Primera - Model P11 Series

Service Manual

Volume 1

<SUPPLEMENT-III>

NISSAN

PRIMERA

MODEL P11 SERIES

Volume 1

FOREWORD

This supplement contains information concerning necessary service procedures and relevant data for the model P11 series.

All information, illustrations and specifications contained in this supplement are based on the latest product information available at the time of publication. If your NISSAN model differs from the specifications contained in this supplement, consult your NISSAN distributor for information.

The right is reserved to make changes in specifications and methods at any time without notice.

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Edition: January 1998
Printing: January 1998 (01)
Publication No.: SM8E-P11SE0E

NISSAN EUROPE N.V.

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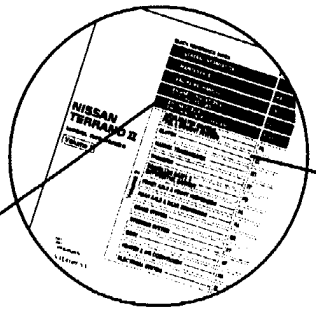
HOW TO USE THIS MANUAL

- This Service Manual contains the new service procedures, service data and specifications for P11 model series which has been in production since January, 1998.
- This Service Manual Supplement does not contain the service procedures, etc. which are the same as those for former models.*
  Please use this manual in conjunction with the NISSAN model P11 series Service Manual (Pub. No. SM6E-0P11E0E and SM7E-P11SE0E).
- Follow the instruction below when using this supplement.

Specific sections titles are printed white on a black background in the QUICK REFERENCE INDEX.

Those sections which are printed black on a white background are not contained in this manual.



YES

NO

Service procedures and service data are added or changed. Use this SUPPLEMENT.
Only the added or changed points are introduced in these chapters.

Service procedures are the same as for the former models. Refer to NISSAN model P11 series Service Manual (Pub. No. SM6E-0P11E0E and SM7E-P11SE0E).

* Former models: Models before the model P11 series introduced in January, 1998.

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the mechanic and the efficient functioning of the vehicle.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.

Service varies with the procedures used, the skills of the mechanic and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.

NISSAN EUROPE N.V.
Service Department
Amsterdam, The Netherlands

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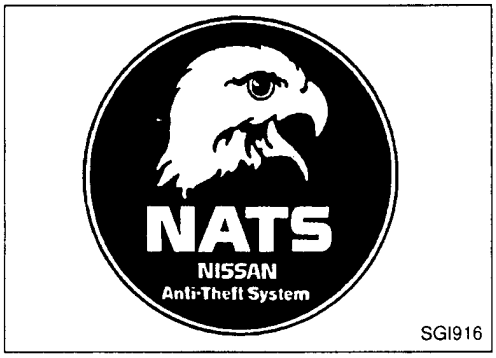
Observe the following precautions to ensure safe and proper servicing.

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

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

WARNING:

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



SGI916

Precautions for NATS V.2.0

NATS (Nissan Anti-Theft System)

NATS V.2.0 will immobilize the engine if someone tries to start it without the registered key of NATS V.2.0.
Both of the originally supplied ignition key IDs have been NATS registered.
The NATS security indicator is located on the instrument panel. The indicator flashes when the ignition switch is in "LOCK" or "Acc" position. Therefore, NATS warns outsiders that the vehicle is equipped with the anti-theft system.

- When NATS detects trouble, the malfunction indicator lamp (MIL) flashes.
  This flashing indicates that the anti-theft is not functioning, so prompt service is required.
- When servicing NATS (trouble diagnoses, system initialisation and additional registration of other NATS ignition key IDs), CONSULT hardware and CONSULT NATS software is necessary.
  Regarding the procedures of NATS initialisation and NATS ignition key ID registration, refer to CONSULT operation manual, NATS V.2.0.

Therefore, CONSULT NATS software (program card and operation manual) must be kept strictly confidential to maintain the integrity of the anti-theft function.

- When servicing NATS V.2.0 (trouble diagnoses, system initialisation and additional registration of other NATS ignition

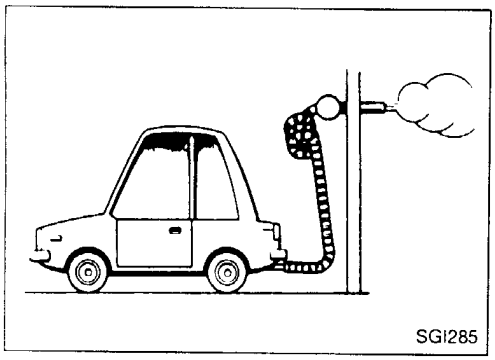
Precautions for NATS V.2.0 (Cont'd)

key IDs), it may be necessary to re-register original key identification. Therefore, be sure to obtain all keys from vehicle owner.
A maximum of four key IDs can be registered into NATS.

- When failing to start the engine first-time using the key of NATS V.2.0, start as follows.
  (1) Leave the ignition key in the "ON" position for approximately 5 seconds.
  (2) Turn ignition key to "LOCK" position.
  (3) Wait approx. 5 seconds.
  (4) Turn ignition key to "START" position again while keeping the key separate from any others on key-chain.

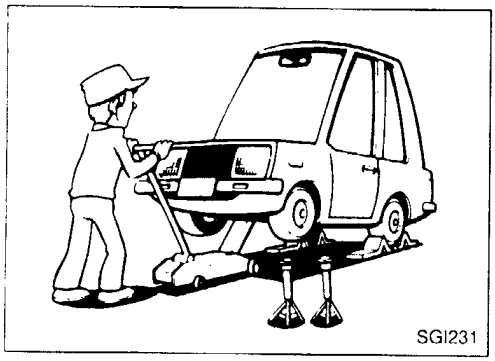
Precautions for Super Lock System

Locking the driver's door or front passenger's door with the key will lock all doors and activate the Super Lock System.
The Super Lock System is designed to prevent theft as it can only be released when a front door is unlocked using a key.
This means, none of the door locks can be operated from the inside using the door lock knob when the Super Lock System is activated.

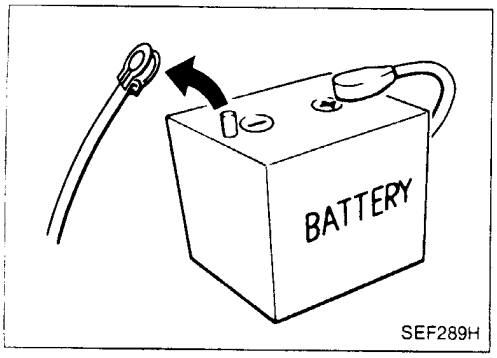

SGI285

General Precautions

- Do not operate the engine for an extended period of time without proper exhaust ventilation.
  Keep the work area well ventilated and free of any flammable materials. Special care should be taken when handling any flammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area before working with hazardous materials.
  Do not smoke while working on the vehicle.


SGI231

- Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting before working on the vehicle.
  These operations should be done on a level surface.
- When removing a heavy component such as the engine or transaxle/transmission, be careful not to lose your balance and drop them. Also, do not allow them to strike adjacent parts, especially the brake tubes and master cylinder.



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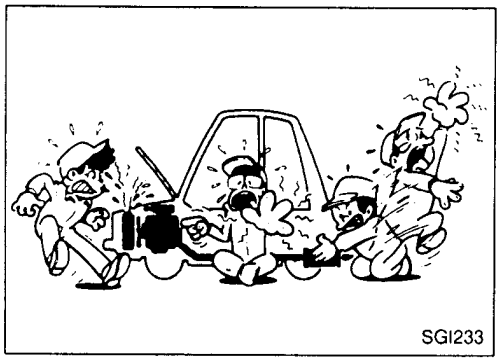
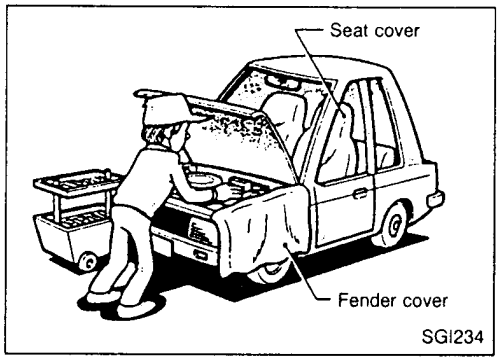
- Before starting repairs which do not require battery power:
  Turn off ignition switch.
  Disconnect the negative battery terminal.

General Precautions (Cont'd)


SGI233

- To prevent serious burns:
  Avoid contact with hot metal parts.
  Do not remove the radiator cap when the engine is hot.

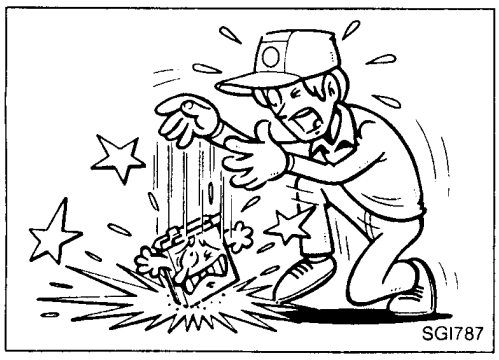


SGI234

- Before servicing the vehicle:
  Protect fenders, upholstery and carpeting with appropriate covers.
  Take care that keys, buckles or buttons do not scratch paint.

- Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
- Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
- Replace inner and outer races of tapered roller bearings and needle bearings as a set.
- Arrange the disassembled parts in accordance with their assembled locations and sequence.
- Do not touch the terminals of electrical components which use microcomputers (such as ECMs).
  Static electricity may damage internal electronic components.
- After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.
- Use only the fluids and lubricants specified in this manual.
- Use approved bonding agent, sealants or their equivalents when required.
- Use tools and recommended special tools where specified for safe and efficient service repairs.
- When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.
- Dispose of drained oil or solvent used for cleaning parts in an appropriate manner.

Precautions for Multiport Fuel Injection System or ECCS Engine


SGI787

- Before connecting or disconnecting any harness connector for the multiport fuel injection system or ECM (ECCS control module):
  Turn ignition switch to "LOCK" position.
  Disconnect negative battery terminal.
  Otherwise, there may be damage to ECM.
- Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure.

- Be careful not to jar components such as ECM and mass air flow sensor.

Precautions for Three Way Catalyst

If a large amount of unburned fuel flows into the catalyst, the catalyst temperature will be excessively high. To prevent this, follow the instructions below:

- Use unleaded gasoline only. Leaded gasoline will seriously damage the three way catalyst.
- When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
- Do not run engine when the fuel tank level is low, otherwise the engine may misfire causing damage to the catalyst.

Do not place the vehicle on flammable material. Keep flammable material off the exhaust pipe and the three way catalyst.

Precautions for Engine Oils

Prolonged and repeated contact with used engine oil may cause skin cancer. Try to avoid direct skin contact with used oil.
If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.

HEALTH PROTECTION PRECAUTIONS

- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- Wear protective clothing, including impervious gloves where practicable.
- Do not put oily rags in pockets.
- Avoid contaminating clothes, particularly underpants, with oil.
- Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly.
- First Aid treatment should be obtained immediately for open cuts and wounds.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
- Wash with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.
- Do not use gasoline, kerosine, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- If skin disorders develop, obtain medical advice without delay.
- Where practicable, degrease components prior to handling.
- Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be provided.

Precautions for Air Conditioning

Use an approved refrigerant recovery unit any time the air conditioning system must be discharged. Refer to HA section ("HFC-134a (R134a) Service Procedure", "SERVICE PROCEDURES") for specific instructions.

Precautions for Air Conditioning (Cont'd)

ENVIRONMENTAL PROTECTION PRECAUTIONS

Burning used engine oil in small space heaters or boilers can be recommended only for units of approved design. The heating system must meet the requirements of HM Inspectorate of Pollution for small burners of less than 0.4 MW. If in doubt check with the appropriate local authority and/or manufacturer of the approved appliance.

Dispose of used oil and used oil filters through authorized waste disposal contractors to licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact the local authority for advice on disposal facilities.

It is illegal to pour used oil on to the ground, down sewers or drains, or into water courses.

The regulations concerning the pollution of the environment will vary between regions.

Precautions for Fuel

GASOLINE ENGINE:

Unleaded gasoline of at least 95 octane (RON)

CAUTION:

Do not use leaded gasoline. Using leaded gasoline will damage the catalytic converter.

DIESEL ENGINE*:

Diesel fuel of at least 50 cetane

* If two types of diesel fuel are available, use summer or winter fuel properly according to the following temperature conditions.

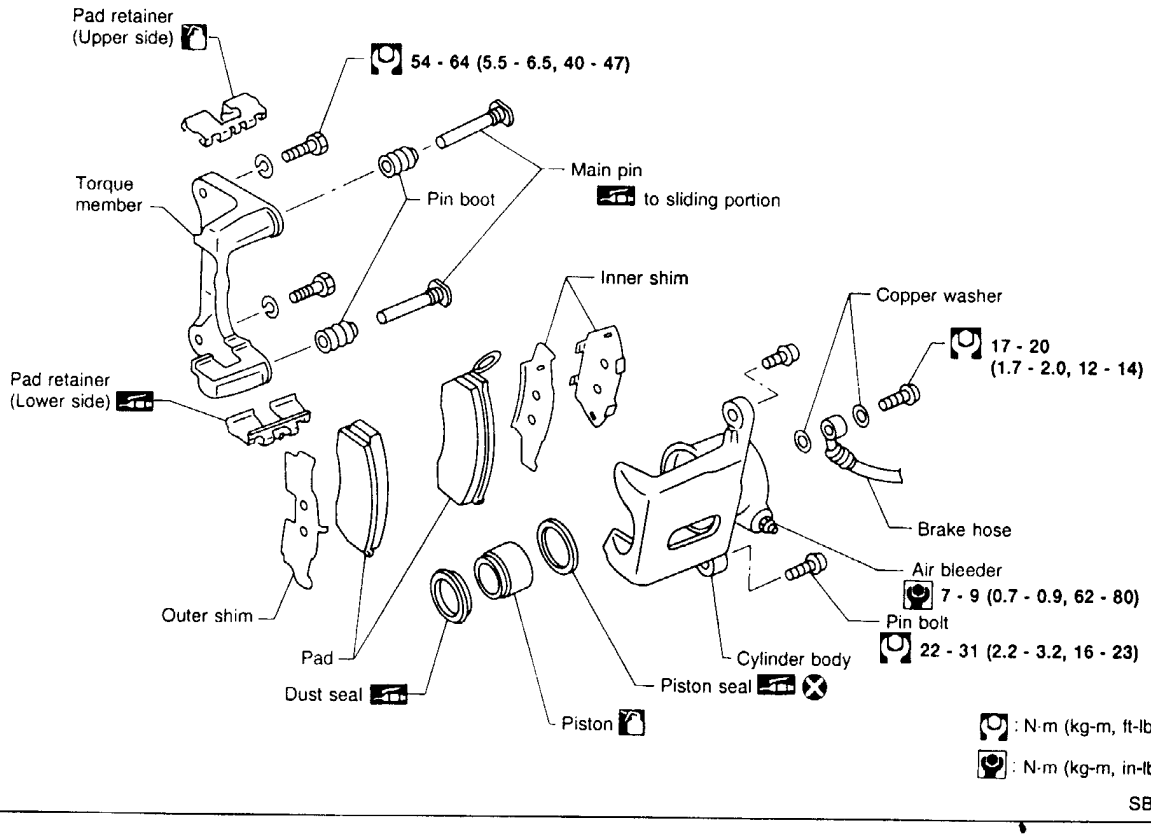
- Above −7°C (20°F) ... Summer type diesel fuel.
- Below −7°C (20°F) ... Winter type diesel fuel.

CAUTION:

- **Do not use home heating oil, gasoline, or other alternate fuels in your diesel engine. The use of fuels other than those recommended by the manufacturer can cause engine damage.**
- **Do not use summer fuel at temperatures below −7°C (20°F). Cold temperatures will cause wax to form in the fuel, as a result, it may prevent the engine from running smoothly.**
- **Do not add gasoline or other alternative fuels to diesel fuel.**

- **ALPHABETICAL INDEX** is provided at the end of this manual so that you can rapidly find the item and page you are searching for.
- **A QUICK REFERENCE INDEX,** a black tab (e.g. BR) is provided on the first page. You can quickly find the first page of each section by mating it to the section's black tab.
- **THE CONTENTS** are listed on the first page of each section.
- **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
- **THE PAGE NUMBER** of each section consists of two letters which designate the particular section and a number (e.g. "BR-5").
- **THE LARGE ILLUSTRATIONS** are exploded views (See below) and contain tightening torques, lubrication points, section number of the **PARTS CATALOG (MICROFICHE)** or **(EURO)FAST** system (E.g. SEC440) and other information necessary to perform repairs.
  The illustrations should be used in reference to service matters only. When ordering parts, refer to the appropriate **PARTS CATALOG.**

"Example"
SEC. 440



- **THE SMALL ILLUSTRATIONS** show the important steps such as inspection, use of special tools, knacks of work and hidden or tricky steps which are not shown in the previous large illustrations.
  Assembly, inspection and adjustment procedures for the complicated units such as the automatic transaxle or transmission, etc. are presented in a step-by-step format where necessary.

- The following **SYMBOLS AND ABBREVIATIONS** are used:

	:	Tightening torque	M/T	:	Manual Transaxle/Transmission
	:	Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.	A/T	:	Automatic Transaxle/Transmission
			A/C	:	Air Conditioner
			P/S	:	Power Steering
			SST	:	Special Service Tools
	:	Should be lubricated with oil.	SAE	:	Society of Automotive Engineers, Inc.
	:	Sealing point			
	:	Checking point	SMJ	:	Super Multiple Junction
	:	Always replace after every disassembly.	ATF	:	Automatic Transmission Fluid
Ⓟ	:	Apply petroleum jelly.	D_1	:	Drive range 1st gear
ATF	:	Apply ATF.	D_2	:	Drive range 2nd gear
★	:	Select with proper thickness.	D_3	:	Drive range 3rd gear
☆	:	Adjustment is required.	D_4	:	Drive range 4th gear
SDS	:	Service Data and Specifications	OD	:	Overdrive
LH, RH	:	Left-Hand, Right-Hand	2_2	:	2nd range 2nd gear
LHD, RHD	:	Left-Hand Drive, Right-Hand Drive	2_1	:	2nd range 1st gear
FR, RR	:	Front, Rear	1_2	:	1st range 2nd gear
			1_1	:	1st range 1st gear

- The **UNITS** given in this manual are primarily expressed as an SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.

  "Example"

  Tightening torque:

  59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

- **TROUBLE DIAGNOSES** are included in sections dealing with complicated components and systems.
- **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
- The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.

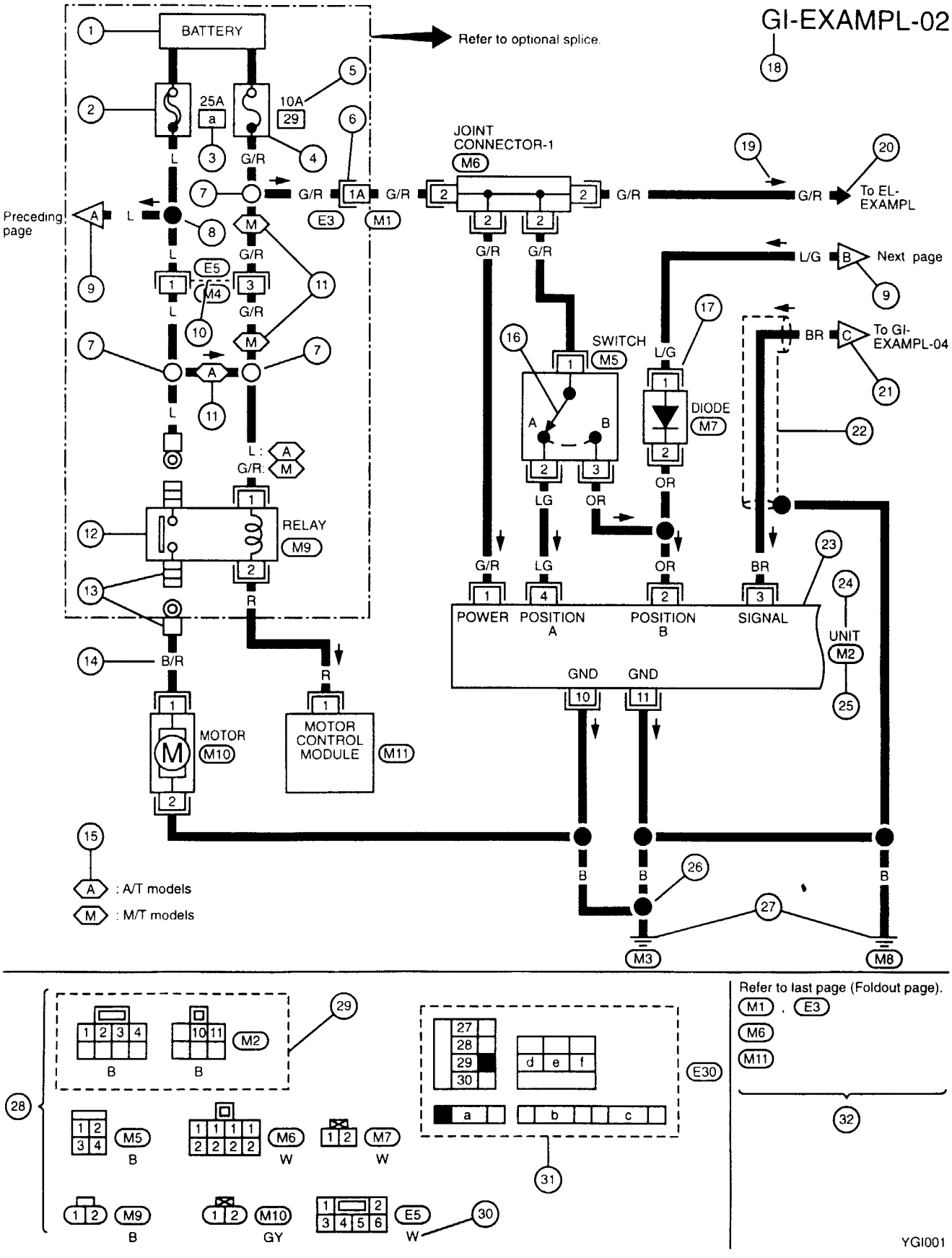
  WARNING indicates the possibility of personal injury if instructions are not followed.

  CAUTION indicates the possibility of component damage if instructions are not followed.

  BOLD TYPED STATEMENTS except **WARNING** and **CAUTION** give you helpful information.

Sample/Wiring Diagram — EXAMPL —

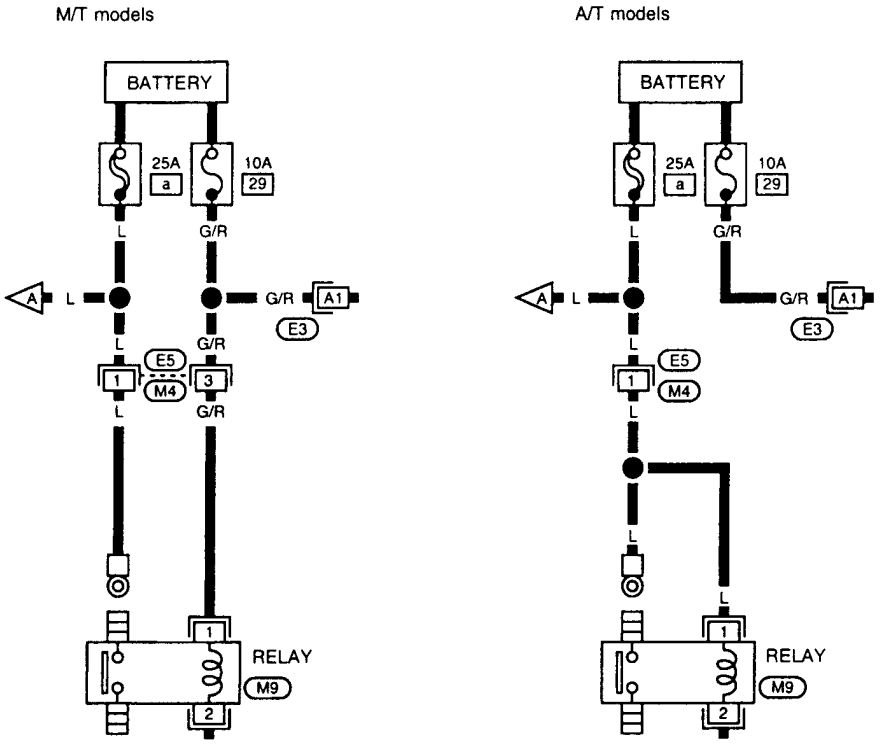
- For Description, refer to GI-10.



Sample/Wiring Diagram — EXAMPL — (Cont'd)

OPTIONAL SPLICE

Optional splice



SGI858

Description

Number	Item	Description
①	Power condition	• This shows the condition when the system receives battery positive voltage (can be operated).
②	Fusible link	• The double line shows that this is a fusible link. • The open circle shows current flow in, and the shaded circle shows current flow out.
③	Fusible link/fuse location	• This shows the location of the fusible link or fuse in the fusible link or fuse box. For arrangement, refer to EL section ("POWER SUPPLY ROUTING").
④	Fuse	• The single line shows that this is a fuse. • The open circle shows current flow in, and the shaded circle shows current flow out.
⑤	Current rating	• This shows the current rating of the fusible link or fuse.
⑥	Connectors	• This shows that connector (E3) is female and connector (M1) is male. • The G/R wire is located in the 1A terminal of both connectors. • Terminal number with an alphanumeric reference (1A, 5B, etc.) indicates that the connector is an SMJ connector. Refer to GI-16.
⑦	Optional splice	• The open circle shows that the splice is optional depending on vehicle application.
⑧	Splice	• The shaded circle shows that the splice is always on the vehicle.
⑨	Page crossing	• This arrow shows that the circuit continues to an adjacent page. • The A will match with the A on the preceding or next page.
⑩	Common connector	• The dotted lines between terminals show that these terminals are part of the same connector.
⑪	Option abbreviation	• This shows that the circuit is optional depending on vehicle application.
⑫	Relay	• This shows an internal representation of the relay. For details, refer to EL section ("STANDARDIZED RELAY").
⑬	Connectors	• This shows that the connector is connected to the body or a terminal with bolt or nut.
⑭	Wire color	• This shows a code for the color of the wire. B = Black, BR = Brown W = White, OR = Orange R = Red, P = Pink G = Green, PU = Purple L = Blue, GY = Gray Y = Yellow, SB = Sky Blue LG = Light Green, CH = Dark Brown DG = Dark Green When the wire color is striped, the base color is given first, followed by the stripe color as shown below: Example: L/W = Blue with White Stripe
⑮	Option description	• This shows a description of the option abbreviation used on the page.
⑯	Switch	• This shows that continuity exists between terminals 1 and 2 when the switch is in the A position. Continuity exists between terminals 1 and 3 when the switch is in the B position.
⑰	Assembly parts	• Connector terminal in component shows that it is a harness incorporated assembly.
⑱	Cell code	• This identifies each page of the wiring diagram by section, system and wiring diagram page number.

Description (Cont'd)

Number	Item	Description
⑲	Current flow arrow	• Arrow indicates electric current flow, especially where the direction of standard flow (vertically downward or horizontally from left to right) is difficult to follow. • A double arrow "◀▶" shows that current can flow in either direction depending on circuit operation.
⑳	System branch	• This shows that the system branches to another system identified by cell code (section and system).
㉑	Page crossing	• This arrow shows that the circuit continues to another page identified by cell code. • The C will match with the C on another page within the system other than the next or preceding pages.
㉒	Shielded line	• The line enclosed by broken line circle shows shield wire.
㉓	Component box in wave line	• This shows that another part of the component is also shown on another page (indicated by wave line) within the system.
㉔	Component name	• This shows the name of a component.
㉕	Connector number	• This shows the connector number. • The letter shows which harness the connector is located in. Example: **M**: main harness. For details and to locate the connector, refer to EL section ("Main Harness", "HARNESS LAYOUT"). A coordinate grid is included for complex harnesses to aid in locating connectors.
㉖	Ground (GND)	• The line spliced and grounded under wire color shows that ground line is spliced at the grounded connector.
㉗	Ground (GND)	• This shows the ground connection.
㉘	Connector views	• This area shows the connector faces of the components in the wiring diagram on the page.
㉙	Common component	• Connectors enclosed in broken line show that these connectors belong to the same component.
㉚	Connector color	• This shows a code for the color of the connector. For code meaning, refer to wire color codes, Number ⑭ of this chart.
㉛	Fusible link and fuse box	• This shows the arrangement of fusible link(s) and fuse(s), used for connector views of "POWER SUPPLY ROUTING" in EL section. The open square shows current flow in, and the shaded square shows current flow out.
㉜	Reference area	• This shows that more information on the Super Multiple Junction (SMJ) and Joint Connectors (J/C) exists on the foldout page. Refer to GI-16 for details.

Description (Cont'd)

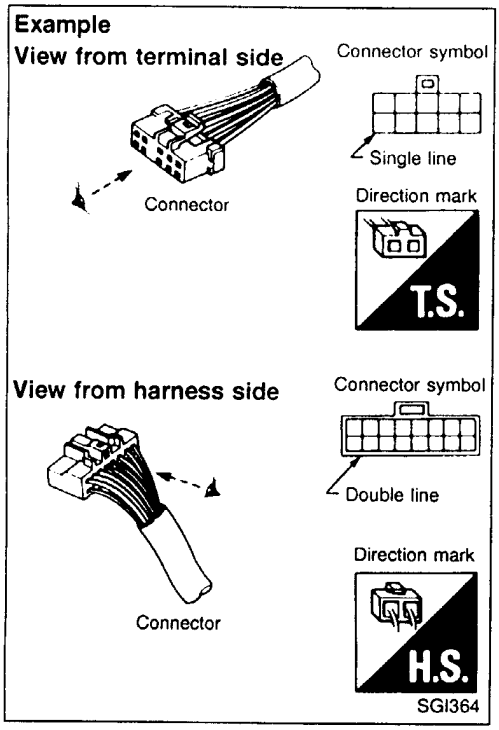
CONNECTOR SYMBOLS

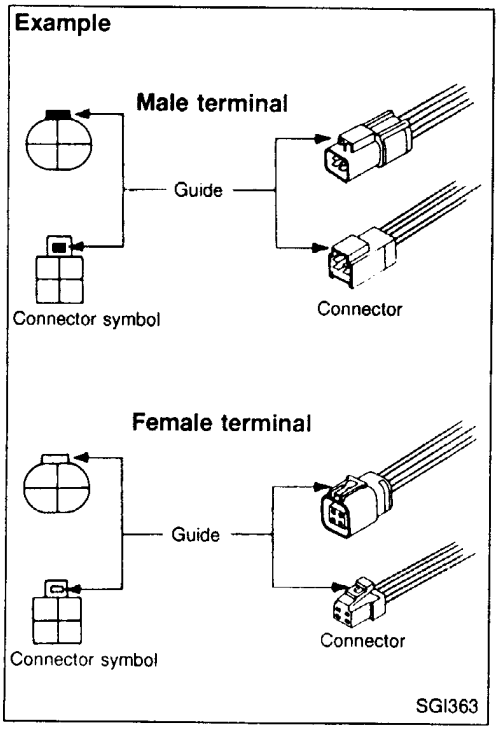
Most of connector symbols in wiring diagrams are shown from the terminal side.

- Connector symbols shown from the **terminal side** are enclosed by a **single line** and followed by the direction mark

.
- Connector symbols shown from the **harness side** are enclosed by a **double line** and followed by the direction mark

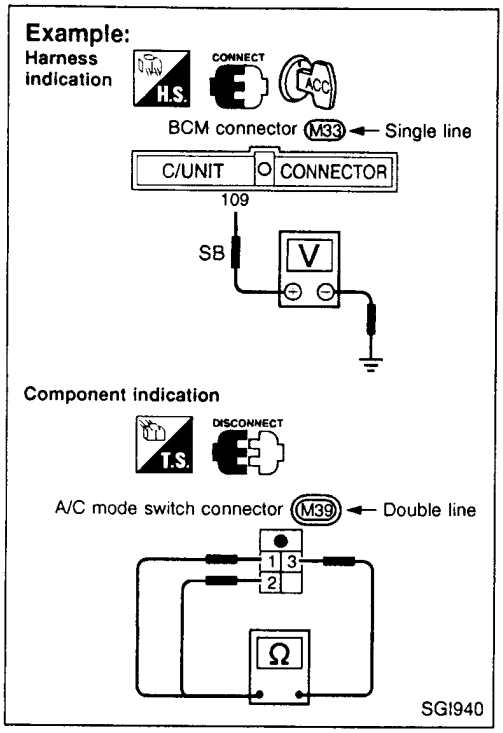
.



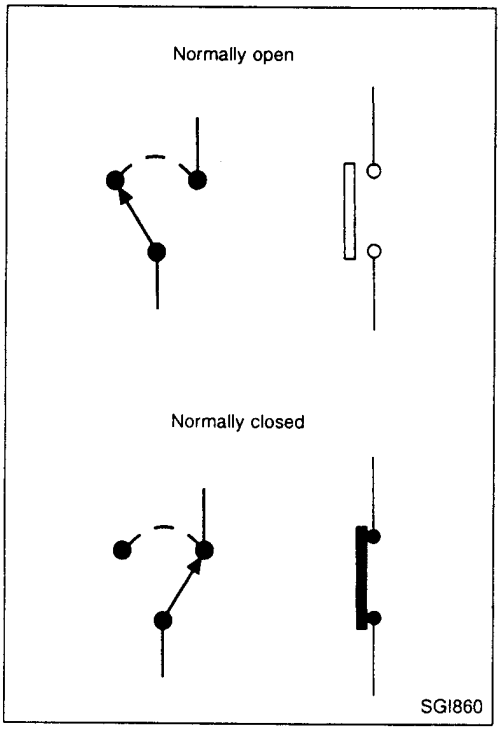


- Male and female terminals
  Connector guides for **male** terminals are shown in **black** and **female** terminals in **white** in wiring diagrams.

Description (Cont'd)



- Connector numbers that indicate the harness side are enclosed by a single line.
- Connector numbers that indicate components are enclosed by a double line.



SWITCH POSITIONS

Switches are shown in wiring diagrams as if the vehicle is in the "normal" condition.

A vehicle is in the "normal" condition when:

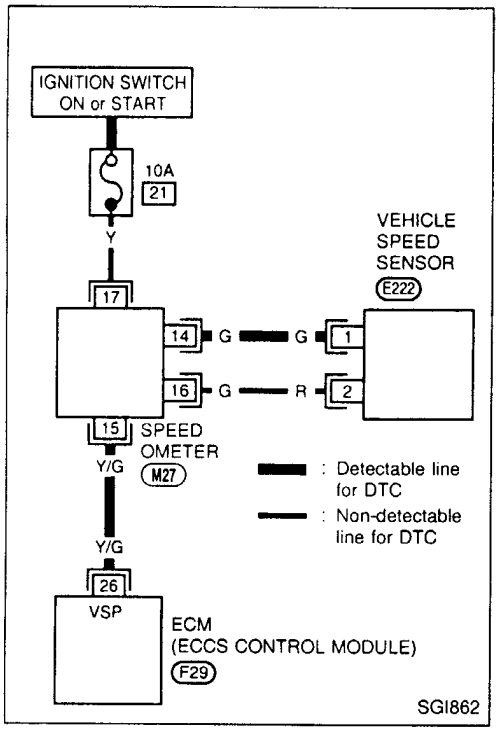
- ignition switch is in the "LOCK" position,
- doors, hood and trunk lid/back door are closed,
- pedals are not depressed, and
- parking brake is released.

Description (Cont'd)

DETECTABLE LINES AND NON-DETECTABLE LINES

In some wiring diagrams, two kinds of lines, representing wires, with different weight are used.

- A line with regular weight (wider line) represents a "detectable line for DTC (Diagnostic Trouble Code)". A "detectable line for DTC" is a circuit in which ECM (ECCS control module) can detect its malfunctions with the on-board diagnostic system.
- A line with less weight (thinner line) represents a "non-detectable line for DTC". A "non-detectable line for DTC" is a circuit in which ECM cannot detect its malfunctions with the on-board diagnostic system.



Description (Cont'd)

MULTIPLE SWITCH

The continuity of a multiple switch is described in two ways as shown below.

- The switch chart is used in schematic diagrams.
- The switch diagram is used in wiring diagrams.

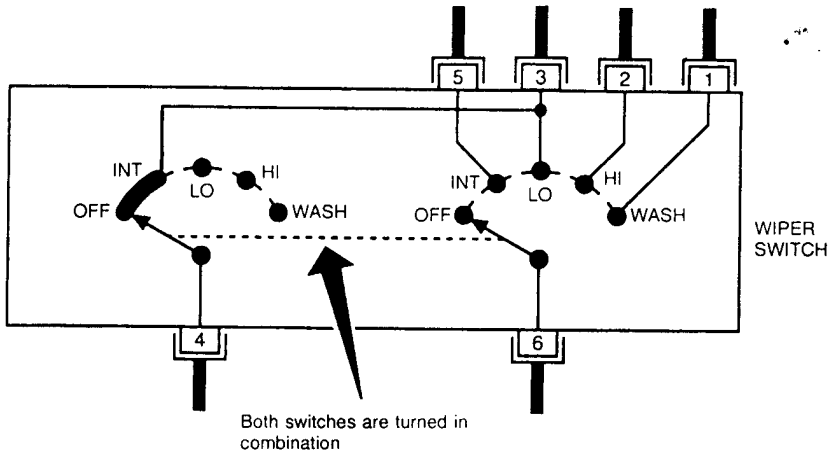
Example

(SWITCH CHART)

WIPER SWITCH

	OFF	INT	LO	HI	WASH
1					○
2				○	
3	○	○	○		
4	○	○			
5		○			
6		○	○	○	○

(SWITCH DIAGRAM)



Continuity circuit of wiper switch

SWITCH POSITION	CONTINUITY CIRCUIT
OFF	3 - 4
INT	3 - 4, 5 - 6
LO	3 - 6
HI	2 - 6
WASH	1 - 6

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Description (Cont'd)

FOLDOUT PAGE

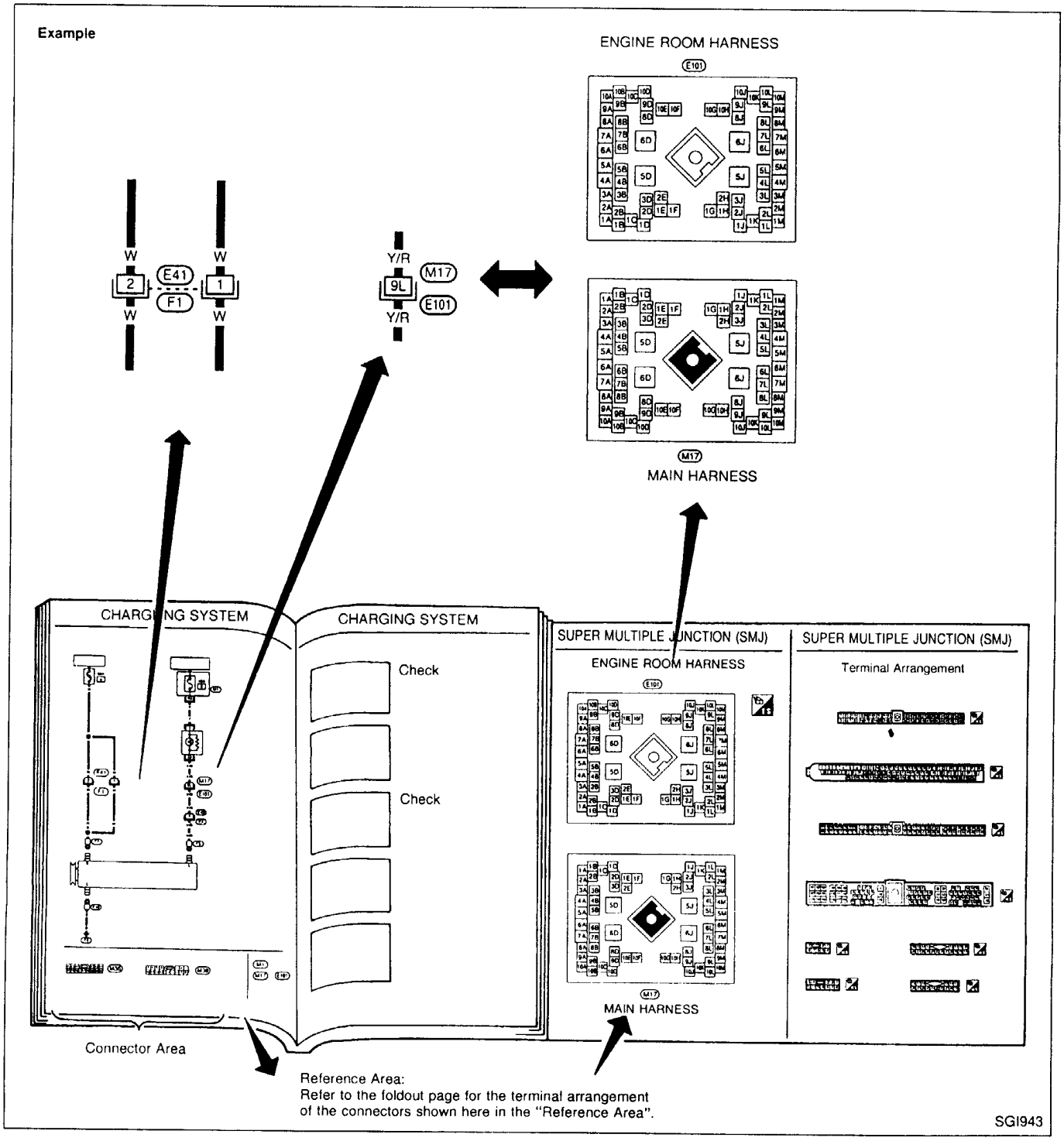
The foldout page should be opened when reading wiring diagrams.

Super multiple junction (SMJ)

In wiring diagrams, connectors consisting of terminals having terminal numbers indicated by an alphanumeric code (B1, D0, etc.) are SMJ connectors.
If connector numbers are shown in Reference Area, these connector symbols are not shown in Connector Area. For terminal arrangement of these connectors, refer to the foldout page at the end of this manual.

Joint connector

Joint connector symbols are shown in Connector Area in the wiring diagram concerned. Foldout page also carries inside wiring layout together with such joint connector symbols.



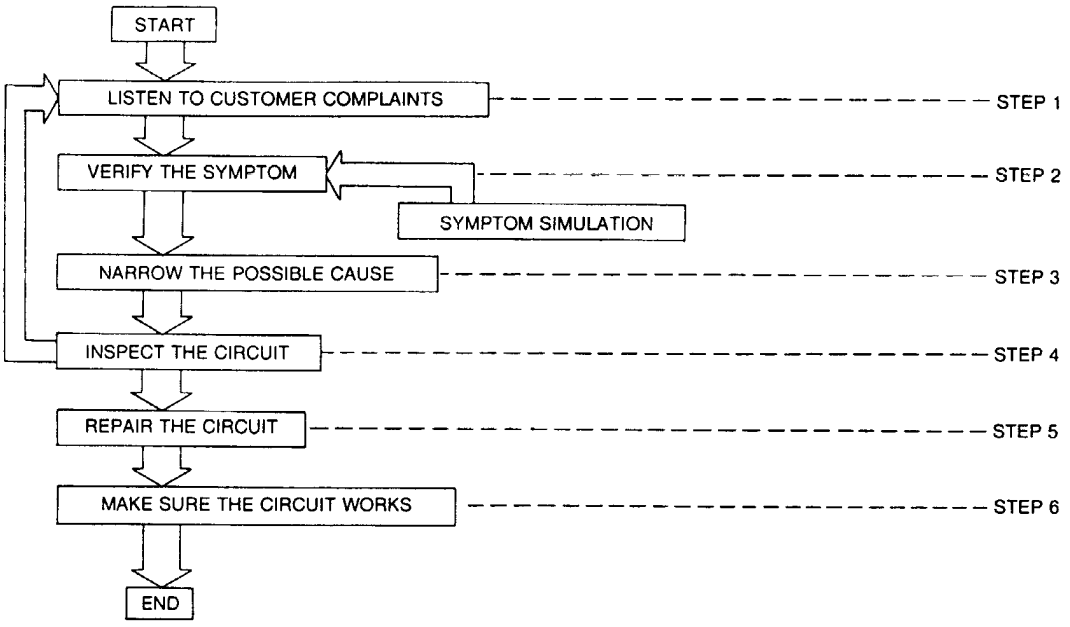
Wiring Diagram Codes (Cell Codes)

Use the chart below to find out what each wiring diagram code stands for.

Code	Section	Wiring Diagram Name
AAC/V	EC	IACV-AAC Valve
ABS	BR	Anti-lock Brake System
ACL/SW	EC	Accelerator Position Switch
ADJRES	EC	Adjustment Resistor
A/C	HA	Manual Air Conditioner
A/CCUT	EC	Air Conditioner Cut Control
ACC/SW	EC	Accelerator Switch (FC)
A/T	AT	Automatic Transmission
AIM	EL	Headlamp Aiming Control
APS	EC	Accelerator Position Sensor
AIRREG	EC	IACV-Air Regulator
AT/C	EC	A/T Control
AUDIO	EL	Audio
BACK/L	EL	Back-up Lamp
BUZZER	EL	Warning Buzzer
CHARGE	EL	Charging System
CKPS	EC	Crankshaft Position Sensor
CHIME	EL	Warning Chime
CMPS	EC	Camshaft Position Sensor
COOL/F	EC	Cooling Fan Control
CSPS	EC	Control Sleeve Position Sensor
DTRL	EL	Headlamp — With Daytime Light System
DEF	EL	Rear Window Defogger
D/LOCK	EL	Power Door Lock
DTRL	EL	Headlamp — With Daytime Light System
ECTS	EC	Engine Coolant Temperature Sensor
EGRC/V	EC	EGR and canister Control Solenoid Valve
FCUT	EC	Fuel Cut Solenoid Valve
F/FOG	EL	Front Fog Lamp
FICD	EC	IACV-FICD Solenoid Valve
F/PUMP	EC	Fuel Pump
FTS	EC	Fuel Temperature Sensor
GLOW	EC	Quick-glow system
GOVNR	EC	Electric Governor
H/LAMP	EL	Headlamp — Without Daytime Light System
H/SEAT	EL	Heated Seat
HEAT	HA	Heater
HLC	EL	Headlamp Washer
HO2S	EC	Heated Oxygen Sensor
HORN	EL	Horn, Cigarette Lighter, Clock
IATS	EC	Intake Air Temperature Sensor
IGN/SG	EC	Ignition Signal

Code	Section	Wiring Diagram Name
ILL	EL	Illumination
INJECT	EC	Injector
INT/L	EL	Interior, Spot and Trunk Room Lamps
KS	EC	Knock Sensor
LOAD	EC	Load Signal
LKUP	EC	Torque Converter Clutch Solenoid Valve
LOAD	EC	Load Signal
MAFS	EC	Mass Air Flow Sensor
MAIN	EC	Main Power Supply and Ground Circuit
METER	EL	Speedometer, Tachometer, Temp. and Fuel Gauges
MIL	EC	Malfunction Indicator Lamp
MIRROR	EL	DOOR MIRROR
NATS	EL	NISSAN ANTI-THEFT SYSTEM
NLS	EC	Needle Lift Sensor
O2S	EC	OXYGEN SENSOR
PGC/V	EC	EVAP CANISTER PURGE CONTROL SOLENOID VALVE
PLA	EC	PARTIAL LOAD ADVANCE CONTROL
PNP/SW	EC	PARK/NEUTRAL POSITION SWITCH
POWER	EL	POWER SUPPLY ROUTING
PST/SW	EC	POWER STEERING OIL PRESSURE SWITCH
R/FOG	EL	REAR FOG LAMP
SROOF	EL	SUN ROOF
SRS	RS	SUPPLEMENTAL RESTRAINT SYSTEM
S/LOCK	EL	Power Door Lock — Super Lock
S/SIG	EC	START SIGNAL
START	EL	STARTING SYSTEM
STOP/L	EL	STOP LAMP
TAIL/L	EL	CLEARANCE, LICENSE, AND TAIL LAMPS
TCV	EC	Injection Timing Control Valve
TPS	EC	THROTTLE POSITION SENSOR
TURN	EL	TURN SIGNAL AND HAZARD WARNING LAMPS
VSS	EC	VEHICLE SPEED SENSOR
VTC	EC	VTC SOLENOID VALVE
WARN	EL	WARNING LAMPS
WINDOW	EL	POWER WINDOW
WIPER	EL	FRONT WIPER AND WASHER
WIP/R	EL	REAR WIPER AND WASHER

Work Flow



STEP	DESCRIPTION
STEP 1	Get detailed information about the conditions and the environment when the incident occurred. The following are key pieces of information required to make a good analysis: **WHAT** Vehicle Model, Engine, Transmission and the System (i.e. Radio). **WHEN** Date, Time of Day, Weather Conditions, Frequency. **WHERE** Road Conditions, Altitude and Traffic Situation. **HOW** System Symptoms, Operating Conditions (Other Components Interaction). Service History and if any After Market Accessories have been installed.
STEP 2	Operate the system, road test if necessary. Verify the parameter of the incident. If the problem can not be duplicated, refer to "Incident Simulation Tests" next page.
STEP 3	Get the proper diagnosis materials together including: POWER SUPPLY ROUTING System Operation Descriptions Applicable Service Manual Sections Identify where to begin diagnosis based upon your knowledge of the system operation and the customer comments.
STEP 4	Inspect the system for mechanical binding, loose connectors or wiring damage. Determine which circuits and components are involved and diagnose using the Power Supply Routing and Harness Layouts.
STEP 5	Repair or replace the incident circuit or component.
STEP 6	Operate the system in all modes. Verify the system works properly under all conditions. Make sure you have not inadvertently created a new incident during your diagnosis or repair steps.

Incident Simulation Tests

INTRODUCTION

Sometimes the symptom is not present when the vehicle is brought in for service. If possible, re-create the conditions present at the time of the incident. Doing so may help avoid a No Trouble Found Diagnosis. The following section illustrates ways to simulate the conditions/environment under which the owner experiences an electrical incident.

The section is broken into the six following topics:

- Vehicle vibration
- Heat sensitive
- Freezing
- Water intrusion
- Electrical load
- Cold or hot start up

Get a thorough description of the incident from the customer. It is important for simulating the conditions of the problem.

VEHICLE VIBRATION

The problem may occur or become worse while driving on a rough road or when engine is vibrating (idle with A/C on). In such a case, you will want to check for a vibration related condition. Refer to the illustration below.

Connectors & harness

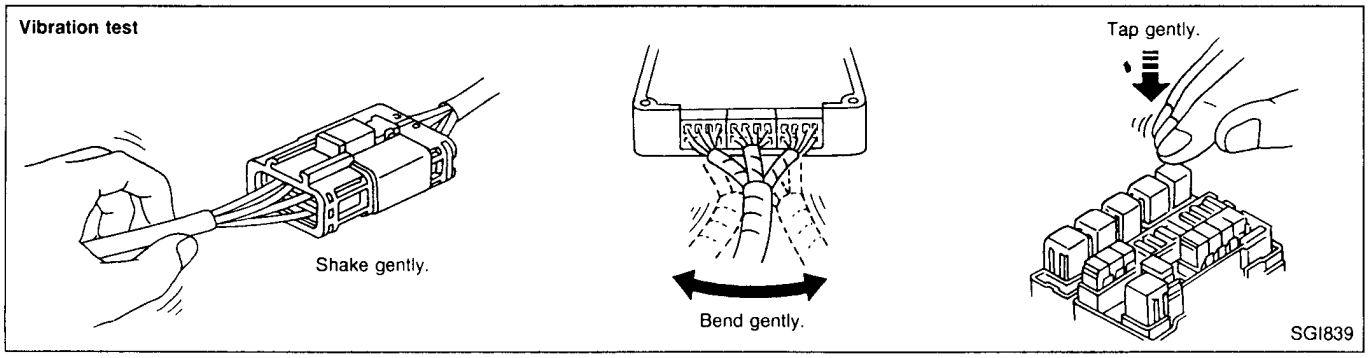
Determine which connectors and wiring harness would affect the electrical system you are inspecting. **Gently** shake each connector and harness while monitoring the system for the incident you are trying to duplicate. This test may indicate a loose or poor electrical connection.

Hint

Connectors can be exposed to moisture. It is possible to get a thin film of corrosion on the connector terminals. A visual inspection may not reveal this without disconnecting the connector. If the problem occurs intermittently, perhaps the problem is caused by corrosion. It is a good idea to disconnect, inspect and clean the terminals on related connectors in the system.

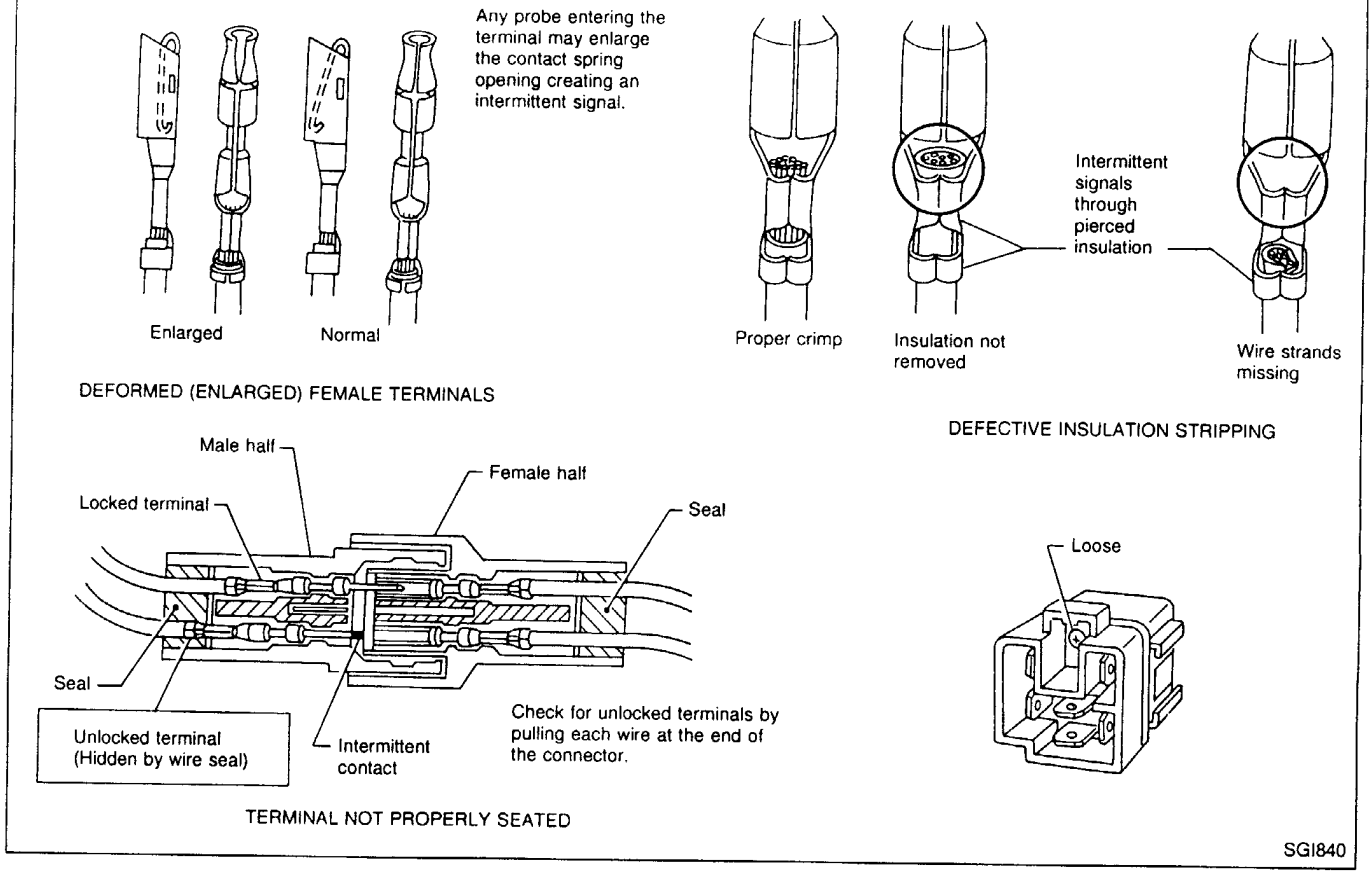
Sensors & relays

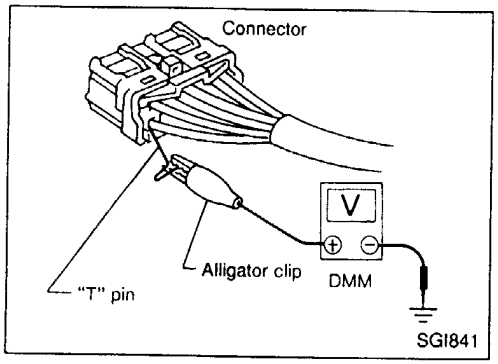
Gently apply a slight vibration to sensors and relays in the system you are inspecting.
This test may indicate a loose or poorly mounted sensor or relay.



Incident Simulation Tests (Cont'd)

Possible cause





Tester probe

When probing a connector it is possible to enlarge the contact spring opening. If this occurs it may create an intermittent signal in the circuit. When probing a connector, use care not to enlarge the opening. The probe of the Digital Multimeter (DMM) may not fit into the connector cavity. In such cases make an extension of a "T" pin and probe it from the harness side of the connector. Most DMMs have accessory alligator clips. Slide these over the probe to allow clipping the "T" pin for a better contact. If you have any difficulty probing a terminal, inspect the terminal. Ensure you have not accidentally opened the contact spring or pulled a wire loose.

Incident Simulation Tests (Cont'd)

Engine compartment

There are several reasons a vehicle or engine vibration could cause an electrical complaint. Some of the things to check for are:

- Connectors not fully seated.
- Wiring harness not long enough and is being stressed due to engine vibrations or rocking.
- Wires laying across brackets or moving components.
- Loose, dirty or corroded ground wires.
- Wires routed too close to hot components.

To inspect components under the hood, start by verifying the integrity of ground connections. (Refer to GROUND INSPECTION described later.) First check that the system is properly grounded. Then check for loose connection by **gently shaking** the wiring or components as previously explained. Using the wiring diagrams inspect the wiring for continuity.

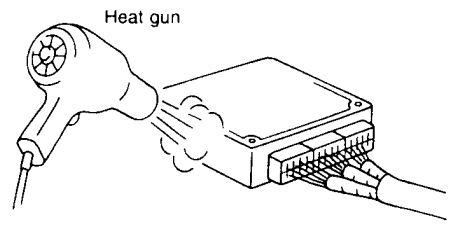
Behind the instrument panel

An improperly routed or improperly clamped harness can become pinched during accessory installation. Vehicle vibration can aggravate a harness which is routed along a bracket or near a screw.

Under seating areas

An unclamped or loose harness can cause wiring to be pinched by seat components (such as slide guides) during vehicle vibration. If the wiring runs under seating areas, inspect wire routing for possible damage or pinching.

Heating test



Do not heat above 60°C (140°F).

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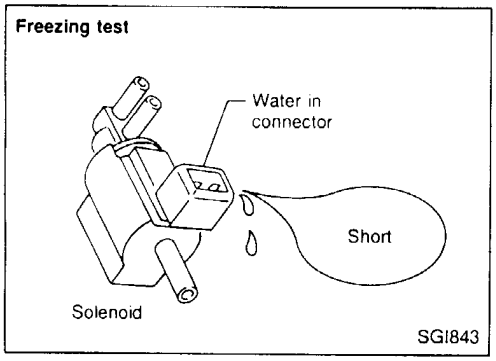
HEAT SENSITIVE

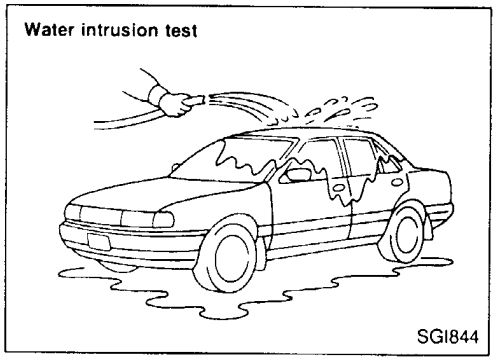
The owner's problem may occur during hot weather or after car has sat for a short time. In such cases you will want to check for a heat sensitive condition.
To determine if an electrical component is heat sensitive, heat the component with a heat gun or equivalent.
Do not heat components above 60°C (140°F). If incident occurs while heating the unit, either replace or properly insulate the component.

Incident Simulation Tests (Cont'd)



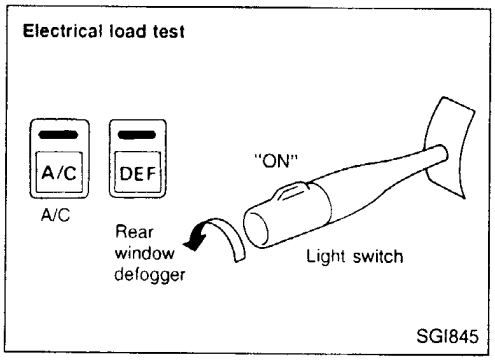
FREEZING

The customer may indicate the incident goes away after the car warms up (winter time). The cause could be related to water freezing somewhere in the wiring/electrical system.
There are two methods to check for this. The first is to arrange for the owner to leave his car overnight. Make sure it will get cold enough to demonstrate his complaint. Leave the car parked outside overnight. In the morning, do a quick and thorough diagnosis of those electrical components which could be affected.
The second method is to put the suspect component into a freezer long enough for any water to freeze. Reinstall the part into the car and check for the reoccurrence of the incident. If it occurs, repair or replace the component.



WATER INTRUSION

The incident may occur only during high humidity or in rainy/snowy weather. In such cases the incident could be caused by water intrusion on an electrical part. This can be simulated by soaking the car or running it through a car wash.
Do not spray water directly on any electrical components.



ELECTRICAL LOAD

The incident may be electrical load sensitive. Perform diagnosis with all accessories (including A/C, rear window defogger, radio, fog lamps) turned on.

COLD OR HOT START UP

On some occasions an electrical incident may occur only when the car is started cold. Or it may occur when the car is restarted hot shortly after being turned off. In these cases you may have to keep the car overnight to make a proper diagnosis.

Circuit Inspection

INTRODUCTION

In general, testing electrical circuits is an easy task if it is approached in a logical and organized method. Before beginning it is important to have all available information on the system to be tested. Also, get a thorough understanding of system operation. Then you will be able to use the appropriate equipment and follow the correct test procedure.
You may have to simulate vehicle vibrations while testing electrical components. **Gently shake** the wiring harness or electrical component to do this.

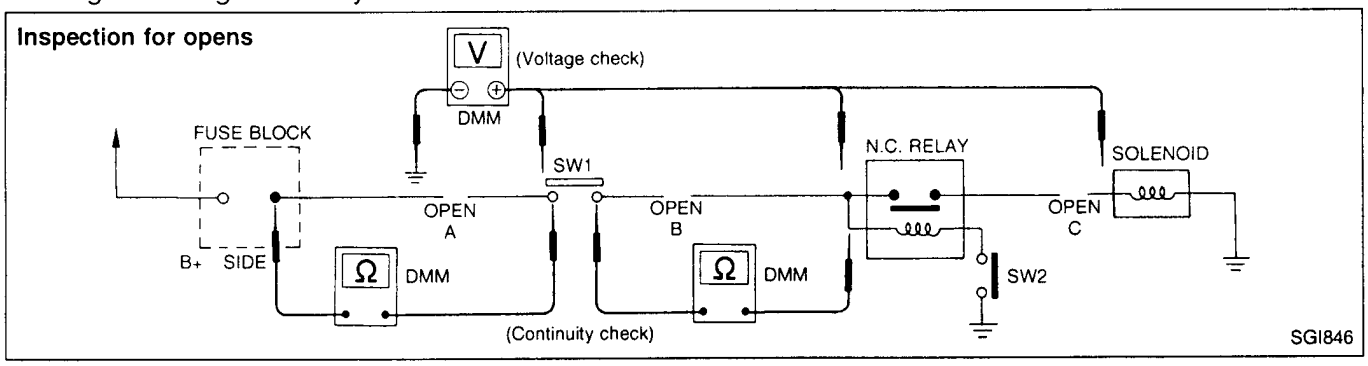
OPEN — A circuit is open when there is no continuity through a section of the circuit.

SHORT — There are two types of shorts.

- SHORT CIRCUIT — When a circuit contacts another circuit and causes the normal resistance to change.
- SHORT TO GROUND — When a circuit contacts a ground source and grounds the circuit.

TESTING FOR "OPENS" IN THE CIRCUIT

Before you begin to diagnose and test the system, you should rough sketch a schematic of the system. This will help you to logically walk through the diagnosis process. Drawing the sketch will also reinforce your working knowledge of the system.



Continuity check method

The continuity check is used to find an open in the circuit. The Digital Multimeter (DMM) set on the resistance function will indicate an open circuit as over limit (OL, no beep tone or no ohms symbol). Make sure to always start with the DMM at the highest resistance level.
To help in understanding the diagnosis of open circuits please refer to the schematic above.

1. Disconnect the battery negative cable.
2. Start at one end of the circuit and work your way to the other end. (At the fuse block in this example)
3. Connect one probe of the DMM to the fuse block terminal on the load side.
4. Connect the other probe to the fuse block (power) side of SW1. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point A)
5. Connect the probes between SW1 and the relay. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point B)
6. Connect the probes between the relay and the solenoid. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point C)

Any circuit can be diagnosed using the approach in the above example.

Circuit Inspection (Cont'd)

Voltage check method

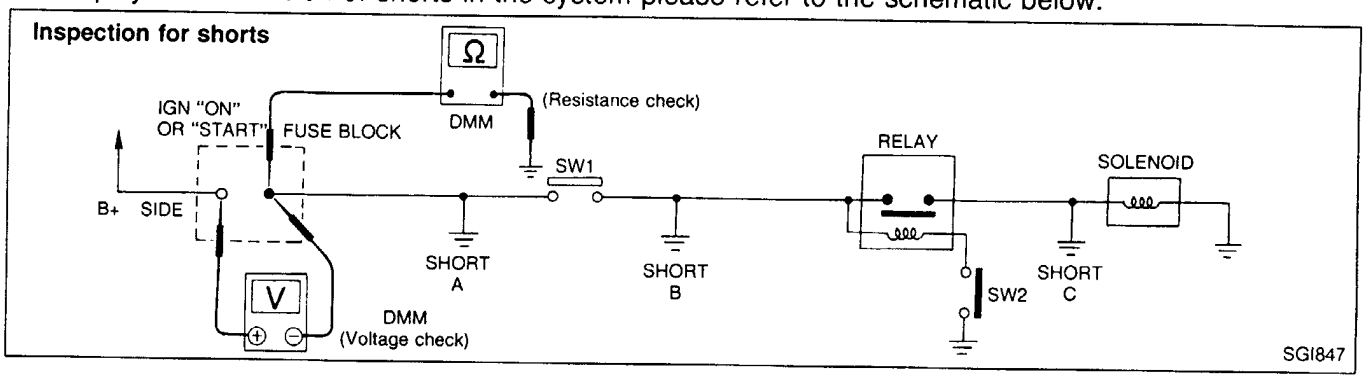
To help in understanding the diagnosis of open circuits please refer to the previous schematic.
In any powered circuit, an open can be found by methodically checking the system for the presence of voltage. This is done by switching the DMM to the voltage function.

1. Connect one probe of the DMM to a known good ground.
2. Begin probing at one end of the circuit and work your way to the other end.
3. With SW1 open, probe at SW1 to check for voltage.
   voltage; open is further down the circuit than SW1.
   no voltage; open is between fuse block and SW1 (point A).
4. Close SW1 and probe at relay.
   voltage; open is further down the circuit than the relay.
   no voltage; open is between SW1 and relay (point B).
5. Close the relay and probe at the solenoid.
   voltage; open is further down the circuit than the solenoid.
   no voltage; open is between relay and solenoid (point C).

Any powered circuit can be diagnosed using the approach in the above example.

TESTING FOR "SHORTS" IN THE CIRCUIT

To simplify the discussion of shorts in the system please refer to the schematic below.



Resistance check method

1. Disconnect the battery negative cable and remove the blown fuse.
2. Disconnect all loads (SW1 open, relay disconnected and solenoid disconnected) powered through the fuse.
3. Connect one probe of the ohmmeter to the load side of the fuse terminal. Connect the other probe to a known good ground.
4. With SW1 open, check for continuity.
   continuity; short is between fuse terminal and SW1 (point A).
   no continuity; short is further down the circuit than SW1.
5. Close SW1 and disconnect the relay. Put probes at the load side of fuse terminal and a known good ground. Then, check for continuity.
   continuity; short is between SW1 and the relay (point B).
   no continuity; short is further down the circuit than the relay.
6. Close SW1 and jump the relay contacts with jumper wire. Put probes at the load side of fuse terminal and a known good ground. Then, check for continuity.
   continuity; short is between relay and solenoid (point C).
   no continuity; check solenoid, retrace steps.

Circuit Inspection (Cont'd)

Voltage check method

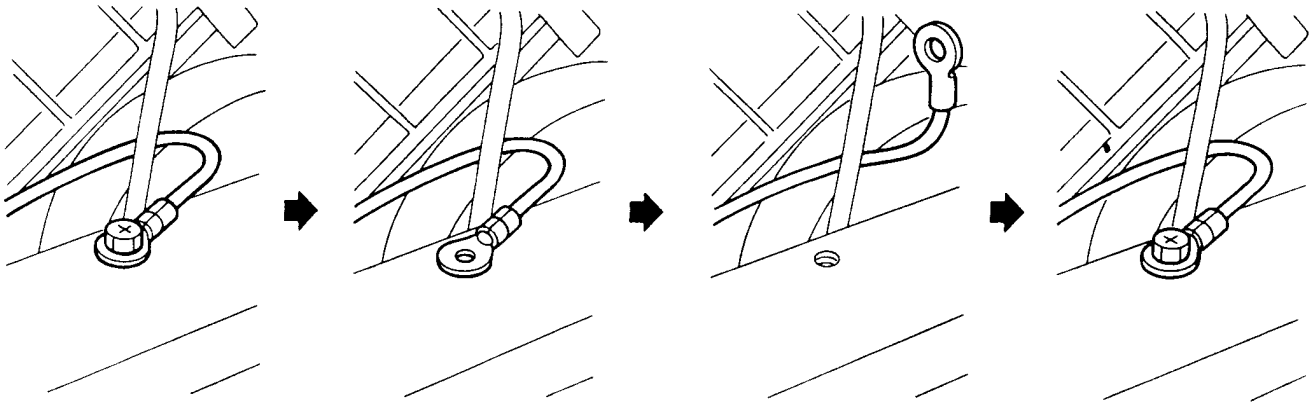
1. Remove the blown fuse and disconnect all loads (i.e. SW1 open, relay disconnected and solenoid disconnected) powered through the fuse.
2. Turn the ignition key to the ON or START position. Verify battery voltage at the B + side of the fuse terminal (one lead on the B + terminal side of the fuse block and one lead on a known good ground).
3. With SW1 open and the DMM leads across both fuse terminals, check for voltage.
   voltage; short is between fuse block and SW1 (point A).
   no voltage; short is further down the circuit than SW1.
4. With SW1 closed, relay and solenoid disconnected and the DMM leads across both fuse terminals, check for voltage.
   voltage; short is between SW1 and the relay (point B).
   no voltage; short is further down the circuit than the relay.
5. With SW1 closed, relay contacts jumped with fused jumper wire check for voltage.
   voltage; short is down the circuit of the relay or between the relay and the disconnected solenoid (point C).
   no voltage; retrace steps and check power to fuse block.

GROUND INSPECTION

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.
Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can easily affect the circuit. Even when the ground connection looks clean, there can be a thin film of rust on the surface.
When inspecting a ground connection follow these rules:

1. Remove the ground bolt screw or clip.
2. Inspect all mating surfaces for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for "add-on" accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are cased in one eyelet make sure no ground wires have excess wire insulation.

Ground Inspection



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Circuit Inspection (Cont'd)

VOLTAGE DROP TESTS

Voltage drop tests are often used to find components or circuits which have excessive resistance. A voltage drop in a circuit is caused by a resistance **when the circuit is in operation.**
Check the wire in the illustration. When measuring resistance with ohmmeter, contact by a single strand of wire will give reading of 0 ohms. This would indicate a good circuit. When the circuit operates, this single strand of wire is not able to carry the current. The single strand will have a high resistance to the current. This will be picked up as a slight voltage drop.
Unwanted resistance can be caused by many situations as follows:

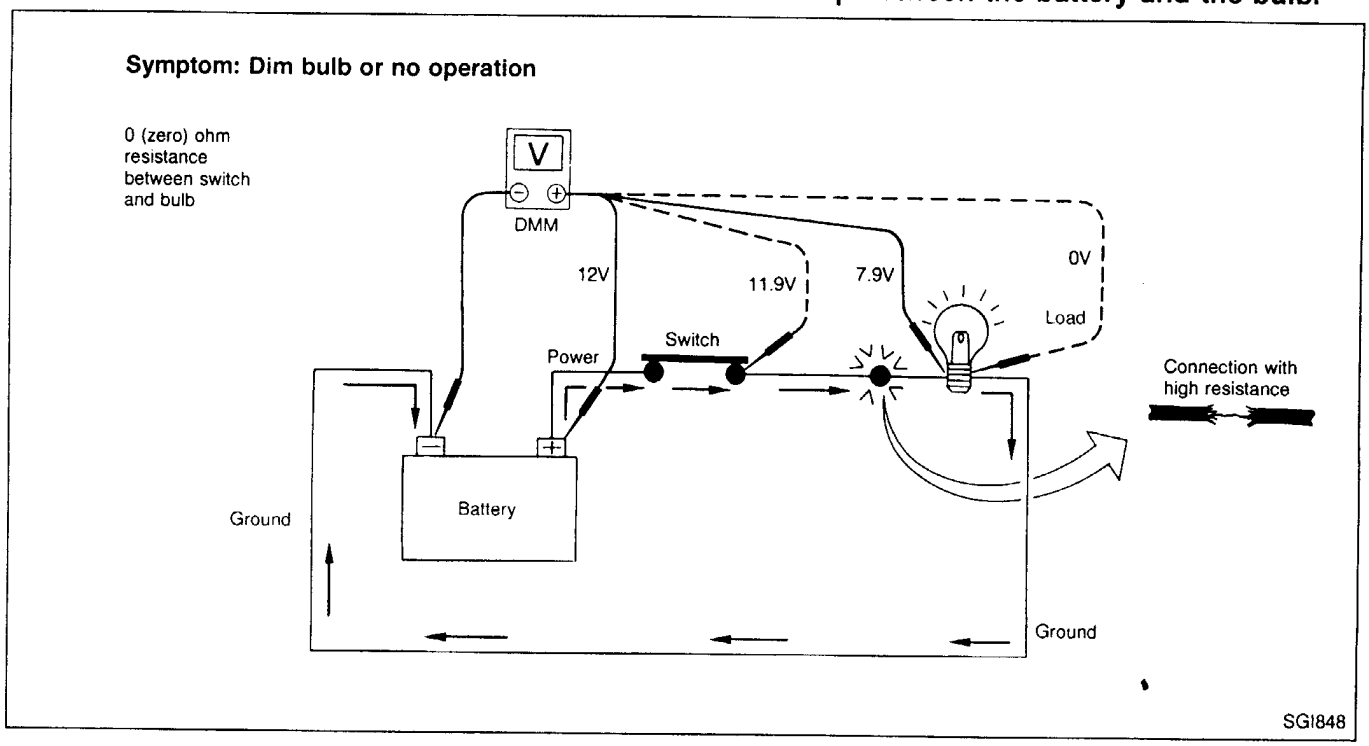
- Undersized wiring (single strand example)
- Corrosion on switch contacts
- Loose wire connections or splices.

If repairs are needed always use wire that is of the same or larger gauge.

Measuring voltage drop — Accumulated method

1. Connect the voltmeter across the connector or part of the circuit you want to check. The positive lead of the voltmeter should be closer to power and the negative lead closer to ground.
2. Operate the circuit.
3. The voltmeter will indicate how many volts are being used to "push" current through that part of the circuit.

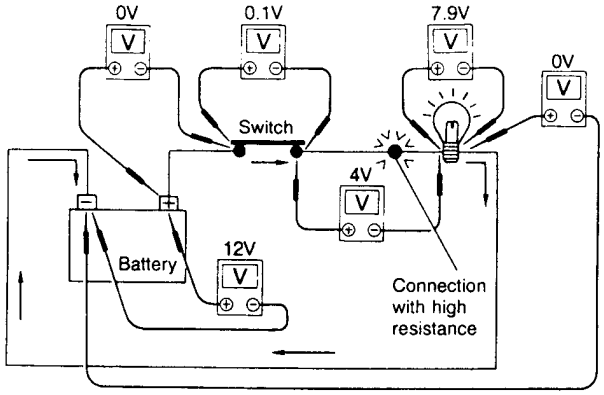
Note in the illustration that there is an excessive 4.1 volt drop between the battery and the bulb.



Measuring voltage drop — Step by step

The step by step method is most useful for isolating excessive drops in low voltage systems (such as those in "Computer Controlled Systems").
Circuits in the "Computer Controlled System" operate on very low amperage.
The (Computer Controlled) system operations can be adversely affected by any variation in resistance in the system. Such resistance variation may be caused by poor connection, improper installation, improper wire gauge or corrosion.
The step by step voltage drop test can identify a component or wire with too much resistance.

Circuit Inspection (Cont'd)



1. Connect the voltmeter as shown, starting at the battery and working your way around the circuit.
2. An unusually large voltage drop will indicate a component or wire that needs to be repaired. The illustration shows a poor connection causes a 4 volt drop.

The chart that follows illustrates some maximum allowable voltage drops. These values are given as a guideline, the exact value for each component may vary.

COMPONENT	VOLTAGE DROP
Wire	Negligible <.001 volts
Ground Connections	Approx. 0.1 volts
Switch Contacts	Approx. 0.3 volts

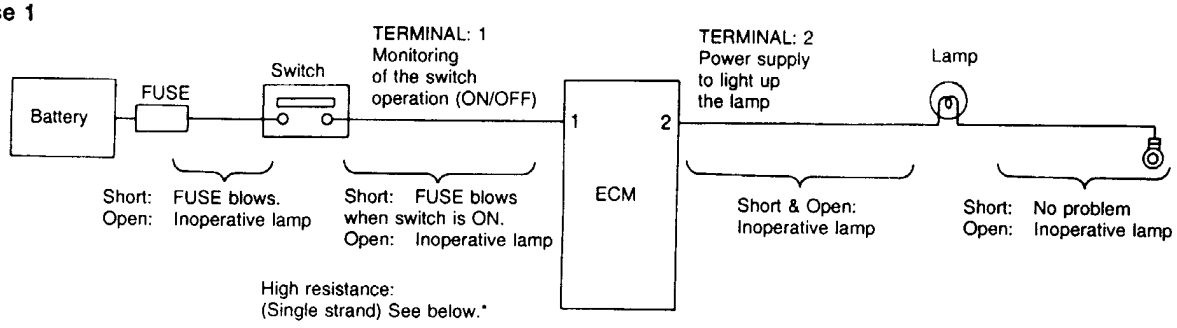
SGI854

Circuit Inspection (Cont'd)

Relationship between open/short (high resistance) circuit and the ECM pin control

System Description: When the switch is ON, the ECM lights up the lamp.

Case 1



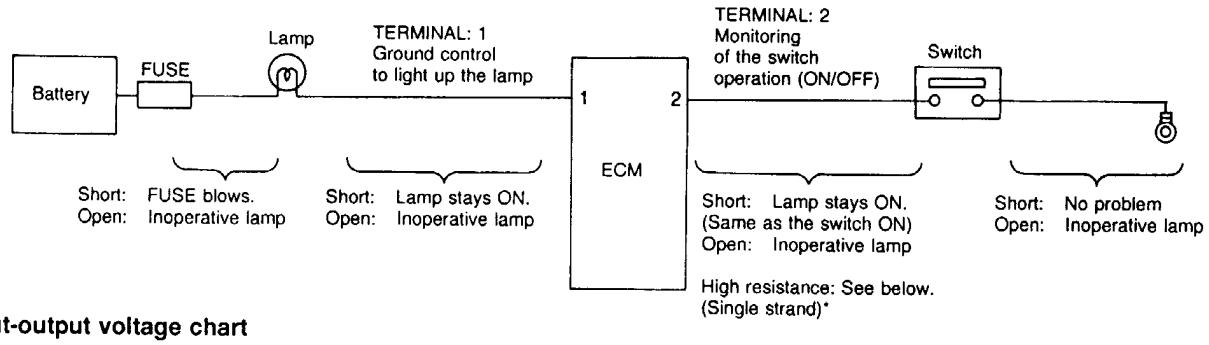
Input-output voltage chart

Pin No.	Item	Condition	Voltage value [V]	In case of high resistance such as single strand [V] *
1	Switch	Switch ON	Battery voltage	Lower than battery voltage Approx. 8 (Example)
		OFF	Approx. 0	Approx. 0
2	Lamp	Switch ON	Battery voltage	Approx. 0 (Inoperative lamp)
		OFF	Approx. 0	Approx.0

The voltage value is based on the body ground.

* : If high resistance exists in the switch side circuit (caused by a single strand), terminal 1 does not detect battery voltage. ECM does not detect the switch is ON even if the switch does turn ON. Therefore, the ECM does not supply power to light up the lamp. .

Case 2



Input-output voltage chart

Pin No.	Item	Condition	Voltage value [V]	In case of high resistance such as single strand [V] *
1	Lamp	Switch ON	Approx. 0	Battery voltage (Inoperative lamp)
		OFF	Battery voltage	Battery voltage
2	Switch	Switch ON	Approx. 0	Higher than 0 Approx. 4 (Example)
		OFF	Approx. 5	Approx.5

The voltage value is based on the body ground.

* : If high resistance exists in the switch side circuit (caused by a single strand), terminal 2 does not detect approx. 0V. ECM does not detect the switch is ON even if the switch does turn ON. Therefore, the ECM does not control ground to light up the lamp.

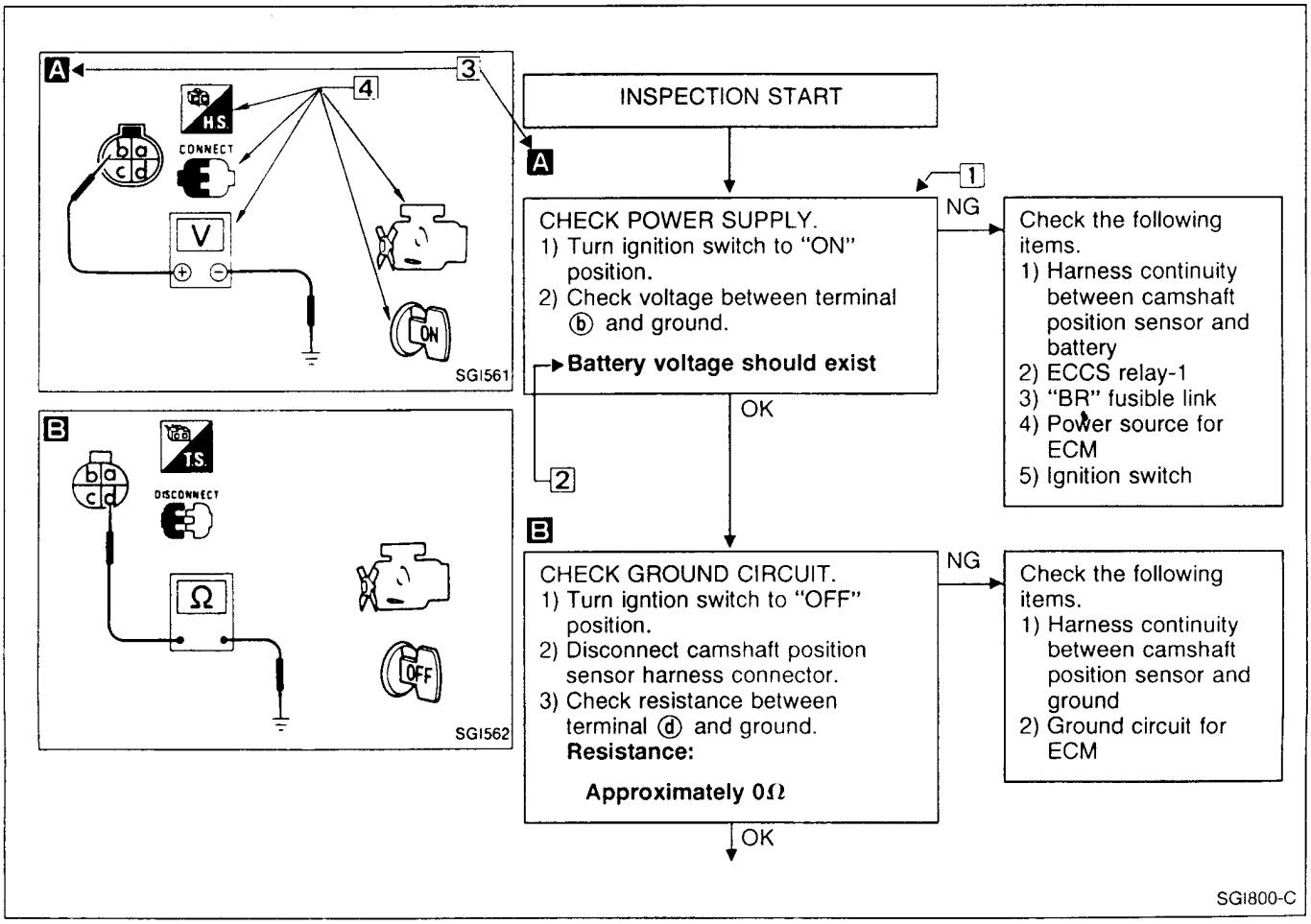
SGI849-A

NOTICE

The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

1) **Use the flow chart after locating probable causes of a problem following the "Preliminary Check", the "Symptom Chart" or the "Work Flow".**
2) **After repairs, re-check that the problem has been completely eliminated.**
3) **Refer to Component Parts and Harness Connector Location for the Systems described in each section for identification/location of components and harness connectors.**
4) **Refer to the Circuit Diagram for Quick Pinpoint Check. If you must check circuit continuity between harness connectors in more detail, such as when a sub-harness is used, refer to Wiring Diagram in each individual section and Harness Layout in EL section for identification of harness connectors.**
5) **When checking circuit continuity, ignition switch should be in the "LOCK" position.**
6) **Before checking voltage at connectors, check battery voltage.**
7) **After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as they were.**

Example



HOW TO FOLLOW THIS FLOW CHART

1 Work and diagnostic procedure

Start to diagnose a problem using procedures indicated in enclosed blocks, as shown in the following example.

A

CHECK POWER SUPPLY.
1) Turn ignition switch to "ON" position.
2) Check voltage between terminal ⑥ and ground.
Battery voltage should exist.

← Check item being performed.

Procedure, steps or measurement results

2 Measurement results

Required results are indicated in bold type in the corresponding block, as shown below:
These have the following meanings:
Battery voltage → 11 - 14V or approximately 12V
Voltage: Approximately 0V → Less than 1V

3 Cross reference of work symbols in the text and illustrations

Illustrations are provided as visual aids for work procedures. For example, symbol A indicated in the left upper portion of each illustration corresponds with the symbol in the flow chart for easy identification. More precisely, the procedure under the "CHECK POWER SUPPLY" outlined previously is indicated by an illustration A.

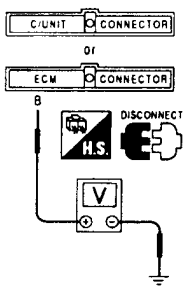
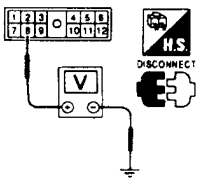
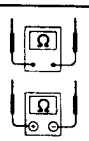
4 Symbols used in illustrations

Symbols included in illustrations refer to measurements or procedures. Before diagnosing a problem, familiarize yourself with each symbol.

Direction mark

Refer to "CONNECTOR SYMBOLS" on GI-12.

Key to symbols signifying measurements or procedures

Symbol	Symbol explanation	Symbol	Symbol explanation
	Check after disconnecting the connector to be measured.		Current should be measured with an ammeter.
	Check after connecting the connector to be measured.		Procedure with CONSULT
	Insert key into ignition switch.		Procedure without CONSULT
	Remove key from ignition switch.		A/C switch is "OFF".
	Turn ignition switch to "LOCK" position.		A/C switch is "ON".
	Turn ignition switch to "ON" position.		Fan switch is "ON". (At any position except for "OFF" position)
	Turn ignition switch to "START" position.		Fan switch is "OFF".
	Turn ignition switch from "LOCK" to "ACC" position.		Apply positive voltage from battery with fuse directly to components.
	Turn ignition switch from "ACC" to "LOCK" position.		Drive vehicle.
	Turn ignition switch from "LOCK" to "ON" position.		Disconnect battery negative cable.
	Turn ignition switch from "ON" to "LOCK" position.		Depress brake pedal.
	Do not start engine, or check with engine stopped.		Release brake pedal.
	Start engine, or check with engine running.		Depress accelerator pedal.
	Apply parking brake.		Release accelerator pedal.
	Release parking brake.		Pin terminal check for SMJ type ECM and A/T control unit connectors. **For details regarding the terminal arrangement, refer to the foldout page.** 
	Check after engine is warmed up sufficiently.		
	Voltage should be measured with a voltmeter.		
	Circuit resistance should be measured with an ohmmeter.		

Function and System Application

Diagnostic test mode	Function	ECCS	ECCS-D	A/T	Air bag	ABS	NATS*1
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT.	×	—	—	—	—	—
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	×	×	×	×	×	×
ECU discriminated No.	Classification number of a replacement ECU can be read to prevent an incorrect ECU from being installed.	—	—	—	×	—	—
Data monitor	Input/Output data in the ECM can be read.	×	×	×	—	×	—
Active test	Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.	×	×	—	—	×	—
ECM part number	ECM part number can be read.	×	×	×	—	×	—
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".	×	—	—	—	—	—
Control unit initialisation	All registered ignition key IDs in NATS components can be initialised and new IDs can be registered.	—	—	—	—	—	×
Self-function check	ECM checks its own NATS communication interface.	—	—	—	—	—	×

×: Applicable
*1: NATS: Nissan Anti-Theft System

Lithium Battery Replacement

CONSULT contains a lithium battery. When replacing the battery obey the following:

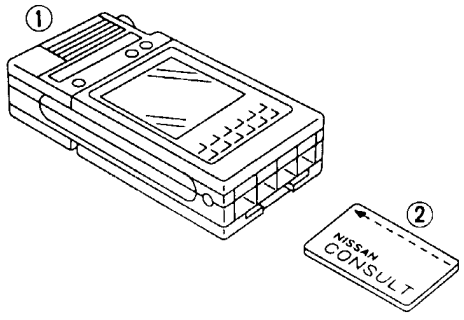
WARNING:

Replace the lithium battery with SANYO Electric Co., Ltd., CR2032 only. Use of another battery may present a risk of fire or explosion. The battery may present a fire or chemical burn hazard if mistreated. Do not recharge, disassemble or dispose of in fire.

Keep the battery out of reach of children and discard used battery conforming to the local regulations.

Checking Equipment

When ordering the equipment below, contact your NISSAN distributor.

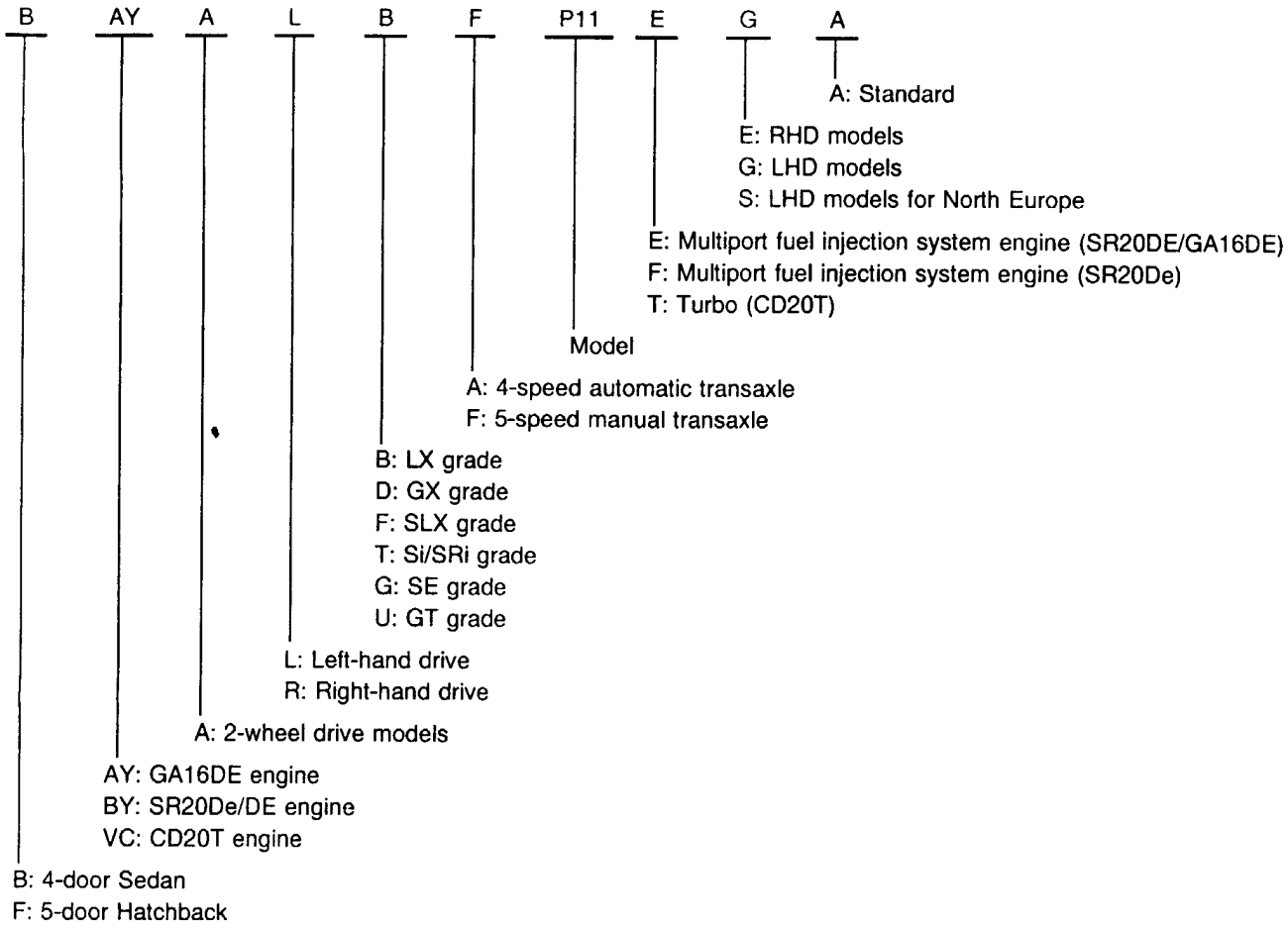
Tool name	Description
NISSAN CONSULT ① CONSULT unit and accessories ② Program card (EE 960) (NATS-E940)	 NT004

Model Variation

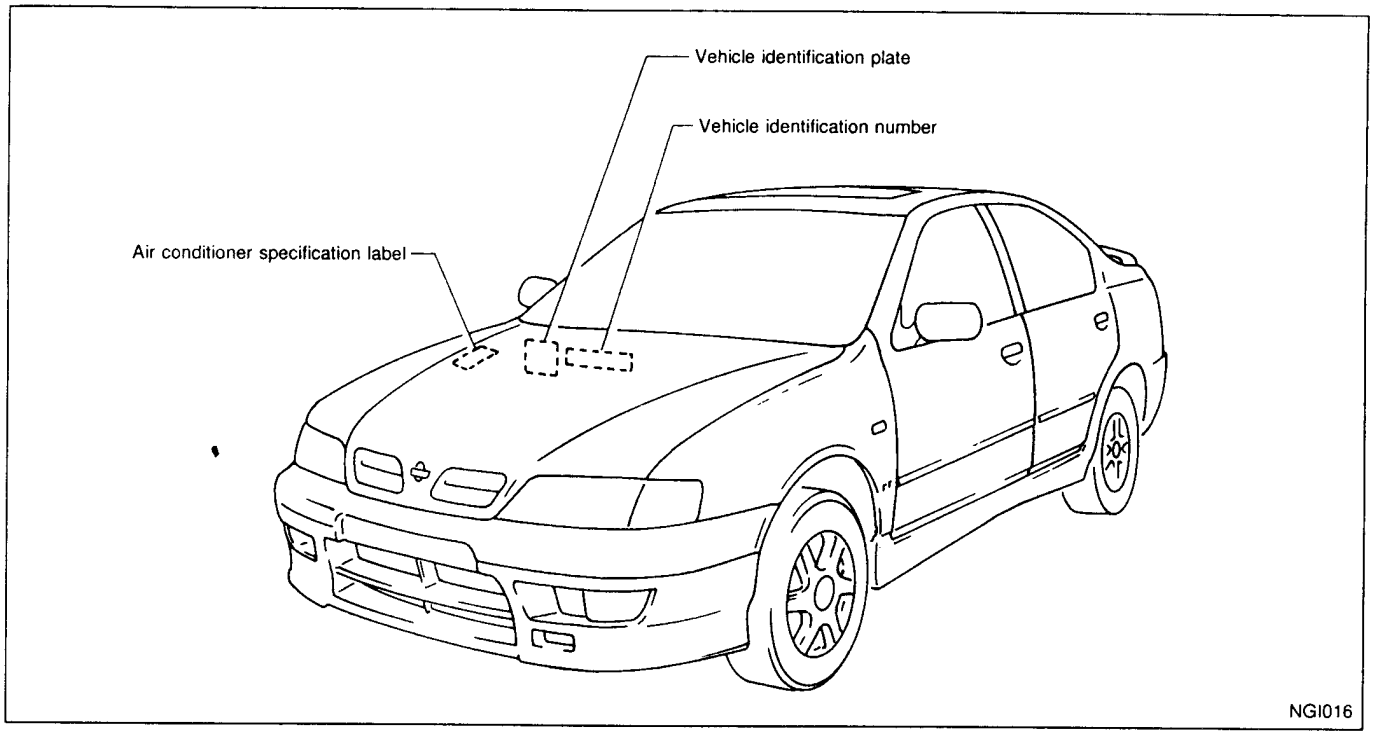
Body	Engine	Transaxle	Destination / Grade	RHD	LHD For Central & South Europe	LHD For North Europe
4-door Sedan	GA16DE	RS5F31A	LX	BAYARBF-EEA	BAYALBF-EGA	BAYALBF-ESA
			GX	BAYARDF-EEA	BAYALDF-EGA	BAYALDF-ESA
			SLX	BAYARFF-EEA	BAYALFF-EGA	BAYALFF-ESA
			Si	BAYARTF-EEA	BAYALTF-EGA	BAYALTF-ESA
	SR20De	RS5F32A	GX	BBYARDF-FEA	BBYALDF-FGA	BBYALDF-FSA
			SLX	BBYARFF-FEA	BBYALFF-FGA	BBYALFF-FSA
			SE	BBYARGF-FEA	BBYALGF-FGA	BBYALGF-FSA
			SRi	BBYARTF-FEA	BBYALTF-FGA	BBYALTF-FSA
		RE4F03A	GX	BBYARDA-FEA	BBYALDA-FGA	
			SLX	BBYARFA-FEA	BBYALFA-FGA	BBYALFA-FSA
			SE	BBYARGA-FEA	BBYALGA-FGA	
	SR20DE	RS5F32A	GT	BBYARUF-EEA	BBYALUF-EGA	BBYALUF-ESA
	CD20T	RS5F32A	GX	BVCARDF-TEA	BVCALDF-TGA	
			SLX	BVCARFF-TEA	BVCALFF-TGA	BVCALFF-TSA
5-door Hatchback	GA16DE	RS5F31A	LX	FAYARBF-EEA		
			GX	FAYARDF-EEA	FAYALDF-EGA	FAYALDF-ESA
			SLX	FAYARFF-EEA	FAYALFF-EGA	
			Si	FAYARTF-EEA	FAYALTF-EGA	FAYALTF-ESA
	SR20De	RS5F32A	GX	FBYARDF-FEA	FBYALDF-FGA	FBYALDF-FSA
			SLX	FBYARFF-FEA	FBYALFF-FGA	FBYALFF-FSA
			SE	FBYARGF-FEA	FBYALGF-FGA	
			SRi	FBYARTF-FEA	FBYALTF-FGA	FBYALTF-FSA
		RE4F03A	GX	FBYARDA-FEA	FBYALDA-FGA	
			SLX	FBYARFA-FEA	FBYALFA-FGA	
			SE	FBYARGA-FEA	FBYALGA-FGA	
	SR20DE	RS5F32A	GT	FBYARUF-EEA	FBYALUF-EGA	
	CD20T	RS5F32A	GX	FVCARDF-TEA	FVCALDF-TGA	
			SLX	FVCARFF-TEA	FVCALFF-TGA	

Model Variation (Cont'd)

Prefix and suffix designations:



Identification Number



VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

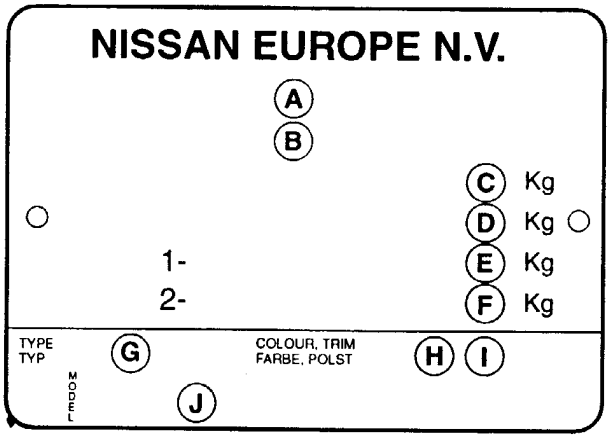
For Europe

SJN B A A P11 U 0 XXXXXX

- SJN — Manufacturer
  SJN : Nissan, Passenger vehicle
- B — Body type
  B : 4-door Sedan
  F : 5-door Hatchback
- A — Engine type
  A : GA16DE engine
  C : SR20De or SR20DE engine
  D : CD20T engine
- A — Model
  A : 2-wheel drive
- P11 — Model
- U — Destination
  U : Europe
- 0 — 0 : Stopgap (no meaning)
- XXXXXX — Vehicle serial number

Identification Number (Cont'd)

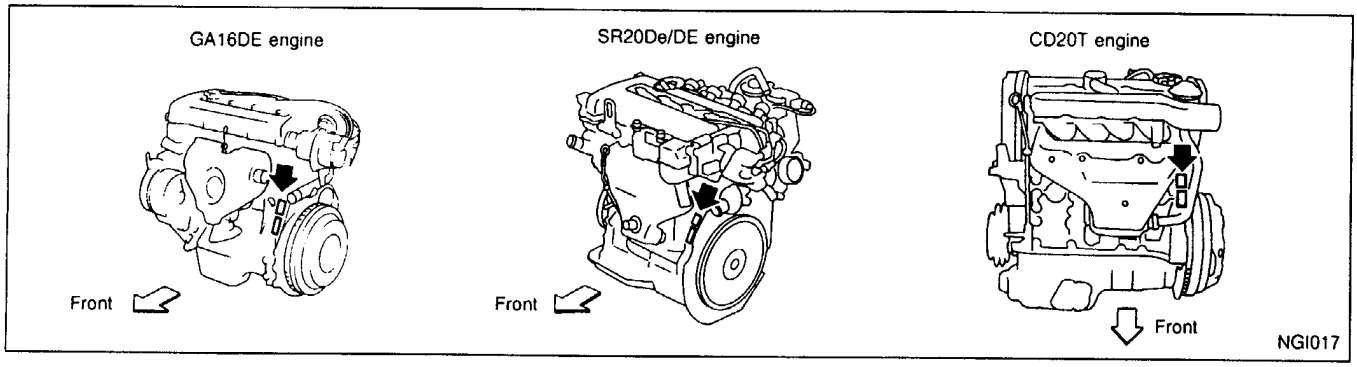
IDENTIFICATION PLATE



A Type approval number
B Vehicle identification number (chassis number)
C Gross vehicle weight (GVW)
D Gross combination weight (GCW)
E Gross axle weight (Front)
F Gross axle weight (Rear)
G Vehicle type specification
H Body colour code
I Trim colour code
J Model

NGI011

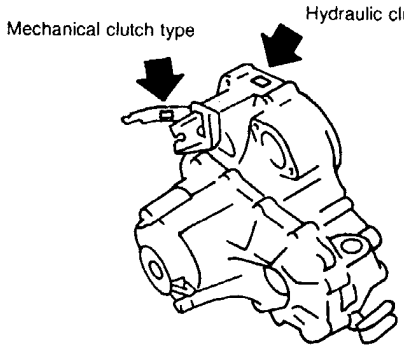
ENGINE SERIAL NUMBER



NGI017

MANUAL TRANSAXLE NUMBER

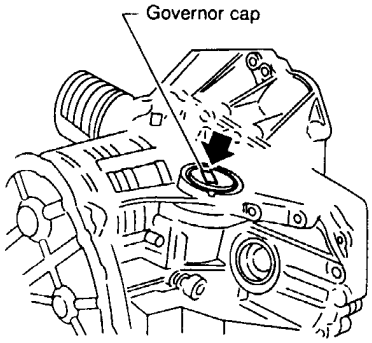
RS5F31A and RS5F32A



NGI018

AUTOMATIC TRANSAXLE NUMBER

RE4F03A



NGI019

Dimensions

Unit: mm (in)

Overall length	4430 (174.4)
Overall width	1700 (66.9)*1
Overall height	1410 (55.5)*2
Front tread	1470 (57.9)
Rear tread	1450 (57.1)
Wheelbase	2600 (102.4)

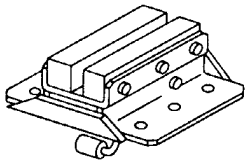
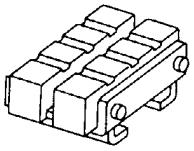
*1: Without mirrors.
*2: Without roof mounted antenna.

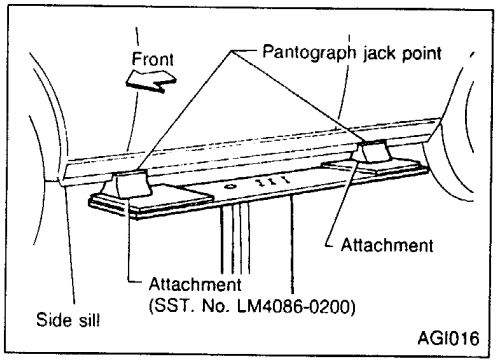
Wheels and Tires

Road wheel	Steel	14 x 5-1/2JJ	14 x 5-1/2JJ	15 x 6JJ
	Offset mm (in)	45 (1.77)	45 (1.77)	45 (1.77)
	Aluminum	—	14 x 6JJ	15 x 6JJ
	Offset mm (in)		45 (1.77)	45 (1.77)
Tire size	Conventional	175/70HR14	185/65HR14	195/60VR15
	Spare	Conventional	Conventional	Conventional

Preparation

SPECIAL SERVICE TOOLS

Tool number Tool name	Description
LM4086-0200 Board on attachment	 NT001
LM4519-0000 Safety stand attachment	 NT002



Board-on Lift

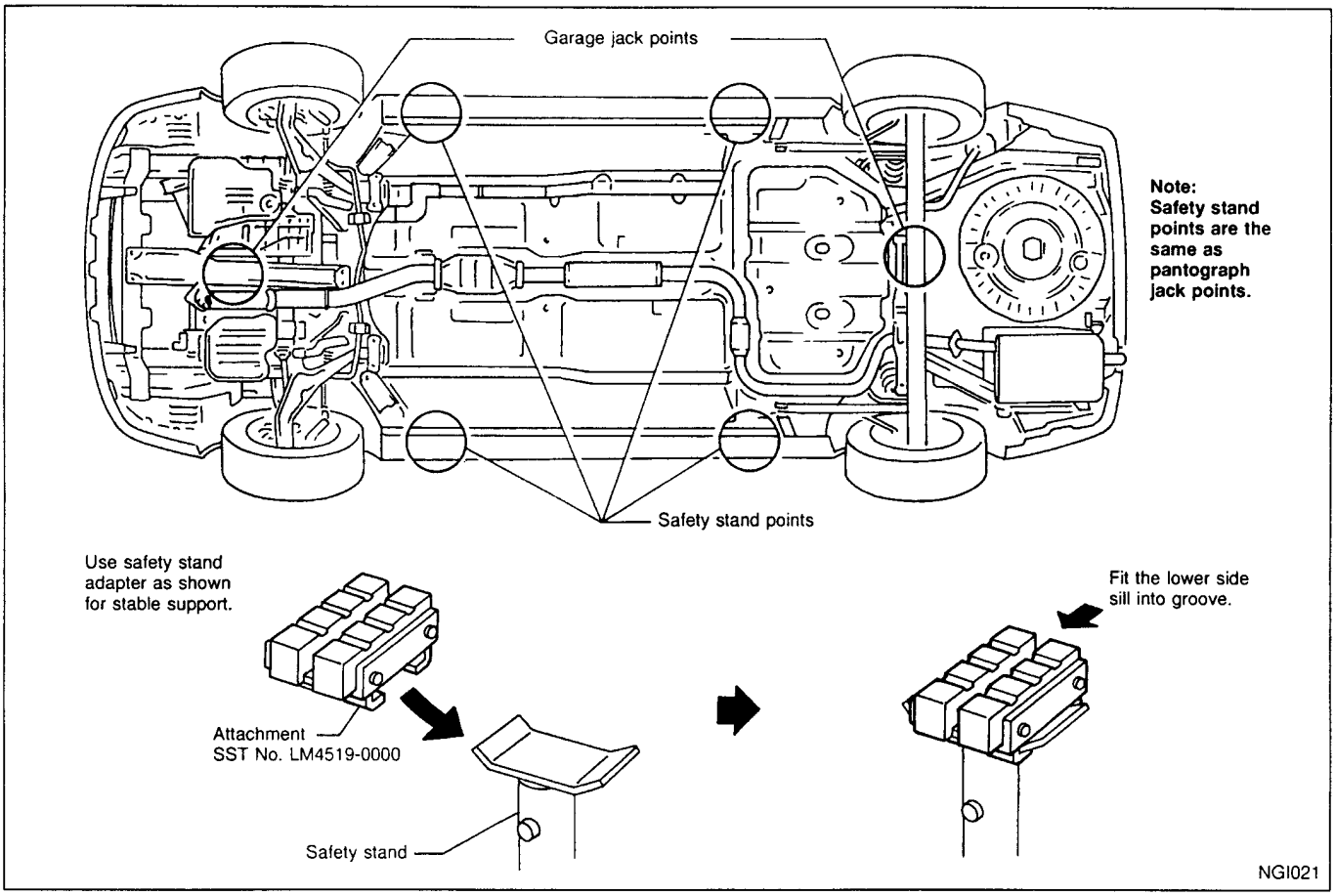
CAUTION:
Make sure vehicle is empty when lifting.

- **The board-on lift attachment (LM4086-0200) set at front end of vehicle should be set on the front of the sill under the front door opening.**
- **Position attachments at front and rear ends of board-on lift.**

Garage Jack and Safety Stand

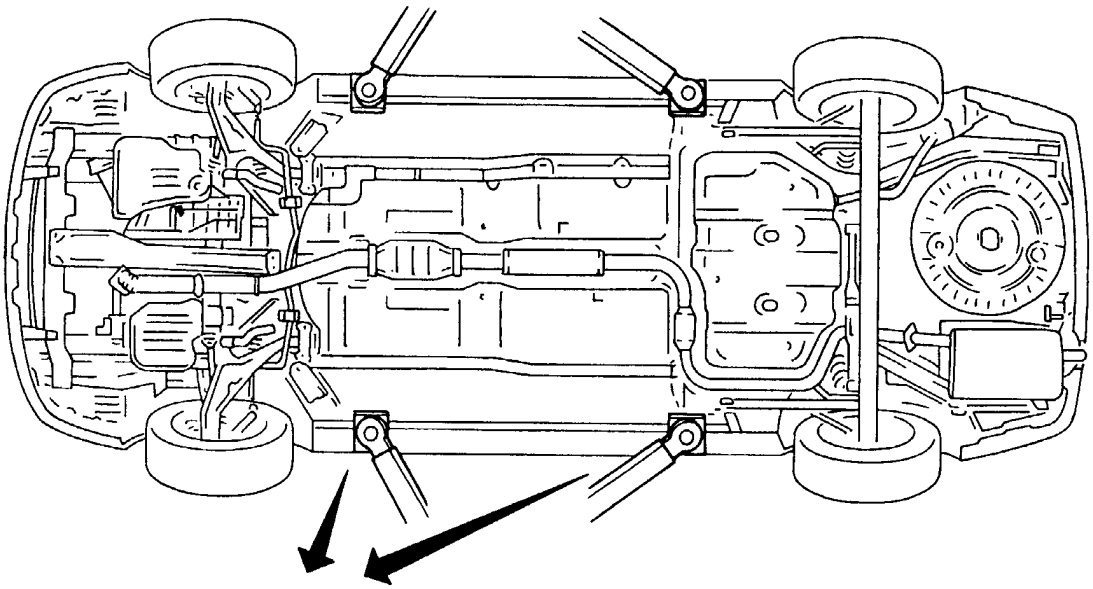
WARNING:

- **Never get under the vehicle while it is supported only by the jack. Always use safety stands when you have to get under the vehicle.**
- **Place wheel chocks at both front and back of the wheels on the ground.**

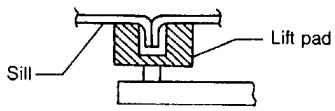


2-pole Lift

WARNING:
When lifting the vehicle, open the lift arms as wide as possible and ensure that the front and rear of the vehicle are well balanced.
When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.



Note:
Lift-up points are the same as pantograph jack points.



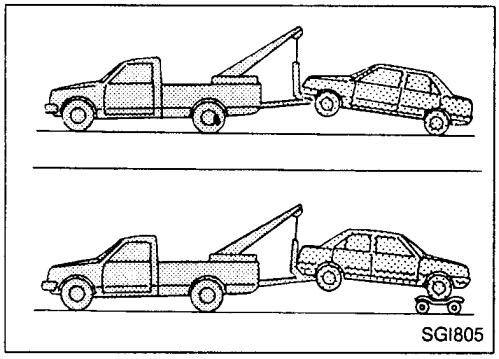
Put the sill in the groove of the lift pad to prevent the sill from deforming. If the pad does not have a groove, prepare a suitable attachment with one.

NGI022

Tow Truck Towing

CAUTION:

- **All applicable local laws regarding the towing operation must be obeyed.**
- **It is necessary to use proper towing equipment to avoid possible damage to the vehicle during towing operation. Towing is in accordance with Towing Procedure Manual at dealer.**
- **When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral position.**


SGI805

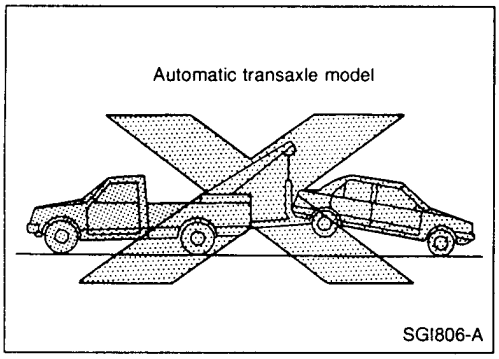
NISSAN recommends that vehicle be towed with the driving (front) wheels off the ground as illustrated.

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

Observe the following restricted towing speeds and distances.

Speed:
Below 50 km/h (30 mph)
Distance:
Less than 65 km (40 miles)

CAUTION:
Never tow an automatic transaxle model from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transaxle.



SGI806-A

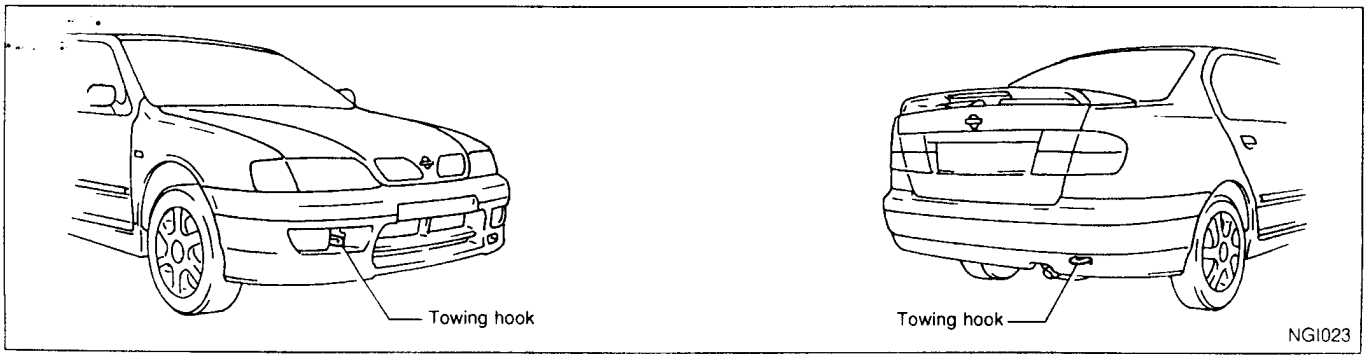
TOWING AN AUTOMATIC TRANSAXLE MODEL WITH REAR WHEELS RAISED (With front wheels on ground)

Never tow an automatic transaxle model with rear wheels raised (with front wheels on ground) as this may cause serious and expensive damage to the transaxle. If it is necessary to tow it with rear wheels raised, always use a towing dolly under the front wheels.

TOWING POINT

Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.

CAUTION:
Remove the front spoiler when towing the vehicle forward. Otherwise, the towing device may damage the front spoiler.



NGI023

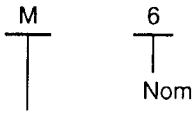
TIGHTENING TORQUE OF STANDARD BOLTS

Grade	Bolt size	Bolt diameter* mm	Pitch mm	Tightening torque (Without lubricant)							
				Hexagon head bolt				Hexagon flange bolt			
				N·m	kg-m	ft-lb	in-lb	N·m	kg-m	ft-lb	in-lb
4T	M6	6.0	1.0	5.1	0.52	3.8	45.1	6.1	0.62	4.5	53.8
	M8	8.0	1.25	13	1.3	9	—	15	1.5	11	—
			1.0	13	1.3	9	—	16	1.6	12	—
	M10	10.0	1.5	25	2.5	18	—	29	3.0	22	—
			1.25	25	2.6	19	—	30	3.1	22	—
	M12	12.0	1.75	42	4.3	31	—	51	5.2	38	—
			1.25	46	4.7	34	—	56	5.7	41	—
	M14	14.0	1.5	74	7.5	54	—	88	9.0	65	—
7T	M6	6.0	1.0	8.4	0.86	6.2	74.6	10	1.0	7	87
	M8	8.0	1.25	21	2.1	15	—	25	2.5	18	—
			1.0	22	2.2	16	—	26	2.7	20	—
	M10	10.0	1.5	41	4.2	30	—	48	4.9	35	—
			1.25	43	4.4	32	—	51	5.2	38	—
	M12	12.0	1.75	71	7.2	52	—	84	8.6	62	—
			1.25	77	7.9	57	—	92	9.4	68	—
	M14	14.0	1.5	127	13.0	94	—	147	15.0	108	—
9T	M6	6.0	1.0	12	1.2	9	—	15	1.5	11	—
	M8	8.0	1.25	29	3.0	22	—	35	3.6	26	—
			1.0	31	3.2	23	—	37	3.8	27	—
	M10	10.0	1.5	59	6.0	43	—	70	7.1	51	—
			1.25	62	6.3	46	—	74	7.5	54	—
	M12	12.0	1.75	98	10.0	72	—	118	12.0	87	—
			1.25	108	11.0	80	—	137	14.0	101	—
	M14	14.0	1.5	177	18.0	130	—	206	21.0	152	—

1. **Special parts are excluded.**
2. **This standard is applicable to bolts having the following marks embossed on the bolt head.**

*: Nominal diameter

Grade		Mark
4T	.....	4
7T	.....	7
9T	.....	9



SAE J1930 Terminology List

All emission related terms used in this publication in accordance with SAE J1930 are listed. Accordingly, new terms, new acronyms/abbreviations and old terms are listed in the following chart.

***: Not applicable

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Absolute pressure sensor	***	***
Air cleaner	ACL	Air cleaner
Barometric pressure	BARO	***
Barometric pressure sensor-BCDD	BAROS-BCDD	BCDD
Camshaft position	CMP	***
Camshaft position sensor	CMPS	Crank angle sensor
Carburetor	CARB	Carburetor
Charge air cooler	CAC	Intercooler
Closed loop	CL	Closed loop
Closed throttle position switch	CTP switch	Idle switch
Clutch pedal position switch	CPP switch	Clutch switch
Continuous fuel injection system	CFI system	***
Continuous trap oxidizer system	CTOX system	***
Crankshaft position	CKP	***
Crankshaft position sensor	CKPS	***
Data link connector	DLC	***
Data link connector for CONSULT	DLC for CONSULT	Diagnostic connector for CONSULT
Diagnostic test mode	DTM	Diagnostic mode
Diagnostic test mode selector	DTM selector	Diagnostic mode selector
Diagnostic test mode I	DTM I	Mode I
Diagnostic test mode II	DTM II	Mode II
Diagnostic trouble code	DTC	Malfunction code
Direct fuel injection system	DFI system	***
Distributor ignition system	DI system	Ignition timing control
Early fuel evaporation-mixture heater	EFE-mixture heater	Mixture heater
Early fuel evaporation system	EFE system	Mixture heater control
Electrically erasable programmable read only memory	EEPROM	***
Electronic ignition system	EI system	Ignition timing control
Engine control module	ECM	ECCS control unit
Engine coolant temperature	ECT	Engine temperature
Engine coolant temperature sensor	ECTS	Engine temperature sensor
Engine modification	EM	***
Engine speed	RPM	Engine speed
Erasable programmable read only memory	EPROM	***
Evaporative emission canister or Canister	EVAP canister or Canister	Canister
Evaporative emission canister purge control solenoid valve	EVAP canister purge control solenoid valve	Canister control solenoid valve

SAE J1930 Terminology List (Cont'd)

***: Not applicable

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Evaporative emission canister purge control valve	EVAP canister purge control valve	Canister purge cut valve
Evaporative emission canister vent control valve	EVAP canister vent control valve	***
Evaporative emission canister purge volume control valve	EVAP canister purge volume control valve	Canister purge control valve
Evaporative emission control system pressure sensor	EVAP control system pressure sensor	***
Evaporative emission shut valve	EVAP shut valve	Shutoff valve
Evaporative emission system	EVAP system	Evaporative emission control system
Exhaust gas recirculation valve	EGR valve	EGR valve
Exhaust gas recirculation control-BPT valve	EGRC-BPT valve	BPT valve
Exhaust gas recirculation control-solenoid valve	EGRC-solenoid valve	EGR control solenoid valve
Exhaust gas recirculation temperature sensor	EGR temperature sensor	Exhaust gas temperature sensor
Flash electrically erasable programmable read only memory	FEEPROM	***
Flash erasable programmable read only memory	FEPROM	***
Flexible fuel sensor	FFS	***
Flexible fuel system	FF system	***
Heated Oxygen sensor	HO2S	Exhaust gas sensor
Idle air control system	IAC system	Idle speed control
Idle air control valve-air regulator	IACV-air regulator	Air regulator
Idle air control valve-auxiliary air control valve	IACV-AAC valve	Auxiliary air control (AAC) valve
Idle air control valve-FICD solenoid valve	IACV-FICD solenoid valve	FICD solenoid valve
Idle air control valve-idle up control solenoid valve	IACV-idle up control solenoid valve	Idle up control solenoid valve
Idle speed control-FI pot	ISC-FI pot	FI pot
Idle speed control system	ISC system	***
Ignition control module	ICM	***
Indirect fuel injection system	IFI system	***
Intake air temperature sensor	IATS	Air temperature sensor
Knock	***	Detonation
Knock sensor	KS	Detonation sensor
Malfunction indicator lamp	MIL	Check engine light
Manifold absolute pressure	MAP	***
Manifold absolute pressure/Barometric pressure switch solenoid valve	MAP/BARO switch solenoid valve	***
Manifold absolute pressure sensor	MAPS	***
Manifold differential pressure	MDP	***
Manifold differential pressure sensor	MDPS	***

SAE J1930 Terminology List (Cont'd)

***: Not applicable

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Manifold surface temperature	MST	***
Manifold surface temperature sensor	MSTS	***
Manifold vacuum zone	MVZ	***
Manifold vacuum zone sensor	MVZS	***
Mass air flow sensor	MAFS	Air flow meter
Mixture control solenoid valve	MC solenoid valve	Air-fuel ratio control solenoid valve
Multiport fuel injection System	MFI system	Fuel injection control
Neutral position switch	***	Neutral switch
Non-volatile random access memory	NVRAM	***
On-board diagnostic system	OBD system	Self-diagnosis
Open loop	OL	Open loop
Oxidation catalyst	OC	Catalyst
Oxidation catalytic converter system	OC system	***
Oxygen sensor	O2S	Exhaust gas sensor
Park position switch	***	Park switch
Park/neutral position switch	PNP switch	Park/neutral switch
Periodic trap oxidizer system	PTOX system	***
Powertrain control module	PCM	***
Programmable read only memory	PROM	***
Pulsed secondary air injection control solenoid valve	PAIRC solenoid valve	AIV control solenoid valve
Pulsed secondary air injection system	PAIR system	Air induction valve (AIV) control
Pulsed secondary air injection valve	PAIR valve	Air induction valve
Random access memory	RAM	***
Read only memory	ROM	***
Scan tool	ST	***
Secondary air injection pump	AIR pump	***
Secondary air injection system	AIR system	***
Sequential multiport fuel injection system	SFI system	Sequential fuel injection
Service reminder indicator	SRI	***
Simultaneous multiport fuel injection system	***	Simultaneous fuel injection
Smoke puff limiter system	SPL system	***
Supercharger	SC	***
Supercharger bypass	SCB	***
System readiness test	SRT	***
Tank fuel temperature sensor	***	***
Thermal vacuum valve	TVV	Thermal vacuum valve
Three way catalyst	TWC	Catalyst
Three way catalytic converter system	TWC system	***
Three way+oxidation catalyst	TWC+OC	Catalyst

SAE J1930 Terminology List (Cont'd)

***: Not applicable

NEW TERM	NEW ACRONYM / ABBREVIATION	OLD TERM
Three way + oxidation catalytic converter system	TWC + OC system	***
Throttle body	TB	Throttle chamber SPI body
Throttle body fuel injection system	TBI system	Fuel injection control
Throttle position	TP	Throttle position
Throttle position sensor	TPS	Throttle sensor
Throttle position switch	TP switch	Throttle switch
Torque converter clutch solenoid valve	TCC solenoid valve	Lock-up cancel solenoid Lock-up solenoid
Turbocharger	TC	Turbocharger
Vacuum cut valve	***	Vacuum control valve
Vacuum cut valve bypass valve	***	***
Vehicle speed sensor	VSS	Vehicle speed sensor
Volume air flow sensor	VAFS	Air flow meter
Warm up oxidation catalyst	WU-OC	Catalyst
Warm up oxidation catalytic converter system	WU-OC system	***
Warm up three way catalyst	WU-TWC	Catalyst
Warm up three way catalytic converter system	WU-TWC system	***
Wide open throttle position switch	WOTP switch	Full switch

SECTION GI

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

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
If the vehicle is equipped with side air bag as the Supplemental Restraint System, the side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (which is one of components of air bags for a frontal collision), wiring harness, warning lamp (which is one of components of air bags for a frontal collision).

WARNING:

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

APPLIED FROM:

SJN *** P11UO165000

* : Any of the possibilities. See Vehicle Identification Number Arrangement.

OUTLINE OF MODIFICATIONS

ENGINE

- A new (localised) Diesel Injection Control System has been introduced (Bosch) on the CD20T engine, including Diesel pump.

BODY

- Introduction of side air bag.

Model Variation

Body	Engine	Transaxle	Destination / Grade	RHD	LHD For Central & South Europe	LHD For North Europe
4-door Sedan	GA16DE	RS5F31A	LX	BAYARBF-EEA	BAYALBF-EGA	BAYALBF-ESA
			GX	BAYARDF-EEA	BAYALDF-EGA	BAYALDF-ESA
			SLX	BAYARFF-EEA	BAYALFF-EGA	BAYALFF-ESA
			Si	BAYARTF-EEA	BAYALTF-EGA	BAYALTF-ESA
	SR20De	RS5F32A	GX	BBYARDF-FEA	BBYALDF-FGA	BBYALDF-FSA
			SLX	BBYARFF-FEA	BBYALFF-FGA	BBYALFF-FSA
			SE	BBYARGF-FEA	BBYALGF-FGA	BBYALGF-FSA
			SRi	BBYARTF-FEA	BBYALTF-FGA	BBYALTF-FSA
		RE4F03A	GX	BBYARDA-FEA	BBYALDA-FGA	
			SLX	BBYARFA-FEA	BBYALFA-FGA	BBYALFA-FSA
			SE	BBYARGA-FEA	BBYALGA-FGA	BBYALGA-FSA
	SR20DE	RS5F32A	GT	BBYARUF-EEA	BBYALUF-EGA	BBYALUF-ESA
			SE	BBYARGF-EEA	BBYALGE-EGA	BBYALGF-ESA
	CD20T	RS5F32A	GX	BVCARDF-TEA	BVCALDF-TGA	
			SLX	BVCARFF-TEA	BVCALFF-TGA	BVCALFF-TSA
			SE	BVCARGF-TEA	BVCALGF-EGA	
5-door Hatchback	GA16DE	RS5F31A	LX	FAYARBF-EEA		FAYALBF-ESA
			GX	FAYARDF-EEA	FAYALDF-EGA	FAYALDF-ESA
			SLX	FAYARFF-EEA	FAYALFF-EGA	
			Si	FAYARTF-EEA	FAYALTF-EGA	FAYALTF-ESA
	SR20De	RS5F32A	GX	FBYARDF-FEA	FBYALDF-FGA	FBYALDF-FSA
			SLX	FBYARFF-FEA	FBYALFF-FGA	FBYALFF-FSA
			SE	FBYARGF-FEA	FBYALGF-FGA	FBYALGF-FSA
			SRi	FBYARTF-FEA	FBYALTF-FGA	FBYALTF-FSA
		RE4F03A	GX	FBYARDA-FEA	FBYALDA-FGA	
			SLX	FBYARFA-FEA	FBYALFA-FGA	
			SE	FBYARGA-FEA	FBYALGA-FGA	FBYALGA-FSA
	SR20DE	RS5F32A	GT	FBYARUF-EEA	FBYALUF-EGA	
			SE	FBYARGF-EEA	FBYALGF-EGA	
	CD20T	RS5F32A	GX	FVCARDF-TEA	FVCALDF-TGA	
			SLX	FVCARFF-TEA	FVCALFF-TGA	FVCALFF-TSA
			SE	FVCARGF-TEA	FVCALGF-TGA	

Wheels and Tires

Road wheel	Steel	15 x 6JJ	15 x 6JJ	15 x 6JJ
	Offset mm (in)	45 (1.77)	45 (1.77)	45 (1.77)
	Aluminum	15 X 6JJ	15 x 6JJ	15 x 6JJ
	Offset mm (in)	45 (1.77)	45 (1.77)	45 (1.77)
Tire size	Conventional	185/65HR15	195/60VR15	195/60R15
	Spare	Conventional	Conventional	Conventional

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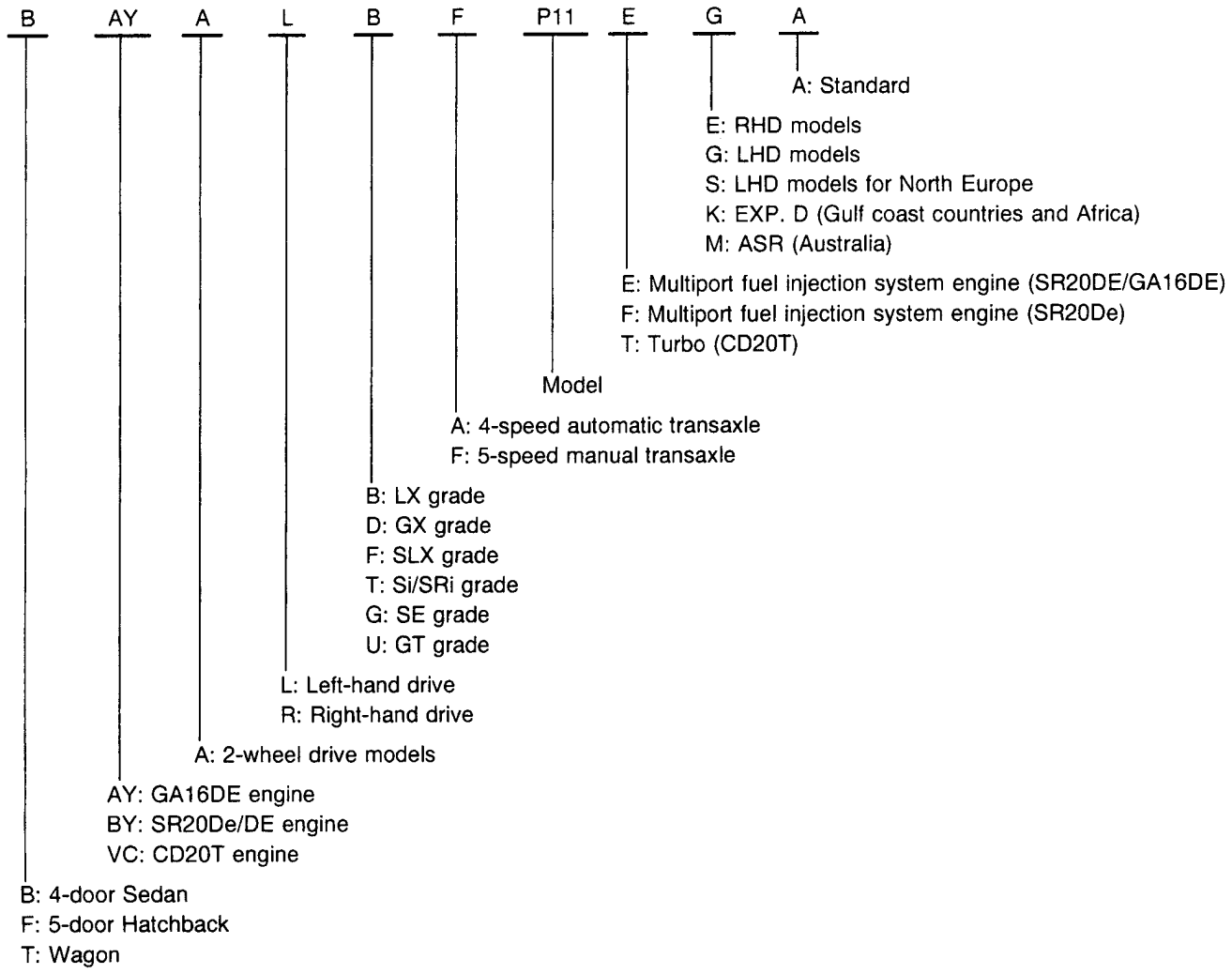
Model Variation

Body	Engine	Transaxle	Destination / Grade	RHD	LHD For Central & South Europe	LHD For North Europe
4-door Sedan	GA16DE	RS5F31A	LX	BAYARBF-EEA	BAYALBF-EGA	BAYALBF-ESA
			GX	BAYARDF-EEA	BAYALDF-EGA	BAYALDF-ESA
			SLX	BAYARFF-EEA	BAYALFF-EGA	BAYALFF-ESA
			Si	BAYARTF-EEA	BAYALTF-EGA	BAYALTF-ESA
	SR20De	RS5F32A	GX	BBYARDF-FEA	BBYALDF-FGA	BBYALDF-FSA
			SLX	BBYARFF-FEA	BBYALFF-FGA	BBYALFF-FSA
			SE	BBYARGF-FEA	BBYALGF-FGA	BBYALGF-FSA
			SRi	BBYARTF-FEA	BBYALTF-FGA	BBYALTF-FSA
		RE4F03A	GX	BBYARDA-FEA	BBYALDA-FGA	
			SLX	BBYARFA-FEA	BBYALFA-FGA	BBYALFA-FSA
			SE	BBYARGA-FEA	BBYALGA-FGA	BBYALGA-FSA
	SR20DE	RS5F32A	GT	BBYARUF-EEA	BBYALUF-EGA	BBYALUF-ESA
			SE	BBYARGF-EEA	BBYALGE-EGA	BBYALGF-ESA
	CD20T	RS5F32A	GX	BVCARDF-TEA	BVCALDF-TGA	
			SLX	BVCARFF-TEA	BVCALFF-TGA	BVCALFF-TSA
			SE	BVCARGF-TEA	BVCALGF-TGA	
5-door Hatchback	GA16DE	RS5F31A	LX	FAYARBF-EEA		FAYALBF-ESA
			GX	FAYARDF-EEA	FAYALDF-EGA	FAYALDF-ESA
			SLX	FAYARFF-EEA	FAYALFF-EGA	
			Si	FAYARTF-EEA	FAYALTF-EGA	FAYALTF-ESA
	SR20De	RS5F32A	GX	FBYARDF-FEA	FBYALDF-FGA	FBYALDF-FSA
			SLX	FBYARFF-FEA	FBYALFF-FGA	FBYALFF-FSA
			SE	FBYARGF-FEA	FBYALGF-FGA	FBYALGF-FSA
			SRi	FBYARTF-FEA	FBYALTF-FGA	FBYALTF-FSA
		RE4F03A	GX	FBYARDA-FEA	FBYALDA-FGA	
			SLX	FBYARFA-FEA	FBYALFA-FGA	
			SE	FBYARGA-FEA	FBYALGA-FGA	FBYALGA-FSA
	SR20DE	RS5F32A	GT	FBYARUF-EEA	FBYALUF-EGA	
			SE	FBYARGF-EEA	FBYALGF-EGA	
	CD20T	RS5F32A	GX	FVCARDF-TEA	FVCALDF-TGA	
			SLX	FVCARFF-TEA	FVCALFF-TGA	FVCALFF-TSA
			SE	FVCARGF-TEA	FVCALGF-TGA	

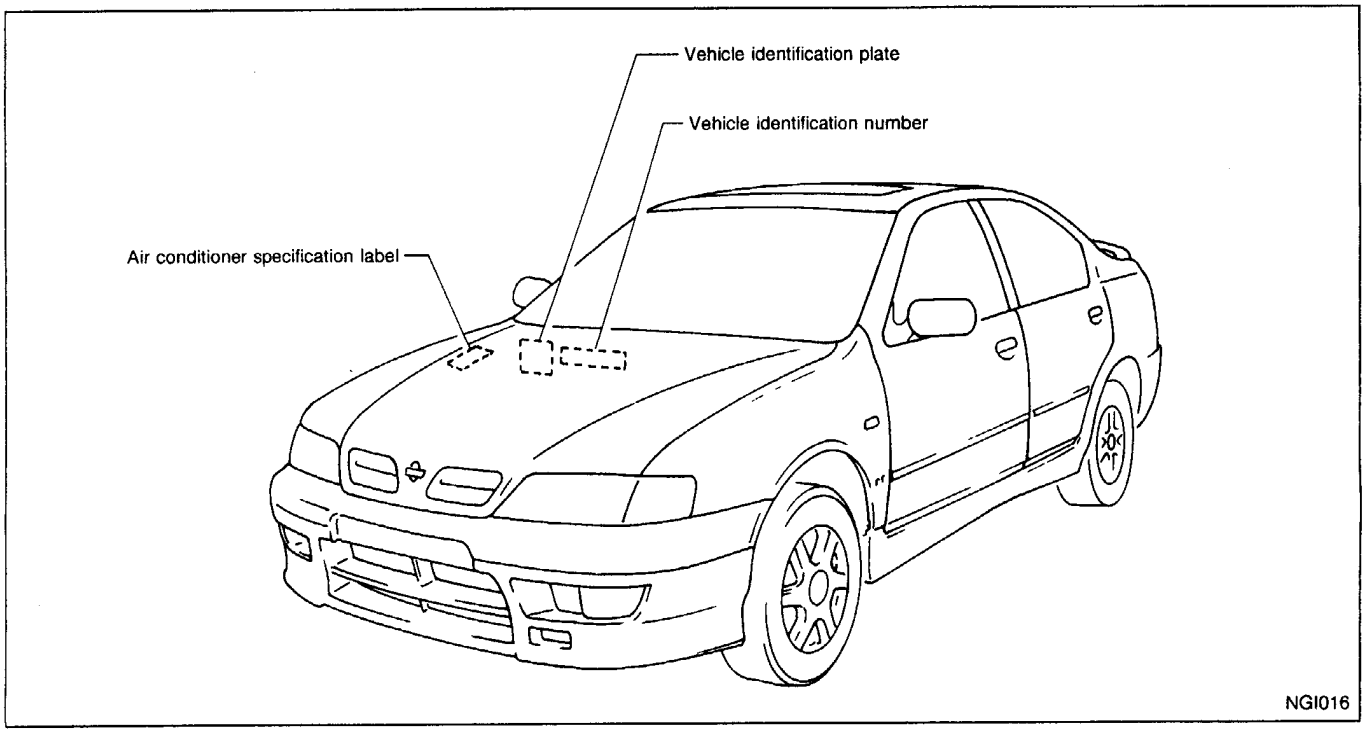
Model Variation (Cont'd)

Body	Engine	Transaxle	Destination / Grade	RHD	LHD For Central & South Europe	LHD For North Europe
Wagon	GA16DE	RS5F31A	GX	TAYARDF-EEA	TAYALDF-EGA	TAYALDF-ESA
			SLX	TAYARFF-EEA	TAYALFF-EGA	TAYALFF-ESA
			Si	TAYARTF-EEA	TAYALTF-EGA	TAYALTF-ESA
	SR20De	RS5F32A	GX	TBYARDF-FEA	TBYALDF-FGA	TBYALDF-FSA
			SLX	TBYARFF-FEA	TBYALFF-FGA	TBYALFF-FSA
			SE	TBYARGF-FEA	TBYALGF-FGA	
			SRi	TBYARTF-FEA	TBYALTF-FGA	TBYALTF-FSA
		RE4F03A	GX	TBYARDA-FEA	TBYALDA-FGA	TBYALDA-FSA
			SLX	TBYARFA-FEA	TBYALFA-FGA	TBYALFA-FSA
			SE	TBYARGA-FEA	TBYALGA-FGA	
	CD20T	RS5F32A	GX	TVCARDF-TEA	TVCALDF-TGA	
			SLX	TVCARFF-TEA	TVCALFF-TGA	TVCALFF-TSA
			SE	TVCARGF-TEA	TVCALGF-TGA	

Prefix and suffix designations:



Identification Number



VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

For Europe

SJN B A A P11 U 0 XXXXXX

- SJN — Manufacturer
  SJN : Nissan, Passenger vehicle
- B — Body type
  B : 4-door Sedan
  F : 5-door Hatchback
  T: Wagon
- A — Engine type
  A : GA16DE engine
  C : SR20De or SR20DE engine
  D : CD20T engine
- A — A : 2-wheel drive
- P11 — Model
- U — Destination
  U : Europe
- 0 — 0 : Stopgap (no meaning)
- XXXXXX — Vehicle serial number

Dimensions

WAGON

Unit: mm (in)

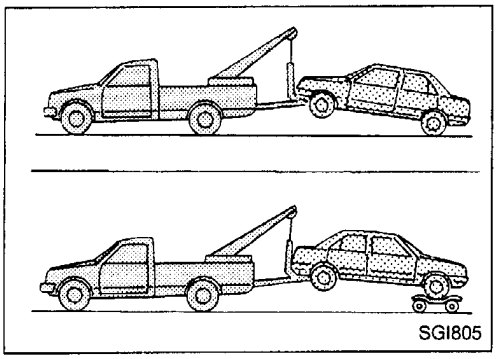
Overall length	4514 (177.7)
Overall width	1695 (66.7)*1
Overall height	1410 (55.5)*2
Front tread	1470 (57.9)
Rear tread	1450 (57.1)
Wheelbase	2600 (102.4)

*1: Without mirrors.
*2: Without roof mounted antenna.

Tow Truck Towing

CAUTION:

- **All applicable local laws regarding the towing operation must be obeyed.**
- **It is necessary to use proper towing equipment to avoid possible damage to the vehicle during towing operation. Towing is in accordance with Towing Procedure Manual at dealer.**
- **When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral position.**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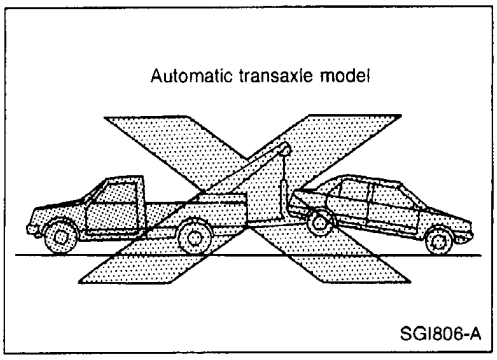
NISSAN recommends that vehicle be towed with the driving (front) wheels off the ground as illustrated.

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

Observe the following restricted towing speeds and distances.

Speed:
Below 50 km/h (30 mph)
Distance:
Less than 65 km (40 miles)

CAUTION:
Never tow an automatic transaxle model from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transaxle.



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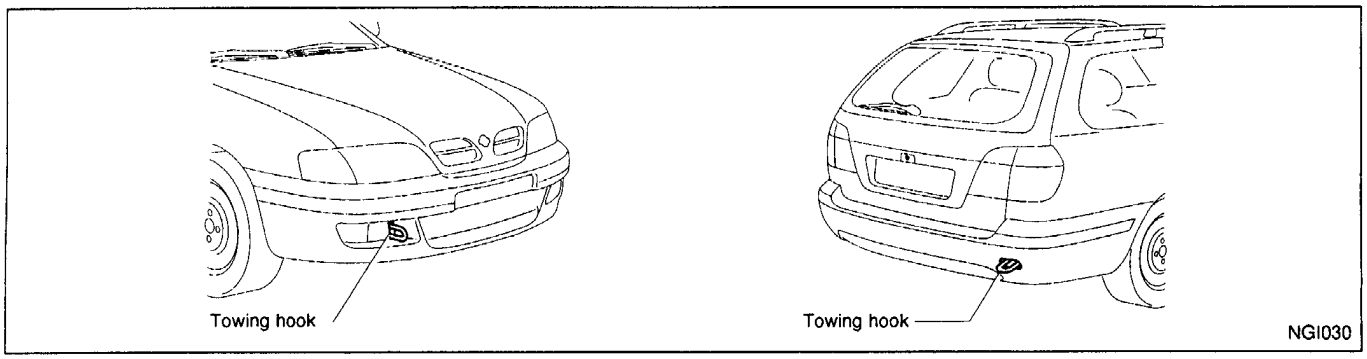
TOWING AN AUTOMATIC TRANSAXLE MODEL WITH REAR WHEELS RAISED (With front wheels on ground)

Never tow an automatic transaxle model with rear wheels raised (with front wheels on ground) as this may cause serious and expensive damage to the transaxle. If it is necessary to tow it with rear wheels raised, always use a towing dolly under the front wheels.

TOWING POINT

Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.

CAUTION:
Remove the front spoiler when towing the vehicle forward. Otherwise, the towing device may damage the front spoiler.



NGI030

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MA

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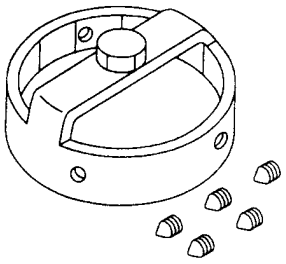
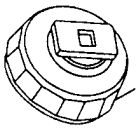
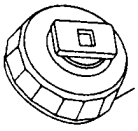
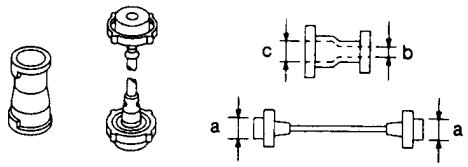
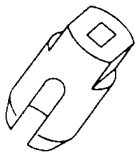
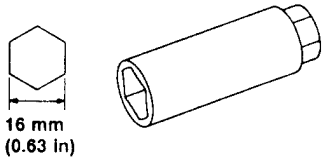
Special Service Tools

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

Tool number Tool name	Description	Engine application		
		GA	SR	CD
KV10105800 Oil filter cap wrench 65 mm (2.56 in) dia.	 NT346 — Removing oil filter	–	X	–
KV10105900 Oil filter cap wrench	 15 faces, Inner span: 80 mm (3.15 in) (Face to opposite corner) NT555 — Removing oil filter	X	–	–
99545R2500 (KV101060S0) Oil filter wrench	 15 faces, Inner span: 92.5 mm (3.642 in) (Face to opposite corner) NT631 — Removing oil filter	–	–	X
EG17650301 Radiator cap tester adapter	 **a: 28 (1.10) dia.** **b: 31.4 (1.236) dia.** **c: 41.3 (1.626) dia.** Unit: mm (in) NT564	X	X	X
KV119E0010 Nozzle holder socket	 NT563 — Removing and installing injection nozzle assembly	–	–	X

Commercial Service Tool

Tool name	Description	Engine application		
		GA	SR	CD
Spark plug wrench	 16 mm (0.63 in) NT047 — Wrench with a magnet to hold spark plug	X	X	–

PRE-DELIVERY INSPECTION ITEMS

Shown below are Pre-delivery Inspection Items required for the new vehicle. It is recommended that necessary items other than those listed here be added, paying due regard to the conditions in each country.

Perform checks for applicable items on each model. Consult text of this section for specifications.

UNDER HOOD – engine off

- ☐ Radiator coolant level and coolant hose connections for leaks
- ☐ Battery fluid level, specific gravity and conditions of battery terminals
- ☐ Drive belts tension
- ☐ Fuel filter for water or dust, fuel lines and connections for leaks
- ☐ Engine oil level and oil leaks
- ☐ Brake/clutch reservoir fluid level and fluid lines for leaks
- ☐ Windshield and rear window washer and headlamp cleaner reservoir fluid level
- ☐ Power steering reservoir fluid level and hose connections for leaks

INSIDE AND OUTSIDE

- ☐ Remove front spring/strut spacer (If applicable)
- ☐ Operation of all instruments, gauges, lights anti-theft system and accessories
- ☐ Operation of horn(s), wiper and washer
- ☐ Steering lock for operation
- ☐ Air conditioner for refrigerant leaks
- ☐ Front and rear seats, and seat belts for operation
- ☐ All moldings, trims and fittings for fit and alignment
- ☐ All windows for operation and alignment
- ☐ Hood, trunk lid, tailgate, door panels for fit and alignment
- ☐ Latches, keys and locks for operation
- ☐ Weatherstrips for adhesion and fit
- ☐ Headlamp aiming
- ☐ Tighten wheel nuts
- ☐ Tire pressure (Inc. spare tire)
- ☐ Check front wheel alignment
- ☐ Install clock/room lamp fuse (If applicable)

UNDER BODY

- ☐ Manual transmission/transaxle oil level
- ☐ Brake and fuel lines and oil/fluid reservoirs for leaks
- ☐ Tighten bolts and nuts of steering linkage and gear box, suspension and drive shafts

ROAD TEST

- ☐ Clutch and manual transmission operation
- ☐ Parking brake operation
- ☐ Service brake operation
- ☐ Automatic transmission shift timing and kickdown
- ☐ Steering control and returnability
- ☐ Engine performance
- ☐ Squeaks and rattles

ENGINE OPERATING AND HOT

- ☐ Adjust idle mixture and speed (and ignition timing*1)
- ☐ Automatic transmission/transaxle fluid level

FINAL INSPECTION

- ☐ Install any supplied or accessory parts (wheel covers, seat belts, carpets or mud flaps)
- ☐ Inspect for interior and exterior metal and paint damage
- ☐ Check for spare tire, jack, tools and literature
- ☐ Wash, clean interior and exterior

*1: Not required on models with a direct ignition system

GENERAL MAINTENANCE

General maintenance includes those items which should be checked during normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue functioning correctly. Owners can perform the checks and inspections themselves, or they can be carried out by a Nissan dealer.

Item	Reference pages
OUTSIDE THE VEHICLE The maintenance items listed here should be checked periodically, unless otherwise specified.	
Tires Check the pressure with a gauge weekly when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	–
Windshield wiper blades Check for cracks or wear if not functioning correctly.	–
Doors and engine hood Check that all doors, the engine hood, the trunk lid and back door function correctly. Also ensure that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch prevents the hood from opening when the primary latch is released. When driving in areas using road salt or other corrosive materials, check for lubrication more often.	MA-41
Tire rotation Tires should be rotated every 10,000 km (6,000 miles).	MA-39
INSIDE THE VEHICLE The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle etc.	
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating correctly and installed securely. Also check headlight aim.	–
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are functioning correctly.	–
Steering wheel Check for changes in the steering operation, such as excessive free play, hard steering or strange noises.	–
UNDER THE HOOD AND VEHICLE The maintenance items listed here should be checked periodically e. g. each time you check the engine oil or refuel.	
Windshield washer fluid Check that there is adequate fluid in the tank.	–
Engine coolant level Check the coolant level when the engine is cold.	MA-10, MA-19 & MA-27
Engine oil level Check the level after parking the vehicle (on level ground) and turning off the engine.	MA-13, MA-22 & MA-30
Brake fluid level Make sure that the brake fluid level is between the "MAX" and "MIN" lines on the reservoir.	MA-36
Battery Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines.	–

Engine Oil & Minor Service

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance may be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

GASOLINE ENGINE

Abbreviations: R = Replace, I = Inspect: Correct or replace if necessary.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform either at number of kilometers (miles) or months, whichever comes first.	km x 1,000	15	30	45	60	75	90	105	120	Reference page
	(miles x 1,000)	(9)	(18)	(27)	(36)	(45)	(54)	(63)	(72)	
	Months	12	24	36	48	60	72	84	96	
Underhood and under vehicle										
Engine oil (API SG or SH oil)★		R	R	R	R	R	R	R	R	MA-13, 22
Engine oil filter★		R	R	R	R	R	R	R	R	MA-13, 23

DIESEL ENGINE

Abbreviations: R = Replace, I = Inspect and correct or replace as necessary.

MAINTENANCE OPERATION										
Perform either at number of kilometers (miles) or months, whichever comes first.	km x 1,000	10	20	30	40	50	60	70	80	Reference page
	(miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	
	Months	6	12	18	24	30	36	42	48	
Underhood and under vehicle										
Engine oil (Use CCMC-PD2 oil)★		R	R	R	R	R	R	R	R	MA-30
Engine oil filter★		R	R	R	R	R	R	R	R	MA-31
Drive belts		I	I		I		I		I	MA-27

NOTE: ★ Maintenance items with "★" should be performed more frequently according to "Maintenance Under Severe Driving Conditions".

Major Service

Abbreviations: R = Replace, I = Inspect: Correct or replace if necessary.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL			
Perform on a mileage basis, but on an annual basis when driving less than 9,000 miles (15,000 km) a year.	km x 1,000	30	60	90	120
	(miles x 1,000)	(18)	(36)	(54)	(72)
	Months	12	24	36	48
ENGINE	**Underhood and under vehicle**				
Engine anti-freeze coolant (Ethylene glycol base)	**See NOTE (1)**				
Cooling system		I	I	I	I
Fuel lines			I		I
Air cleaner filter (Viscous paper type)★			R		R
GASOLINE ENGINE: Drive belts for cracks, fraying, wear & tension			I	I	I
GASOLINE ENGINE: Fuel filter★				R	
GASOLINE ENGINE: Spark plugs		R	R	R	R
GASOLINE ENGINE: Ignition leads				I	
GASOLINE ENGINE: Heated oxygen sensor (Exhaust gas sensor)			I		I
GASOLINE ENGINE: PCV filter★			R		R
GASOLINE ENGINE: Vapor lines			I		I
GASOLINE ENGINE: Adjust intake & exhaust valve clearance	**See NOTE (2)**				
DIESEL ENGINE: Fuel filter★				R	R
DIESEL ENGINE: Nozzles	**See NOTE (3)**				
DIESEL ENGINE: Timing belts for camshaft and injection pump		Replace every 90,000 km (54,000 miles)			
CHASSIS AND BODY	**Underhood**				
Brake and clutch fluid (level and leaks)		I	I	I	I
Automatic Transaxle (level and leaks)		I	I	I	I
Brake and clutch fluid★			R		R
Brake booster vacuum hoses, connections & check valve			I		I
Power steering fluid & lines		I	I	I	I
	Under vehicle				
Brake & clutch systems for security, leaks, cracks, chafing, abrasion, deterioration, etc.		I	I	I	I
Oil level in manual transaxle		I	I	I	I
Steering gear & linkage, axle & suspension parts & exhaust system for damaged, loose & missing parts, lubrication & leaks★			I		I
Drive shafts for damaged, loose & missing parts, lubrication & leaks★		I	I	I	I
	Outside and inside				
Wheel alignment. If necessary, rotate & balance wheels		I	I	I	I
Brake pads, discs & other brake components for wear, deterioration & leaks★		I	I	I	I
Brake linings, drums & other brake components for wear, deterioration & leaks★		I	I	I	I
Seat belts, buckles, retractors, anchors & adjuster		I	I	I	I
Headlamp aiming		I	I	I	I
Foot brake, parking brake & clutch for free play, stroke & operation		I	I	I	I
Ventilation air filter		R	R	R	R
Check body corrosion			Annually		
Supplemental Restraint System	**See NOTE (4)**				

NOTE: (1) Change at 60 months or 54,000 miles (90,000 km), then every 24 months or 36,000 miles (60,000 km).
(2) Periodic maintenance is not required. However, if valve noise increases, check valve clearances.
(3) If engine power decreases, black smoke is emitted or engine noise increases, check and, if necessary, adjust the fuel injection nozzle's starting pressure and the fuel spray pattern.
(4) Inspect at the first 10 years and then every 2 years.
(5) Maintenance items with "★" should be performed more frequently according to "Maintenance under Severe Driving Conditions".

Maintenance Under Severe Driving Conditions

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the items shown in the following table.

SEVERE DRIVING CONDITIONS

A – Driving under dusty conditions
B – Driving repeatedly short distances
C – Towing a trailer
D – Extensive idling
E – Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high
F – Driving in high humidity areas or in mountainous areas
G – Driving in areas using salt or other corrosive materials
H – Driving on rough and/or muddy roads or in the desert
I – Driving with frequent use of braking or in mountainous areas

Maintenance operation: Check = Check. Correct or replace if necessary.

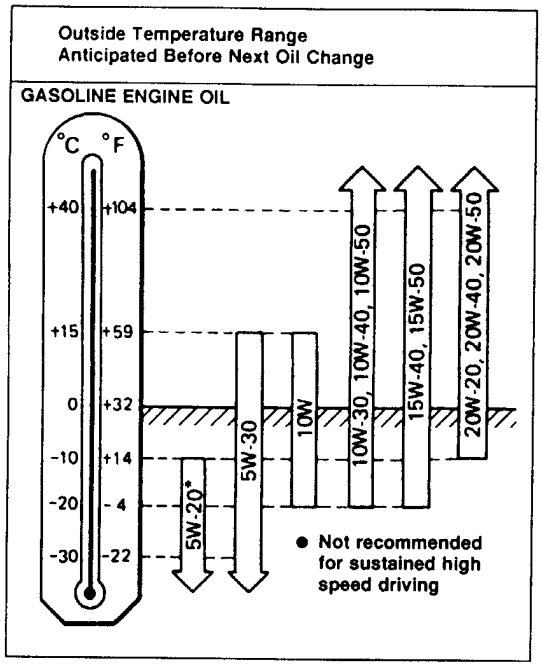
Driving condition	Maintenance item	Maintenance operation	Maintenance interval
Engine oil service			
A B C D	Engine oil & oil filter		
	Gasoline engine	Replace	Every 4,500 miles (7,500 km) or 6 months
	Diesel engine	Replace	Every 3,000 miles (5,000 km) or 6 months
Major service			
A	Air cleaner filter & PCV filter	Replace	Every 12 months or 18,000 miles (30,000 km)
A . . . E	Fuel filter	Replace	
. . . . . F . . .	Brake and clutch fluid	Replace	
. . . . . G H .	Steering gear & linkage, axle & suspension parts, exhaust system	Check	
. . C . . . . H .	Automatic & manual transaxle oil	Replace	Every 24 months or 36,000 miles (60,000 km)
A . C . . . G H I	Brake pads, discs & other brake components	Check	Every 6 months or 9.000 miles (15,000 km)
A . C . . . G H I	Brake linings, drums & other brake components	Check	
. . C . . . . H .	Drive shafts	Check	
A	Ventilation air filter	Replace	More frequently

Fluids and Lubricants

		Capacity (Approximate)		Recommended fluids and lubricants
		Liter	Imp measure	
Engine oil (Refill)				Gasoline engines: API SG or SH* Diesel engines: CCMC-PD2*
With oil filter	GA16DE	3.3	5-7/8 pts	
	SR20De, SR20DE	3.0	5-1/4 pts	
	CD20T	4.7	8-1/4 pts	
Without oil filter	GA16DE	2.9	5-1/8 pts	
	SR20De, SR20DE	2.8	4-7/8 pts	
	CD20T	4.2	7-3/8 pts	
Cooling system (With reservoir tank)	GA16DE	5.5	9-5/8 pts	Anti-freeze coolant (Ethylene glycol base)
	SR20De	6.0	10-5/8 pts	
	SR20DE	6.4	11-1/4 pts	
	CD20T	6.6	11-5/8 pts	
Reservoir		0.7	1-1/4 pts	
Manual transaxle gear oil	RS5F31A	2.9	5-1/8 pts	API GL-4*
	RS5F32A	3.6	6-3/8 pts	
Automatic transaxle fluid		7.0	12-3/8 pts	Genuine NISSAN ATF or equivalent
Power steering fluid		1.1	2 pts	Type DEXRON™
Brake fluid		–	–	DOT 4 (US FMVSS No. 116)
Multi-purpose grease		–	–	NLGI No. 2 (Lithium soap base)
Air conditioning system refrigerant				R-134a
Air conditioning system lubricants				NISSAN A/C System Oil Type R or exact equivalent

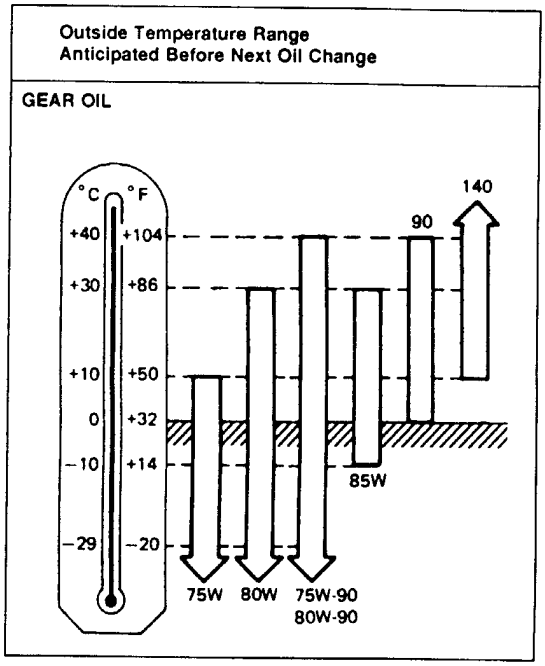
*: For further details, see "SAE Viscosity Number".

SAE Viscosity Number



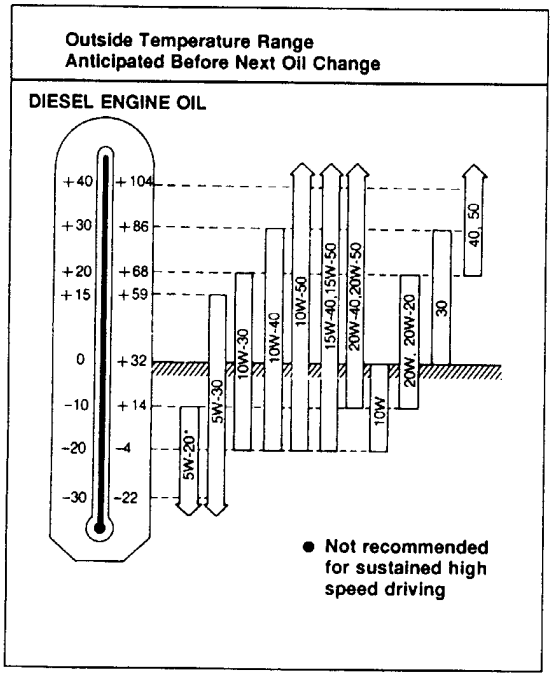
TI0005

- For warm and cold areas: 7.5W-30 is preferable for ambient temperatures above –20°C (–4°F).
- For hot areas: 20W-40 and 20W-50 are suitable.



TI0003

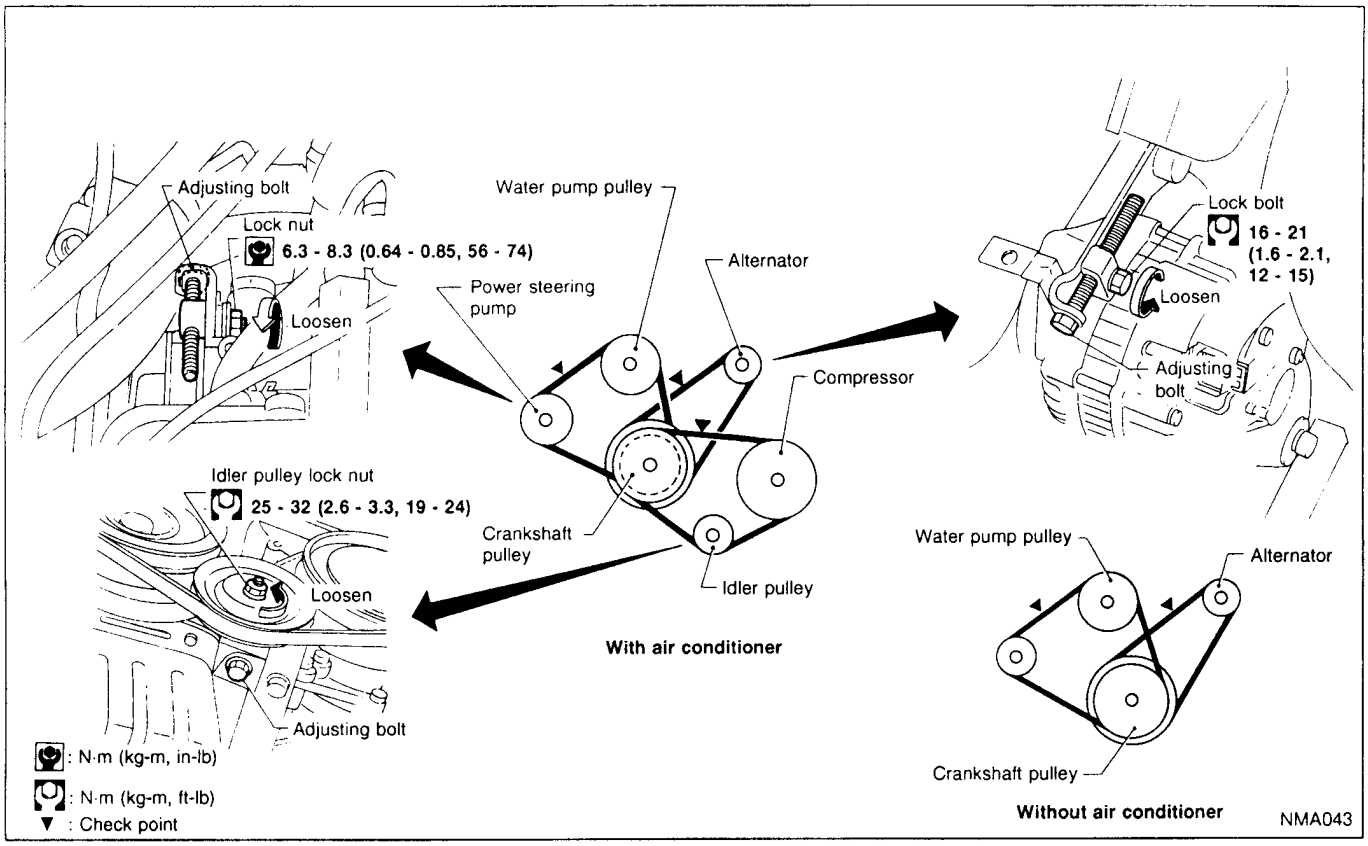
- For cold areas: 80W-90 is preferable for ambient temperatures below 40°C (104°F).
- For hot and warm areas: 90 is suitable.



TI0006

- For cold and warm areas: 10W-30 is preferable for ambient temperatures above –20°C (–4°F).
- For hot areas: 20W-40 and 20W-50 are suitable.

Checking Drive Belts



1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
2. Inspect drive belt deflections by pushing on the belt midway between pulleys.

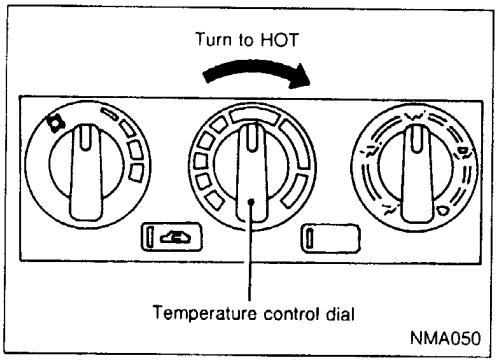
Adjust if belt deflections exceed the limit.

Belt deflection:

Unit: mm (in)

Drive belts	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	11 (0.43)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Air conditioner compressor	9.5 (0.374)	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
Power steering oil pump	7.5 (0.295)	4 - 6 (0.16 - 0.24)	3 - 5 (0.12 - 0.20)
Applied pushing force	98 N (10 kg, 22 lb)		

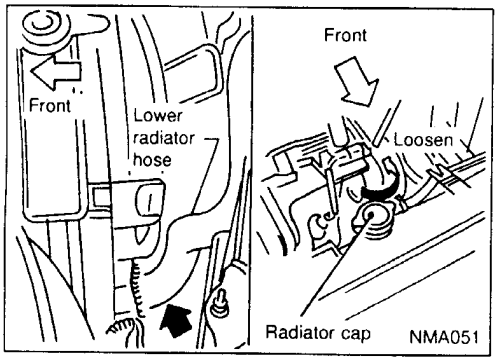
Inspect drive belt deflections when engine is cold.



Changing Engine Coolant

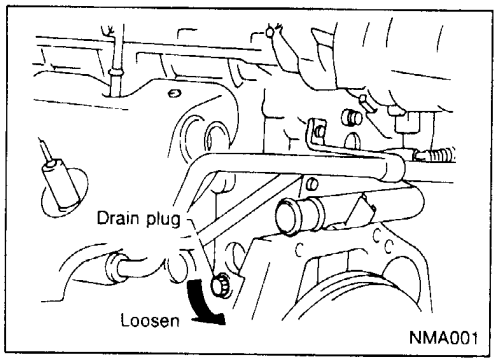
WARNING:
To avoid being scalded, never change the coolant when the engine is hot.

1. Move heater "TEMP" control lever to "HOT" position.



2. Disconnect lower radiator hose, and remove radiator cap.
3. Remove reservoir tank, drain coolant, then clean reservoir tank.
   Re-install it temporarily.

- **Be careful not to allow coolant to contact drive belts.**



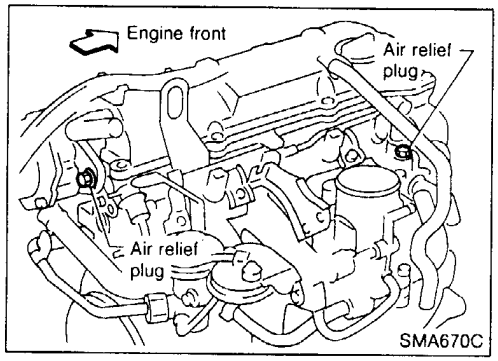
4. Remove cylinder block drain plug and air relief plugs.
5. Connect lower radiator hose.
6. Fill radiator with water until coolant spills from drain plug hole during refill, then re-install drain plug securely.
7. Fill radiator and reservoir tank with water until coolant spills from the air relief holes and air relief valve.
   Reinstall air relief plugs and close air relief valve in this order.
   Air relief plug:
   : 7 - 8 N·m (0.7 - 0.8 kg-m, 5.1 - 5.8 ft-lb)
8. Re-install radiator cap.
9. Warm up engine until radiator fan operates, then race engine 2 or 3 times under no-load.

- **Make sure that blower fan switch is "OFF".**

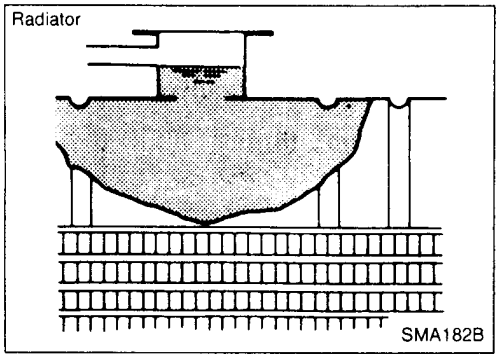
10. Stop engine and wait until it cools down.
11. Repeat step 2 through step 10 until clear water begins to drain from radiator.
12. Drain water.

- **Apply sealant to the thread of drain plug.**
  :34 - 44 N·m (3.5 - 4.5 kg-m, 25 - 33 ft-lb)

13. Re-install reservoir tank.

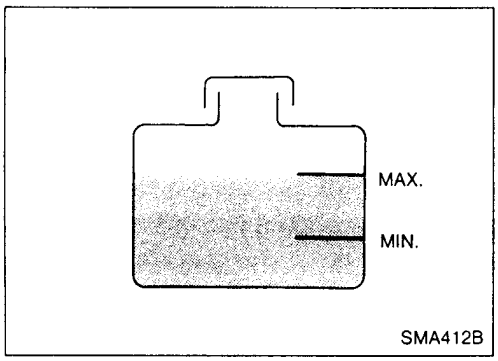


Changing Engine Coolant (Cont'd)



14. Fill radiator and reservoir tank with coolant up to specified level following step 6 through step 9.
    Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.
    Coolant capacity (With reservoir tank):
    5.5 ℓ (9-5/8 Imp pts)
    Reservoir tank:
    0.7 ℓ (1-1/4 Imp pts)

Pour coolant through coolant filler neck slowly to allow air in system to escape.



15. If necessary, add coolant.
16. Start and warm up engine, then increase engine speed to 4,000 rpm. Check that radiator coolant level is not lowered, and that no water noise is heard in heater core. If water noise is heard, bleed air by referring to "Refilling Engine Coolant" in section LC.

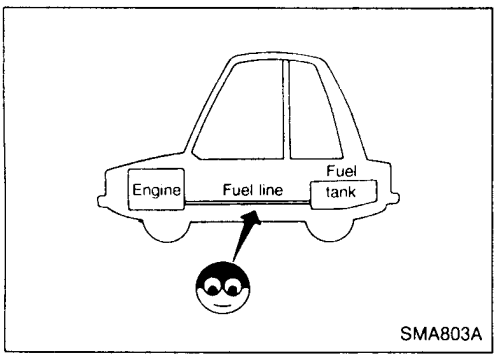
Checking Cooling System

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 clotch around the cap and carefully remove it by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.

CHECKING HOSES

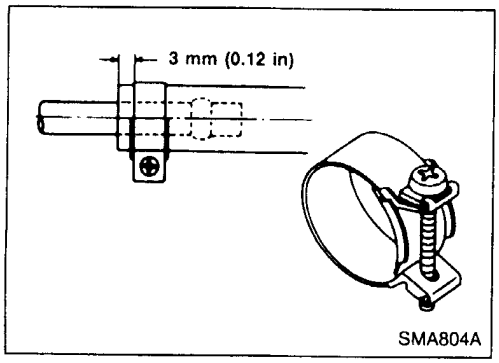
Check hoses for leaks, cracks, damage, loose connections, chafing and deterioration.

Checking Fuel Lines



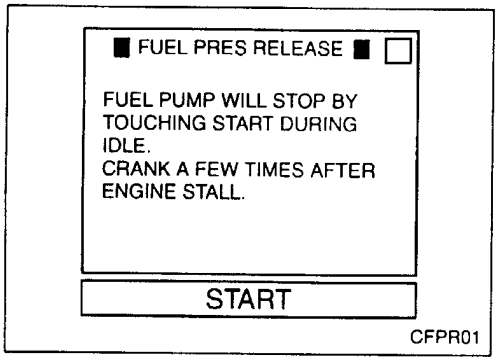
Inspect fuel lines and tank for leaks, cracks, damage, loose connections, chafing and deterioration.
If necessary, repair or replace faulty parts.

Checking Fuel Lines (Cont'd)



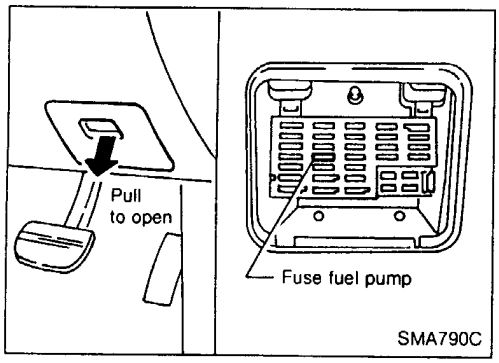
CAUTION:
Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.
Tighten torque specifications are the same for all rubber hose clamps.
Ensure that screw does not contact adjacent parts.

Changing Fuel Filter

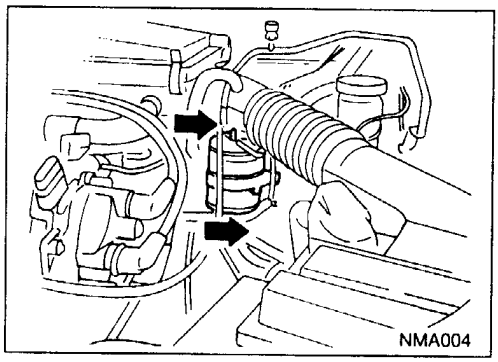


Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.

1. Start engine.
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode and release fuel pressure to zero.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off.



1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off and install fuse for fuel pump.

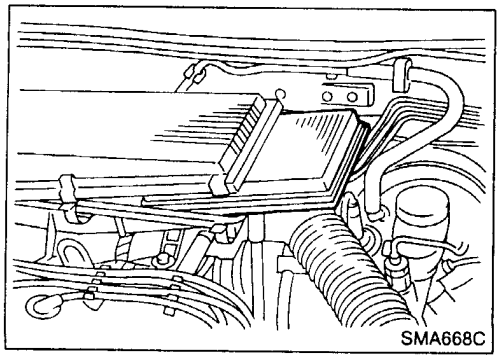


5. Loosen fuel hose clamps.
6. Replace fuel filter.

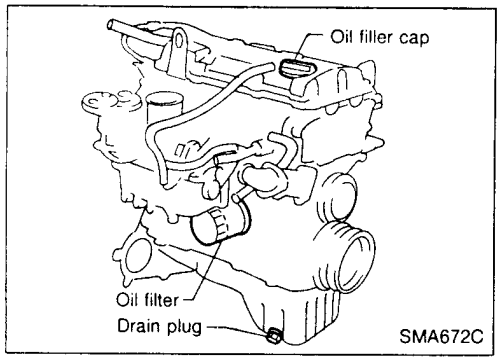
- **Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel spillage.**
- **Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**
- **When tightening fuel hose clamps, refer to "Checking Fuel Lines".**

Changing Air Cleaner Filter

Viscous paper type



The viscous paper type filter does not need cleaning between renewals.



Changing Engine Oil

WARNING:
Be careful not to burn yourself, as the engine oil is hot.

1. Warm up engine, and check for oil leakage from engine components.
2. Remove drain plug and oil filler cap.
3. Drain oil and refill with new engine oil.

Oil grade: API SG
Viscosity: See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section
Refill oil capacity (Approximate):

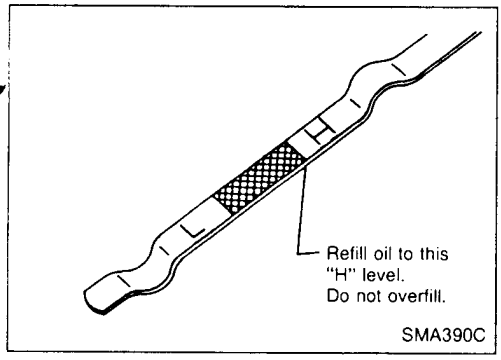
Unit: ℓ (Imp pts)

With oil filter change	3.3 (5-7/8)
Without oil filter change	2.9 (5-1/8)

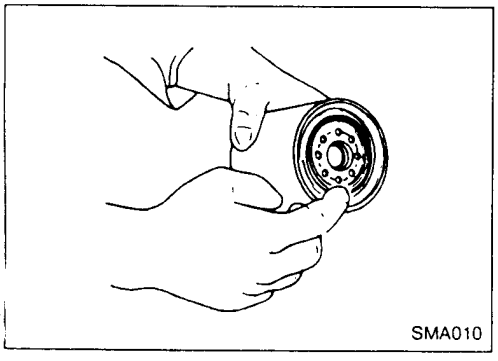
- **Refill oil capacity changes depending on the oil temperature and drain time. Use these values as a reference and be certain to check with the dipstick when changing the oil.**

CAUTION:

- **Be sure to clean drain plug and install with new washer.**
  Drain plug:
  : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)



4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.



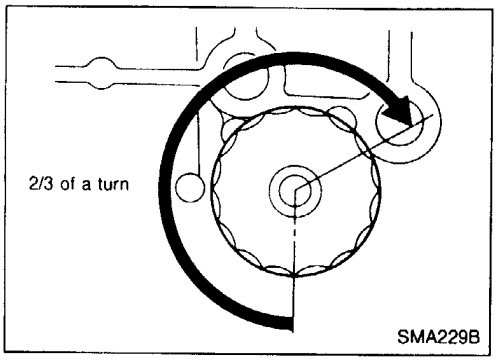
Changing Oil Filter

1. Remove oil filter with Tool.

WARNING:
Be careful not to burn yourself, as the engine and the engine oil are hot.

2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.

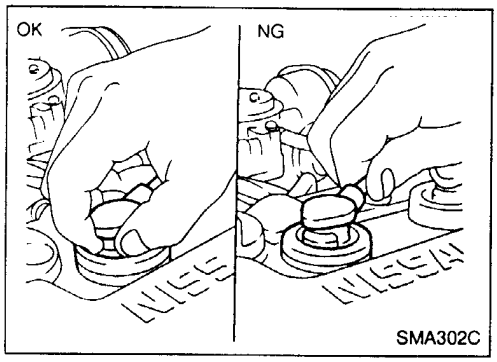
Changing Oil Filter (Cont'd)



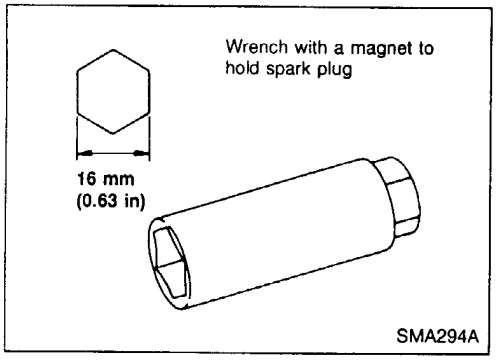
3. Screw in the oil filter until a slight resistance is felt, then tighten an additional 2/3 turn.
4. Add engine oil.

Refer to Changing Engine Oil.

Checking and Changing Spark Plugs



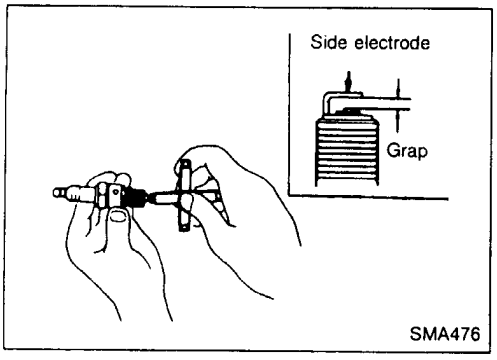
1. Disconnect ignition wires from spark plugs at boot. Do not pull on the wire.



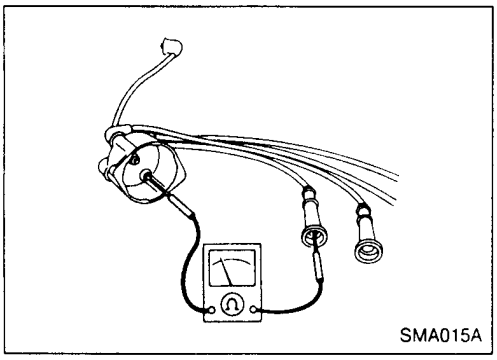
2. Remove spark plugs with spark plug wrench.
3. Clean plugs in sand blast cleaner.
4. Check insulator for cracks or chips, gasket for damage or deterioration and electrode for wear and burning. If excessively worn, replace with new spark plugs.

Spark plug:

Make	CHAMPION	NGK
Standard type	RC9YCC	BKR6E
Hot type	RC12YCC	–
Cold type	RC7YCC	BKR6E, BKR7E



5. Check spark plug gap.
   Gap: 1.0 - 1.1 mm (0.039 - 0.043 in)
6. Install spark plugs. Reconnect ignition wires.
   Spark plug:
   : 20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)


SMA015A

Checking Ignition Leads

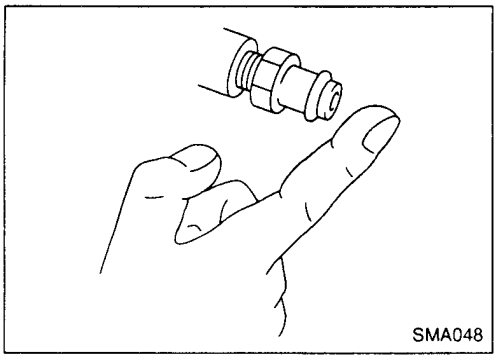
1. Inspect leads for cracks, damage, burnt terminals and for improper fit.
2. Measure the resistance of wires and check for intermittent breaks.

Resistance:

Unit: kΩ/m (kΩ/ft)

Marking	Resistance
"L'ectrofil"	5.4 - 5.8 (1.65 - 1.77)

If it exceeds the above specification, replace the ignition lead with a new one.


SMA048

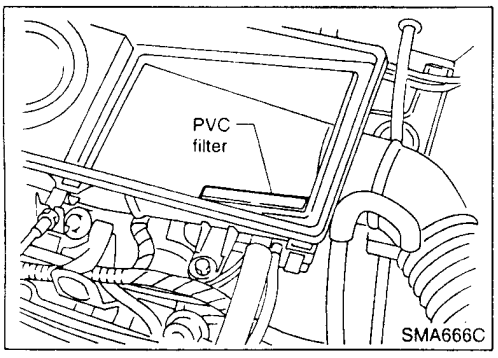
Checking Positive Crankcase Ventilation (PCV) System

CHECKING PCV VALVE

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

CHECKING VENTILATION HOSES

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.



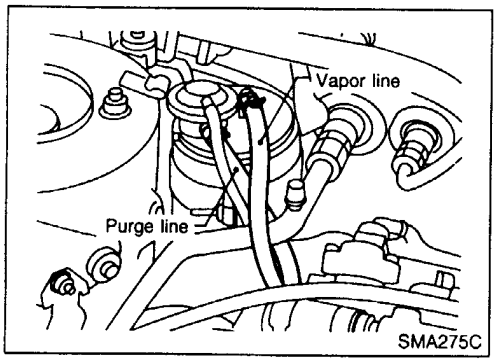
SMA666C

Changing Positive Crankcase Ventilation (PCV) Filter

Remove air cleaner cover and replace PCV filter.

Checking Vacuum Hoses and Connections

Check vacuum hoses for leaks, cracks, damage, loose connections, chafing and deterioration.

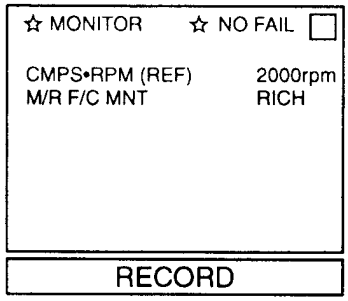


Checking, EVAP Vapor Lines

1. Visually inspect vapor lines for leaks, cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

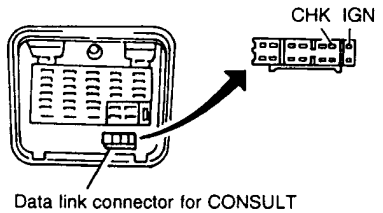
Refer to EVAPORATIVE EMISSION CONTROL SYSTEM INSPECTION in EC section.

A



CMNC04

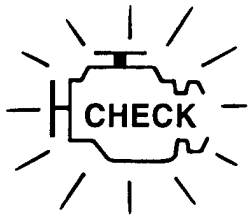
B



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

SEF909P

C



Malfunction indicator lamp

SEF051PA

Checking Heated Oxygen Sensor (HO2S)

Checking procedure

INSPECTION START

↓

Start engine and warm up until engine reaches normal operating temperature.

↓

A B C

1. See "M/R F/C MNT" in "Data monitor" mode.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. 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.

RICH → LEAN → RICH →
1 time 2 times
LEAN → RICH . . . . . .

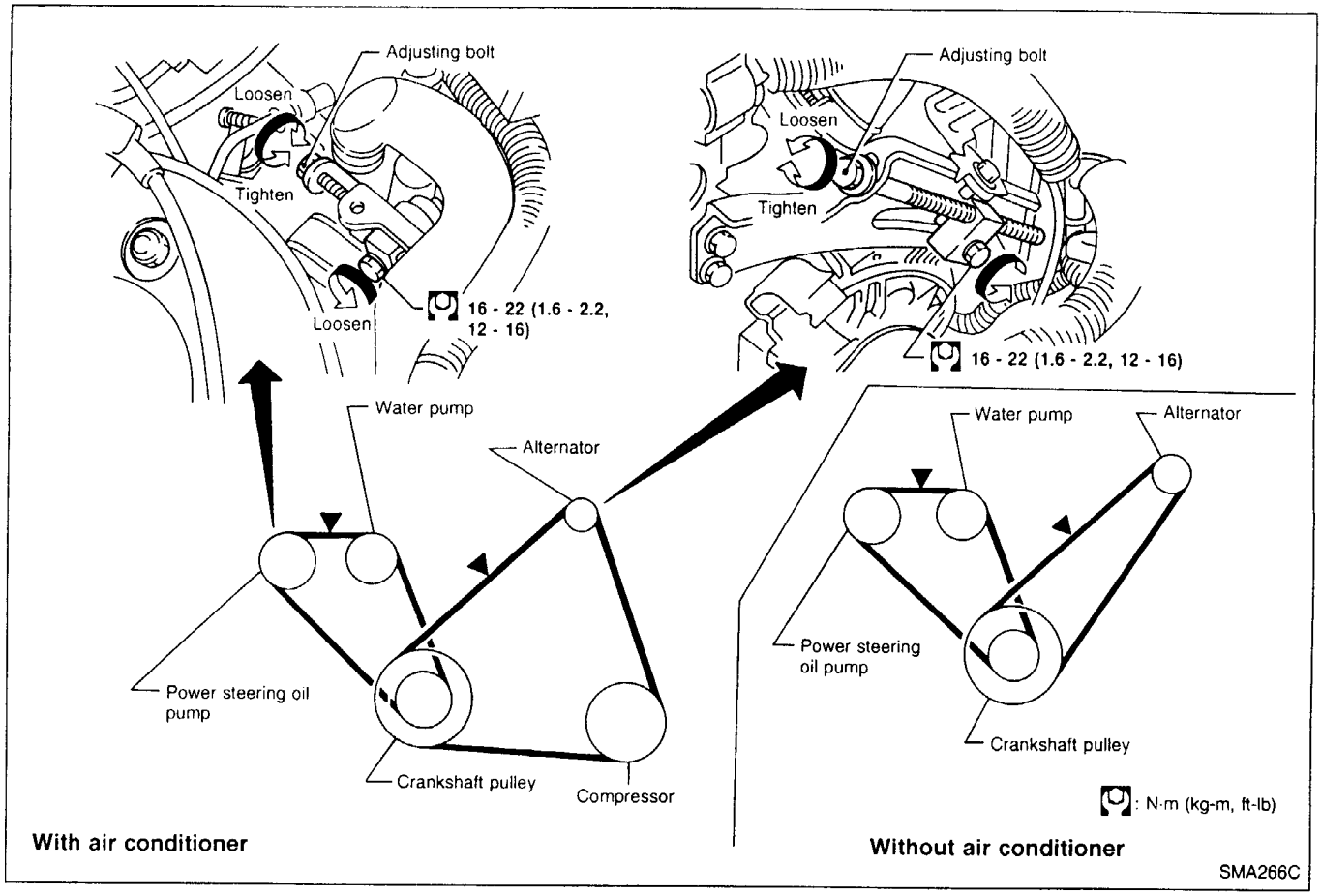
OR

1. Set "Heated oxygen sensor monitor" in the self-diagnostic Mode II.
(Refer to EC-section.)
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintaining engine at 2,000 rpm under no-load, check to make sure that the malfunction indicator lamp on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

OK → INSPECTION END

NG → Check and adjustment should be made by referring to IDLE SPEED/ IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION in EC section.

Checking Drive Belts



1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
2. Inspect drive belt deflections by pushing on the belt midway between pulleys.

Adjust if belt deflections exceed the limit.

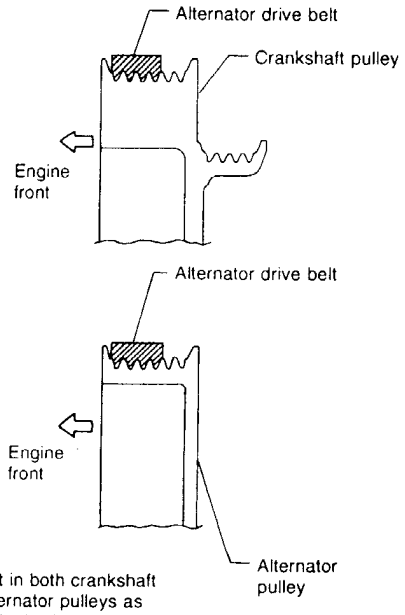
Belt deflection:

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator			
With air conditioner compressor	11.5 - 12.5 (0.453 - 0.492)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
Without air conditioner compressor	12 - 13 (0.47 - 0.51)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump	6 - 7 (0.24 - 0.28)	4 - 5 (0.16 - 0.20)	3.5 - 4.5 (0.138 - 0.177)
Applied pushing force	98 N (10 kg, 22 lb)		

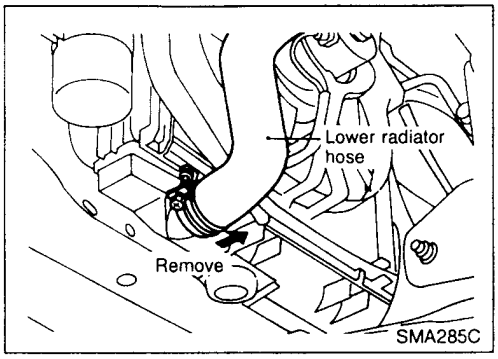
Inspect drive belt deflections when engine is cold.

Alternator drive belt fitting (Models without air conditioner)



Set belt in both crankshaft and alternator pulleys as shown in the figure.

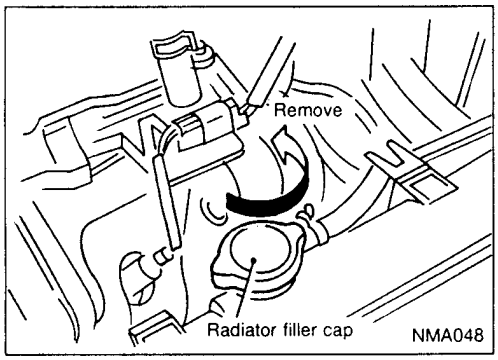
SMA328C



Changing Engine Coolant

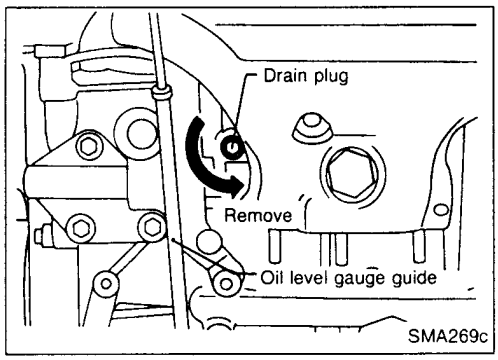
WARNING:
To avoid being scalded, never change the coolant when the engine is hot.

1. Move heater "TEMP" control dial to "HOT" position.

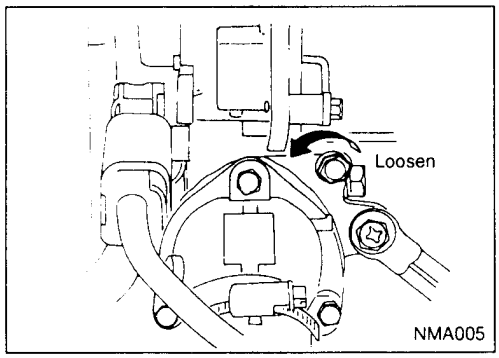


2. Disconnect lower radiator hose and remove radiator cap.
3. Remove reservoir tank, drain coolant, then clean reservoir tank.
   Re-install it temporarily.

- **Be careful not to allow coolant to contact drive belts.**



4. Remove cylinder block drain plug and air relief plug.



5. Connect lower radiator hose and tighten drain plug securely.
6. Fill radiator and reservoir tank with water.
   Reinstall air relief plug once coolant spills from the air relief hole.
   Air relief plug:
   : 10 N·m (1.0 kg-m, 7 ft-lb)
7. Re-install radiator cap.
8. Warm up engine until radiator fan operates, then race engine 2 or 3 times under no-load.

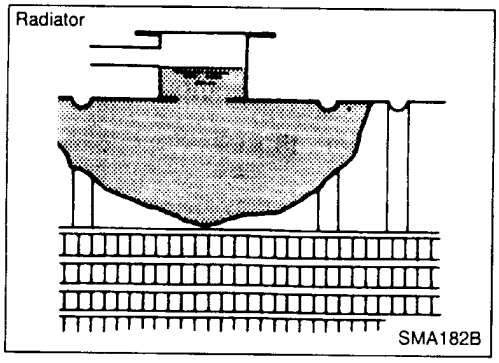
- **Make sure that air conditioner switch is "OFF".**

9. Stop engine and wait until it cools down.
10. Repeat step 2 through step 9 until clear water begins to drain from radiator.
11. Drain water.

- **Apply sealant to the thread of drain plug.**
  : 8 - 12 N·m (0.8 - 1.2 kg-m, 5.8 - 8.7 ft-lb)

12. Reinstall reservoir tank.

Changing Engine Coolant (Cont'd)

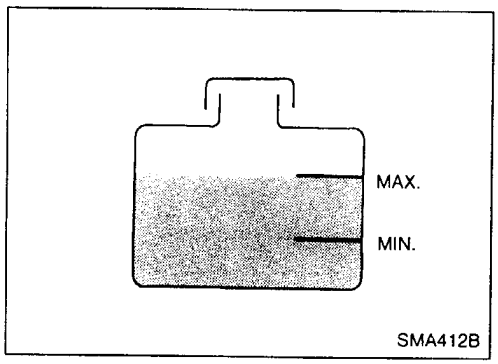


13. Fill radiator and reservoir tank with coolant up to specified level following step 6 through step 9.
    Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity (With reservoir tank):

Unit: ℓ (Imp pts)

SR20De	SR20DE
6.0 (10-5/8)	6.4 (11-1/4)

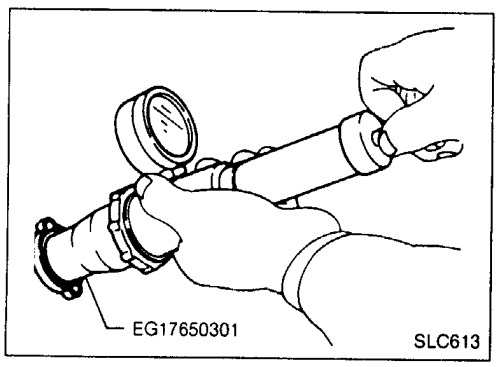


[Reservoir tank capacity for "MAX" level is 0.7 ℓ (1-1/4 Imp pts).]
Pour coolant through coolant filler neck slowly to allow air in system to escape.
15. If necessary, add coolant.

Checking Cooling System

CHECKING HOSES

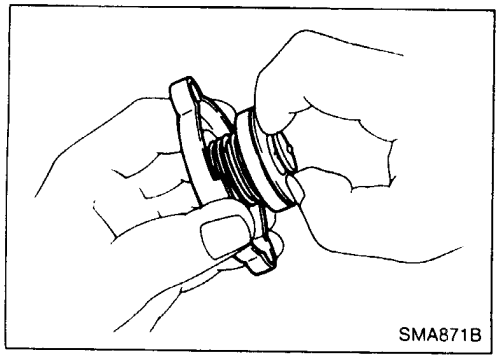
Check hoses for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.



CHECKING RADIATOR CAP

Apply pressure to radiator cap with cap tester to see if it is satisfactory.

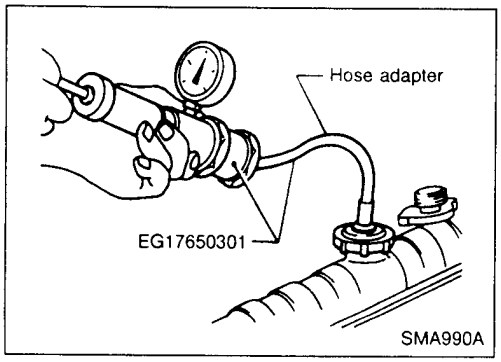
Radiator cap relief pressure:
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm², 11 - 14 psi)



Pull the negative-pressure valve to open it. Check that it closes completely when released.

Checking Cooling System (Cont'd)

CHECKING COOLING SYSTEM FOR LEAKS

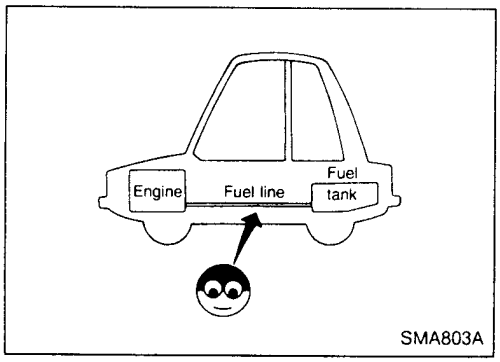


Apply pressure to the cooling system with cap tester to check for leakage.

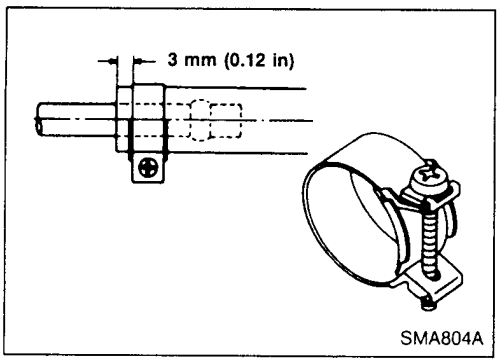
Testing pressure:
98 kPa (0.98 bar, 1.0 kg/cm^2, 14 psi)

CAUTION:
Higher pressure than the specified value may cause damage to radiator.

Checking Fuel Lines

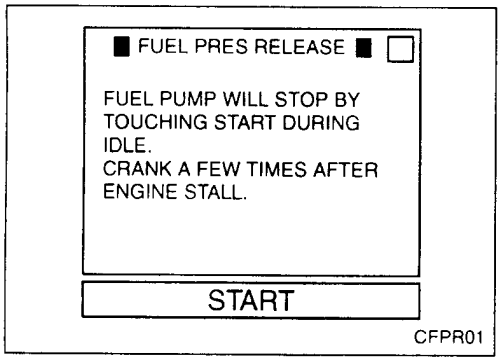


Inspect fuel lines and tank for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration. If necessary, repair or replace faulty parts.



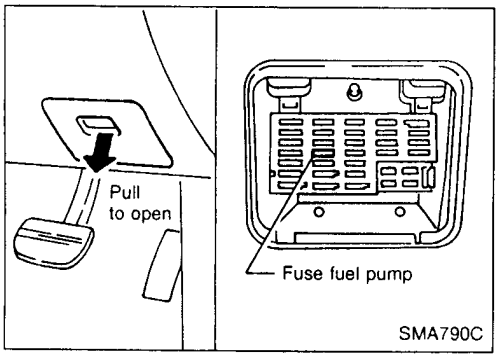
CAUTION:
Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.
Tightening torque specifications are the same for all rubber hose clamps.
Ensure that screw does not contact adjacent parts.

Changing Fuel Filter



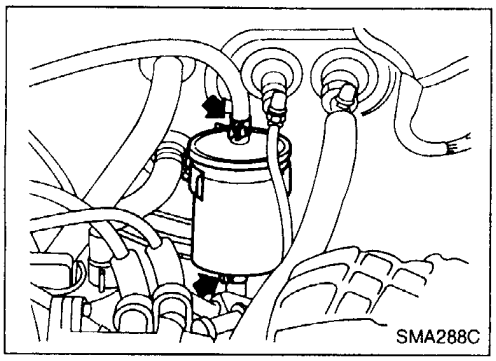
WARNING:
Before removing fuel filter, release fuel pressure from fuel line to eliminate danger.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode and release fuel pressure to zero.
2. Turn ignition switch off.



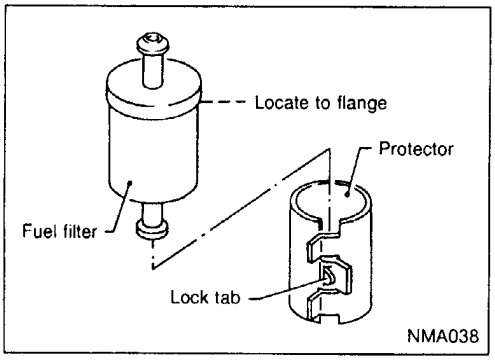
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off and install fuse for fuel pump.

Changing Fuel Filter (Cont'd)


SMA288C

5. Loosen fuel hose clamps.
6. Replace fuel filter.

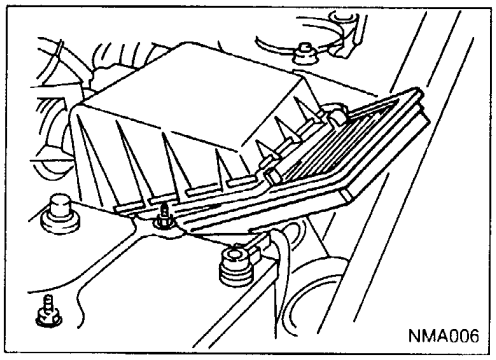
- **Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.**
- **Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**
- **When tightening fuel hose clamps, refer to "Checking Fuel Lines".**



NMA038

SR20 LHD models:

- **Ensure protector is fitted to fuel fitter as shown. Protector should be flush with filter flange.**

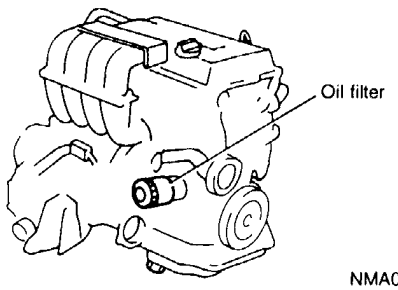

NMA006

Changing Air Cleaner Filter

Viscous paper type

The viscous paper type filter does not need cleaning between renewals.

SR20De engine model



NMA049

Changing Engine Oil

WARNING:

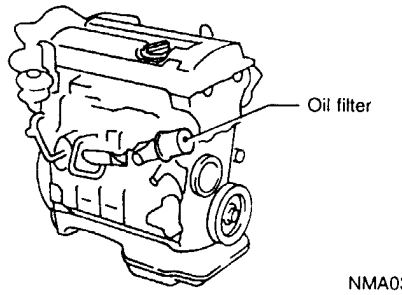
Be careful not to burn yourself, as the engine oil is hot.

1. Warm up engine, and check for oil leakage from engine components.
2. Remove drain plug and oil filler cap.
3. Drain oil and refill with new engine oil.

Refill oil capacity (Approximate): Unit: ℓ (Imp pts)

With oil filter change	3.0 (5-1/4)
Without oil filter change	2.8 (4-7/8)

SR20DE engine models



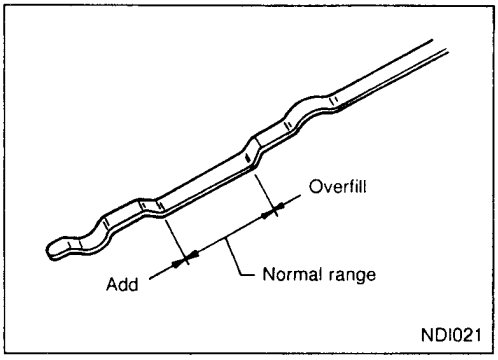
NMA039

The refill capacity changes depending on the oil temperature and drain time, use these values as a reference and be certain to check with the dipstick when changing the oil.

CAUTION:

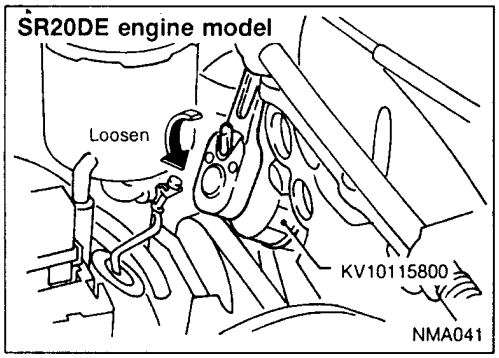
- **Be sure to clean drain plug and install with new washer.**
  Drain plug:
  : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
- **Use recommended engine oil (API SG or SH grade).**

Changing Engine Oil (Cont'd)



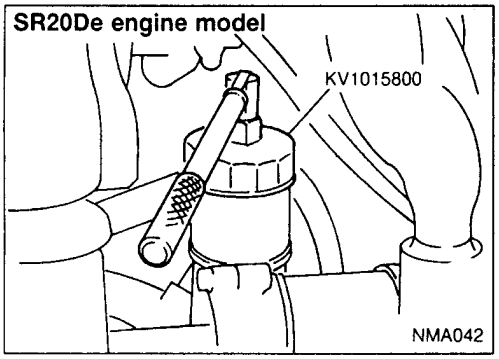
4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

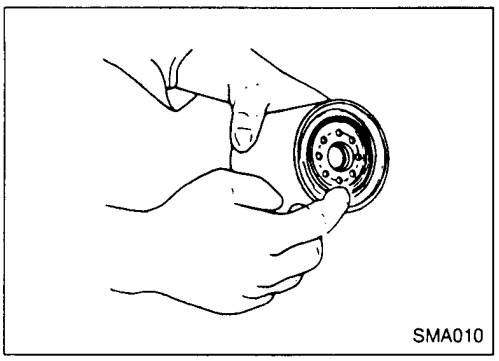
Changing Oil Filter



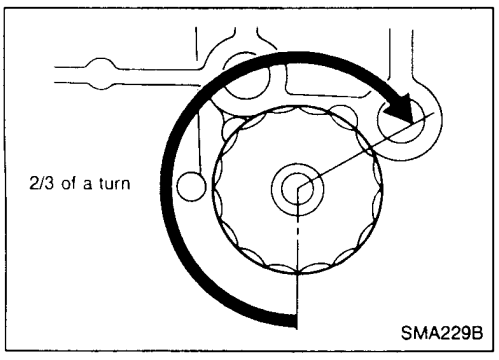
1. Remove oil filter with Tool.

WARNING:
Be careful not to burn yourself, as the engine and the engine oil are hot.



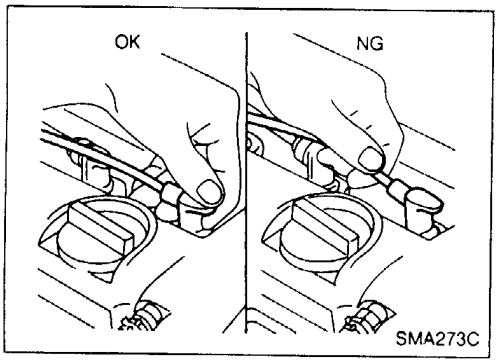


2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.



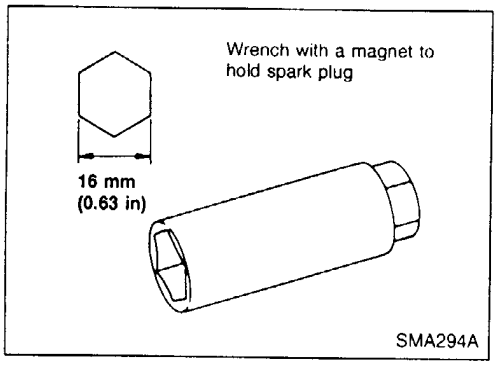
3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.
4. Add engine oil.

Refer to Changing Engine Oil.



Checking and Changing Spark Plugs

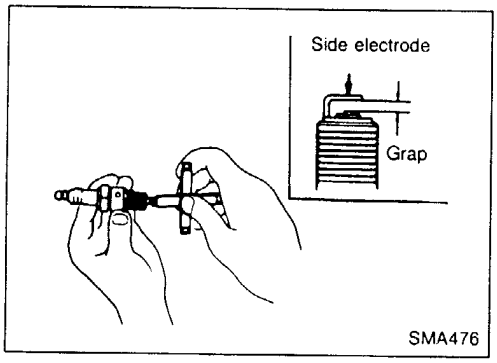
1. Disconnect ignition wires from spark plugs at boot. Do not pull on the wire.



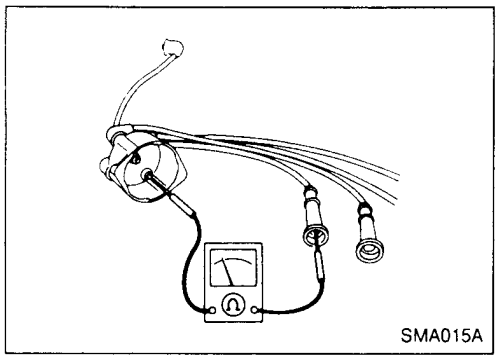
2. Remove spark plugs with spark plug wrench.
3. Clean plugs in sand blast cleaner.
4. Check insulator for cracks or chips, gasket for damage or deterioration and electrode for wear and burning. If they are excessively worn away, replace with new spark plugs.

Spark plug

Engine	SR20DE	SR20De	
Make	NGK		CHAMPION
Standard type	BKR6EY	BKR5EY	RC9MCC
Hot type	BKR5EY	BKR4EY	RC12MCC
Cold type	BKR7EY	BKR6EY	RC7MCC



5. Check spark plug gap.
   Gap: 1.0 - 1.1 mm (0.039 - 0.043 in)
6. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.
   Spark plug:
   : 20 - 29 N·m (2 - 3 kg-m, 14 - 22 ft-lb)


SMA015A

Checking Ignition Leads

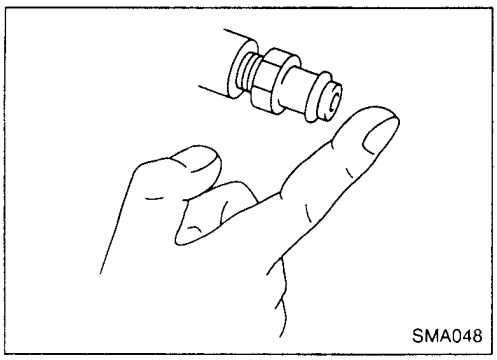
1. Inspect leads for cracks, damage, burned terminals and for incorrect fit.
2. Measure the resistance of leads and check for intermittent breaks.

Resistance:

Unit: kΩ

Ignition Lead	Resistance
No. 1 cylinder	Approx. 3.8
No. 2 cylinder	Approx. 3.5
No. 3 cylinder	Approx. 2.7
No. 4 cylinder	Approx. 2.4

If the resistance exceeds the above specification, replace the ignition lead with a new one.


SMA048

Checking Positive Crankcase Ventilation (PCV) System

CHECKING PCV VALVE

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

CHECKING VENTILATION HOSES

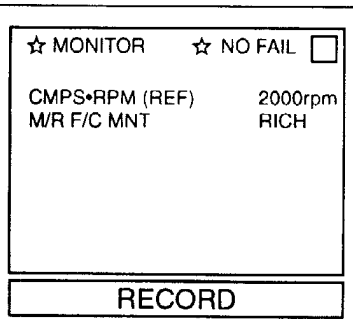
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

Checking Vacuum Hoses and Connections

Check vacuum hoses for leaks, cracks, damage, loose connections, chafing and deterioration.

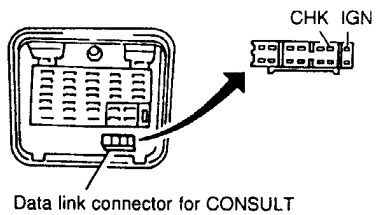
Refer to Vacuum Hose Drawing in EMISSION CONTROL OVERALL SYSTEM in EC section.

A



CMNC04

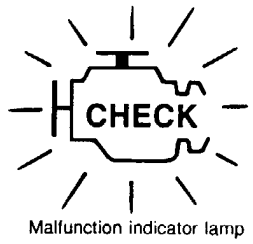
B



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

SEF909P

C



Malfunction indicator lamp

SEF051PA

Checking Heated Oxygen Sensor (HO2S)

Checking procedure

INSPECTION START

↓

Start engine and warm up until engine reaches normal operating temperature.

↓

A B C

1. See "M/R F/C MNT" in "Data monitor" mode.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. 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 time **RICH → LEAN → RICH →**

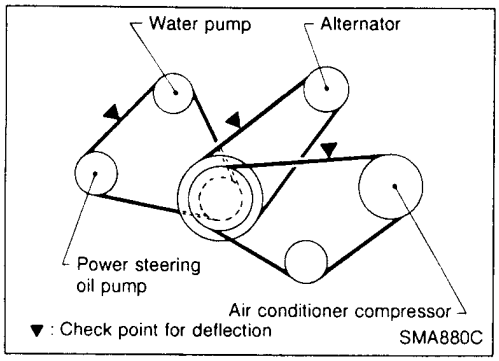
2 times **RICH → LEAN → RICH → LEAN → RICH . . . . . .**

OR

1. Set "Heated oxygen sensor monitor" in the Diagnostic test mode II. (Refer to EC section.)
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintaining engine at 2,000 rpm under no-load, check to make sure that malfunction indicator lamp on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

OK → INSPECTION END

NG → Check and adjustment should be made by referring to IDLE SPEED/ IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION in EC section.



Checking Drive Belt

WARNING:

Inspect drive belt deflections when engine is cold. When engine is hot, check deflections at least 30 minutes after engine has been switched off.

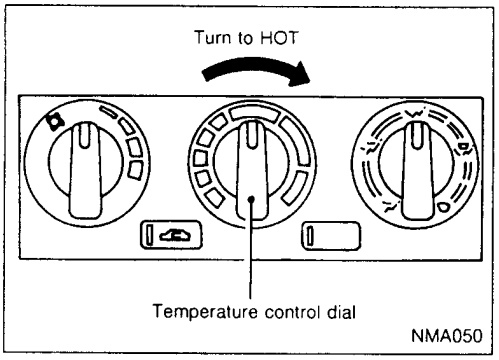
1. Inspect belts for cracks, fraying, wear or oil adhesion. If necessary, replace with new ones.
2. Inspect drive belt deflections by pushing on the belt midway between pulleys.
3. Adjust belt deflection if it exceeds the limit.

Belt deflection:

Unit: mm

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	17 (0.67)	10.5 - 12.5 (0.413 - 0.492)	8.5 - 10.5 (0.335 - 0.413)
Air conditioner compressor	17 (0.67)	11.5 - 13.5 (0.453 - 0.531)	9.5 - 11.5 (0.374- 0.453)
Power steering oil pump	8 (0.31)	5 - 7 (0.20 - 0.28)	4 - 6 (0.16 - 0.24)
Water pump without power steering	–	8 (0.31)	6 (0.24)
Applied pushing force	98 N (10 kg, 22 lb)		

Inspect drive belt deflections when engine is cold.



Changing Engine Coolant

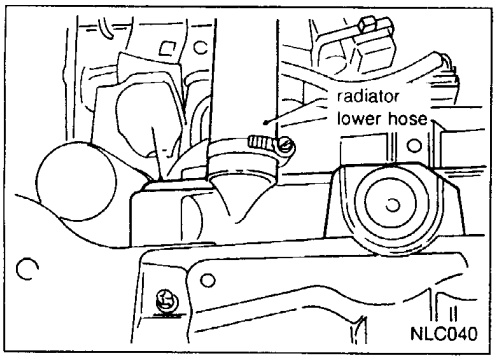
WARNING:

To avoid the danger of being scalded, never attempt to change the coolant when the engine is hot.

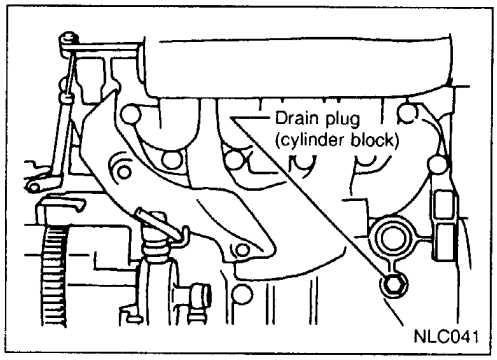
1. Turn ignition switch "ON" and set heater "TEMP" control dial to the max. "HOT" position.

- **Make sure that air conditioner switch is "OFF".**

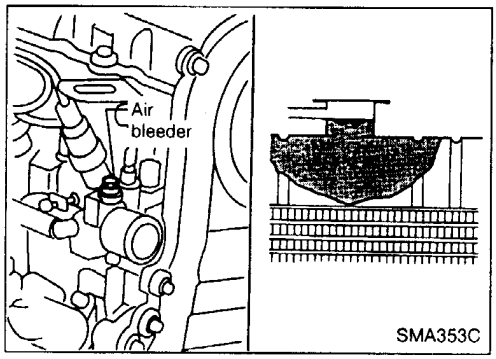
Changing Engine Coolant (Cont'd)



2. Remove radiator lower hose from radiator.



3. Open drain plug behind the turbocharger on the left hand side of cylinder block.
4. Remove radiator cap and drain coolant.
5. Close drain plugs and fill radiator with water up to filler neck.
6. Warm up engine and repeat steps 2, 3, 4 and 5 one or two times to drain old coolant.



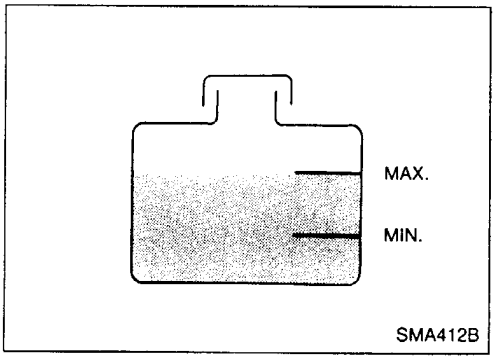
7. Open air bleeder.
8. Fill radiator with coolant up to filler neck.
   Follow instructions attached to anti-freeze container for anti-freeze to water mixing ratio.

Pour coolant slowly to allow air in system to escape.

Coolant capacity:

Unit: ℓ (Imp qt)

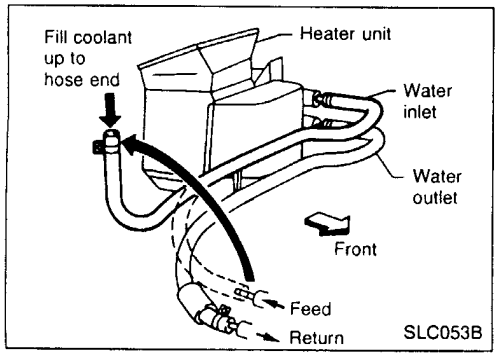
With heater	5.2 (4-5/8)
Without heater	4.9 (4-3/8)



Regarding the Anti-freeze Coolant Mixture Ratio, refer to "RECOMMENDED FLUIDS AND LUBRICANTS".

9. Securely close air bleeder.
10. Fill reservoir tank with coolant up to "MAX" level.
11. Warm up engine at about 2,000 rpm to normal operating temperature.
12. Stop engine and allow it to cool.
13. Check coolant level and refill reservoir tank if necessary.

- **Clean excess coolant from engine.**

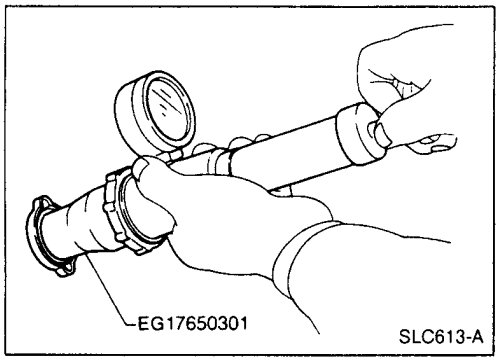


CAUTION:
When heater unit is removed or replaced, refill engine coolant as shown, removing heater hose at feeding connector on engine.

Checking Cooling System

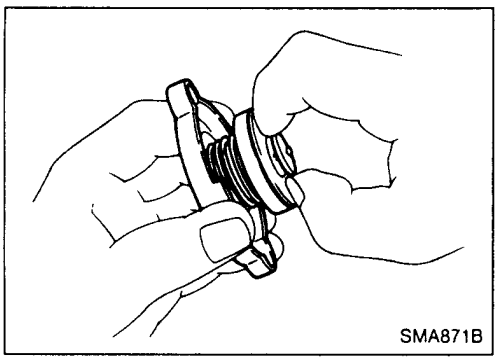
HOSE AND CLAMP CHECK

Check hoses for security, leaks, cracks, damage, loose connections, chafing and deterioration.

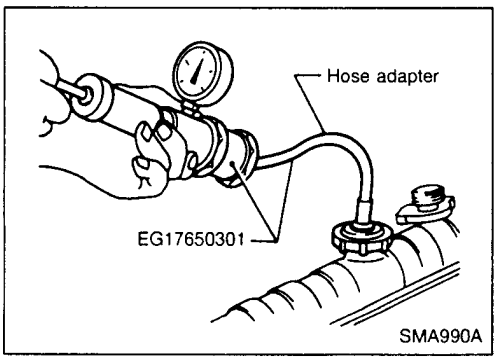


CHECKING RADIATOR CAP

1. Check relief pressure with cap tester.
   Radiator cap relief pressure:
   Standard
   78 - 98 kPa
   (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm², 11 - 14 psi)
   Limit
   59 - 98 kPa
   (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm², 9 - 14 psi)
   Replace radiator cap if pressure is not within the specified values.



2. Pull the negative-pressure valve to open it, and check that it closes completely when released.



CHECKING COOLING SYSTEM FOR LEAKS

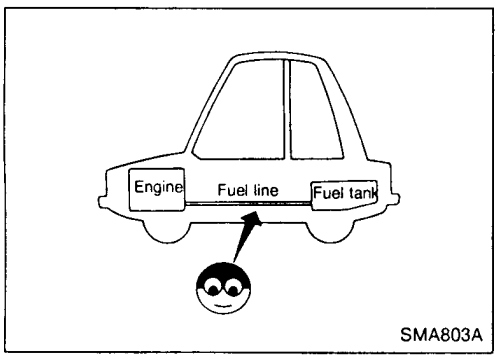
Apply pressure to the cooling system with cap tester to check for leakage.

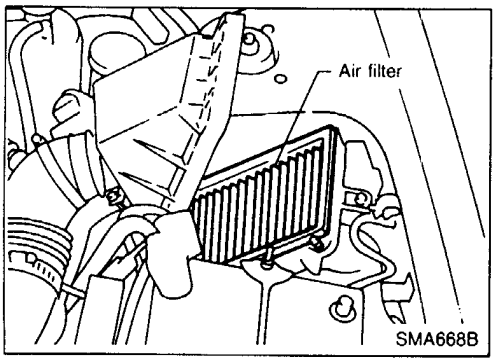
Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm², 23 psi)

CAUTION:
Use of a higher pressure than the specified value may cause damage to radiator.

Checking Fuel Line

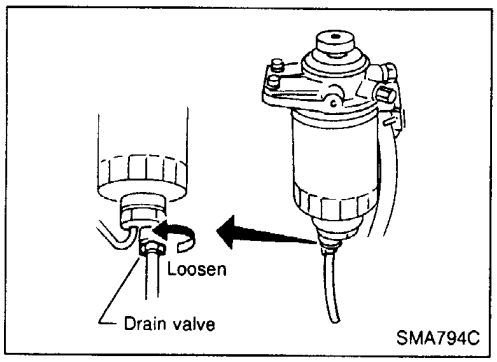
Inspect fuel lines and tank for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration. If necessary, repair or replace malfunctioning parts.





Changing Air Cleaner Filter

The viscous paper type air cleaner filter does not require any cleaning operation between renewals.



Water Draining, Fuel Filter Check and Replacement

DRAINING WATER

Open drain valve at the bottom of fuel filter.

FUEL FILTER CHECK

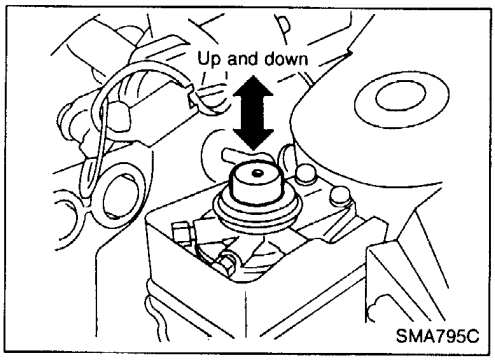
Check fuel filter for fuel leakage, damage and other abnormal signs.

REPLACING FUEL FILTER

1. Disconnect water sensor connector and replace fuel filter with a new one.

Hand-tighten fuel filter by about 2/3 turn after O-ring touches mounting surface. Follow the instructions on fuel filter.

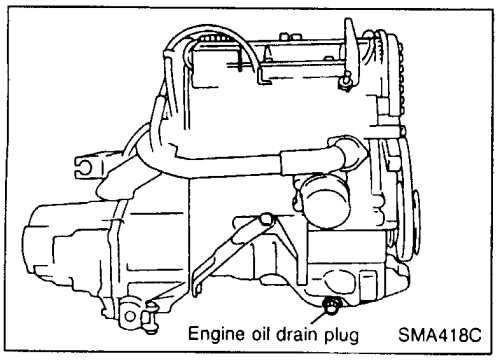
2. Connect water sensor connector and bleed fuel system.



FUEL SYSTEM AIR BLEEDING

1. Move priming pump up and down until there is suddenly more resistance in the movement. Then stop this action and start the engine.
2. If engine does not operate smoothly after being started, rev it two or three times.

When refilling empty fuel tank, bleed air out of fuel system.



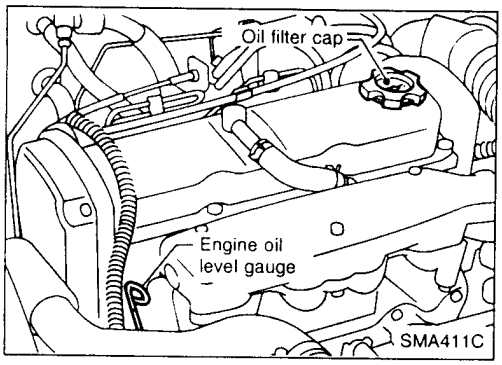
Changing Engine Oil

WARNING:

- **Be careful not to burn yourself, as engine oil is hot.**
- **Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**

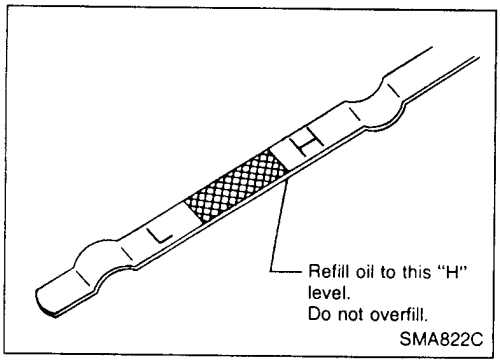
1. Warm up engine, and check for oil leakage from engine components.
2. Remove oil drain plug and drain oil.

Changing Engine Oil (Cont'd)



3. Tighten oil drain plug.
   Tightening torque:
   29 - 39 Nm (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
4. Fill with engine oil.
   Oil refill capacity:
   With oil filter
   4.7 ℓ (8-1/4 Imp pts)
   Without oil filter
   4.2 ℓ (7-3/8 Imp pts)

- **Use recommended engine oil "CCMC-PD2" with suitable viscosity.**
- **Refill oil capacity changes depending on the oil temperature and drain time. Use these values as reference and be certain to check with the dipstick when changing the oil.**

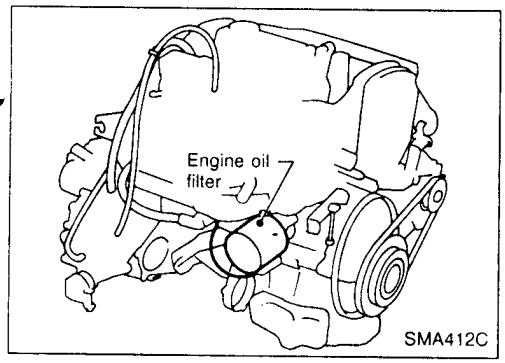


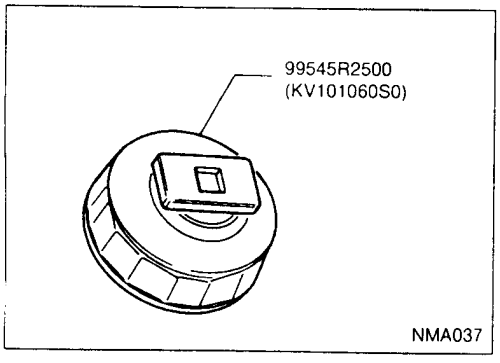
5. Confirm oil level and warm up engine.
6. Recheck oil level and adjust it to "H" level if necessary.

Changing Engine Oil Filter

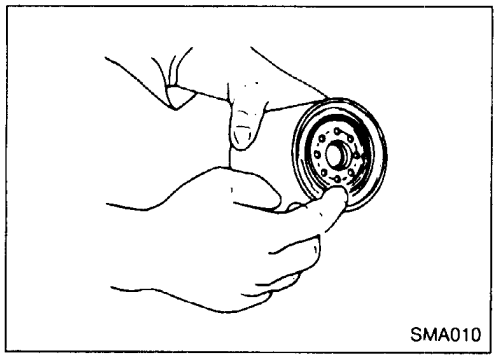
1. Remove oil filter with Tool.

WARNING:
Be careful not to burn yourself, as engine and engine oil are hot.

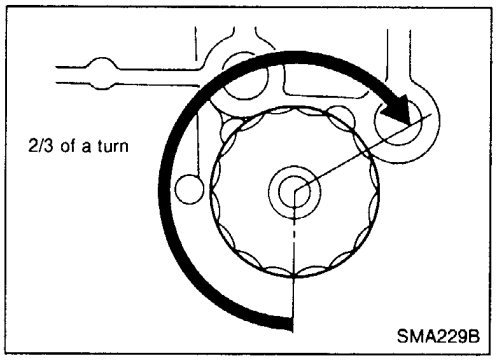




Changing Engine Oil Filter (Cont'd)


SMA010

2. Before installing new oil filter, wipe clean oil filter mounting surface on cylinder block, and apply a little engine oil to rubber seal of oil filter.



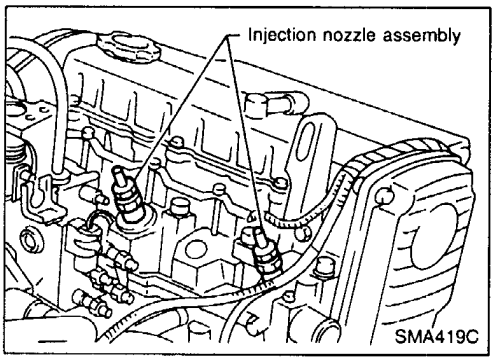
SMA229B

3. Screw oil filter on until a slight resistance is felt, then tighten an additional 2/3 turn.
4. Warm up engine and check oil level.
5. Adjust oil level if necessary.

Refer to Step 4 in "Changing Engine Oil", MA-31.

- **Clean excess oil from engine.**

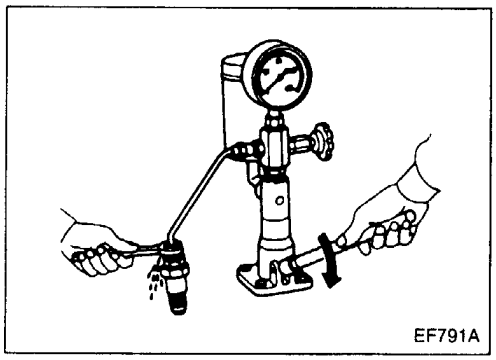
Checking Injection Nozzle



SMA419C

1. Remove injection delivery tubes and fuel spill tube.
2. Remove nozzle assembly with S.S.T. KV11105800.

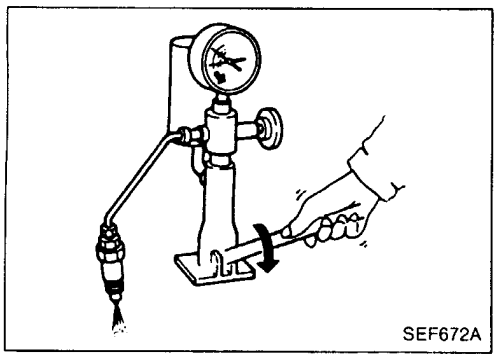
No. 1 cylinder nozzle assembly should not be disassembled as it is provided with a needle lift sensor.


EF791A

WARNING:

When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to come into contact with your hand or body, and make sure that your eyes are properly protected.

3. Clean and check nozzles.
4. Install nozzle to injection nozzle tester and bleed air from flare nut.
5. Check initial injection pressure by pumping tester handle one time per second.


SEF672A

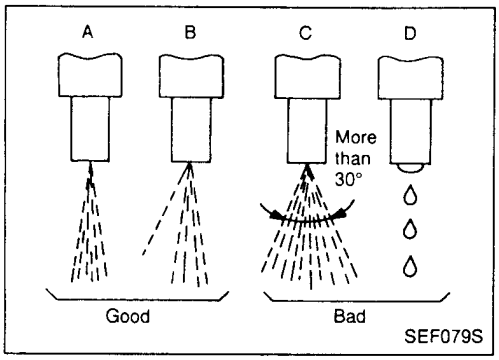
6. Install injector to pressure tester.
7. Check initial injection pressure by pumping tester handle slowly (one time per second).

Injection pressure:

12,749 kPa (127.5 bar, 130 kg/cm^2, 1,849 psi)

- **Always check initial injection pressure before installing new nozzle.**

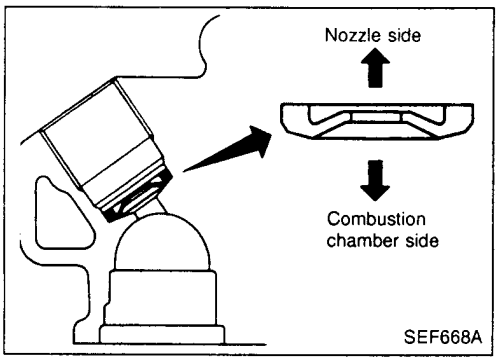
Checking Injection Nozzle (Cont'd)



8. Check fuel spray pattern by pumping tester handle one full stroke per second.

a. If main spray angle is within 30 degrees as shown, injection nozzle is good.

b. It is still normal even if a thin stream of spray deviates from main spray (pattern B).



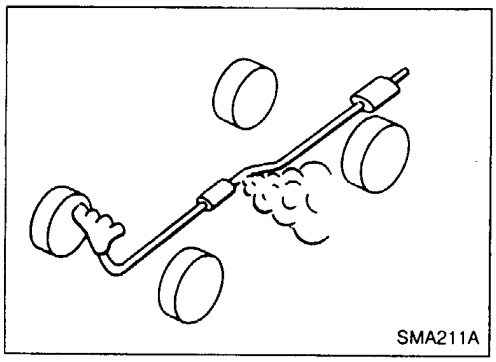
9. If initial injection pressure or injection nozzle is not normal, adjust or clean injection nozzle or replace it.

Refer to EC section for injection pressure adjustment, cleaning and replacement.

10. Install all injection nozzles with S.S.T. KV11105800 and securely connect fuel spill tube and delivery tubes.
11. Bleed air from fuel system and check for fuel leakage with engine running.

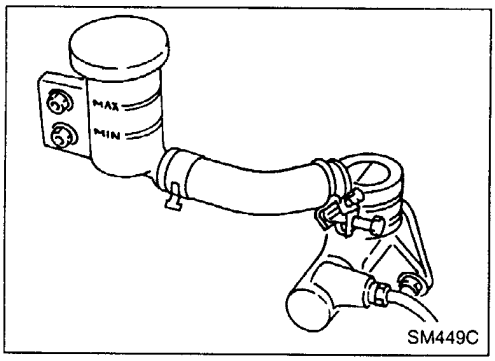
Replacing Timing Belt

Refer to "TIMING BELT" in EM section.


SMA211A

Checking Exhaust System

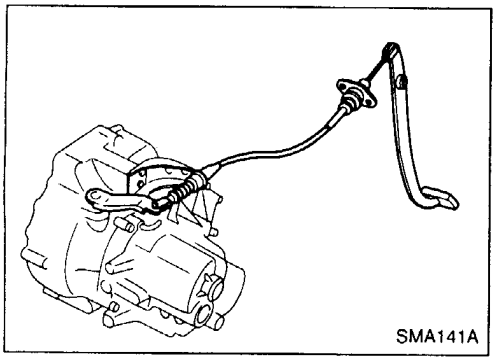
Check exhaust pipes, silencers and mountings are attached correctly and inspect for leaks, cracks, damage, loose connections, chafing or deterioration.



SM449C

Checking Clutch Fluid level and leaks

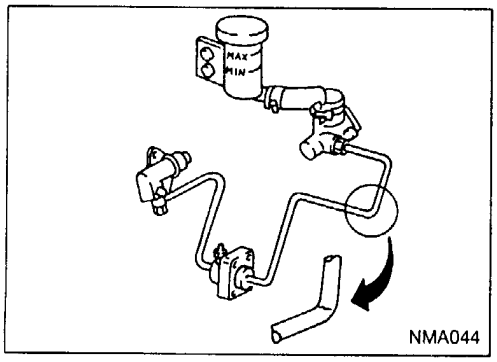
If fluid level is very low, check clutch system for leaks.


SMA141A

Checking Clutch System

MECHANICAL TYPE

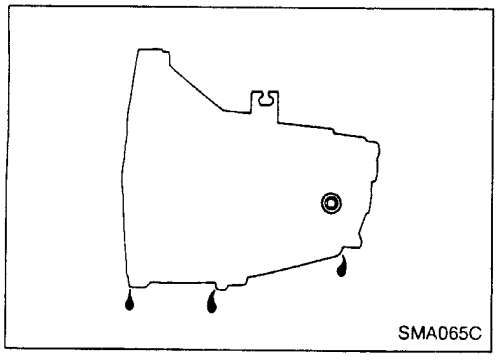
Check cable and linkage for incorrect attachment, chafing, wear and deterioration.



NMA044

HYDRAULIC TYPE

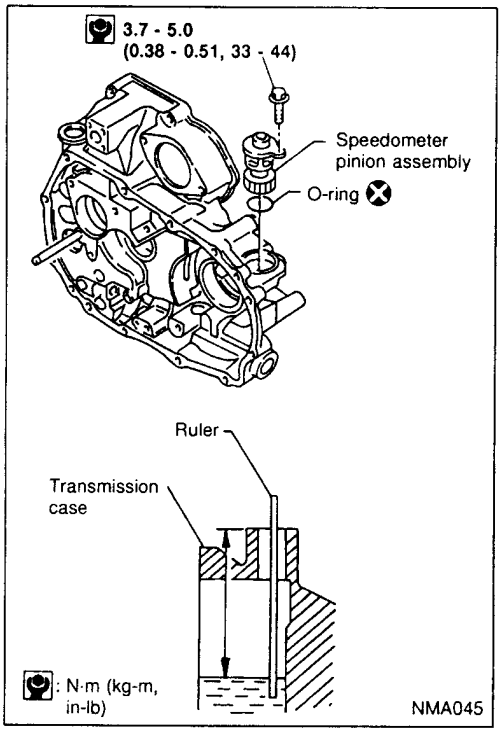
Check fluid lines, operating cylinder & damper for leaks, cracks, damage, loose connections, chafing & deterioration.


