ENGINE CONTROL SYSTEM

SECTION EC

MODIFICATION NOTICE:

Gasoline engine

- KA24DE engine has been newly adopted.
- Wiring Diagrams of KA24E and Z24S engines have been changed.

Diesel engine

- The quick glow system for models for Australia has been modified to the cold area specifications. The solenoid timer is not used on models for Australia.
- Wiring diagrams have been changed.

CONTENTS

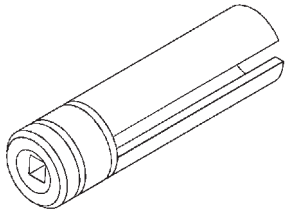
CONTENTS (Cont'd)

CONTENTS (Cont'd)

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

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

Special Service Tool (KA24DE engine)

Tool number Tool name	Description
KV10117100 Heated oxygen sensor wrench	 NT379 Loosening or tightening front heated oxygen sensor with 22 mm (0.87 in) hexagon nut

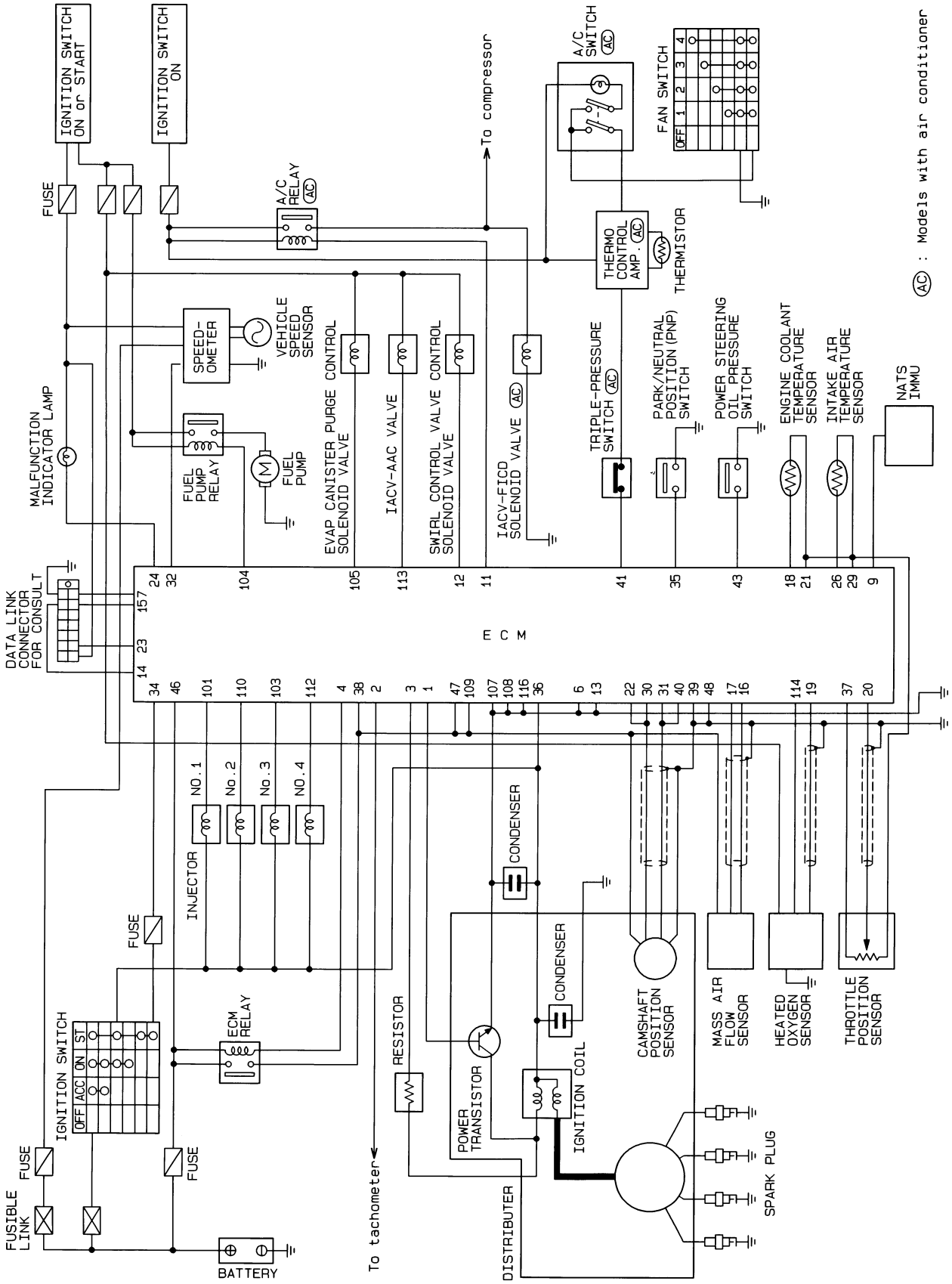
Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The SRS system composition which is available to NISSAN MODEL D22 is as follows (The composition varies according to the destination and optional equipment.):
Driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioner, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

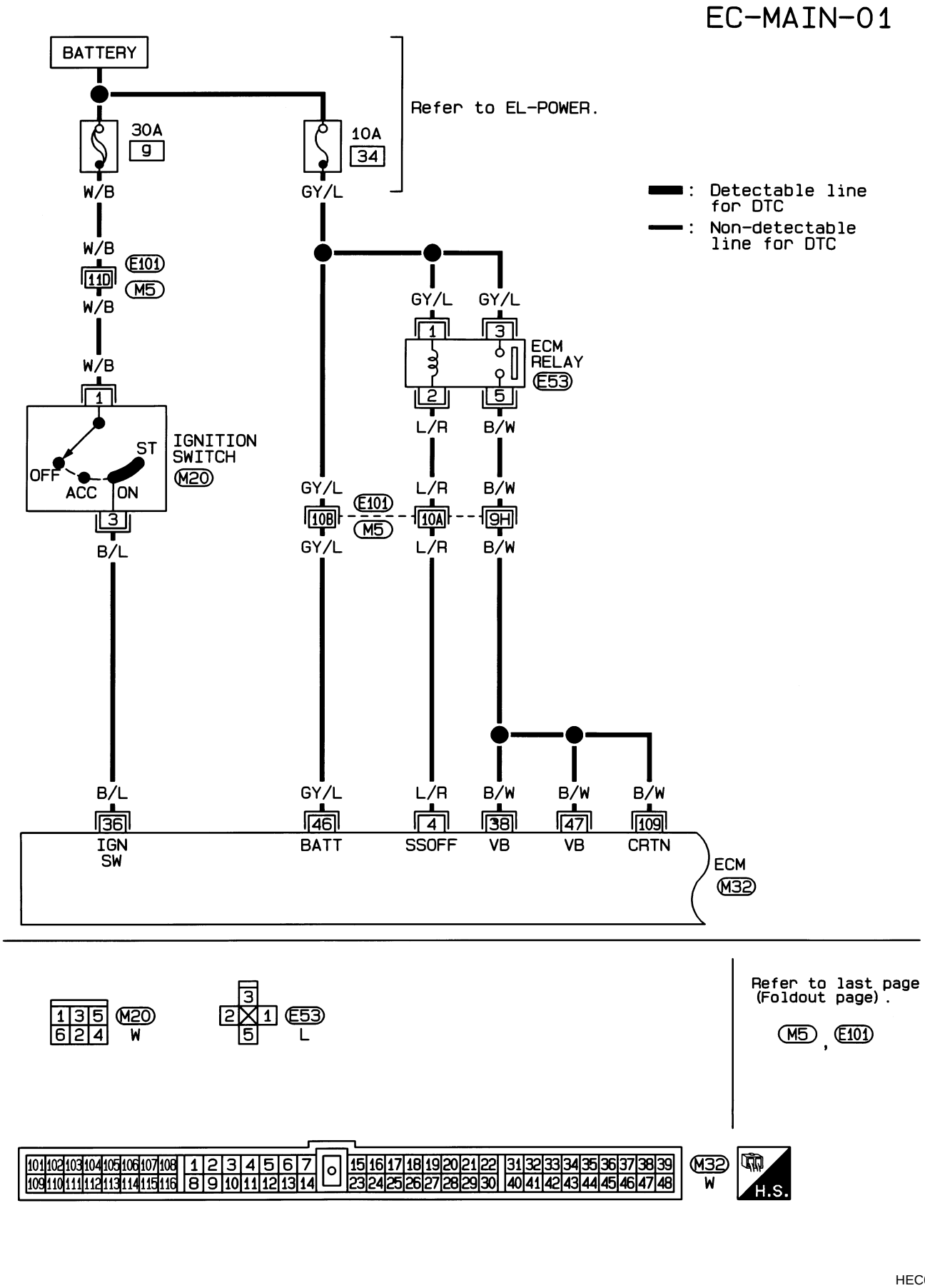
- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation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

Circuit Diagram



HEC631

Main Power Supply and Ground Circuit

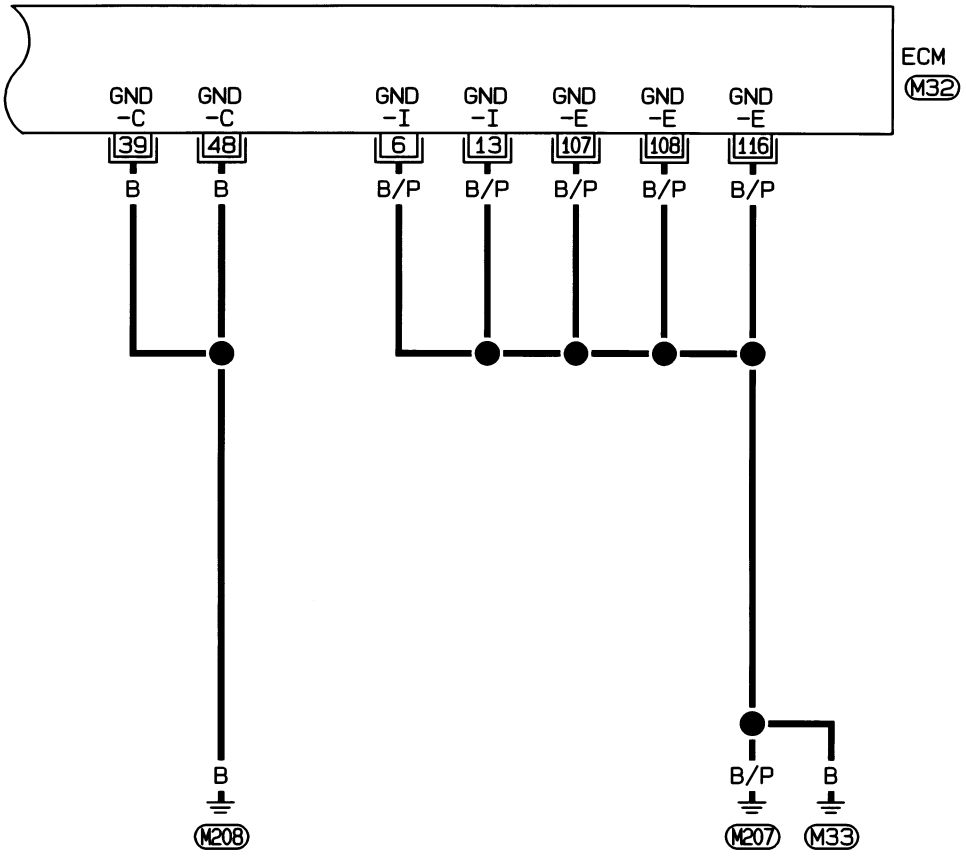


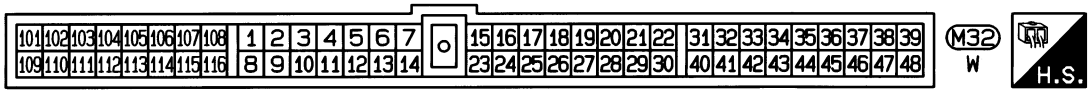
HEC632

Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-02

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

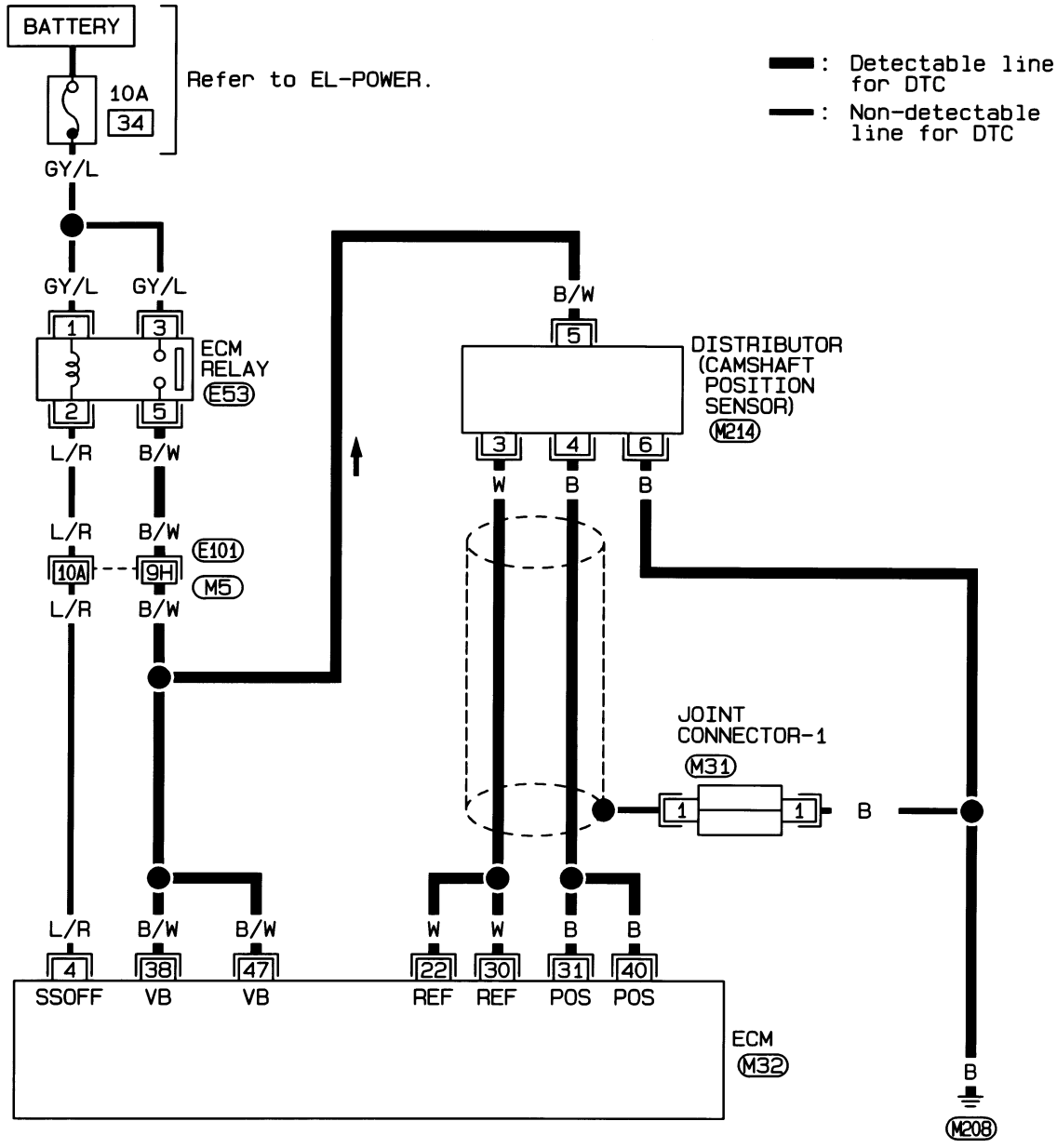


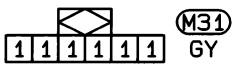


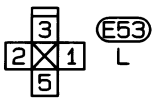
HEC633

Camshaft Position Sensor (CMPS)

EC-CMPS-01







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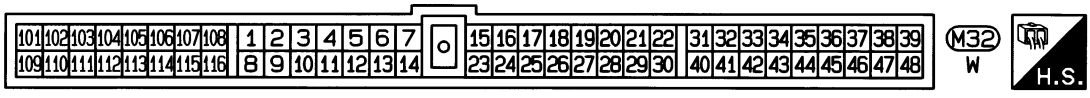
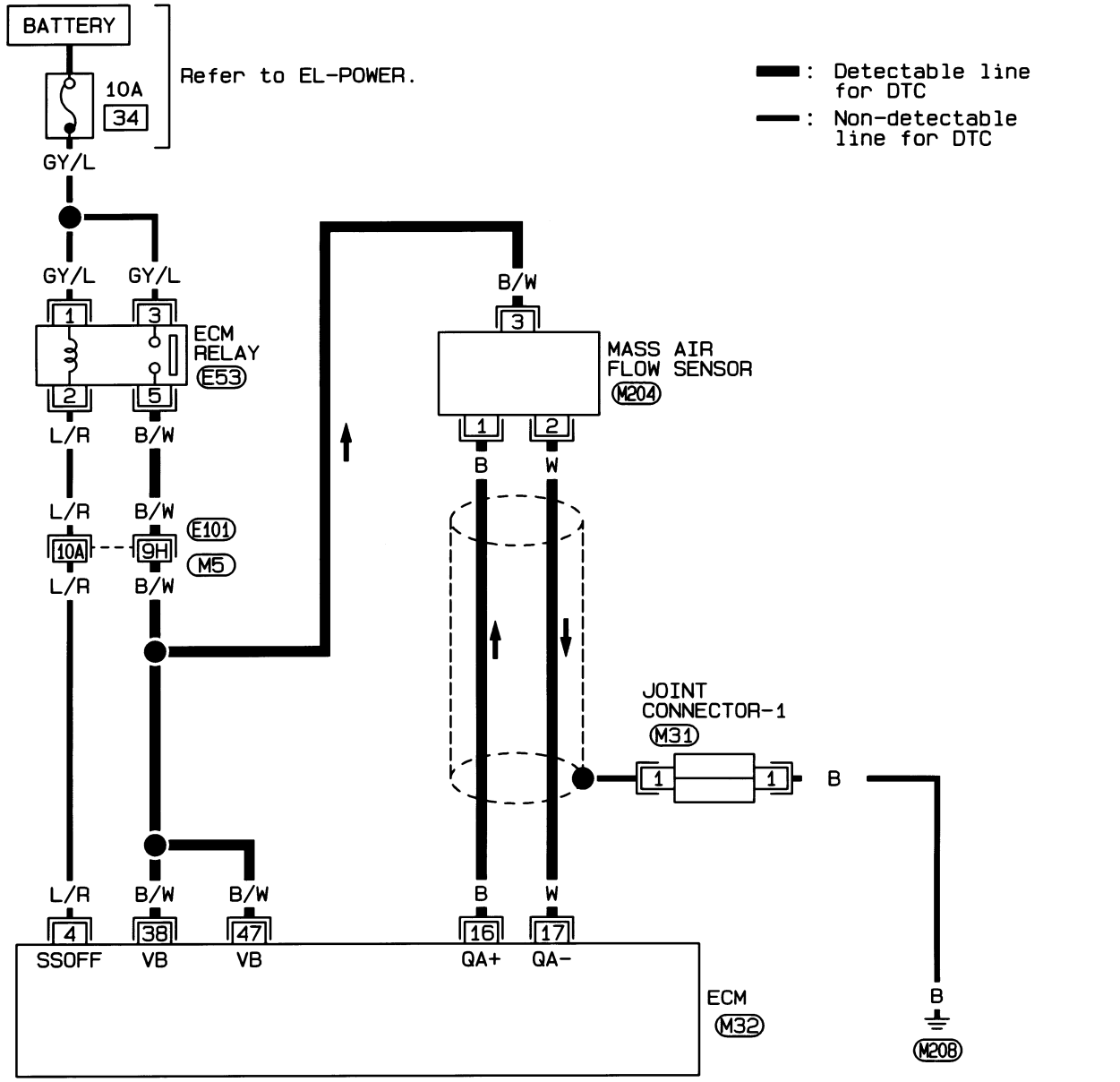
M5, E101

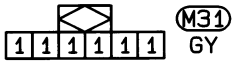


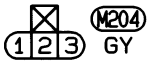
HEC634

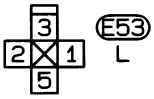
Mass Air Flow Sensor (MAFS)

EC-MAFS-01









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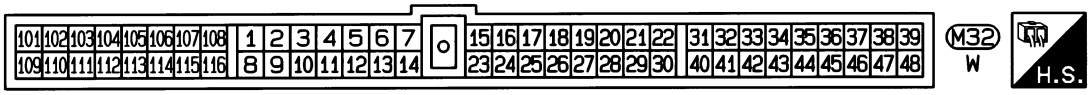
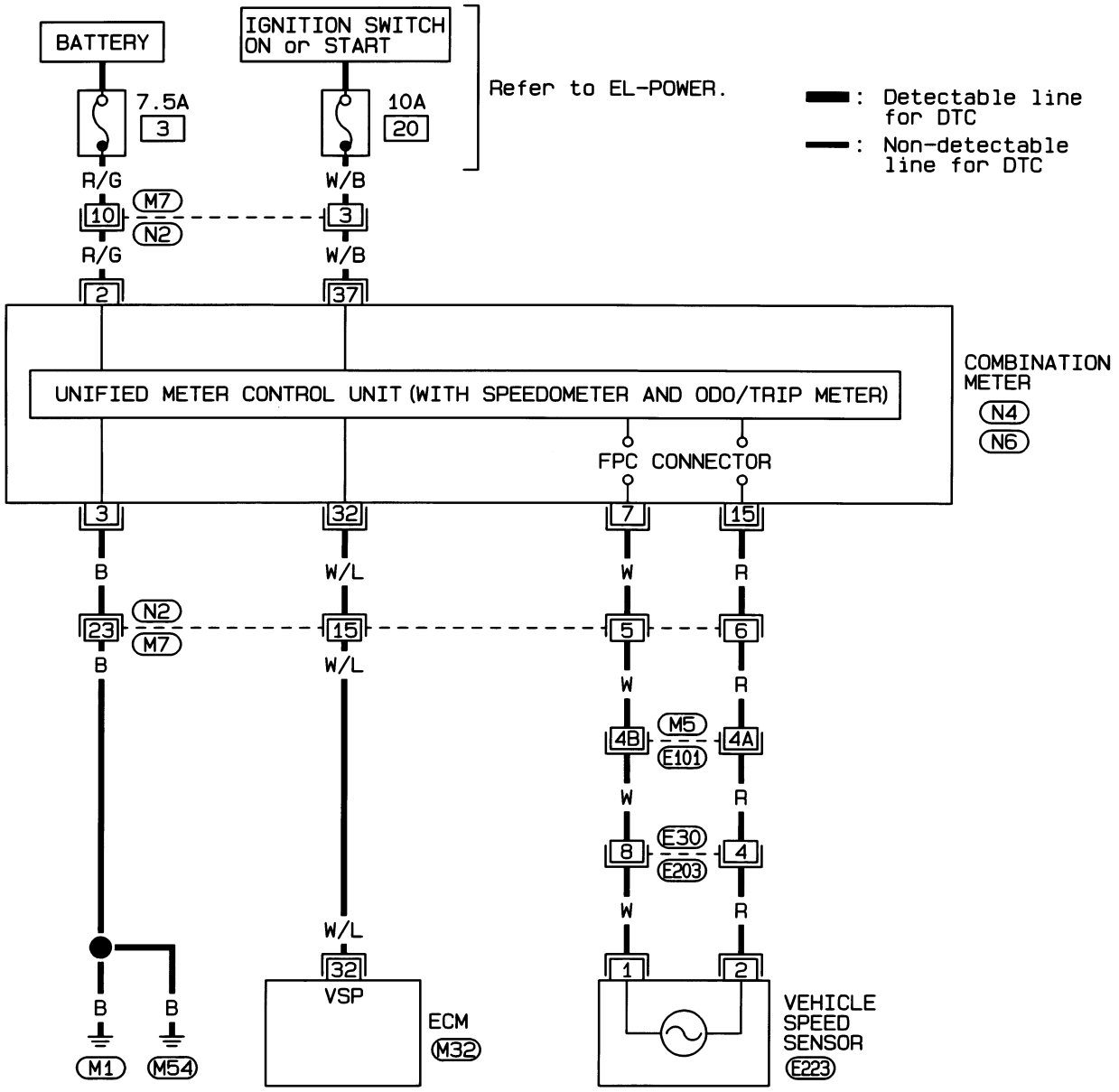
M5, E101

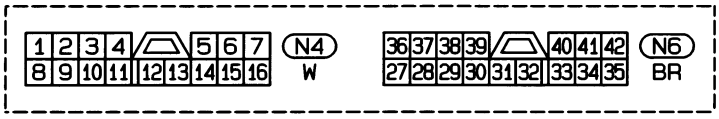


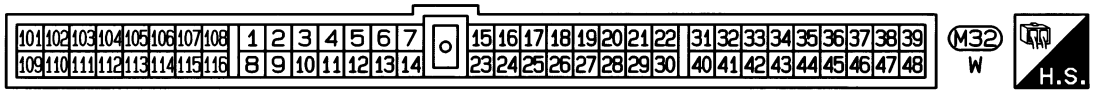
HEC635

Vehicle Speed Sensor (VSS)

EC-VSS-01







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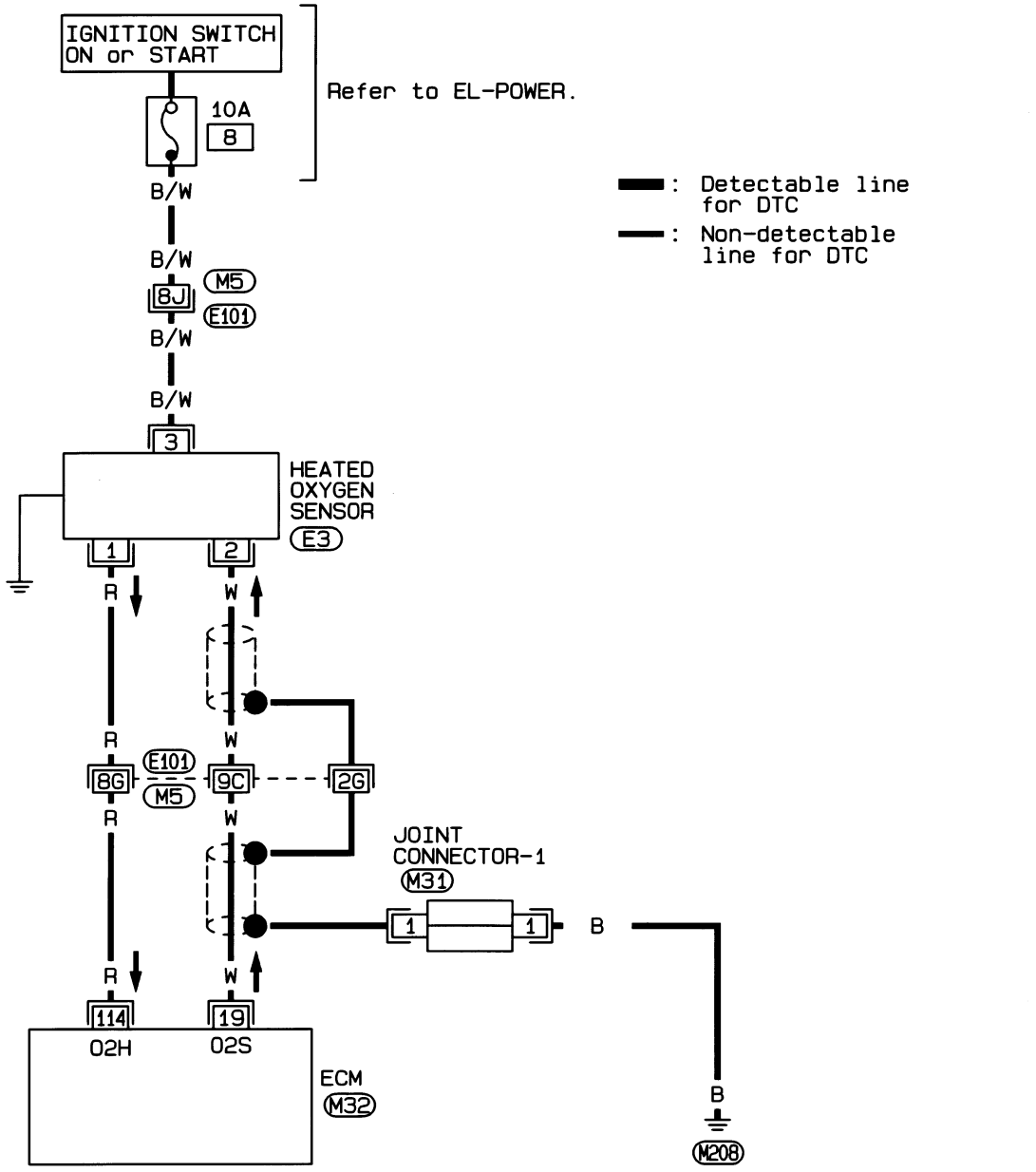
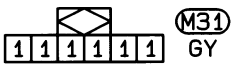
M5, E101

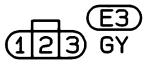
HEC636

Heated Oxygen Sensor (HO2S)
— LHD Models —

EC-H02S-01







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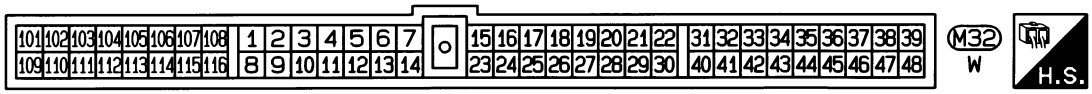
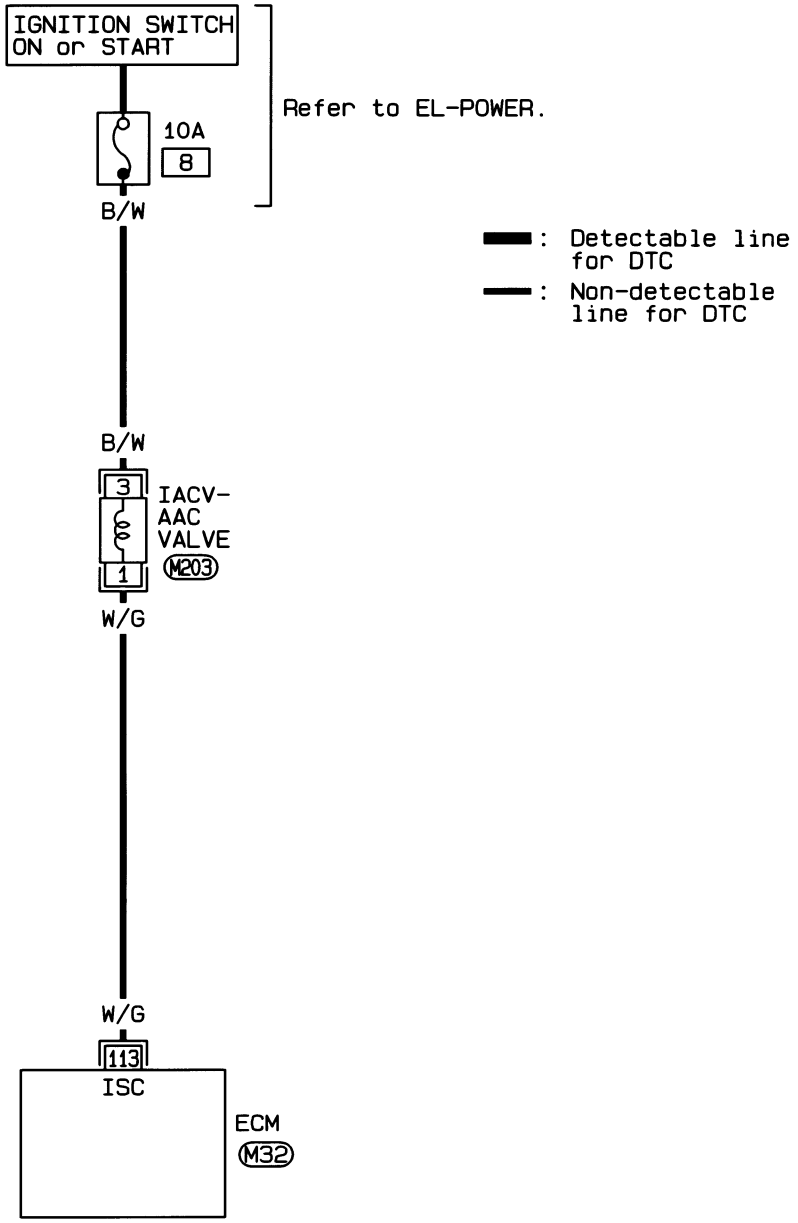
M5, E101

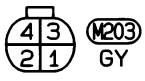


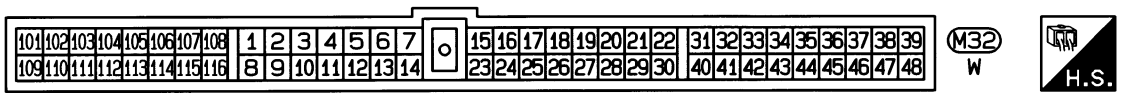
HEC637

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

EC-AAC/V-01



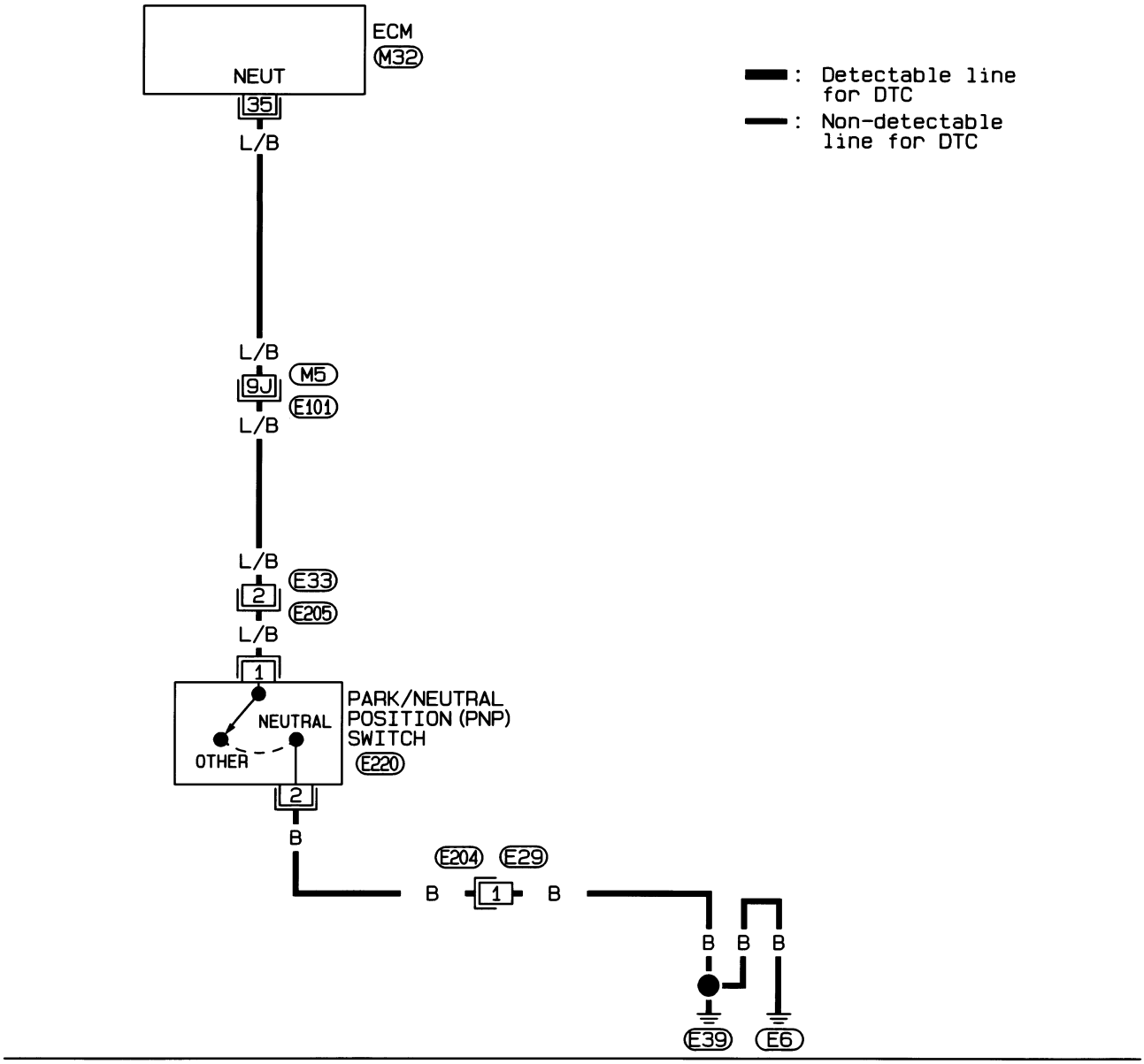


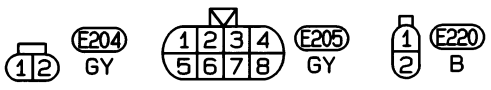


HEC638

Park/Neutral Position Switch

EC-PNP/SW-01





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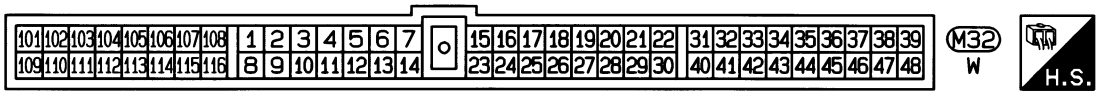
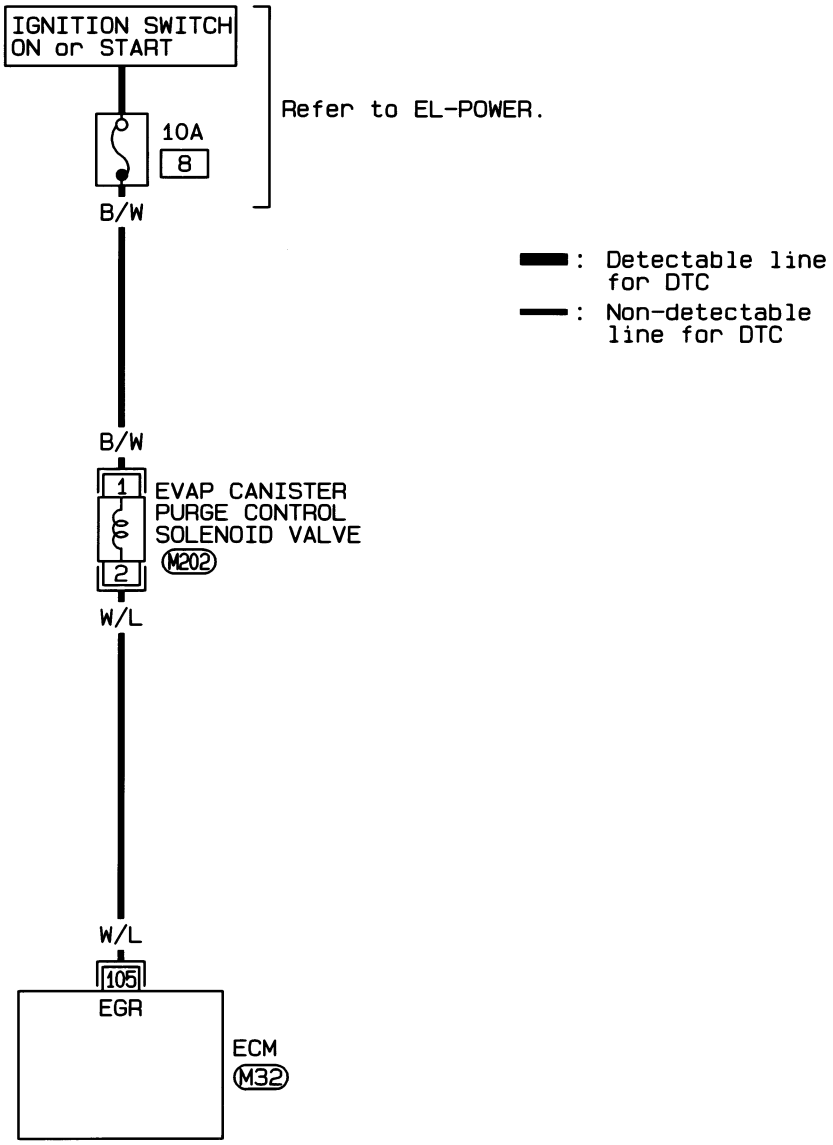
M5, E101

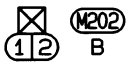


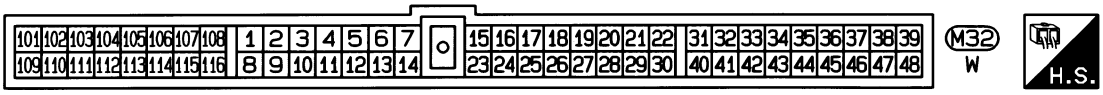
HEC639

EVAP Canister Purge Control Solenoid Valve

EC-PGC/V-01



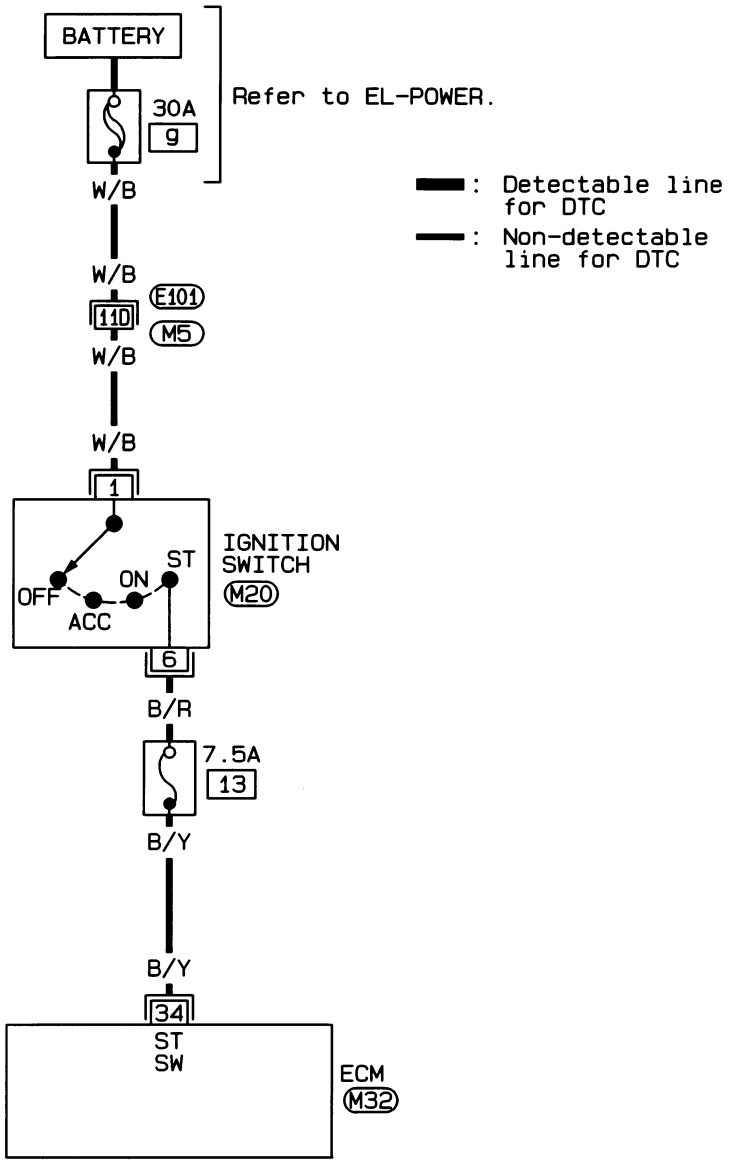


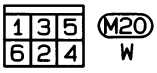


HEC640

Start Signal

EC-S/SIG-01





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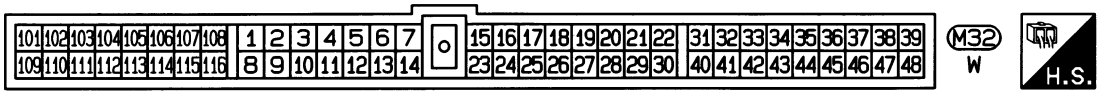
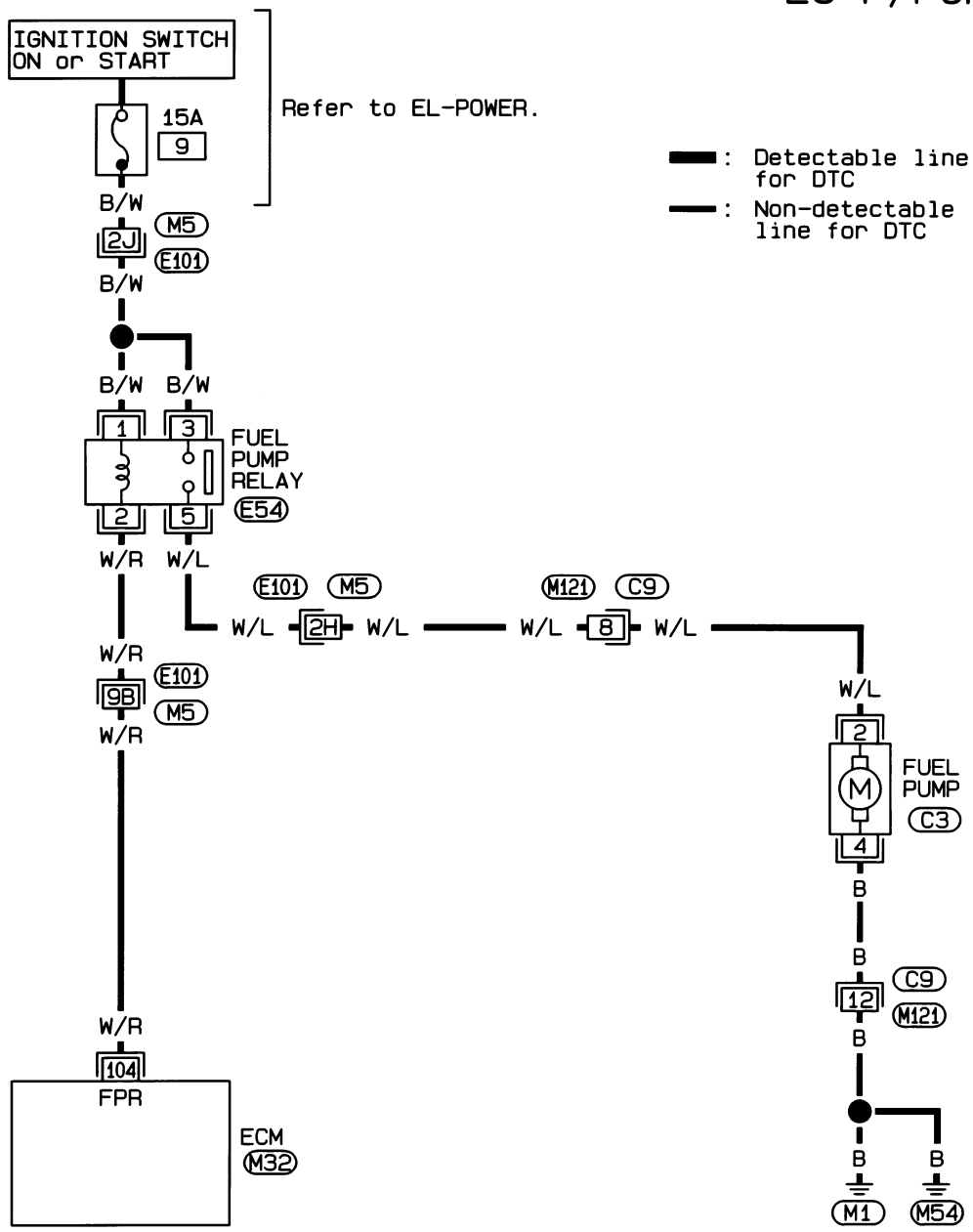
M5, E101

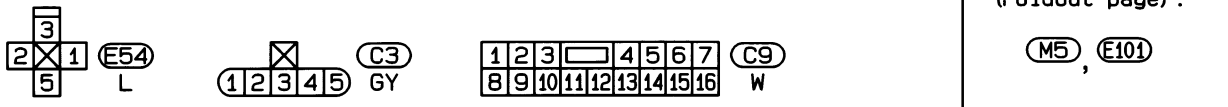


HEC641

Fuel Pump

EC-F/PUMP-01





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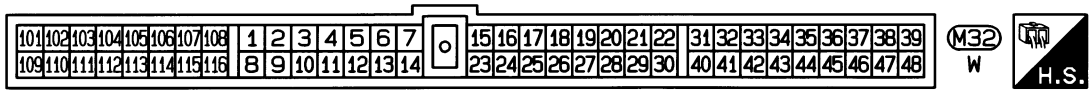
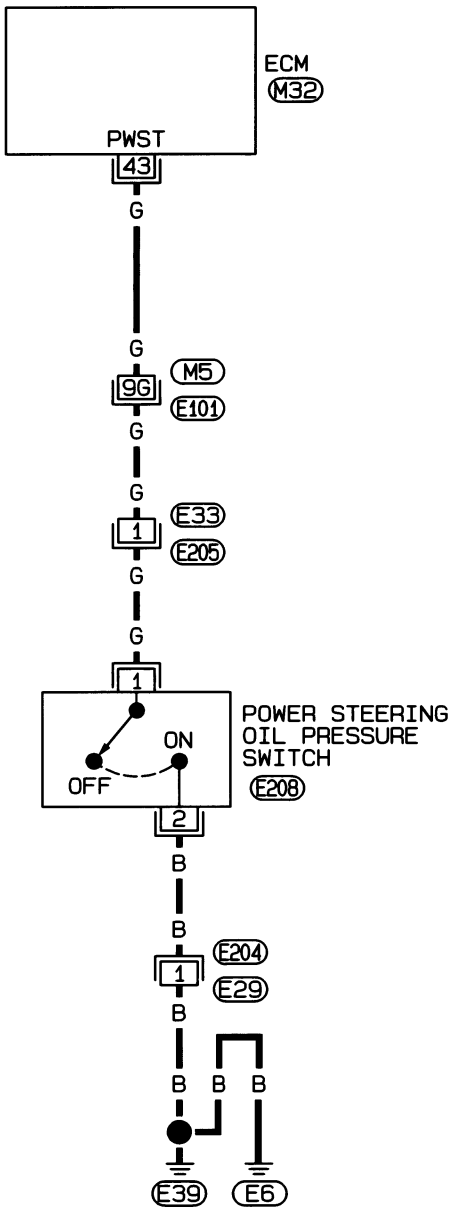
M5, E101



HEC642

Power Steering Oil Pressure Switch

EC-PST/SW-01

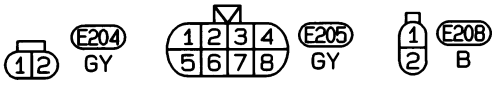


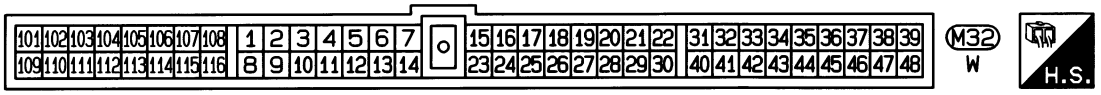
: Detectable line for DTC

: Non-detectable line for DTC

Refer to last page (Foldout page).

M5, E101

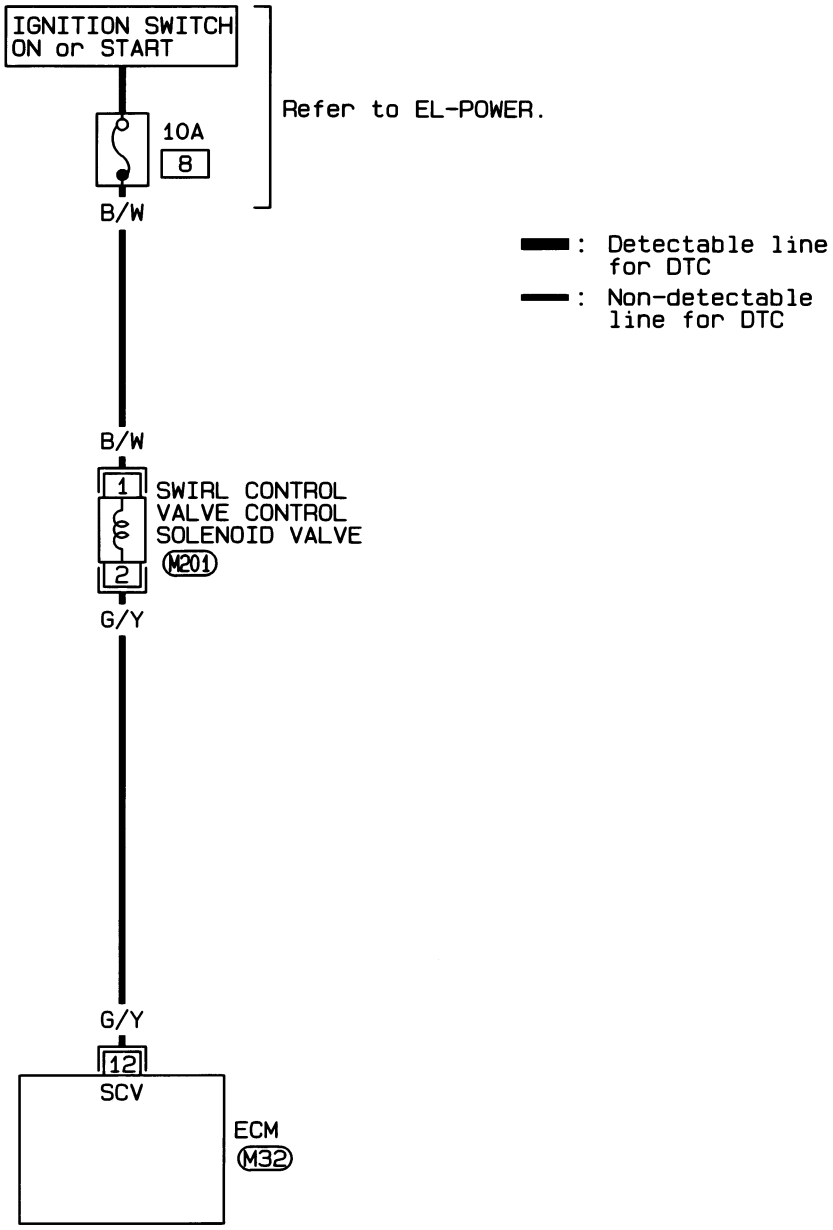


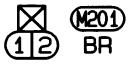


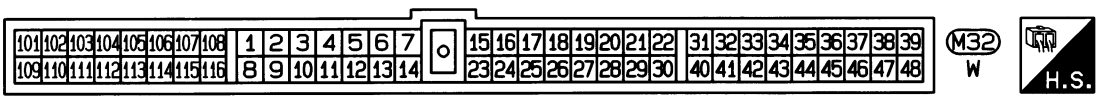
HEC643

Swirl Control Valve Control Solenoid Valve

EC-SWL/V-01

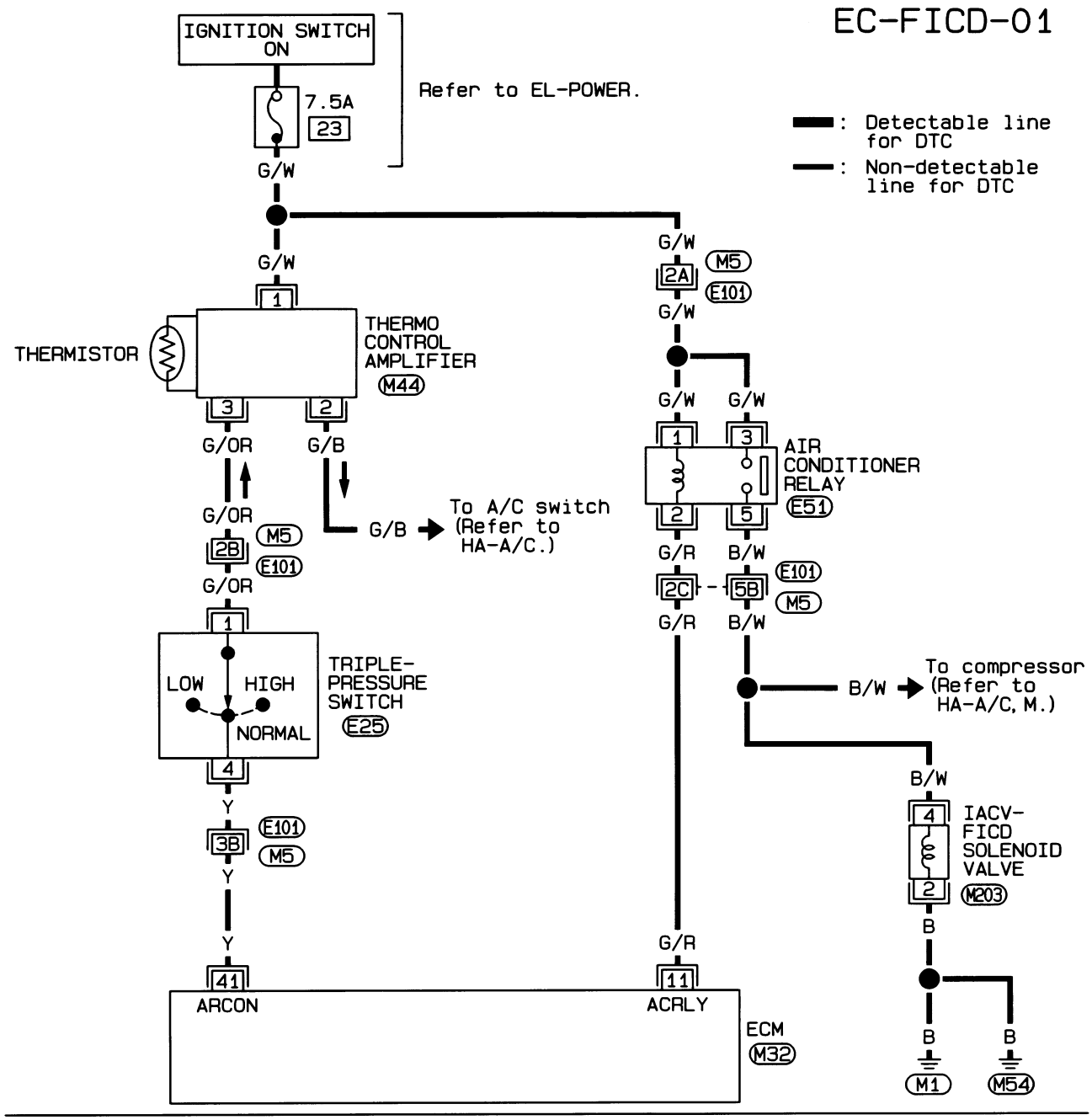






HEC644

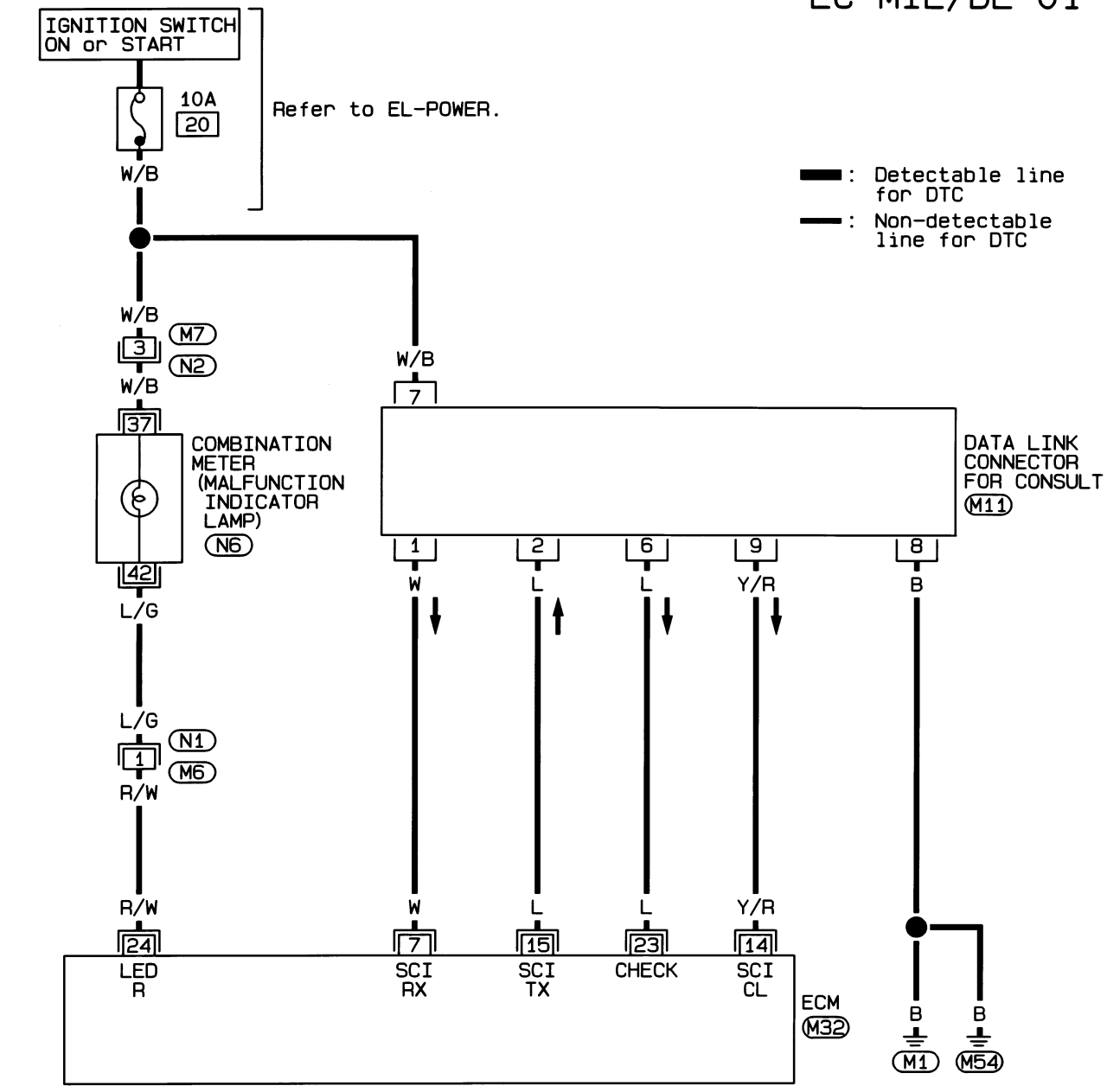
IACV-FICD Solenoid Valve

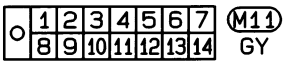


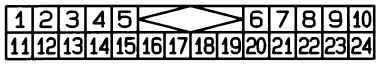
HEC645

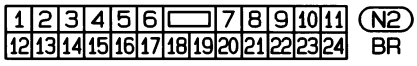
MIL & Data Link Connectors

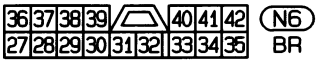
EC-MIL/DL-01

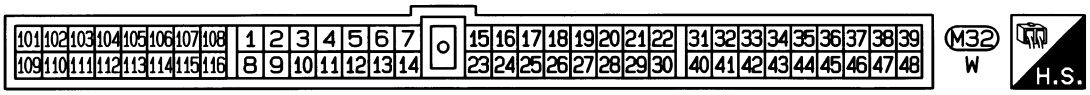












HEC646

Alphabetical & Numerical Index for DTC

ALPHABETICAL INDEX FOR DTC

X: Applicable
—: Not applicable

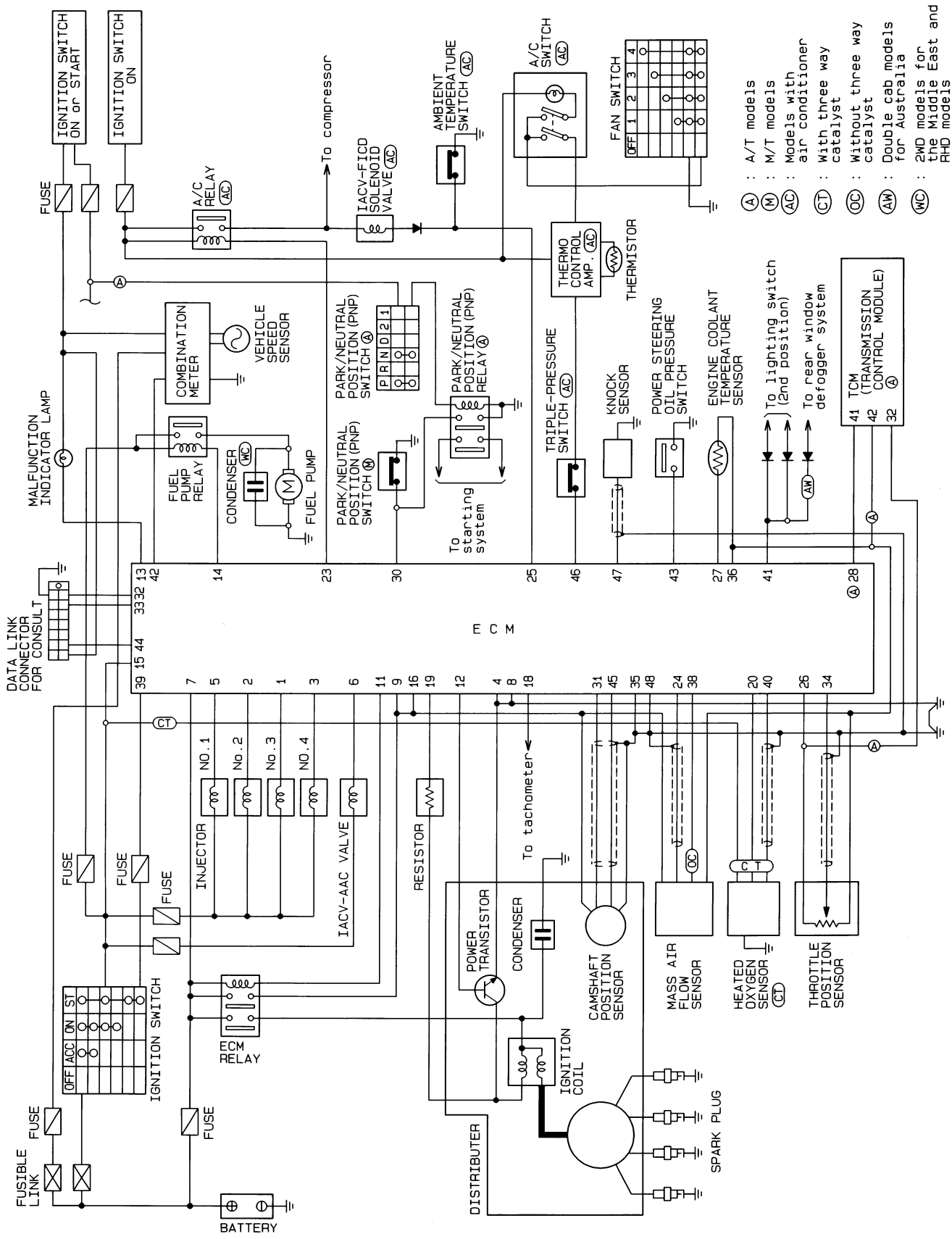
Items (CONSULT screen terms)	DTC	MIL illumination	Reference page
CAMSHAFT POSI SEN	11	—	EC-92
COOLANT TEMP SEN	13	X	EC-106
IGN SIGNAL-PRIMARY	21	X	EC-110
KNOCK SEN	34	—	EC-122
MASS AIR FLOW SEN	12	X	EC-99
NO SELF DIAGNOSTIC FAILURE INDICATED	**55**	**—**	**—**
OVER HEAT	28	X	EC-119
THROTTLE POSI SEN	43	X	EC-126

NUMERICAL INDEX FOR DTC

X: Applicable
—: Not applicable

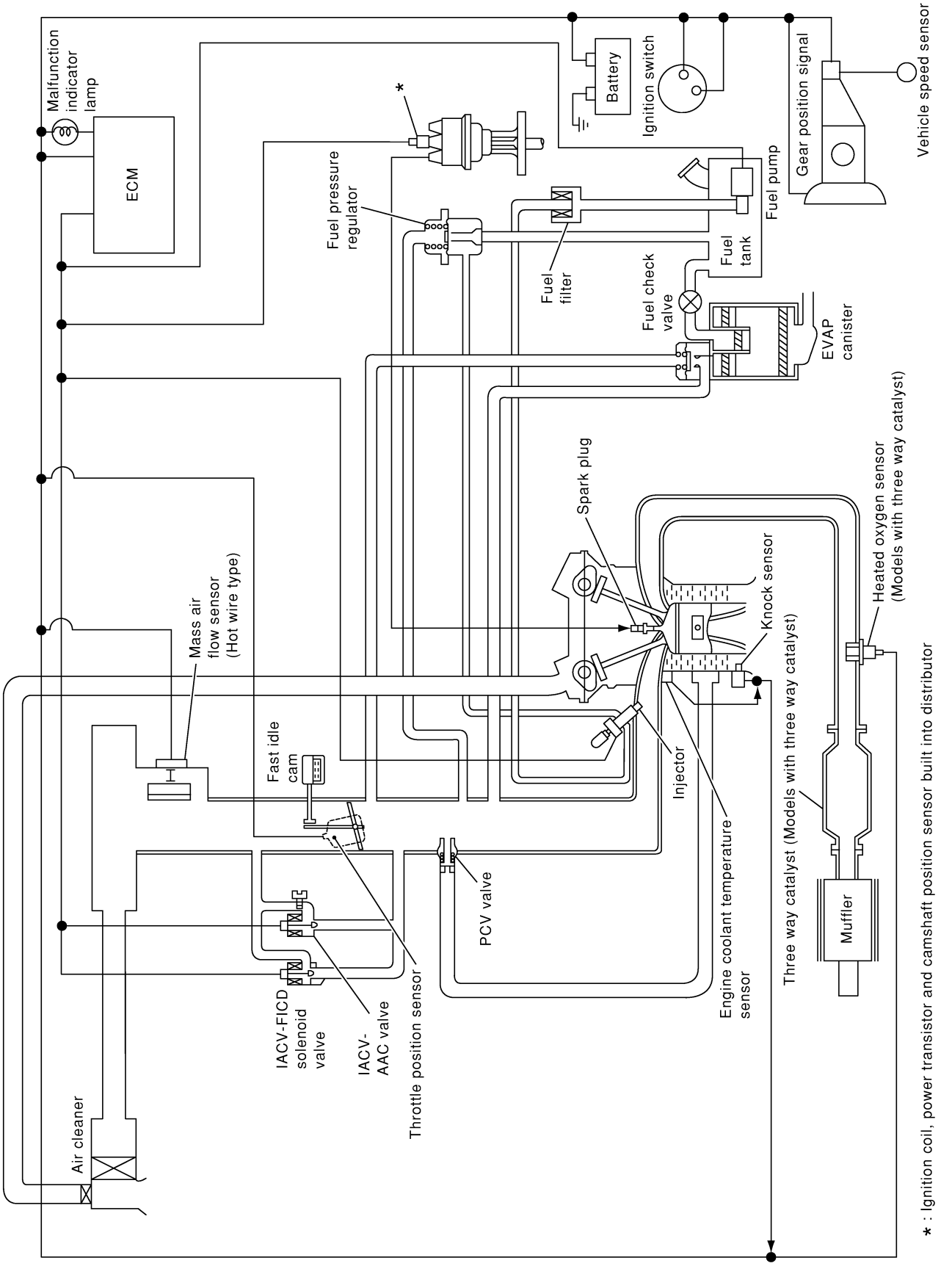
DTC	MIL illumination	Items (CONSULT screen terms)	Reference page
11	—	CAMSHAFT POSI SEN	EC-92
12	X	MASS AIR FLOW SEN	EC-99
13	X	COOLANT TEMP SEN	EC-106
21	X	IGN SIGNAL-PRIMARY	EC-110
28	X	OVER HEAT	EC-119
34	—	KNOCK SEN	EC-122
43	X	THROTTLE POSI SEN	EC-126
55	**—**	**NO SELF DIAGNOSTIC FAILURE INDICATED**	—

Circuit Diagram



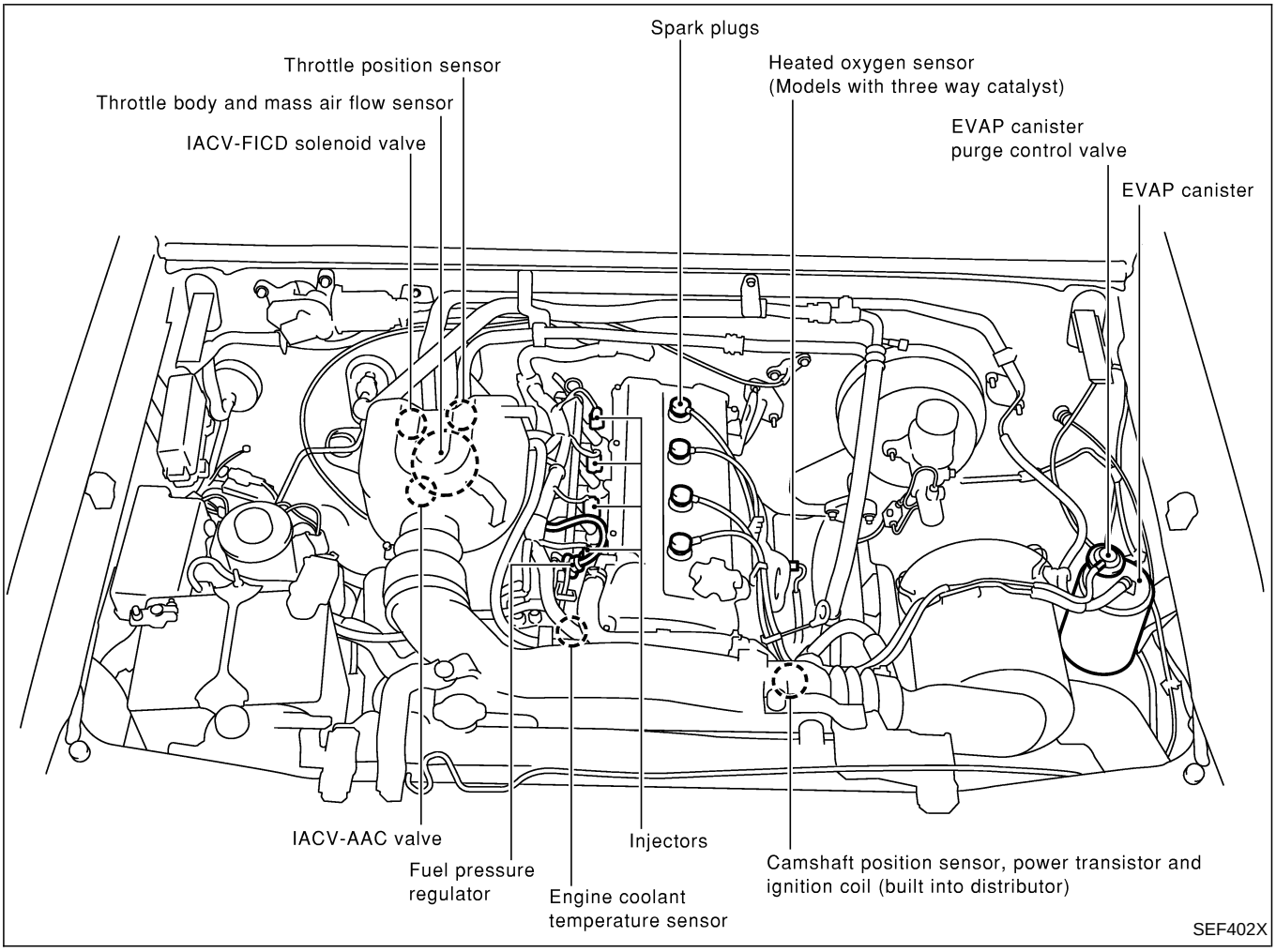
HEC654

System Diagram

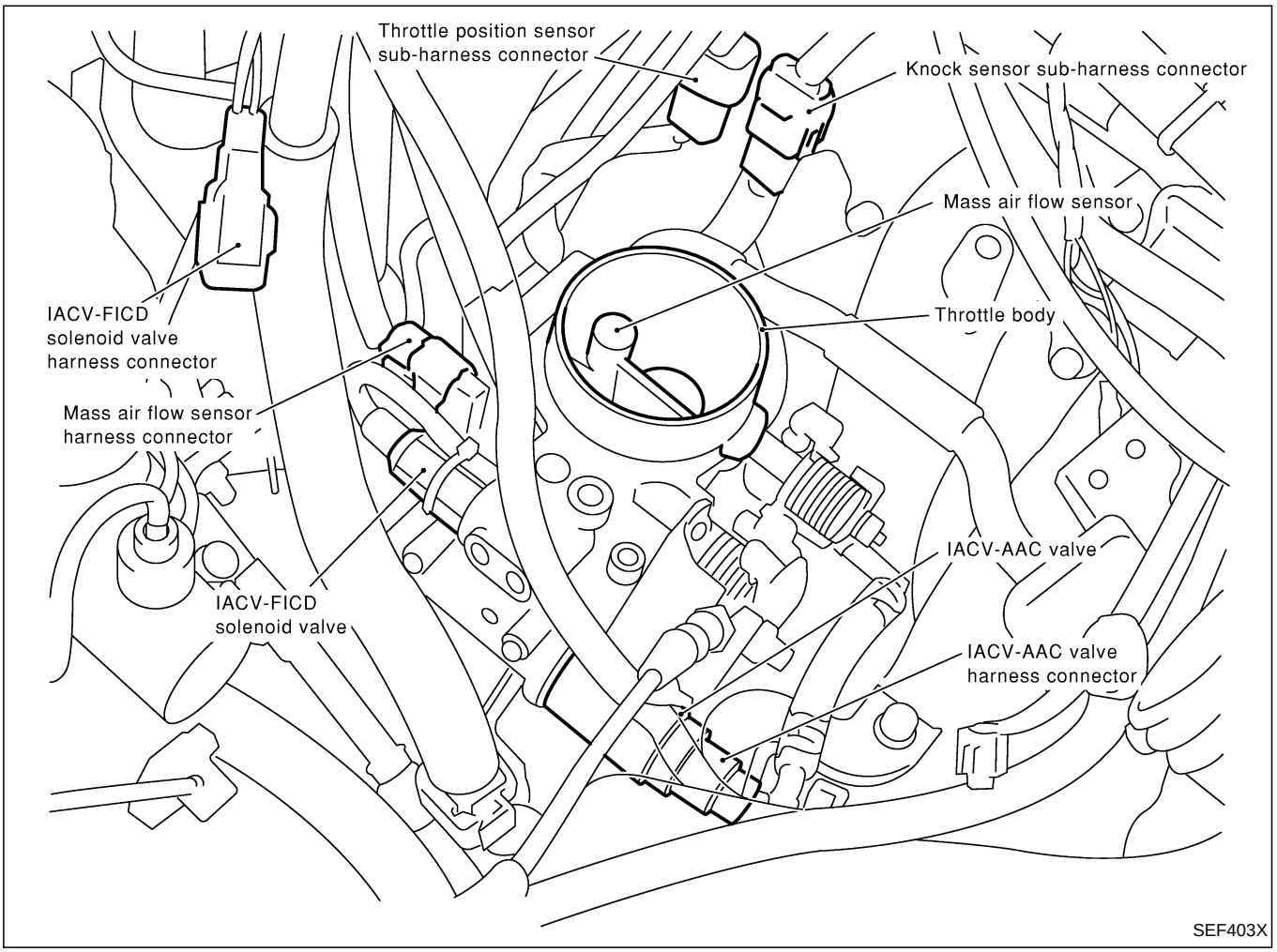


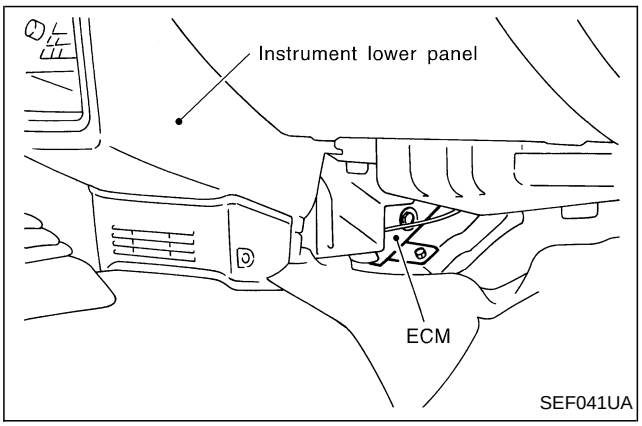
SEF401X

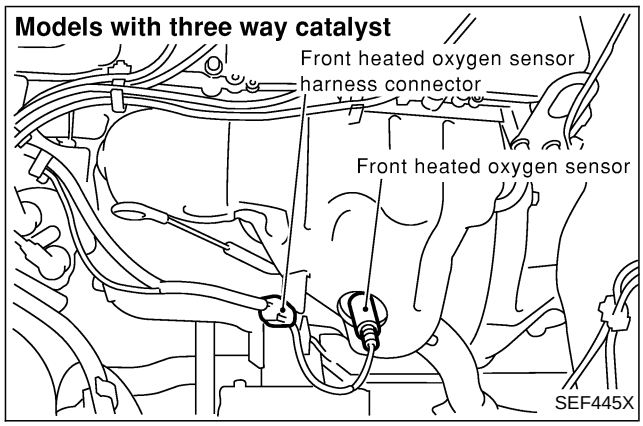
ECM Component Parts Location



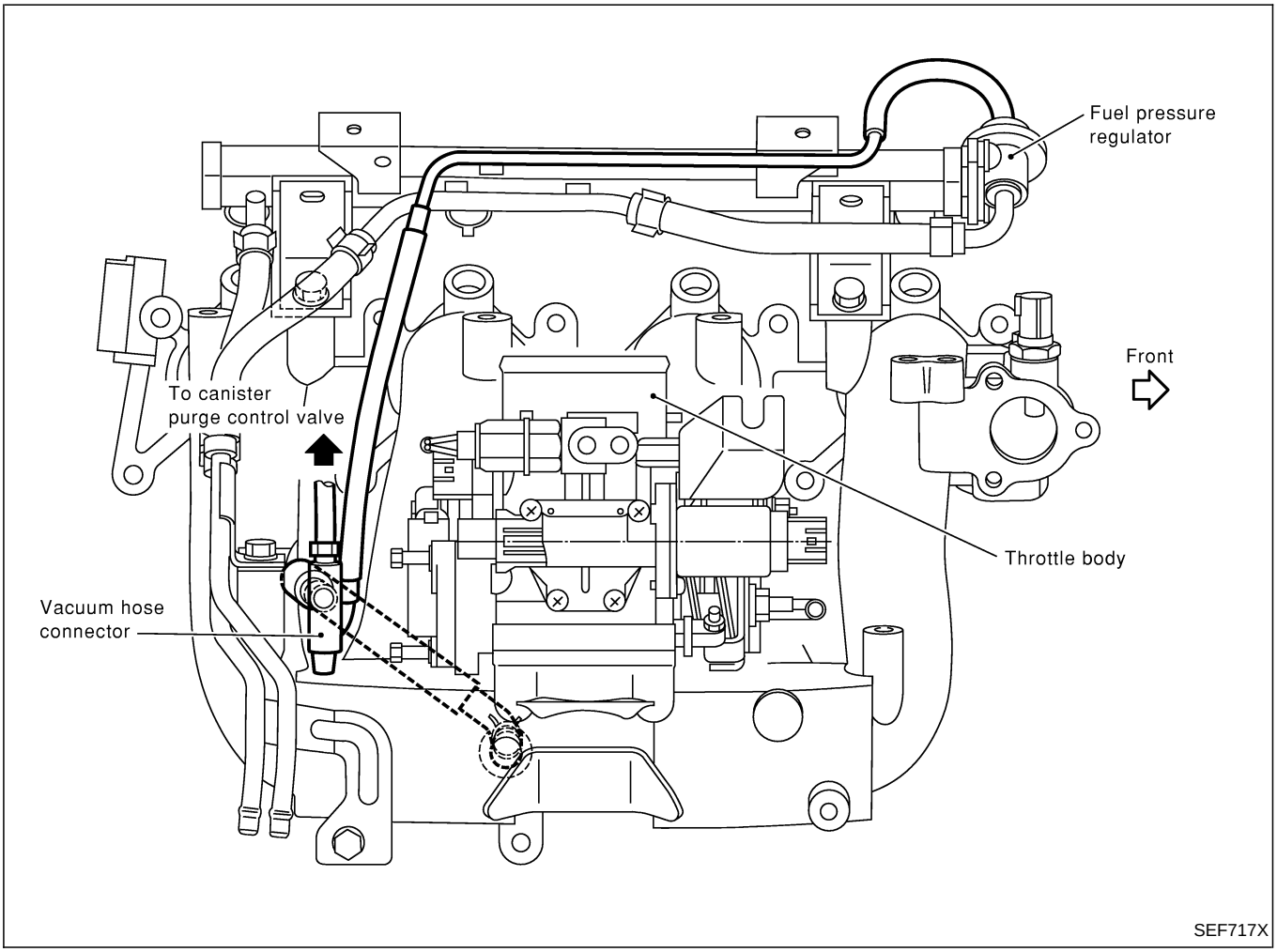
ECM Component Parts Location (Cont'd)

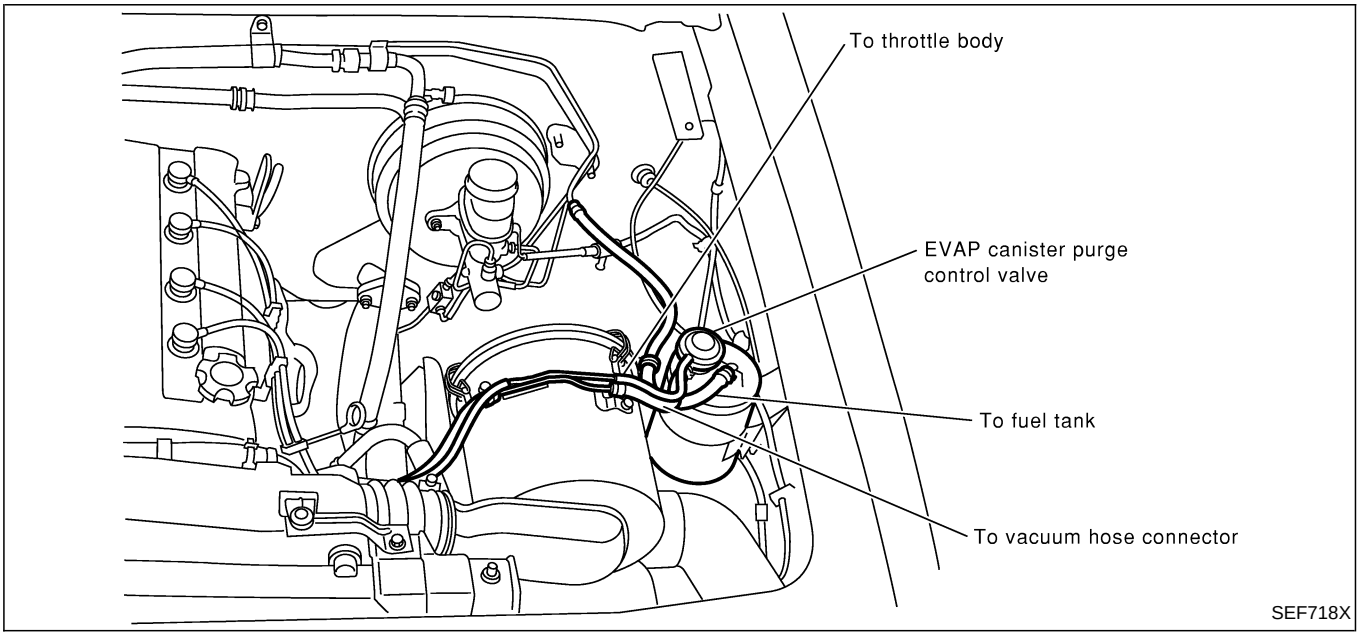




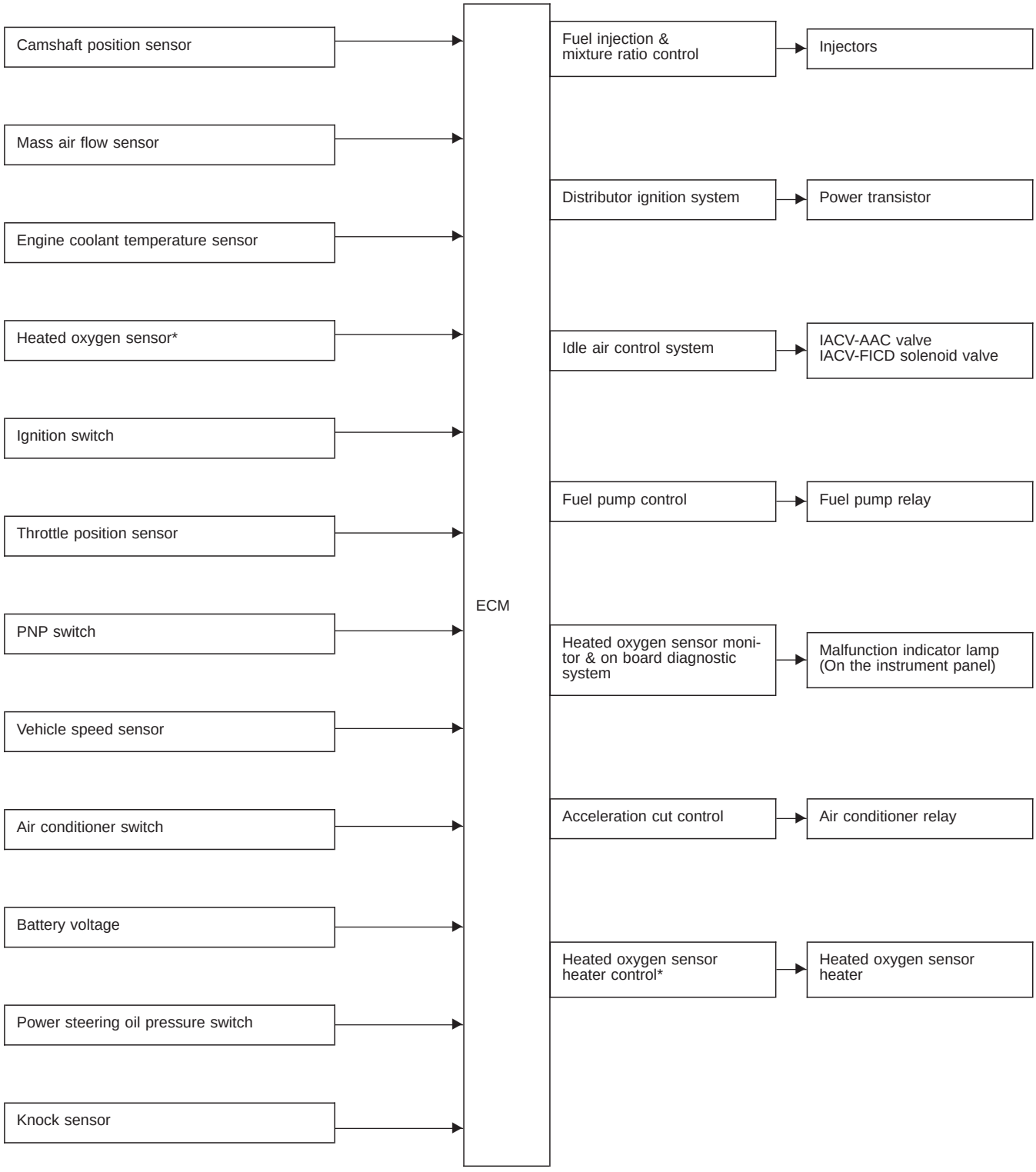


Vacuum Hose Drawing





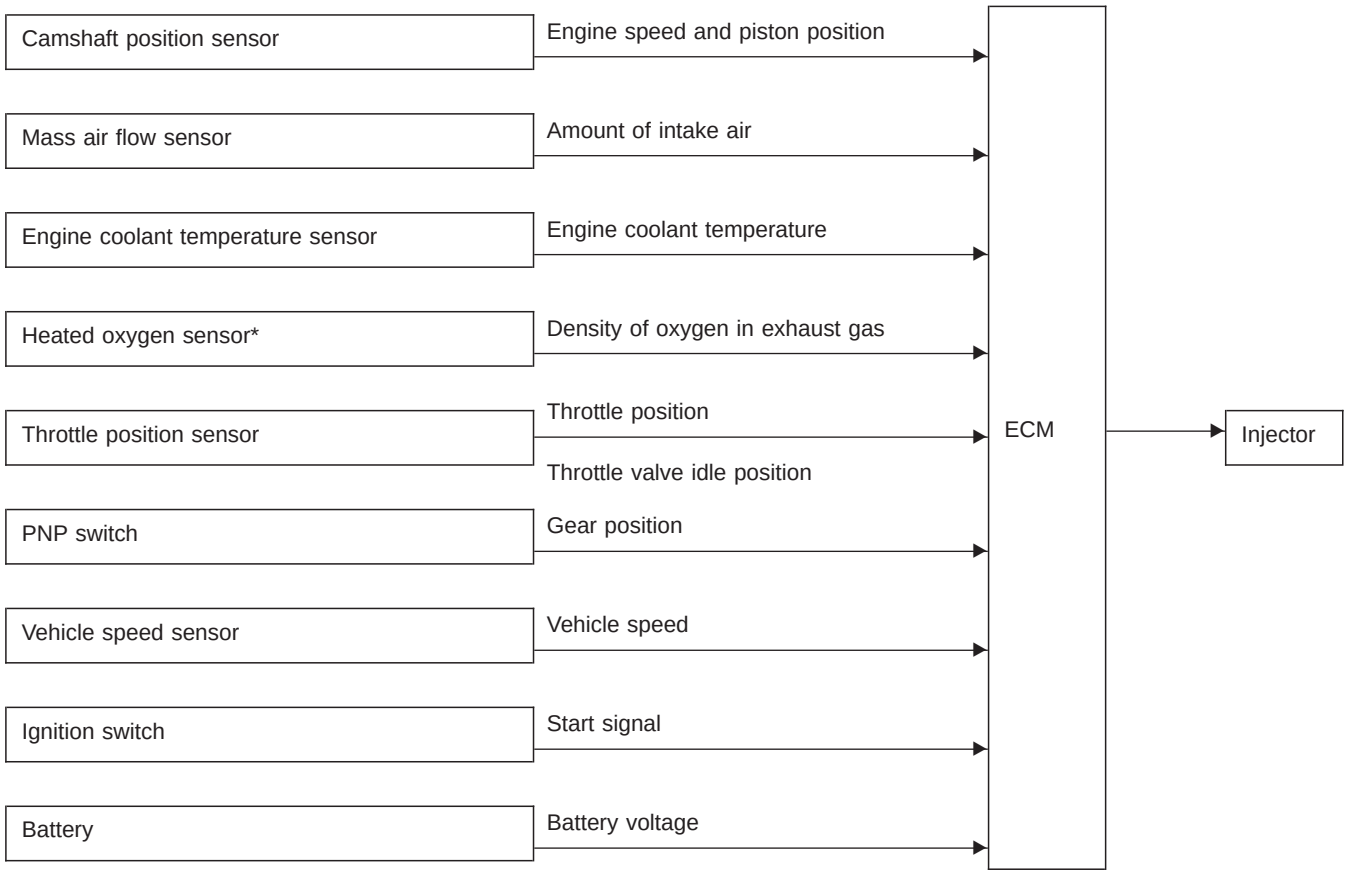
System Chart



*: Models with three way catalyst

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



*: Models with three way catalyst

BASIC MULTIPORT FUEL INJECTION SYSTEM

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

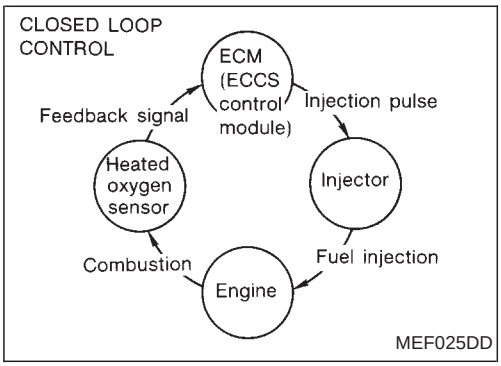
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

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

<Fuel decrease>
- During deceleration
- During high-engine speed operation
- Extremely high-engine coolant temperature

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



MIXTURE RATIO FEEDBACK CONTROL (Models with three way catalyst)

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a heated oxygen sensor in the exhaust manifold to monitor if the engine is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor, refer to page EC-136. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.

