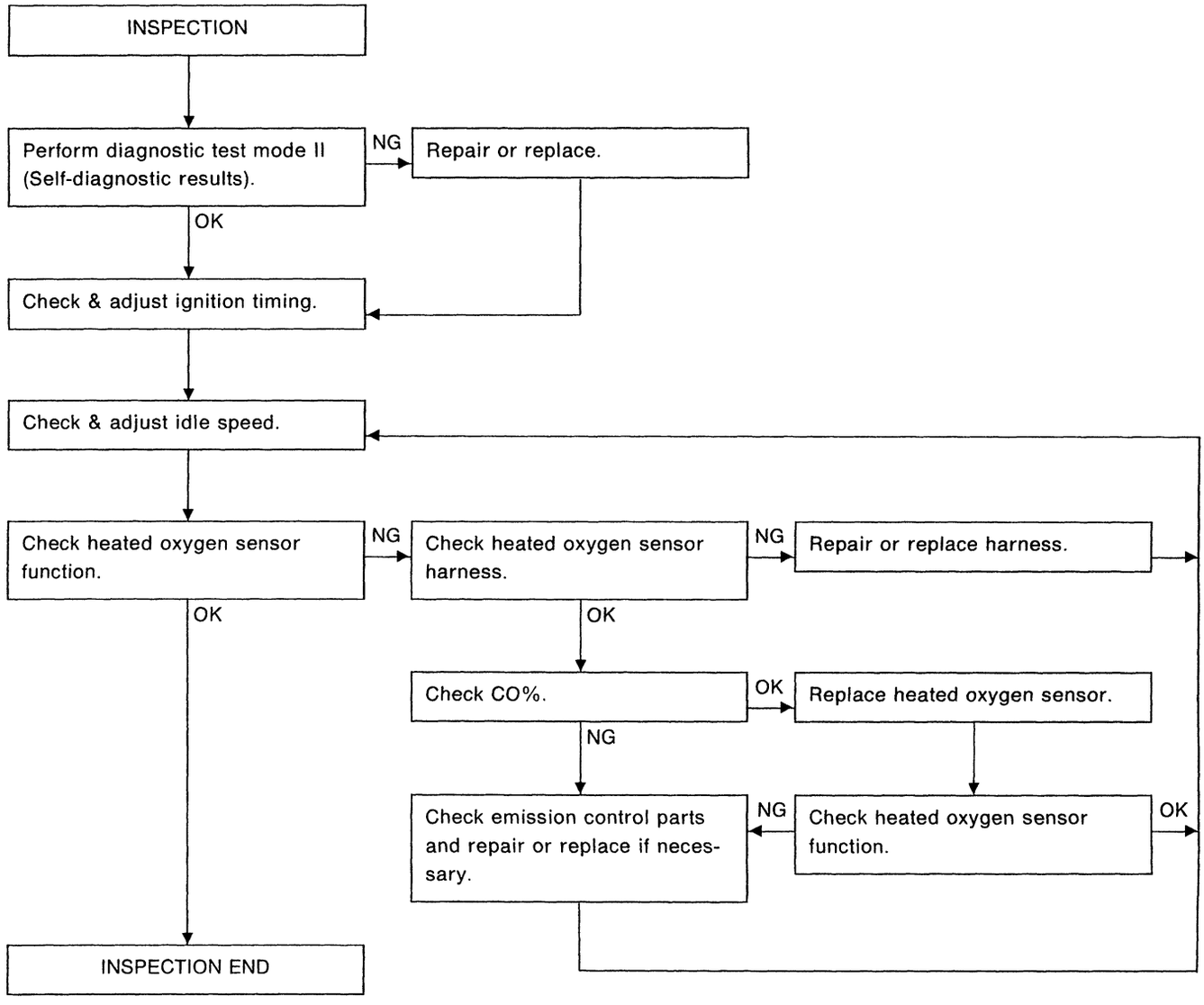
PREPARATION

- **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) **Throttle valve**

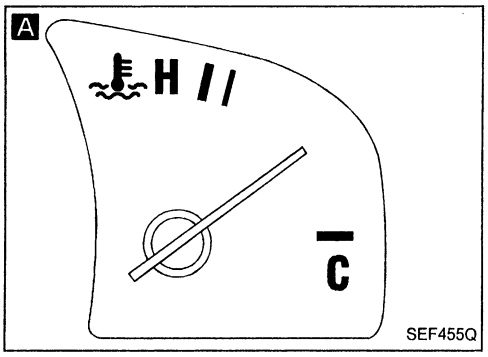
- **On models equipped with air conditioner, checks should be carried out while the air conditioner is "OFF".**
- **On models equipped with automatic transaxle, when checking idle speed, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.**
- **When measuring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

Overall inspection sequence



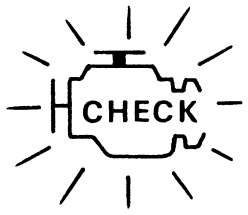
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

A



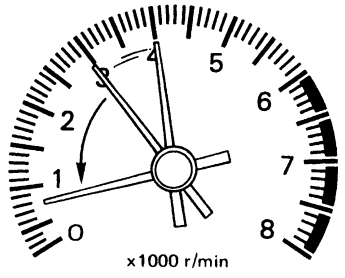
SEF455Q

B



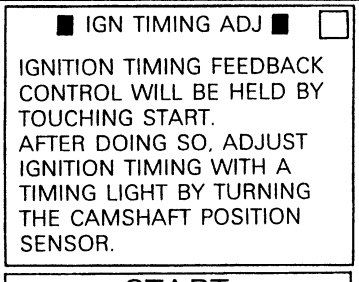
Malfunction indicator lamp
SEF051PA

C



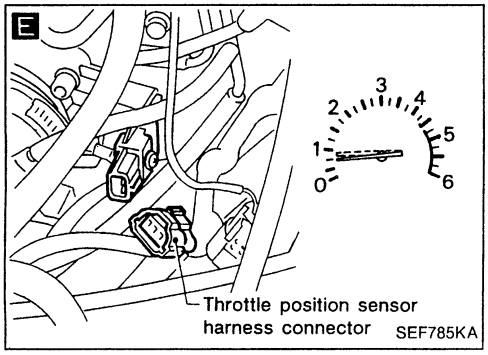
SEF248F

D



SEF546N

E



SEF785KA

START

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

A

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

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

B

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

OK

NG → Repair or replace components as necessary.

C

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

D E

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

OR

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

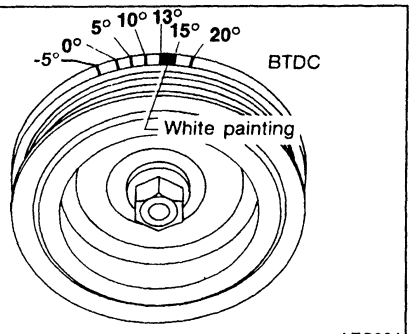
Rev engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, then run engine at idle speed.

Ⓐ

EC

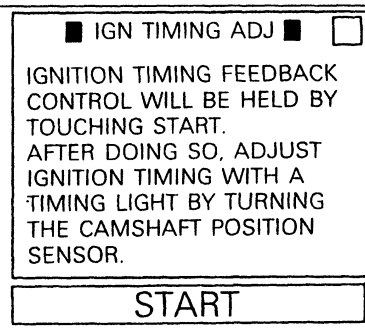
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

F



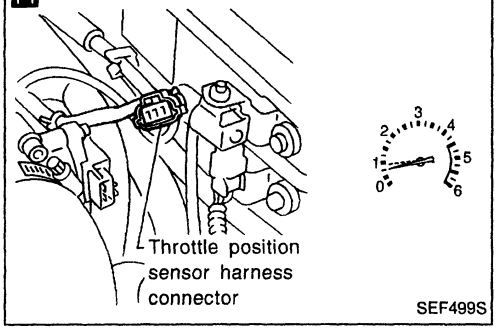
AEC804

G



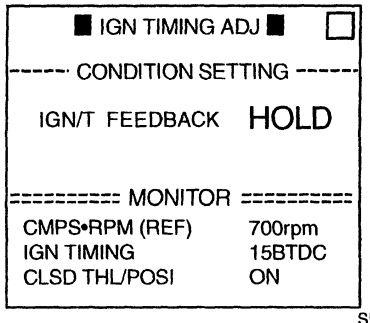
SEF546N

H



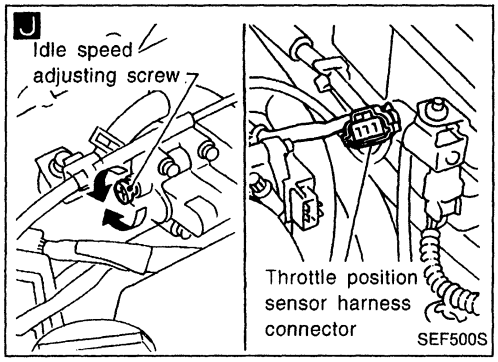
SEF499S

I



SEF844S

J



SEF500S

Ⓐ

F

Check ignition timing with a timing light.

15° ± 2° BTDC

NG

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

15° ± 2° BTDC

Ⓑ

G H

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

OR

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

I

Check idle speed.

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

OR

Check idle speed.

700 ± 50 rpm

OK

NG

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

J

Adjust idle speed by turning idle speed adjusting screw.

700 ± 50 rpm

K

Touch "BACK".

OR

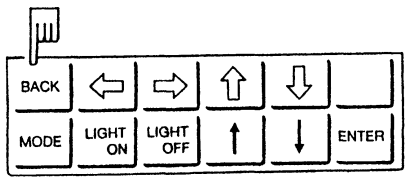
1. Turn off engine and connect throttle position sensor harness connector.
2. Start engine.

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

Ⓒ

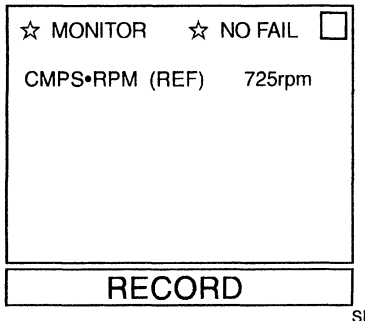
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

K



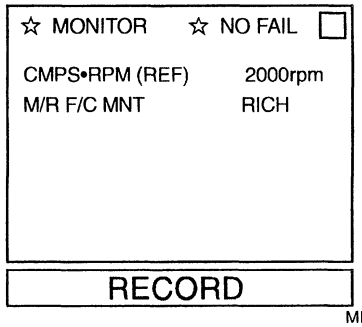
SEF913J

L



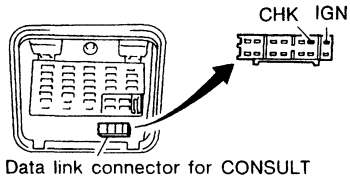
SEF863S

M



MEC711B

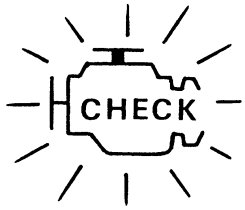
N



Data link connector for CONSULT (Connect CHK and IGN terminals with a suitable harness.)

SEF909P

O



SEF051P

Ⓒ

L

Check idle speed.

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

OR

Check idle speed.

750±50 rpm

OK

NG

Check IACV-AAC valve and replace if necessary.

Check IACV-AAC valve harness and repair if necessary.

Check ECM function* by substituting another known good ECM.

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

M N O

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

NG → Ⓓ

OR

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

OK

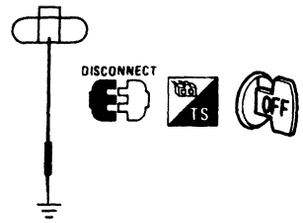
END

EC

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

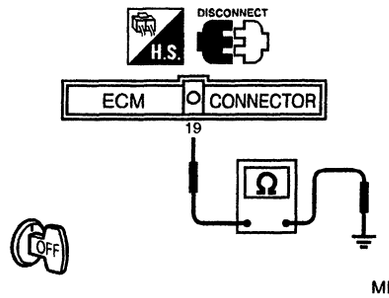
P

Heated oxygen sensor harness connector



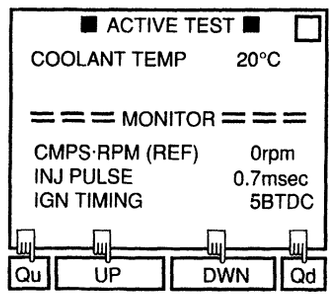
MEF031DB

Q



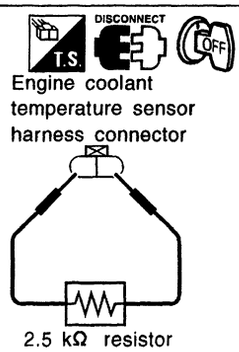
MEC712B

R



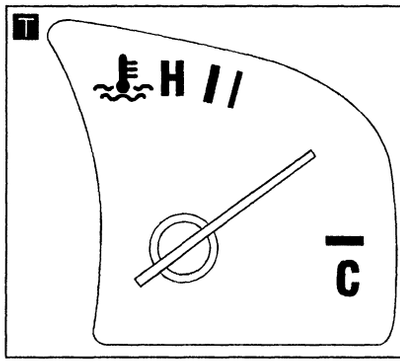
AEC681

S



SEF750S

T



SEF455Q

Ⓓ

P Q

Check heated oxygen sensor harness:
1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector from ECM.
3. Disconnect heated oxygen sensor harness connector. Then connect harness side terminal for heated oxygen sensor to ground with a jumper wire.
4. Check for continuity between terminal ⑲ of ECM harness connector and body ground.

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

OK

NG

Repair or replace harness. → Ⓑ

Connect ECM harness connector to ECM.

R S

1. Connect battery ground cable.
2. Select "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
3. Set "COOLANT TEMP" to 20°C (68°F) by touching "Qu" and "Qd" and "UP", "DWN".

OR

1. Disconnect engine coolant temperature sensor harness connector.
2. Connect a resistor (2.5 kΩ) between terminals of engine coolant temperature sensor harness connector.
3. Connect battery ground cable.

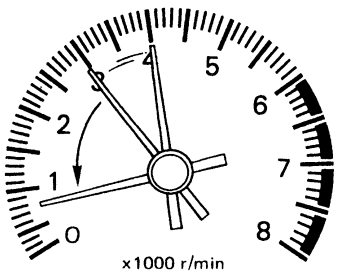
T

Start engine and warm it up until engine coolant temperature indicator points to middle of gauge. (Be sure to start engine after setting "COOLANT TEMP" or installing a 2.5 kΩ resistor.)

Ⓔ

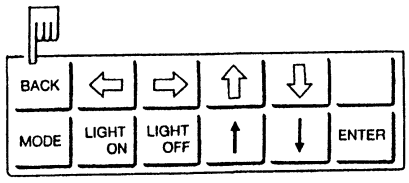
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

U



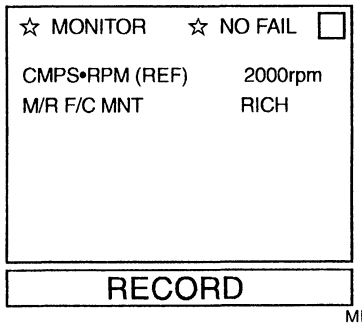
SEF248F

V



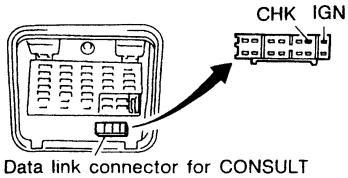
SEF913J

W



MEC711B

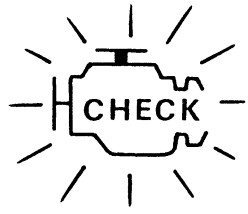
X



Data link connector for CONSULT
(Connect CHK and IGN terminals with a suitable harness.)

SEF909P

Y



SEF051P

Ⓔ

U

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

V

Check "CO"%.

Idle CO: Less than 10% and engine runs smoothly.

After checking CO%,

1. Touch "BACK".

OR

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

NG

OK

Replace heated oxygen sensor.

W X Y

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

OR

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

NG

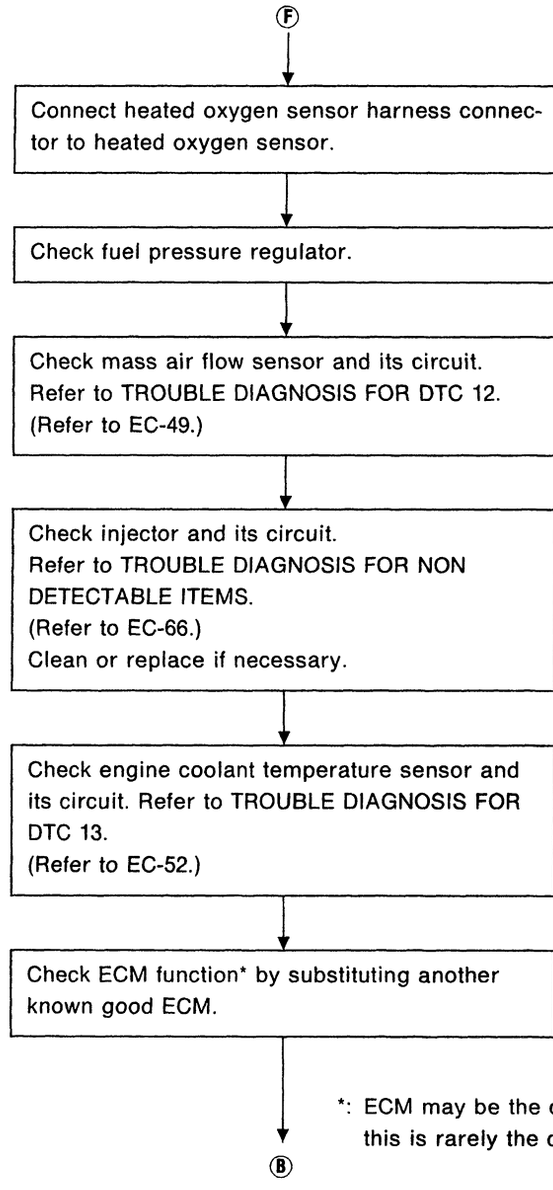
OK

Ⓕ

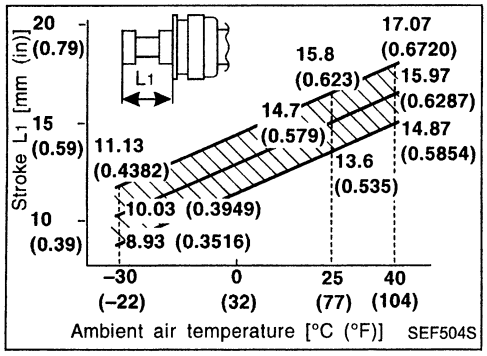
Ⓑ

EC

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



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



Fast Idle Cam (FIC) Inspection and Adjustment

Perform inspection and adjustment as follows:

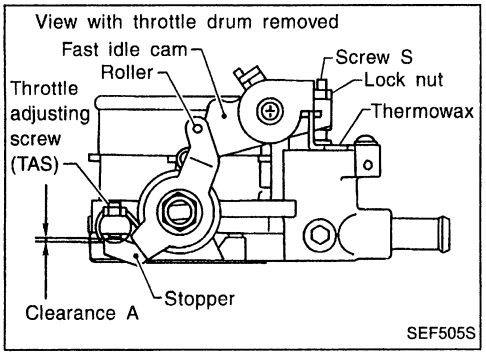
1. Make sure the engine has cooled down and remove the throttle body. Refer to "OUTER COMPONENT PARTS" in EM section.
2. Leave the throttle body for more than 3 hours so the temperature of the thermowax levels with the ambient air temperature.

Avoid direct sunlight or other heat source (heater, air conditioner, etc.).

3. Check dimension L_1 without removing thermowax from throttle body. Measure ambient air temperature with a thermometer.

EC

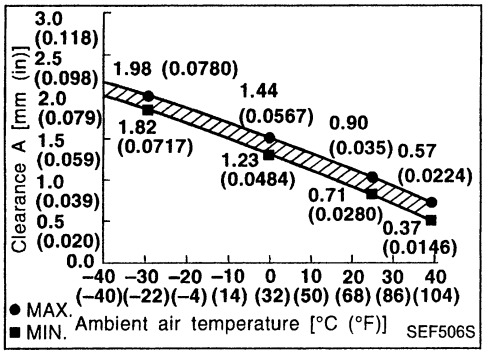
L_1 dimension	Judgement and remedy
Inside hatched area	The thermowax is normal. Perform FIC adjustment. Go to step 4.
Outside hatched area	Replace the thermowax and install the FIC. Perform adjustment from step 2.



4. Check the clearance A between the stopper and the throttle adjusting screw (TAS). If not within specifications (the hatched area as shown in the figure below), adjust clearance using screw S.

Do not adjust the clearance using the throttle adjusting screw (TAS).

5. After adjusting clearance A, tighten the lock nut of screw S.
6. Install the throttle body. Refer to "OUTER COMPONENT PARTS" in EM section.
7. Warm up engine sufficiently. Confirm there is clearance between FIC and roller.



CONSULT

ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item			DIAGNOSTIC TEST MODE				
			WORK SUPPORT	SELF-DIAG-NOSTIC RESULTS	DATA MONITOR	ACTIVE TEST	FUNCTION TEST
ECCS COMPONENT PARTS	INPUT	Camshaft position sensor		X	X		
		Mass air flow sensor		X	X		
		Engine coolant temperature sensor		X	X	X	
		Heated oxygen sensor			X		X
		Vehicle speed sensor			X		X
		Throttle position sensor	X	X	X		X
		Knock sensor		X			
		Ignition switch (start signal)			X		X
		Air conditioner switch			X		
		Park/Neutral position switch			X		X
		Power steering oil pressure switch			X		X
		Electrical load signal			X		
		Ambient air temperature switch			X		
		Battery voltage			X		
	OUTPUT	Injectors			X	X	X
		Power transistor (Ignition timing)	X	X (Ignition signal)	X	X	X
		IACV-AAC valve	X		X	X	X
		Air conditioner relay			X		
		Fuel pump relay	X		X	X	X
		Cooling fan			X	X	X
		EVAP canister purge volume control solenoid valve			X	X	X

X: Applicable

CONSULT (Cont'd)

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CMPS·RPM (REF) [rpm]	○	○	• Indicates the engine speed computed from the REF signal (180° signal) of the camshaft position sensor.	• Accuracy becomes poor if engine speed drops below the idle rpm. • If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS AIR/FL SE [V]	○	○	• The signal voltage of the mass air flow sensor is displayed.	• When the engine is stopped, a certain value is indicated.
COOLAN TEMP/S [°C] or [°F]	○	○	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
O2 SEN [V]	○	○	• The signal voltage of the heated oxygen sensor is displayed.	
M/R F/C MNT [RICH/LEAN]	○	○	• Display of heated oxygen sensor signal during air-fuel ratio feedback control: RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN ... means the mixture became "lean", and control is being affected toward a rich mixture.	• After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins. • When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
VHCL SPEED SE [km/h] or [mph]	○	○	• The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	○	○	• The power supply voltage of ECM is displayed.	
THRTL POS SEN [V]	○	○	• The throttle position sensor signal voltage is displayed.	
START SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the starter signal.	• After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL/POSI [ON/OFF]	○	○	• Indicates the closed throttle position [ON/OFF] determined by the throttle position sensor signal. ON: Closed throttle position OFF: Other than closed throttle position	

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

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
AIR COND SIG [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioning signal.	
P/N POSI SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the park/neutral position switch signal.	
PW/ST SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal.	
LOAD SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the electrical load signal.	
AMB TEMP SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the ambient air temperature switch signal	
INJ PULSE [msec]		○	• Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	• When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		○	• Indicates the ignition timing computed by ECM according to the input signals.	
IACV-AAC/V [%]		○	• Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals.	
CAN/P CONT SV [step]			• Indicates the EVAP canister purge volume control value computed by the ECM according to the input signals. • The opening becomes larger as the value increases.	
A/F ALPHA [%]		○	• Indicates the mean value of the air-fuel ratio feedback correction factor per cycle.	• When the engine is stopped, a certain value is indicated. • This data also includes the data for the air-fuel ratio learning control.
AIR COND RLY [ON/OFF]		○	• Indicates the air conditioner relay control condition (determined by ECM according to the input signal).	
FUEL PUMP RLY [ON/OFF]		○	• Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]		○	• Indicates the control condition of the cooling fans (determined by ECM according to the input signal). HI ... High speed operation LOW ... Low speed operation OFF ... Stopped	
VOLTAGE [V]			• Voltage measured by the voltage probe.	
PULSE [msec] or [Hz] or [%]			• Pulse width, frequency or duty cycle measured by the pulse probe.	• Only "#" is displayed if item is unable to be measured. • Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

CONSULT (Cont'd)

ACTIVE TEST MODE

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

EC

CONSULT (Cont'd)

FUNCTION TEST MODE

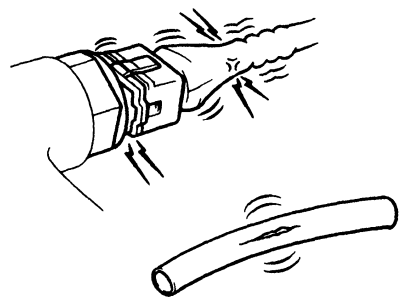
FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	• Ignition switch: ON (Engine stopped) • Displays the results of on-board diagnostic system.	—		Objective system
CLOSED THROTTLE POSI	• Ignition switch: ON (Engine stopped) • Closed throttle position is tested when throttle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

CONSULT (Cont'd)

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

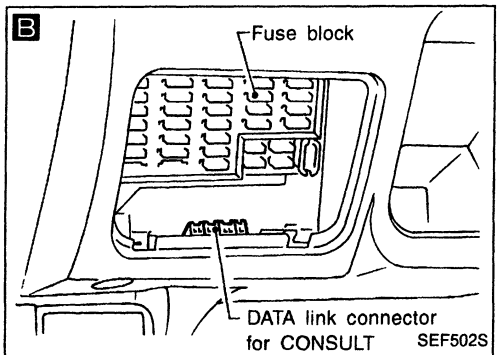
EC

A



SEF142I

B



SEF502S

C

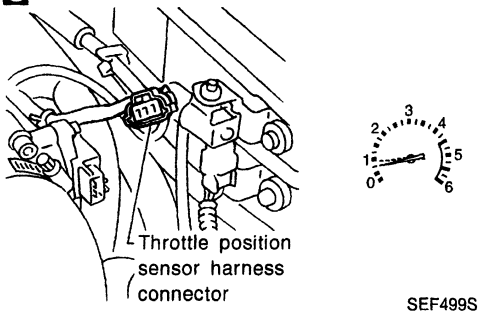
■ IGN TIMING ADJ ■ □

IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING START.
AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.

START

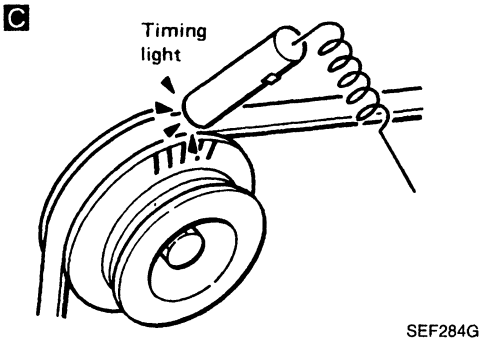
SEF555N

C



SEF499S

C



SEF284G

Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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

A

BEFORE STARTING

1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:

- Harness connectors for improper connections
- Vacuum hoses for splits, kinks, or improper connections
- Wiring for improper connections, pinches, or cuts

B

CONNECT CONSULT TO THE VEHICLE.

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu.

DOES ENGINE START?

No → Go to E

Yes

C

CHECK IGNITION TIMING.

1. Warm up engine sufficiently.
2. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
3. Touch "START".
4. Check ignition timing at idle using timing light.

Ignition timing:
15° ± 2° BTDC

NG → Adjust ignition timing by turning distributor.

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

Ignition timing:
15° ± 2° BTDC

OK

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)

D

■ IGN TIMING ADJ ■ □

IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING START.
AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.

START

SEF546N

E

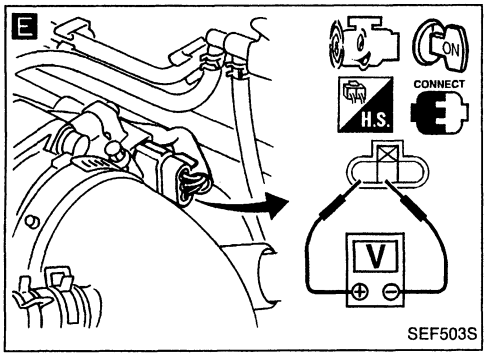
■ THRTL POS SEN ADJ ■ □

*** ADJ MONITOR ***

THRTL POS SEN	0.52V
========== MONITOR ==========	
CMPS•RPM (REF)	0rpm
CLSD THL/POSI	ON

SEF842S

E



SEF503S

Ⓐ

D

CHECK IDLE ADJ. SCREW INITIAL SET RPM.

1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine speed fall to **700 ± 50 rpm?**

NG → Adjust engine speed by turning idle adjusting screw.

OR

Does engine run at **700 ± 50 rpm?**

OK

Reconnect throttle position sensor harness connector.

E

CHECK THROTTLE POSITION SENSOR IDLE POSITION.

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

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

OR

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

OK

RESET IDLE POSITION MEMORY.

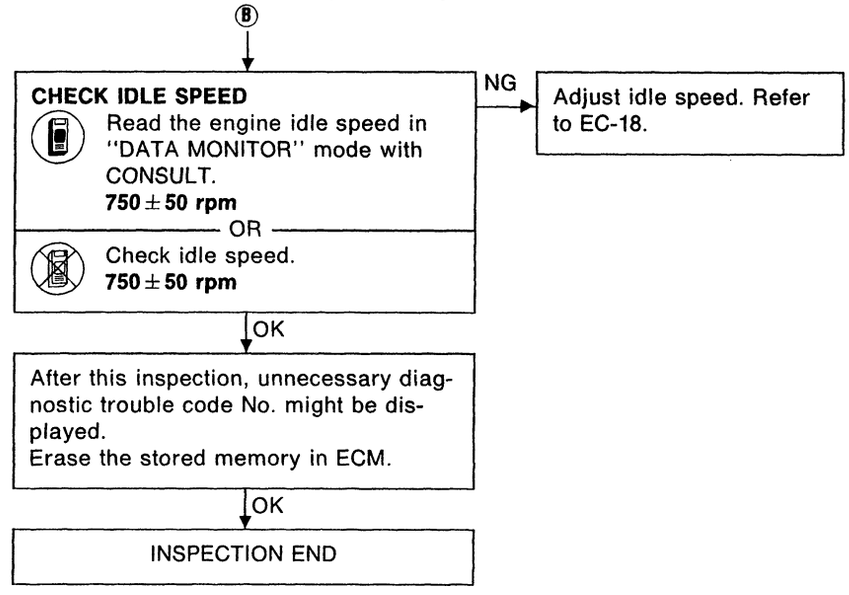
1. Warm up engine sufficiently and stop.
2. Select "CLSD THL/POSI" in "DATA MONITOR" mode with CONSULT before stopping engine.
3. Turn ignition switch "ON".
4. Turn ignition switch "OFF" and wait at least 5 seconds.
5. Repeat steps 2. and 3. until "CLSD THL/POSI" in "DATA MONITOR" mode with CONSULT changes to "ON".
6. Repeat steps 2. and 3. 20 times.

Ⓑ

(Go to next page)

EC

Basic Inspection (Cont'd)



CONSULT Reference Value in Data Monitor Mode

Remarks:

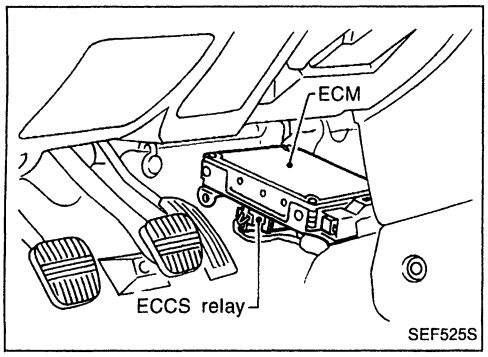
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  (i.e., Adjust ignition timing with a timing light before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

EC

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

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

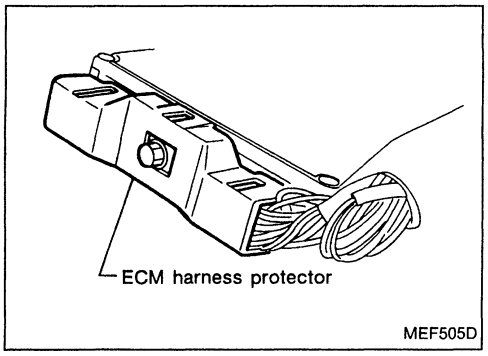
MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
LOAD SIGNAL	• Engine: Running	Rear window defogger or headlamp "ON"	ON
		Except the above	OFF
AMB TEMP SW	• Ignition switch: ON • Compare ambient temperature with the following:	Below 23.5°C (74°F)	OFF
		Above 23.5°C (74°F)	ON
INJ PULSE	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: "N" • No-load	Idle	2.5 - 3.7 msec.
		2,000 rpm	1.9 - 2.8 msec.
IGN TIMING	ditto	Idle	13 - 15° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V	ditto	Idle	20 - 40%
		2,000 rpm	—
CAN/P CONT SV	ditto	Idle	0 step
		3,000 rpm	Approx. 100 step
A/F ALPHA	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	53 - 155%
AIR COND RLY	• Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	• Ignition switch is turned to ON (Operates for 5 seconds) • Engine running and cranking • When engine is stopped (stops in 1.0 seconds)		ON
	• Except as shown above		OFF
COOLING FAN	• After warming up engine, idle the engine. • Air conditioner switch: OFF • Vehicle stopped	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	LOW



ECM Terminals and Reference Value

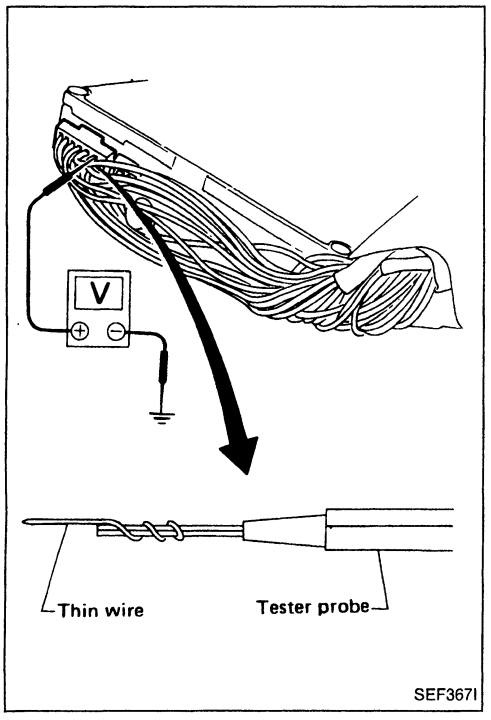
PREPARATION

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



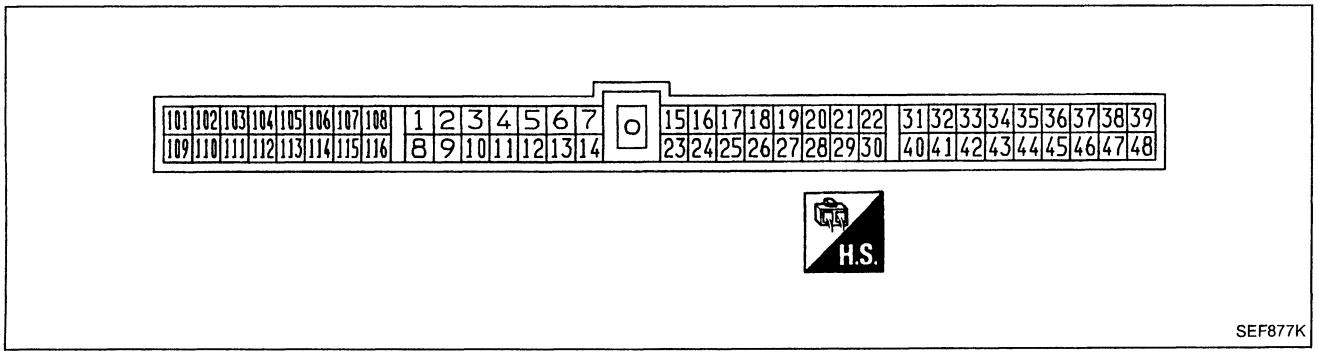
2. Remove ECM harness protector.

EC



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

ECM HARNESS CONNECTOR TERMINAL LAYOUT



ECM Terminals and Reference Value (Cont'd)

ECM inspection table

*Data are reference values.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	*DATA
1	W/B	Ignition signal	Engine is running. └ Idle speed	0.2 - 0.3V
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.5V
2	L/OR	Tachometer	Engine is running. └ Idle speed	Approximately 0.9V
3	GY/R	Ignition check	Engine is running. └ Idle speed	Approximately 13V
4	W/G	ECCS relay (Self-shut-off)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds after turning ignition switch "OFF" and thereafter	BATTERY VOLTAGE (11 - 14V)
6	B/W	ECCS ground	Engine is running. └ Idle speed	Engine ground
7	G/B	Data link connector for CONSULT	Engine is running. └ Idle speed and CONSULT is connected and turned on. (DATA MONITOR screen)	Approximately 0V
14	G/W			Approximately 3.6V
15	GY/L			Approximately 0V
23	G/R			Approximately 0V
9	LG/R	Cooling fan relay (Low speed)	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating.	Approximately 0V
11	Y	Air conditioner relay	Engine is running. └ Both A/C switch and blower fan switch are "ON". (Compressor is operating.)	Approximately 0V
			Engine is running. └ A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
13	B/W	ECCS ground	Engine is running. └ Idle speed	Engine ground
16	OR	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.3 - 1.7V
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	1.7 - 2.1V

ECM Terminals and Reference Value (Cont'd)

*Data are reference values.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	*DATA
17	W	Mass air flow sensor ground	Engine is running. └ Idle speed	Approximately 0V
18	G/Y	Engine coolant temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine coolant temperature.
19	W	Heated oxygen sensor	Engine is running. └ After warming up sufficiently	0 - Approximately 1.0V
20	Y	Throttle position sensor	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal released	0.35 - 0.65V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
21	B	Sensor's ground	Engine is running. └ Idle speed	Approximately 0V
22 30	L	Camshaft position sensor (Reference signal)	Engine is running.	Approximately 2.5V (AC range)
24	OR/L	Malfunction indicator lamp	Ignition switch "ON"	Approximately 0V
			Engine is running.	BATTERY VOLTAGE (11 - 14V)
27	W	Knock sensor	Engine is running. └ Idle speed	Approximately 2.5V
29	B	Sensor's ground	Engine is running. └ Idle speed	Approximately 0V
31 40	B/W	Camshaft position sensor (Position signal)	Engine is running.	Approximately 1V (AC range)
32	PU/R	Vehicle speed sensor	Ignition switch "ON" ├ Engine stopped and gear position is "Neutral position". └ While rotating drive wheel by hand	Varies from 0 to 5V
33	R	Electrical load signal	Engine is running. └ Idle speed (Electrical load: "OFF")	0V
			Engine is running. └ Idle speed (Rear window defogger or headlamp: "ON")	BATTERY VOLTAGE (11 - 14V)
34	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)

EC

ECM Terminals and Reference Value (Cont'd)

*Data are reference values.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	*DATA
35	G/OR	Neutral position switch	Ignition switch "ON" └ Neutral position	0V
			Ignition switch "ON" └ Except the above gear position	Approximately 5V
36	B/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	P/L	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	W/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
41	G	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower fan switch are "ON".	Approximately 0V
			Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
43	PU/W	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0V
			Engine is running. └ Steering wheel is not being turned.	Approximately 5V
45	R/W	Ambient air temperature switch	Ignition switch "ON" ├ Idle speed ├ Ambient air temperature is above 23.5°C (74°F) └ Air conditioner is operating	0V
			Ignition switch "ON" ├ Idle speed ├ Ambient air temperature is below 23.5°C (74°F) └ Air conditioner is operating	BATTERY VOLTAGE (11 - 14V)
46	W/L	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
48	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
101	R/B	Injector No. 1	Engine is running.	BATTERY VOLTAGE (11 - 14V)
103	G/B	Injector No. 3		
110	Y/B	Injector No. 2		
112	L/B	Injector No. 4		

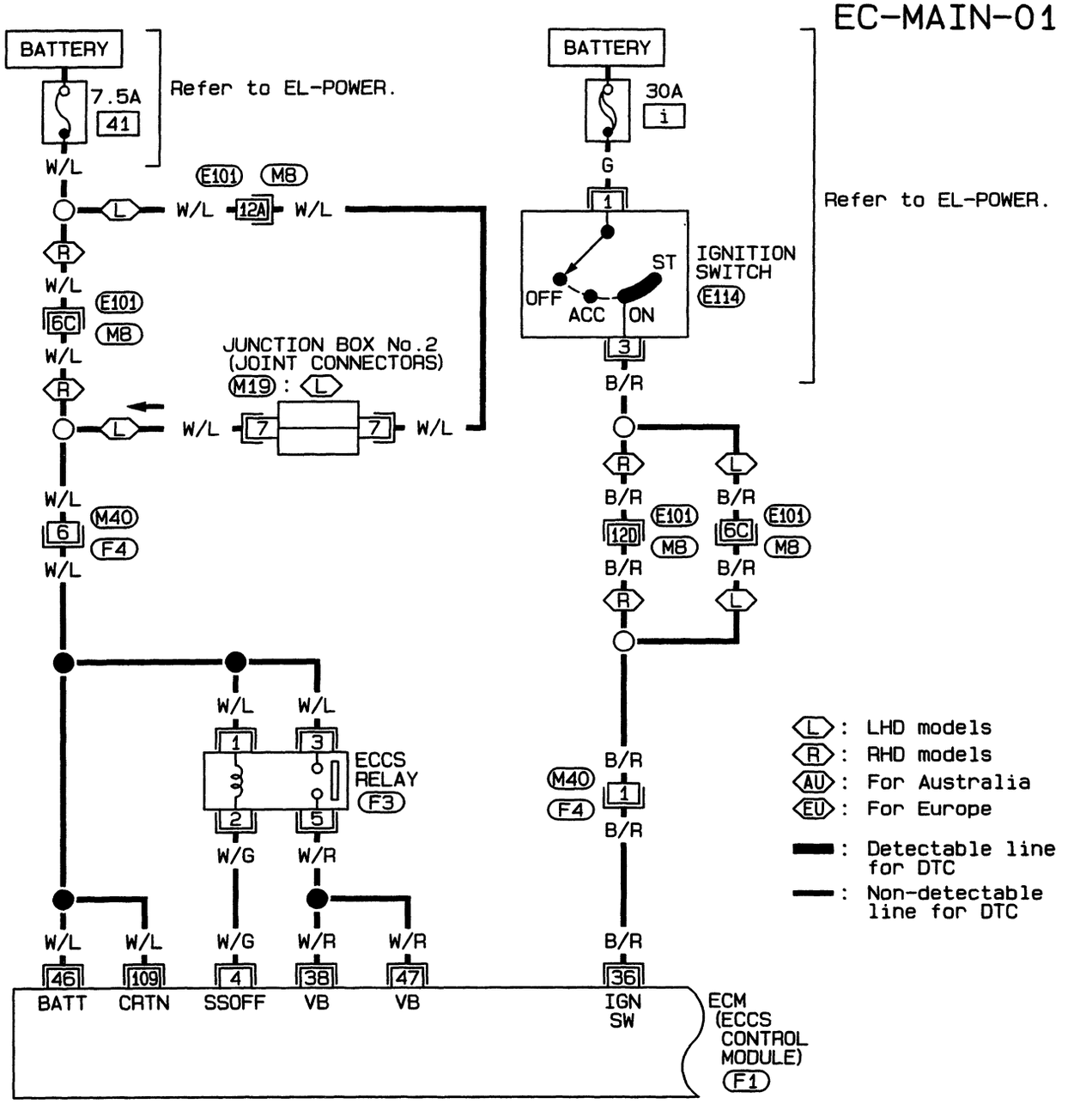
ECM Terminals and Reference Value (Cont'd)

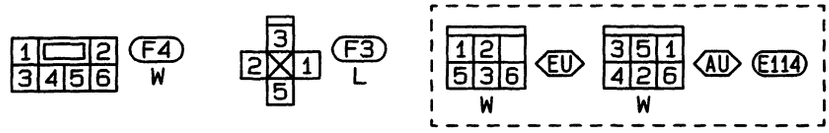
*Data are reference values.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	*DATA
106	B/P	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	Approximately 0V
			Ignition switch "ON" └ 5 seconds after turning ignition switch "ON" and thereafter	BATTERY VOLTAGE (11 - 14V)
107 108	B/Y	ECCS ground	Engine is running. └ Idle speed	Engine ground
109	W/L	Current return	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
111	OR	Heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,200 rpm.	Approximately 0.2V
			Engine is running. └ Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
113	SB	IACV-AAC valve	Engine is running. └ Idle speed	11 - 14V
			Engine is running. — Steering wheel is being turned. — Air conditioner is operating. — Rear window defogger switch is "ON". └ Lighting switch is "ON".	2 - 11V
114	P	EVAP canister purge volume control solenoid valve	Engine is running. └ Engine speed is 3,000 rpm.	7 - 8V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
116	B/Y	ECCS ground	Engine is running. └ Idle speed	Engine ground

EC

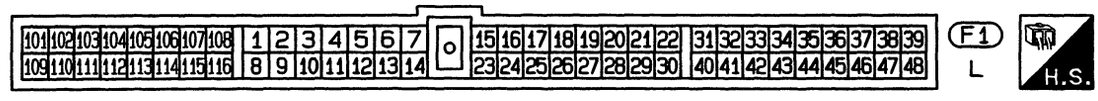
Main Power Supply and Ground Circuit





Refer to last page (Foldout page).

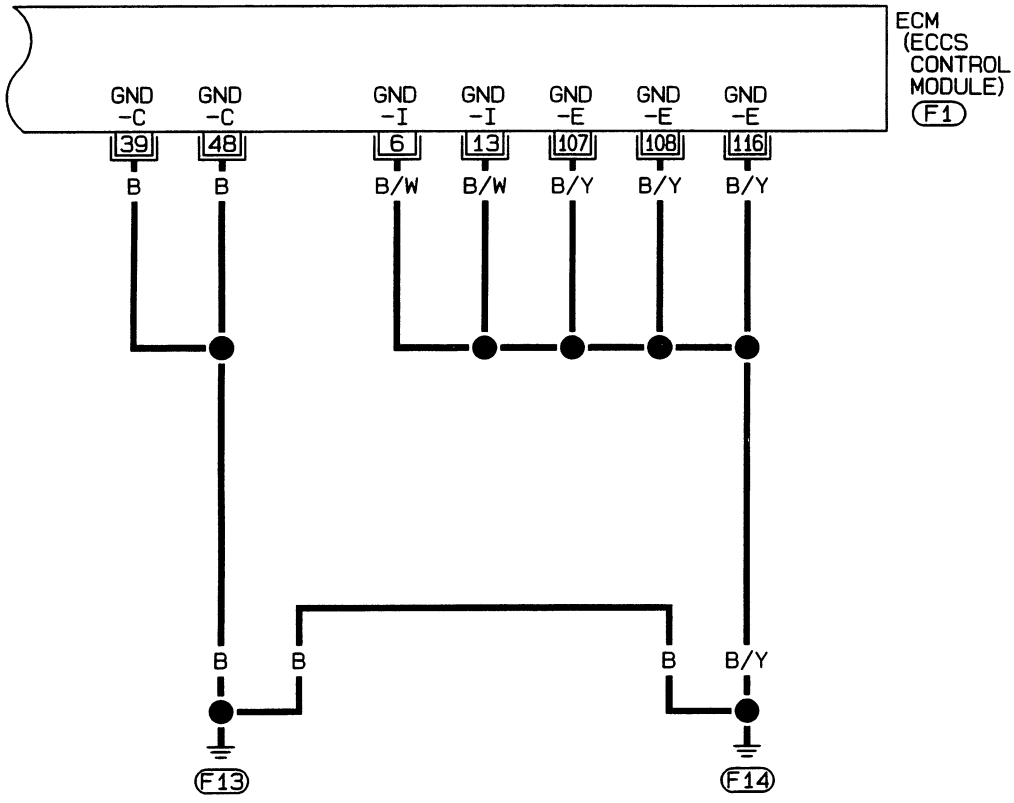
M8, E101, M19

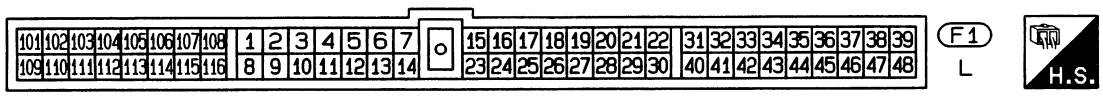


HEC212

EC-MAIN-02

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

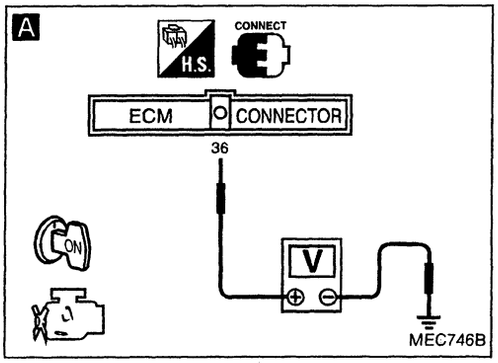




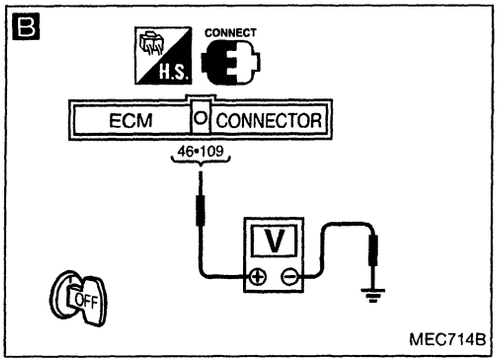
HEC027

Main Power Supply and Ground Circuit (Cont'd)

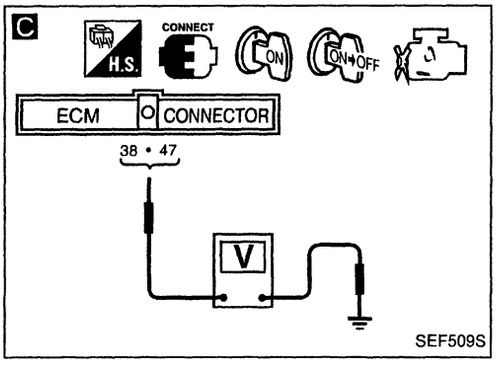
A

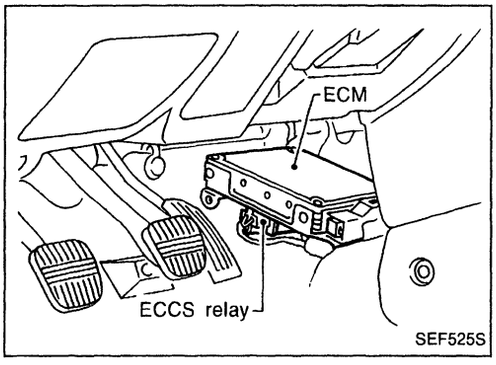


B



C





INSPECTION START

Start engine.
Is engine running?

No → A

Yes

A

CHECK POWER SUPPLY-I.
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal (36) and ground with CONSULT or tester.
   Voltage: Battery voltage

If NG, check the following.
- Harness connectors (F4), (M40)
- Harness connectors (M8), (E101)
- Harness for open or short between ECM and ignition switch

If NG, repair harness or connectors.

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

B

CHECK POWER SUPPLY-II.
1. Stop engine.
2. Check voltage between ECM terminals (46), (109) and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F4), (M40)
- Harness connectors (M8), (E101)
- Junction box No. 2 (M19)
- 7.5A fuse
- Harness for open or short between ECM and battery

If NG, repair harness or connectors.

OK

C

CHECK POWER SUPPLY-III.
1. Turn ignition switch "ON" and then "OFF".
2. Check voltage between ECM terminals (38), (47) and ground with CONSULT or tester.
   Voltage:
   After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

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

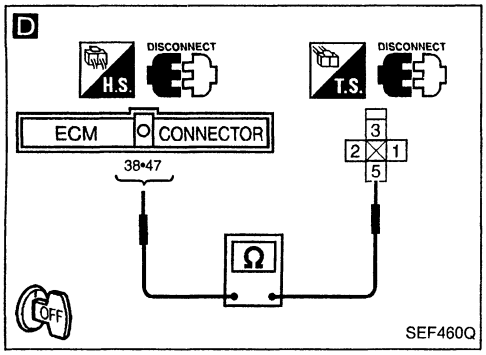
Case-1: Battery voltage does not exist.
Case-2: Battery voltage exists for more than a few seconds.

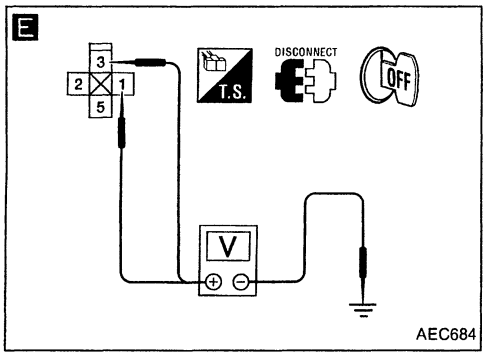
NG

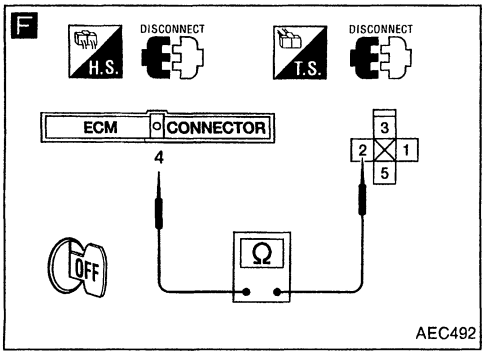
Case-1 / Case-2 → Go to G "CHECK ECCS RELAY" on next page.

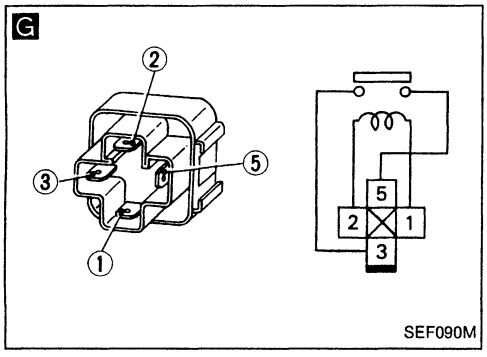
Ⓐ

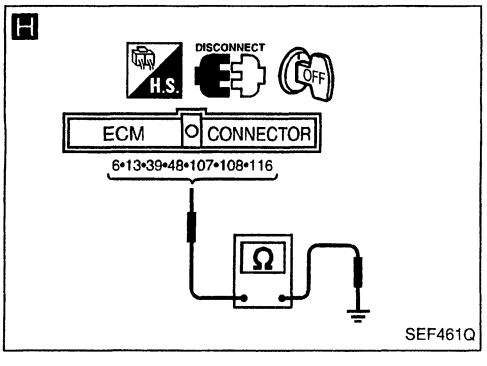
Main Power Supply and Ground Circuit (Cont'd)











Ⓐ

D

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.
1. Disconnect ECM harness connector.
2. Disconnect ECCS relay.
3. Check harness continuity between ECM terminals ㊳, ㊼ and terminal ⑤.

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

NG → Repair harness or connectors.

OK ↓

E

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

Voltage: Battery voltage

NG → Check the following.
- Harness for open or short between ECCS relay and harness connector (F4)

If NG, repair harness or connectors.

OK ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
Check harness continuity between ECM terminal ④ and terminal ②.

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

NG → Repair harness or connectors.

OK ↓

G

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

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

NG → Replace ECCS relay.

OK ↓

H

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminals ⑥, ⑬, ㊴, ㊽, (107), (108), (116) and engine ground.

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

NG → Repair harness or connectors.

OK ↓

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

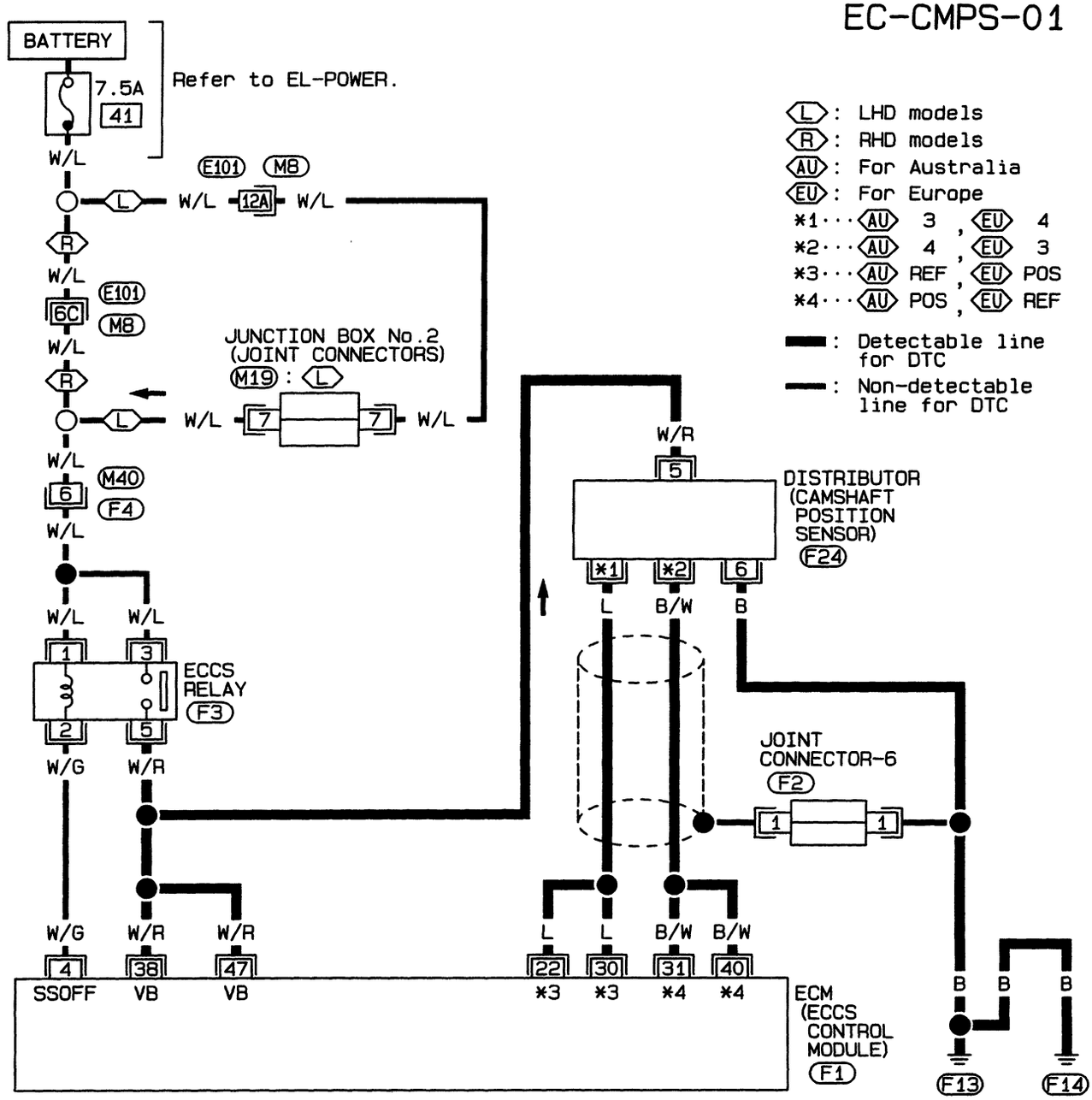
↓

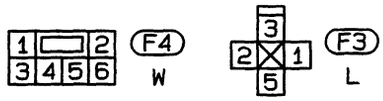
INSPECTION END

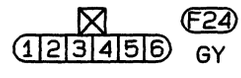
EC

Camshaft Position Sensor (CMPS)

EC-CMPS-01



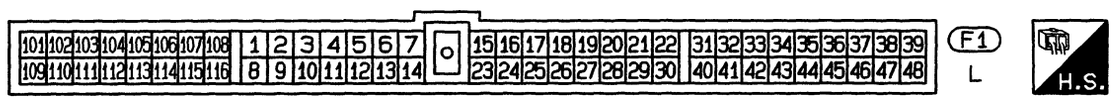






Refer to last page (Foldout page).

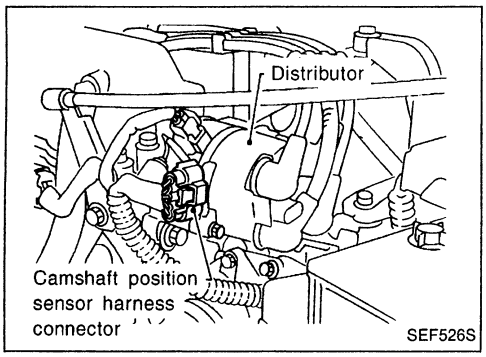
M8, E101, M19

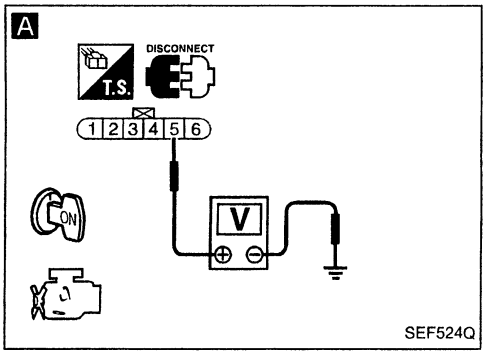


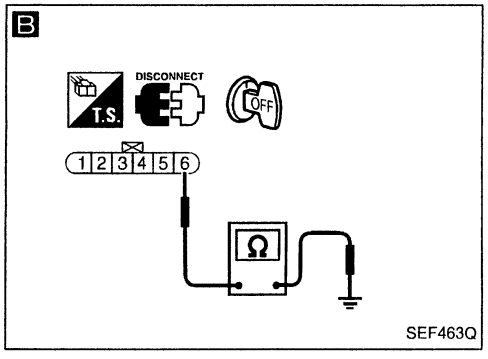
HEC214

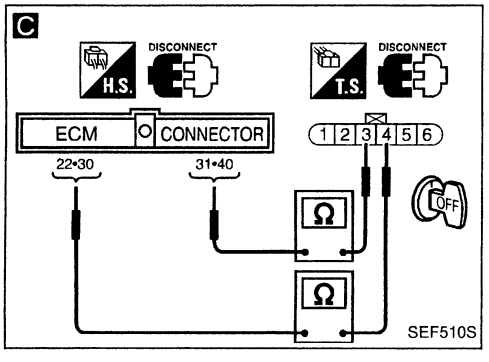
Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

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

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

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.
3. Check harness continuity between terminal ⑥ and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connector.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between terminal ③ and ECM terminals ㉛, ㊵, terminal ④ and ECM terminals ㉒, ㉚.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace camshaft position sensor.

OK ↓

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

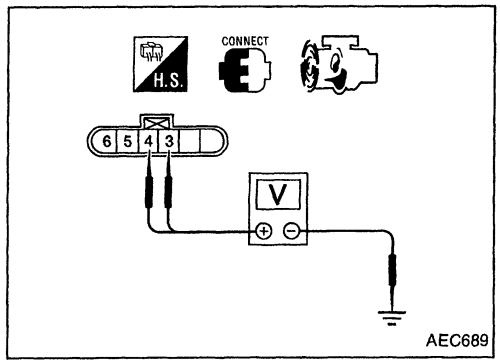
Trouble is not fixed. ↓

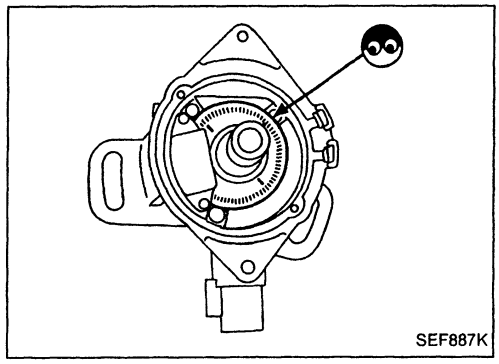
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

EC





Camshaft Position Sensor (CMPS) (Cont'd)

COMPONENT INSPECTION

Camshaft position sensor

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

Condition	Terminal	Voltage (AC range)
Engine running at idle	③ and ground	Approximately 2.5V*
	④ and ground	Approximately 1V*

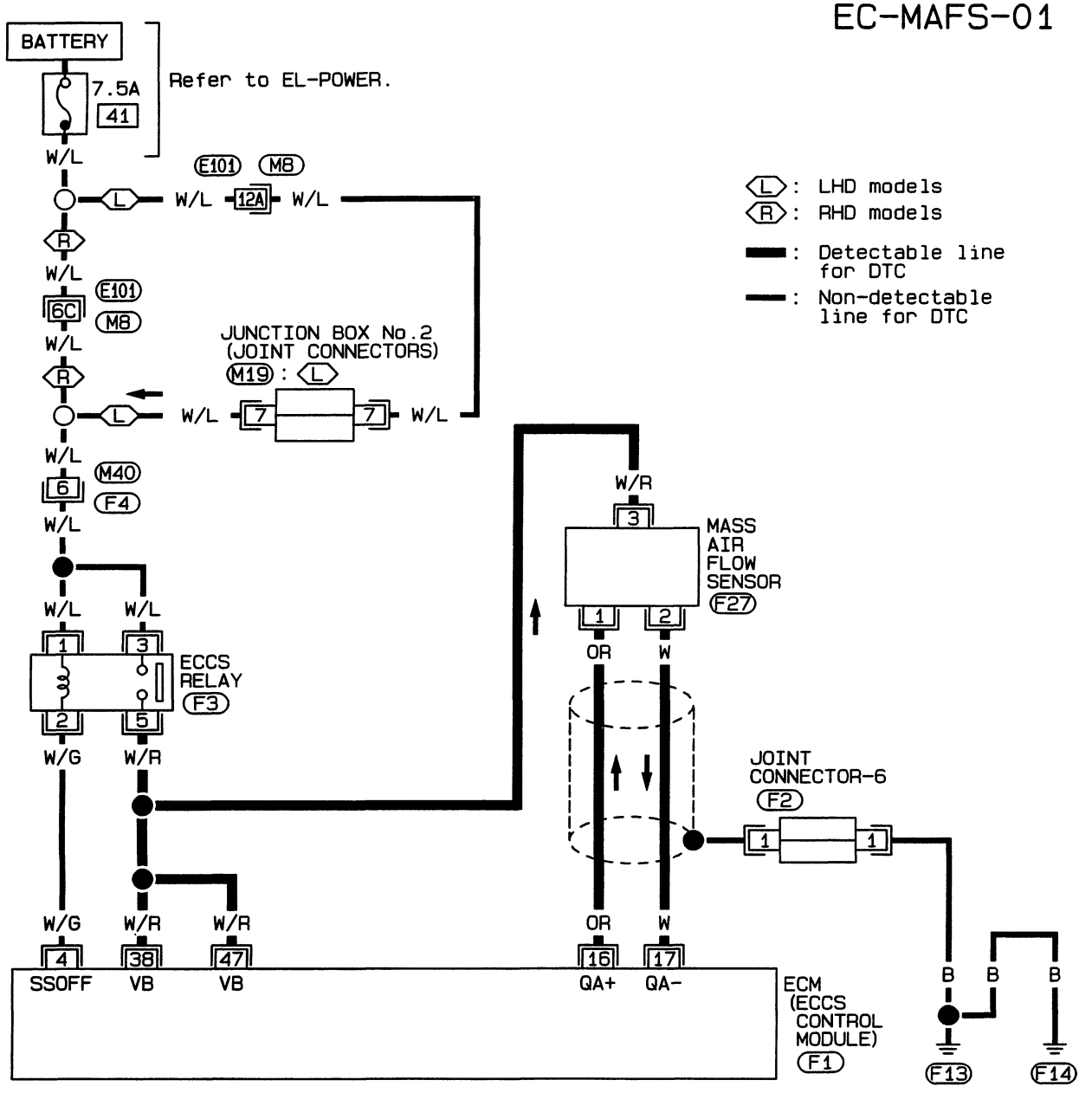
*: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

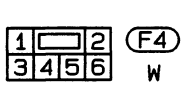
3. If NG, replace distributor assembly with camshaft position sensor.
4. Remove distributor cap. Visually check signal plate for damage or dust.

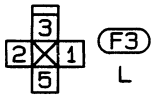
After this inspection, diagnostic trouble code No. 11 might be displayed with camshaft position sensor functioning properly. Erase the stored memory.

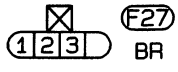
Mass Air Flow Sensor (MAFS)

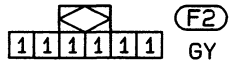
EC-MAFS-01





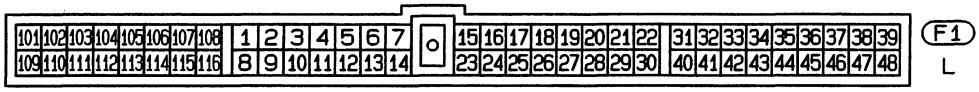






Refer to last page (Foldout page).

M8, E101
M19

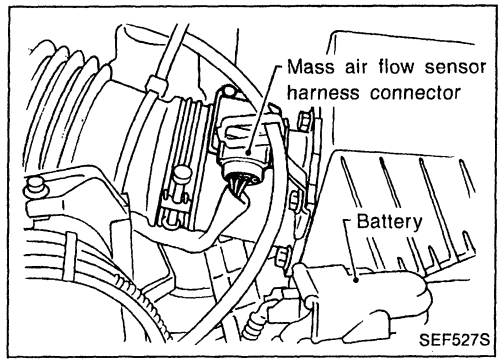




HEC215

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

DIAGNOSTIC PROCEDURE



INSPECTION START

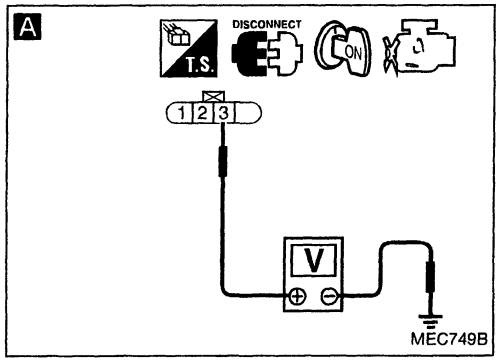
A

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

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

If NG, repair harness or connectors.

OK ↓

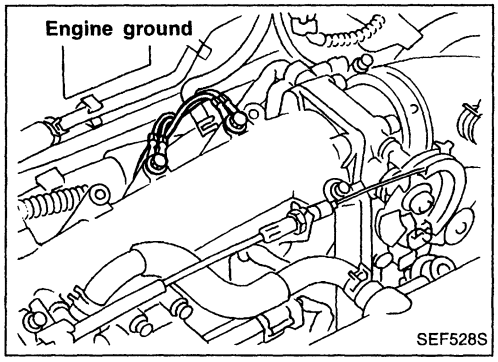


B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Loosen and retighten engine ground screws.
4. Check harness continuity between terminal ② and ECM terminal ⑰.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

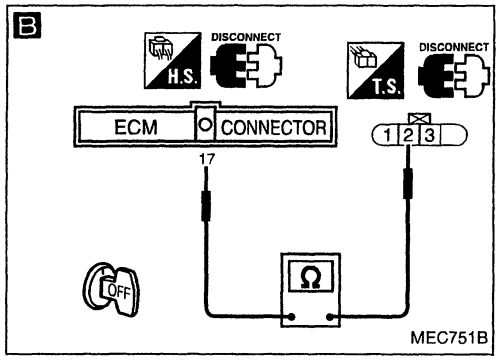


C

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between terminal ① and ECM terminal ⑯.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓



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

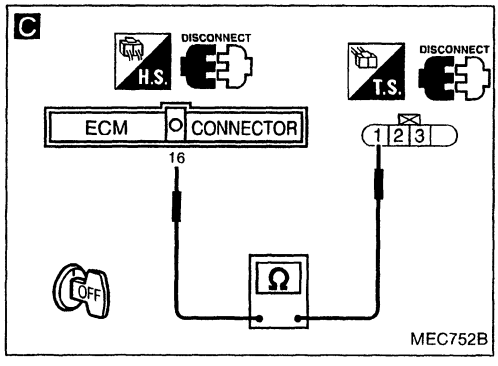
NG → Replace mass air flow sensor.

OK ↓

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

Trouble is not fixed. ↓

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

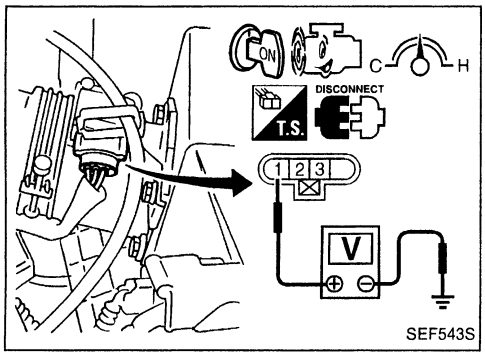


INSPECTION END

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

COMPONENT INSPECTION

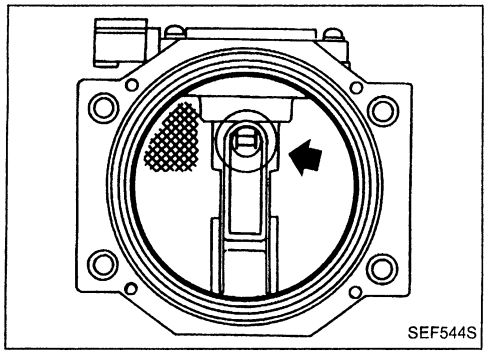
Mass air flow sensor



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

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up sufficiently.)	1.3 - 1.7

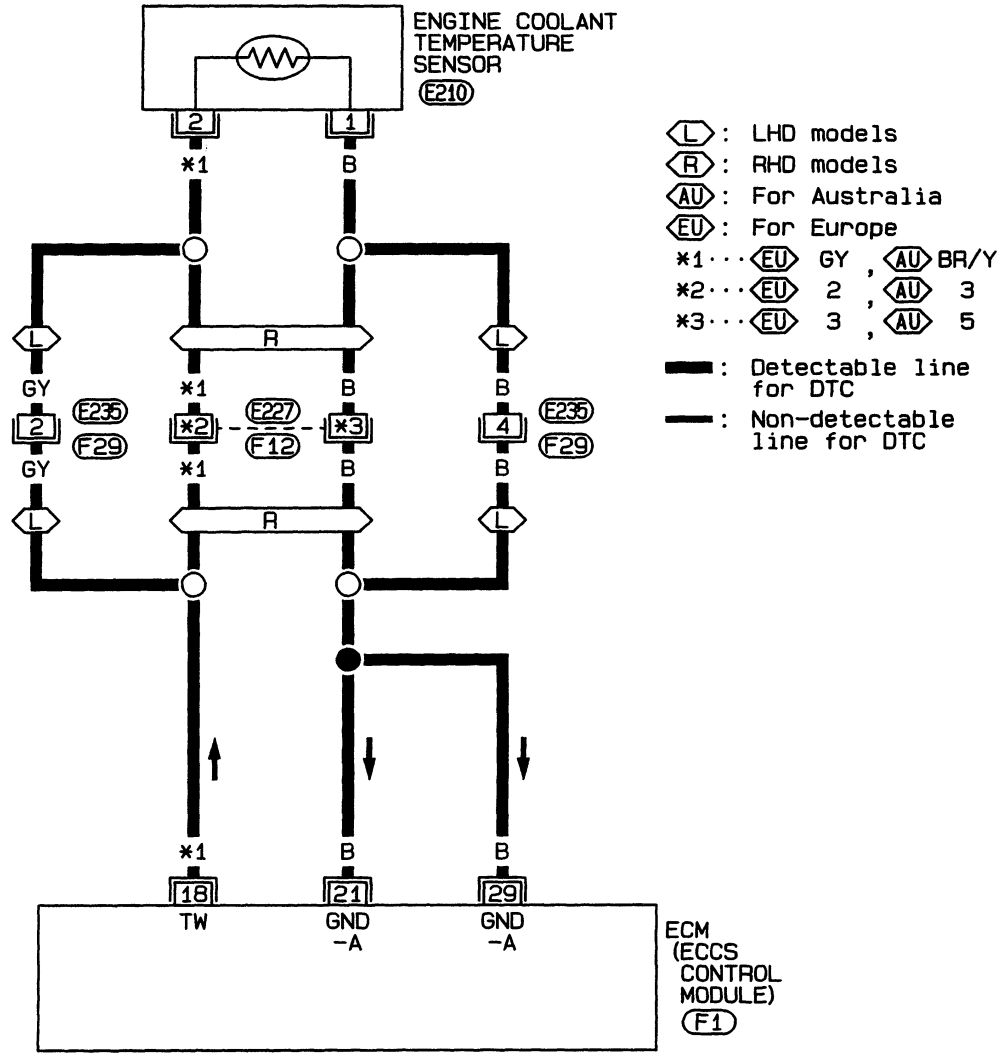
4. If NG, remove mass air flow sensor from air duct. Check hot wire for damage or dust.

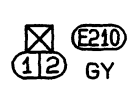


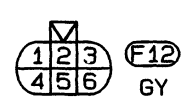
EC

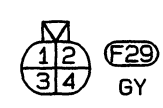
Engine Coolant Temperature Sensor (ECTS)

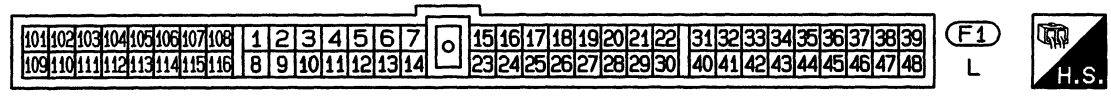
EC-ECTS-01







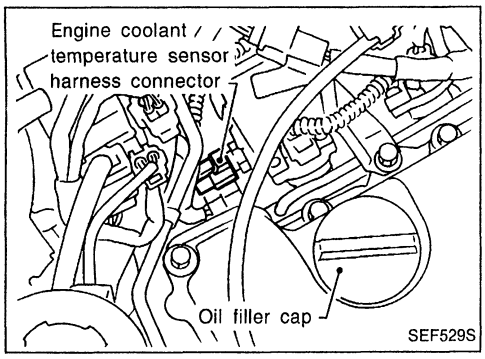


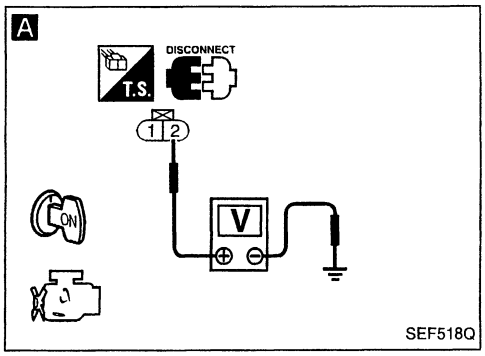


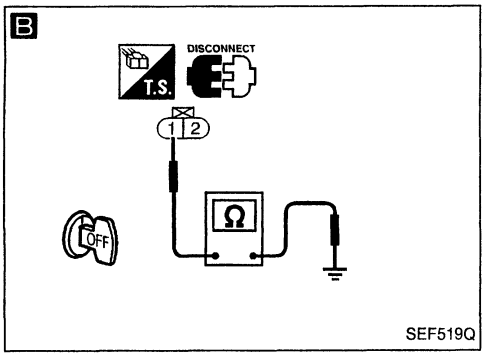
HEC216

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

NG → Check the following.
- Harness connectors (E227), (F12) or (E235), (F29)
- Harness for open or short between ECM and engine coolant temperature sensor

If NG, repair harness or connectors.

OK

B

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

NG → Check the following.
- Harness connectors (E227), (F12) or (E235), (F29)
- Harness for open or short between ECM and engine coolant temperature sensor

If NG, repair harness or connectors.

OK

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

NG → Replace engine coolant temperature sensor.

OK

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

Trouble is not fixed.

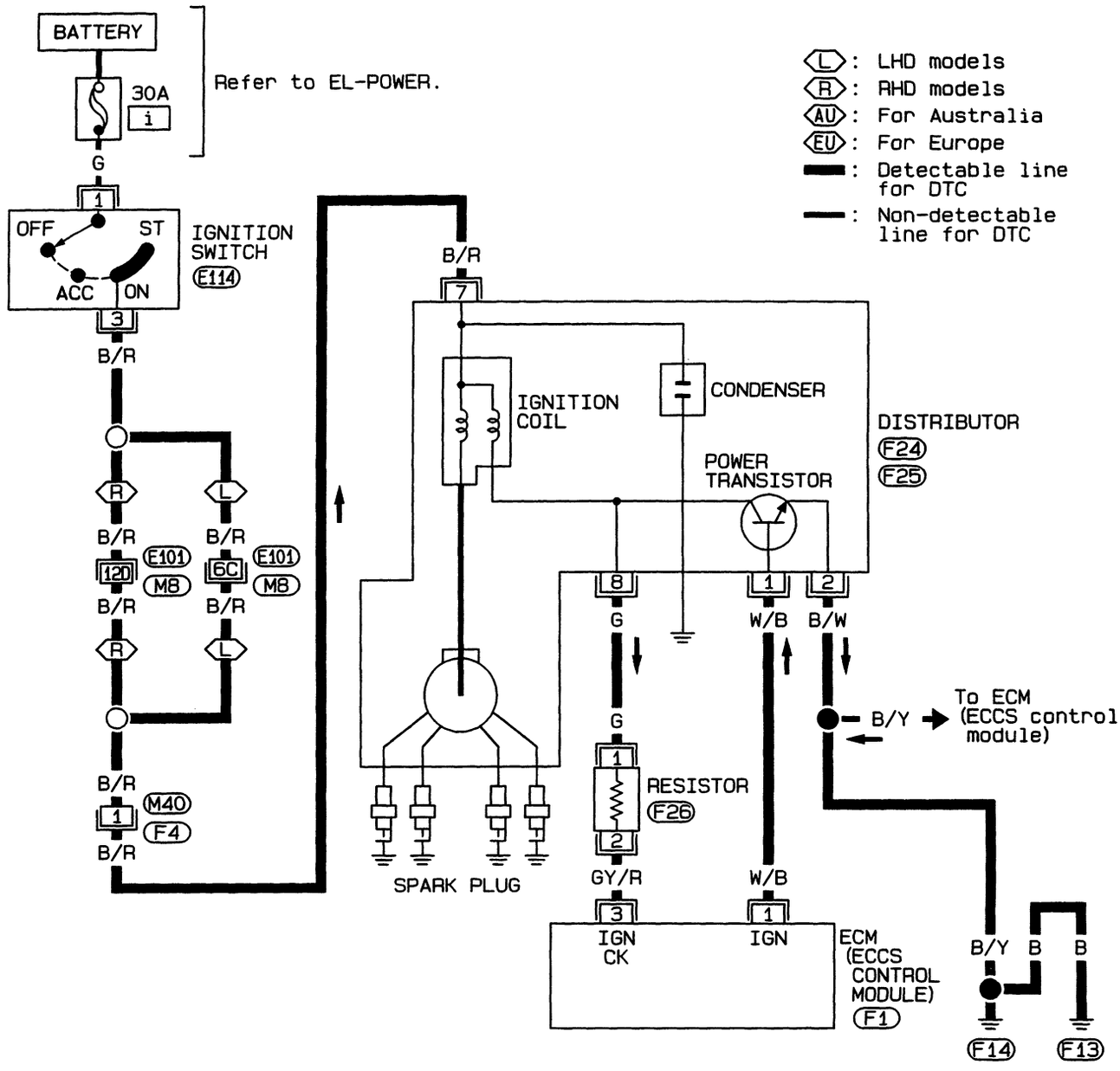
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

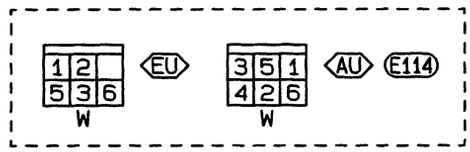
INSPECTION END

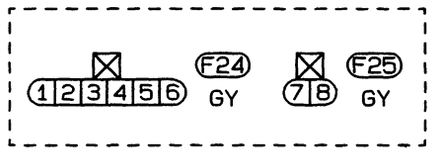
EC

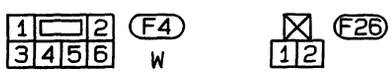
Ignition Signal

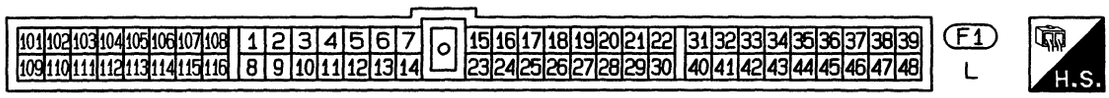
EC-IGN/SG-01











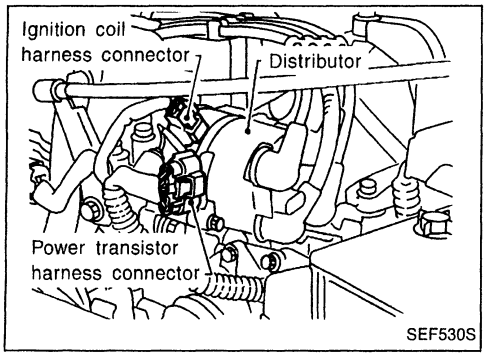
Refer to last page (Foldout page).