SMA065C

Checking M/T Oil

1. Check for oil leaks.

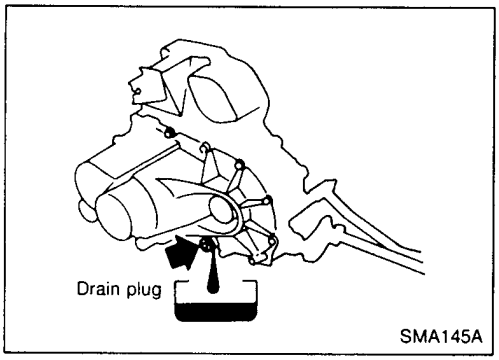
Checking M/T Oil (Cont'd)



2. Check oil level.
- **Remove speedometer pinion and check oil level distance "L" as shown.**

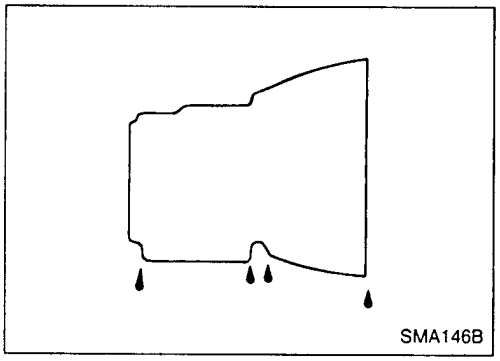
Oil level ("L"):
RS5F31A 57 - 66 mm (2.24 - 2.60 in)
RS5F32A (CD20T) 57 - 62 mm (2.24 - 2.44 in)
RS5F32A (SR20) 40 - 45 mm (1.57 - 1.77 in)

Use recommended gear oil (API GL-4 grade).



Changing M/T Oil

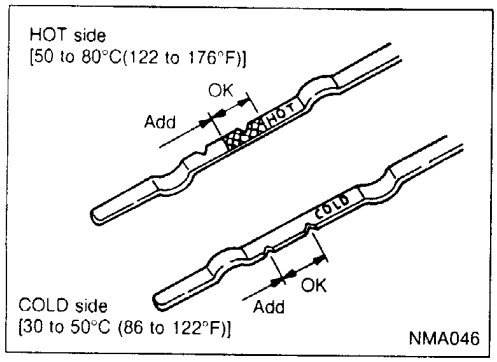
Oil capacity (reference values only):
RS5F31A 2.9 - 3.2 ℓ (5-1/8 - 5-5/8)
RS5F32A 3.6 - 3.8 ℓ (6-3/8 - 6-3/4 Imp pts)
Drain plug:
: 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)



Checking A/T Fluid Level

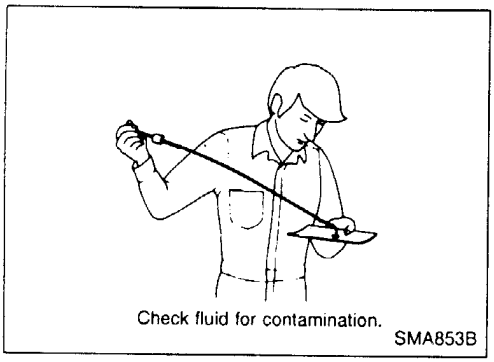
1. Check for fluid leakage.

Checking A/T Fluid Level (Cont'd)

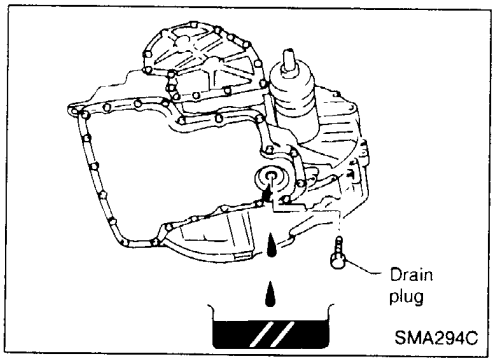


2. Check fluid level.
   Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) after vehicle has been driven approximately 5 minutes in urban areas after engine is warmed up. Fluid level can also be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick for reference after engine is warmed up and before driving. However, fluid level must be rechecked using "HOT" range.
   1) Park vehicle on level surface and set parking brake.
   2) Start engine and then move selector lever through each gear range, ending in "P".
   3) Check fluid level with engine idling.
   4) Remove dipstick and wipe it clean with lint-free paper.
   5) Re-insert dipstick into charging pipe as far as it will go.
   6) Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.

CAUTION:
Do not overfill.

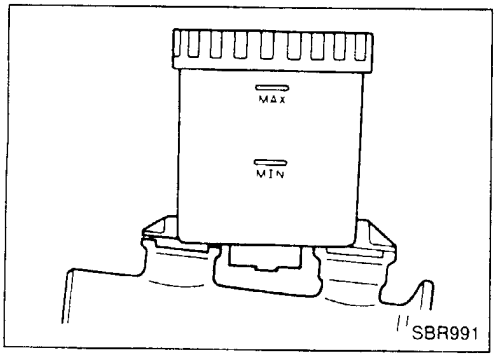


3. Check fluid condition.
   Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
   Refer to AT section for checking operation of A/T.



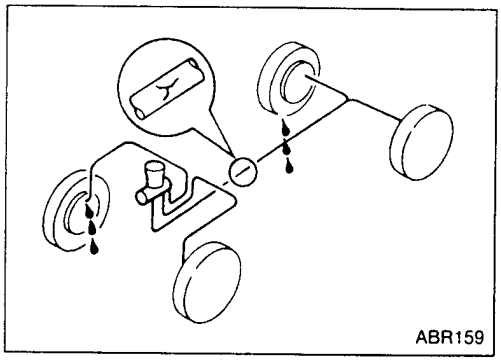
Changing A/T Fluid

Oil capacity (With torque converter):
7.0 ℓ (12-3/8 Imp pts)
Drain plug:
[O]: 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
Use recommended A/T fluid "DEXRON™" type.



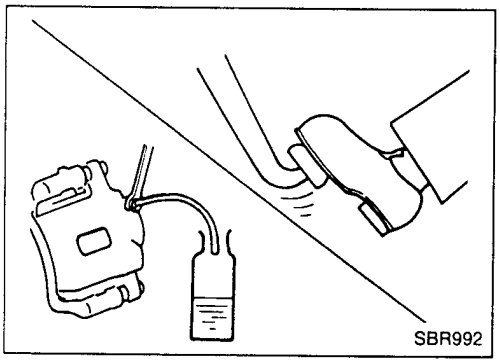
Checking Brake Fluid Level and Leaks

If fluid level is extremely low, check brake system for leaks, and brake pads for wear.


ABR159

Checking Brake System

Check brake fluid lines and parking brake cables for security, leaks, chafing, abrasion, deterioration, etc.

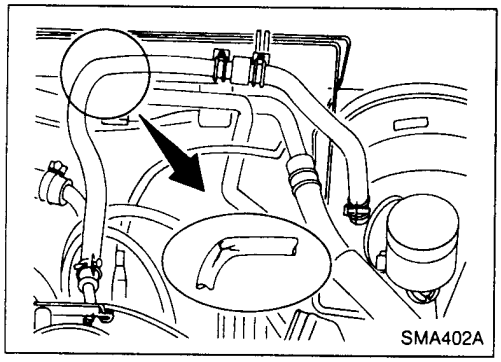

SBR992

Changing Brake Fluid

1. Drain brake fluid from each air bleeder valve.
2. Refill until new brake fluid comes out from each air bleeder valve. Use same procedure as in bleeding hydraulic system to refill brake fluid.

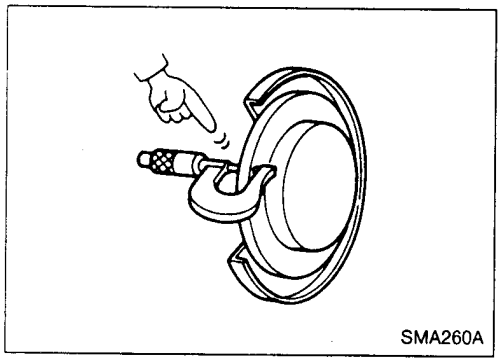
Refer to section BR.

- **Refill with recommended brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **Avoid skin contamination and ingestion.**


SMA402A

Checking Brake Booster, Vacuum Hoses, Connections and Check Valve

Check vacuum lines, connections and check valve for security, air tightness, chafing and deterioration.


SMA260A

Checking Disc Brake

Check condition of disc brake components.

ROTOR

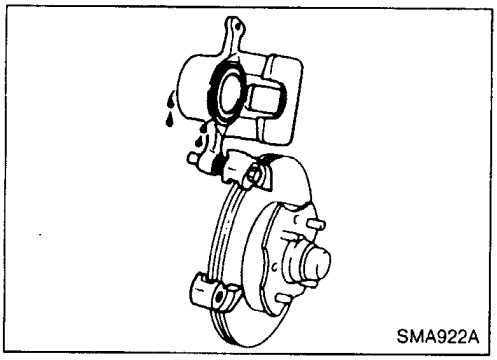
Check condition and thickness.

CL25VBG:
Standard thickness
22.0 mm (0.866 in)
Minimum thickness
20.0 mm (0.787 in)

CL25VG:
Standard thickness
22.0 mm (0.866 in)
Minimum thickness
20.0 mm (0.787 in)

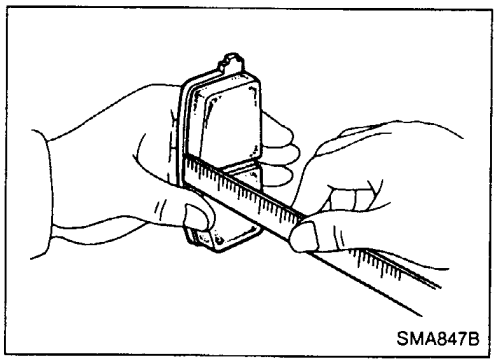
CL9HG:
Standard thickness
10.0 mm (0.394 in)
Minimum thickness
9.0 mm (0.354 in)

Checking Disc Brake (Cont'd)


SMA922A

CALIPER

Check operation and for leakage.


SMA847B

PAD

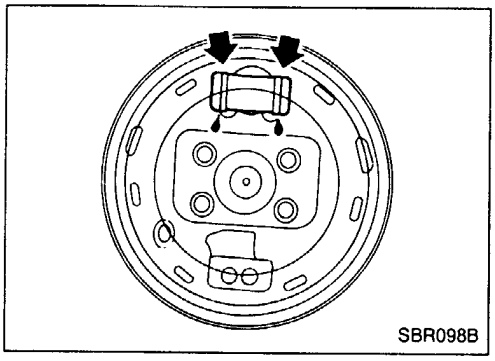
Check for wear or damage.

CL25VBG:
Standard thickness
11.0 mm (0.433 in)
Minimum thickness
2.0 mm (0.079 in)

CL25VG:
Standard thickness
11.0 mm (0.433 in)
Minimum thickness
2.0 mm (0.079 in)

CL9HG:
Standard thickness
9.3 mm (0.366 in)
Minimum thickness
2.0 mm (0.079 in)

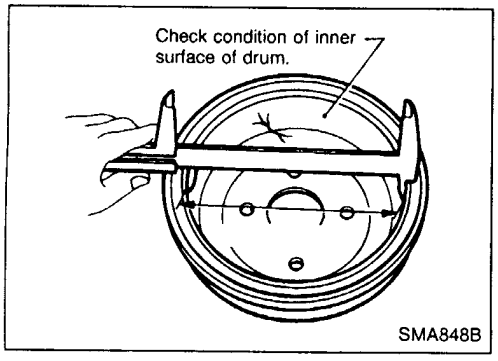
Checking Drum Brake


SBR098B

Check condition of drum brake components.

WHEEL CYLINDER

Check for leakage.



SMA848B

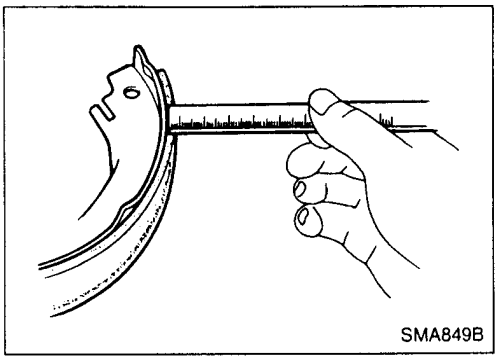
DRUM

Check condition of inner surface.

Standard inner diameter:
228.6 mm (9.00 in)
Maximum diameter:
230.0 mm (9.06 in)

Checking Drum Brake (Cont'd)

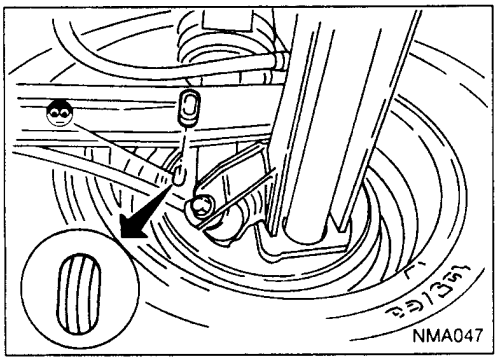
LINING


SMA849B

Check for wear or damage.

Standard thickness:
Trailing & Leading 4.4 mm (0.173 in) & Leading
Minimum thickness:
1.5 mm (0.059 in)

Refer to BR section for shoe replacement.

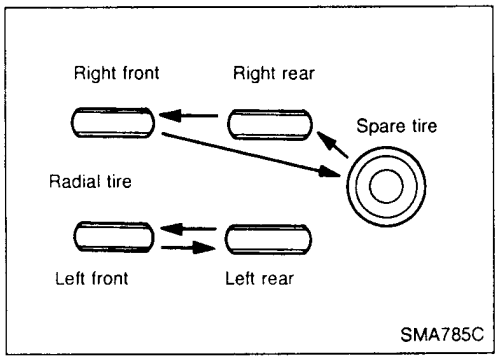

NMA047

TEMPORARY METHOD FOR CHECKING LINING WEAR

Remove inspection hole plug and check for lining wear.

Balancing Wheels

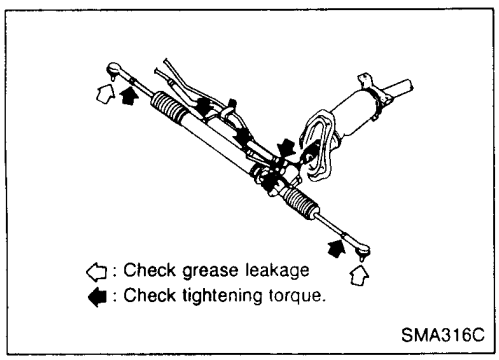
Wheel balance (maximum allowable unbalance):
10 g (0.35 oz) at rim flange.
Tire balance weight:
5 - 60 g (0.18 - 2.12 oz)



SMA785C

Tire Rotation

Wheel nuts:
[O]: 98 - 118 N·m (10 - 12 kg-m, 72 - 87 ft-lb)



SMA316C

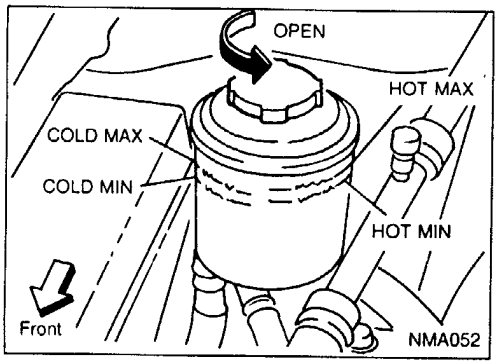
Checking Steering Gear and Linkage

STEERING GEAR

- Check gear housing and boots for security, damage or grease leakage.
- Check connection with steering column for security.

STEERING LINKAGE

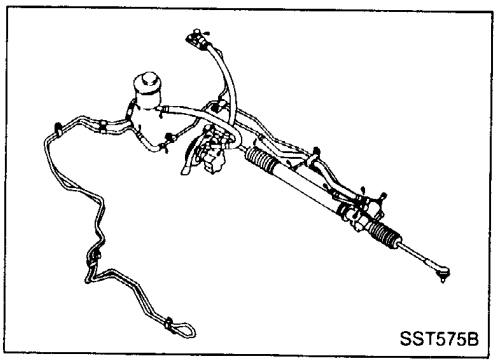
- Check ball joint, dust cover and other component parts for security, wear, damage or grease leakage.



Checking Power Steering Fluid and Lines

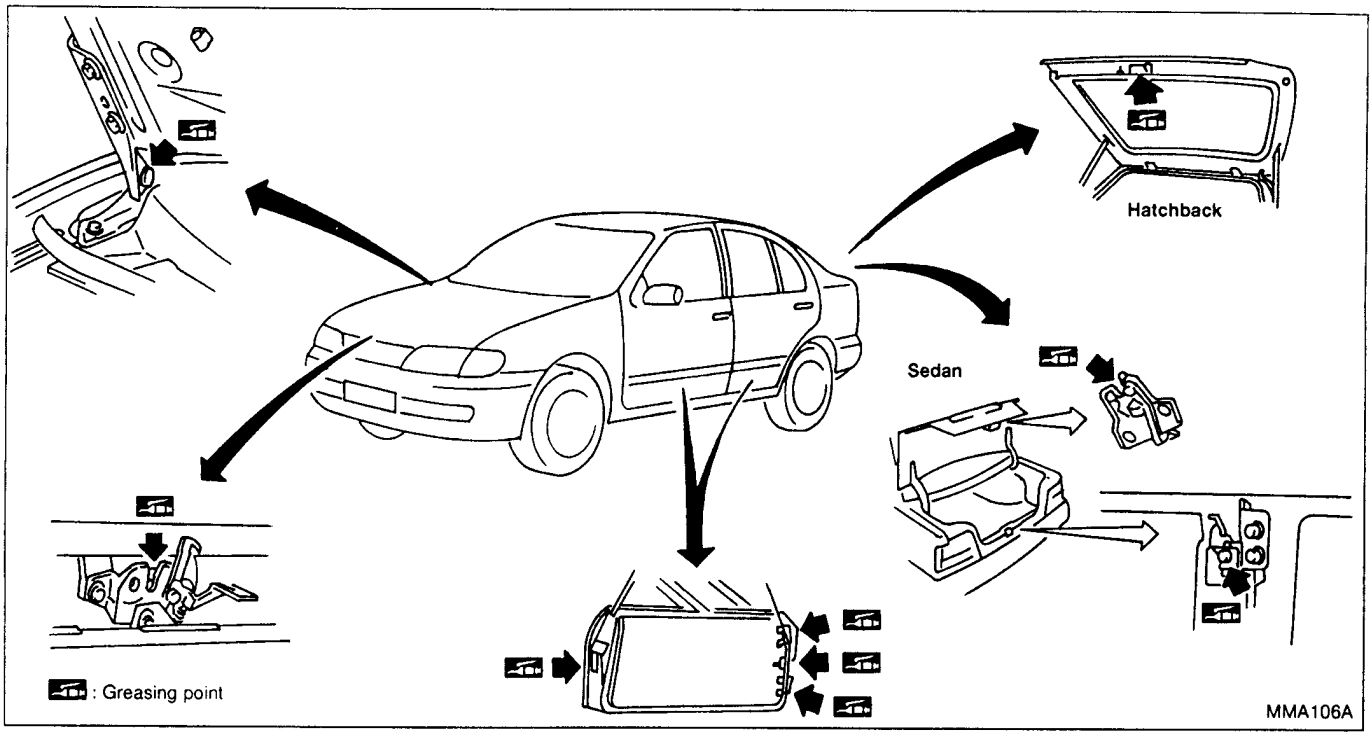
Check fluid level.
Fluid level can be checked when the fluid is either hot or cold.
CAUTION:

- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "DEXRON™" type.**



- Check lines for leaks, cracks, damage, loose connections, chafing and deterioration.

Lubricating Hood Latches, Locks and Hinges



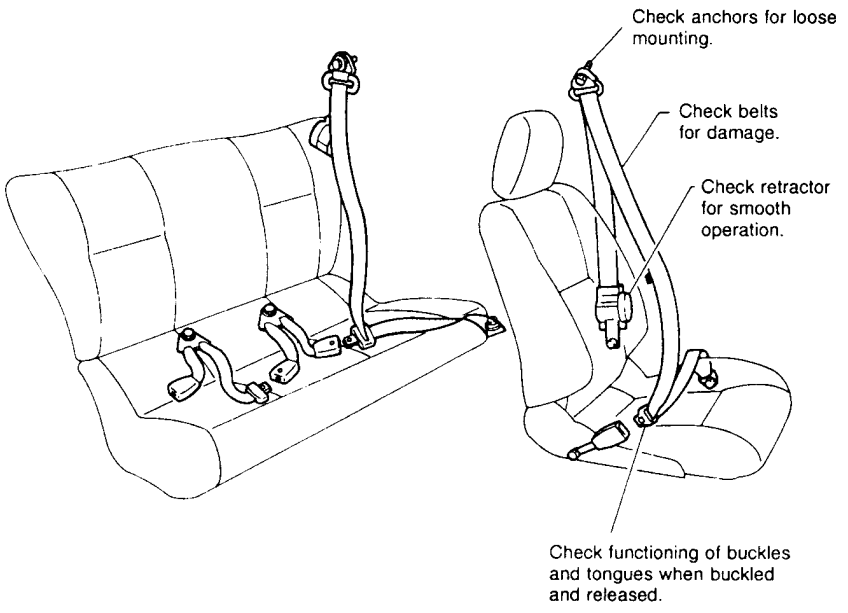
Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

- After any collision, inspect all seat belt assemblies, including retractors and other attached hardwares (i.e. guide rail set). Nissan recommends to replace all seat belt assemblies in use during a collision, unless not damaged and properly operating after minor collision.
  Also inspect seat belt assemblies not in use during a collision, and replace if damaged or improperly operating.
- If any component of seat belt assembly is questionable, do not repair.
  Replace as seat belt assembly.
- If webbing is cut, frayed, or damaged, replace belt assembly.
- Never oil tongue and buckle.
- Use a genuine seat belt assembly.

For seat belt pre-tensioner, refer to section RS.

Anchor bolt
43 - 55 N·m
(4.4 - 5.6 kg-m,
32 - 41 ft-lb)



Checking Body Corrosion

Visually check body panels for corrosion, paint damage (scratches, chipping, rubbing, etc.) or damage to the anti-corrosion materials. In particular, check the following locations.

Hemmed panels

Hood front end, door lower end, trunk lid rear end, etc.

Panel joint

Side sill of rear fender and center pillar, rear wheel housing of rear fender, around strut tower in engine compartment, etc.

Panel edge

Trunk lid opening, sun roof opening, fender wheel-arch flange, fuel filler lid flange, around holes in panel, etc.

Parts contact

Waist moulding, windshield moulding, bumper, etc.

Protectors

Damage or condition of mudguard, fender protector, chipping protector, etc.

Anti-corrosion materials

Damage or separation of anti-corrosion materials under the body.

Drain holes

Condition of drain holes at door and side sill.

When repairing corroded areas, refer to the Corrosion Repair Manual.

Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

Drive belts	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	11 (0.43)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Power steering oil pump	7.5 (0.295)	4 - 6 (0.16 - 0.24)	3 - 5 (0.12 - 0.20)
Air conditioner compressor	9.5 (0.374)	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
Applied pushing force	98 N (10 kg, 22 lb)		

Oil capacity (Refill capacity)

Unit: ℓ (Imp pts)

With oil filter change	3.3 (5-7/8)
Without oil filter change	2.9 (5-1/8)

Coolant capacity

Unit: ℓ (Imp pts)

With reservoir tank	5.5 (9-5/8)
Reservoir tank	0.7 (1-1/4)

Spark plug

Make	CHAMPION	NGK
Type		
Standard	RC9YCC	BKR5E
Alternative	RC12YCC, RC7YCC	BKR6E, BKR7E
Plug gap mm (in)	1.0 - 1.1 (0.39 - 0.043)	

Ignition lead

Ignition lead resistance kΩ/m (kΩ/ft)	5.4 - 5.8 (1.65 - 1.77)

Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

Drive belts	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator			
With air conditioner compressor	11.5 - 12.5 (0.453 - 0.492)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
Without air conditioner compressor	12 - 13 (0.47 - 0.51)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump	6 - 7 (0.24 - 0.28)	4 - 5 (0.16 - 0.20)	3.5 - 4.5 (0.138 - 0.177)
Applied pushing force	98 N (10 kg, 22 lb)		

Oil capacity (Refill capacity)

Unit: ℓ (Imp pts)

With oil filter change	3.0 (5-1/4)
Without oil filter change	2.8 (4-7/8)

Coolant capacity (Refill capacity)

Unit: ℓ (Imp pts)

Engine		SR20De	SR20DE
With reservoir tank	M/T	6.0 (10-5/8)	6.4 (11-1/4)
Reservoir tank		0.7 (1-1/4)	

Spark plug

Engine	SR20De		SR20DE
Make	CHAMPION		NGK
Type			
Standard	RC9MCC	BKR5EY	BKR6EY
Hot	RC12MCC	BKR4EY	BKR5EY
Cold	RC7MCC	BKR6EY	BKR7EY
Plug gap mm (in)	1.0 - 1.1 (0.039 - 0.043)		

Ignition lead

Unit: kΩ

Ignition lead	Resistance
No. 1 cylinder	Approx 3.8
No. 2 cylinder	Approx 3.5
No. 3 cylinder	Approx 2.7
No. 4 cylinder	Apoprox 2.4

Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	17 (0.67)	10.5 - 12.5 (0.413 - 0.492)	8.5 - 10.5 (0.335 - 0.413)
Air conditioner compressor	17 (0.67)	11.5 - 13.5 (0.453 - 0.531)	9.5 - 11.5 (0.374 - 0.453)
Power steering oil pump	8 (0.31)	5 - 7 (0.20 - 0.28)	4 - 6 (0.16 - 0.24)
Water pump without power steering	–	8 (0.31)	6 (0.24)
Applied pushing force	98 N (10 kg, 22 lb)		

Coolant capacity (Refill capacity)

Unit: ℓ (Imp pts)

With heater	5.2 (9-1/8)
Without heater	4.9 (8-5/8)
Reservoir tank	0.7 (1-1/4)

Cooling system check

Unit: kPa (bar, kg/cm², psi)

Radiator cap relief pressure	
Standard	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)
Limit	59 - 98 (0.59 - 0.98, 0.6 - 1.0, 9 - 14)
Radiator testing pressure	157 (1.57, 1.6, 23)

Engine oil capacity (Refill capacity)

Unit: ℓ (Imp pts)

With oil filter	4.7 (8-1/4)
Without oil filter	4.2 (7-3/8)

Injection nozzle

Unit: kPa (bar, kg/cm², psi)

Injection pressure	12,749 (127.5, 130, 1,849)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Alternator, power steering mounting bolt	62 - 75	6.3 - 7.6	46 - 55
Alternator, power steering adjuster lock bolt	16 - 21	1.6 - 2.1	12 - 15
Cylinder block drain plug	54 - 74	5.5 - 7.5	40 - 54
Engine oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29
Injector (To head)	59 - 69	6.0 - 7.0	43 - 51
Spill tube	39 - 49	4.0 - 5.0	29 - 36
Delivery tube	22 - 25	2.2 - 2.5	16 - 18

Chassis and Body Maintenance

Brake

Disc brake mm (in)	
Pad	
Standard thickness	
CL25VBG/CL25VG	11.0 (0.433)
CL9HG*	9.3 (0.366)
Minimum thickness	
CL25VBG/CL25VG	2.0 (0.079)
CL9HG*	2.0 (0.079)
Rotor	
Standard thickness	
CL25VBG/CL25VG	22.0 (0.866)
CL9HG*	10.0 (0.394)
Minimum thickness	
CL25VBG/CL25VG	20.0 (0.787)
CL9HG*	9.0 (0.354)
Drum brake mm (in)	
Lining	
Standard thickness	
Trailing/Leading	4.4 (0.173)
Minimum thickness	1.5 (0.059)
Drum	
Standard diameter	228.6 (9)
Maximum diameter	230.0 (9.06)

*: Rear disc brake

Wheel balance

Wheel balance (Maximum allowable unbalance at rim flange) g (oz)	10 (0.35)
Tire balance weight g (oz)	5 - 60 (0.18 - 2.12) Spacing 5 (0.18)

Wheel bearing

	Front	Rear
Wheel bearing axle end play mm (in)	0.05 (0.0020) or less	
Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb)	235 - 314 (24 - 32, 174 - 231)	186 - 255 (19 - 26, 137 - 188)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Manual transaxle			
Filler plug	25 - 34	2.5 - 3.5	18 - 25
Drain plug	20 - 29	2.0 - 3.0	14 - 22
Automatic transaxle			
Drain plug	25 - 34	2.5 - 3.5	18 - 25
Front axle and front suspension			
Tie-rod lock nut	38 - 47	3.9 - 4.8	28 - 35
Rear axle and rear suspension			
Toe adjusting pin nut	108 - 127	11 - 13	80 - 94
Brake system			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Wheel and tire			
Wheel nut	98 - 118	10.0 - 12.0	72 - 87

MAINTENANCE

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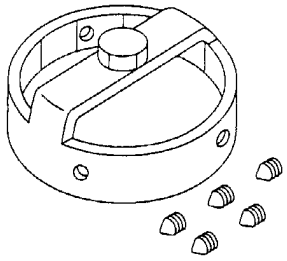
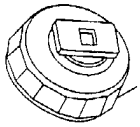
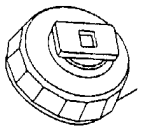
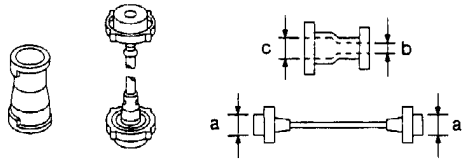
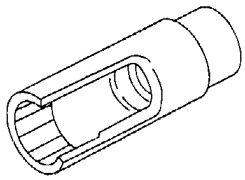
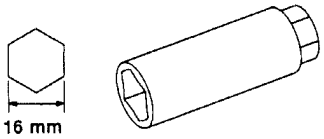
Special Service Tools

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

Tool number Tool name	Description		Engine application		
			GA	SR	CD
KV10115800 Oil filter cap wrench 65 mm (2.56 in) dia.	 NT346	Removing oil filter	–	X	–
KV10105900 Oil filter cap wrench	 15 faces, Inner span: 80 mm (3.15 in) (Face to opposite corner) NT555	Removing oil filter	X	–	–
99545R2500 (KV101060S0) Oil filter wrench	 15 faces, Inner span: 92.5 mm (3.642 in) (Face to opposite corner) NT631	Removing oil filter	–	–	X
EG17650301 Radiator cap tester adapter	 NT564	**a: 28 (1.10) dia.** **b: 31.4 (1.236) dia.** **c: 41.3 (1.626) dia.** Unit: mm (in)	X	X	X
KV119E0030 Nozzle holder socket	 NT648	Removing and installing injection nozzle assembly	–	–	X

Commercial Service Tool

Tool name	Description		Engine application		
			GA	SR	CD
Spark plug wrench	 **16 mm** **(0.63 in)** NT047	Wrench with a magnet to hold spark plug	X	X	–

General maintenance includes those items which should be checked during normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue functioning correctly. Owners can perform the checks and inspections themselves, or they can be carried out by a NISSAN dealer.

Item	Reference pages
OUTSIDE THE VEHICLE The maintenance items listed here should be checked periodically, unless otherwise specified.	
Tires Check the pressure with a gauge weekly when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	—
Windshield wiper blades Check for cracks or wear if not functioning correctly.	—
Doors and engine hood Check that all doors, the engine hood, the trunk lid and back door function correctly. Also ensure that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch prevents the hood from opening when the primary latch is released. When driving in areas using road salt or other corrosive materials, check for lubrication more often.	MA-41
INSIDE THE VEHICLE The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle etc.	
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating correctly and installed securely. Also check headlight aim.	—
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are functioning correctly.	—
Steering wheel Check for changes in the steering operation, such as excessive free play, hard steering or strange noises.	—
Seat belts Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear of damage.	MA-41
UNDER THE HOOD AND VEHICLE The maintenance items listed here should be checked periodically e. g. each time you check the engine oil or refuel.	
Windshield washer fluid Check that there is adequate fluid in the tank.	
Engine coolant level Check the coolant level when the engine is cold.	MA-10, MA-19 & MA-27
Engine oil level Check the level after parking the vehicle (on level ground) and turning off the engine.	MA-13, MA-22 & MA-30
Brake fluid level Make sure that the brake fluid level is between the "MAX" and "MIN" lines on the reservoir.	MA-36
Battery Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines.	—

The following tables show the normal maintenance schedules. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance may be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

Maintenance Schedule for Petrol Engine Models (annual mileage < 30,000 km/year)

Engine Maintenance
GA16DE / SR20De / SR20DE engines

Abbreviations: R = Replace I = Inspect: Correct or replace if necessary [ ]: next maintenance to be conducted at next similar interval

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform on a kilometer basis, but on an annual basis when driving less than 15,000 km (9,000 miles) per year.	km x 1,000	15	30	45	60	75	90	105	120	Reference page
	(Miles x 1,000)	(9)	(18)	(27)	(36)	(45)	(54)	(63)	(72)	
	Months	12	24	36	48	60	72	84	96	
Engine compartment and under vehicle										
Engine oil (Use recommended oil)★		R	R	R	R	R	R	R	R	MA-13/MA-22
Engine oil filter (Use Nissan PREMIUM type or equivalent)★		R	R	R	R	R	R	R	R	MA-13/MA-23
Drive belts		I	I	I	I	I	I	I	I	MA-9/MA-18
Cooling system/coolant	See NOTE (1)	I	I	I	I	I	R	I	I	MA-10/MA-19
Air cleaner filter (Viscous paper type)★					R				R	MA-12/MA-22
Valve clearance (GA16DE engine, if valve noise increases only)			I		I		I		I	EM-35
Fuel and vapour lines			I		I		I		I	MA-11/MA-16/ MA-21
Spark plugs			R		R		R		R	MA-14/MA-24
Ignition leads							[I]			MA-15/MA-25
Fuel filter★							[R]			MA-12/MA-21
Heated oxygen sensor (Exhaust gas sensor)			I		I		I		I	MA-17/MA-26
PCV system			I		I		I		I	MA-15/MA-25
PCV filter★			R		R		R		R	MA-15R

NOTE: (1) First replace at 90,000 km (54,000 miles), then every 60,000 km (36,000 miles).

★ Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Maintenance Schedule for Petrol Engine Models (annual mileage < 30,000 km/year) (Cont'd)

Chassis and Body Maintenance

Abbreviations: R = Replace I = Inspect: Correct or replace if necessary

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform on a kilometer basis, but on an annual basis when driving less than 15,000 km (9,000 miles) in a year.	km × 1,000	15	30	45	60	75	90	105	120	Reference page
	(Miles × 1,000)	(9)	(18)	(27)	(36)	(45)	(54)	(63)	(72)	
	Months	12	24	36	48	60	72	84	96	
Underhood and under vehicle										
Headlamp aiming			I		I		I		I	EL-67
Wheel alignment (if necessary, rotate & balance wheels)		I	I	I	I	I	I	I	I	MA-39
Brake pads, discs & other components★		I	I	I	I	I	I	I	I	MA-37
Brake linings, drums & other components★		I	I	I	I	I	I	I	I	MA-37
Foot brake, parking brake: operation/free play		I	I	I	I	I	I	I	I	BR-9/BR-32
Brake booster vacuum hoses, connections, check valve			I		I		I		I	MA-37
Brake fluid	Level	I	I	I	I	I	I	I	I	MA-36
	Fluid★		R		R		R		R	MA-37
Clutch system, clutch pedal free play & clutch fluid level		I	I	I	I	I	I	I	I	MA-34/CL-4
Power steering fluid and lines		I	I	I	I	I	I	I	I	MA-40
Air bag system	See NOTE (1)									RS-8
Ventilation air filter★			R		R		R		R	MA-2019
Manual transaxle oil (check for leakage)★			I		I		I		I	MA-34
A/T fluid (level, leakage)★		I	I	I	I	I	I	I	I	MA-35
Steering gear & linkage, axle & suspension parts, drive shafts and exhaust system★			I		I		I		I	MA-39/FA-3/ RA-3/FA-13/ MA-34
Body corrosion	See NOTE (2)									MA-42

NOTE: (1) Inspect after 10 years, then every 2 years.
(2) Inspect once per year.
★ Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Maintenance Schedule for Petrol Engine Models (annual mileage > 30,000 km/year)

Engine Maintenance
GA16DE / SR20De / SR20DE engines

Abbreviations: R = Replace I = Inspect: Correct or replace if necessary [ ]: next maintenance to be conducted at next similar interval

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform on a kilometer basis only.	km x 1,000	15	30	45	60	75	90	105	120	Reference page
	(miles x 1,000)	(9)	(18)	(27)	(36)	(45)	(54)	(63)	(72)	
Engine compartment and under vehicle										
Engine oil (Use recommended oil)★		R	R	R	R	R	R	R	R	MA-13/MA-22
Engine oil filter (Use Nissan PREMIUM type or equilvalent)★		R	R	R	R	R	R	R	R	MA-13/MA-23
Drive belts		I	I	I	I	I	I	I	I	MA-9/MA-18
Cooling system/coolant	See NOTE (1)		I		I		R		I	MA-10/MA-19
Air cleaner filter (viscous paper type)★					R				R	MA-12/MA-22
Valve clearance (GA16DE engine, if valve noise increases only)			I		I		I		I	EM-35
Fuel and vapour lines			I		I		I		I	MA-11/MA-16/ MA-21
Spark plugs			R		R		R		R	MA-14/MA-24
Ignition leads							[I]			MA-15/MA-25
Fuel filter★							[R]			MA-12/MA-21
Heated oxygen sensor (Exhaust gas sensor)			I		I		I		I	MA-17/MA-26
PCV system			I		I		I		I	MA-15/MA-25
PCV filter★					R				R	MA-15

NOTE: (1) First replace at 90,000 km (54,000 miles) then every 60,000 km (36,000 miles).
★ Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Maintenance Schedule for Petrol Engine Models (annual mileage > 30,000 km/year) (Cont'd)

Chassis and Body Maintenance

Abbreviations: R = Replace I = Inspect: Correct or replace if necessary

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform on a kilometer basis only.	km × 1,000	15	30	45	60	75	90	105	120	Reference page
	(Miles × 1,000)	(9)	(18)	(27)	(36)	(45)	(54)	(63)	(72)	
Underhood and under vehicle										
Headlamp aiming			I		I		I		I	EL-67
Wheel alignment (if necessary, rotate & balance wheels)		I	I	I	I	I	I	I	I	MA-39
Brake pads, discs & other components★		I	I	I	I	I	I	I	I	MA-37
Brake linings, drums & other components★		I	I	I	I	I	I	I	I	MA-37
Foot brake, parking brake: operation/free play		I	I	I	I	I	I	I	I	BR-9/BR-32
Brake booster vacuum hoses, connections, check valve			I		I		I		I	MA-37
Brake fluid	Level	I	I	I	I	I	I	I	I	MA-36
	Fluid★		R		R		R		R	MA-37
Clutch system, clutch pedal free play & clutch fluid level		I	I	I	I	I	I	I	I	MA-34/CL-4
Power steering fluid and lines		I	I	I	I	I	I	I	I	MA-40
Air bag system	See NOTE (1)									RS-8
Ventilation air filter★			R		R		R		R	MA-2019
Manual transaxle oil (check for leakage)★			I		I		I		I	MA-34
A/T fluid (level, leakage)★		I	I	I	I	I	I	I	I	MA-35
Steering gear & linkage, axle & suspension parts, drive shafts and exhaust system★			I		I		I		I	MA-39/FA-3/ RA-3/FA-13/ MA-34
Body corrosion	See NOTE (2)									MA-42

NOTE: (1) Inspect after 10 years, then every 2 years.
(2) Inspect once per year.
★ Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Maintenance Schedule for Diesel Engine Models (annual mileage < 30,000 km/year)

Engine Maintenance
CD20T engine

Abbreviations: R = Replace I = Inspect: Correct or replace if necessary [ ]: next maintenance to be conducted at next similar interval

MAINTENANCE OPERATION		MAINTENANCE INTERVAL												
Perform on a kilometer basis, but on a semi-annual basis when driving less than 20,000 km (12,000 miles) per year.	km x 1,000	10	20	30	40	50	60	70	80	90	100	110	120	Reference page
	(miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	
	Months	6	12	18	24	30	36	42	48	54	50	66	72	
Engine compartment and under vehicle														
Engine oil (Use recommended oil)★		R	R	R	R	R	R	R	R	R	R	R	R	MA-30
Engine oil filter (Use Nissan PREMIUM type or equivalent)★		R	R	R	R	R	R	R	R	R	R	R	R	MA-31
Drive belts		I	I	I	I	I	I	I	I	I	I	I	I	MA-27
Timing belts	Camshaft drive belt								[R]					EM-116
	Injection pump drive belt								[R]					EM-120
Cooling system / coolant	See NOTE (1)		I		I		I		R		I		I	MA-27
Air cleaner filter (Viscous paper type)★					R				R				R	MA-30
Fuel lines					I				I				I	MA-29
Diesel fuel filter★					R				R				R	MA-30
Injection nozzles							See NOTE (2)							MA-2018

NOTE: (1) First replace at 80,000 km (48,000 miles), then every 60,000 km (36,000 miles).
(2) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check the fuel injection nozzles' starting pressure and spray pattern.
★ Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Maintenance Schedule for Diesel Engine Models (annual mileage < 30,000 km/year) (Cont'd)

Chassis and Body Maintenance

Abbreviations: R = Replace I = Inspect: Correct or replace if necessary

MAINTENANCE OPERATION		MAINTENANCE INTERVAL												
Perform on a kilometer basis, but on a semi-annual basis when driving less than 20,000 km (12,000 miles) per year.	km x 1,000	10	20	30	40	50	60	70	80	90	100	110	120	Reference page
	(miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	
	Months	6	12	18	24	30	36	42	48	54	60	66	72	
Underhood and under vehicle														
Headlamp aiming			I		I		I		I		I		I	EL-67
Wheel alignment (if necessary, rotate & balance wheels)			I		I		I		I		I		I	MA-39
Brake pads, discs & other components★			I		I		I		I		I		I	MA-37
Brake linings, drums & other components★			I		I		I		I		I		I	MA-37
Foot brake, parking brake: operation/free play			I		I		I		I		I		I	BR-9/BR-32
Brake booster vacuum hoses, connections, check valve					I				I				I	MA-37
Brake fluid	Level		I		I		I		I		I		I	MA-36
	Fluid★				R				R				R	MA-37
Clutch system, free pedal play & clutch fluid level			I		I		I		I		I		I	MA-34/CL-4
Power steering fluid and lines			I		I		I		I		I		I	MA-40
Air bag system	See NOTE (1)													RS-8
Ventilation air filter★				R			R			R			R	MA-2019
Manual transaxle oil (for leakage)★			I		I		I		I		I		I	MA-34
Steering gear & linkage, axle & suspension parts, drive shafts and exhaust system			I		I		I		I		I		I	MA-39/FA-3/ RA-3/FA-13/ MA-34
Body corrosion	See NOTE (2)													MA-42

NOTE: (1) Inspect after 10 years, then every 2 years.
(2) Inspect once per year.
★ Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Maintenance Schedule for Diesel Engine Models (annual mileage > 30,000 km/year)

Engine Maintenance
CD20T engine

Abbreviations: R = Replace I = Inspect: Correct or replace if necessary [ ]: next maintenance to be conducted at next similar interval

MAINTENANCE OPERATION		MAINTENANCE INTERVAL												
Perform on a kilometer basis only.	km x 1,000	10	20	30	40	50	60	70	80	90	100	110	120	Reference page
	(miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	
Engine compartment and under vehicle														
Engine oil (Use recommended oil)★		R	R	R	R	R	R	R	R	R	R	R	R	MA-30
Engine oil filter (Use Nissan PREMIUM type or equivalent)★		R	R	R	R	R	R	R	R	R	R	R	R	MA-31
Drive belts		I	I	I	I	I	I	I	I	I	I	I	I	MA-27
Timing belts	Camshaft drive belt									R				EM-116
	Injection pump drive belt									R				EM-120
Cooling system/coolant	See NOTE (1)			I			I			R			I	MA-27
Air cleaner filter (Viscous paper type)★							R						R	MA-30
Fuel lines							I						I	MA-29
Diesel fuel filter★							R						R	MA-30
Injection nozzles							See NOTE (2)							MA-2018

NOTE: (1) First replace at 90,000 km (54,000 miles), then every 60,000 km (36,000 miles).
(2) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check the fuel injection nozzles' starting pressure and spray pattern.
★ Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Maintenance Schedule for Diesel Engine Models (annual mileage > 30,000 km/year) (Cont'd)

Chassis and Body Maintenance

Abbreviations: R = Replace I = Inspect: Correct or replace if necessary

MAINTENANCE OPERATION		MAINTENANCE INTERVAL											
Perform on a kilometer basis only.	km x 1,000	10	20	30	40	50	60	70	80	90	100	110	120
	(miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)
Underhood and under vehicle													
Headlamp aiming		I		I		I		I		I		I	EL-67
Wheel alignment (if necessary, rotate & balance wheels)		I		I		I		I		I		I	MA-39
Brake pads, discs & other components★		I		I		I		I		I		I	MA-37
Brake linings, drums & other components★		I		I		I		I		I		I	MA-37
Foot brake, parking brake: operation/free play		I		I		I		I		I		I	BR-9/BR-32
Brake booster vacuum hoses, connections, check valve				I				I				I	MA-37
Brake fluid	Level	I		I		I		I		I		I	MA-36
	Fluid★				R				R				R	MA-37
Clutch system, free pedal play & clutch fluid level		I		I		I		I		I		I	MA-34/CL-4
Power steering fluid and lines		I		I		I		I		I		I	MA-40
Air bag system	See NOTE (1)												RS-8
Ventilation air filter★				R			R			R			R	MA-2019
Manual transaxle oil (for leakage)★		I		I		I		I		I		I	MA-34
Steering gear & linkage, axle & suspension parts, drive shafts and exhaust system		I		I		I		I		I		I	MA-39/FA-3/ RA-3/FA-13/ MA-34
Body corrosion	See NOTE (2)												MA-42

NOTE: (1) Inspect after 10 years, then every 2 years.
(2) Inspect once per year.
★ Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Maintenance Under Severe Driving Conditions (annual mileage < 30,000 km/year)

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

A — Driving under dusty conditions
B — Driving repeatedly short distances
C — Towing a trailer
D — Extensive idling
E — Driving in extremely adverse weather conditions or in areas where ambient temperature is either extremely low or extremely high
F — Driving in high humidity areas or in mountainous areas
G — Driving in areas using salt or other corrosive materials
H — Driving on rough and/or muddy roads or in the desert
I — Driving with frequent use of brakes or in mountainous areas
J — Frequent off road use or driving in water

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A B C D	**Engine oil & engine oil filter**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 7,500 km (4,500 miles) or 6 months	MA-13/MA-22/ MA-23
	CD20T engine	Replace	Every 5,000 km (3,000 miles) or 3 months	MA-30/MA-31
A	**Air cleaner filter (viscous paper type)**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 30,000 km (18,000 miles) or 24 months	MA-12/MA-22
	CD20T engine	Replace	Every 20,000 km (12,000 miles) or 12 months	MA-30
A . . . E	**Fuel filter**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 45,000 km (27,000 miles) or 36 months	MA-12/MA-22
	CD20T engine	Replace	Every 20,000 km (12,000 miles) or 12 months	MA-30
A	**PCV filter**			
	GA16DE engine only	Replace	Every 15,000 km (9,000 miles) or 12 months	MA-15
A . . . . F	**Ventilation air filter**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 15,000 km (9,000 miles) or 12 months	MA-2019
	CD20T engine	Replace	Every 20,000 km (12,000 miles) or 12 months	MA-2019
. . . . . F	**Brake fluid**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 15,000 km (9,000 miles) or 12 months	MA-37
	CD20T engine	Replace	Every 20,000 km (12,000 miles) or 12 months	MA-37

Maintenance Under Severe Driving Conditions (annual mileage < 30,000 km/year) (Cont'd)

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A . C . . . . H . .	**A/T fluid and manual transaxle oil**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 60,000 km (36,000 miles) or 24 months	MA-34/MA-35
	CD20T engine	Replace	Every 60,000 km (36,000 miles) or 24 months	MA-34
A . C . . . G H I .	**Brake pads/linings, discs/drums & other brake system components**			
	GA16DE / SR20De / SR20DE engine	Inspect	Every 7,500 km (4,500 miles) or 6 months	MA-37
	CD20T engine	Inspect	Every 10,000 km (6,000 miles) or 6 months	MA-37
. . . . . G H . .	**Steering gear & linkage, axle & suspension parts and exhaust system**			
	GA16DE / SR20De / SR20DE engine	Inspect	Every 7,500 km (4,500 miles) or 6 months	MA-39/FA-3/ RA-3/MA-34
	CD20T engine	Inspect	Every 10,000 km (6,000 miles) or 6 months	MA-39/FA-3/ RA-3/MA-34
. . C . . . . H . .	**Drive shafts**			
	GA16DE / SR20De / SR20DE engine	Inspect	Every 7,500 km (4,500 miles) or 6 months	FA-13
	CD20T engine	Inspect	Every 10,000 km (6,000 miles) or 6 months	FA-13

Maintenance Under Severe Driving Conditions (annual mileage > 30,000 km/year)

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

A — Driving under dusty conditions
B — Driving repeatedly short distances
C — Towing a trailer
D — Extensive idling
E — Driving in extremely adverse weather conditions or in areas where ambient temperature is either extremely low or extremely high
F — Driving in high humidity areas or in mountainous areas
G — Driving in areas using salt or other corrosive materials
H — Driving on rough and/or muddy roads or in the desert
I — Driving with frequent use of brakes or in mountainous areas
J — Frequent off road use or driving in water

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A B C D	**Engine oil & engine oil filter**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 7,500 km (4,500 miles)	MA-13/MA-22/ MA-23
	CD20T engine	Replace	Every 5,000 km (3,000 miles)	MA-30/MA-31
A	**Air cleaner filter (viscous paper type)**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 30,000 km (18,000 miles)	MA-12/MA-22
	CD20T engine	Replace	Every 20,000 km (12,000 miles)	MA-30
A . . . E	**Fuel filter**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 45,000 km (27,000 miles)	MA-12/MA-22
	CD20T engine	Replace	Every 20,000 km (12,000 miles)	MA-30
A	**PCV filter**			
	GA16DE engine only	Replace	Every 15,000 km (9,000 miles)	MA-15
A . . . . F	**Ventilation air filter**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 15,000 km (9,000 miles)	MA-2019
	CD20T engine	Replace	Every 20,000 km (12,000 miles)	MA-2019
. . . . . F	**Brake fluid**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 15,000 km (9,000 miles)	MA-37
	CD20T engine	Replace	Every 20,000 km (12,000 miles)	MA-37

Maintenance Under Severe Driving Conditions (annual mileage > 30,000 km/year) (Cont'd)

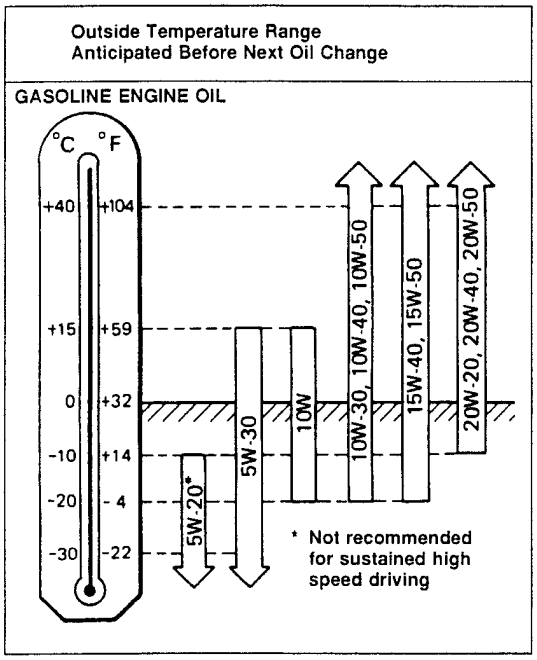
Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A . C . . . . H . .	**A/T fluid and manual transaxle oil**			
	GA16DE / SR20De / SR20DE engine	Replace	Every 60,000 km (36,000 miles)	MA-34/MA-35
	CD20T engine	Replace	Every 60,000 km (36,000 miles)	MA-34
A . C . . . G H I .	**Brake pads/linings, discs/drums & other brake system components**			
	GA16DE / SR20De / SR20DE engine	Inspect	Every 7,500 km (4,500 miles)	MA-37
	CD20T engine	Inspect	Every 10,000 km (6,000 miles)	MA-37
. . . . . G H . .	**Steering gear & linkage, axle & suspension parts and exhaust system**			
	GA16DE / SR20De / SR20DE engine	Inspect	Every 7,500 km (4,500 miles)	MA-39/FA-3/ RA-3/MA-34
	CD20T engine	Inspect	Every 10,000 km (6,000 miles)	MA-39/FA-3/ RA-3/MA-34
. . C . . . . H . .	**Drive shafts**			
	GA16DE / SR20De / SR20DE engine	Inspect	Every 7,500 km (4,500 miles)	FA-13
	CD20T engine	Inspect	Every 10,000 km (6,000 miles)	FA-13

Fluids and Lubricants

		Capacity (Approximate)		Recommended fluids and lubricants
		Liter	Imp measure	
Engine oil (Refill)				Gasoline engines: API SG or SH* Diesel engines: ACEA B3-96 (CCMC-PD2)*
With oil filter	GA16DE	3.3	5-7/8 pts	
	SR20De, SR20DE	3.0	5-1/4 pts	
	CD20T	5.0	8-3/4 pts	
Without oil filter	GA16DE	2.9	5-1/8 pts	
	SR20De, SR20DE	2.8	4-7/8 pts	
	CD20T	4.5	7-7/8 pts	
Cooling system (With reservoir tank)	GA16DE	5.5	9-5/8 pts	Anti-freeze coolant (Ethylene glycol base)
	SR20De	6.0	10-5/8 pts	
	SR20DE	6.4	11-1/4 pts	
	CD20T	6.6	11-5/8 pts	
Reservoir		0.7	1-1/4 pts	
Manual transaxle gear oil	RS5F31A	2.9	5-1/8 pts	API GL-4*
	RS5F32A	3.6	6-3/8 pts	
Automatic transaxle fluid		7.0	12-3/8 pts	Genuine NISSAN ATF or equivalent
Power steering fluid		1.1	2 pts	Type DEXRON™
Brake fluid		–	–	DOT 4 (US FMVSS No. 116)
Multi-purpose grease		–	–	NLGI No. 2 (Lithium soap base)
Air conditioning system refrigerant				R-134a
Air conditioning system lubricants				NISSAN A/C System Oil Type R or exact equivalent

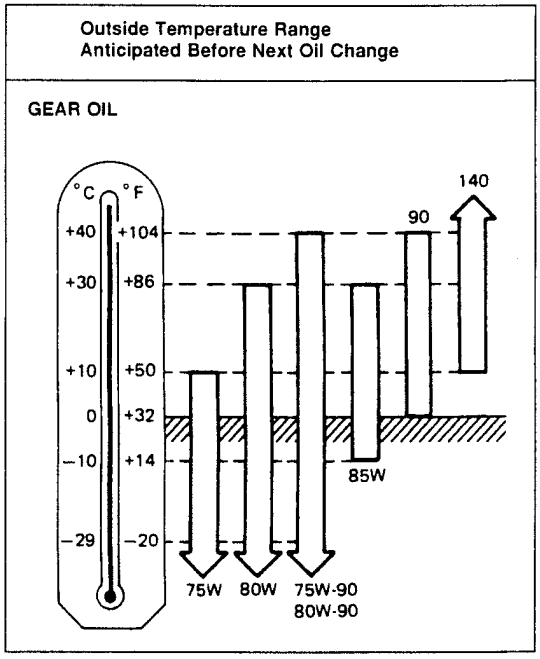
*: For further details, see "SAE Viscosity Number".

SAE Viscosity Number



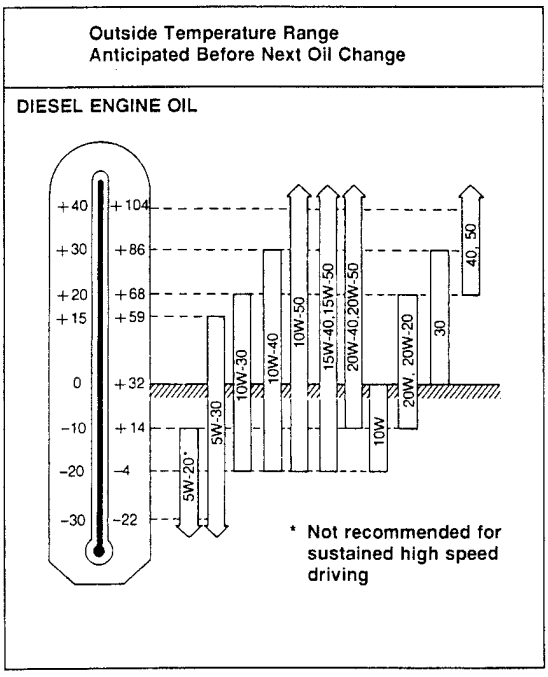
TI0005

- For warm and cold areas: 7.5W-30 is preferable for ambient temperatures above –20°C (–4°F).
- For hot areas: 20W-40 and 20W-50 are suitable.



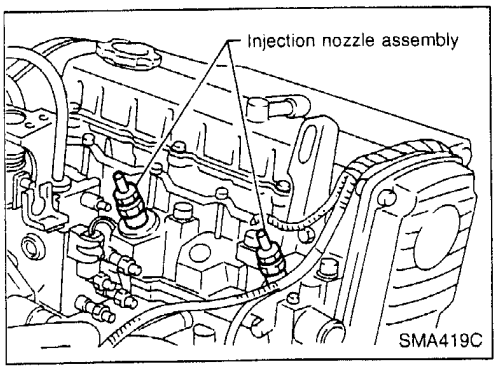
TI0003

- For cold areas: 80W-90 is preferable for ambient temperatures below 40°C (104°F).
- For hot and warm areas: 90 is suitable.



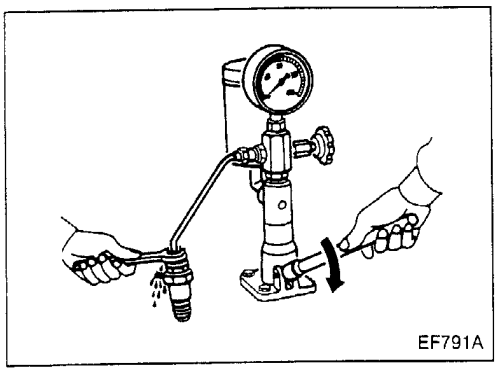
TI0006

- For cold and warm areas: 10W-30 is preferable for ambient temperatures above –20°C (–4°F).
- For hot areas: 20W-40 and 20W-50 are suitable.



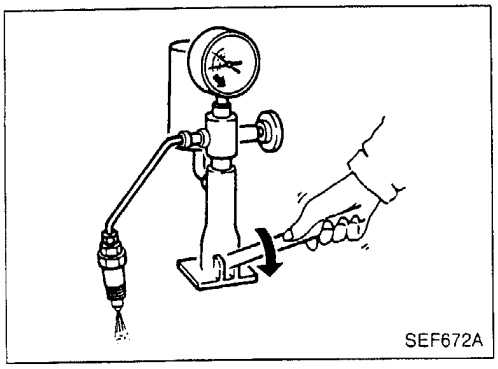
Checking Injection Nozzle

1. Remove injection delivery tubes and fuel spill hoses.
2. Remove nozzle assembly with S.S.T. KV119E0030.



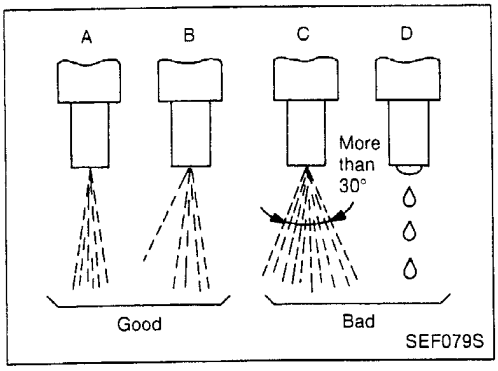
WARNING:
When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to come into contact with your hand or body, and make sure that your eyes are properly protected.

3. Clean and check nozzles.
4. Install nozzle to injection nozzle tester and bleed air from flare nut.



5. Check initial injection pressure by pumping tester handle one time per second.
   Injection pressure:
   15,500 kPa (155 bar, 158 kg/cm², 2,247 psi)

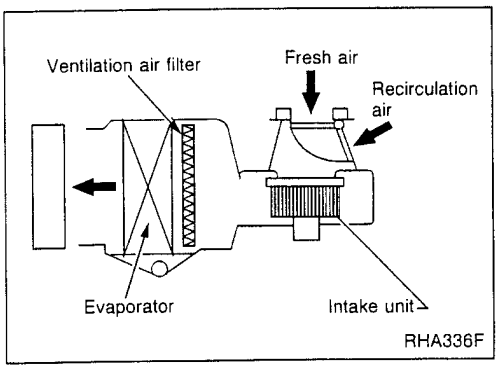
- **Always check initial injection pressure before installing new nozzle. Do not disassemble injection nozzle assembly. Entrust disassembly or adjustment to BOSCH service shop.**

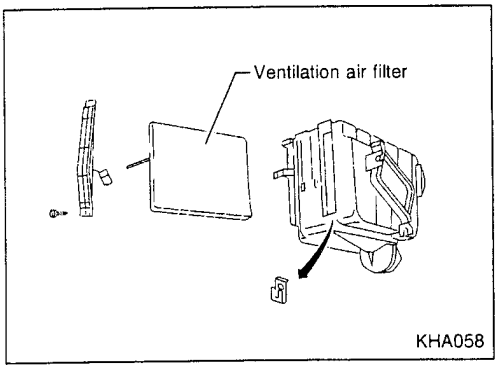


6. Check fuel spray pattern by pumping tester handle quickly (4 or 6 times per second).

a. If main spray angle is within 30 degrees as shown, injection nozzle is good.
b. It is still normal even if a thin stream of spray deviates from main spray (pattern B).

7. If spray is not correct, clean injection nozzle tip or replace it.
Refer to EC section for injection pressure adjustment, cleaning and replacement.
8. Install all injection nozzles with S.S.T. KV119E0030 and securely connect fuel spill hoses and delivery tubes.
9. Bleed air from fuel system and check for fuel leakage with engine running.





Ventilation Air Filter

FUNCTION

Air inside passenger compartment is kept clean at either recirculation or fresh mode by installing ventilation air filter into cooling unit.

REPLACEMENT PROCEDURES

- Remove instrument lower cover with glove box. Refer to BT section.
- Take out ventilation air filter which is secured with one clip, from cooling unit.
- Replace with new one and reinstall instrument lower cover and glove box.

Engine Maintenance

Injection nozzle

	Unit: kPa (bar, kg/cm^2, psi)
Injection pressure	15,500 (155, 158, 2,247)

<SUPPLEMENT-III> (For wagon models)

MAINTENANCE

SECTION MA

MA

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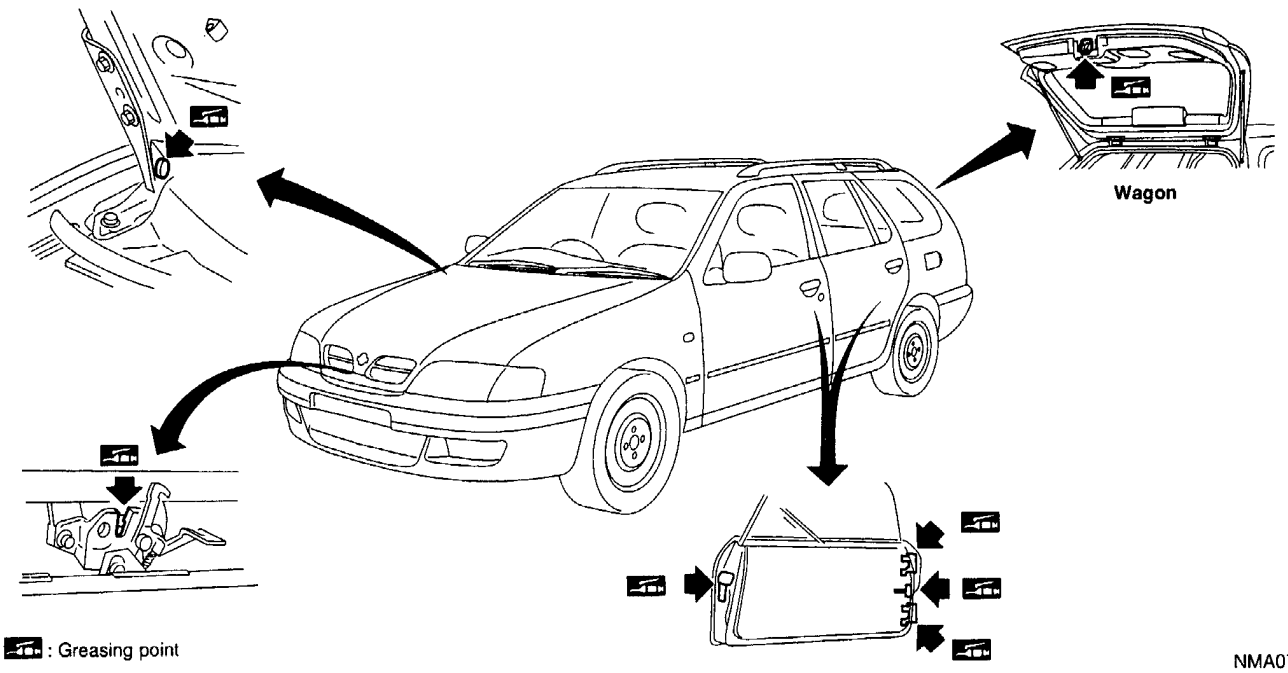
Lubricating Hood Latches, Locks and Hinges

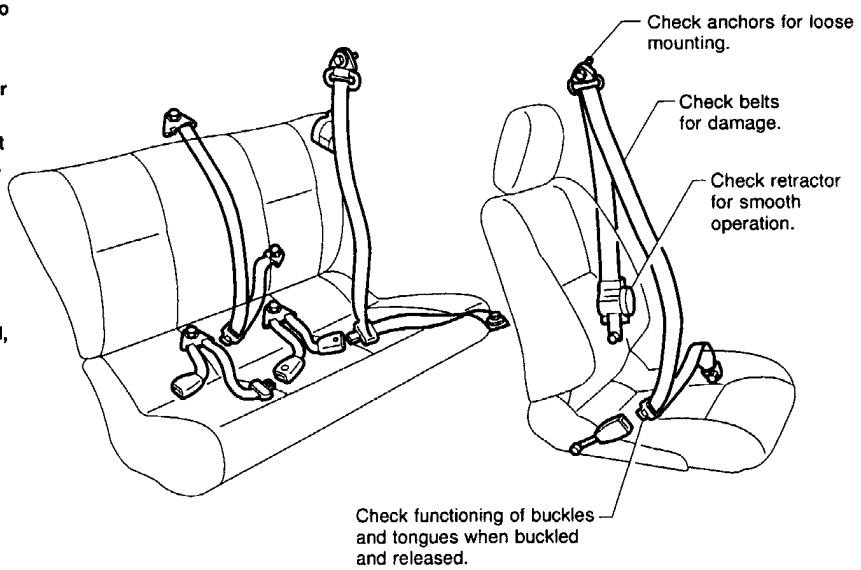


Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

- After any collision, inspect all seat belt assemblies, including retractors and other attached hardwares (i.e. guide rail set). Nissan recommends to replace all seat belt assemblies in use during a collision, unless not damaged and properly operating after minor collision.
  Also inspect seat belt assemblies not in use during a collision, and replace if damaged or improperly operating.
- If any component of seat belt assembly is questionable, do not repair.
  Replace as seat belt assembly.
- If webbing is cut, frayed, or damaged, replace belt assembly.
- Never oil tongue and buckle.
- Use a genuine seat belt assembly.

For seat belt pre-tensioner, refer to section RS.



Anchor bolt
43 - 55 N·m
(4.4 - 5.6 kg-m,
32 - 41 ft-lb)

NMA072

ENGINE MECHANICAL

SECTION EM

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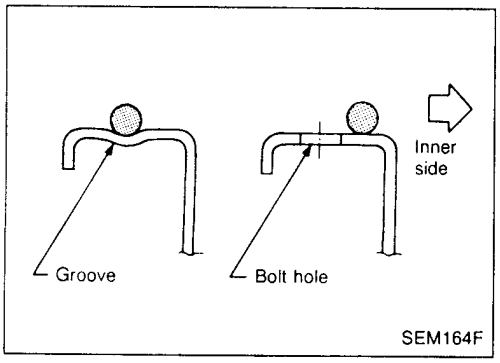
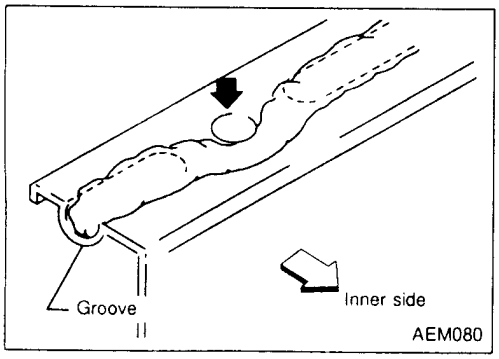
NO CHANGES

Parts Requiring Angular Tightening

- Some important engine parts are tightened using an angular-tightening method rather than a torque setting method.
- If these parts are tightened using a torque setting method, dispersal of the tightening force (axial bolt force) will be two or three times that of the dispersal produced by using the correct angular-tightening method.
- Although the torque setting values (described in this manual) are equivalent to those used when bolts and nuts are tightened with an angular-tightening method, they should be used for reference only.
- To assure the satisfactory maintenance of the engine, bolts and nuts must be tightened using an angular-tightening method.
- Before tightening the bolts and nuts, ensure that the thread and seating surfaces are clean and then coated with engine oil.
- The bolts and nuts which require the angular-tightening method are as follows:
  (1) Cylinder head bolts ..... SR, GA, CD
  (2) Main bearing cap bolts ..... SR
  (3) Connecting rod cap nuts ..... SR, GA

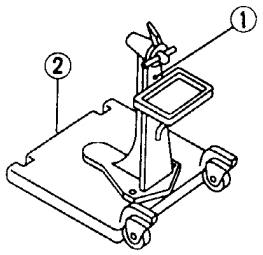
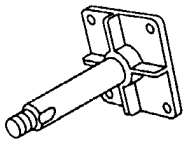
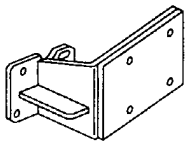
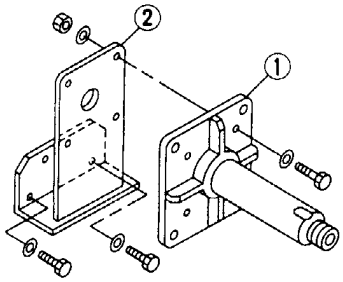
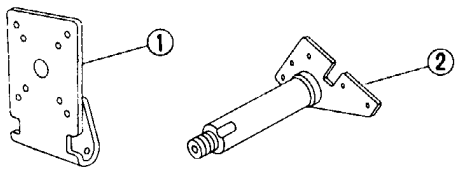
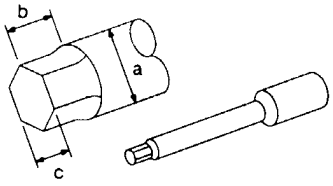




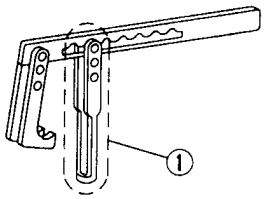
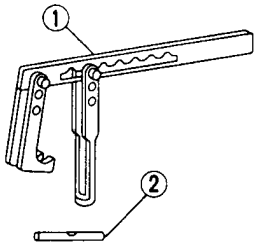
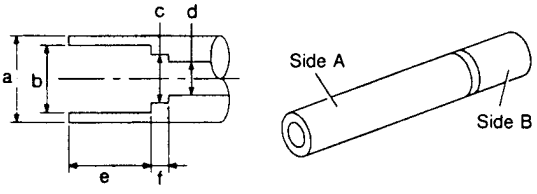
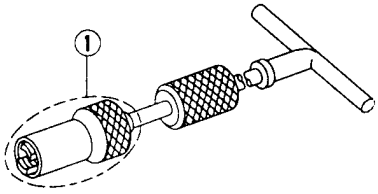
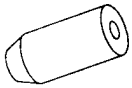
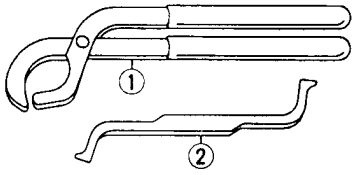
Liquid Gasket Application Procedure

a. **Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface and groove, and then completely clean any oil stains from these areas.**
b. **Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)**
   - **Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide for SR engine and 3.5 to 4.5 mm (0.138 to 0.177 in) wide for GA and CD engine (for oil pan).**
   - **Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).**
c. **Apply liquid gasket to inner surface around hole perimeter area.**
   (Assembly should be done within 5 minutes after coating.)
d. **Wait at least 30 minutes before refilling with engine oil and engine coolant.**

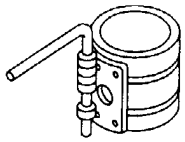
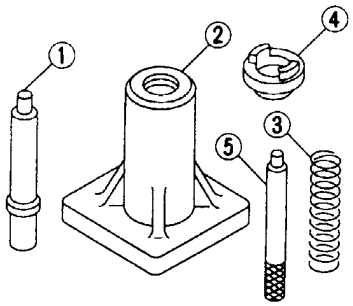
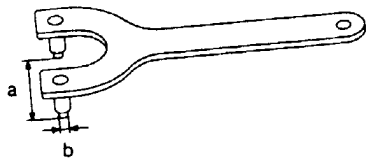
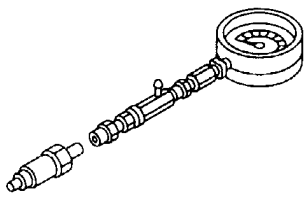
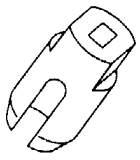
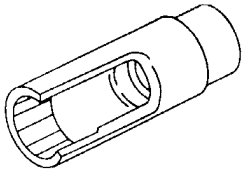
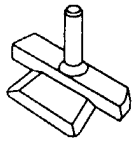
Special Service Tools

Tool number Tool name	Description	Engine application		
		GA	SR	CD
ST0501S000 Engine stand assembly ① ST05011000 Engine stand ② ST05012000 Base	 NT042 When overhauling engine	X	X	X
KV10106500 Engine stand shaft	 NT028 When overhauling engine	—	X	—
KV10115300 Engine sub-attachment	 NT008 When overhauling engine	—	X	—
Engine attachment assembly ① KV10106500 Engine attachment ② KV10113300 Sub-attachment	 NT029 When overhauling engine	X	—	—
① KV10108101 Engine attachment ② KV10102500 Engine stand shaft	 NT366 When overhauling engine	—	—	X
ST10120000 Cylinder head bolt wrench	 NT583 Loosening and tightening cylinder head bolt **a: 13 (0.51) dia.** **b: 12 (0.47)** **c: 10 (0.39)** Unit: mm (in)	X	X	—

Special Service Tools (Cont'd)

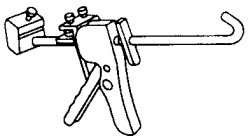
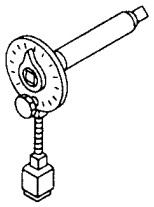
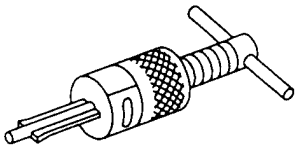
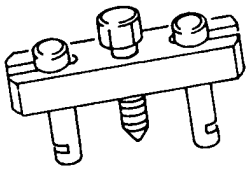
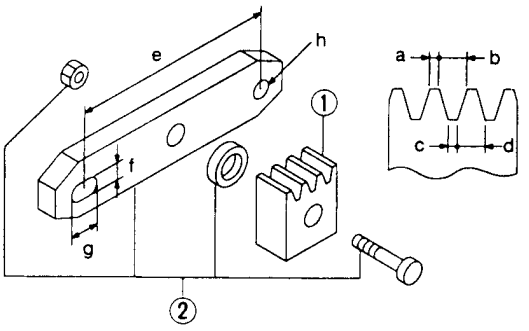
Tool number Tool name	Description		Engine application		
			GA	SR	CD
KV10116200 Valve spring compressor ① KV10115900 Attachment	 NT022	Disassembling and assembling valve mechanism	X	X	—
KV101092S0 Valve spring compressor ① KV10109210 Compressor ② KV10109220 Adapter	 NT021	Disassembling and assembling valve mechanism	—	—	X
KV10115600 Valve oil seal drift	 NT603	Installing valve oil seal **Side A / Side B** **a: 20 (0.79) / 20 (0.79)** **b: 13 (0.51) / 14.2 (0.559)** **c: 10.3 (0.406) / 11 (0.43)** **d: 8 (0.31) / 8 (0.31)** **e: 10.7 (0.421) / 10.7 (0.421)** **f: 5 (0.20) / 5 (0.20)** Unit: mm (in)	X (Side A)	X (Side B)	—
KV10107902 Valve oil seal puller ① KV10116100 Valve oil seal puller adapter	 NT605	Removing valve oil seal	X	X	X
KV10115700 Dial gauge stand	 NT012	Adjusting shims	X	—	—
KV101151S0 Lifter stopper set ① KV10115110 Camshaft pliers ② KV10115120 Lifter stopper	 NT041	Changing shims	X	—	—

Special Service Tools (Cont'd)

Tool number Tool name	Description		Engine application		
			GA	SR	CD
EM03470000 Piston ring compressor	 NT044	Installing piston assembly into cylinder bore	X	X	X
KV10107400 Piston pin press stand ① KV10107310 Center shaft ② ST13040020 Stand ③ ST13040030 Spring ④ KV10107320 Cap ⑤ ST13040050 Drift	 NT013	Disassembling and assembling piston pin	X	X	—
KV10109300* Pulley holder	 NT628	Removing and installing camshaft sprocket **a: 68 mm (2.68 in)** **b: 8 mm (0.31 in) dia.**	—	—	X
ED19600000* Compression gauge set	 NT626	Measuring compression pressure	—	—	X
KV11100300 Nozzle holder socket No. 2-4 injection nozzle holder socket	 NT563	Loosening and tightening injector nozzle	—	—	X
KV11105800 No. 1 injection nozzle holder socket	 NT648	Loosening and tightening injector nozzle	—	—	X
KV10111100 Seal cutter	 NT046	Removing oil pan	X	X	X

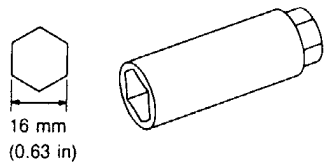
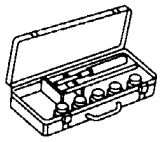
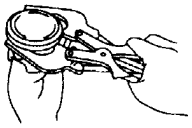
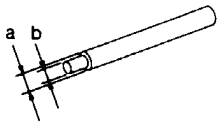
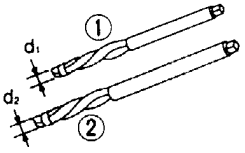
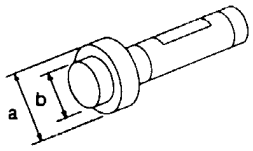
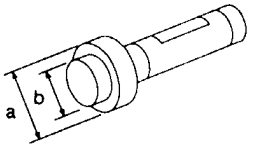
*: Special tool or commercial equivalent

Special Service Tools (Cont'd)

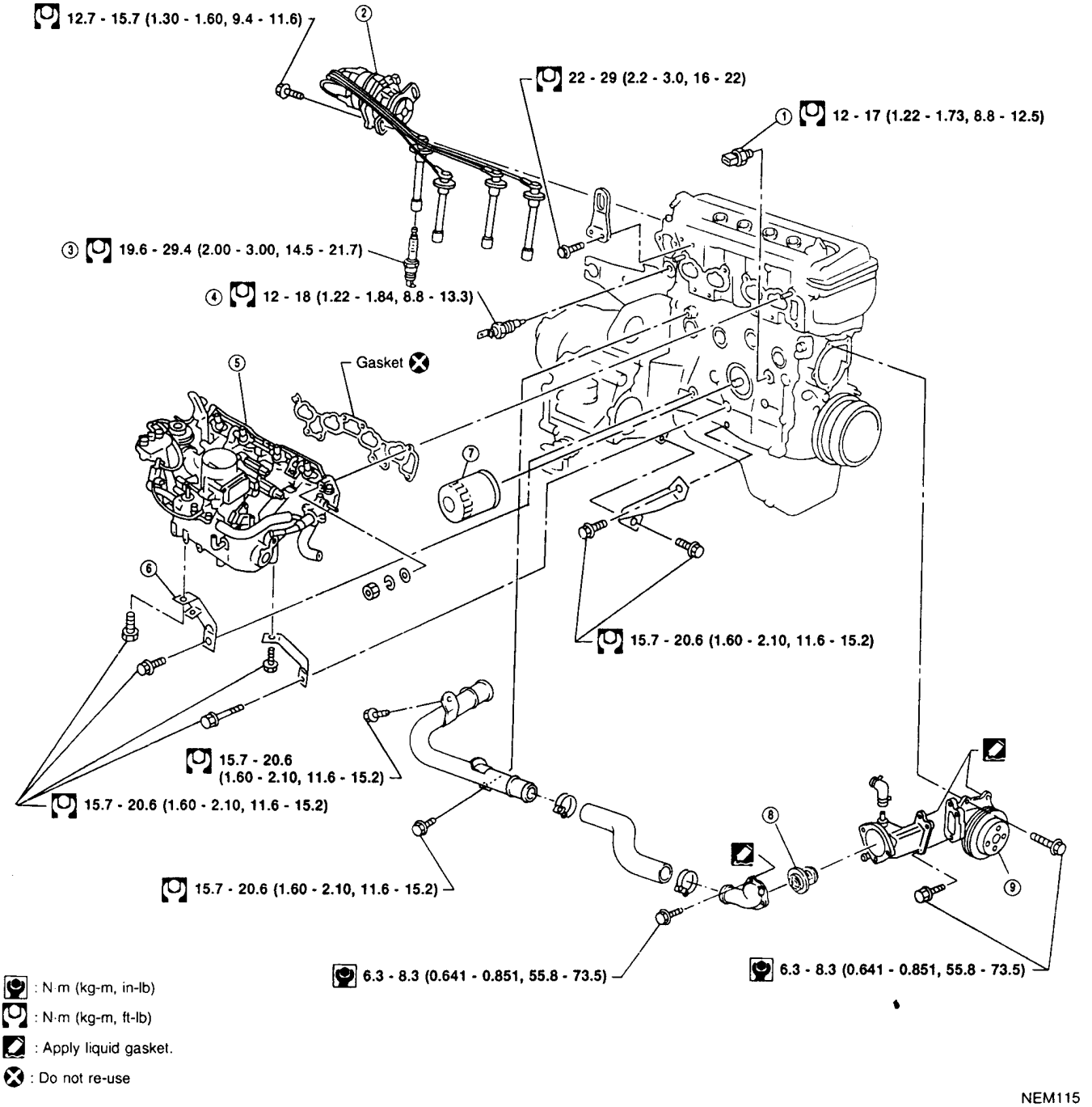
Tool number Tool name	Description		Engine application		
			GA	SR	CD
WS39930000 Tube presser	 NT052	Pressing the tube of liquid gasket	X	X	X
KV10112100 Angle wrench	 NT014	Tightening bolts for bearing cap, cylinder head, etc.	X	X	X
ST16610001* Pilot bushing puller	 NT045	Removing pilot bushing	—	X	X
KV11102900* Pulley puller	 NT647	Removing injection pump pulley	—	—	X
KV101056S0* Ring gear stopper ① KV10105630 Adapter ② KV10105610 Plate assembly	 NT617	Preventing crankshaft from rotating **a: 3 (0.12)** **b: 6.4 (0.252)** **c: 2.8 (0.110)** **d: 6.6 (0.260)** **e: 107 (4.21)** **f: 14 (0.55)** **g: 20 (0.79)** **h: 14 (0.55) dia.** Unit: mm (in)	—	—	X

*: Special tool or commercial equivalent

Commercial Service Tools

Tool name	Description		Engine application		
			GA	SR	CD
Spark plug wrench	 NT047	Removing and installing spark plug	X	X	—
Valve seat cutter set	 NT048	Finishing valve seat dimensions	X	X	X
Piston ring expander	 NT030	Removing and installing piston ring	X	X	X
Valve guide drift	 NT015	Removing and installing valve guide **SR Intake & Exhaust** **a = 9.5 mm (0.374 in) dia.** **b = 5.0 mm (0.197 in) dia.** **GA Intake & Exhaust** **a = 9.5 mm (0.374 in) dia.** **b = 5.5 mm (0.217 in) dia.**	X	X	—
Valve guide reamer	 NT016	Reaming valve guide ① or hole for oversize valve guide ② **SR Intake & Exhaust** **d_1 = 6.0 mm (0.236 in) dia.** **d_2 = 10.175 mm (0.4006 in) dia.** **GA Intake & Exhaust** **d_1 = 5.5 mm (0.217 in) dia.** **d_2 = 9.685 mm (0.3813 in) dia.**	X	X	—
Front oil seal drift	 NT049	Installing front oil seal **a = 75 mm (2.95 in) dia.** **b = 45 mm (1.77 in) dia.**	X	X	—
Rear oil seal drift	 NT049	Installing rear oil seal **a = 110 mm (4.33 in) dia.** **b = 80 mm (3.15 in) dia.**	X	X	—

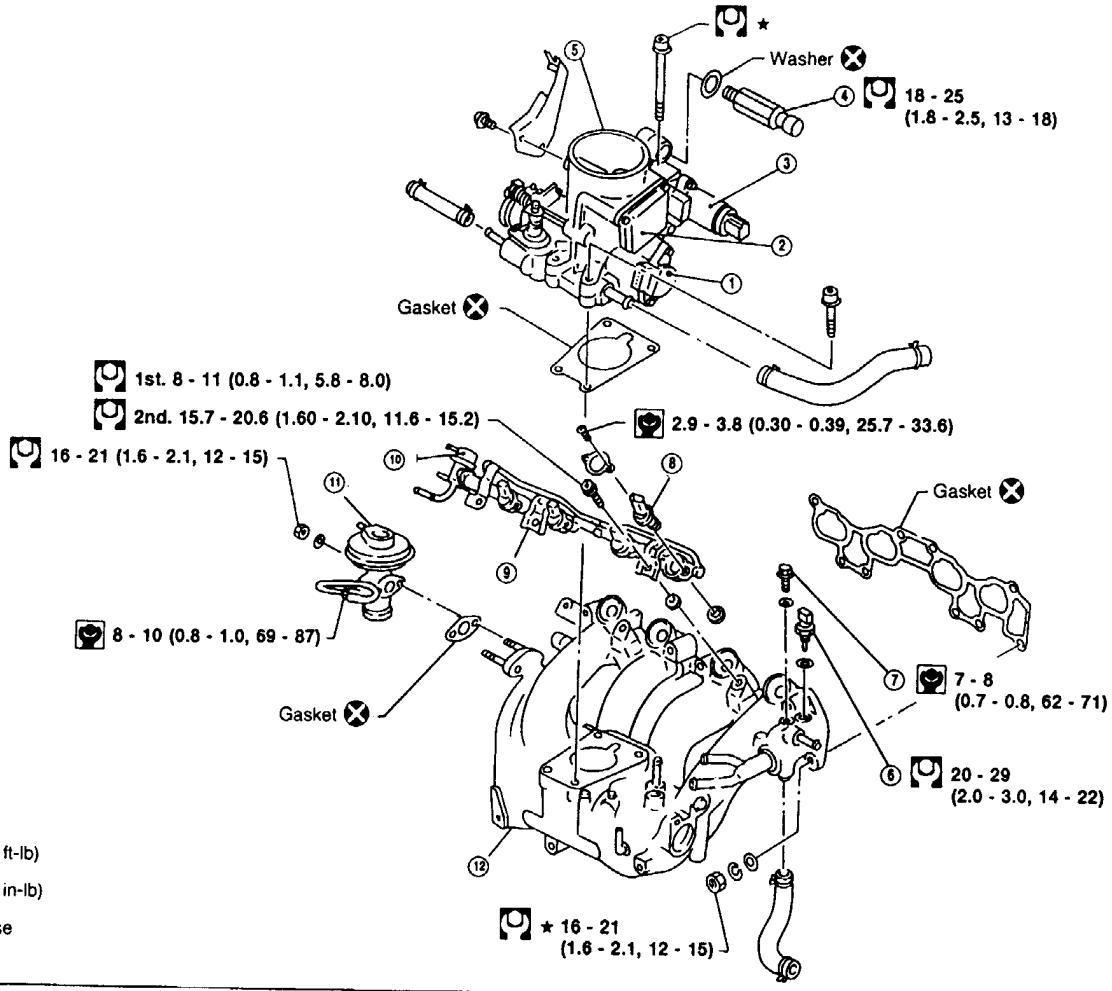
SEC. 140•150•210•211•220•221•253



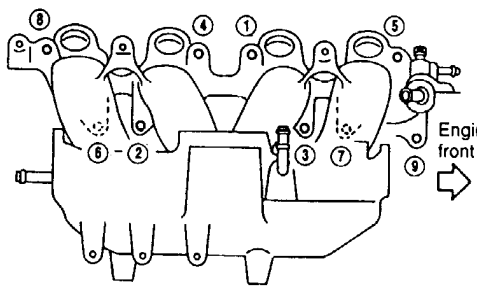
NEM115

① Oil pressure switch
② Distributor
③ Spark plug
④ Thermal transmitter
⑤ Intake manifold
⑥ Intake manifold supports
⑦ Oil filter
⑧ Thermostat
⑨ Water pump

SEC. 140•147•163•164



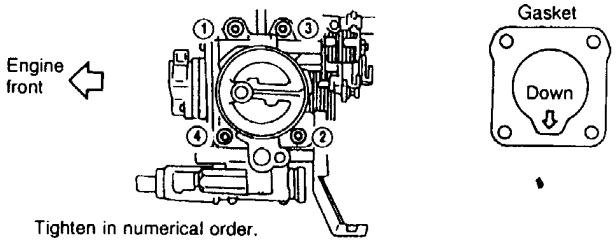
★ **Intake manifold bolts and nuts tightening order**



★ **Throttle body bolts tightening procedure**

1) Tighten all bolts to 9 to 11 N·m (0.9 to 1.1 kg-m, 6.5 to 8.0 ft-lb)
2) Tighten all bolts to 18 to 22 Nm (1.8 to 2.2 kg-m, 13 to 16 ft-lb)

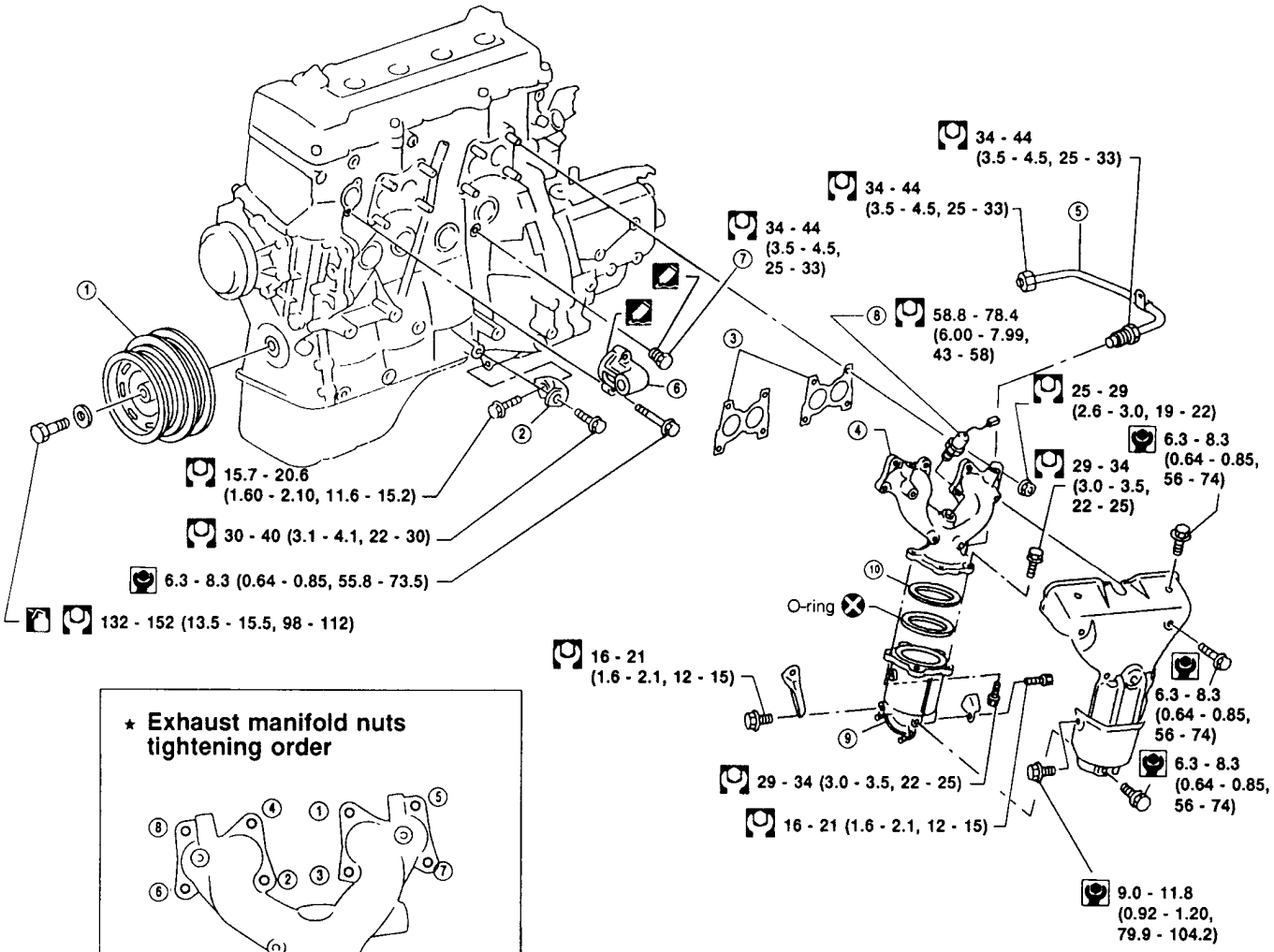
● Ensure gasket direction is correct.



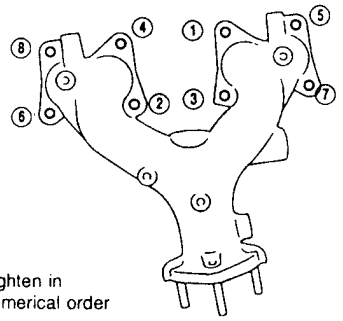
NEM116

① Throttle position sensor
② Mass air flow sensor
③ IACV - AAC valve
④ IACV - FICD solenoid valve
⑤ Throttle body
⑥ Engine coolant temperature sensor
⑦ Air relief plug
⑧ Injector
⑨ Injector tube
⑩ Pressure regulator
⑪ EGR valve
⑫ Intake manifold

SEC. 120•140•147•210



★ **Exhaust manifold nuts tightening order**

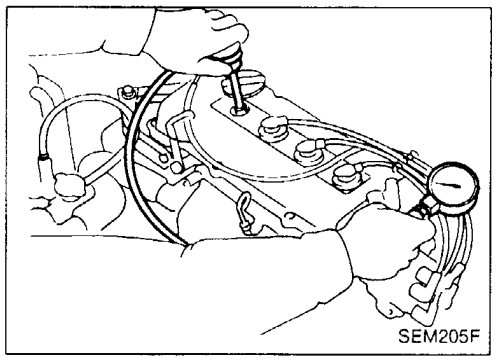


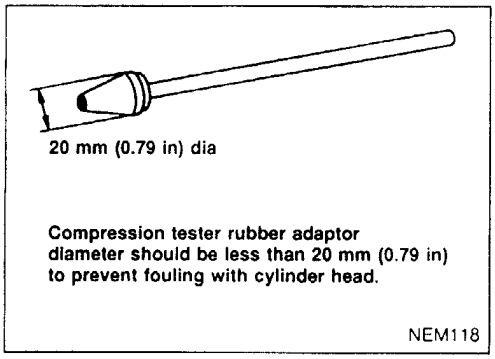
Tighten in numerical order

: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)
: Apply liquid gasket
: Do not re-use.
: Lubricate with new engine oil.

NEM117

① Crankshaft pulley
② Gusset
③ Gasket
④ Exhaust manifold
⑤ EGR tube
⑥ Water outlet
⑦ Water drain plug
⑧ Heated oxygen sensor
⑨ Three-way catalyst


SEM205F



Measurement of Compression Pressure

1. Warm up engine.
2. Turn ignition switch off.
3. Release fuel pressure.
   Refer to "Releasing Fuel Pressure" in EC section.
4. Remove all spark plugs.
5. Disconnect distributor center cable.
6. Attach a compression tester to No. 1 cylinder.
7. Depress accelerator pedal fully to keep throttle valve wide open.
8. Crank engine and record highest gauge indication.
9. Repeat the measurement on each cylinder as shown above.

- **Always use a fully-charged battery to obtain specified engine revolution.**

Compression pressure:

Unit: kPa (bar, kg/cm^2, psi)/rpm

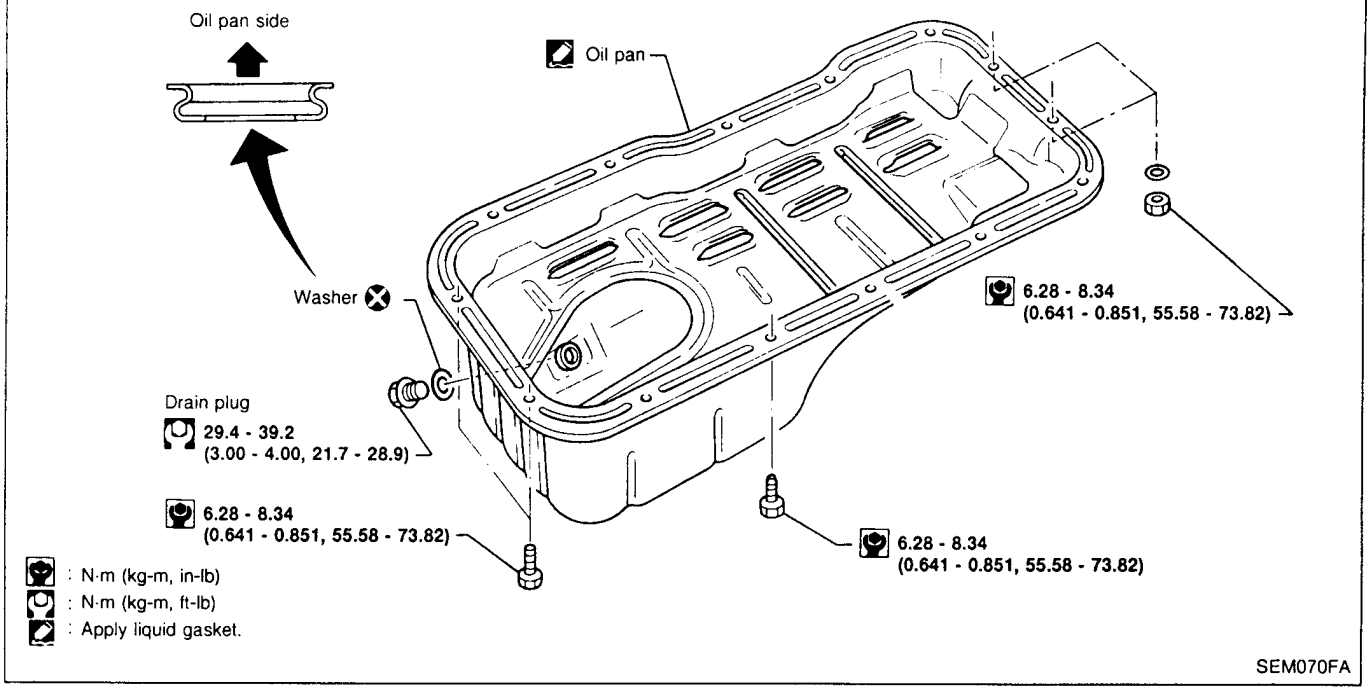
Compression ratio	Standard	Minimum	Difference limit between cylinders
9.8	1,353 (13.53, 13.8, 196)/350	1,157 (11.57, 11.8, 168)/350	98 (0.98, 1.0, 14)/350

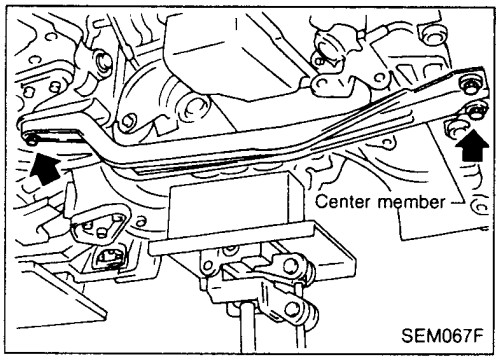
10. If compression in one or more cylinders is low:

a. Pour a small amount of engine oil into cylinders through spark plug holes.
b. Re-test compression.

- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
- **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. Refer to SDS (EM-161). If valve or valve seat is damaged excessively, replace them.**
- **If compression stays low in two cylinders that are next to each other:**
  The cylinder head gasket may be leaking, or both cylinders may have valve component damage. Inspect and repair as necessary.

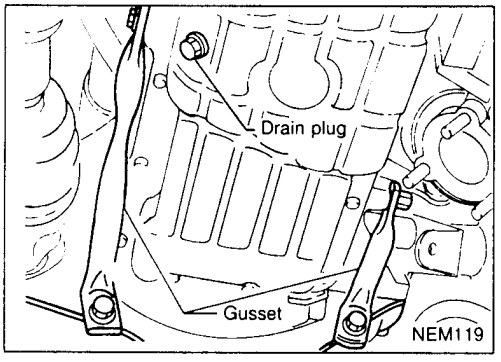
SEC. 110



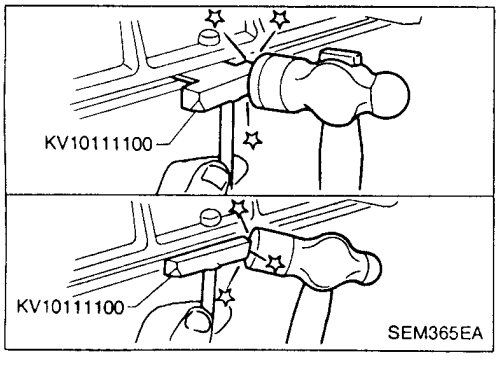


Removal

1. Remove undercovers.
2. Drain engine oil.
3. Remove front exhaust tube. Refer to "Exhaust system" in FE section.
4. Remove center member.

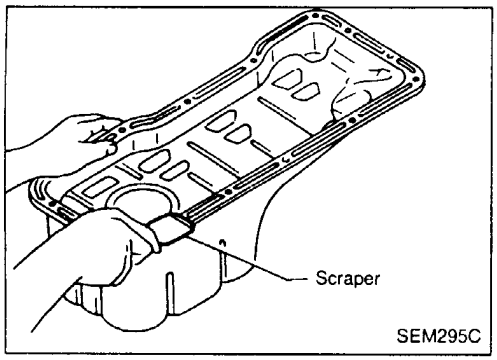


5. Remove engine front and rear gussets.



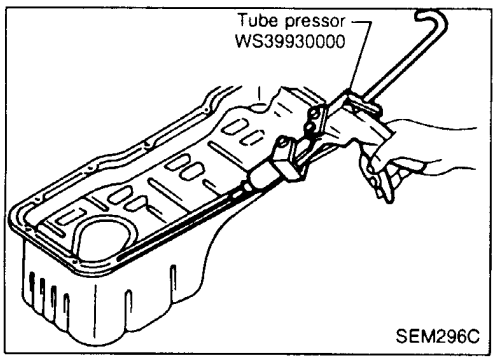
6. Remove oil pan.
(1) Insert Tool between cylinder block and oil pan.
- **Be careful not to damage aluminum mating face.**
- **Do not insert screwdriver, or oil pan flange will be deformed.**

(2) Slide Tool by tapping its side with a hammer, and remove oil pan.

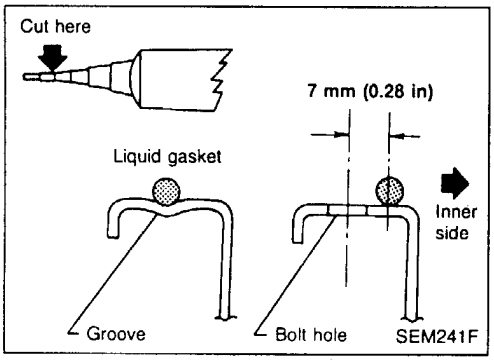


Installation

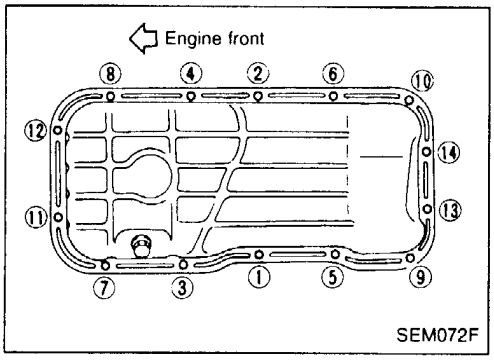
1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



2. Apply a continuous bead of liquid gasket to mating surface of oil pan.
- **Use Genuine Liquid Gasket or equivalent.**

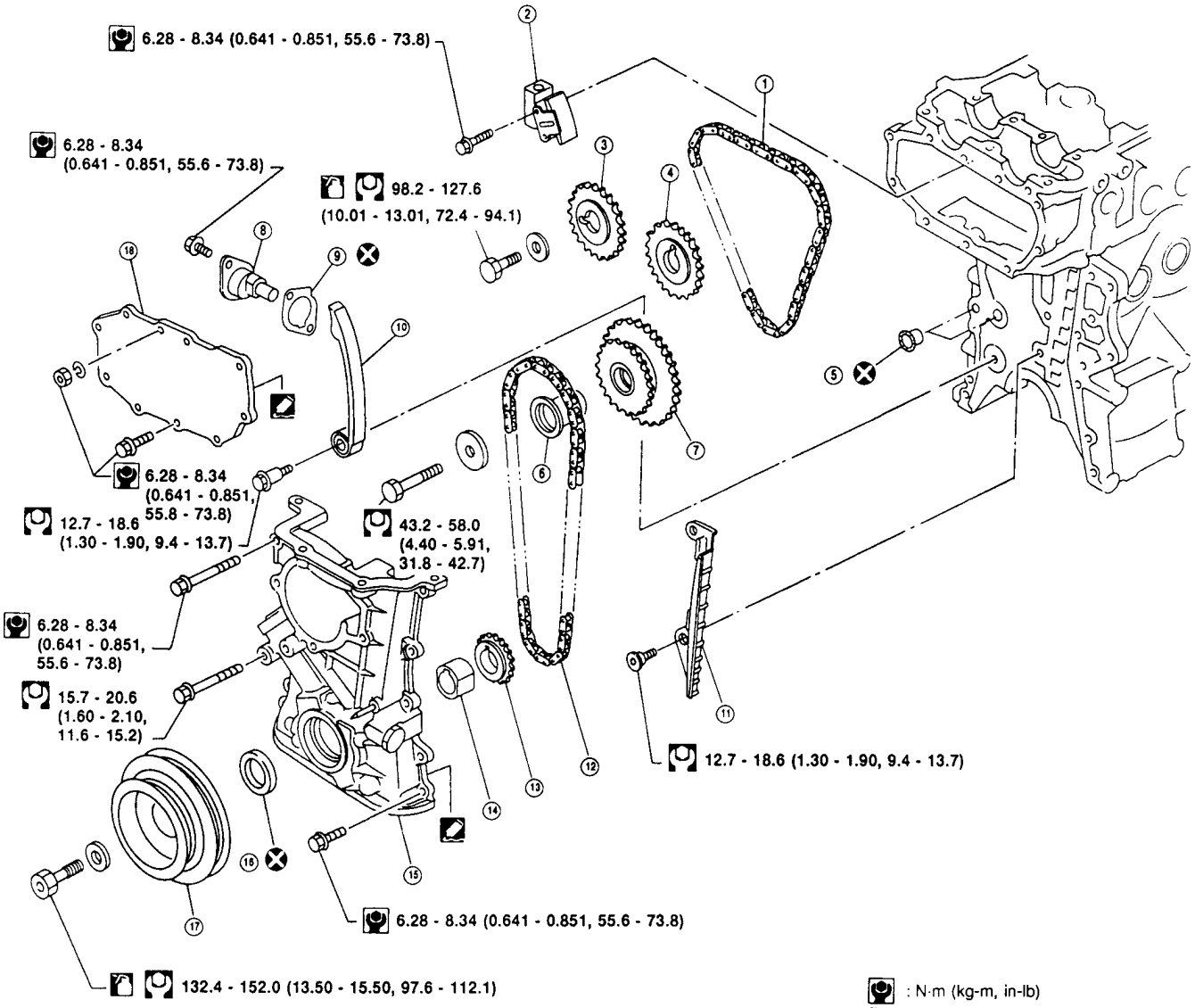


- Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide.
- Apply liquid gasket to inner sealing surface as shown in figure.
- Attaching should be done within 5 minutes after coating.



3. Install oil pan.
- Tighten oil pan bolts in numerical order.
- Wait at least 30 minutes before refilling with engine oil.
4. Install other removed parts in the reverse order of removal.

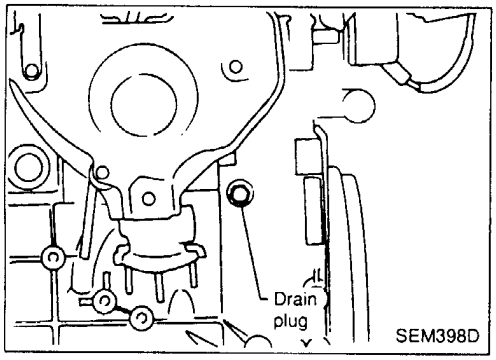
SEC. 130



: N·m (kg-m, in-lb)
: N·m (kg-m, ft-lb)
: Apply liquid gasket.
: Lubricate with new engine oil
: Do not re-use

NEM120

① Upper timing chain
② Upper chain tensioner
③ Camshaft sprocket (Intake)
④ Camshaft sprocket (Exhaust)
⑤ O-ring
⑥ Idler shaft
⑦ Idler sprocket
⑧ Lower chain tensioner
⑨ Gasket
⑩ Slack side timing chain guide
⑪ Timing chain guide
⑫ Lower timing chain
⑬ Crankshaft sprocket
⑭ Oil pump drive spacer
⑮ Front cover
⑯ Oil seal
⑰ Crankshaft pulley
⑱ Cylinder head front cover

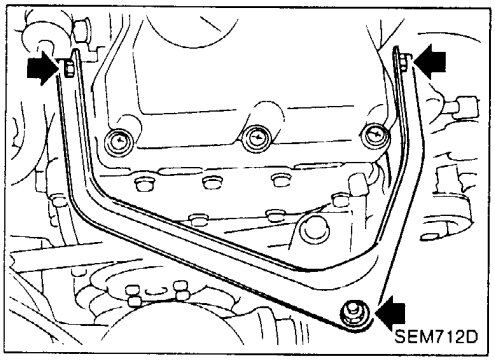


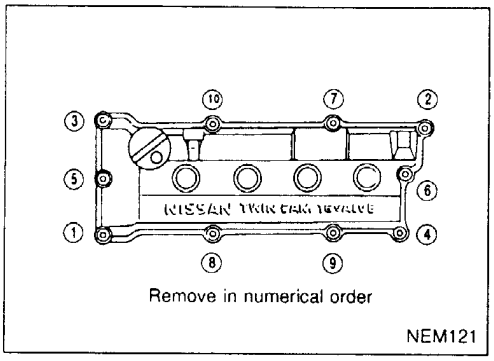
CAUTION:

- **After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.**
- **When installing camshafts, chain tensioner, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.**
- **Apply new engine oil to bolt threads and seat surfaces when installing cylinder head, camshaft sprocket, crankshaft pulley, and camshaft brackets.**

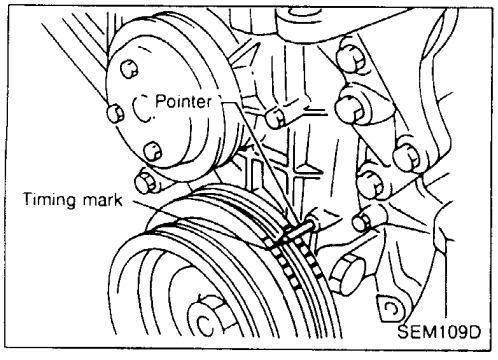
Removal

1. Drain engine coolant from radiator and cylinder block. Be careful not to spill coolant on drive belts.
2. Release fuel pressure. Refer to "Releasing Fuel Pressure" in EC section.
3. Remove the following belts.
   - Power steering pump drive belt
   - Alternator drive belt
4. Remove power steering pulley and pump with bracket.
5. Remove air duct to intake manifold collector.
6. Remove front right-side wheel.
7. Remove front right-side splash cover.
8. Remove front undercovers.
9. Remove front exhaust tube.
10. Remove cylinder head front mounting bracket.



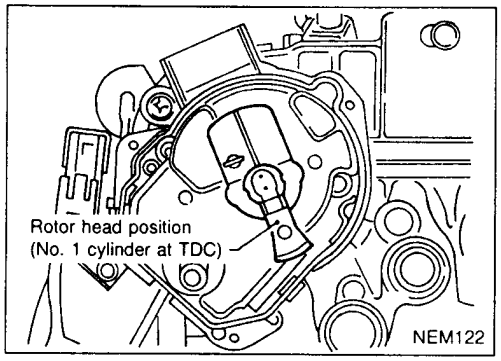


11. Remove rocker cover in numerical order as shown in the figure.
12. Remove distributor cap.
13. Remove all spark plugs.
14. Remove intake manifold support.



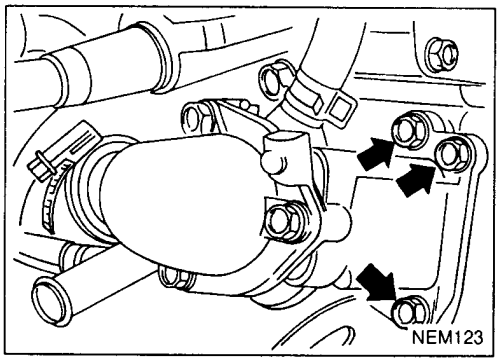
15. Set No. 1 piston at TDC on its compression stroke.

Removal (Cont'd)

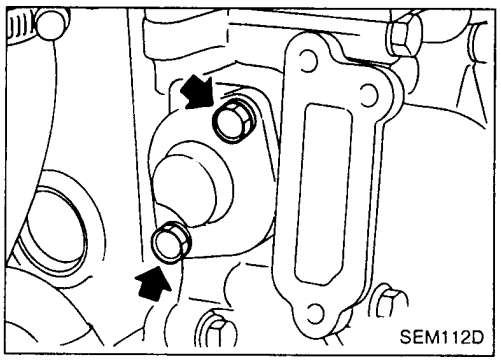


- Make sure No. 1 cylinder is at TDC by looking at distributor rotor position.

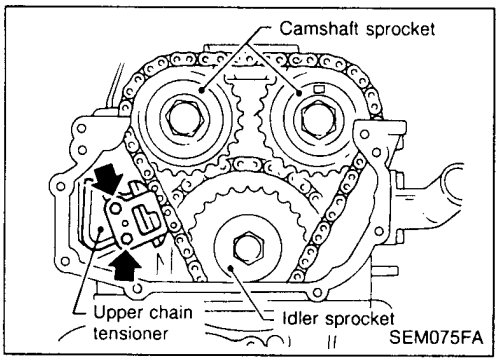
16. Remove distributor.
17. Remove cylinder head front cover.
18. Remove water pump pulley.



19. Remove thermostat housing.



20. Remove lower chain tensioner.



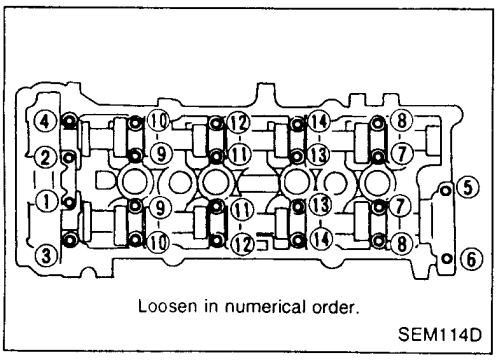
21. Remove upper chain tensioner.
22. Loosen idler sprocket bolt.
23. Remove camshaft sprocket bolts.

- **Apply paint to upper timing chain and cam sprockets for alignment during installation.**

24. Remove camshaft sprockets.
25. Remove camshaft brackets and camshafts.

- **Apply I.D. marks to brackets to ensure correct re-asembly.**
- **Bolts should be loosened in two or three steps.**

26. Remove idler sprocket bolt.



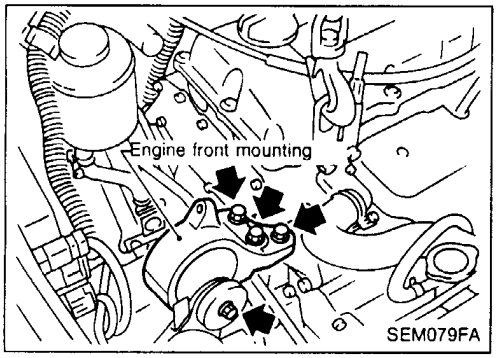
27. Rem ove cylinder head with manifolds.

- **Head warpage or cracking could result from removing in incorrect order.**
- **Cylinder head bolts should be loosened in two or three steps.**

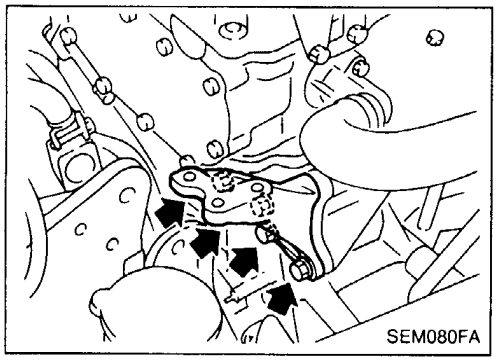
28. Remove idler sprocket shaft.
29. Remove upper timing chain.
30. Remove center member.
31. Remove oil pan. Refer to "Removal" in "OIL PAN" (EM-11).
32. Remove oil strainer.
33. Remove crankshaft pulley.
34. Support engine with a suitable hoist or jack.

Removal (Cont'd)

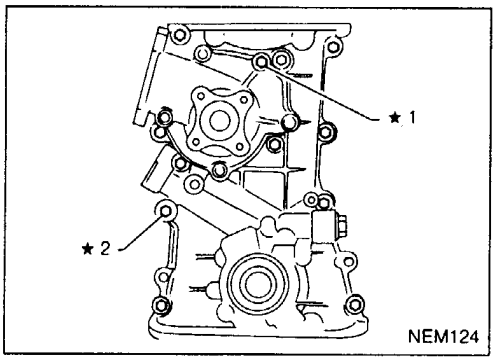
35. Remove engine front mounting.



36. Remove engine front mounting bracket.

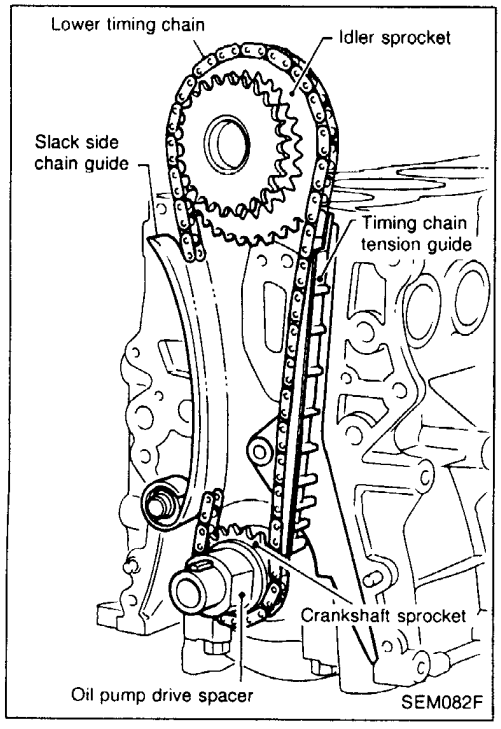


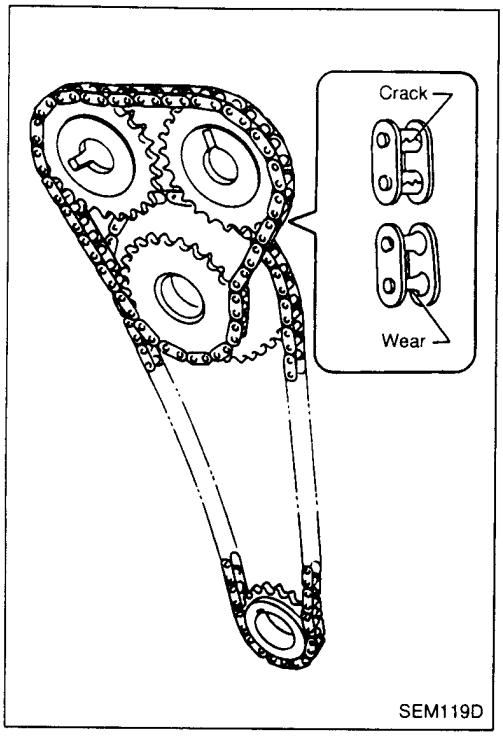
37. Remove front cover bolts and front cover as shown.
★1: Located on water pump
★2: Located on power steering pump adjusting bar



38. Remove idler sprocket.
- **Apply paint to lower timing chain and idler sprockets for alignment during installation.**

39. Remove lower timing chain.
40. Remove oil pump drive spacer.
41. Remove chain guides.
42. Remove crankshaft sprocket.





Inspection

Check for cracks and excessive wear at roller links. Replace if necessary.

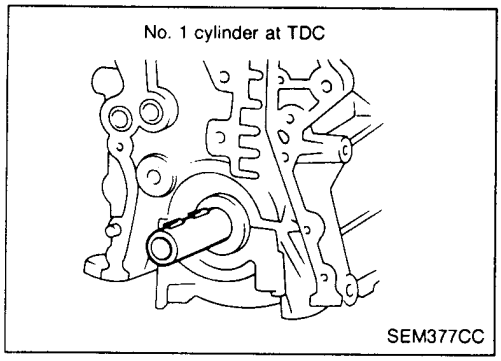
Installation

1. Position crankshaft so that No. 1 piston is at TDC and key way is at 12 o'clock.

a. Install crankshaft sprocket.

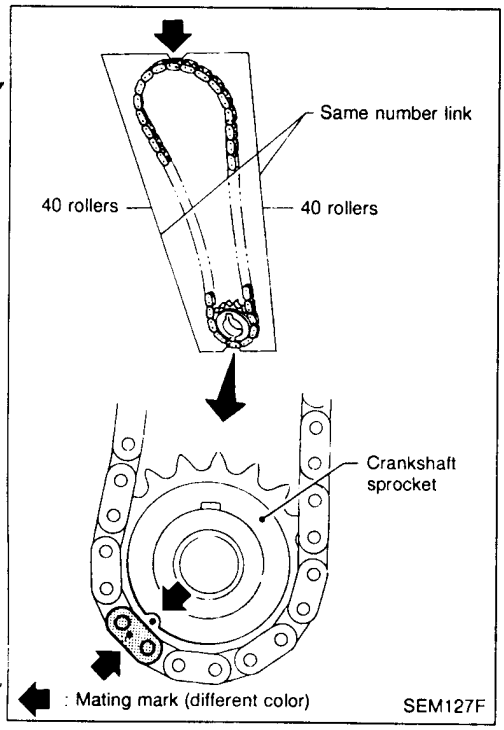
- **Make sure mating marks on crankshaft sprocket face front of engine.**

b. Install oil pump drive spacer.

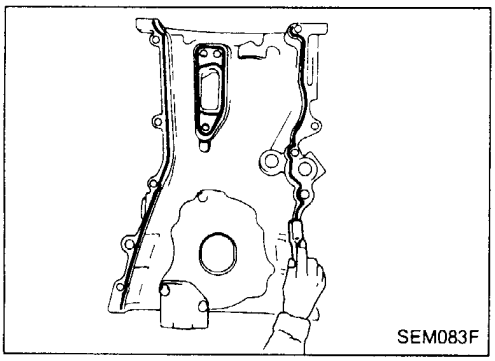


2. Install chain guide.
3. Install crankshaft sprocket and lower timing chain.

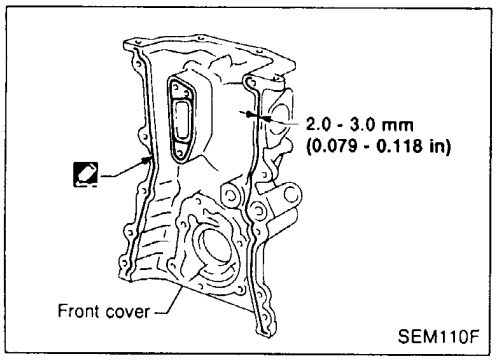
- **Set timing chain by aligning its mating mark with that on the crankshaft sprocket.**
- **Make sure sprocket's mating mark faces engine front.**
- **The number of links between alignment marks are the same for the left and right sides. Either side can be used during alignment with the sprocket.**



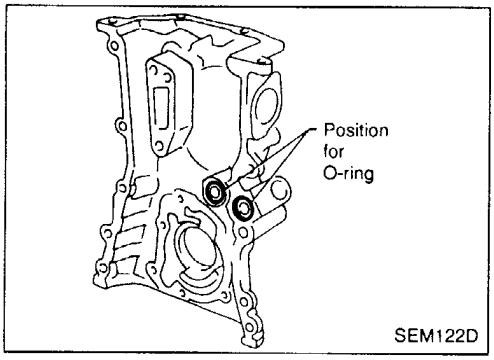
Installation (Cont'd)



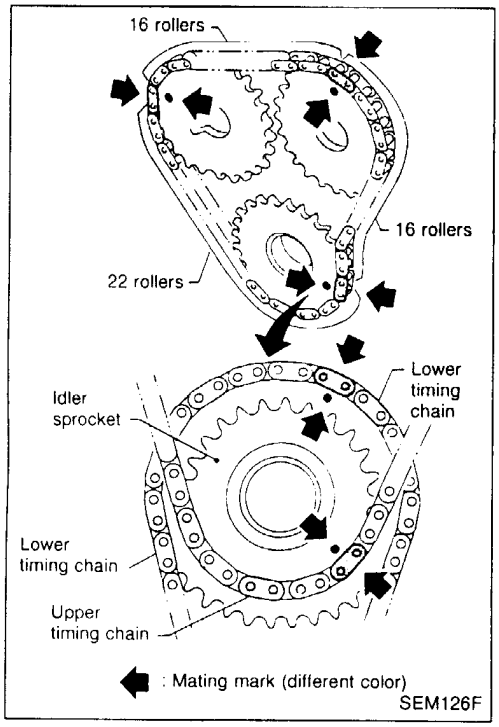
4. Before installing front cover, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



5. Apply liquid gasket to front cover.
6. Install front cover.
- **Check alignment of mating marks on chain and crankshaft sprocket.**
- **Align oil drive spacer with oil pump.**
- **Place timing chain to the side of chain guide. This prevents the chain from making contact with water seal area of front cover.**
- **Make sure two O-rings are present.**
- **Be careful not to damage oil seal when installing front cover.**

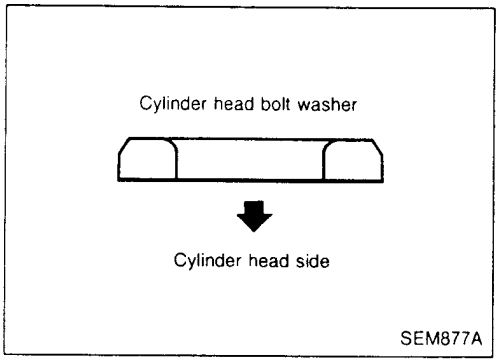


7. Install engine front mounting bracket and mounting.
8. Install oil strainer.
9. Install oil pan. Refer to "Installation" in "OIL PAN" (EM-12).
10. Install crankshaft pulley.
11. Install center member.

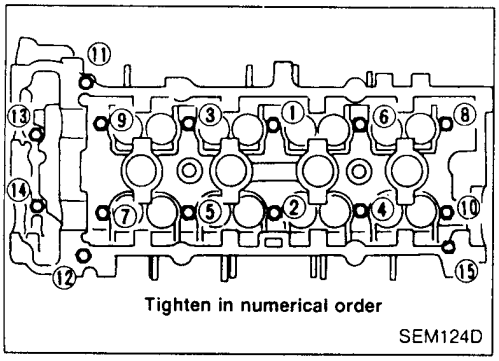


12. Set idler sprocket by aligning the mating mark on the larger sprocket with mating mark on the lower timing chain.
13. Install upper timing chain and set it by aligning mating marks on the smaller sprocket with mating mark on upper timing chain.
- **Make sure sprocket's mating mark faces engine front.**
14. Install idler sprocket shaft.

Installation (Cont'd)

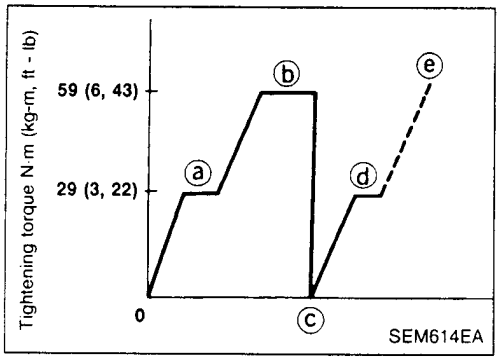


15. Install cylinder head with new gasket.
- **Be sure to install washers between bolts and cylinder head.**
- **Do not rotate crankshaft and camshaft separately, or valves will strike piston heads.**
- **Apply new engine oil to cylinder head bolt threads and seat surfaces.**



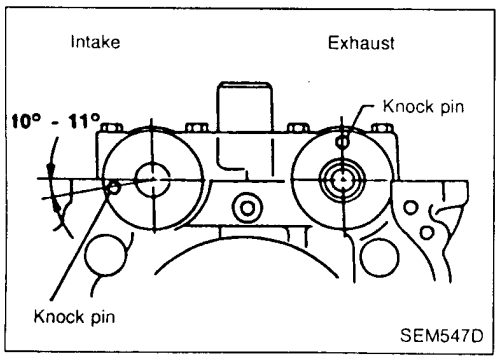
- **Tightening procedure**

ⓐ Tighten bolts to 29 N·m (3 kg-m, 22 ft-lb).
ⓑ Tighten bolts to 59 N·m (6 kg-m, 43 ft-lb).
ⓒ Loosen bolts completely.
ⓓ Tighten bolts to 29 N·m (3 kg-m, 22 ft-lb).
ⓔ Turn bolts 50 to 55 degrees clockwise or if angle wrench is not available, tighten bolts to 59±4.9 N·m (6±0.5 kg-m, 43±3.6 ft-lb).
ⓕ Tighten bolts (⑪ - ⑮) to 6.3 to 8.3 N·m (0.64 to 0.85 kg-m, 55.8 to 73.5 in-lb).



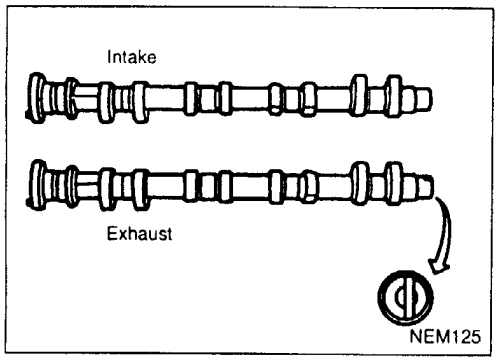
	Tightening torque N·m (kg-m, ft-lb)				
	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ, ⓕ
Bolts (① - ⑩)	29 (3, 22)	59 (6, 43)	0 (0, 0)	29 (3, 22)	50 - 55 degrees or 59±4.9 (6±0.5, 43±3.6 ft-lb)
Bolts (⑪ - ⑮)	—	—	—	—	6.3 - 8.3 (0.64 - 0.85, 55.8 - 73.5 in-lb)

16. Install idler sprocket bolt.

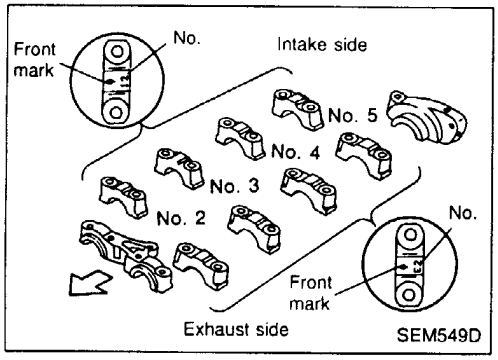


17. Install camshaft.
- **Make sure camshafts are aligned as shown in figure.**

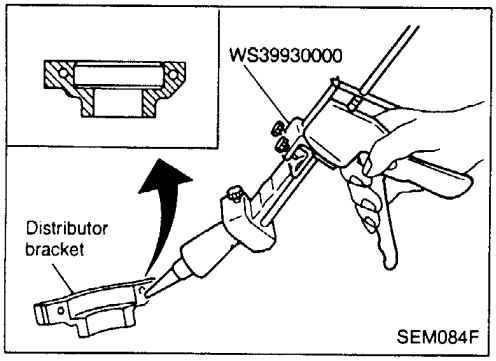
Installation (Cont'd)



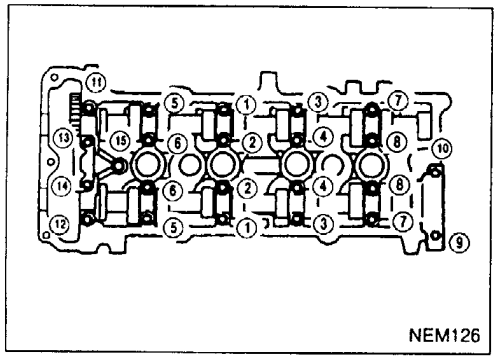
- **Exhaust camshaft is identified by cutout (for distributor).**



18. Install camshaft brackets and distributor bracket.
- **Make sure camshaft brackets are aligned as marked during dis-assembly.**



- **Apply liquid gasket to distributor bracket as shown in the figure.**



- **Apply new engine oil to bolt threads and seat surface.**
- **Tighten camshaft bracket bolts in the following steps.**

ⓐ **Tighten bolts ⑪ - ⑮, then ① - ⑩.**
: 2.0 N·m (0.204 kg-m, 17.7 in-lb)

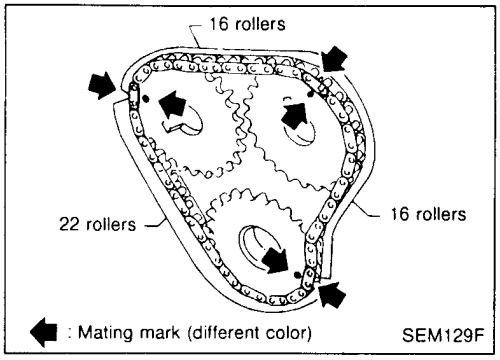
ⓑ **Tighten bolts ① - ⑮.**
: 5.9 N·m (0.60 kg-m, 52.2 in-lb)

ⓒ **Tighten bolts ① - ⑭.**
: 9.8 - 11.8 N·m (1.00 - 1.20 kg-m, 86.7 - 104.4 in-lb)
Tighten bolt ⑮.
: 6.3 - 8.3 N·m (0.64 - 0.85 kg-m, 55.8 - 73.5 in-lb)

- **If any part of valve assembly or camshaft is replaced, check valve clearance according to reference data. After completing assembly check valve clearance. Refer to "Checking" and "Adjusting" in "VALVE CLEARANCE" (EM-35).**

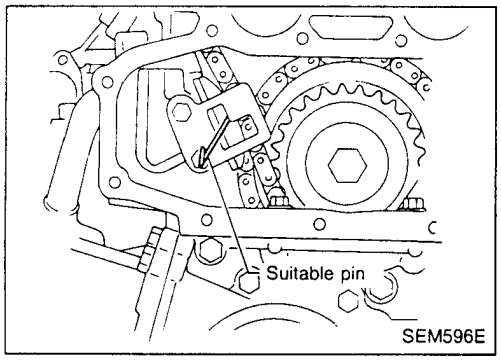
Reference data valve clearance (Cold):
Intake
0.25 - 0.33 mm (0.010 - 0.013 in)
Exhaust
0.32 - 0.40 mm (0.013 - 0.016 in)

Installation (Cont'd)

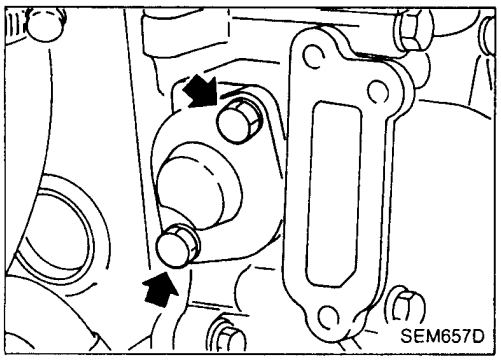


19. Assemble camshaft sprocket with chain.
- **Set timing chain by aligning mating marks with those of camshaft sprockets.**
- **Make sure sprocket's mating marks face engine front.**

20. Install camshaft sprocket bolts to correct torque.
- **Apply new engine oil to bolt threads and seat surface.**

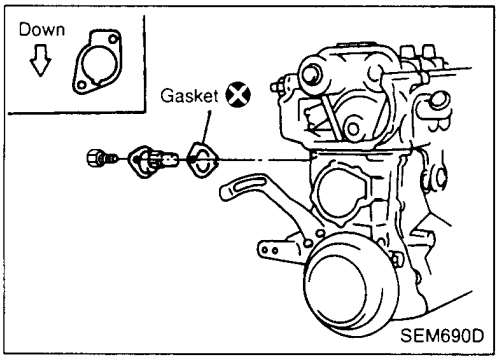


21. Install upper chain tensioner.
- **Before installing chain tensioner, insert a suitable pin into pin hole of chain tensioner.**
- **After installing chain tensioner, remove the pin.**

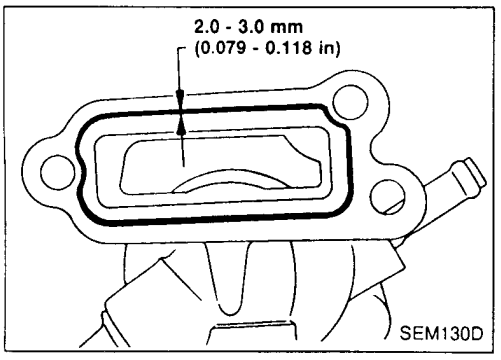


22. Install lower chain tensioner.

CAUTION:
- **Check no problems occur when engine is rotated.**
- **Make sure that No. 1 piston is set at TDC on its compression stroke.**



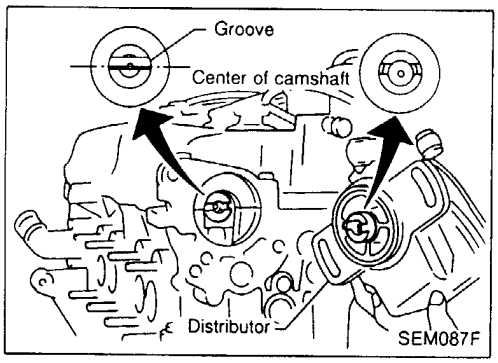
- **Make sure of the direction of the gasket before installing lower chain tensioner.**



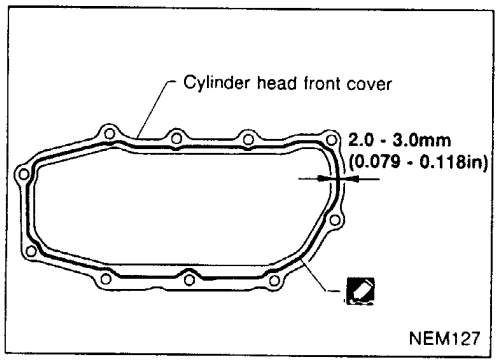
23. Apply liquid gasket to thermostat housing.
- Use Genuine Liquid Gasket or equivalent.

24. Install thermostat housing.
25. Install water pump pulley.

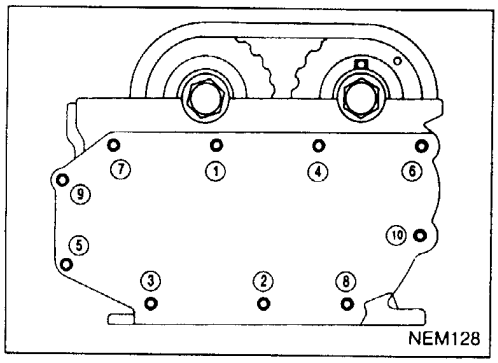
Installation (Cont'd)



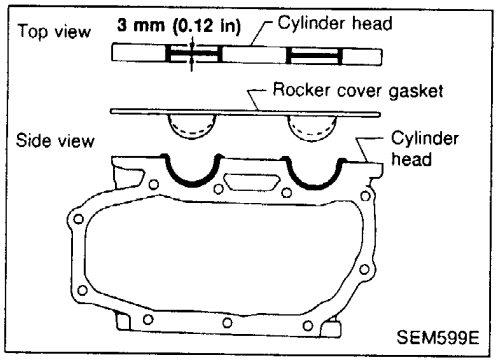
26. Install distributor.
- **Make sure that position of camshaft is as shown in figure.**



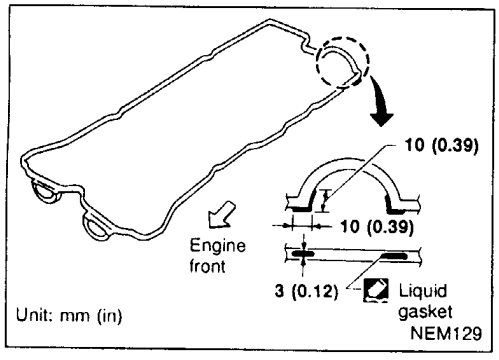
27. Install cylinder head front cover.
- Apply liquid gasket to cylinder head front cover.
- Use Genuine Liquid Gasket or equivalent.



- Tighten bolts and nuts in numerical order as shown in the figure.

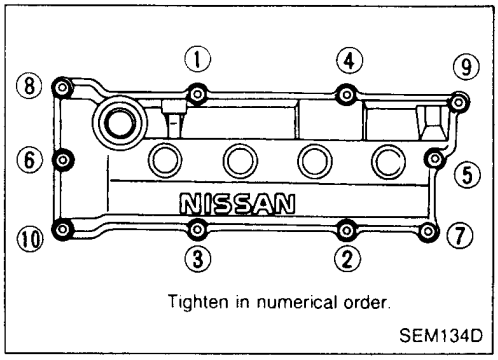


28. Apply liquid gasket to cylinder head.



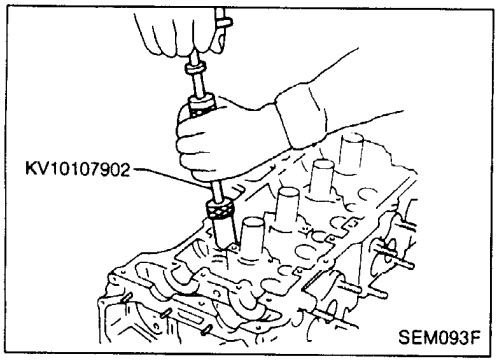
29. Apply liquid gasket to rocker cover gasket.

Installation (Cont'd)



Tighten in numerical order.
SEM134D

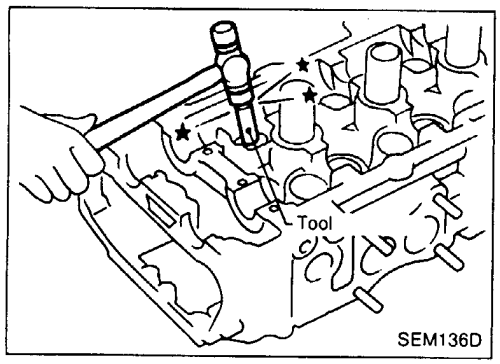
30. Install rocker cover and tighten in numerical order as shown in the figure.
31. Install all spark plugs and leads.
32. Install engine front mounting bracket and mounting.
33. Install front exhaust tube.
34. Install front undercover.
35. Install front right splash cover.
36. Install front right wheel.
37. Install air cleaner.
38. Install power steering pulley and pump with bracket.
    To check power steering fluid, refer to MA section ("Checking Power Steering Fluid and Lines", "CHASSIS AND BODY MAINTENANCE").
39. Drive belts.
    For adjusting drive belt deflection, refer to MA section ("Checking Drive Belts", "ENGINE MAINTENANCE").



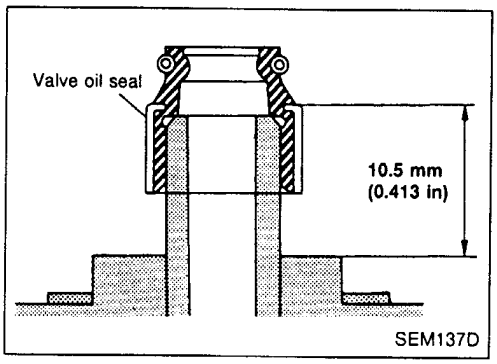
VALVE OIL SEAL

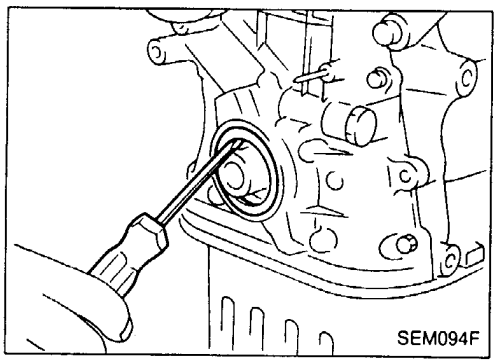
1. Remove rocker cover.
2. Remove camshaft.
3. Remove valve spring. Refer to "CYLINDER HEAD".
4. Remove valve oil seal with a suitable tool.

Piston concerned should be set at TDC to prevent valve from falling.



5. Apply engine oil to new valve oil seal, then install oil seal with Tool.



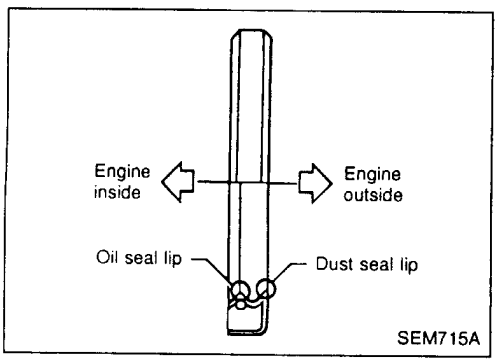


FRONT OIL SEAL

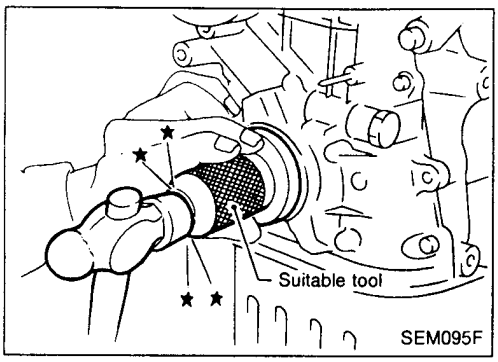
1. Remove the following parts:
- Engine undercover
- Right-side splash cover
- Alternator and power steering drive belts
- Crankshaft pulley

2. Remove front oil seal from front cover.

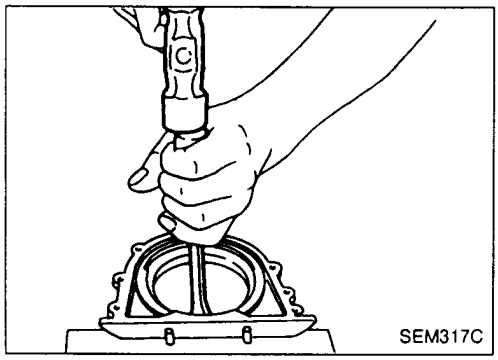
Be careful not to damage oil seal portion.



- Install new oil seal in the direction shown.



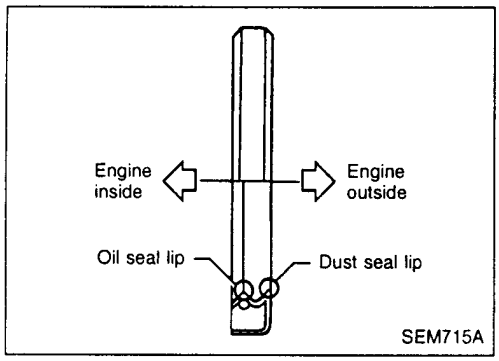
3. Apply engine oil to new oil seal, then install oil seal to front cover using a suitable tool.



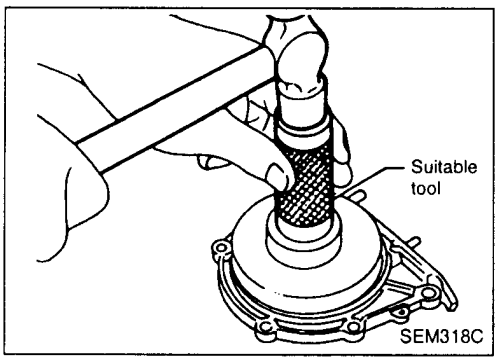
REAR OIL SEAL

1. Remove flywheel or drive plate.
2. Remove rear oil seal retainer.
3. Remove traces of liquid gasket using scraper.
4. Remove seal from rear oil seal retainer.

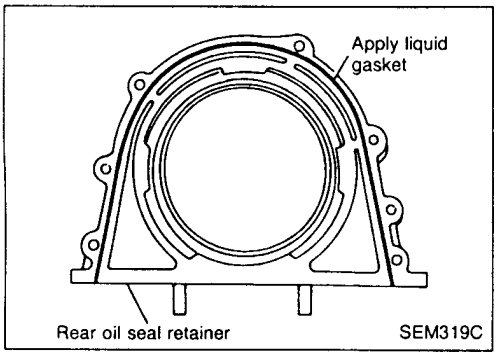
Be careful not to scratch rear oil seal retainer.



- Install new oil seal in the direction shown.

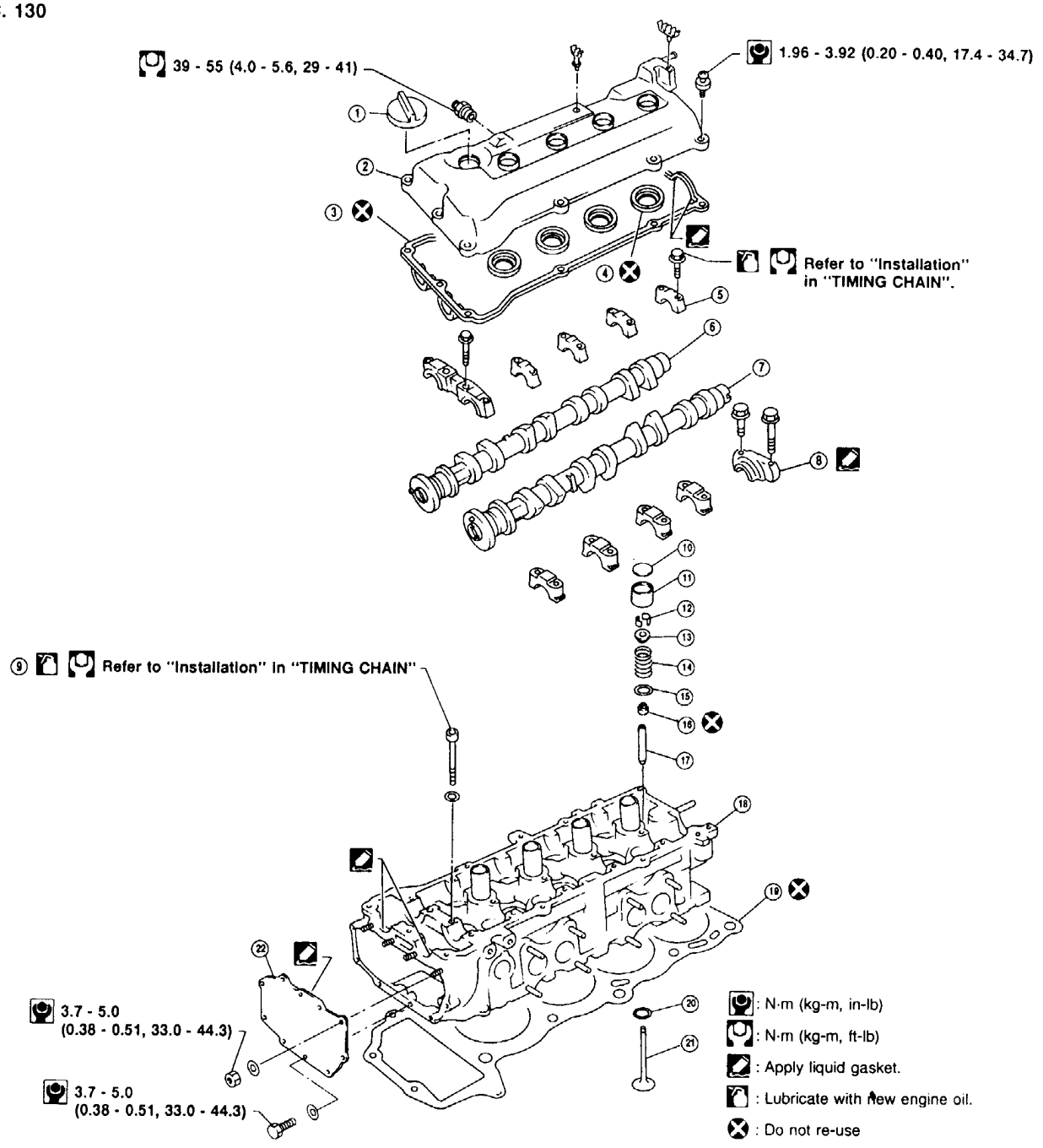


5. Apply engine oil to new oil seal, then install oil seal to rear oil seal retainer using a suitable tool.



6. Apply liquid gasket to retainer as shown.
7. Fit retainer, tighten bolts. Refit flywheel or drive plate.

SEC. 130



NEM130

① Oil filler cap
② Rocker cover
③ Rocker cover gasket
④ Oil seal
⑤ Camshaft bracket
⑥ Intake camshaft
⑦ Exhaust camshaft
⑧ Distributor bracket
⑨ Cylinder head bolt
⑩ Shim
⑪ Valve lifter
⑫ Valve cotter
⑬ Valve spring retainer
⑭ Valve spring
⑮ Valve spring seat
⑯ Valve oil seal
⑰ Valve guide
⑱ Cylinder head
⑲ Cylinder head gasket
⑳ Valve seat
㉑ Valve
㉒ Cylinder head front cover

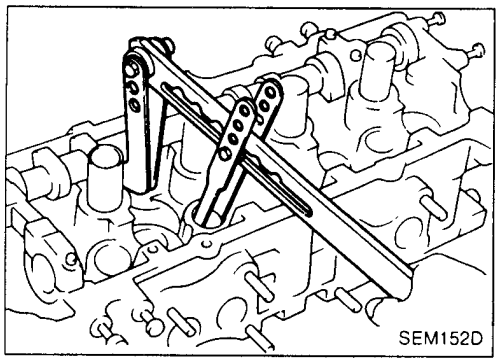
Installation

CAUTION:

- **When installing camshaft, oil seals or other sliding parts, lubricate contacting surfaces with new engine oil.**
- **When tightening cylinder head bolts, camshaft sprocket bolts and camshaft bracket bolts, lubricate threaded areas and seat surfaces of bolts with new engine oil.**
- **Attach tags to valve lifters so as not to mix them up.**

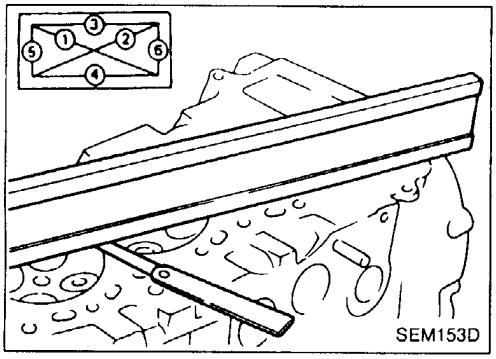
Removal

- This removal is the same procedure as those for timing chain. Refer to "Removal" in "TIMING CHAIN" (EM-14).
- **Apply paint to camshaft and idler sprockets for alignment during installation.**



Disassembly

1. Remove valve components with Tool.
2. Remove valve oil seal with a suitable tool.



Inspection

CYLINDER HEAD DISTORTION

Clean surface of cylinder head.
Use a reliable straightedge and a feeler gauge to check the flatness of cylinder head surface.
Check along six positions shown in figure.

Head surface flatness:
Standard:
Less than 0.03 mm (0.0012 in)
Limit:
0.1 mm (0.004 in)

If beyond the specified limit, replace or resurface.

Resurfacing limit:
The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.
Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)

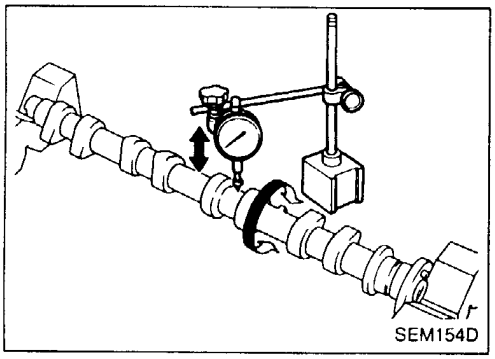
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:
117.8 - 118.0 mm (4.638 - 4.646 in)

CAMSHAFT VISUAL CHECK

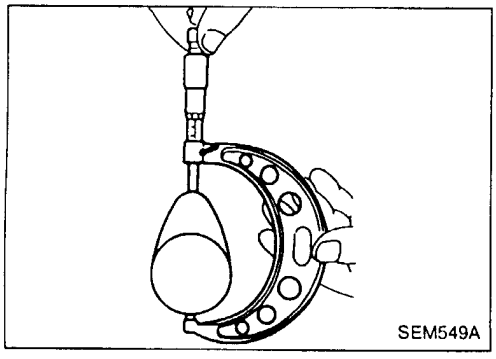
Check camshaft for scratches, seizure and wear.

CAMSHAFT RUNOUT



1. Measure camshaft runout at the center journal.
Runout (Total indicator reading):
Standard:
Less than 0.02 mm (0.0008 in)
Limit:
0.1 mm (0.004 in)
2. If it exceeds the limit, replace camshaft.

CAMSHAFT CAM HEIGHT



1. Measure camshaft cam height.

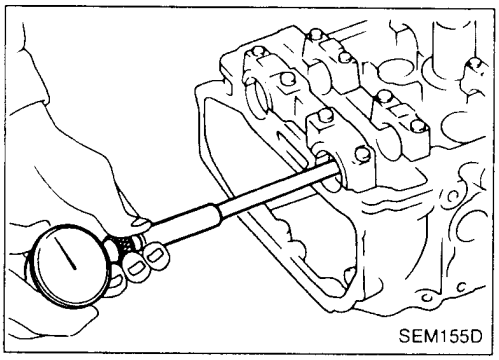
Unit: mm (in)

Standard cam height	Intake	39.380 - 39.570 (1.5504 - 1.5579)
	Exhaust	39.880 - 40.070 (1.5701 - 1.5776)
Cam wear limit		0.20 (0.0079)

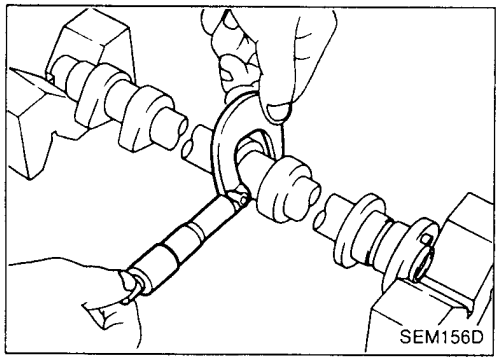
2. If wear is beyond the limit, replace camshaft.

Inspection (Cont'd)

CAMSHAFT JOURNAL CLEARANCE

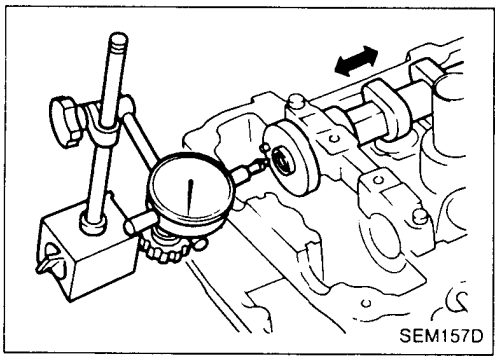

SEM155D

1. Install camshaft bracket and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.
   Standard inner diameter:
   No. 1 bearing
   28.000 - 28.021 mm (1.1024 - 1.1032 in)
   No. 2 to No. 5 bearings
   24.000 - 24.021 mm (0.9449 - 0.9457 in)


SEM156D

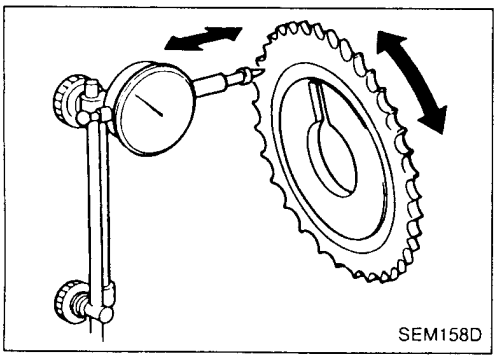
3. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   No. 1 journal
   27.935 - 27.955 mm (1.0998 - 1.1006 in)
   No. 2 to No. 5 journals
   23.935 - 23.955 mm (0.9423 - 0.9431 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance:
   Standard
   0.045 - 0.086 mm (0.0018 - 0.0034 in)
   Limit
   0.15 mm (0.0059 in)

CAMSHAFT END PLAY


SEM157D

1. Install camshaft in cylinder head.
2. Measure camshaft end play.
   Camshaft end play:
   Standard
   0.070 - 0.143 mm (0.0028 - 0.0056 in)
   Limit
   0.20 mm (0.0079 in)

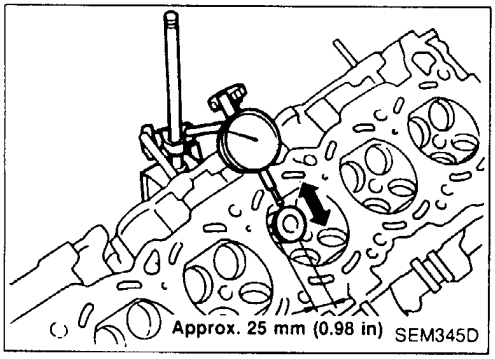
CAMSHAFT SPROCKET RUNOUT


SEM158D

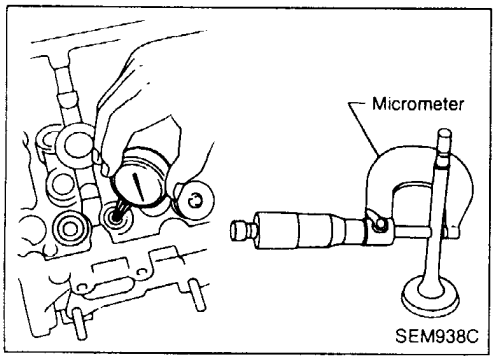
1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
   Runout (Total indicator reading):
   Limit 0.1 mm (0.004 in)
3. If it exceeds the limit, replace camshaft sprocket.

Inspection (Cont'd)

VALVE GUIDE CLEARANCE



1. Measure valve deflection in a parallel direction with rocker arm. (Valve and valve guide mostly wear in this direction.)
   Valve deflection limit (Dial gauge reading):
   Intake & Exhaust
   0.2 mm (0.008 in)



2. If it exceeds the limit, check valve to valve guide clearance.
   a. Measure valve stem diameter and valve guide inner diameter.
   b. Check that clearance is within specification.

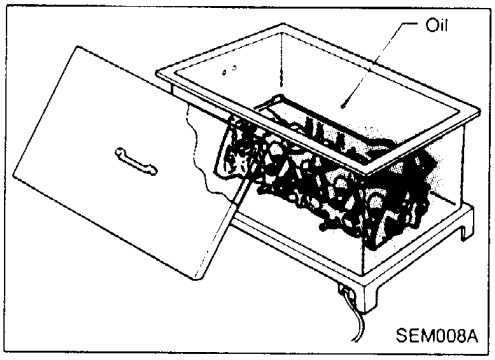
Valve to valve guide clearance:

Unit: mm (in)

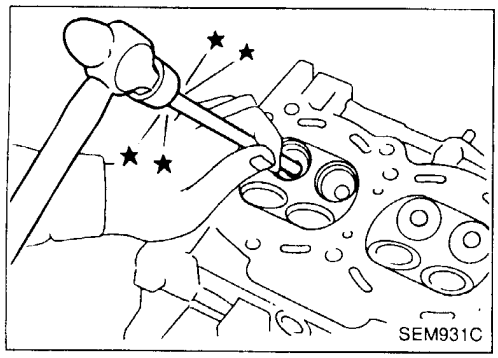
	Standard	Limit
Intake	0.020 - 0.050 (0.0008 - 0.0020)	0.1 (0.004)
Exhaust	0.040 - 0.070 (0.0016 - 0.0028)	0.1 (0.004)

   c. If it exceeds the limit, replace valve or valve guide.

VALVE GUIDE REPLACEMENT

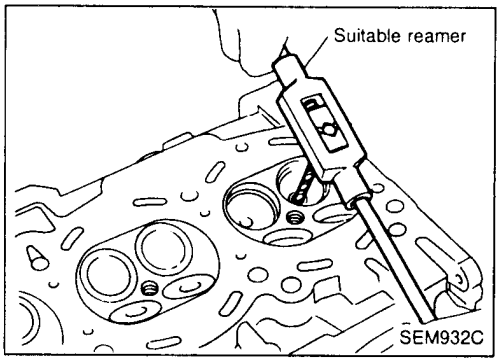


1. To remove valve guide, heat cylinder head to 110 to 120°C (230 to 248°F).

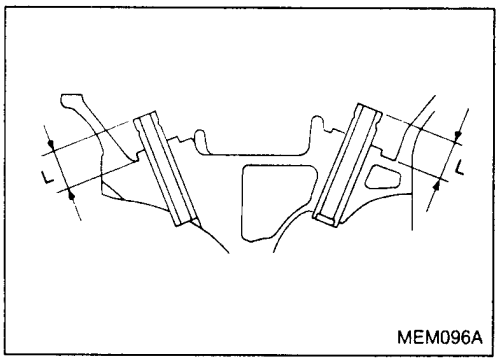


2. Drive out valve guide with a press [under a 20 kN (2 ton, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.

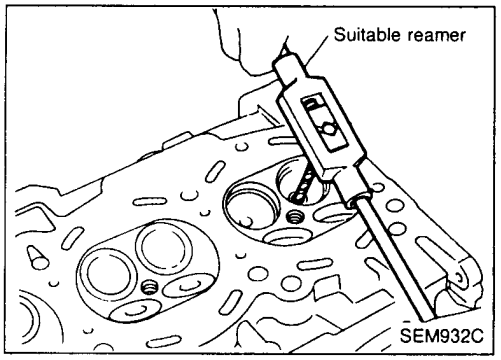
Inspection (Cont'd)



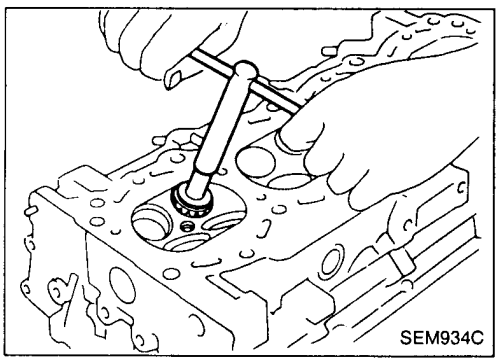
3. Ream cylinder head valve guide hole.
   Valve guide hole diameter
   (for service parts):
   Intake & Exhaust
   9.685 - 9.696 mm (0.3813 - 0.3817 in)



4. Heat cylinder head to 110 to 120°C (230 to 248°F) and press service valve guide into cylinder head.
   Projection "L":
   11.5 - 11.7 mm (0.453 - 0.461 in)



5. Ream valve guide.
   Finished size:
   Intake & Exhaust
   5.500 - 5.515 mm (0.2165 - 0.2171 in)



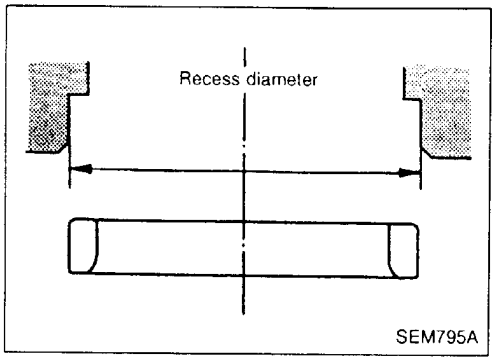
VALVE SEATS

Check valve seats for pitting at contact surface. Resurface or replace if excessively worn.

- **Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.**
- **Cut with both hands to uniform the cutting surface.**

Inspection (Cont'd)

REPLACING VALVE SEAT FOR SERVICE PARTS



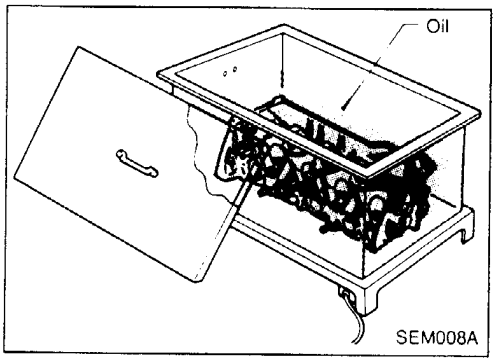
1. Bore out old seat until it collapses. Set machine depth stop so that boring cannot contact bottom face of seat recess in cylinder head.
2. Ream cylinder head recess.

Reaming bore for service valve seat
Oversize [0.5 mm (0.020 in)]:

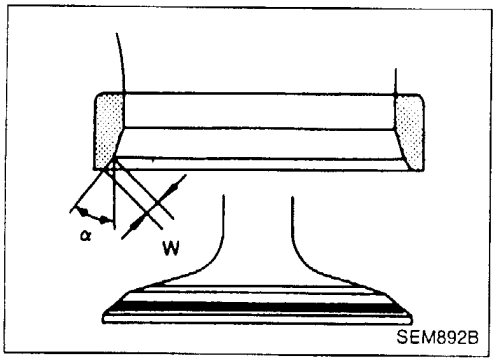
Unit: mm (in)

Intake	31.500 - 31.516 (1.2402 - 1.2408)
Exhaust	25.500 - 25.516 (1.0039 - 1.0046)

Use the valve guide center for reaming to ensure valve seat will have the correct fit.

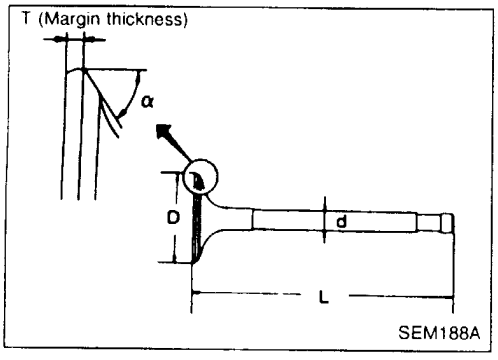


3. Heat cylinder head to 110 to 120°C (230 to 248°F).
4. Press fit valve seat until it seats on the bottom.



5. Cut or grind valve seat using suitable tool at the specified dimensions as shown in SDS (EM-164).
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seating condition.

Seat face angle "α":
45°15′ - 45°45′ deg.
Contacting width "W":
Intake
1.06 - 1.34 mm (0.0417 - 0.0528 in)
Exhaust
1.20 - 1.68 mm (0.0472 - 0.0661 in)



VALVE DIMENSIONS

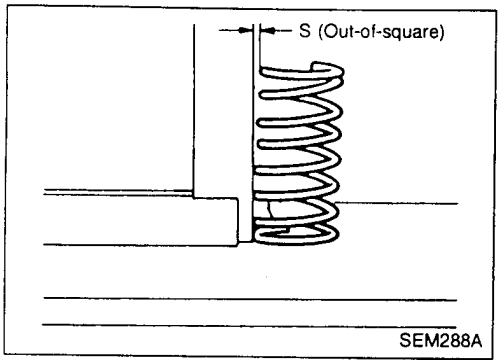
Check dimensions in each valve. For dimensions, refer to SDS (EM-161).

When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.

Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.

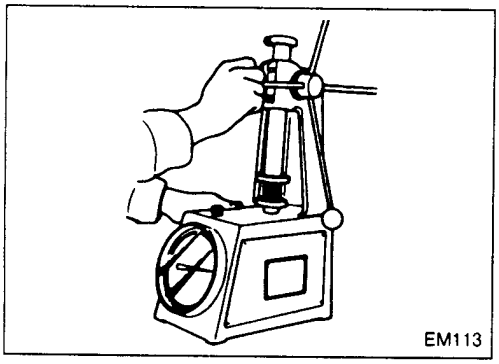
Inspection (Cont'd)

VALVE SPRING



Squareness

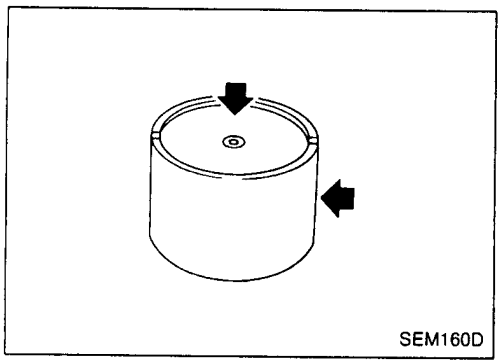
1. Measure "S" dimension.
   Out-of-square:
   Less than 1.80 mm (0.0709 in)
2. If it exceeds the limit, replace spring.



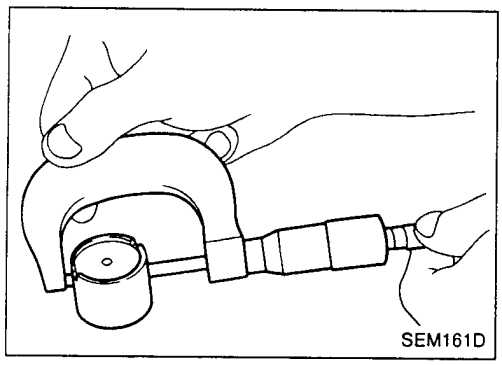
Pressure

Check valve spring pressure.
Pressure: N (kg, lb) at height mm (in)
Standard
344.42 (35.12, 77.44) at 25.26 (0.9945)
Limit
More than 323.73 (33.01, 72.79) at 25.26 (0.9945)
If it exceeds the limit, replace spring.

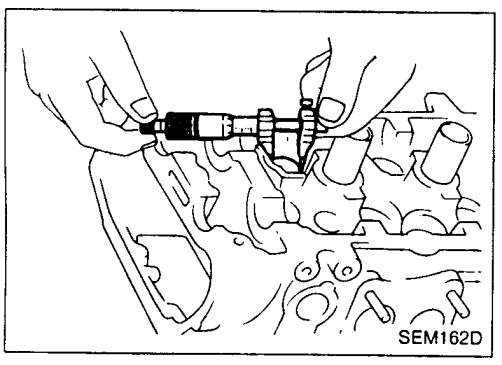
VALVE LIFTER AND VALVE SHIM



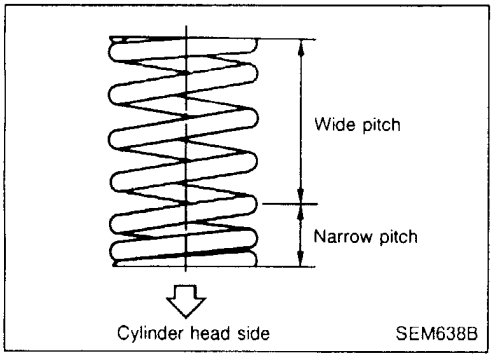
1. Check contact and sliding surfaces for wear or scratches.



2. Check diameter of valve lifter and valve lifter guide bore.
   Valve lifter diameter:
   29.960 - 29.975 mm (1,1795 - 1,1801 in)



Lifter guide bore diameter:
30.000 - 30.021 mm (1.1811 - 1.1819 in)
Clearance between valve lifter and valve lifter guide
0.025 - 0.061 mm (0.0010 - 0.0024 in)
If it exceeds the limit, replace valve lifter or cylinder head which exceeds the standard diameter tolerance.



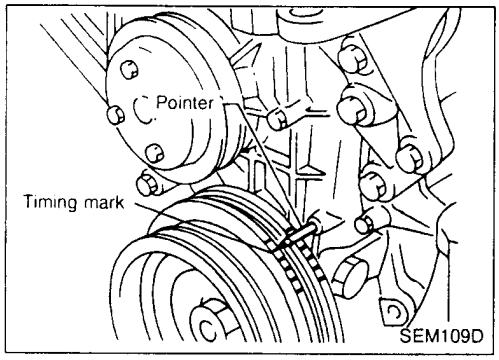
Assembly

1. Install valve component parts.

- **Always use new valve oil seal. Refer to OIL SEAL REPLACEMENT (EM-24).**
- **Before installing valve oil seal, install valve spring seat.**
- **After installing valve components, tap valve stem tip with a plastic hammer to assure a proper fit.**
- **Install uneven pitch type spring with its narrow pitch end toward cylinder head. (Identification color side down, if present.)**

Installation

- This installation is the same procedure as those for timing chain. Refer to "Installation" in "TIMING CHAIN" (EM-17).



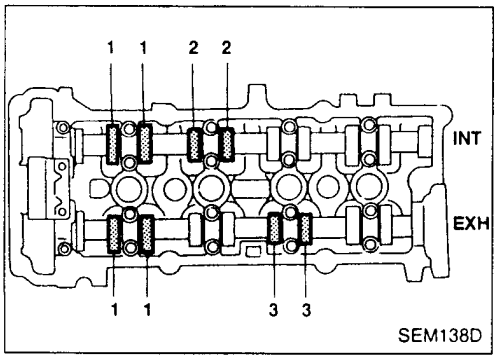
Checking

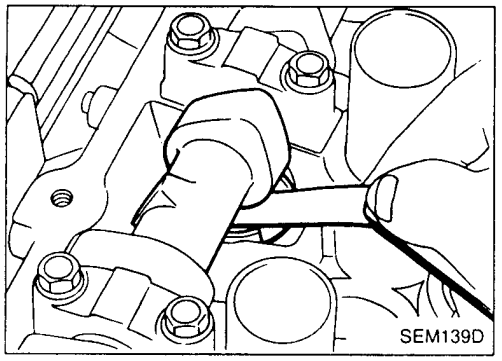
Check valve clearance while engine is warm and not running.

1. Remove rocker cover.
2. Remove all spark plugs.
3. Set No. 1 cylinder at TDC on its compression stroke.
- Align pointer with TDC mark on crankshaft pulley.
- Check that valve lifters on No. 1 cylinder are loose and valve lifters on No. 4 are tight.

  If not, turn crankshaft one revolution (360°) and align as above.

4. Check only those valves shown in the figure.





- Using a feeler gauge, measure clearance between valve lifter and camshaft.
- Record any valve clearance measurements which are out of specification. They will be used later to determine the required replacement adjusting shim.

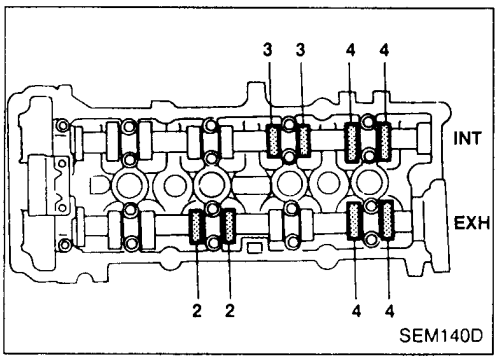
Valve clearance for checking (Hot):

Intake

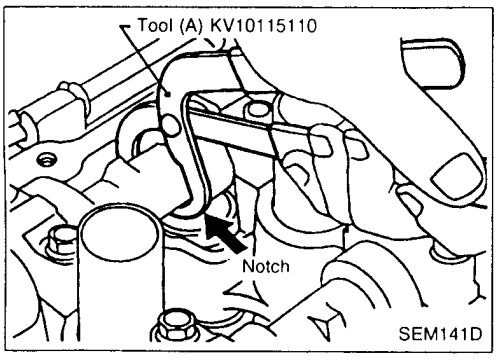
0.21 - 0.49 mm (0.008 - 0.019 in)

Exhaust

0.30 - 0.58 mm (0.012 - 0.023 in)



5. Turn crankshaft one revolution (360°) and align mark on crankshaft pulley with pointer.
6. Check those valves shown in the figure.
- Use the same procedure as mentioned in step 4.
7. If all valve clearances are within specification, install the following parts.
- Rocker cover
- All spark plugs



Adjusting

Adjust valve clearance while engine is cold.

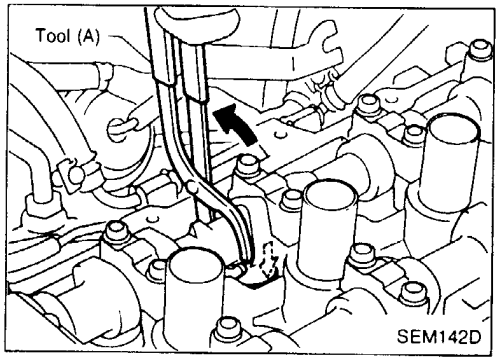
1. Turn crankshaft, to position cam lobe on camshaft of valve that must be adjusted upward.
2. Place Tool (A) around camshaft as shown in figure.

Before placing Tool (A), rotate notch toward center of cylinder head (See figure.) to simplify shim removal later.

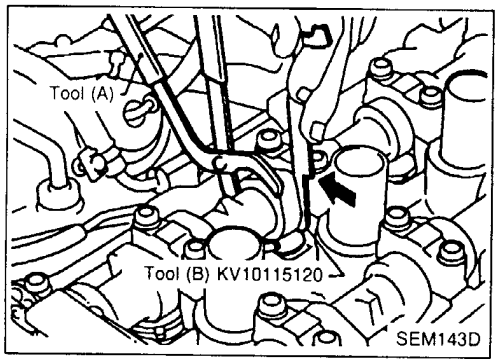
CAUTION:

Be careful not to damage cam surface with Tool (A).

Adjusting (Cont'd)



3. Rotate Tool (A), see figure, so that valve lifter is pushed down.

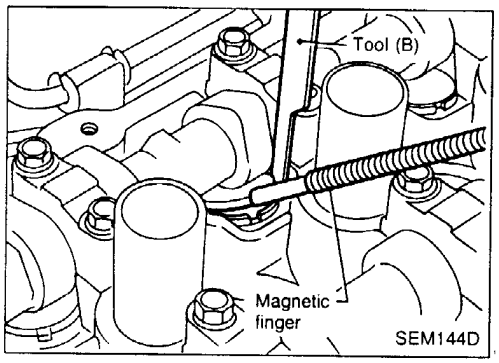


4. Place Tool (B) between camshaft and valve lifter to retain valve lifter.

CAUTION:

- **Tool (B) must be placed as close to camshaft bracket as possible.**
- **Be careful not to damage cam surface with Tool (B).**

5. Remove Tool (A).



6. Remove adjusting shim using a small screwdriver and a magnetic finger.
7. Determine replacement adjusting shim size following formula.

- Using a micrometer determine thickness of removed shim.
- Calculate thickness of new adjusting shim so valve clearance comes within specified values.

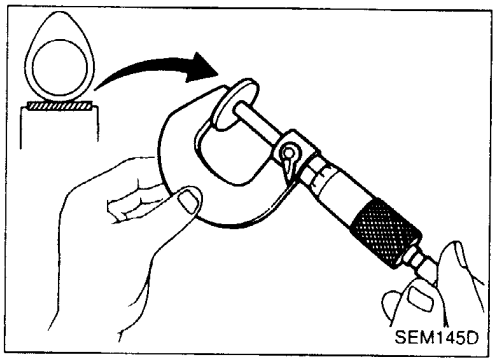
R = Thickness of removed shim
N = Thickness of new shim
M = Measured valve clearance

Intake:

N = R + [M – 0.37 mm (0.0146 in)]

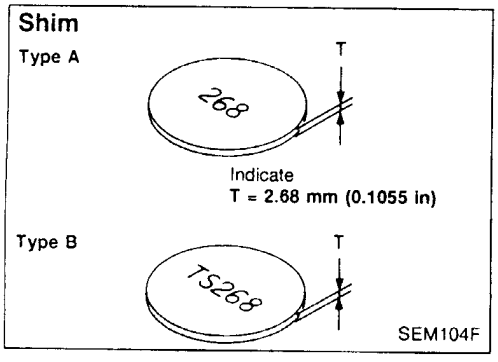
Exhaust:

N = R + [M – 0.40 mm (0.0157 in)]

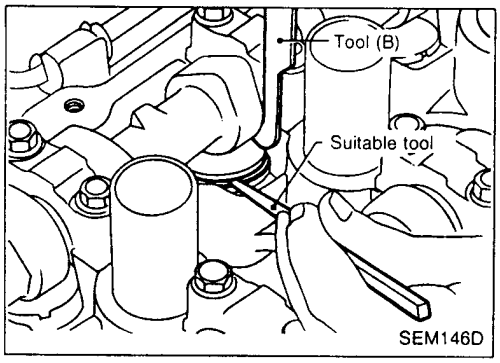


Shims are available in 50 sizes from 2.00 mm (0.0787 in) to 2.98 mm (0.1173 in), in steps of 0.02 mm (0.0008 in).

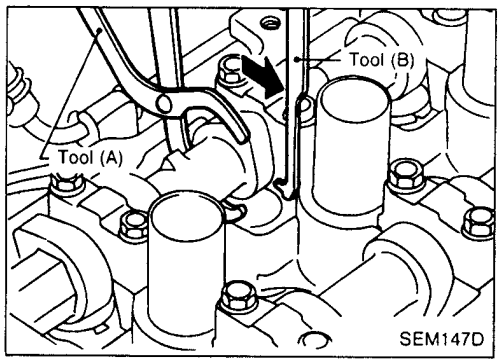
- Select new shim with thickness as close as possible to calculated value.



Adjusting (Cont'd)



8. Install new shim using a suitable tool.
- **Install with the surface on which the thickness is stamped facing down.**



9. Place Tool (A) as mentioned in steps 2 and 3.
10. Remove Tool (B).
11. Remove Tool (A).
12. Recheck valve clearance.

Valve clearance:

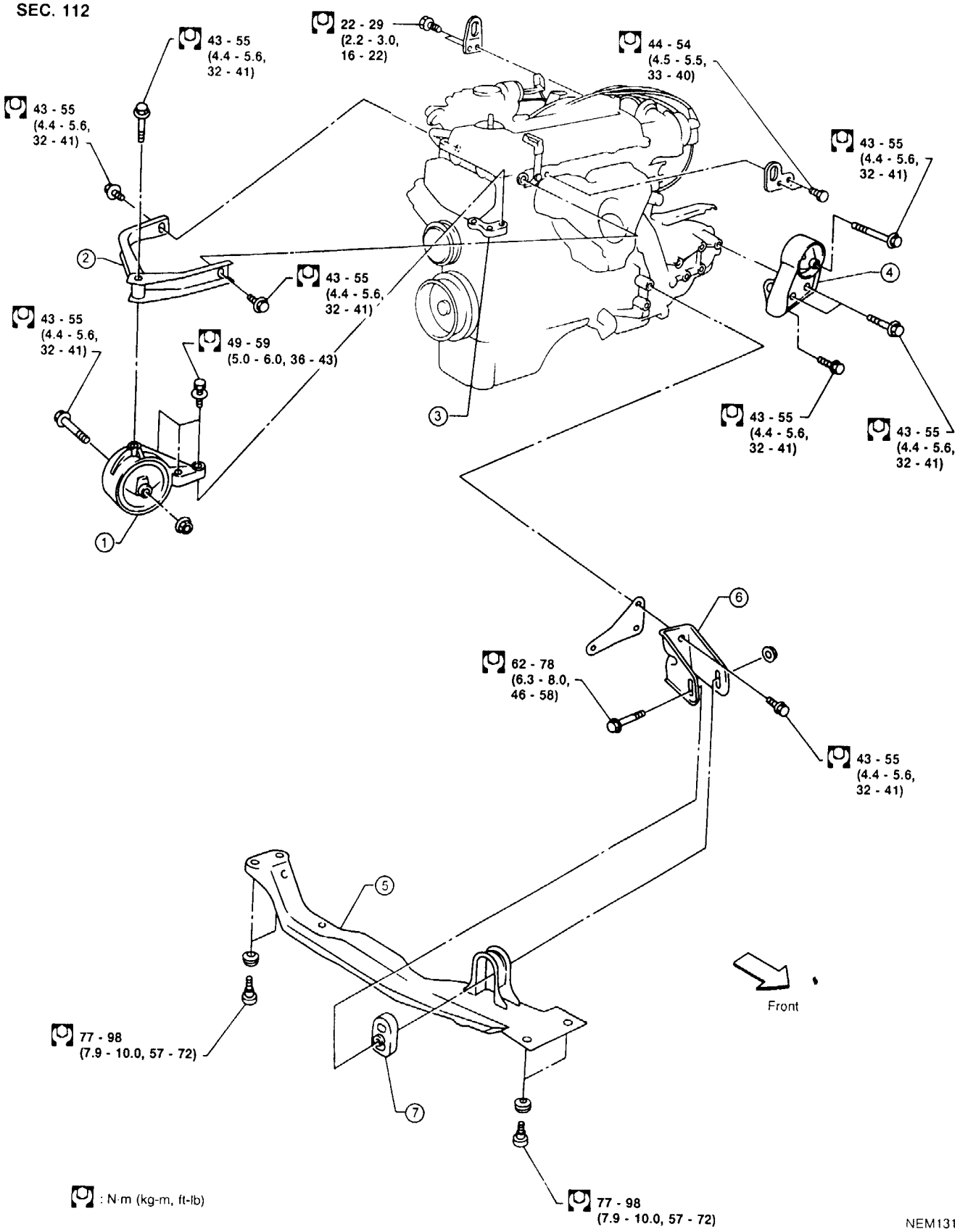
Unit: mm (in)

	For adjusting		For checking
	Hot	Cold* (reference data)	Hot
Intake	0.32 - 0.40 (0.013 - 0.016)	0.25 - 0.33 (0.010 - 0.013)	0.21 - 0.49 (0.008 - 0.019)
Exhaust	0.37 - 0.45 (0.015 - 0.018)	0.32 - 0.40 (0.013 - 0.016)	0.30 - 0.58 (0.012 - 0.023)

*: At a temperature of approximately 20°C (68°F)

Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

SEC. 112



① Engine front mounting
② Cylinder head front mounting bracket
③ Engine front mounting bracket
④ Transaxle mounting
⑤ Center member
⑥ Buffer rod bracket
⑦ Buffer rod

WARNING:
a. Situate vehicle on a vehicle lift.
b. Do not remove engine until exhaust system has completely cooled off.
Otherwise, you may burn yourself and/or fire may break out in fuel line.
c. For safety during subsequent steps, the tension of wires should be slackened against the engine.
d. Before disconnecting fuel hose, release fuel pressure from fuel line.
Refer to "Releasing Fuel Pressure" in EC section.
e. Be sure to hoist engine and transaxle in a safe manner.
f. For engines not equipped with engine slingers, attach correct slingers and bolts described in PARTS CATALOG.

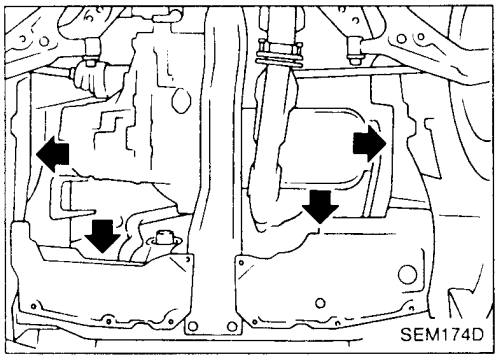
CAUTION:
- When lifting engine, be sure to clear surrounding parts. Take special care for accelerator wire casing, brake lines and brake master cylinder.
- When hoisting the engine, always use engine slingers in a safe manner.
- When removing drive shaft, be careful not to damage grease seal of transaxle.

Engine cannot be removed separately from transaxle. Remove engine with transaxle.

Removal

1. Drain water.
2. Remove hood.
3. Remove battery.
4. Remove reservoir tank and bracket.
5. Remove drive belts.
6. Remove alternator, compressor and power steering oil pump from engine.

Power steering pump does not need to be disconnected from power steering tubes.

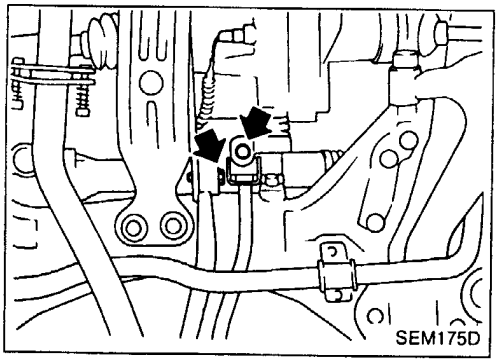


7. Remove the following parts:
- Right and left front wheels
- Under covers
- Splash covers
- Brake caliper assembly

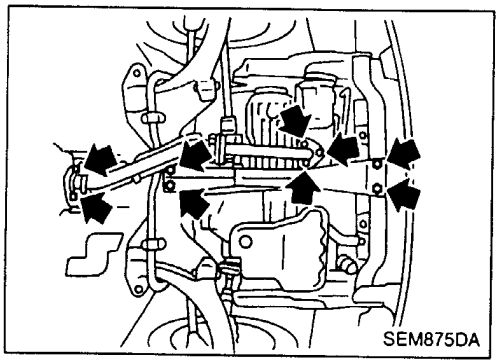
Brake hose does not need to be disconnected from brake caliper assembly.
Never depress brake pedal when caliper is removed.
- Disconnect tie-rod ball joint (RH & LH).
- RH & LH drive shaft

When removing drive shaft, be careful not to damage transaxle side grease seal.

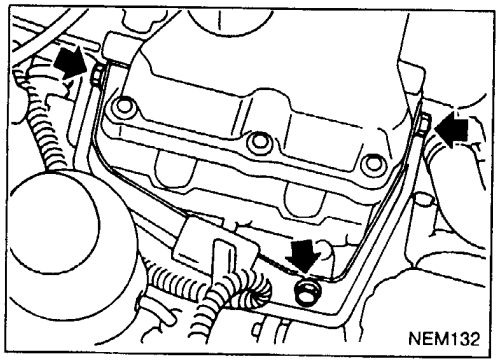
Removal (Cont'd)



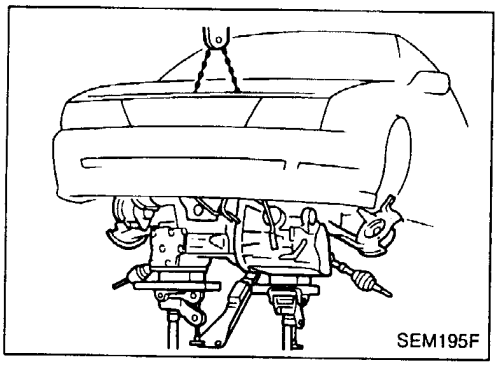
- Disconnect control rod and support rod from transaxle.



- Center member
- Front exhaust tube
- Stabilizer
- Cooling fan
- Radiator



- Cylinder head front mounting bracket

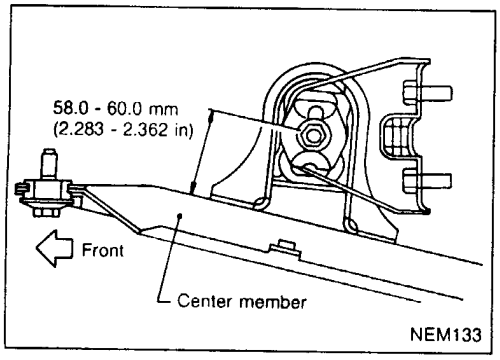


- Remove air duct and disconnect wires, harness, pipes, and hoses.

8. Lift up engine slightly and disconnect or remove all engine mountings.

When lifting engine, be careful not to hit it against adjacent parts, especially against brake tubes and brake master cylinder.

9. Remove engine with transaxle as shown.

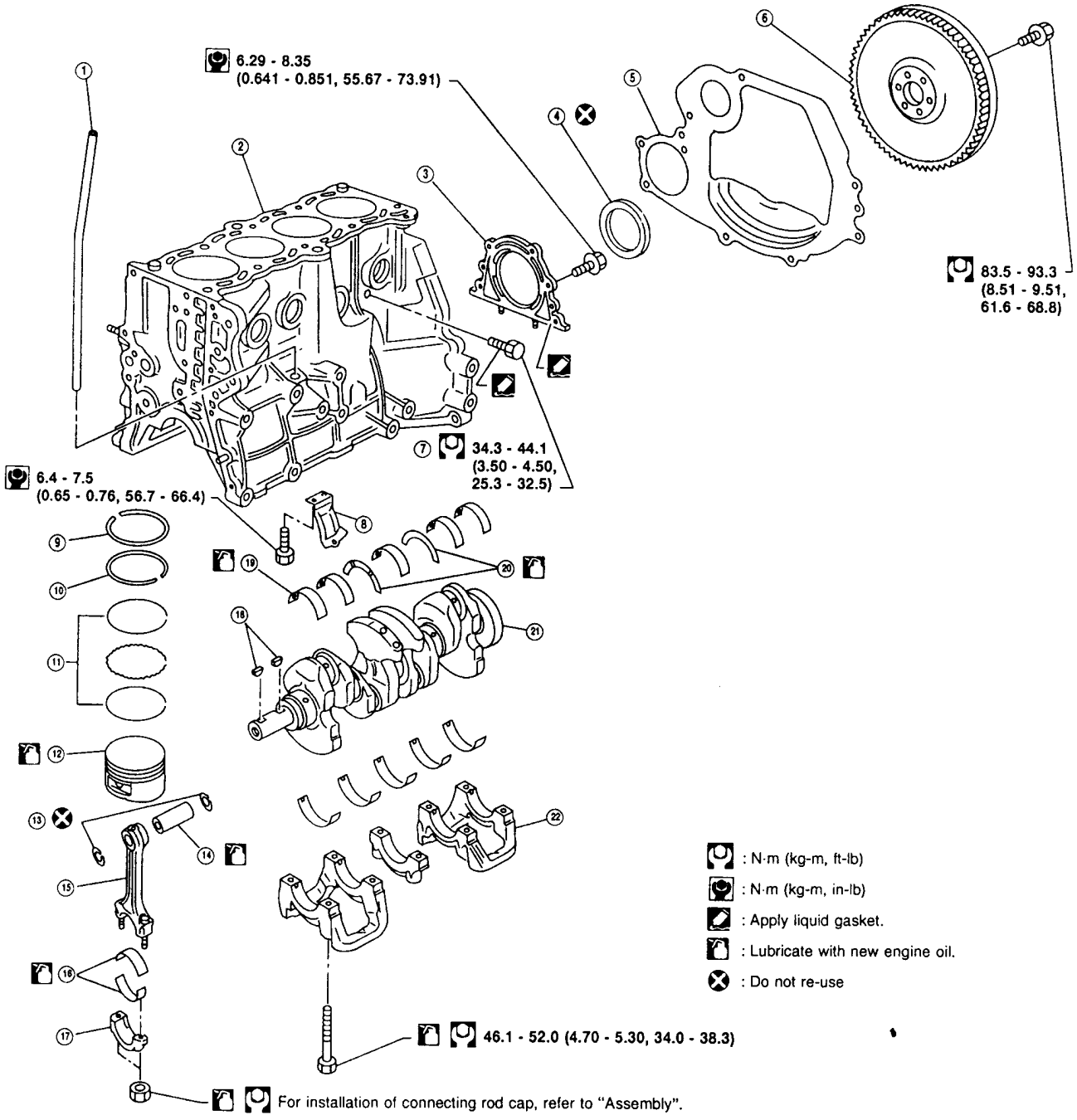


Installation

When installing the engine, adjust the height of buffer rod as shown.

- Installation is the reverse order of removal.

SEC. 110•120

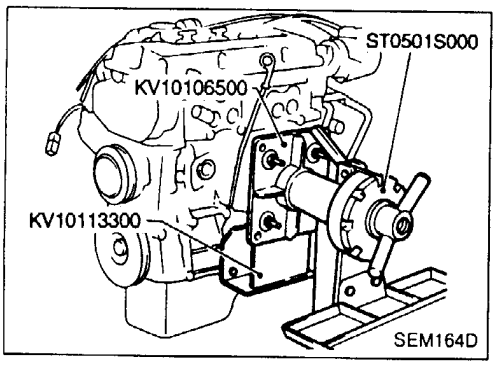


NEM134

① Oil level gauge guide
② Cylinder block
③ Rear oil seal retainer
④ Rear oil seal
⑤ Rear plate
⑥ Flywheel
⑦ Drain plug
⑧ Buffer plate
⑨ Top ring
⑩ 2nd ring
⑪ Oil ring
⑫ Piston
⑬ Snap ring
⑭ Piston pin
⑮ Connecting rod
⑯ Connecting rod bearing
⑰ Connecting rod cap
⑱ Key
⑲ Main bearing
⑳ Thrust bearing
㉑ Crankshaft
㉒ Main bearing cap

CAUTION:

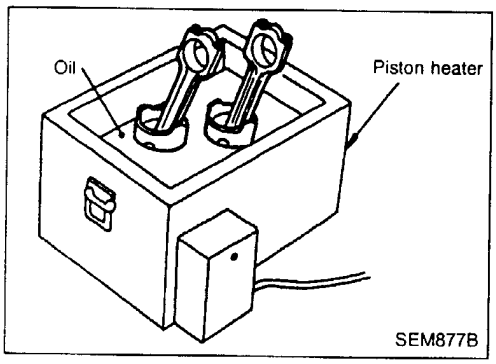
- **When installing sliding parts (bearings, pistons, etc.), lubricate contacting surfaces with new engine oil.**
- **Place removed parts such as bearings and bearing caps in their correct order and direction.**
- **When installing connecting rod nuts, and main bearing cap bolts, apply new engine oil to threads and seating surfaces.**



Disassembly

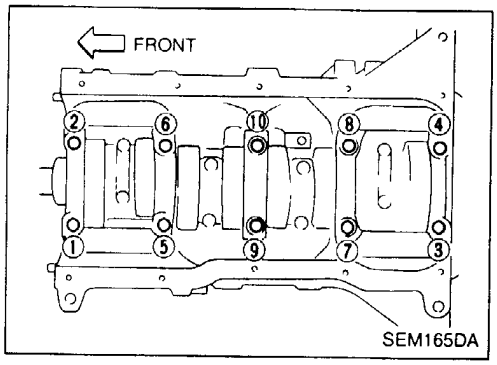
PISTON AND CRANKSHAFT

1. Place engine on a work stand.
2. Drain coolant and oil.
3. Remove timing chain.
   Refer to "Removal" in "TIMING CHAIN" (EM-16).



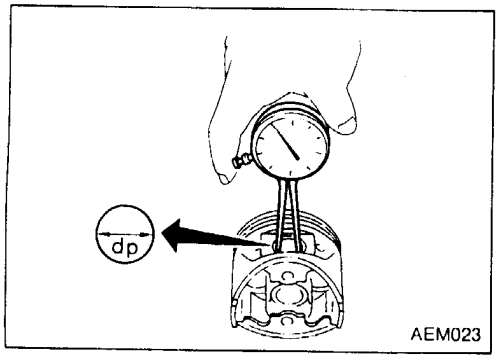
4. Remove pistons with connecting rods.

- When disassembling piston and connecting rod, remove snap ring first, then heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.



5. Loosen main bearing cap in numerical order as shown in the figure.
6. Remove bearing caps, main bearings and crankshaft.

- **Before removing bearing caps, measure crankshaft end play for reference, see page EM-51.**
- **Bolts should be loosened in two or three steps.**

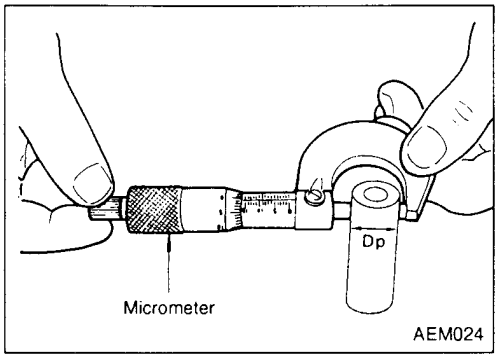


Inspection

PISTON AND PISTON PIN CLEARANCE

1. Measure inner diameter of piston pin hole "dp".
   Standard diameter "dp":
   18.987 - 18.999 mm (0.7475 - 0.7480 in)

Inspection (Cont'd)

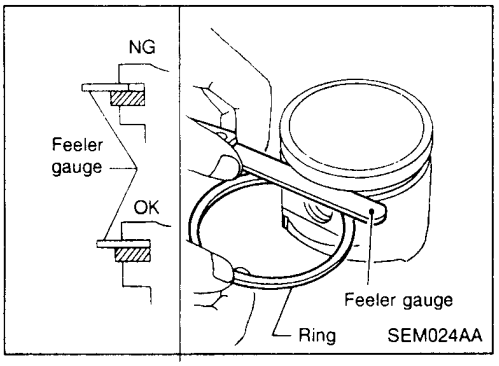


2. Measure outer diameter of piston pin "Dp".
   Standard diameter "Dp":
   18.989 - 19.001 mm (0.7476 - 0.7481 in)
3. Calculate piston pin clearance.
   dp – Dp = –0.004 to 0 mm (–0.0002 to 0 in)
   If it exceeds the above value, replace piston assembly with pin.

PISTON RING SIDE CLEARANCE

Side clearance:
Top ring
0.035 - 0.080 mm (0.0014 - 0.0031 in)
2nd ring
0.030 - 0.065 mm (0.0012 - 0.0026 in)
Max. limit of side clearance:
0.2 mm (0.008 in)

If out of specification, replace piston and/or piston ring assembly.

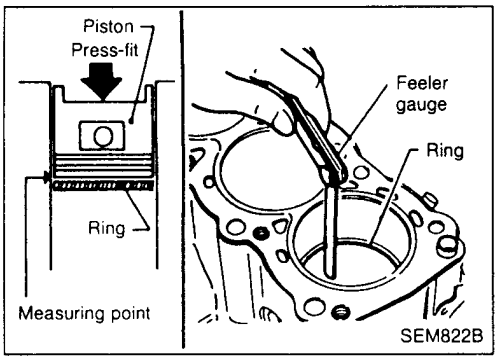


PISTON RING END GAP

End gap:
Top ring
0.14 - 0.35 mm (0.0055 - 0.0138 in)
2nd ring
0.35 - 0.55 mm (0.0138 - 0.0217 in)
Oil ring
0.25 - 1.00 mm (0.0098 - 0.0394 in)
Max. limit of ring gap:
1.0 mm (0.039 in)

If out of specification, replace piston ring. If gap exceeds maximum limit with new ring, rebore cylinder and use oversize piston and piston rings.

Refer to SDS (EM-166).

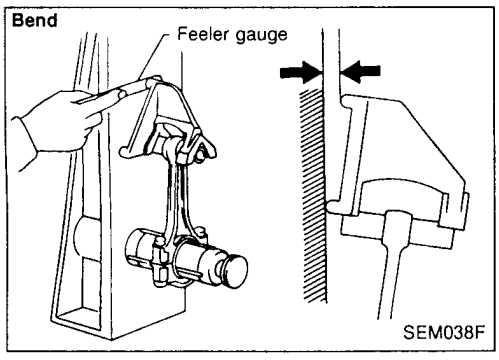


- When replacing the piston, check the cylinder block surface for scratches or seizure. If scratches or seizure is found, hone or replace the cylinder block.

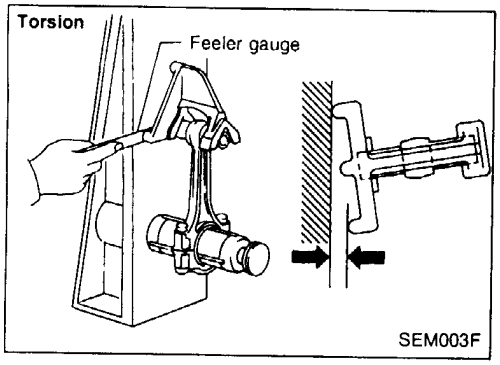
CONNECTING ROD BEND AND TORSION

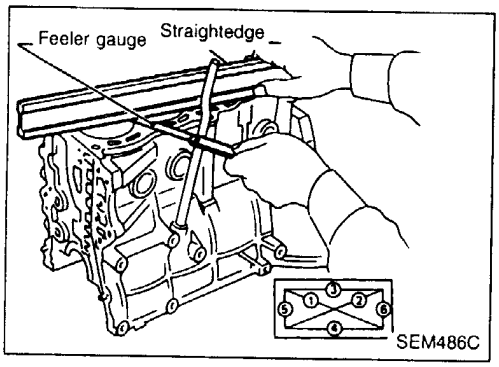
Bend:
Limit 0.15 mm (0.0059 in)
per 100 mm (3.94 in) length
Torsion:
Limit 0.3 mm (0.012 in)
per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.



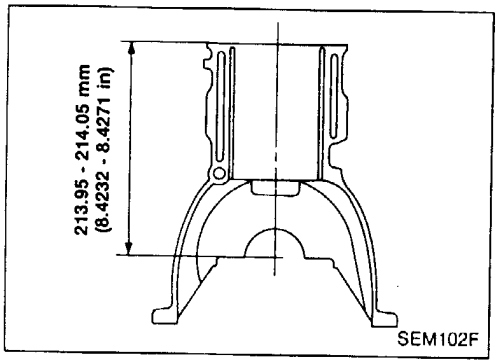
Inspection (Cont'd)





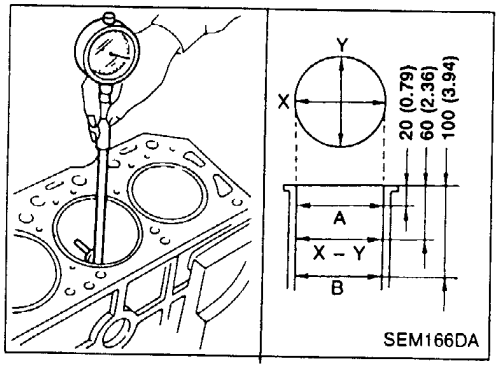
CYLINDER BLOCK DISTORTION AND WEAR

1. Clean upper face of cylinder block and measure the distortion.
   Limit:
   0.10 mm (0.0039 in)
2. If out of specification, resurface it.
   The resurfacing limit is determined by cylinder head resurfacing in engine.



Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)
Nominal cylinder block height from crankshaft center:
213.95 - 214.05 mm (8.4232 - 8.4271 in)

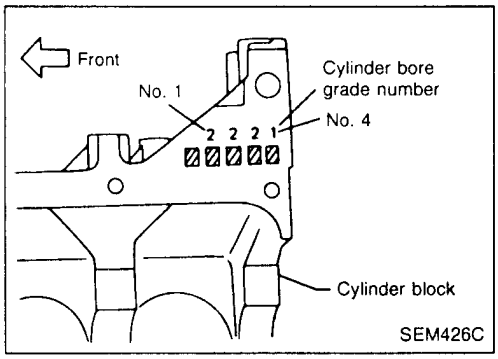
3. If necessary, replace cylinder block.



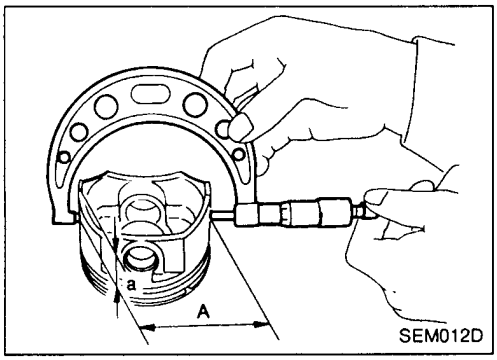
PISTON-TO-BORE CLEARANCE

1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.
   Standard inner diameter:
   76.000 - 76.030 mm (2.9921 - 2.9933 in)
   Wear limit:
   0.2 mm (0.008 in)
   If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.
   Out-of-round (X – Y) standard:
   0.015 mm (0.0006 in)
   Taper (A – B) standard:
   0.01 mm (0.0004 in)

Inspection (Cont'd)



2. Check for scratches and seizure. If seizure is found, hone it.
- **If cylinder block or piston is replaced, match piston grade with grade number on cylinder block lower surface.**



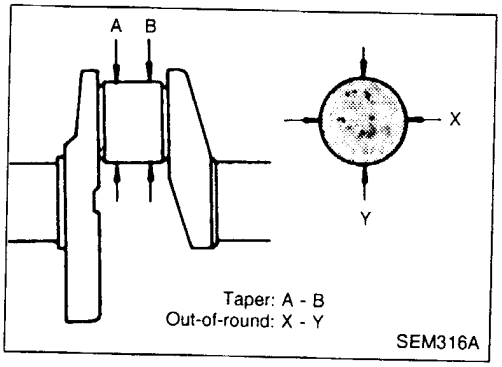
3. Measure piston skirt diameter.
   Piston diameter "A":
   Refer to SDS (EM-166).
   Measuring point "a" (Distance from the bottom):
   Refer to SDS (EM-166).
4. Check that piston-to-bore clearance is within specification.
   Piston-to-bore clearance "B":
   0.010 - 0.030 mm (0.0004 - 0.0012 in)
5. Determine piston oversize according to amount of cylinder wear.

Oversize pistons are available for service. Refer to SDS (EM-166).

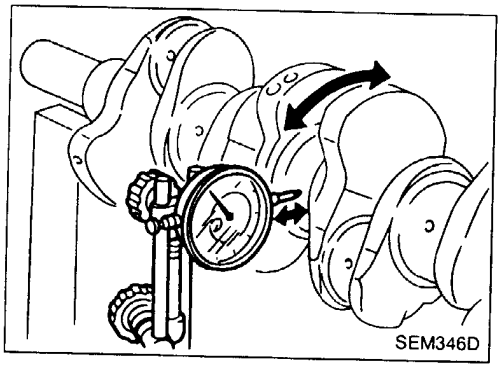
6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".
   Rebored size calculation:
   D = A + B – C
   where,
   D: Bored diameter
   A: Piston diameter as measured
   B: Piston-to-bore clearance
   C: Honing allowance 0.02 mm (0.0008 in)
7. Install main bearing caps and tighten bolts to the specified torque. This will prevent distortion of cylinder bores.
8. Cut cylinder bores.
- **When any cylinder needs boring, all other cylinders must also be bored.**
- **Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**
9. Hone cylinders to obtain specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.
- **Measurement should be done after cylinder bore cools down.**

Inspection (Cont'd)

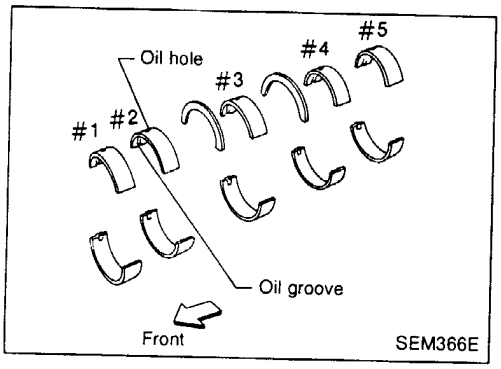
CRANKSHAFT



1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out-of-round.
   Out-of-round (X – Y):
   Less than 0.005 mm (0.0002 in)
   Taper (A – B):
   Less than 0.002 mm (0.0001 in)



3. Measure crankshaft runout.
   Runout (Total indicator reading):
   Less than 0.05 mm (0.0020 in)



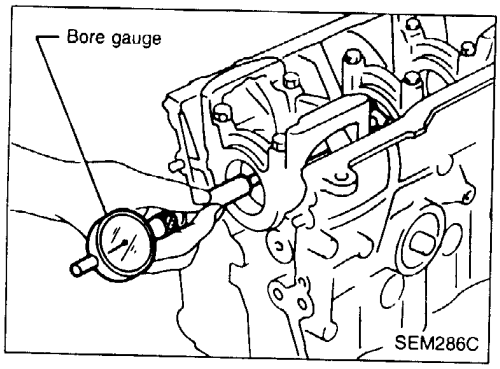
BEARING CLEARANCE

- Use Method A or Method B. Method A is preferred because it is more accurate.

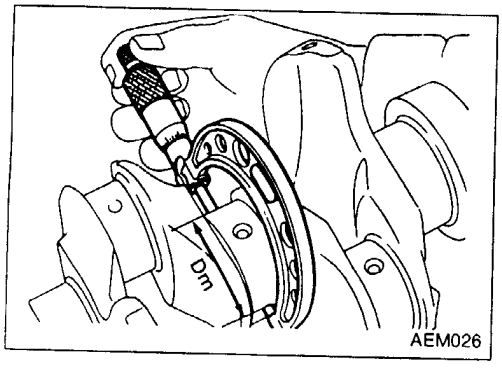
Method A (Using bore gauge & micrometer)

Main bearing

1. Set main bearings in their proper positions on cylinder block and main bearing cap.

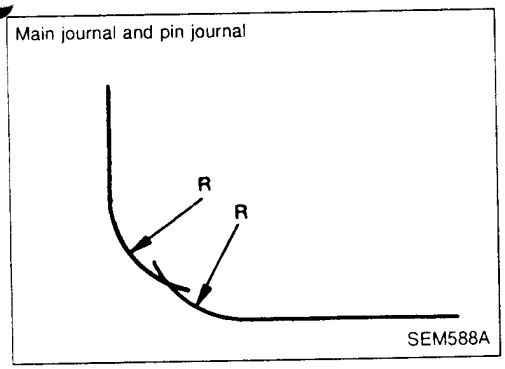


2. Install main bearing cap to cylinder block.
   Tighten all bolts in correct order in two or three stages.
3. Measure inner diameter "A" of each main bearing.



4. Measure outer diameter "Dm" of each main journal in crankshaft.
5. Calculate main bearing clearance.
   Main bearing clearance = A – Dm
   Standard:
   0.018 - 0.042 mm (0.0007 - 0.0017 in)
   Limit: 0.1 mm (0.004 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

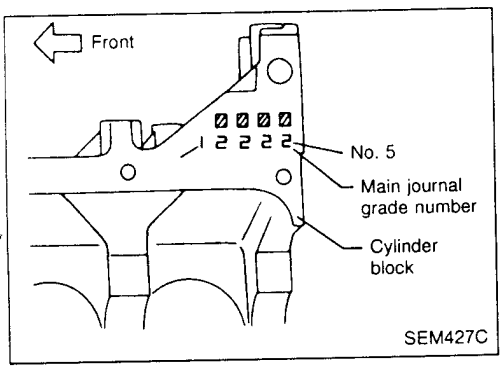
Inspection (Cont'd)



When grinding crank pin and crank journal:

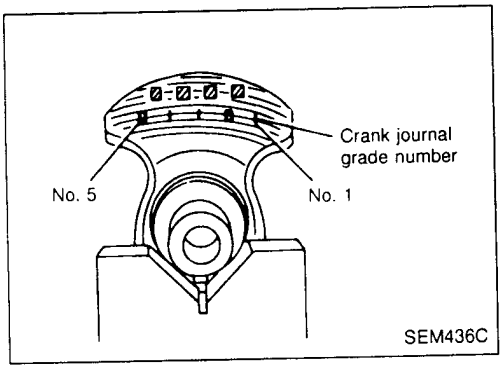
a. **Grind until clearance is within specified standard bearing clearance.**

b. **Fillets should be finished as shown in the figure.**
R: 2.3 - 2.5 mm (0.091 - 0.098 in)



8. If crankshaft, cylinder block or main bearing is reused again, measure main bearing clearance. If the above parts are all replaced, select thickness of main bearings as follows:

a. **Grade number of each cylinder block main journal is punched on the respective cylinder block. These numbers are punched in either Arabic or Roman numerals.**

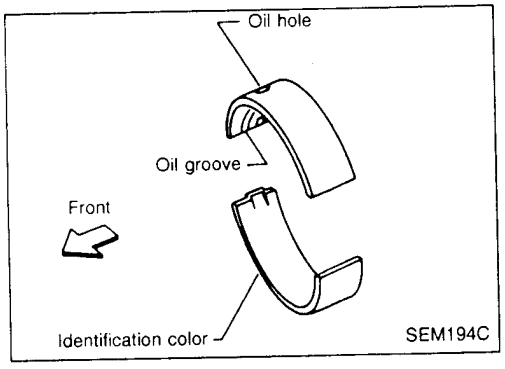


b. **Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Roman numerals.**

c. **Select main bearing with suitable thickness according to the following table.**

Main bearing grade color:

Main journal grade number / Crankshaft journal grade number	0	1	2
0	Black	Brown	Green
1	Brown	Green	Yellow
2	Green	Yellow	Blue



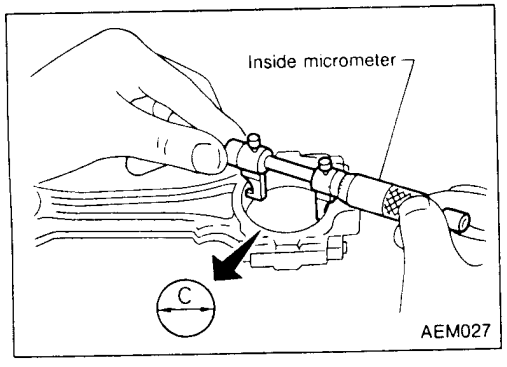
For example:
Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2 = Yellow

Connecting rod bearing (Big end)

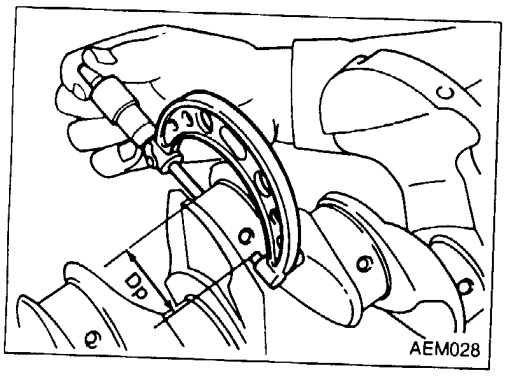
1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

Tighten bolts to the specified torque.

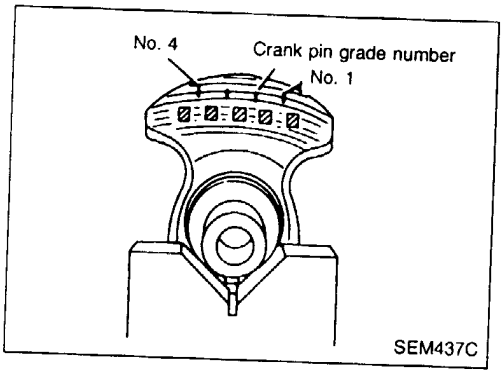
3. Measure inner diameter "C" of each bearing.



Inspection (Cont'd)



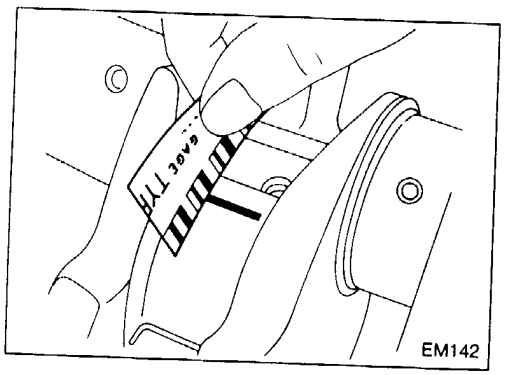
4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance = C – Dp
   Standard:
   0.014 - 0.039 mm (0.0006 - 0.0015 in)
   Limit: 0.1 mm (0.004 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing. Refer to step 7 of "BEARING CLEARANCE – Main bearing" (EM-164).



8. If bearing, crankshaft or connecting rod is replaced with a new one, select connecting rod bearing according to the following table.

Connecting rod bearing grade number:
Grade numbers are punched in either Arabic or Roman numerals.

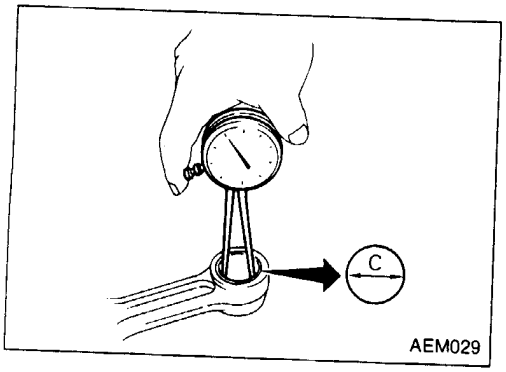
Crank pin grade color	Connecting rod bearing grade color
0	Black
1	Brown
2	Green



Method B (Using plastigage)

CAUTION:

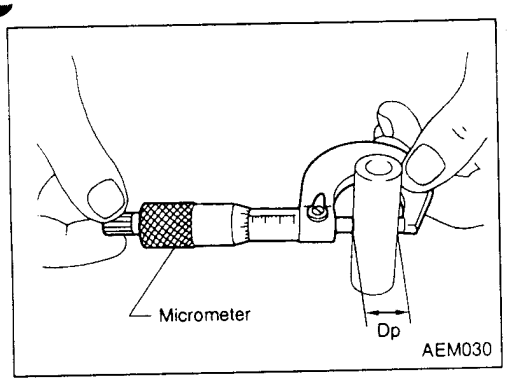
- **Do not turn crankshaft or connecting rod while plastigage is being inserted.**
- **When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified bearing clearance is obtained.**



CONNECTING ROD BUSHING CLEARANCE (Small end)

1. Measure inner diameter "C" of bushing.

Inspection (Cont'd)



2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bushing clearance.

Connecting rod bushing clearance = C – Dp

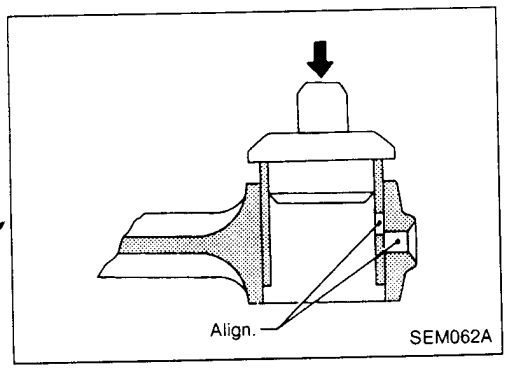
Standard:

0.005 - 0.017 mm (0.0002 - 0.0007 in)

Limit:

0.023 mm (0.0009 in)

If it exceeds the limit, replace connecting rod assembly or connecting rod bushing and/or piston pin.



REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

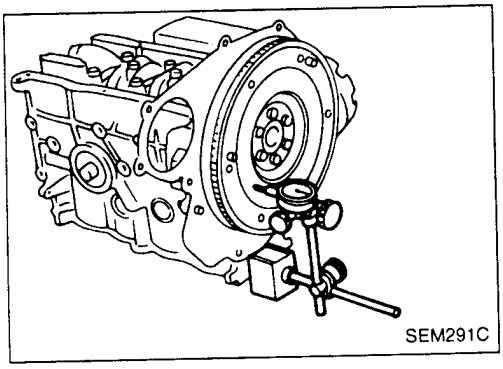
1. Drive in small end bushing until it is flush with end surface of rod.

Be sure to align the oil holes.

2. Ream the bushing so that clearance with piston pin is within specification.

Clearance between connecting rod bushing and piston pin:

0.005 - 0.017 mm (0.0002 - 0.0007 in)

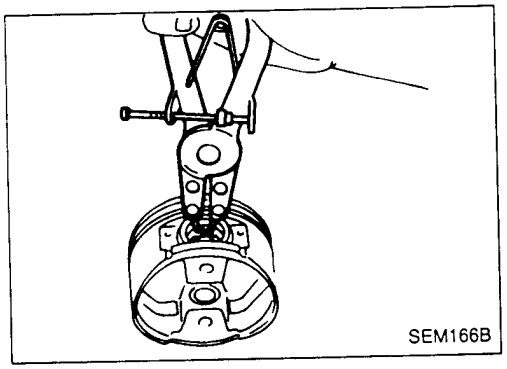


FLYWHEEL RUNOUT

Runout (Total indicator reading):

Flywheel (M/T model)

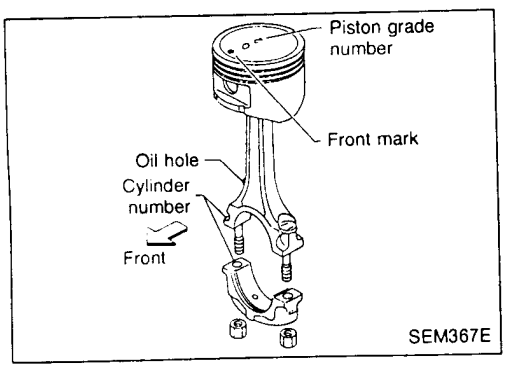
Less than 0.15 mm (0.0059 in)



Assembly

PISTON

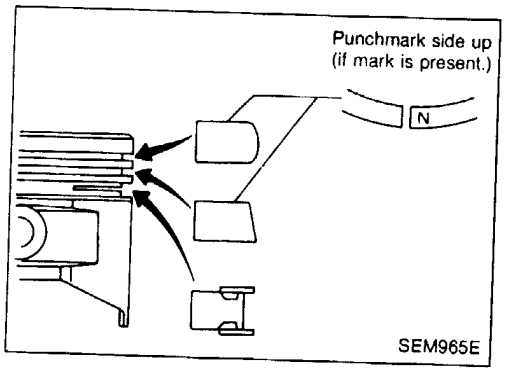
1. Install new snap ring on one side of piston pin hole.



2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.

- **Align the direction of piston and connecting rod.**
- **Numbers stamped on connecting rod and cap correspond to each cylinder.**
- **After assembly, make sure connecting rod rotates freely on piston pin.**

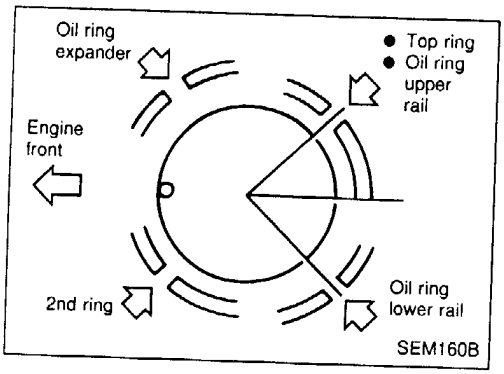
Assembly (Cont'd)

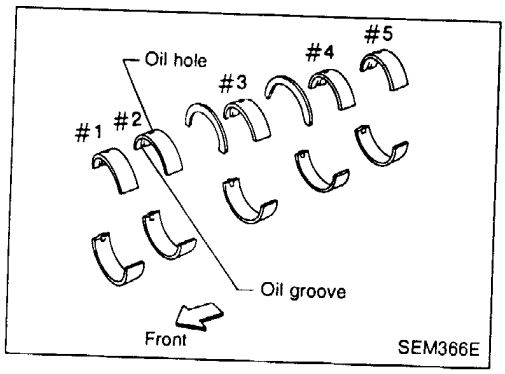


3. Set piston rings as shown.

CAUTION:

- **When piston rings are not replaced, make sure that piston rings are mounted in their original position.**
- **When piston rings are being replaced and no punch mark is present, piston rings can be mounted with either side up.**

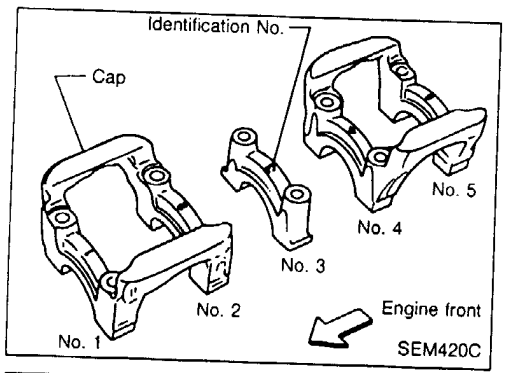


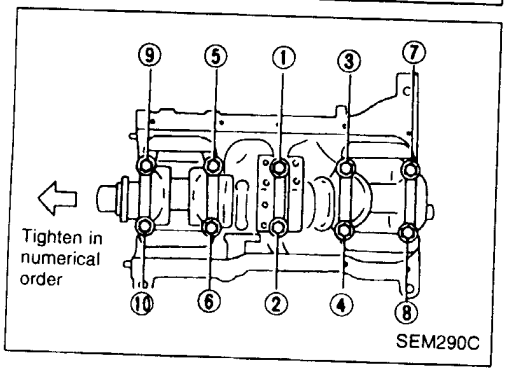


CRANKSHAFT

1. Set main bearings in their proper positions on cylinder block and main bearing cap.

- **Confirm that correct main bearings are used. Refer to "Inspection" (EM-49).**
- **Apply engine oil to bearing surfaces.**

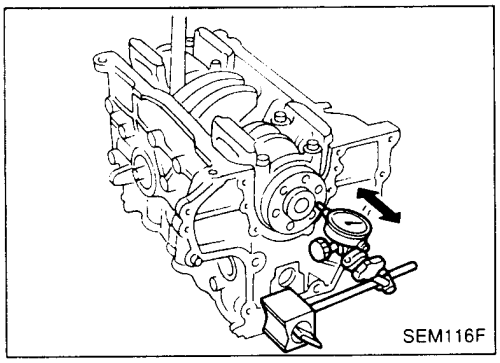




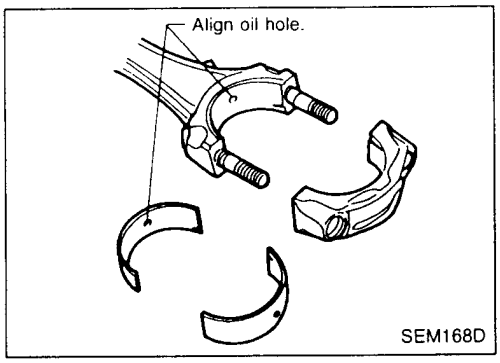
2. Install crankshaft and main bearing caps and tighten bolts to the specified torque.

- **Apply new engine oil to bolt threads and seat surface.**
- **Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.**
- **Tighten bearing cap bolts gradually in two or three stages. Start with center bearing and move outward sequentially.**
- **After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.**

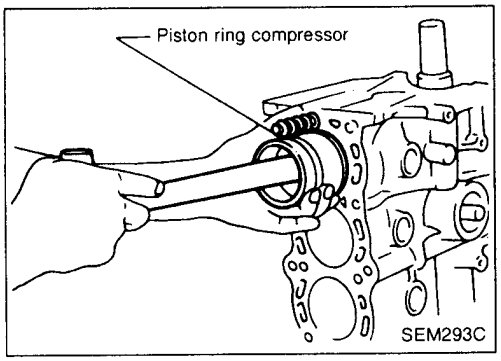
Assembly (Cont'd)



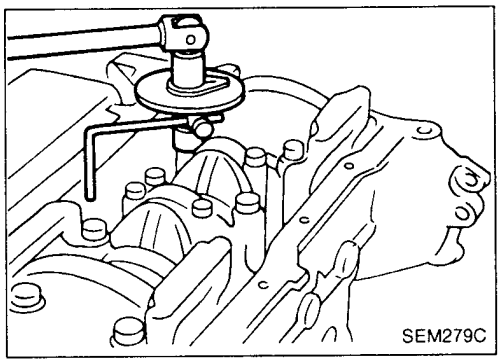
3. Measure crankshaft end play.
   Crankshaft end play:
   Standard:
   0.060 - 0.180 mm (0.0024 - 0.0071 in)
   Limit:
   0.3 mm (0.012 in)
   If beyond the limit, replace thrust bearing with a new one.



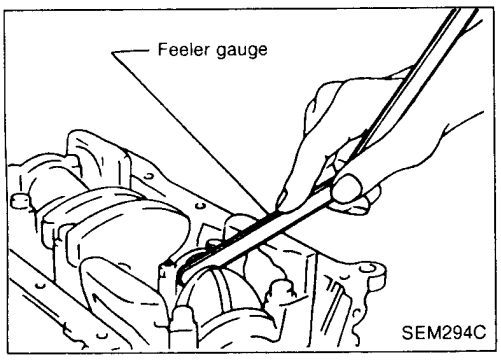
4. Install connecting rod bearings in connecting rods and connecting rod caps.
- **Confirm that correct bearings are used. Refer to "Inspection" (EM-49).**
- **Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.**
- **Apply engine oil to bolt threads and bearing surfaces.**



5. Install pistons with connecting rods.
a. Install them into corresponding cylinders with Tool.
- **Be careful not to scratch cylinder wall by connecting rod.**
- **Arrange so that front mark on piston head faces toward front of engine.**
- **Apply engine oil to piston rings and sliding surface of piston.**

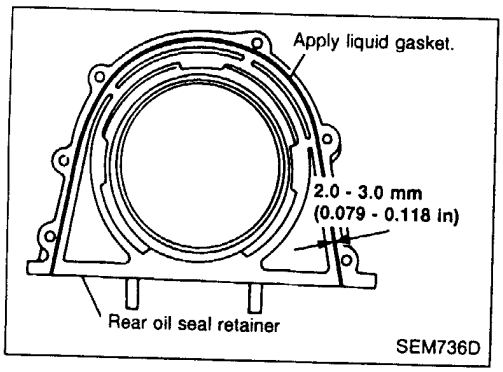


b. Install connecting rod caps.
Tighten connecting rod cap nuts to the specified torque.
: Connecting rod cap nuts
(1) Tighten to 13.72 to 15.68 N·m (1.399 to 1.599 kg-m, 10.120 to 11.566 ft-lb).
(2) Turn nuts to 35° to 40° degrees clockwise with an angle wrench. If an angle wrench is not available tighten nuts to 23 to 28 N·m (2.3 to 2.9 kg-m, 17 to 21 ft-lb).



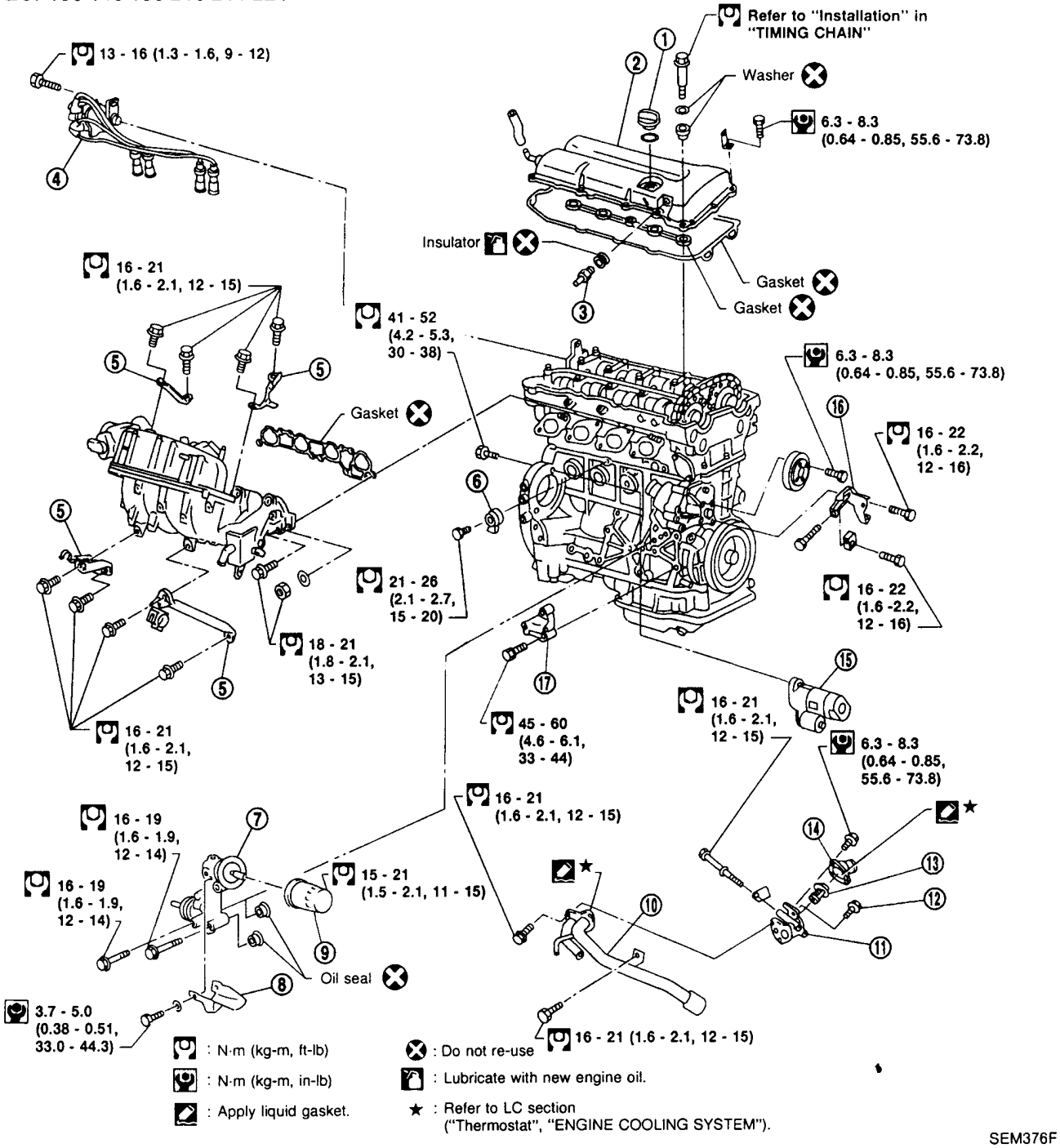
6. Measure connecting rod side clearance.
   Connecting rod side clearance:
   Standard:
   0.200 - 0.470 mm (0.0079 - 0.0185 in)
   Limit:
   0.52 mm (0.0205 in)
   If beyond the limit, replace connecting rod and/or crankshaft.

Assembly (Cont'd)



7. Install rear oil seal retainer:
a. Before installing, remove all traces of liquid gasket from cylinder block and retainer with a scraper.
b. Apply a continuous bead of liquid gasket to rear oil seal retainer.
- Apply around inner side of bolt holes.