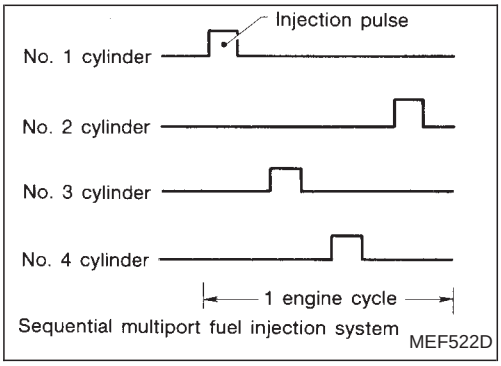
OPEN LOOP CONTROL

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

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

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both Manufacturing differences (i.e. mass air flow sensor hot wire) and characteristic changes during operation (i.e. injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.



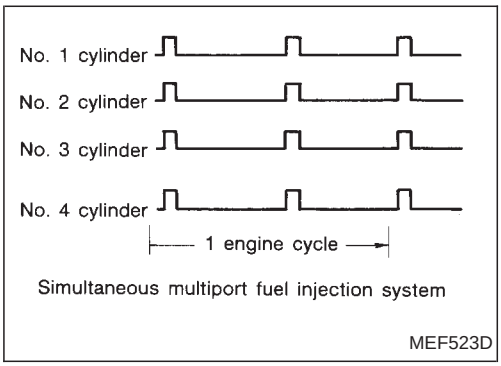
FUEL INJECTION SYSTEM

Two types of systems are used.

Sequential multiport fuel injection system

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

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



Simultaneous multiport fuel injection system
MEF523D

Simultaneous multiport fuel injection system

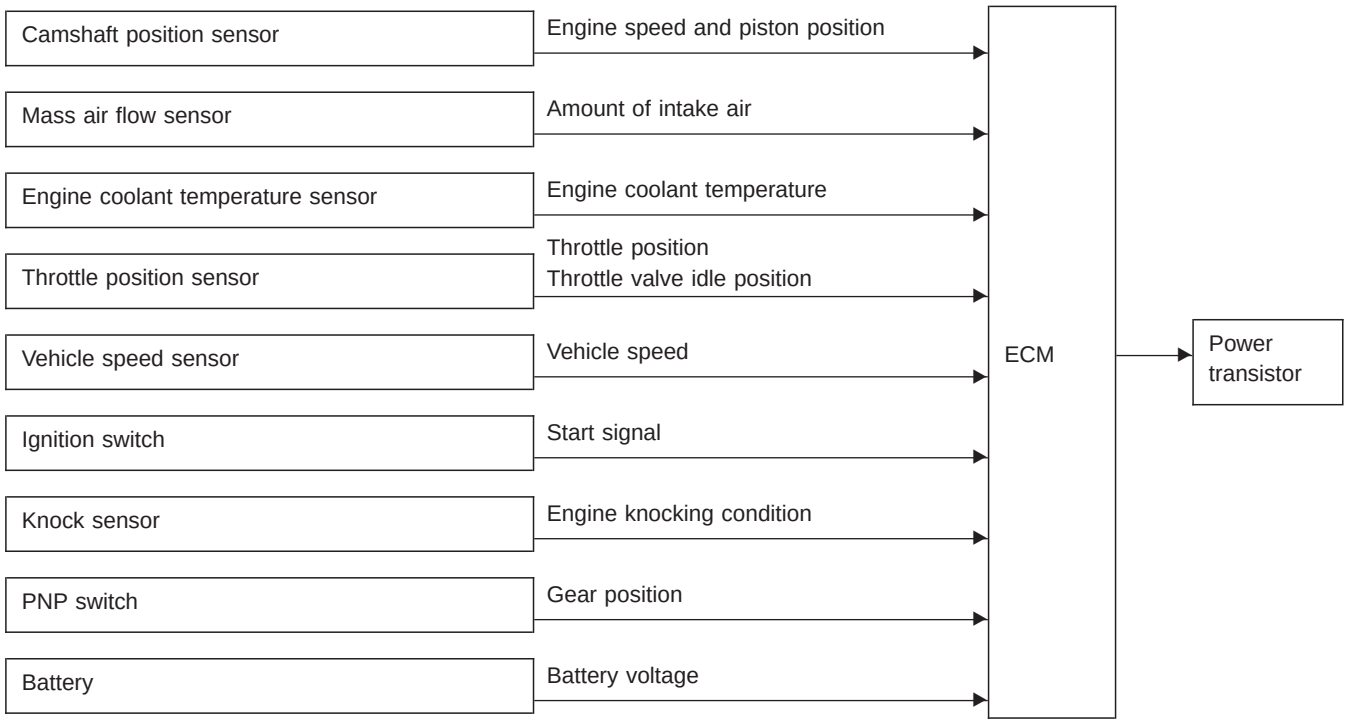
Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe mode (CPU) is operating.

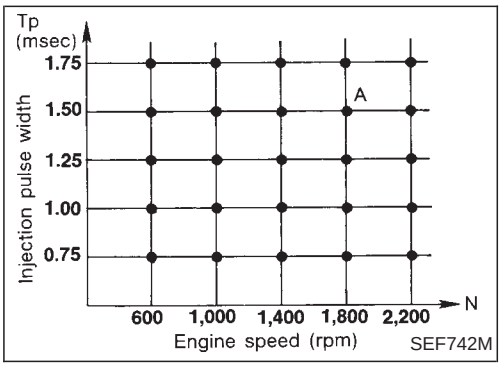
FUEL SHUT-OFF

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

Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE





SYSTEM DESCRIPTION

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

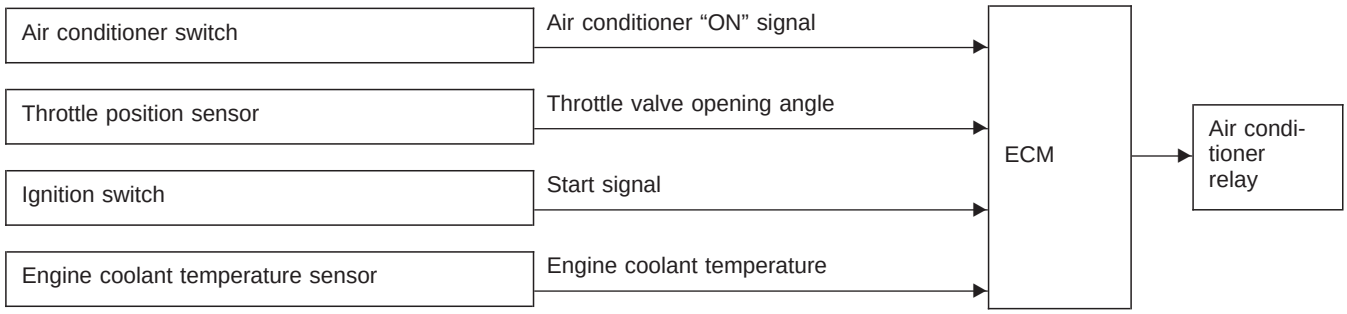
e.g. N: 1,800 rpm, Tp: 1.50 msec
A °BTDC

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

1 At starting
2 During warm-up
3 At idle
4 When swirl control valve operates
5 Hot-engine operation
6 At acceleration

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE



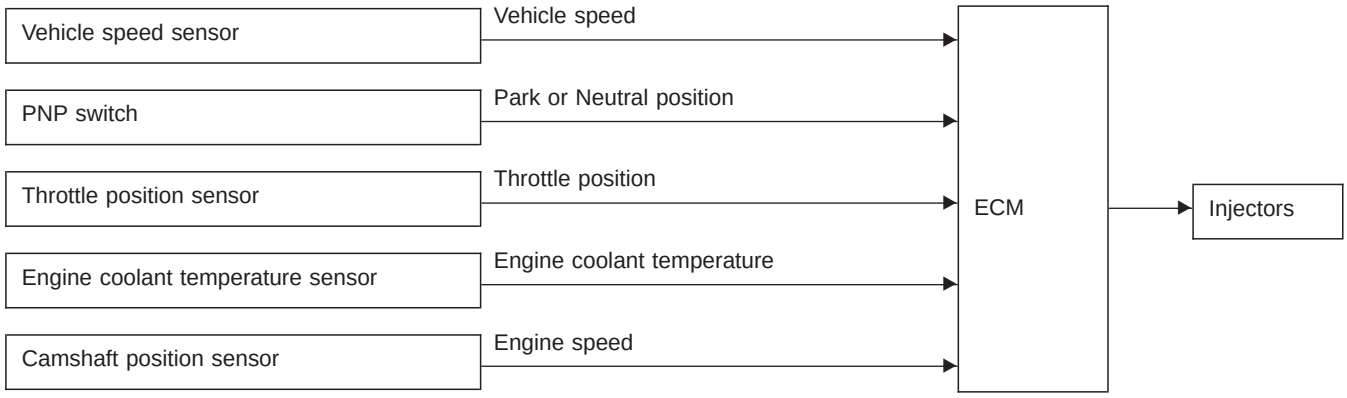
SYSTEM DESCRIPTION

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

- When the accelerator pedal is fully depressed
- When cranking the engine
- When the engine coolant temperature becomes excessively high

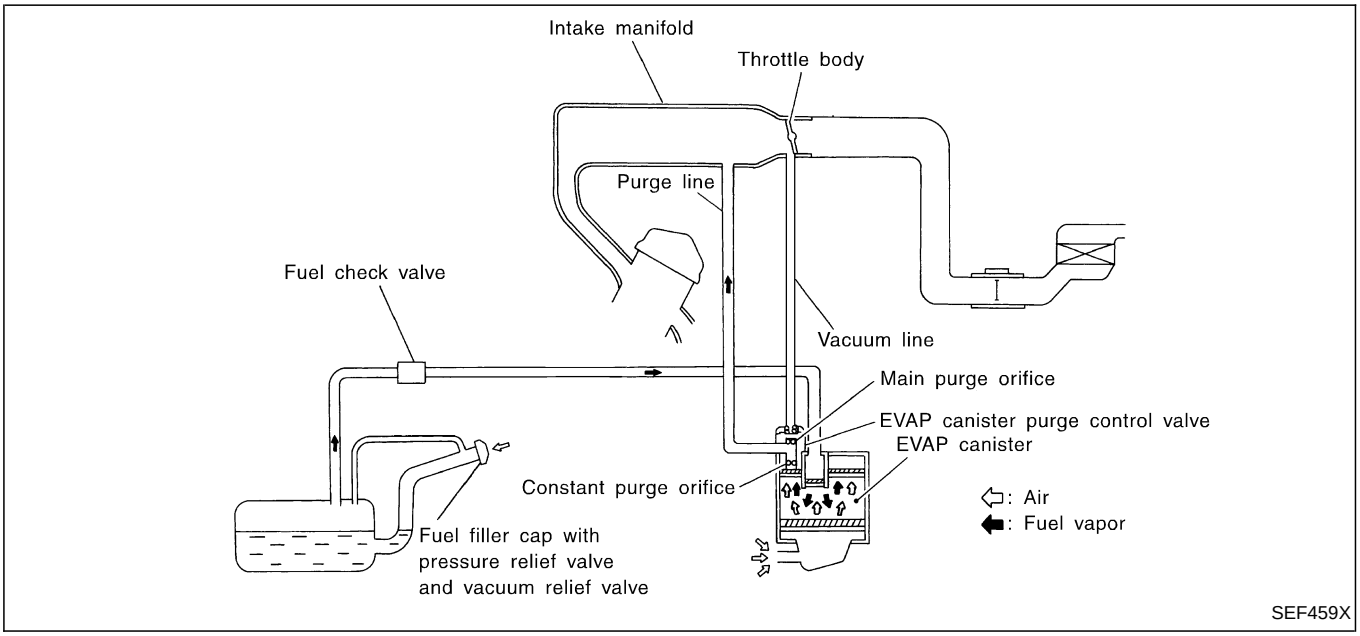
Fuel Cut Control (at no load & high engine speed)

INPUT/OUTPUT SIGNAL LINE



If the engine speed is above 3,500 rpm with no load (for example, in neutral and engine speed over 3,500 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.
Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.
NOTE:
This function is different than deceleration control listed under multiport fuel injection on EC-29.

Description



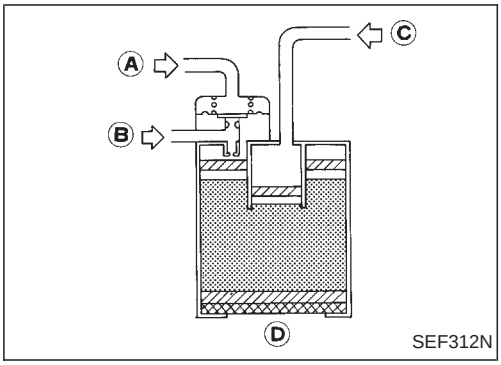
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

The fuel vapor from sealed fuel tank is led into the EVAP canister when the engine is off. The fuel vapor is then stored in the EVAP canister. The EVAP canister retains the fuel vapor until the EVAP canister is purged by air.

When the engine is running, the air is drawn through the bottom of the EVAP canister. The fuel vapor will then be led to the intake manifold.

When the engine runs at idle, the EVAP canister purge control valve is closed. Only a small amount of vapor flows into the intake manifold through the constant purge orifice.

As the engine speed increases and the throttle vacuum rises, the EVAP canister purge control valve opens. The vapor is sucked through both main purge and constant purge orifices.



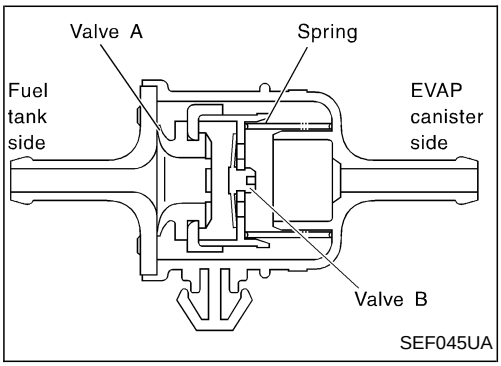
Inspection

EVAP CANISTER

Check EVAP canister as follows:

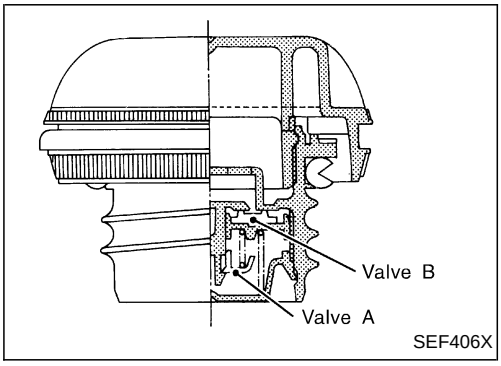
1. Blow air in port Ⓐ and check that there is no leakage.
2. Apply vacuum to port Ⓐ. [Approximately −13.3 to −20.0 kPa (−133 to −200 mbar, −100 to −150 mmHg, −3.94 to −5.91 inHg)]
3. Cover port Ⓓ by hand.
4. Blow air in port Ⓒ and check that it flows freely out of port Ⓑ.

Inspection (Cont'd)



FUEL CHECK VALVE

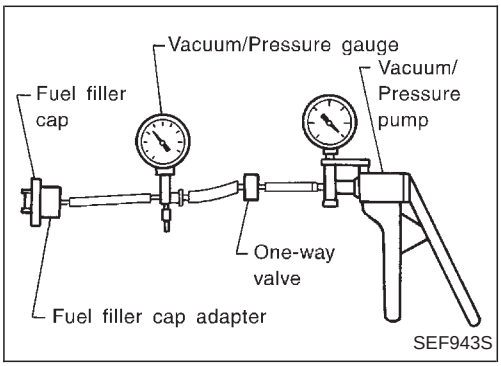
1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side.
   Air flow should be smoothly directed toward fuel tank side.
3. If fuel check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



FUEL TANK VACUUM RELIEF VALVE

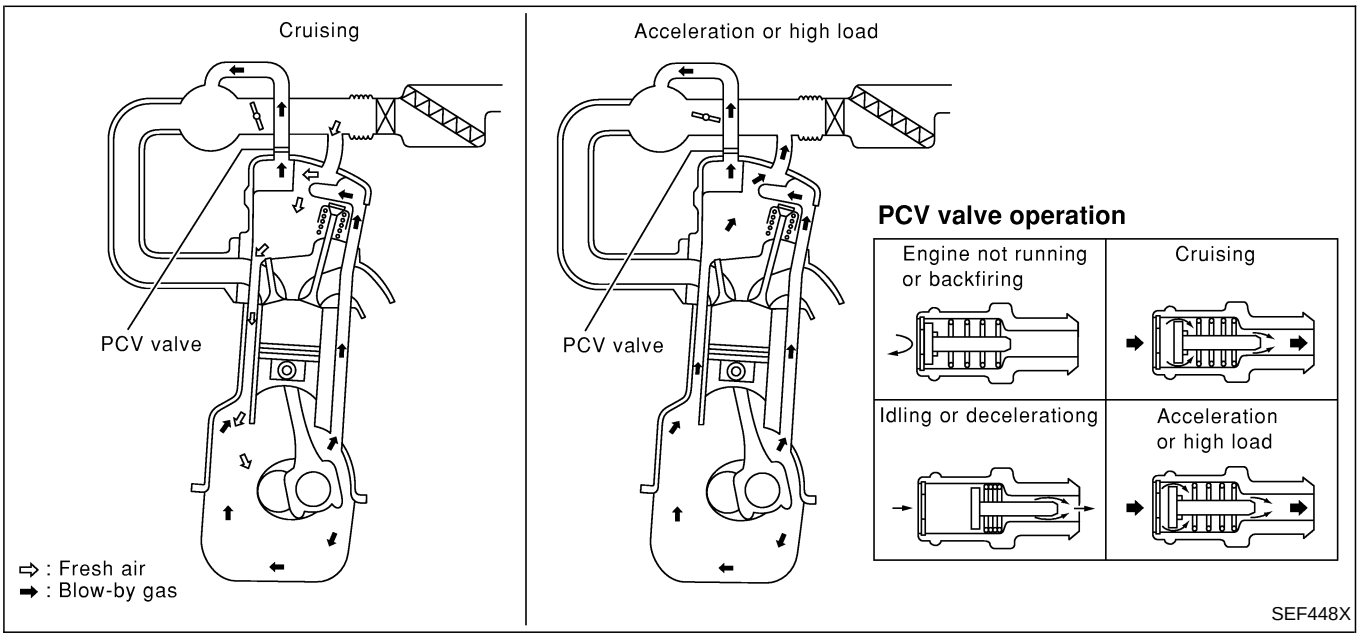
1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.
   Pressure:
   15.3 - 20.0 kPa (0.1530 - 0.2001 bar, 0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)
   Vacuum:
   −6.0 to −3.3 kPa (−0.0598 to −0.0333 bar, −0.061 to −0.034 kg/cm^2, −0.87 to −0.48 psi)
3. If out of specification, replace fuel filler cap as an assembly.

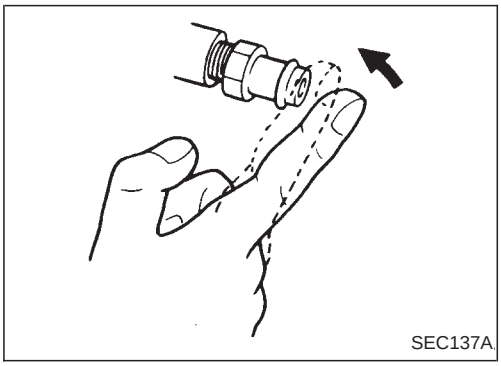
CAUTION:
Use only a genuine fuel filler cap as a replacement.

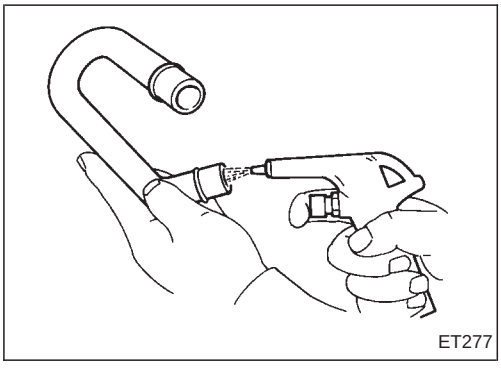


Description

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







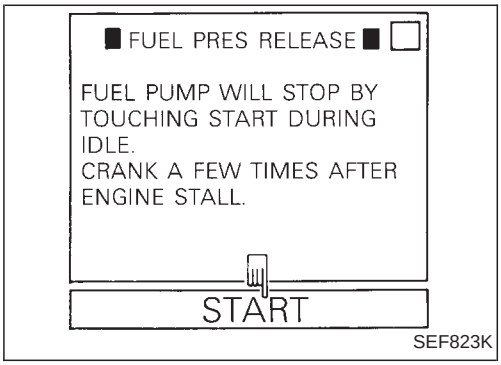
Inspection

PCV (Positive Crankcase Ventilation) VALVE

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

VENTILATION HOSE

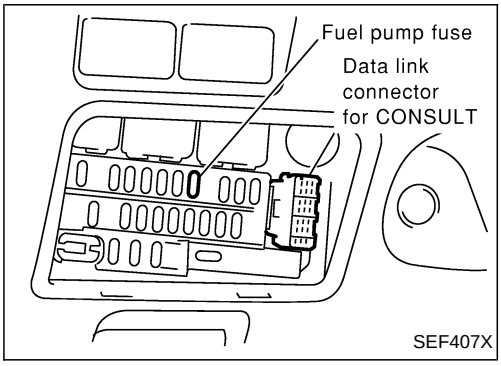
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



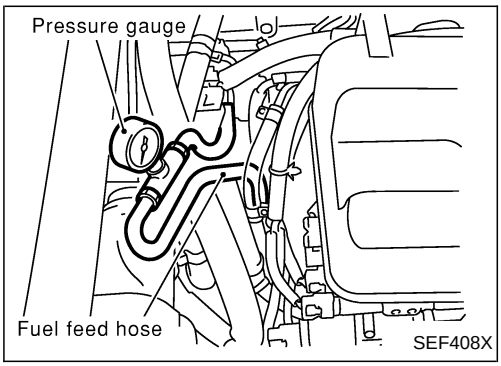
Fuel Pressure Release

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

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



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

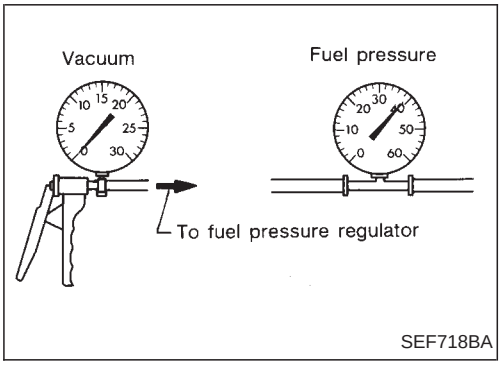


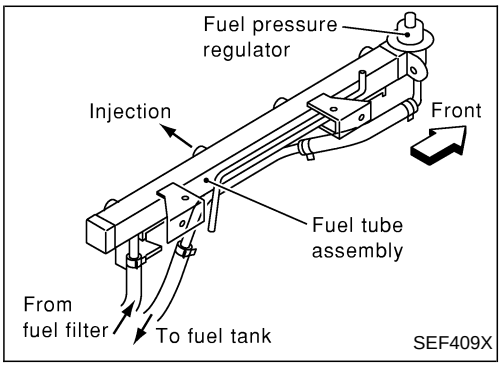
Fuel Pressure Check

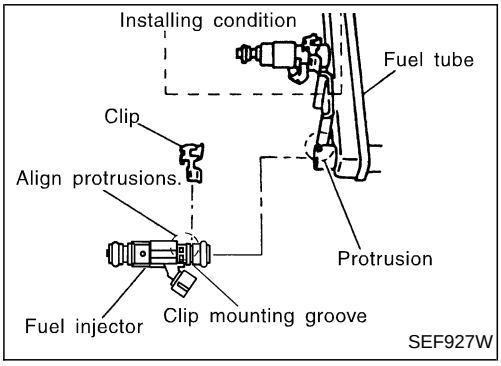
- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**

1. Release fuel pressure to zero, refer to above.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.
   At idling:
   Approximately 235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)
   A few seconds after ignition switch is turned OFF to ON:
   Approximately 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.
9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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







Injector Removal and Installation

1. Release fuel pressure to zero.
2. Remove fuel tube assemblies.
3. Expand and remove clips securing fuel injectors.
4. Extract fuel injectors straight from fuel tubes.

- **Be careful not to damage injector nozzles during removal.**
- **Do not bump or drop fuel injectors.**
- **Do not disassemble or adjust fuel injectors.**

5. Install fuel injectors.
   Carefully install O-rings, including the one used with the pressure regulator.

- **Use bare hands to install O-rings. Do not wear gloves.**
- **Apply a coat of engine oil (with a low viscosity of 5W-30, etc.) to O-rings before installation.**
- **Do not use solvent to clean O-rings and other parts.**
- **Make sure that O-rings and other parts are clean and free from foreign particles.**
- **Be careful not to damage O-rings with service tools or finger nails. Do not expand or twist O-rings. If stretched, do not insert them into fuel tubes immediately after stretching.**
- **Always insert O-rings straight into fuel tubes. Do not tilt or rotate them during installation.**

6. Position clips in grooves on fuel injectors.

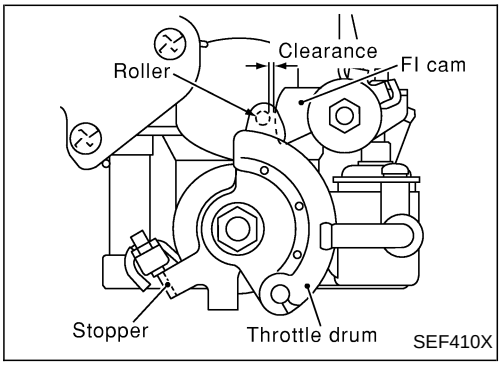
- **Make sure that protrusions of fuel injectors are aligned with cutouts of clips after installation.**

7. Align protrusions of fuel tubes with those of fuel injectors. Insert fuel injectors straight into fuel tubes.
8. After properly inserting fuel injectors, check to make sure that fuel tube protrusions are engaged with those of fuel injectors, and that flanges of fuel tubes are engaged with clips.

- **Discard old clips; replace with new ones.**

9. Tighten fuel tube assembly mounting nuts in two stages.
   : Tightening torque N·m (kg-m, ft-lb)
   1st stage:
   9.3 - 11.0 (0.94 - 1.13, 7 - 8)
   2nd stage:
   21 - 26 (2.1 - 2.7, 16 - 19)
10. Insert fuel hoses into fuel tubes so that ends of fuel hoses butt up against fuel tubes; fasten with clamps, avoiding bulges.

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



Fast Idle Cam (FIC) Inspection and Adjustment

1. Remove air duct on a throttle body.
2. Turn ignition switch “ON”.
3. See “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT.
4. Start engine and warm it up.
   When engine temperature is 80±5°C (176±9°F), make sure there is clearance between FI cam and roller as shown in the figure.

OR

Fast Idle Cam (FIC) Inspection and Adjustment (Cont'd)

1. Remove air duct on a throttle body.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminal ㉗ (Engine coolant temperature sensor signal) and ground.
4. Start engine and warm it up.
   When the voltage is between 1.10 to 1.36V, make sure there is clearance between FI cam and roller as shown in the figure.

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

PREPARATION

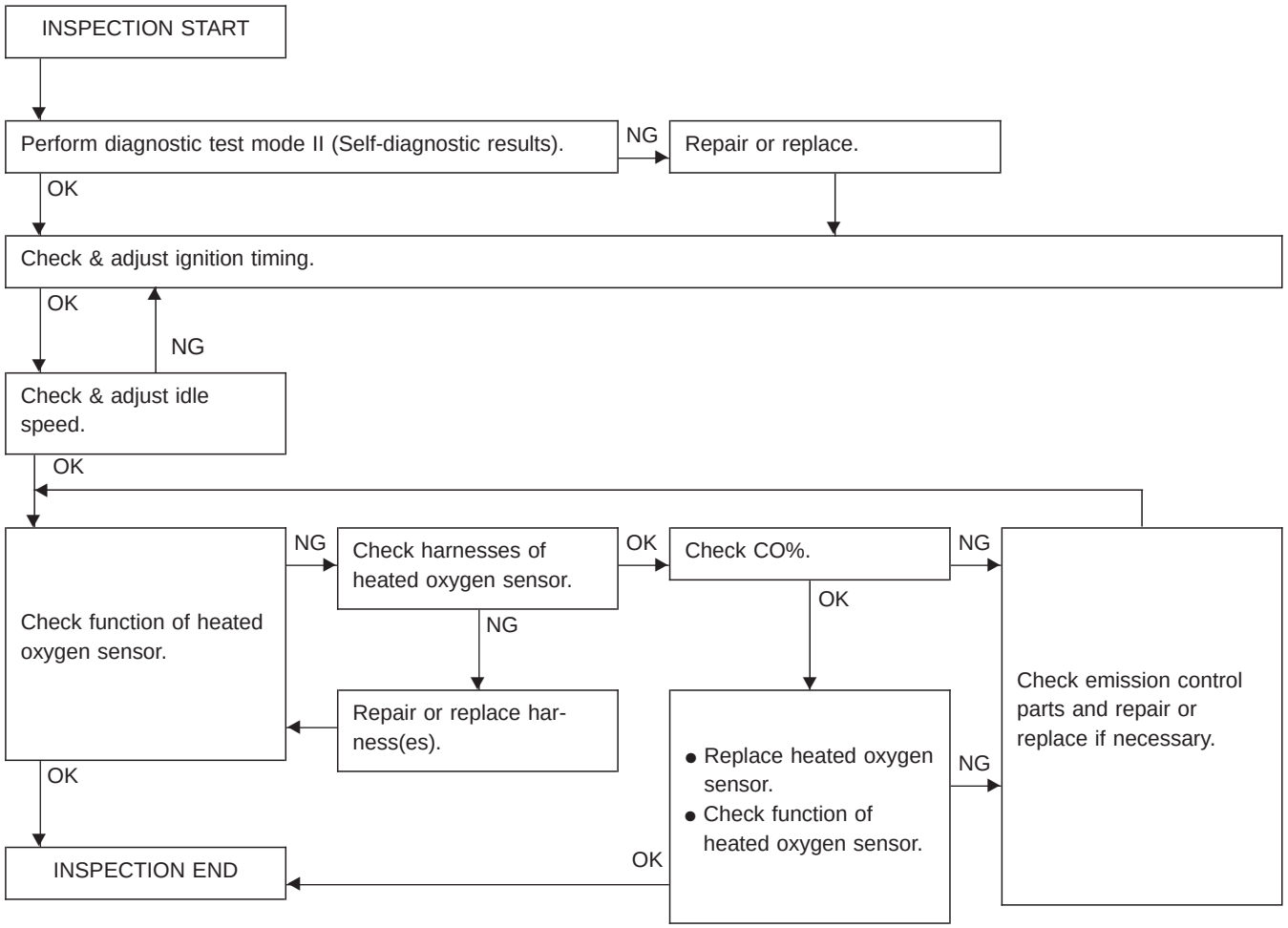
- Make sure that the following parts are in good order.

(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 air conditioner equipped models, checks should be carried out while the air conditioner is “OFF”.
- When measuring “CO” percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
- Turn off headlamps, heater blower, rear window defogger.
- Keep front wheels pointed straight ahead.

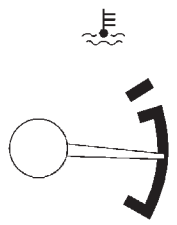
MODELS WITH THREE WAY CATALYST

Overall inspection sequence



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

A



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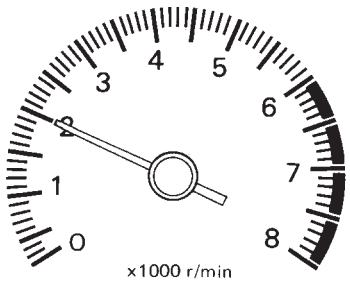
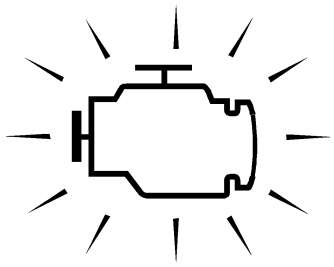


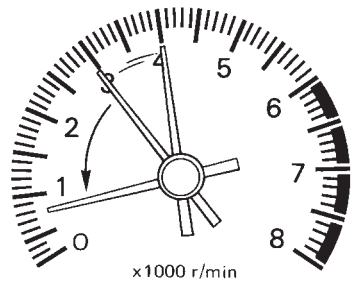
SEF247F

C



SAT652J

D



SEF248F

E

■ 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

START

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

A

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

B

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

C

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

OK / NG

Repair or replace components as necessary.

D

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 for about 1 minute at idle speed.

E

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

1. Stop 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 and run engine at idle speed.

F

Check ignition timing with a timing light.

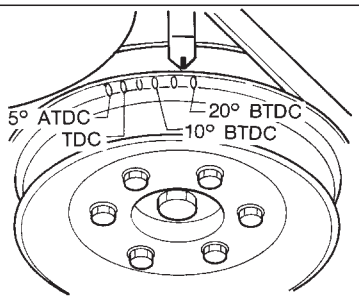
20°±2° BTDC

OK → Ⓐ

NG → Ⓑ

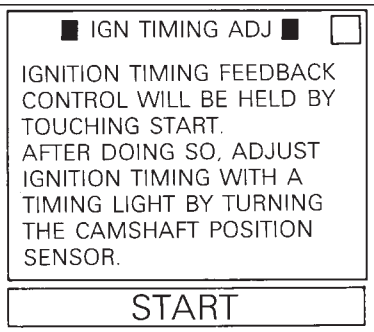
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

F



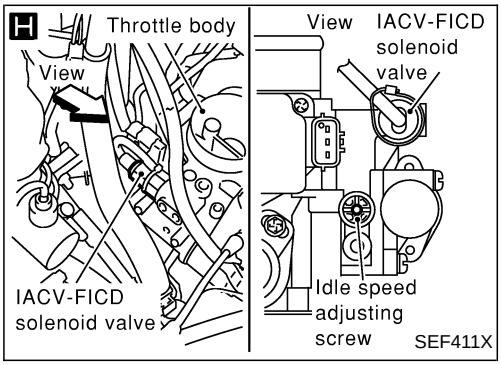
SMA189AA

G



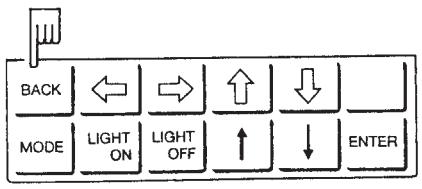
SEF546N

H



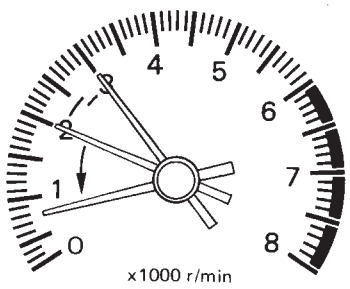
SEF411X

I



SEF913J

J



SEF602K

Ⓐ

Ⓑ

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

20°±2° BTDC

Ⓕ

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

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

G

Check base idle speed.

Read idle speed in "IGN TIMING ADJ" mode with CONSULT.

Check idle speed.

650±50 rpm

OK

NG

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

H

Adjust base idle speed by turning idle speed adjusting screw.

650±50 rpm

I

Touch "Back".

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

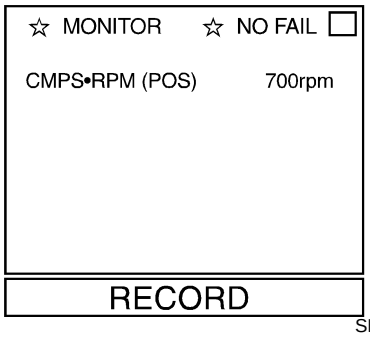
J

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

Ⓒ

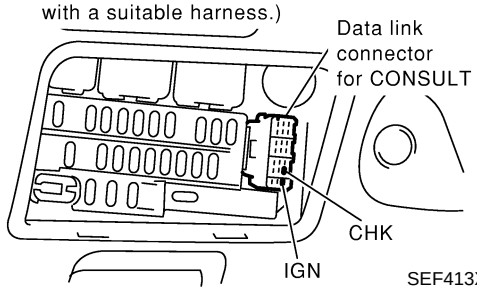
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

K



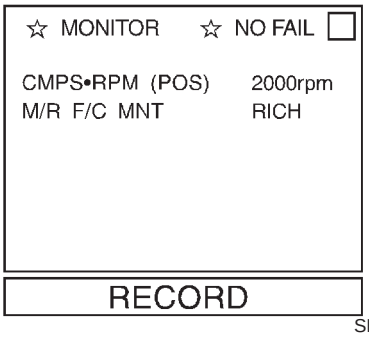
SEF412X

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



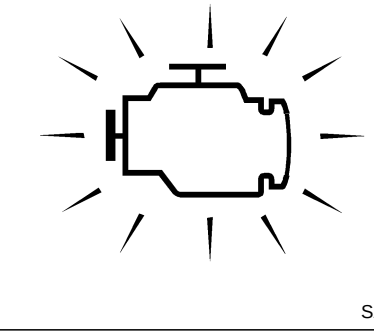
SEF413X

M



SEF052U

N



SAT652J

Ⓒ

K

Check target idle speed.

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

OR

Check idle speed.

700±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.

L

Set the diagnostic test mode II (heated oxygen sensor monitor).

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

M N

Check heated oxygen sensor signal.

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

NG → Ⓓ

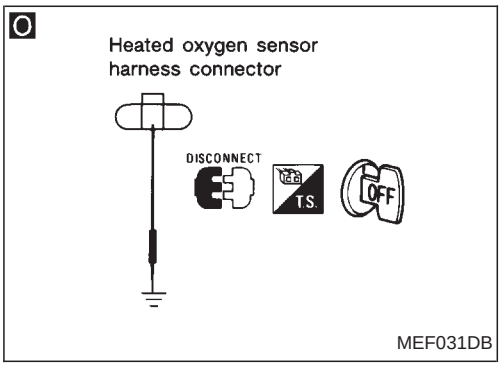
OR

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

OK

INSPECTION END

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



Ⓓ

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 and connect terminal for heated oxygen sensor to ground with a jumper wire.
4. Check for continuity between terminal ㊵ of ECM harness connector and ground metal on vehicle body. Refer to wiring diagram.

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

OK

NG

Repair harness. → Ⓕ

Connect ECM harness connector to ECM.

1. Select "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
2. Set "COOLANT TEMP" at 20°C (68°F).

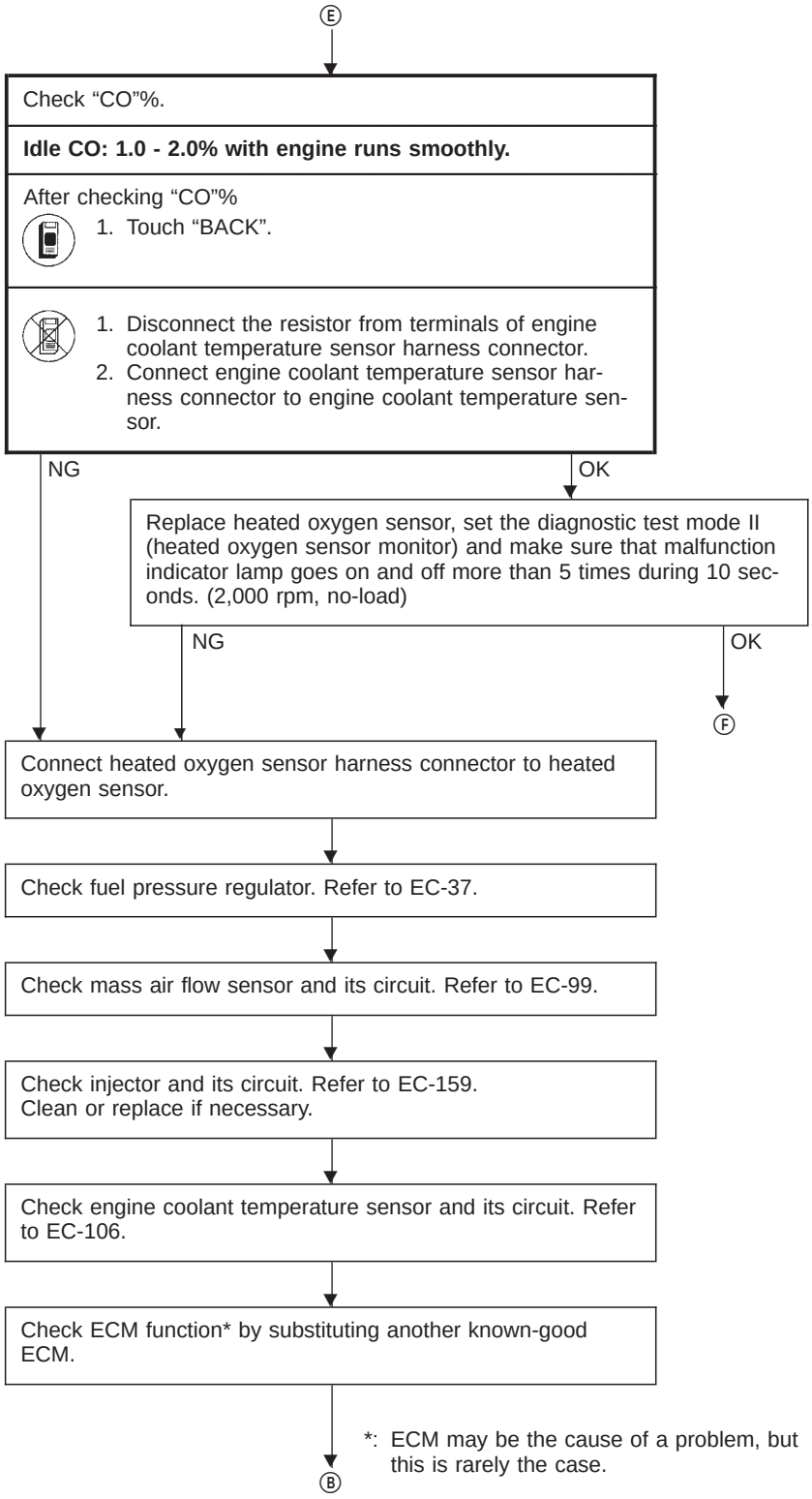
- Disconnect engine coolant temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of engine coolant temperature sensor harness connector.

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

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

Ⓔ

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



Introduction

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. Self-diagnosis items are listed in “DIAGNOSTIC TROUBLE CODE INDEX”, EC-22.

The malfunction indicator lamp (MIL) on the instrument panel lights up when a malfunction is detected, or when the ECM enters fail-safe mode (Refer to EC-70.).

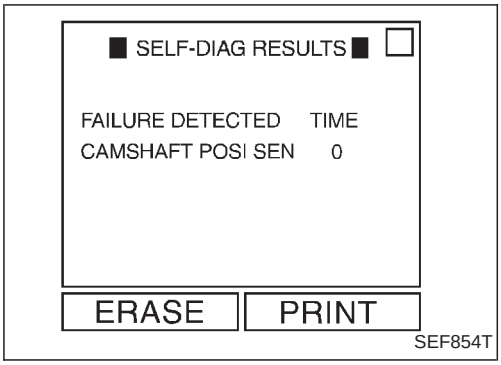
Diagnostic Trouble Code (DTC)

HOW TO CONFIRM MALFUNCTION ITEMS

Malfunction items can be confirmed by the following methods.

1. The number of blinks of the malfunction indicator lamp in the Diagnostic Test Mode II (Self- Diagnostic Results) indicates the DTC. Examples: 11, 21 etc.
2. CONSULT displays the malfunctioning component or system in “SELF DIAGNOSTIC RESULTS” mode.

- **Output of a DTC indicates a malfunction. However, Mode II does not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal.**
  CONSULT can identify malfunction status as shown below. Therefore, using CONSULT (if available) is recommended.



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

HOW TO ERASE DTC

The DTC can be erased from the back-up memory in the ECM by the following methods.

Selecting “ERASE” in the SELF- DIAG RESULTS” mode with CONSULT

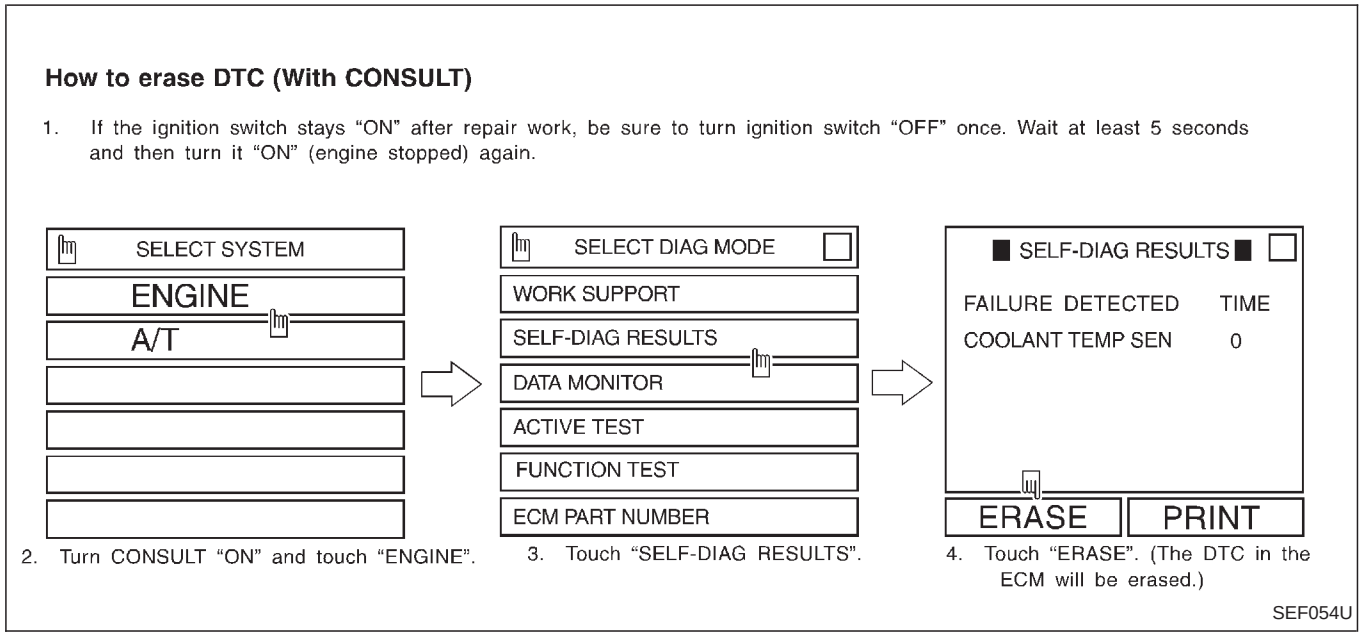
Changing the diagnostic test mode from Diagnostic Test Mode II to Mode I by connecting the data link connector for CONSULT terminals. (Refer to EC-49.)

- **If the battery terminal is disconnected, the DTC will be lost within 24 hours.**
- **Erasing the DTC, using CONSULT is easier and quicker than connecting the data link connector for CONSULT terminals.**

Diagnostic Trouble Code (DTC) (Cont'd)

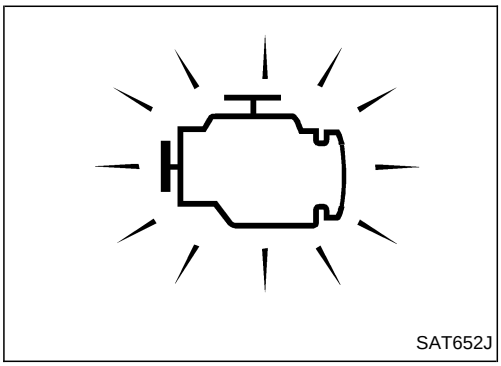
How to erase DTC (With CONSULT)

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



How to erase DTC (Without CONSULT)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" again.
2. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM (RHD model only) or connecting the data link connector for CONSULT terminals. (See EC-49.)


SAT652J

Malfunction Indicator Lamp (MIL)

The malfunction indicator lamp is located on the instrument panel.

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is for checking the blown lamp.
   - If the malfunction indicator lamp does not light up, see the WARNING LAMPS in the EL section. (Or see EC-181.)
2. When the engine is started, the malfunction indicator lamp should go off.
   If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode I

1. BULB CHECK : This function checks the bulb for damage (blown, open circuit, etc.) of the malfunction indicator lamp.
   If the MIL does not come on, check MIL circuit and ECM test mode selector. (See next page.)
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.

Diagnostic Test Mode II

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

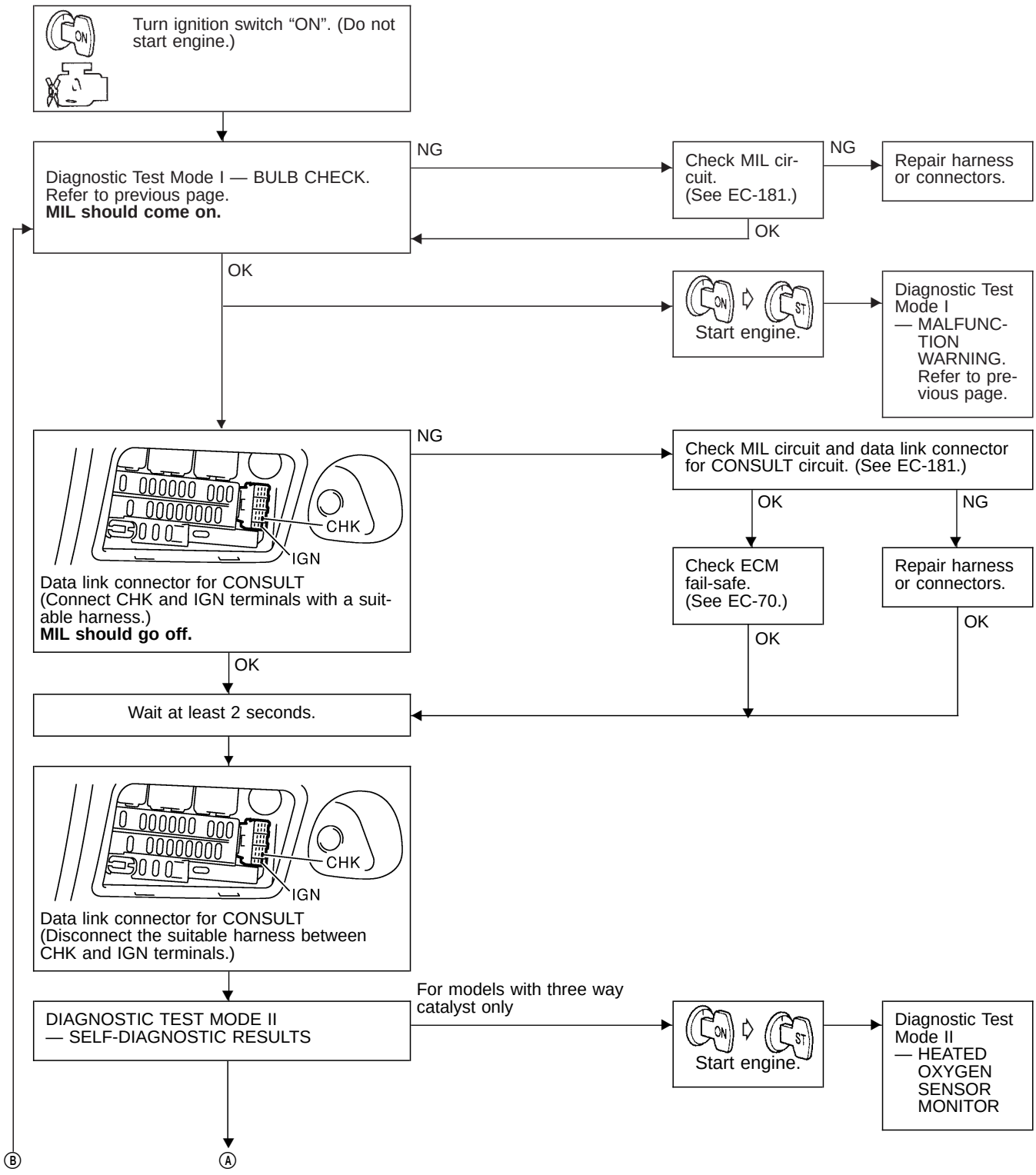
MIL Flashing without DTC

If the ECM is in Diagnostic Test Mode II, the MIL may flash when the engine is running. In this case, check ECM test mode selector following “HOW TO SWITCH DIAGNOSTIC TEST MODES” on next page.
How to switch the diagnostic test (function) modes and details of the above functions are described later. (See page EC-49.)

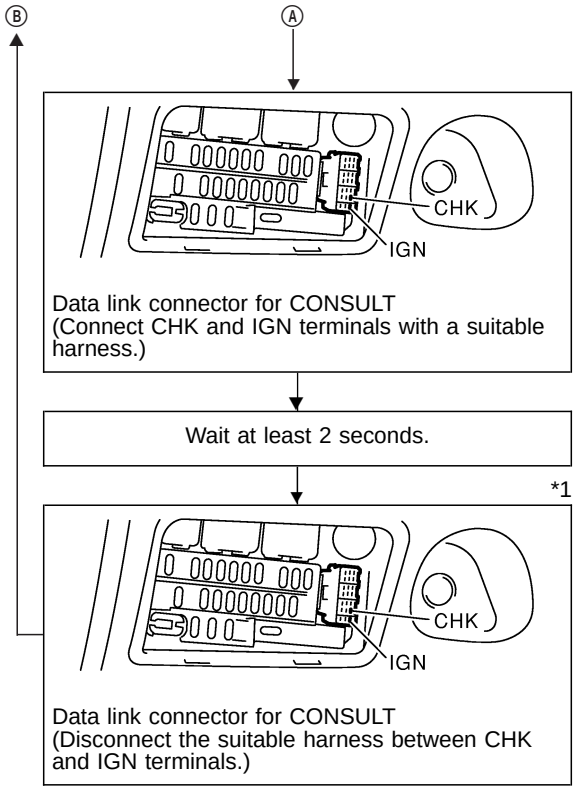
Condition		Diagnostic Test Mode I	Diagnostic Test Mode II
Ignition switch in “ON” position 	Engine stopped 	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running 	MALFUNCTION WARNING	HEATED OXYGEN SENSOR MONITOR

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



Malfunction Indicator Lamp (MIL) (Cont'd)



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

***1: If the suitable harness is disconnected at this time, the diagnostic trouble code will be erased from the backup memory in the ECM.**

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE I—BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. (See the WARNING LAMPS AND CHIME in the EL section. Or see EC-181.)

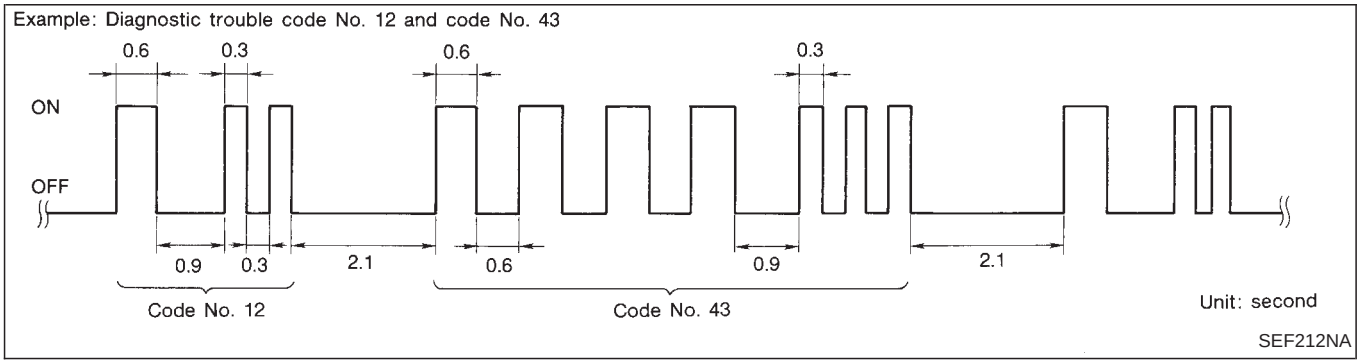
DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected (Refer to EC-22.) or the ECM's CPU is malfunctioning.
OFF	No malfunction

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

DIAGNOSTIC TEST MODE II—SELF-DIAGNOSTIC RESULTS

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



Long (0.6 second) blinking indicates the number of ten digits, and short (0.3 second) blinking indicates the number of single digits. For example, the malfunction indicator lamp blinks 4 times for about 5 seconds (0.6 sec x 8 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 throttle position sensor.
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 INDEX, refer to page EC-22.)

How to erase diagnostic test mode II (Self-diagnostic results)

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

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

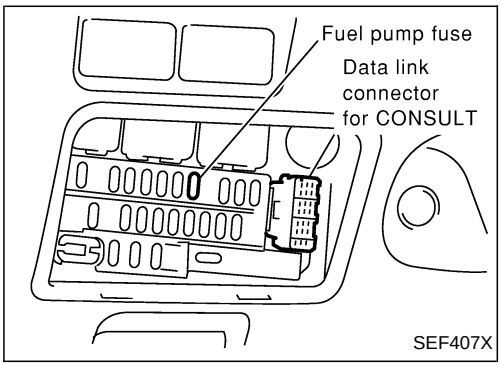
DIAGNOSTIC TEST MODE II—HEATED OXYGEN SENSOR MONITOR

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

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

*: Maintains conditions just before switching to open loop.

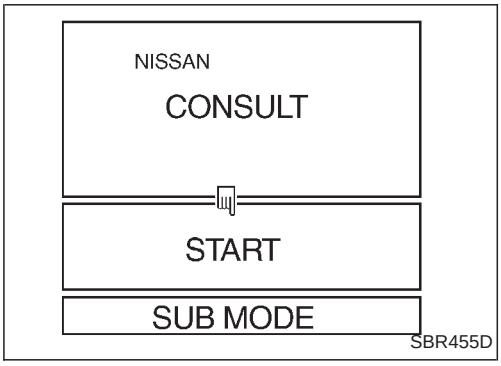
To check the heated oxygen sensor function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MALFUNCTION INDICATOR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



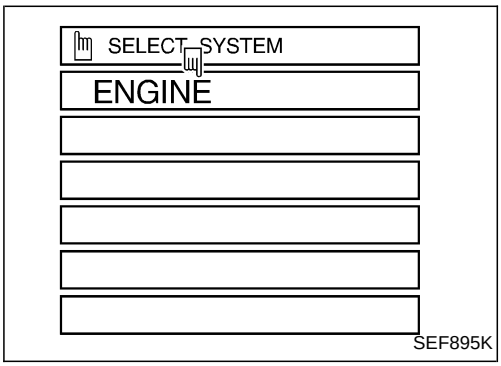
CONSULT

CONSULT INSPECTION PROCEDURE

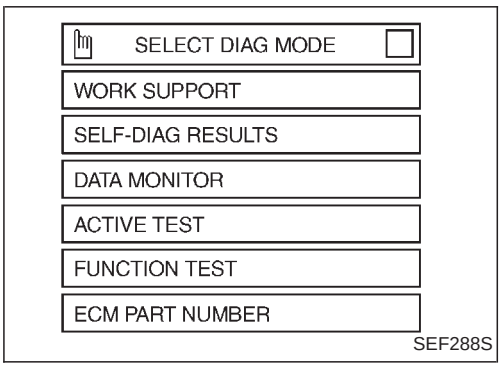
1. Turn off ignition switch.
2. Connect “CONSULT” to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



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)

FUNCTION

Diagnostic test mode	Function
Work support	A technician can adjust some devices faster and more accurately by following indications on CONSULT.
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.
Data monitor	Input/Output data in the ECM can be read.
Active test	CONSULT drives some actuators apart from the ECM's and also shifts some parameters in a specified range.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".
ECM part number	ECM part number can be read.

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THRTL POS SEN ADJ	CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED	When adjusting throttle position sensor initial position
IGNITION TIMING ADJ	● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANKSHAFT POSITION SENSOR.	When adjusting initial ignition timing
IACV-AAC VALVE ADJ	SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. ● ENGINE WARMED UP ● NO-LOAD	—
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line

CONSULT (Cont'd)

ENGINE CONTROL COMPONENT PARTS/SYSTEMS APPLICATION

Item			DIAGNOSTIC TEST MODE				
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST	FUNCTION TEST
ENGINE CONTROL 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		
		Vehicle speed sensor			X		X
		Throttle position sensor	X	X	X		X
		Knock sensor		X			
		Ignition switch (start signal)			X		X
		Closed throttle position switch			X		X
		Air conditioner switch			X		
		PNP switch			X		X
		Power steering oil pressure switch			X		X
		Battery voltage			X		
		Ambient air temperature switch			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

X: Applicable

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "DIAGNOSTIC TROUBLE CODE INDEX", EC-22.

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CMPS·RPM (POS) [rpm]	○	○	• Indicates the engine speed computed from the POS signal (1° signal) of the camshaft position sensor.	
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.	• Models with three way catalyst only
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. • Models with three way catalyst only
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 [ON/OFF] condition from the throttle position sensor signal.	
AIR COND SIG [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the park/neutral position switch signal.	
PW/ST SIGNAL [ON/OFF]	○	○	• [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated.	
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.	• When the engine is stopped, a certain value is indicated.
IACV-AAC/V [%]		○	• Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals.	

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

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
A/F ALPHA [%]		○	• The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	• When the engine is stopped, a certain value is indicated. • This data also includes the data for the air-fuel ratio learning control.
AIR COND RLY [ON/OFF]		○	• The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
FUEL PUMP RLY [ON/OFF]		○	• Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
VOLTAGE [V]			• Voltage measured by the voltage probe.	
PULSE [msec] or [Hz] or [%]			• Pulse width, frequency or duty cycle measured by the pulse probe.	• Only "#" is displayed if item is unable to be measured. • Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	• Engine: Return to the original trouble condition • Change the amount of fuel injection using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Fuel injectors • 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 using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Engine coolant temperature sensor • Fuel injectors
IGNITION TIMING	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Adjust ignition timing (by moving camshaft position sensor)
POWER BALANCE	• Engine: After warming up, idle the engine. • A/C switch "OFF" • Shift lever "N" • Cut off each injector signal one at a time using CONSULT.	Engine runs rough or dies.	• Harness and connector • Compression • Injectors • Ignition coil with power transistor • Spark plugs
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.		

CONSULT (Cont'd)

FUNCTION TEST MODE

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	● Ignition switch: ON (Engine stopped) ● Displays the results of on board diagnostic system.	—		Objective system
CLOSED THROTTLE POSI	● Ignition switch: ON (Engine stopped) ● Throttle position sensor circuit is tested when throttle is opened and closed fully. ("IDLE POSITION" is the test item name for the vehicles in which idle is selected by throttle position sensor.)	Throttle valve: opened	OFF	● Harness and connector ● Throttle position sensor (Closed throttle position) ● Throttle position sensor (Closed throttle position) adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode.
		Throttle valve: closed	ON	
THROTTLE POSI SEN CKT	● Ignition switch: ON (Engine stopped) ● Throttle position sensor circuit is tested when throttle is opened and closed fully.	Range (Throttle valve fully opened — Throttle valve fully closed)	More than 3.0V	● Harness and connector ● Throttle position sensor ● Throttle position sensor adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode.
PARK/NEUT POSI SW CKT	● Ignition switch: ON (Engine stopped) ● PNP switch circuit is tested when shift lever is manipulated.	Out of N/P positions	OFF	● Harness and connector ● PNP switch ● Linkage adjustment
		In N/P positions	ON	
FUEL PUMP CIRCUIT	● Ignition switch: ON (Engine stopped) ● Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.	There is pressure pulsation on the fuel feed hose.		● Harness and connector ● Fuel pump ● Fuel pump relay ● Fuel filter clogging ● Fuel level
START SIGNAL CIRCUIT	● Ignition switch: ON → START ● Start signal circuit is tested when engine is started by operating the starter. Battery voltage and water temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed.	Start signal: OFF → ON		● Harness and connector ● Ignition switch

CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
PW/ST SIGNAL CIRCUIT	● Ignition switch: ON (Engine running) ● Power steering oil pressure switch 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 is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		● Adjust ignition timing (by moving camshaft position sensor or distributor) ● Camshaft position sensor drive mechanism
MIXTURE RATIO TEST	● Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the 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, ignition coil, power transistor 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, ignition coil, power transistor harness or connector) ● Compression ● Valve timing
IACV-AAC/V SYSTEM	● After warming up, idle the engine. ● IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 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

CONSULT (Cont'd)

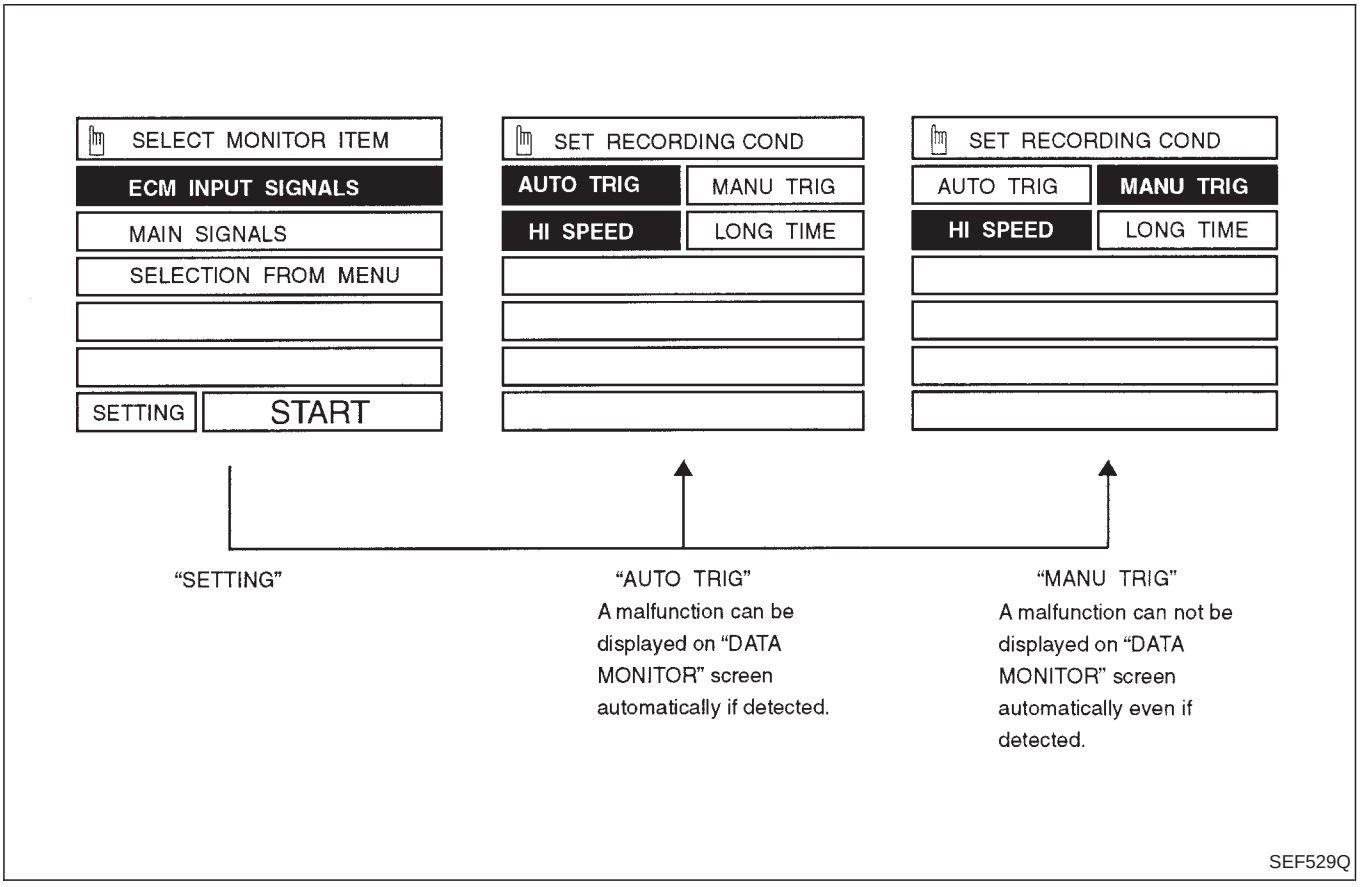
REAL TIME DIAGNOSIS IN DATA MONITOR MODE

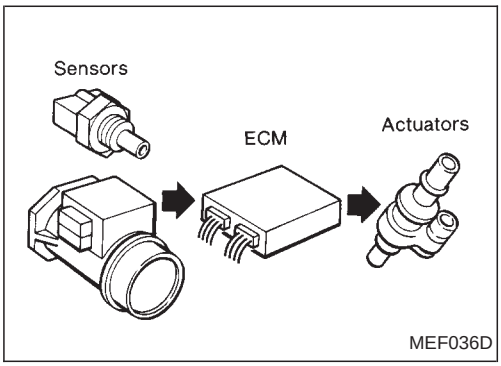
CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

1. "AUTO TRIG" (Automatic trigger):
   - The malfunction will be identified on the CONSULT screen in real time.
     In other words, 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):
   - Malfunction item will not be displayed automatically on CONSULT screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:

1. "AUTO TRIG"
   - While trying to detect the DTC by performing the "DTC CONFIRMATION PROCEDURE", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DTC CONFIRMATION PROCEDURE", the moment a malfunction is found the malfunction item 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.





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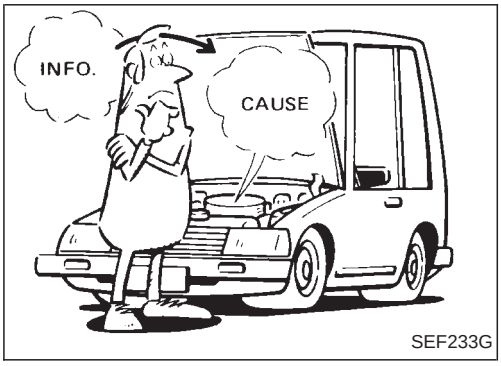

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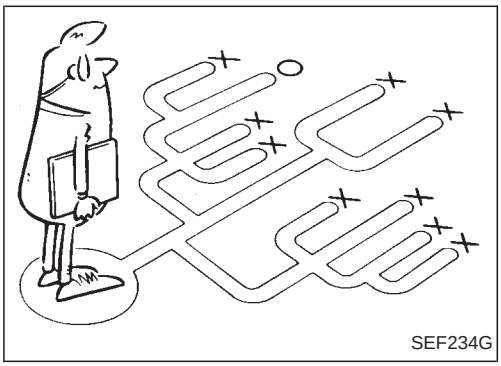
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KEY POINTS

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

SEF907L

Introduction

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

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

A visual check only may not find the cause of the problems. A road test with CONSULT or a circuit tester connected should be performed. Follow the “Work Flow” on EC-62.

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

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

Diagnostic Worksheet

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

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

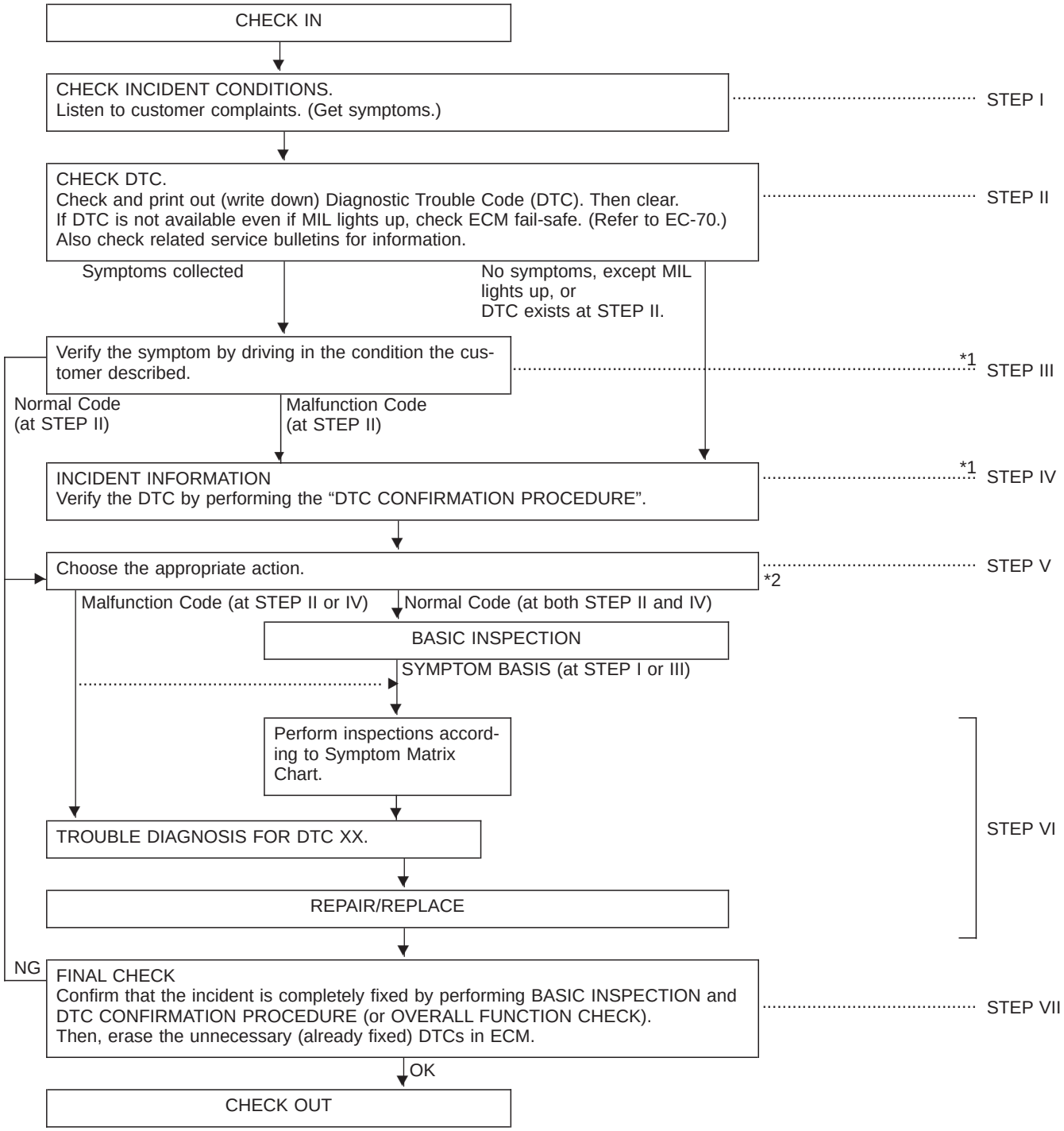
Utilize a diagnostic worksheet like the one on next page in order to organize all the information for troubleshooting.

Diagnostic Worksheet (Cont'd)

WORKSHEET SAMPLE

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

Work Flow



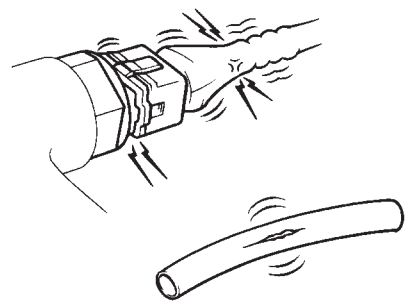
***1: If the incident cannot be duplicated, see "Incident Simulation Tests" of "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT" in GI section.**

***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit (See TROUBLE DIAGNOSIS FOR POWER SUPPLY, EC-84).**

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-60.
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-46.) The DTC can be used when duplicating the incident at STEP III & IV. Study the relationship between the cause, specified by DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See page EC-71.) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” 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 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 on next page. Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-71.)
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-73, EC-77. The “DIAGNOSTIC PROCEDURE” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. For details, refer to GI section (“HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”, “Circuit Inspection”). Repair or replace the malfunction parts.
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer’s initial complaint. Perform the “DTC CONFIRMATION PROCEDURE” and confirm the normal code (Diagnostic trouble code No. 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-46.)

A



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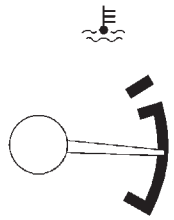

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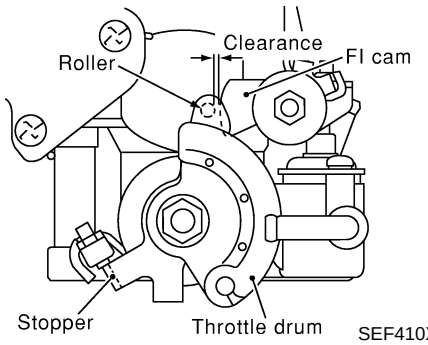

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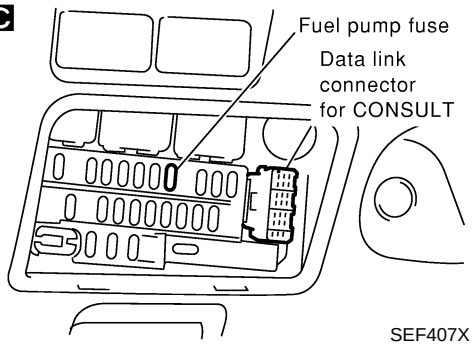

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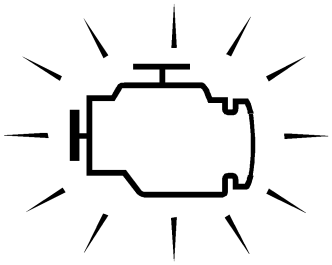


SAT652J

Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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

A

BEFORE STARTING

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

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

B

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

NG → Check FI cam. Refer to EC-38.