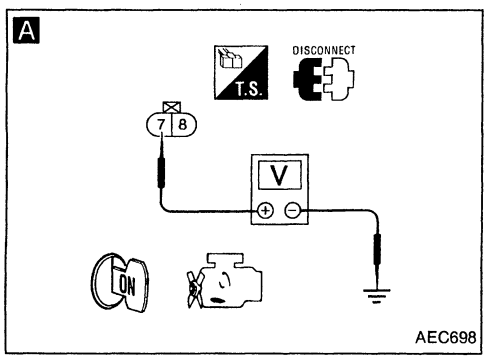
M8, E101

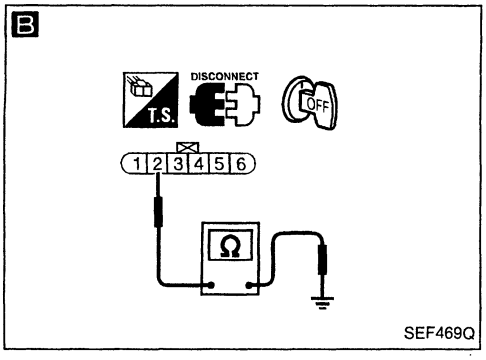
HEC217

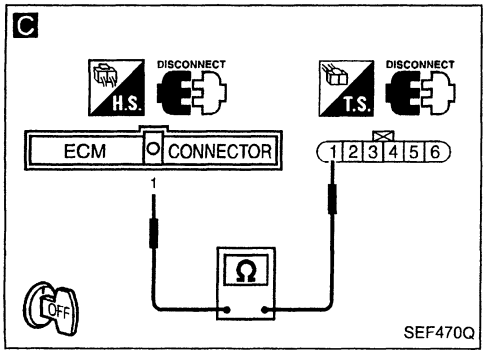
Ignition Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

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

Yes → Ⓐ

No

A

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

NG → Check the following.
- Harness connectors (F4), (M40)
- Harness connectors (M8), (E101)
- Harness for open or short between ignition coil and ignition switch

If NG, repair harness or connectors.

OK

B

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

NG → Repair harness or connectors.

OK

C

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

NG → Repair harness or connectors.

OK

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

NG → Replace malfunctioning component(s).

OK

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

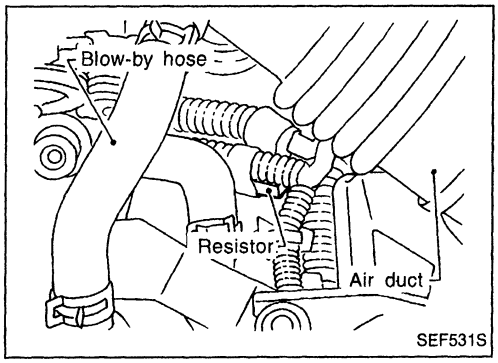
Trouble is not fixed.

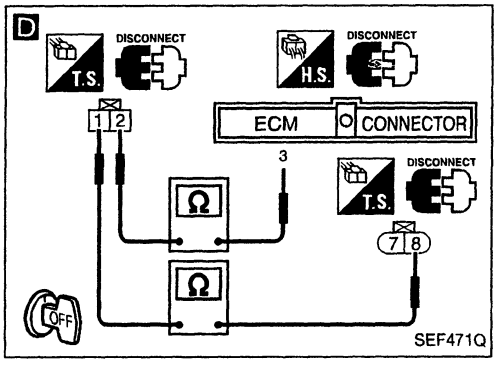
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

EC

Ignition Signal (Cont'd)





Ⓐ

D

CHECK INPUT SIGNAL CIRCUIT.

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

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Resistor).
Refer to "COMPONENT INSPECTION".

NG → Replace resistor.

OK ↓

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

Trouble is not fixed. ↓

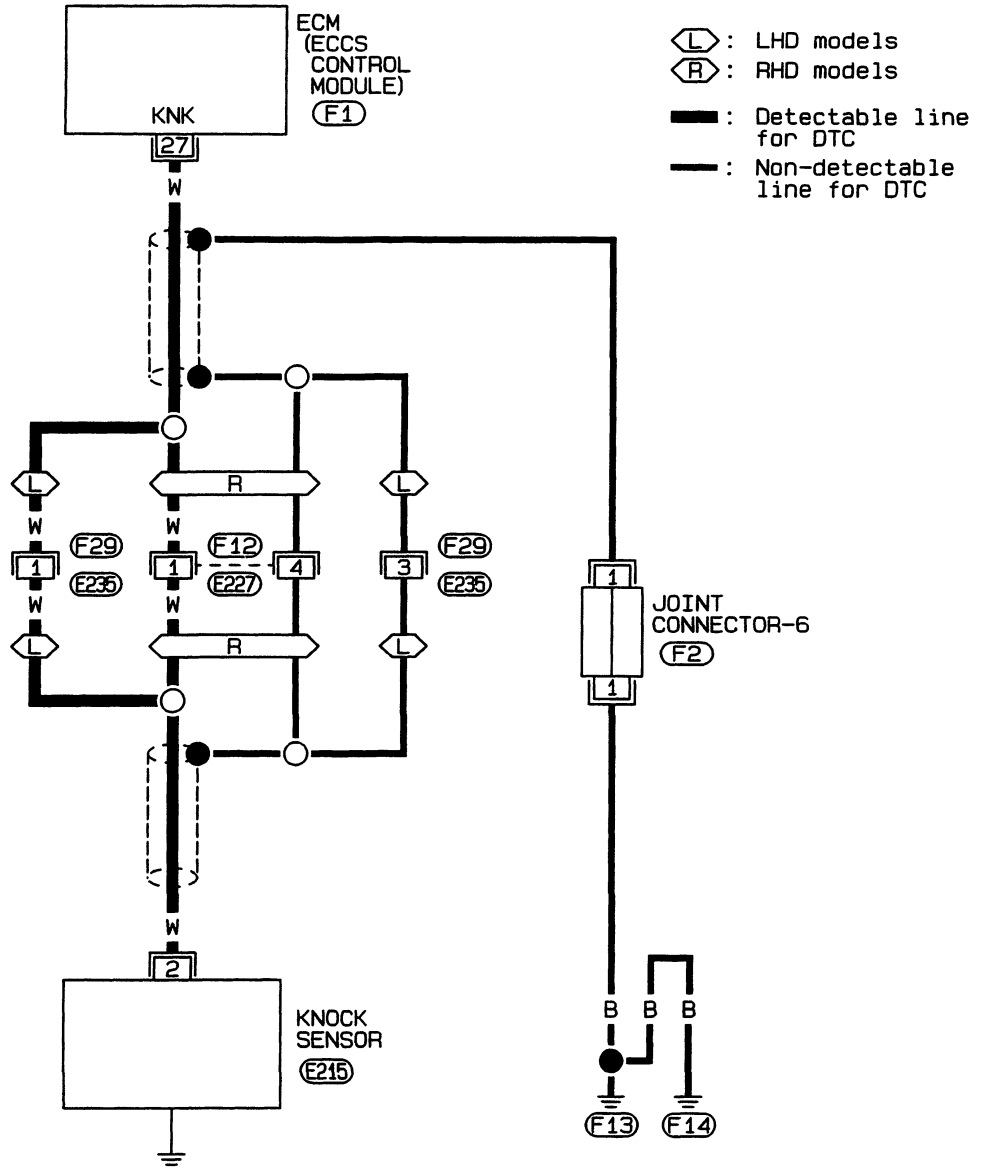
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

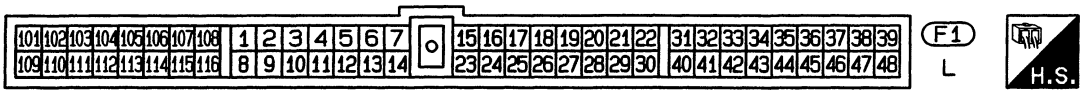
INSPECTION END

Knock Sensor (KS)

EC-KS-01



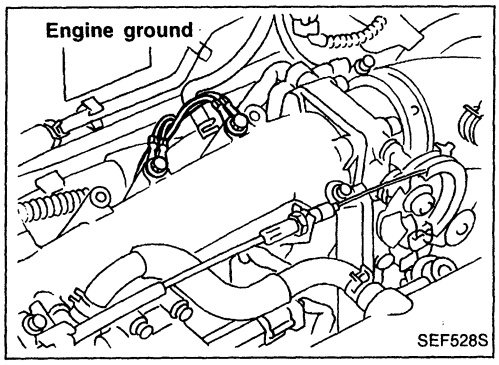


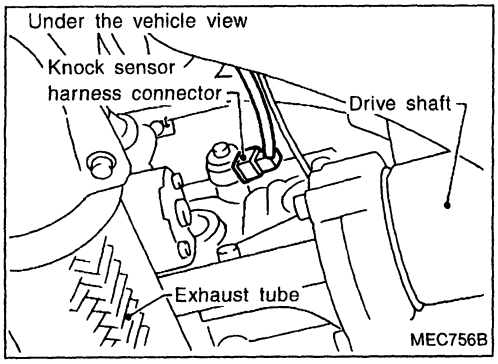


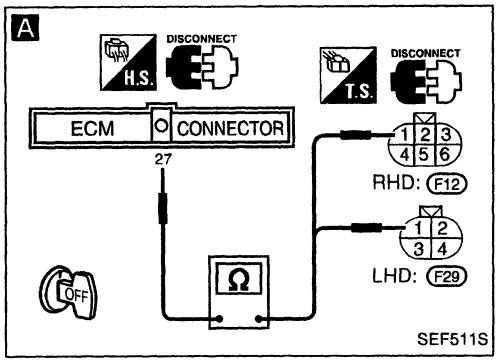
HEC218

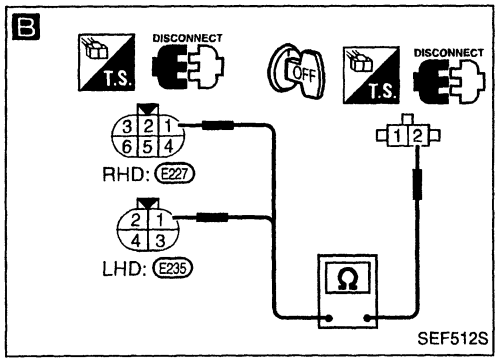
Knock Sensor (KS) (Cont'd)

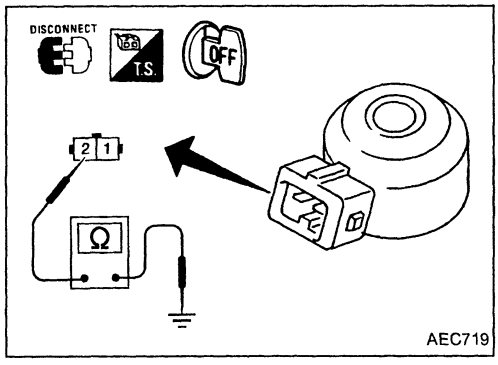
DIAGNOSTIC PROCEDURE











INSPECTION START

↓

Loosen and retighten engine ground screws.

↓

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Disconnect sub-harness connectors (F12), (E227) or (F29), (E235).
4. Check harness continuity between terminal ① and ECM terminal ㉗.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

B

CHECK SUB-HARNESS CIRCUIT.
1. Disconnect knock sensor harness connector.
2. Check harness continuity between knock sensor harness connector terminal ② and knock sensor sub-harness connector terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

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

NG → Replace knock sensor.

↓ OK

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

↓ Trouble is not fixed.

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

↓

INSPECTION END

COMPONENT INSPECTION

Knock sensor

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

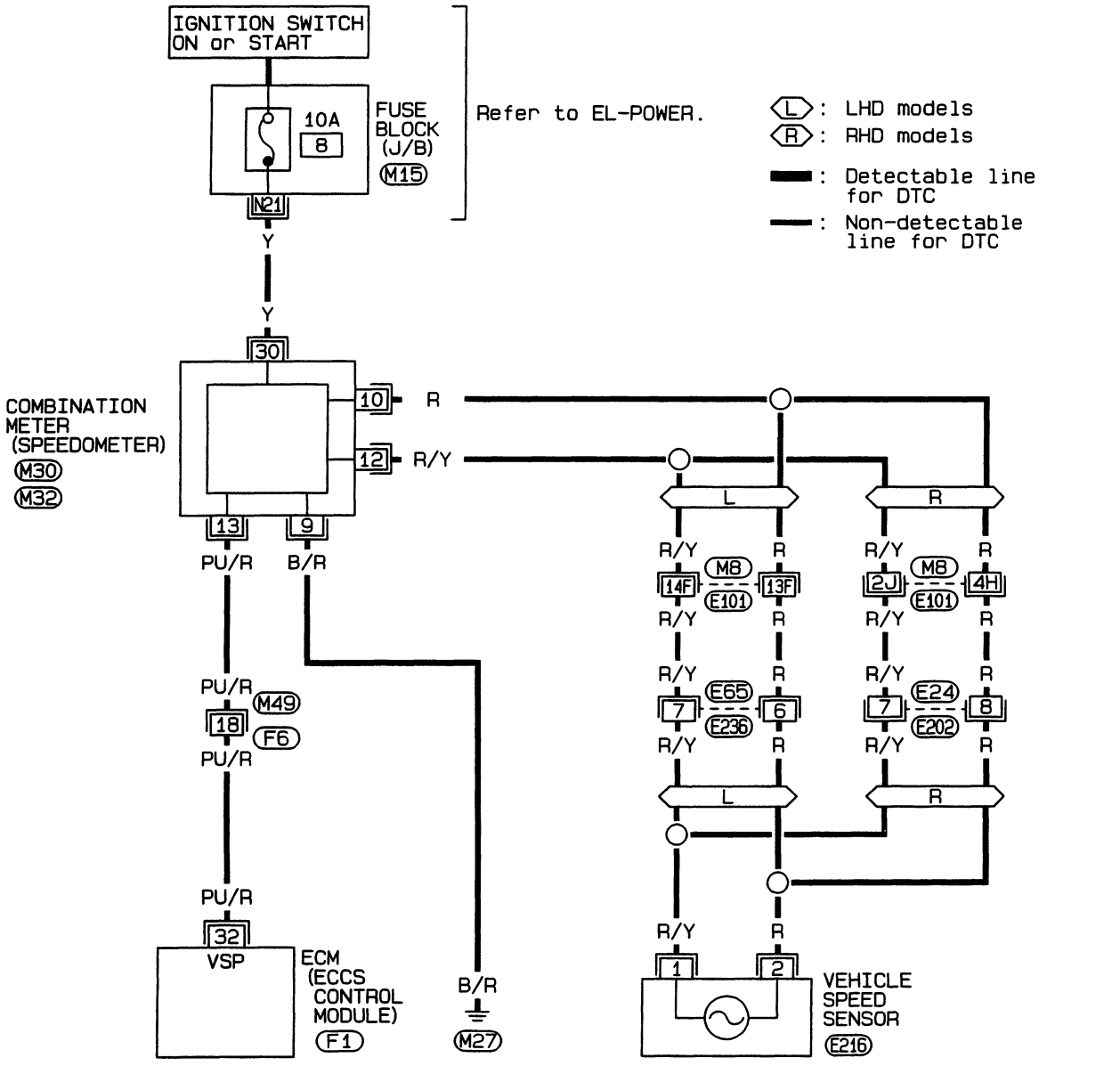
1. Disconnect knock sensor harness connector.
2. Check resistance between terminal ② and ground.
   Resistance: 500 - 620 kΩ [at 25°C (77°F)]

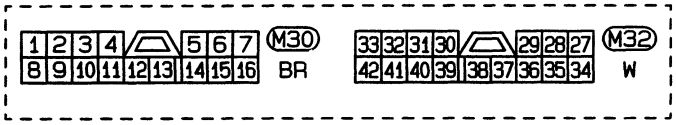
CAUTION:

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

Vehicle Speed Sensor (VSS)

EC-VSS-01

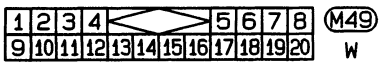


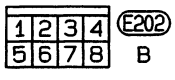


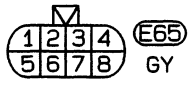


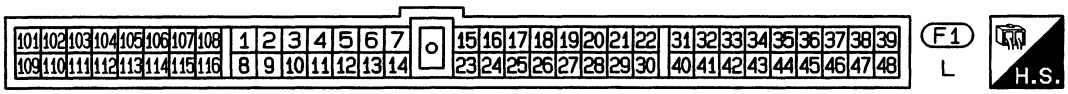
Refer to last page (Foldout page).

M8, E101
M15





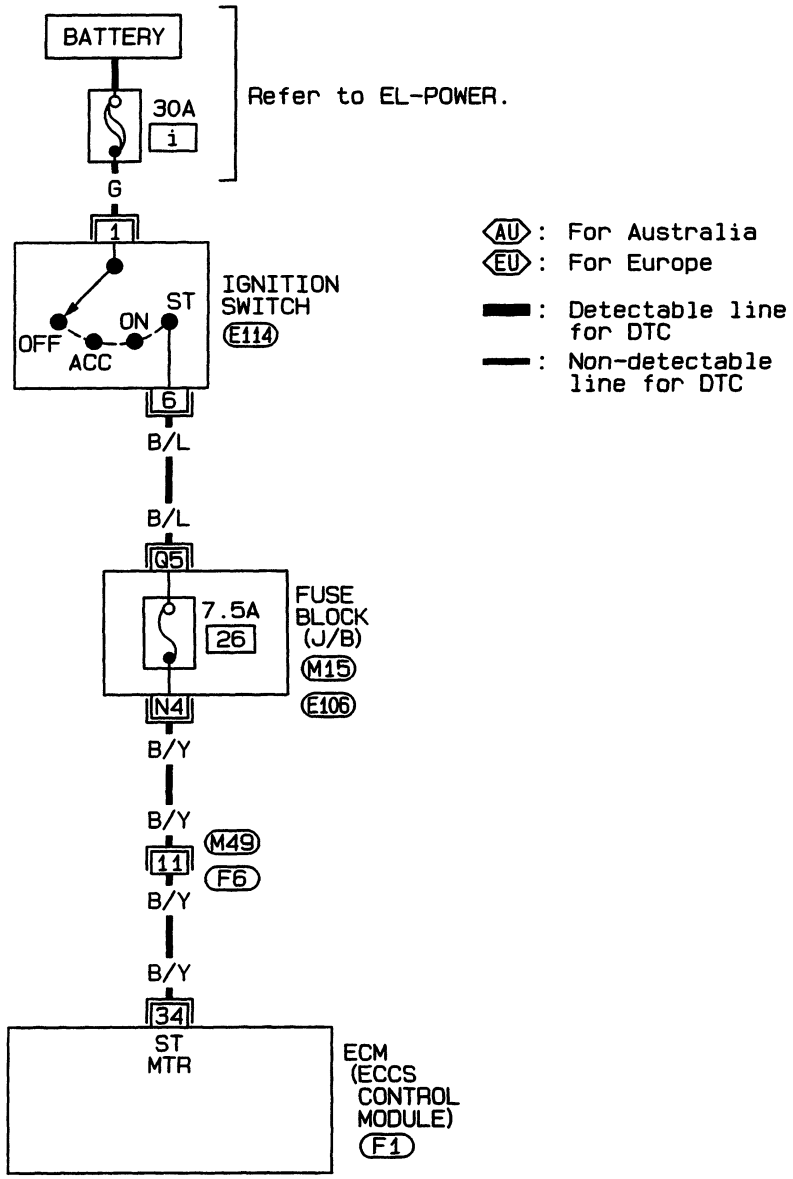


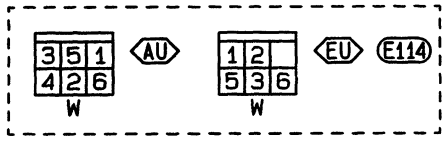


HEC220

Start Signal

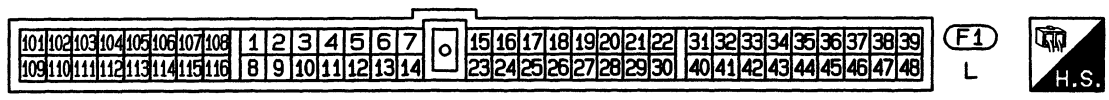
EC-S/SIG-01







Refer to last page (Foldout page).
M15, E106

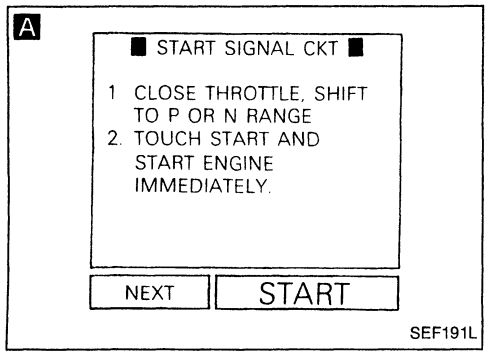


HEC221

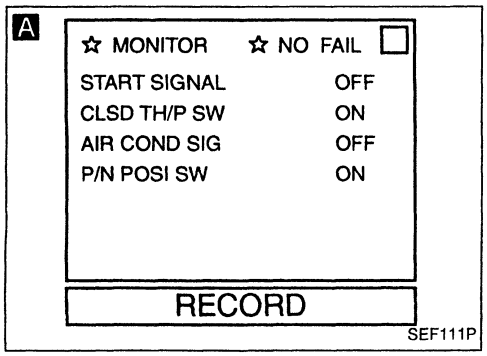
Start Signal (Cont'd)

DIAGNOSTIC PROCEDURE

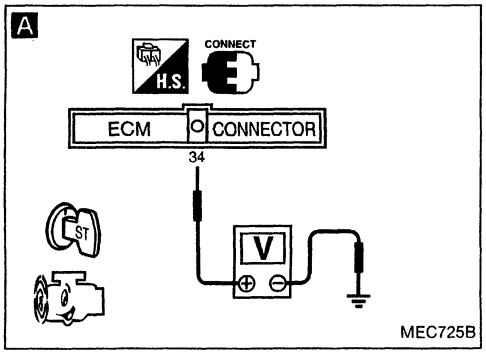
A



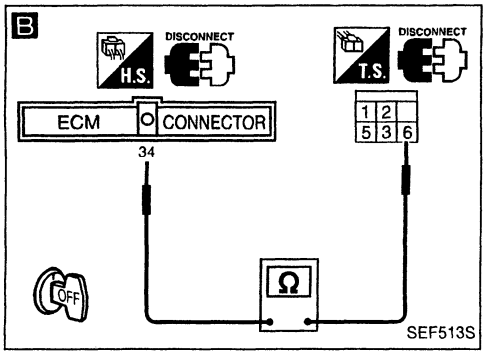
A



A



B



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 ㉞ and ground.

Voltage:
Ignition switch "START"
Battery voltage
Except above
Approximately 0V

OK → INSPECTION END

NG

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and ignition switch harness connector.
3. Check harness continuity between ECM terminal ㉞ and terminal ⑥.

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

NG → Check the following.
- Harness connectors (F6), (M49)
- Fuse block harness connectors (M15), (E106)
- 7.5A fuse
- Harness for open or short between ECM and ignition switch

If NG, repair harness or connectors.

OK

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

Trouble is not fixed.

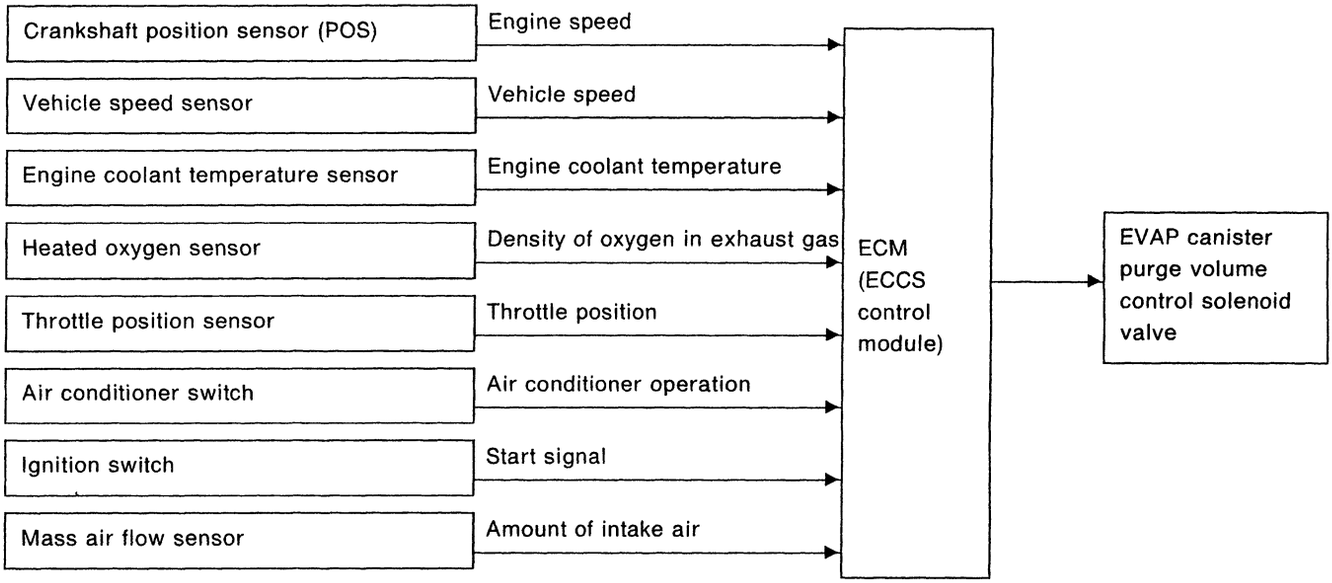
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

EC

EVAP Canister Purge Volume Control Solenoid Valve

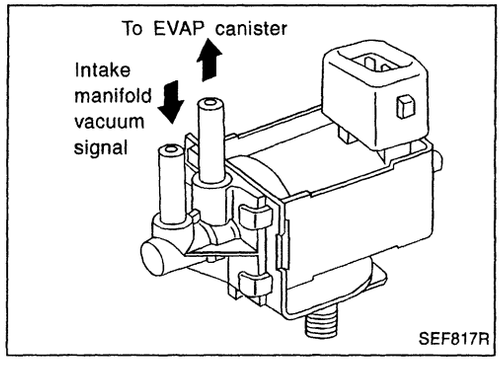
SYSTEM DESCRIPTION



This system controls the EVAP canister purge volume control solenoid valve in response to a signal (ON or OFF pulse) sent from ECM. The higher the ON-pulse ratio the solenoid valve receives, the greater the purge volume flow.
This system operates under the following conditions:

- During idling
  1) The mixture ratio feedback control is in operation when the coolant temperature is higher than 70°C (158°F).
  2) Engine is set at the closed throttle position.
  3) Air conditioning system is ON.

While the vehicle is being driven, the purge volume is controlled in response to engine speed and the fuel volume injected.

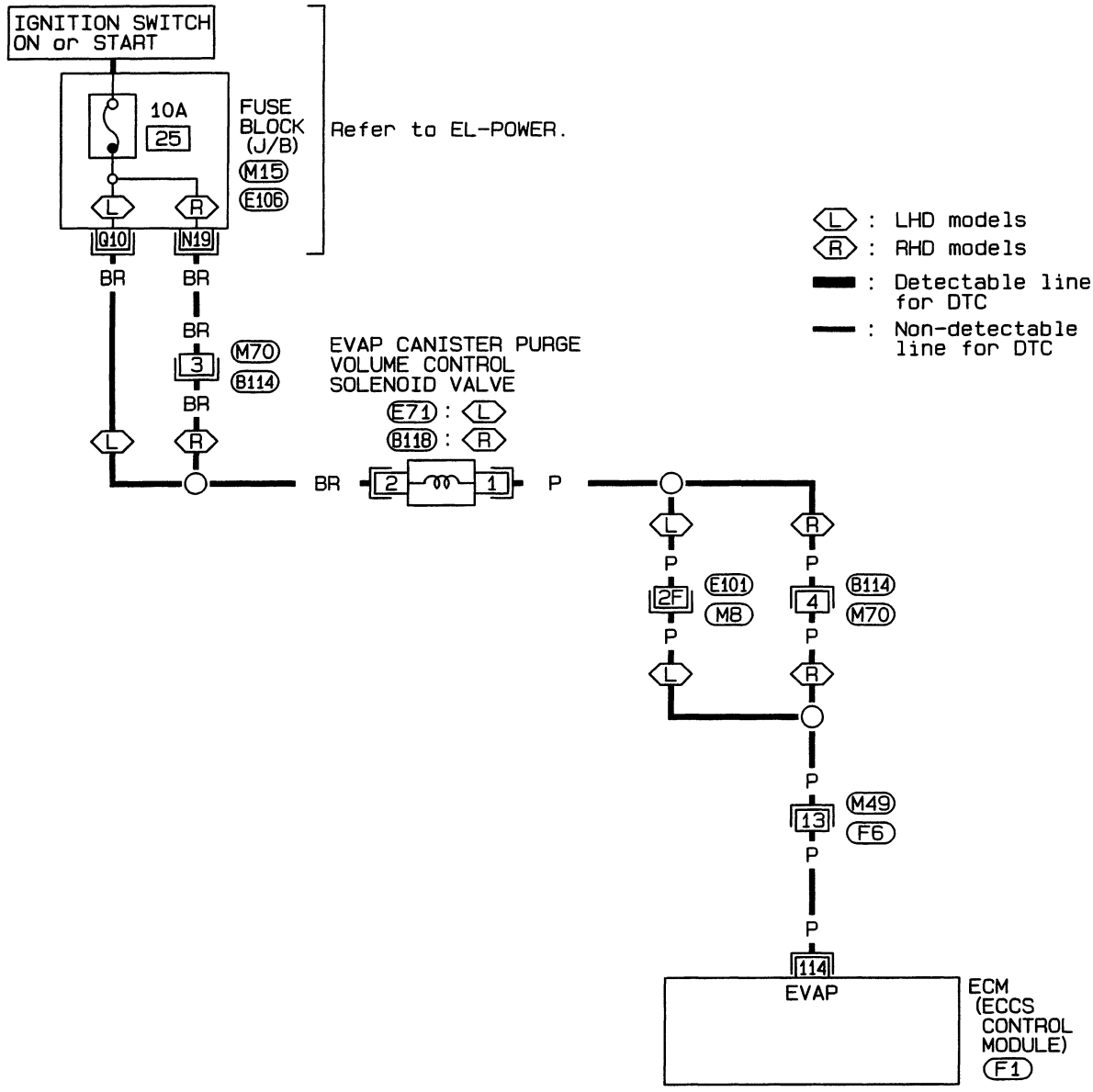


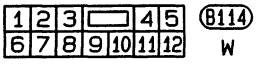
COMPONENT DESCRIPTION

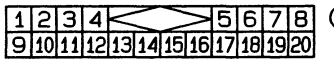
The EVAP canister purge volume control solenoid valve turns on or off in response to a signal (ON or OFF) sent from ECM. It changes the ON-OFF time ratio according to engine speed, controlling the EVAP canister purge volume.

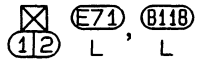
EVAP Canister Purge Volume Control Solenoid Valve (Cont'd)

EC-PGC/V-01





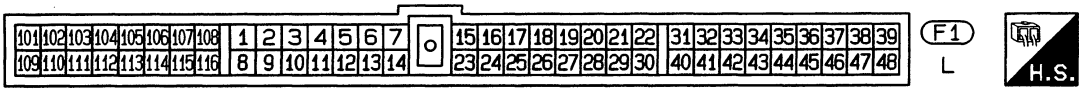




Refer to last page (Foldout page).

M8, E101

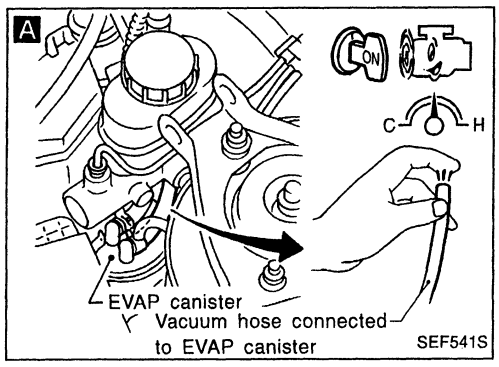
M15, E106

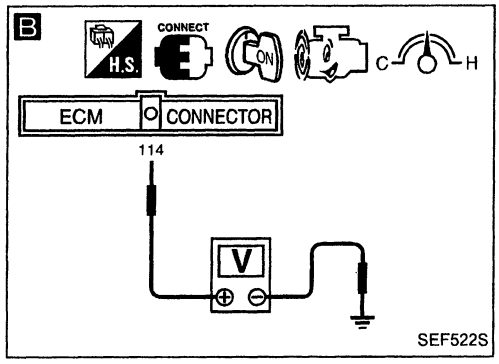


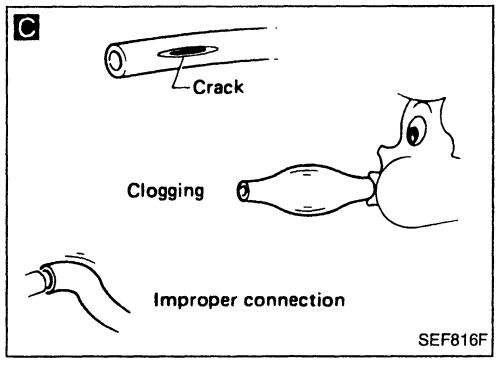
HEC222

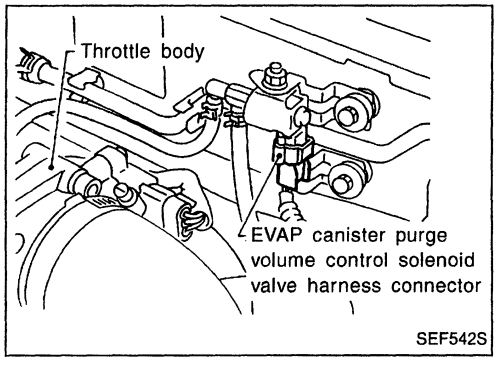
EVAP Canister Purge Volume Control Solenoid Valve (Cont'd)

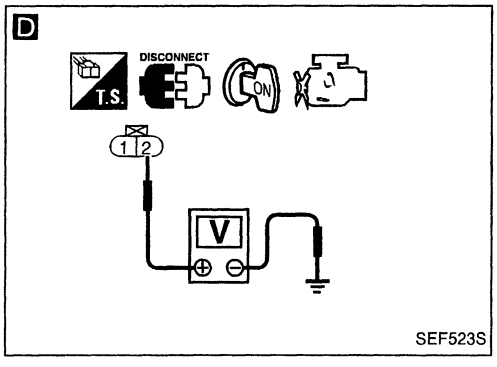
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK VACUUM SOURCE TO EVAP CANISTER.
1) Start engine and warm it up sufficiently.
2) Perform diagnostic test mode II (Self-diagnostic results). Make sure that diagnostic trouble code No. 55 is displayed.
3) Disconnect vacuum hose to EVAP canister.
4) Make sure that vacuum exists under the following conditions.

At idle:
Vacuum should not exist.
Keep engine speed at 3,000 rpm:
Vacuum should exist.

OK → CHECK COMPONENT. (EVAP canister) (See page EC-15.) If NG, replace EVAP canister.

NG ↓

B

CHECK CONTROL FUNCTION.
1) Check voltage between ECM terminal (114) and ground with CONSULT or tester under the following conditions.

Voltage:
At idle
Battery voltage
Keep engine speed at 3,000 rpm
Approximately 7 - 8V

OK → **C** Check vacuum hose for clogging, cracks or improper connection.

NG ↓

D

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect EVAP canister purge volume control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ② and ground with CONSULT or tester.

Voltage: Battery voltage

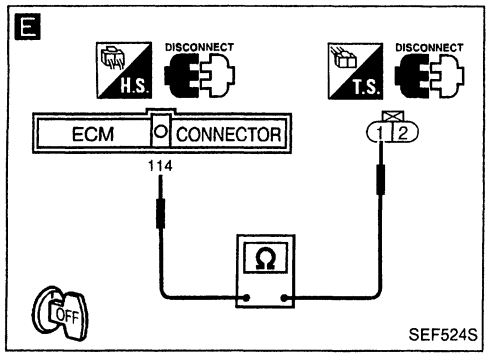
NG → Check the following.
- Harness connectors (M70), (B114) (RHD)
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

If NG, repair harness or connectors.

OK ↓

Ⓐ

EVAP Canister Purge Volume Control Solenoid Valve (Cont'd)



Ⓐ

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal (114) and terminal ①.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors (F6), (M49)
- Harness connectors (M8), (E101) (LHD)
- Harness connectors (M70), (B114) (RHD)
- Harness for open or short between ECM and EVAP canister purge volume control solenoid valve

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(EVAP canister purge volume control solenoid valve).
Refer to "COMPONENT INSPECTION" below.

NG → Replace EVAP canister purge volume control solenoid valve.

OK ↓

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

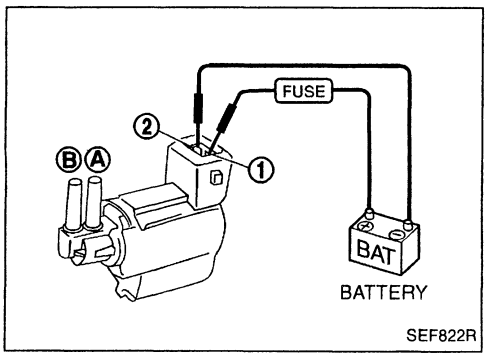
Trouble is not fixed. ↓

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

↓

INSPECTION END

EC



COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

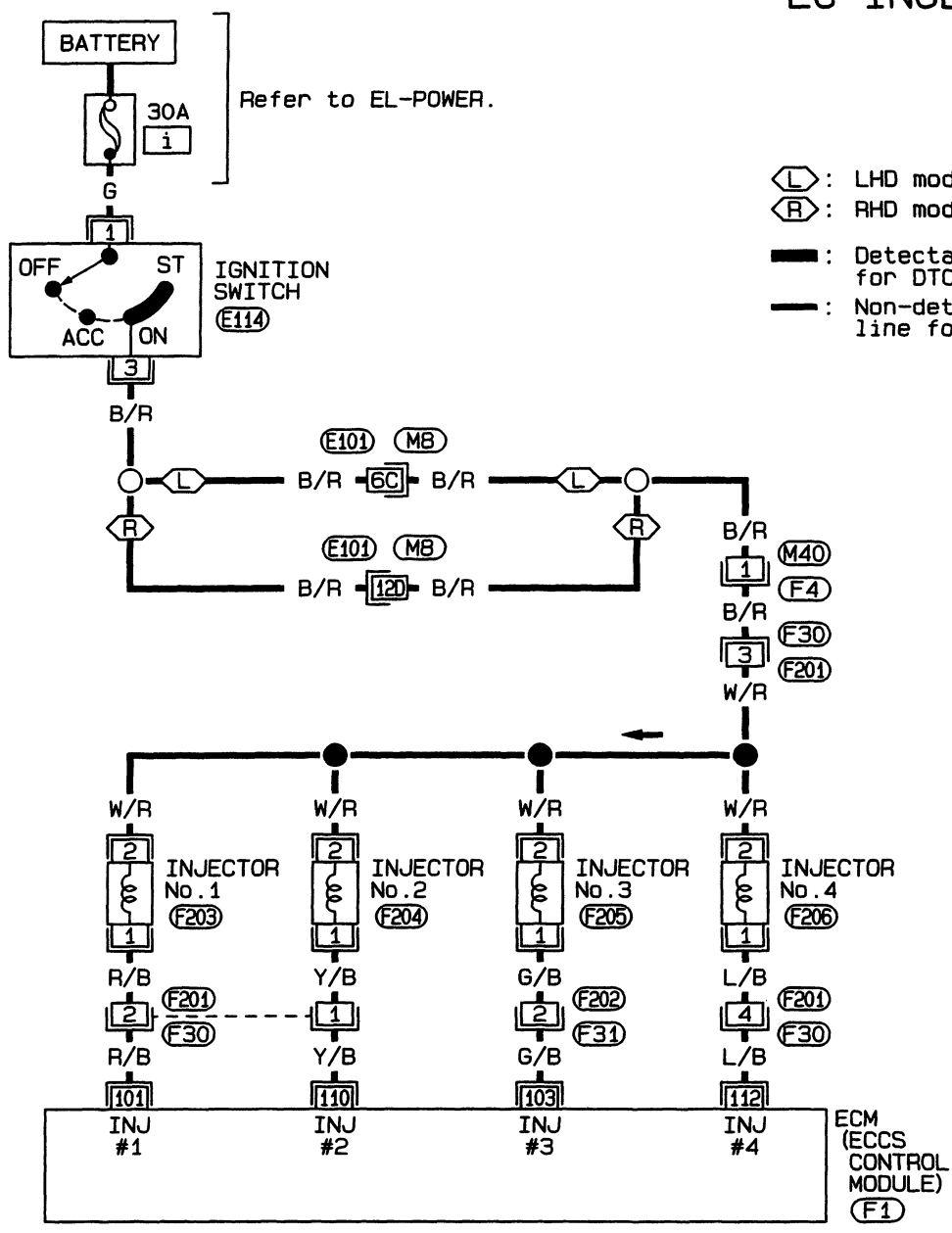
Check air passage continuity.

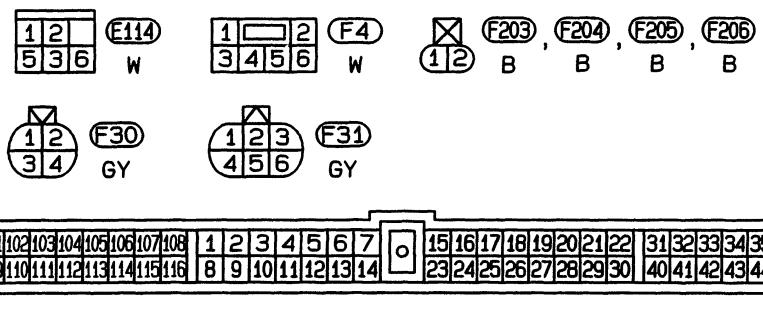
Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals ① and ②	Yes
No supply	No

If NG, replace solenoid valve.

Injector

EC-INJECT-01

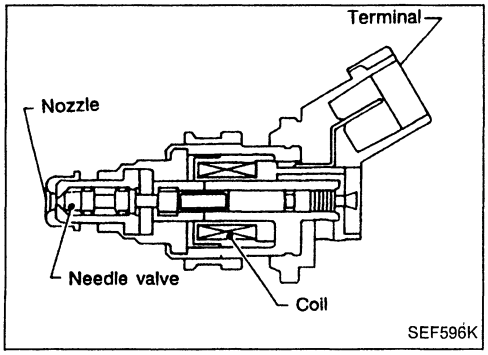




Refer to last page (Foldout page).
M8, E101

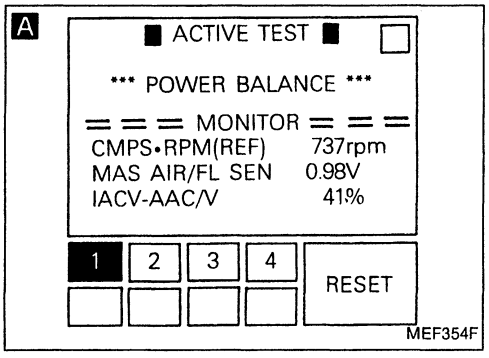
HEC223

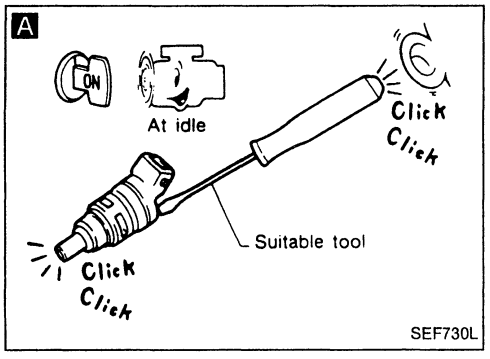
Injector (Cont'd)

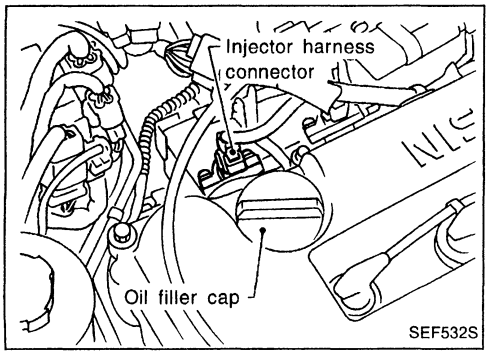


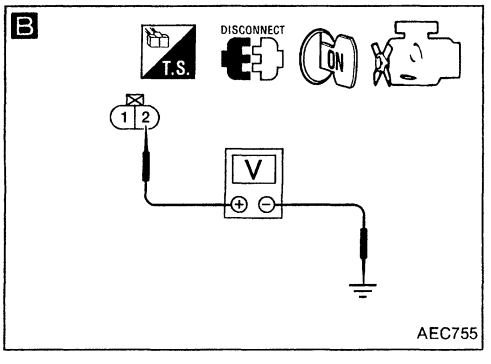
COMPONENT DESCRIPTION

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.









DIAGNOSTIC PROCEDURE

EC

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.

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

Voltage: Battery voltage

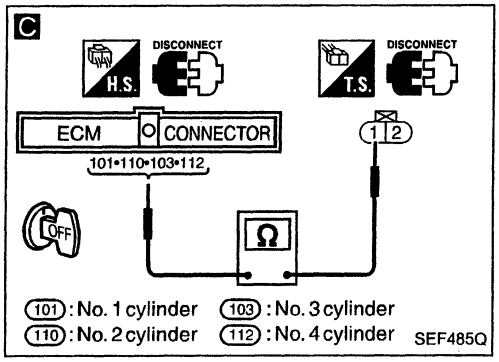
NG → Check the following.
- Harness connectors (F201), (F30)
- Harness connectors (F4), (M40)
- Harness connectors (M8), (E101)
- Harness for open or short between injector and ignition switch

If NG, repair harness or connectors.

OK

Ⓐ

Injector (Cont'd)



Ⓐ

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminal ① and ECM terminals (101), (110), (103), (112).

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

NG → Check the following.
- Harness connectors (F30), (F201)
- Harness connectors (F31), (F202)
- Harness for open or short between injector and ECM

If NG, repair harness or connectors.

OK ↓

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

NG → Replace injector.

OK ↓

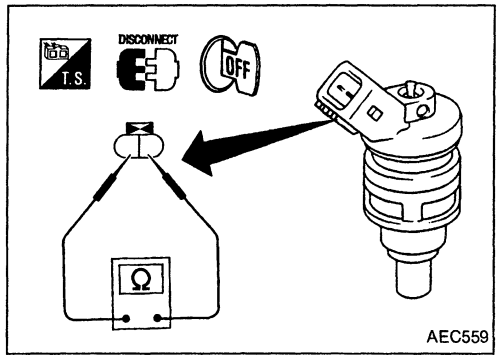
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END

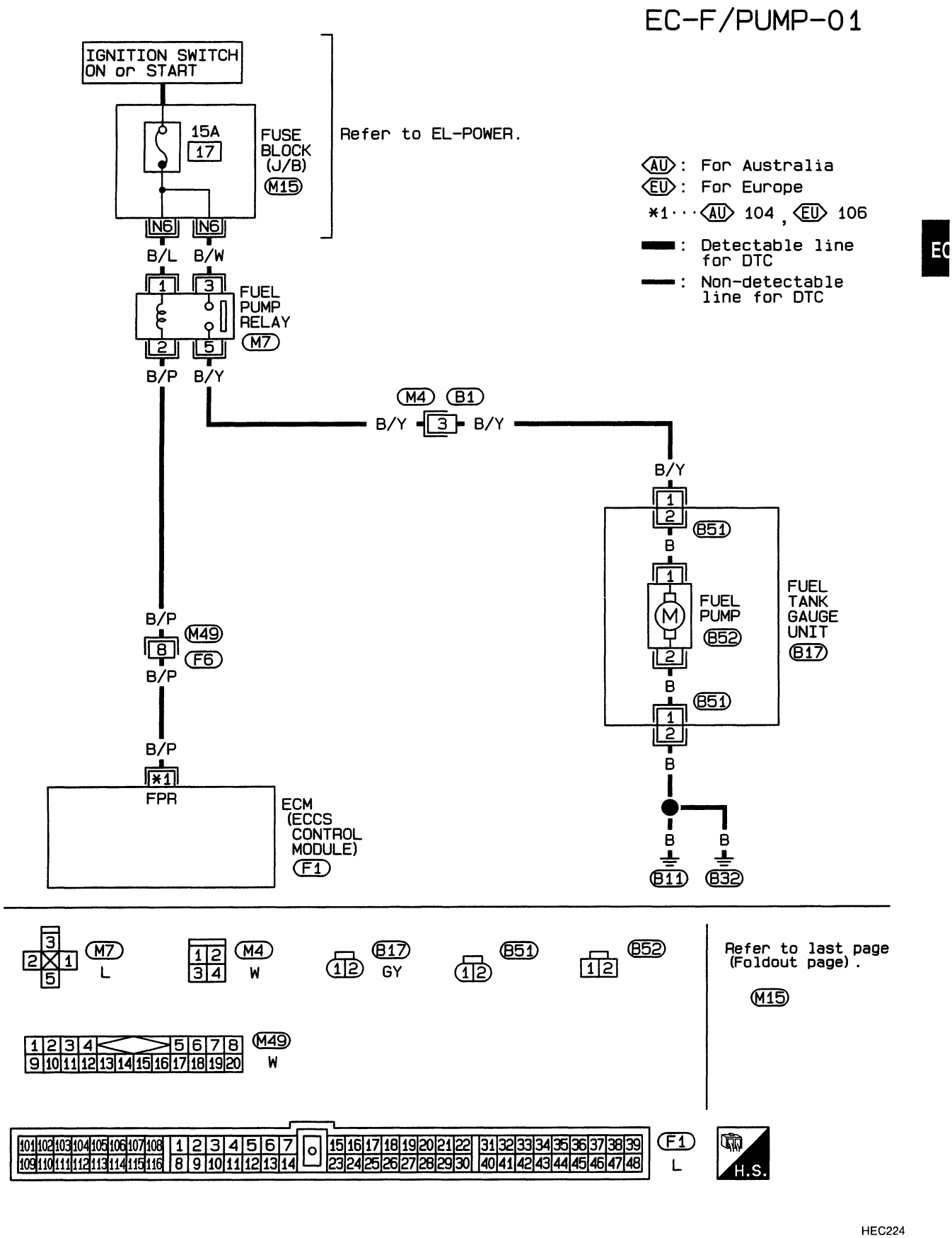


COMPONENT INSPECTION

Injector

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

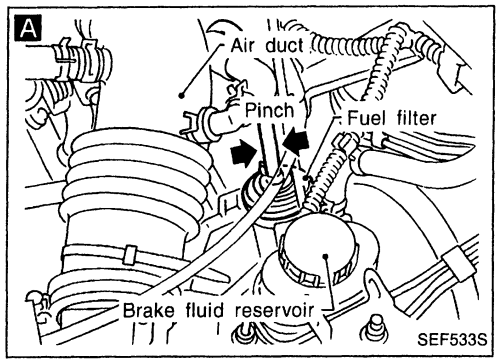
Fuel Pump

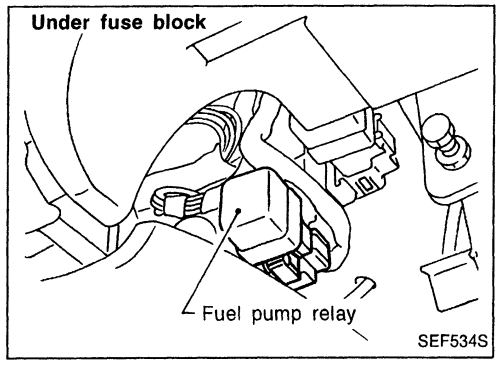


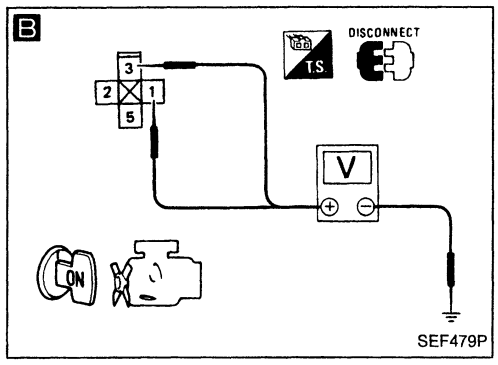
HEC224

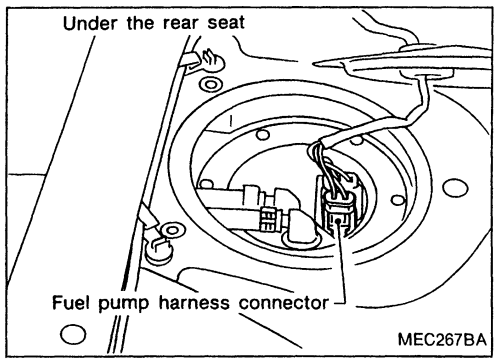
Fuel Pump (Cont'd)

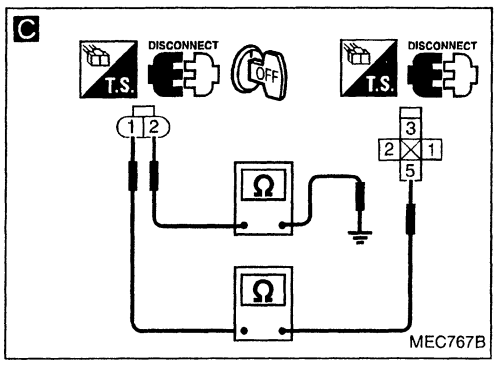
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Turn ignition switch "ON".
2. Pinch fuel feed hose with fingers.
   Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
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.
- Fuse block harness connector (M15)
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

If NG, repair harness or connectors.

OK

C

CHECK POWER AND GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.
3. Check harness continuity between terminal ② and body ground, terminal ① and fuel pump relay connector terminal ⑤.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M4), (B1)
- Harness for open or short between fuel pump and body ground
- Harness for open or short between fuel pump and fuel pump relay

If NG, repair harness or connectors.

OK

D

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (106) and fuel pump relay connector terminal ②.
   Continuity should exist.
   If OK, check harness for short.

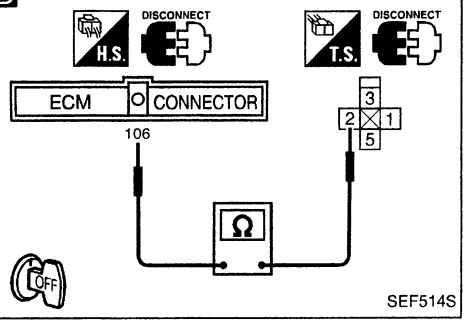
NG → Check the following.
- Harness connectors (M49), (F6)
- Harness for open or short between ECM and fuel pump relay

If NG, repair harness or connectors.

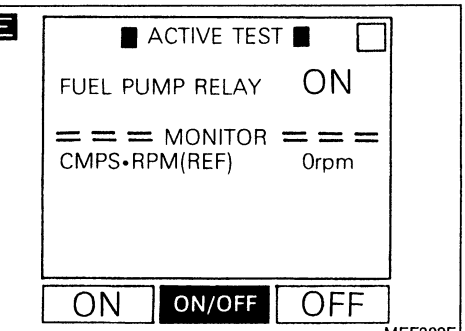
OK → Ⓐ

Fuel Pump (Cont'd)

D



E



Ⓐ

E

CHECK COMPONENT
(Fuel pump relay).

1. Reconnect fuel pump relay, fuel pump harness connector and ECM harness connector.
2. Turn ignition switch "ON".
3. Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

NG → Replace fuel pump relay.

OR

Refer to "COMPONENT INSPECTION".

OK ↓

CHECK COMPONENT
(Fuel pump).
Refer to "COMPONENT INSPECTION".

NG → Replace fuel pump.

OK ↓

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

Trouble is not fixed. ↓

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

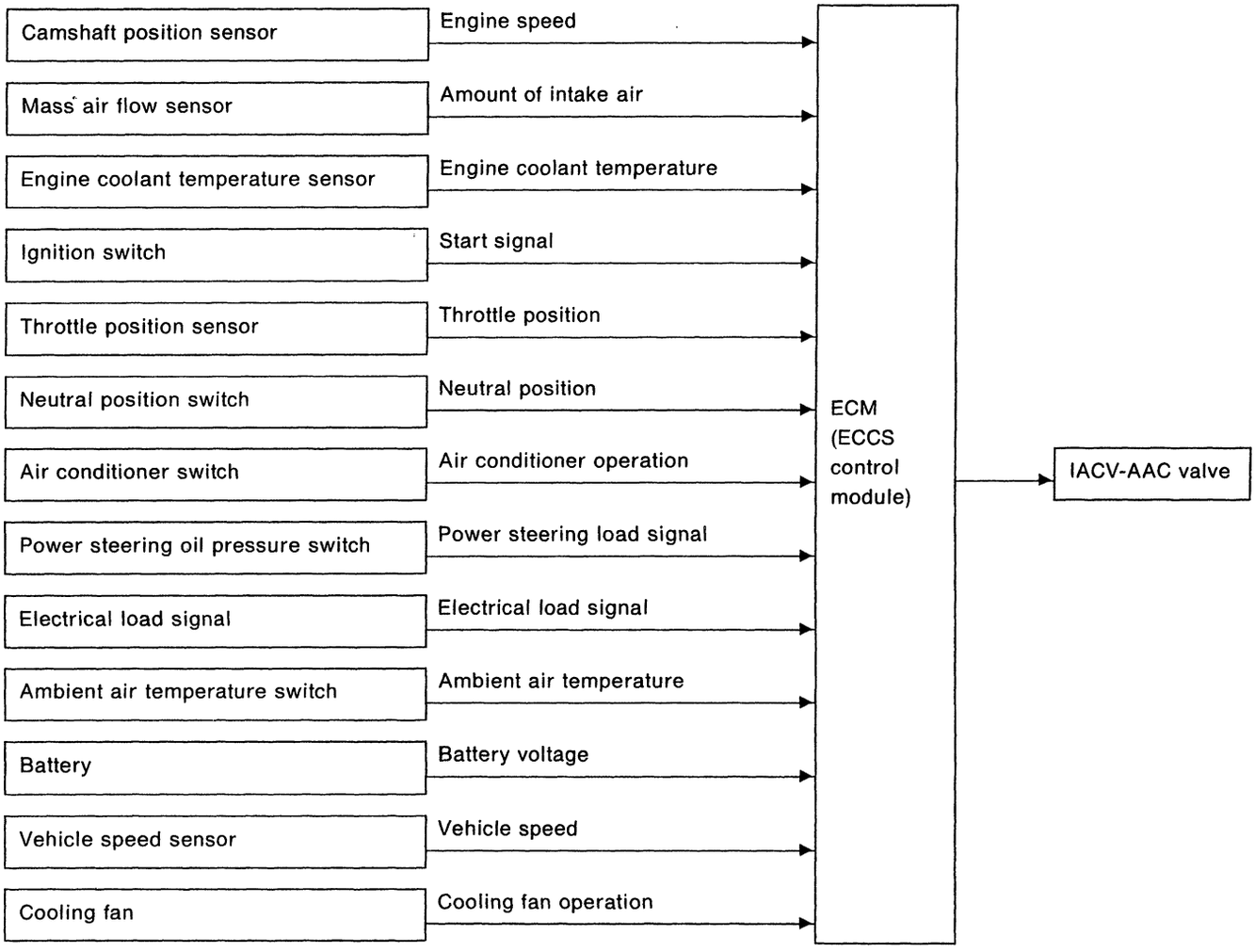
↓

INSPECTION END

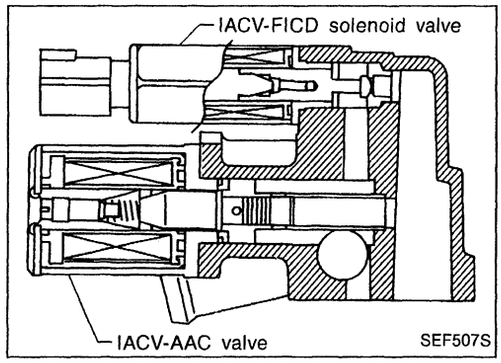
EC

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

SYSTEM DESCRIPTION



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



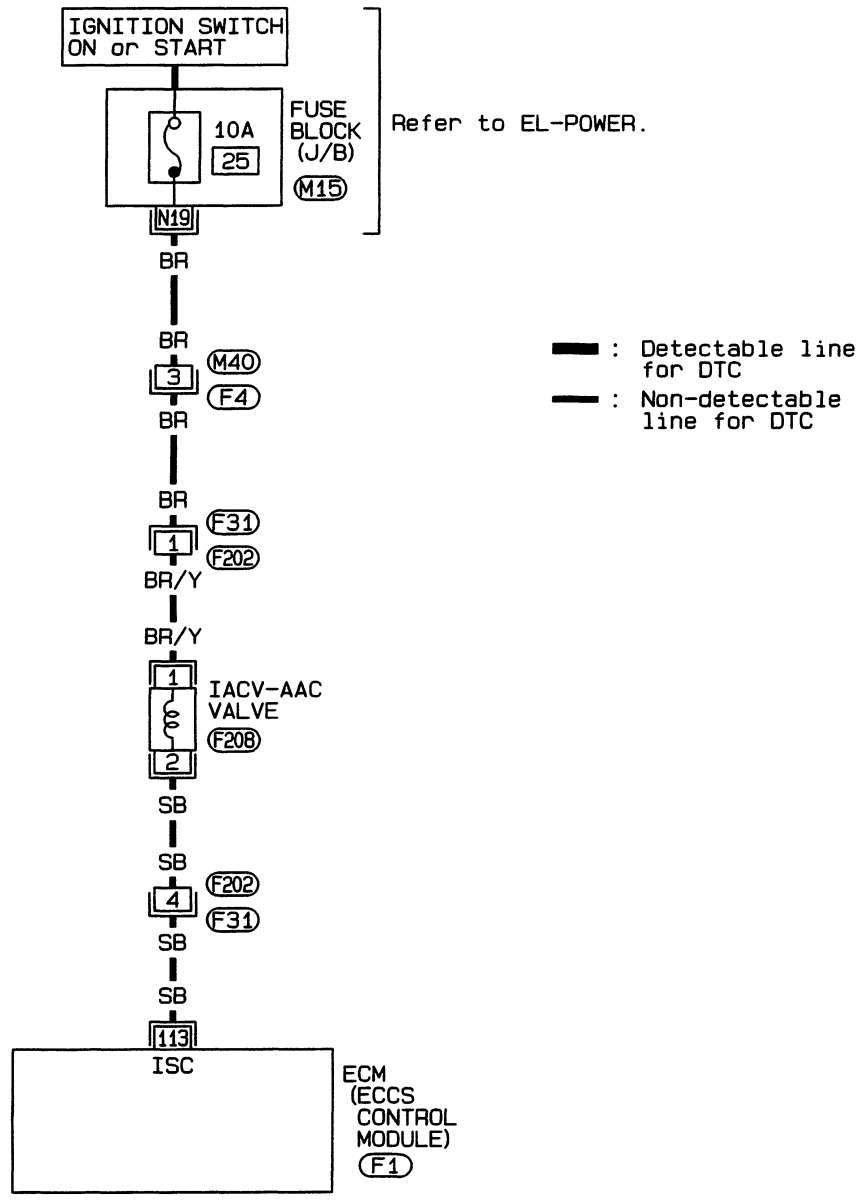
COMPONENT DESCRIPTION

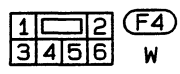
IACV-AAC valve

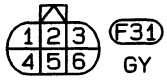
The IACV-AAC valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of air that will flow through the valve. The more air that flows through the valve, the higher the idle speed.

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

EC-AAC/V-01



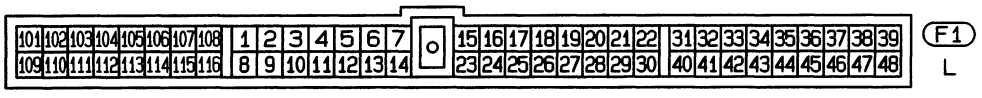






Refer to last page (Foldout page).

M15

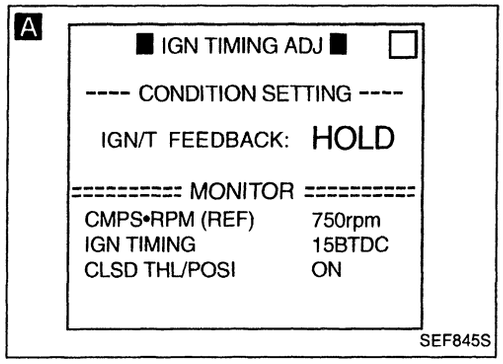


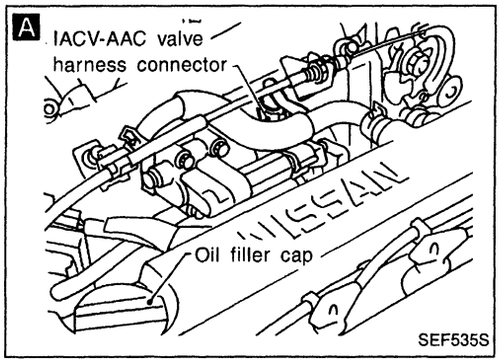


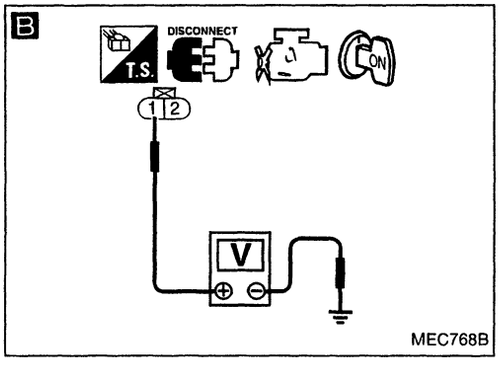
HEC225

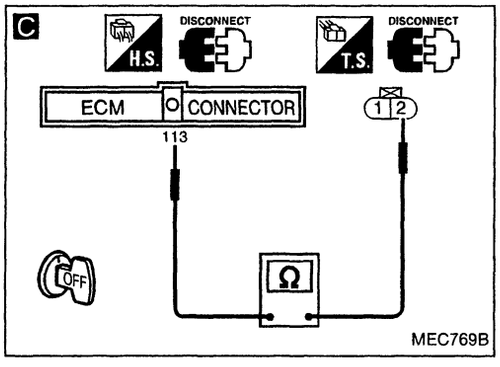
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up sufficiently.
2. Check idle speed.
   750 ± 50 rpm
   If NG, adjust idle speed. (Refer to page EC-18.)
3. ● Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode with CONSULT.
   ● Disconnect IACV-AAC valve harness connector.
4. Make sure that idle speed drops.

Drops → INSPECTION END

Does not drop ↓

B

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

NG → Check the following.
- Harness connectors (M40), (F4)
- Harness connectors (F31), (F202)
- 10A fuse
- Harness for open or short between IACV-AAC valve and fuse

If NG, repair harness or connectors.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (113) and terminal ②.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F202), (F31)
- Harness for open or short between ECM and IACV-AAC valve

If NG, repair harness or connectors.

OK ↓

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

NG → Replace IACV-AAC valve.

OK ↓

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

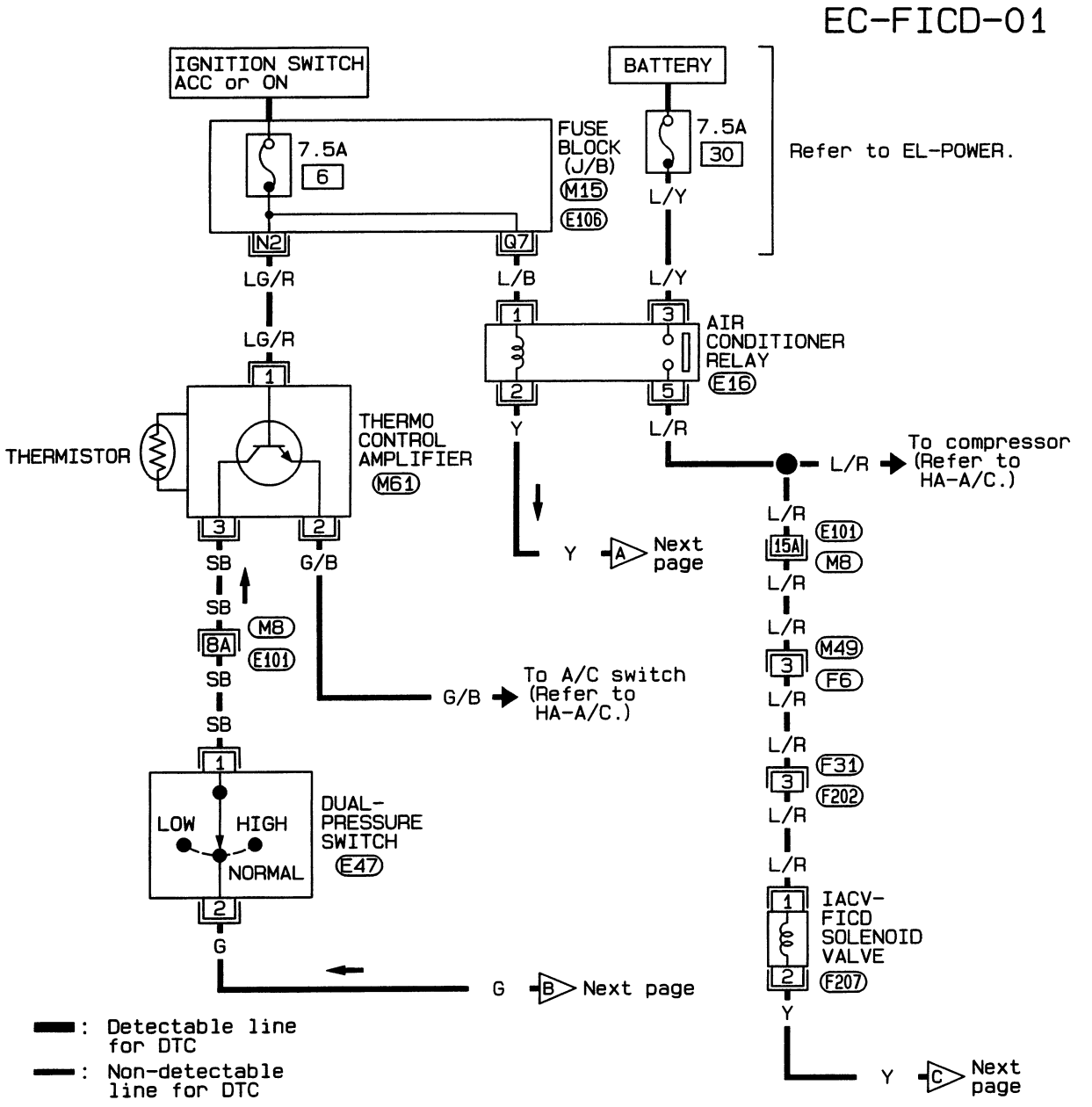
Trouble is not fixed. ↓

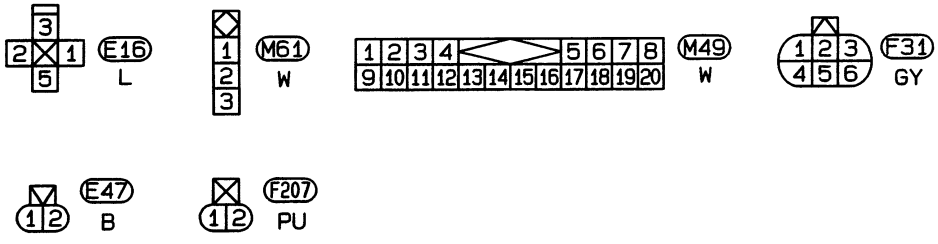
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Idle Air Control Valve (IACV)-FICD Solenoid Valve

LHD models





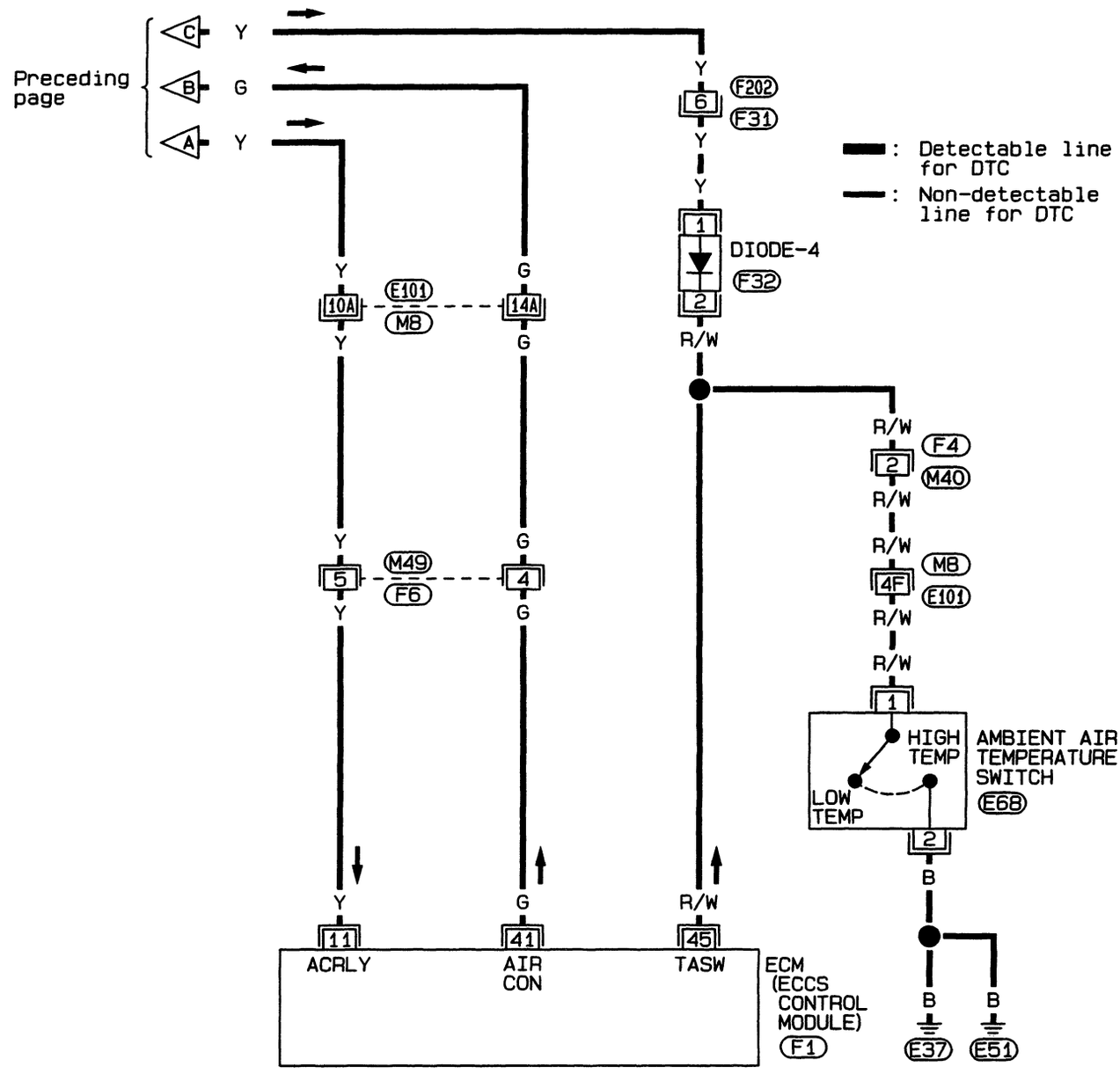
Refer to last page (Foldout page).

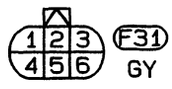
M8, E101
M15, E106

HEC226

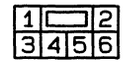
Idle Air Control Valve (IACV)-FICD Solenoid Valve (Cont'd)

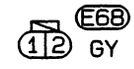
EC-FICD-02

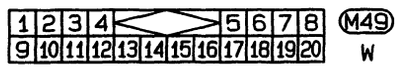






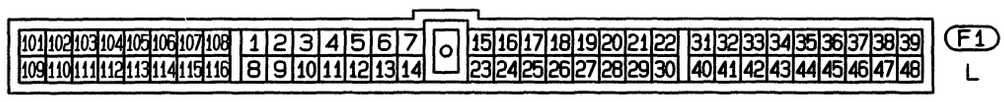






Refer to last page (Foldout page).

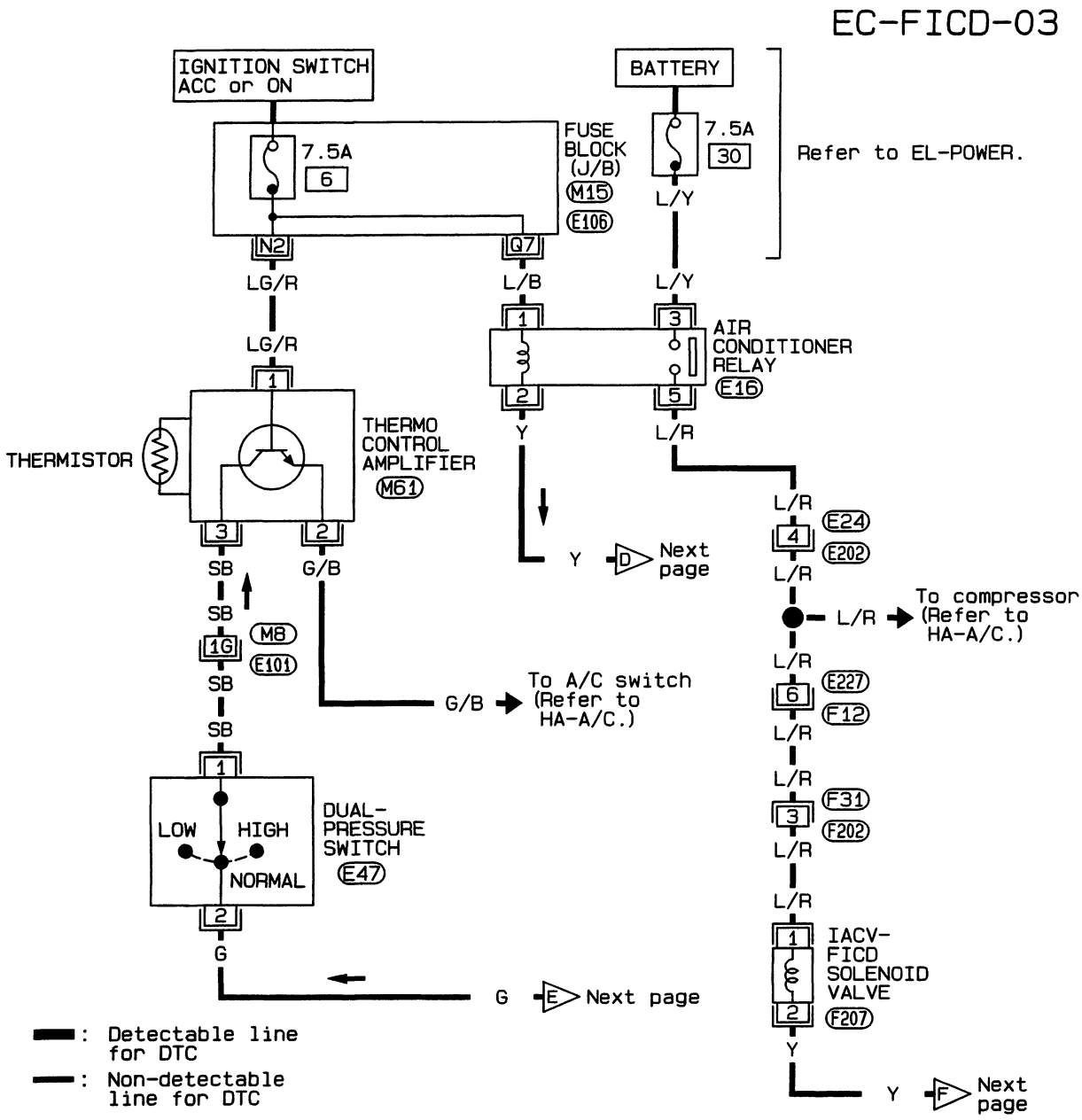
M8, E101

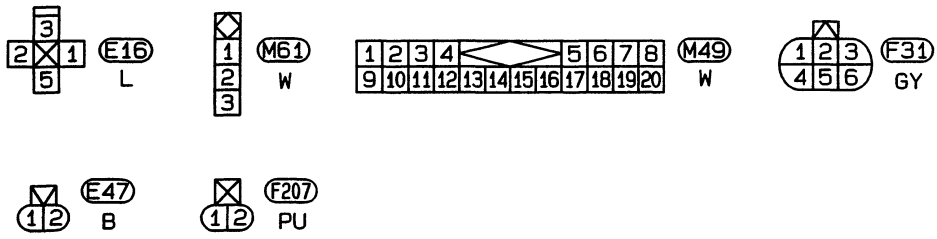


HEC227

Idle Air Control Valve (IACV)-FICD Solenoid Valve (Cont'd)

RHD models





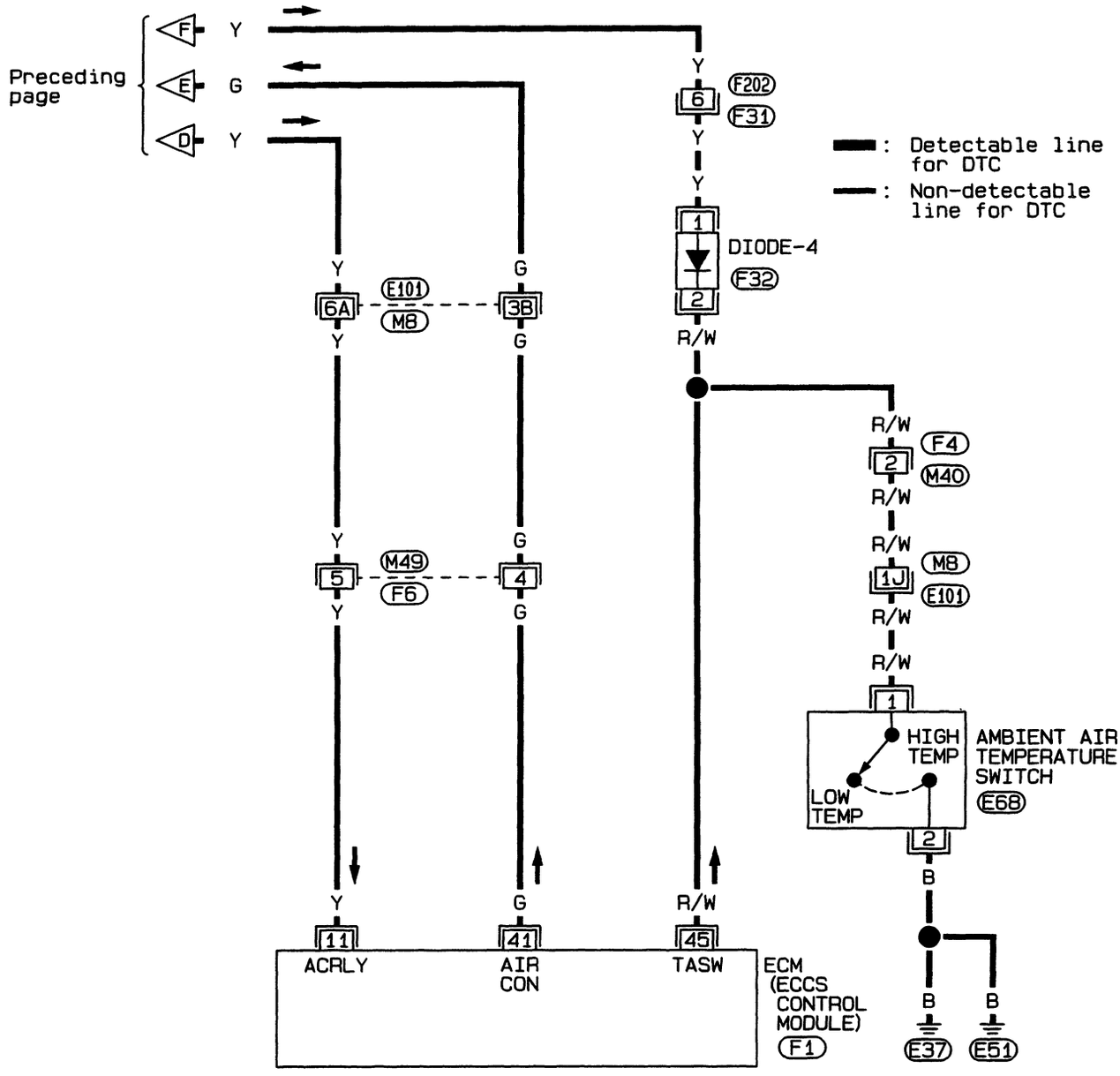
Refer to last page (Foldout page).