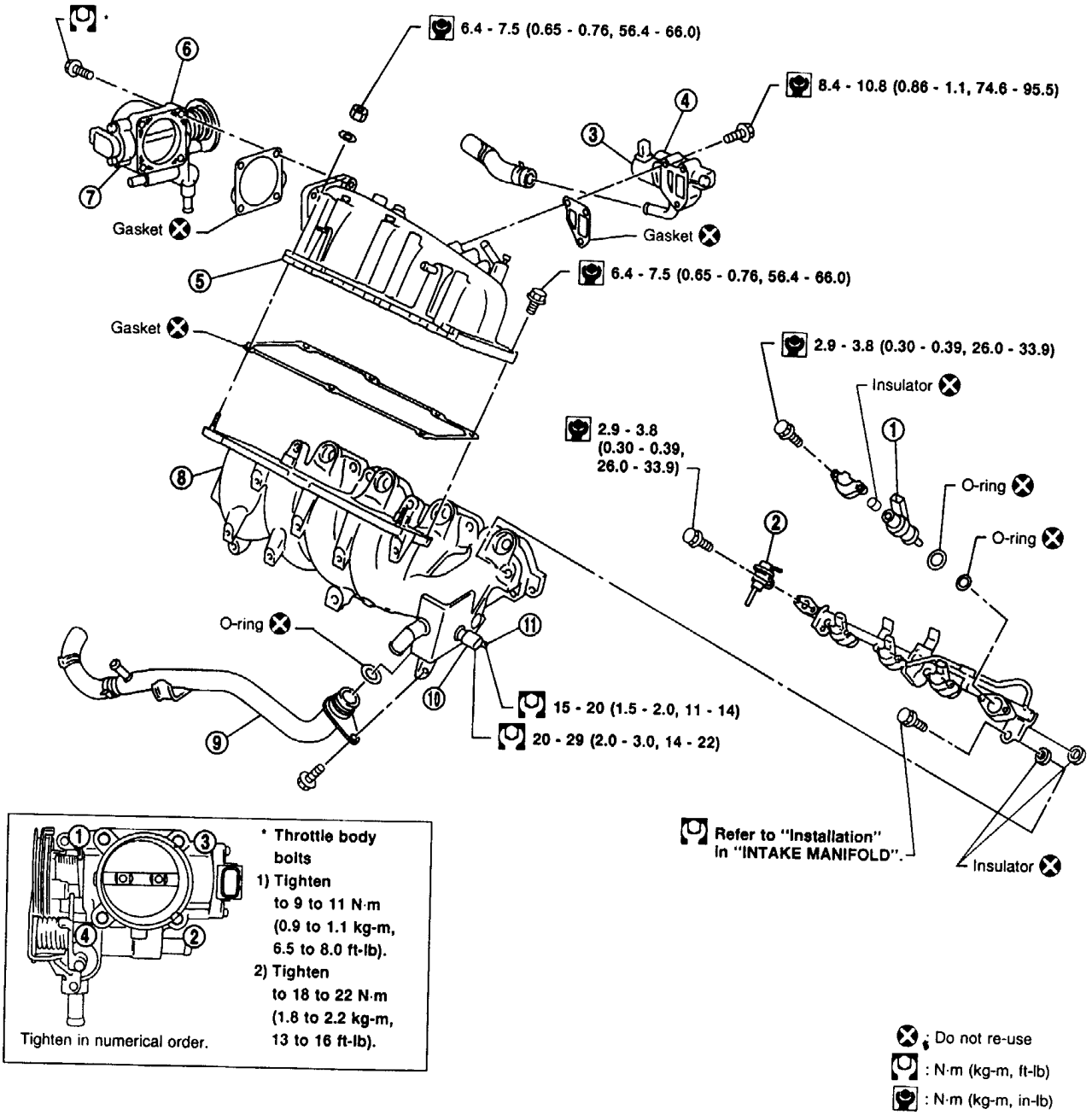
SEC. 130·140·150·210·211·221



SEM376F

① Oil filler cap
② Rocker cover
③ PCV valve
④ Camshaft position sensor, ignition coil and power transistor built into distributor
⑤ Intake manifold supports
⑥ Knock sensor
⑦ Oil filter bracket
⑧ Oil catcher
⑨ Oil filter
⑩ Water pipe assembly
⑪ Thermostat housing
⑫ Air relief plug
⑬ Thermostat
⑭ Water inlet
⑮ Starter motor
⑯ Power steering oil pump adjusting bar
⑰ Power steering oil pump bracket

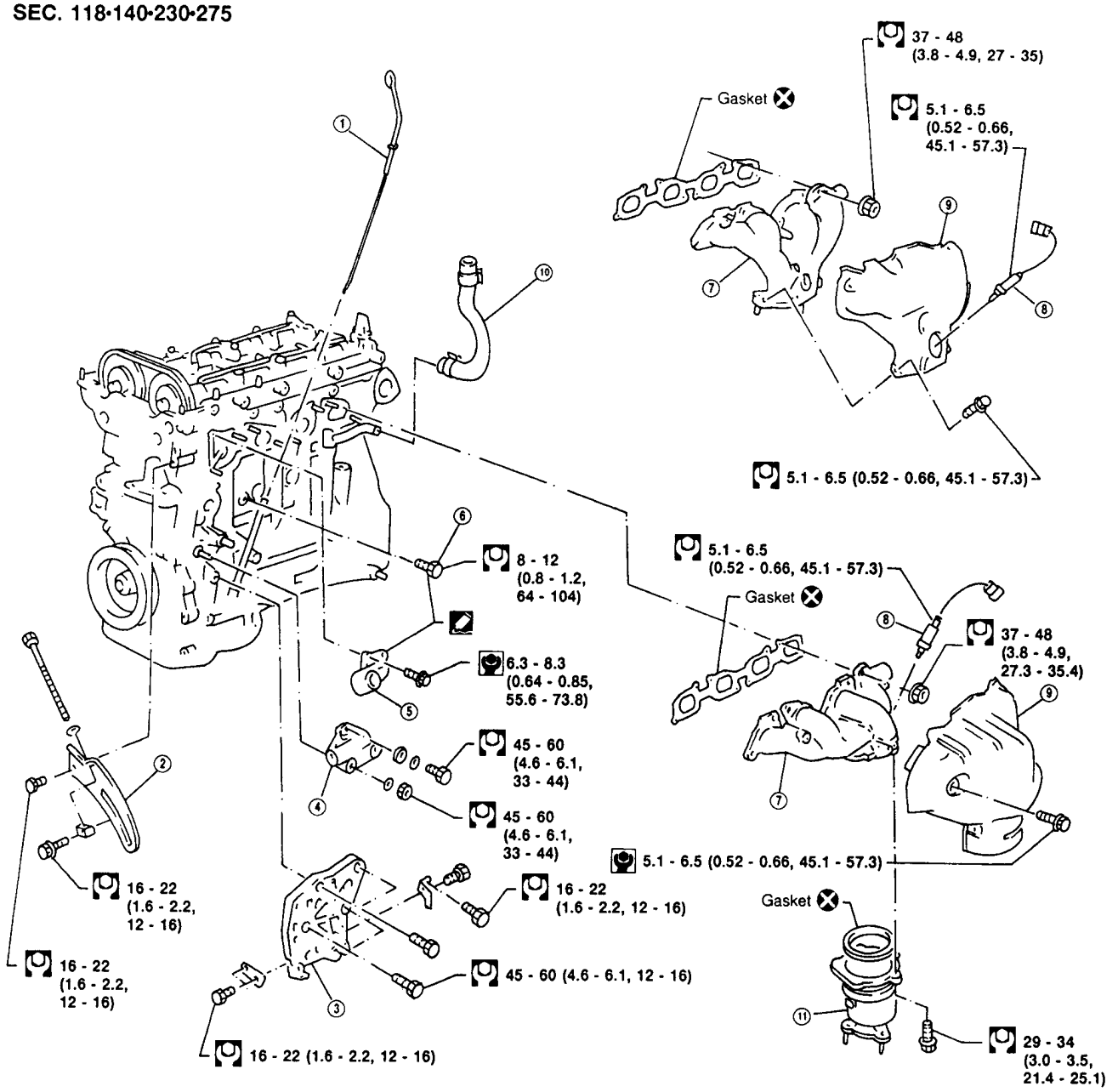
SEC. 140•147•163•164



SEM377F

① Injector
② Pressure regulator
③ IACV-AAC valve
④ IACV-FICD solenoid valve
⑤ Intake manifold collector
⑥ Throttle body
⑦ Throttle position sensor
⑧ Intake manifold
⑨ Water pipe
⑩ Engine coolant temperature sensor
⑪ Thermal transmitter

SEC. 118•140•230•275



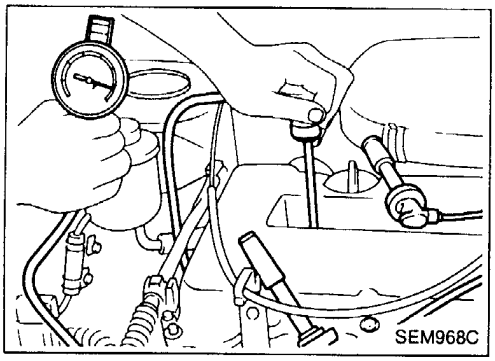
: N·m (kg-m, in-lb)
: N·m (kg-m, ft-lb)
: Apply liquid gasket.
: Do not re-use

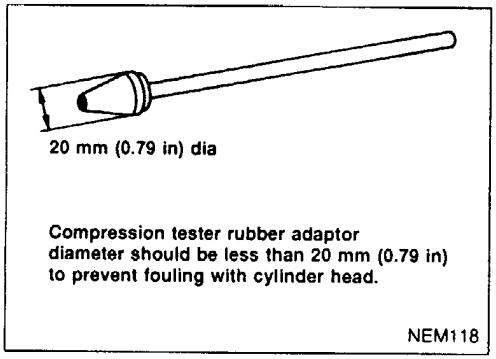
NEM213

① Oil level gauge
② Alternator adjusting bar
③ Compressor bracket
④ Alternator bracket
⑤ Water outlet
⑥ Drain plug
⑦ Exhaust manifold
⑧ Heated oxygen sensor
⑨ Exhaust manifold cover
⑩ Blow-by hose
⑪ Catalytic convertor

Measurement of Compression Pressure

1. Warm up engine.
2. Turn ignition switch off.
3. Release fuel pressure.
   Refer to "Releasing Fuel Pressure" in EC-section.
4. Remove all spark plugs.
5. Disconnect distributor center cable.





6. Attach a compression tester to No. 1 cylinder.
7. Depress accelerator pedal fully to keep throttle valve wide open.
8. Crank engine and record highest gauge indication.
9. Repeat the measurement for each cylinder.

- **Always use a fully-charged battery to obtain specified engine revolution.**

Compression pressure:

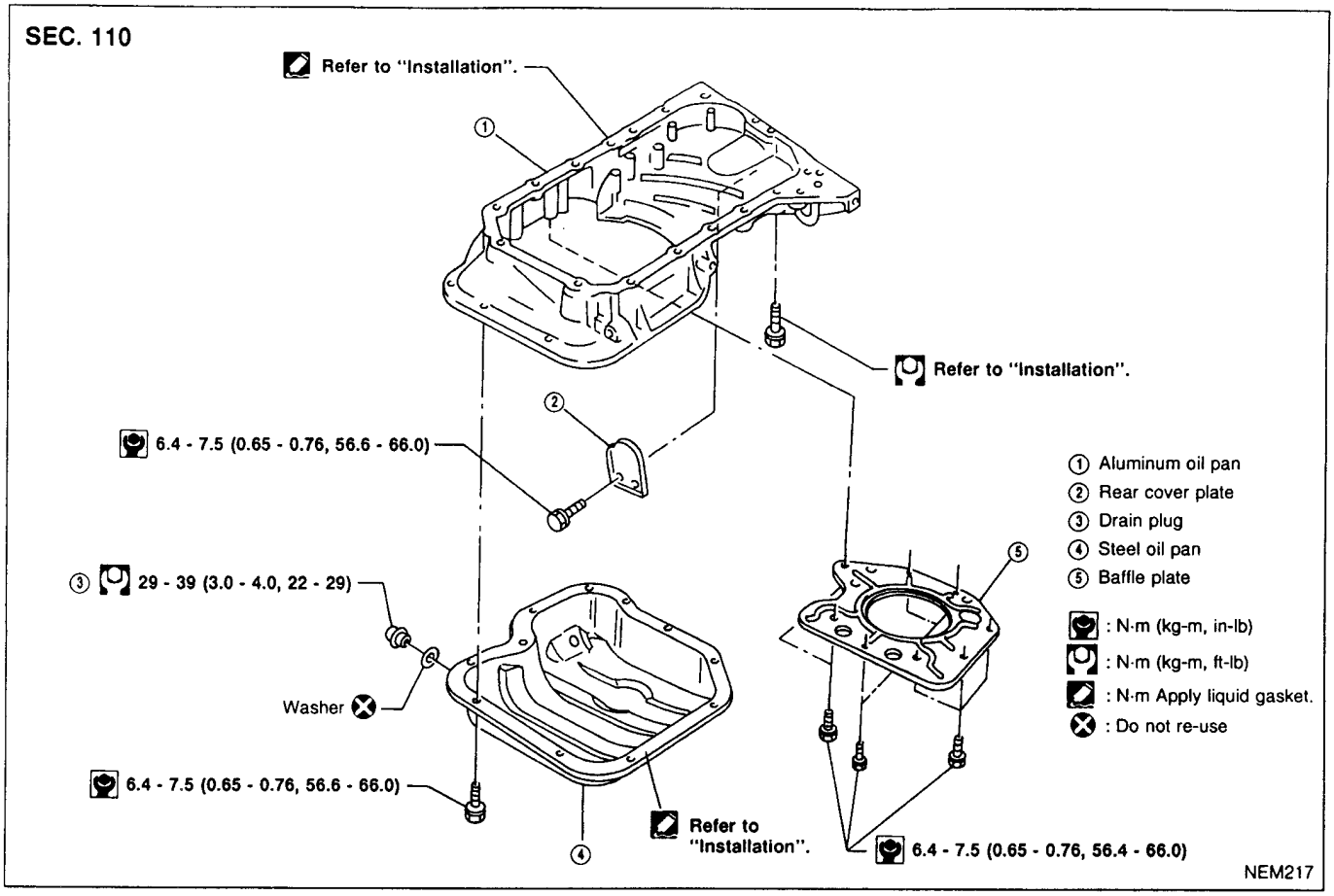
kPa (bar, kg/cm^2, psi)/300 rpm

Standard	1,275 (12.75, 13.0, 185)
Minimum	1,079 (10.79, 11.0, 156)
Difference limit between cylinders	98 (0.98, 1.0, 14)

10. If cylinder compression in one or more cylinders is low:
    A: pour a small amount of engine oil into cylinders through spark plug holes.
    B. retest compression.

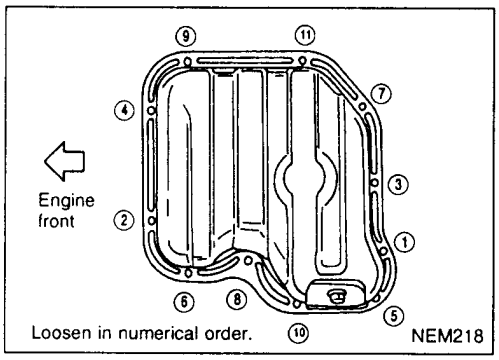
- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston condition.**
- **If pressure stays low, a valve may be sticking or seating badly. Inspect and repair valve and valve seat. (Refer to SDS) If valve or valve seat is damaged excessively, replace them.**
- **If compression stays low in two cylinders that are next to each other:**
  A. The cylinder head gasket may be leaking, or
  B. Both cylinders may have valve component damage. Inspect and repair as necessary.

SEC. 110

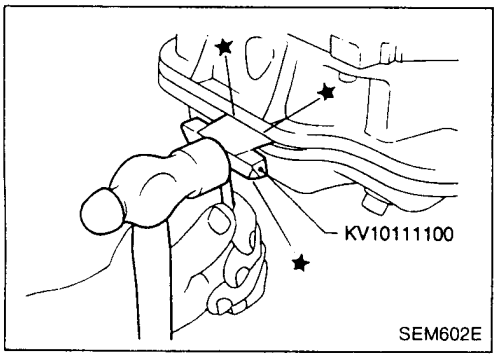


Removal

1. Remove engine under cover.
2. Drain engine oil.



3. Remove steel oil pan bolts.

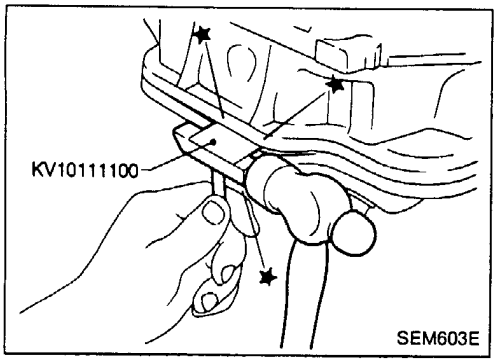


4. Remove steel oil pan.

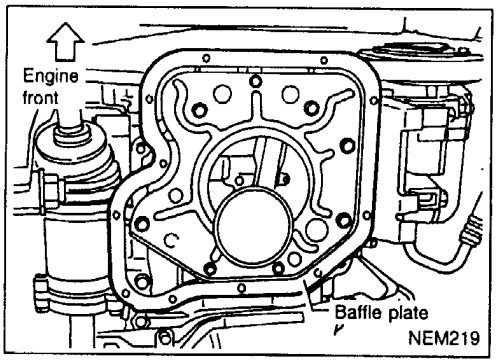
a. Insert Tool between aluminum oil pan and steel oil pan.

- **Be careful not to damage aluminum mating surface.**
- **Do not insert screwdriver, or oil pan flange will be deformed.**

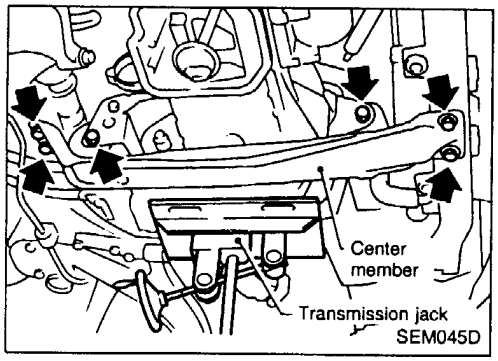
Removal (Cont'd)



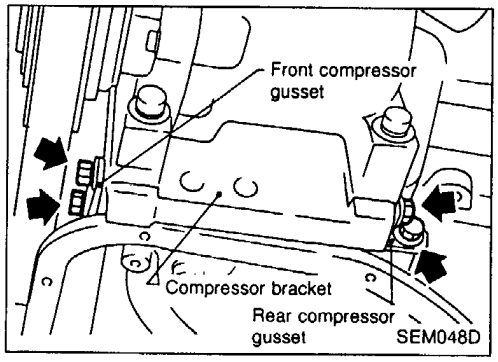
b. Slide Tool by tapping on the side of the Tool with a hammer.
c. Remove steel oil pan.



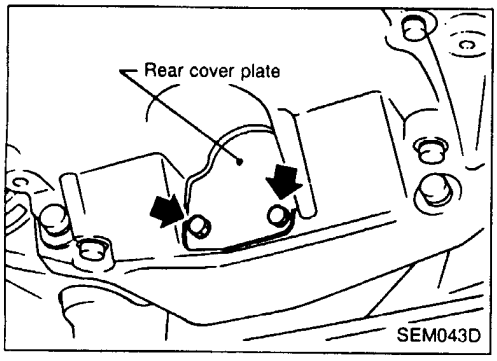
d. Remove baffle plate.



5. Remove front exhaust tube.
6. Set a suitable transmission jack under transaxle and hoist engine with engine slinger.
7. Remove center member.
8. Remove A/T shift control cable. (A/T only)



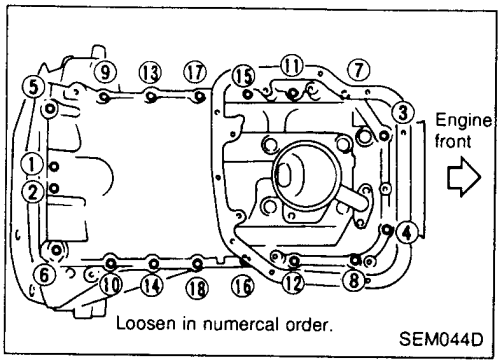
9. Remove compressor gussets.



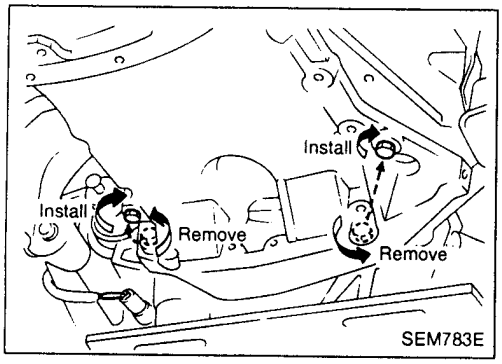
10. Remove rear cover plate.

Removal (Cont'd)

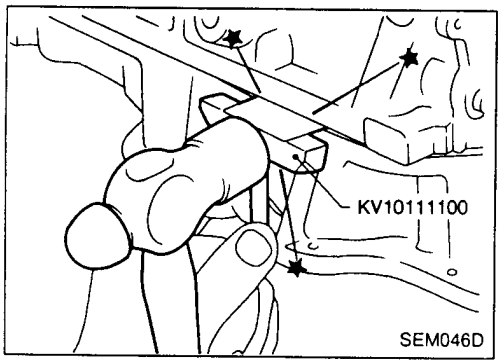
11. Remove aluminum oil pan bolts.



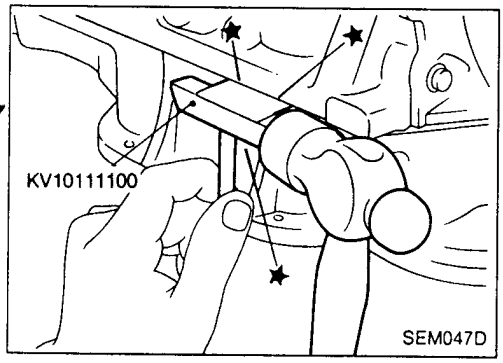
12. Remove the two engine-to-transaxle bolts and install them into open bolt holes shown. Tighten the bolts to release aluminum oil pan from cylinder block.



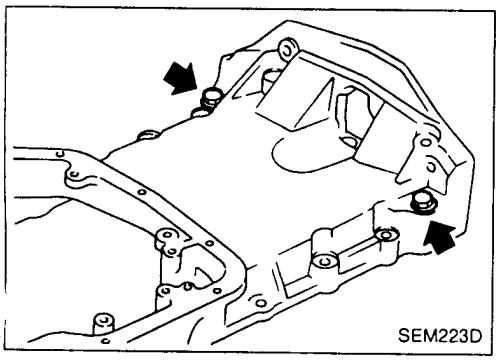
13. Remove aluminum oil pan.
a. Insert Tool between cylinder block and aluminum oil pan.
- **Be careful not to damage aluminum mating surface.**
- **Do not insert screwdriver, or oil pan flange will be damaged.**

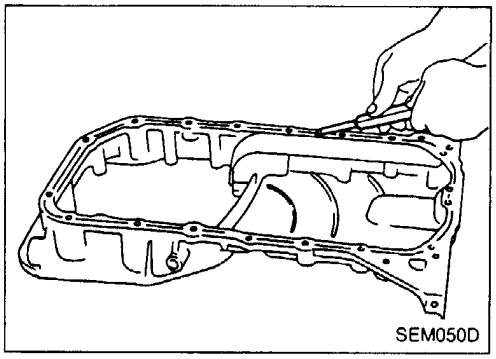


b. Slide Tool by tapping on the side of the Tool with a hammer.



14. Remove the two engine-to-transaxle bolts previously installed in aluminum oil pan.



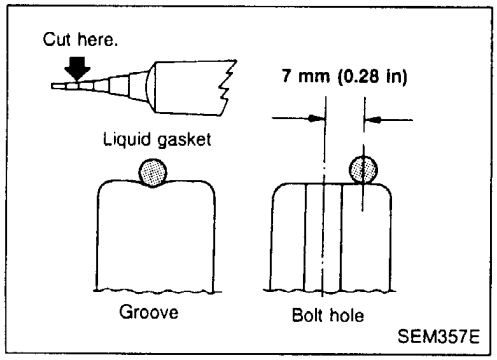

SEM050D

Installation

1. Install aluminum oil pan.

a. Before installation use a scraper to remove all traces of liquid gasket from mating surfaces.

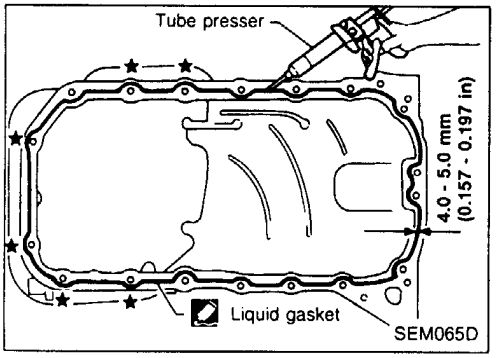
- Also remove traces of liquid gasket from mating surface of cylinder block and front cover.



SEM357E

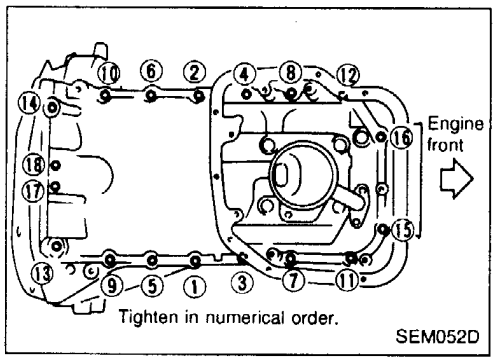
b. Apply a continuous bead of liquid gasket to mating surface of aluminum oil pan.

- **Use Genuine Liquid Gasket or equivalent.**
- **Be sure liquid gasket diameter is 4.0 to 5.0 mm (0.157 to 0.197 in).**
- **Attaching should be done within 5 minutes after coating.**



SEM065D

- **For areas marked with "★", apply liquid gasket to the outer side of the bolt hole.**



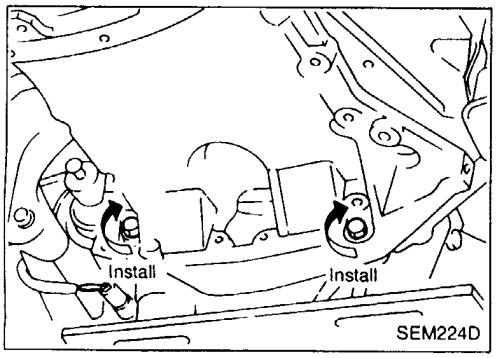
SEM052D

c. Install aluminum oil pan.

- Install bolts in the reverse order of removal.

① - ⑯ bolts:
: 16 - 19 N·m (1.6 - 1.9 kg-m, 12 - 14 ft-lb)

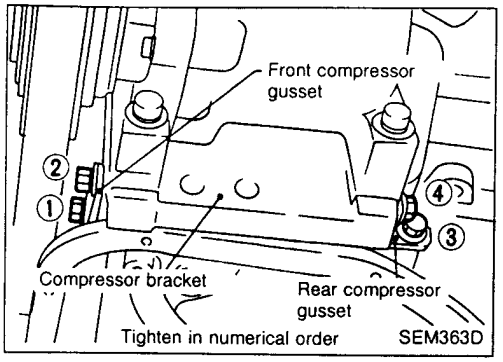
⑰, ⑱ bolts:
: 8.14 - 9.51 N·m (0.830 - 0.970 kg-m, 72.05 - 84.77 in-lb)



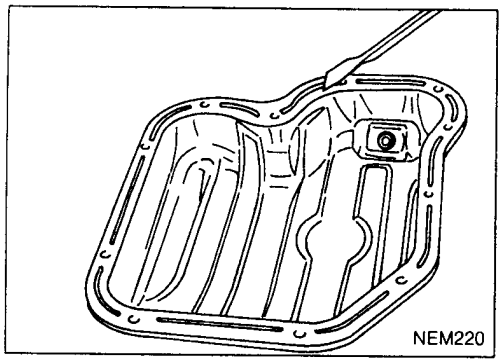
SEM224D

2. Install the two engine to transaxle bolts.
: 30-40 N·m (3.1 - 4.1 kg-m, 22 - 30 ft-lb)
3. Install rear cover plate.

Installation (Cont'd)



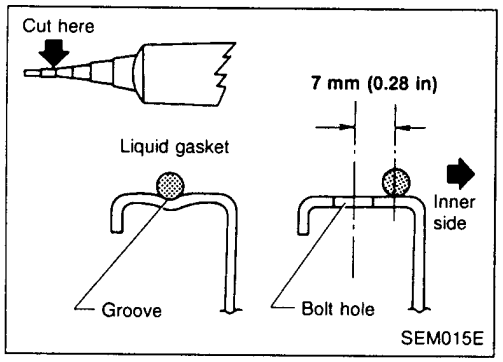
4. Install compressor gussets.
5. Install A/T shift control cable. (A/T only)
6. Install center member.
7. Install front exhaust tube.
8. Install baffle plate.



9. Install steel oil pan.

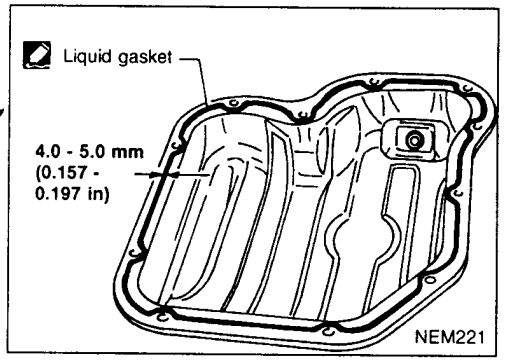
a. Before installation, use a scraper to remove all traces of liquid gasket from mating surfaces.

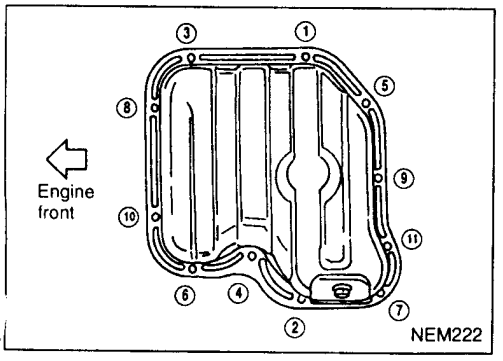
- Also remove traces of liquid gasket from mating surface of aluminum oil pan.



b. Apply a continuous bead of liquid gasket to mating surface of steel oil pan.

- **Use Genuine Liquid Gasket or equivalent.**
- **Be sure liquid gasket diameter is 4.0 to 5.0 mm (0.157 to 0.197 in).**
- **Attaching should be done within 5 minutes after coating.**

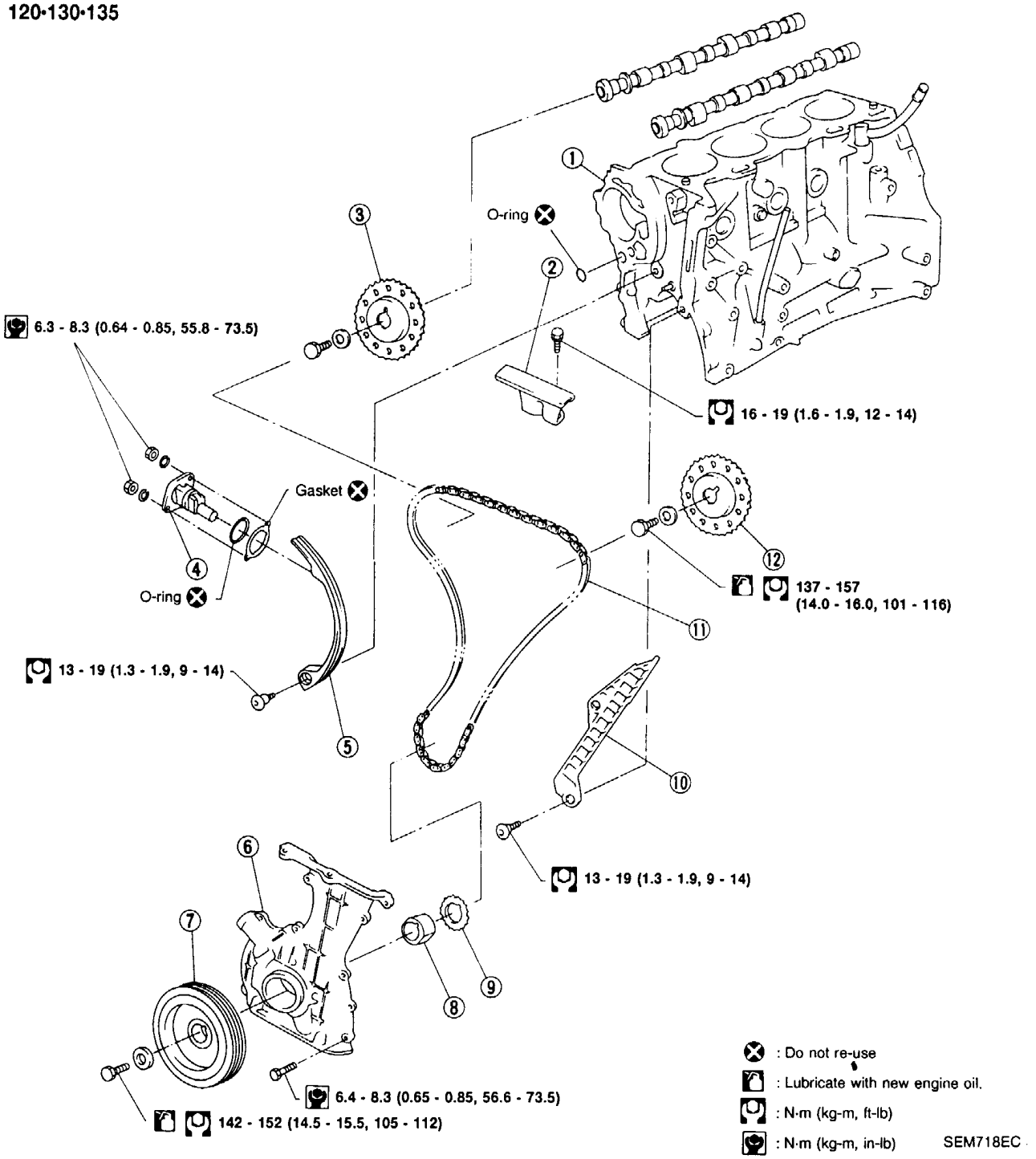




c. Install steel oil pan.

- Install bolts in the reverse order of removal together with heated oxygen sensor harness bracket.
- Wait at least 30 minutes before refilling engine oil.

SEC. 120•130•135



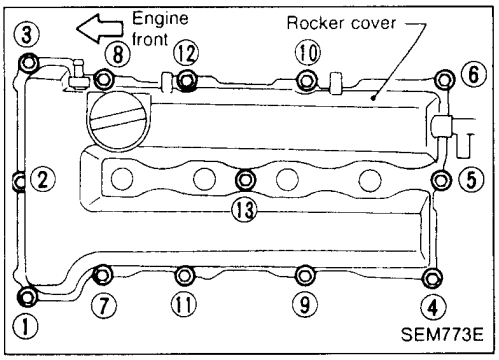
① Cylinder block
② Upper chain guide
③ Intake camshaft sprocket
④ Chain tensioner
⑤ Chain guide
⑥ Front cover
⑦ Crank pulley
⑧ Oil pump spacer
⑨ Crankshaft sprocket
⑩ Chain guide
⑪ Timing chain
⑫ Exhaust camshaft sprocket

CAUTION:

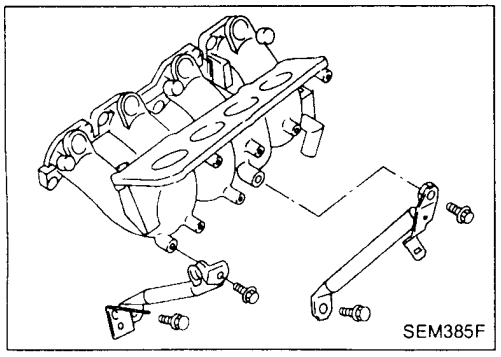
- **After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.**
- **When installing rocker arms, camshafts, chain tensioner, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.**
- **Apply new engine oil to bolt threads and seat surfaces when installing cylinder head, camshaft sprockets, crankshaft pulley, and camshaft brackets.**
- **Before disconnecting fuel hose, release fuel pressure. Refer to EC section ("Fuel Pressure Release", "Basic Service procedure").**
- **Do not spill engine coolant on drive belts.**

Removal

1. Release fuel pressure.
   Refer to "Releasing Fuel Pressure" in EC section.
2. Remove engine under covers.
3. Remove front RH wheel and engine side cover.
4. Drain coolant by removing cylinder block drain plug and lower radiator hose.
5. Remove radiator.
6. Remove air duct to intake manifold.
7. Remove drive belts and water pump pulley.
8. Remove alternator and power steering oil pump.
9. Remove vacuum hoses, fuel hoses, wires, and harness connectors.
10. Remove all spark plugs.



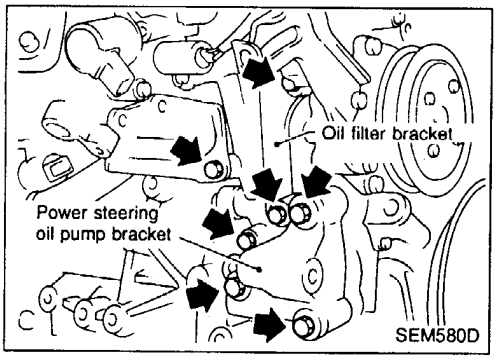
11. Remove rocker cover.



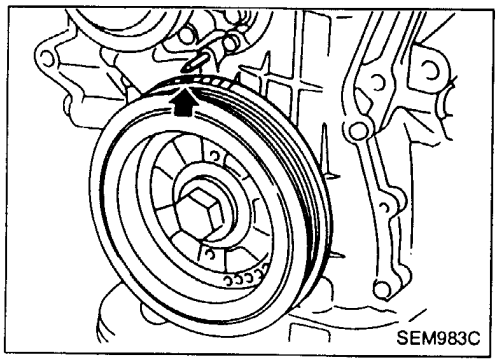
12. Remove intake manifold collector. Refer to "INTAKE MANIFOLD" (EM-78).
- **Do not remove fuel rail and intake manifold.**

13. Remove intake manifold supports.

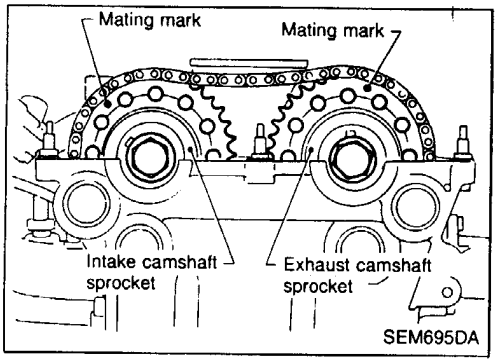
Removal (Cont'd)



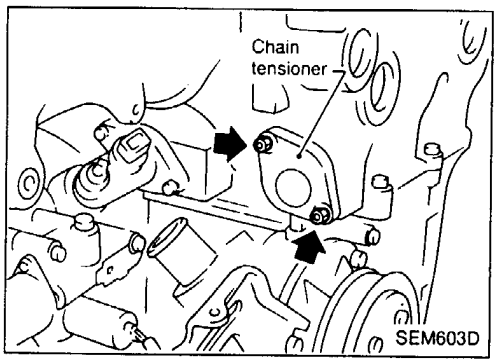
14. Remove oil filter bracket (SR20DE engine only) and power steering oil pump bracket.



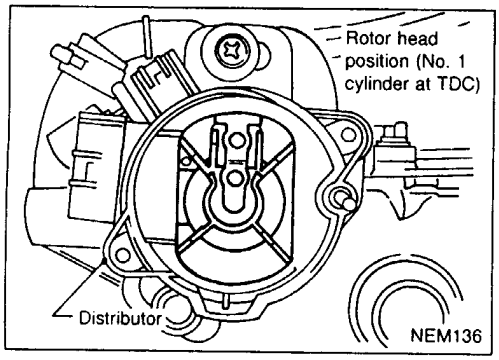
15. Set No. 1 piston at TDC on the compression stroke by rotating crankshaft.



- **Rotate crankshaft until mating mark on camshaft sprocket is set at position indicated in figure at left.**
- **Apply paint to timing chain and camshaft sprockets for alignment during installation.**



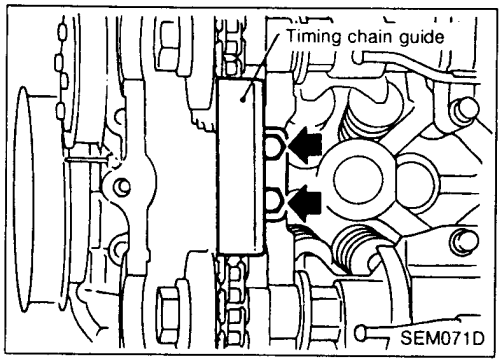
16. Remove chain tensioner.



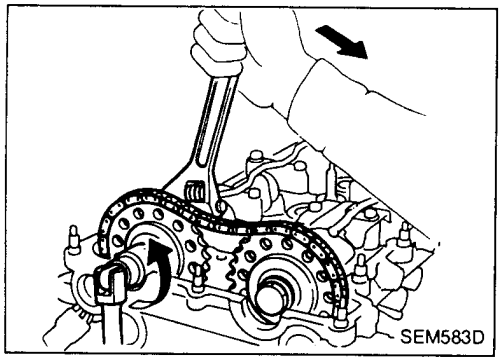
17. Remove distributor.

Do not turn rotor with distributor removed.

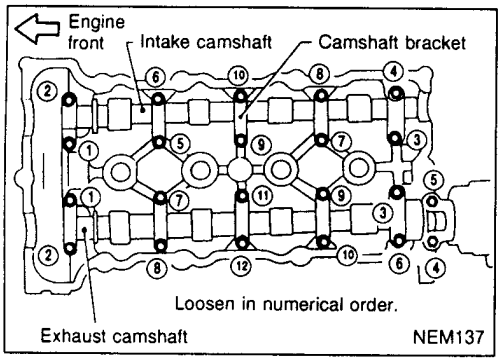
Removal (Cont'd)



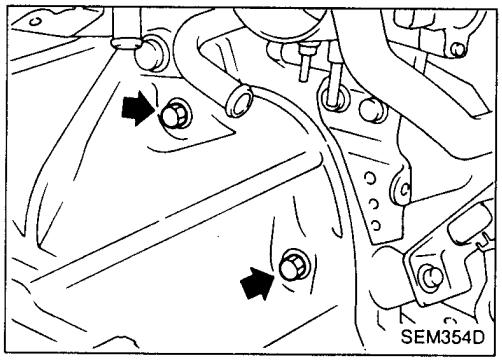
18. Remove timing chain guide.



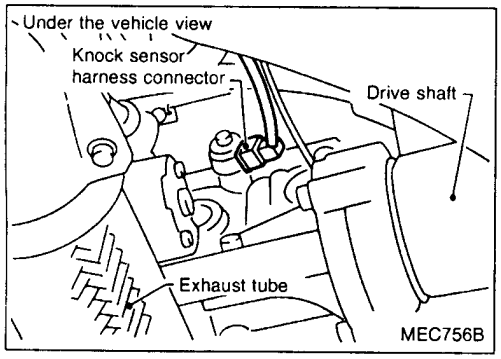
19. Remove camshaft sprockets.



20. Remove camshafts and camshaft brackets.



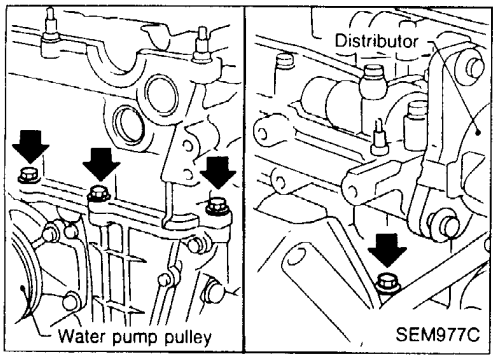
21. Remove starter motor.



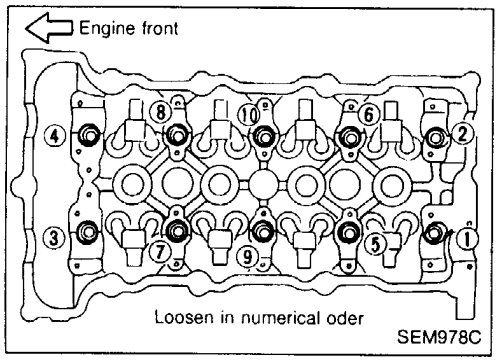
22. Remove the following water hoses:
- Water hose to water pump.
- Water hoses for heater.

23. Remove knock sensor harness connector.

Removal (Cont'd)

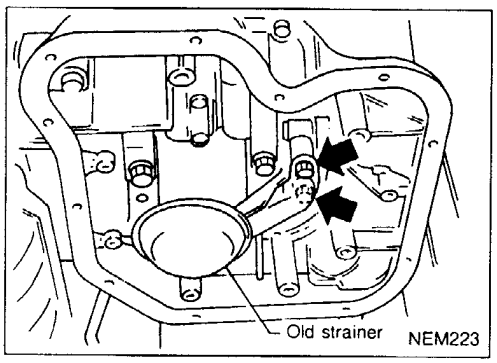


24. Remove cylinder head outside bolts.

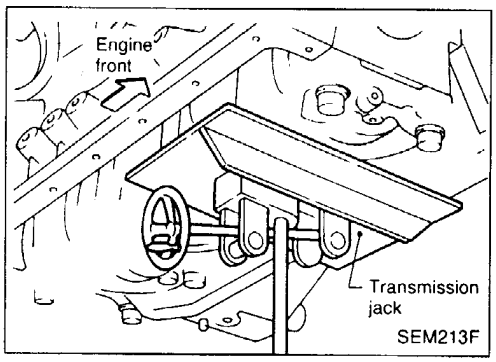


25. Remove cylinder head bolts.
- **Bolts should be loosened in two or three steps.**

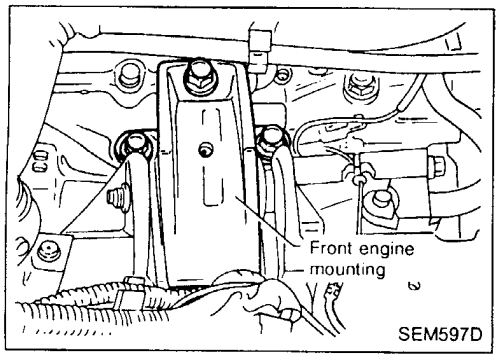
26. Remove cylinder head completely with intake and exhaust manifolds.
27. Remove oil pan.
Refer to "Removal" in "OIL PAN" (EM-59).



28. Remove oil strainer.
29. Remove crankshaft pulley.

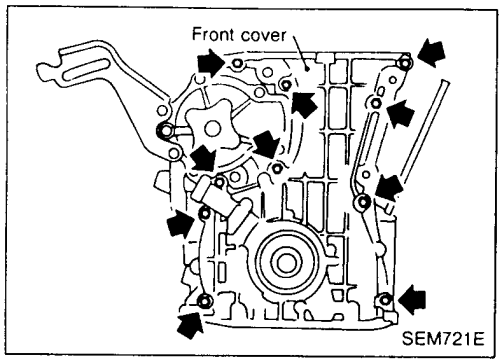


30. Set a suitable transmission jack under main bearing.

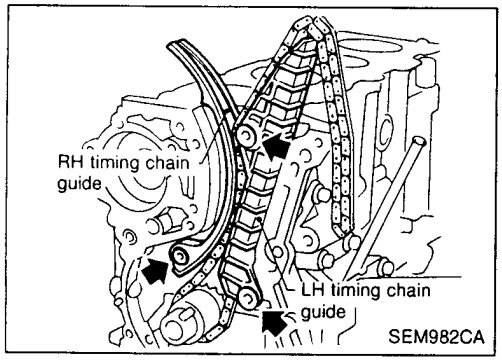


31. Remove front engine mounting.

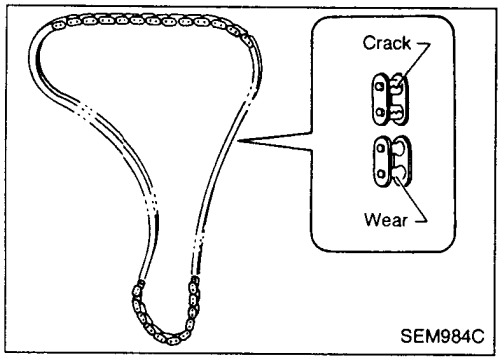
Removal (Cont'd)



32. Remove front cover and oil pump drive spacer.
- **Inspect for oil leakage at front oil seal. Replace seal if oil leak is present.**

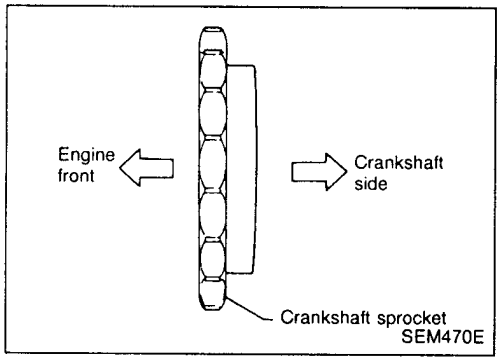


33. Remove timing chain guides and timing chain.



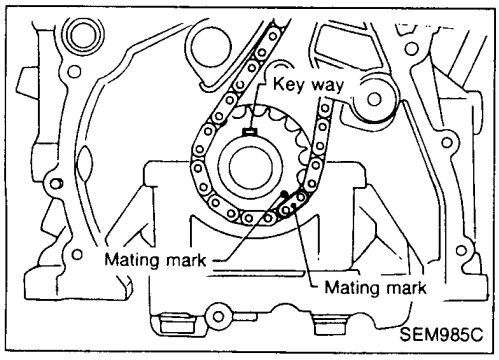
Inspection

Check for cracks and excessive wear at roller links. Replace chain if necessary.



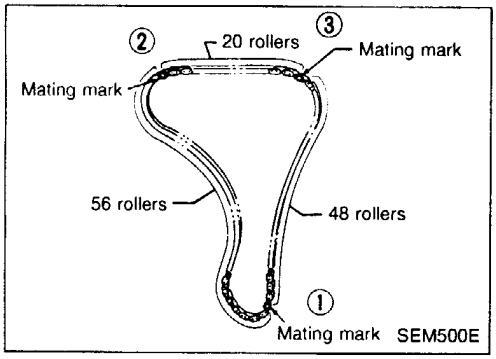
Installation

1. Install crankshaft sprocket on crankshaft.
- **Make sure that mating marks on crankshaft sprocket face front of engine.**

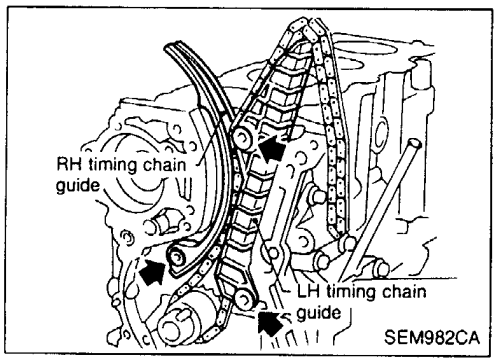


2. Position crankshaft so that No. 1 piston is set at TDC and key way is at 12 o'clock. Fit timing chain on crankshaft sprocket, aligning the mating marks.

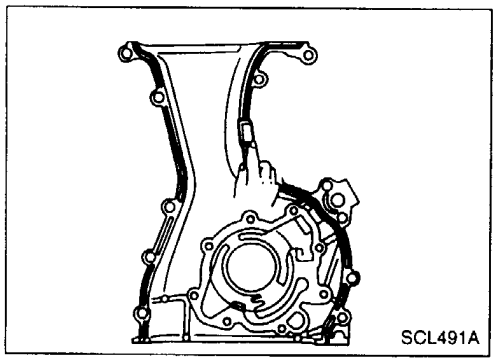
Installation (Cont'd)



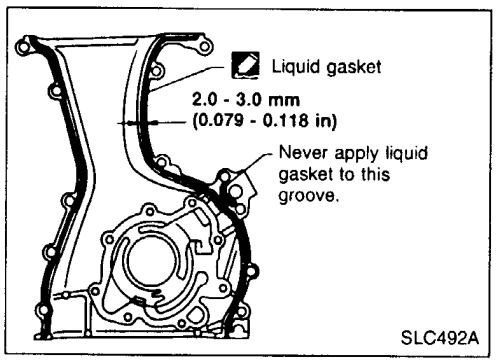
- Mating mark color on timing chain.
  ① : **Copper**
  ②, ③: **Silver**



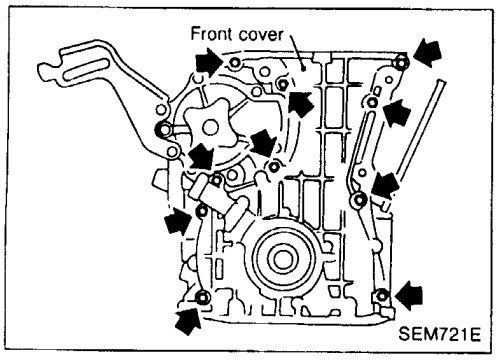
3. Install timing chain and timing chain guides.



4. Before installing front cover, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

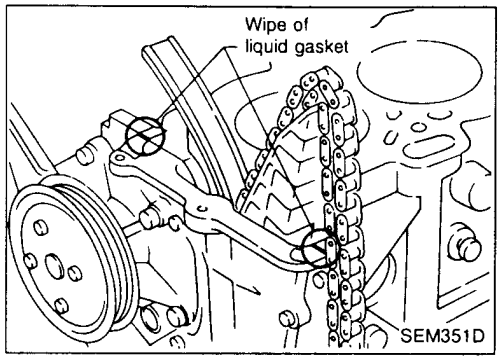


5. Apply a continuous bead of liquid gasket to mating surface of front cover.
- **Use Genuine Liquid Gasket or equivalent.**
- **Be sure to install new front oil seal in the right direction. Refer to EM-76.**

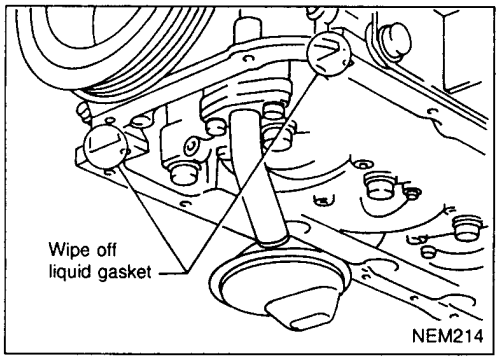


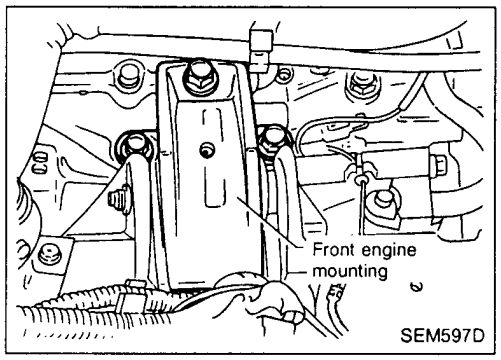
6. Install oil pump drive spacer and front cover.

Installation (Cont'd)

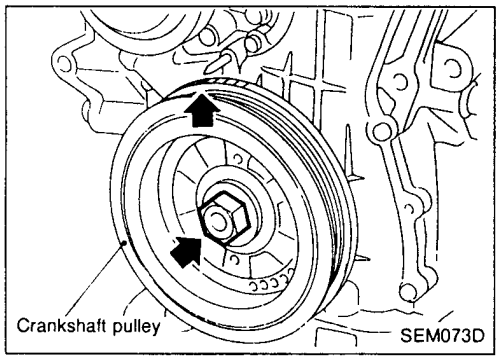


- Wipe off excessive liquid gasket.

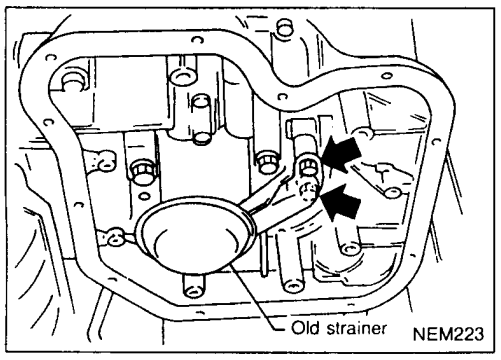




7. Install front engine mounting.

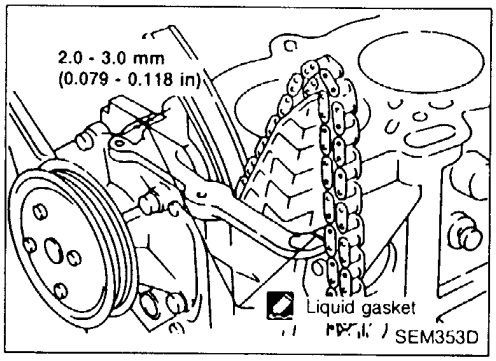


8. Install crankshaft pulley.
9. Set No. 1 piston at TDC on its compression stroke.

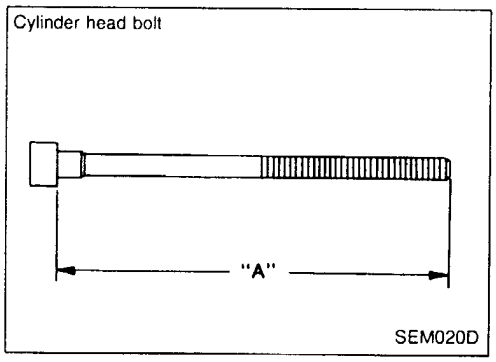


10. Install oil strainer.
11. Install oil pan.
    Refer to "Installation" in "OIL PAN" (EM-61).

Installation (Cont'd)



12. Before installing cylinder head gasket, apply a continuous bead of liquid gasket to mating surface of cylinder block.

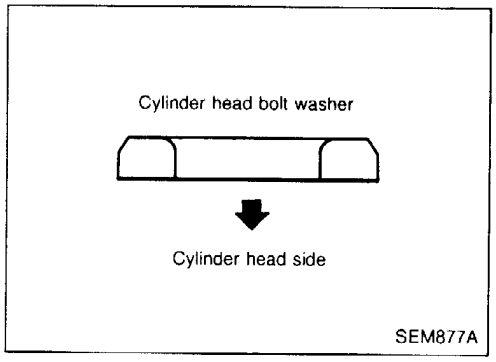


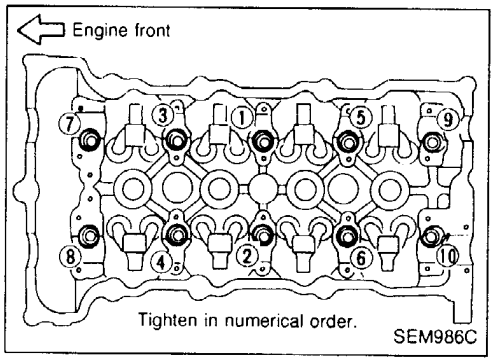
13. Install cylinder head completely with intake and exhaust manifolds.

- **Apply engine oil to threads and seating surfaces of cylinder head bolts before installing them.**
- **Be sure to install washers between bolts and cylinder head.**

CAUTION:
The cylinder head bolts can be reused providing dimension "A" is not exceeded.

Dimension "A":
158.2 mm (6.228 in)

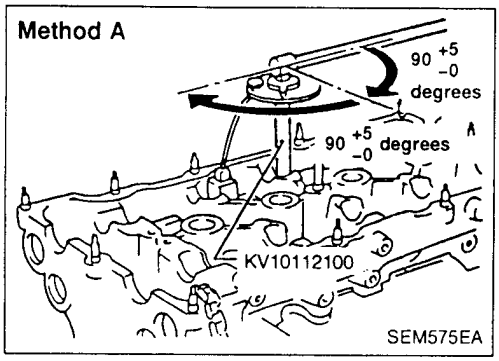




- **Tightening procedure:**

ⓐ Tighten all bolts to 39 N·m (4.0 kg-m, 29 ft-lb).
ⓑ Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).
ⓒ Loosen all bolts completely.
ⓓ Tighten all bolts to 39 N·m (4.0 kg-m, 29 ft-lb).

Installation (Cont'd)



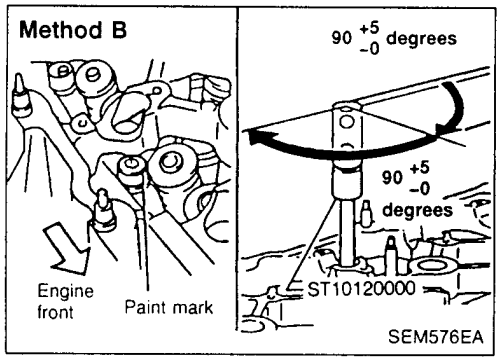
ⓔ **Method A: Turn all bolts 90 to 95 degrees clockwise with Tool or suitable angle wrench.**

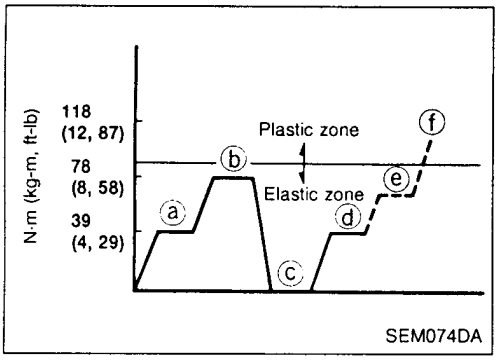
Method B: If angle wrench is not available, do the following. Mark the side of all bolts with paint marks facing the front of the engine. Then turn them 90 to 95 degrees clockwise.

ⓕ **Turn all bolts 90 to 95 degrees clockwise.**

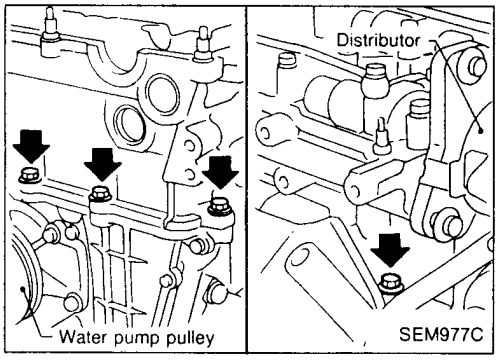
ⓖ **Ensure that paint mark on each bolt faces the rear of the engine. (Method B only)**

Do not turn any bolt 180 to 190 degrees clockwise all at once.

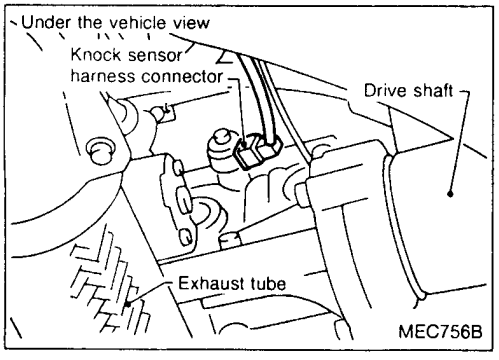




	Tightening torque N·m (kg-m, ft-lb)
ⓐ	39 (4.0, 29)
ⓑ	78 (8.0, 58)
ⓒ	0 (0, 0)
ⓓ	39 (4.0, 2.9)
ⓔ	90 - 95 degrees (90 degree preferred)
ⓕ	90 - 95 degrees (90 degree preferred)

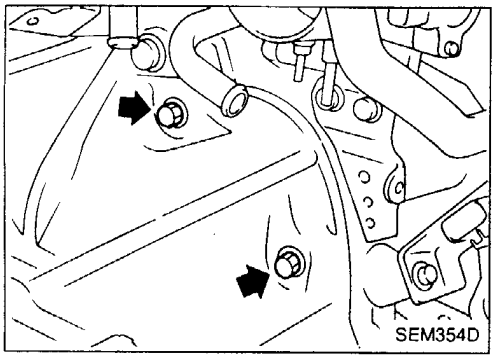


14. Install cylinder head outside bolts.
15. Install the following water hoses.
- Water hose for cylinder block.
- Water hoses for heater.

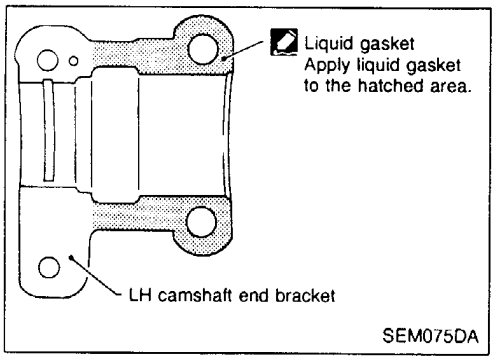


16. Install knock sensor harness connector.

Installation (Cont'd)

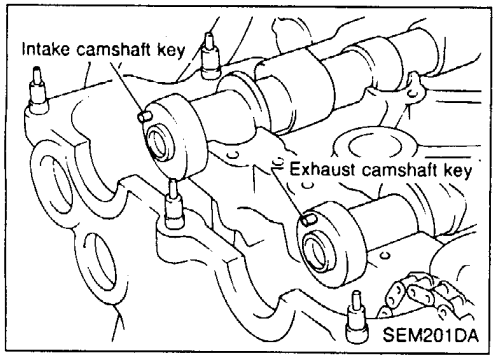


17. Install starter motor.



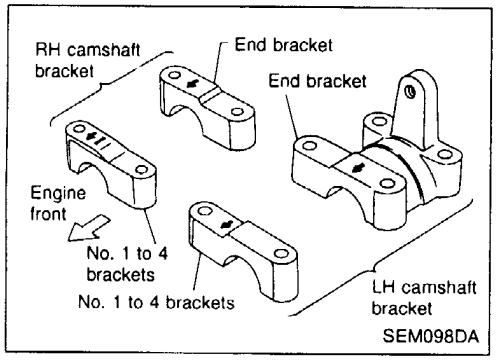
18. Remove all traces of liquid gasket from mating surface of LH camshaft end bracket.
- Also remove traces of liquid gasket from mating surface of cylinder head.

19. Apply liquid gasket to mating surface of LH camshaft end bracket as shown in illustration.
- Use Genuine Liquid Gasket or equivalent.



20. Install camshafts and camshaft brackets.
- Position camshaft.
- Exhaust camshaft key at about 12 o'clock
- Intake camshaft key at about 10 o'clock

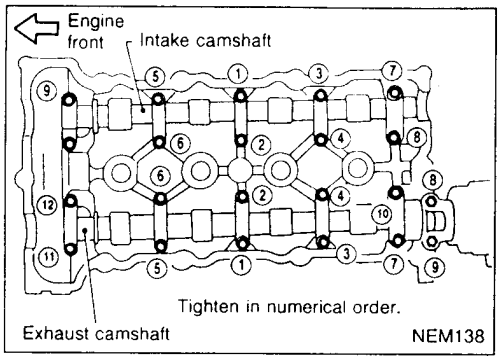
Apply engine oil to bearings and cam surfaces of camshafts before installing them.



- Position camshaft brackets as shown in illustration.

Apply engine oil to threads and seating surfaces of camshaft bracket bolts before installing them.

Installation (Cont'd)



- **Tightening procedure**

STEP 1:

Intake camshaft

Tighten bolts ⑨ - ⑩ in that order then tighten bolts ① - ⑧ in that order.

: 2 N·m (0.2 kg-m, 1.4 ft-lb)

Exhaust camshaft

Tighten bolts ⑪ - ⑫ in that order then tighten bolts ① - ⑩ in that order.

: 2 N·m (0.2 kg-m, 1.4 ft-lb)

STEP 2:

Tighten bolts in the specified order.

: 6 N·m (0.6 kg-m, 4.3 ft-lb)

STEP 3:

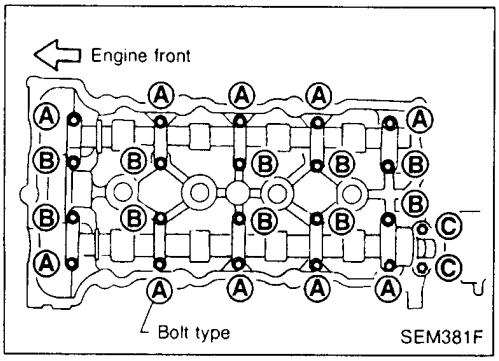
Tighten bolts in the specified order.

Bolt type Ⓐ Ⓑ

: 10 - 12 N·m
(1.0 - 1.2 kg-m, 7.2 - 8.7 ft-lb)

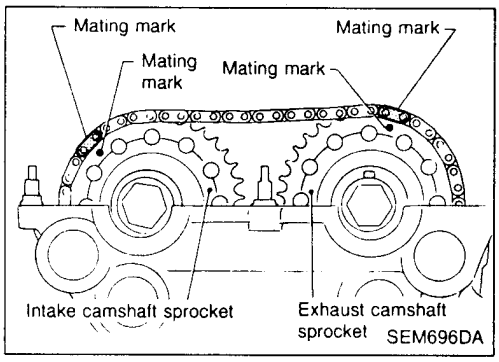
Bolt type Ⓒ

: 18 - 25 N·m
(1.8 - 2.6 kg-m, 13 - 19 ft-lb)



21. Install camshaft sprockets.

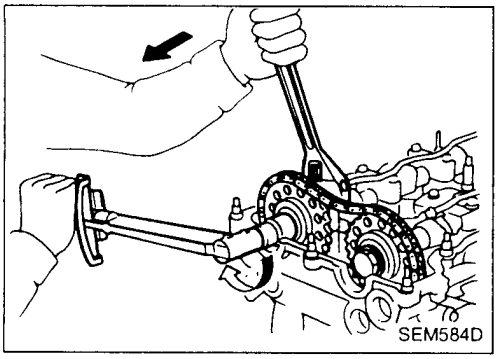
Line up mating marks on timing chain with mating marks on camshaft sprockets.



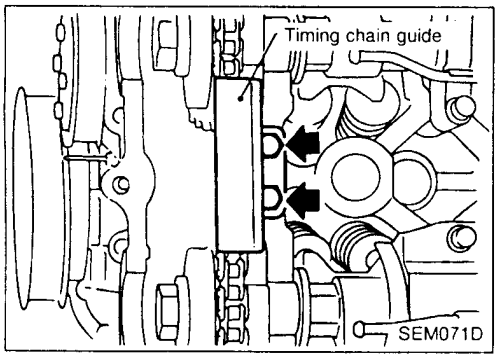
- Lock camshafts as shown in figure and tighten to specified torque.

: 137 - 157 N·m
(14.0 - 16.0 kg-m, 101 - 116 ft-lb)

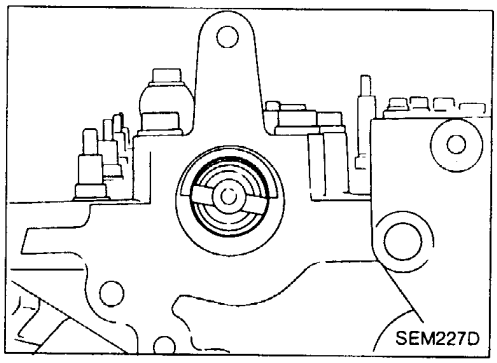
Apply engine oil to threads and seating surfaces of camshaft sprocket bolts before installing them.



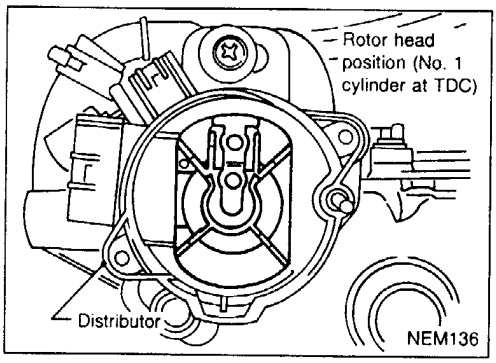
22. Install timing chain guide.



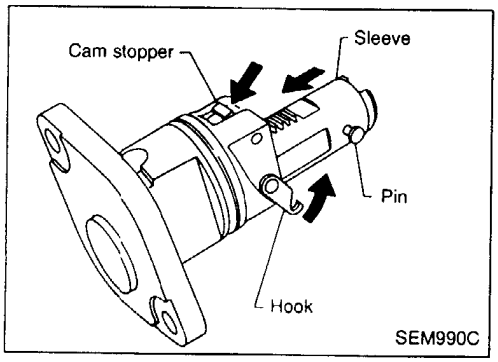
Installation (Cont'd)



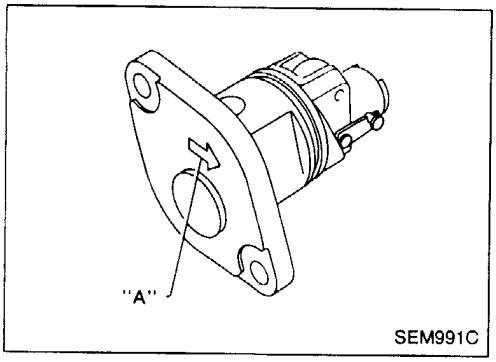
23. Install distributor.
- **Make sure that position of camshaft is as shown in figure.**



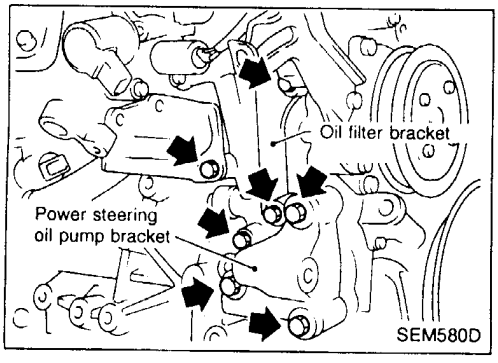
- **Make sure that No. 1 piston is set at TDC and that distributor is set at No. 1 cylinder spark position.**



24. Install chain tensioner.
- **Make sure the camshaft sprockets are tightened completely.**
  Press cam stopper down and "press-in" sleeve until hook can be engaged on pin. When tensioner is bolted in position the hook will release automatically.

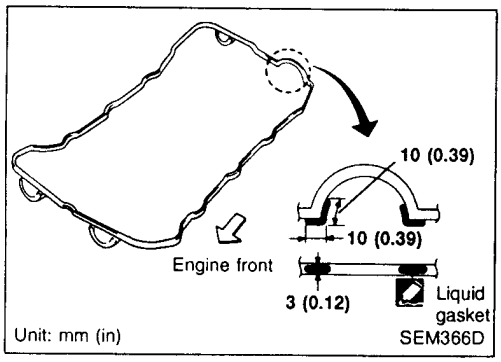


- **Make sure arrow "A" points toward engine front.**

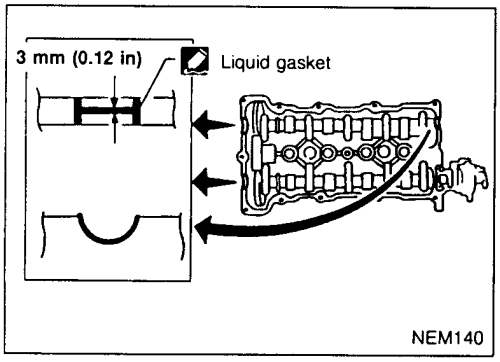


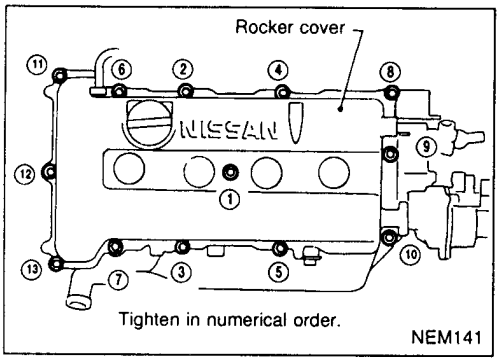
25. Install oil filter bracket (SR20DE engine only) and power steering oil pump bracket.
26. Install intake manifold supports.

Installation (Cont'd)

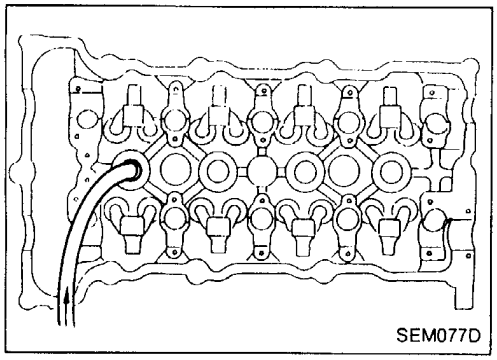


27. Remove all old liquid gasket from mating surfaces of rocker cover gasket and cylinder head.
28. Apply a continuous bead of liquid gasket to mating surfaces of rocker cover gasket and cylinder head.
- **Use Genuine Liquid Gasket or equivalent.**



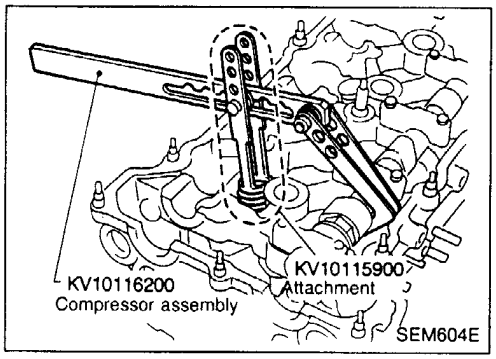


29. Install rocker cover.
(1) Tighten bolts ① - ⑩ - ⑪ - ⑬ - ⑧ in that order to 8 to 10 N·m (0.8 to 1.0, 69 to 89 in-lb).
(2) Tighten bolts ① through ⑬ in numerical order to 8 to 10 N·m (0.8 to 1.0 kg-m, 70 to 89 in-lb).
30. Refit spark plugs and leads.
31. Install vacuum hoses, fuel hoses, wires, harness, connectors and so on.
32. Install power steering oil pump and alternator.
33. Install water pump pulley and drive belts.
34. Install intake manifold collector and brackets.
35. Refit air duct to intake manifold.
36. Install radiator.
37. Refit hoses and refill with coolant. (Refer to MA section.)
38. Install engine side cover and front RH wheel.
39. Install engine under covers.


SEM077D

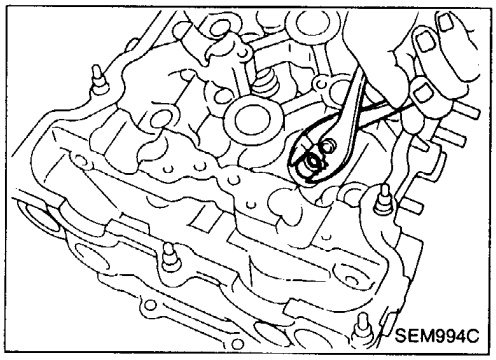
VALVE OIL SEAL

1. Remove accelerator cable.
2. Remove rocker cover and oil separator.
3. Remove camshafts and sprockets.
   Refer to "Removal" in "TIMING CHAIN" (EM-67).
4. Remove spark plugs.
5. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place. Apply a pressure of 490 kPa (4.9 bar, 5 kg/cm^2, 71 psi).
6. Remove rocker arm, rocker arm guide and shim.

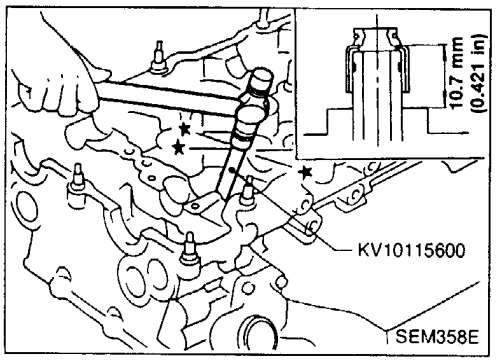


7. Remove valve spring with Tool.

Piston concerned should be set at TDC to prevent valve from falling.


SEM994C

8. Remove valve oil seal.



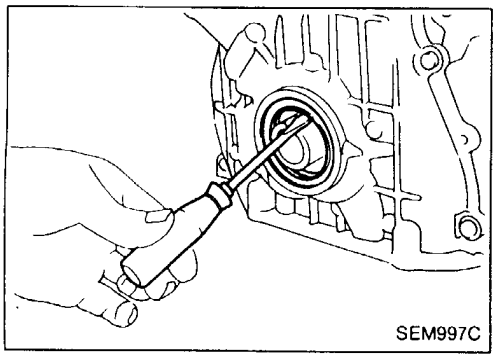
9. Apply engine oil to new valve oil seal and install it with Tool.

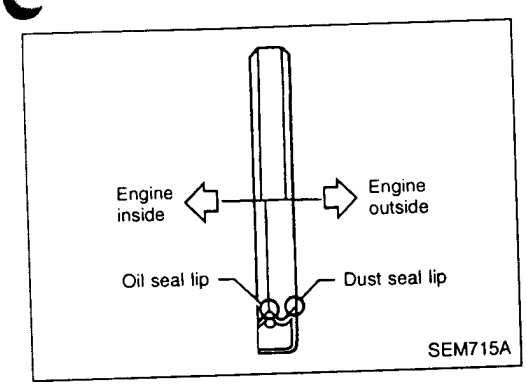
FRONT OIL SEAL

1. Remove the following parts:
- Engine under cover
- Front RH wheel and engine side cover
- Drive belts
- Crankshaft pulley

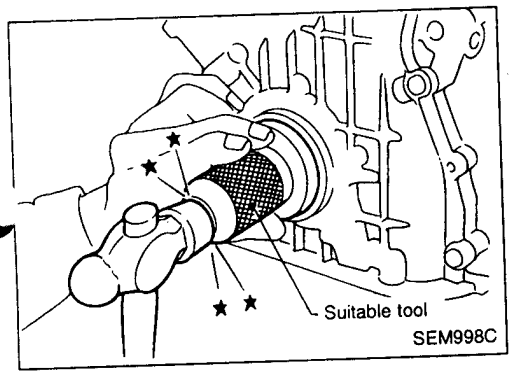
2. Remove front oil seal.

Be careful not to scratch front cover.


SEM997C



- **Install new oil seal in the direction shown.**

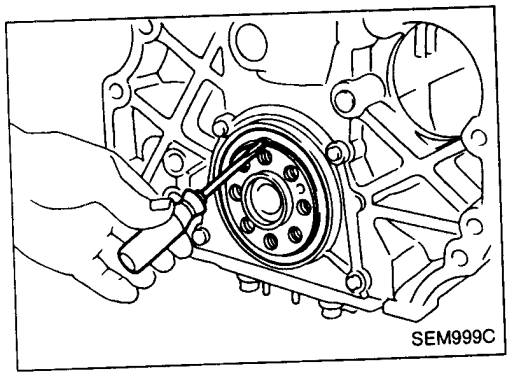


3. Apply engine oil to new oil seal and install it using a suitable tool.

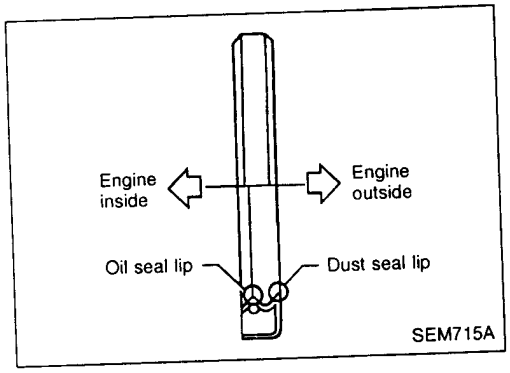
REAR OIL SEAL

1. Remove transaxle. (Refer to MT or AT section.)
2. Remove flywheel or drive plate.
3. Remove rear oil seal.

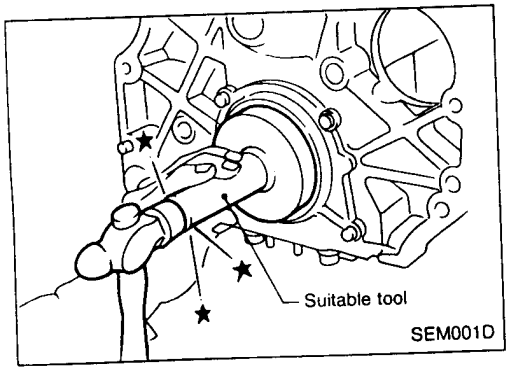
- **Be careful not to scratch rear oil seal retainer.**



- Install new oil seal in the direction shown.

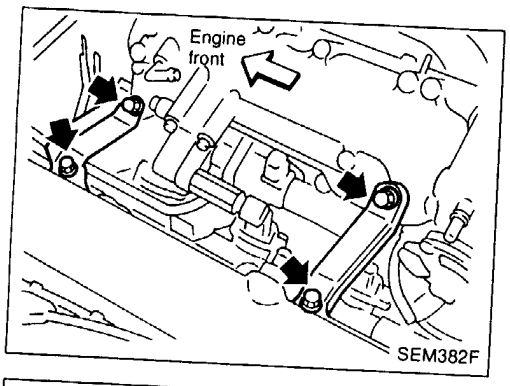


4. Apply engine oil to new oil seal and install it using a suitable tool.

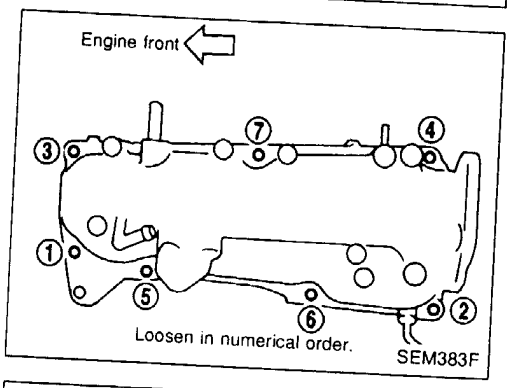


Removal

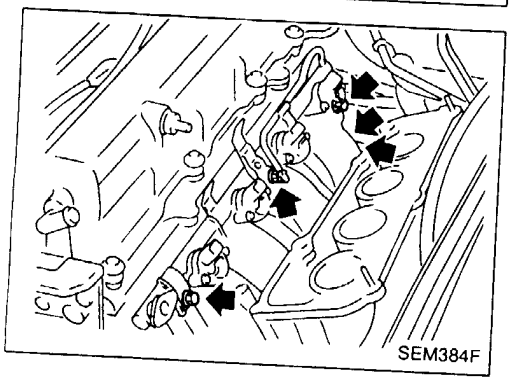
1. Release fuel pressure.
   Refer to "Releasxing Fuel Pressure" in EC section.
2. Remove engine undercover.
3. Remove front RH wheel and engine side cover.
4. Drain coolant.
5. Remove front tower bar.
6. Remove air duct from intake manifold.
7. Remove PCV hoses from rocker cover.
8. Remove vacuum hoses, fuel hoses, water hoses, wires, harnesses, connectors, etc. from intake manifold.
9. Remove drive belts and water pump pulley.
10. Remove power steerling oil pump and oil npump bracket.
11. Remove power steering oil pump adjusting bar.
12. Remove oil filter bracket (SR20DE only).



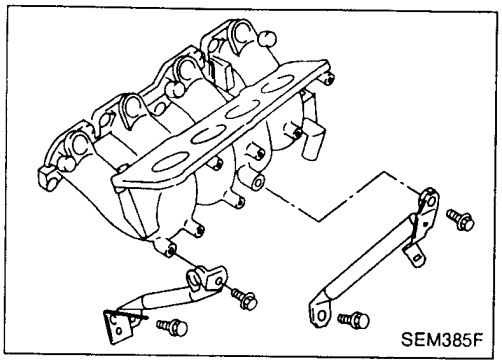
13. Remove intake manifold collector supports.



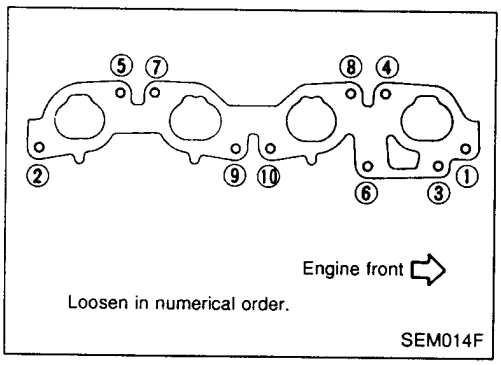
14. Remove intake manifold collector.



15. Remove harness connectors of engine coolant temperature sensor and thermal transmitter.
16. Remove fuel tube assembly.


SEM385F

17. Remove intake manifold supports.

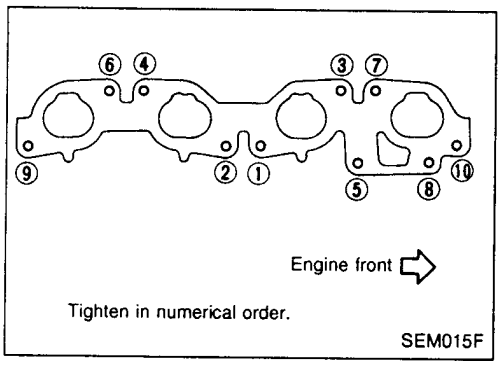


SEM014F

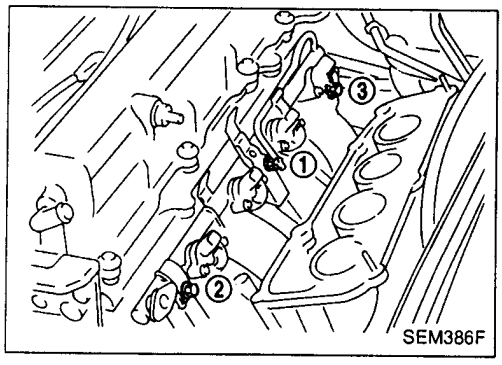
18. Remove intake manifold.

Installation

1. Install intake manifold
2. Install intake manifold supports.

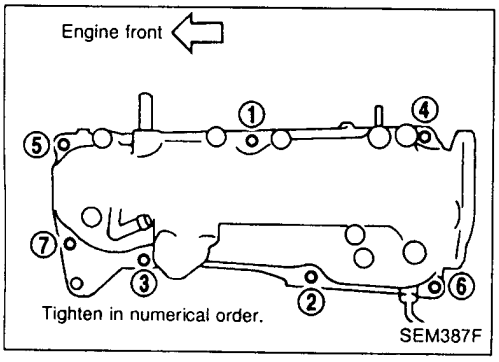


SEM015F



SEM386F

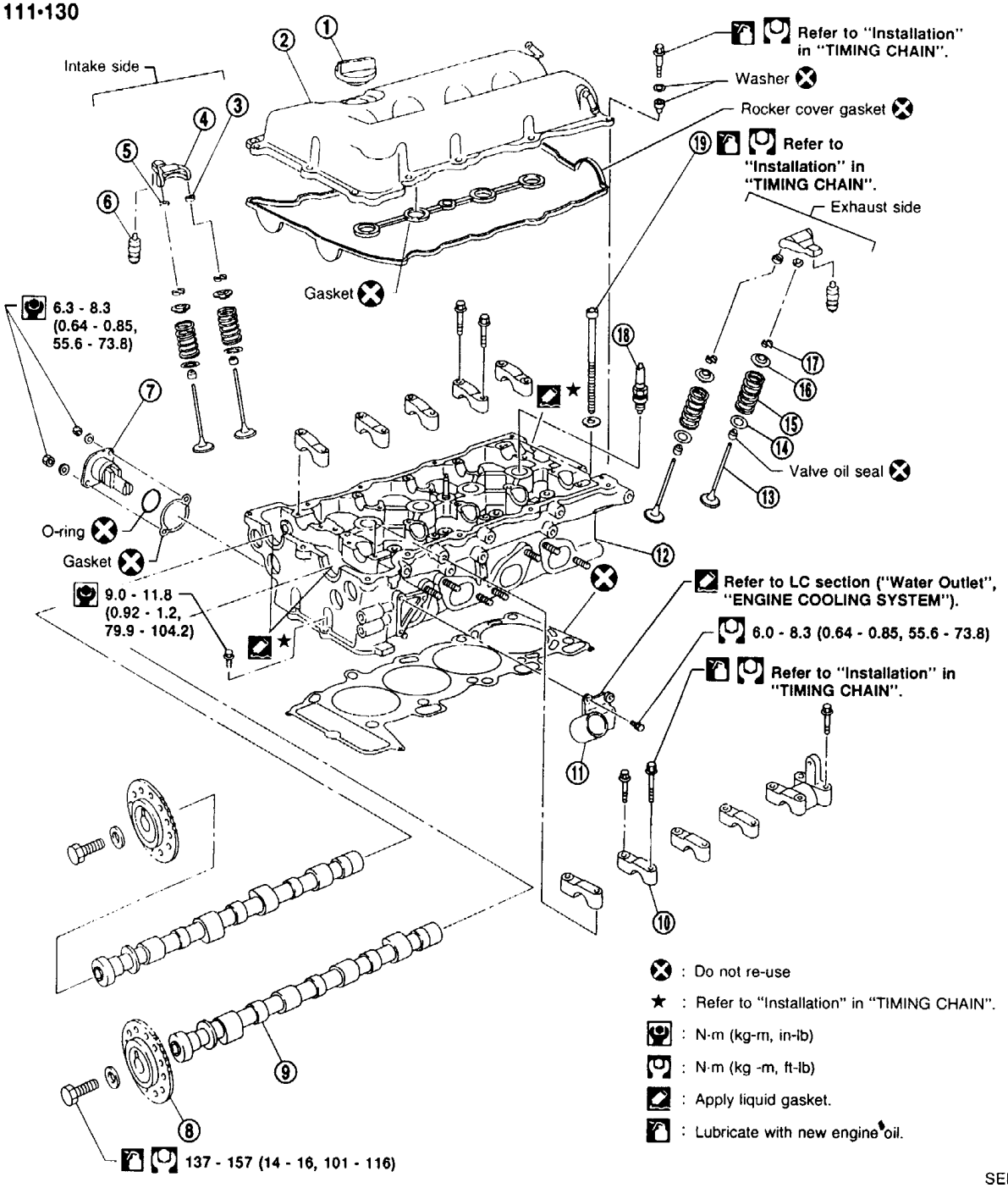
3. Install fuel tube assembly.
- **Tighten bolts in two steps.**
  1st: 9.3 - 10.8 N·m (0.95 - 1.1 kg-m, 6.9 -8.0 ft-lb)
  2nd: 21 - 26 N·m (2.1 - 2.7 kg-m, 15 - 20 ft-lb)
4. Connect harness connectors of engine coolant temperature sensor and thermal transmitter.



SEM387F

5. Install intake manifold collector and collector supports.
6. Reinstall any parts removed in reverse order of removal.

SEC. 111•130

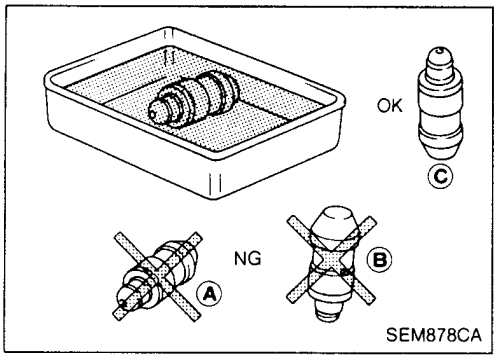


SEM388F

① Oil filler cap
② Rocker cover
③ Rocker arm guide
④ Rocker arm
⑤ Shim
⑥ Hydraulic lash adjuster
⑦ Chain tensioner
⑧ Camshaft sprocket
⑨ Camshaft
⑩ Camshaft bracket
⑪ Water outlet
⑫ Cylinder head
⑬ Valve
⑭ Valve spring seat
⑮ Valve spring
⑯ Valve spring retainer
⑰ Valve collet
⑱ Spark plug
⑲ Cylinder head bolt

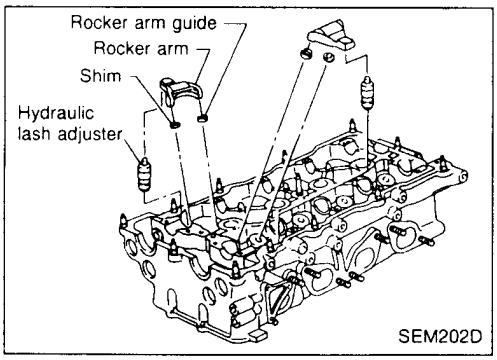
CAUTION:

- **When installing camshafts, chain tensioners, oil seals or other sliding parts, lubricate contacting surfaces with new engine oil.**
- **When tightening cylinder head bolts, camshaft sprocket bolts, cramshaft pulley bolt and seat surfaces, lubricate with new engine oil.**
- **If a hydraulic lash adjuster is kept on its side, there is a risk of air entering it. After removal, always set hydraulic lash adjuster straight up, or keep it soaked in new engine oil.**
- **Do not disassemble hydraulic lash adjusters.**
- **Attach tags to lash adjusters so as not to mix them up.**



Removal

- This removal procedure is the same as for timing chain. Refer to EM-67.
- Apply paint to camshaft sprockets for alignment during installation.

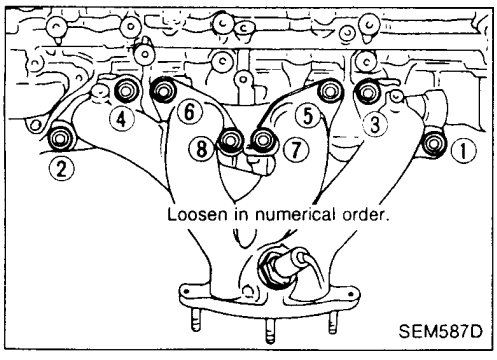


Disassembly

1. Remove rocker arms, shims, rocker arm guides and hydraulic lash adjusters from cylinder head.

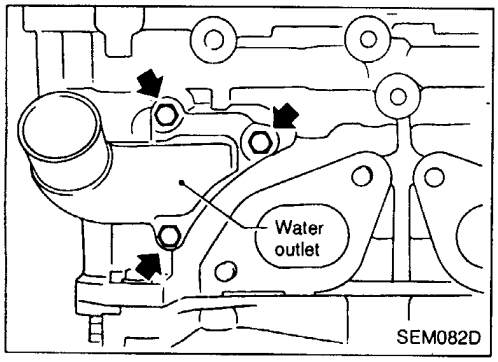
CAUTION:

Keep parts in order so that they can be installed in their original positions during assembly.

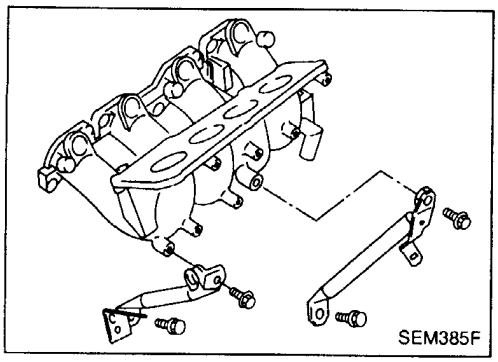


2. Remove exhaust manifold cover.
3. Remove exhaust manifold.

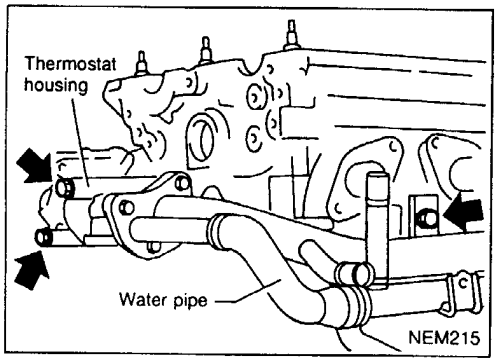
Disassembly (Cont'd)



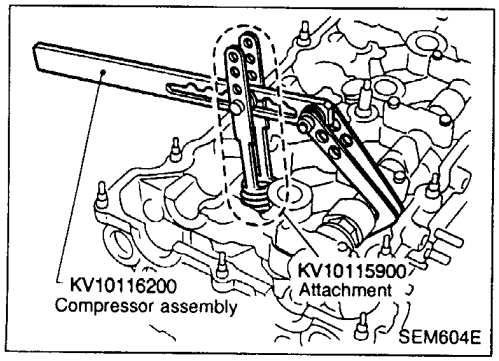
4. Remove water outlet.



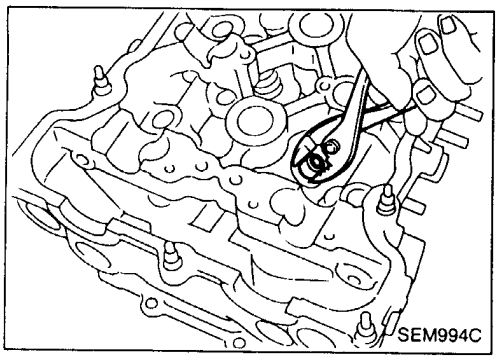
5. Remove intake manifold. **Refer to "INTAKE MANIFOLD", (EM-78).**



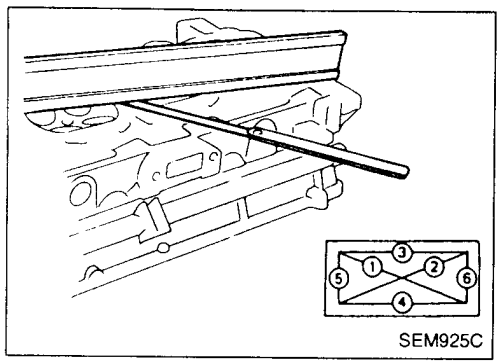
6. Remove thermostat housing with water pipe.



7. Remove valve components with Tool.



8. Remove valve oil seal with a suitable tool.



Inspection

CYLINDER HEAD DISTORTION

Head surface flatness:

Standard

Less than 0.03 mm (0.0012 in)

Limit

0.1 mm (0.004 in)

If beyond the specified limit, replace or resurface.

Resurfacing limit:

The limit of cylinder head is determined by the cylinder block resurfacing in an engine.

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

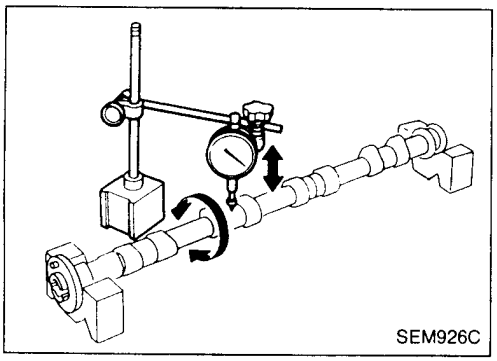
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:

136.9 - 137.1 mm (5.390 - 5.398 in)

CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.



CAMSHAFT RUNOUT

1. Measure camshaft runout at the center journal.

Runout (Total indicator reading):

Standard

Less than 0.02 mm (0.0008 in)

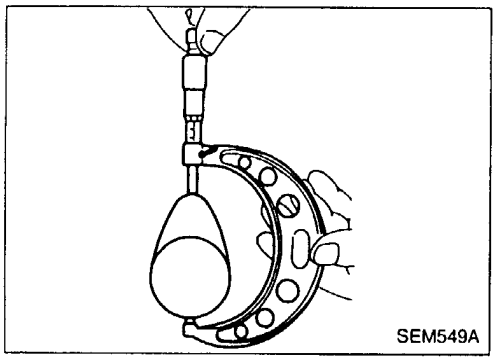
Limit

0.1 mm (0.004 in)

2. If it exceeds the limit, replace camshaft.

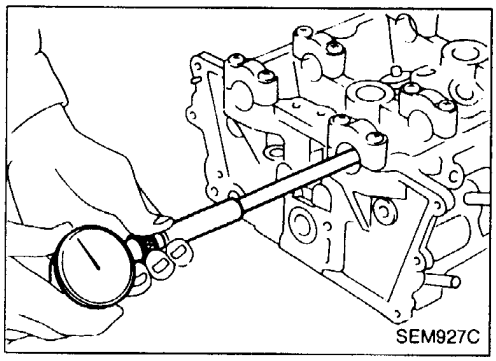
Inspection (Cont'd)

CAMSHAFT CAM HEIGHT

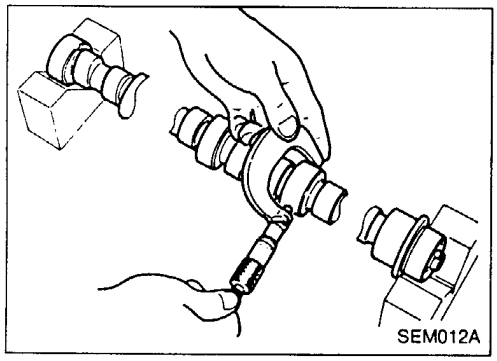


1. Measure camshaft cam height.
   Standard cam height:
   Intake
   SR20DE: 37.989 - 38.179 mm (1.4956 - 1.5031 in)
   SR20De: 37.433 - 37.623 mm (1.4737 - 1.4812 in)
   Exhaust
   SR20DE/SR20De: 37.309 - 37.499 mm (1.4689 - 1.4763 in)
   Cam wear limit:
   Intake & Exhaust
   0.2 mm (0.008 in)
2. If wear is beyond the limit, replace camshaft.

CAMSHAFT JOURNAL CLEARANCE

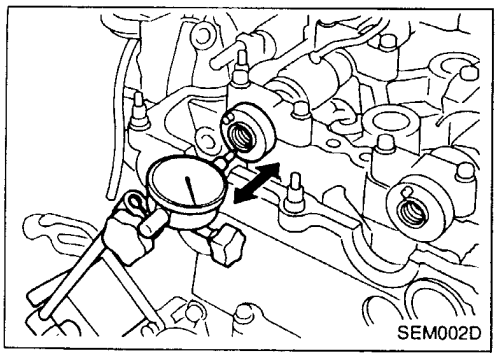


1. Install camshaft bracket and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.
   Standard inner diameter:
   28.000 - 28.021 mm (1.1024 - 1.1032 in)



3. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   27.935 - 27.955 mm (1.0998 - 1.1006 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance:
   Standard
   0.045 - 0.086 mm (0.0018 - 0.0034 in)
   Limit
   0.15 mm (0.0059 in)

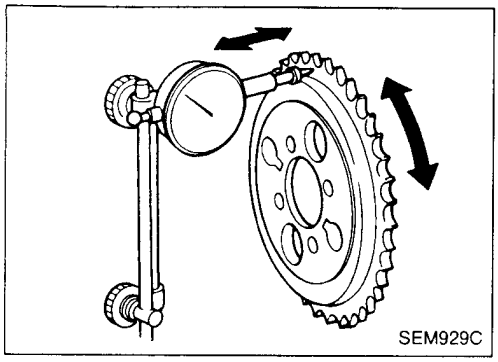
CAMSHAFT END PLAY



1. Install camshaft in cylinder head.
2. Measure camshaft end play.
   Camshaft end play:
   Standard
   0.055 - 0.139 mm (0.0022 - 0.0055 in)
   Limit
   0.20 mm (0.0079 in)

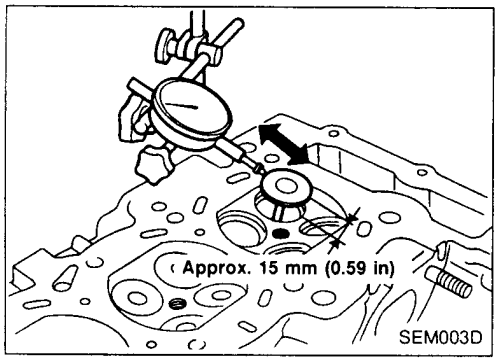
Inspection (Cont'd)

CAMSHAFT SPROCKET RUNOUT

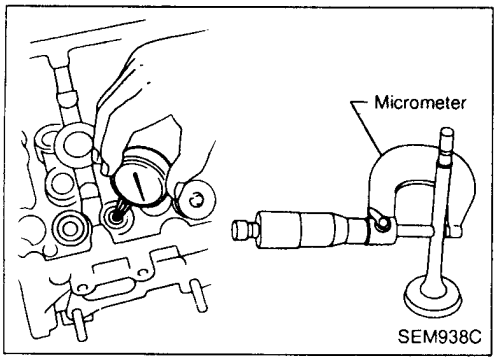


1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
   Runout (Total indicator reading):
   Limit 0.25 mm (0.0098 in)
3. If it exceeds the limit, replace camshaft sprocket.

VALVE GUIDE CLEARANCE



1. Measure valve deflection in a parallel direction with rocker arm. (Valve and valve guide mostly wear in this direction.)
   Valve deflection limit (Dial gauge reading):
   Intake & Exhaust
   0.2 mm (0.008 in)



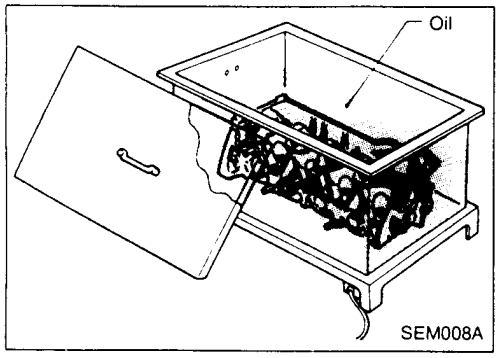
2. If it exceeds the limit, check valve to valve guide clearance.

a. Measure valve stem diameter and valve guide inner diameter.

b. Check that clearance is within specification.
   Valve to valve guide clearance:
   Standard
   Intake 0.020 - 0.053 mm (0.0008 - 0.0021 in)
   Exhaust 0.040 - 0.073 mm (0.0016 - 0.0029 in)
   Limit
   Intake 0.08 mm (0.0031 in)
   Exhaust 0.1 mm (0.004 in)

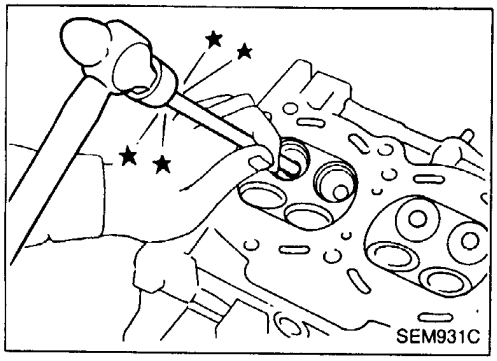
c. If it exceeds the limit, replace valve or valve guide.

VALVE GUIDE REPLACEMENT

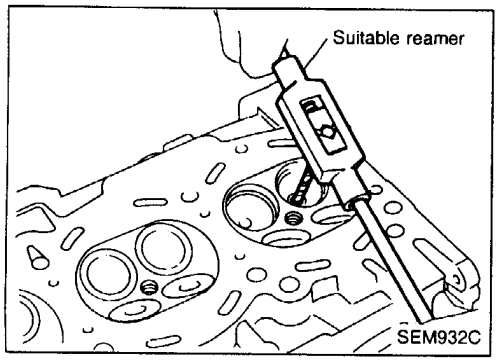


1. To remove valve guide, heat cylinder head to 110 to 130°C (230 to 266°F).

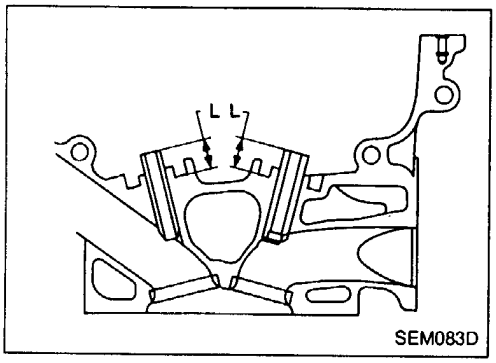
Inspection (Cont'd)



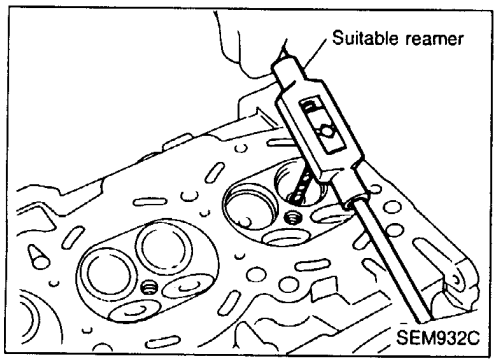
2. Press out valve guide or use a hammer and suitable tool.



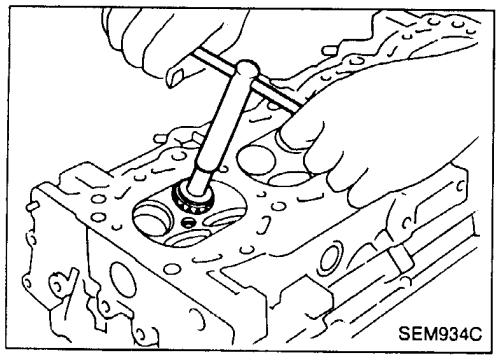
3. Ream cylinder head valve guide hole.
   Valve guide hole diameter
   (for service parts):
   Intake:
   10.175 - 10.196 mm (0.4006 - 0.4014 in)
   Exhaust:
   10.175 - 10.196 mm (0.4006 - 0.4014 in)



4. Heat cylinder head to 110 to 130°C (230 to 266°F) and press service valve guide onto cylinder head.
   Projection "L":
   14.0 - 14.2 mm (0.551 - 0.559 in)



5. Ream valve guide.
   Valve guide inner diameter:
   Intake:
   6.000 - 6.018 mm (0.2362 - 0.2369 in)
   Exhaust:
   6.000 - 6.018 mm (0.2362 - 0.2369 in)



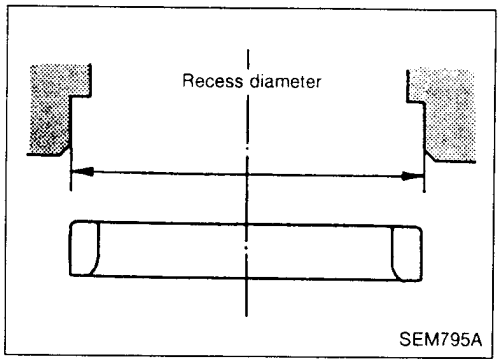
VALVE SEATS

Check valve seats for any evidence of pitting at valve contact surface. Reset or replace if it has worn out excessively.

- **Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.**
- **Use both hands to cut uniformly.**

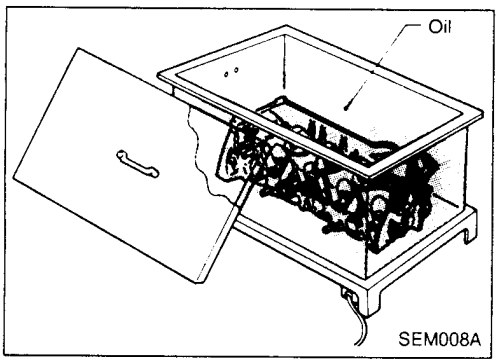
Inspection (Cont'd)

REPLACING VALVE SEAT FOR SERVICE PARTS

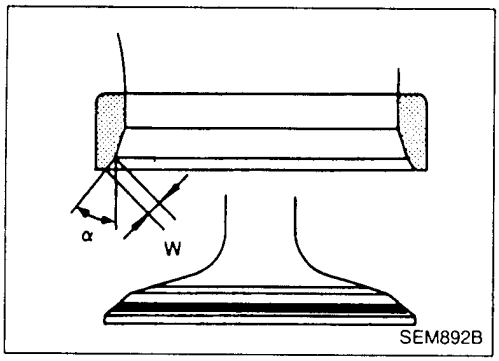


1. Bore out old seat until it collapses. Boring should not continue beyond the bottom face of the seat recess in cylinder head. Set the machine depth stop to ensure this.
2. Ream cylinder head recess.
   Reaming bore for service valve seat
   Oversize [0.5 mm (0.020 in)]:
   Intake 35.500 - 35.516 mm (1.3976 - 1.3983 in)
   Exhaust 31.500 - 31.516 mm (1.2402 - 1.2408 in)

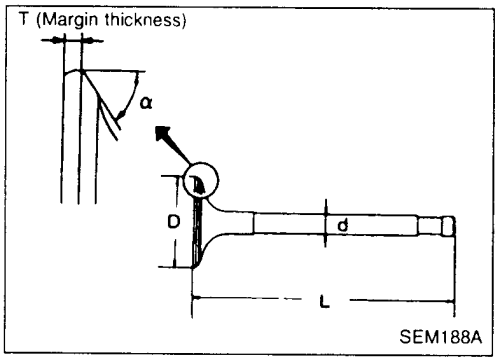
Be sure to ream in circles concentric to the valve guide center. This will enable valve seat to fit correctly.



3. Heat cylinder head to 110 to 130°C (230 to 266°F).
4. Press fit valve seat until it seats on the bottom.

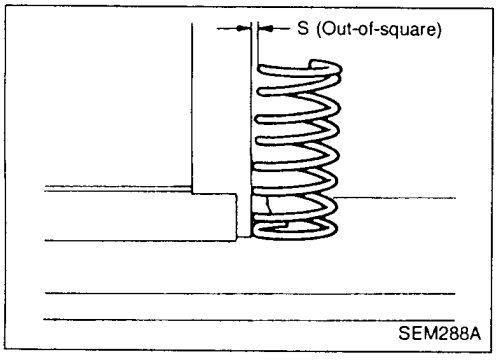


5. Cut or grind valve seat using a suitable tool at the specified dimensions as shown in SDS (EM-171).
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seating condition.
   Seat face angle "α":
   44°53′ - 45°07′
   Contacting width "W":
   Intake
   1.385 - 1.401 mm (0.0545 - 0.0552 in)
   Exhaust
   1.385 - 1.401 mm (0.0545 - 0.0552 in)



VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to SDS (EM-169).
When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.
Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.

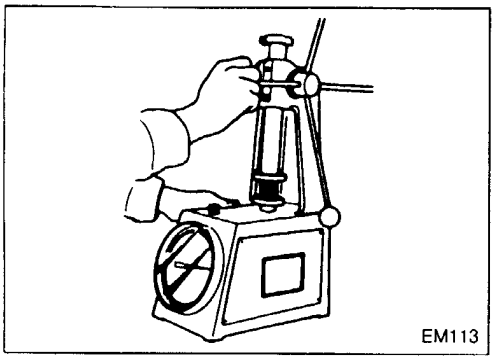


VALVE SPRING

Squareness

1. Measure "S" dimension.
   Out-of-square:
   Less than 2.2 mm (0.087 in)
2. If it exceeds the limit, replace spring.
   Free height
   Check free height: 49.36 mm (1.9433 in)

Inspection (Cont'd)


EM113

Pressure

Check valve spring pressure.

Pressure: N (kg, lb) at height mm (in)

Standard

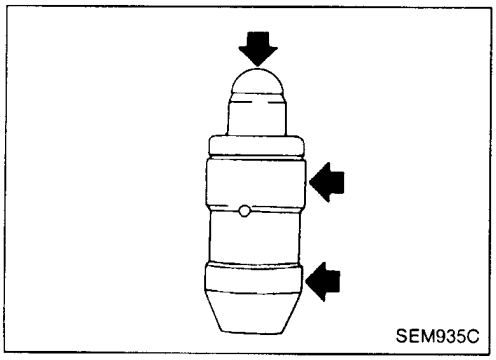
519 - 571 (52.9 - 58.2, 116.6 - 128.3) at 27 (1.063)

Limit

Replace if load is less than 501 (51.1 - 112.7) at 27 (1.063)

HYDRAULIC LASH ADJUSTER

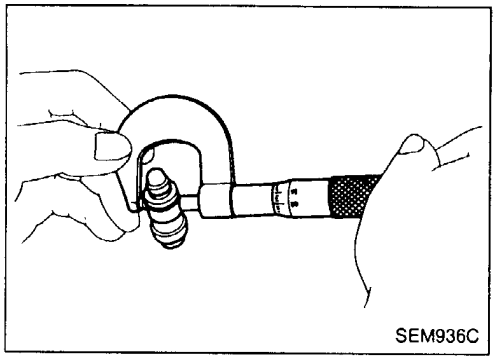
1. Check contact and sliding surfaces for wear or scratches.


SEM935C

2. Check diameter of lash adjuster.

Outer diameter:

16.980 - 16.993 mm (0.6685 - 0.6690 in)


SEM936C

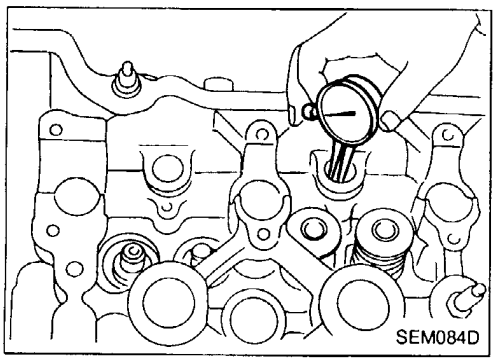
3. Check lash adjuster guide inner diameter.

Inner diameter:

17.000 - 17.020 mm (0.6693 - 0.6701 in)

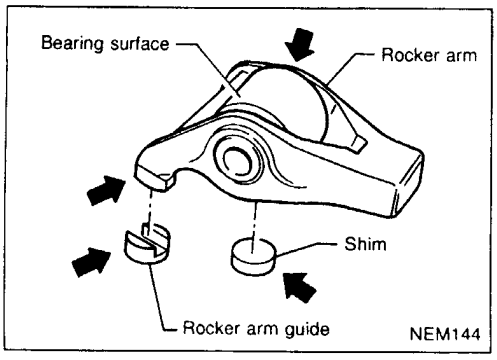
Standard clearance between lash adjuster and adjuster guide:

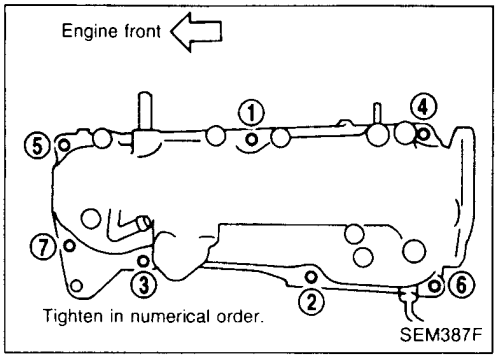
0.007 - 0.040 mm (0.0003 - 0.0016 in)


SEM084D

ROCKER ARM, SHIM AND ROCKER ARM GUIDE

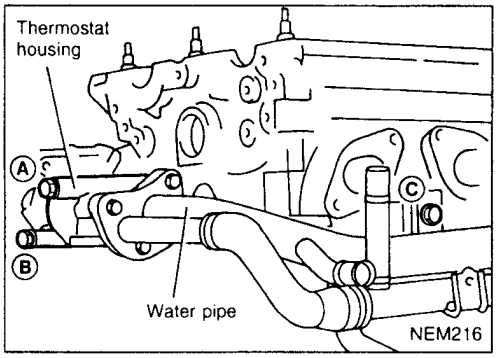
Check contact and sliding surfaces of rocker arms, shims and rocker arm guides for wear or scratches.





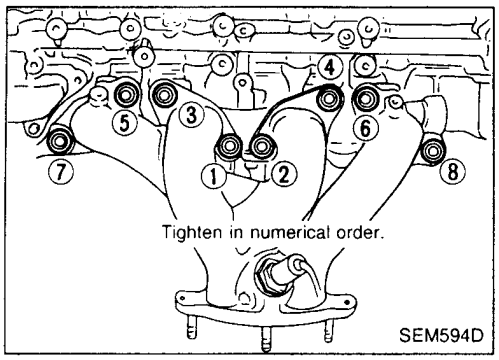
Assembly

1. Install intake manifold.
   Prefer to "INTAKE MANIFOLD", page EM-78

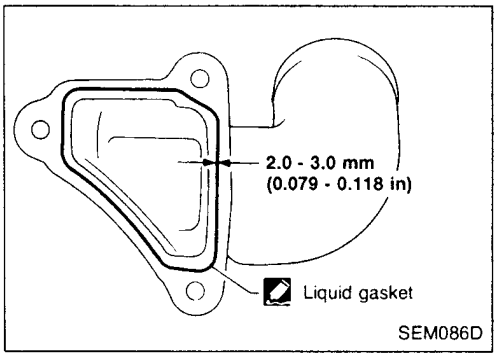


2. Install thermostat housing with water pipe.
- Tightening procedure:

1) Tighten bolt Ⓐ to 2 - 5 N·m (0.2 - 0.5 kg-m, 1.4 - 3.6 ft-lb).
2) Tighten bolt Ⓒ to 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb).
3) Tighten bolt Ⓐ to 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb).
4) Tighten bolt Ⓑ to 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb).



3. Install exhaust manifold.
4. Install exhaust manifold cover.



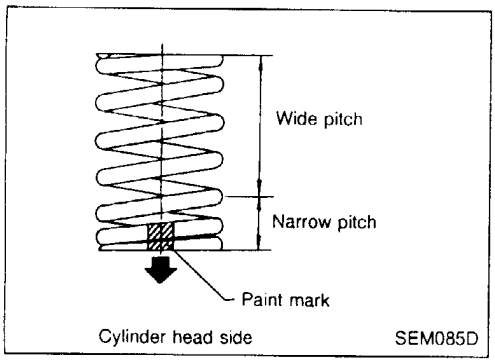
5. Install water outlet.

a. Before installing water outlet, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder head.

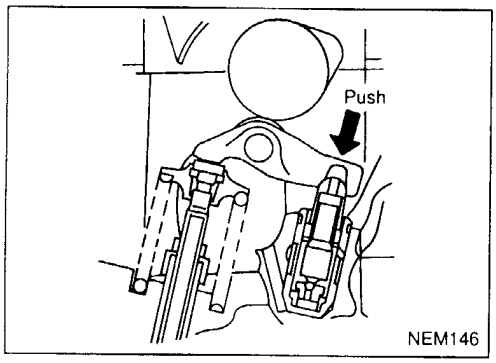
b. Apply a continuous bead of liquid gasket to mating surface of water outlet.
- **Use Genuine Liquid Gasket or equivalent.**

6. Install valve component parts.
- **Install valves with larger diameter head on the intake side.**

Assembly (Cont'd)

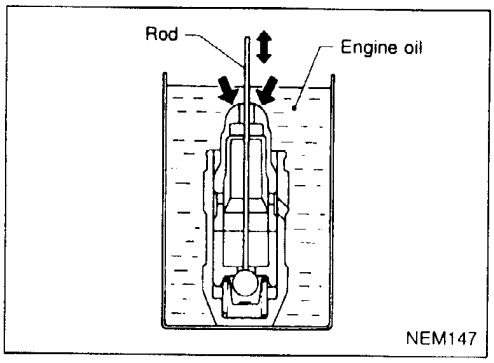


- **Always use new valve oil seal.**
  Refer to OIL SEAL REPLACEMENT.
- **Before installing valve oil seal, install valve spring seat.**
- **Install valve spring (uneven pitch type) with its narrow pitched side toward cylinder head side (paint mark).**
- **After installing valve component parts, tap valve stem tip with plastic hammer to assure a proper fit.**



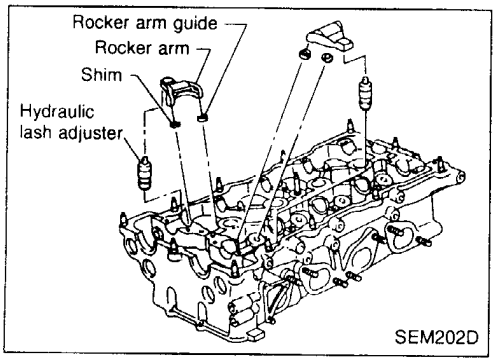
7. Check hydraulic lash adjusters.

a. Push rocker arm at hydraulic lash adjuster location, and see if rocker arm moves. If it moves at least 1 mm (0.04 in), it indicates that there is air in the high pressure chamber. Noise will be emitted from hydraulic lash adjuster if engine is started without bleeding air.



b. Remove hydraulic lash adjuster and dip in a container filled with engine oil. While pushing plunger as shown in figure, lightly push check ball using a thin rod. Air is completely bled when plunger no longer moves.

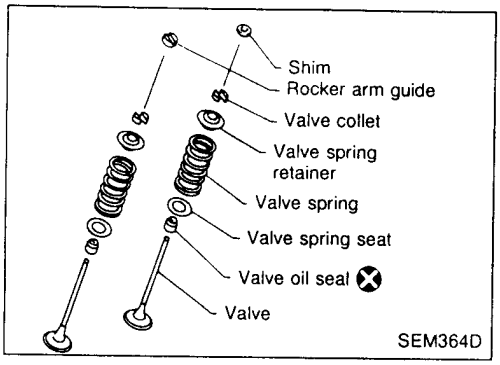
Air cannot be bled from this type of lash adjuster by running the engine.



8. Install rocker arms, shims, rocker arm guides and hydraulic lash adjusters.

CAUTION:
Install all parts in their original positions.

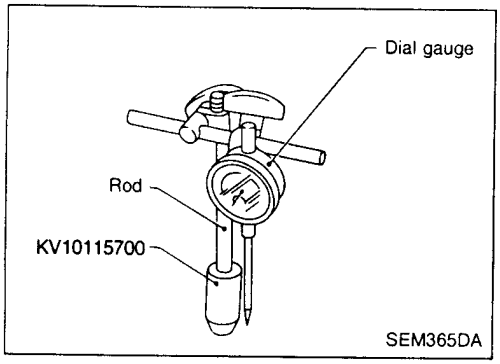
Assembly (Cont'd)



9. Select a suitable shim when replacing any of the following parts with a new one: Cylinder head, shim, rocker arm guide and valve seat. Proceed as follows to select the shim of correct thickness.

a. Install valve component parts to cylinder head (Except shim).

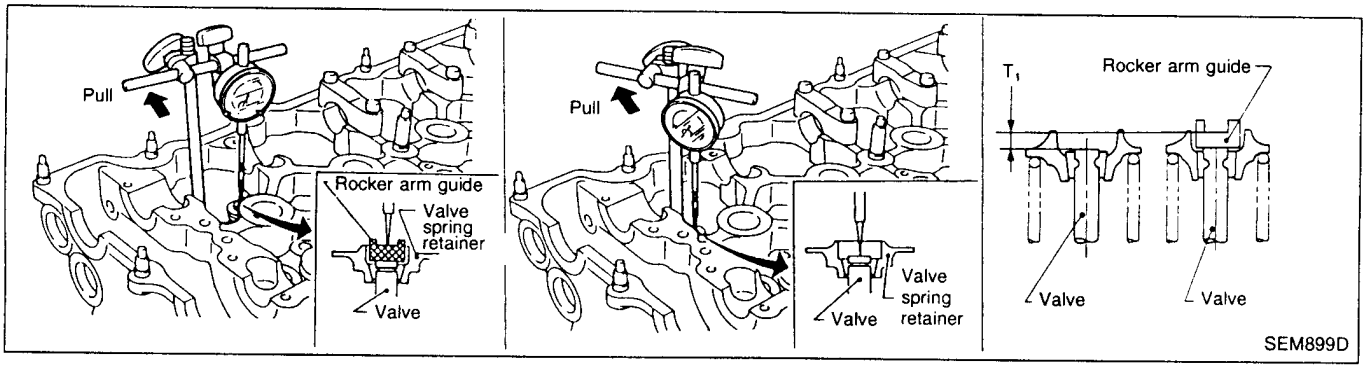
- Always replace rocker arm guide with a new one.



b. Remove hydraulic lash adjuster.

c. Install Tool* into hydraulic lash adjuster fixing hole.

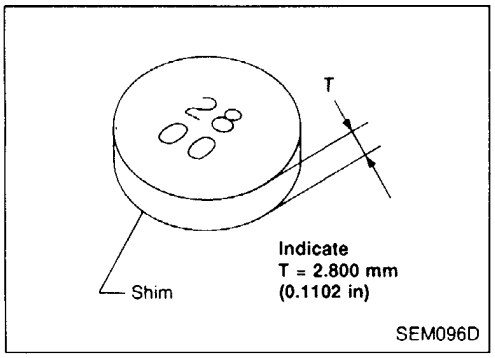
* Tool (KV10115700) is screwed into magnetic stand rod used with dial gauge.



d. Make sure that the following parts are installed to the cylinder head: Valve, valve spring, collet, retainer and rocker arm guide (except shim). Measure difference (T_1) between sliding surface of rocker arm guide and valve stem end on shim side.

When measuring, lightly pull dial indicator rod toward you to eliminate play in Tool (KV10115700).

Assembly (Cont'd)



e. Select correct shim.

Shim thickness (T):

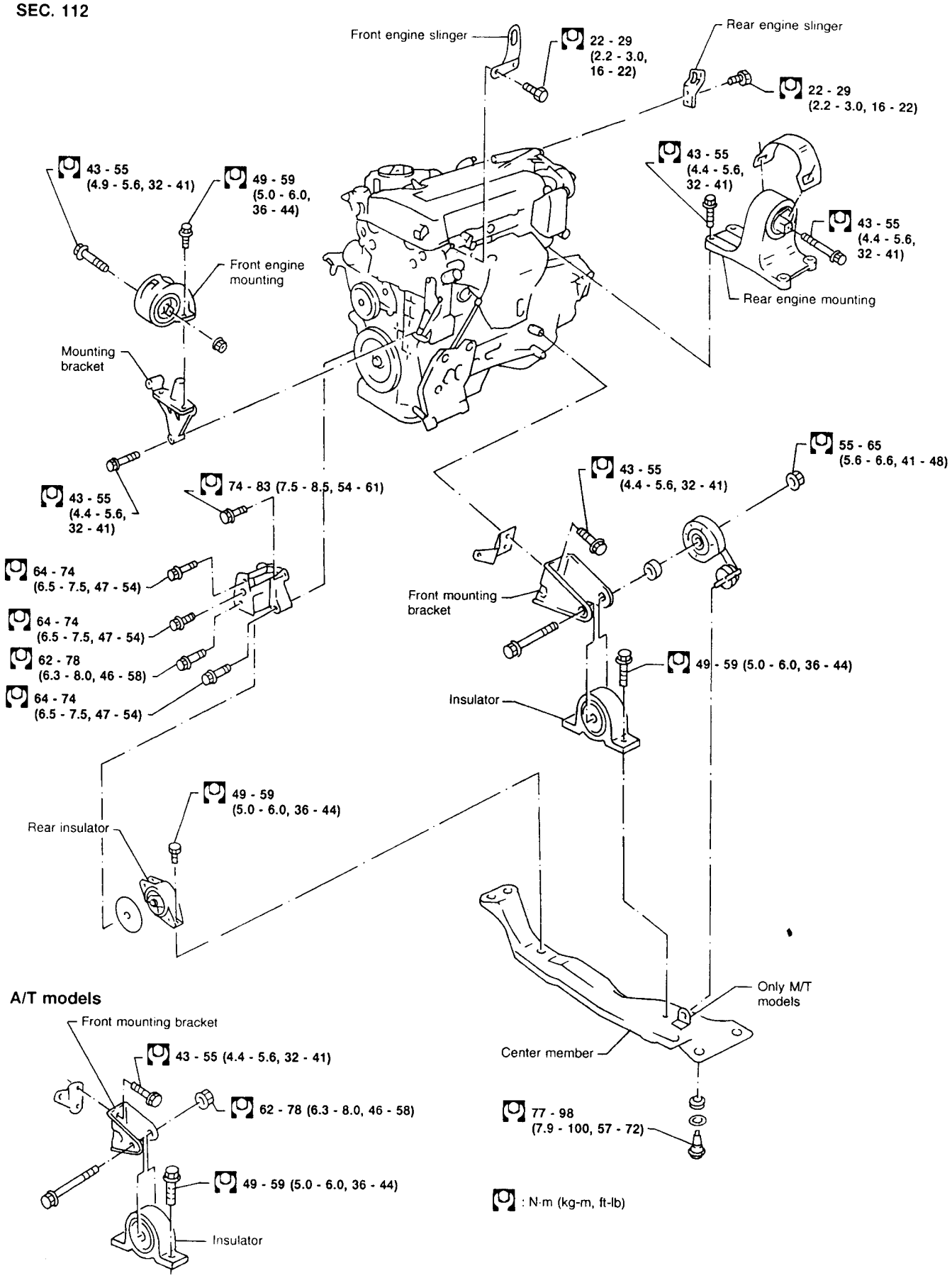
T_1 ± 0.025 mm (0.0010 in)

- Shims are available in different thicknesses from 2.800 mm (0.1102 in) to 3.200 mm (0.1260 in) in increments of 0.025 mm (0.0010 in).

Installation

- This installation is the same procedure as those for timing chain. Refer to "Installation" in "TIMING CHAIN" (EM-75).

SEC. 112



A/T models

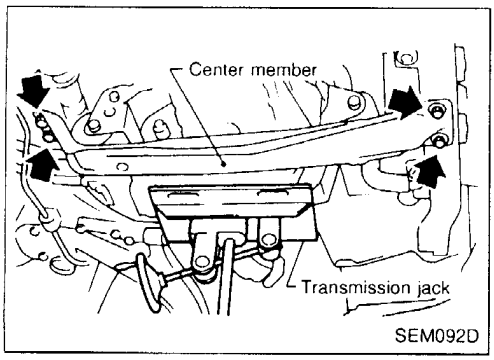
NEM148

WARNING:
- Position vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.
- Do not remove engine until exhaust system has completely cooled;
  Otherwise, you may burn yourself and/or fire may break out in fuel line.
- Before disconnecting fuel hose, release fuel pressure from fuel line.
  Refer to "Releasing Fuel Pressure" in EC section.
- Be sure to hoist engine and transaxle in a safe manner.
- For engines not equipped with engine slingers, attach slingers and bolts described in PARTS CATALOG.

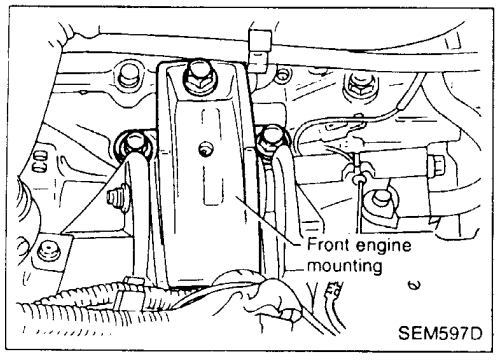
CAUTION:
- When lifting engine, be sure to clear surrounding parts. Use special care for accelerator cable, brake lines and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.
- When removing drive shaft, be careful not to damage grease seal of transaxle.

Removal

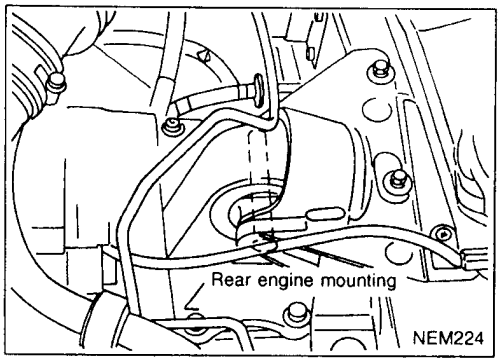
1. Remove engine under cover and hood.
2. Drain coolant from both cylinder block, and radiator.
3. Drain engine oil.
4. Remove vacuum hoses, fuel hoses, wires, harness and connectors.
5. Remove exhaust tubes, ball joints and drive shafts.
6. Remove radiator and fans.
7. Remove drive belts.
8. Remove alternator, compressor and power steering oil pump from engine.
9. Set a suitable transmission jack under transaxle. Hoist engine with engine slinger.
10. Remove center member.

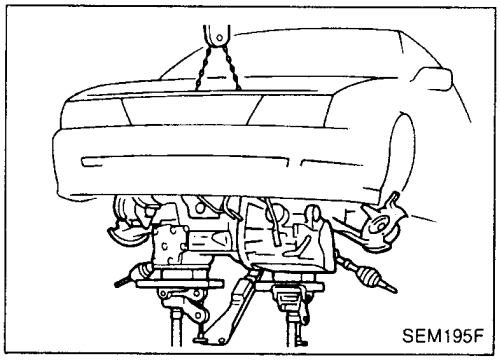


11. Remove engine mounting bolts from both sides and then slowly lower transmission jack.



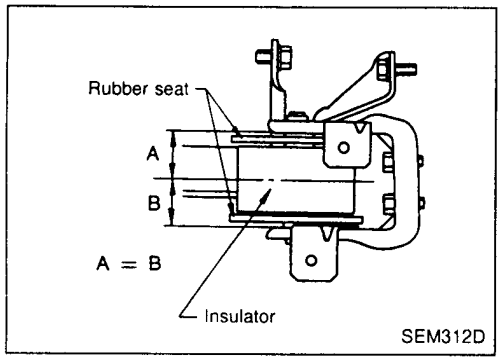
Removal (Cont'd)





12. Remove engine with transaxle as shown.

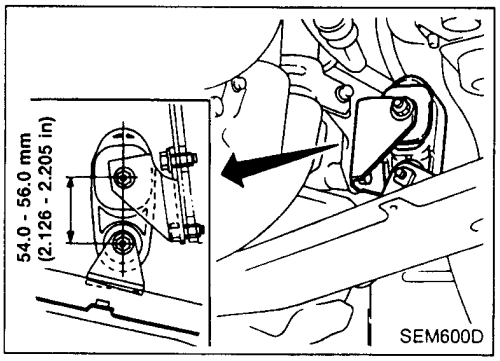
Installation



1. Install engine mounting bracket and fixing bolts.

Be sure that insulators are correctly positioned on the brackets.

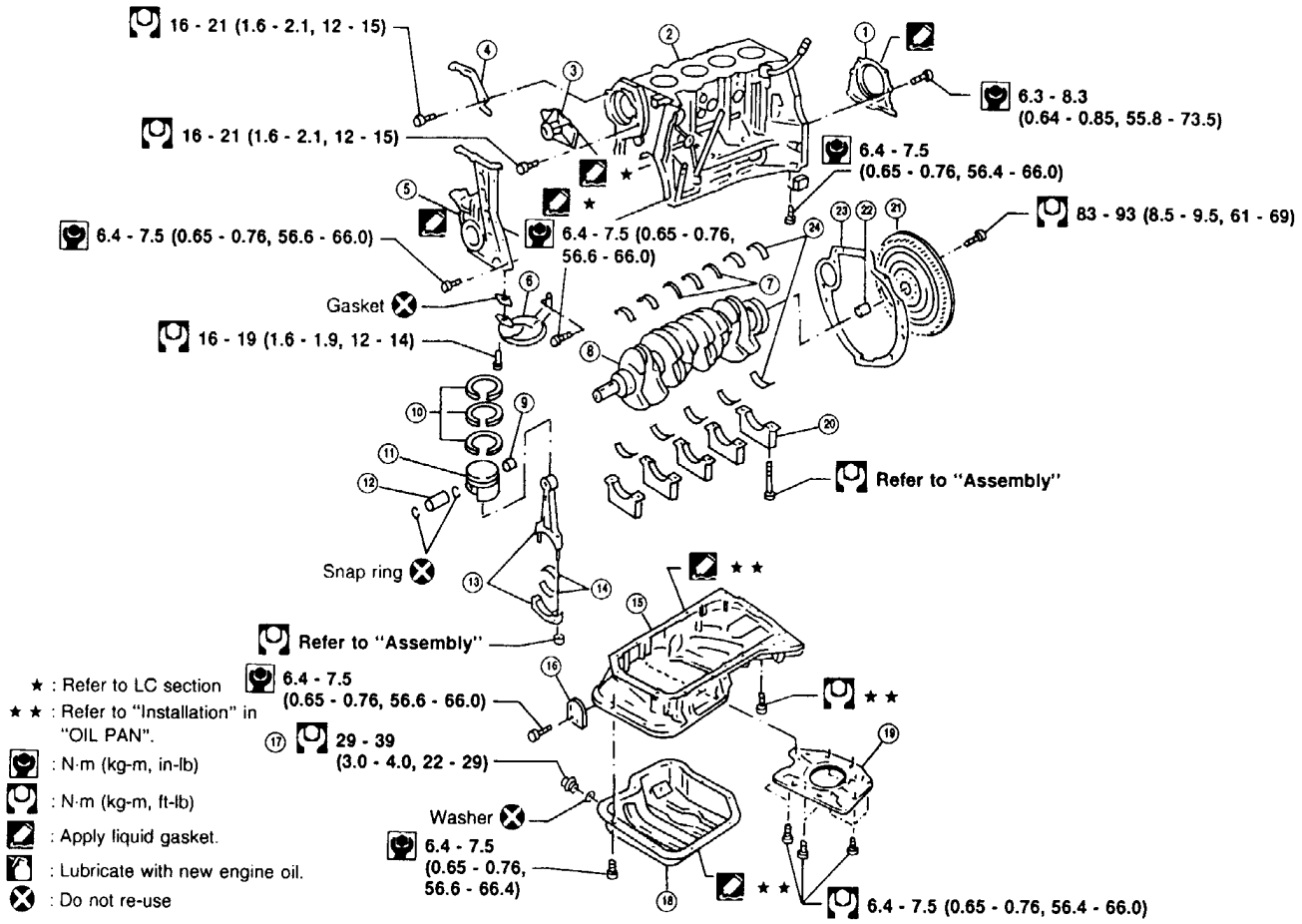
2. Carefully lower the engine onto engine mounting insulators.



When installing the engine, adjust the height of the engine mounting as shown. (For M/T)

3. Installation is in the reverse order of removal.

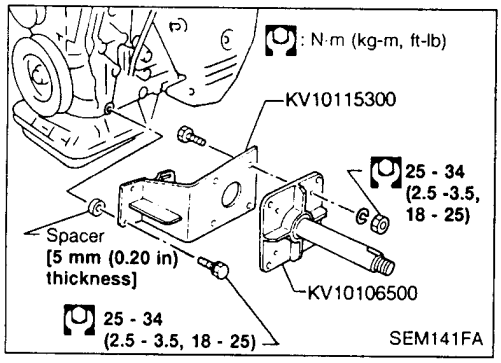
SEC. 110•120•150



NEM225

① Rear oil seal retainer
② Cylinder block
③ Water pump
④ Power steering oil pump adjusting bar
⑤ Front cover with oil pump
⑥ Oil strainer
⑦ Thrust bearing
⑧ Crankshaft
⑨ Connecting rod bushing
⑩ Piston rings
⑪ Piston
⑫ Piston pin
⑬ Connecting rod
⑭ Connecting rod bearing
⑮ Aluminum oil pan
⑯ Rear cover plate
⑰ Drain plug
⑱ Steel oil pan
⑲ Baffle plate
⑳ Main bearing cap
㉑ Flywheel
㉒ Pilot bushing
㉓ Rear plate
㉔ Main bearing

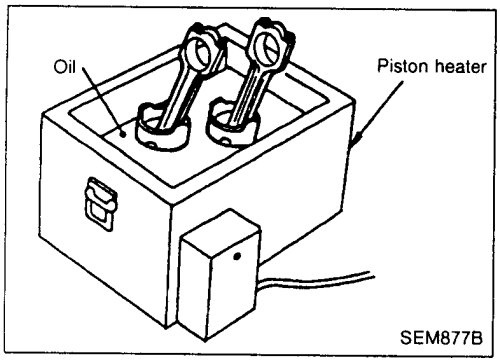
CAUTION:
- **When installing sliding parts (bearings, pistons, etc.), apply new engine oil to the sliding surfaces.**
- **Place removed parts such as bearings and bearing caps in their correct order and direction.**
- **When installing connecting rod nuts and main bearing cap bolts, apply new engine oil to threads and seating surfaces.**
- **Do not allow any magnetic materials to contact the ring gear teeth of flywheel/drive plate.**



Disassembly

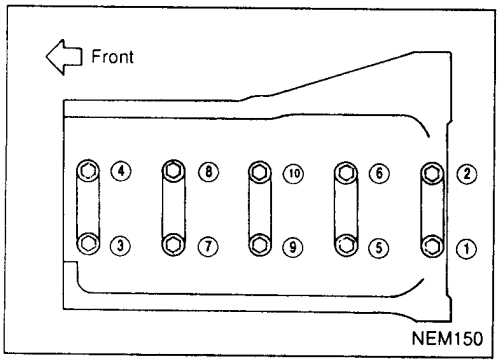
PISTON AND CRANKSHAFT

1. Place engine on a work stand.
2. Remove cylinder head.
   Refer to "Removal" in "TIMING CHAIN" (EM-63).
3. Remove oil pan.
   Refer to "Removal" in "OIL PAN" (EM-57).
4. Remove timing chain.
   Refer to "Removal" in "TIMING CHAIN" (EM-63).



5. Remove pistons with connecting rods.
- When disassembling piston and connecting rod, remove snap ring first. Then heat piston to 60 to 70°C (140 to 158°F), or use piston pin press stand at room temperature.

6. Remove rear oil seal retainer.

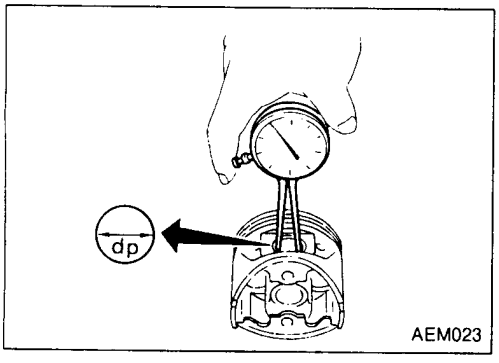


7. Remove bearing caps and crankshaft in numerical order as shown in the figure.
- **Before removing bearing cap, measure crankshaft end play.**
- **Bolts should be loosened in two or three steps.**

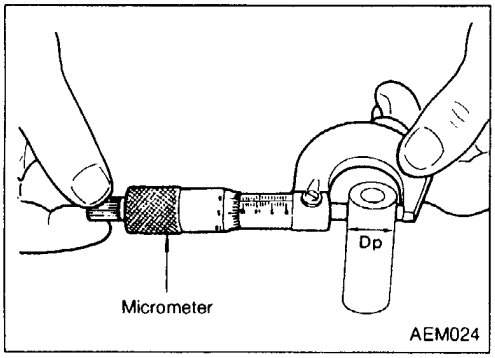
Inspection

PISTON AND PISTON PIN CLEARANCE

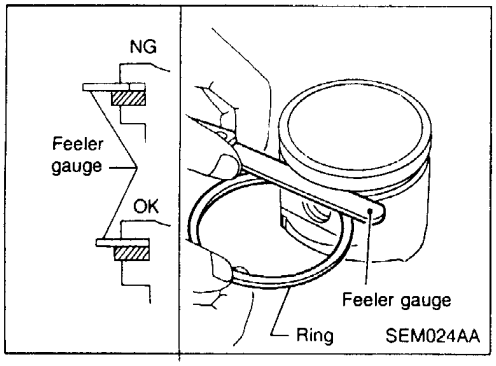
1. Measure inner diameter of piston pin hole "dp".
   Standard diameter "dp":
   21.993 - 22.005 mm (0.8659 - 0.8663 in)



Inspection (Cont'd)



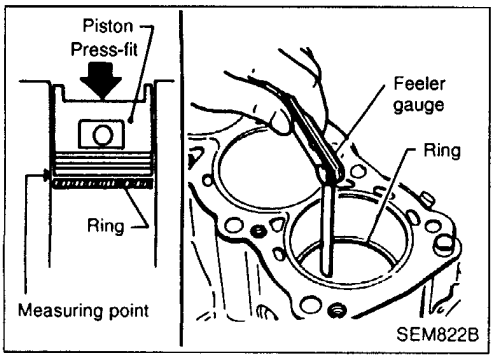
2. Measure outer diameter of piston pin "Dp".
   Standard diameter "Dp":
   21.989 - 22.001 mm (0.8657 - 0.8662 in)
3. Calculate piston pin clearance.
   dp – Dp = –0.006 to 0.002 mm (–0.0002 to 0.0001 in)
   If it exceeds the above value, replace piston assembly with pin.



PISTON RING SIDE CLEARANCE

Side clearance:
Top ring 0.040 - 0.080 mm (0.0016 - 0.0031 in)
2nd ring 0.030 - 0.070 (0.0012 - 0.0028 in)
Max. limit of side clearance:
0.2 mm (0.008 in)

If out of specification, replace piston and/or piston ring assembly.

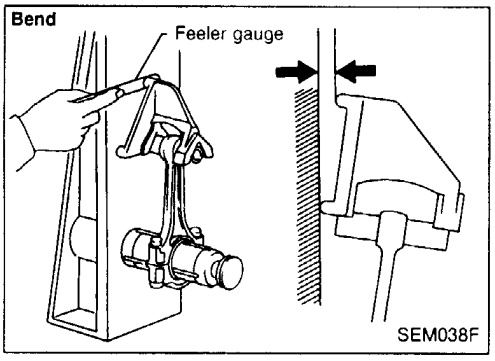


PISTON RING END GAP

End gap:
Top ring 0.20 - 0.30 mm (0.0079 - 0.0118 in)
2nd ring 0.35 - 0.50 mm (0.0138 - 0.0197 in)
Oil ring 0.20 - 0.60 mm (0.0079 - 0.0236 in)
Max. limit of ring gap:
1.0 mm (0.039 in)

If out of specification, replace piston ring. If gap still exceeds the limit even with a new ring, do the following. Rebore cylinder and use over-sized piston and piston rings.
Refer to SDS (EM-175).

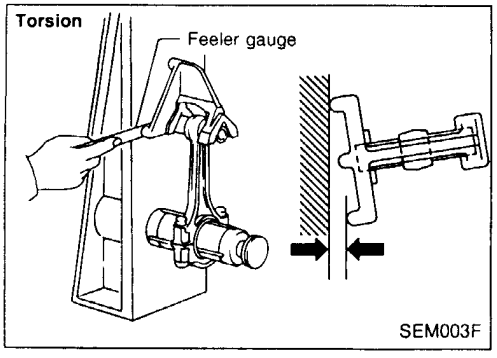
- When replacing the piston, inspect cylinder block surface for scratches or seizure. If scratches or seizure are found, hone or replace the cylinder block.



CONNECTING ROD BEND AND TORSION

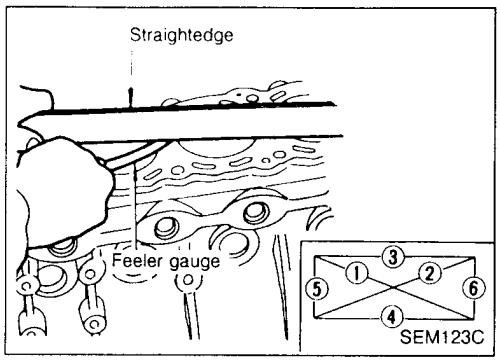
Bend:
Limit 0.15 mm (0.0059 in)
per 100 mm (3.94 in) length
Torsion:
Limit 0.30 mm (0.0118 in)
per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.

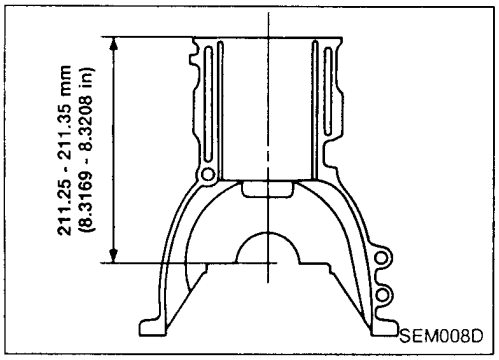


Inspection (Cont'd)

CYLINDER BLOCK DISTORTION AND WEAR



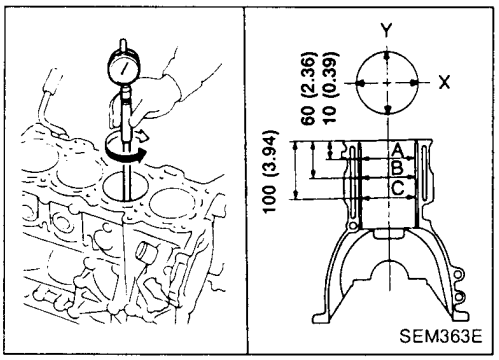
1. Clean upper face of cylinder block and measure the distortion.
   Standard:
   Less than 0.03 mm (0.0012 in)
   Limit:
   0.10 mm (0.0039 in)
2. If out of specification, resurface it.
   The resurfacing limit is determined by cylinder head resurfacing in engine.



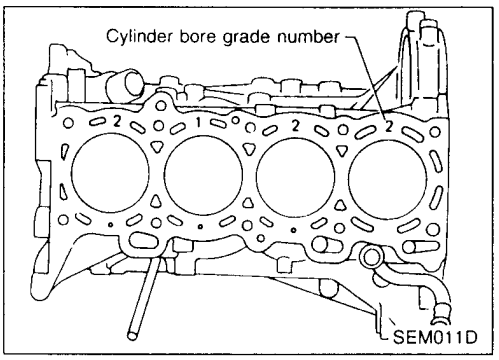
Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)
Nominal cylinder block height from crankshaft center:
211.25 - 211.35 mm (8.3169 - 8.3208 in)

3. If necessary, replace cylinder block.

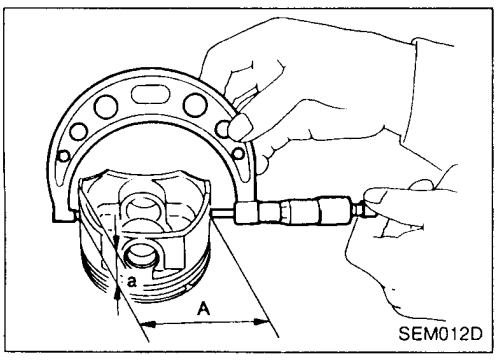
PISTON-TO-BORE CLEARANCE



1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.
   Standard inner diameter:
   86.000 - 86.030 mm (3.3858 - 3.3870 in)
   Wear limit: 0.20 mm (0.0079 in)
   If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.
   Out-of-round (X – Y) standard:
   Less than 0.015 mm (0.0006 in)
   Taper (A – B and A – C) standard:
   Less than 0.010 mm (0.0004 in)
2. Check for scratches and seizure. If seizure is found, hone it.



- **When replacing both cylinder block and piston with new ones, select piston making sure of grade numbers. Piston grade number should be the same as the grade number punched on cylinder block upper surface.**



3. Measure piston skirt diameter.
   Piston diameter "A": Refer to SDS (EM-174).
   Measuring point "a" (Distance from the bottom):
   13.1 mm (0.516 in)
4. Check that piston-to-bore clearance is within specification.
   Piston-to-bore clearance "B":
   0.010 - 0.030 mm (0.0004 - 0.0012 in)
5. Determine piston oversize according to amount of cylinder wear.

Oversize pistons are available for service. Refer to SDS (EM-174).

Inspection (Cont'd)

6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".
   Rebored size calculation:
   D = A + B – C
   where,
   D: Bored diameter
   A: Piston diameter as measured
   B: Piston-to-bore clearance
   C: Honing allowance 0.02 mm (0.0008 in)
7. Install main bearing caps, and tighten to the specified torque.

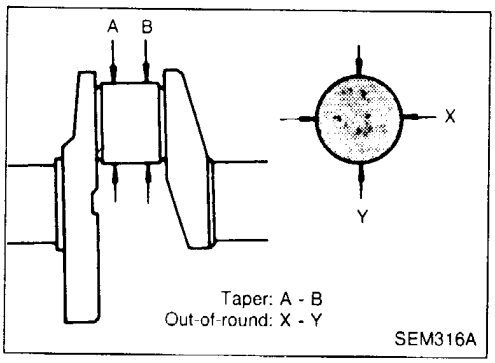
- **Otherwise, cylinder bores may be distorted in final assembly.**

8. Cut cylinder bores.

- **When any cylinder needs boring, all other cylinders must also be bored.**
- **Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**

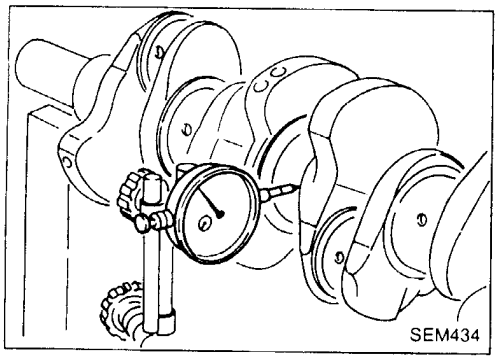
9. Hone cylinders to obtain specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.

- **Measurement should be done after cylinder bore cools down.**



CRANKSHAFT

1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out- of-round.
   Out-of-round (X – Y) standard:
   Main journal:
   Less than 0.005 mm (0.0002 in)
   Pin journal:
   Less than 0.0025 mm (0.0001 in)
   Taper (A – B) standard:
   Main journal:
   Less than 0.005 mm (0.0002 in)
   Pin journal:
   Less than 0.0025 mm (0.0001 in)



3. Measure crankshaft runout.
   Runout (Total indicator reading) limit:
   Less than 0.05 mm (0.0020 in)

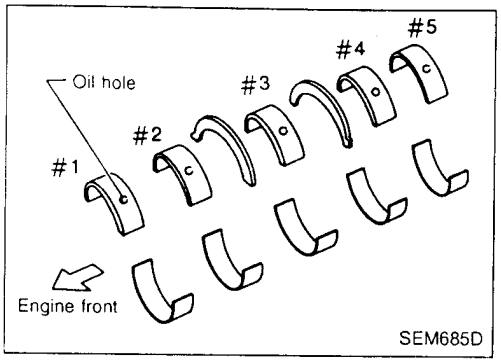
Inspection (Cont'd)

BEARING CLEARANCE

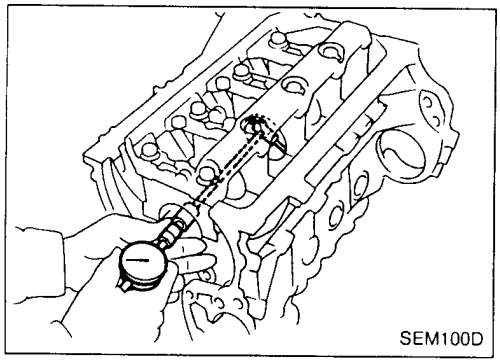
- Use either of the following two methods, however, method "A" gives more reliable results and is preferred.

Method A (Using bore gauge & micrometer)

Main bearing



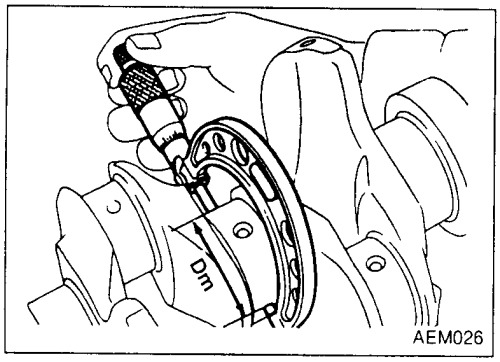
1. Set main bearings in their proper positions on cylinder block and main bearing cap.



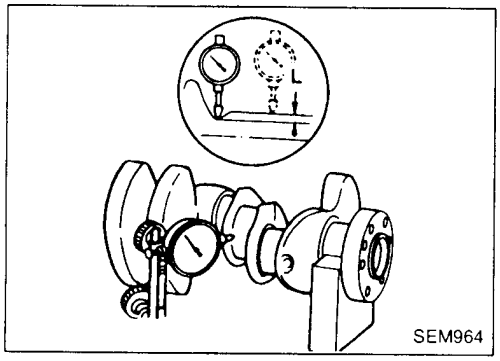
2. Install main bearing caps to cylinder block.

Tighten all bolts in correct order in two or three stages.

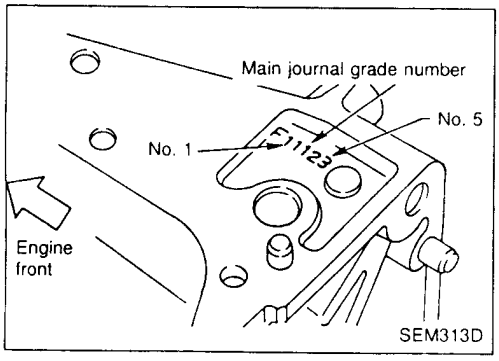
3. Measure inner diameter "A" of each main bearing.



4. Measure outer diameter "Dm" of each crankshaft main journal.
5. Calculate main bearing clearance.
   Main bearing clearance = A – Dm
   Standard: 0.004 - 0.022 mm (0.0002 - 0.0009 in)
   Limit: 0.050 mm (0.0020 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

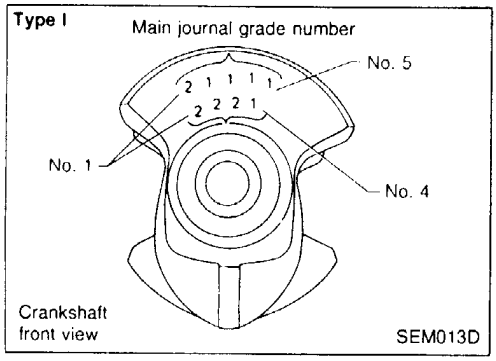


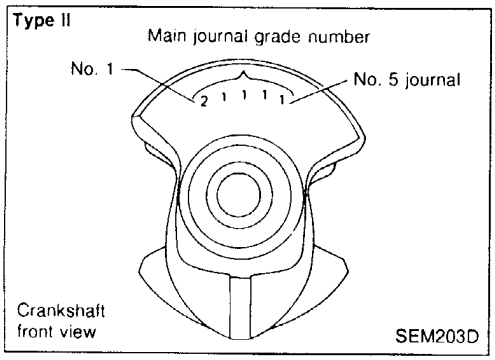
a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.
   "L": 0.1 mm (0.004 in)
b. Refer to SDS for grinding crankshaft and available service parts.



8. If crankshaft is reused, measure main bearing clearances and select thickness of main bearings.
   If crankshaft is replaced with a new one, select thickness of main bearings as follows:
a. Grade number of each cylinder block main journal is punched on the respective cylinder block. These numbers are punched in either Arabic or Roman numerals.

Inspection (Cont'd)



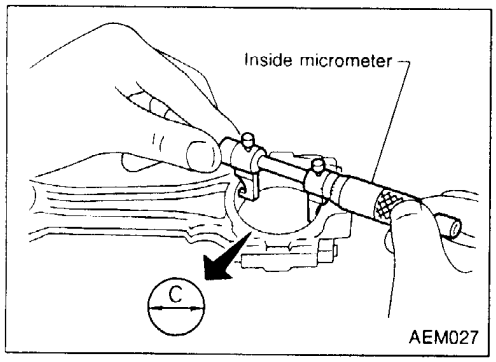


b. Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Roman numerals.
c. Select main bearing with suitable thickness according to the following table.

How to select main bearings (Identification mark and color)

Crankshaft main journal grade number	Cylinder block main journal grade number			
	0	1	2	3
0	0 (A, Black)	1 (B, Brown)	2 (C, Green)	3 (D, Yellow)
1	1 (B, Brown)	2 (C, Green)	3 (D, Yellow)	4 (E, Blue)
2	2 (C, Green)	3 (D, Yellow)	4 (E, Blue)	5 (F, Pink)
3	3 (D, Yellow)	4 (E, Blue)	5 (F, Pink)	6 (G, White)

For example:
Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2
= 3 (D, Yellow)

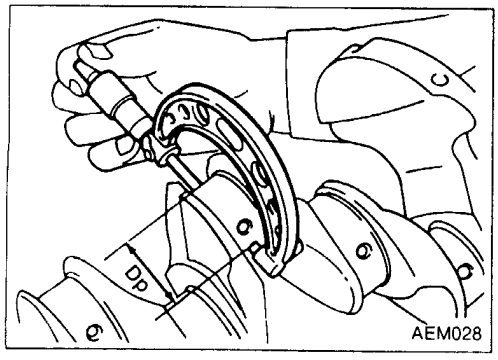


Connecting rod bearing (Big end)

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

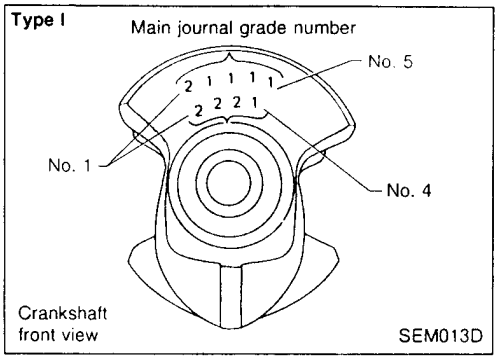
Tighten bolts to the specified torque.

3. Measure inner diameter "C" of each bearing.



4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance = C – Dp
   Standard: 0.020 - 0.045 mm (0.0008 - 0.0018 in)
   Limit: 0.065 mm (0.0026 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing. Refer to step 7 of "BEARING CLEARANCE – Main bearing" (EM-101).

Inspection (Cont'd)

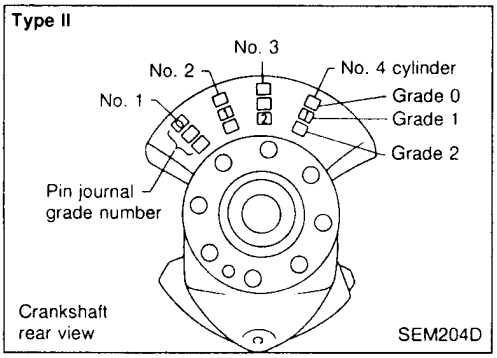


8. If crankshaft is replaced with a new one, select connecting rod bearing according to the following table.

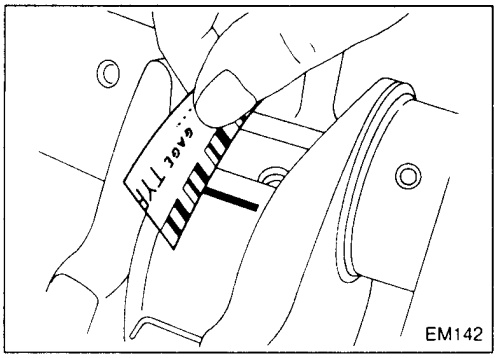
Connecting rod bearing grade number:

These numbers are punched in either Arabic or Roman numerals.

Crank pin grade number	Connecting rod bearing grade number
0	0
1	1
2	2



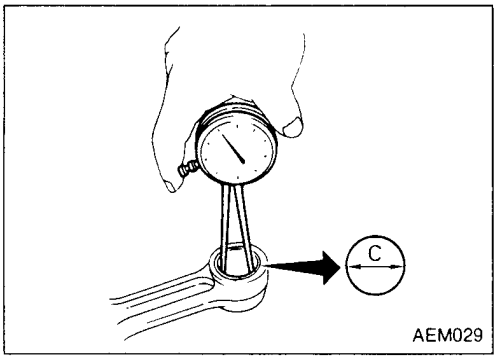
Identification color:
Grade 0; Black
Grade 1; Brown
Grade 2; Green



Method B (Using plastigage)

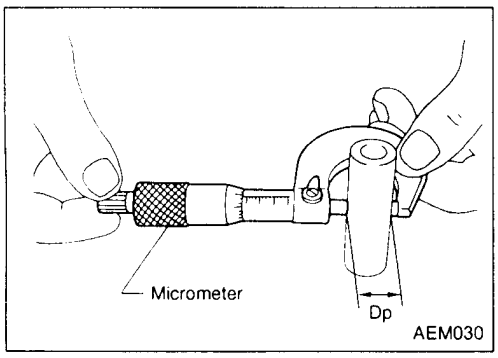
CAUTION:

- **Do not turn crankshaft or connecting rod while plastigage is being inserted.**
- **When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. If incorrect bearing clearance exists, use a thicker or undersized main bearing to ensure specified clearance.**



CONNECTING ROD BUSHING CLEARANCE (Small end)

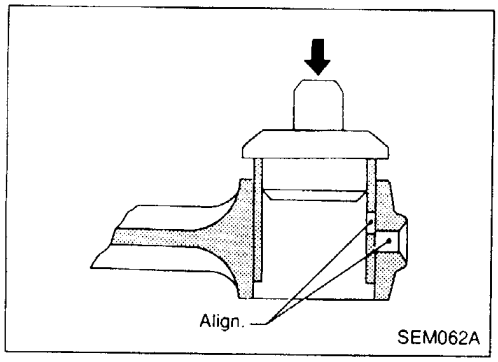
1. Measure inner diameter "C" of bushing.
   Refer to SDS EM-175 - "CONNECTING ROD"



2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bushing clearance.
   Connecting rod bushing clearance = C – Dp
   Standard:
   0.005 - 0.017 mm (0.0002 - 0.0007 in)
   Limit:
   0.023 mm (0.0009 in)
   If it exceeds the limit, replace connecting rod assembly or connecting rod bushing and/or piston set with pin.

Inspection (Cont'd)

REPLACEMENT OF CONNECTING ROD BUSHING (Small end)



1. Drive in small end bushing until it is flush with end surface of rod.

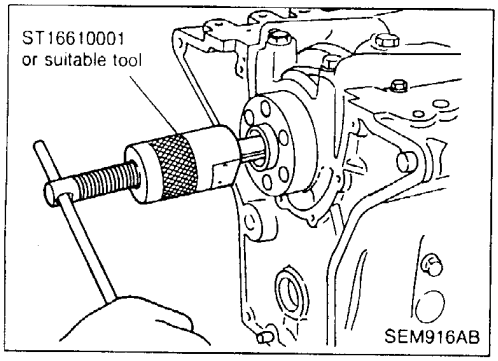
Be sure to align the oil holes.

2. After driving in small end bushing, ream the bushing. This is to ensure the clearance between connecting rod bushing and piston pin is the specified value.

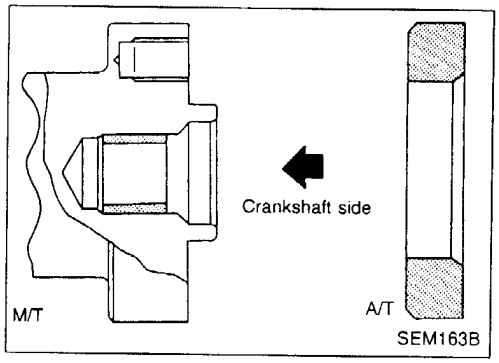
Clearance between connecting rod bushing and piston pin:

0.005 - 0.017 mm (0.0002 - 0.0007 in)

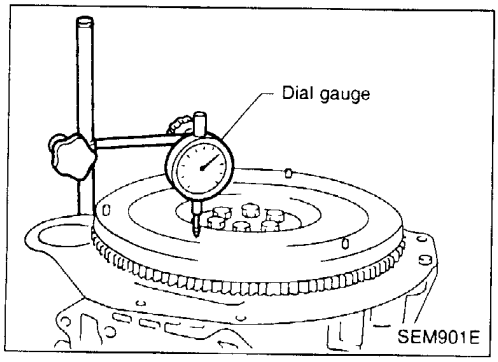
REPLACEMENT OF PILOT BUSHING (M/T) OR PILOT CONVERTER (A/T)



1. Remove pilot bushing or pilot converter using Tool or suitable tool.



2. Install pilot bushing or pilot converter as shown.



FLYWHEEL/DRIVE PLATE RUNOUT

Runout (Total indicator reading):

Flywheel (M/T model)

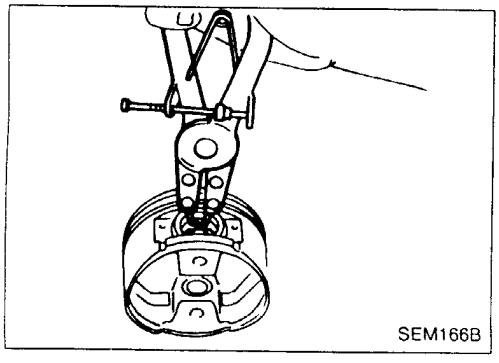
Less than 0.15 mm (0.0059 in)

Drive plate (A/T model)

Less than 0.20 mm (0.0079 in)

CAUTION:

Do not allow any magnetic materials to contact the ring gear teeth.

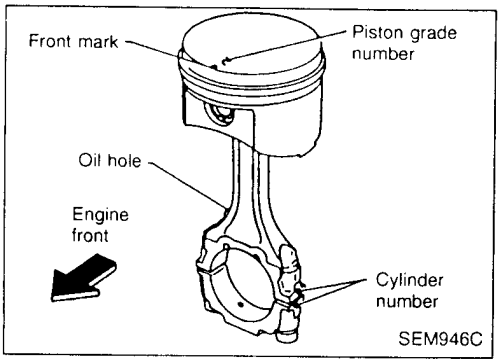


Assembly

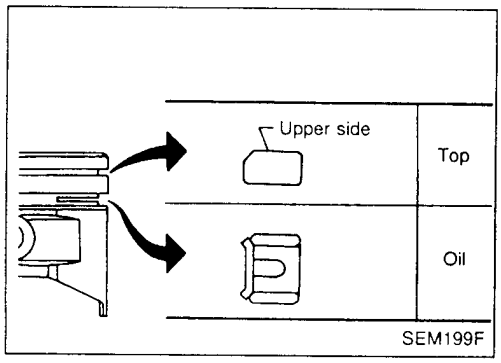
PISTON

1. Install new snap ring on one side of piston pin hole.

Assembly (Cont'd)

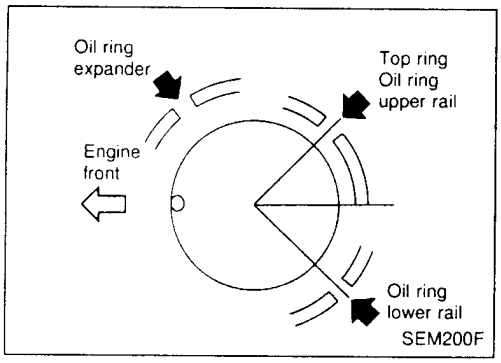


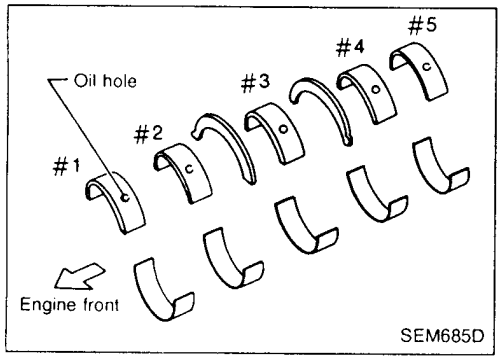
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.
- **Align the direction of piston and connecting rod.**
- **Numbers stamped on connecting rod and cap correspond to each cylinder.**
- **After assembly, make sure connecting rod swings smoothly.**



3. Set piston rings as shown.

CAUTION:
- **When piston rings are not replaced, make sure that piston rings are mounted in their original positions.**
- **When replacing piston rings, those without punchmarks can be mounted with either side up.**

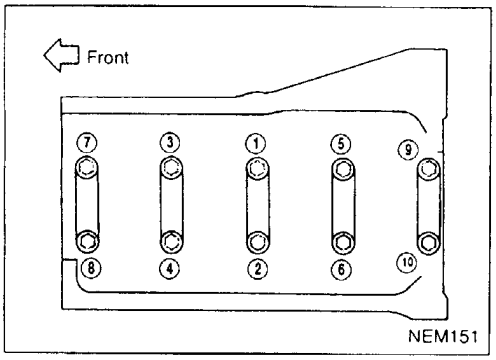




CRANKSHAFT

1. Set main bearings in their proper positions on cylinder block and main bearing cap.
- **Confirm that correct main bearings are used. Refer to "Inspection" of this section.**
- **Apply new engine oil to bearing surfaces.**

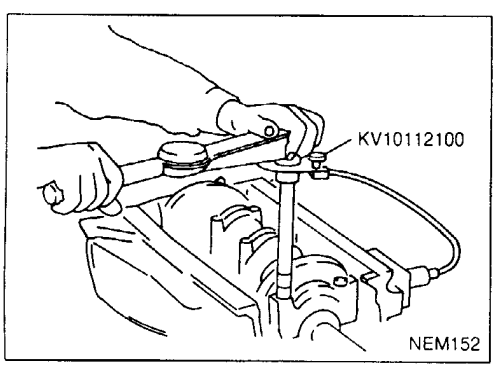
Assembly (Cont'd)

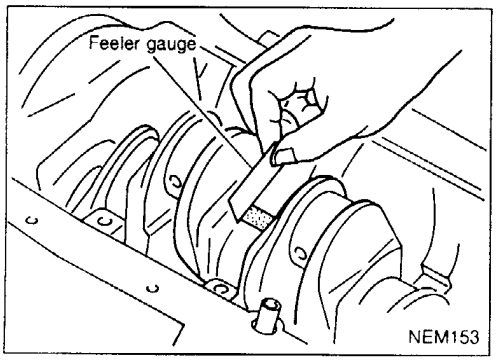


2. Install crankshaft and main bearing caps and tighten bolts to the specified torque and in numerical order as shown in the figure.
- **Apply new engine oil to thread of bearing cap bolts.**
- **Prior to tightening bearing cap bolts, shift crankshaft back and forth to properly seat the bearing cap.**
- **Tightening procedure**

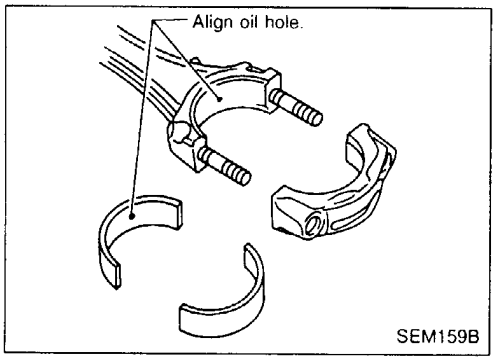
a. **Tighten all bolts to 7 to 13 N·m (0.7 to 1.3 kg-m, 5.2 to 9.4 ft-lb).**
b. **Turn all bolts 75 to 80 degrees clockwise with Tool or suitable angle wrench.**
c. **Loosen all bolts completely.**
d. **Tighten all bolts to 32 to 38 N·m (3.3 to 3.9 kg-m, 24 to 28 ft-lb).**
e. **Turn all bolts 30 to 35 degrees clockwise with Tool or suitable angle wrench.**

- **If an angle wrench is not available, mark all bearing cap bolts on the side facing engine rear. Then, turn each bolt specified degrees clockwise. Confirm angle of degrees with a graduator, not by eye-measurement.**
- **After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.**

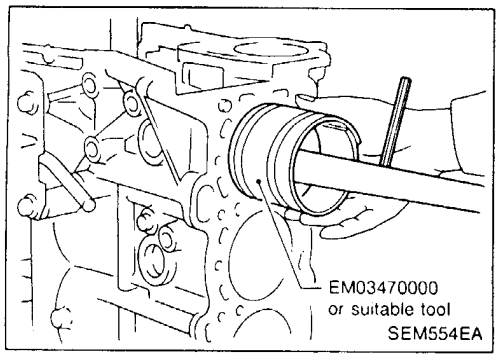




3. Measure crankshaft end play.
Crankshaft end play:
Standard
0.10 - 0.26 mm (0.0039 - 0.0102 in)
Limit
0.30 mm (0.0118 in)
If beyond the limit, replace thrust bearings with new ones.

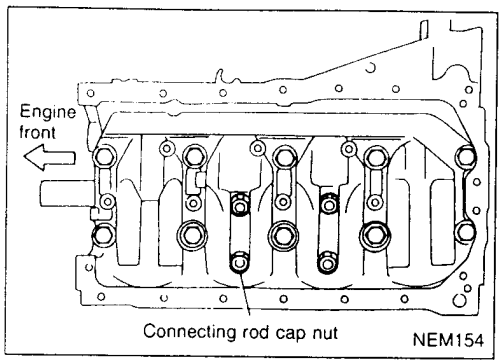


4. Install connecting rod bearings in connecting rods and connecting rod caps.
- **Confirm that correct bearings are used. Refer to "Inspection".**
- **Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.**
- **Apply new engine oil to bolt threads and bearing surfaces.**

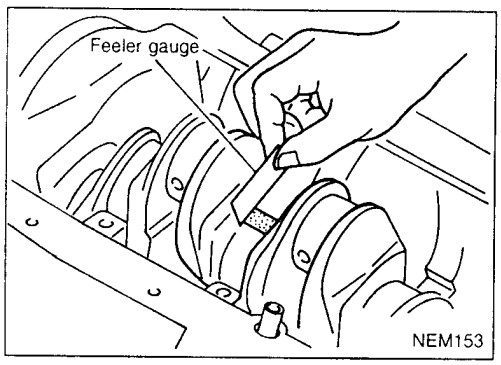


5. Install pistons with connecting rods.
a. Install them into corresponding cylinders with Tool.
- **Be careful not to scratch cylinder wall by connecting rod.**
- **Arrange so that front mark on piston head faces toward front of engine.**
- **Apply new engine oil to piston rings and sliding surface of piston.**

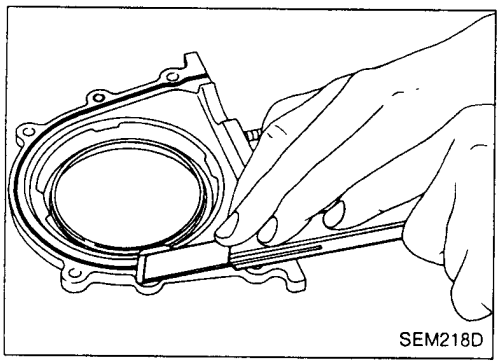
Assembly (Cont'd)



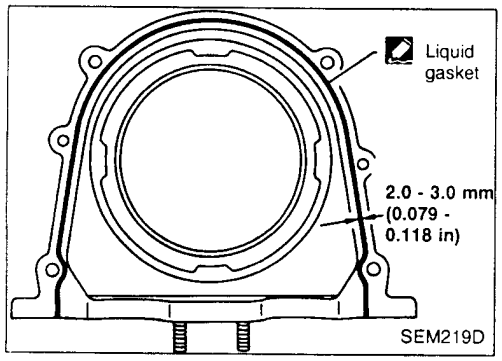
b. Install connecting rod caps.
Tighten connecting rod cap nuts to the specified torque.
Tightening procedure:
1) Tighten nuts to 14 to 16 N·m (1.4 to 1.6 kg-m, 10 to 12 ft-lb).
2) Turn nuts 60 to 65 degrees clockwise with angle wrench. If angle wrench is not available, tighten nuts to 38 to 44 N·m (3.9 to 4.5 kg-m, 28 to 33 ft-lb).



6. Measure connecting rod side clearance.
Connecting rod side clearance:
Standard
0.20 - 0.35 mm (0.0079 - 0.0138 in)
Limit
0.50 mm (0.0197 in)
If beyond the limit, replace connecting rod and/or crankshaft.



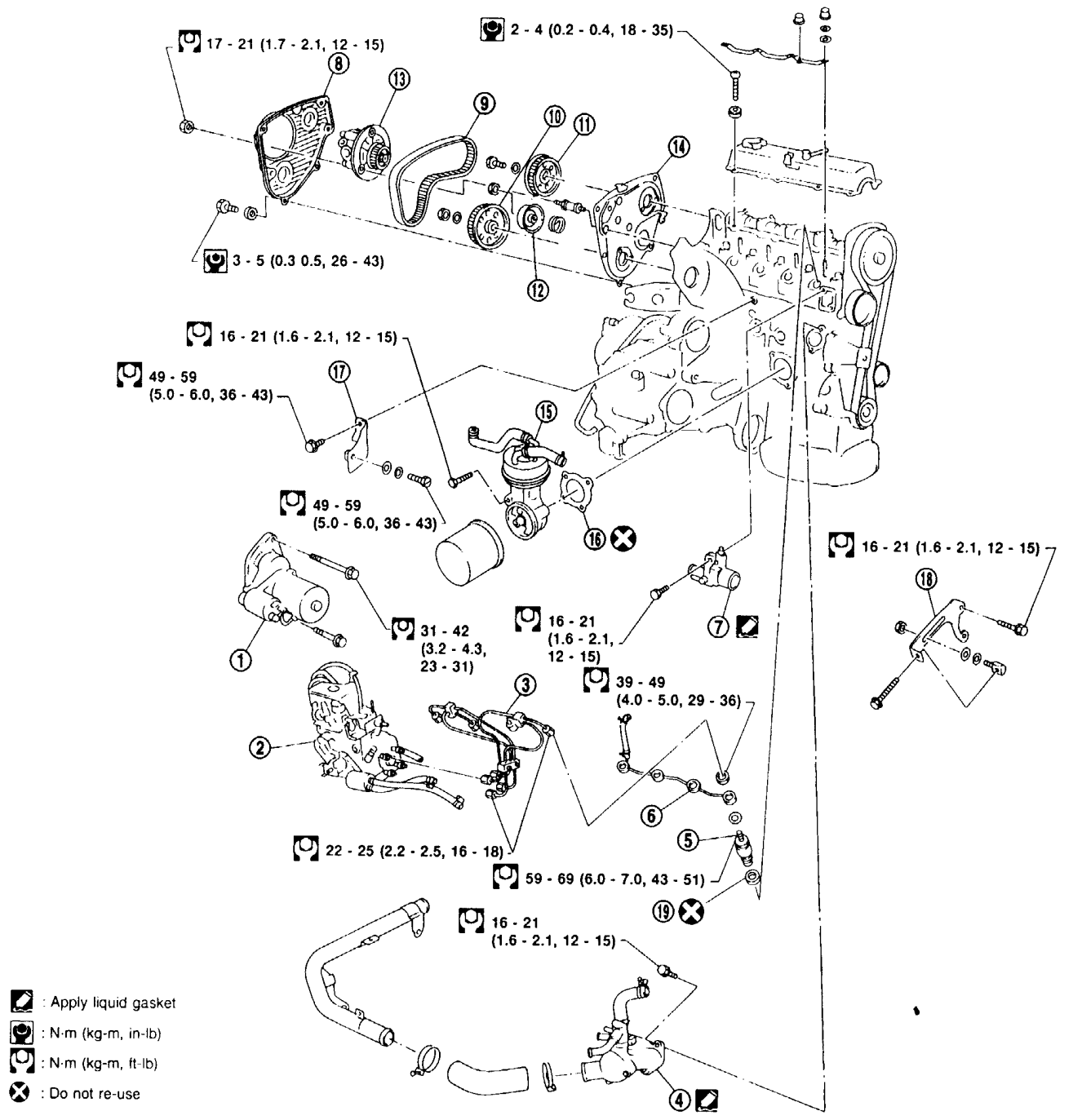
7. Install rear oil seal retainer.
a. Before installing rear oil seal retainer, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



b. Apply a continuous bead of liquid gasket to mating surface of rear oil seal retainer.
- Use Genuine Liquid Gasket or equivalent.

Right side

SEC. 130•135•185•186•210•213•233

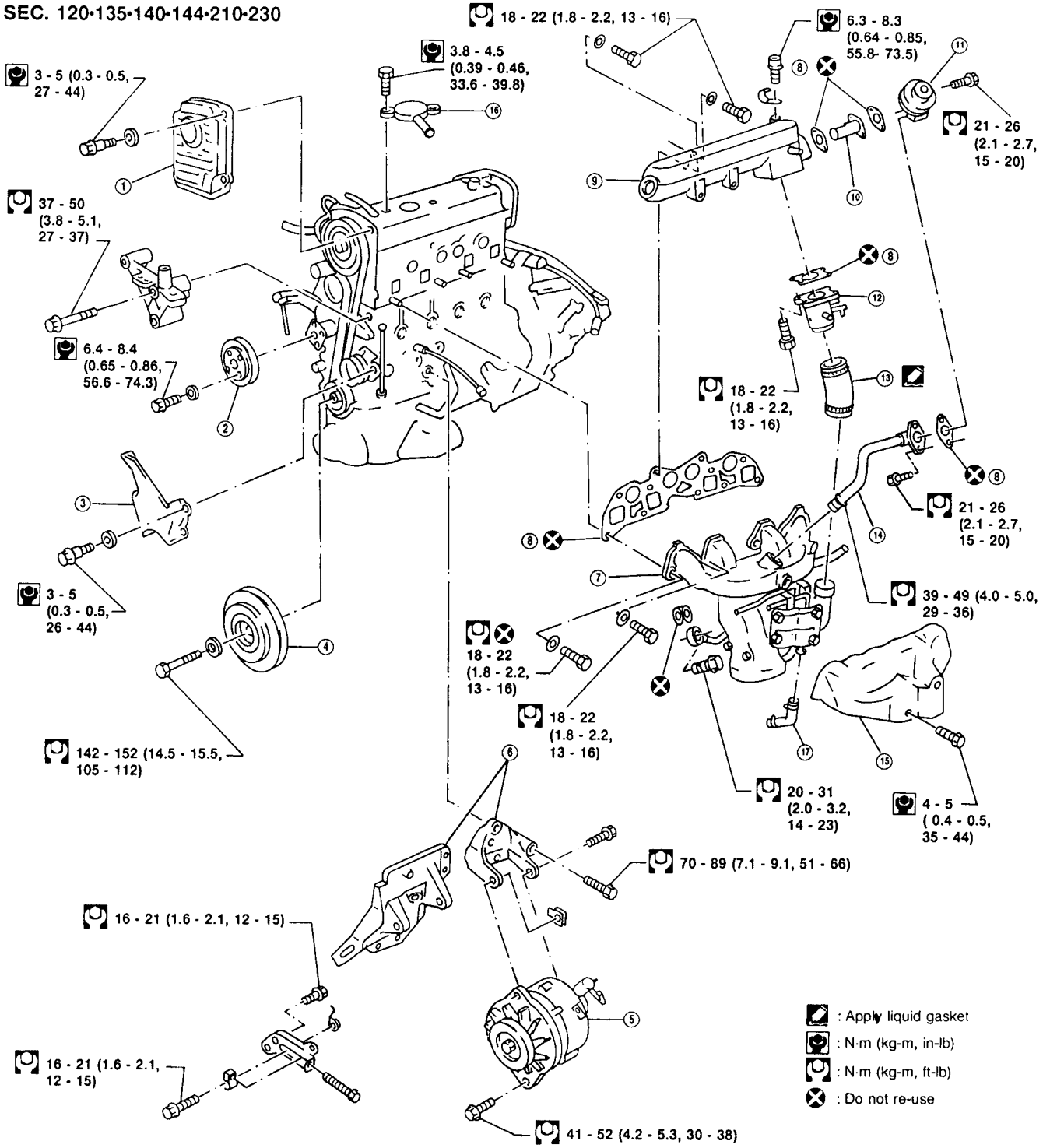


SEM396F

① Starter motor
② Injection pump
③ Injection tube
④ Thermostat housing
⑤ Injection nozzle
⑥ Spill tube
⑦ Water outlet
⑧ Belt cover
⑨ Timing belt
⑩ Injection pump sprocket
⑪ Rear camshaft sprocket
⑫ Tensioner
⑬ Vacuum pump
⑭ Rear back cover
⑮ Oil cooler
⑯ Gasket
⑰ Bracket
⑱ Power steering oil pump adjusting bar
⑲ Gasket

Left side

SEC. 120•135•140•144•210•230

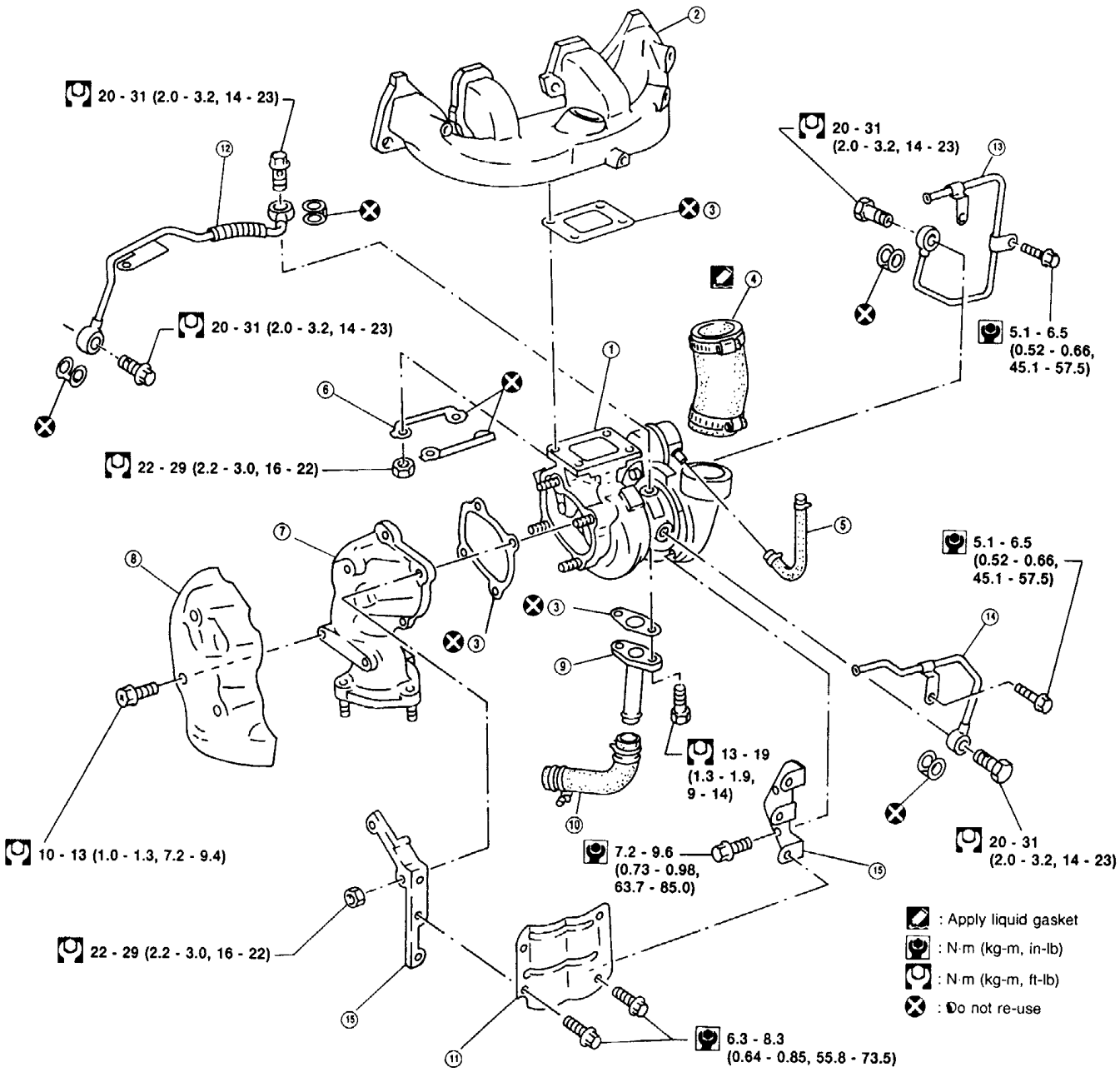


NEM197

① Belt cover upper
② Water pump pulley
③ Belt cover lower
④ Crankshaft pulley
⑤ Alternator
⑥ Alternator bracket
⑦ Exhaust manifold with turbo-charger assembly
⑧ Gasket
⑨ Intake manifold
⑩ EGR passage (To install, face EGR gas discharge port upward)
⑪ EGR valve
⑫ Air inlet
⑬ Air inlet hose
⑭ EGR tube
⑮ Exhaust manifold cover
⑯ Blow-by gas control valve
⑰ Turbocharger oil return hose

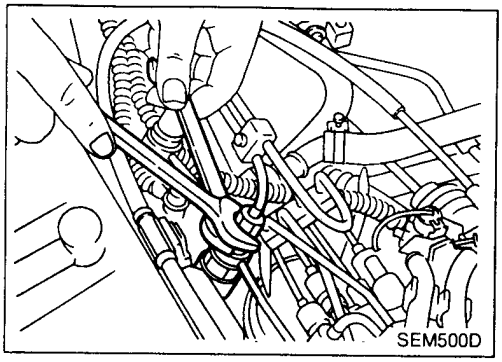
Left side

SEC. 140•144



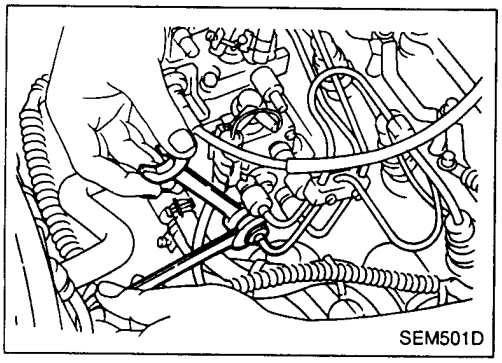
NEM198

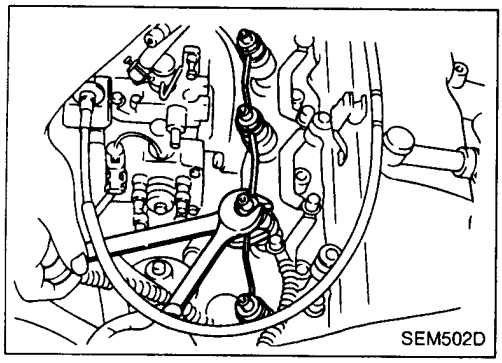
① Turbocharger assembly
② Exhaust manifold
③ Gasket
④ Air inlet hose
⑤ Air hose
⑥ Lock plate
⑦ Exhaust outlet
⑧ Exhaust outlet cover
⑨ Turbocharger oil return pipe
⑩ Turbocharger oil return hose
⑪ Insulator
⑫ Turbocharger oil feed tube
⑬ Turbocharger water feed tube
⑭ Turbocharger water return tube
⑮ Bracket


SEM500D

1. Warm up engine sufficiently.
2. Disconnect injection tubes on nozzle side and loosen injection tubes on pump side. Release clamps on injection tubes.

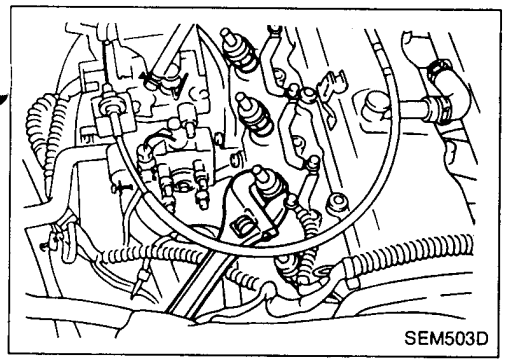
- **Use two wrenches to prevent delivery holder on pump side from loosening.**


SEM501D

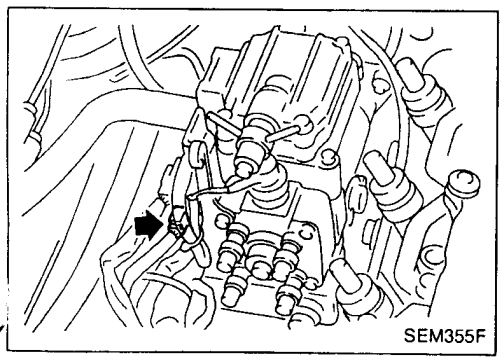

SEM502D

3. Remove spill-tube assembly.

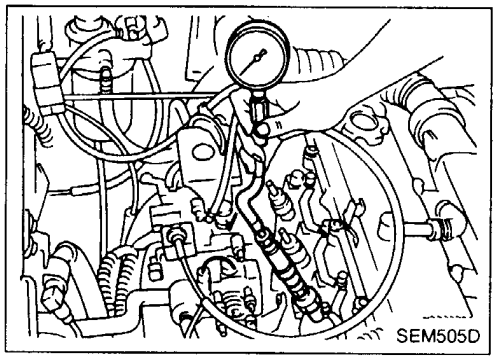
- **To prevent spill tube from breaking, remove it by gripping nozzle holder.**


SEM503D

4. Remove all injection nozzles using a suitable tool.

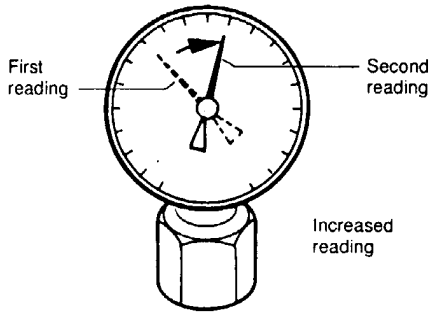
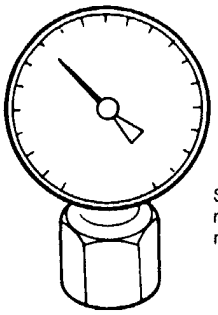

SEM355F

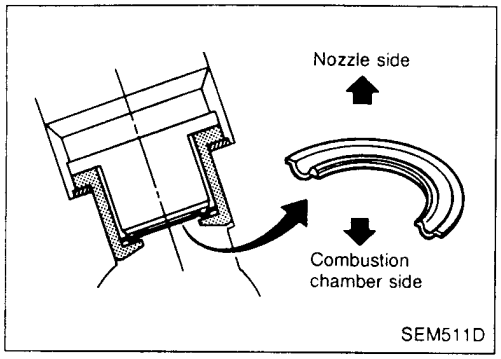
5. Turn ignition switch off and disconnect harness connector (black colored) at injection pump.



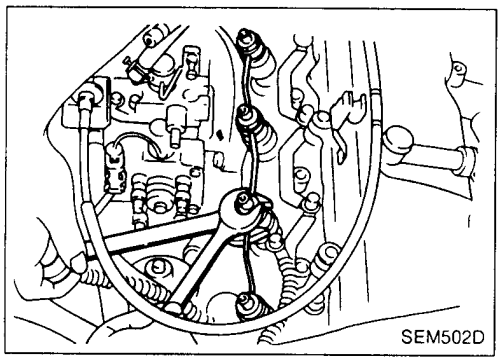
6. Fit compression gauge to cylinder head.

7. Crank engine and read compression gauge indication.
   Cranking speed: 200 rpm
   Compression pressure: kPa (bar, kg/cm², psi)
   Standard
   3,138 (31.4, 32, 455)
   Limit
   2,452 (24.5, 25, 356)
   Limit of difference between cylinders
   490 (4.9, 5, 71)
8. If the pressure appears low, pour about 3 mℓ (0.11 Imp fl oz) of engine oil through nozzle holes and repeat test.
   For indications of test, refer to the following table.

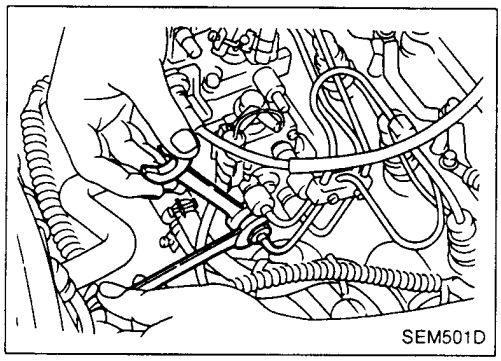
Gauge indication during tests	Trouble diagnosis
	● Piston rings are worn or damaged.
	● If two adjacent cylinders are low, gasket is damaged. ● Valve is sticking. ● Valve seat or valve contact surface is incorrect.



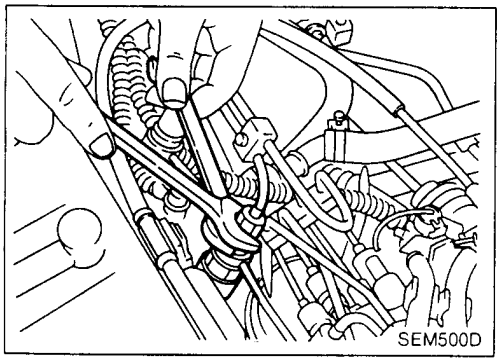
9. Replace nozzle gaskets and re-install injection nozzles.
New nozzle gaskets must be installed in the direction shown.
Nozzle to cylinder head:
: 59 - 69 N·m (6 - 7 kg-m, 43 - 51 ft-lb)



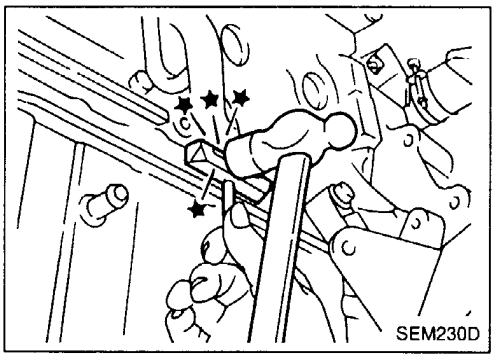
10. Install spill tube by holding nozzle holder.
Spill tube nut:
: 39 - 49 N·m (4 - 5 kg-m, 29 - 36 ft-lb)



11. Install injection tubes using two wrenches as shown.
Injection tubes:
: 22 - 25 N·m (2.2 - 2.5 kg-m, 16 - 18 ft-lb)



12. Initialize the ECM.
Refer to EC-section ("HOW TO ERASE DTC").

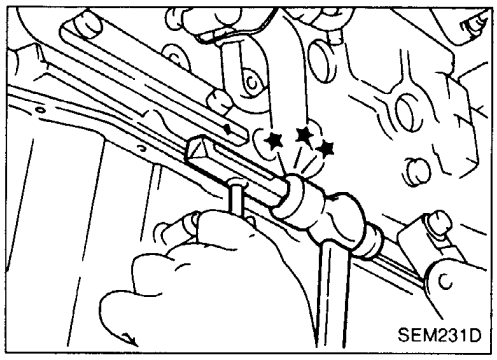


Removal

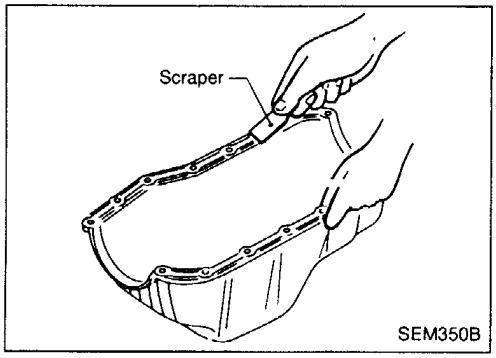
1. Drain oil.
2. Remove oil pan using tool as illustrated.

1) Insert Tool between oil pan and cylinder block.

- **Do not drive seal cutter into oil pump or rear oil seal retainer portion, or aluminum mating surfaces will be damaged.**
- **Do not insert screwdriver, or oil pan flange will be deformed.**



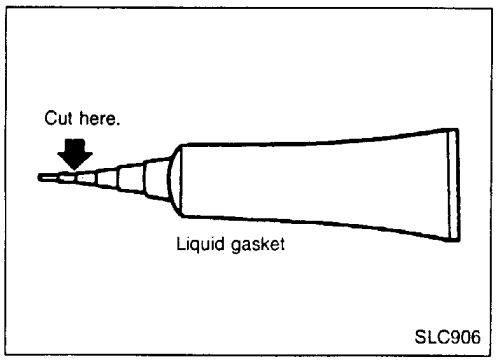
2) Slide Tool by tapping it with a hammer, and remove oil pan.



Installation

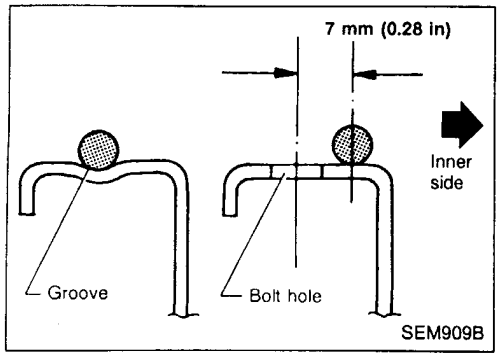
1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.

- Also remove traces of liquid gasket from mating surface of cylinder block.



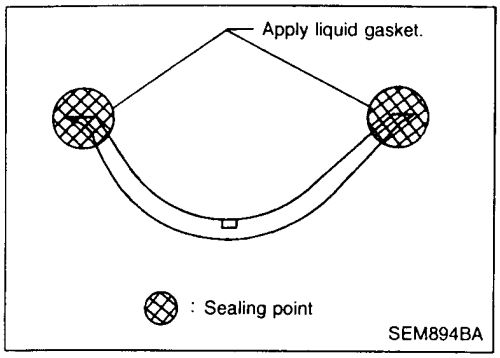
- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.

Use Genuine Liquid Gasket or equivalent.

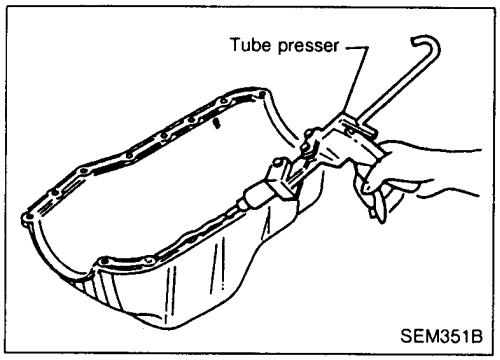


2. Apply liquid gasket to inner sealing surface as shown at left.

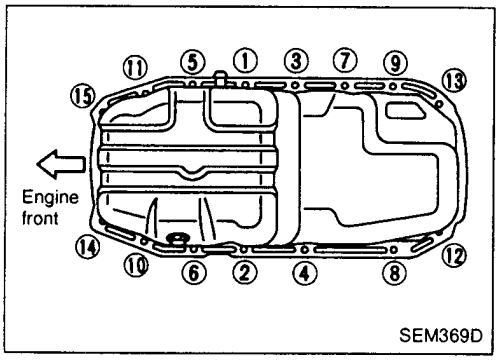
Installation (Cont'd)



3. Apply liquid gasket to oil pan front oil seal and rear oil seal.



4. Apply a continuous bead of liquid gasket to mating surface of oil pan.
- Attaching should be done within 5 minutes after coating.



5. Install oil pan and tighten bolts in the order shown in the figure.

Wait at least 30 minutes before refilling engine oil.

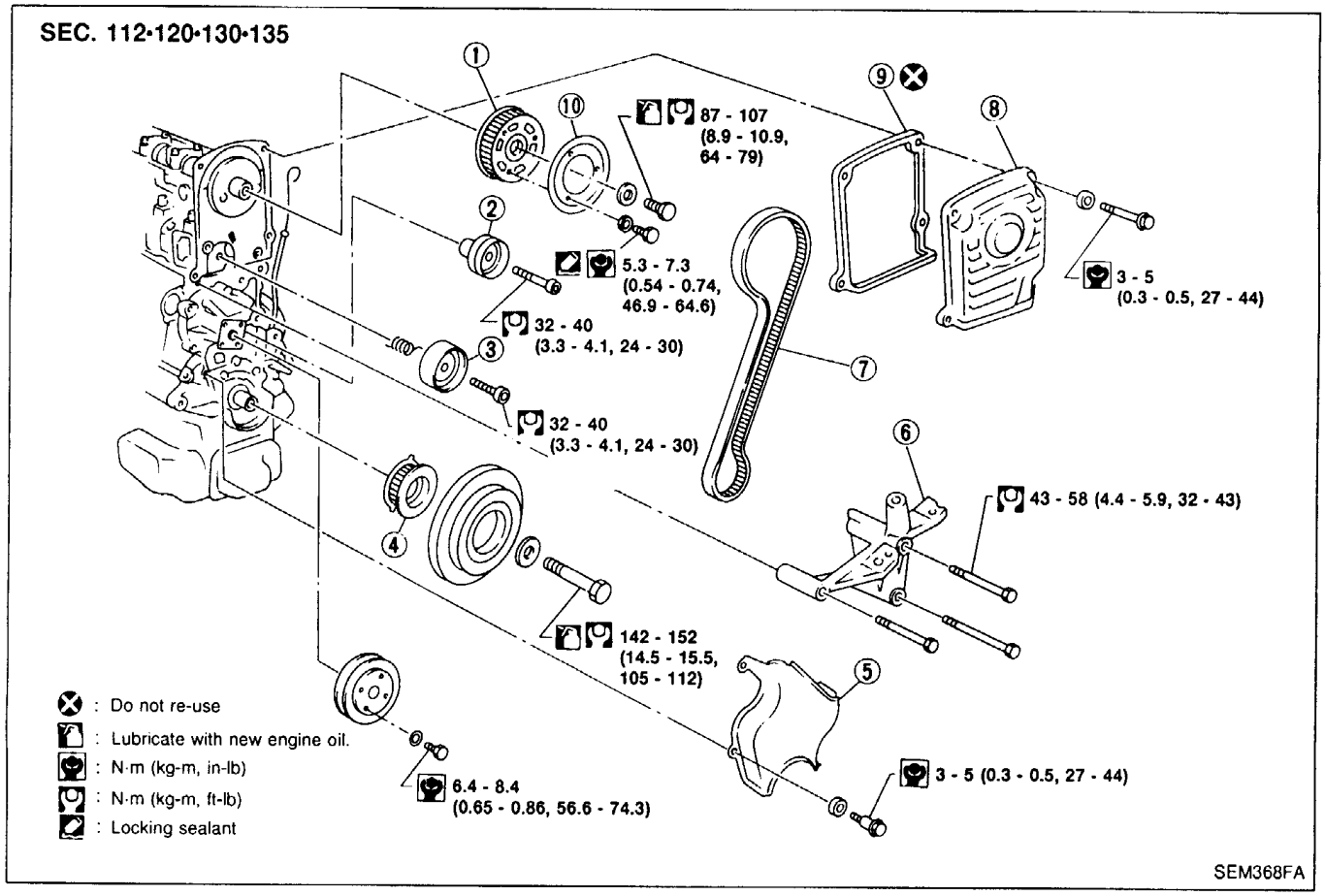
Oil pan bolts:

: 6.3 - 8.3 N·m (0.64 - 0.85 kg-m, 55.8 - 73.5 in-lb)

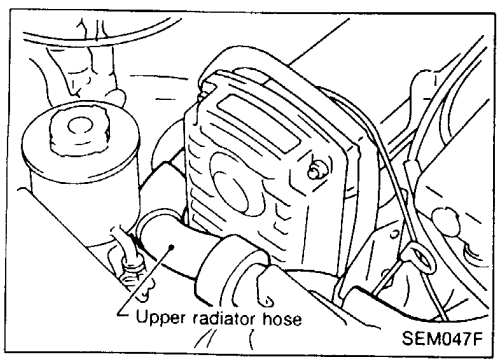
Camshaft Timing Belt

CAUTION:

a. **Do not bend or twist timing belt.**
b. **After removing timing belt, do not turn crankshaft and camshaft separately because valves will strike piston heads.**
c. **Ensure that timing belt, camshaft sprocket, crankshaft sprocket and belt tensioner are clean and free from oil and water.**



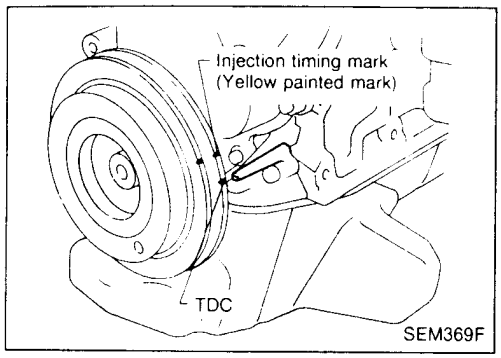
① Front camshaft sprocket
② Idler
③ Belt tensioner
④ Crankshaft sprocket
⑤ Belt cover lower
⑥ Belt cover center (Engine mounting bracket)
⑦ Timing belt
⑧ Belt cover upper
⑨ Gasket
⑩ Front camshaft sprocket plate



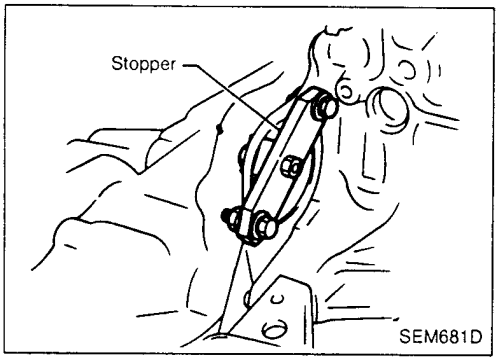
REMOVAL

1. Drain engine coolant from radiator.
2. Remove upper radiator hose and upper belt cover.
3. Remove water pump pulley.

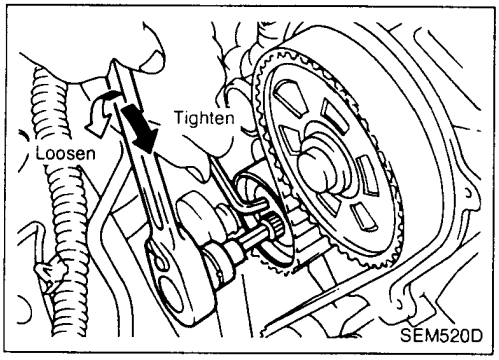
Camshaft Timing Belt (Cont'd)



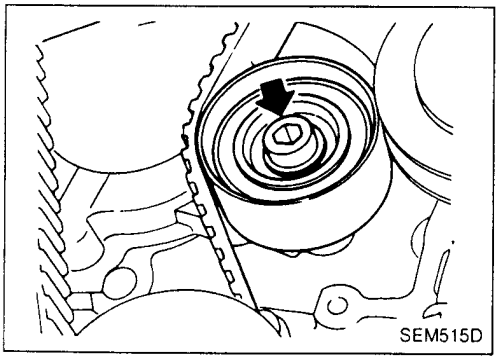
4. Set No. 1 cylinder at TDC on its compression stroke. (TDC is indicated by crankshaft pulley notch without painted mark.)



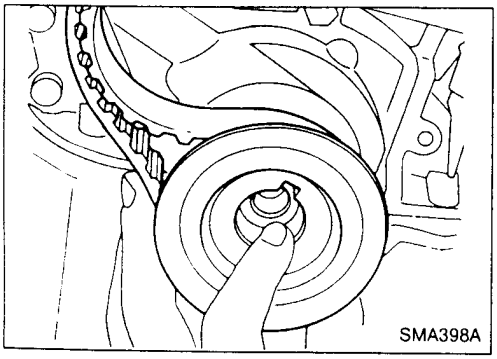
5. Remove starter motor, and install ring gear stopper using mounting bolt holes.
6. Remove crank pulley bolt.
7. Remove crank pulley using puller.
   Be sure to securely attach puller jaws. Attach jaws only to the rear side of pulley.
8. Remove lower belt cover.



9. Remove timing belt.
(1) Loosen tensioner pulley bolt, turn tensioner pulley counterclockwise then tighten bolt.
(2) Remove camshaft sprocket plate.



(3) Remove idler pulley.



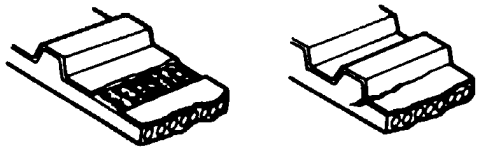
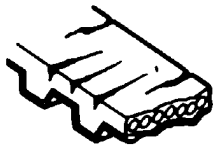
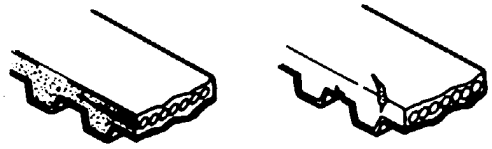
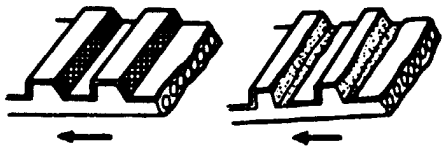
(4) Remove timing belt with crankshaft sprocket.
   CAUTION:
   Do not allow any magnetic materials to contact crankshaft sprocket.
(5) Remove tensioner pulley and return spring.

Camshaft Timing Belt (Cont'd)

INSPECTION

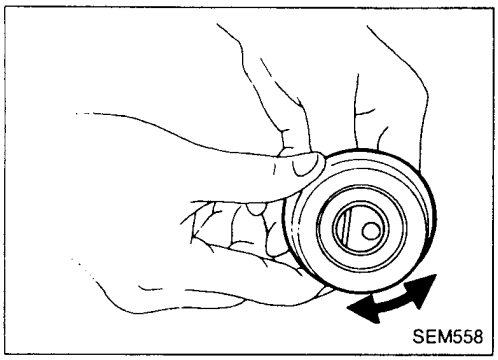
Timing belt

Visually check the condition of timing belt.
Replace if any abnormality is found.

Item to check	Problem	Cause
Tooth is broken/tooth root is cracked.	 SEM394A	● Camshaft jamming ● Damaged camshaft/crankshaft oil seal
Back surface is cracked/ worn.	 SEM395A	● Tensioner jamming ● Overheated engine ● Interference with belt cover
Side surface is worn.	 ● Belt corners are worn and round. ● Wicks are frayed and coming out. SEM396A	● Improper installation of belt ● Malfunctioning crankshaft pulley plate/timing belt plate
Teeth are worn.	 Rotating direction ● Canvas on tooth face is worn down. ● Canvas on tooth is fluffy, rubber layer is worn down and faded white, or weft is worn down and invisible. SEM397A	● Poor belt cover sealing ● Coolant leakage at water pump ● Camshaft not functioning properly ● Excessive belt tension
Oil, coolant or water is stuck to belt.		● Poor oil sealing of each oil seal ● Coolant leakage at water pump ● Poor belt cover sealing

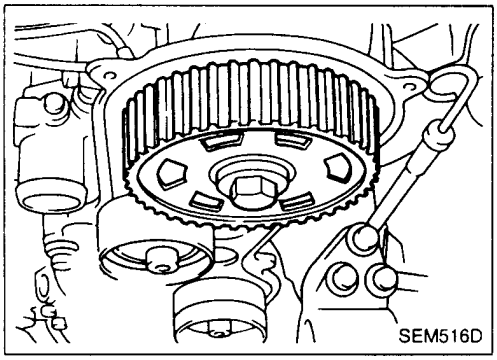
Camshaft Timing Belt (Cont'd)

Belt tensioner, tensioner spring and idler


SEM558

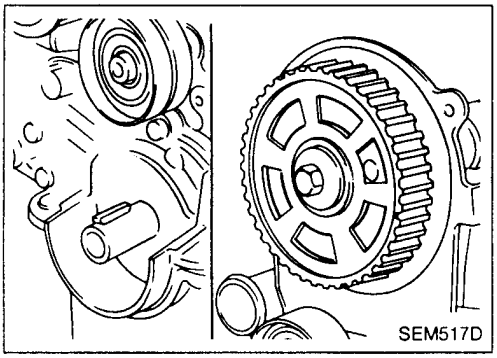
1. Check belt tensioner and idler for smooth turning.
2. Check condition of tensioner spring.

Crankshaft sprocket and front camshaft sprocket

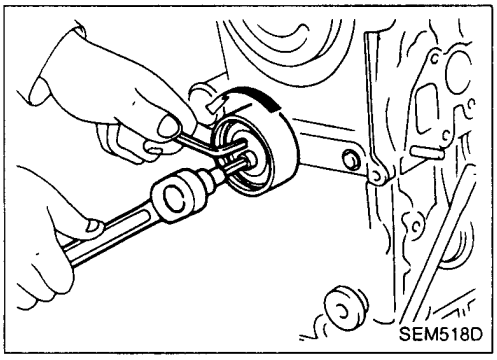

SEM516D

Check teeth for abnormal signs.

INSTALLATION


SEM517D

1. Confirm that No. 1 piston is set at TDC on its compression stroke. (TDC is indicated by crankshaft pulley notch without painted mark.)


SEM518D

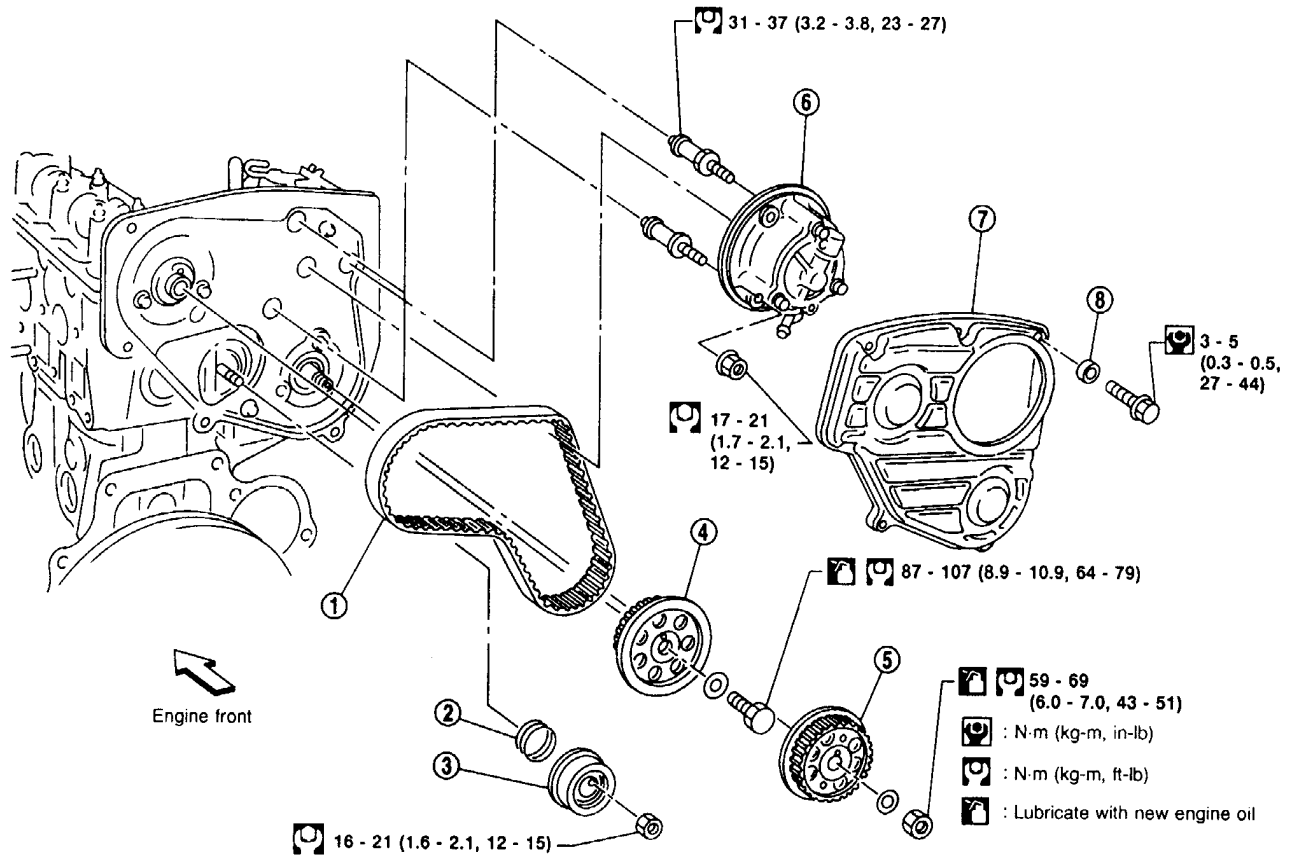
2. Install tensioner and return spring.

Temporarily tighten bolts so that tensioner is set at the fully outside position.

3. Install idler and tighten bolt to the specified torque.

Injection Pump Timing Belt

SEC. 130•135

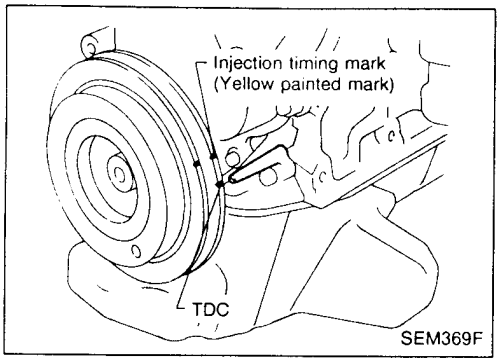


① Timing belt
② Tensioner spring
③ Tensioner
④ Rear camshaft sprocket
⑤ Injection pump sprocket
⑥ Vacuum pump
⑦ Timing belt cover
⑧ Grommet

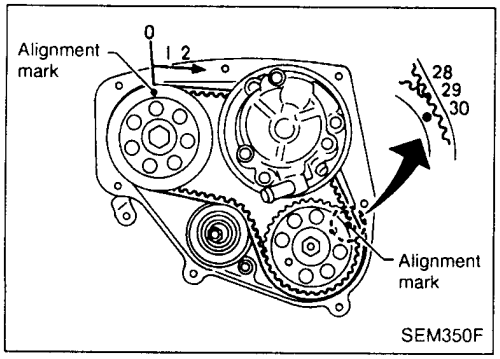
REMOVAL

1. Remove battery from engine room.
2. Remove air cleaner case, air duct and resonator.
3. Disconnect all piping connections from vacuum pump.
4. Remove water pipe mounting bolt under injection pump timing belt cover, then remove water pipe.
5. Remove timing belt cover.

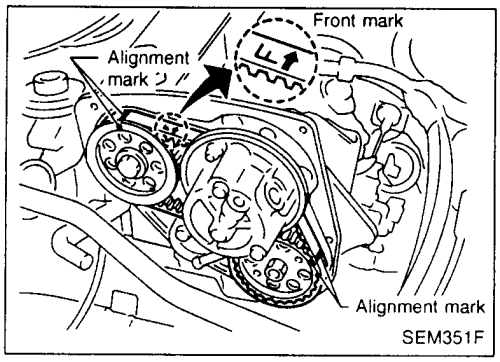
Injection Pump Timing Belt (Cont'd)



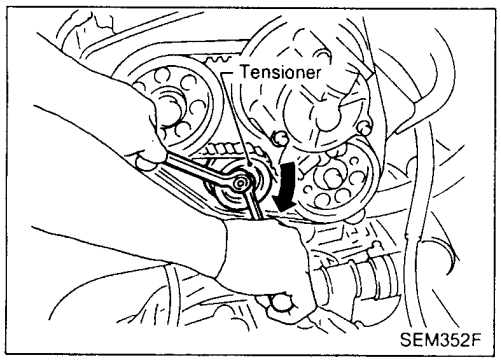
6. Set No. 1 cylinder at TDC on its compression stroke. (TDC is indicated by crankshaft pulley notch without painted mark.)



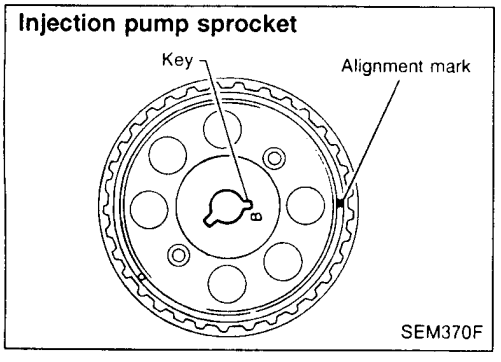
- Make sure that alignment marks of rear camshaft sprocket and injection pump sprocket are positioned as shown



7. Apply alignment marks on the back of timing belt according to rear camshaft sprocket and injection pump sprocket alignment marks. Also apply a front mark on the back of timing belt.



8. Loosen tensioner mounting nut. Using a screwdriver, turn tensioner in direction of arrow to release belt tension.
9. Remove vacuum pump
10. Remove timing belt.



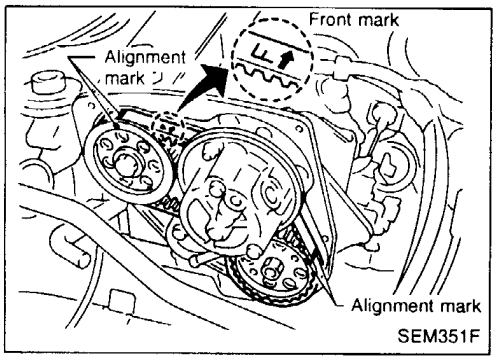
INSTALLATION

1. Confirm that No. 1 piston is set at TDC on its compression stroke. (TDC is indicated by crankshaft pulley notch without painted mark.)

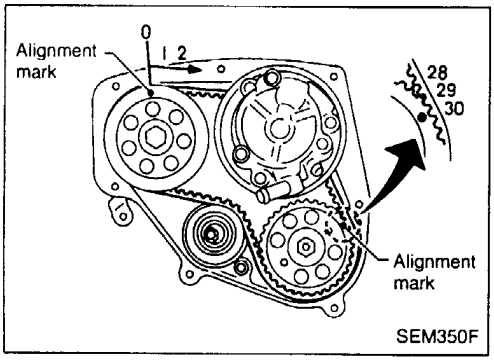
- If injection pump sprocket was removed, confirm that it is re-installed as illustrated.

Identification of alignment:
Use mark "Ⓑ"

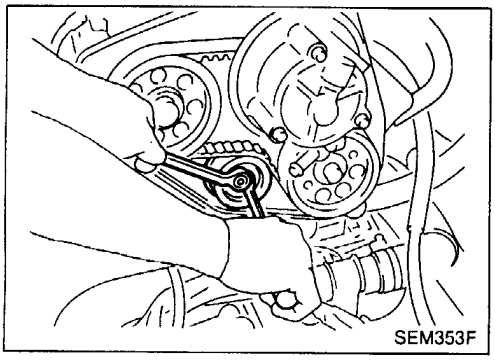
Injection Pump Timing Belt (Cont'd)



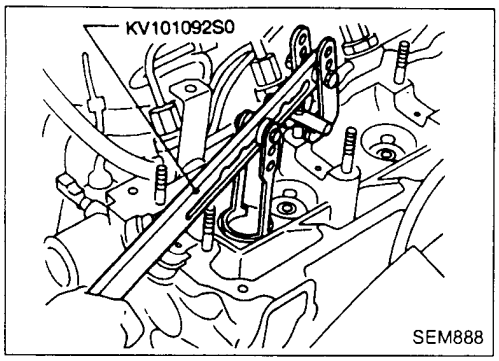
2. Install timing belt.
1) Set timing belt with the front mark facing front of engine.
2) Install vacuum pump.
3) Position timing belt matching the alignment marks with rear camshaft sprocket and injection pump sprocket alignment marks.



3. Adjust belt tension.
1) Loosen tensioner lock nut to apply tension to timing belt.
- Make sure that all sprocket and timing belt alignment marks are positioned as shown.

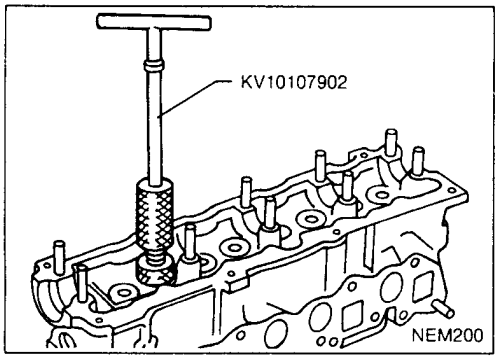


2) Rotate crankshaft clockwise by two revolutions.
Do not turn crankshaft by camshaft sprockets
3) Tighten tensioner lock nut while holding tensioner with a screwdriver.
Belt tension:
98±49 N (10±5 kg, 22±11 lb)
4. Install timing belt cover.
5. Install remaining parts in the reverse order of removal.



VALVE OIL SEAL

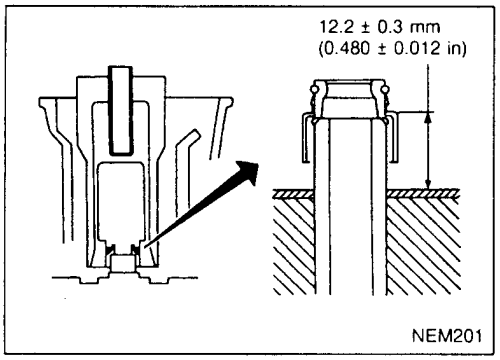
1. Remove both timing belts.
2. Remove camshaft sprockets and back covers.
3. Remove camshaft brackets by loosening bracket nuts from center to outside in two or three stages.
4. Remove camshaft oil seals and camshaft.



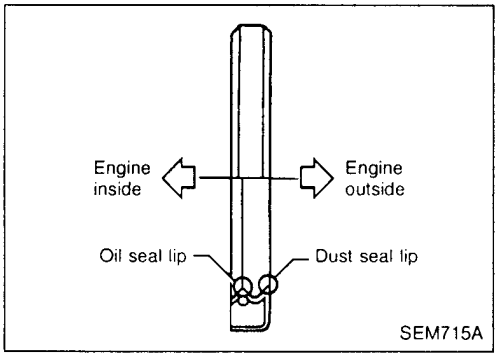
5. Remove valve lifters and mark order No. on each lifter.
6. Replace valve oil seal according to the following procedure.

When replacing valve oil seal, set the corresponding piston at TDC. Failure to do so causes the valve to drop into the cylinder.

1) Set No. 1 cylinder at TDC.
2) Remove valve springs and valve oil seals for No. 1 and No. 4 cylinders. Valve spring seats should not be removed.

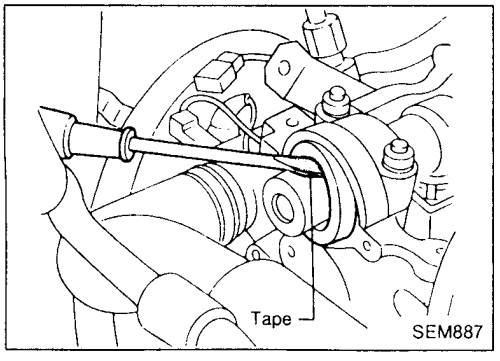


3) Install new valve oil seals for No. 1 and No. 4 cylinders as illustrated. Reinstall valve springs. (narrow pitch side toward cylinder head)
4) Install valve spring retainers on intake valves and valve rotators on exhaust valves, and remount valve assembly.
5) Set No. 2 cylinder at TDC.
6) Replace valve oil seals for No. 2 and No. 3 cylinders according to steps 2) and 3).
7) Install valve lifters in original positions.



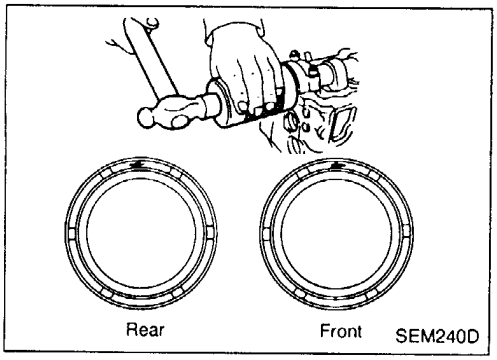
CAMSHAFT AND CRANKSHAFT OIL SEAL INSTALLING DIRECTION AND MANNER

- **When installing camshaft and crankshaft oil seals, be careful to install them correctly, as shown in the figure.**
- **Apply engine oil to oil seal lip, outer face, camshaft and bracket.**
- **Wipe off excess oil after installing oil seal.**

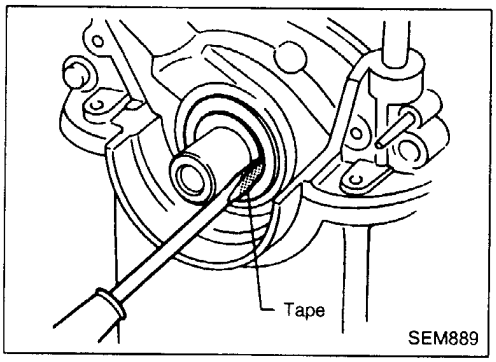


CAMSHAFT OIL SEALS

1. Remove timing belts, sprockets and back covers.
2. Pull out oil seal with a suitable tool.

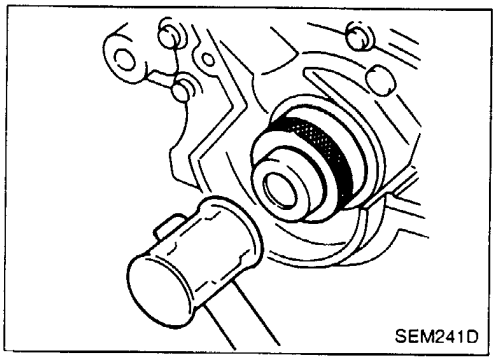


3. Install new oil seals with a suitable tool.
Confirm turning direction of both oil seals and camshaft.

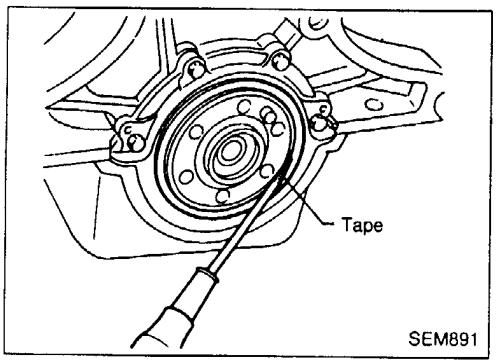


CRANKSHAFT FRONT OIL SEAL

1. Remove valve timing belt and crankshaft sprocket.
2. Remove oil seal with a suitable tool.

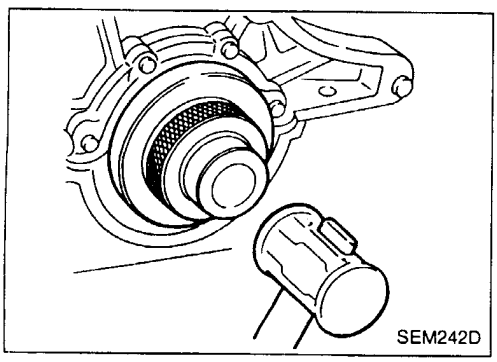


3. Apply engine oil to new oil seal and install oil seal using a suitable tool.



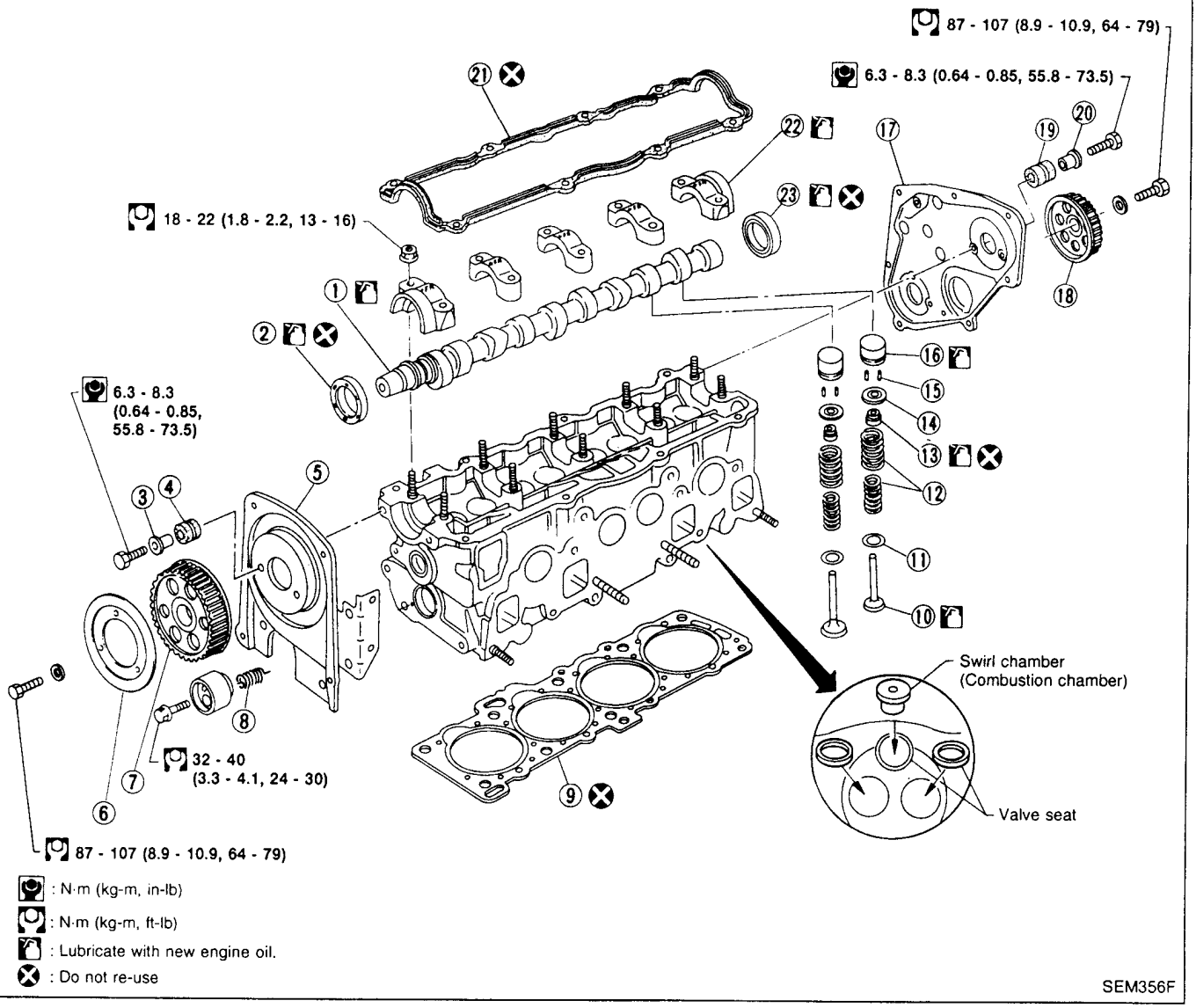
CRANKSHAFT REAR OIL SEAL

1. Remove transaxle assembly. (Refer to "REMOVAL AND INSTALLATION" in MT section.)
2. Remove flywheel.
3. Remove rear oil seal with a suitable tool.