OK

C

CONNECT CONSULT TO THE VEHICLE.
Connect “CONSULT” to the data link connector for CONSULT and select “ENGINE” from the menu. Refer to EC-52.

D

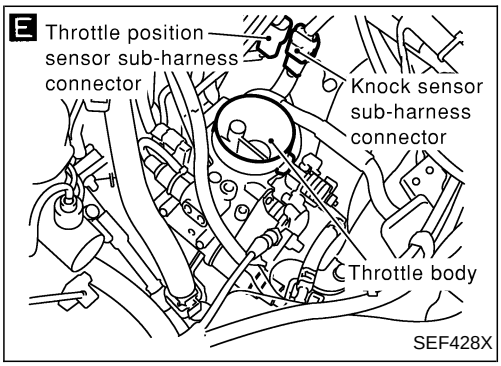
Perform the diagnostic test mode II (Self-diagnostic results).

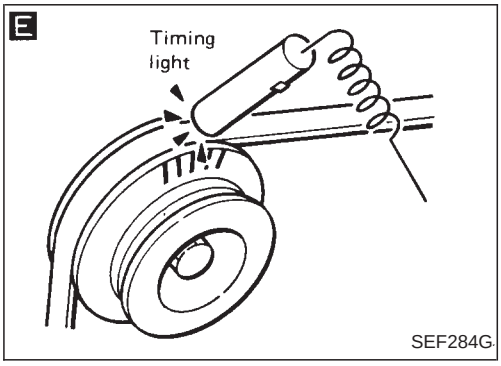
NG → Go to corresponding “TROUBLE DIAGNOSIS”.

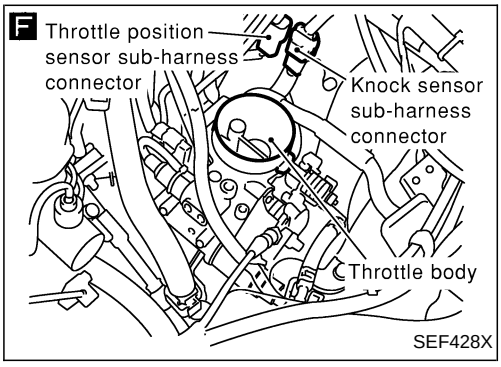
OK

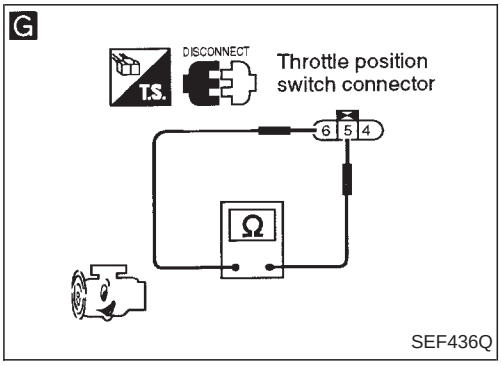
Ⓐ

Basic Inspection (Cont'd)









Ⓐ

E

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

1. Stop 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 and run engine at idle speed.

E

Check ignition timing with a timing light.

20°±2° BTDC

NG → Adjust ignition timing by turning camshaft position sensor.

OK

F

CHECK BASE IDLE SPEED.
When disconnecting throttle position sensor harness connector, does engine run at 650±50 rpm?

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

OK

OK → For M/T models, go to I.

G

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

- **Warm engine up to normal operating temperature.**
- **Check FI cam. Refer to procedure B.**
- **Always check ignition timing and base idle before performing the followings.**

1. Disconnect throttle position sensor harness connector and closed throttle position switch harness connector.
2. Rev engine (2,000 to 3,000 rpm) 2 or 3 times under no-load and then run engine at idle speed.
3. Check continuity between closed throttle position switch connector terminals ⑤ and ⑥ under following conditions.
   - Raise engine speed to 2,000 rpm.
   - Lower engine speed as gradually as possible.

Engine speed at the point closed throttle position "OFF" (No continuity) → "ON" (Continuity exists.): 700±50 rpm ("P" or "N" position)

NG →

G

ADJUST TPS IDLE POSITION.

1. Adjust continuity signal by rotating throttle position sensor body as follow.
2. Check continuity between closed throttle position switch connector terminals ⑤ and ⑥ under following conditions.
   - Raise engine speed to 2,000 rpm.
   - Lower engine speed as gradually as possible.

Engine speed at the point closed throttle position "OFF" (No continuity) → "ON" (Continuity exists.): 700±50 rpm ("P" or "N" position)

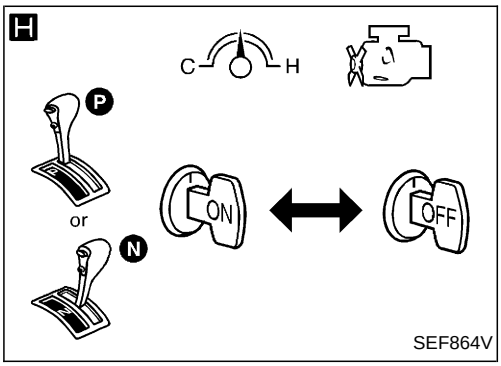
→ Ⓒ

OK

Ⓑ

Basic Inspection (Cont'd)

H



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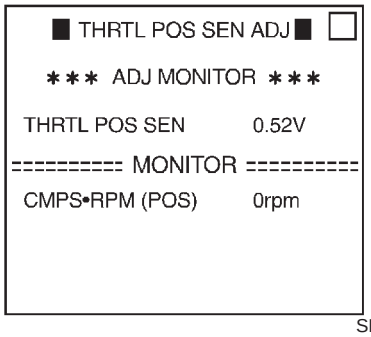

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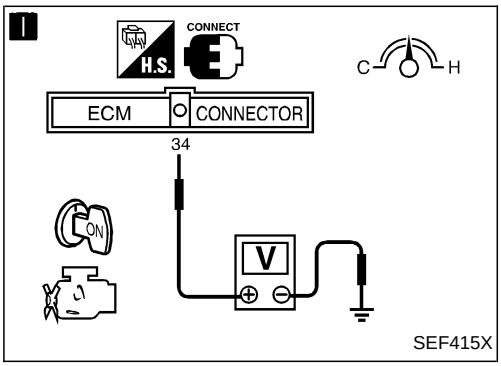

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Ⓑ

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

Ⓒ

H

RESET IDLE POSITION MEMORY.

1. Disconnect throttle position sensor harness connector.
2. Warm up engine to normal operating temperature.
3. Select "CLSD THL/POSI" in "DATA MONITOR" mode (Manual trigger) with CONSULT, then stop engine.
4. Reconnect throttle position sensor harness connector.
5. Start engine and wait for a few seconds.
6. Turn ignition switch "OFF" and wait at least 5 seconds.
7. Repeat steps 5. and 6. until "CLSD THL/POSI" in "DATA MONITOR" mode with CONSULT changes to "ON".

Repeat steps 5. and 6. 10 times.

I

CHECK THROTTLE POSITION SENSOR IDLE POSITION. (M/T models)

1. Stop engine and then turn ignition switch "ON".
2. Perform "THRTL POS SEN ADJ" in "WORK SUPPORT" mode.
3. Check output voltage of throttle position sensor.
   Voltage: 0.35 - 0.65V

OR

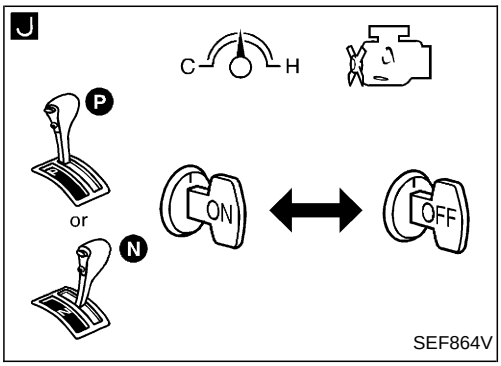
2. Reconnect throttle position sensor harness connector.
3. Check voltage between ECM terminal ㉞ and ground with voltmeter.
   Voltage: 0.35 - 0.65V

NG → Adjust output voltage to 0.5V by rotating throttle position sensor body.

OK → Ⓓ

Ⓔ

Basic Inspection (Cont'd)



Ⓓ

Ⓔ

RESET IDLE POSITION MEMORY.

1. Disconnect throttle position sensor sub-harness connector.
2. Warm up engine to normal operating temperature.
3. Select "CLSD THL/POSI" in "DATA MONITOR" mode (Manual trigger) with CONSULT, then stop engine.
4. Reconnect throttle position sensor sub-harness connector.
5. Start engine and wait for a few seconds.
6. Turn ignition switch "OFF" and wait at least 5 seconds.
7. Repeat steps 5. and 6. until "CLSD THL/POSI" in "DATA MONITOR" mode with CONSULT changes to "ON".

Repeat steps 5. and 6. 10 times.

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

CHECK TARGET IDLE SPEED.

Read the engine idle speed in "DATA MONITOR" mode with CONSULT.
700±50 rpm

OR

Check idle speed.
700±50 rpm

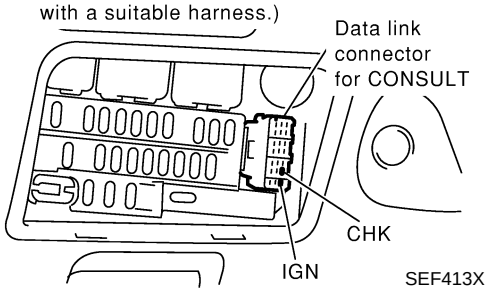
NG → Adjust idle speed. Refer to EC-40.

OK (With three way catalyst) → Ⓕ

OK (Without three way catalyst) → Ⓗ

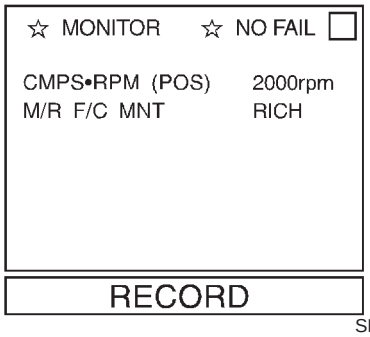
Basic Inspection (Cont'd)

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



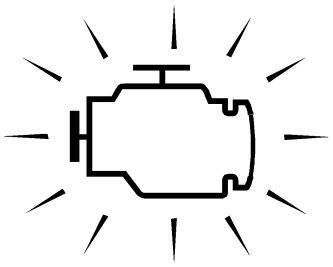
SEF413X

L



SEF052U

M



SAT652J

Ⓕ With three way catalyst

K

Set the diagnostic test mode II (Oxygen sensor monitor).

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

L M

Check oxygen sensor signal.

1. See "M/R F/C MNT" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

NG → Check oxygen sensor and the circuit. Refer to EC-137.

OR

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

OK

Without three way catalyst Ⓗ

Check "CO"%.

Idle CO: Less than 2.0% (Without three way catalyst)
Less than 0.1% (With three way catalyst)

NG → Connect oxygen sensor harness connector to oxygen sensor (Models with three way catalyst only).

OK

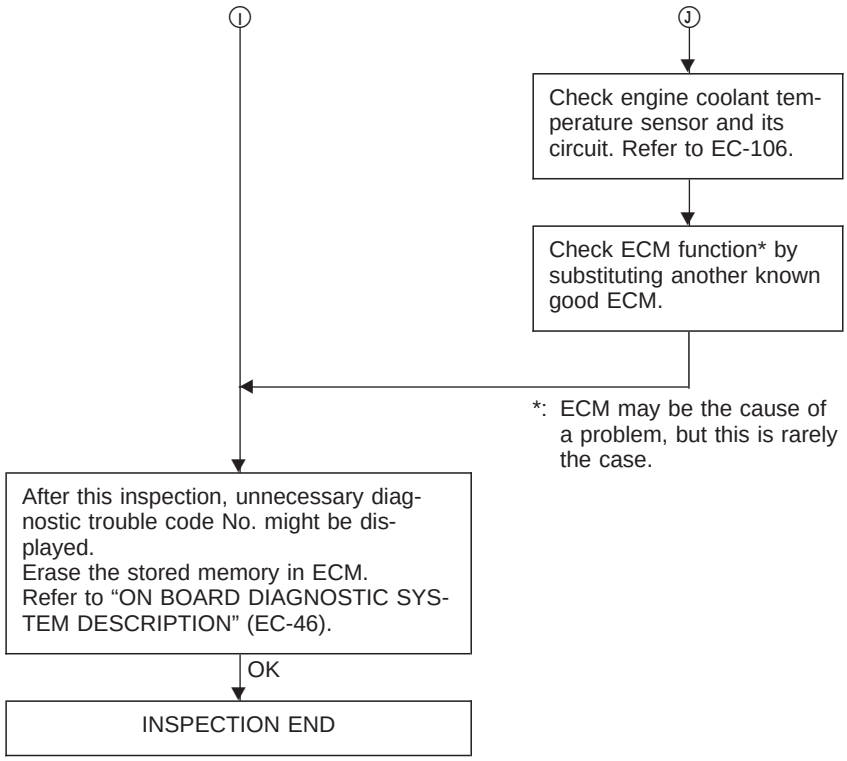
Check fuel pressure regulator. Refer to EC-37.

Check mass air flow sensor and its circuit. Refer to EC-99.

Check injector and its circuit. Refer to EC-159. Clean or replace if necessary.

Ⓘ Ⓙ

Basic Inspection (Cont'd)



Fail-Safe Chart

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

<table>
<tr><th>DTC No.</th><th>Detected items</th><th>Engine operating condition in fail-safe mode</th></tr>
<tr><td>12</td><td>Mass air flow sensor circuit</td><td>Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>13</td><td>Engine coolant temperature sensor circuit</td><td>Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT displays the engine coolant temperature decided by ECM.
<table>
<tr><th>Condition</th><th>Engine coolant temperature decided (CONSULT display)</th></tr>
<tr><td>Just as ignition switch is turned ON or START</td><td>40°C (104°F)</td></tr>
<tr><td>More than 4 minutes after ignition START</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
</table></td></tr>
<tr><td>43</td><td>Throttle position sensor circuit</td><td>Throttle position will be determined based on the amount of mass air flow and the engine speed. Therefore, acceleration will be poor.
<table>
<tr><th></th><th>Driving condition</th></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
</table></td></tr>
<tr><td>Unable to access Diagnostic Test Mode II</td><td>ECM</td><td>ECM fail-safe activating condition
The computing function of the ECM was judged to be malfunctioning.
When the fail-safe system activates, i.e. if the ECM detects a malfunction condition in the CPU of ECM, the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver. However, it is not possible to access ECM and DTC cannot be confirmed.
Engine control with ECM fail-safe
When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation and IACV-AAC valve operation are controlled under certain limitations.
<table>
<tr><th></th><th>ECM fail-safe operation</th></tr>
<tr><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm.</td></tr>
<tr><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td>Ignition timing</td><td>Ignition timing is fixed at the preset value.</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is “ON” when engine is running and “OFF” when engine stalls.</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
</table>
Replace ECM, if ECM fail-safe condition is confirmed.</td></tr>
</table>

Symptom Matrix Chart

			SYMPTOM																Reference page
			HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	OVERCOOLS	OVERCHARGING	
Warranty Symptom Code			AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	1P	1X	
Basic engine control system	Fuel	Fuel pump circuit	●	●	●	○	●		●	○			○		○			EC-165
		Fuel pressure regulator system	●	●	●	○	●	○	●	●	○		●					EC-37
		Injector circuit	●	●	●	○	●		●	●			●					EC-159
		Evaporative emission system	○	○	○	○	●	○	○	○	○		○					EC-34
	Air	Positive crankcase ventilation system	○	○	○	○	●	○	○	○	○		○	○				EC-36
		Incorrect idle speed adjustment	○	○				○	○	○	○		○					EC-40
		IACV-AAC valve circuit	●	●	●	○	●	●	●	●	●		○		○			EC-146
		IACV-FICD solenoid valve circuit	○	○	○	○	○	○	○	○	○		○					EC-173
	Ignition	Incorrect ignition timing adjustment	○	○	●	●	●		●	●			●					EC-40
		Ignition circuit	●	●	●	●	●		●	●			●					EC-110
	Main power supply and ground circuit		●	●	●	○	○		○	○		○	○		○			EC-84
	Air conditioner circuit		○	○	○	○	○	○	○	○	○		○		○			HA section
Engine control system	ECM	Camshaft position sensor circuit	●	●	●	●	●		○	○			○					EC-92
		Mass air flow sensor circuit	●	●	●	●	●		●	○			○					EC-99
		Heated oxygen sensor circuit		●	●	○	●		●	○			●					EC-136, 141
		Engine coolant temperature sensor circuit	●	●	●	○	●	●	●	○	○		●					EC-106
		Throttle position sensor circuit		●	●		●	●	●	●	●		●					EC-126
		Incorrect throttle position sensor adjustment		●	○		○	●	○	○	●		○					EC-64
		Vehicle speed sensor circuit		○	○		○						○					EC-131
		ECM	○	○	○	○	○	○	○	○	○	○	○					EC-70
		Start signal circuit	○															EC-163
		Park/Neutral position switch circuit			○		○		○	○			○					EC-151
		Power steering oil pressure switch circuit		○					○	○								EC-169

● ; High Possibility Item
○; Low Possibility Item

(continued on next page)

Symptom Matrix Chart (Cont'd)

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

● ; High Possibility Item
○; Low Possibility Item

CONSULT Reference Value in Data Monitor Mode

Remarks:

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

MONITOR ITEM	CONDITION		SPECIFICATION
CMPS·RPM (POS)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
MAS AIR/FL SE	• Engine: After warming up • Air conditioner switch: “OFF” • Shift lever: Neutral position • No-load	Idle	0.9 - 1.8V
		2,500 rpm	1.8 - 2.3V
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 MNTR			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: Neutral position	ON
		Except above	OFF
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
AMB TEMP SW	• Ignition switch: ON • Compare ambient temperature with the following.	Below 23°C (73°F)	OFF
		Above 23°C (73°F)	ON

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

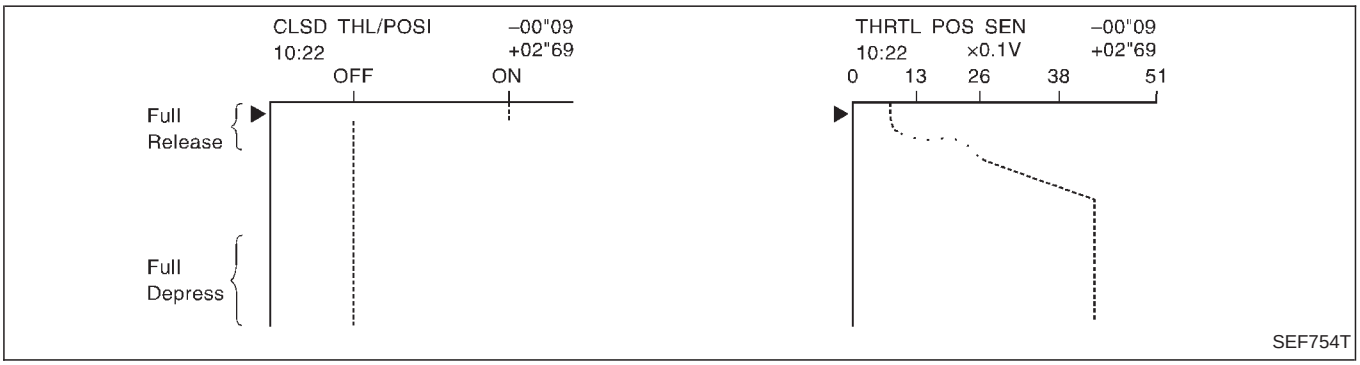
MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: Neutral position • No-load	Idle	2.5 - 3.3 msec.
		2,000 rpm	2.4 - 3.2 msec.
IGN TIMING	ditto	Idle	20° BTDC
		2,000 rpm	More than 18° BTDC
IACV-AAC/V	ditto	Idle	Approx. 30%
		2,000 rpm	—
A/F ALPHA	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	75 - 125%
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 second)		ON
	Except as shown above		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.)

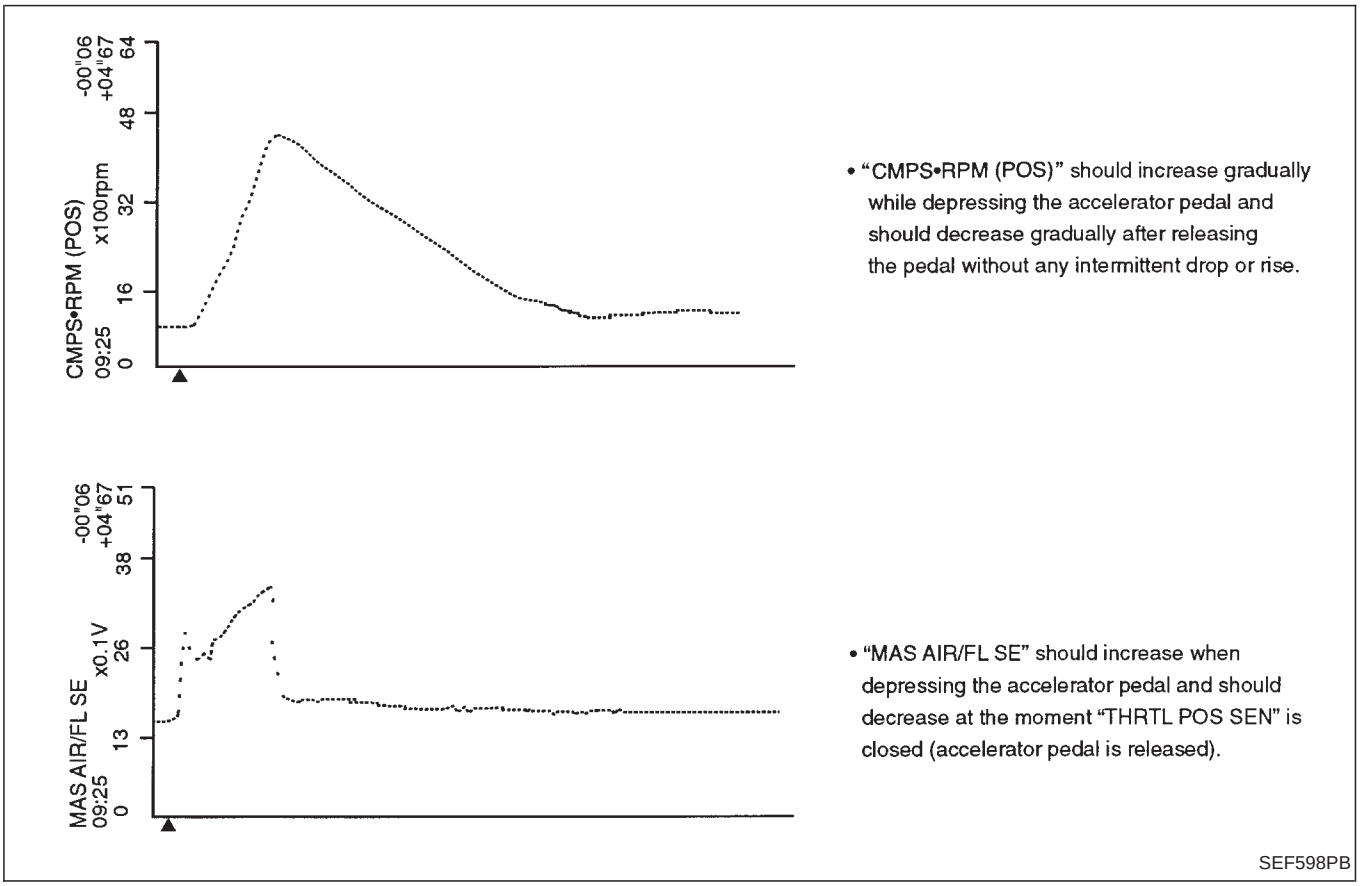
THRTL POS SEN, CLSD THL/POSI

Below is the data for “THRTL POS SEN” and “CLSD THL/POSI” when depressing the accelerator pedal with the ignition switch “ON”.
The signal of “THRTL POS SEN” should rise gradually without any intermittent drop or rise after “CLSD THL/POSI” is changed from “ON” to “OFF”.

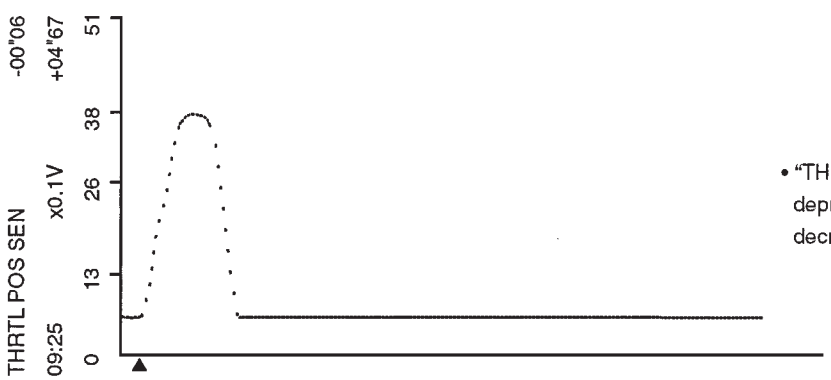


CMPS·RPM (POS), MAS AIR/FL SE, THRTL POS SEN, O2 SEN, INJ PULSE

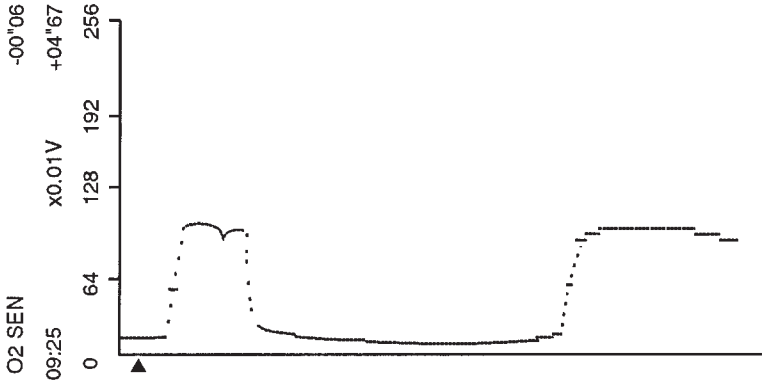
Below is the data for “CMPS·RPM (POS)”, “MAS AIR/FL SE”, “THRTL POS SEN”, “O2 SEN” and “INJ PULSE” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



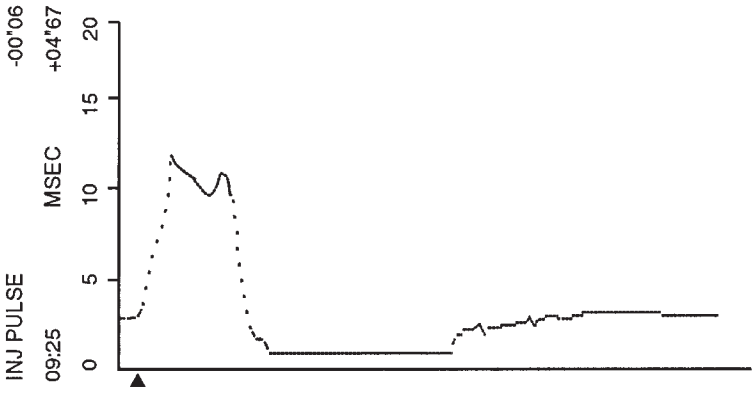
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



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

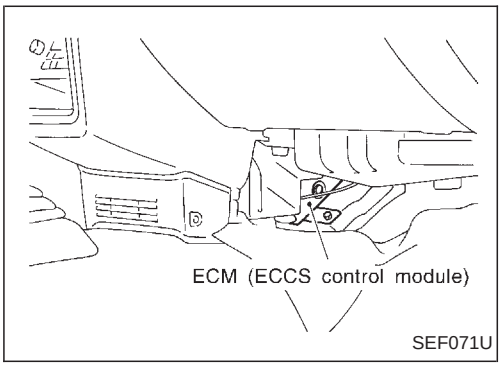


• "O2 SEN" may increase immediately after depressing the accelerator pedel and may decrease after releasing the pedal.



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

SEF259QA

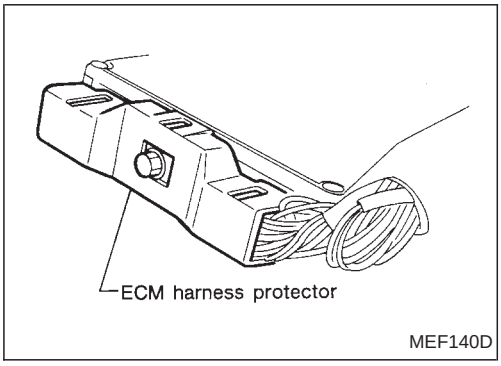


SEF071U

ECM Terminals and Reference Value

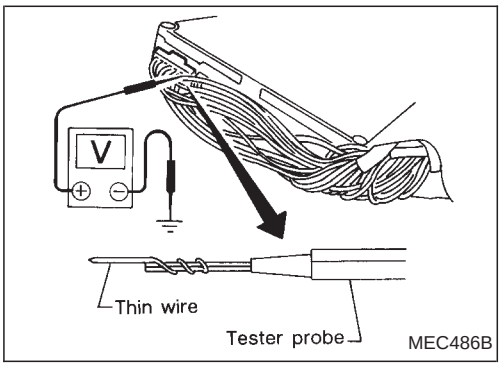
PREPARATION

1. ECM is located behind the instrument lower panel.



MEF140D

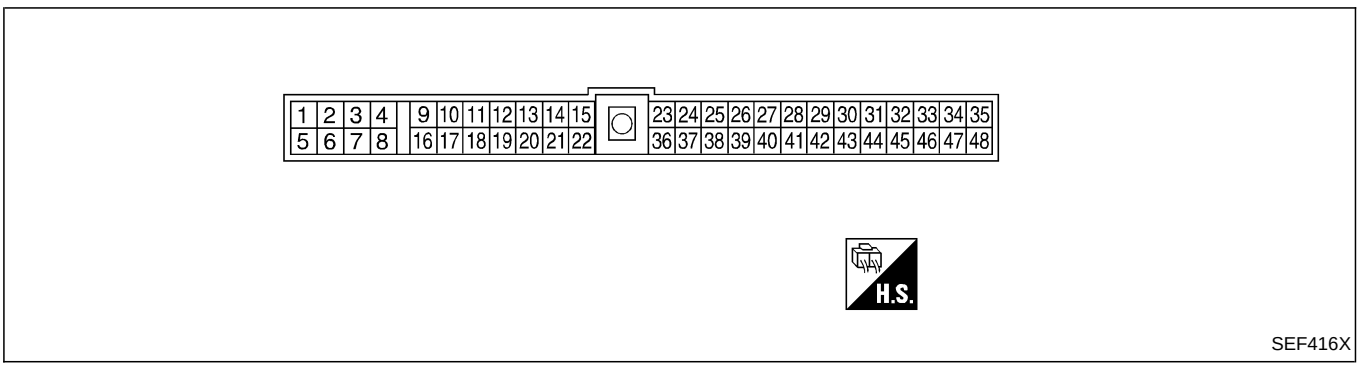
2. Remove ECM harness protector.



MEC486B

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

ECM HARNESS CONNECTOR TERMINAL LAYOUT

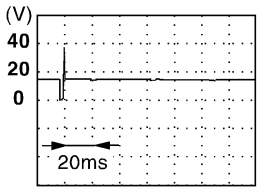
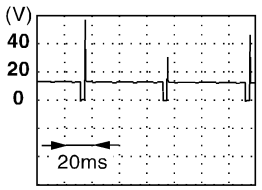


SEF416X

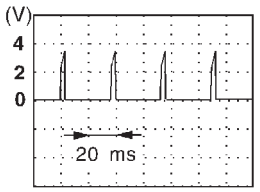
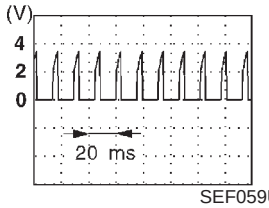
ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

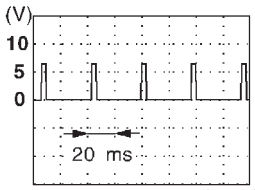
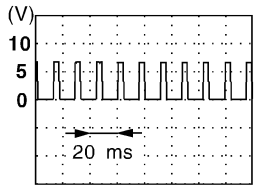
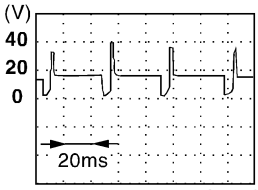
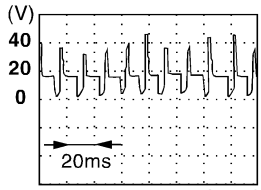
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
1 2 3 5	W/G W/R W/B W/L	Injector No. 3 Injector No. 2 Injector No. 4 Injector No. 1	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF204T
			Engine is running. └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)  SEF205T
4 8	B/P	ECM ground	Engine is running. └ Idle speed	Engine ground
6	G/Y	IACV-AAC valve	Engine is running. └ Idle speed	10 - 13V
			Engine is running. └ Steering wheel is being turned. └ Air conditioner is operating. └ Rear window defogger switch is "ON". └ Lighting switch is "ON".	5 - 10V
7	GY/L	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
9	W	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
11	L/B	ECM relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

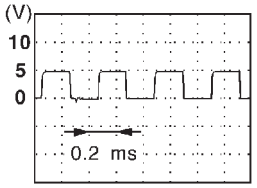
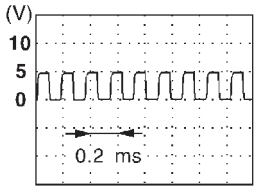
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
12	L	Ignition signal	Engine is running. └ Idle speed	Approximately 0.3V  SEF058U
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.7V  SEF059U
13	OR/B	Malfunction indicator lamp	Ignition switch "ON"	Approximately 1.5V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
14	Y	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	Approximately 1V
			Ignition switch "ON" └ 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
15	B/L	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
16	W	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)

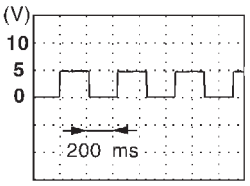
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
18	W	Tachometer (Models with tachometer)	Engine is running. └ Idle speed	Approximately 0.7V  SEF060U
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 1.6V  SEF061U
19	L/R	Ignition check	Engine is running. └ Idle speed	Approximately 13V  SEF188T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 13V  SEF189T
20	Y/R	Heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,000 rpm.	Approximately 0V
			Engine is running. └ Engine speed is above 3,000 rpm.	BATTERY VOLTAGE (11 - 14V)
23	G/R	Air conditioner relay	Engine is running. └ Both air conditioner switch and blower switch are "ON". (Compressor operates.)	Approximately 1V
			Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
24	L	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	0.9 - 1.8V
			Engine is running. (Warm-up condition) └ Engine speed is 2,500 rpm.	1.8 - 2.3V

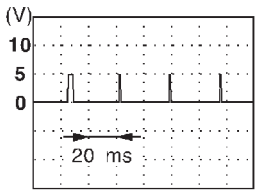
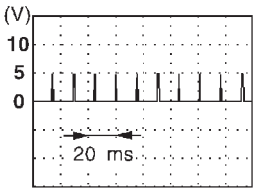
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
25	BR/W	Ambient air temperature switch	Engine is running. └ ● Idle speed ● Ambient air temperature is above 23°C (73°F) ● Air conditioner is operating	0V
			Engine is running. └ ● Idle speed ● Ambient air temperature is below 23°C (73°F) ● Air conditioner is operating	BATTERY VOLTAGE (11- 14V)
			Engine is running. └ ● Idle speed ● Ambient air temperature is below 23°C (73°F) ● Air conditioner is not operating	Approximately 5V
26	G/B	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
27	LG/R	Engine coolant temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
30	Y/R	Park/neutral position (PNP) switch	Ignition switch "ON" └ Park or Neutral position	0V
			Ignition switch "ON" └ Except the above gear position	Approximately 5V
31	W	Camshaft position sensor (POS) (1° signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.5V  SEF066U
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 2.5V  SEF067U
32	G/Y	Data link connector for CONSULT	Engine is running. └ Idle speed Connect CONSULT and select DATA MONITOR mode.	Approximately 0.1V
33	G/R			Approximately 4 - 6V
44	L			Approximately 0V

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
34	G	Throttle position sensor	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal released	0.35 - 0.65V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
35	B	ECM ground	Engine is running. └ Idle speed	Engine ground
36	B/G	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V
39	R	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
40	R	Heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 1.0V (periodically change)
41	Y	Load switch	Engine is running. └ Lighting switch and rear window defogger switch "OFF".	Approximately 0V
			Engine is running. └ Lighting switch or rear window defogger switch is "ON".	BATTERY VOLTAGE (11 - 14V)
42	W/L	Vehicle speed sensor	Ignition switch "ON" └ Jack up all wheels and run engine at idle in 1st position.	Varies from 0 to 5V  SEF068U
43	SB	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

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
45	OR	Camshaft position sensor (REF) (180° signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.4V  SEF064U
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.4V  SEF065U
46	Y	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower fan switch are "ON". (Compressor operates.)	Approximately 0V
			Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
47	W	Knock sensor	Engine is running. └ Idle speed	2.0 - 3.0V
48	B	ECM ground	Engine is running. └ Idle speed	Engine ground

Main Power Supply and Ground Circuit

ECM TERMINALS AND REFERENCE VALUE

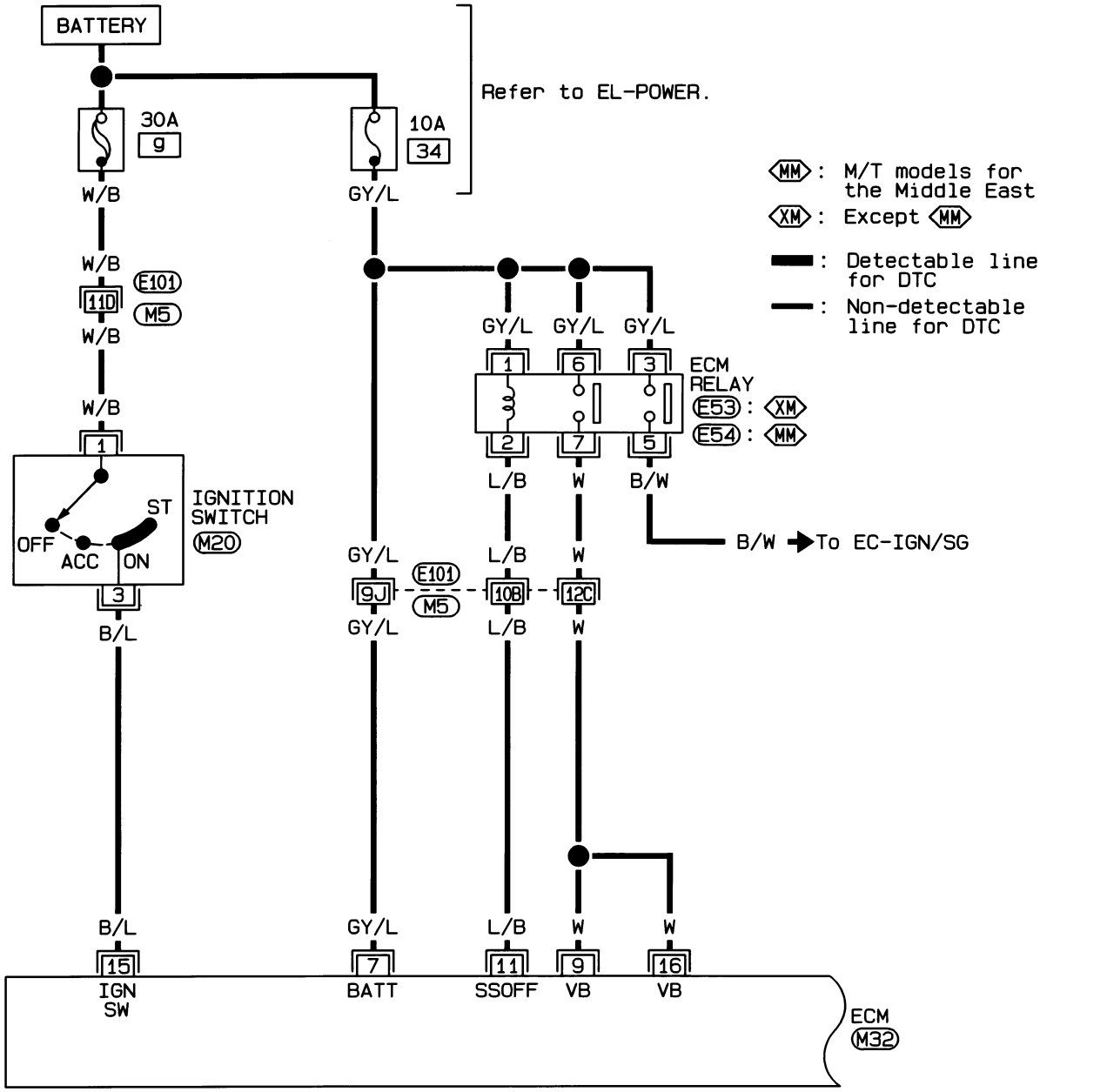
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

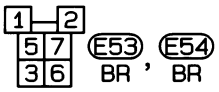
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
7	GY/L	Power supply (Back-up)	Ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)
9	W	Power supply for ECM	Ignition switch “ON”	BATTERY VOLTAGE (11 - 14V)
11	L/B	ECM relay (Self-shutoff)	Engine is running. Ignition switch “OFF” └ For a few seconds after turning ignition switch “OFF”	0 - 1V
			Ignition switch “OFF” └ A few seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)
15	B/L	Ignition switch	Ignition switch “OFF”	0V
			Ignition switch “ON”	BATTERY VOLTAGE (11 - 14V)
16	W	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)

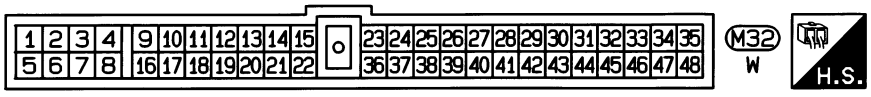
Main Power Supply and Ground Circuit (Cont'd)

FOR LHD MODELS

EC-MAIN-01







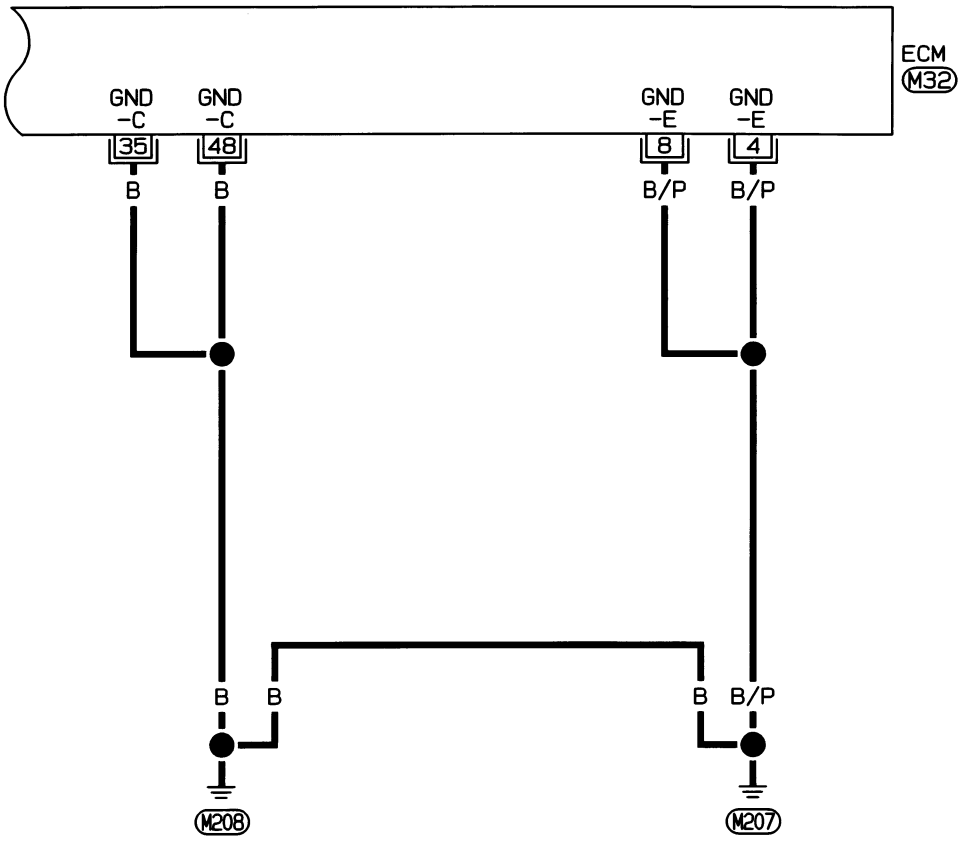
Refer to last page (Foldout page).

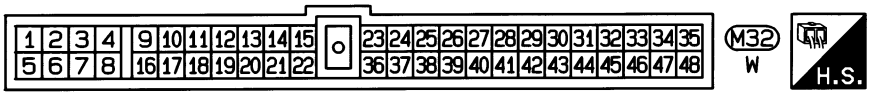
M5 , E101

Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-02

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



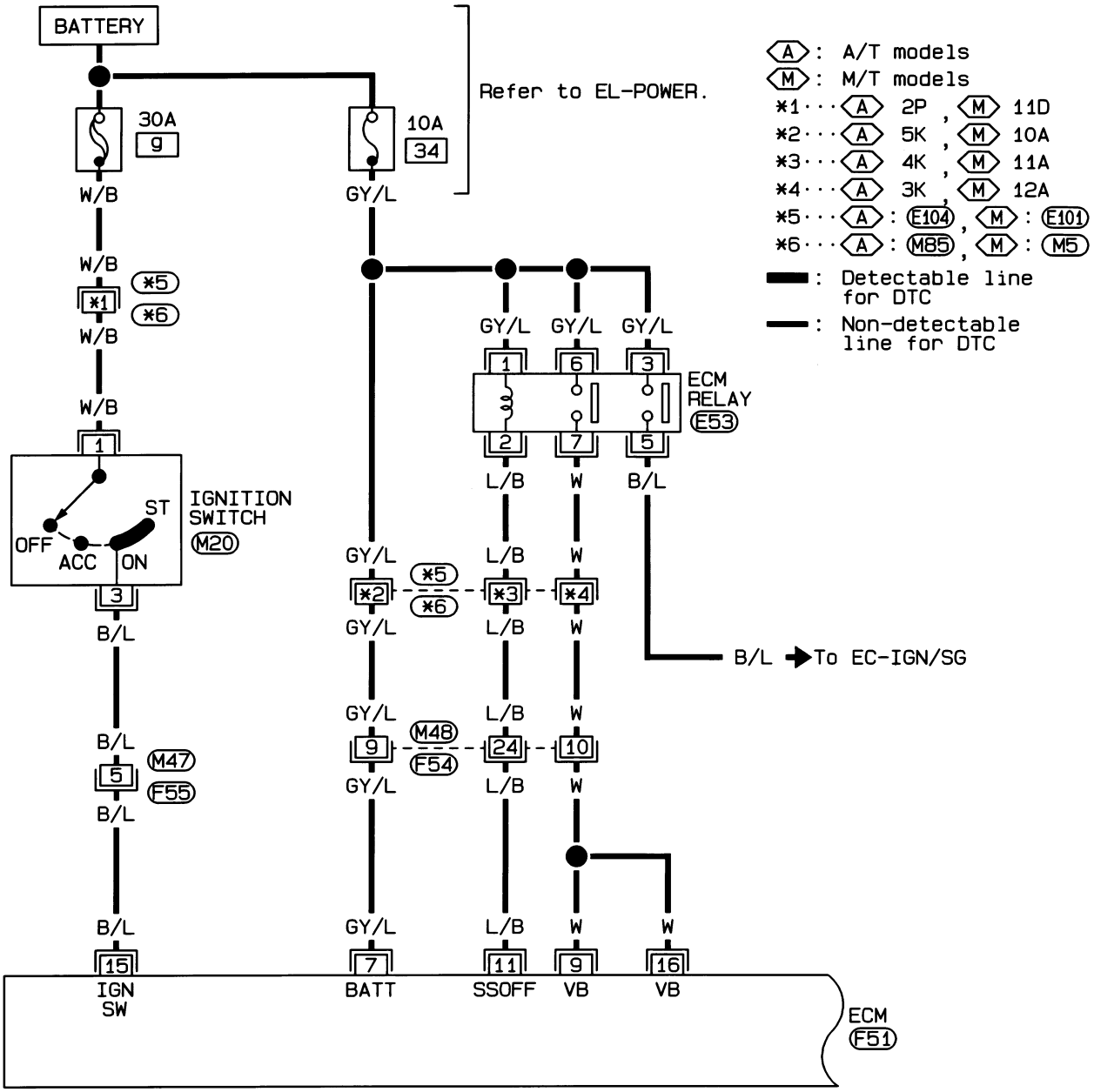


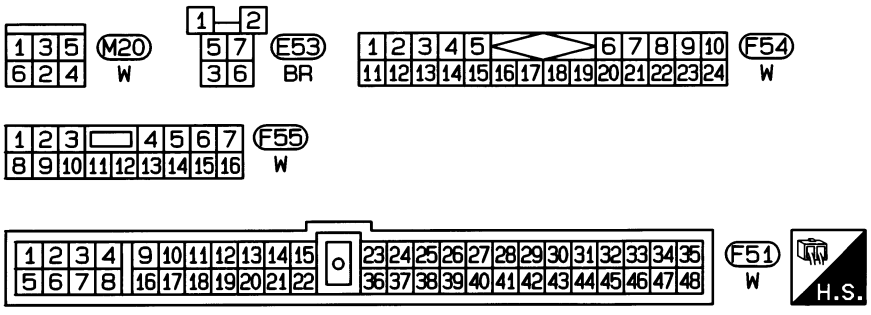
HEC656

Main Power Supply and Ground Circuit (Cont'd)

FOR RHD MODELS

EC-MAIN-03





Refer to last page (Foldout page).

M5, E101

M85, E104

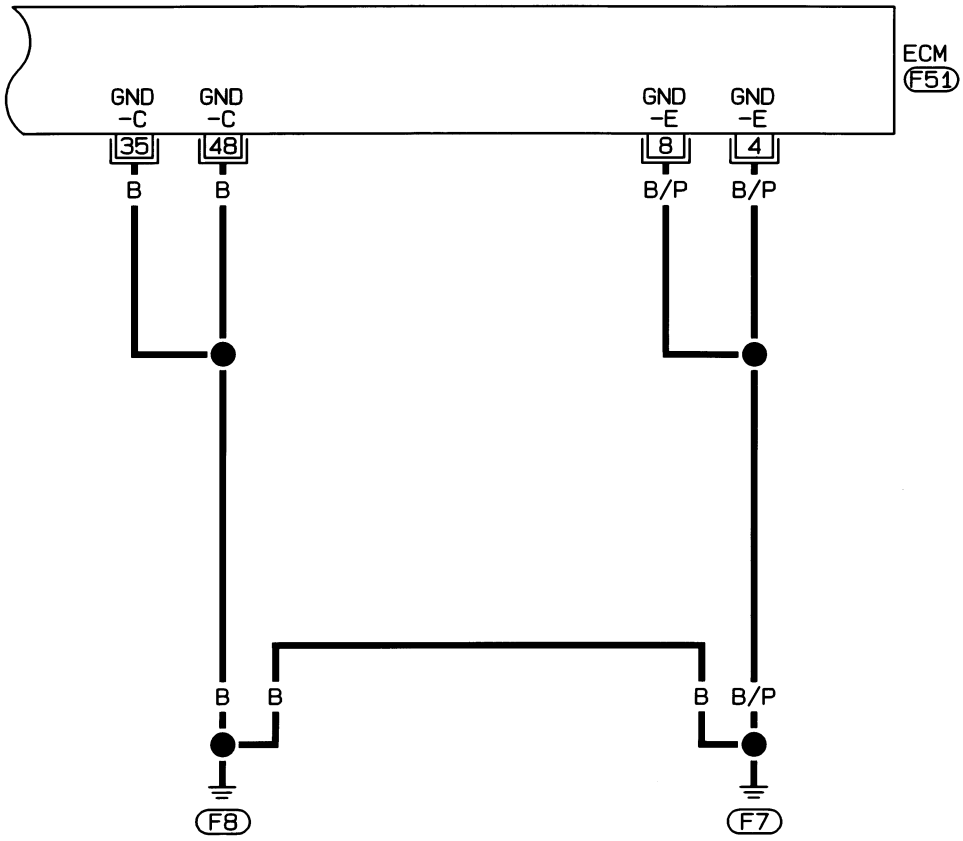
HEC657

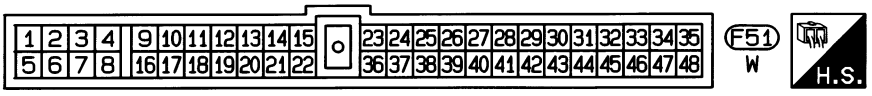
Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-04

: Detectable line for DTC

: Non-detectable line for DTC

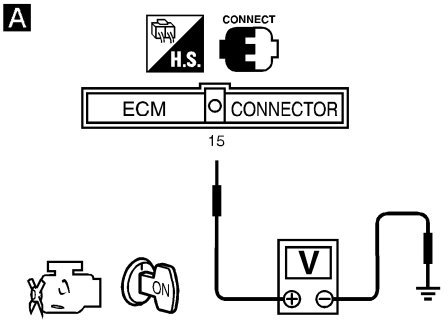




HEC658

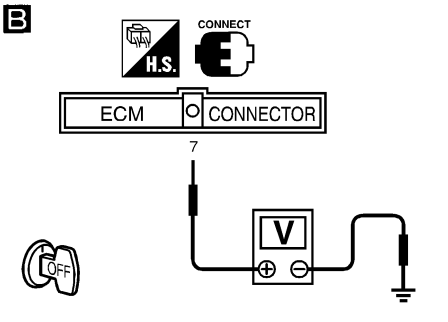
Main Power Supply and Ground Circuit (Cont'd)

A

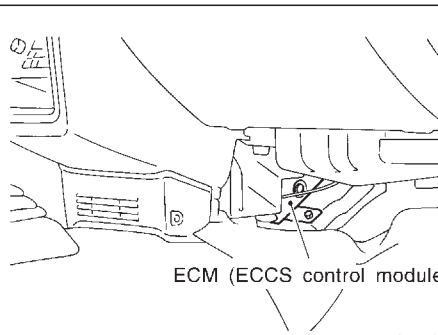


SEF417X

B

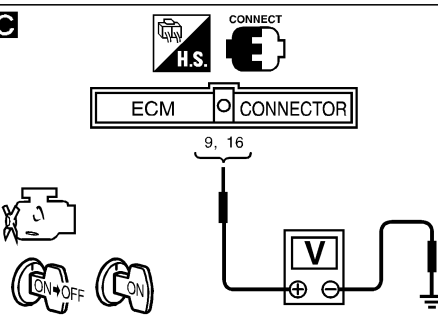


SEF418X



SEF071U

C



SEF419X

INSPECTION START

Start engine.
Is engine running?

No → A

CHECK POWER SUPPLY-I.
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal ⑮ and ground with CONSULT or tester.
   Voltage: Battery voltage

If NG, check the following.
- Harness connectors (F55), (M47) (RHD models only)
- Harness for open or short between ECM and ignition switch

If NG, repair harness or connectors.

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

Yes

B

CHECK POWER SUPPLY-II.
1. Stop engine.
2. Check voltage between ECM terminal ⑦ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG →
Check the following.
- Harness connectors (F54), (M48) (RHD models)
  (E104), (M85) (RHD, A/T models)
  (E101), (M5) (RHD, M/T models)
- Harness connectors (M5), (E101) (LHD models)
- 10A fuse
- Harness for open or short between ECM and battery

If NG, repair harness or connectors.

OK

C

CHECK POWER SUPPLY-III.
1. Turn ignition switch "ON" and then turn "OFF".
2. Check voltage between ECM terminals ⑨, ⑯ and ground with CONSULT or tester.
   Voltage:
   After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

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

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

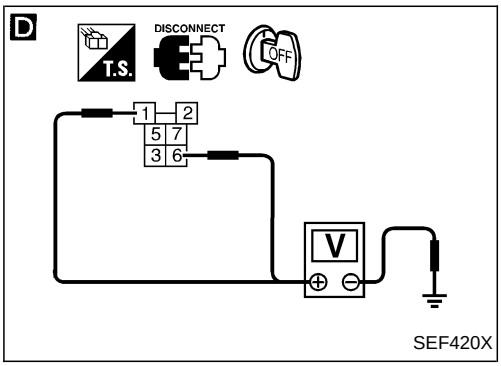
NG

Case-1 → Case-2 → Go to "CHECK ECM RELAY" on next page.

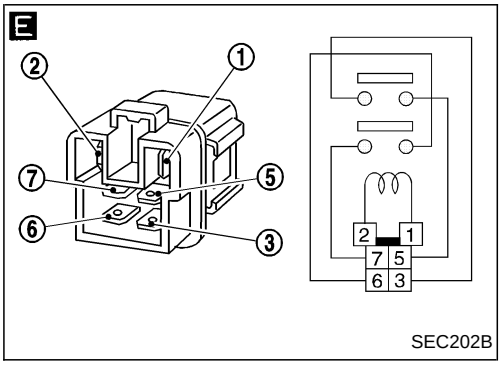
Ⓐ
(Go to next page.)

Main Power Supply and Ground Circuit (Cont'd)

D



E



Ⓐ

CHECK HARNESS CONTINUITY BETWEEN ECM RELAY AND ECM.
1. Disconnect ECM harness connector.
2. Disconnect ECM relay.
3. Check harness continuity between ECM terminals ⑨, ⑯ and ECM relay terminal ⑦.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors F54, M48 (RHD models)
  E104, M85 (RHD, A/T models)
  E101, M5 (RHD, M/T models)
- Harness connectors M5, E101
- Harness for open or short between ECM and ECM relay

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

OK

D

CHECK VOLTAGE BETWEEN ECM RELAY AND GROUND.
Check voltage between terminals ①, ⑥ and ground with CONSULT or tester.
Voltage: Battery voltage

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

If NG, repair harness or connectors.

OK

CHECK OUTPUT SIGNAL CIRCUIT.
Check harness continuity between ECM terminal ⑪ and relay terminal ②.
Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors F54, M48 (RHD models)
  E104, M85 (RHD, A/T models)
  E101, M5 (RHD, M/T models)
- Harness connectors M5, E101
- Harness for open or short between ECM and ECM relay

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

OK

E

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

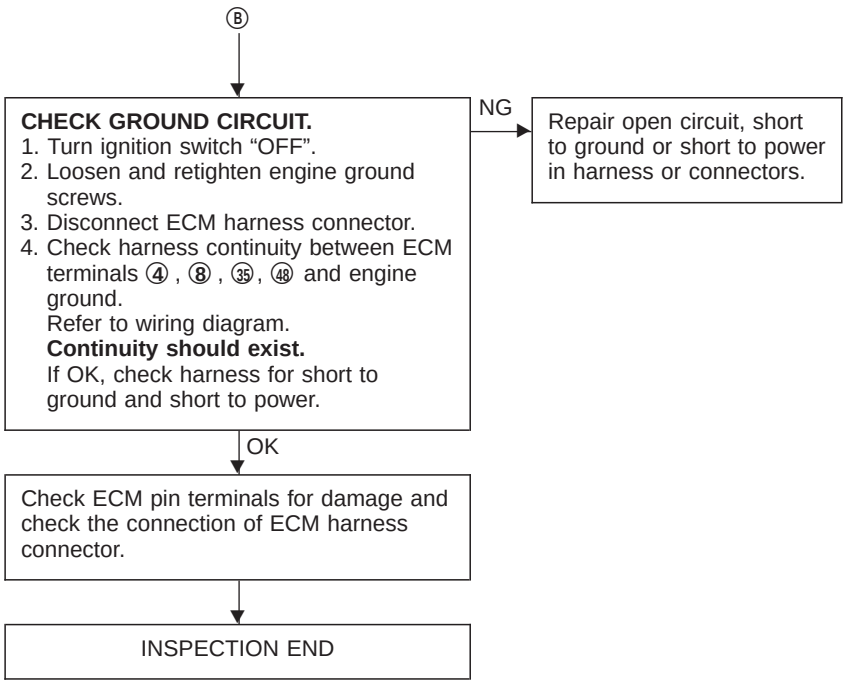
NG → Replace ECM relay.

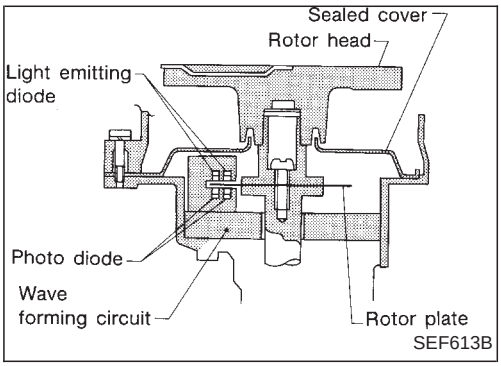
OK

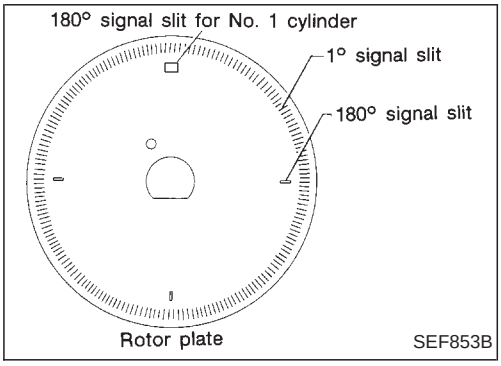
Ⓑ

(Go to next page.)

Main Power Supply and Ground Circuit (Cont'd)







Camshaft Position Sensor (CMPS)

COMPONENT DESCRIPTION

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

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

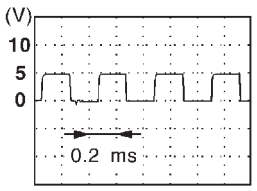
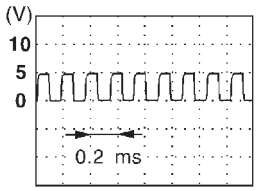
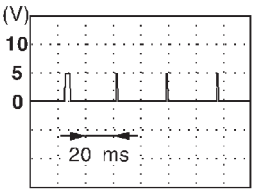
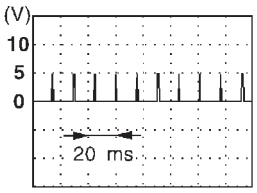
The rotor plate is positioned between the LED and the photo diode. The LED transmits light to the photo diode. As the rotor plate turns, the slits cut the light to generate rough-shaped pulses. These pulses are converted into on-off signals by the wave-forming circuit and sent to the ECM.

The distributor is not repairable and must be replaced as an assembly, except distributor cap.

Camshaft Position Sensor (CMPS) (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

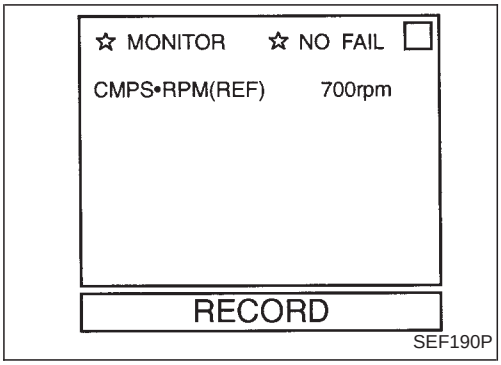
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
31	W	Camshaft position sensor (POS) (1° signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.5V  SEF066U
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 2.5V  SEF067U
45	OR	Camshaft position sensor (REF) (180° signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.4V  SEF064U
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0.4V  SEF065U

Camshaft Position Sensor (CMPS) (Cont’d)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
11	● Either 1° or 180° signal is not sent to ECM for the first few seconds during engine cranking. ● Either 1° or 180° signal is not sent to ECM during engine running. ● Either 1° or 180° signal is not in the normal pattern during engine running.	● Harness or connectors (The camshaft position sensor circuit is open or shorted.) ● Camshaft position sensor ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.) ● Dead (Weak) battery



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) Start engine and run it for at least 2 seconds at idle speed.
   (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)

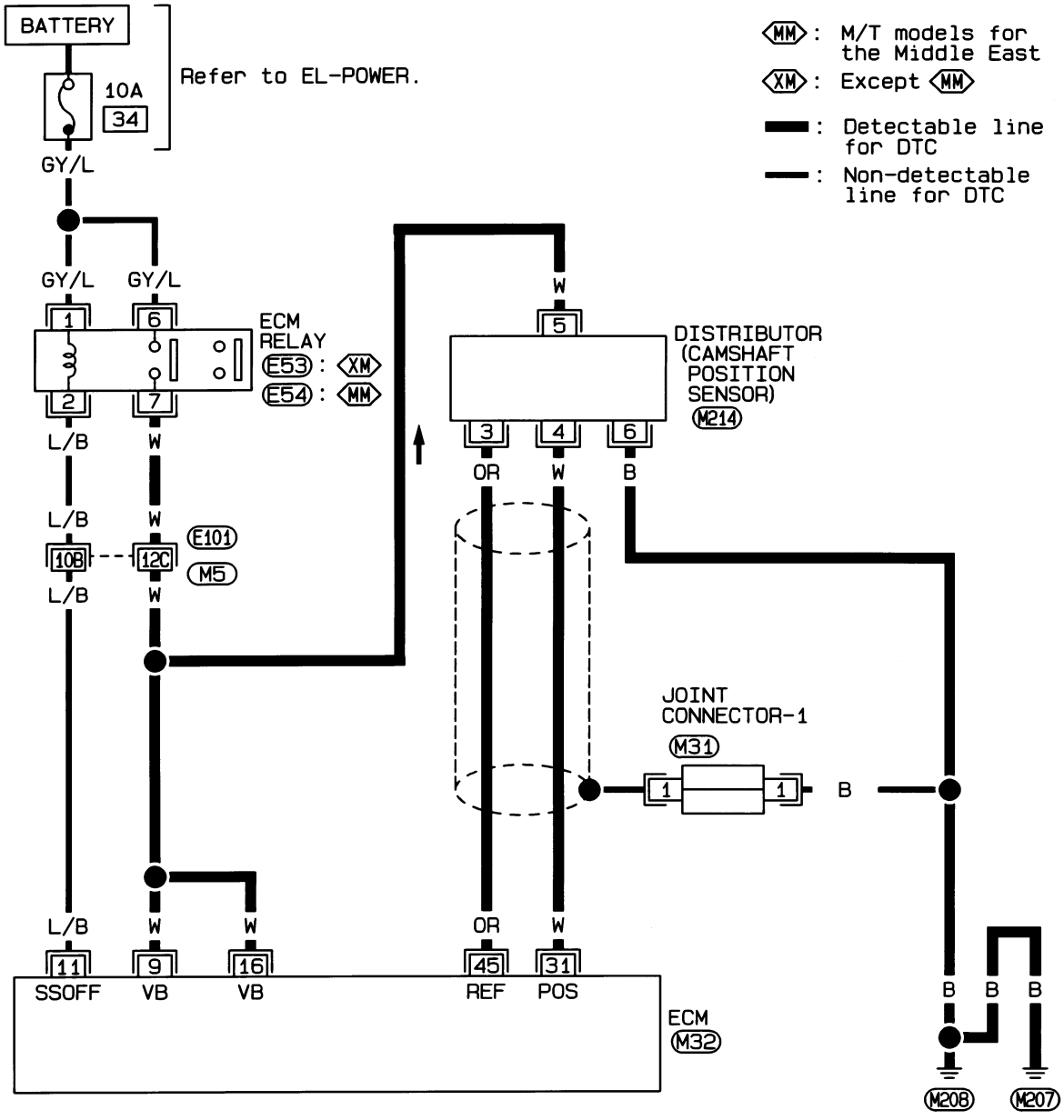
OR

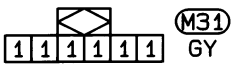
1) Start engine and run it for at least 2 seconds at idle speed.
   (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
2) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

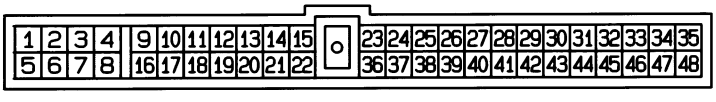
Camshaft Position Sensor (CMPS) (Cont'd)

FOR LHD MODELS

EC-CMPS-01







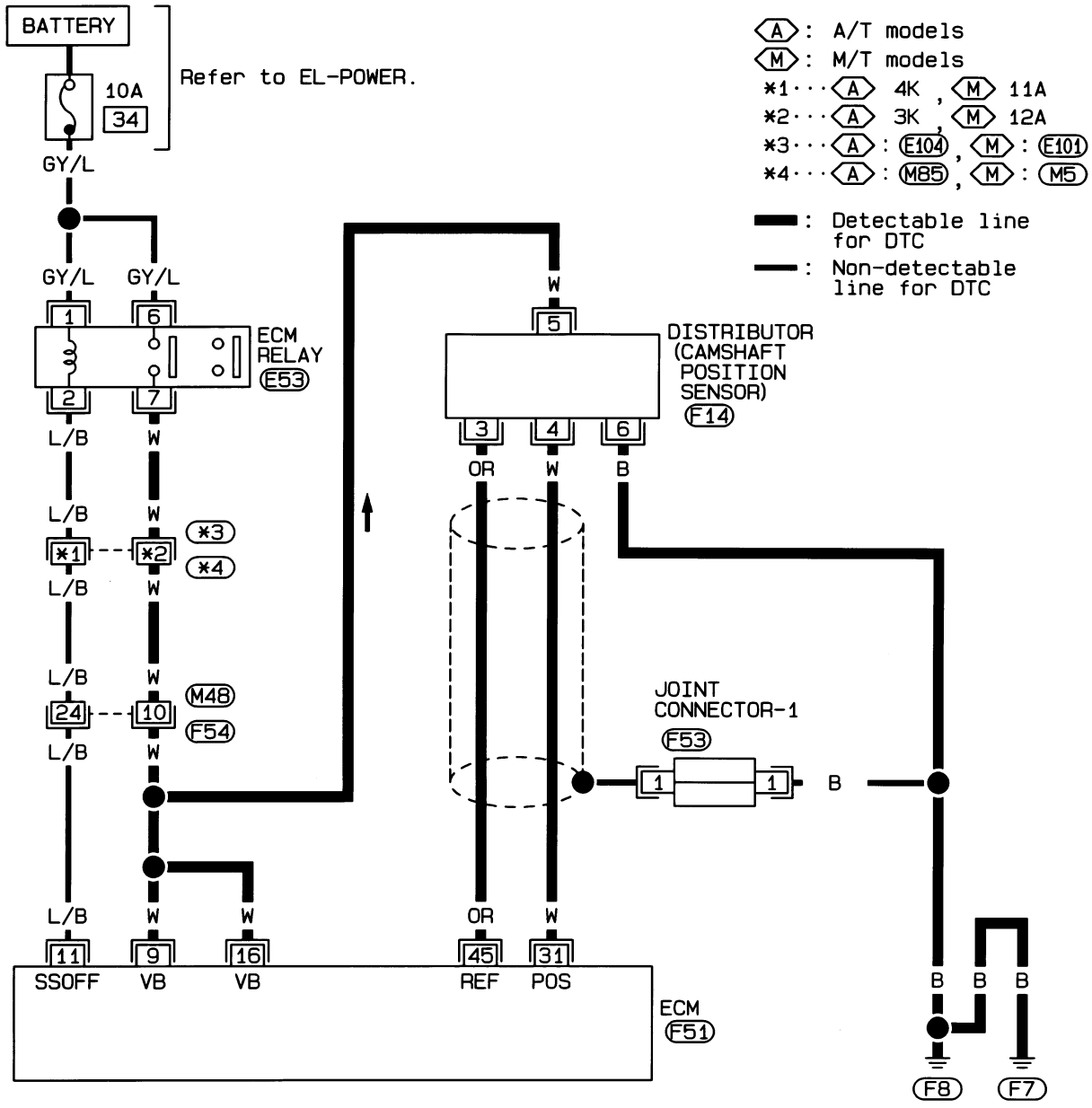
Refer to last page (Foldout page).
M5, E101

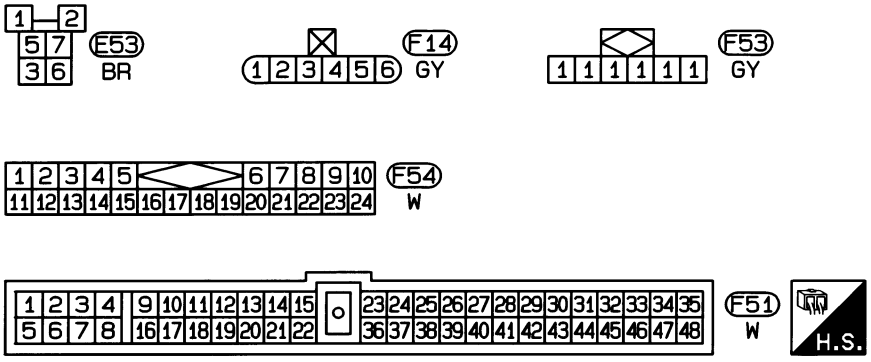
HEC659

Camshaft Position Sensor (CMPS) (Cont'd)

FOR RHD MODELS

EC-CMPS-02





Refer to last page (Foldout page).

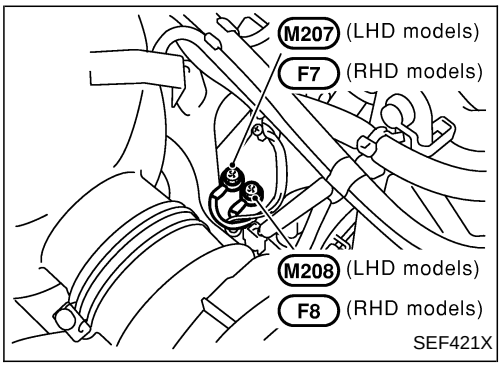
M5, E101

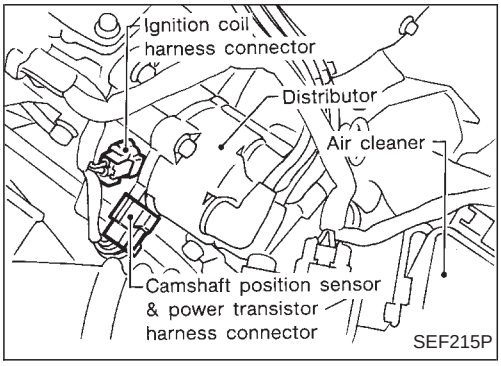
M85, E104

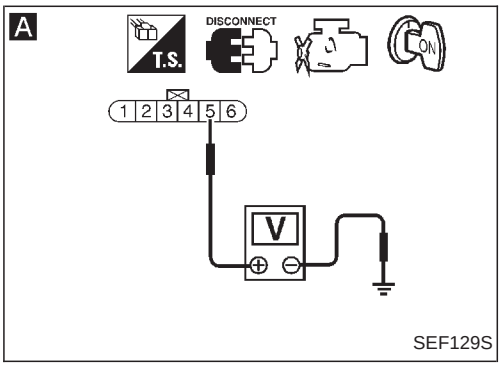
HEC660

Camshaft Position Sensor (CMPS) (Cont’d)

DIAGNOSTIC PROCEDURE







INSPECTION START

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

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

Yes

A

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

NG → Check the following.
- Harness connectors M5, E101 (LHD models)
- Harness connectors F54, M48 (RHD models)
  E104, M85 (RHD, A/T models)
  E101, M5 (RHD, M/T models)
- Harness for open or short between camshaft position sensor and ECM
- Harness for open or short between camshaft position sensor and ECM relay

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT.
1. Disconnect camshaft position sensor harness connector.
2. Check harness continuity between terminal ⑥ and engine ground.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short.

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

OK

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ④ and ECM terminals ㉛ (1° signal), terminal ③ and ECM terminals ㊺ (180° signal).
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

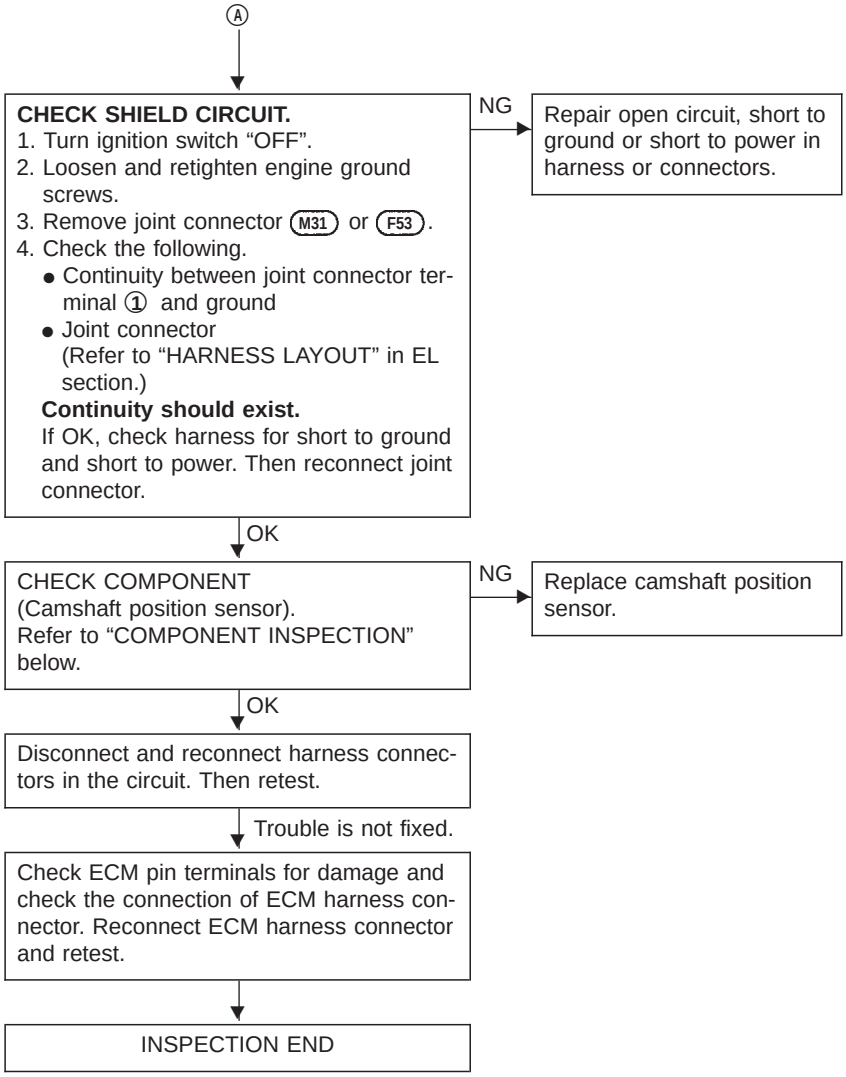
NG → Repair open circuit, short to ground or short to power in harness or connectors.

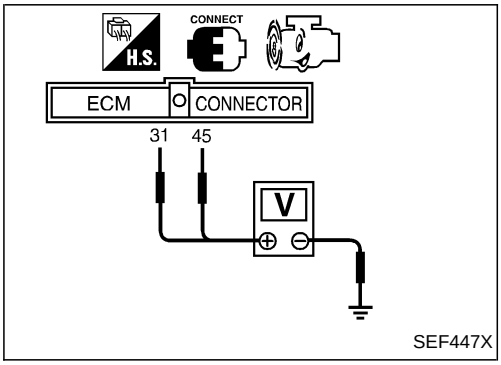
OK

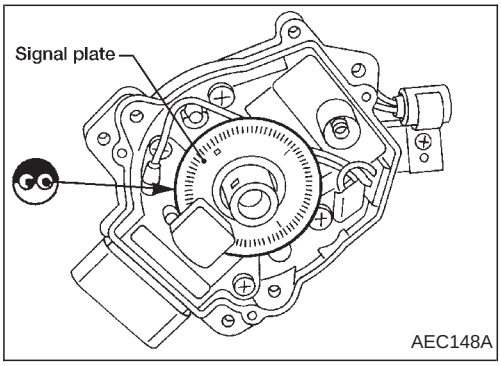
Ⓐ

(Go to next page.)

Camshaft Position Sensor (CMPS) (Cont’d)







COMPONENT INSPECTION

Camshaft position sensor

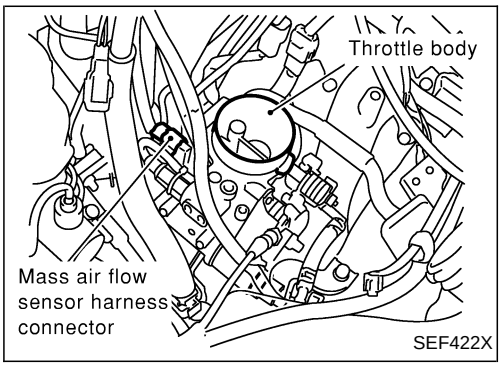
1. Start engine.
2. Check voltage between ECM terminals ㉛ , ㊺ and ground with DC range.

Condition	Terminals	Voltage
Engine running at idle	㉛ and ground	Approximately 0.4V*
	㊺ and ground	Approximately 2.5V*

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

If NG, replace distributor assembly with camshaft position sensor.

3. Visually check signal plate for damage or dust.



Mass Air Flow Sensor (MAFS)

COMPONENT DESCRIPTION

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

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: Neutral position ● No-load	Idle	0.9 - 1.8V
		2,500 rpm	1.8 - 2.3V

ECM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

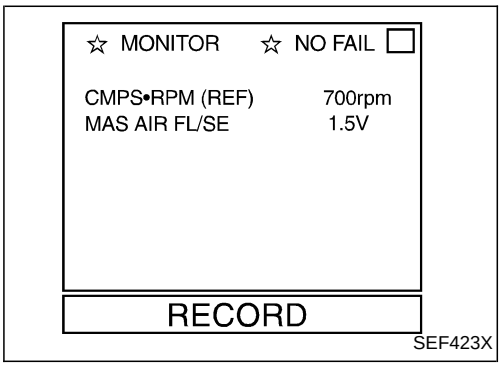
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
24	L	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	0.9 - 1.8V
			Engine is running. (Warm-up condition) └ Engine speed is 2,500 rpm.	1.8 - 2.3V
36	B/G	Mass air flow sensor ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
12	● An excessively high or low voltage from the sensor is sent to ECM.*	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

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

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



Mass Air Flow Sensor (MAFS) (Cont’d)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

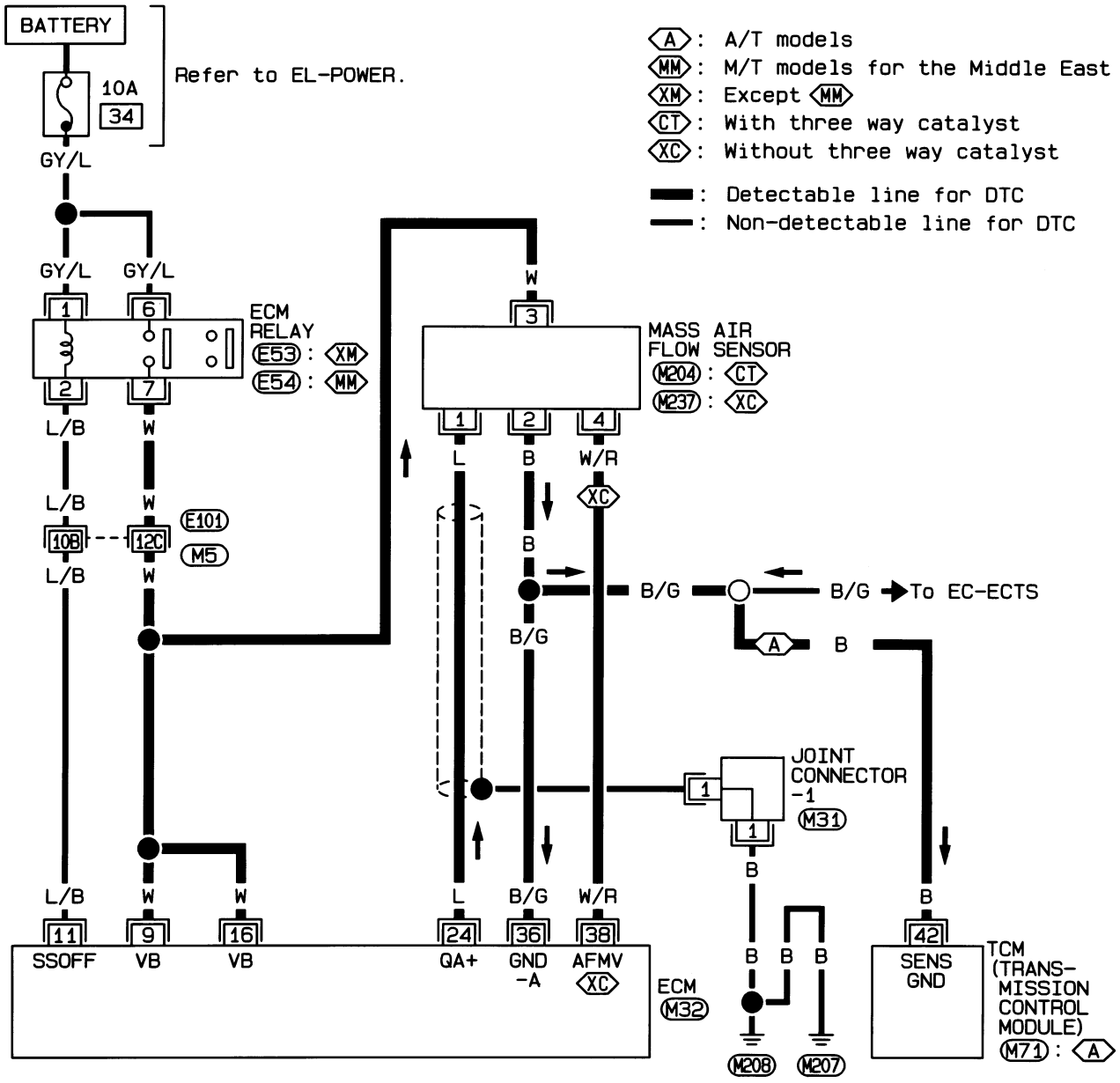
OR

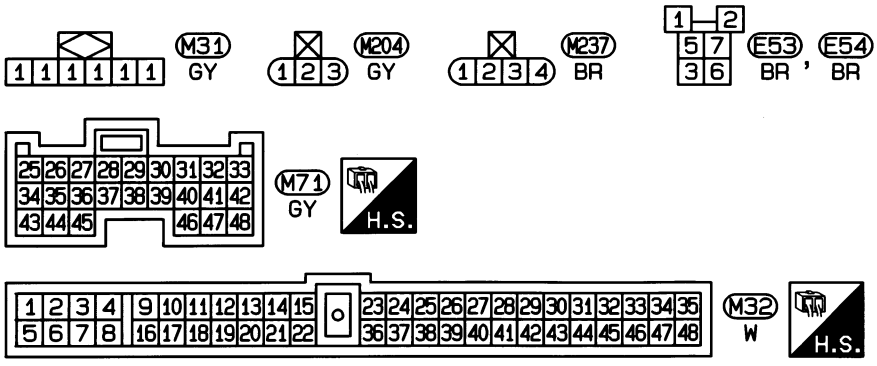
1) Turn ignition switch “ON”, and wait at least 6 seconds.
2) Start engine and wait at least 3 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

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

FOR LHD MODELS

EC-MAFS-01





Refer to last page (Foldout page).