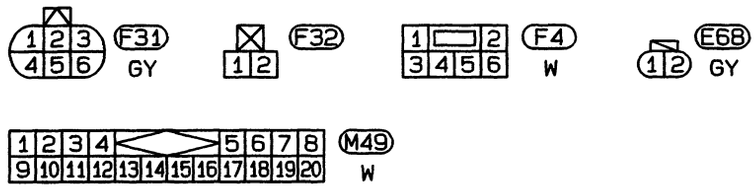
M8, E101
M15, E106

HEC228

Idle Air Control Valve (IACV)-FICD Solenoid Valve (Cont'd)

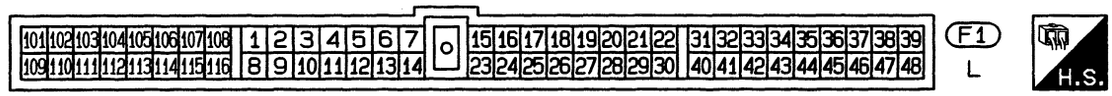
EC-FICD-04





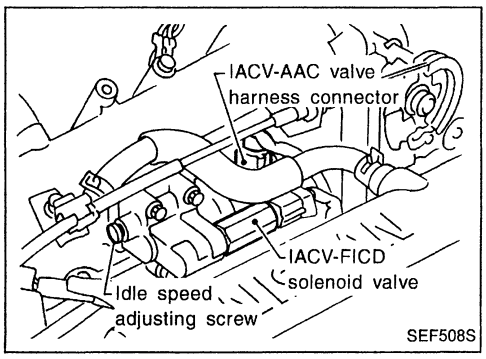
Refer to last page (Foldout page).

M8, E101



HEC229

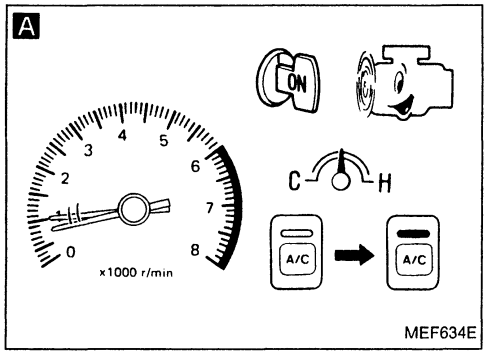
Idle Air Control Valve (IACV)-FICD Solenoid Valve (Cont'd)

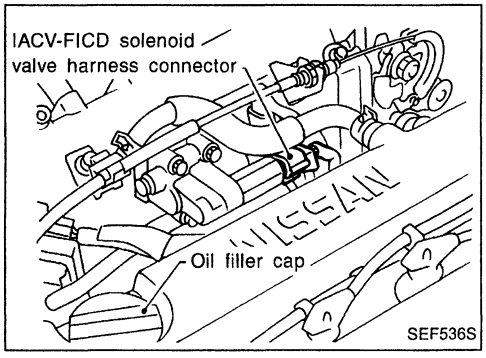


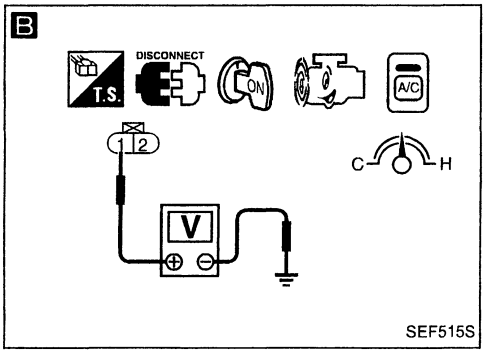
COMPONENT DESCRIPTION

When the air conditioner is on, the IACV-FICD solenoid valve supplies additional air to adjust to the increased load.

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up sufficiently.
2. Check idle speed.
   750 ± 50 rpm
   If NG, adjust idle speed.
3. Turn air conditioner switch and blower fan switch "ON".
4. Recheck idle speed.
   850 rpm or more

OK → INSPECTION END

NG ↓

Check if air conditioner compressor functions normally.

NG → Refer to "TROUBLE DIAGNOSES" in HA section.

OK ↓

B

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect IACV-FICD solenoid valve harness connector.
3. Start engine, then turn air conditioner switch and blower fan "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F31), (E202)
- Harness connectors (E101), (M8) (LHD)
- Harness connectors (M49), (F6) (LHD)
- Harness connectors (E24), (E202) (RHD)
- Harness connectors (E227), (F12) (RHD)
- Harness for open or short between IACV-FICD solenoid valve and air conditioner relay

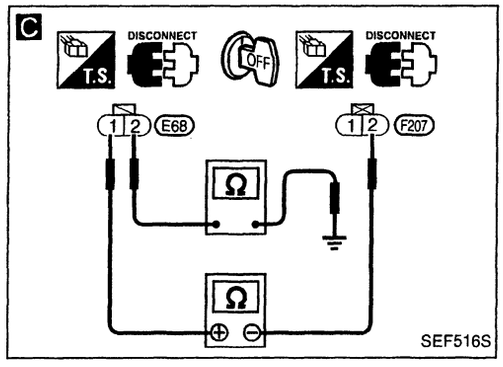
If NG, repair harness or connectors.

OK ↓

Ⓐ

EC

Idle Air Control Valve (IACV)-FICD Solenoid Valve (Cont'd)



Ⓐ

C

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

NG → Check the following.
- Harness connectors F202, F31
- Harness connectors F4, M40
- Harness connectors M8, E101
- Diode-4
- Harness for open or short between IACV-FICD solenoid valve and ambient air temperature switch
- Harness for open or short between ambient air temperature switch and body ground

If NG, repair harness or connectors.

OK ↓

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

NG → Replace IACV-FICD solenoid valve.

OK ↓

CHECK COMPONENT
(Ambient air temperature switch).
Refer to HA section.

NG → Replace ambient air temperature sensor.

OK ↓

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

Trouble is not fixed. ↓

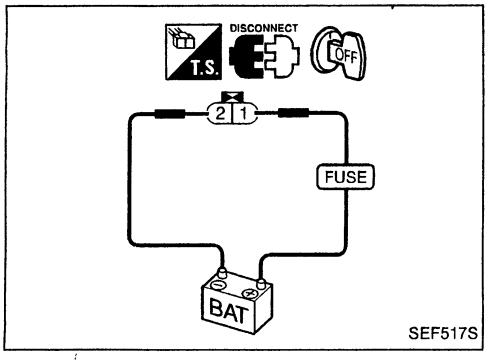
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector. Then retest.

↓

INSPECTION END

Idle Air Control Valve (IACV)-FICD Solenoid Valve (Cont'd)

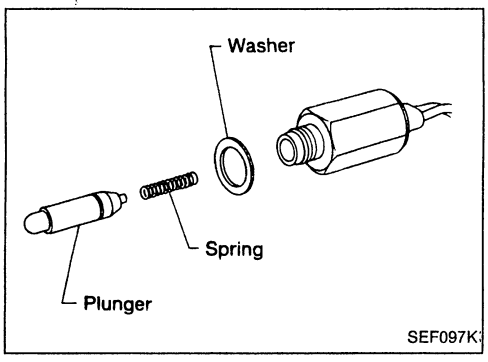
COMPONENT INSPECTION



IACV-FICD solenoid valve

Disconnect IACV-FICD solenoid valve harness connector.

- Check for clicking sound when applying 12V direct current to terminals.



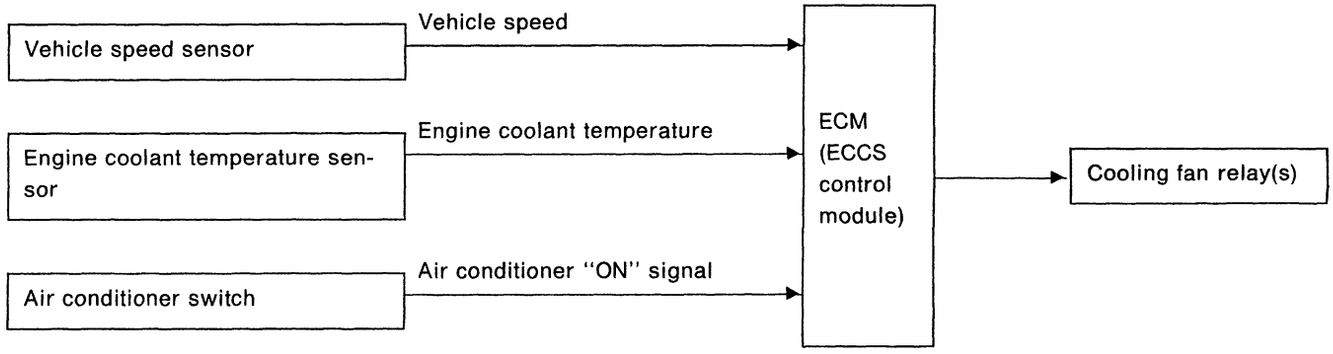
- Check plunger for seizing or sticking.
- Check for broken spring.

EC

Cooling Fan Control

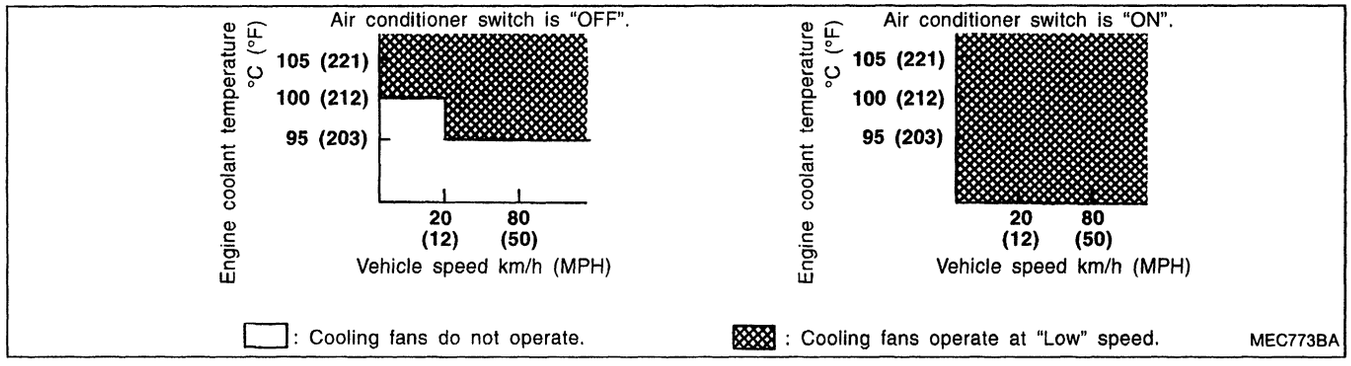
SYSTEM DESCRIPTION

Cooling fan control



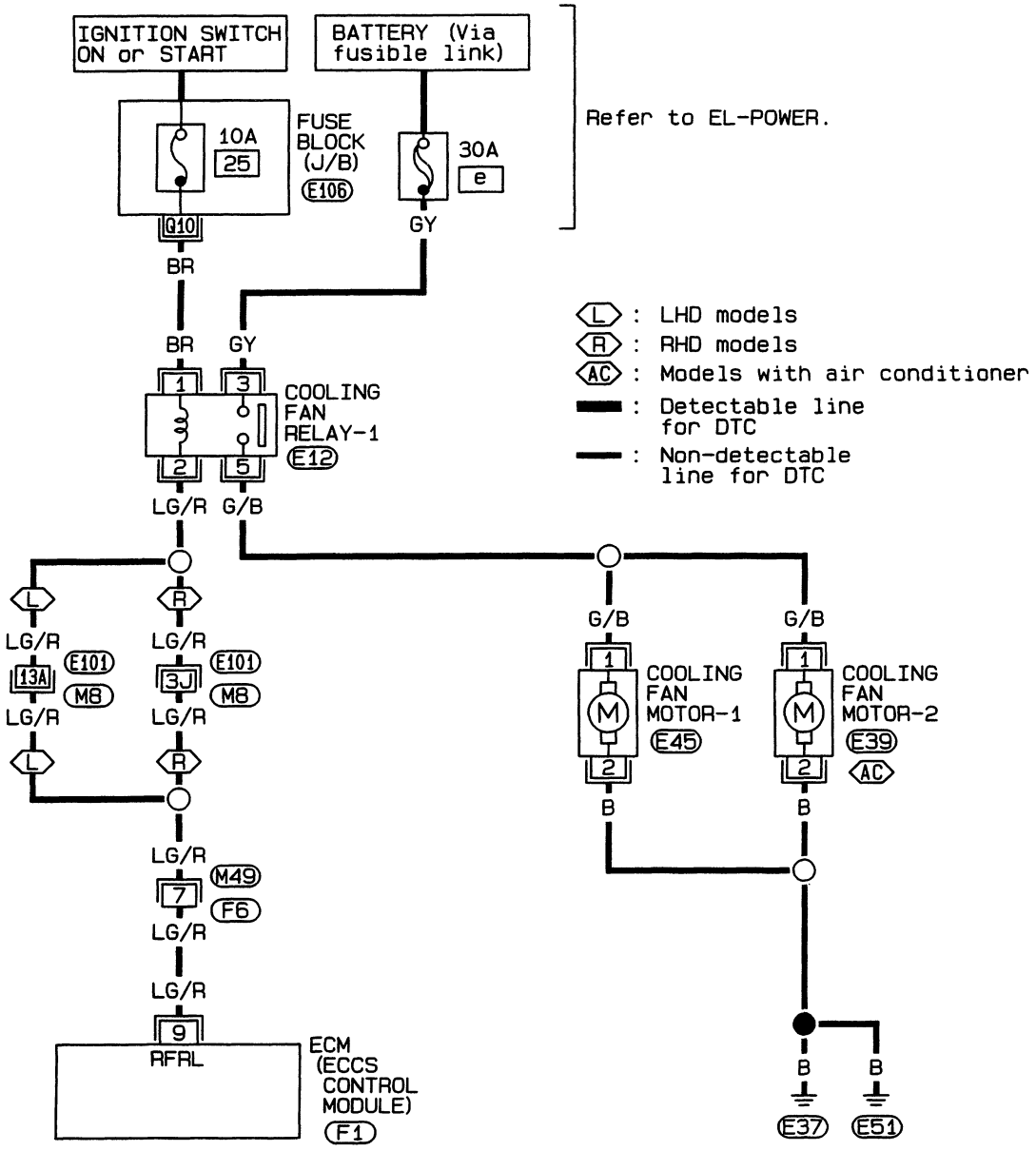
The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal. The control system has 2-step control [ON/OFF].

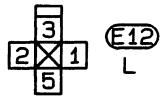
Operation

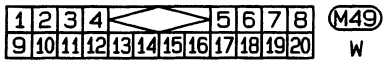


Cooling Fan Control (Cont'd)

EC-COOL/F-01



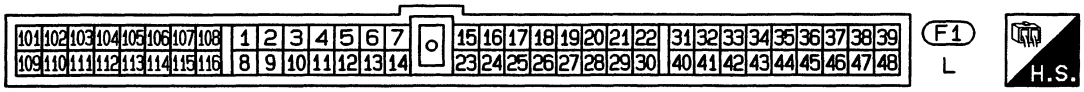






Refer to last page (Foldout page).

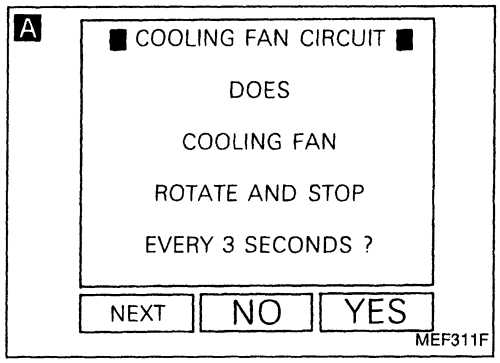
M8, E101, E106

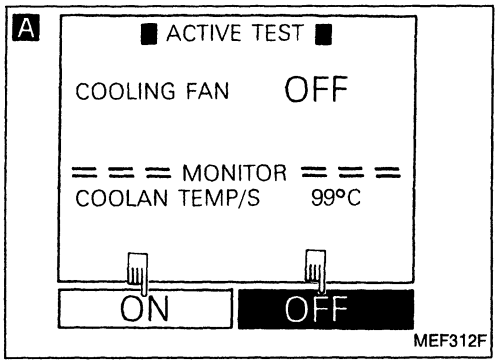


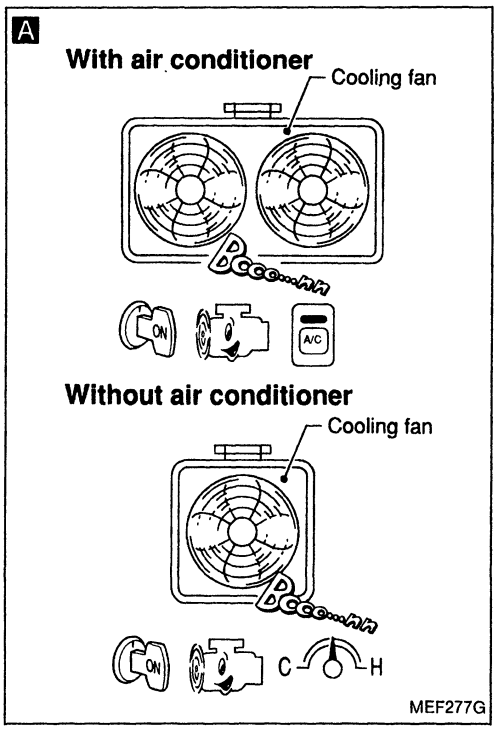
HEC230

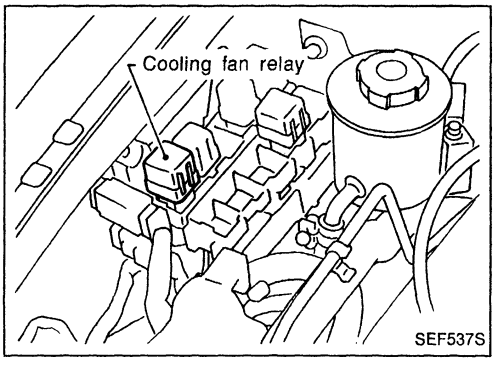
Cooling Fan Control (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

1. Turn ignition switch "ON".
2. Select "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

With air conditioner

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

Without air conditioner

1. Start engine.
2. Keep engine speed at about 2,000 rpm until engine is warmed up sufficiently.
3. Make sure that cooling fan begins to operate during warm-up.

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.

1. Turn air conditioner switch "OFF".
2. Turn blower fan switch "OFF". (Step 1 and 2 are only performed for models with air conditioner.)
3. Stop engine.
4. Disconnect cooling fan relay.
5. Turn ignition switch "ON".
6. Check voltage between terminals ①, ③ and ground.

Voltage: Battery voltage

NG → Check the following.
- 30A fusible link
- 10A fuse
- Harness for open or short between fuse and cooling fan relay
- Harness for open or short between battery and cooling fan relay

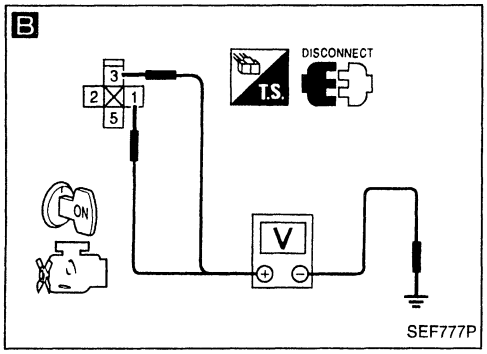
If NG, repair harness or connectors.

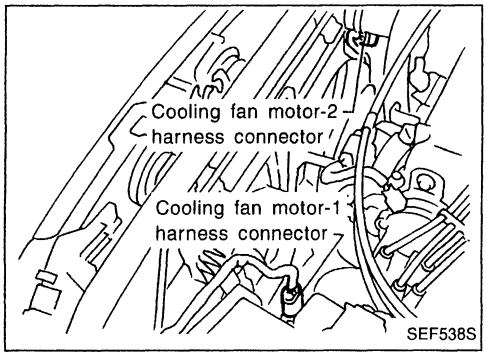
OK

Ⓐ

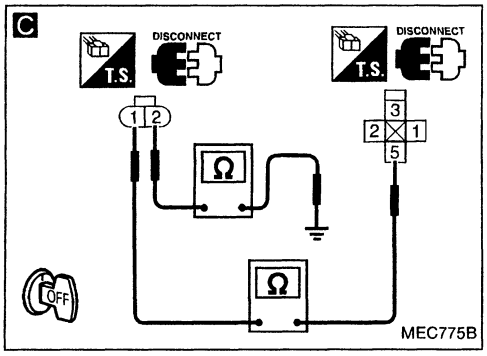
Cooling Fan Control (Cont'd)

B

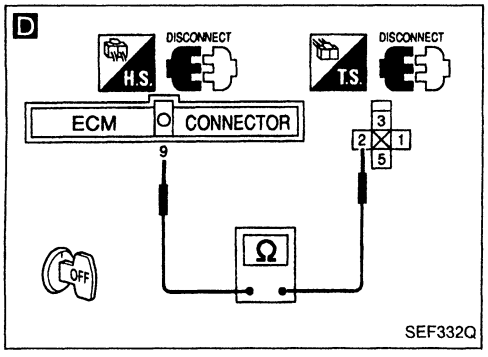




C



D



Ⓐ

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between terminal ① and terminal ⑤, terminal ② and body ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

D

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑨ and terminal ②.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F6), (M49)
- Harness connectors (M8), (E101)
- Harness for open or short between ECM and cooling fan relay

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay).
Refer to "COMPONENT INSPECTION".

NG → Replace cooling fan relay.

OK ↓

CHECK COMPONENTS
(Cooling fan motors).
Refer to "COMPONENT INSPECTION".

NG → Replace cooling fan motors.

OK ↓

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

Trouble is not fixed. ↓

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

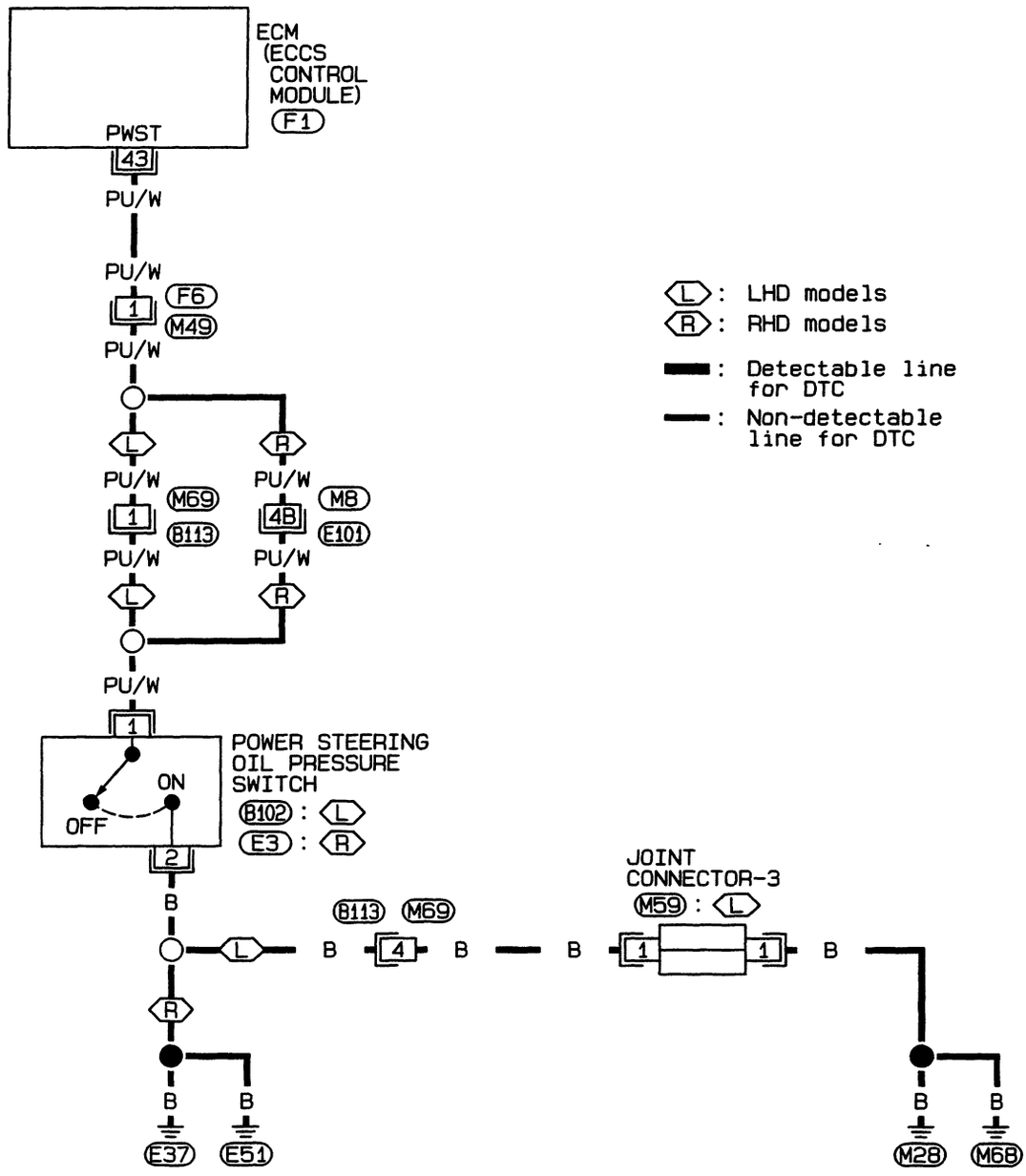
↓

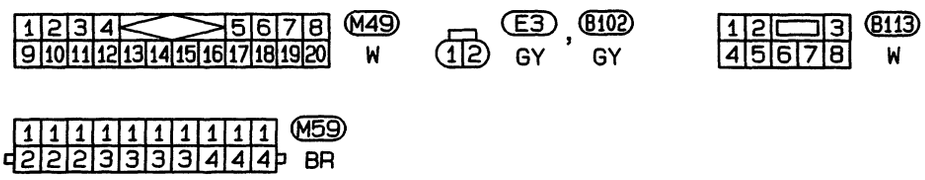
INSPECTION END

EC

Power Steering Oil Pressure Switch

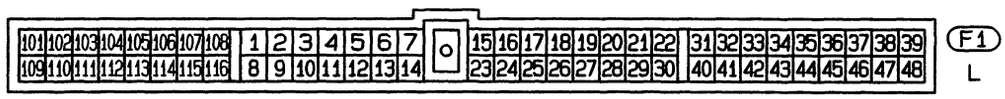
EC-PST/SW-01





Refer to last page
(Foldout page).

M8, E101

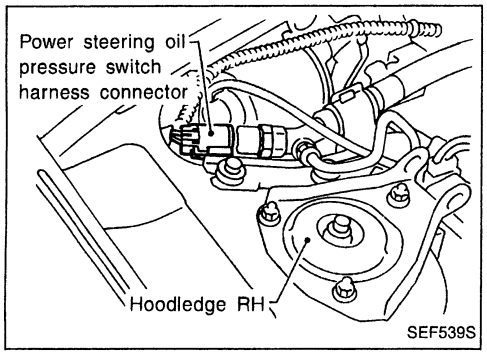


HEC231

Power Steering Oil Pressure Switch (Cont'd)

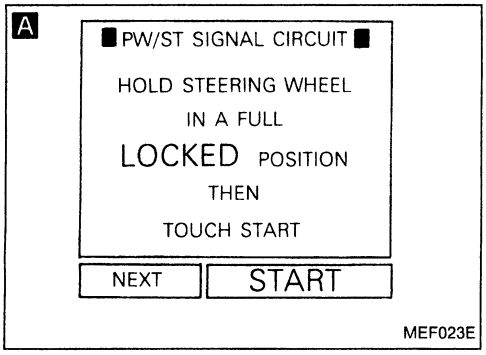
COMPONENT DESCRIPTION

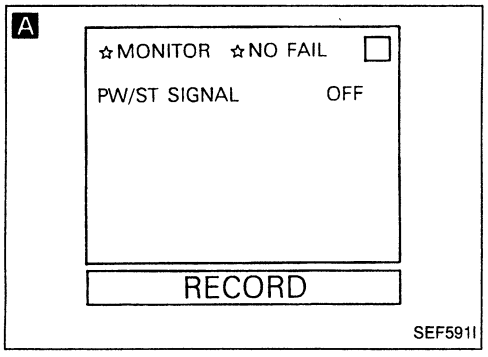
The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

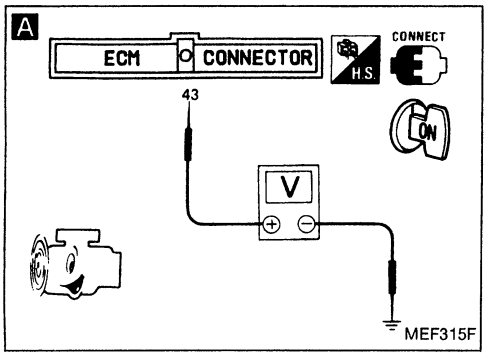


DIAGNOSTIC PROCEDURE

EC







INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently.
2. Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT.
   Steering is in neutral position:
   OFF
   Steering is turned:
   ON

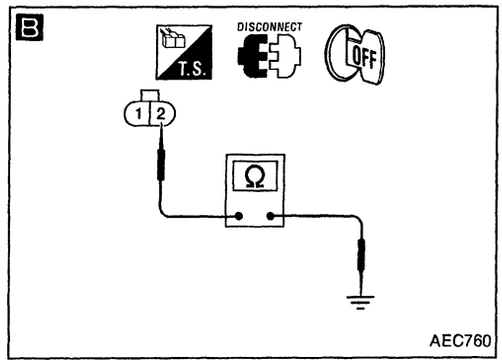
OR

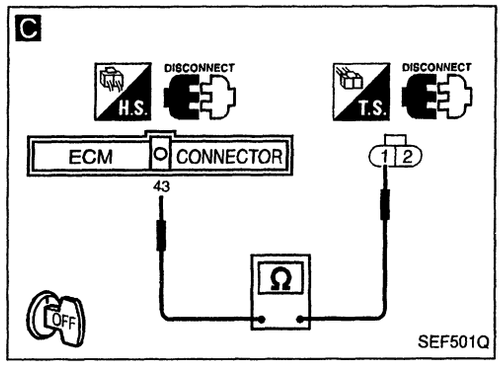
2. Check voltage between ECM terminal ㊸ and ground.
   Voltage:
   When steering wheel is turned quickly.
   Approximately 0V
   Except above
   Approximately 5V

OK → INSPECTION END

NG → Ⓐ

Power Steering Oil Pressure Switch (Cont'd)





Ⓐ

B

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

NG → Check the following.
- Harness connectors (B113), (M69) (LHD)
- Joint connector-3 (LHD)
- Harness for open or short between power steering oil pressure switch and body ground

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㊸ and terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F6), (M49)
- Harness connectors (M69), (B113) (LHD)
- Harness connectors (M8), (E101) (RHD)
- Harness for open or short between ECM and power steering oil pressure switch

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "COMPONENT INSPECTION".

NG → Replace power steering oil pressure switch.

OK ↓

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

Trouble is not fixed. ↓

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

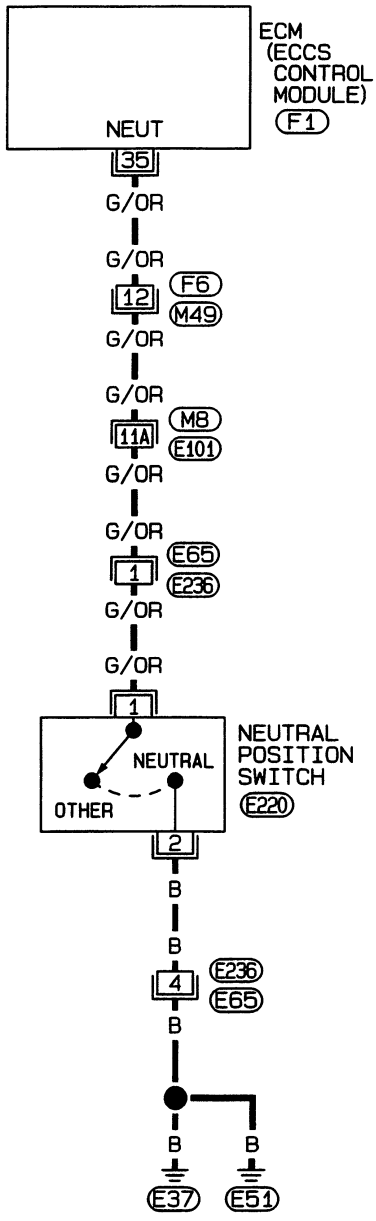
↓

INSPECTION END

Park/Neutral Position Switch

LHD models

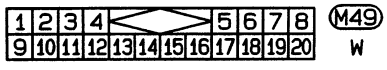
EC-PNP/SW-01



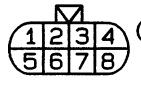
: Detectable line for DTC

: Non-detectable line for DTC

EC



M49 W



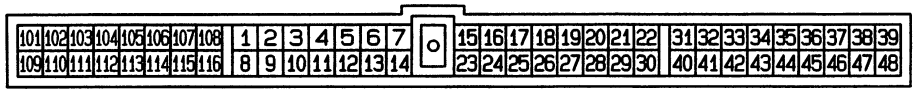
E65 GY



E220 B

Refer to last page (Foldout page).

M8, E101



F1 L

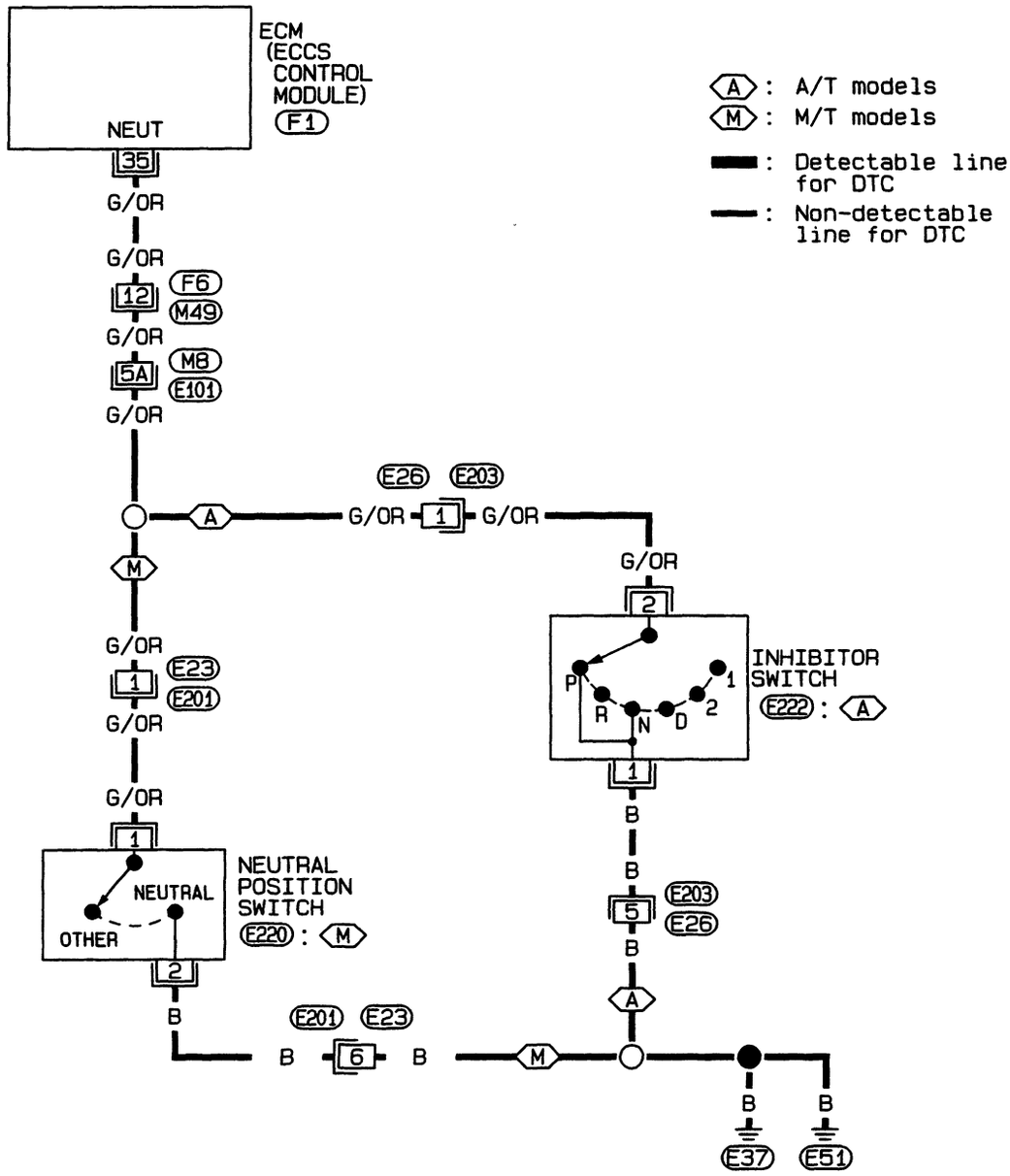
H.S.

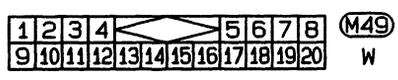
HEC232

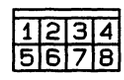
Park/Neutral Position Switch (Cont'd)

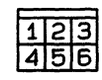
RHD models

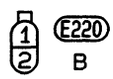
EC-PNP/SW-02

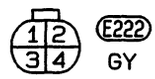


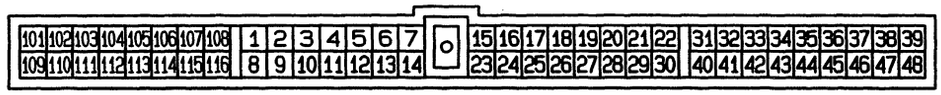












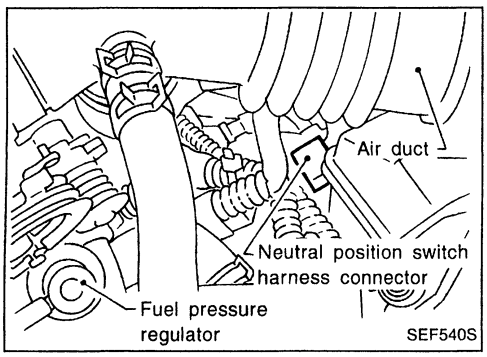


Refer to last page
(Foldout page).

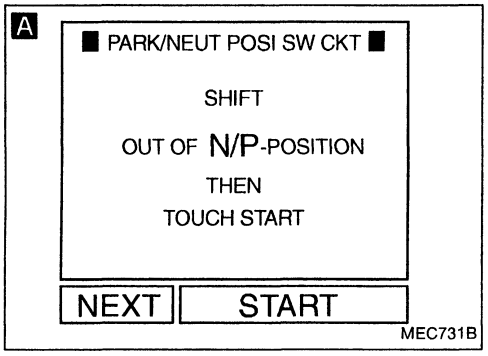
M8, E101

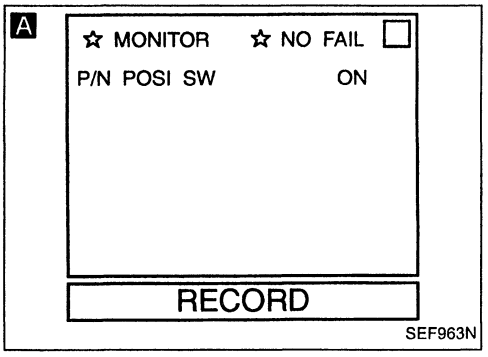
HEC233

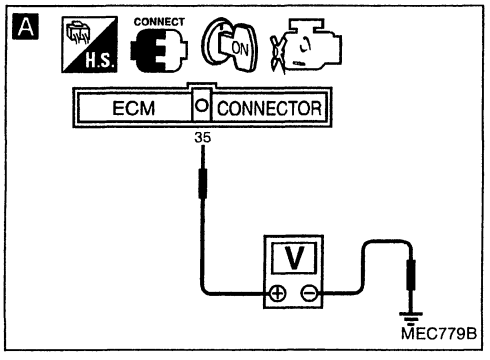
Park/Neutral Position Switch (Cont'd)



When the gear position is in neutral position, neutral position switch is "ON". ECM detects the position because the continuity of the line (the "ON" signal) exists.







DIAGNOSTIC PROCEDURE

EC

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

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

Neutral position: ON
Except neutral position: OFF

OR

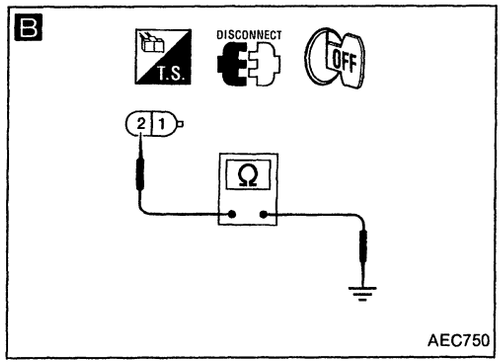
2. Check voltage between ECM terminal ㉟ and ground under the following conditions.

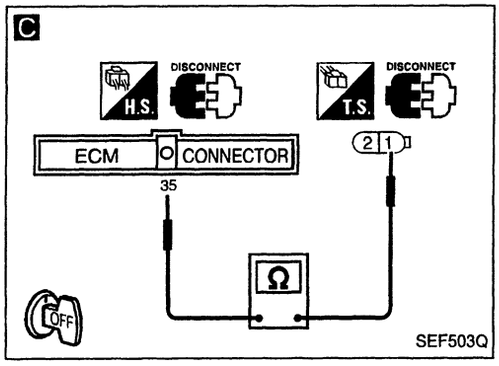
Voltage:
Neutral position
Approximately 0V
Except neutral position
Approximately 5V

OK → INSPECTION END

NG → Ⓐ

Park/Neutral Position Switch (Cont'd)





Ⓐ

B

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

NG → Check the following.
- Harness connectors E236, E65 (LHD)
- Harness connectors E201, E23 (RHD)
- Harness for open or short between neutral position switch and body ground

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉟ and terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors F6, M49
- Harness connectors M8, E101
- Harness connectors E65, E236 (LHD)
- Harness connectors E23, E201 (RHD)
- Harness for open or short between ECM and neutral position switch

If NG, repair harness or connectors.

OK ↓

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

NG → Replace neutral position switch.

OK ↓

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

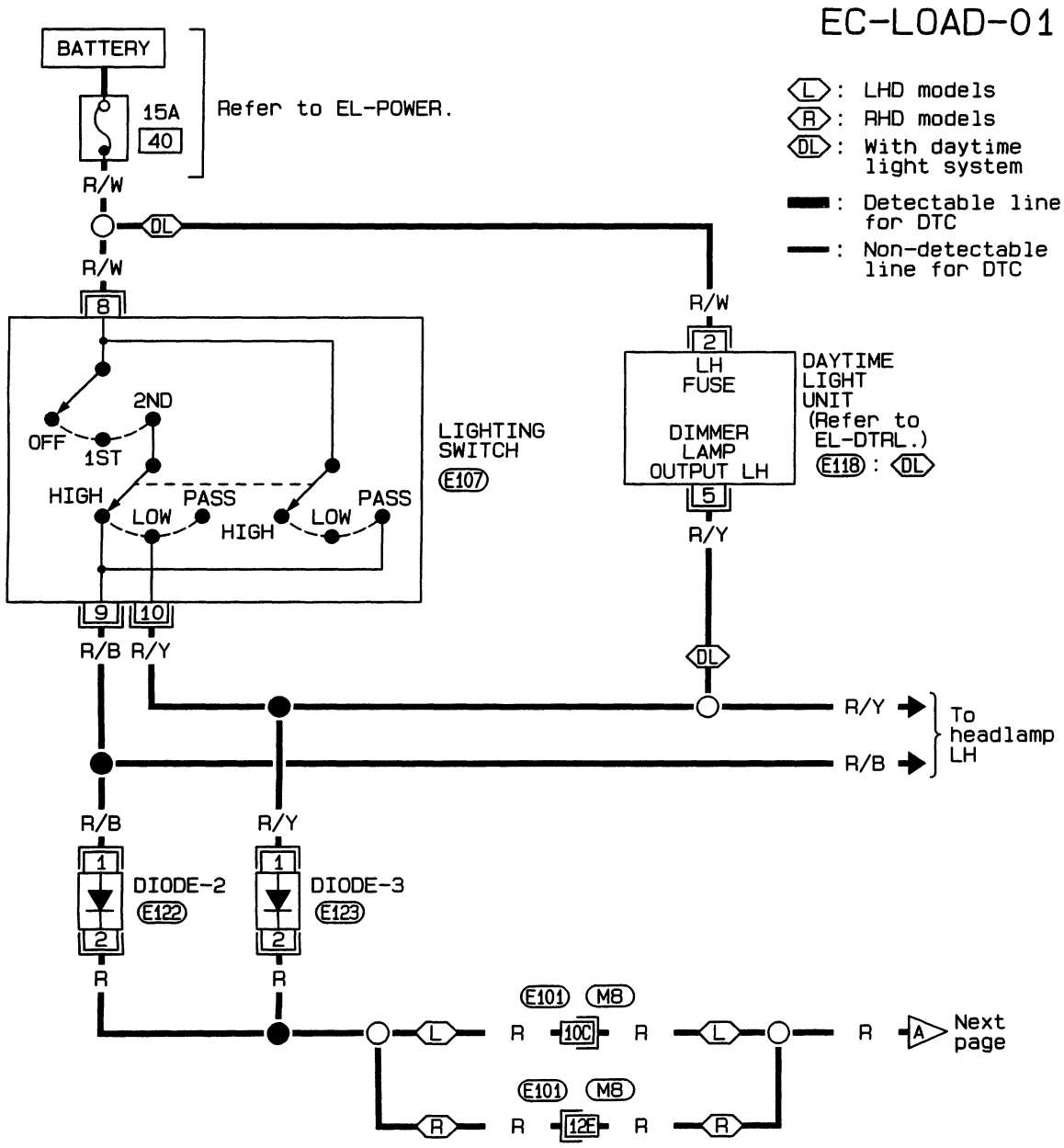
Trouble is not fixed. ↓

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

↓

INSPECTION END

Electrical Load Signal



E107 W

E122, E123

E118 GY

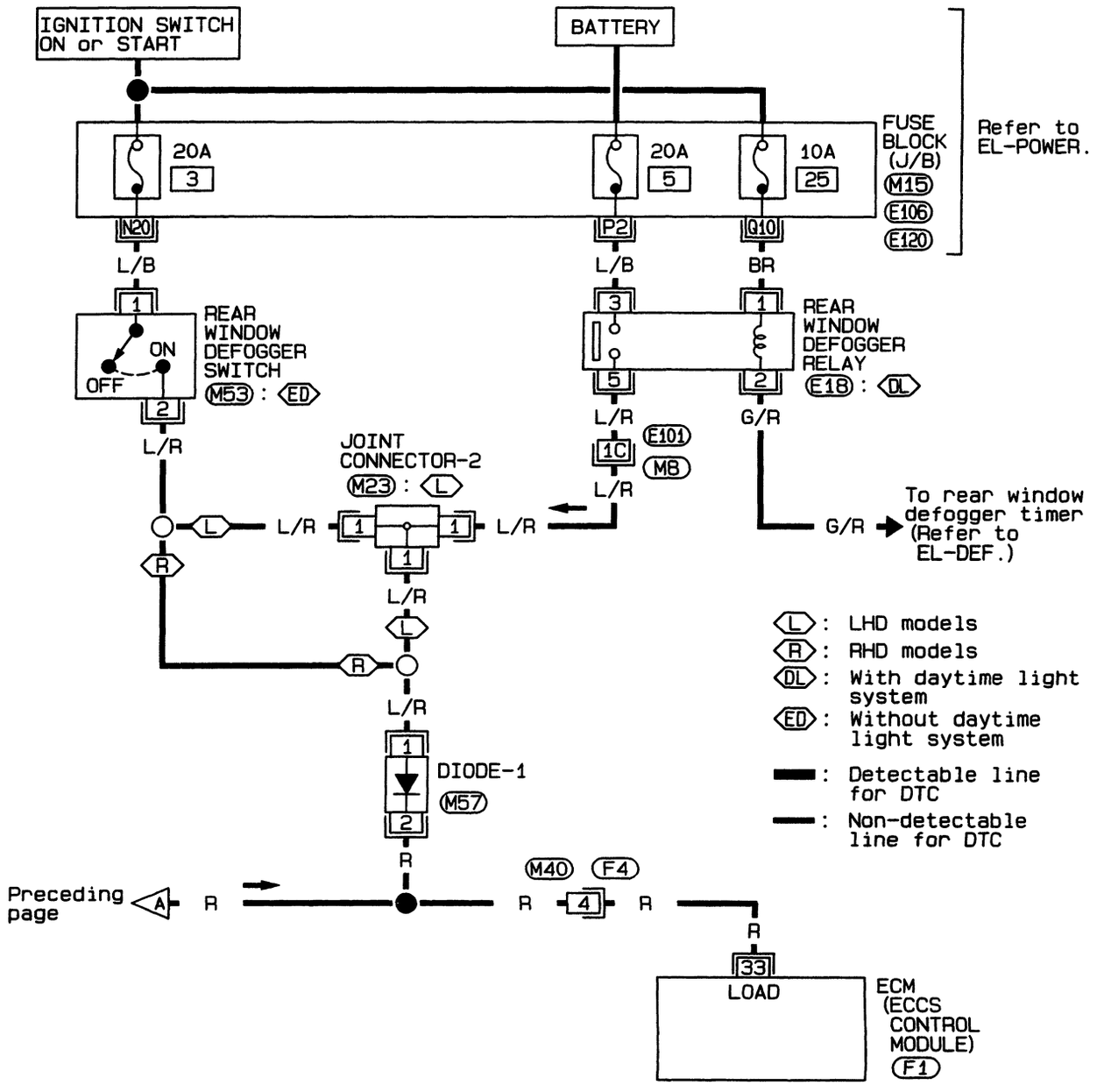
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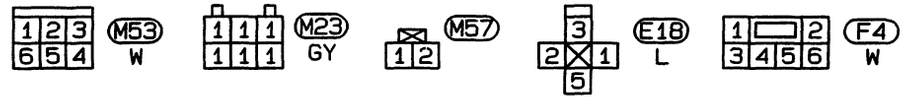
M8, E101

HEC235

Electrical Load Signal (Cont'd)

EC-LOAD-02

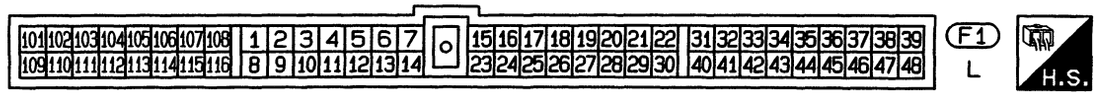




Refer to last page (Foldout page).

M8, E101

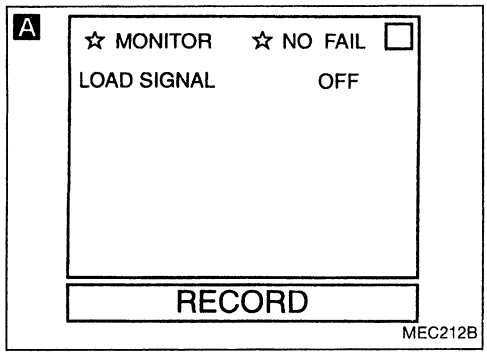
M15, E106, E120

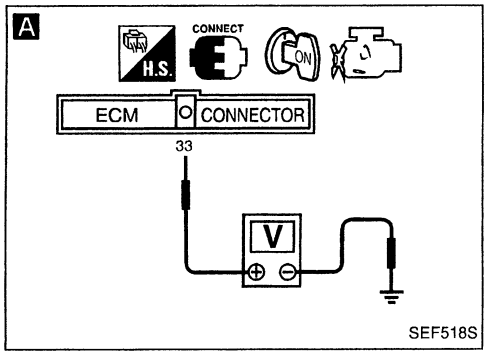


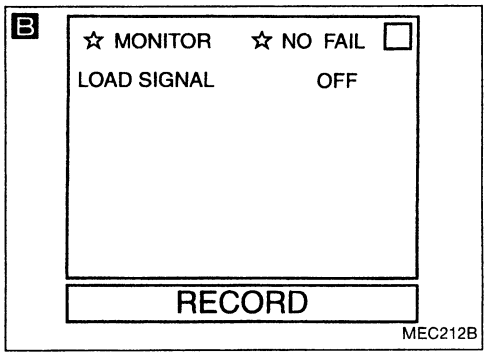
HEC236

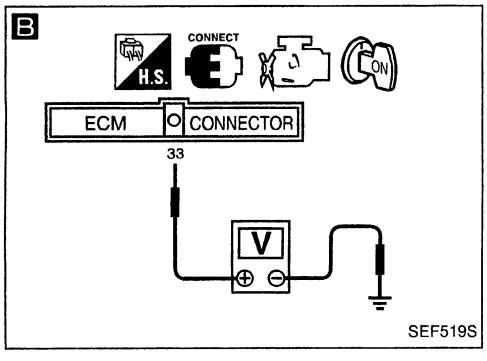
Electrical Load Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION-I.
1) Turn ignition switch "ON".
2) Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT.
Rear window defogger switch is "ON": ON
Rear window defogger switch is "OFF": OFF

NG → Check rear window defogger circuit. (Go to Procedure A.)

OR

2) Check voltage between ECM terminal ㉝ and ground under the following conditions.
Voltage:
Rear window defogger switch is "ON".
Battery voltage
Rear window defogger switch is "OFF".
Approximately 0V

OK

B

CHECK OVERALL FUNCTION-II.
1) Turn rear window defogger switch "OFF".
2) Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT.
Lighting switch is "ON": ON
Lighting switch is "OFF": OFF

NG → Check lighting switch circuit. (Go to Procedure B.)

OR

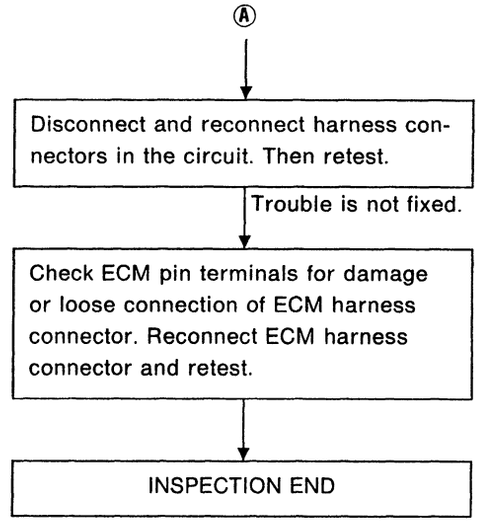
2) Turn ignition switch "OFF".
3) Check voltage between ECM terminal ㉝ and ground under the following conditions.
Voltage:
Lighting switch is "ON".
Battery voltage
Lighting switch is "OFF".
Approximately 0V

OK

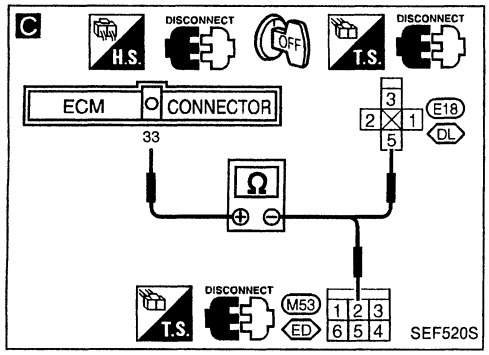
Ⓐ

EC

Electrical Load Signal (Cont'd)



Electrical Load Signal (Cont'd)



PROCEDURE A

INSPECTION START

Check if rear window defogger functions normally.

NG → Check rear window defogger circuit. (Refer to "REAR WINDOW DEFOGGER" in EL section.)

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1. Turn rear window defogger switch "OFF".
2. Turn ignition switch "OFF".
3. Disconnect ECM harness connector and rear window defogger switch harness connector or rear window defogger relay.
4. Check harness continuity between ECM terminal ㉝ and terminal ② or terminal ⑤.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F4), (M40)
- Harness connectors (M8), (E101) (DL)
- Diode (M57)
- Joint connector (M23) (LHD)
- Harness for open or short between ECM and rear window defogger relay (DL)
- Harness for open or short between ECM and rear window defogger switch (ED)

If NG, repair harness or connectors.

OK

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

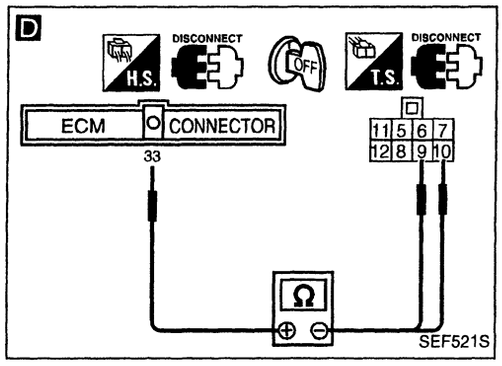
Trouble is not fixed.

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

INSPECTION END

EC

Electrical Load Signal (Cont'd)



PROCEDURE B

INSPECTION START

Check if lamps light when lighting switch is turned "ON".

NG → Check lighting switch circuit. (Refer to "COMBINATION SWITCH" in EL section.)

OK

D

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and lighting switch harness connector.
3. Check harness continuity between ECM terminal ㉝ and terminals ⑨, ⑩.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F4), (M40)
- Harness connectors (M8), (E101)
- Diodes (E122), (E123)
- Harness for open or short between lighting switch and ECM

If NG, repair harness or connectors.

OK

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

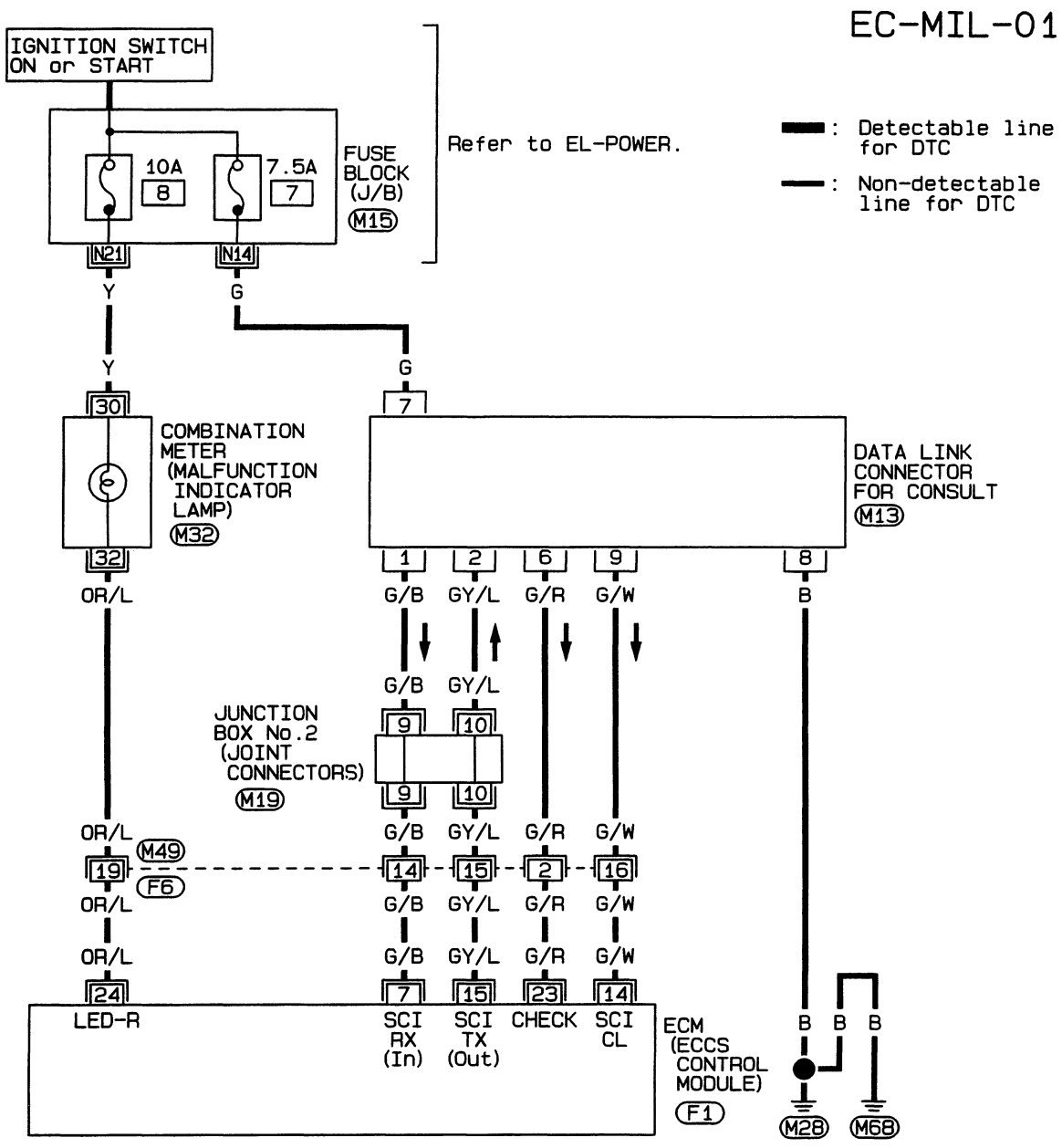
Trouble is not fixed.

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

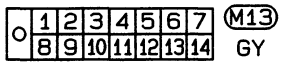
INSPECTION END

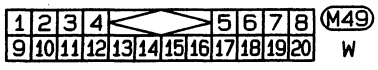
Malfunction Indicator Lamp (MIL) & Data Link Connector (DLC) for CONSULT

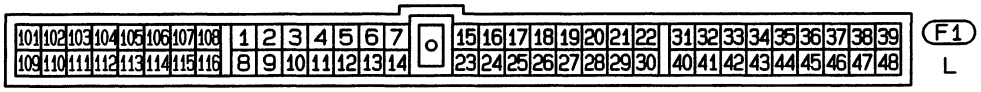
LHD models











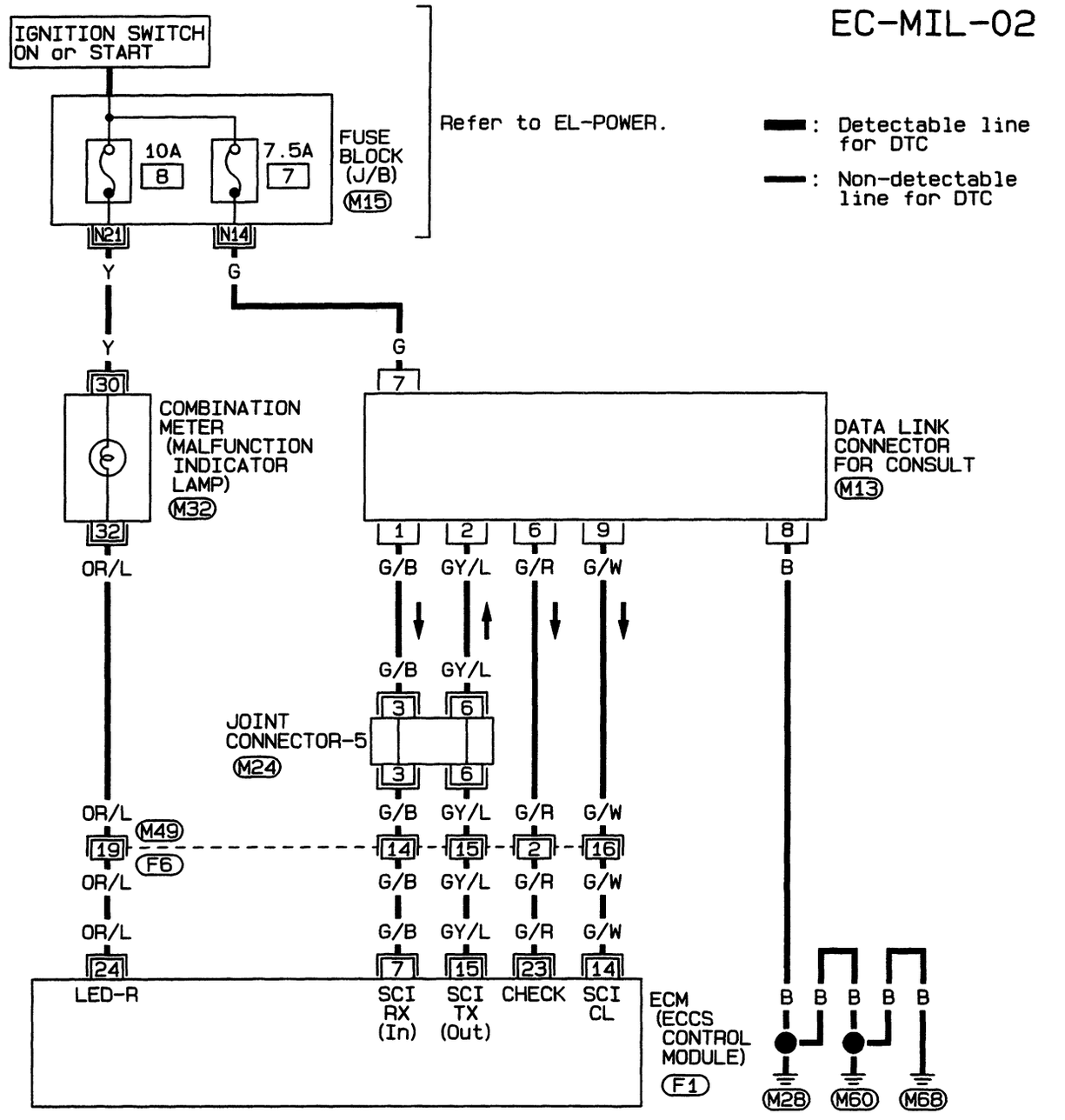
Refer to last page (Foldout page).
M15
M19

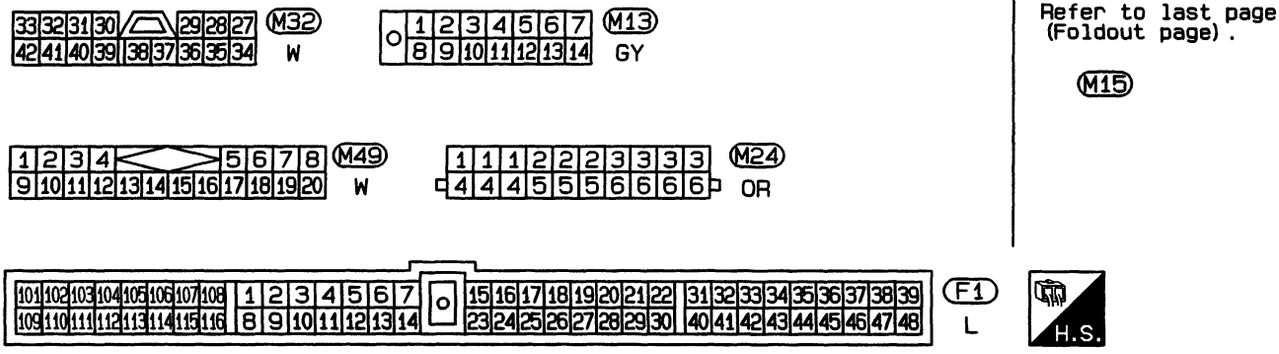
H.S.

HEC237

Malfunction Indicator Lamp (MIL) & Data Link Connector (DLC) for CONSULT (Cont'd)

RHD models





Refer to last page (Foldout page).

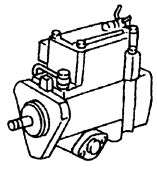
M15

HEC238

Engine Fuel & Emission Control System

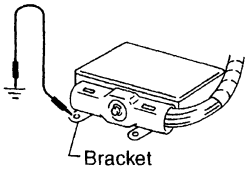
BATTERY
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

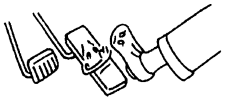
ELECTRONIC FUEL INJECTION PUMP
- Do not disconnect pump harness connectors with engine running.
- Do not disassemble electronic fuel injection pump except for the following parts:
  (Camshaft position sensor (pump), Injection timing control valve, Fuel cut solenoid valve)
  If NG, take proper action.



ECM PARTS HANDLING
- Do not disassemble No. 1 injection nozzle (with needle lift sensor built-in).
  If NG, replace No. 1 injection nozzle.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crankshaft position sensor (TDC).

ECM (ECCS-D control module)
- Do not disassembly ECM.
- If a battery terminal is disconnected, the memory will return to the ECM value.
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.
- When ECM is removed for inspection, make sure to ground the ECM mainframe.

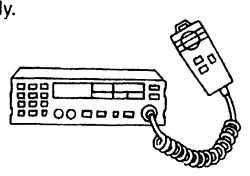




WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

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

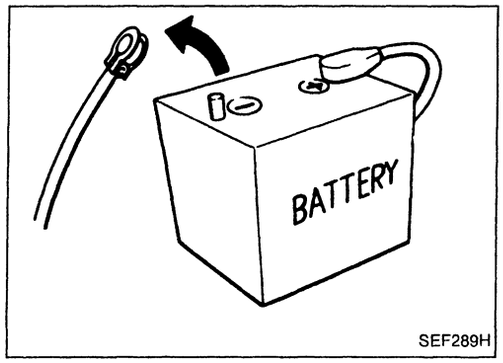
1) Keep the antenna as far as possible away from the ECM.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.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



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

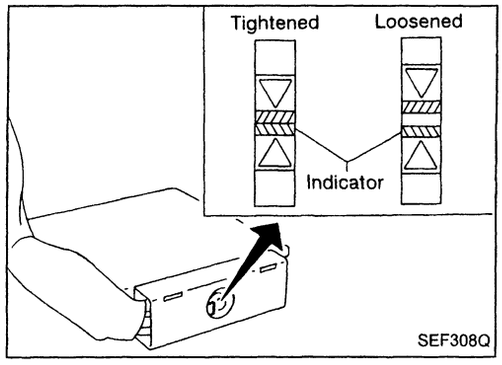
EC

SEF545S

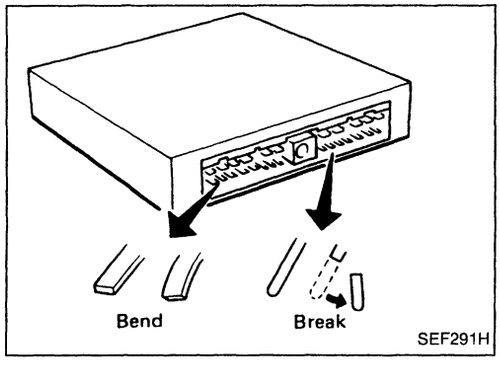


Precautions

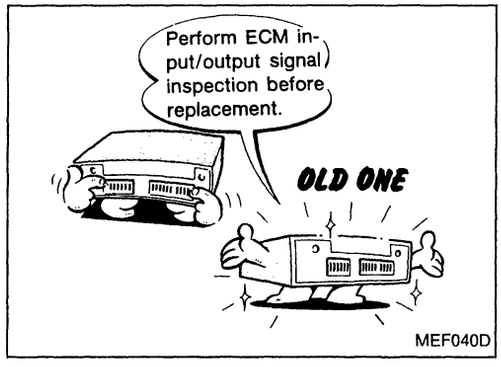
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**



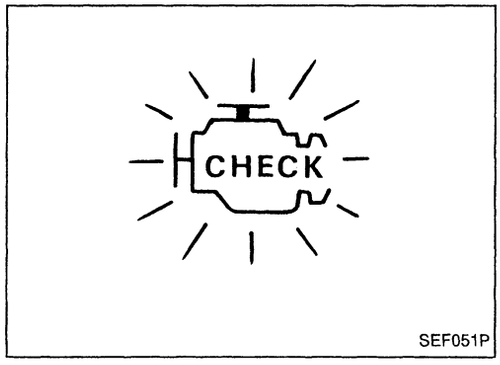
- **When connecting ECM harness connector, tighten securing bolt until the gap between orange indicators disappears.**
  : 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



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

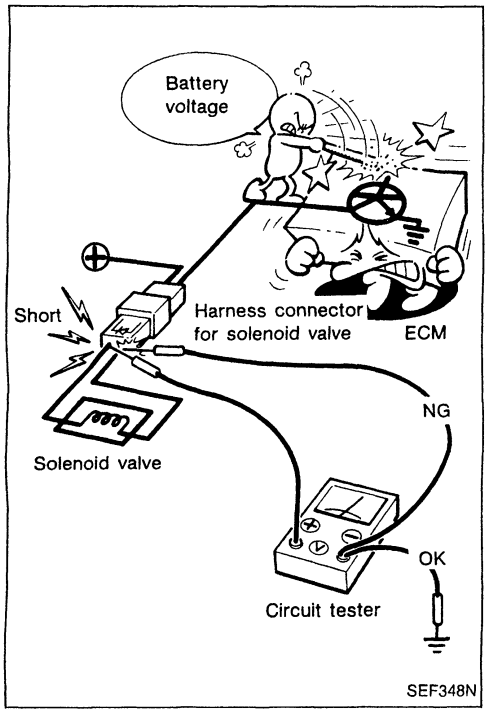


- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-154.**



- **If MIL illuminates or blinks irregularly when engine is running, water may have accumulated in fuel filter. Drain water from fuel filter. If this does not correct the problem, perform specified trouble diagnostic procedures.**
- **After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE".**
  The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE if the repair is completed. The "OVERALL FUNCTION CHECK" should be a good result if the repair is completed.