4. Apply engine oil to new oil seal and install oil seal using a suitable tool.

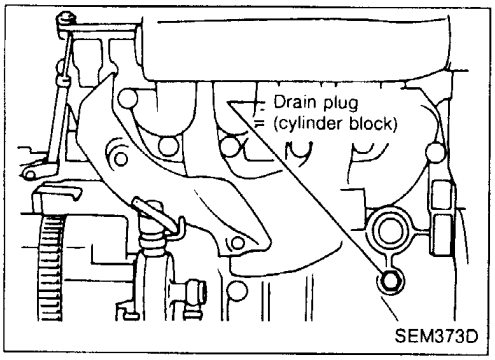
SEC. 111•130•135



① Camshaft
② Front oil seal
③ Collar
④ Grommet
⑤ Front back cover
⑥ Front camshaft sprocket plate
⑦ Front camshaft sprocket
⑧ Spring
⑨ Selective cylinder head gasket
⑩ Valve
⑪ Spring seat
⑫ Valve spring
⑬ Valve oil seal
⑭ Spring retainer (INT)/Valve rotator (EXH)
⑮ Valve cotter
⑯ Hydraulic valve lifter
⑰ Rear back cover
⑱ Rear camshaft sprocket
⑲ Grommet
⑳ Collar
㉑ Rocker cover gasket
㉒ Cam bracket
㉓ Rear oil seal

For hydraulic valve lifter

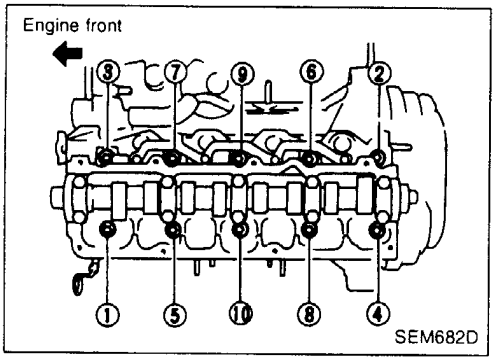
- Before starting engine, make sure that valve does not hit piston when rotating crankshaft by hand.
- When bleeding air out from hydraulic valve lifter, run engine at more than 2,400 rpm for 20 minutes or more.



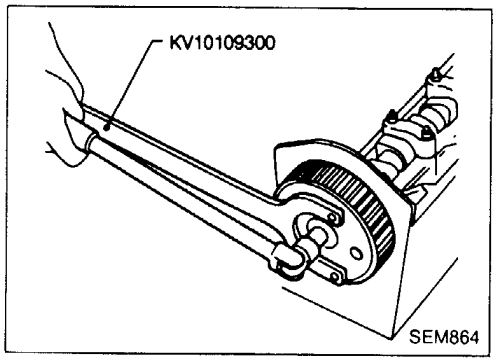
Removal

1. Drain coolant and disconnect front exhaust pipe from manifold.
2. Remove water hoses, air duct and intake manifold.
3. Remove heat shield and exhaust manifold.
4. Remove rocker cover and injection tubes.
5. Remove both timing belts.
   Set No. 1 cylinder at TDC on its compression stroke. Refer to "TIMING BELT" (EM-119).

After timing belts have been removed, do not rotate crankshaft and/or camshaft separately as valves will hit piston heads.

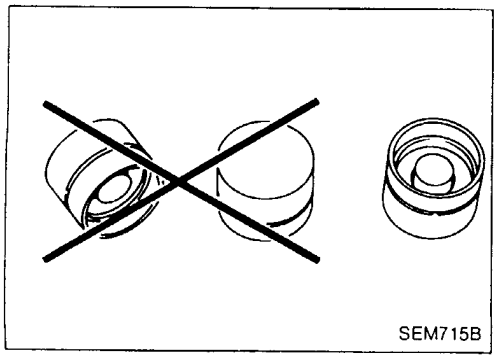


6. Remove cylinder head bolts in numerical order as shown in the figure.



Disassembly

1. Remove front camshaft sprocket plate, front and rear sprockets using special service tool or a suitable tool, and front back cover.
2. Remove camshaft brackets in order from outside to inside.
   - Loosen camshaft bracket nuts in two or three stages.
3. Remove camshaft and oil seals.

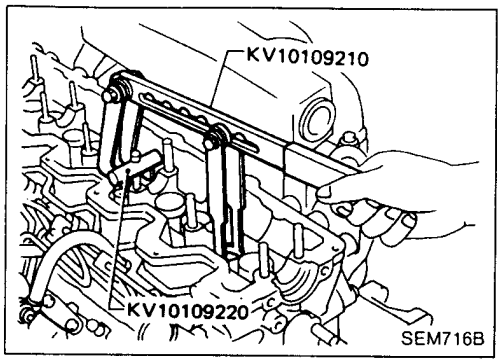


4. Remove valve lifters.

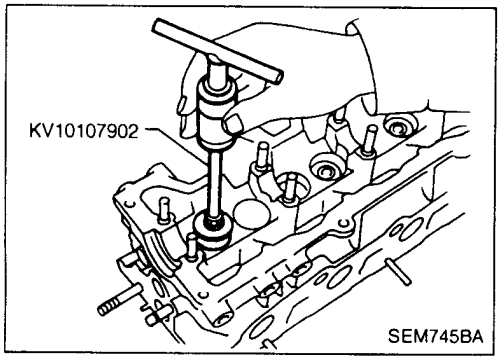
For hydraulic valve lifter

- **Do not set hydraulic valve lifters as illustrated as air will enter valve lifter causing malfunction.**
- **Do not disassemble hydraulic valve lifters.**
- **Attach tags to valve lifters for identification.**
- **Valve lifters must be put in engine oil after removal.**

Disassembly (Cont'd)



5. Remove valve component parts using special service tool or a suitable tool.
- **Keep each valve and its components together and mark them so they can be reassembled in their original positions.**



6. Remove valve oil seals using special tool.

Inspection

CYLINDER HEAD DISTORTION

1. Visually check for cracks and deformation.
2. Check cylinder head for distortion.

Head surface flatness:

Less than 0.1 mm (0.004 in)

If beyond the specified limit, replace or resurface cylinder head.

Resurfacing limit:

The resurfacing limit of the cylinder head is related to the amount of resurfacing of the cylinder block.

When:

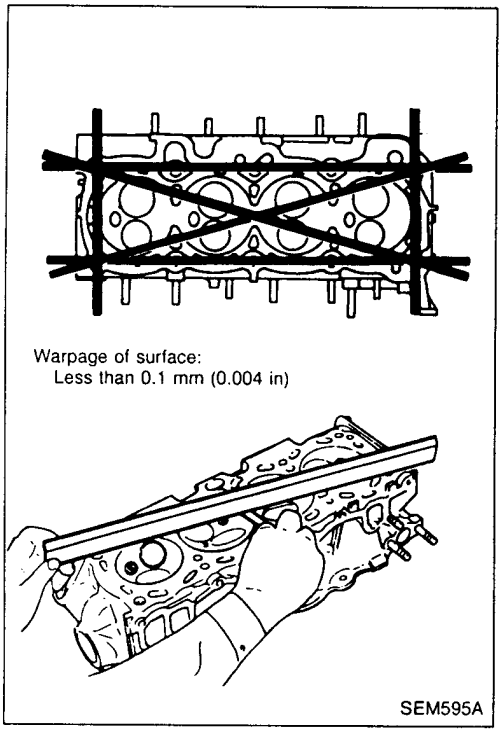
"A" is the amount of resurfacing needed for the cylinder head and "B" is the amount of resurfacing needed for the cylinder block, the maximum limit is determined by

A + B = 0.1 mm (0.004 in)

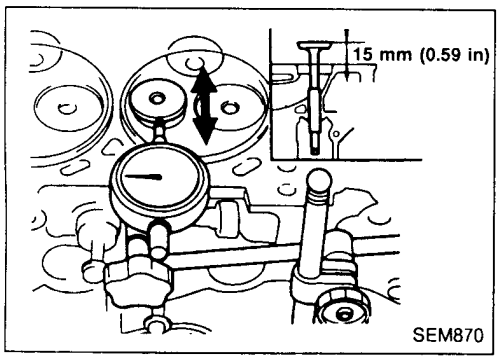
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, the cylinder head must be replaced.

Nominal height of cylinder head:

137.9 - 138.1 mm (5.429 - 5.437 in)



VALVE GUIDE CLEARANCE

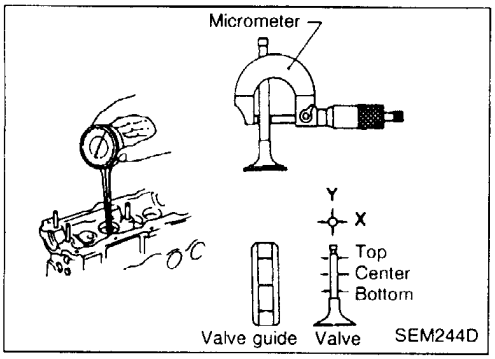


1. Measure deflection across the cylinder head as illustrated.

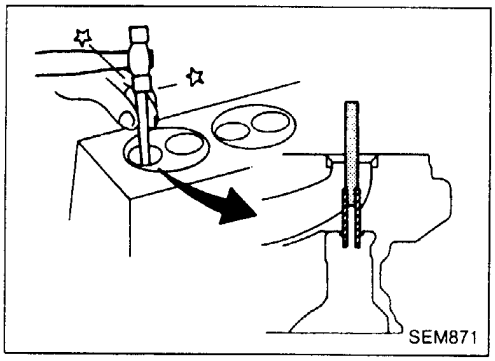
Valve deflection limit (dial gauge reading):

0.1 mm (0.004 in)

Inspection (Cont'd)

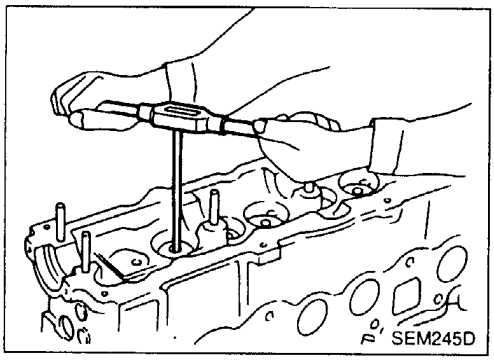


2. If exceeding the limit, check valve-to-guide clearance.
a) Measure valve stem diameter and valve guide inner diameter as illustrated.
b) Check that clearance is within the specification.
Valve stem to valve guide clearance limit:
0.1 mm (0.004 in)
c) If exceeding the limit, replace valve or valve guide.

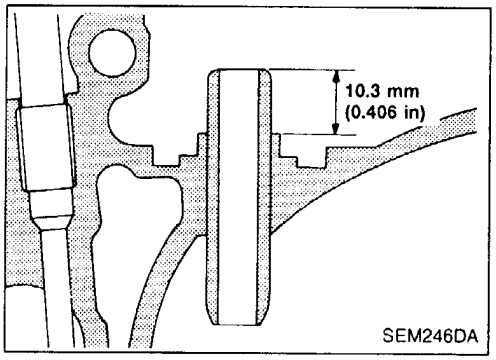


VALVE GUIDE REPLACEMENT

1. Heat cylinder head in oil to 150 to 160°C (302 to 320°F).
2. Drive out valve guide using a press or hammer and a suitable tool.



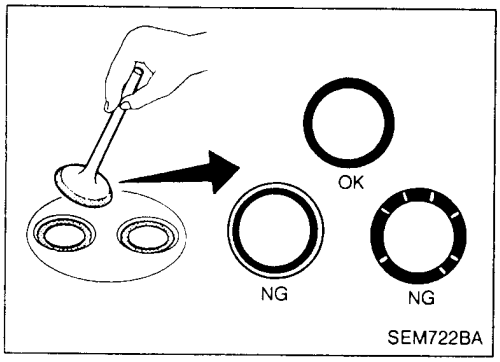
3. Ream cylinder head valve guide bore.
Reaming bore (service part):
11.185 - 11.196 mm (0.4404 - 0.4408 in)



4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.
5. Ream valve guide.
Final size:
7.000 - 7.015 mm (0.2756 - 0.2762 in)

Inspection (Cont'd)

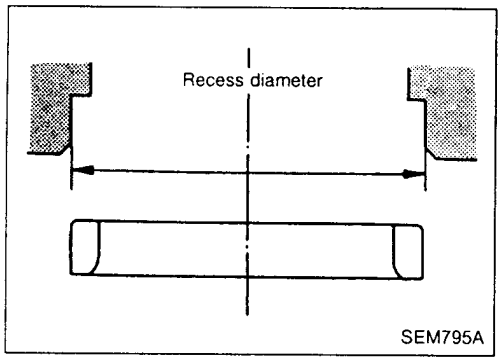
VALVE SEATS



1. Check valve and valve seat for contact.
   Coat the valve face with prussian red lead. If contact is wrong, correct valve seat. If the valve red lead appears 360° around face, the valve stem and face are concentric. If not, repair or replace valve.

2. Check valve seats for pitting at contact surface. Resurface or replace if excessively worn.
   Correct valve seat surface.

When repairing valve seat, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.



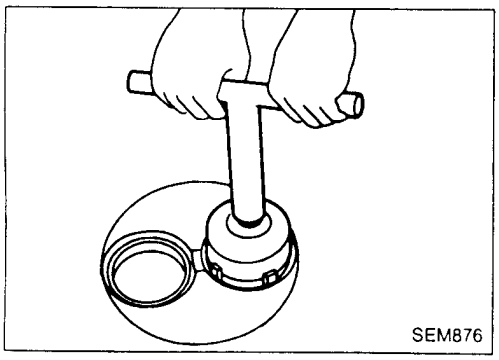
VALVE SEAT REPLACEMENT

1. Bore out old seat until it collapses.
   Set machine depth stop so that boring cannot contact bottom face of seat recess in cylinder head.
2. Ream the cylinder head recess.
   Reaming bore for service valve seat
   [Oversize 0.5 mm (0.020 in)]:
   Intake 41.432 - 41.454 mm (1.6312 - 1.6320 in)
   Exhaust 35.432 - 35.454 mm (1.3950 - 1.3958 in)

Use the valve guide center for reaming to ensure valve seat will have the correct fit.

3. Heat cylinder head to a temperature of 150 to 160°C (302 to 320°F) and press fit seat until it seats on the bottom.
4. Install valve seats.

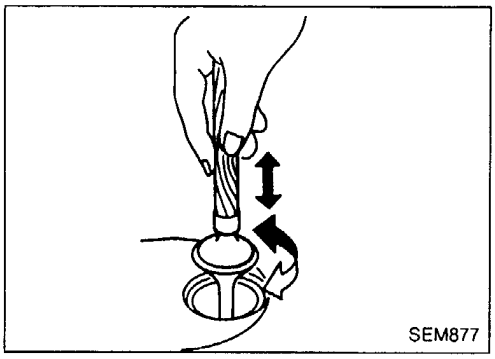
When replacing valve seat, valve should be replaced as well.



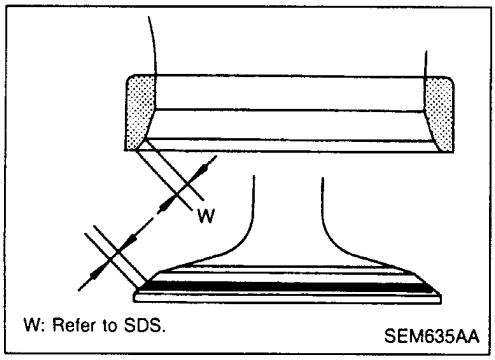
5. Cut or grind valve seat using a suitable tool at the specified dimensions as shown in SDS (EM-180).

The cutting should be done with both hands to obtain a uniform and concentric finish.

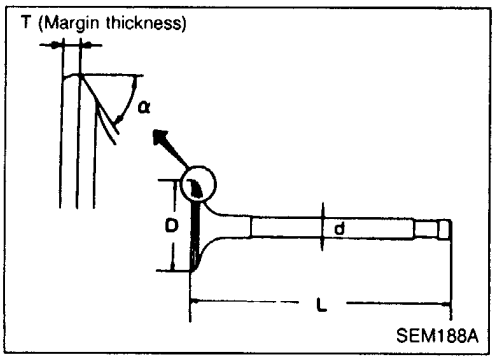
Inspection (Cont'd)



6. Apply a small amount of fine grinding compound to the valve's contacting face and put the valve into its guide. Lap valve against its seat until proper valve seating is obtained.

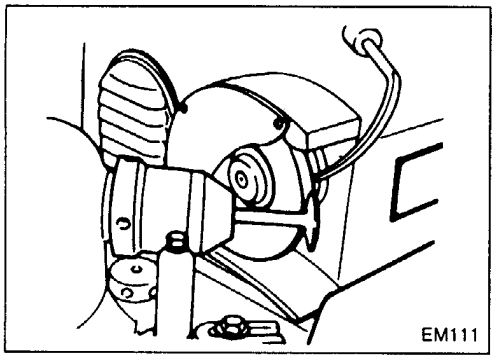


7. Check valve seating condition.



VALVE DIMENSIONS

1. Check dimensions of each valve. For dimensions, refer to SDS (EM-179).
2. Correct or replace any valve that is faulty.

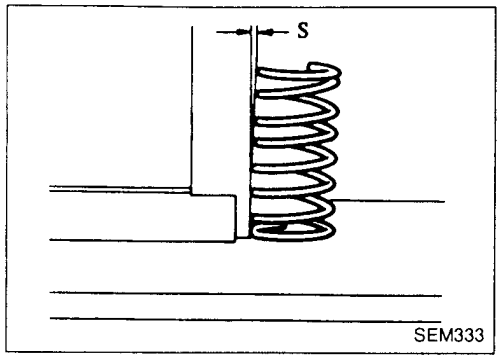


3. Valve face or valve stem end surface should be refaced by using a valve grinder.

When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace the valve.

Grinding allowance for valve stem tip is 0.5 mm (0.020 in) or less.

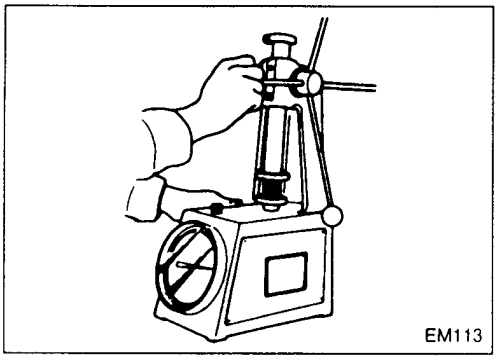
Inspection (Cont'd)



VALVE SPRING SQUARENESS

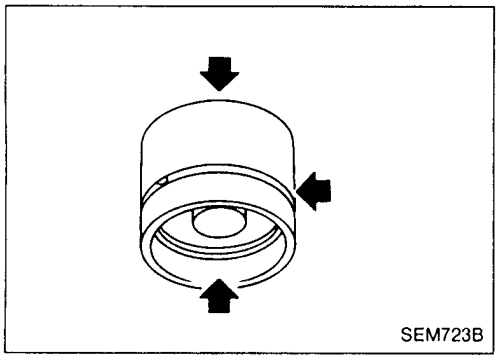
Check valve spring for squareness using a steel square and flat surface plate.
If spring is out of square "S" more than specified limit, replace with new one.

Out-of-square:
Outer
Less than 1.8 mm (0.071 in) — Intake —
Less than 2.2 mm (0.087 in) — Exhaust —
Inner
Less than 1.6 mm (0.063 in) — Intake —
Less than 1.8 mm (0.071 in) — Exhaust —



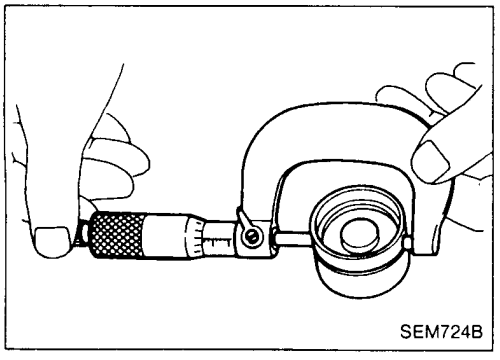
VALVE SPRING PRESSURE LOAD

Measure the free length and the tension of each spring. If the measured value exceeds the specified limit, replace spring. Refer to SDS (EM-180).



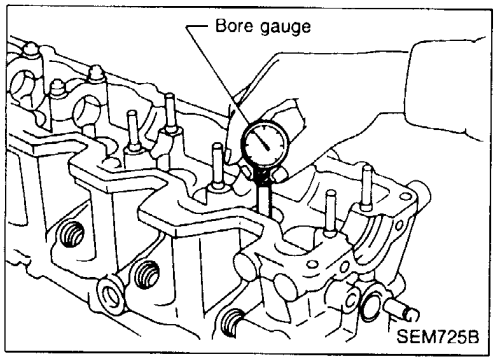
HYDRAULIC VALVE LIFTER

1. Check contact and sliding surfaces for wear or scratches.

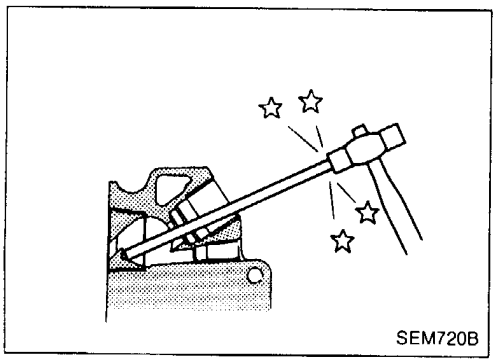


2. Check diameter of valve lifters.
Outer diameter:
34.959 - 34.975 mm (1.3763 - 1.3770 in)

Inspection (Cont'd)



3. Check valve lifter guide bore.
   Bore diameter
   34.998 - 35.018 mm (1.3779 - 1.3787 in)
   Standard clearance
   0.023 - 0.059 mm (0.0009 - 0.0023 in)



COMBUSTION CHAMBER REPLACEMENT

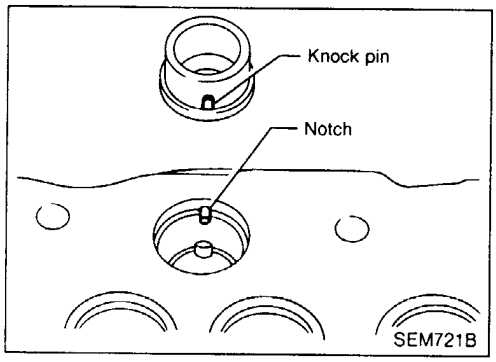
Usually combustion chambers should not be removed. However, if they show cracks or extensive damage, they should be replaced.

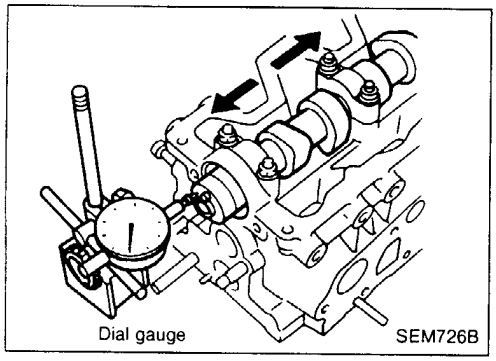
1. Remove glow plug connecting plate, glow plugs and injection nozzle.
2. Heat cylinder head in oil to between 150 and 160°C (302 and 320°F).
3. Remove combustion chamber so that cylinder head will not be damaged.

Be careful not to scratch inside of nozzle hole.

4. Install combustion chamber.

a. Heat cylinder head 150 to 160°C (302 to 320°F) in oil.
b. Align combustion chamber knock pin with cylinder head notch, and install it into cylinder head using a plastic-tip hammer.



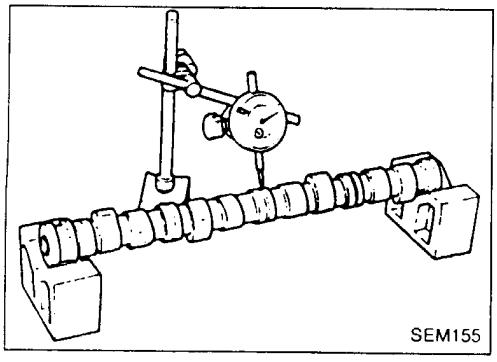


CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

CAMSHAFT END PLAY

1. Install camshaft in cylinder head.
2. Tighten bracket bolts to the specified torque.
3. Measure camshaft end play.
   Camshaft end play: Standard
   0.115 - 0.188 mm (0.0045 - 0.0074 in)

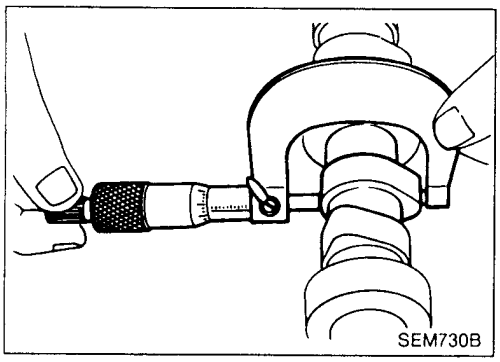


CAMSHAFT RUNOUT

1. Measure camshaft runout at the center journal.
   Runout (Total indicator reading):
   Limit 0.05 mm (0.0020 in)
2. If it exceeds the limit, replace camshaft.

Inspection (Cont'd)

CAMSHAFT CAM HEIGHT


SEM730B

1. Measure camshaft cam height.

Cam height: Standard

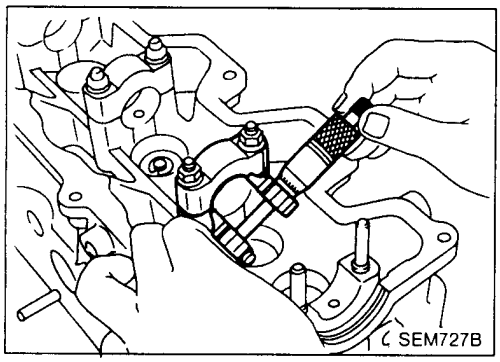
Unit: mm (in)

Intake	48.70 - 48.75 (1.9173 - 1.9193)
Exhaust	49.15 - 49.20 (1.9350 - 1.9370)

2. If wear is beyond the limit, replace camshaft.

CAMSHAFT JOURNAL CLEARANCE

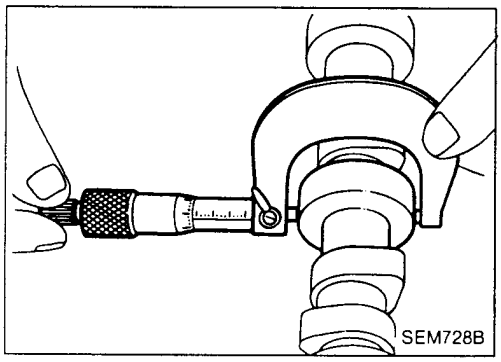
Using micrometer


SEM727B

1. Measure the inner diameter of camshaft bearings.

Standard inner diameter:
30.000 - 30.021 mm (1.1811 - 1.1819 in)

Tighten bracket bolts to the specified torque.


SEM728B

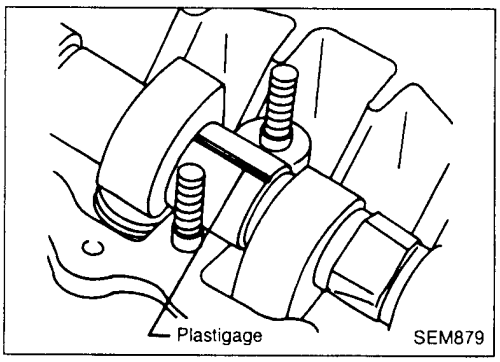
2. Measure the outer diameter of camshaft journals.

Standard outer diameter:
29.935 - 29.955 mm (1.1785 - 1.1793 in)

If clearance exceeds the limit, replace camshaft and/or cylinder head.

Standard clearance:
0.045 - 0.086 mm (0.0018 - 0.0034 in)
Limit: 0.1 mm (0.004 in)

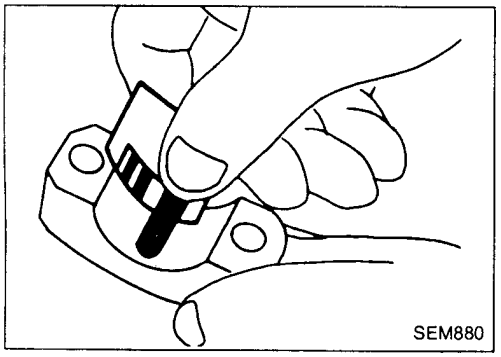
Using plastigage



SEM879

1. Wipe off oil from camshaft journal bracket caps and brackets.
2. Install camshaft in journal bracket caps and put plastigage on each camshaft journal.
3. Install cam bracket caps and tighten cam bracket cap nuts in the correct order to the specified torque.

: 18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)

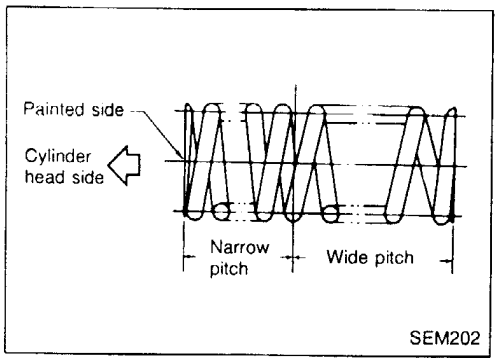

SEM880

4. Remove cam bracket caps and measure maximum width of plastigage.

Camshaft bearing clearance:
Limit
0.1 mm (0.004 in)

5. If clearance appears to exceed the limit, replace camshaft or cylinder head.

- Which parts to be replaced should be decided upon after measuring the diameters of the parts concerned.

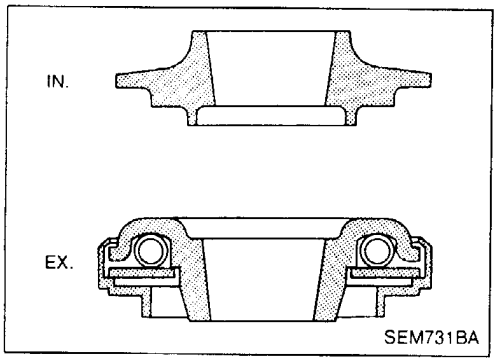


Assembly

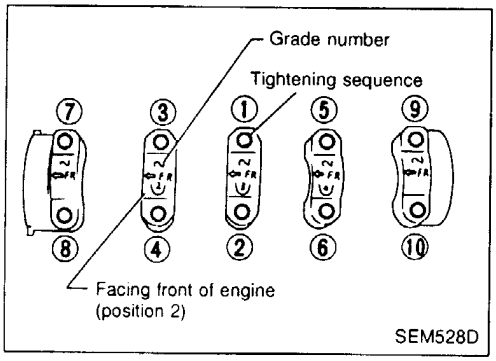
1. Install valve component parts.

Install valve spring with its narrow pitch side toward cylinder head side.

- **Always install new valve oil seals. Refer to oil seal replacement.**
- **Before installing oil seal, install valve-spring seat.**
- **When installing valve, apply engine oil on the valve stem and lip of valve oil seal.**
- **Check whether the valve face is free from foreign matter.**



- **Install valve spring retainers on the intake side and valve rotators on the exhaust side.**
- **Valve rotators cannot be disassembled.**

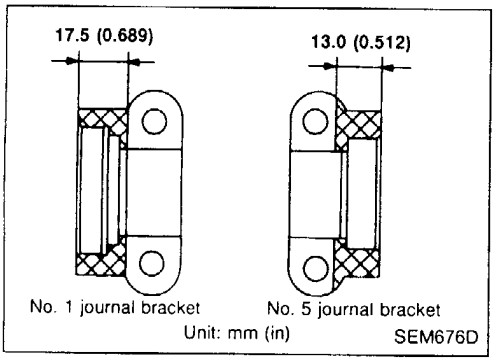


2. Install camshaft and brackets and tighten bracket nuts to the specified torque in two or three stages.

Camshaft-bracket nuts:

: 18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)

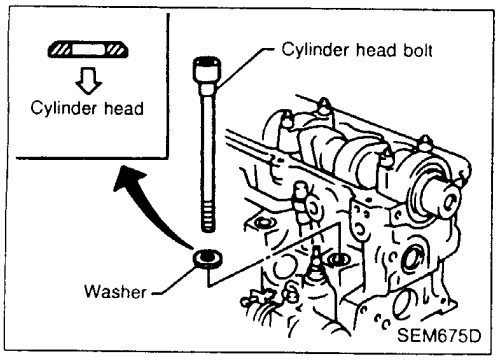
- **Tighten bracket from center to outside.**
- **Apply sealant to brackets No. 1 and No. 5.**
- **When installing brackets, set camshaft so that the pin of camshaft front head is uppermost.**
- **Install new camshaft oil seals. Refer to oil seal replacement.**



Installation

1. Install cylinder head gasket.

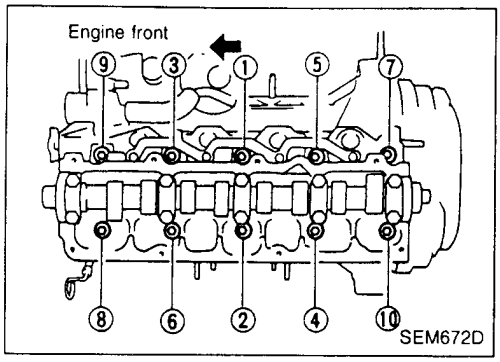
- **When replacing only cylinder head gasket, install same grade gasket as the one formerly used.**
- **When replacing or repairing cylinder block, piston, connecting rod and crankshaft, select gasket referring to "Selecting cylinder head gasket".**
- **Pay attention to the direction of the cylinder head bolt washer as shown in the figure.**



2. Install cylinder head and tighten cylinder head bolts according to the following sequence.

Installation (Cont'd)

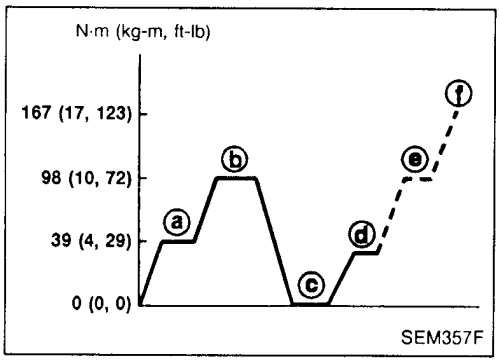
Tightening procedure

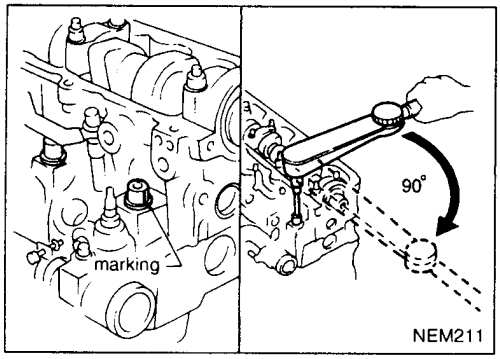


- **Apply engine oil to threads and underhead seating face of each bolt.**

1. Tighten bolts in the numerical order shown in the figure and following the steps below.
   - ⓐ 34 - 44 N·m (3.5 - 4.5 kg-m, 25 - 33 ft-lb)
   - ⓑ 93 - 103 N·m (9.5 - 10.5 kg-m, 69 - 76 ft-lb)
   - ⓒ Return to 0 N·m (0 kg-m, 0 ft-lb)
   - ⓓ 31 - 37 N·m (3.2 - 3.8 kg-m, 23 - 27 ft-lb)
   - ⓔ Tighten to 90 - 95°
   - ⓕ Tighten to 90 - 95°

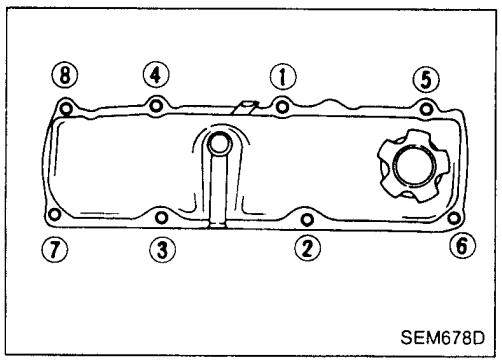
If it is difficult to check tightening angle of bolt, tighten to 111 N·m (11.3 kg-m, 82 ft-lb) in step ⓔ and tighten to 173 N·m (17.6 kg-m, 127 ft-lb) in step ⓕ.



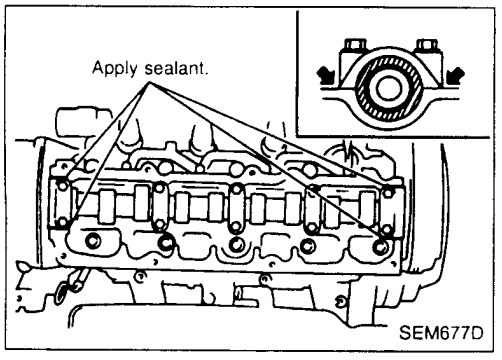


2. Install rocker cover.

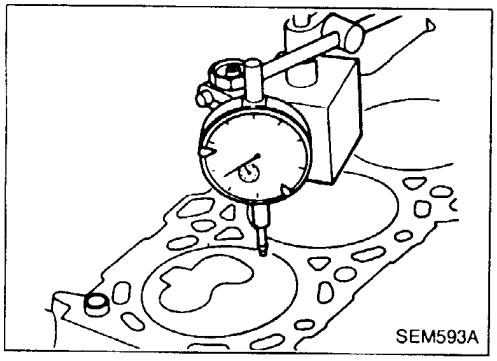
- Install rocker cover in the sequence shown at left.



- Apply sealing compound (THREE-BOND No. 10 or equivalent) to both ends of brackets No. 1 and No. 5.



Installation (Cont'd)



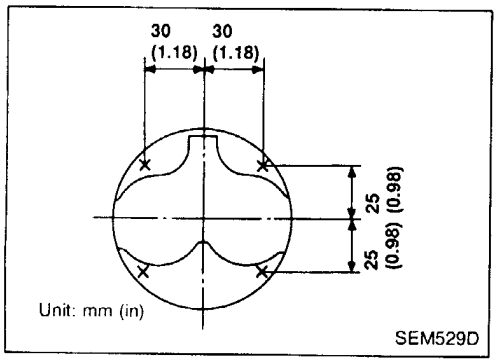
Selecting cylinder head gasket

When replacing only cylinder head gasket, install the same grade (Number of notches) gasket as the one formerly used.

Step 1

Measure projection of piston to cylinder head surface.

a) Set dial gauge and needle on cylinder block and adjust dial gauge to zero.
b) Set dial gauge needle at measuring point on piston, taking care not to disturb its zero setting.
c) Rotate crankshaft around the top dead center position.



d) Record the maximum value.
e) Reset dial gauge on cylinder block and confirm that zero setting has not been disturbed during measurement.
f) Repeat steps b through d for all measuring points as illustrated and for each cylinder.

- Be sure that piston whose projection is being measured is at its TDC.

Step 2

Calculate the average value of measurements taken for each piston.

Step 3

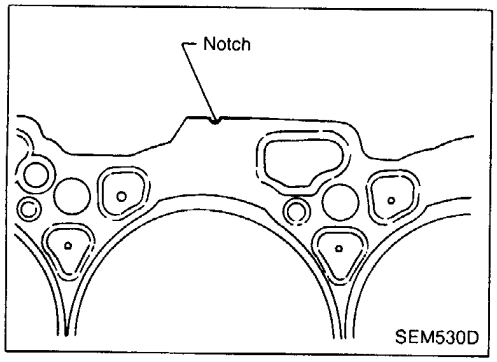
Calculate the average value of measurements for all pistons from the values obtained from step 2.

Step 4

Round off the value obtained.

Step 5

Determine required thickness of gasket, referring to chart A.



Relation between piston average projection and cylinder head gasket (Chart A)

Average value of piston projections mm (in)	Gasket thickness mm (in)		Grade (Number of notches)
	New parts	In assembly	
Less than 0.505 (0.0199)	1.30 (0.0512)	$1.15^{\pm 0.05}$ ($0.0453^{\pm 0.0020}$)	1
0.505 - 0.555 (0.0199 - 0.0219)	1.35 (0.0531)	$1.20^{\pm 0.05}$ ($0.0472^{\pm 0.0020}$)	2
Over 0.555 (0.0219)	1.40 (0.0551)	$1.25^{\pm 0.05}$ ($0.0492^{\pm 0.0020}$)	3

Step 6

Check if the average value of each projection obtained from step 2 is larger than the max. value of the standard projection (of selected gasket) incremented by 0.05 mm (0.0020 in).

If so, use gasket that is 1 grade thicker. If not, use gasket as selected in step 4.

Installation (Cont'd)

Example

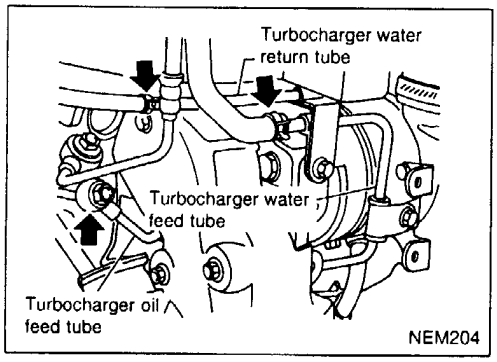
Unit: mm (in)

Step	Cylinder No. / Item	1				2				3				4			
1.	Measured value	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4	M1	M2	M3	M4
		0.53 (0.0209)	0.56 (0.0220)	0.53 (0.0209)	0.56 (0.0220)	0.59 (0.0232)	0.55 (0.0217)	0.59 (0.0232)	0.55 (0.0217)	0.53 (0.0209)	0.58 (0.0228)	0.57 (0.0224)	0.54 (0.0213)	0.58 (0.0228)	0.51 (0.0201)	0.52 (0.0205)	0.57 (0.0224)
2.	Average value of each piston	0.545 (0.0215)				0.570 (0.0224)				0.555 (0.0219)				0.545 (0.0215)			
3.	Average value of all pistons	0.55375 (0.02180)															
4.	Round off value	0.554 (0.0218)*1															
5.	Determined gasket thickness (Temporarily)	1.20 (0.0472) (Grade 2)															
6.	X: Maximum value of standard projection of selected gasket . . . 0.555 (0.0219) (in chart A) + 0.05 (0.0020) = 0.605 (0.0238) Y: Maximum value in step 2 = 0.57 (0.0224) The relationship between X and Y is "X > Y". *2																
7.	Determined gasket thickness (Finally)	1.20 (0.0472) (Grade 2)*2															

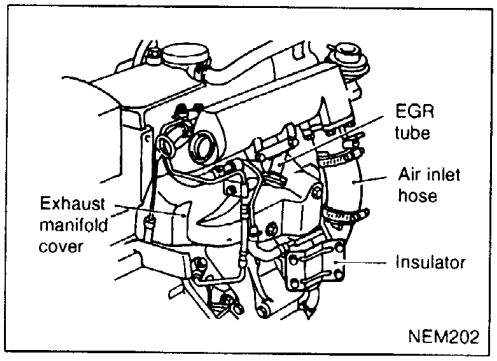
***1: If the average value of projections for all pistons is, for example, 0.553 (7) 5, as shown in the table above, it should be rounded off as follows:**
If the digit in the fourth decimal place (which is enclosed by a circle in this case) is smaller than 5, the average value should be regarded as 0.553 mm (0.0218 in); if it is larger than 5, the average value should be regarded as 0.554 mm (0.0218 in).
***2: If X < Y, then the thicker grade 3 gasket must be used.**

Removal

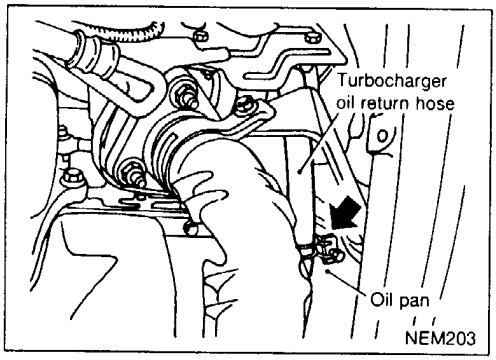
1. Disconnect radiator lower hose and drain coolant.
2. Drain coolant from cylinder block.
3. Remove engine under cover.
4. Remove front exhaust tube.
5. Remove air inlet hose from turbocharger unit.



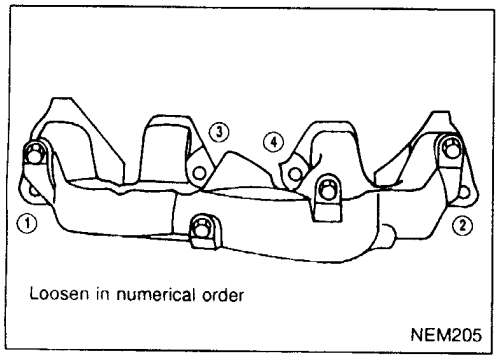
6. Remove connector bolts of turbocharger oil feed tube and hoses for turbocharger water feed and return tubes.



7. Remove EGR tube.
8. Remove exhaust manifold cover.
9. Remove insulator.



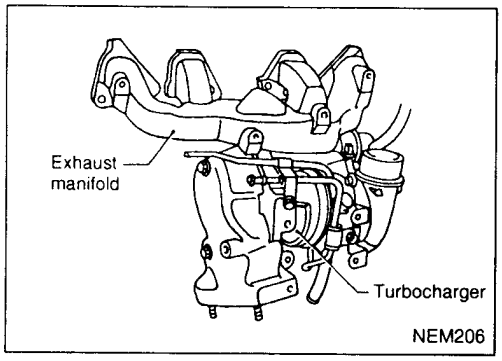
10. Remove turbocharger oil return hose from oil pan.



11. Remove exhaust manifold fixing nuts and bolts.

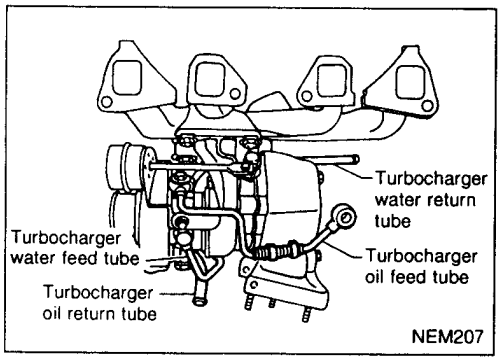
Removal (Cont'd)

12. Remove exhaust manifold with turbocharger unit.

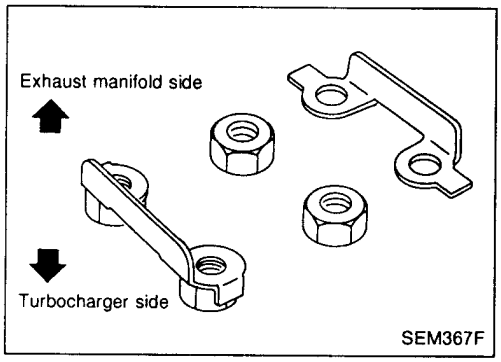


Disassembly

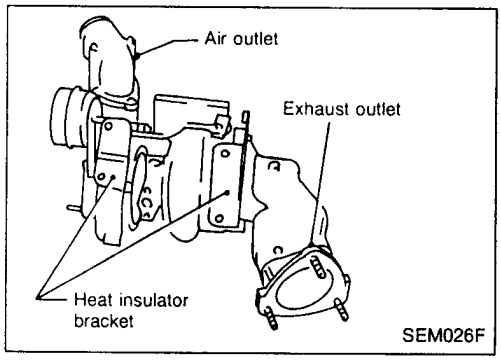
1. Remove oil tubes and water tubes. Before removing tubes, put mating marks on tube connectors and turbocharger.



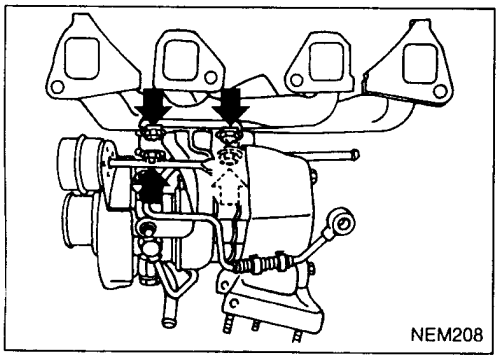
2. Unbend locking plates for turbocharger unit fastening nuts.



3. Remove exhaust outlet cover, exhaust outlet, and heat insulator brackets.

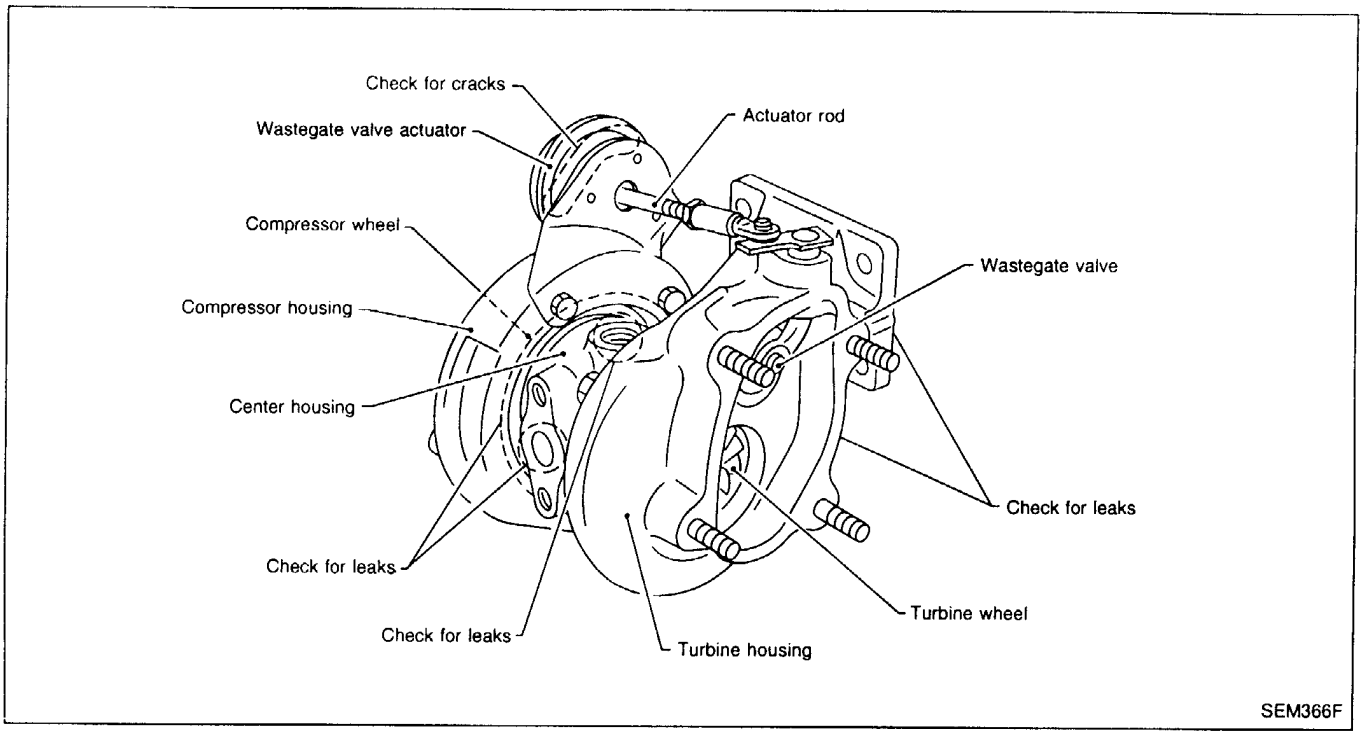


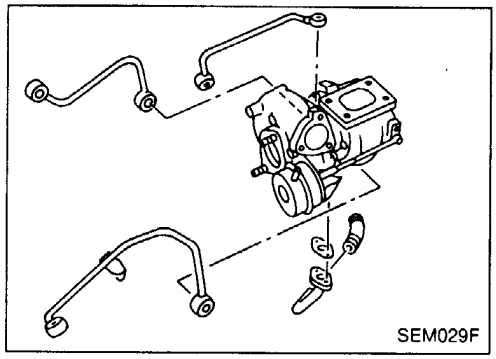
4. Remove exhaust manifold from turbocharger unit.



Inspection

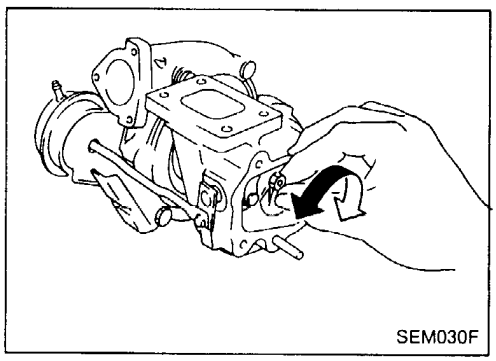
Perform the following checks. If NG, replace turbocharger unit.





OIL AND WATER TUBES

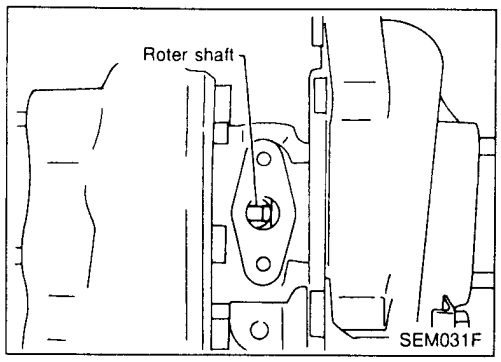
Check tubes for clogging



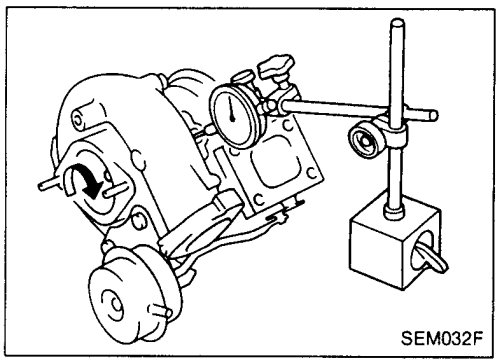
ROTOR SHAFT

1. Check rotor shaft for smooth rotation.

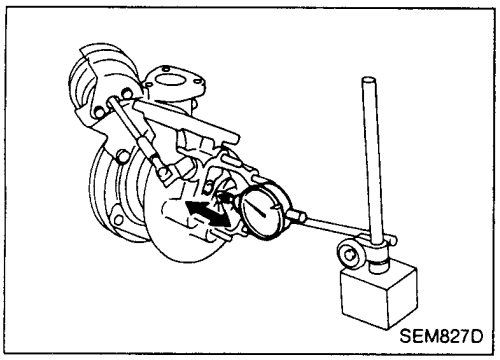
Inspection (Cont'd)



2. Check rotor shaft for carbon deposits.

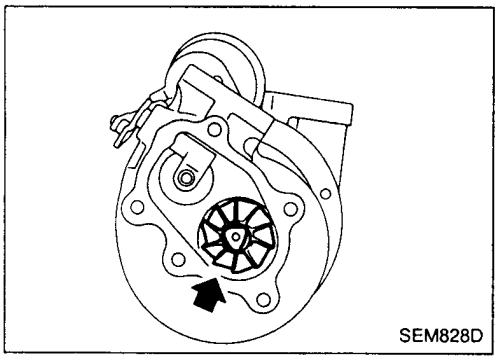


3. Measure rotor shaft runout.
   Runout (Total indicator reading):
   Standard
   0.056 - 0.127 mm (0.0022 - 0.0050 in)



4. Measure rotor shaft end play.
   End play:
   Standard
   0.013 - 0.097 mm (0.0005 - 0.0038 in)

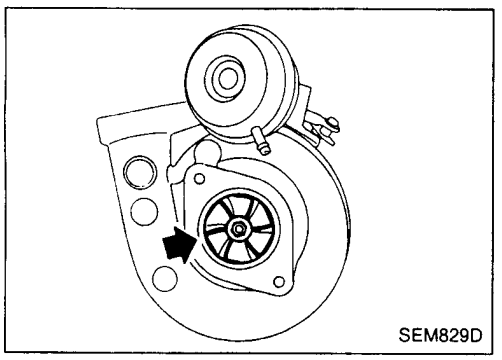
- **Do not allow wheels to turn when axial play is being measured.**



TURBINE WHEEL

Check turbine wheel for the following:

- Oil
- Carbon deposits
- Deformed fins
- Contact with turbine housing



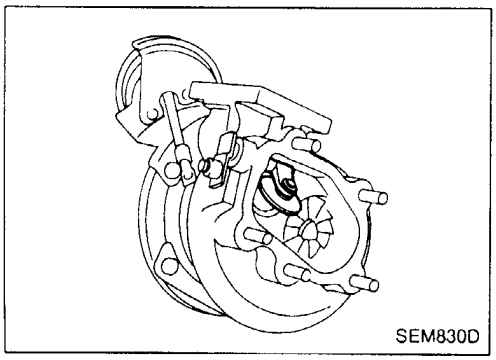
COMPRESSOR WHEEL

Check compressor wheel for the following:

- Oil
- Deformed fins
- Contact with compressor housing

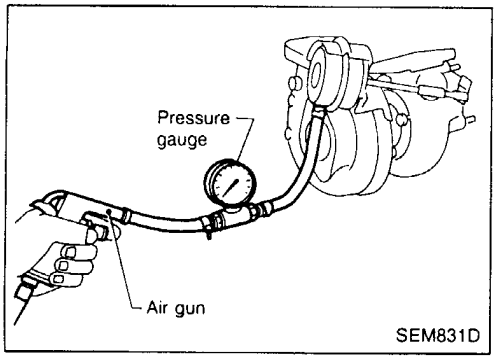
Inspection (Cont'd)

WASTEGATE VALVE


SEM830D

Remove rod pin and check wastegate valve for cracks, deformation and smooth movement. Check valve seat surface for smoothness.

WASTEGATE VALVE ACTUATOR

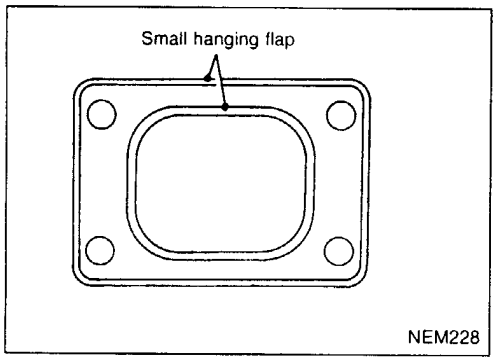


SEM831D

Apply compressed air to wastegate valve actuator and check it for smooth movement.

- **Do not applying compressed air to the actuator continuously**
- **The air pressure should be in the range of 73.3 to 101.3 kPa (733 to 1,013 mbar, 550 to 760 mmHg, 21.65 to 29.92 inHg).**

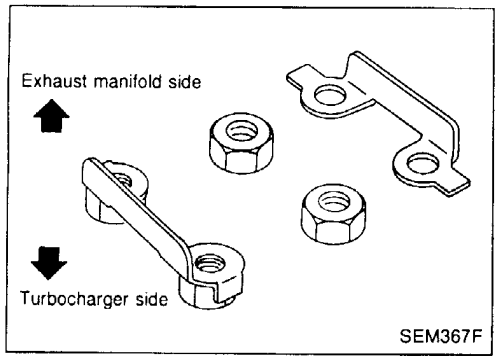
Assembly



NEM228

Assembly is the reverse order of disassembly.

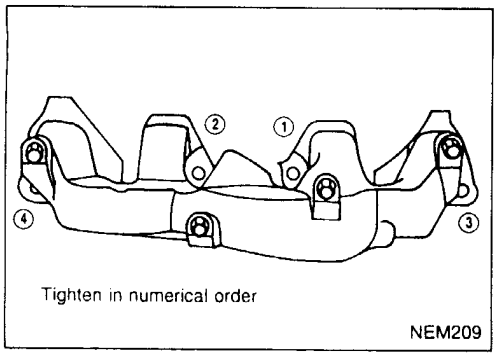
- Install gasket between exhaust manifold and turbocharger with small hanging flap side facing exhaust manifold.



SEM367F

- Bend locking plates along the side of turbocharger fastening nuts.
  Always use new locking plates.

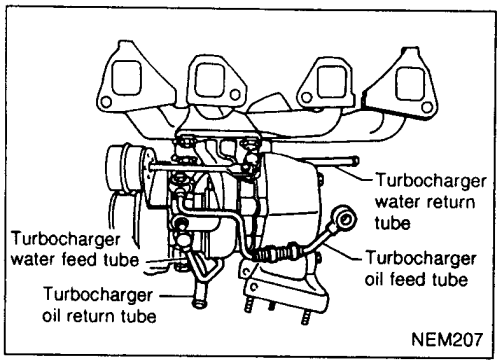
Installation



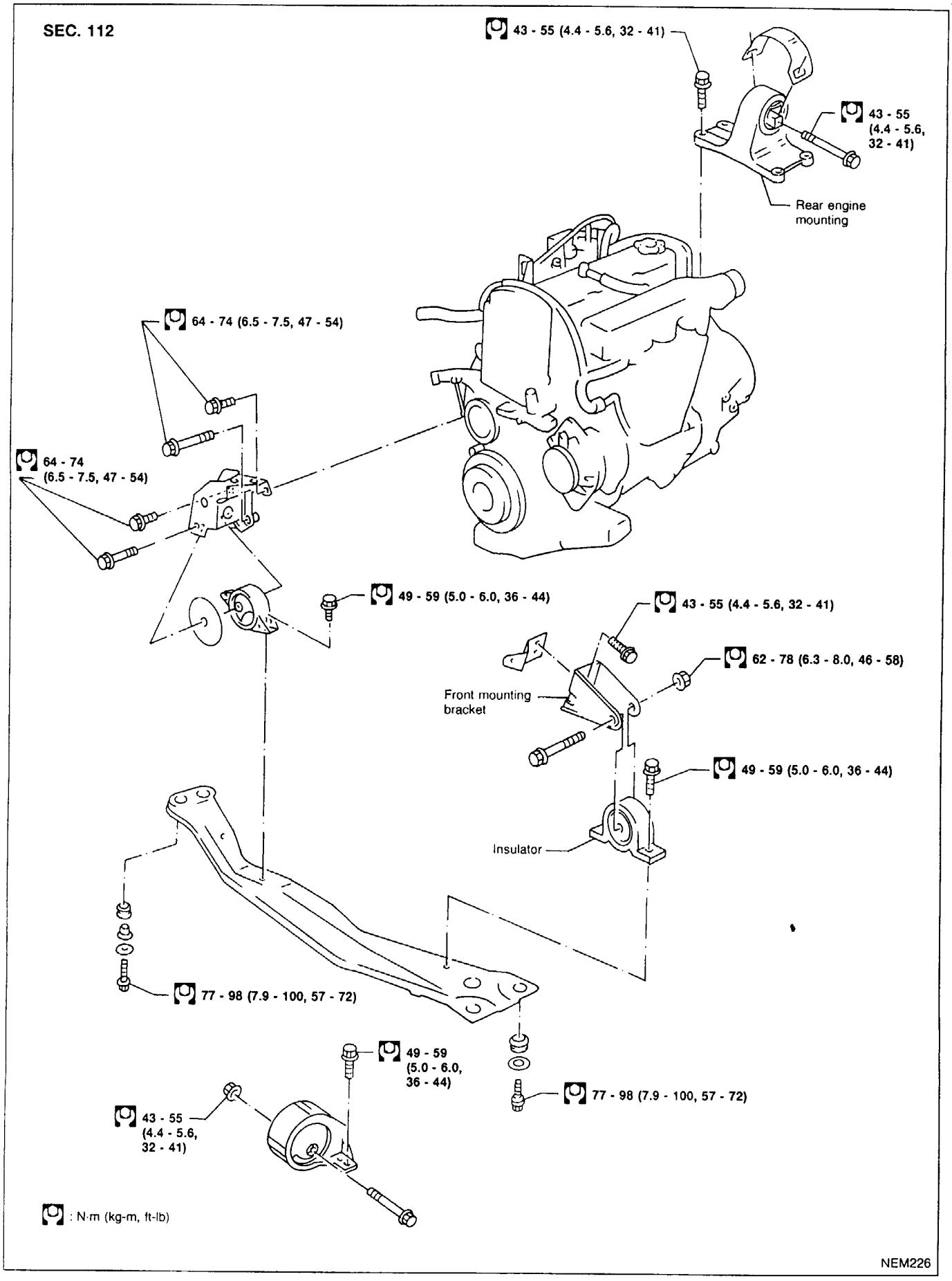
NEM209

1. Install exhaust manifold fixing nuts.

Installation (Cont'd)

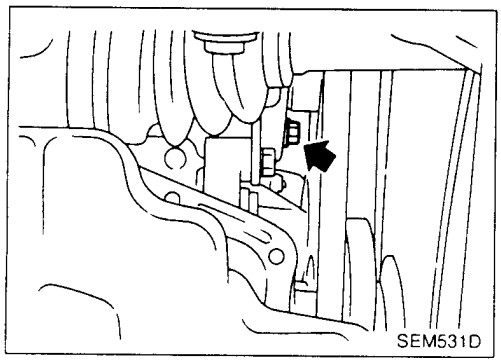


2. Installation is the reverse order of removal.
- Install oil tubes and water tubes in the following order, aligning the mating marks.
  a. Oil feed tube
  b. Water return tube
  c. Water feed tube
  d. Oil return tube

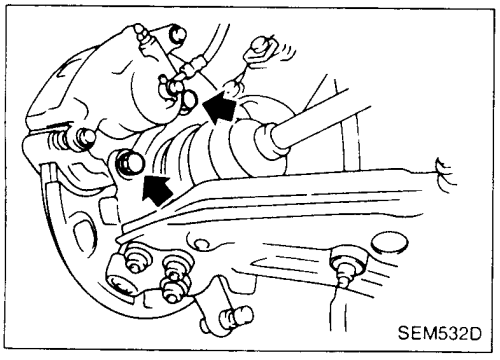

SEC. 112
43 - 55 (4.4 - 5.6, 32 - 41)
43 - 55 (4.4 - 5.6, 32 - 41)
Rear engine mounting
64 - 74 (6.5 - 7.5, 47 - 54)
64 - 74 (6.5 - 7.5, 47 - 54)
49 - 59 (5.0 - 6.0, 36 - 44)
43 - 55 (4.4 - 5.6, 32 - 41)
62 - 78 (6.3 - 8.0, 46 - 58)
Front mounting bracket
49 - 59 (5.0 - 6.0, 36 - 44)
Insulator
77 - 98 (7.9 - 100, 57 - 72)
49 - 59 (5.0 - 6.0, 36 - 44)
77 - 98 (7.9 - 100, 57 - 72)
43 - 55 (4.4 - 5.6, 32 - 41)
: N·m (kg-m, ft-lb)
NEM226

WARNING:
- **Situate vehicle on a flat and solid surface.**
- **Place chocks at front and back of rear wheels.**
- **Do not remove engine until exhaust system has completely cooled down.**
- **For safety during subsequent steps, the tension of wires should be slackened against the engine.**
- **Before removing front axle from transaxle, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.**
- **Be sure to hoist engine and transaxle in a safe manner.**
- **For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG or Eurofast.**

CAUTION:
- **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**
- **Always use engine slingers when hoisting the engine.**
- **When removing drive shaft, be careful not to damage transaxle oil seal.**

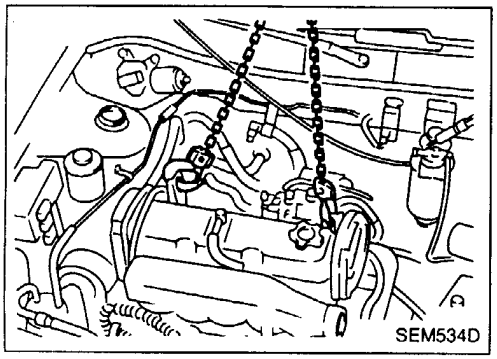

SEM531D

1. Remove engine undercovers and splash covers.
2. Remove front exhaust tube.
3. Disconnect lower water hose from radiator and drain coolant.
4. Drain transaxle oil.
5. Remove power steering mounting bolt. (See left.)
6. Drain coolant from cylinder head.
7. Disconnect water hoses and electrical wiring from radiator and remove radiator.
8. Disconnect fuel tubes and vacuum tubes.
9. Release power steering belt adjusting nut and remove power steering pump from engine.
   Bind pump properly to the vehicle.
10. Remove A/C compressor.
11. Disconnect or remove electrical wiring where necessary.
12. Release clutch lever cable.
13. Release tachometer cable from transaxle housing.
14. Remove front wheels.

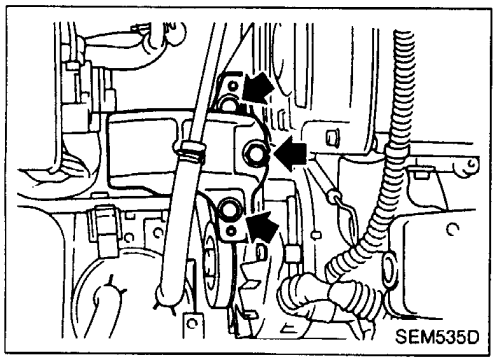

SEM532D

15. Remove brake caliper mounting bolts and bind caliper properly to vehicle LH & RH.

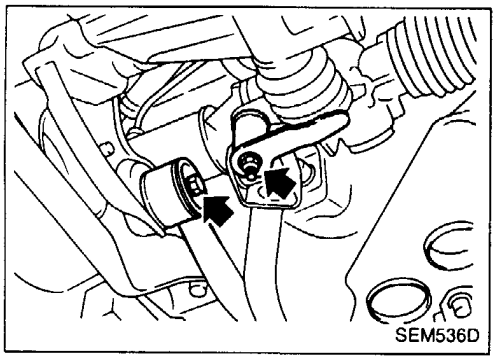
16. Disconnect tie rod ball joints and lower ball joints (LH & RH).
17. Remove stabilizer.
18. Remove drive shafts from transaxle.
1) RH: Split drive shaft center thrust bearing.
2) RH & LH: Remove hub mounting bolts and remove drive shaft carefully from transaxle.


SEM534D

19. Mount suitable slingers to cylinder head. Use a suitable hoist to release the force on the engine mountings.

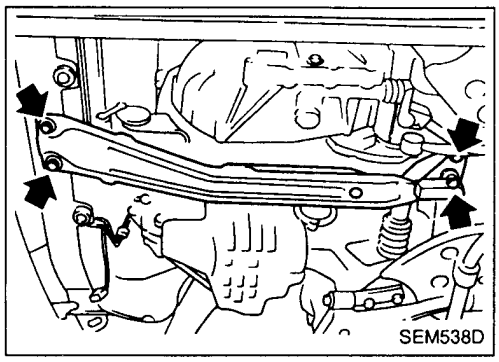

SEM535D

20. Remove upper mounting (Right side).

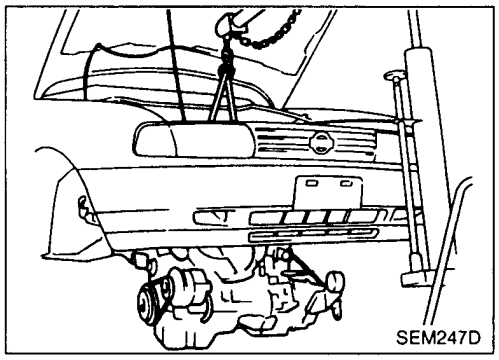

SEM536D

21. Release transaxle shift linkages.

22. Release left engine mounting.

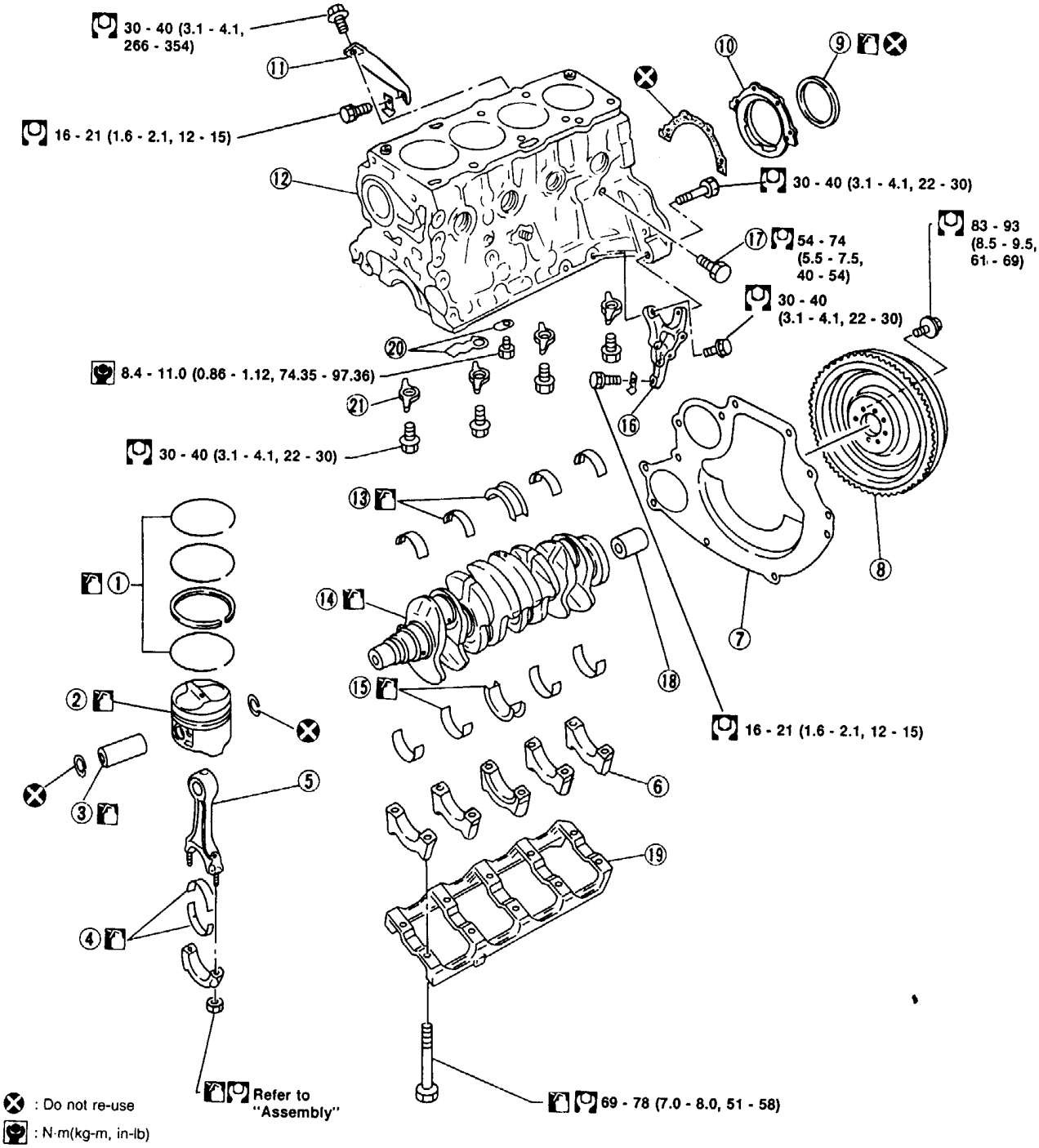

SEM538D

23. Remove center member fixing bolts from chassis.


SEM247D

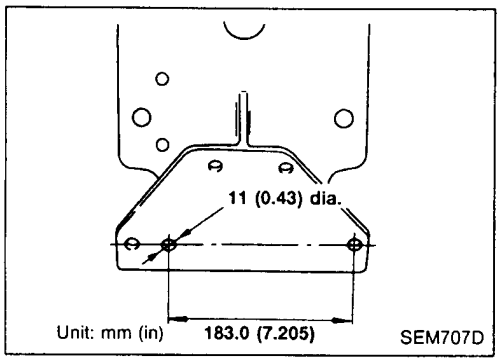
24. Remove engine with transaxle as shown.

SEC. 110•120



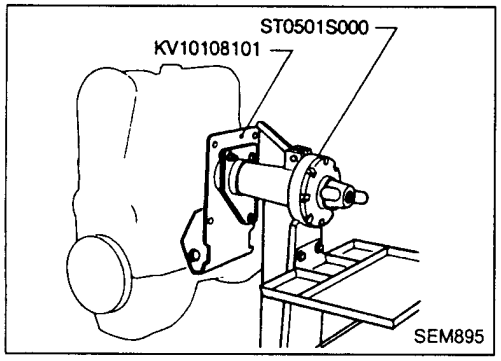
SEM358F

① Piston ring
② Piston
③ Piston pin
④ Connecting rod bearing
⑤ Connecting rod
⑥ Main bearing cap
⑦ Rear plate
⑧ Flywheel
⑨ Rear oil seal
⑩ Rear oil seal retainer
⑪ Gusset
⑫ Cylinder block
⑬ Main bearing
⑭ Crankshaft
⑮ Main bearing
⑯ Gusset
⑰ Drain plug
⑱ Pilot bushing
⑲ Main bearing beam
⑳ Plate
㉑ Oil jet



Preparation

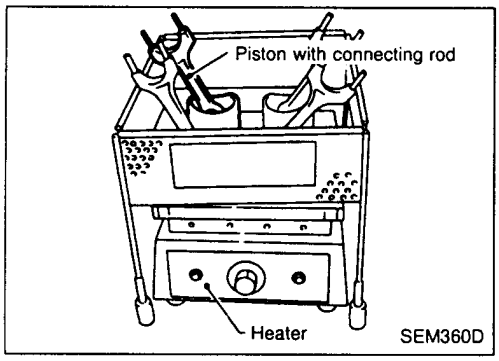
- Drill a hole into the attachment (KV10108101).



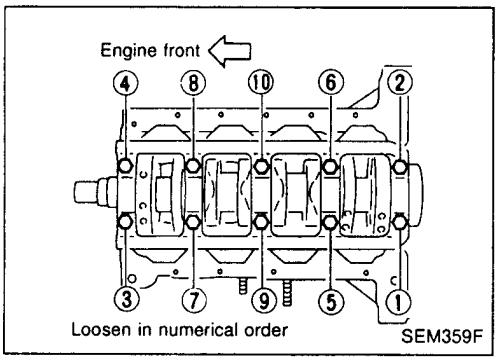
Disassembly

PISTON AND CRANKSHAFT

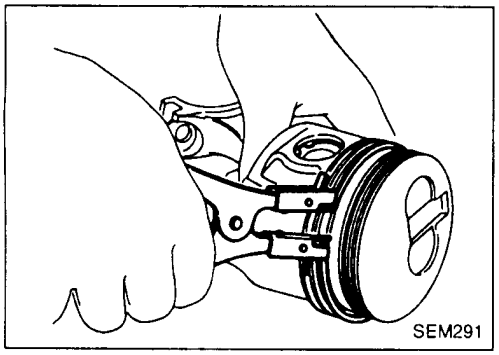
1. Place engine on a work stand.
2. Drain coolant and oil.
3. Remove timing belt.
4. Remove water pump.
5. Remove oil pan and oil pump.
6. Remove cylinder head.
7. Remove pistons with connecting rods.



When disassembling piston and connecting rod, heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.



8. Remove main bearing beam, bearing cap and crankshaft.
Place the bearings and caps in their proper order.
Upper bearings (cylinder block side) have oil groove.



9. Remove piston rings with a tool.

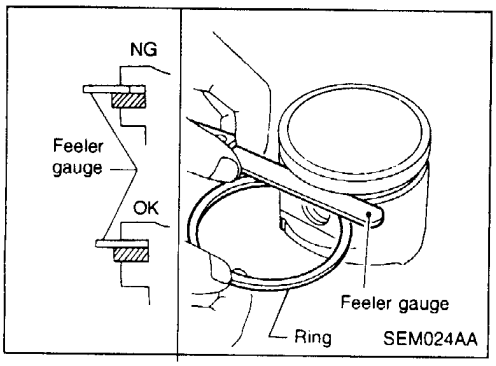
Inspection

PISTON AND PISTON PIN CLEARANCE

1. Measure outer diameter of piston pin and inner diameter of piston pin hole.
2. Calculate piston to piston pin clearance.

Pin diameter:
27.994 - 28.000 mm (1.1021 - 1.1024 in)
Pin hole diameter:
27.991 - 27.999 mm (1.1020 - 1.1023 in)
Clearance:
–0.004 to 0 mm (–0.0002 to 0 in)
(Interference fit)

Service parts are available as a set of piston and piston pin.



PISTON RING SIDE CLEARANCE

Side clearance:

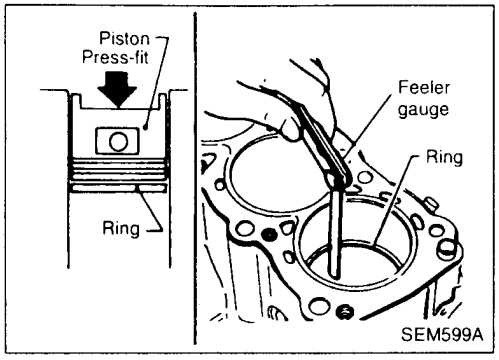
Unit: mm (in)

	Standard	Limit
Top ring	0.020 - 0.040 (0.0008 - 0.0016)	0.10 (0.0039)
2nd ring	0.050 - 0.085 (0.0020 - 0.0033)	0.10 (0.0039)
Oil ring	0.030 - 0.070 (0.0012 - 0.0028)	0.10 (0.0039)

If out of specification, replace piston and/or piston ring assembly.

Inspection (Cont'd)

PISTON RING END GAP



End gap:

Unit: mm (in)

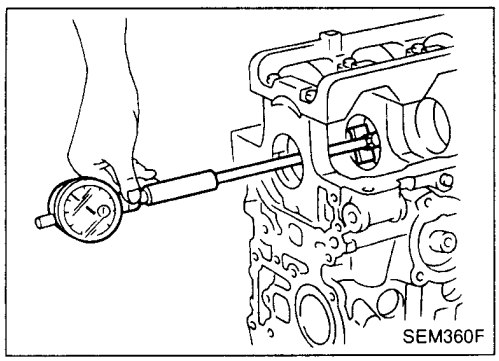
	Standard	Limit
Top ring	Bore grade 1, 2, 3 0.22 - 0.32 (0.0087 - 0.0126) Bore grade 4, 5 0.12 - 0.22 (0.0047 - 0.0087)	1.0 (0.039)
2nd ring	0.38 - 0.53 (0.0150 - 0.0209)	0.7 (0.028)
Oil ring	0.30 - 0.55 (0.0118 - 0.0217)	0.6 (0.024)

- If out of specification, replace piston ring. If gap exceeds maximum limit with new ring, rebore cylinder and use oversize piston and piston rings.

Refer to SDS (EM-182).

- When replacing the piston, check the cylinder block surface for scratches or evidence of seizure. If scratches or evidence of seizure is found, hone or replace the cylinder block.

MAIN BEARING CLEARANCE

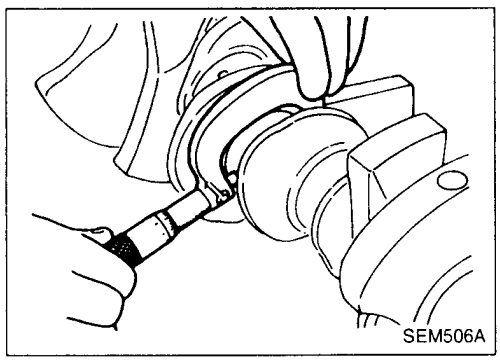


1. Install main bearings to cylinder block and main bearing cap.
2. Install main bearing cap with bearing to cylinder block.

Tighten all bolts in two or three stages.

: 69 - 78 N·m (7.0 - 8.0 kg-m, 51 - 58 ft-lb)

3. Measure inside diameter "A" of main journal.



4. Measure outside diameter "Dm" of main journal of crankshaft.

Journal diameter:

Refer to SDS (EM-182).

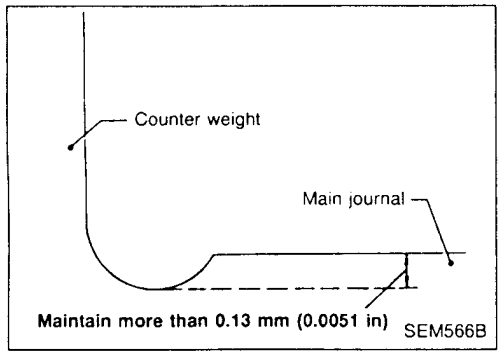
5. Calculate main bearing clearance.

Main bearing clearance = A – Dm

Standard:

0.039 - 0.065 mm (0.0015 - 0.0026 in)

- If it exceeds the limit, replace the bearing.

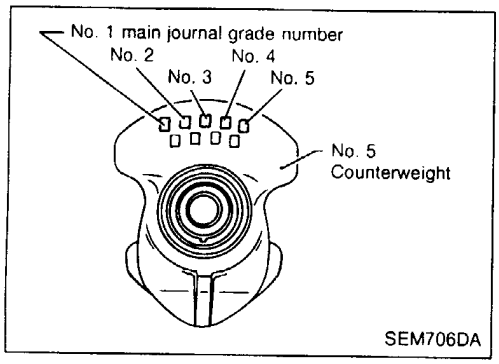


- If crankshaft main journal is worn or shows any abnormality, regrind crank journal and use undersized bearings to maintain the specified oil clearance.
- **Refer to SDS for regrinding crankshaft journal diameter and available service parts (EM-182).**
- **When regrinding crankshaft journal, do not grind fillet-roll.**

Inspection (Cont'd)

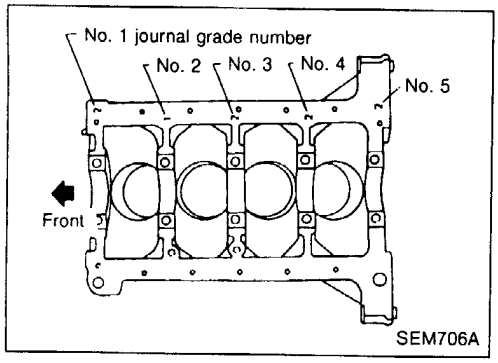
- If either bearing, crankshaft or cylinder block is replaced with a new one, select main bearing according to the following table. These numbers are punched in either Arabic or Roman numerals.

		Main bearing housing grade number		
		0	1	2
		Main bearing grade number		
Crankshaft main journal grade number	0	0	1	2
	1	1	2	3
	2	2	3	4



Identification color:

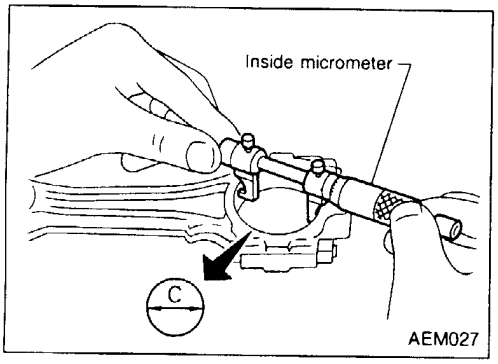
Grade 0	Yellow
Grade 1	Green
Grade 2	Brown
Grade 3	Black
Grade 4	Blue



For example:

Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2 = 3

Main bearing thickness:
Refer to SDS (EM-183).



CONNECTING ROD BEARING CLEARANCE (Big end)

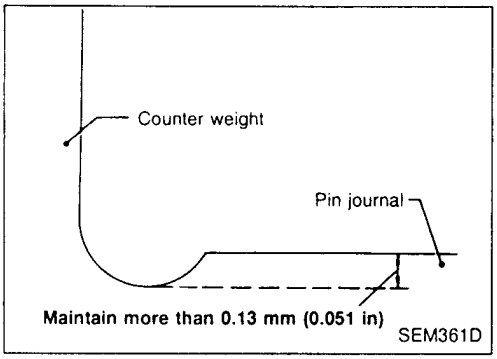
1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap with bearing to connecting rod.

Apply oil to the threaded portion of bolts and seating surface of nuts.

: 37 - 45 N·m (3.8 - 4.6 kg-m, 27 - 33 ft-lb)

3. Measure inside diameter "C" of bearing.

Inspection (Cont'd)



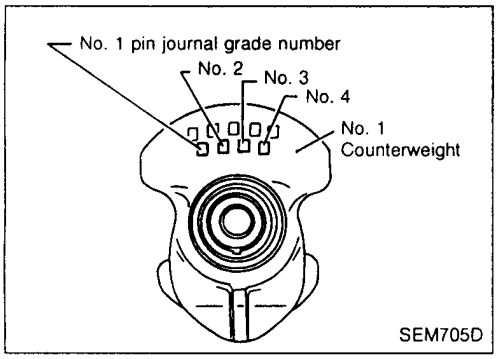
4. Measure outside diameter "Dp" of crankshaft pin journal.
5. Calculate connecting rod bearing clearance.

Connecting rod bearing clearance = C – Dp

Standard:

0.031 - 0.055 mm (0.0012 - 0.0022 in)

- If it exceeds the limit, replace the bearing.
- If crankshaft pin journal is worn or shows any abnormality, regrind crank pin and use undersized bearings to maintain the specified oil clearance.
- **Refer to SDS for regrinding diameter of crankshaft pin and available service parts (EM-182).**
- **When regrinding crankshaft pin, do not grind fillet-roll.**



Selective connecting rod bearing

- If either bearings or crankshaft are being replaced with new ones, select connecting rod bearings according to the following table. Grade numbers are punched in either Arabic or Roman numerals.

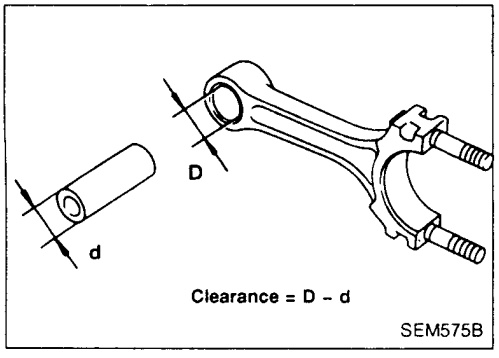
	Crankshaft pin journal grade number		
	0	1	2
Connecting rod bearing grade number	0	1	2

Identification color

Grade 0: Black

Grade 1: Yellow

Grade 2: Blue



CONNECTING ROD AND PISTON PIN CLEARANCE (Small end)

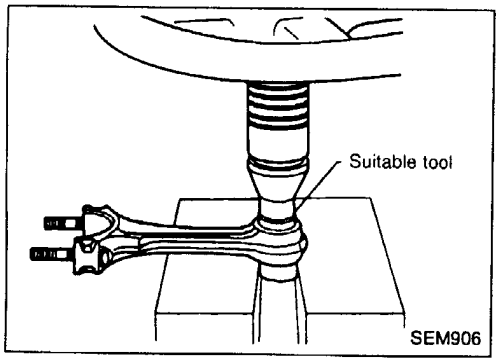
Clearance (D – d):

0.025 - 0.044 mm (0.0010 - 0.0017 in)

- If clearance exceeds the specifications, replace the bearing.

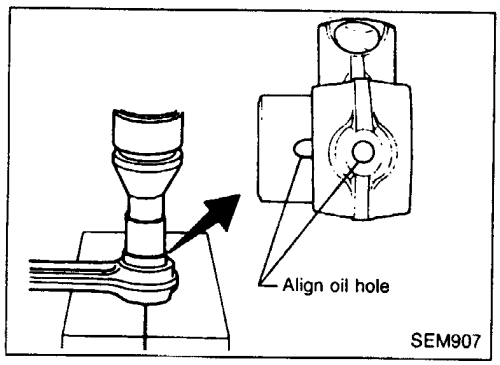
Inspection (Cont'd)

Bearing replacement



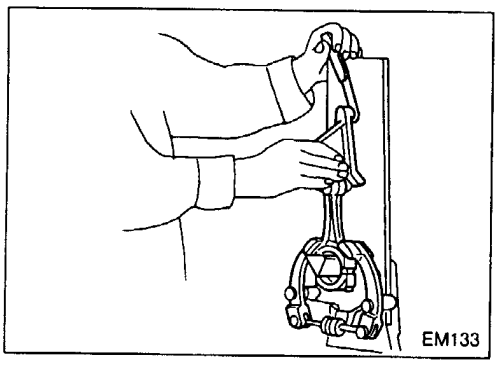
1. Remove bearing with a suitable tool.

Do not scratch inner surface of connecting rod.



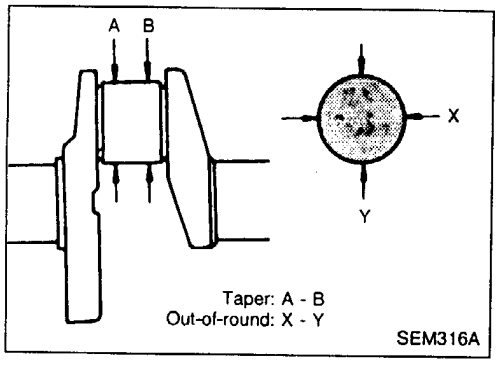
2. Install new bearing with oil holes aligned correctly.
3. Ream bore using a suitable tool.

Ream bore:
28.025 - 28.038 mm (1.1033 - 1.1039 in)



CONNECTING ROD BEND AND TORSION

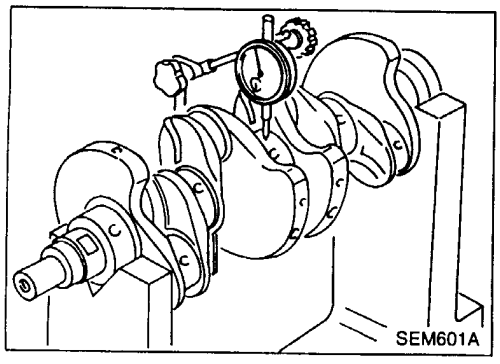
Bend and torsion [per 100 mm (3.94 in) length]:
Bend Less than 0.025 mm (0.0010 in)
Torsion Less than 0.025 mm (0.0010 in)



CRANKSHAFT

1. Check crankshaft journals and pins for score, bias, wear or cracks. If faults are minor, correct with fine emery paper.
2. Check journals and pins with a micrometer for taper and out-of-round.

Out-of-round (X – Y):
Less than 0.005 mm (0.0002 in)
Taper (A – B):
Less than 0.005 mm (0.0002 in)



3. Check crankshaft runout.

Runout (Total indicator reading):
Less than 0.05 mm (0.0020 in)

Inspection (Cont'd)

CYLINDER BLOCK DISTORTION

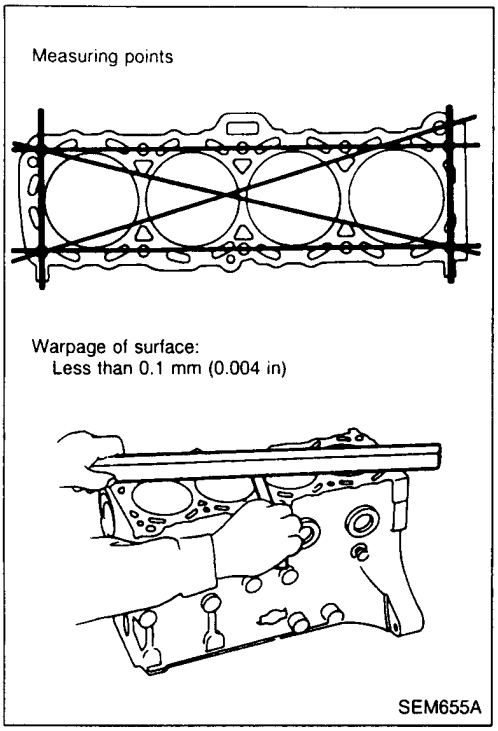
Clean upper face of cylinder block and measure the distortion.

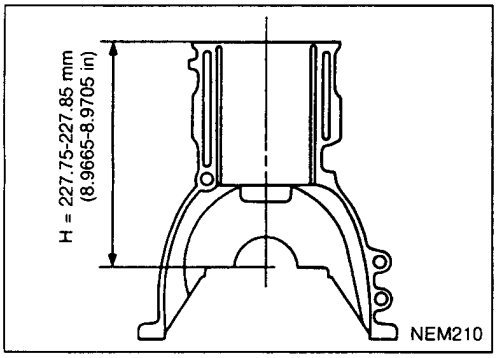
Limit:

0.10 mm (0.0039 in)

If out of specification, resurface it.

The resurfacing limit of cylinder block is determined by cylinder head resurfacing in an engine.





Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".

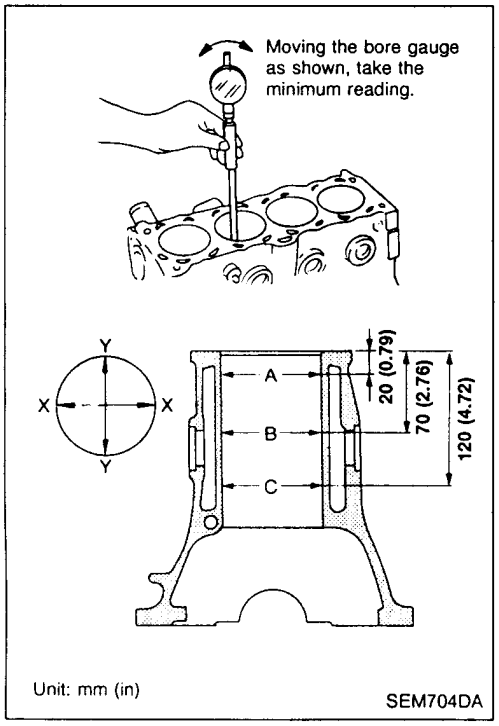
The maximum limit is as follows:

A + B = 0.1 mm (0.004 in)

Nominal cylinder block height from crankshaft center:

227.75 - 227.85 mm (8.9665 - 8.9705 in)

If necessary, replace cylinder block.



CYLINDER BORE

1. Check for scratches or seizure. If seizure is found, hone bore.
2. Using a bore gauge, measure cylinder bore for wear, out-of-round or taper.

Standard bore diameter:

84.500 - 84.550 mm (3.3268 - 3.3287 in)

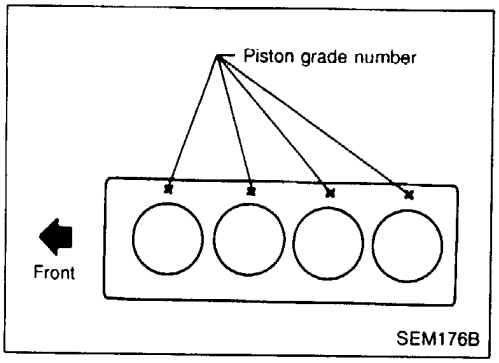
Unit: mm (in)

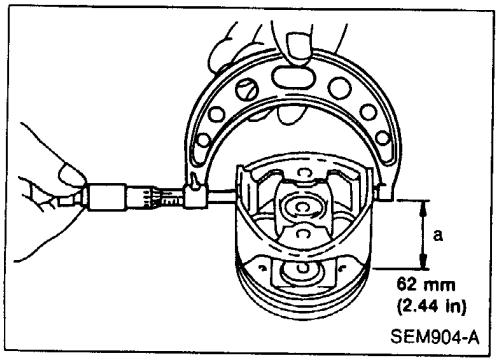
Bore wear limit	0.2 (0.008)
Out-of-round (X – Y) standard	0.015 (0.0006)
Taper (A – B) standard	0.010 (0.0004)

If it exceeds the limit, rebore all four cylinders. Replace cylinder block if necessary.

If cylinder block or piston is replaced, match piston grade with grade number on cylinder block upper surface.

Inspection (Cont'd)





Reboring

1. The size to which cylinders must be honed, is determined by adding piston-to-cylinder clearance to the piston skirt diameter "A".
   Dimension "a":
   Approximately 62 mm (2.44 in)
   Rebored size calculation
   D = A + B – C = A + [0.03 to 0.05 mm (0.0012 to 0.0020 in)]
   where,
   D : Honed diameter
   A : Skirt diameter as measured
   B : Piston-to-wall clearance
   C : Machining allowance 0.02 mm (0.0008 in)
2. Install main bearing caps and tighten bolts to the specified torque. This will prevent distortion of cylinder bores.
3. Cut cylinder bores in the order of 2-4-1-3.

Do not cut too much out of the cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.

4. Hone the cylinders to the required size referring to SDS (EM-182).
5. Measure the finished cylinder bore for out-of-round and taper.

Measurement of a just machined cylinder bore requires utmost care since it is expanded by cutting heat.

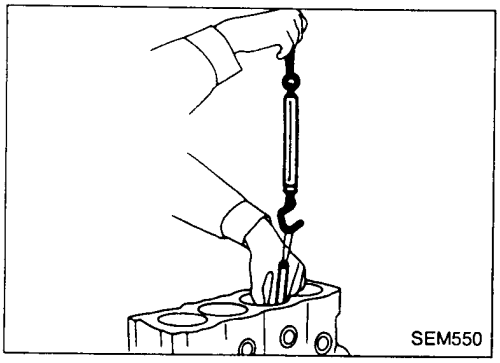
PISTON-TO-BORE CLEARANCE

Using micrometer

1. Measure piston and cylinder bore diameter.
   Piston diameter "A":
   Refer to SDS (EM-182).
   Measuring point "a" (Distance from the bottom):
   Approximately 62 mm (2.44 in)
   Bore diameter "D":
   Refer to SDS (EM-182).
   Measuring point (Distance from the top):
   Approximately 70 mm (2.76 in)
2. Check that piston clearance is within the specification.
   Piston clearance (D – A):
   0.030 - 0.050 mm (0.0012 - 0.0020 in)

Inspection (Cont'd)

Using feeler gauge

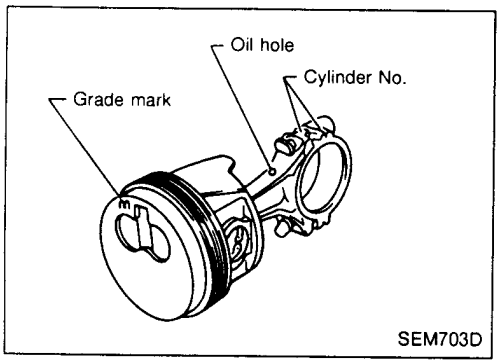


1. Set piston and feeler gauge with spring scale.
2. Measure extracting force while pulling up scale slowly.

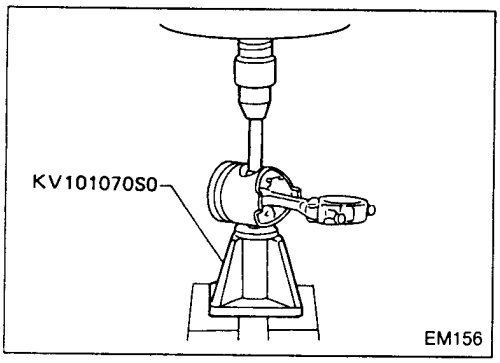
Feeler gauge used:
0.05 - 0.07 mm (0.0020 - 0.0028 in)
Extracting force:
7.8 - 14.7 N (0.8 - 1.5 kg, 1.8 - 3.3 lb)

Assembly

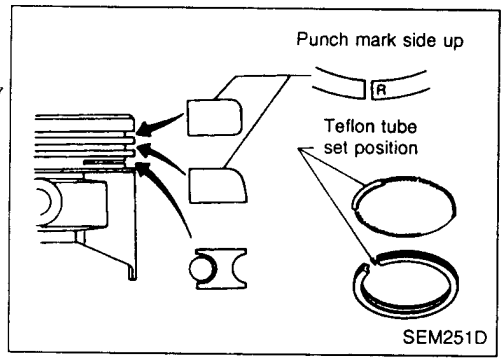
PISTON



- **Numbers stamped on connecting rod and cap correspond to each cylinder. Care should be taken to avoid a wrong combination including bearing and connecting rod direction.**



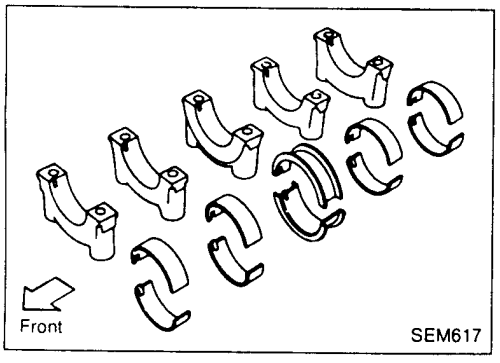
- **Install new snap ring on one side of piston pin hole.**
- **When assembling piston and connecting rod with piston pin, heat piston to between 60 and 80°C (140 and 176°F) and install piston pin with a suitable tool.**
- **Install new snap ring.**
- **After assembling, ascertain that piston swings smoothly.**



- Install piston rings with a suitable tool.

Selective top ring; When installing new top ring or replacing cylinder block, select top ring to adjust ring gap.

	Cylinder bore grade	
	1, 2, 3	4, 5
Top ring grade No.	No mark	S

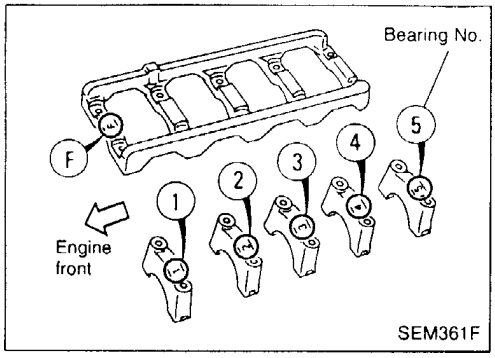


CRANKSHAFT

1. Set main bearings in the proper position on cylinder block and main bearing caps.

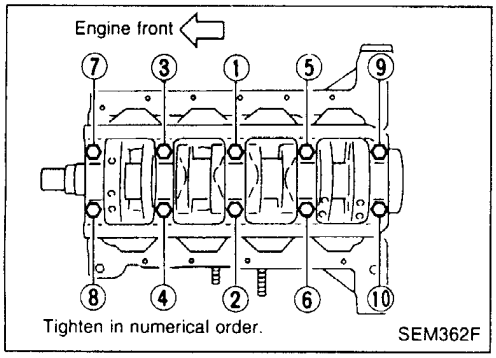
- **If either crankshaft, cylinder block or main bearing is reused again, it is necessary to measure main bearing clearance.**
- **Upper bearings (cylinder block side) have oil groove.**
- **Apply new engine oil to bearing surfaces.**

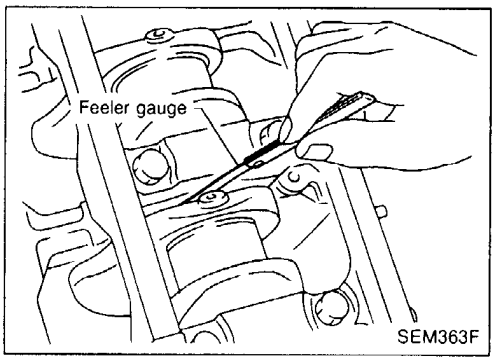
Assembly (Cont'd)



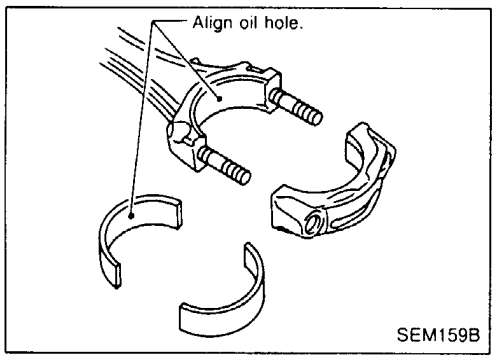
2. Apply engine oil to main bearing surfaces on crankshaft journal side.
3. Install crankshaft, main bearing caps and main bearing beam.
4. Tighten main bearing cap bolts.
   : 69 - 78 N·m (7.0 - 8.0 kg-m, 51 - 58 ft-lb)

- **Arrange the parts so that the indicated numbers on bearing caps are in a row from the front of engine.**
- **Tighten bearing cap bolts gradually in two or three stages and outwardly from center bearing in sequence.**
- **After securing bearing cap bolts, ascertain that crankshaft turns smoothly.**
- **Apply new engine oil to threads of bearing cap bolts.**





5. Measure crankshaft free end play at center bearing.
   Crankshaft free end play:
   Standard
   0.05 - 0.18 mm (0.0020 - 0.0071 in)
   Limit
   0.30 mm (0.0118 in)



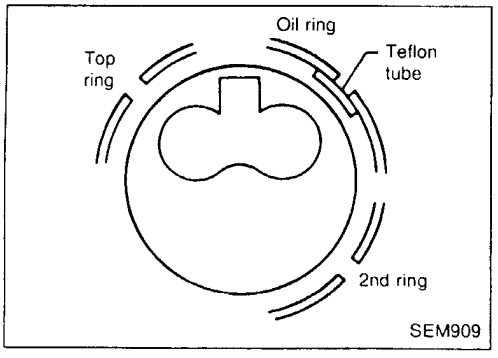
PISTON WITH CONNECTING ROD

1. Install connecting rod bearings in the connecting rods and connecting rod caps.

- Confirm that correct size of bearings is used.

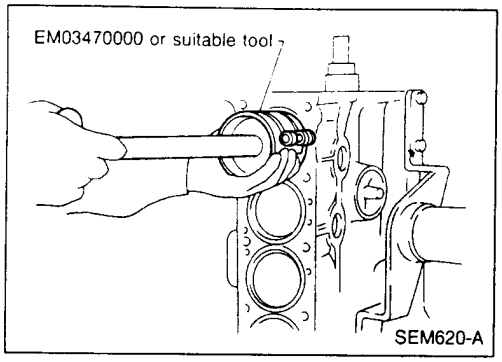
Refer to "Inspection" (EM-152).

- Install the bearings so that the oil hole in the connecting rod aligns with the oil hole of the bearing.
- **Apply engine oil to connecting rod bearing surfaces on the crankshaft journal side.**

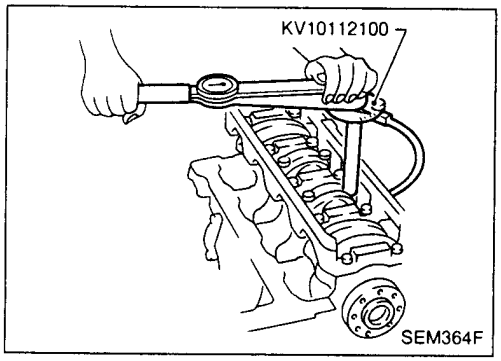


- Set piston rings as shown.

Assembly (Cont'd)



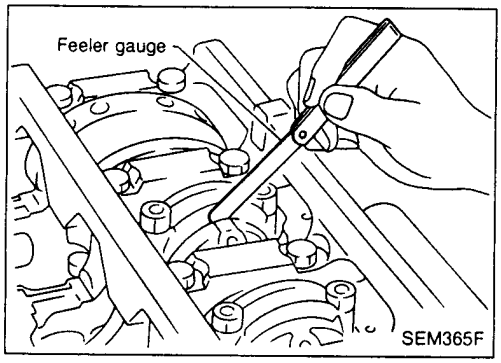
2. Install pistons with connecting rods.
- Install them into corresponding cylinder using Tool.
- **Be careful not to scratch cylinder wall with connecting rod.**
- **Apply engine oil to cylinder wall, piston and bearing.**
- **Arrange so that the front mark on piston head faces to the front of engine.**



3. Install connecting rod bearing caps.
- **Apply engine oil to the thread of connecting rod bearing nut.**

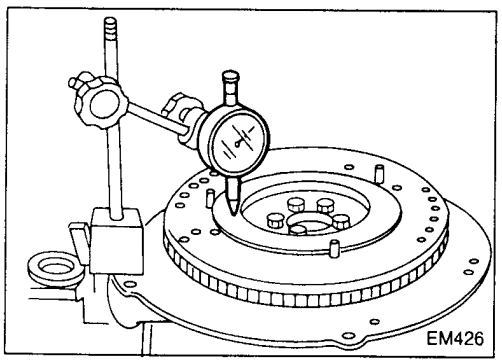
(1) Tighten connecting rod bearing nut to 15±1 N·m (1.5±0.1 kg-m, 10.8±0.7 ft-lb).
(2) Then tighten an additional $60^{+5^\circ}_{-0^\circ}$ turns with an angular tightening wrench.

: 15±1 N·m (1.5±0.1 kg-m, 11±0.7 ft-lb) plus $60^{+5^\circ}_{-0^\circ}$ or
: 37 - 45 N·m (3.8 - 4.6 kg-m, 27 - 33 ft-lb)



4. Measure connecting rod side clearance.

Connecting rod side clearance (Big end play):
Limit
0.3 mm (0.012 in)



FLYWHEEL RUNOUT

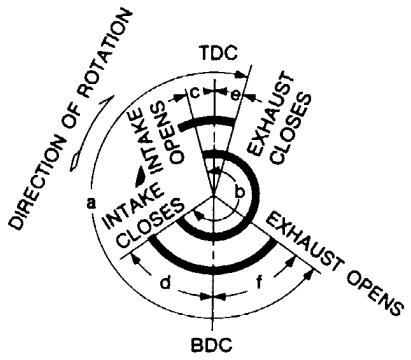
Runout (Total indicator reading):
Less than 0.15 mm (0.0059 in)

General Specifications

GENERAL SPECIFICATIONS

Engine		GA16DE
Classification		Gasoline
Cylinder arrangement		4, in-line
Displacement	cm^3 (cu in)	1,597 (97.45)
Bore x stroke	mm (in)	76.0 x 88.0 (2.992 x 3.465)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings		
Compression		2
Oil		1
Number of main bearings		5
Compression ratio		9.8

Valve timing



EM120
Unit: degree

	a	b	c	d	e	f
GA16DE	222°	214°	0°	34°	17°	42°

Inspection and Adjustment

ENGINE COMPRESSION PRESSURE

Unit: kPa (bar, kg/cm², psi)/350 rpm

Standard	1,324 (13.24, 13.5, 192)
Minimum	1,128 (11.28, 11.5, 164)
Difference limit between cylinders	98 (0.98, 1.0, 14)

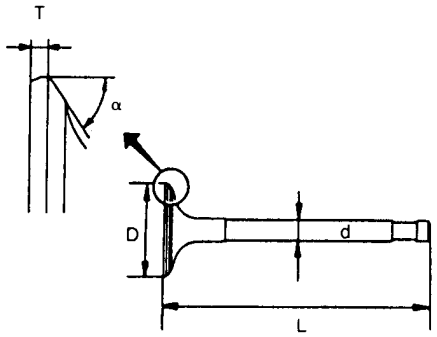
CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface flatness	Less than 0.03 (0.0012)	0.1 (0.004)
Height	117.8 - 118.0 (4.638 - 4.646)	—

VALVE

Unit: mm (in)



SEM188

		GA16DE
Valve head diameter "D"	Intake	29.9 - 30.2 (1.177 - 1.189)
	Exhaust	23.9 - 24.2 (0.941 - 0.949)
Valve length "L"	Intake	92.00 - 92.50 (3.6220 - 3.6417)
	Exhaust	92.37 - 92.87 (3.6366 - 3.6563)
Valve stem diameter "d"	Intake	5.465 - 5.480 (0.2152 - 0.2157)
	Exhaust	5.445 - 5.460 (0.2144 - 0.2150)
Valve face angle "α"		45°15' - 45°45'
Valve margin "T" limit		1.05 - 1.35 (0.0413 - 0.0531)
Valve stem end surface grinding limit		Less than 0.2 (0.008)

Valve clearance

Unit: mm (in)

	For adjusting		For checking
	Hot	Cold*	Hot
Intake	0.32 - 0.40 (0.013 - 0.016)	0.25 - 0.33 (0.010 - 0.013)	0.21 - 0.49 (0.008 - 0.019)
Exhaust	0.37 - 0.45 (0.015 - 0.018)	0.32 - 0.40 (0.013 - 0.016)	0.30 - 0.58 (0.012 - 0.023)

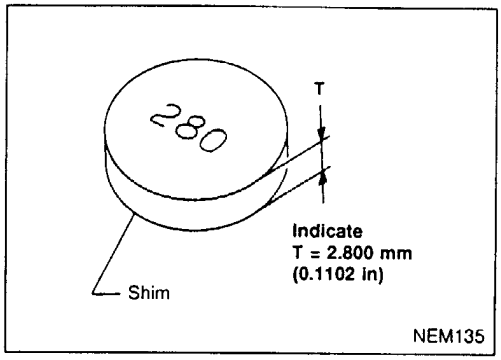
*: At a temperature of approximately 20°C (68°F)

Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

Inspection and Adjustment (Cont'd)

Available shims

Thickness mm (in)	Identification mark
2.00 (0.0787)	200
2.02 (0.0795)	202
2.04 (0.0803)	204
2.06 (0.0811)	206
2.08 (0.0819)	208
2.10 (0.0827)	210
2.12 (0.0835)	212
2.14 (0.0843)	214
2.16 (0.0850)	216
2.18 (0.0858)	218
2.20 (0.0866)	220
2.22 (0.0874)	222
2.24 (0.0882)	224
2.26 (0.0890)	226
2.28 (0.0898)	228
2.30 (0.0906)	230
2.32 (0.0913)	232
2.34 (0.0921)	234
2.36 (0.0929)	236
2.38 (0.0937)	238
2.40 (0.0945)	240
2.42 (0.0953)	242
2.44 (0.0961)	244
2.46 (0.0969)	246
2.48 (0.0976)	248
2.50 (0.0984)	250
2.52 (0.0992)	252
2.54 (0.1000)	254
2.56 (0.1008)	256
2.58 (0.1016)	258
2.60 (0.1024)	260
2.62 (0.1031)	262
2.64 (0.1039)	264
2.66 (0.1047)	266
2.68 (0.1055)	268
2.70 (0.1063)	270
2.72 (0.1071)	272
2.74 (0.1079)	274
2.76 (0.1087)	276
2.78 (0.1094)	278
2.80 (0.1102)	280
2.82 (0.1110)	282
2.84 (0.1118)	284
2.86 (0.1126)	286
2.88 (0.1134)	288
2.90 (0.1142)	290
2.92 (0.1150)	292
2.94 (0.1157)	294
2.96 (0.1165)	296
2.98 (0.1173)	298



Inspection and Adjustment (Cont'd)

Valve guide

Unit: mm (in)

	Intake		Exhaust	
	Standard	Service	Standard	Service
Valve guide Outer diameter	9.523 - 9.534 (0.3749 - 0.3754)	9.723 - 9.734 (0.3828 - 0.3832)	9.523 - 9.534 (0.3749 - 0.3754)	9.723 - 9.734 (0.3828 - 0.3832)
Valve guide Inner diameter [Finished size]	5.500 - 5.515 (0.2165 - 0.2171)			
Cylinder head valve guide hole diameter	9.475 - 9.496 (0.3730 - 0.3739)	9.685 - 9.696 (0.3813 - 0.3817)	9.475 - 9.496 (0.3730 - 0.3739)	9.685 - 9.696 (0.3813 - 0.3817)
Interference fit of valve guide	0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)	0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)
Stem to guide clearance	0.020 - 0.050 (0.0008 - 0.0020)		0.040 - 0.070 (0.0016 - 0.0028)	
Valve deflection limit (Dial gauge reading)	0.2 (0.008)			
Projection length	11.5 - 11.7 (0.453 - 0.461)			

Valve spring

Free height	mm (in)	40.00 (1.5748)
Pressure N (kg, lb) at height mm (in)	Standard	369.92 (37.72, 83.17) at 23.64 (0.9307)
	Limit	347.66 (35.45, 78.17) at 23.64 (0.9307)
Out-of-square	mm (in)	Less than 1.74 (0.0685)

Valve lifter

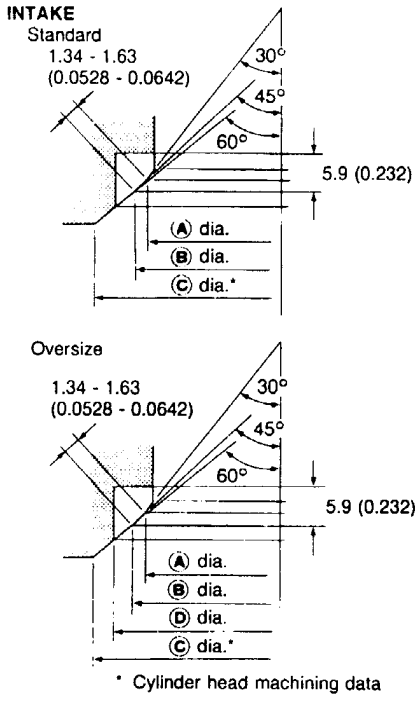
Unit: mm (in)

Valve lifter outside diameter	29.960 - 29.975 (1.1795 - 1.1801)
Lifter guide inside diameter	30.000 - 30.021 (1.1811 - 1.1819)
Clearance between lifter and lifter guide	0.025 - 0.061 (0.0010 - 0.0024)

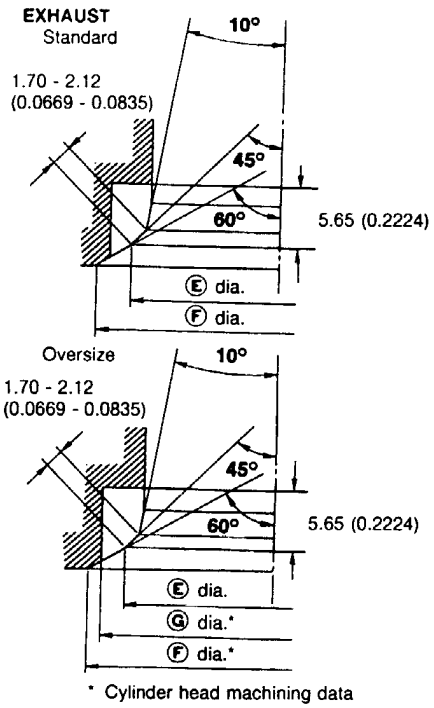
Inspection and Adjustment (Cont'd)

Valve seat

Unit: mm (in)



SEM573D



SEM574D

Dia.	GA16DE
Ⓐ	27.8 - 28.0 (1.0945 - 1.1024)
Ⓑ	29.5 - 29.7 (1.161 - 1.169)
Ⓒ	31.9 - 32.1 (1.256 - 1.264)
Ⓓ	31.500 - 31.516 (1.2402 - 1.2408)
Ⓔ	23.5 - 23.7 (0.925 - 0.933)
Ⓕ	25.2 - 25.4 (0.992 - 1.000)
Ⓖ	25.500 - 25.516 (1.0039 - 1.0046)

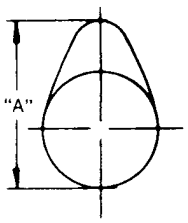
Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING

Camshaft

Unit: mm (in)

Cam height "A"	Intake	39.380 - 39.570 (1.5504 - 1.5779)
	Exhaust	39.880 - 40.070 (1.5701 - 1.5776)
Cam wear limit		0.20 (0.0079)



EM671

Camshaft bearing

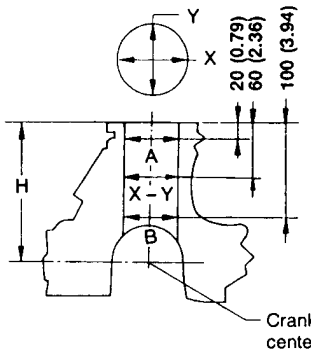
Unit: mm (in)

		Standard	Limit
Camshaft journal to bearing clearance		0.045 - 0.086 (0.0018 - 0.0034)	0.15 (0.0059)
Inner diameter of camshaft bearing	No. 1	28.000 - 28.021 (1.1024 - 1.1032)	—
	No. 2 to No. 5	24.000 - 24.021 (0.9449 - 0.9457)	
Outer diameter of camshaft journal	No. 1	27.935 - 27.955 (1.0998 - 1.1006)	—
	No. 2 to No. 5	23.935 - 23.955 (0.9423 - 0.9431)	
Camshaft runout [TIR*]		Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft end play		0.070 - 0.143 (0.0028 - 0.0056)	0.20 (0.0079)

*: Total indicator reading

CYLINDER BLOCK

Unit: mm (in)



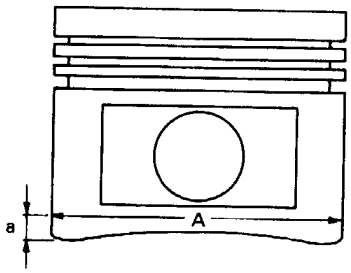
SEM171D

	Standard	Limit
Surface flatness	Less than 0.03 (0.0012)	0.1 (0.004)
Height "H" (nominal)	213.95 - 214.05 (8.4232 - 8.4271)	—
Standard Inner diameter		
Grade No. 1	76.000 - 76.010 (2.9921 - 2.9925)	0.2 (0.008)
Grade No. 2	76.010 - 76.020 (2.9925 - 2.9929)	
Grade No. 3	76.020 - 76.030 (2.9929 - 2.9933)	
Out-of-round (X – Y)	Less than 0.015 (0.0006)	—
Taper (A – B)	Less than 0.010 (0.0004)	—
Difference in inner diameter between cylinders	0.05 (0.0020)	0.2 (0.008)

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)



SEM658D

	GA16DE
Piston skirt diameter "A"	
Standard	
Grade No. 1	75.980 - 75.990 (2.9913 - 2.9917)
Grade No. 2	75.990 - 76.000 (2.9917 - 2.9921)
Grade No. 3	76.000 - 76.010 (2.9921 - 2.9925)
0.5 (0.020) oversize (service)	76.490 - 76.510 (3.0114 - 3.0122)
1.0 (0.039) oversize (service)	76.990 - 77.010 (3.0311 - 3.0319)
"a" dimension	9.5 (0.374)
Piston pin hole inner diameter	18.987 - 18.999 (0.7475 - 0.7480)
Piston pin outer diameter	18.989 - 19.001 (0.7476 - 0.7481)
Piston to bore clearance	0.015 - 0.035 (0.0006 - 0.0014)

Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.035 - 0.080 (0.0014 - 0.0031)	0.2 (0.008)
	2nd	0.030 - 0.065 (0.0012 - 0.0026)	
End gap	Top	0.14 - 0.35 (0.0055 - 0.0138)	0.49 (0.0193)
	2nd	0.35 - 0.55 (0.0138 - 0.0217)	0.64 (0.0252)
	Oil	0.25 - 1.00 (0.0098 - 0.0394)	1.09 (0.0429)

Piston pin

Unit: mm (in)

Piston pin outer diameter	18.989 - 19.001 (0.7476 - 0.7481)
Piston pin to piston clearance	−0.004 to 0 (−0.0002 to 0)
Piston pin to connecting rod bushing clearance	0.005 - 0.017 (0.0002 - 0.0007)

CONNECTING ROD

Unit: mm (in)

Center distance	140.45 - 140.55 (5.5295 - 5.5335)
Bend limit [per 100 (3.94)]	0.15 (0.0059)
Torsion limit [per 100 (3.94)]	0.3 (0.012)
Connecting rod bushing inner diameter* (small end)	19.000 - 19.012 (0.7480 - 0.7485)
Connecting rod big end inner diameter	43.000 - 43.013 (1.6929 - 1.6934)
Side clearance	
Standard	0.20 - 0.47 (0.0079 - 0.0185)
Limit	0.52 (0.0205)

*: After installing in connecting rod

CRANKSHAFT

Unit: mm (in)

	GA16DE
Main journal dia. "Dm"	
Grade No. 0	49.956 - 49.964 (1.9668 - 1.9671)
Grade No. 1	49.948 - 49.956 (1.9665 - 1.9668)
Grade No. 2	49.940 - 49.948 (1.9661 - 1.9665)
Pin journal dia. "Dp"	
Grade No. 0	39.968 - 39.974 (1.5735 - 1.5738)
Grade No. 1	39.962 - 39.968 (1.5733 - 1.5735)
Grade No. 2	39.956 - 39.962 (1.5731 - 1.5733)
Center distance "r"	43.95 - 44.05 (1.7303 - 1.7342)
Out-of-round (X – Y)	
Standard	Less than 0.005 (0.0002)
Taper (A – B)	
Standard	Less than 0.002 (0.0001)
Runout [TIR*]	
Standard	Less than 0.05 (0.0020)
Free end play	
Standard	0.060 - 0.180 (0.0024 - 0.0071)
Limit	0.3 (0.012)

*: Total indicator reading

MAIN BEARING

Standard

Grade No.	Thickness "T" mm (in)	Identification color
0	1.826 - 1.830 (0.0719 - 0.0720)	Black
1	1.830 - 1.834 (0.0720 - 0.0722)	Brown
2	1.834 - 1.838 (0.0722 - 0.0724)	Green
3	1.838 - 1.842 (0.0724 - 0.0725)	Yellow
4	1.842 - 1.846 (0.0725 - 0.0727)	Blue

Undersize

Unit: mm (in)

	Thickness "T"
0.25 (0.0098)	1.956 - 1.965 (0.0770 - 0.0774)
0.50 (0.0197)	2.081 - 2.090 (0.0819 - 0.0823)

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing

Unit: mm (in)

	Grade No.	Thickness	Identification color or number
Standard	0	1.505 - 1.508 (0.0593 - 0.0594)	Black
	1	1.508 - 1.511 (0.0594 - 0.0595)	Brown
	2	1.511 - 1.514 (0.0595 - 0.0596)	Green
Undersize	0.08 (0.0031)	1.539 - 1.548 (0.0606 - 0.0609)	8
	0.12 (0.0047)	1.559 - 1.568 (0.0614 - 0.0617)	12
	0.25 (0.0098)	1.624 - 1.633 (0.0639 - 0.0643)	25

Bearing clearance

Unit: mm (in)

Main bearing clearance		
Standard		0.020 - 0.044 (0.0008 - 0.0017)
Limit		0.064 (0.0025)
Connecting rod bearing clearance		
Standard		0.010 - 0.035 (0.0004 - 0.0014)
Limit	All	0.055 (0.0022)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

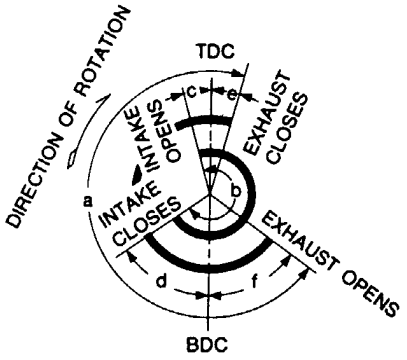
Flywheel	
Runout [TIR*]	Less than 0.15 (0.0059)
Camshaft sprocket runout limit [TIR*]	0.17 (0.0067)

*: Total indicator reading

General Specifications

Cylinder arrangement		In-line 4
Displacement	cm^3 (cu in)	1,998 (121.92)
Bore and stroke	mm (in)	86 x 86 (3.39 x 3.39)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings		
Compression		2
Oil		1
Number of main bearings		5
Compression ratio		10.0

Valve timing



EM120
Unit: degree

	a	b	c	d	e	f
SR20De	240°	236°	0°	56°	28°	53°
SR20DE	232°	244°	2°	62°	30°	45°

Inspection and Adjustment

COMPRESSION PRESSURE

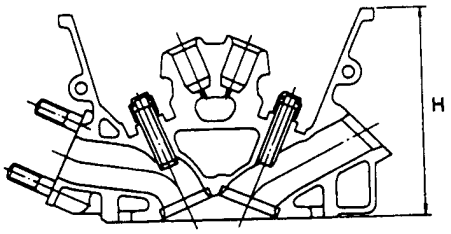
Unit: kPa (bar, kg/cm², psi)/300 rpm

Standard	1,275 (12.75, 13.0, 185)
Minimum	1,079 (10.79, 11.0, 156)
Differential limit between cylinders	98 (0.98, 1.0, 14)

CYLINDER HEAD

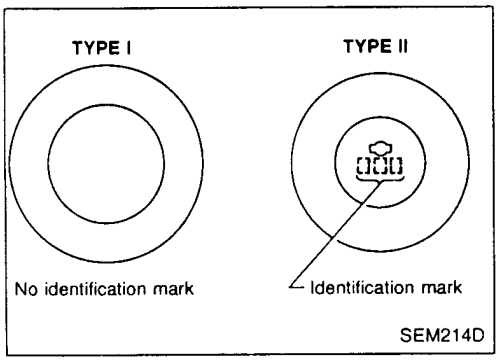
Unit: mm (in)

	Standard	Limit
Head surface distortion	Less than 0.03 (0.0012)	0.1 (0.004)



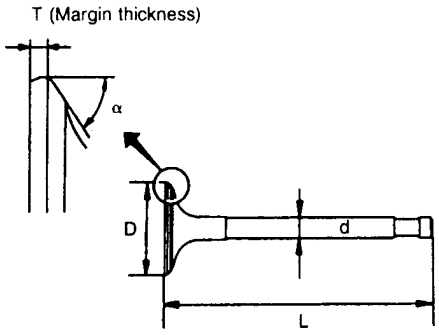
Nominal cylinder head height:
H = 136.9 - 137.1 mm (5.390 - 5.398 in)

SEM956C



VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	
Intake	34.0 - 34.2 (1.339 - 1.346)
Exhaust	30.0 - 30.2 (1.181 - 1.189)
Valve length "L"	
Intake	101.19 - 101.61 (3.9839 - 4.0004)
Exhaust	102.11 - 102.53 (4.0201 - 4.0366)
Valve stem diameter "d"	
Intake	5.965 - 5.980 (0.2348 - 0.2354)
Exhaust	5.945 - 5.960 (0.2341 - 0.2346)
Valve seat angle "α"	
Intake Exhaust	45°15′ - 45°45′
Valve margin "T"	
Intake	1.3 (0.051)
Exhaust	1.6 (0.063)
Valve margin "T" limit	More than 0.5 (0.020)
Valve stem end surface grinding limit	Less than 0.2 (0.008)
Valve clearance	
Intake	0 (0)
Exhaust	0 (0)

Inspection and Adjustment (Cont'd)

Valve spring

Free height	mm (in)	49.36 (1.9433)
Pressure N (kg, lb) at height mm (in)		
Standard		569.00 - 641.57 (58.02 - 65.42, 127.93 - 144.25) at 30.0 (1.181)
Limit		549.2 (56.0, 123.5) at 30.0 (1.181)
Out-of-square	mm (in)	Less than 2.2 (0.087)

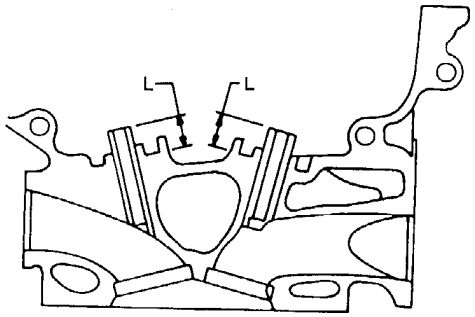
Hydraulic lash adjuster (HLA)

Unit: mm (in)

HLA outer diameter	16.980 - 16.993 (0.6685 - 0.6690)
HLA guide inner diameter	17.000 - 17.020 (0.6693 - 0.6701)
Clearance between HLA and HLA guide	0.007 - 0.040 (0.0003 - 0.0016)

Valve guide

Unit: mm (in)



NEM032

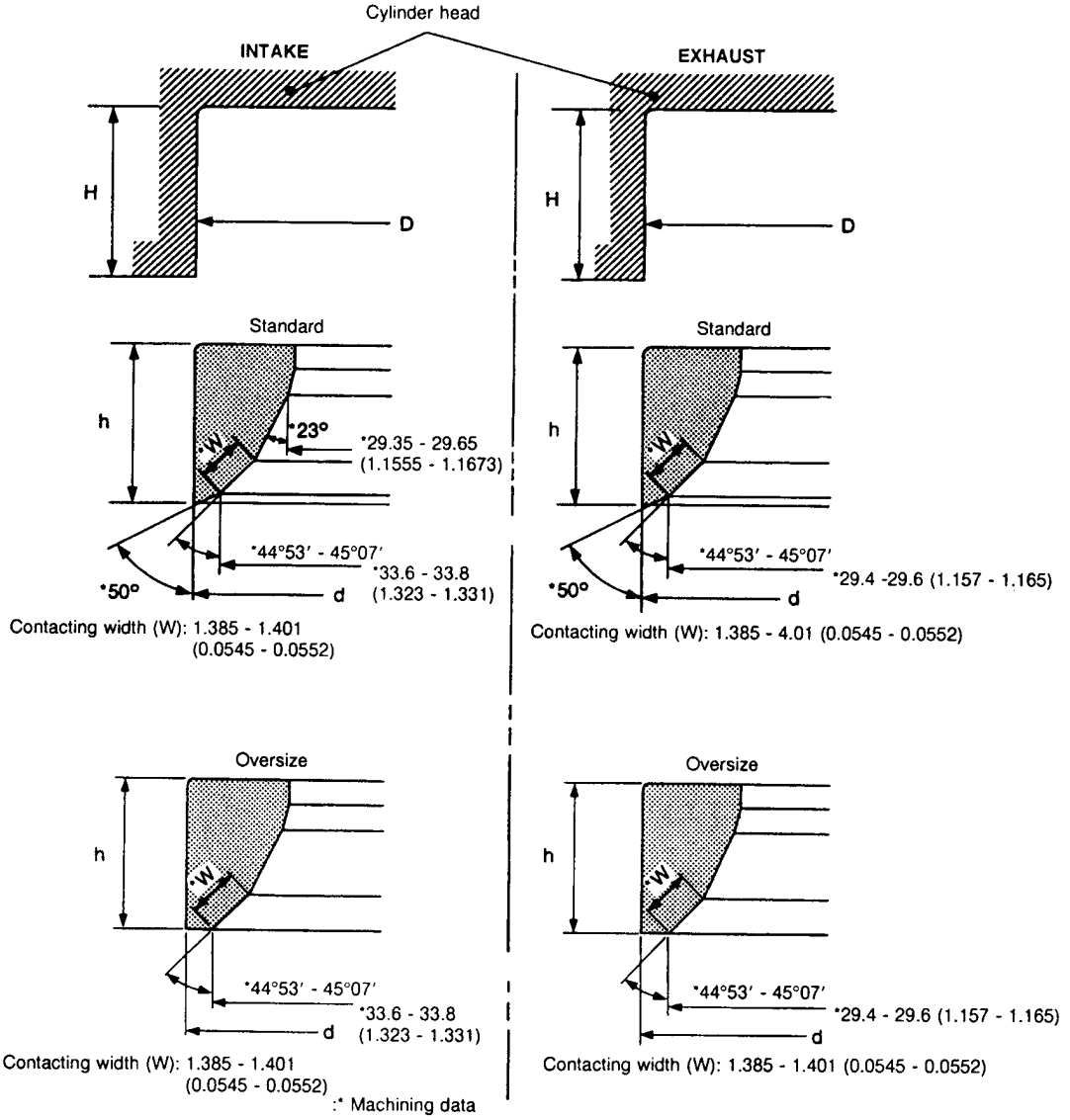
		Standard	Service
Valve guide Outer diameter	Intake	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
	Exhaust	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
Valve guide Inner diameter (Finished size)	Intake	6.000 - 6.018 (0.2362 - 0.2369)	
	Exhaust	6.000 - 6.018 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter	Intake	9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
	Exhaust	9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	

		Standard	Limit
Stem to guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.08 (0.0031)
	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
Valve deflection limit		0.2 (0.008)	
Projection length "L"		14.0 - 14.2 (0.551 - 0.559)	

Inspection and Adjustment (Cont'd)

Valve seat
SR20De/DE engine

Unit: mm (in)



NEM212

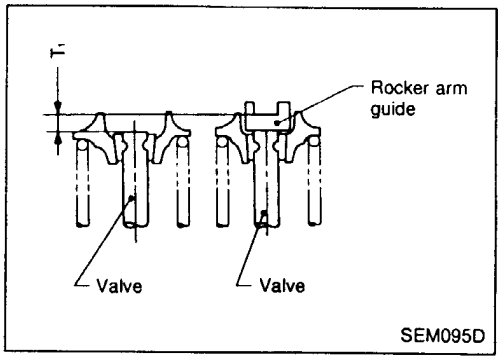
		Standard	Service
Cylinder head seat recess diameter (D)	In.	35.000 - 35.016 (1.3780 - 1.3786)	35.500 - 35.516 (1.3976 - 1.3983)
	Ex.	31.000 - 31.016 (1.2205 - 1.2211)	31.500 - 31.516 (1.2402 - 1.2408)
Valve seat interference fit	In.	0.064 - 0.096 (0.0025 - 0.0038)	
	Ex.	0.064 - 0.096 (0.0025 - 0.0038)	
Valve seat outer diameter (d)	In.	35.080 - 35.096 (1.3811 - 1.3817)	35.580 - 35.596 (1.4008 - 1.4014)
	Ex.	31.080 - 31.096 (1.2236 - 1.2242)	31.580 - 31.596 (1.2433 - 1.2439)
Depth (H)	In.	6.25 (0.2461)	
	Ex.	6.25 (0.2461)	
Height (h)		6.2 - 6.3 (0.244 - 0.248)	

Inspection and Adjustment (Cont'd)

Valve clearance adjustment

Unit: mm (in)

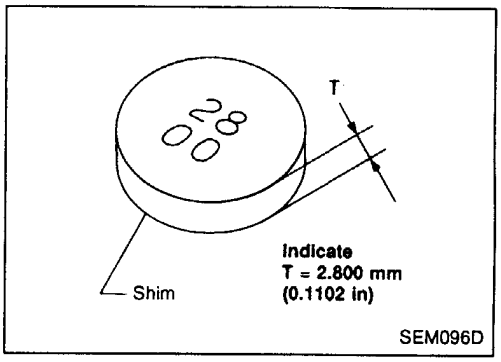
Valve clearance	
Intake	0 (0)
Exhaust	0 (0)
Valve clearance "T"	T_1±0.025 (0.001)



SEM095D

Available shim

Thickness mm (in)	Identification mark
2.800 (0.1102)	28 00
2.825 (0.1112)	28 25
2.850 (0.1122)	28 50
2.875 (0.1132)	28 75
2.900 (0.1142)	29 00
2.925 (0.1152)	29 25
2.950 (0.1161)	29 50
2.975 (0.1171)	29 75
3.000 (0.1181)	30 00
3.025 (0.1191)	30 25
3.050 (0.1201)	30 50
3.075 (0.1211)	30 75
3.100 (0.1220)	31 00
3.125 (0.1230)	31 25
3.150 (0.1240)	31 50
3.175 (0.1250)	31 75
3.200 (0.1260)	32 00



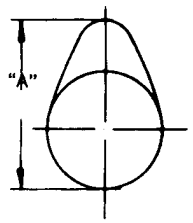
SEM096D

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Limit
Camshaft journal to bearing clearance	0.045 - 0.086 (0.0018 - 0.0034)	0.15 (0.0059)
Inner diameter of camshaft bearing	28.000 - 28.021 (1.1024 - 1.1032)	—
Outer diameter of camshaft journal	27.935 - 27.955 (1.0998 - 1.1006)	—
Camshaft runout [TIR*]	Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft sprocket runout [TIR*]	Less than 0.25 (0.0098)	—
Camshaft end play	0.055 - 0.139 (0.0022 - 0.0055)	0.20 (0.0079)



EM671

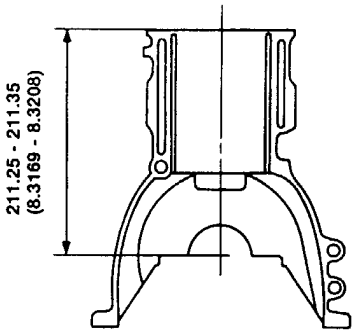
	SR20De	SR20DE
Cam height "A"		
Intake	37.433 - 37.623 (1.4737 - 1.4812)	37.989 - 38.179 (1.4956 - 1.5031)
Exhaust	37.309 - 37.499 (1.4689 - 1.4763)	
Cam wear limit	0.2 (0.008)	
Valve lift		
Intake	9.2 (0.3543)	9.9 (0.3898)
Exhaust	9.4 (0.3701)	8.8 (0.3465)

*Total indicator reading

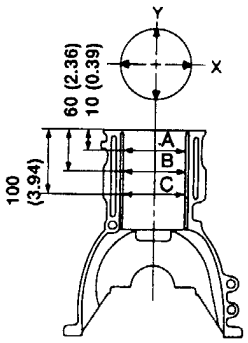
Inspection and Adjustment (Cont'd)

CYLINDER BLOCK

Unit: mm (in)



SEM008D



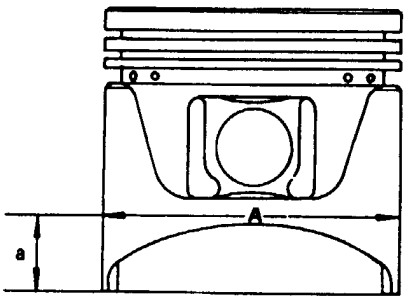
SEM010D

Surface flatness	
Standard	Less than 0.03 (0.0012)
Limit	0.10 (0.0039)
Cylinder bore	
Inner diameter	
Standard	
Grade No. 1	86.000 - 86.010 (3.3858 - 3.3862)
Grade No. 2	86.010 - 86.020 (3.3862 - 3.3866)
Grade No. 3	86.020 - 86.030 (3.3866 - 3.3870)
Wear limit	0.20 (0.0079)
Out-of-round (X – Y)	Less than 0.015 (0.0006)
Taper (A – B – C)	Less than 0.010 (0.0004)
Difference in inner diameter between cylinders	
Limit	Less than 0.05 (0.0020)
Main journal inner diameter	
Grade No. 0	58.944 - 58.950 (2.3206 - 2.3209)
Grade No. 1	58.950 - 58.956 (2.3209 - 2.3211)
Grade No. 2	58.956 - 58.962 (2.3211 - 2.3213)
Grade No. 3	58.962 - 58.968 (2.3213 - 2.3216)

PISTON, PISTON RING AND PISTON PIN

Available piston

Unit: mm (in)



SEM750C

Piston skirt diameter "A"	
Standard	
Grade No. 1	85.980 - 85.990 (3.3850 - 3.3854)
Grade No. 2	85.990 - 86.000 (3.3854 - 3.3858)
Grade No. 3	86.000 - 86.010 (3.3858 - 3.3862)
0.20 (0.0079) oversize (Service)	86.180 - 86.210 (3.3929 - 3.3941)
"a" dimension	13.1 (0.5157)
Piston clearance to cylinder block	0.010 - 0.030 (0.0004 - 0.0012)
Piston pin hole diameter	21.993 - 22.005 (0.8659 - 0.8663)

Inspection and Adjustment (Cont'd)

Piston ring

Unit: mm (in)

Side clearance	
Top	
Standard	0.040 - 0.080 (0.0016 - 0.0031)
Limit	0.2 (0.008)
2nd	
Standard	0.030 - 0.070 (0.0012 - 0.0028)
Limit	0.2 (0.008)
Ring gap	
Top	
Standard	0.20 - 0.30 (0.0079 - 0.0118)
Limit	1.0 (0.039)
2nd	
Standard	0.35 - 0.50 (0.0138 - 0.0197)
Limit	1.0 (0.039)
Oil	
Standard	0.20 - 0.60 (0.0079 - 0.0236)
Limit	1.0 (0.039)

Piston pin

Unit: mm (in)

Piston pin outer diameter	21.989 - 22.001 (0.8657 - 0.8662)
Interference fit of piston pin to piston	−0.006 to 0.002 mm (−0.0002 - 0.0001 in)
Piston pin to connecting rod bushing clearance	
Standard	0.005 - 0.017 (0.0002 - 0.0007)
Limit	0.023 (0.0009)

* Values measured at ambient temperature of 20°C (68°F)

CONNECTING ROD

Unit: mm (in)

Center distance	136.30 (5.3661)
Bend, torsion [per 100 (3.94)]	
Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	
Limit	0.3 (0.0012)
Connecting rod small end inner diameter	24.980 - 25.000 (0.9835 - 0.9843)
Piston pin bushing inner diameter*	22.000 - 22.012 (0.8661 - 0.8666)
Connecting rod big end inner diameter	51.000 - 51.013 (2.0079 - 2.0084)
Side clearance	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	0.5 (0.020)

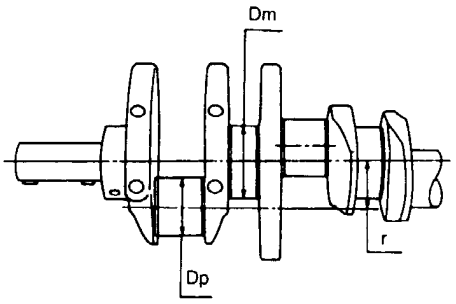
* After installing in connecting rod

Inspection and Adjustment (Cont'd)

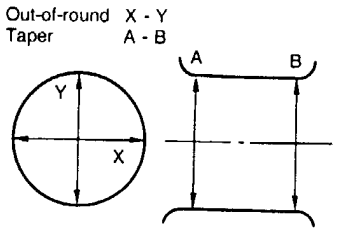
CRANKSHAFT

Unit: mm (in)

Main journal dia. "Dm"	
Grade No. 0	54.974 - 54.980 (2.1643 - 2.1646)
Grade No. 1	54.968 - 54.974 (2.1641 - 2.1643)
Grade No. 2	54.962 - 54.968 (2.1639 - 2.1641)
Grade No. 3	54.956 - 54.962 (2.1636 - 2.1639)
Pin journal dia. "Dp"	
Grade No. 0	47.968 - 47.974 (1.8885 - 1.8887)
Grade No. 1	47.962 - 47.968 (1.8883 - 1.8885)
Grade No. 2	47.956 - 47.962 (1.8880 - 1.8883)
Center distance "r"	42.96 - 43.04 (1.6913 - 1.6945)
Out-of-round (X – Y)	
Standard	Pin journal: Less than 0.0025 (0.0001) Main journal: Less than 0.005 (0.0002)
Taper (A – B)	
Standard	Pin journal: Less than 0.0025 (0.0001) Main journal: Less than 0.005 (0.0002)
Runout [TIR]	
Standard	Less than 0.025 (0.0010)
Limit	Less than 0.05 (0.0020)
Free end play	
Standard	0.10 - 0.26 (0.0039 - 0.0102)
Limit	0.30 (0.0118)

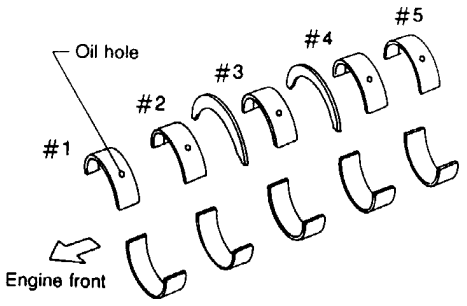


SEM954C



EM715

AVAILABLE MAIN BEARING



SEM021D

Main bearing (Standard)

Unit: mm (in)

Grade number	Thickness "T"	Width "W"	Identification color (mark)
0	1.977 - 1.980 (0.0778 - 0.0780)	18.9 - 19.1 (0.744 - 0.752)	Black (A)
1	1.980 - 1.983 (0.0780 - 0.0781)		Brown (B)
2	1.983 - 1.986 (0.0781 - 0.0782)		Green (C)
3	1.986 - 1.989 (0.0782 - 0.0783)		Yellow (D)
4	1.989 - 1.992 (0.0783 - 0.0784)		Blue (E)
5	1.992 - 1.995 (0.0784 - 0.0785)		Pink (F)
6	1.995 - 1.998 (0.0785 - 0.0787)		White (G)

Main bearing (Undersize)

Unit: mm (in)

Undersize	Thickness "T"	Main journal diameter "Dm"
0.25 (0.0098)	2.109 - 2.117 (0.0830 - 0.0833)	Grind so that bearing clearance is the specified value.

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing

Standard size

Unit: mm (in)

Grade number	Thickness "T"	Width "W"	Identification color (mark)
0	1.500 - 1.503 (0.0591 - 0.0592)	16.9 - 17.1 (0.665 - 0.673)	Black
1	1.503 - 1.506 (0.0592 - 0.0593)		Brown
2	1.506 - 1.509 (0.0593 - 0.0594)		Green

Undersize

Unit: mm (in)

Undersize	Thickness "T"	Crank pin journal diameter "Dp"
0.08 (0.0031)	1.541 - 1.549 (0.0607 - 0.0610)	Grind so that bearing clearance is the specified value.
0.12 (0.0047)	1.561 - 1.569 (0.0615 - 0.0618)	
0.25 (0.0098)	1.626 - 1.634 (0.0640 - 0.0643)	

Bearing clearance

Unit: mm (in)

Main bearing clearance	
Standard	0.004 - 0.022 (0.0002 - 0.0009)
Limit	0.05 (0.0020)
Connecting rod bearing clearance	
Standard	0.020 - 0.045 (0.0008 - 0.0018)
Limit	0.065 (0.00256)

MISCELLANEOUS COMPONENTS

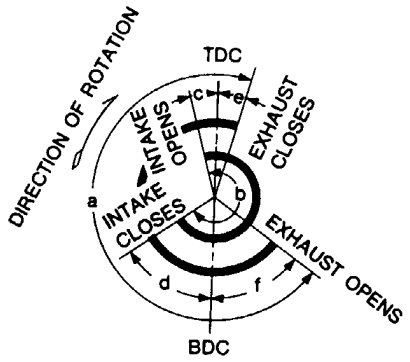
Unit: mm (in)

Camshaft sprocket runout limit [TIR]	0.25 (0.0098)
Flywheel runout limit [TIR]	0.15 (0.0059)
Drive plate runout limit [TIR]	0.2 (0.008)

General Specifications

Cylinder arrangement		In-line 4
Displacement	cm^3 (cu in)	1,974 (120.45)
Bore and stroke	mm (in)	84.5 x 88.0 (3.329 x 3.465)
Valve arrangement		OHC
Firing order		1-3-4-2
Number of piston rings		
Compression		2
Oil		1
Number of main bearing		5
Compression ratio		22.2

Valve timing



EM120
Unit: degree

a	b	c	d	e	f
248°	232°	14°	38°	12°	56°

Inspection and Adjustment

COMPRESSION PRESSURE

Unit: kPa (bar, kg/cm², psi) at 200 rpm

Standard	3,138 (31.4, 32, 455)
Limit	2,452 (24.5, 25, 356)
Difference limit between cylinders	490 (4.9, 5, 71)

CYLINDER HEAD

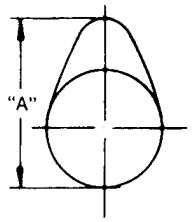
Unit: mm (in)

Head surface flatness	
Standard	Less than 0.03 (0.0012)
Limit	0.1 (0.004)
Nominal cylinder head height	137.9 - 138.1 (5.429 - 5.437)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Max. tolerance
Camshaft journal clearance	0.045 - 0.086 (0.0018 - 0.0034)	0.1 (0.004)
Inner diameter of camshaft bearing	30.000 - 30.021 (1.1811 - 1.1819)	—
Outer diameter of camshaft journal	29.935 - 29.955 (1.1785 - 1.1793)	—
Camshaft runout	Less than 0.02 (0.0008)	0.05 (0.0020)
Camshaft end play	0.115 - 0.188 (0.0045 - 0.0074)	—

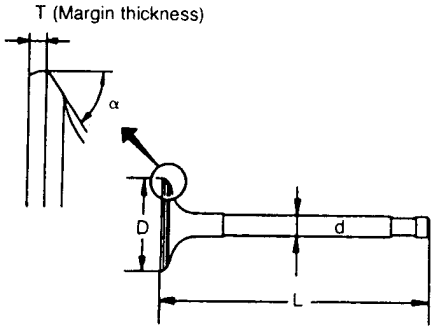


EM671

Cam height "A"	
Intake	48.70 - 48.75 (1.9173 - 1.9193)
Exhaust	49.15 - 49.20 (1.9350 - 1.9370)

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	
Intake	39.0 - 39.3 (1.535 - 1.547)
Exhaust	32.0 - 32.3 (1.260 - 1.272)
Valve length "L"	
Intake	99.53 - 99.97 (3.9185 - 3.9358)
Exhaust	99.38 - 99.82 (3.9126 - 3.9299)
Valve stem diameter "d"	
Intake	6.965 - 6.980 (0.2742 - 0.2748)
Exhaust	6.945 - 6.960 (0.2734 - 0.2740)
Valve seat angle "α"	45°30′
Valve margin "T" limit	0.5 (0.020)
Valve stem end surface grinding limit	0.5 (0.020)

Inspection and Adjustment (Cont'd)

Valve spring

		Inner	Outer
Free height	mm (in)		
	Intake	36.57 (1.4398)	42.25 (1.6634)
	Exhaust	41.27 (1.6248)	49.35 (1.9429)
Pressure N (kg, lb) at height	mm (in)		
Standard	Intake	233.21 (23.78, 52.43) at 22.2 (0.874)	437.69 (44.63, 98.41) at 25.7 (1.012)
	Exhaust	233.4 (23.8, 52.5) at 22.2 (0.874)	437.4 (44.6, 98.3) at 25.7 (1.012)
Limit	Intake	208.01 (21.21, 46.77) at 22.2 (0.874)	392.28 (40.00, 88.20) at 25.7 (1.012)
	Exhaust	208.69 (21.28, 46.92) at 22.2 (0.874)	390.42 (39.81, 87.78) at 25.7 (1.012)
Out-of-square	mm (in)		
	Intake	Less than 1.6 (0.063)	Less than 1.8 (0.071)
	Exhaust	Less than 1.8 (0.071)	Less than 2.2 (0.087)

Valve guide

Unit: mm (in)

	Standard	Service
Valve guide Outer diameter	11.023 - 11.034 (0.4340 - 0.4344)	11.223 - 11.234 (0.4418 - 0.4423)
Valve guide Inner diameter (Finished size)	7.000 - 7.015 (0.2756 - 0.2762)	
Cylinder head valve guide hole diameter	10.985 - 10.996 (0.4325 - 0.4329)	11.185 - 11.196 (0.4404 - 0.4408)
Interference fit of valve guide	0.027 - 0.049 (0.0011 - 0.0019)	

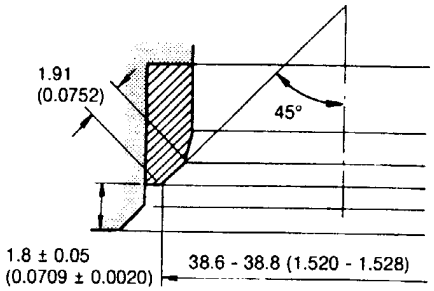
	Standard	Max. tolerance
Stem to guide clearance		
Intake	0.020 - 0.050 (0.0008 - 0.0020)	0.10 (0.0039)
Exhaust	0.040 - 0.070 (0.0016 - 0.0028)	0.10 (0.0039)
Valve deflection limit		0.1 (0.004)

Valve seat resurfacing

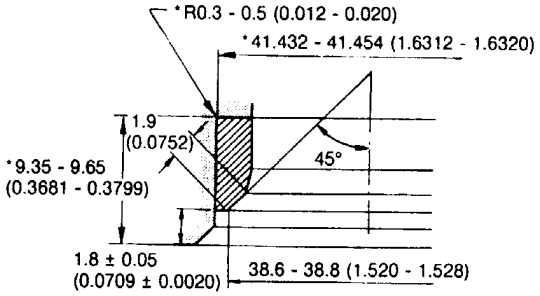
Unit: mm (in)

Intake

Standard (Original)



0.5 (0.020) Oversize

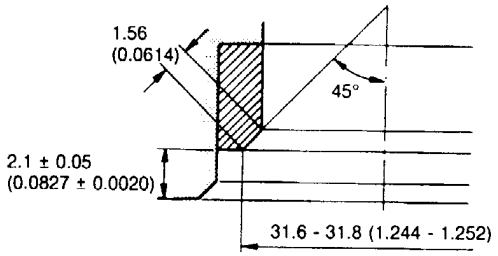


*: Cylinder head machining data

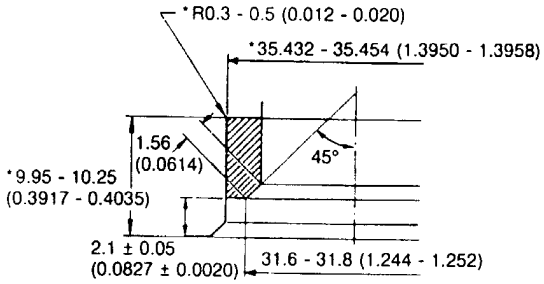
SEM917-B

Exhaust

Standard (Original)



0.5 (0.020) Oversize



*: Cylinder head machining data

SEM113FA

Inspection and Adjustment (Cont'd)

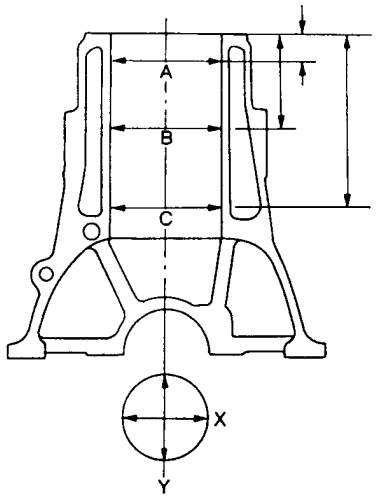
VALVE LIFTER

Unit: mm (in)

Valve lifter outer diameter	
Standard	34.959 - 34.975 (1.3763 - 1.3770)
Cylinder head valve lifter hole diameter	34.998 - 35.018 (1.3779 - 1.3787)
Clearance	
Standard	0.023 - 0.059 (0.0009 - 0.0023)
Limit	0.1 (0.004)

CYLINDER BLOCK

Unit: mm (in)



SEM902-A

		Standard	Limit
Surface flatness		Less than 0.03 (0.0012)	0.10 (0.0039)
Cylinder bore	Inner diameter	Grade No. 1 84.500 - 84.510 (3.3268 - 3.3272) Grade No. 2 84.510 - 84.520 (3.3272 - 3.3276) Grade No. 3 84.520 - 84.530 (3.3276 - 3.3279) Grade No. 4 84.530 - 84.540 (3.3279 - 3.3283) Grade No. 5 84.540 - 84.550 (3.3283 - 3.3287)	0.2 (0.008)
	Out-of-round (X – Y)	Less than 0.015 (0.0006)	0.04 (0.0016)
	Taper (A – B)	Less than 0.010 (0.0004)	0.04 (0.0016)
Piston to cylinder clearance		0.030 - 0.050 (0.0012 - 0.0020)	—
Main journal inner diameter		Grade No. 0 56.654 - 56.663 (2.2305 - 2.2308) Grade No. 1 56.663 - 56.672 (2.2308 - 2.2312) Grade No. 2 56.672 - 56.680 (2.2312 - 2.2315)	—

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)

Piston skirt diameter	Standard	Grade No. 1	84.460 - 84.470 (3.3252 - 3.3256)
		Grade No. 2	84.470 - 84.480 (3.3256 - 3.3260)
		Grade No. 3	84.480 - 84.490 (3.3260 - 3.3264)
		Grade No. 4	84.490 - 84.500 (3.3264 - 3.3268)
		Grade No. 5	84.500 - 84.510 (3.3268 - 3.3272)
	Oversize	0.25 (0.0098)	84.710 - 84.760 (3.3350 - 3.3370)
		0.5 (0.020)	84.960 - 85.010 (3.3449 - 3.3468)
Measure position (From Top)			62 (2.44)
Piston pin hole diameter			27.991 - 27.999 (1.1020 - 1.1023)

Piston ring

Unit: mm (in)

Side clearance		
Top		
Standard		0.020 - 0.040 (0.0008 - 0.0016)
Limit		0.10 (0.0039)
2nd		
Standard		0.050 - 0.085 (0.0020 - 0.0033)
Limit		0.10 (0.0039)
Oil		
Standard		0.030 - 0.070 (0.0012 - 0.0028)
End gap		
Top		
Standard		
Bore grade 1, 2, 3		0.22 - 0.32 (0.0087 - 0.0126)
Bore grade 4, 5		0.12 - 0.22 (0.0047 - 0.0087)
Limit		1.0 (0.039)
2nd		
Standard		0.38 - 0.53 (0.0150 - 0.0209)
Limit		0.7 (0.028)
Oil		
Standard		0.30 - 0.55 (0.0118 - 0.0217)
Limit		0.6 (0.024)

Piston pin

Unit: mm (in)

Piston pin outer diameter	27.994 - 28.000 (1.1021 - 1.1024)
Interference fit of piston pin to piston	−0.004 to 0 (−0.0002 to 0)
Piston pin to connecting rod clearance	0.025 - 0.044 (0.0010 - 0.0017)

CONNECTING ROD

Unit: mm (in)

Bend [per 100 mm (3.94 in)]	
Standard	Less than 0.025 (0.0010)
Torsion	
Standard	Less than 0.025 (0.0010)
Piston pin bore dia.	28.025 - 28.038 (1.1033 - 1.1039)
Big end play	
Limit	0.3 (0.012)

CRANKSHAFT

Unit: mm (in)

Main journal dia.	Grade No. 0 52.967 - 52.975 (2.0853 - 2.0856) Grade No. 1 52.959 - 52.967 (2.0850 - 2.0853) Grade No. 2 52.951 - 52.959 (2.0847 - 2.0850)
Pin journal dia.	Grade No. 0 49.968 - 49.974 (1.9672 - 1.9675) Grade No. 1 49.961 - 49.968 (1.9670 - 1.9672) Grade No. 2 49.954 - 49.961 (1.9667 - 1.9670)
Out-of-round (X – Y) and taper (A – B)	
Standard	Less than 0.005 (0.0002)
Runout	
Standard	Less than 0.05 (0.0020)
Free end play	
Standard	0.05 - 0.18 (0.0020 - 0.0071)
Limit	0.3 (0.012)

Inspection and Adjustment (Cont'd)

AVAILABLE MAIN BEARINGS

No. 1, No. 2, No. 4 and No. 5 main bearings

Grade number	Thickness "T" mm (in)	Width "W" mm (in)	Identification color
0	1.816 - 1.820 (0.0715 - 0.0717)	20.0 (0.787) 17.8 (0.701)*	Yellow
1	1.820 - 1.824 (0.0717 - 0.0718)		Green
2	1.824 - 1.828 (0.0718 - 0.0720)		Brown
3	1.828 - 1.832 (0.0720 - 0.0721)		Black
4	1.832 - 1.836 (0.0721 - 0.0723)		Blue

*: Contacting width

No. 3 main bearings

Grade number	Thickness "T" mm (in)	Width "W" mm (in)	Identification color
0	1.816 - 1.820 (0.0715 - 0.0717)	27.95 (1.1004) 21.35 (0.8405)*	Yellow
1	1.820 - 1.824 (0.0717 - 0.0718)		Green
2	1.824 - 1.828 (0.0718 - 0.0720)		Brown
3	1.828 - 1.832 (0.0720 - 0.0721)		Black
4	1.832 - 1.836 (0.0721 - 0.0723)		Blue

*: Contacting width

Main bearing undersize

Unit: mm (in)

	Crank journal diameter
STD	52.951 - 52.975 (2.0847 - 2.0856)
0.25 (0.0098) undersize	52.701 - 52.725 (2.0748 - 2.0758)

Bearing clearance

Unit: mm (in)

Main bearing clearance	
Standard	0.039 - 0.065 (0.0015 - 0.0026)
Connecting rod bearing clearance	
Standard	0.031 - 0.055 (0.0012 - 0.0022)

Connecting rod bearing undersize

Unit: mm (in)

			Crank pin diameter
STD	Grade 0	Black	49.968 - 49.974 (1.9672 - 1.9675)
	Grade 1	Yellow	49.961 - 49.968 (1.9670 - 1.9672)
	Grade 2	Blue	49.954 - 49.961 (1.9667 - 1.9670)
0.08 (0.0031) undersize			49.874 - 49.894* (1.9635 - 1.9643)
0.12 (0.0047) undersize			49.834 - 49.854* (1.9620 - 1.9628)
0.25 (0.0098) undersize			49.704 - 49.724* (1.9568 - 1.9576)

*: Reference value

TURBOCHARGER

Unit: mm (in)

Rotor shaft	
Runout [TIR*]	0.056 - 0.127 (0.0022 - 0.0050)
End play	0.013 - 0.097 (0.0005 - 0.0038)

*: Total indicator reading

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Flywheel	
Runout [TIR*]	Less than 0.15 (0.0059)

*: Total indicator reading

<SUPPLEMENT-II>

ENGINE MECHANICAL

SECTION EM

EM

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CD20T

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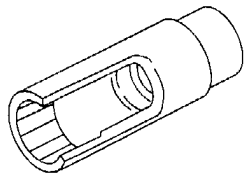
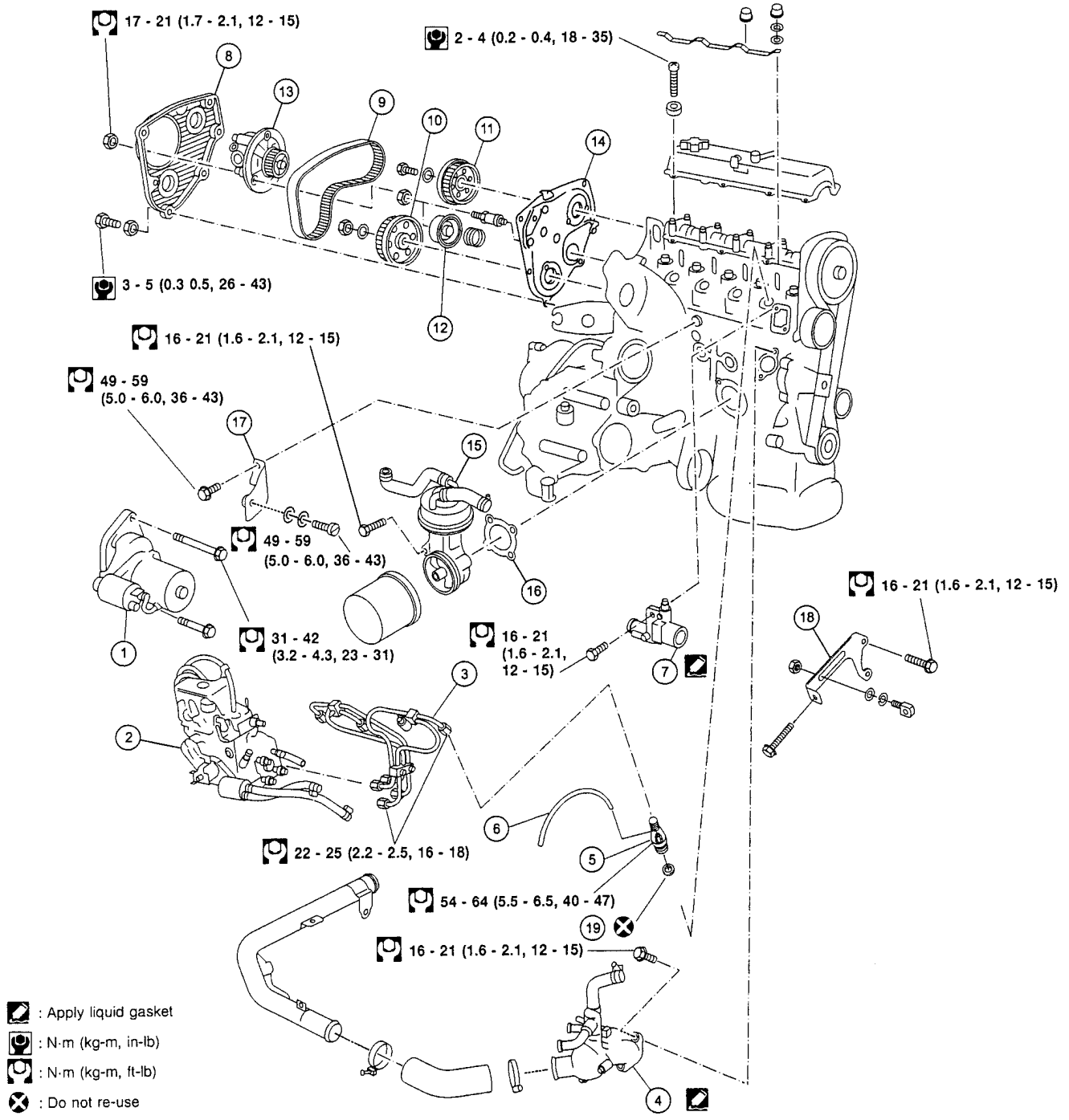
COMPRESSION PRESSURE 2004

Special Service Tools

Tool number Tool name	Description	Engine application		
		GA	SR	CD
KV119E0030 Injection nozzle holder socket	 NT648 Loosening and tightening injector nozzle	—	—	X

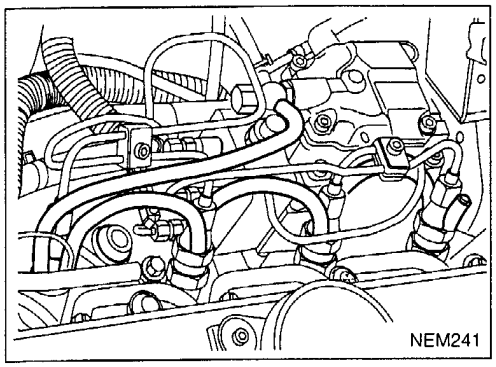
Right side

SEC. 130•135•185•186•210•213•233

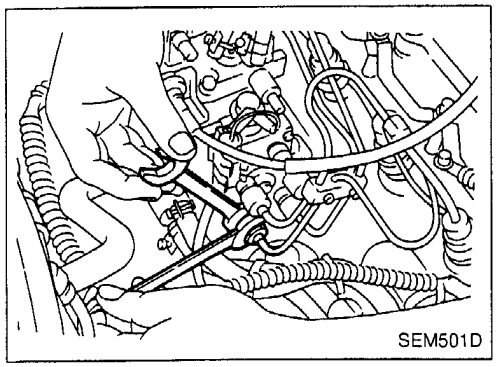


NEM240

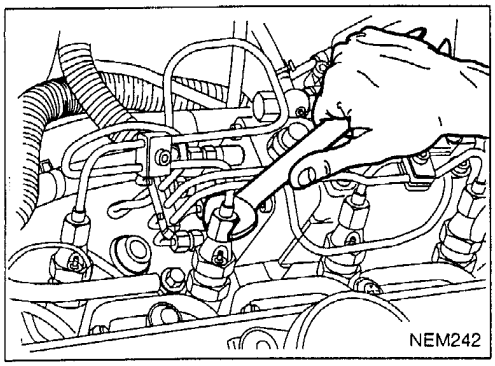
① Starter motor
② Injection pump
③ Injection tube
④ Thermostat housing
⑤ Injection nozzle
⑥ Spill hose
⑦ Water outlet
⑧ Belt cover
⑨ Timing belt
⑩ Injection pump sprocket
⑪ Rear camshaft sprocket
⑫ Tensioner
⑬ Vacuum pump
⑭ Rear back cover
⑮ Oil cooler
⑯ Gasket
⑰ Bracket
⑱ Power steering oil pump adjusting bar
⑲ Gasket


NEM241

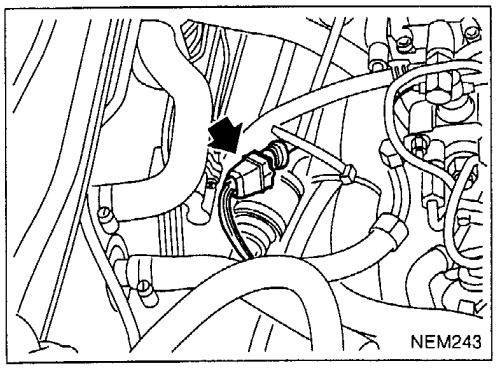
1. Warm up engine sufficiently.
2. Remove spill hoses.


SEM501D

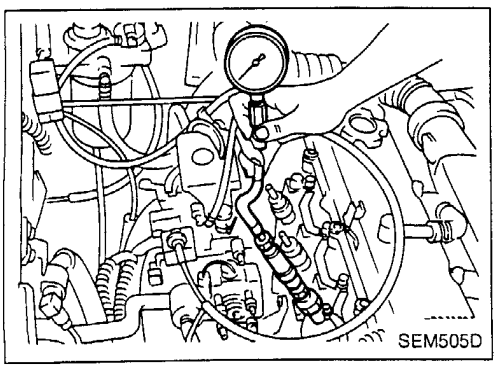
3. Disconnect injection tubes on nozzle side and loosen injection tubes on pump side. Release clamps on injection tubes.
- **Use two wrenches to prevent delivery holder on pump side from loosening.**


NEM242

4. Remove all injection nozzles using S.S.T. KV119E0030.

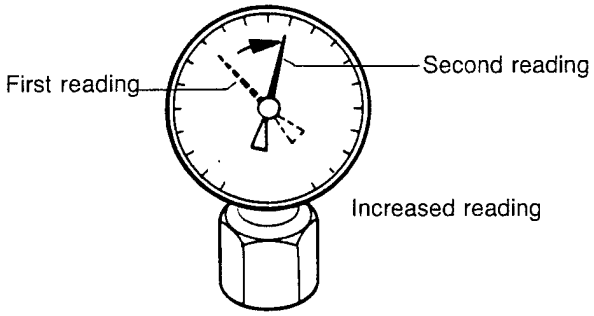
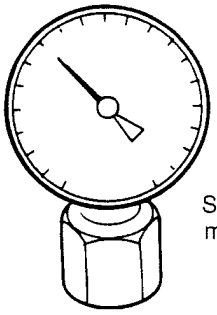

NEM243

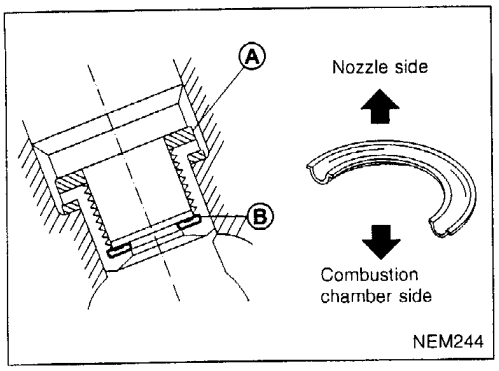
5. Turn ignition switch off and disconnect harness connector (black colored) at injection pump.


SEM505D

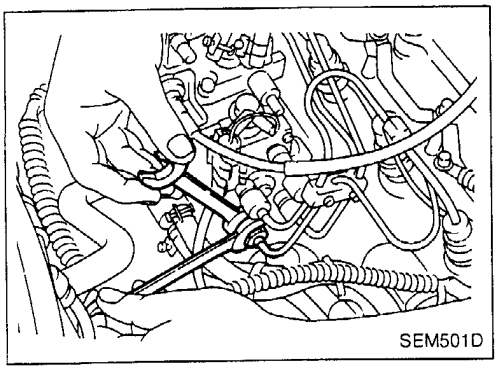
6. Fit compression gauge to cylinder head.

7. Crank engine and read compression gauge indication.
   Cranking speed: 200 rpm
   Compression pressure: kPa (bar, kg/cm^2, psi)
   Standard
   3,138 (31.4, 32, 455)
   Limit
   2,452 (24.5, 25, 356)
   Limit of difference between cylinders
   490 (4.9, 5, 71)
8. If the pressure appears low, pour about 3 mℓ (0.11 Imp fl oz) of engine oil through nozzle holes and repeat test.
   For indications of test, refer to the following table.

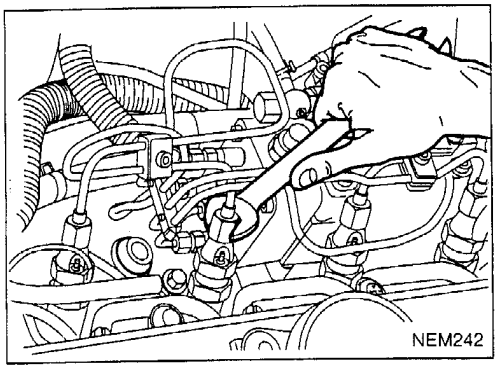
Gauge indication during tests	Trouble diagnosis
	● Piston rings are worn or damaged.
	● If two adjacent cylinders are low, gasket is damaged. ● Valve is sticking. ● Valve seat or valve contact surface is incorrect.

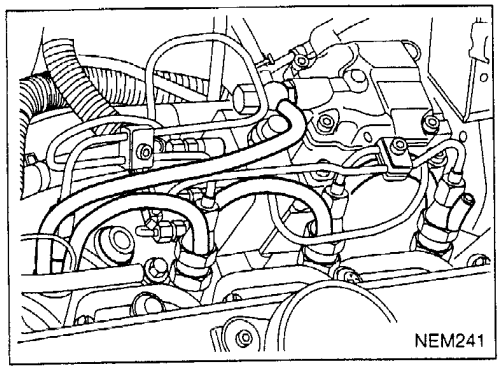


9. Replace nozzle gaskets and re-install injection nozzles.
New nozzle gaskets must be installed in the direction shown.
Nozzle to cylinder head:
: 54 - 64 N·m (5.5 - 6.5 kg-m, 40 - 47 ft-lb)



10. Install injection tubes using two wrenches as shown.
Injection tubes:
: 22 - 25 N·m (2.2 - 2.5 kg-m, 16 - 18 ft-lb)





11. Install spill hoses
12. Initialize the ECM.
Refer to EC-section ("HOW TO ERASE DTC").

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

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<COMBINED EDITION>

GA16DE

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SR20DE

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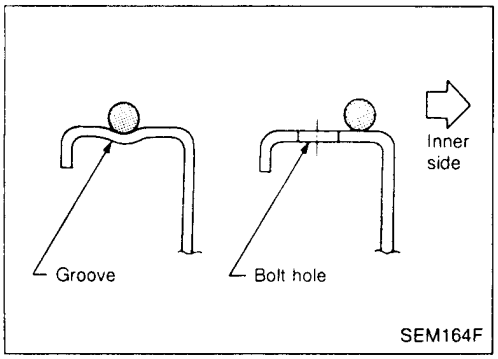
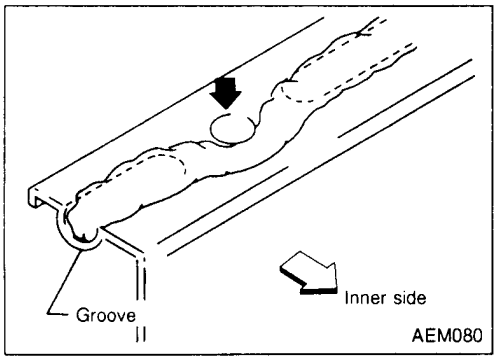
NO CHANGES

<SUPPLEMENT-III>

NO CHANGES



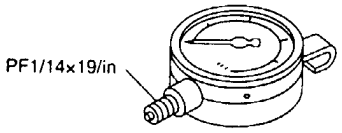
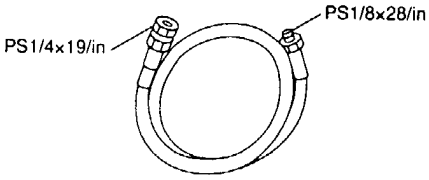
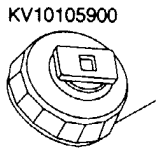
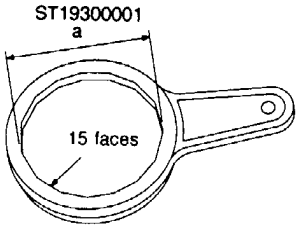
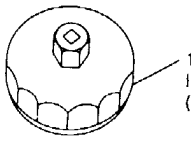
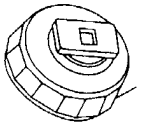


LIQUID GASKET APPLICATION PROCEDURE

a. Use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.
b. Apply a continuous bead of liquid gasket to mating surfaces.
   (Use Genuine Liquid Gasket or equivalent.)
   - For SR engine oil pan, be sure liquid gasket diameter is 4.0 to 5.0 mm (0.157 to 0.197 in) and 3.5 to 4.5 mm (0.138 to 0.177 in) except for SR engine.
   - For areas except oil pan, be sure liquid gasket diameter is 2.0 to 3.0 mm (0.079 to 0.118 in).
c. Apply liquid gasket to inner sealing surface around hole perimeter area.
   (Assembly should be done within 5 minutes after coating.)
d. Wait at least 30 minutes before refilling engine oil and engine coolant.

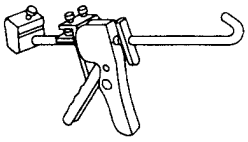
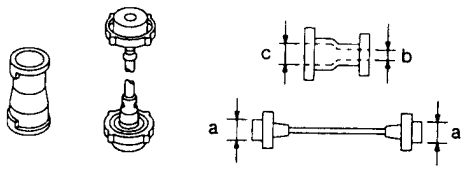
Special service tools

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

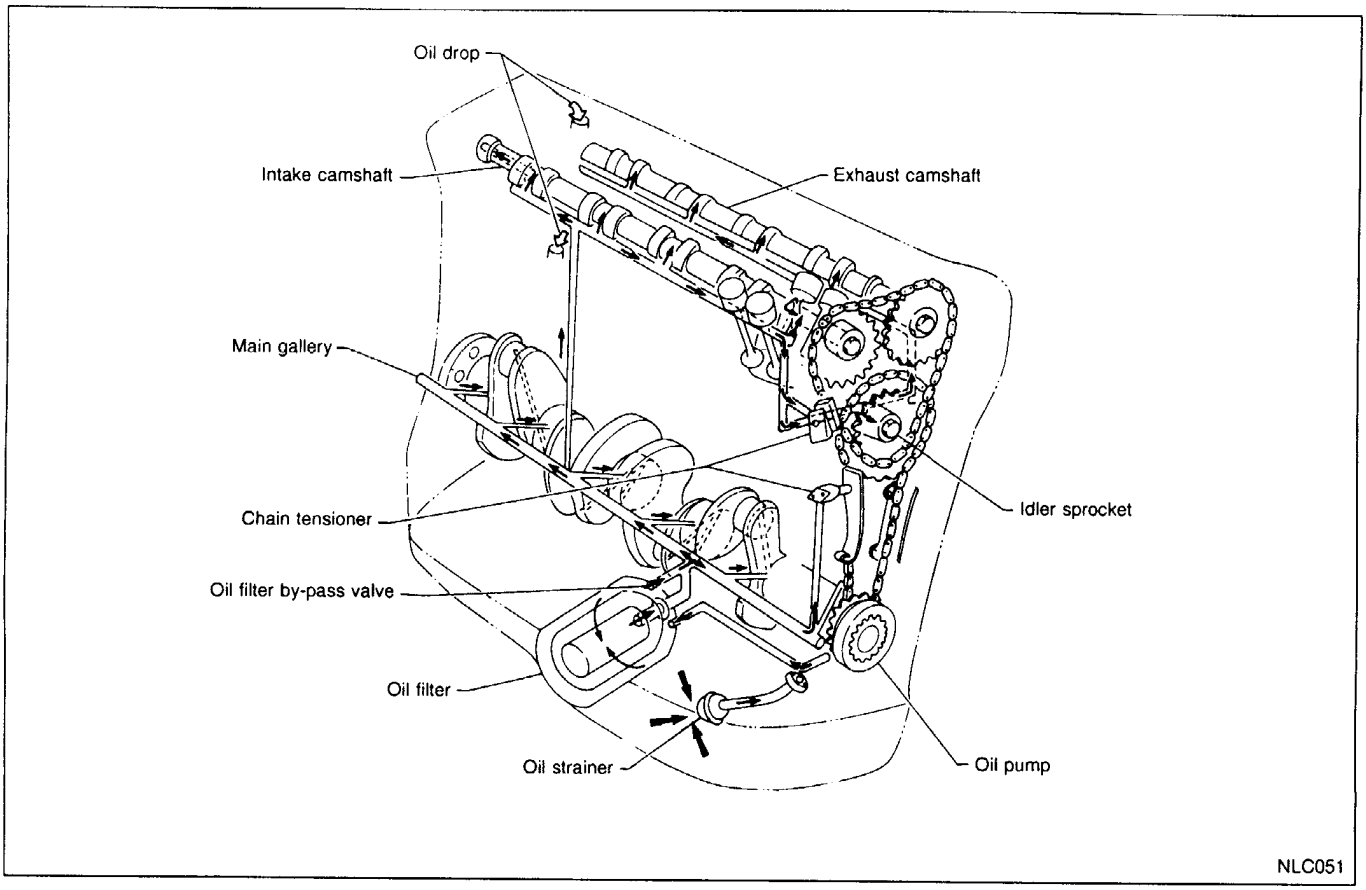
Tool number Tool name	Description		Engine application		
			GA	SR	CD
ST25051001* Oil pressure gauge	 NT558	Measuring oil pressure **Maximum measuring range: 2,452 kPa (24.5 bar, 25 kg/cm², 356 psi)**	X	X	X
ST25052000* Hose	 NT559	Adapting oil pressure gauge to cylinder block	X	X	X
KV10105900 Oil filter wrench	  NT638	Removing oil filter **a: 78 mm (3.07 in) (Face to opposite corner)**	X	—	—
KV10115801 or KV10115800 Oil filter wrench	 NT362	Removing oil filter	—	X	—
99545R2500 (KV101060S0) Oil filter wrench	 NT631	Removing oil filter	—	—	X

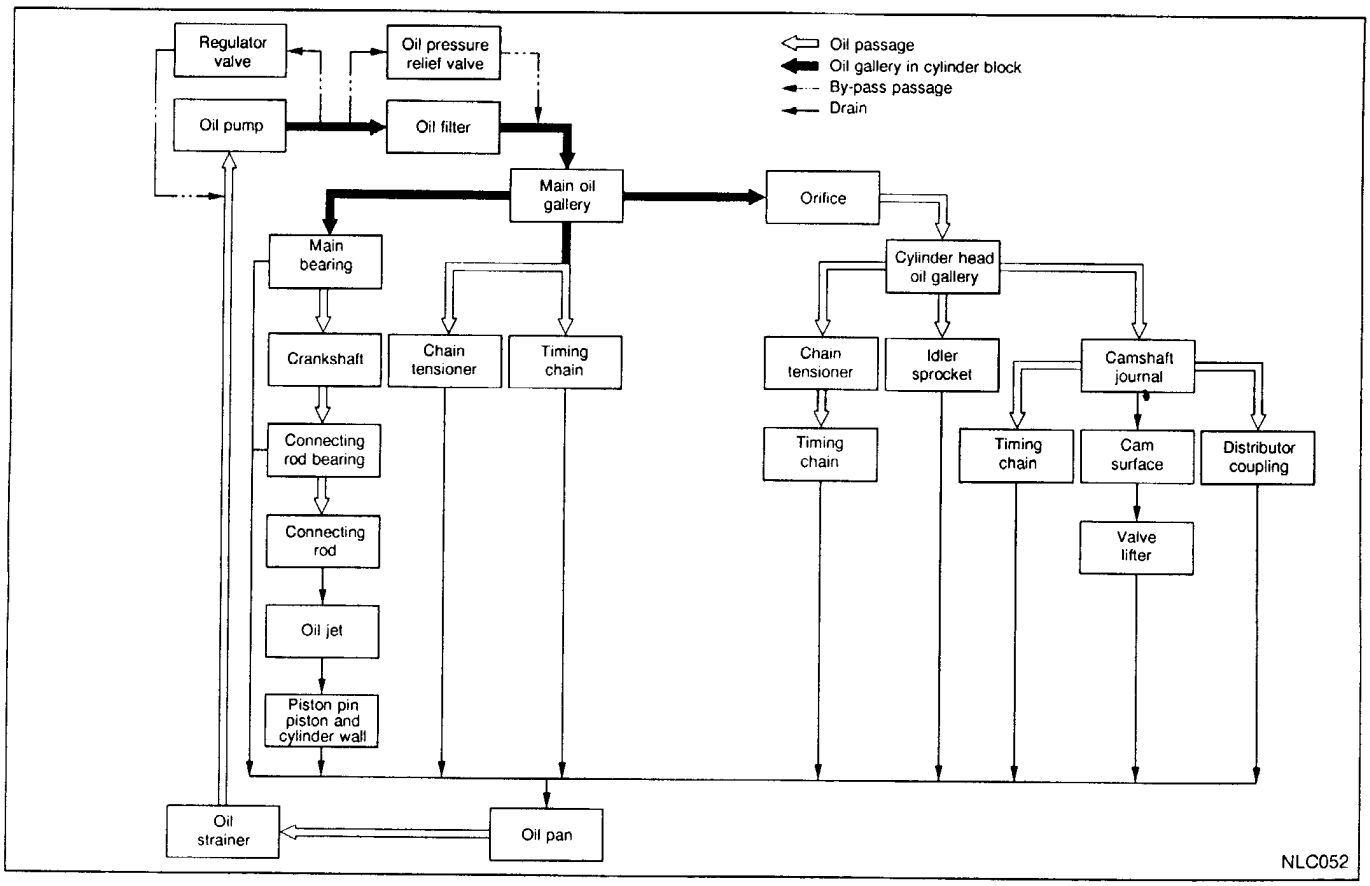
*: Special tool or commercial equivalent

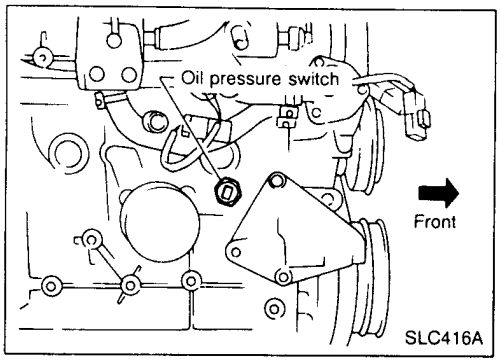
Special service tools (Cont'd)

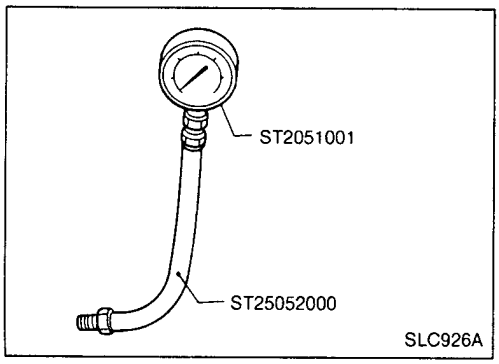
Tool number Tool name	Description		Engine application		
			GA	SR	CD
WS39930000 Tube presser	 NT052	Pressing the tube of liquid gasket	X	X	X
EG17650301 Radiator cap tester adapter	 NT564	Adapting radiator cap tester to radiator filler neck **a: 28 (1.10) dia.** **b: 31.4 (1.236) dia.** **c: 41.3 (1.626) dia.** Unit: mm (in)	X	X	X

Lubrication Circuit









Oil Pressure Check

WARNING:

- **Be careful not to burn yourself, as the engine and oil may be hot.**
- **Oil pressure check should be done in "Neutral" gear position.**

1. Check oil level.
2. Remove oil pressure switch.

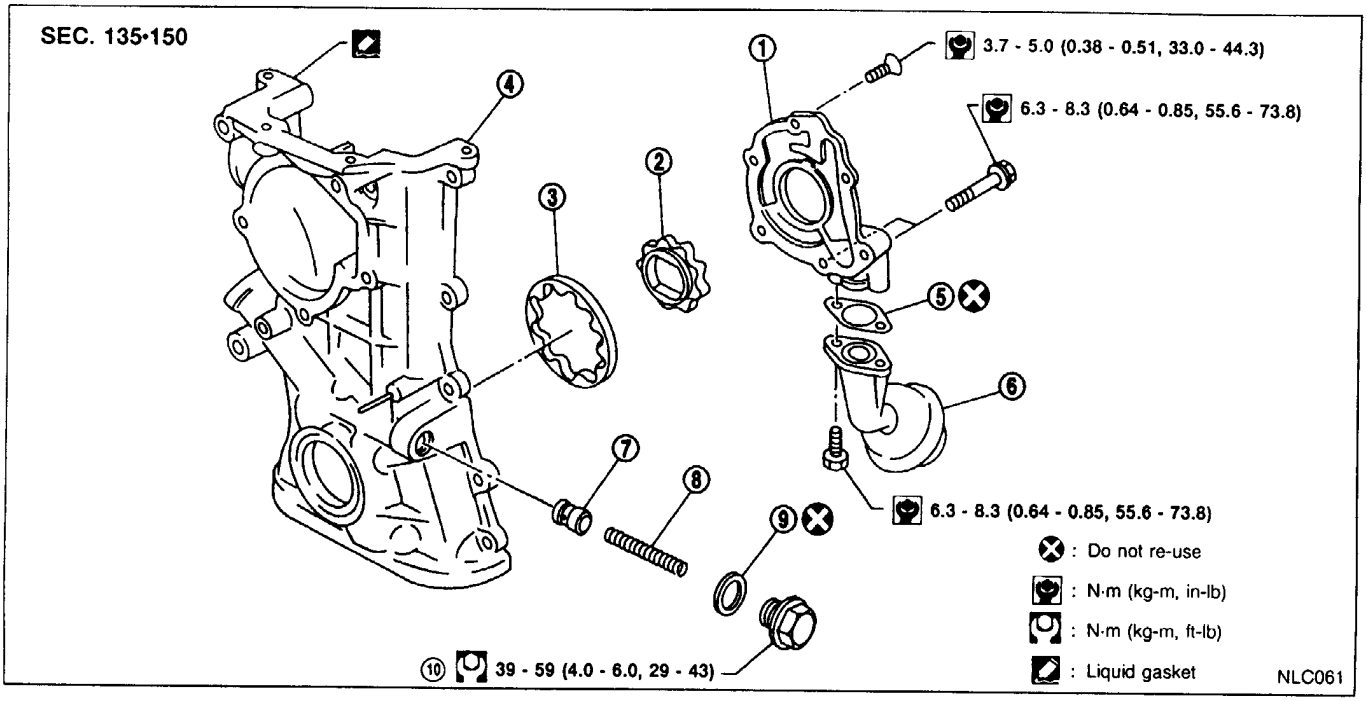
Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 59 (0.59, 0.6, 9)
2,000	More than 245 (2.45, 2.5, 36)
6,000	More than 422 (4.22, 4.3, 61)

3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.

Oil Pump



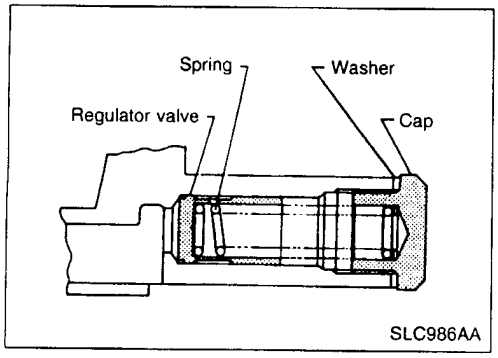
① Oil pump cover
② Inner gear
③ Outer gear
④ Front cover
⑤ Gasket
⑥ Oil strainer
⑦ Regulator valve
⑧ Spring
⑨ Washer
⑩ Plug

REMOVAL

1. Remove drive belts.
2. Remove cylinder head (Refer to EM section).
3. Remove oil pan (Refer to EM section).
4. Remove oil strainer and baffle plate.
5. Remove front cover assembly.

DISASSEMBLY AND ASSEMBLY

- **Always replace oil seal with a new one.**
- **When installing oil pump, apply engine oil to gears.**
- **Make sure that O-ring is fitted properly.**

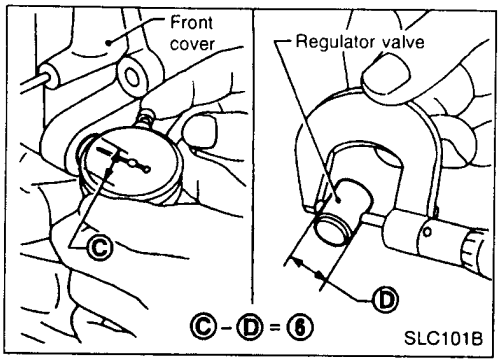


REGULATOR VALVE INSPECTION

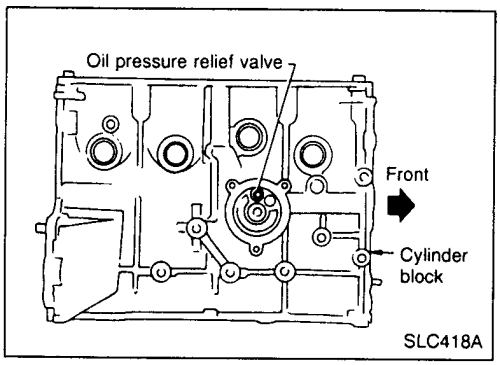
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil. Check that regulator valve falls freely into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.

Oil Pump (Cont'd)



4. Check regulator valve to front cover clearance:
   Clearance:
   ⑥: 0.04 - 0.10 mm (0.0016 - 0.0039 in)
   If it exceeds the limit, replace front cover assembly.

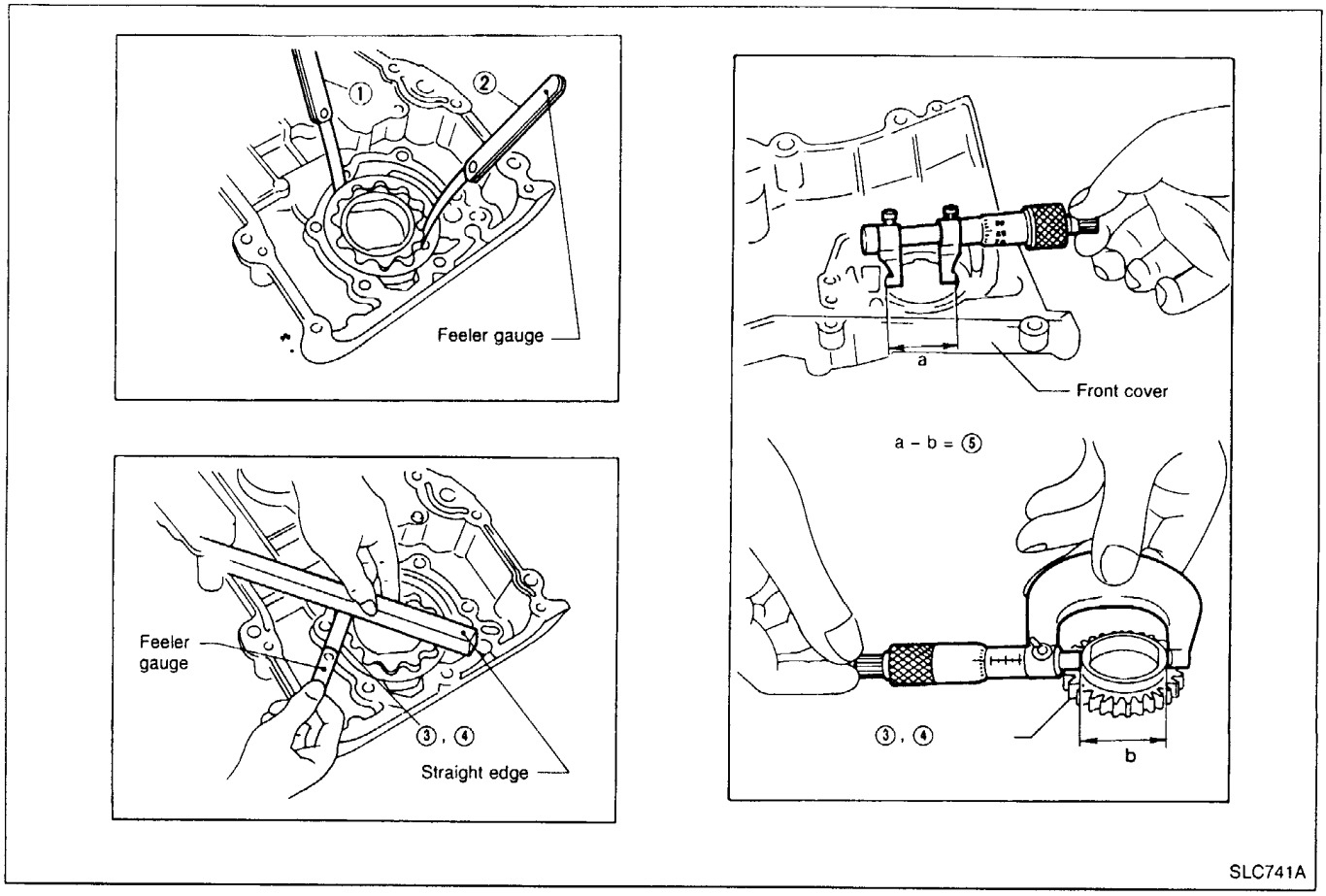


OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with suitable tool.
Install a new valve by tapping it into place.

Oil Pump (Cont'd)

OIL PUMP INSPECTION



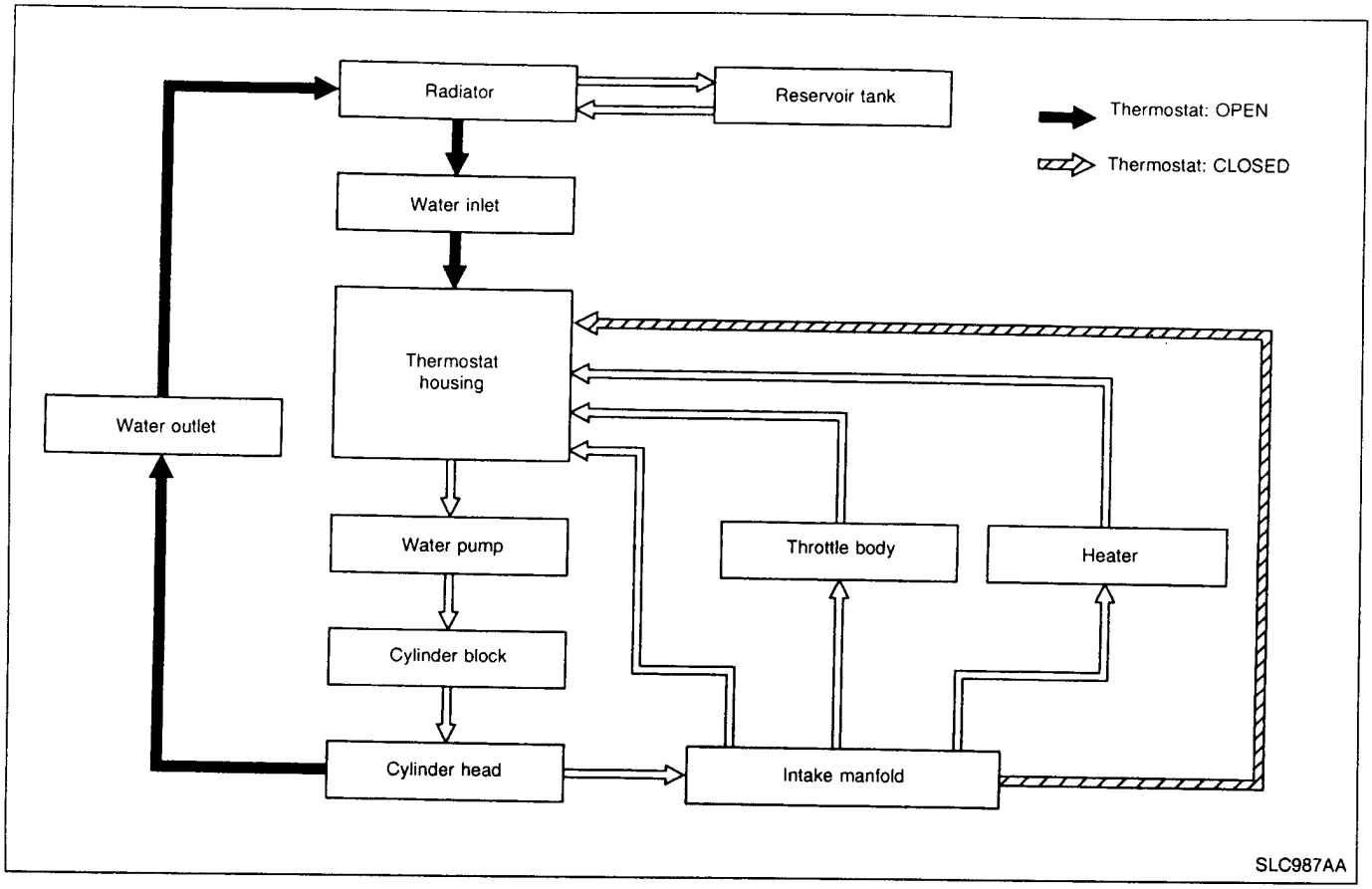
Using a feeler gauge, check the following clearances:

Unit: mm (in)

Body to outer gear clearance (radial) ①	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.217 - 0.327 (0.0085 - 0.0129)
Body to inner gear clearance ③	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance (axial) ④	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance ⑤	0.045 - 0.091 (0.0018 - 0.0036)

- **If the tip clearance (②) exceeds the limit, replace gear set.**
- **If body to gear clearances (①, ③, ④, ⑤) exceed the limit, replace front cover assembly.**

Cooling Circuit

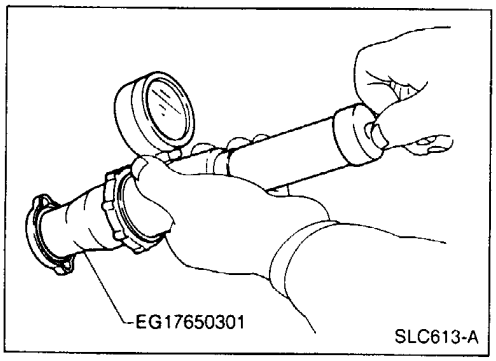


System Check

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 and carefully loosen it a quarter turn to release built-up pressure. Then remove the cap completely.

CHECKING COOLING SYSTEM HOSES

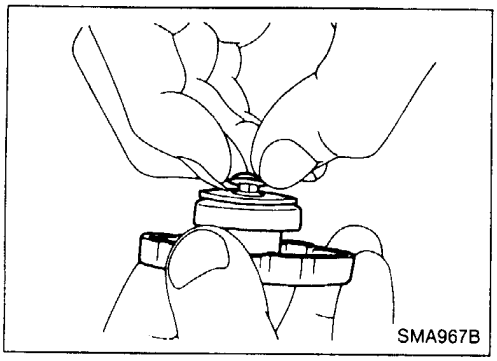
Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



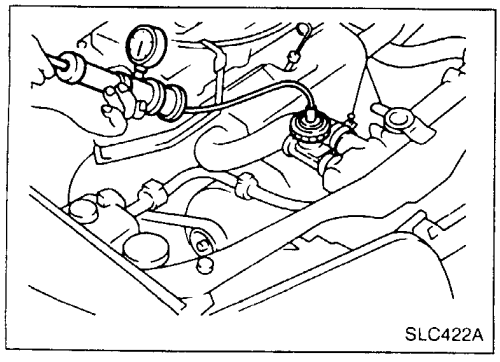
CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:
Standard
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)
Limit
59 - 98 kPa
(0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)



Pull the negative pressure valve to open it. Check that it closes completely when released.



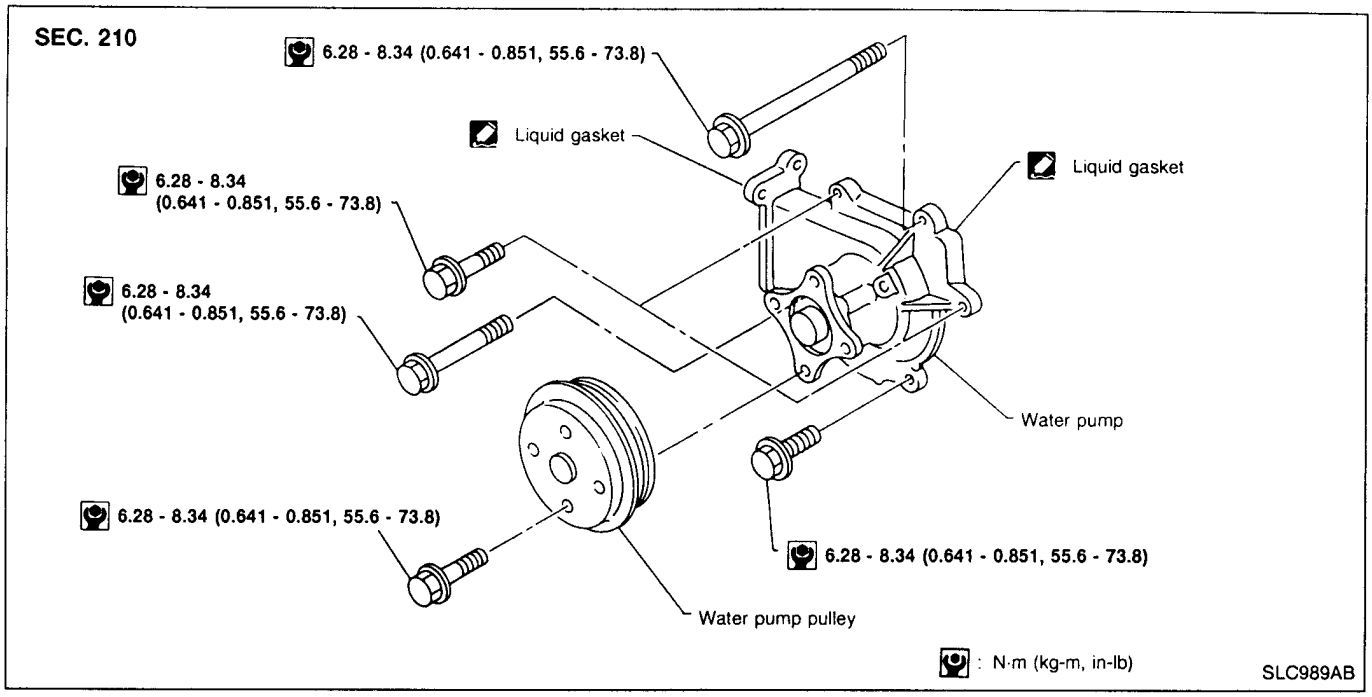
CHECKING COOLING SYSTEM FOR LEAKS

To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

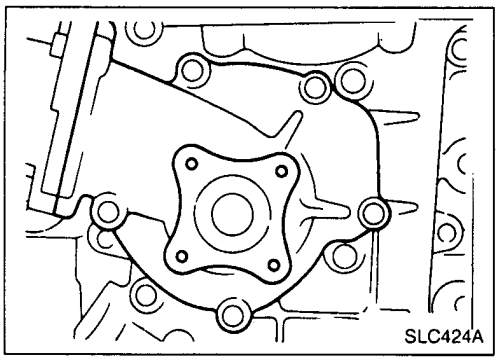
CAUTION:
Higher than the specified pressure may cause radiator damage.

Water Pump



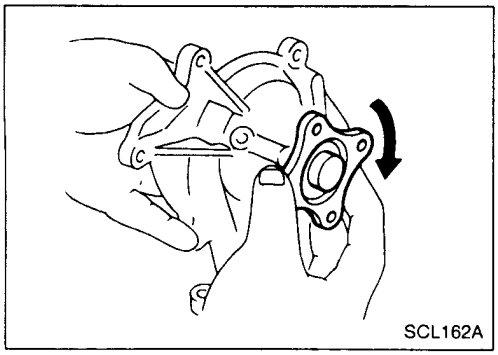
CAUTION:

- **When removing water pump assembly, be careful not to get coolant on timing chain.**
- **Water pump cannot be disassembled and should be replaced as a unit.**
- **After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.**



REMOVAL

1. Remove radiator lower hose from radiator and drain coolant from radiator and cylinder block.
2. Remove drive belts for compressor, power steering pump and alternator.
3. Remove water pump pulley.
4. Remove water pump.

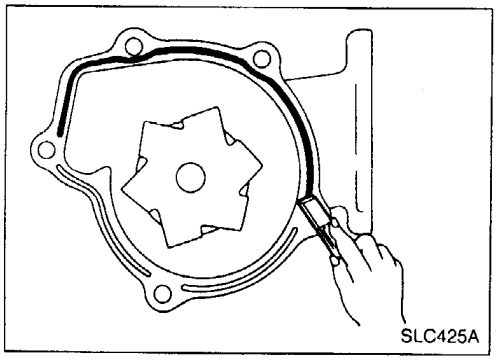


INSPECTION

1. Check body assembly for rust or corrosion.
2. Check for rough operation due to excessive end play.

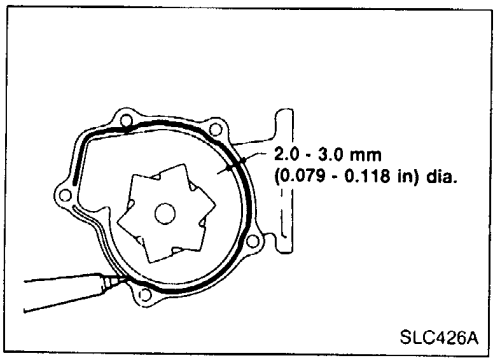
Water Pump (Cont'd)

INSTALLATION



Use a scraper to remove liquid gasket from water pump.
Be sure liquid gasket in grooves is also removed.

- Remove liquid gasket from mating surface of front cover.
- Remove all traces of liquid gasket using white gasoline.

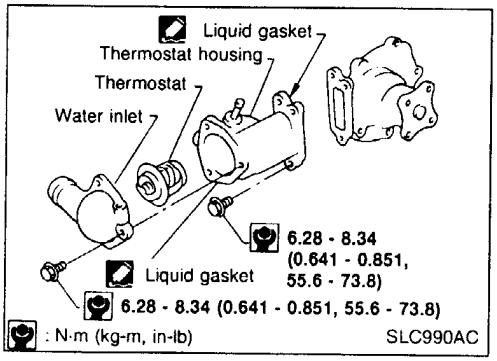


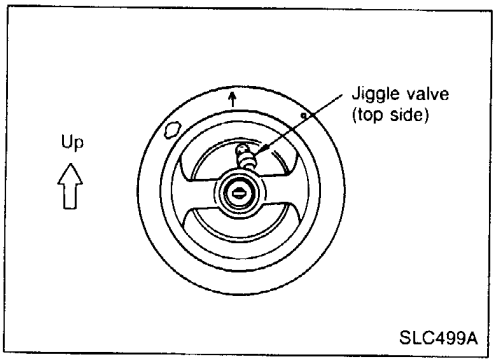
- Apply liquid gasket to mating surface of pump housing as shown.

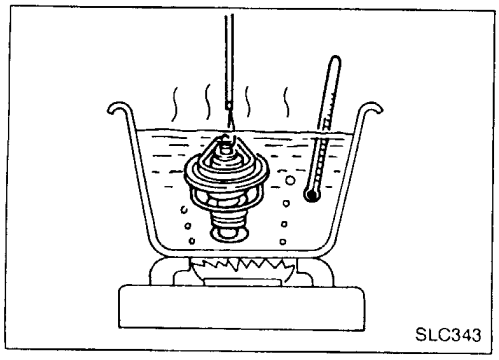
Thermostat

INSPECTION

1. Check for valve seating condition at ordinary temperatures. It should seat tightly.







2. Check valve opening temperature and maximum valve lift.

Valve opening temperature	°C (°F)	82 (180)
Valve lift	mm/°C (in/°F)	More than 9/95 (0.35/203)

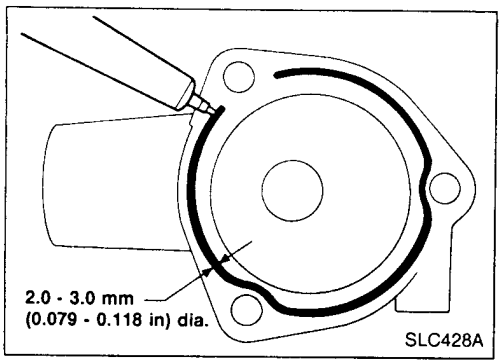
3. Then check if valve closes at 5°C (41°F) below valve opening temperature.

- **After installation, run engine for a few minutes, and check for leaks.**

Thermostat (Cont'd)

INSTALLATION

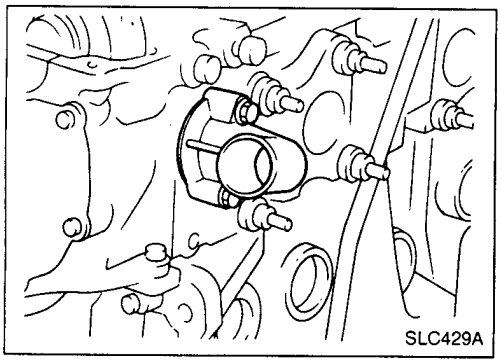
When installing water inlet apply liquid gasket as shown.



Water Outlet

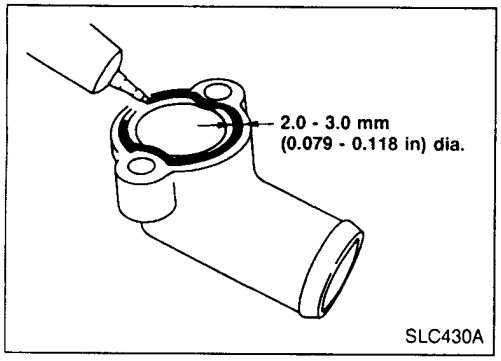
INSPECTION

Visually inspect for water leaks. If there is leakage, apply liquid gasket.

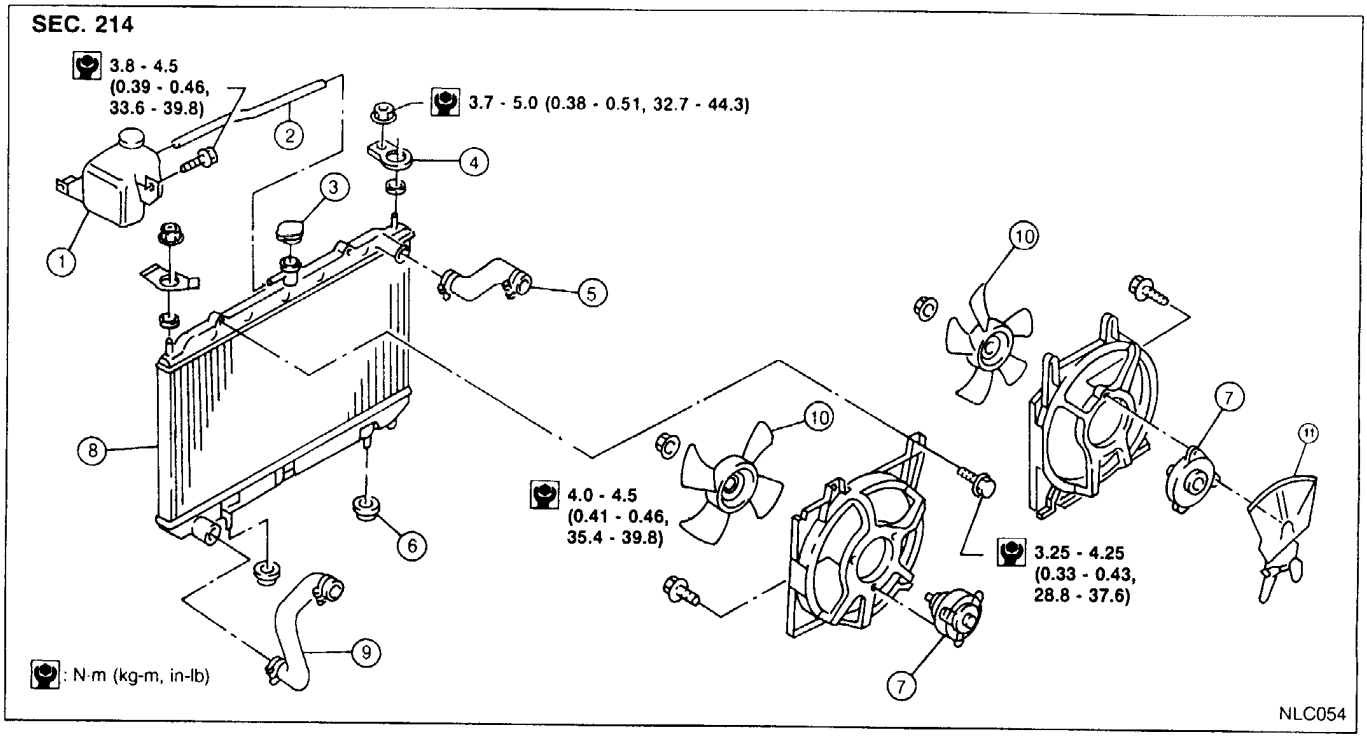


INSTALLATION

When installing water outlet, apply liquid gasket as shown.



Radiator



① Reservoir tank
② Reservoir tank hose
③ Radiator cap
④ Mounting bracket
⑤ Upper hose
⑥ Mounting rubber
⑦ Cooling fan motor
⑧ Radiator
⑨ Lower hose
⑩ Cooling fan
⑪ Cooling fan motor shield

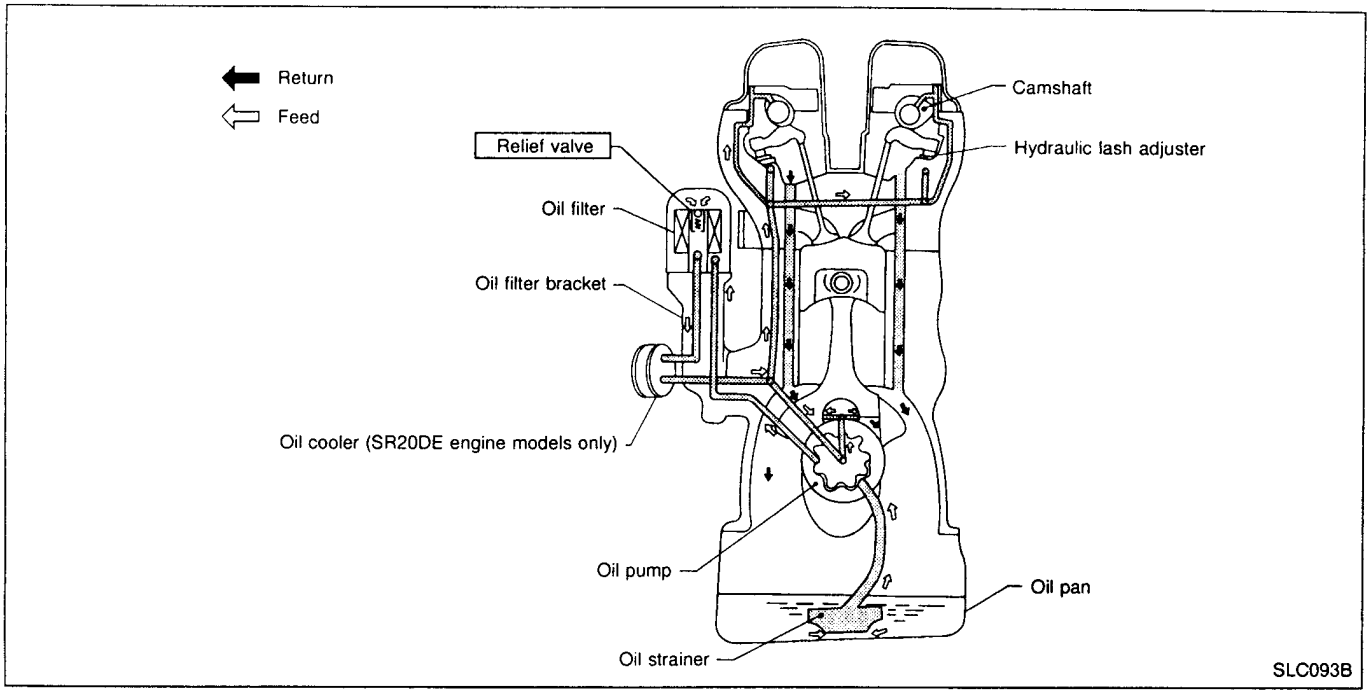
Cooling fan control system

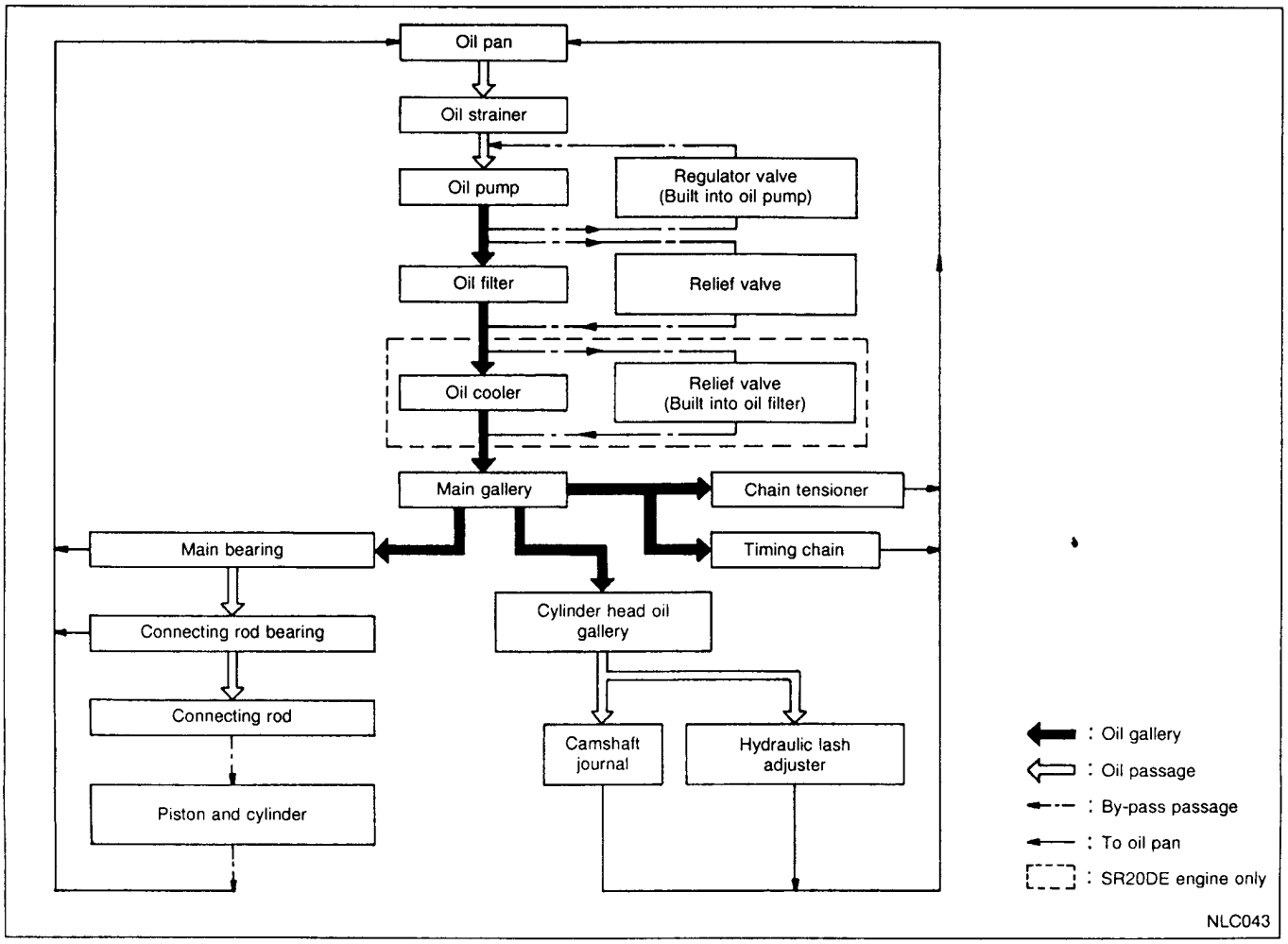
- Cooling fans are controlled by the ECM. For details, refer to EC section ("Cooling Fan Control", "TROUBLE DIAGNOSES", EC-125).

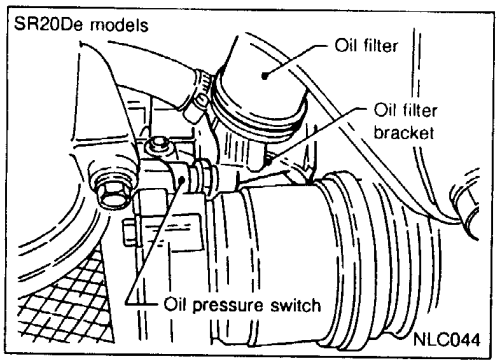
Refilling engine coolant

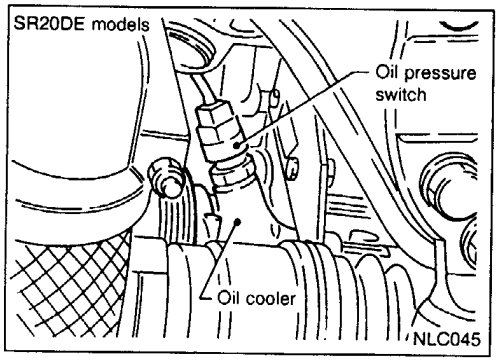
- For details on refilling engine coolant, refer to MA section ("REFILLING ENGINE COOLANT", "Changing Engine Coolant", MA-10).

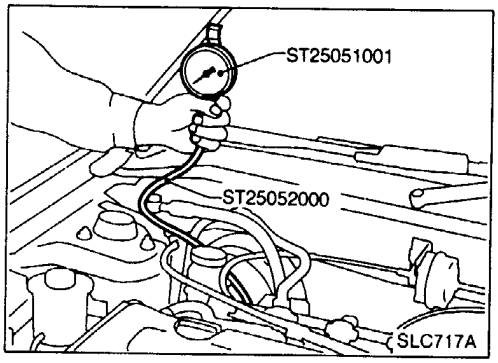
Lubrication Circuit











Oil Pressure Check

WARNING:

- **Be careful not to burn yourself, as the engine and oil may be hot.**
- **Oil pressure check should be done in "Neutral position".**

1. Check oil level.
2. Remove oil pressure switch.
3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,200	314 - 392 (3.14 - 3.92, 3.2 - 4.0, 46 - 57)

If difference is extreme, check oil passage and oil pump for oil leaks.

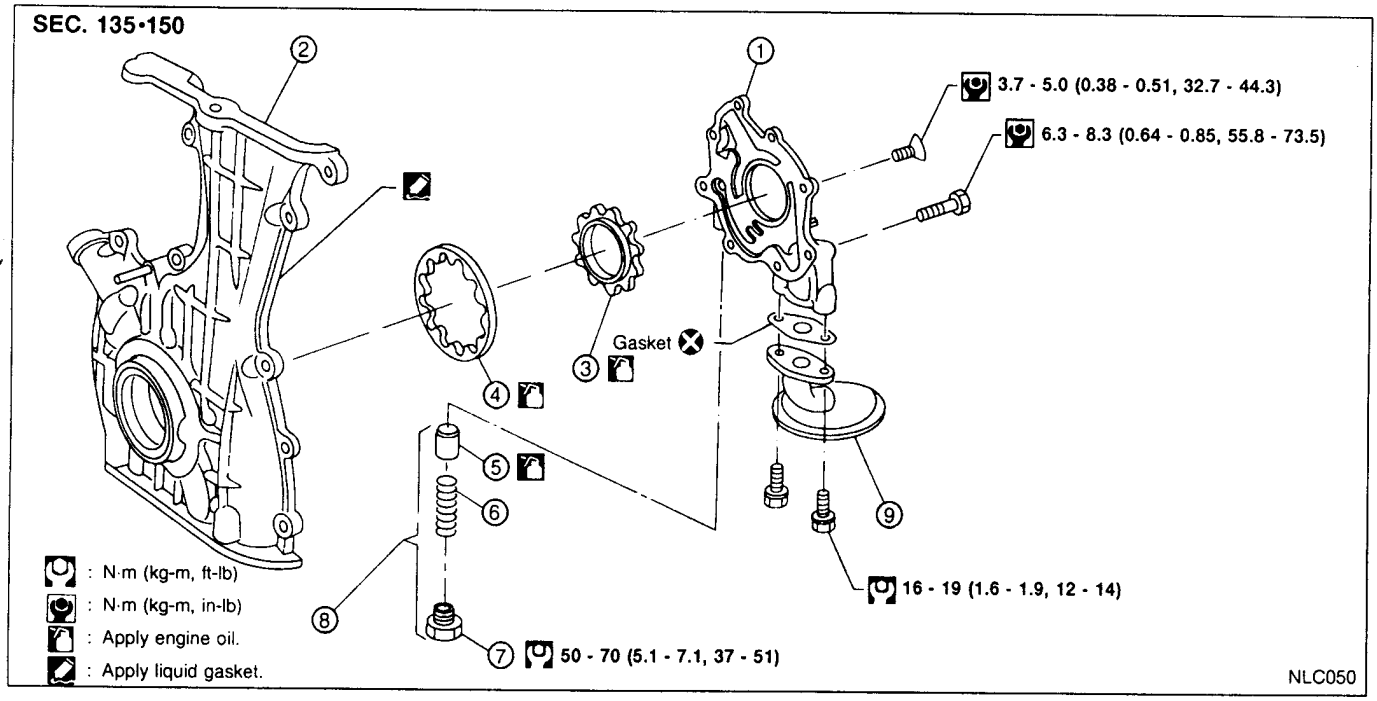
6. Install oil pressure switch with sealant.

Oil Pump

REMOVAL

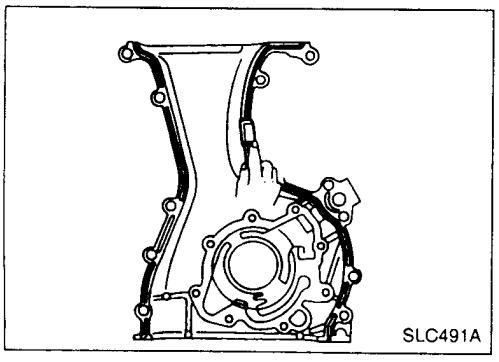
1. Remove drive belts.
2. Remove cylinder head. (Refer to EM section).
3. Remove oil pan. (Refer to EM section).
4. Remove oil strainer and baffle plate.
5. Remove front cover assembly.

DISASSEMBLY AND ASSEMBLY



① Oil pump cover
② Front cover
③ Inner gear
④ Outer gear
⑤ Regulator valve
⑥ Spring
⑦ Plug
⑧ Regulator valve set
⑨ Oil strainer

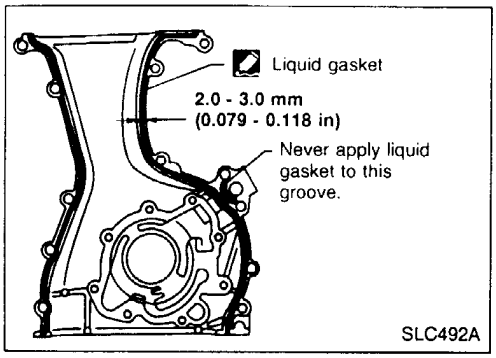
- **Always replace oil seal, gasket and O-ring with new ones.**
- **When installing oil pump, apply engine oil to inner and outer gears.**
- **Be sure that O-rings are properly fitted.**



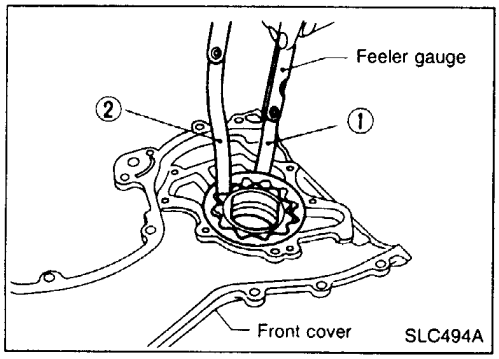
INSTALLATION

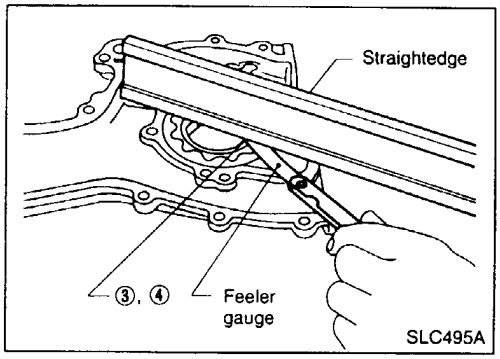
- Before installing front cover assembly, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

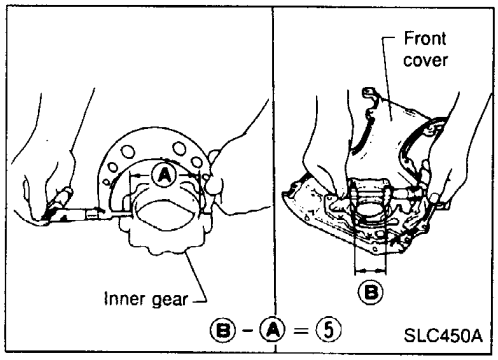
Oil Pump (Cont'd)



1. Apply a continuous bead of liquid gasket to mating surface of front cover assembly.
   - Use Genuine Liquid Gasket or equivalent.
2. Installation is the reverse order of removal.







SLC860A

INSPECTION

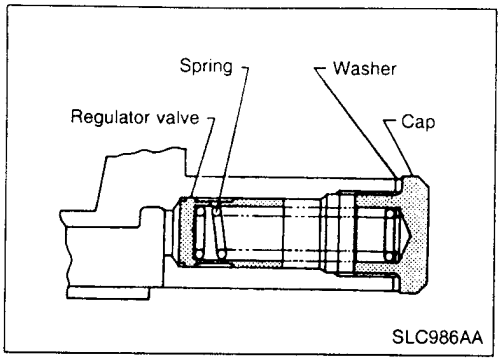
Using a feeler gauge, check the following clearances:

Unit: mm (in)

Body to outer gear clearance (radial) ①	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance ②	Below 0.18 (0.0071)
Body to inner gear clearance ③	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance (axial) ④	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance ⑤	0.045 - 0.091 (0.0018 - 0.0036)

- **If the tip clearance (②) exceeds the limit, replace gear set.**
- **If body to gear clearances (①, ③, ④, ⑤) exceed the limit, replace front cover assembly.**

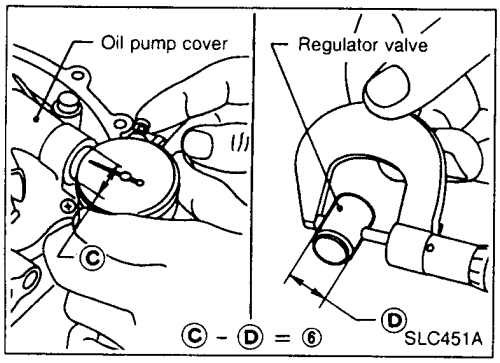
Oil Pump (Cont'd)



REGULATOR VALVE INSPECTION

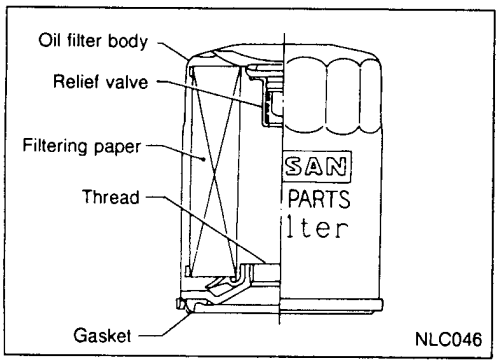
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil.
   Check that regulator valve falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump cover.