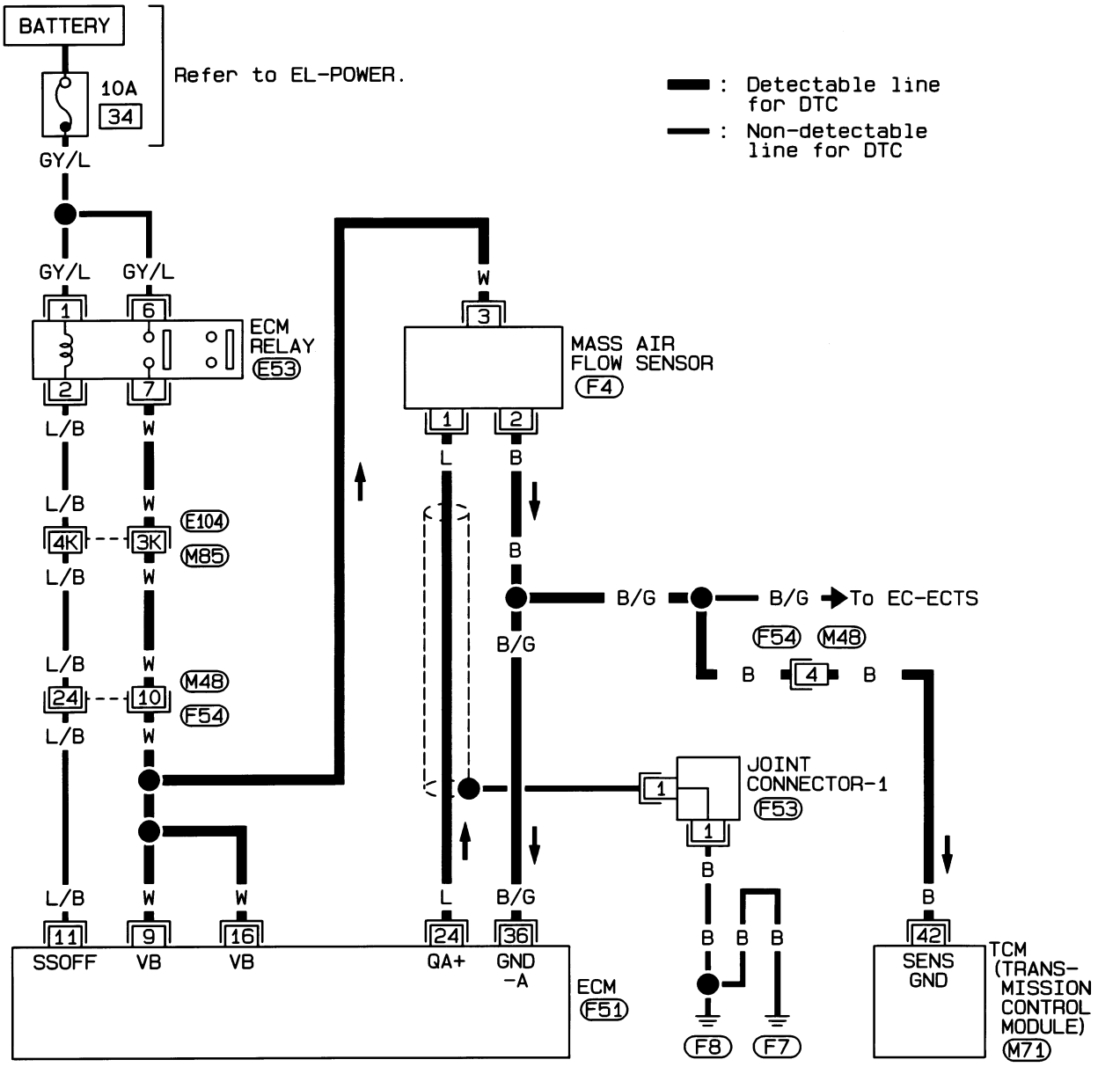
M5, E101

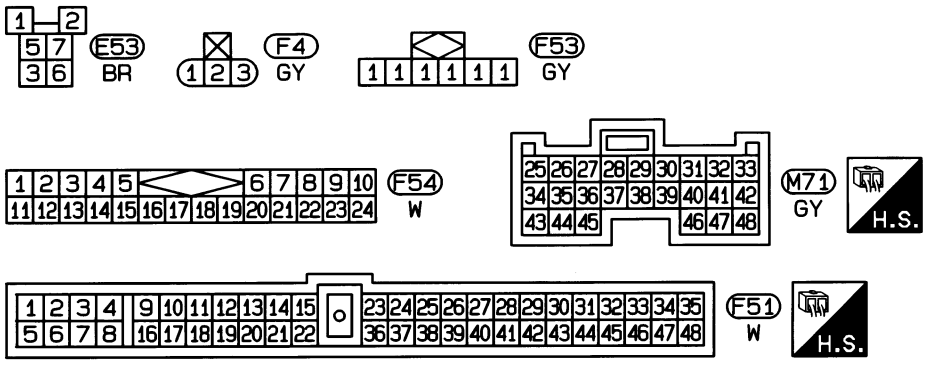
HEC661

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

FOR RHD A/T MODELS

EC-MAFS-02





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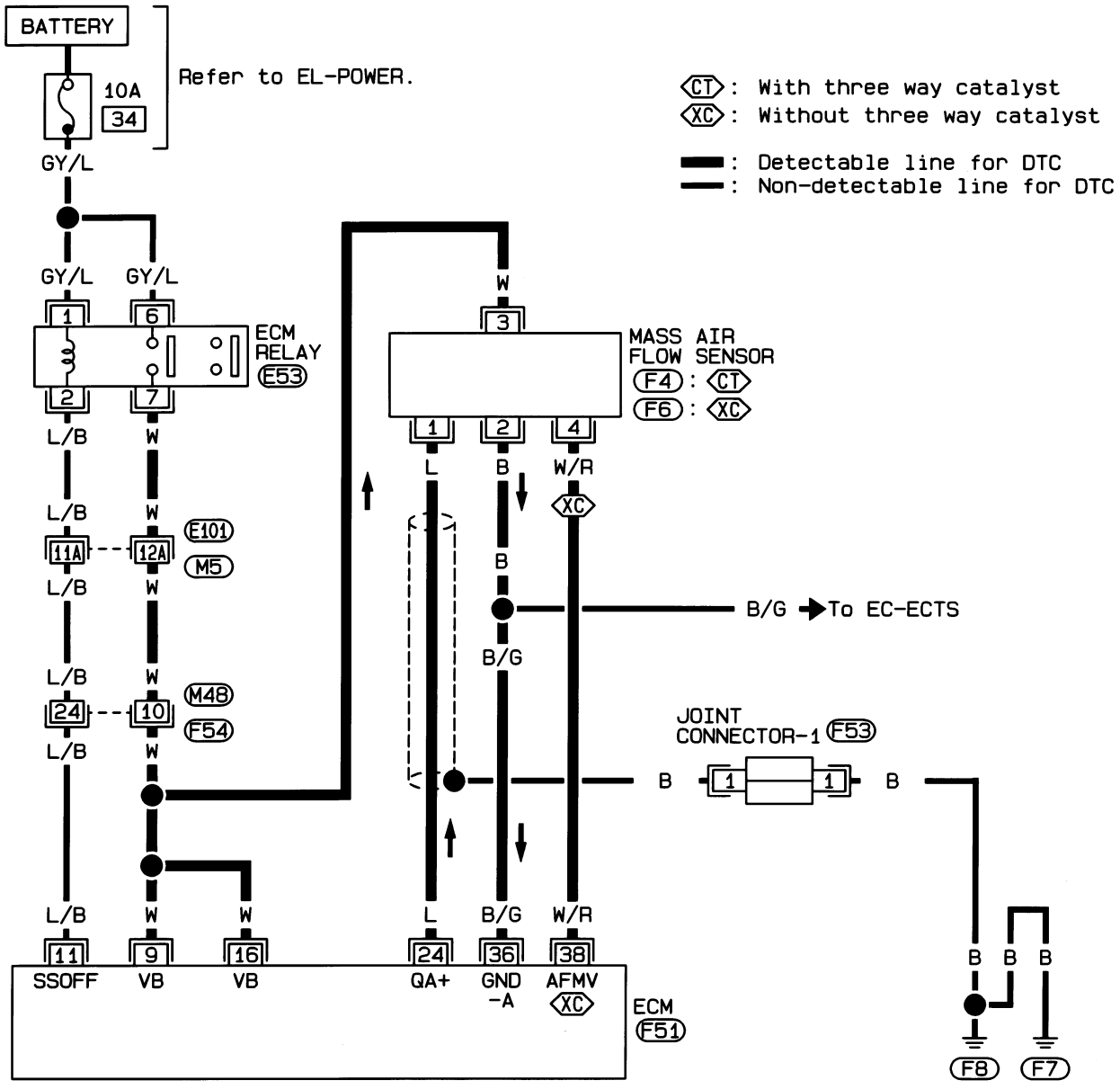
M85, E104

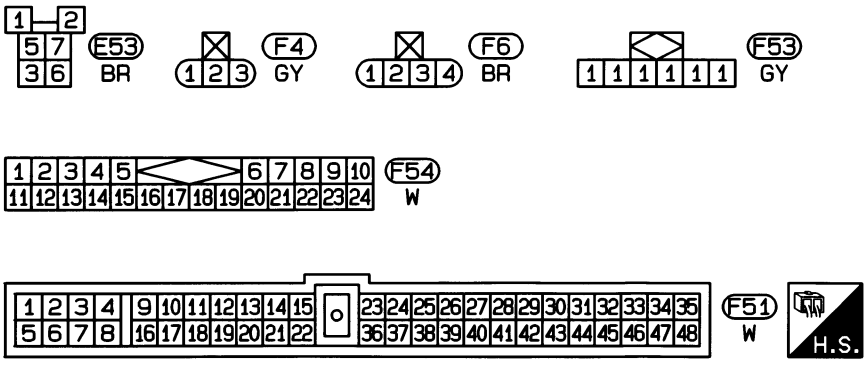
HEC662

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

FOR RHD M/T MODELS

EC-MAFS-03



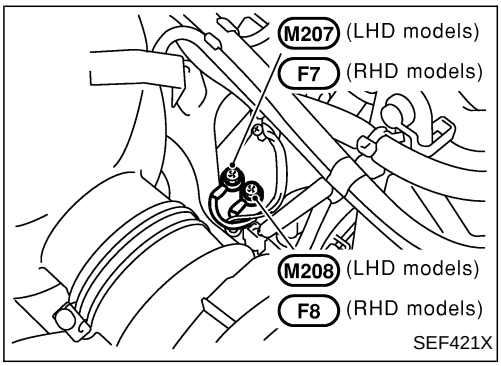


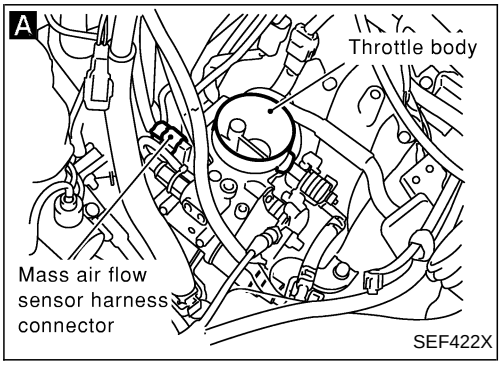
Refer to last page (Foldout page).
M5, E101

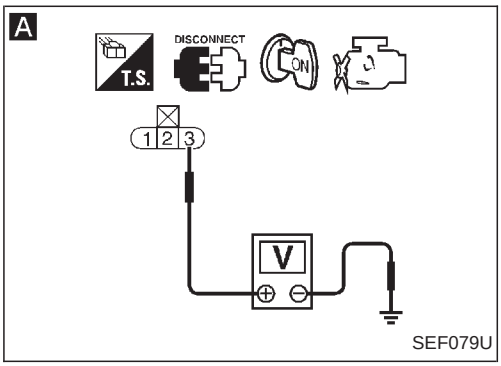
HEC689

Mass Air Flow Sensor (MAFS) (Cont’d)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

NG → Check the following.
- Harness connectors M5, E101 (LHD models)
- Harness connectors F54, M48 (RHD models)
  E104, M85 (RHD, A/T models)
  E101, M5 (RHD, M/T models)
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

If NG, repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT.
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ② and ECM terminal ㊱.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between terminal ① and ECM terminal ㉔.
Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short to ground and short to power.

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

OK ↓

CHECK SHIELD CIRCUIT.
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.
3. Remove joint connector M31 or F53.
4. Check the following.
   - Continuity between joint connector terminal ① and ground
   - Joint connector
     (Refer to “HARNESS LAYOUT” in EL section.)

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

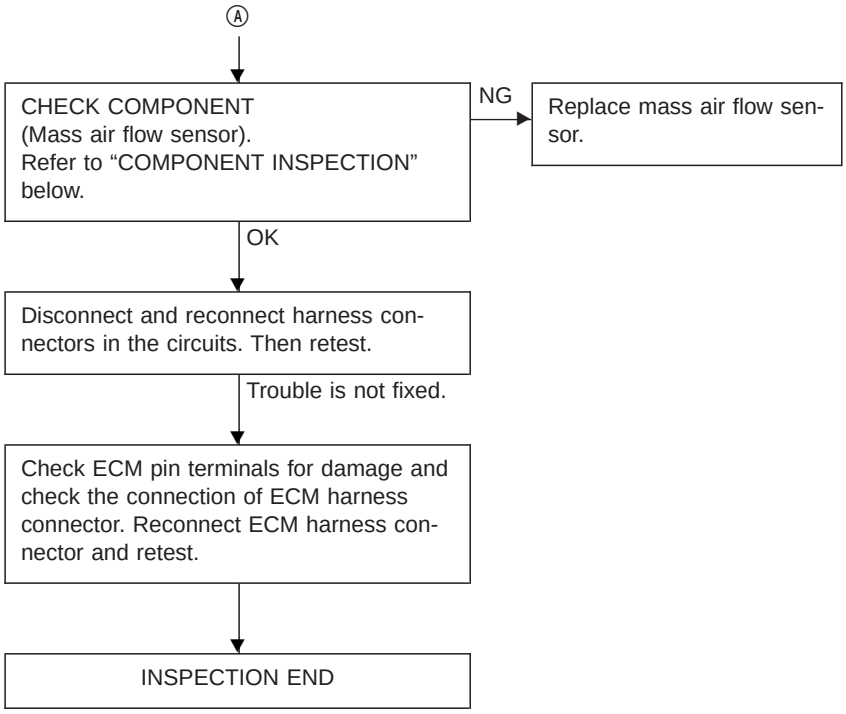
NG → Repair open circuit, short to ground or short to power in harness or connectors.

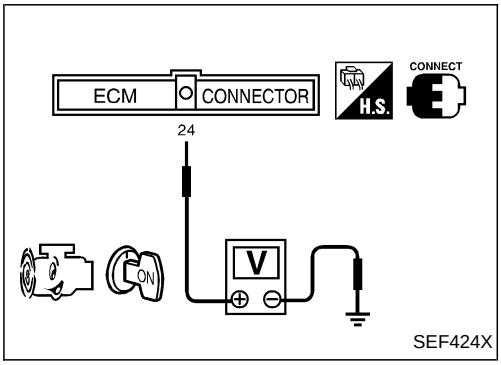
OK ↓

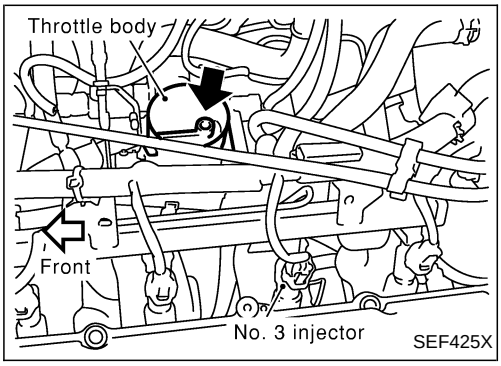
Ⓐ

(Go to next page.)

Mass Air Flow Sensor (MAFS) (Cont’d)







COMPONENT INSPECTION

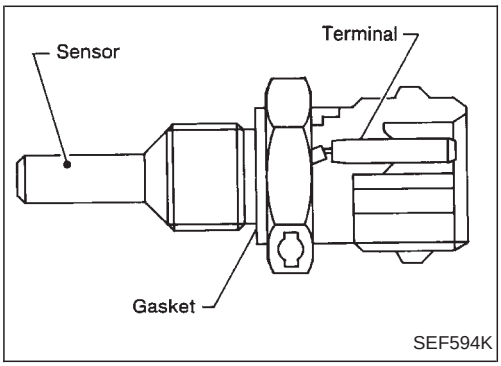
Mass air flow sensor

1. Turn ignition switch “ON”.
2. Start engine and warm it up sufficiently.
3. Check voltage between ECM terminal ㉔ and ground.

Conditions	Voltage V
Ignition switch “ON” (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up sufficiently.)	0.9 - 1.8
2,500 rpm	1.8 - 2.3
Idle to about 4,000 rpm*	0.9 - 1.8 to Approx. 4.0

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

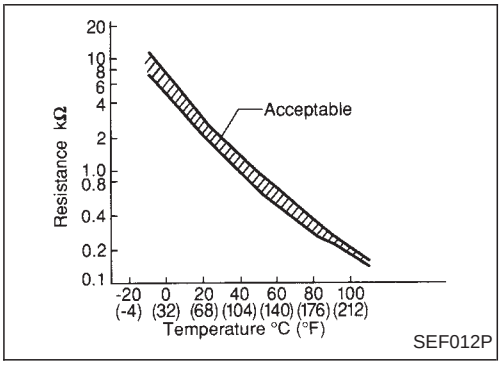
4. If NG, remove mass air flow sensor from air duct. Check hot wire for damage or dust.



Engine Coolant Temperature Sensor (ECTS)

COMPONENT DESCRIPTION

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



<Reference data>

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

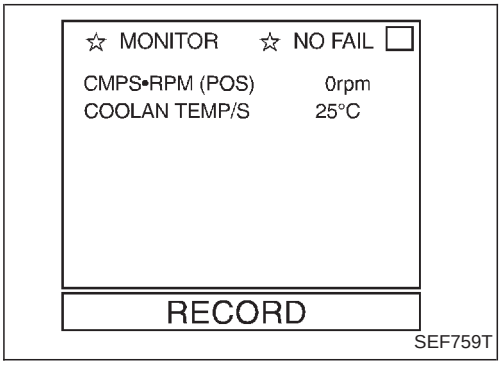
*: These data are reference values and are measured between ECM terminal ㉗ (Engine coolant temperature sensor) and ECM terminal ㊱ (ECM ground).

ON BOARD DIAGNOSIS LOGIC

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

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

Engine operating condition in fail-safe mode	Condition	Engine coolant temperature decided (CONSULT DISPLAY)
Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT displays the engine coolant temperature decided by ECM.	Just as ignition switch is turned ON or START	40°C (104°F)
	More than 4 minutes after ignition START	80°C (176°F)
	Except as shown above	40 - 80°C (140 - 176°F) (Depends on the time)



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

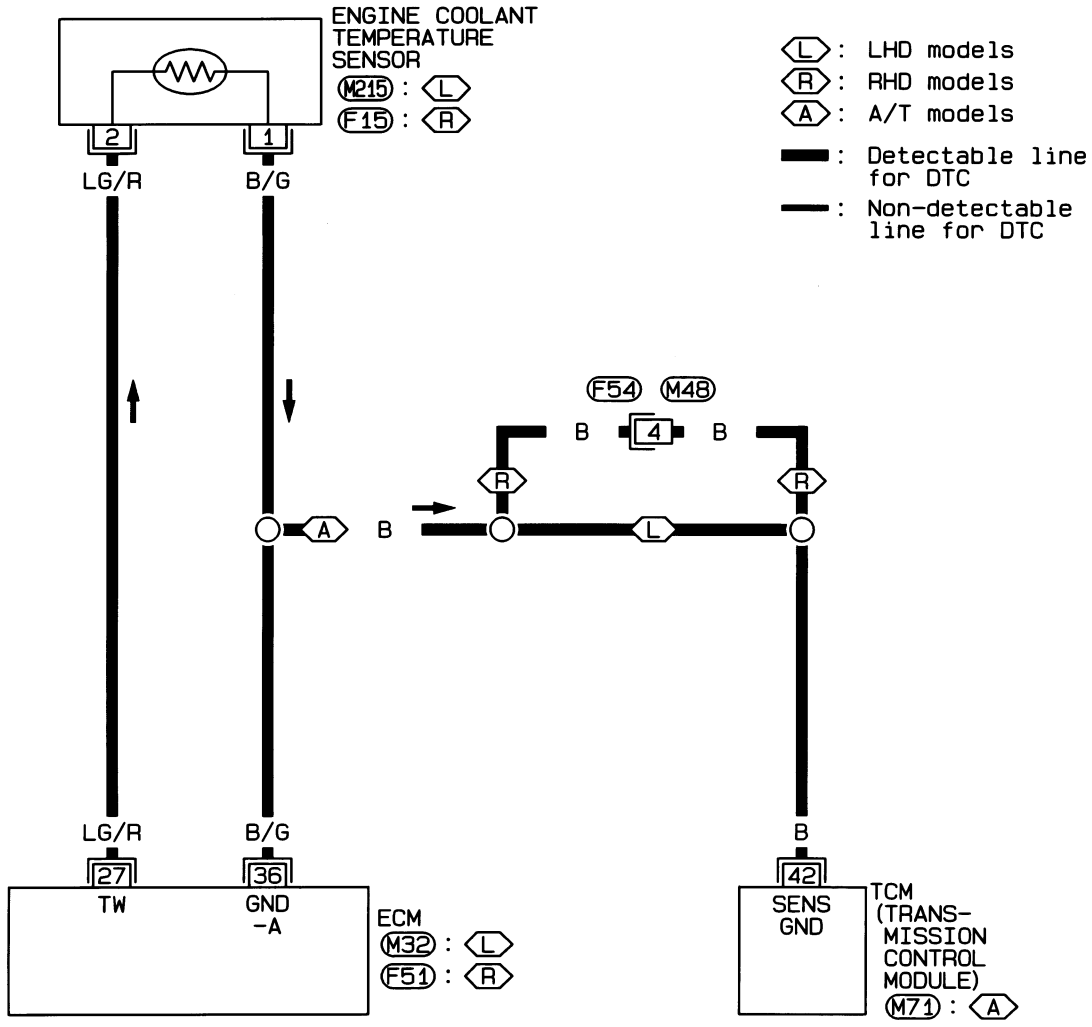
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT.
3) Wait at least 5 seconds.

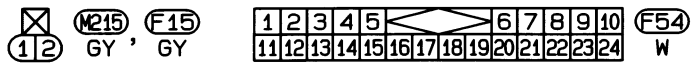
OR

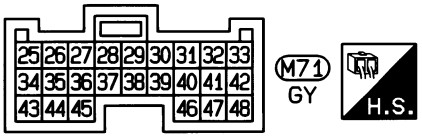
1) Turn ignition switch “ON” and wait at least 5 seconds.
2) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

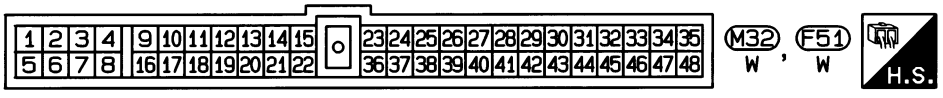
Engine Coolant Temperature Sensor (ECTS) (Cont'd)

EC-ECTS-01





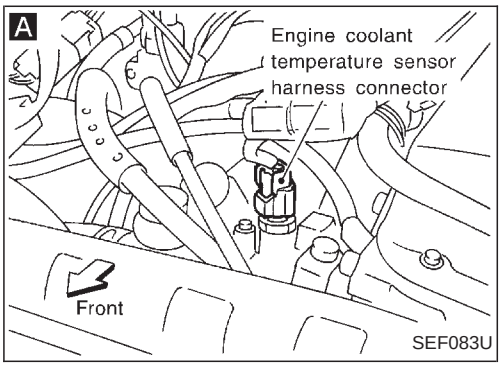


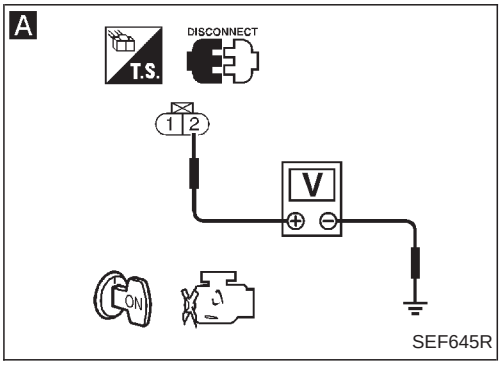


HEC663

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 → Repair harness or connectors.

OK

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

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

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

OK

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

NG → Replace engine coolant temperature sensor.

OK

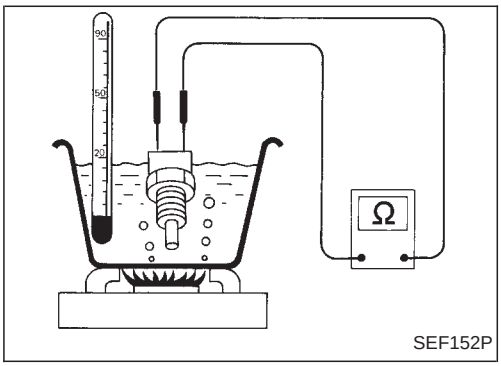
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

INSPECTION END

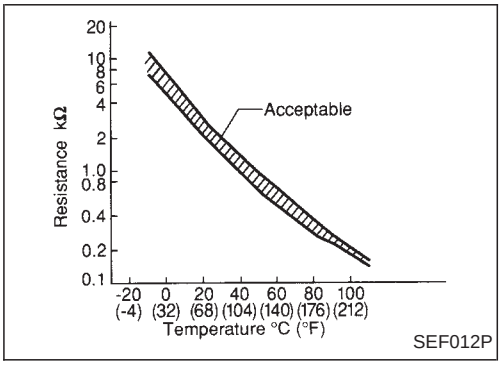
Engine Coolant Temperature Sensor (ECTS) (Cont’d)



COMPONENT INSPECTION

Engine coolant temperature sensor

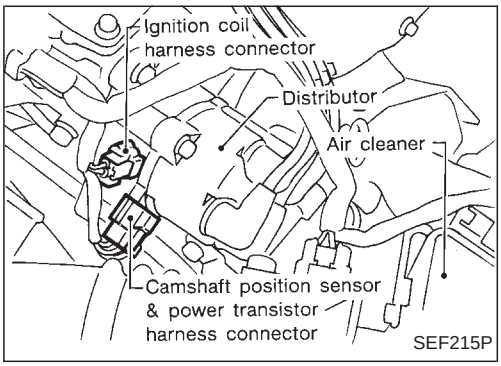
Check resistance as shown in the figure.



<Reference data>

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

If NG, replace engine coolant temperature sensor.



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor (Built into distributor)

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

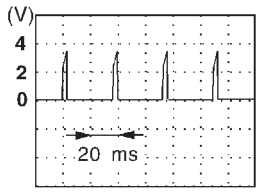
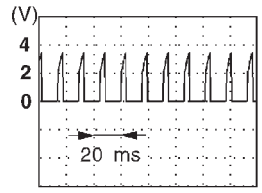
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

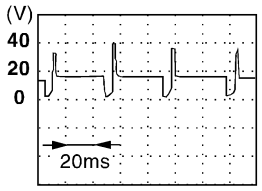
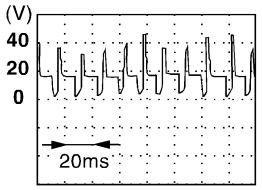
MONITOR ITEM	CONDITION		SPECIFICATION
IGN TIMING	• Engine: After warming up • Air conditioner switch: “OFF” • Shift lever: Neutral position • No-load	Idle	20° BTDC
		2,000 rpm	More than 18° BTDC

ECM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

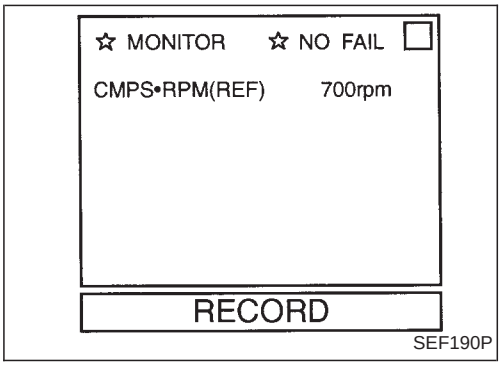
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
12	L	Ignition signal	Engine is running. └ Idle speed	Approximately 0.3V  SEF058U
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.7V  SEF059U

Ignition Signal (Cont’d)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
19	L/R	Ignition check	Engine is running. └ Idle speed	Approximately 13V  SEF188T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 13V  SEF189T

ON BOARD DIAGNOSIS LOGIC

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



SEF190P

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note:
- **If “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” has been previously conducted, always turn ignition switch “OFF” and wait at least 5 seconds before conducting the next test.**
- **If both DTC 21 and DTC 11 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 11 first. (See EC-92.)**

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

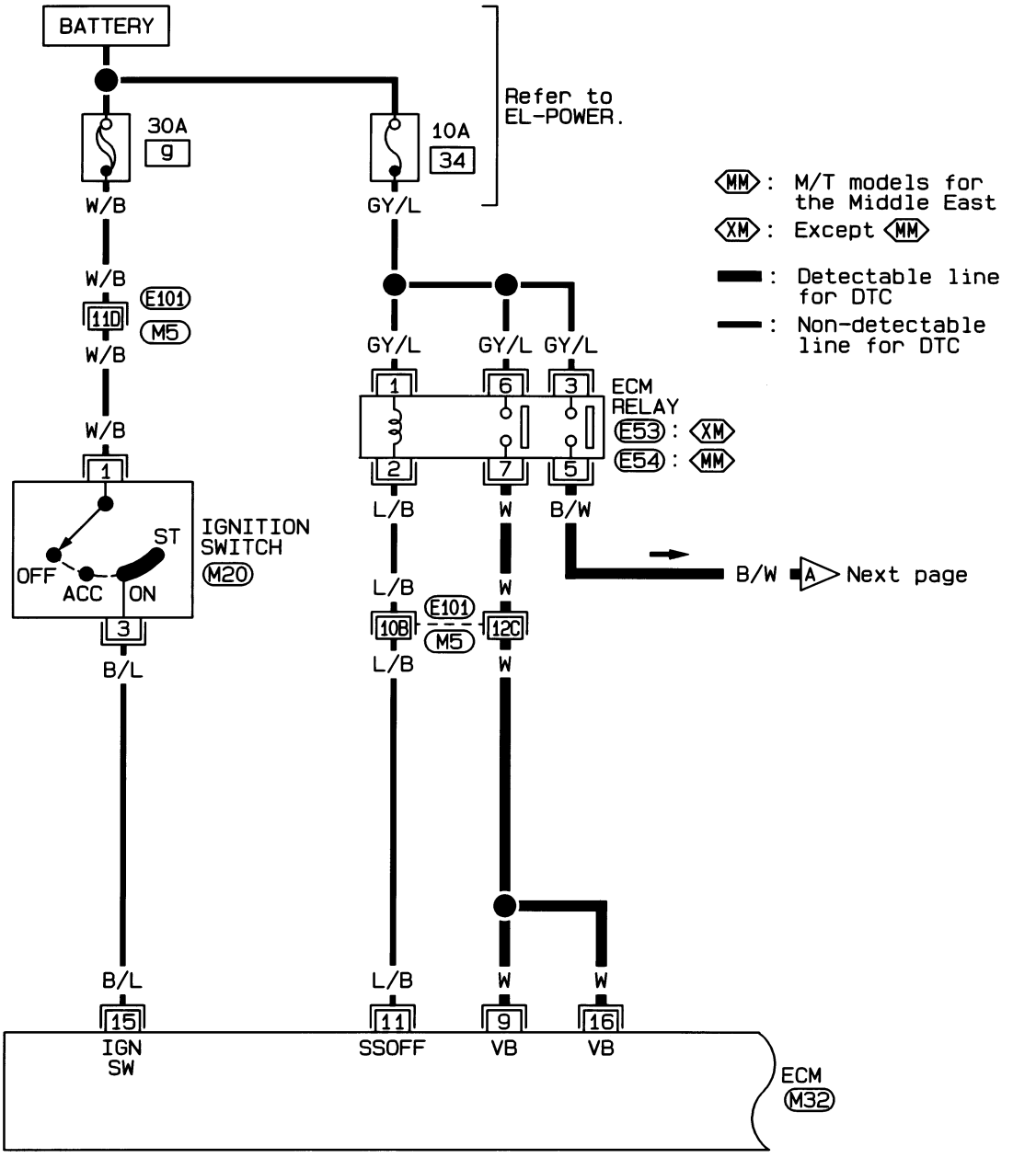
OR

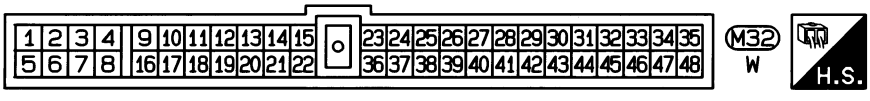
1) Turn ignition switch “ON”.
2) Start engine and wait at least 2 seconds. (If engine does not run, turn ignition switch to “START” for at least 5 seconds.)
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

Ignition Signal (Cont'd)

FOR LHD MODELS

EC-IGN/SG-01





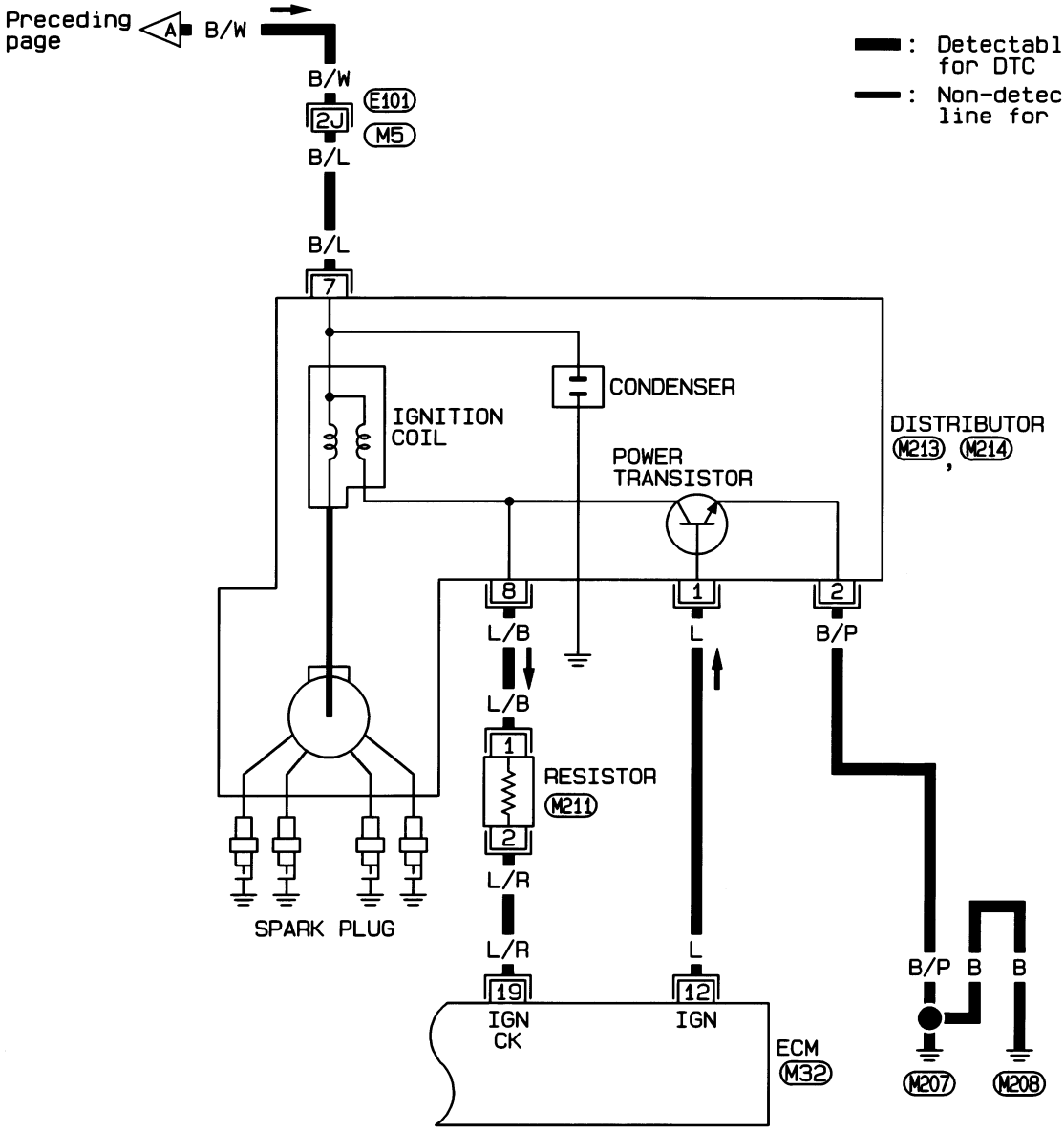
Refer to last page (Foldout page).

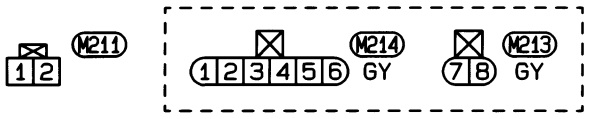
M5, E101

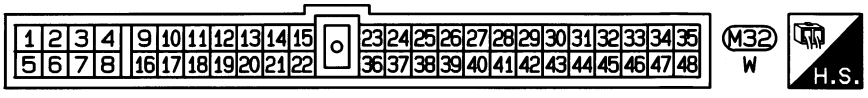
HEC664

Ignition Signal (Cont'd)

EC-IGN/SG-02







Refer to last page (Foldout page).

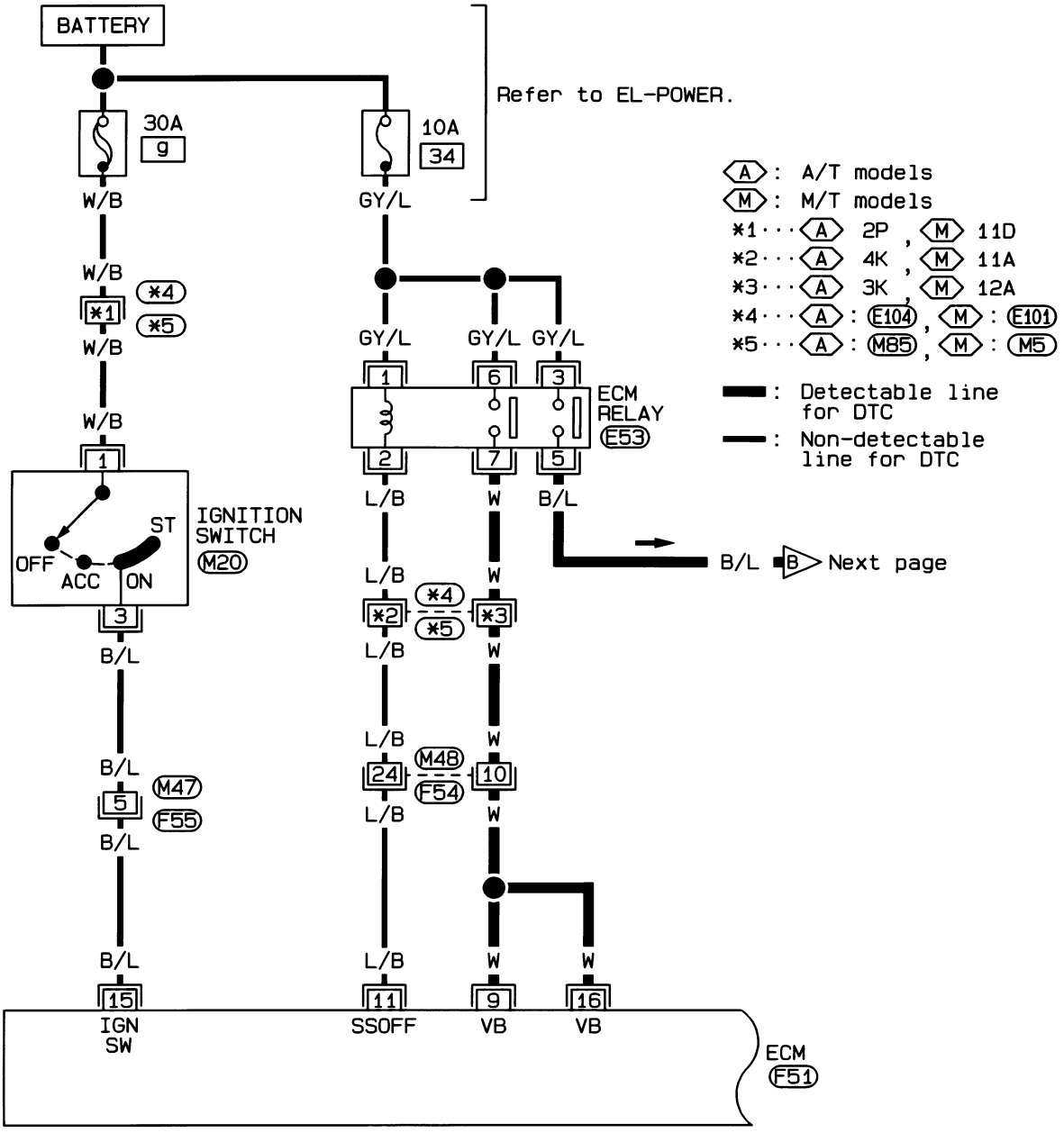
M5, E101

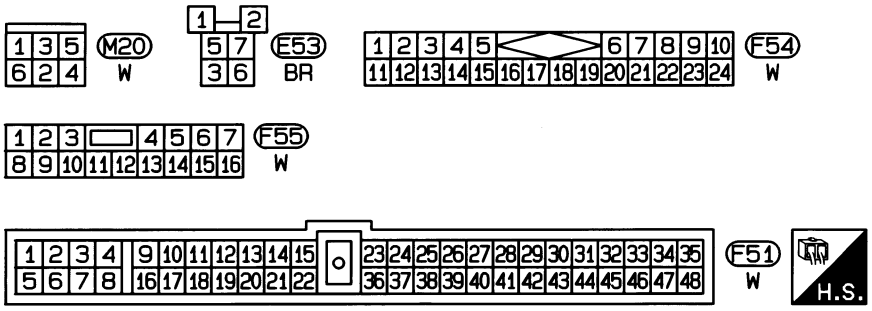
HEC665

Ignition Signal (Cont'd)

FOR RHD MODELS

EC-IGN/SG-03



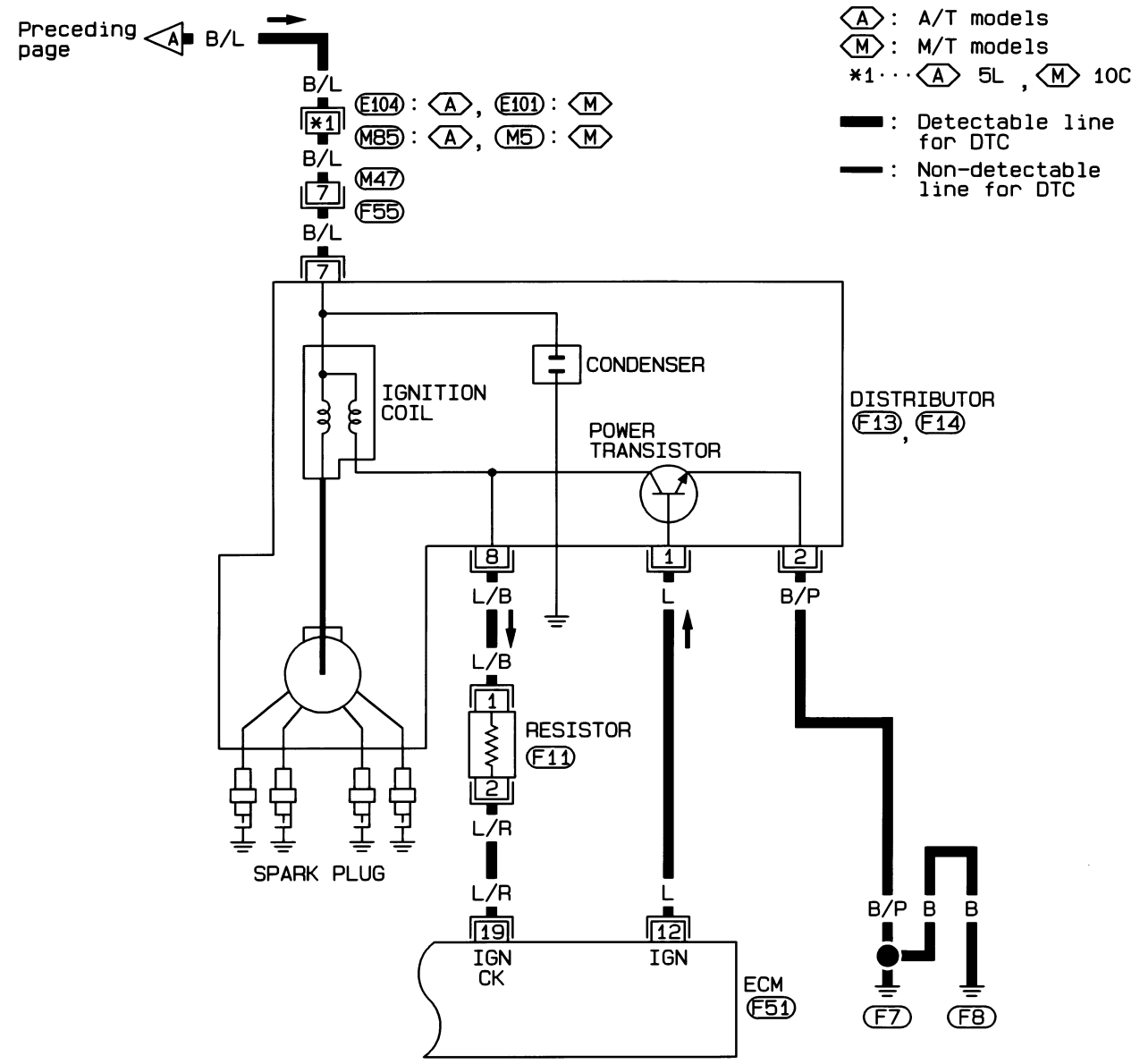


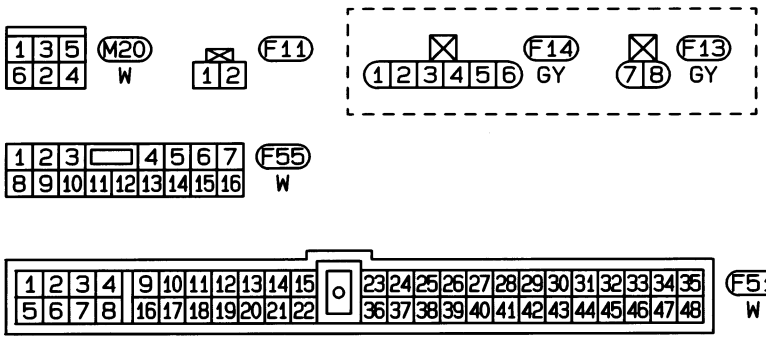
Refer to last page
(Foldout page).
M5 , E101
M85 , E104

HEC666

Ignition Signal (Cont'd)

EC-IGN/SG-04





Refer to last page (Foldout page).

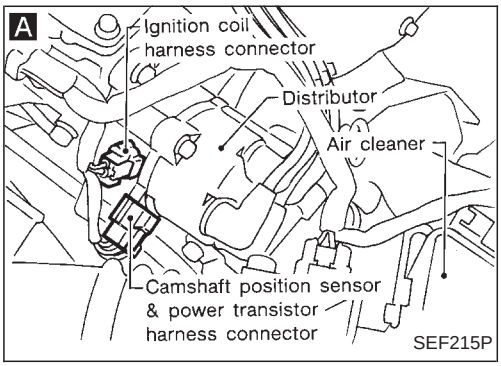
M5, E101

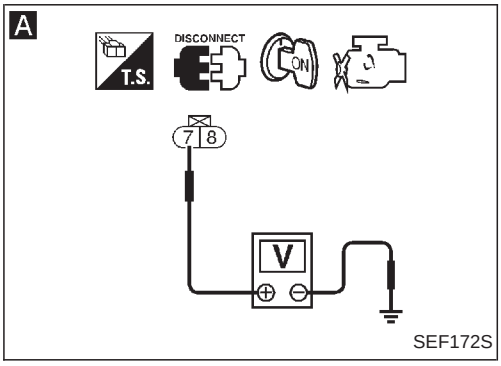
M85, E104

HEC667

Ignition Signal (Cont’d)

DIAGNOSTIC PROCEDURE





INSPECTION START

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

Yes → Ⓐ (Go to next page.)

No

A

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

NG →
Check the following.
- ECM relay (Refer to “Main Power Supply and Ground Circuit”, EC-85.)
- Harness connector (E101), (M5) (LHD models)
- Harness connector (M47), (F55) (RHD models)
  (E101), (M5) (RHD, M/T models)
  (E104), (M85) (RHD, A/T models)
- Harness for open or short between ignition coil and ignition switch

If NG, repair harness or connectors.

OK

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

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

OK

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑫ and power transistor harness connector terminal ① .
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

CHECK COMPONENTS
(Ignition coil, power transistor).
Refer to “COMPONENT INSPECTION”, EC-118.

NG → Replace malfunctioning component(s).

OK

Ⓑ
(Go to next page.)

Ignition Signal (Cont’d)

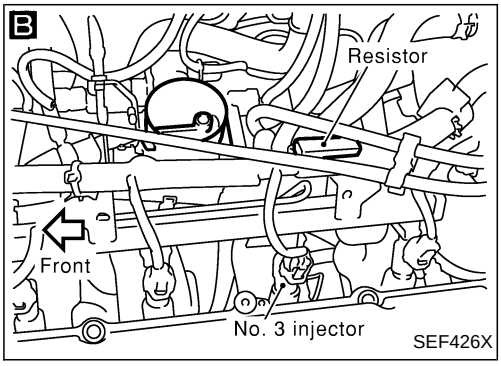
Ⓑ

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

Trouble is not fixed.

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

INSPECTION END



Ⓐ

B

CHECK INPUT SIGNAL CIRCUIT.
1. Stop engine.
2. Disconnect ignition coil harness connector.
3. Strip tape covering resistor.
4. Disconnect resistor harness connector.
5. Disconnect ECM harness connector.
6. Check harness continuity between ignition coil harness connector terminal ⑧ and resistor terminal ①, resistor terminal ② and ECM terminal ⑲.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

CHECK COMPONENT (Resistor).
Refer to “COMPONENT INSPECTION” on next page.

NG → Replace resistor.

OK

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

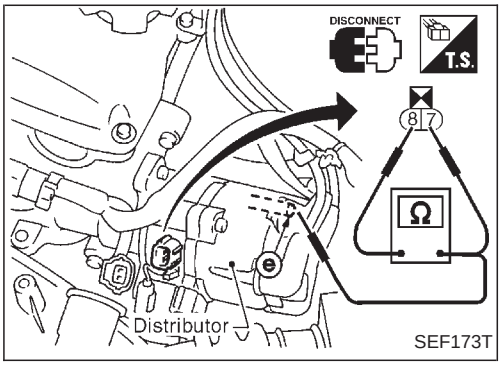
Trouble is not fixed.

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

INSPECTION END

Ignition Signal (Cont’d)

COMPONENT INSPECTION

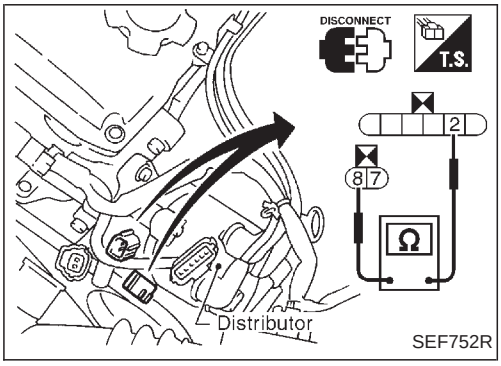


Ignition coil

1. Disconnect ignition coil harness connector.
2. Remove distributor cap.
3. Check resistance as shown in the figure.

Terminal	Resistance [at 25°C (77°F)]
⑦ - ⑧	Approximately 1Ω
⑧ - ⓔ	Approximately 20 kΩ

If NG, replace distributor assembly.

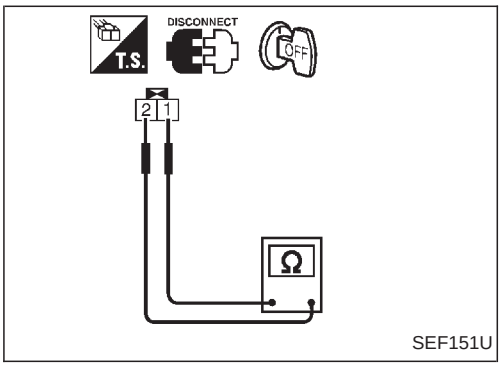


Power transistor

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

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

If NG, replace distributor assembly.



Resistor

1. Disconnect resistor harness connector.
2. Check resistance between terminals ① and ②.

Resistance: Approximately 2.2 kΩ [at 25°C (77°F)]

If NG, replace resistor.

Overheat

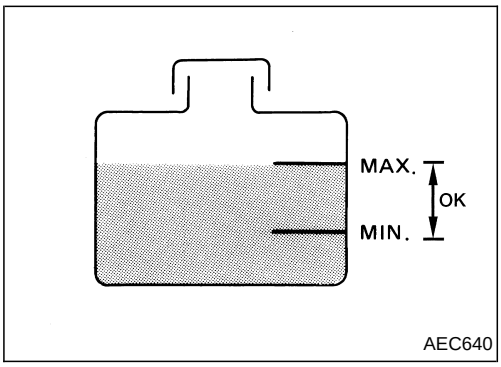
ON BOARD DIAGNOSIS LOGIC

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

Diagnostic trouble code No.	Malfunction is detected when ...	Check Items (Possible Cause)
28	● Engine coolant temperature reaches an abnormally high temperature.	● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to “MAIN 12 CAUSES OF OVERHEATING”, EC-121.

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

- **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant by kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA section (“Anti-freeze Coolant Mixture Ratio”, “RECOMMENDED FLUIDS AND LUBRICANTS”).**
- **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**



OVERALL FUNCTION CHECK

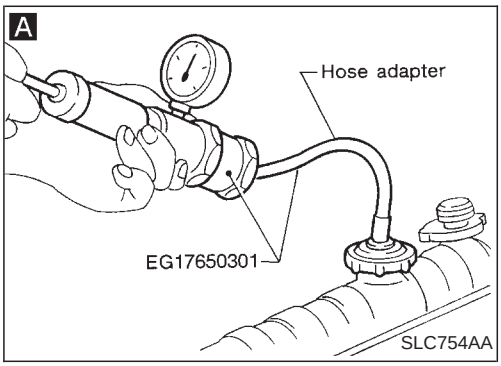
WARNING:
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following step and go to “DIAGNOSTIC PROCEDURE” on next page.
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, go to “DIAGNOSTIC PROCEDURE” on next page.

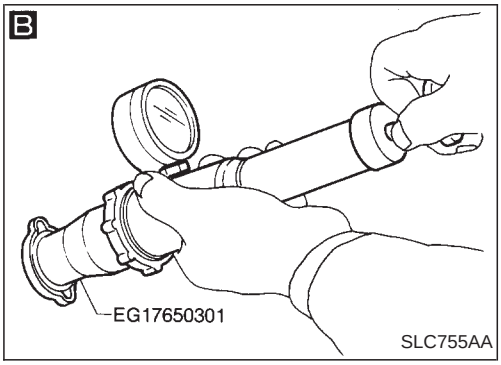
Overheat (Cont’d)

DIAGNOSTIC PROCEDURE

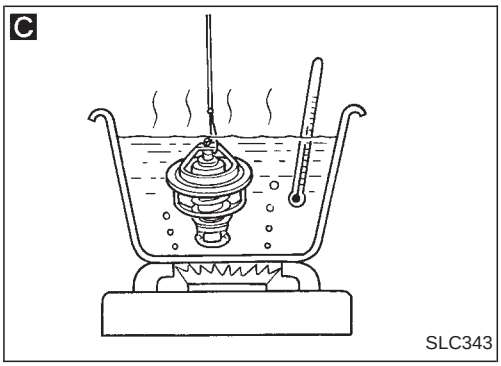
A



B



C



INSPECTION START

A

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/cm^2, 23 psi)
Pressure should not drop.
CAUTION:
Higher than the specified pressure may cause radiator damage.

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

Refer to LC section (“Water Pump”).

OK

B

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/cm^2 , 11 - 14 psi)

NG → Replace radiator cap.

OK

C

CHECK THERMOSTAT.
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.
   Valve opening temperature:
   76.5°C (170°F) [standard]
   Valve lift:
   More than 10 mm/90°C (0.39 in/194°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC section (“Thermostat”).

NG → Replace thermostat.

OK

Check engine coolant temperature sensor. Refer to “COMPONENT INSPECTION”, EC-109.

NG → Replace engine coolant temperature sensor.

OK

If the cause cannot 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.

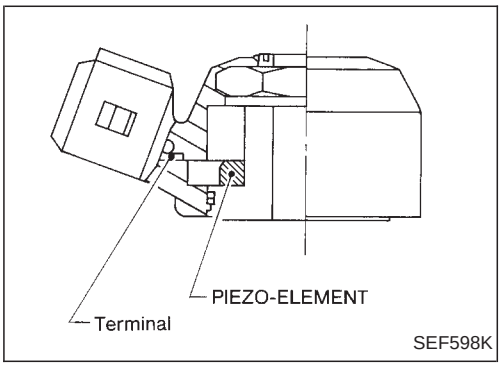
1. Warm up engine. Run the vehicle for at least 20 minutes. Pay attention to engine coolant temperature gauge on the instrument panel. If the reading shows an abnormally high temperature, another part may be malfunctioning.
2. Stop vehicle and let engine idle. Check the intake and exhaust systems for 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”.

Overheat (Cont’d)

MAIN 12 CAUSES OF OVERHEATING

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See “RECOMMENDED FLUIDS AND LUBRICANTS” in MA section.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See “Changing Engine Coolant”, “ENGINE MAINTENANCE” in MA section.
	4	● Radiator cap	● Pressure tester	78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi) 59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See “System Check”, “ENGINE COOLING SYSTEM” in LC section.
ON*2	5	● Coolant leaks	● Visual	No leaks	See “System Check”, “ENGINE COOLING SYSTEM” in LC section.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot.	See “Thermostat” and “Radiator”, “ENGINE COOLING SYSTEM” in LC section.
ON*1	7	● Cooling fan	● Visual	Operating	See “Cooling Fan”, “ENGINE COOLING SYSTEM” in LC section.
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See “Changing Engine Coolant”, “ENGINE MAINTENANCE” in MA section.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See “ENGINE MAINTENANCE” in MA section.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See “Inspection”, “CYLINDER HEAD” in EM section.
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See “Inspection”, “CYLINDER BLOCK” in EM section.

*1: Engine running at idle.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to “OVERHEATING CAUSE ANALYSIS” in LC section.



Knock Sensor (KS)

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

Diagnostic Trouble Code No.	Malfunction is detected when	Check items (Possible cause)
34	● An excessively low or high voltage from the knock sensor is entered to ECM.	● Harness or connectors (The knock sensor circuit is open or shorted.) ● Knock sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

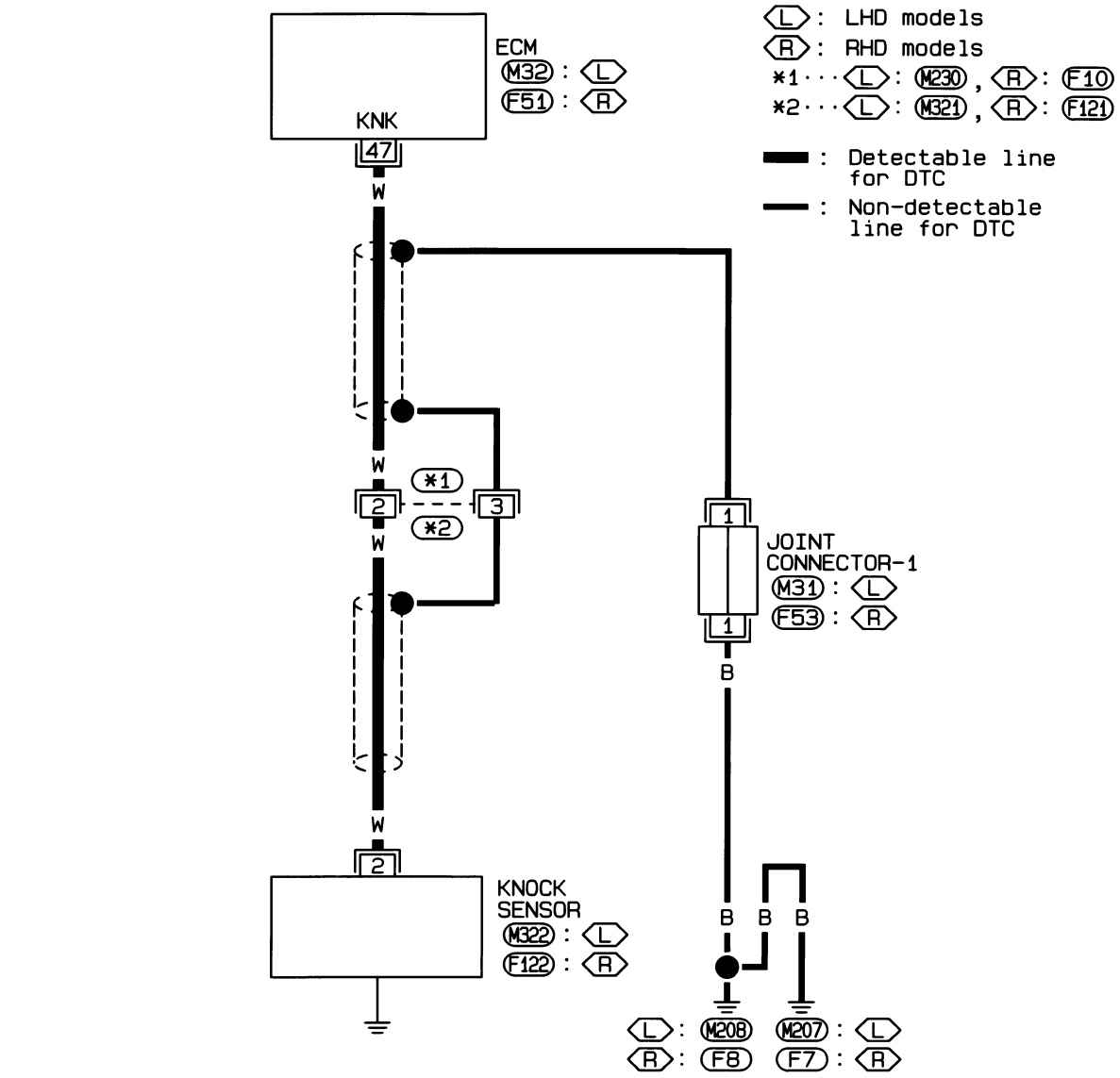
1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT.
2) Start engine and run it for at least 5 seconds at idle speed.

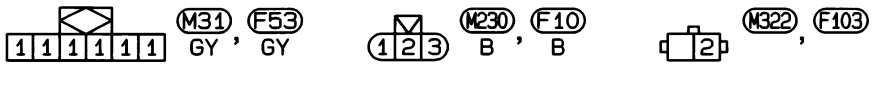
OR

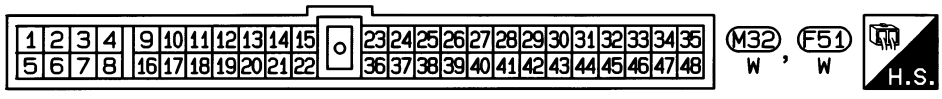
1) Start engine and run it for at least 5 seconds at idle speed.
2) Turn ignition switch “OFF”, wait for at least 5 seconds and then “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

Knock Sensor (KS) (Cont'd)

EC-KS-01



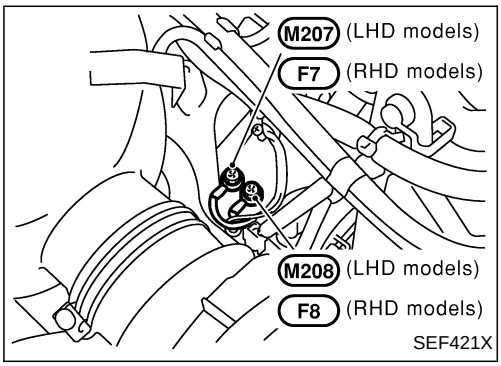


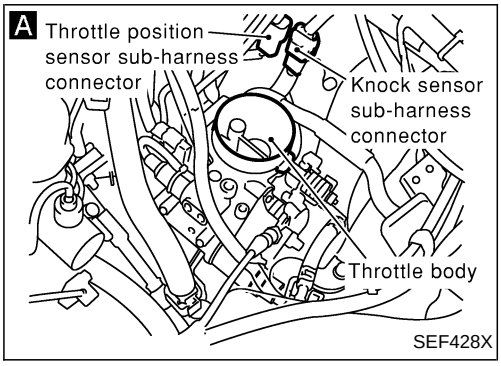


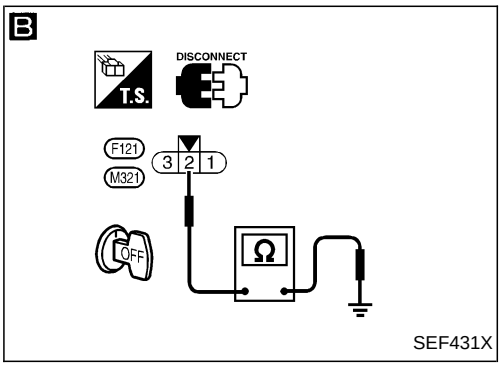
HEC669

Knock Sensor (KS) (Cont’d)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

Loosen and retighten engine ground screws.

↓

A

CHECK INPUT SIGNAL CIRCUIT-1.
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and knock sensor sub-harness connector.
3. Check harness continuity between knock sensor sub-harness connector terminal ② and ECM terminal ㊼.
   Refer to wiring diagram.
   Continuity should exist.

NG → Repair harness or connectors.

OK ↓

B

CHECK INPUT SIGNAL CIRCUIT-2.
1. Check harness continuity between terminal ② and engine ground.
   Continuity should exist.

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

NG → Check the following.
- Harness continuity between knock sensor sub-harness connector and knock sensor

If NG, repair harness or connectors.
- Knock sensor (Refer to “COMPONENT INSPECTION”.)

If NG, replace knock sensor.

OK ↓

CHECK SHIELD CIRCUIT.
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.
3. Remove joint connector (M31) or (F53).
4. Check the following.
   - Continuity between joint connector terminal ① and ground
   - Joint connector
     (Refer to “HARNESS LAYOUT” in EL section.)

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

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

OK ↓

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

Trouble is not fixed. ↓

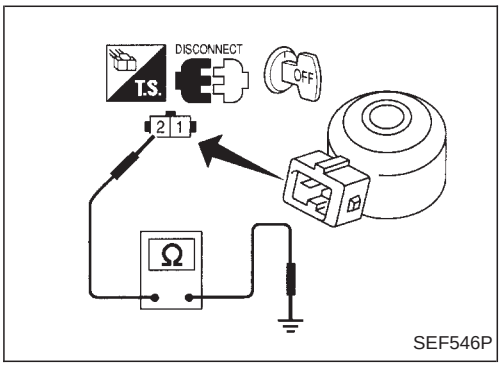
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Knock Sensor (KS) (Cont’d)

COMPONENT INSPECTION



Knock sensor

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

1. Disconnect knock sensor harness connector.
2. Check resistance between terminal ② and ground at 25°C (77°F).

Resistance: 500 - 620 kΩ

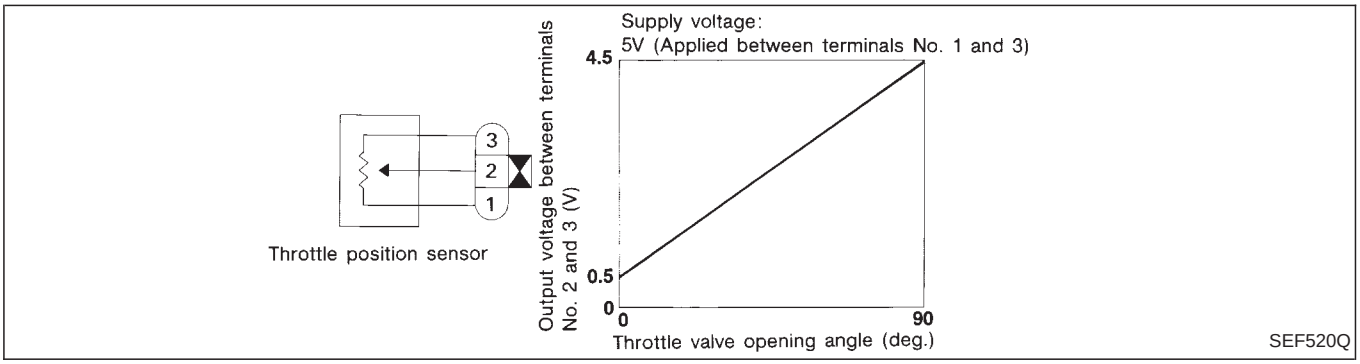
CAUTION:

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

Throttle Position Sensor

COMPONENT DESCRIPTION

The throttle position sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.
Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This one controls engine operation such as fuel cut.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	• Ignition switch: ON (Engine stopped)	Throttle valve: fully closed	0.35 - 0.65V
		Throttle valve: fully opened	Approximately 4V
CLSD THL/POSI*	• Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

*A/T models only

ECM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
26	G/B	Throttle position sensor power supply	Ignition switch “ON”	Approximately 5V
34	G	Throttle position sensor signal	Ignition switch “ON” (Warm-up condition) └ Accelerator pedal released	0.35 - 0.65V
			Ignition switch “ON” └ Accelerator pedal fully depressed	Approximately 4V
36	B/G	Sensors’ ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V

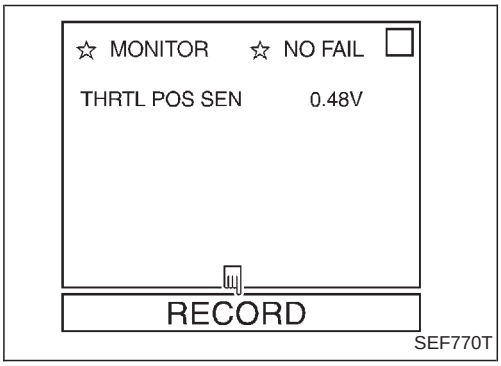
Throttle Position Sensor (Cont’d)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
43	● An excessively low or high voltage from the sensor is sent to ECM.*	● Harness or connectors (The sensor circuit is open or shorted.) ● Throttle position sensor

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

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



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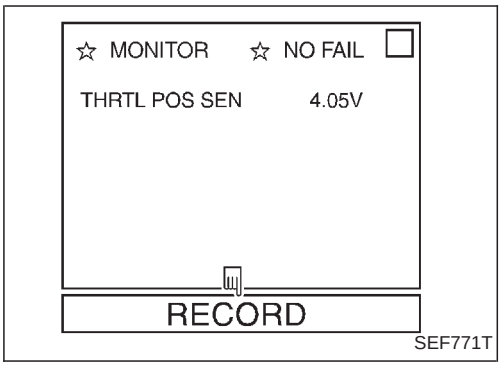

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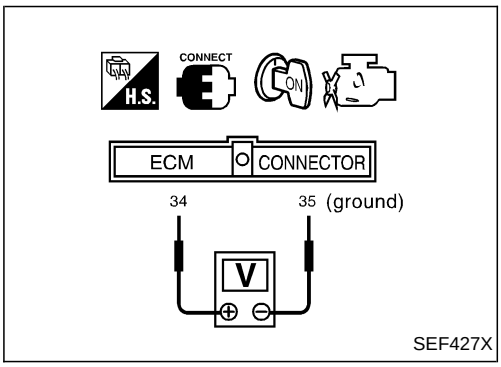


SEF427X

OVERALL FUNCTION CHECK

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

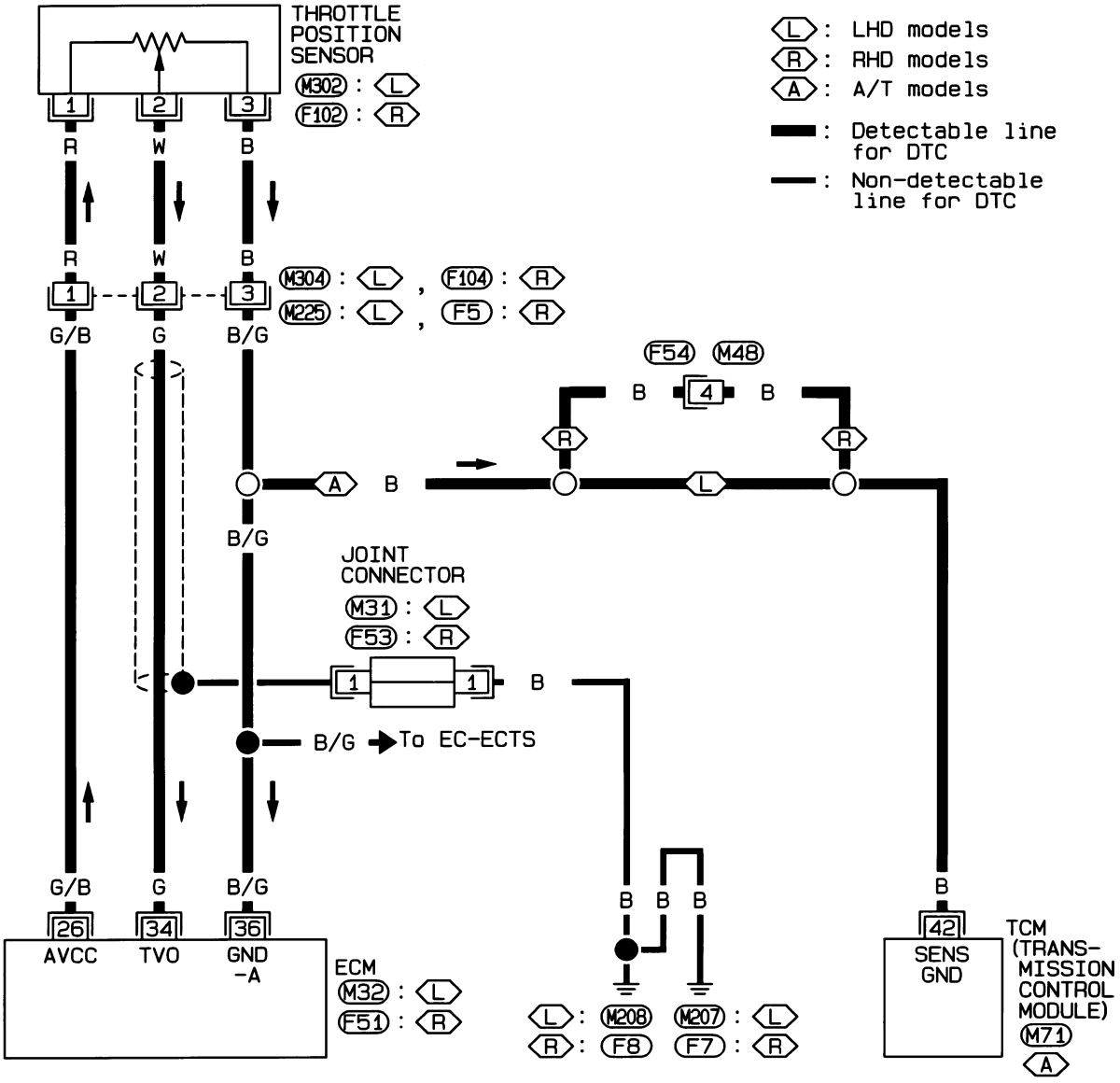
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 5 seconds.
3) Turn ignition switch “ON”.
4) Select “THRTL POS SEN” in “DATA MONITOR” mode with CONSULT.
5) Read “THRTL POS SEN” signal and check the following:
   - The voltage when accelerator pedal fully released is approximately 0.35 - 0.65V.
   - The voltage when accelerator pedal fully depressed is approximately 4V.

OR

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF” and wait at least 5 seconds.
3) Turn ignition switch “ON”.
4) Check the voltage between ECM terminals ㉞ and ㉟ (ground) and check the following:
   - The voltage when accelerator pedal fully released is approximately 0.35 - 0.65V.
   - The voltage when accelerator pedal fully depressed is approximately 4V.

Throttle Position Sensor (Cont'd)

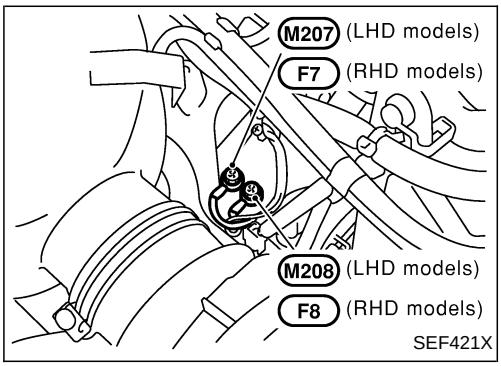
EC-TPS-01

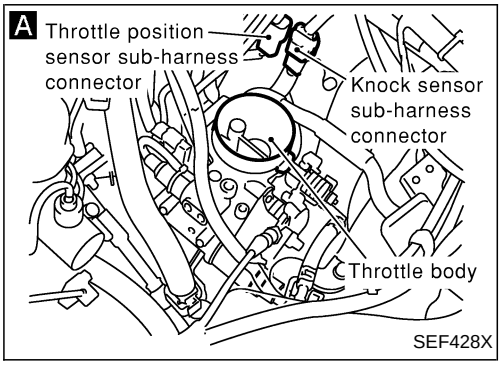


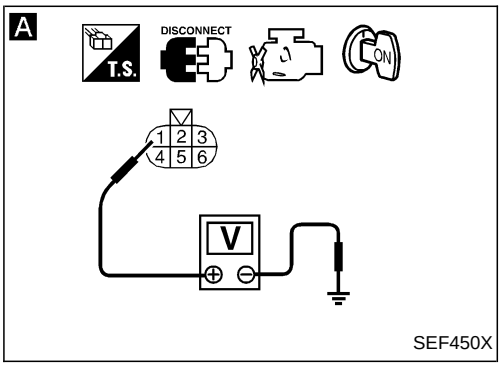
HEC668

Throttle Position Sensor (Cont’d)

DIAGNOSTIC PROCEDURE







INSPECTION START

ADJUST THROTTLE POSITION SENSOR.
Perform BASIC INSPECTION, EC-64.

OK

CHECK SHIELD CIRCUIT.
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.
3. Remove joint connector M31 or F53.
4. Check the following.
   - Continuity between joint connector terminal ① and ground
   - Joint connector
     (Refer to “HARNESS LAYOUT” in EL section.)

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

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

OK

A

CHECK POWER SUPPLY.
1. Disconnect throttle position sensor sub-harness connector.
2. Turn ignition switch “ON”.
3. Check voltage between terminal ① and ground with CONSULT or tester.

Voltage: Approximately 5V

NG → Check the following.
- Harness connectors M225, M304 (LHD models)
  F5, F104 (RHD models)
- Harness for open or short between throttle position sensor and ECM

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT.
1. Turn ignition switch “OFF”.
2. Check harness continuity between throttle position sensor sub-harness connector terminal ③ and engine ground.
   Refer to wiring diagram.

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

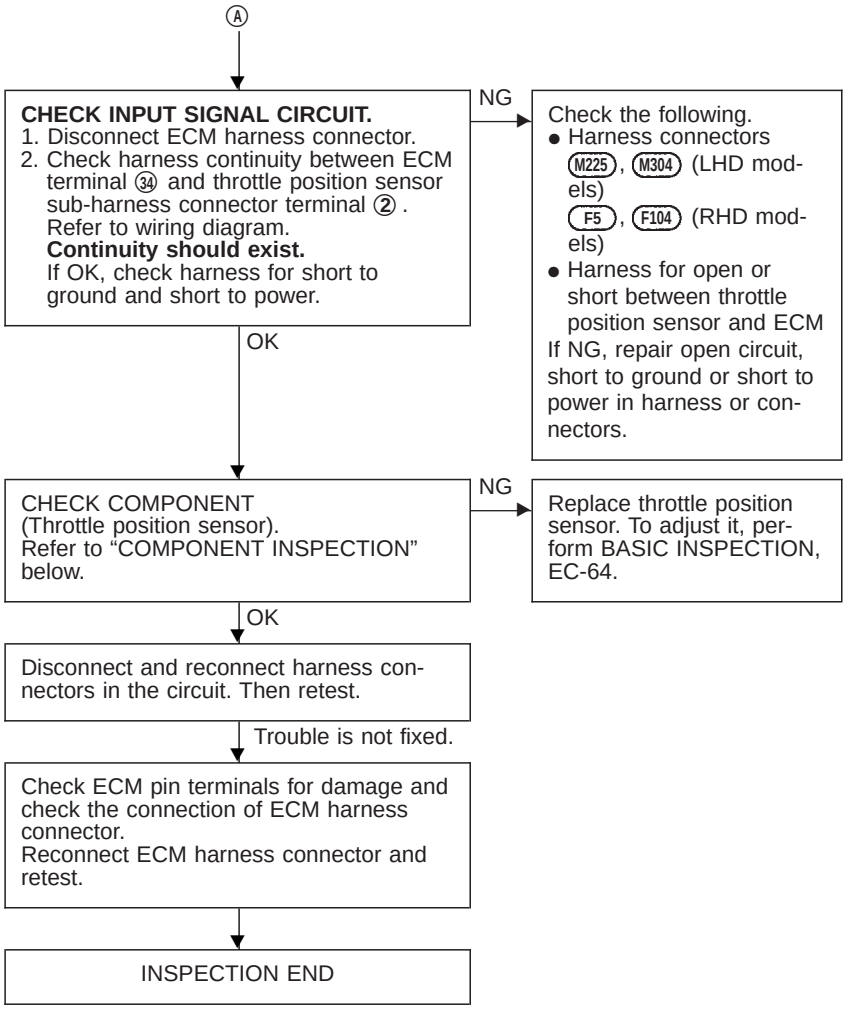
NG → Check the following.
- Harness connectors M225, M304 (LHD models)
  F5, F104 (RHD models)
- Harness connectors F54, M48 (RHD A/T models)
- Harness for open or short between throttle position sensor and ECM

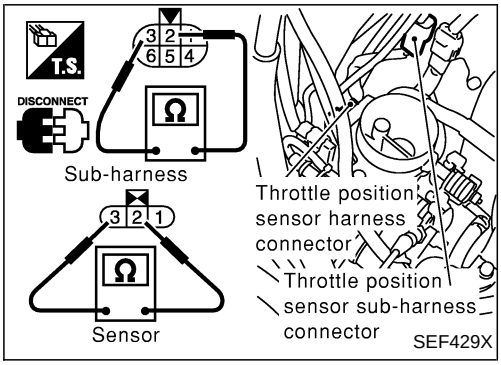
If NG, repair open circuit, short to ground or short to power in harness or connectors.

OK

Ⓐ
(Go to next page.)

Throttle Position Sensor (Cont’d)





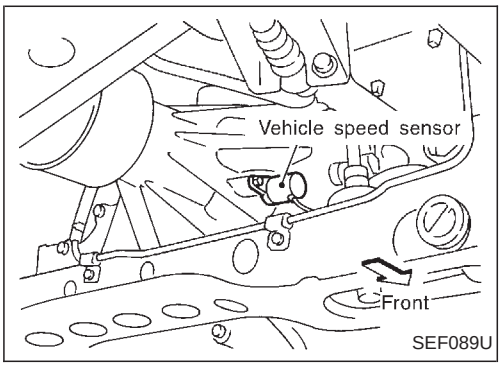
COMPONENT INSPECTION

Throttle position sensor

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect throttle position sensor harness connector.
4. Make sure that resistance between terminals ② and ③ changes when opening throttle valve manually.
   It is also possible to inspect using the sub-harness connector (6-pins).

Throttle valve conditions	Resistance at 25°C (77°F)
Completely closed	Approximately 0.6 kΩ
Partially open	0.6 - 4.0 kΩ
Completely open	Approximately 4 kΩ

If NG, replace throttle position sensor.
To adjust throttle position sensor, perform “BASIC INSPECTION”, EC-64.