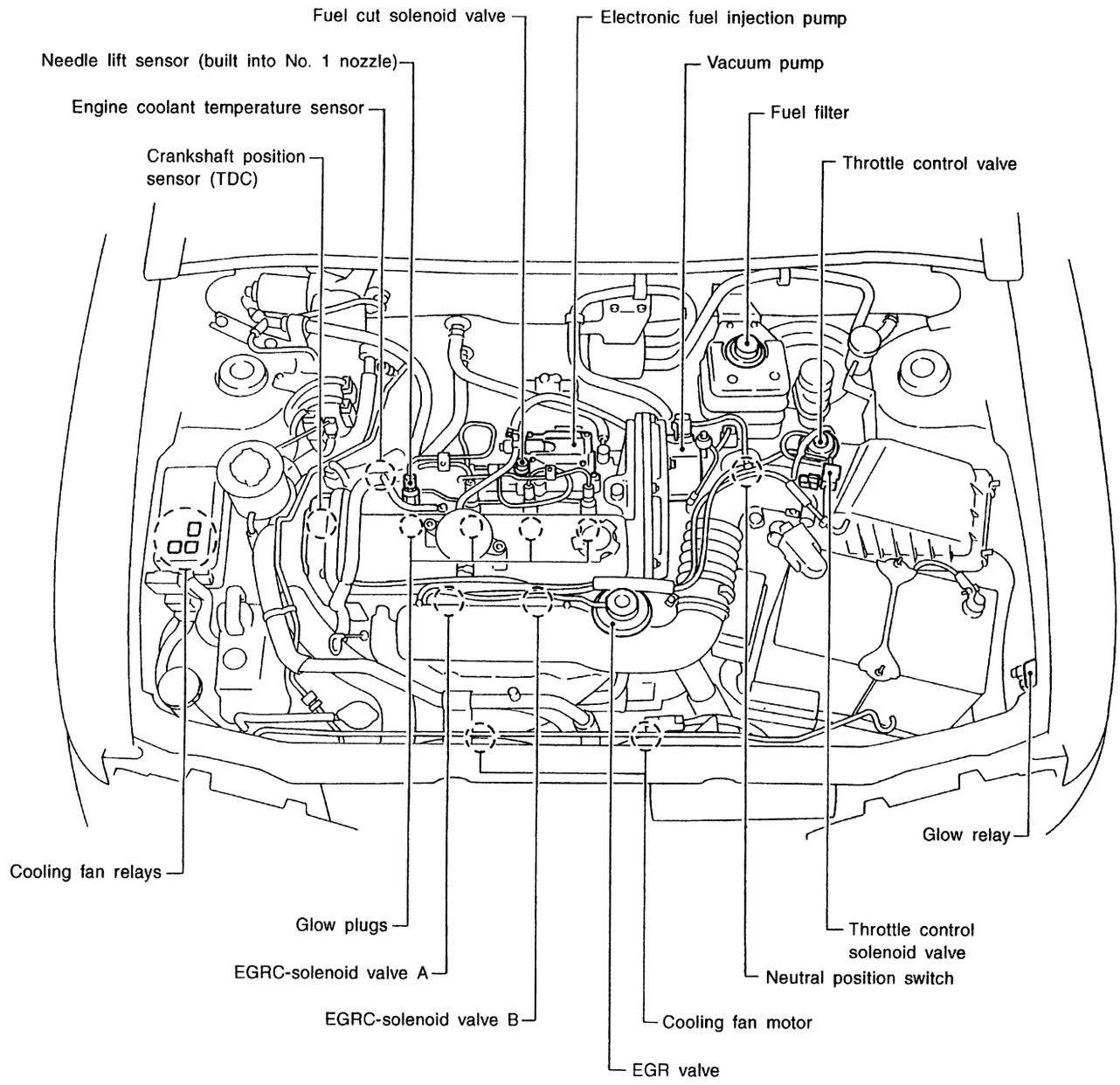
Precautions (Cont'd)



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

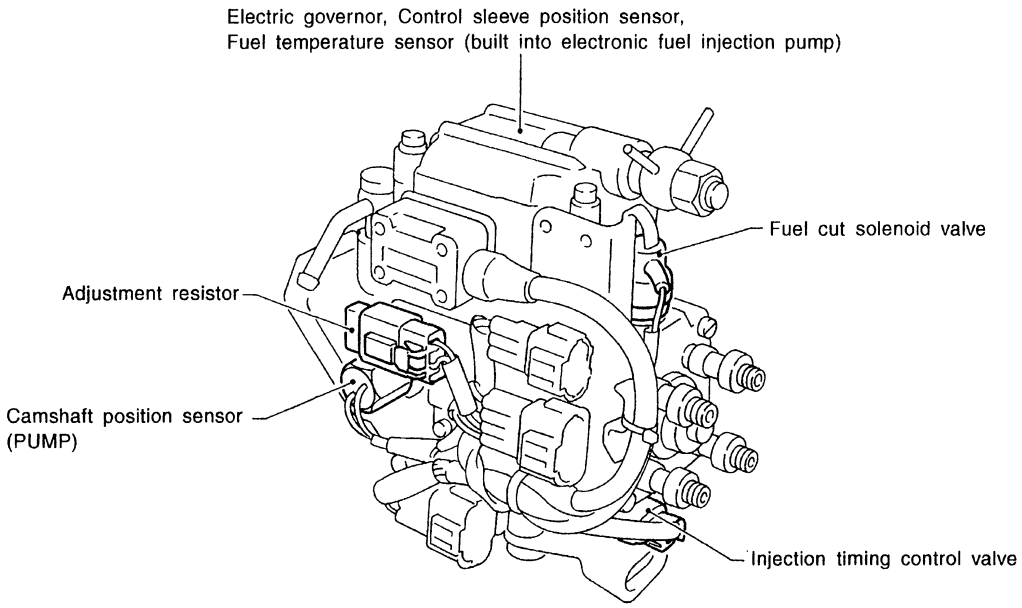
EC

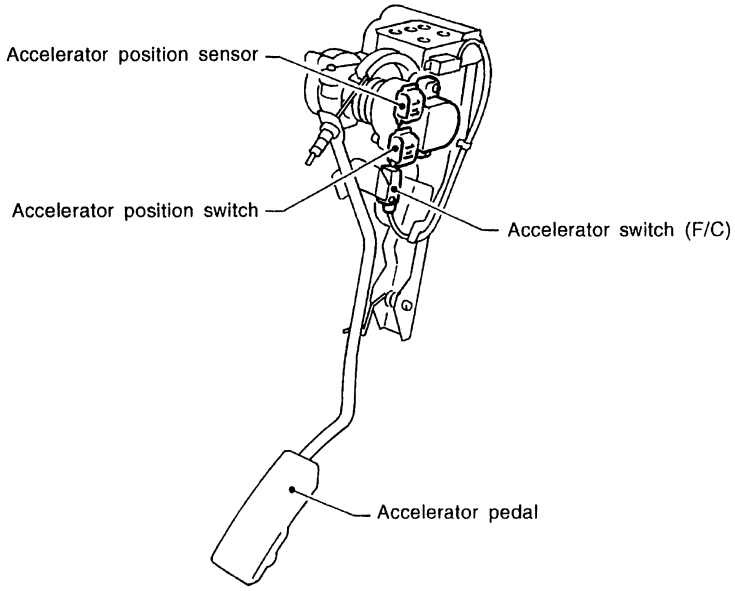
ECCS Component Parts Location

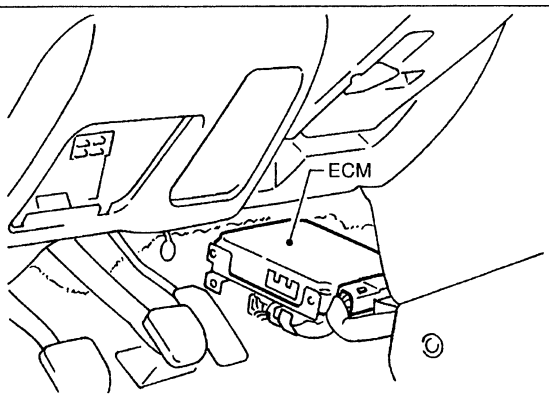


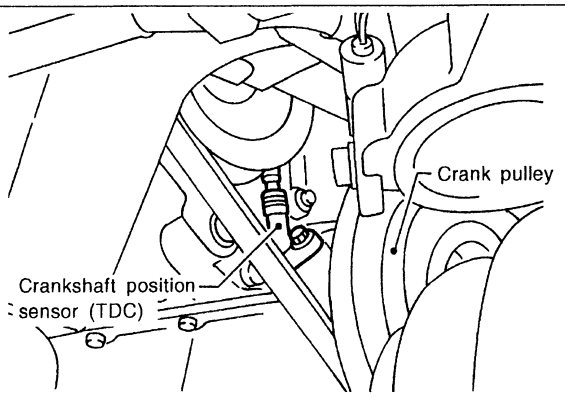
SEF546S

ECCS Component Parts Location (Cont'd)



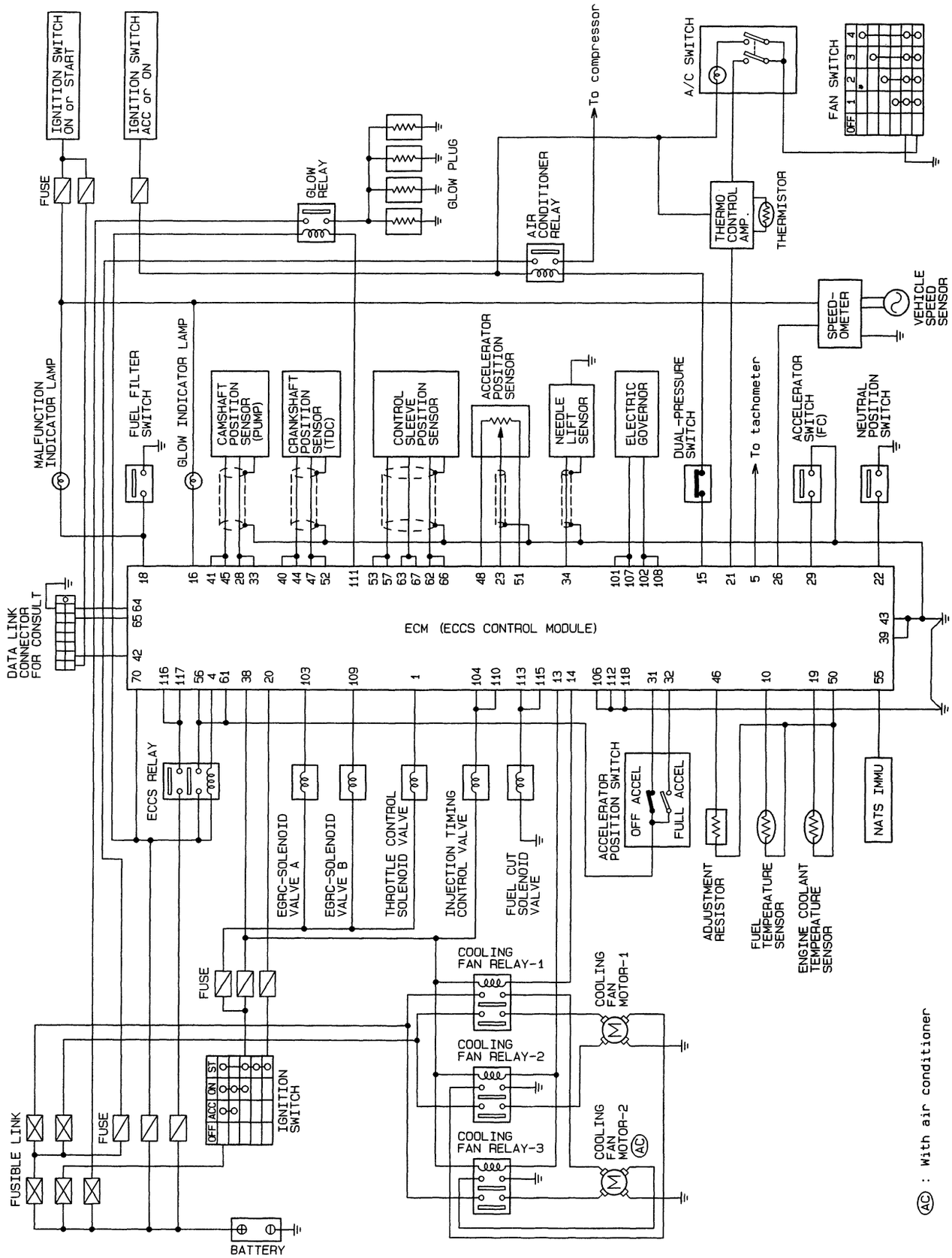






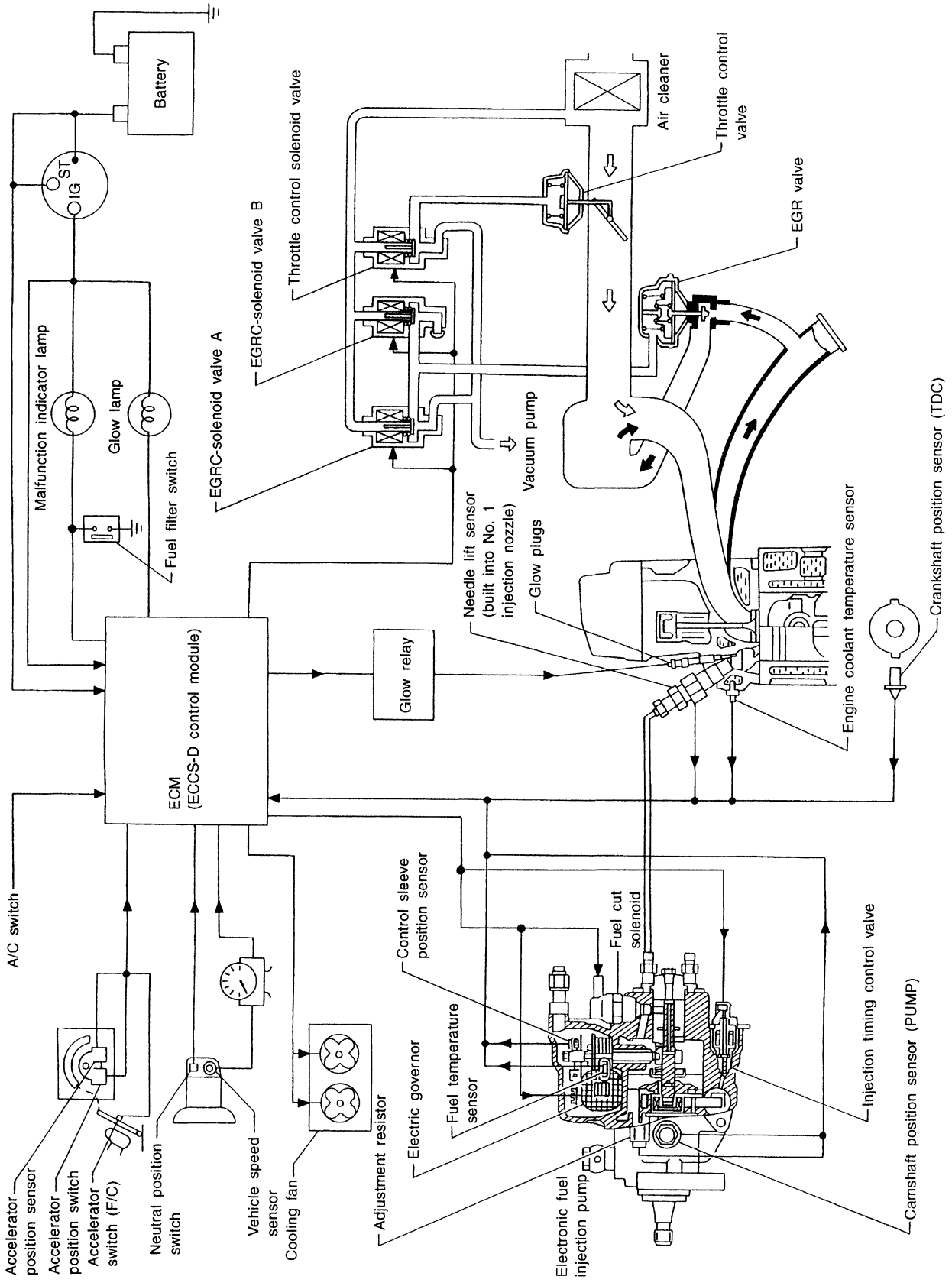
SEF547S

Circuit Diagram



HAC239

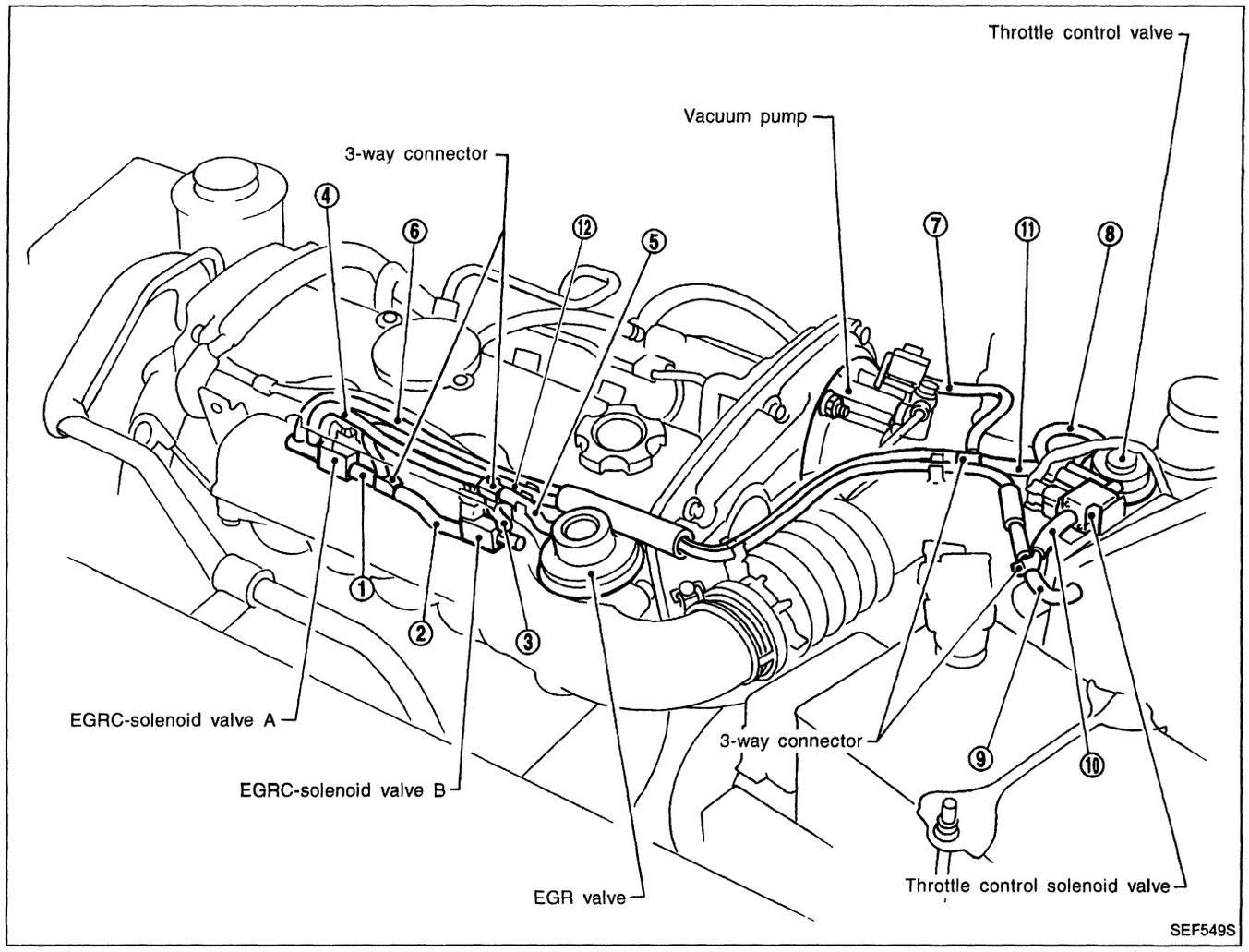
System Diagram



SEF548S

EC

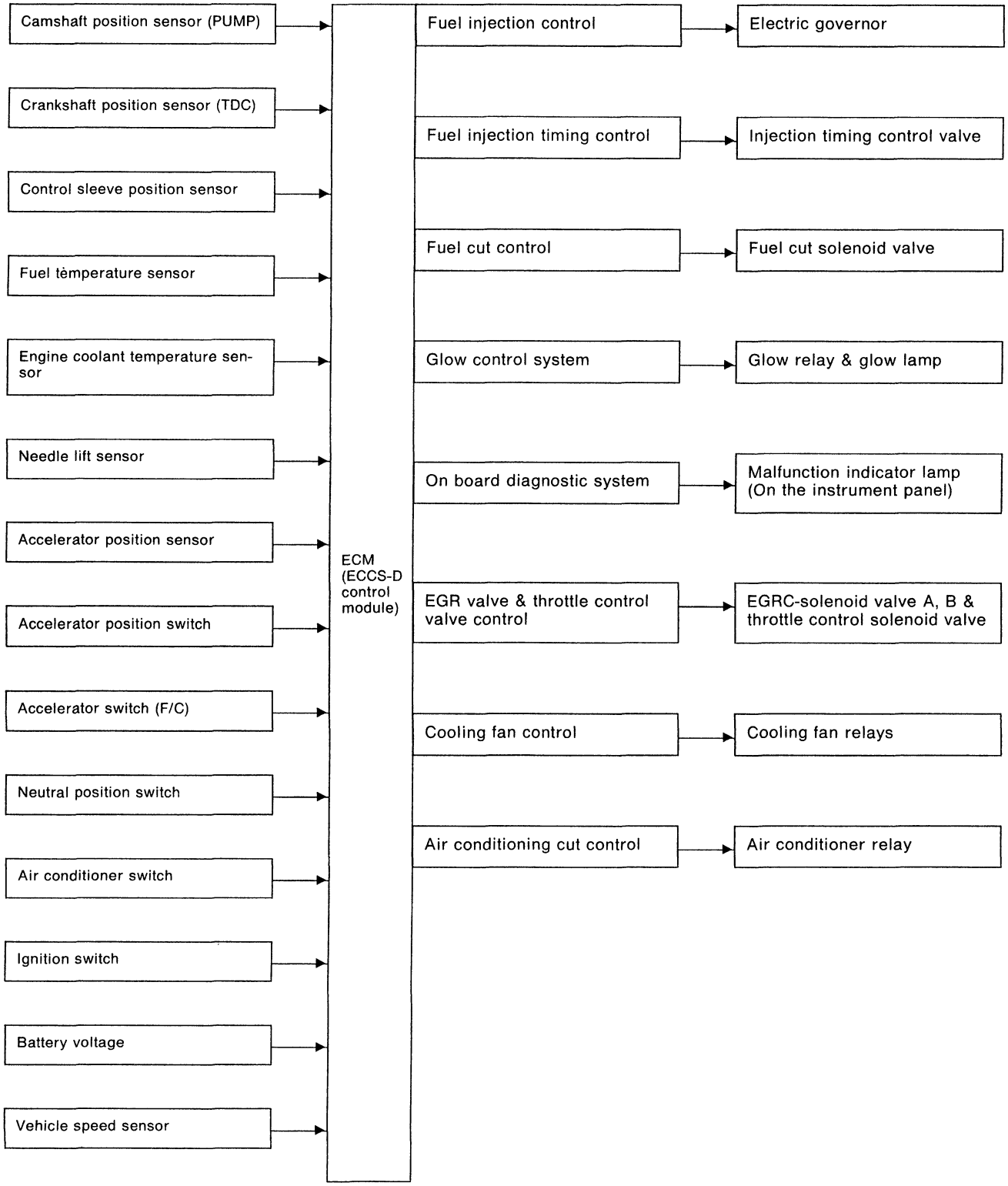
Vacuum Hose Drawing



① EGRC-solenoid valve A to 3-way connector
② EGRC-solenoid valve B to 3-way connector
③ 3-way connector to EGRC-solenoid valve B
④ EGRC-solenoid valve A to 3-way connector
⑤ EGR valve to 3-way connector
⑥ EGRC-solenoid valve A to 3-way connector
⑦ Vacuum pump to 3-way connector
⑧ Throttle control valve to Throttle control solenoid valve
⑨ Air duct to 3-way connector
⑩ Throttle control solenoid valve to 3-way connector
⑪ Throttle control solenoid valve to 3-way connector
⑫ 3-way connector to 3-way connector

Refer to "System Diagram", EC-107 for vacuum control system.

System Chart



EC

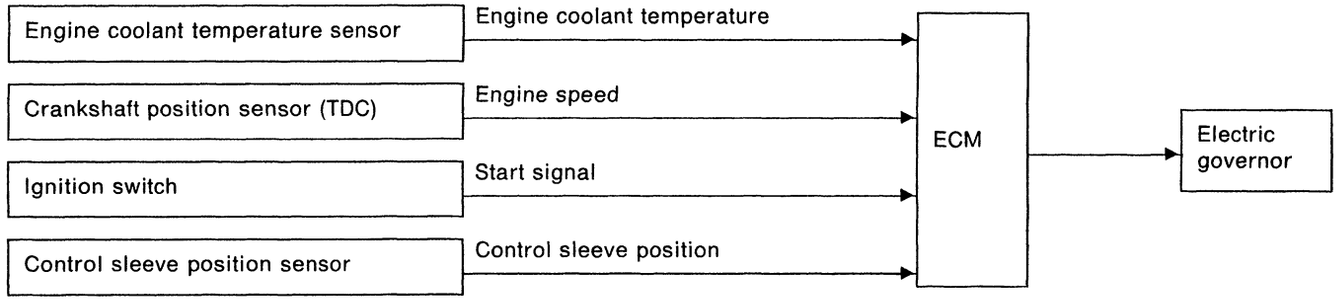
Fuel Injection System

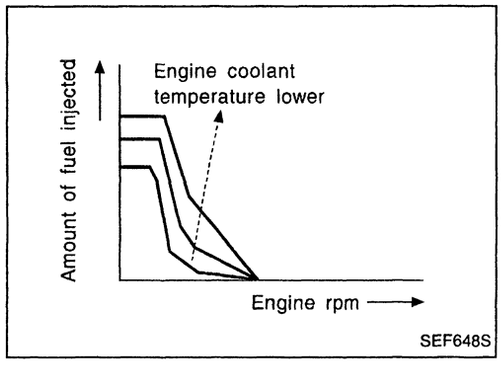
SYSTEM DESCRIPTION

Three types of fuel injection control are provided to accommodate engine operating conditions; normal control, idle control and start control. The ECM determines the appropriate fuel injection control. Under each control, the amount of fuel injected is compensated to improve engine performance. The ECM performs duty control on the electric governor (built into the fuel injection pump) according to sensor signals to compensate the amount of fuel injected to the preset value.

START CONTROL

Input/output signal line



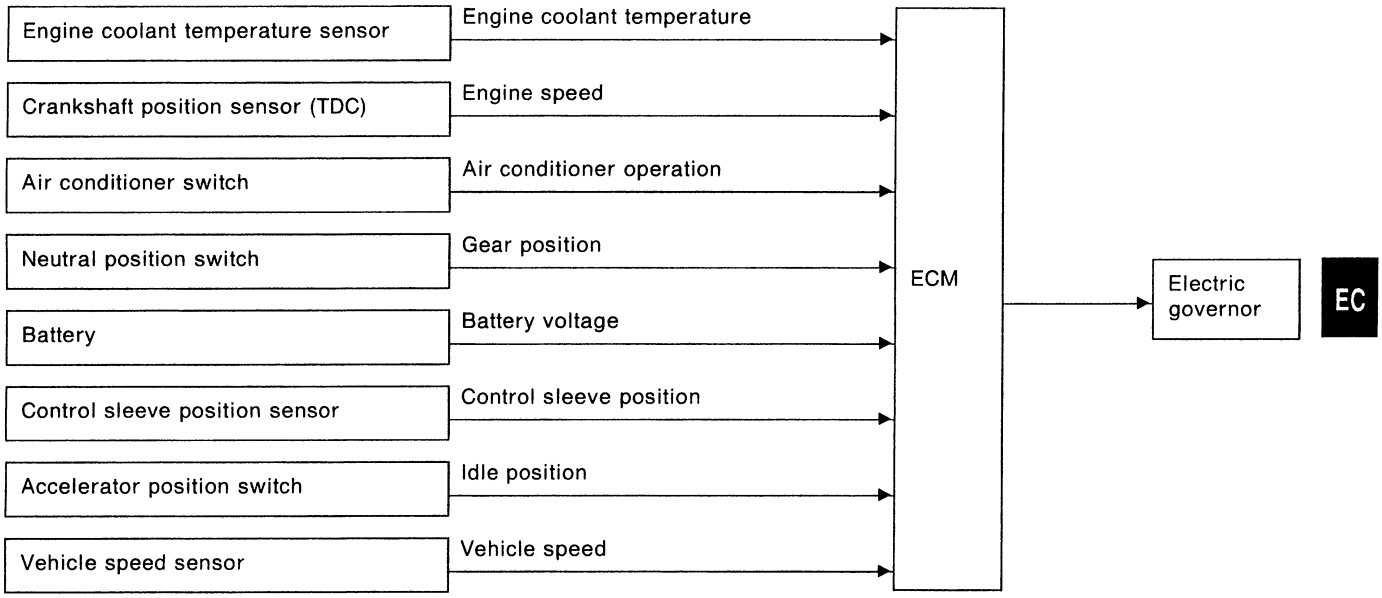


When the ECM receives a start signal from the ignition switch, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed and engine coolant temperature.
For better startability under cool engine conditions, the lower the coolant temperature becomes, the greater the amount of fuel injected. The ECM ends the start control when the engine speed reaches 400 rpm and shifts the control to the normal or idle control.

Fuel Injection System (Cont'd)

IDLE CONTROL

Input/output signal line

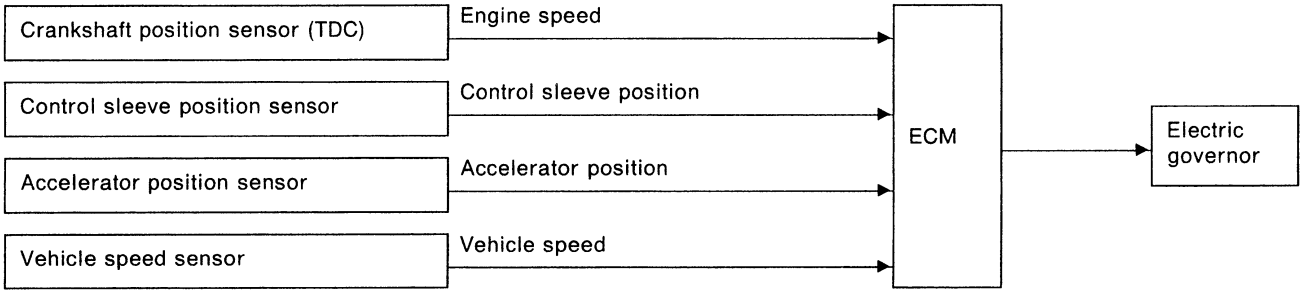


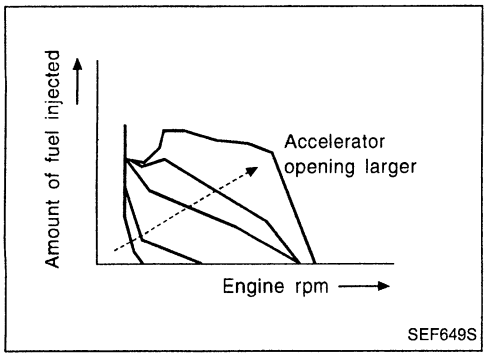
EC

When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. The ECM also provides the system with a fast idle control in response to the engine coolant temperature.

NORMAL CONTROL

Input/output signal line





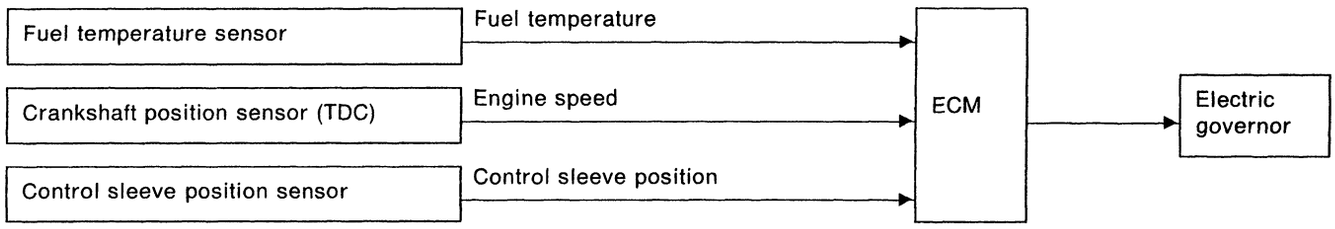
The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor (TDC) detects engine speed and the accelerator position sensor detects accelerator position. These sensors send signals to the ECM.

The fuel injection data, predetermined by correlation between various engine speeds and accelerator positions, are stored in the ECM memory, forming a map. The ECM determines the optimal amount of fuel to be injected using the sensor signals in comparison with the map.

Fuel Injection System (Cont'd)

FUEL TEMPERATURE COMPENSATION

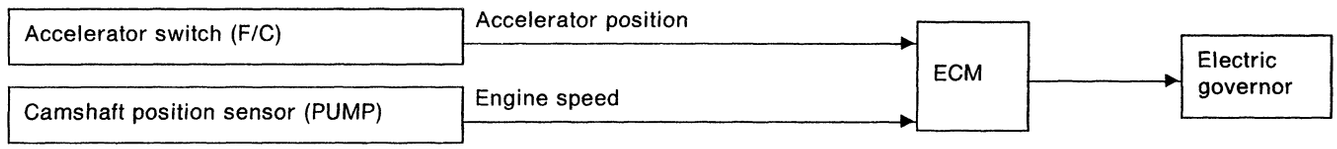
Input/output signal line



The amount of fuel leaking at or around high-pressure parts inside fuel injection pump varies with fuel temperature and engine speed. This will result in a difference between the target amount of fuel injected and the actual amount. The ECM compensates for the actual amount depending on the signal from the fuel temperature sensor which detects fuel temperature.

DECELERATION CONTROL

Input/output signal line



The ECM cuts power supply delivery to the electric governor during deceleration for better fuel efficiency. The ECM determines the time of deceleration according to signals from the accelerator switch (F/C) and camshaft position sensor (PUMP).

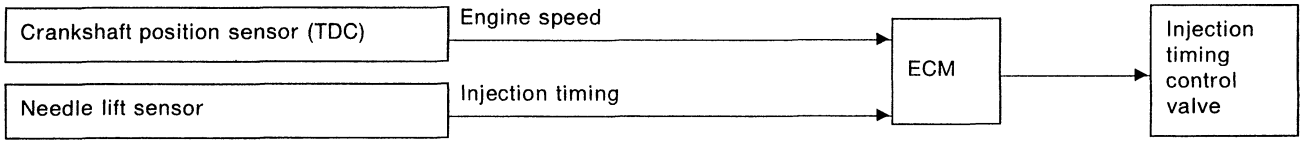
Fuel Injection Timing System

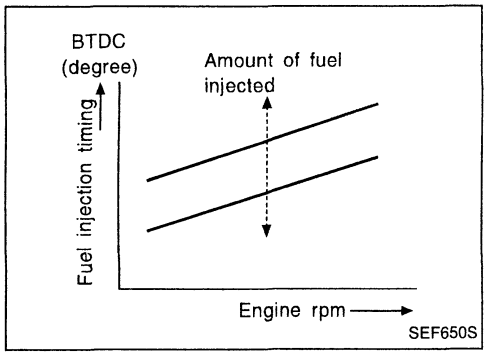
SYSTEM DESCRIPTION

The fuel injection timing system provides the optimal fuel injection timing for the target amount of fuel injected according to engine speed. The timing is compensated when the vehicle is being driven or when starting depending on the engine coolant temperature.
The ECM performs duty control on the timing control valve, allowing the valve to provide optimal fuel injection timing. The ECM also performs feedback control on the timing control valve using the signal from the needle lift sensor which detects the actual fuel injection timing.

BASIC CONTROL

Input/output signal line

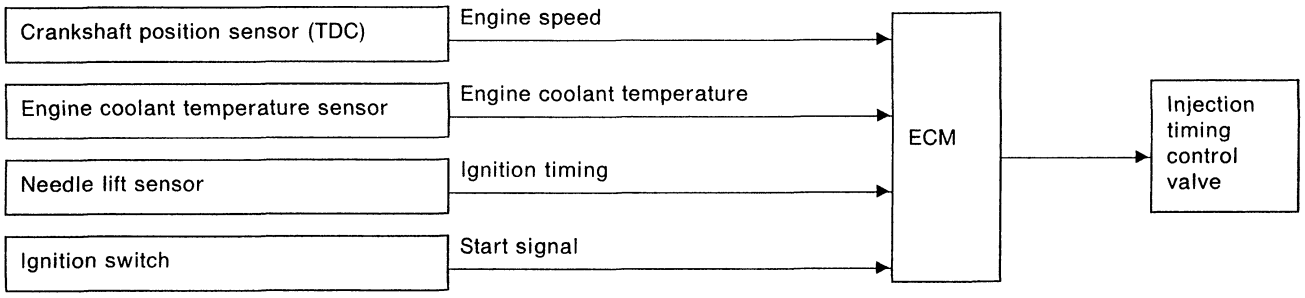


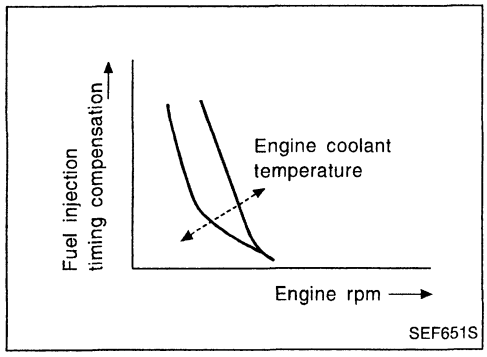


The optimal fuel injection timing data, predetermined in proportion to engine speeds and amount of fuel injected, are stored in the ECM memory. The ECM uses the data to control the fuel injection timing.

ENGINE COOLANT TEMPERATURE COMPENSATION (When starting)

Input/output signal line



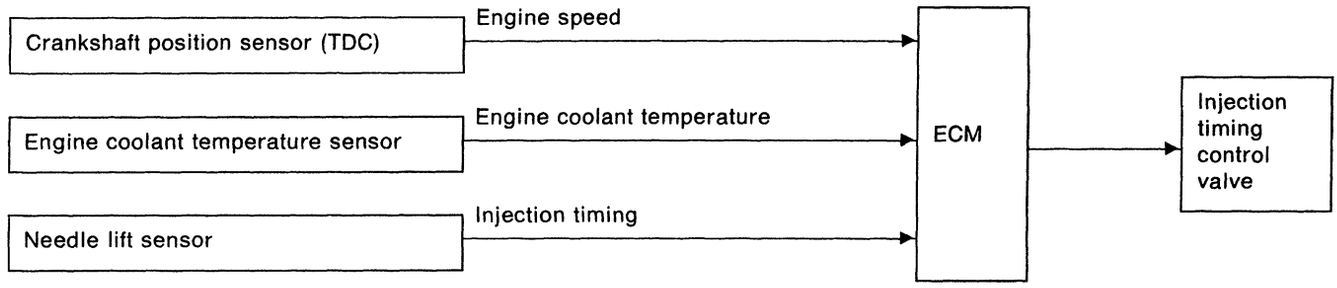


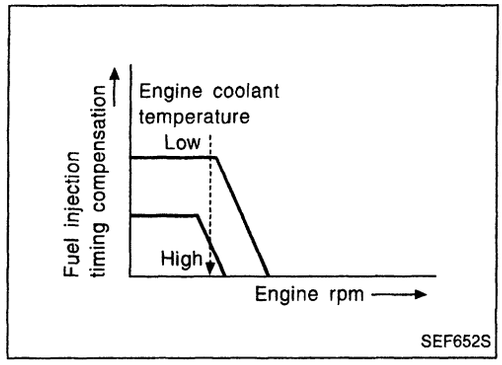
For better startability under cool engine conditions, the fuel injection timing is compensated according to the engine coolant temperature.

Fuel Injection Timing System (Cont'd)

ENGINE COOLANT TEMPERATURE COMPENSATION (During driving)

Input/output signal line

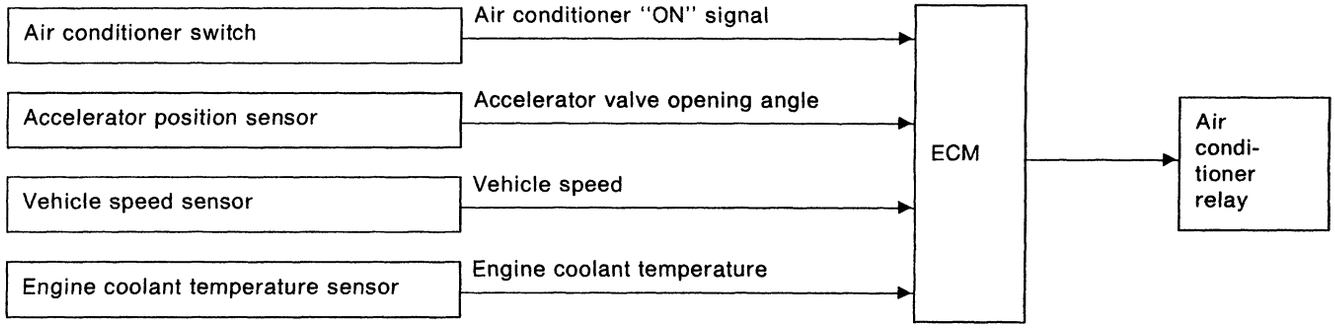




For better exhaust efficiency under cool engine conditions, the fuel injection timing is controlled within a compensation range depending on the engine speed, engine coolant temperature and amount of fuel injected.

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE

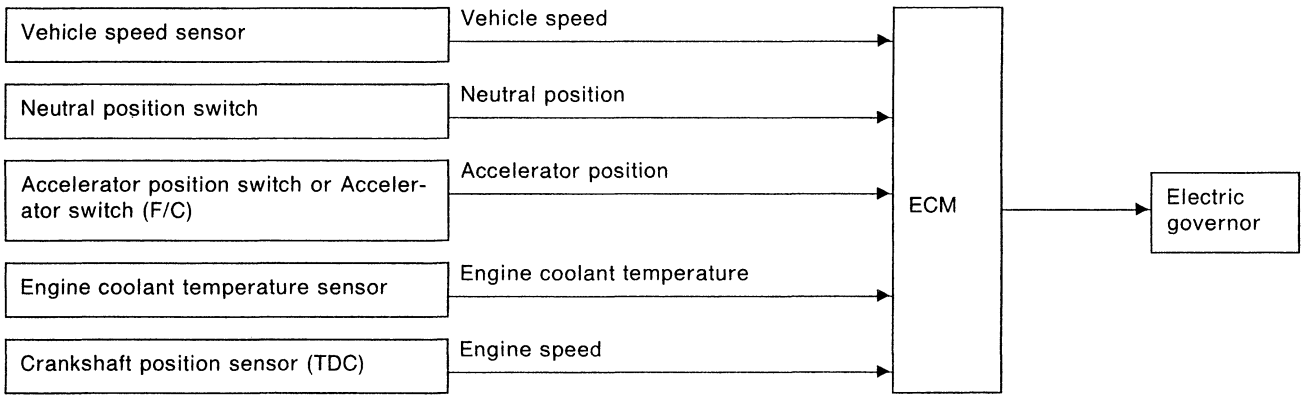


SYSTEM DESCRIPTION

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

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

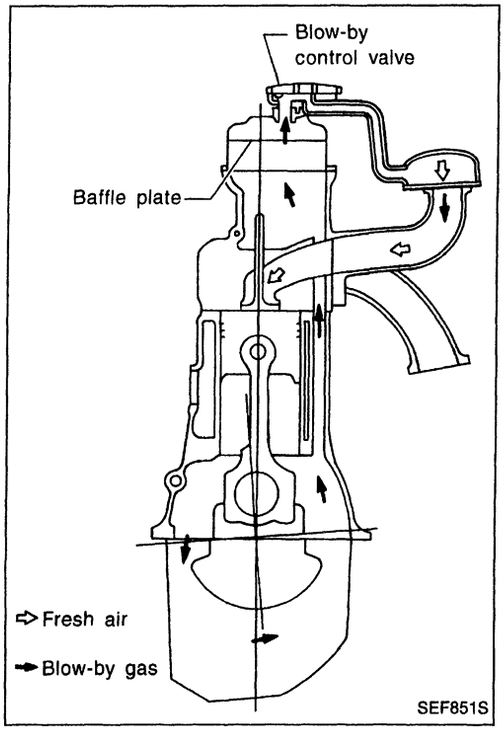
INPUT/OUTPUT SIGNAL LINE



If the engine speed is above 4,000 rpm with no load (for example, in neutral and engine speed over 4,000 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.
Fuel cut will operate until the engine speed reaches 1,000 rpm, then fuel cut is cancelled.

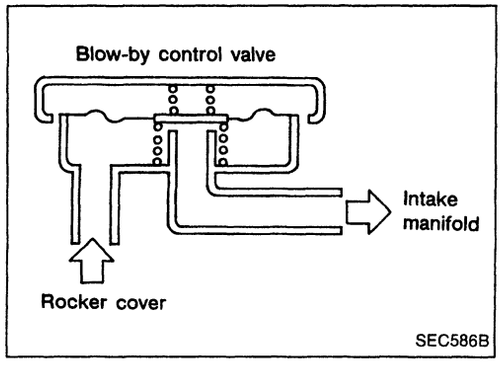
NOTE:
This function is different from deceleration control and fuel cut solenoid valve control listed under "Fuel Injection System", EC-110 and "TROUBLE DIAGNOSIS FOR DTC 36, 37, 38", EC-215.

EC



Description

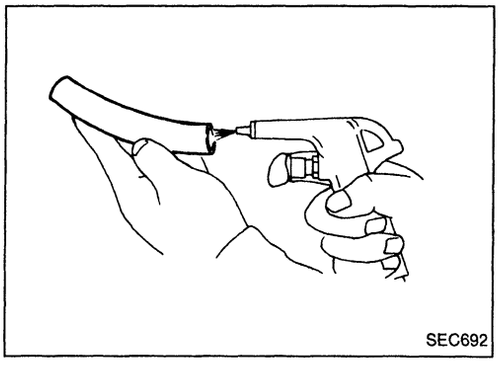
In this system, blow-by gas is sucked into the air inlet pipe through the control valve after oil separation by oil separator in the rocker cover.



Inspection

BLOW-BY CONTROL VALVE

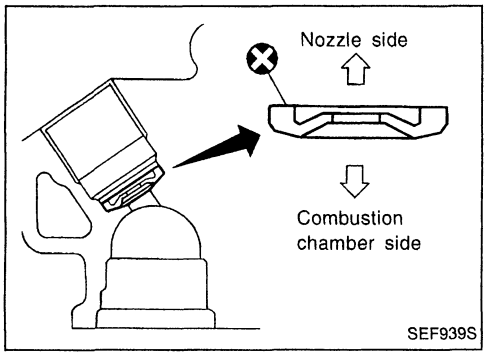
Check control valve for clogging and abnormalities.



VENTILATION HOSE

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

CAUTION:
- **Do not disassemble No. 1 nozzle (with needle lift sensor built-in). If NG, replace No. 1 injection nozzle.**
- **Plug flare nut with a cap or rag so that no dust enters the nozzle. Cover nozzle tip for protection of needle.**



Removal and Installation

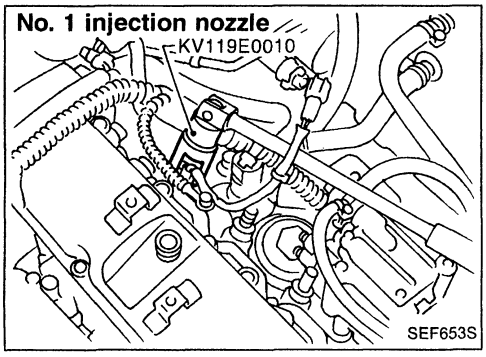
1. Remove fuel injection tube and spill tube.
2. Remove injection nozzle assembly.

Also remove gasket from nozzle end.

3. Install injection nozzle in the reverse order of removal.

Injection nozzle to engine:
: 59 - 69 N·m (6.0 - 7.0 kg-m, 43 - 51 ft-lb)
Injection nozzle to tube:
: 22 - 25 N·m (2.2 - 2.5 kg-m, 16 - 18 ft-lb)
Spill tube:
: 39 - 49 N·m (4.0 - 5.0 kg-m, 29 - 36 ft-lb)

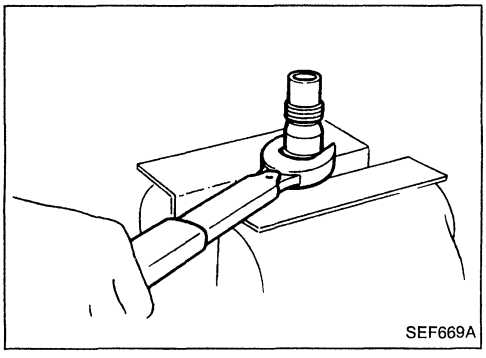
a. Always clean the nozzle holes.
b. Always use new injection nozzle gasket.
c. Note that small washer should be installed in specified direction.
d. Bleed air from fuel system.



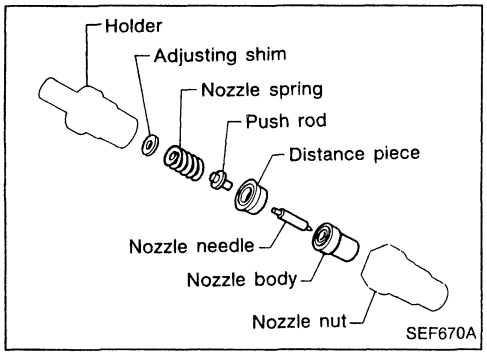
Disassembly (No. 2 - 4 nozzles)

Do not disassemble No. 1 nozzle (with needle lift sensor).

1. Loosen nozzle nut while preventing nozzle top from turning.



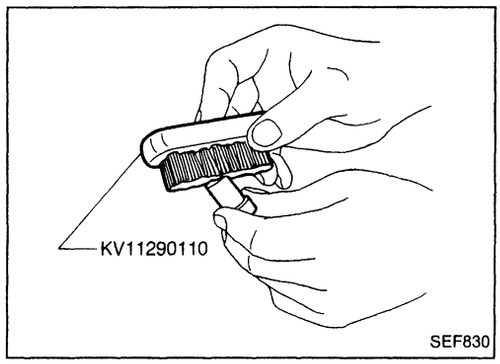
2. Arrange all disassembled parts in the order shown at left.



Inspection (No. 2 - 4 nozzles)

Thoroughly clean all disassembled parts with fresh kerosene or solvent.

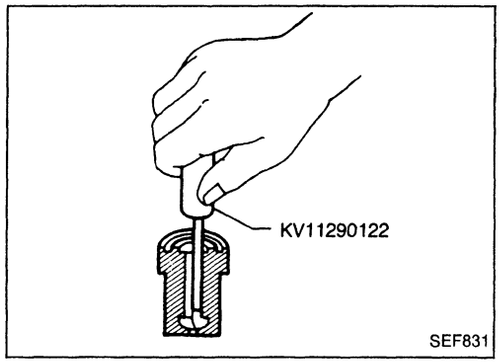
- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or distance piece.
- Check distance piece and nozzle holder for proper contact. If excessively worn or damaged, replace distance piece or nozzle holder.
- Check nozzle spring for excessive wear or damage. If excessively worn or damaged, replace it with a new spring.



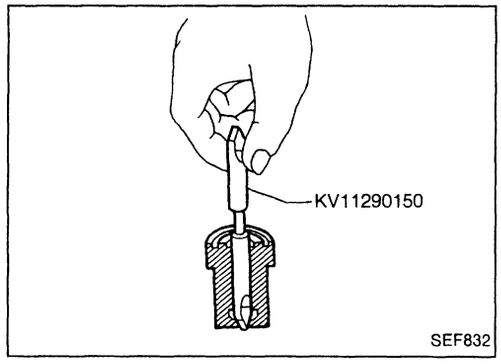
Cleaning (No. 2 - 4 nozzles)

a. Do not touch the nozzle mating surface with your fingers.
b. To wash the nozzles, use a wooden stick and brass brush with clean diesel fuel.

1. Remove any carbon from exterior of nozzle body (except wrapping angle portion) by using Tool.



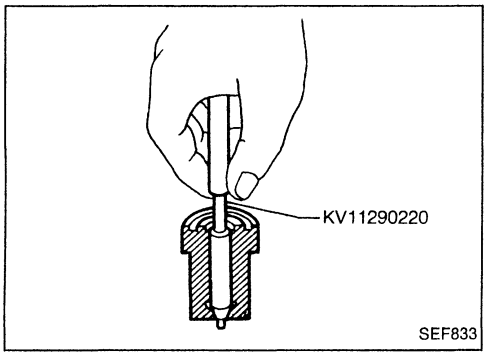
2. Clean oil sump of nozzle body using Tool.



3. Clean nozzle seat by using Tool.

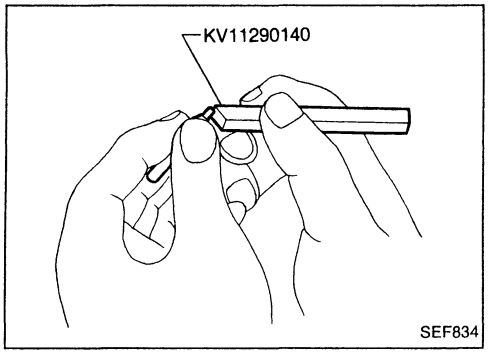
This job should be performed with extra precautions, since efficiency of nozzle depends greatly on a good nozzle seat.

Cleaning (No. 2 - 4 nozzles) (Cont'd)



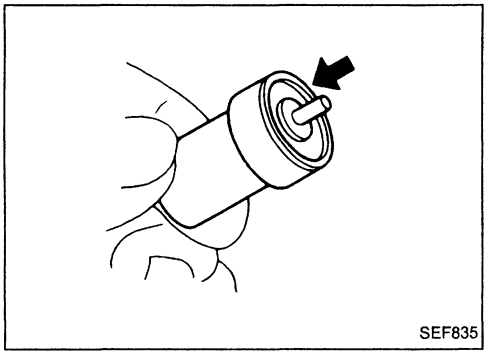
4. Clean spray hole of nozzle body by using Tool.

To prevent spray hole from canting, always clean it by starting with inner side and working towards outside.



5. Decarbonate nozzle needle tip by using Tool.

EC

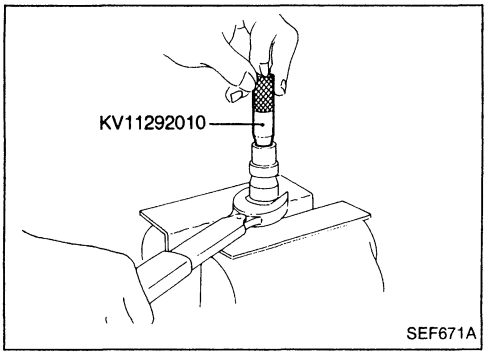


6. Check needle sinking.
(1) Pull needle about halfway out from body and then release it.
(2) Needle should sink into body very smoothly from just its own weight.
(3) Repeat this test and rotate needle slightly each time.

If needle fails to sink smoothly from any position, replace both needle and body as a unit.

Assembly (No. 2 - 4 nozzles)

Assemble in the reverse order of disassembly, observing the following.



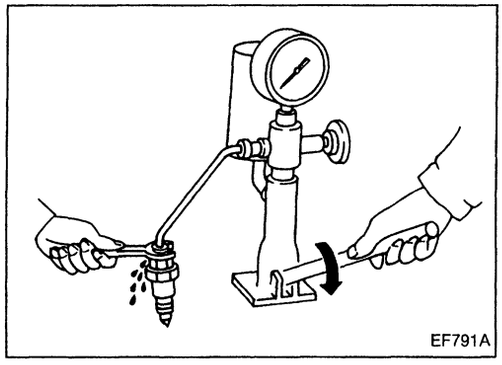
If nozzle body is not installed properly, Tool cannot be removed and nozzle body may be damaged.

Holder to nozzle nut:

: 78 - 98 N·m (8.0 - 10.0 kg-m, 58 - 72 ft-lb)

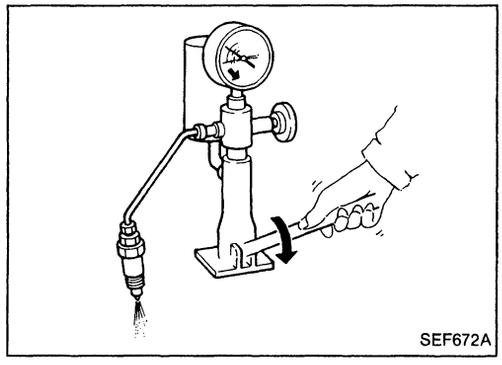
Test and Adjustment

WARNING:
When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to contact your hands or body, and make sure your eyes are properly protected with goggles.


EF791A

INJECTION PRESSURE TEST

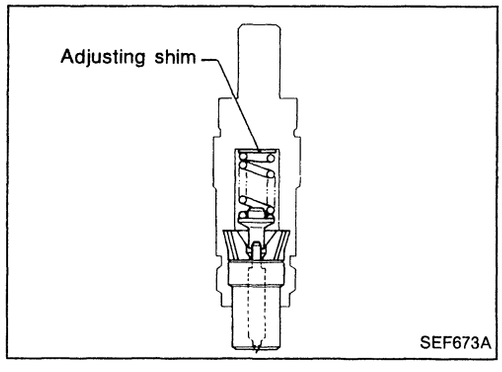
1. Install nozzle to injection nozzle tester and bleed air from flare nut.


SEF672A

2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:
Used
12,259 - 13,239 kPa (122.6 - 132.4 bar, 125 - 135 kg/cm^2, 1,778 - 1,920 psi)
New
13,239 - 14,024 kPa (132.4 - 140.2 bar, 135 - 143 kg/cm^2, 1,920 - 2,033 psi)

Always check initial injection pressure using a new nozzle.



SEF673A

4. To adjust injection pressure, change adjusting shims (No. 2 - 4 nozzles).

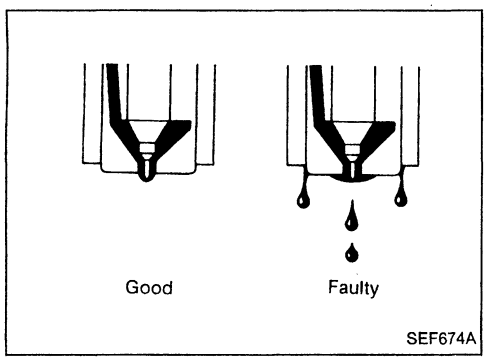
a. Increasing the thickness of adjusting shims increases initial injection pressure. Decreasing thickness reduces initial pressure.

b. A shim thickness of 0.04 mm (0.0016 in) corresponds approximately to a difference of 471 kPa (4.71 bar, 4.8 kg/cm^2, 68 psi) in initial injection pressure.

Refer to SDS for adjusting shim (EC-259).

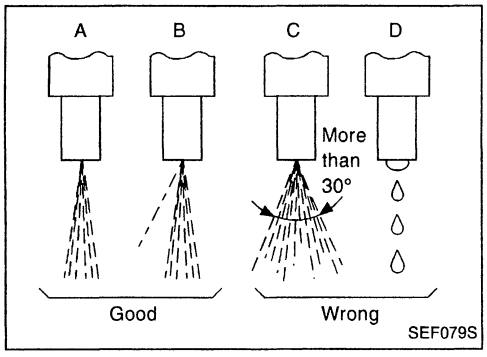
Test and Adjustment (Cont'd)

LEAKAGE TEST



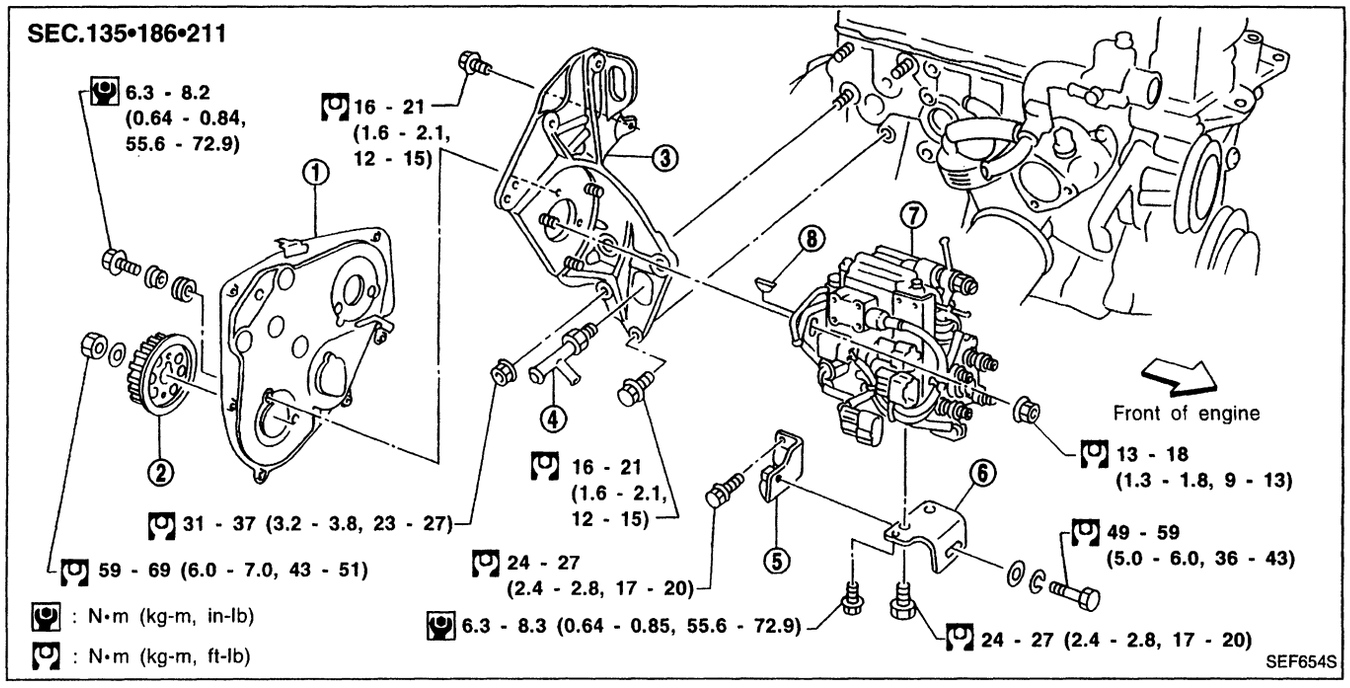
1. Maintain the pressure at about 981 to 1,961 kPa (9.8 to 19.6 bar, 10 to 20 kg/cm^2, 142 to 284 psi) below initial injection pressure.
2. Check that there is no dripping from the nozzle tip or around the body.
3. If there is leakage, clean, overhaul or replace nozzle.

EC



SPRAY PATTERN TEST

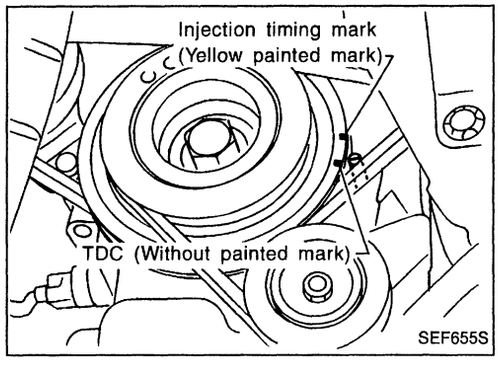
1. Check spray pattern by pumping tester handle one full stroke per second.
- **If main spray angle is within 30 degrees as shown, injection nozzle is good.**
- **It is still normal even if a thin stream of spray deviates from the main spray (pattern B).**
2. If the spray pattern is not correct, disassemble and clean nozzle.
3. Test again and if spray pattern is not corrected, replace nozzle.



① Rear back cover
② Injection pump sprocket
③ Injection pump bracket
④ Water connector
⑤ Bracket
⑥ Bracket
⑦ Electronic fuel injection pump
⑧ Key

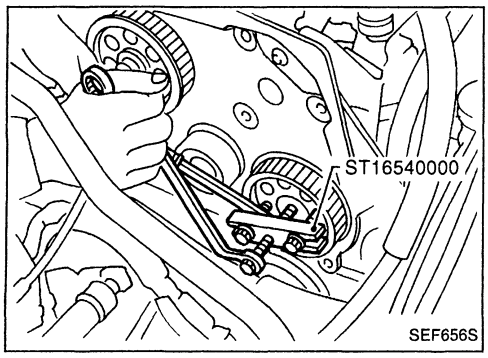
Removal

1. Remove battery.
   Disconnect electronic injection pump harness connectors.

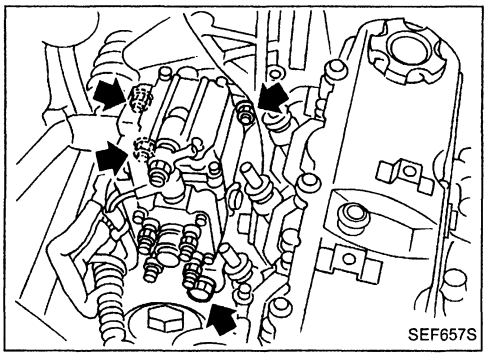


2. Set No. 1 piston at TDC on its compression stroke.
   TDC: Crankshaft pulley notch without painted mark
3. Remove fuel hoses (supply, return and spill) and injection tubes.
4. Remove air duct and injection pump timing belt cover.
5. Remove injection pump timing belt.
   Refer to EM section ("Injection Pump Timing Belt").

Removal (Cont'd)

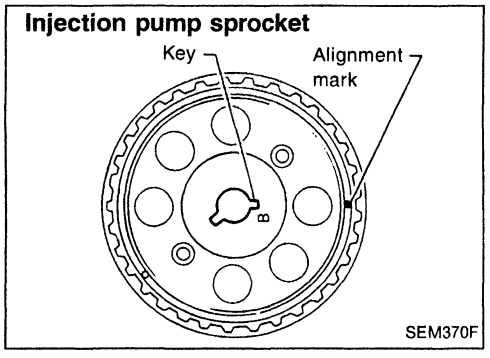


6. Remove injection pump sprocket with Tool.
- **Remove key from injection pump shaft and store safely.**



7. Remove injection pump assembly.

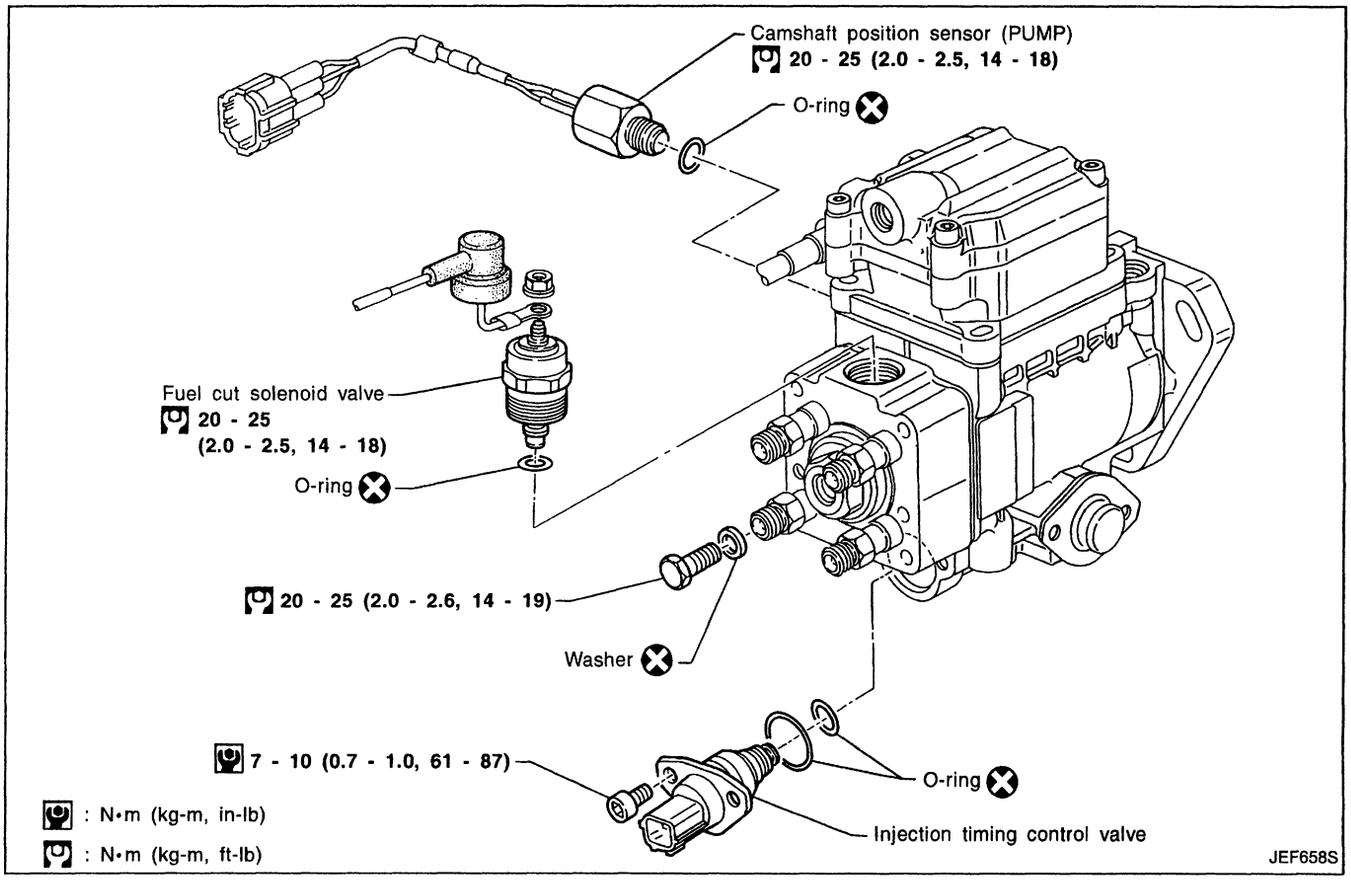
EC



Installation

1. Install key on injection pump shaft, then install injection pump sprocket.
- Use mark "B" on sprocket.
2. Install injection pump timing belt.
   Refer to EM section ("Injection Pump Timing Belt").

3. Adjust injection timing.
   Refer to "Basic Inspection", EC-140.
4. Install all parts removed.



Disassembly and Assembly

CAUTION:

- **Do not disassemble the parts not shown in the illustration above.**
- **Before installing injection timing control valve, liberally apply a coat of diesel fuel to O-ring and its mating area. Insert injection timing control valve straight into bore in fuel pump body. After properly positioning injection timing control valve, visually check that fuel does not leak.**
- **After assembling the parts, erase Diagnostic Trouble Code (DTC), and perform DTC CONFIRMATION PROCEDURE (or OVERALL FUNCTION CHECK).**

DTC and MIL Detection Logic

When a malfunction is detected for the first time, the malfunction (DTC) is stored in the ECM memory. The MIL will light up each time the ECM detects malfunction. However, if the same malfunction is experienced in two consecutive driving patterns and the engine is still running, the MIL will stay lit up. For diagnostic items causing the MIL to light up, refer to "Diagnostic Trouble Code (DTC) Chart", EC-142.

Diagnostic Trouble Code (DTC)

HOW TO READ DTC

The diagnostic trouble code 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: 11, 13, 14, etc.
   These DTCs are controlled by NISSAN.
2. CONSULT Examples: "CAM POS SEN (PUMP)", etc.

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

EC

HOW TO ERASE DTC

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

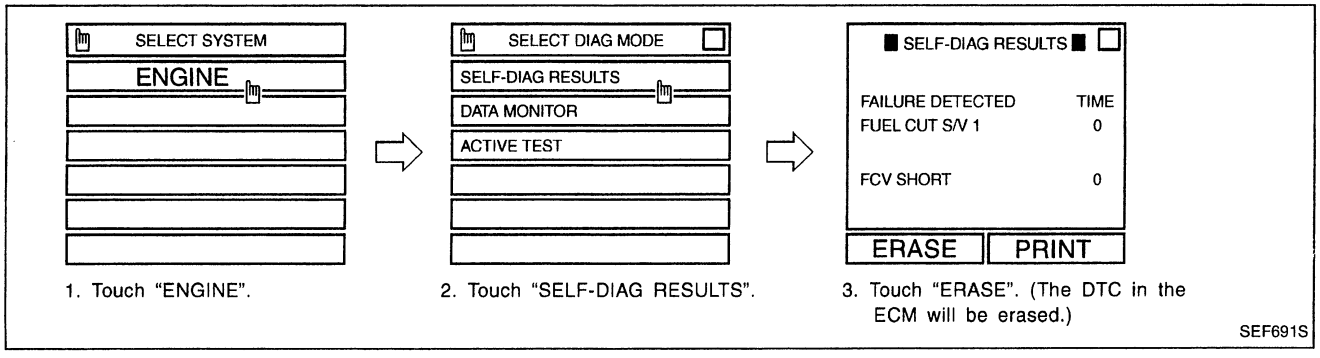
Selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT.

Changing the diagnostic test mode from Diagnostic Test Mode II to Mode I. (Refer to EC-127.)

- **If the battery terminal is disconnected, the diagnostic trouble code will be lost within 24 hours.**
- **When you erase the DTC, using CONSULT is easier and quicker than switching the diagnostic test modes.**

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 for at least 5 seconds and then turn it "ON" (Engine stopped) again.
2. Turn CONSULT "ON" and touch "ENGINE".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the ECM will be erased.)

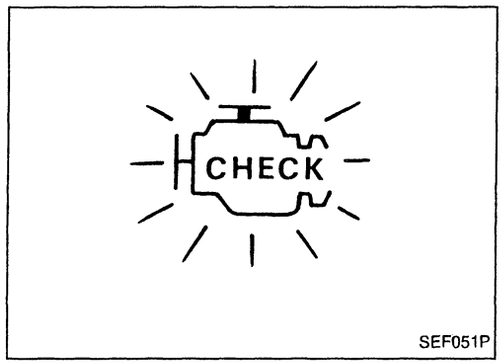


1. Touch "ENGINE".
2. Touch "SELF-DIAG RESULTS".
3. Touch "ERASE". (The DTC in the ECM will be erased.)

SEF691S

HOW TO ERASE DTC (No Tools)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" again.
2. Change the diagnostic test mode from Mode II to Mode I. (Refer to EC-127.)



Malfunction Indicator Lamp (MIL)

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator lamp does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-256.

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.

If MIL illuminates or blinks irregularly after starting engine, water may have accumulated in fuel filter. Drain water from fuel filter.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following three functions.

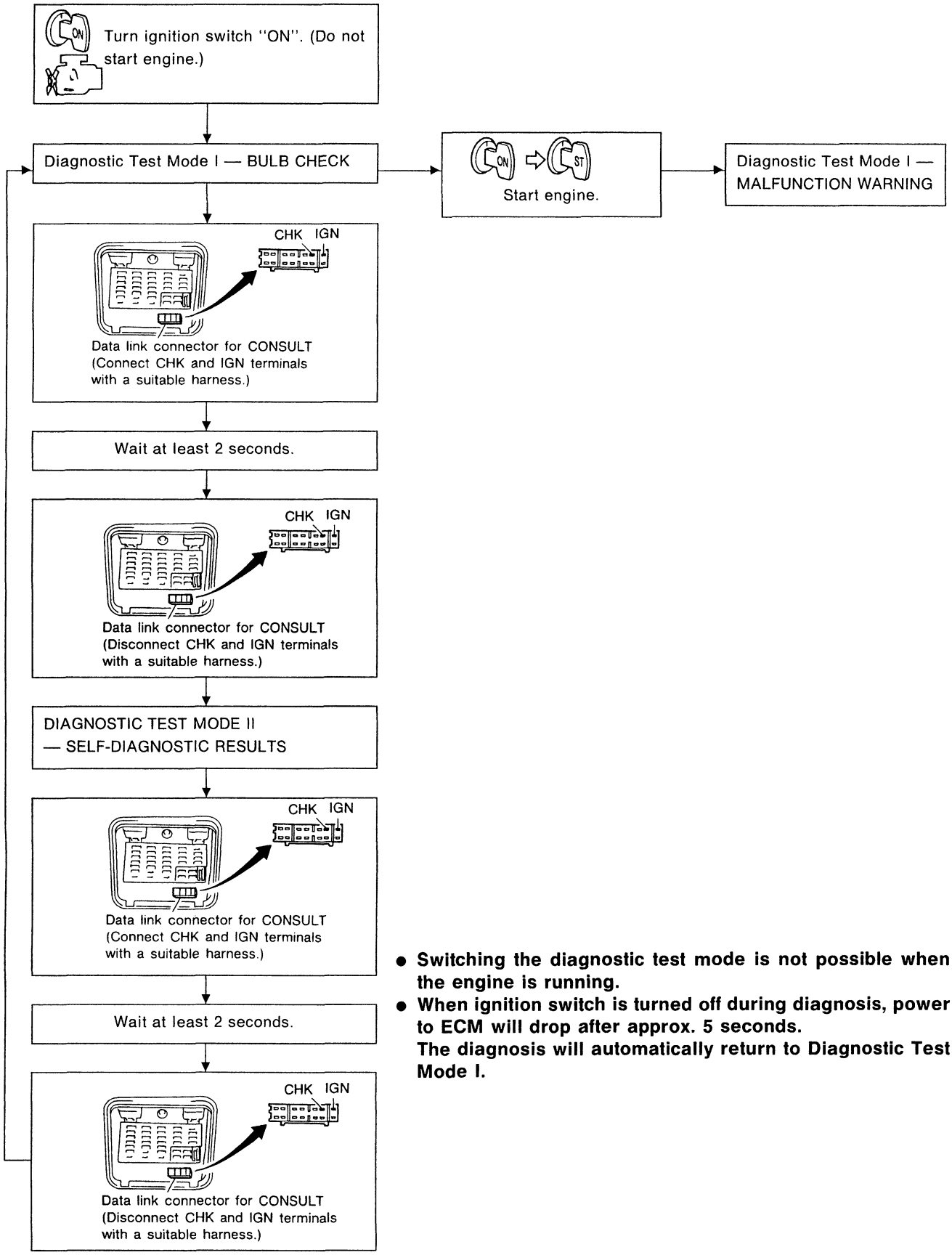
1. BULB CHECK	: This function checks the MIL bulb for damage (blown, open circuit, etc.).
2. MALFUNCTION WARNING	: This is a usual driving condition. When a malfunction is detected, the MIL will light up to inform the driver that a malfunction has been detected.
3. SELF-DIAGNOSTIC RESULTS	: This function allows diagnostic trouble codes to be read.

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

Condition		Diagnostic Test Mode I	Diagnostic Test Mode II
Ignition switch in "ON" position 	Engine stopped 	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running 	MALFUNCTION WARNING	—

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



- **Switching the diagnostic test mode is not possible when the engine is running.**
- **When ignition switch is turned off during diagnosis, power to ECM will drop after approx. 5 seconds. The diagnosis will automatically return to Diagnostic Test Mode I.**

EC

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE I—BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section ("WARNING LAMPS AND CHIME") or see EC-256.

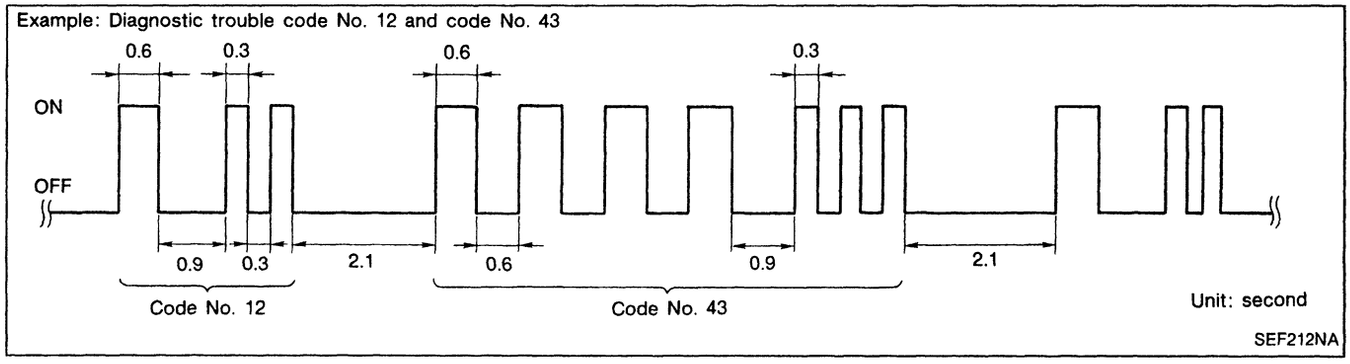
DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning. (The "MIL Illumination" of the "DTC Chart".) Refer to EC-142.
OFF	No malfunction.

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

DIAGNOSTIC TEST MODE II—SELF-DIAGNOSTIC RESULTS

In this mode, a diagnostic trouble code is indicated by the number of blinks of the MALFUNCTION INDICATOR LAMP as shown below.



Long (0.6 second) blinking indicates the number of ten digits, and short (0.3 second) blinking indicates the number of single digits. For example, the malfunction indicator lamp blinks 4 times for 5 seconds (0.6 sec x 4 times) and then it blinks three times for about 1 second (0.3 sec x 3 times). This indicates the DTC "43" and refers to the malfunction of the accelerator position sensor circuit.
In this way, all the detected malfunctions are classified by their diagnostic trouble code numbers. The DTC "55" refers to no malfunction. (See DIAGNOSTIC TROUBLE CODE CHART, EC-142.)

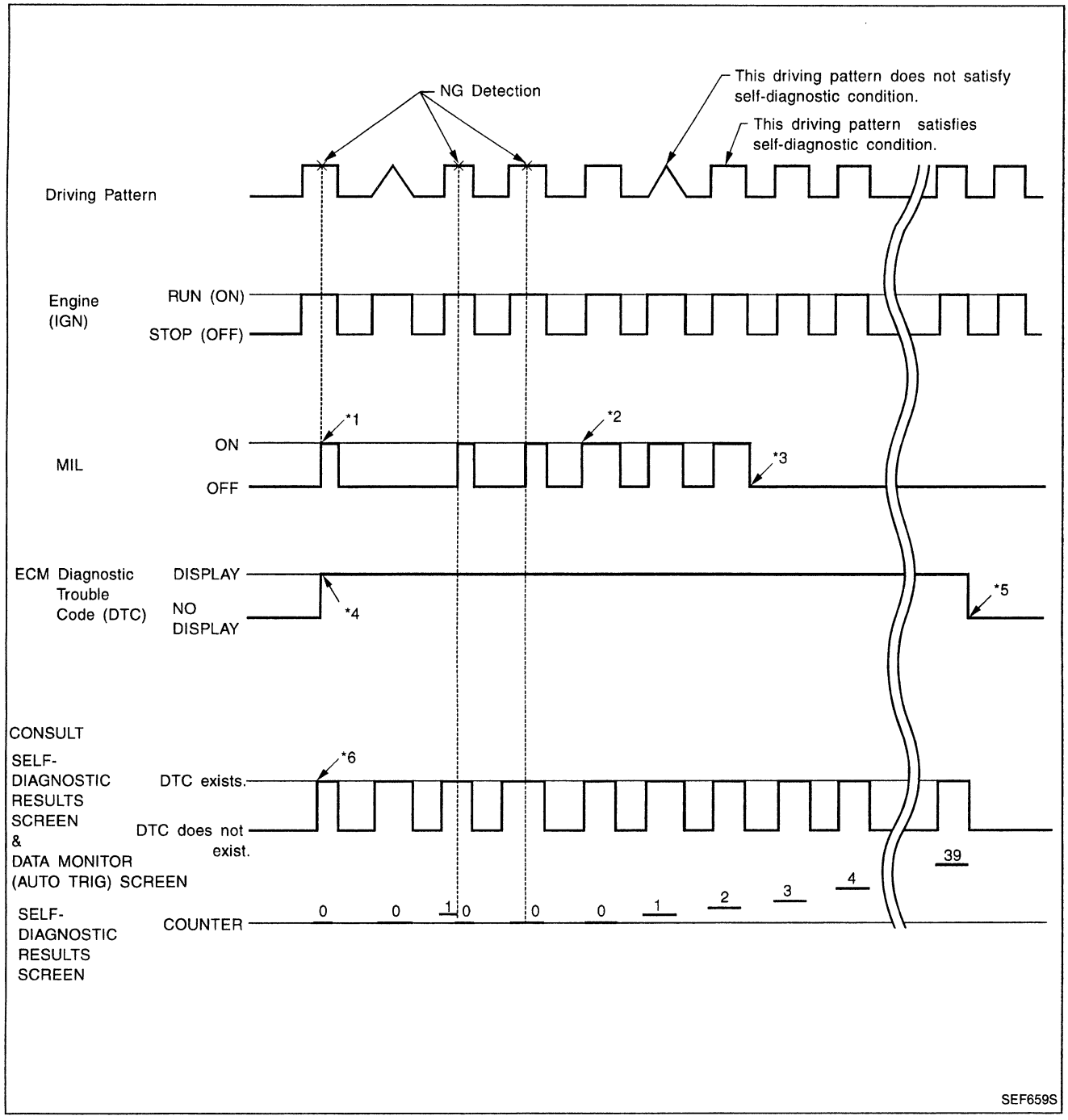
HOW TO ERASE DIAGNOSTIC TEST MODE II (Self-diagnostic results)

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

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

Malfunction Indicator Lamp (MIL) (Cont'd)

RELATIONSHIP BETWEEN MIL, DTC, CONSULT AND DRIVING PATTERNS



*1: When a malfunction is detected, MIL will light up.

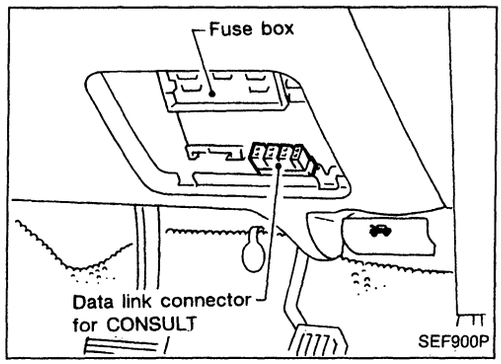
*2: When the same malfunction is detected in two consecutive driving patterns, MIL will stay lit up.

*3: MIL will go off after vehicle is driven three times without any malfunctions.

*4: When a malfunction is detected for the first time, the DTC will be stored in ECM.

*5: The DTC will not be displayed any longer after vehicle is driven 40 times without the same malfunction. (The DTC still remain in ECM.)

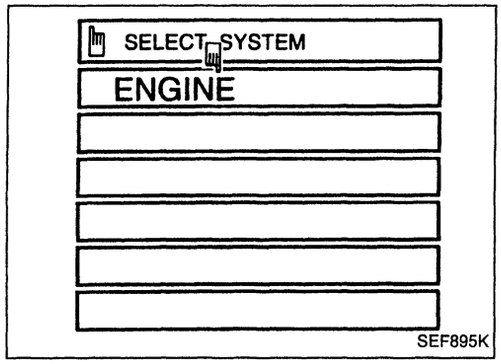
*6: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.



CONSULT

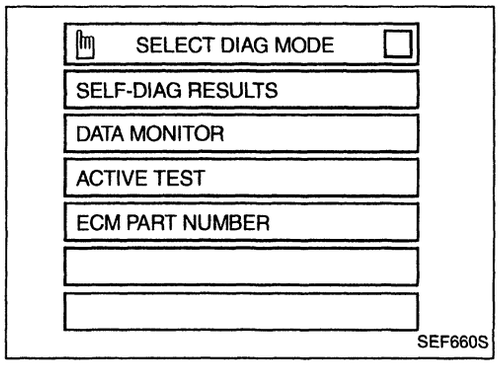
CONSULT INSPECTION PROCEDURE

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



3. Turn on ignition switch.
4. Touch "START".
5. Touch "ENGINE".
6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT Operation Manual.



CONSULT (Cont'd)

ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item			DIAGNOSTIC TEST MODE		
			SELF-DIAG-NOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
ECCS COMPONENT PARTS	INPUT	Camshaft position sensor (PUMP)	X	X	
		Engine coolant temperature sensor	X	X	
		Control sleeve position sensor	X	X	
		Fuel temperature sensor	X	X	
		Vehicle speed sensor	X	X	
		Accelerator position sensor	X	X	X
		Accelerator position switch	X	X	
		Accelerator switch (F/C)	X	X	
		Crankshaft position sensor (TDC)	X	X	
		Needle lift sensor	X		
		Ignition switch (start signal)		X	
		Air conditioner switch		X	
		Neutral position switch		X	
		Battery voltage		X	
	OUTPUT	Injection timing control valve	X	X	X
		Fuel cut solenoid valve	X	X	X
		Air conditioner relay		X	
		Glow relay		X	X
		EGRC-solenoid valve A, B & throttle control solenoid valve		X	X
		Cooling fan relay		X	X

X: Applicable

EC

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "Diagnostic Trouble Code (DTC) chart". (See EC-142.)

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CKPS·RPM (TDC) [rpm]	○	○	• The engine speed computed from the crankshaft position sensor (TDC) signal is displayed.	
CKPS·RPM (REF) [rpm]	○	○	• The engine speed [determined by the time between pulses from the crankshaft position sensor (TDC) signal] is displayed.	
CMPS·RPM - PUMP [rpm]	○	○	• The engine speed computed from the camshaft position sensor (PUMP) signal is displayed.	
COOLAN TEMP/S [°C] or [°F]	○	○	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
VHCL SPEED SE [km/h] or [mph]	○	○	• The vehicle speed computed from the vehicle speed sensor signal is displayed.	
FUEL TEMP SEN [°C] or [°F]	○	○	• The fuel temperature (determined by the signal voltage of the fuel temperature sensor) is displayed.	
ACCEL POS SEN [V]	○	○	• The accelerator position sensor signal voltage is displayed.	
FULL ACCEL SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the accelerator position switch signal.	
ACCEL SW (FC) [OPEN/CLOSE]	○	○	• Indicates [OPEN/CLOSE] condition from the accelerator switch (FC) signal.	
OFF ACCEL SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the accelerator position switch signal.	
C/SLEEV POS/S [V]	○	○	• The control sleeve position sensor signal voltage is displayed.	
BATTERY VOLT [V]	○	○	• The power supply voltage of ECM is displayed.	
P/N POSI SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the park/neutral position switch signal.	
START SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the starter signal.	• After starting the engine, [OFF] is displayed regardless of the starter signal.

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

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
AIR COND SIG [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
IGN SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from ignition switch.	
ACT INJ TIMG [°]	○		• The actual injection timing angle determined by the ECM (an approximate average angle between injection start and end from TDC) is displayed.	
INJ TIMG C/V [%]			• Indicates the duty ratio of fuel injection timing control valve.	
DECELER F/CUT [ON/OFF]			• Indicates [ON/OFF] condition from deceleration fuel cut signal.	• When the accelerator pedal is released quickly with engine speed at 3,000 rpm or more, "ON" is displayed.
FUEL CUT S/V [ON/OFF]			• The control condition of the fuel cut solenoid valve (determined by ECM according to the input signal) is indicted. • OFF ... Fuel cut solenoid valve is not operating. ON ... Fuel cut solenoid valve is operating.	• When the fuel cut solenoid valve is not operating, fuel is not supplied to injection nozzles.
AIR COND RLY [ON/OFF]		○	• The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
GLOW RLY [ON/OFF]		○	• The glow relay control condition (determined by ECM according to the input signal) is displayed.	
COOLING FAN [LOW/HI/OFF]		○	• Indicates the control condition of the cooling fans (determined by ECM according to the input signal). • LOW ... Operates at low speed. HI ... Operates at high speed. OFF ... Stopped.	
EGRC SOL/V A [ON/OFF]			• The control condition of the EGRC-solenoid valve A (determined by ECM according to the input signal) is indicated. • OFF ... EGRC-solenoid valve A is not operating. ON ... EGRC-solenoid valve A is operating.	
EGRC SOL/V B [ON/OFF]			• The control condition of the EGRC-solenoid valve B (determined by ECM according to the input signal) is indicated. • OFF ... EGRC-solenoid valve B is not operating. ON ... EGRC-solenoid valve B is operating.	
THROT RLY [ON/OFF]			• The control condition of the throttle control solenoid valve (determined by ECM according to the input signal) is indicated. • OFF ... Throttle control solenoid valve is not operating. ON ... Throttle control solenoid valve is operating.	

EC

CONSULT (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
COOLING FAN	• Ignition switch: ON • Operate the cooling fan at "LOW", "HI" speed and turn "OFF" using CONSULT.	Cooling fan moves at "LOW", "HI" speed and stops.	• Harness and connector • Cooling fan motor
OFF ACCEL PO SIG	• Clears the self-learning fully closed accelerator position, detected by accelerator position sensor, from the ECM.		
FUEL CUT SOL/V	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
EGRC SOL/V A	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
EGRC SOL/V B	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
THROT CONT SOL/V	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
GLOW RLY	• Ignition switch: ON (Engine stopped) • Turn the glow relay "ON" and "OFF" using CONSULT and listen to operating sound.	Glow relay makes the operating sound.	• Harness and connector • Glow relay
INJ TIMING	• Engine: Return to the original trouble condition • Retard the injection timing using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Adjust initial injection timing

CONSULT (Cont'd)

REAL TIME DIAGNOSIS IN DATA MONITOR MODE

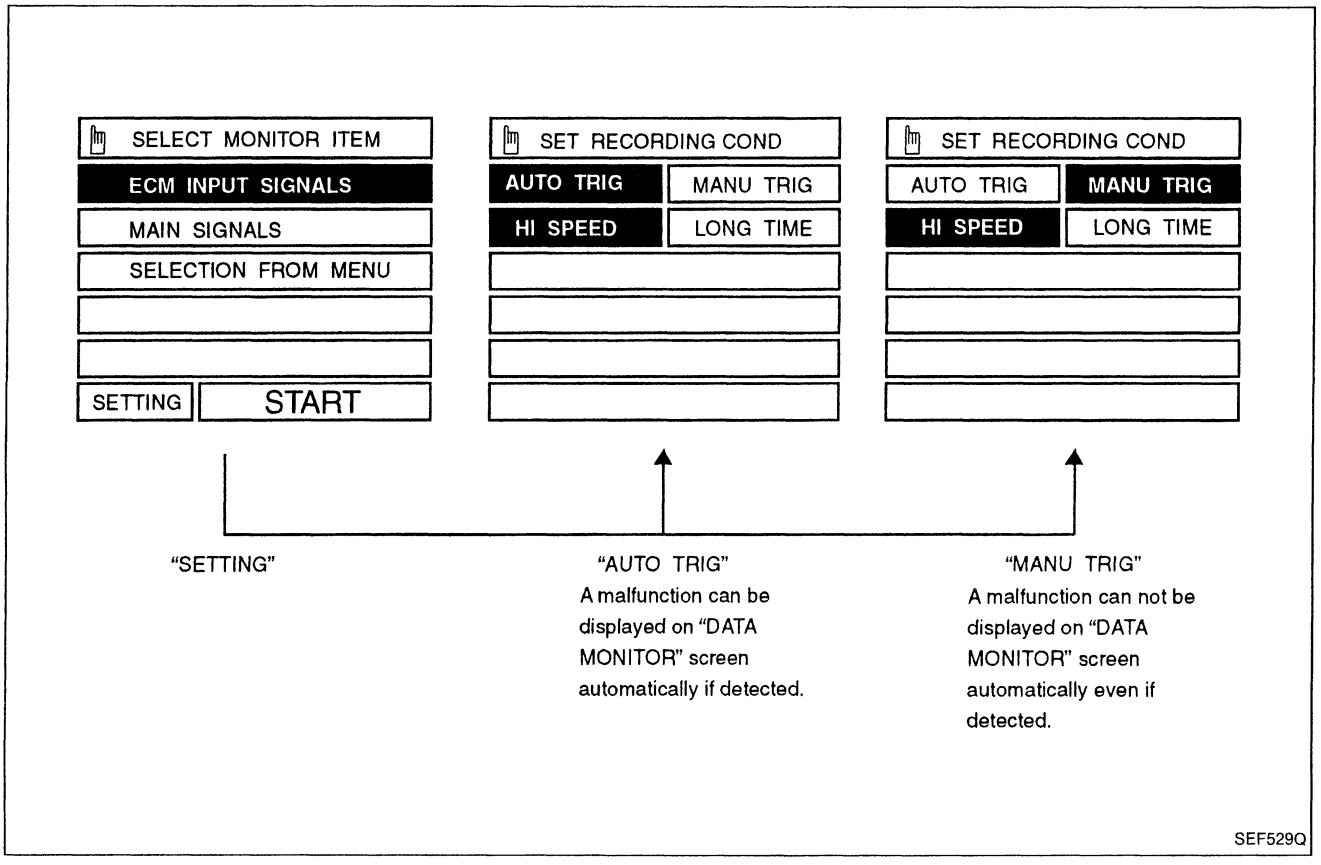
CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

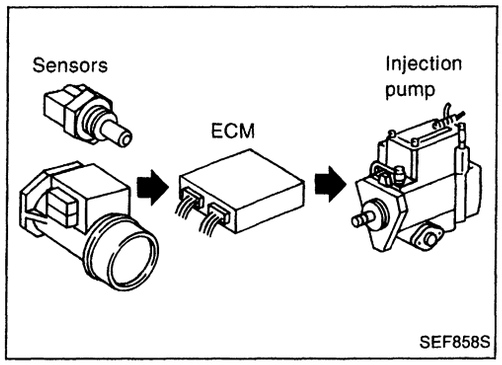
1. "AUTO TRIG" (Automatic trigger):
   - The malfunction will be identified on the CONSULT screen in real time.
     In other words, DTC and malfunction item will be displayed at the moment the malfunction is detected by ECM.
     DATA MONITOR can be performed continuously until a malfunction is detected. However, DATA MONITOR cannot continue any longer after the malfunction detection.
2. "MANU TRIG" (Manual trigger):
   - DTC and malfunction item will not be displayed automatically on CONSULT screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.