4. Check regulator valve to oil pump cover clearance.
   Clearance:
   ⑥ : 0.040 - 0.097 mm (0.0016 - 0.0038 in)

If it exceeds the limit, replace oil pump cover.

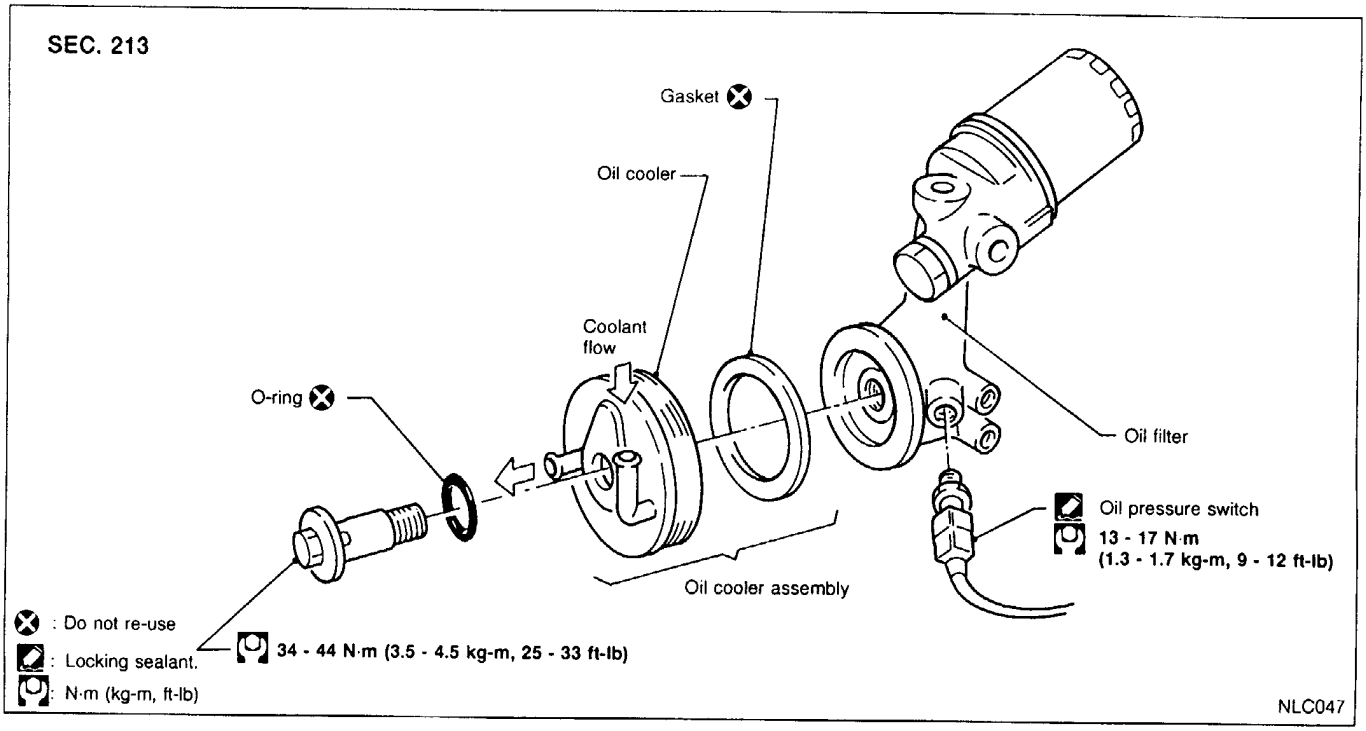


Oil Filter

The oil filter is a small, full-flow cartridge type and is provided with a relief valve.

- **The new and existing oil filter designs differ from each other and are not interchangeable.**
- **Use Tool KV10115801 or KV10115800 for removing oil filter.**

Oil Cooler



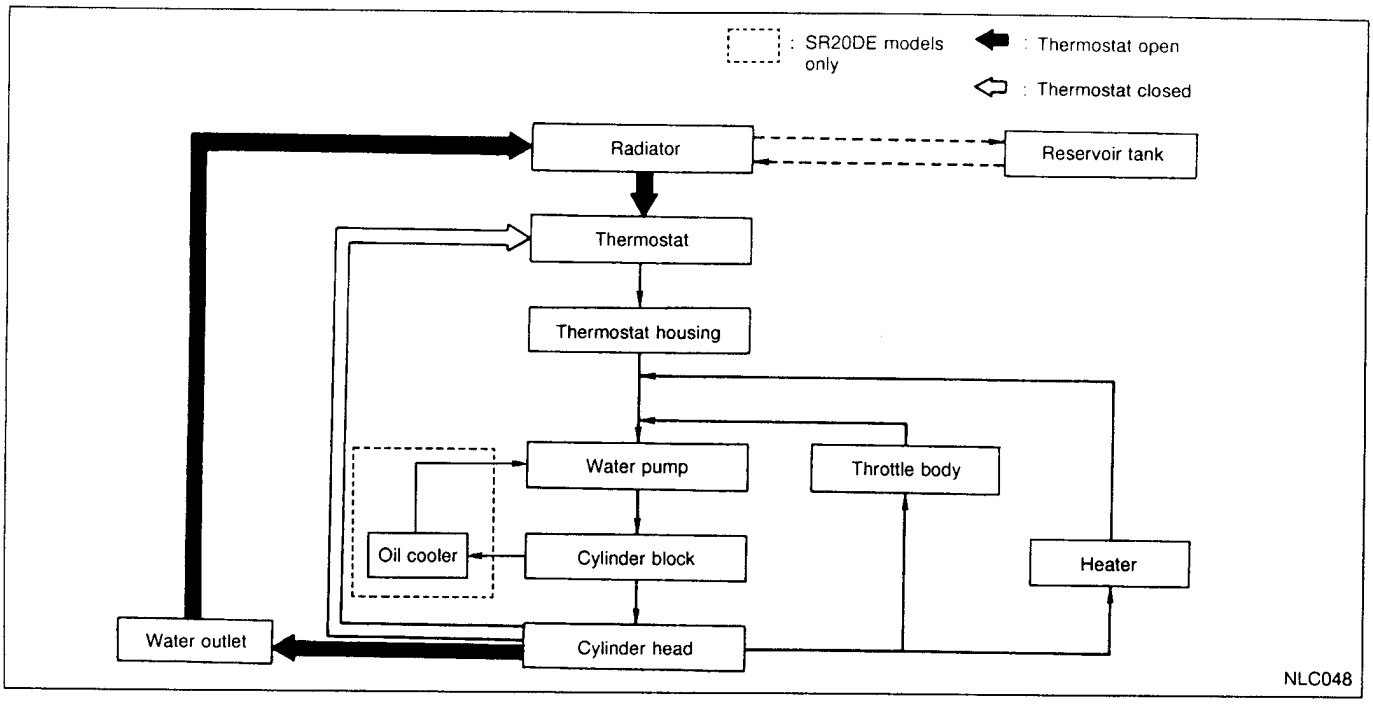
REMOVAL AND INSTALLATION

1. Drain engine oil and coolant.
2. Remove oil cooler.
3. Installation is in reverse order of removal

INSPECTION

1. Check oil cooler for cracks.
2. Check oil cooler for clogging by blowing through coolant inlet. If necessary, replace oil cooler assembly.

Cooling Circuit



System Check

WARNING:

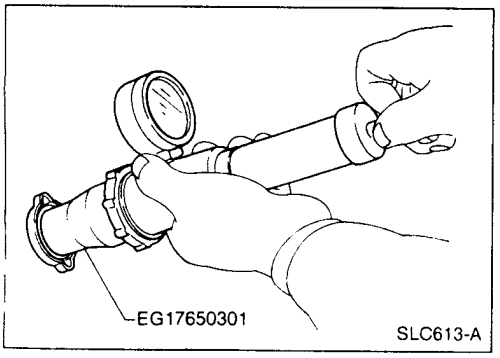
Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around the cap and carefully remove it by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.

Cooling System Inspection

CHECKING HOSES

Check water hoses for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:

Standard

78 - 98 kPa

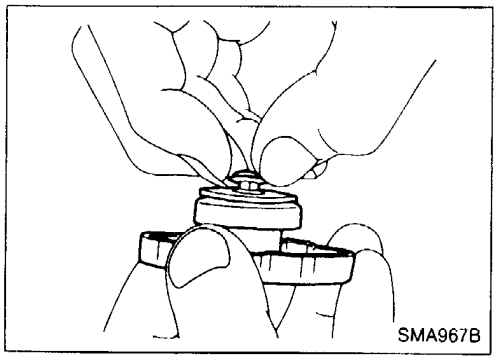
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)

Limit

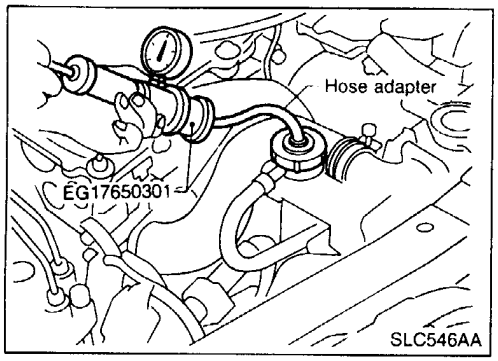
59 - 98 kPa

(0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)

Cooling System Inspection (Cont'd)



Pull the negative pressure valve to open it.
Check that it closes completely when released.



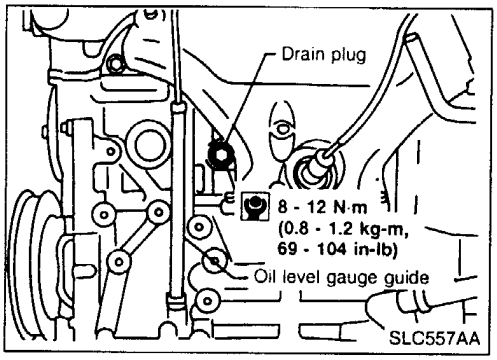
CHECKING COOLING SYSTEM FOR LEAKS

To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm², 23 psi)

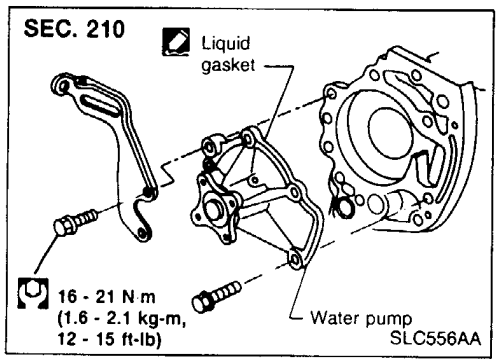
CAUTION:
Higher than the specified pressure may cause radiator damage.

Water Pump



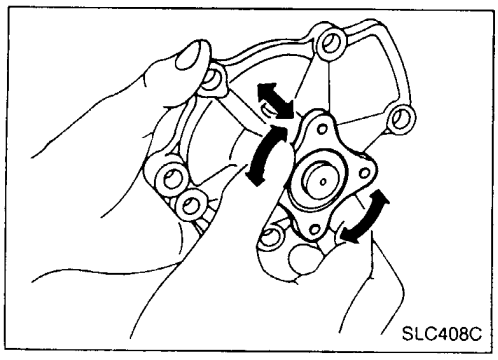
REMOVAL

1. Drain coolant from radiator.
2. Remove cylinder block drain plug located at left front of cylinder block and drain coolant.
3. Remove front RH wheel and engine side cover.
4. Remove drive belts.
5. Remove front engine mounting.



6. Remove water pump.

CAUTION:
- **When removing water pump assembly, be careful not to get coolant on drive belt.**
- **Water pump cannot be disassembled and should be replaced as a unit.**
- **After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.**

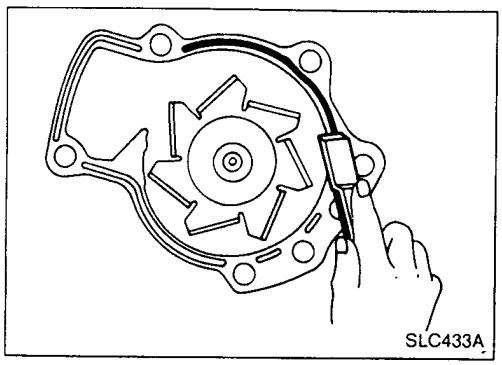


INSPECTION

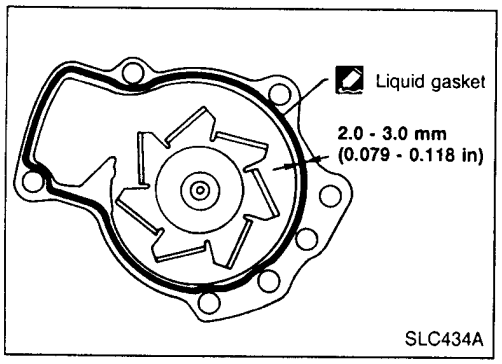
1. Check body assembly for rust or corrosion.
2. Check for rough operation due to excessive end play.

Water Pump (Cont'd)

INSTALLATION

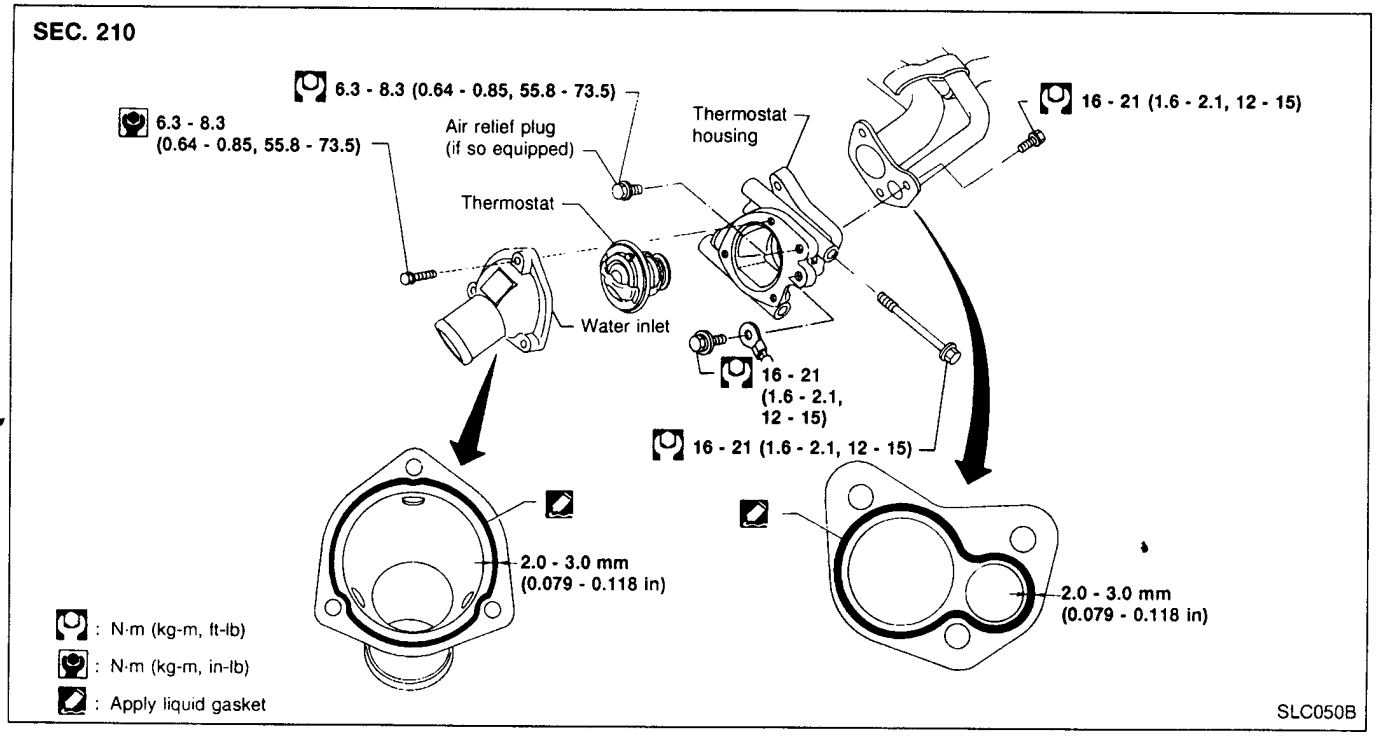


1. Before installing, remove all traces of liquid gasket from mating surface of water pump using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



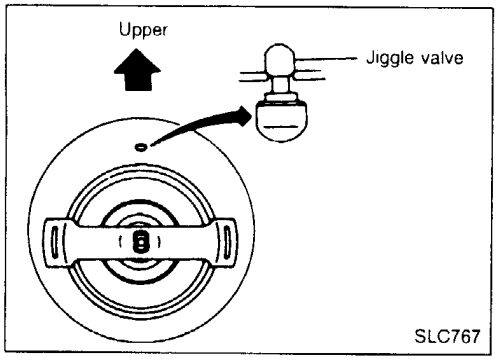
2. Apply a continuous bead of liquid gasket to mating surface of water pump.
- Use Genuine Liquid Gasket or equivalent.

Thermostat



Thermostat (Cont'd)

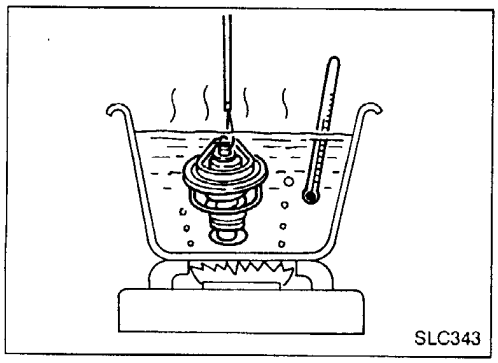
REMOVAL AND INSTALLATION



1. Remove lower radiator hose and drain engine coolant.
2. Remove water inlet, then take out thermostat.
3. Install thermostat with jiggle valve or air bleeder facing upward.

- **After installation, run engine for a few minutes, and check for leaks.**
- **Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.**

INSPECTION



1. Check for valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and valve lift.

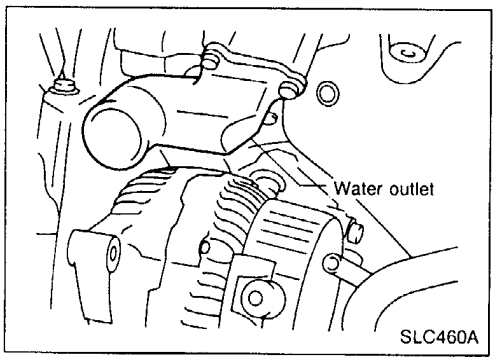
Valve opening temperature	°C(°F)	82 (180)
Valve lift	mm/°C (in/°F)	More than 9/95 (0.35/203)

3. Then check if valve closes at 5°C (41°F) below valve opening temperature.

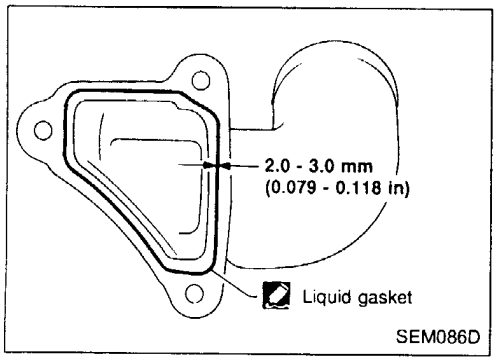
Water Outlet

INSPECTION

Visually inspect for water leaks. If there is leakage, apply liquid gasket.



INSTALLATION



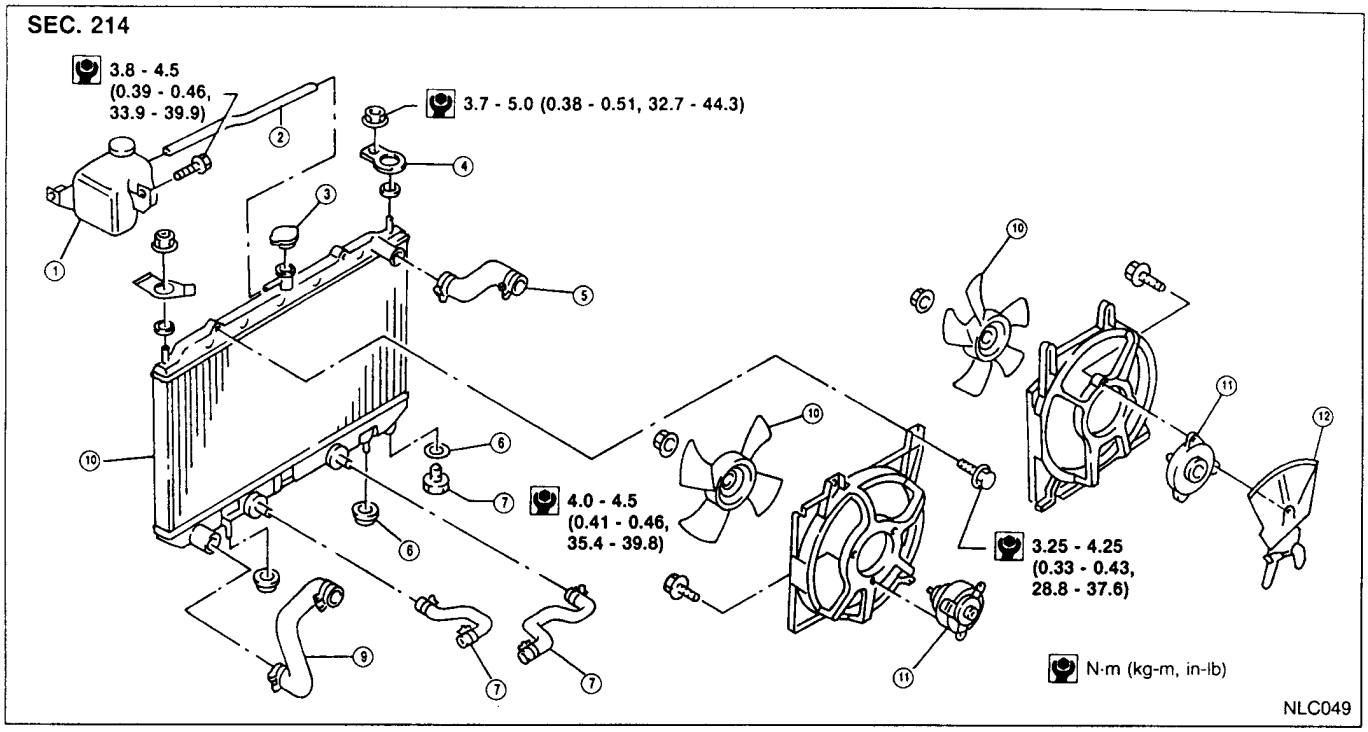
1. Before installing, remove all traces of liquid gasket from mating surface of water outlet using a scraper.

- Also remove traces of liquid gasket from mating surface of cylinder head.

2. Apply a continuous bead of liquid gasket to mating surface of water outlet.

- Use Genuine Liquid Gasket or equivalent.

Radiator



① Reservoir tank
② Reservoir tank hose
③ Radiator cap
④ Mounting bracket
⑤ Upper hose
⑥ Mounting rubber
⑦ Oil cooler hose (A/T models)
⑧ Radiator
⑨ Lower hose
⑩ Cooling fan
⑪ Cooling fan motor
⑫ Cooling fan motor shield

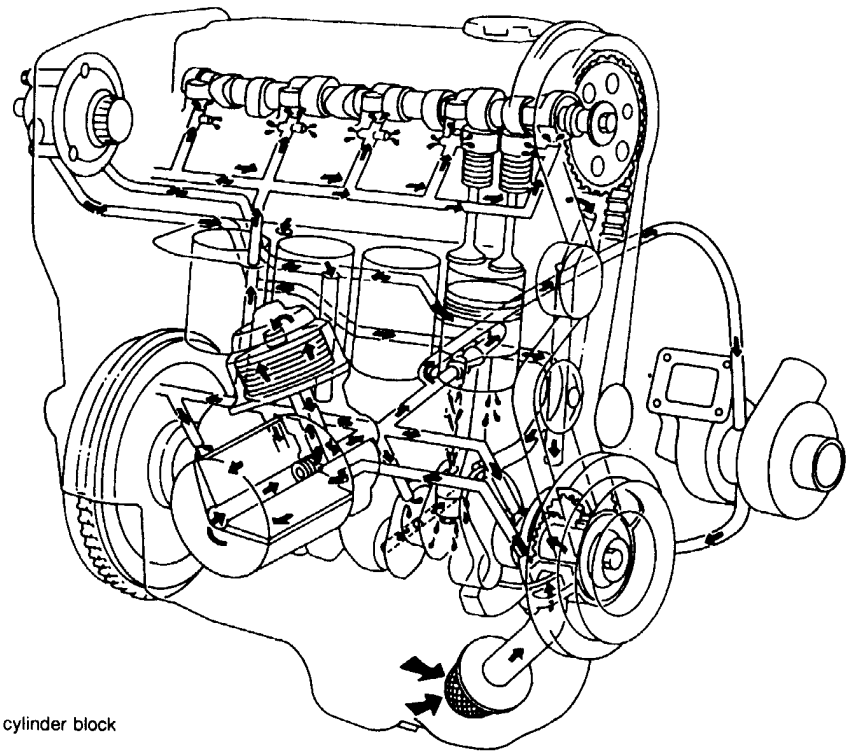
Cooling fan control system

- Cooling fans are controlled by the ECM. For details, refer to EC-section ("Cooling Fan Control", "TROUBLE DIAGNOSES", EC-265).

Refilling engine coolant

- For details on refilling engine coolant, refer to MA section ("REFILLING ENGINE COOLANT", "Changing Engine Coolant", MA-19).

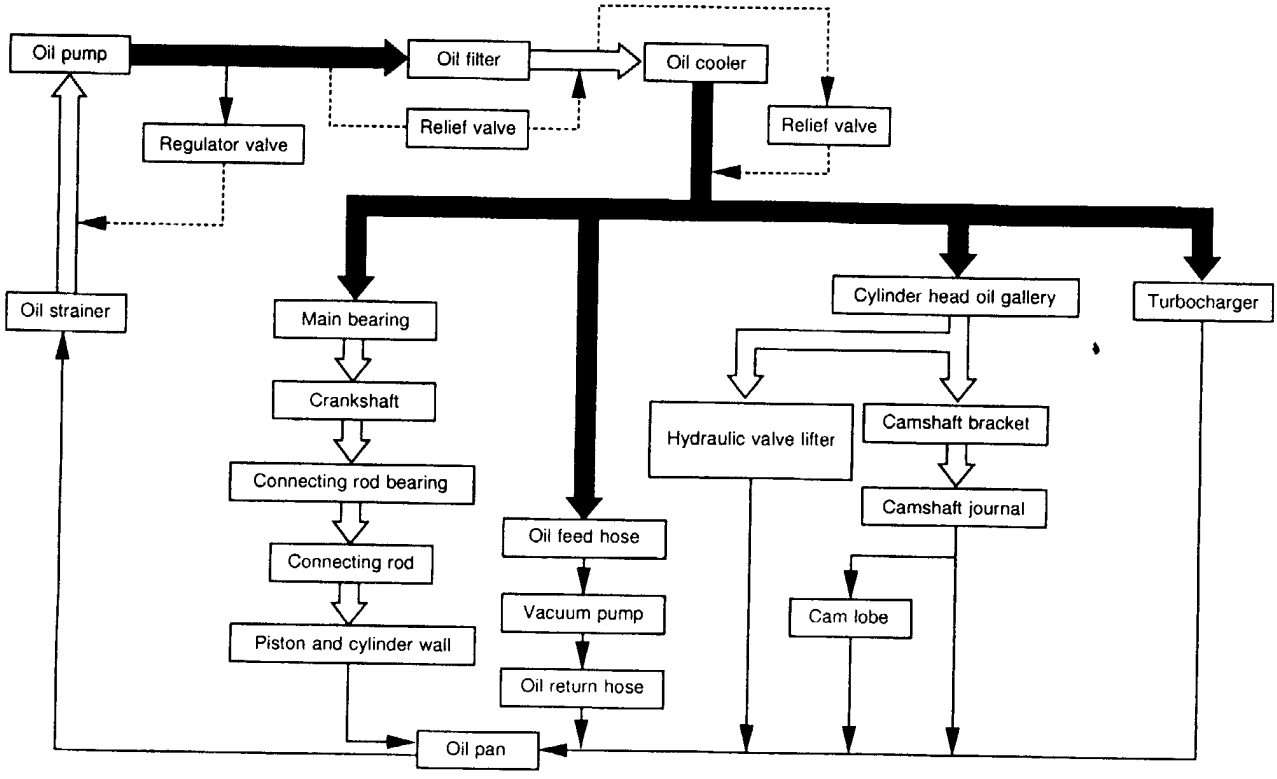
Lubrication Circuit



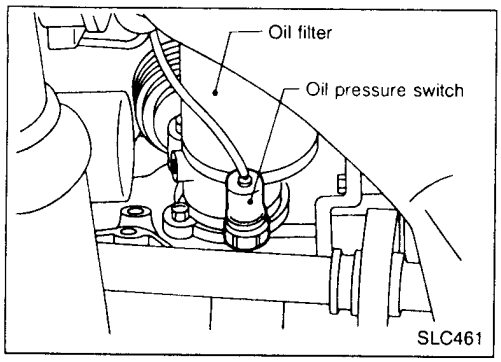
: Oil gallery in cylinder block

: Oil passage

: By-pass passage



SLC083B

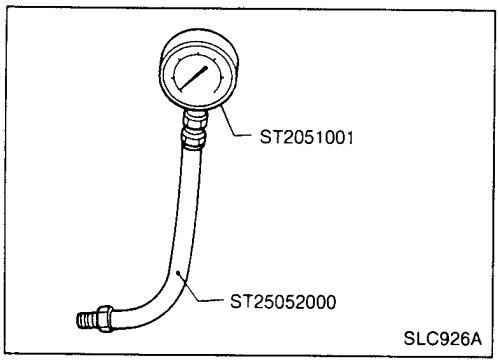


Oil Pressure Check

WARNING:

- **Be careful not to burn yourself, as the engine and oil may be hot.**
- **Oil pressure check should be done in "Neutral" gear position.**

1. Check oil level.
2. Remove oil pressure switch.

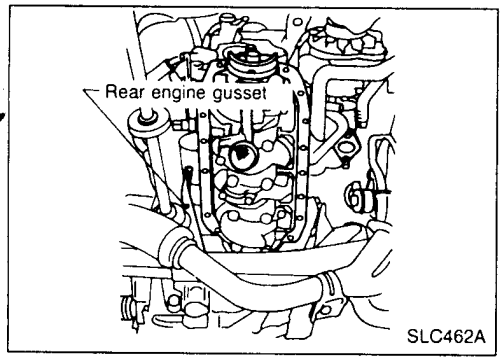


3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 59 (0.59, 0.6, 9)
2,000	294 (2.9, 3, 43)

If difference is extreme, check oil passage and oil pump for oil leaks.

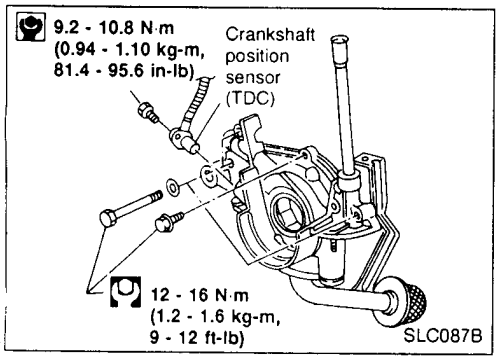
6. Install oil pressure switch with sealant.



Oil Pump

REMOVAL AND INSTALLATION

1. Drain engine coolant and engine oil.
2. Remove upper radiator hose, drive belts, crank pulley, timing belt covers and timing belt.
3. Remove exhaust front tube, timing belt pulley and rear engine gusset (bar type), then remove oil pan.



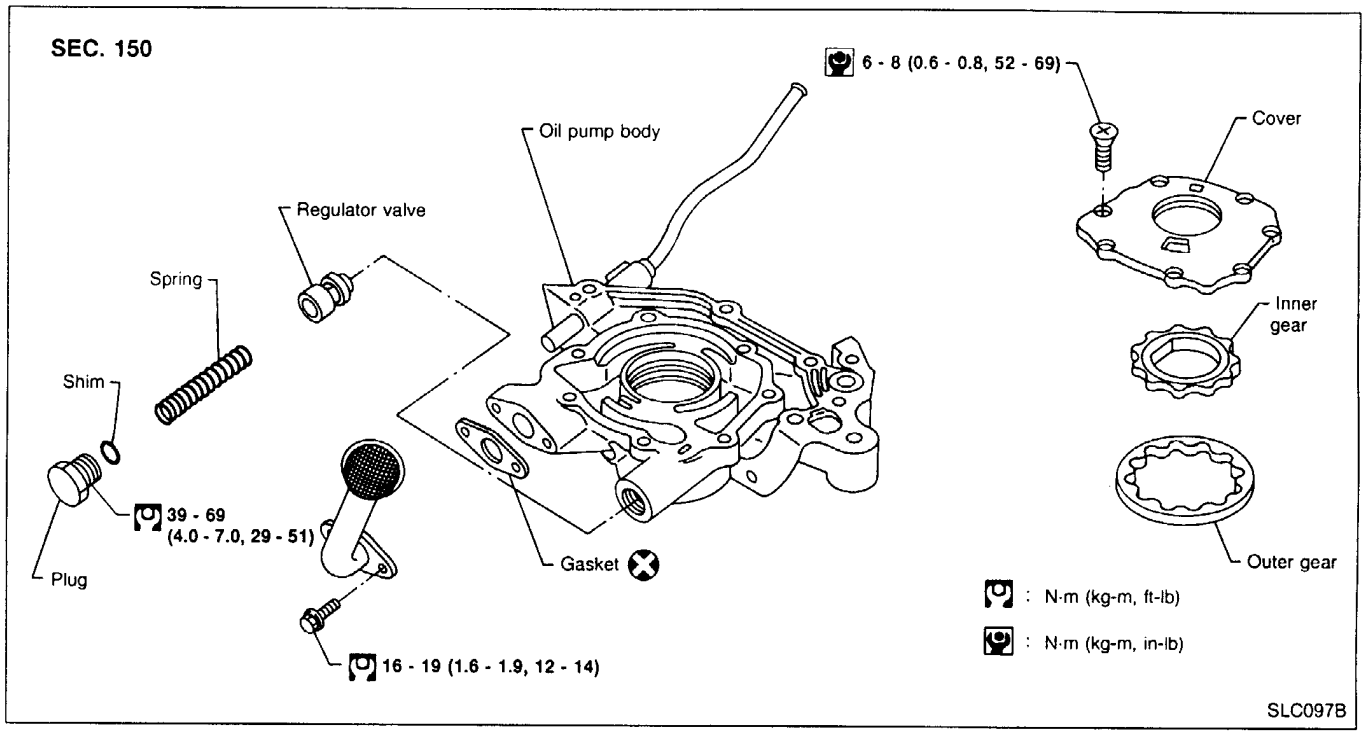
4. Remove crankshaft position sensor (TDC).
5. Remove oil pump assembly with oil strainer.
6. Reinstall any part removed. Refill engine oil and engine coolant.

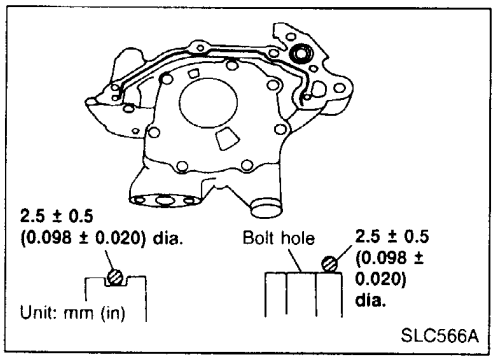
- Apply liquid gasket to oil pump.
- Apply liquid gasket to oil pan.
- Apply liquid gasket to both ends of oil pan oil seals.
- Install oil pan, fitting oil seals in the correct position.

Oil Pump (Cont'd)

DISASSEMBLY AND ASSEMBLY

When installing oil pump, apply engine oil to inner and outer gears.





- Apply liquid gasket when installing oil pump onto engine.

Oil Pump (Cont'd)

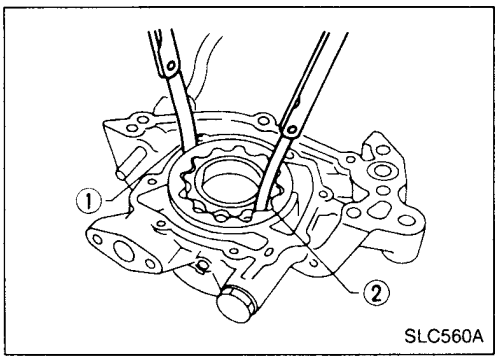
INSPECTION

Using a feeler gauge, check the following clearances.

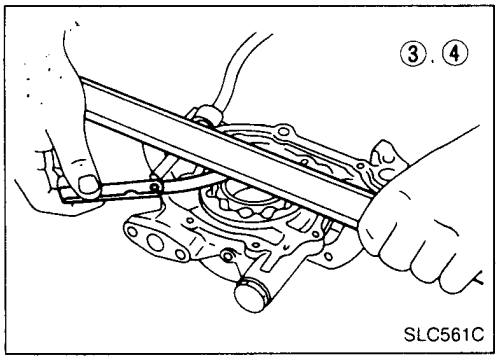
Unit: mm (in)

Body to outer gear clearance ①	0.114 - 0.200 (0.0045 - 0.0079)
Outer gear to inner gear clearance ②	less than 0.18 (0.0071)
Housing to inner gear clearance ③	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance ④	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to housing clearance ⑤	0.045 - 0.091 (0.0018 - 0.0036)

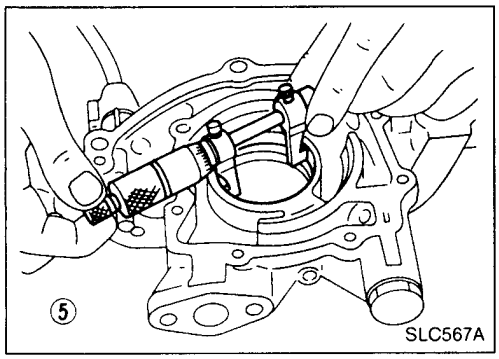
If it exceeds the limit, replace gear set or entire oil pump assembly.



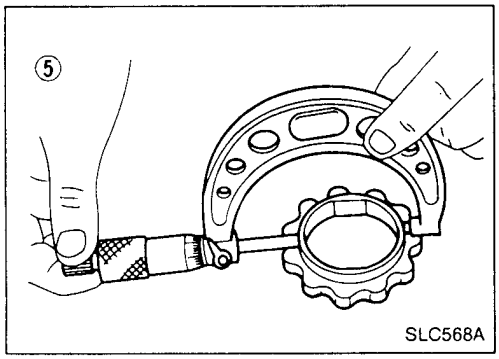
SLC560A



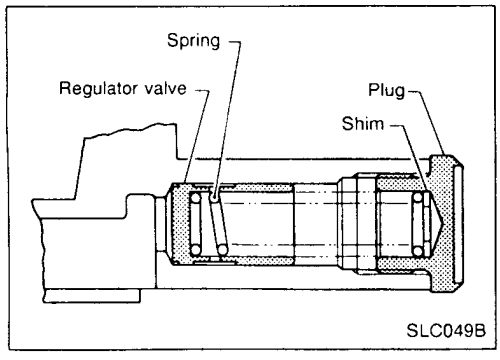
SLC561C



SLC567A



SLC568A



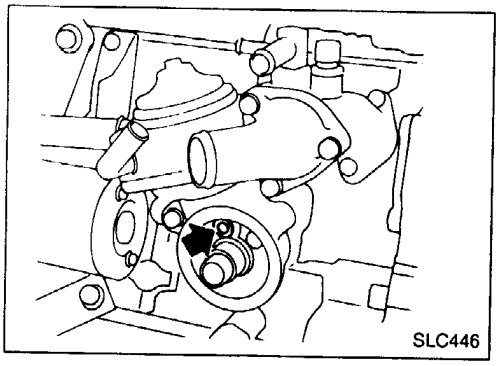
SLC049B

REGULATOR VALVE INSPECTION

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil. Check that it falls freely into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.

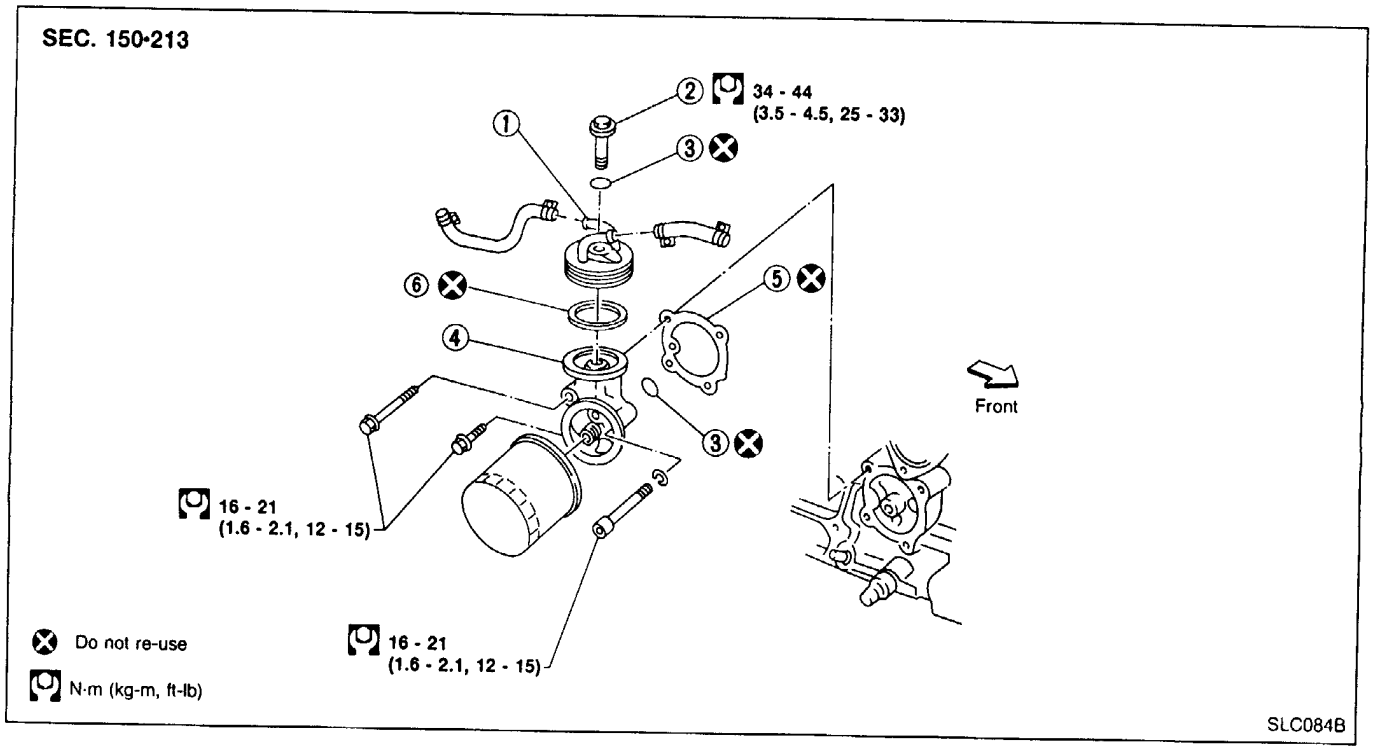
Oil Pump (Cont'd)



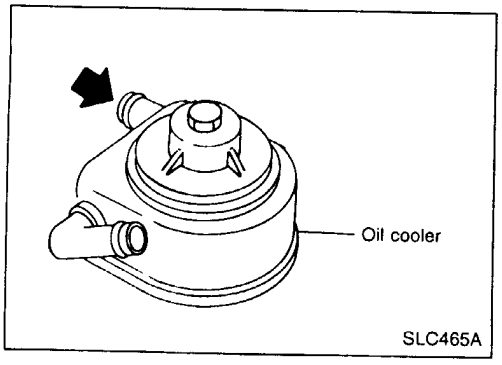
OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve (indicated by arrow) for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a suitable tool. Install a new valve by tapping it into place.

Oil Cooler



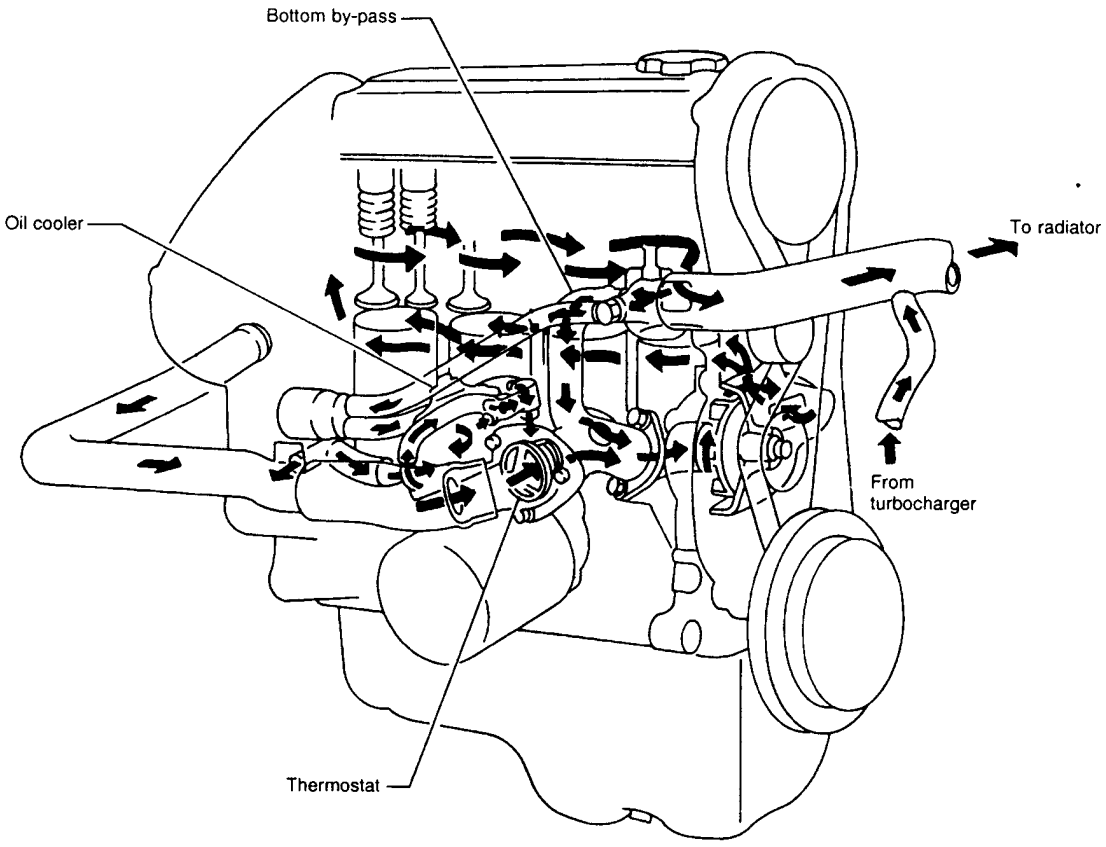
① Oil cooler
② Connector
③ O-ring
④ Oil filter bracket
⑤ Gasket
⑥ Gasket

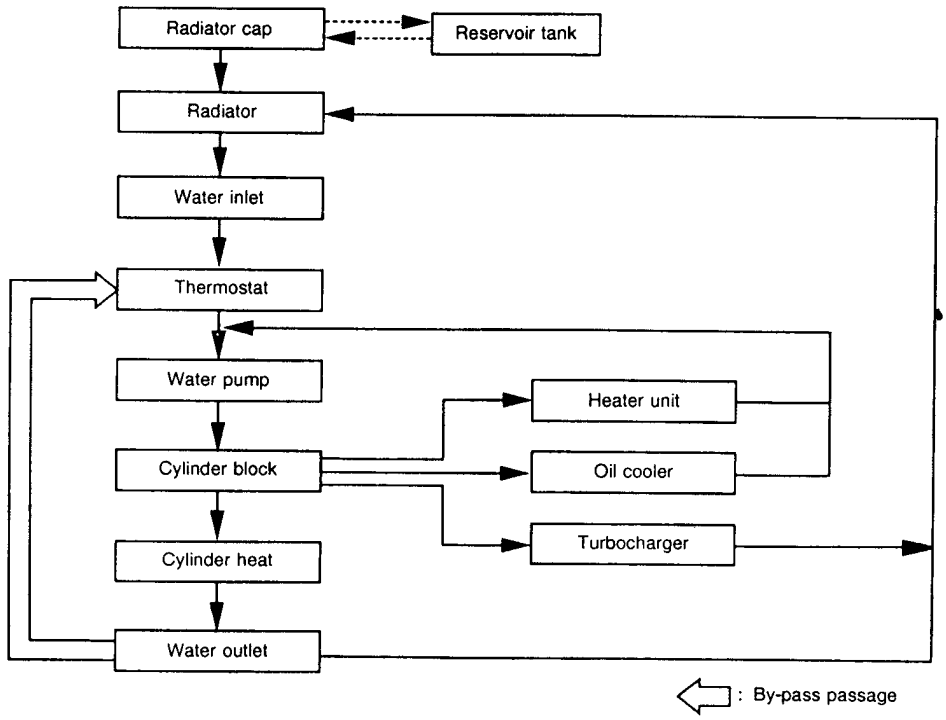


INSPECTION

1. Check oil cooler element and housing for cracks.
2. Check coolant inlet of oil cooler for clogging by blowing through it.
   Replace it if necessary.

Cooling Circuit





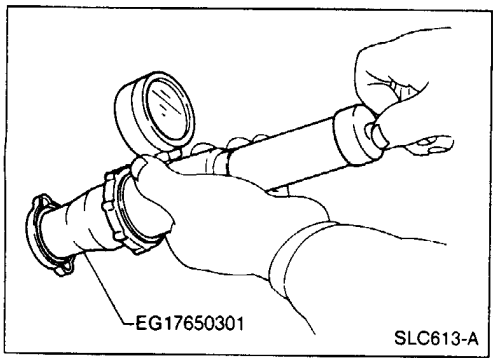
SLC085B

System 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 and carefully loosen it a quarter turn to release built-up pressure. Then remove the cap completely.

CHECKING COOLING SYSTEM HOSES

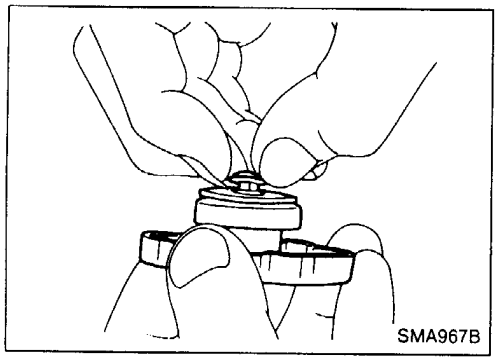
Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



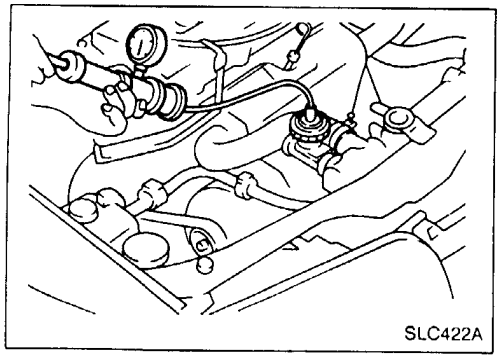
CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:
Standard
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm², 11 - 14 psi)
Limit
59 - 98 kPa
(0.59 - 0.98 bar, 0.6 - 1.0 kg/cm², 9 - 14 psi)



Pull the negative pressure valve to open it. Check that it closes completely when released.

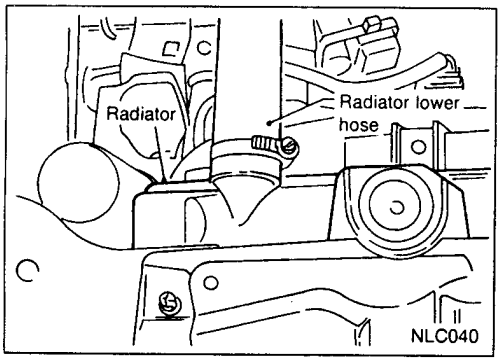


CHECKING COOLING SYSTEM FOR LEAKS

To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm², 23 psi)

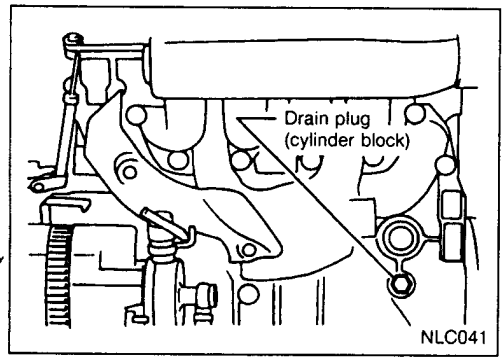
CAUTION:
Higher than the specified pressure may cause radiator damage.



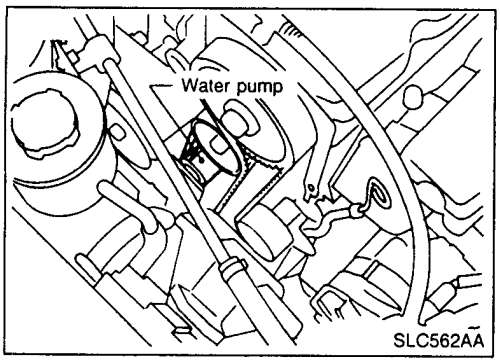
Water Pump

REMOVAL AND INSTALLATION

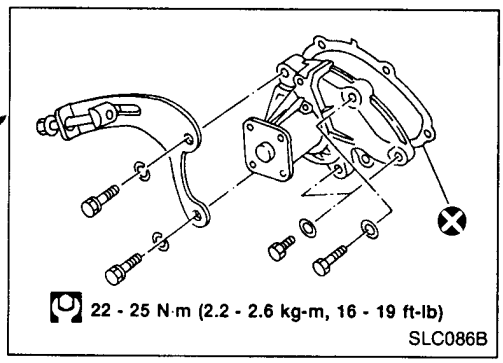
1. Remove radiator lower hose from radiator and drain engine coolant.



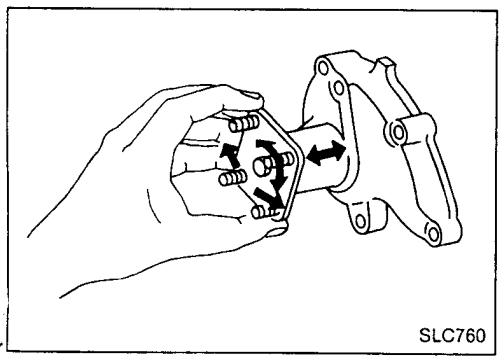
2. Drain engine coolant from cylinder block.
3. Remove upper radiator hose, timing belt covers, front engine mounting bracket and timing belt.
4. Remove timing belt tensioner and idler and timing belt lower back cover.



5. Remove water pump.



- When installing water pump, replace the gasket with a new one.

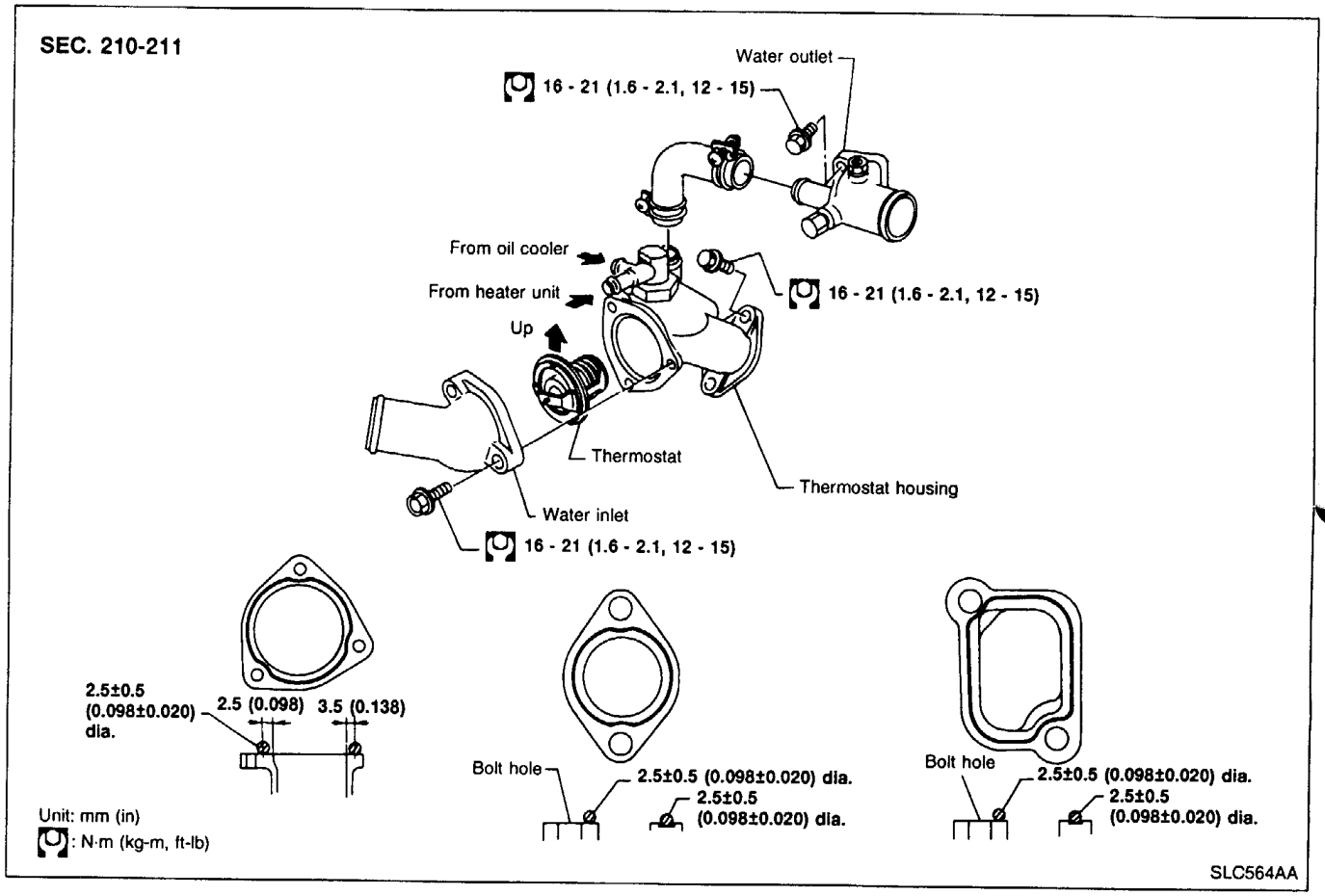


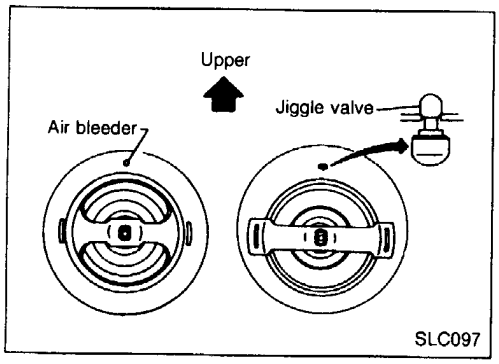
INSPECTION

- Check body assembly for rust or corrosion.
- Check for rough operation due to excessive end play.

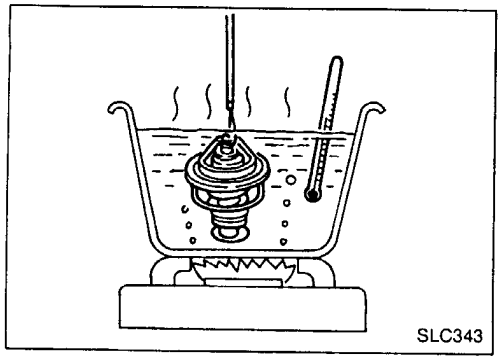
Thermostat

REMOVAL AND INSTALLATION





- Apply liquid gasket to water outlet, thermostat housing and water inlet.
- Install thermostat with jiggle valve uppermost.
- **After installation, run engine for a few minutes, and check for leaks.**



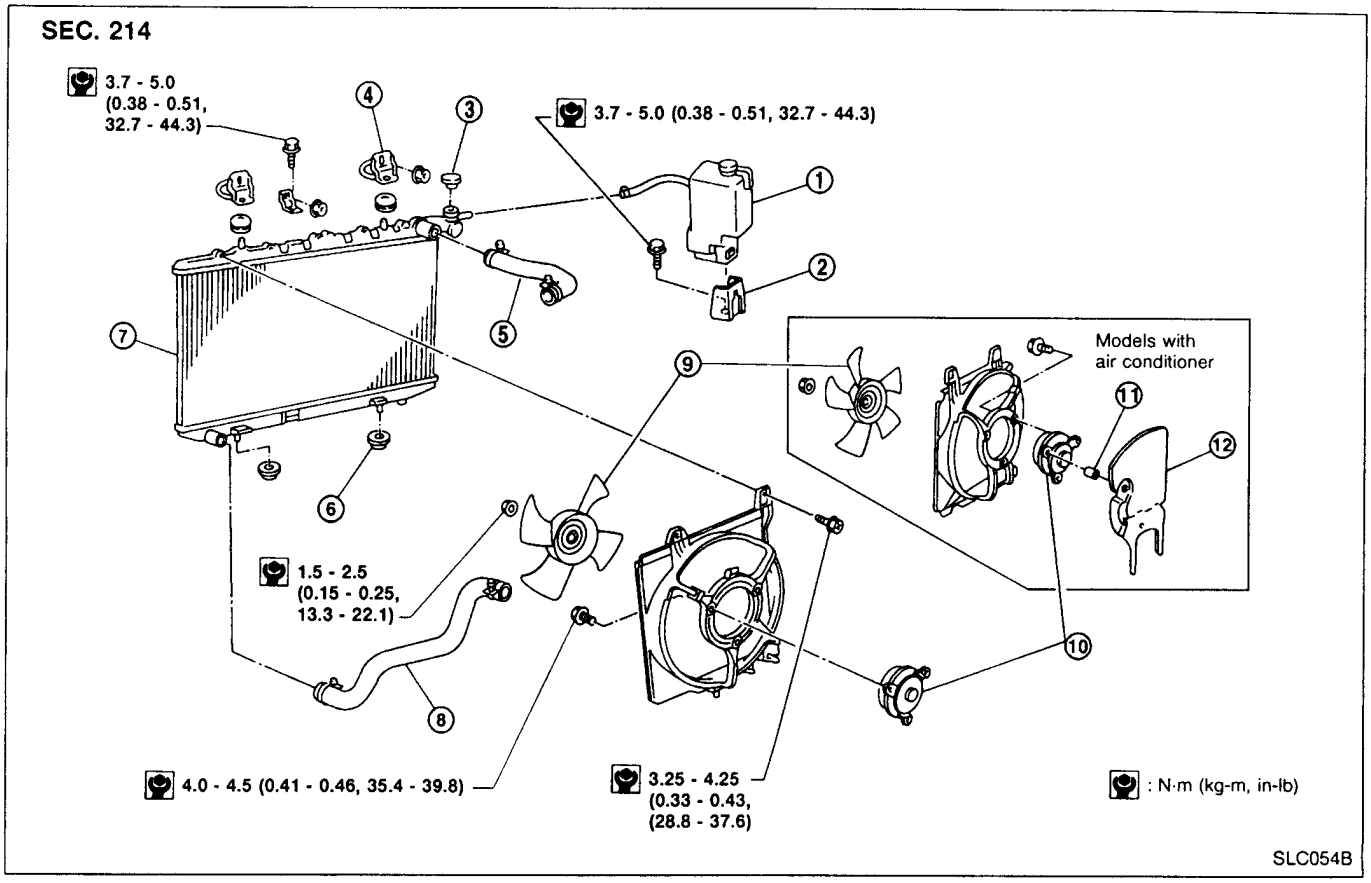
INSPECTION

1. Check for valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and valve lift.

Valve opening temperature	°C (°F)	82 (180)
Valve lift	mm/°C (in/°F)	More than 10/95 (0.39/203)

3. Then check if valve closes at 5°C (41°F) below valve opening temperature.

Radiator



① Reservoir tank
② Reservoir tank bracket
③ Radiator cap
④ Mounting bracket
⑤ Upper radiator hose
⑥ Mounting rubber
⑦ Radiator
⑧ Lower radiator hose
⑨ Cooling fan
⑩ Cooling fan motor
⑪ Shield spacer
⑫ Cooling fan motor shield

Cooling fan control system

- Cooling fans are controlled by the ECM. For details, refer to EC section ("Cooling Fan Control", "TROUBLE DIAGNOSES", EC-389).

Refilling engine coolant

- For details on refilling engine coolant, refer to MA section ("REFILLING ENGINE COOLANT", "Changing Engine Coolant", MA-27).

Overheating Cause Analysis

Symptom		Cause	Check items	
Cooling system parts malfunction	Poor heat transfer	Water pump malfunction	—	—
		Thermostat stuck closed	—	
		Water control valve closed	—	
		Damaged fins	Dust contamination or paper clogging	
			Mechanical damage	
		Clogged radiator cooling tube	Excess foreign material (rust, dirt, sand, etc.)	
	Reduced air flow	High resistance to fan rotation	—	—
		Damaged fan blades		
	Damaged radiator shroud	—	—	
	Improper coolant mixture ratio	—	—	—
	Poor coolant quality	—	—	—
	Insufficient coolant	Coolant leaks	Cooling hose	Loose clamp
				Cracked hose
			Water pump	Poor sealing
			Radiator cap	Loose
				Poor sealing
			Radiator	O-ring damage, deterioration or improper fitting
				Cracked radiator tank
				Cracked radiator core
			Reservoir tank	Cracked reservoir tank
		Overflowing reservoir tank	Exhaust gas leaks into cooling system	Cylinder head deterioration
				Cylinder head gasket deterioration
Except cooling system parts malfunction	—	Overload on engine	Abusive driving	High engine rpm under no load
				Driving in low gear for extended time
				Driving at extremely high speed
			Powertrain system malfunction	—
			Improper size wheels and tires	
			Dragging brakes	
			Incorrect ignition timing	
	Blocked or restricted air flow	Blocked bumper	—	—
		Blocked radiator grille	Installed car brassiere	
			Mud contamination, paper or other debris clogging	
		Blocked radiator	—	
		Blocked condenser	—	
		Installed large fog lamp		

Engine Lubrication System

Oil pressure check

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 59 (0.59, 0.6, 9)
2,000	More than 245 (2.45, 2.5, 36)
6,000	More than 422 (4.22, 4.3, 61)

Regular valve inspection

Unit: mm (in)

Regulator valve to oil pump cover clearance	0.04 - 0.10 (0.0016 - 0.0039)

Oil pump inspection

Unit: mm (in)

Body to outer gear clearance (radial)	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.217 - 0.327 (0.0085 - 0.0129)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)
Body to inner gear clearance	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance (axial)	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

Engine Cooling System

Thermostat

Valve opening temperature °C (°F)	82 (180)
Valve lift mm/°C (in/°F)	More than 9/95 (0.35/203)

Radiator

Unit: kPa (bar, kg/cm^2, psi)

Cap relief pressure	Standard	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)
	Limit	59 - 98 (0.59 - 0.98, 0.6 - 1.0, 9 - 14)
Leakage test pressure		157 (1.57, 1.6, 23)

Engine Lubrication System

Oil pressure check

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm², psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,200	314 - 392 (3.14 - 3.92, 3.2 - 4.0, 46 - 57)

Regulator valve inspection

Unit: mm (in)

Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)

Oil pump inspection

Unit: mm (in)

Body to outer gear clearance (radial)	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance	Below 0.18 (0.0071)
Body to inner gear clearance	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance (axial)	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

Engine Cooling System

Thermostat

Valve opening temperature °C (°F)		82 (180)
Valve lift	mm/°C (in/°F)	More than 9/95 (0.35/203)

Radiator

Unit: kPa (bar, kg/cm², psi)

Cap relief pressure	Standard	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)
	Limit	59 - 98 (0.59 - 0.98, 0.6 - 1.0, 9 - 14)
Leakage test pressure		157 (1.57, 1.6, 23)

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 59 (0.59, 0.6, 9)
2000	294 (2.9, 3, 43)

Oil pump inspection

Unit: mm (in)

Body to outer gear clearance	0.114 - 0.200 (0.0045 - 0.0079)
Outer gear to inner gear clearance	Less than 0.18 (0.0071)
Housing to inner gear clearance	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

Engine Cooling System

Thermostat

Valve opening temperature °C (°F)	82 (180)
Valve lift mm/°C (in/°F)	More than 10/95 (0.39/203)

Radiator

Unit: kPa (bar, kg/cm^2, psi)

Cap relief pressure	Standard	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)
	Limit	59 - 98 (0.59 - 0.98, 0.6 - 1.0, 9 - 14)
Leakage test pressure		157 (1.57, 1.6, 23)

ENGINE CONTROL SYSTEM

SECTION EC

EC

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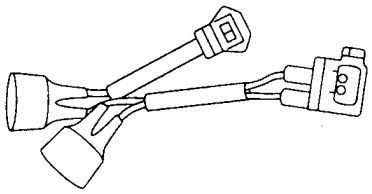
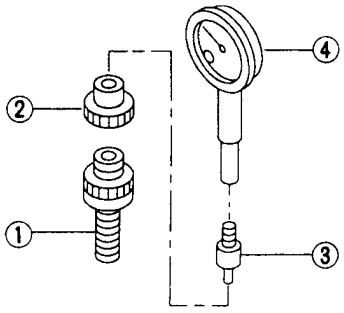
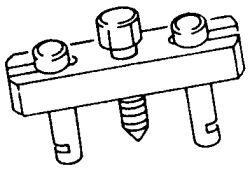
When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

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".

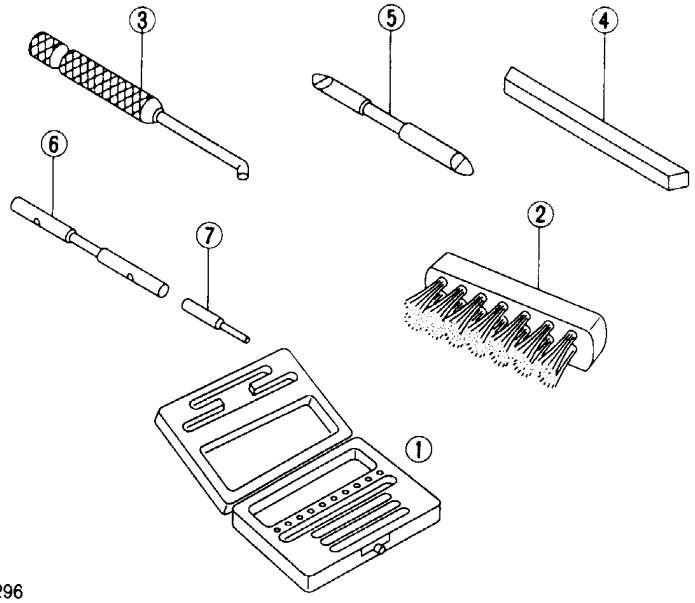
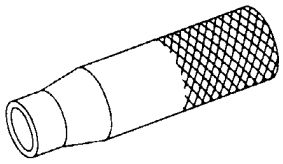
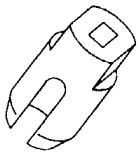
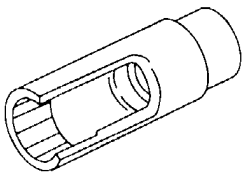
For clarification of system component abbreviations and terminology read GI section "SAE J1930 TERMINOLOGY LIST".

Special Service Tools

X: Applicable
—: Not applicable

Tool number Tool name	Description		Engine application		
			GA	SR	CD
EG11140000 Ignition coil adapter harness	 NT338	Measuring engine speed	X	X	–
KV10117100 Heated oxygen sensor wrench	 NT630	Loosening or tightening heated oxygen sensor	X	X	–
KV11229352 Measuring device ① KV11229350 Holder ② KV11229360 Nut ③ KV11229370 Pin ④ KV11254410 Dial gauge	 NT570	Measuring set length of plunger spring	–	–	X
ST16540000 Pulley puller	 NT647	Removing injection pump sprocket	–	–	X

Special Service Tools (Cont'd)

Tool number Tool name	Description	Engine application		
		GA	SR	CD
KV11289004 Nozzle cleaning kit ① KV11290012 Box ② KV11290110 Brush ③ KV11290122 Nozzle oil sump scraper ④ KV11290140 Nozzle needle tip cleaner ⑤ KV11290150 Nozzle seat scraper ⑥ KV11290210 Nozzle holder ⑦ KV11290220 Nozzle hole cleaning needle	 NT296	–	–	X
KV11292010 Nozzle centering device	 NT293	–	–	X
KV11100300 No. 2-4 injection nozzle holder socket	 NT563	–	–	X
KV11105800 No. 1 injection nozzle holder socket	 NT648	–	–	X

Supplemental Restraint System (SRS) "AIR BAG" (Dual Air Bag System)

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

WARNING:

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

Supplemental Restraint System (SRS) "AIR BAG" (Single Air Bag System)

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

WARNING:

- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation), all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual.**

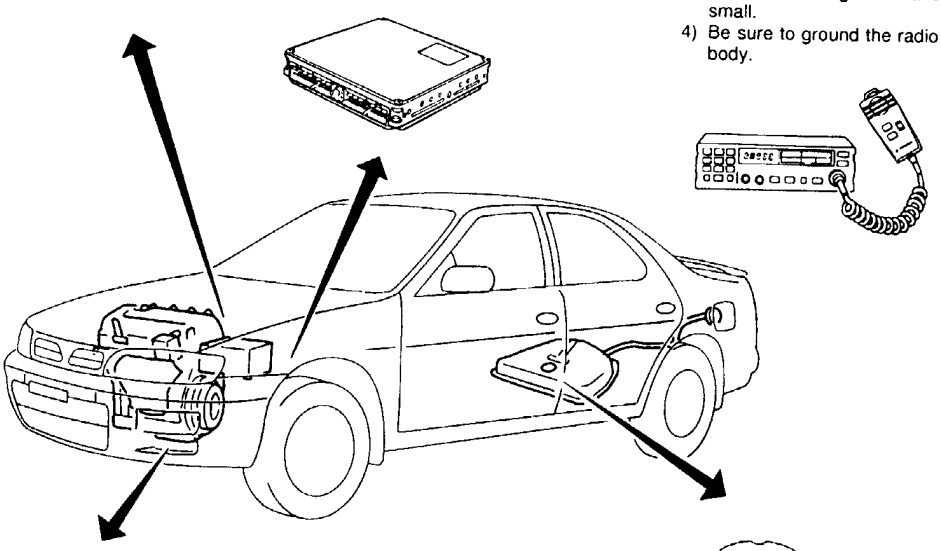
Engine Fuel & Emission Control System

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

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

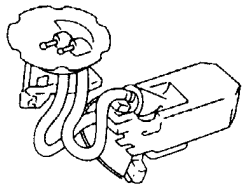
WIRELESS EQUIPMENT
- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.

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



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

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



FUEL PUMP
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque (Refer to EM section.).

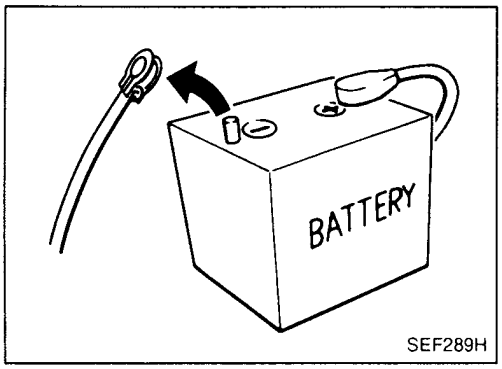
ECCS HARNESS HANDLING
- Correct ECCS harness connectors securely.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, resulting in damage to ICs.
- Keep ECCS harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECCS system malfunction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

NEF561

Precautions for ECCS Trouble Diagnosis of Engine

CAUTION:

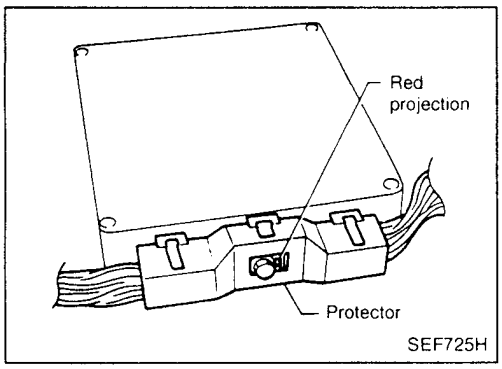
- Be sure to turn the ignition switch "OFF" and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause malfunction.
- Be sure to connect and lock the connectors securely after work. A loose (unlocked)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



SEF289H

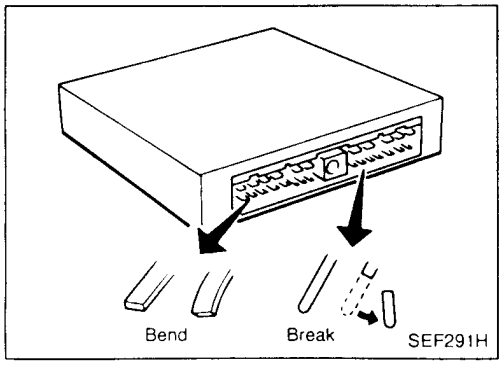
Precautions

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



SEF725H

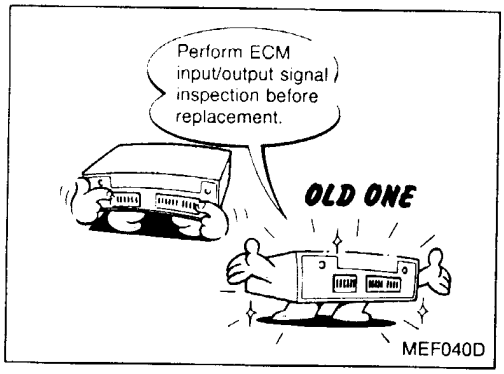
- When connecting ECM harness connector, tighten securing bolt until red projection is in line with connector face.
  : 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



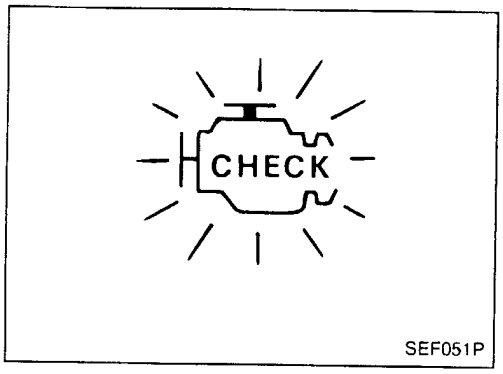
SEF291H

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

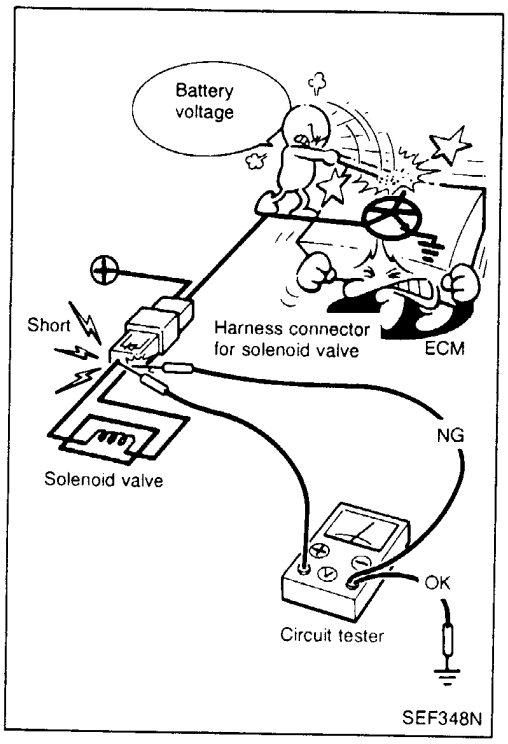
Precautions (Cont'd)



- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-199 for SR engine model and EC-63 for GA engine model.

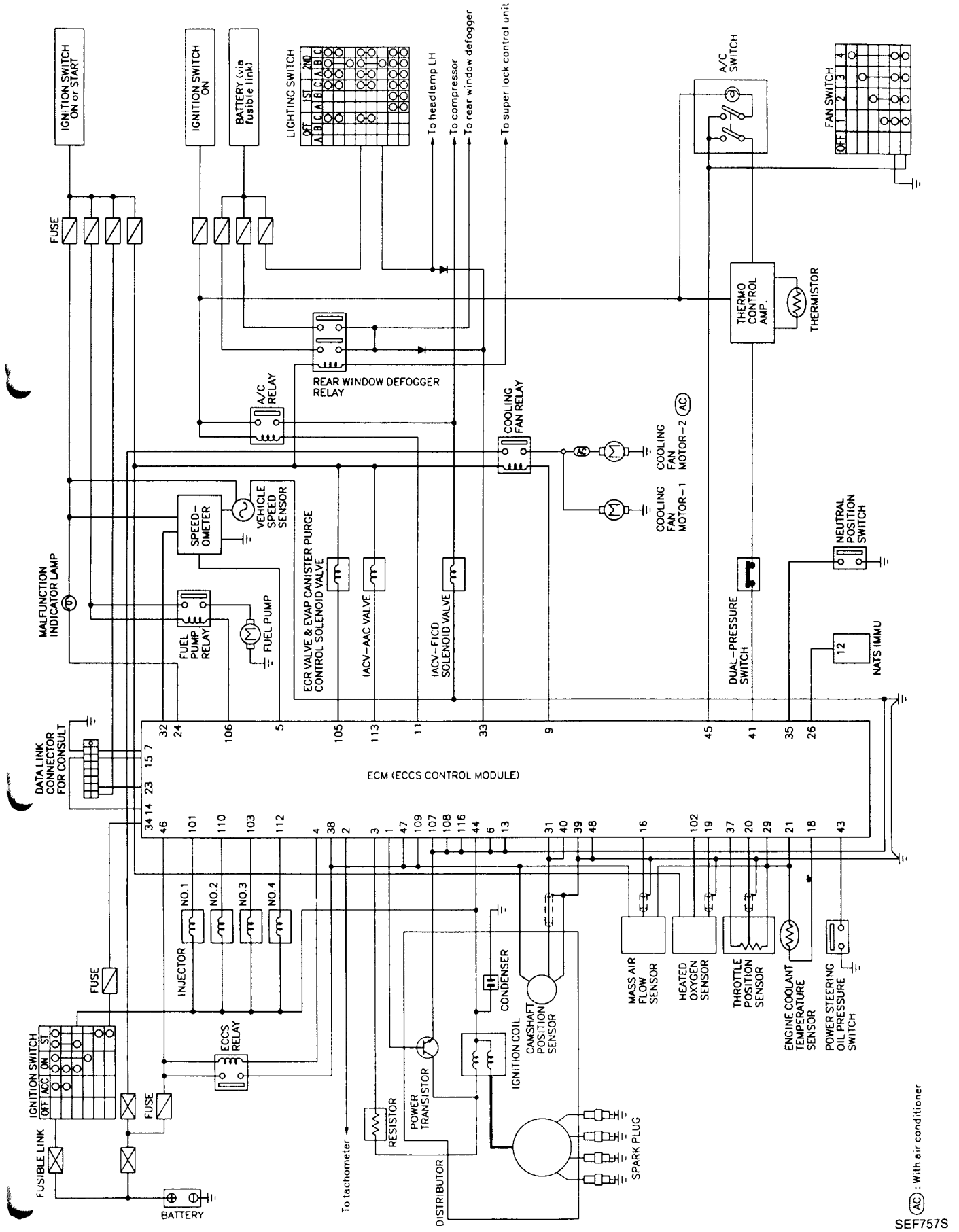


- After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE".
  The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is completed successfully. The "OVERALL FUNCTION CHECK" should be a good result if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

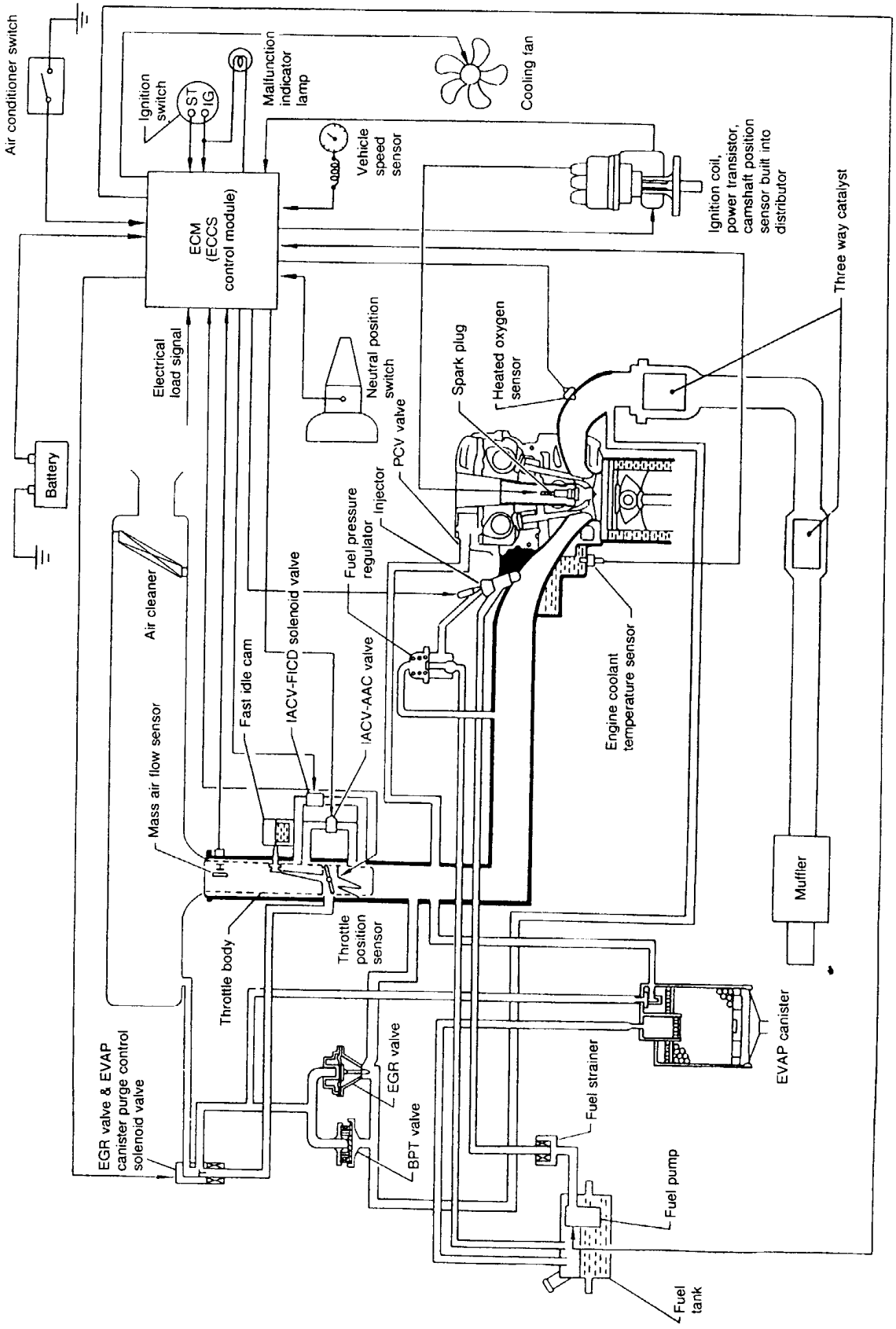


- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
  Accidental contact of probes will cause a short circuit and may damage the ECM power transistor.

Circuit Diagram

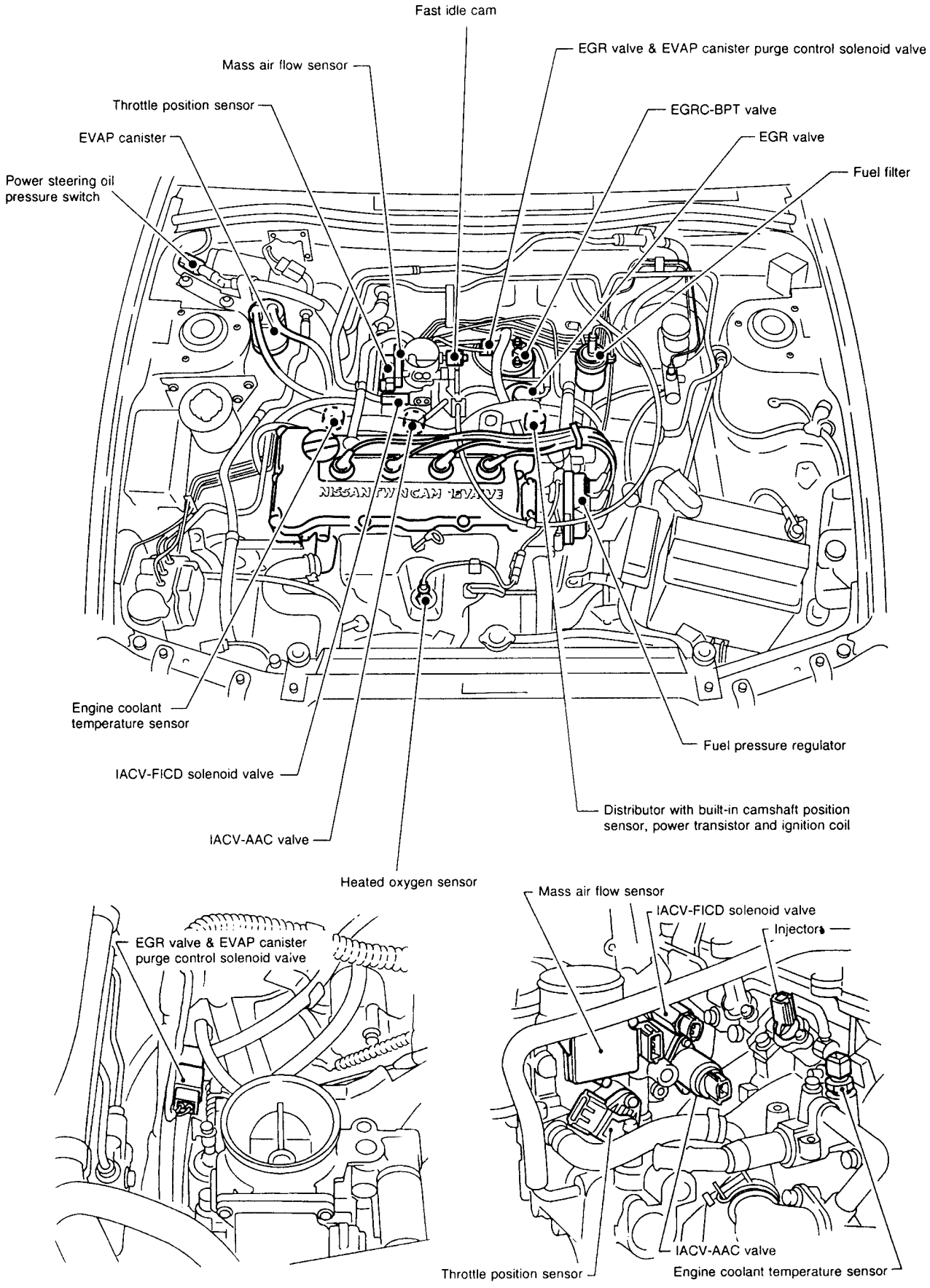


System Diagram



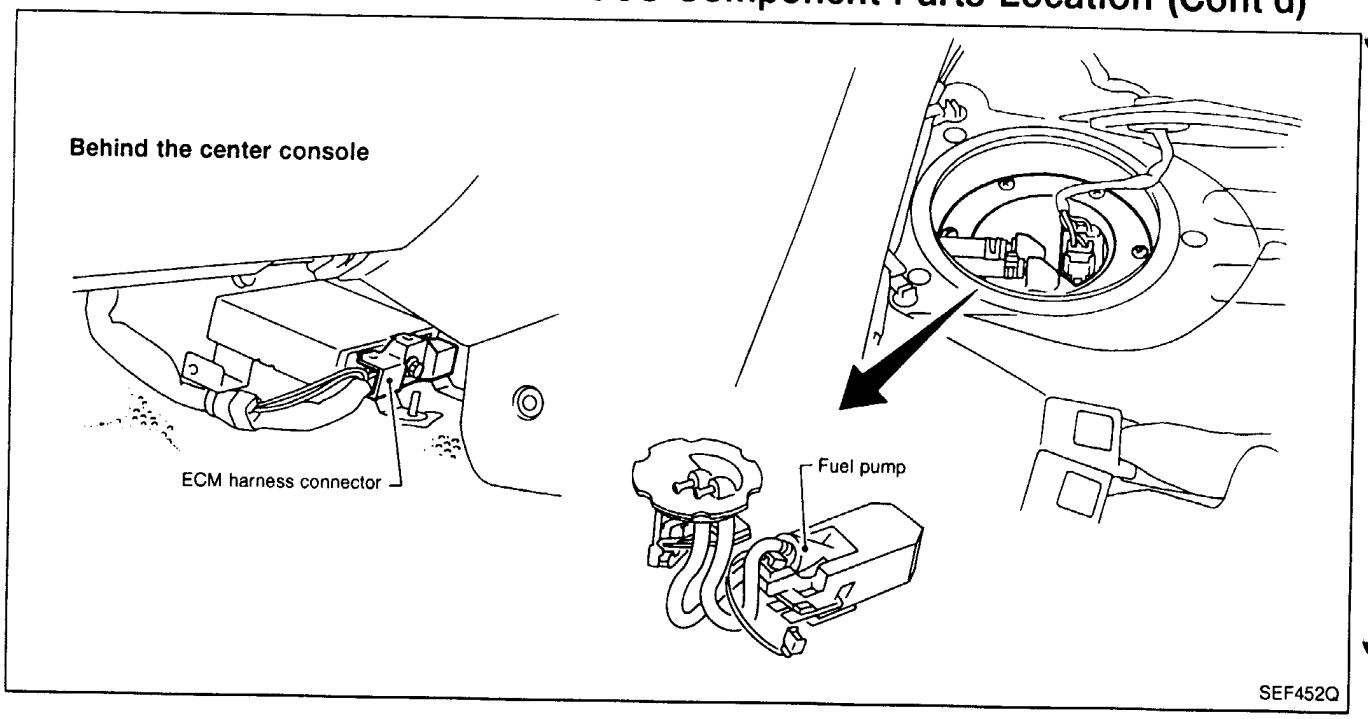
SEF779S

ECCS Component Parts Location

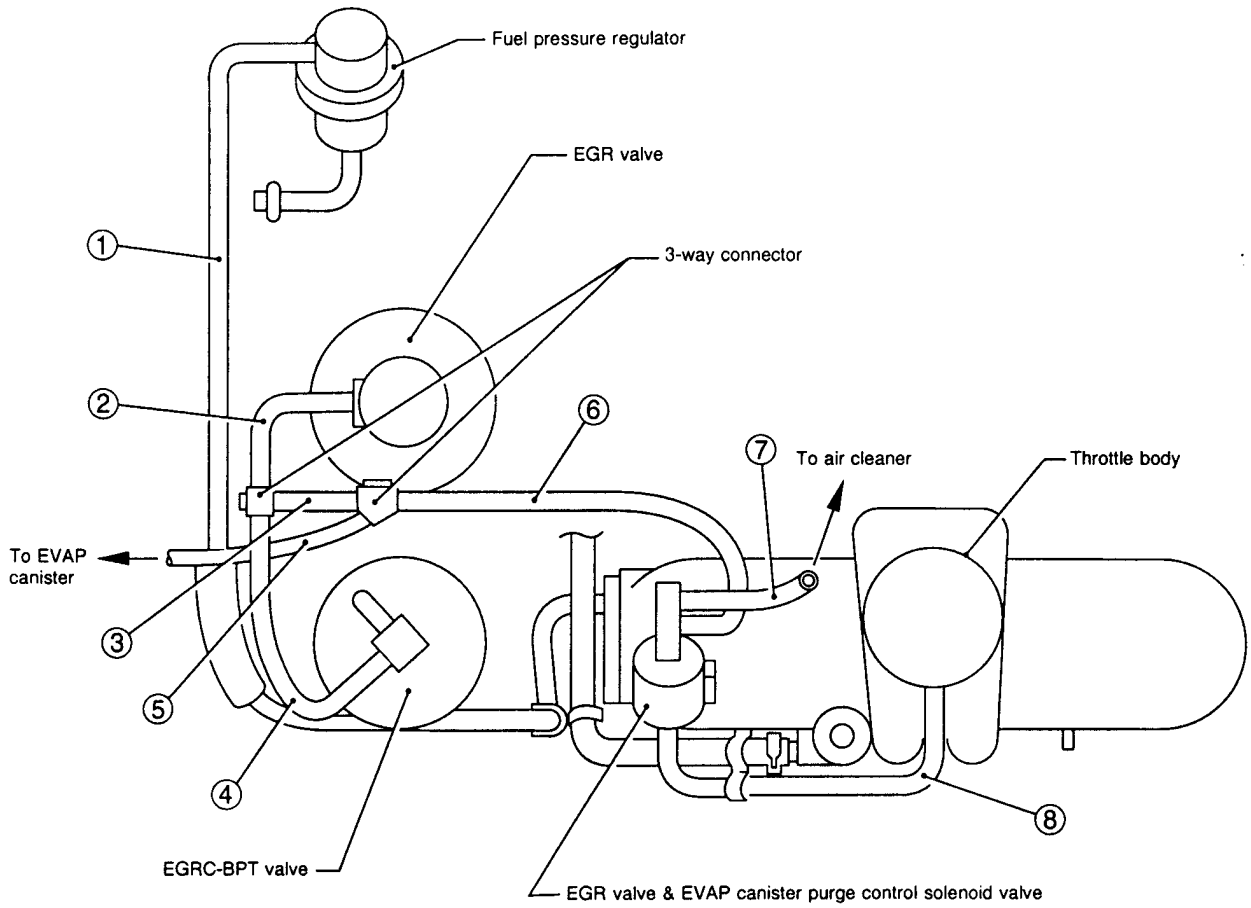


NEF365

ECCS Component Parts Location (Cont'd)

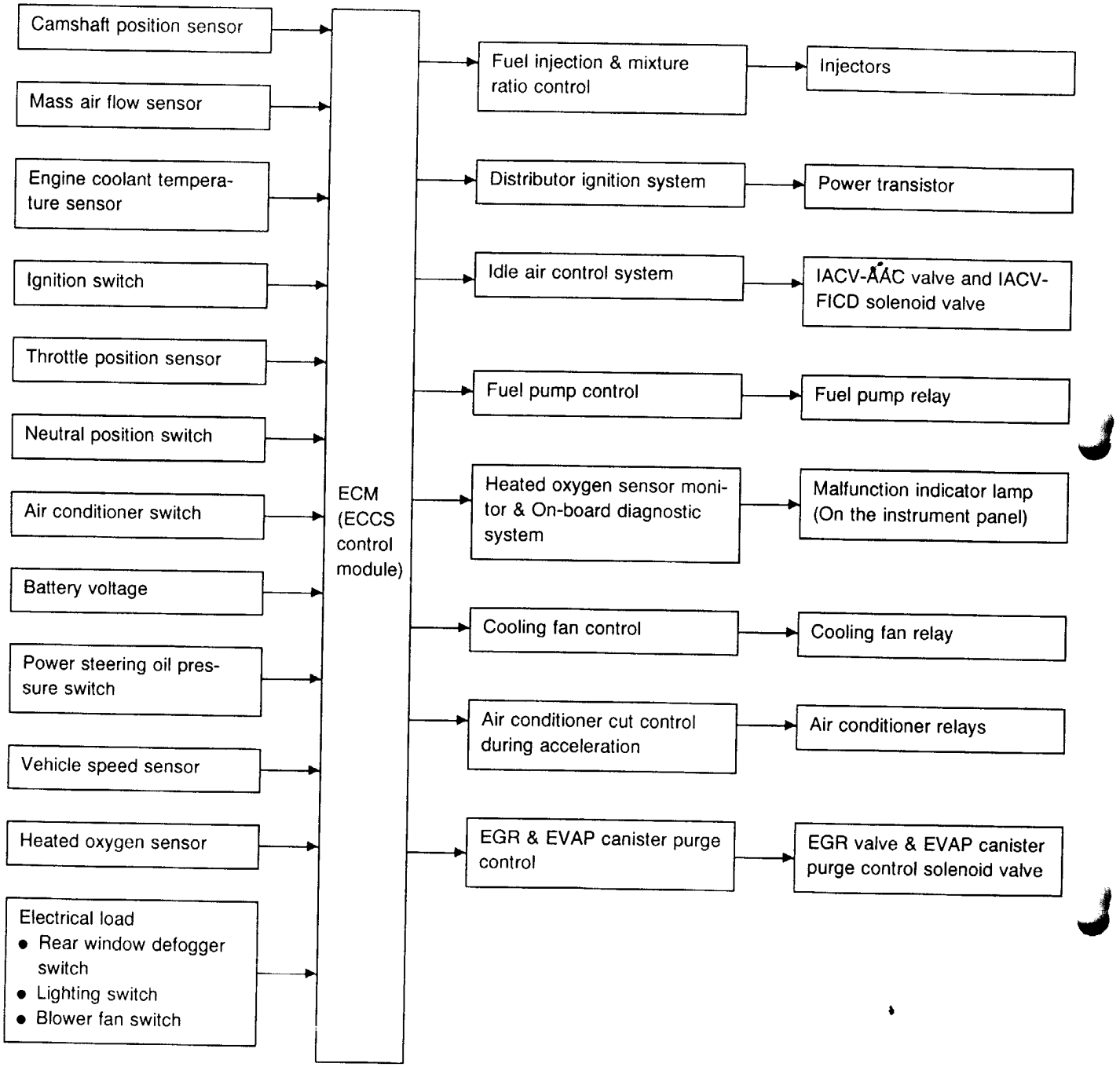


Vacuum Hose Drawing



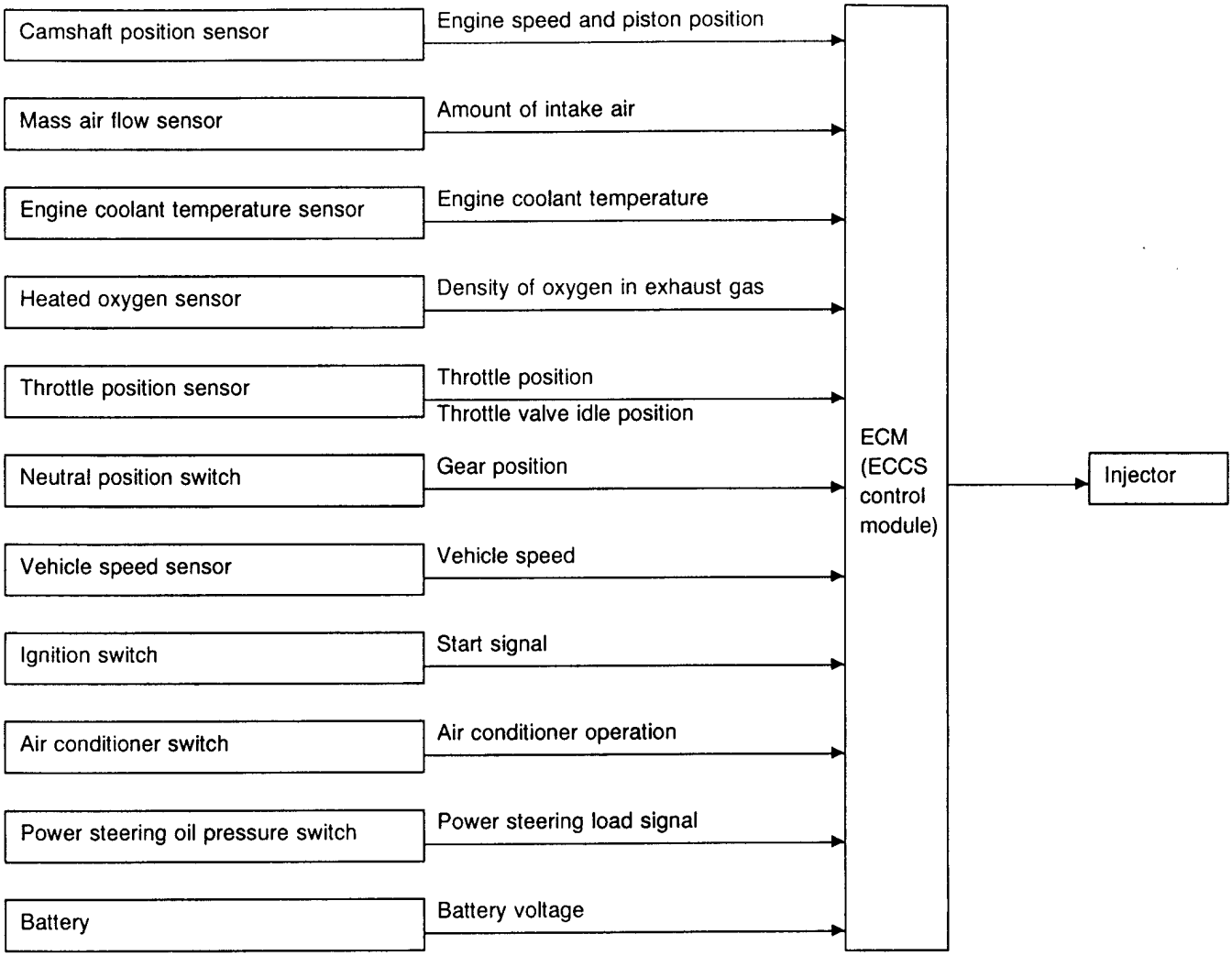
① Fuel pressure regulator to intake manifold
② EGR valve to 3-way connector
③ 3-way connector to 3-way connector
④ EGRC-BPT valve to 3-way connector
⑤ 3-way connector to EVAP canister
⑥ EGR valve & EVAP canister purge control solenoid valve to 3-way connector
⑦ EGR valve & EVAP canister purge control solenoid valve to air cleaner
⑧ EGR valve & EVAP canister purge control solenoid valve to throttle body

System Chart



Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPORT FUEL INJECTION SYSTEM

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

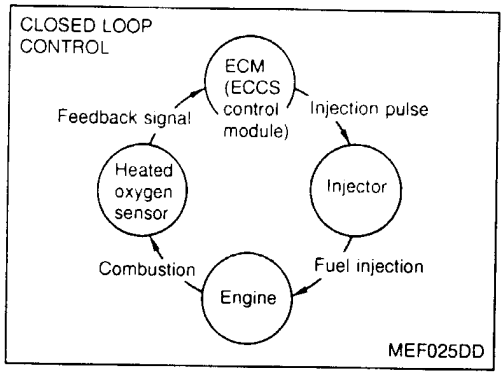
In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

⟨Fuel increase⟩

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

⟨Fuel decrease⟩

- During deceleration



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

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)

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

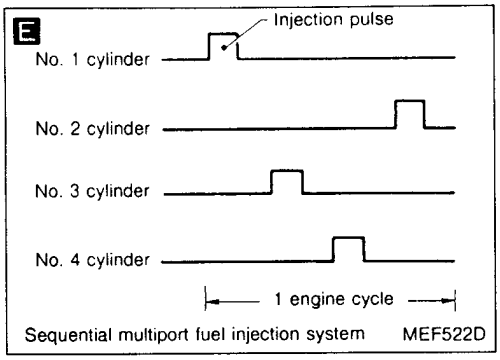
OPEN LOOP CONTROL

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.

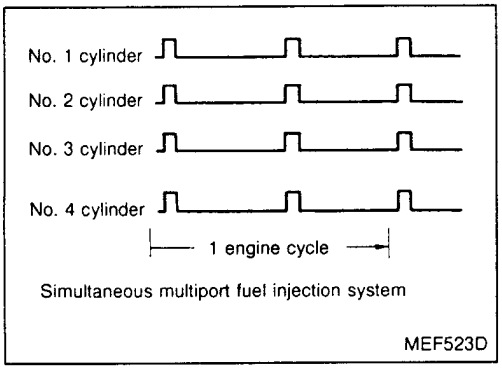
- Deceleration and acceleration
- High-load, high-speed operation
- Engine idling
- Malfunction of heated oxygen sensor or its circuit
- Insufficient activation of heated oxygen sensor at low engine coolant temperature
- High-engine coolant temperature
- During warm-up
- When starting the engine

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 film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.



Sequential multiport fuel injection system MEF522D



Simultaneous multiport fuel injection system

MEF523D

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

FUEL INJECTION TIMING

Two types of systems are used.

Sequential multiport fuel injection system

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

Simultaneous multiport fuel injection system

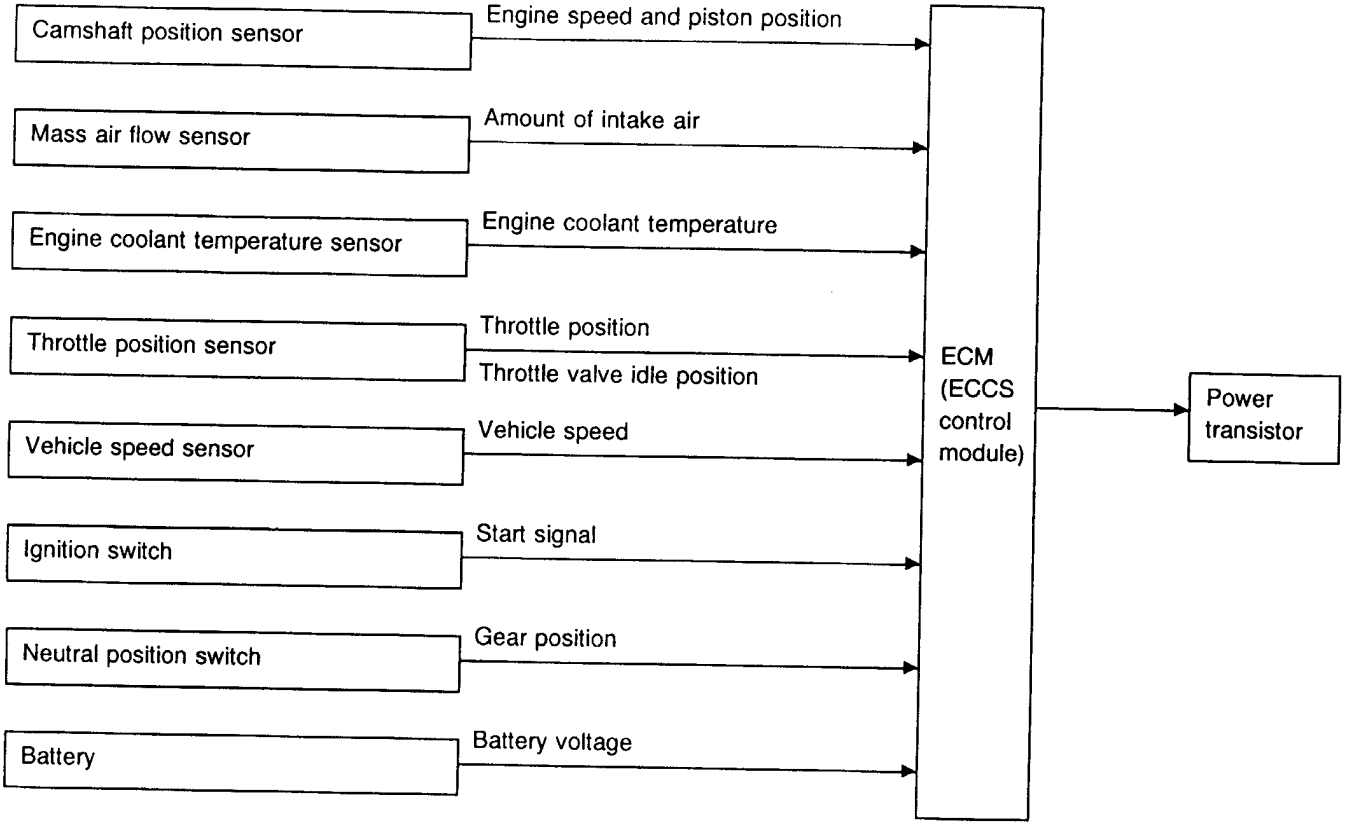
Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals twice for each engine cycle.
This system is used when the engine is being started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

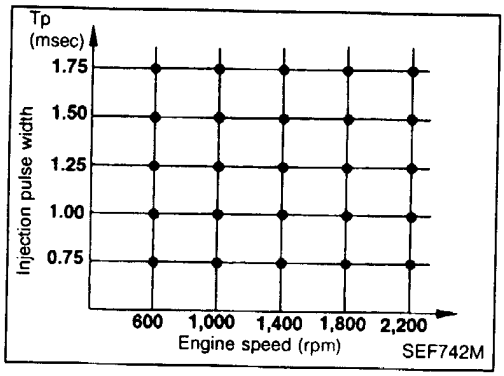
FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine and the vehicle 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 operating condition of the engine.
The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.

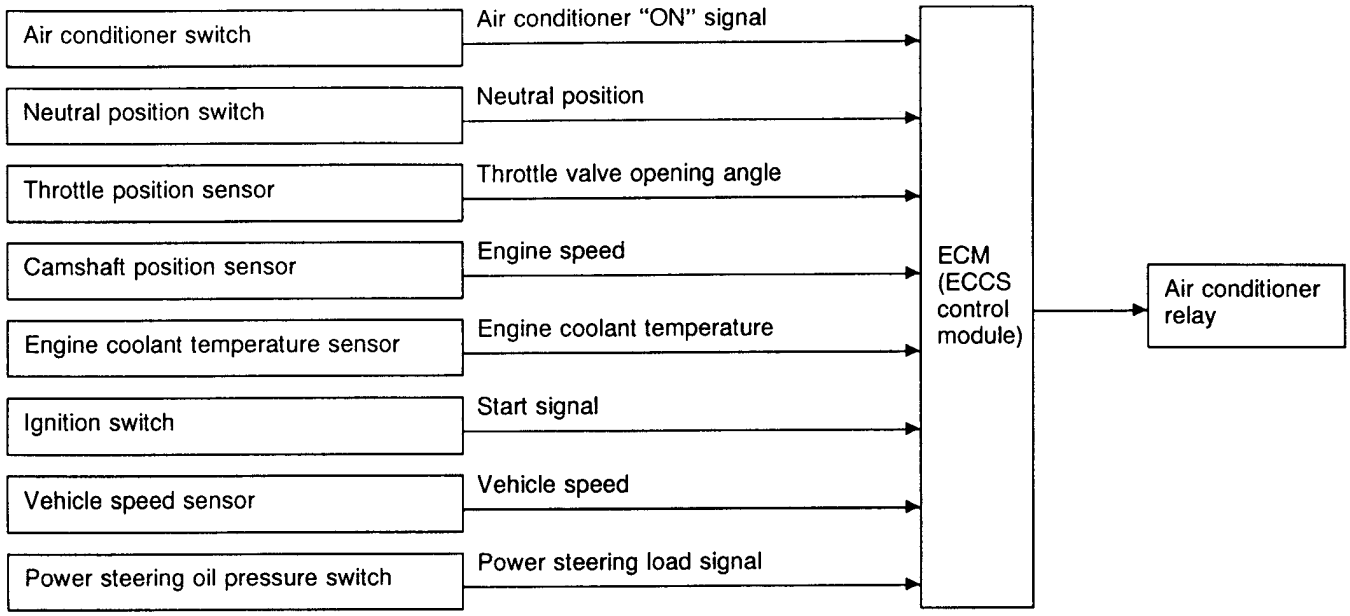
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC

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

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

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE

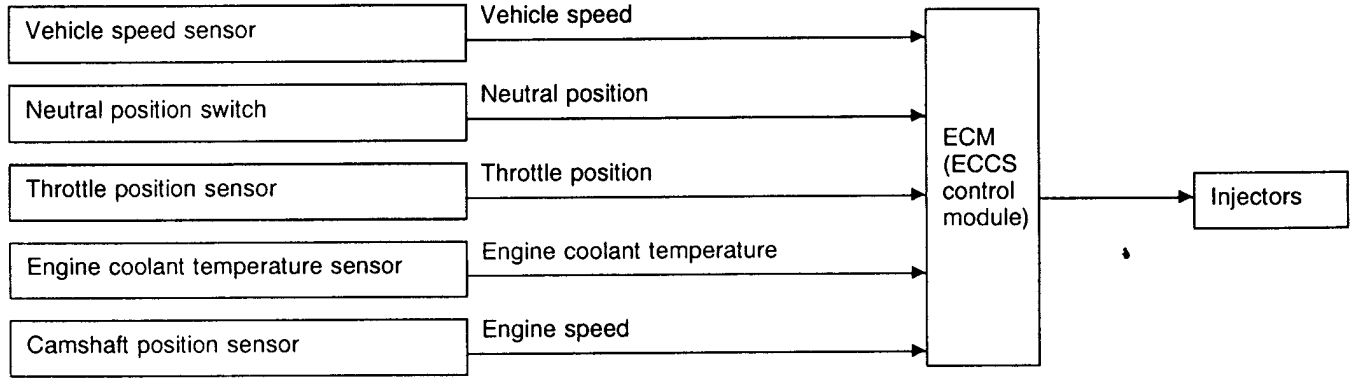


SYSTEM DESCRIPTION

This system improves acceleration when the air conditioner is used.
When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.

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

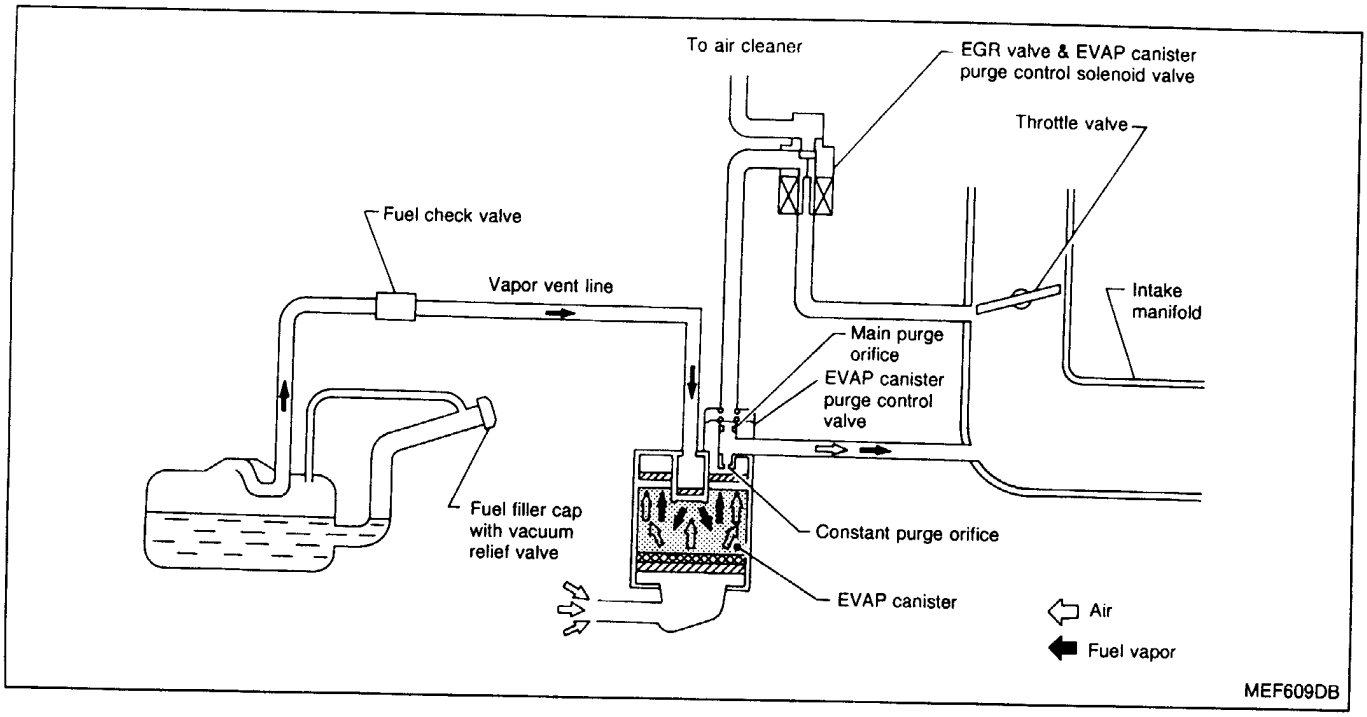
INPUT/OUTPUT SIGNAL LINE



If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.
Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different than deceleration control listed under "Multiport Fuel Injection (MFI) System" on EC-13.

Description



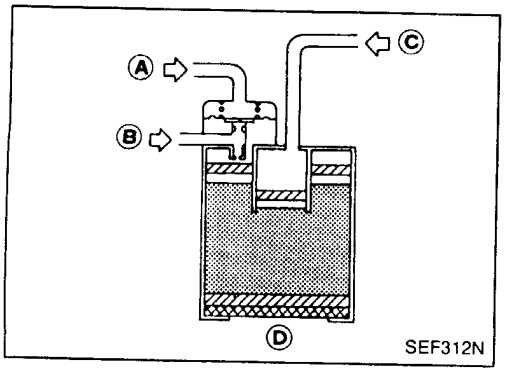
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

The fuel vapor from the sealed fuel tank is routed 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 fed into 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

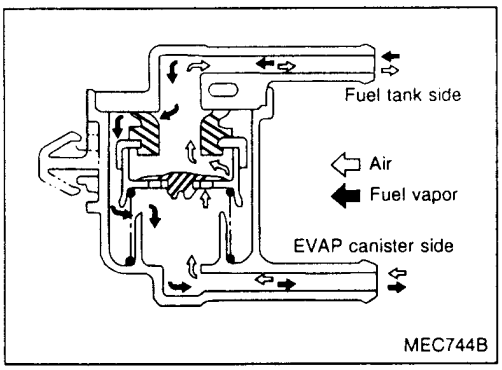
Check EVAP canister as follows:

1. Blow air in port Ⓐ and ensure 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)]
- Cover port Ⓓ with hand.
- Blow air in port Ⓒ and ensure free flow out of port Ⓑ.

Inspection (Cont'd)

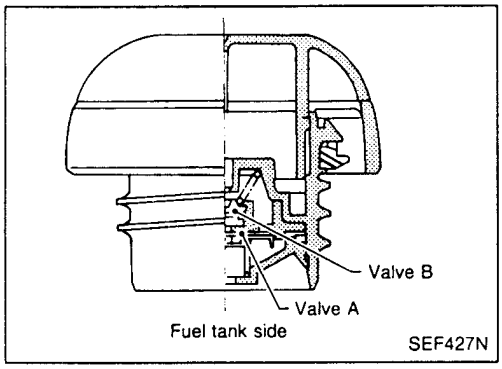
FUEL CHECK VALVE



Check valve operation

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

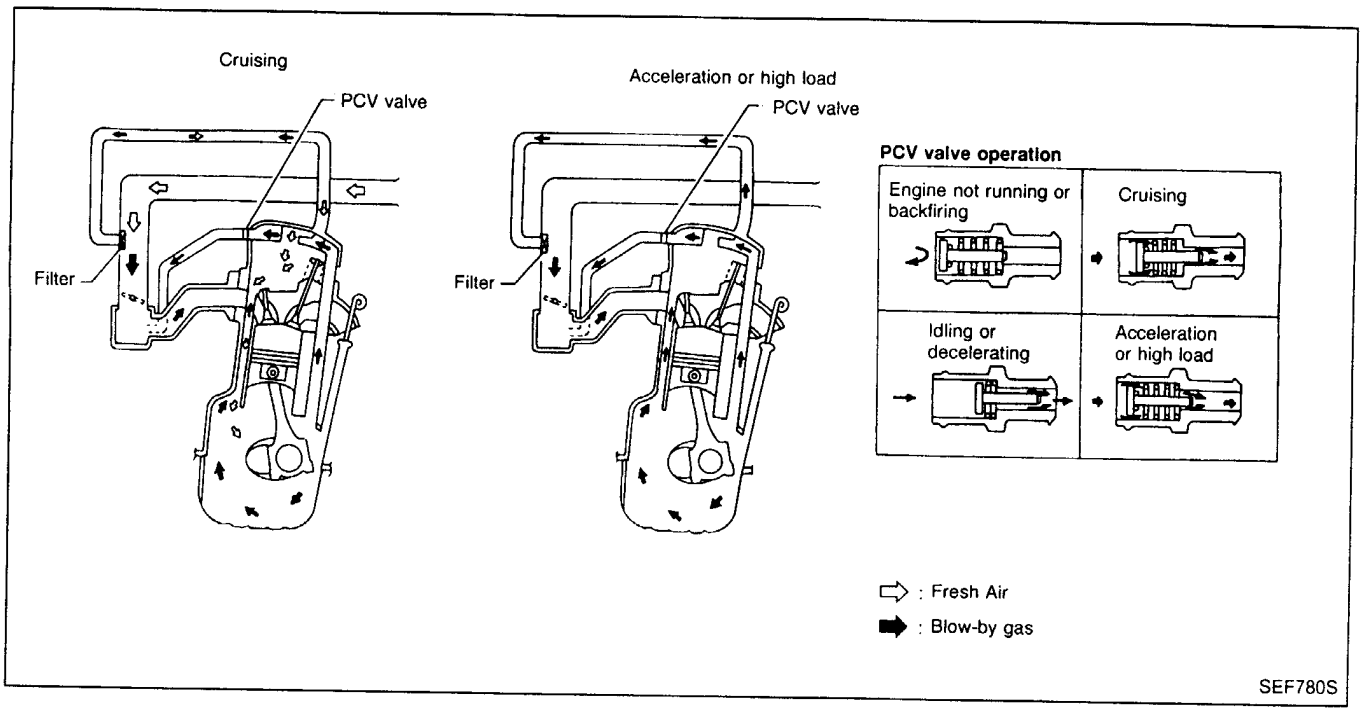
FUEL TANK VACUUM RELIEF VALVE

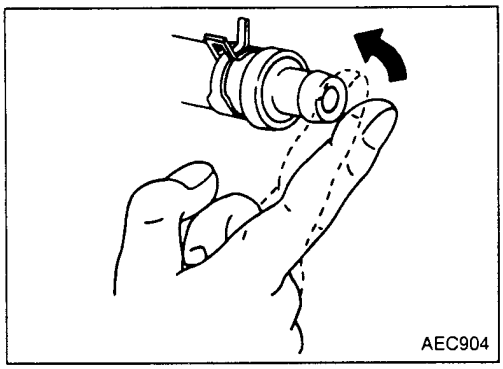


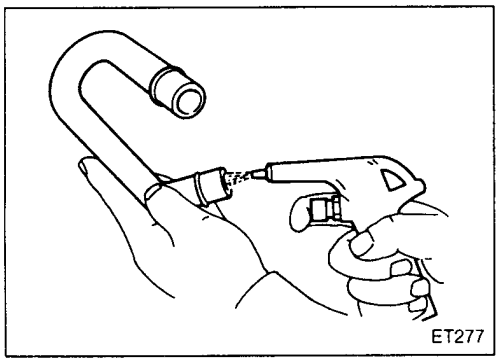
1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve A is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. Blow air on fuel tank side and ensure that continuity of air passage exists through valve B.
4. If valve is clogged or if no resistance is felt, replace cap as an assembly.

Description

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




AEC904


ET277

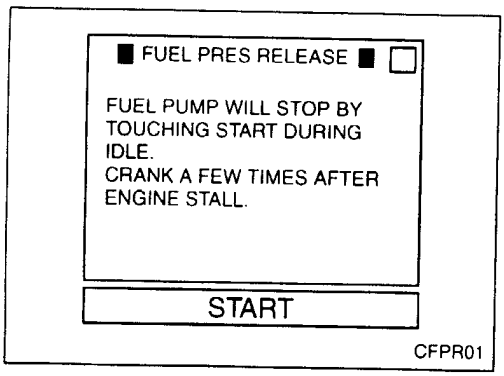
Inspection

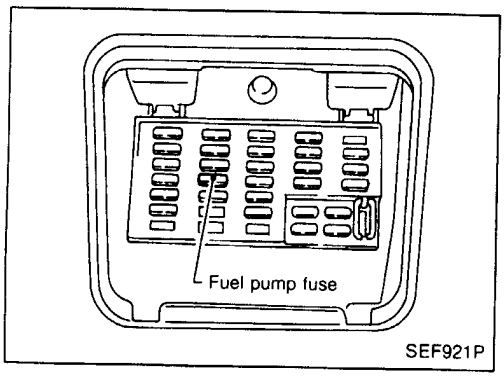
PCV (Positive Crankcase Ventilation) VALVE

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

PCV HOSE

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





Fuel Pressure Release

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

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

OR

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

Fuel Pressure Check

- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**
- **Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.**

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

At idling:

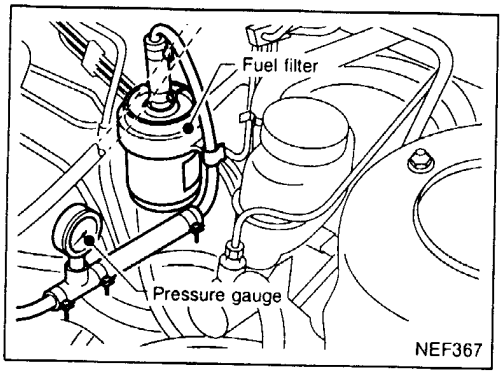
With vacuum hose connected

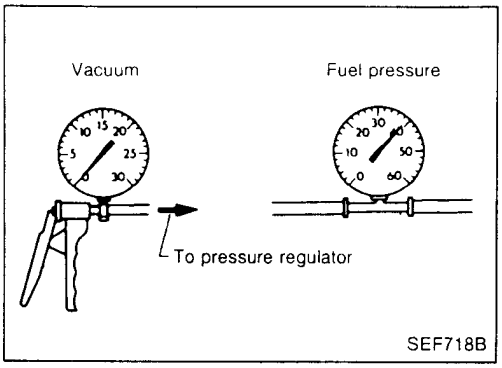
Approximately 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)

With vacuum hose disconnected

Approximately 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)

If results are unsatisfactory, perform Fuel Pressure Regulator Check.

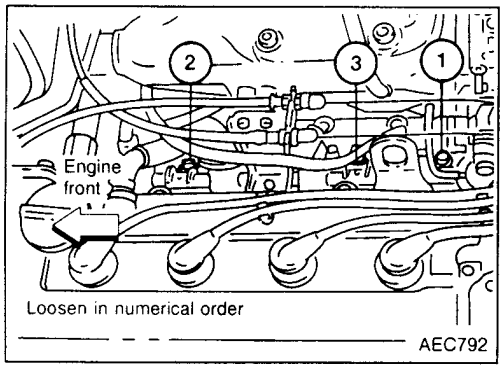




Fuel Pressure Regulator Check

1. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
2. Plug intake manifold with a rubber cap.
3. Connect variable vacuum source to fuel pressure regulator.
4. Start engine and read indication of fuel pressure gauge as vacuum is changed.

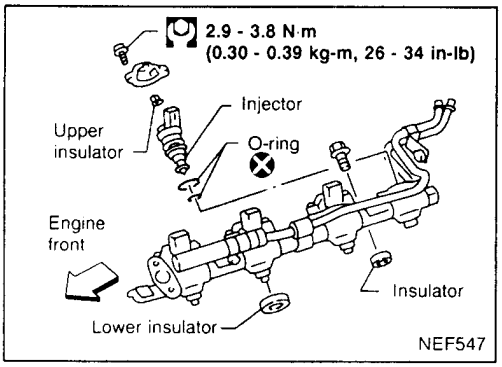
Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.



Injector Removal and Installation

1. Release fuel pressure to zero.
2. Remove injector tube assembly with injectors from intake manifold.
3. Remove injectors from injector tube assembly.

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

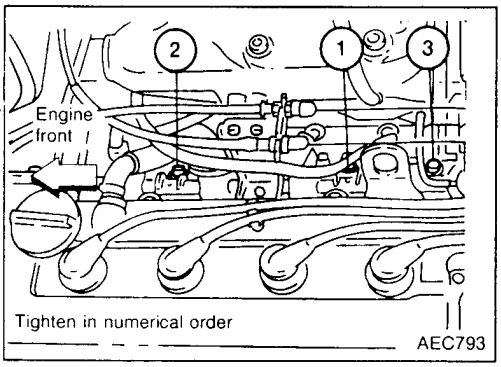


4. Install injectors.

- Clean exterior of injector tail piece.
- Use new O-rings.
- Face metal plate of upper insulator to injector.

CAUTION:
After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.

5. Assemble injectors to injector tube assembly.
6. Install injector tube assembly to intake manifold.



7. Tighten fuel tube bolts to 9.3 - 10.8 N·m (0.95 - 1.10 kg-m, 82 - 96 in-lb) as shown in the figure. Then tighten the bolts to 20.6 - 26.5 N·m (2.10 - 2.70 kg-m, 15 - 20 ft-lb).

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

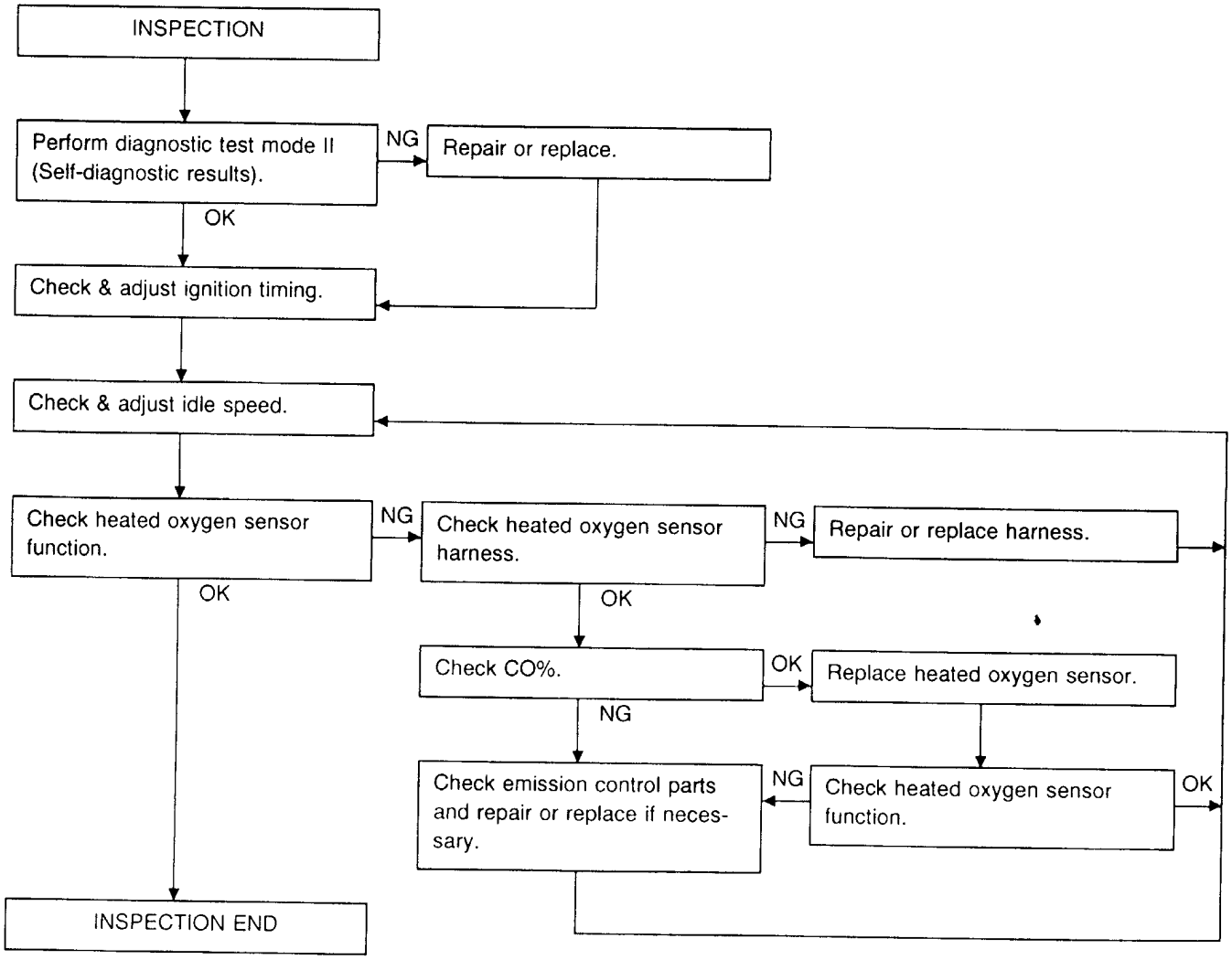
PREPARATION

- 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
(11) EGR valve operation
(12) Evaporative emission system

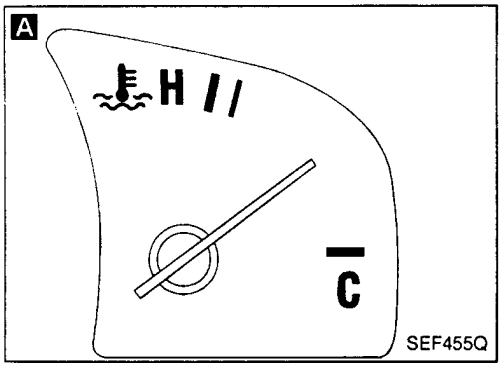
- On models equipped with air conditioner, checks should be carried out while the air conditioner is "OFF".
- On models equipped with automatic transaxle, when checking idle speed, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
- When measuring "CO"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

Overall inspection sequence



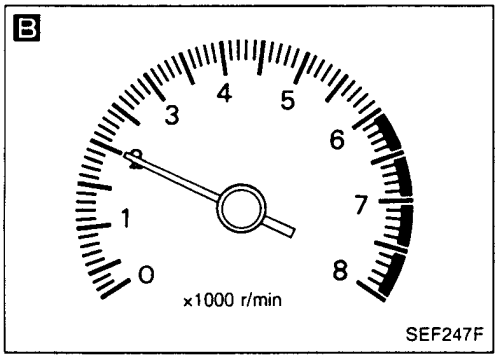
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

A



SEF455Q

B



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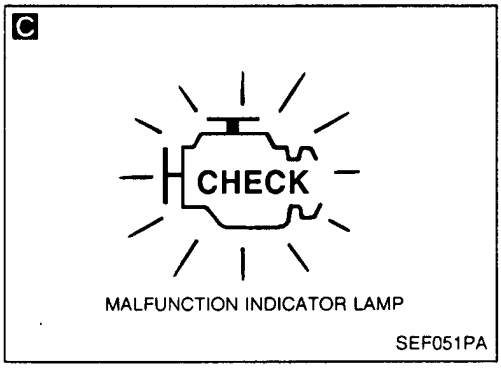
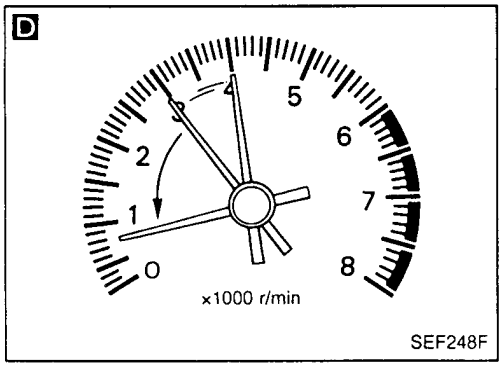


MALFUNCTION INDICATOR LAMP

SEF051PA

D



SEF248F

START

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

A

Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
Ensure engine stays 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 ECM on-board diagnostic system (Diagnostic test mode II).

OK

NG

Repair or replace components as necessary.

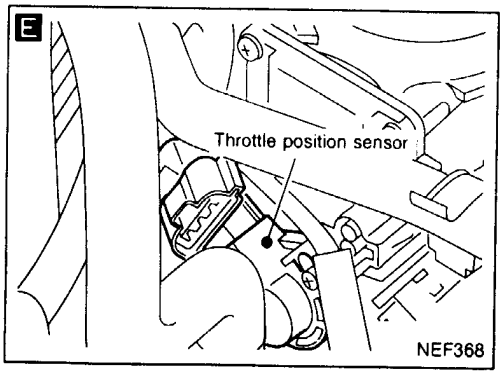
D

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

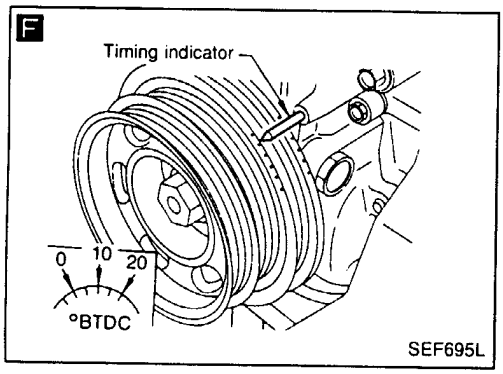
Ⓐ

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

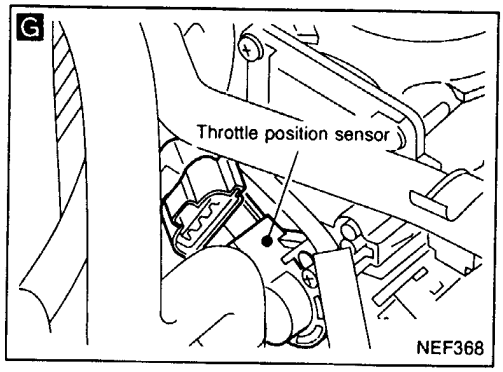
E



F



G



Ⓐ

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

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

F

Check ignition timing with a timing light.

Ignition timing: 10°±2° BTDC

OK

NG

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

Ignition timing: 10°±2° BTDC

Ⓑ

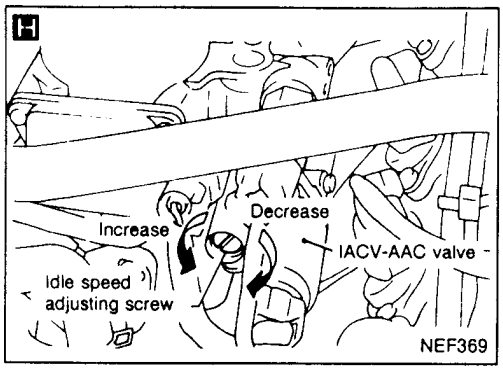
Ⓔ

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

Ⓒ

Ⓑ

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



Ⓑ

Check base idle speed.
625±50 rpm

OK

NG

Ⓒ

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

Adjust idle speed by turning idle speed adjusting screw.

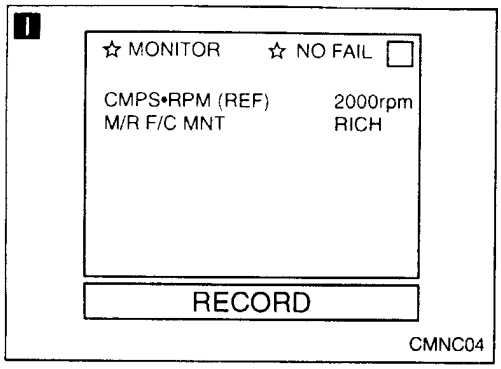
Base idle speed: 625±50 rpm

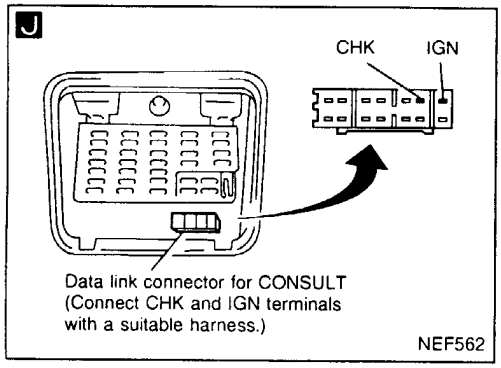
1) Turn off engine and connect throttle position sensor harness connector.
2) Start engine.

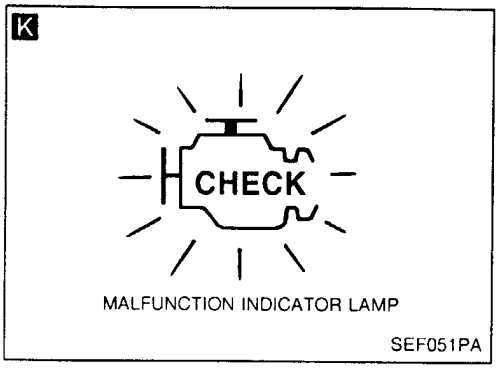
Start engine.
Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.

Ⓓ

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







Ⓓ

Check idle speed.
Models with daytime light system: 800±50 rpm
Models without daytime light system: 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.

I

1. See "M/R F/C MNT" in "Data monitor" mode.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. 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 time : RICH → LEAN → RICH
   2 times : RICH → LEAN → RICH → LEAN → RICH

NG → Ⓕ

OR

J K

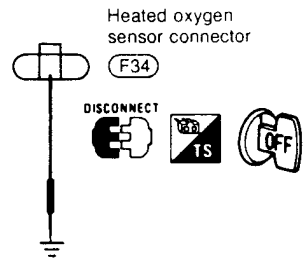
1. Set "Heated oxygen sensor monitor" in diagnostic test mode II.
   (See page EC-33.)
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintaining engine at 2,000 rpm under no-load, check that the malfunction indicator lamp on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

OK

END

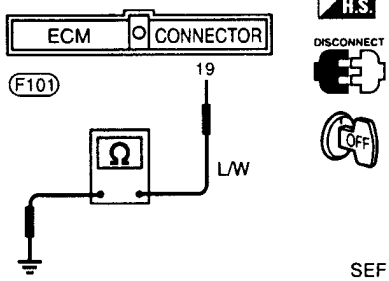
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

L



MEF031DB

L



SEF194RA

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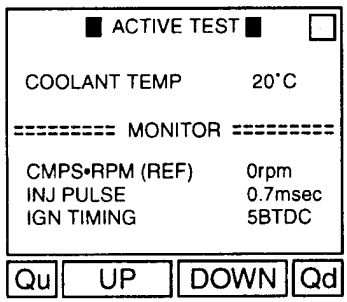
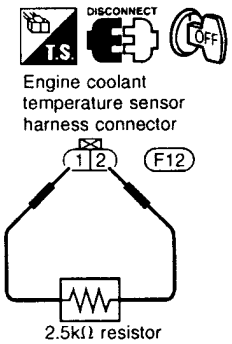


CATC03

N



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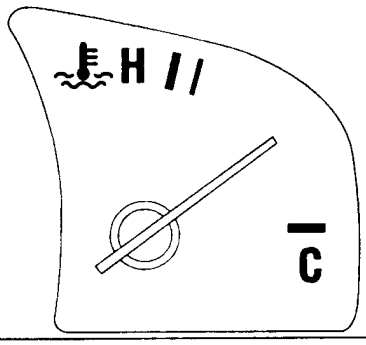


SEF455Q

Ⓕ

L

Check heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect ECM harness connector from ECM.
3) Disconnect heated oxygen sensor harness connector. Then connect harness side terminal for heated oxygen sensor to ground with a jumper wire.
4) Check for continuity between terminal No. 19 of ECM harness connector and body ground.

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

OK / NG

NG → Repair or replace harness. → Ⓔ

OK → Connect ECM harness connector to ECM.

M N

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

OR

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

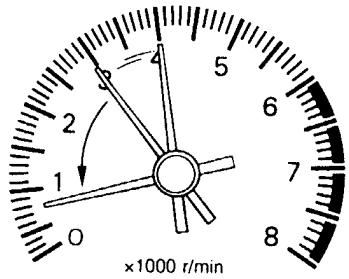
O

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

Ⓖ

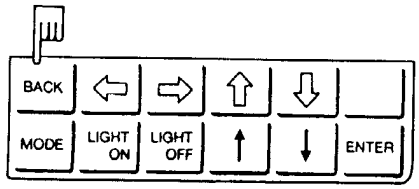
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

P



SEF248F

Q



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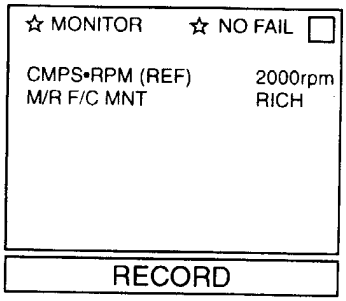
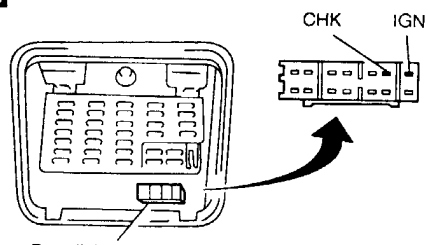
R



CMNC04

S



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

NEF562

Ⓖ

P

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

Check "CO"%.

Idle CO: Less than 0.3%

Q

After checking CO%,

1) Touch "BACK".

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

NG

OK

Replace heated oxygen sensor.

R

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 time : RICH → LEAN → RICH
   2 times : RICH → LEAN → RICH → LEAN → RICH

OR

S

1. Set "Heated oxygen sensor monitor" in diagnostic test mode II.
   (See page EC-33.)
2. Maintaining engine at 2,000 rpm under no-load, check that the malfunction indicator lamp on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

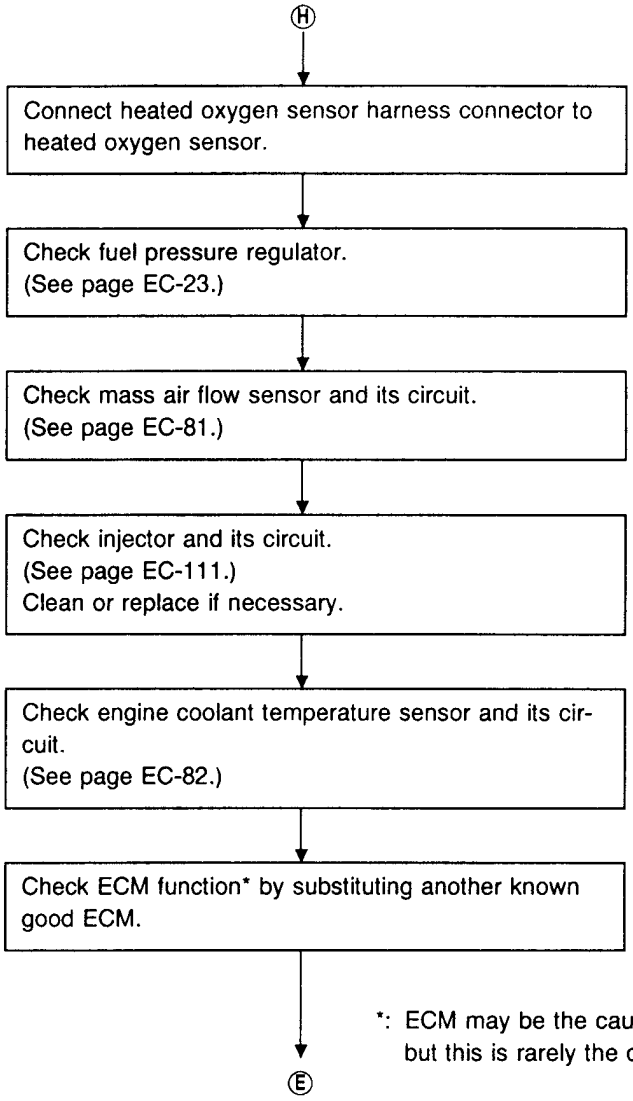
NG

OK

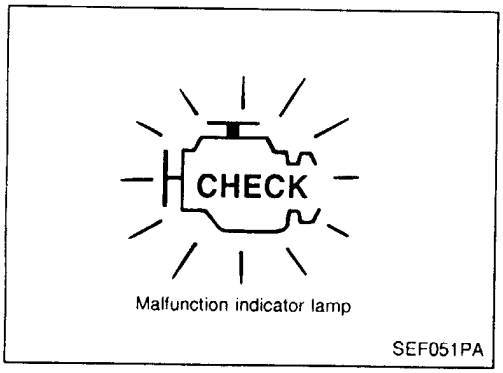
Ⓗ

Ⓔ

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



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



Malfunction indicator lamp

SEF051PA

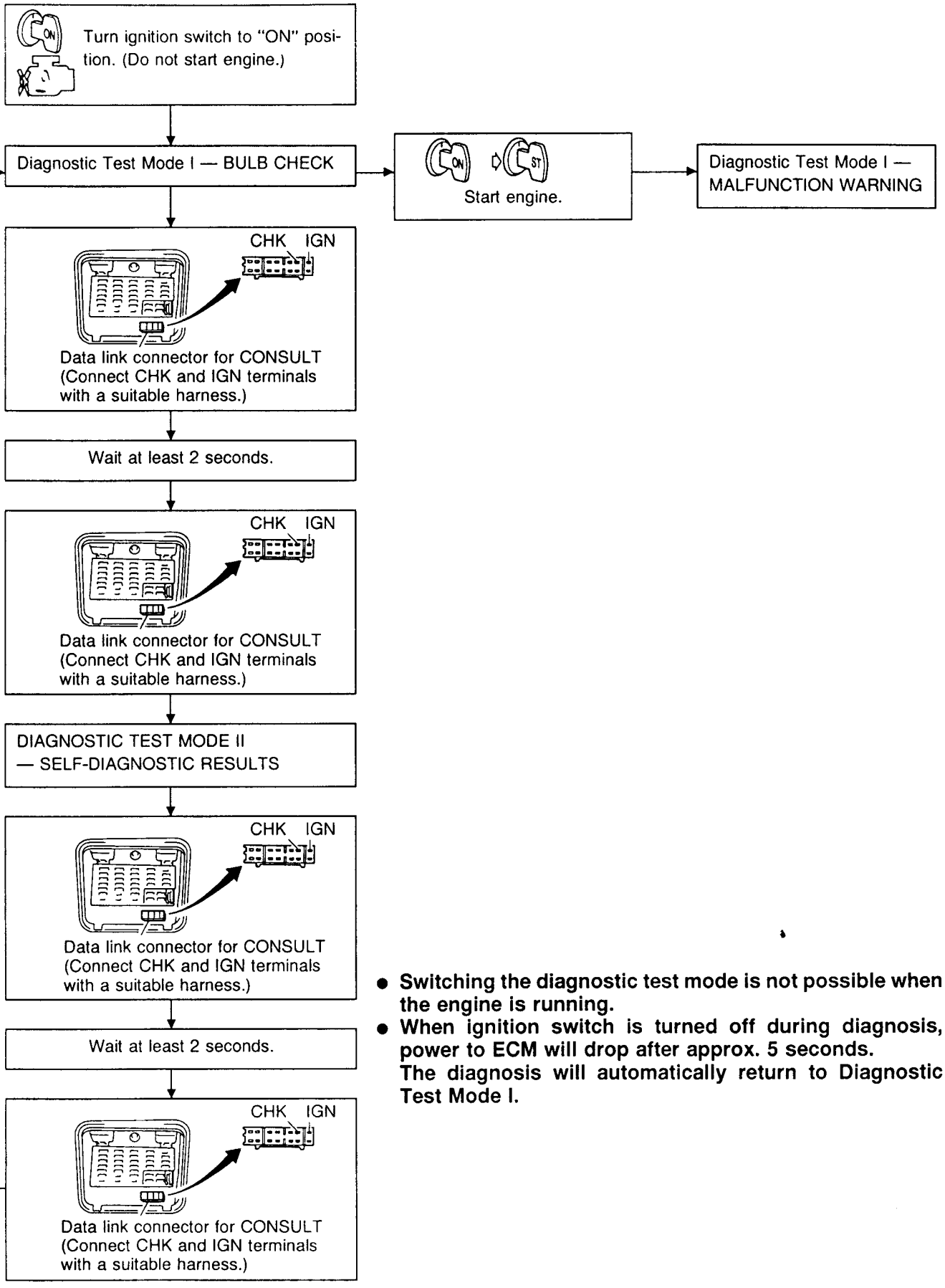
Malfunction Indicator Lamp (MIL)

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator lamp does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-142.
2. When the engine is started, the malfunction indicator lamp should go off.

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



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

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section ("WARNING LAMPS AND CHIME") or see EC-142.

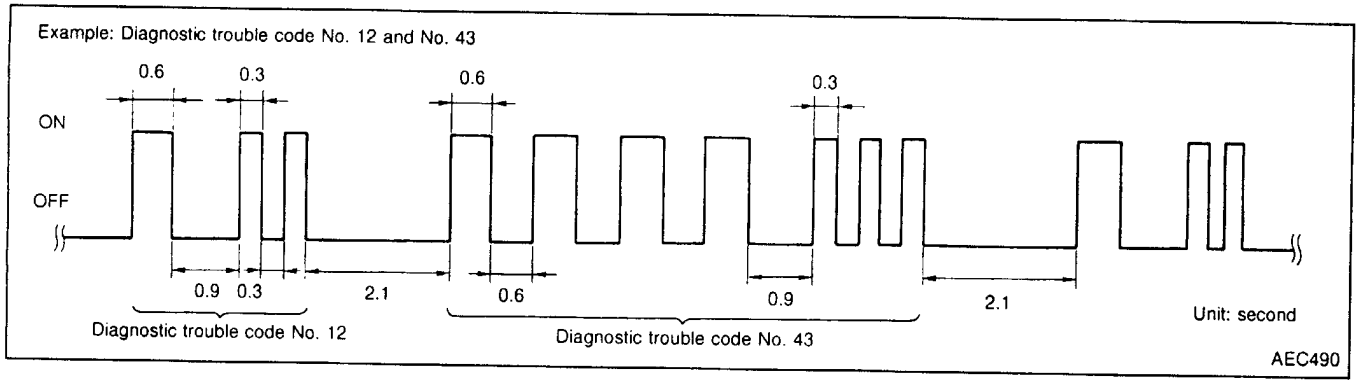
DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MALFUNCTION INDICATOR LAMP	Condition
ON	Engine coolant temperature sensor circuit malfunction or overheating is detected, or the ECM's CPU is malfunctioning.
OFF	No malfunction.

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

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

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



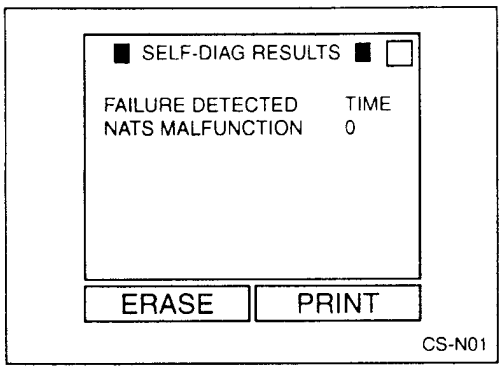
Long (0.6 second) flashes indicate the number of ten digits, and short (0.3 second) flashes indicate the number of single digits. For example, the malfunction indicator lamp flashes 4 times for about 2.5 seconds (0.6 sec x 4 times) and then flashes three times for about 1 second (0.3 sec x 3 times). 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 CHART, refer to EC-50.)

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

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

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

Malfunction Indicator Lamp (MIL) (Cont'd)



- **If the MIL flashes or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT using NATS program card (NATS-E960). Refer to EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT.**
- **When replacing ECM, initialisation of NATS V.2.0 system and registration of all NATS V.2.0 ignition key IDs must be carried out with CONSULT using NATS program card (NATS-E960).**
  Therefore, be sure to receive all keys from vehicle owner.
  Regarding the procedures of NATS initialisation and NATS ignition key ID registration, refer to CONSULT operation manual, NATS V.2.0.

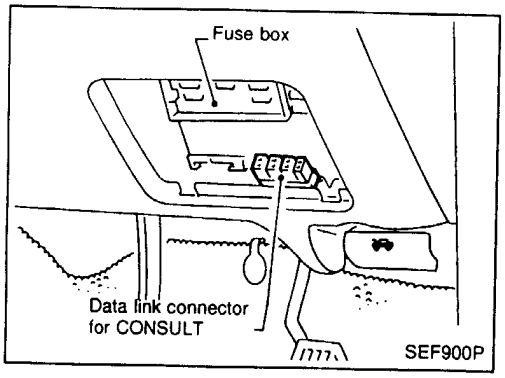
DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR MONITOR

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 system
OFF	Rich	
*1 Remains ON or OFF	Any condition	Open loop system

*1: Maintains conditions just before switching to open loop.

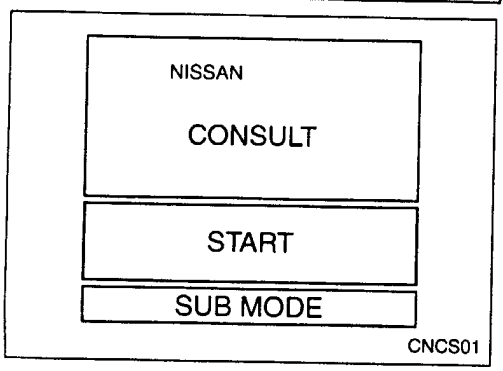
To check the heated oxygen sensor function, start engine in Diagnostic Test Mode II. Then warm it up until engine coolant temperature indicator points to middle of gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Make sure that the MALFUNCTION INDICATOR LAMP comes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



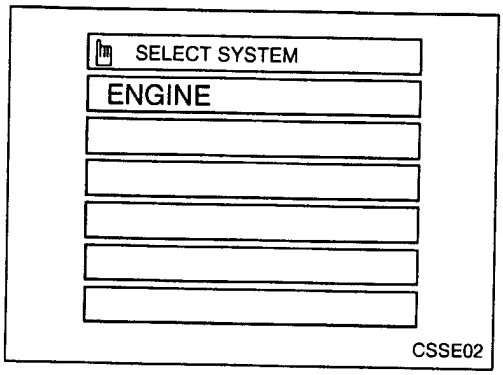
CONSULT

CONSULT INSPECTION PROCEDURE

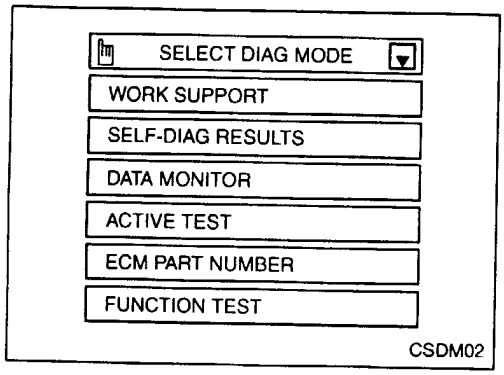
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



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



5. Touch "ENGINE".



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

For further information, see the CONSULT Operation Manual.

CONSULT (Cont'd)

ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

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

X: Applicable

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.
ECM part numbers	ECM part numbers can be read.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".

WORK SUPPORT MODE

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

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "Diagnostic Trouble Code (DTC) Chart". (Refer to EC-50.)

DATA MONITOR MODE

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

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
LOAD SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the rear defogger signal and/or lighting switch. ON: Rear defogger is operating and/or lighting switch is on. OFF: Rear defogger is not operating and lighting switch is not on.	
INJ PULSE [msec]		○	• Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	• When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		○	• Indicates the ignition timing computed by ECM according to the input signals.	
IACV-AAC/V [%]		○	• Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals.	
A/F ALPHA [%]		○	• Indicates the mean value of the air-fuel ratio feedback correction factor per cycle.	• When the engine is stopped, a certain value is indicated. • This data also includes the data for the air-fuel ratio learning control.
AIR COND RLY [ON/OFF]		○	• Indicates the air conditioner relay control condition (determined by ECM according to the input signal).	
COOLING FAN [ON/OFF]		○	• Indicates the control condition of the cooling fans (determined by ECM according to the input signal). ON ... Operating OFF ... Stopped	
FUEL PUMP RLY [ON/OFF]		○	• Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
EGRC SOL/V [ON/OFF]		○	• Indicates the control condition of the EGR valve & EVAP canister purge control solenoid valve (determined by ECM according to the input signal). ON ... EGR system operation cut-off OFF ... EGR system operation not cut-off	
VOLTAGE [V]			• Voltage measured by the voltage probe.	
PULSE [msec] or [Hz] or [%]			• Pulse width, frequency or duty cycle measured by the pulse probe.	• Only "#" is displayed if item is unable to be measured. • Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

CONSULT (Cont'd)

ACTIVE TEST MODE

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

CONSULT (Cont'd)

FUNCTION TEST MODE

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

CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
COOLING FAN CIRCUIT	• Ignition switch: ON (Engine stopped) • Cooling fan circuit is tested when cooling fan is rotated.	The cooling fan rotates and stops every 3 seconds.		• Harness and connector • Cooling fan motor • Cooling fan relay
START SIGNAL CIRCUIT	• Ignition switch: ON → START • Start signal circuit is tested when engine is started by operating the starter. Before cranking, battery voltage and engine coolant temperature are displayed. During cranking, average battery voltage, mass air flow sensor output voltage and cranking speed are displayed.	Start signal: OFF → ON		• Harness and connector • Ignition switch
PW/ST SIGNAL CIRCUIT	• Ignition switch: ON (Engine running) • Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position.	Locked position	ON	• Harness and connector • Power steering oil pressure switch • Power steering pump
		Neutral position	OFF	
VEHICLE SPEED SEN CKT	• Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 mph) or higher.	Vehicle speed sensor input signal is greater than 4 km/h (2 mph)		• Harness and connector • Vehicle speed sensor • Speedometer
IGN TIMING ADJ	• After warming up, idle the engine. • Ignition timing adjustment is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		• Adjust ignition timing (by moving 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, power transistor, ignition coil, harness or connector) • VACUUM SYS (Intake air leaks) • Heated oxygen sensor circuit • Heated oxygen sensor operation • Fuel pressure high or low • Mass air flow sensor

CONSULT (Cont'd)

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

CONSULT (Cont'd)

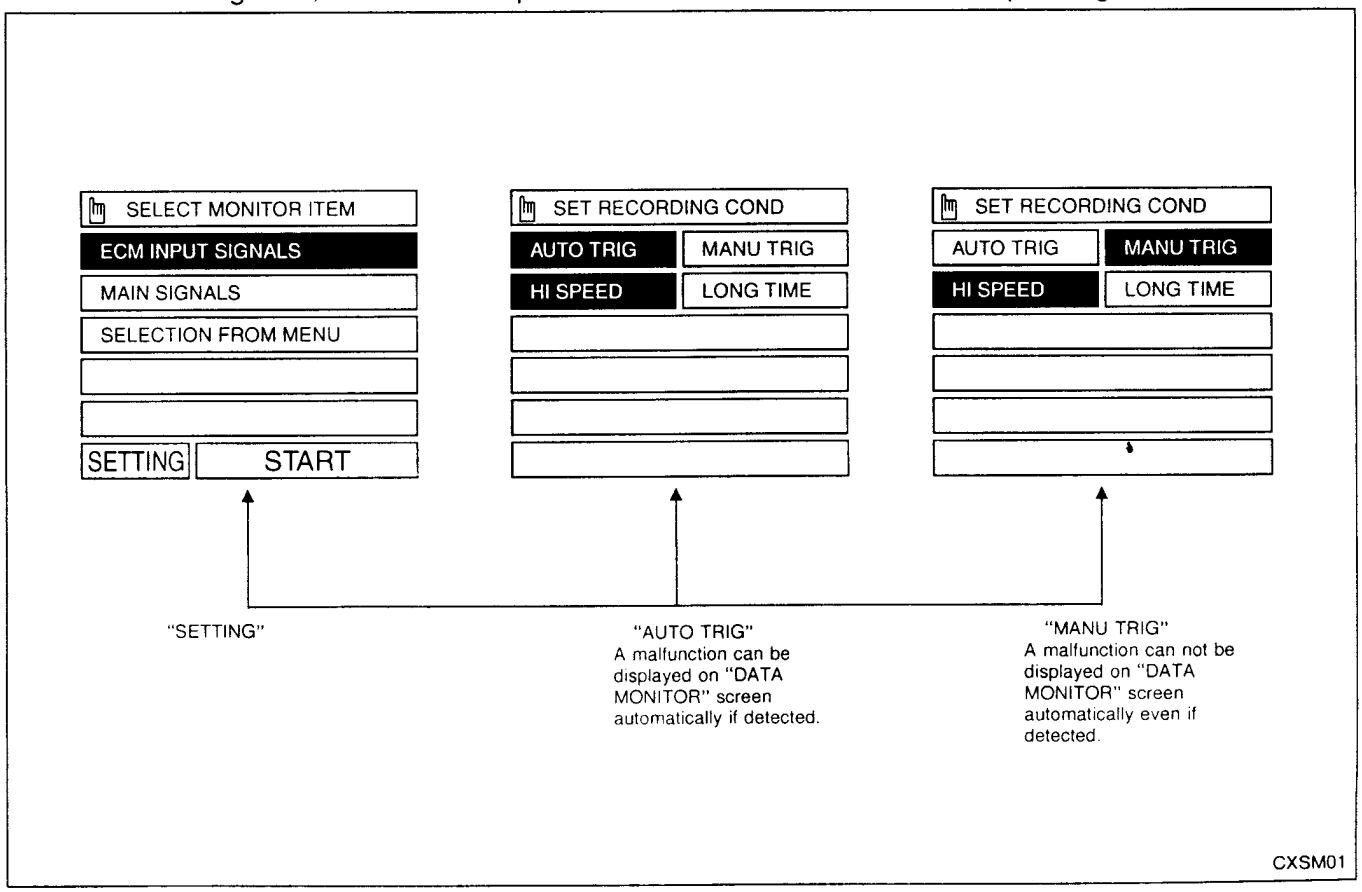
REAL TIME DIAGNOSIS IN DATA MONITOR MODE

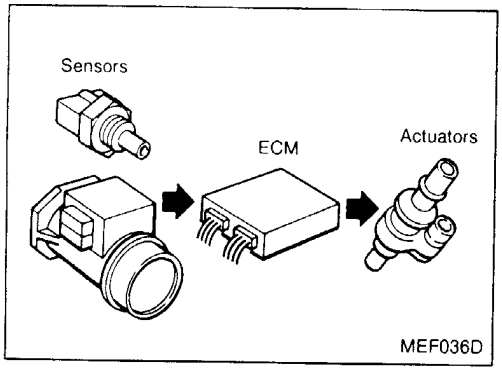
CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

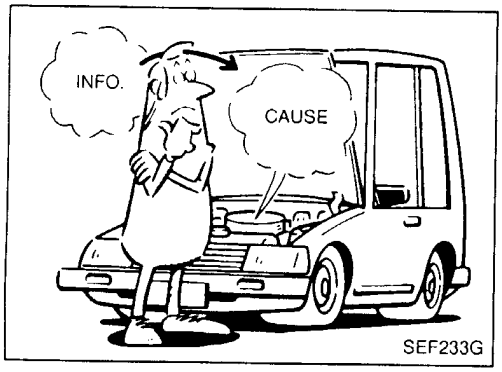
1. "AUTO TRIG" (Automatic trigger):
   - The malfunction will be identified on the CONSULT screen in real time.
     In other words, DTC and malfunction item will be displayed at the moment the malfunction is detected by ECM.
     DATA MONITOR can be performed continuously until a malfunction is detected.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

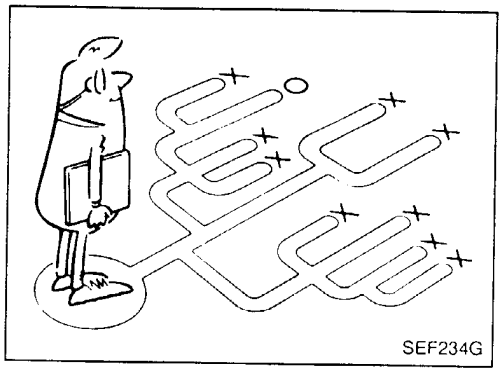
Use these triggers as follows:

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









Introduction

The engine has an ECM to control major systems such as fuel 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 correct 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.

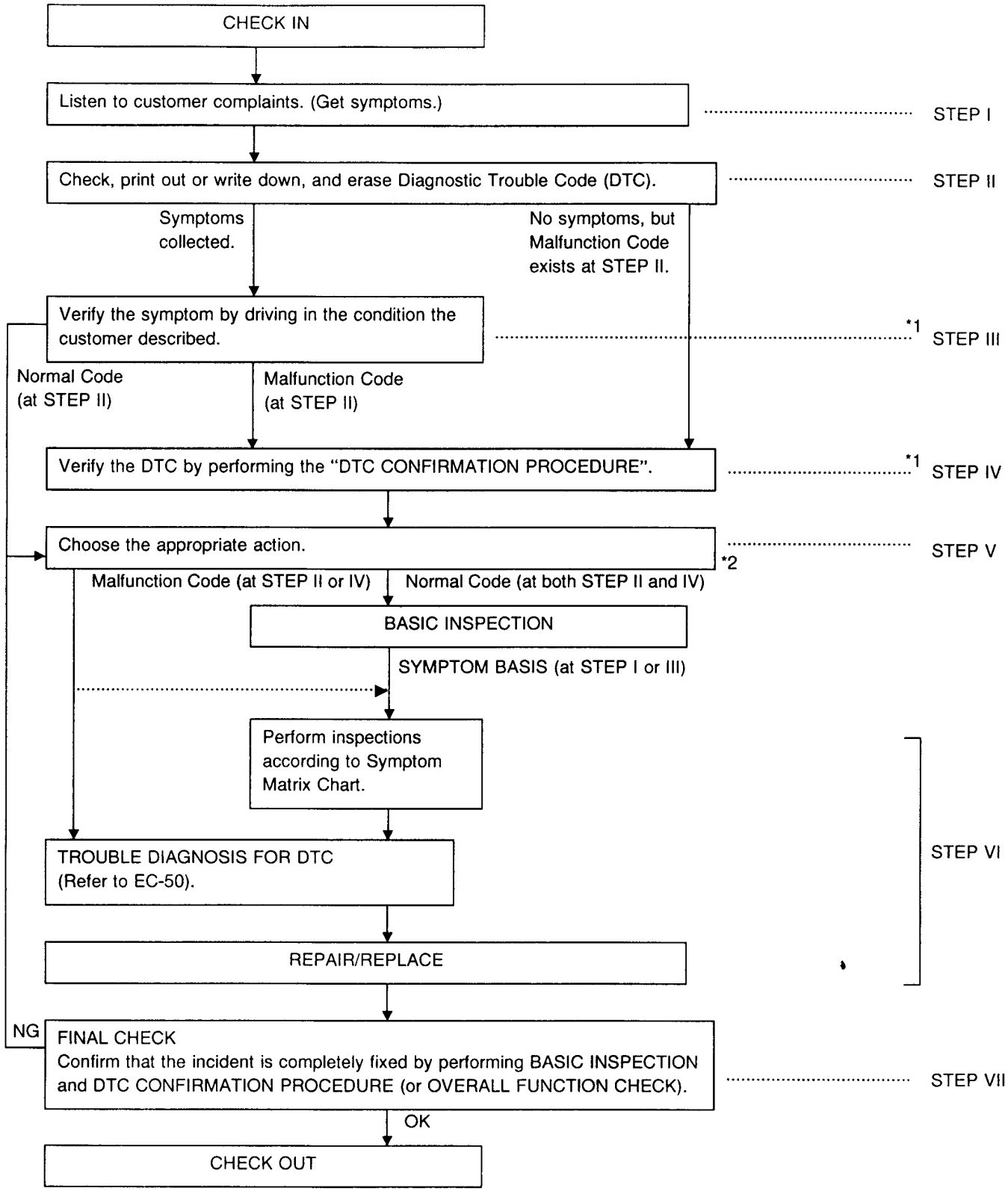
It is much more difficult to diagnose a problem that occurs intermittently rather than catastrophically. Most intermittent problems are caused by poor electrical connections or faulty wiring. In this case, careful checking of suspected circuits may help prevent the unnecessary replacement of good parts.

A visual check only may not find the cause of the problems. A road test with CONSULT or a circuit tester connected should be performed. Follow the "Work Flow" on the next page.

Before undertaking actual checks, take 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 EC-49 should be used.

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

Work Flow



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

***2: If the on-board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-70.**

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORKSHEET" as shown on the next page.
STEP II	Before confirming the concern, check and write down (print out using CONSULT) the Diagnostic Trouble Code (DTC), then erase the code. 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. Refer to EC-56.)
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The "DIAGNOSTIC WORK SHEET" is useful to verify the incident. Connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section. If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the Diagnostic Trouble Code (DTC) by driving in (or performing) the "DTC CONFIRMATION PROCEDURE". Check and read the DTC by using CONSULT. During the DTC verification, be sure to connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section. In case the "DTC CONFIRMATION PROCEDURE" is not available, perform the "OVERALL FUNCTION CHECK" instead. The DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "OVERALL FUNCTION CHECK" is the same as the DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC (Refer to EC-50). If the normal code is indicated, proceed to the BASIC INSPECTION. Refer to EC-53. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-56.
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-60. 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-34.

KEY POINTS

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

SEF907L

Diagnostic Worksheet

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

WORKSHEET SAMPLE

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion 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	

Diagnostic Trouble Code (DTC) Chart

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
11	Camshaft position sensor circuit (CAMSHAFT POSI SEN)	• 180° signal is not sent to the ECM for the first few seconds during engine cranking. • The pulse width of 180° signal is smaller than the specified value.
12	Mass air flow sensor circuit (MASS AIR FLOW SEN)	• An excessively high or low voltage is sent to ECM.
13	Engine coolant temperature sensor circuit (COOLANT TEMP SEN)	• An excessively high or low voltage from the sensor is sent to the ECM.
21	Ignition signal circuit (IGN SIGNAL-PRIMARY)	• The ignition signal in the primary circuit is not sent to the ECM during engine cranking or running.
28	OVER HEAT	• The engine coolant temperature sensor output voltage is below 0.35V.
43	Throttle position sensor circuit (THROTTLE POSI SEN)	• An excessively low or high voltage from the sensor is sent to the ECM.
55	No failure (NO SELF DIAGNOSTIC FAILURE INDICATED...)	• No malfunction is detected by the ECM.

*1: This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each TROUBLE DIAGNOSIS FOR DTC.
Abbreviations are as follows:
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).

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

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

X: Applicable
—: Not applicable

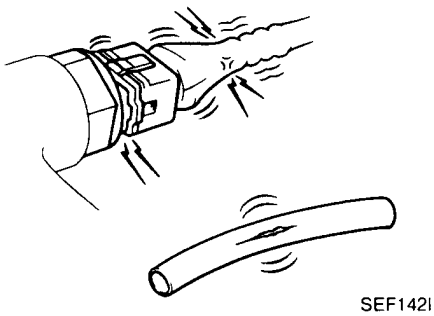
Check Items (Possible Cause)	"DTC CONFIRMATION PROCEDURE" Quick Ref. *1	"OVERALL FUNCTION CHECK" Quick Ref. *2	Fail Safe System	Reference Page
• Harness or connectors (The sensor circuit is open or short-circuited.) • Camshaft position sensor • Starter motor • Starting system circuit (EL section) • Dead (Weak) battery	RUNNING	—	—	EC-74
• Harness or connectors (The sensor circuit is open or short-circuited.) • Mass air flow sensor	RUNNING	RUNNING	X	EC-78
• Harness or connectors (The sensor circuit is open or short-circuited.) • Engine coolant temperature sensor	IGN: ON	—	X	EC-82
• Harness or connectors (The ignition primary circuit is open or short-circuited.) • Power transistor unit • Camshaft position sensor • Camshaft position sensor circuit	RUNNING	—	—	EC-86
Refer to "Overheat cause analysis", ENGINE COOLING SYSTEM in LC section.	—	—	—	LC section
• Harness or connectors (The sensor circuit is open or short-circuited.) • Throttle position sensor	—	IGN: ON	X	EC-91
• No failure	—	—	—	—

Fail-Safe Chart

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

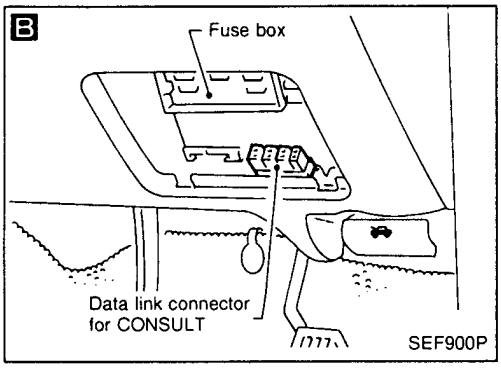
<table>
<tr><th>DTC No.</th><th>Detected items</th><th>Engine operating condition in fail-safe mode</th></tr>
<tr><td>12</td><td>Mass air flow sensor circuit</td><td>Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>13</td><td>Engine coolant temperature sensor circuit</td><td>Engine coolant temperature will be determined based on the time after turning ignition switch to "ON" or "START" position.
<table>
<tr><th>Condition</th><th>Engine coolant temperature decided</th></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>35°C (95°F)</td></tr>
<tr><td>More than 4.5 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>35 - 80°C (95 - 176°F)
(Depends on the time)</td></tr>
</table>
When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>43</td><td>Throttle position sensor circuit</td><td>Throttle position will be determined based on the injected fuel amount and the engine speed.
Therefore, acceleration will be poor.
<table>
<tr><th>Condition</th><th>Driving condition</th></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
</table></td></tr>
<tr><td>—</td><td>ECM</td><td>Fail-safe system activating condition when ECM is malfunctioning
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.
Engine control, with fail-safe system, operates when ECM is malfunctioning
When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.
<table>
<tr><th></th><th>Operation</th></tr>
<tr><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm</td></tr>
<tr><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td>Ignition timing</td><td>Ignition timing is fixed at the preset valve</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td>Cooling fans</td><td>Cooling fan relay "ON" when engine is running, and "OFF" when engine stalls</td></tr>
</table></td></tr>
</table>

A



SEF142I

B



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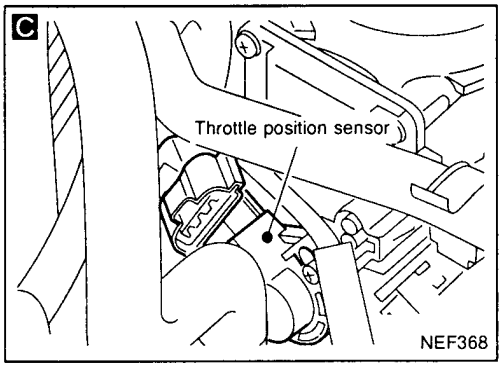

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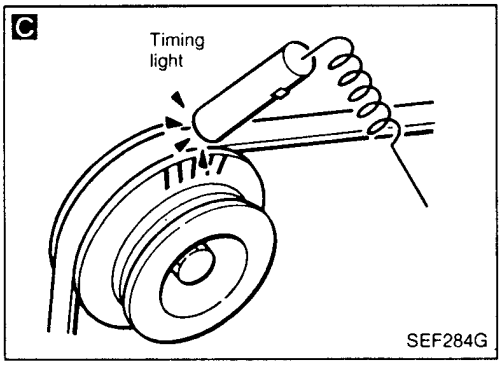


SEF284G

Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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

A

BEFORE STARTING

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

B

CONNECT CONSULT TO THE VEHICLE.

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-36.

DOES ENGINE START?

No → Go to E.

Yes

C

CHECK IGNITION TIMING.

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

Ignition timing: 10°±2° BTDC

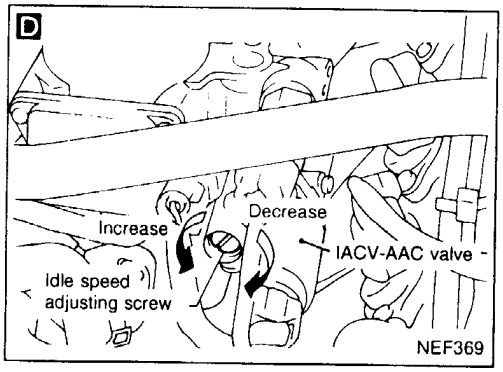
NG → Adjust ignition timing by turning distributor.

OK

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)

D



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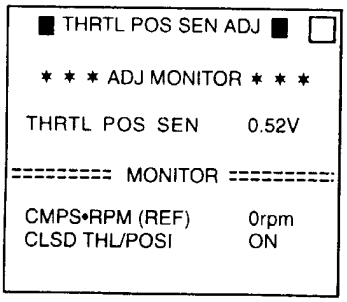

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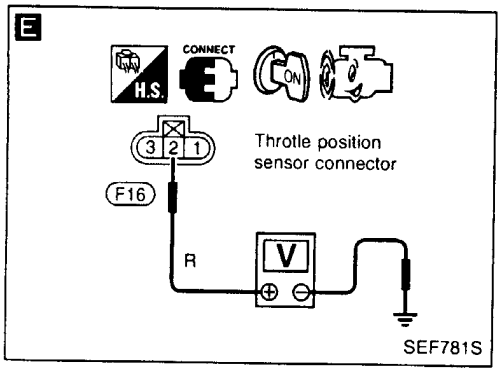


Ⓐ

D

CHECK IDLE ADJ. SCREW INITIAL SET RPM.
Idle speed: 625±50 rpm

NG → Adjust engine speed by turning idle adjusting screw.

OK

Reconnect throttle position sensor harness connector.

OK

E

CHECK THROTTLE POSITION SENSOR IDLE POSITION.

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

OR

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

NG → Adjust output voltage to 0.50V ± 0.1V by rotating throttle position sensor body.

OK

RESET IDLE POSITION MEMORY.

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

CHECK IDLE SPEED
Check idle speed.
Models with daytime light system:
800±50 rpm
Models without daytime light system:
700±50 rpm

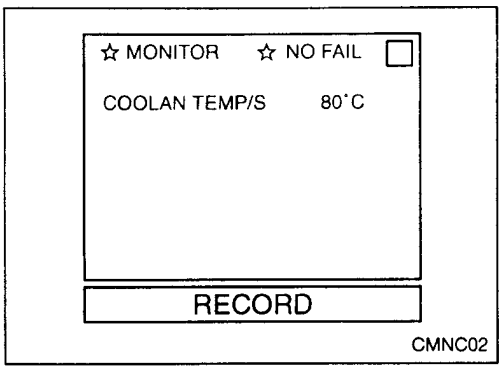
NG → Adjust idle speed by turning idle adjusting screw.

OK

After this inspection, unnecessary diagnostic trouble code No. might be displayed.
Erase the stored memory in ECM.

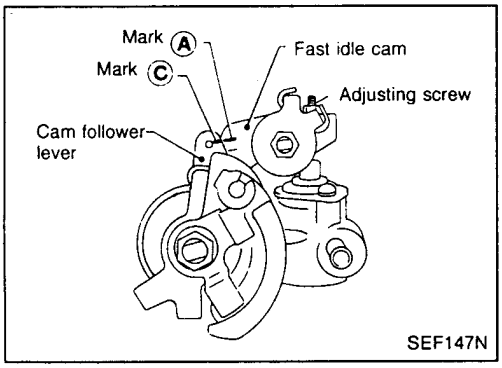
OK

INSPECTION END

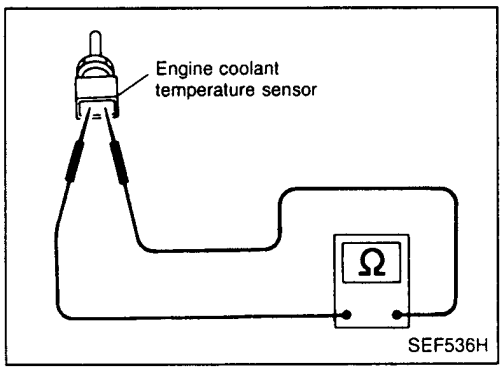


Fast Idle Cam (FIC) Inspection and Adjustment

1. Start engine and warm it up.
2. See "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
3. When engine coolant temperature is 75 to 85°C (167 to 185°F), make sure that mark Ⓐ is aligned with mark Ⓒ as shown in the figure.



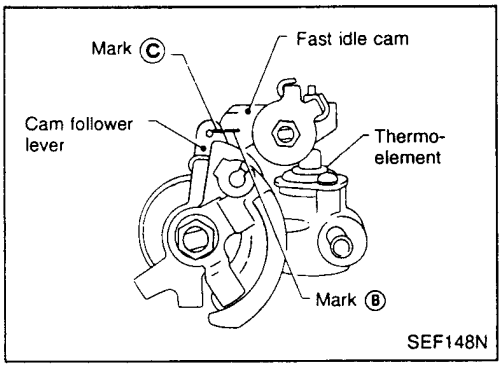
2. Disconnect engine coolant temperature sensor harness connector and check resistance of sensor as shown in the figure.
3. When the resistance of engine coolant temperature sensor is 0.26 to 0.39 kΩ, make sure that mark Ⓐ is aligned with mark Ⓒ as shown in the figure.



- If NG, adjust by turning adjusting screw.

Adjusting screw tightening torque:
1.0 - 2.0 N·m (10 - 20 kg-cm, 8.7 - 17.4 in-lb)

4. Stop engine.
5. Turn ignition switch to "ON" position and see "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
6. When engine coolant temperature is 20 to 30°C (68 to 86°F), make sure that mark Ⓑ is aligned with mark Ⓒ as shown in the figure.



5. When the resistance of engine coolant temperature sensor is 1.65 to 2.40 kΩ, make sure that mark Ⓑ is aligned with mark Ⓒ as shown in the figure.

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

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	●	●	●	○	●		●	●			●		○	EC-114
	Fuel pressure regulator system	●	●	●	○	●	○	●	●	○		●			EC-23
	Injector circuit	●	●	●	○	●		●	●			●			EC-111
	Evaporative emission system	○	○	○	○	○	○	○	○	○		○			EC-18
Air	Positive crankcase ventilation system	○	○	●	○	○	○	●	●	○		○			EC-20
	Incorrect idle speed adjustment	○	○				○	○	○	○		○			EC-24
	IACV-AAC valve circuit	●	●	●	○	●	●	●	●	●		●		○	EC-118
	IACV-FICD solenoid valve circuit	○	○	○	○	○	○	○	○	○		○			EC-122
Ignition	Incorrect ignition timing adjustment	○	○	●	●	●		●	●			●			EC-24
	Ignition circuit	●	●	●	●	●		●	●			●			EC-86
EGR	EGR valve & EVAP canister purge control solenoid valve circuit		●	●	●	○						●			EC-101
	EGR system	○	●	●	●	○	○	●	●	○		○			EC-101
Main power supply and ground circuit		○	○	○	○	○		○	○		○	○		○	EC-70
Cooling	Cooling fan circuit	○	○	○	○	○	○	○	○	○	○	○		○	EC-125
Air conditioner circuit		○	○	○	○	○	○	○	○	○		○		○	HA section

● ; High Possibility Item
○; Low Possibility Item

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — ECCS system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
ECCS	Camshaft position sensor circuit	●	●	●	○	○		○	○			○			EC-74
	Mass air flow sensor circuit	●	●	●	○	●		●	●			●			EC-78
	Heated oxygen sensor circuit		●	●	○	●		●	●			●			EC-106
	Engine coolant temperature sensor circuit	●	●	●	○	●	●	●	●	●		●			EC-82
	Throttle position sensor circuit		●	●		●	●	●	●	●		●			EC-91
	Incorrect throttle position sensor adjustment		●	○		○	●	○	○	●		○			EC-53
	Vehicle speed sensor circuit		○	○		○						○			EC-96
	ECM	○	○	○	○	○	○	○	○	○	○	○			EC-63
	Start signal circuit	○													EC-99
	Neutral position switch circuit			○		○		○	○			○			EC-133
	Power steering oil pressure switch circuit		○					○	○						EC-130

● ; 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)	
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	○	○												
	Fuel piping	○	○	○	○	○		○	○			○			
	Vapor lock		○												
	Valve deposit	○	○	○	○	○		○	○			○			
	Poor fuel (Heavy weight gasoline, Low octane)	○	○	○	○	○		○	○			○			—
Air	Air duct		○	○		○		○	○			○			
	Air cleaner		○	○		○		○	○			○			
	Air leakage from air duct (Mass air flow sensor — throttle body)	○	○	○	○	○	○	○	○	○		○			
	Throttle body, Throttle wire	●	●	●		●	●	●	●	●		●			FE section
	Air leakage from intake manifold/ Collector/Gasket	○	●	○	○	○	○	○	○	○		○			—
Cranking	Battery	○	○	○		○		○	○			○		○	
	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. Specification data might be displayed even when ignition timing is not adjusted to specification. This IGN TIMING monitors the data calculated by the ECM according to the input signals from the camshaft position sensor and other ignition timing related sensors.)
- If the real-time diagnosis results are NG, and the on-board diagnostic system results are OK, when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CONDITION		SPECIFICATION
CMPS•RPM (REF)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
MAS AIR/FL SE	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: "N" • No-load	Idle	1.2 - 1.8V
		2,000 rpm	1.7 - 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 MNT			LEAN ↔ RICH Changes more than 5 times during 10 seconds.
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
THRTL POS SEN	• Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.35 - 0.65V
		Throttle valve fully opened	Approx. 4.0V
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/POSI	• Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	• Engine: After warming up, idle the engine	A/C switch "OFF"	OFF
		A/C switch "ON" (Compressor operates)	ON
P/N POSI SW	• Ignition switch: ON	Shift lever "P" or "N"	ON
		Except above	OFF
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
LOAD SIGNAL	• Ignition switch: ON	Rear window defogger is operating and/or lighting switch is on	ON
		Rear window defogger is not operating and lighting switch is not on	OFF
INJ PULSE	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: "N" • No-load	Idle	2.4 - 3.2 msec.
		2,000 rpm	1.9 - 3.2 msec.

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

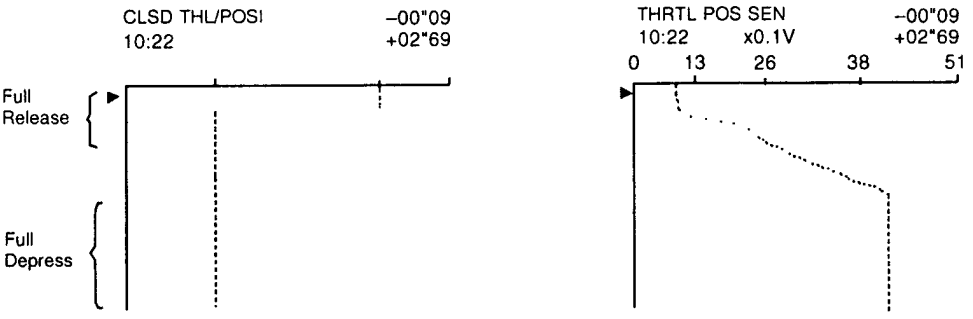
MONITOR ITEM	CONDITION		SPECIFICATION
IGN TIMING	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: "N" • No-load	Idle	2 -10° BTDC
		2,000 rpm	More than 20° BTDC
IACV-AAC/V	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: N • No-load	Idle	0 - 40%
		2,000 rpm	—
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 1.0 seconds)		ON
	• Except as shown above		OFF
COOLING FAN	• When cooling fan is stopped		OFF
	• When cooling fan operates at low speed		LOW
	• When cooling fan operates at high speed		HI
EGRC SOL/V	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: N • No-load	Idle	ON
		Revving engine from idle to 3,000 rpm in 1st position	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.)

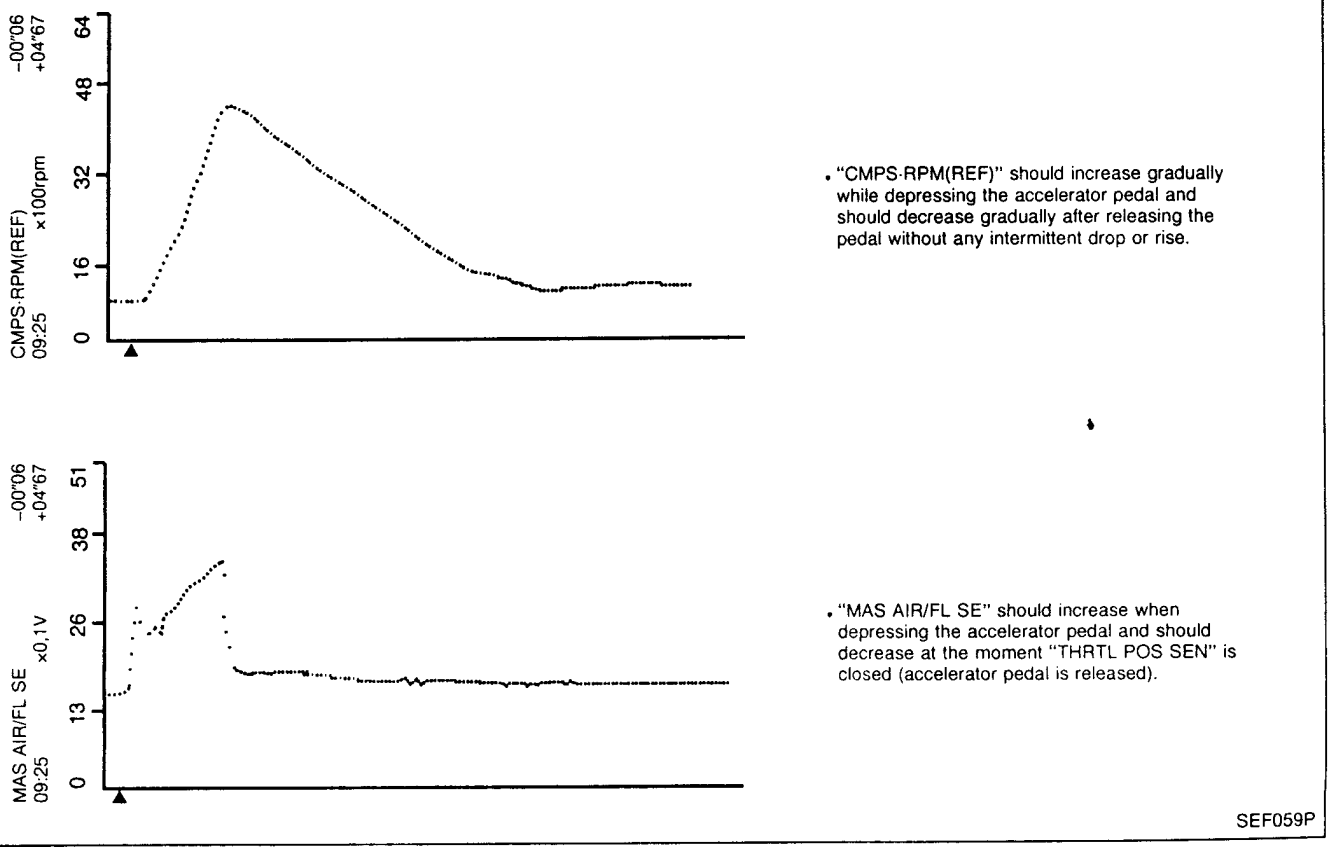
THRTL POS SEN, CLSD THL/POSI

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".



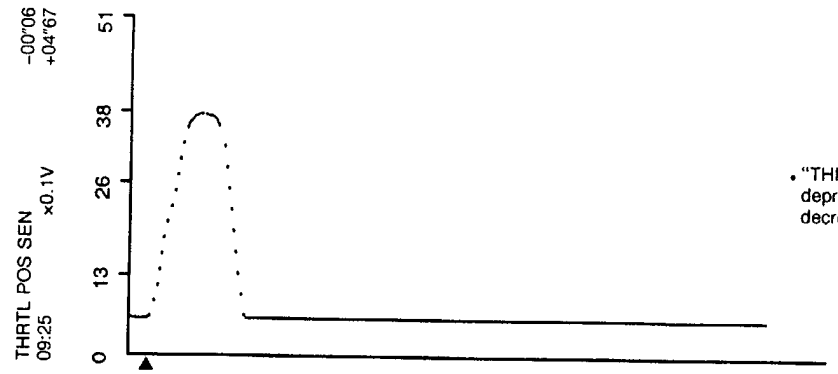
CMPS•RPM (REF), MAS AIR/FL SE, THRTL POS SEN, O2 SENSOR, INJ PULSE

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

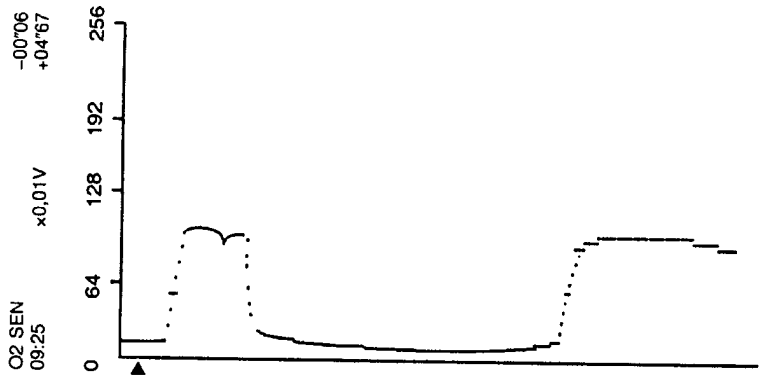


- "CMPS·RPM(REF)" should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intermittent drop or rise.
- "MAS AIR/FL SE" should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is closed (accelerator pedal is released).

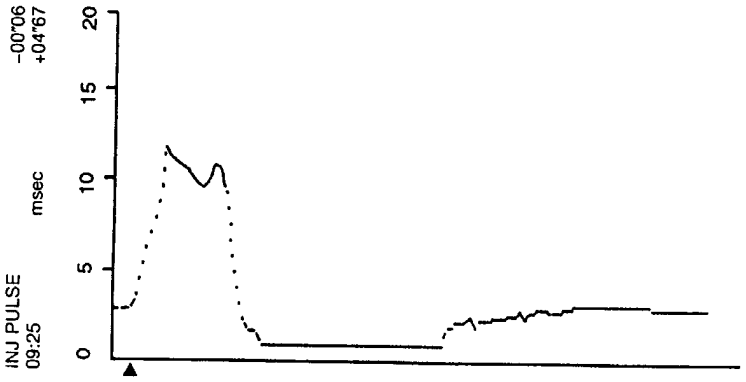
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



• "THRTL POS SEN" should increase while depressing the accelerator pedal 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.

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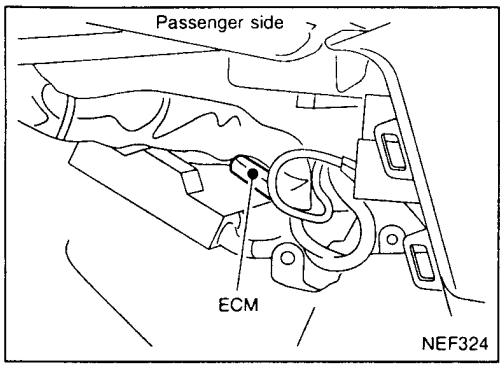
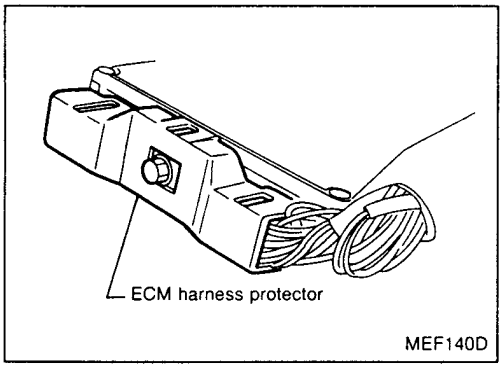


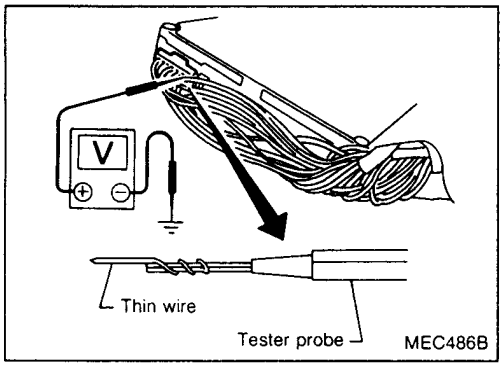
ECM Terminals and Reference Value

PREPARATION

1. ECM is located behind the center console panel. For this inspection, remove the center console under cover.

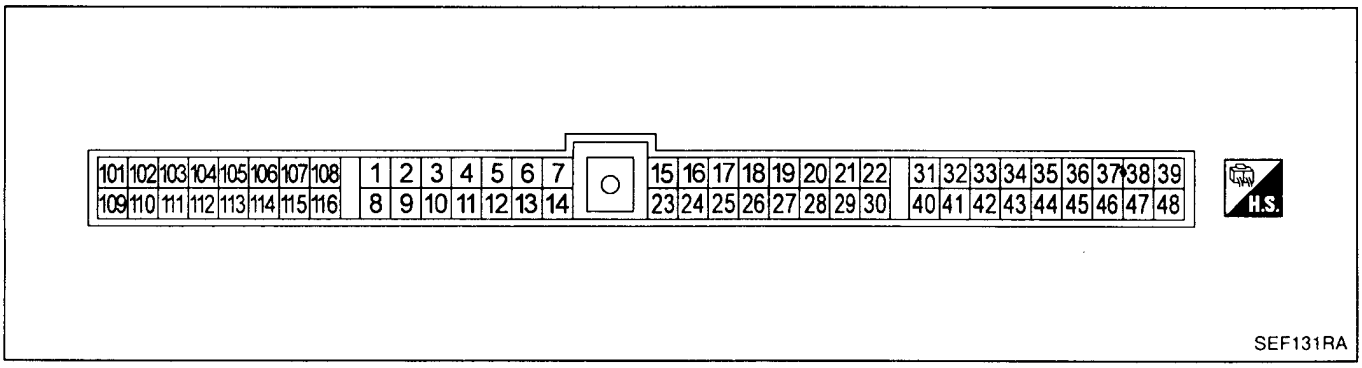


2. Remove ECM harness protector.



3. When checking ECM output voltages, perform all voltage measurements with the connectors connected. Extend tester probe as shown to perform tests easily.

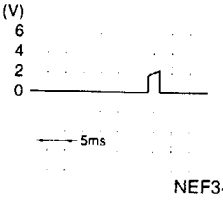
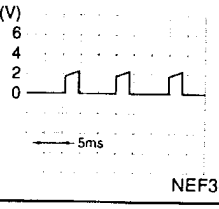
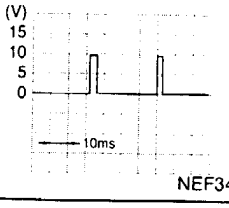
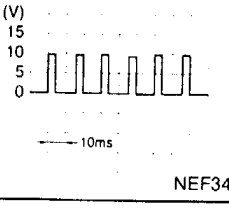
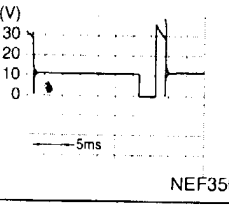
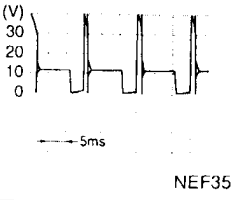
ECM HARNESS CONNECTOR TERMINAL LAYOUT



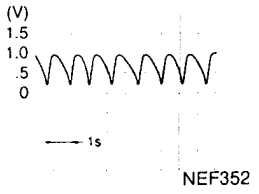
ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

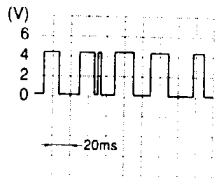
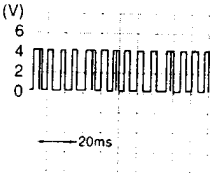
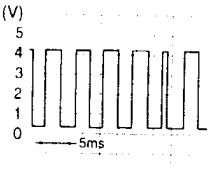
Specification data are reference values and are measured between each terminal and terminal ㊴ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA
1	W/B	Ignition signal	Engine is running. (Warm-up condition) └ Idle speed	0.2 - 0.3V  NEF346
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.7V  NEF347
2	L/B	Tachometer	Engine is running. (Warm-up condition) └ Idle speed	1.0 - 1.3V  NEF348
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 3V  NEF349
3	Y/PU	Ignition check	Engine is running. (Warm-up condition) └ Idle speed	Approximately 13V  NEF350
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 13V  NEF351

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA
4	W/G	ECCS relay (Self-shut-off)	Engine is running. ↓ Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ Following a few seconds delay after turning ignition switch "OFF" and thereafter	BATTERY VOLTAGE (11 - 14V)
6	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
7	G/B	Data link connector for CONSULT	Engine is running. └ Idle speed (DATA MONITOR screen)	Approximately 0V
14	G/W			Approximately 3.5V
15	GY/L			Approximately 3.5V
23	G/R			Approximately 3.5V
9	LG/R	Cooling fan relay	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating.	Approximately 0V
11	G/Y	Air conditioner relay	Engine is running. └ Both A/C switch and blower fan switch are "ON".	Approximately 0V
			Engine is running. └ A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
13	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
16	Y	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.2 - 1.8V
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	1.7 - 2.3V
18	L/OR	Engine coolant temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
19	L/W	Heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V  NEF352

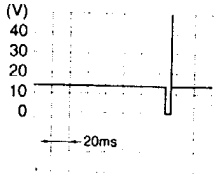
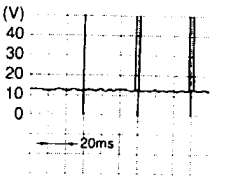
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA
20	R	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
24	OR	Malfunction indicator lamp	Ignition switch "ON"	Approximately 1.5V
			Engine is running.	BATTERY VOLTAGE (11 - 14V)
31 40	L/W	Camshaft position sensor (Reference signal)	Engine is running. (Warm-up condition) └ Idle speed	1.5 - 3.0V  NEF370
			Engine is running. └ Engine speed is 2,000 rpm.	1.5 - 3.0V  NEF371
32	Y/G	Vehicle speed sensor	Ignition switch "ON" ├ Raise the vehicle ├ In 1st gear position └ Vehicle speed is 40 km/h (25 mph).	0 - Approximately 4.2V  NEF357
33	R	Electrical load switch	Engine is running. ├ Rear window defogger is operating. └ Lighting switch is "ON".	BATTERY VOLTAGE (11 - 14V)
			Engine is running. ├ Rear window defogger is not operating. └ Lighting switch is "OFF".	0V
34	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)

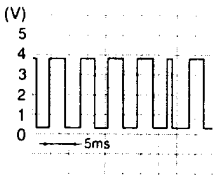
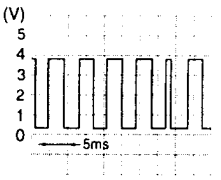
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA
35	G/OR	Neutral position switch	Ignition switch "ON" └ Neutral position	0V
			Ignition switch "ON" └ Except the above gear position	Approximately 5V
37	P/L	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	W/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39 48	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
41	L/W	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower fan switch are "ON".	Approximately 0V
			Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
43	PU/W	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0V
			Engine is running. └ Steering wheel is not being turned.	Approximately 5V
44	B/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
45	LG/B	Blower fan switch	Engine is running. └ Blower fan switch is "ON".	Approximately 0V
			Engine is running. └ Blower fan switch is "OFF".	Approximately 5V
46	W/L	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

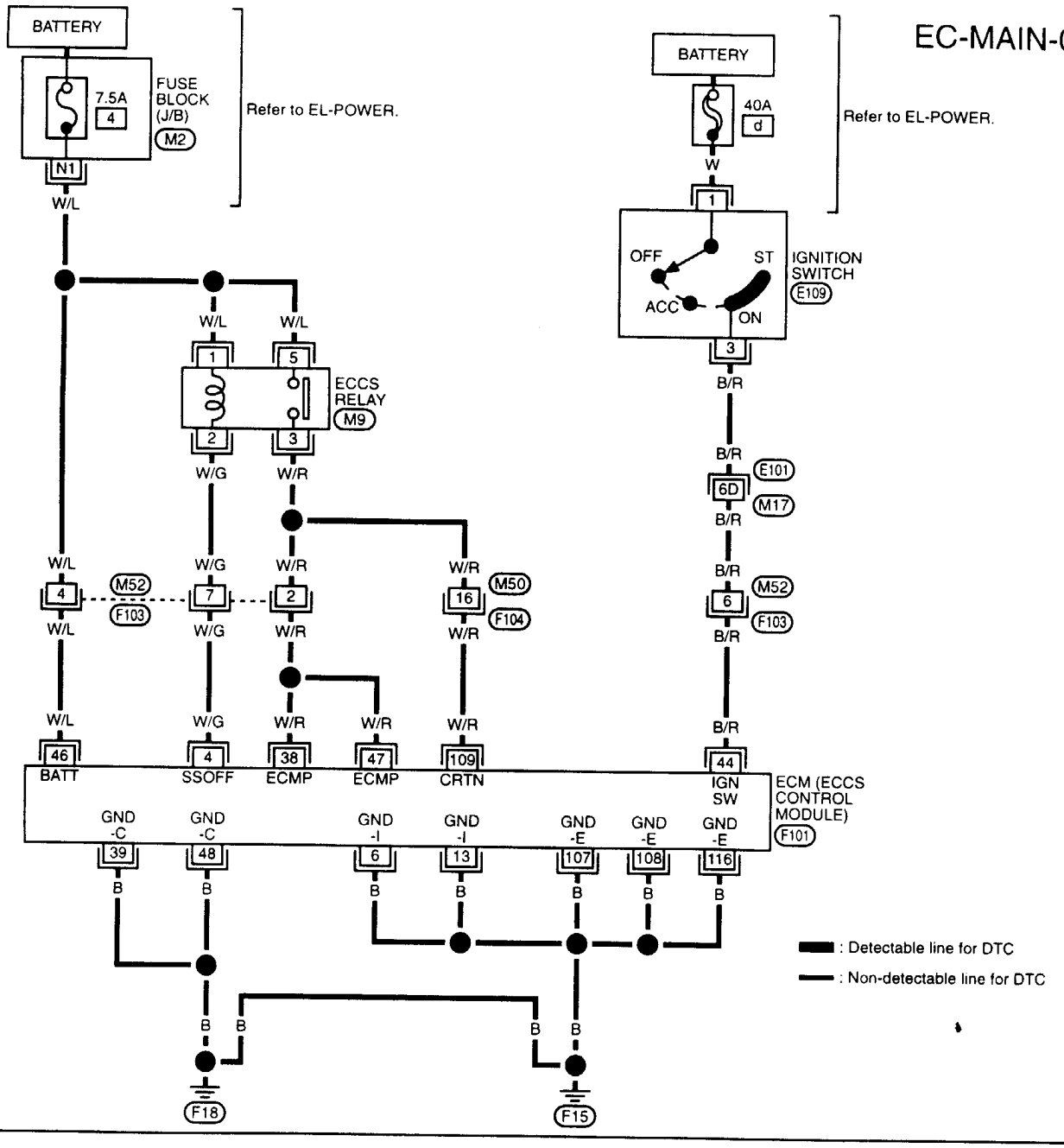
ECM Terminals and Reference Value (Cont'd)

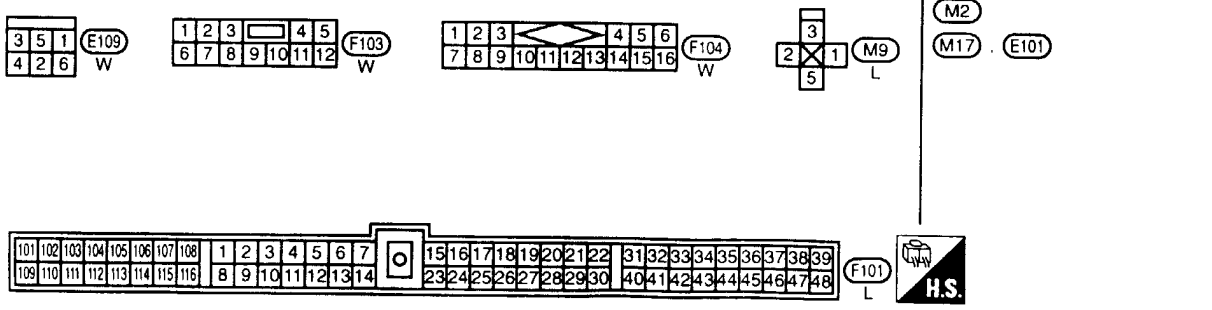
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA
101 103	R/B G/B	Injector No. 1 Injector No. 3	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)  NEF358
110 112	Y/B L/B	Injector No. 2 Injector No. 4	Engine is running. └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)  NEF359
102	R/Y	Heated oxygen sensor heater ground	Engine is running. └ Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Engine speed is below 3,200 rpm.	Approximately 0V
105	P	EGR valve & EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm in 1st position (Raise the vehicle.).	BATTERY VOLTAGE (11 - 14V)
106	B/P	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	Approximately 0.9V
			Ignition switch "ON" └ Following a 5 seconds delay after turning ignition switch "ON" and thereafter	BATTERY VOLTAGE (11 - 14V)
107 108	B	Injector ground	Engine is ground. └ Idle speed	Engine ground

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA
113	SB	IACV-AAC valve	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)  NEF585
			Engine is running. └ Engine speed is 2,000 rpm.	1 - 10V  NEF585
116	B	Injector ground	Engine is running. └ Idle speed	Engine ground

Main Power Supply and Ground Circuit



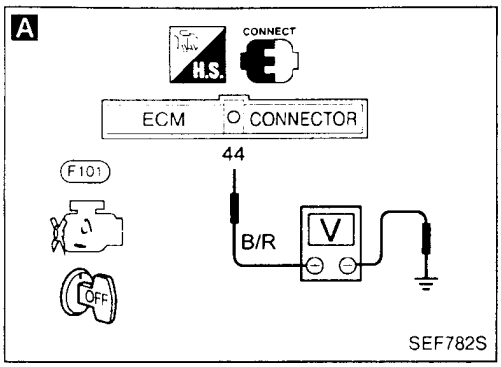


Refer to last page (Foldout page).
M2
M17 . E101

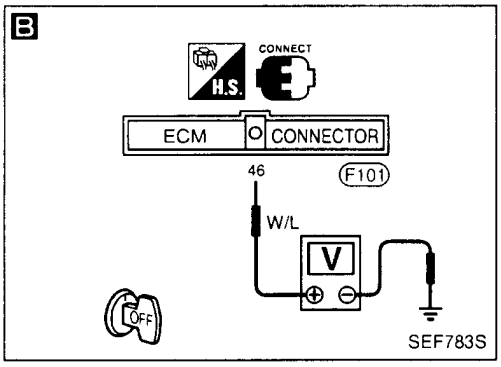
SEF758S

Main Power Supply and Ground Circuit (Cont'd)

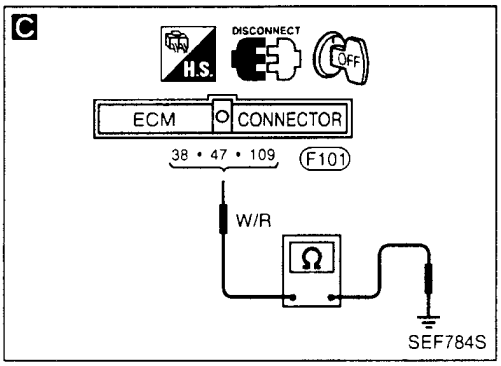
A



B



C



INSPECTION START

Start engine.
Is engine running?

No → A

Yes

A

CHECK POWER SUPPLY-I.
1. Turn ignition switch to "ON" position.
2. Check voltage between ECM connector terminal (44) and ground with CONSULT or tester.
   Voltage: Battery voltage

If NG, check the following:
- 40A fusible link
- Condition and operation of ignition switch
- Harness connectors (F103), (M52)
- Harness connectors (E101), (M17)
- Harness for open or short-circuit between ECM and ignition switch

If NG, replace 40A fusible link or repair ignition switch, harness or connectors.

OK → Go to H "CHECK GROUND CIRCUIT", EC-73.

B

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

NG → Check the following:
- Harness connectors (F103), (M52)
- Harness connector (M2)
- 7.5A fuse
- Harness for open or short-circuit between ECM and battery.

If NG, replace 7.5A fuse or repair harness or connectors.

OK

C

CHECK POWER SUPPLY-III.
1. Turn ignition switch to "ON" and then to "LOCK" position.
2. Check voltage between ECM connector terminals (38), (47), (109) and ground with CONSULT or tester.
   After turning ignition switch to "LOCK" position, battery voltage will exist for a few seconds, then drop to approximately 0V.

OK → Go to H "CHECK GROUND CIRCUIT", EC-73.

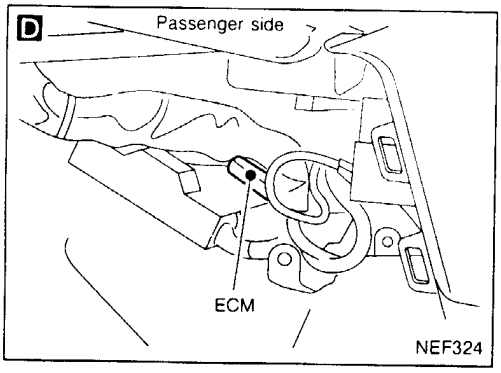
NG

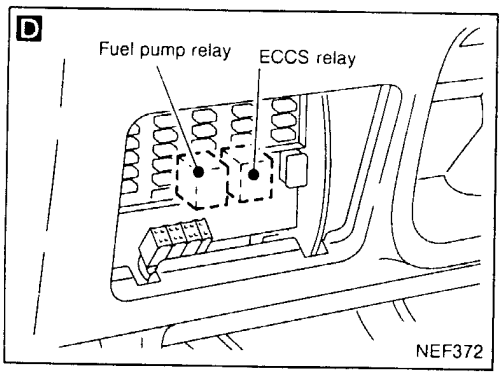
Case-1 → Ⓐ

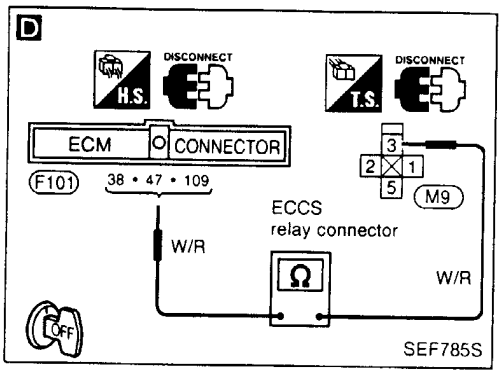
Case-2 → Go to G "CHECK ECCS RELAY", EC-73.

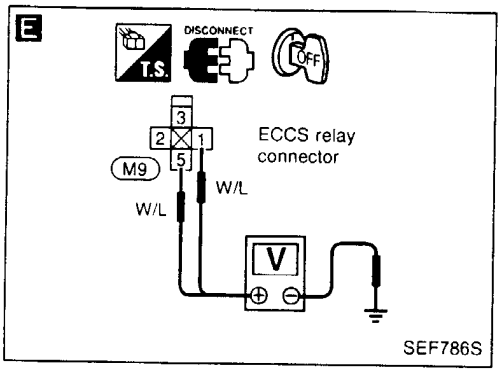
Case-1: Battery voltage does not exist for a few seconds.
Case-2: Battery voltage exists for more than a few seconds.

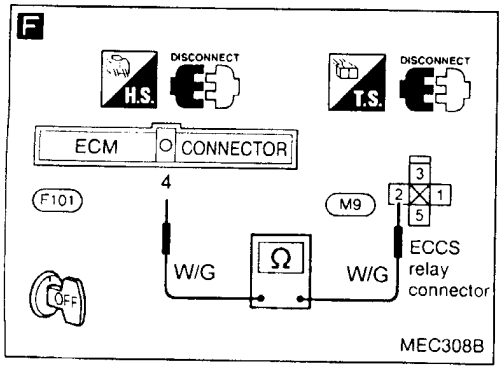
Main Power Supply and Ground Circuit (Cont'd)











Ⓐ

D

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.
1. Disconnect ECM harness connector.
2. Disconnect ECCS relay.
3. Check harness continuity between ECM connector terminals (38), (47), (109) and ECCS relay connector terminal (3).
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness connectors (M52), (F103)
- Harness for open or short-circuit between ECM and ECCS relay.

If NG, repair harness or connectors.

OK ↓

E

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.
Check voltage between ECCS relay connector terminals (1), (5) and ground with CONSULT or voltage tester.
Voltage: Battery voltage

NG → Repair harness or connectors.

OK ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
Check harness continuity between ECM connector terminal (4) and ECCS relay connector terminal (2).
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M52), (F103)
- Harness for open or short-circuit between ECM and ECCS relay.

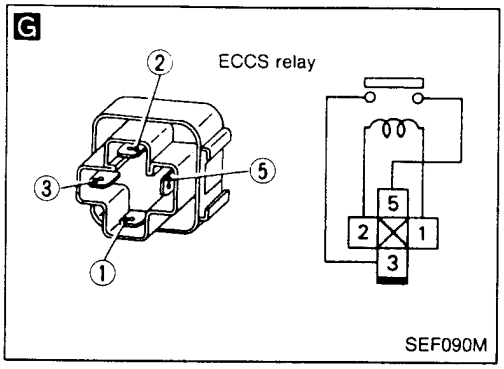
If NG, repair harness or connectors.

OK ↓

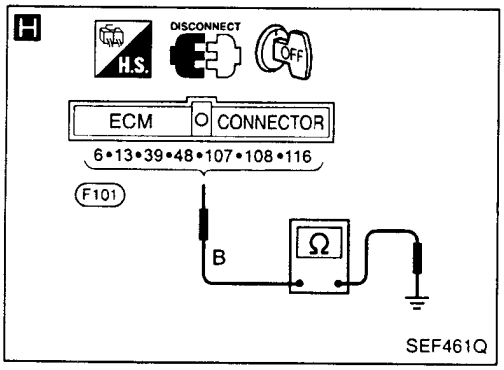
Ⓑ

Main Power Supply and Ground Circuit (Cont'd)

G



H



Ⓑ

G

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

NG → Replace ECCS relay.

OK

H

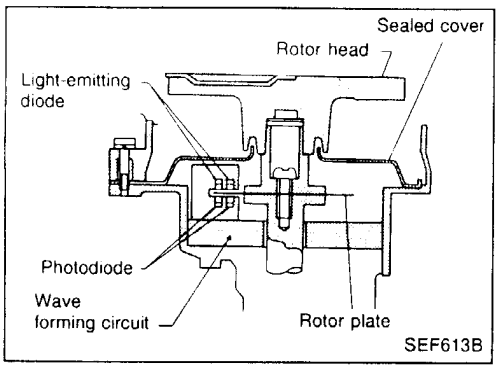
CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM connector terminals ⑥, ⑬, ㊴, ㊽, (107), (108), (116) and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

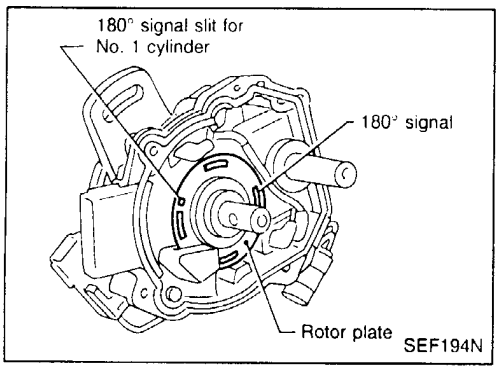
NG → Repair harness or connectors.

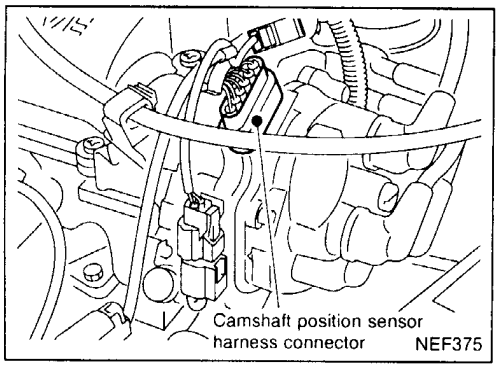
OK

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

INSPECTION END







Camshaft Position Sensor (CMPS)

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

The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 4 slits for a 180° (REF) signal. The wave-forming circuit consists of Light-emitting Diodes (LED) and photodiodes.

The rotor plate is positioned between the LED and the photo diode. The LED transmits light to the photodiode. 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).

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
11	• 180° signal is not sent to ECM for the first few seconds during engine cranking. • The pulse width of 180° signal is smaller than the specified value.	• Harness or connectors (The camshaft position sensor circuit is open or short-circuited.) • Camshaft position sensor • Starter motor (Refer to EL section.) • Starting system circuit (Refer to EL section.) • Dead (Weak) battery

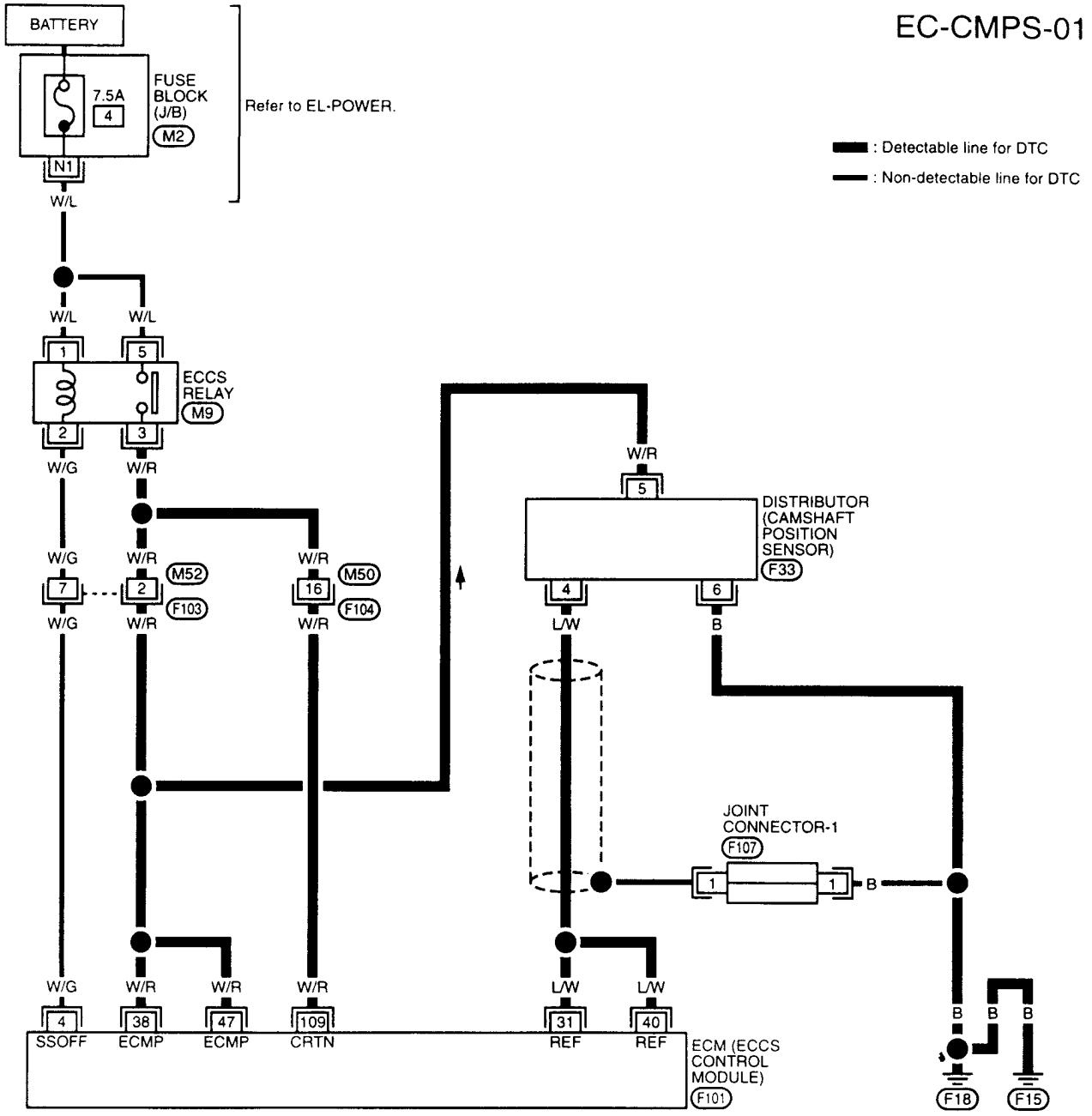
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

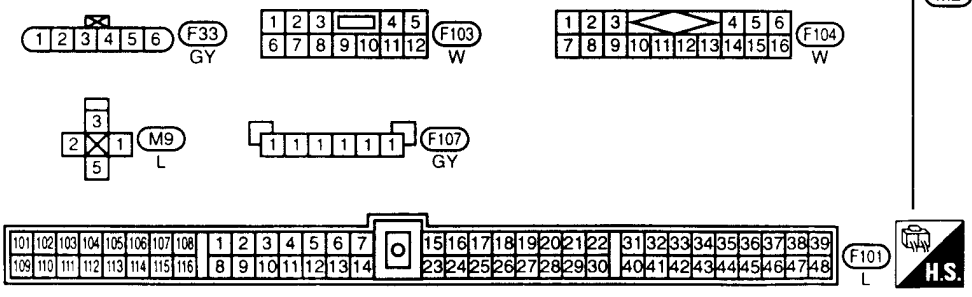
OR

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

EC-CMPS-01



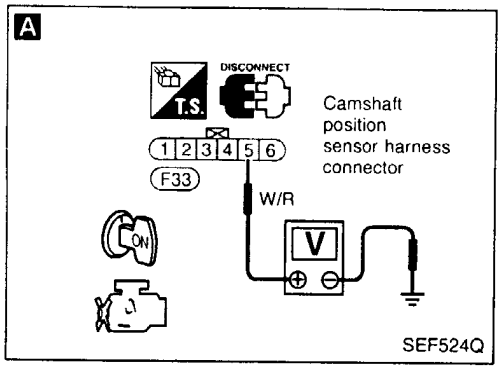
Refer to last page (Foldout page).

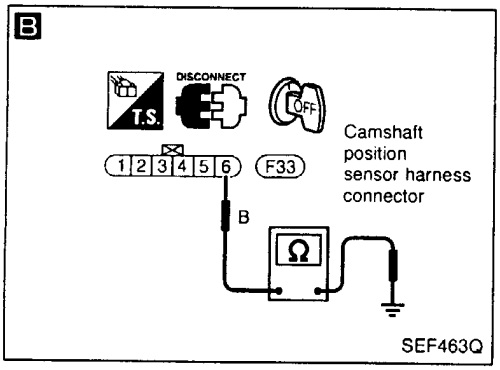


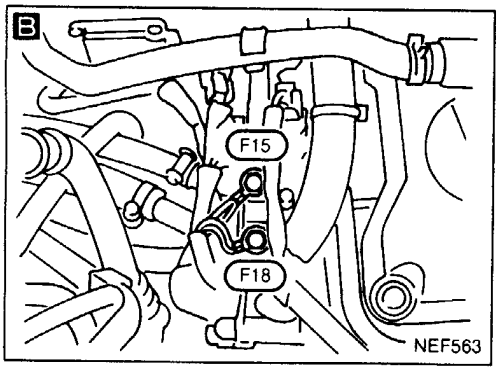
SEF759S

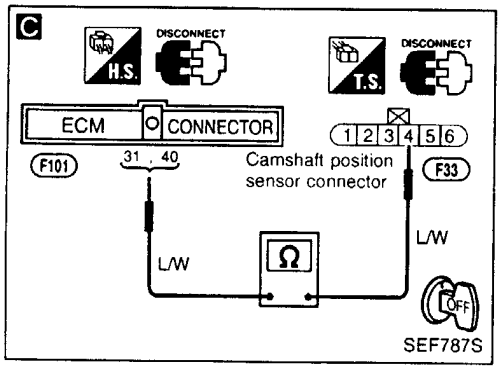
Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

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

NG → Check the following:
- 7.5A fuse in fuse block
- Operation of ECCS relay.
- Harness connectors (M52), (F103)
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between camshaft position sensor and ECCS relay.
- Harness for open or short-circuit between camshaft position sensor and ECM

Harness for open or short-circuit between ECCS relay and battery power supply.
If NG, replace 7.5A fuse or ECCS relay, or repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between camshaft position sensor connector terminal ⑥ and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between camshaft position sensor connector terminal ④ and ECM connector terminals ㉛ & ㊵.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace camshaft position sensor.

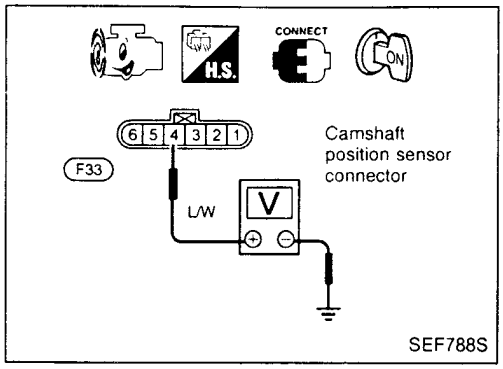
OK ↓

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

Trouble is not fixed. ↓

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

INSPECTION END

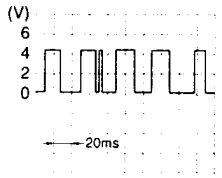
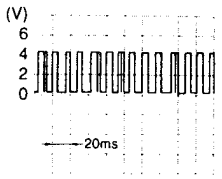


Camshaft Position Sensor (CMPS) (Cont'd)

COMPONENT INSPECTION

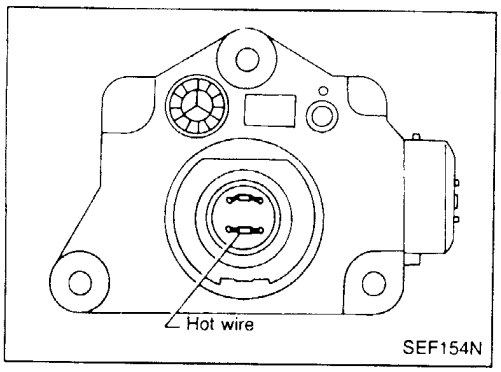
Camshaft position sensor

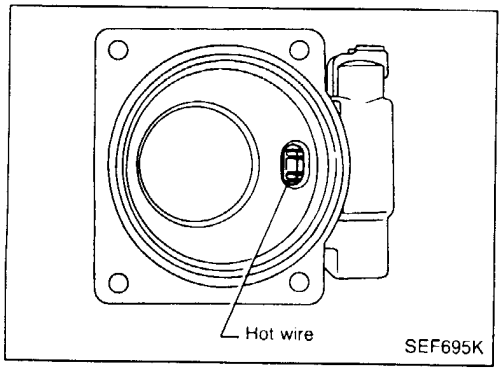
1. Start engine.
2. Check voltage between camshaft position sensor connector terminal ④ and ground with DC range or check pulse signal with oscilloscope under the following conditions:

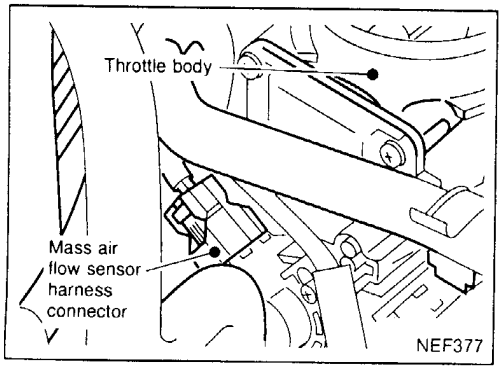
Condition	Idle	2,000 rpm
Voltage	1.5 - 3.0V	1.5 - 3.0V
Pulse signal	 NEF370	 NEF371

3. If NG, replace distributor assembly with camshaft position sensor.

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







Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the intake air flow rate by analysing a part of the entire flow. Measurements from the mass air flow sensor are received by the ECM as an electrical input signal which has a voltage level proportional to the amount of heat emitted from the hot wire placed in the stream of the intake air.

When intake air flows into the intake manifold through a route around the hot wire, the heat generated from the hot wire is convected away by the air. The intensity of heat detected depends on the volume of air flow and in addition, current compensation is introduced so that the temperature of the hot wire is automatically controlled within a limited range °C (°F).

Therefore, when the volume of the air flow is increased it is necessary to supply the hot wire with more electric current in order to maintain the temperature of the hot wire. This enables the ECM to determine the volume of the air flow by means of the electric change.

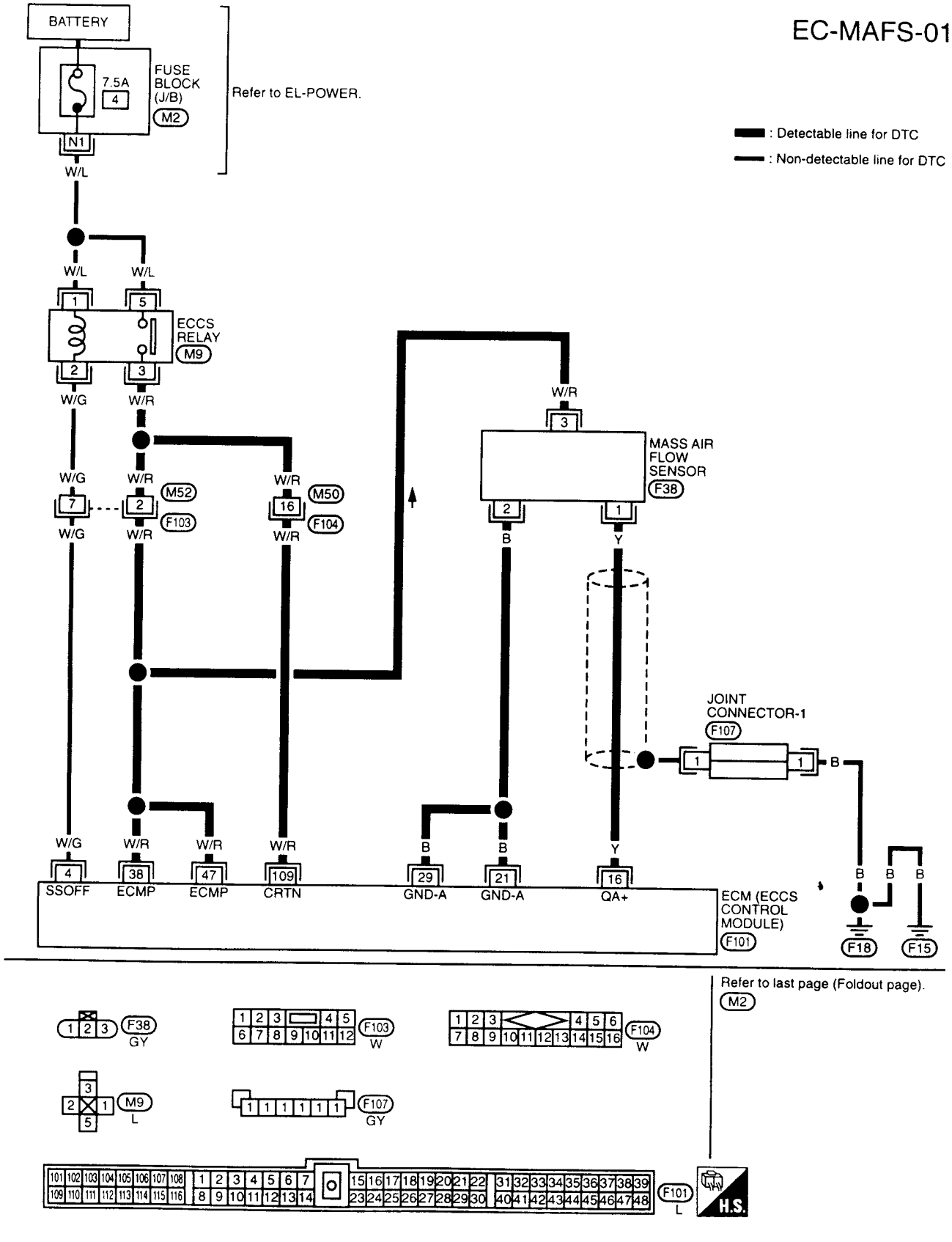
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
12	• An excessively high or low voltage from the mass air flow sensor is entered to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

OR

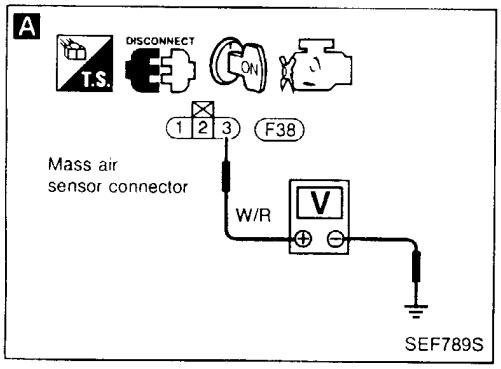
1) Turn ignition switch to "ON" position, and wait at least 6 seconds.
2) Start engine and wait at least 3 seconds.
3) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

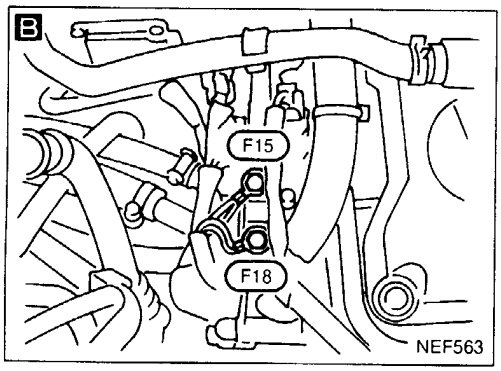

EC-MAFS-01
: Detectable line for DTC
: Non-detectable line for DTC
BATTERY
FUSE BLOCK (J/B) M2
7.5A 4
Refer to EL-POWER.
N1
W/L
ECCS RELAY M9
MASS AIR FLOW SENSOR F38
JOINT CONNECTOR-1 F107
M52
F103
M50
F104
SSOFF
ECMP
ECMP
CRTN
GND-A
GND-A
QA+
ECM (ECCS CONTROL MODULE) F101
F18
F15
Refer to last page (Foldout page).
M2
F38 GY
F103 W
F104 W
M9 L
F107 GY
F101 L
H.S.