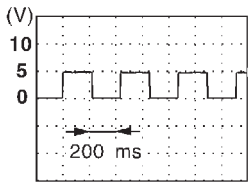
Vehicle Speed Sensor (VSS)

COMPONENT DESCRIPTION

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

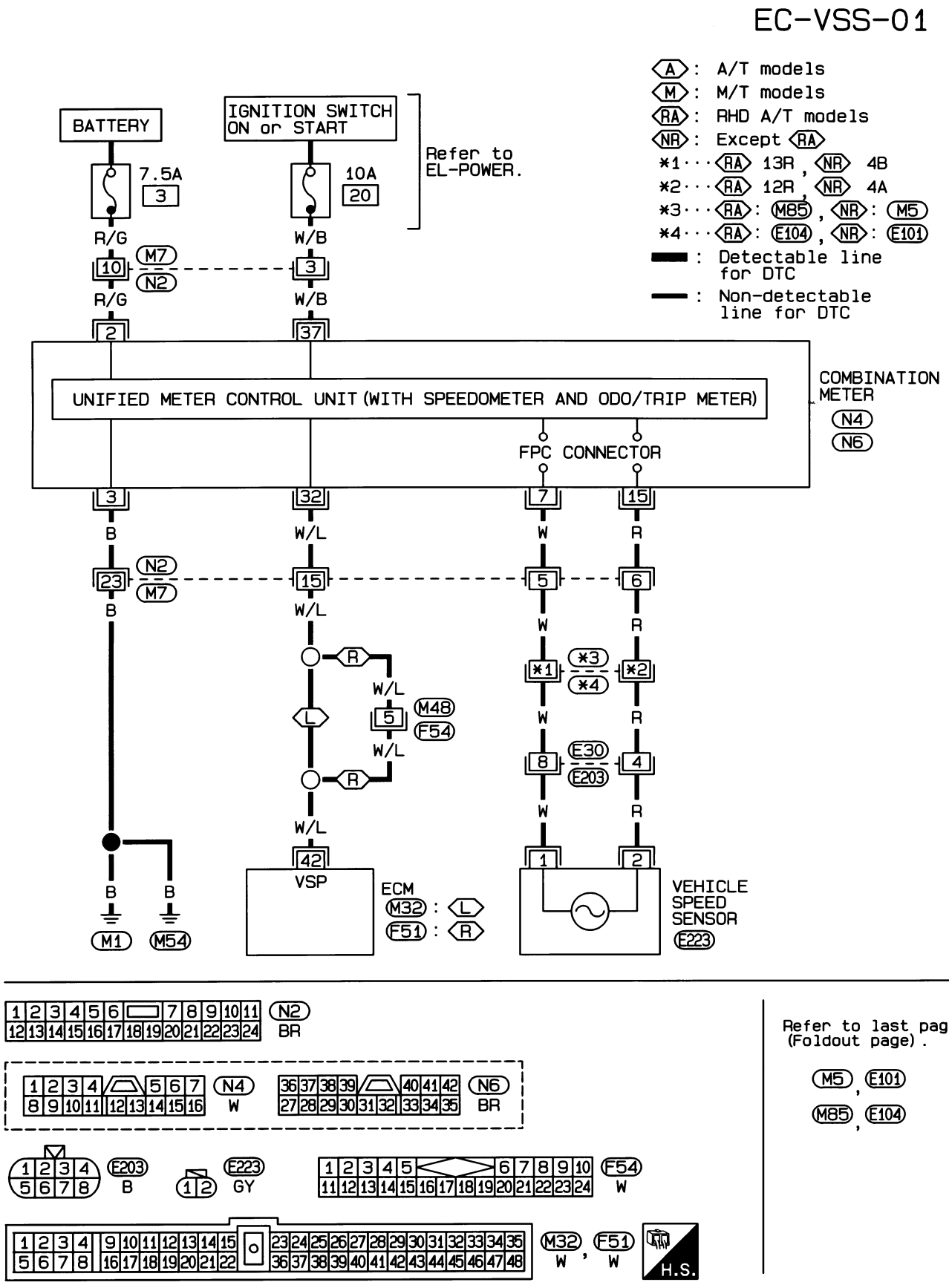
ECM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
42	W/L	Vehicle speed sensor	Engine is running. └ Jack up all wheels and run engine at idle in 1st position.	Varies from 0 to 5V  SEF068U

Vehicle Speed Sensor (VSS) (Cont'd)

WITH TACHOMETER MODELS

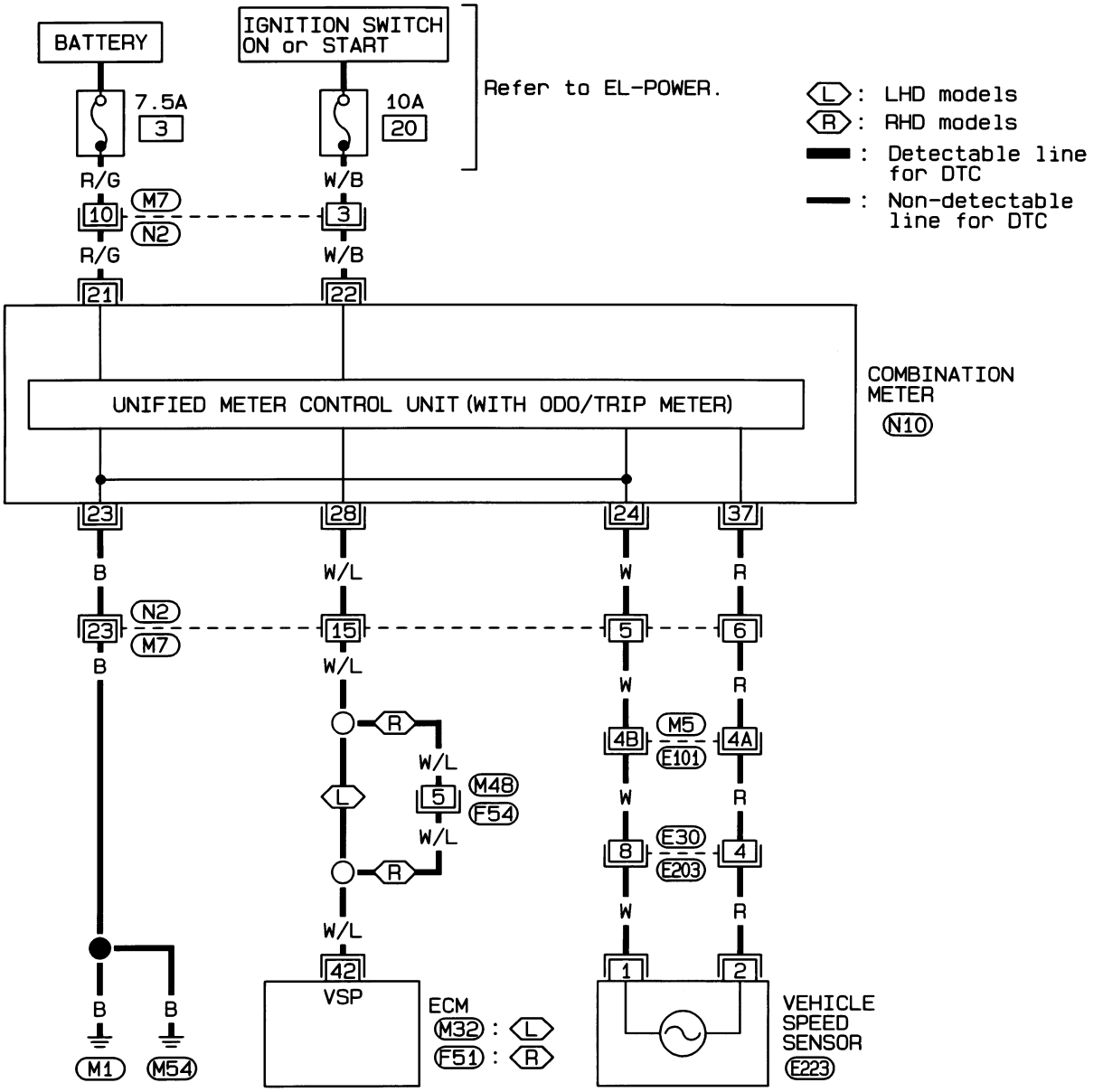


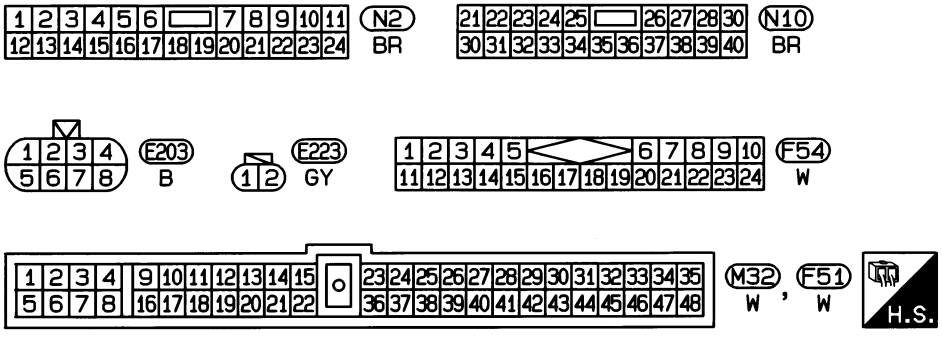
HEC670

Vehicle Speed Sensor (VSS) (Cont'd)

FOR WITHOUT TACHOMETER MODELS

EC-VSS-02





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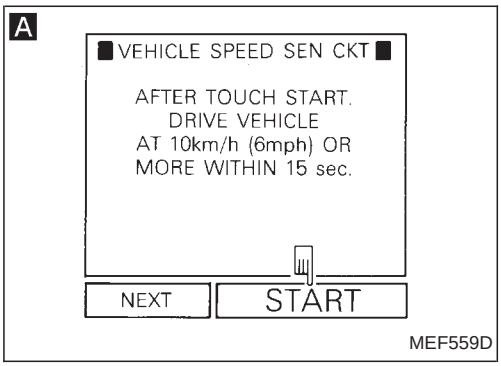
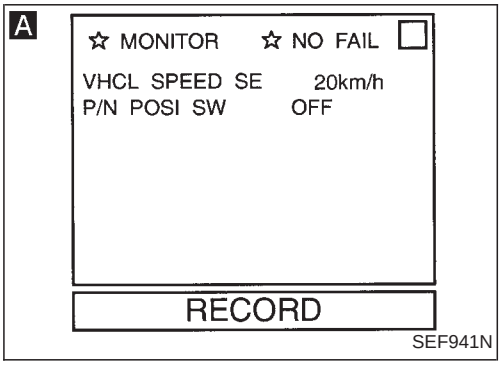
M5, E101

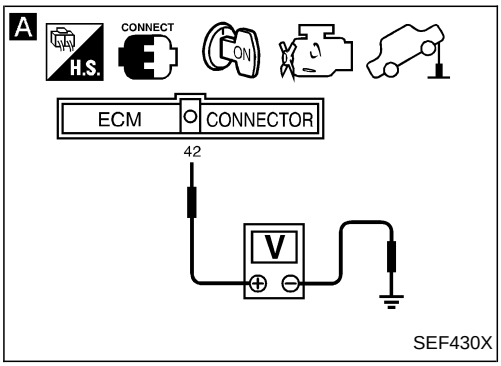
HEC671

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Lift up the vehicle.
2. Start engine.
3. Perform "VEHICLE SPEED SEN CKT" in "FUNCTION TEST" mode with CONSULT.

OR

2. Start engine.
3. Read "VHCL SPEED SE" signal in "DATA MONITOR" mode with CONSULT.
The vehicle speed on CONSULT should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

OR

2. Turn ignition switch "ON".
3. Rotate drive wheel by hand.
4. Check voltage between ECM terminal ㊷ and ground.
Voltage should vary between approx. 0 - 5V.

OK → INSPECTION END

NG

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 ㊷ and combination meter terminal ㉜ (with tachometer) ㉘ (without tachometer).
Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG →
Check the following.
- Harness connectors (F54), (M48) (RHD models only)
- Harness connectors (M7), (N2)
- Harness for open or short between ECM and combination meter

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

OK

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

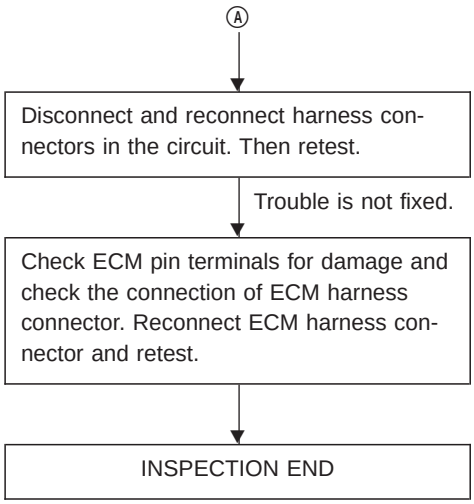
NG →
Check the following.
- Harness for open or short between combination meter and vehicle speed sensor
Refer to wiring diagram.

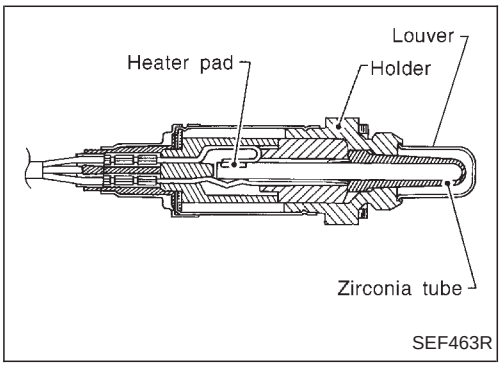
If NG, repair harness or connectors.
- Vehicle speed sensor and its circuit
(Refer to EL section.)

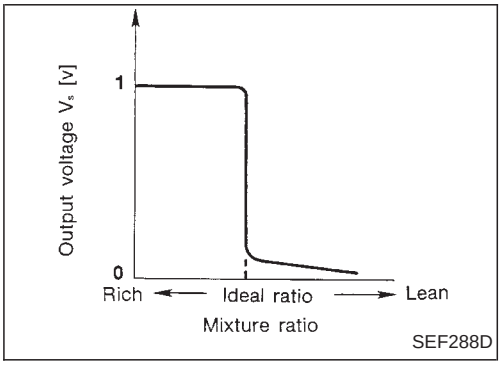
OK

Ⓐ
(Go to next page.)

Vehicle Speed Sensor (VSS) (Cont'd)







Heated Oxygen Sensor (HO2S) — Models with Three Way Catalyst —

COMPONENT DESCRIPTION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

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

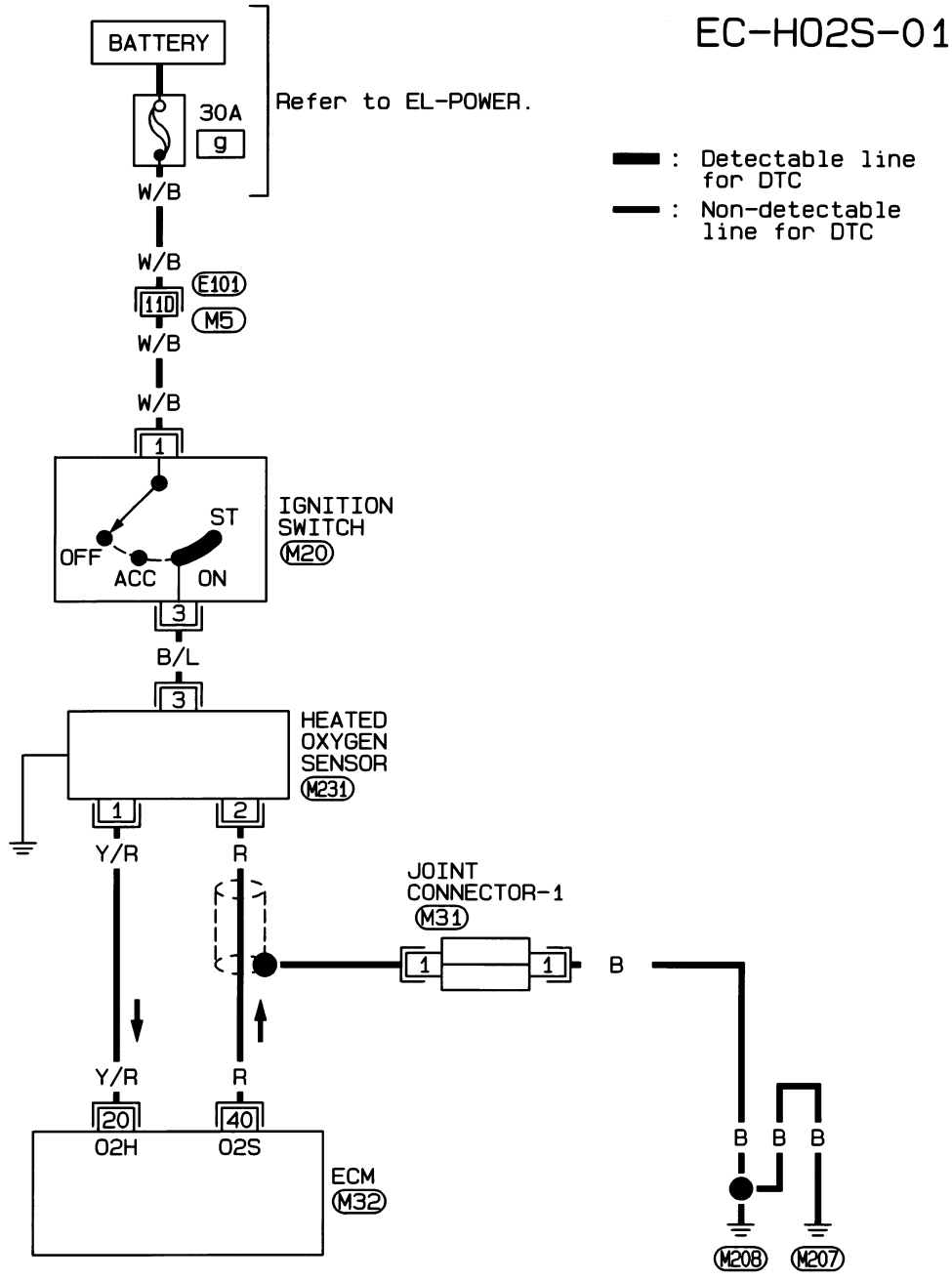
ECM TERMINALS AND REFERENCE VALUE

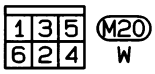
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

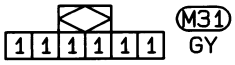
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
19	L/R	Heated oxygen sensor	Engine is running. └ After warming up to normal operating temperature and engine speed is 2,000 rpm.	0 - Approximately 1.0V (periodically change)

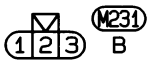
Heated Oxygen Sensor (HO2S)
— Models with Three Way Catalyst — (Cont'd)

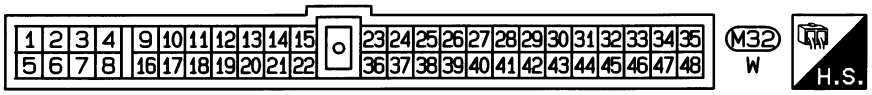
EC-H02S-01











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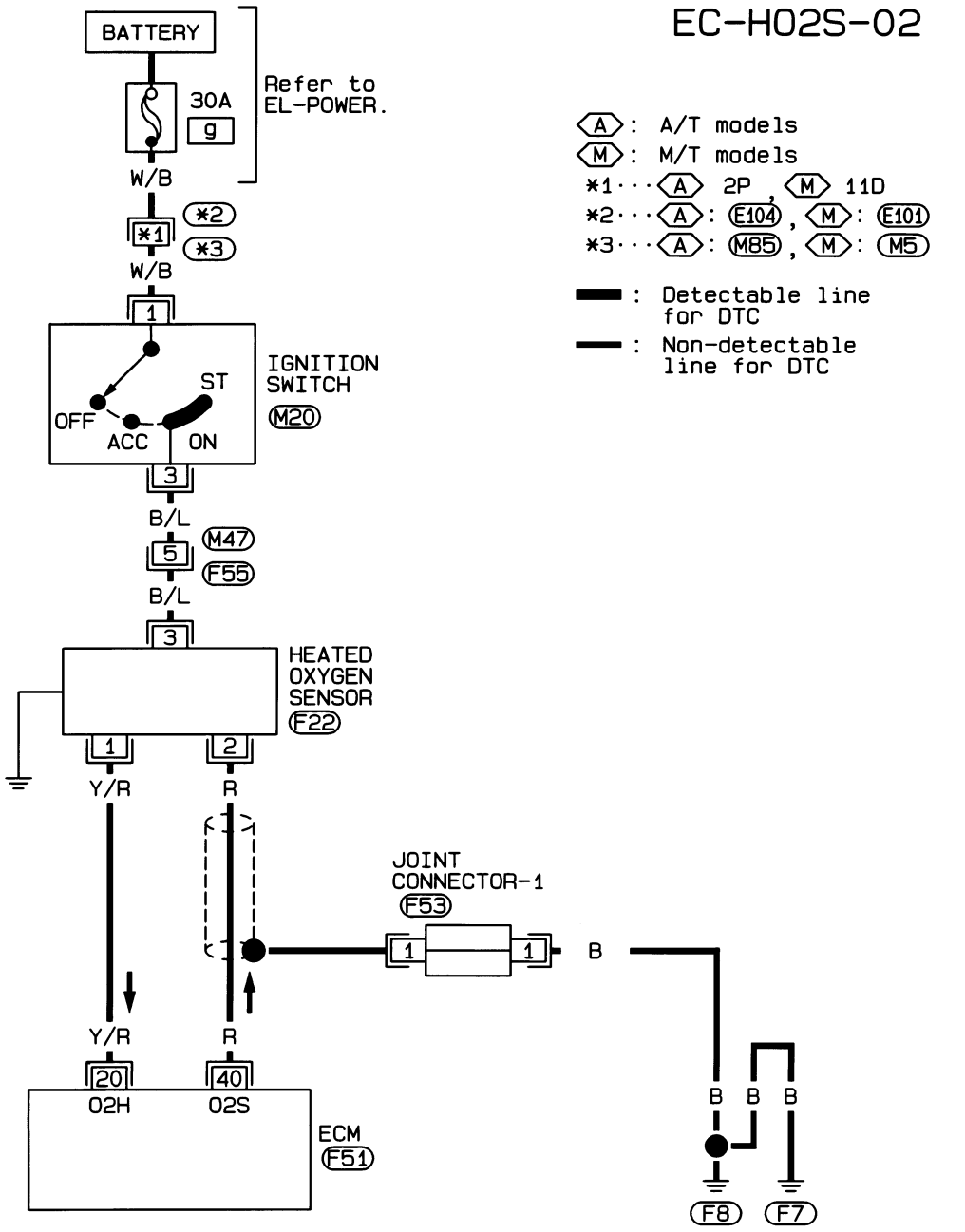
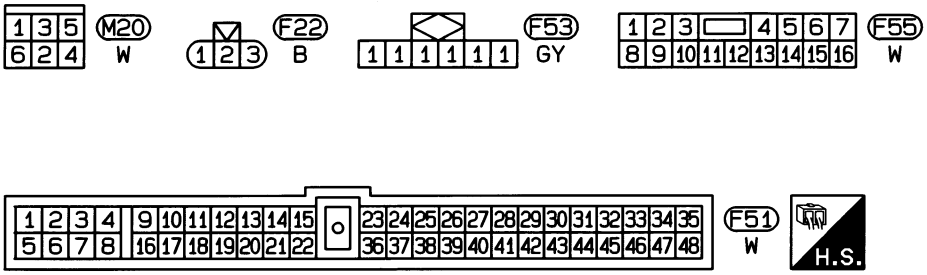
M5, E101

HEC672

Heated Oxygen Sensor (HO2S)
— Models with Three Way Catalyst — (Cont'd)





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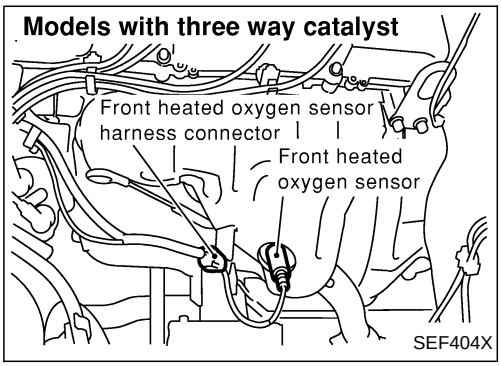
M5, E101

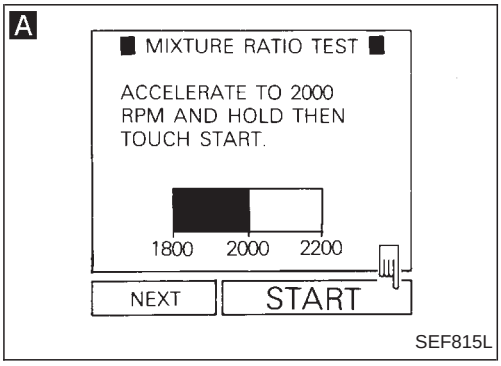
M85, E104

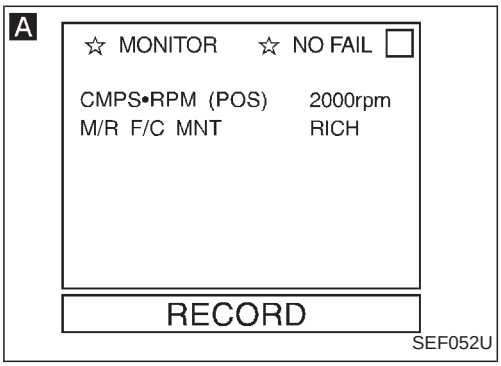
HEC673

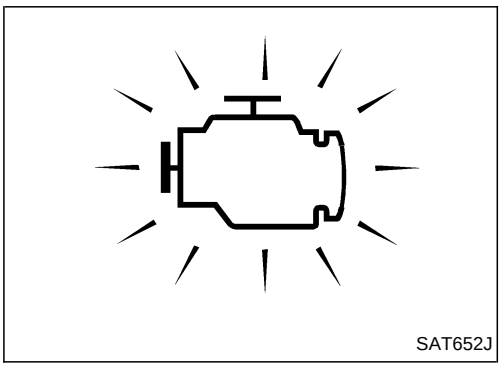
Heated Oxygen Sensor (HO2S) — Models with Three Way Catalyst — (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK HEATED OXYGEN SENSOR CIRCUIT.

1. Start engine and warm it up to normal operating temperature.
2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode with CONSULT.

OR

2. Make sure that "M/R F/C MNT" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm.

OR

2. Stop engine and set ECM Diagnostic Test Mode II (Heated oxygen sensor monitor).
3. Restart engine and run it at about 2,000 rpm for about 2 minutes under no-load.
4. Keep engine speed at 2,000 rpm and make sure that the malfunction indicator lamp on the instrument panel comes on more than 5 times during each 10 seconds.

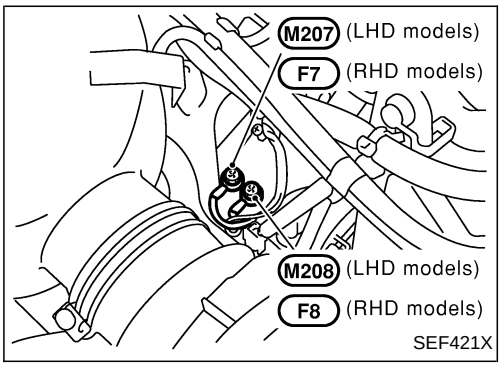
OK → INSPECTION END

NG

Ⓐ

(Go to next page.)

Heated Oxygen Sensor (HO2S) — Models with Three Way Catalyst — (Cont'd)



Ⓐ

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.
3. Remove joint connector M31.
4. Check the following.
   - Continuity between joint connector terminal ① and ground
   - Joint connector
     (Refer to "HARNESS LAYOUT" in EL section.)

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

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

OK ↓

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ㊵ and heated oxygen sensor harness connector terminal ② .
   Continuity should exist.
4. Check harness continuity between ECM terminal ㊵ and ground.
   Refer to wiring diagram.
   Continuity should not exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓

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

Trouble is not fixed. ↓

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

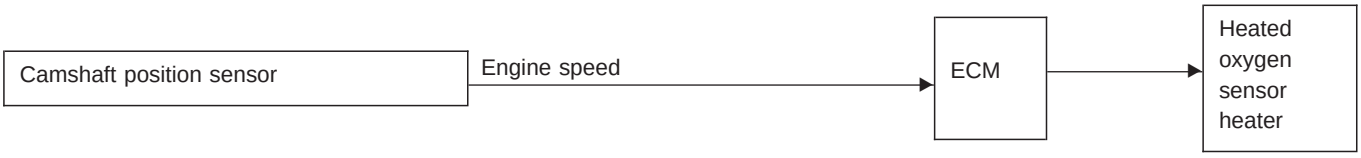
NG → Replace heated oxygen sensor.

OK ↓

INSPECTION END

Heated Oxygen Sensor Heater — Models with Three Way Catalyst —

SYSTEM DESCRIPTION



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

OPERATION

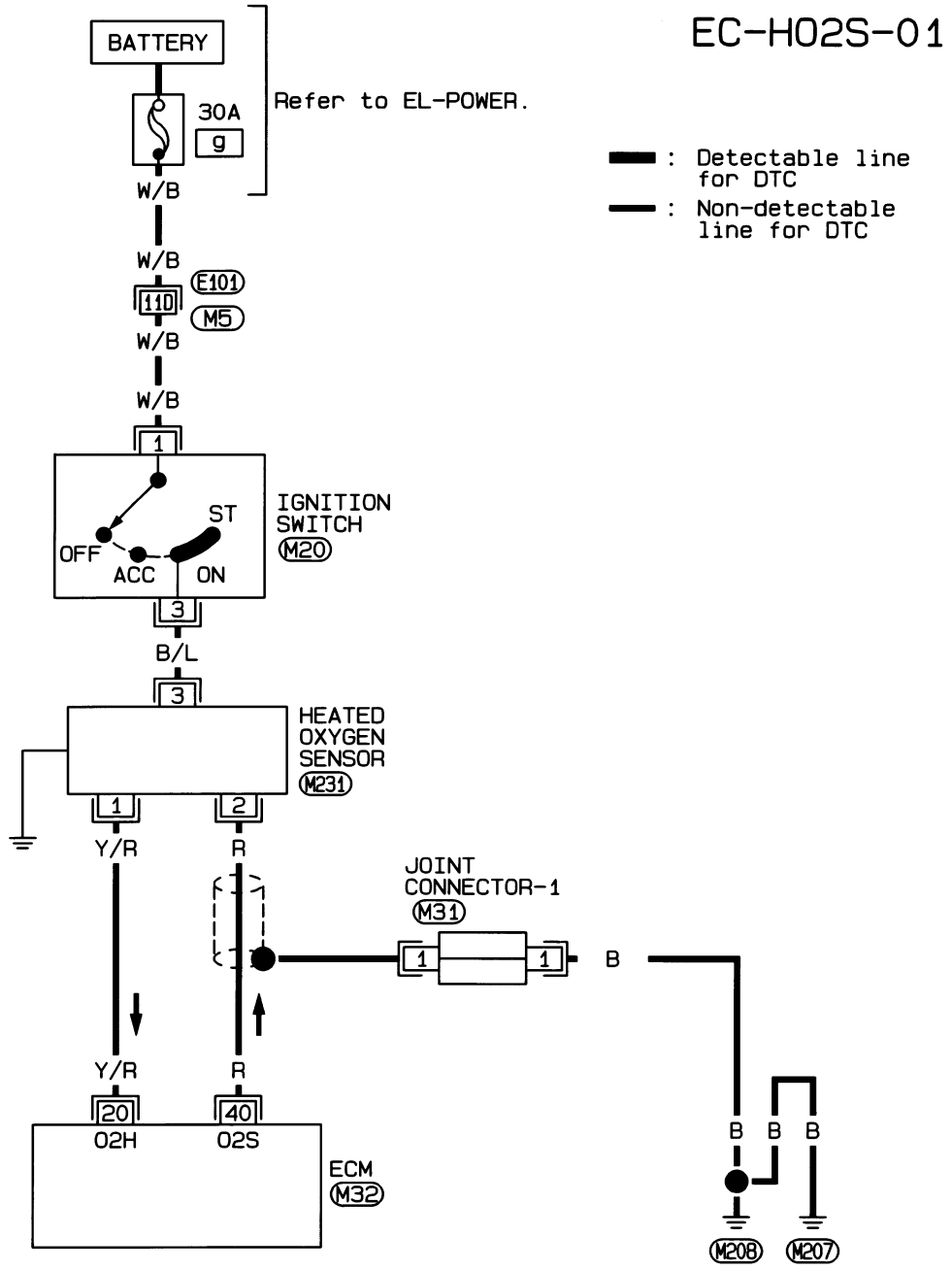
Engine speed rpm	Heated oxygen sensor heater
Above 3,000	OFF
Below 3,000	ON

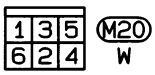
ECM TERMINALS AND REFERENCE VALUE

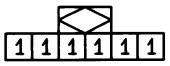
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

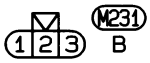
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
20	Y/R	Heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,000 rpm.	Approximately 0V
			Engine is running. └ Engine speed is above 3,000 rpm.	BATTERY VOLTAGE (11 - 14V)

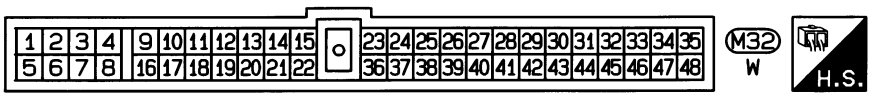
Heated Oxygen Sensor Heater — Models with Three Way Catalyst — (Cont'd)











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M5, E101

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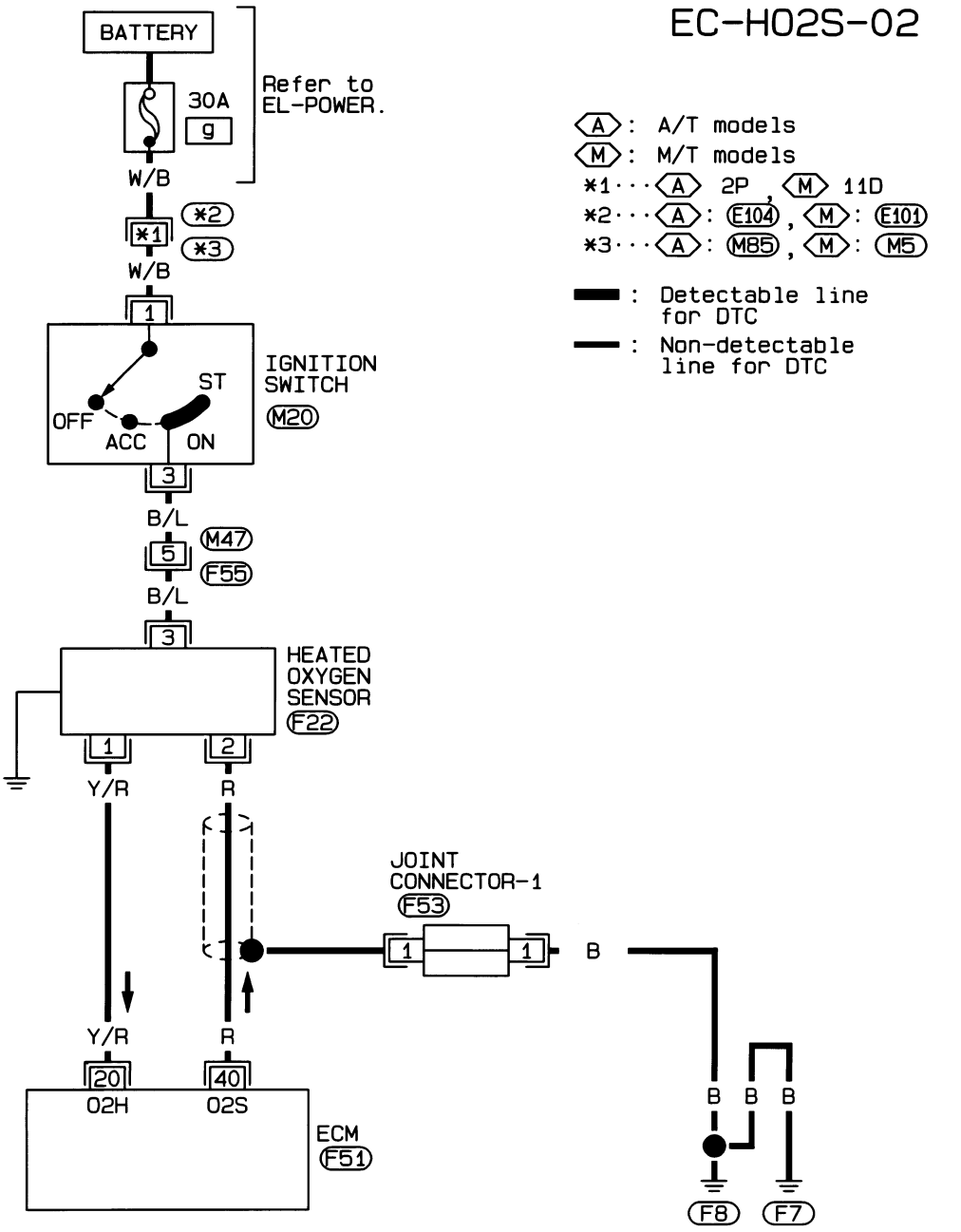
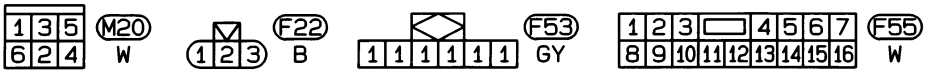
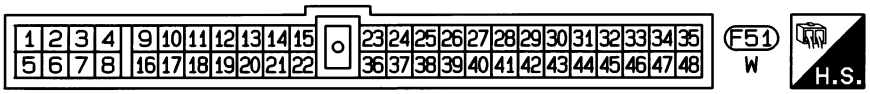
Heated Oxygen Sensor Heater — Models with Three Way Catalyst — (Cont'd)







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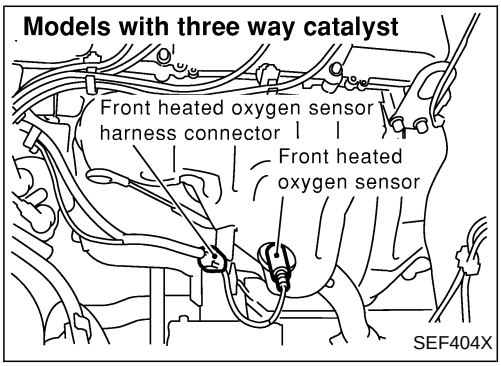
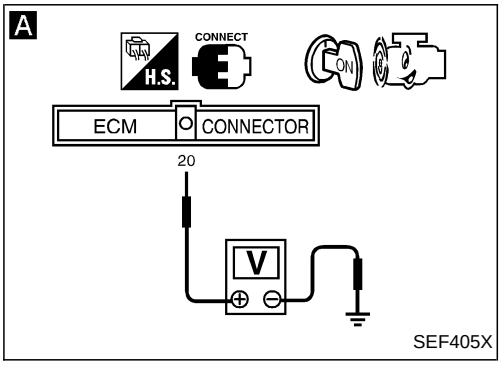
M5, E101

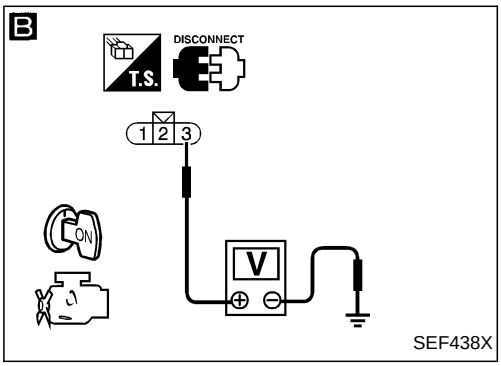
M85, E104

Heated Oxygen Sensor Heater — Models with Three Way Catalyst — (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine.
2. Check voltage between ECM terminal ⑳ and ground with CONSULT or tester under the following conditions.

Voltage:
Engine speed is below 3,000 rpm
Approximately 0V
Engine speed is above 3,000 rpm
Battery voltage

OK → INSPECTION END

NG ↓

B

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect heated oxygen 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 connectors (M47), (F55) (RHD models)
- Harness for open or short between heated oxygen sensor and fuse

If NG, repair harness or connectors.

OK ↓

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between heated oxygen sensor harness connector terminal ① and ECM terminal ⑳. Refer to wiring diagram.

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

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

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

OK ↓

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

NG → Replace heated oxygen sensor.

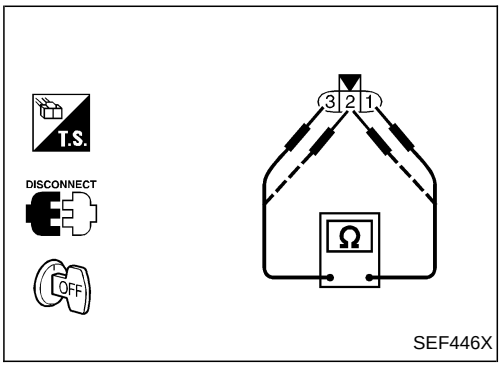
OK ↓

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

Trouble is not fixed. ↓

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

INSPECTION END



Heated Oxygen Sensor Heater — Models with Three Way Catalyst — (Cont'd)

COMPONENT INSPECTION

Heated oxygen sensor heater

Check resistance between terminals ③ and ① .

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

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

Continuity should not exist.

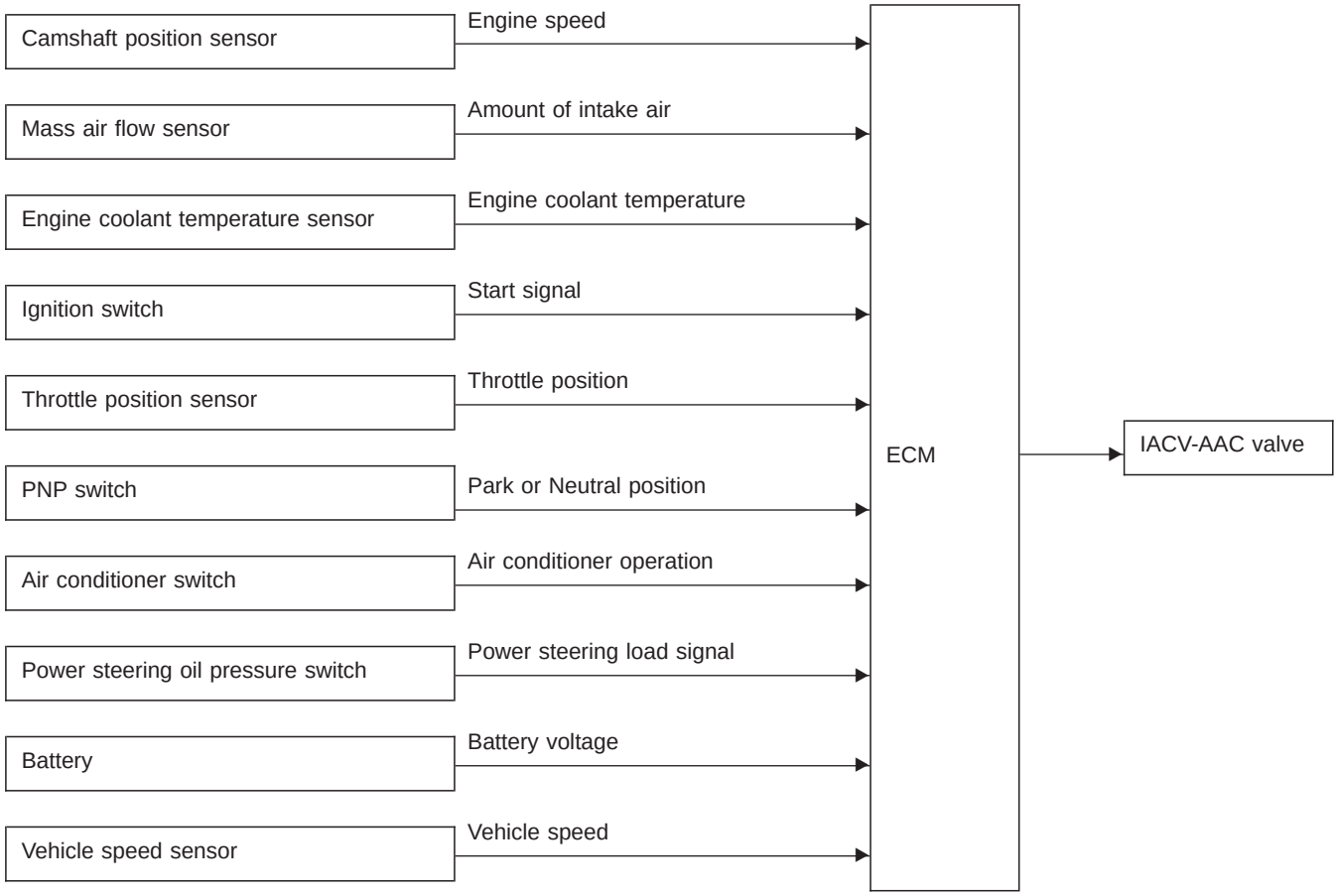
If NG, replace the heated oxygen sensor.

CAUTION:

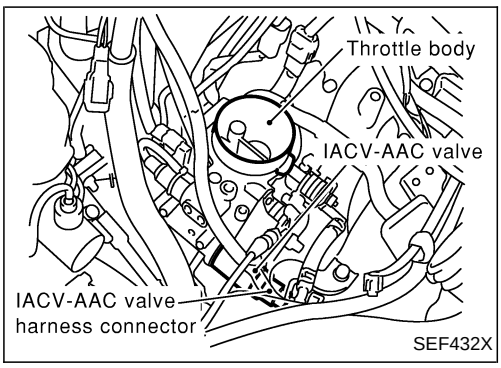
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

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

SYSTEM DESCRIPTION



This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve 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 and power steering operation).



COMPONENT DESCRIPTION

IACV-ACC 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)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

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

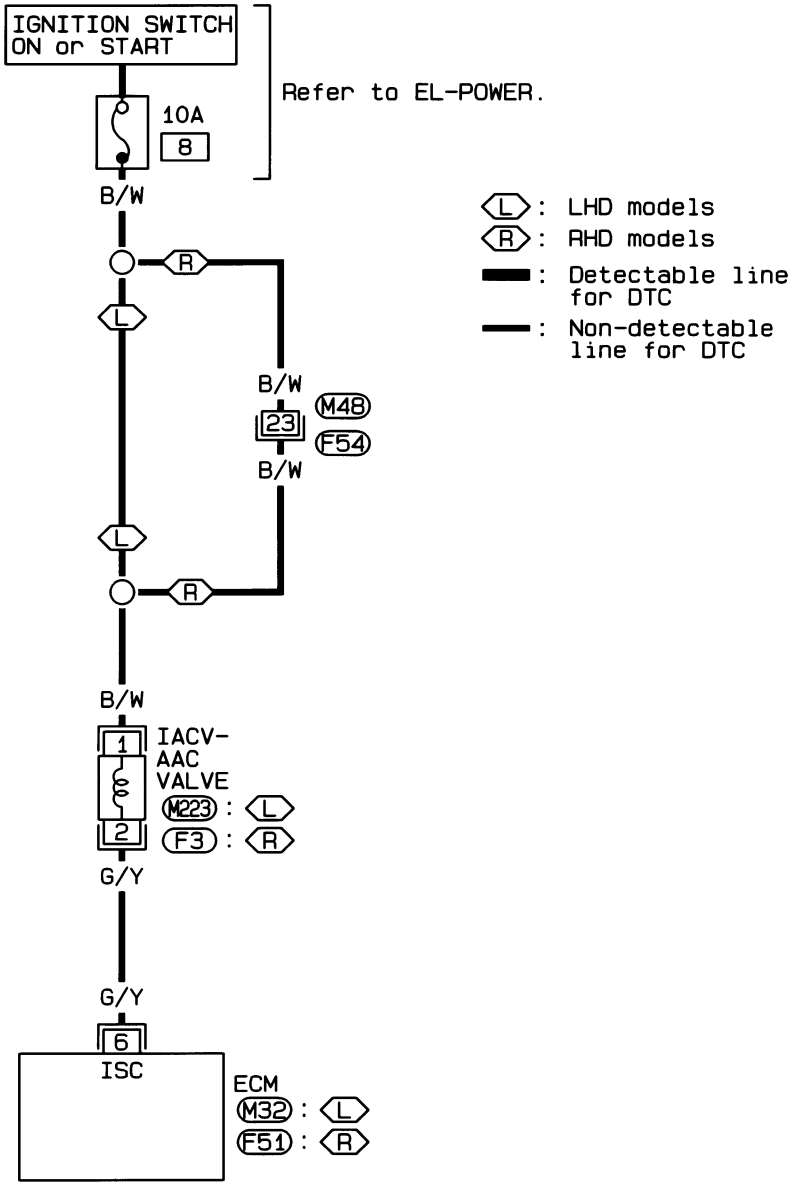
ECM TERMINALS AND REFERENCE VALUE

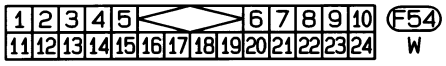
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

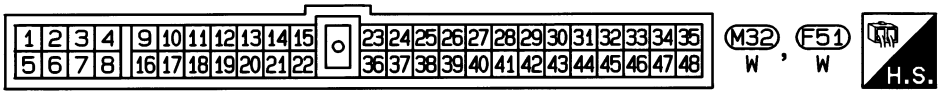
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
6	G/Y	IACV-AAC valve	Engine is running. └ Idle speed	10 - 13V
			Engine is running. — Steering wheel is being turned. — Air conditioner is operating. — Rear window defogger switch is "ON". └ Lighting switch is "ON".	5 - 10V

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

EC-AAC/V-01







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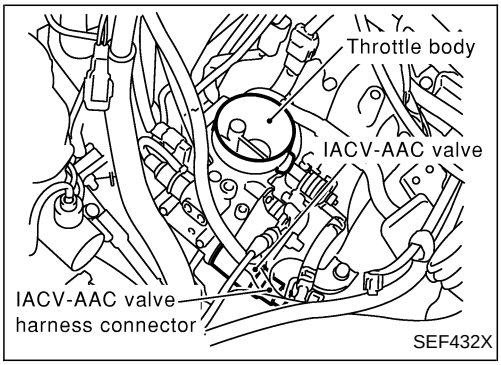
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

DIAGNOSTIC PROCEDURE



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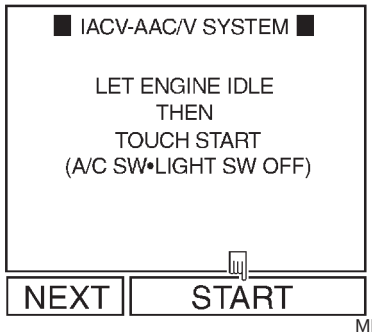

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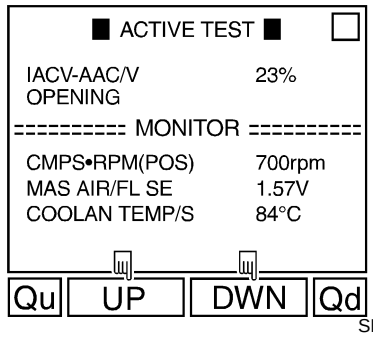

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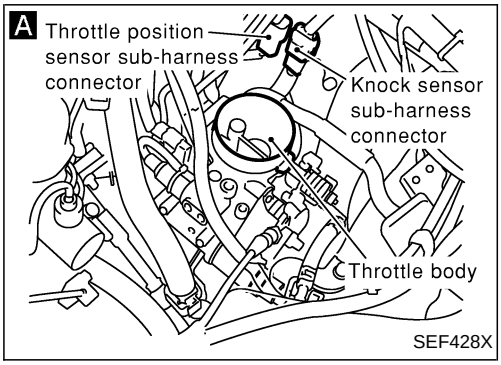

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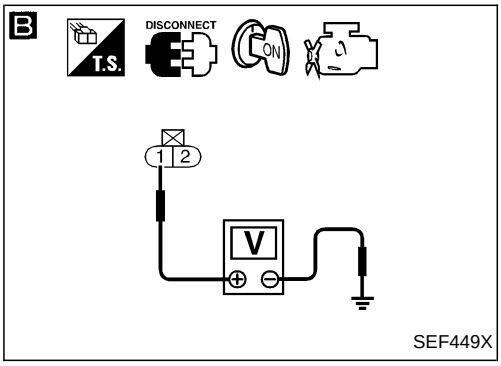

INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up to normal operating temperature.
2. Perform "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

2. Perform "IACV-AAC/V OPENING" in "ACTIVE TEST" mode with CONSULT.
3. Check engine speed varies corresponding to IACV-AAC VALVE opening percent.

OR

2. Check idle speed.
   700±50 rpm
   If NG, adjust idle speed.
3. Stop engine and disconnect throttle position sensor sub-harness connector.
4. Restart engine and let it idle after revving it to 2,000 - 3,000 rpm a few times.
5. Check idle speed again.
   650±50 rpm

OK → INSPECTION END

NG

B

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

NG → Check the following.
- 10A fuse
- Harness connectors F54, M48 (RHD models only)
- Harness for open or short between IACV-AAC valve and fuse

If NG, repair harness or connectors.

OK

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ⑥ and IACV-AAC valve harness connector terminal ② .
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

Ⓐ

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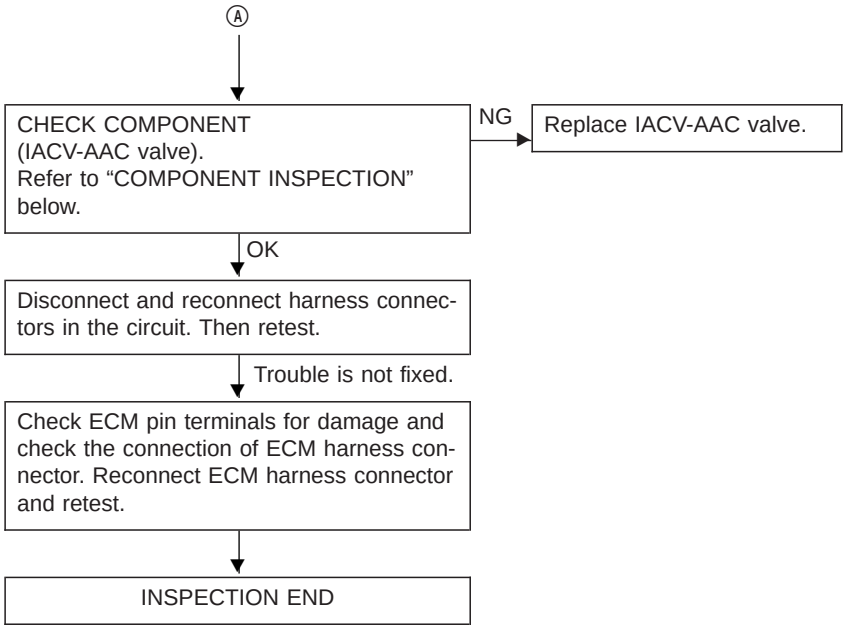
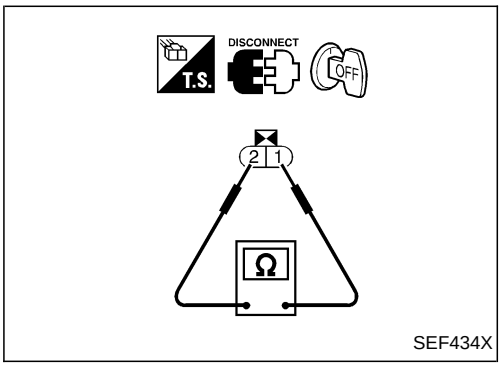
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)





COMPONENT INSPECTION

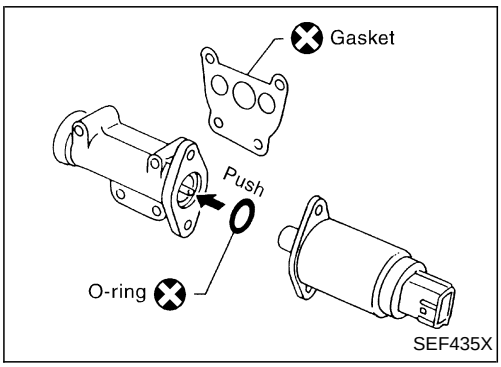
IACV-AAC valve

Disconnect IACV-AAC valve harness connector.

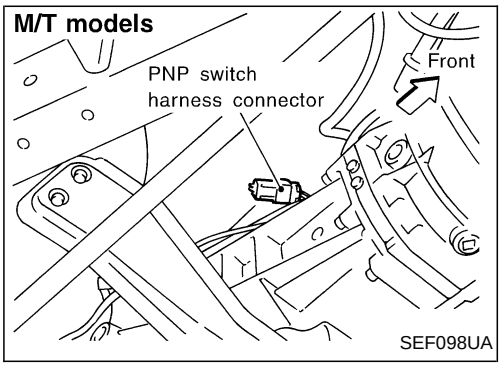
- Check IACV-AAC valve resistance.

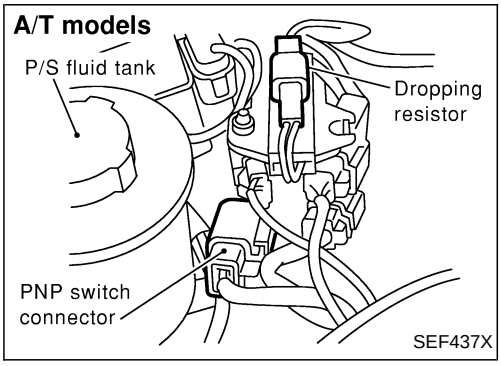
  Resistance:

  Approximately 10Ω at 25°C (77°F)



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





Park/Neutral Position Switch

COMPONENT DESCRIPTION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

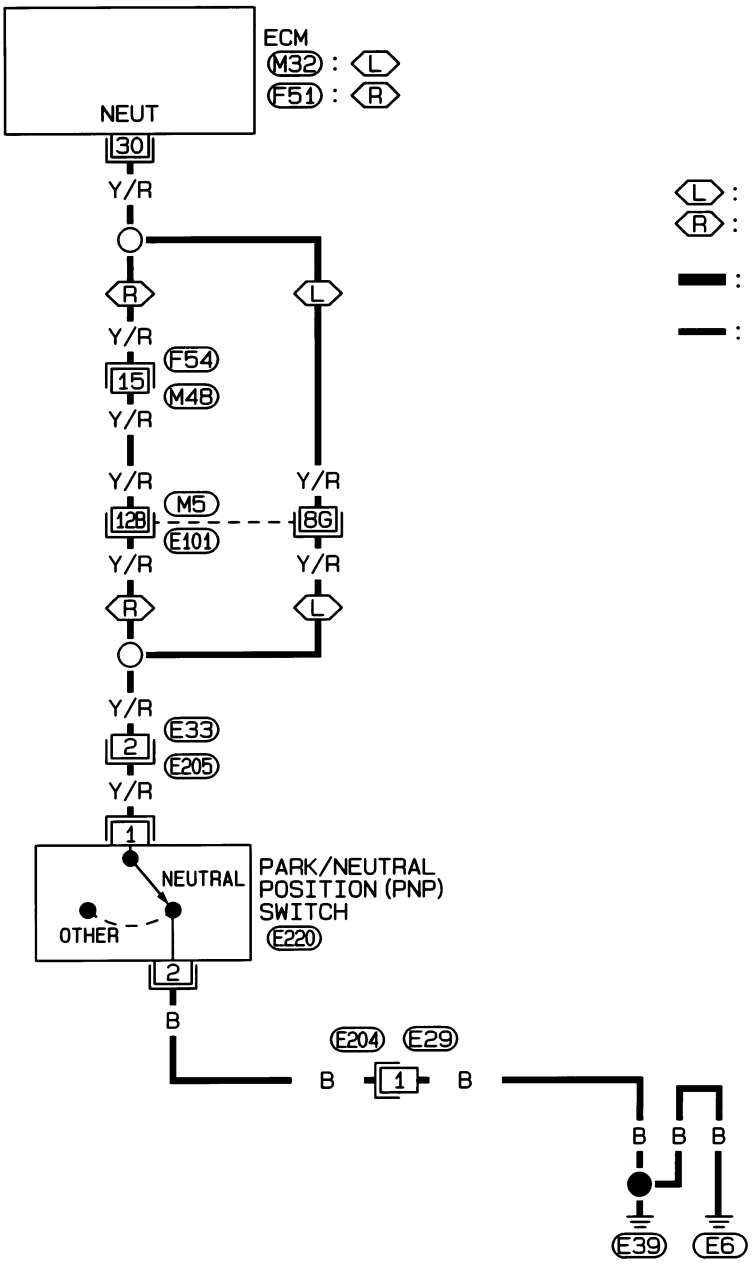
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
30	Y/R	Park/Neutral position	Ignition switch “ON” └ “P” or “N” position	Approximately 0V
			Ignition switch “ON” └ Except the above gear position	Approximately 5V

Park/Neutral Position Switch (Cont'd)

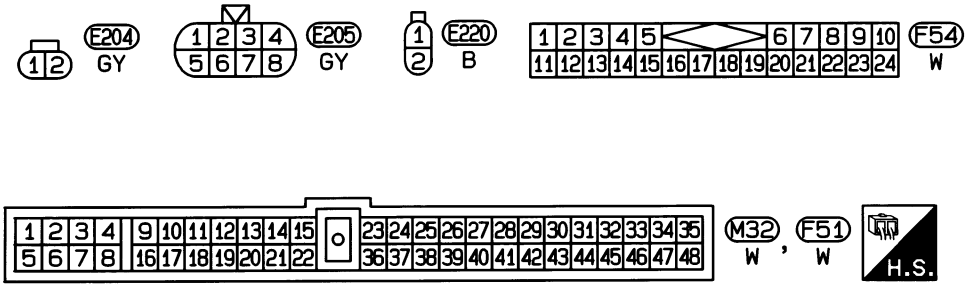
FOR M/T MODELS

EC-PNP/SW-01



L : LHD models
R : RHD models

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



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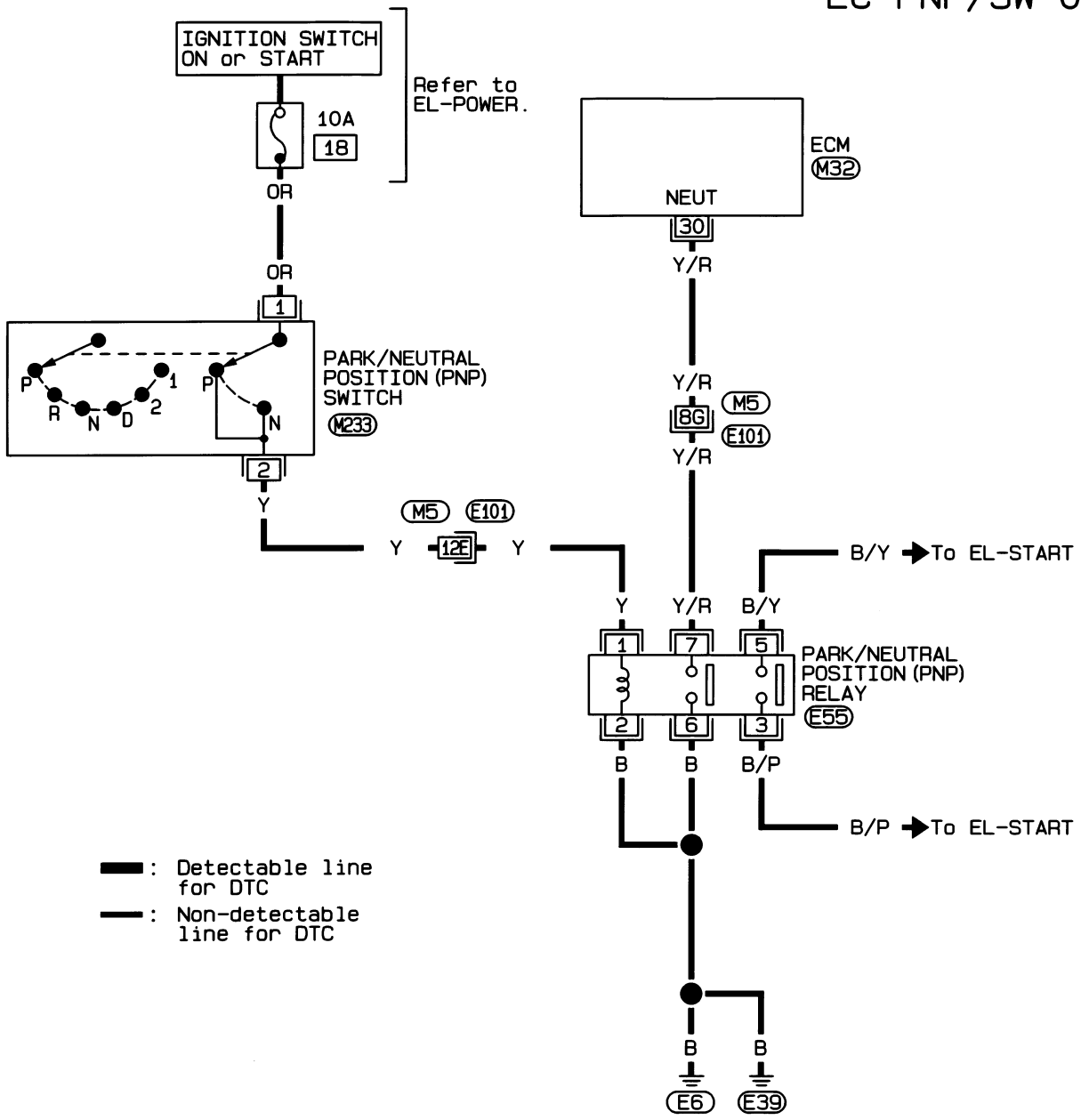
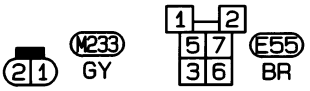
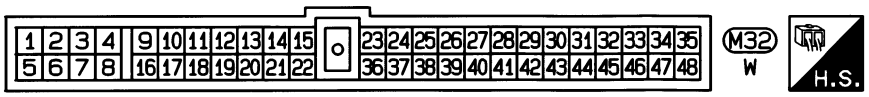
Park/Neutral Position Switch (Cont'd)

FOR A/T LHD MODELS

EC-PNP/SW-02







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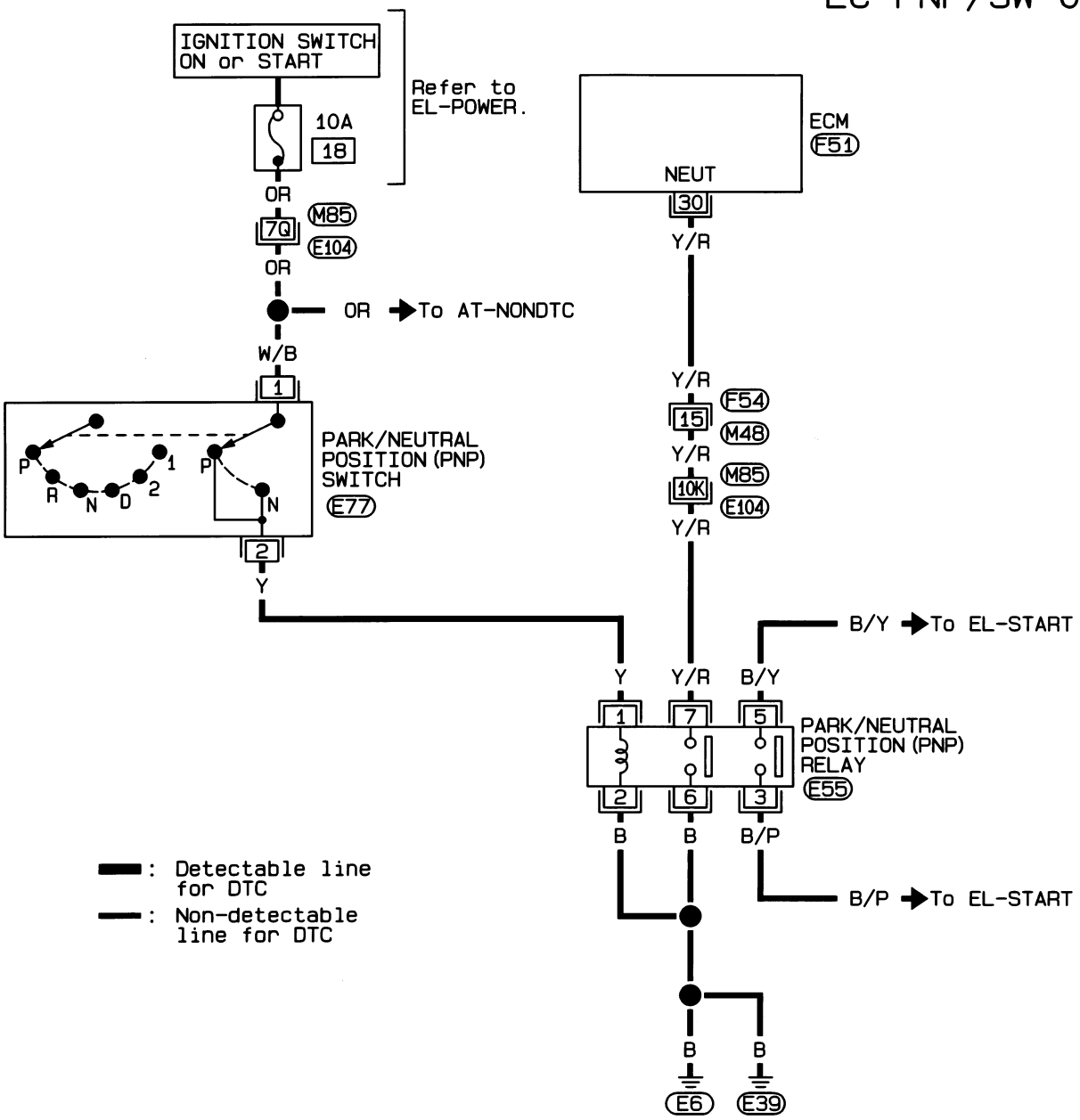
M5, E101

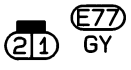
HEC676

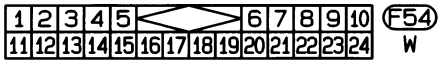
Park/Neutral Position Switch (Cont'd)

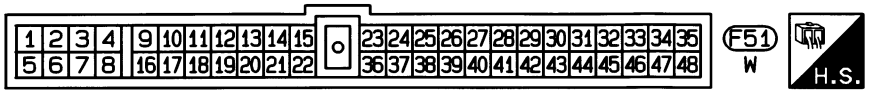
FOR A/T RHD MODELS

EC-PNP/SW-03









Refer to last page (Foldout page).

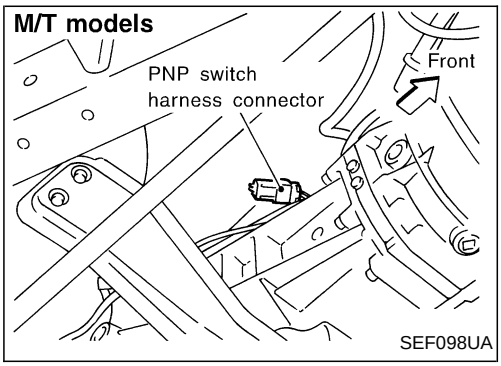
M85, E104

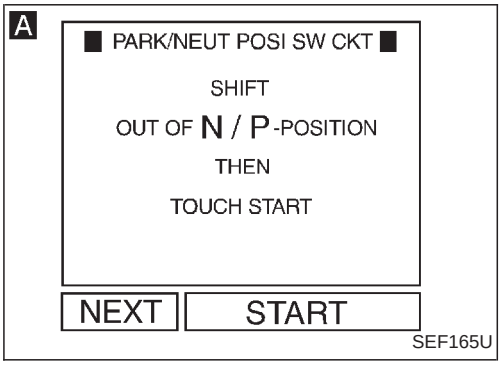
HEC677

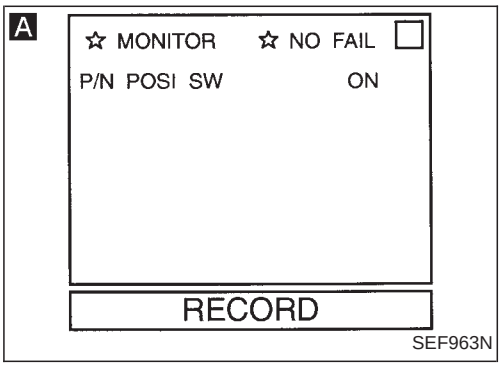
Park/Neutral Position Switch (Cont'd)

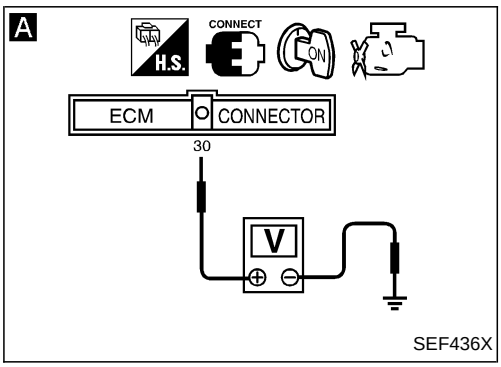
DIAGNOSTIC PROCEDURE

M/T models









INSPECTION START

A

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

OK → INSPECTION END

OR

2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT.
3. Check the "P/N POSI SW" signal under the following conditions.
   Neutral position: ON
   Except above position: OFF

OR

2. Check voltage between ECM terminal ㉚ and ground with CONSULT or tester under the following conditions.
   Voltage:
   Neutral position
   Approximately 0V
   Except above position
   Approximately 5V

NG

CHECK GROUND CIRCUIT.
1. Disconnect PNP switch harness connector.
2. Check harness continuity between PNP switch harness connector terminal ② and body ground.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors E204, E29
- Harness for open or short between PNP switch and body ground

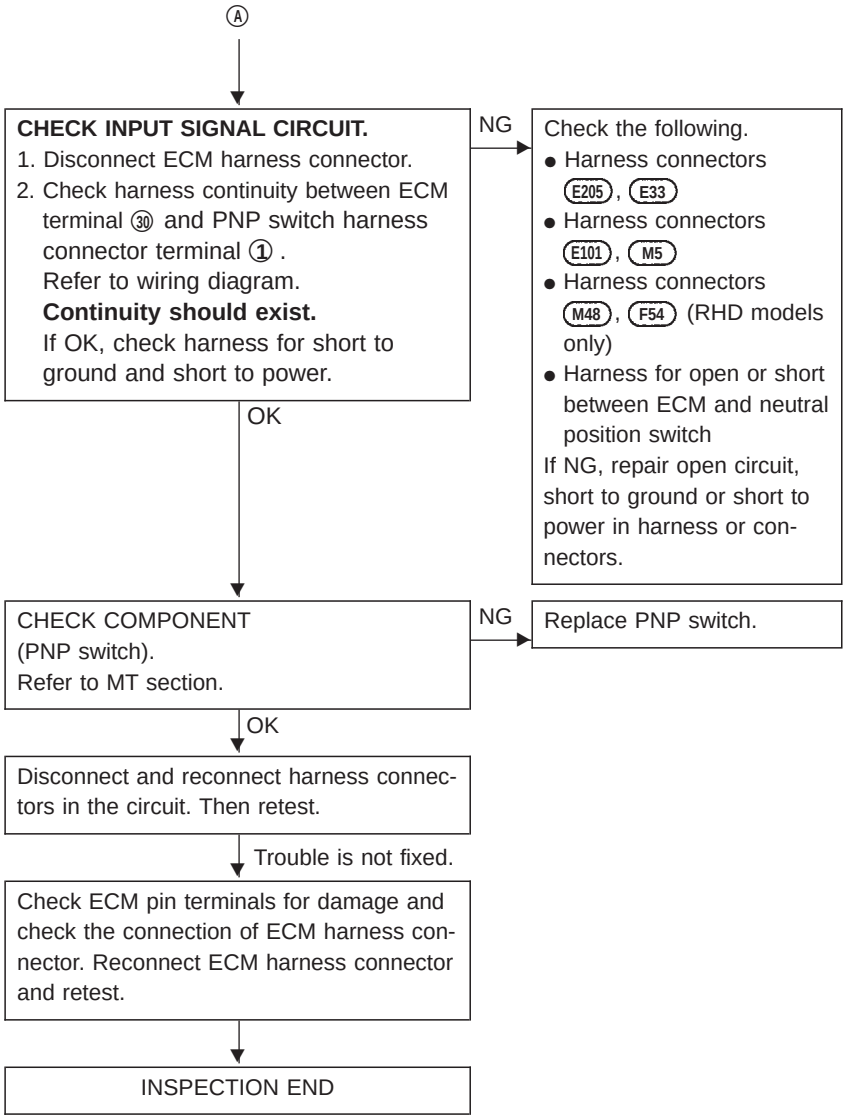
If NG, repair open circuit, short to ground or short to power in harness or connectors.

OK

Ⓐ

(Go to next page.)

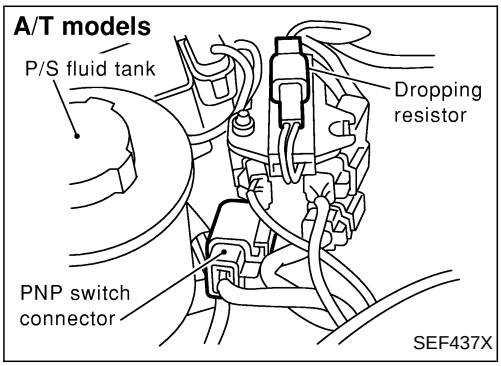
Park/Neutral Position Switch (Cont'd)

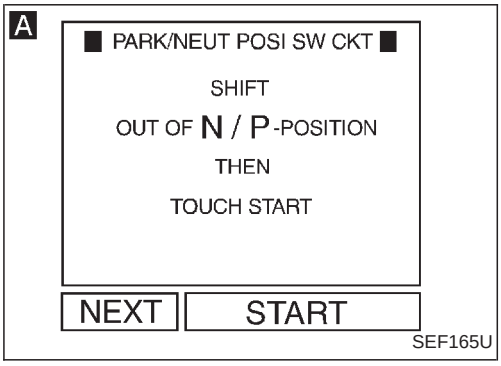


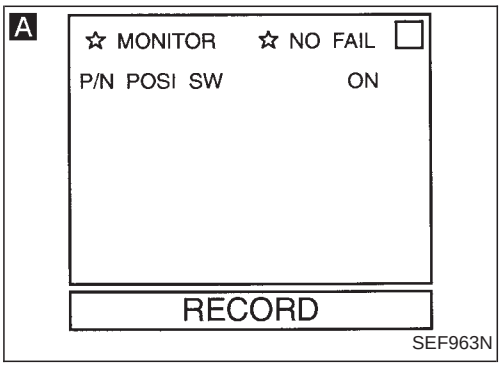
Park/Neutral Position Switch (Cont'd)

DIAGNOSTIC PROCEDURE

A/T models







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 the "P/N POSI SW" signal under the following conditions.
   "P" or "N" position: ON
   Except above position: OFF

OR

2. Check voltage between ECM terminal ㉚ and ground with CONSULT or tester under the following conditions.
   Voltage:
   "P" or "N" position
   Approximately 0V
   Except above position
   Approximately 5V

OK → INSPECTION END

NG ↓

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect Park/Neutral position relay harness connector.
3. Turn ignition switch "ON".
4. Select "P" or "N" position.
5. Check voltage between PNP relay harness connector terminal ① and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
Fuse 10A
- Harness connectors (E101), (M5) (LHD models) (E104), (M85) (RHD models)
- Harness for open or short between fuse and PNP relay

If NG, repair harness or connectors.
- Check component (PNP switch) (Refer to A/T section.)

OK ↓

CHECK GROUND CIRCUIT.
1. Disconnect park/neutral position relay harness connector.
2. Check harness continuity between park/neutral position relay terminal ②, PNP relay terminal ⑦ and body ground. Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

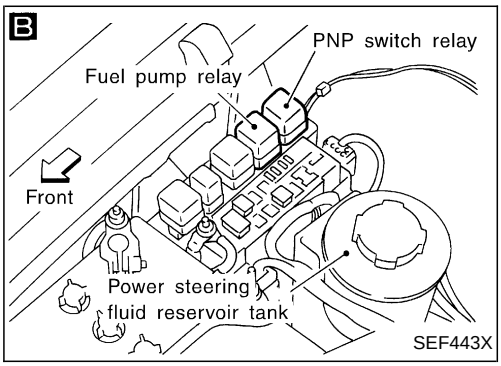
NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK ↓

Ⓐ

(Go to next page.)

Park/Neutral Position Switch (Cont'd)



Ⓐ

B

CHECK PARK/NEUTRAL POSITION RELAY.

1. Apply 12V direct current between relay terminals ① and ② .
2. Check continuity between relay terminals ⑥ and ⑦ .

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

NG → Replace park/neutral position relay.

OK ↓

CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (30) and PNP relay terminal ⑥ .
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (M5), (E101)
- Harness for open or short between ECM and PNP relay

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

OK ↓

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

Trouble is not fixed. ↓

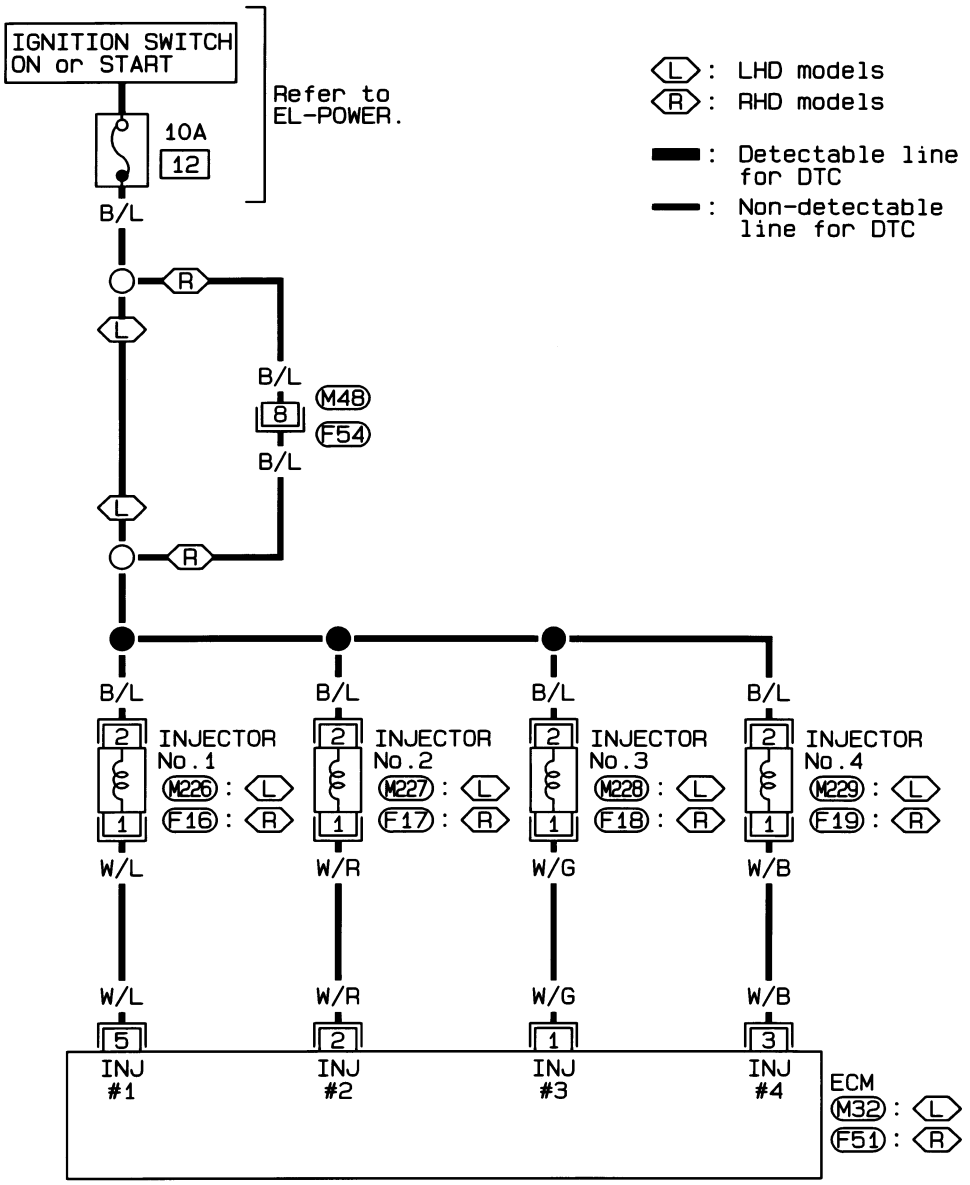
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

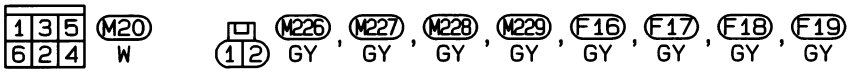
↓

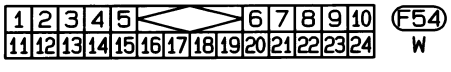
INSPECTION END

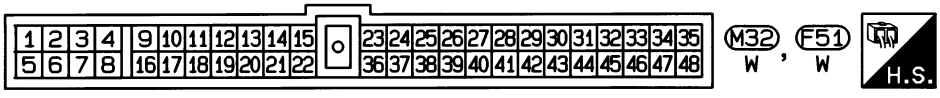
Injector

EC-INJECT-01



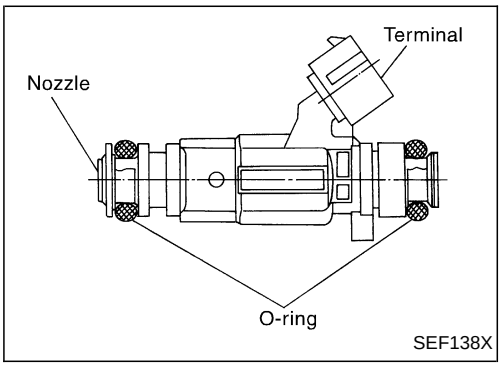






HEC678

Injector (Cont'd)

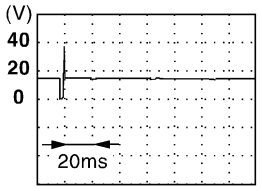
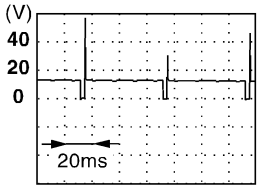


COMPONENT DESCRIPTION

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.

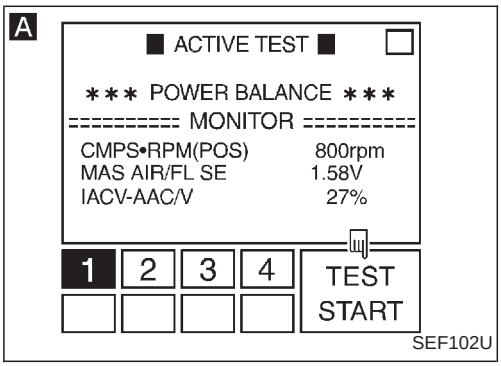
ECM TERMINALS AND REFERENCE VALUE

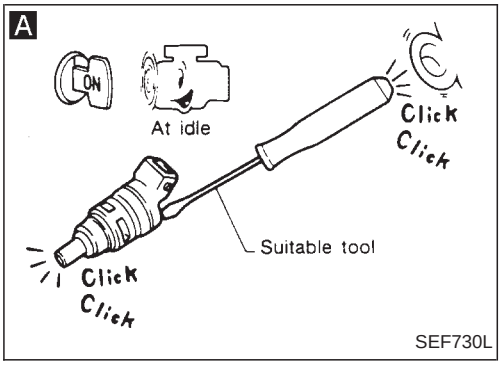
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

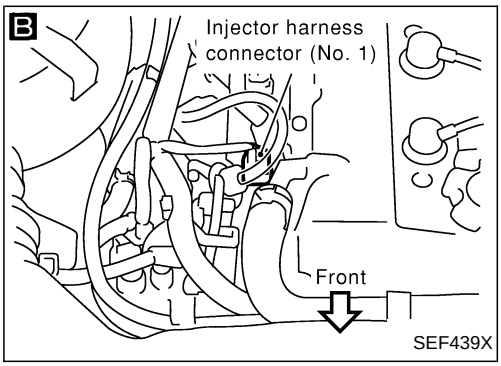
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
1 2 3 5	W/G W/R W/B W/L	Injector No. 3 Injector No. 2 Injector No. 4 Injector No. 1	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF204T
			Engine is running. └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)  SEF205T

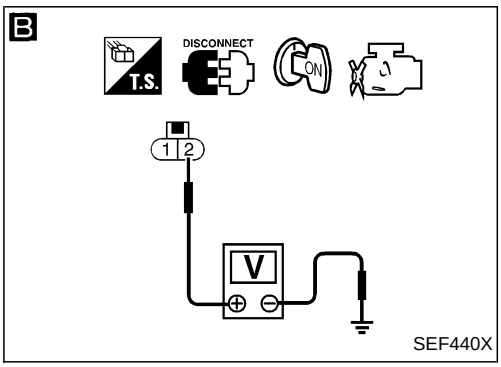
Injector (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

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

OR

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

OK → INSPECTION END

NG

B

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

NG → Check the following.
- Harness connectors (F54), (M48) (RHD models only)
- Harness for open or short between injector and ignition switch

If NG, repair harness or connectors.