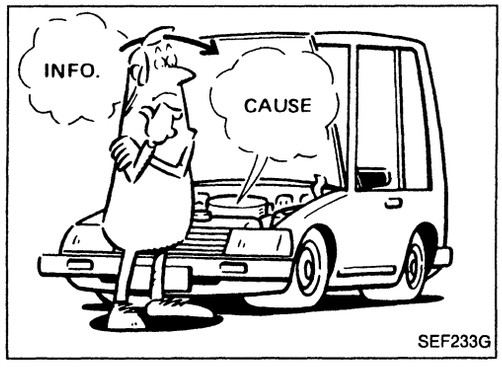
EC

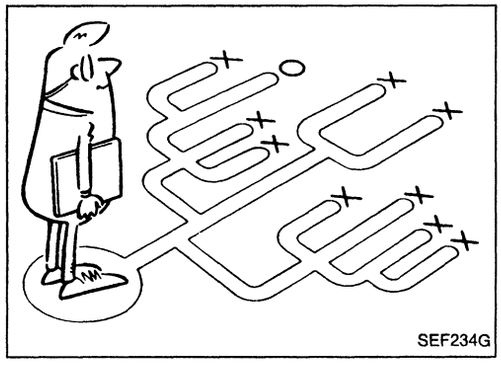
Use these triggers as follows:

1. "AUTO TRIG"
   - While trying to detect the DTC by performing the "DTC CONFIRMATION PROCEDURE", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent.
     Inspect the circuit by gently shaking (or twisting) suspicious connectors, components and harness in the "DTC CONFIRMATION PROCEDURE". The moment a malfunction is found the DTC will be displayed. (Refer to GI section, "Incident Simulation Tests" in "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".)
2. "MANU TRIG"
   - If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.









Introduction

The engine has an ECM to control major systems such as fuel injection control, fuel injection timing control, glow control system, etc. The ECM accepts input signals from sensors and instantly drives electronic fuel injection pump. 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, 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 a circuit tester connected should be performed. Follow the "Work Flow" on the next page.

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

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

KEY POINTS

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

SEF907L

Diagnostic Worksheet

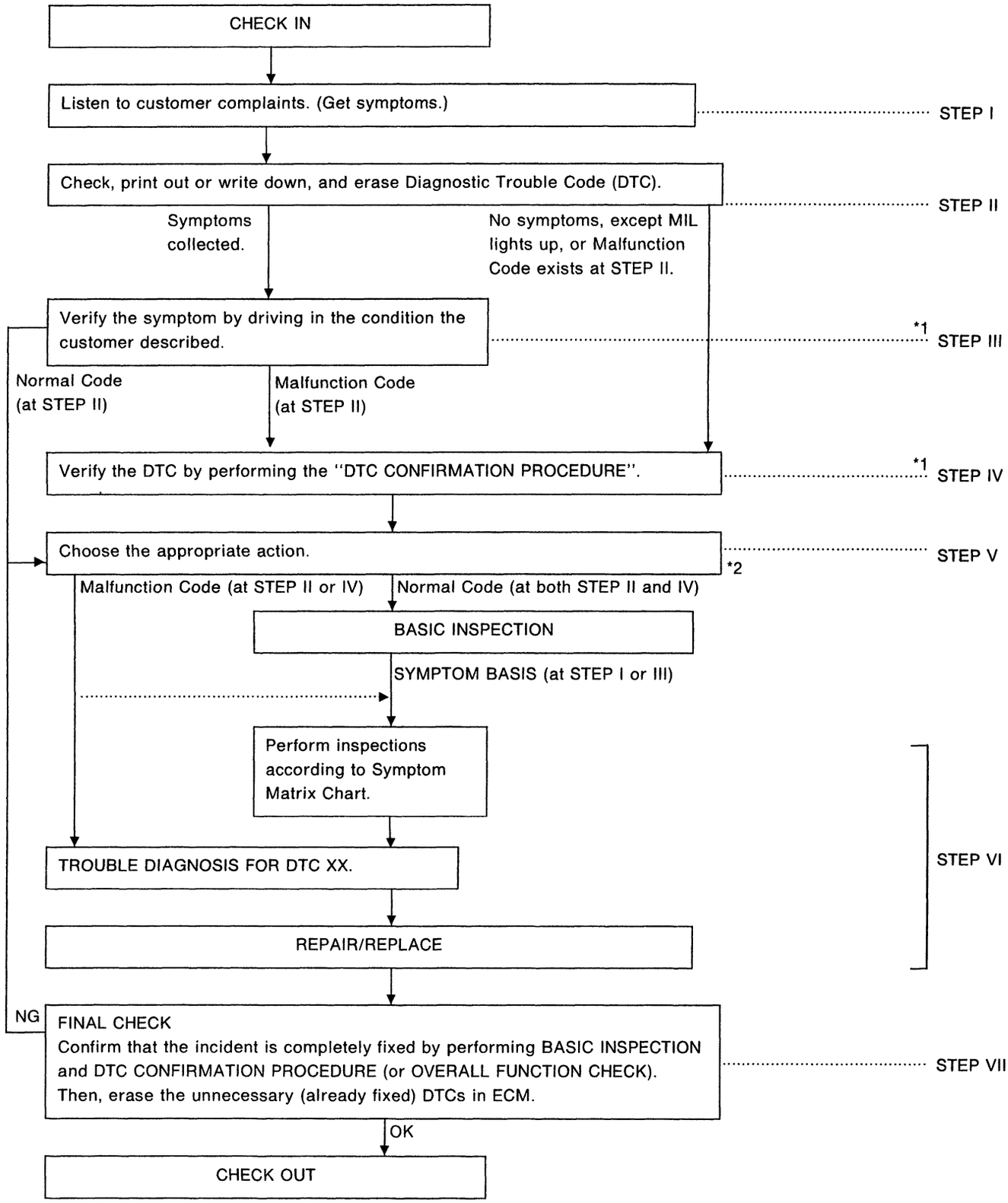
There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one shown below in order to organize all the information for troubleshooting.

EC

WORKSHEET SAMPLE

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

Work Flow



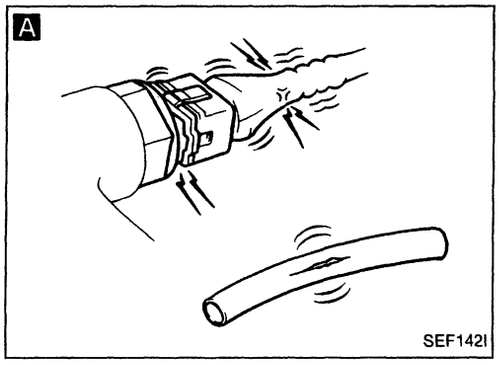
***1: If the incident cannot be duplicated, refer to GI section ("Incident Simulation Tests", "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT").**

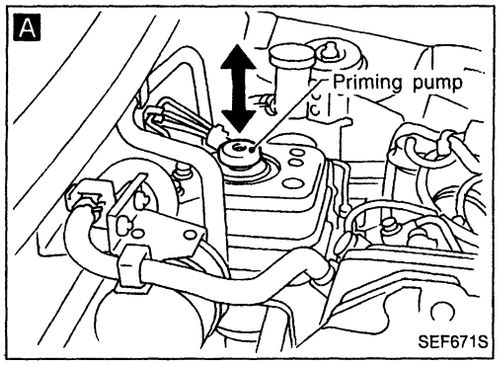
***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-162.**

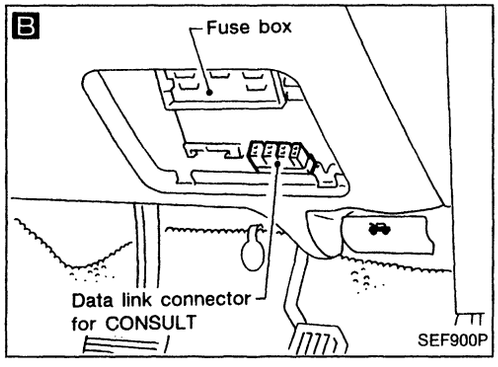
Description for Work Flow

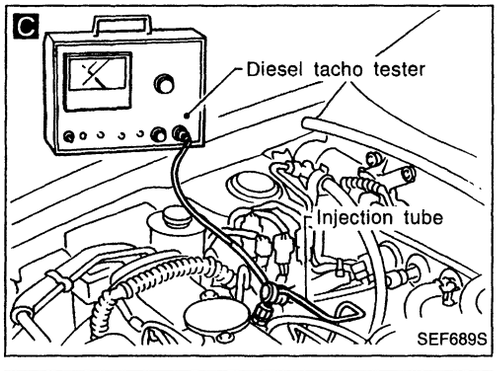
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORKSHEET" as shown on the next page.
STEP II	Before confirming the concern, check and write down (print out using CONSULT) the Diagnostic Trouble Code (DTC), then erase the code. Refer to EC-125. Study the relationship between the cause, specified by DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. Refer to EC-148.)
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The "DIAGNOSTIC WORK SHEET" is useful to verify the incident. Connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section. If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the Diagnostic Trouble Code (DTC) by driving in (or performing) the "DTC CONFIRMATION PROCEDURE". Check and read the DTC by using CONSULT. During the DTC verification, be sure to connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section. In case the "DTC CONFIRMATION PROCEDURE" is not available, perform the "OVERALL FUNCTION CHECK" instead. The DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "OVERALL FUNCTION CHECK" is the same as the DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC XX. If the normal code is indicated, proceed to the BASIC INSPECTION. Refer to EC-140. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-148.
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-151. The "DIAGNOSTIC PROCEDURE" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. For details, refer to GI section ("Circuit Inspection", "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"). Repair or replace the malfunction parts.
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the "DTC CONFIRMATION PROCEDURE" and confirm the normal code (Diagnostic trouble code No. 55) is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) DTC in ECM. (Refer to EC-125.)

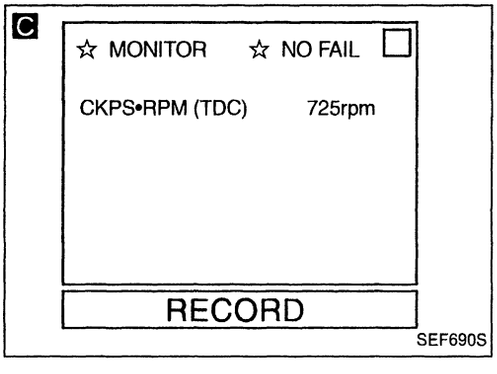
EC











Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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

A

BEFORE STARTING

1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:
   - Harness connectors for improper connections
   - Vacuum hoses for splits, kinks, or improper connections
   - Wiring for improper connections, pinches, or cuts
3. Using priming pump, bleed air from fuel system. Refer to "Fuel Filter Check" in MA section.

B

CONNECT CONSULT TO THE VEHICLE.

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-130.

DOES ENGINE START?

No → Turn ignition switch OFF, wait 5 seconds and then start engine. If engine fails to start, check diagnostic trouble code (DTC).

Yes

Run engine for 10 minutes.

C

CHECK IDLE SPEED.

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

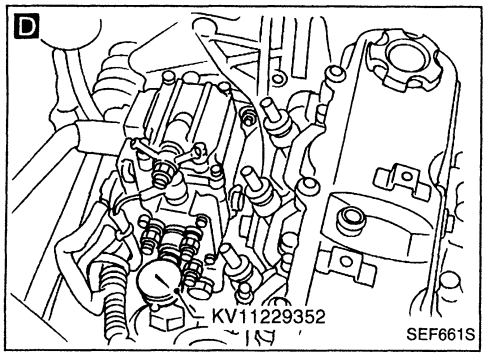
OR

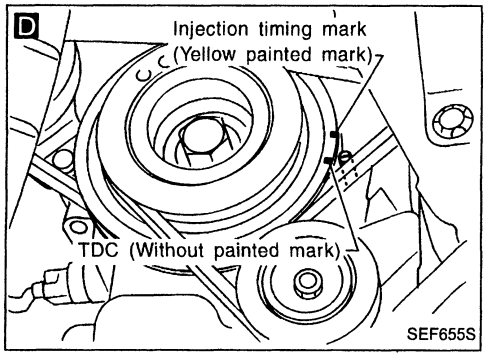
Check idle speed using tachometer tester.

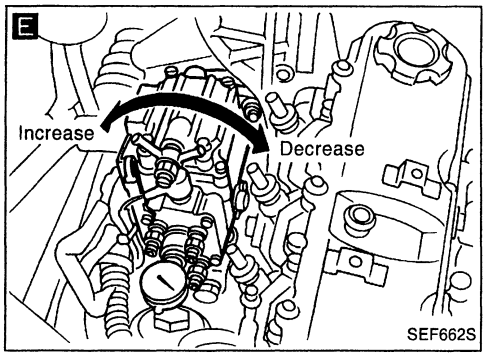
725 ± 25 rpm

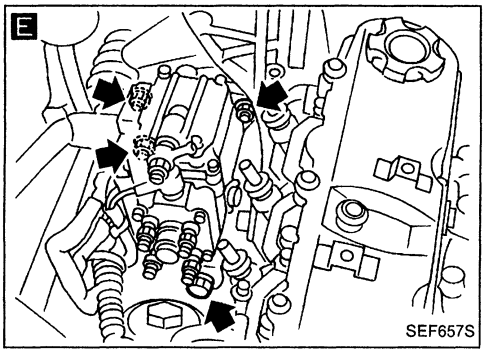
(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)









Ⓐ

D

CHECK INJECTION TIMING.

1. Set No. 1 piston at TDC on its compression stroke.
   TDC: Without painted mark
2. Remove injection tubes and air bleeder on the back of injection pump.
3. Set dial gauge so its indicator points to somewhere between 1.0 and 2.0 mm (0.039 and 0.079 in) on the scale.
4. Turn crankshaft 1 turn clockwise and check that dial gauge indicates the same value again.
5. Turn crankshaft counterclockwise about 100 degrees, then turn crankshaft clockwise slowly, and set dial gauge indicator to 0 mm at the position it stops.
6. Turn crankshaft clockwise and set the pump timing mark to the mark on the crankshaft pulley.
   Pump timing mark:
   Yellow painted mark
7. Read plunger lift.
   Plunger lift:
   0.38 ± 0.03 mm (0.0150 ± 0.0012 in) at pump timing mark

- **When repeating the checking, start with step 5.**

OK →
- Bleed air from fuel system.
- After this inspection, unnecessary diagnostic trouble code No. might be displayed.
  Erase the stored memory in ECM.
  Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" (EC-125) and "HOW TO ERASE DTC" (EC-125).

OK ↓

INSPECTION END

NG ↓

E

Adjusting

1. If plunger lift is not within the specified value, adjust by turning injection pump.

- **If indication is smaller than the specified value, turn pump body away from engine.**
- **If indication is larger than the specified value, turn pump body towards engine.**

2. Tighten injection pump securing bolts and nuts.
   Nut:
   : 13 - 18 N·m
   (1.3 - 1.8 kg-m, 9 - 13 ft-lb)
   Bolt:
   : 49 - 59 N·m
   (5.0 - 6.0 kg-m, 36 - 43 ft-lb)
3. Remove dial gauge and install air bleeder with new washer.
4. Install injection tubes.
   Flare nut:
   : 22 - 25 N·m
   (2.2 - 2.5 kg-m, 16 - 18 ft-lb)
5. Bleed air from fuel system.
   Refer to "Water Draining, Fuel Filter Check and Replacement" of "ENGINE MAINTENANCE" in MA section.

→ Go to A

EC

Diagnostic Trouble Code (DTC) Chart

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
11	Camshaft position sensor (PUMP) circuit [CAM POS SEN (PUMP)]	• An improper signal from the sensor is detected by the ECM during engine running.
13	Engine coolant temperature sensor circuit (COOLANT TEMP SEN)	• An excessively high or low voltage from the sensor is detected by the ECM.
14	Vehicle speed sensor circuit (VEHICLE SPEED SEN)	• The almost 0 km/h (0 MPH) signal from the sensor is detected by the ECM even when vehicle is being driven.
15	Control sleeve position sensor circuit (CONT SLEEV POS SEN)	• An excessively high or low voltage from the sensor is detected by the ECM. • An improper voltage signal from the sensor is detected by the ECM during engine running.
17	Adjustment resistor circuit (ADJ RESISTOR)	• An excessively high or low voltage from the resistor is detected by the ECM.
18	Fuel injection feedback 2 (F/INJ F/B 2)	• The fuel injection feedback system (consists of the ECM, electric governor and control sleeve position sensor) does not operate properly.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC Confirmation Procedure Quick Ref. *1	Overall Function Check *2	MIL Illumination	Reference Page
• Harness or connectors (The sensor circuit is open or shorted.) • Camshaft position sensor (PUMP)	RUNNING	—	Lighting up	EC-167
• Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor	IGN: ON	—	Lighting up	EC-171
• Harness or connectors (The sensor circuit is open or shorted.) • Vehicle speed sensor	—	LIFTING	—	EC-175
• Harness or connectors (The sensor circuit is open or shorted.) • Control sleeve position sensor	RUNNING	—	Lighting up	EC-178
• Harness or connectors (The resistor circuit is open or shorted.) • Adjustment resistor	IGN: ON	—	—	EC-183
• Main power supply circuit (ECM terminals (116), (117)) and fuse • Harness or connectors (Electric governor and control sleeve position sensor circuit) • Electronic fuel injection pump • ECM • Electric governor	RUNNING (DRIVING)	—	Lighting up	EC-187

*1: • This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each TROUBLE DIAGNOSIS FOR DTC XX.

*2: • The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
• During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
• This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each TROUBLE DIAGNOSIS FOR DTC XX.

EC

Diagnostic Trouble Code (DTC) Chart (Cont'd)

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
21	Fuel injection timing feedback (F/INJ TIMG F/B)	• The fuel injection timing feedback system (consists of the ECM, injection timing control valve and needle lift sensor) does not operate properly.
22	Fuel injection feedback (F/INJ F/B)	• The fuel injection feedback system (consists of the ECM, electric governor and control sleeve position sensor) does not operate properly.
23	Accelerator switch (Fuel cut) circuit [ACCEL SW (F/C)]	• The OFF (short) signal is sent to the ECM for a certain period of time even when the accelerator pedal is not being depressed.
25	Electric governor circuit (ELECTRIC GOV)	• Electric governor circuit is shorted.
27	ECM1 (ECM1)	• ECM calculation function is malfunctioning.
28	Cooling fan (OVER HEAT)	• Cooling fan does not operate properly. (Overheat) • Cooling system does not operate properly. (Overheat) • Engine coolant was not added to the system using the proper filling method.
31	ECM2 (ECM2)	• ECM calculation function is malfunctioning.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC Confirmation Procedure Quick Ref. *1	Overall Function Check *2	MIL Illumination	Reference Page
• Harness or connectors (Injection timing control valve, Needle lift sensor and Crankshaft position sensor (TDC) circuit] • Injection timing control valve • Needle lift sensor • Crankshaft position sensor	RUNNING (DRIVING)	—	—	EC-192
• Main power supply circuit (ECM terminals (116), (117)) and fuse. • Harness or connectors (Electric governor and control sleeve position sensor circuit) • Electric governor • Electronic fuel injection pump • ECM	RUNNING (DRIVING)	—	Lighting up	EC-187
• Harness or connectors (The switch circuit is shorted.) • Accelerator switch (F/C)	IGN: ON	—	Lighting up	EC-196
• Harness or connectors (Electric governor circuit is shorted.) • ECM	RUNNING (DRIVING)	—	Lighting up	EC-187
• ECM	IGN: ON	—	Lighting up	EC-200
• Harness or connectors (The cooling fan circuit is open or shorted.) • Cooling fan • Radiator hose • Radiator • Radiator cap • Water pump • Thermostat • Fan belt • Engine coolant temperature sensor For more information, refer to "MAIN 12 CAUSES OF OVERHEATING". (EC-210)	—	IGN: ON (RUNNING)	Lighting up	EC-202
• ECM	IGN: ON	—	Lighting up	EC-200

*1: • This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each TROUBLE DIAGNOSIS FOR DTC XX.

*2: • The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
• During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
• This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each TROUBLE DIAGNOSIS FOR DTC XX.

EC

Diagnostic Trouble Code (DTC) Chart (Cont'd)

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
34	Needle lift sensor circuit (NEEDLE LIFT SEN)	• An improper signal from the sensor is detected by the ECM during engine running.
36	Fuel cut solenoid valve 1 (FUEL CUT S/V 1)	• Fuel cut solenoid valve circuit is shorted. • Fuel cut solenoid valve does not operate properly.
37	Fuel cut solenoid valve short (FCV SHORT)	• Fuel cut solenoid valve circuit is shorted.
38	Fuel cut solenoid valve 2 (FUEL CUT S/V 2)	• Fuel cut solenoid valve circuit is broken. • Fuel cut solenoid valve does not operate properly.
42	Fuel temperature sensor circuit (FUEL TEMP SENSOR)	• An excessively high or low voltage from the sensor is detected by the ECM.
43	Accelerator position sensor circuit (ACCEL POS SENSOR)	• An excessively high or low voltage from the sensor is detected by the ECM.
47	Crankshaft position sensor (TDC) [CRANK POS SEN (TDC)]	• An improper signal from the sensor is detected by the ECM during engine running and cranking.
48	Governor cut circuit (GOV CUT CIRCUIT)	• Accelerator switch is shorted. • Camshaft position sensor (PUMP) or ECM does not operate properly.
55	No failure (NO SELF DIAGNOSTIC FAILURE INDICATED)	No malfunction is detected by the ECM.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC *1 Confirmation Procedure Quick Ref.	*2 Overall Function Check	MIL Illumination	Reference Page
• Harness or connectors (The sensor circuit is open or shorted.) • Needle lift sensor	RUNNING	—	—	EC-212
• Harness or connectors (The solenoid valve circuit is open or shorted.) • Fuel cut solenoid valve	RUNNING	—	Lighting up	EC-215
• Main power supply circuit (ECM terminals (116), (117)) and fuse.	RUNNING	—	Lighting up	EC-215
• Main power supply circuit (ECM terminals (116), (117)) and fuse. • ECM	RUNNING	—	Lighting up	EC-215
• Harness or connectors (The sensor circuit is open or shorted.) • Fuel temperature sensor	IGN: ON	—	—	EC-219
• Harness or connectors (The sensor circuit is open or shorted.) • Accelerator position sensor • Accelerator position switch • Accelerator switch (F/C)	IGN: ON	—	Lighting up	EC-223
• Harness or connectors (The sensor circuit is open or shorted.) • Crankshaft position sensor (TDC)	RUNNING	—	Lighting up	EC-227
• Harness or connectors [Accelerator switch and camshaft position sensor (PUMP) circuit] • Accelerator switch (F/C) • Camshaft position sensor (PUMP) • ECM	RUNNING	—	Lighting up	EC-231
• No failure	—	—	—	—

*1: • This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each TROUBLE DIAGNOSIS FOR DTC XX.

*2: • The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
• During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
• This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each TROUBLE DIAGNOSIS FOR DTC XX.

EC

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM: HARD/NO START/RESTART (EXCP. HA)				SYMPTOM: ENGINE STALL			SYMPTOM																						Reference page	Feature of symptom, Check point
		NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR: BLACK SMOKE	ABNORMAL SMOKE COLOR: WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator lamp illuminates.	Can be detected by CONSULT?	Fuel cut			
New CT/CS		AA				AB			AC	AD	AE		AF		AG	AH	AJ	AK	AL	AM	AP		HA							
Injection timing	Advanced	○	○	●	●			○		●					○	○					●				○		EC-140	
	Retarded	○	○	●	●			○			●				○	○						●			○		EC-140	
Electric injection pump mainframe		●	●	●	●	○	○	○	○	○	●	○	○	○	●	●	○		○		●	○		○	○	○	—	*1
Injection nozzle		○	○	○	○	○	○	○		●	○	○		○	●	●					●						EC-117	*2
Glow system		○	○	●	●					●												●					EC-233	
Engine body		○	○	●	●	○	○	○		●	○	○		○	●	●		○	○	○		●					EM section	*3
EGR system											●	●									●						EC-238	
Air cleaner and ducts											●	●									●				○		MA section	*4

● ; High Possibility Item
○ ; Low Possibility Item
*1: Insufficient or excess amount. Governor malfunction may be the cause.
*2: Depends on open-valve pressure and spray pattern.
*3: Caused mainly by insufficient compression pressure.
*4: Symptom varies depending on off-position of air duct, etc.

Symptom Matrix Chart (Cont'd)

SYMPTOM				Feature of symptom / Check point	Tachometer malfunction		Compensation according to engine coolant temperature does not function.						Injection timing cannot be controlled.						Engine runs on after turning ignition switch OFF.	Compensation for amount of fuel injected according to fuel temperature does not function.			
				Reference page	EC-167		EC-171	EC-175	EC-178	EC-183	EC-187		EC-192		EC-196		EC-212		EC-215	EC-219	EC-223	EC-227	
				Fuel cut					○		○								○	○			
				Can be detected by CONSULT?	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○
				Malfunction indicator lamp illuminates.	○	○	○		○		○	○			○	○			○		○	○	○
			HA	DEAD BATTERY (UNDER CHARGE)																			
		ABNORMAL SMOKE COLOR	AP	WHITE SMOKE									○				○						
				BLACK SMOKE						○				○									
			AM	EXCESSIVE OIL CONSUMPTION																			
			AL	EXCESSIVE FUEL CONSUMPTION																			
			AK	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE																			
			AJ	SLOW/NO RETURN TO IDLE																			
			AH	IDLING VIBRATION			○													○		○	
			AG	ROUGH IDLE/HUNTING			○													○		○	
			AF	LOW IDLE			○			○										○			
				HI IDLE						○													
			AE	POOR ACCELERATION				○		○										○	○		
				LACK OF POWER						○										○	○		
			AD	SPARK KNOCK/DETONATION									○				○						
			AC	HESITATION/SURGING/FLAT SPOT		○									○					○	○		
		ENGINE STALL	AB	WHEN DECELERATING		○	○		○	○	○								○	○			○
				DURING DRIVING		○			○		○								○				○
				AT IDLE		○	○		○	○	○								○	○			○
		HARD/NO START/ RESTART (EXCP. HA)	AA	HARD TO START WHEN ENGINE IS HOT																○			
				HARD TO START WHEN ENGINE IS COLD			○																
				NO START (without first firing)							○								○				
				NO START (with first firing)																			

Malfunction	New CT/CS	ECCS
		Camshaft position sensor (PUMP) circuit — open, short
		Camshaft position sensor (PUMP) circuit — noise
		Engine coolant temperature sensor circuit — open, short
		Vehicle speed sensor circuit — open, short
		Control sleeve position sensor circuit — open, short
		Adjustment resistor circuit — open, short
		Electric governor circuit — open, ground short
		Electric governor circuit — short
		Injection timing control valve circuit — open, short
		Injection timing control valve circuit — ground short
		Accelerator switch (FC) circuit — open, short
		Accelerator switch (FC) circuit — ground short
		Needle lift sensor circuit — open, short
		Fuel cut solenoid valve circuit — open, ground short
		Fuel cut solenoid valve circuit — short
		Fuel temperature sensor circuit — open, short
		Accelerator position sensor circuit — open, short
		Crankshaft position sensor (TDC) circuit — open, short
		Crankshaft position sensor (TDC) circuit — noise

SYSTEM
— ECCS system

EC

Symptom Matrix Chart (Cont'd)

Feature of symptom / Check point				Reference page	Start control does not function.	Air conditioner does not stop operating.	Air conditioner does not work.			Accelerator position sensor NG signal is output.			Engine does not stop.		Does not operate.	Does not stop operating.	Does not stop operating.	Glow lamp does not turn on.	Glow lamp does not turn off.	Ground short makes engine unable to stop.	Air conditioner does not operate.	Air conditioner does not stop operating.	
					EC-245	EC-254			EC-251		EC-247		EC-247	EC-162	EC-162		EC-238	EC-238	EC-233	EC-162	EC-254		EC-200
SYMPTOM	Fuel cut														○					○			
	Can be detected by CONSULT?										○		○		○								○
	Malfunction indicator lamp illuminates.										○		○		○	○							○
	DEAD BATTERY (UNDER CHARGE)			HA																			○
	ABNORMAL SMOKE COLOR	WHITE SMOKE		AP															○				○
		BLACK SMOKE															○	○					○
	EXCESSIVE OIL CONSUMPTION			AM																			○
	EXCESSIVE FUEL CONSUMPTION			AL																			○
	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE			AK																			○
	SLOW/NO RETURN TO IDLE			AJ																			○
	IDLING VIBRATION			AH				○	○											○			○
	ROUGH IDLE/HUNTING			AG				○	○											○			○
	LOW IDLE			AF						○													○
	HI IDLE																						○
	POOR ACCELERATION			AE							○		○				○						○
	LACK OF POWER										○		○				○						○
	SPARK KNOCK/DETONATION			AD																			○
	HESITATION/SURGING/FLAT SPOT			AC							○		○										○
	ENGINE STALL	WHEN DECELERATING		AB				○		○				○						○			○
		DURING DRIVING												○						○			○
		AT IDLE								○				○						○			○
	HARD/NO START/ RESTART (EXCP. HA)	HARD TO START WHEN ENGINE IS HOT		AA	○														○				○
		HARD TO START WHEN ENGINE IS COLD			○														○				○
		NO START (without first firing)												○					○				○
		NO START (with first firing)																					○

Malfunction				
New CT/CS				
Start signal circuit			open, short	
Air conditioner switch circuit			open, ground short	
			short	
Neutral position switch circuit			open, short	
			ground short	
Accelerator position switch (Idle) circuit			open, ground short	
Accelerator position switch (Full) circuit			short	
Ignition switch circuit			open, short	
Power supply for ECM circuit			open	
Throttle control solenoid valve circuit			short	
EGRC-solenoid valve A, B circuit			open, short	
Glow relay circuit			ground short	
ECCS relay (Self-shutoff) circuit			open	
Air conditioner relay circuit			short	
ECM, Connector circuit			open	
			short	
			open, short	

SYSTEM — ECCS system

ECCS

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.

MONITOR ITEM	CONDITION		SPECIFICATION
CKPS·RPM (TDC) CKPS·RPM (REF) CKPS·RPM-PUMP	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
FUEL TEMP SEN	• Engine: After warming up		More than 40°C (104 °F)
ACCEL POS SEN	• Ignition switch: ON (Engine stopped)	Accelerator pedal: released	0.40 - 0.60V
		Accelerator pedal: depressed	Approx. 4.0V
FULL ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: depressed	ON
		Except above	OFF
ACCEL SW (FC)	• Ignition switch: ON (Engine stopped)	Accelerator pedal: released	CLOSE
		Accelerator pedal: slightly open	OPEN
OFF ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: released	ON
		Accelerator pedal: slightly open	OFF
C/SLEEV POS/S	• Engine: After warming up		1.0 - 3.5V
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
P/N POSI SW	• Ignition switch: ON	Shift lever: Neutral	ON
		Except above	OFF
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: "OFF"	OFF
		Air conditioner switch: "ON" (Compressor operates.)	ON
IGN SW	• Ignition switch: ON → OFF		ON → OFF
ACT INJ TIMG	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	–9.5 to –12.0°
		2,000 rpm	–10.0 to –15.5°
INJ TIMG C/V	• Engine: After warming up, idle the engine.		Approx. 50%
DECELER F/CUT	• Engine: After warming up	Idle	OFF
		When accelerator pedal is released quickly with engine speed at 3,000 rpm or more.	ON
FUEL CUT S/V	• Ignition switch: ON → OFF		ON → OFF
AIR COND RLY	• Air conditioner switch: OFF → ON		OFF → ON
GLOW RLY	• Refer to EC-xx.		

EC

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

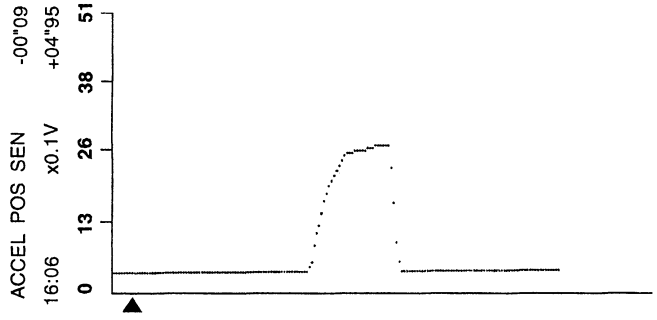
MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	• When cooling fan is stopped.		OFF
	• When cooling fan operates at low speed.		LOW
	• When cooling fan operates at high speed.		HI
EGRC SOL/V A	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		2,800 rpm	OFF
EGRC SOL/V B	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		2,800 rpm	OFF
THROT RLY	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		Racing engine from idle to 2,500 rpm	OFF

Major Sensor Reference Graph in Data Monitor Mode

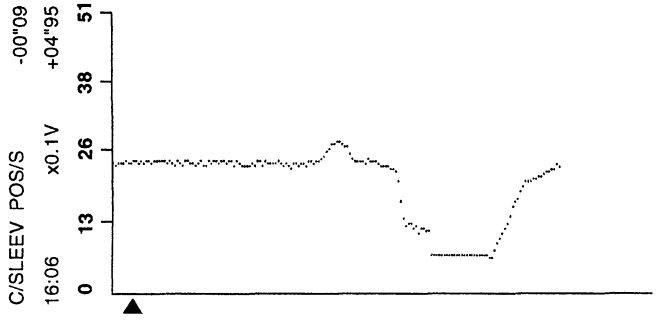
The following are the major sensor reference graphs in "DATA MONITOR" mode.
(Select "HI SPEED" in "DATA MONITOR" with CONSULT.)

ACCEL POS SEN, C/SLEEV POS/S, ACT INJ TIMG

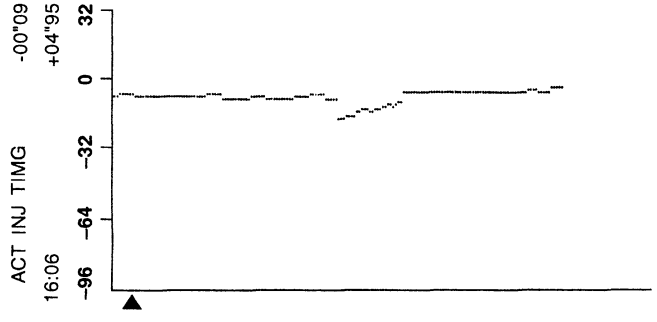
Below is the data for "ACCEL POS SEN", "C/SLEEV POS/S" and "ACT INJ TIMG" when revving engine quickly up to 3,000 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



- "ACCEL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



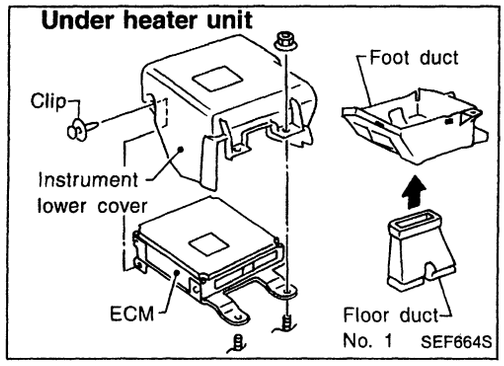
- "C/SLEEV POS/S" should increase when depressing the accelerator pedal and should decrease when the pedal is released.



- "ACT INJ TIMG" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

SEF663S

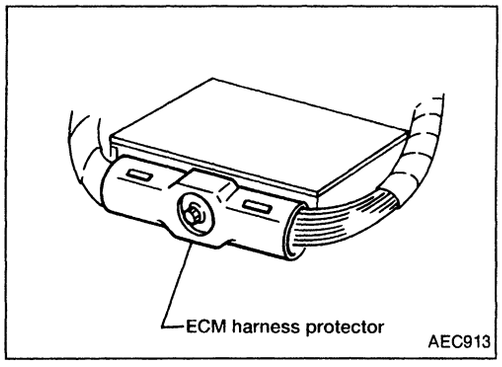
EC



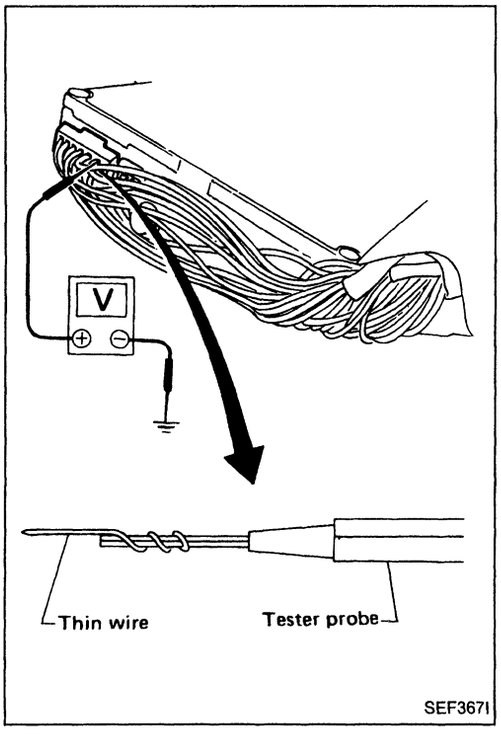
ECM Terminals and Reference Value

PREPARATION

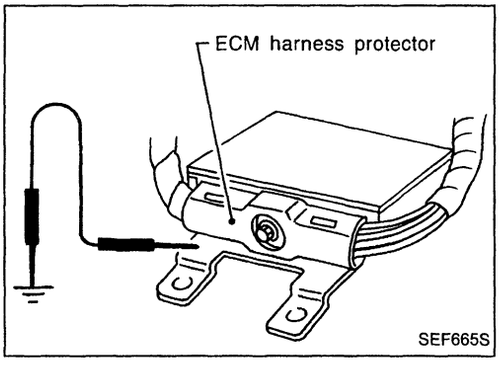
1. ECM is located beneath heater unit. For this inspection:
   - Remove foot duct and floor duct No. 1.
   - Remove instrument lower cover.



2. Remove ECM harness protector.



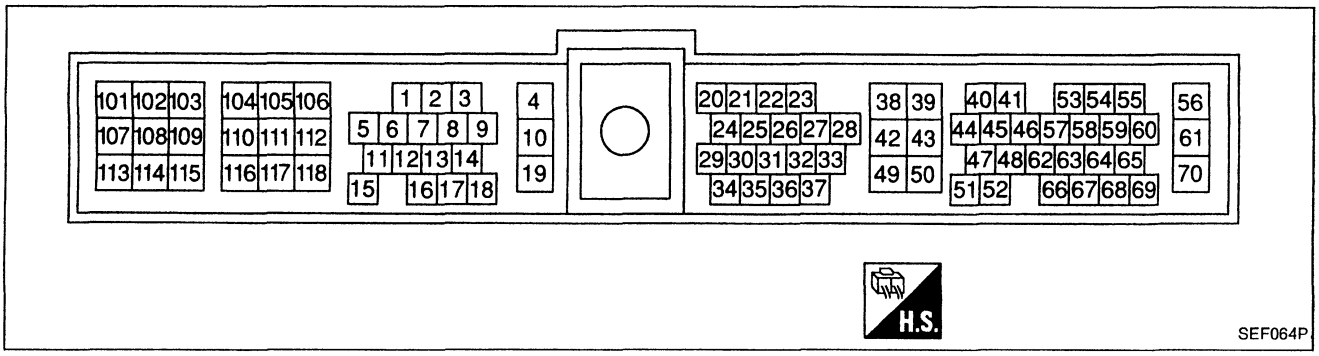
3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
   - Open harness securing clip to make testing easier.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



Be sure ECM unit is properly grounded before checking.

ECM Terminals and Reference Value (Cont'd)

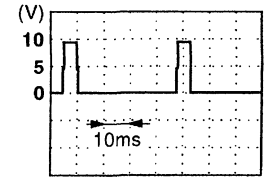
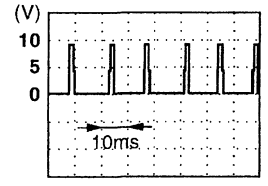
ECM HARNESS CONNECTOR TERMINAL LAYOUT



EC

ECM INSPECTION TABLE

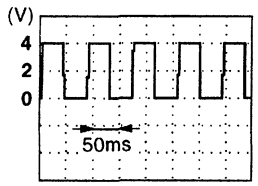
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
1	L	Throttle control solenoid valve	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.4V
			Engine is running. (Warm-up condition) └ Racing engine from idle to 2,500 rpm	BATTERY VOLTAGE (11 - 14V)
4	W/G	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
5	L/OR	Tachometer	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.9 - 1.3V  SEF550S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 0.9 - 1.3V  SEF551S
10	OR/B	Fuel temperature sensor	Engine is running.	0.6 - 5V Output voltage varies with fuel temperature.

ECM Terminals and Reference Value (Cont'd)

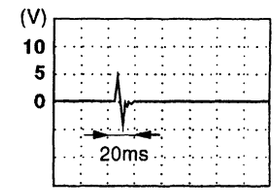
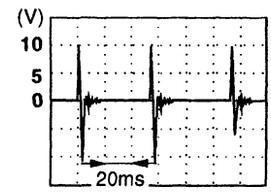
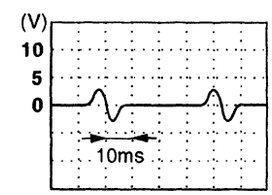
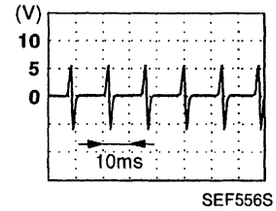
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
13	LG	Cooling fan relay (High speed)	Engine is running. — Cooling fan is not operating. — Cooling fan is operating at low speed.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. — Cooling fan is operating at high speed.	Approximately 0.5V
14	LG/R	Cooling fan relay (Low speed)	Engine is running. — Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. — Cooling fan is operating.	Approximately 0.4V
15	G	Air conditioner relay	Engine is running. — Both A/C switch and blower switch are "ON".	Approximately 0.4V
			Engine is running. — A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
16	OR	Glow lamp	Ignition switch "ON" — Glow lamp is "ON".	Approximately 1.4V
			Ignition switch "ON" — Glow lamp is "OFF".	BATTERY VOLTAGE (11 - 14V)
18	OR/L	Malfunction indicator lamp	Ignition switch "ON"	Approximately 1.4V
			Engine is running. — Idle speed	BATTERY VOLTAGE (11 - 14V)
19	G/B	Engine coolant temperature sensor	Engine is running.	0.6 - 5.0V Output voltage varies with engine coolant temperature.
20	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
21	R/L	Air conditioner switch	Engine is running. — Both air conditioner switch and blower switch are "ON" (Compressor operates).	Approximately 0V
			Engine is running. — Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
22	G/OR	Neutral position switch	Ignition switch "ON" — Gear position is "Neutral".	Approximately 0V
			Ignition switch "ON" — Except the above gear position	BATTERY VOLTAGE (11 - 14V)

ECM Terminals and Reference Value (Cont'd)

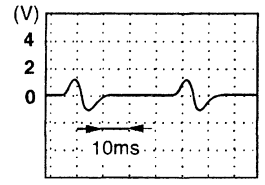
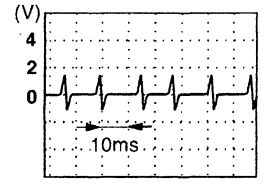
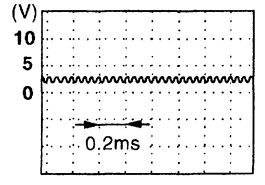
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
23	G	Accelerator position sensor	Ignition switch "ON" └ Accelerator pedal released	0.4 - 0.5V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4.0V
26	PU/R	Vehicle speed sensor	Engine is running. ├ Lift up the vehicle. ├ In 1st gear position └ Vehicle speed is 40 km/h.	0 - Approximately 4.2V  SEF552S
28 33	B/W	Camshaft position sensor (PUMP) ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V
29	PU	Accelerator switch (F/C)	Ignition switch "ON" └ Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
31	L/Y	Accelerator position switch (Idle)	Ignition switch "ON" └ Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
32	Y	Accelerator position switch (Full)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0V
			Ignition switch "ON" └ Accelerator pedal fully depressed	BATTERY VOLTAGE (11 - 14V)

EC

ECM Terminals and Reference Value (Cont'd)

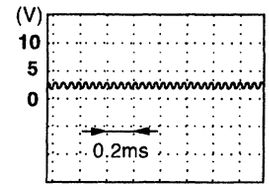
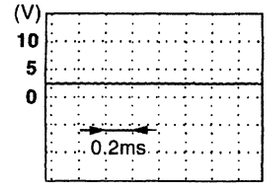
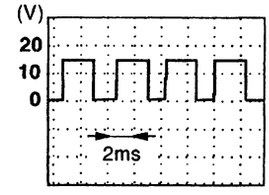
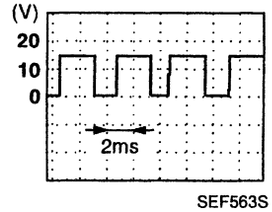
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
34	W	Needle lift sensor	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.06 - 0.07V  SEF553S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 0.07 - 0.08V  SEF554S
38	BR	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39 43	B	ECCS ground	Engine is running. └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
40 44	W	Crankshaft position sensor (TDC)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V  SEF555S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 0V  SEF556S

ECM Terminals and Reference Value (Cont'd)

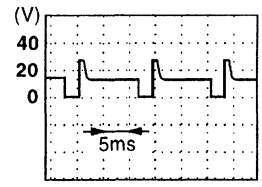
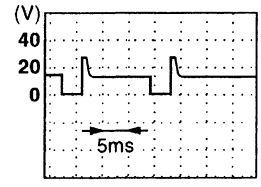
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
41 45	L	Camshaft position sensor (PUMP)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V  SEF557S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 0V  SEF558S
42	G/R	Data link connector for CONSULT	Engine is running. └ Idle speed (CONSULT is connected and turned on)	Approximately 0V
64	G/B			Approximately 0V
65	GY/L			Approximately 4 - 9V
46	P/B	Adjustment resistor	Ignition switch "ON"	Approximately 0.6 - 4.6V (Voltage varies with numbers of adjustment resistors.)
47 52	OR	Crankshaft position sensor (TDC) ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V
48	Y/R	Accelerator position sensor power supply	Ignition switch "ON"	Approximately 5V
50	B/W	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V
51	BR	Accelerator position sensor ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V
53 57	R	Control sleeve position sensor power supply	Engine is running. └ Idle speed	Approximately 2.6V  SEF559S
56 61	R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

EC

ECM Terminals and Reference Value (Cont'd)

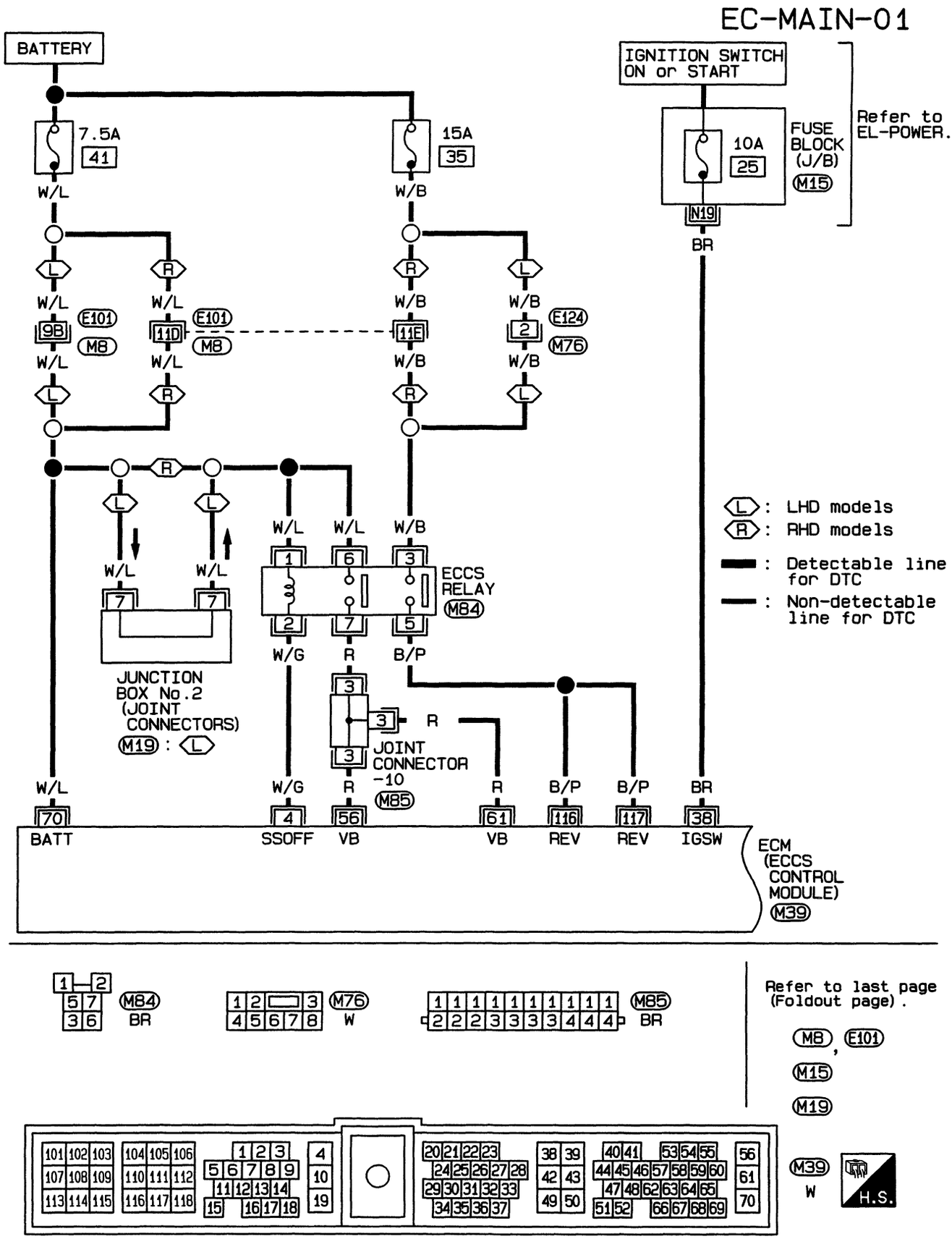
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
62 66	W	Control sleeve position sensor ground	Engine is running. └ Idle speed	Approximately 2.6V  SEF560S
63 67	B	Control sleeve position sensor	Engine is running. └ Idle speed	Approximately 2.6V  SEF561S
70	W/L	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101 107	OR/L	Electric governor	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
102 108	BR/R	Electric governor ground	Engine is running. └ Idle speed	Approximately 8.6 - 8.8V  SEF562S
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 7.8 - 9.8V  SEF563S
103	GY	EGRC-solenoid valve A	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.4V
			Engine is running. (Warm-up condition) └ Engine speed is 2,800 rpm	BATTERY VOLTAGE (11 - 14V)

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
104 110	SB	Injection timing control valve	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF564S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 9 - 14V  SEF565S
106 112 118	B/Y	ECCS ground	Engine is running. └ Idle speed	Approximately 0V
109	P	EGRC-solenoid valve B	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.4V
			Engine is running. (Warm-up condition) └ Engine speed is 2,800 rpm	BATTERY VOLTAGE (11 - 14V)
111	W/R	Glow relay	Refer to "Glow Control System".	
113 115	P/W	Fuel cut solenoid valve	Ignition switch "OFF"	Approximately 0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
116 117	B/P	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

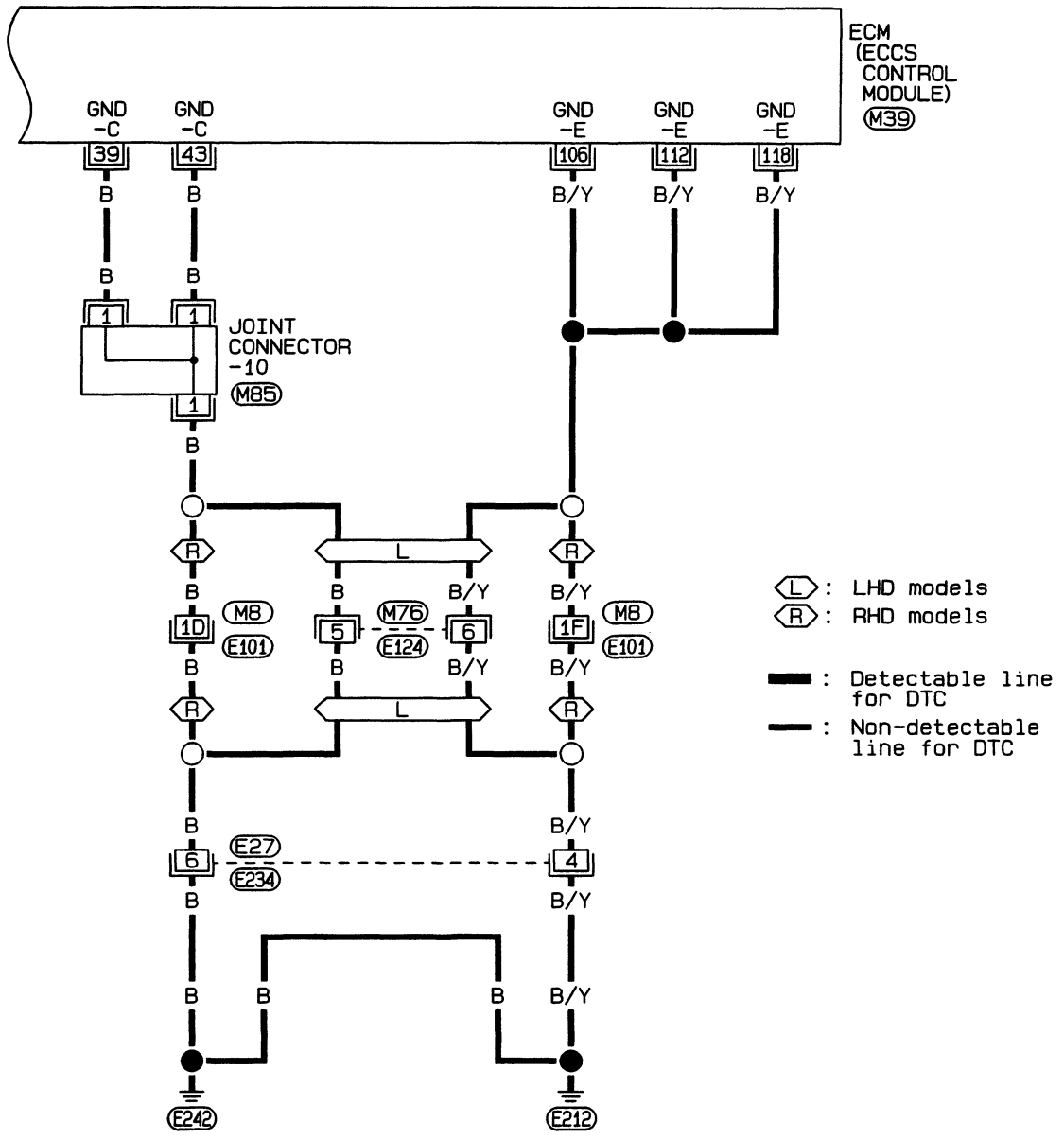
EC

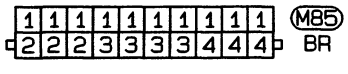
Main Power Supply and Ground Circuit

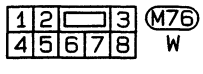


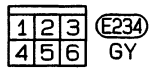
HEC240

EC-MAIN-02



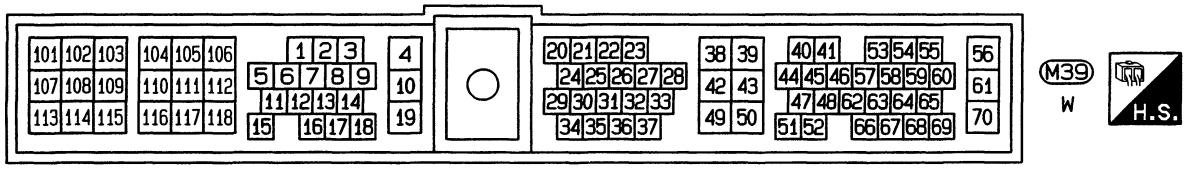






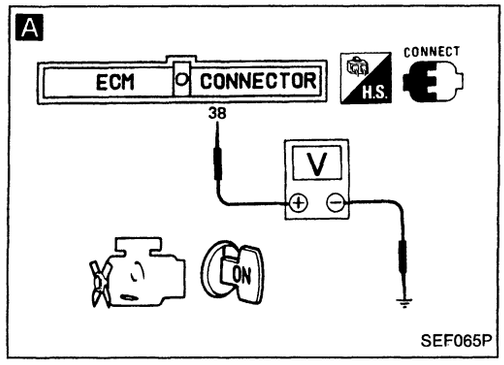
Refer to last page (Foldout page).

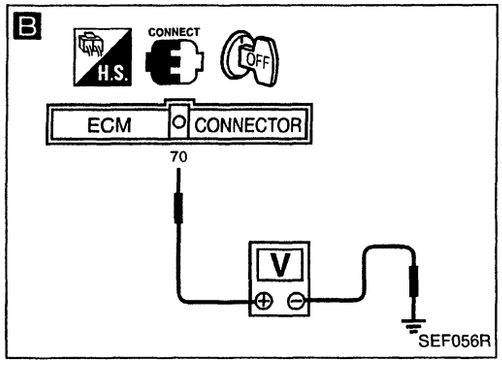
M8, E101

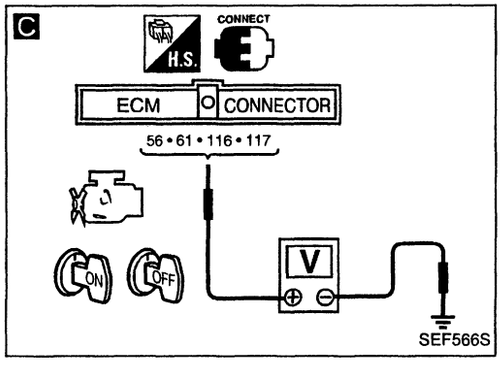


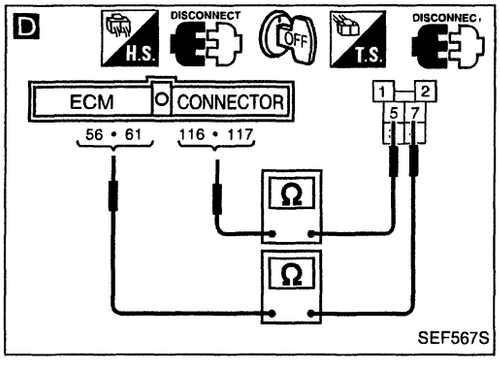
HEC241

Main Power Supply and Ground Circuit (Cont'd)









INSPECTION START

Start engine.
Is engine running?

No → **A**

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

If NG, check the following.
- 10A fuse
- Harness for open or short between ECM and ignition switch

If NG, repair harness or connectors.

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

Yes → **B**

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

NG → Check the following.
- Harness connectors (M8), (E101)
- 7.5A fuse
- Harness for open or short between ECM and battery

If NG, repair harness or connectors.

OK → **C**

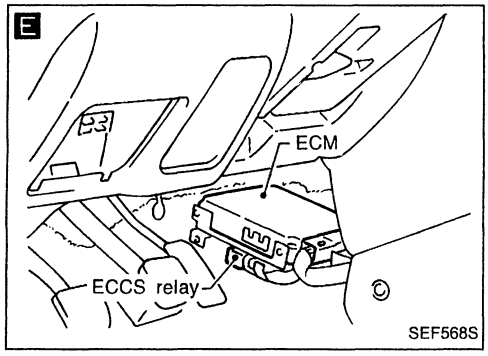
CHECK POWER SUPPLY-III.
1. Turn ignition switch "ON" and then "OFF".
2. Check voltage between ECM terminals (56), (61), (116), (117) and ground with CONSULT or tester.
   Voltage:
   After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

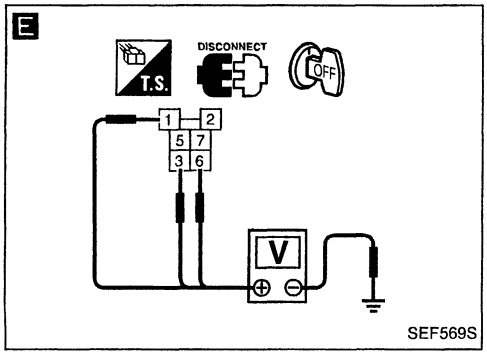
OK → Go to H "CHECK GROUND CIRCUIT" on next page.

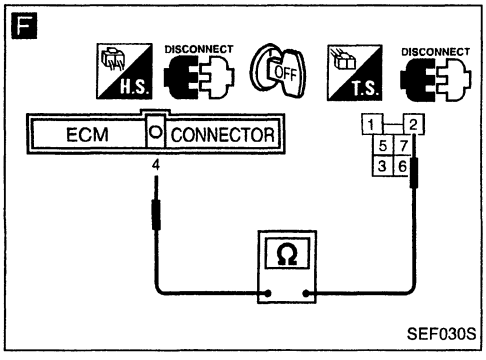
Case-1: Battery voltage does not exist.
Case-2: Battery voltage exists for more than a few seconds.

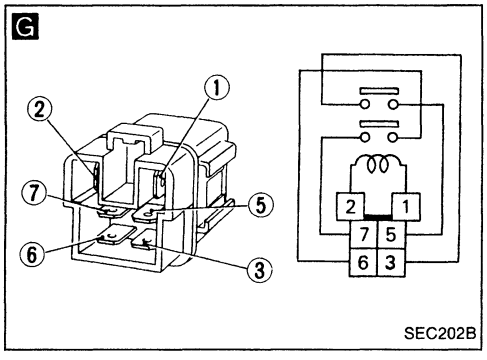
NG
- Case-2 → Go to G "CHECK ECCS RELAY" on next page.
- Case-1 → Ⓐ

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 harness connector.
3. Check harness continuity between ECM terminals (56), (61) and relay terminal (7), and ECM terminals (116), (117) and relay terminal (5).

Continuity should exist.

If OK, check harness for short.

NG → Check the following.
- Joint connector-10
- Harness for open or short between relay and ECM

If NG, repair harness or connectors.

OK ↓

E

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.

Check voltage between relay terminals (1), (3), (6) and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (M76), (E124)
- 15A fuse
- Harness for open or short between ECCS relay and battery

If NG, repair harness or connectors.

OK ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.

Check harness continuity between ECM terminal (4) and relay terminal (2).

Continuity should exist.

If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

G

CHECK ECCS RELAY.

1. Apply 12V direct current between relay terminals (1) and (2).
2. Check continuity between relay terminals (3) and (5), (7) and (6).

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

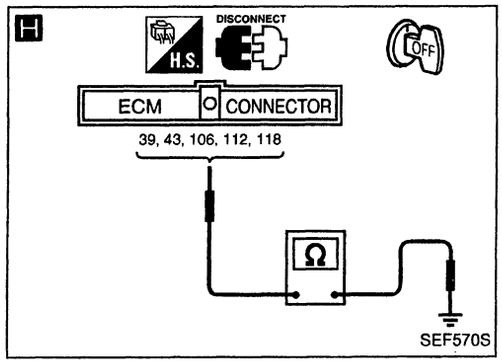
NG → Replace ECCS relay.

OK ↓

Ⓑ

EC

Main Power Supply and Ground Circuit (Cont'd)



Ⓑ

H

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals ㊴, ㊸, (106), (112), (118) and engine ground.

Continuity should exist.

If OK, check harness for short.

NG →

Check the following.

- Harness connectors (M8), (E101)
- Harness connectors (M76), (E124)
- Harness connectors (E27), (E234)
- Joint connector-10
- Harness for open or short between ECM and ground

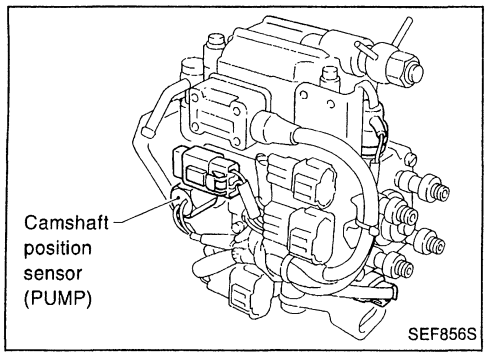
If NG, repair harness or connectors.

OK ↓

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

↓

INSPECTION END



Camshaft Position Sensor (CMPS) (PUMP)

The camshaft position sensor (PUMP) is located on the fuel injection pump.
The sensor consists of a permanent magnet, core and coil.
When engine is running, gap between sensor and drive shaft rotating plate 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 (4 pulses/2 engine revolutions).
These signals are used for tachometer indication.

EC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
11	• An improper signal from the sensor is detected by ECM during engine running.	• Harness or connectors (The camshaft position sensor (PUMP) circuit is open or shorted.) • Camshaft position sensor (PUMP)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

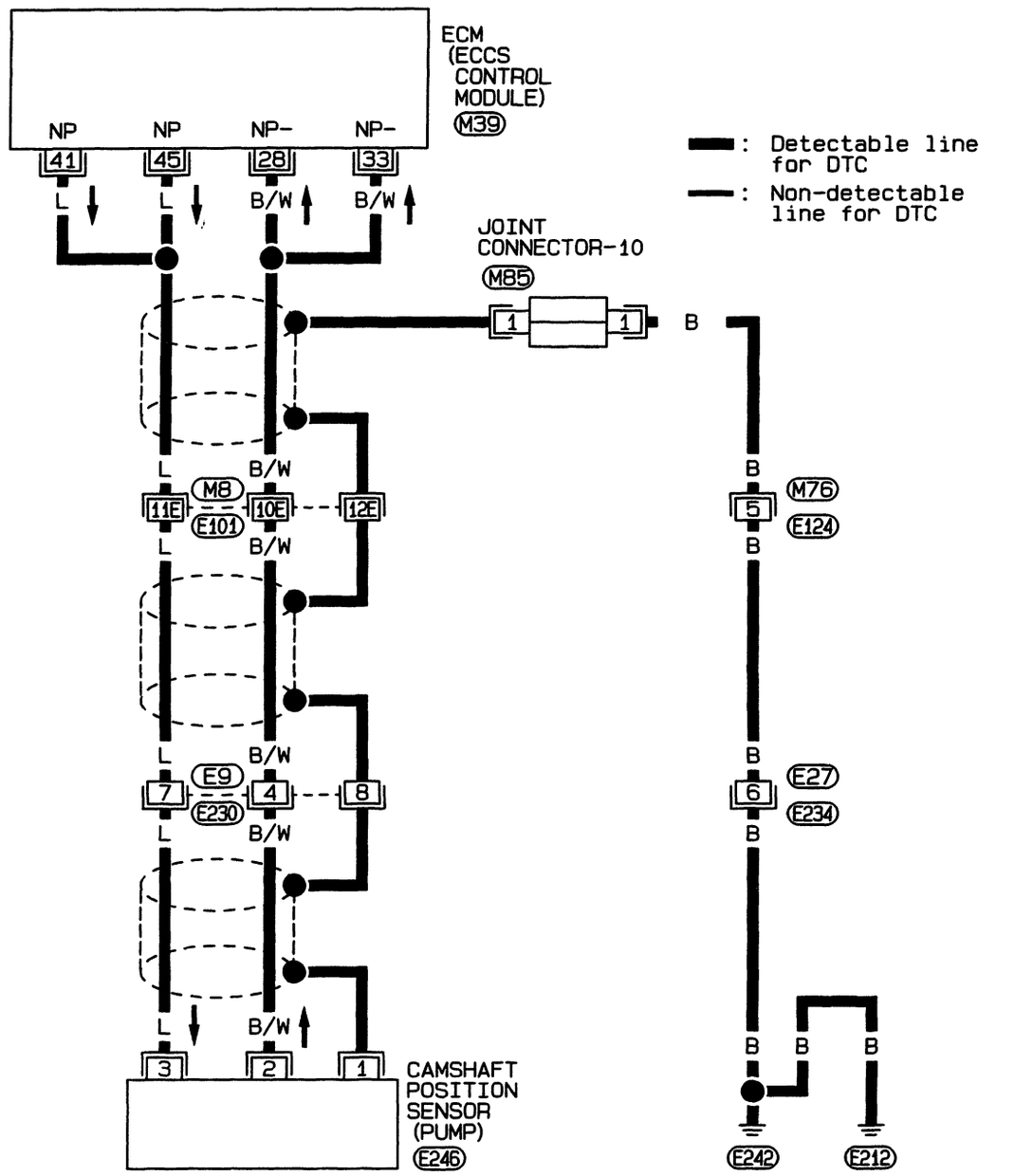
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 2 seconds at idle speed.

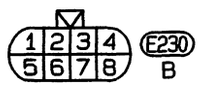
OR

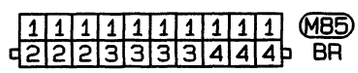
1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 5 seconds and then "ON".
3) Perform Diagnostic Test Mode II (Self-diagnostic results).

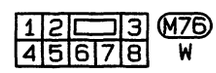
Camshaft Position Sensor (CMPS) (PUMP) (Cont'd)

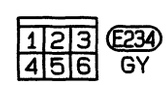
EC-CMPS-01

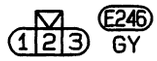






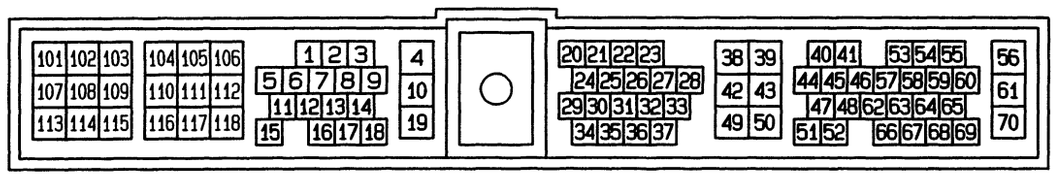






Refer to last page (Foldout page).

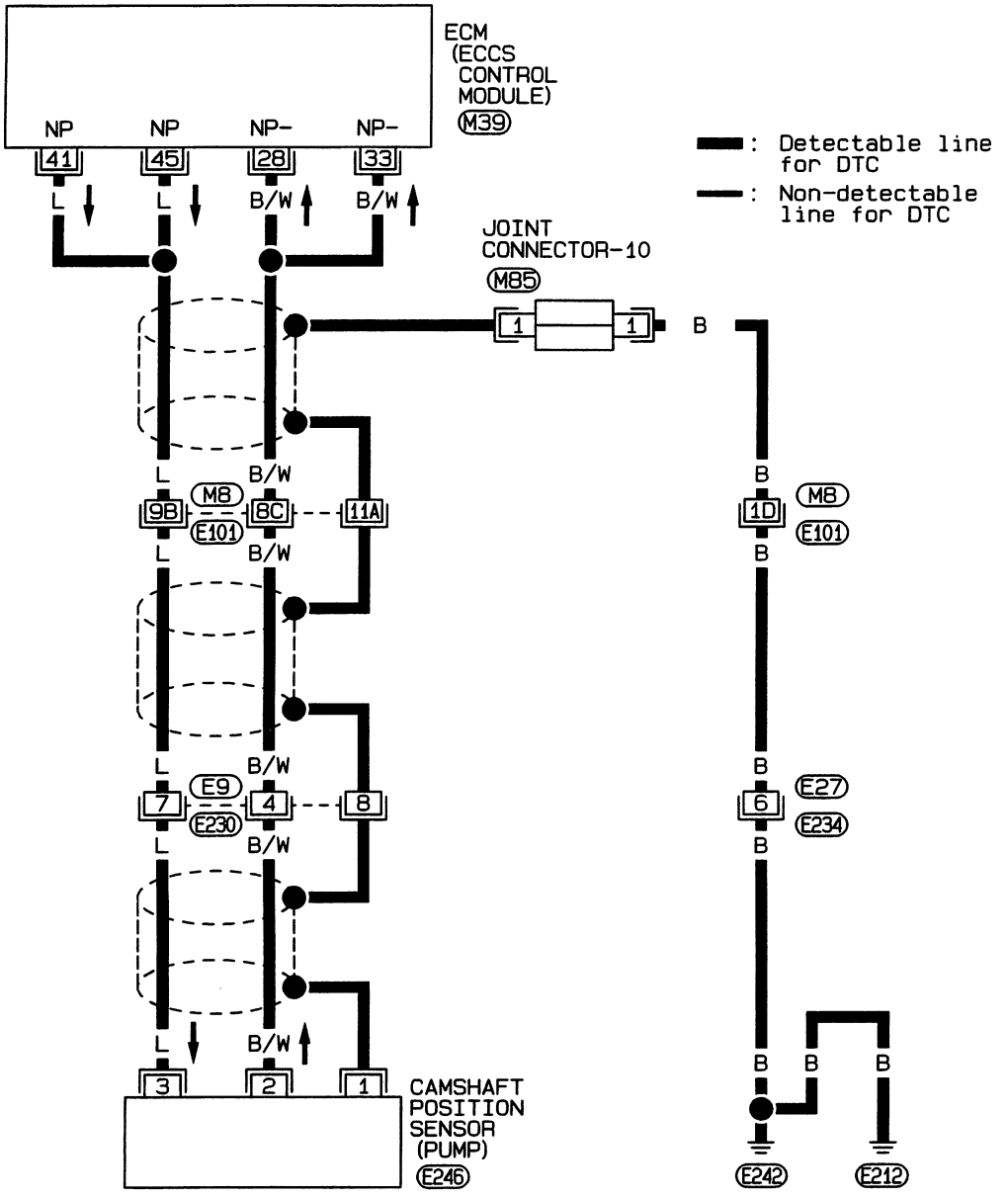
M8, E101



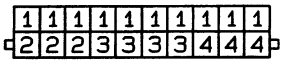
HEC242

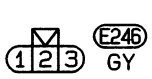
Camshaft Position Sensor (CMPS) (PUMP) (Cont'd)

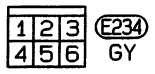
EC-CMPS-02





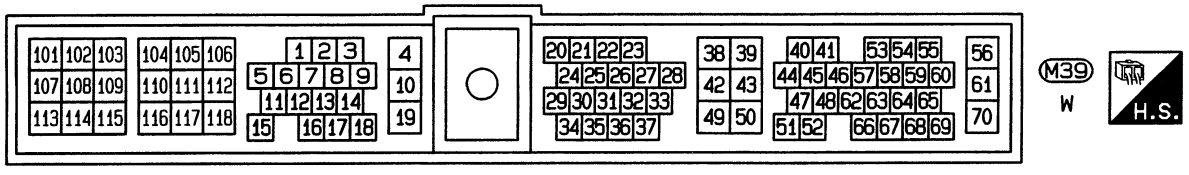






Refer to last page (Foldout page).

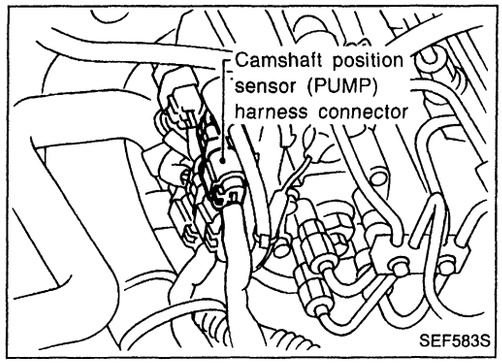
M8, E101



HEC243

Camshaft Position Sensor (CMPS) (PUMP) (Cont'd)

DIAGNOSTIC PROCEDURE



SEF583S

INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect camshaft position sensor (PUMP) harness connector and ECM harness connector.
3. Check harness continuity between terminal ③ and ECM terminals ㊶, ㊺.

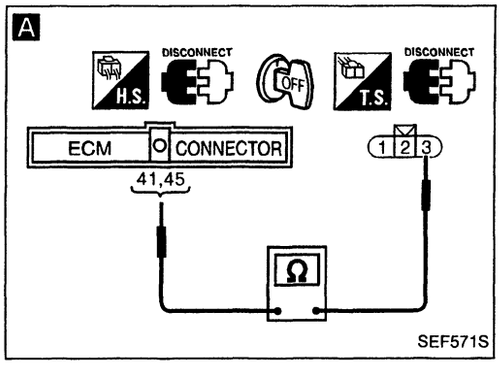
Continuity should exist.

If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E9), (E230)
- Harness for open or short between camshaft position sensor (PUMP) and ECM

If NG, repair harness or connectors.

OK



SEF571S

B

CHECK GROUND CIRCUIT-I.
1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ② and ECM terminals ㉘, ㉝.

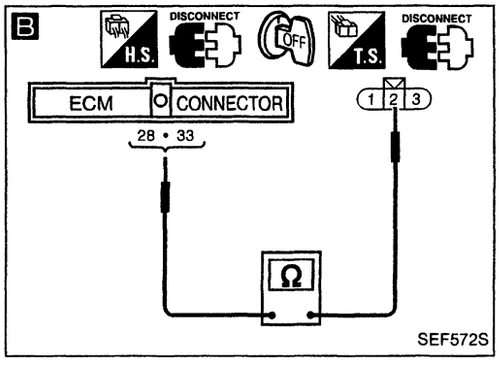
Continuity should exist.

If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E9), (E230)
- Harness for open or short between camshaft position sensor (PUMP) and ECM

If NG, repair harness or connectors.

OK



SEF572S

C

CHECK GROUND CIRCUIT-II.
1. Loosen and retighten engine ground screws.
2. Check harness continuity between terminal ① and engine ground.

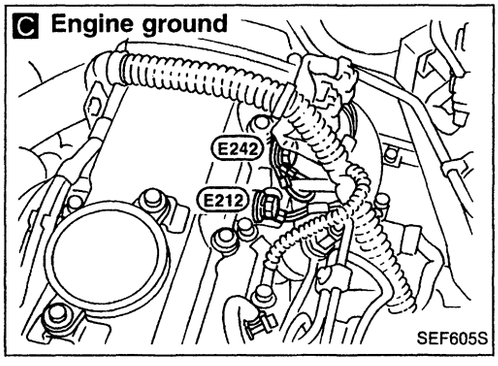
Continuity should exist.

If OK, check harness for short.

NG → Check the following.
- Harness connectors (M76), (E124), (E27), (E234)
- Joint connector-10 (M85)
- Harness for open or short between camshaft position sensor (PUMP) and engine ground

If NG, repair harness or connectors.

OK



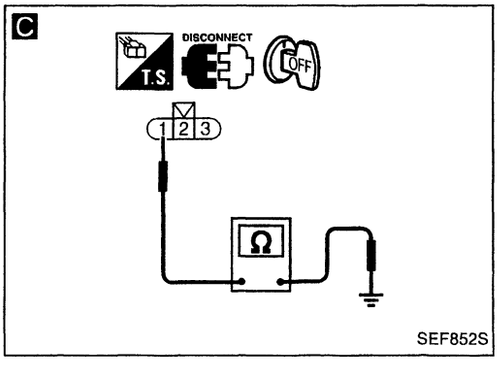
SEF605S

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

NG → Replace camshaft position sensor (PUMP).

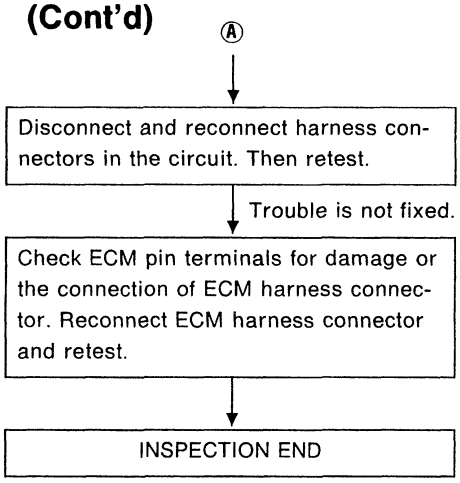
OK

Ⓐ

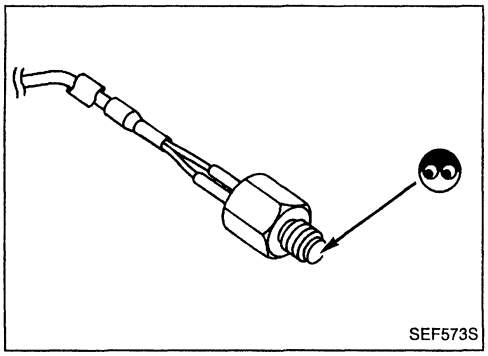


SEF852S

Camshaft Position Sensor (CMPS) (PUMP) (Cont'd)



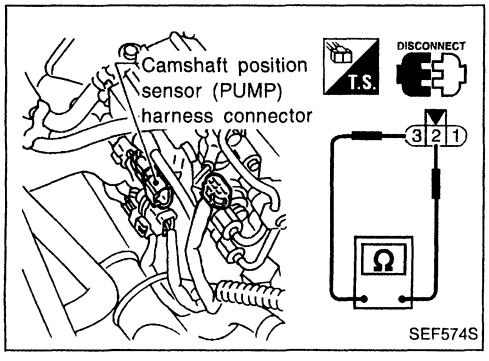
EC



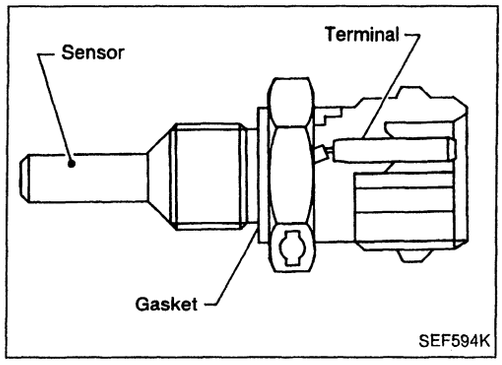
COMPONENT INSPECTION

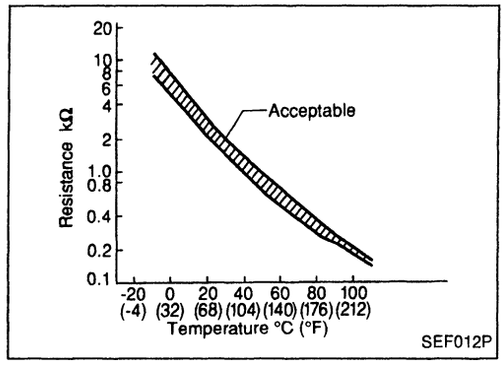
Camshaft position sensor (PUMP)

1. Disconnect camshaft position sensor (PUMP) harness connector.
2. Loosen the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance between terminals ② and ③.
   Resistance:
   Approximately 1,600Ω [at 25°C (77°F)]
   If NG, replace camshaft position sensor (PUMP).





Engine Coolant Temperature (ECT) Sensor

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

<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)	2.3	0.68 - 1.00
90 (194)	1.0	0.236 - 0.260

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

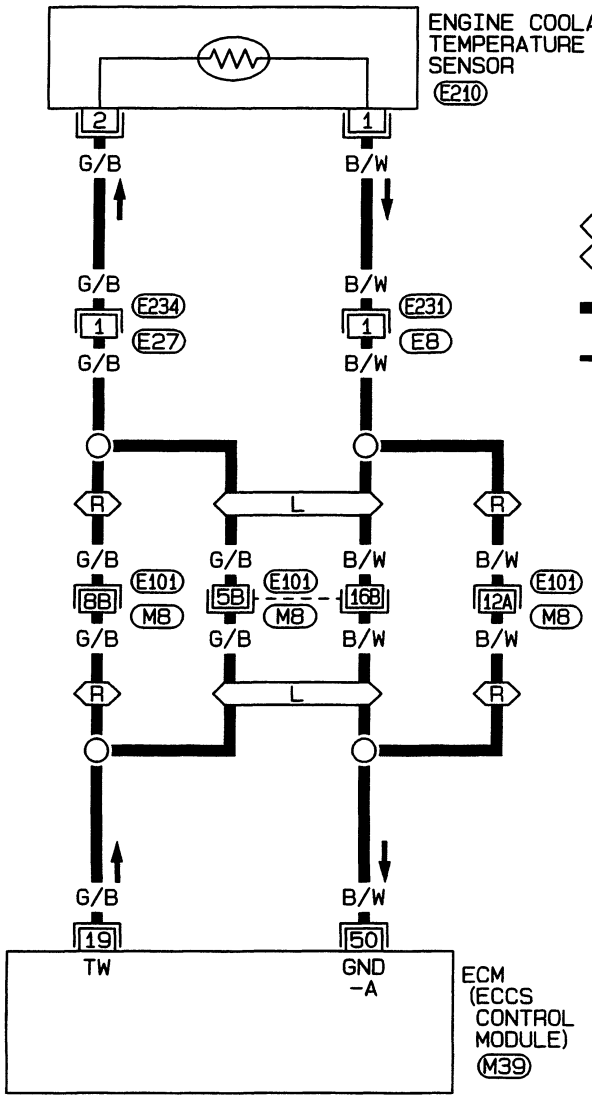
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

OR

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

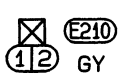
Engine Coolant Temperature (ECT) Sensor (Cont'd)

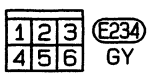
EC-ECTS-01

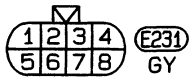


EC

L : LHD models
R : RHD models
: Detectable line for DTC
: Non-detectable line for DTC

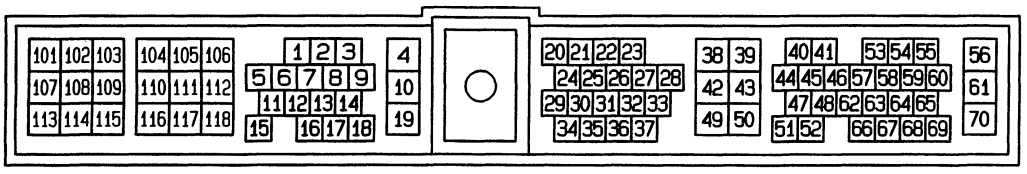






Refer to last page (Foldout page).