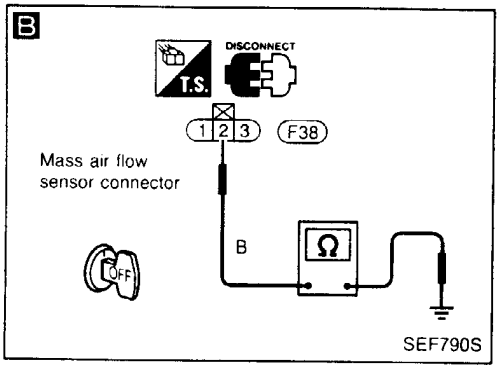
SEF760S

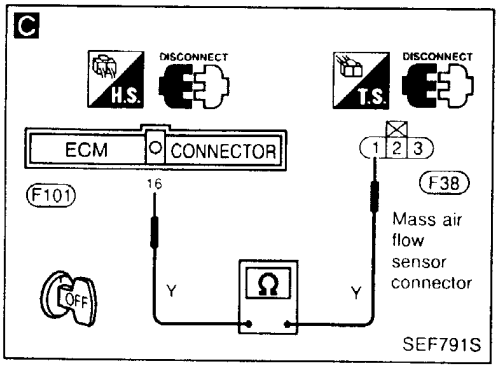
Mass Air Flow Sensor (MAFS) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

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

NG → Check the following:
- 7.5A fuse in fuse block
- Operation, of ECCS relay.
- Harness connectors (M52), (F103)
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between mass air flow sensor and ECCS relay.
- Harness for open or short-circuit between mass air flow sensor and ECM.
- Harness for open or short-circuit between ECCS relay and battery power supply.

If NG, replace 7.5A fuse or ECCS relay or repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between mass air flow sensor connector terminal ② and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between mass air flow sensor connector terminal ① and ECM connector terminal ⑯.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace mass air flow sensor.

OK ↓

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

Trouble is not fixed. ↓

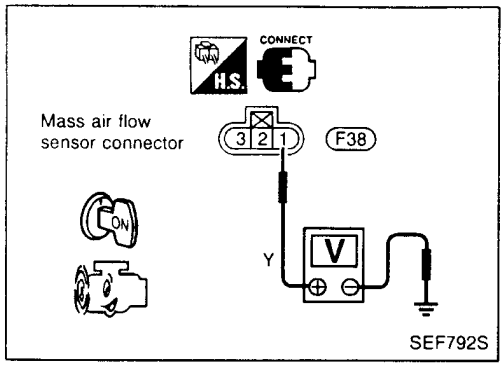
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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

COMPONENT INSPECTION

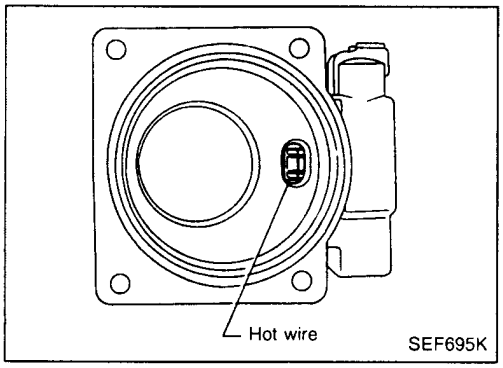
Mass air flow sensor

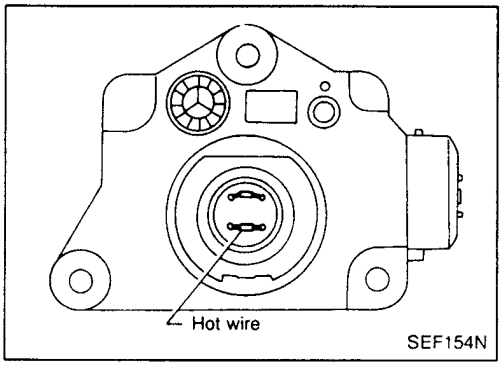


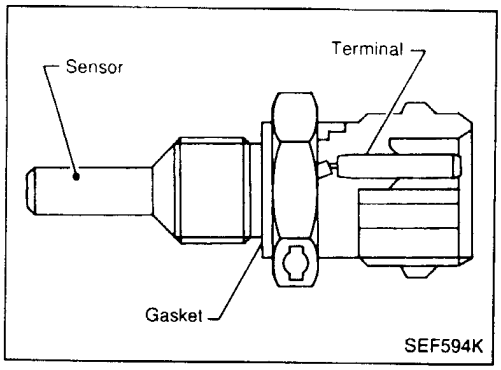
1. Turn ignition switch to "ON" position.
2. Start engine and warm it up sufficiently.
3. Check voltage between mass air flow sensor connector terminal ① and ground.

Conditions	Voltage V
Ignition switch "ON" position (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up sufficiently.)	1.2 - 1.8

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

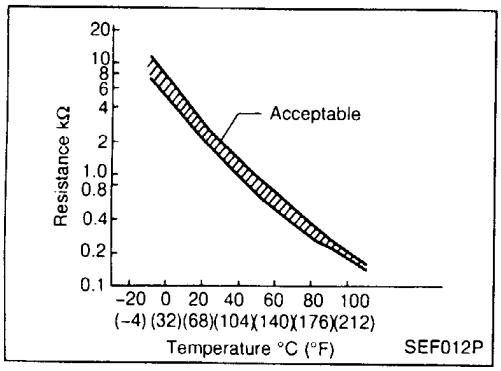






Engine Coolant Temperature Sensor (ECTS)

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



〈Reference data〉

Engine coolant temperature °C (°F)	Voltage (V)	Resistance (kΩ)
−10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.6 - 1.0
90 (194)	0.9	0.23 - 0.26

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

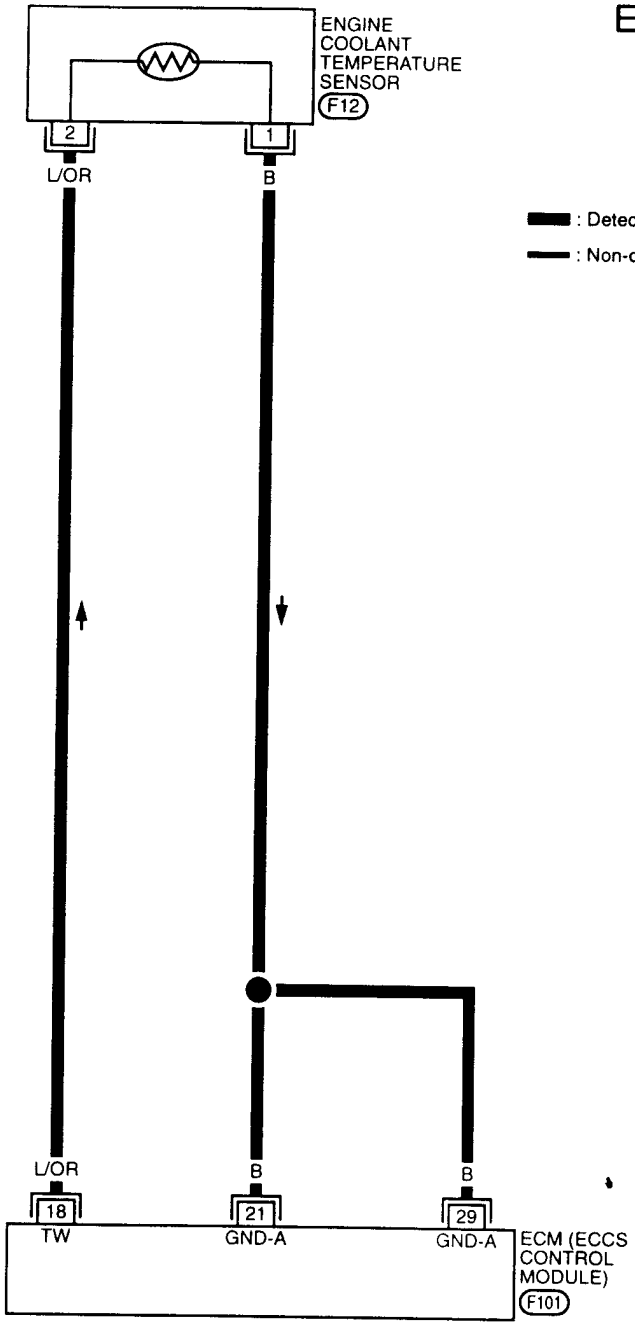
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

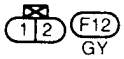
OR

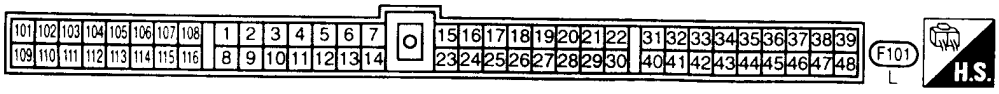
1) Turn ignition switch to "ON" position and wait at least 5 seconds.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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

EC-ECTS-01



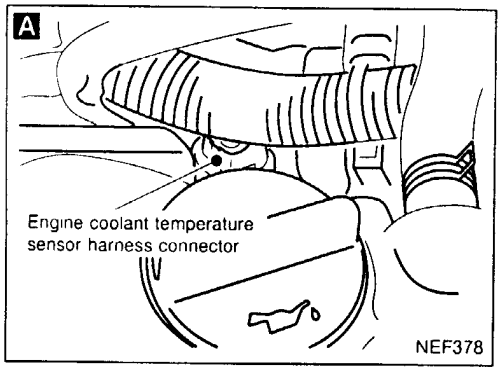


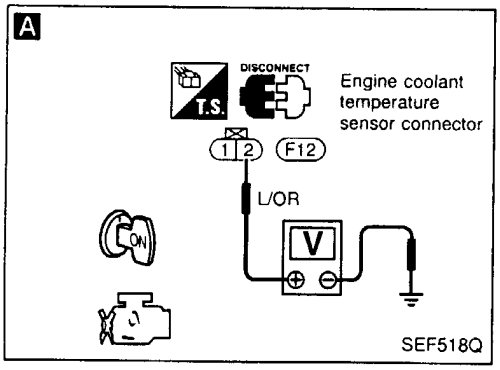


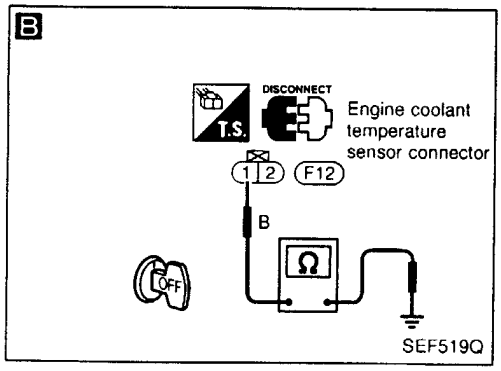
SEF761S

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

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

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between engine coolant temperature sensor connector terminal ① and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

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

If NG, repair harness or connectors.

OK ↓

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

NG → Replace engine coolant temperature sensor.

OK ↓

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

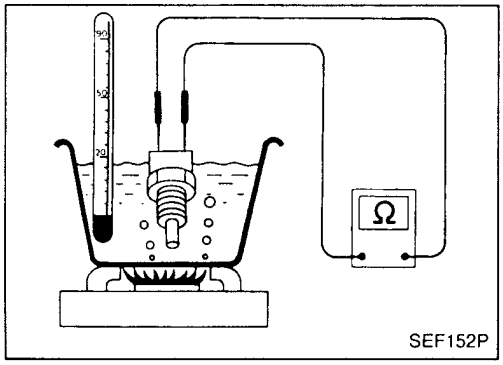
Trouble is not fixed. ↓

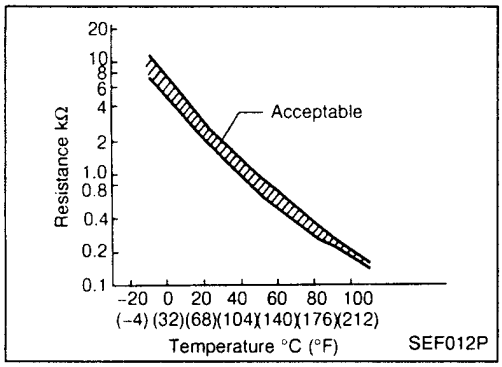
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

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





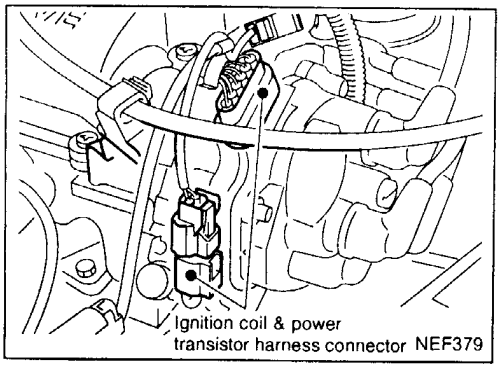
COMPONENT INSPECTION

Engine coolant temperature sensor

Check resistance as shown in the figure.

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 coil is built into the distributor. The ignition signal from the ECM is sent to the power transistor. The power transistor switches the ignition coil primary circuit on and off. As the primary circuit is turned on and off, the required high voltage is induced in the coil of the secondary circuit.

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC 11 and 21 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 11 first. Refer to EC-74.

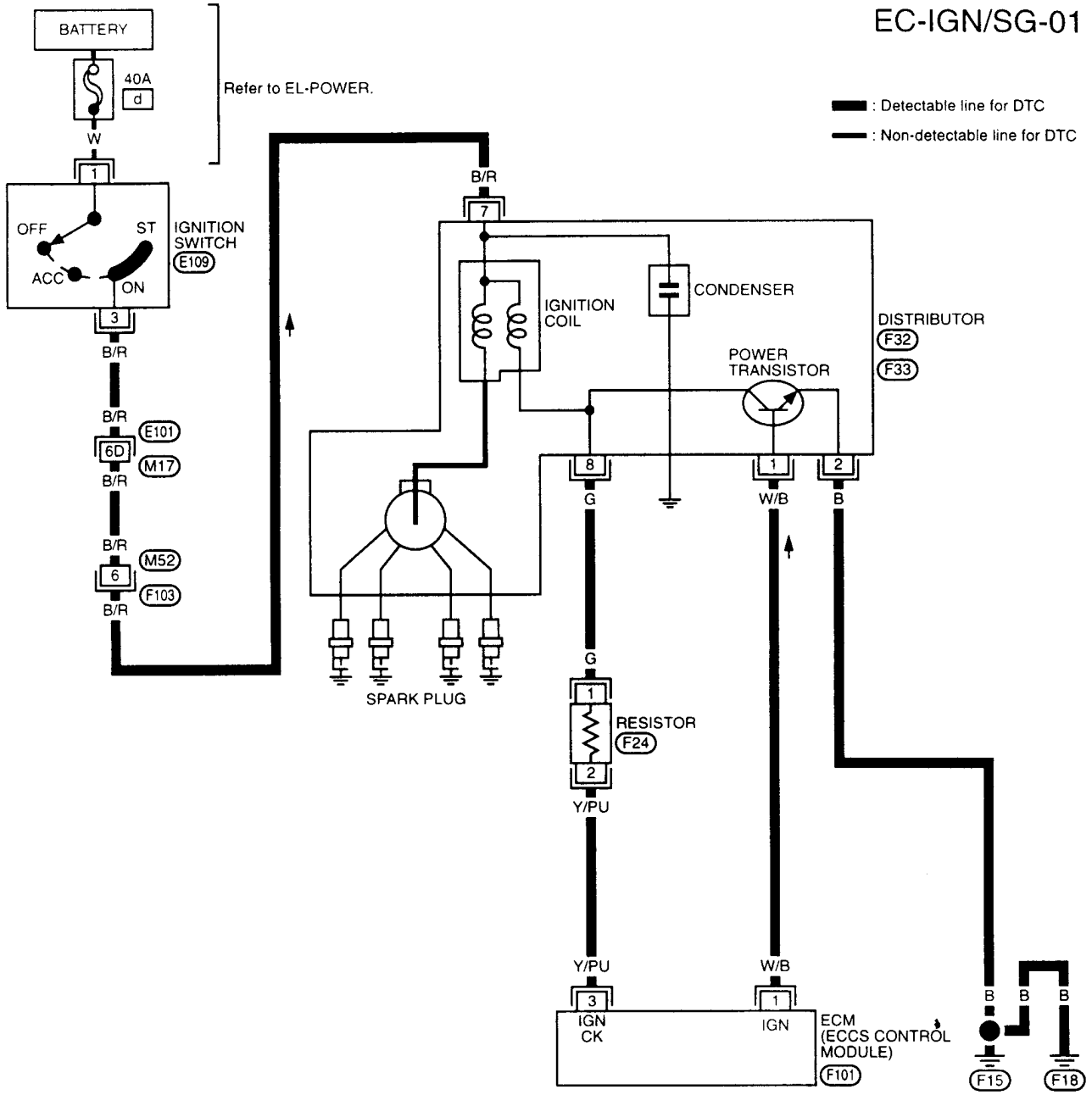
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine.

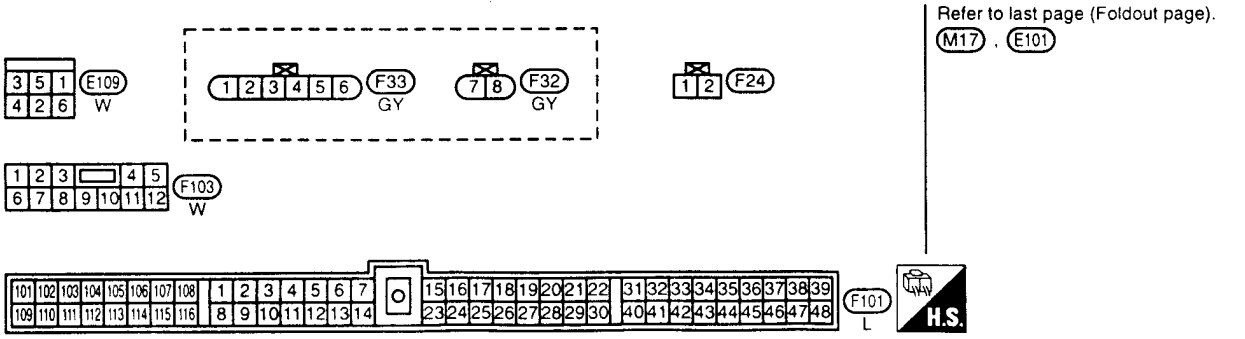
OR

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

Ignition Signal (Cont'd)

EC-IGN/SG-01



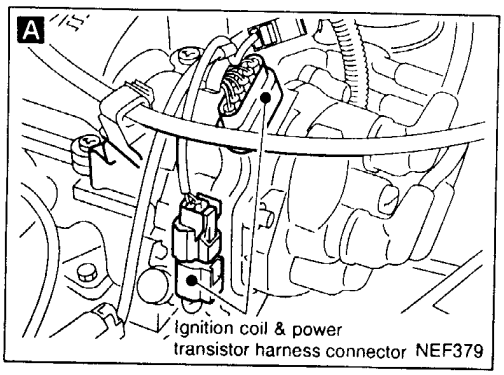


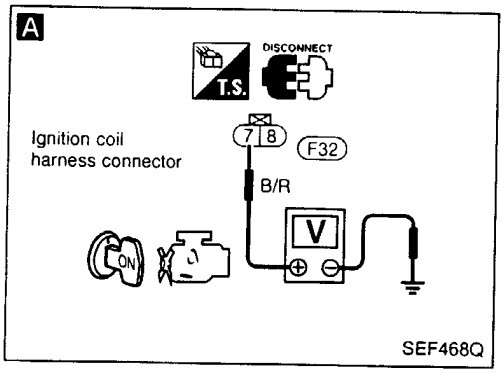
Refer to last page (Foldout page).
M17 , E101

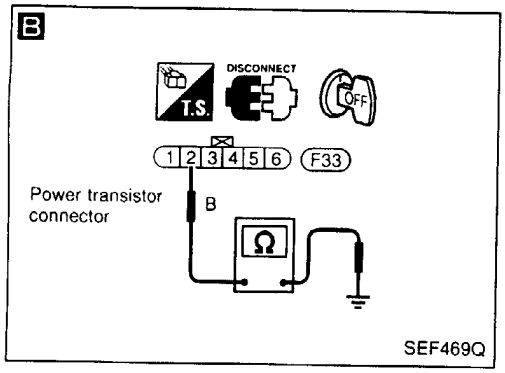
SEF762S

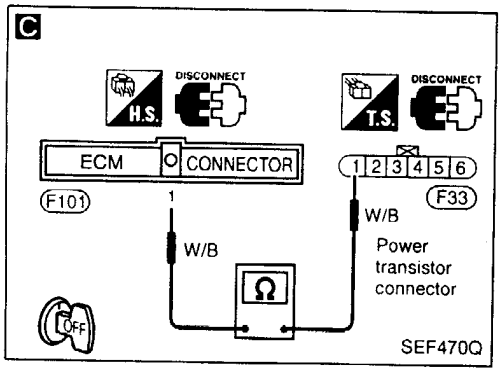
Ignition Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

Turn ignition switch to "LOCK" position, and restart engine.
Is engine running?

Yes → Ⓐ

No

A

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

NG → Check the following:
- 40A fusible link.
- Condition and operation of ignition switch.
- Harness continuity between battery power supply and ignition switch.
- Harness connectors (E101), (M17)
- Harness connectors (M52), (F103)
- Harness for open or short-circuit between ignition coil and ignition switch.

If NG, replace 40A fusible link or repair ignition switch harness or connectors.

OK

B

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

NG → Repair harness or connectors.

OK

C

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

NG → Repair harness or connectors.

OK

CHECK COMPONENTS
(Ignition coil, power transistor).
Refer to "COMPONENT INSPECTION", EC-90.

NG → Replace malfunctioning component(s).

OK

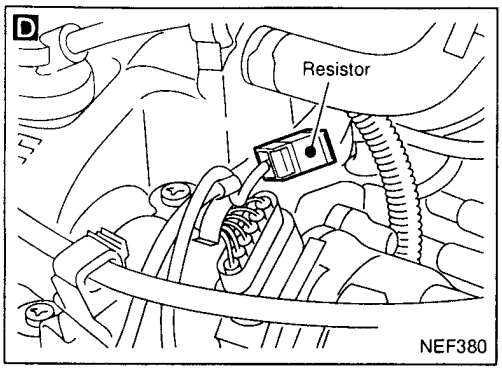
Disconnect and reconnect harness connectors in the circuit. Then retest.

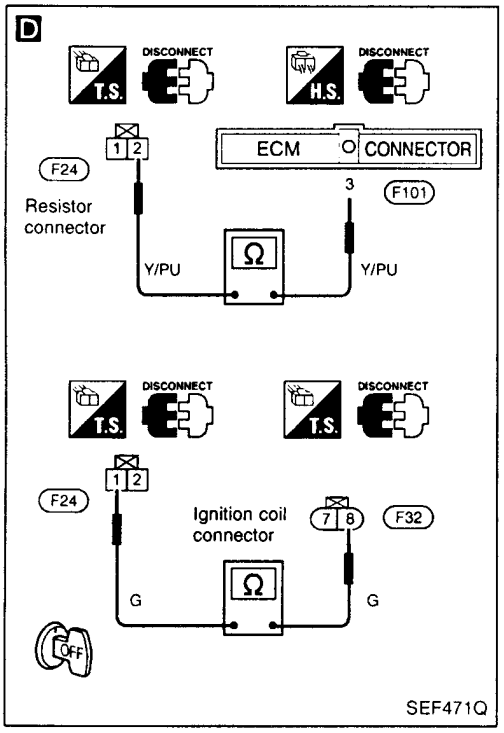
Trouble is not fixed.

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

INSPECTION END

Ignition Signal (Cont'd)





Ⓐ

D

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

NG → Repair harness or connectors.

OK ↓

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

NG → Replace resistor.

OK ↓

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

Trouble is not fixed. ↓

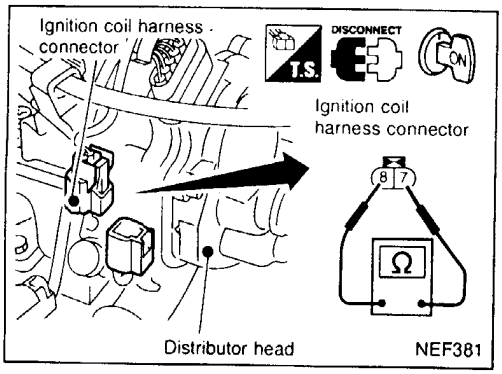
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Ignition Signal (Cont'd)

COMPONENT INSPECTION



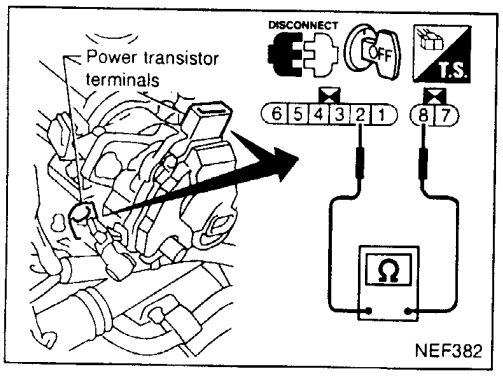
Ignition coil

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

Terminal	Resistance [at 25°C (77°F)]
⑦ - ⑧ (Primary coil)	Approximately 1 Ω
⑦ - secondary terminal on distributor head (Secondary coil)	Approximately 10 kΩ

If NG, replace ignition coil.

3. For checking secondary coil, remove distributor cap.
4. Check resistance between ignition coil harness connector terminal ⑦ and the secondary terminal on the distributor head.
   If NG, replace distributor.

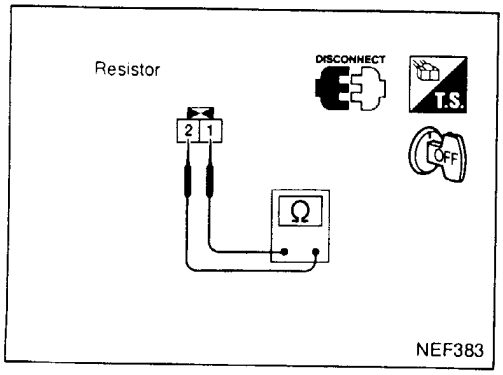


Power transistor

1. Disconnect power transistor harness connector.
2. Check power transistor resistance between terminals ② and ⑧.

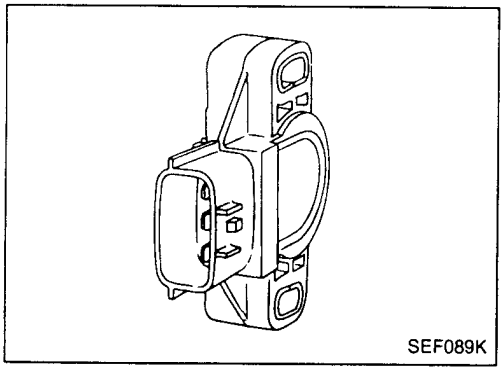
Terminals	Resistance	Result
② and ⑧	Not 0Ω	OK
	0Ω	NG

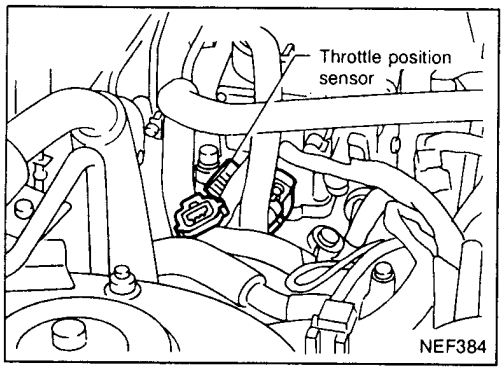
If NG, replace distributor.



Resistor

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

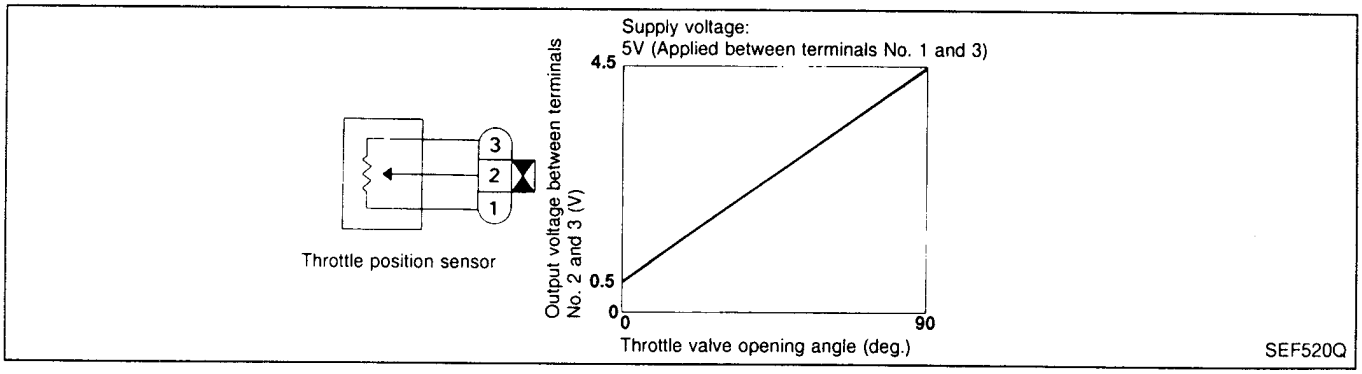

SEF089K



Throttle Position Sensor

The throttle position sensor responds to the accelerator pedal movement. This sensor is a potentiometer which converts the throttle position into a proportional output voltage, which is then used as an input voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and so also feeds the rate of change in voltage signal to the ECM.

Idle position of the throttle valve is determined by the ECM based upon the signal received from the throttle position sensor and also controls engine operation such as fuel cut.

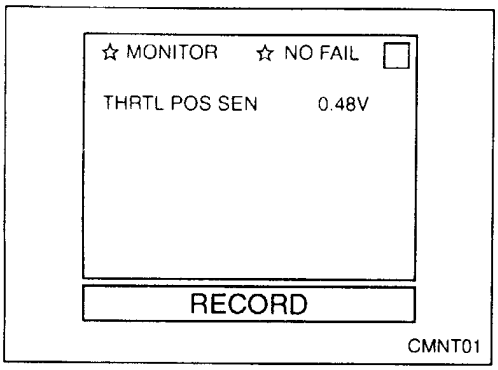


Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
43	• An excessively low or high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Throttle position sensor

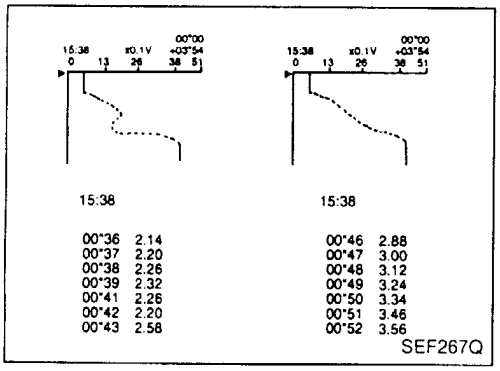
Throttle Position Sensor (Cont'd)

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.

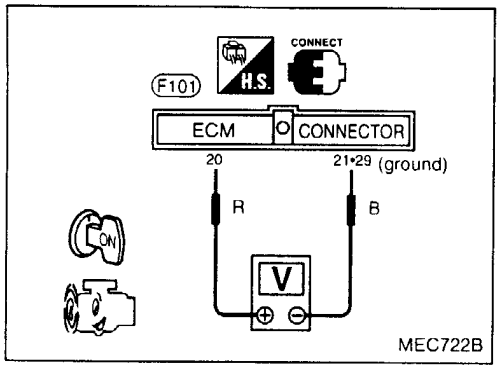


1) Turn ignition switch to "ON" position.
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
3) Select "THRTL POS SEN" in "DATA MONITOR" mode with CONSULT.
4) Press RECORD on CONSULT SCREEN at the same time the accelerator pedal is depressed.
5) Print out the recorded data and check the following:
   - The voltage when accelerator pedal is fully released is approximately 0.35 - 0.65V.
   - The voltage rise is linear in response to accelerator pedal depression.
   - The voltage when accelerator pedal is fully depressed is approximately 4V.



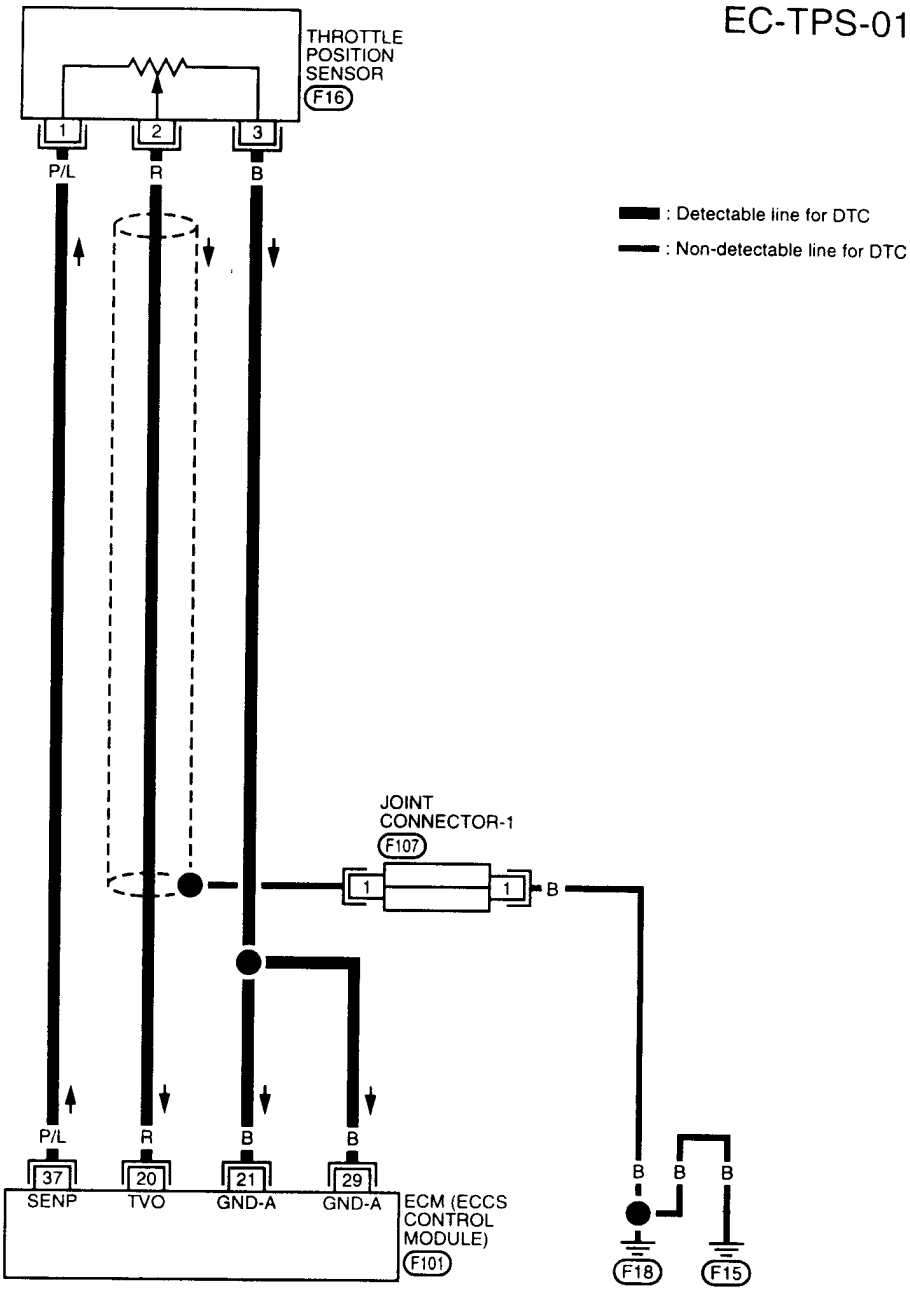
OR

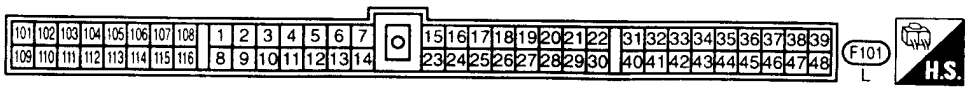
1) Turn ignition switch to "ON" position.
2) Check the voltage between ECM connector terminals ⑳ and ㉑, ㉙ (ground) and check the following:
   - The voltage when accelerator pedal is fully released is approximately 0.35 - 0.65V.
   - The voltage rise is linear in response to accelerator pedal depression.
   - The voltage when accelerator pedal is fully depressed is approximately 4V.



Throttle Position Sensor (Cont'd)

EC-TPS-01

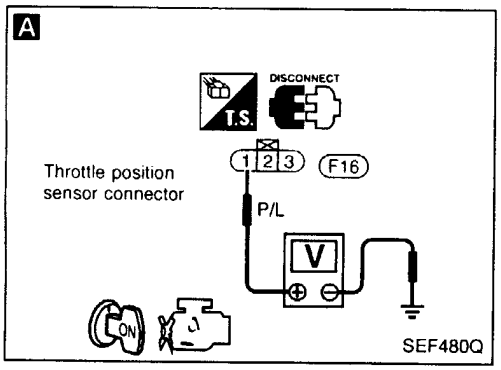


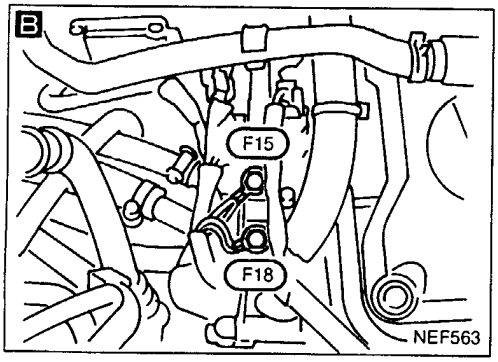


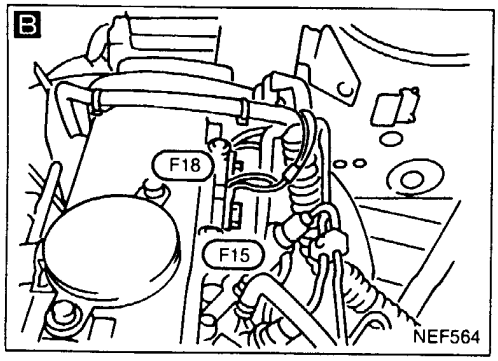
SEF763S

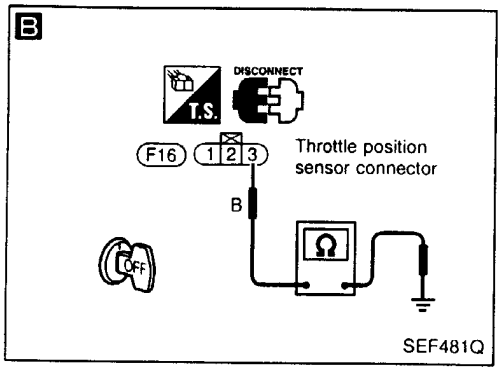
Throttle Position Sensor (Cont'd)

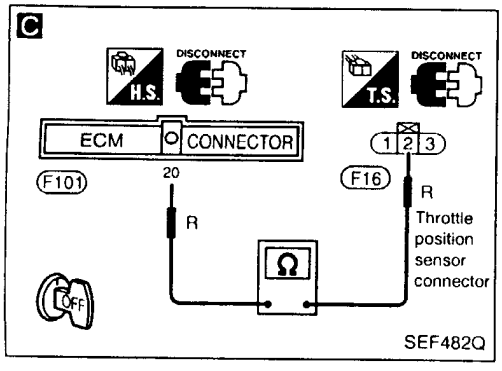
DIAGNOSTIC PROCEDURE











INSPECTION START

A

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

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between throttle position sensor connector terminal ③ and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

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

If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ⑳ and throttle position sensor connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

ADJUST THROTTLE POSITION SENSOR.
Perform "Basic Inspection", EC-53.

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

NG → Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-53.

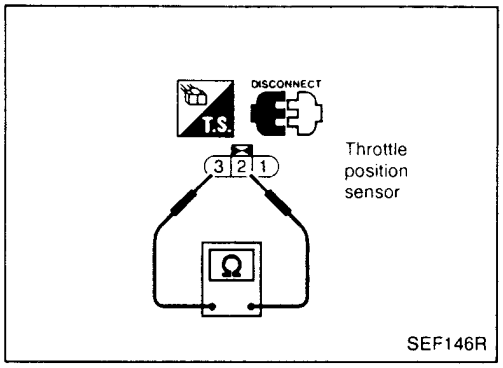
OK

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



Throttle Position Sensor (Cont'd)

COMPONENT INSPECTION

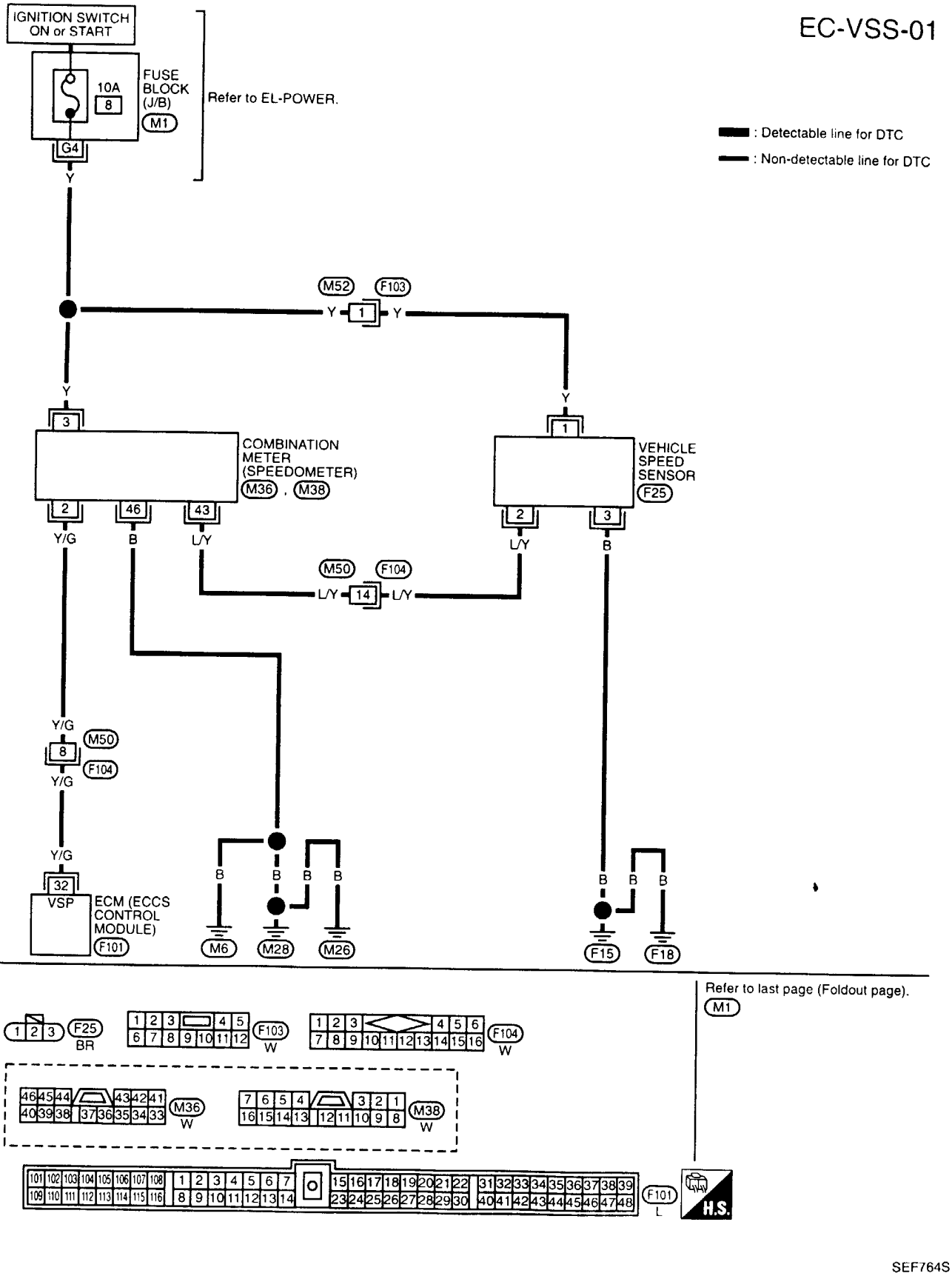
Throttle position sensor

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

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

If NG, replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-53.

Vehicle Speed Sensor (VSS)



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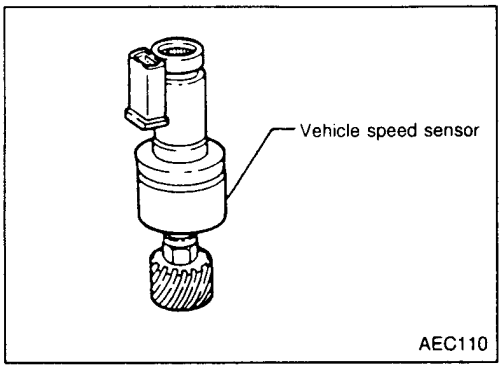
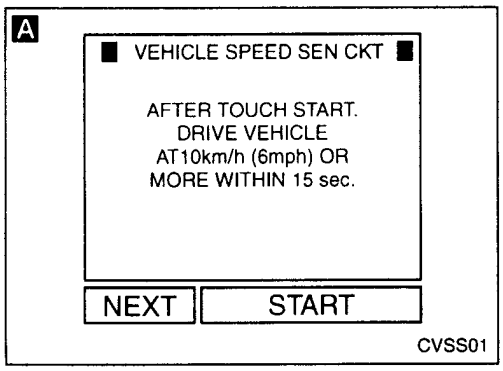
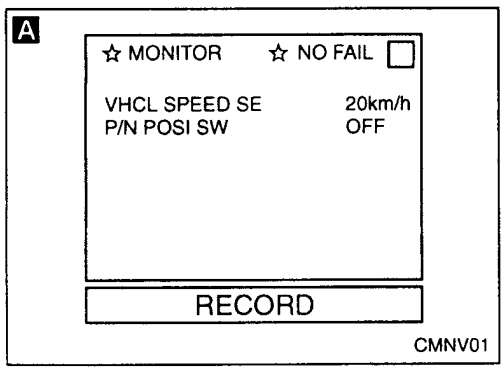
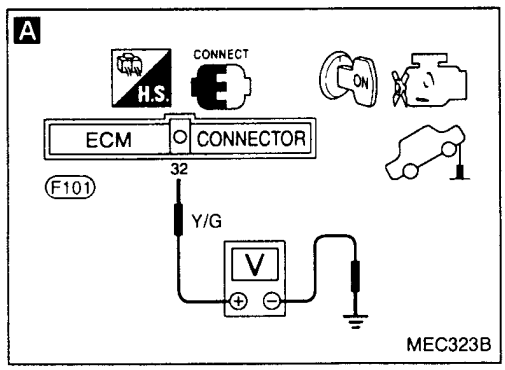
Vehicle Speed Sensor (VSS) (Cont'd)

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









DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OK → INSPECTION END

OR

2. Read "VHCL SPEED SE" signal in "DATA MONITOR" mode with CONSULT.

CONSULT value should be the same as the speedometer indication.

OR

2. Turn ignition switch to "ON" position.
3. Rotate drive wheel by hand.
4. Check voltage between ECM connector terminal (32) and body ground.

Voltage should vary between approx. 0 - 4.2V.

NG

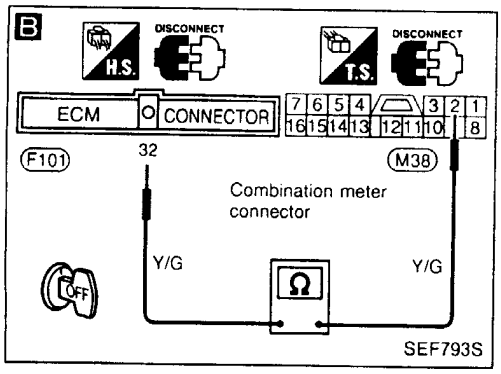
CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check vehicle speed sensor and circuit. (Refer to "Inspection/ Speedometer and Vehicle Speed Sensor" of "METER AND GAUGES" in EL section.)

OK

Ⓐ

Vehicle Speed Sensor (VSS) (Cont'd)



Ⓐ

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM connector terminal (32) and combination meter connector terminal (2).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and combination meter.

If NG, repair harness or connectors.

OK ↓

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

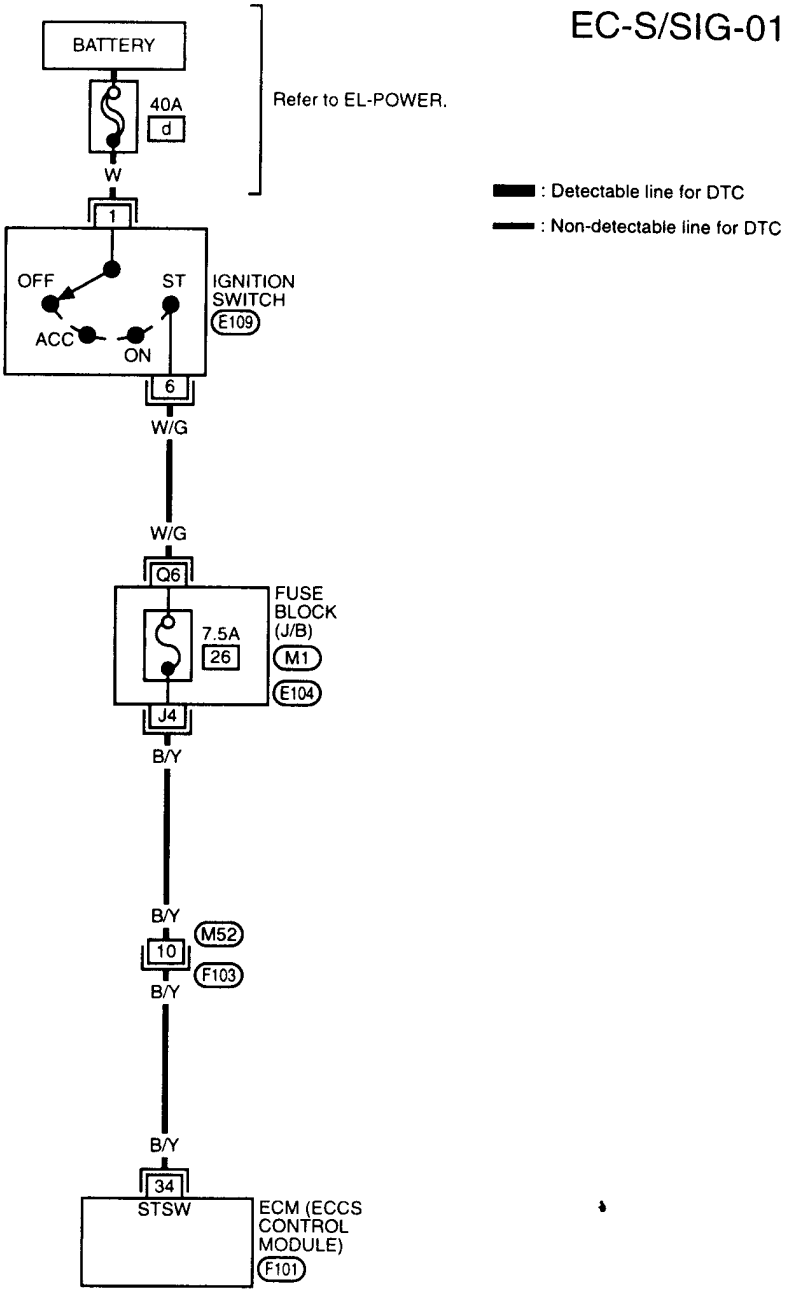
Trouble is not fixed. ↓

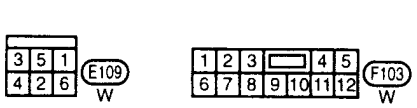
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

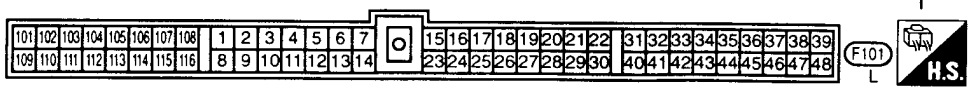
↓

INSPECTION END

Start Signal







Refer to last page (Foldout page).
M1 , E104

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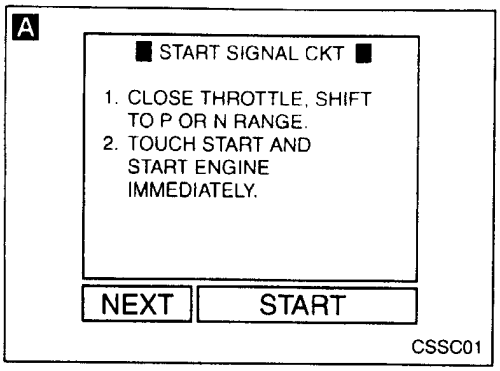
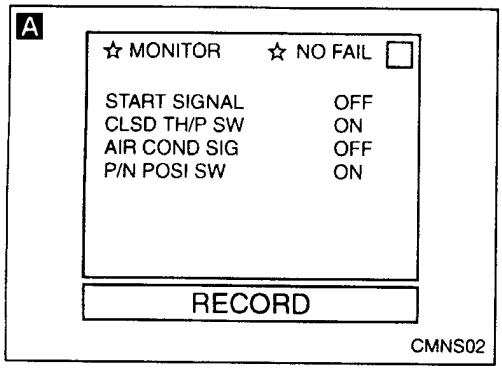
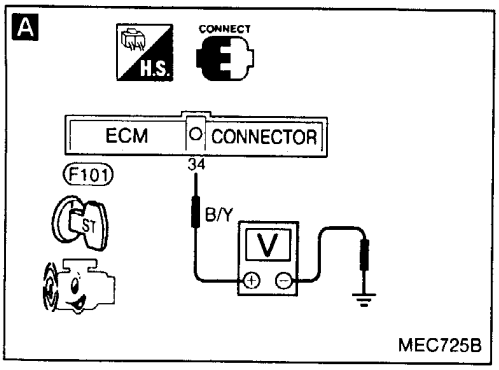
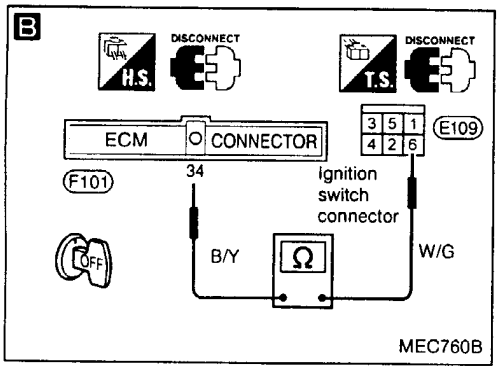
Start Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OK → INSPECTION END

OR

2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1. Turn ignition switch to "START" position.
2. Check voltage between ECM connector terminal (34) and ground.

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

NG

Check if 7.5A fuse,40A fusible link and operation of ignition switch is OK.

NG → Replace 7.5A fuse or 40A fusible link, or repair ignition switch.

OK

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and ignition switch harness connector.
3. Check harness continuity between ECM connector terminal (34) and ignition switch connector terminal (6).

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

NG → Check the following:
- Harness connectors (M52), (F103)
- Harness connectors (M1), (E104)
- Harness for open or short-circuit between ECM and ignition switch.

If NG, repair harness or connectors.

OK

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

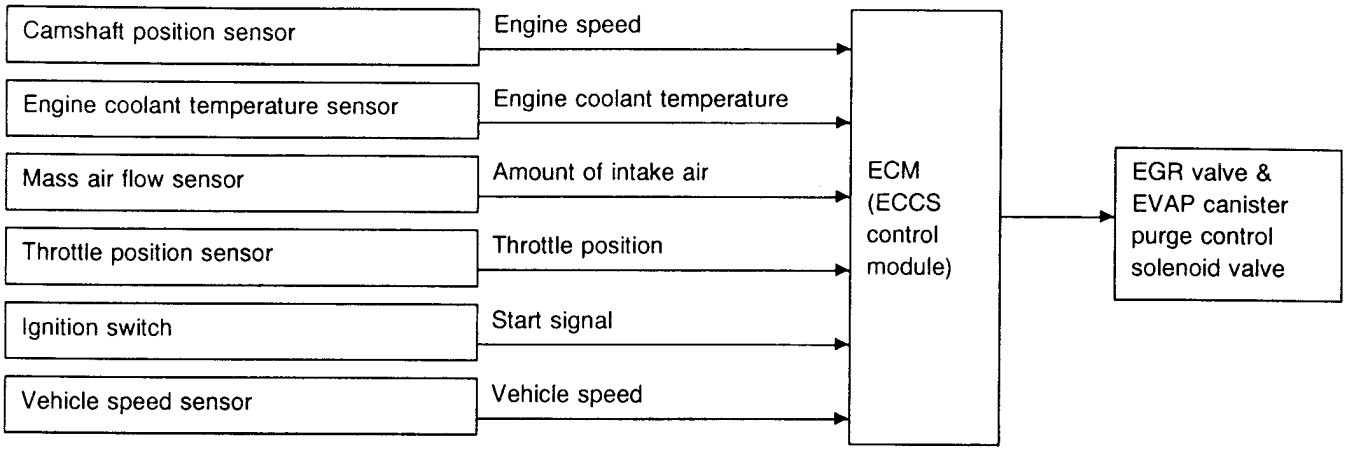
Trouble is not fixed.

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

INSPECTION END

EGR Valve and EVAP Canister Purge Control Solenoid Valve

SYSTEM DESCRIPTION

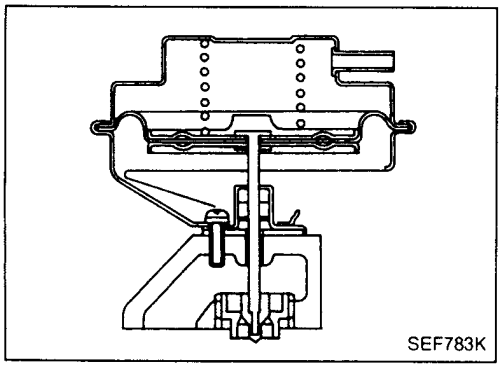


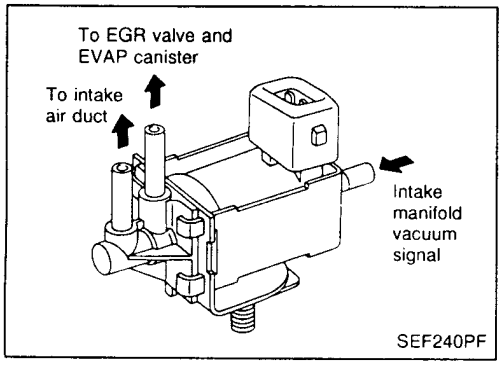
This system cuts and controls the port vacuum applied to the EGR valve and EVAP canister purge control solenoid valve to suit engine operating conditions.

This cut-and-control operation is accomplished through the ECM. When the ECM detects any of the following conditions, current flows through the solenoid valve in the EGR valve and EVAP canister purge control solenoid valve control vacuum line.

This causes the port vacuum to be discharged into the atmosphere so that the EGR valve and EVAP canister purge line remains closed.

- Engine starting
- Closed throttle position
- Low and high engine coolant temperature
- During deceleration
- Engine stopped
- Vehicle speed: below 10 km/h (6 mph)
- Mass air flow sensor malfunction





COMPONENT DESCRIPTION

Exhaust gas recirculation (EGR) valve

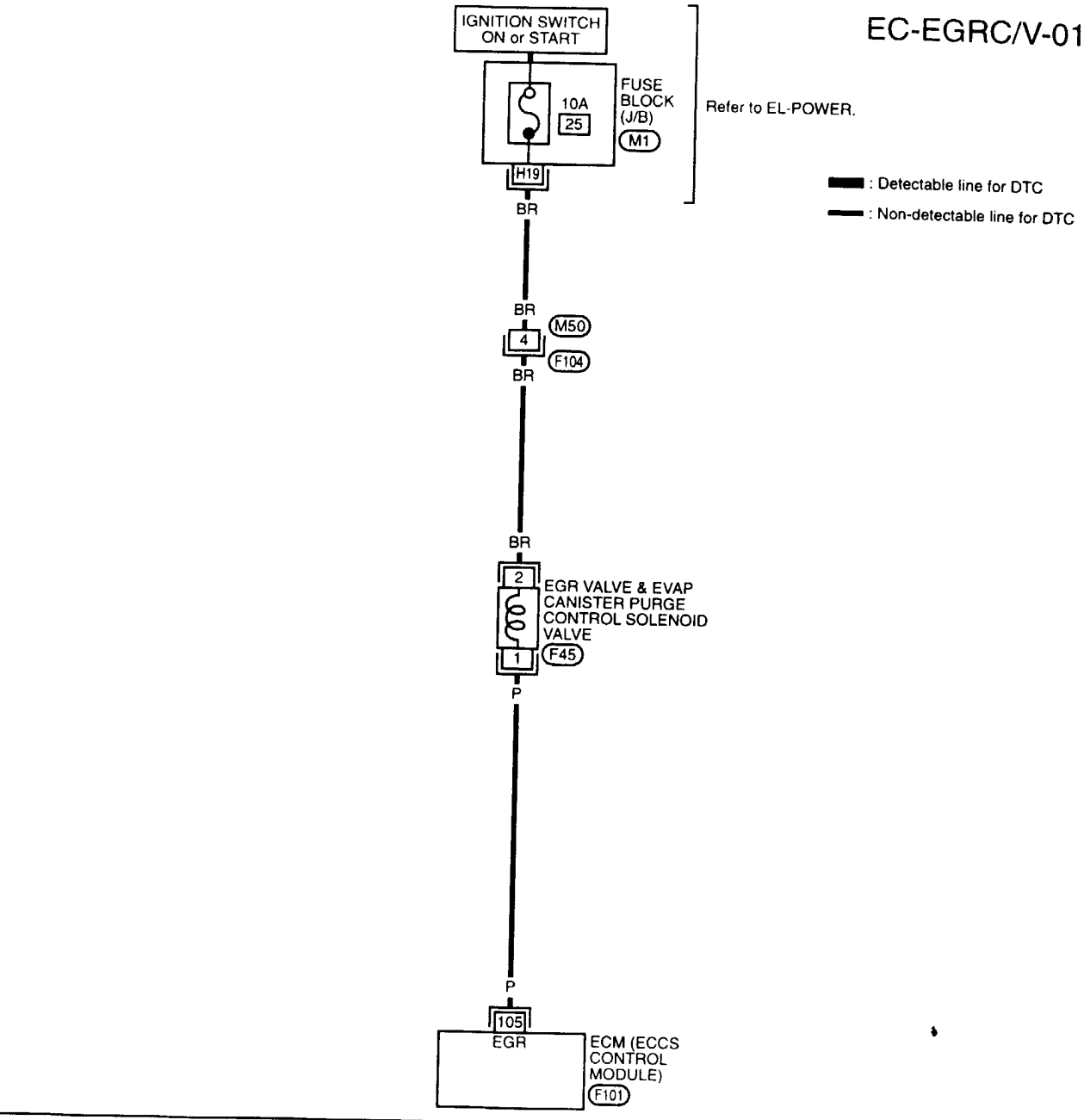
The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to the throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

EGR valve and EVAP canister purge control solenoid valve

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

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

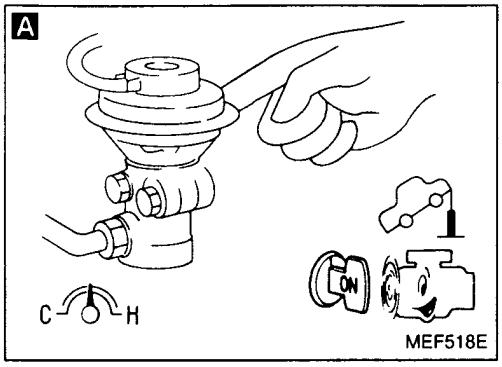
EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

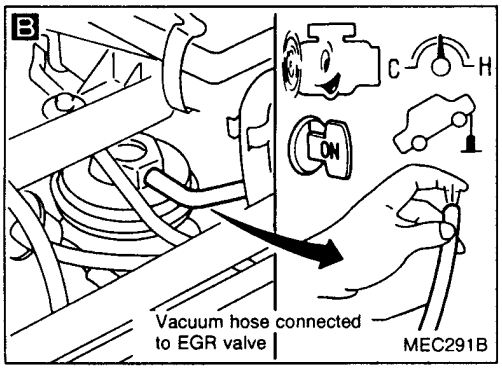


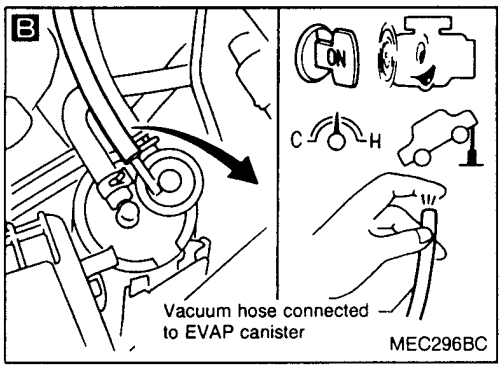
SEF766S

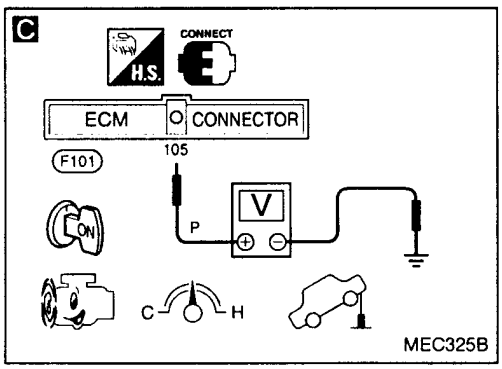
EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

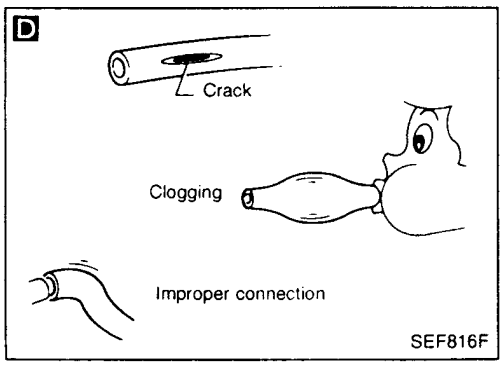
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Jack up drive wheels.
2. Start engine and warm it up sufficiently.
3. Perform diagnostic test mode II (Self-diagnostic results). Make sure that diagnostic trouble code No. 55 is displayed.
4. Set the shift lever to 1st position.
5. Make sure that EGR valve spring moves up and down (Use your finger) under the following conditions:
   At idle:
   Spring does not move.
   Revving engine from idle to 3,000 rpm:
   Spring moves up and down.

OK → INSPECTION END

NG ↓

B

CHECK VACUUM SOURCES TO EGR VALVE AND EVAP CANISTER.
1. Disconnect vacuum hoses to EGR valve and EVAP canister.
2. Make sure that vacuum exists under the following conditions.
   At idle:
   Vacuum should not exist.
   Revving engine from idle to 3,000 rpm:
   Vacuum should exist.

OK → CHECK COMPONENTS (EGR valve, EGRC-BPT valve and EVAP canister). Refer to "COMPONENT INSPECTION". (See page EC-105.)

NG ↓ Replace malfunctioning component(s).

NG ↓

C

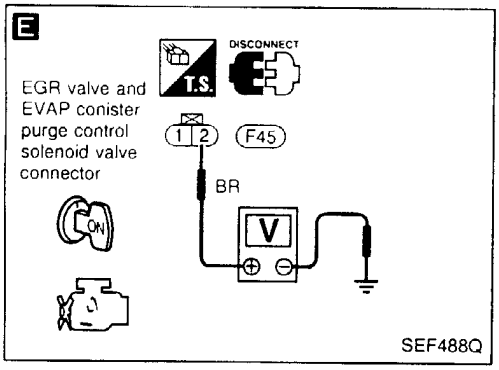
CHECK CONTROL FUNCTION.
Check voltage between ECM connector terminal (105) and ground under the following conditions:
Voltage:
At idle
Approximately 0V
Engine speed is 2,000 rpm
Battery voltage

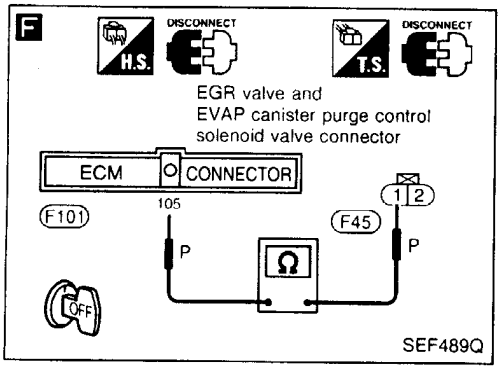
OK → D **CHECK VACUUM HOSE.** Check vacuum hose for clogging, cracks or improper connection.

NG ↓

Ⓐ

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





Ⓐ

E

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect EGR valve & EVAP canister purge control solenoid valve harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between EGR valve & EVAP conister purge control solenoid valve connector terminal ② and ground.
   Voltage: Battery voltage

NG → Check the following:
- Harness connectors (M50), (F104)
- 10A fuse
- Harness for open or short-circuit between EGR valve & EVAP canister purge control solenoid valve and fuse.

If NG, replace 10A fuse or repair harness or connectors.

OK ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM connector terminal (105) and EGR valve & EVAP canister purge control solenoid valve connector terminal ①.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

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

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

OK ↓

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

Trouble is not fixed. ↓

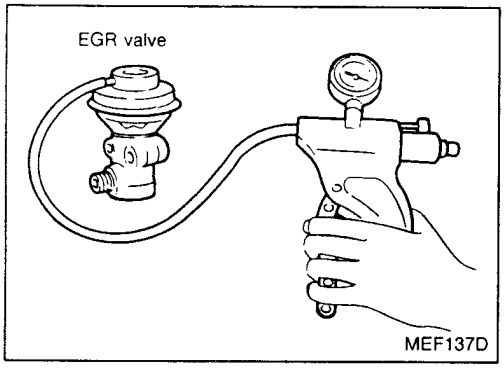
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

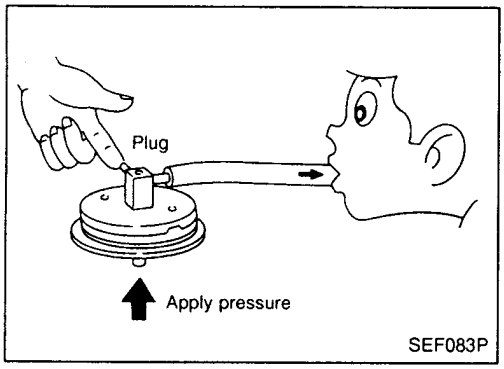
EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

COMPONENT INSPECTION



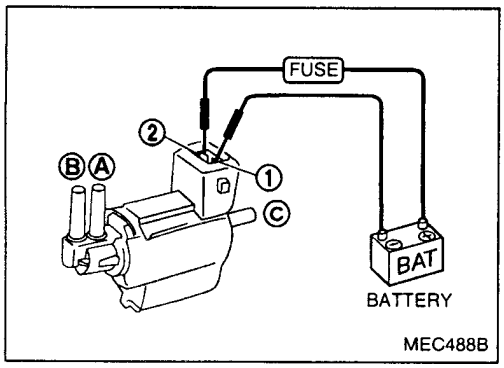
EGR valve

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



EGRC-BPT valve

1) Plug one of two ports of EGRC-BPT valve.
2) Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (9.81 mbar, 100 mmH_2O, 3.94 inH_2O) from under EGRC-BPT valve.
3) If a leakage is noted, replace the valve.



EGR valve and EVAP canister purge control solenoid valve

Check air passage continuity.

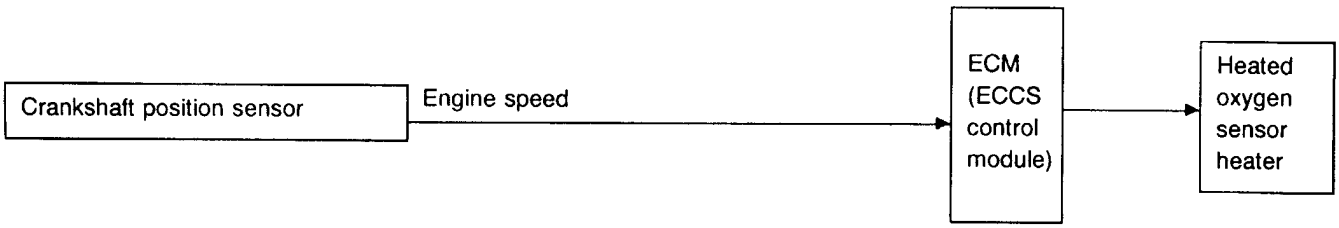
Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.

Heated Oxygen Sensor (HO2S)

SYSTEM DESCRIPTION

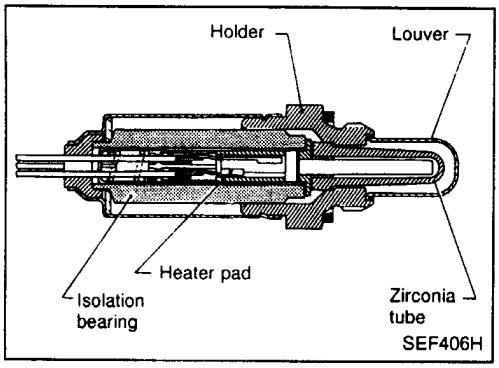
Heated oxygen sensor heater control

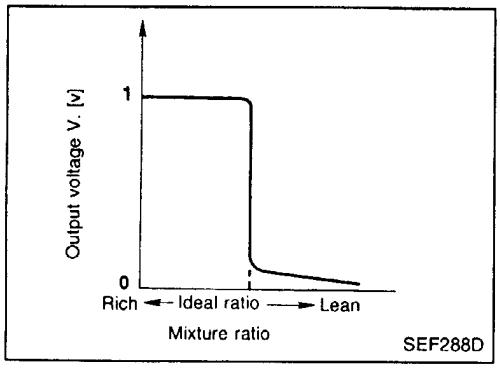


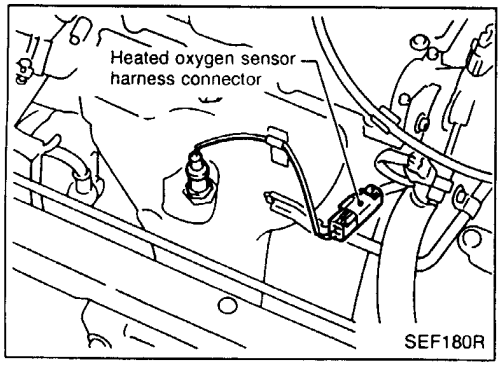
The ECM performs ON/OFF control of the heated oxygen sensor heater corresponding to the engine speed.

OPERATION

Engine speed rpm	Heated oxygen sensor heater
Above 3,200	OFF
Below 3,200	ON





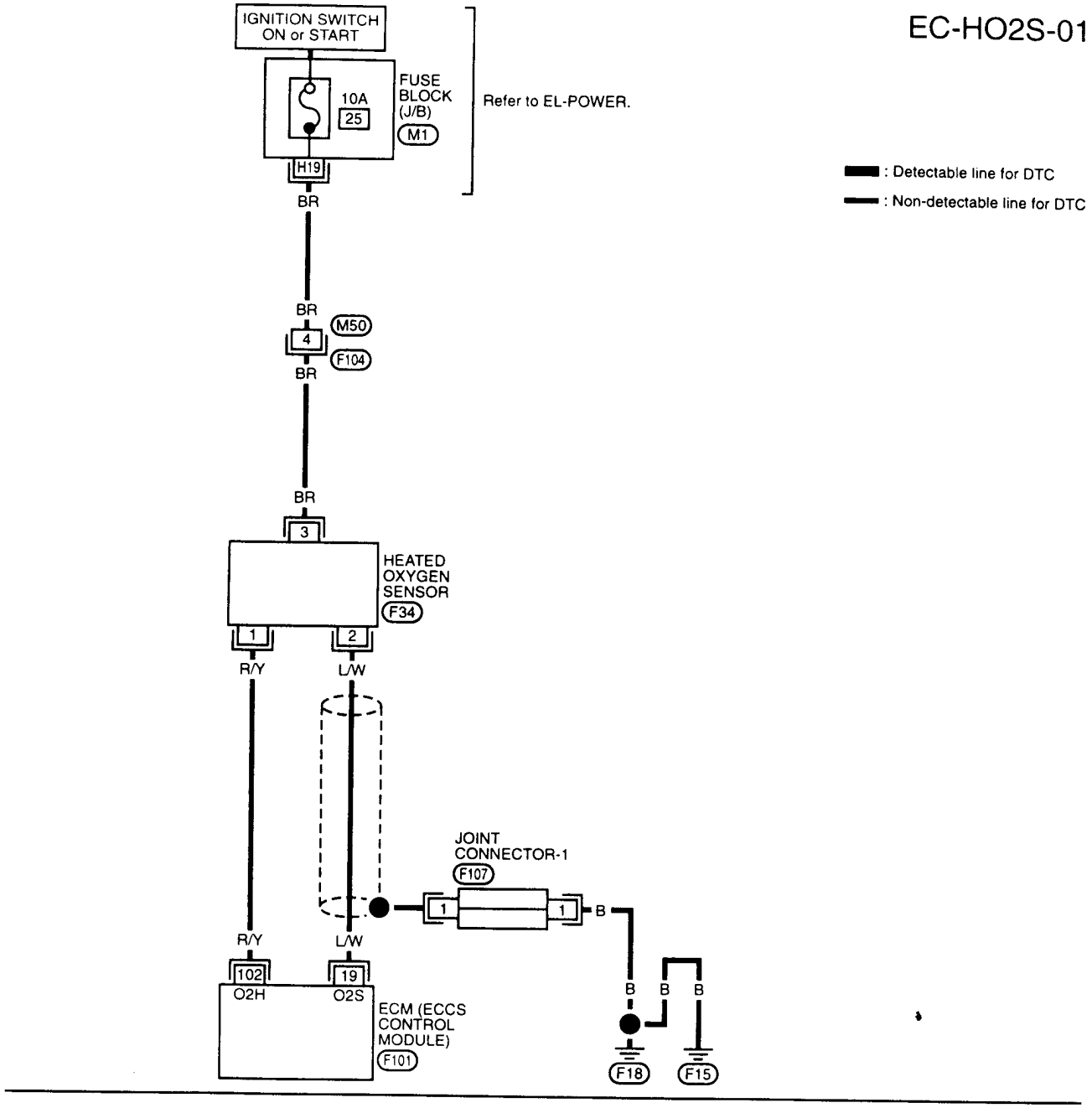


COMPONENT DESCRIPTION

The heated oxygen sensor is placed into the front exhaust tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The 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.

Heated Oxygen Sensor (HO2S) (Cont'd)

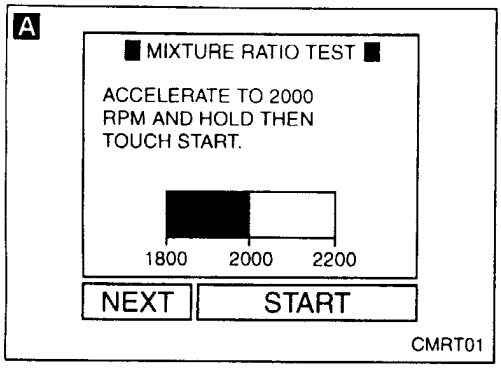
EC-HO2S-01

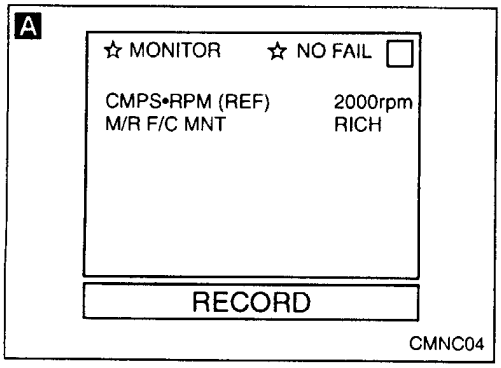


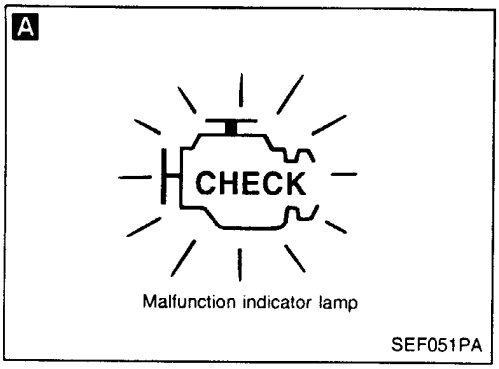
SEF767S

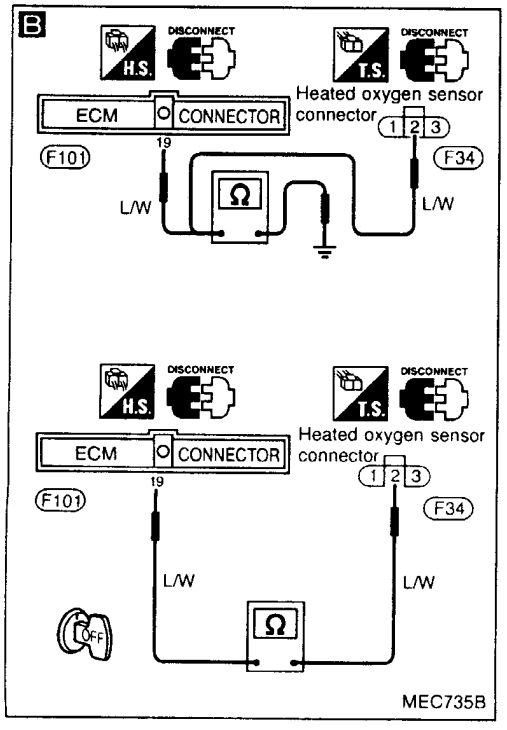
Heated Oxygen Sensor (HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OXYGEN SENSOR CIRCUIT.

1. Start engine and warm it up sufficiently.
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 goes on and off more than 5 times during 10 seconds.

OK → INSPECTION END

NG

B

CHECK INPUT SIGNAL CIRCUIT.

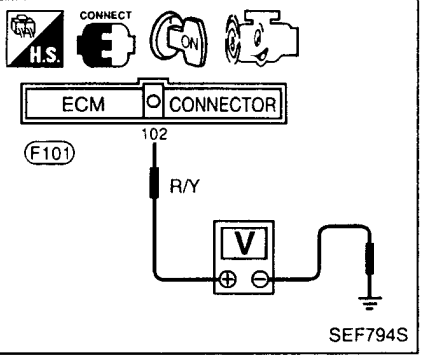
1. Stop engine.
2. Disconnect ECM harness connector and heated oxygen sensor harness connector.
3. Check harness continuity between ECM connector terminal ⑲ and heated oxygen sensor connector terminal ②.
   Continuity should exist.
4. Check harness continuity between ECM connector terminal ⑲ (or heated oxygen sensor connector terminal ②) and engine ground.
   Continuity should not exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK → Ⓐ

Heated Oxygen Sensor (HO2S) (Cont'd)

C



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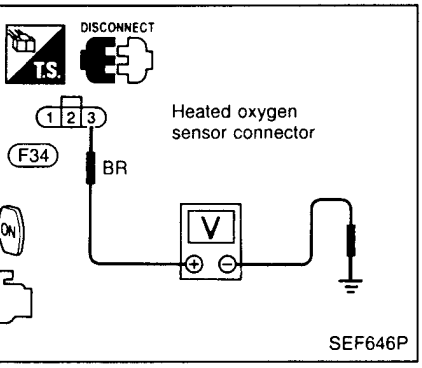

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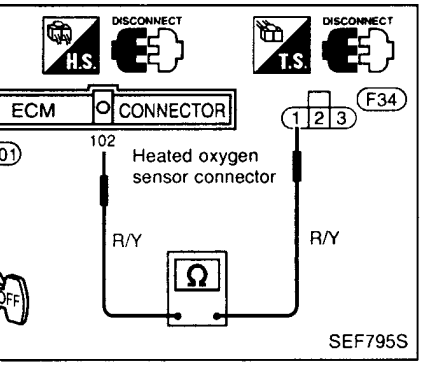

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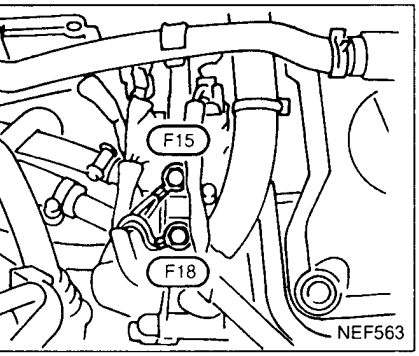

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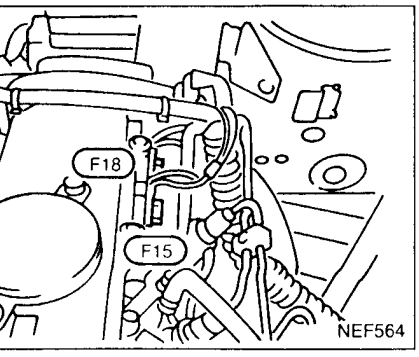


Ⓐ

C

CHECK HEATED OXYGEN SENSOR HEATER CIRCUIT.

1. Reconnect harness connectors.
2. Start engine.
3. Check voltage between ECM connector terminal (102) and ground with CONSULT or tester under the following conditions:

Voltage:

Engine speed is below 3,200 rpm
Approximately 0V
Engine speed is above 3,200 rpm
Battery voltage

OK → Go to "CHECK COMPONENT".

NG

D

CHECK POWER SUPPLY.

1. Stop engine.
2. Disconnect heated oxygen sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between heated oxygen sensor connector terminal ③ and ground.

Voltage: Battery voltage

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness connector (M1)
- 10A fuse
- Harness for open or short-circuit between heated oxygen sensor and fuse

If NG, replace fuse or repair harness or connectors.

OK

E

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between heated oxygen sensor connector terminal ① and ECM connector terminal (102).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

F

Loosen and retighten engine ground screws.

OK

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

NG → Replace heated oxygen sensor.

OK

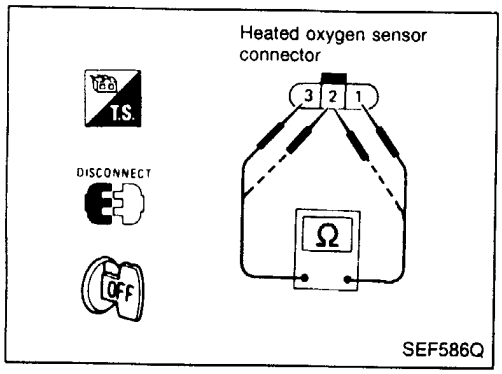
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

Trouble is not fixed.

Replace heated oxygen sensor.



Heated Oxygen Sensor (HO2S) (Cont'd)

COMPONENT INSPECTION

Heated oxygen sensor heater

Check resistance between heated oxygen sensor connector terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

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

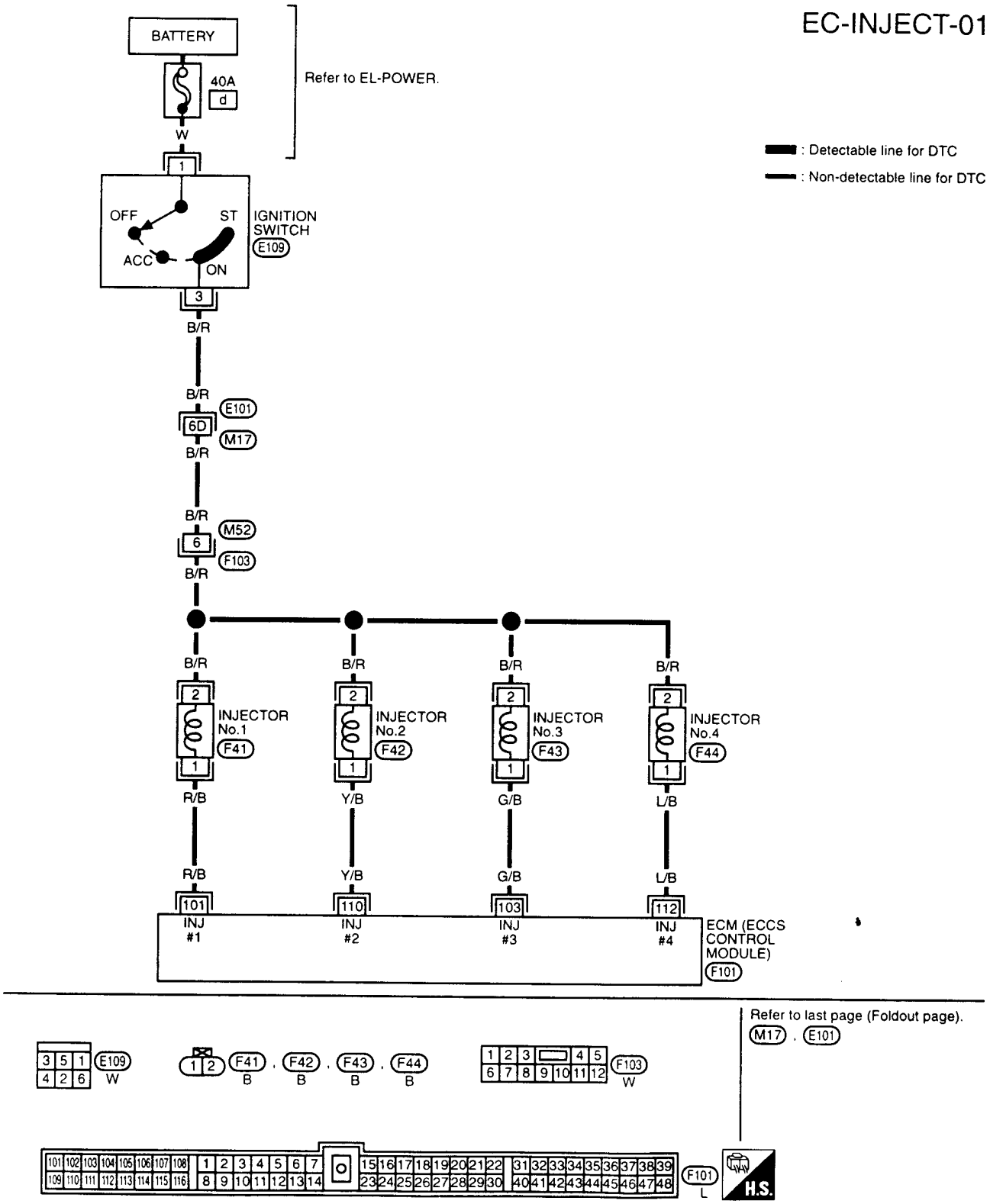
Continuity should not exist.

If NG, replace the heated oxygen sensor.

CAUTION:

- **Discard any 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, and replace with a new one.**

Injector

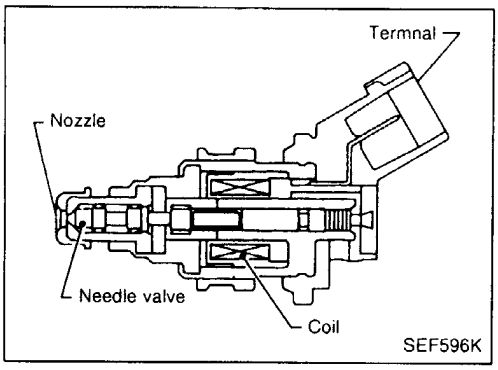


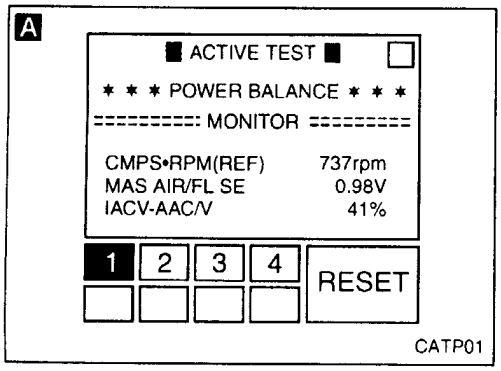
SEF768S

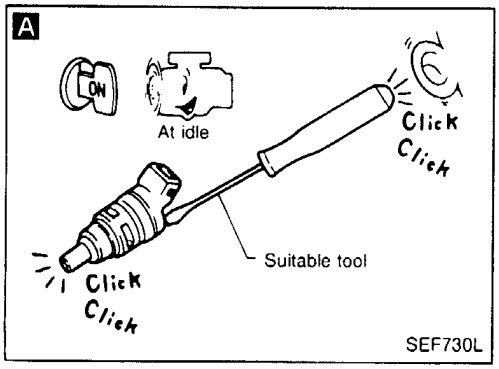
Injector (Cont'd)

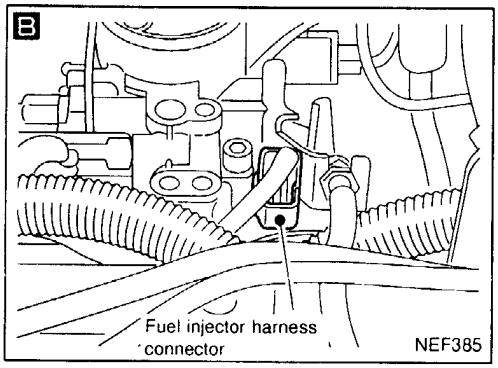
COMPONENT DESCRIPTION

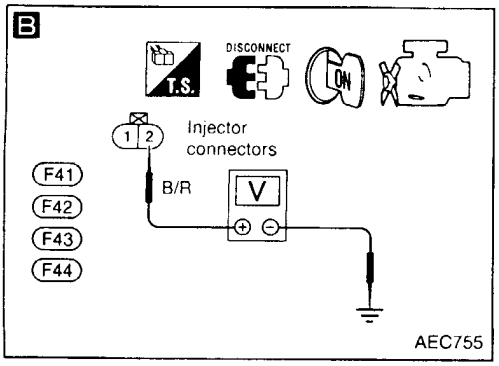
The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends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











DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

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

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.

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

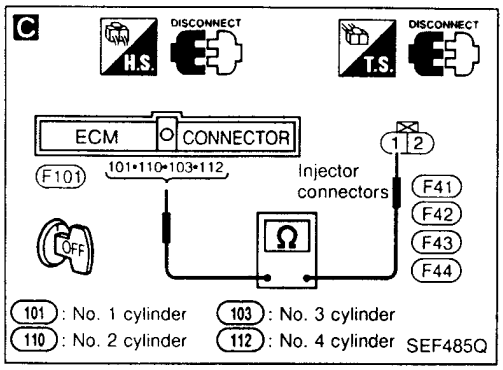
NG → Check the following:
- 40A fusible link
- Ignition switch condition and operation.
- Harness connectors (E101), (M17)
- Harness connectors (M52), (F103)
- Harness for open or short-circuit between injector and ignition switch.

If NG, replace fusible link or repair ignition switch, harness or connectors.

OK

Ⓐ

Injector (Cont'd)



Ⓐ

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between each injector harness connector terminal ① and ECM connector terminals (101), (110), (103), (112).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and injector.

If NG, repair harness or connectors.

OK ↓

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

NG → Replace injector.

OK ↓

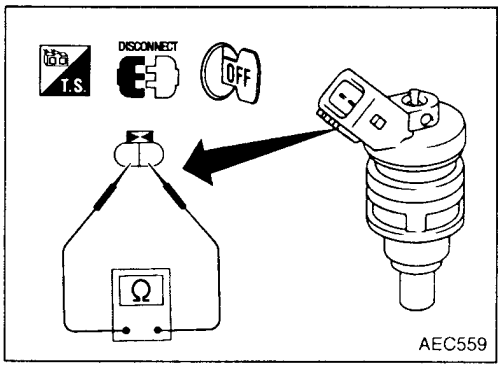
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END



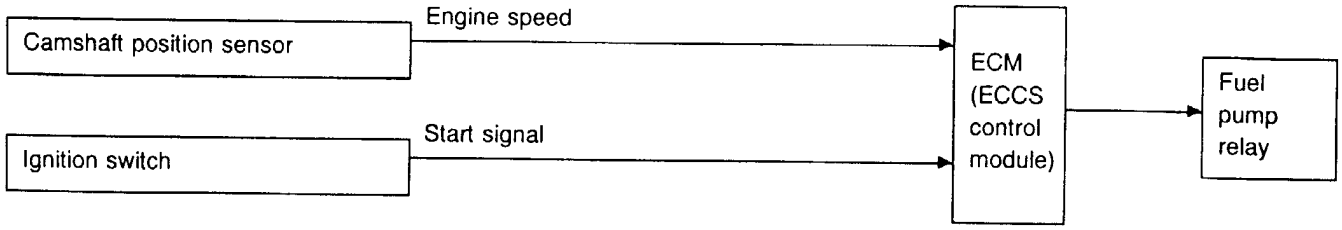
COMPONENT INSPECTION

Injector

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

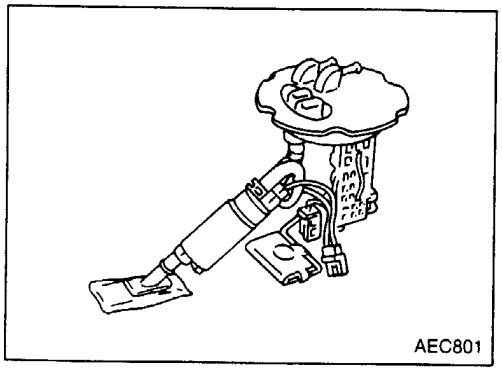
Fuel Pump

SYSTEM DESCRIPTION



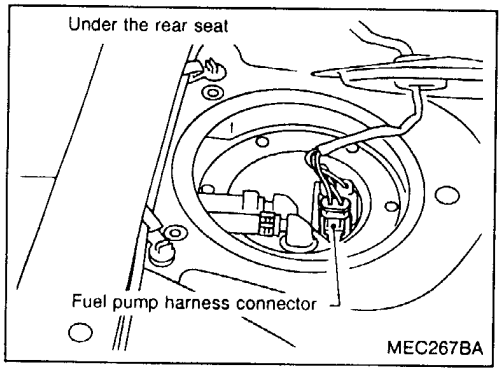
The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to operate. If the 180° signal is not received when 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 supplies voltage to the fuel pump.

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

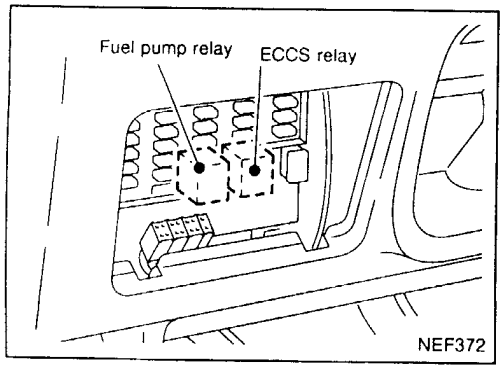

AEC801

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



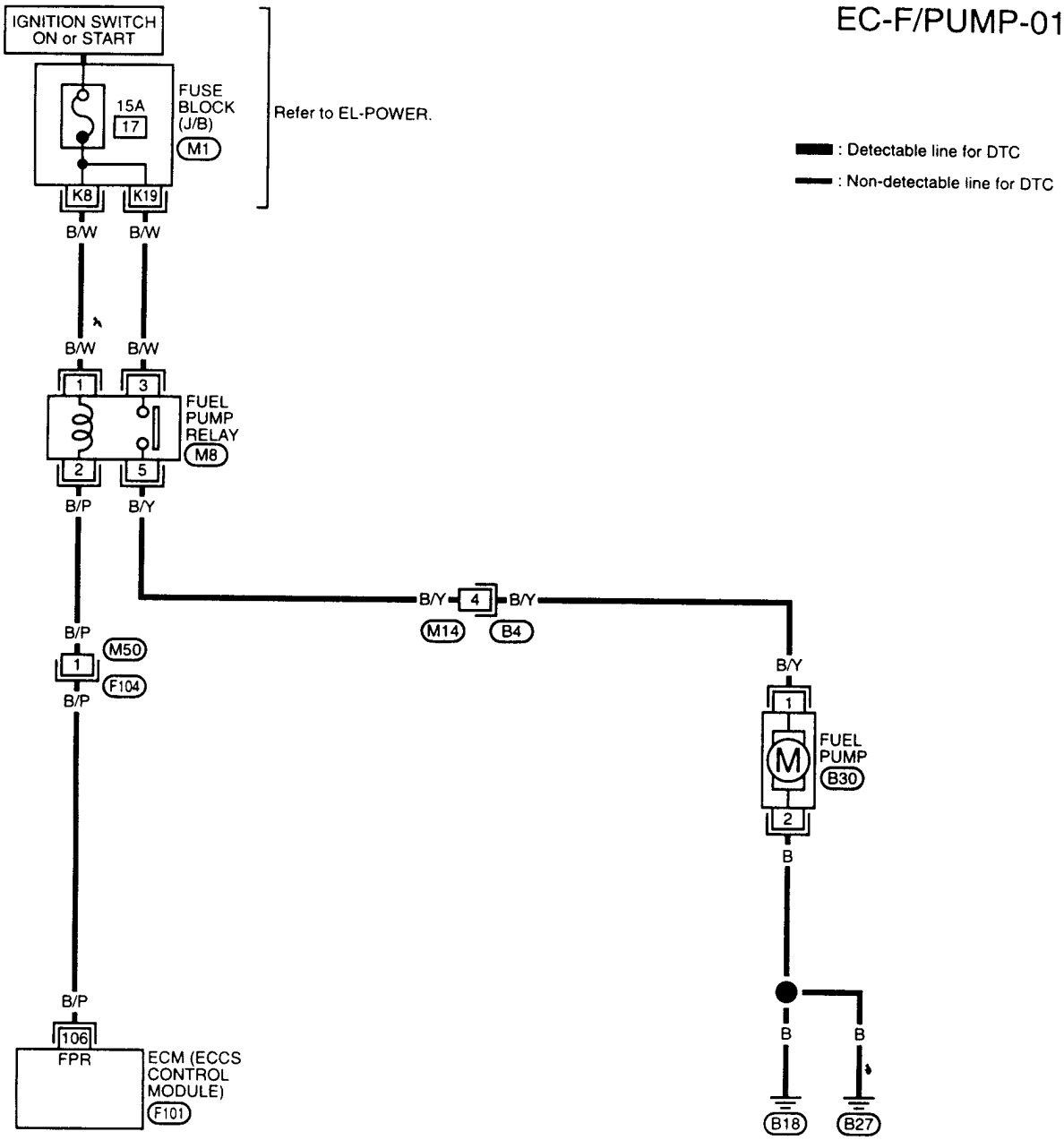
MEC267BA

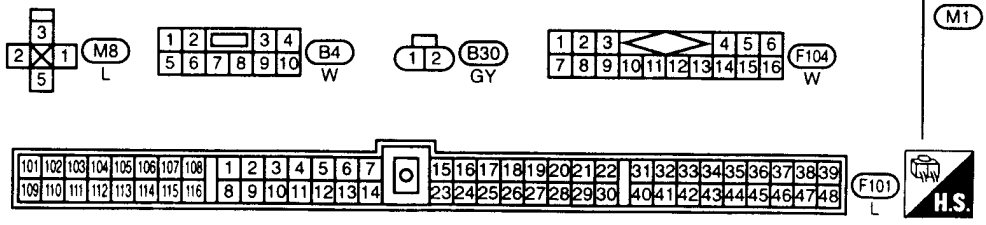


NEF372

Fuel Pump (Cont'd)

EC-F/PUMP-01

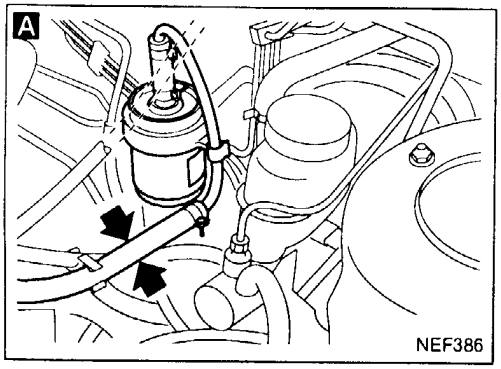


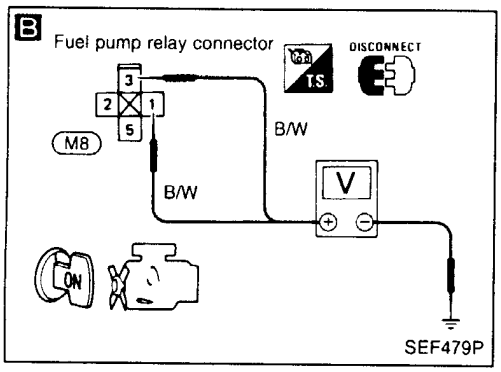


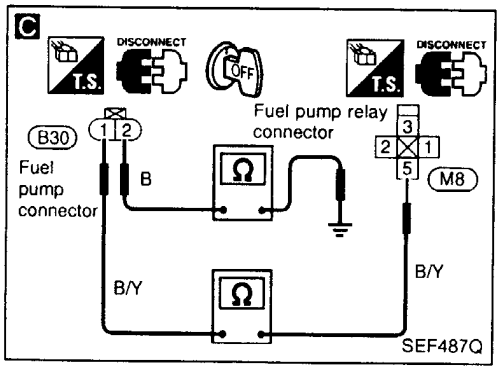
SEF769S

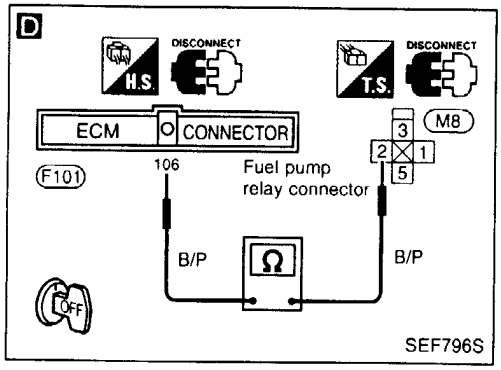
Fuel Pump (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Turn ignition switch to "ON" position.
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 to "ON" position.

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect fuel pump relay.
3. Turn ignition switch to "ON" position.
4. Check voltage between fuel pump relay connector terminals ①, ③ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG →
Check the following:
- 15A fuse
- Harness for open or short-circuit between fuse and fuel pump relay.

If NG, replace 15A fuse or repair harness or connectors.

OK

C

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

NG →
Check the following:
- Harness connectors (M14), (B4)
- Harness for open or short-circuit between fuel pump and body ground.
- Harness for open or short-circuit between fuel pump and fuel pump relay.

If NG, repair harness or connectors.

OK

D

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

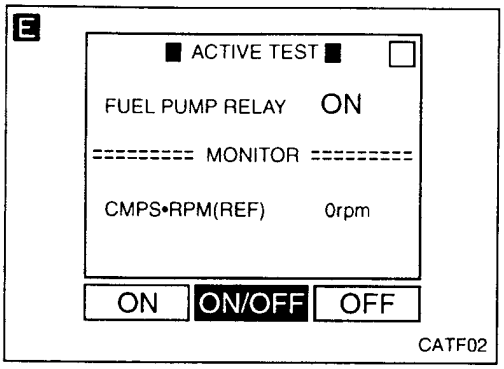
NG →
Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and fuel pump relay.

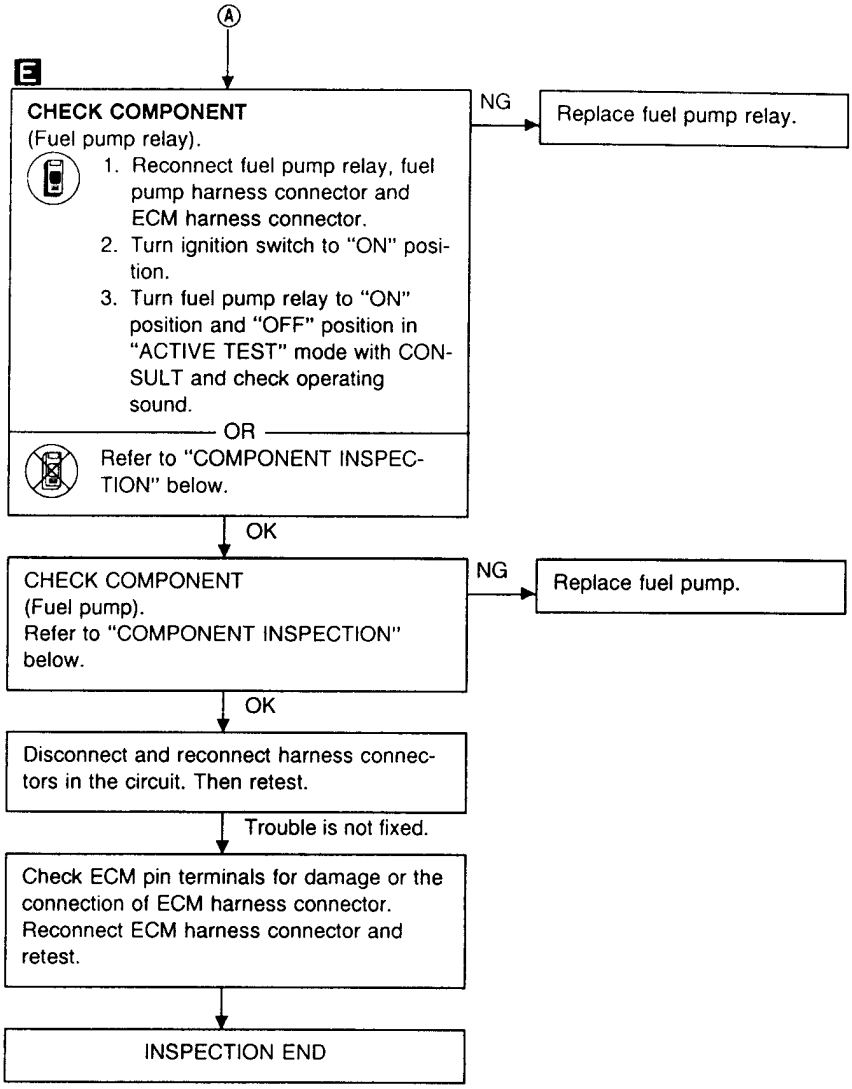
If NG, repair harness or connectors.

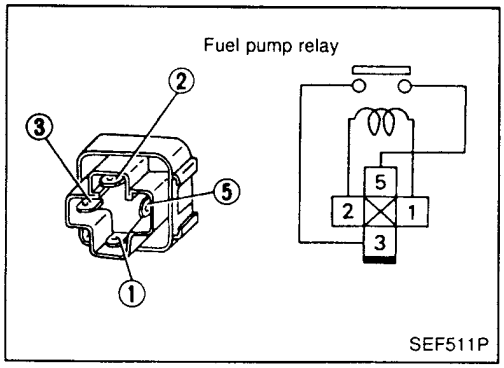
OK

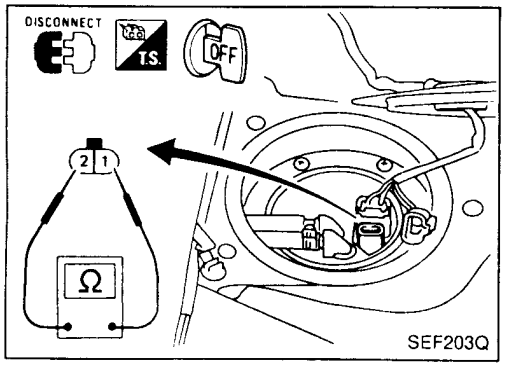
Ⓐ

Fuel Pump (Cont'd)









COMPONENT INSPECTION

Fuel pump relay

Check continuity between fuel pump relay terminals ③ and ⑤.

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

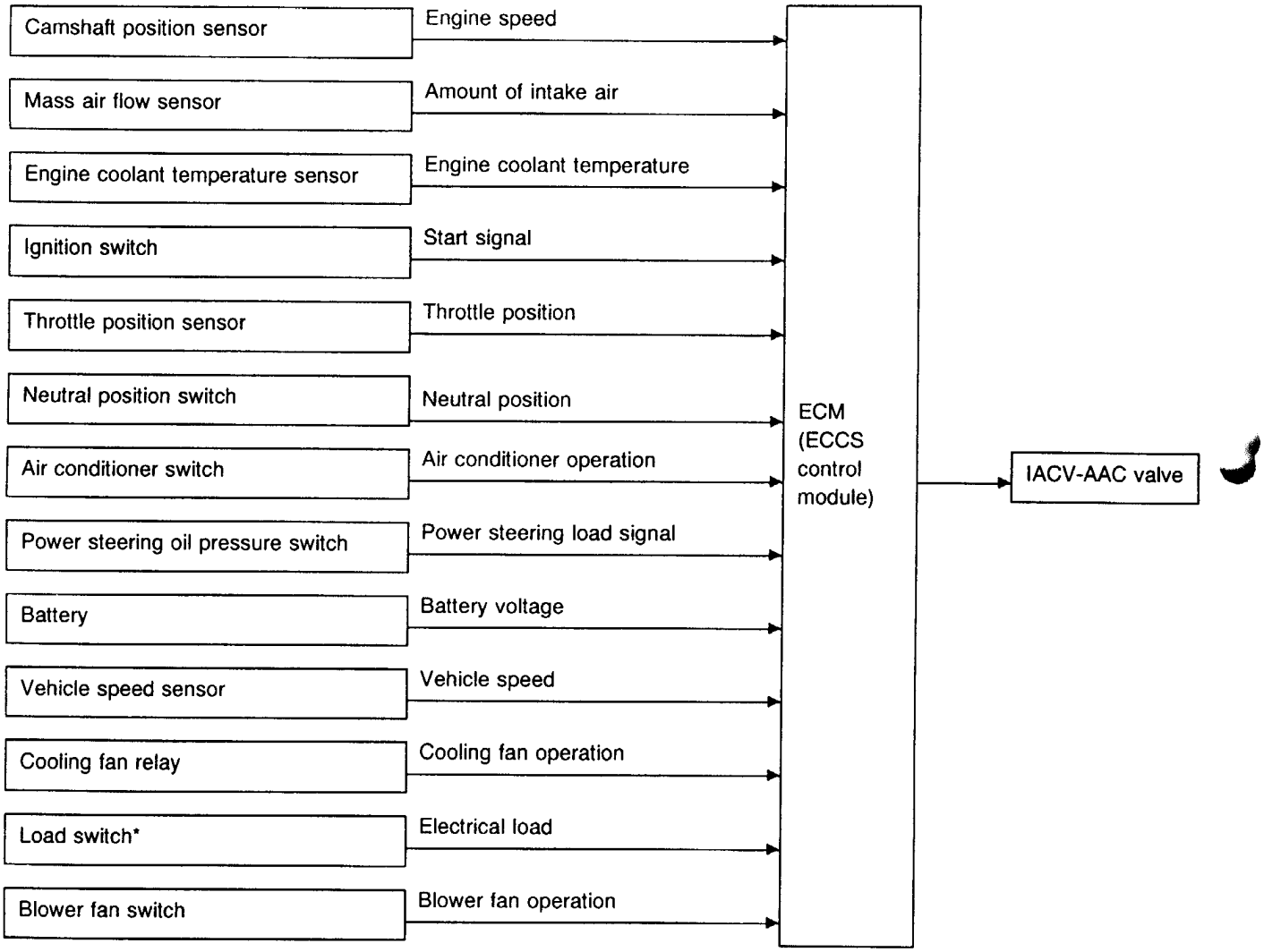
If NG, replace relay.

Fuel pump

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

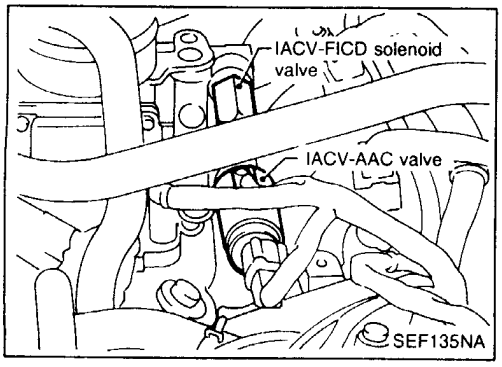
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve

SYSTEM DESCRIPTION



*: Rear window defogger switch and headlamp switch.

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



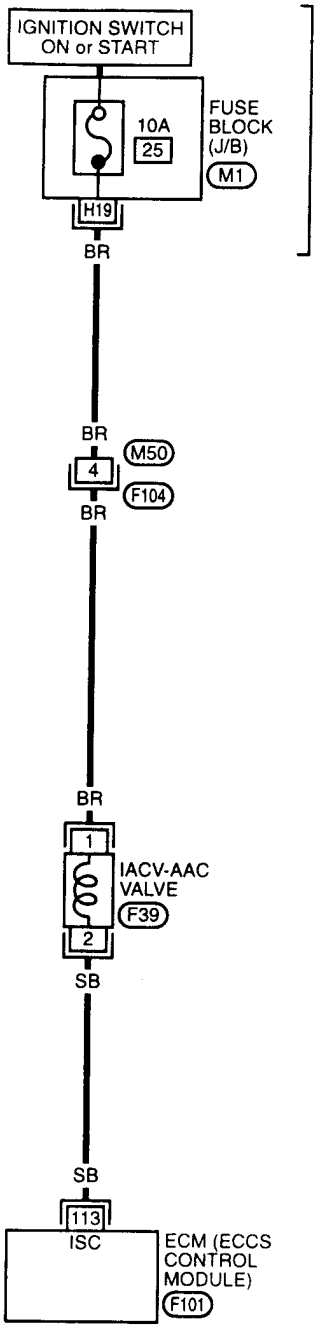
COMPONENT DESCRIPTION

IACV-AAC valve

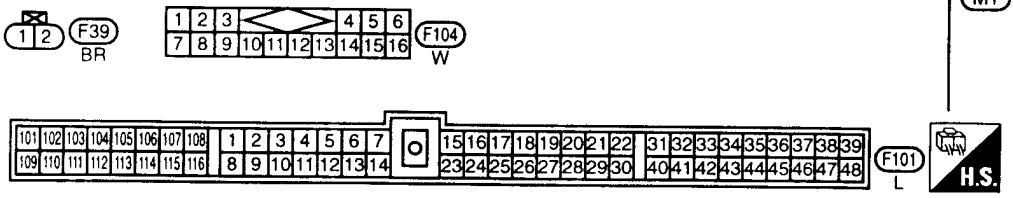
The IACV-AAC valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of air that will flow through the valve. The more air that flows through the valve, the higher the idle speed.

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

EC-AAC/V-01



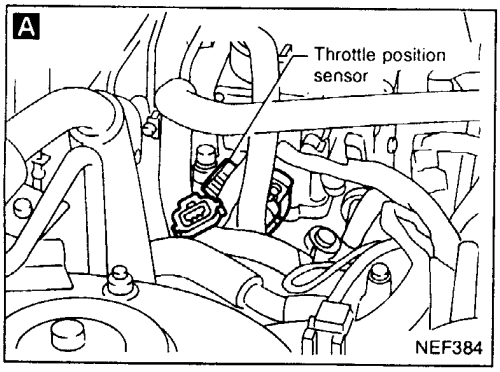
Refer to last page (Foldout page).
M1

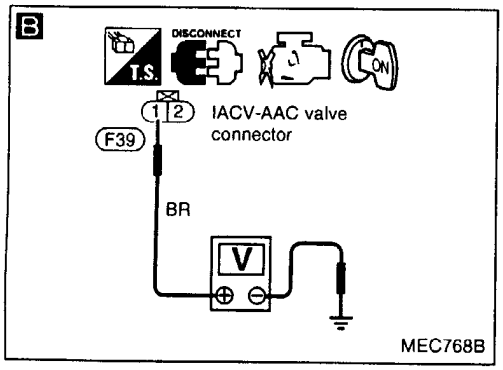


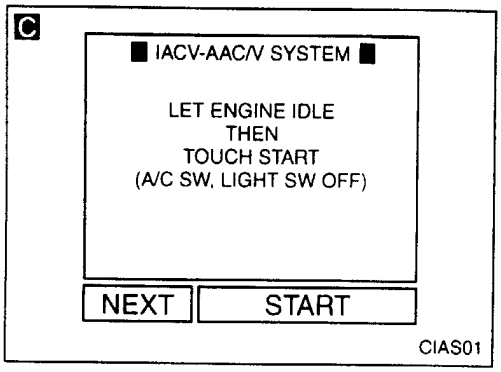
SEF770S

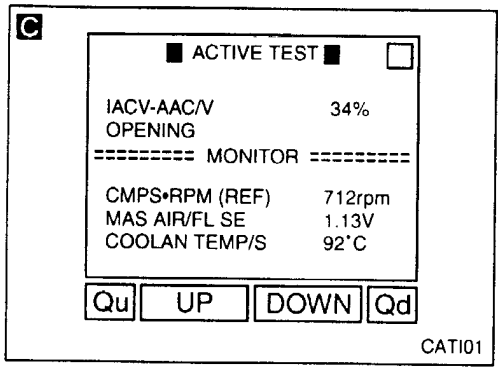
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

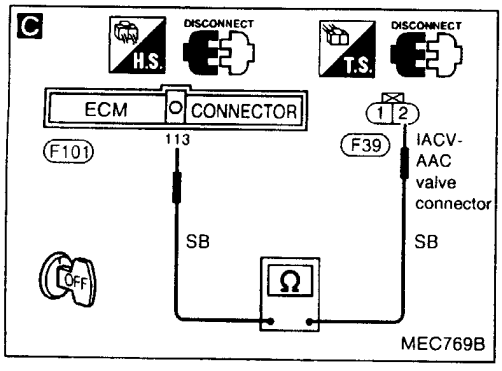
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up sufficiently.
2. Check idle speed.
   Models with daytime light system:
   800±50 rpm
   Models without daytime light system:
   700±50 rpm
   If NG, adjust idle speed.
3. • Perform "IACV-AAC/V ADJ" in "WORK SUPPORT" mode with CONSULT.
   • Disconnect throttle position sensor harness connector.
4. Make sure that idle speed drops.

OK → INSPECTION END

NG ↓

B

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

NG → Check the following:
- Harness connectors M50, F104
- Harness connector M1
- 10A fuse
- Harness for open or short-circuit between IACV-AAC valve and fuse.

If NG, replace 10A fuse or repair harness or connectors.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Reconnect IACV-AAC valve harness connector and then start engine.
3. Perform "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

3. Perform "IACV-AAC/V OPENING" in "ACTIVE TEST" mode with CONSULT.

OR

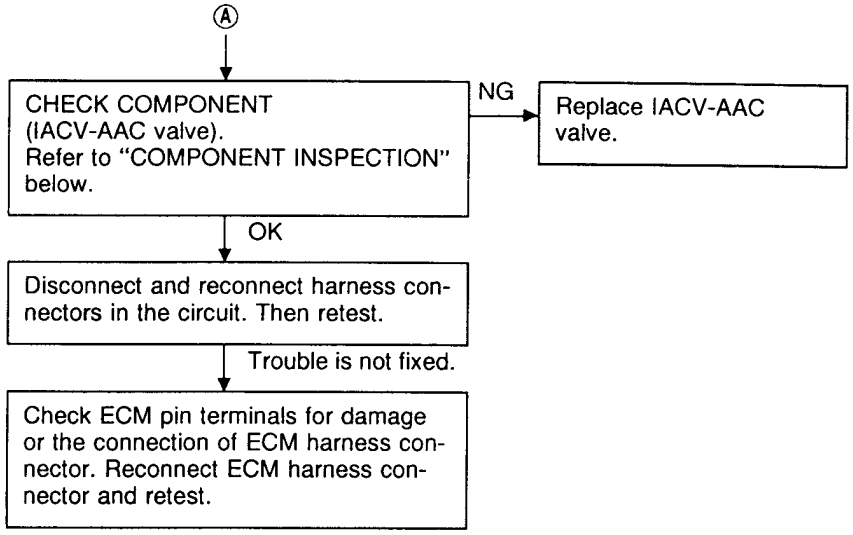
2. Disconnect ECM connector harness connector.
3. Check harness continuity between ECM terminal 113 and IACV-AAC valve connector terminal ②.
   Continuity should exist.
   If OK, check harness for short.

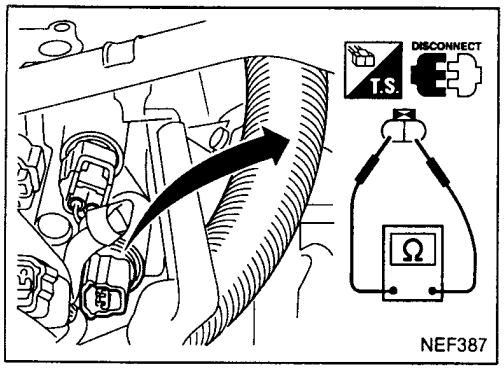
NG → Repair harness or connectors.

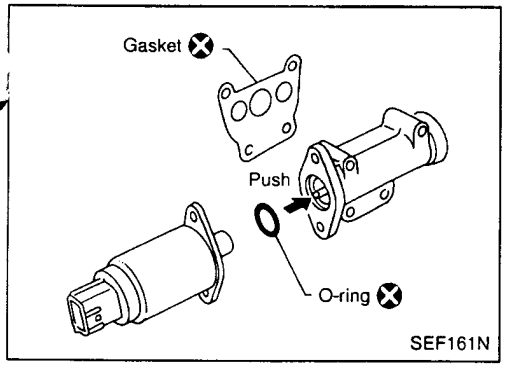
OK ↓

Ⓐ

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







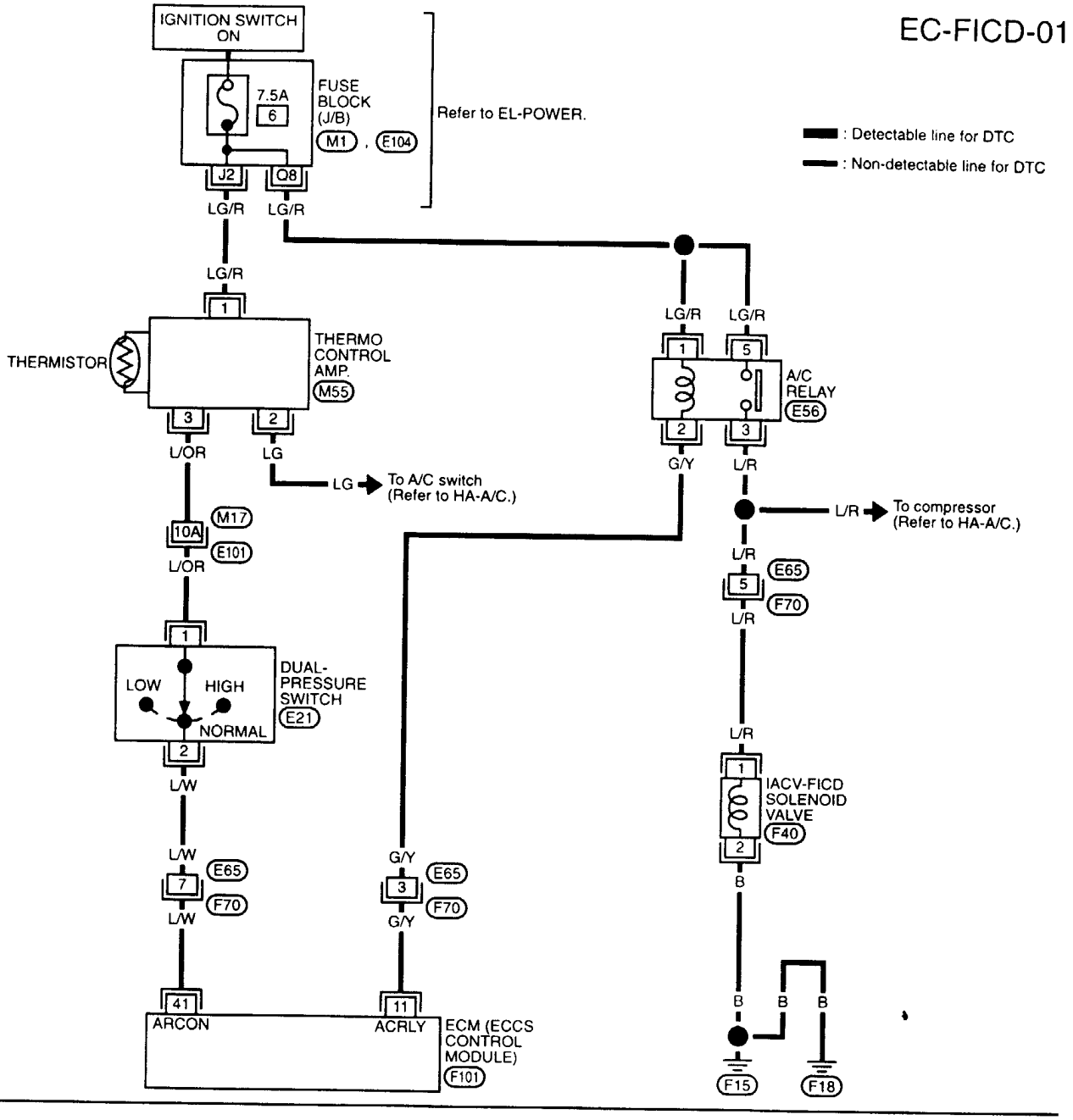
COMPONENT INSPECTION

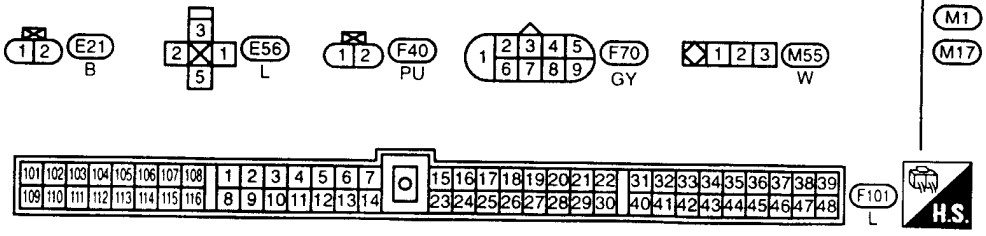
IACV-AAC VALVE

- Check IACV-AAC valve resistance.
  Resistance:
  Approximately 10Ω [at 25°C (77°F)]

- Check plunger for seizing or sticking.

IACV-FICD Solenoid Valve





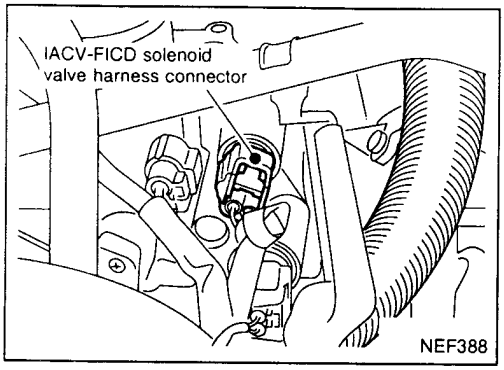
Refer to last page (Foldout page).
M1 , E104
M17 , E101

SEF771S

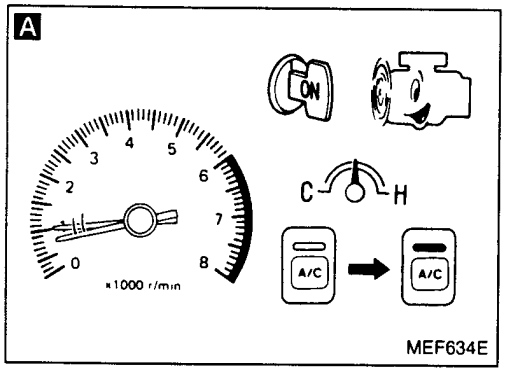
IACV-FICD Solenoid Valve (Cont'd)

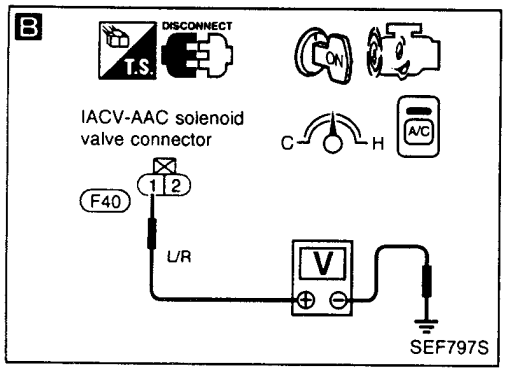
COMPONENT DESCRIPTION

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



DIAGNOSTIC PROCEDURE





INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently.
2. Check idle speed.
   Models with daytime light system:
   800±50 rpm
   Models without daytime light system:
   700±50 rpm
   If NG, adjust idle speed.
3. Turn air conditioner switch and blower fan switch to "ON" position.
4. Recheck idle speed.
   900 rpm or more

OK → INSPECTION END

NG

Check if air conditioner compressor functions normally.

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

OK

B

CHECK POWER SUPPLY.

1. Turn air conditioner switch to "OFF" position and stop engine.
2. Disconnect IACV-FICD solenoid valve harness connector.
3. Restart engine, then turn air conditioner switch and blower fan switch to "ON" position.
4. Check voltage between IACV/FICD solenoid valve connector terminal ① and ground with CONSULT or voltage tester.
   Voltage: Battery voltage

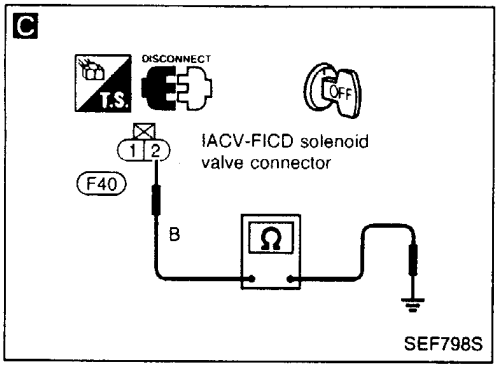
NG → Check the following:
- Harness for open or short-circuit between IACV-FICD solenoid valve and harness connector (F70).

If NG, repair harness or connectors.

OK

Ⓐ

IACV-FICD Solenoid Valve (Cont'd)



Ⓐ

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between IACV-FICD solenoid valve connector terminal ② and body ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace IACV-FICD solenoid valve.

OK ↓

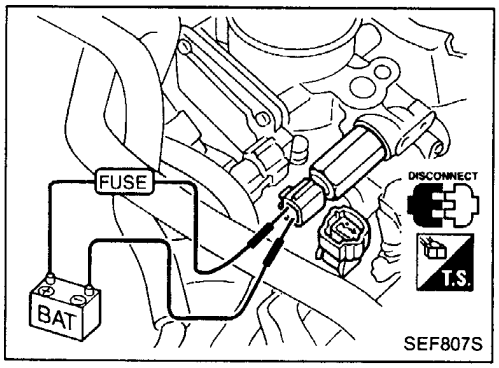
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

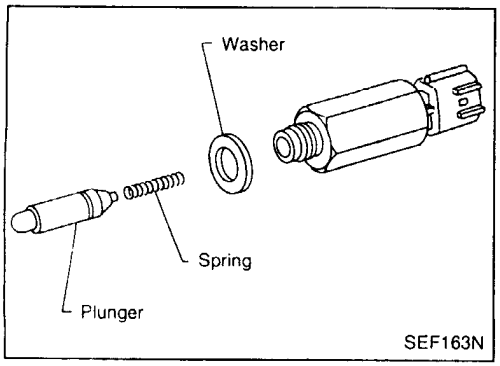
INSPECTION END



COMPONENT INSPECTION

IACV-FICD solenoid valve

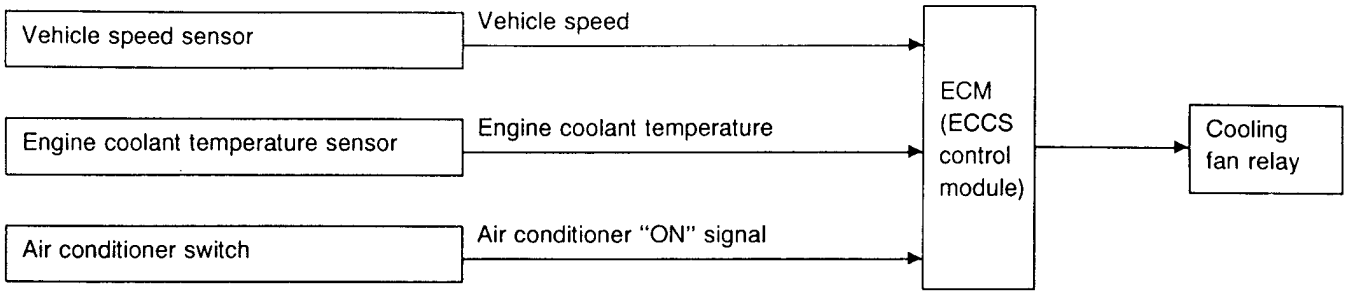
- Check for clicking sound when applying 12V direct current to IACV-FICD solenoid valve terminals.



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

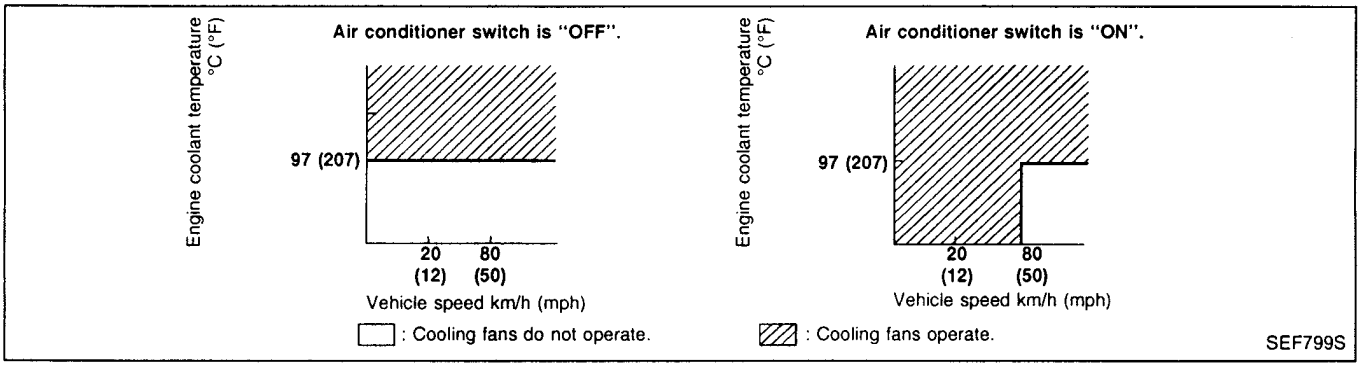
Cooling Fan Control

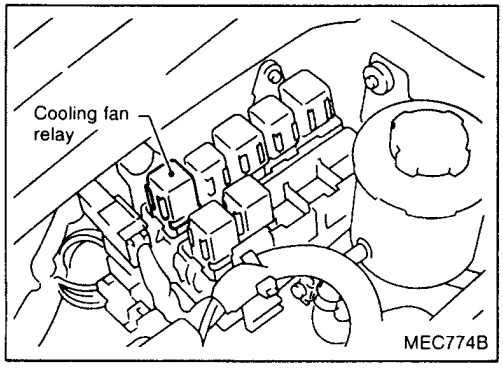
SYSTEM DESCRIPTION



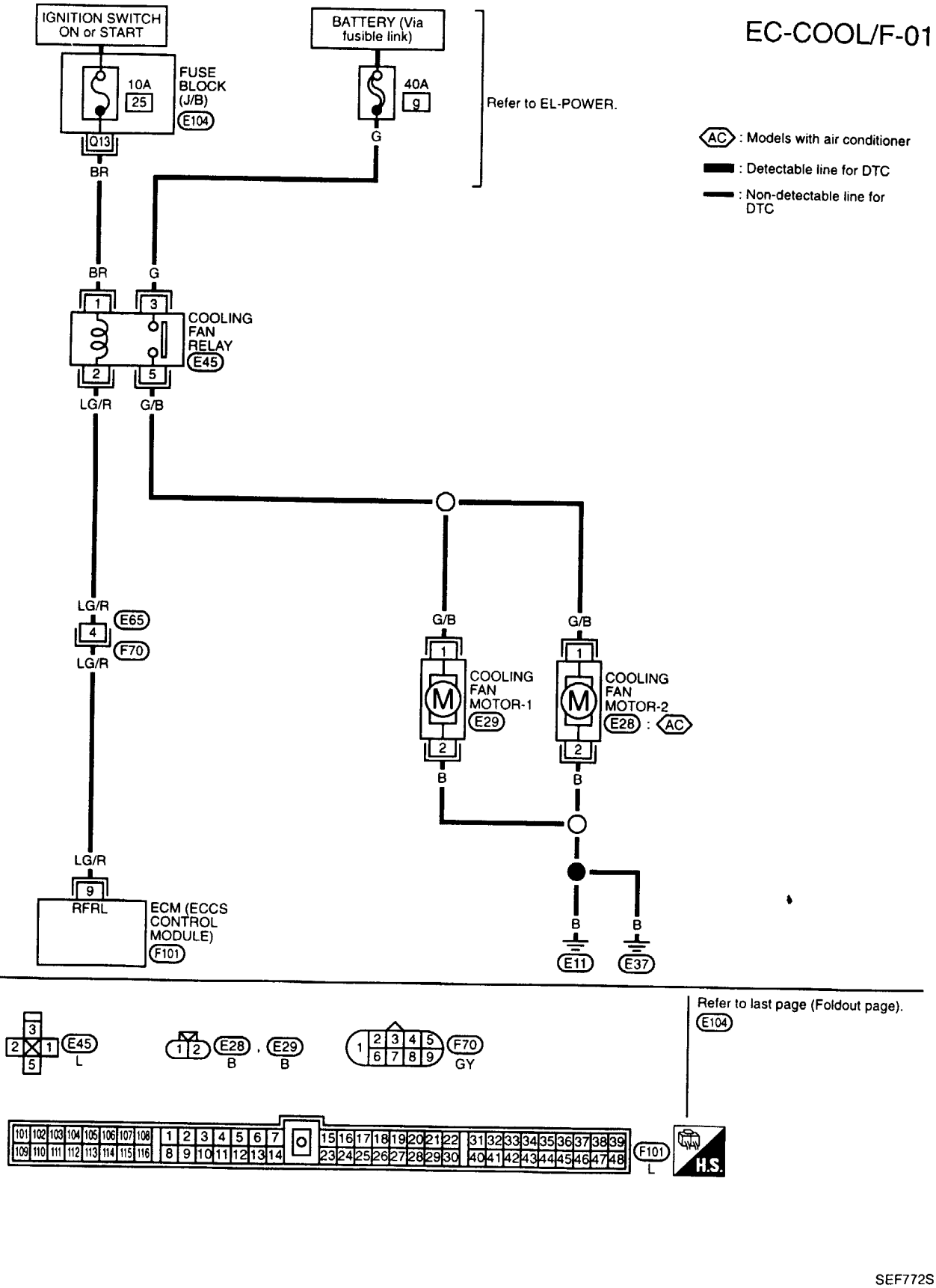
The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal. The control system has 2-step control [ON/OFF].

Operation





Cooling Fan Control (Cont'd)

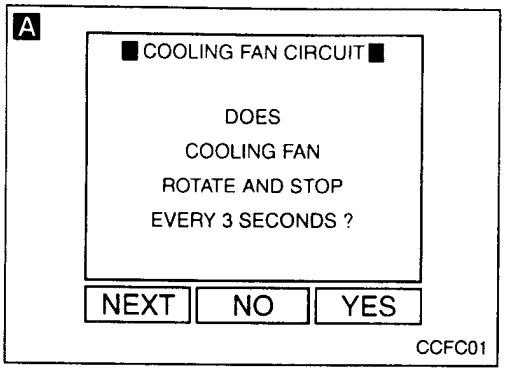


SEF772S

Cooling Fan Control (Cont'd)

DIAGNOSTIC PROCEDURE

A



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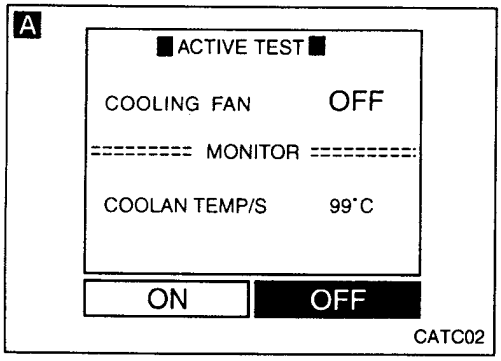
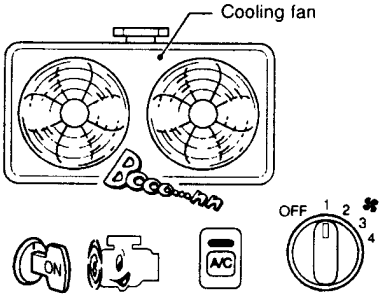
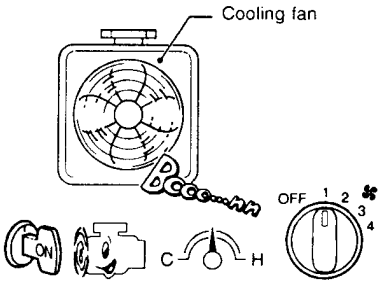


A

With air conditioner

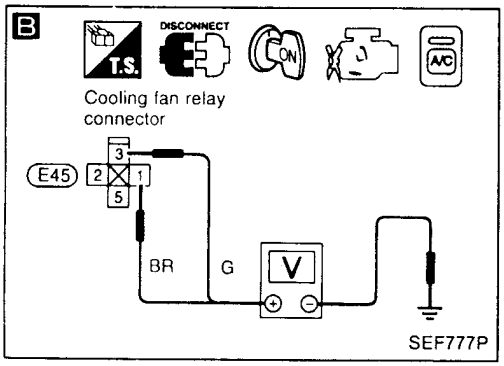


Without air conditioner



MEF277G

B



INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

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

OR

With Air Conditioner

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

Without Air Conditioner

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

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.

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

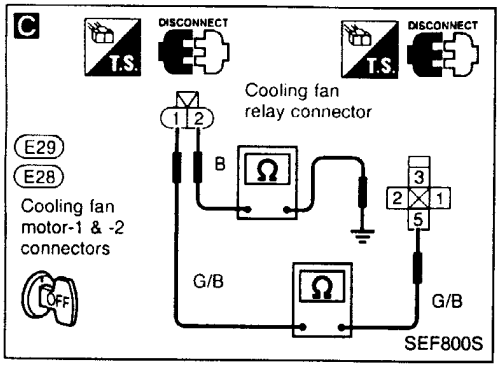
NG → Check the following:

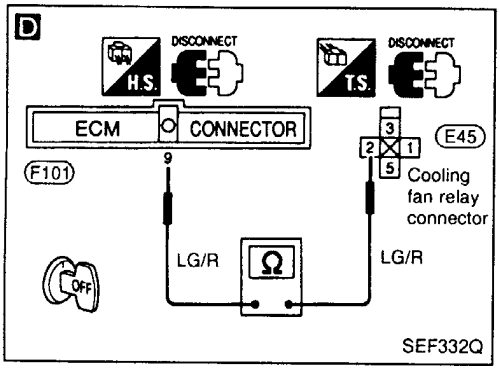
- Harness connector (E104)
- 40A fusible link
- 10A fuse
- Harness for open or short-circuit between fuse and cooling fan relay.
- Harness for open or short-circuit between battery and cooling fan relay.

If NG, replace fuse or fusible link or repair harness or connectors.

OK

Ⓐ





Ⓐ

C

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan motor-1 & -2 connector terminals ① and cooling fan relay connector terminal ⑤; cooling fan motor-1 & -2 connector terminals ② and body ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

D

CHECK OUTPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ⑨ and cooling fan relay connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors F70, E65
- Harness for open or short-circuit between ECM and cooling fan relay.

If NG, repair harness or connectors.

OK ↓

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

NG → Replace cooling fan relay.

OK ↓

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

NG → Replace cooling fan motors.

OK ↓

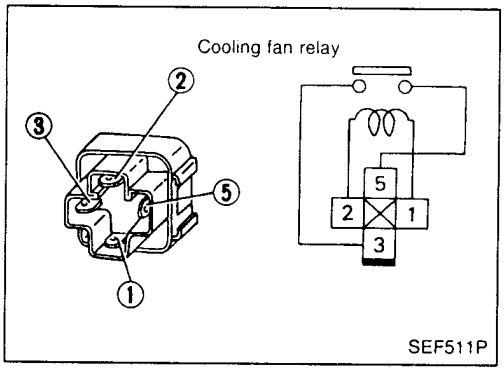
Disconnect and reconnect harness connectors in the circuit. Then retest.

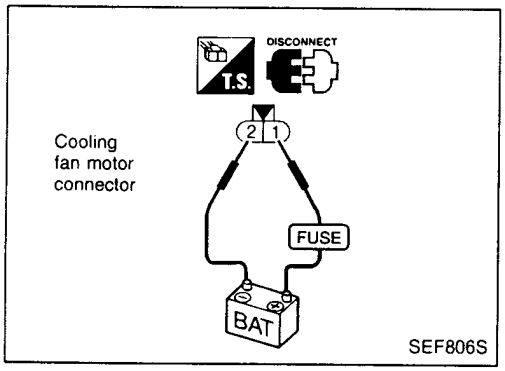
Trouble is not fixed. ↓

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

↓

INSPECTION END





Cooling Fan Control (Cont'd)

COMPONENT INSPECTION

Cooling fan relay

Check continuity between cooling fan relay terminals ③ and ⑤.

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

If NG, replace relay.

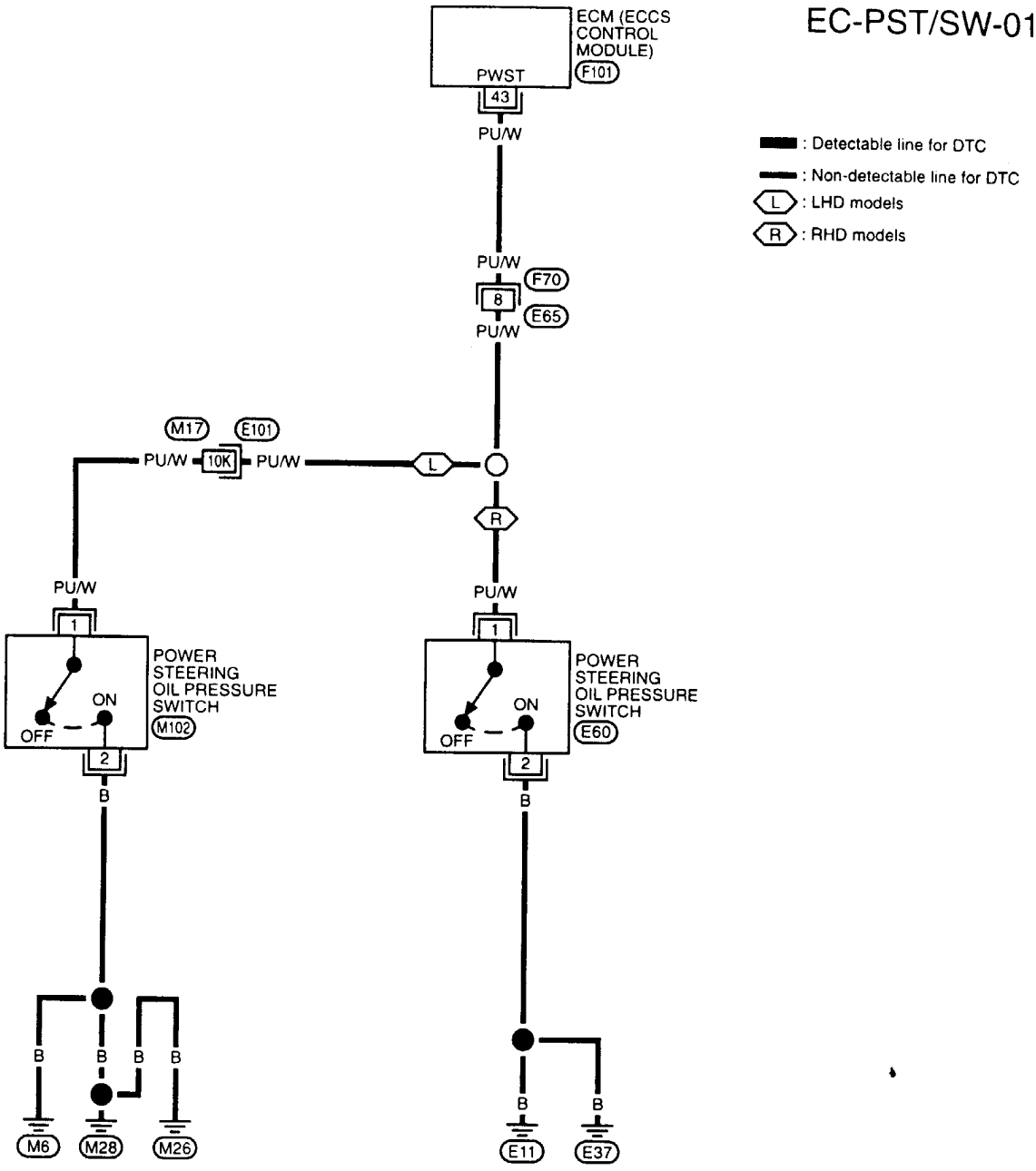
Cooling fan motors-1 and -2

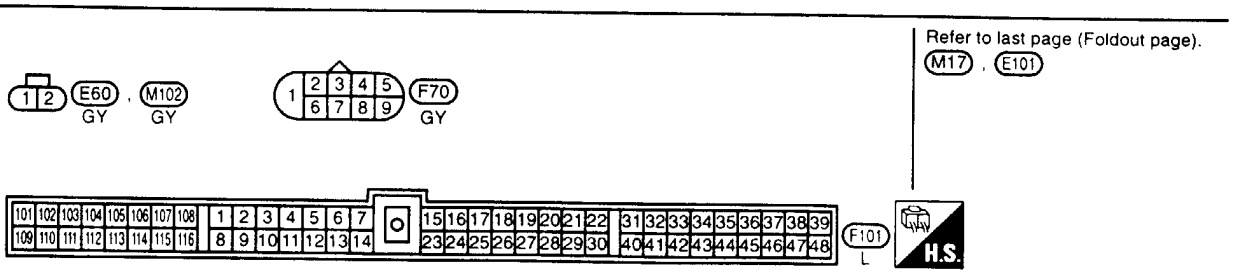
1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(⊕)	(⊖)
Cooling fan motor	①	②

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

Power Steering Oil Pressure Switch





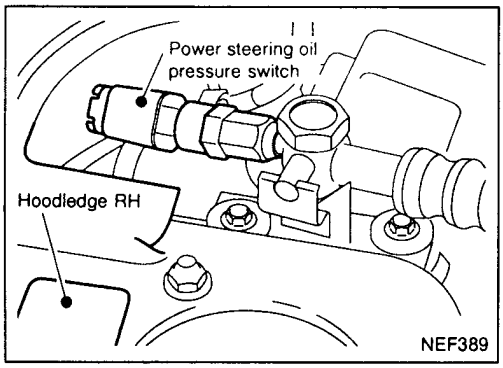
Refer to last page (Foldout page).
M17 , E101

SEF773S

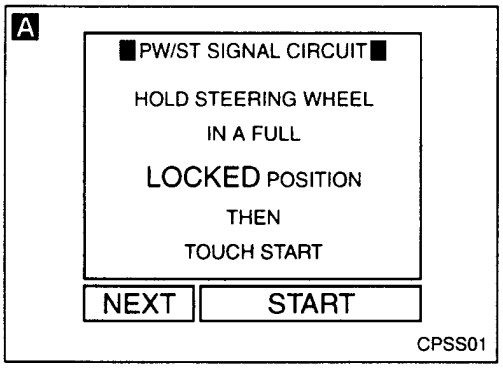
Power Steering Oil Pressure Switch (Cont'd)

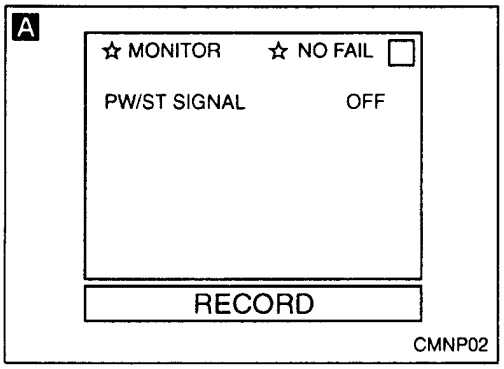
COMPONENT DESCRIPTION

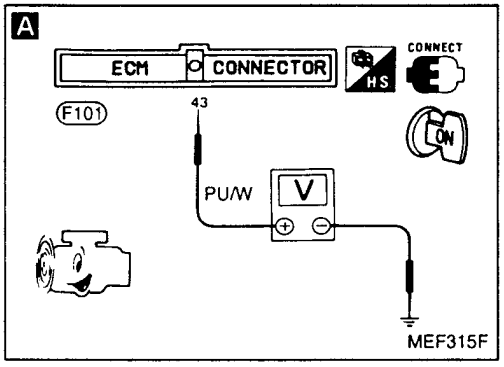
The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

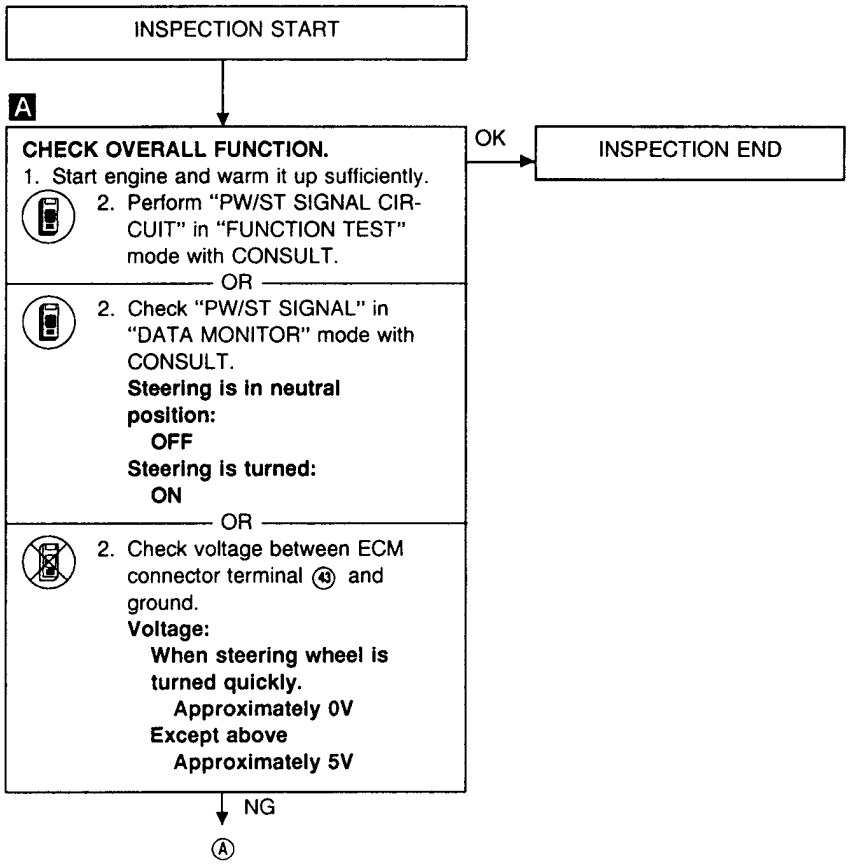


DIAGNOSTIC PROCEDURE

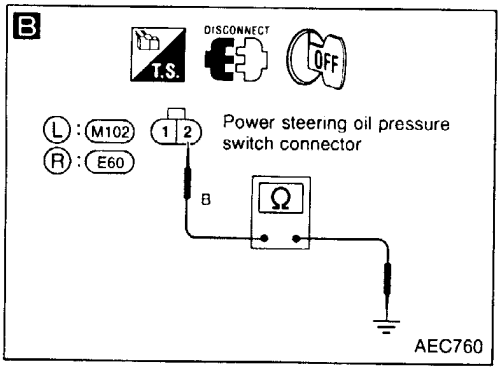


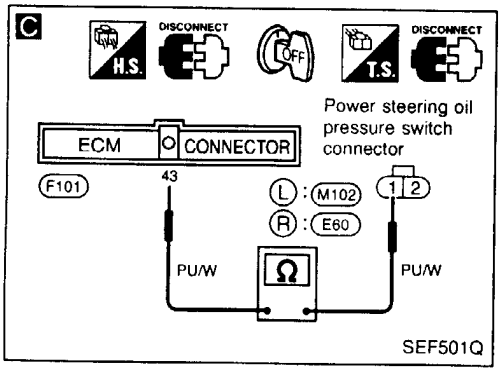






Power Steering Oil Pressure Switch (Cont'd)





Ⓐ

B

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

NG → Repair harness or connectors.

OK

C

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

NG → Check the following:
- Harness connectors F70, E65
- Harness connectors E101, M17
- Harness for open or short-circuit between ECM and power steering oil pressure switch.

If NG, repair harness or connectors.

OK

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

NG → Replace power steering oil pressure switch.

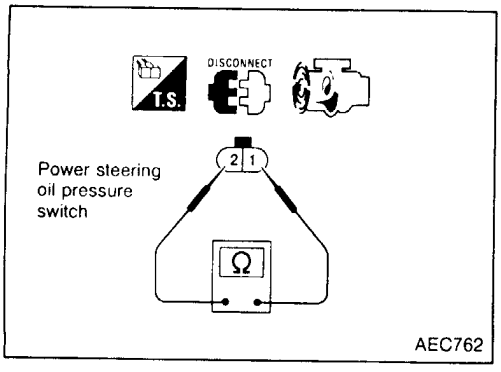
OK

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

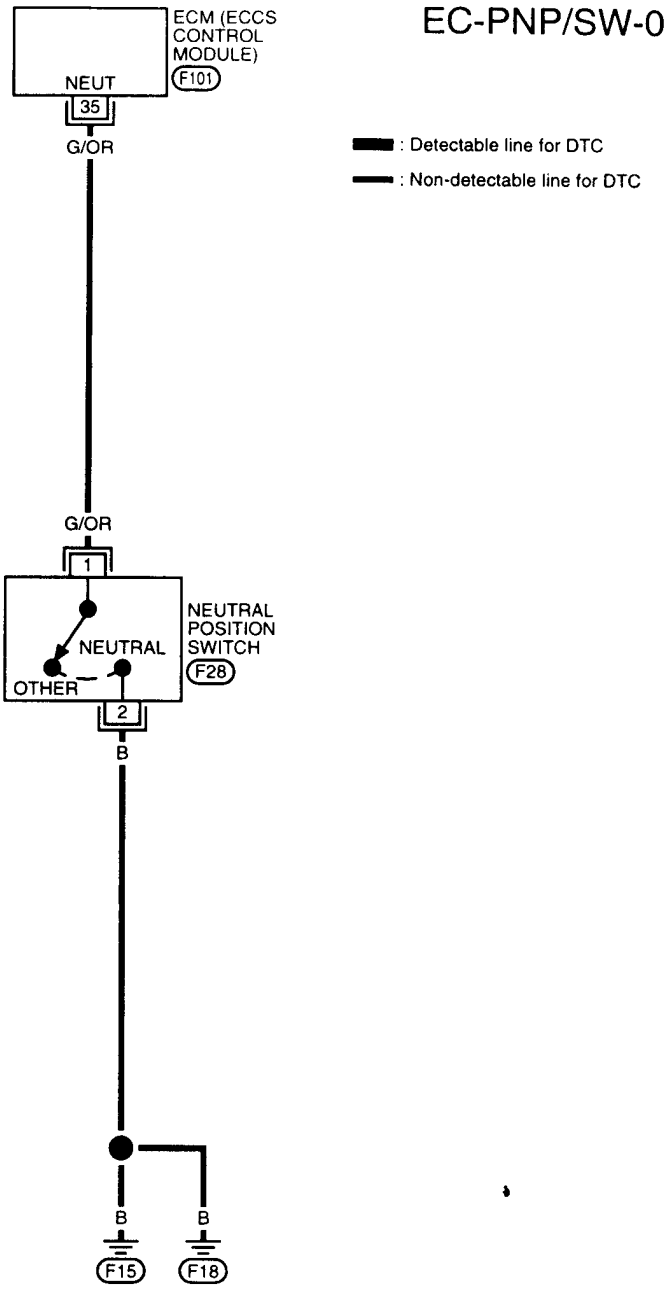
Power steering oil pressure switch

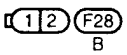
1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between power steering oil pressure switch terminals ① and ②.

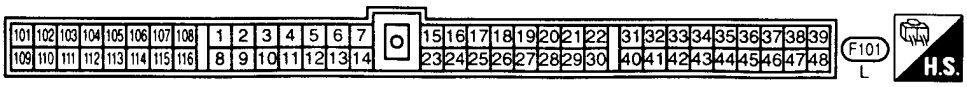
Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If NG, replace power steering oil pressure switch.

Neutral Position Switch



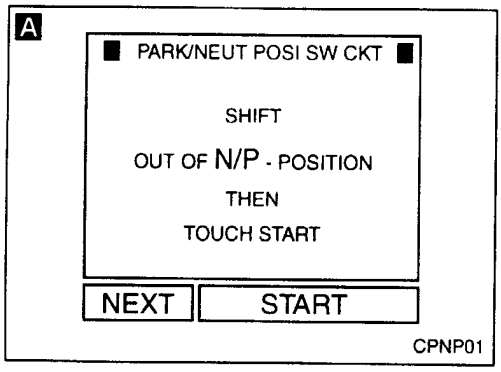


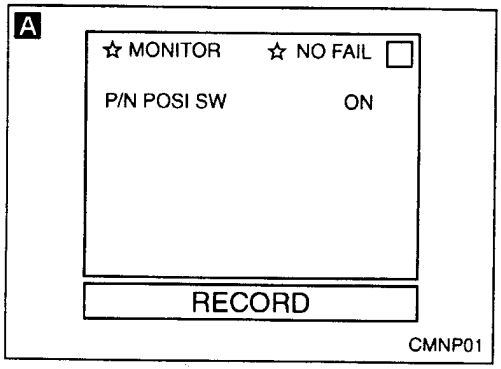


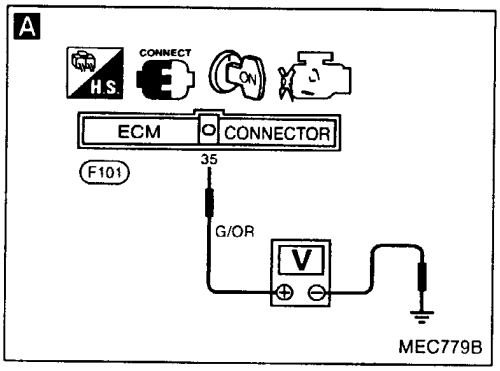
SEF774S

Neutral Position Switch (Cont'd)

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







DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

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

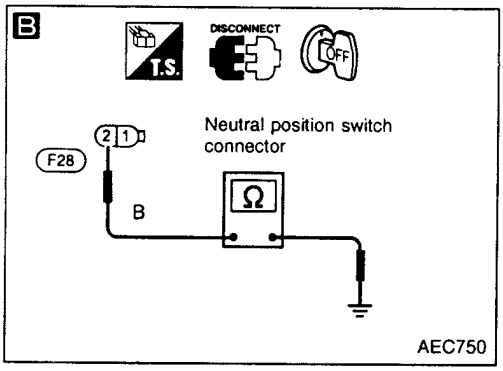
OR

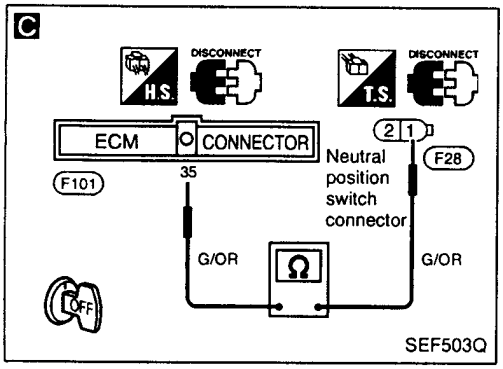
2. Check voltage between ECM connector terminal (35) and ground under the following conditions:
   Voltage:
   Neutral position
   Approximately 0V
   Except neutral position
   Approximately 5V

OK → INSPECTION END

NG → (A)

Neutral Position Switch (Cont'd)





Ⓐ

B

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect neutral position switch harness connector.
3. Check harness continuity between neutral position switch connector terminal ② and body ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ㉟ and neutral position switch connector terminal ①.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace neutral position switch.

OK ↓

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

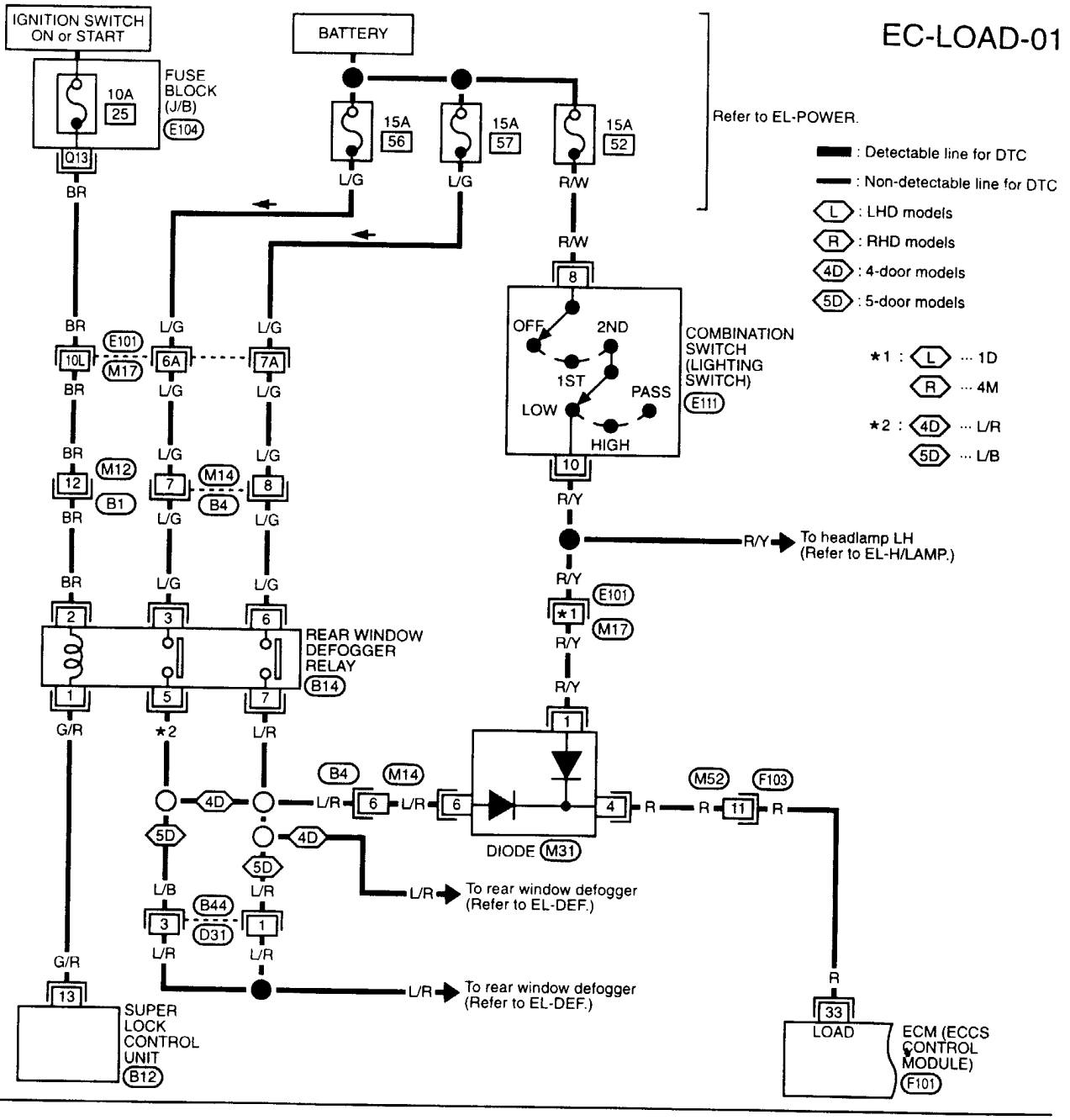
Trouble is not fixed. ↓

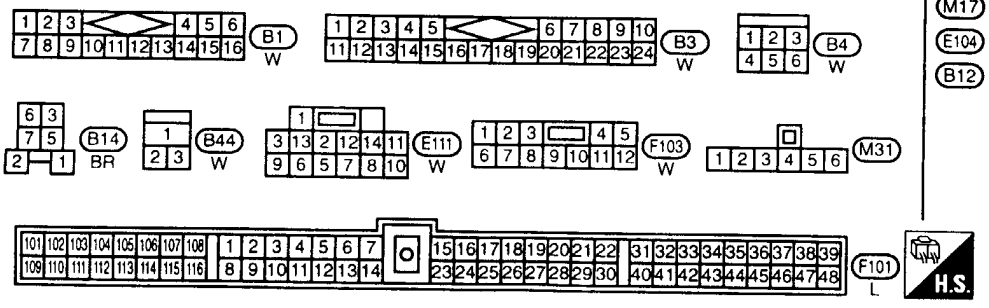
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Electrical Load Signal



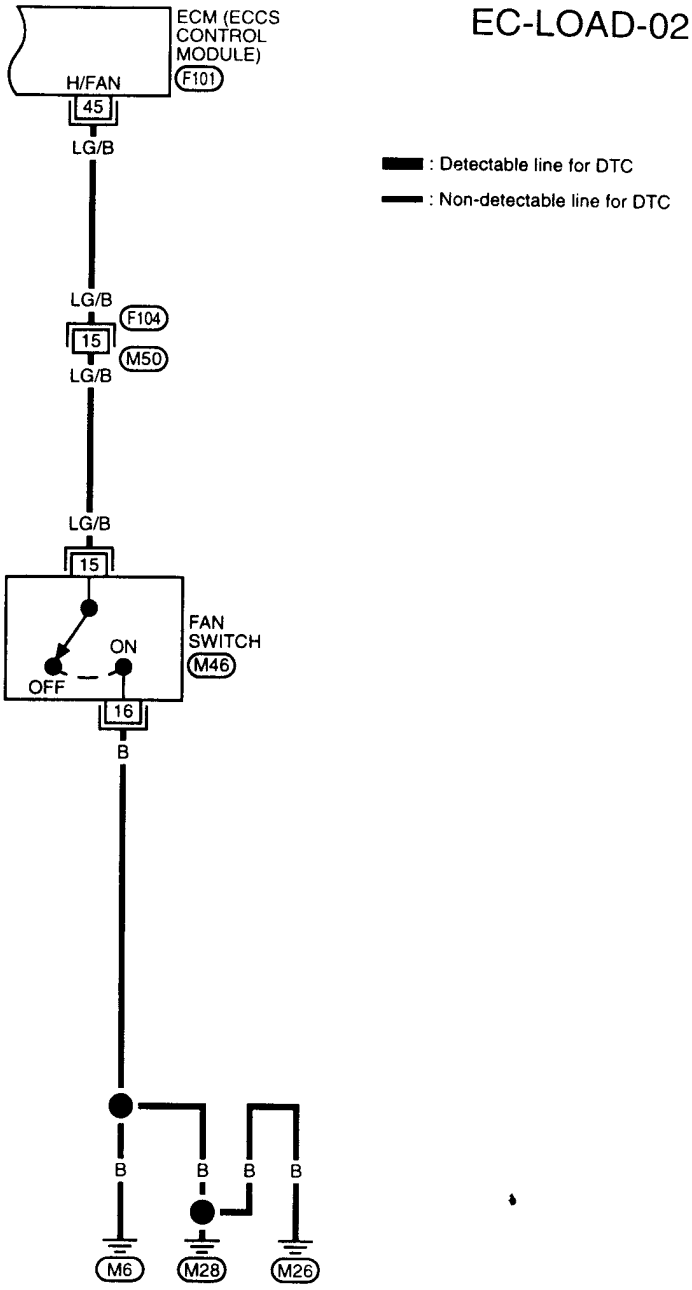


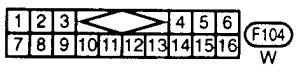
Refer to last page (Foldout page).
M17 , E101
E104
B12

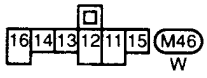
SEF775S

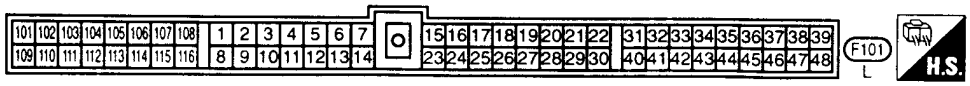
Electrical Load Signal (Cont'd)

EC-LOAD-02





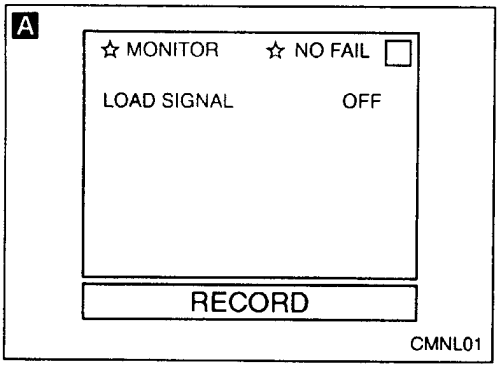


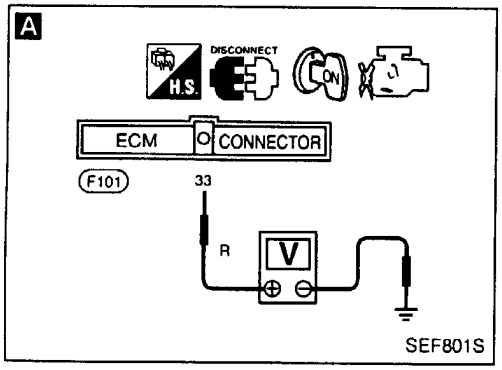


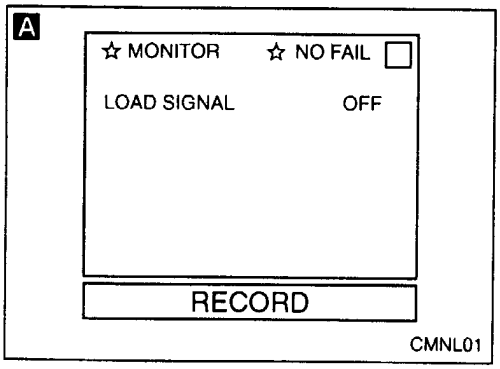
SEF776S

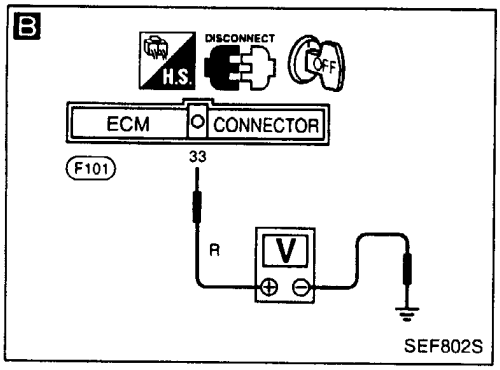
Electrical Load Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION-I.

1. Turn ignition switch to "ON" position.
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT.
   Rear window defogger switch is "ON": ON
   Rear window defogger switch is "OFF": OFF

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

OR

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

OK

B

CHECK OVERALL FUNCTION-II.

1. Turn rear window defogger switch to "OFF" position.
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT.
   Lighting switch is "ON": ON
   Lighting switch is "OFF": OFF

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

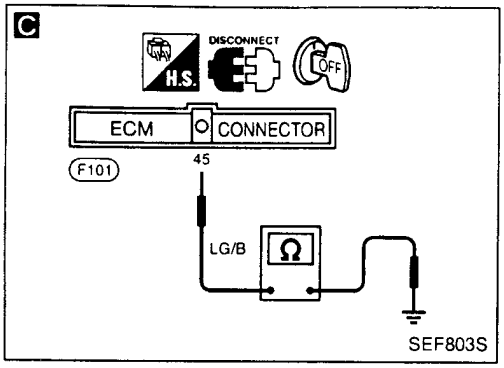
OR

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

OK

Ⓐ

Electrical Load Signal (Cont'd)



Ⓐ

C

CHECK POWER AND GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Check continuity between ECM connector terminal (45) and ground.
   Blower fan switch "ON":
   Continuity should exist.
   Blower fan switch "OFF":
   Continuity should not exist.

NG →

Check the following:
- Harness connectors (M50), (F104)
- Harness continuity between ECM and fan switch, fan switch and ground.
- Fan switch (Refer to HA section.)

If NG, repair harness or connectors.

OK ↓

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

Trouble is not fixed. ↓

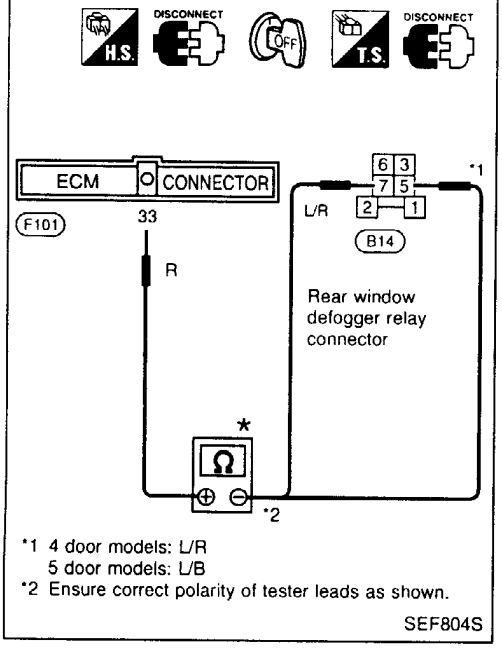
Check ECM pin terminals for damage or loose connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Electrical Load Signal (Cont'd)

D



*1 4 door models: L/R
5 door models: L/B
*2 Ensure correct polarity of tester leads as shown.

SEF804S

PROCEDURE A

INSPECTION START

Check if rear window defogger functions normally.

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

OK

D

CHECK INPUT SIGNAL CIRCUIT.

1. Turn rear window defogger switch to "OFF" position.
2. Turn ignition switch to "LOCK" position.
3. Disconnect ECM harness connector and rear window defogger relay.
4. Check harness continuity between ECM connector terminal (33) and rear window defogger relay connector terminals (5), (7).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (B4), (M14)
- Harness connectors (M52), (F103)
- Diode (M31)
- Harness for open or short-circuit between ECM and rear window defogger relay.

If NG, repair harness or connectors.

OK

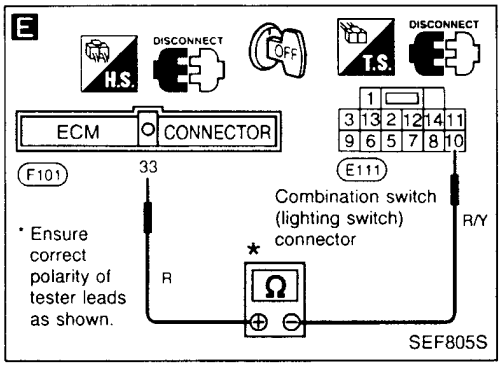
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

INSPECTION END

Electrical Load Signal (Cont'd)



PROCEDURE B

INSPECTION START

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

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

OK

E

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and lighting switch harness connector.
3. Check harness continuity between ECM connector terminal (33) and combination switch (lighting switch) connector terminal (10).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (E101), (M17)
- Harness connectors (M52), (F103)
- Diode (M31)
- Harness for open or short-circuit between lighting switch and ECM.

If NG, repair harness or connectors.

OK

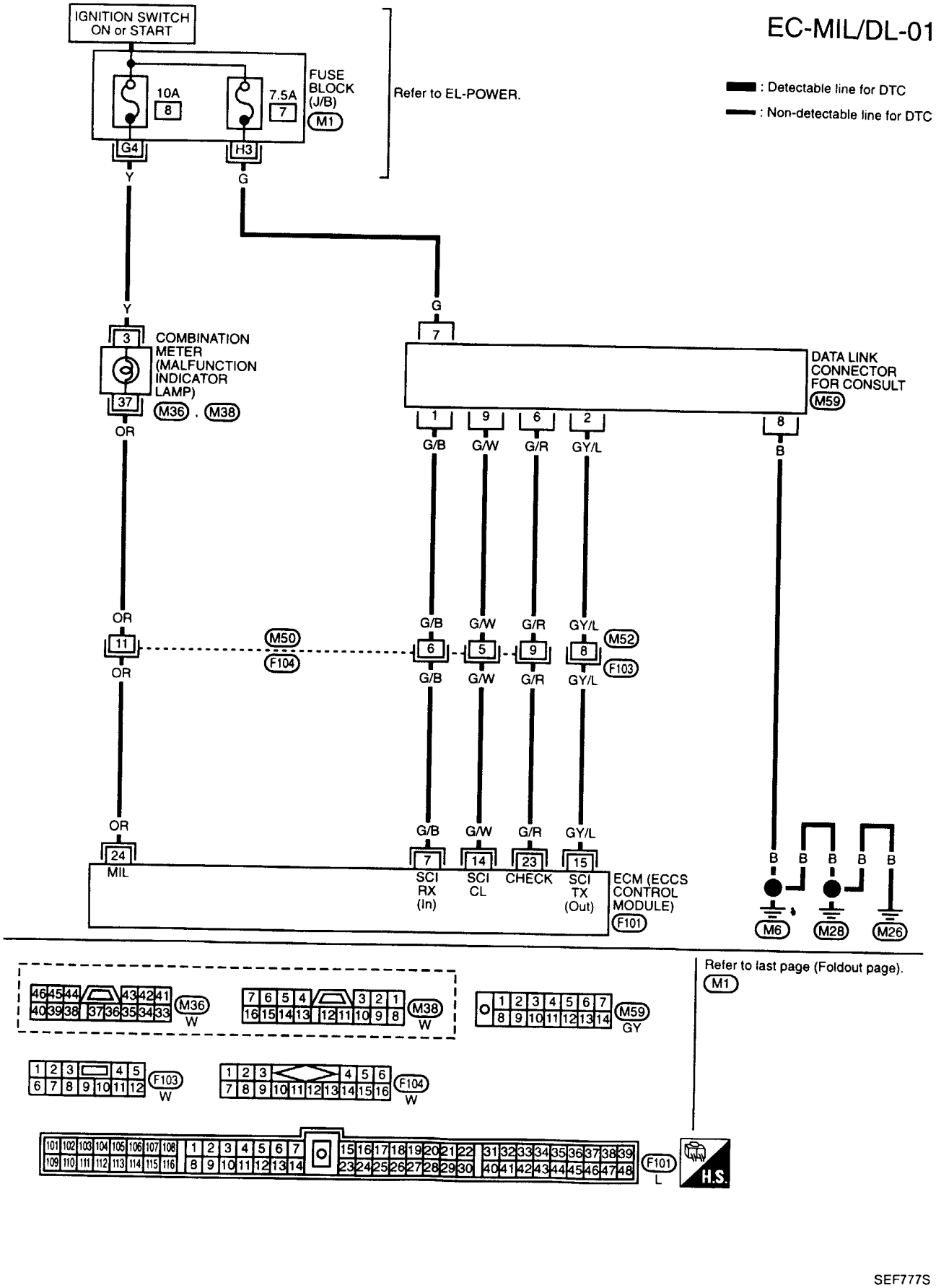
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

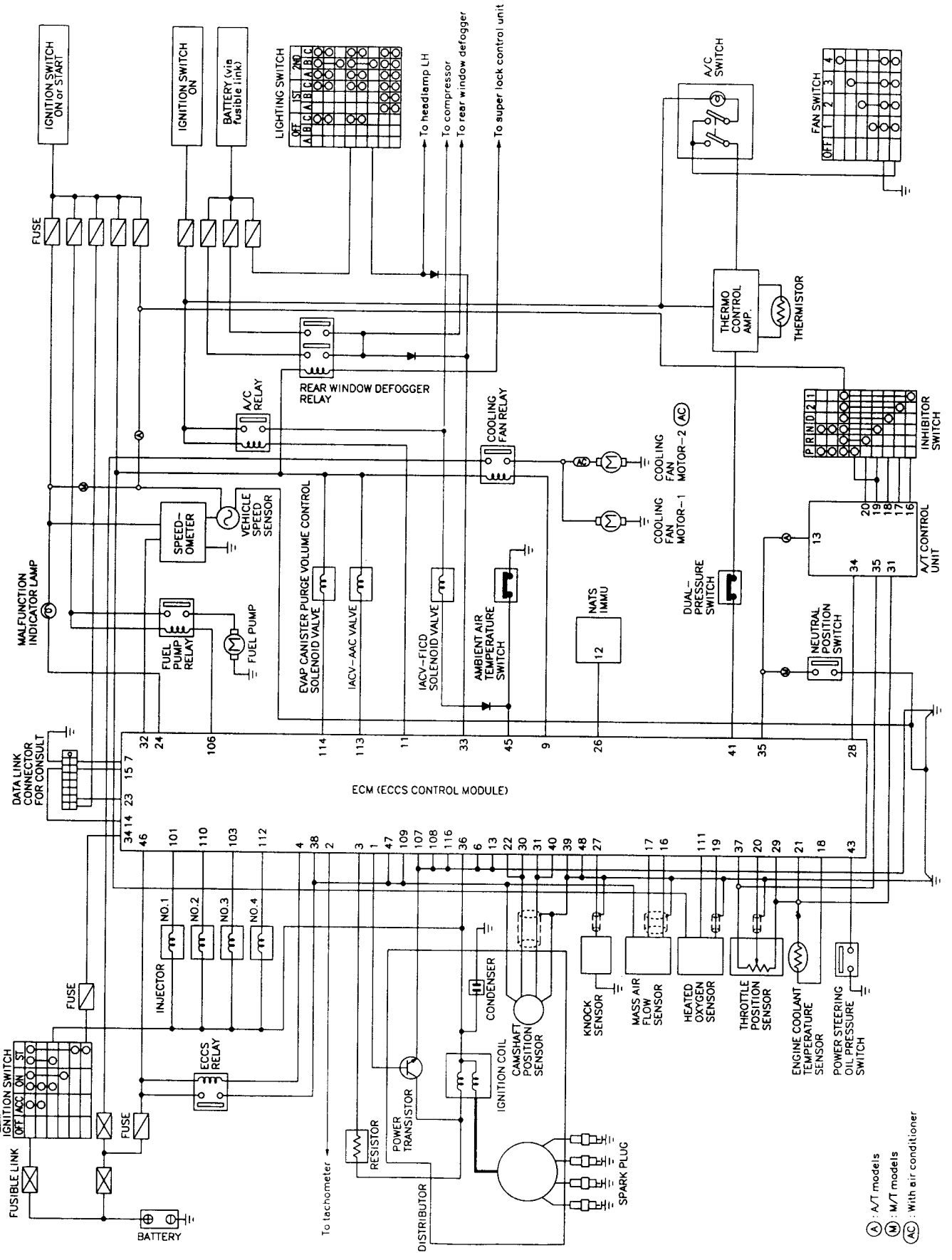
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

MIL & Data Link Connectors

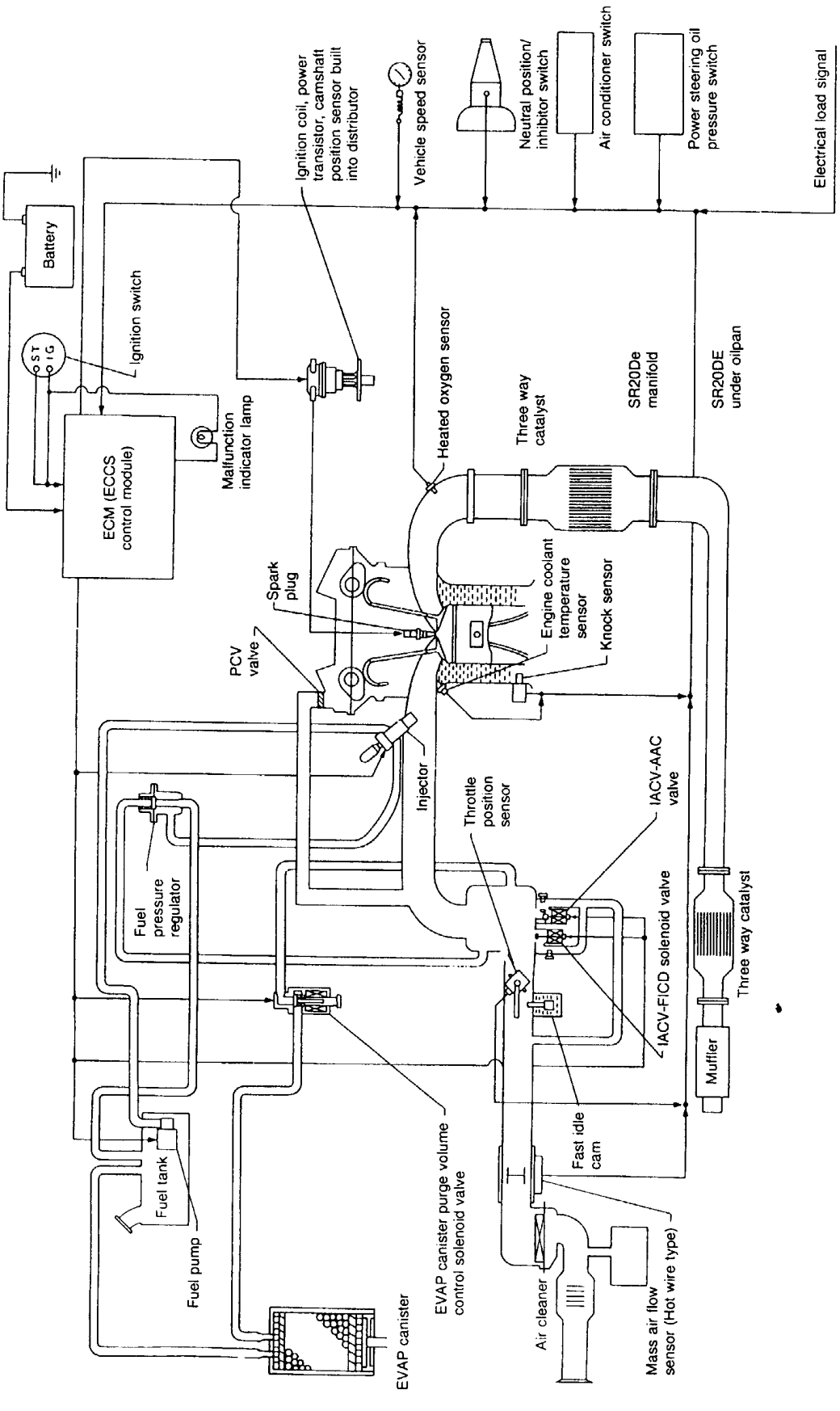


Circuit Diagram



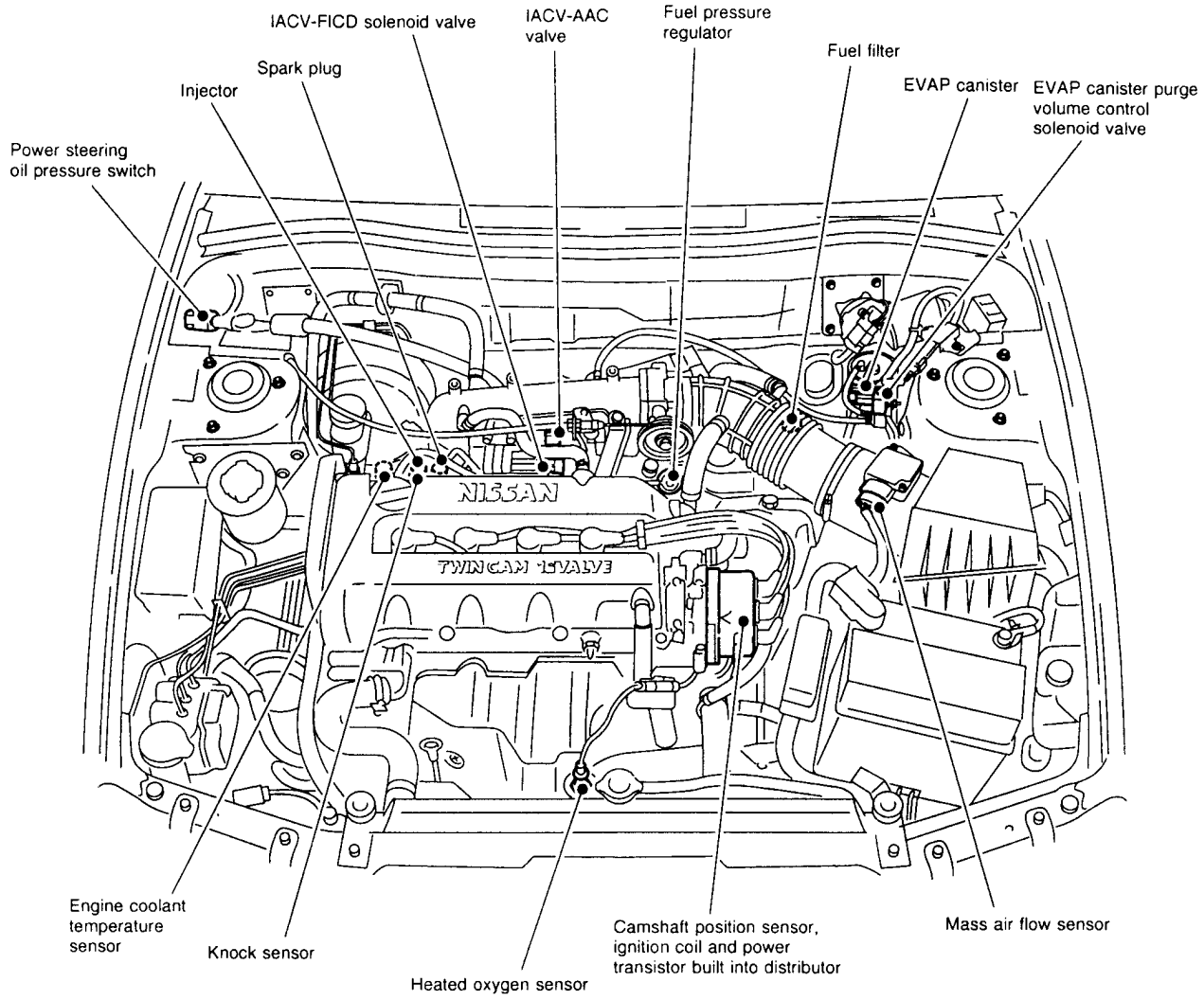
SEF808S

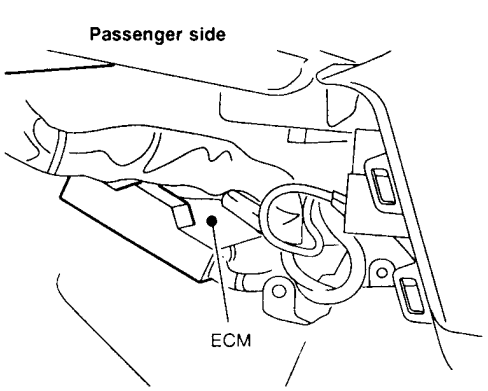
System Diagram

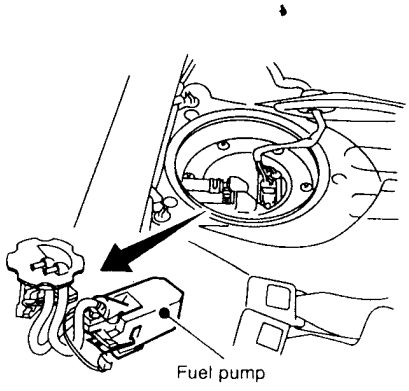


SEF830S

ECCS Component Parts Location

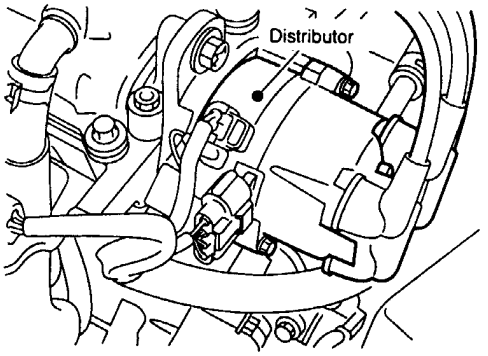


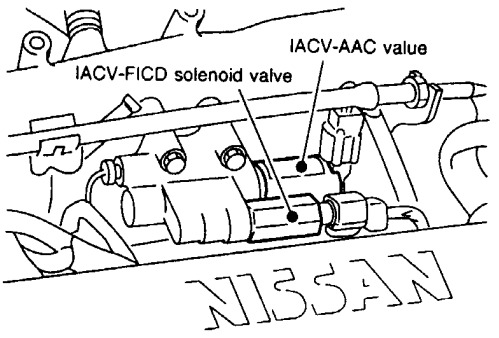


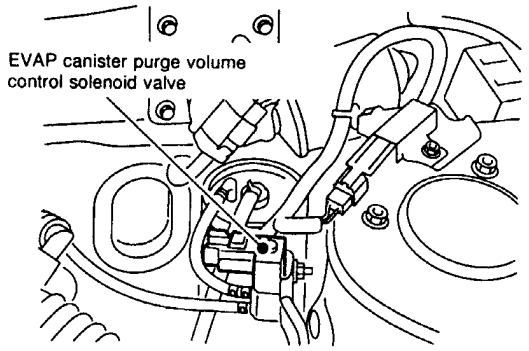


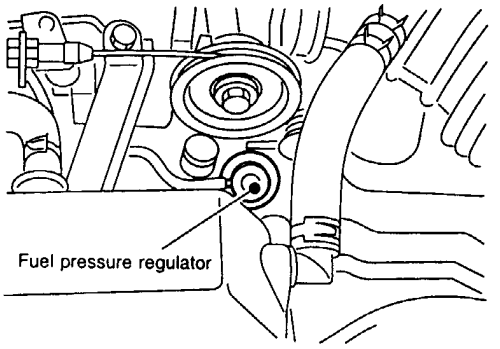
NEF314

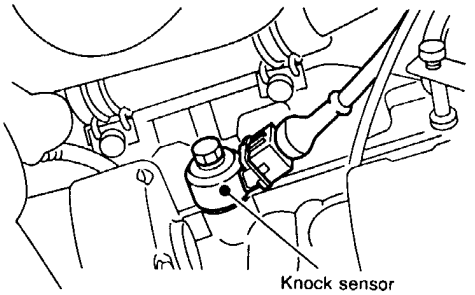
ECCS Component Parts Location (Cont'd)







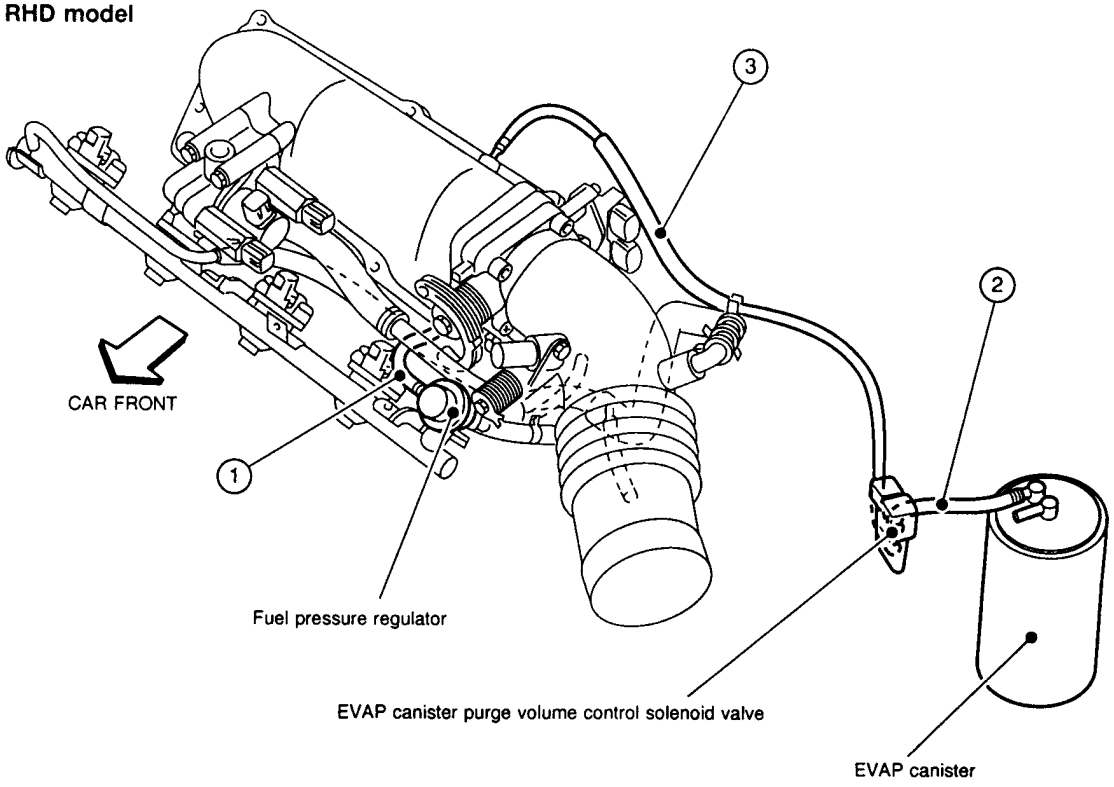




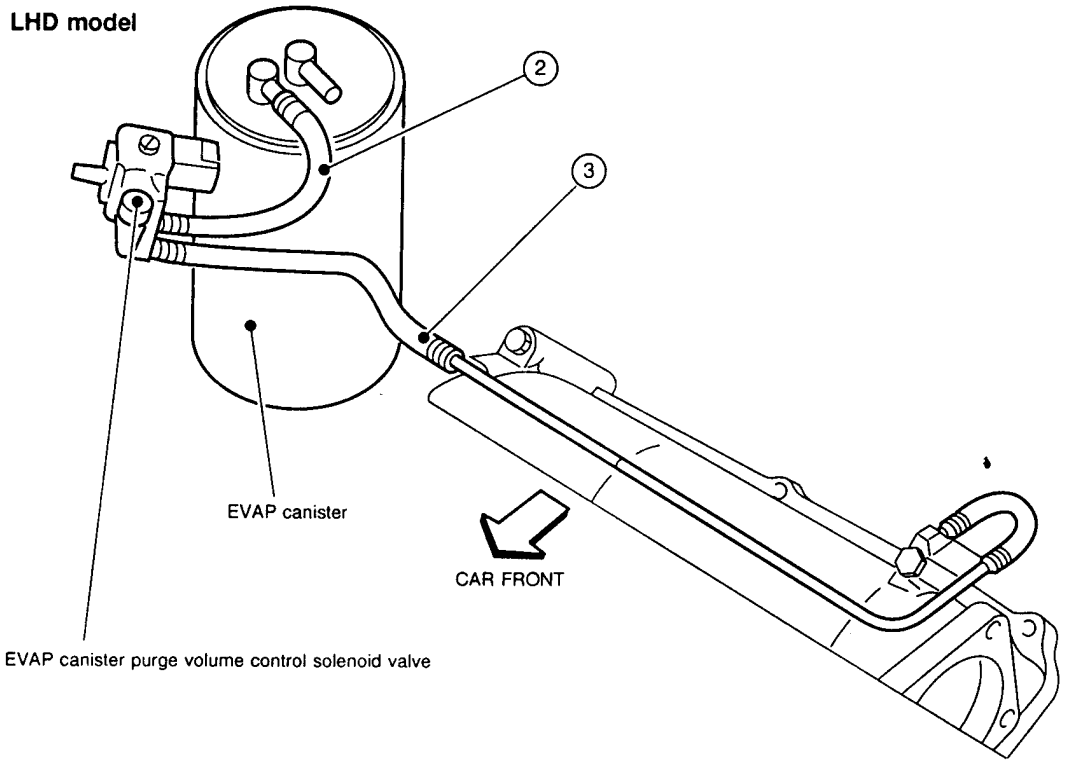
NEF315

Vacuum Hose Drawing

RHD model



LHD model



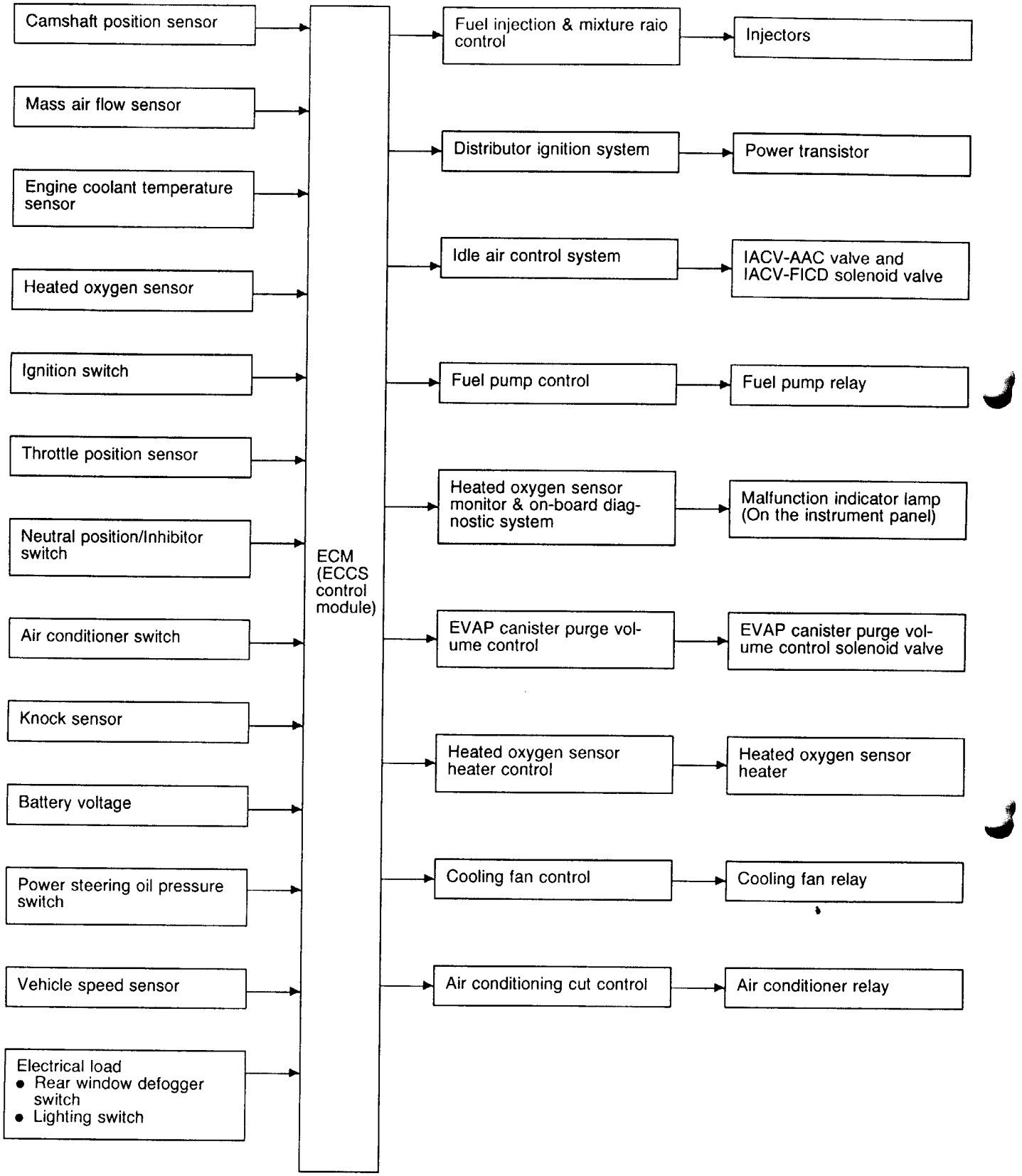
NEF344

① Fuel pressure regulator to throttle body

② EVAP canister (purge line) to EVAP canister purge volume control solenoid valve

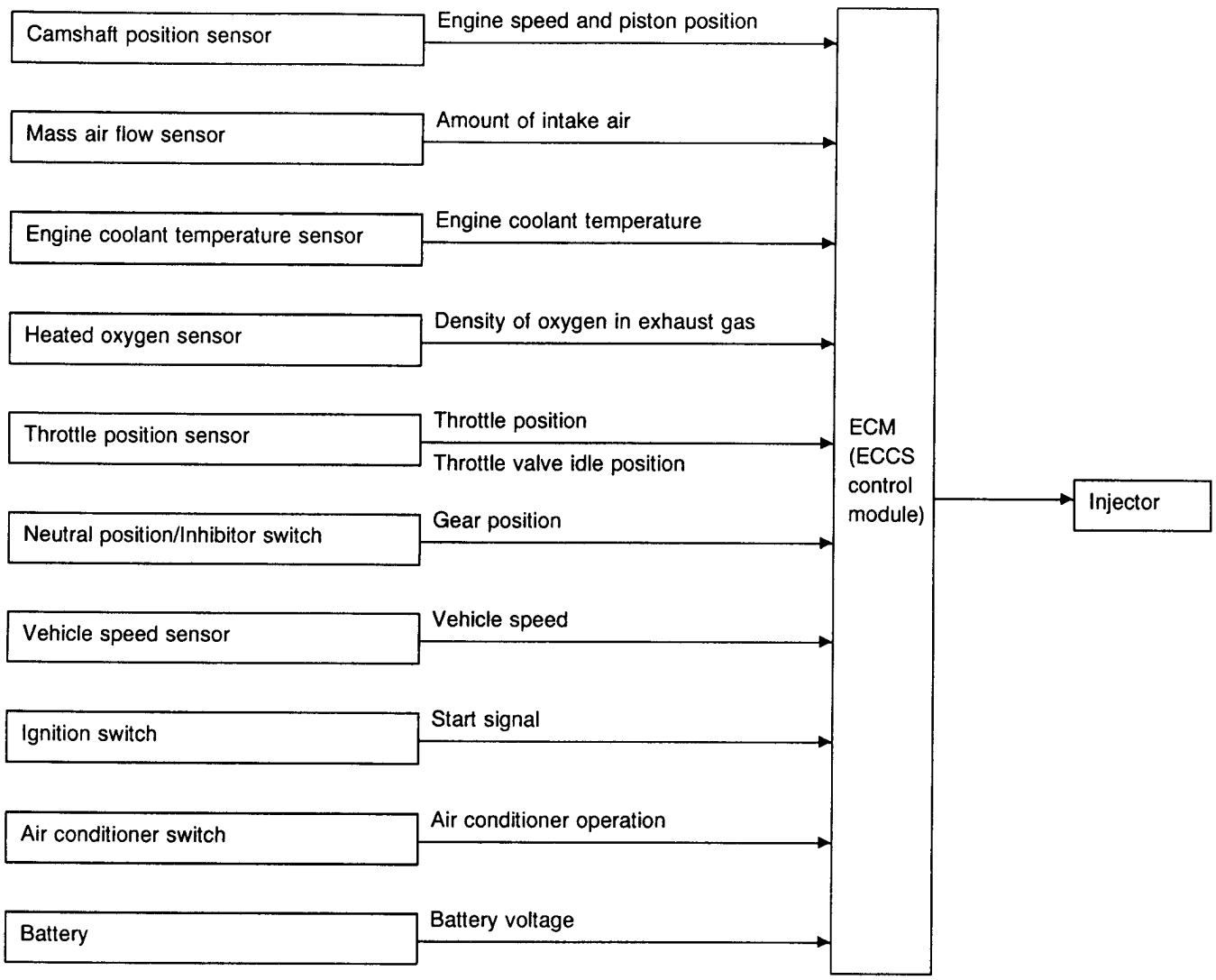
③ EVAP canister purge volume control solenoid valve (purge line) to intake manifold collector

System Chart



Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPORT FUEL INJECTION SYSTEM

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

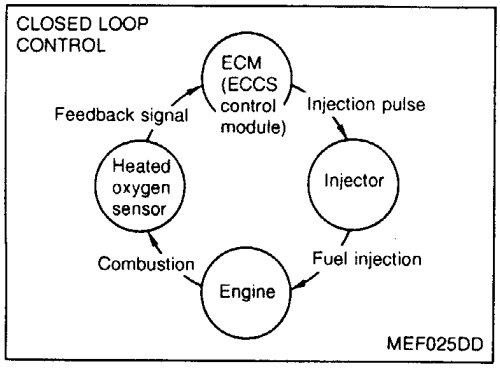
In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below:

⟨Fuel increase⟩

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

⟨Fuel decrease⟩

- During deceleration



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

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a heated oxygen sensor in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the heated oxygen sensor, refer to EC-244. 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
- After shifting from "N" to "D"
- During warm-up
- When starting the engine

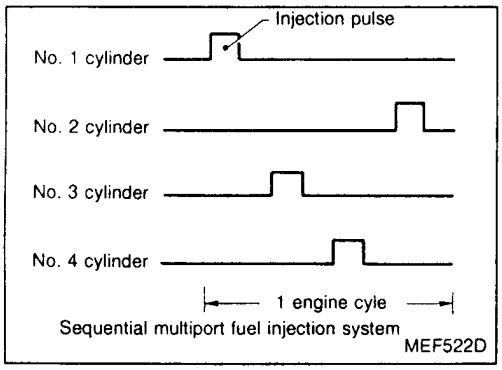
MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the 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.

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

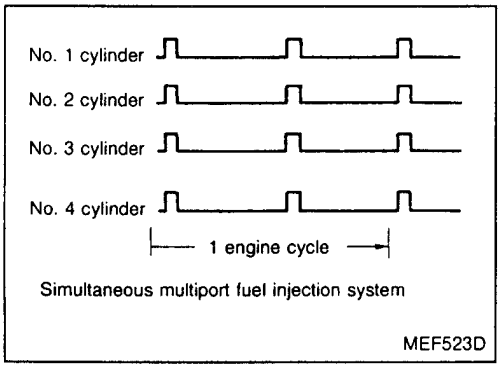
FUEL INJECTION TIMING

Two types of systems are used.



Sequential multiport fuel injection system

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



Simultaneous multiport fuel injection system

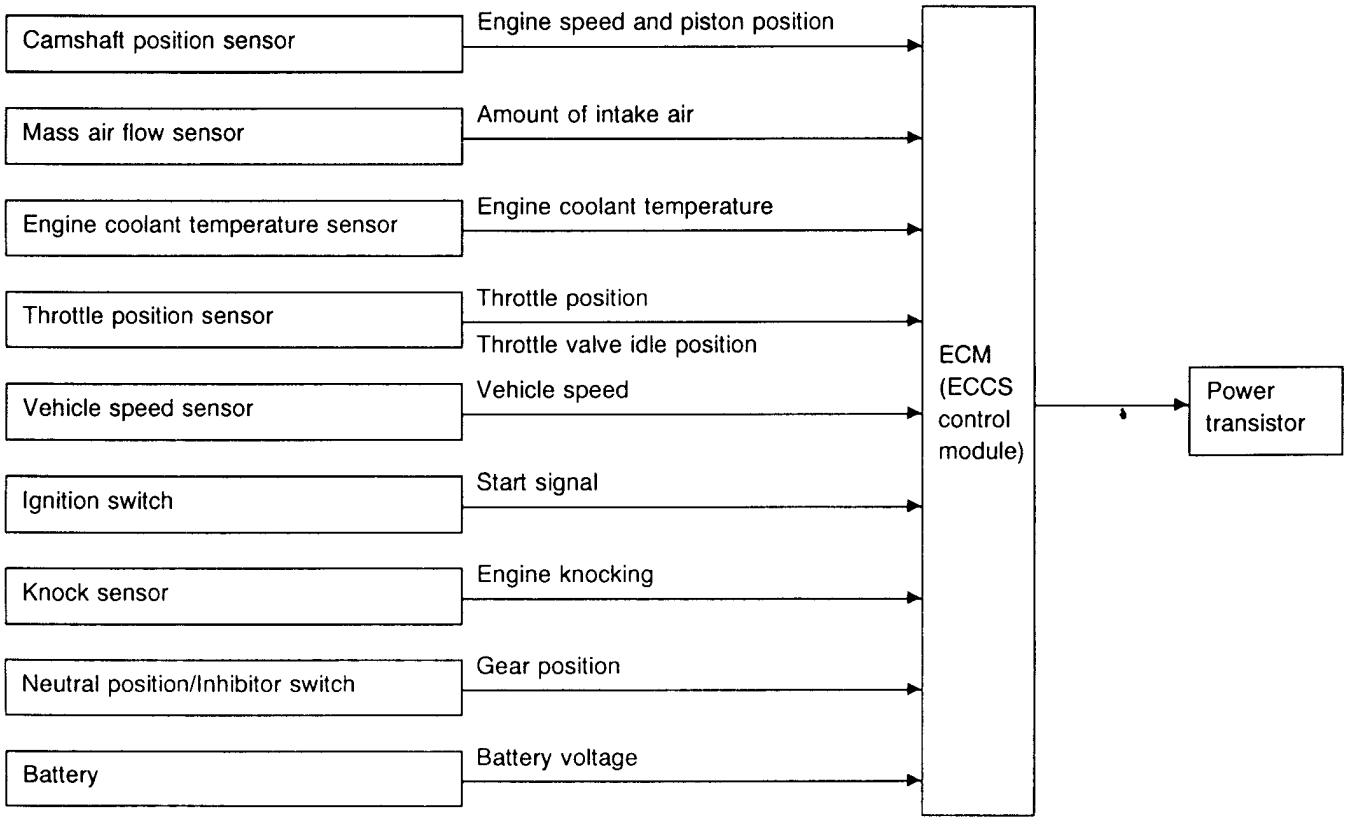
Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals twice each engine cycle.
This system is used when the engine is being started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

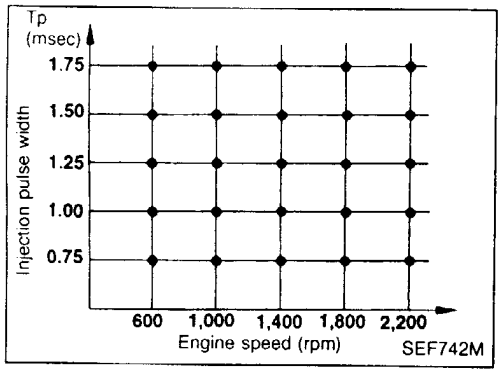
FUEL SHUT-OFF

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

Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE





Distributor Ignition (DI) System (Cont'd)

SYSTEM DESCRIPTION

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

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

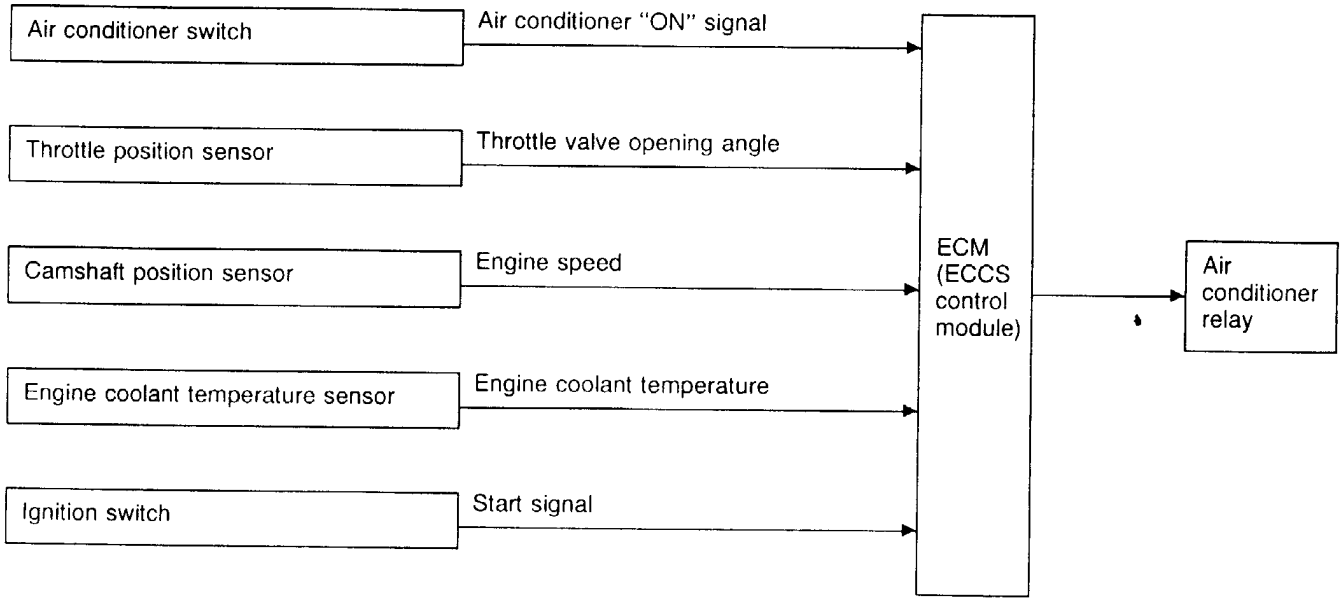
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

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

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

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE

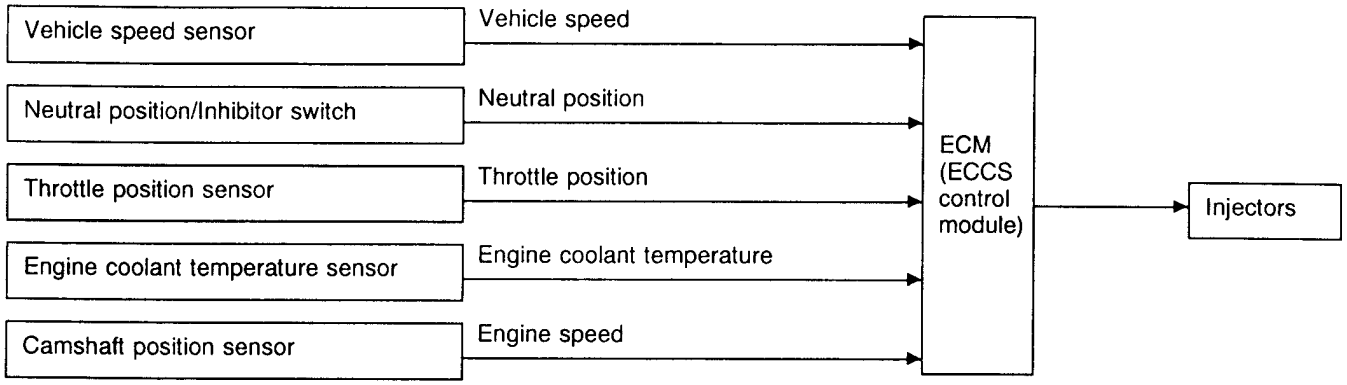


SYSTEM DESCRIPTION

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

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

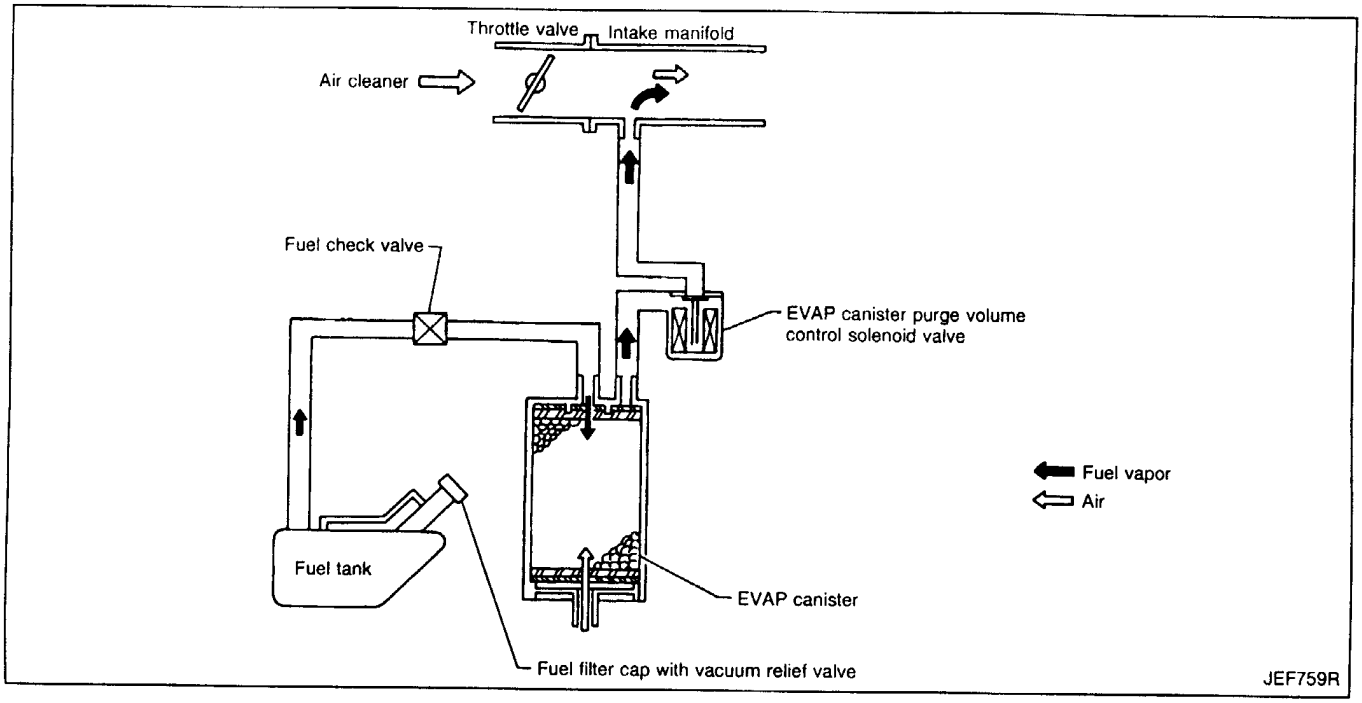
INPUT/OUTPUT SIGNAL LINE



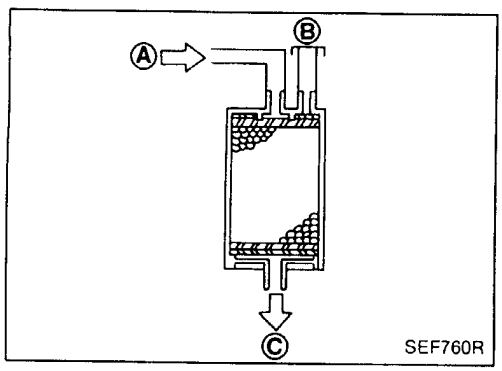
If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.
Fuel cut will operate until the engine speed reaches 1,150 rpm, then fuel cut is cancelled.

NOTE:
This function is different than deceleration control listed under "Multiport Fuel Injection (MFI) System" on EC-150.

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



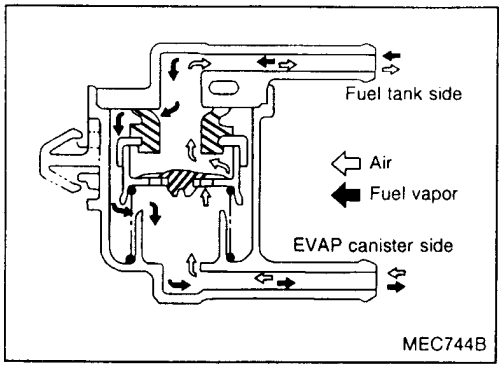
Inspection

EVAP CANISTER

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

Inspection (Cont'd)

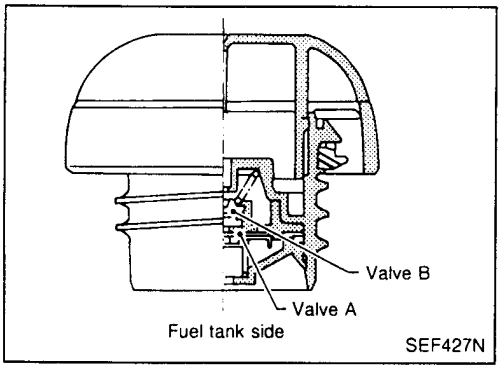
FUEL CHECK VALVE



Check valve operation

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

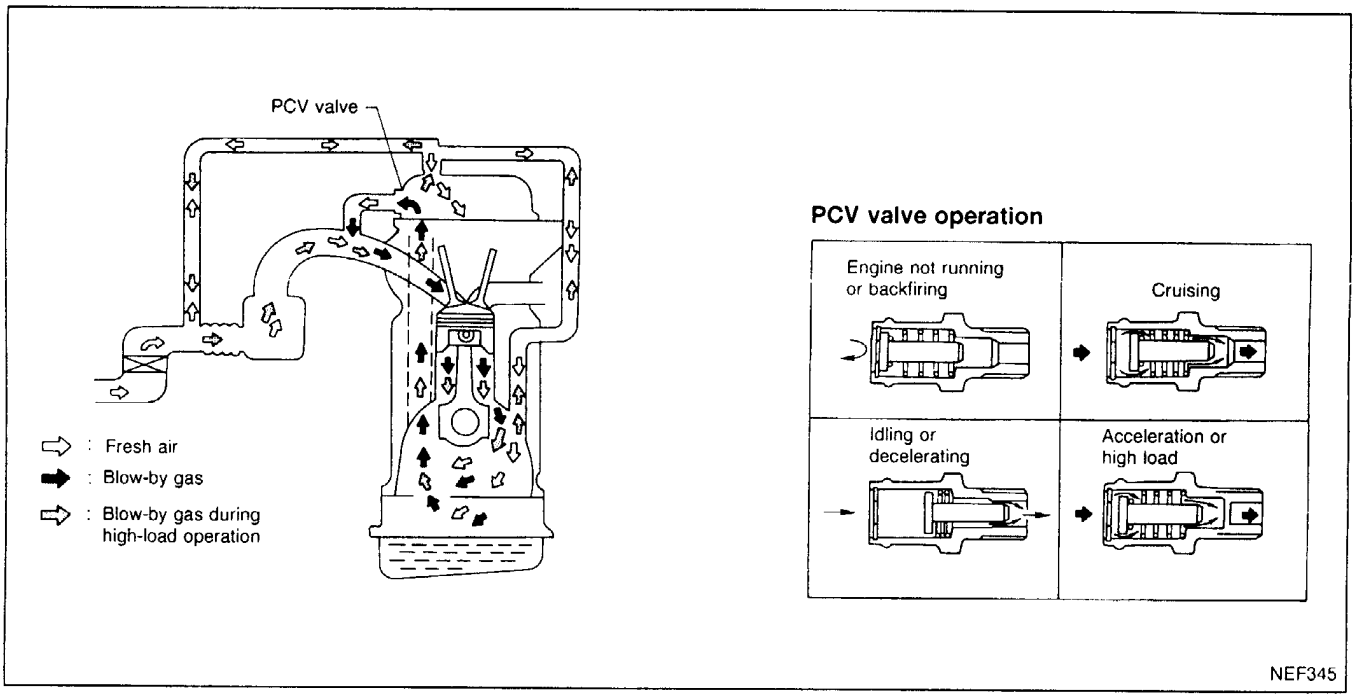
FUEL TANK VACUUM RELIEF VALVE

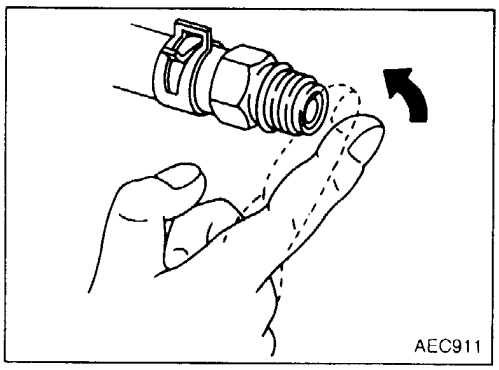


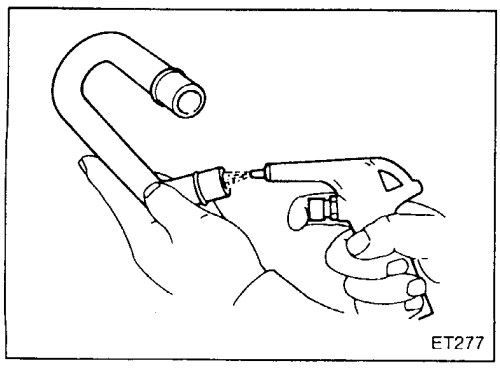
1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve A is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. Blow air on fuel tank side and ensure that continuity of air passage exists through valve B.
4. If valve is clogged or if no resistance is felt, replace cap as an assembly.

Description

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







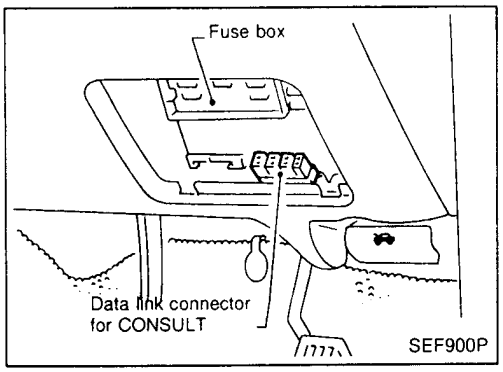
Inspection

PCV (Positive Crankcase Ventilation)

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

VENTILATION HOSE

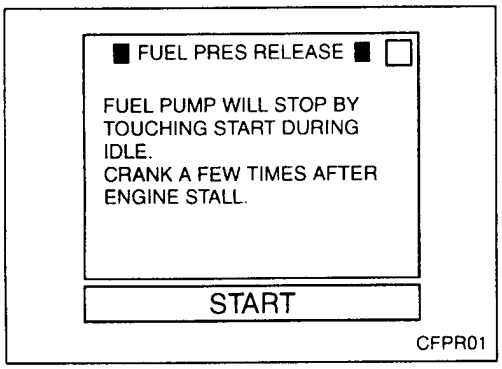
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



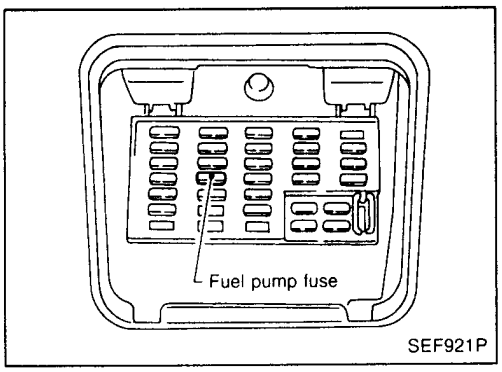
Fuel Pressure Release

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

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



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



Fuel Pressure Check

- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**
- **Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.**

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

At idling:

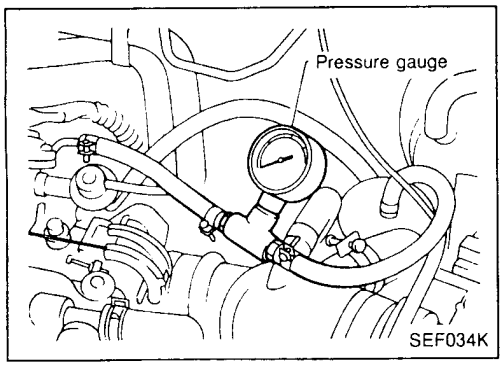
With vacuum hose connected

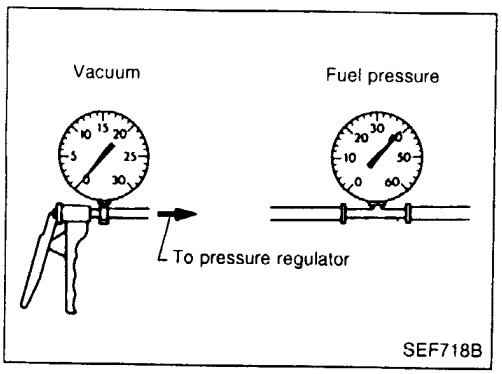
Approximately 235 kPa (2.35 bar, 2.4 kg/cm^2, 34 psi)

With vacuum hose disconnected

Approximately 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)

If results are unsatisfactory, perform Fuel Pressure Regulator Check.

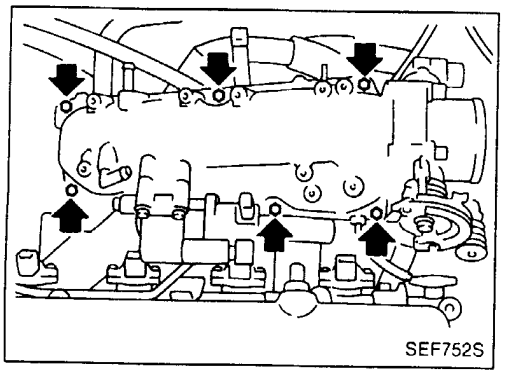




Fuel Pressure Regulator Check

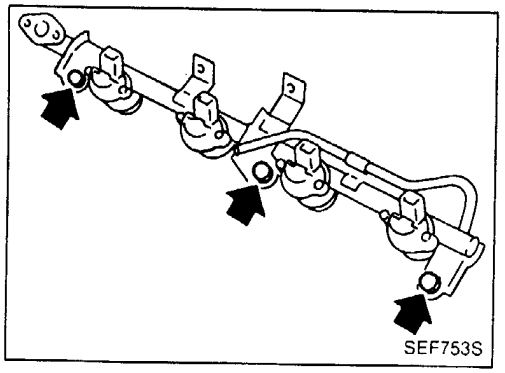
1. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
2. Plug intake manifold with a rubber cap.
3. Connect variable vacuum source to fuel pressure regulator.
4. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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

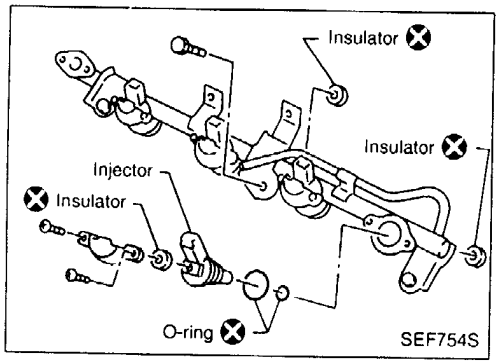


Injector Removal and Installation

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



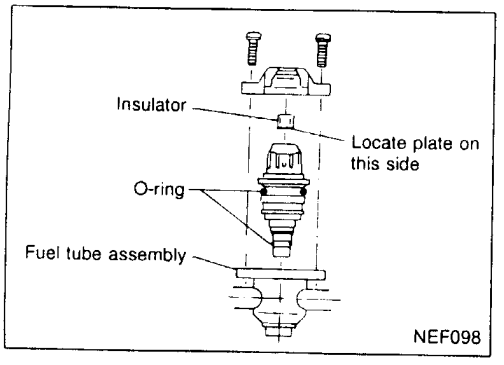
5. Disconnect injector harness connectors.
6. Disconnect fuel hoses from fuel tube assembly.
7. Remove injectors with fuel tube assembly.



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

Do not extract injector by pinching connector.

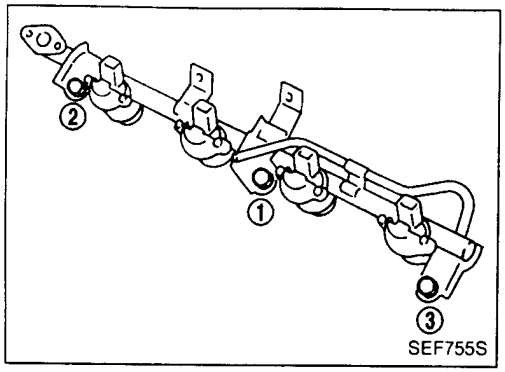
9. Replace or clean injector as necessary.