OK

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ① and ECM terminals ①, ②, ③, ⑤.
Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short to ground and short to power.

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

OK

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

NG → Replace injector.

OK

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

Trouble is not fixed.

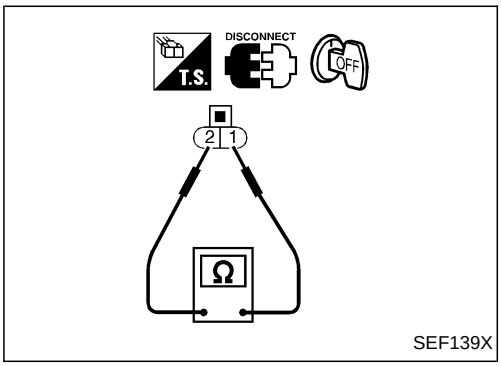
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Injector (Cont'd)

COMPONENT INSPECTION

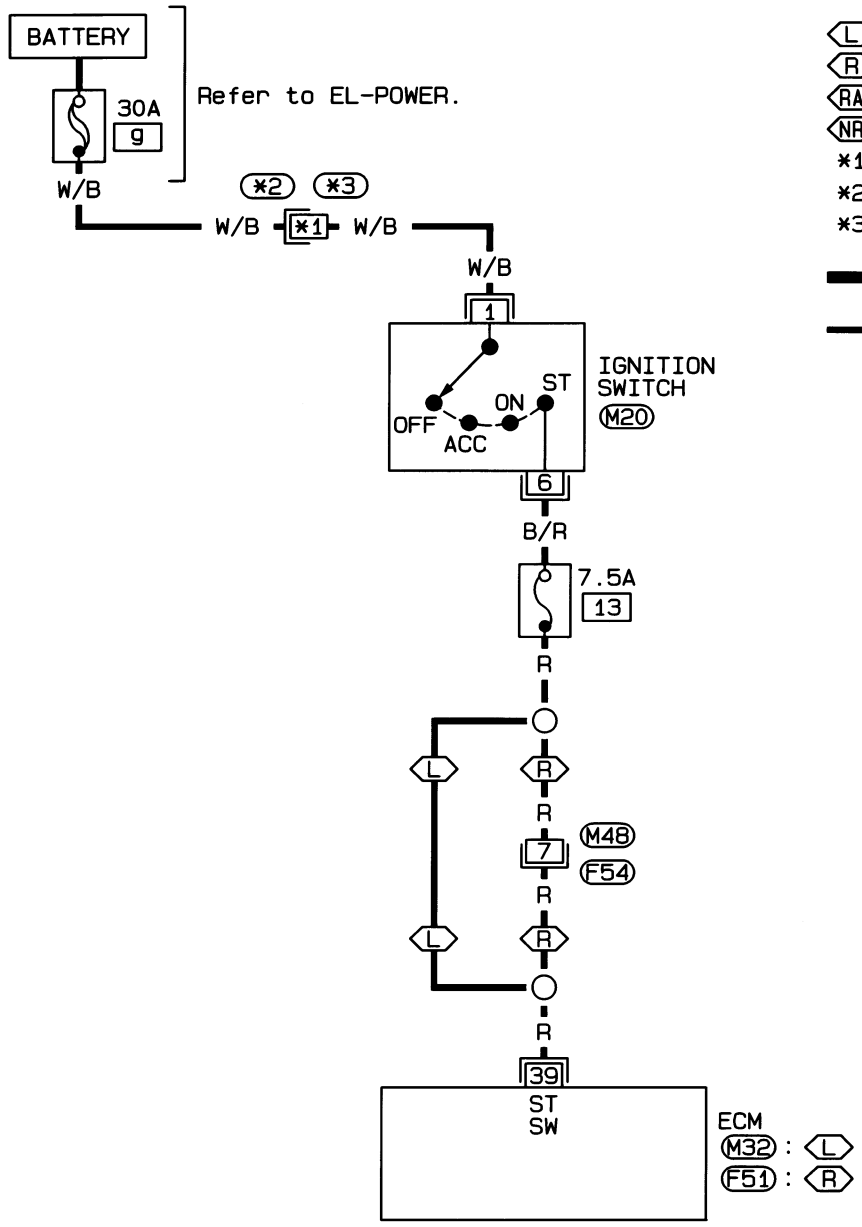
Injector

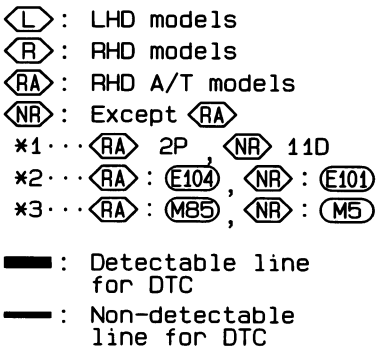


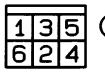
1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 14 - 15Ω at 20°C (68°F)
   If NG, replace injector.

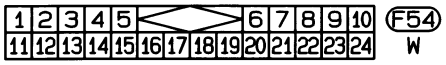
Start Signal

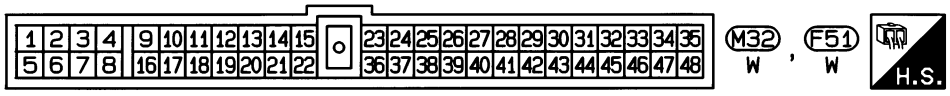
EC-S/SIG-01











Refer to last page (Foldout page).

M5 , E101

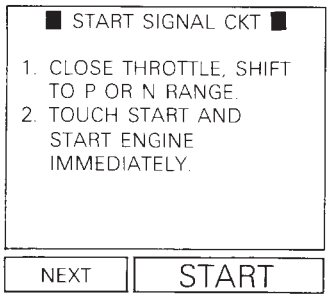
M85 , E104

HEC679

Start Signal (Cont'd)

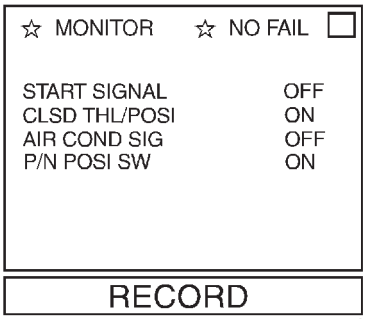
DIAGNOSTIC PROCEDURE

A



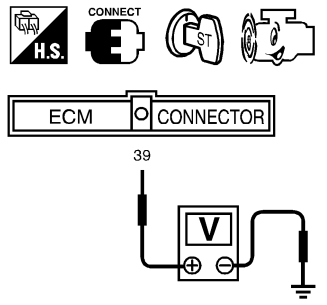
SEF191L

A



SEF153U

A



SEF441X

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "START SIGNAL CKT" in "FUNCTION TEST" mode with CONSULT.

OK → INSPECTION END

OR

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1. Turn ignition switch to "START".
2. Check voltage between ECM terminal (39) 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

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 (39) and fuse block.
   Continuity should exist.
   Refer to wiring diagram.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (F54), (M48) (RHD models only)
- Harness for open or short between ECM and fuse block

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

OK

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

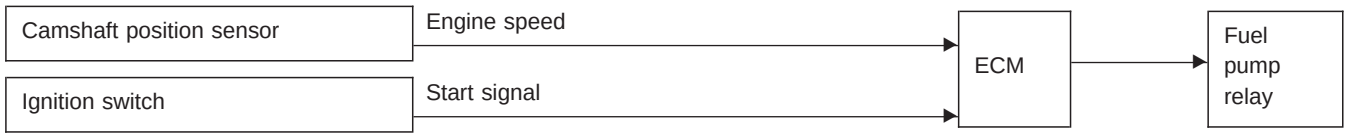
Trouble is not fixed.

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

INSPECTION END

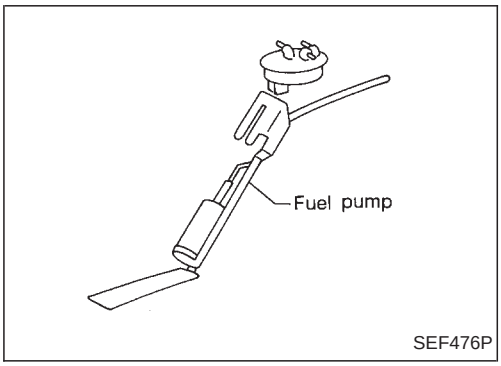
Fuel Pump

SYSTEM DESCRIPTION



The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to operate. If the 180° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1 second.
Except as shown above.	Stops.



COMPONENT DESCRIPTION

The fuel pump with a fuel damper is an in-tank type (the pump and damper are located in the fuel tank).

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	• Ignition switch is turned to ON (Operates for 5 seconds). • Engine running and cranking • When engine is stopped (Stops in 1 second)	ON
	Except as shown above	OFF

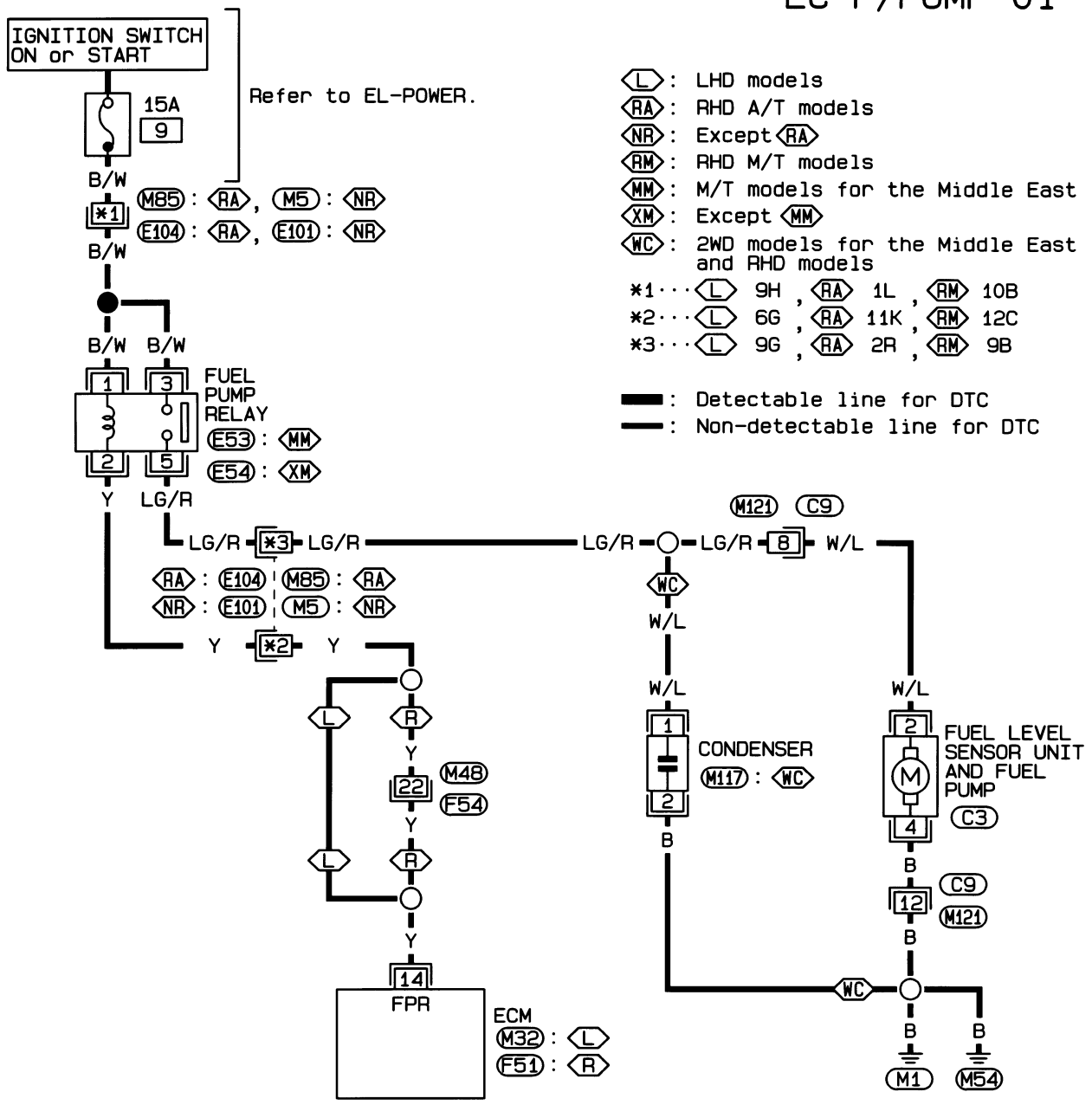
ECM TERMINALS AND REFERENCE VALUE

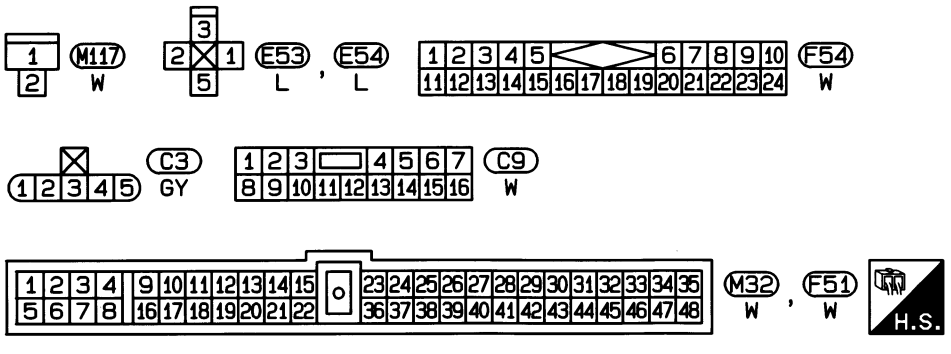
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
14	Y	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	Approximately 1V
			Ignition switch "ON" └ 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

Fuel Pump (Cont'd)

EC-F/PUMP-01





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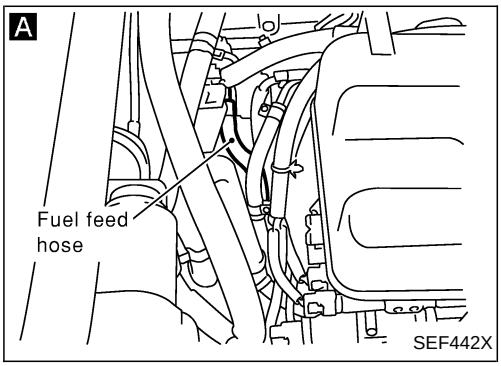
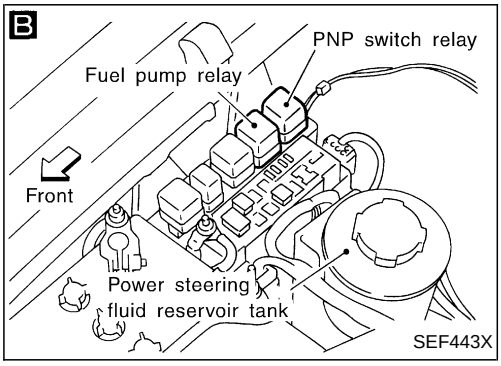
M5, E101
M85, E104

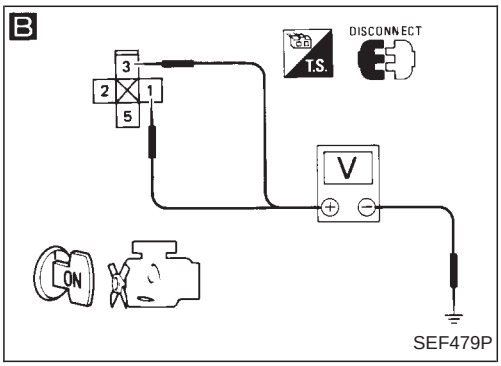
HEC680

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.
- 15A fuse

If NG, check the condenser circuit for short.
Refer to wiring diagram.
- Harness connectors (M85), (E104) (RHD A/T models)
  (E101), (M5) (Except RHD A/T models)
- Harness for open or short between fuse and fuel pump relay

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.
3. Check harness continuity between fuel pump harness connector terminal ④ and body ground, relay terminal ⑤ and fuel pump harness connector terminal ② .
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (C9), (M121)
- Harness connectors (M85), (E104) (RHD A/T models)
  (E101), (M5) (Except RHD A/T models)
- 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 open circuit, short to ground or short to power in harness or connectors.

OK

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (14) and fuel pump relay terminal ② .
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (M85), (E104) (RHD A/T models)
  (E101), (M5) (Except RHD A/T models)
- Harness connectors (M48), (F54) (RHD models only)
- Harness for open or short between ECM and fuel pump relay

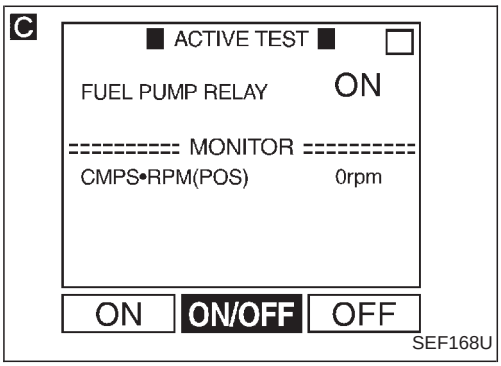
If NG, repair open circuit, short to ground or short to power in harness or connectors.

OK

Ⓐ

(Go to next page.)

Fuel Pump (Cont'd)



Ⓐ

C

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" below.

OK ↓

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

NG → Replace fuel pump.

OK ↓

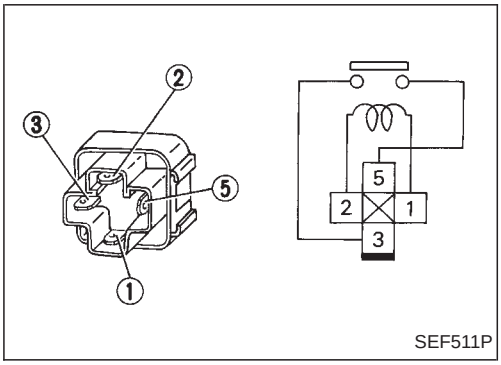
Disconnect and reconnect harness connectors in the circuit. Then retest.

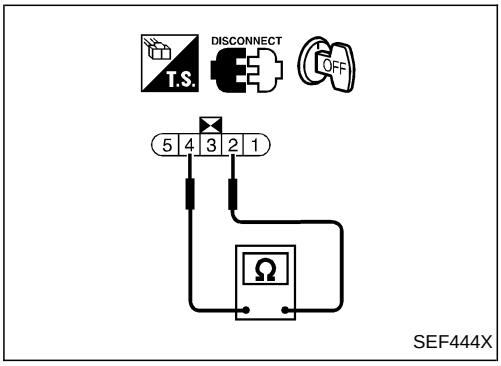
Trouble is not fixed. ↓

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

↓

INSPECTION END





COMPONENT INSPECTION

Fuel pump relay

Check continuity between terminals ③ and ⑤.

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

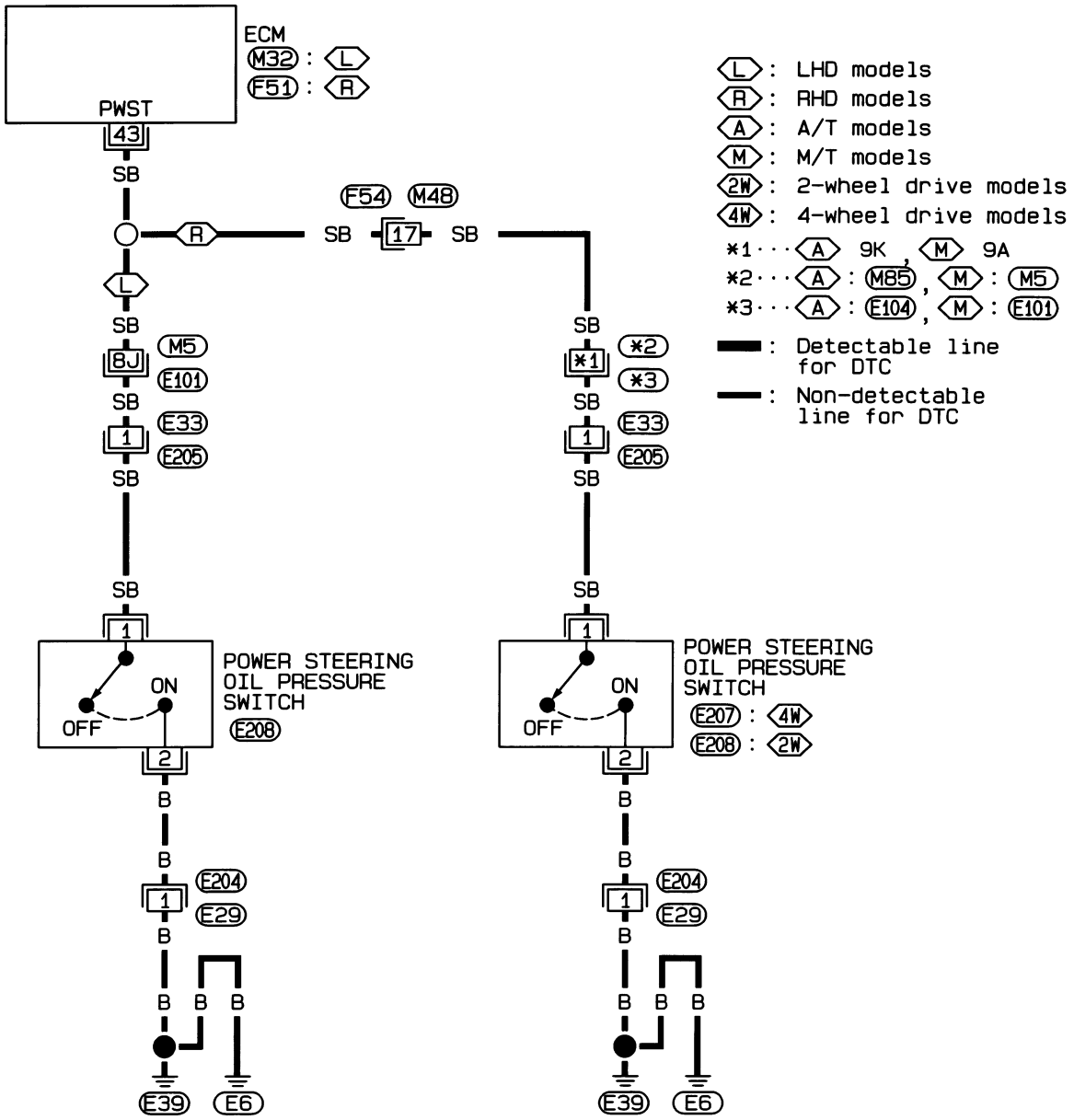
If NG, replace relay.

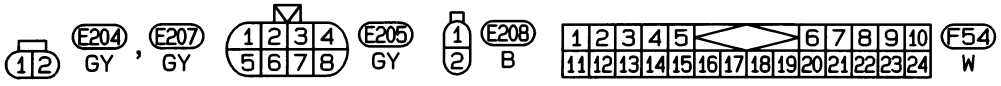
Fuel pump

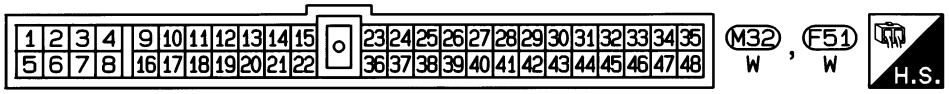
1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ② and ④.
   Resistance: 0.2 - 5.0Ω at 25°C (77°F)
   If NG, replace fuel pump.

Power Steering Oil Pressure Switch

EC-PST/SW-01







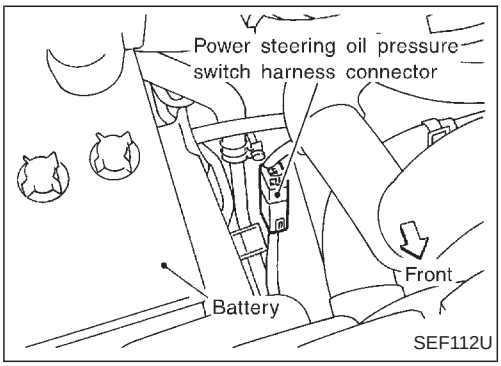
Refer to last page (Foldout page).

M5 , E101

M85 , E104

HEC681

Power Steering Oil Pressure Switch (Cont'd)



COMPONENT DESCRIPTION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON

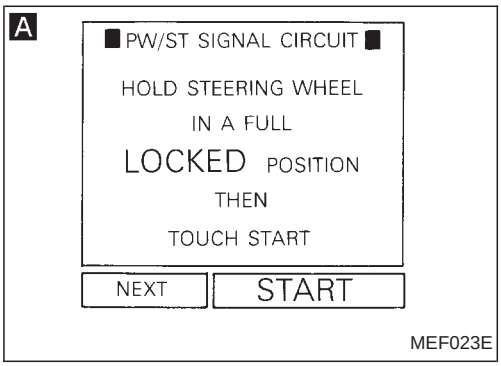
ECM TERMINALS AND REFERENCE VALUE

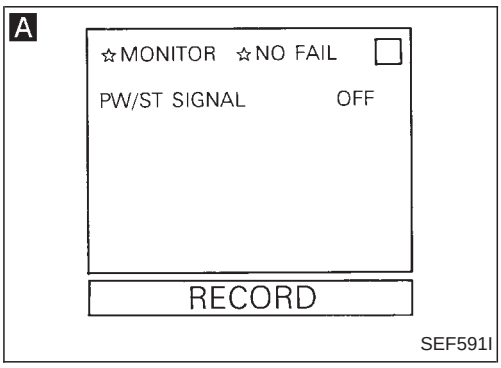
Remarks: Specification data are reference values, and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

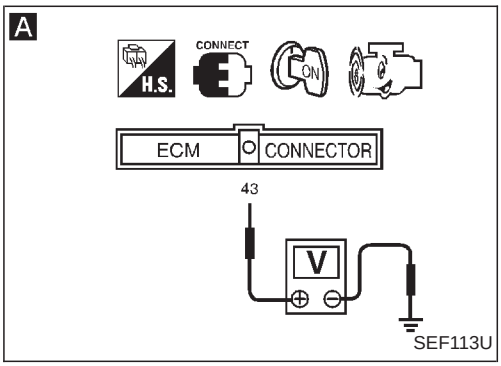
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
43	SB	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0V
			Engine is running. └ Steering wheel is not being turned.	Approximately 5V

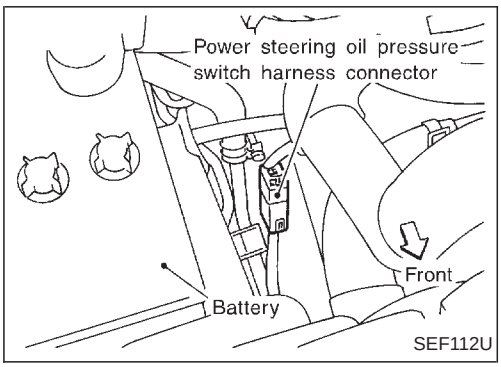
Power Steering Oil Pressure Switch (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Start engine.
2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT.

Steering is neutral position: OFF
Steering is turned: ON

OR

1. Start engine.
2. Check voltage between ECM terminal ㊸ and ground.

Voltage:
When steering wheel is turned quickly
Approximately 0V
Except above
Approximately 5V

OK → INSPECTION END

NG

CHECK GROUND CIRCUIT.

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

NG → Check the following.
- Harness connectors E204, E29
- Harness for open or short between power steering oil pressure switch and engine ground

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

OK

Ⓐ

(Go to next page.)

Power Steering Oil Pressure Switch (Cont'd)

Ⓐ

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㊸ and power steering oil pressure switch harness connector terminal ① .
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors E205, E33
- Harness connectors E101, M5
- Harness connectors M48, F54 (RHD models only)
- Harness connectors E104, M85 (RHD A/T models only)
- Harness for open or short between ECM and power steering oil pressure switch

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

OK ↓

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

NG → Replace power steering oil pressure switch.

OK ↓

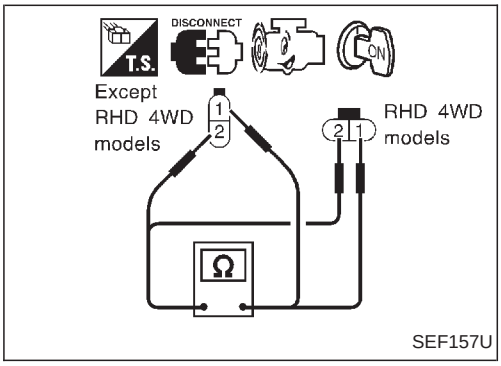
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END



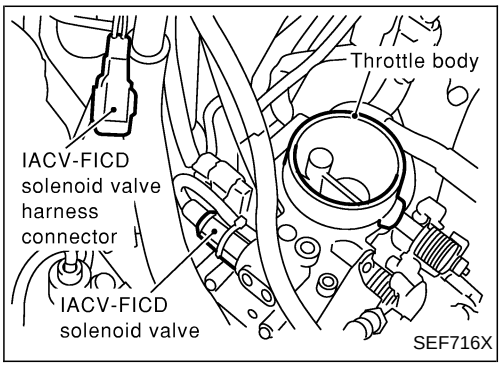
COMPONENT INSPECTION

Power steering oil pressure switch

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals ① and ② .

Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If NG, replace power steering oil pressure switch.



IACV-FICD Solenoid Valve

COMPONENT DESCRIPTION

The idle air adjusting (IAA) unit is made up of the IACV-AAC valve, IACV-FICD solenoid valve and idle adjusting screw. It receives the signal from the ECM and controls the idle speed at the preset value. For more information, refer to “DESCRIPTION” in HA section.

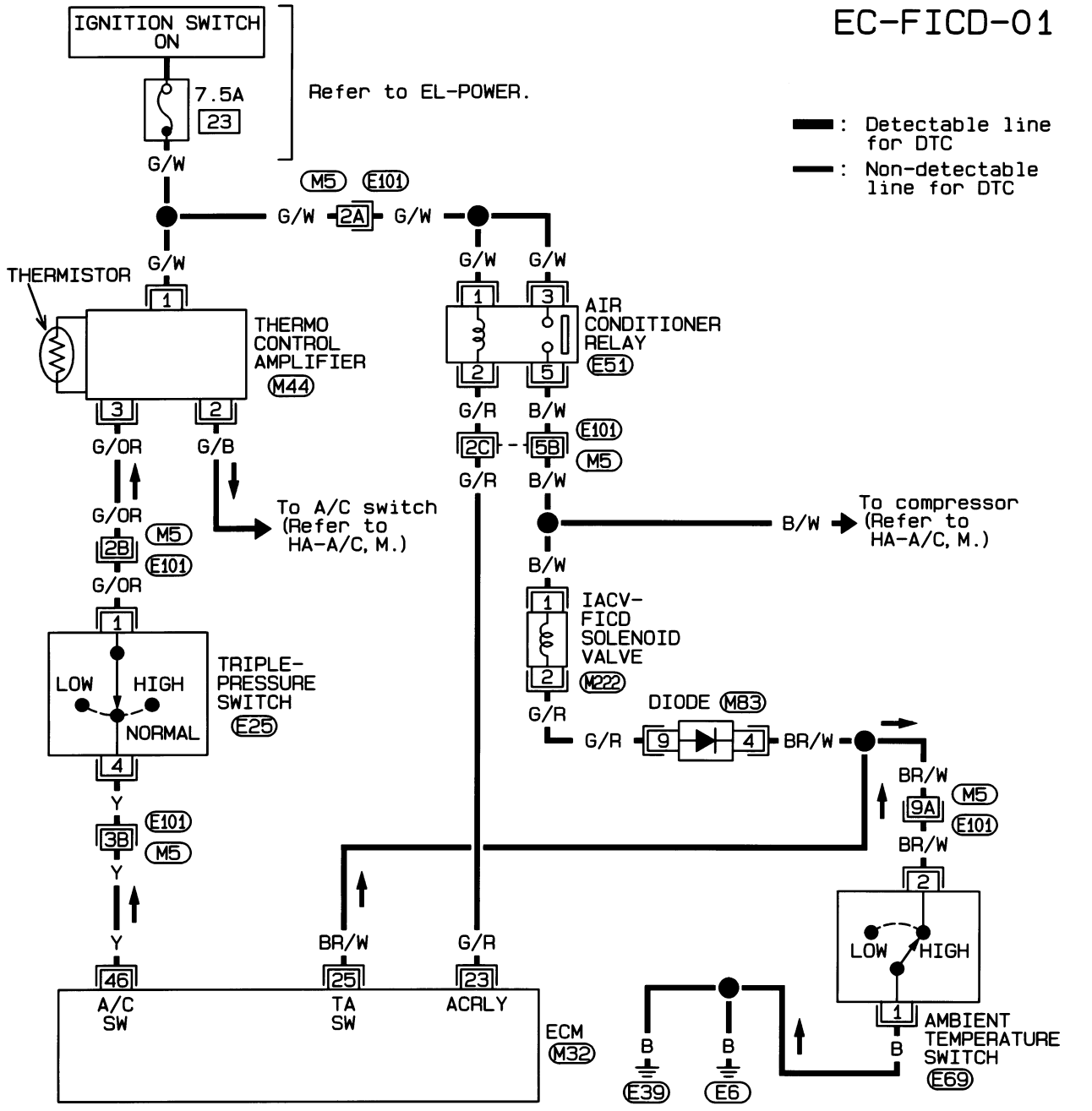
ECM TERMINALS AND REFERENCE VALUE

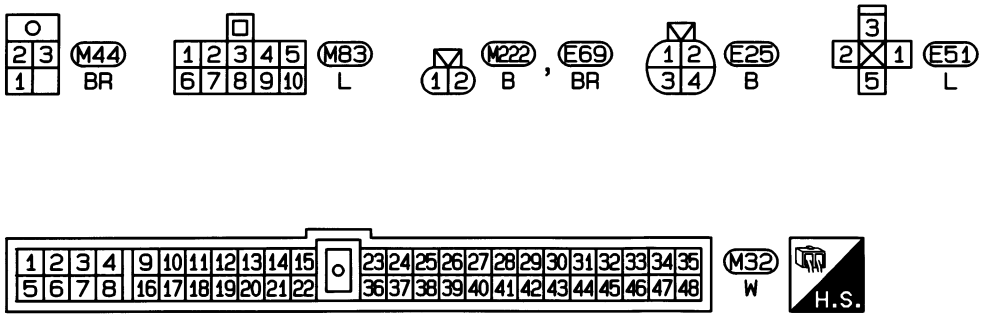
Remarks: Specification data are reference values and are measured between each terminal and ㉟ (ECM ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
23	G/R	Air conditioner relay	Engine is running. └ Both air conditioner switch and blower switch are “ON”. (Compressor operates.)	Approximately 1V
			Engine is running. └ Air conditioner switch is “OFF”.	BATTERY VOLTAGE (11 - 14V)
25	BR/W	Ambient air temperature switch	Engine is running. └ ● Idle speed ● Ambient air temperature is above 23°C (73°F) ● Air conditioner is operating	0V
			Engine is running. └ ● Idle speed ● Ambient air temperature is below 23°C (73°F) ● Air conditioner is operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ ● Idle speed ● Ambient air temperature is below 23°C (73°F) ● Air conditioner is not operating	Approximately 5V
46	Y	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are “ON”. (Compressor operates.)	Approximately 0V
			Engine is running. └ Air conditioner switch is “OFF”.	BATTERY VOLTAGE (11 - 14V)

IACV-FICD Solenoid Valve (Cont'd)

FOR LHD MODELS





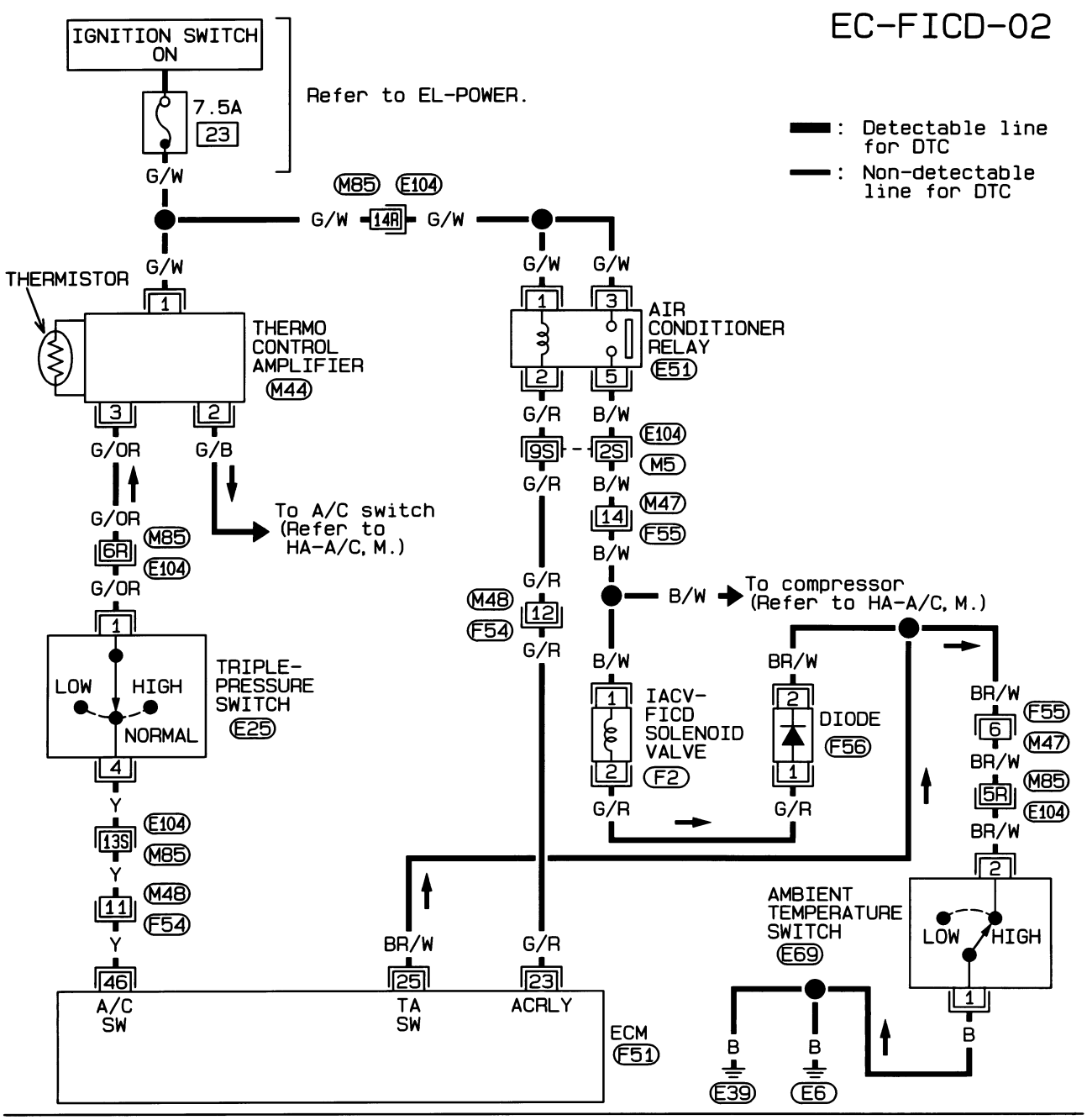
Refer to last page (Foldout page).

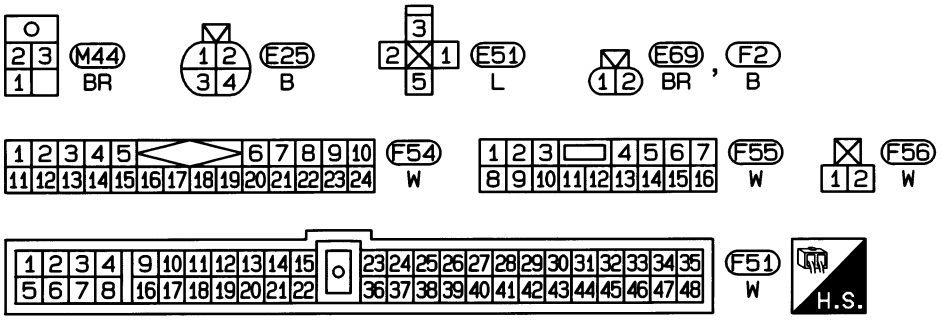
M5, E101

HEC682

IACV-FICD Solenoid Valve (Cont'd)

FOR RHD A/T MODELS





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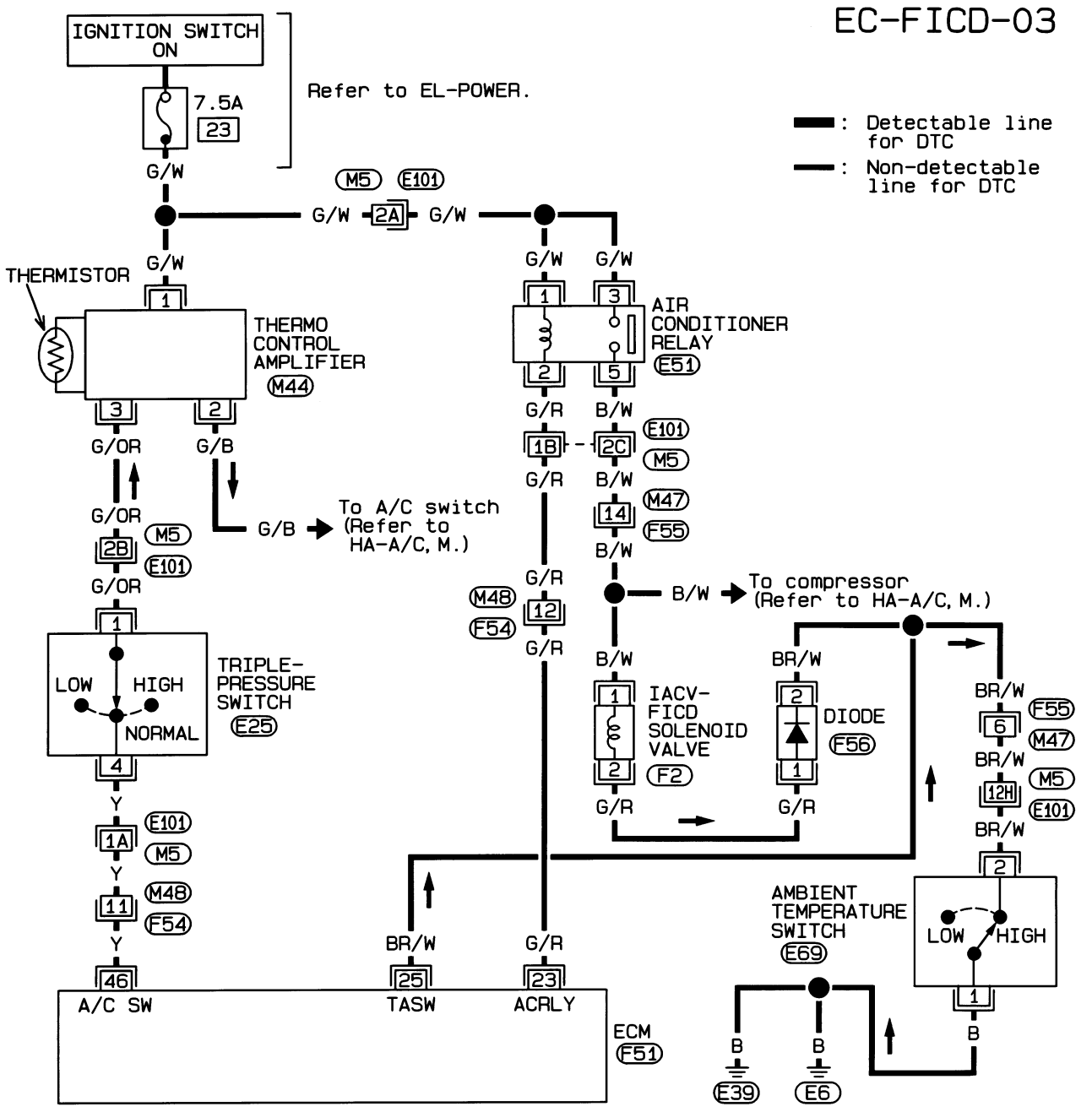
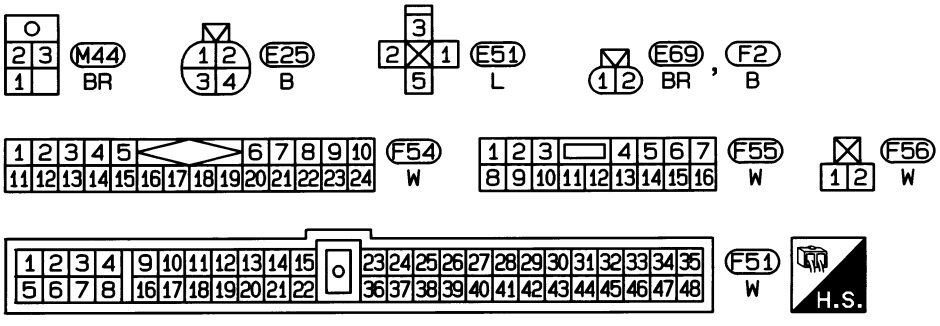
M85, E104

HEC683

IACV-FICD Solenoid Valve (Cont'd)

FOR RHD A/T MODELS





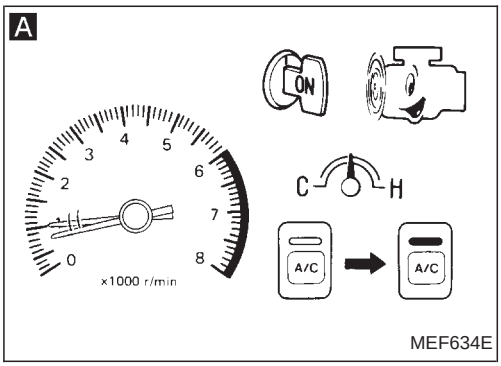
Refer to last page (Foldout page).

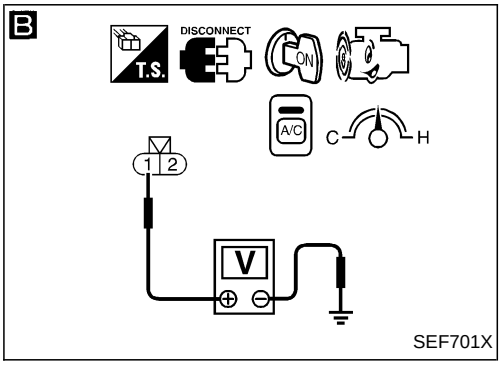
M5, E101

HEC684

IACV-FICD Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   700±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 HA section.

OK

B

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

NG → Check the following.
- Harness connectors, (E101), (M5)
- Harness connectors, (M47), (F55) (RHD models) (E104), (M5), (M85), (E104) (RHD A/T models)
- Harness for open or short between IACV-FICD solenoid valve and air conditioner relay

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ambient air temperature switch harness connector, and ECM connector.
3. Check harness continuity between ambient temperature switch harness connector terminal ① (for location of ambient air temperature switch, refer to HA section) and body ground, switch terminal ② and IACV-FICD solenoid terminal ② . (Including diode)
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

Check if ambient air temperature switch functions normally.

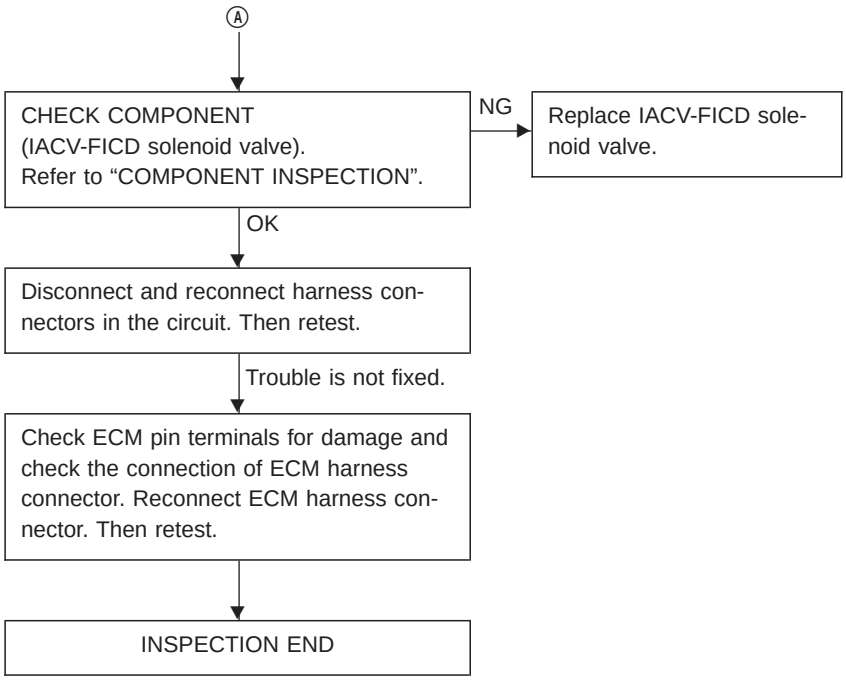
NG → Refer to HA section.

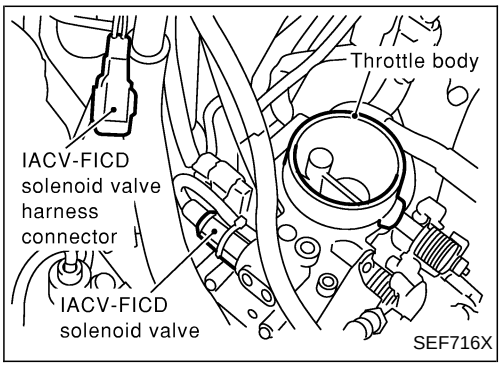
OK

Ⓐ

(Go to next page.)

IACV-FICD Solenoid Valve (Cont'd)



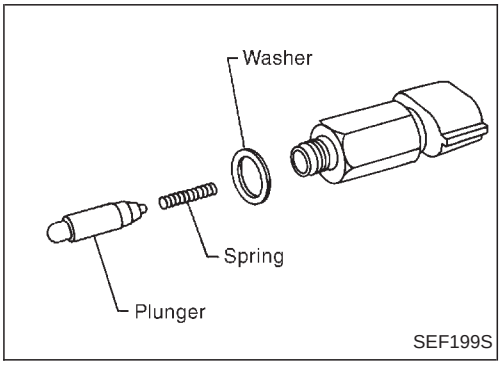


COMPONENT INSPECTION

IACV-FICD solenoid valve

Disconnect IACV-FICD solenoid valve harness connector.

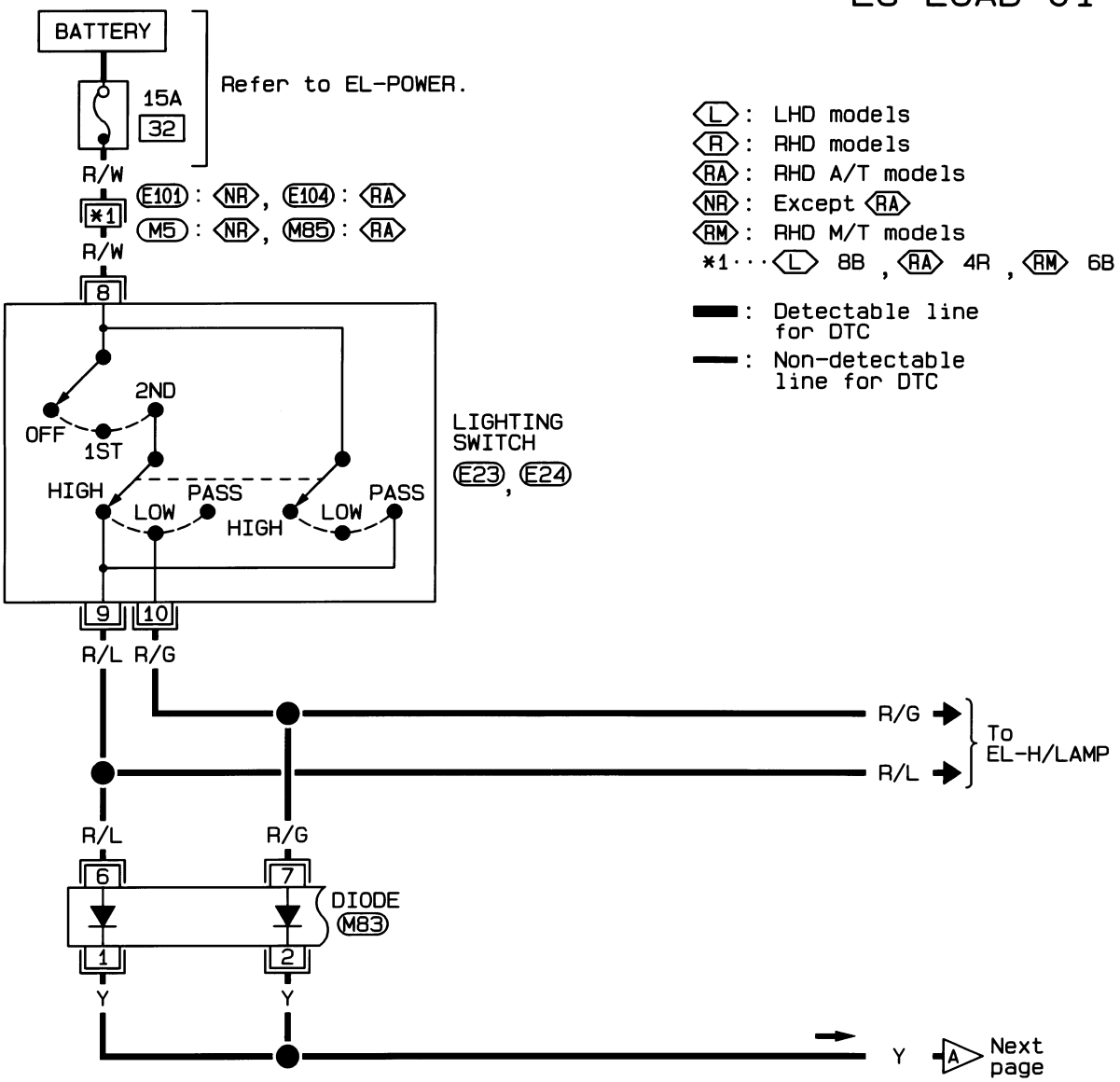
- Check for clicking sound when applying 12V direct current to terminals.

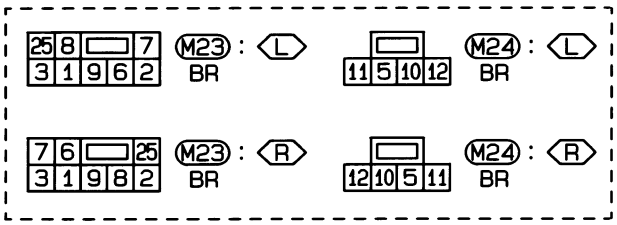


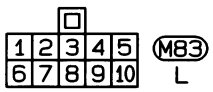
- Check plunger for seizing or sticking.
- Check for broken spring.

Electrical Load Signal

EC-LOAD-01







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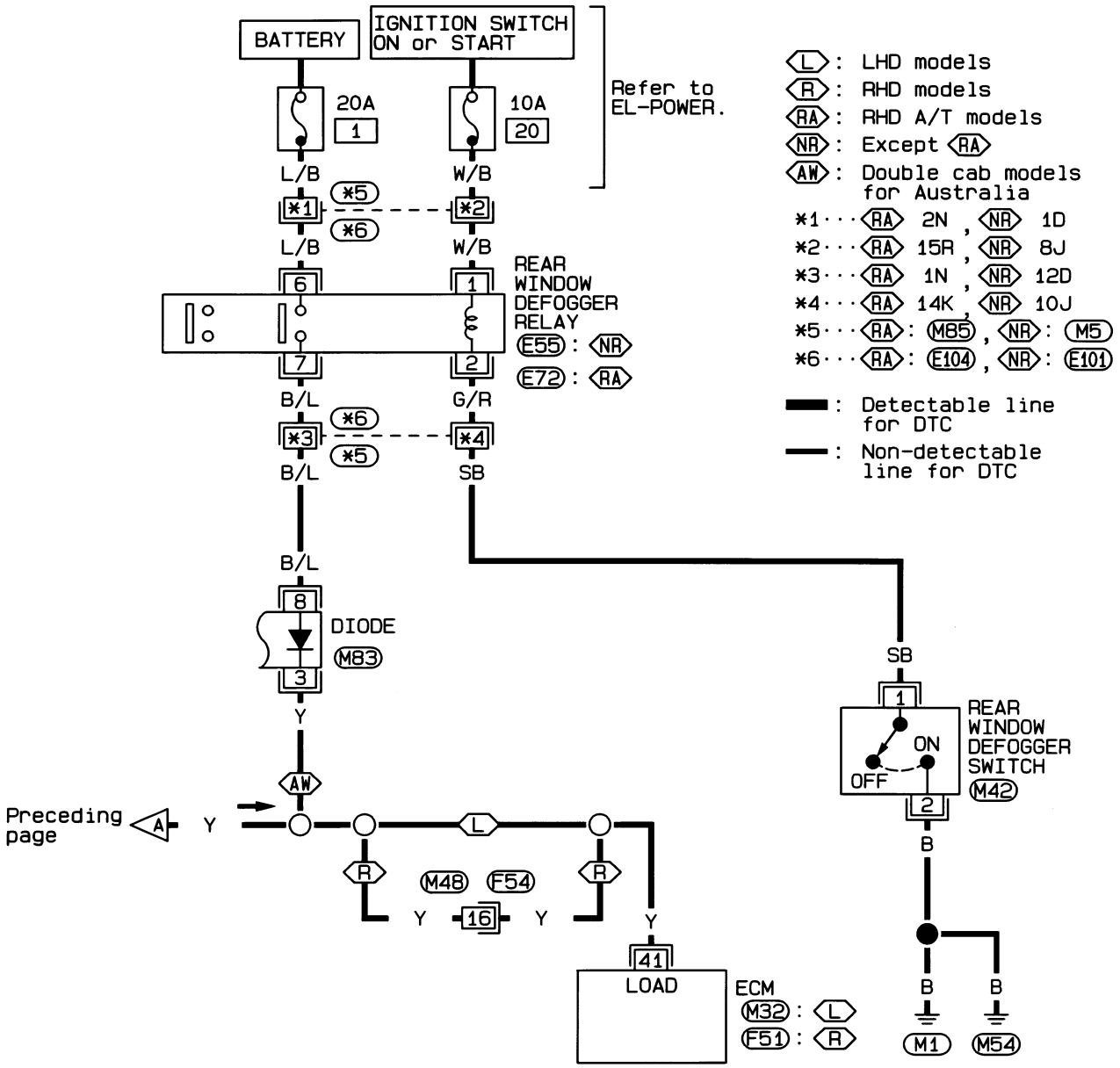
M5, E101

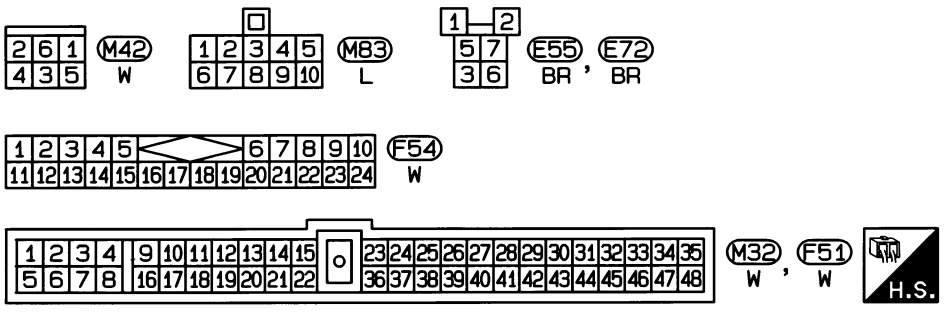
M85, E104

HEC685

Electrical Load Signal (Cont'd)

EC-LOAD-02





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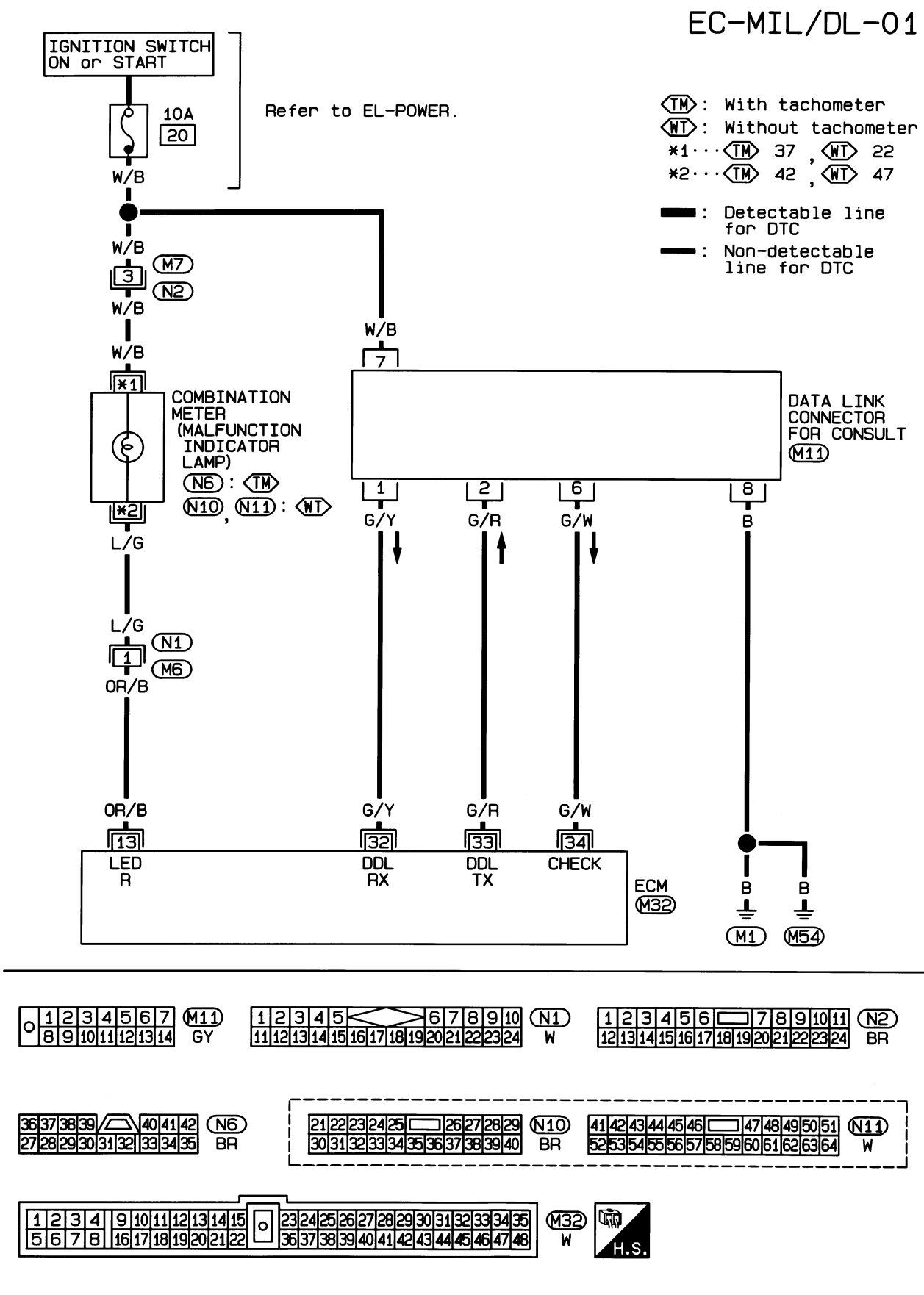
M5, E101

M85, E104

HEC686

MIL & Data Link Connectors

FOR LHD MODELS

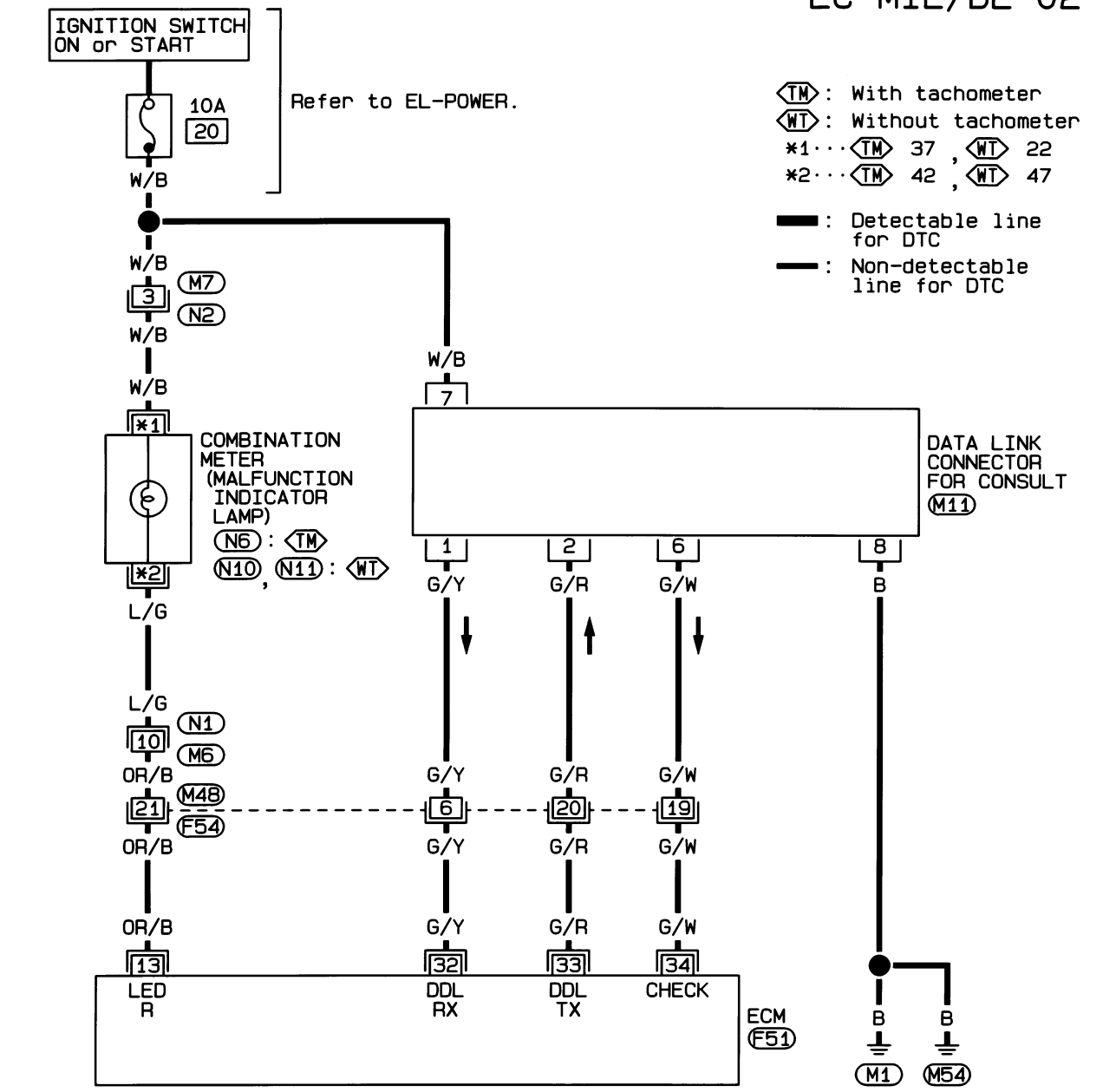


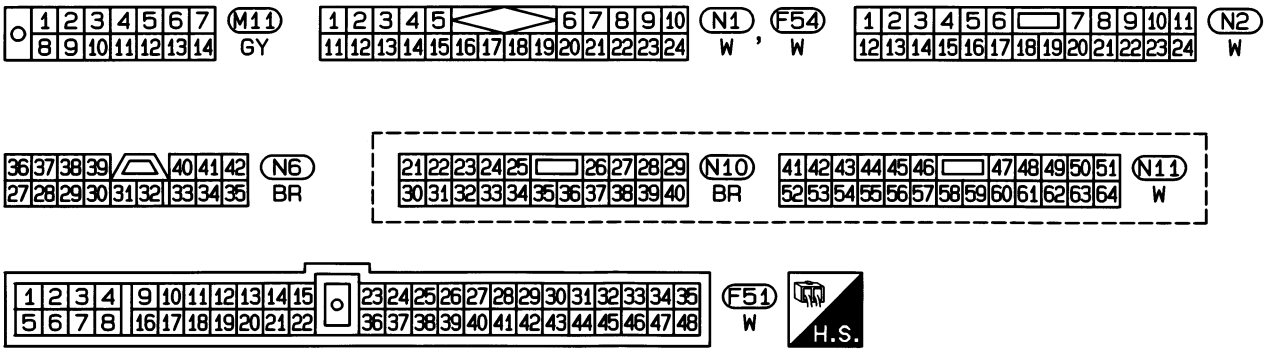
HEC687

MIL & Data Link Connectors (Cont'd)

FOR RHD MODELS

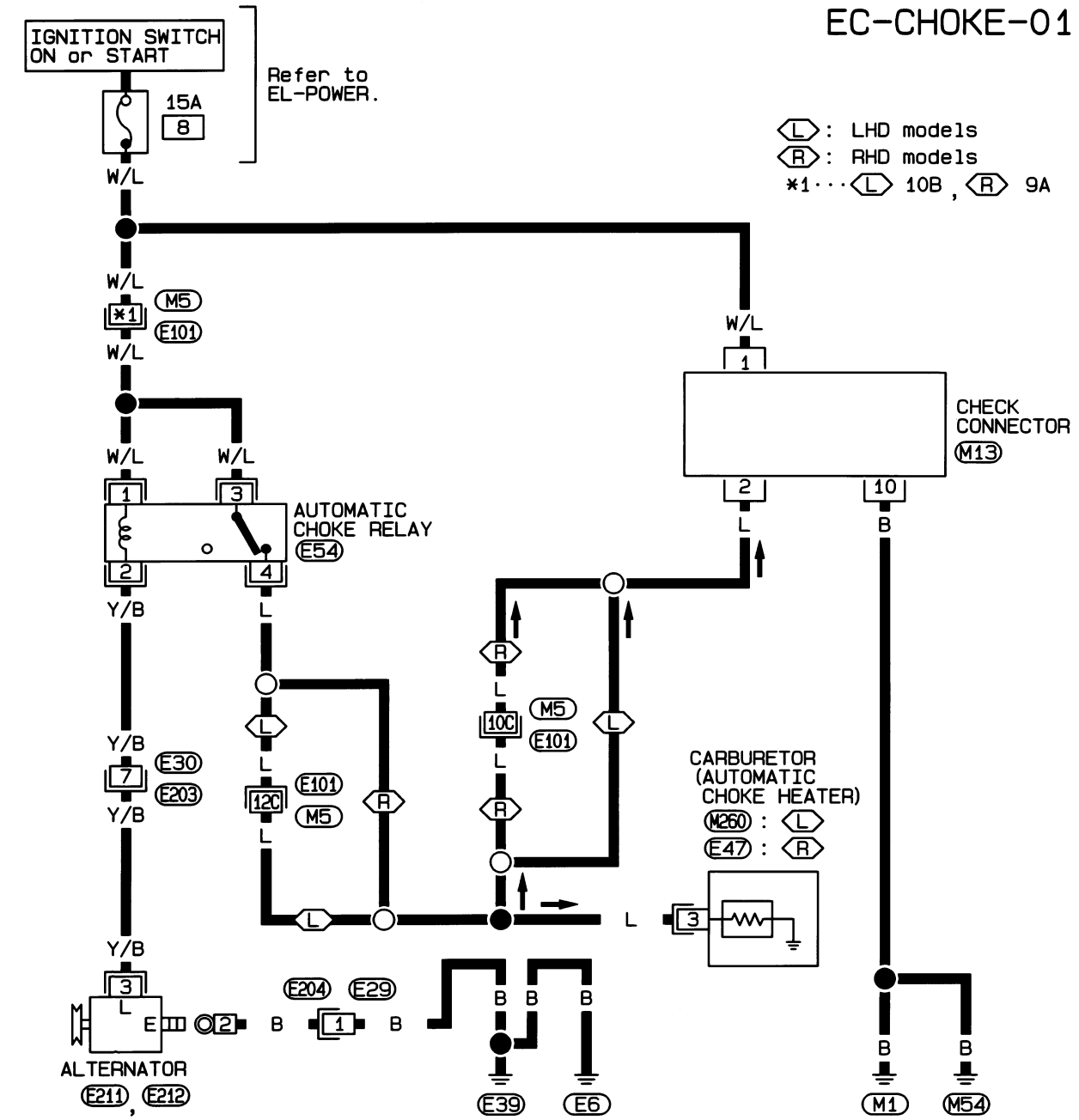
EC-MIL/DL-02

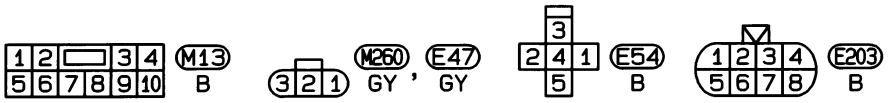


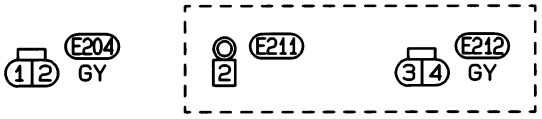


HEC688

Automatic Choke





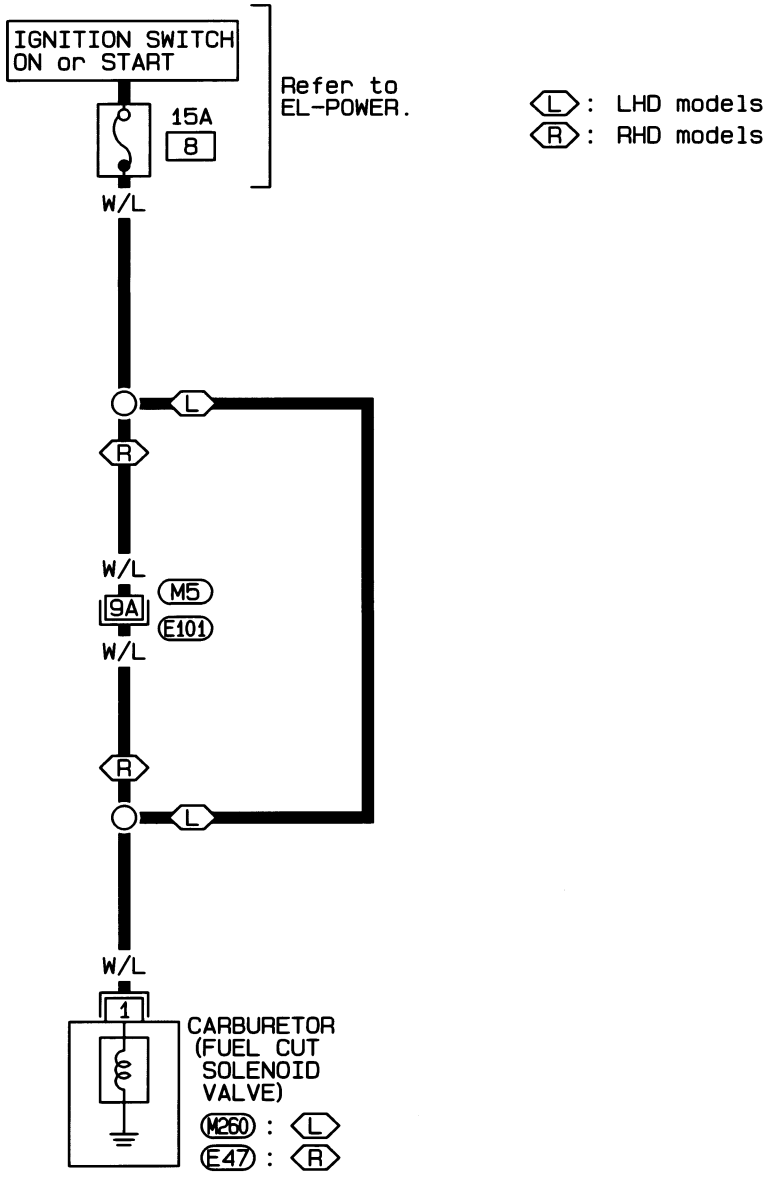


Refer to last page (Foldout page).
M5, E101

HEC648

Fuel Cut Control System

EC-FCUT-01



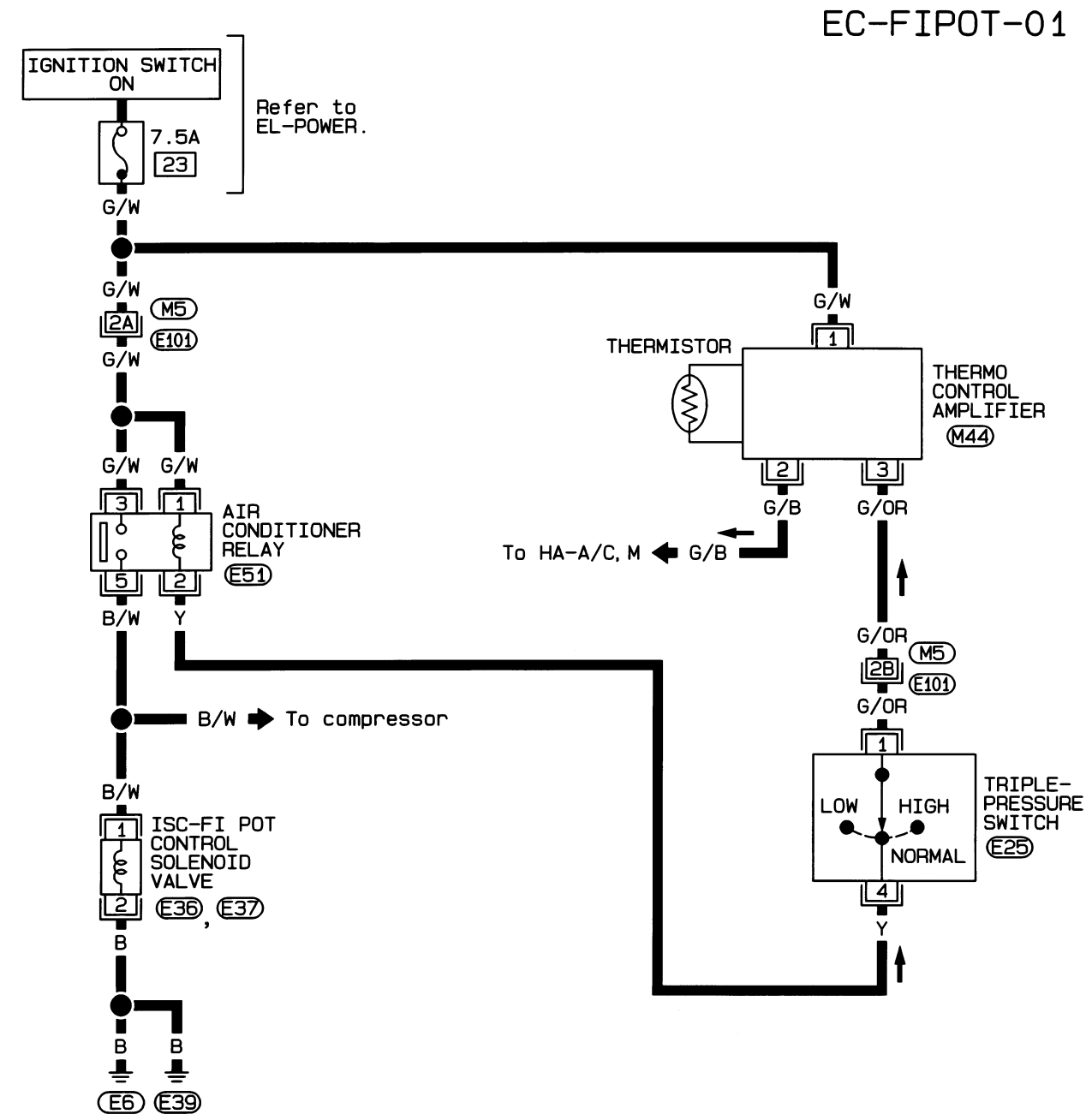
3 2 1 M260 GY, E47 GY

Refer to last page
(Foldout page).

M5, E101

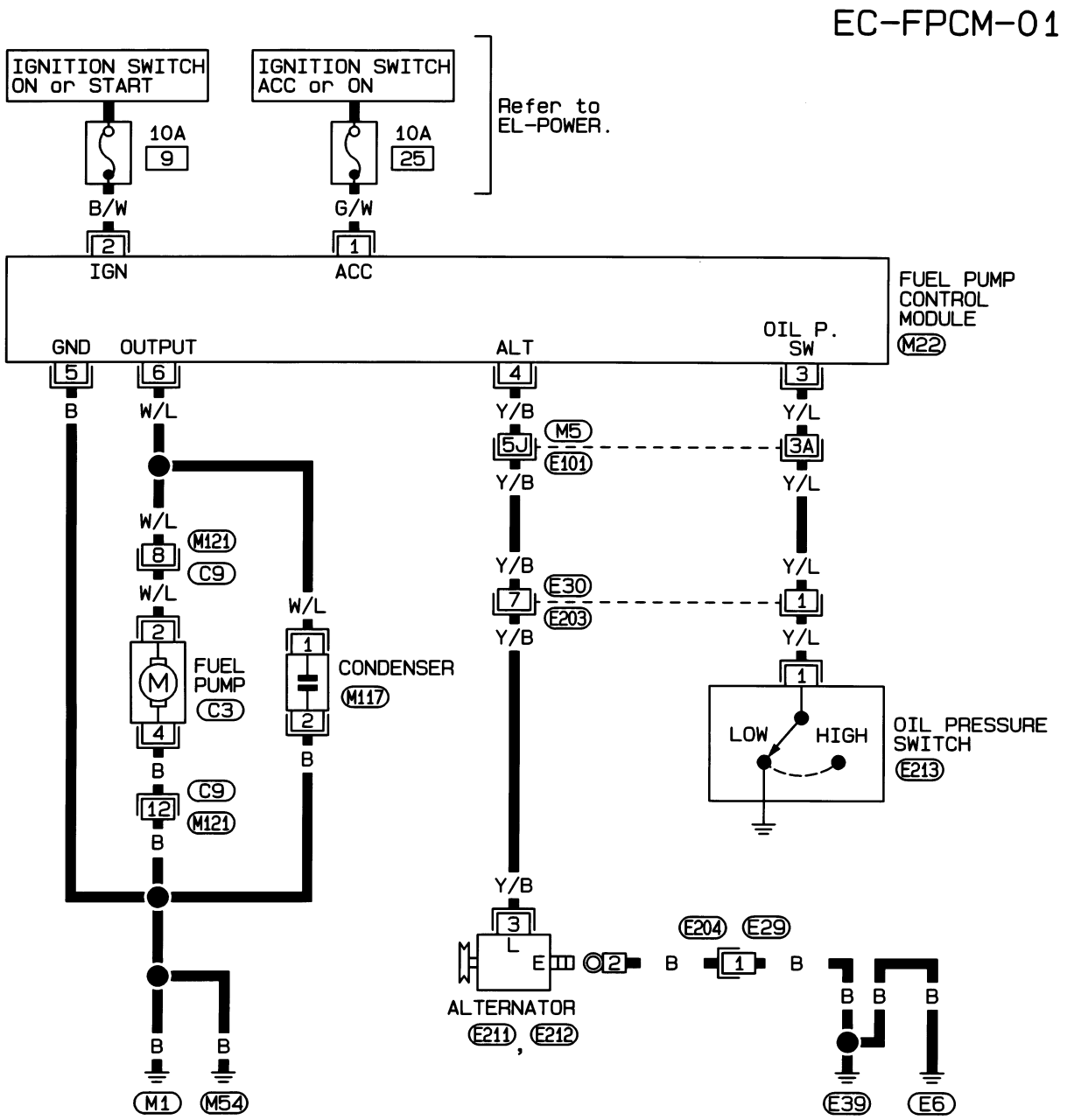
HEC649

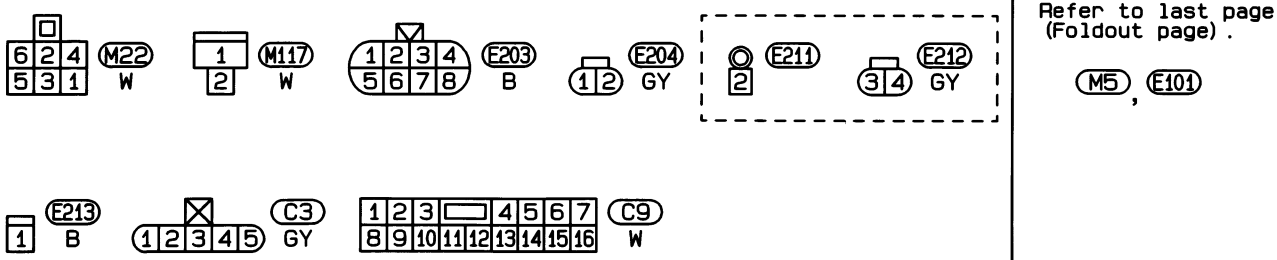
ISC-FI Pot



HEC650

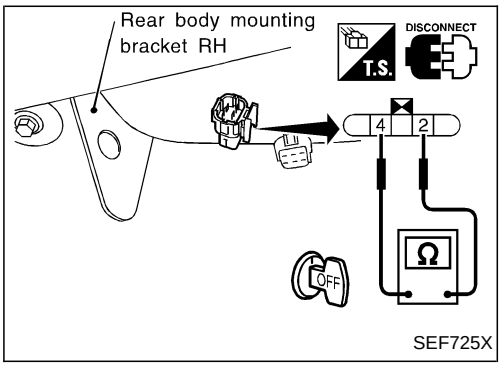
Wiring Diagram — FPCM —





Refer to last page (Foldout page).
M5, E101

HEC652



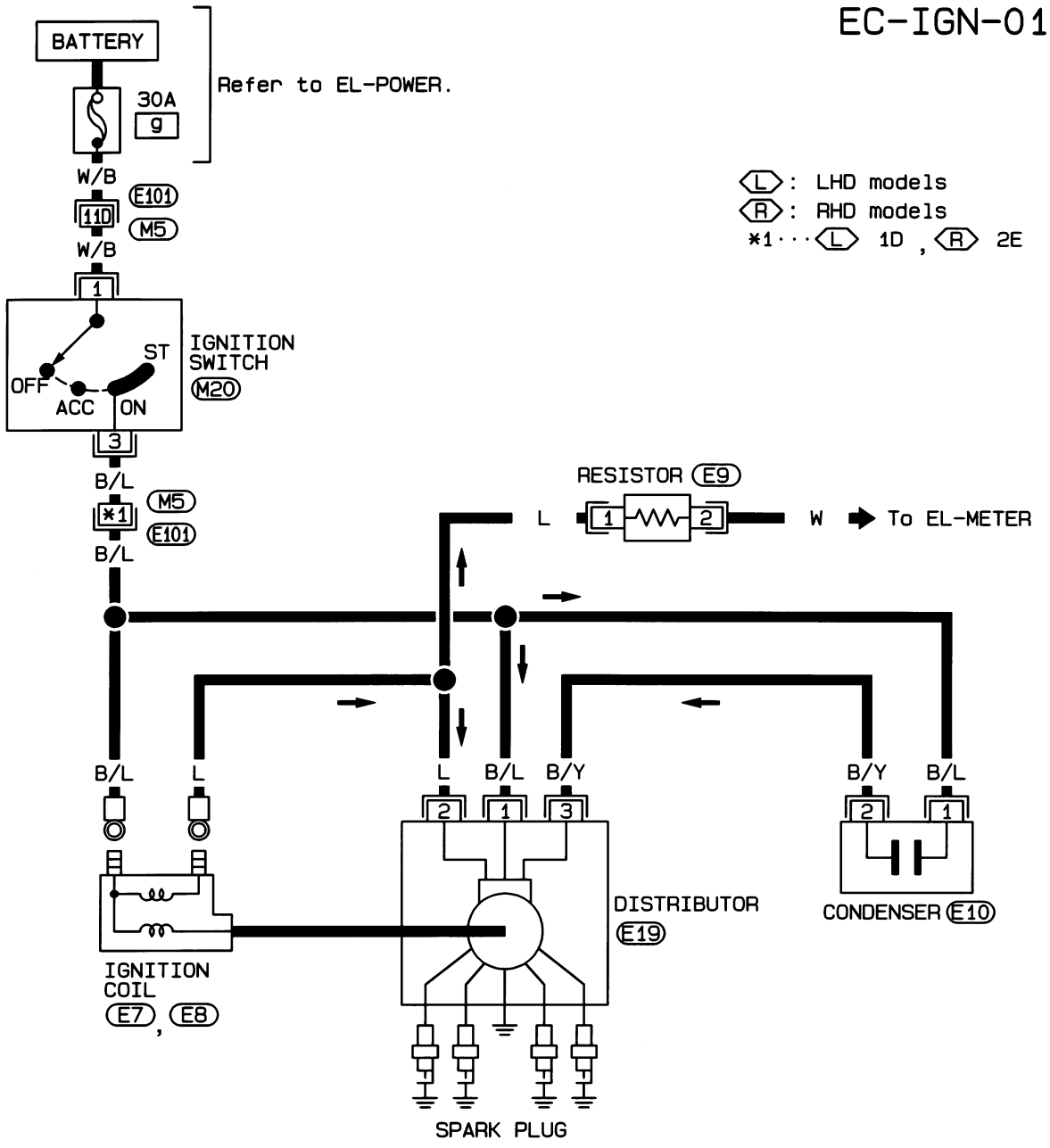
Inspection

FUEL PUMP

1) Make sure that ignition switch is “OFF”.
2) Disconnect fuel pump harness connector.
3) Check resistance between fuel pump connector terminals ② and ④ .