M8, E101



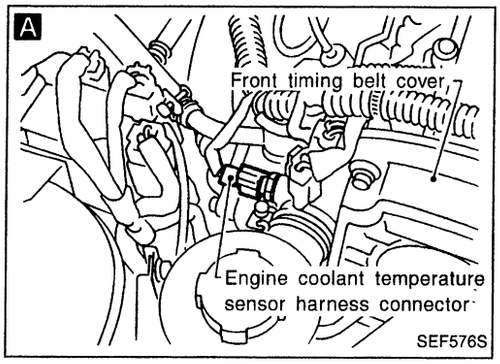
M39
W

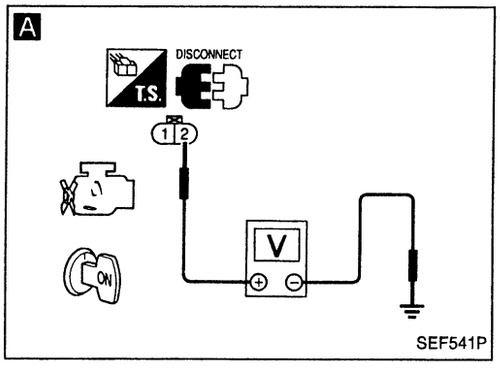


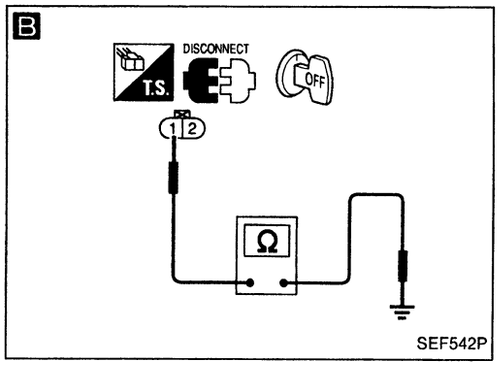
HEC244

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect engine coolant temperature sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and ground with CONSULT or tester.
   Voltage:
   Approximately 4.9V

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E27), (E234)
- Harness for open or short between ECM and engine coolant temperature sensor

If NG, repair harness or connectors.

OK ↓

B

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

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E8), (E231)
- Harness for open or short between ECM and engine coolant temperature sensor

If NG, repair harness or connectors.

OK ↓

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

NG → Replace engine coolant temperature sensor.

OK ↓

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

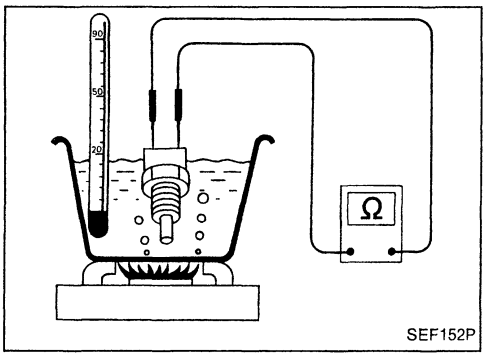
Trouble is not fixed. ↓

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

↓

INSPECTION END

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

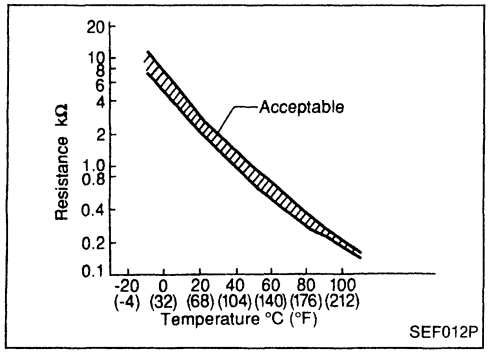


COMPONENT INSPECTION

Engine coolant temperature sensor

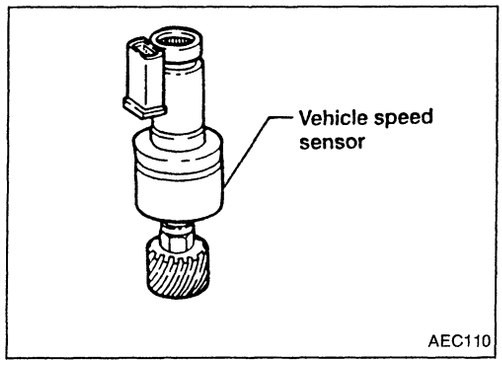
Check resistance as shown in the figure.

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



If NG, replace engine coolant temperature sensor.

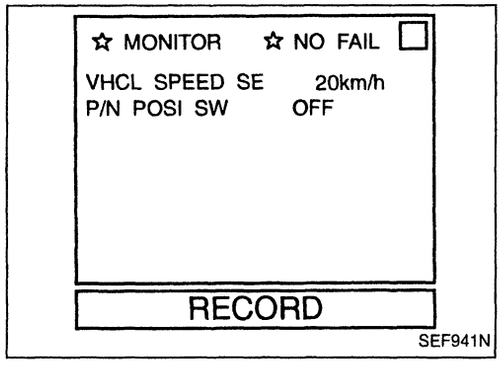
EC

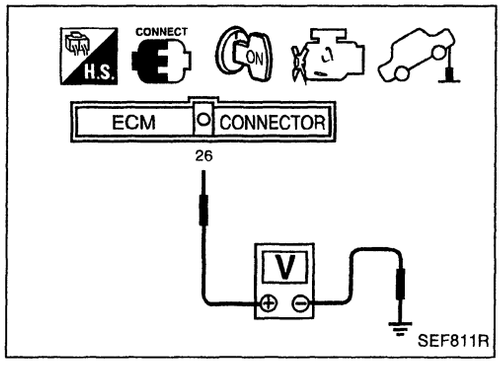


Vehicle Speed Sensor (VSS)

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

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





OVERALL FUNCTION CHECK

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

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

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

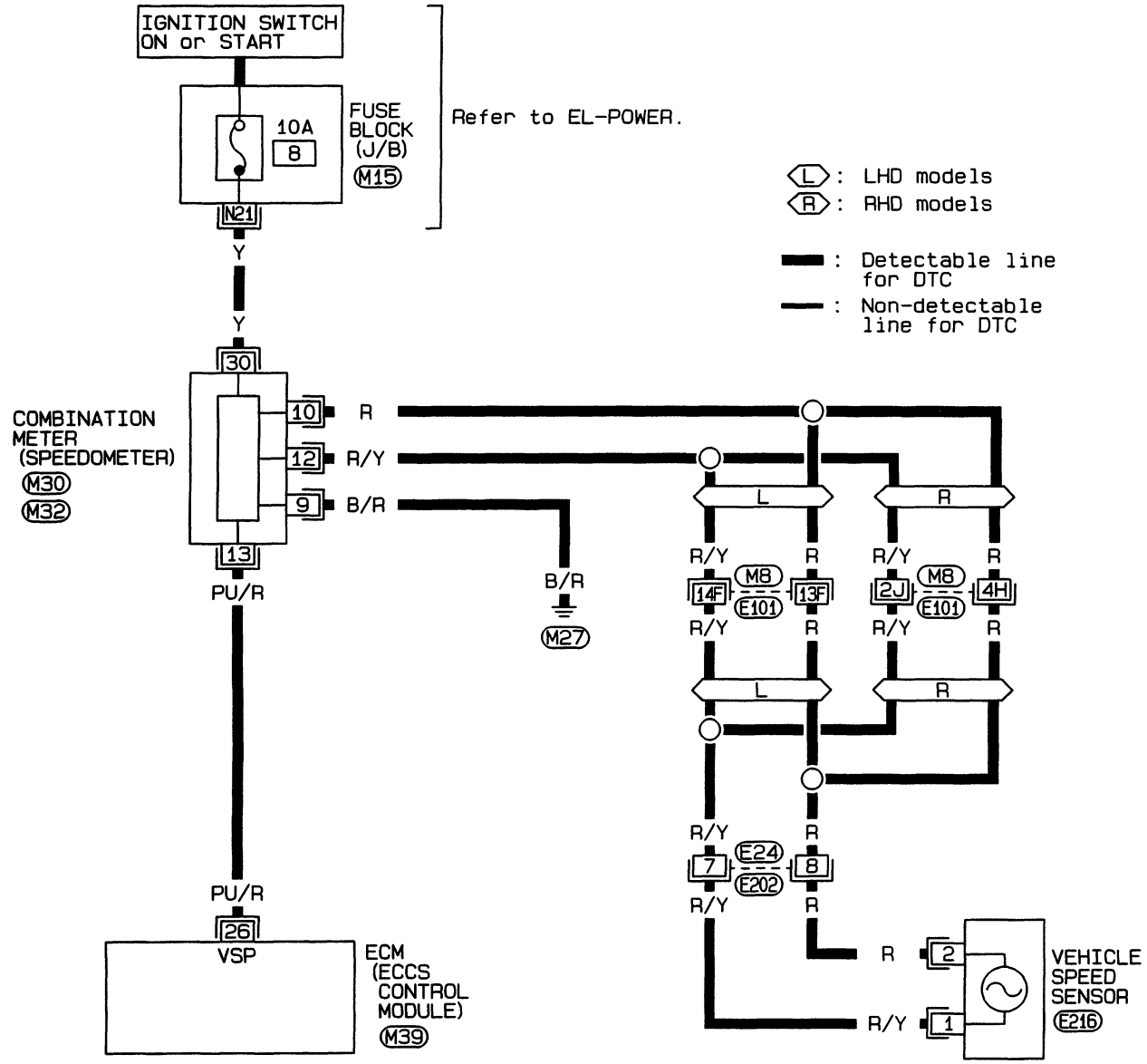
OR

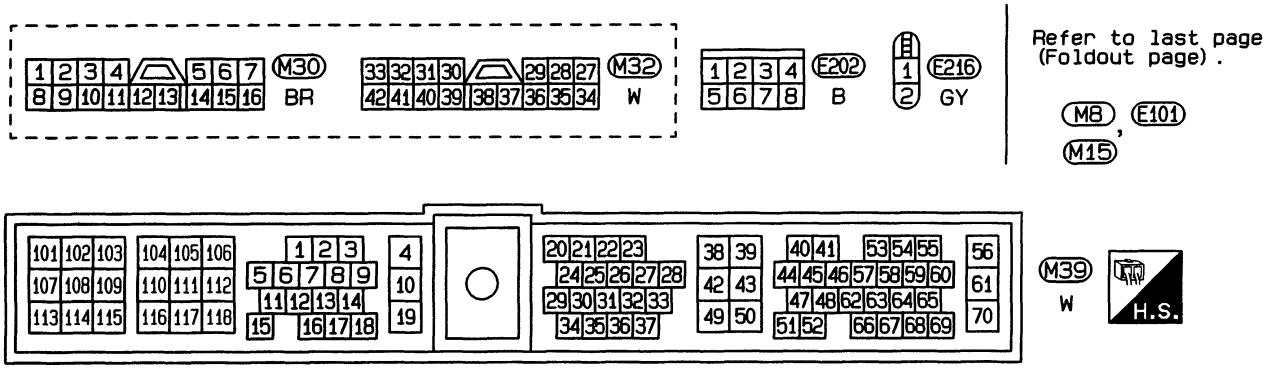
1) Jack up drive wheels.
2) Start engine.
3) Rotate drive wheel by hand.
4) Check voltage between ECM terminal ㉖ and ground with tester.

Voltage should vary between approx. 0 - 4.2V.

Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01

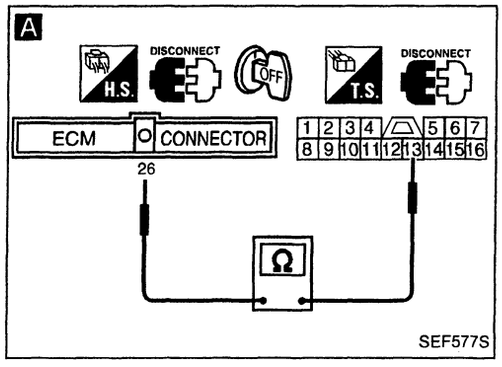




HEC245

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM terminal ㉖ and meter terminal ⑬.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness for open or short between ECM and combination meter

If NG, repair harness or connectors.

OK ↓

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E24), (E202)
- Harness for open or short between combination meter and vehicle speed sensor

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

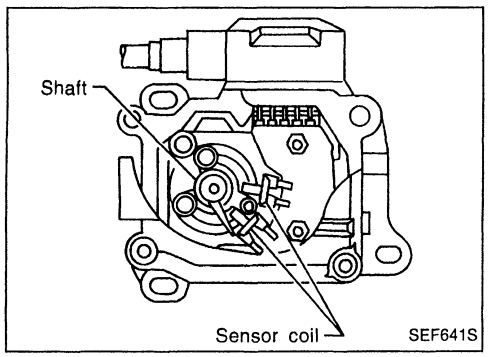
OK ↓

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

Trouble is not fixed. ↓

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

INSPECTION END



Control Sleeve Position Sensor (CSPS)

The control sleeve position sensor is installed on the electric governor. It senses the position of control sleeve (rotor angle) while the control sleeve is being driven by the electric governor, and feeds it back to the ECM.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
15	• An excessively high or low voltage from the sensor is detected by ECM. ..... • An improper voltage signal from the sensor is detected by ECM during engine running.	• Harness or connectors (The control sleeve position sensor circuit is open or shorted.) • Control sleeve position sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

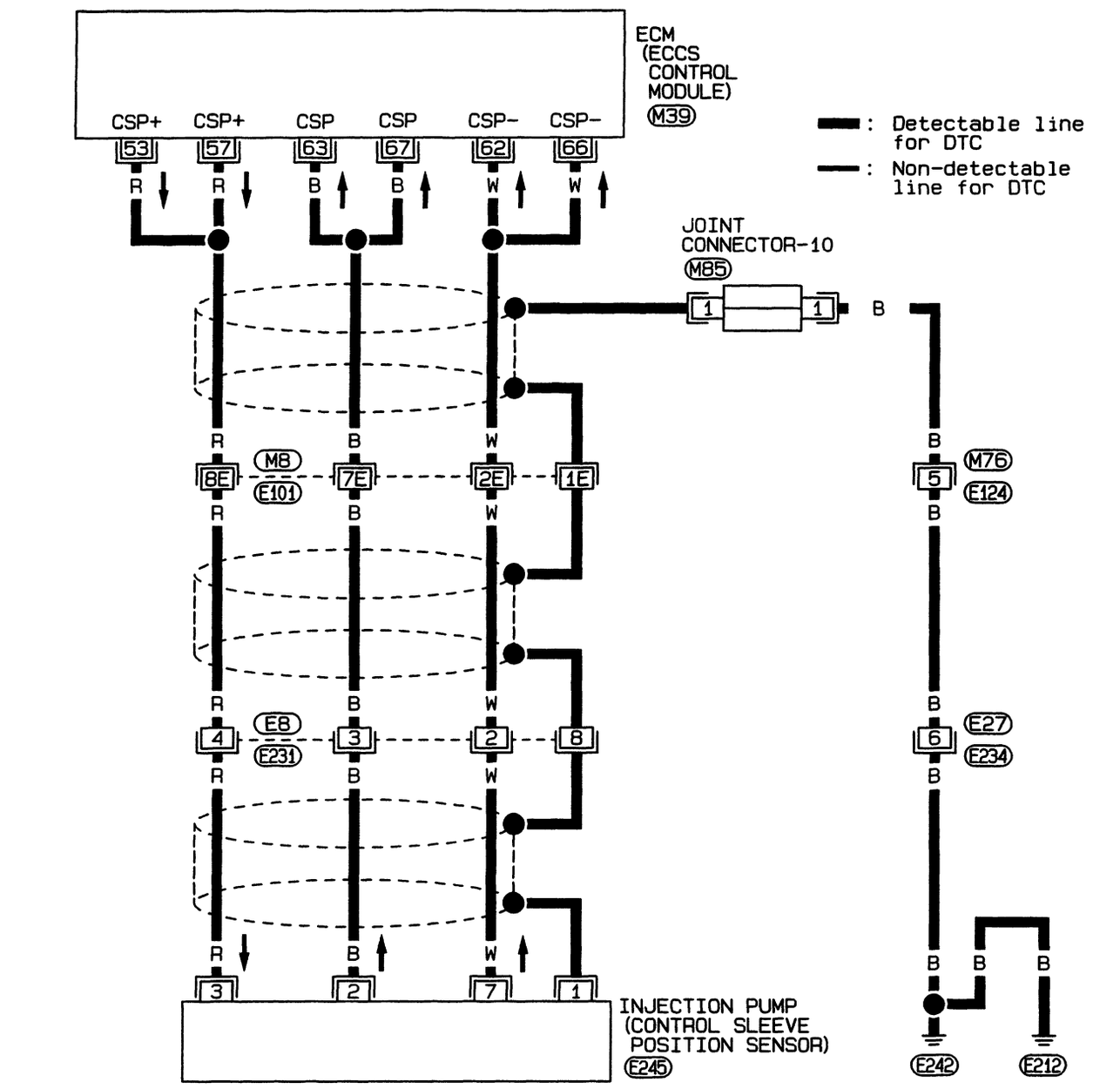
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 2 seconds at idle speed.

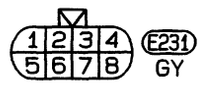
OR

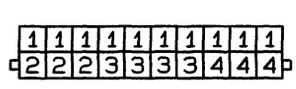
1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 5 seconds and then "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)".

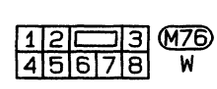
Control Sleeve Position Sensor (CSPS) (Cont'd)

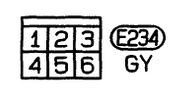
EC-CSPS-01

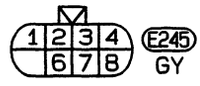






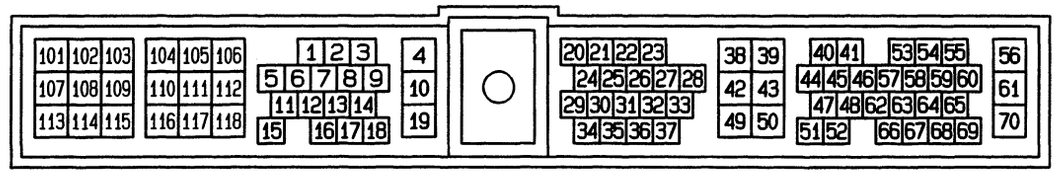






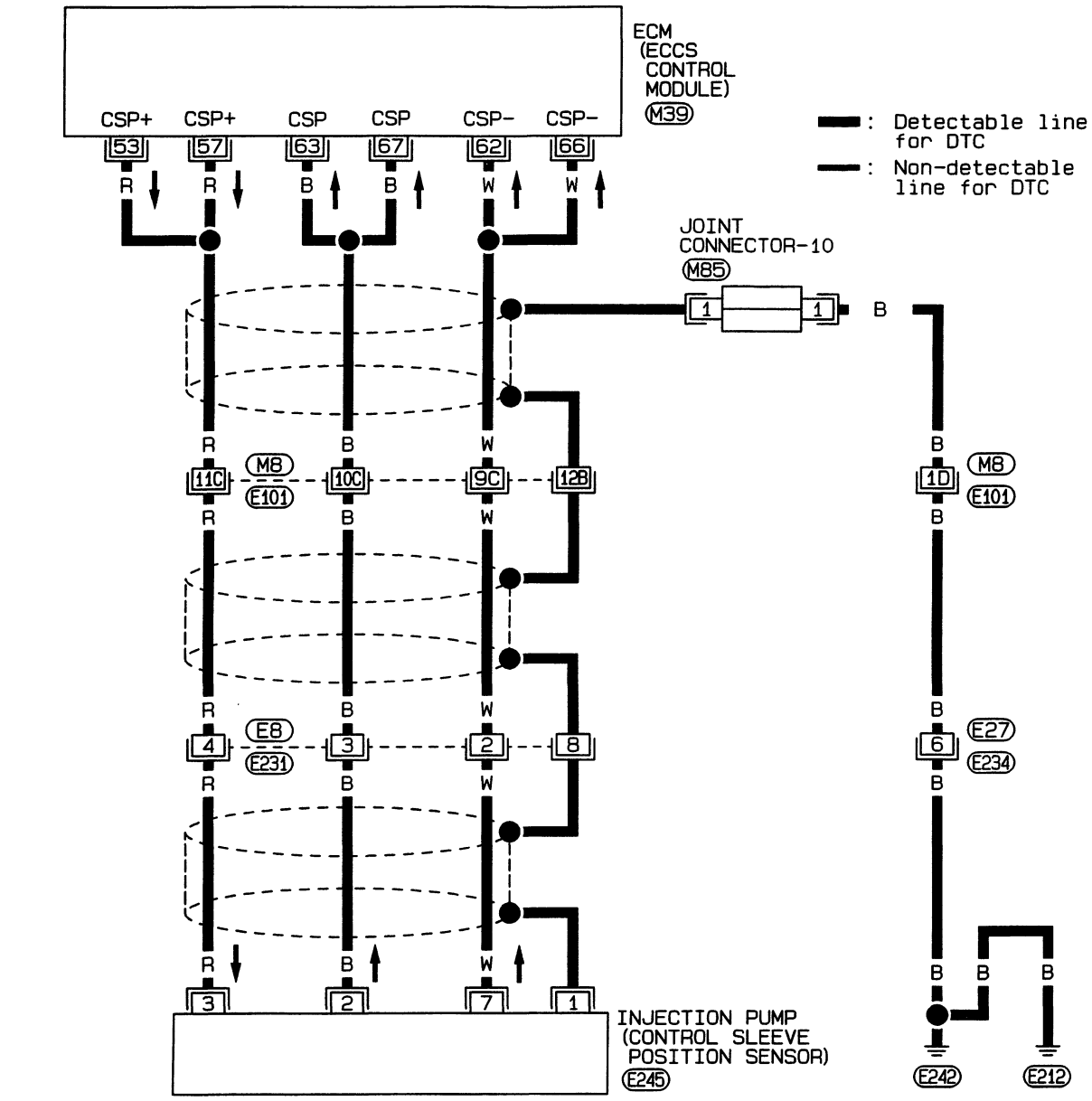
Refer to last page (Foldout page).

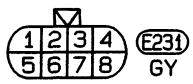
M8, E101

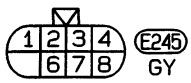


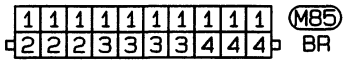
HEC246

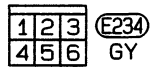
EC-CSPS-02





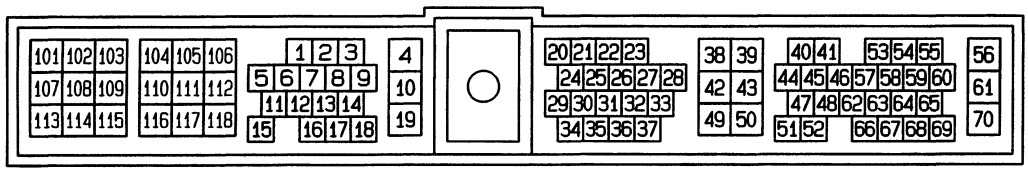






Refer to last page (Foldout page).

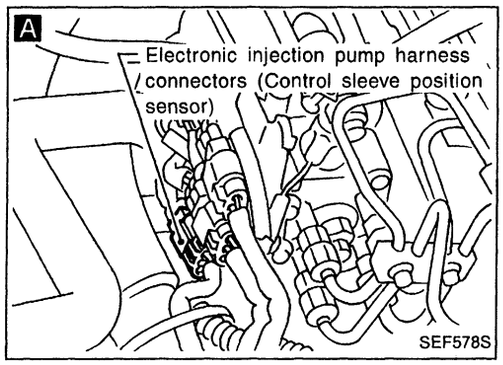
M8, E101

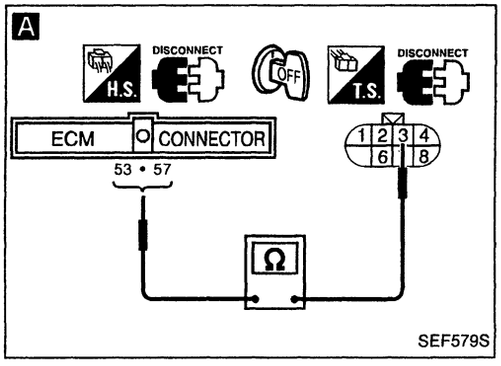


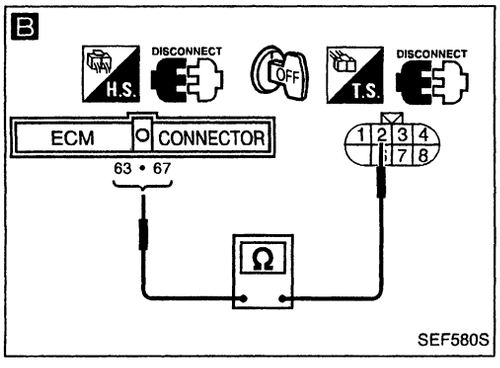
HEC247

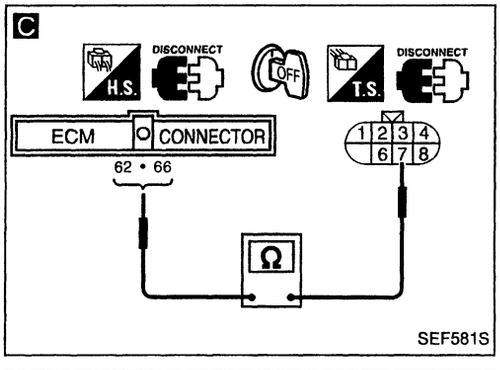
Control Sleeve Position Sensor (CSPS) (Cont'd)

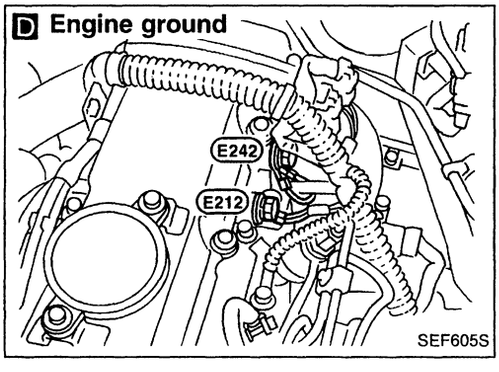
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between terminal ③ and ECM terminals ⑤③, ⑤⑦.

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

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E8), (E231)
- Harness for open or short between ECM and control sleeve position sensor

If NG, repair harness or connectors.

OK ↓

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between sensor terminal ② and ECM terminals ⑥③, ⑥⑦.

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

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E8), (E231)
- Harness for open or short between ECM and control sleeve position sensor

If NG, repair harness or connectors.

OK ↓

C

CHECK GROUND CIRCUIT-I.
Check harness continuity between sensor terminal ⑦ and ECM terminals ⑥②, ⑥⑥.

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

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E8), (E231)
- Harness for open or short between ECM and control sleeve position sensor

If NG, repair harness or connectors.

OK ↓

D

CHECK GROUND CIRCUIT-II.
1. Loosen and retighten engine ground screws.
2. Check harness continuity between terminal ① and engine ground.

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

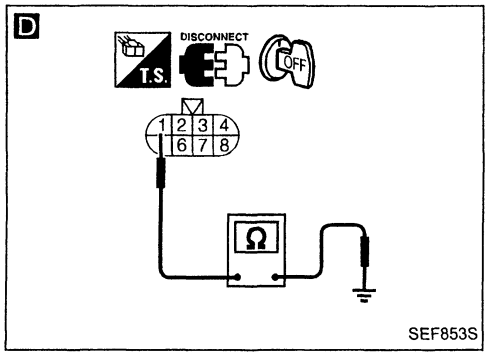
NG → Check the following.
- Harness connectors (M76), (E124), (E27), (E234)
- Joint connector-10 (M85)
- Harness for open or short between control sleeve position sensor and engine ground

If NG, repair harness or connectors.

OK ↓

Ⓐ

Control Sleeve Position Sensor (CSPS) (Cont'd)



Ⓐ

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

NG → Take proper action.

OK

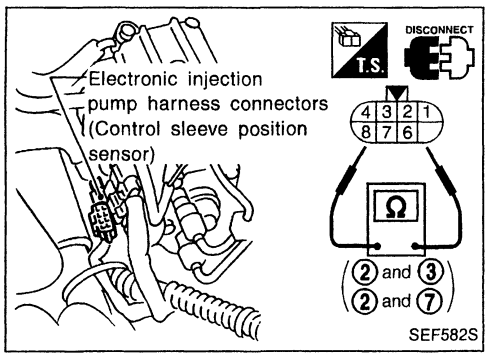
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

INSPECTION END

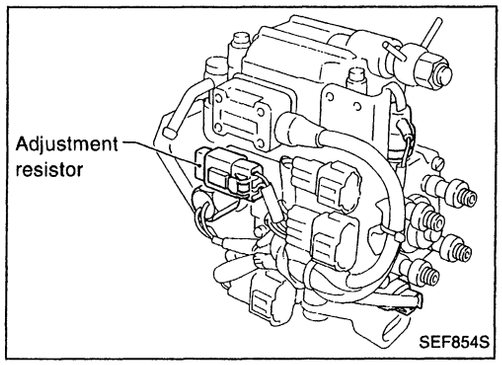
EC



COMPONENT INSPECTION

Control sleeve position sensor

1. Disconnect electronic injection pump harness connector.
2. Check continuity between terminals ② and ③, ② and ⑦.
   Resistance: Approximately 5.8Ω [at 23°C (73°F)]
   If NG, take proper action.



Adjustment Resistor

The adjustment resistor is used to achieve uniform pump characteristics.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
17	• An excessively high or low voltage from the resistor is detected by ECM.	• Harness or connectors (The adjustment resistor circuit is open or shorted.) • Adjustment resistor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

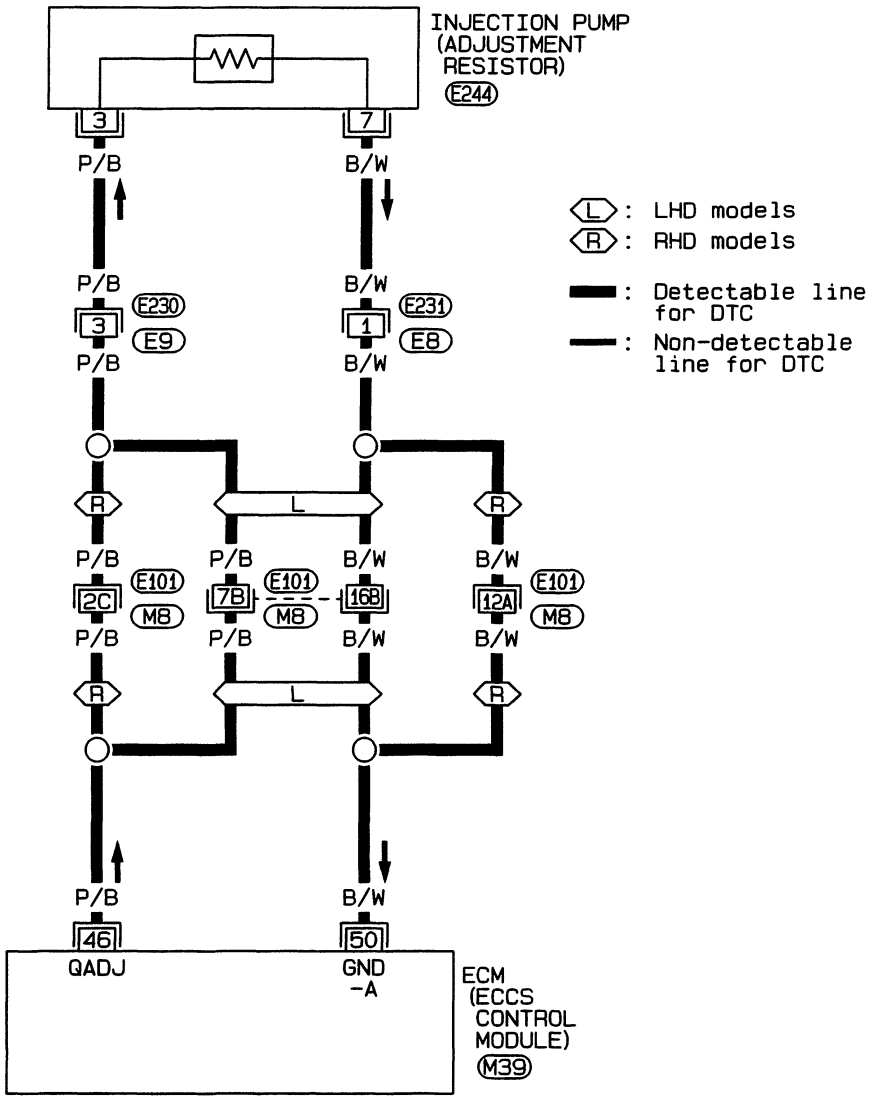
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

OR

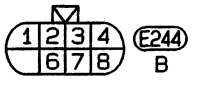
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform diagnostic test mode II (Self-diagnostic results).

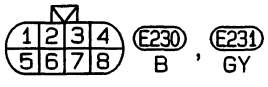
Adjustment Resistor (Cont'd)

EC-ADJRES-01



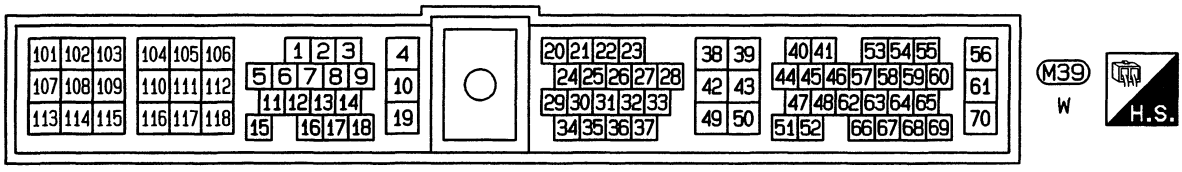
EC





Refer to last page (Foldout page).

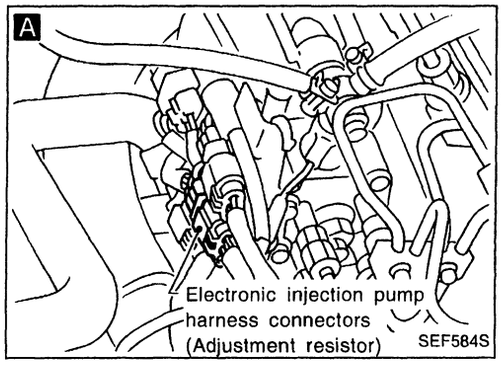
M8, E101

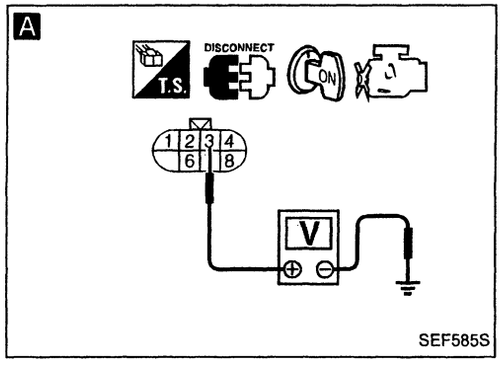


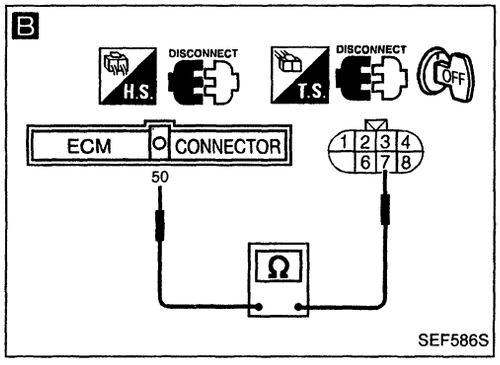
HEC248

Adjustment Resistor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E9), (E230)
- Harness for open or short between ECM and adjustment resistor

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ⑦ and ECM terminal ⑤⓪.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E8), (E231)
- Harness for open or short between ECM and adjustment resistor

If NG, repair harness or connectors

OK ↓

CHECK COMPONENT (Adjustment resistor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace adjustment resistor.

OK ↓

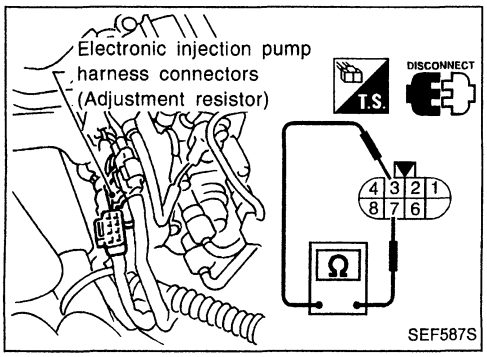
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

INSPECTION END

Adjustment Resistor (Cont'd)



COMPONENT INSPECTION

Adjustment resistor

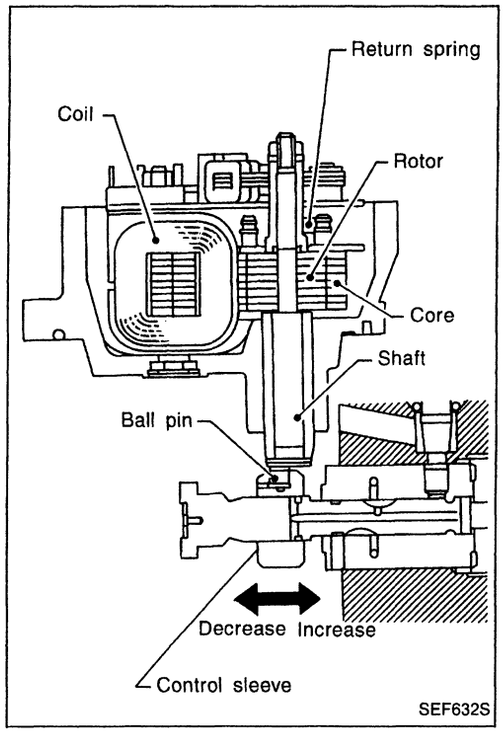
Check resistance between terminals ③ and ⑦.

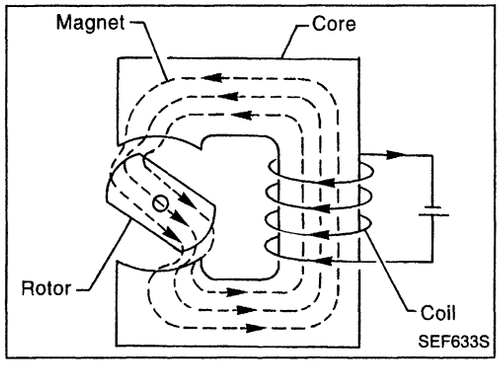
Resistance: Approximately 0.2 - 15.0 kΩ [at 25°C (77°F)]
Resistance value varies with adjustment sensor numbers.

If NG, replace adjustment resistor.

Always replace adjustment resistor with a new one which has same number on label.

EC





Electric Governor

The electric governor is built into the fuel injection pump. It moves the control sleeve to increase or decrease the amount of fuel injected.
When current flows through the coil, a magnetic force is produced, rotating the rotor. The rotor shaft is installed to the control sleeve via a ball pin which is eccentrically situated in relation to the rotor shaft. With this arrangement, the control sleeve can be moved in relation to rotor rotation.
The rotor's rotating angle is determined by a balanced condition of magnetic force (generated by current flow regulated by means of the ECM) and tension of return spring (installed to rotor). The larger the current flow through the coil, the greater the rotor's rotating angle. This means that the control sleeve moves to the right, increasing the amount of fuel injected.
The ECM regulates the current flow through the coil by changing the duty ratio which controls the ON-OFF operation of the electric governor grounding circuit.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
18, 22, 25	• Fuel injection feedback system does not operate properly. (This system consists essentially of ECM, electric governor and control sleeve position sensor.)	• Main power supply circuit (ECM terminals (116), (117)) and fuse • Harness or connectors (Electric governor and control sleeve position sensor circuit) • Electric governor • Electronic fuel injection pump • ECM

Electric Governor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If DTC 18, 22, 25 and DTC 15 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 15. (See EC-179.)



1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and warm it up sufficiently.
3) Run engine for 2 seconds at 3,000 rpm. Return engine speed to idle, then increase to 3,000 rpm under no load.

OR



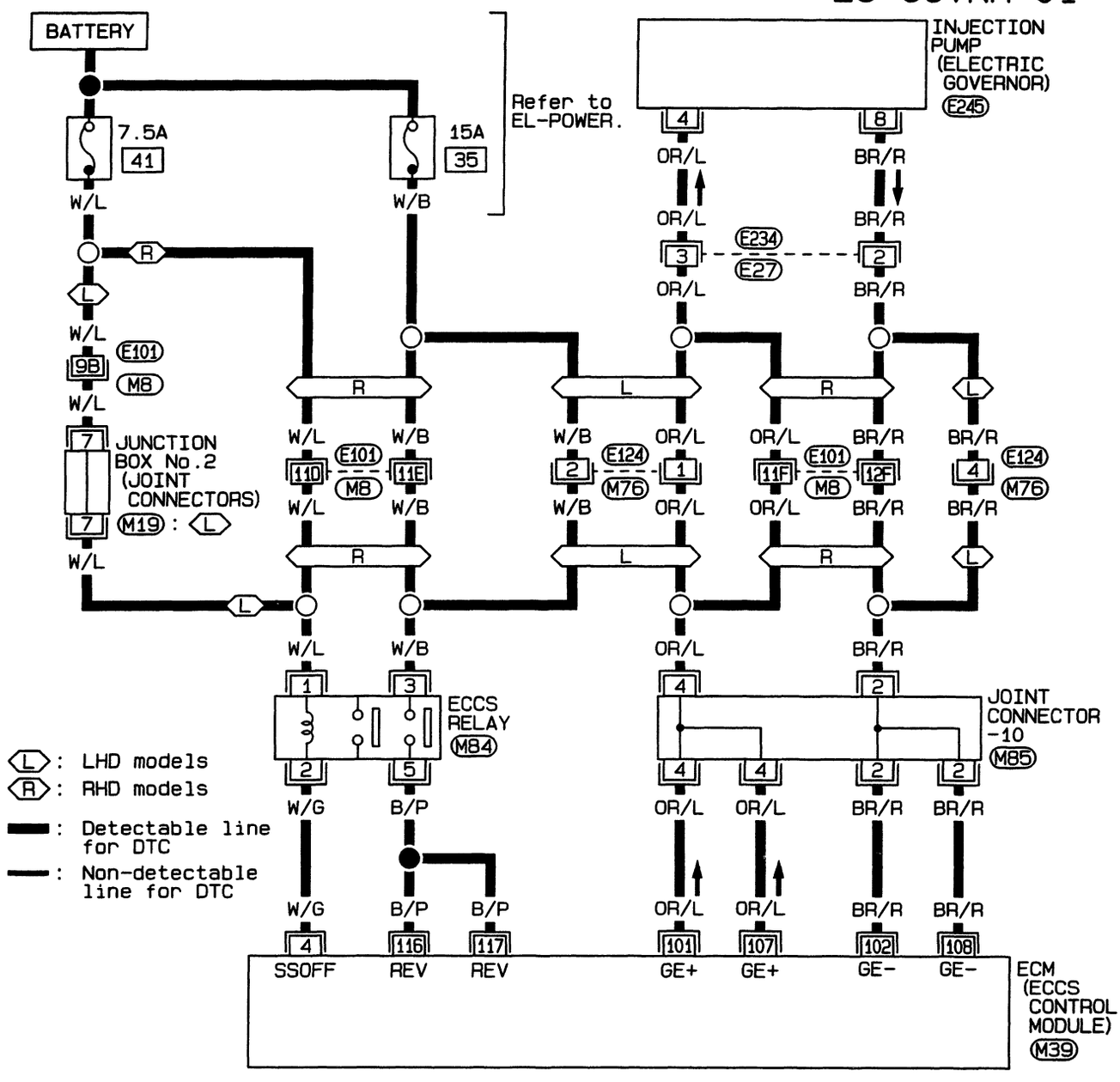
1) Start engine and warm it up sufficiently.
2) Run engine for 2 seconds at 3,000 rpm. Return engine speed to idle, then increase to 3,000 rpm under no load.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

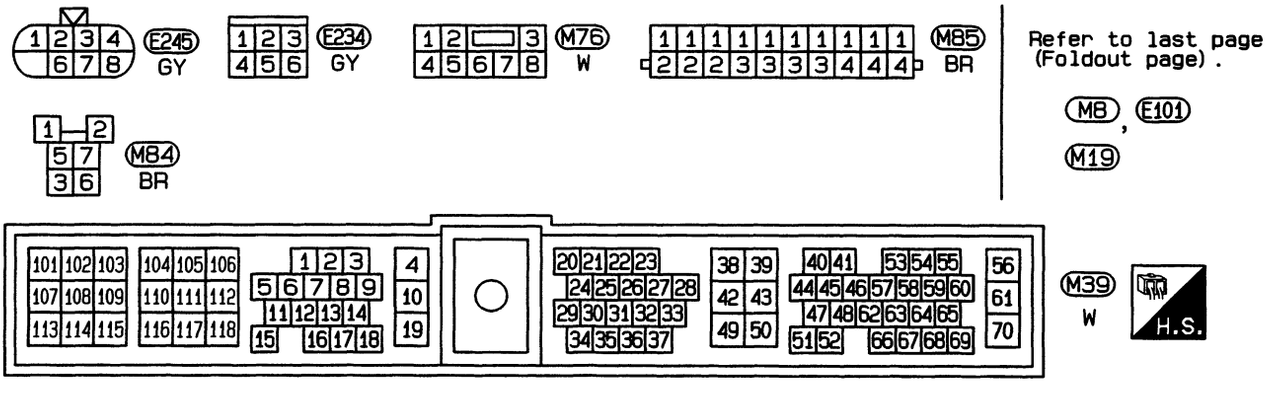
Note: If a malfunction occurs intermittently, conduct suitable driving pattern for 10 minutes. This makes it possible to determine DTC.

EC

Electric Governor (Cont'd)

EC-GOVNR-01

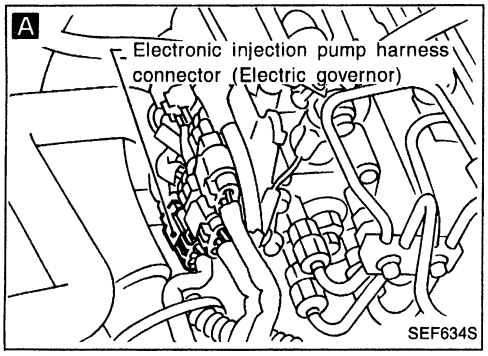


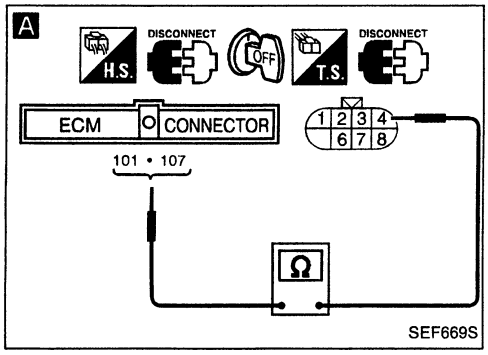


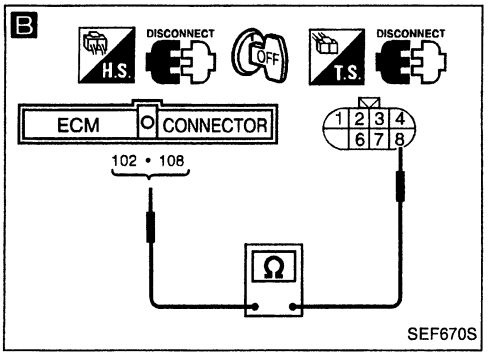
HEC249

Electric Governor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

CHECK POWER SUPPLY.
Refer to EC-162.

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between terminal ④ and ECM terminals (101), (107).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E101) or (M76), (E124)
- Harness connectors (E27), (E234)
- Harness for open or short between ECM and electric governor

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
Check harness continuity between terminal ⑧ and ECM terminals (102), (108).
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E101) or (M76), (E124)
- Harness connectors (E27), (E234)
- Joint connector-10
- Harness for open or short between ECM and electric governor

If NG, repair harness or connectors.

OK

CHECK COMPONENT
(Electric governor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Take proper action.

OK

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

Trouble is not fixed.

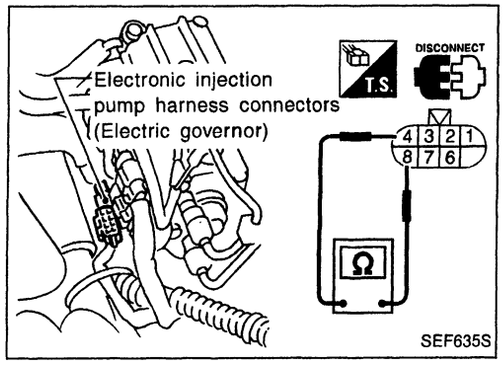
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

EC

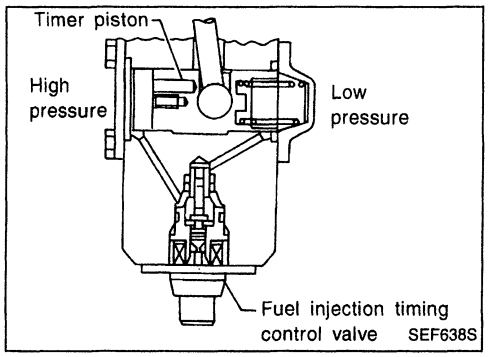
Electric Governor (Cont'd)

COMPONENT INSPECTION



Electric governor

1. Disconnect electronic injection pump harness connector.
2. Check continuity between terminals ④ and ⑧.
   Resistance: Approximately 0.6Ω [at 23°C (73°F)]
   If NG, take proper action.



Injection Timing Control Valve

The injection timing control valve is built into the fuel injection pump. It controls the timer piston to change the fuel injection timing.

The timing control valve is a solenoid valve located in the line between high-pressure chamber and low-pressure chamber. It changes fuel pressure in the high-pressure chamber.

When current flows through the solenoid (the solenoid turns ON), the timing control valve opens, advancing fuel injection timing. When current does not flow through it, the timing control valve closes, retarding injection timing.

The ECM emits an ON-OFF duty signal. The longer the OFF-duration, the greater the advance angle. The longer the ON-duration, the greater the retard angle. This means that changing the ON-OFF duty ratio makes it possible to achieve an optimal advance angle and accurately control fuel injection timing.

EC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
21	• Injection timing feedback system does not operate properly. (This system consists essentially of ECM, injection timing control valve and needle lift sensor.)	• Harness or connectors [Injection timing control valve, needle lift sensor, crankshaft position sensor (TDC) circuits] • Injection timing control valve • Needle lift sensor • Crankshaft position sensor (TDC)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC 21 and 34 or 47 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 34 or 47. (See EC-213 or EC-228.)

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for 3 seconds at 3,000 rpm. Return engine speed to idle, then increase to 3,000 rpm under no load.

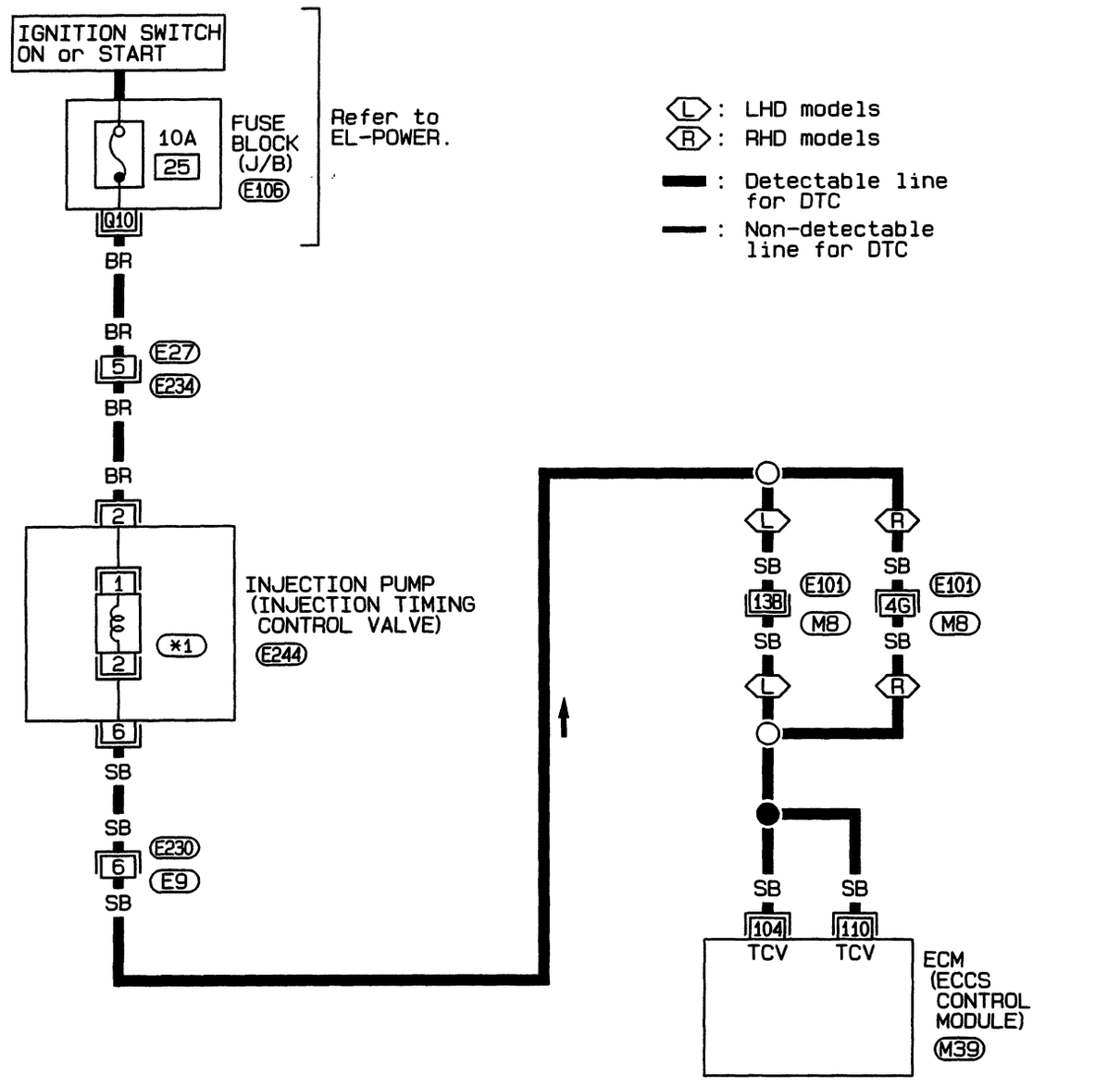
OR

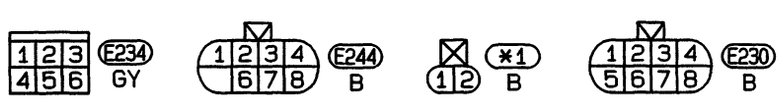
1) Start engine and run it for 3 seconds at 3,000 rpm. Return engine speed to idle, then increase to 3,000 rpm under no load.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Note: If a malfunction occurs intermittently, conduct suitable driving pattern for 10 minutes. This makes it possible to determine DTC.

Injection Timing Control Valve (Cont'd)

EC-TCV-01

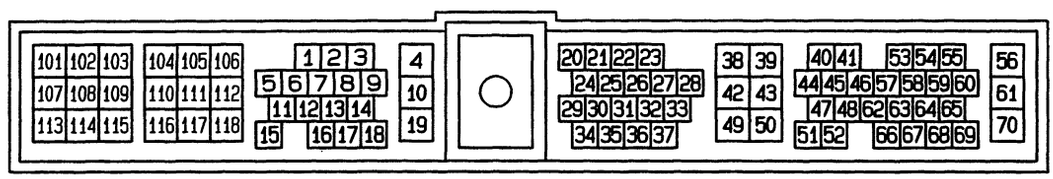




Refer to last page (Foldout page).

M8, E101

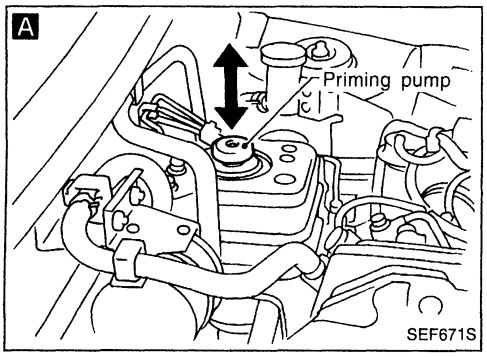
E106

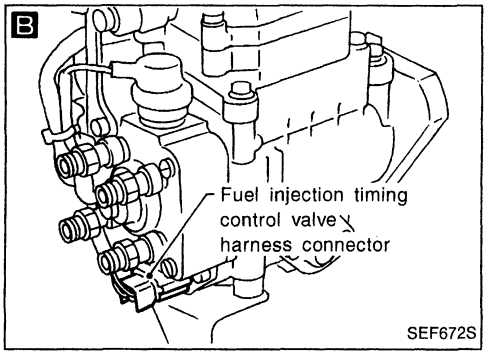


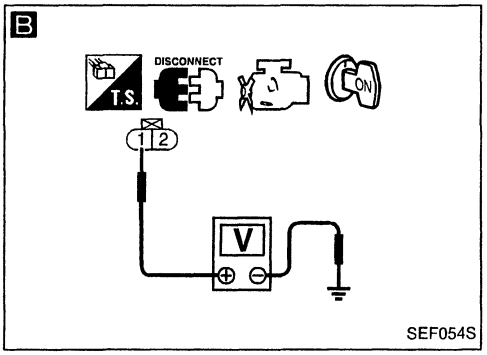
HEC263

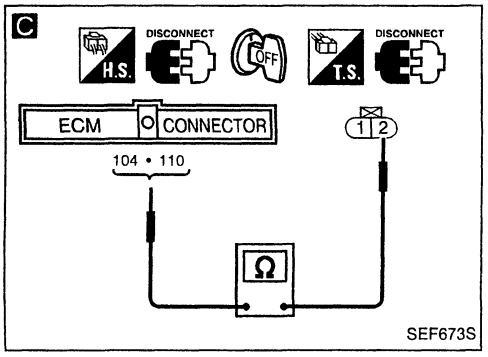
Injection Timing Control Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK FOR AIR IN FUEL FILTER.

1. Move priming pump up and down to purge air from fuel filter.
2. Perform "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".

B

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect injection timing control valve harness connector.
3. Turn ignition switch "ON".
4. Check harness continuity between terminal ① and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.
- Harness connectors (E23), (E201)
- Electronic injection pump harness connector (E244)
- 10A fuse
- Harness for open or short between injection timing control valve harness connector and fuse

If NG, repair harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ② and ECM terminals (104), (110).

Continuity should exist.

If OK, check harness for short.

NG → Check the following.
- Electronic injection pump harness connector (E244)
- Harness connectors (E9), (E230)
- Harness connectors (M8), (E101)
- Harness for open or short between injection timing control valve and ECM

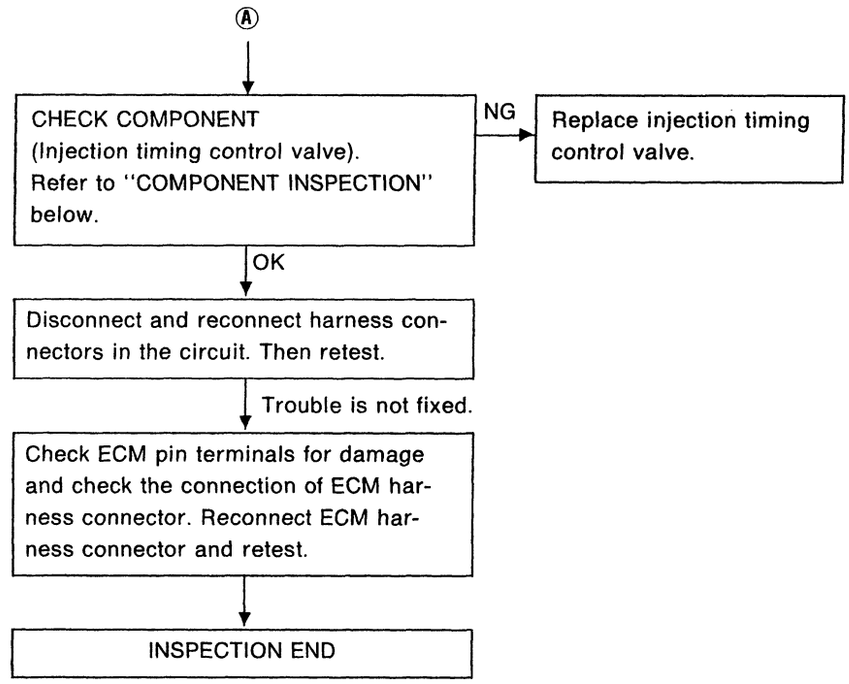
If NG, repair harness or connectors.

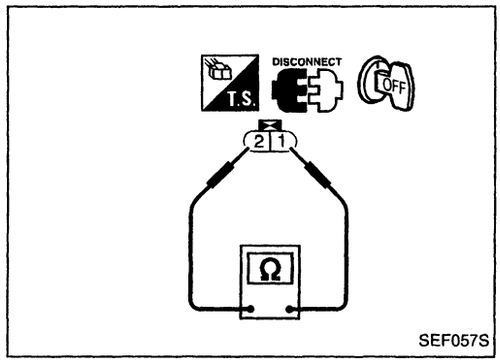
OK

Ⓐ

EC

Injection Timing Control Valve (Cont'd)

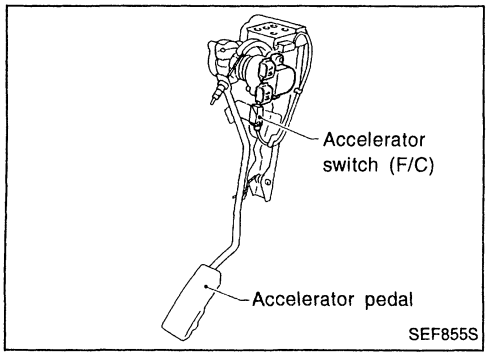




COMPONENT INSPECTION

Injection timing control valve

1. Disconnect injection timing control valve harness connector.
2. Check resistance between terminals ① and ②.
   Resistance: Approximately 11Ω [at 20°C (68°F)]
   If NG, replace injection timing control valve.



Accelerator Switch (F/C)

The accelerator switch is installed to the accelerator pedal assembly. The switch senses pressure applied to the accelerator pedal and sends an ON-OFF signal to the ECM. The ECM uses the signal to control the fuel cut operation at deceleration for better fuel efficiency.

EC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
23	• The OFF signal (short) is sent to the ECM for a certain period of time even when the accelerator pedal is not being depressed.	• Harness or connectors (The switch circuit is shorted.) • Accelerator switch (F/C)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

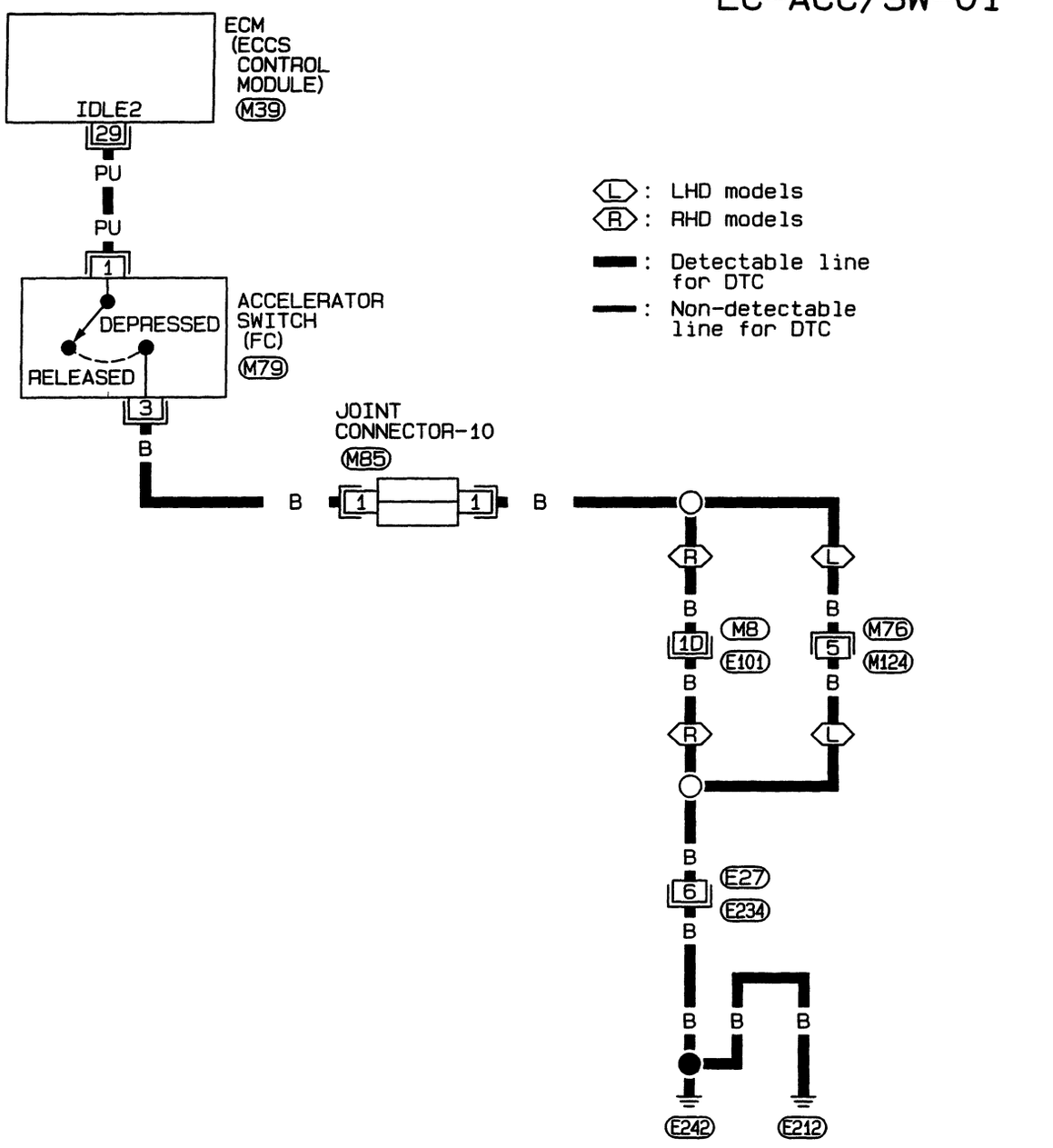
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Depress and release accelerator pedal once for 15 seconds.
3) Repeat step 2 for 26 times.

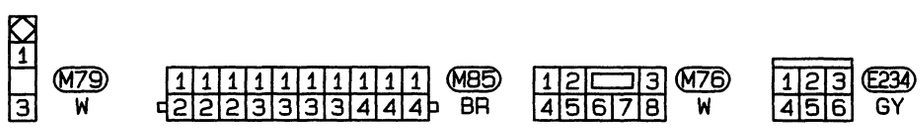
OR

1) Turn ignition switch "ON".
2) Depress and release accelerator pedal once for 15 seconds.
3) Repeat step 2 for 26 times.
4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
5) Perform "Diagnostic Test Mode II (Self-diagnostic results).

Accelerator Switch (F/C) (Cont'd)

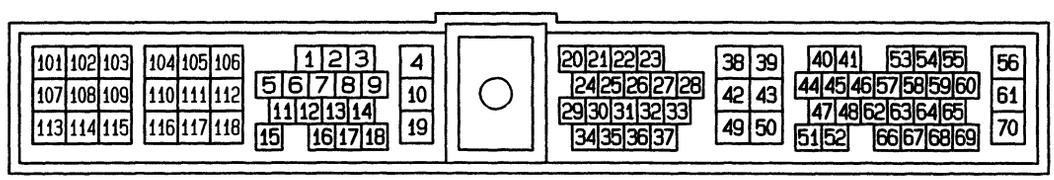
EC-ACC/SW-01





Refer to last page (Foldout page).

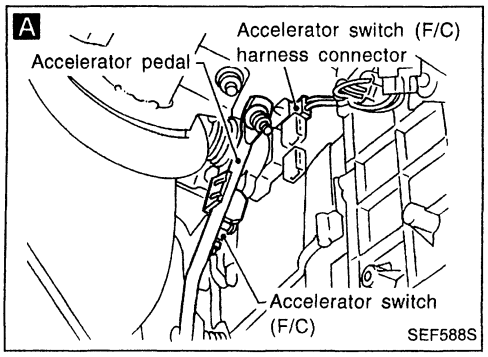
M8, E101

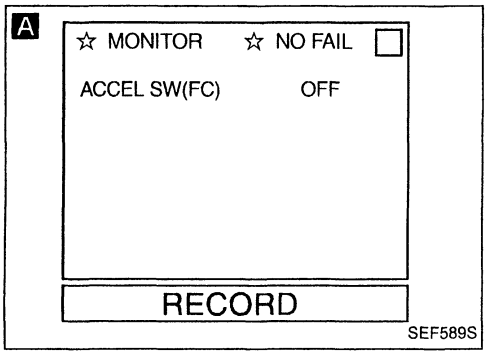


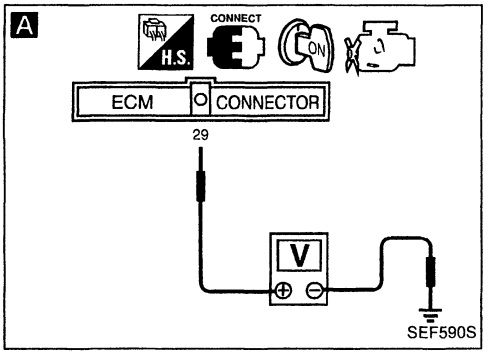
HEC250

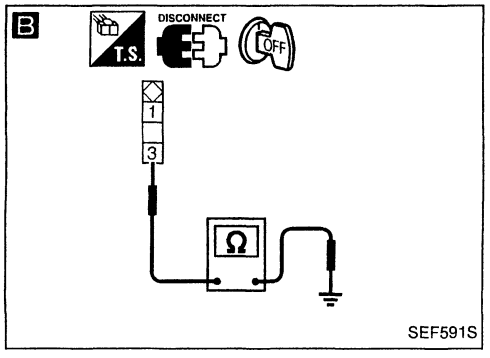
Accelerator Switch (F/C) (Cont'd)

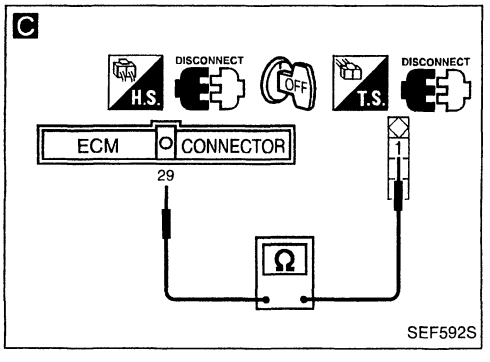
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Turn ignition switch "ON".
2. Check "ACCEL SW (F/C)" in "DATA MONITOR" mode with CONSULT.
   Accelerator pedal released: OFF
   Accelerator pedal depressed: ON

OR

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal ㉙ and ground.
   Voltage:
   Accelerator pedal released Battery voltage
   Accelerator pedal depressed Approximately 0V

OK → INSPECTION END

NG

B

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

NG → Check the following.
- Harness connectors (M8), (E101) or (M76), (E124)
- Harness connectors (E27), (E234)
- Joint connector-10
- Harness for open or short between accelerator switch (F/C) and engine ground.

If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉙ and terminal ①.
   Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
[Accelerator switch (F/C)].
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace accelerator switch (F/C).

OK

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

Trouble is not fixed.

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

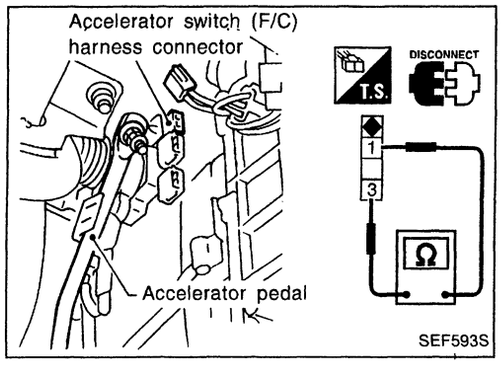
INSPECTION END

EC

Accelerator Switch (F/C) (Cont'd)

COMPONENT INSPECTION

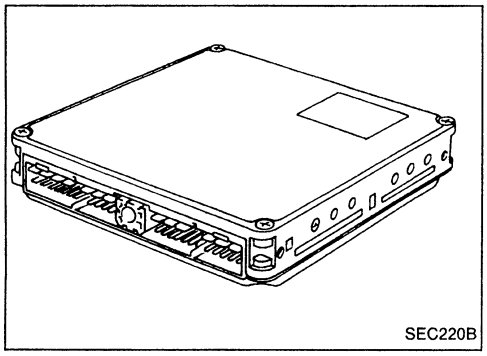
Accelerator switch (F/C)



1. Disconnect accelerator switch (F/C) harness connector.
2. Check continuity between terminals ① and ③.

Conditions	Continuity
Accelerator pedal released	No
Accelerator pedal depressed	Yes

If NG, replace accelerator pedal assembly.


SEC220B

Engine Control Module (ECM)-ECCS-D Control Module

The ECM consists of a microcomputer 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)
27, 31	• ECM calculation function is malfunctioning.	• ECM (ECCS-D control module)

EC

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

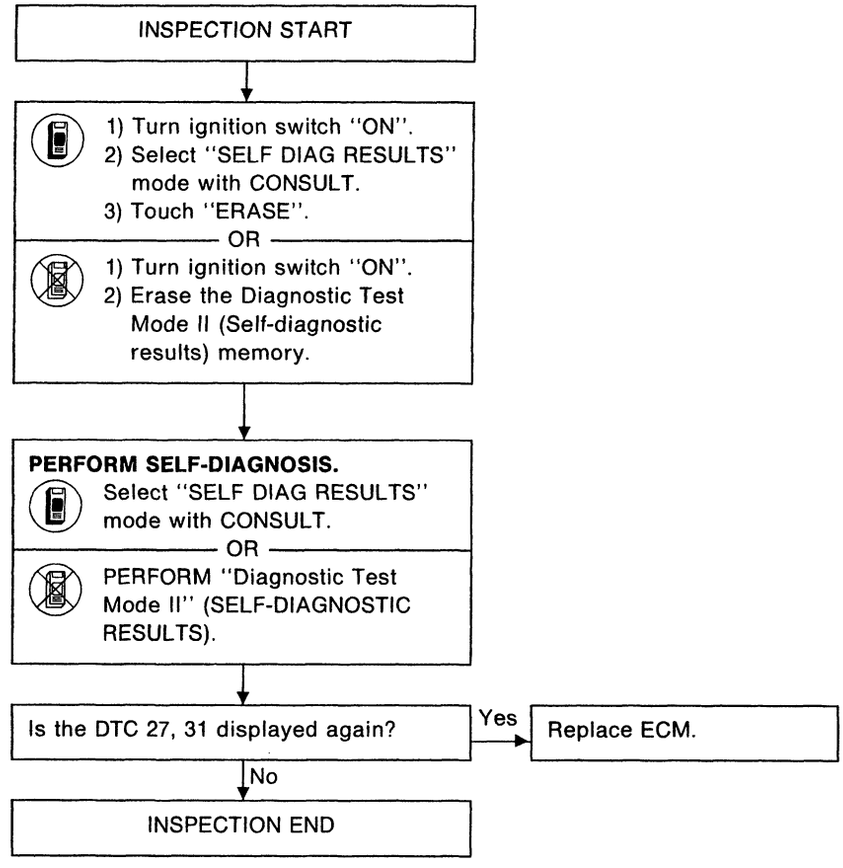
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

OR

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

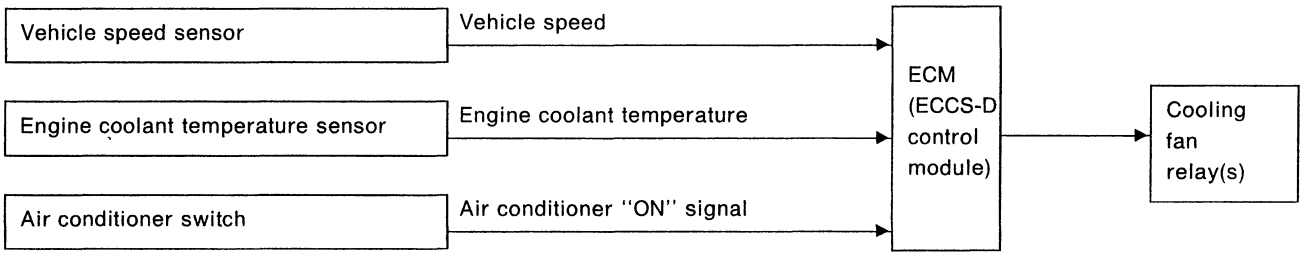
Engine Control Module (ECM)-ECCS-D Control Module (Cont'd)

DIAGNOSTIC PROCEDURE



Cooling Fan (Overheat)

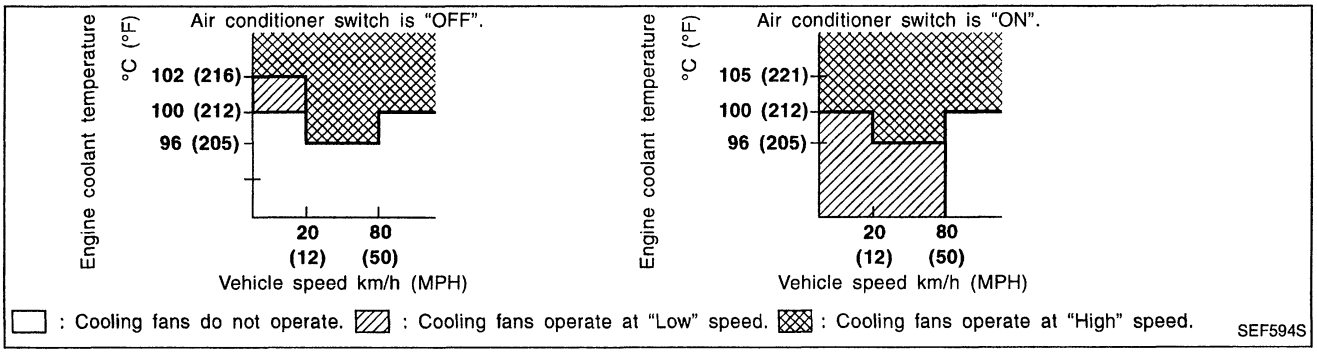
SYSTEM DESCRIPTION



The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, air conditioner system pressure and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

EC

Operation



ON-BOARD DIAGNOSIS LOGIC

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

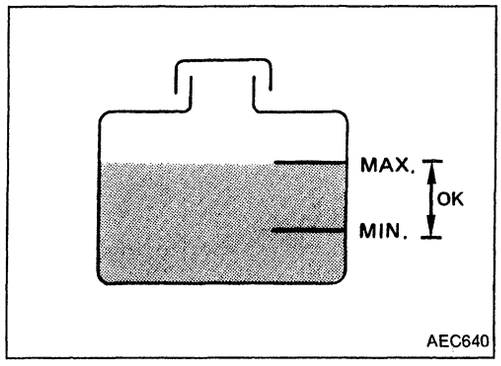
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
28	• Cooling fan does not operate properly (Overheat). • Cooling fan system does not operate properly (Overheat). • Engine coolant was not added to the system using the proper filling method.	• Harness or connectors (The cooling fan circuit is open or shorted.) • Cooling fan • Radiator hose • Radiator • Radiator cap • Water pump • Thermostat • Fan belt • Engine coolant temperature sensor For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-211.

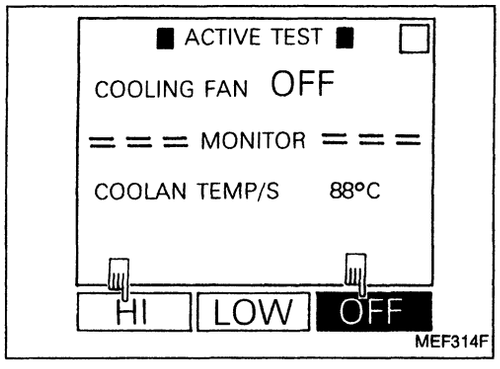
CAUTION:
When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.

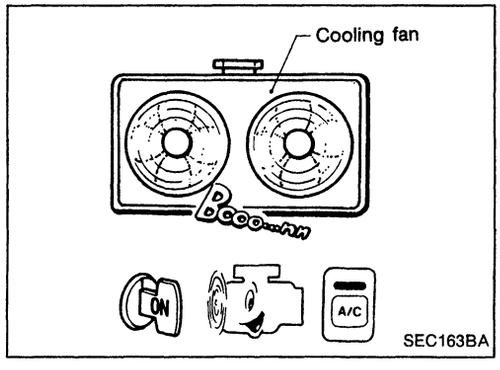
a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").

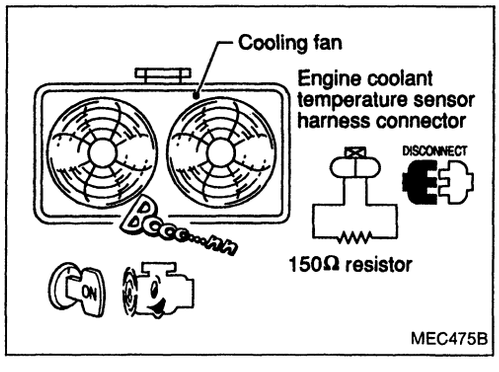
b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

Cooling Fan (Overheat) (Cont'd)









OVERALL FUNCTION CHECK

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

WARNING:

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

Wrap a thick cloth around the 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-205.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-205.

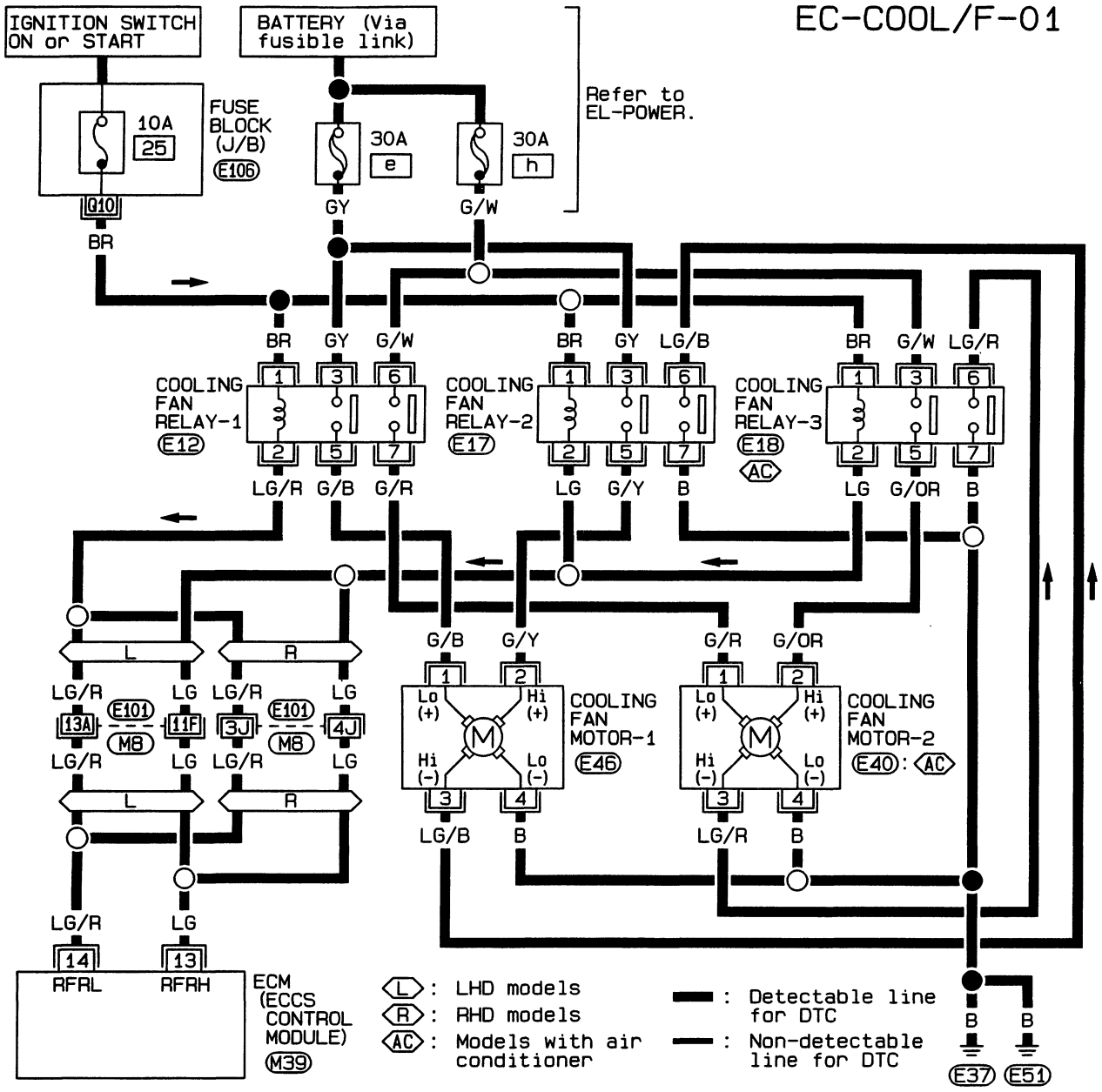
3) Turn ignition switch "ON".
4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT (LOW speed and HI speed).