10. Install injector to fuel tube assembly.

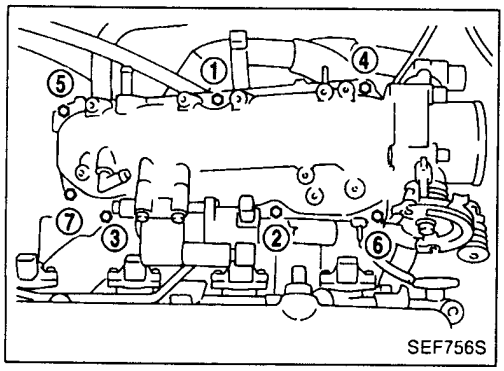
Always replace O-rings and insulators with new ones.
Lubricate O-rings with a smear of silicone oil.

Injector Removal and Installation (Cont'd)



11. Install injectors with fuel tube assembly to intake manifold. Tighten fuel tube bolts to the specified torque.
    Tightening procedure:
    1) **Tighten all bolts to 9.3 to 10.8 N·m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).**
    2) **Tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).**
12. Install fuel hoses to fuel tube assembly.

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



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

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

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

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

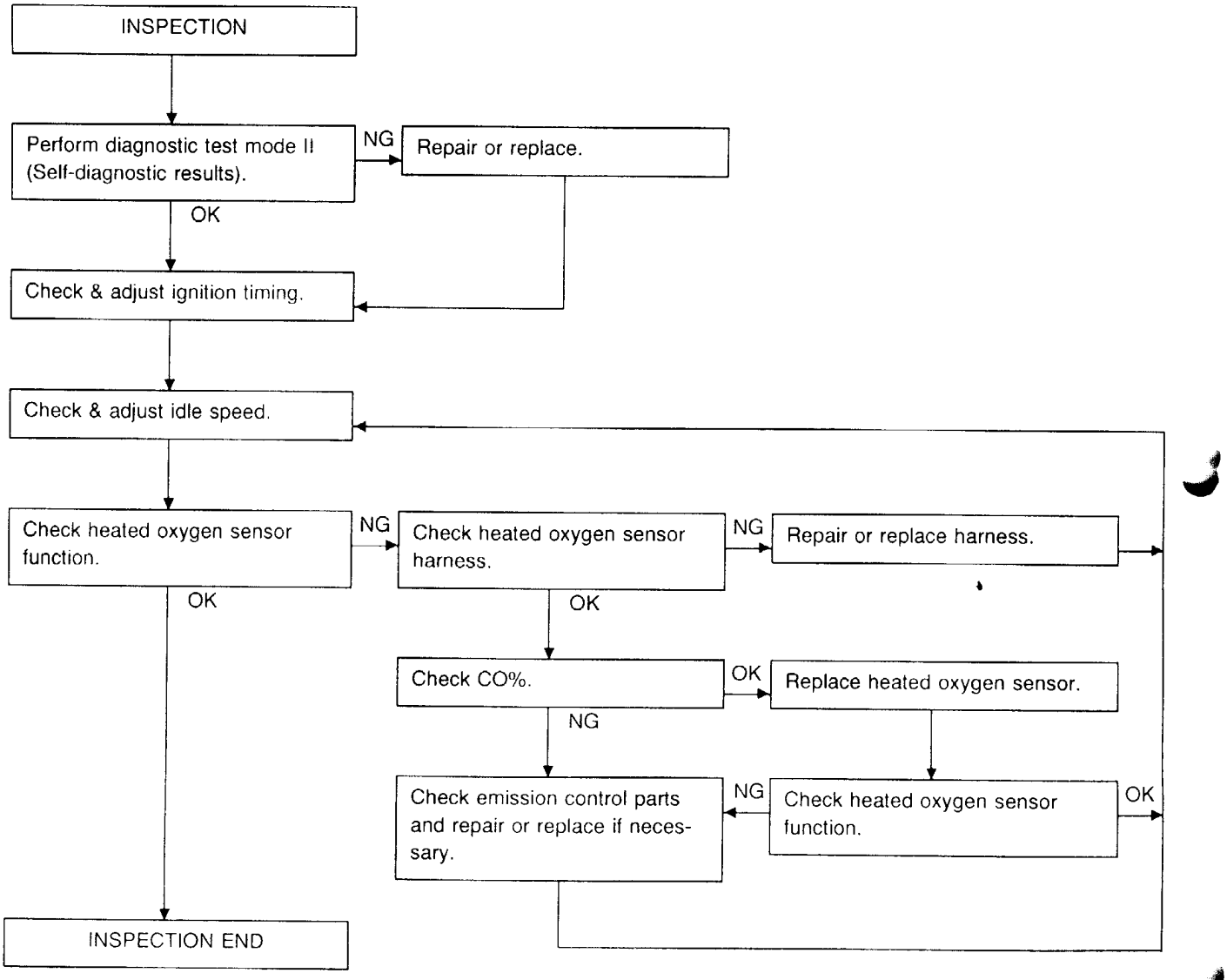
PREPARATION

- 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
(11) Evaporative emission system

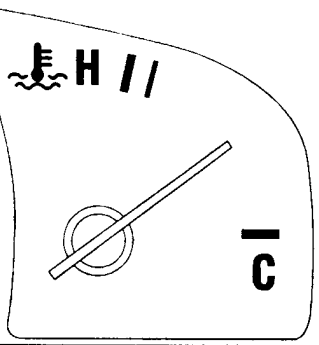
- On models equipped with air conditioner, checks should be carried out while the air conditioner is off.
- On models equipped with automatic transaxle, when checking idle speed, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
- When measuring "CO"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

Overall inspection sequence



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

A



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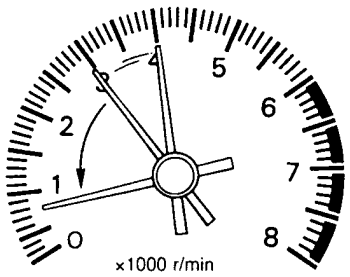
B



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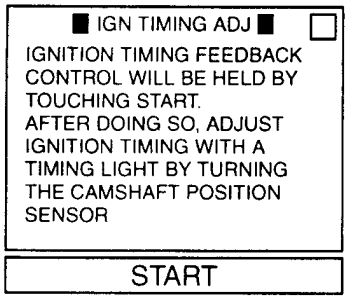
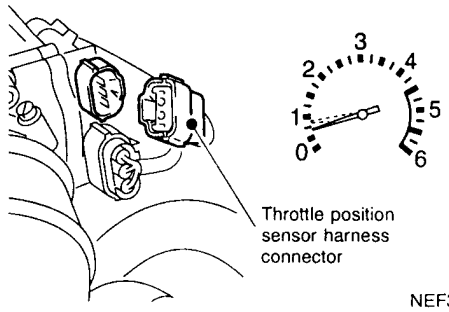
C



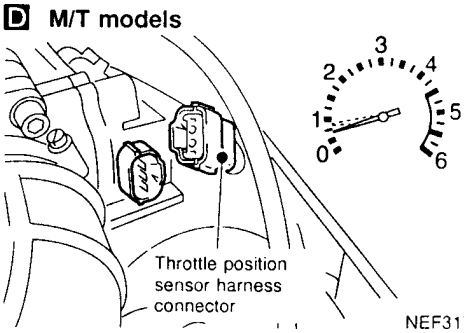
CITA02

D A/T models



NEF316

D M/T models



NEF317

START

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

A

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

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

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

OK

NG

Repair or replace components as necessary.

B

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

C D

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

OR

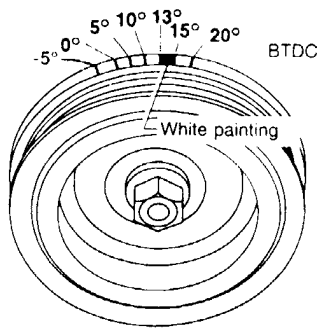
1. Turn off engine and disconnect throttle position sensor harness connector.
2. Start engine.

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

Ⓐ

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

E



AEC804

F

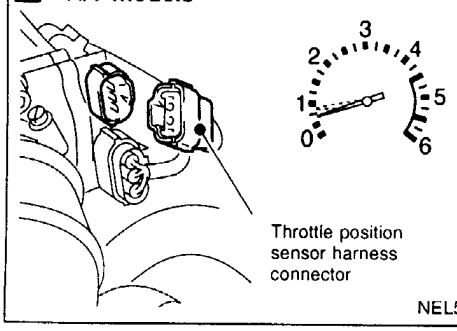
■ IGN TIMING ADJ ■ □

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

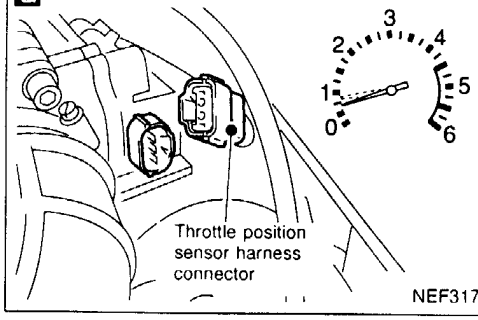
CITA02

G A/T models



NEL586

G M/T models



NEF317

H

■ IGN TIMING ADJ ■ □

---- CONDITION SETTING ----

IGN/T FEEDBACK: HOLD

========== MONITOR ==========

CMPS•RPM (REF)	700rpm
IGN TIMING	15BTDC
CLSD THL/POSI	ON

CITA01

Ⓐ

E

Check ignition timing with a timing light.

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

NG

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

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

Ⓑ

F **G**

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

OR

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

H

Check idle speed.

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

OR

Check idle speed.

M/T: 700^{+75}_{-50} rpm

A/T: 700^{+75}_{-50} rpm (in "N" position)

NG

OK

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

I (See next page for illustration)

Adjust idle speed by turning idle speed adjusting screw.

M/T: 700^{+75}_{-50} rpm

A/T: 700^{+75}_{-50} rpm (in "N" position)

J (See next page for illustration)

Touch "BACK".

OR

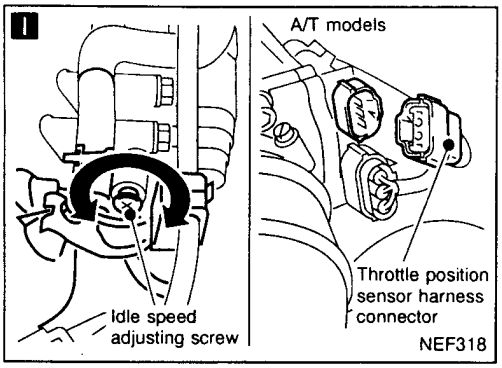
1. Turn off engine and connect throttle position sensor harness connector.
2. Start engine.

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

Ⓒ

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

I



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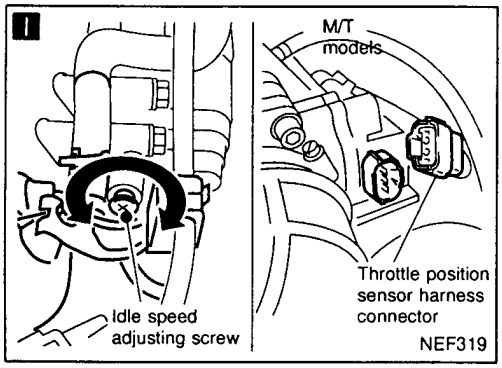
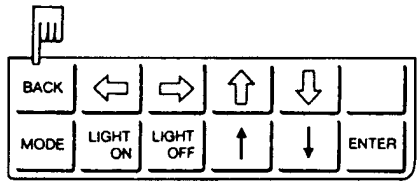
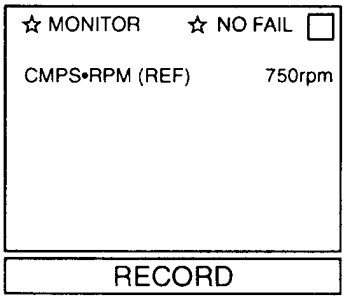


J



SEF913J

K



CMNC03

Ⓒ

K

Check idle speed.

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

— OR —

Check idle speed.

Models without daytime light system
M/T: 750±50 rpm
A/T: 750±50 rpm (in "N" position)
Models with daytime light system
M/T: 825±50 rpm
A/T: 750±50 rpm (in "N" position)

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 M N (See next page for illustration)

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

NG → Ⓓ

— OR —

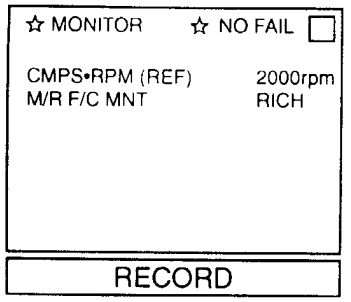
1. Set "Heated oxygen sensor monitor" in the Diagnostic Test Mode II.
   (See page EC-168.)
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintain engine at 2,000 rpm under no-load. Check that the malfunction indicator lamp goes on and off more than 5 times during 10 seconds.

OK

END

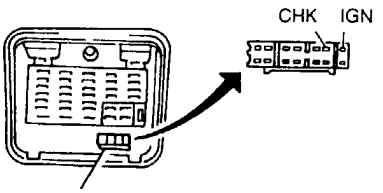
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

L



CMNC04

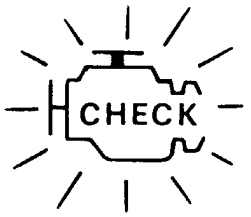
M



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

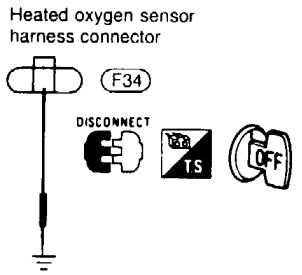
SEF909P

N



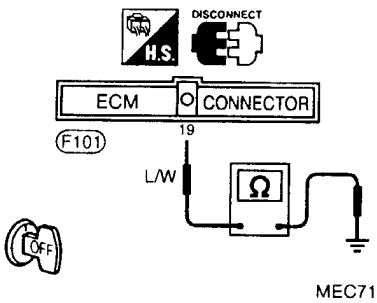
SEF051P

O



MEF031DB

P



MEC712B

Ⓓ

O P

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

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

OK

NG

Repair or replace harness. → Ⓑ

Connect ECM harness connector to ECM.

Q R (See next page for illustration)

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

OR

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

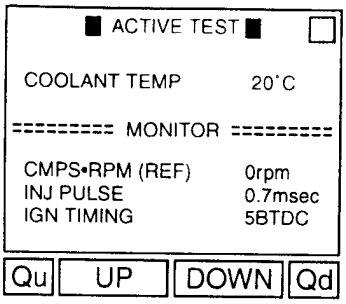
S (See next page for illustration)

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

Ⓔ

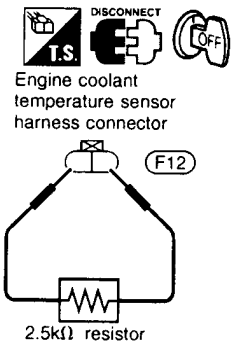
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

Q



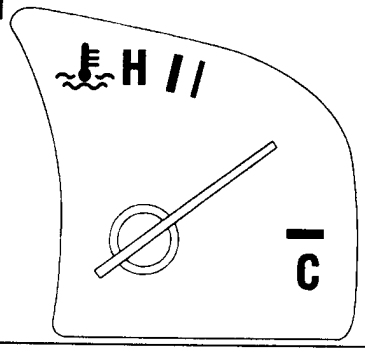
CATC03

R



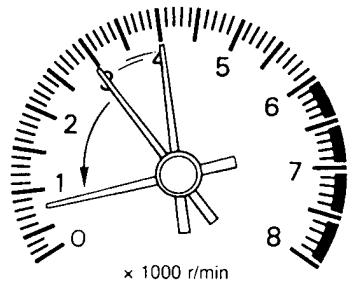
SEF750S

S



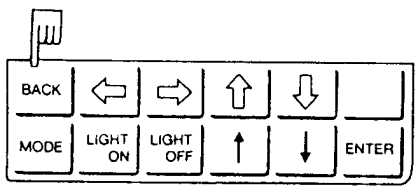
SEF455Q

T



SEF248F

U



SEF913J

Ⓔ

T

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

U

Check "CO"%.

Idle CO: Less than 0.3% and engine runs smoothly.

After checking CO%,

1. Touch "BACK".

OR

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

NG

OK

Replace heated oxygen sensor.

V W X

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

OR

1. Set "Heated oxygen sensor monitor" in the Diagnostic Test Mode II. (Refer to EC-168.)
2. Maintain engine at 2,000 rpm under no-load. Check that the malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

NG

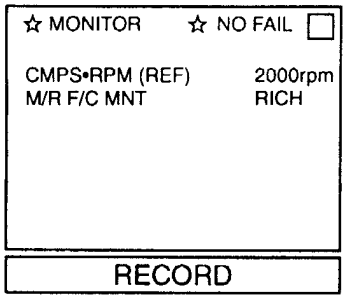
OK

Ⓕ

Ⓑ

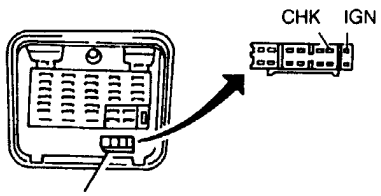
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

V



CMNC04

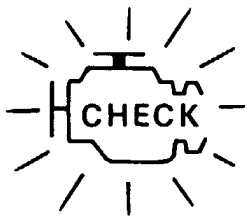
W



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

SEF909P

X



SEF051P

Ⓕ

Connect heated oxygen sensor harness connector to heated oxygen sensor.

Check fuel pressure regulator.
(Refer to EC-158.)

Check mass air flow sensor and its circuit.
Refer to TROUBLE DIAGNOSIS FOR DTC 12.
(Refer to EC-212.)

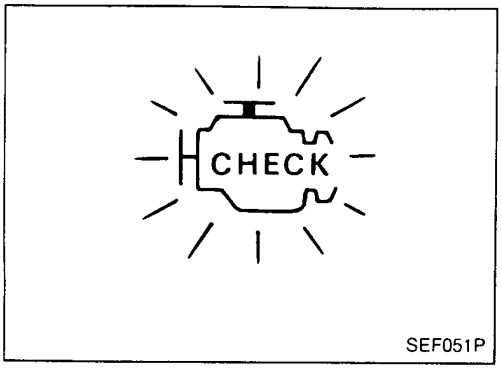
Check injector and its circuit.
Refer to TROUBLE DIAGNOSIS FOR NON DETECTABLE ITEMS.
(Refer to EC-249.)
Clean or replace if necessary.

Check engine coolant temperature sensor and its circuit. Refer to TROUBLE DIAGNOSIS FOR DTC 13.
(Refer to EC-216.)

Check ECM function* by substituting another known good ECM.

Ⓑ

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



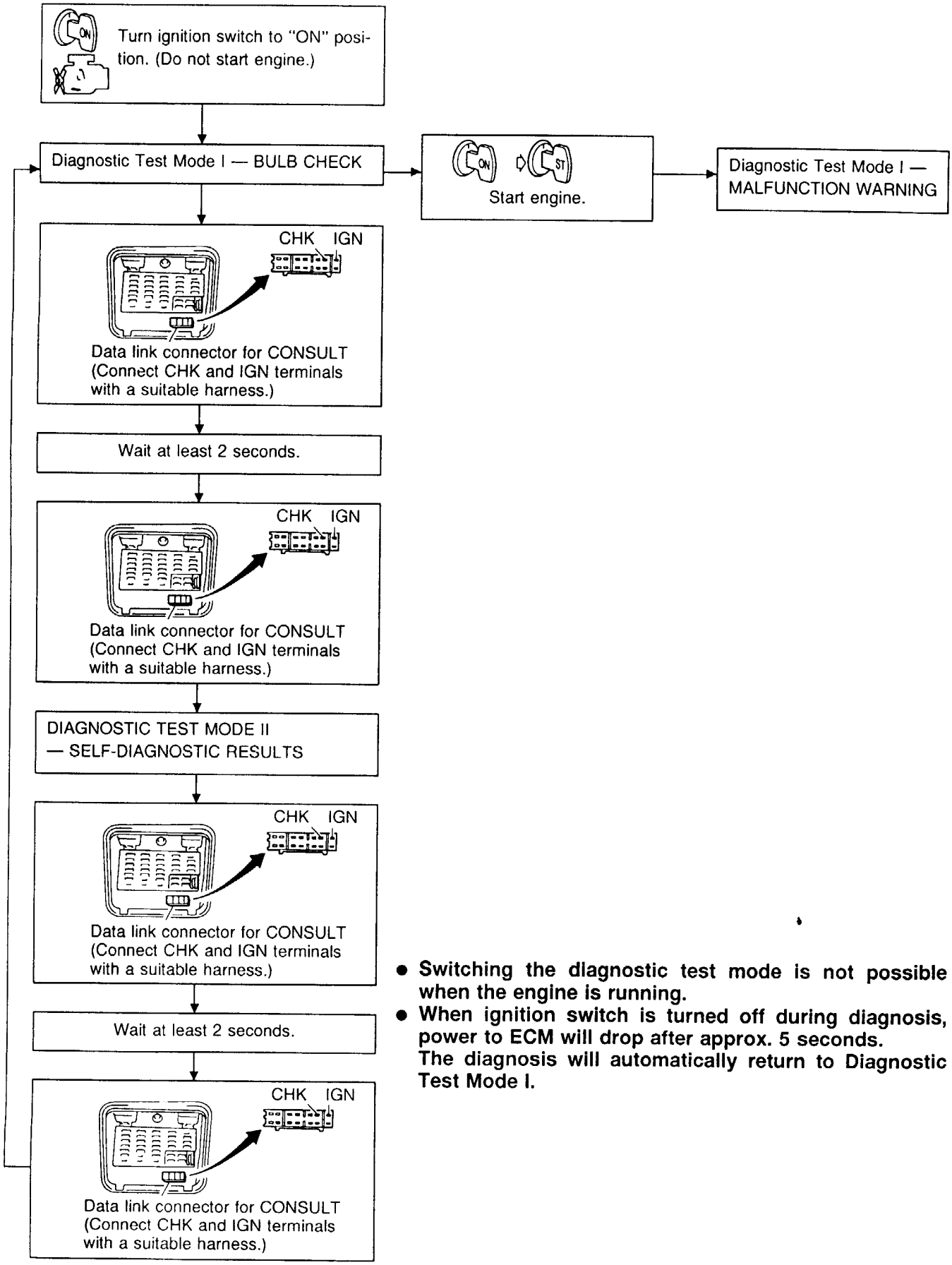
Malfunction Indicator Lamp (MIL)

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator lamp does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-283.
2. When the engine is started, the malfunction indicator lamp should go off.

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



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

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE I—BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section ("WARNING LAMPS AND CHIME") or see EC-283.

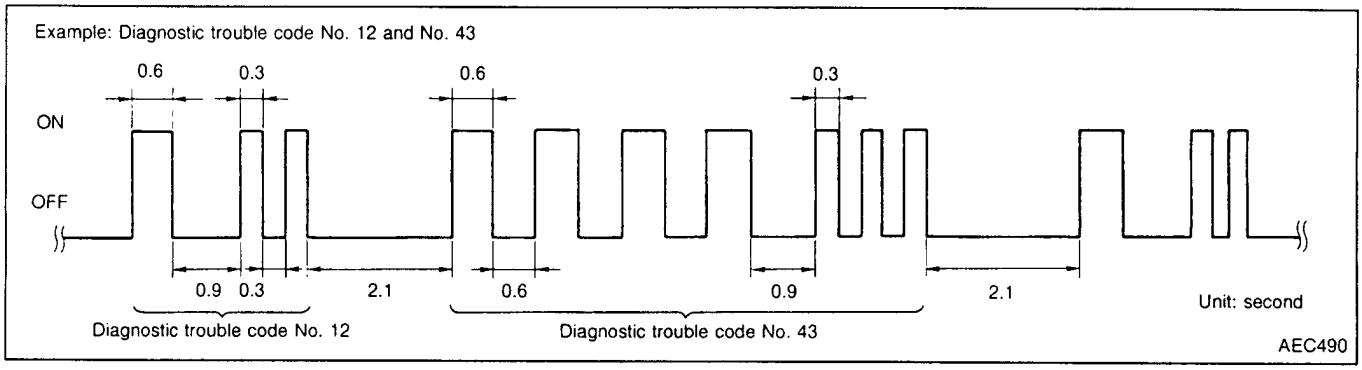
DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

MALFUNCTION INDICATOR LAMP	Condition
ON	Engine coolant temperature sensor circuit malfunction or overheating is detected, or the ECM's CPU is malfunctioning.
OFF	No malfunction.

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

DIAGNOSTIC TEST MODE II—SELF-DIAGNOSTIC RESULTS

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

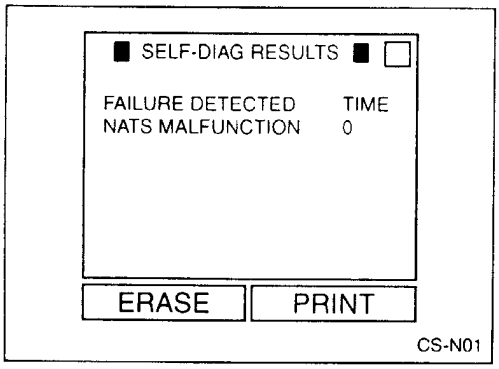


Long (0.6 second) flashes indicate the number of ten digits, and short (0.3 second) flashes indicate the number of single digits. For example, the malfunction indicator lamp flashes 4 times for about 2.5 seconds (0.6 sec x 4 times) and then it flashes three times for about 1 second (0.3 sec x 3 times). 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 CHART, refer to EC-186.)

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

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

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



Malfunction Indicator Lamp (MIL) (Cont'd)

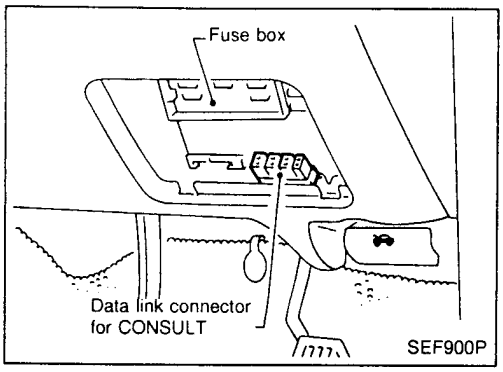
- **If the MIL blinks or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT using NATS program card (NATS-E960). Refer to EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT.**
- **When replacing ECM, initialisation of NATS V.2.0 system and registration of all NATS V.2.0 ignition key IDs must be carried out with CONSULT using NATS program card (NATS-E960).**
  Therefore, be sure to receive all keys from vehicle owner.
  Regarding the procedures of NATS initialisation and NATS ignition key ID registration, refer to CONSULT operation manual, NATS V.2.0.

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 system
OFF	Rich	
Remains ON or OFF	Any condition	Open loop system

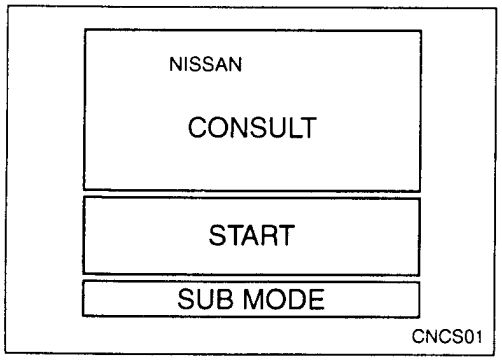
To check the heated oxygen sensor function, start engine in Diagnostic Test Mode II. Then warm it up until engine coolant temperature indicator points to middle of gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Make sure that the MALFUNCTION INDICATOR LAMP comes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



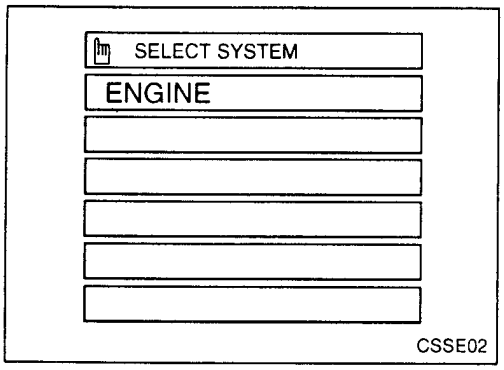
CONSULT

CONSULT INSPECTION PROCEDURE

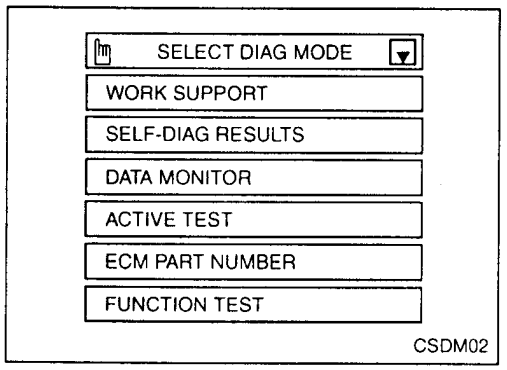
1. Turn off ignition switch.
2. Connect "CONSULT" to Data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



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



5. Touch "ENGINE".



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

For further information, see the CONSULT Operation Manual.

CONSULT (Cont'd)

ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

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

X: Applicable

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.
ECM part numbers	ECM part numbers can be read.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".

WORK SUPPORT MODE

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

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "Diagnostic Trouble Code (DTC) Chart". (See page EC-186.)

DATA MONITOR MODE

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

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

CONSULT (Cont'd)

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

CONSULT (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	• Engine: Return to the original trouble condition • Change the amount of fuel injection using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Fuel injectors • Heated oxygen sensor
IACV-AAC/V OPENING	• Engine: After warming up, idle the engine. • Change the IACV-AAC valve opening percent using CONSULT.	Engine speed changes according to the opening percent.	• Harness and connector • IACV-AAC valve
ENG COOLANT TEMP	• Engine: Return to the original trouble condition • Change the engine coolant temperature indication using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Engine coolant temperature sensor • Fuel injectors
IGNITION TIMING	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Adjust initial ignition timing
POWER BALANCE	• Engine: After warming up, idle the engine. • A/C switch "OFF" • Shift lever "N" • Cut off each injector signal one at a time using CONSULT.	Engine runs rough or dies.	• Harness and connector • Compression • Injectors • Power transistor • Spark plugs • Ignition coils
COOLING FAN	• Ignition switch: ON • Turn the cooling fan "ON" and "OFF" using CONSULT.	Cooling fan moves and stops.	• Harness and connector • Cooling fan motor • Cooling fan relay
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
CANIST CONT S/V	• Engine: After warming up, run engine at idle speed. • Change the EVAP canister purge volume control solenoid valve opening step using CONSULT.	Engine speed changes according to the opening step.	• Harness and connector • EVAP canister purge volume control solenoid valve
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) • Closed throttle position is tested when throttle is opened and closed fully. (Closed throttle position is selected by throttle position sensor.)	Throttle valve: opened	OFF	• Harness and connector • Throttle position sensor • Throttle position sensor adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
		Throttle valve: closed	ON	
THROTTLE POSI SEN CKT	• Ignition switch: ON (Engine stopped) • Throttle position sensor circuit is tested when throttle is opened and closed fully.	Range (Throttle valve fully opened — Throttle valve fully closed)	More than 3.0V	• Harness and connector • Throttle position sensor • Throttle position sensor adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
PARK/NEUT POSI SW CKT	• Ignition switch: ON (Engine stopped) • Inhibitor/Neutral position switch circuit is tested when shift lever is manipulated.	Out of N/P positions	OFF	• Harness and connector • Neutral position switch or inhibitor switch • Linkage or inhibitor switch adjustment
		In N/P positions	ON	
FUEL PUMP CIRCUIT	• Ignition switch: ON (Engine stopped) • Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.	There is pressure pulsation on the fuel feed hose.		• Harness and connector • Fuel pump • Fuel pump relay • Fuel filter clogging • Fuel level
COOLING FAN CIRCUIT	• Ignition switch: ON (Engine stopped) • Cooling fan circuit is tested when cooling fan is rotated.	The cooling fan rotates and stops every 3 seconds.		• Harness and connector • Cooling fan motor • Cooling fan relay
START SIGNAL CIRCUIT	• Ignition switch: ON → START • Start signal circuit is tested when engine is started by operating the starter. Before cranking, battery voltage and engine coolant temperature are displayed. During cranking, average battery voltage, mass air flow sensor output voltage and cranking speed are displayed.	Start signal: OFF → ON		• Harness and connector • Ignition switch

CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
PW/ST SIGNAL CIRCUIT	• Ignition switch: ON (Engine running) • Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position.	Locked position	ON	• Harness and connector • Power steering oil pressure switch • Power steering oil pump
		Neutral position	OFF	
VEHICLE SPEED SEN CKT	• Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 mph) or higher.	Vehicle speed sensor input signal is greater than 4 km/h (2 mph)		• Harness and connector • Vehicle speed sensor • Speedometer
IGN TIMING ADJ	• After warming up, idle the engine. • Ignition timing adjustment is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		• Adjust ignition timing (by moving crankshaft 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, power transistor, ignition coil, harness or connector) • VACUUM SYS (Intake air leaks) • Heated oxygen sensor circuit • Heated oxygen sensor operation • Fuel pressure high or low • Mass air flow sensor
POWER BALANCE	• After warming up, idle the engine. • Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.)	Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder.		• Injector circuit (Injector, harness or connector) • Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector) • Compression • Valve timing

CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
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)

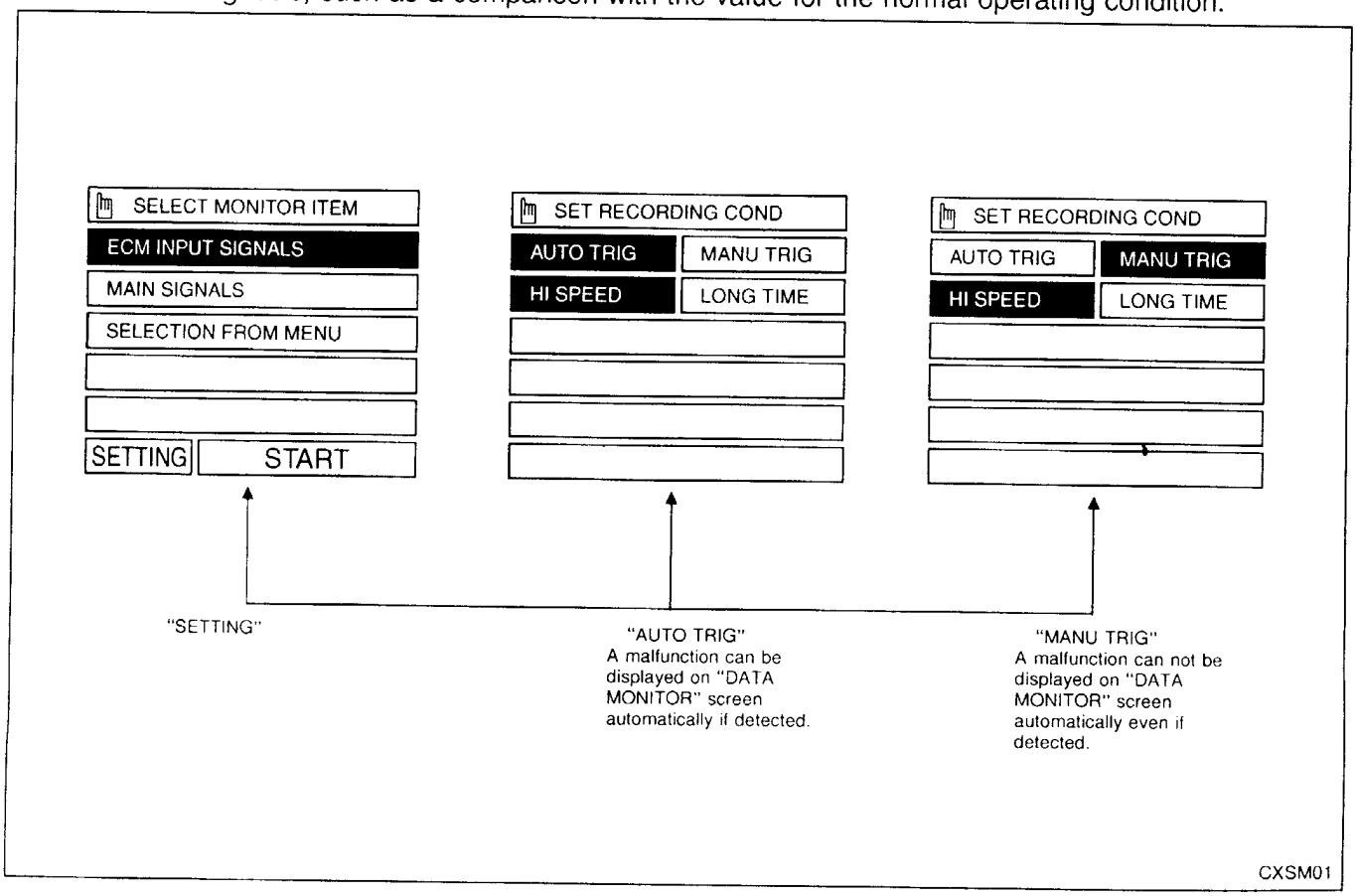
REAL TIME DIAGNOSIS IN DATA MONITOR MODE

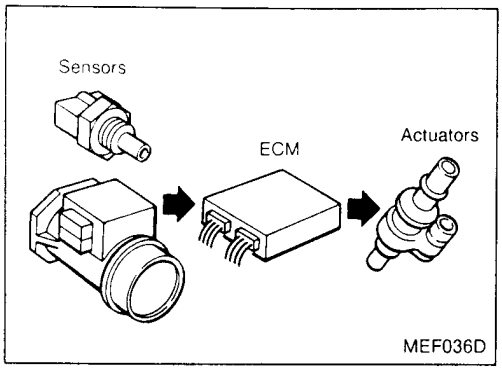
CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

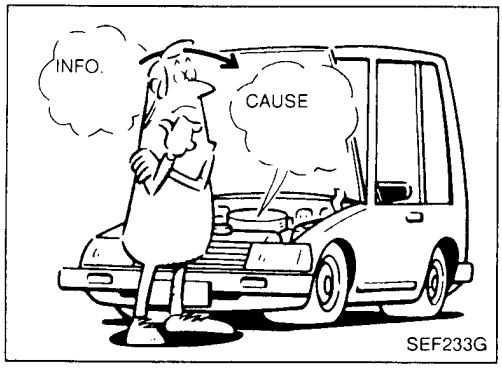
1. "AUTO TRIG" (Automatic trigger):
   - The malfunction will be identified on the CONSULT screen in real time.
     In other words, DTC and malfunction item will be displayed at the moment the malfunction is detected by ECM.
     DATA MONITOR can be performed continuously until a malfunction is detected.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

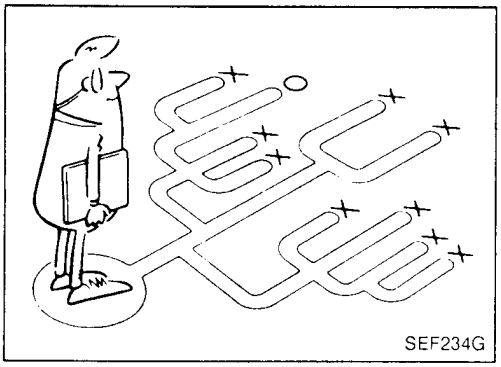
Use these triggers as follows:

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









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 correct 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.

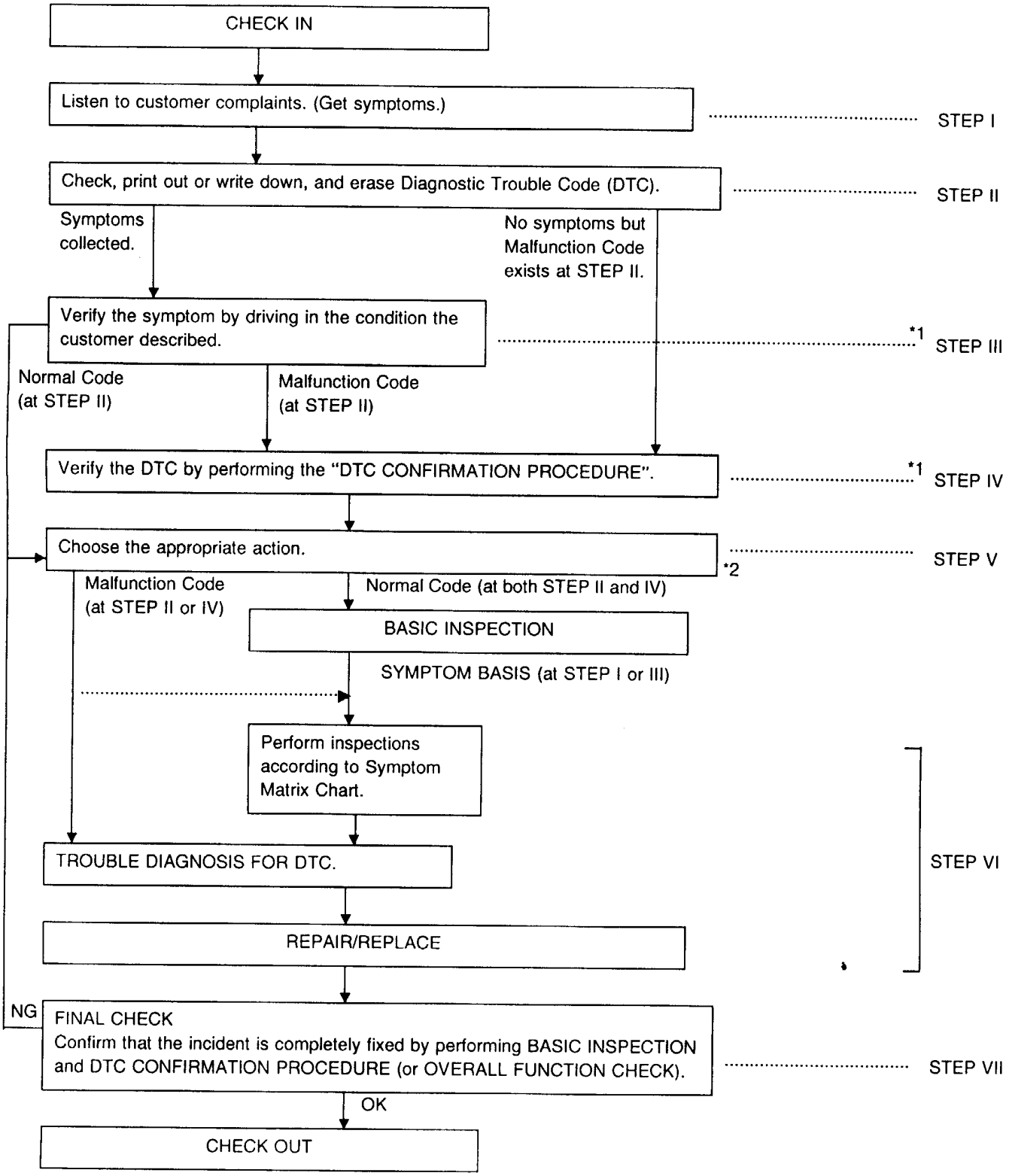
It is much more difficult to diagnose a problem that occurs intermittently rather than catastrophically. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the unnecessary replacement of good parts.

A visual check only may not find the cause of the problems. A road test with CONSULT or a circuit tester connected should be performed. Follow the "Work Flow" on the next page.

Before undertaking actual checks, take 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 EC-184 should be used.

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

Work Flow



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

***2: If the on-board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR MAIN POWER SUPPLY AND GROUND CIRCUIT", EC-205.**

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORKSHEET" as shown on the next page.
STEP II	Before confirming the concern, check and write down (print out using CONSULT) the Diagnostic Trouble Code (DTC), then erase the code. 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. Refer to EC-192.)
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The "DIAGNOSTIC WORK SHEET" is useful to verify the incident. Connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section. If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the Diagnostic Trouble Code (DTC) by driving in (or performing) the "DTC CONFIRMATION PROCEDURE". Check and read the DTC by using CONSULT. During the DTC verification, be sure to connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section. In case the "DTC CONFIRMATION PROCEDURE" is not available, perform the "OVERALL FUNCTION CHECK" instead. The DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "OVERALL FUNCTION CHECK" is the same as the DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to the relevant TROUBLE DIAGNOSIS FOR DTC. If the normal code is indicated, proceed to the BASIC INSPECTION. Refer to EC-189. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-192.
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-200. 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 malfunctioning 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-169.)

KEY POINTS

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

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Diagnostic Worksheet

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

WORKSHEET SAMPLE

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion 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	

Note:

Diagnostic Trouble Code (DTC) Chart

ENGINE RELATED ITEMS

Diagnostic trouble code No. / MIL	Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
11	Camshaft position sensor circuit (CAMSHAFT POSI SEN)	• Either 1° or 180° signal is not sent to the ECM for the first few seconds during engine cranking. • Either 1° or 180° signal is not sent to the ECM often enough while the engine speed is higher than the specified rpm. • The relation between 1° and 180° signals is not in the normal range during the specified rpm.
12	Mass air flow sensor circuit (MASS AIR FLOW SEN)	• An excessively high or low voltage is sent to ECM. • Voltage sent to ECM is not practical when compared with the camshaft position sensor signal and throttle position sensor signal.
13	Engine coolant temperature sensor circuit (COOLANT TEMP SEN)	• An excessively high or low voltage from the sensor is sent to the ECM.
21	Ignition signal circuit (IGN SIGNAL-PRIMARY)	• The ignition signal in the primary circuit is not sent to the ECM during engine cranking or running.
28*3	Over heat (OVER HEAT)	• An excessively low voltage (high engine coolant temperature) from engine coolant temperature sensor is sent to ECM.
34	Knock sensor circuit (KNOCK SENSOR)	• An excessively low or high voltage from the sensor is sent to the ECM.
43	Throttle position sensor circuit (THROTTLE POSI SEN)	• An excessively low or high voltage from the sensor is sent to the ECM. • Voltage sent to ECM is not practical when compared with the mass air flow sensor and camshaft position sensor signals.
55	No failure (NO SELF DIAGNOSTIC FAILURE INDICATED...)	• No malfunction is detected by ECM.

*1: This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each TROUBLE DIAGNOSIS FOR DTC.
Abbreviations are as follows:
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
*3: When this malfunction is detected, MIL lights up as a warning.

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

X: Applicable
—: Not applicable

Check Items (Possible Cause)	"DTC CONFIRMATION PROCEDURE" Quick Ref. *1	"OVERALL FUNCTION CHECK" Quick Ref. *2	Fail Safe System *3	Reference Page
• Harness or connectors (The sensor circuit is open or shorted.) • Camshaft position sensor • Starter motor • Starting system circuit (EL section) • Dead (Weak) battery	RUNNING	—	—	EC-208
• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor	RUNNING	RUNNING	X	EC-212
• Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor	IGN: ON	—	X	EC-216
• Harness or connectors (The ignition primary circuit is open or shorted.) • Power transistor unit • Camshaft position sensor • Camshaft position sensor circuit	RUNNING	—	—	EC-220
Refer to "Overheat cause analysis", ENGINE COOLING SYSTEM in LC section.	—	—	—	LC section
• Harness or connectors (The sensor circuit is open or shorted.) • Knock sensor	RUNNING	—	—	EC-225
• Harness or connectors (The sensor circuit is open or shorted.) • Throttle position sensor	—	IGN: ON	X	EC-229
• No failure	—	—	—	—

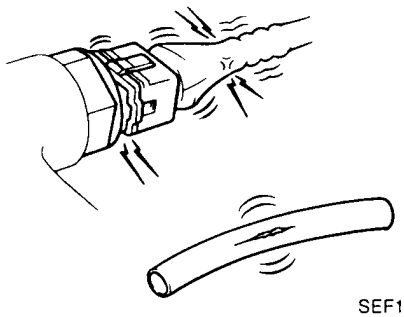
*2: • The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit. In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION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

Fail-Safe Chart

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

<table>
<tr><th>DTC No.
MIL</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 based on the time after turning ignition switch to "ON" or "START" position.
<table>
<tr><th>Condition</th><th>Engine coolant temperature decided</th></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>30°C (86°F)</td></tr>
<tr><td>More than 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>30 - 80°C (86 - 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 injected fuel amount and the engine speed.
Therefore, acceleration will be poor.
<table>
<tr><th>Condition</th><th>Driving condition</th></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
</table></td></tr>
<tr><td>—</td><td>Start signal circuit</td><td>If the ECM always receives a start signal, the ECM will judge the start signal "OFF" when engine speed is above 1,000 rpm.
This prevents extra enrichment.
After the engine speed is below 200 rpm, start-up enrichment will be allowed until the engine speed reaches 1,000 rpm.</td></tr>
<tr><td>—</td><td>ECM</td><td>Fail-safe system activating condition when ECM is malfunctioning
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.
Engine control, with fail-safe system, operates when ECM is malfunctioning
When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.
<table>
<tr><th></th><th>Operation</th></tr>
<tr><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm</td></tr>
<tr><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td>Ignition timing</td><td>Ignition timing is fixed at the preset valve</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td>Cooling fans</td><td>Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls</td></tr>
</table></td></tr>
</table>

A



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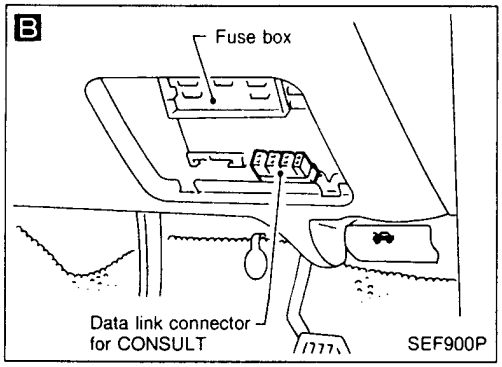

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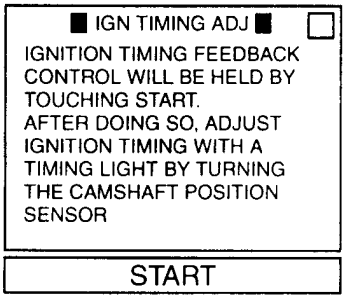
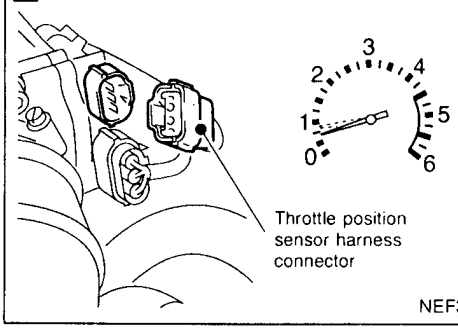


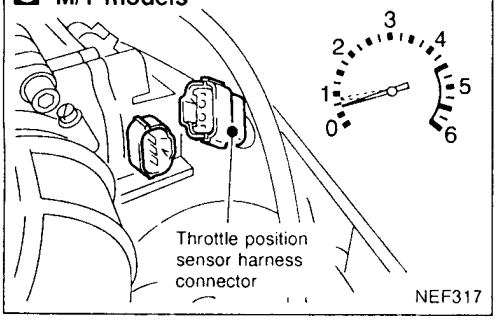
CITA02

C A/T models



NEF316

C M/T models



NEF317

Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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

A

BEFORE STARTING

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

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

B

CONNECT CONSULT TO THE VEHICLE.

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-171.

DOES ENGINE START? — No → Go to E.

Yes

C

CHECK IGNITION TIMING. — NG → Adjust ignition timing by turning distributor.

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

Ignition timing:
15°±2° BTDC

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

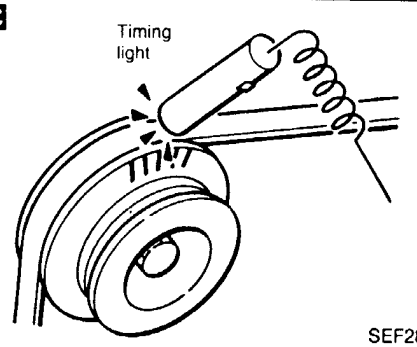
Ignition timing:
15°±2° BTDC

OK

(Go to Ⓐ on next page.)

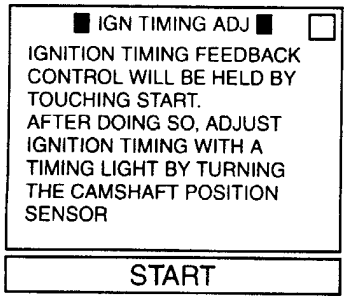
Basic Inspection (Cont'd)

C



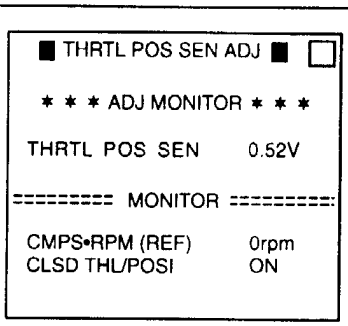
SEF284G

D



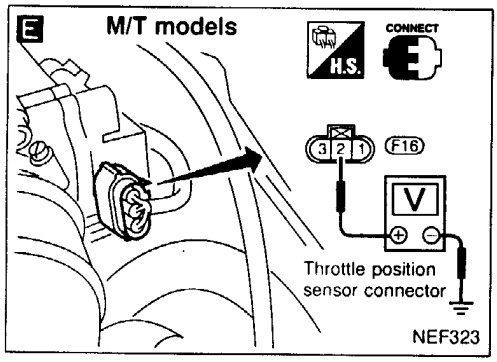
CITA02

E



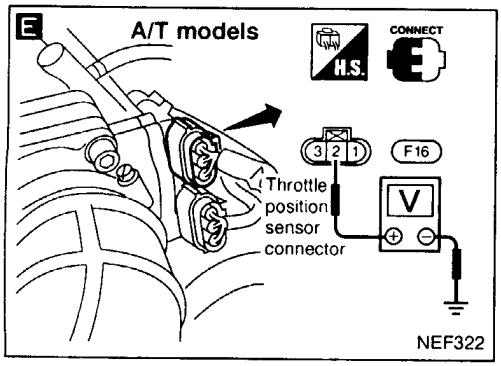
CTPS01

E M/T models



NEF323

E A/T models



NEF322

Ⓐ

D

CHECK IDLE ADJ. SCREW INITIAL SET RPM.

1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine speed fall to **700^{+75}_{-50} rpm (A/T in "N" position)?**

NG → Adjust engine speed by turning idle adjusting screw.

OR

Does engine run at 700^{+75}_{-50} rpm (A/T in "N" position)?

OK

Reconnect throttle position sensor harness connector.

E

CHECK THROTTLE POSITION SENSOR IDLE POSITION.

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

OR

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

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

RESET IDLE POSITION MEMORY.

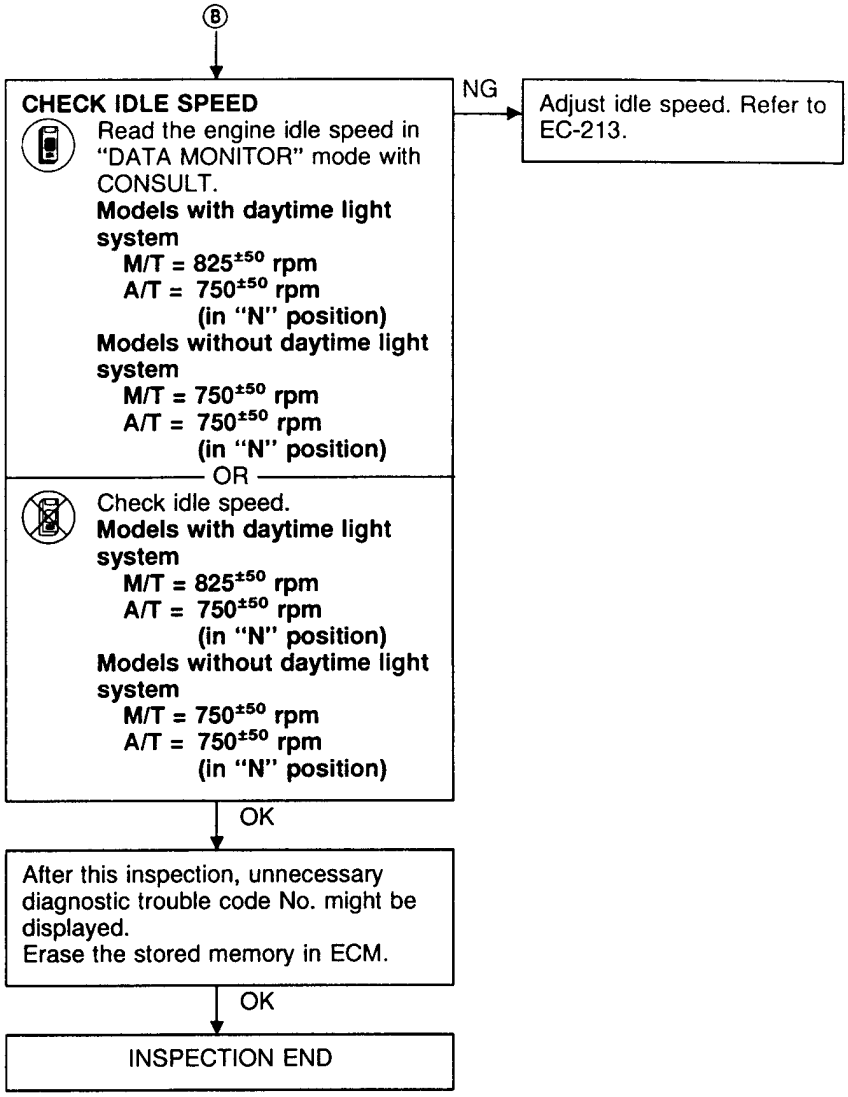
1. Warm up engine sufficiently.
2. Select "CLSD THL/POSI" in "DATA MONITOR" mode with CONSULT.
3. Stop engine and wait at least 5 seconds.
4. Turn ignition switch to "ON" position.
5. Turn ignition switch to "LOCK" position and wait at least 5 seconds.
6. Repeat steps 4. and 5. until "CLSD THL/POSI"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

Repeat steps 4. and 5. 20 times.

OK

Ⓑ

(Go to next page)


Ⓑ
CHECK IDLE SPEED
Read the engine idle speed in "DATA MONITOR" mode with CONSULT.
Models with daytime light system
M/T = 825±50 rpm
A/T = 750±50 rpm
(in "N" position)
Models without daytime light system
M/T = 750±50 rpm
A/T = 750±50 rpm
(in "N" position)
NG
Adjust idle speed. Refer to EC-213.
OR
Check idle speed.
Models with daytime light system
M/T = 825±50 rpm
A/T = 750±50 rpm
(in "N" position)
Models without daytime light system
M/T = 750±50 rpm
A/T = 750±50 rpm
(in "N" position)
OK
After this inspection, unnecessary diagnostic trouble code No. might be displayed.
Erase the stored memory in ECM.
OK
INSPECTION END

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM																	Reference page
		HARD/NO START (COLD)	HARD/NO RE-START (HOT)	ROUGH IDLE	ENGINE STALL	HESITATION/FLAT SPOT/SURGE	LACK OF POWER/POOR ACCELERATION	NO RETURN TO IDLE/HIGH IDLE	SPARK KNOCK (PINGING)	BACK FIRE	AFTER FIRE	ENGINE RUN ON (DIESELING)	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	OVERHEATS	OVERCOOLS	OVERCHARGING	BATTERY DEAD (UNDER CHARGE)	
		1A	1B	1C	1F	1H	1R	1S	1M	1J	1L	1K	1T	1V	1N	1P	1X	1Y	
Fuel	Fuel pump circuit	●	●	●	●	●	●		○	○			●					○	EC-252
	Fuel pressure regulator system	●	●	●	●	●	●	○	○	○	○		●						EC-158
	Injector circuit	●	●	●	●	●	●		○	○	○		●						EC-249
	Evaporative emission system	○	○	○	○	○	○	○	○	○	○		○						EC-154
Air	Positive crankcase ventilation system	○	○	●	○	●	○	○	○	○	○		○	○					EC-156
	Incorrect idle speed adjustment	○	○	○	○			○					○						EC-160
	IACV-AAC valve circuit	●	●	●	●	●	●	●	○	●	○		●					○	EC-257
	IACV-FICD solenoid valve circuit	○	○	○	○	○	○	○	○	○			○						EC-261
Ignition	Incorrect ignition timing adjustment	○	○	●	○	●	●		●	○	○		●						EC-160
	Ignition circuit	●	●	●	●	●	●		●		●		●						EC-220
EVAP	EVAP canister purge volume control solenoid valve circuit				●	●	○		●		○		●						EC-240
Main power supply and ground circuit		○	○	○	○	○	○		○	○			○		○			○	EC-205
Cooling	Cooling fan circuit	○	○	○	○	○	○	○	○				○		○	○		○	EC-265
Air conditioner circuit		○	○	○	○	○	○	○	○				○					○	HA section

● ; High Possibility Item
○; Low Possibility Item

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — ECCS system		SYMPTOM																		Reference page
		HARD/NO START (COLD)	HARD/NO RE-START (HOT)	ROUGH IDLE	ENGINE STALL	HESITATION/FLAT SPOT/SURGE	LACK OF POWER/POOR ACCELERATION	NO RETURN TO IDLE/HIGH IDLE	SPARK KNOCK (PINGING)	BACK FIRE	AFTER FIRE	ENGINE RUN ON (DIESELING)	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	OVERHEATS	OVERCOOLS	OVERCHARGING	BATTERY DEAD (UNDER CHARGE)	
		1A	1B	1C	1F	1H	1R	1S	1M	1J	1L	1K	1T	1V	1N	1P	1X	1Y	
ECCS	Camshaft position sensor circuit	●	○	○	●	●	○		○	○	○		○						EC-208
	Mass air flow sensor circuit	●	●	●	●	●	●		○	○	○		●						EC-212
	Heated oxygen sensor circuit			●	●	●	●		○	○	○		●						EC-244
	Engine coolant temperature sensor circuit	●	●	●	●	●	●	●	○	○	○		●						EC-216
	Throttle position sensor circuit			●	●	●	●	●					●						EC-229
	Incorrect throttle position sensor adjustment			○	●	○	○	●			○		○						EC-190
	Vehicle speed sensor circuit				○	○	○						○						EC-235
	Knock sensor circuit					○	○		○				○						EC-225
	ECM	○	○	○	○	○	○	○	○	○	○	○	○		○				EC-199
	Start signal circuit	○	○																EC-238
	Park/Neutral position switch circuit			○		○	○						○						EC-273
	Power steering oil pressure switch circuit			○	○														EC-270

● ; 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 (COLD)	HARD/NO RE-START (HOT)	ROUGH IDLE	ENGINE STALL	HESITATION/FLAT SPOT/SURGE	LACK OF POWER/POOR ACCELERATION	NO RETURN TO IDLE/HIGH IDLE	SPARK KNOCK (PINGING)	BACK FIRE	AFTER FIRE	ENGINE RUN ON (DIESELING)	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	OVERHEATS	OVERCOOLS	OVERCHARGING	BATTERY DEAD (UNDER CHARGE)	
		1A	1B	1C	1F	1H	1R	1S	1M	1J	1L	1K	1T	1V	1N	1P	1X	1Y	
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 (Drive plate)	●	○																—
	Inhibitor switch	○	○																AT section
Engine	Cylinder head	●	○	●	●	●	●		●	○			○						
	Cylinder head gasket	●	○	○	●	○	●		○				○	○	○				
	Cylinder block	●	○	○	○	○	○		○				○	○					
	Piston	●	○	○	●	○	○		●				○	○					
	Piston ring	●	○	○	○	○	○		○				○	○					
	Connecting rod	○	○	○	○	○	○		○				○						
	Bearing	○	○	○	○	○	○		○				○						
	Crankshaft	○	○	○	○	○	○		○				○						
Valve mechanism	Timing chain	●	○	○	●	●	●		○	○			○						
	Camshaft	●	○	●	●	●	○		○				○						
	Intake valve	●	○	○	○	○	○		●	○			○	○					
	Exhaust valve	●	○	○	○	○	○		○		○		○	○					
	Hydraulic lash adjuster			○	○	○	○		○	○			○						—
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	○	○	○	○	○	○		○	○	○		○						
	Three way catalyst	●	○	○	●	○	○		○	○	○		○						
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/ Oil gallery	●	○	●	○	○	○		○				○	○					
	Oil level (Low)/Filthy oil	○	○	○	○	○	○		○				○	○					
Cooling	Radiator/Hose/Radiator filler cap	○	○	○	○	○	○		○				○		○				
	Thermostat	○	○	○	○	○	○	○	○				○		○	○			
	Water pump	○	○	○	○	○	○		○				○		○				
	Water gallery	○	○	○	○	○	○		○				○		○				
	Cooling fan	○	○	○	○	○	○	○	○				○		○	○			
	Coolant level (low)/Contaminated coolant	○	○	○	○	○	○		○				○		○				

● ; High Possibility Item
○; Low Possibility Item

CONSULT Reference Value in Data Monitor Mode

Remarks:

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

MONITOR ITEM	CONDITION		SPECIFICATION
CMPS•RPM (REF)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
MAS AIR/FL SE	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: "N" • No-load	Idle	0.7 - 1.2V
		2,000 rpm	1.2 - 1.7V
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
O2 SEN	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
M/R F/C MNT			LEAN ↔ RICH Changes more than 5 times during 10 seconds.
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
THRTL POS SEN	• Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.35 - 0.65V
		Throttle valve fully opened	Approx. 4.0V
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/POSI	• Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
P/N POSI SW	• Ignition switch: ON	Shift lever "P" or "N"	ON
		Except above	OFF

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

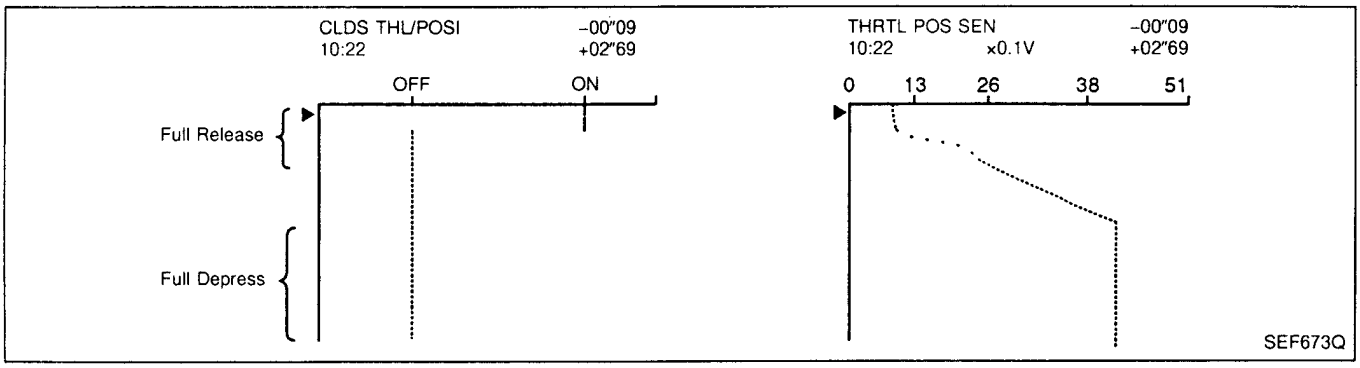
MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
LOAD SIGNAL	• Ignition switch: ON	Rear window defogger is operating and/or lighting switch is on.	ON
		Rear window defogger is not operating and lighting switch is not on.	OFF
INJ PULSE	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: "N" • No-load	Idle	2.0 - 3.0 msec.
		2,000 rpm	1.9 - 2.8 msec.
IGN TIMING	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: "N" • No-load	Idle	10 - 15° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: "N" • No-load	Idle	20 - 40%
		2,000 rpm	—
PURG VOL C/V	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: "N" • No-load	Idle	0 step
		3,000 rpm	Approx. 100 step
A/F ALPHA	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	53 - 155%
AIR COND RLY	• Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	• Ignition switch is turned to ON (Operates for 5 seconds) • Engine running and cranking • When engine is stopped (stops in 1.0 seconds)		ON
	• Except as shown above		OFF
COOLING FAN	• After warming up engine, idle the engine. • Air conditioner switch: OFF • Vehicle stopped	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON

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.)

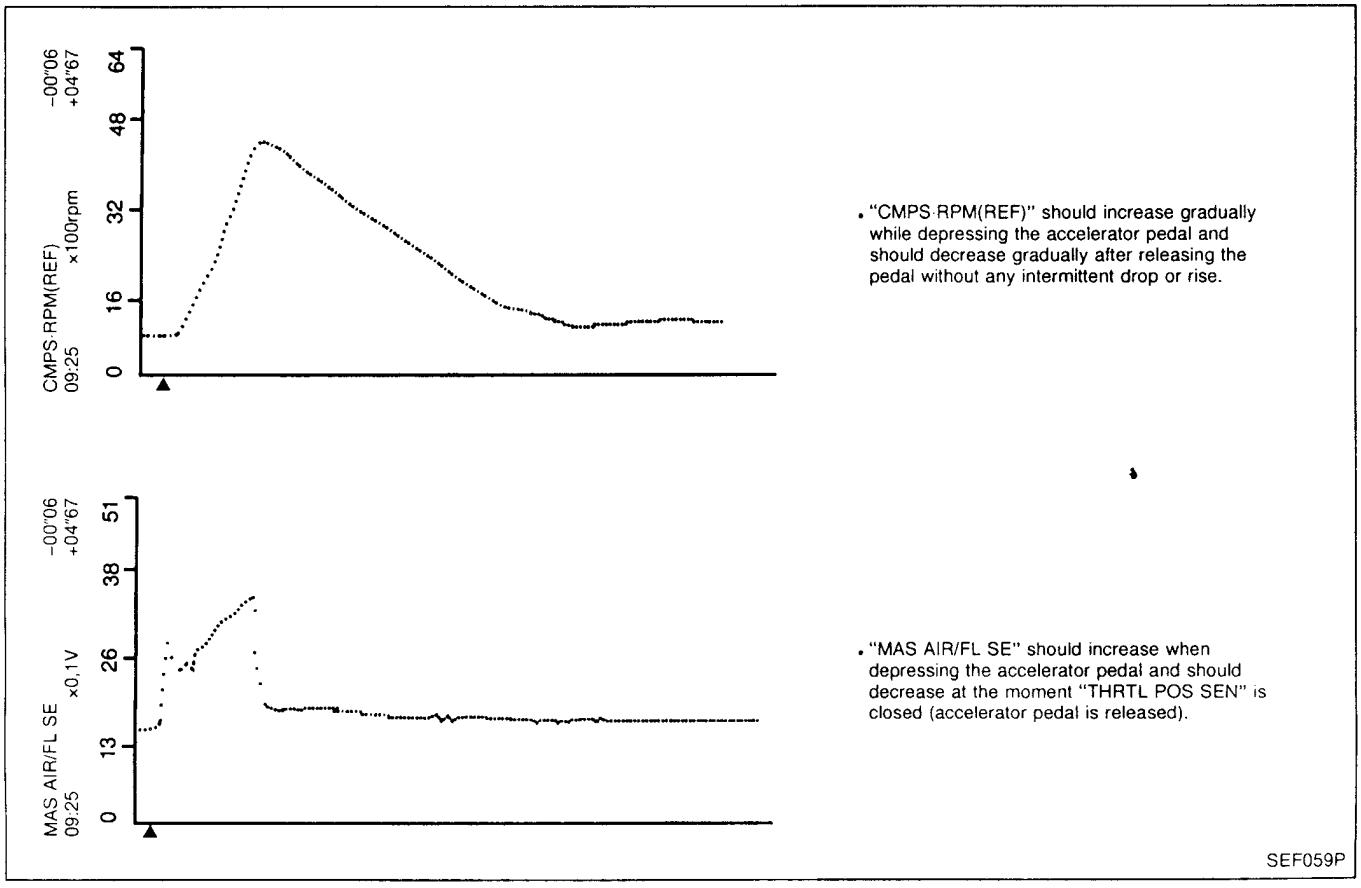
THRTL POS SEN, CLSD THL/POSI

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 (REF), MAS AIR/FL SE, THRTL POS SEN, O2 SEN, INJ PULSE

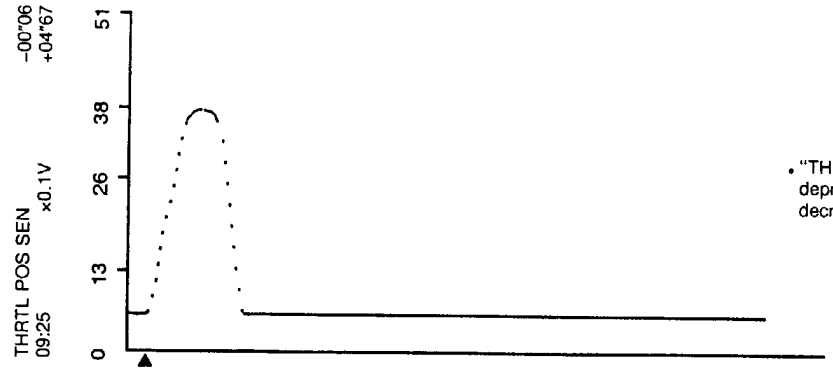
Below is the data for "CMPS•RPM (REF)", "MAS AIR/FL SE", "THRTL POS SEN", "O2 SEN" and "INJ PULSE" when revving quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



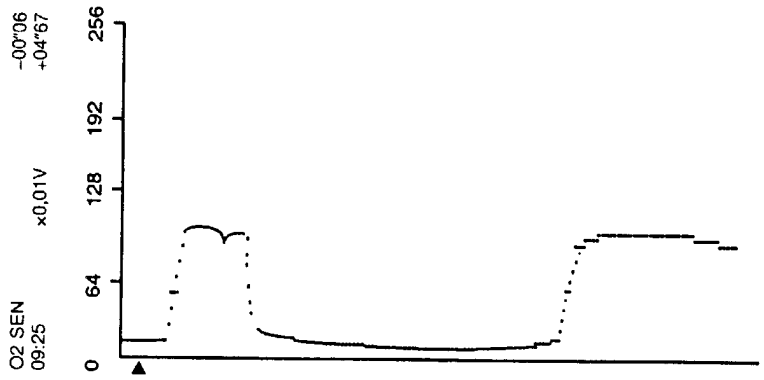
- "CMPS·RPM(REF)" should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intermittent drop or rise.

- "MAS AIR/FL SE" should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is closed (accelerator pedal is released).

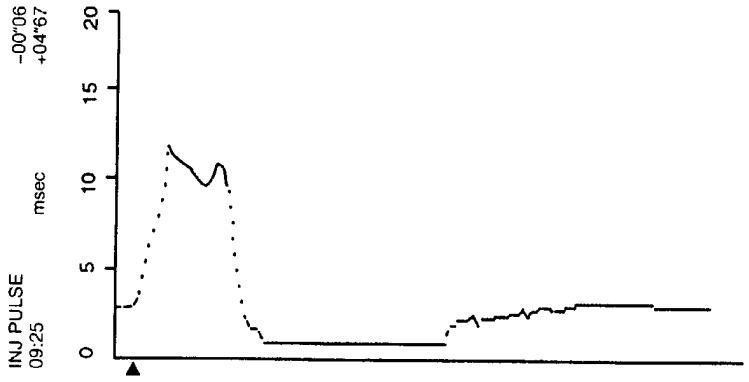
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



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

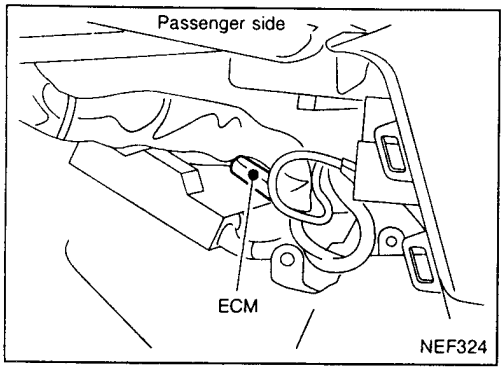


• "O2 SEN" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



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

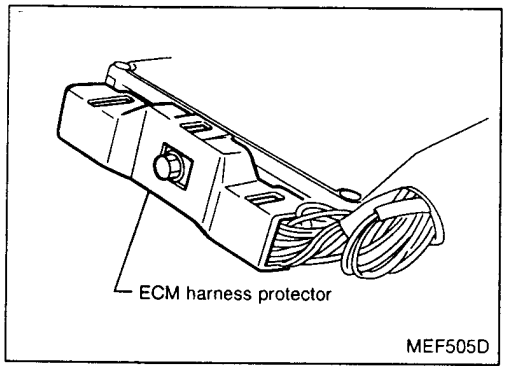
SEF259QA



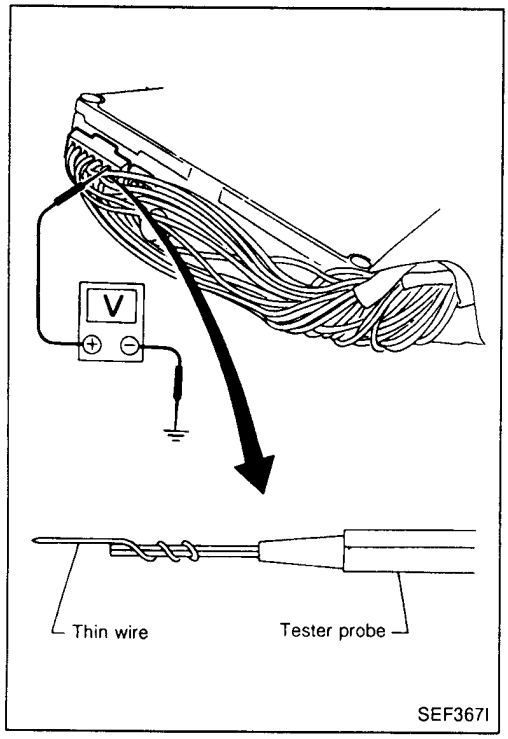
ECM Terminals and Reference Value

PREPARATION

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

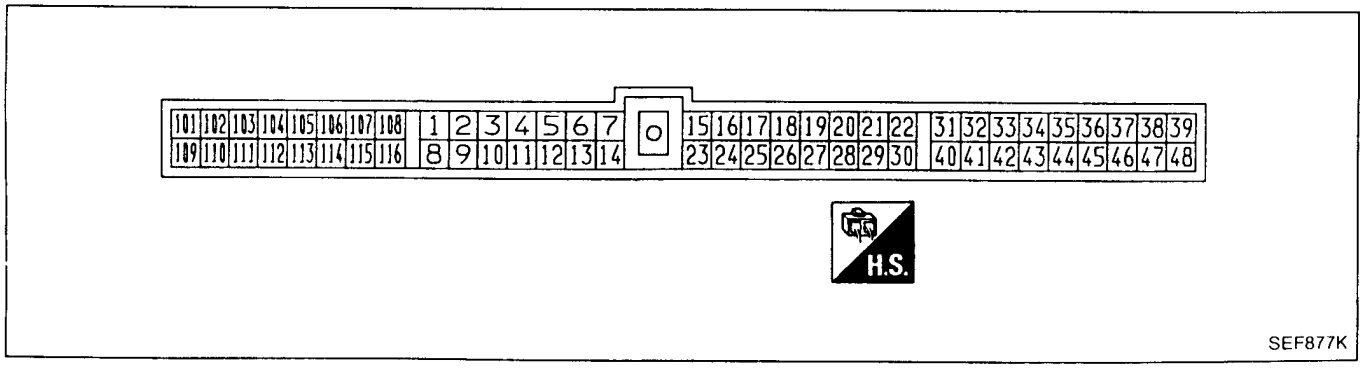


2. Remove ECM harness protector.



3. When checking ECM output voltages perform all voltage measurements with the connectors connected. Extend tester probe as shown to perform tests easily.

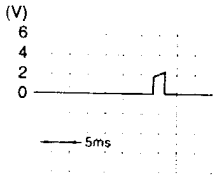
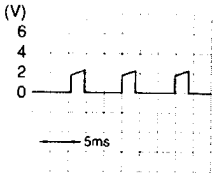
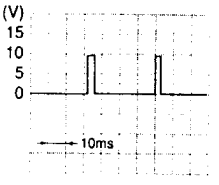
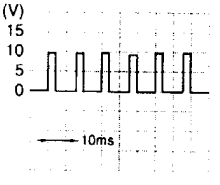
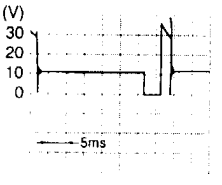
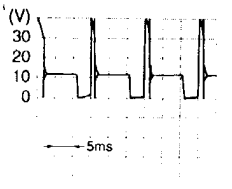
ECM HARNESS CONNECTOR TERMINAL LAYOUT



ECM inspection table

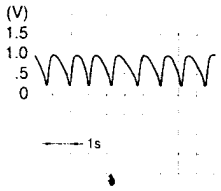
ECM Terminals and Reference Value (Cont'd)

*Data are reference values.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	*DATA
1	W/B	Ignition signal	Engine is running. (Warm-up condition) └ Idle speed	0.2 - 0.3V  NEF346
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.6V  NEF347
2	L/B	Tachometer	Engine is running. (Warm-up condition) └ Idle speed	Approximately 1.2V  NEF348
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 3.0V  NEF349
3	Y/PU	Ignition check	Engine is running. (Warm-up condition) └ Idle speed	Approximately 13V  NEF350
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 13V  NEF351
4	W/G	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "LOCK" └ For a few seconds after turning ignition switch "LOCK"	0 - 1V
			Ignition switch "LOCK" └ Following a few seconds delay after turning ignition switch "LOCK" and thereafter	BATTERY VOLTAGE (11 - 14V)

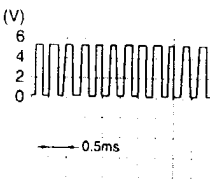
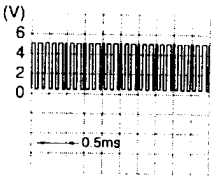
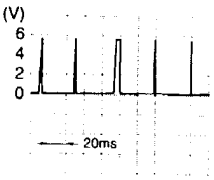
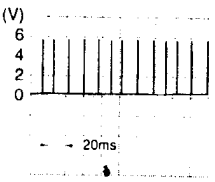
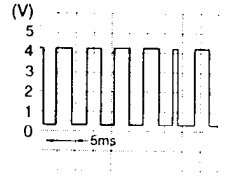
ECM Terminals and Reference Value (Cont'd)

*Data are reference values.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	*DATA
6	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
7	G/B	Data link connector for CONSULT	Engine is running. └ Idle speed (DATA MONITOR screen)	Approximately 0V
14	G/W			Approximately 3.5V
15	GY/L			Approximately 5V
23	G/R			Approximately 0V
9	LG/R	Cooling fan relay (Low speed)	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating.	Approximately 0V
11	G/Y	Air conditioner cut relay	Engine is running. └ Both A/C switch and blower fan switch are on.	Approximately 0V
			Engine is running. └ A/C switch is off.	BATTERY VOLTAGE (11 - 14V)
13	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
16	OR	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	0.8 - 1.2V
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	1.2 - 1.6V
17	W	Mass air flow sensor ground	Engine is running. └ Idle speed	Approximately 0V
18	L/OR	Engine coolant temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
19	L/W	Heated oxygen sensor	Engine is running. (warm-up condition) └ Engine speed is 2,000 rpm.	0 - Approximately 1.0V  NEF352
20	R	Throttle position sensor	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal released	0.35 - 0.65V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
21	B	Sensor's ground	Engine is running. └ Idle speed	Approximately 0V

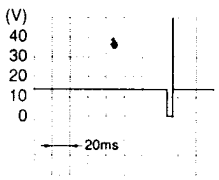
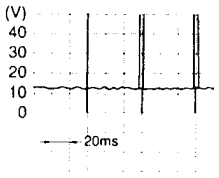
ECM Terminals and Reference Value (Cont'd)

*Data are reference values.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	*DATA
22 30	B/W	Camshaft position sensor (Position signal)	Engine is running. (Warm-up condition) └ Idle speed	2.0 - 3.0V  NEF353
			Engine is running. └ Engine speed is 2,000 rpm.	2.0 - 3.0V  NEF354
24	OR	Malfunction indicator lamp	Ignition switch "ON"	Approximately 1.5V
			Engine is running.	BATTERY VOLTAGE (11 - 14V)
27	Y	Knock sensor	Engine is running. └ Idle speed	Approximately 2.4V
28	W/R	Throttle position signal (For A/T control unit)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0.4V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 3V
29	B	Sensor's ground	Engine is running. └ Idle speed	Approximately 0V
31 40	L	Camshaft position sensor (Reference signal)	Engine is running. (Warm-up condition) └ Idle speed	0.1 - 0.4V  NEF355
			Engine is running. └ Engine speed is 2,000 rpm.	0.1 - 0.4V  NEF356
32	Y/G	Vehicle speed sensor	Engine is running. ├ Lift up the vehicle. ├ In 2nd gear position └ Vehicle speed is 40 km/h (25 mph).	0-Approximately 4.2V  NEF357
33	R	Electrical load signal	Engine is running. ├ Rear window defogger is operating. └ Lighting switch is "ON".	BATTERY VOLTAGE (11 - 14V)
			Engine is running. ├ Rear window defogger is not operating. └ Lighting switch is "OFF".	0V

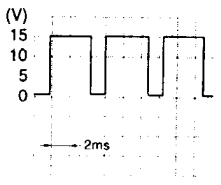
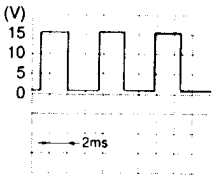
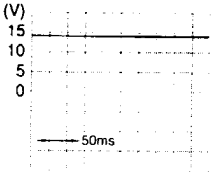
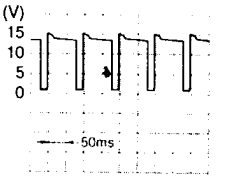
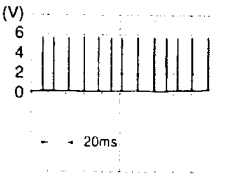
ECM Terminals and Reference Value (Cont'd)

*Data are reference values.

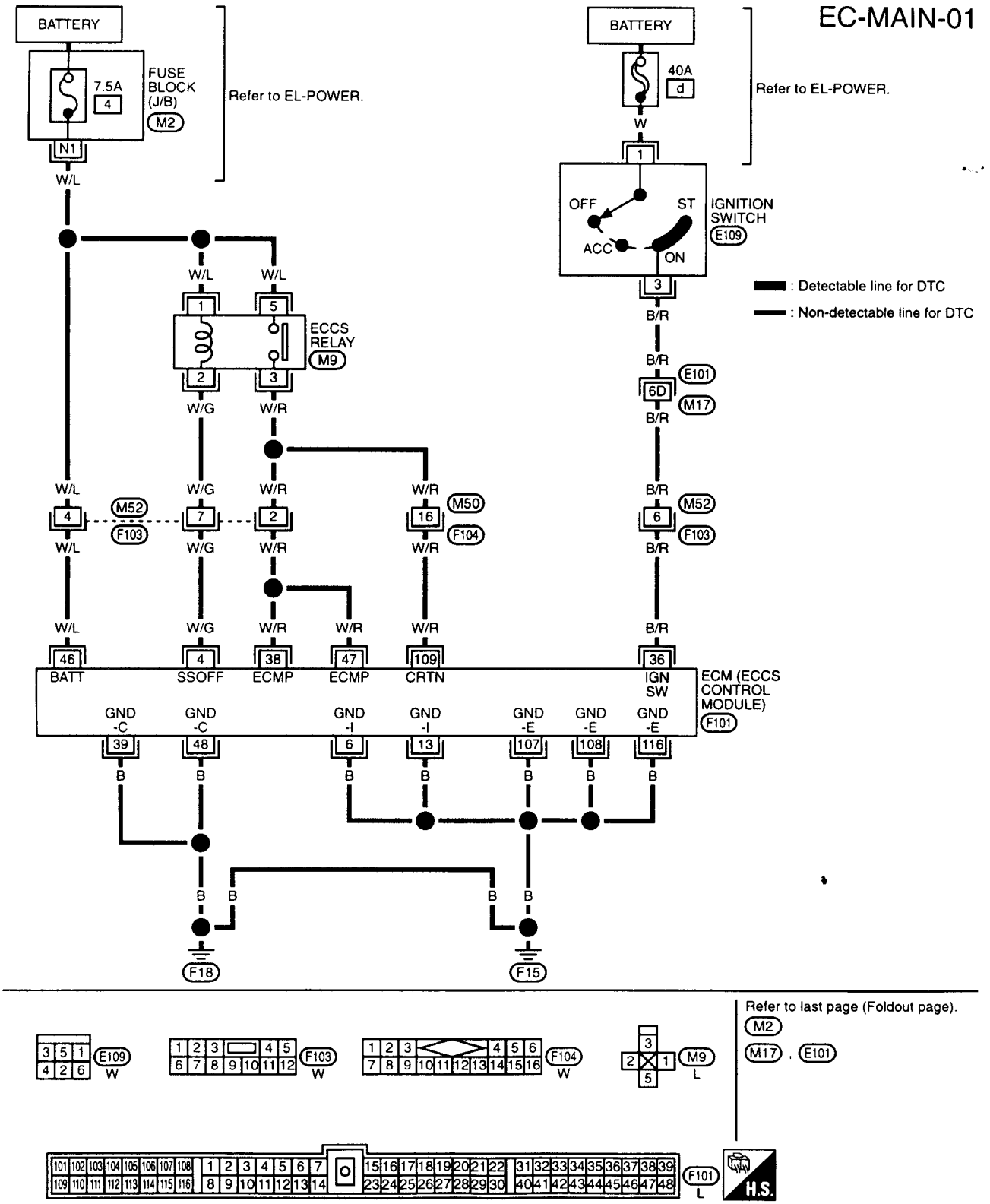
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	*DATA
34	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
35	G/OR (M/T) B/W (A/T)	Neutral position switch/Inhibitor switch	Ignition switch "ON" — "N" or "P" position (A/T); Neutral position (M/T)	0V
			Ignition switch "ON" — Except the above gear position	BATTERY VOLTAGE (11 - 14V)
36	B/R	Ignition switch	Ignition switch "LOCK"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	P/L	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
38, 47	W/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39	B	ECCS ground	Engine is running. — Idle speed	Engine ground
41	L/OR	Air conditioner switch	Engine is running. — Both air conditioner switch and blower fan switch are on.	Approximately 0V
			Engine is running. — Air conditioner switch is off.	BATTERY VOLTAGE (11 - 14V)
43	PU/W	Power steering oil pressure switch	Engine is running. — Steering wheel is being turned.	0V
			Engine is running. — Steering wheel is not being turned.	4 - 6V
46	W/L	Power supply (Back-up)	Ignition switch "LOCK"	BATTERY VOLTAGE (11 - 14V)
48	B	ECCS ground	Engine is running. — Idle speed	Engine ground
109	W/R	Current return	Ignition switch "LOCK"	BATTERY VOLTAGE (11 - 14V)
101, 103	R/B, G/B	Injector No. 1, Injector No. 3	Engine is running. (Warm-up condition) — Idle speed	BATTERY VOLTAGE (11 - 14V)  NEF358
110, 112	Y/B, L/B	Injector No. 2, Injector No. 4	Engine is running. — Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)  NEF359

ECM Terminals and Reference Value (Cont'd)

*Data are reference values.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	*DATA
106	B/P	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	Approximately 0V
			Ignition switch "ON" └ Following a 5 seconds delay after turning ignition switch "ON" and thereafter	BATTERY VOLTAGE (11 - 14V)
107 108	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
111	R/Y	Heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,200 rpm.	Approximately 0.2V
			Engine is running. └ Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
113	SB	IACV-AAC valve	Engine is running. └ Idle speed	8 - 14V  NEF360
			Engine is running. ├ Steering wheel is being turned. ├ Engine speed is 2,000 rpm.. ├ Rear window defogger switch is "ON". └ Lighting switch is "ON".	2 - 8V  NEF361
114	P	EVAP canister purge volume control solenoid valve	Engine is running. └ Idle speed.	BATTERY VOLTAGE (11 - 14 V)  NEF362
			Engine is running. (Warm-up condition) ├ Idle speed └ Air conditioner is operating.	12 - 13V  NEF363
			Engine is running. └ Engine speed is 3,000 rpm.	5 - 8V  NEF356
116	B	ECCS ground	Engine is running. └ Idle speed	Engine ground

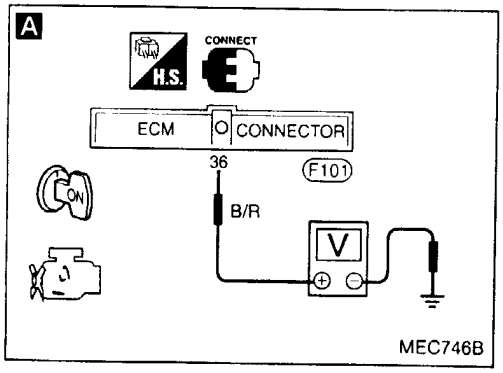
Main Power Supply and Ground Circuit



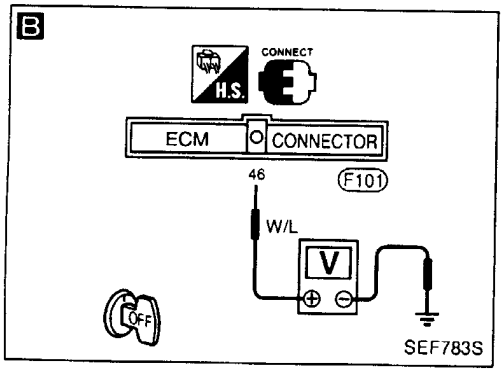
SEF809S

Main Power Supply and Ground Circuit (Cont'd)

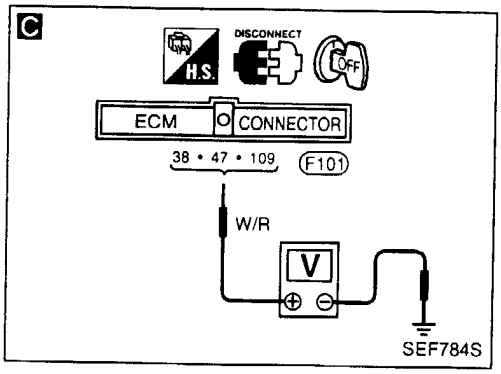
A

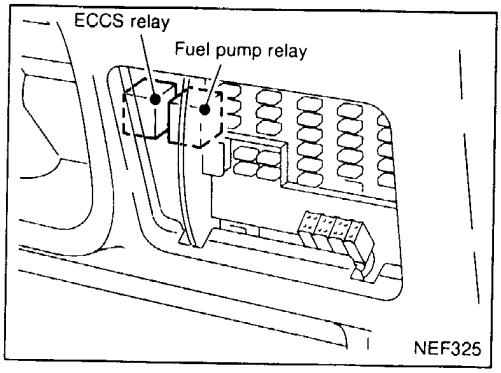


B



C





INSPECTION START

Start engine.
Is engine running?

No → **A**

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

If NG, check the following:
- 40A fusible link
- Operation of ignition switch
- Harness connectors (M52), (F103)
- Harness connectors (E101), (M17)
- Harness for open or short-circuit between ECM and ignition switch.

If NG, replace 40A fusible link or repair ignition switch, harness or connectors.

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

Yes

B

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

NG → Check the following:
- Harness connectors (M52), (F103)
- 7.5A fuse
- Harness for open or short-circuit between ECM and battery.

If NG, replace 7.5A fuse or repair harness or connectors.

OK

C

CHECK POWER SUPPLY-III.
1. Turn ignition switch to "ON" and then to "LOCK" position.
2. Check voltage between ECM connector terminals (38), (47), (109) and ground with CONSULT or tester.
   Voltage:
   After turning ignition switch to "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

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

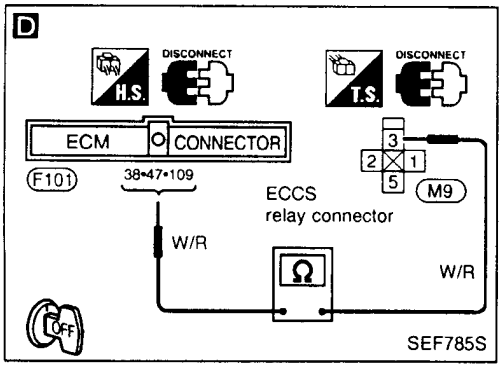
Case-1: Battery voltage does not exist.
Case-2: Battery voltage exists for more than a few seconds.

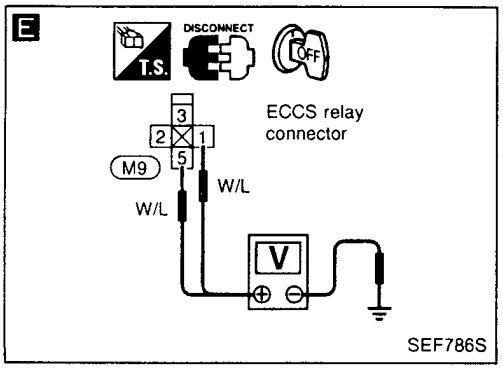
NG

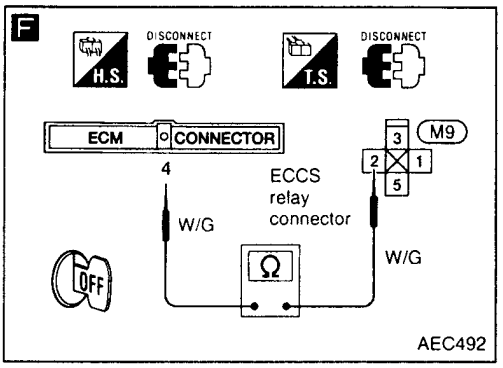
Case-2 → Go to G "CHECK ECCS RELAY" on next page.

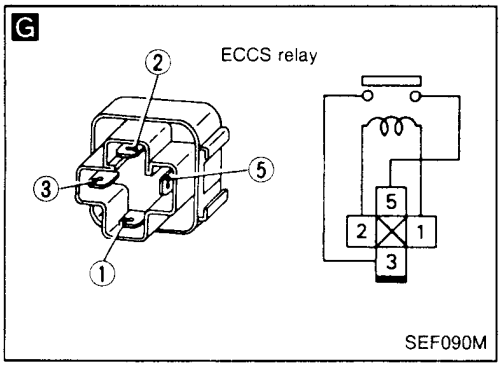
Case-1 → Ⓐ

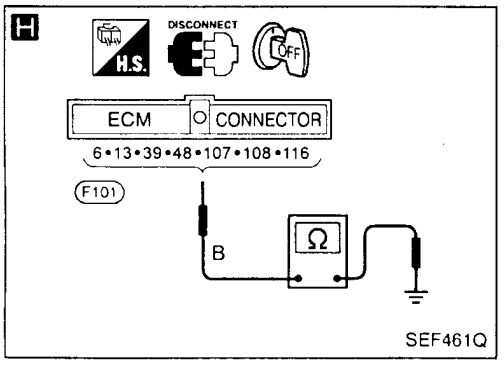
Main Power Supply and Ground Circuit (Cont'd)











Ⓐ

D **CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.**
1. Disconnect ECM harness connector.
2. Disconnect ECCS relay.
3. Check harness continuity between ECM connector terminals ㊳, ㊼, (109) and ECCS relay connector terminal ③.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M52), (F103)
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and ECCS relay.

If NG, repair harness or connectors.

OK ↓

E **CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.**
Check voltage between ECCS relay connector terminals ①, ⑤ and ground with CONSULT or voltage tester.
Voltage: Battery voltage

NG → Replace 7.5A fuse or repair harness or connectors.

OK ↓

F **CHECK OUTPUT SIGNAL CIRCUIT.**
Check harness continuity between ECM connector terminal ④ and ECCS relay connector terminal ②.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M52), (F103)
- Harness for open or short-circuit between ECM and ECCS relay.

If NG, repair harness or connectors.

OK ↓

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

NG → Replace ECCS relay.

OK ↓

H **CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM connector terminals ⑥, ⑬, ㊴, ㊽, (107), (108), (116) and engine ground.
Continuity should exist.
If OK, check harness for short-circuit.

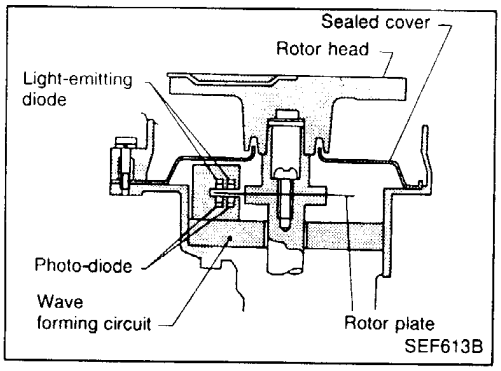
NG → Repair harness or connectors.

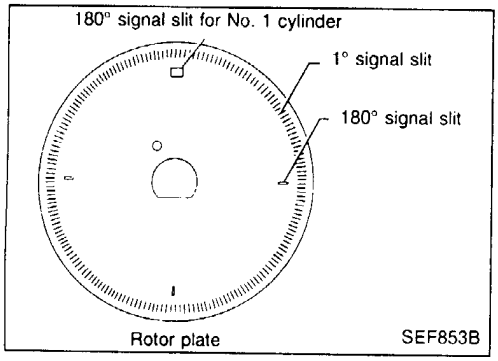
OK ↓

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

↓

INSPECTION END





Camshaft Position Sensor (CMPS)

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

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

The rotor plate is positioned between the LED and the photo-diode. The LED transmits light to the photo-diode. As the rotor plate turns, the beam of light from the LED is interrupted causing the photo-diode recepter 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 for distributor cap and rotor head.

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 often enough while the engine speed is higher than the specified engine speed. • The relation between 1° and 180° signal is not in the normal range during the specified engine speed.	• Harness or connectors (The camshaft position sensor circuit is open or shorted.) • Camshaft position sensor • Starter motor (Refer to EL section.) • Starting system circuit (Refer to EL section.) • Dead (Weak) battery

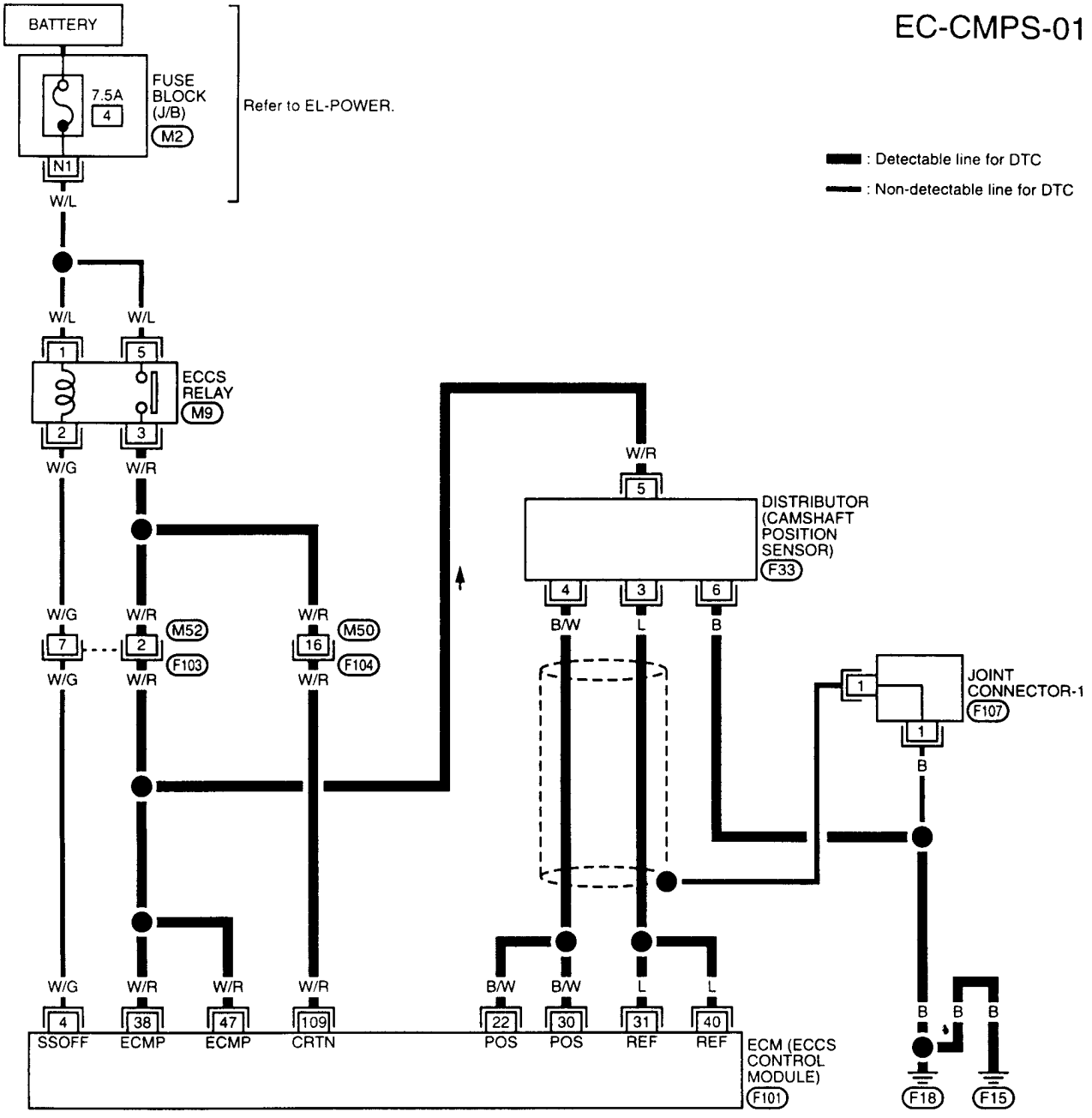
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

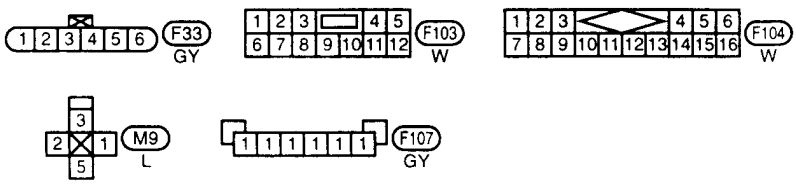
OR

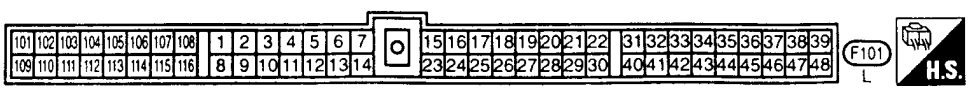
1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch to "LOCK" position, wait at least 7 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

EC-CMPS-01



Refer to last page (Foldout page).
M2

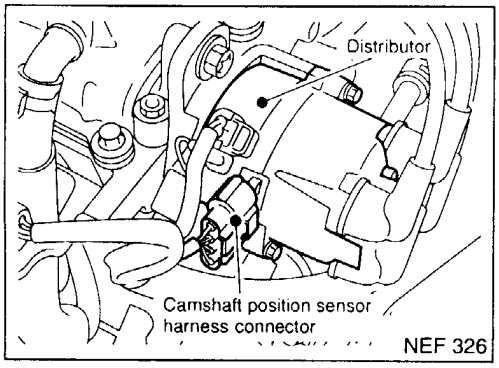


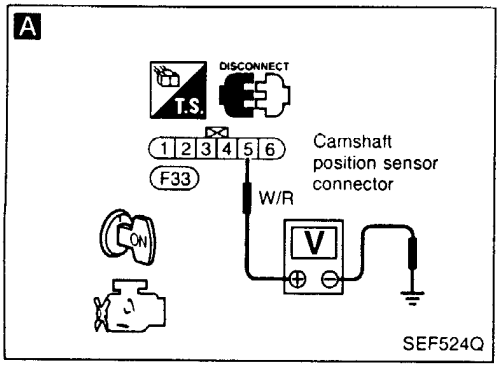


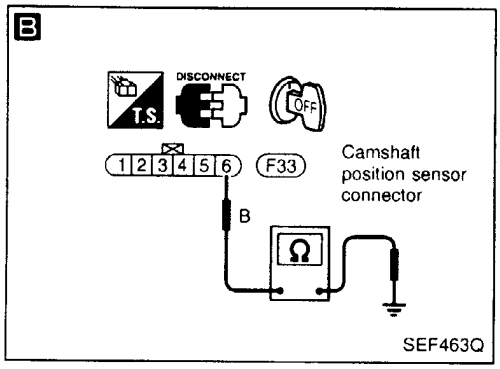
SEF810S

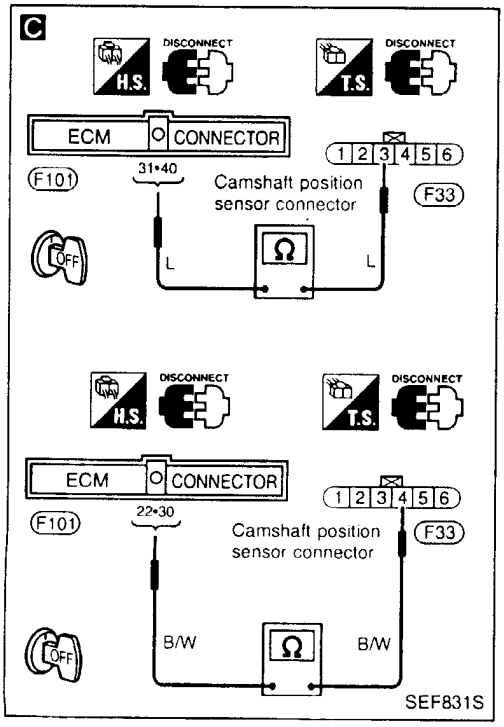
Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE (DETECTABLE CIRCUIT)









INSPECTION START

A

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

NG → Check the following:
- 7.5A fuse in fuse block.
- Operation of ECCS relay.
- Operation of ignition switch.
- Harness connectors (M52), (F103)
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between camshaft position sensor and ECCS relay.
- Harness for open or short-circuit between camshaft position sensor and ECM.

If NG, replace 7.5A fuse or ECCS relay or repair ignition switch, harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between camshaft position sensor connector terminal ⑥ and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connector.

OK ↓

C

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

NG → Repair harness or connectors.

OK ↓

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

NG → Replace camshaft position sensor.

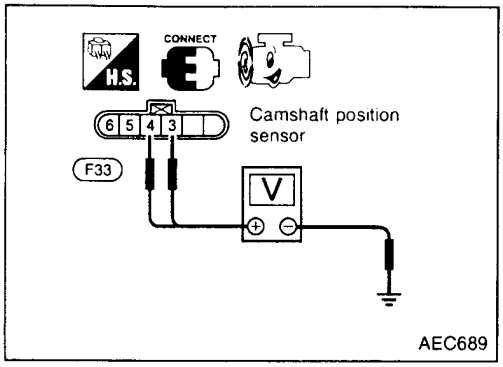
OK ↓

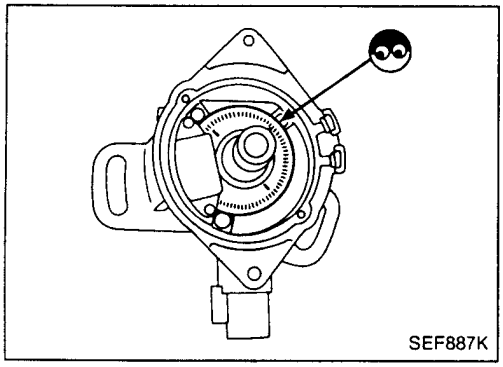
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

INSPECTION END



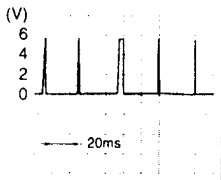
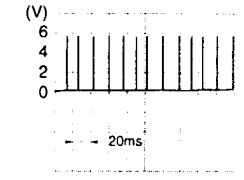
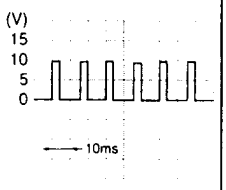
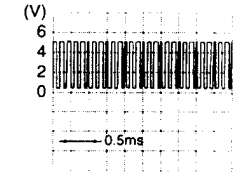


Camshaft Position Sensor (CMPS) (Cont'd)

COMPONENT INSPECTION

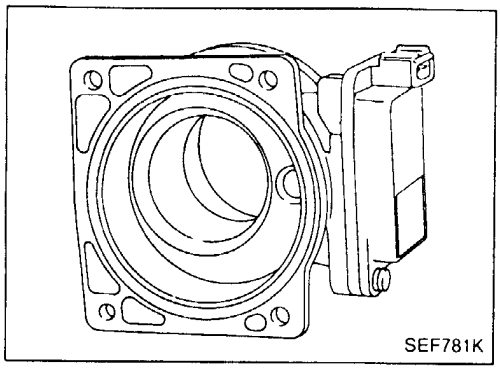
Camshaft position sensor

1. Start engine and warm it up sufficiently..
2. Check voltage between camshaft position sensor terminals ③, ④ and ground with DC range or check pulse signal with oscilloscope under the following conditions.

Condition		Idle	2,000 rpm
Terminal ③	Voltage	0.1 - 0.4V	0.1 - 0.4V
	Pulse signal	 NEF355	 NEF356
Terminal ④	Voltage	2.0 - 3.0V	2.0 - 3.0V
	Pulse signal	 NEF349	 NEF354

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

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


SEF781K

Mass Air Flow Sensor (MAFS)

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by analyzing a part of the entire air intake flow. The sensor 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 which supplies current in proportion to the change in volume of air flow in order to maintain a temperature close to the optimum set value. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by analysing the change in current necessary to maintain the hot-wire temperature.

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

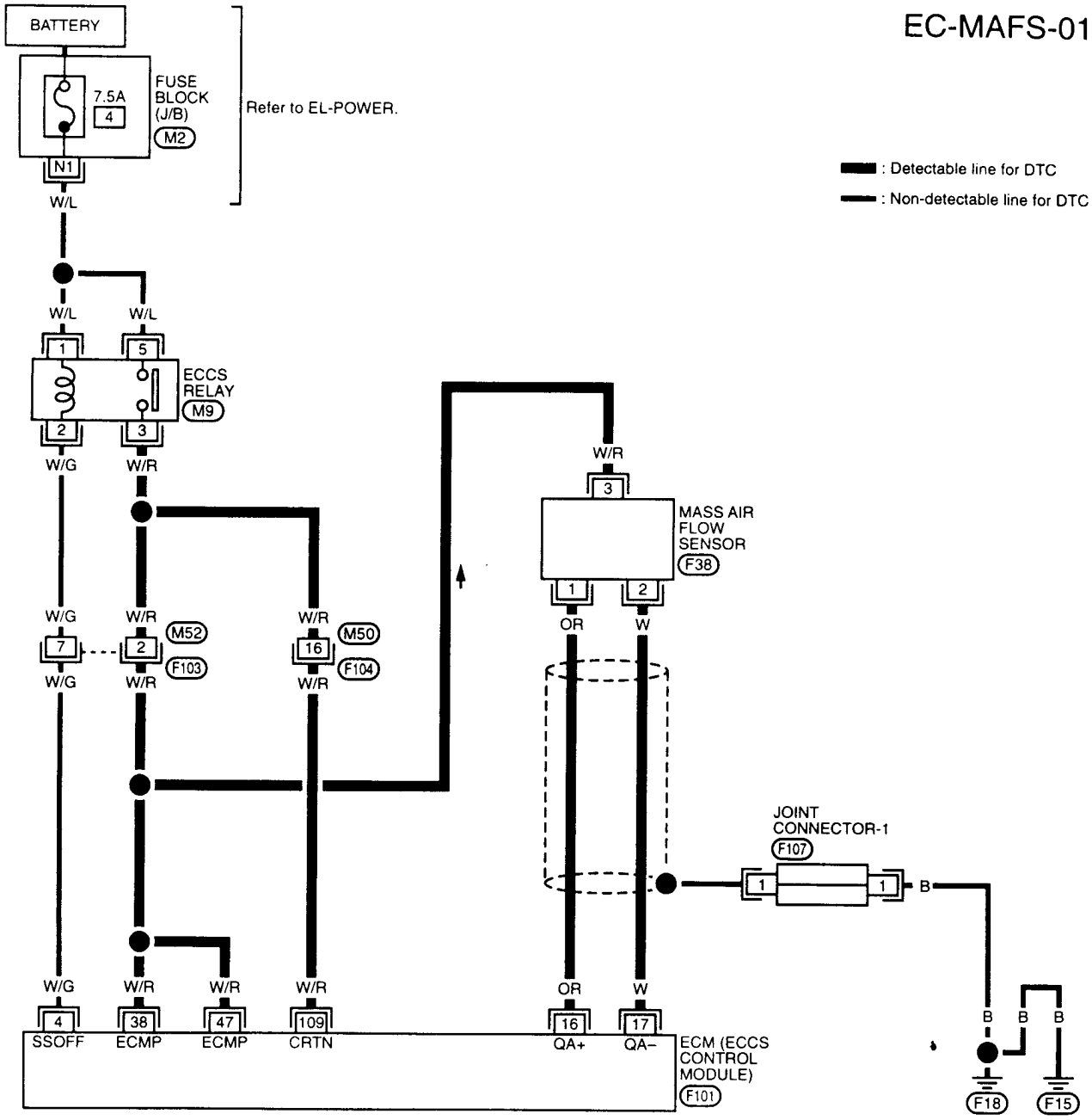
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

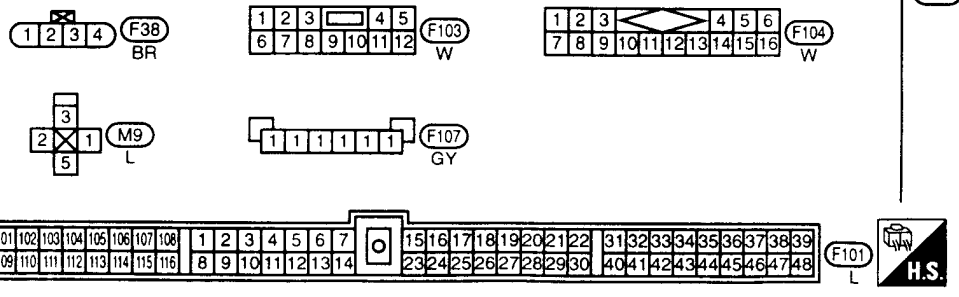
1) Turn ignition switch to "ON" position, and wait at least 6 seconds.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 3 seconds.

OR

1) Turn ignition switch to "ON" position, and wait at least 6 seconds.
2) Start engine and wait at least 3 seconds.
3) Turn ignition switch to "LOCK" position, wait at least 7 seconds and then turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

EC-MAFS-01



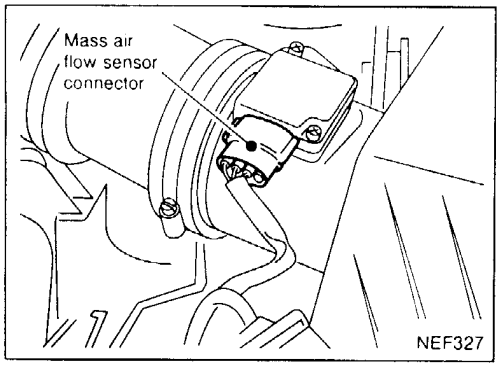


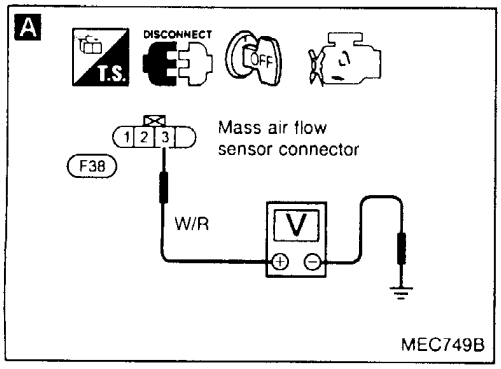
Refer to last page (Foldout page).
M2

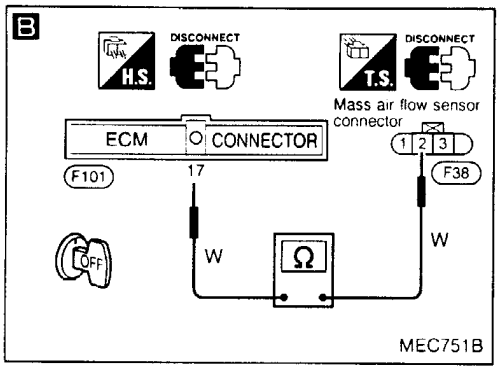
SEF811S

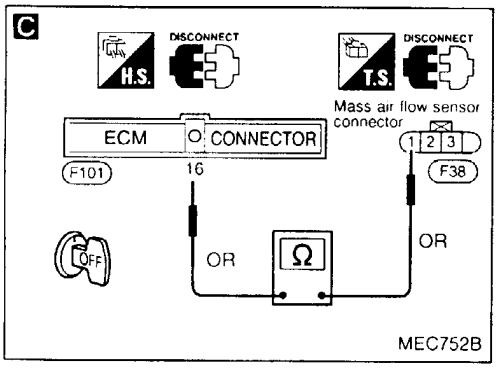
Mass Air Flow Sensor (MAFS) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

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

NG → Check the following:
- 7.5A fuse in fuse block.
- Operation of ECCS relay.
- Operation of ignition switch.
- Harness connectors (M52), (F103)
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between mass air flow sensor and ECCS relay.
- Harness for open or short-circuit between mass air flow sensor and ECM.

If NG, replace 7.5A fuse or ECCS relay or repair ignition switch, harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Loosen and retighten engine ground screws.
4. Check harness continuity between mass air flow sensor connector terminal ② and ECM connector terminal ⑰.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between mass air flow sensor connector terminal ① and ECM connector terminal ⑯.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace mass air flow sensor.

OK ↓

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

Trouble is not fixed. ↓

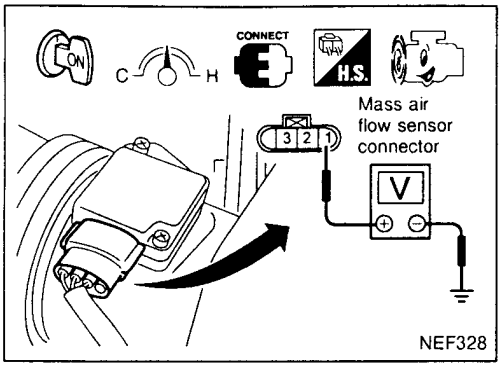
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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

COMPONENT INSPECTION

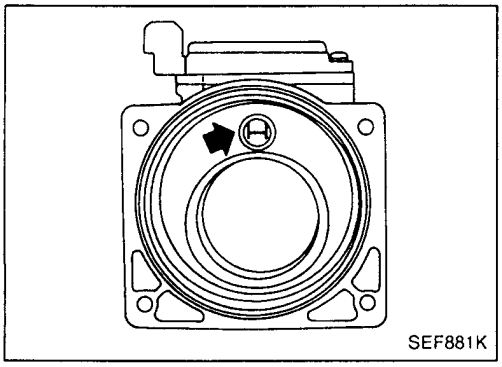
Mass air flow sensor

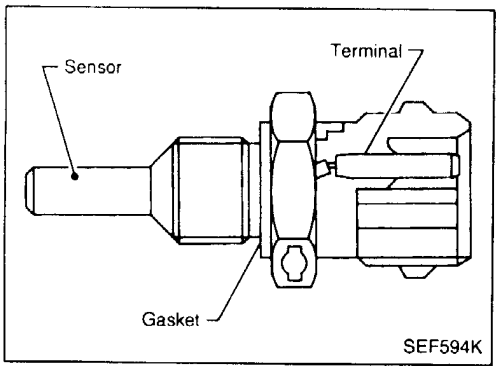


1. Turn ignition switch to "ON" position.
2. Start engine and warm it up sufficiently.
3. Check voltage between mass air flow sensor connector terminal ① and ground.

Conditions	Voltage V
Ignition switch to "ON" position (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up sufficiently.)	0.8 - 1.2

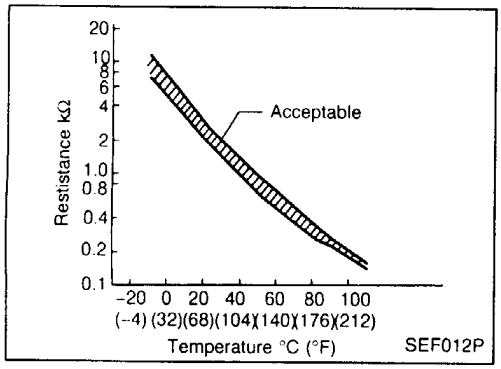
4. If NG, remove mass air flow sensor from air duct. Check hot wire for damage or dust.





Engine Coolant Temperature Sensor (ECTS)

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



〈Reference data〉

Engine coolant temperature °C (°F)	Voltage (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

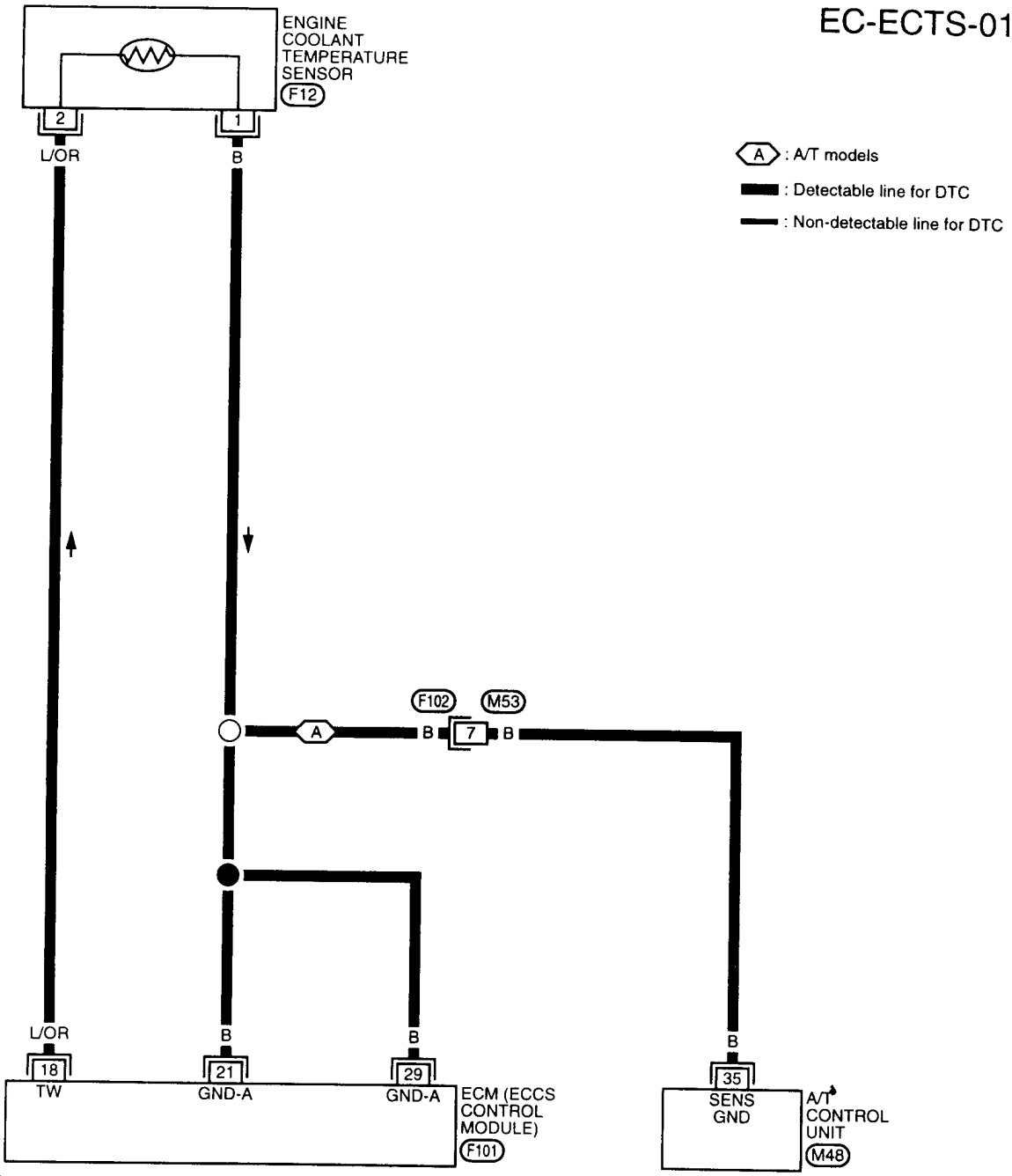
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

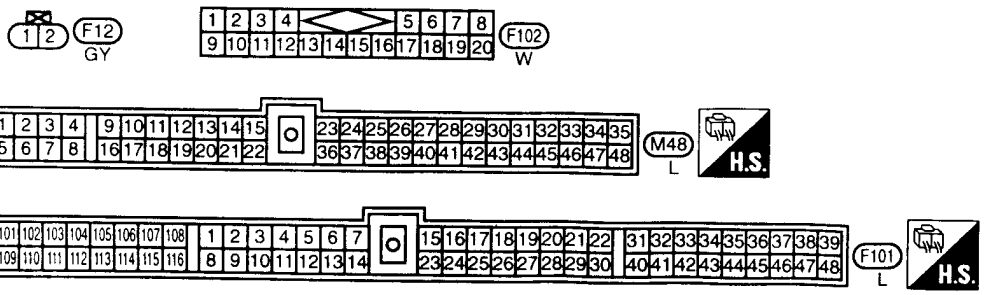
OR

1) Turn ignition switch to "ON" position and wait at least 5 seconds.
2) Turn ignition switch to "LOCK" position, wait at least 7 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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

EC-ECTS-01

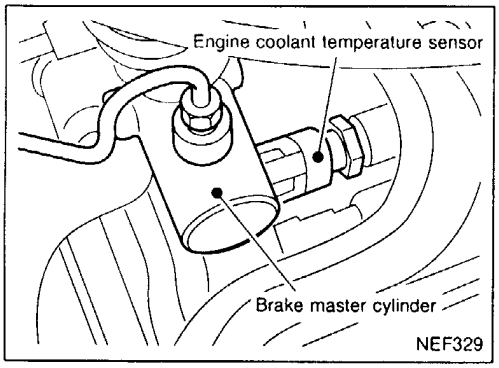


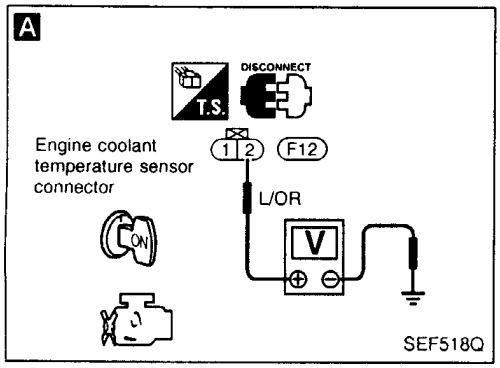


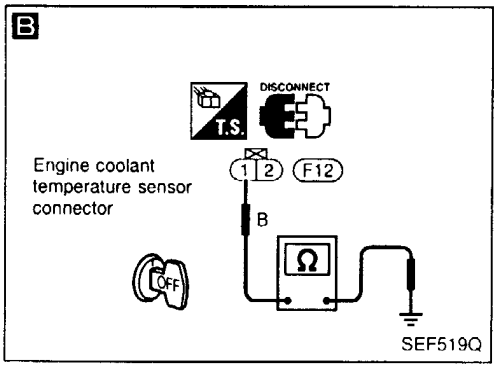
SEF812S

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

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

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between engine coolant temperature sensor connector terminal ① and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following:
- Harness connectors (F102), (M53)
- Harness for open or short-circuit between ECM and engine coolant temperature sensor.
- Harness for open or short-circuit between A/T control unit and engine coolant temperature sensor.

If NG, repair harness or connectors.

OK

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

NG → Replace engine coolant temperature sensor.

OK

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

Trouble is not fixed.

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

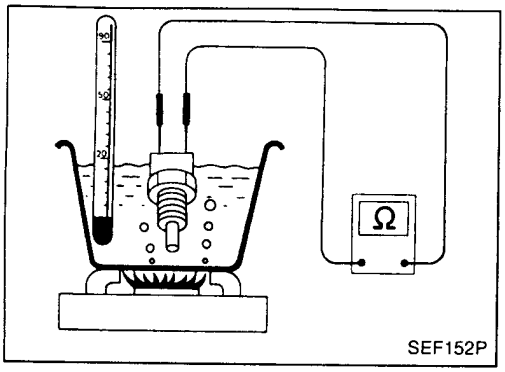
INSPECTION END

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

COMPONENT INSPECTION

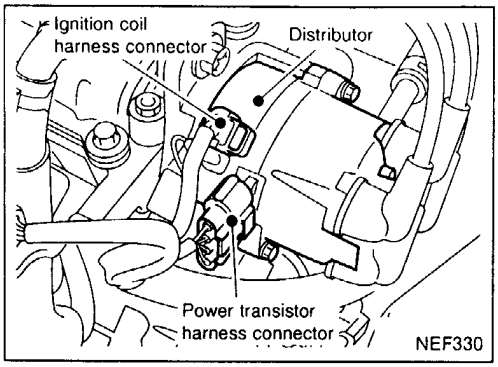
Engine coolant temperature sensor

Check resistance as shown in the figure.



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

If NG, replace engine coolant temperature sensor.



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor (Built into distributor)

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

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC 11 and 21 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 11 first. Refer to EC-208.

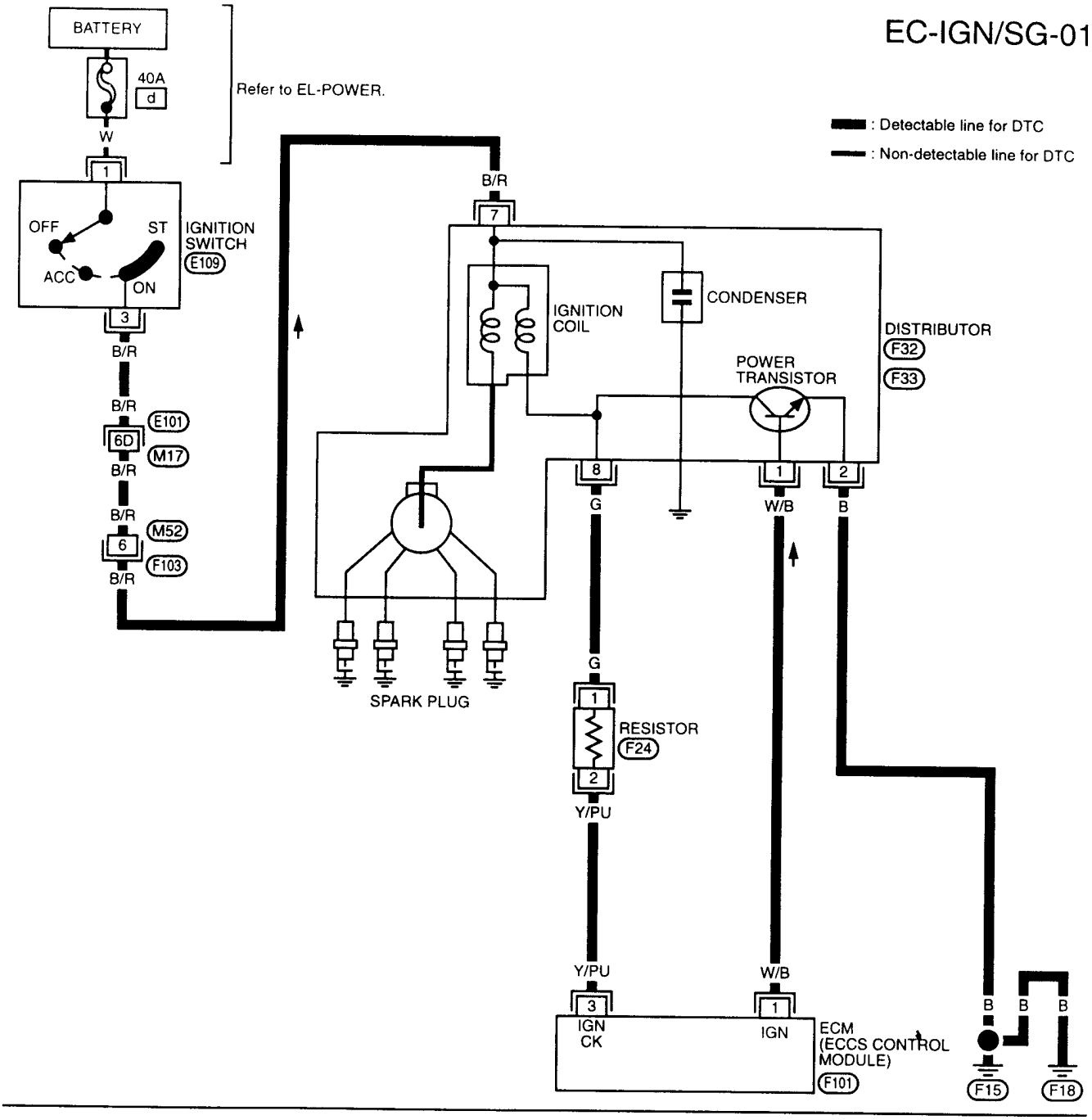
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)

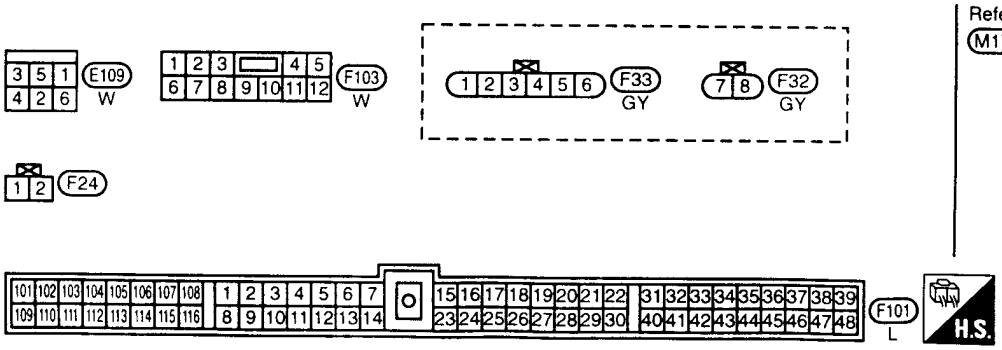
OR

1) Turn ignition switch to "ON" position.
2) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
3) Turn ignition switch to "LOCK" position, wait at least 7 seconds and then turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

Ignition Signal (Cont'd)

EC-IGN/SG-01



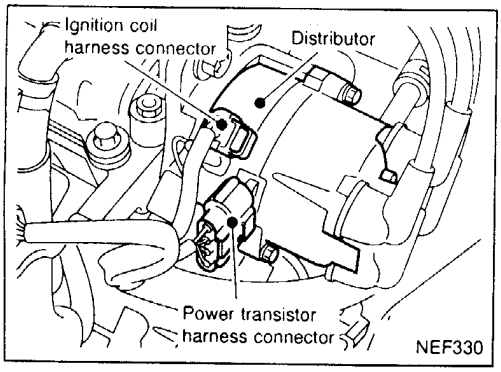


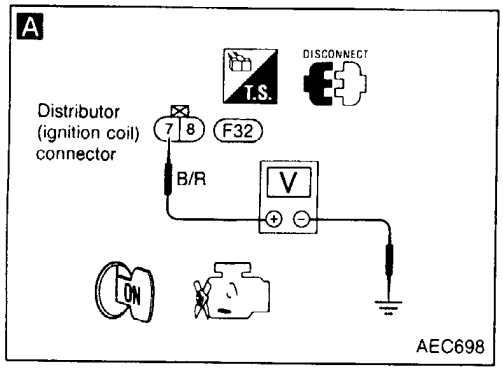
Refer to last page (Foldout page).
M17 , E101

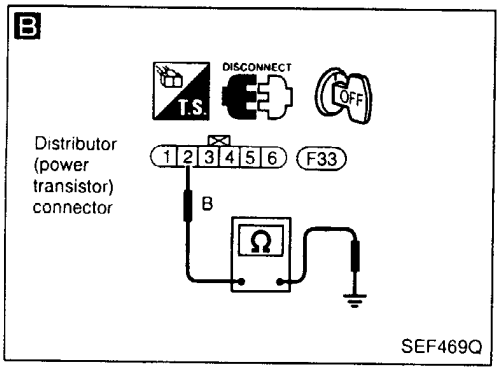
SEF813S

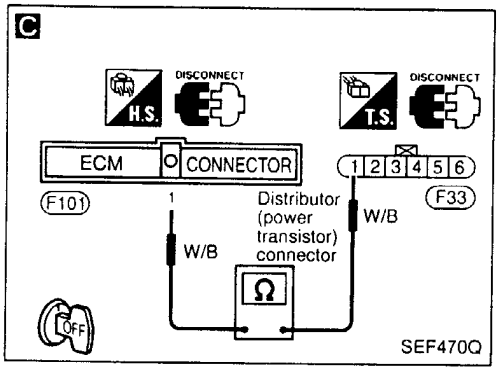
Ignition Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

Turn ignition switch to "LOCK" position, and restart engine.
Is engine running?

Yes → Ⓐ

No

A

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

NG →
Check the following:
- 40A fusible link.
- Operation of ignition switch.
- Harness connectors (E101), (M17)
- Harness connectors (M52), (F103)
- Harness for open or short-circuit between ignition coil and ignition switch.

If NG, replace 40A fusible link or repair ignition switch, harness or connectors.

OK

B

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

NG → Repair harness or connectors.

OK

C

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

NG → Repair harness or connectors.

OK

CHECK COMPONENTS
(Ignition coil, power transistor).
Refer to "COMPONENT INSPECTION", EC-224.

NG → Replace malfunctioning component(s).

OK

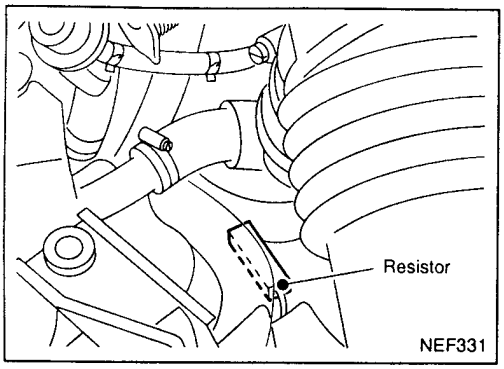
Disconnect and reconnect harness connectors in the circuit. Then retest.

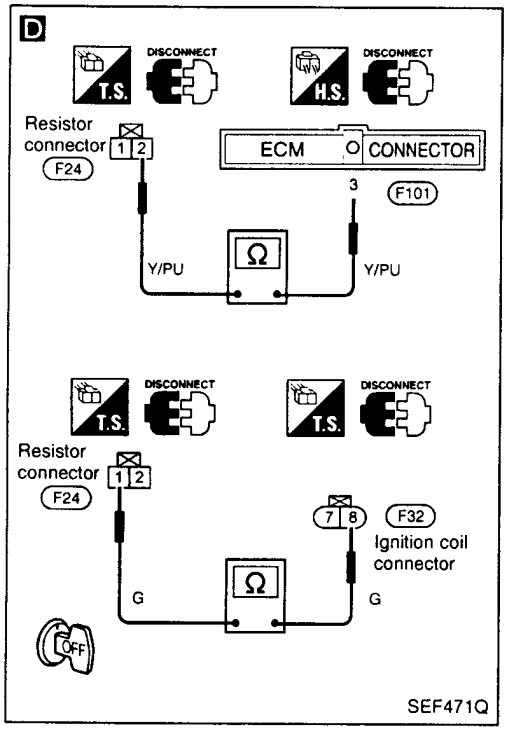
Trouble is not fixed.

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

INSPECTION END

Ignition Signal (Cont'd)





Ⓐ

D

CHECK INPUT SIGNAL CIRCUIT.
1. Stop engine.
2. Disconnect ignition coil harness connector.
3. Disconnect resistor harness connector.
4. Disconnect ECM harness connector.
5. Check harness continuity between ignition coil connector terminal ⑧ and resistor connector terminal ①; resistor connector terminal ② and ECM connector terminal ③.

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

NG → Repair 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. ↓

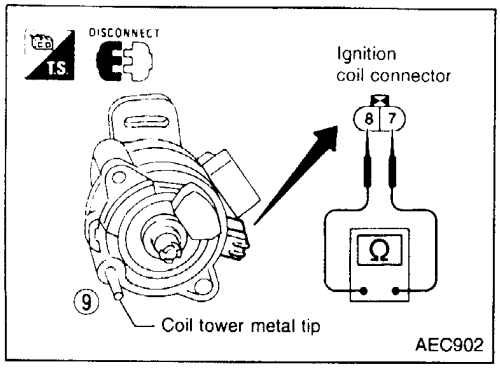
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Ignition Signal (Cont'd)

COMPONENT INSPECTION

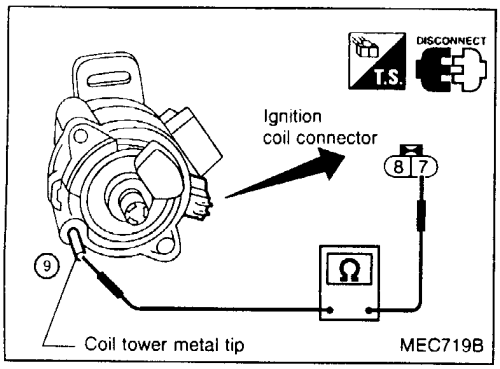


Ignition coil

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

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

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

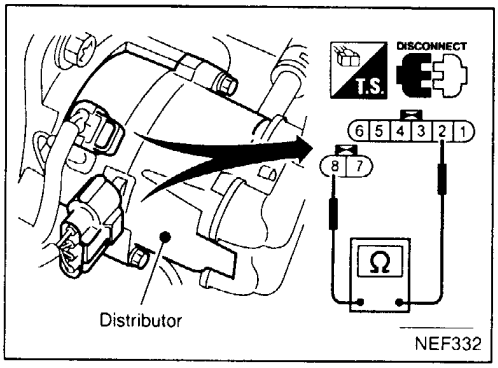


Power transistor

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

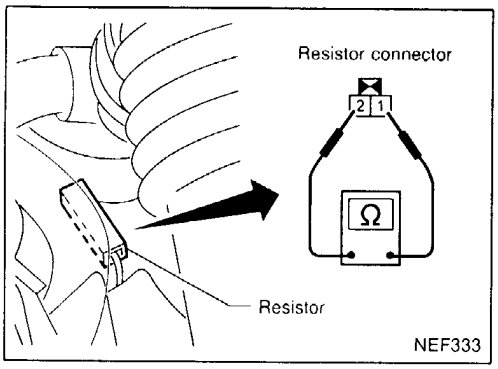
Terminals	Resistance	Result
② and ⑧	Not 0Ω	OK
	0Ω	NG

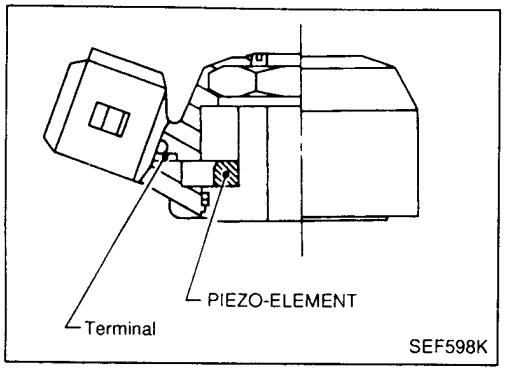
If NG, replace distributor assembly.



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.





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 sent to ECM.	• Harness or connectors (The knock sensor circuit is open or shorted.) • Knock sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

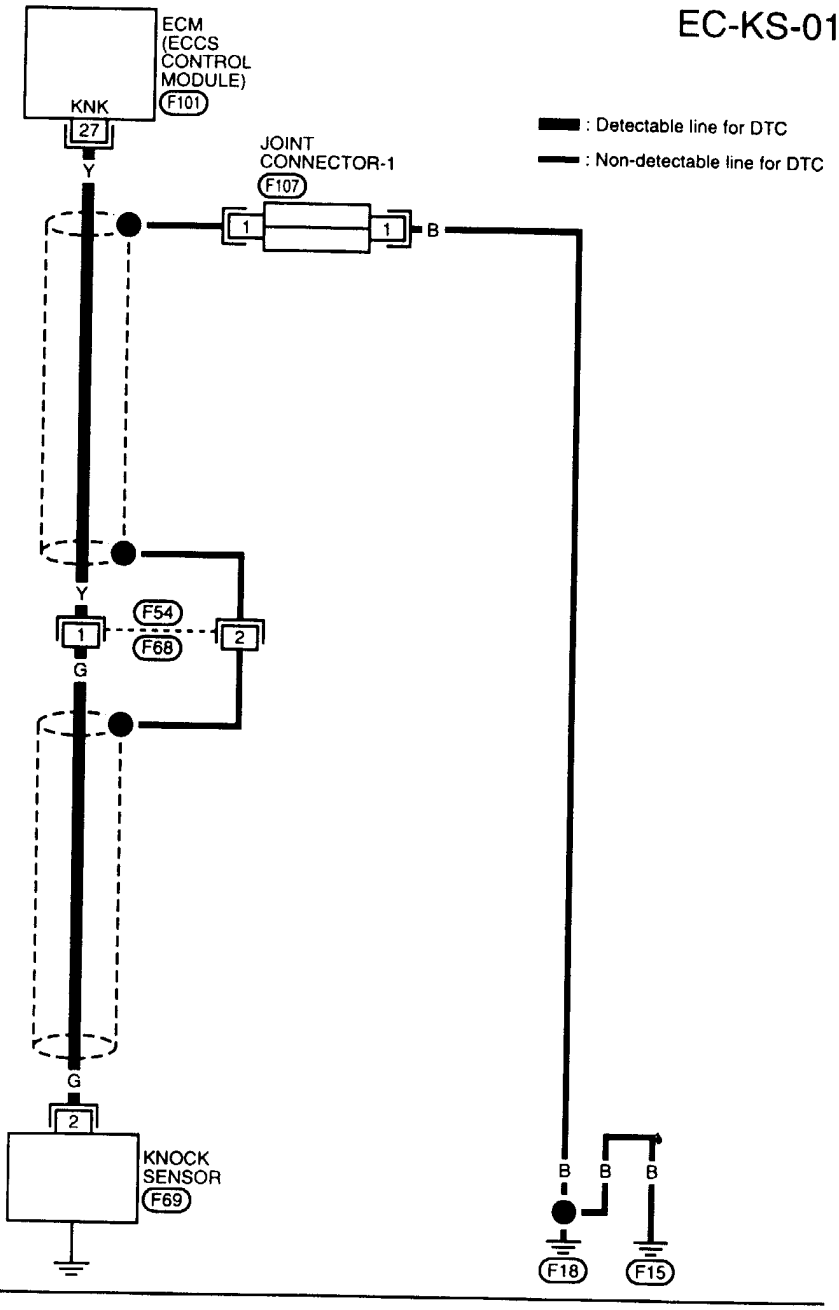
OR

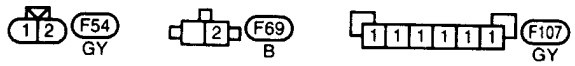
1) Start engine and run it for at least 5 seconds at idle speed.
2) Turn ignition switch to "LOCK" position, wait at least 7 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

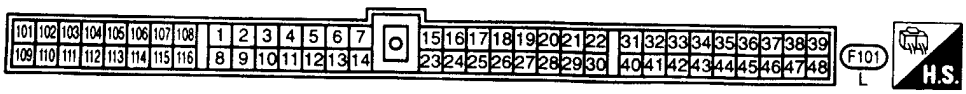
Knock Sensor (KS) (Cont'd)

SR20DE engine

EC-KS-01





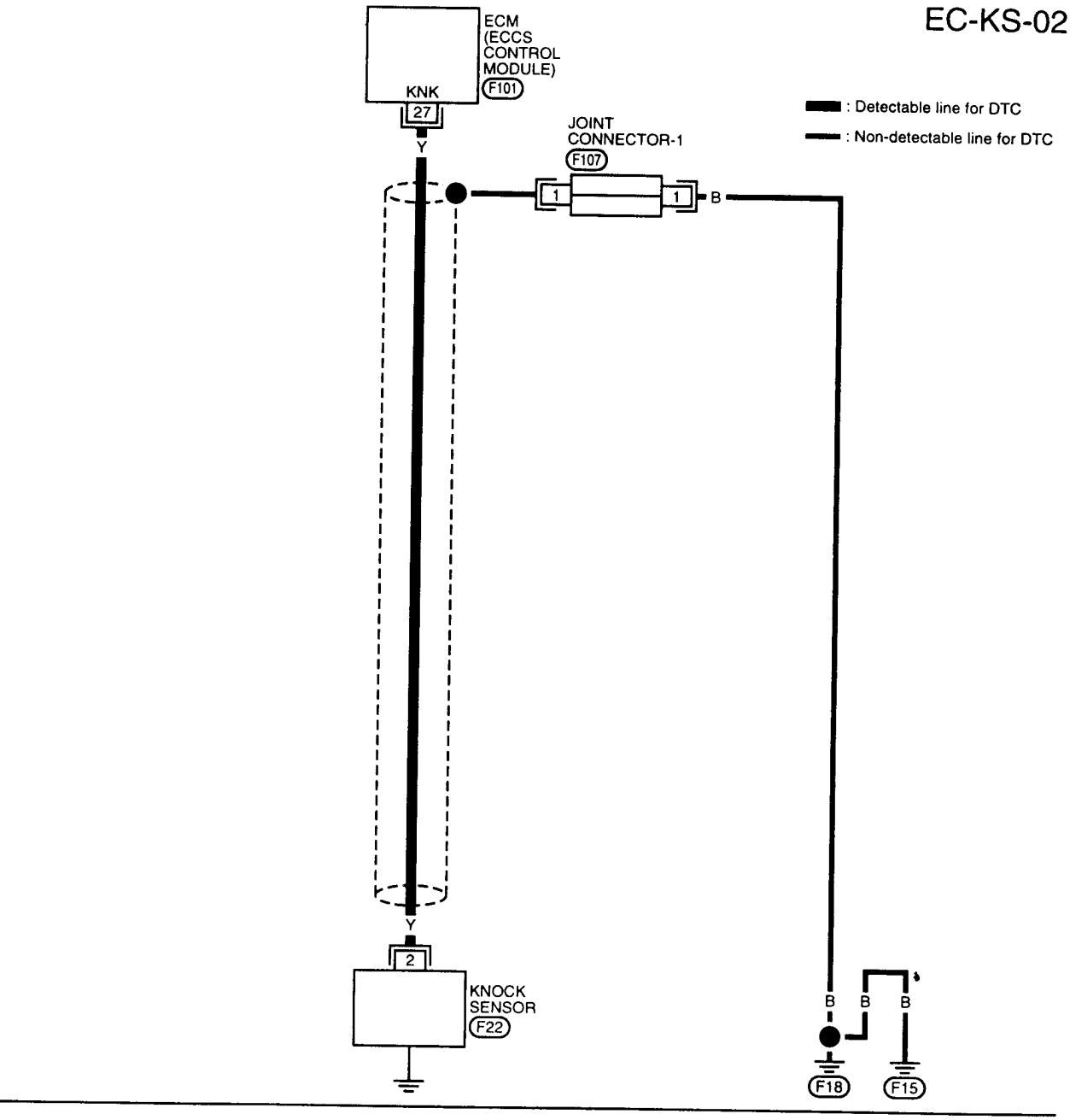


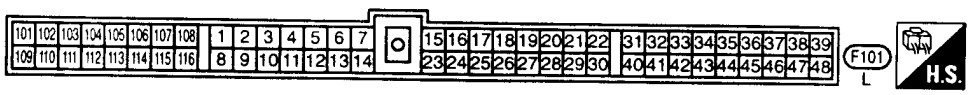
SEF814S

Knock Sensor (KS) (Cont'd)

SR20De engine

EC-KS-02

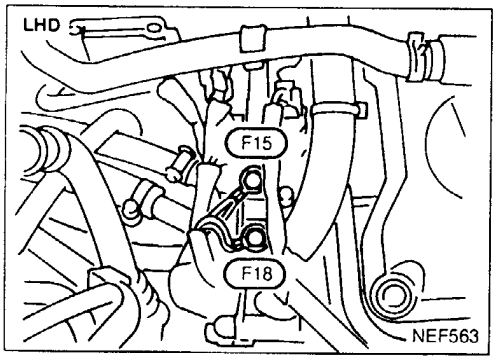


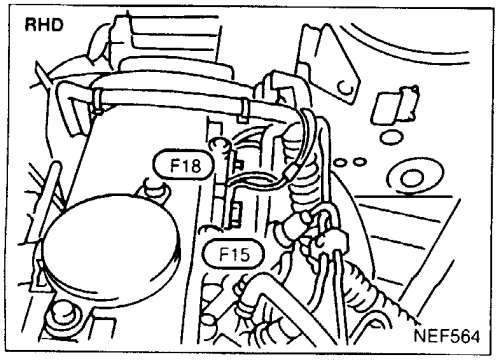


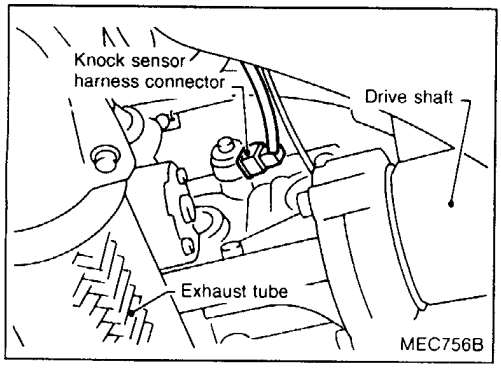
SEF815S

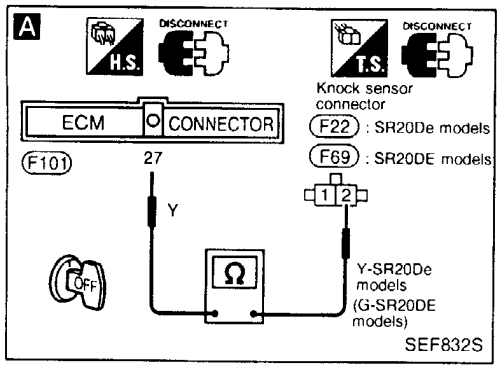
Knock Sensor (KS) (Cont'd)

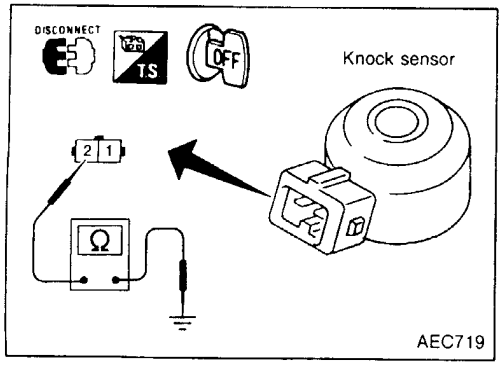
DIAGNOSTIC PROCEDURE











INSPECTION START

↓

Loosen and retighten engine ground screws.

↓

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and knock sensor harness connector.
3. Check harness continuity between knock sensor connector terminal ② and ECM connector terminal ㉗ .
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors F54, F68 (SR20DE engine)
- Harness for open or short between ECM and knock sensor.

If NG, repair harness or connectors.

↓ OK

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

NG → Replace knock sensor.

↓ OK

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

↓ Trouble is not fixed.

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

↓

INSPECTION END

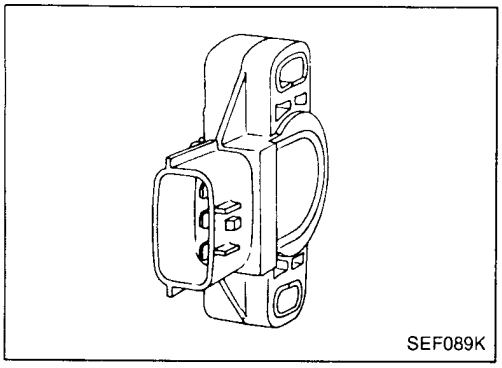
COMPONENT INSPECTION

Knock sensor

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

1. Disconnect knock sensor harness connector.
2. Check resistance between knock sensor connectorterminal ② and ground.
   Resistance: 532 - 588 kΩ [at 25°C (77°F)]

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

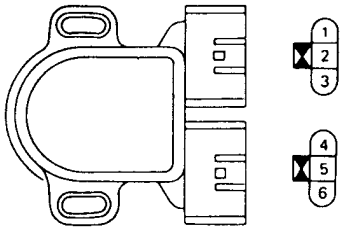

SEF089K

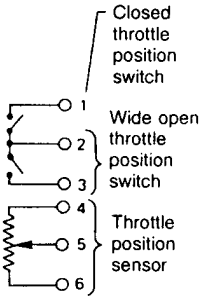
Throttle Position Sensor

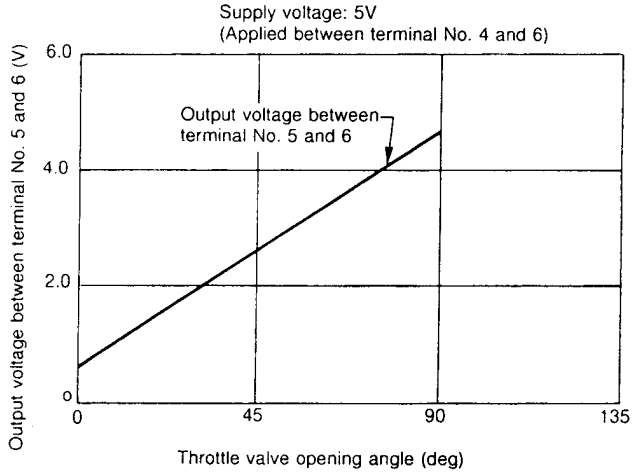
The throttle position sensor responds to the accelerator pedal movement. This sensor is a potentiometer which converts the throttle position into a proportional output voltage, which is then used as an input voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and so also feeds the rate of change of the voltage signal to the ECM.

Idle position of the throttle valve is determined by the ECM based upon the signal received from the throttle position sensor and also controls engine operation such as fuel cut. In addition, a "Wide open & Closed throttle position switch", is built into the throttle position sensor unit for A/T models.

A/T models







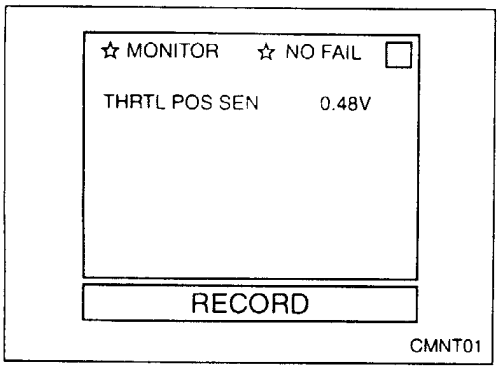
SEF265QC

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

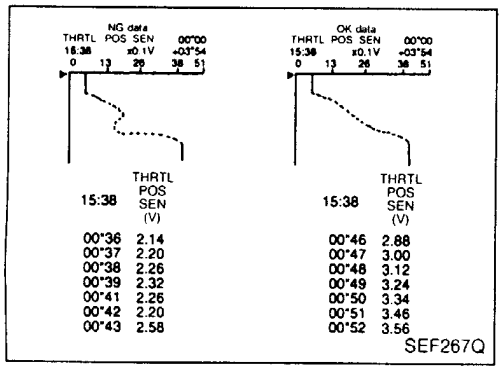
Throttle Position Sensor (Cont'd)

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.

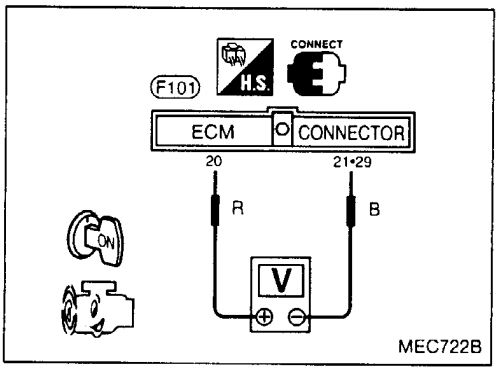


1) Turn ignition switch to "ON" position.
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
3) Select "THRTL POS SEN" in "DATA MONITOR" mode with CONSULT.
4) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.
5) Print out the recorded data and check the following:
   - The voltage when accelerator pedal fully released is approximately 0.35 - 0.65V.
   - The voltage rise is linear in response to accelerator pedal depression.
   - The voltage when accelerator pedal is fully depressed is approximately 4V.



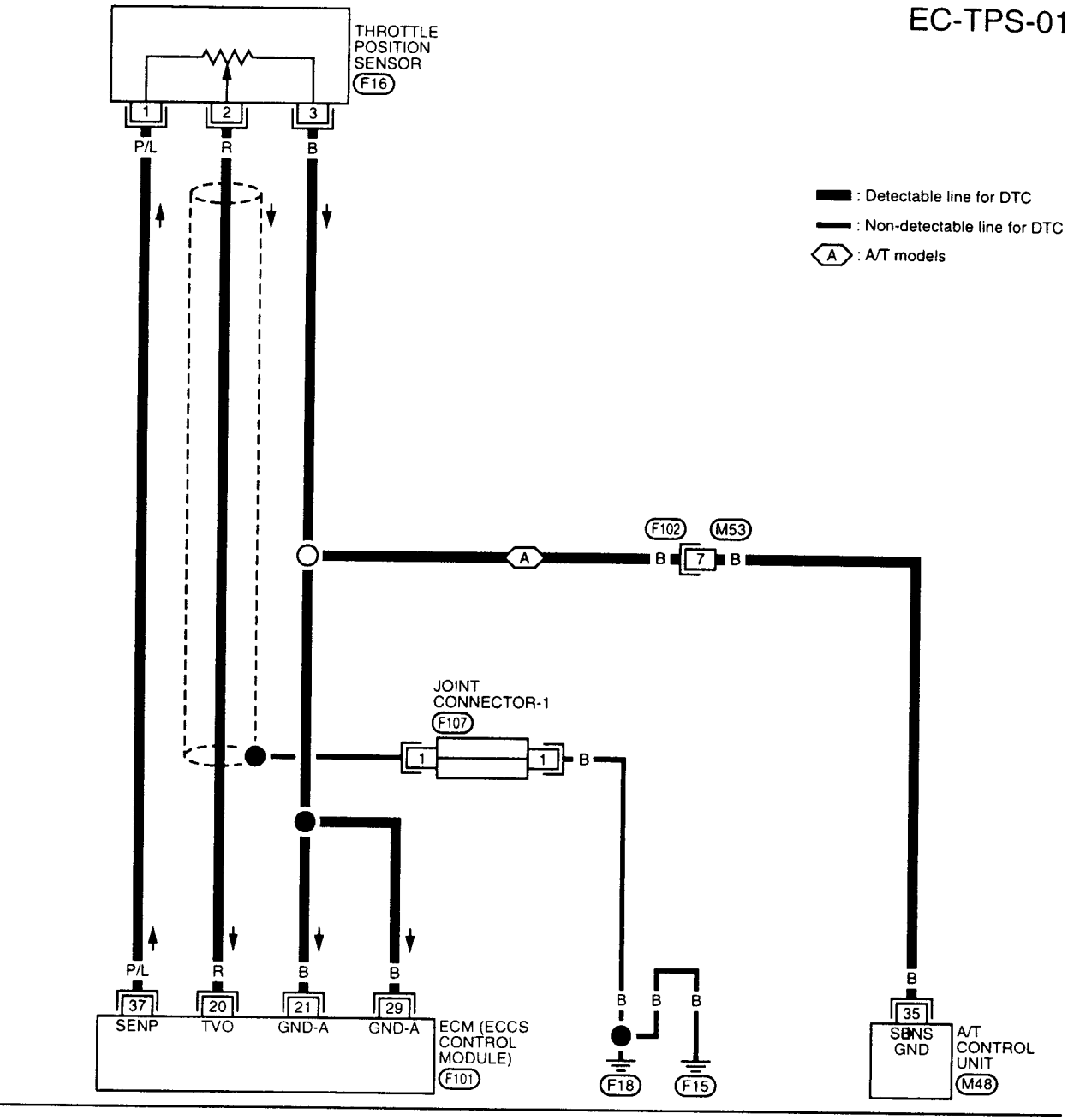
OR

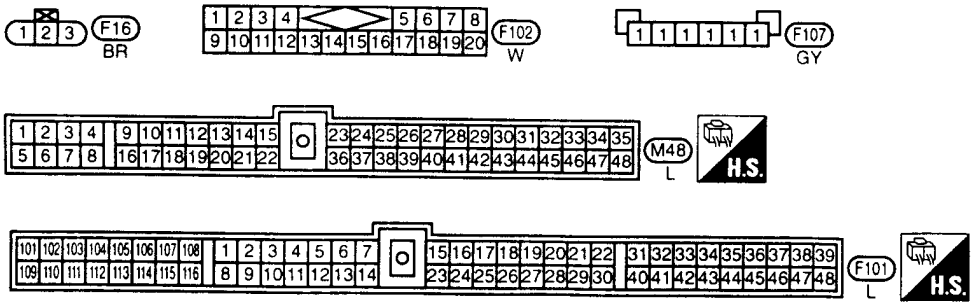
1) Turn ignition switch to "ON" position.
2) Check the voltage between ECM connector terminals ⑳ and ㉑, ㉙ (ground) and check the following:
   - The voltage when accelerator pedal fully released is approximately 0.35 - 0.65V.
   - The voltage rise is linear in response to accelerator pedal depression.
   - The voltage when accelerator pedal is fully depressed is approximately 4V.



Throttle Position Sensor (Cont'd)

EC-TPS-01



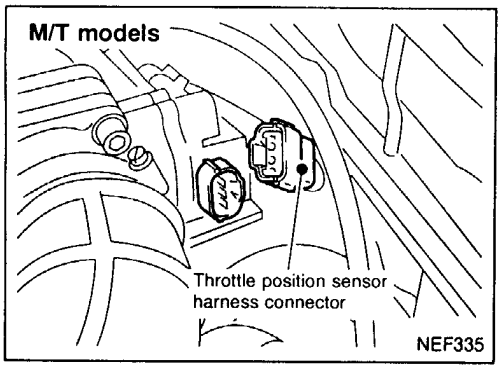


SEF816S

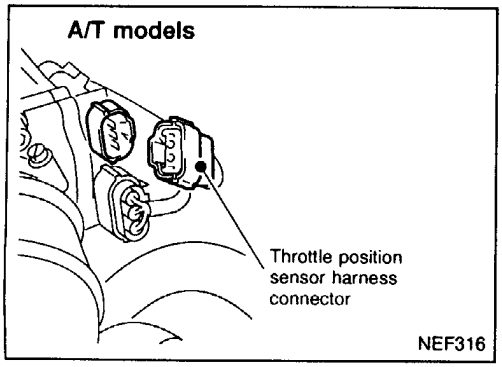
Throttle Position Sensor (Cont'd)

DIAGNOSTIC PROCEDURE

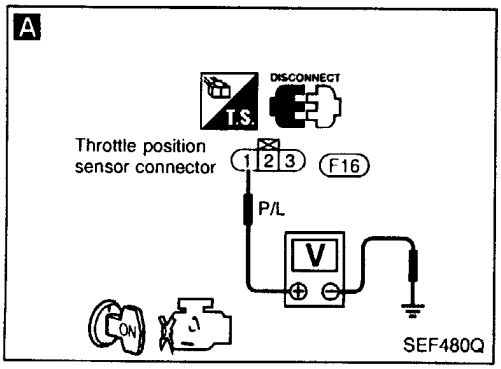
M/T models

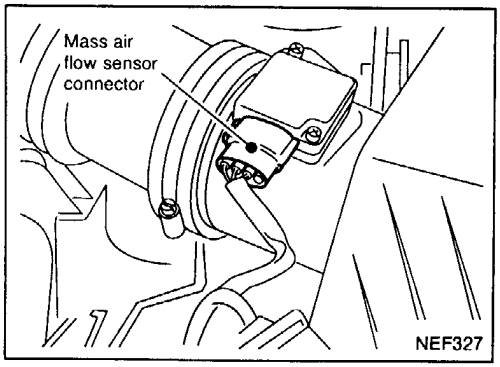


A/T models

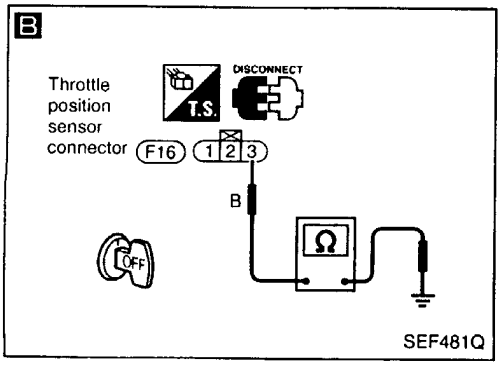


A





B



INSPECTION START

A

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

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between throttle position sensor connector terminal ③ and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

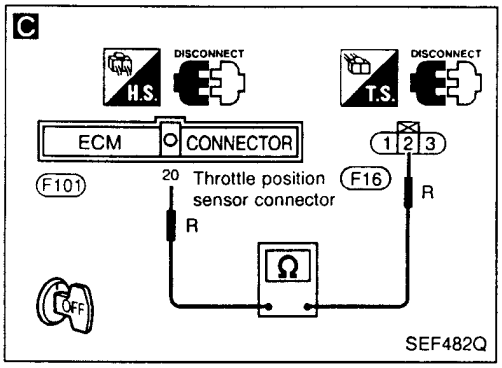
NG → Check the following:
- Harness connectors (F102), (M53) (A/T models only)
- Harness for open or short-circuit between ECM and throttle position sensor.
- Harness for open or short-circuit between A/T control unit and throttle position sensor.

If NG, repair harness or connectors.

OK

Ⓐ

Throttle Position Sensor (Cont'd)



Ⓐ

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ⑳ and throttle position sensor connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

ADJUST THROTTLE POSITION SENSOR.
Perform "Basic Inspection", EC-190.

OK ↓

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

NG → Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-190.

OK ↓

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

Trouble is not fixed. ↓

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

↓

INSPECTION END

Throttle Position Sensor (Cont'd)

COMPONENT INSPECTION

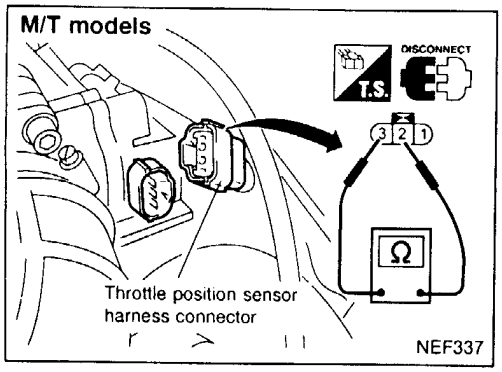
Throttle position sensor

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

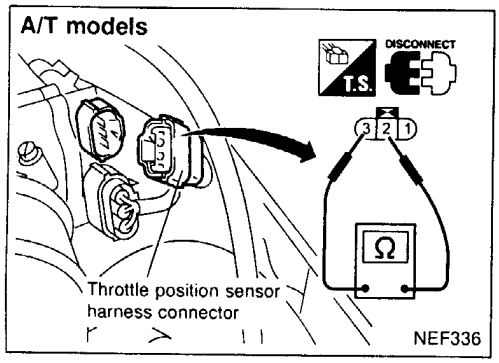
Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 1 kΩ
Partially open	1 - 10 kΩ
Completely open	Approximately 10 kΩ

If NG, replace throttle position sensor.
To adjust it, perform "Basic Inspection", EC-190.

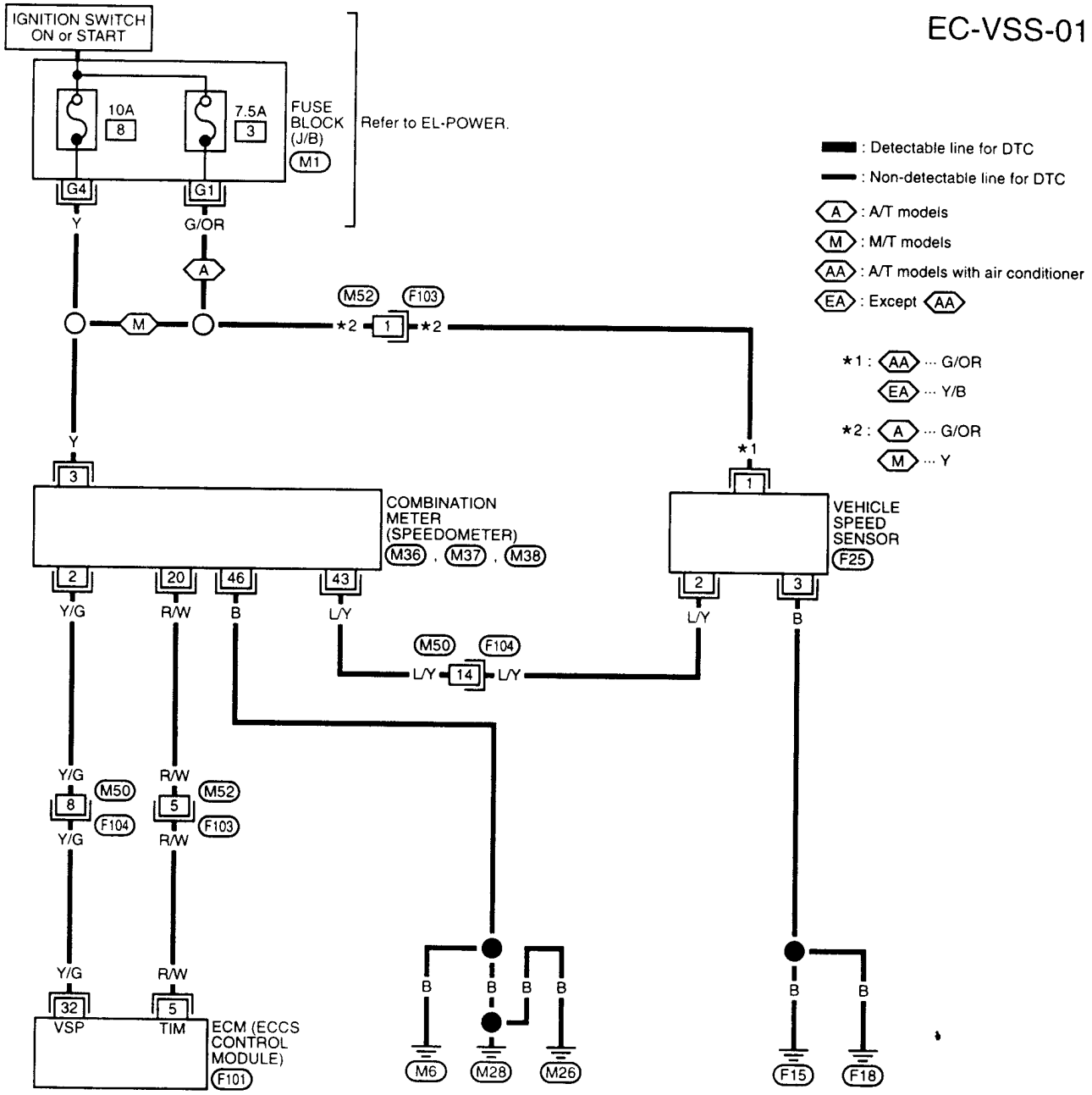
M/T models

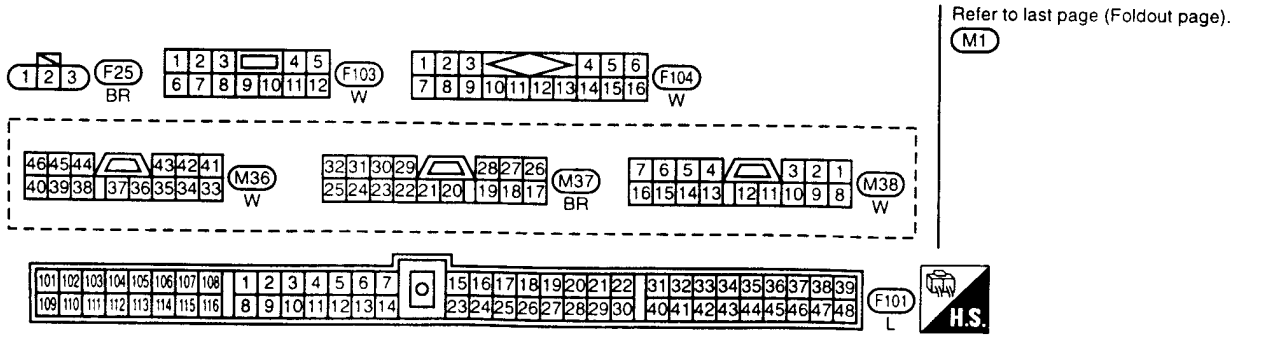


A/T models



Vehicle Speed Sensor (VSS)



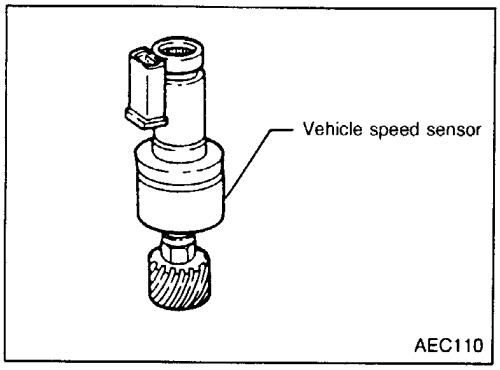


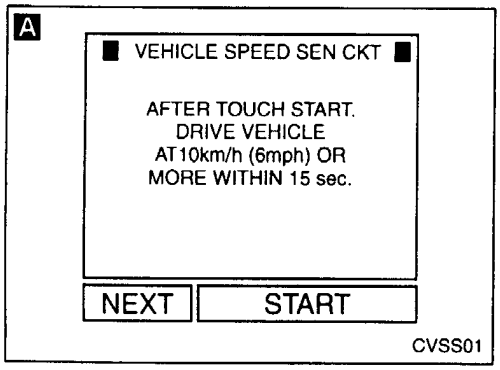
SEF817S

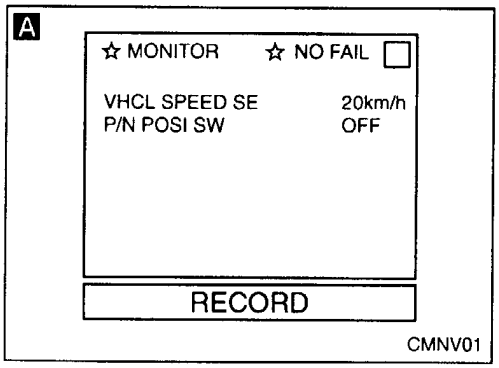
Vehicle Speed Sensor (VSS) (Cont'd)

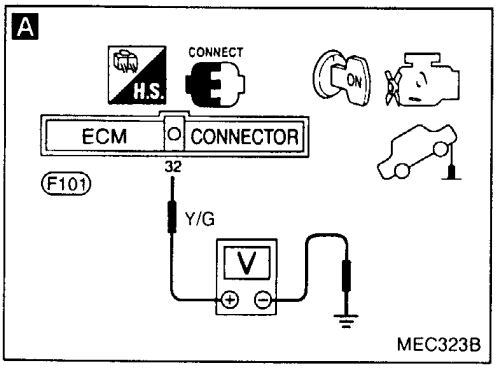
COMPONENT DESCRIPTION

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









DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

2. Read "VHCL SPEED SE" signal in "DATA MONITOR" mode with CONSULT.
   CONSULT value should be the same as the speedometer indication.

OR

2. Turn ignition switch to "ON" position.
3. Rotate drive wheel by hand.
4. Check voltage between ECM terminal (32) and body ground.
   Voltage should vary between approx. 0 - 5V.

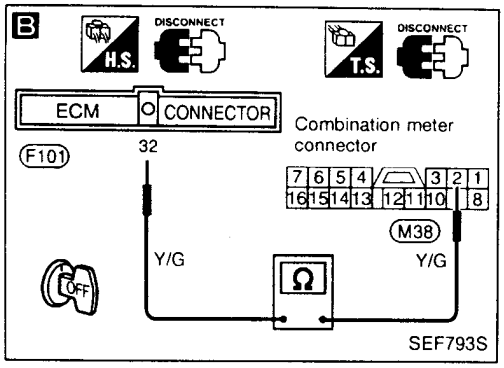
OK → INSPECTION END

NG → CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check vehicle speed sensor and circuit. (Refer to "Inspection/ Speedometer and Vehicle Speed Sensor" of "METER AND GAUGES" in EL section.)

OK → Ⓐ

Vehicle Speed Sensor (VSS) (Cont'd)



Ⓐ

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM connector terminal ㉜ and combination meter connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and combination meter.

If NG, repair harness or connectors.

OK ↓

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

Trouble is not fixed. ↓

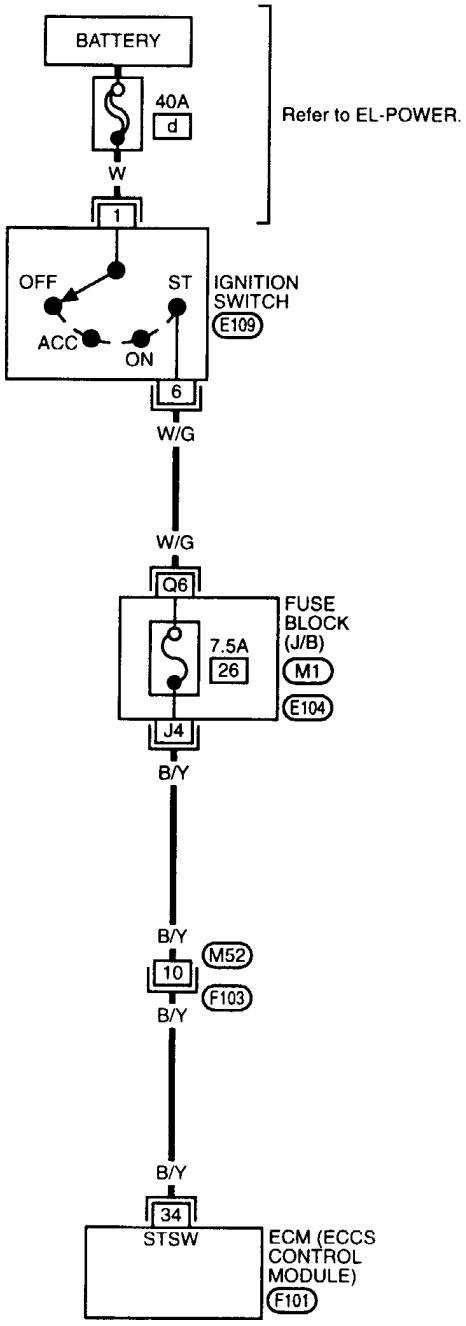
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Start Signal

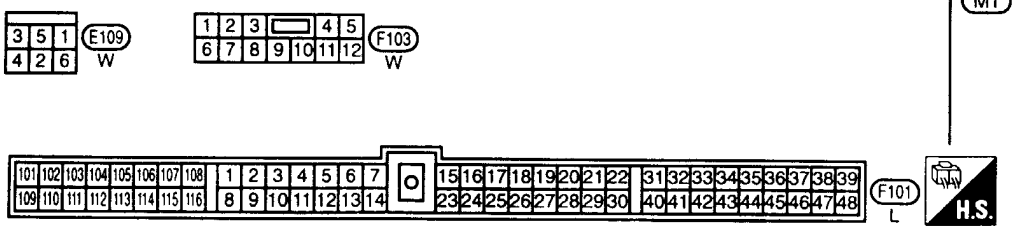
EC-S/SIG-01



: Detectable line for DTC

: Non-detectable line for DTC

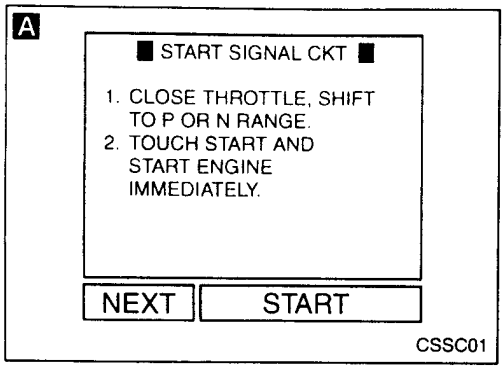
Refer to last page (Foldout page).
M1 , E104

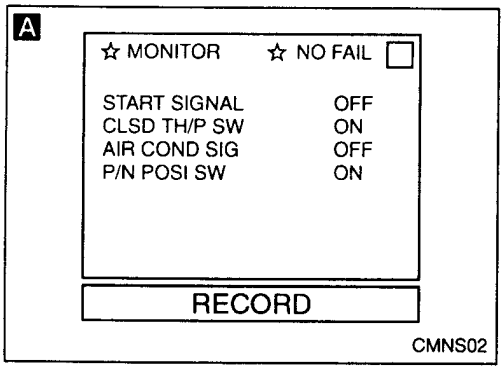


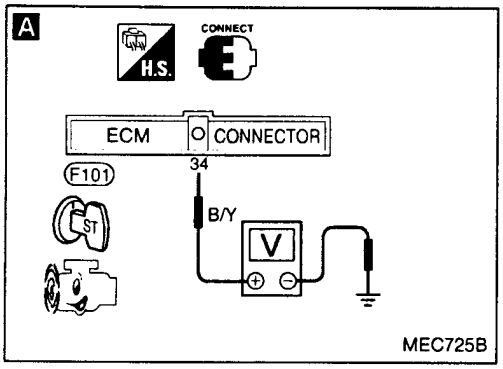
SEF818S

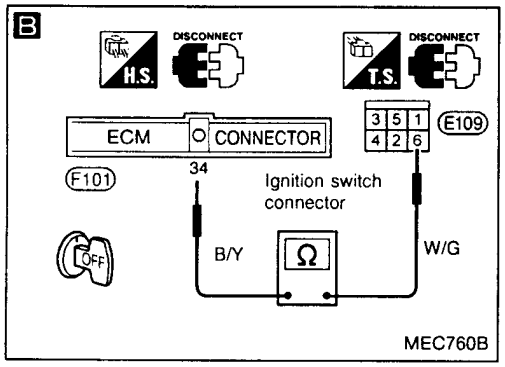
Start Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OK → INSPECTION END

OR

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

IGN "ON"	OFF
IGN "START"	ON

OR

1. Turn ignition switch to "START" position.
2. Check voltage between ECM connector terminal (34) and ground.

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

NG

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and ignition switch harness connector.
3. Check harness continuity between ECM connector terminal (34) and ignition switch connector terminal (6).

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

NG → Check the following:
- Harness connectors (M52), (F103)
- Harness connectors (M1), (E104)
- 7.5A fuse
- 40A fusible link.
- Operation of ignition switch.
- Harness for open or short-circuit between ECM and ignition switch.

If NG, replace fuse or fusible link or repair ignition switch, harness or connectors.

OK

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

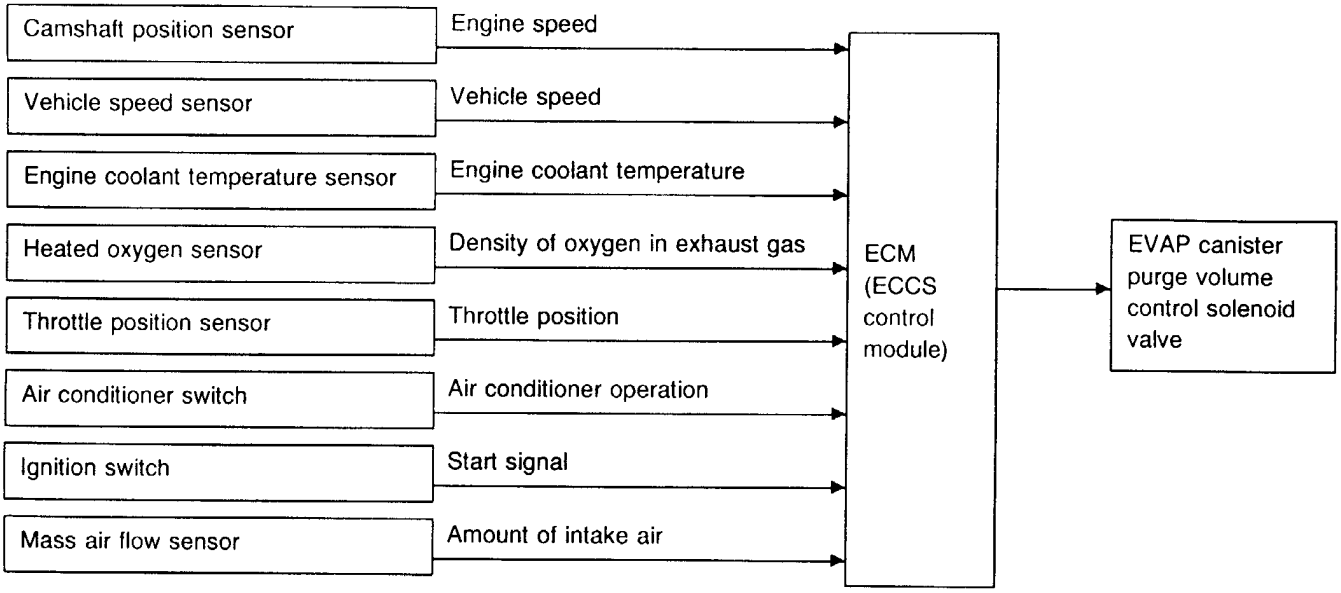
Trouble is not fixed.

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

INSPECTION END

EVAP Canister Purge Volume Control Solenoid Valve

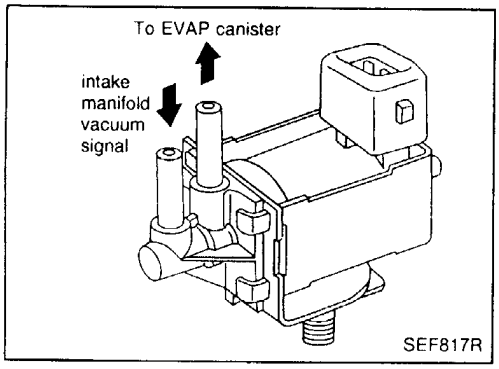
SYSTEM DESCRIPTION

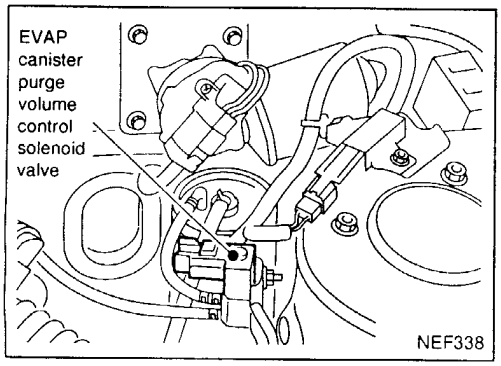


This system controls the EVAP canister purge volume control solenoid valve in response to a signal (ON or OFF pulse) sent from ECM. The higher the ON-pulse ratio the solenoid valve receives, the greater the purge volume flow.
This system operates under the following conditions:

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

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



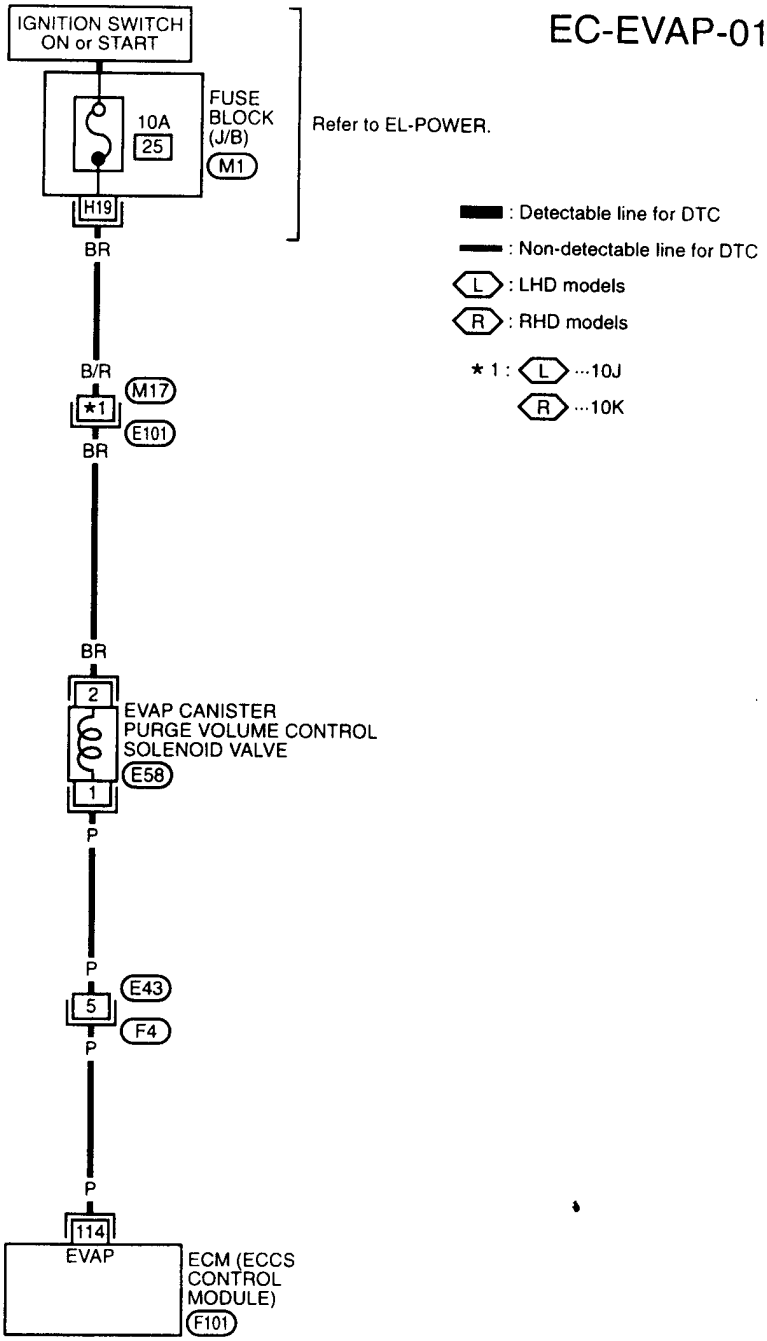


COMPONENT DESCRIPTION

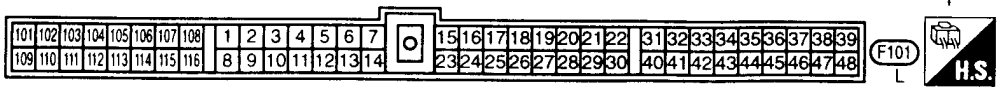
The EVAP canister purge volume control solenoid valve turns on or off in response to a signal (ON or OFF) sent from ECM. It changes the ON-OFF time ratio according to engine speed, controlling the EVAP canister purge volume.

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

EC-EVAP-01



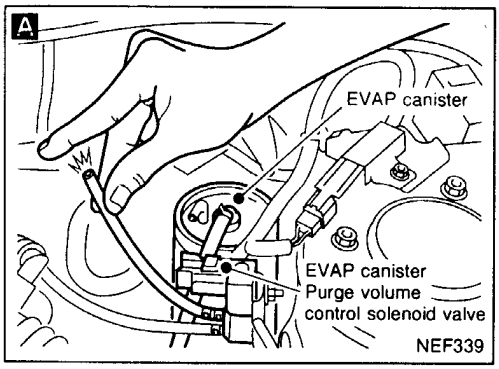
Refer to last page (Foldout page).
M17 , E101
M1

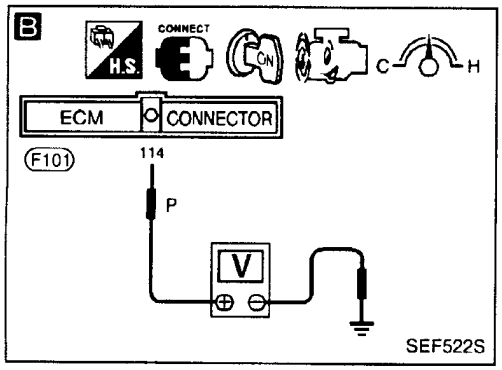


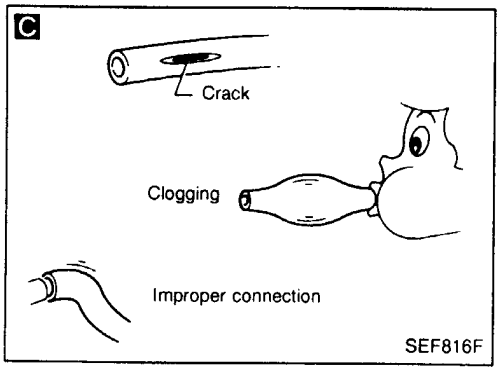
SEF819S

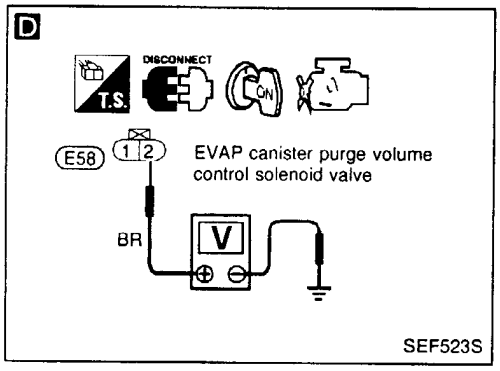
EVAP Canister Purge Volume Control Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK VACUUM SOURCE TO EVAP CANISTER.

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

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

OK → CHECK COMPONENT. (EVAP canister) (See page EC-243.) If NG, replace EVAP canister.

NG

B

CHECK CONTROL FUNCTION.

Check voltage between ECM connector terminal (114) and ground with CONSULT or voltage tester under the following conditions.

Voltage:
At idle (A/C OFF)
Battery voltage
Keep engine speed at 3,000 rpm
Approximately 5 - 8V

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

NG

D

CHECK POWER SUPPLY.

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

Voltage: Battery voltage

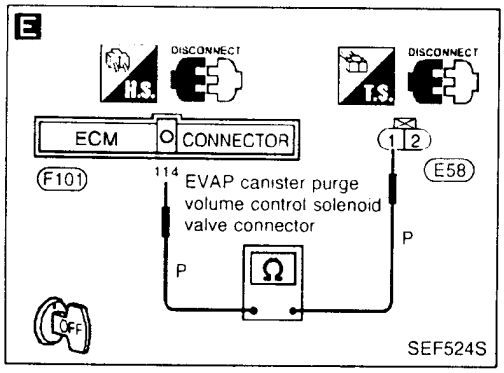
NG → Check the following:
- Harness connectors (M17), (E101)
- Harness connector (M1)
- 10A fuse
- Harness for open or short-circuit between EVAP canister purge volume control solenoid valve and fuse.

If NG, replace fuse or repair harness or connectors.

OK

Ⓐ

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



Ⓐ

E

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM connector terminal (114) and EVAP canister purge volume control solenoid valve connector terminal ①.

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

NG → Check the following:
- Harness connectors (E43), (F4)
- Harness for open or short-circuit between ECM and EVAP canister purge volume control solenoid valve.

If NG, repair harness or connectors.

OK ↓

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

NG → Replace EVAP canister purge volume control solenoid valve.

OK ↓

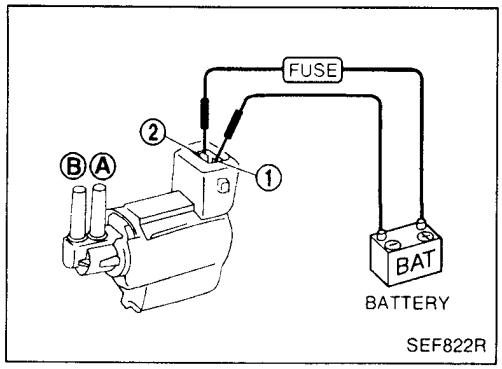
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END



COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

Check air passage continuity.

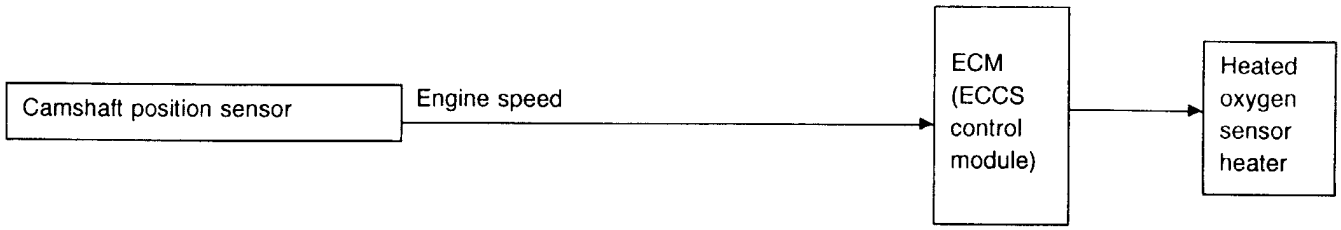
Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals ① and ②	Yes
No supply	No

If NG, replace solenoid valve.

Heated Oxygen Sensor (HO2S)

SYSTEM DESCRIPTION

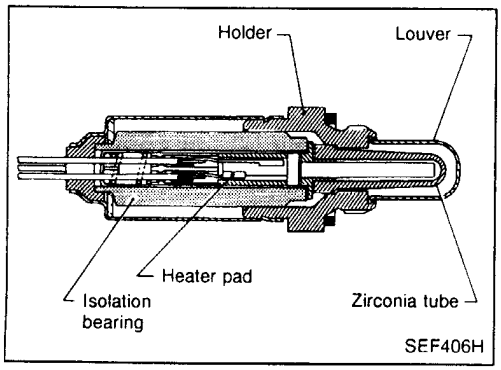
Heated oxygen sensor heater control

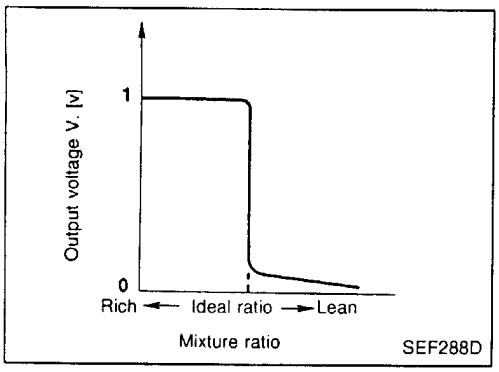


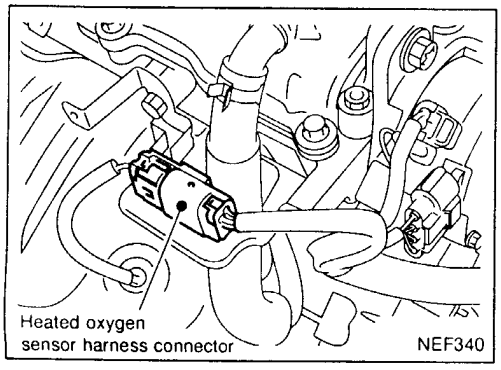
The ECM performs ON/OFF control of the heated oxygen sensor heater corresponding to the engine speed.

OPERATION

Engine speed rpm	Heated oxygen sensor heater
Above 3,200	OFF
Below 3,200	ON





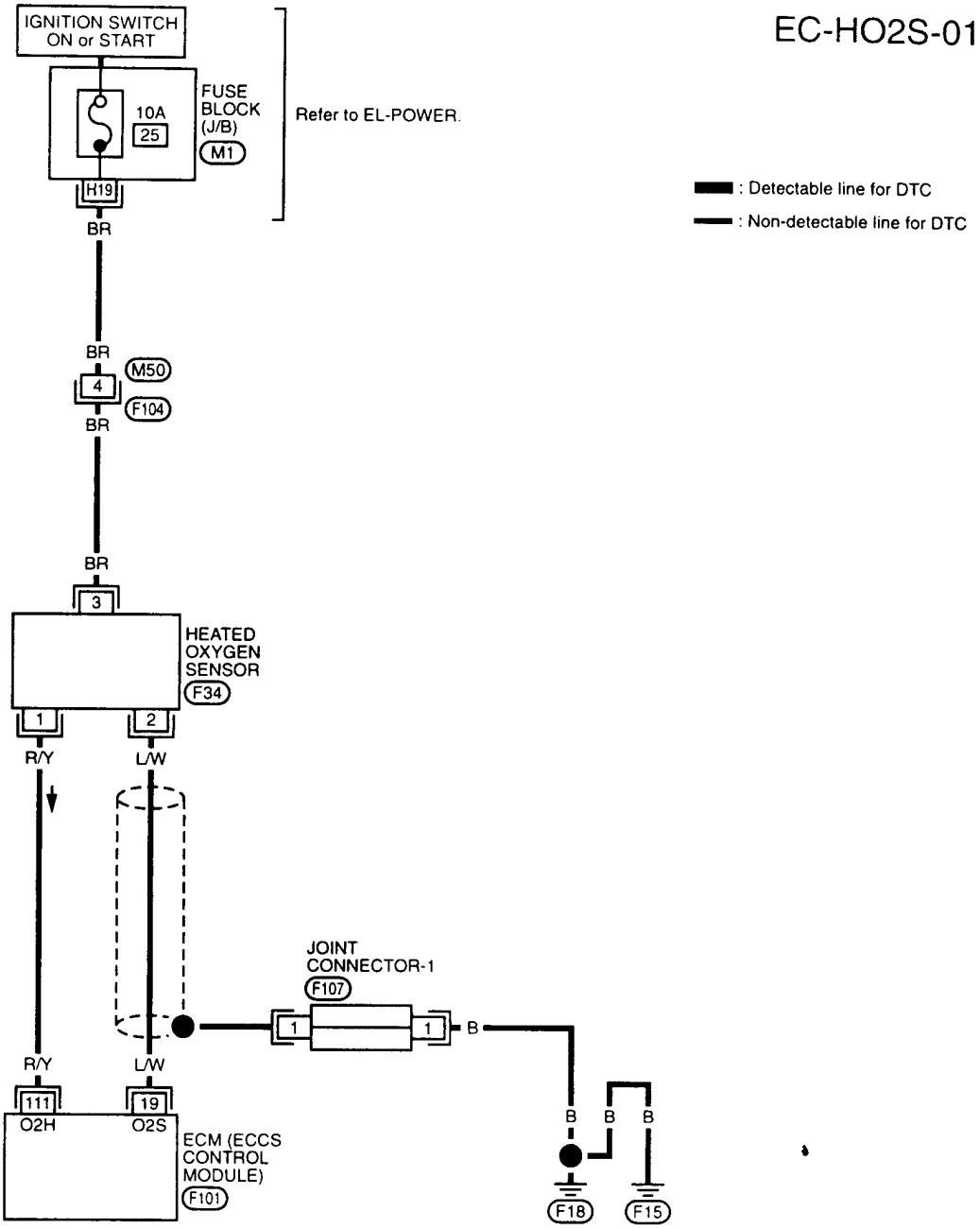


COMPONENT DESCRIPTION

The heated oxygen sensor is placed into the front exhaust tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The 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.

Heated Oxygen Sensor (HO2S) (Cont'd)

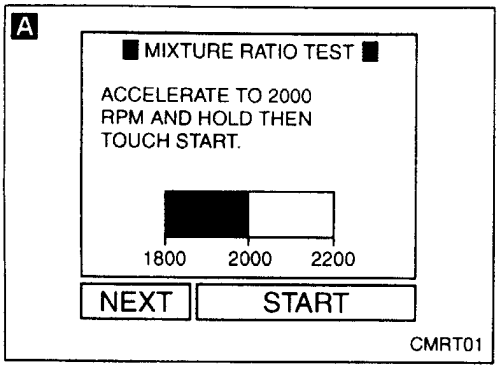
EC-HO2S-01

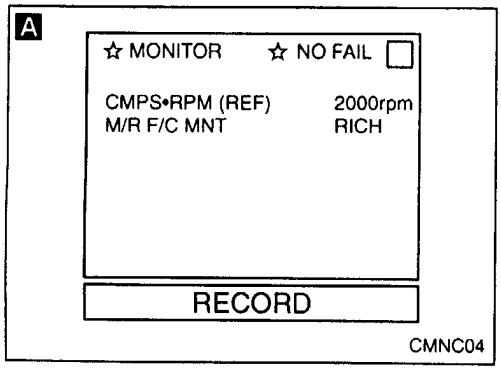


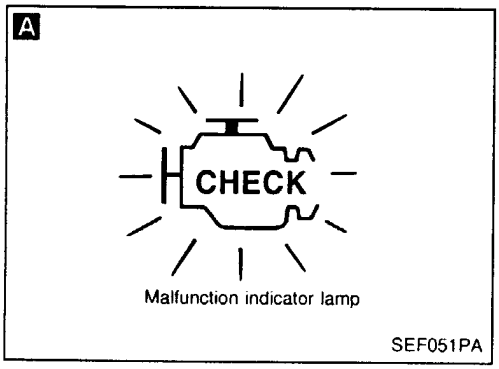
SEF820S

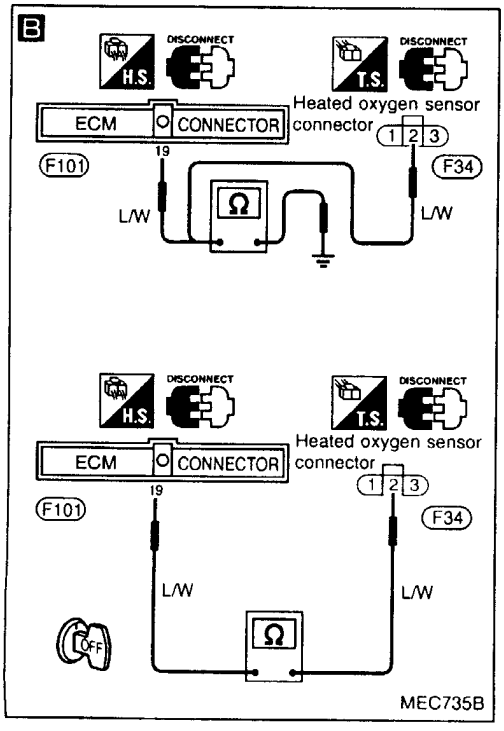
Heated Oxygen Sensor (HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK HEATED OXYGEN SENSOR CIRCUIT.

1. Start engine and warm it up sufficiently.
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 goes on and off more than 5 times during 10 seconds.

OK → INSPECTION END

NG

B

CHECK INPUT SIGNAL CIRCUIT.

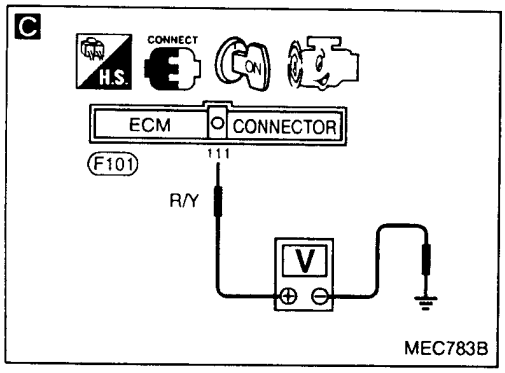
1. Turn ignition switch to "LOCK" position.
2. Disconnect heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM connector terminal ⑲ and heated oxygen sensor connector terminal ②.
   Continuity should exist.
4. Check harness continuity between ECM connector terminal ⑲ (or heated oxygen sensor connector terminal ②) and ground.
   Continuity should not exist.
   If OK, check harness for short-circuit.

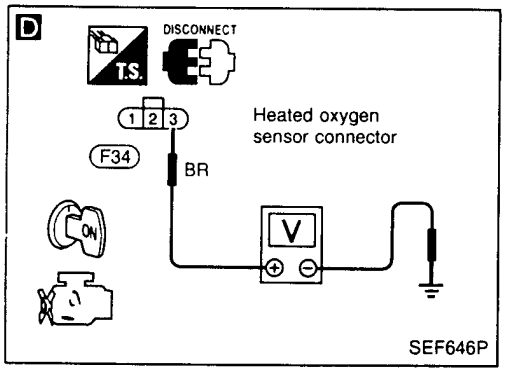
NG → Repair harness or connectors.

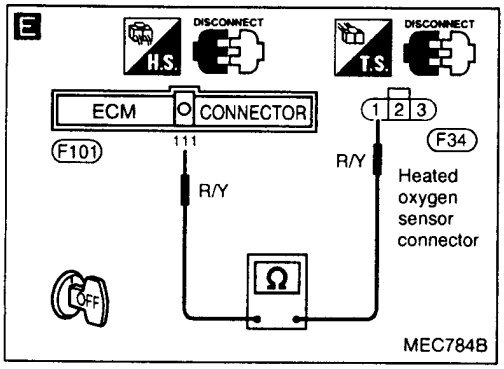
OK

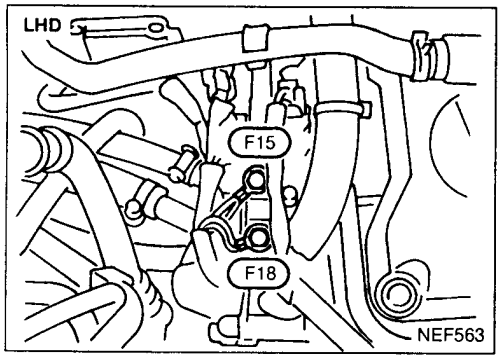
Ⓐ

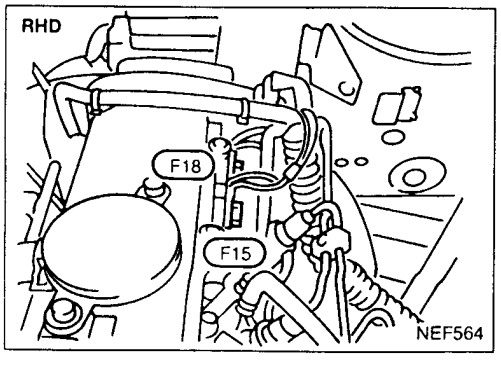
Heated Oxygen Sensor (HO2S) (Cont'd)











Ⓐ

C

CHECK HEATED OXYGEN SENSOR HEATER CIRCUIT.

1. Reconnect harness connectors.
2. Start engine.
3. Check voltage between ECM connector terminal (111) and ground with CONSULT or voltage tester under the following conditions.

Voltage:

Engine speed is below 3,200 rpm
Approximately 0V
Engine speed is above 3,200 rpm
Battery voltage

OK → Go to "CHECK COMPONENT".

NG

D

CHECK POWER SUPPLY.

1. Stop engine.
2. Disconnect heated oxygen sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between heated oxygen sensor connector terminal ③ and ground.

Voltage: Battery voltage

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness connector (M1)
- 10A fuse
- Harness for open or short-circuit between heated oxygen sensor and fuse.

If NG, replace fuse or repair harness or connectors.

OK

E

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between heated oxygen sensor connector terminal ① and ECM connector terminal (111).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

Loosen and retighten engine ground screws.

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

NG → Replace heated oxygen sensor.

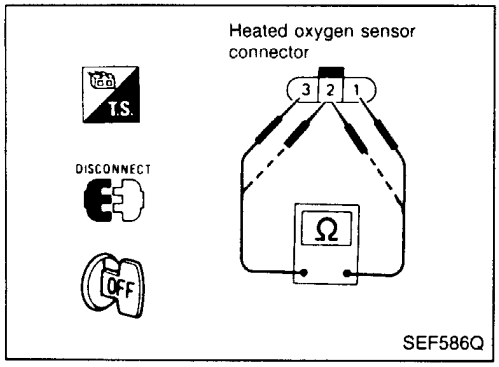
OK

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 (HO2S) (Cont'd)

COMPONENT INSPECTION

Heated oxygen sensor heater

Check resistance between terminals ① and ③.

Resistance: 3.3 - 6.3Ω [at 25°C (77°F)]

If NG, replace the heated oxygen sensor.

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

Continuity should not exist.

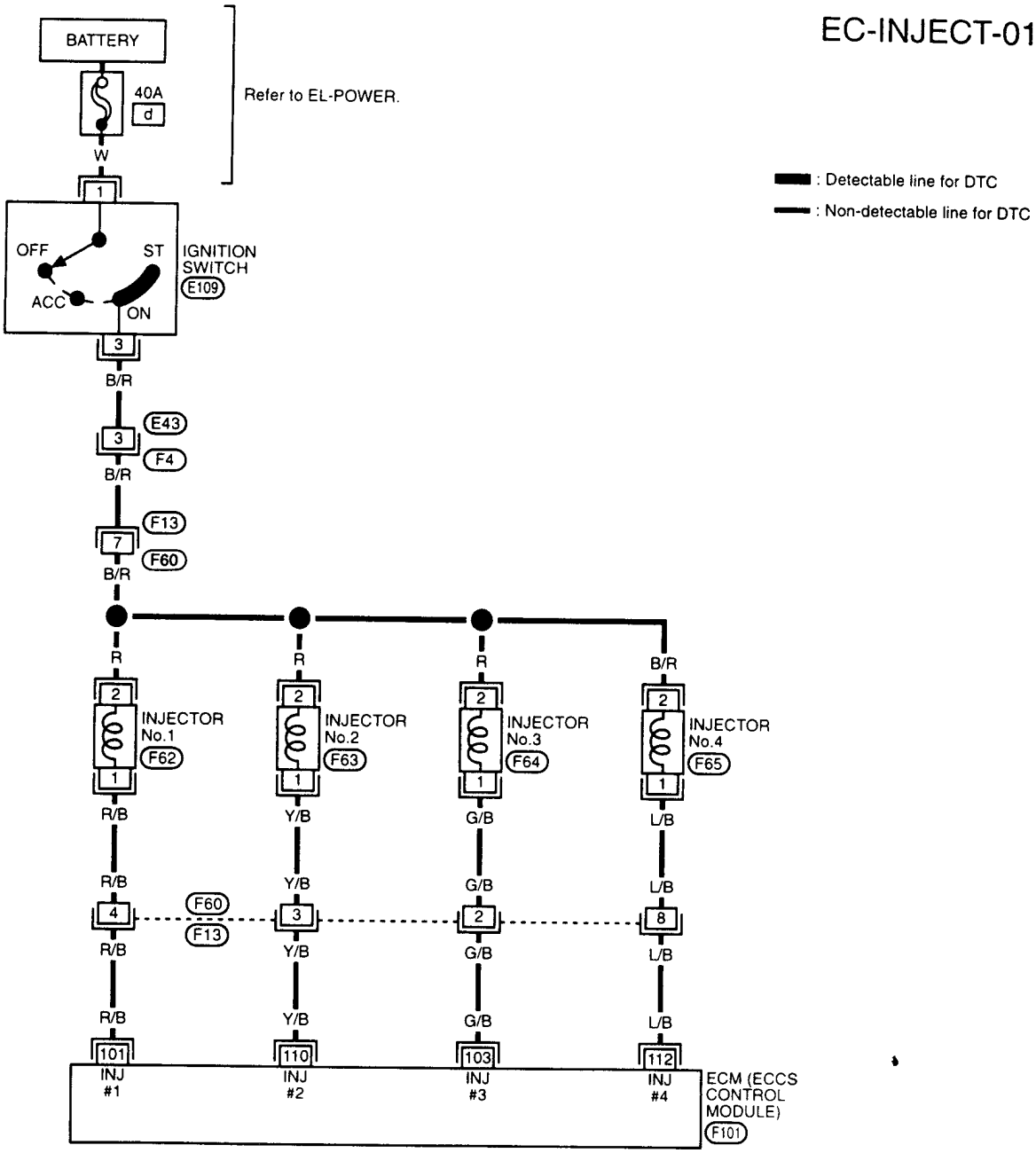
If NG, replace the heated oxygen sensor.

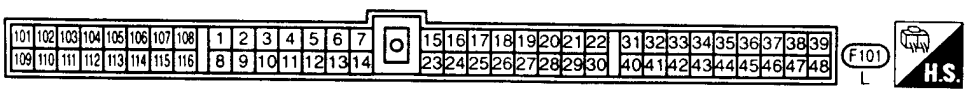
CAUTION:

- **Discard any 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.**

Injector

EC-INJECT-01



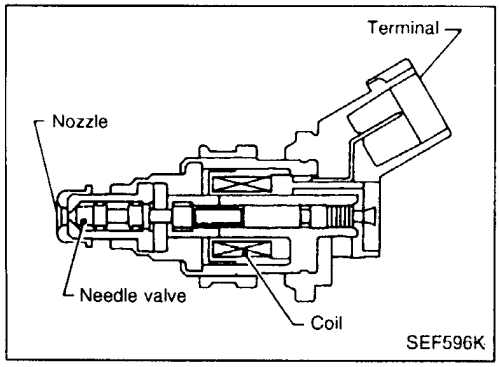


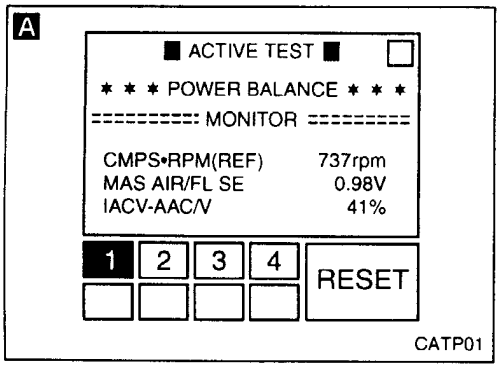
SEF821S

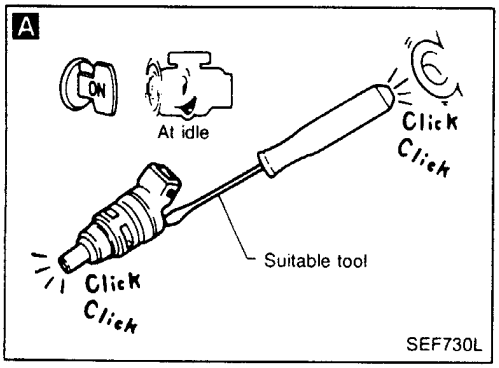
Injector (Cont'd)

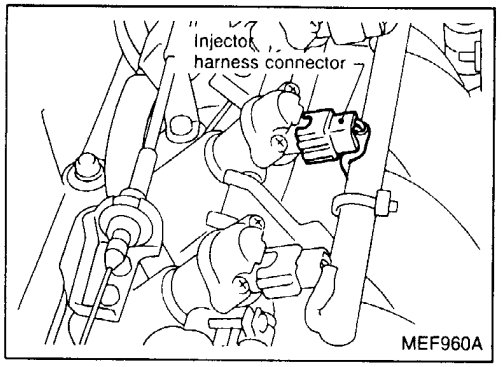
COMPONENT DESCRIPTION

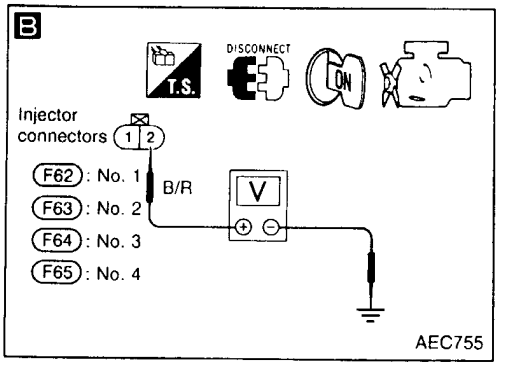
The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends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











DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

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

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.

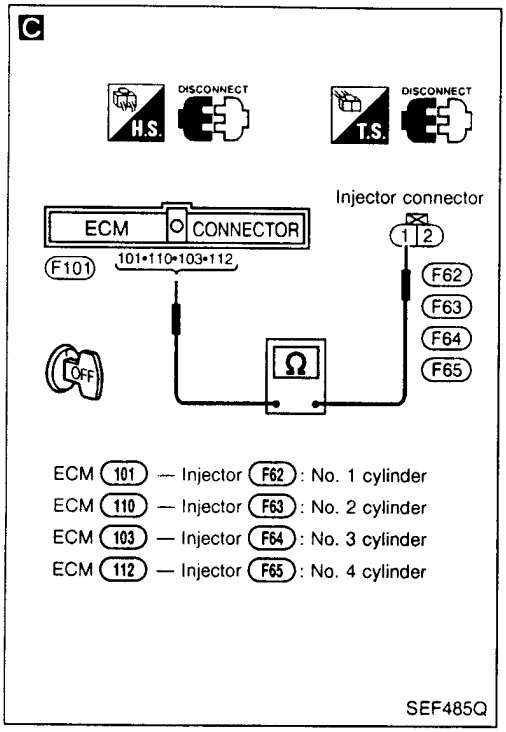
1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between injector harness connector terminal ② and ground with CONSULT or voltage tester.
   Voltage: Battery voltage

NG → Check the following:
- 40A fusible link.
- Operation of ignition switch.
- Harness connectors (E43), (F4)
- Harness connectors (F13), (F60)
- Harness for open or short-circuit between injector and ignition switch.

If NG, replace fusible link or repair ignition switch, harness or connectors.

OK → Ⓐ

Injector (Cont'd)



Ⓐ

C

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminals ① and ECM connector terminals (101), (110), (103), (112).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (F13), (F60)
- Harness for open or short-circuit between ECM and injector.

If NG, repair harness or connectors.

OK ↓

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

NG → Replace injector.

OK ↓

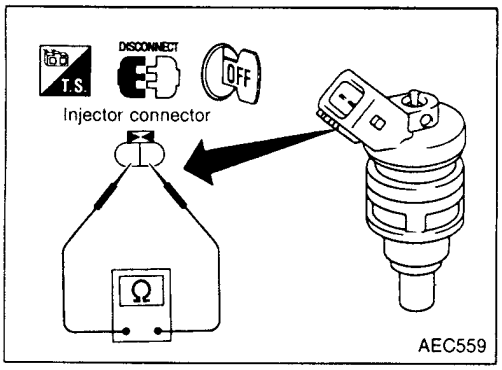
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END



COMPONENT INSPECTION

Injector

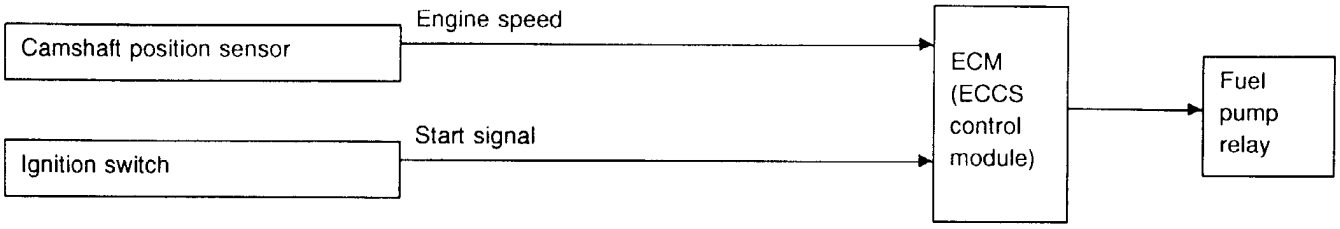
1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 10 - 14Ω [at 25° (77°F)]

If NG, replace injector.

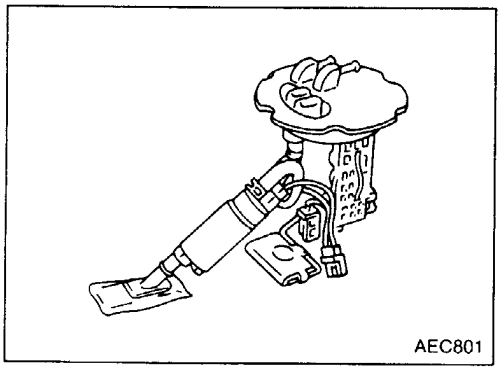
Fuel Pump

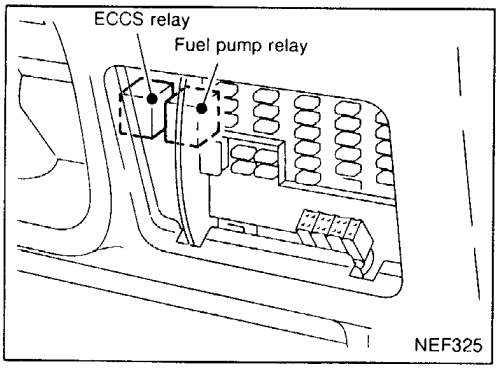
SYSTEM DESCRIPTION

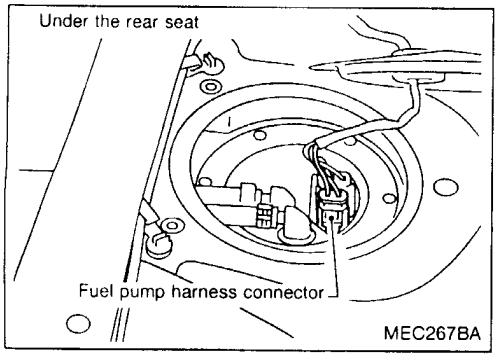


The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 180° signal is not received when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

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





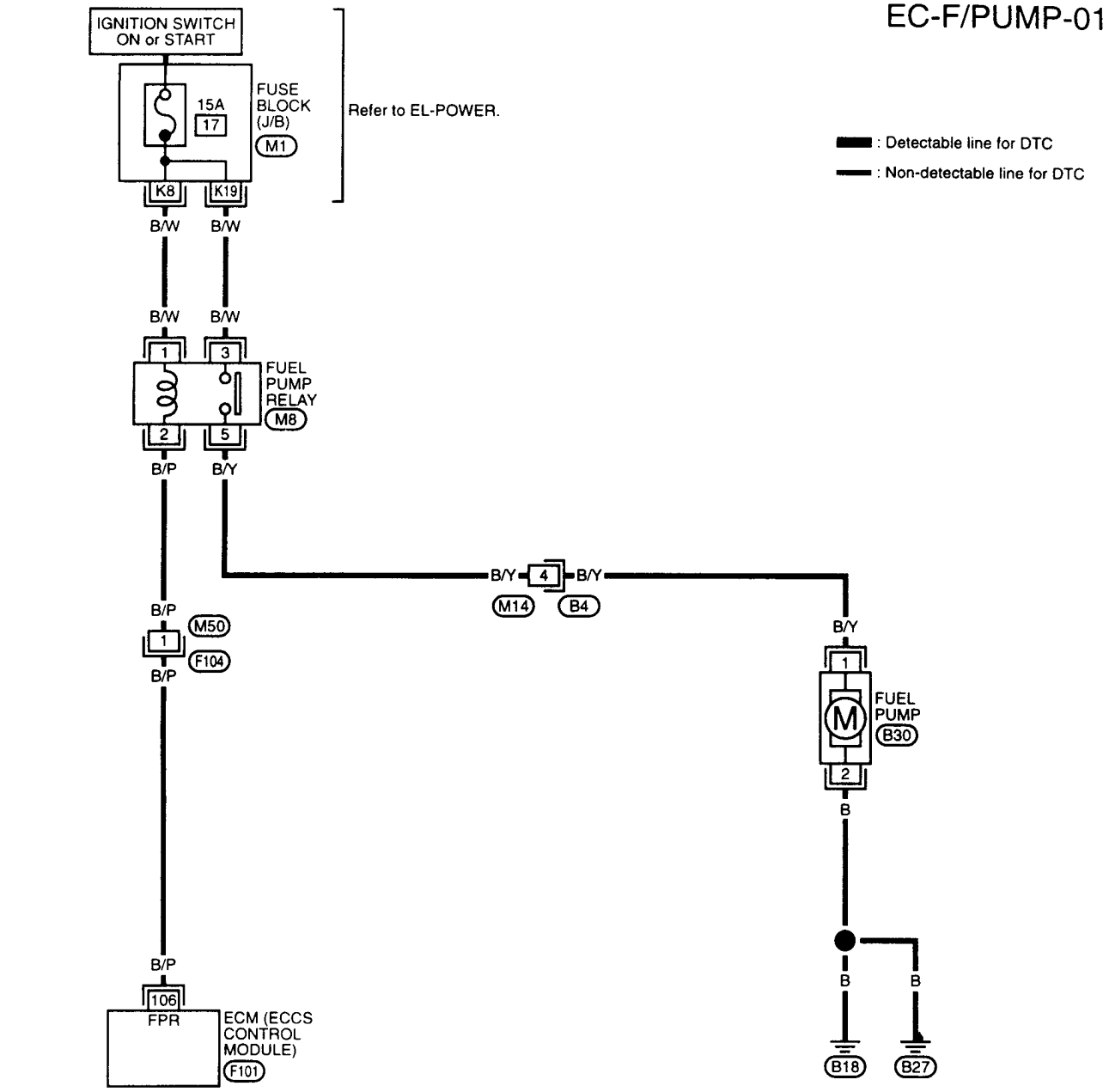


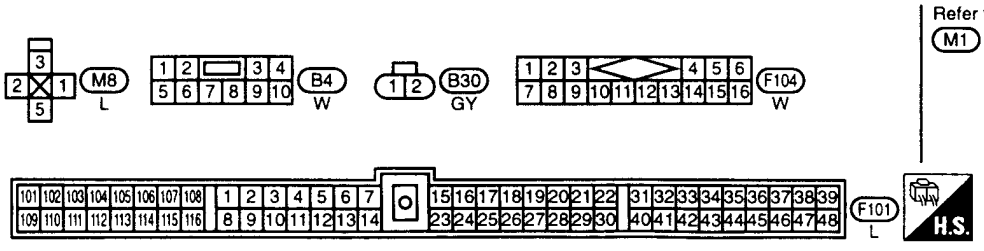
COMPONENT DESCRIPTION

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

Fuel Pump (Cont'd)

EC-F/PUMP-01

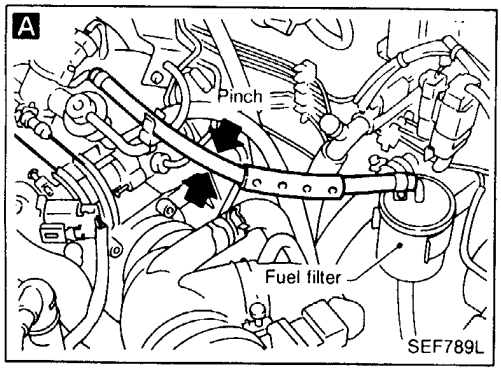


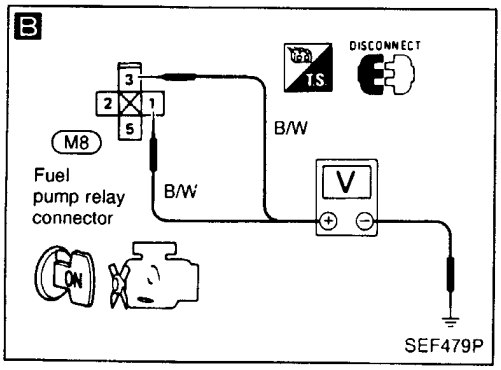


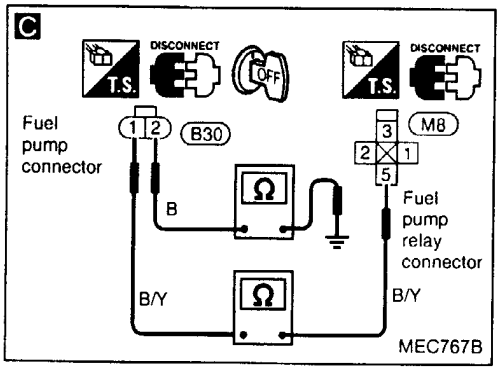
SEF822S

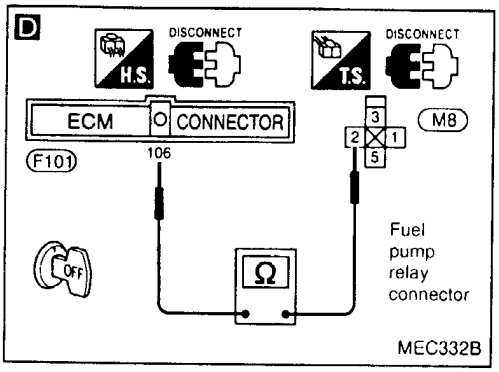
Fuel Pump (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Turn ignition switch to "ON" position.
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 to "ON" position.

OK → INSPECTION END

NG ↓

B

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect fuel pump relay.
3. Turn ignition switch to "ON" position.
4. Check voltage between fuel pump relay connector terminals ①, ③ and ground with CONSULT or voltage tester.
   Voltage: Battery voltage

NG → Check the following:
- Harness connector (M1)
- 15A fuse
- Harness for open or short-circuit between fuse and fuel pump relay.

If NG, replace fuse or repair harness or connectors.

OK ↓

C

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

NG → Check the following:
- Harness connectors (M14), (B4)
- Harness for open or short-circuit between fuel pump and body ground
- Harness for open or short-circuit between fuel pump and fuel pump relay.

If NG, repair harness or connectors.

OK ↓

D

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

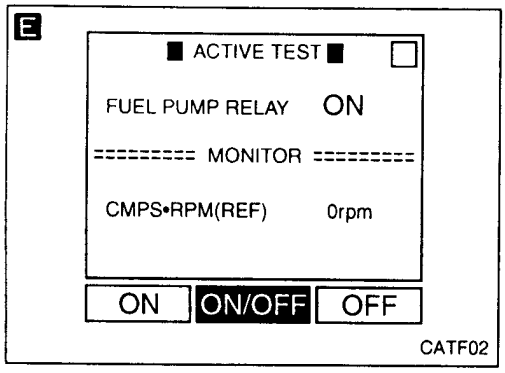
NG → Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and fuel pump relay.

If NG, repair harness or connectors.

OK ↓

Ⓐ

Fuel Pump (Cont'd)



Ⓐ

E

CHECK COMPONENT
(Fuel pump relay).

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

OR

Refer to "COMPONENT INSPECTION" on next page.

NG → Replace fuel pump relay.

OK ↓

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

NG → Replace fuel pump.

OK ↓

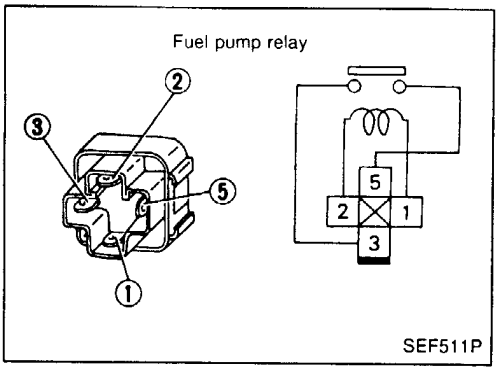
Disconnect and reconnect harness connectors in the circuit. Then retest.