Resistance: Approximately 0.2 - 5Ω

Wiring Diagram — IGN —



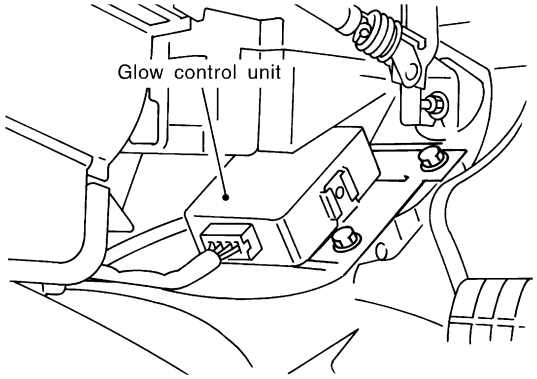
Refer to last page (Foldout page).
M5 , E101

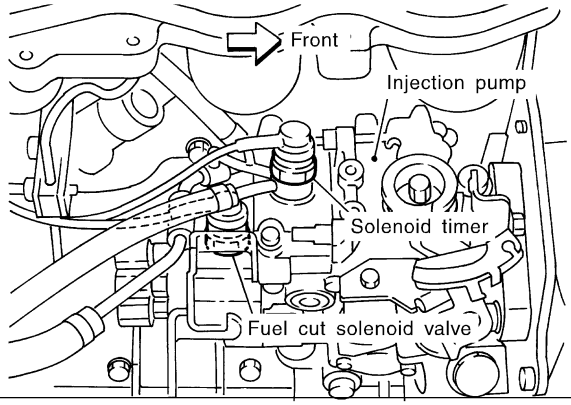
HEC651

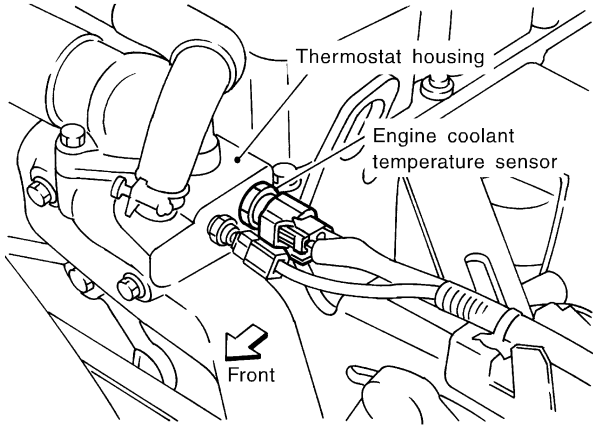
Component Parts Location

TD27 AND QD32 ENGINES

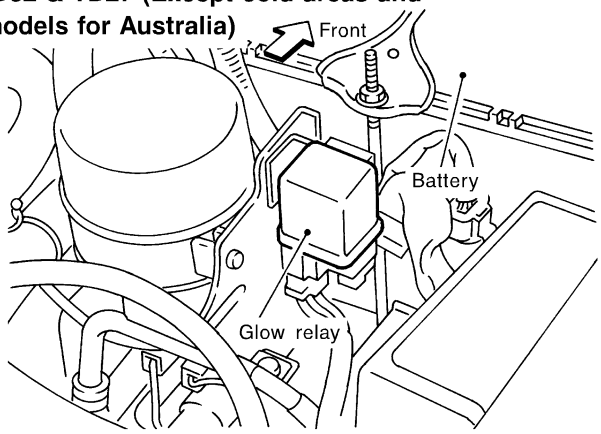
Under instrument panel



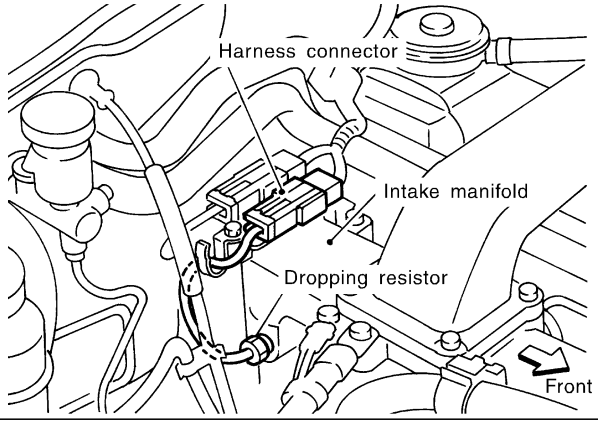




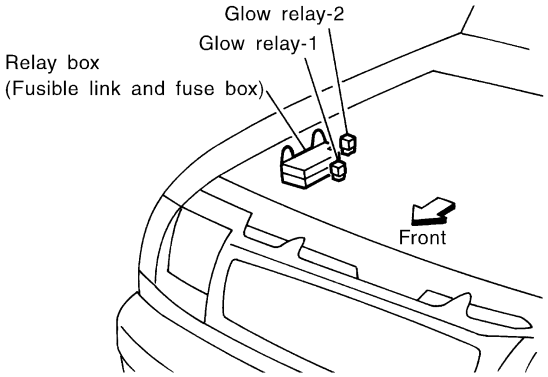
QD32 & TD27 (Except cold areas and models for Australia)



TD27 (For cold areas and models for Australia)



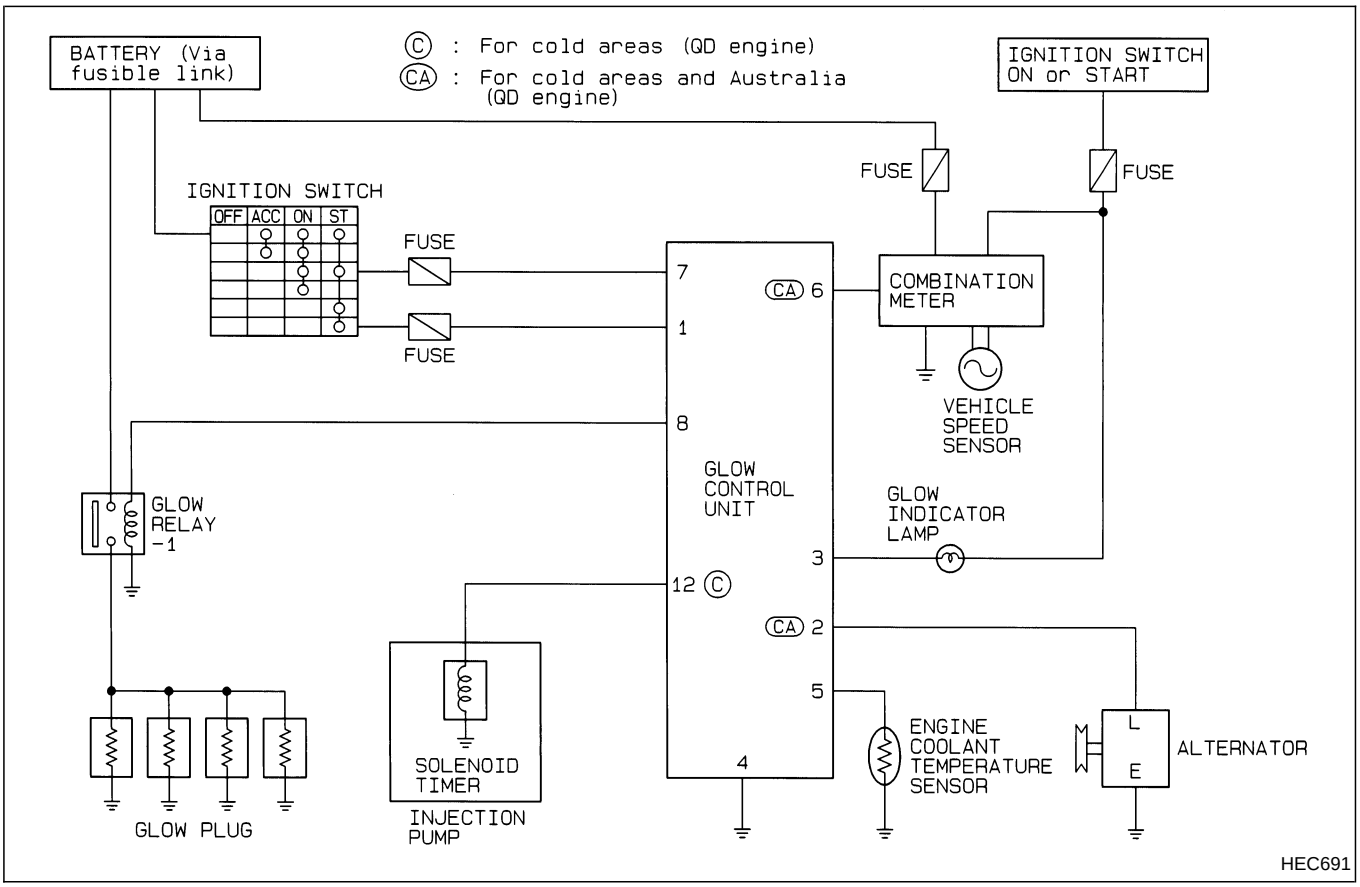
TD27 (For cold areas and models for Australia)



DEF030-B

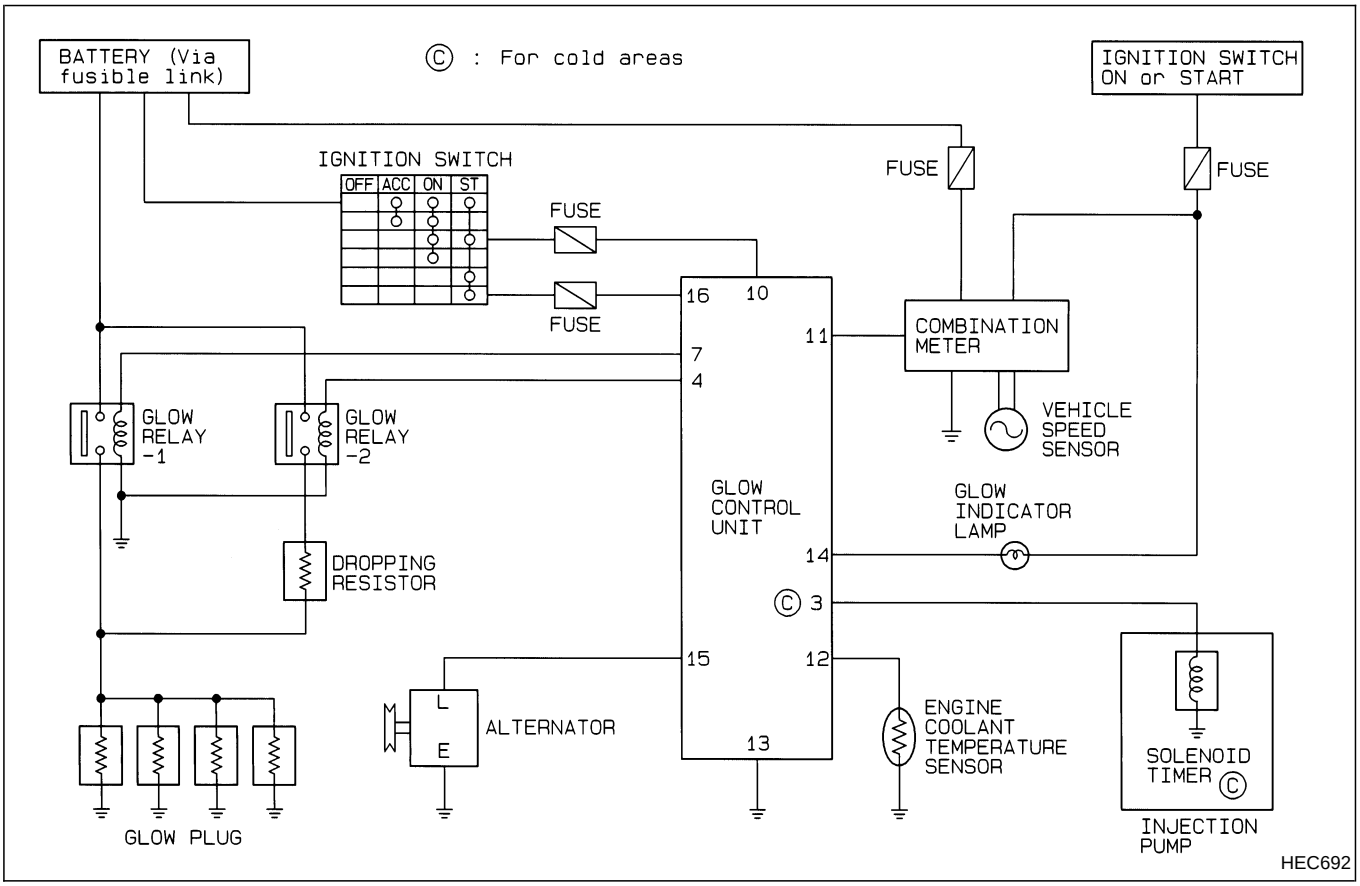
Circuit Diagram

TD27 (EXCEPT FOR COLD AREAS AND MODELS FOR AUSTRALIA) AND QD32 ENGINES



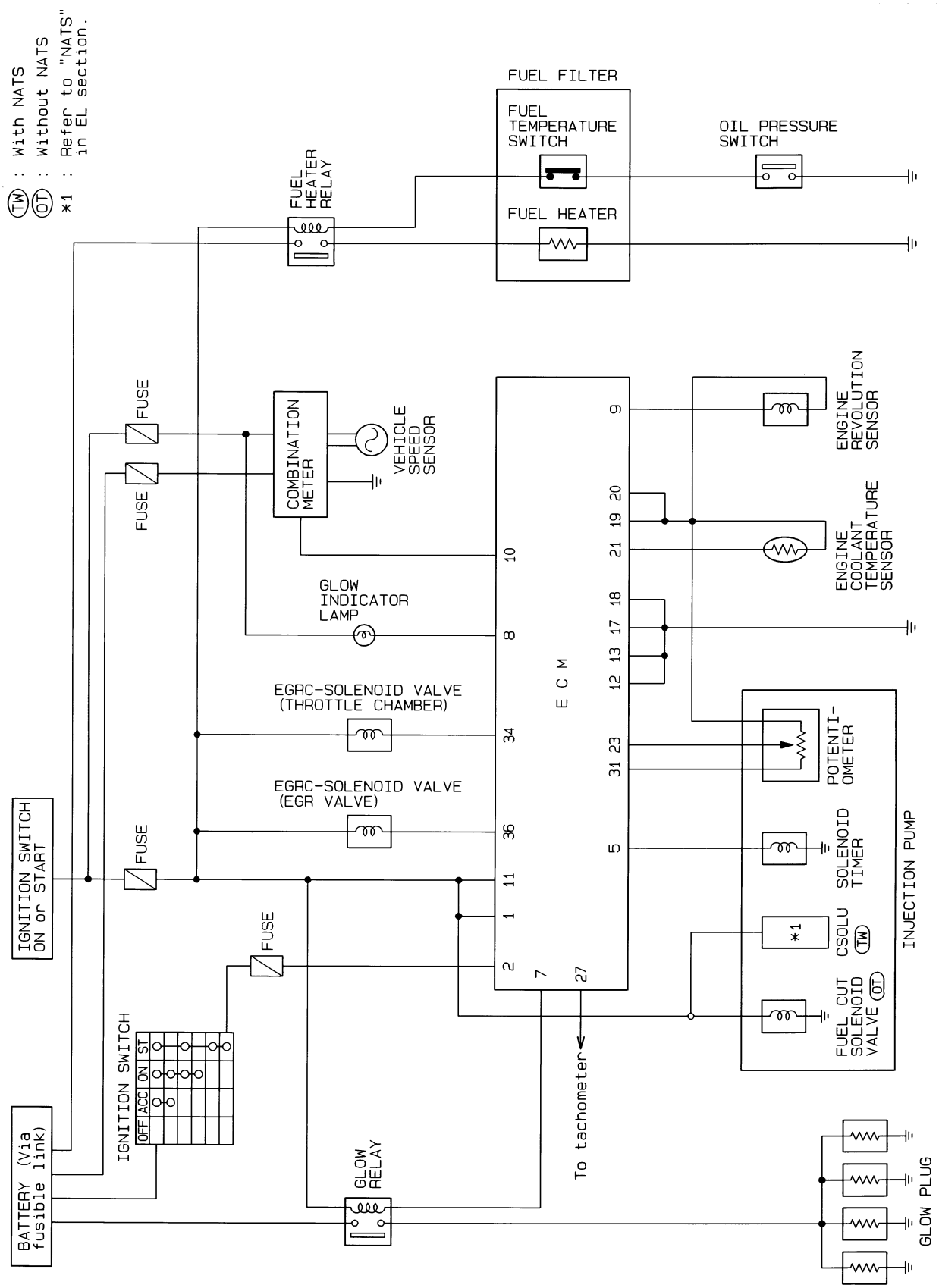
Circuit Diagram (Cont'd)

TD27 ENGINE FOR COLD AREAS AND AUSTRALIA



Circuit Diagram (Cont'd)

TD25 AND TD25Ti ENGINES

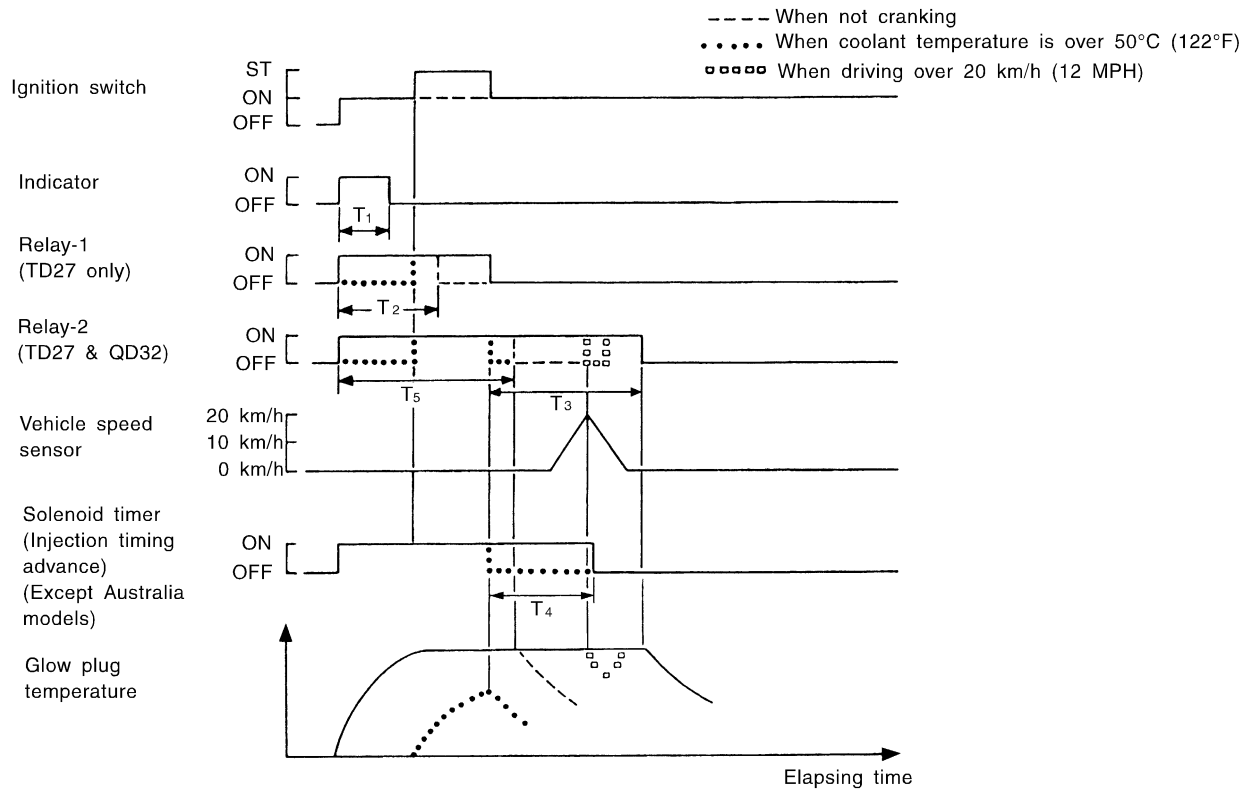


HEC693

Description

TD27 AND QD32 ENGINES

For cold areas and Australia



SEL983ND

When coolant temperature is lower than 50°C (122°F), the relay-1 and the relay-2 are turned on at the same time that the ignition switch is turned on. From this time, the electric current flows through the glow plugs and heats them up quickly. After T_1 seconds have passed, the control unit turns off the indicator. The relay-1 automatically turns off after it has been on for T_2 seconds or the cranking time, whichever is longer.
The solenoid timer (for advance injection timing) is turned on at the time that the ignition switch is turned to "ON". The relay-2 remains on for T_3 seconds and the solenoid timer remains on for T_4 seconds after the ignition switch has returned to "ON" from "START". The solenoid timer advances injection timing. These features improve the combustion performance of the engine after it has started.
When the coolant temperature is higher than 50°C (122°F), the relay-2 is turned on only during engine cranking for TD27 engine.
When the coolant temperature is higher than 10°C (50°F), the solenoid timer is turned on only during engine cranking.

T_1: approx. 2 - 6	[sec.]	(Varies with coolant temperature.)
T_2: approx. 4 - 8	[sec.]	(Varies with coolant temperature.)
T_3: 600	[sec.]	[When coolant temperature is below 50°C (122°F).]
0	[sec.]	[When coolant temperature is over 50°C (122°F).]
T_4, T_5*1: 30	[sec.]	[When coolant temperature is below 10°C (50°F).]
0	[sec.]	[When coolant temperature is over 10°C (50°F).]
T_5*2: 30	[sec.]	[When coolant temperature is below 50°C (122°F).]
5	[sec.]	[When coolant temperature is over 50°C (122°F).]

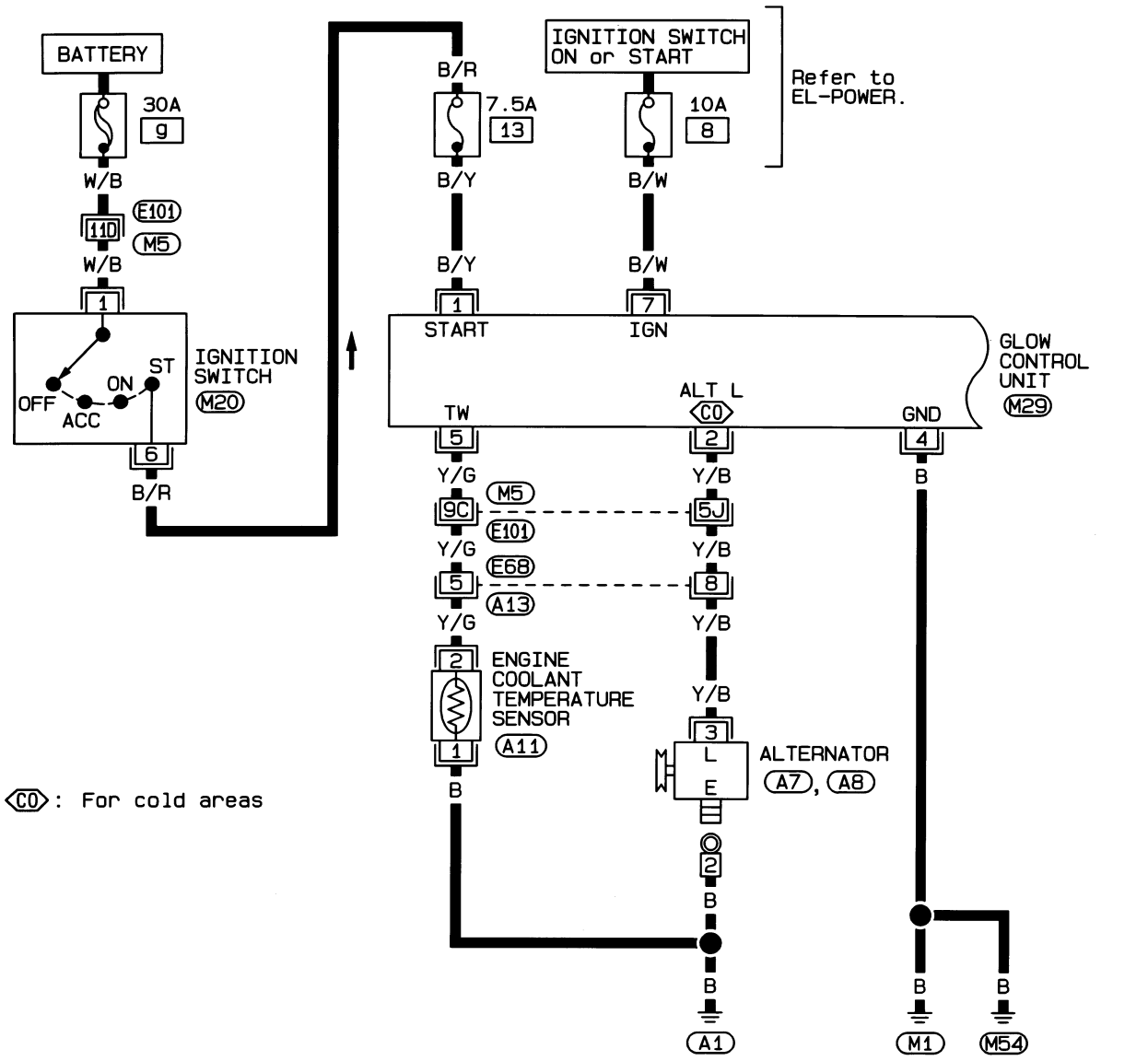
*1: For TD27 *2: For QD32

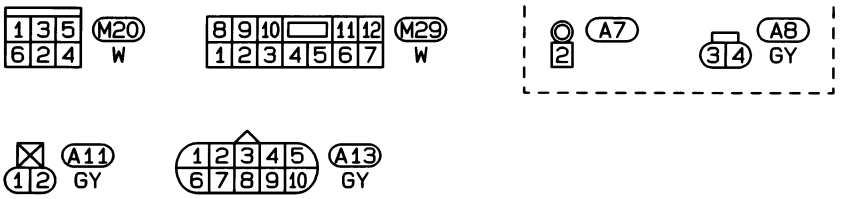
- When the ignition switch is repeatedly turned "ON" and "OFF", T_2 becomes shorter.

Wiring Diagram

LHD MODELS WITH TD27 EXCEPT COLD AREAS AND QD32 ENGINES

EC-GLOW-01





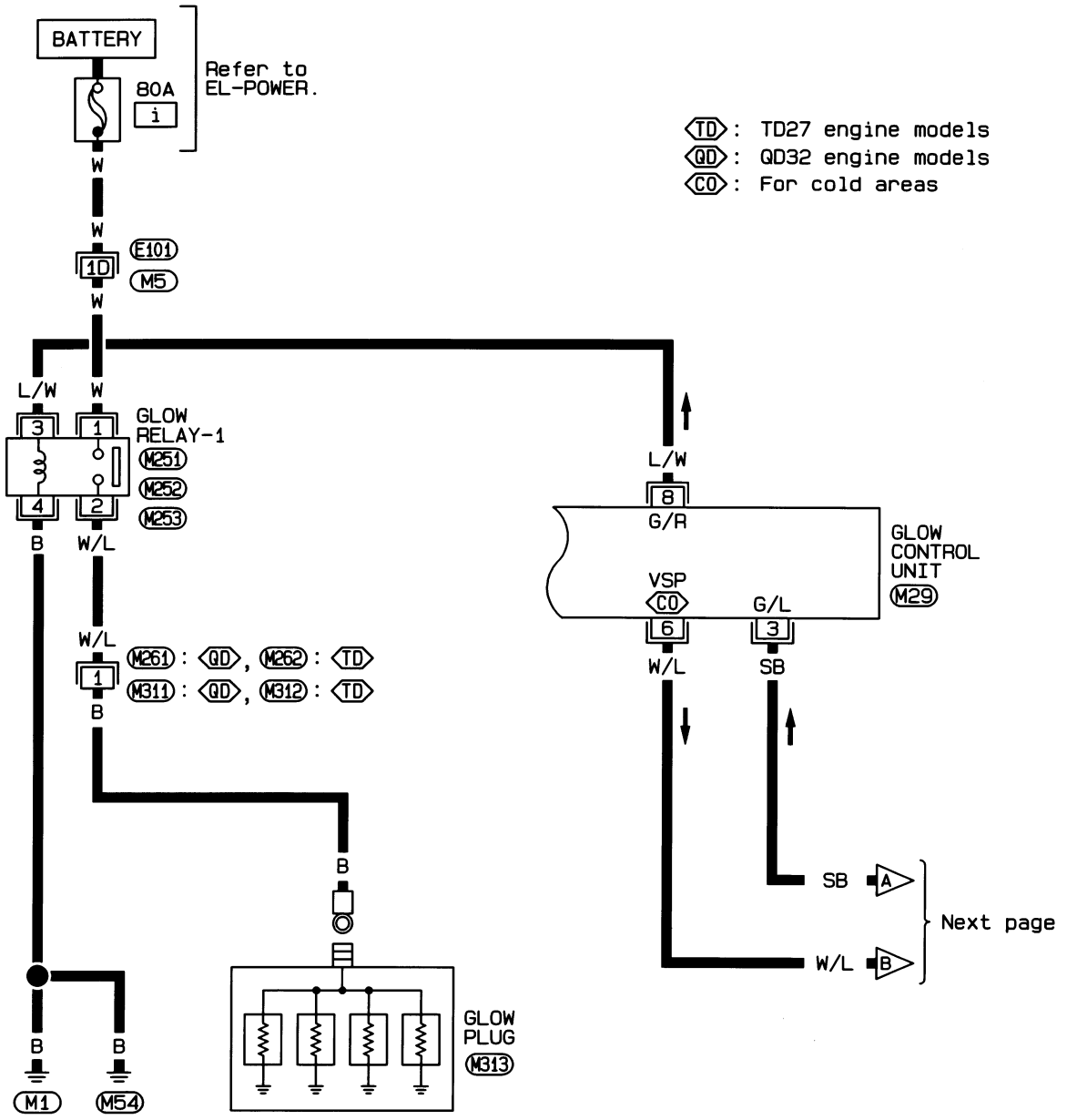
Refer to last page (Foldout page).

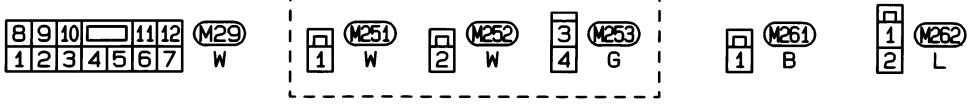
M5, E101

HEC694

Wiring Diagram (Cont'd)

EC-GLOW-02





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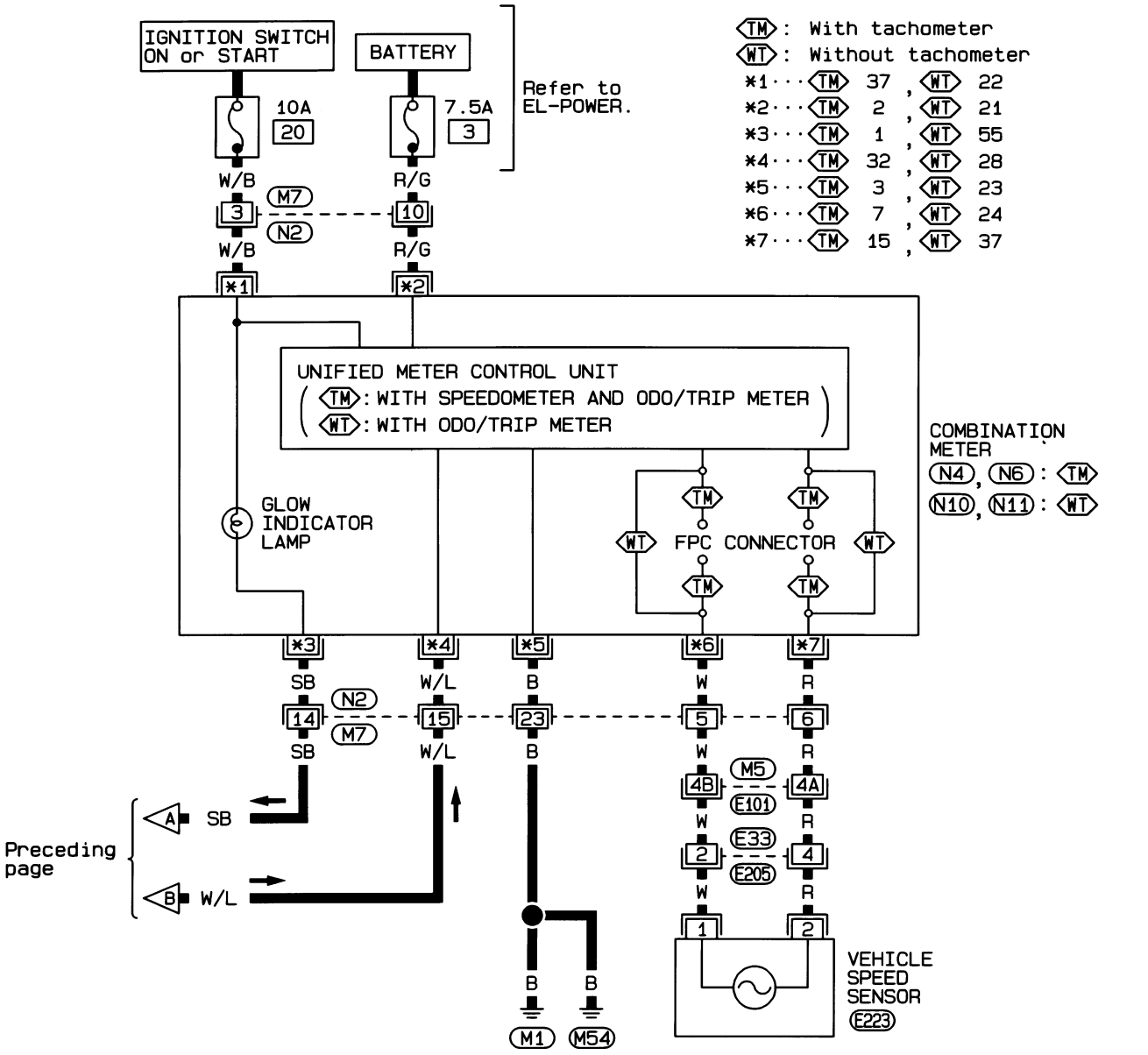
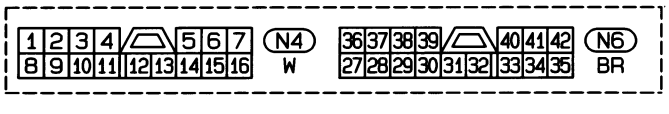
M5, E101

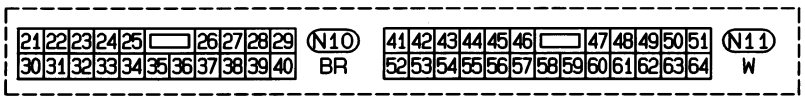
HEC695

Wiring Diagram (Cont'd)

EC-GLOW-03







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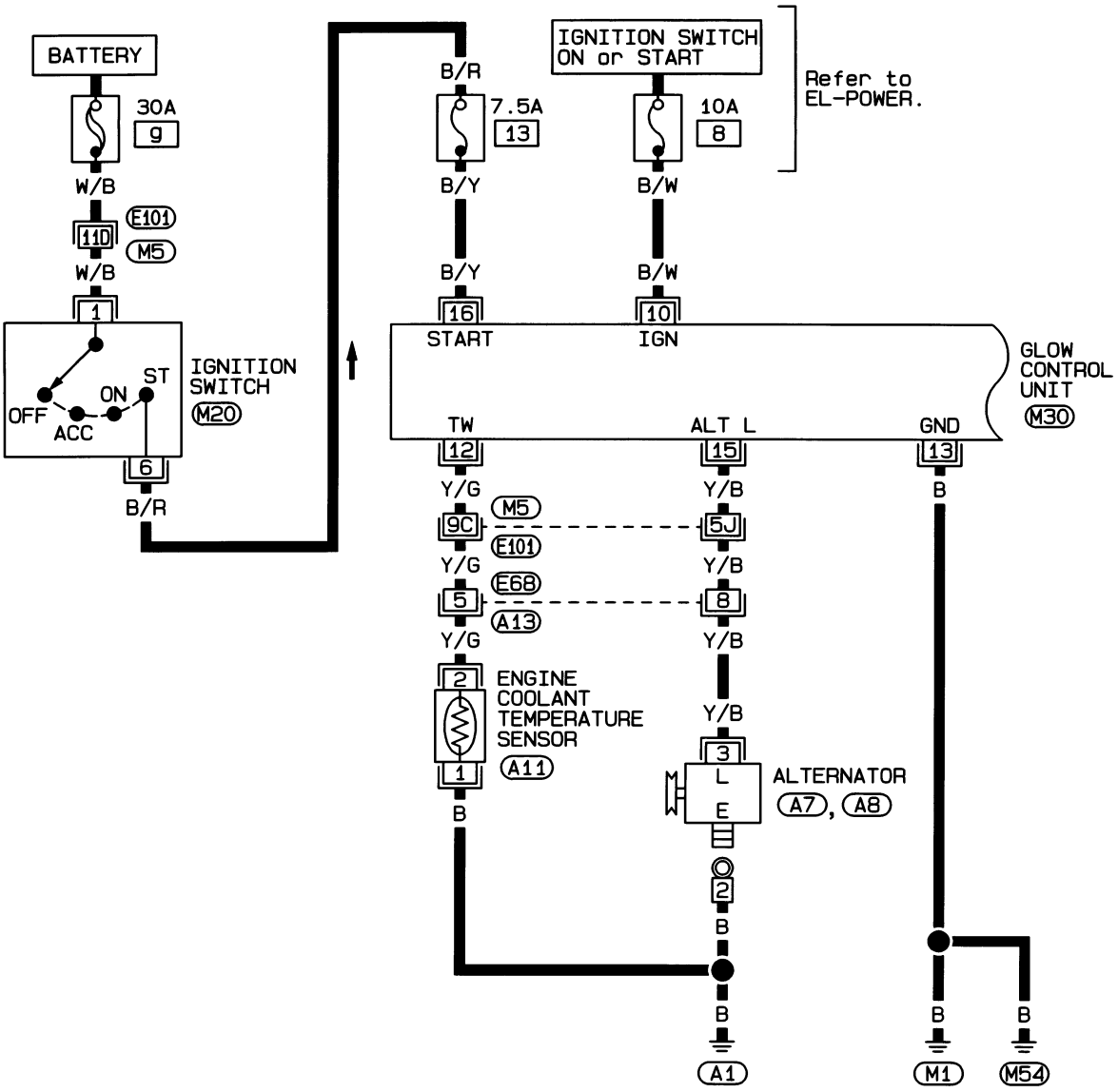
M5, E101

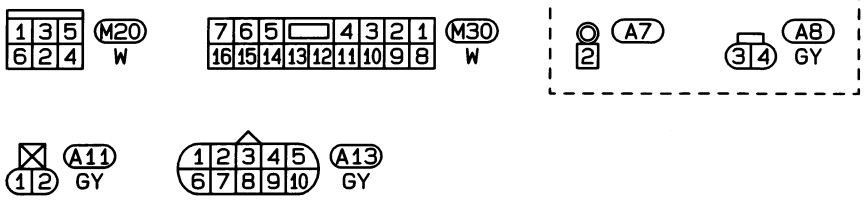
HEC696

Wiring Diagram (Cont'd)

LHD MODELS WITH TD27 ENGINE FOR COLD AREAS

EC-GLOW-04





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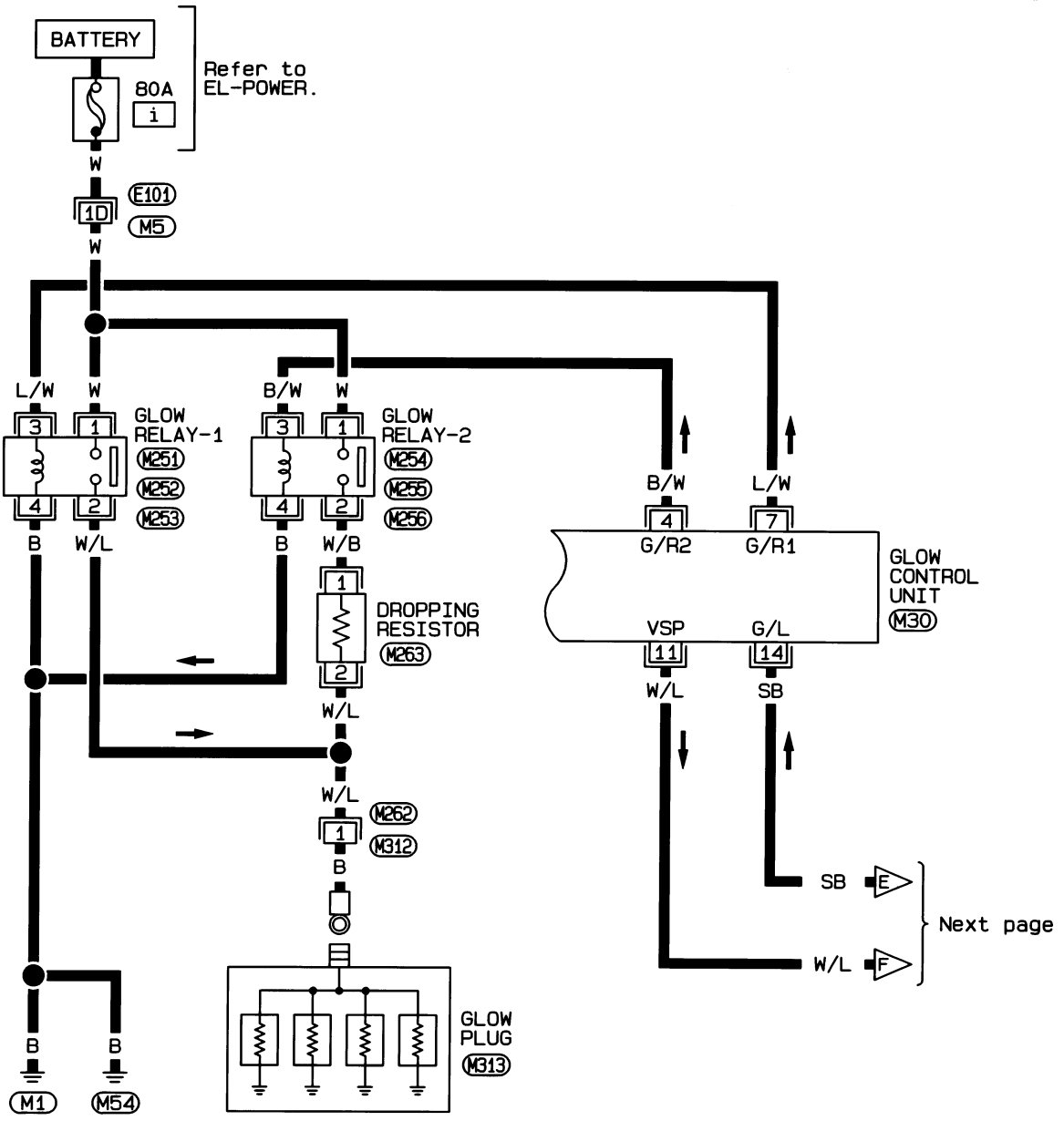
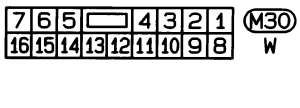
M5, E101

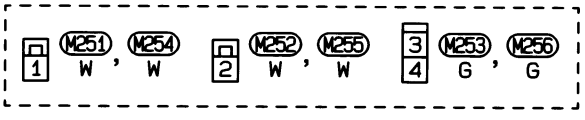
HEC700

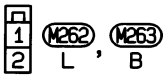
Wiring Diagram (Cont'd)

EC-GLOW-05









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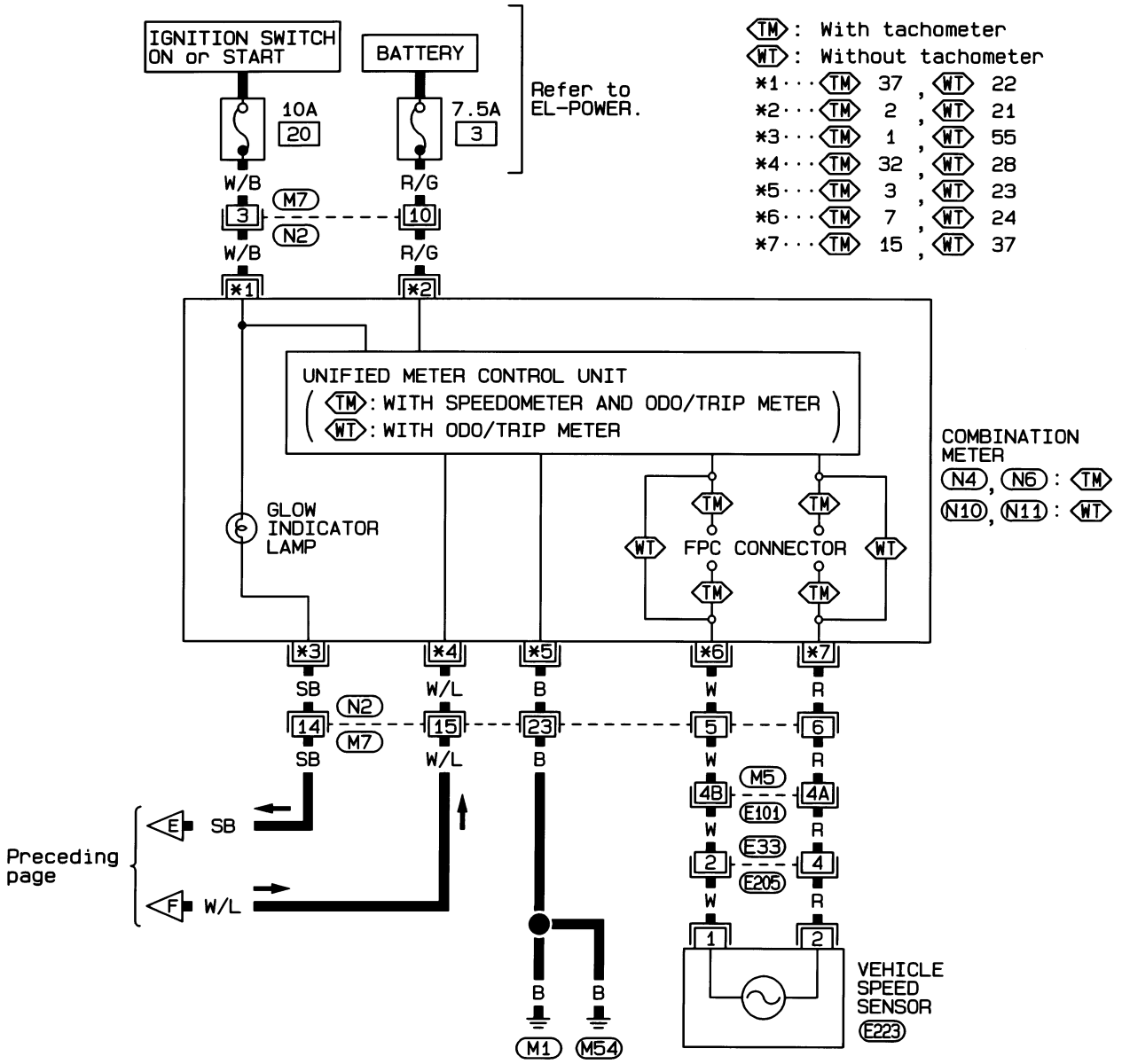
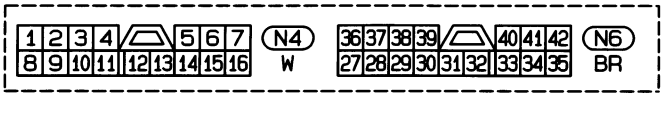
M5, E101

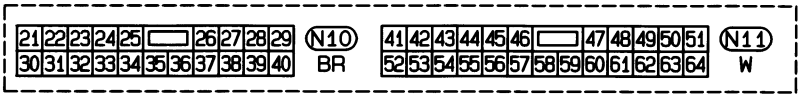
HEC701

Wiring Diagram (Cont'd)

EC-GLOW-06







Refer to last page (Foldout page).

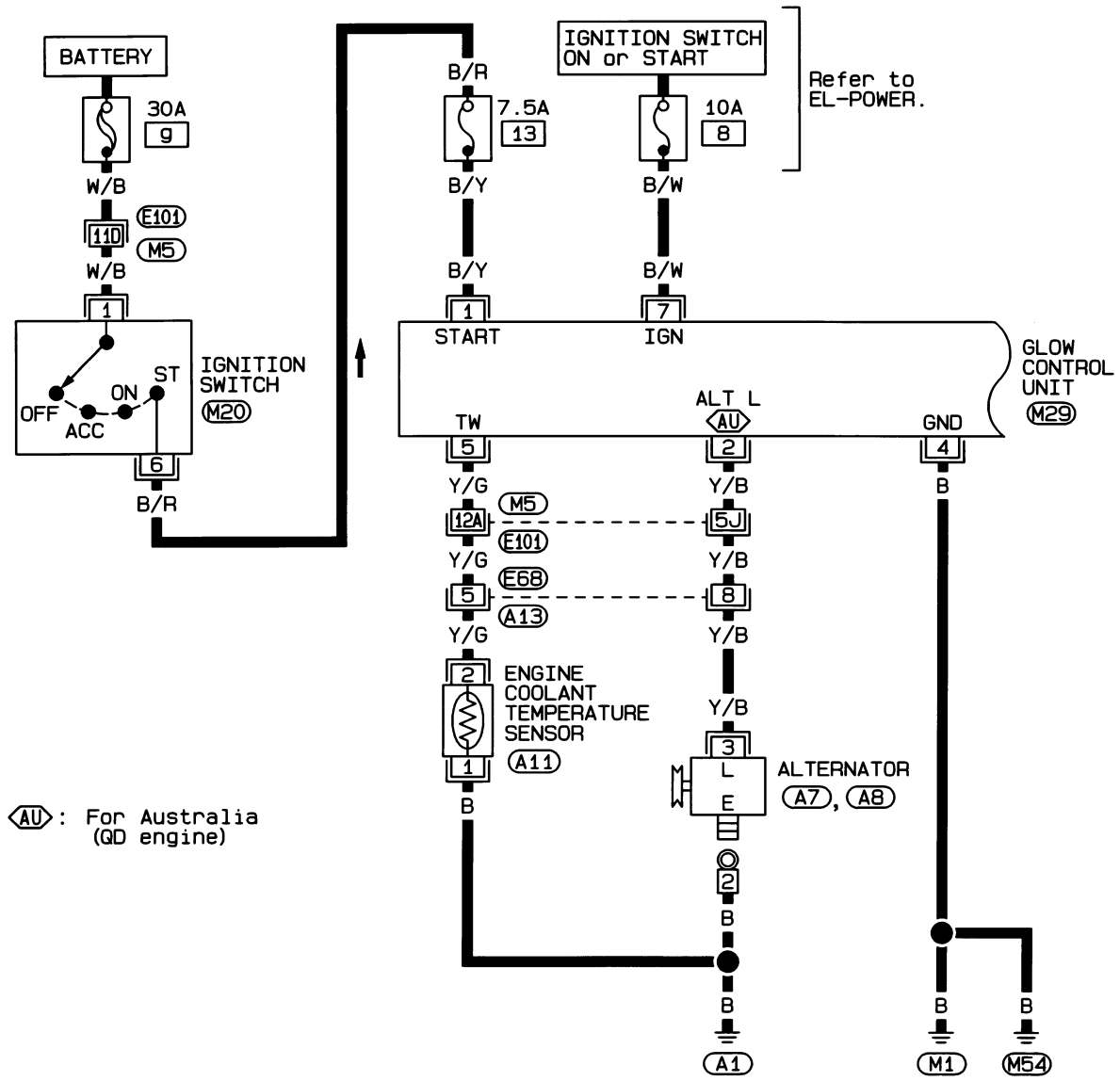
M5, E101

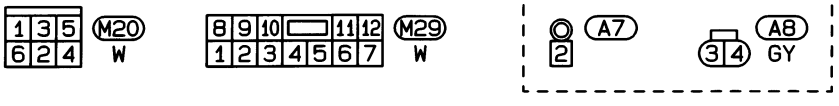
HEC702

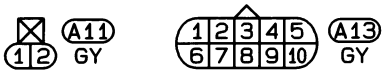
Wiring Diagram (Cont'd)

RHD MODELS WITH TD27 EXCEPT AUSTRALIA AND QD32 ENGINES

EC-GLOW-07







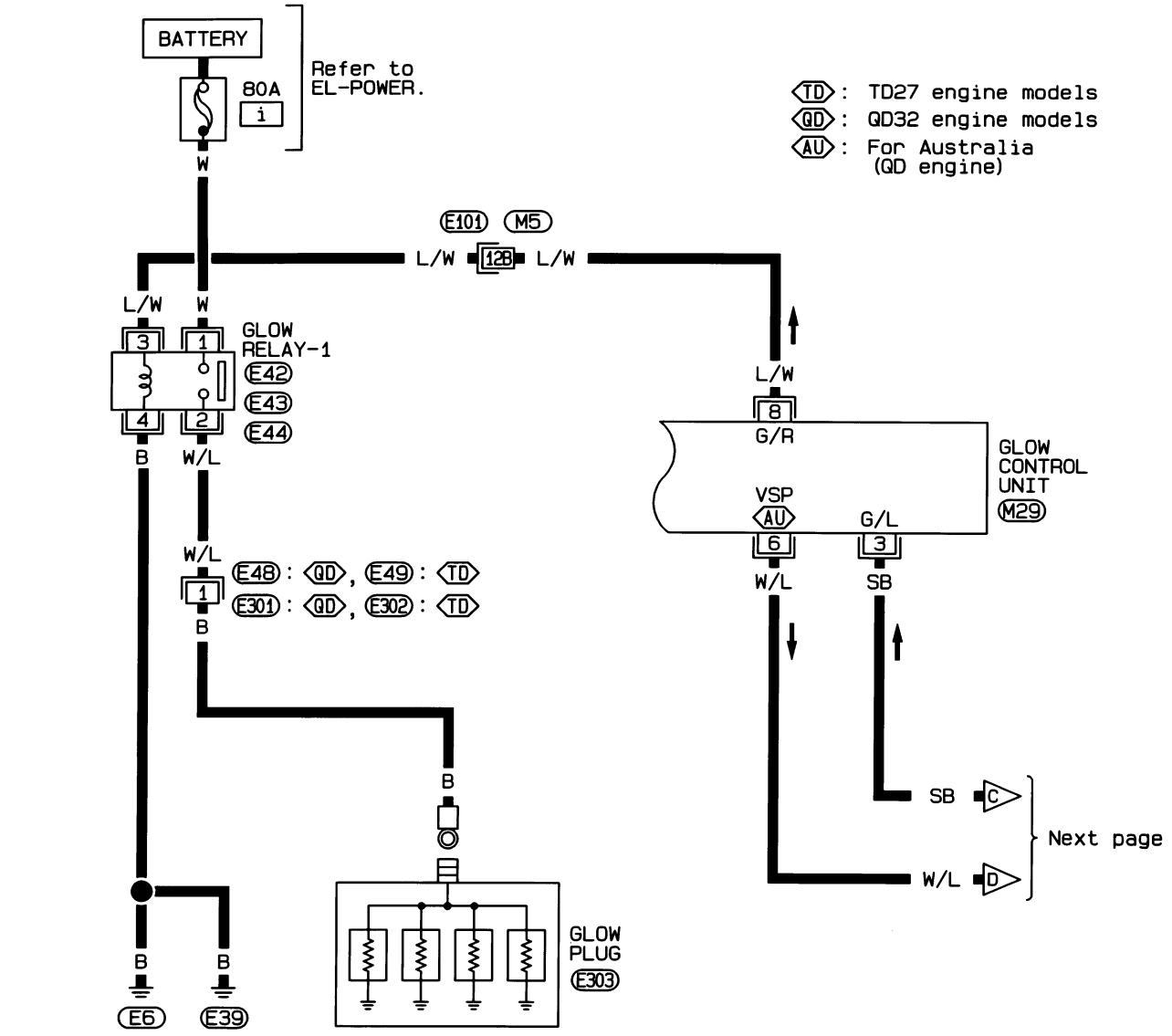
Refer to last page (Foldout page).

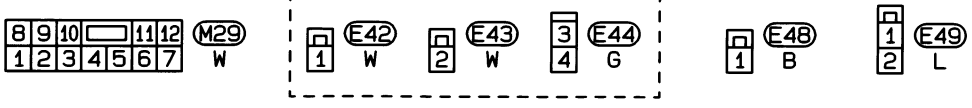
M5, E101

HEC697

Wiring Diagram (Cont'd)

EC-GLOW-08





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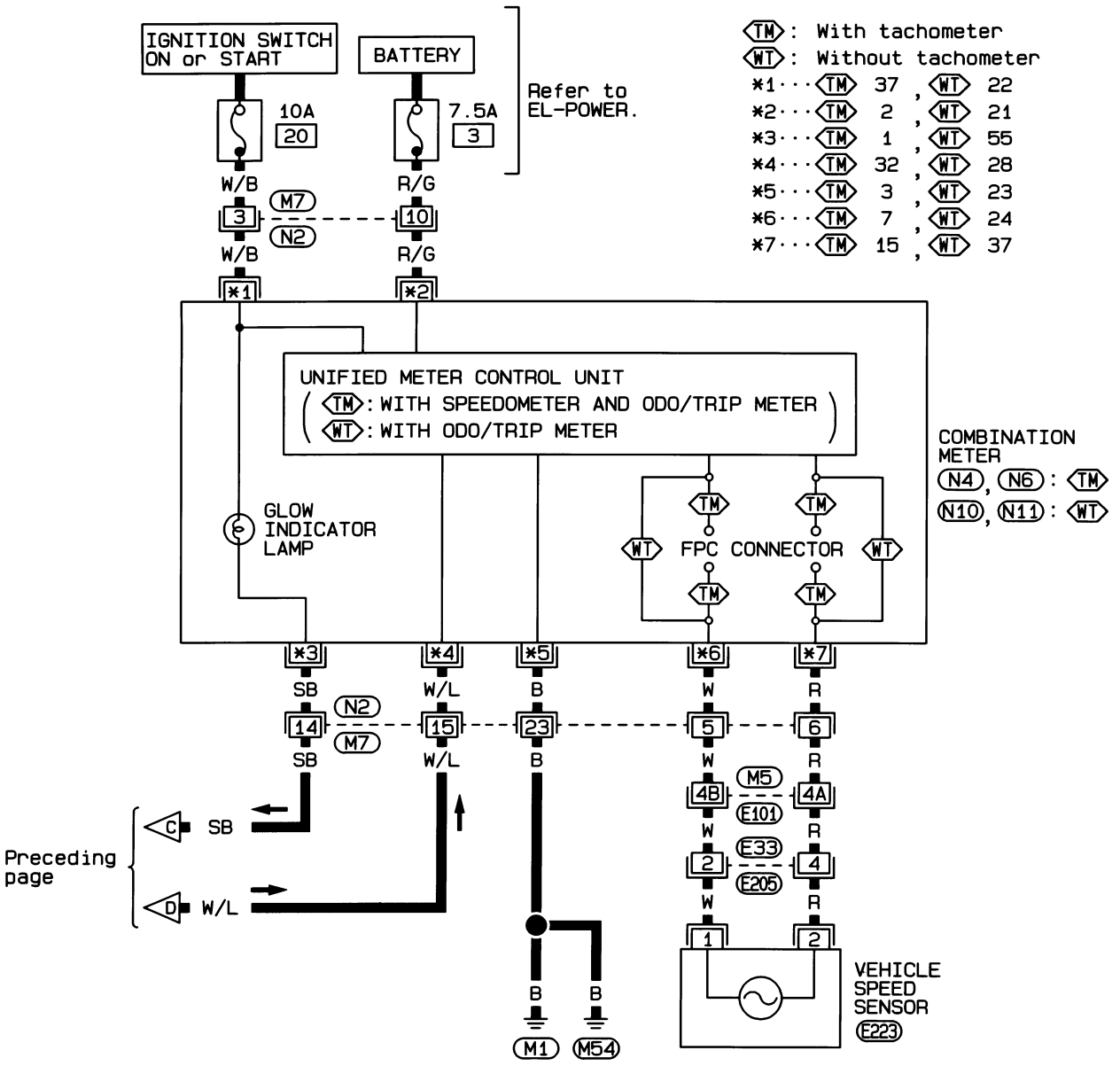
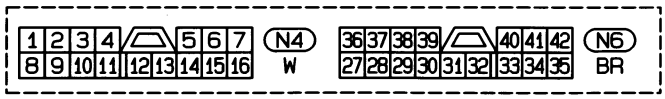
M5, E101

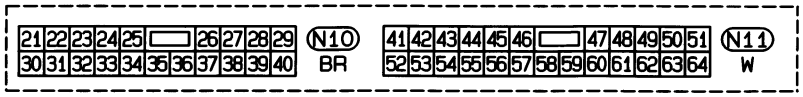
HEC698

Wiring Diagram (Cont'd)

EC-GLOW-09







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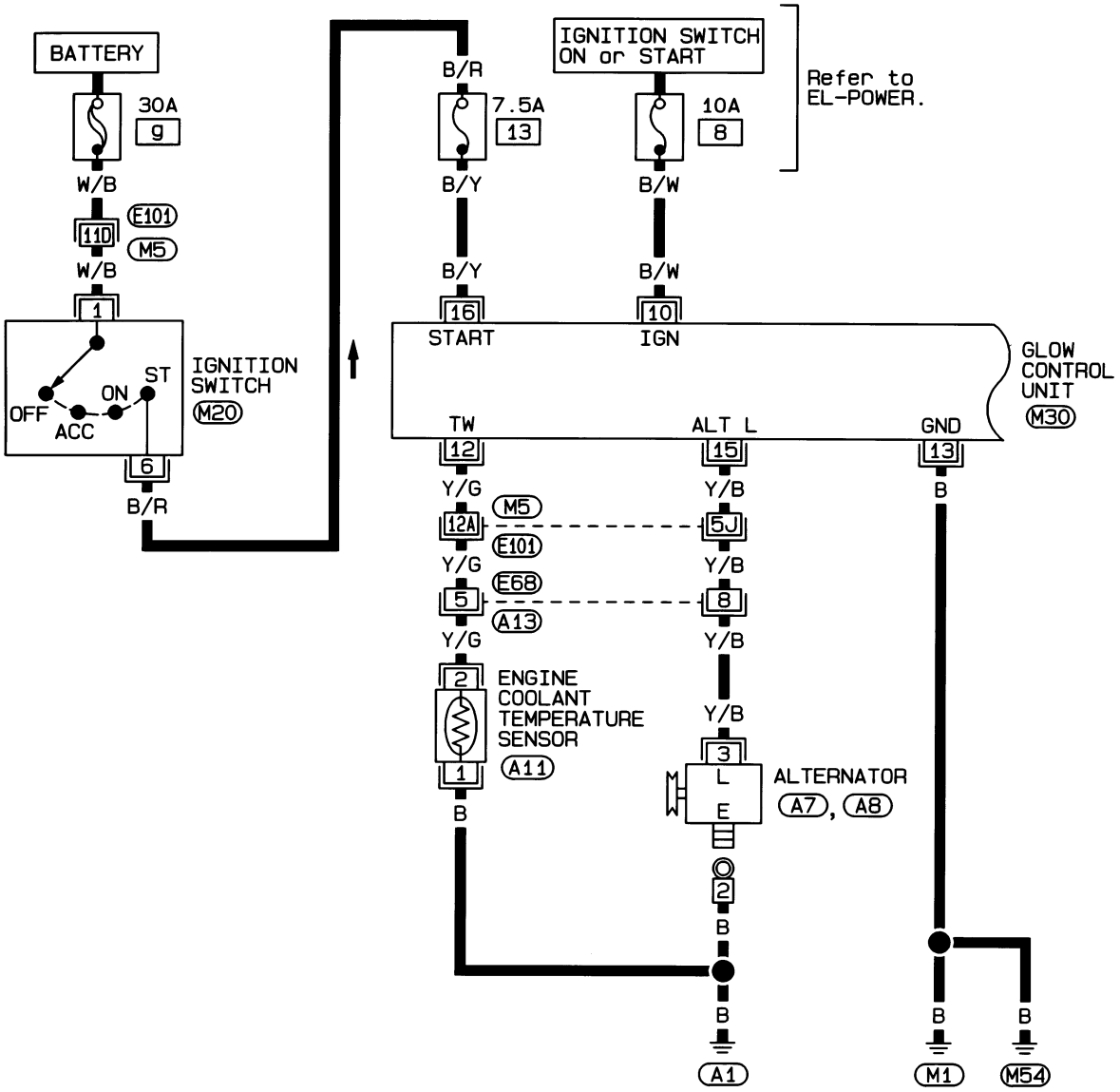
M5, E101

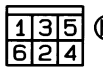
HEC699

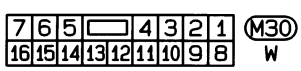
Wiring Diagram (Cont'd)

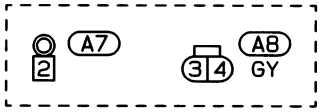
RHD MODELS WITH TD27 ENGINE FOR AUSTRALIA

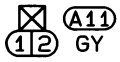
EC-GLOW-10

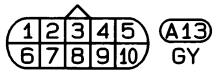












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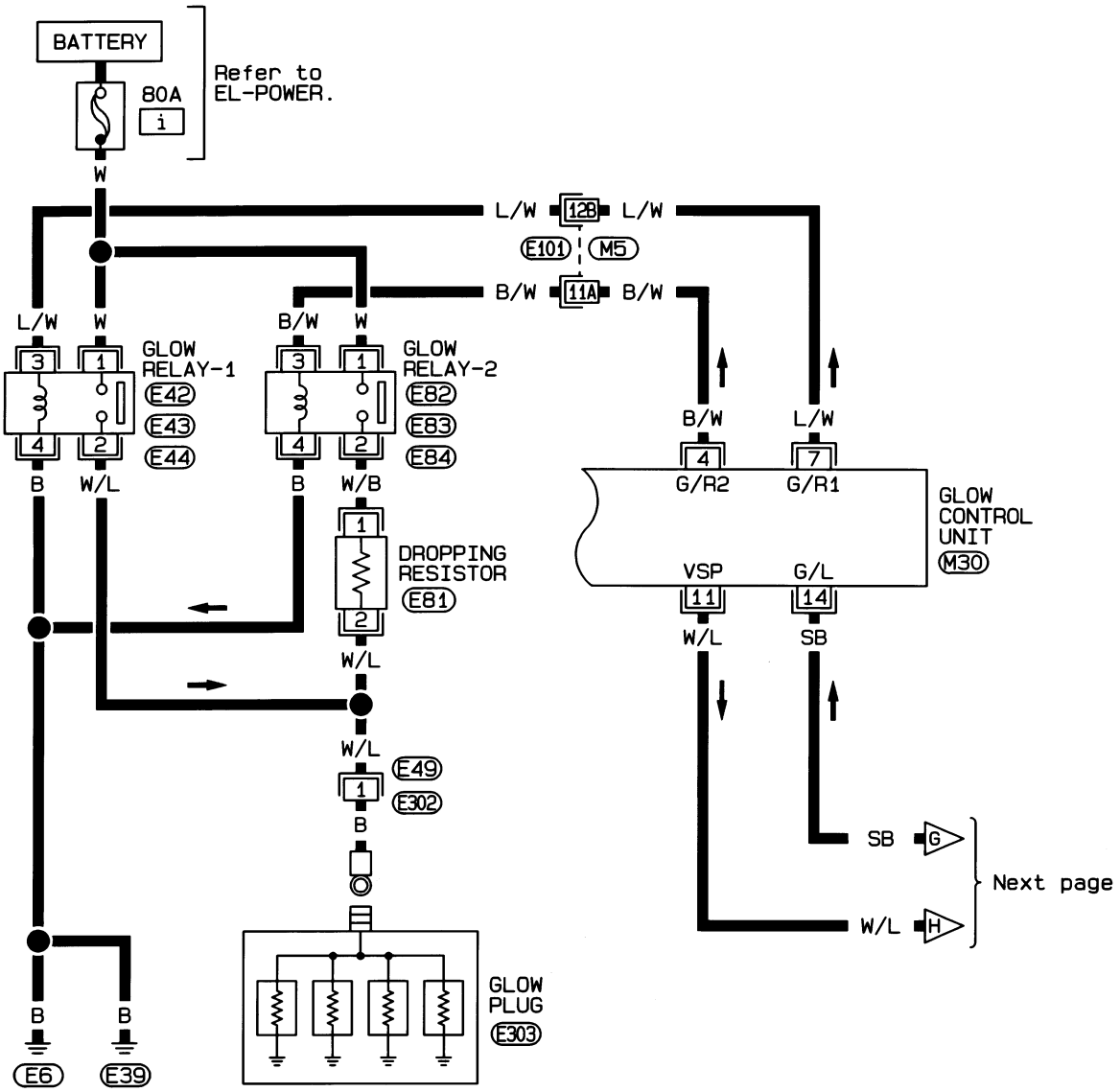
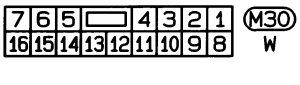
M5, E101

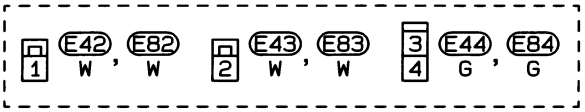
HEC703

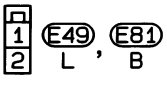
Wiring Diagram (Cont'd)

EC-GLOW-11









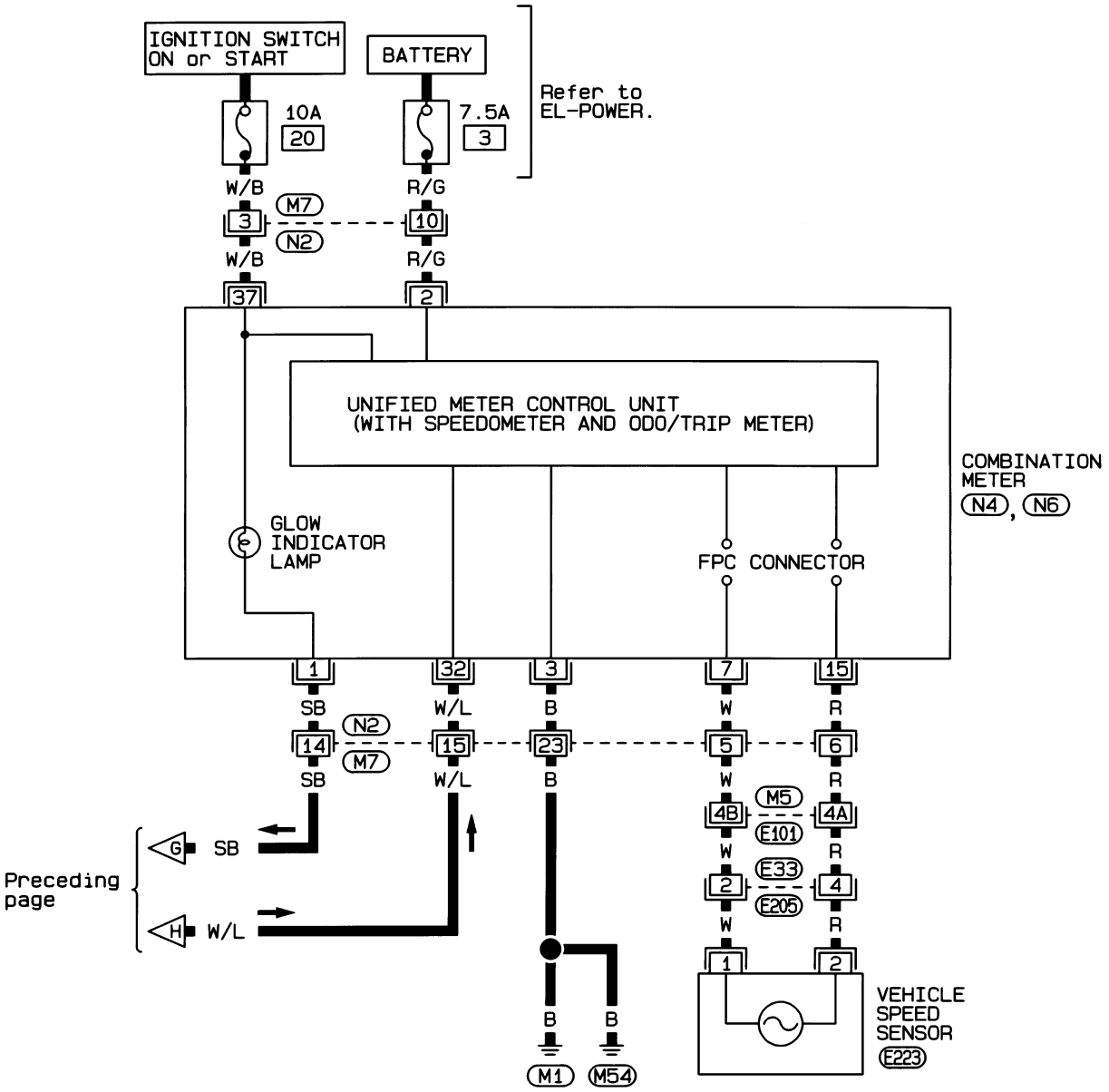
Refer to last page (Foldout page).

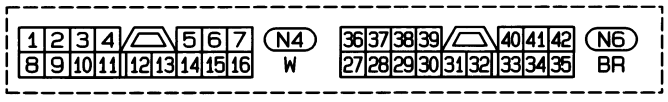
M5, E101

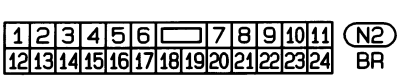
HEC704

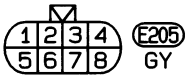
Wiring Diagram (Cont'd)

EC-GLOW-12









Refer to last page (Foldout page).

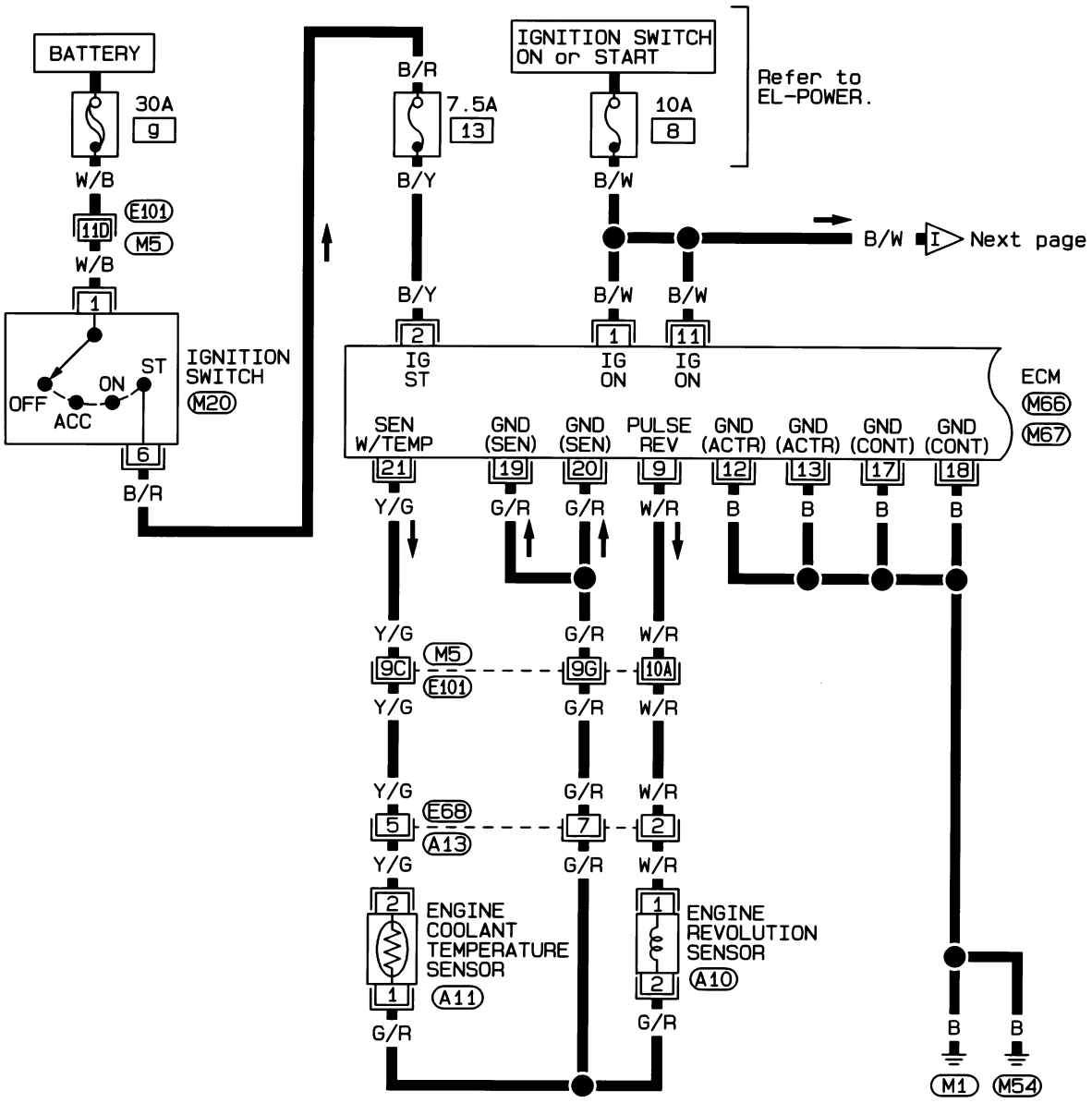
M5, E101

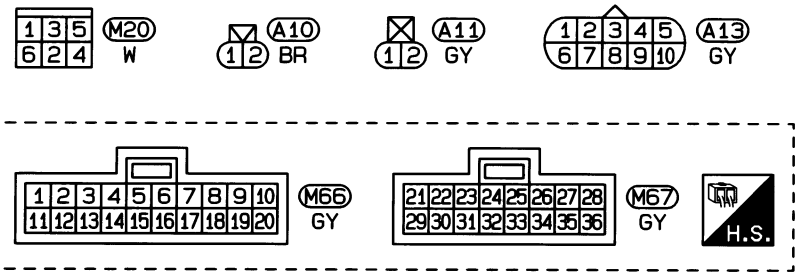
HEC705

Wiring Diagram (Cont'd)

LHD MODELS WITH TD25 AND TD25Ti ENGINES

EC-GLOW-13





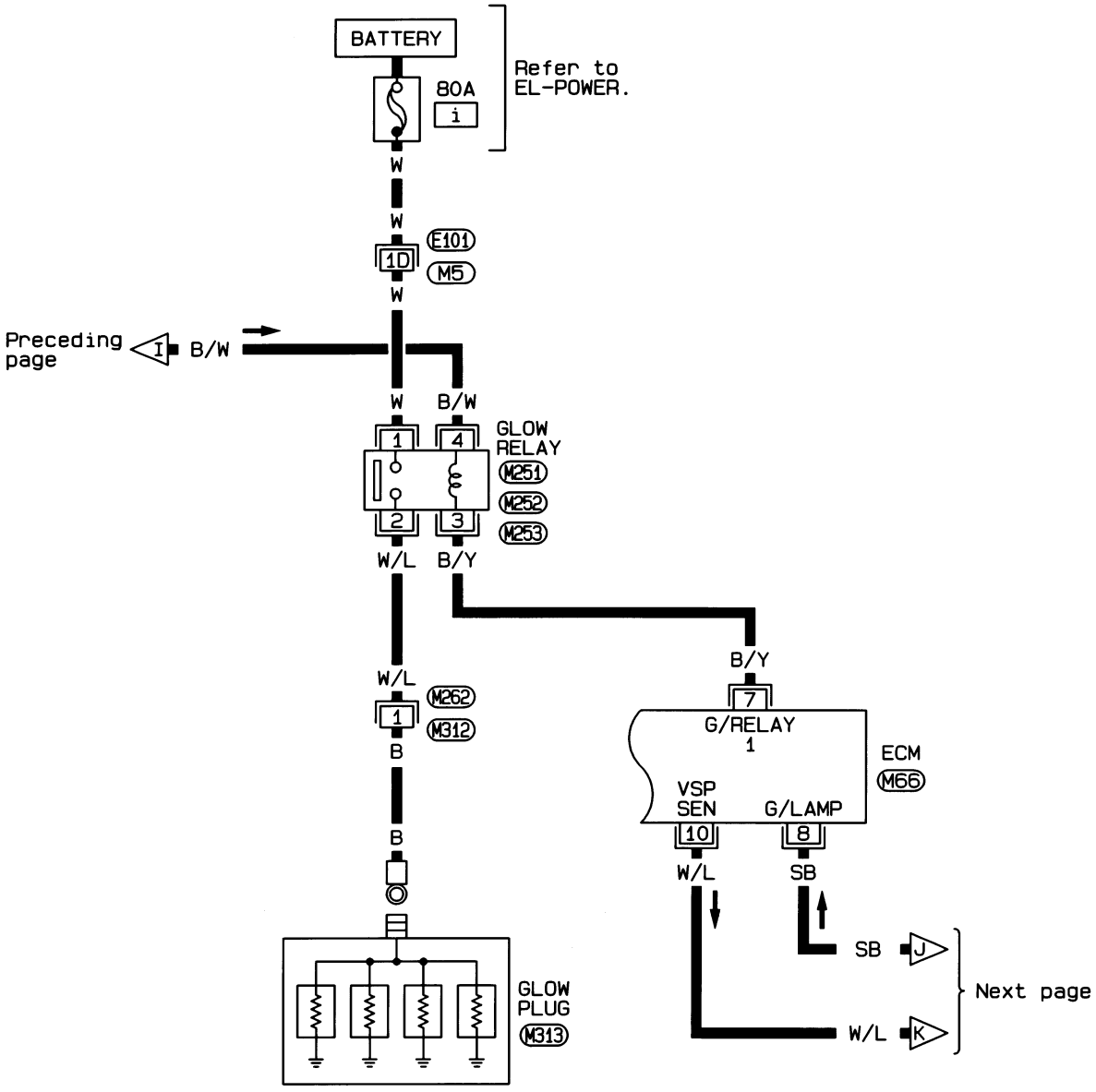
Refer to last page (Foldout page).