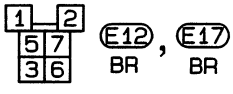
OR

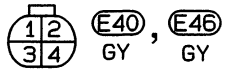
3) Start engine.
   Be careful not to overheat engine.
4) Set temperature control lever to full cold position.
5) Turn air conditioner switch "ON".
6) Turn blower fan switch "ON".
7) Run engine at idle for a few minutes with air conditioner operating.
   Be careful not to overheat engine.
8) Make sure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

Cooling Fan (Overheat) (Cont'd)

EC-COOL/F-01

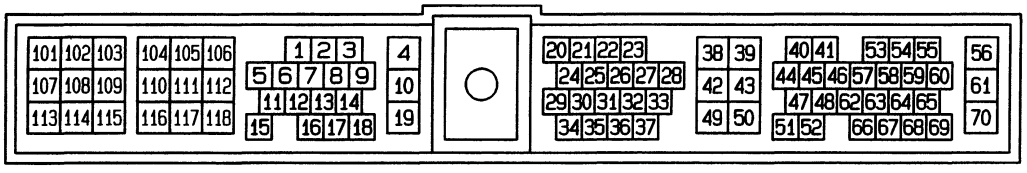






Refer to last page (Foldout page).

M8, E101
E106



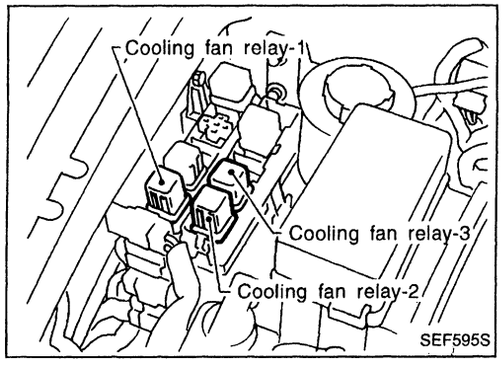
M39
W

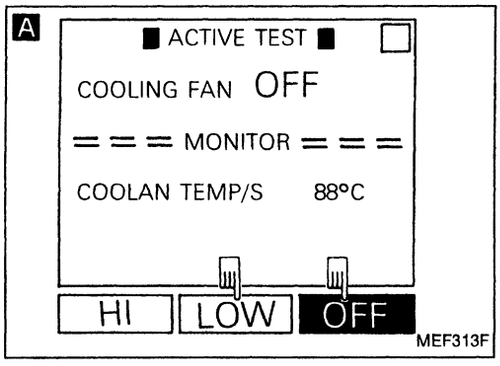


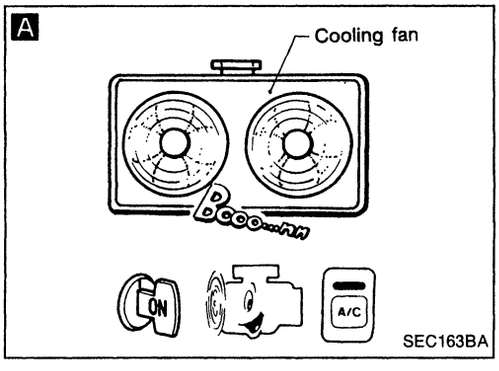
HEC266

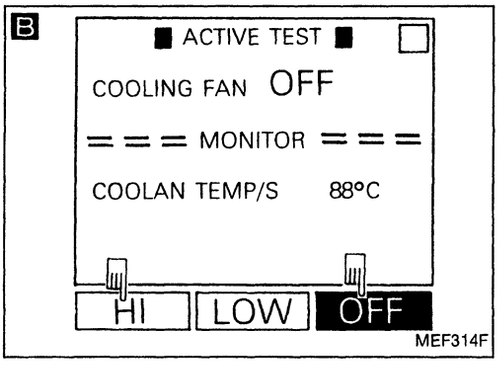
Cooling Fan (Overheat) (Cont'd)

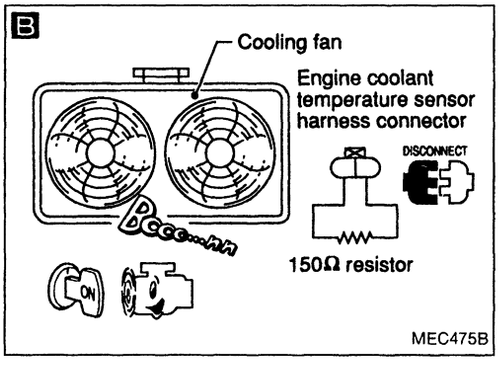
DIAGNOSTIC PROCEDURE











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" in "ACTIVE TEST" mode with CONSULT.

OR

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

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

OK

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" in "ACTIVE TEST" mode with CONSULT.

OR

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

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

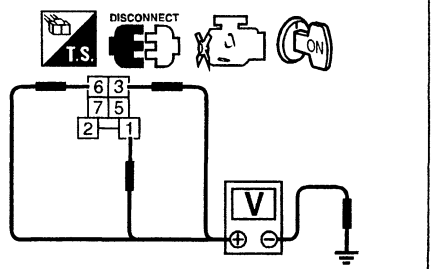
OK

Ⓑ

(Go to EC-210.)

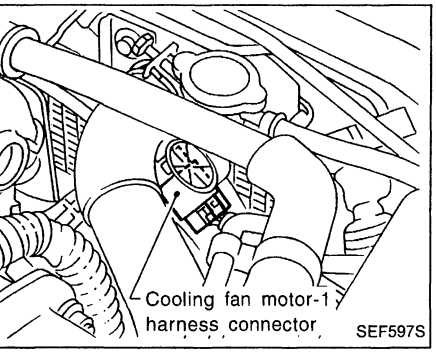
Cooling Fan (Overheat) (Cont'd)

C



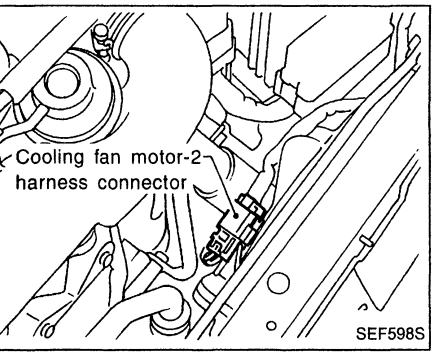
SEF596S

D



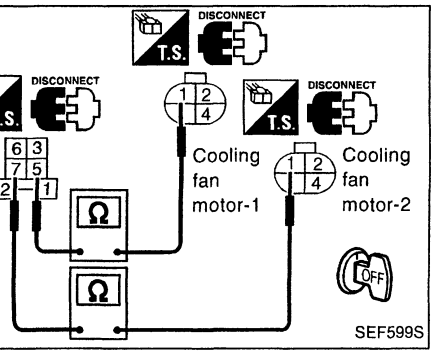
SEF597S

D



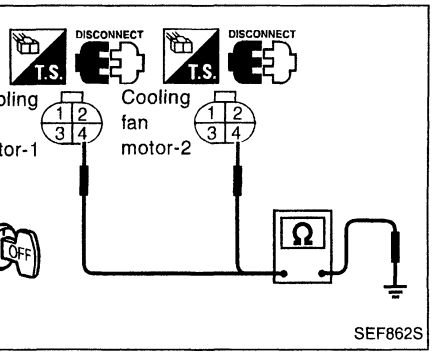
SEF598S

D



SEF599S

E



SEF862S

PROCEDURE A

INSPECTION START

C

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-1.
3. Turn ignition switch "ON".
4. Check voltage between terminals ①, ③, ⑥ 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.

D 3. Check harness continuity between terminal ⑤ and terminal ① (motor-1), terminal ⑦ and terminal ① (motor-2).
   Continuity should exist.
   If OK, check harness for short.

E 4. Check harness continuity between terminal ④ (motor-1, 2) and body ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

F

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

NG → Check the following.
- Harness connectors (E101), (M8)
- Harness for open or short between cooling fan relay-1 and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-1).
Refer to "COMPONENT INSPECTION", EC-212.

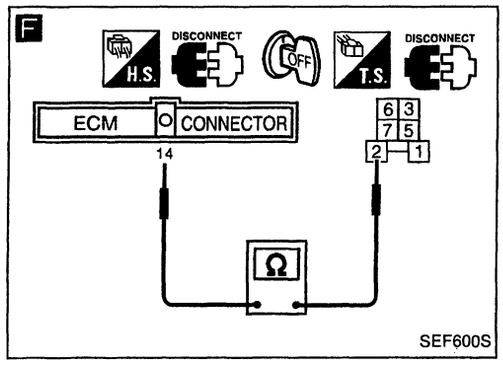
NG → Replace cooling fan relay.

OK ↓

Ⓒ

EC

Cooling Fan (Overheat) (Cont'd)



Ⓒ

CHECK COMPONENT
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-212.

NG → Replace cooling fan motors.

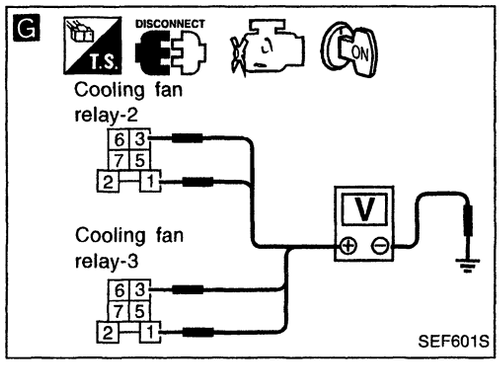
OK

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

Trouble is not fixed.

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

INSPECTION END



PROCEDURE B

INSPECTION START

Ⓖ

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

NG → Check the following.
- Harness for open or short between cooling fan relay-2, 3 and 30A fusible link

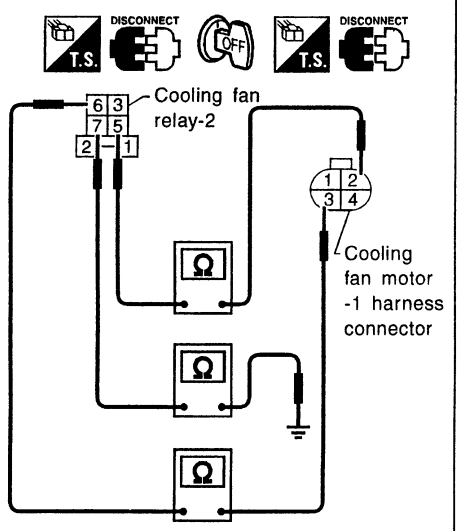
If NG, repair harness or connectors.

OK

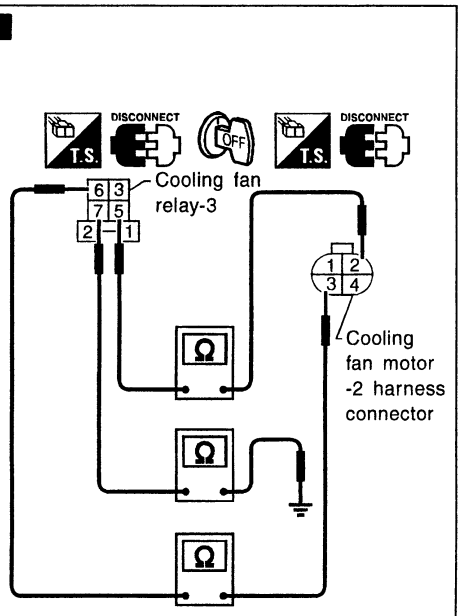
Ⓓ

Cooling Fan (Overheat) (Cont'd)

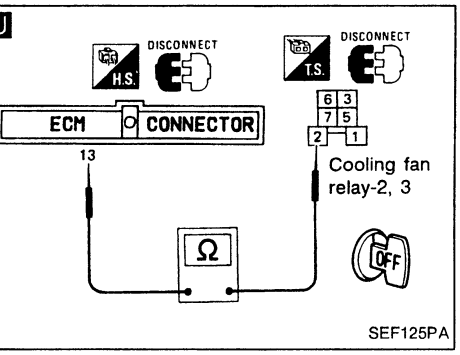
H



I



J



Ⓓ

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.

H 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.

I 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.

NG → Repair harness or connectors.

OK ↓

J

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.

NG → Check the following.
- Harness connectors (E101), (M8)
- Harness for open or short between cooling fan relay-2, 3 and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-2, 3).
Refer to "COMPONENT INSPECTION", EC-212.

NG → Replace cooling fan relays.

OK ↓

CHECK COMPONENTS
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-212.

NG → Replace cooling fan motors.

OK ↓

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

Trouble is not fixed. ↓

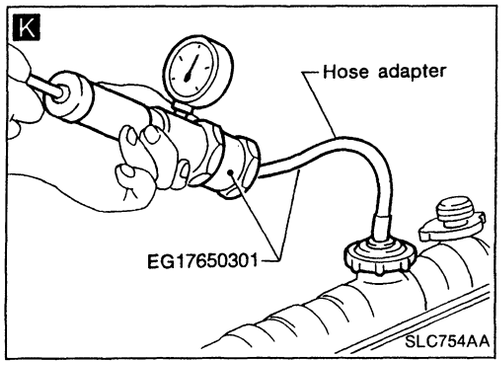
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

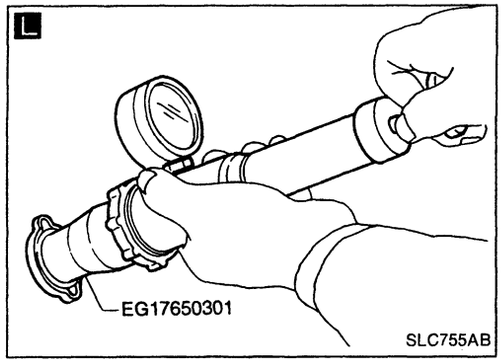
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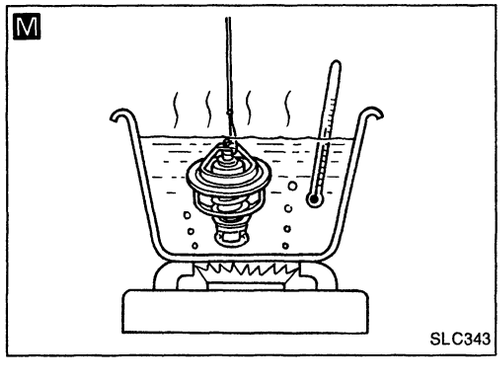
INSPECTION END

EC

Cooling Fan (Overheat) (Cont'd)







Ⓑ

K

CHECK COOLING SYSTEM FOR LEAK.
Apply pressure to the cooling system with a tester, and check if the pressure drops.
Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm², 23 psi)
Pressure should not drop.
CAUTION:
Higher than the specified pressure may cause radiator damage.

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

Refer to LC section ("Water Pump").

OK ↓

L

CHECK RADIATOR CAP.
Apply pressure to cap with a tester.
Radiator cap relief pressure:
78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm², 11 - 14 psi)

NG → Replace radiator cap.

OK ↓

M

CHECK THERMOSTAT.
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.
   Valve opening temperature:
   88°C (190°F) [standard]
   Maximum valve lift:
   10 mm/100°C (0.39 in/212°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

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

NG → Replace thermostat

OK ↓

Check engine coolant temperature sensor. Refer to "COMPONENT INSPECTION", EC-175.

NG → Replace engine coolant temperature sensor.

OK ↓

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

↓

INSPECTION END

Perform FINAL CHECK by the following procedure after repair is completed.

1. Warm up engine. Run the vehicle for at least 20 minutes. Pay attention to engine coolant temperature gauge on the instrument panel. If the reading shows an abnormally high temperature, another part may be malfunctioning.
2. Stop vehicle and let engine idle. Check the intake and exhaust systems for leaks by listening for noise or visually inspecting the components.
3. Allow engine to cool and visually check for oil and coolant leaks. Then, perform "OVERALL FUNCTION CHECK".

Cooling Fan (Overheat) (Cont'd)

MAIN 12 CAUSES OF OVERHEATING

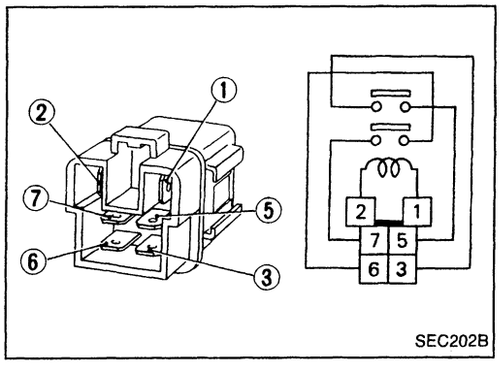
Engine	Step	Inspection item	Equipment	Condition	Reference page
OFF	1	• Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	50 - 50% coolant mixture	See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section
	4	• Radiator cap	• Pressure tester	59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	5	• Coolant leaks	• Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section
ON*1	7	• Cooling fan	• CONSULT	Operating	See "TROUBLE DIAGNOSIS FOR DTC 28", EC-203.
OFF	8	• Combustion gas leak	• Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	• Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	—
		• Coolant overflow to reservoir tank	• Visual	No overflow during driving and idling	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	See "ENGINE MAINTENANCE" in MA section
OFF	11	• Cylinder head	• Straight gauge feeler gauge	0.1mm (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 (55MPH) 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.

EC

Cooling Fan (Overheat) (Cont'd)

COMPONENT INSPECTION



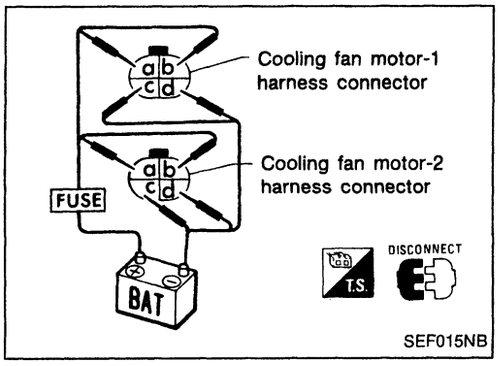
SEC202B

Cooling fan relays-1, -2, -3

Check continuity between terminals ③ and ⑤, ⑥ and ⑦.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.



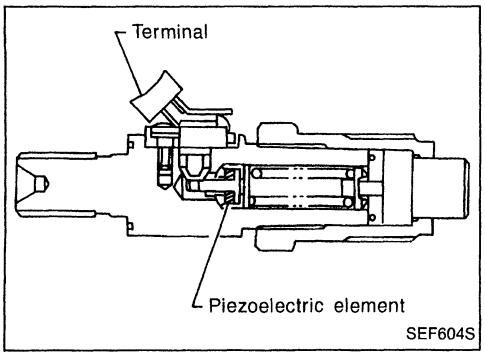
SEF015NB

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	ⓑ	ⓒ
	High	ⓐ, ⓑ	ⓒ, ⓓ
Cooling fan motor-2	Low	ⓑ	ⓒ
	High	ⓐ, ⓑ	ⓒ, ⓓ

Cooling fan motor should operate.
If NG, replace cooling fan motor.



Needle Lift Sensor (NLS)

The needle lift sensor is built into the No. 1 nozzle. Its piezo-electric element senses changes in fuel injection timing caused by fuel temperature, etc. This change of fuel injection timing is sent as a pulse signal to the ECM.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
34	• An improper signal from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Needle lift sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

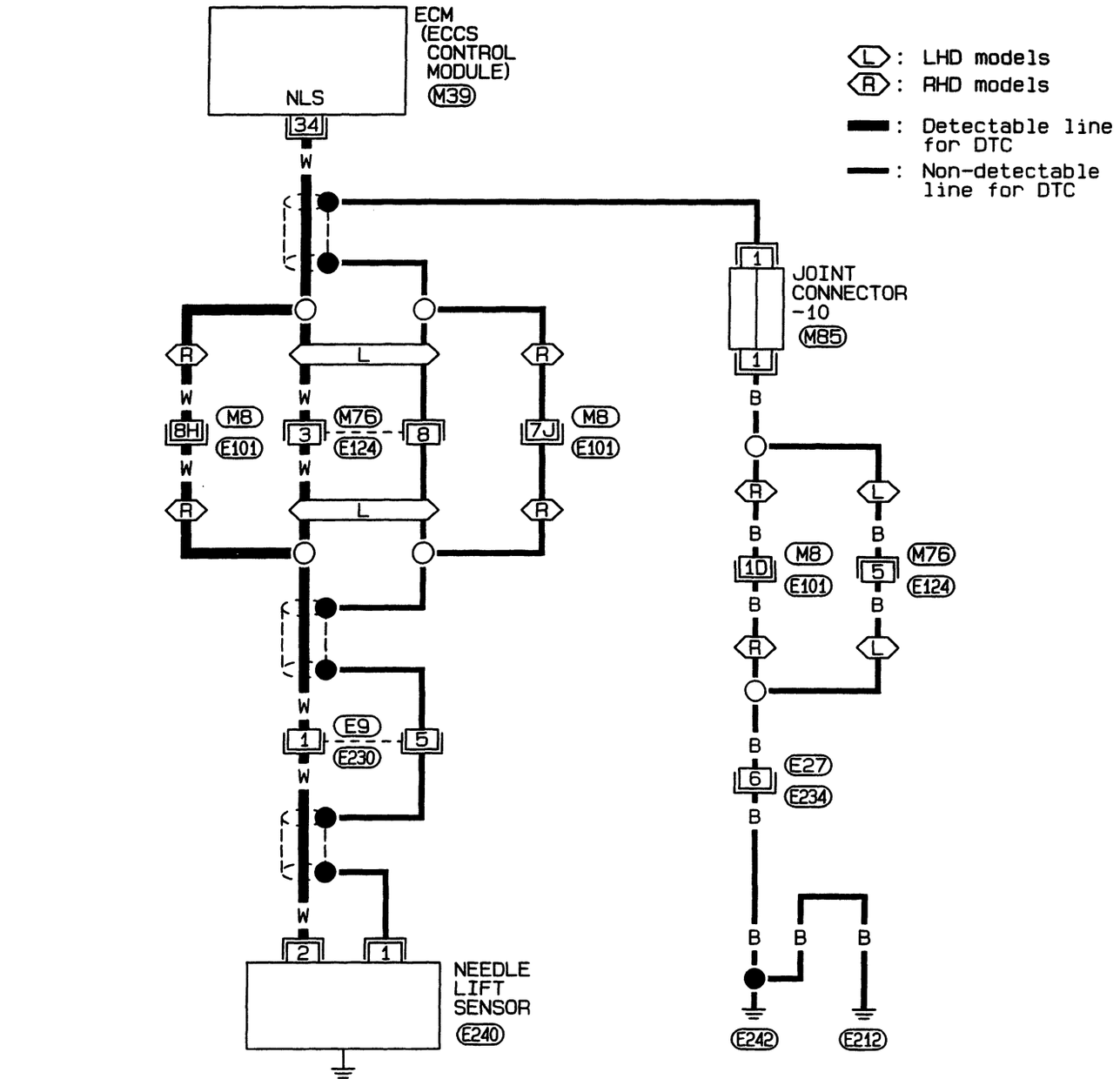
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 15 seconds at idle speed.

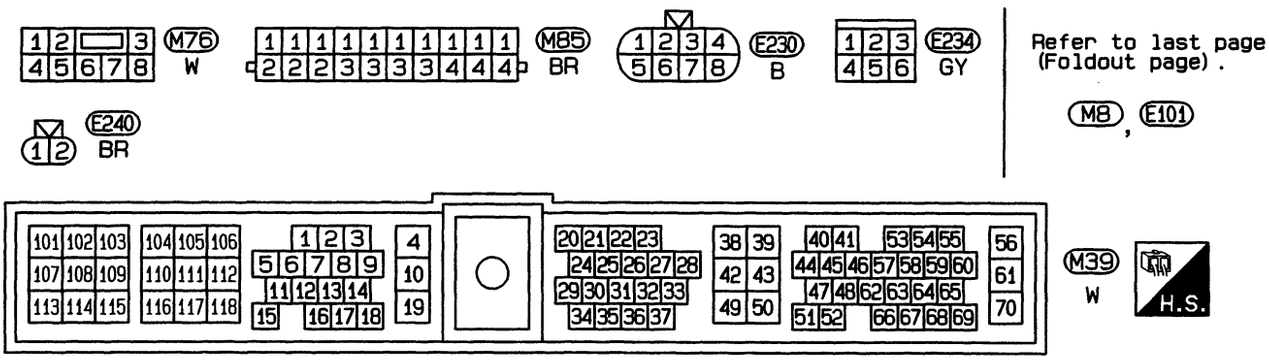
OR

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

Needle Lift Sensor (NLS) (Cont'd)

EC-NLS-01

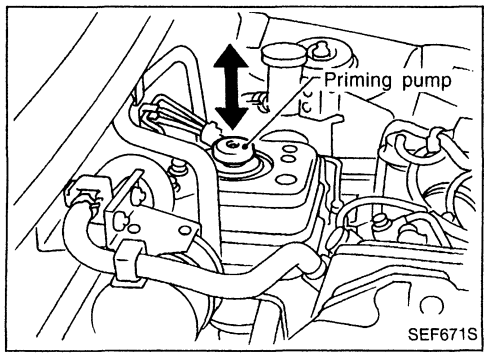




HEC251

Needle Lift Sensor (NLS) (Cont'd)

DIAGNOSTIC PROCEDURE

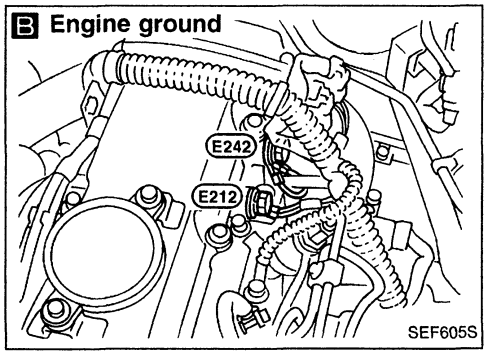


INSPECTION START

A

CHECK FOR AIR IN FUEL FILTER.
1. Move priming pump up and down to purge air from fuel filter.
2. Perform "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".

B



Loosen and retighten engine ground screws.

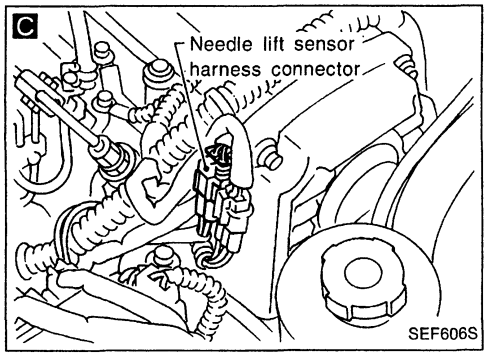
C

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and needle lift sensor harness connector.
3. Check harness continuity between terminal ② and ECM terminal ㉞.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors E9, E230
- Harness connectors M8, E101 or M76, E124
- Harness for open or short between needle lift sensor and ECM

If NG, repair harness or connectors.

OK



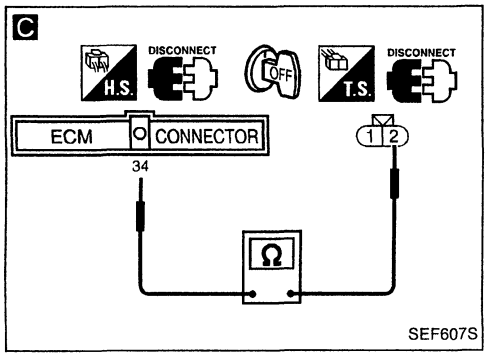
D

CHECK GROUND CIRCUIT.
Check resistance between terminal ① and engine ground.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors M76, E124, E27, E234
- Joint connector-10 M85
- Harness for open or short between needle lift sensor and engine ground

If NG, repair harness or connectors.

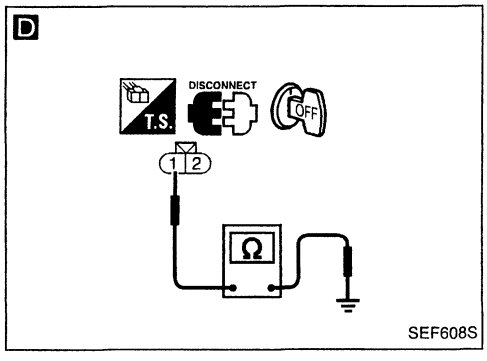
OK



CHECK NO. 1 INJECTION NOZZLE FOR CLOGGING.
Refer to spray pattern test of "INJECTION NOZZLE".
If NG, replace No. 1 injection nozzle.

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

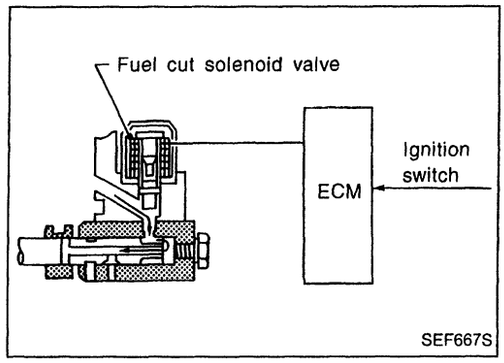
Trouble is not fixed.



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

INSPECTION END

EC



Fuel Cut Solenoid Valve

When the ignition switch is OFF, the ECM turns the fuel cut solenoid valve OFF (under this condition, no current flows through the fuel cut solenoid valve), shutting off fuel supply.
When the engine is not operating due to trouble, the fuel cut solenoid valve may or may not be OFF even when the ignition switch is ON.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
36, 37, 38	• Fuel cut solenoid valve circuit is malfunctioning.	• Main power supply circuit (ECM terminals (116), (117)) and fuse • Harness or connectors (The solenoid valve circuit is open or shorted.) • Fuel cut solenoid valve • ECM

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

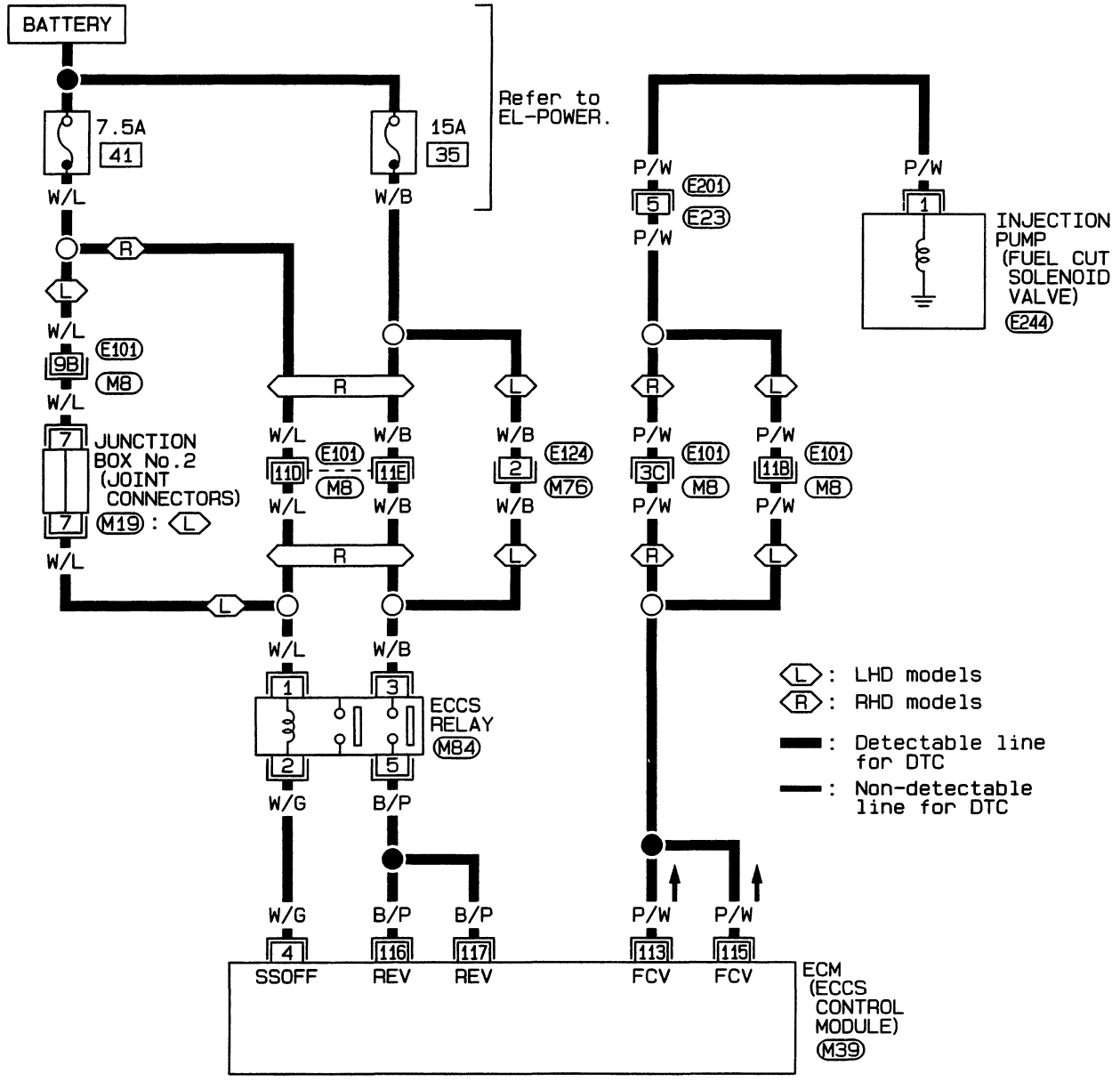
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine.
4) Turn ignition switch "OFF" and wait at least 5 seconds.

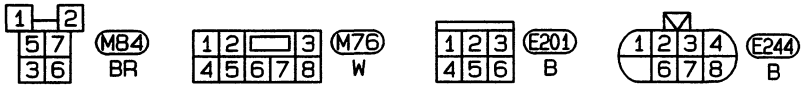
OR

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

Fuel Cut Solenoid Valve (Cont'd)

EC-FCUT-01

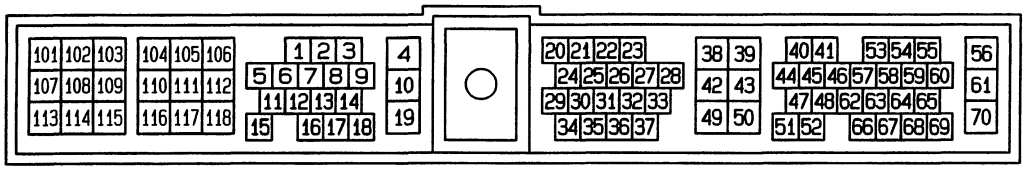




Refer to last page (Foldout page).

M8, E101

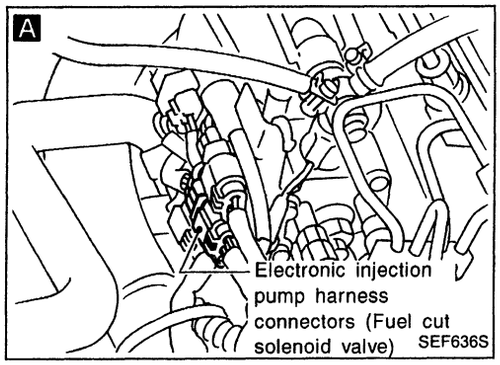
M19

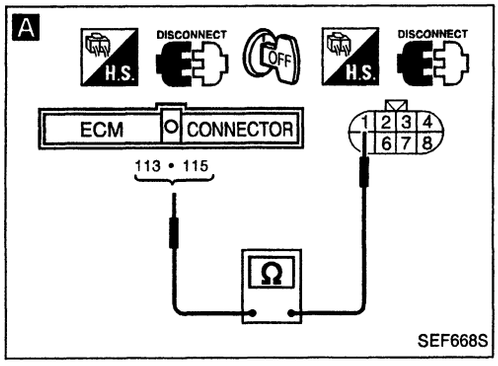


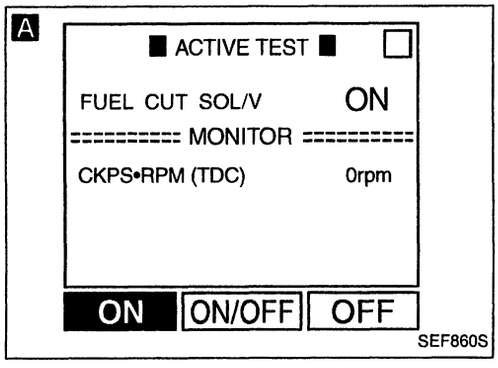
HEC252

Fuel Cut Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

CHECK POWER SUPPLY.
Check power supply. Refer to EC-162.

A

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "ON".
2. Select "FUEL CUT SOL/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "ON" and "OFF" alternately.
4. Check that operating sound is emitted.

OR

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between terminal ① and ECM terminals (113), (115).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E23), (E201)
- Harness for open or short between ECM and fuel cut solenoid valve

If NG, repair harness or connectors.

OK

CHECK COMPONENT
(Fuel cut solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace fuel cut solenoid valve.

OK

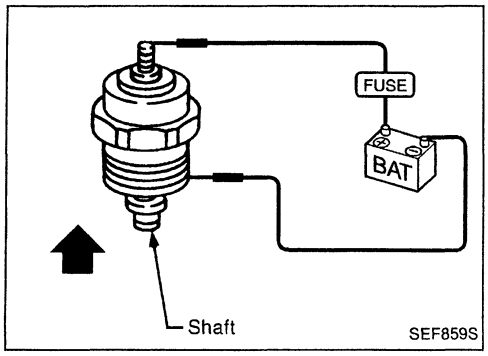
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

INSPECTION END

Fuel Cut Solenoid Valve (Cont'd)



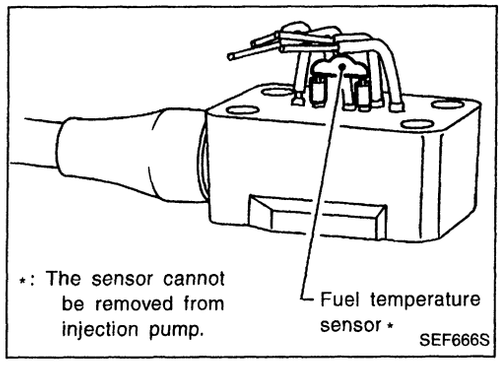
COMPONENT INSPECTION

Fuel cut solenoid valve

1. Remove fuel cut solenoid valve.
2. Check shaft to see if it is lifted when applying 12V direct current to terminals.

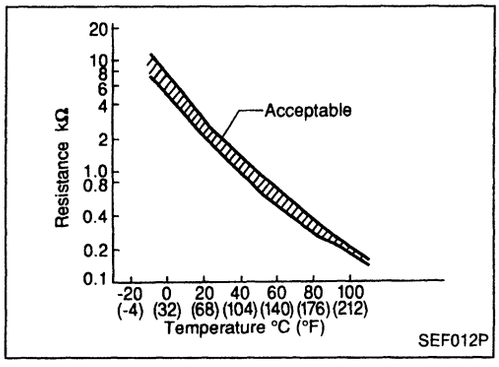
If NG, replace fuel cut solenoid valve.

EC



Fuel Temperature Sensor (FTS)

The fuel temperature sensor is used to detect the fuel temperature in the injection pump. 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>

Engine coolant temperature °C (°F)	Voltage (V)	Resistance (kΩ)
–20 (–4)	4.6	13.6 - 16.3
20 (68)	3.5	2.3 - 2.5
25 (77)	3.3	1.9 - 2.1
50 (122)	2.2	0.75 - 0.86
60 (140)	1.8	0.538 - 0.624
80 (176)	1.2	0.289 - 0.344

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
42	• An excessively high or low voltage from the sensor is detected by ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Fuel temperature sensor

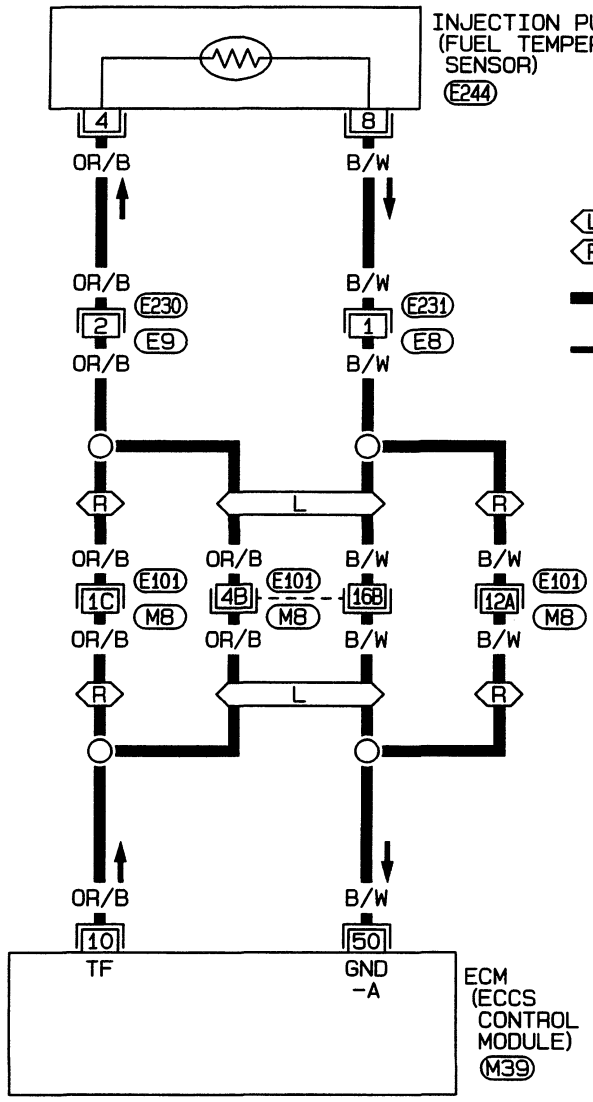
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

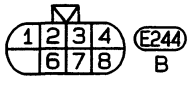
OR

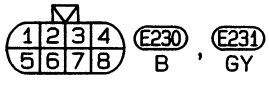
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

EC-FTS-01



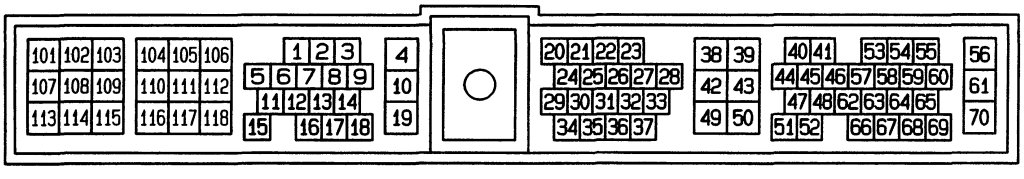
EC





Refer to last page (Foldout page).

M8, E101



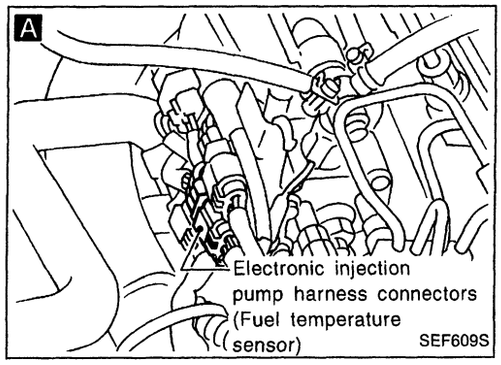
M39
W

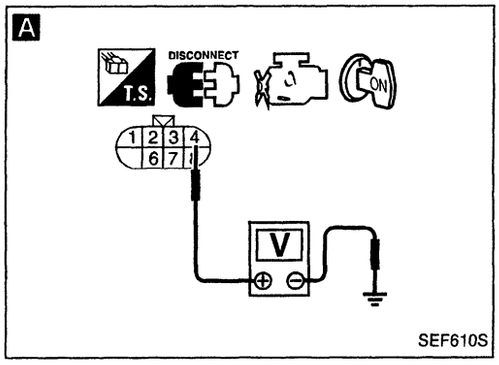


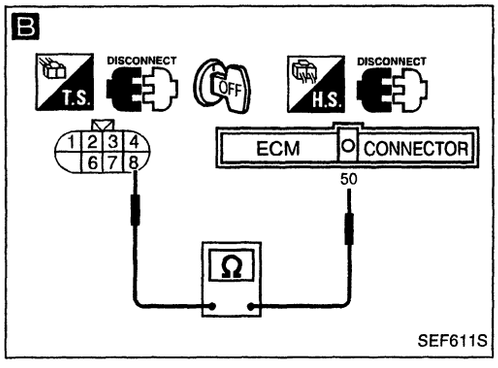
HEC253

Fuel Temperature Sensor (FTS) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect fuel temperature sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ④ and ground with CONSULT or tester.
   Voltage:
   Approximately 4.9V

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E9), (E230)
- Harness for open or short between ECM and fuel temperature sensor

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ⑧ and ECM terminal ⑤⓪.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E8), (E231)
- Harness for open or short between ECM and fuel temperature sensor

If NG, repair harness or connectors.

OK ↓

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

NG → Take proper action.

OK ↓

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

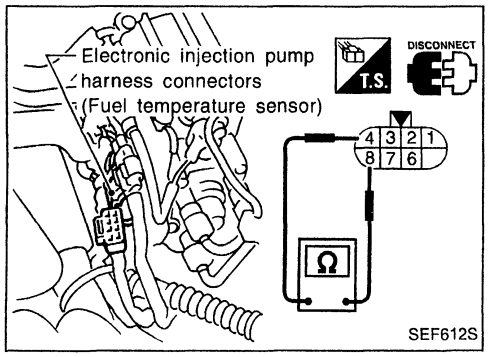
Trouble is not fixed. ↓

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

INSPECTION END

Fuel Temperature Sensor (FTS) (Cont'd)

COMPONENT INSPECTION

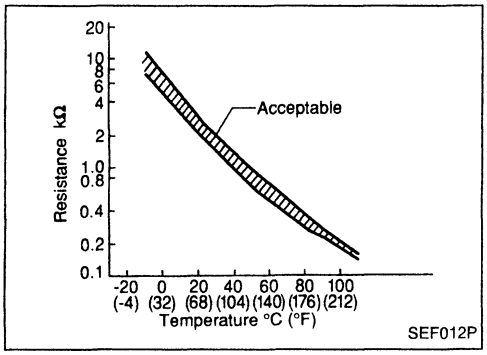


Fuel temperature sensor

Wait until fuel temperature sensor reaches room temperature.
Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.5
25 (77)	1.9 - 2.1
50 (122)	0.75 - 0.86
60 (140)	0.538 - 0.624
80 (176)	0.289 - 0.344

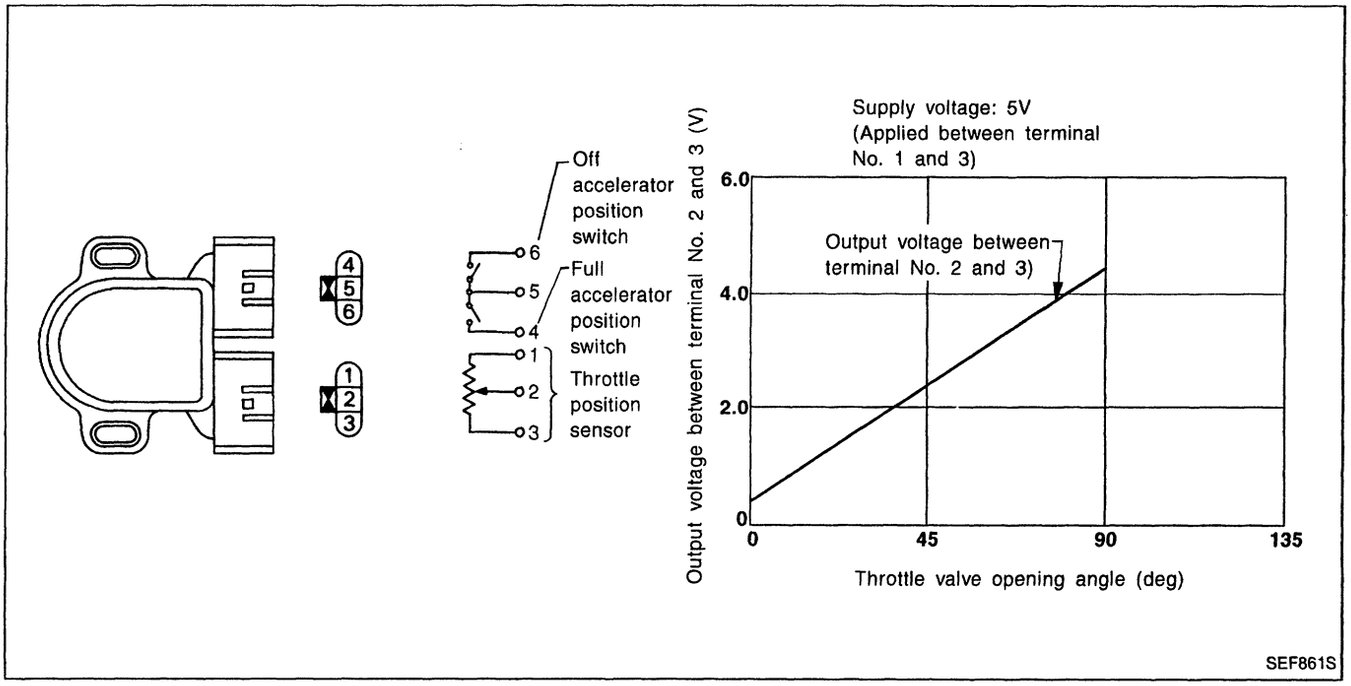
If NG, take proper action.



EC

Accelerator Position Sensor

The accelerator position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.



Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
43	• An excessively low or high voltage from the sensor is detected by the ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Accelerator position sensor • Accelerator position switch • Accelerator switch (F/C)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

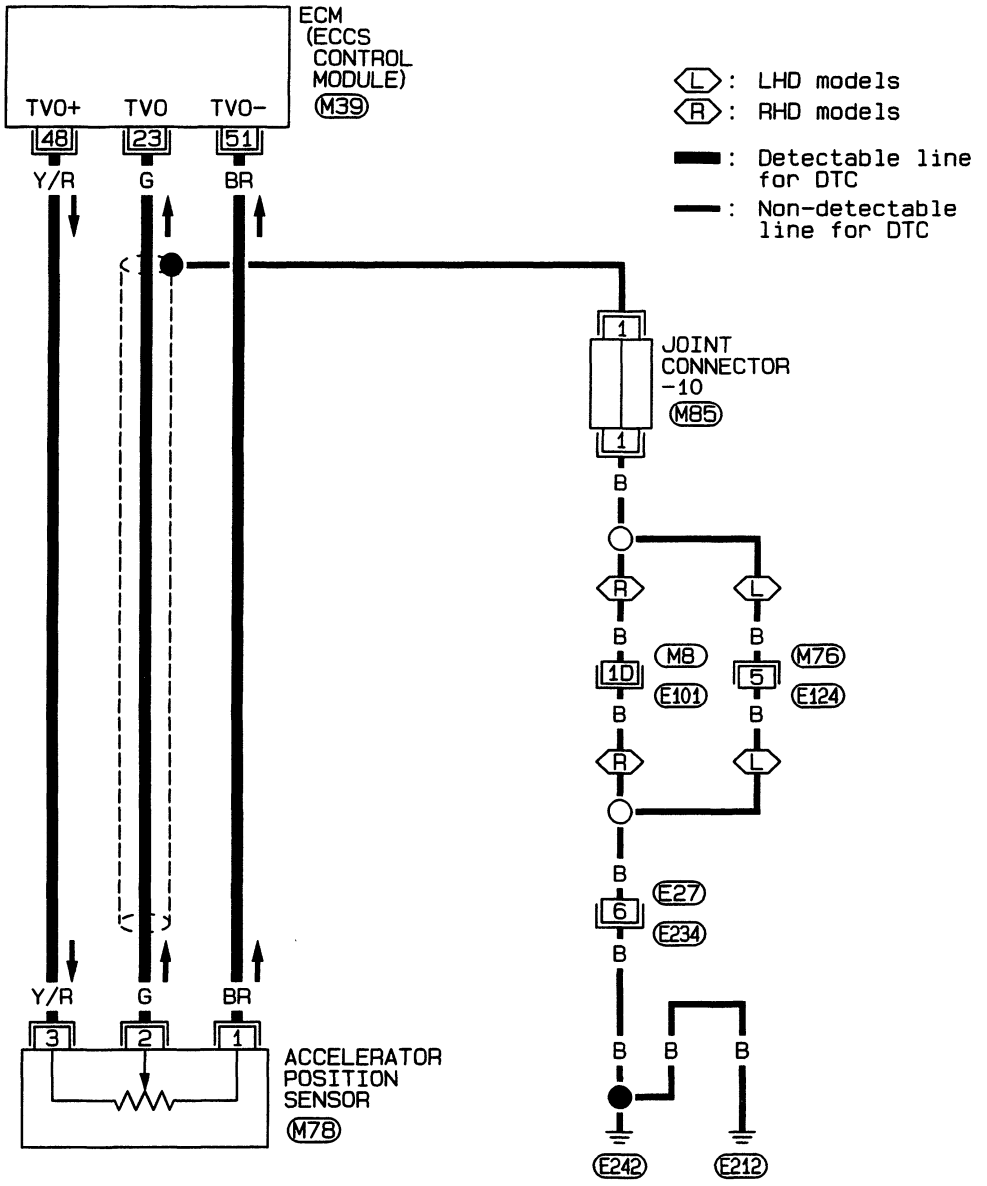
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

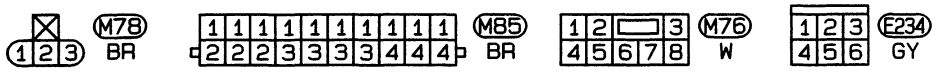
OR

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

Accelerator Position Sensor (Cont'd)

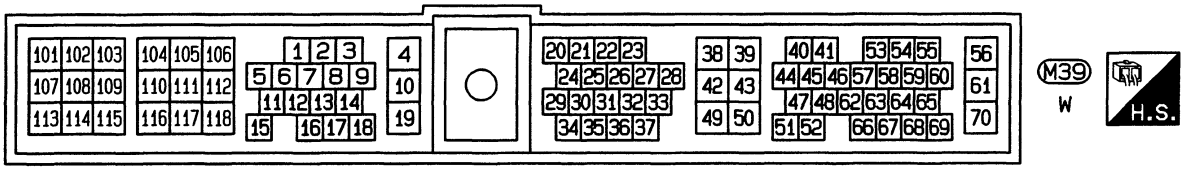
EC-APS-01





Refer to last page (Foldout page).

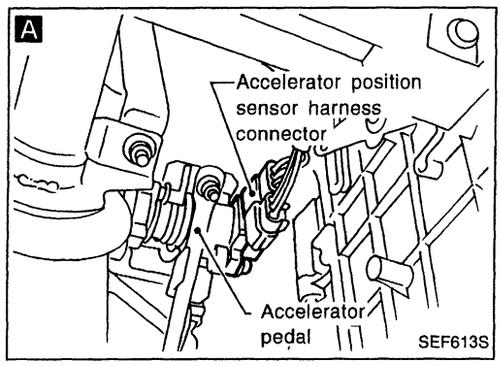
M8, E101

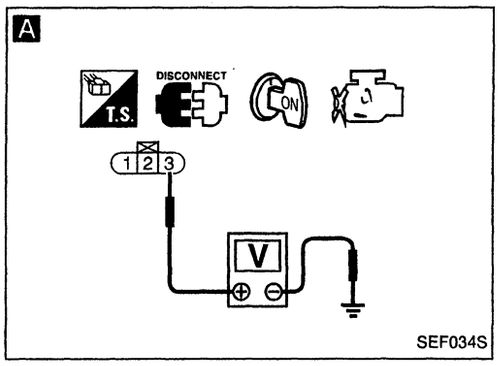


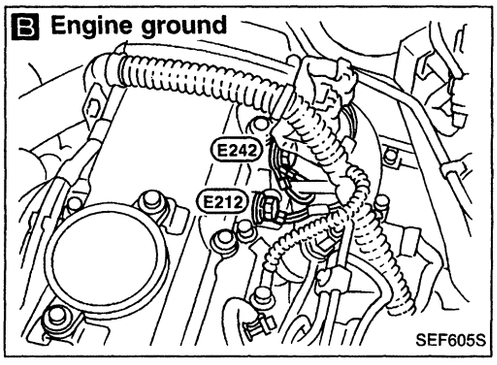
HEC254

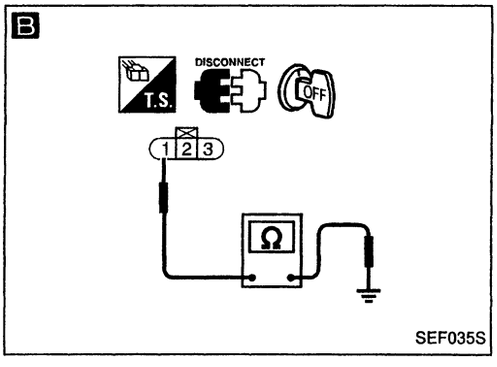
Accelerator Position Sensor (Cont'd)

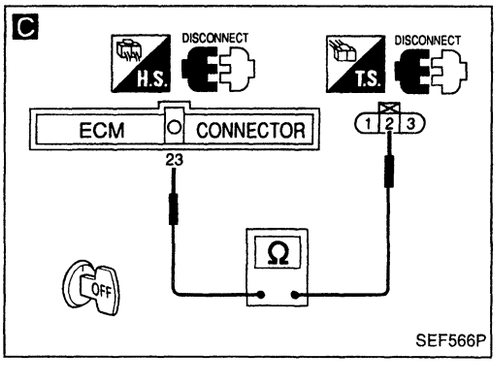
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect accelerator position sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ③ and ground with CONSULT or tester.
Voltage: Approximately 5.12V

NG → Repair harness or connectors.

OK

B

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

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

If NG, repair harness or connectors.

OK

C

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

NG → Repair harness or connectors.

OK

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

NG → Replace accelerator pedal assembly.

OK

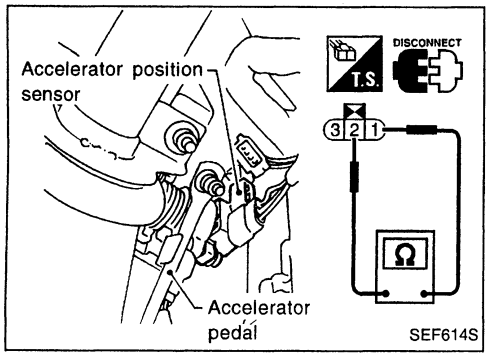
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

INSPECTION END

Accelerator Position Sensor (Cont'd)



COMPONENT INSPECTION

Accelerator position sensor

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

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

If NG, replace accelerator pedal assembly.

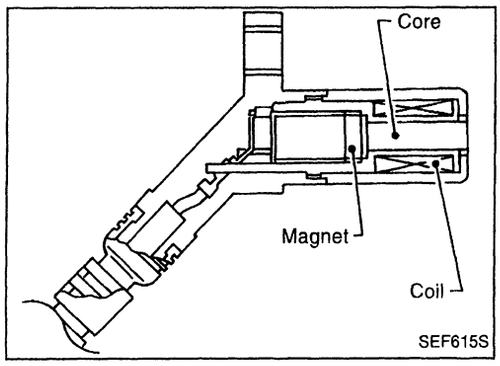
EC

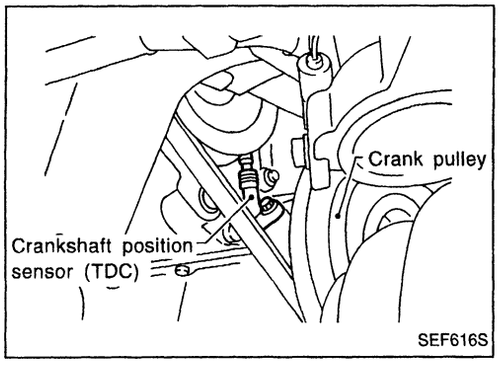
CAUTION:

If accelerator position sensor or ECM connector is disconnected, perform the following procedures:

Select "OFF ACCEL PO SIG" in "ACTIVE TEST" mode. Touch CLEAR.

Start and warm up engine. After engine has warmed up, idle for 10 minutes.





Crankshaft Position Sensor (TDC)

The crankshaft position sensor (TDC) monitors engine speed by means of signals from the sensing plate (with two protrusions) installed to the crankshaft pulley. The datum signal output is detected at ATDC 70° and sent to the ECM. The sensor signal is used for fuel injection control and fuel injection timing control.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
47	• An improper signal from the sensor is detected by ECM during engine running and cranking.	• Harness or connectors (The sensor circuit is open.) • Crankshaft position sensor (TDC)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

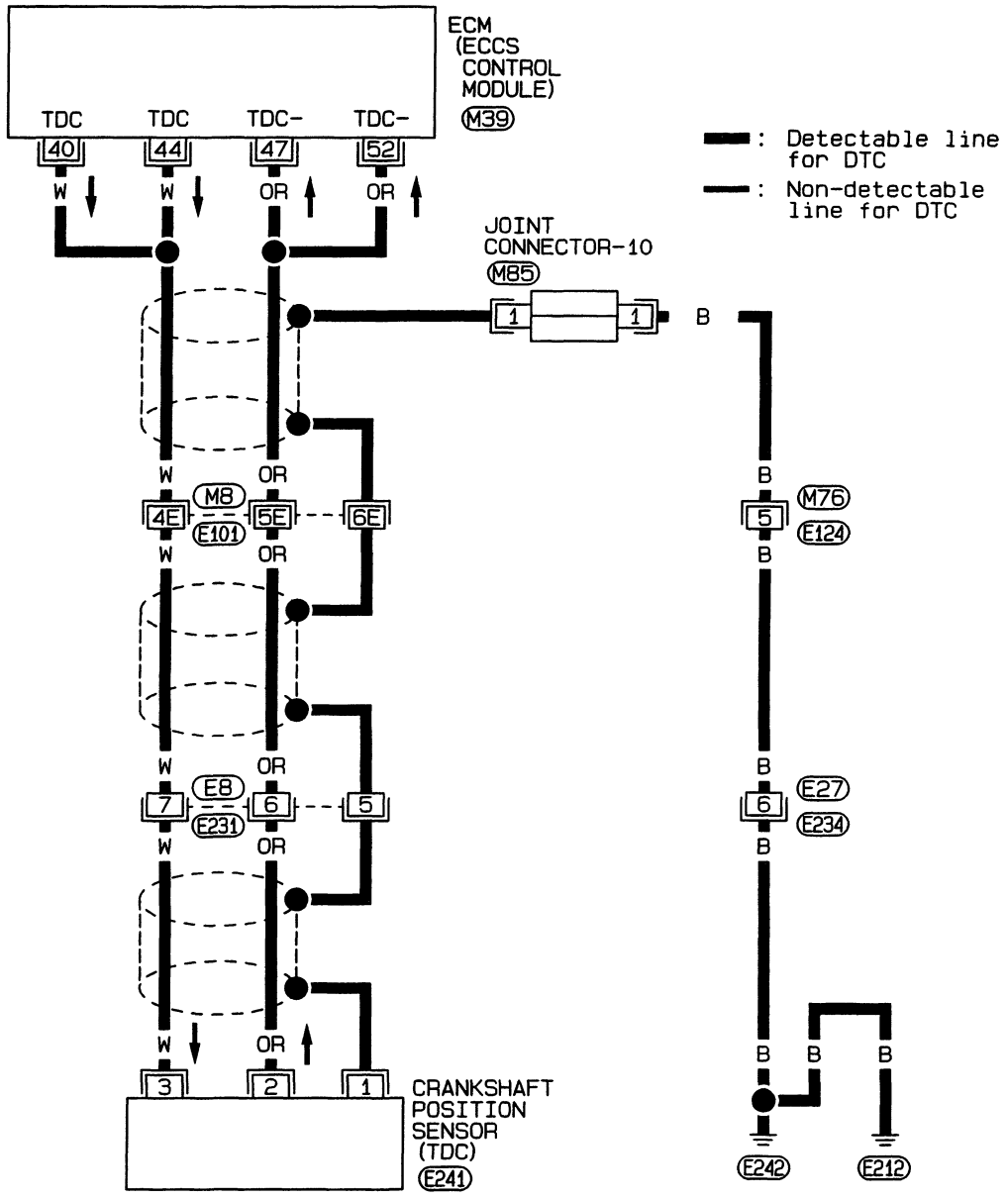
Before performing the following procedure, confirm that battery voltage is more than 10V.

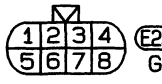
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Set START switch to ON for at least 0.5 seconds.
3) Start engine and run it for at least 2 seconds at idle speed.

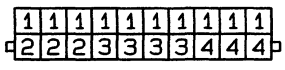
OR

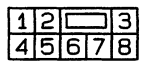
1) Set START switch to ON for at least 0.5 seconds.
2) Start engine and run it for at least 2 seconds at idle speed.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

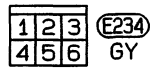
EC-CKPS-01





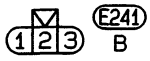


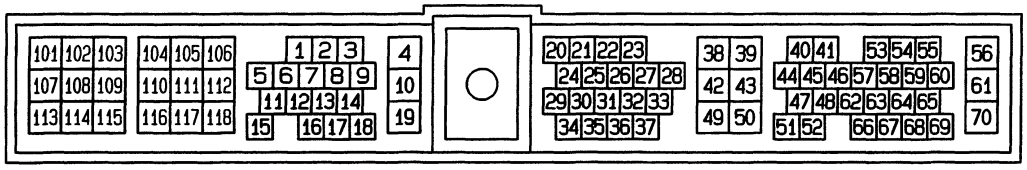




Refer to last page (Foldout page).

M8, E101

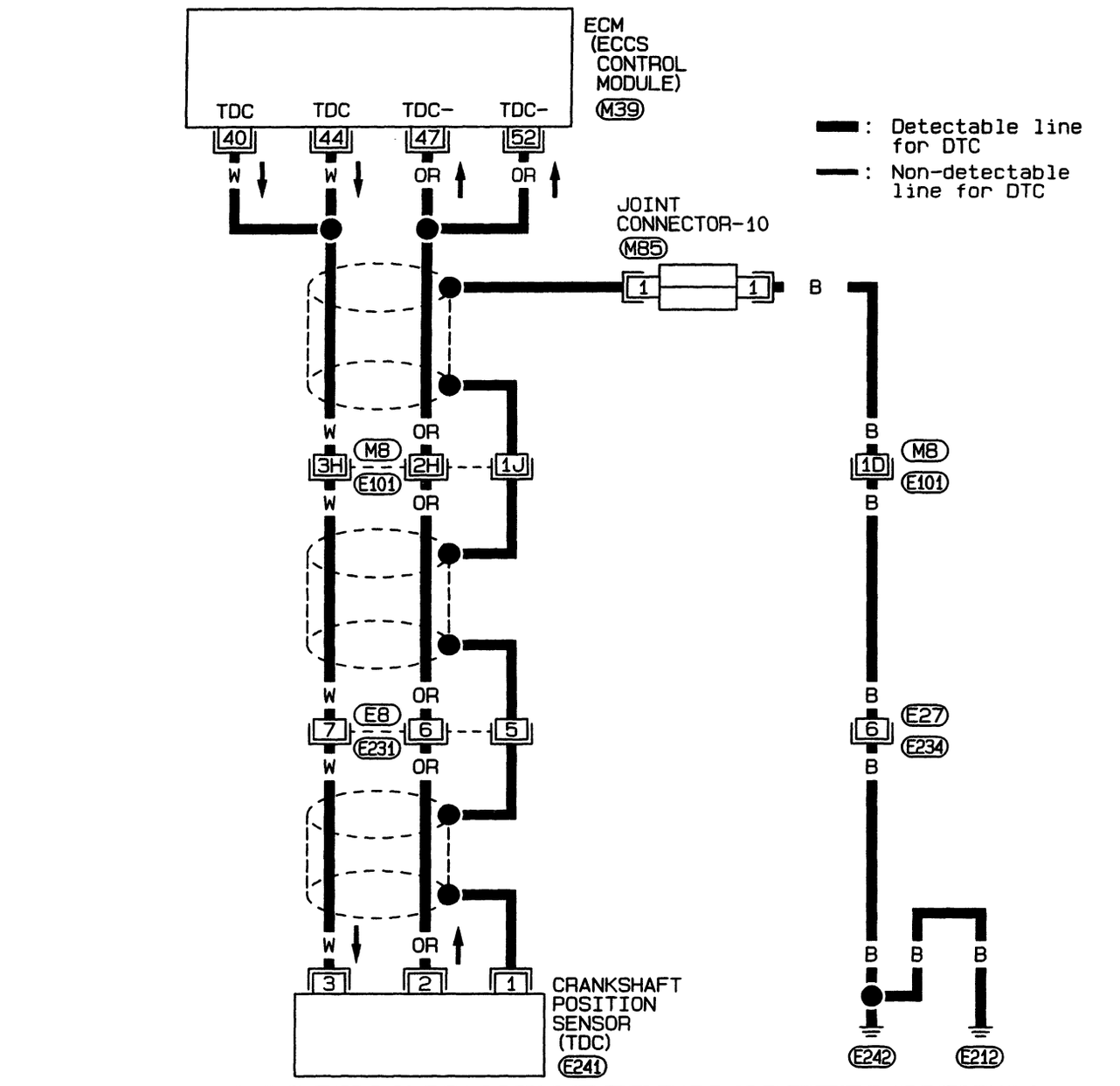


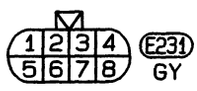


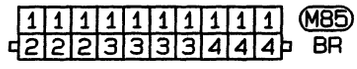
HEC255

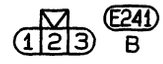
Crankshaft Position Sensor (TDC) (Cont'd)

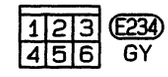
EC-CKPS-02





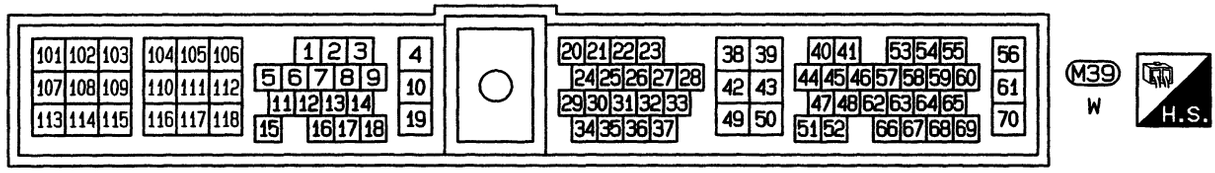






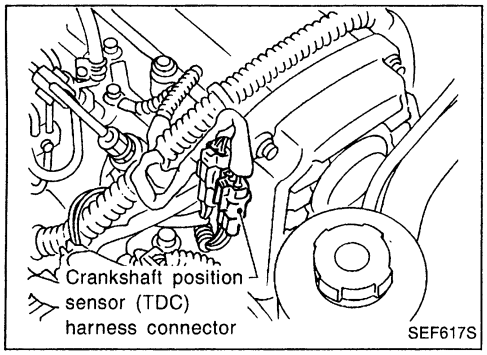
Refer to last page (Foldout page).

M8, E101



HEC256

Crankshaft Position Sensor (TDC) (Cont'd)



DIAGNOSTIC PROCEDURE

INSPECTION START

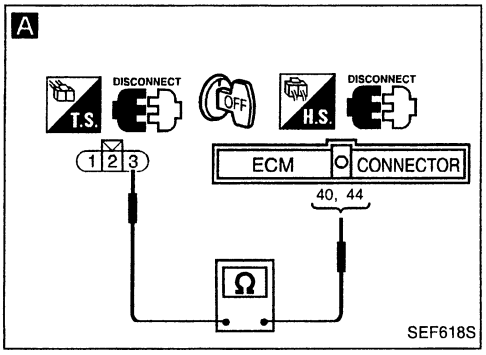
A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect crankshaft position sensor (TDC) and ECM harness connectors.
3. Check continuity between ECM terminal ㊵, ㊹ and terminal ③.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E8), (E231)
- Harness for open or short between ECM and crankshaft position sensor (TDC)

If NG, repair harness or connectors.

OK ↓



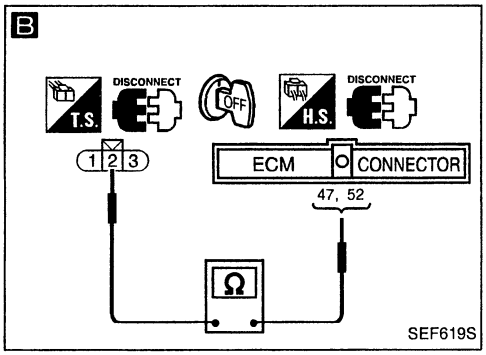
B

CHECK GROUND CIRCUIT-I.
Check harness continuity between terminal ② and ECM terminals ㊼, ㊷.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E8), (E231)
- Harness for open or short between crankshaft position sensor (TDC) harness connector and ECM

If NG, repair harness or connectors.

OK ↓



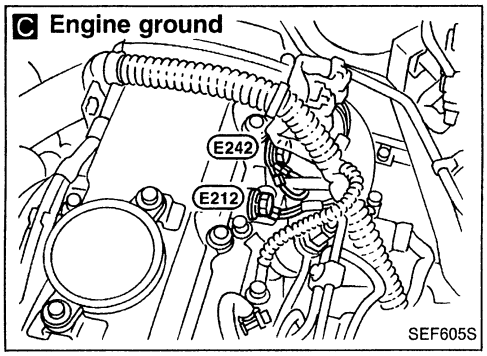
C

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

NG → Check the following.
- Harness connectors (M76), (E124), (E27), (E234)
- Joint connector-10 (M85)
- Harness for open or short between crankshaft position sensor (TDC) and engine ground

If NG, repair harness or connectors.

OK ↓

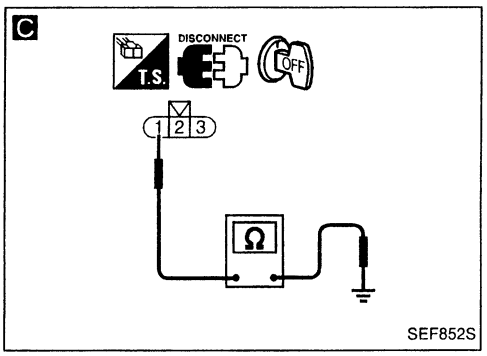


CHECK COMPONENT
[Crankshaft position sensor (TDC)].
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace crankshaft position sensor (TDC).

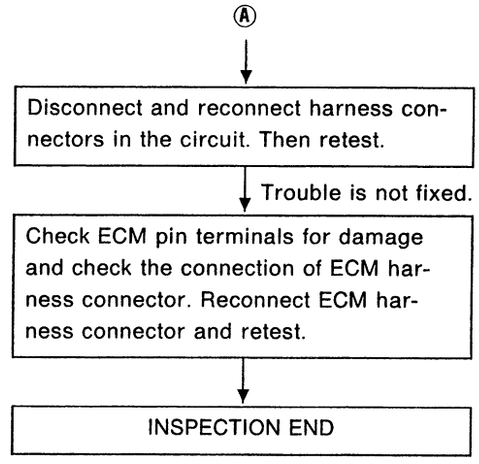
OK ↓

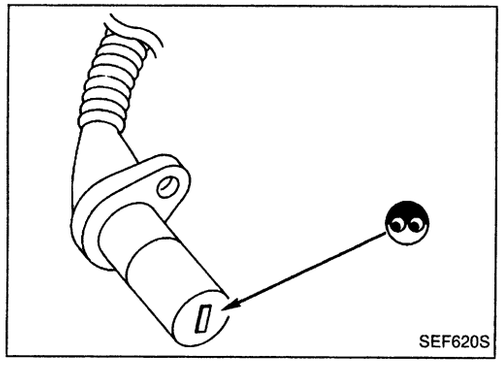
Ⓐ

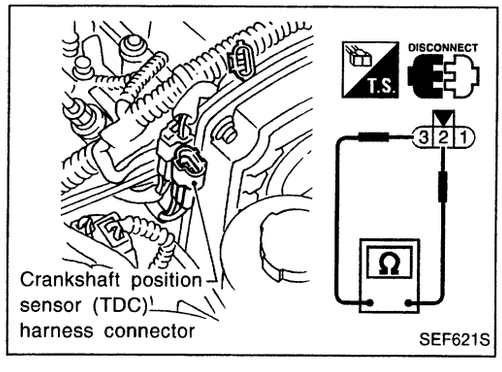


EC

Crankshaft Position Sensor (TDC) (Cont'd)







COMPONENT INSPECTION

Crankshaft position sensor (TDC)

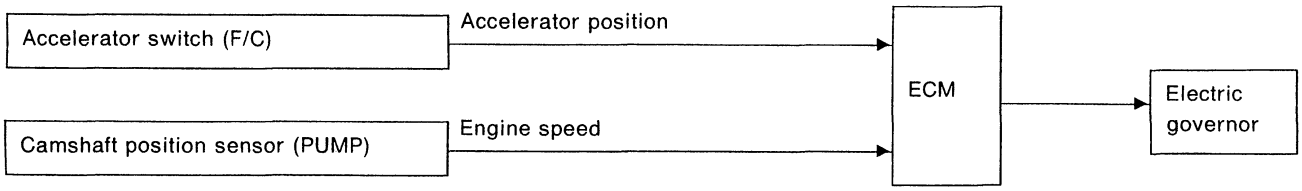
1. Disconnect crankshaft position sensor (TDC) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.

5. Check resistance between terminals ② and ③.
   Resistance: Approximately 1,215 - 1,485Ω
   [at 25°C (77°F)]
   If NG, replace crankshaft position sensor (TDC).

Governor Cut Circuit

ON BOARD DIAGNOSIS LOGIC

This diagnostic procedure checks whether or not fuel cut is being performed during deceleration. Signals from the accelerator switch and camshaft position sensor (PUMP) are sent to the ECM. The ECM uses these signals to control the electric governor operation.



EC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Item (Possible Cause)
48	• Accelerator switch circuit is shorted. • Crankshaft position sensor (PUMP) or ECM is malfunctioning.	• Harness or connectors [Accelerator switch and camshaft position sensor (PUMP) circuits] • Accelerator switch (F/C) • Camshaft position sensor (PUMP) • ECM

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC 48 and 11 or 23 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 11 or 23 (See EC-167 or 197).

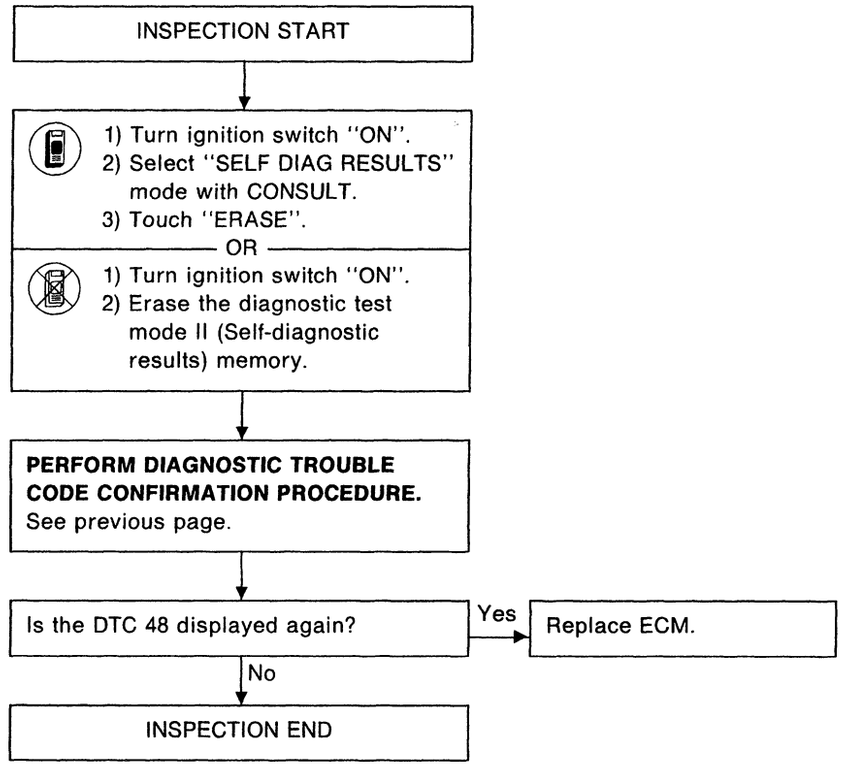
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and run it to 3,000 rpm, then quickly release accelerator pedal.

OR

1) Start engine and run it to 3,000 rpm, then quickly release accelerator pedal.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)".

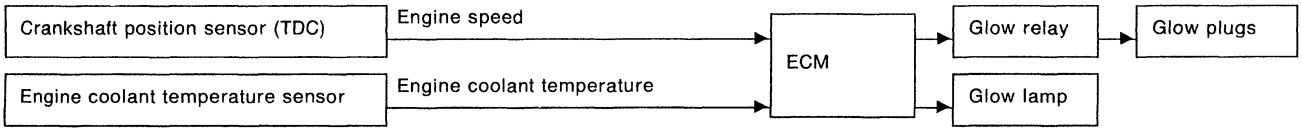
Governor Cut Circuit (Cont'd)

DIAGNOSTIC PROCEDURE



Glow Control System

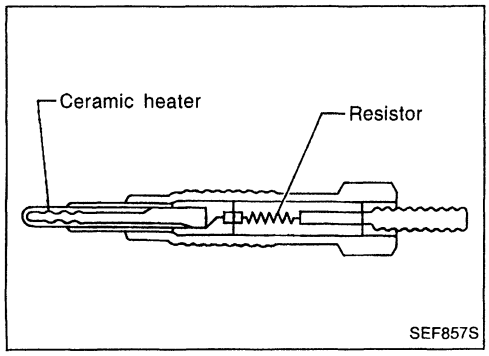
SYSTEM DESCRIPTION



When engine coolant temperature is more than 75°C (167°F), the glow relay turns off, inactivating the quick-glow control until coolant temperature drops below 55°C (131°F).
When coolant temperature is lower than 75°C (167°F):

- Ignition switch ON
  After ignition switch has turned to ON, the glow relay turns ON for a certain period of time in relation to engine coolant temperature, allowing current to flow through glow plug.
- Cranking
  The glow relay turns ON, allowing current to flow through glow plug.
- Starting
  After engine has started, current continues to flow through glow plug (after-glow mode) for a certain period in relation to engine coolant temperature.
  When engine coolant temperature exceeds 50°C (122°F), current flow through glow plug is interrupted.

EC



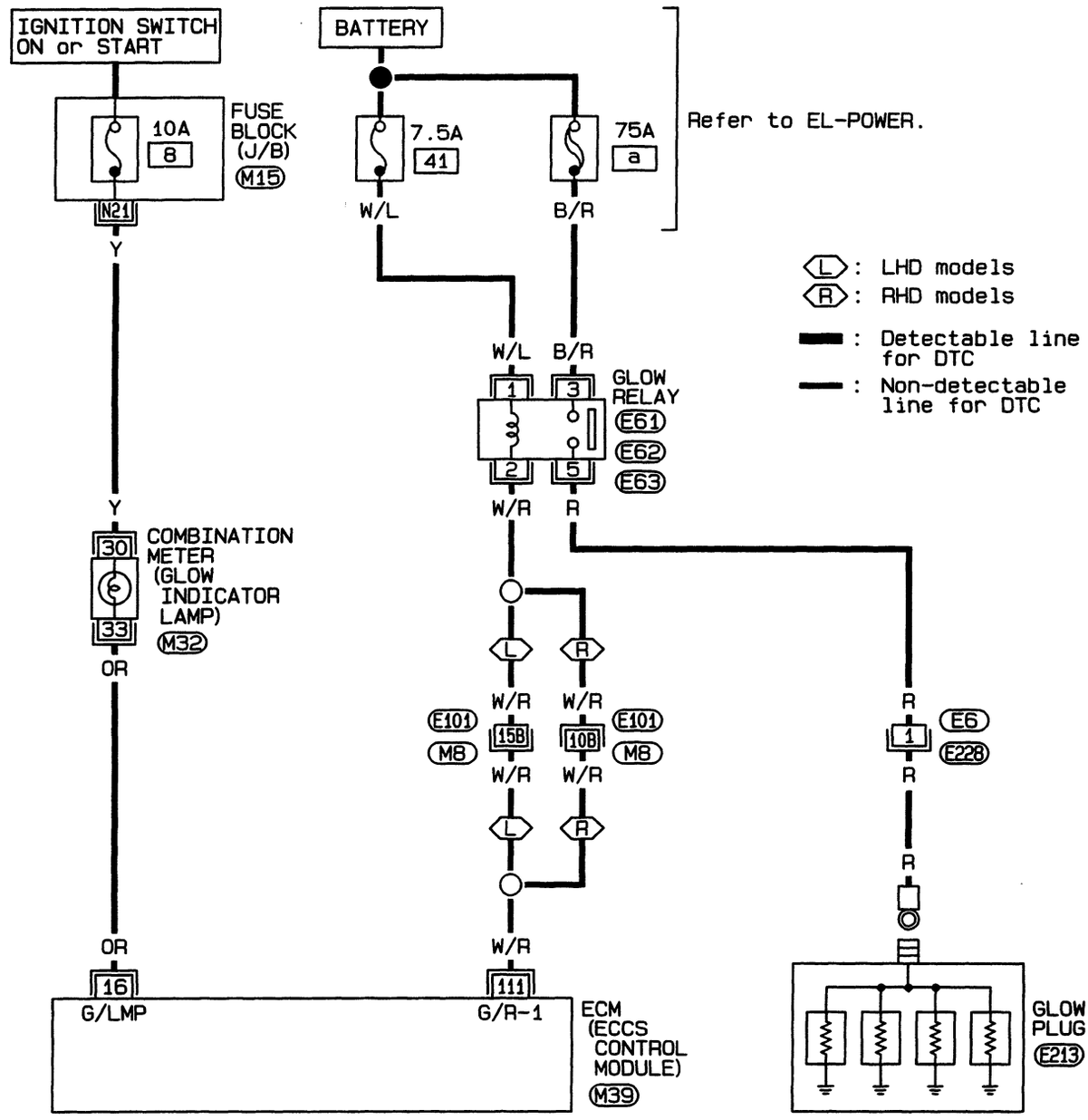
COMPONENT DESCRIPTION

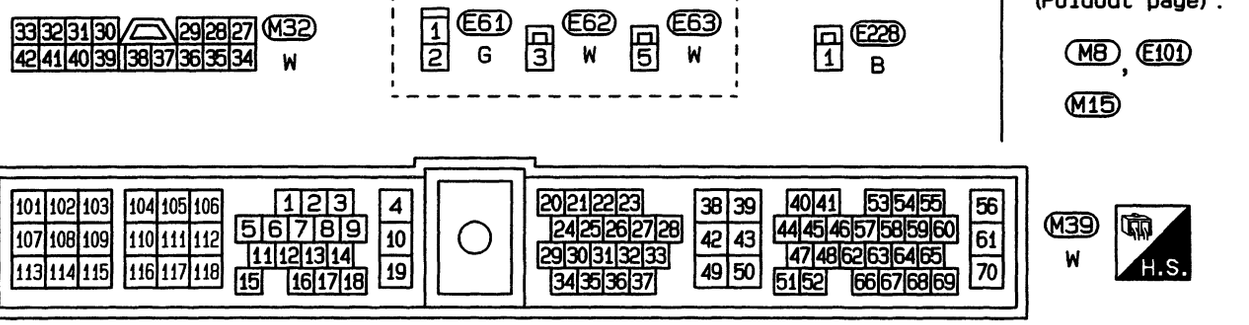
Glow plug

The glow plug is provided with a ceramic heating element to obtain a high-temperature resistance. It glows in response to a signal sent from the ECM, allowing current to flow through the glow plug via the glow relay.

Glow Control System (Cont'd)

EC-GLOW-01

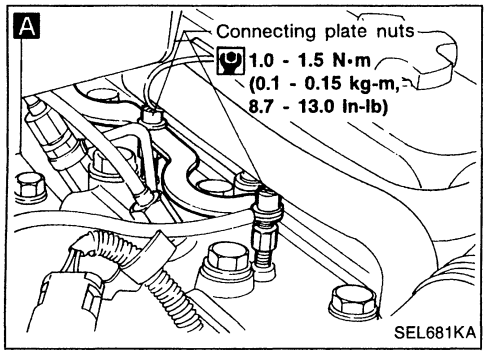


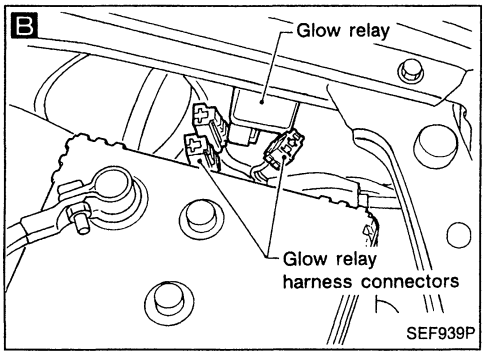


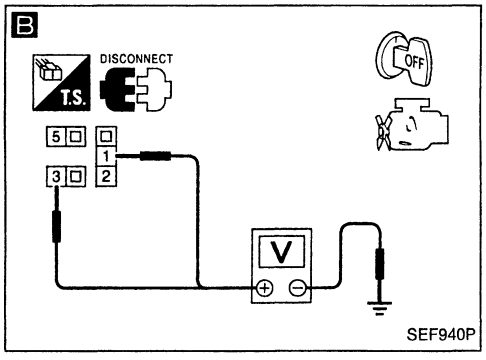
HEC262

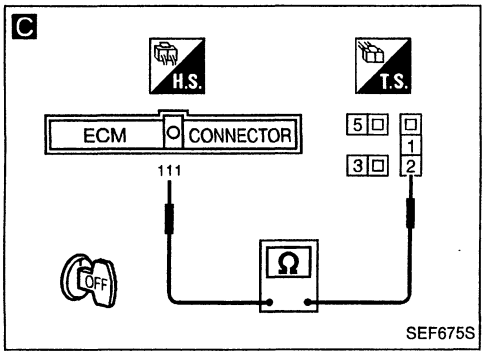
Glow Control System (Cont'd)

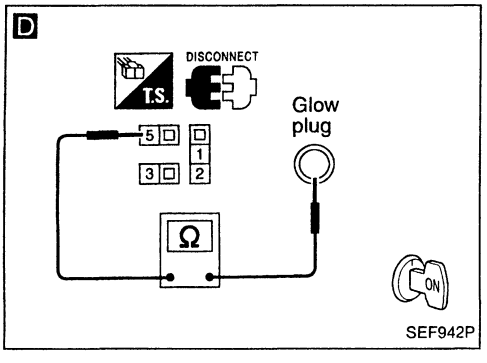
DIAGNOSTIC PROCEDURE











INSPECTION START

Check fuel level, fuel supplying system, starter motor, etc.
- NG → Correct.
- OK ↓

A

Check that all glow plug connecting plate nuts are installed properly.
- NG → Install properly.
- OK ↓

CHECK OVERALL FUNCTION.
Check entire glow control system.
(Refer to "System Operation Check" on next page.)
- OK → CHECK COMPONENT (Glow plug). See page EC-239.
- NG ↓

B

CHECK VOLTAGE BETWEEN GLOW RELAY AND GROUND.
Check voltage between terminals ①, ③ and ground with tester.
Voltage: Battery voltage
- NG → Check the following.
  - 7.5A fuse
  - 75A fusible link
  - Harness continuity between glow relay and fuse

  If NG, repair harness or connectors.
- OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
Check harness continuity between ECM terminal (111) and terminal ②.
Continuity should exist.
If OK, check harness for short.
- NG → Repair harness or connectors.
- OK ↓

D

CHECK HARNESS CONTINUITY BETWEEN GLOW RELAY AND GLOW PLUG.
1. Disconnect ECM harness connector.
2. Disconnect glow relay.
3. Check harness continuity between glow relay terminal ⑤ and glow plug.

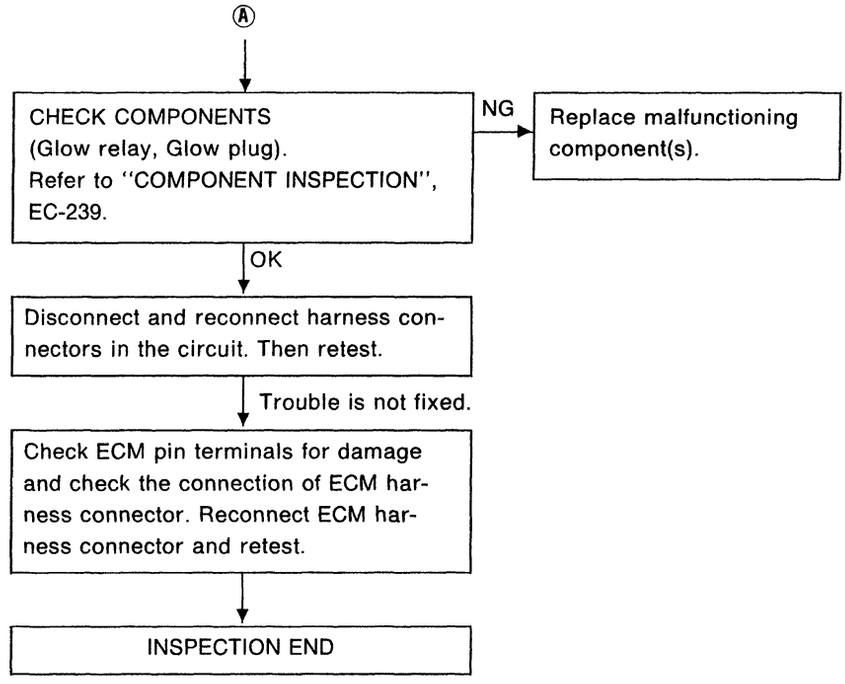
   Continuity should exist.

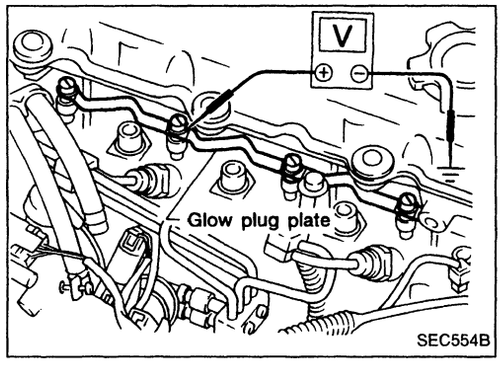
   If OK, check harness for short.
- NG → Repair harness or connectors.
- OK ↓

Ⓐ

EC

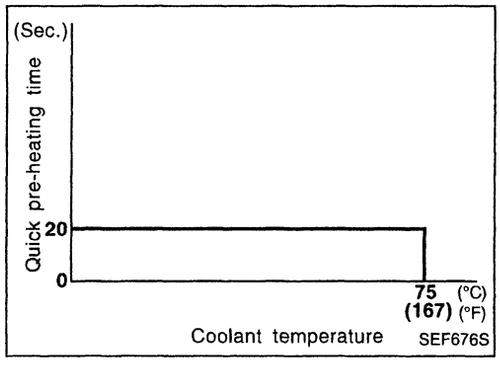
Glow Control System (Cont'd)





SYSTEM OPERATION CHECK

Set voltmeter between glow plug and engine body.



1. Quick-glow (Pre-glow) system

a. Turn ignition switch "ON".

b. Read voltage.

Voltage:

Battery voltage for about 20* seconds

*** Engine coolant temperature is lower than 75°C (167°F). [It is lower than 55°C (131°F) after warm-up.]**

*** Repeating ignition switch "ON" and "OFF" may change the time.**

2. Quick-glow (Cranking) system

a. Disconnect "S" terminal for starter motor to prevent engine from cranking.

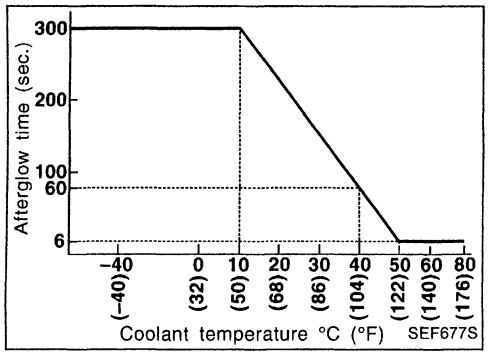
b. Read voltage when ignition switch is turned to "START".

Voltage:

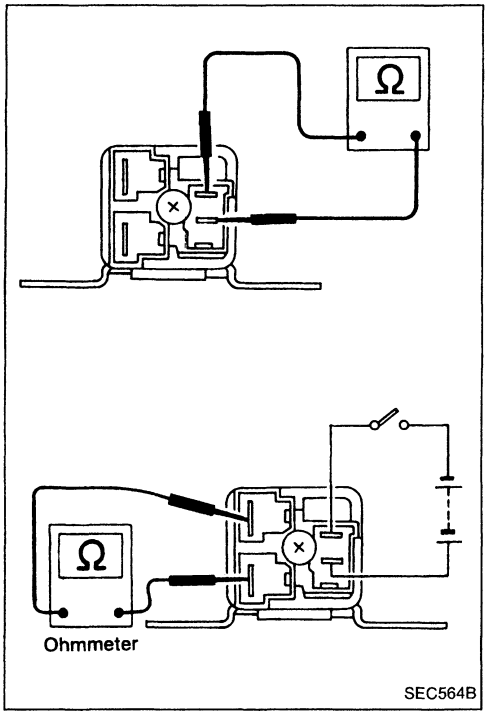
Battery voltage*

*** For about 20 seconds after returning ignition switch to "ON".**

Glow Control System (Cont'd)



3. After-glow system
a. Connect "S" terminal to starter motor.
b. Start engine and read voltage.
Voltage:
Battery voltage for 5* minutes
*** Engine coolant temperature is lower than 10°C (50°F).**



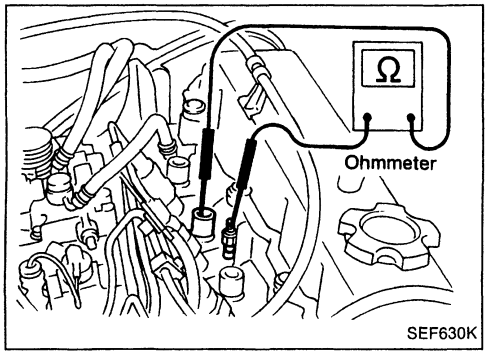
COMPONENT INSPECTION

EC

Glow relay

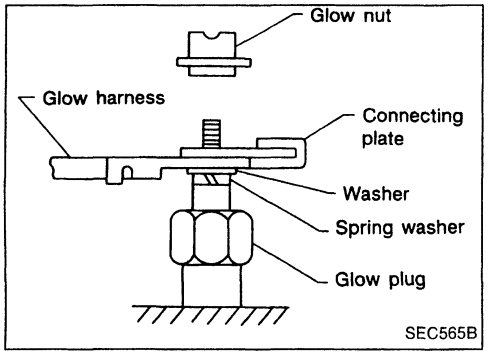
1. Check relay for coil continuity.
Continuity should exist.
2. Check relay for proper operation.

Coil voltage	Continuity	Contact point
0V	No	OFF
12V	Yes	ON



Glow plug

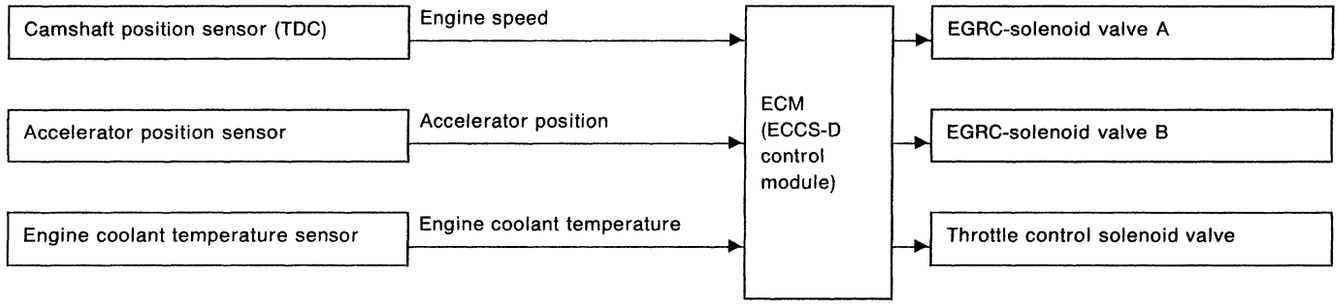
1. Remove glow plug connecting plate.
2. Check each glow plug for continuity.
Continuity should exist:
Approximately 0.5Ω [at 25°C (77°F)]
- If NG, replace glow plug.



3. Install glow plug connecting plate securely.
- **Do not bump glow plug heating element. If it is bumped, replace glow plug with new one. (If glow plug is dropped from a height of 10 cm (3.94 in), replace with new one.)**
- **If glow plug installation hole is contaminated with carbon, remove using a reamer or suitable tool.**
- **Hand-tighten glow plug by turning it 2 to 3 times, then tighten using a tool to specified torque.**
⊙: 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)

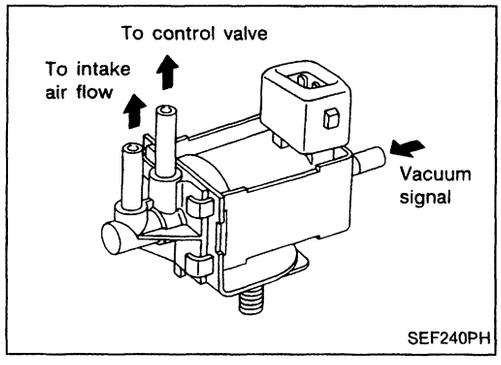
EGRC-Solenoid Valve A, B and Throttle Control Solenoid Valve

SYSTEM DESCRIPTION



The ECM receives signals sent from the engine coolant temperature sensor, crankshaft position sensor (TDC) and accelerator position sensor to determine engine speed and operating conditions. Based on these signals, the ECM controls EGR control solenoid valve (A and B) operation and throttle control solenoid valve operation.

Engine coolant temperature °C (°F)	Load	EGRC-solenoid valve		Throttle control solenoid valve	EGR valve	Throttle control valve	Amount of EGR gas
		A	B				
Below 70 (158)	Any	OFF (Closed)	OFF (Closed)	OFF (Closed)	Fully closed	Fully open	—
Above 70 (158)	Low load	ON (Open)	ON (Open)	ON (Open)	Fully open	Closed	Large
	Medium load-1	ON (Open)	ON (Open)	OFF (Closed)	Fully open	Fully open	Medium
	Medium load-2	ON (Open)	OFF (Closed)	OFF (Closed)	Half open	Fully open	Small
	High load	OFF (Closed)	OFF (Closed)	OFF (Closed)	Fully closed	Fully open	—

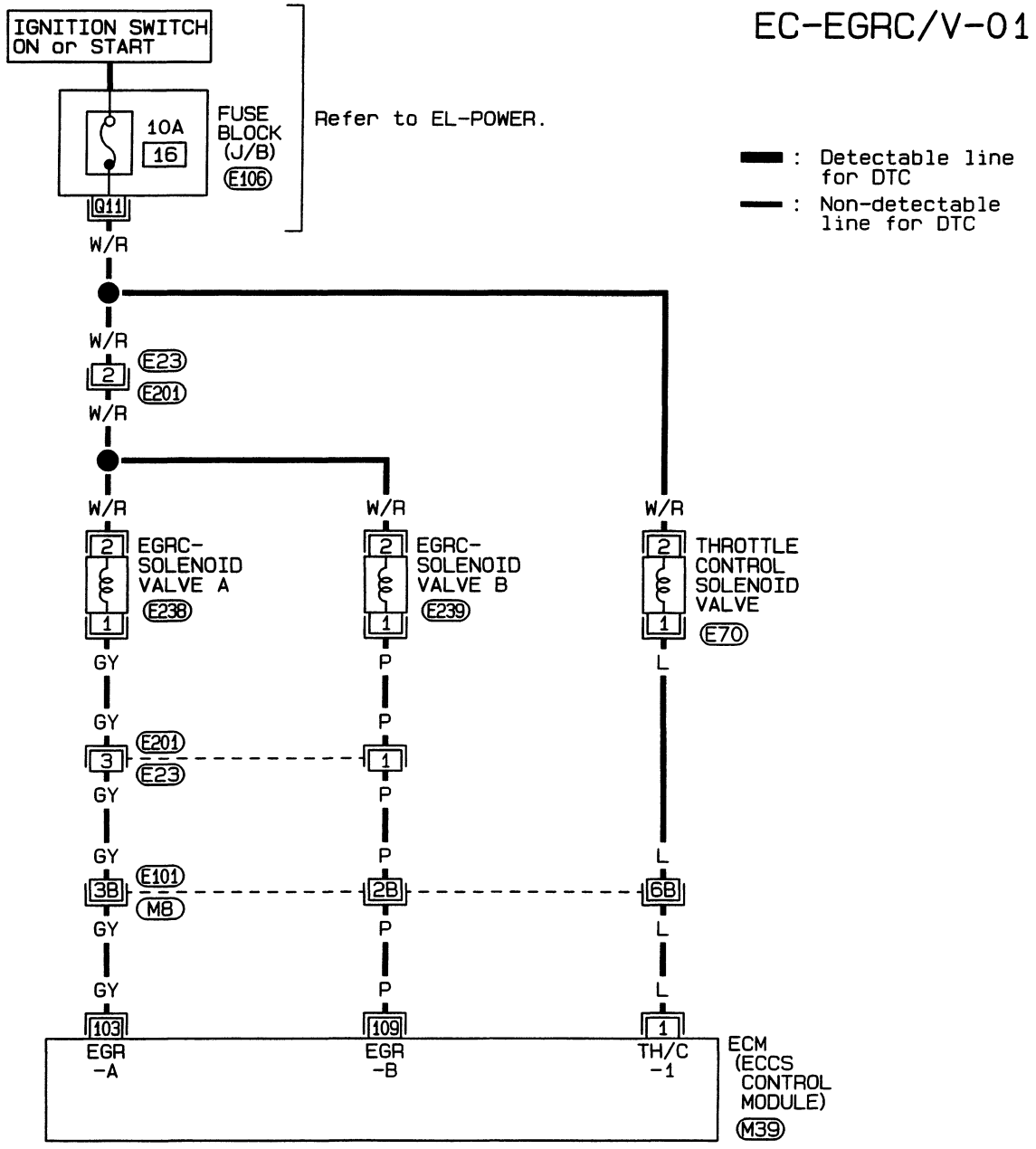


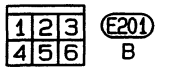
COMPONENT DESCRIPTION

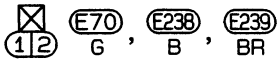
The EGRC-solenoid valves A and B control vacuum pressure acting on the EGR valve. The EGR control valve will then be fully opened, half-opened or fully closed, as required.

The throttle control solenoid valve controls vacuum pressure acting on the throttle chamber. Thus, intake air passages are opened or closed in relation to exhaust gas and intake air. Utilizing the relationship between exhaust gas pressure and intake air pressure control, the amount of EGR (exhaust gas recirculated) is regulated in three stages — large, medium, small.

EGRC-Solenoid Valve A, B and Throttle Control Solenoid Valve (Cont'd)

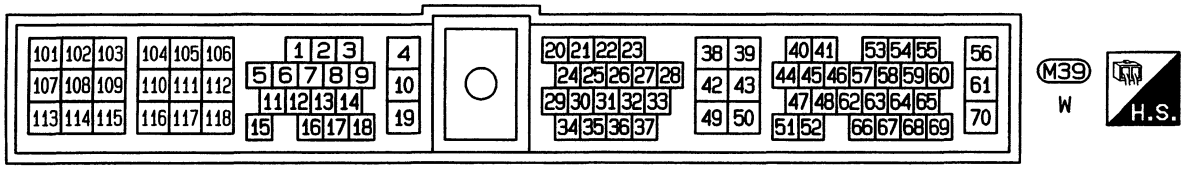






Refer to last page (Foldout page).

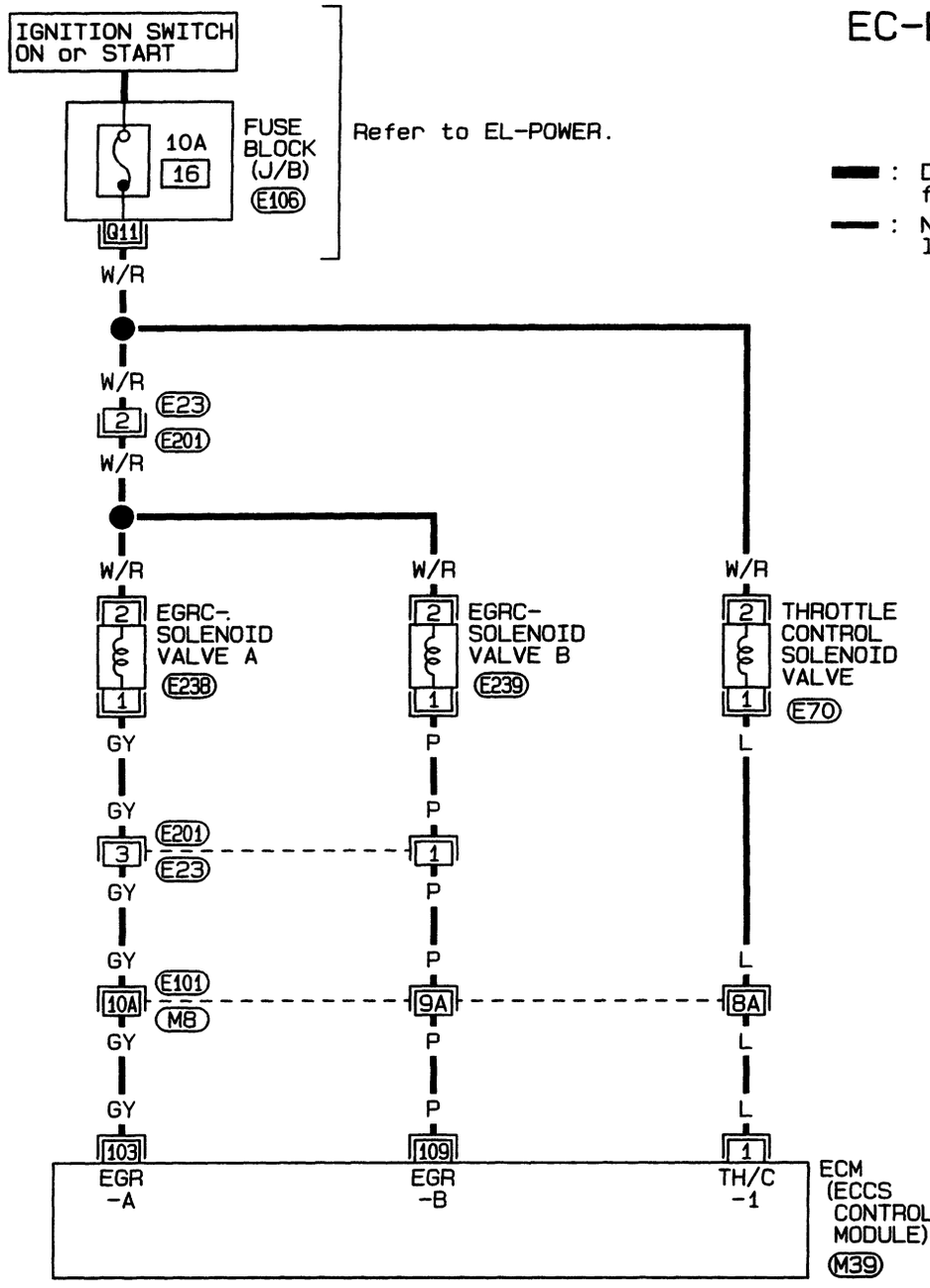
M8, E101, E106



HEC264

EGRC-Solenoid Valve A, B and Throttle Control Solenoid Valve (Cont'd)

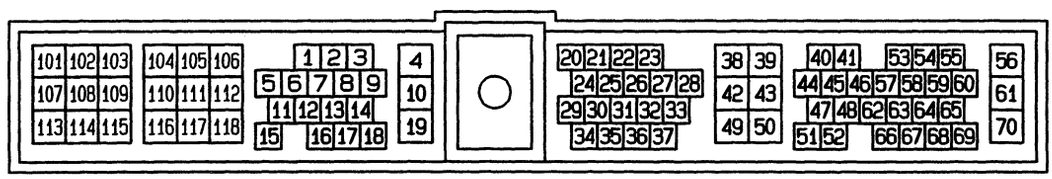
EC-EGRC/V-02





Refer to last page (Foldout page).

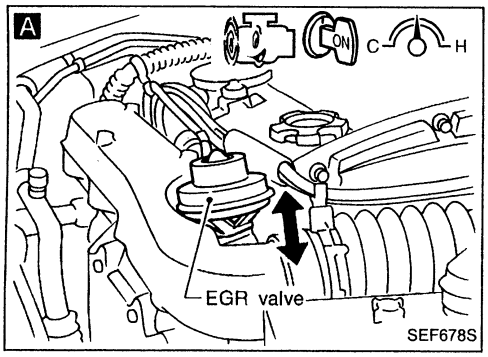
M8, E101, E106

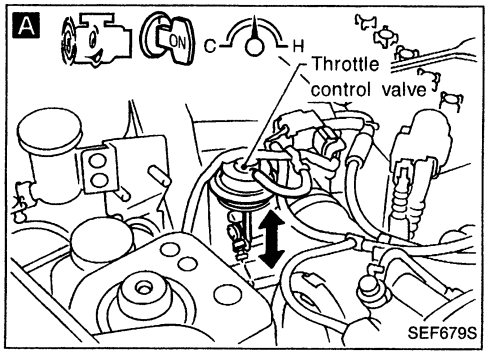


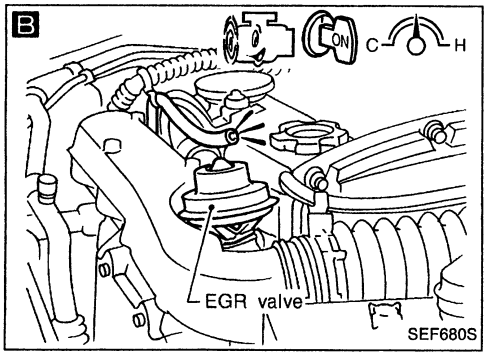
HEC265

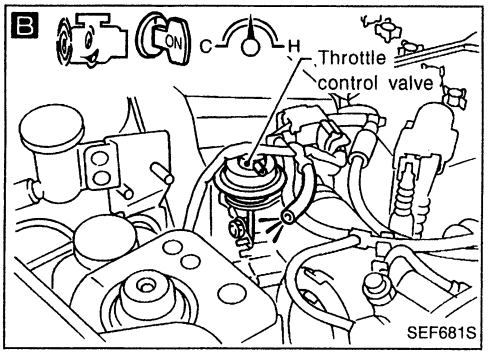
EGRC-Solenoid Valve A, B and Throttle Control Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently.
2. Perform diagnostic test mode II (Self-diagnostic results).
   Make sure that diagnostic trouble code No. 55 is displayed.
3. Make sure that EGR valve spring moves up and down (Use your finger) under the following conditions.
   At idle:
   Spring does not move.
   Racing engine from idle to 2,800 rpm:
   Spring moves up and down.
4. Make sure that throttle control valve rod moves up and down under the following conditions.
   At idle:
   Rod does not move.
   Racing engine from idle to 2,500 rpm:
   Rod moves up and down.

OK → INSPECTION END

NG

B

CHECK VACUUM SOURCES TO EGR VALVE AND THROTTLE CONTROL VALVE.

1. Disconnect vacuum hoses to EGR valve and throttle control valve.
2. Make sure that vacuum exists under the following conditions.
   At idle:
   Vacuum should exist.
   Racing engine from idle to 2,800 rpm:
   Vacuum should not exist.

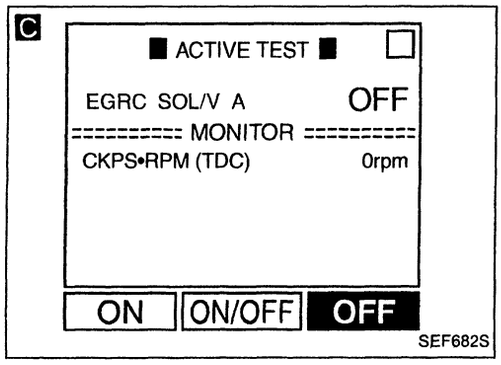
OK → CHECK COMPONENTS (EGR valve and throttle control valve).
(See page EC-246.)

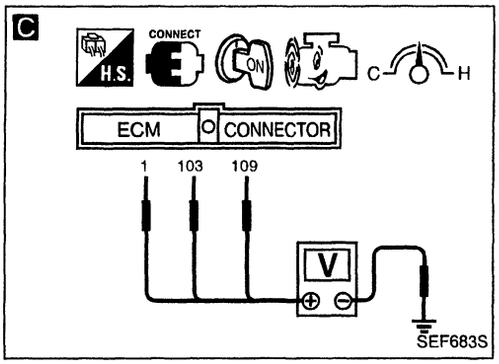
NG → Replace malfunctioning component(s).

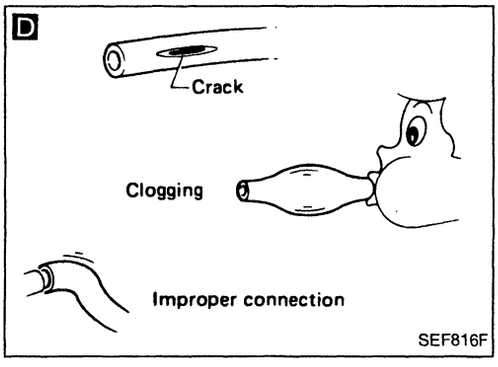
NG → Ⓐ

EC

EGRC-Solenoid Valve A, B and Throttle Control Solenoid Valve (Cont'd)







Ⓐ

C

CHECK CONTROL FUNCTION.

1. Turn ignition switch "ON".
2. Turn EGRC-solenoid valve A, B and throttle chamber control solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

1. Check voltage between ECM terminals (103), (109) and ground with tester under the following conditions.

Voltage:

At idle

Approximately 0.4V

Engine speed is 2,800 rpm

Battery voltage

2. Check voltage between ECM terminal ① and ground with tester under the following conditions.

Voltage:

At idle

Approximately 0.4V

Racing engine from idle to 2,500 rpm

Battery voltage

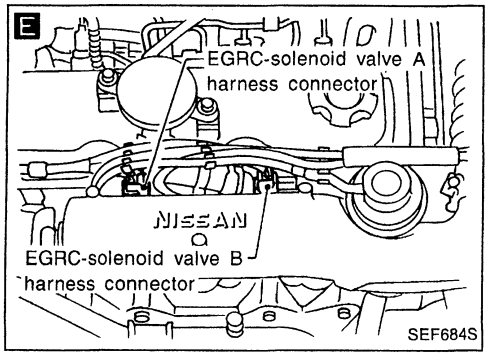
OK → **D**

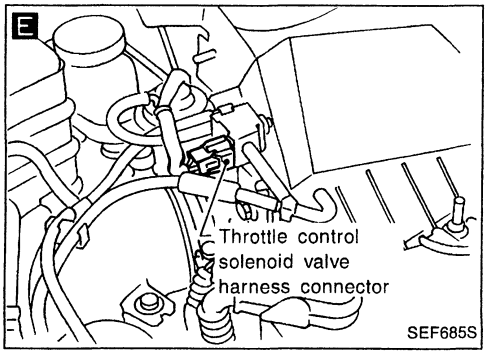
CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connection.

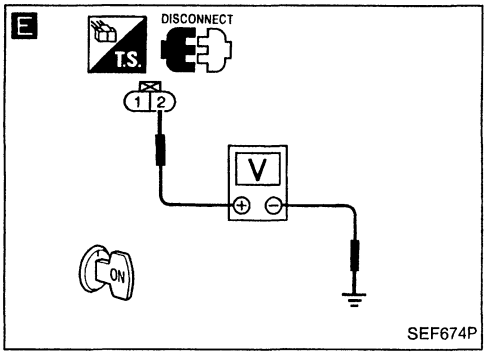
NG

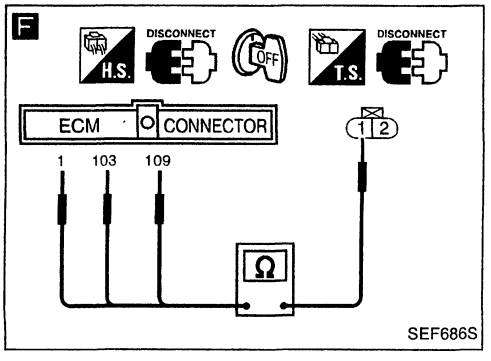
Ⓑ

EGRC-Solenoid Valve A, B and Throttle Control Solenoid Valve (Cont'd)









Ⓑ

E

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect EGRC-solenoid valve A, B and throttle control solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (E23), (E201)
- 10A fuse
- Harness for open or short between EGRC-solenoid valve A, B and fuse
- Harness for open or short between throttle control solenoid valve and fuse

If NG, repair harness or connectors.

OK ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ① and terminal ①, ECM terminal (103) and terminal ①, ECM terminal (109) and terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M8), (E100)
- Harness connectors (E23), (E201)
- Harness for open or short between EGRC-solenoid valve A, B and ECM
- Harness for open or short between throttle control solenoid valve and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENTS (EGRC-solenoid valve A, B and throttle control solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace malfunctioning component(s).

OK ↓

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

Trouble is not fixed. ↓

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

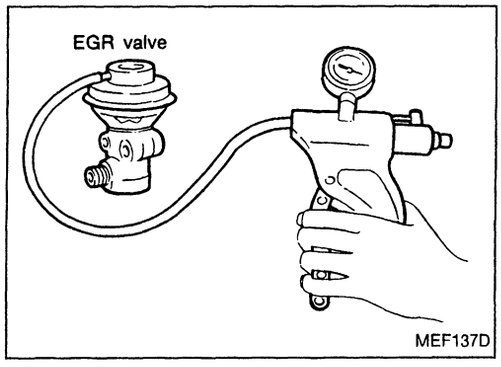
↓

INSPECTION END

EC

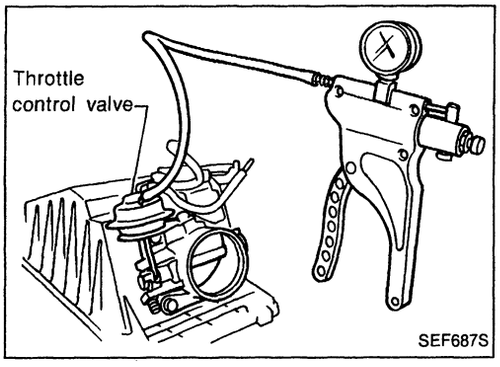
EGRC-Solenoid Valve A, B and Throttle Control Solenoid Valve (Cont'd)

COMPONENT INSPECTION



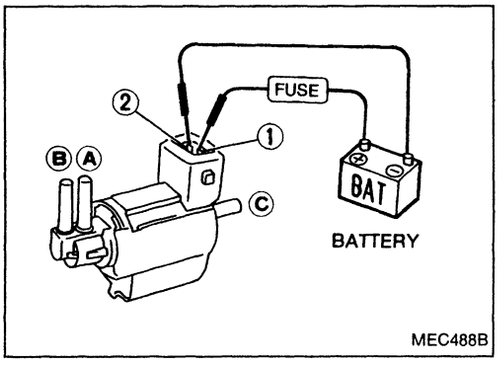
EGR valve

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



Throttle control valve

Apply vacuum to throttle control valve vacuum port with a hand vacuum pump.
Throttle control valve should close.
If NG, replace throttle control valve.



EGRC-solenoid valve A, B and throttle control solenoid valve

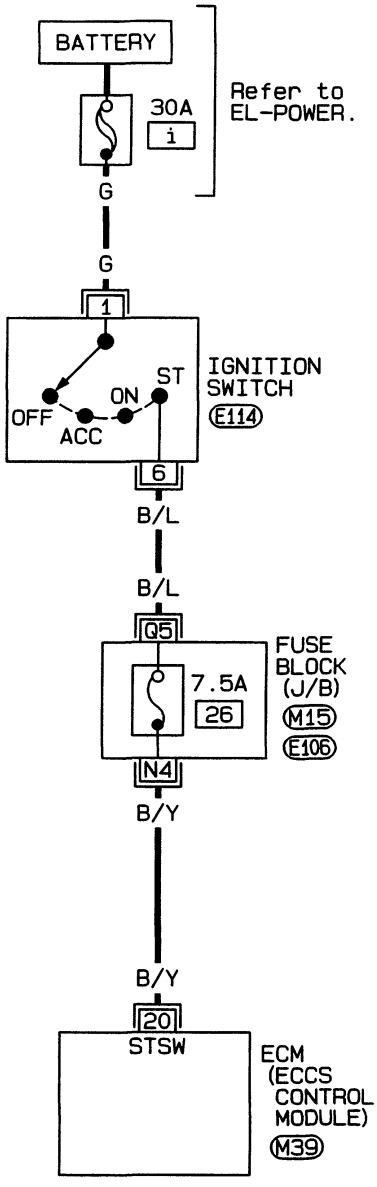
Check air passage continuity.

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

If NG, replace solenoid valve(s).

Start Signal

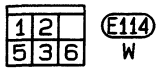
EC-S/SIG-01



: Detectable line for DTC

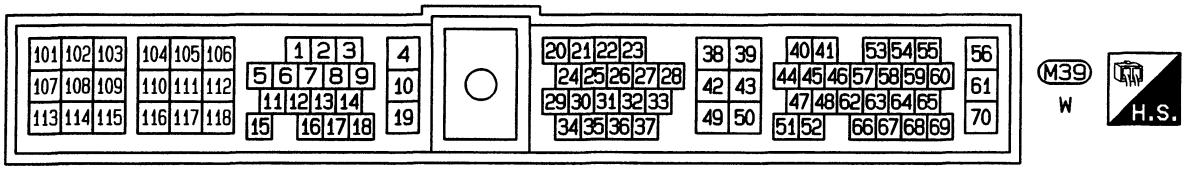
: Non-detectable line for DTC

EC



Refer to last page (Foldout page).

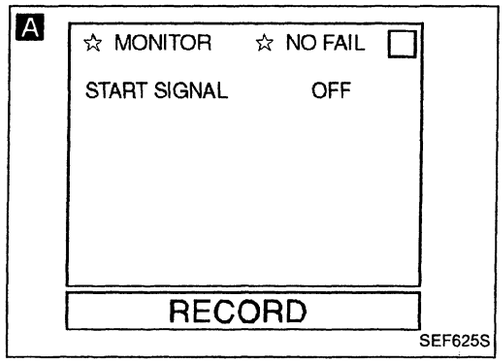
M15, E106

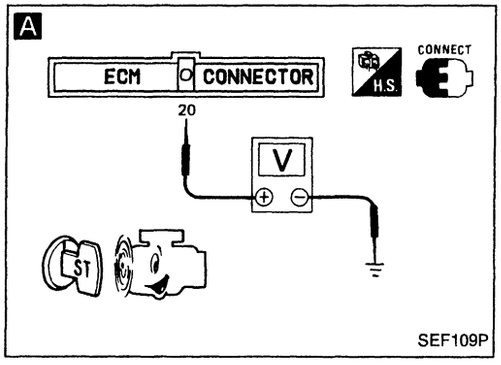


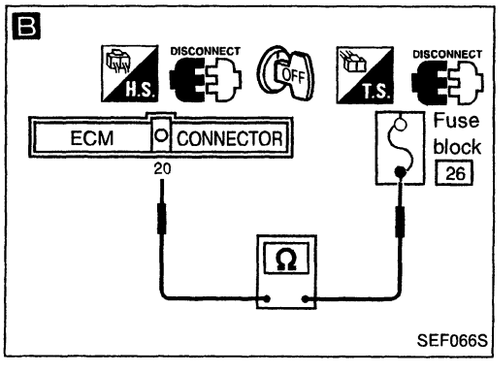
HEC257

Start Signal (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OK → INSPECTION END

OR

1. Turn ignition switch to "START".
2. Check voltage between ECM terminal ⑳ and ground.

Voltage:
Ignition switch "START"
Battery voltage
Except above
Approximately 0V

NG

Check if 7.5A fuse is OK.

NG → Replace 7.5A fuse.

OK

B

CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and 7.5A fuse.
3) Check harness continuity between ECM terminal ⑳ and fuse block.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness for open or short between ECM and fuse block

If NG, repair harness or connectors.

OK

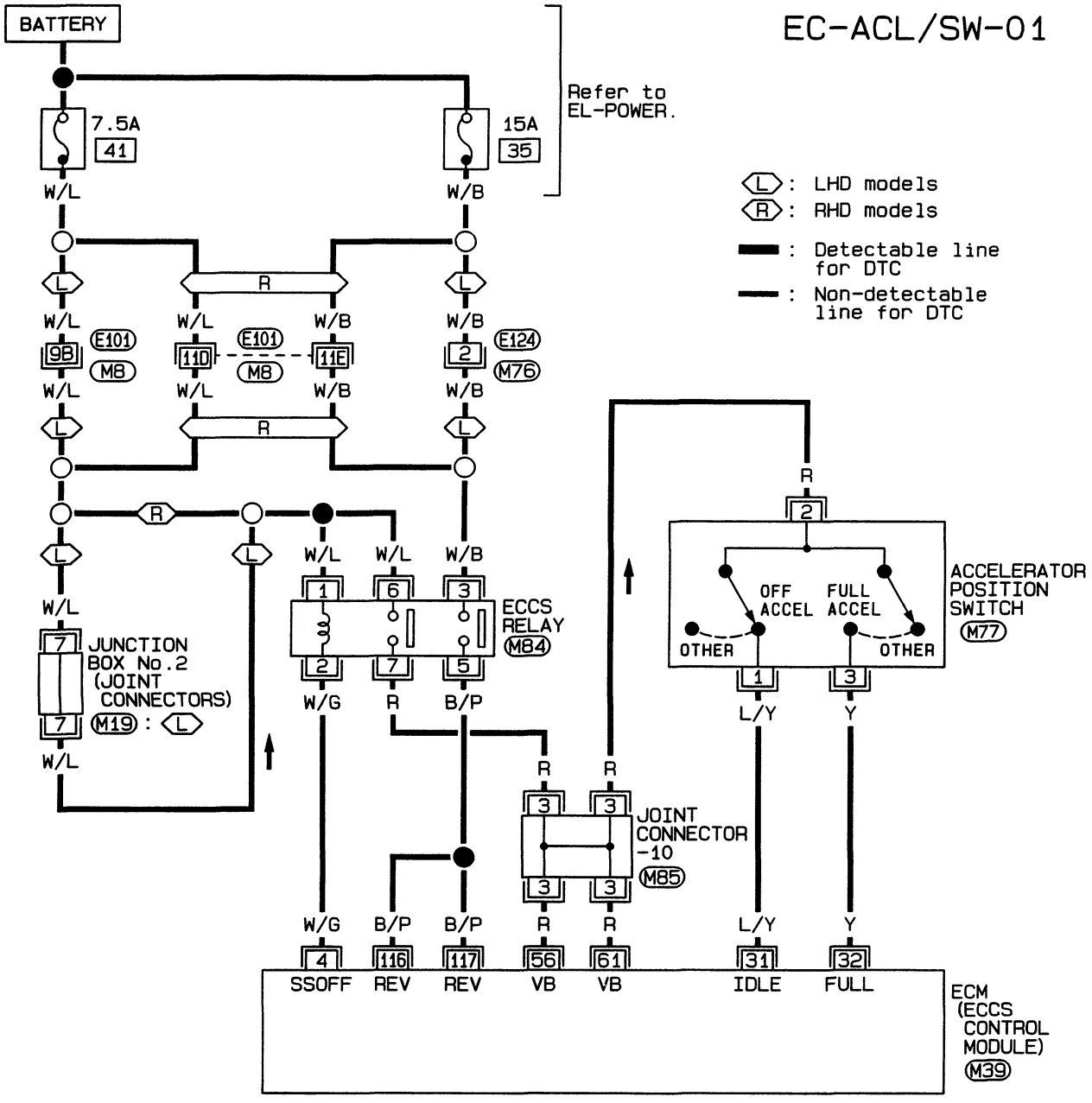
Disconnect and reconnect harness connectors in the circuit. Then retest.

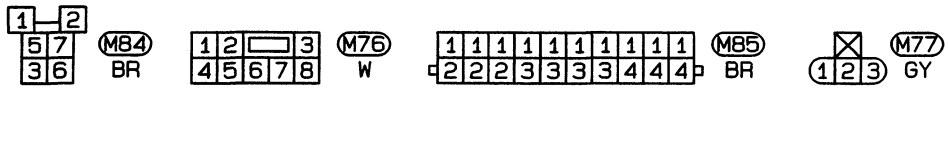
Trouble is not fixed.

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

INSPECTION END

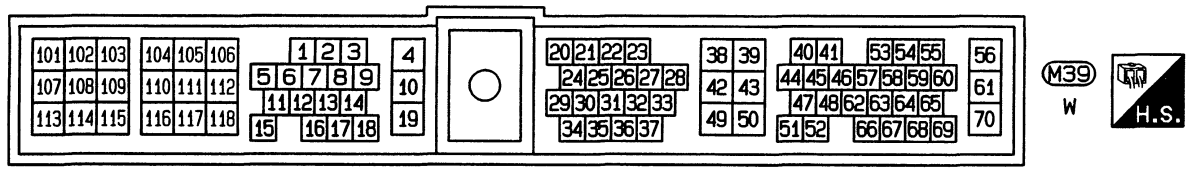
Accelerator Position Switch





Refer to last page (Foldout page).

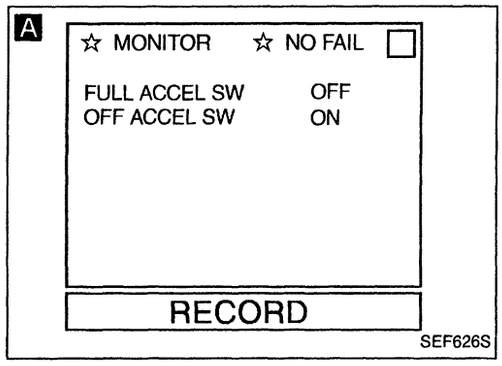
M8, E101, M19

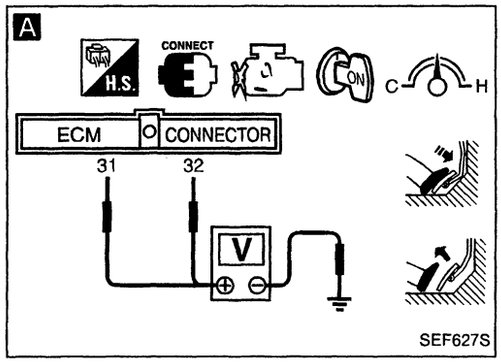


HEC258

Accelerator Position Switch (Cont'd)

The accelerator position switch detects OFF-accelerator switch signal and Full-accelerator switch signal and send these signals to the ECM. The ECM will then determine engine idle conditions. These signals are also used for diagnosing the accelerator position sensor.





DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Select "FULL ACCEL SW" and "OFF ACCEL SW" in "DATA MONITOR" mode with CONSULT.
3. Check "FULL ACCEL SW" and "OFF ACCEL SW" signal under the following conditions.

OFF ACCEL SW:
Accelerator pedal released
ON
Accelerator pedal depressed OFF

FULL ACCEL SW:
Accelerator pedal released
OFF
Accelerator pedal fully depressed ON

OK → INSPECTION END

OR

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal (31) and ground under the following conditions.

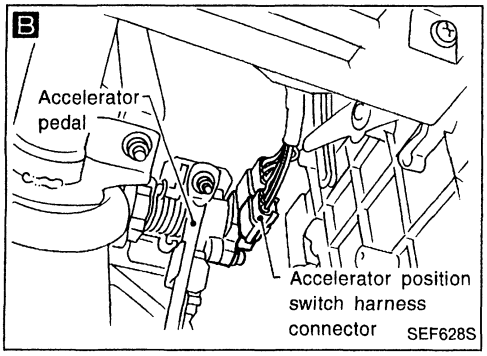
Voltage:
Accelerator pedal released
Battery voltage
Accelerator pedal fully depressed
Approximately 0V

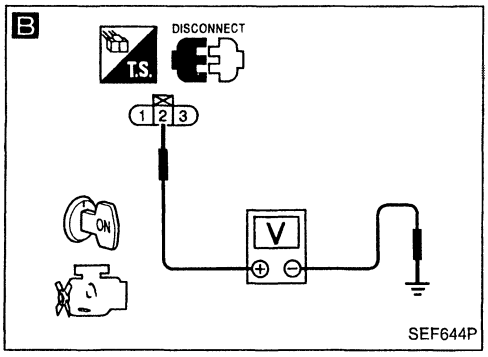
3. Check voltage between ECM terminal (32) and ground under the following conditions.

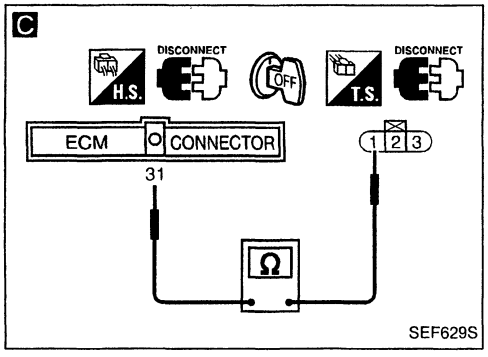
Voltage:
Accelerator pedal released
Approximately 0V
Accelerator pedal fully depressed
Battery voltage

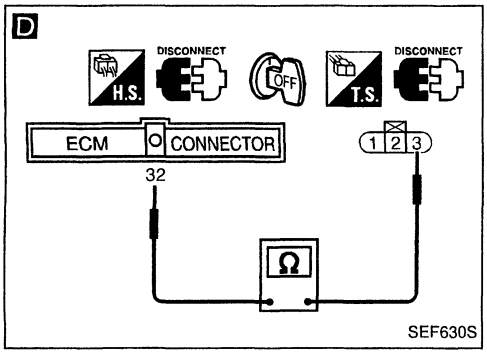
NG
Ⓐ

Accelerator Position Switch (Cont'd)









Ⓐ

B

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

NG → Check the following.
- Joint connector-10
- Harness for open or short between ECCS relay and accelerator position switch

If NG, repair harness or connectors.

OK ↓

C

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

NG → Repair harness or connectors.

OK ↓

D

CHECK INPUT SIGNAL CIRCUIT-II.
Check harness continuity between terminal ③ and ECM terminal ㉜.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Accelerator position switch).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace accelerator pedal assembly.

OK ↓

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

Trouble is not fixed. ↓

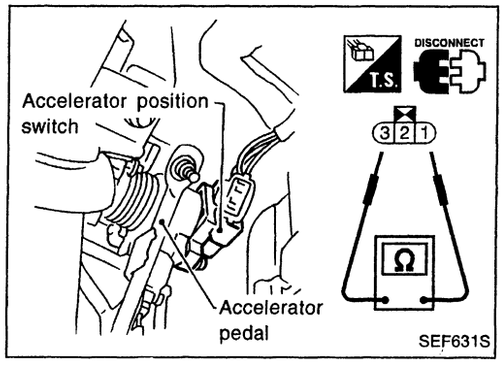
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

EC

Accelerator Position Switch (Cont'd)



COMPONENT INSPECTION

Accelerator position switch

1. Disconnect accelerator position switch harness connector.
2. Check continuity between terminals ① and ②.

Conditions	Continuity
Accelerator pedal released	Yes
Accelerator pedal depressed	No

3. Check continuity between terminals ② and ③.

Conditions	Continuity
Accelerator pedal released	No
Accelerator pedal fully depressed	Yes

If NG, replace accelerator pedal assembly.

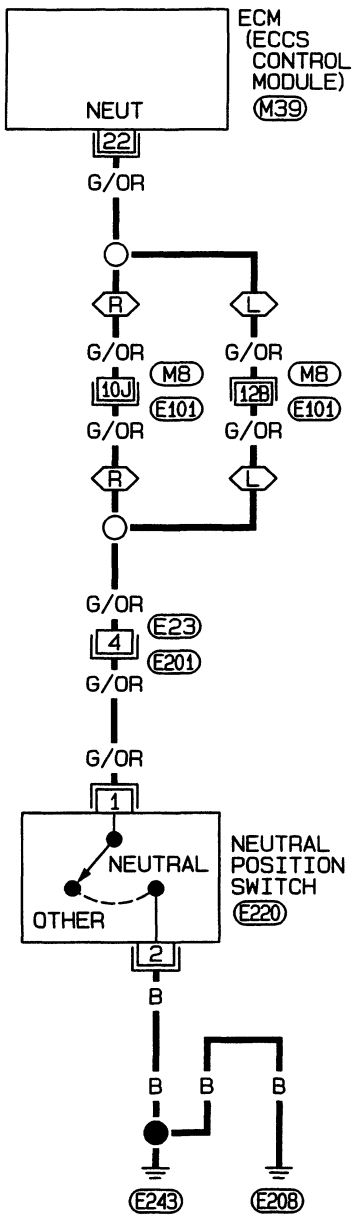
CAUTION:
If accelerator position sensor or ECM connector is disconnected, perform the following procedures:

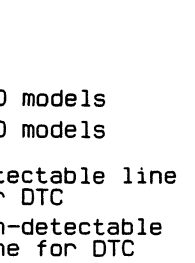
Select "OFF ACCEL PO SIG" in "ACTIVE TEST" mode. Touch CLEAR.

Start and warm up engine. After engine has warmed up, idle for 10 minutes.

Neutral Position Switch

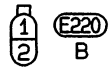
EC-PNP/SW-01





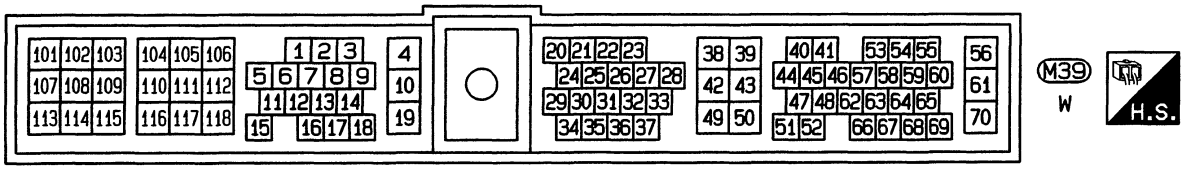
EC





Refer to last page (Foldout page).

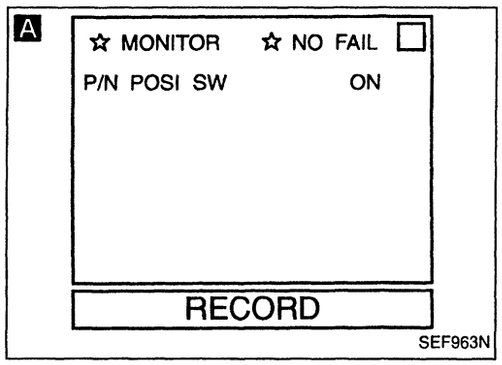
M8, E101

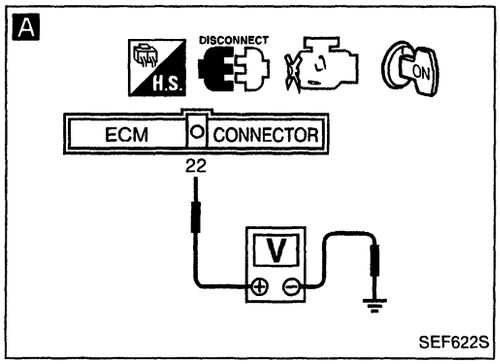


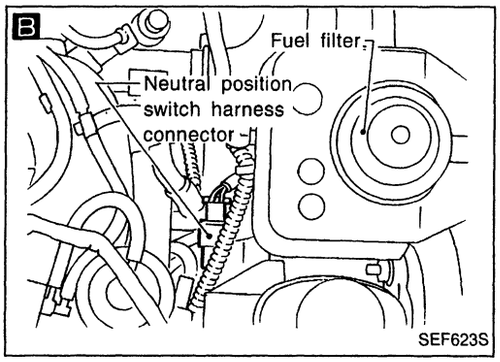
HEC259

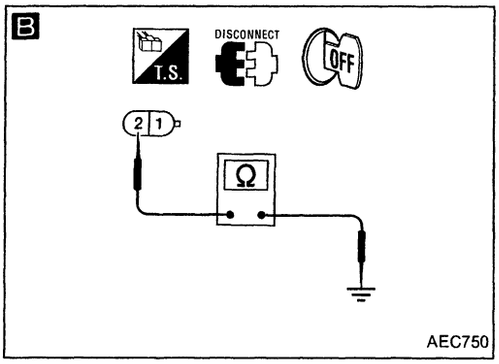
Neutral Position Switch (Cont'd)

When the gear position is in "N", neutral position switch is "ON". The ECM detects the position because the continuity of the line (the "ON" signal) exists.









DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT.
3. Check "P/N POSI SW" signal under the following conditions.
   Neutral position: ON
   Except neutral position: OFF

OK → INSPECTION END

OR

2. Check voltage between ECM terminal ㉒ and ground under the following conditions.
   Voltage:
   Neutral position
   Approximately 0V
   Except neutral position
   Battery voltage

NG

B

CHECK GROUND CIRCUIT.

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

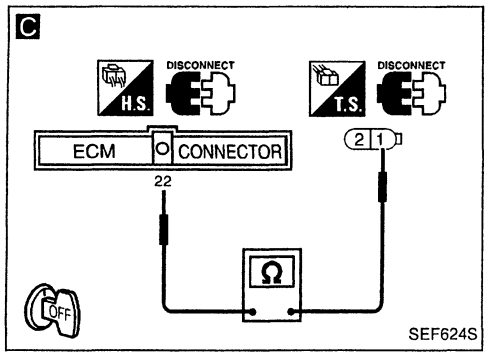
NG → Check the following.
- Harness for open or short between neutral position switch and body ground

If NG, repair harness or connectors.

OK

Ⓐ

Neutral Position Switch (Cont'd)



Ⓐ

C

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

NG → Check the following.
- Harness connectors (M8), (E101)
- Harness connectors (E23), (E201)
- Harness for open or short between ECM and neutral position switch

If NG, repair harness or connectors.

OK ↓

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

NG → Replace neutral position switch.

OK ↓

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

Trouble is not fixed. ↓

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

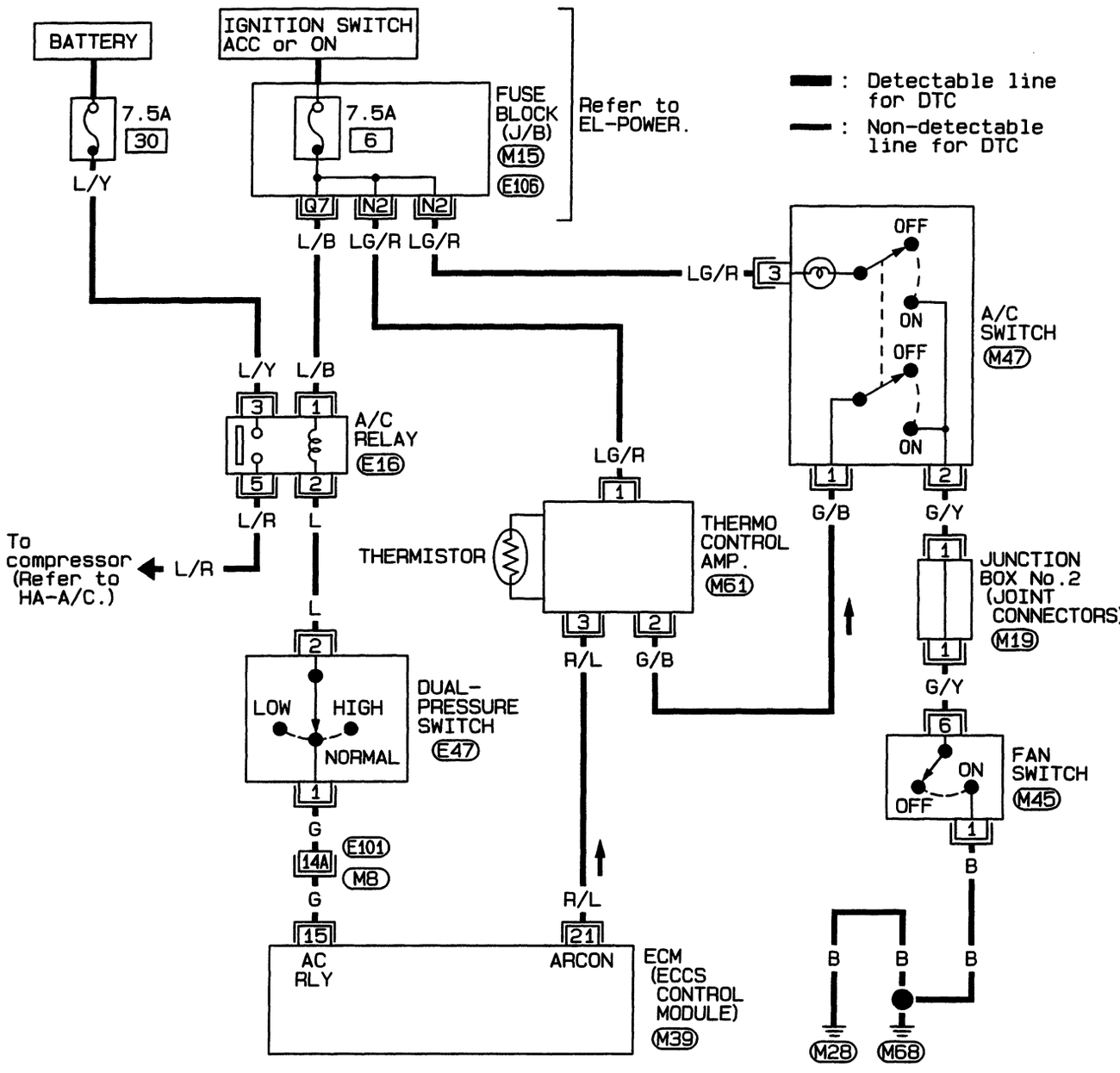
↓

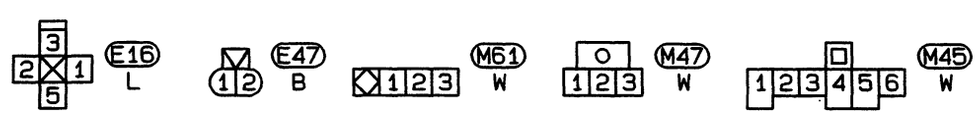
INSPECTION END

EC

Air Conditioner Control

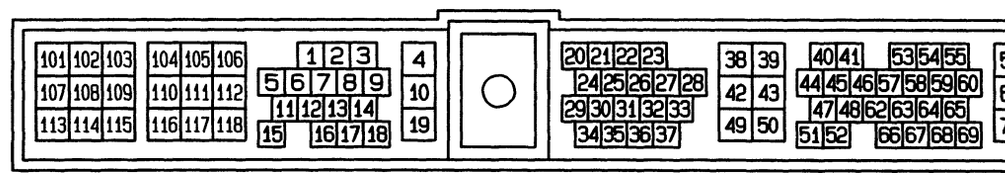
EC-A/CCUT-01





Refer to last page (Foldout page).

M8, E101
M15, E106
M19



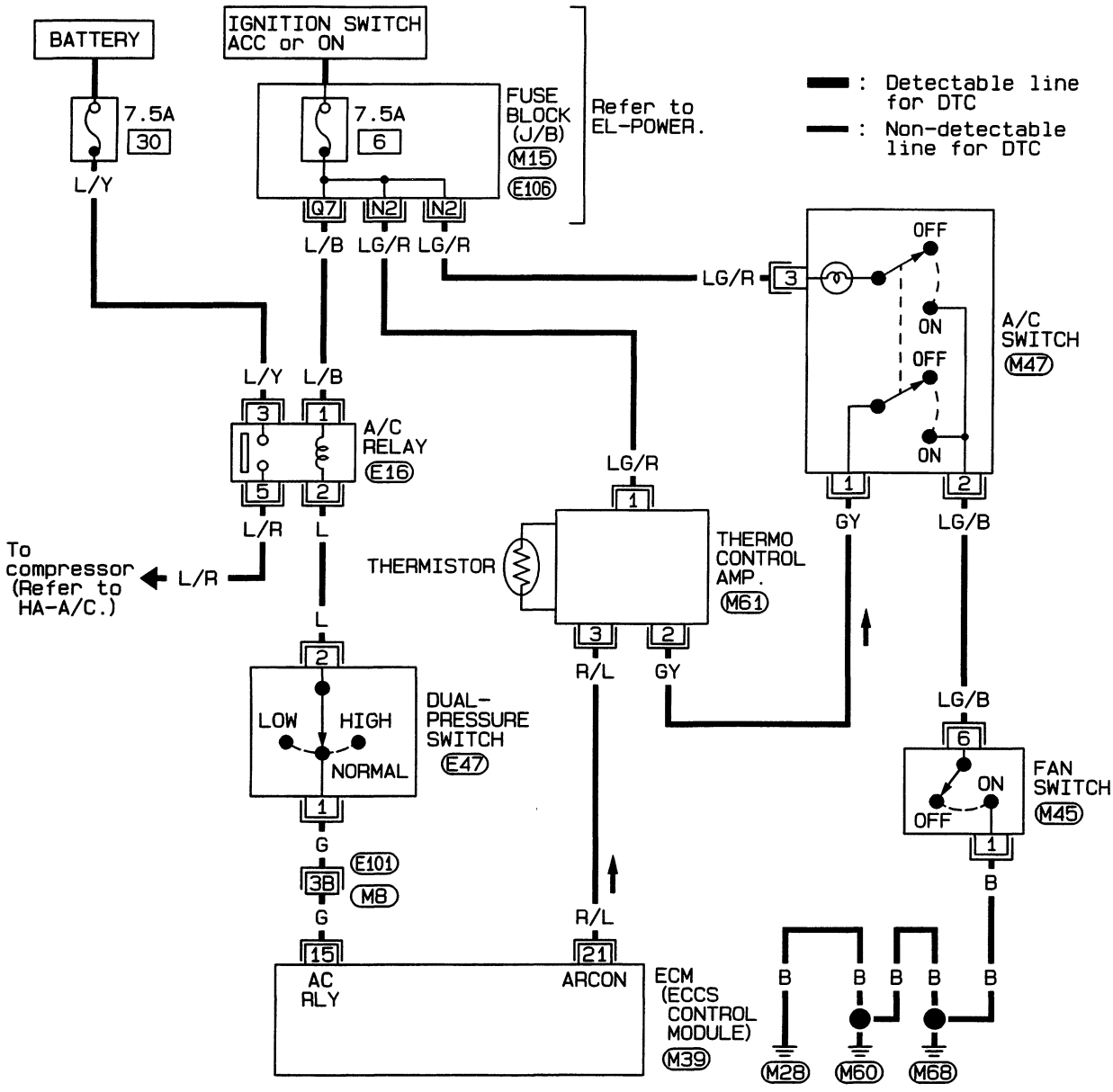
M39 W

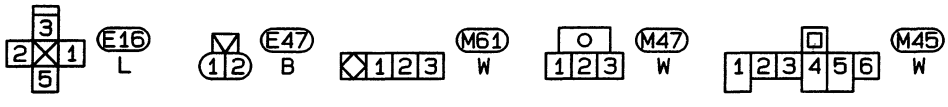


HEC260

Air Conditioner Control (Cont'd)

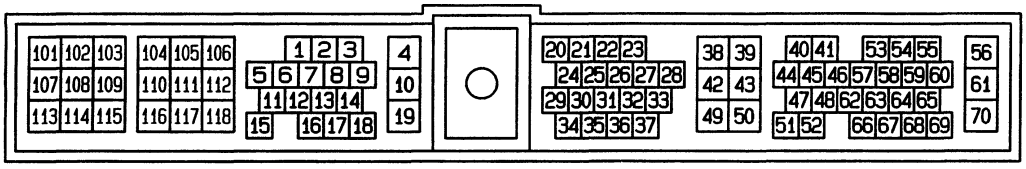
EC-A/CCUT-02





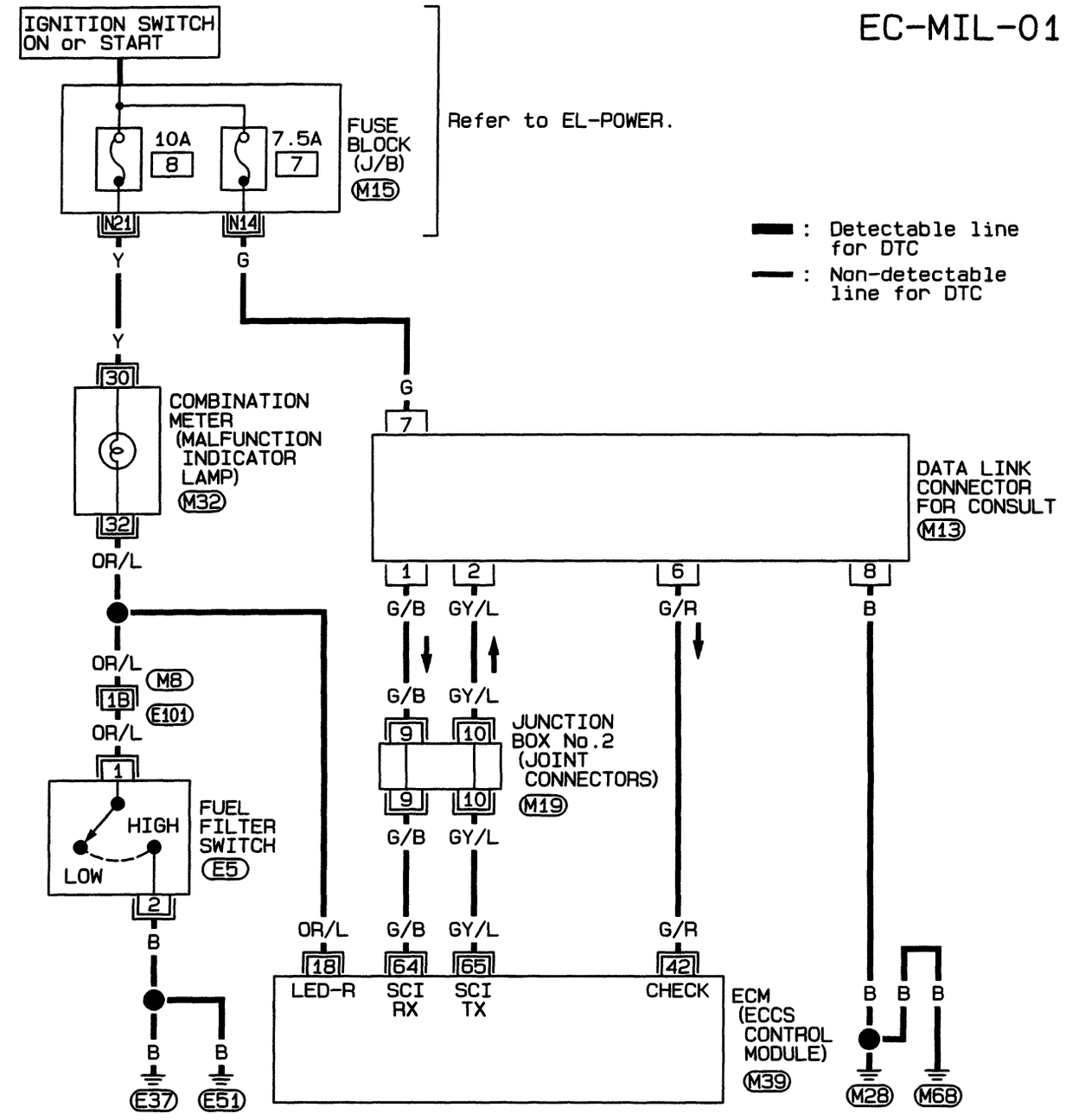
Refer to last page (Foldout page).

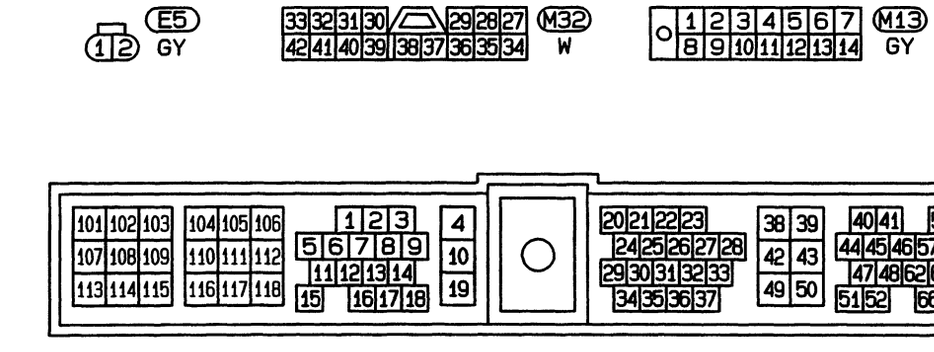
M8, E101
M15, E106



HEC261

MIL & Data Link Connectors

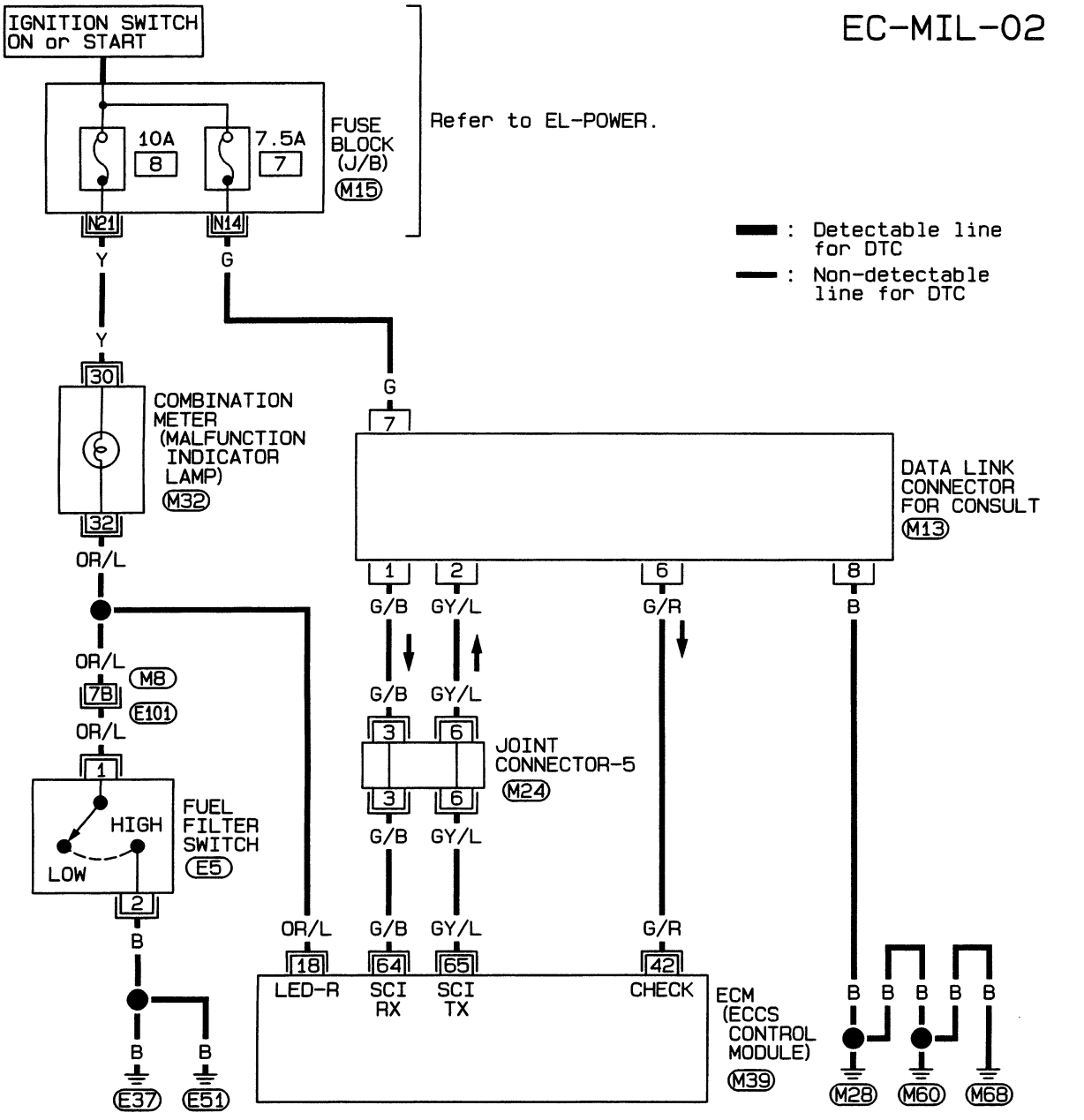


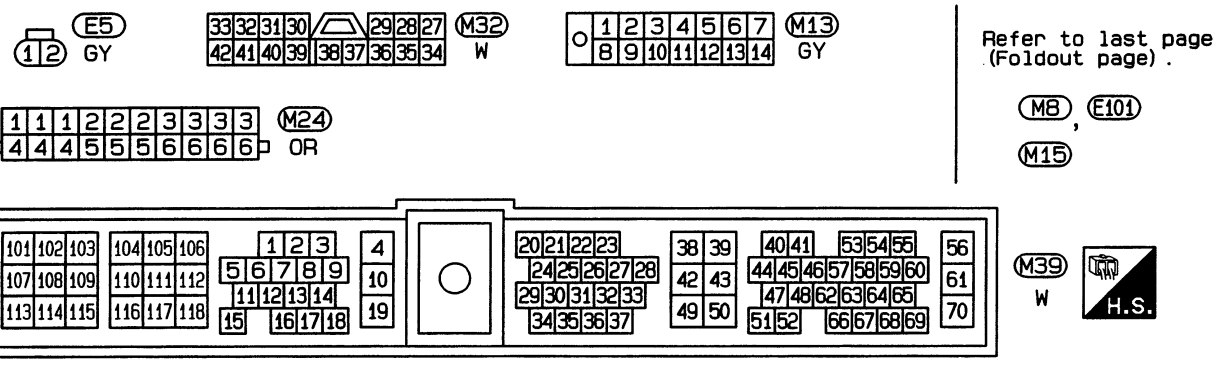


Refer to last page (Foldout page).

HEC267

MIL & Data Link Connectors (Cont'd)





HEC268

Inspection and Adjustment

Idle speed*1 rpm	
No-load*2 (in "N" position)	750 ± 50
Air conditioner: ON (in "N" position)	850 or more
Ignition timing	15° ± 2° BTDC
Throttle position sensor idle position V	0.35 - 0.65

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear defogger)

General Specifications

Unit: rpm

Engine	CD20E
Idle speed	725±25
A/C: ON	825±25
Maximum engine speed	5,400

Pump numbers

Engine	Part number	Pump assembly number
CD20E	16700 2J610	NP-VE4/ 10E2500LNP13

Injection Nozzle

INSPECTION AND ADJUSTMENT

Injection nozzle assembly

Unit: kPa (bar, kg/cm^2, psi)

Initial injection pressure	
New	13,239 - 14,024 (132.4 - 140.2, 135 - 143, 1,920 - 2,033)
Used	12,259 - 13,239 (122.6 - 132.4, 125 - 135, 1,778 - 1,920)

Adjusting shims

Thickness mm (in)	Parts No.
0.50 (0.0197)	16613-V0700
0.54 (0.0213)	16613-V0702
0.58 (0.0228)	16613-V0704
0.62 (0.0244)	16613-V0706
0.66 (0.0260)	16613-V0708
0.70 (0.0276)	16613-V0710
0.74 (0.0291)	16613-V0712
0.78 (0.0307)	16613-V0714
0.82 (0.0323)	16613-V0716
0.86 (0.0339)	16613-V0718
0.90 (0.0354)	16613-V0720
0.94 (0.0370)	16613-V0722
0.98 (0.0386)	16613-V0724
1.00 (0.0394)	16613-V0760

EC

Inspection and Adjustment

Plunger lift mm (in) (Injection timing)	0.38±0.03 (0°±1° BTDC)

CAMSHAFT POSITION SENSOR (PUMP)

Resistance [at 25°C (77°F)] Ω	1,600

ENGINE COOLANT TEMPERATURE SENSOR

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

CONTROL SLEEVE POSITION SENSOR

Resistance [at 23°C (73°F)] Ω	5.8

Inspection and Adjustment (Cont'd)

ADJUSTMENT RESISTOR

Resistance [at 25°C (77°F)]	kΩ	0.2 - 15.0

INJECTION TIMING CONTROL VALVE

Resistance [at 20°C (68°F)]	Ω	Approximately 11

ELECTRIC GOVERNOR

Resistance [at 23°C (73°F)]	Ω	0.6

CRANKSHAFT POSITION SENSOR (TDC)

Resistance [at 25°C (77°F)]	Ω	Approximately 1,215 - 1,485

GLOW PLUG

Resistance [at 25°C (77°F)]	Ω	0.5

ACCELERATOR POSITION SENSOR

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

FUEL TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.5
25 (77)	1.9 - 2.1
50 (122)	0.75 - 0.86
60 (140)	0.538 - 0.624
80 (176)	0.289 - 0.344