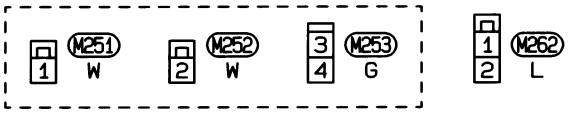
M5, E101

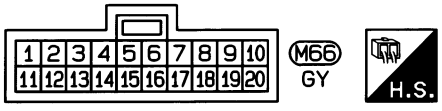
HEC706

Wiring Diagram (Cont'd)

EC-GLOW-14







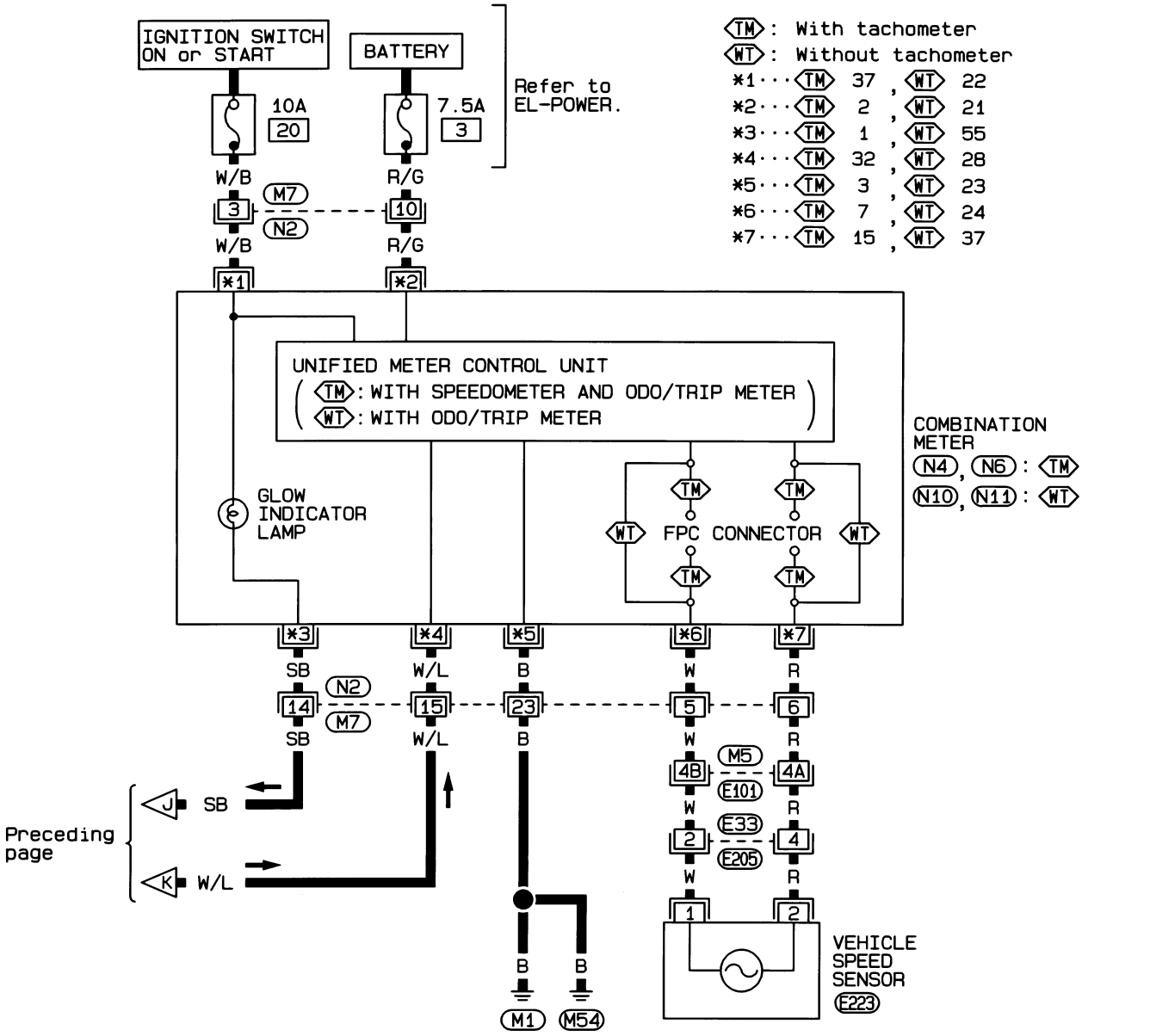
Refer to last page (Foldout page).

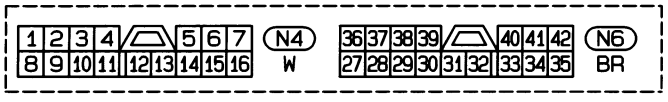
M5, E101

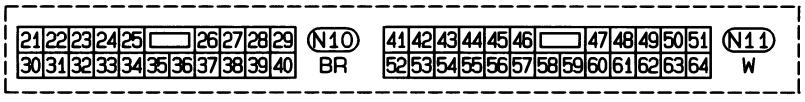
HEC707

Wiring Diagram (Cont'd)

EC-GLOW-15







Refer to last page (Foldout page).

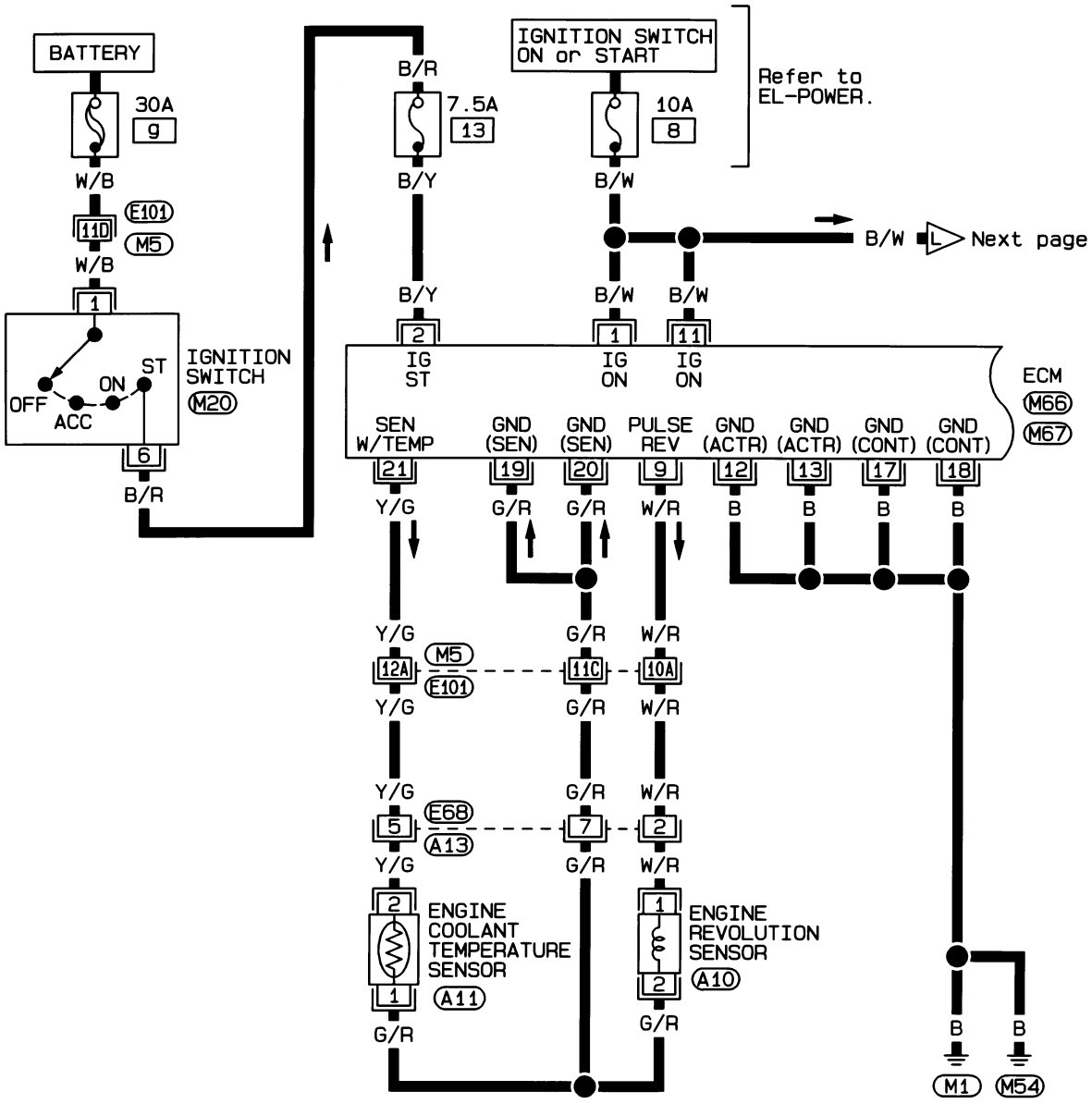
M5, E101

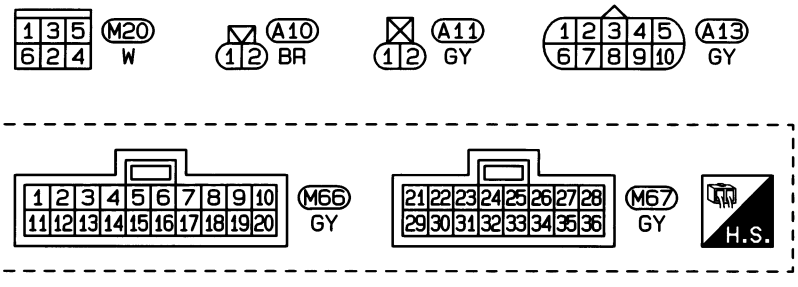
HEC708

Wiring Diagram (Cont'd)

RHD MODELS WITH TD25 AND TD25Ti ENGINES

EC-GLOW-16





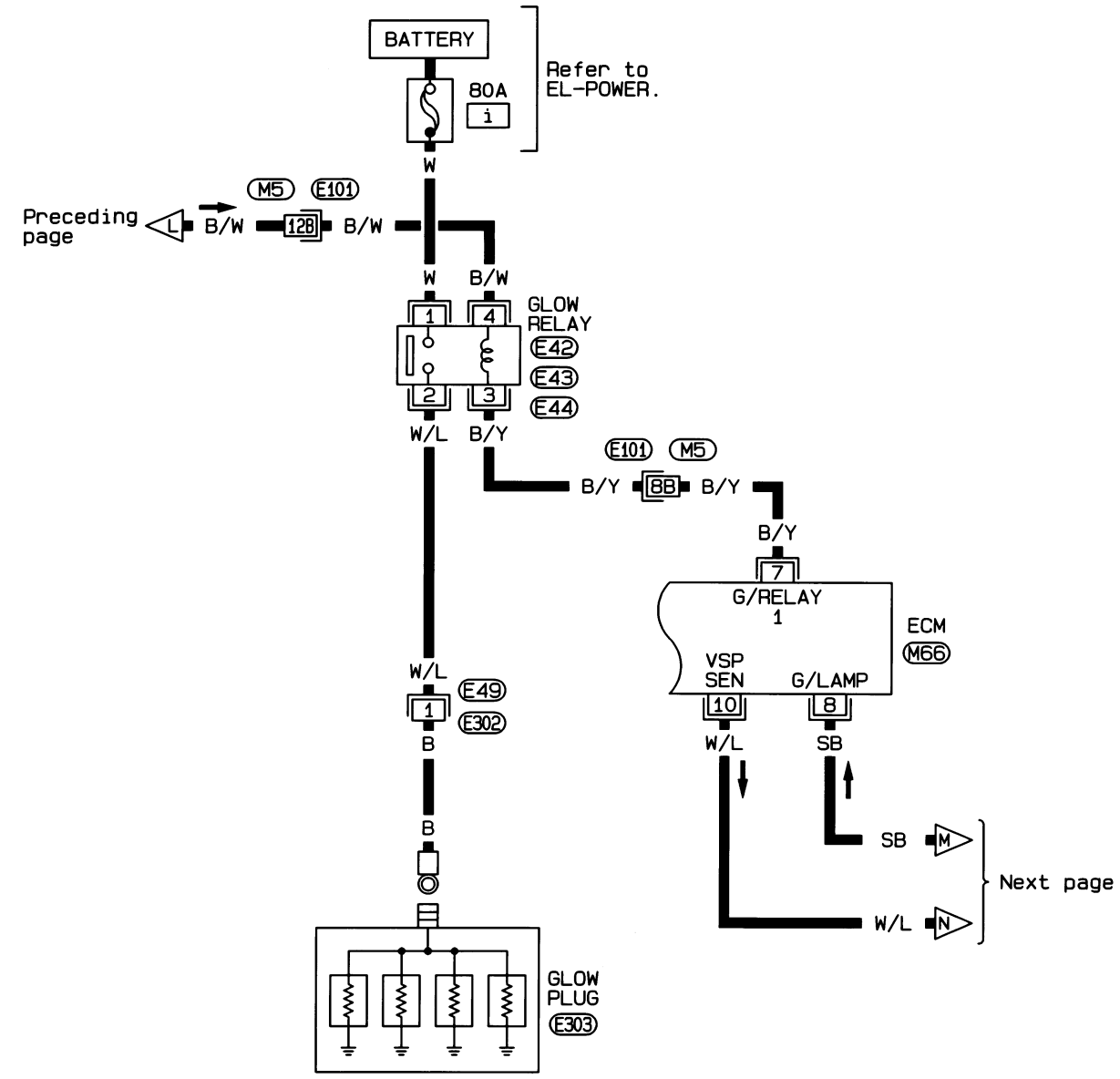
Refer to last page (Foldout page).

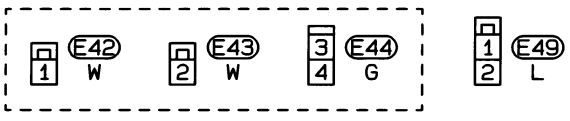
M5, E101

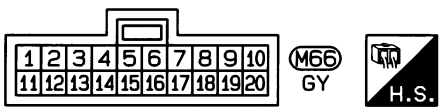
HEC709

Wiring Diagram (Cont'd)

EC-GLOW-17







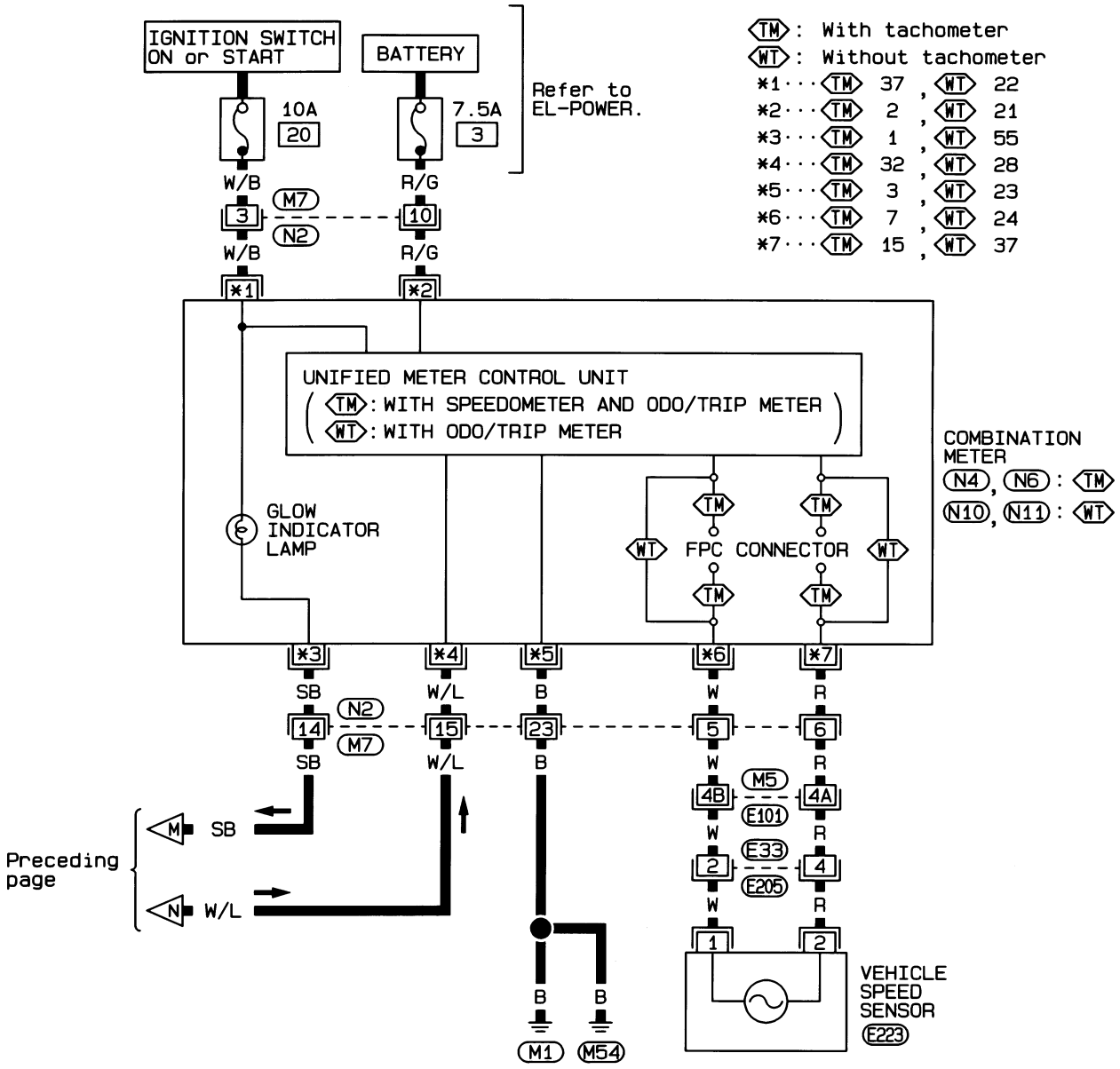
Refer to last page (Foldout page).

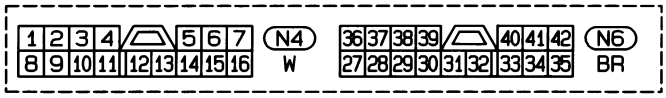
M5, E101

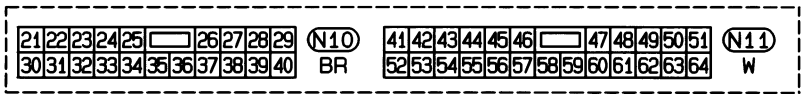
HEC710

Wiring Diagram (Cont'd)

EC-GLOW-18

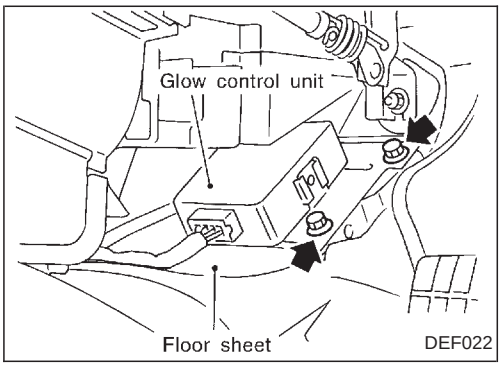






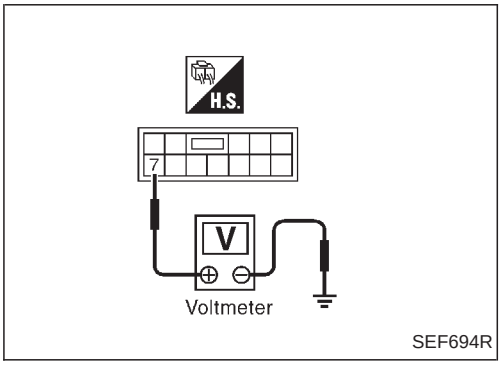
Refer to last page (Foldout page).
M5, E101

HEC711



Glow Control Unit Circuit Inspection (For Cold Areas and Australia)

Roll up the floor sheet. Check the glow control unit.

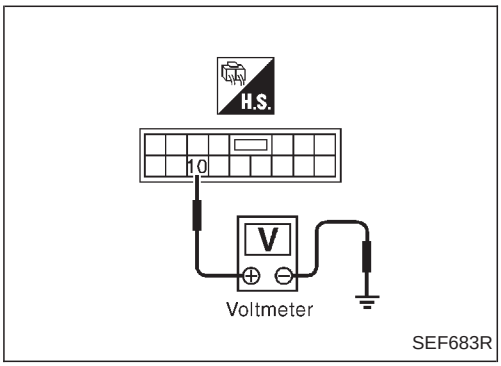


POWER SUPPLY CIRCUIT

QD engine

Turn ignition switch ON and check voltage between terminal ⑦ and body ground.

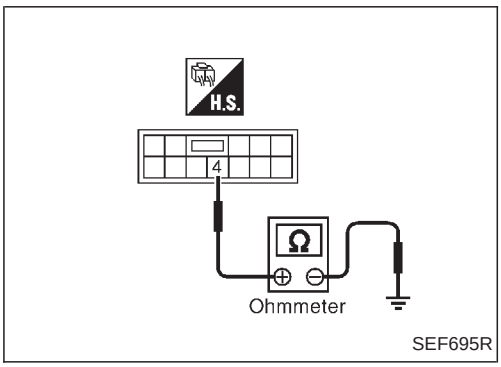
Voltage: approx. 12V



TD engine

Turn ignition switch ON and check voltage between terminal ⑩ and body ground.

Voltage: approx. 12V

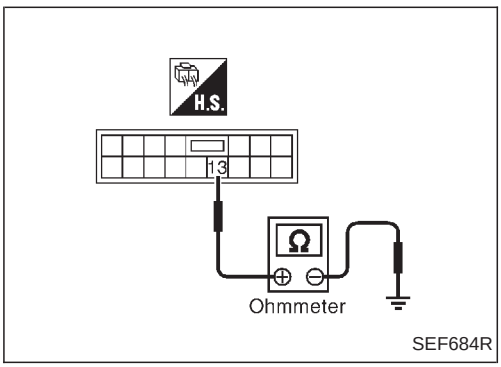


GROUND CIRCUIT

QD engine

Check continuity between terminal ④ and body ground.

Continuity should exist.

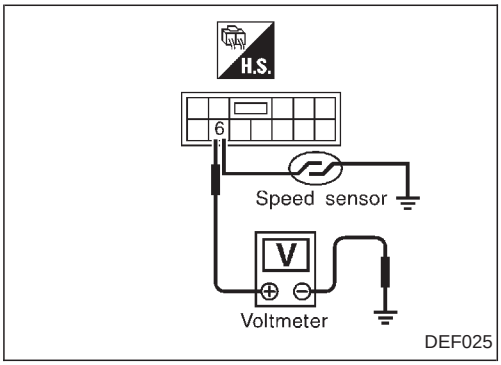


TD engine

Check continuity between terminal ⑬ and body ground.

Continuity should exist.

Glow Control Unit Circuit Inspection (For Cold Areas and Australia) (Cont'd)



SPEED SENSOR SIGNAL CIRCUIT

QD engine

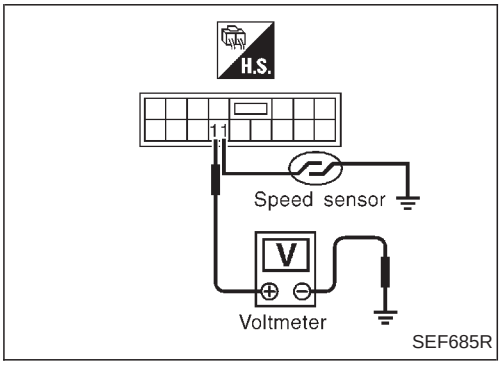
While running vehicle or lifting rear wheels in 2WD position, check that voltage between terminal ⑥ and body ground fluctuates.

Voltage: approx. 5V

TD engine

While running vehicle or lifting rear wheels in 2WD position, check that voltage between terminal ⑪ and body ground fluctuates.

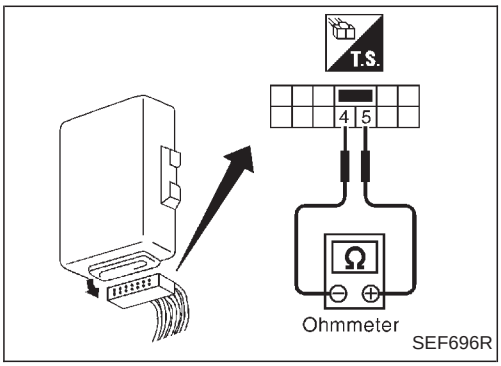
Voltage: approx. 5V



COOLANT TEMPERATURE SENSOR CIRCUIT

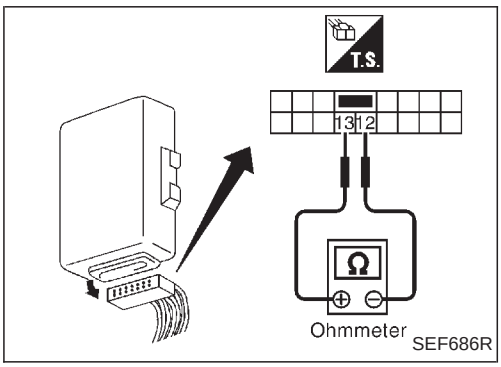
QD engine

Check continuity between terminals ⑤ and ④.
Measure resistance to temperature approximately as shown in "COOLANT TEMPERATURE SENSOR", "Component Inspection" of original Service Manual.



TD engine

Check continuity between terminals ⑫ and ⑬.
Measure resistance to temperature approximately as shown in "COOLANT TEMPERATURE SENSOR", "Component Inspection" of original Service Manual.

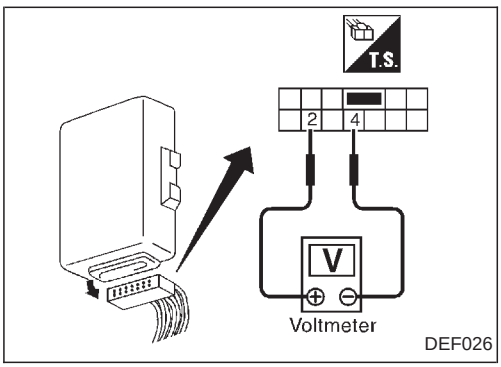


ALTERNATOR'S "L" TERMINAL CIRCUIT

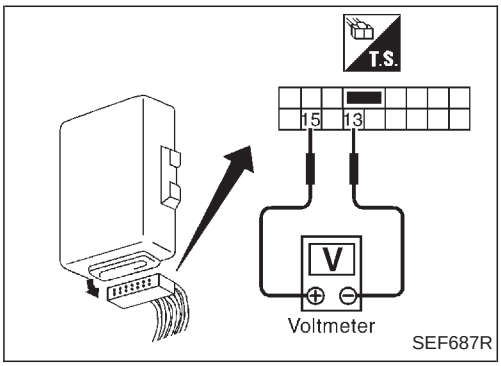
QD engine

1. Turn ignition switch OFF.
2. Disconnect harness connector from glow control unit.
3. Disconnect harness connector from the alternator's "L" terminal.
4. Check terminal voltage between terminals ② and ④ when the ignition switch is turned to ON.

Voltage: approx. 12V

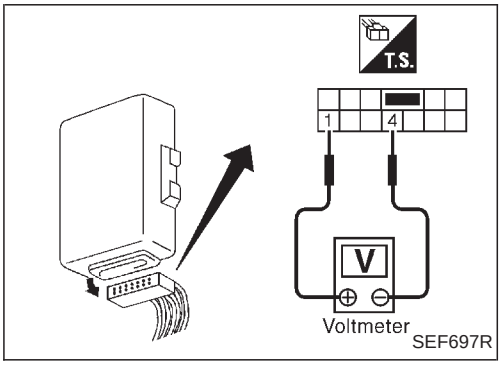


Glow Control Unit Circuit Inspection (For Cold Areas and Australia) (Cont'd)



TD engine

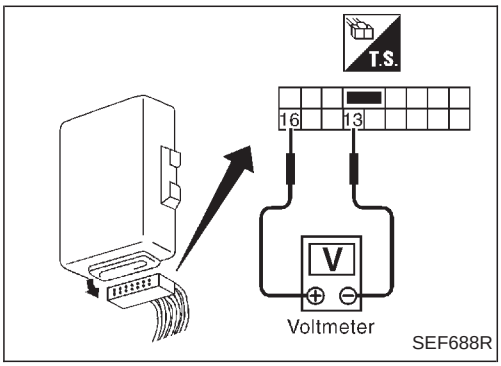
1. Turn ignition switch OFF.
2. Disconnect harness connector from glow control unit.
3. Disconnect harness connector from the alternator's "L" terminal.
4. Check terminal voltage between terminals ⑮ and ⑬ when the ignition switch is turned to ON.
   Voltage: approx. 12V



START SIGNAL INPUT CIRCUIT

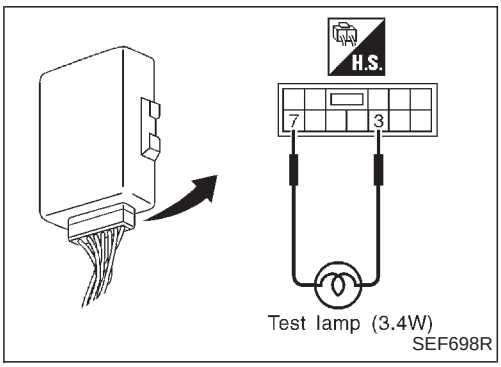
QD engine

1. Turn ignition switch OFF.
2. Disconnect harness connector from the starter motor's "S" terminal.
3. Check terminal voltage between terminals ① and ④ when the ignition switch is at "START".
   Voltage: approx. 12V



TD engine

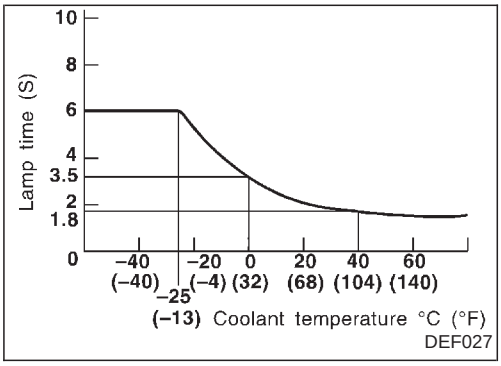
1. Turn ignition switch OFF.
2. Disconnect harness connector from the starter motor's "S" terminal.
3. Check terminal voltage between terminals ⑯ and ⑬ when the ignition switch is at "START".
   Voltage: approx. 12V



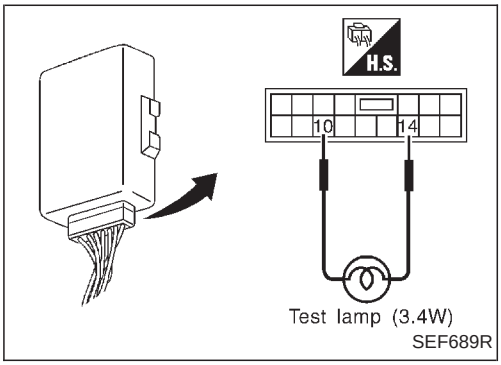
GLOW INDICATOR CONTROL CIRCUIT

QD engine

1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.
   Time the test lamp should stay lit:
   Approx. 2 - 6 seconds
   (The time will vary according to coolant temperature.)



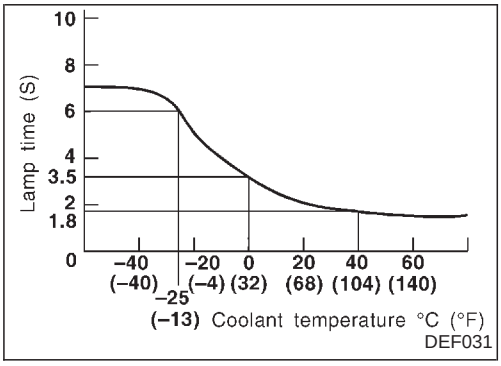
Glow Control Unit Circuit Inspection (For Cold Areas and Australia) (Cont'd)



TD engine

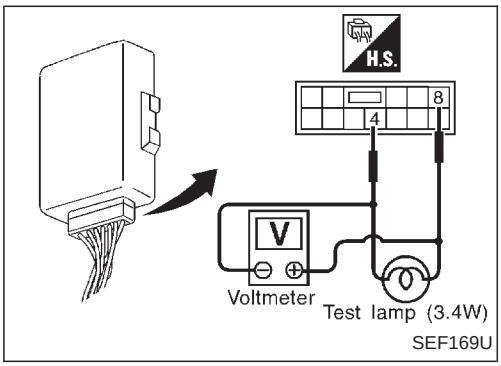
1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.

Time the test lamp should stay lit:
Approx. 2 - 6 seconds
(The time will vary according to coolant temperature.)



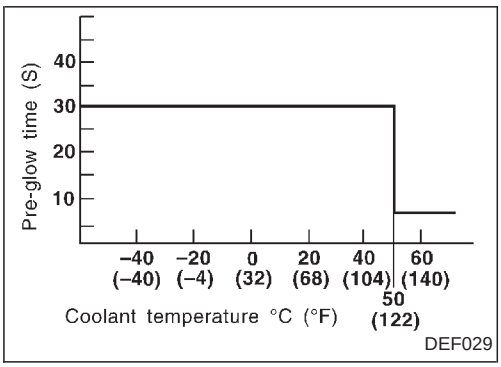
PRE-GLOW CONTROL CIRCUIT

QD engine

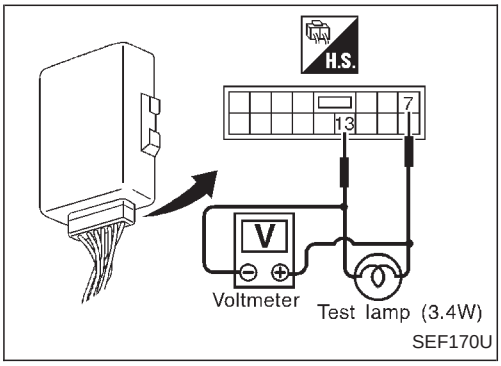


1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown below.
4. Turn ignition switch ON and measure terminal voltage and the time the test lamp stays lit.

Battery voltage should appear for 30 seconds at coolant temperature below 50°C (122°F).
Battery voltage should appear for 5 seconds at coolant temperature over 50°C (122°F).



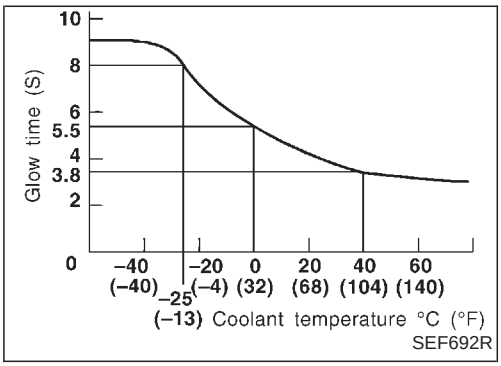
TD engine



1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch ON and measure terminal voltage and the time the test lamp stays lit.

Battery voltage should appear for 4 to 8 seconds*.
*** (Varies with coolant temperature)**

Glow Control Unit Circuit Inspection (For Cold Areas and Australia) (Cont'd)

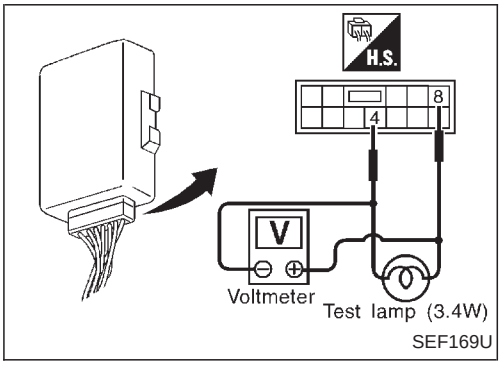


- **The time will be shortened if ignition switch is OFF for only a brief period.**
  Therefore, when measuring the time, leave ignition switch OFF for more than 1 minute, and then turn ignition switch ON.
- **When the coolant temperature is below 10°C (50°F), the battery voltage should appear for 30 seconds.**

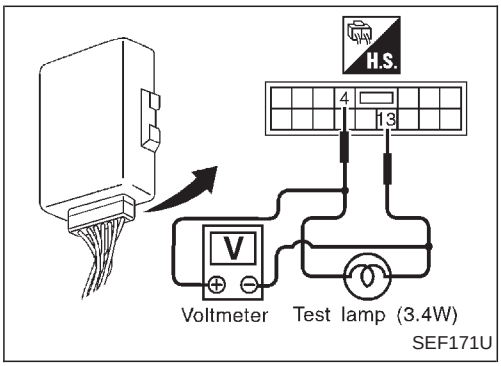
AFTER-GLOW CONTROL CIRCUIT

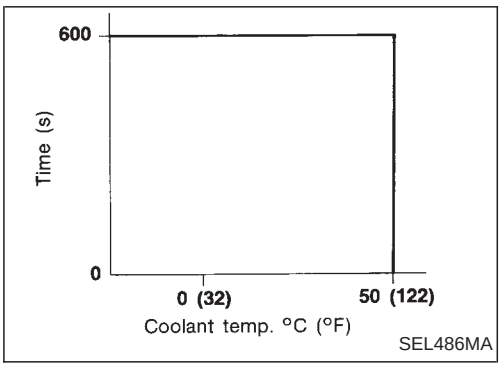
1. Connect test lamp to glow control unit as shown.
2. Turn ignition switch to START and run engine, then measure glow plug terminal voltage and the time the test lamp stays lit.

QD engine



TD engine



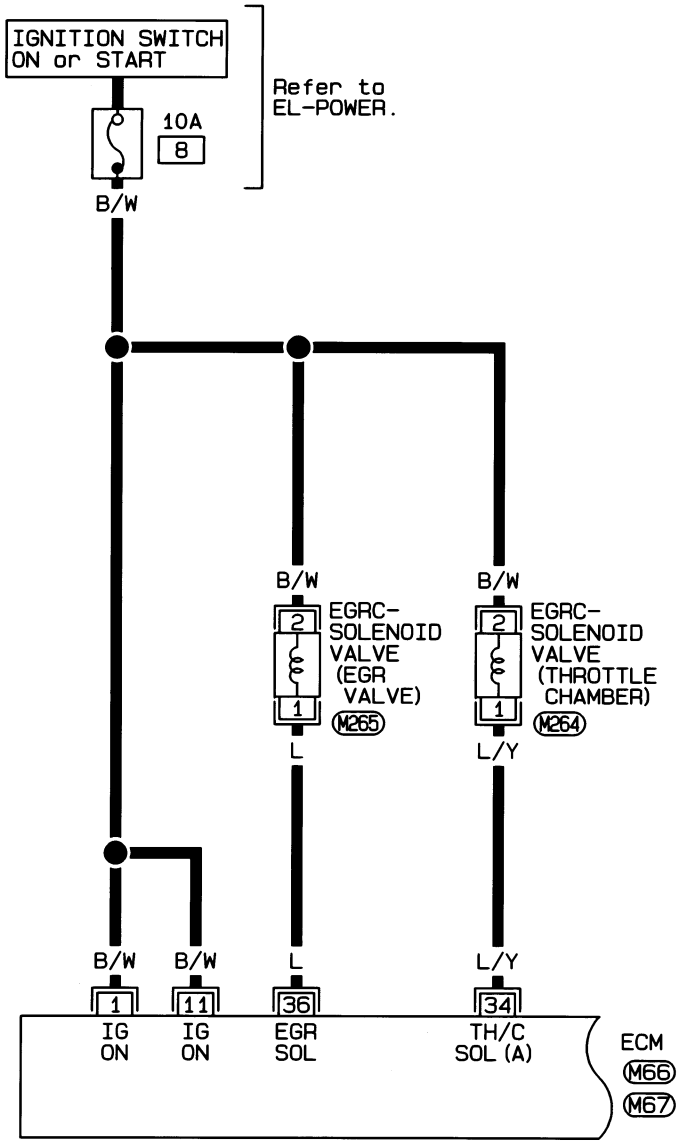


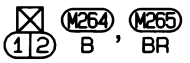
Battery voltage should continue for 10 minutes at coolant temperature below 50°C (122°F).
[If vehicle speed is above 20 km/h (12 MPH), glow plug terminal voltage should drop to 0V. If the speed drops below 10 km/h (6 MPH), the battery voltage should appear.]
The voltage should not appear at coolant temperature over 50°C (122°F).

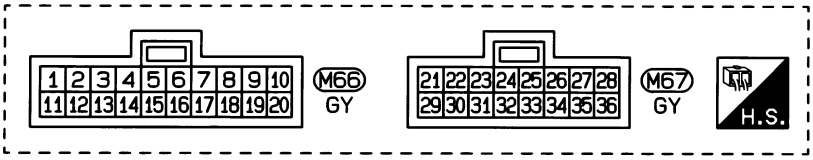
Wiring Diagram

TD25 & TD25Ti ENGINES (LHD)

EC-EGRC/V-01





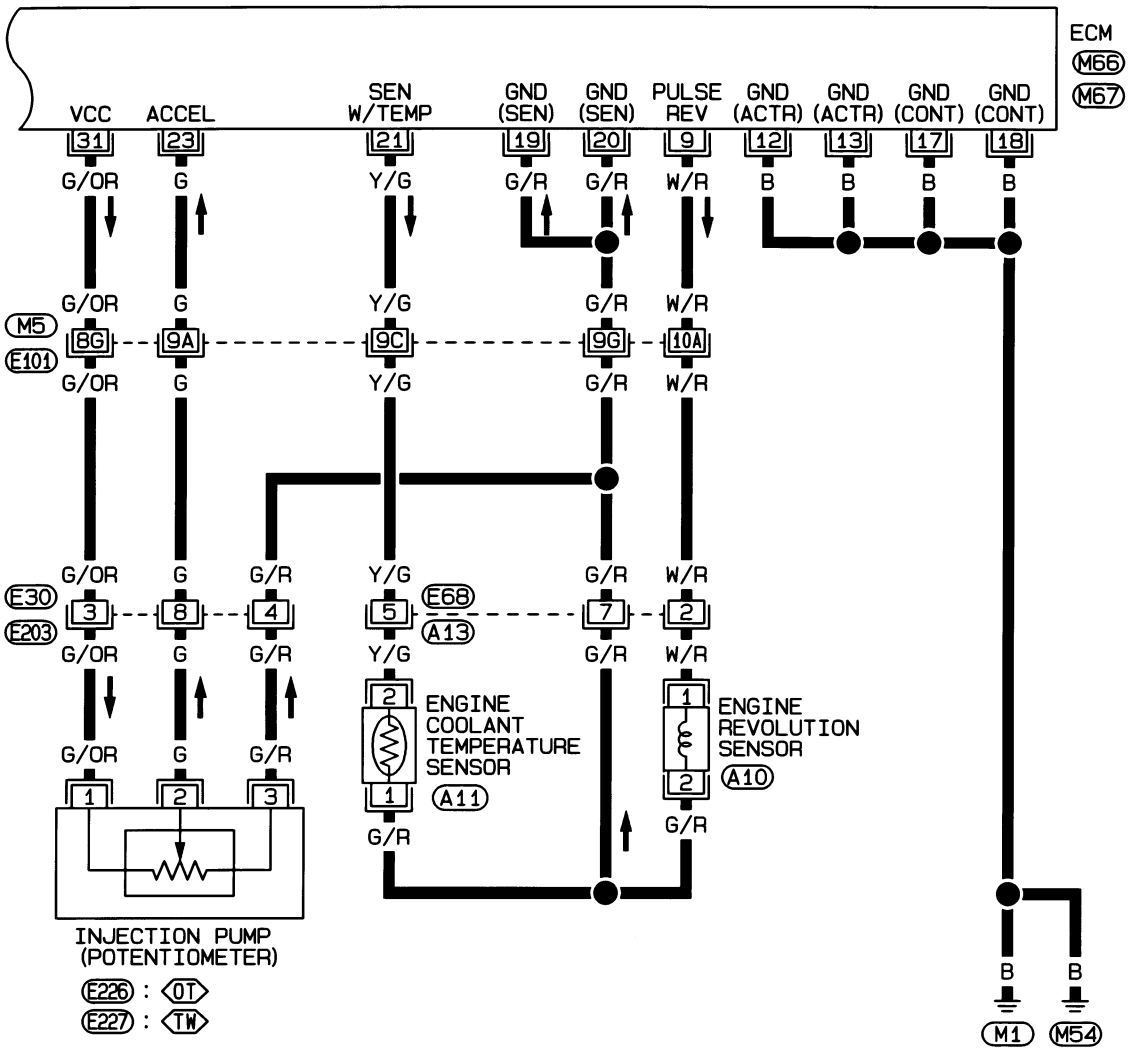


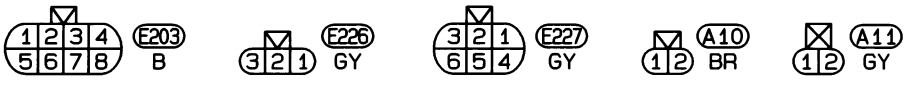
HEC712

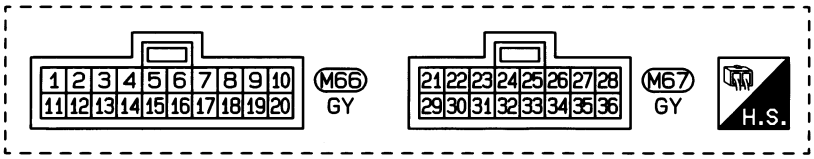
Wiring Diagram (Cont'd)

EC-EGRC/V-02

TW : With NATS
OT : Without NATS







Refer to last page (Foldout page).

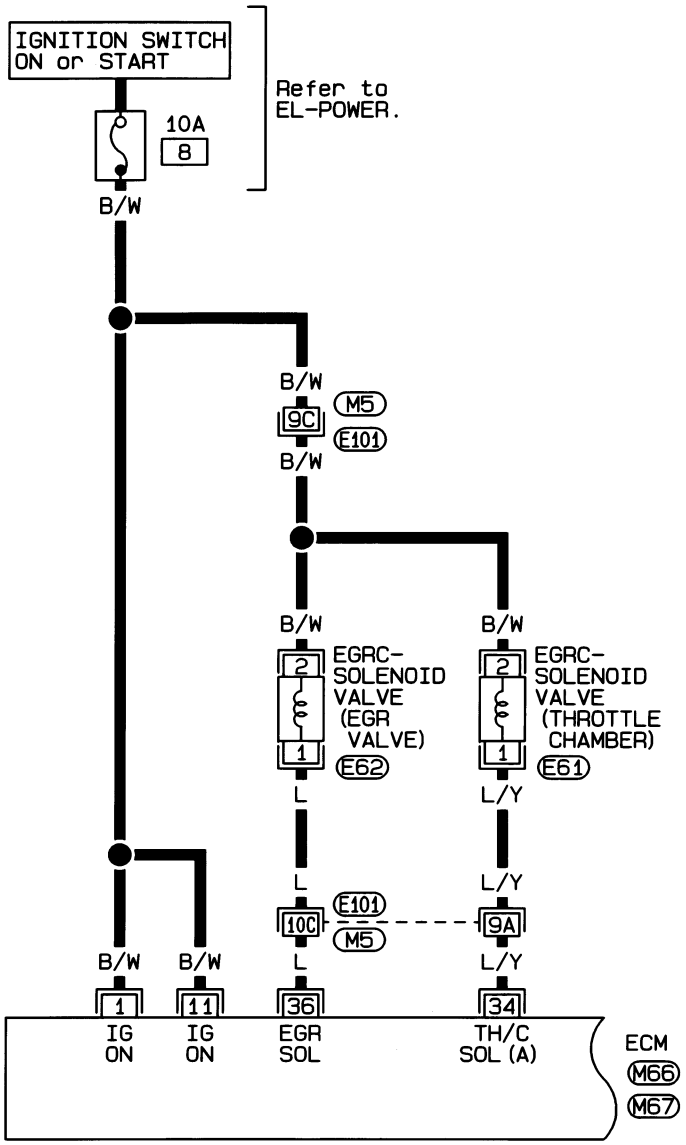
M5, E101

HEC713

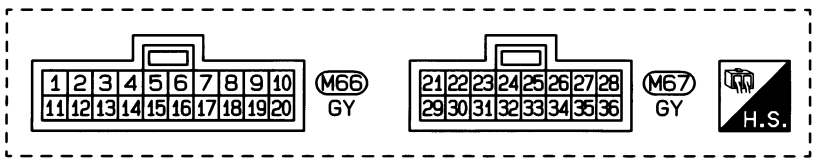
Wiring Diagram (Cont'd)

TD25 & TD25Ti ENGINES (RHD)

EC-EGRC/V-03



E61, E62
B, BR



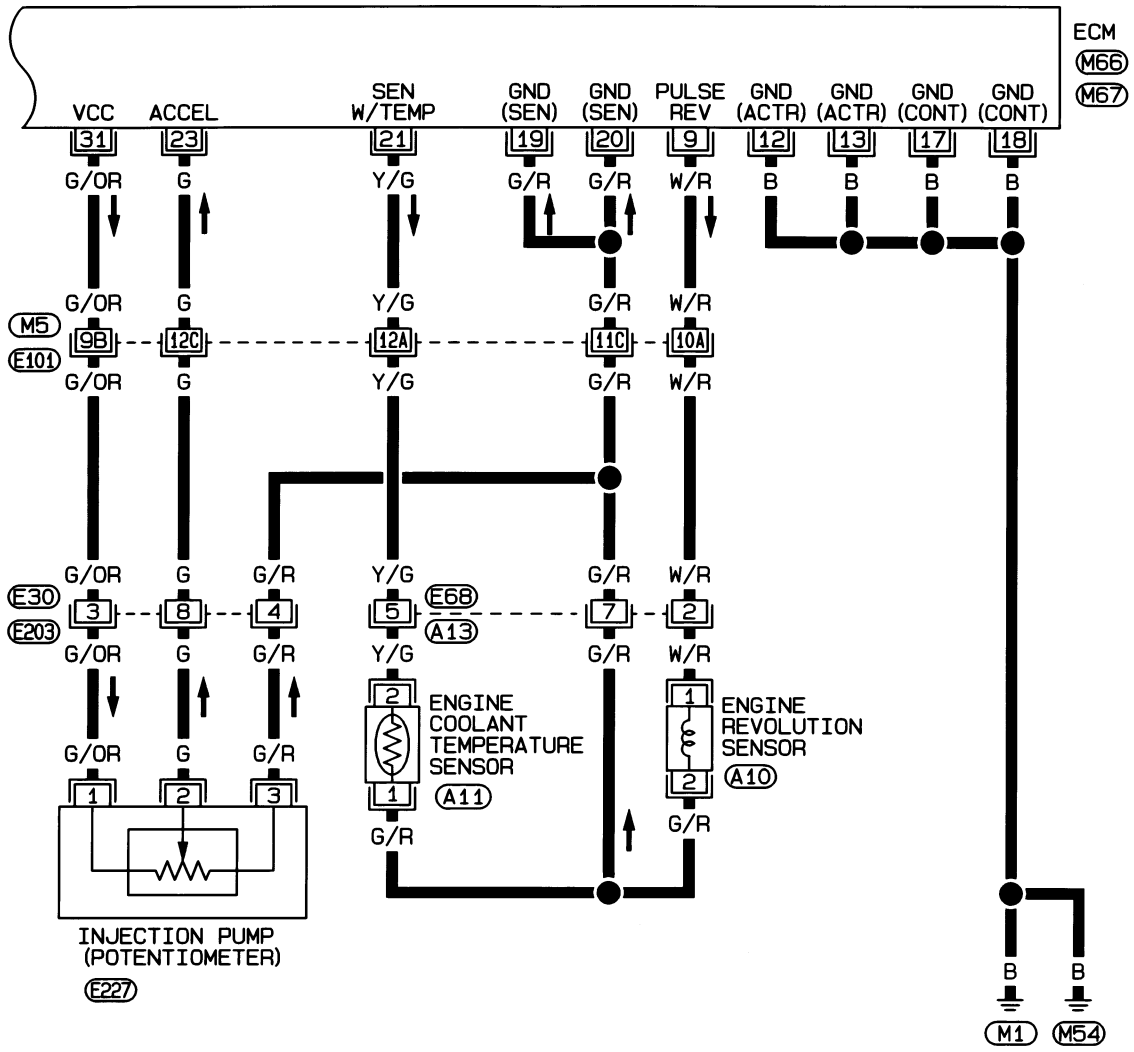
Refer to last page
(Foldout page).

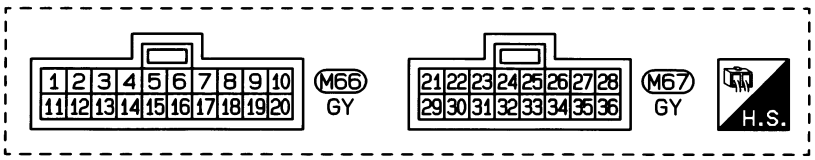
M5, E101

HEC714

Wiring Diagram (Cont'd)

EC-EGRC/V-04





Refer to last page (Foldout page).

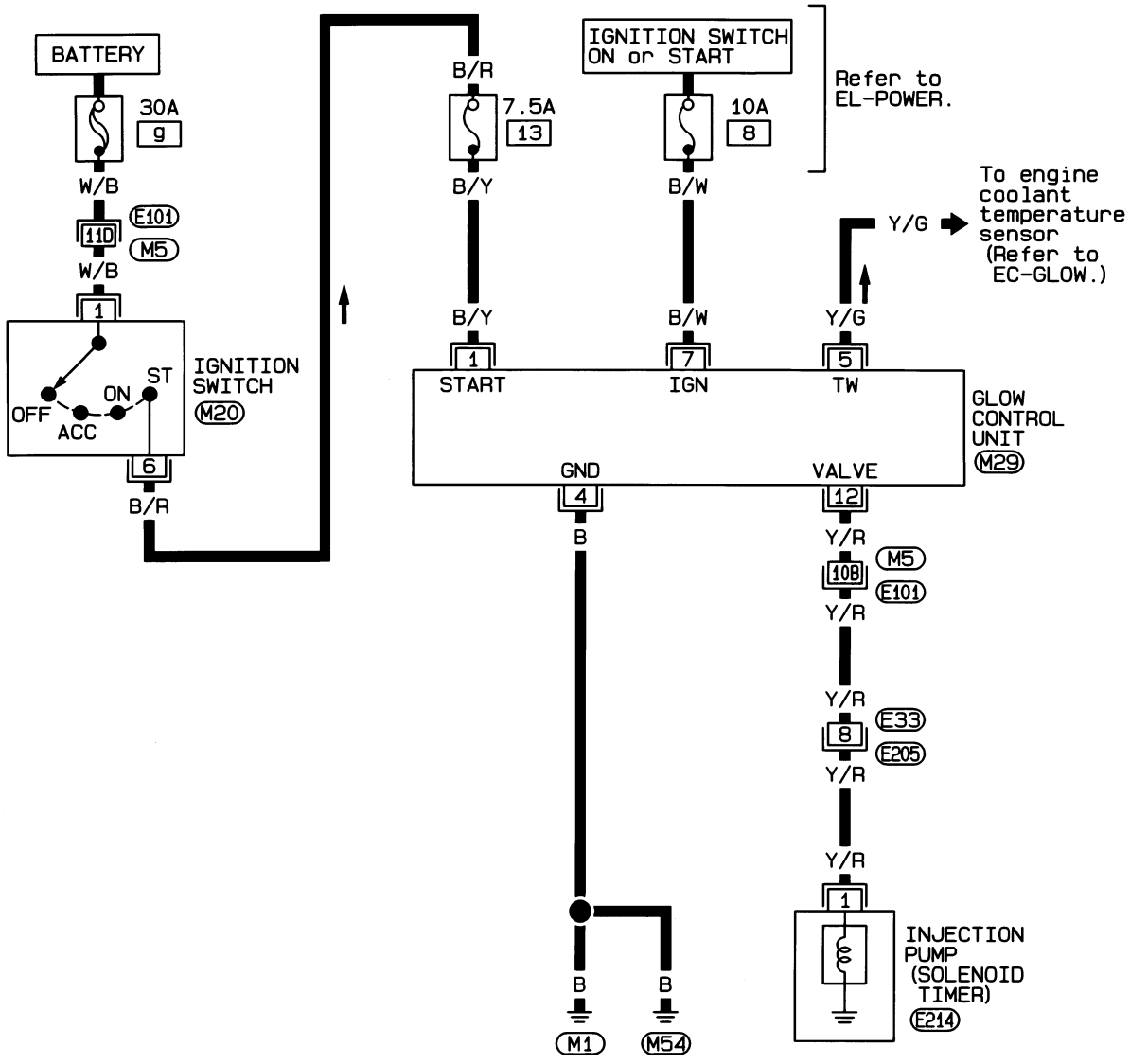
M5, E101

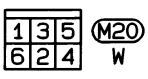
HEC715

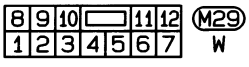
Wiring Diagram

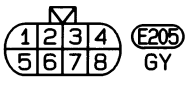
QD32 ENGINE

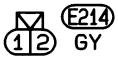
EC-PLA-01











Refer to last page (Foldout page).

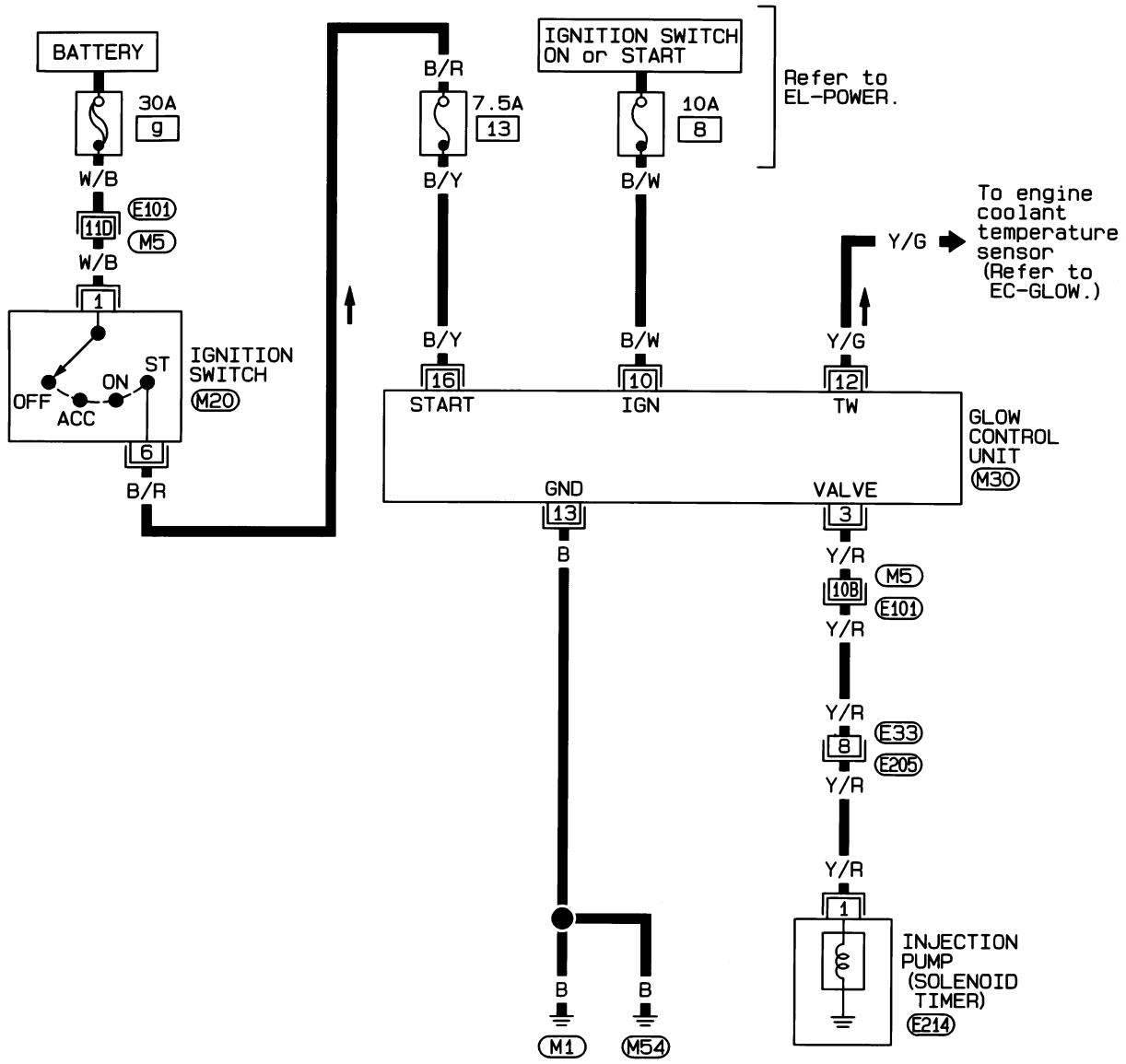
M5, E101

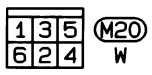
HEC716

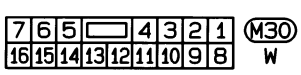
Wiring Diagram (Cont'd)

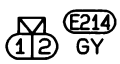
TD27 ENGINE

EC-PLA-02









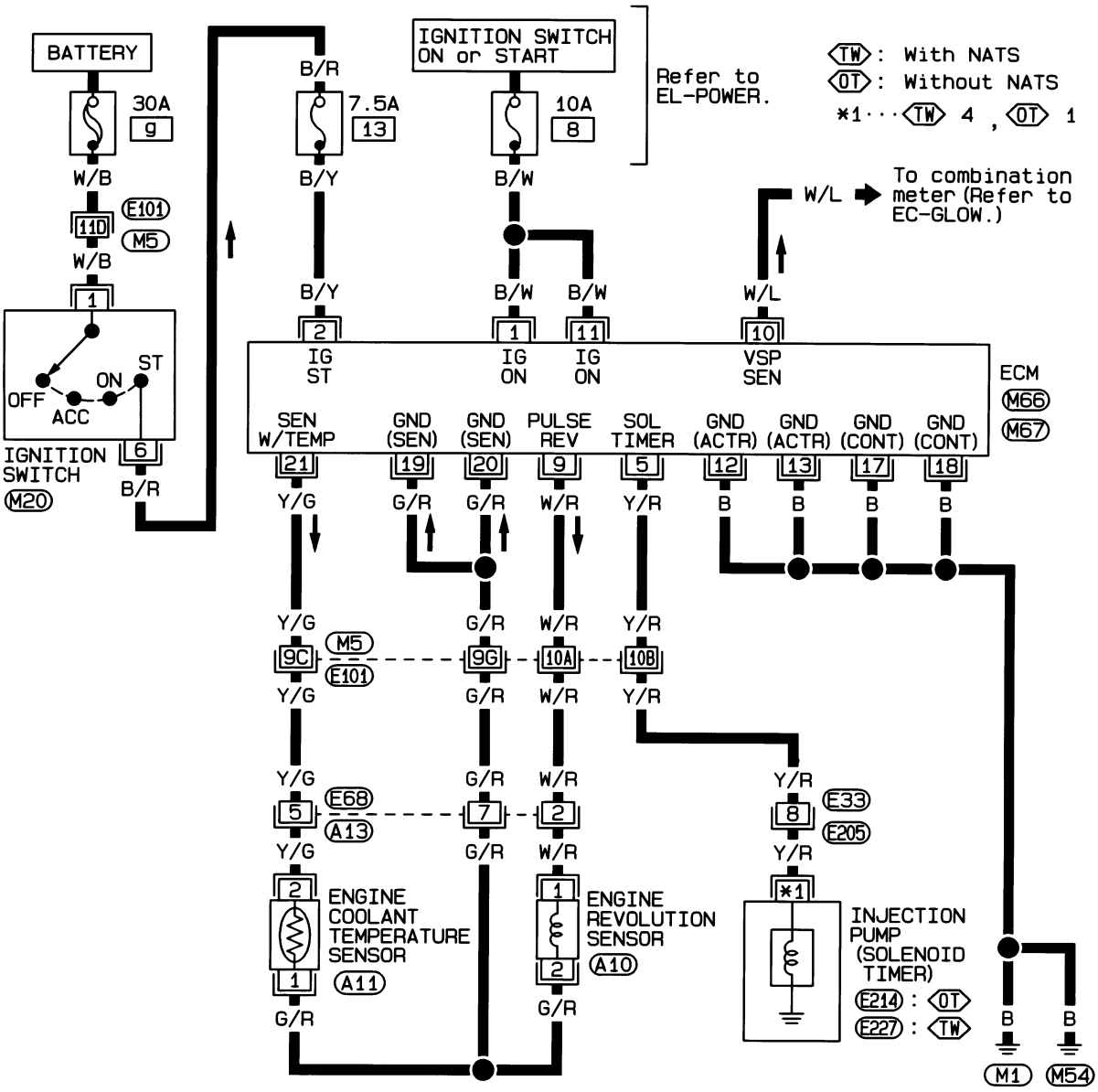
Refer to last page (Foldout page).
M5, E101

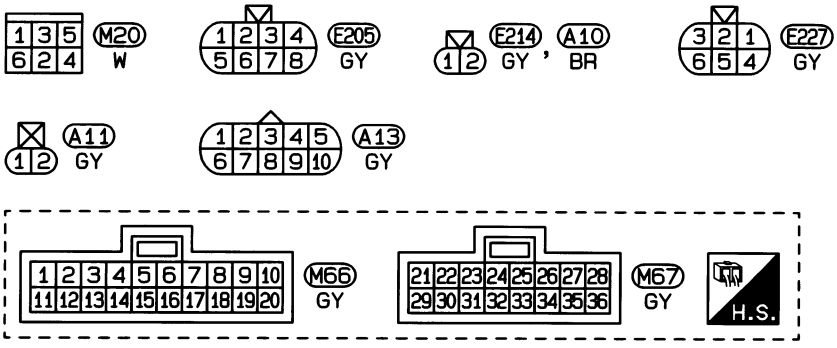
HEC717

Wiring Diagram (Cont'd)

TD25 & TD25Ti ENGINE (LHD)

EC-PLA-03





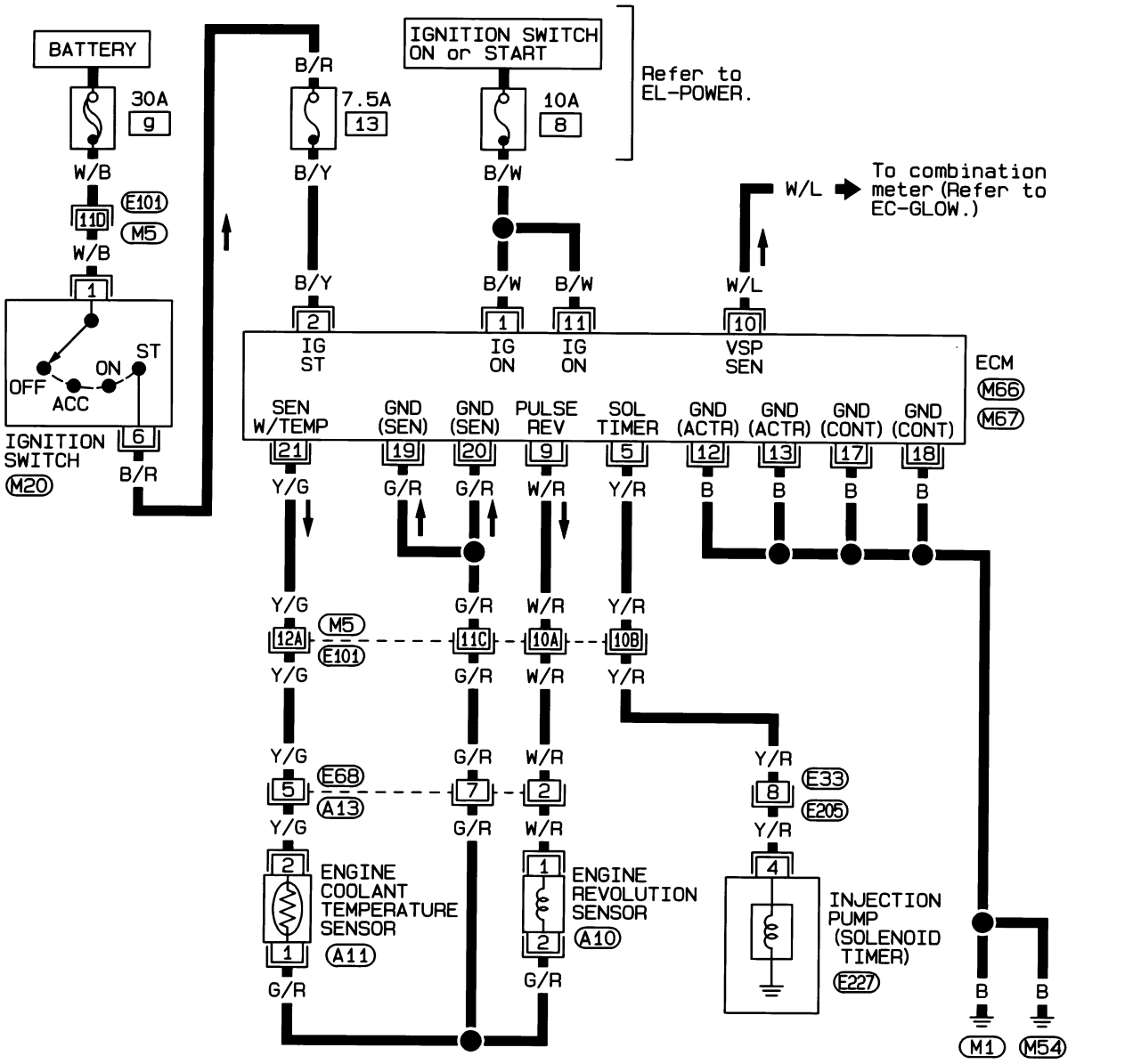
Refer to last page (Foldout page).
M5 , E101

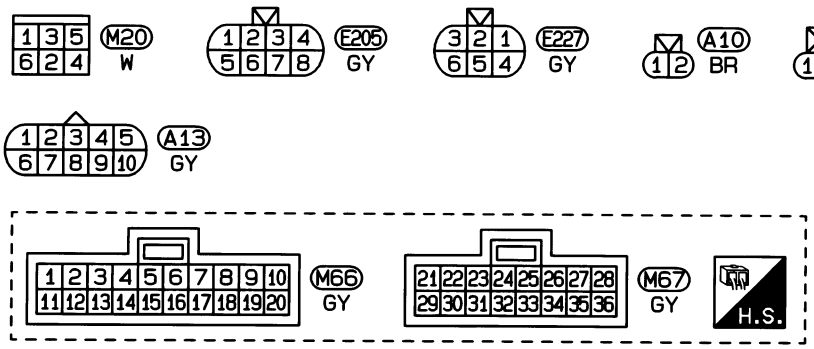
HEC718

Wiring Diagram (Cont'd)

TD25 & TD25Ti ENGINE (RHD)

EC-PLA-04





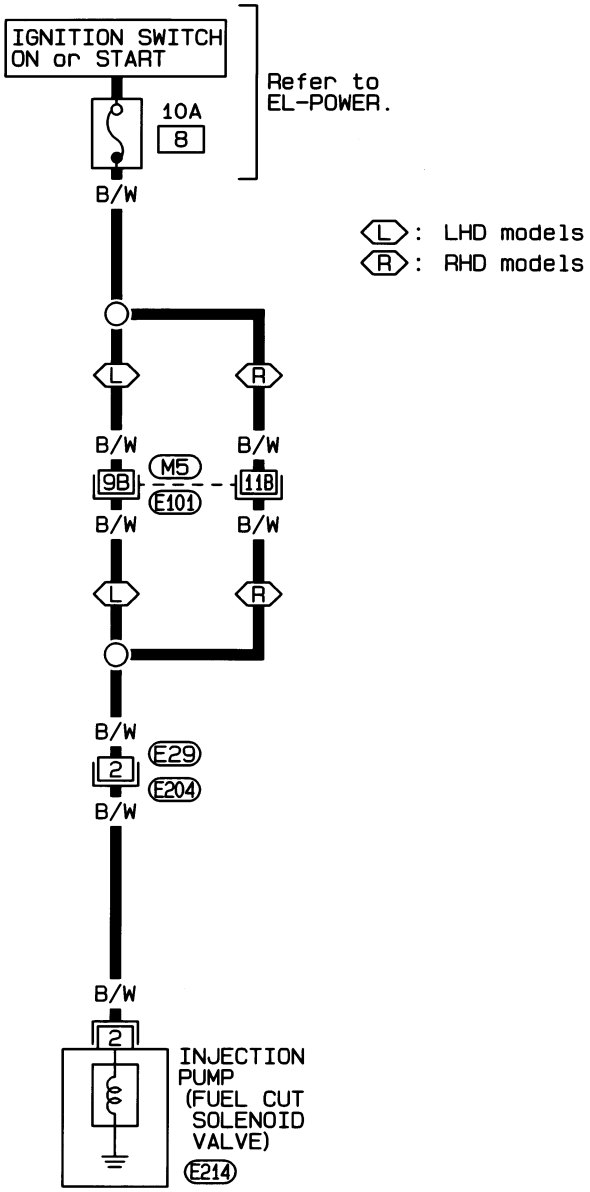
Refer to last page (Foldout page).
M5, E101

HEC719

Wiring Diagram

WITHOUT NATS

EC-FCUT-01



E204 GY

E214 GY

Refer to last page
(Foldout page).

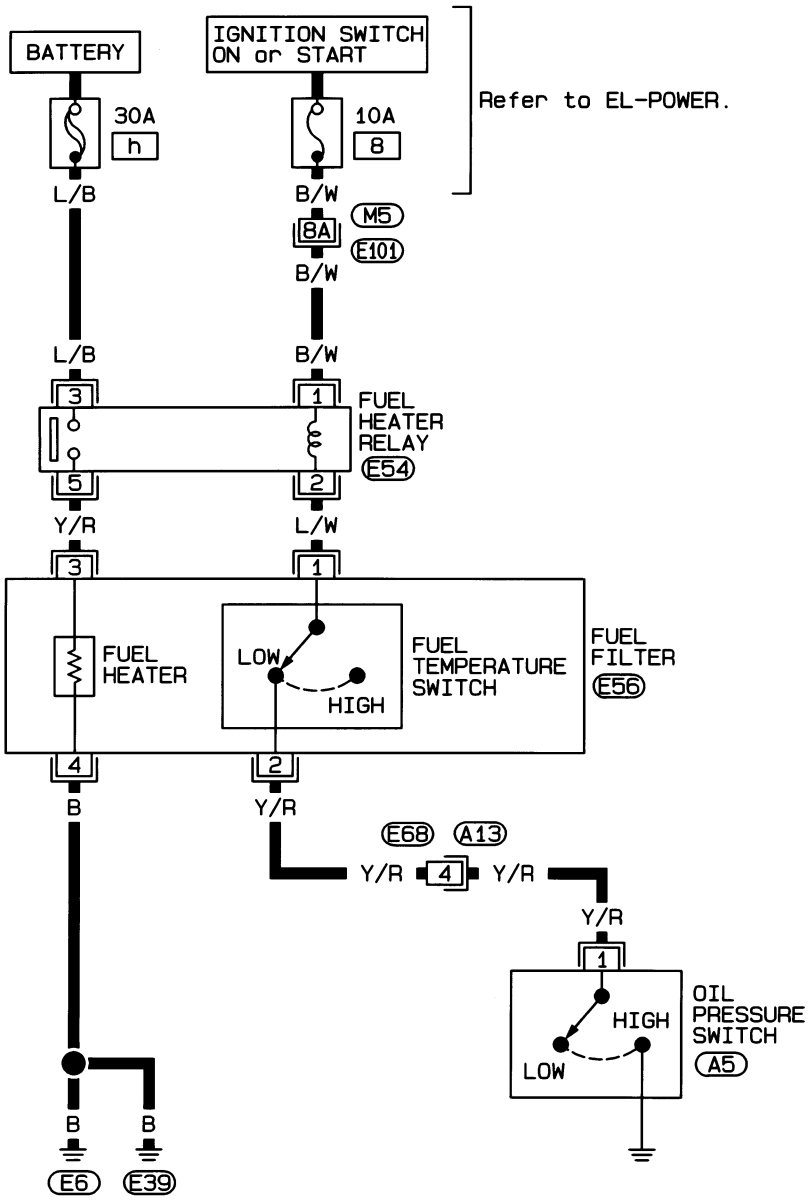
M5, E101

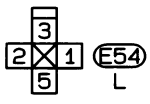
HEC720

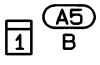
Wiring Diagram

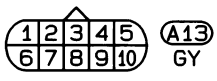
TD25 & TD25Ti ENGINES (RHD)

EC-F/HEAT-01









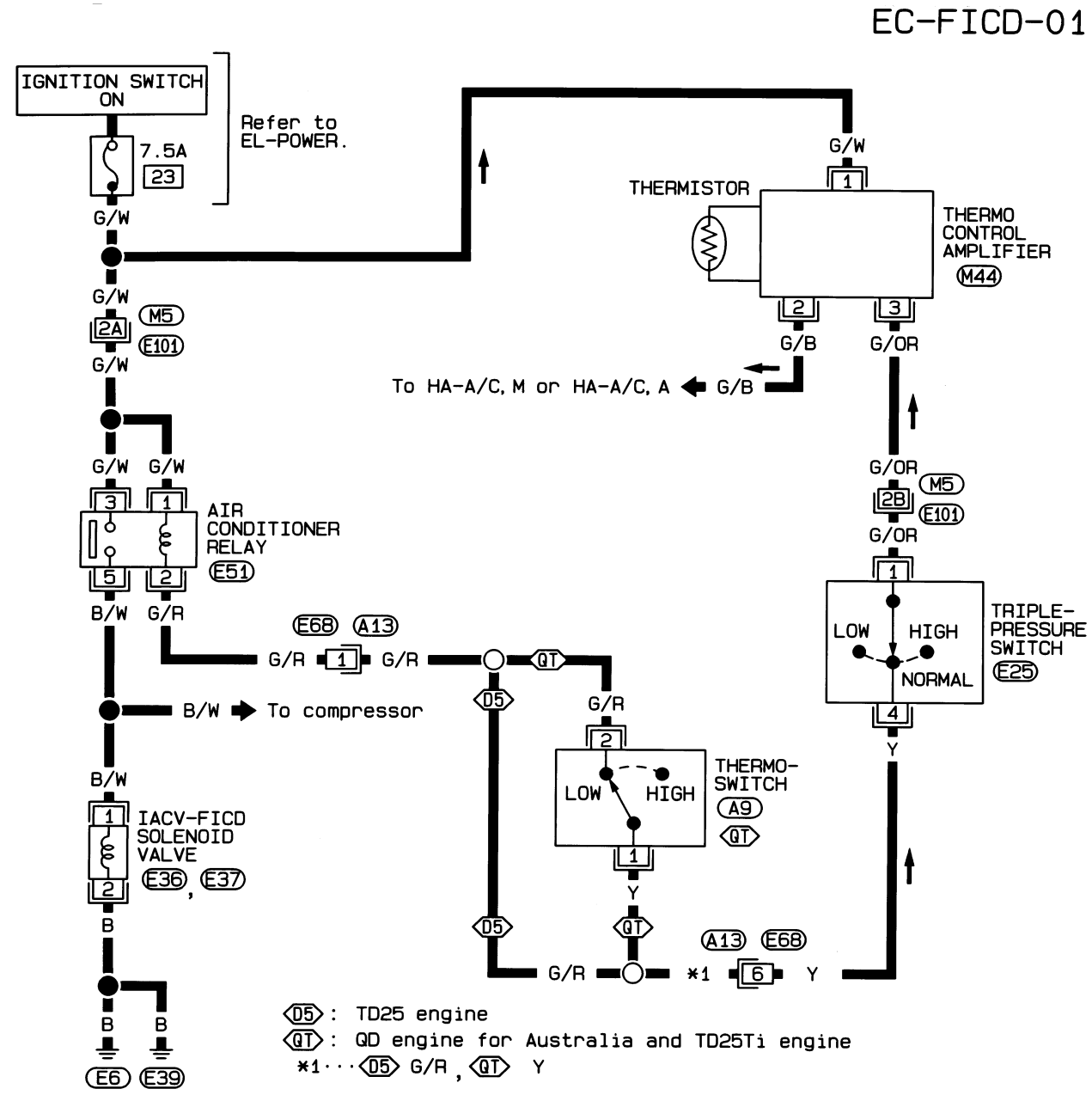
Refer to last page (Foldout page).

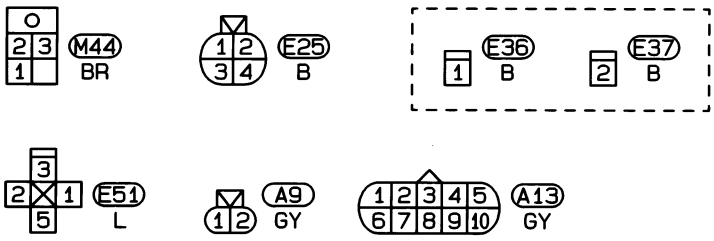
M5, E101

HEC721

Wiring Diagram

QD32 FOR AUSTRALIA, TD25 AND TD25Ti ENGINES





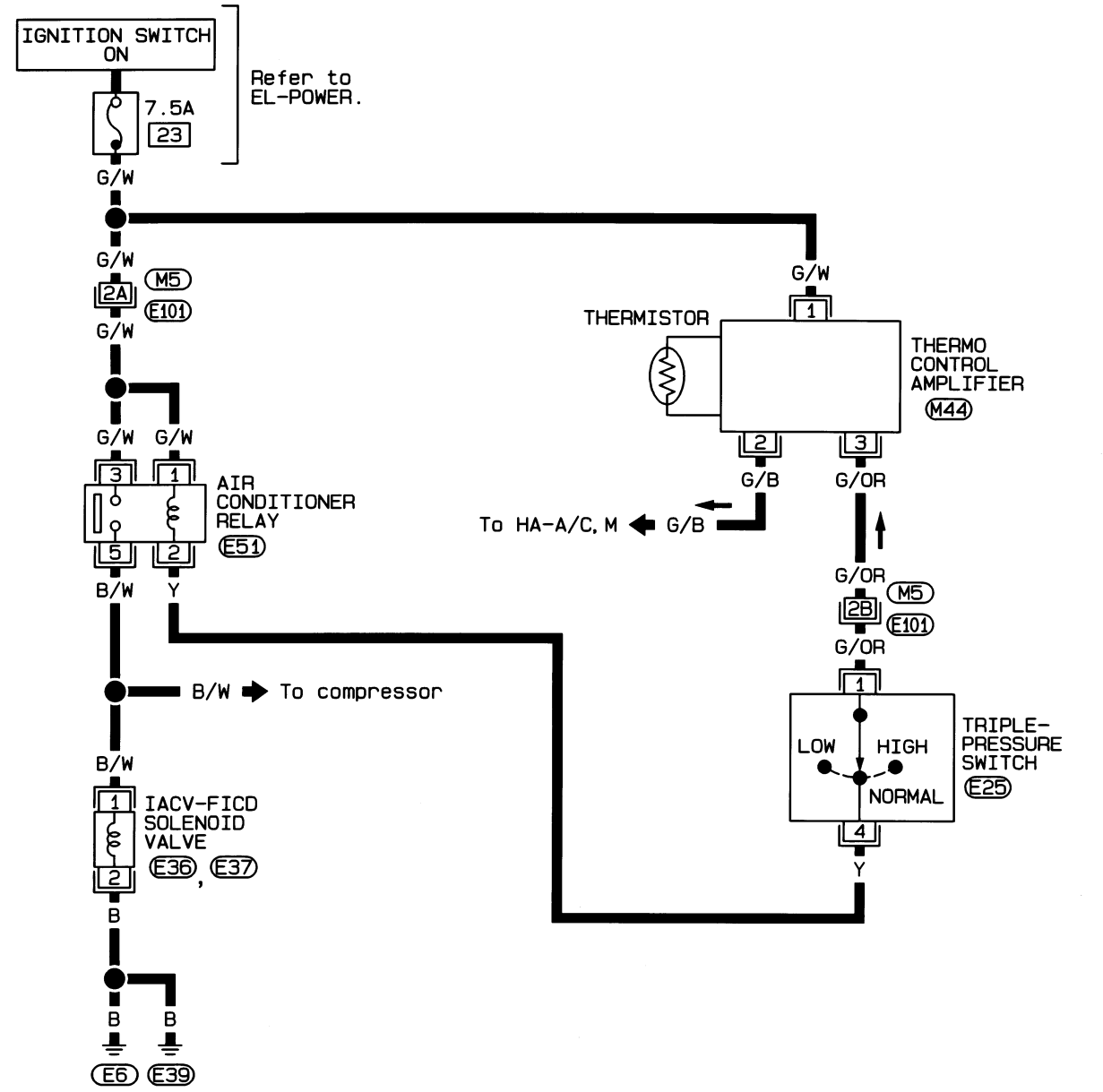
Refer to last page (Foldout page).
M5, E101

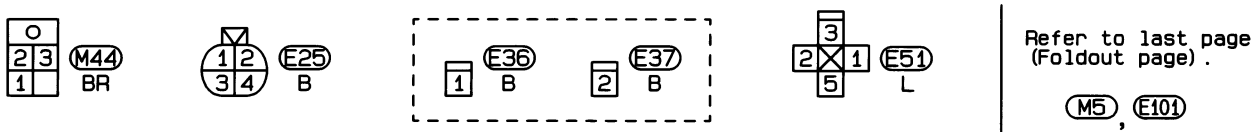
HEC722

Wiring Diagram (Cont'd)

QD32 EXCEPT AUSTRALIA AND TD27 ENGINES

EC-FICD-02





Refer to last page (Foldout page).

M5, E101

HEC723

General Specifications

PRESSURE REGULATOR

Fuel pressure kPa (bar, kg/cm^2, psi)	
At idle	Approximately 235 (2.35, 2.4, 34)
A few seconds after ignition switch is turned OFF to ON	Approximately 294 (2.94, 3.0, 43)

Inspection and Adjustment

Idle speed*1 rpm	Base idle speed*3	650±50
No-load*2 (in "N" position)	Target idle speed	900±50
Air conditioner: ON (in "N" position)	850 or more	
Ignition timing	20°±2° BTDC	

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Steering wheel: Kept in straight-ahead position
- Electrical load: OFF (Lights, heater fan & rear window defogger)

*3: Throttle position sensor connector is disconnected.

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage at idle	V	0.9 - 1.8 at idle* 1.8 - 2.3 at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

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

FUEL PUMP

Resistance [at 25°C (77°F)]	Ω	0.2 - 5.0

IACV-AAC VALVE

Resistance [at 25°C (77°F)]	Ω	Approximately 10.0

INJECTOR

Resistance [at 20°C (68°F)]	Ω	14 - 15

RESISTOR

Resistance [at 25°C (77°F)]	kΩ	Approximately 2.2

THROTTLE POSITION SENSOR

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

HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3

KNOCK SENSOR

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

General Specifications

Carburetor model		DCR384-73
Vacuum break operating clearance	mm (in)	
"R_1" [Below 5±4°C (41±7.2°F)]		1.46±0.15 (0.0575±0.0059)
"R_2" [Above 20±4°C (68±7.2°F)]		3.40±0.3 (0.134±0.0118)
BCDD operating pressure	kPa (mbar, mmHg, inHg)	−78.7±0.7 (−787.0±7.0, −590.4±5.0, −23.24±0.20)

Inspection and Adjustment

IGNITION TIMING

Type I*1	3°±2° BTDC
Type II*2	8°±5° BTDC

*1: Type I: Distributor vacuum hose disconnected and plugged
*2: Type II: Distributor vacuum hose connected