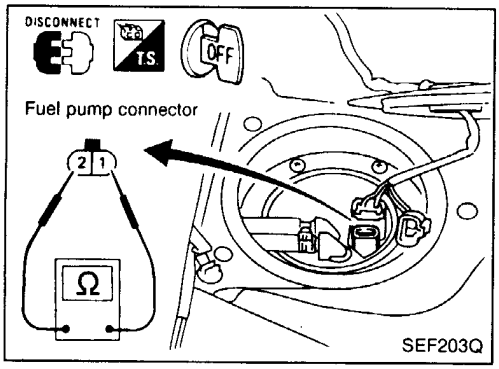
Trouble is not fixed. ↓

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

↓

INSPECTION END





Fuel Pump (Cont'd)

COMPONENT INSPECTION

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

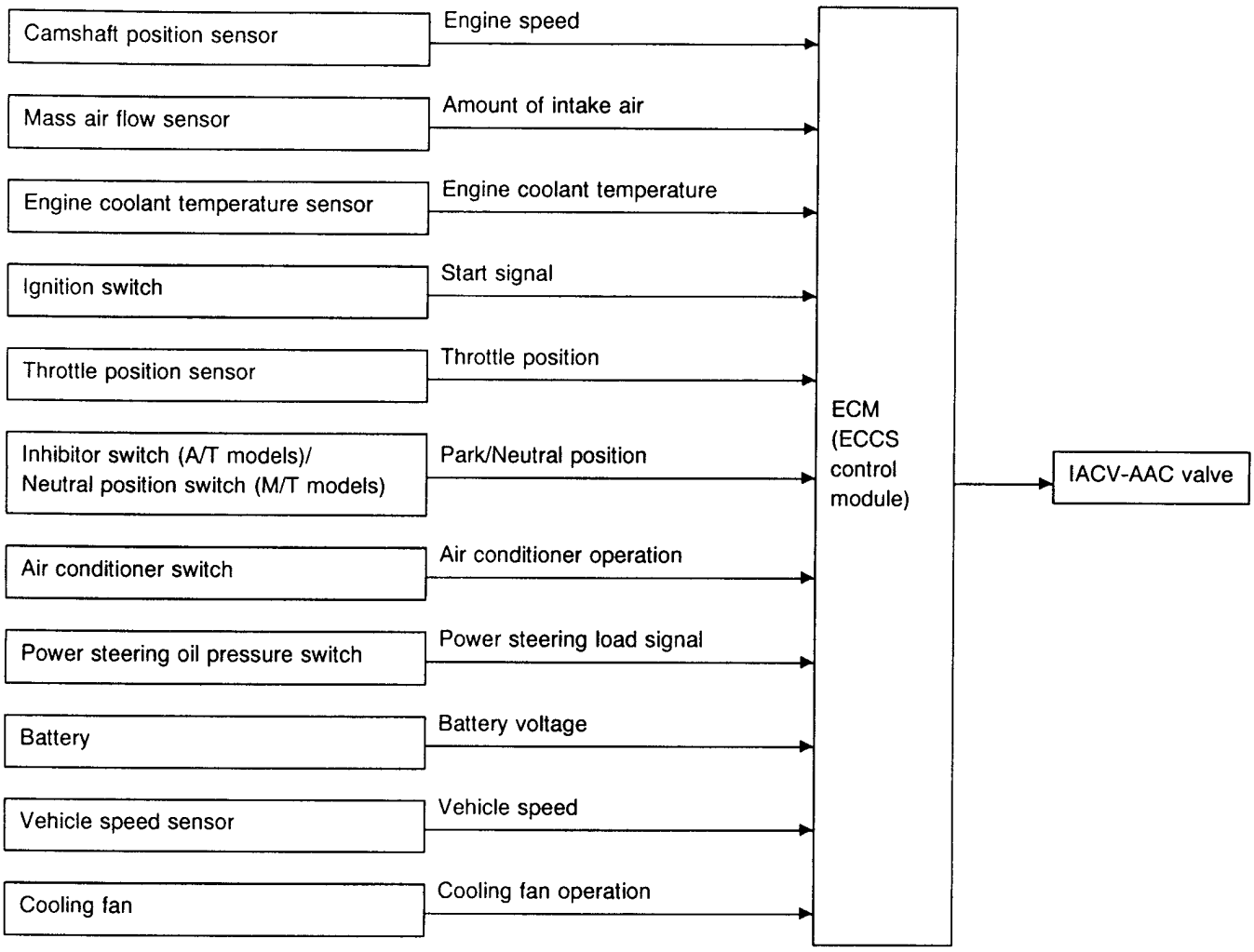
1. Disconnect fuel pump harness connector.
2. Check resistance between fuel pump connector terminals ① and ②.

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

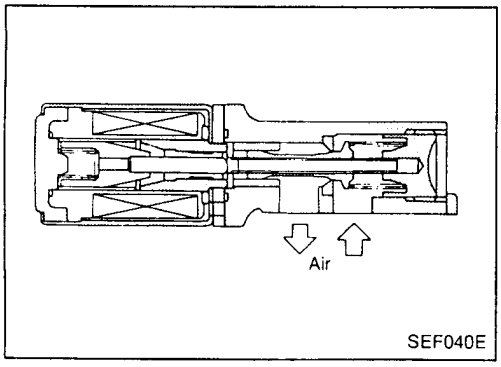
If NG, replace fuel pump.

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

SYSTEM DESCRIPTION



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



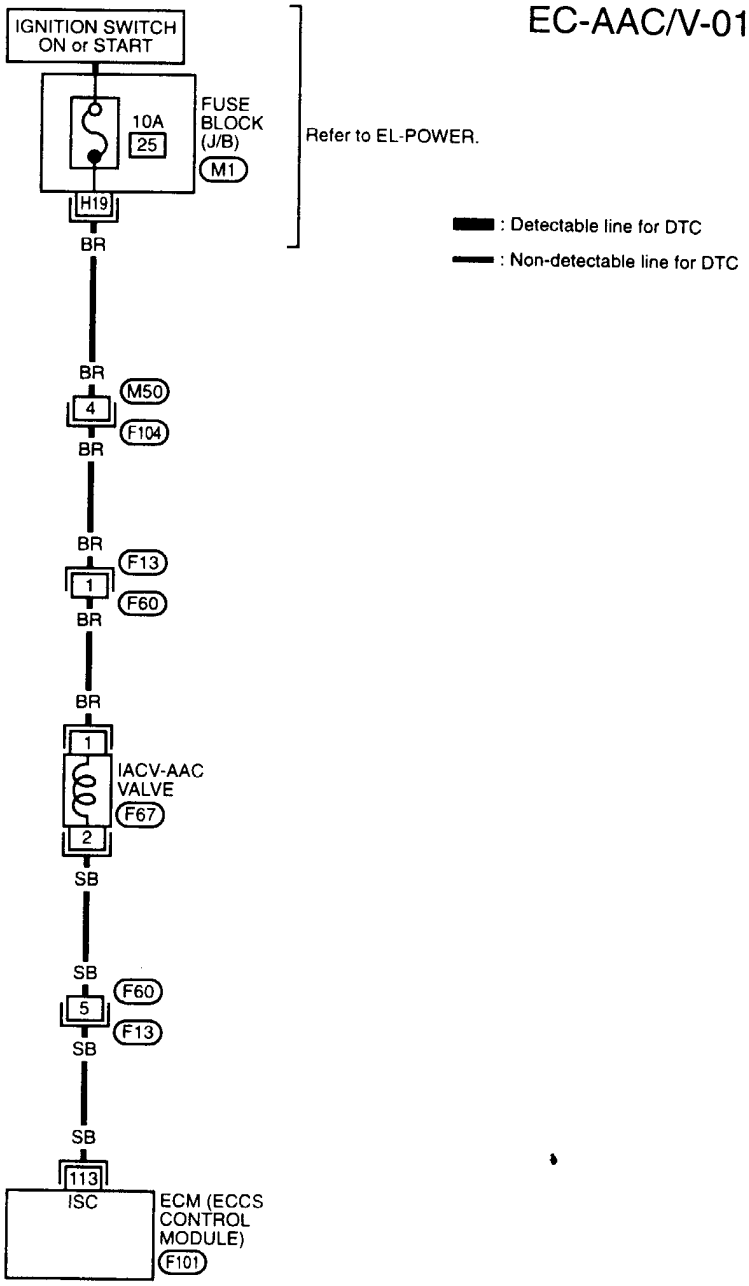
COMPONENT DESCRIPTION

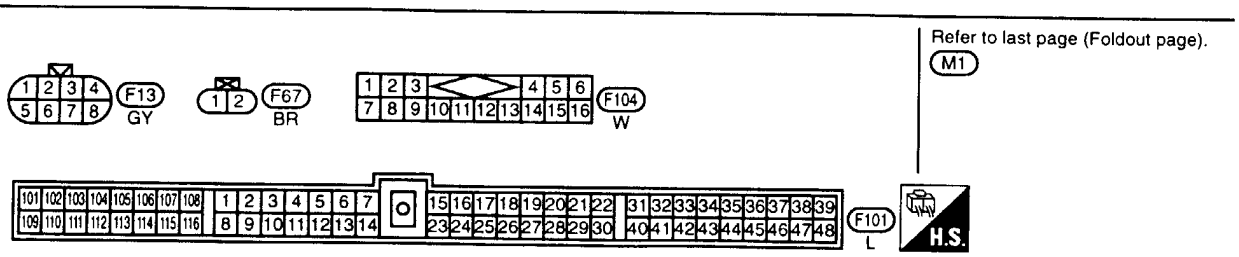
IACV-AAC valve

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

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

EC-AAC/V-01



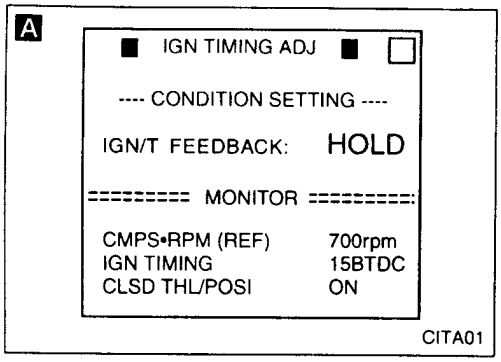


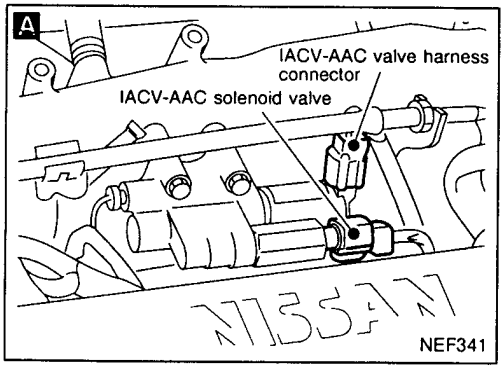
Refer to last page (Foldout page).
M1

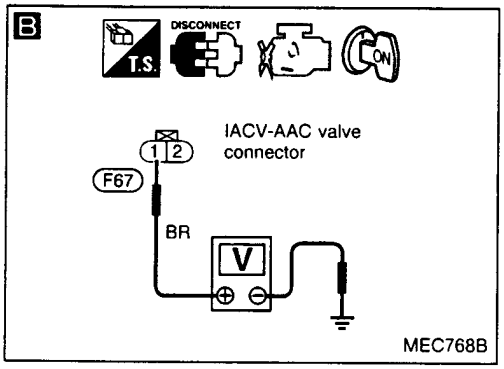
SEF823S

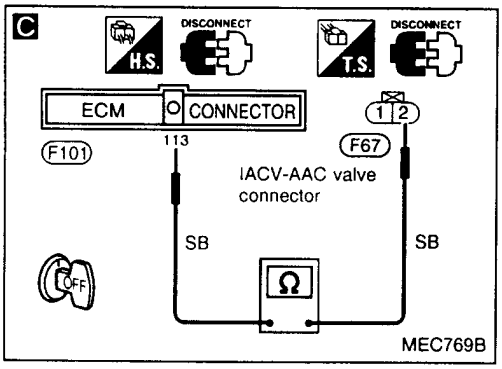
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up sufficiently.
2. Check idle speed.
   Models without daytime light system
   M/T=750±50 rpm
   A/T=750±50 rpm (in "N" position)
   Models with daytime light system
   M/T=825±50 rpm (in "N" position)
   A/T=750±50 rpm (in "N" position)
   If NG, adjust idle speed. (Refer to page EC-243.)
3. ● Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode with CONSULT.
   ● Disconnect throttle position sensor harness connector.
4. Make sure that idle speed drops.

Drops → INSPECTION END

Does not drop ↓

B

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

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness connectors (F13), (F60)
- Harness connector (M1)
- 10A fuse
- Harness for open or short-circuit between IACV-AAC valve and fuse.

If NG, replace fuse or repair harness or connectors.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal (113) and IACV-AAC valve connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (F13), (F60)
- Harness for open or short-circuit between ECM and IACV-AAC valve.

If NG, repair harness or connectors.

OK ↓

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

NG → Replace IACV-AAC valve.

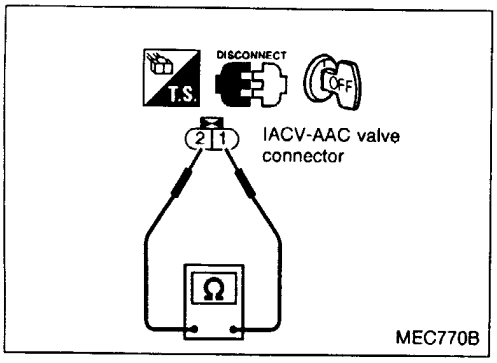
OK ↓

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

Trouble is not fixed. ↓

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

INSPECTION END



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

COMPONENT INSPECTION

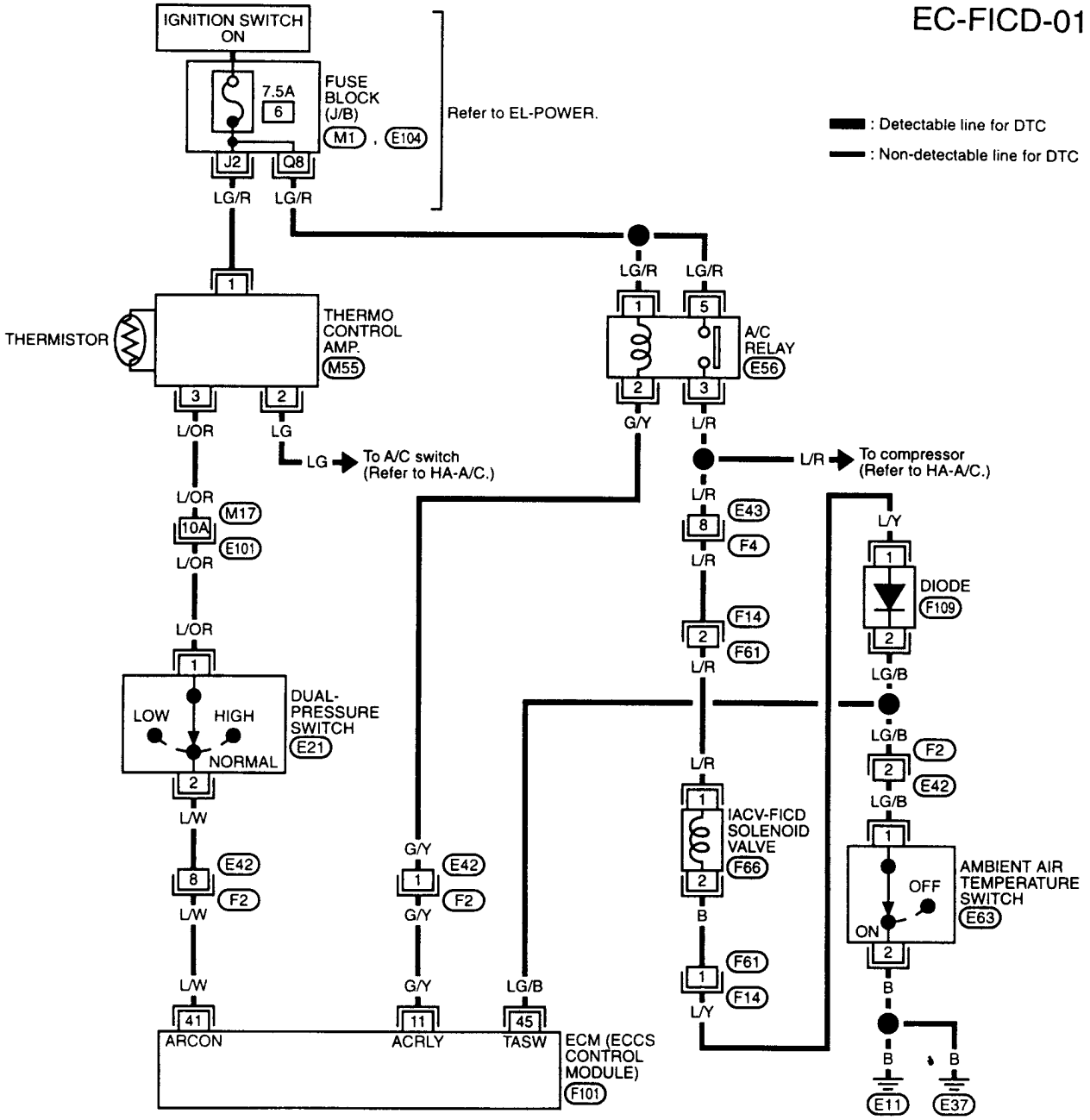
IACV-AAC valve

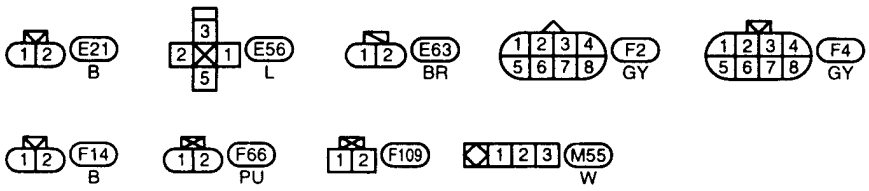
Disconnect IACV-AAC valve harness connector.

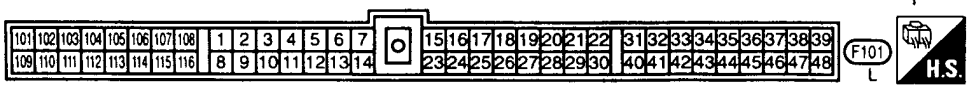
- Check IACV-AAC valve resistance.
  Resistance:
  Approximately 10Ω [at 25°C (77°F)]
- Check plunger for seizing or sticking.
- Check for broken spring.

Idle Air Control Valve (IACV)-FICD Solenoid Valve

EC-FICD-01



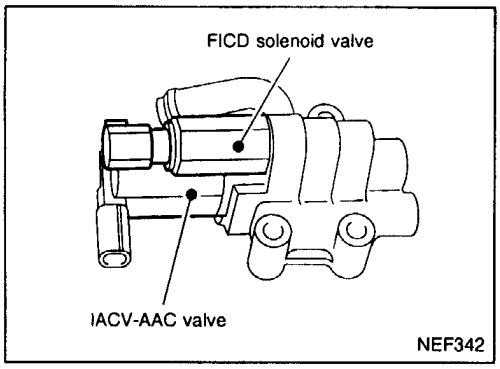




Refer to last page (Foldout page).
M1 , E104
M17 , E101

SEF824S

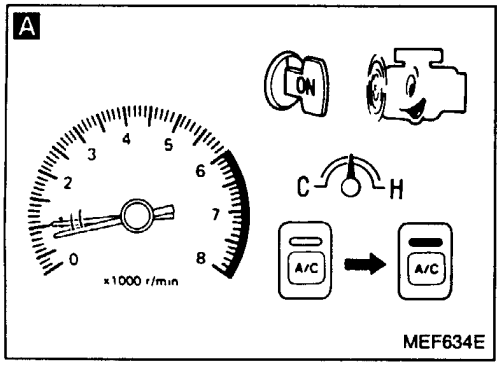
Idle Air Control Valve (IACV)-FICD Solenoid Valve (Cont'd)

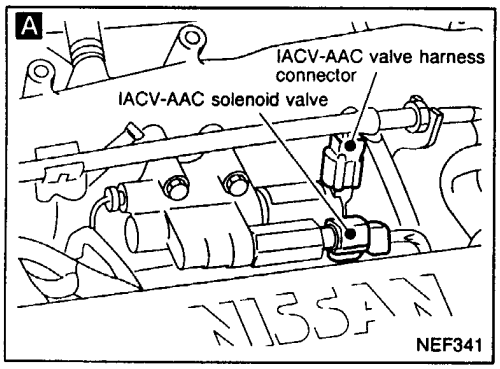


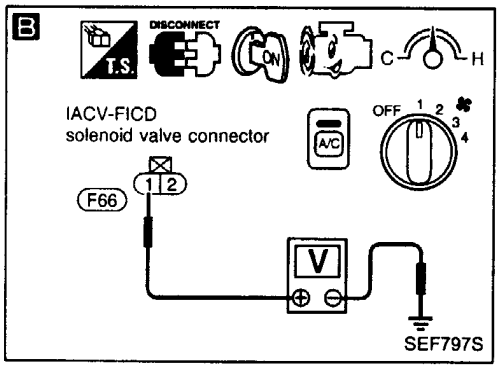
COMPONENT DESCRIPTION

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up sufficiently.
2. Check idle speed.
   Models without daytime light system
   M/T=750±50 rpm
   A/T=750±50 rpm (in "N" position)
   Models with daytime light system
   M/T=825±50 rpm (in "N" position)
   A/T=750±50 rpm (in "N" position)
   If NG, adjust idle speed.
3. Turn Air Conditioner switch and blower fan switch to "ON" position.
4. Recheck idle speed.
   M/T: 850 rpm or more
   A/T: 825 rpm or more

OK → INSPECTION END

NG

Check if Air Conditioner compressor functions normally.

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

OK

B

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

NG → Check the following:
- 7.5A fuse in fuse block.
- Operation of ignition switch.
- Operation of A/C relay.
- Harness connectors (F14), (F61)
- Harness connectors (E43), (F4)
- Harness for open or short-circuit between IACV-FICD solenoid valve and A/C relay.

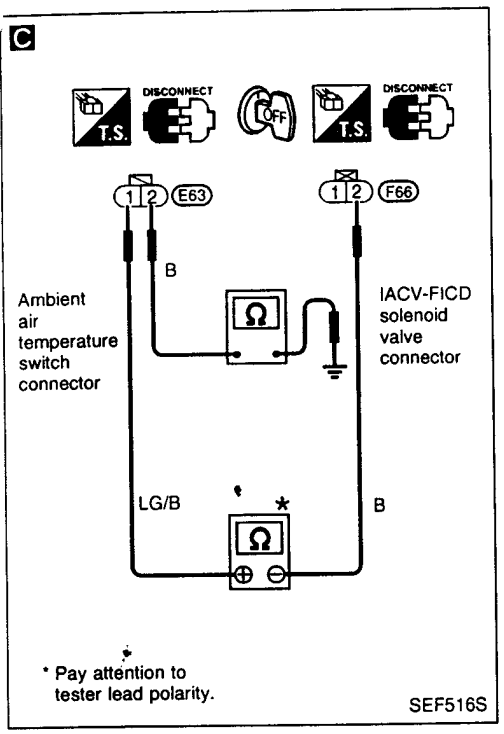
If NG, replace fuse or A/C relay or repair ignition switch, harness or connectors.

OK

Ⓐ

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

C



Ⓐ

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ambient air temperature switch harness connector.
3. Check harness continuity between IACV-FICD solenoid valve connector terminal ② and ambient air temperature switch connector terminal ①; ambient air temperature switch connector terminal ② and body ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (F61), (F14)
- Harness connectors (F22), (E42)
- Harness connectors (M8), (E101)
- Diode (F109)
- Harness for open or short-circuit between IACV-FICD solenoid valve and ambient air temperature switch.
- Harness for open or short-circuit between ambient air temperature switch and body ground.

If NG, replace diode or repair harness or connectors.

OK ↓

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

NG → Replace IACV-FICD solenoid valve.

OK ↓

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

NG → Replace ambient air temperature sensor.

OK ↓

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

Trouble is not fixed. ↓

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

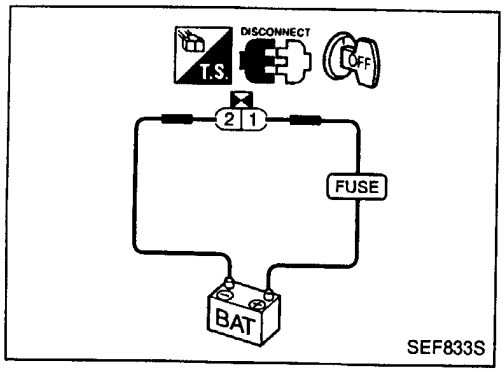
↓

INSPECTION END

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

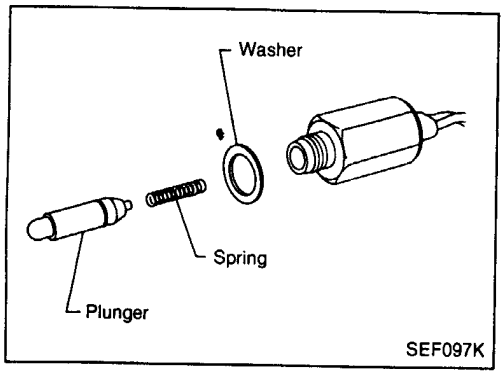
COMPONENT INSPECTION

IACV-FICD solenoid valve



Disconnect IACV-FICD solenoid valve harness connector.

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

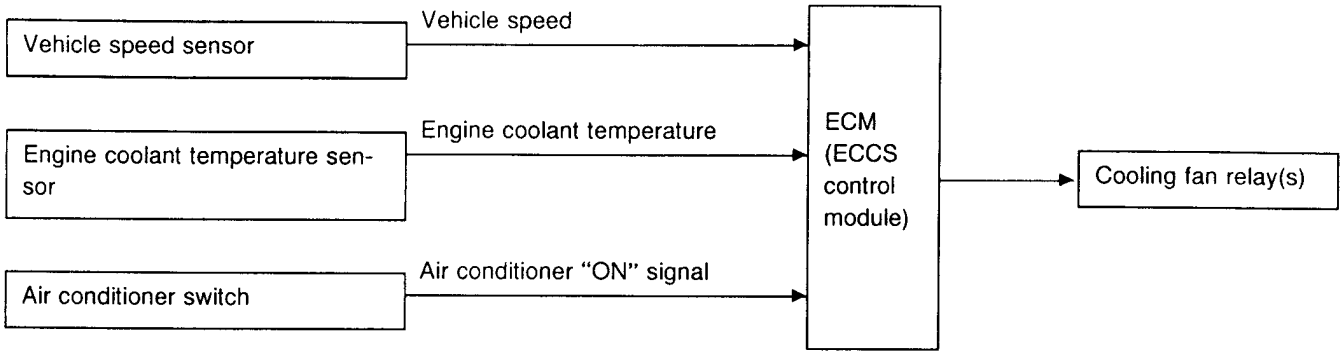


- Check plunger for seizing or sticking.
- Check for broken spring.

Cooling Fan Control

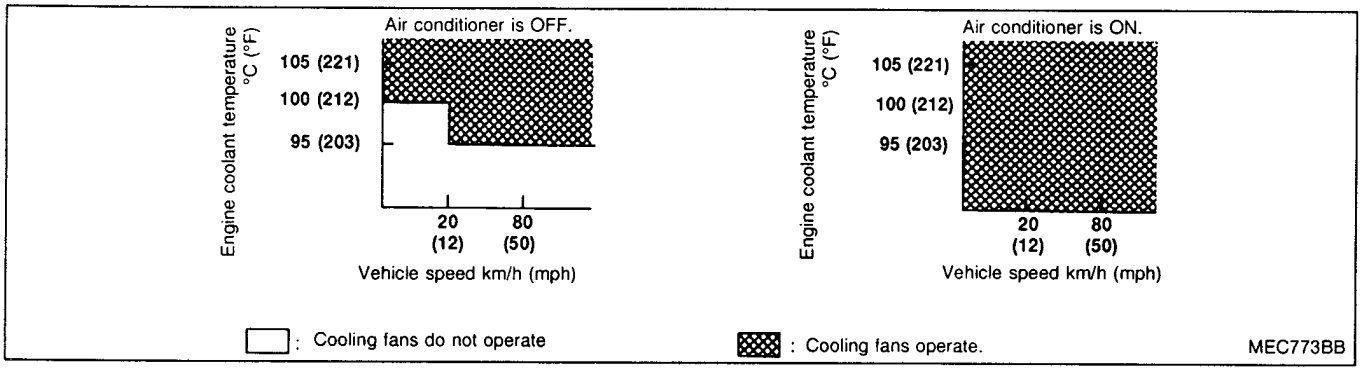
SYSTEM DESCRIPTION

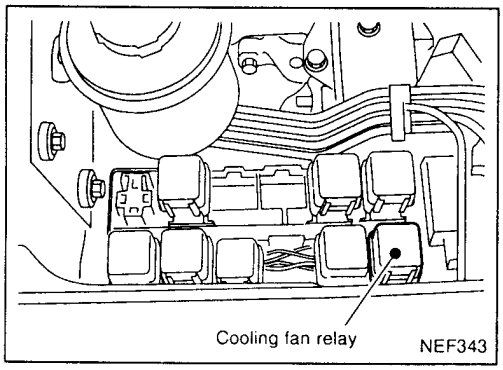
Cooling fan control



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

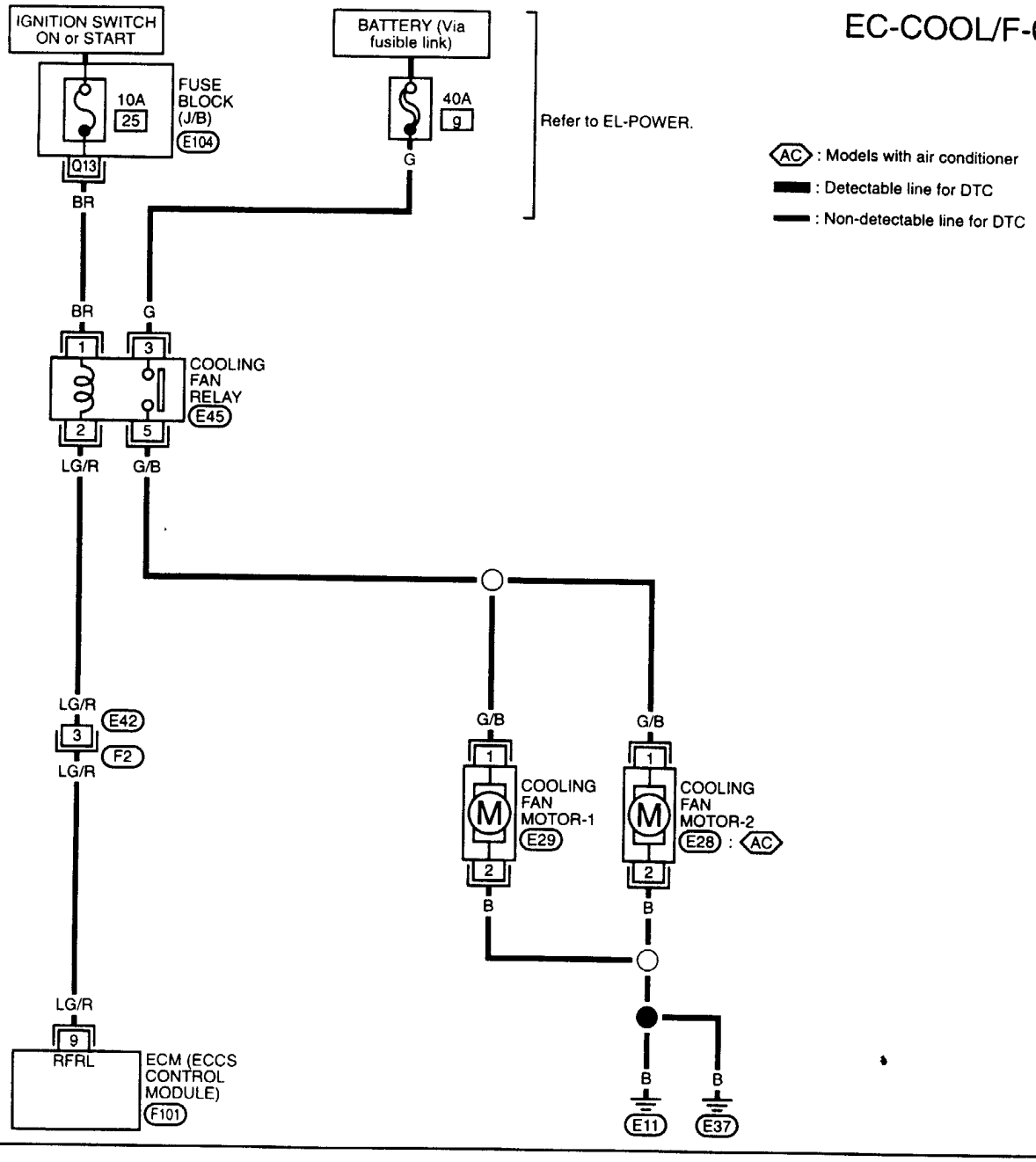
Operation

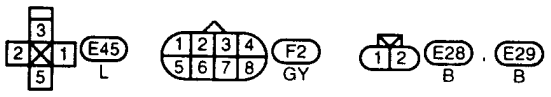




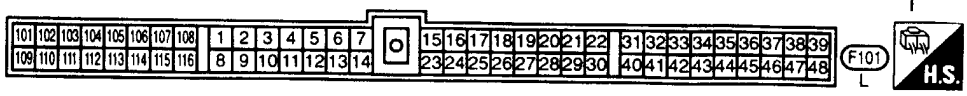
Cooling Fan Control (Cont'd)

EC-COOL/F-01





Refer to last page (Foldout page).
E104

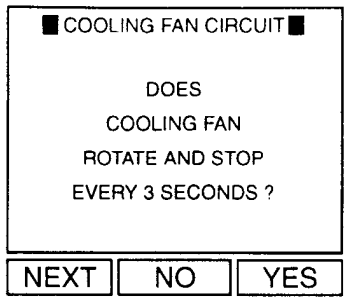


SEF825S

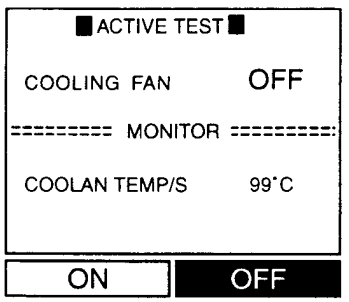
Cooling Fan Control (Cont'd)

DIAGNOSTIC PROCEDURE

A

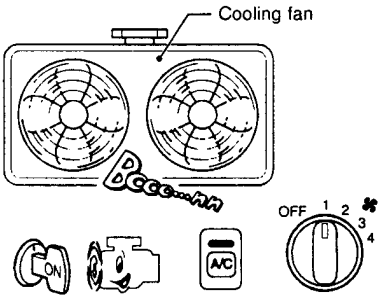


CCFC01

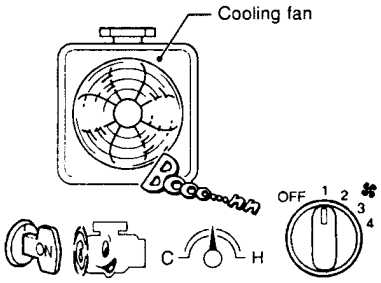


CATC02

A **With air conditioner**

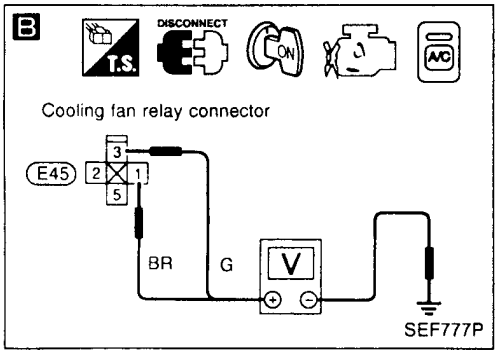


Without air conditioner



MEF277G

B



SEF777P

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

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

OR

With air conditioner

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

Without air conditioner

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

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.

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

NG → Check the following:

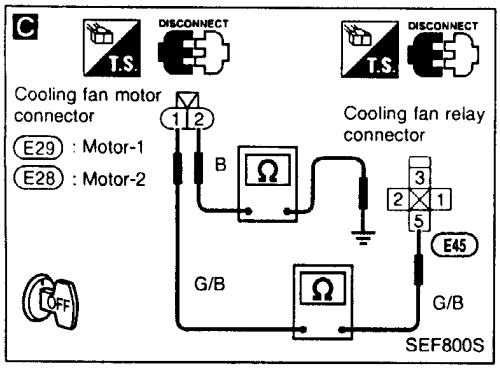
- Harness connector (E104)
- 40A fusible link
- 10A fuse
- Harness for open or short-circuit between fuse and cooling fan relay.
- Harness for open or short-circuit between battery and cooling fan relay.

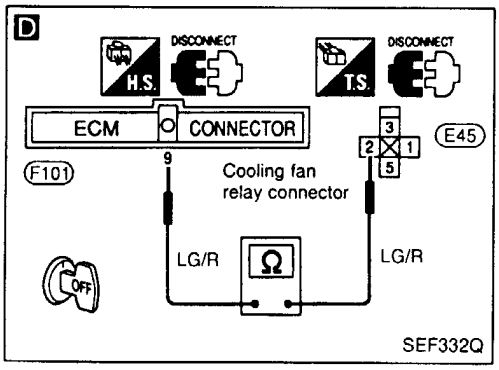
If NG, replace fuse or fusible link or repair harness or connectors.

OK

Ⓐ

Cooling Fan Control (Cont'd)





Ⓐ

C

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan motor-1 & -2 connector terminals ① and cooling fan relay connector terminal ⑤; cooling fan motor-1 & -2 connector terminals ② and body ground.
   Continuity should exist.

NG → Repair harness or connectors.

OK ↓

D

CHECK OUTPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ⑨ and cooling fan relay connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (E42), (F2)
- Harness for open or short-circuit between ECM and cooling fan relay.

If NG, repair harness or connectors.

OK ↓

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

NG → Replace cooling fan relay.

OK ↓

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

NG → Replace cooling fan motors.

OK ↓

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

Trouble is not fixed. ↓

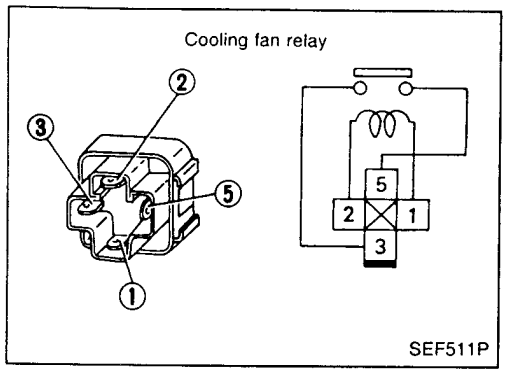
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Cooling Fan Control (Cont'd)

COMPONENT INSPECTION

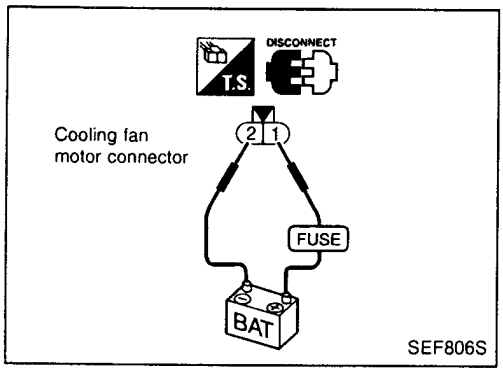


Cooling fan relay

Check continuity between cooling fan relay terminals ③ and ⑤.

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

If NG, replace relay.



Cooling fan motors-1 and -2

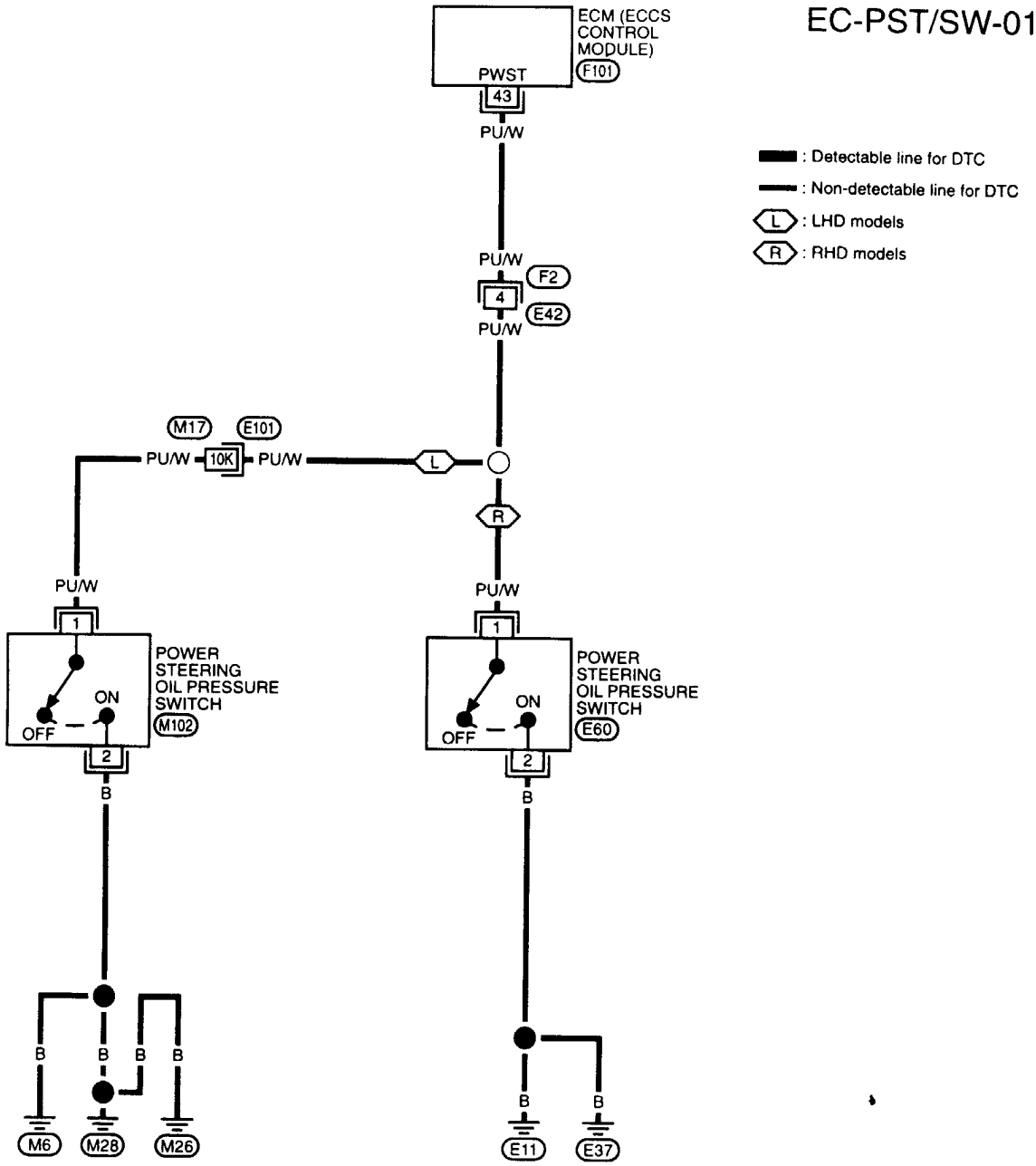
1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(⊕)	(⊖)
Cooling fan motor	①	②

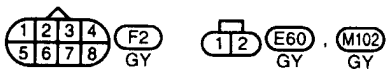
Cooling fan motor should operate.
If NG, replace cooling fan motor.

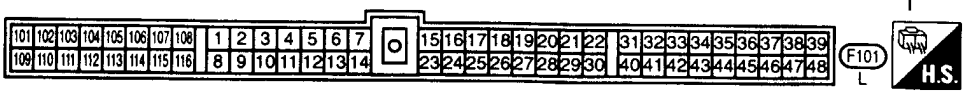
Power Steering Oil Pressure Switch

EC-PST/SW-01



Refer to last page (Foldout page).
M17 , E101



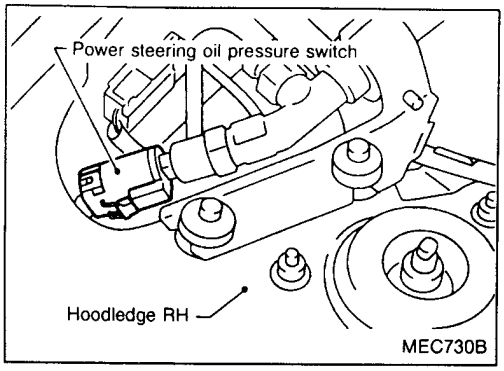


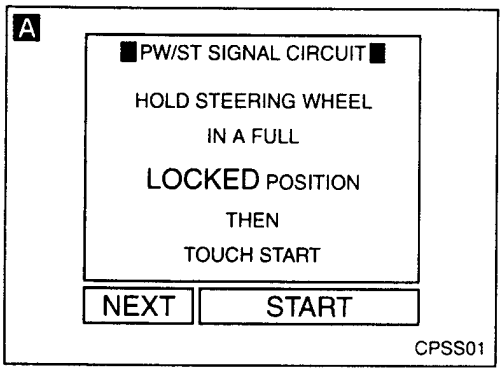
SEF826S

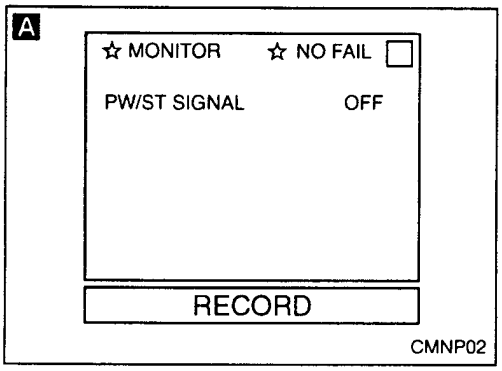
Power Steering Oil Pressure Switch (Cont'd)

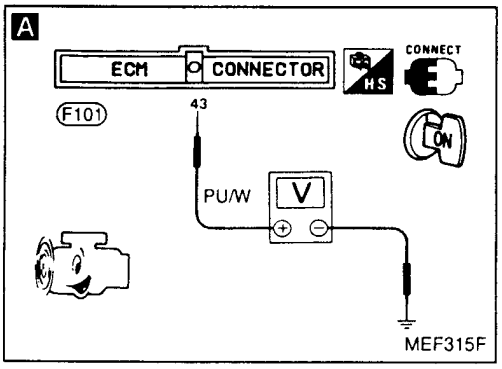
COMPONENT DESCRIPTION

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









DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

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

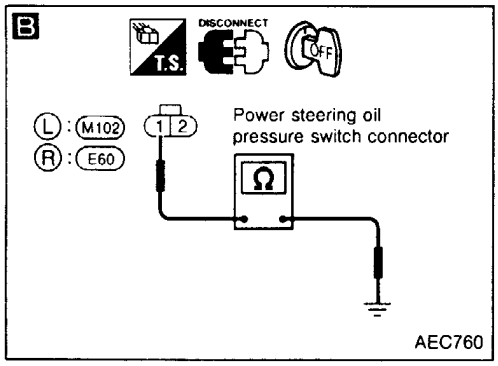
OR

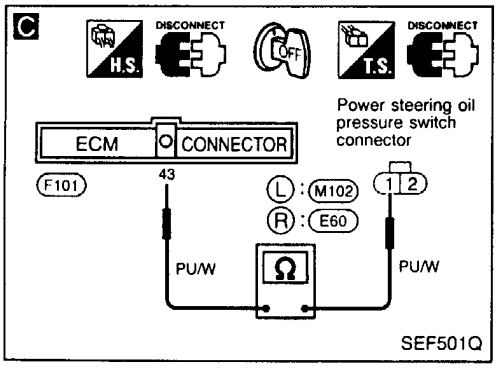
2. Check voltage between ECM connector terminal (43) and ground.
   Voltage:
   When steering wheel is turned quickly.
   Approximately 0V
   Except above
   Approximately 4 - 6V

OK → INSPECTION END

NG → (A)

Power Steering Oil Pressure Switch (Cont'd)





Ⓐ

B

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

NG → Repair harness or connectors.

OK ↓

C

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

NG → Check the following:
- Harness connectors (F2), (E42)
- Harness connectors (M17), (E101) (LHD models)
- Harness for open or short-circuit between ECM and power steering oil pressure switch.

If NG, repair harness or connectors.

OK ↓

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

NG → Replace power steering oil pressure switch.

OK ↓

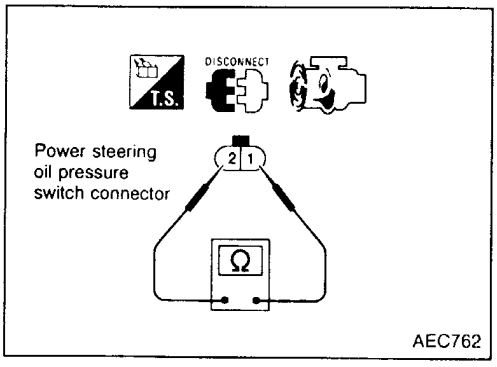
Disconnect and reconnect harness connectors in the circuit. Then retest.

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

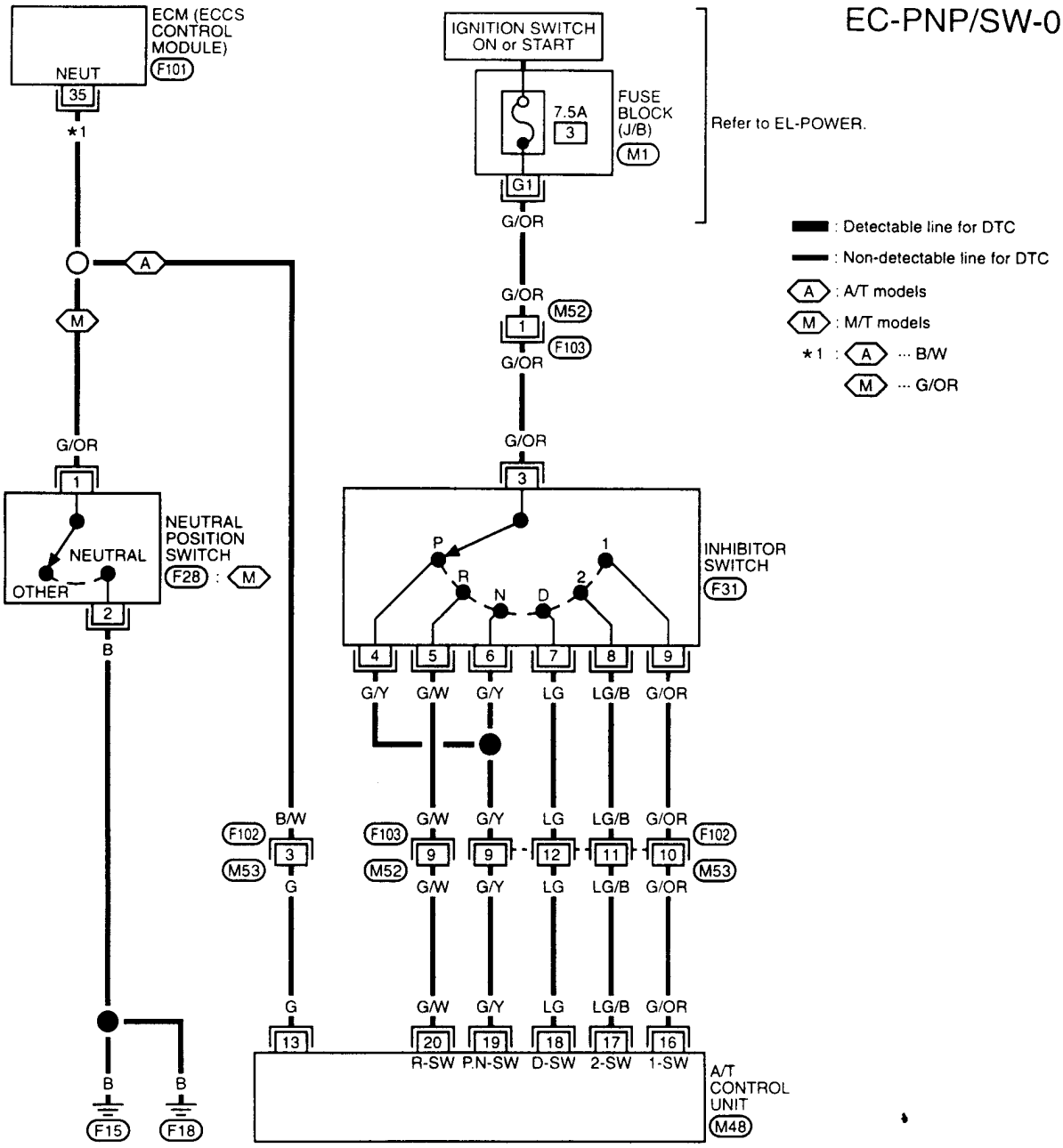
1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals ① and ②.

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

If NG, replace power steering oil pressure switch.

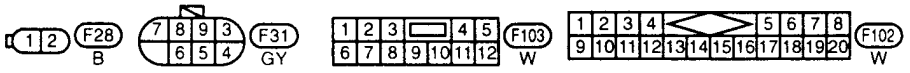
Park/Neutral Position Switch

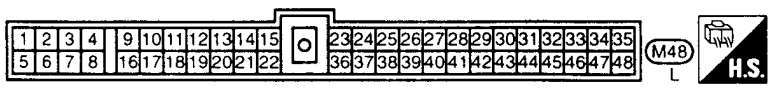
EC-PNP/SW-01

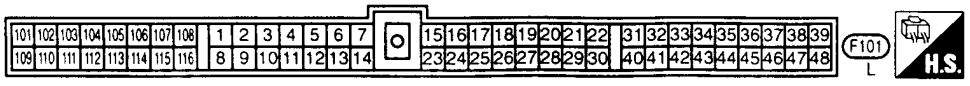


Refer to last page (Foldout page).

M1



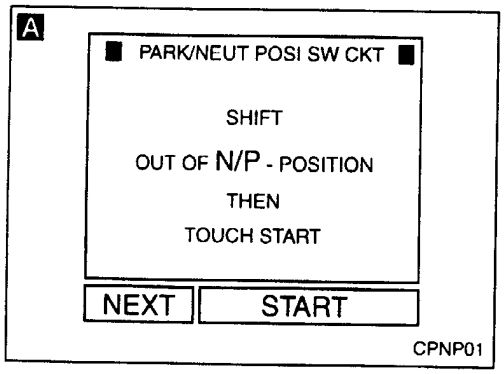


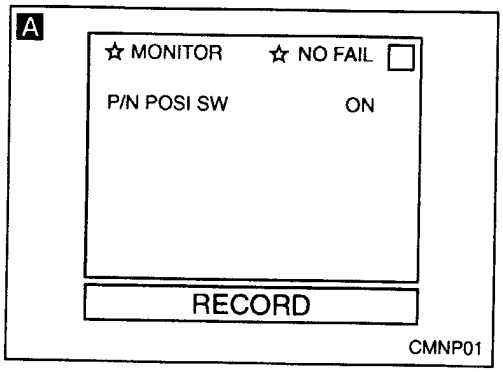


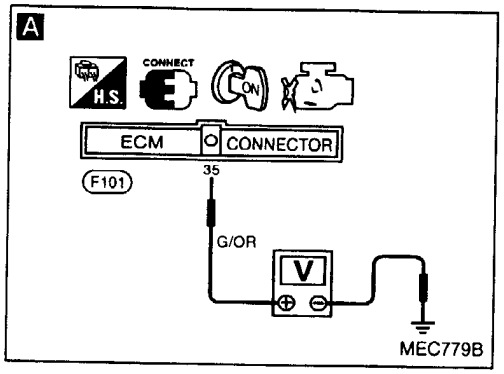
SEF827S

Park/Neutral Position Switch (Cont'd)

When the gear position is in "P" (A/T models only) or "N", park/neutral position is "ON". ECM detects the position because the continuity of the line (the "ON" signal) exists.







DIAGNOSTIC PROCEDURE

Neutral position switch (M/T models)

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OR

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

Neutral position: ON
Except neutral position: OFF

OR

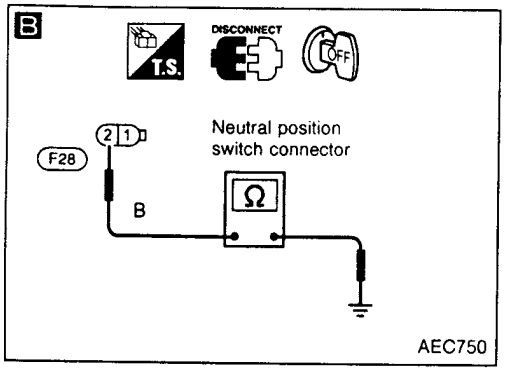
2. Check voltage between ECM connector terminal (35) and ground under the following conditions.

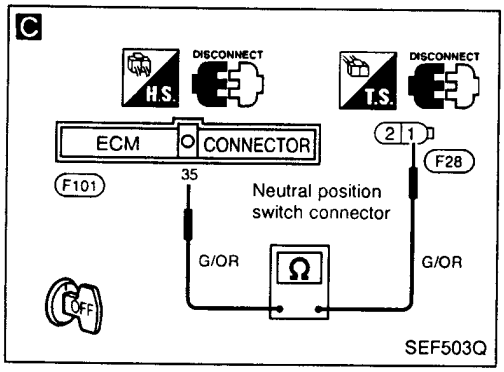
Voltage:
Neutral position
Approximately 0V
Except neutral position
Battery voltage

OK → INSPECTION END

NG → (A)

Park/Neutral Position Switch (Cont'd)





Ⓐ

B

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect neutral position switch harness connector.
3. Check harness continuity between neutral position switch connector terminal ② and body ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ㉟ and neutral position switch connector terminal ①.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace neutral position switch.

OK ↓

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

Trouble is not fixed. ↓

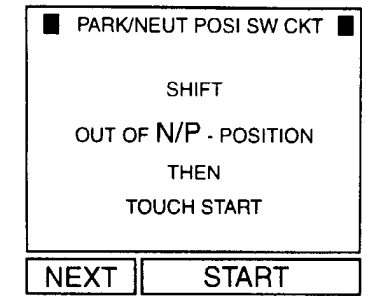
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

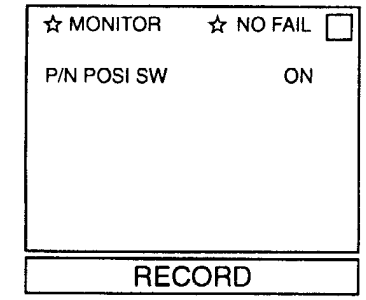
Park/Neutral Position Switch (Cont'd)

A



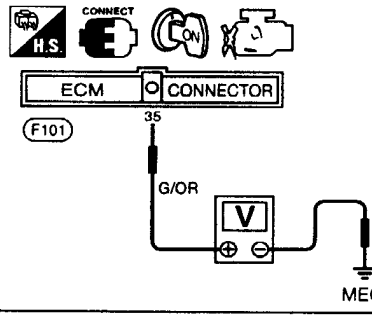
CPNP01

A



CMNP01

A



MEC779B

Inhibitor switch (A/T models)

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OK → INSPECTION END

OR

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

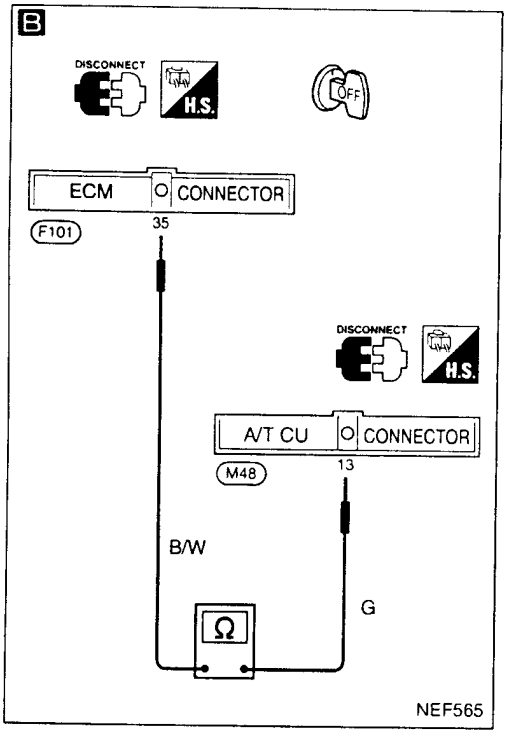
OR

1. Make sure that inhibitor switch circuit functions properly. (Refer to AT section.)
2. Turn ignition switch to "ON" position.
3. Check voltage between ECM connector terminal (35) and ground under the following conditions.
   Voltage:
   "N" or "P" position
   Approximately 0V
   Except above position
   Battery voltage

NG

Ⓐ

Park/Neutral Position Switch (Cont'd)



Ⓐ

B

CHECK INPUT SIGNAL CIRCUIT.
- Turn ignition switch to "LOCK" position.
- Disconnect A/T control unit connector.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ㉟ and A/T control unit terminal ⑬.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG →
- Check harness connectors (F102), (M53)
- Check harness continuity between ECM and A/T control unit.

If NG, repair harness or connectors.

OK ↓

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

NG → Replace inhibitor switch.

OK ↓

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

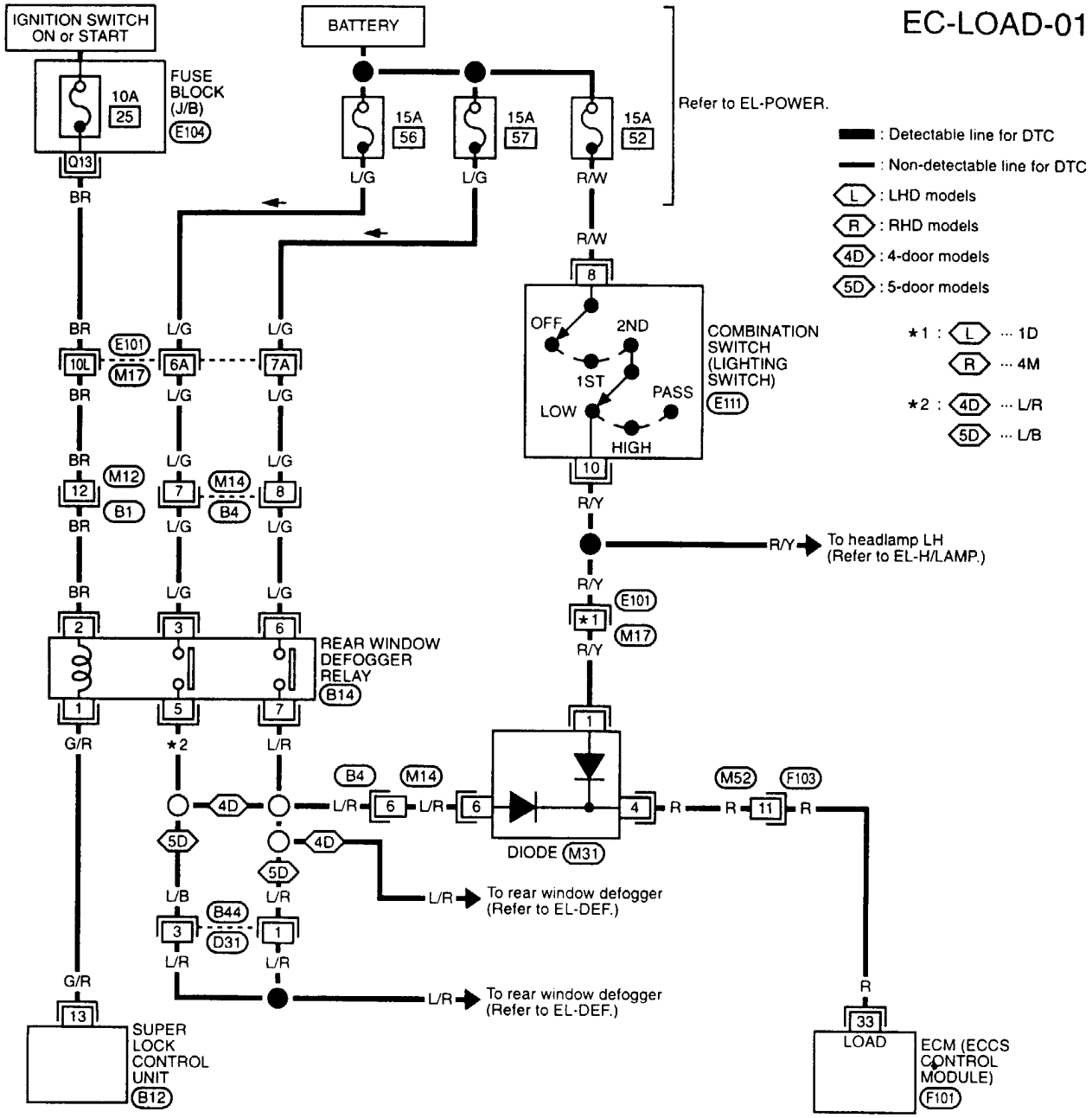
Trouble is not fixed. ↓

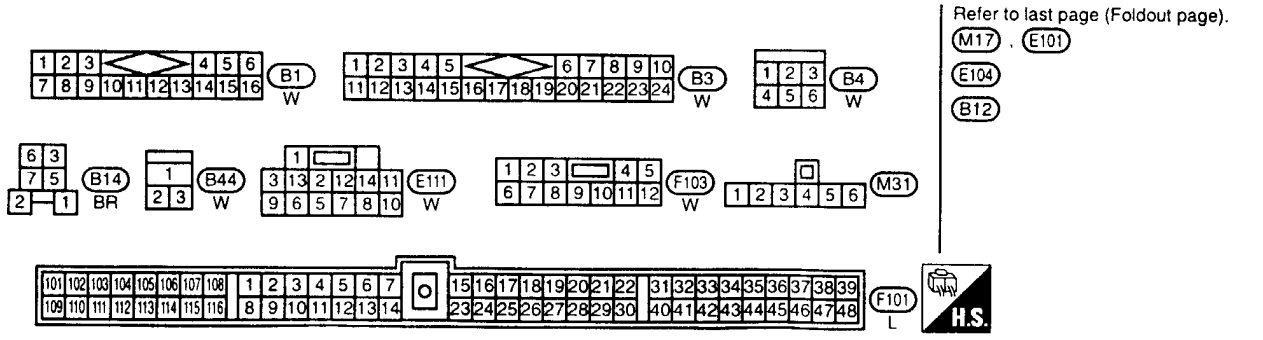
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Electrical Load Signal



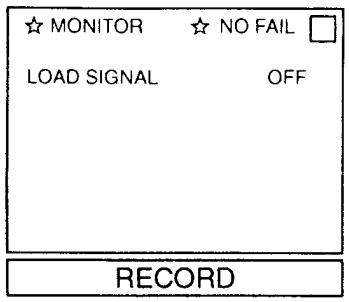


SEF828S

Electrical Load Signal (Cont'd)

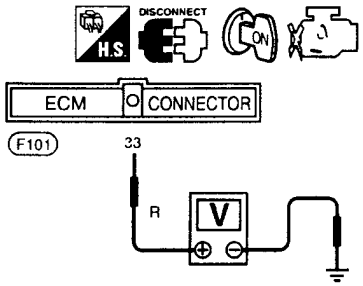
DIAGNOSTIC PROCEDURE

A



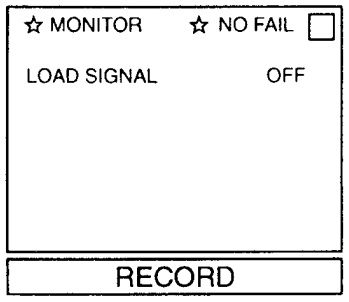
CMNL01

A



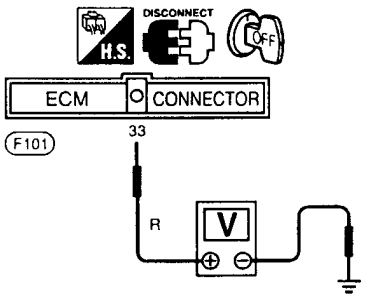
SEF801S

B



CMNL01

B



SEF802S

INSPECTION START

A

CHECK OVERALL FUNCTION-I.

1. Turn ignition switch to "ON" position.
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT.
   Rear window defogger switch is "ON": ON
   Rear window defogger switch is "OFF": OFF

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

OR

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

OK

B

CHECK OVERALL FUNCTION-II.

1. Turn rear window defogger switch to "OFF" position.
2. Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT.
   Lighting switch is "ON": ON
   Lighting switch is "OFF": OFF

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

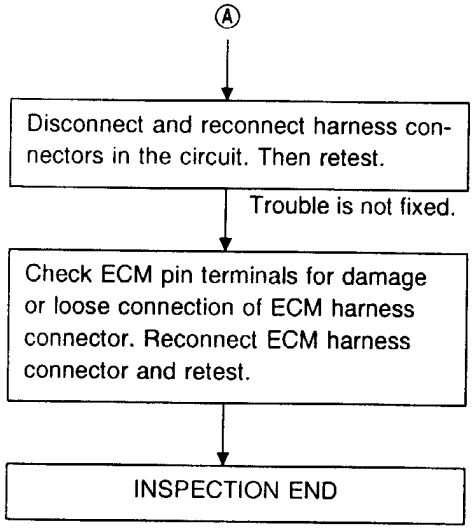
OR

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

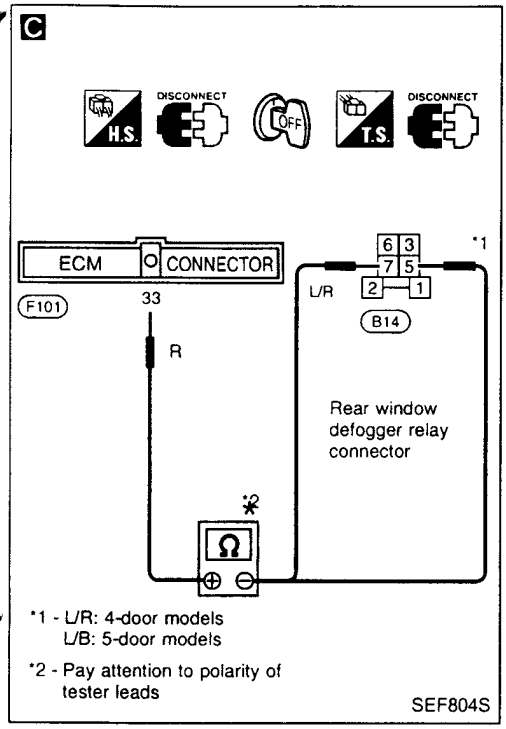
OK

Ⓐ

Electrical Load Signal (Cont'd)



Electrical Load Signal (Cont'd)



PROCEDURE A

INSPECTION START

Check if rear window defogger functions normally.

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

OK

C

CHECK INPUT SIGNAL CIRCUIT.

1. Turn rear window defogger switch to "OFF" position.
2. Turn ignition switch to "LOCK" position.
3. Disconnect ECM harness connector and rear window defogger relay.
4. Check harness continuity between ECM connector terminal (33) and rear window defogger relay connector terminals (5), (7).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (B4), (M14)
- Harness connectors (M52), (F103)
- Diode (M31)
- Harness for open or short-circuit between ECM and rear window defogger relay.

If NG, replace diode or repair harness or connectors.

OK

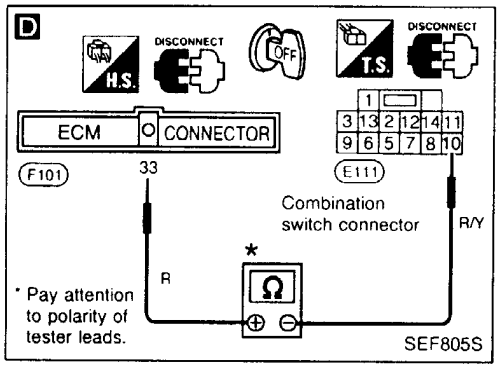
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

INSPECTION END

Electrical Load Signal (Cont'd)



PROCEDURE B

INSPECTION START

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

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

OK

D

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and lighting switch harness connector.
3. Check harness continuity between ECM connector terminal (33) and combination switch connector terminal (10).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (E101), (M17)
- Harness connectors (M52), (F103)
- Diode (M31)
- Harness for open or short-circuit between lighting switch and ECM.

If NG, repair harness or connectors.

OK

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

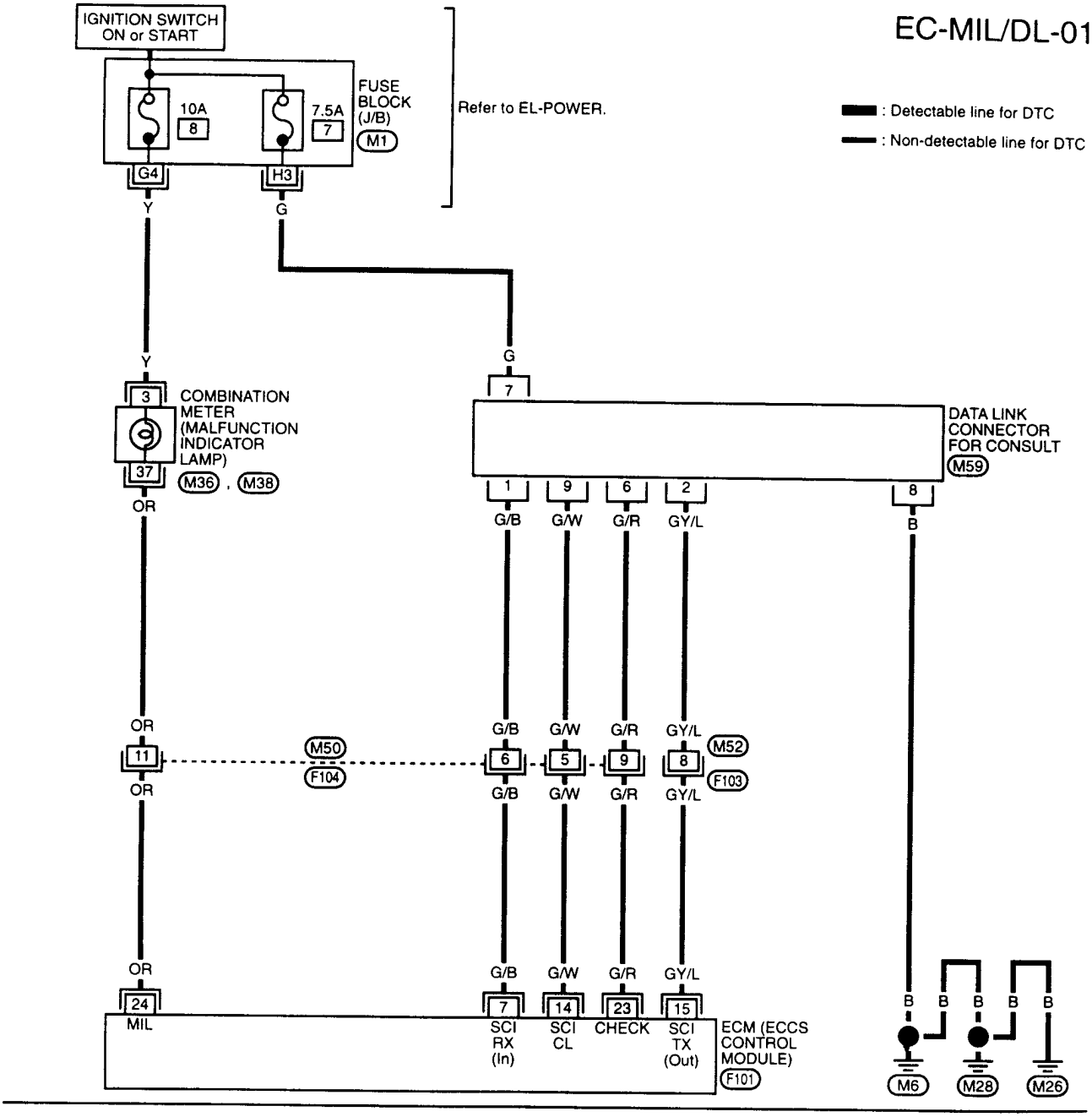
Trouble is not fixed.

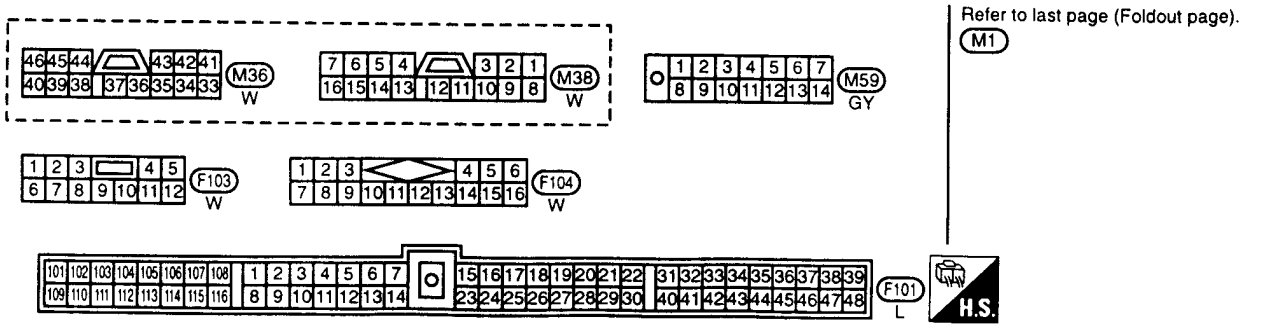
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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

EC-MIL/DL-01





Refer to last page (Foldout page). M1

SEF829S

Note:

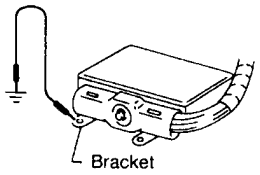
Engine Fuel & Emission Control System

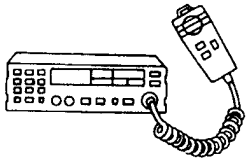
ECM (ECCS-D control module)
- Do not disassemble ECM .
- If a battery terminal is disconnected, the memory will return to the ECM value. The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication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

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

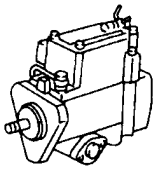
1) Keep the antenna as far as possible away from the ECM.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept small.
4)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

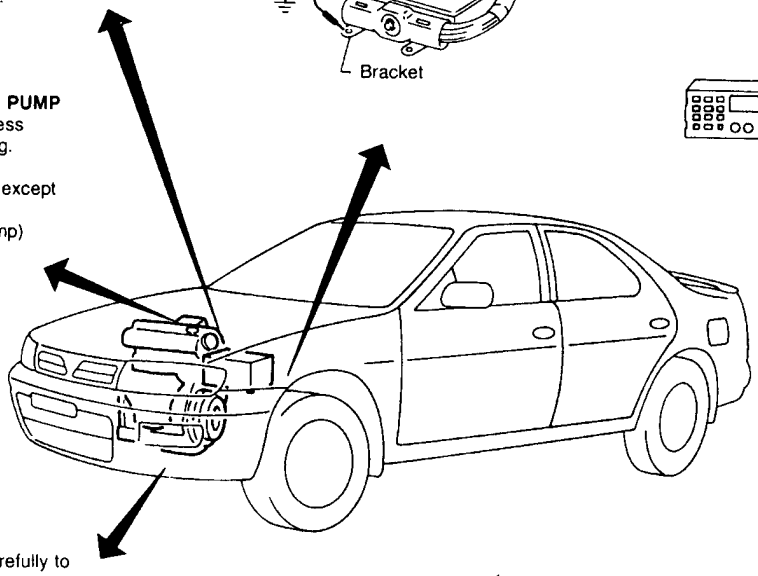
BATTERY
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.





ELECTRONIC FUEL INJECTOR PUMP
- Do not disconnect pump harness connectors with engine running.
- Do not disassemble or adjust electronic fuel injection pump, except for the following parts.
  Camshaft position sensor (pump)
  Injection timing control valve
  Fuel cut solenoid valve



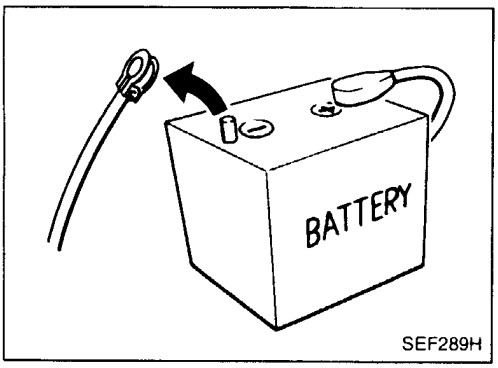


ECM PARTS HANDLING
- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble No. 1 injection nozzle (built-in needle lift sensor).
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor (TDC).

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

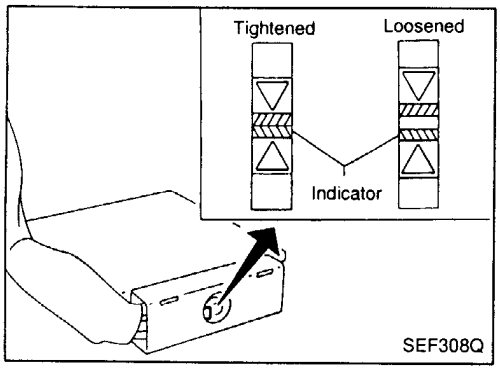
ECM HARNESS HANDLING
- Connect ECM harness connectors securely.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECM system malfunction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

NEF390

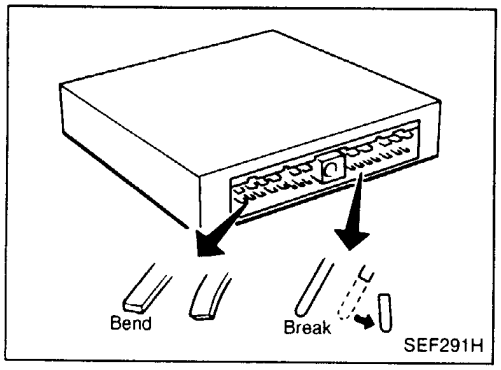


Precautions

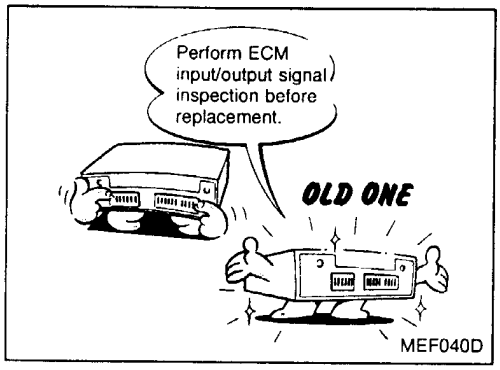
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.



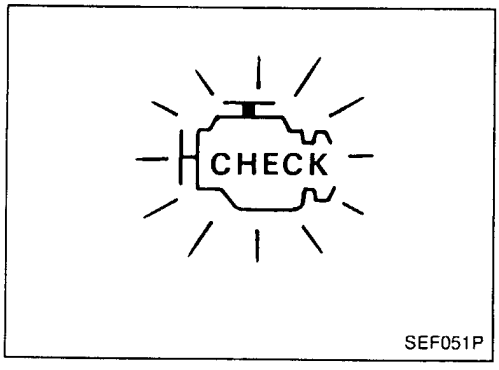
- When connecting ECM harness connector, tighten securing bolt until the gap between orange indicators disappears.
  : 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



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

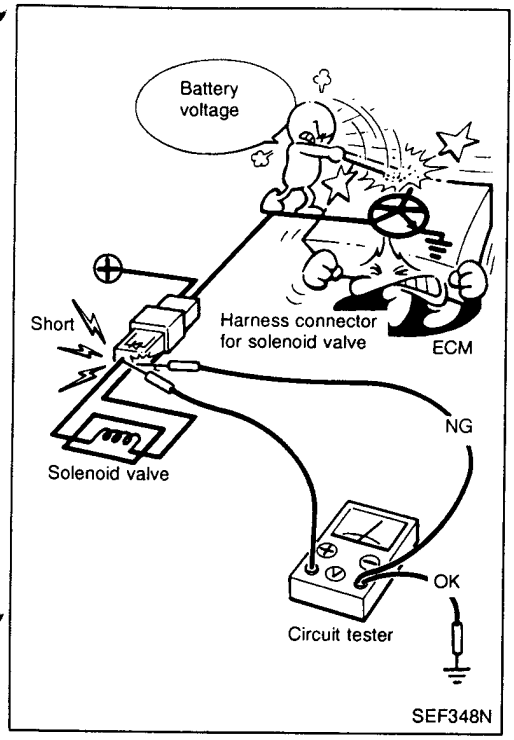


- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-338.



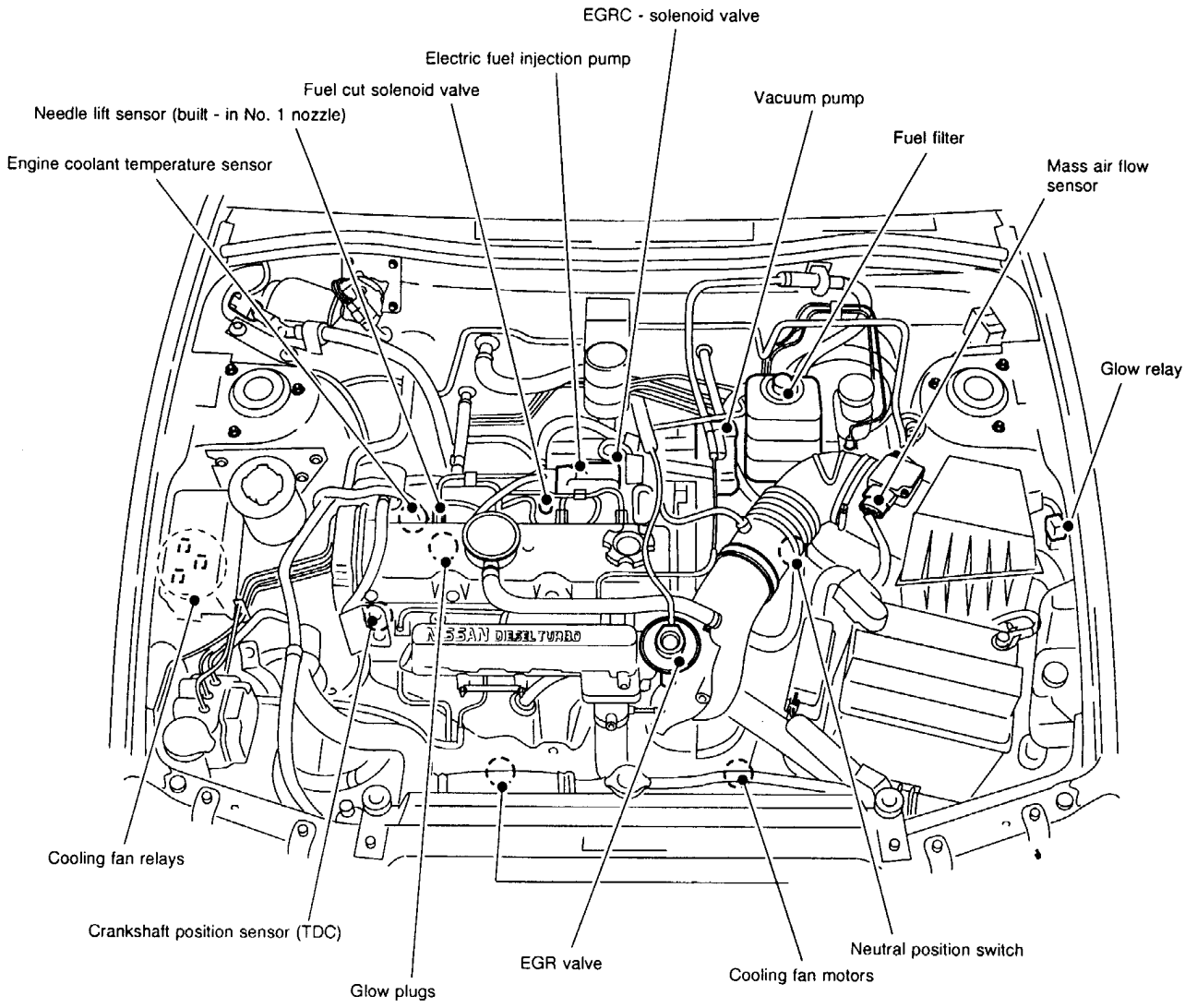
- If MIL illuminates or blinks irregularly during engine running, water may have accumulated in fuel filter. Drain water from fuel filter. If this does not correct the problem, perform specified trouble diagnostic procedures.
- After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK"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

Precautions (Cont'd)



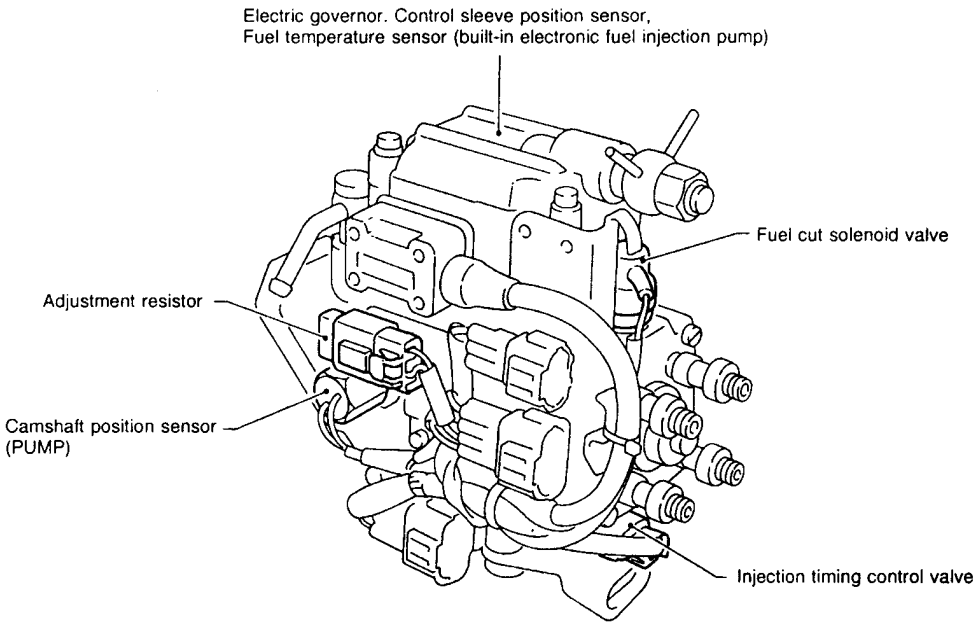
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

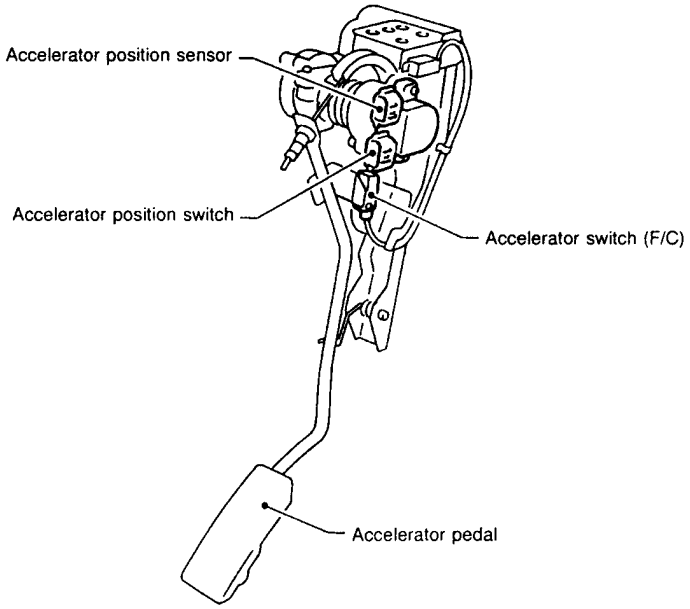
ECCS Component Parts Location

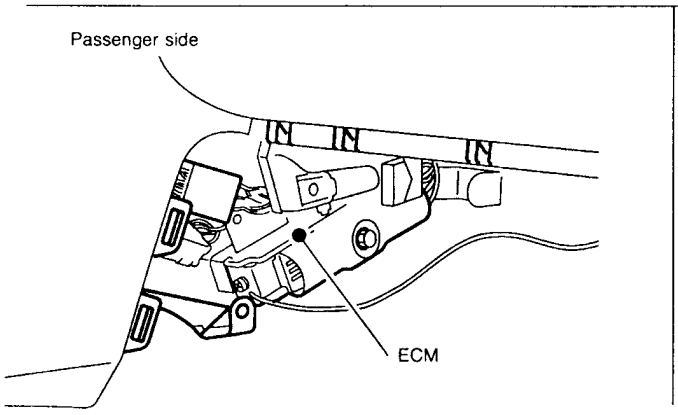


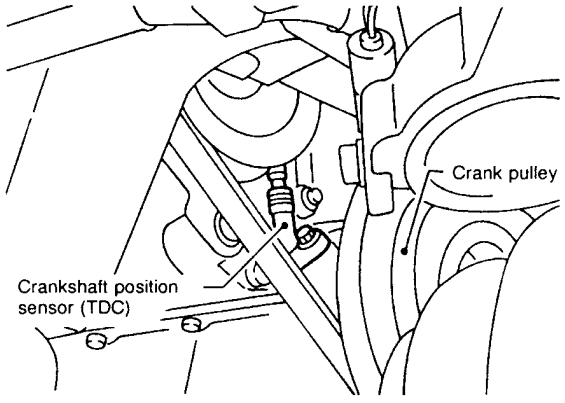
NEF391

ECCS Component Parts Location (Cont'd)



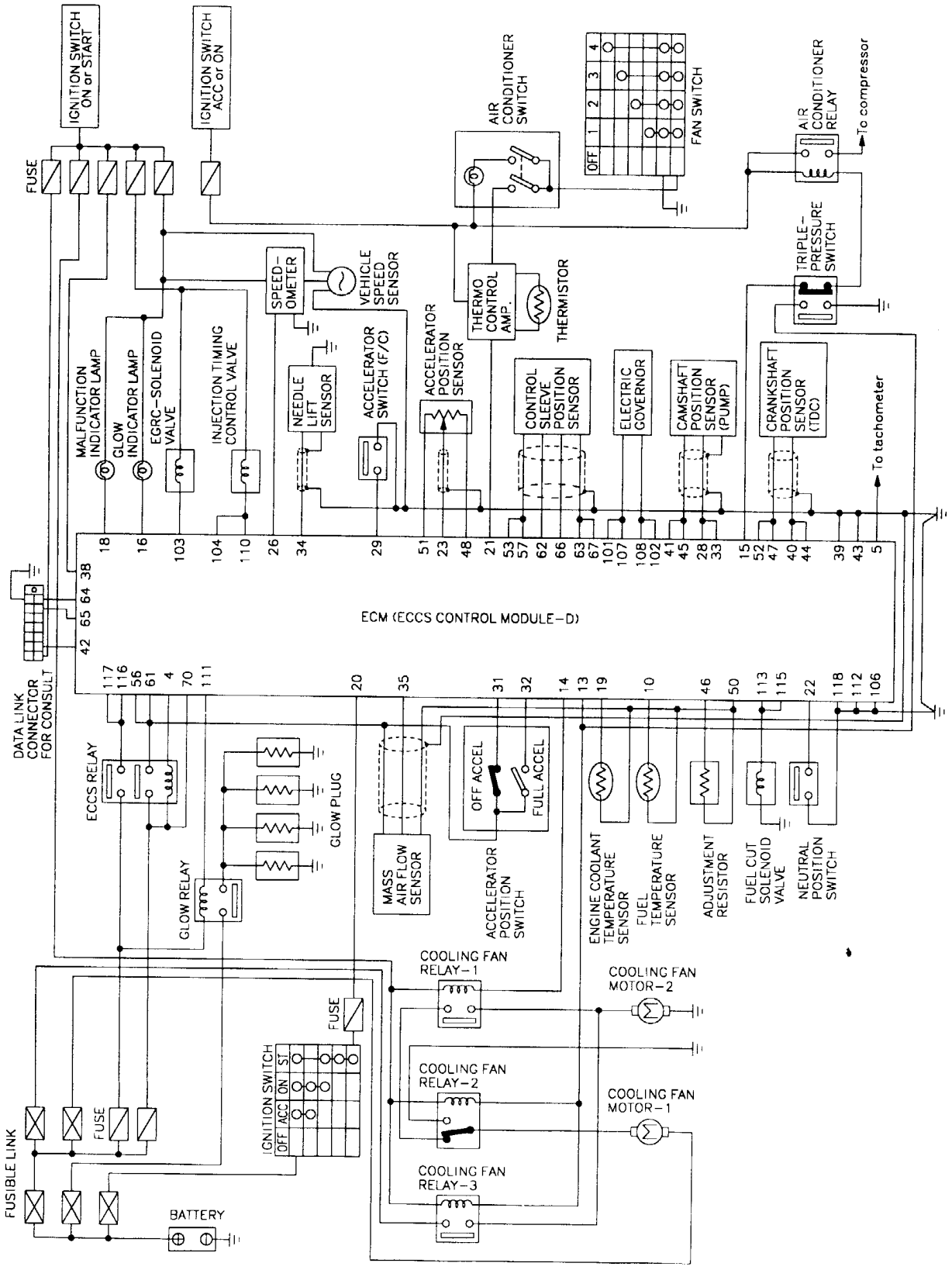






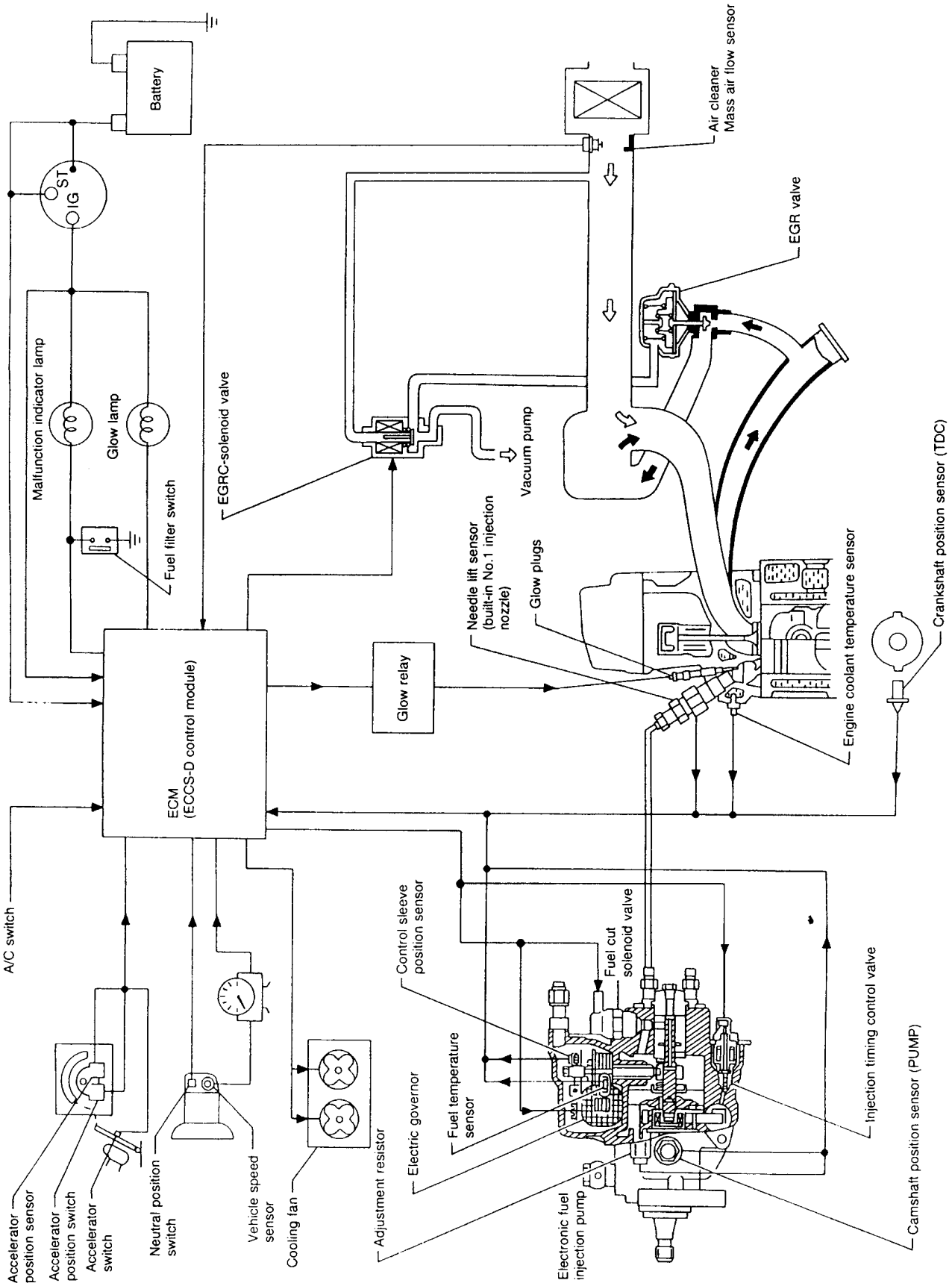
NEF393

Circuit Diagram



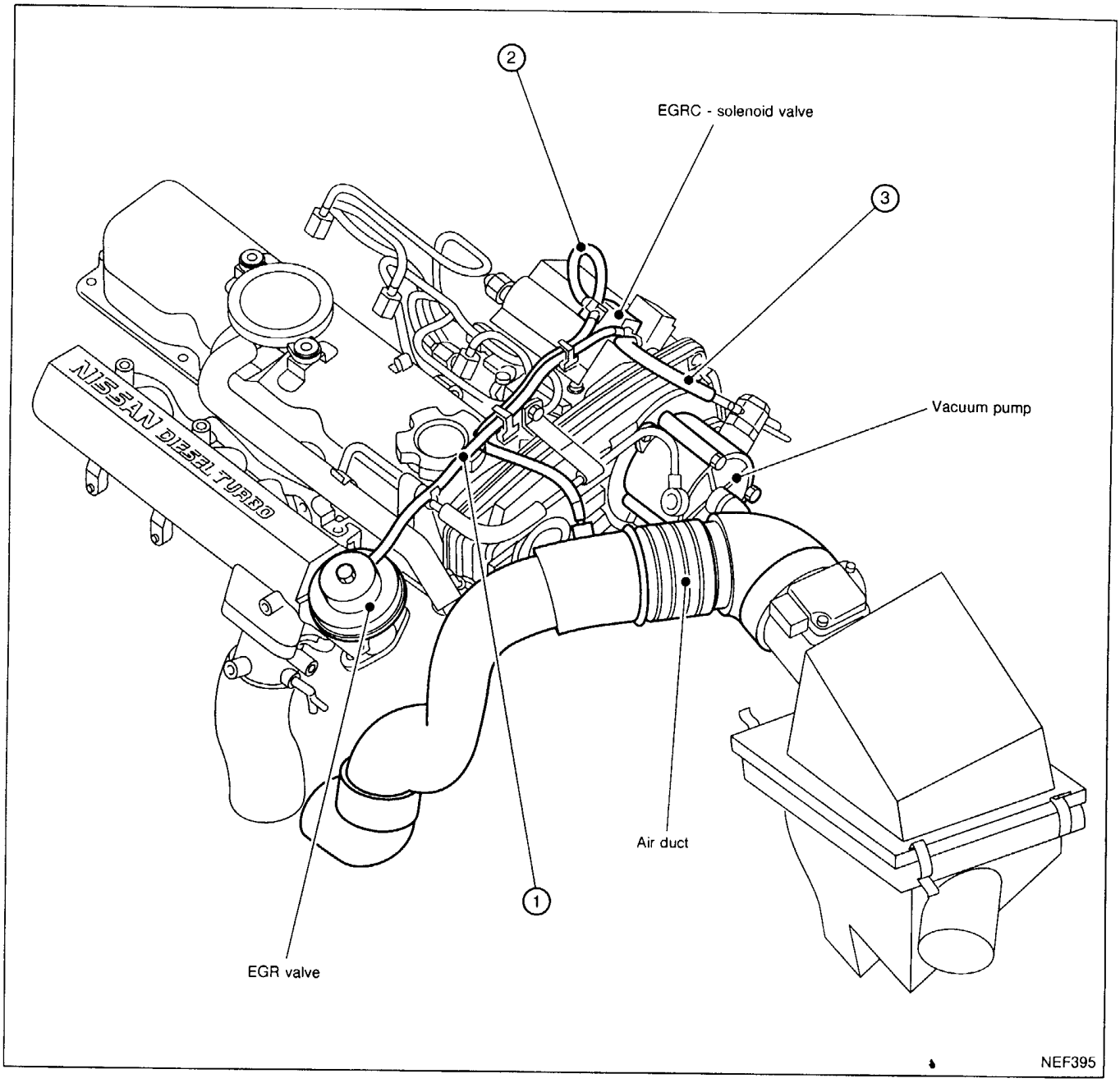
SEF418S

System Diagram



NEF394

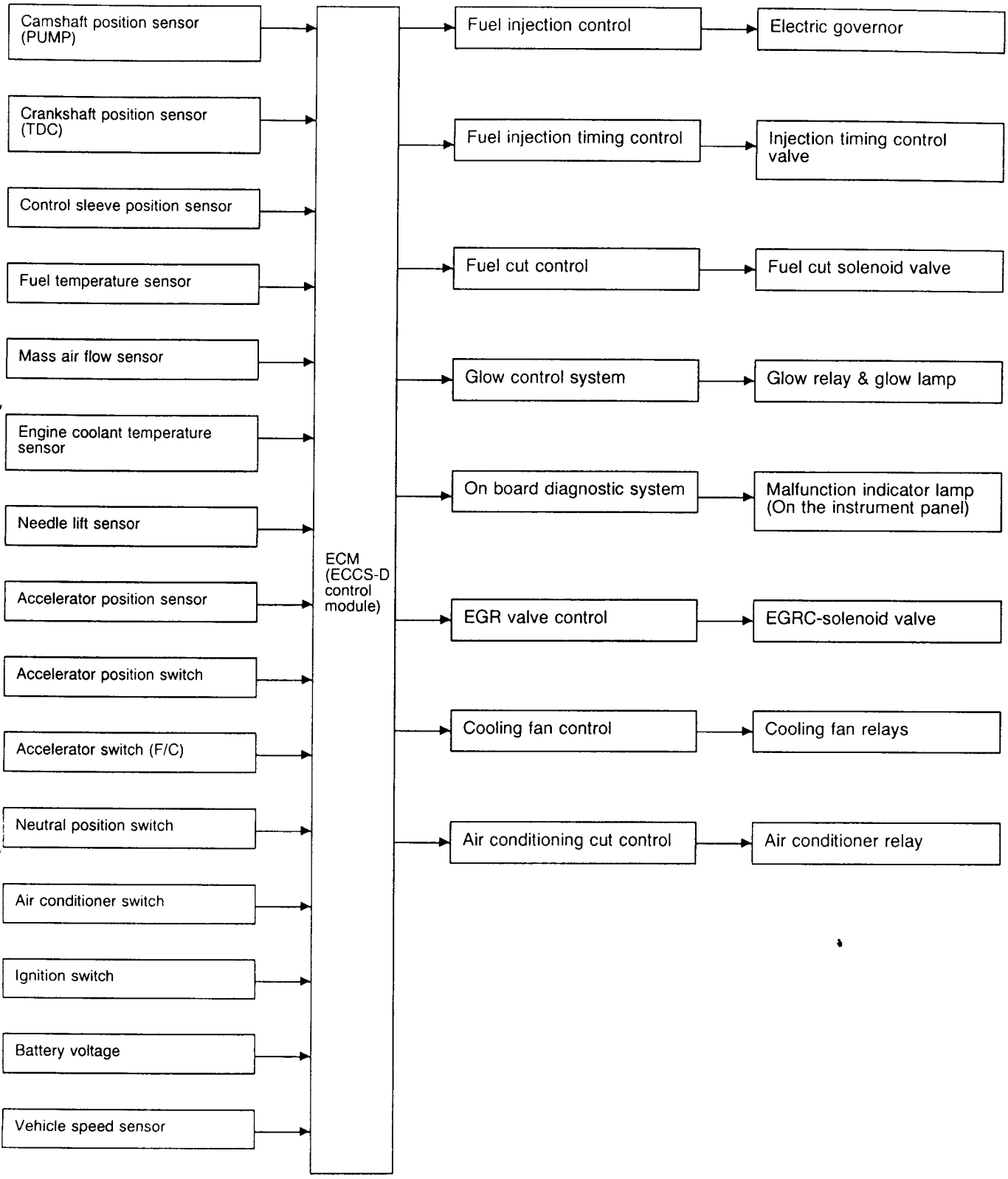
Vacuum Hose Drawing



① EGRC-solenoid valve to EGR valve
② EGRC-solenoid valve to air duct
③ EGRC-solenoid valve to vacuum pump

Refer to "System Diagram" on previous page for vacuum control system.

System Chart



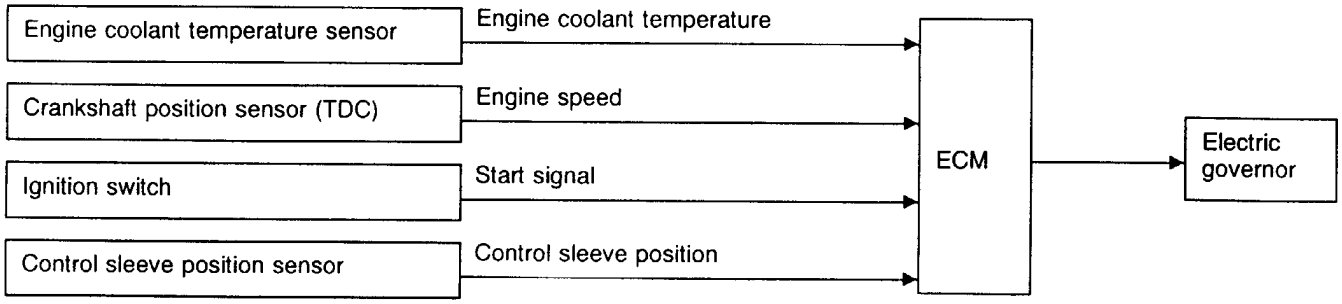
Fuel Injection System

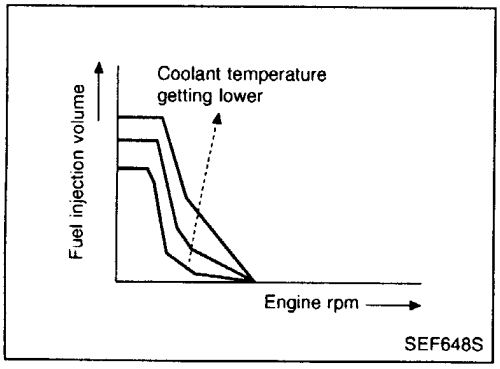
SYSTEM DESCRIPTION

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

START CONTROL

Input/output signal line



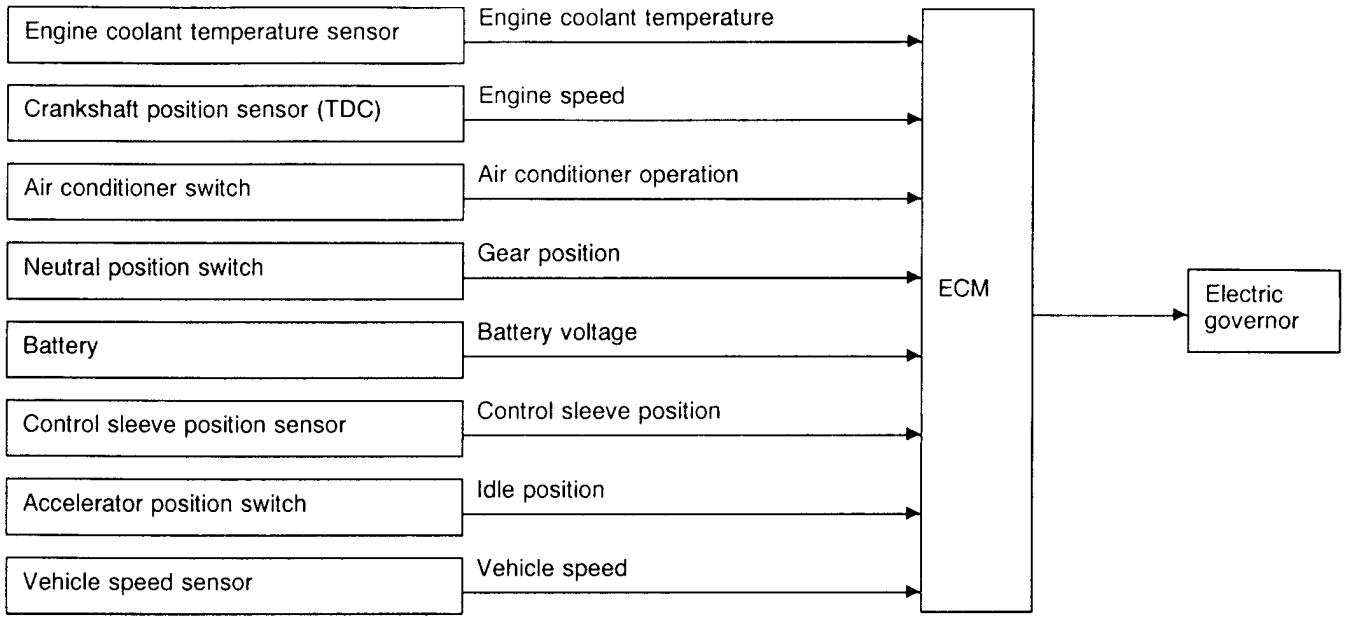


When the ECM receives a start signal from the ignition switch, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed and engine coolant temperature.
For better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

Fuel Injection System (Cont'd)

IDLE CONTROL

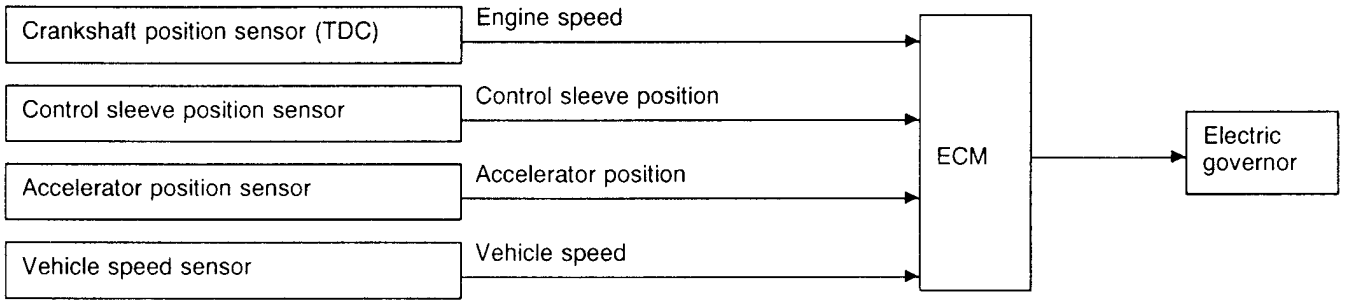
Input/output signal line

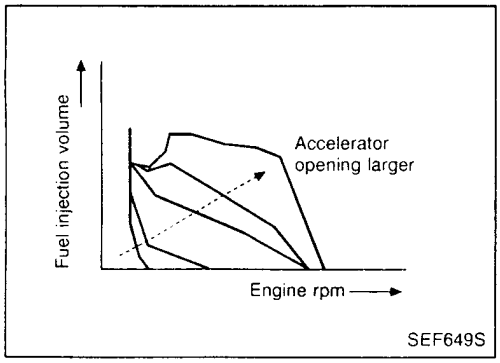


When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. The ECM also provides the system with a fast idle control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

NORMAL CONTROL

Input/output signal line





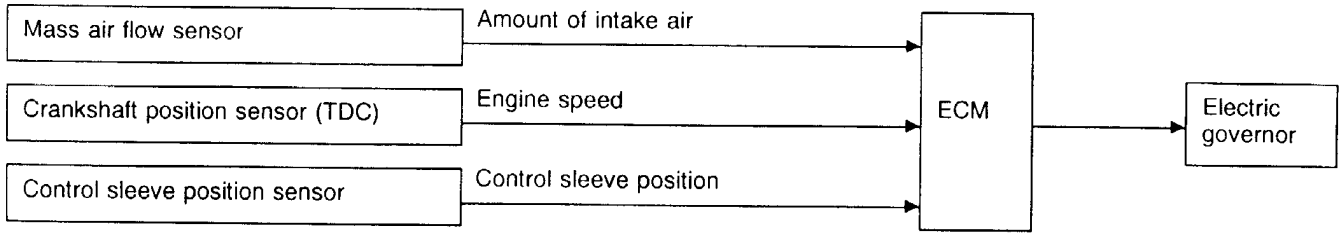
The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor (TDC) detects engine speed and the accelerator position sensor detects accelerator position. These sensors send signals to the ECM.

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

Fuel Injection System (Cont'd)

MAXIMUM FUEL INJECTION CONTROL

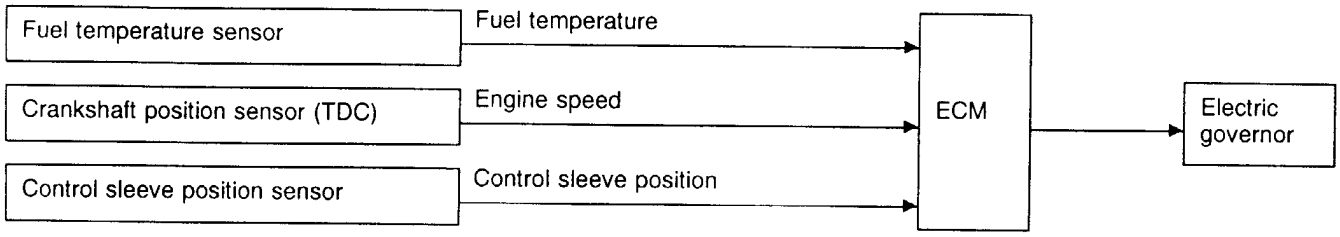
Input/output signal line



The maximum amount of fuel injected is limited depending on the amount of intake air and engine speed. The ECM controls the limit by monitoring the amount of intake air, detected by the mass air flow sensor, and engine speed signal. This ensures an appropriate amount of fuel is injected for turbocharged combustion and prevents black-smoke exhaust at high altitudes.

FUEL TEMPERATURE COMPENSATION

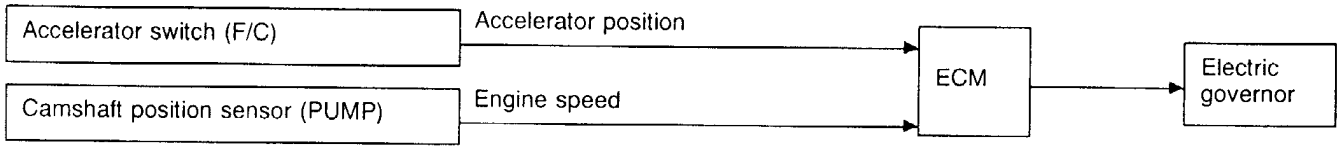
Input/output signal line



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

DECELERATION CONTROL

Input/output signal line



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

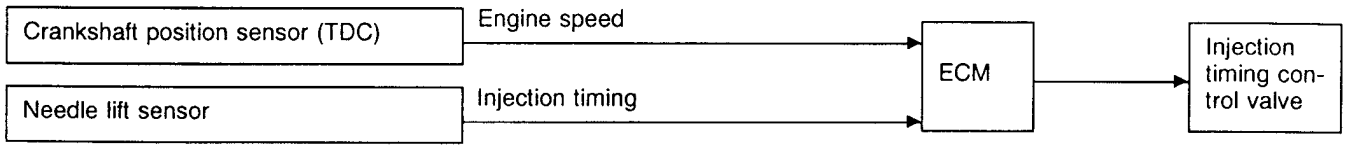
Fuel Injection Timing System

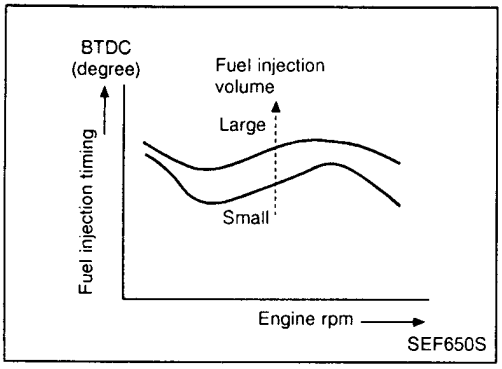
SYSTEM DESCRIPTION

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

BASIC CONTROL

Input/output signal line

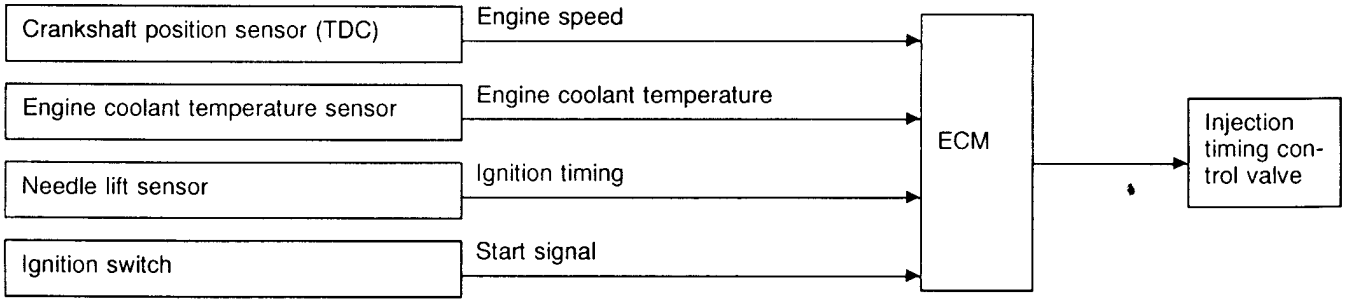


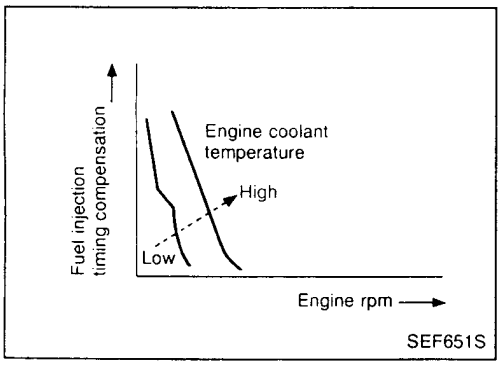


The optimal fuel injection timing data, predetermined in proportion to engine speeds and amount of fuel injected, are stored in the ECM memory. The ECM uses the data to control the fuel injection timing.

ENGINE COOLANT TEMPERATURE COMPENSATION (When starting)

Input/output signal line



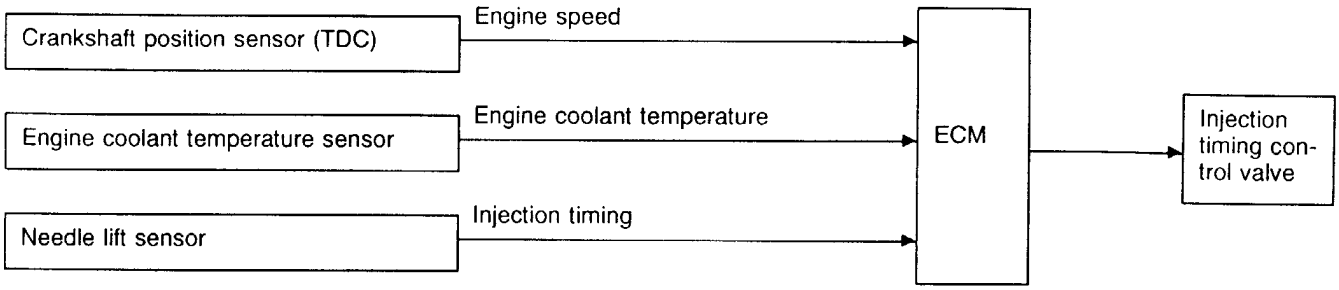


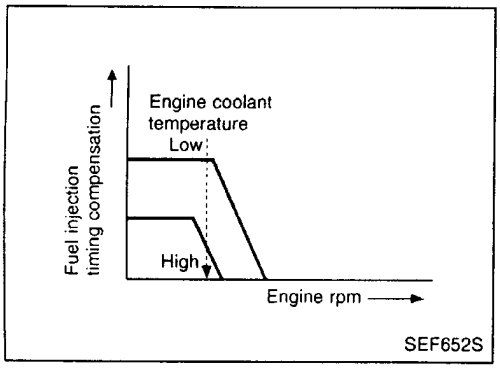
For better startability under cool engine conditions, the fuel injection timing is compensated according to the engine coolant temperature.

Fuel Injection Timing System (Cont'd)

ENGINE COOLANT TEMPERATURE COMPENSATION (During driving)

Input/output signal line

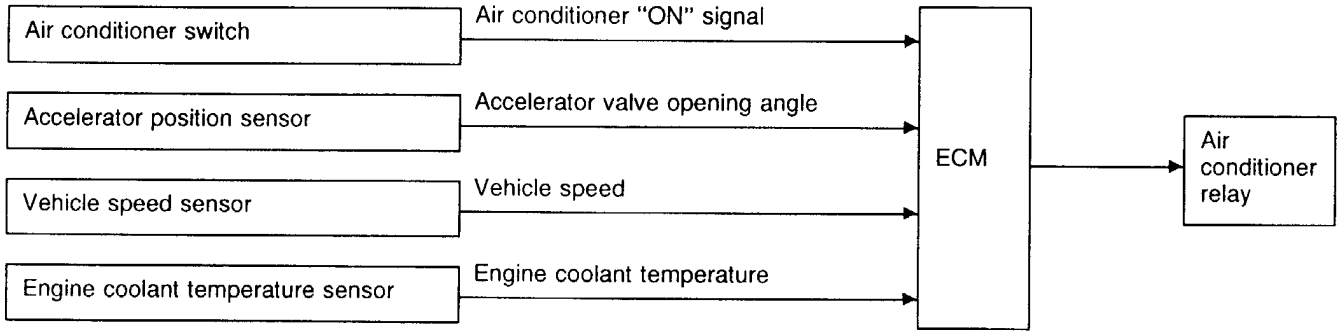




For better exhaust efficiency under cool engine conditions, the fuel injection timing is controlled within a compensation range depending on the engine speed, engine coolant temperature and amount of fuel injected.

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE

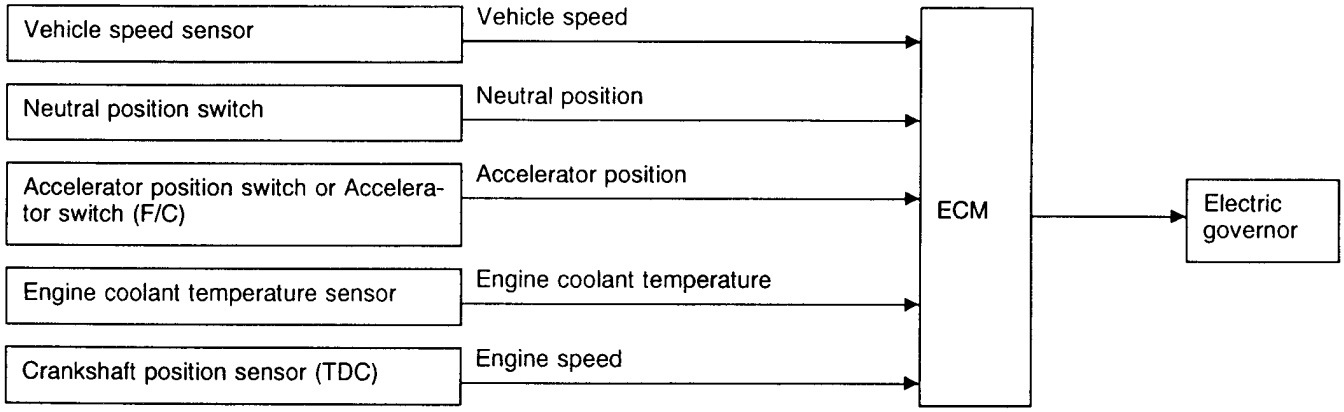


SYSTEM DESCRIPTION

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

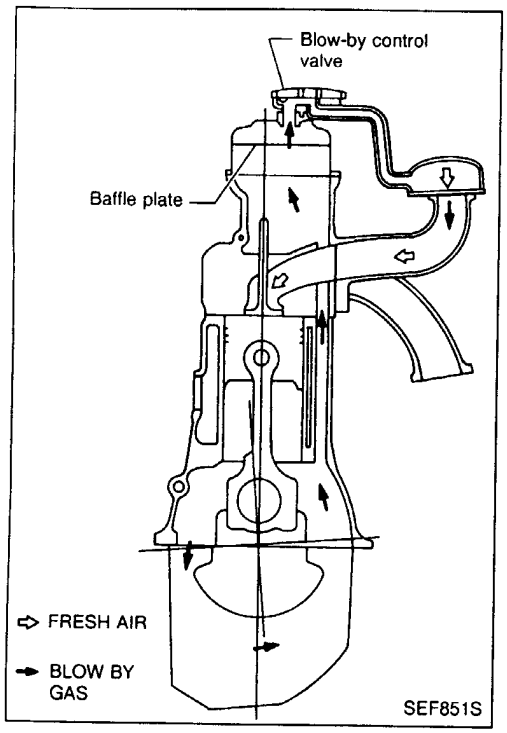
Fuel Cut Control (at no load & high engine speed)

INPUT/OUTPUT SIGNAL LINE



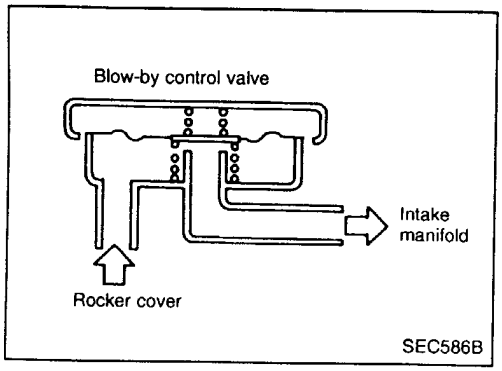
If the engine speed is above 4,000 rpm with no load (for example, in neutral and engine speed over 4,000 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.
Fuel cut will operate until the engine speed reaches 1,000 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control and fuel cut solenoid valve control listed under "Fuel Injection System", EC-294 and "TROUBLE DIAGNOSIS FOR DTC 36, 37, 38", EC-402.



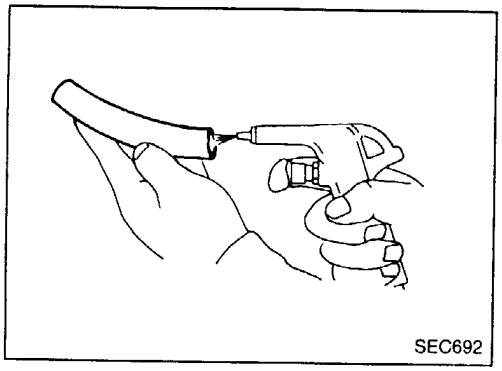
Description

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



Blow-by Control Valve

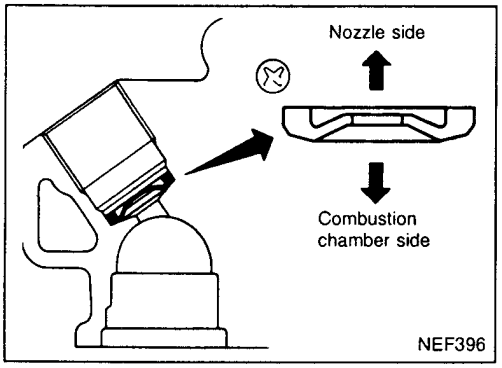
- Check control valve for clogging and abnormalities.



Ventilation Hose

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

CAUTION:
- **Do not disassemble No. 1 nozzle (with needle lift sensor). Entrust disassembly or adjustment to BOSCH service shop.**
- **Plug flare nut with a cap or rag so that no dust enters the nozzle. Cover nozzle tip for protection of needle.**



Removal and Installation

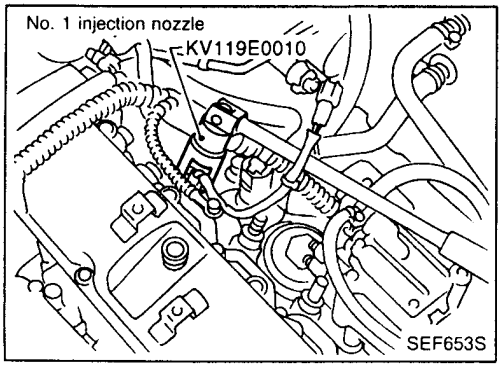
1. Remove fuel injection tube and spill tube.
2. Remove injection nozzle assembly.

Also remove gasket from nozzle end.

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

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

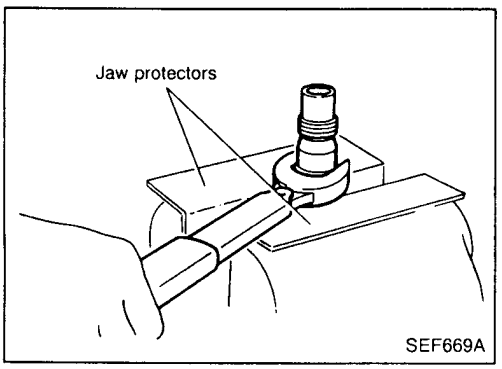
a. Always clean the nozzle holes.
b. Always use new injection nozzle gasket.
c. Note that small washer should be installed in specified direction.
d. Bleed air from fuel system.



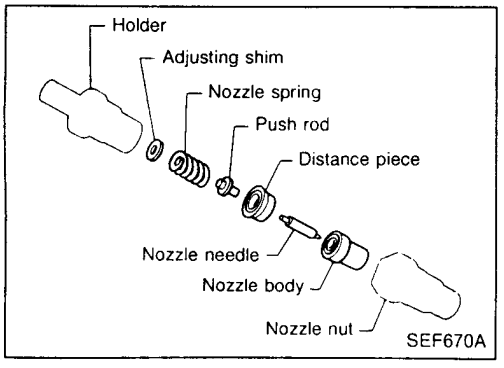
Disassembly (No. 2-4 nozzle)

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

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



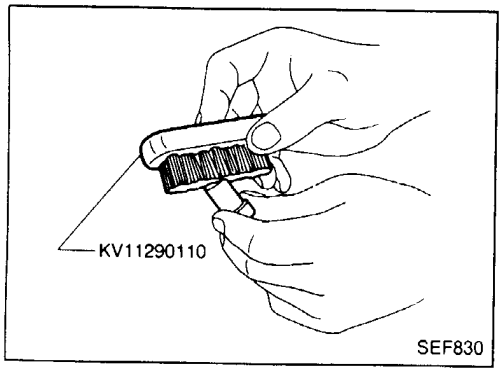
2. Arrange all disassembled parts in the order shown at left.



Inspection (No. 2-4 nozzle)

Thoroughly clean all disassembled parts with fresh kerosene or solvent.

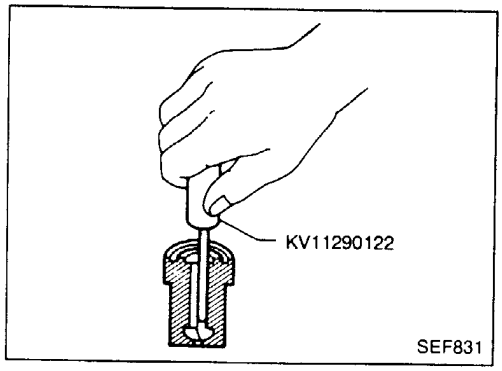
- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or distance piece.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



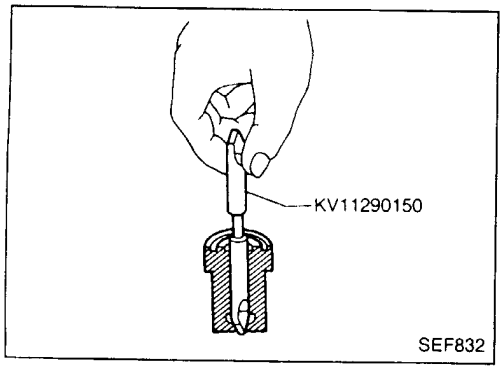
Cleaning (No. 2-4 nozzle)

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

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



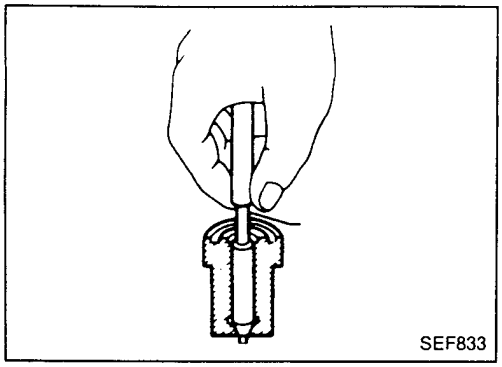
2. Clean oil sump of nozzle body using Tool.



3. Clean nozzle seat by using Tool.

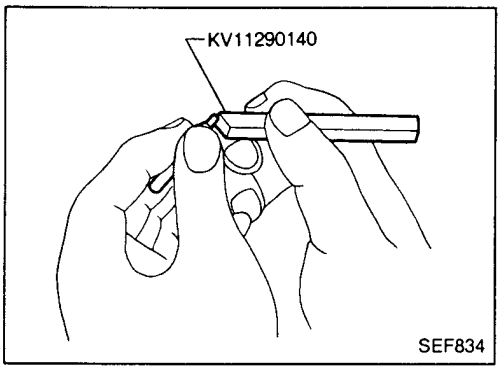
This job should be performed with extra precautions, since efficiency of nozzle depends greatly on a good nozzle seat.

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

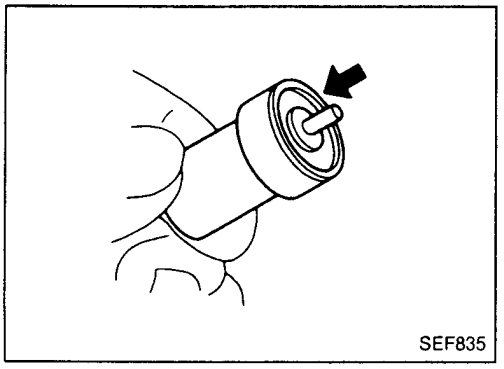


4. Clean spray hole of nozzle body by using Tool.

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

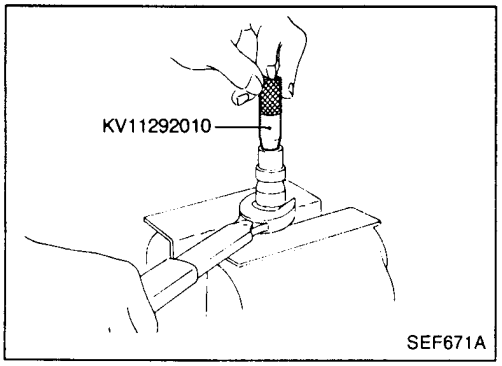


5. Decarbonate nozzle needle tip by using Tool.



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

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



Assembly (No. 2-4 nozzle)

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

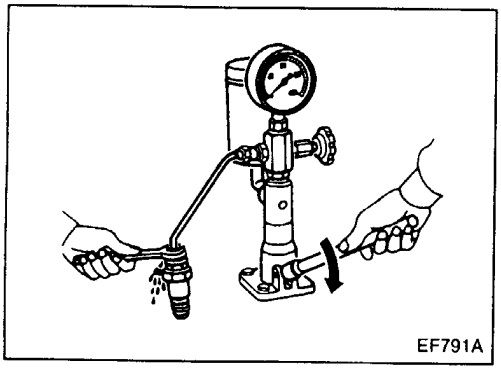
If nozzle body is not installed properly, Tool cannot be removed and nozzle body may be damaged.

Holder to nozzle nut:

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

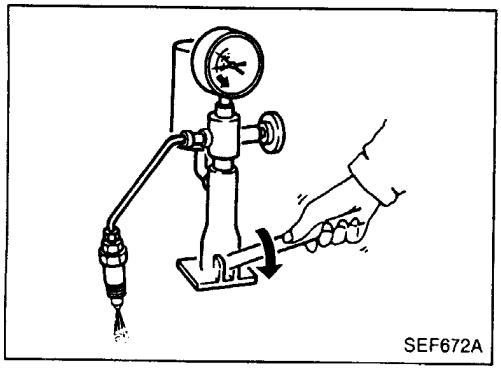
Test and Adjustment

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


EF791A

INJECTION PRESSURE TEST

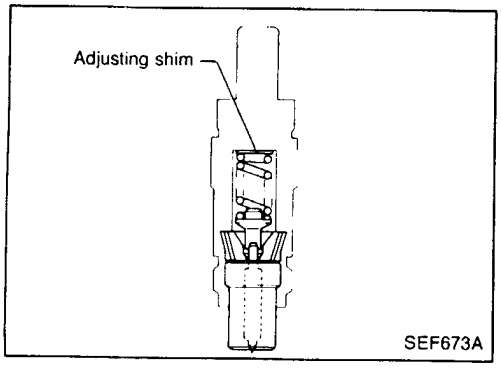
1. Install nozzle to injection nozzle tester and bleed air from flare nut.


SEF672A

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

Initial injection pressure:
Used
12,259 - 13,239 kPa
(122.6 - 132.4 bar,
125 - 135 kg/cm², 1,778 - 1,920 psi)
New
12,749 - 13,534 kPa
(127.5 - 135.3 bar,
130 - 138 kg/cm², 1,849 - 1,962 psi)

Always check initial injection pressure using a new nozzle.



SEF673A

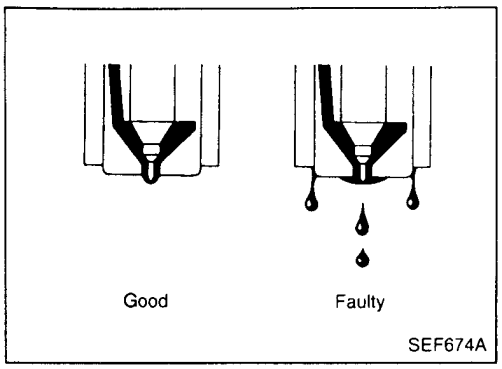
4. To adjust injection pressure, change adjusting shims (No. 2-4 nozzle).

a. **Increasing the thickness of adjusting shims increases initial injection pressure. Decreasing thickness reduces initial pressure.**
b. **A shim thickness of 0.04 mm (0.0016 in) corresponds approximately to a difference of 471 kPa (4.71 bar, 4.8 kg/cm², 68 psi) in initial injection pressure.**

Refer to SDS for adjusting shim (EC-444).

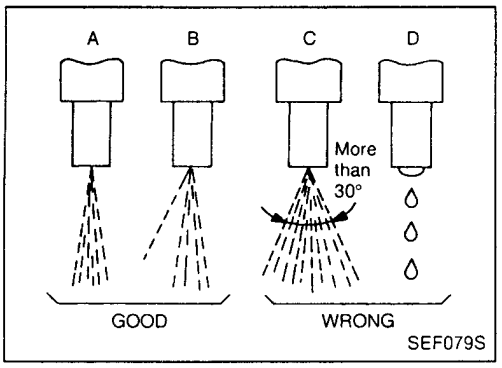
Test and Adjustment (Cont'd)

LEAKAGE TEST



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

SPRAY PATTERN TEST

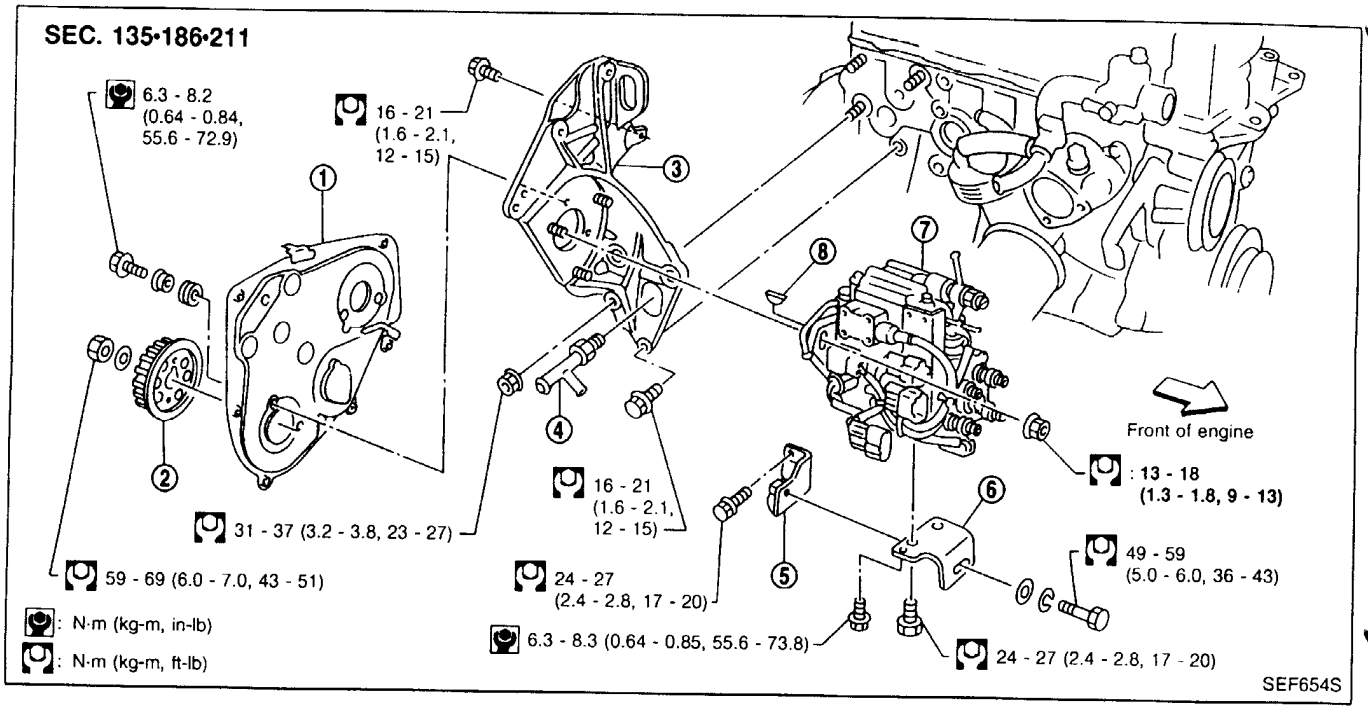


1. Check spray pattern by pumping tester handle one full stroke per second.

a. If main spray angle is within 30 degrees as shown, injection nozzle is good.

b. It is still normal even if a thin stream of spray deviates from the main spray (pattern B).

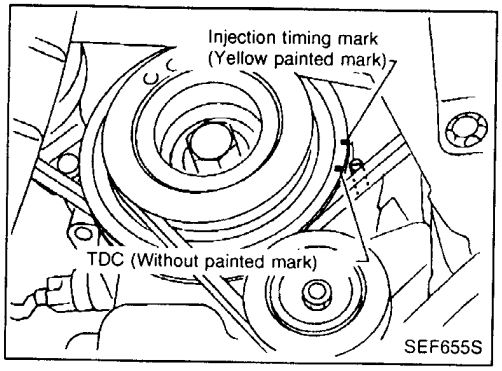
2. If the spray pattern is not correct, disassemble and clean nozzle.
3. Test again and if spray pattern is not corrected, replace nozzle.



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

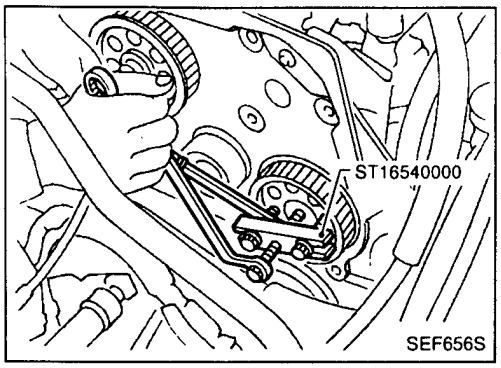
Removal

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

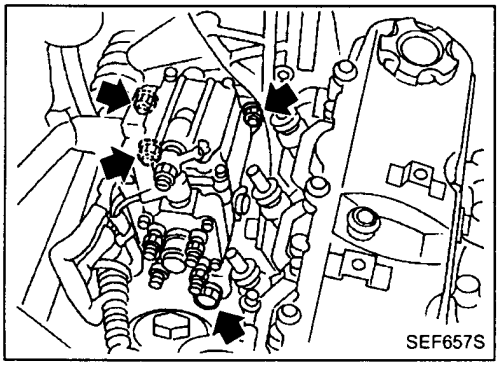


2. Set No. 1 piston at TDC on its compression stroke.
   TDC: Crankshaft pulley notch without painted mark
3. Remove fuel hoses (supply, return and spill) and injection tubes.
4. Remove air duct and injection pump timing belt cover.
5. Remove injection pump timing belt.
   Refer to EM section ("Injection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

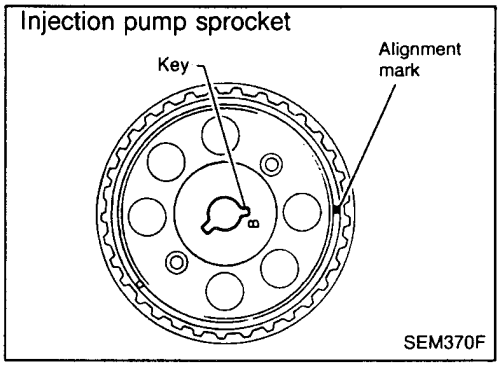
Removal (Cont'd)



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



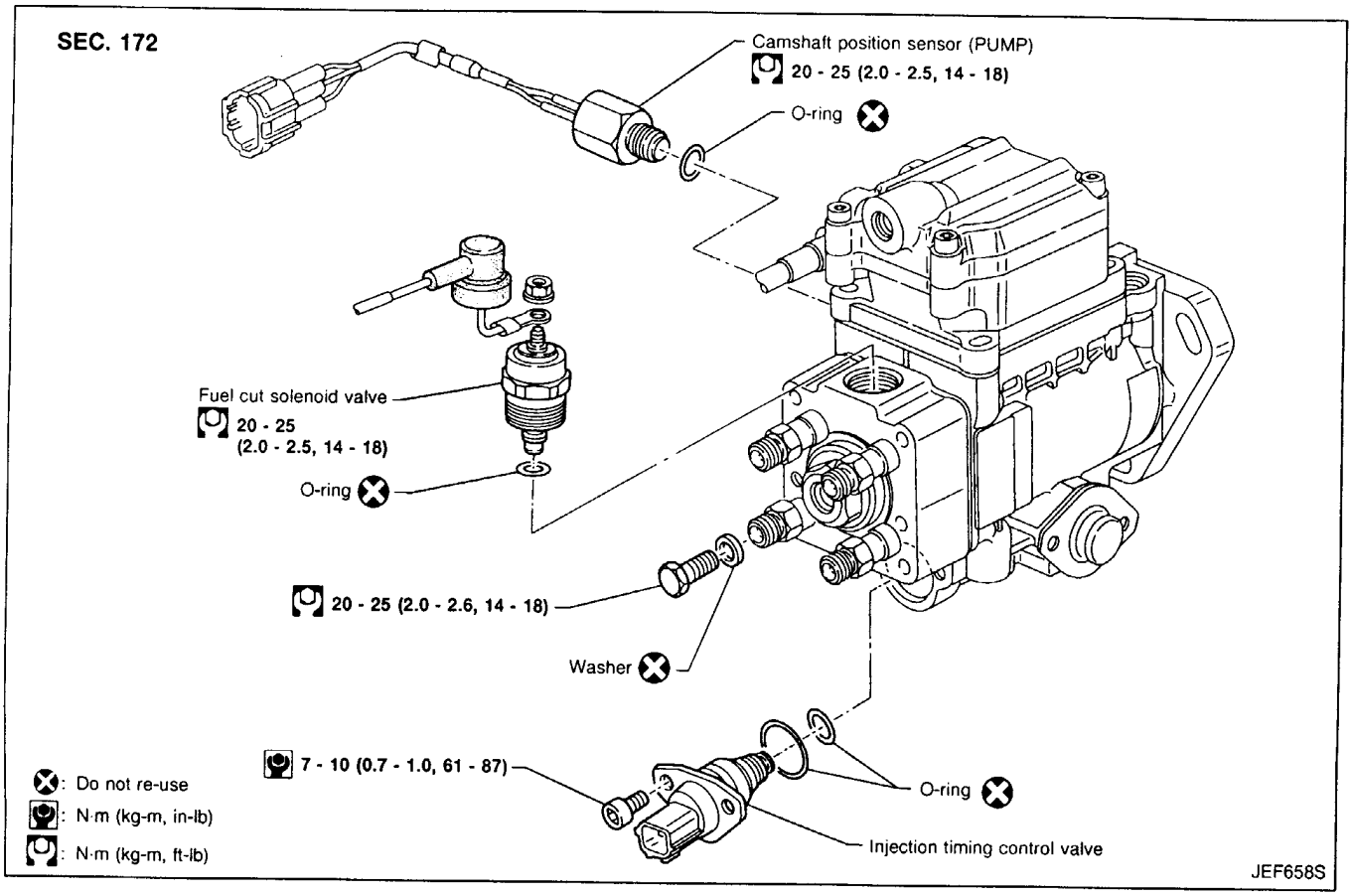
7. Remove injection pump assembly.



Installation

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

3. Adjust injection timing.
   Refer to "Basic Inspection", EC-324.
4. Install all parts removed.



Disassembly and Assembly

CAUTION:

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

DTC and MIL Detection Logic

When a malfunction is detected for the first time, the malfunction (DTC) is stored in the ECM memory. The MIL will light up each time the ECM detects a malfunction. However, if the same malfunction is experienced in two consecutive driving patterns and the engine is still running, the MIL will stay lit up. For diagnostic items causing the MIL to light up, refer to "Diagnostic Trouble Code (DTC) Chart", EC-326.

Diagnostic Trouble Code (DTC)

HOW TO READ DTC

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

1. The number of flashes of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 11, 13, 14, etc.
   These DTCs are controlled by NISSAN.
2. CONSULT Examples: "CAM POS SEN (PUMP)", etc.

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

HOW TO ERASE DTC

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

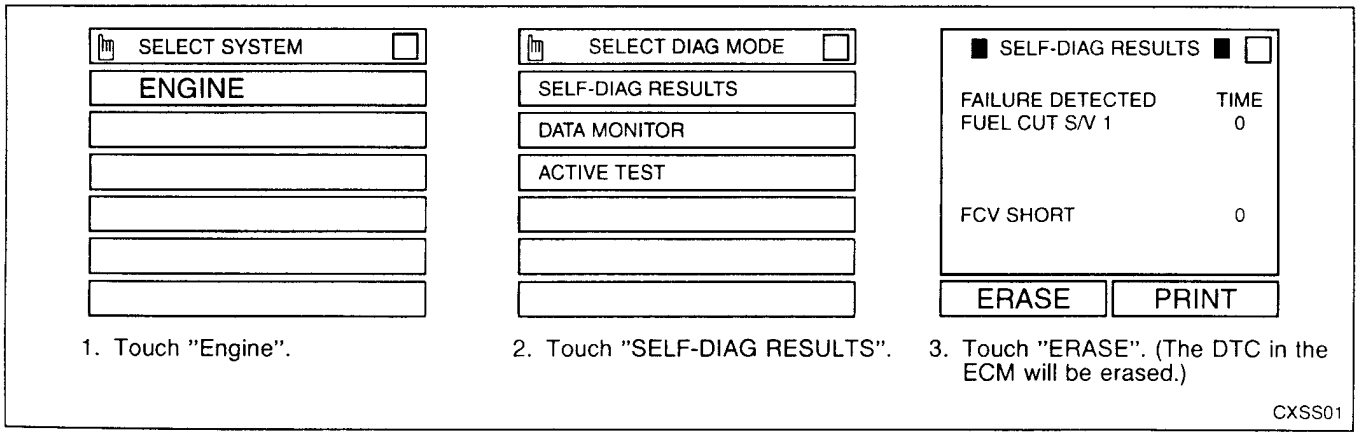
Selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT.

Changing the diagnostic test mode from Diagnostic Test Mode II to Mode I. (Refer to EC-311.)

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

HOW TO ERASE DTC (With CONSULT)

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

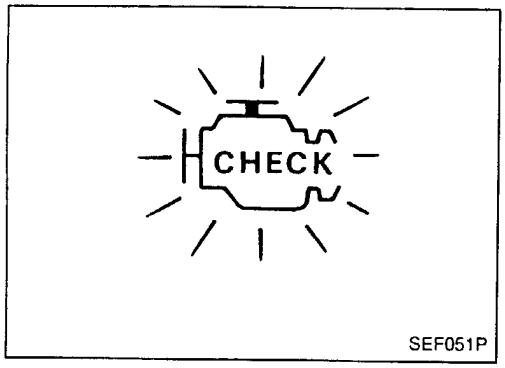


1. Touch "Engine".
2. Touch "SELF-DIAG RESULTS".
3. Touch "ERASE". (The DTC in the ECM will be erased.)

CXSS01

HOW TO ERASE DTC (No Tools)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch to "LOCK" position once. Wait at least 5 seconds and then turn it "ON" again.
2. Change the diagnostic test mode from Mode II to Mode I. (Refer to EC-311.)



Malfunction Indicator Lamp (MIL)

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator lamp does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-441.
2. When the engine is started, the malfunction indicator lamp should go off.
   If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

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

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The ON BOARD DIAGNOSTIC SYSTEM FUNCTION
The on board diagnostic system has the following three functions:

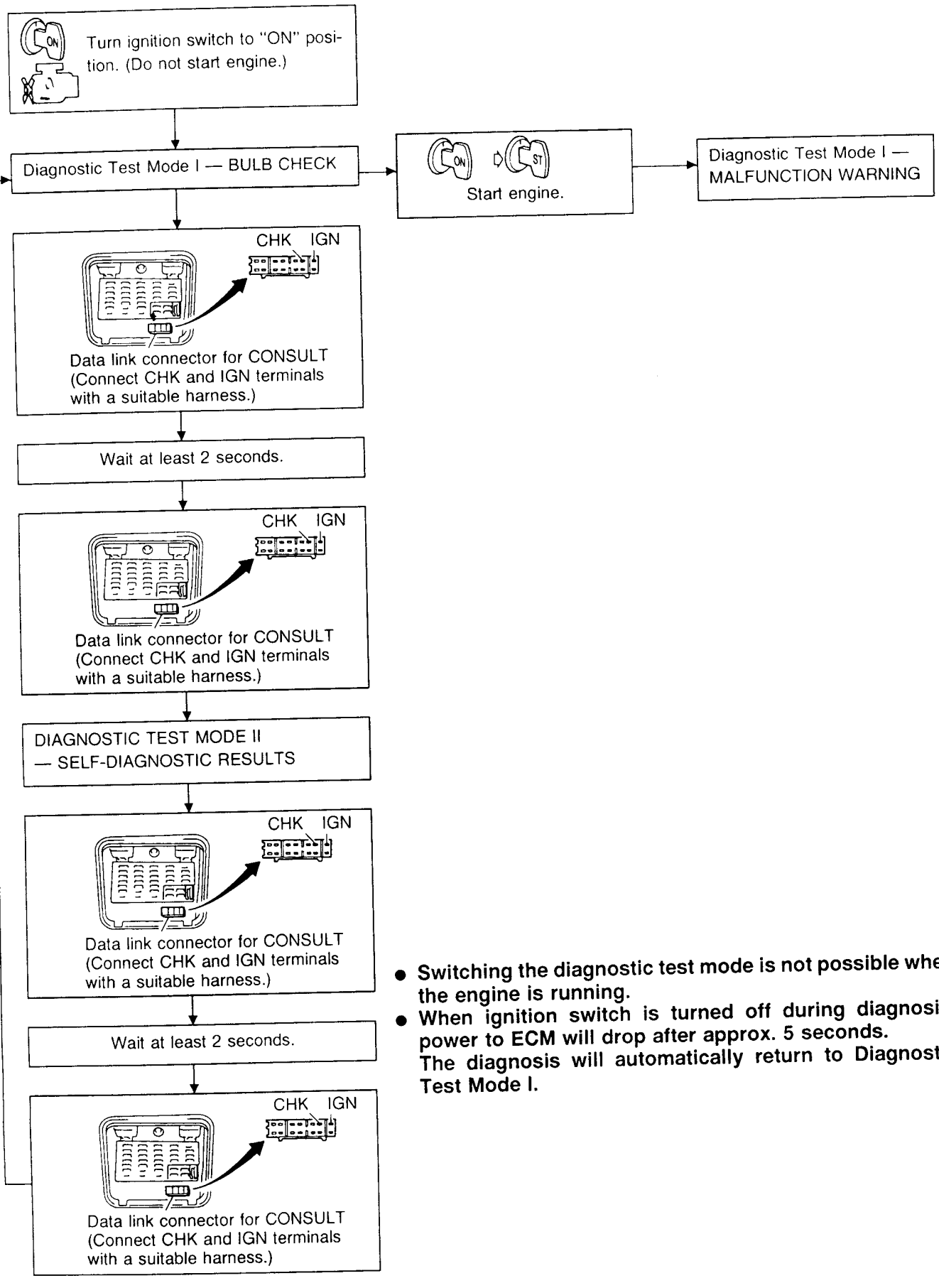
1. BULB CHECK : This function checks the MIL bulb for damage (blown, open circuit, etc.).
2. MALFUNCTION WARNING : This is a usual driving condition. When a malfunction is detected, the MIL will light up to inform the driver that a malfunction has been detected.
3. SELF-DIAGNOSTIC RESULTS : This function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

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

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

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



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

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE I—BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section ("WARNING LAMPS AND CHIME") or see EC-441.

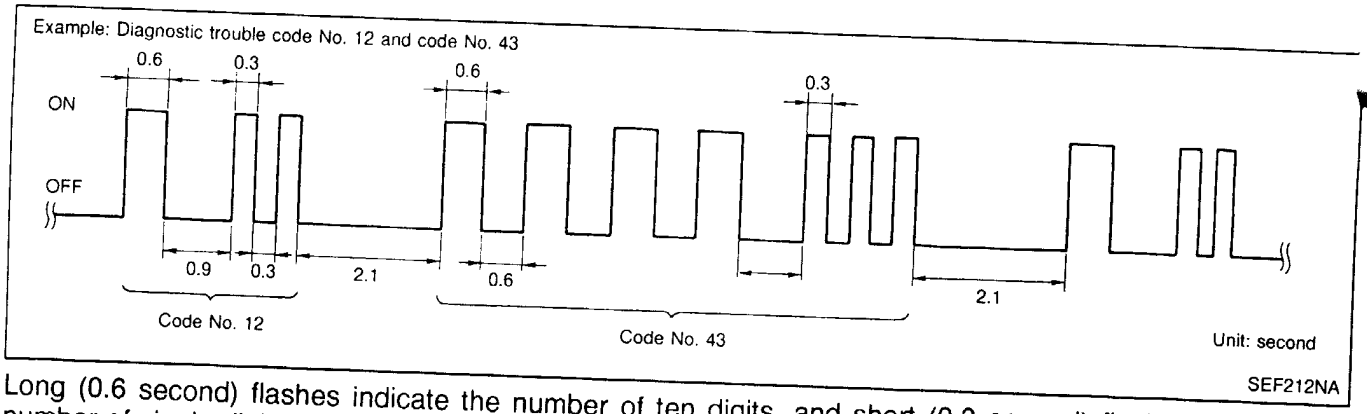
DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning. (The "MIL Illumination" of the "DTC Chart".) Refer to EC-326.
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 flashes of the MALFUNCTION INDICATOR LAMP as shown below.

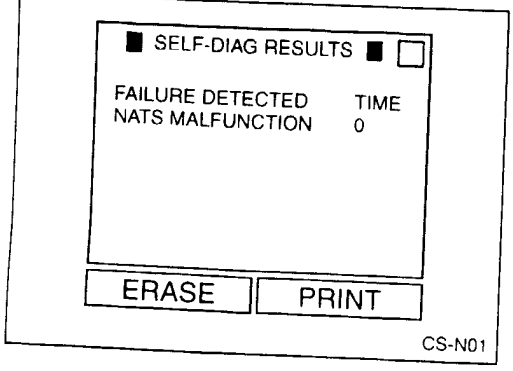


Long (0.6 second) flashes indicate the number of ten digits, and short (0.3 second) flashes indicate the number of single digits. For example, the malfunction indicator lamp flashes 4 times for 5 seconds (0.6 sec x 4 times) and then it flashes three times for about 1 second (0.3 sec x 3 times). This indicates the DTC "43" and refers to the malfunction of the accelerator position sensor.
In this way, all the detected malfunctions are classified by their diagnostic trouble code numbers. The DTC "55" refers to no malfunction. (See DIAGNOSTIC TROUBLE CODE CHART, EC-326.)

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

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

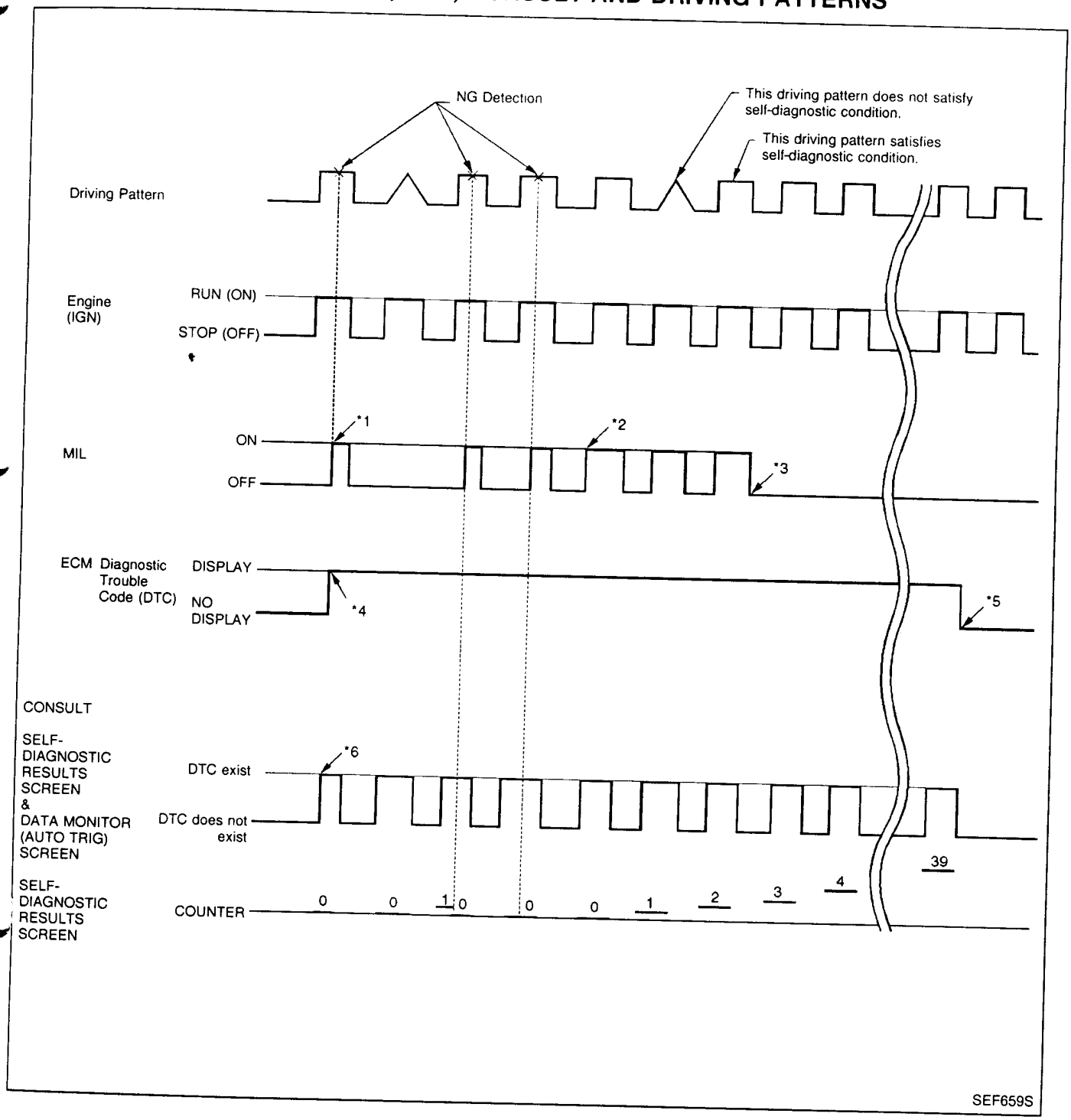
- **If the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**



- **If the MIL blinks or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT using NATS program card (NATS-E960). Refer to EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT.**
- **When replacing ECM, initialisation of NATS V.2.0 system and registration of all NATS V.2.0 ignition key IDs must be carried out with CONSULT using NATS program card (NATS-E960).**
  Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NATS initialisation and NATS ignition key ID registration, refer to CONSULT operation manual, NATS V.2.0.

Malfunction Indicator Lamp (MIL) (Cont'd)

RELATIONSHIP BETWEEN MIL, DTC, CONSULT AND DRIVING PATTERNS



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

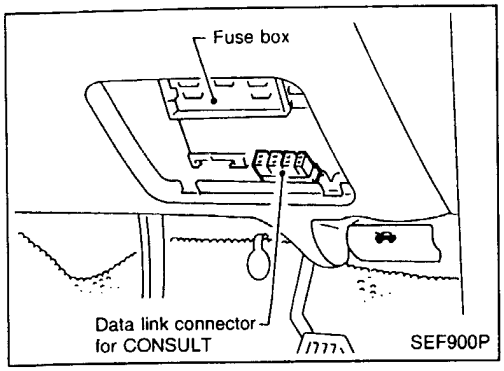
*2: When the same malfunction is detected in two consecutive driving patterns, MIL will stay lit up.

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

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

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

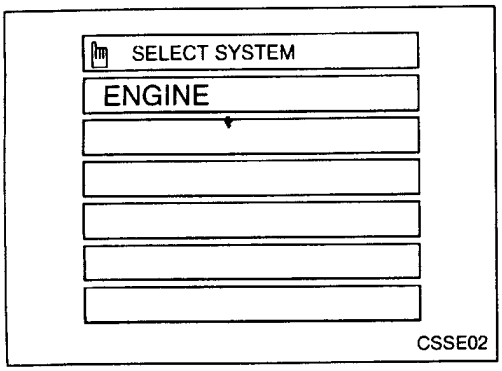
*6: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.



CONSULT

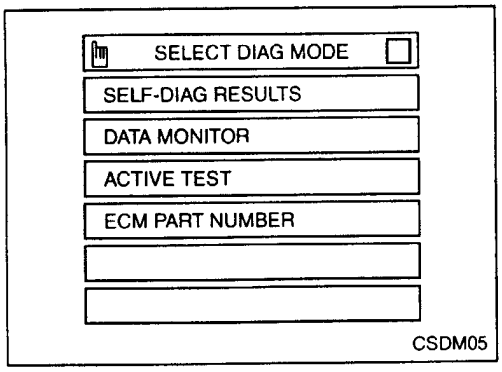
CONSULT INSPECTION PROCEDURE

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



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

For further information, see the CONSULT Operation Manual.



CONSULT (Cont'd)

ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

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

X: Applicable

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "Diagnostic Trouble Code (DTC) chart". (See EC-326.)

DATA MONITOR MODE

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

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

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
AIR COND SIG [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
IGN SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from ignition switch.	
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.
ACT INJ TIMG [°]	○		• The actual injection timing angle determined by the ECM (an approximate average angle between injection start and end from TDC) is displayed.	
DECELER F/CUT [ON/OFF]			• Indicates [ON/OFF] condition from deceleration fuel cut signal.	• When accelerator pedal is released quickly with engine speed at 3000 rpm or more, "ON" is displayed.
FUEL CUT S/V [ON/OFF]			• The control condition of the fuel cut solenoid valve (determined by ECM according to the input signal) is indicated. • OFF ... Fuel cut solenoid valve is not operating. ON ... Fuel cut solenoid valve is operating.	• When the fuel cut solenoid valve is not operating, fuel supply is shut off.
AIR COND RLY [ON/OFF]		○	• The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
GLOW RLY [ON/OFF]		○	• The glow relay control condition (determined by ECM according to the input signal) is displayed.	
COOLING FAN [LOW/HI/OFF]		○	• Indicates the control condition of the cooling fans (determined by ECM according to the input signal). • LOW ... Operates at low speed. HI ... Operates at high speed. OFF ... Stopped.	
EGRC SOL/V A [ON/OFF]			• The control condition of the EGRC-solenoid valve (determined by ECM according to the input signal) is indicated. • OFF ... EGRC-solenoid valve is not operating. ON ... EGRC-solenoid valve is operating.	

CONSULT (Cont'd)

ACTIVE TEST MODE

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

CONSULT (Cont'd)

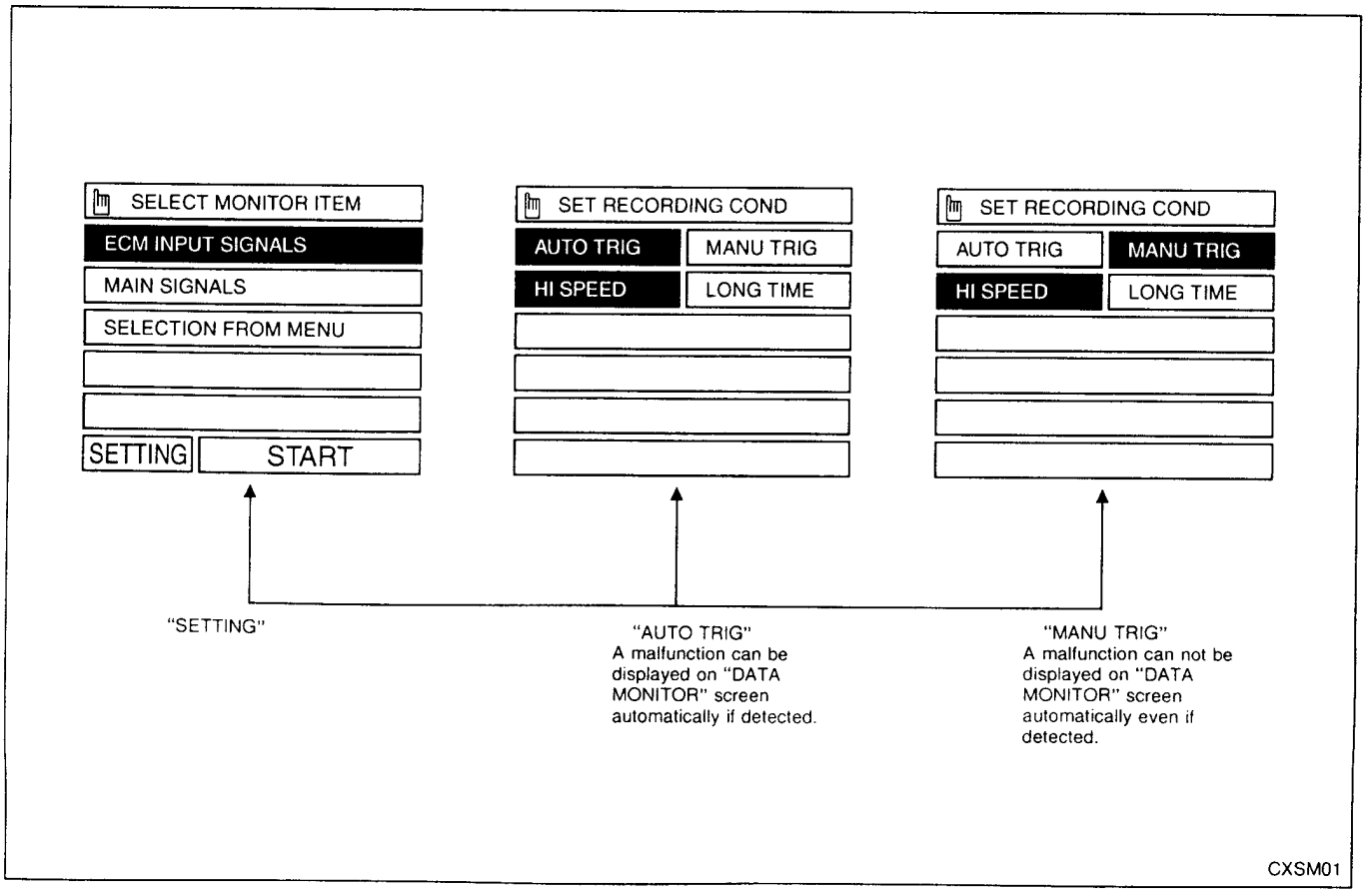
REAL TIME DIAGNOSIS IN DATA MONITOR MODE

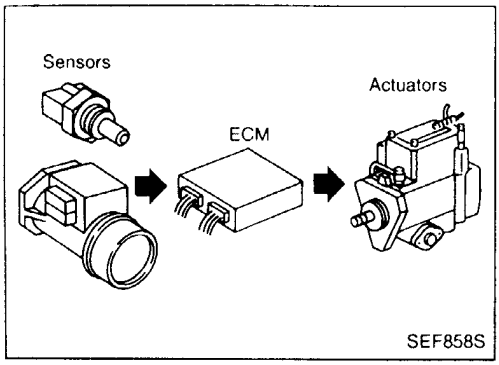
CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

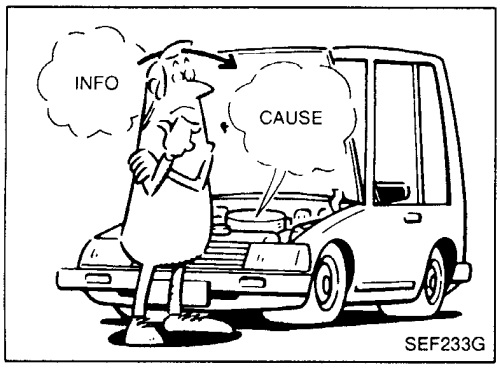
1. "AUTO TRIG" (Automatic trigger):
   - The malfunction will be identified on the CONSULT screen in real time.
     In other words, DTC and malfunction item will be displayed at the moment the malfunction is detected by ECM.
     DATA MONITOR can be performed continuously until a malfunction is detected.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

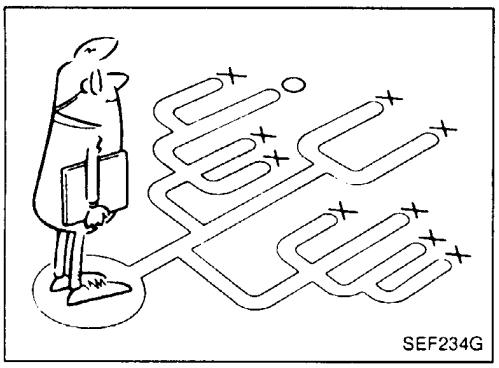
Use these triggers as follows:

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









Introduction

The engine has an ECM to control major systems such as fuel injection control, fuel injection timing control, glow control system, etc. The ECM accepts input signals from sensors and uses the data to instantly drive the electronic fuel injection pump based on current ambient conditions. It is essential that both input and output signals are correct and stable. In addition, it is important that there are no faults such as vacuum leaks, or other problems with the engine.

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

A visual check only may not be sufficient to determine the cause of the problems. A road test with CONSULT or a circuit tester connected should be performed. Follow the "Work Flow" on the next page.

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

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

KEY POINTS

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

SEF907L

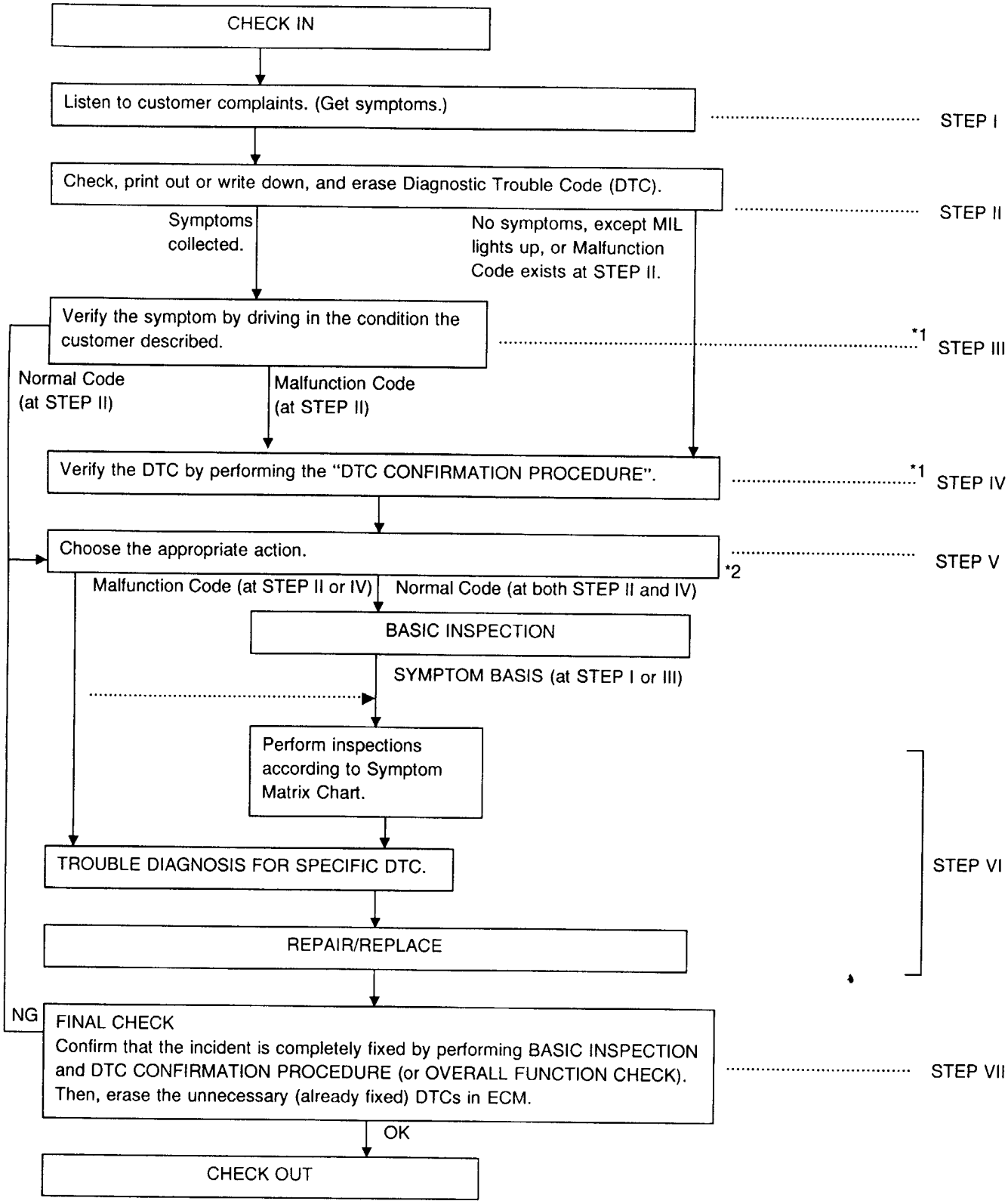
Diagnostic Worksheet

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

WORKSHEET SAMPLE

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

Work Flow



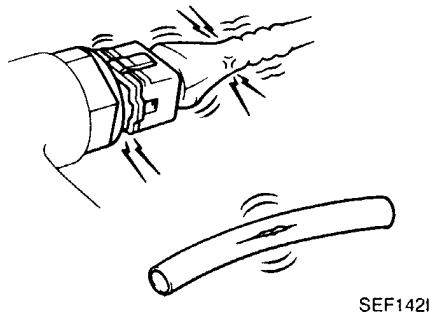
***1: If the incident cannot be duplicated, refer to GI section ("Incident Simulation Tests", "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT").**

***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR MAIN POWER SUPPLY AND GROUND CIRCUIT", EC-346.**

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORKSHEET" as shown on the next page.
STEP II	Before confirming the concern, check and write down (print out using CONSULT) the Diagnostic Trouble Code (DTC), then erase the code. Refer to EC-309.) 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. Refer to EC-332.)
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The "DIAGNOSTIC WORK SHEET" is useful to verify the incident. Connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section. If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the Diagnostic Trouble Code (DTC) by driving in (or performing) the "DTC CONFIRMATION PROCEDURE". Check and read the DTC by using CONSULT. During the DTC verification, be sure to connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. Refer to GI section. In case the "DTC CONFIRMATION PROCEDURE" is not available, perform the "OVERALL FUNCTION CHECK" instead. The DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "OVERALL FUNCTION CHECK" is the same as the DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to specific TROUBLE DIAGNOSIS FOR DTC. If the normal code is indicated, proceed to the BASIC INSPECTION. Refer to EC-324. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-332.
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-338. The "DIAGNOSTIC PROCEDURE" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. For details, refer to GI section ("Circuit Inspection", "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"). Repair or replace the malfunctioning 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-309.)

A



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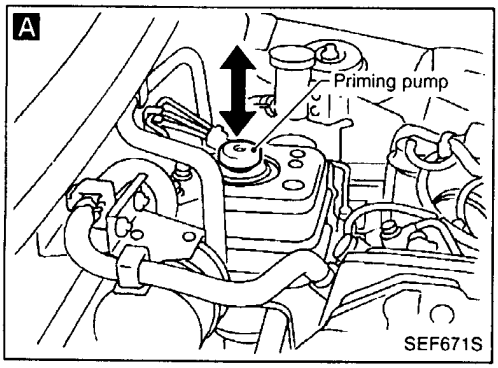

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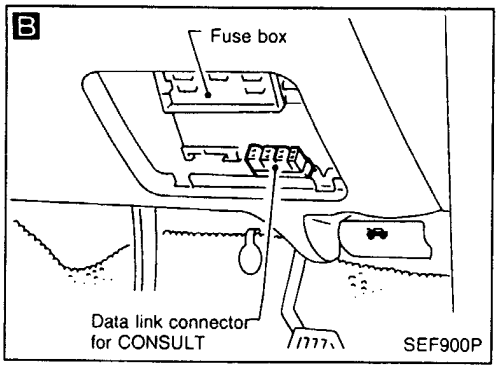

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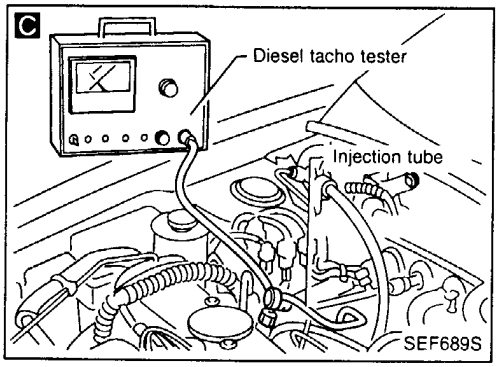

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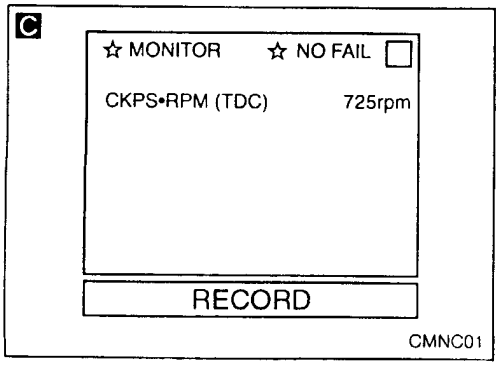


CMNC01

Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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

A

BEFORE STARTING

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

B

CONNECT CONSULT TO THE VEHICLE.

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-314.

DOES ENGINE START?

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

Yes

Run engine for 10 minutes.

C

CHECK IDLE SPEED.

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

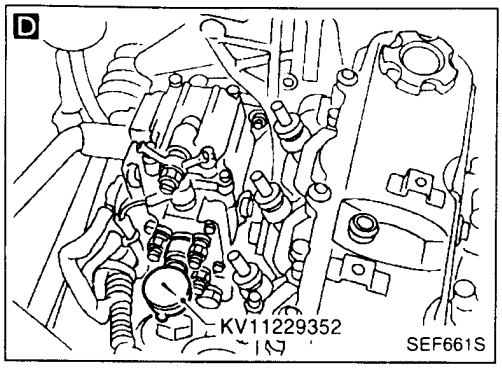
OR

Check idle speed using tachometer tester.

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)

D



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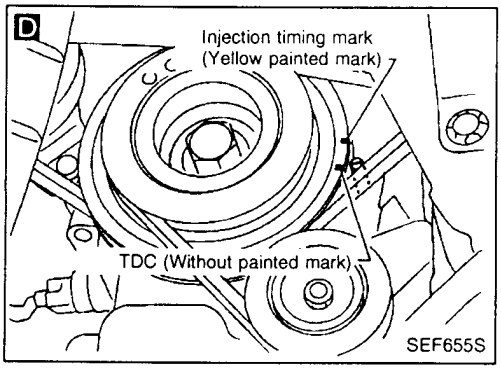

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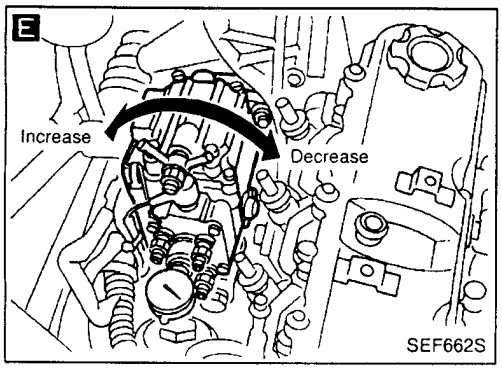

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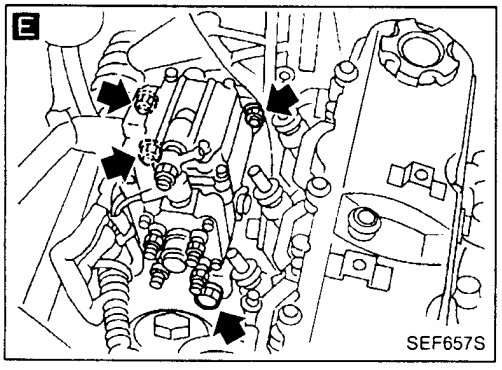


Ⓐ

D

CHECK INJECTION TIMING.

1. Set No. 1 piston at TDC on its compression stroke.
   TDC: Without painted mark
2. Remove injection tubes and air bleeder on the back of injection pump.
3. Set dial gauge so its indicator points to somewhere between 1.0 and 2.0 mm (0.039 and 0.079 in) on the scale.
4. Turn crankshaft 1 turn clockwise and check that dial gauge indicates the same value again.
5. Turn crankshaft counterclockwise about 100 degrees, then turn crankshaft slowly clockwise, and set dial gauge indicator to 0 mm at the position it stops.
6. Turn crankshaft clockwise and set the pump timing mark to the mark on the crankshaft pulley.
   Pump timing mark: Yellow painted mark
7. Read plunger lift.
   Plunger lift:
   0.82±0.07 mm (0.0323 ± 0.0028 in) at pump timing mark

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

OK → Bleed air from fuel system. After this inspection, unnecessary diagnostic trouble code No. might be displayed. Erase the stored memory in ECM. Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" (EC-309).

OK → INSPECTION END

NG

E

Adjusting

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

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

2. Tighten injection pump securing bolts and nuts.
   Nut:
   : 20 - 25 N·m
   (2.0 - 2.6 kg-m, 15 - 18 ft-lb)
   Bolt:
   : 25 - 35 N·m
   (2.6 - 3.6 kg-m, 18 - 26 ft-lb)
3. Remove dial gauge and install air bleeder with new washer.
4. Install injection tubes.
   Flare nut:
   : 14 - 20 N·m
   (1.4 - 2.0 kg-m, 10 - 15 ft-lb)
5. Bleed air from fuel system.
   Refer to "Water Draining, Fuel Filter Check and Replacement" of "ENGINE MAINTENANCE" in MA section.

→ Go to A

Diagnostic Trouble Code (DTC) Chart

ENGINE RELATED ITEMS

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

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

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

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

—: Not applicable

Check Items (Possible Cause)	DTC *1 Confirmation Procedure Quick Ref.	*2 Overall Function Check	MIL Illumination	Reference Page
• Harness or connectors (The sensor circuit is open or shorted.) • Camshaft position sensor (PUMP)	RUNNING	—	Lighting up	EC-351
• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor	IGN: ON	—	—	EC-355
• Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor	IGN: ON	—	Lighting up	EC-359
• Harness or connectors (The sensor circuit is open or shorted.) • Vehicle speed sensor	—	LIFTING	—	EC-363
• Harness or connectors (The sensor circuit is open or shorted.) • Control sleeve position sensor	RUNNING	—	Lighting up	EC-366
• Harness or connectors (The resistor circuit is open or shorted.) • Adjustment resistor	IGN: ON	—	—	EC-370
• Main power supply circuit (ECM terminals (116), (117)) and fuse • Harness or connectors (Electric governor and control sleeve position sensor circuit) • Electronic fuel injection pump • ECM • Electric governor	RUNNING (DRIVING)	—	Lighting up	EC-374

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

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

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

ENGINE RELATED ITEMS

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

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

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

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

—: Not applicable

Check Items (Possible Cause)	DTC *1 Confirmation Procedure Quick Ref.	*2 Overall Function Check	MIL Illumination	Reference Page
• Harness or connectors (Injection timing control valve, Needle lift sensor and Crankshaft position sensor (TDC) circuit) • Injection timing control valve • Needle lift sensor • Crankshaft position sensor • Air in fuel line	RUNNING (DRIVING)	—	—	EC-379
• Main power supply circuit (ECM terminals (116), (117)) and fuse. • Harness or connectors (Electric governor and control sleeve position sensor circuit) • Electric governor • Electronic fuel injection pump • ECM	RUNNING (DRIVING)	—	Lighting up	EC-374
• Harness or connectors (The switch circuit is shorted.) • Accelerator switch (F/C)	IGN: ON	—	Lighting up	EC-383
• Harness or connectors (Electric governor circuit is shorted.) • ECM	RUNNING (DRIVING)	—	Lighting up	EC-374
• ECM	IGN: ON	—	Lighting up	EC-387
• Harness or connectors (The cooling fan circuit is open or shorted.) • Cooling fan • Radiator hose • Radiator • Radiator cap • Water pump • Thermostat • Fan belt • Engine coolant temperature For more information, refer to "MAIN 12 CAUSES OF OVERHEATING". (EC-397)	—	IGN: ON (RUNNING)	Lighting up	EC-389
• ECM	IGN: ON	—	Lighting up	EC-387

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

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

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

ENGINE RELATED ITEMS

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

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

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

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

—: Not applicable

Check Items (Possible Cause)	DTC *1 Confirmation Procedure Quick Ref.	*2 Overall Function Check	MIL Illumination	Reference Page
• Harness or connectors (The sensor circuit is open or shorted.) • Needle lift sensor • Air in fuel line • Clogging No. 1 injection nozzle	RUNNING	—	—	EC-399
• Harness or connectors (The solenoid valve circuit is open or shorted.) • Fuel cut solenoid valve	RUNNING	—	Lighting up	EC-402
• Main power supply circuit (ECM terminals (116), (117)) and fuse.	RUNNING	—	Lighting up	EC-402
• Main power supply circuit (ECM terminals (116), (117)) and fuse. • ECM	RUNNING	—	Lighting up	EC-402
• Harness or connectors (The sensor circuit is open or shorted.) • Fuel temperature sensor	IGN: ON	—	—	EC-406
• Harness or connectors (The sensor circuit is open or shorted.) • Accelerator position sensor • Accelerator position switch • Accelerator switch (F/C)	IGN: ON	—	Lighting up	EC-410
• Harness or connectors (The sensor circuit is open or shorted.) • Crankshaft position sensor (TDC)	RUNNING	—	Lighting up	EC-414
• Harness or connectors [Accelerator switch and camshaft position sensor (PUMP) circuit] • Accelerator switch (F/C) • Camshaft position sensor (PUMP) • ECM	RUNNING	—	Lighting up	EC-418
• No failure	—	—	—	—

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

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

Symptom Matrix Chart

SYSTEM — Basic engine control system	SYMPTOM: HARD/NO START/RESTART (EXCP. HA) — NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	SYMPTOM: ENGINE STALL — AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR — BLACK SMOKE	WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator lamp illuminates.	Can be detected by CONSULT?	Fuel cut	Reference page	Feature of symptom, Check point
New CT/CS	AA				AB			AC	AD	AE		AF		AG	AH	AJ	AK	AL	AM	AP		HA					
Injection timing — Advanced	○	○	●	●			○		●					○	○					●				○		EC-325	
Injection timing — Retarded	○	○	●	●			○			●				○	○						●			○		EC-325	
Electric injection pump mainframe	●	●	●	●	○	○	○	○	○	●	○	○	○	●	●	○		○		●	○		○	○	○	—	*1
Injection nozzle	○	○	○	○	○	○	○		●	○	○		○	●	●					●						EC-301	*2
Glow system	○	○	●	●					●												●					EC-420	
Engine body	○	○	●	●	○	○	○		●	○	○		○	●	●		○	○	○		●					EM-section	*3
EGR system										●	●									●						EC-425	
Air cleaner and ducts										●	●									●				○		MA-section	*4

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

Symptom Matrix Chart (Cont'd)

SYMPTOM				Feature of symptom / Check point				Tachometer malfunction				Compensation according to engine coolant temperature does not function.				Injection timing cannot be controlled.				Engine runs on after turning ignition switch OFF.				Compensation for amount of fuel injected according to fuel temperature does not function.			
				Reference page				EC-351				EC-355				EC-359				EC-363				EC-366			
	Fuel cut																							○			
	Can be detected by CONSULT?							○	○			○	○			○	○			○				○	○		
	Malfunction indicator lamp illuminates.							○	○							○	○							○	○		
	DEAD BATTERY (UNDER CHARGE)				HA																						
	ABNORMAL SMOKE COLOR	WHITE SMOKE			AP																						
		BLACK SMOKE										○															
	EXCESSIVE OIL CONSUMPTION				AM																						
	EXCESSIVE FUEL CONSUMPTION				AL																						
	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE				AK																						
	SLOW/NO RETURN TO IDLE				AJ																						
	IDLING VIBRATION				AH											○	○										
	ROUGH IDLE/HUNTING				AG											○	○										
	LOW IDLE				AF											○	○										
	HI IDLE																										
	POOR ACCELERATION				AE							○	○							○							
	LACK OF POWER											○	○														
	SPARK KNOCK/DETONATION				AD																						
	HESITATION/SURGING/FLAT SPOT				AC			○	○			○	○														
	ENGINE STALL	WHEN DECELERATING			AB			○	○							○	○							○	○		
		DURING DRIVING						○	○															○	○		
		AT IDLE						○								○	○							○	○		
	HARD/NO START/ RESTART (EXCP. HA)	HARD TO START WHEN ENGINE IS HOT			AA																			○	○		
		HARD TO START WHEN ENGINE IS COLD														○											
		NO START (without first firing)																									
		NO START (with first firing)																									

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

Symptom Matrix Chart (Cont'd)

Feature of symptom / Check point				Reference page	Start control does not function.	Air conditioner does not stop operating.	Air conditioner does not work.			Accelerator position sensor NG signal is output.		Engine does not stop		Does not stop operating.	Glow lamp does not turn on	Glow lamp does not turn off.	Ground short makes engine unable to stop.	Air conditioner does not operate.	Air conditioner does not stop operating.	
					EC-431	EC-440	EC-437			EC-433	EC-433	EC-346	EC-346	EC-425	EC-420	EC-346	EC-346	EC-440	EC-387	
SYMPTOM	Fuel cut															○		●	○	
	Can be detected by CONSULT?									○	○		○						⊙	
	Malfunction indicator lamp illuminates.									○	○		○						○	
	DEAD BATTERY (UNDER CHARGE)			HA															○	
	ABNORMAL SMOKE COLOR	WHITE SMOKE		AP															○	
		BLACK SMOKE												○	○				○	
	EXCESSIVE OIL CONSUMPTION			AM															○	
	EXCESSIVE FUEL CONSUMPTION			AL															○	
	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE			AK															○	
	SLOW/NO RETURN TO IDLE			AJ															○	
	IDLING VIBRATION			AH			○	○											○	
	ROUGH IDLE/HUNTING			AG			○	○									○		○	
	LOW IDLE			AF					○										○	
	HI IDLE																		○	
	POOR ACCELERATION			AE						○	○								○	
	LACK OF POWER									○	○							○	○	
	SPARK KNOCK/DETONATION			AD															○	
	HESITATION/SURGING/FLAT SPOT			AC						○	○								○	
	ENGINE STALL	WHEN DECELERATING		AB			○		○										○	
		DURING DRIVING										○	○						○	
		AT IDLE							○							○			○	
	HARD/NO START/ RESTART (EXCP. HA)	HARD TO START WHEN ENGINE IS HOT		AA	○														○	
		HARD TO START WHEN ENGINE IS COLD			○														○	
		NO START (without first firing)									○	○			○				○	
		NO START (with first firing)				○								○	○				○	

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

ECCS

CONSULT Reference Value in Data Monitor Mode

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.

MONITOR ITEM	CONDITION		SPECIFICATION
CKPS•RPM (TDC) CKPS•RPM (REF) CKPS•RPM-PUMP	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
FUEL TEMP SEN	• Engine: After warming up		More than 40°C (104 °F)
ACCEL POS SEN	• Ignition switch: ON (Engine stopped)	Accelerator pedal: release	0.40 - 0.60V
		Accelerator pedal: depress	Approx. 4.0V
FULL ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: depress	ON
		Except above	OFF
ACCEL SW (FC)	• Ignition switch: ON (Engine stopped)	Accelerator pedal: release	CLOSE
		Accelerator pedal: slightly open	OPEN
OFF ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: release	ON
		Accelerator pedal: slightly open	OFF
C/SLEEV POS/S	• Engine: After warming up		1.0 - 3.5V
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
P/N POSI SW	• Ignition switch: ON	Shift lever: Neutral	ON
		Except above	OFF
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: "OFF"	OFF
		Air conditioner switch: "ON" (Compressor operates.)	ON
IGN SW	• Ignition switch: ON → OFF		ON → OFF
MAS AIR/FL SE	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	1.9 - 2.3V
		2,000 rpm	2.5 - 2.9V
ACT INJ TIMG	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	-6.5° to -9.0°
		2,000 rpm	-7.0° to -12.5°
INJ TIMG C/V	• Engine: After warming up, idle the engine.		Approx. 50%
DECELER F/CUT	• Engine: After warming up	Idle	OFF
		When accelerator pedal is released quickly with engine speed at 3,000 rpm or more.	ON
FUEL CUT S/V	• Ignition switch: ON → OFF		ON → OFF
AIR COND RLY	• Air conditioner switch: OFF → ON		OFF → ON
GLOW RLY	• Refer to EC-424.		

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

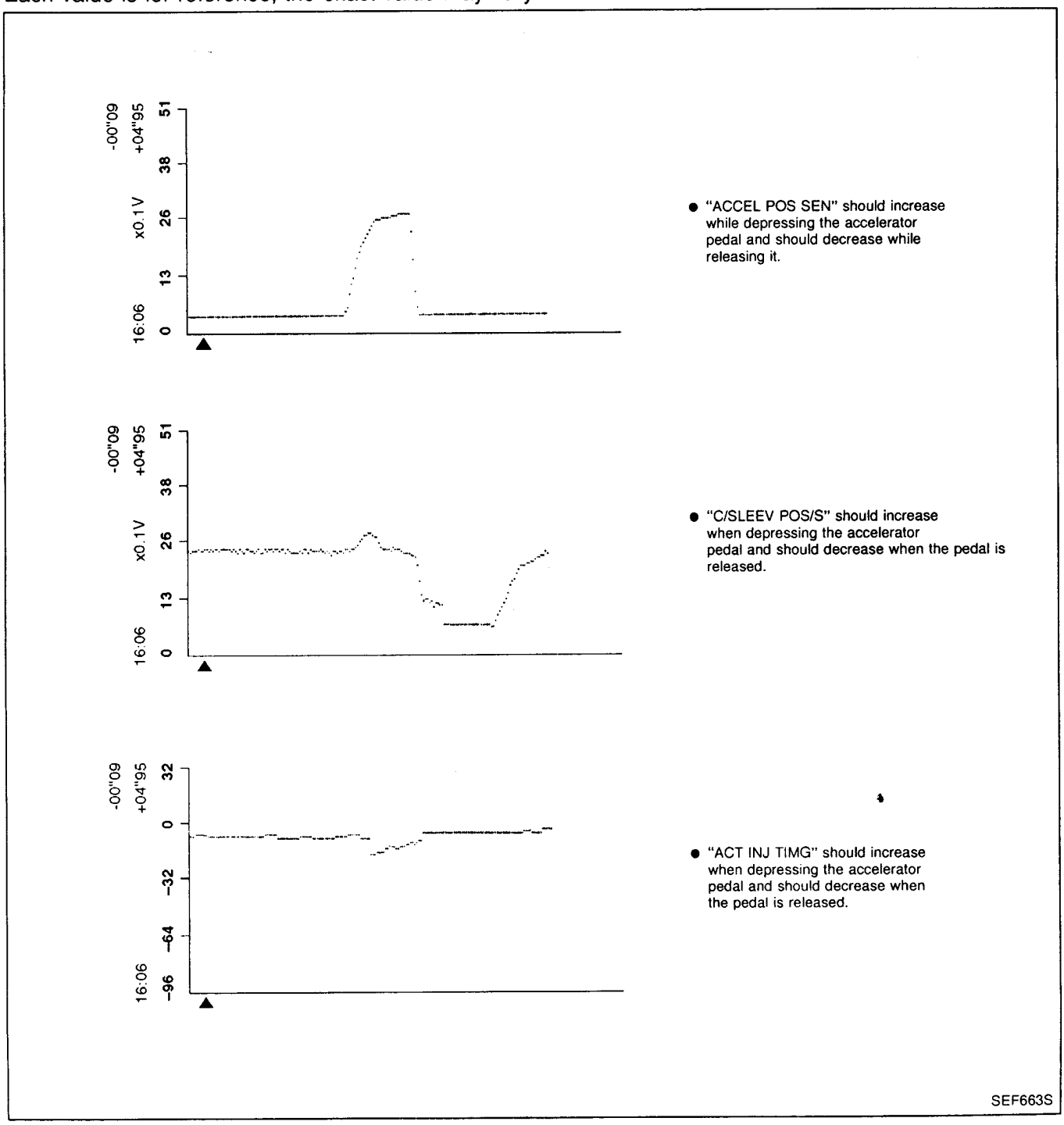
MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	• When cooling fan is stopped.		OFF
	• When cooling fan operates at low speed.		LOW
	• When cooling fan operates at high speed.		HI
EGRC SOL/V A	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		2,800 rpm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

Major Sensor Reference Graph in Data Monitor Mode

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

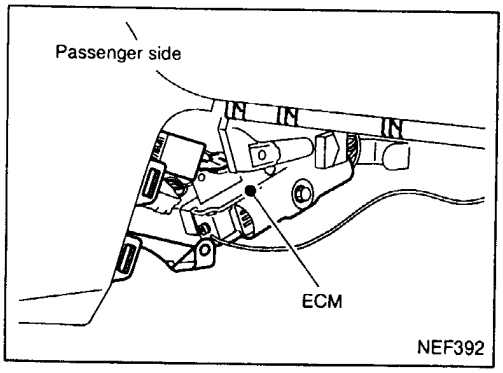
ACCEL POS SEN, C/SLEEV POS/S, ACT INJ TIMG

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



- "ACCEL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.
- "C/SLEEV POS/S" should increase when depressing the accelerator pedal and should decrease when the pedal is released.
- "ACT INJ TIMG" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

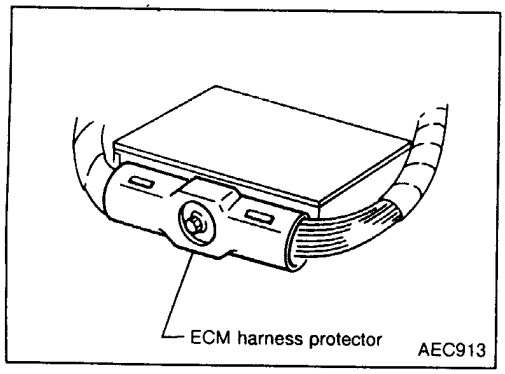
SEF663S



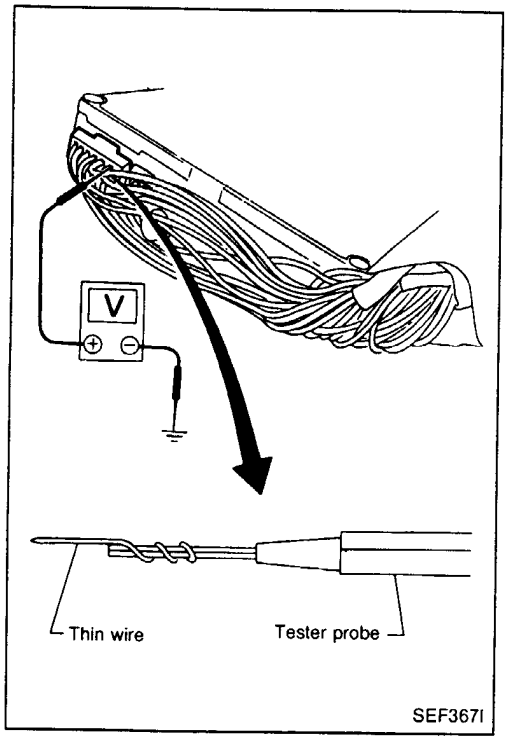
ECM Terminals and Reference Value

PREPARATION

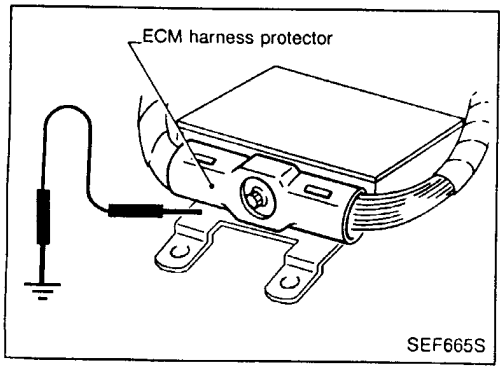
1. ECM is located beneath heater unit. For this inspection remove the center console under cover for passenger side.



2. Remove ECM harness protector.



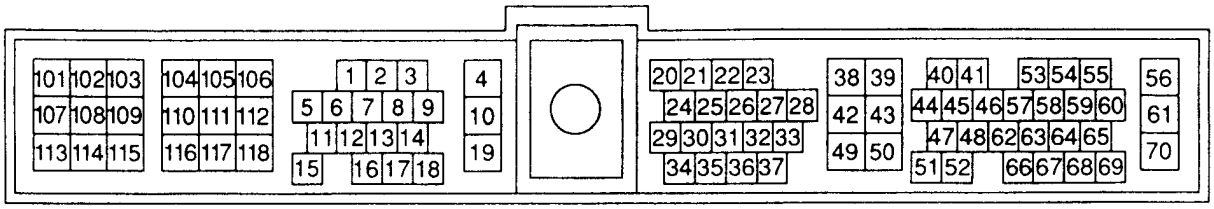
3. Perform all voltage measurements for ECM (ECC-D Control Module) from the harness side with the connector connected. Extend tester probe as shown to perform tests easily.
   - Open harness securing clip to make testing easier.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for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



Be sure ECM unit is properly grounded before checking.

ECM Terminals and Reference Value (Cont'd)

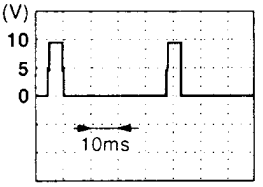
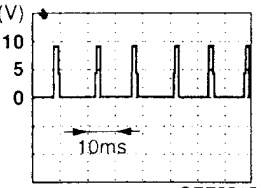
ECM HARNESS CONNECTOR TERMINAL LAYOUT



SEF064P

ECM INSPECTION TABLE

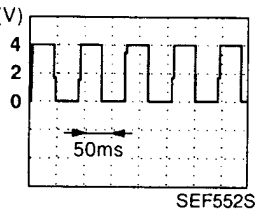
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
4	W/G	ECCS relay (Self-shut-off)	Engine is running. Ignition switch "LOCK" └ For a few seconds after turning ignition switch to the "LOCK" position	0 - 1V
			Ignition switch "LOCK" └ Following a few seconds delay after turning ignition switch to the "LOCK" position	BATTERY VOLTAGE (11 - 14V)
5	L/OR	Tachometer	Engine is running. (Warm-up condition) └ Idle speed	Approximately 1.1 - 1.5V  SEF550S
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 1.1 - 1.5V  SEF551S
10	G	Fuel temperature sensor	Engine is running.	0.6 - 4.8V Output voltage varies with fuel temperature.

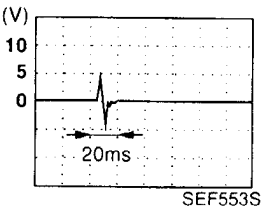
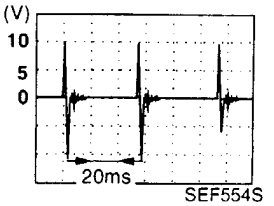
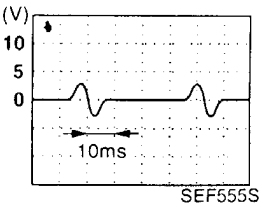
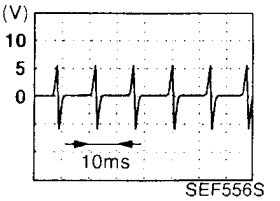
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
13	LG	Cooling fan relay (High speed)	Engine is running. — Cooling fan is not operating. └ Cooling fan is operating at low speed.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating at high speed.	Approximately 0.5V
14	LG/R	Cooling fan relay (Low speed)	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating.	Approximately 0.4V
15	G/Y	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON"	Approximately 0.4V
			Engine is running. └ A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
16	OR	Glow lamp	Ignition switch "ON" └ Glow lamp is "ON".	Approximately 1.0V
			Ignition switch "ON" └ Glow lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)
18	OR/L	Malfunction indicator lamp	Ignition switch "ON"	Approximately 1.0V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
19	L/OR	Engine coolant temperature sensor	Engine is running.	0.6 - 4.8V Output voltage varies with engine coolant temperature.
20	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
21	L/W	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			Engine is running. └ Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
22	G/OR	Neutral position switch	Ignition switch "ON" └ Gear position is "Neutral"	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	BATTERY VOLTAGE (11 - 14V)

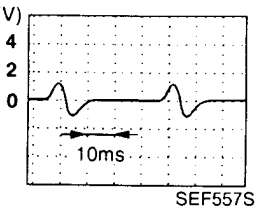
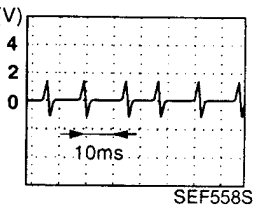
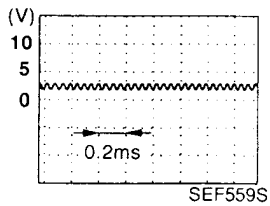
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
23	Y	Accelerator position sensor	Ignition switch "ON" └ Accelerator pedal released	0.4 - 0.6V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4.0V
26	Y/G	Vehicle speed sensor	Engine is running. ├ Lift up the vehicle. ├ In 2nd gear position └ Vehicle speed is 40 km/h (25 mph)	0 - Approximately 4.2V  SEF552S
28 33	B/W	Camshaft position sensor (PUMP) ground	Engine is running. └ Idle speed	Approximately 0V
29	L	Accelerator switch (F/C)	Ignition switch "ON" └ Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
31	L/Y	Accelerator position switch (Idle)	Ignition switch "ON" └ Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
32	P	Accelerator position switch (Full)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0V
			Ignition switch "ON" └ Accelerator pedal fully depressed	BATTERY VOLTAGE (11 - 14V)

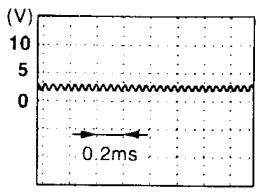
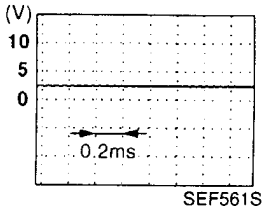
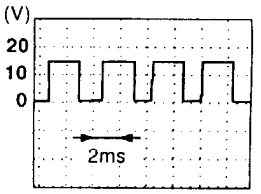
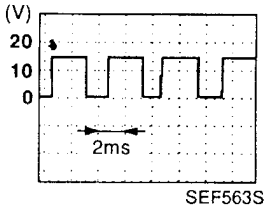
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
34	W	Needle lift sensor	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.04 - 0.08V  SEF553S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 0.05 - 0.09V  SEF554S
35	W	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.9 - 2.3V
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	2.5 - 2.9V
38	BR	Ignition switch	Ignition switch "LOCK"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39 43	B	ECCS ground	Engine is running. └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
40 44	W	Crankshaft position sensor (TDC) (Signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V  SEF555S
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0V  SEF556S

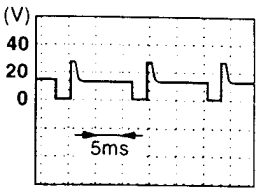
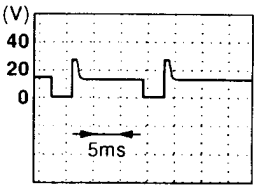
ECM Terminals and Reference Value (Cont'd)

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

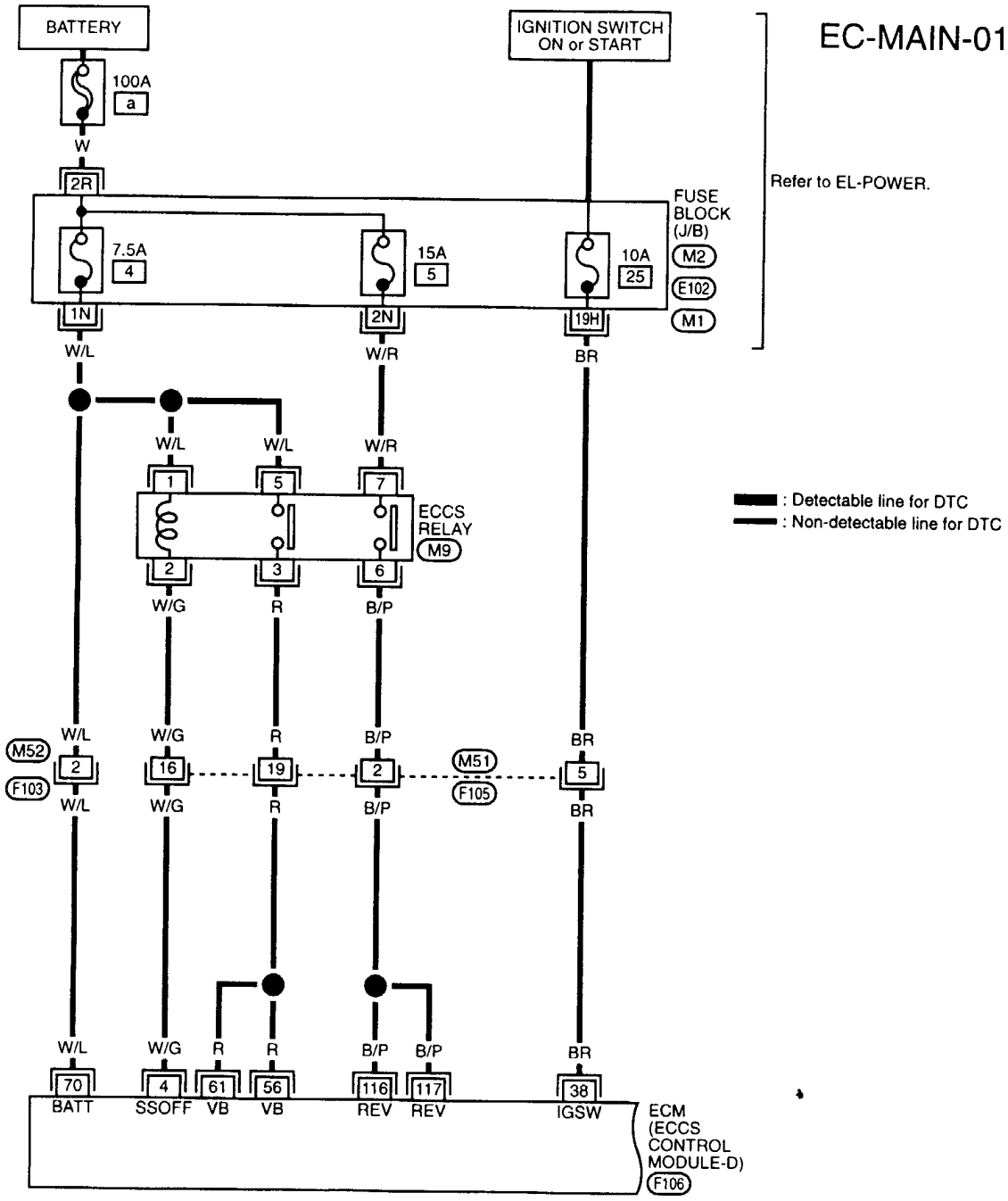
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
62 66	R G	Control sleeve position sensor ground	Engine is running. └ Idle speed	Approximately 2.6V  SEF560S
63 67	W	Control sleeve position sensor	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.6V  SEF561S
70	W/L	Power supply (Back-up)	Ignition switch "LOCK"	BATTERY VOLTAGE (11 - 14V)
101 107	B/Y	Electric governor	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
102 108	B/L	Electric governor ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 9.7 - 9.9V  SEF562S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 10.0 - 10.2V  SEF563S
103	P	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Engine speed is 2,800 rpm	Approximately 0.3V

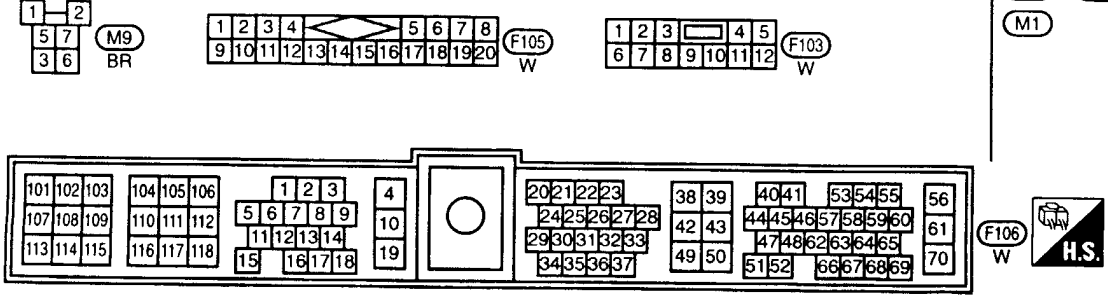
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
104 110	SB	Injection timing control valve	Engine is running. (Warm-up condition) └ Idle speed	Approximately 10 - 12V  SEF564S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 9 - 14V  SEF565S
106 112 118	B	ECCS ground	Engine is running. └ Idle speed	Approximately 0V
111	W/R	Glow relay	Refer to "Glow control System".	
113 115	B/Y	Fuel cut solenoid valve	Ignition switch "LOCK"	Approximately 0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
116 117	B/P	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

Main Power Supply and Ground Circuit



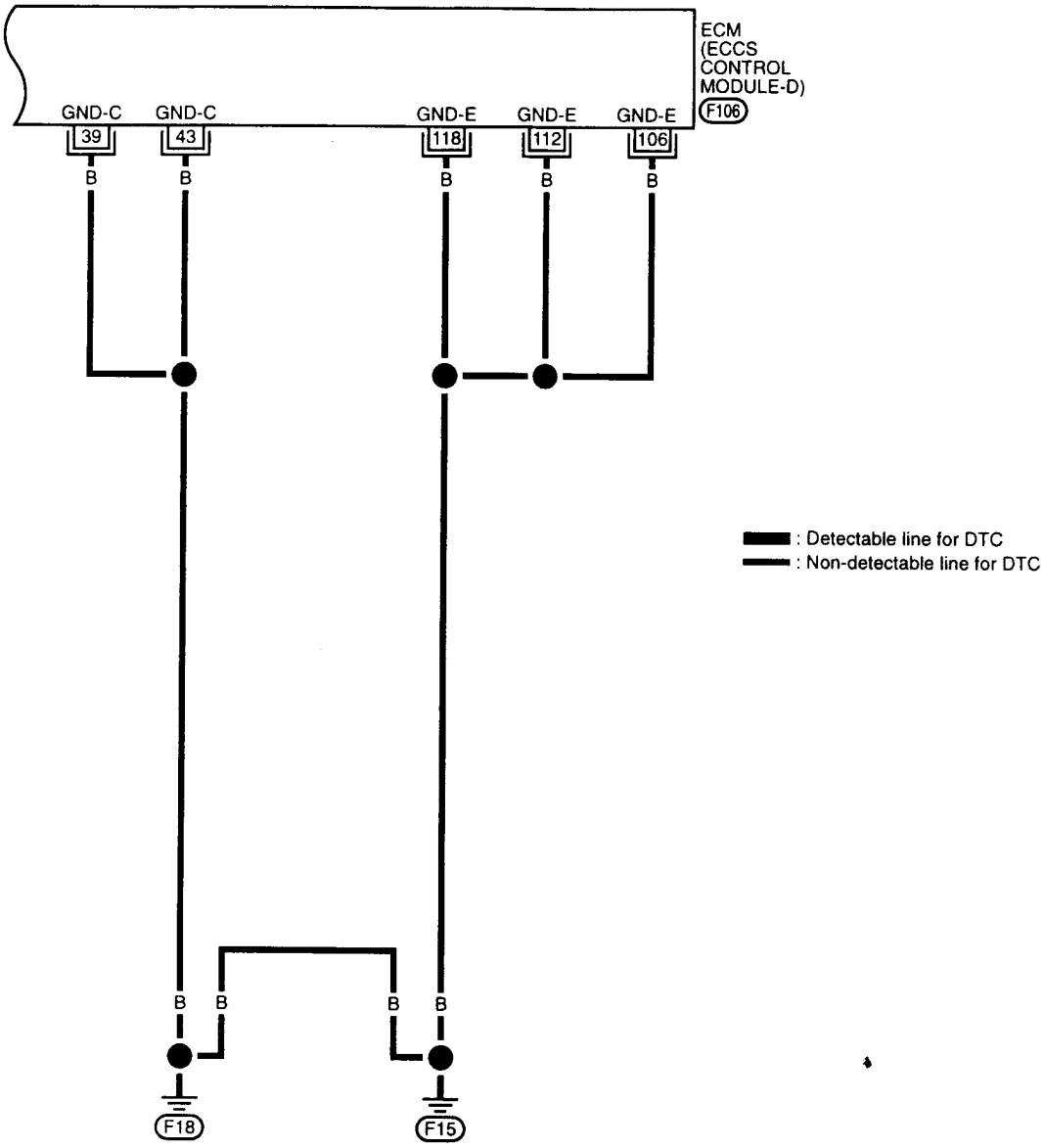
Refer to last page (Foldout page).
M2 , E102
M1

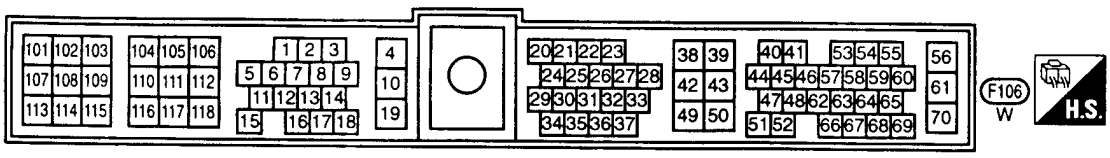


SEF419S

Main Power Supply and Ground Circuit (Cont'd)

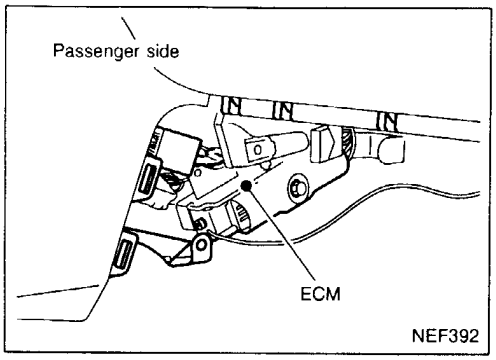
EC-MAIN-02

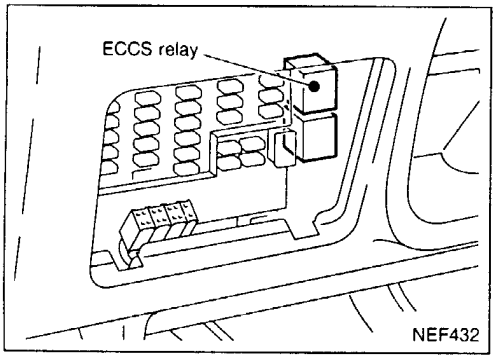


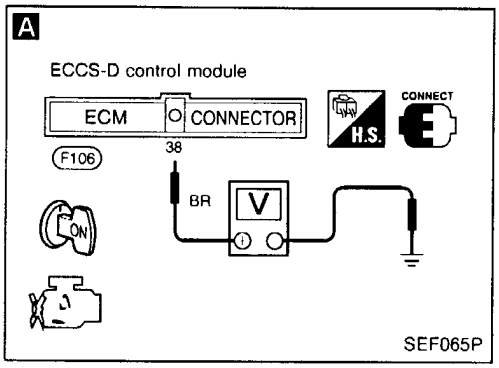


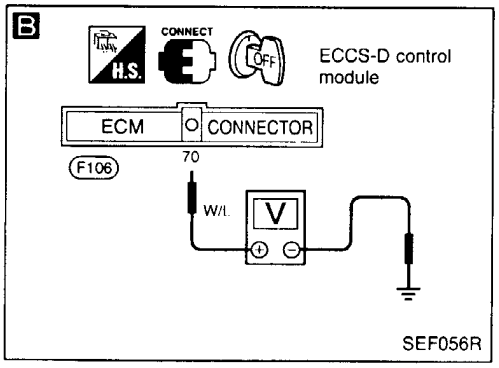
SEF420S

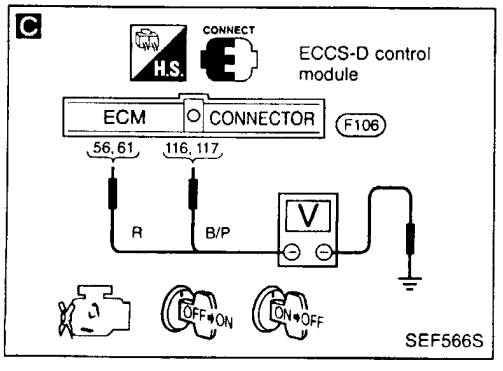
Main Power Supply and Ground Circuit (Cont'd)











INSPECTION START

Start engine.
Is engine running?

No → **A**

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

If NG, check the following:
- 10A fuse
- Harness connectors (M51), (F105)
- Harness for open or short-circuit between ECM (ECCS-D control module) and ignition switch.

If NG, replace 10A fuse or repair harness or connectors.

OK → Go to H "CHECK GROUND CIRCUIT" on page EC-350.

Yes → **B**

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

NG → Check the following:
- Harness connectors (M52), (F103)
- 7.5A fuse
- 100A fusible link.
- Harness for open or short-circuit between ECM (ECCS-D control module) and battery.

If NG, replace fuse or fusible link or repair harness or connectors.

OK → **C**

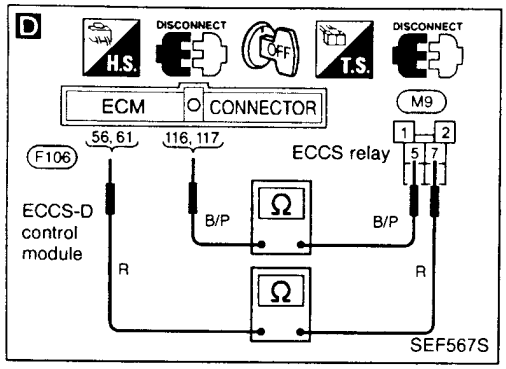
CHECK POWER SUPPLY-III.
1. Turn ignition switch to "ON" position and then to "LOCK" position.
2. Check voltage between ECM terminals (56), (61), (116), (117) and ground with CONSULT or tester.
   Voltage:
   After turning ignition switch to "LOCK" position, battery voltage will exist for a few seconds,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

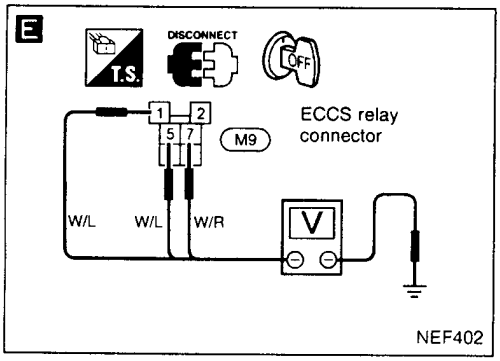
OK → Go to H "CHECK GROUND CIRCUIT" on page EC-350.

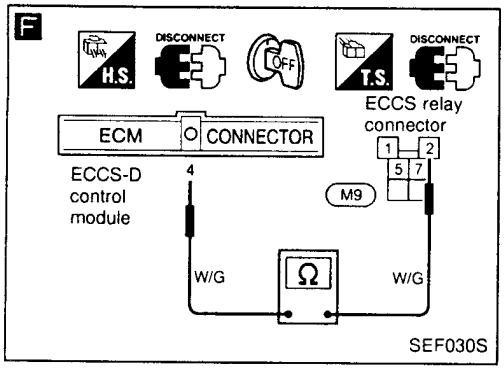
Case-1: Battery voltage does not exist.
Case-2: Battery voltage exists for more than a few seconds.

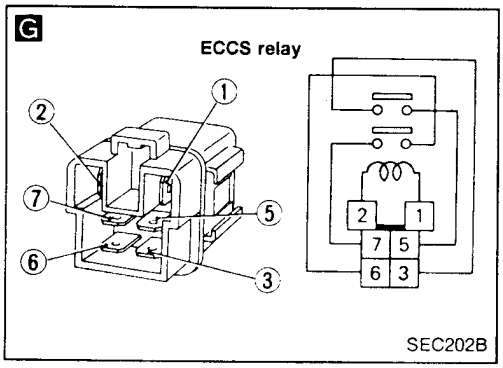
NG
- Case-2 → Go to G "CHECK ECCS RELAY" on next page.
- Case-1 → (A)

Main Power Supply and Ground Circuit (Cont'd)









Ⓐ

D

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM

1. Disconnect ECM (ECCS-D control module) harness connector.
2. Disconnect ECCS relay harness connector.
3. Check harness continuity between ECM (ECCS-D control module) connector terminals (56), (61) and ECCS relay connector terminal (7); and ECM (ECCS-D control module) connector terminals (116), (117) and ECCS relay connector terminal (5).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M51), (F105)
- Harness for open or short-circuit between ECCS relay and ECM.

If NG, repair harness or connectors.

OK ↓

E

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.

Check voltage between ECCS relay connector terminals (1), (5), (7) and ground with CONSULT or voltage tester.

Voltage: Battery voltage

NG → Check the following:
- 15A fuse
- 7.5A fuse
- 100A fusible link.
- Harness for open or short-circuit between ECCS relay and battery.

If NG, replace fuses or fusible link or repair harness or connectors.

OK ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.

Check harness continuity between ECM (ECCS-D control module) connector terminal (4) and ECCS relay connector terminal (2).

Continuity should exist.

If OK, check harness for short-circuit.

NG →
- Check harness connectors (M51), (F105)

Repair harness or connectors.

OK ↓

G

CHECK ECCS RELAY.

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

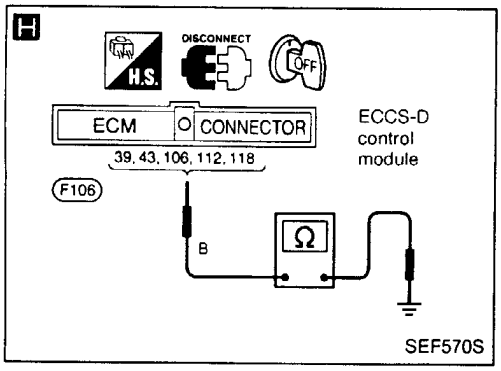
12V ((1) - (2)) applied:
Continuity exists.
No voltage applied:
No continuity

NG → Replace ECCS relay.

OK ↓

Ⓑ

Main Power Supply and Ground Circuit (Cont'd)



Ⓑ

H

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM (ECCS-D control module) harness connector.
3. Check harness continuity between ECM (ECCS-D control module) connector terminals ㊴, ㊸, ⑩⑥, ⑪②, ⑪⑧ and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

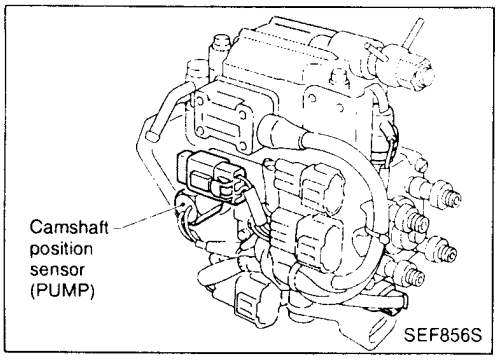
NG → Repair harness or connectors.

OK ↓

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector.

↓

INSPECTION END



Camshaft Position Sensor (CMPS) (PUMP)

The camshaft position sensor (PUMP) is located on the fuel injection pump.
The sensor is of an electro-magnetic proximity type, which consists of a permanent magnetic core surrounded by a coil to form a "pick-up" which is sensitive to localised changes in the electro-magnetic field.
When the engine is running, the gap between the sensor and drive shaft rotating plate will periodically change causing fluctuations in the sensor's magnetic field which effects a proportional change of voltage signal induced in the sensor's coil.
The ECM receives the voltage signal (4 pulses/2 engine revolutions) and uses the data for tachometer indication.

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

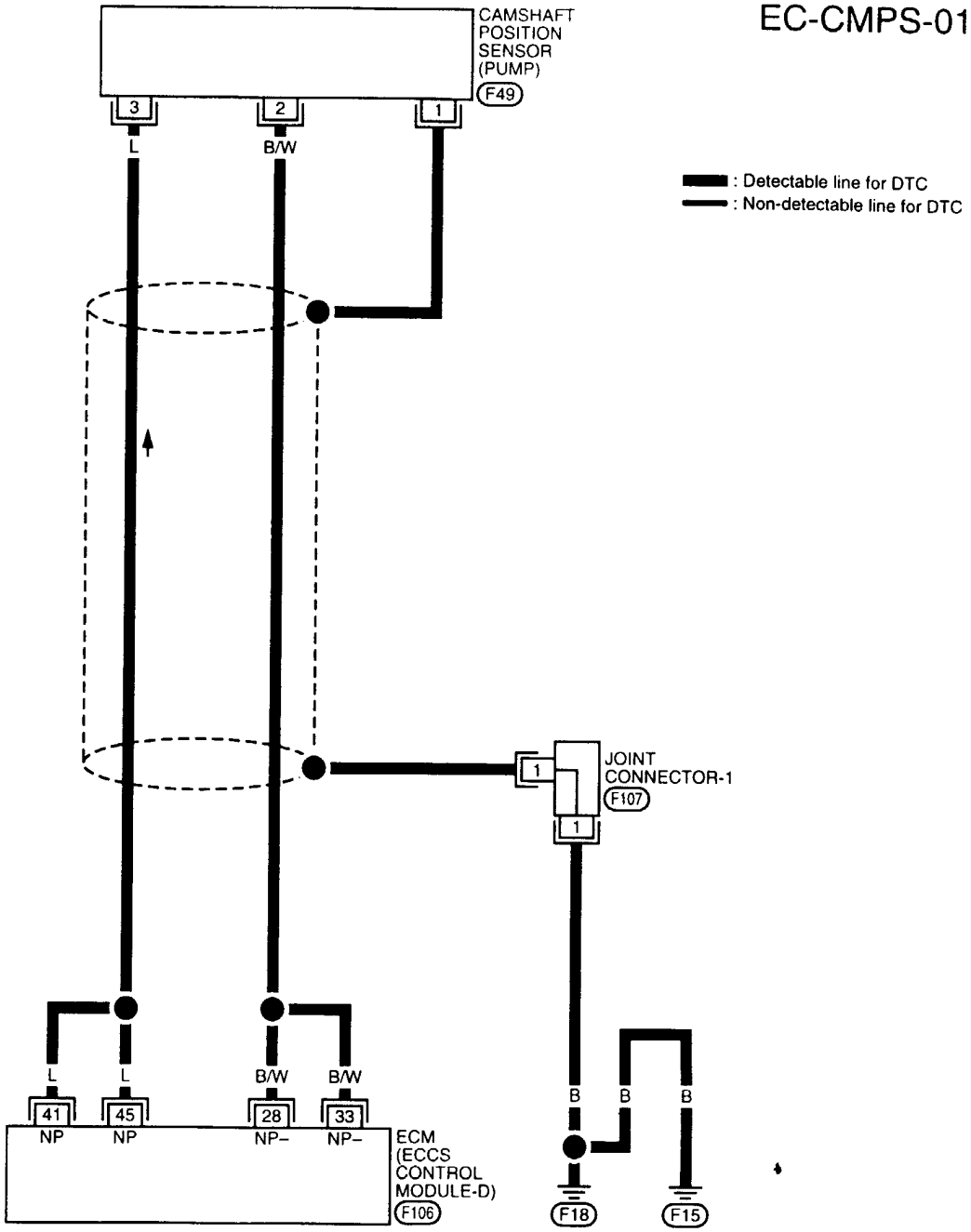
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 2 seconds at idle speed.

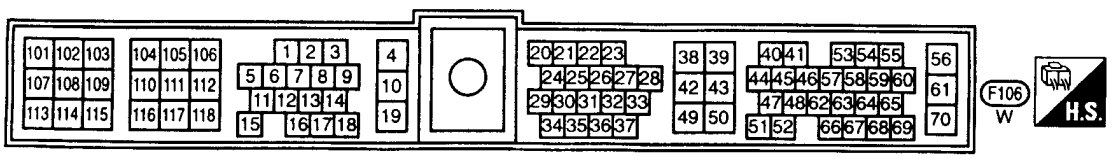
OR

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

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

EC-CMPS-01

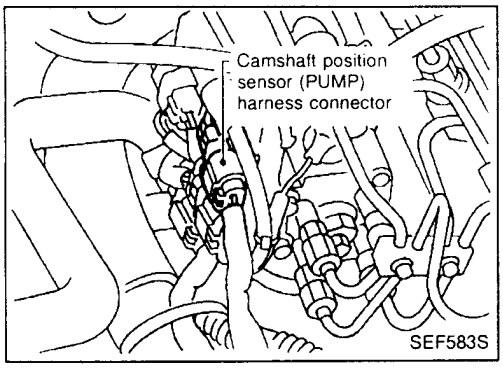


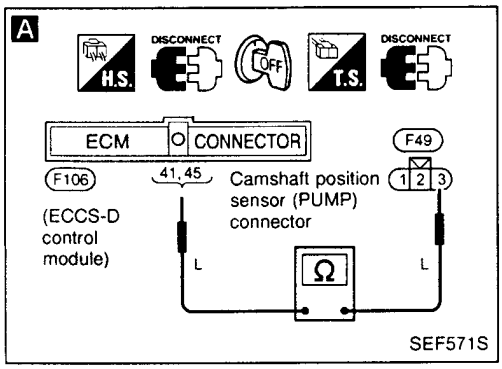


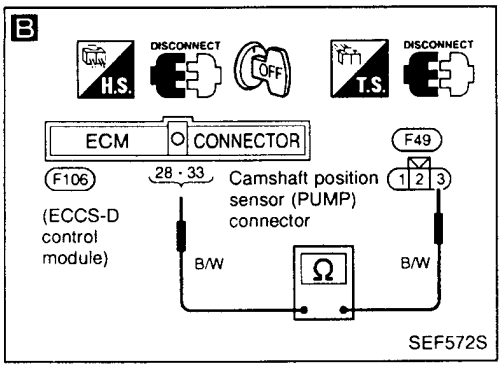
SEF422S

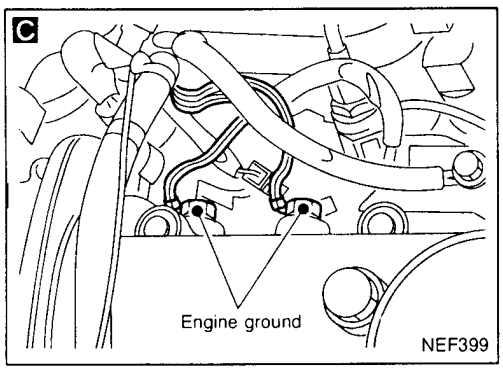
Camshaft Position Sensor (CMPS) (PUMP) (Cont'd)

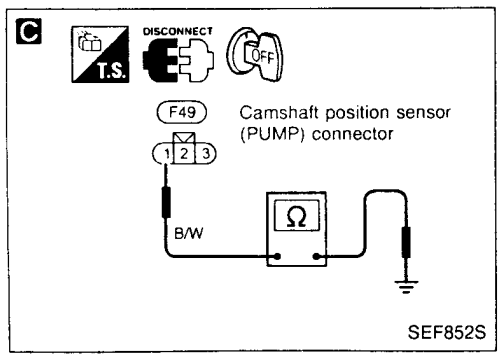
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch to "LOCK" position.
2) Disconnect camshaft position sensor (PUMP) harness connector and ECM (ECCS-D control module) harness connector.
3) Check harness continuity between camshaft position sensor connector terminal ③ and ECM (ECCS-D control module) connector terminals ㊶, ㊺.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT – I.
1) Turn ignition switch to "LOCK" position.
2) Check harness continuity between camshaft position sensor (PUMP) connector terminal ② and ECM (ECCS-D control module) connector terminals ㉘, ㉝.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

C

CHECK GROUND CIRCUIT – II.
1) Loosen and retighten engine ground & screws.
2) Check harness continuity between camshaft position sensor (PUMP) connector terminal ① and engine ground.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

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

NG → Replace camshaft position sensor (PUMP).

OK

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

Trouble is not fixed.

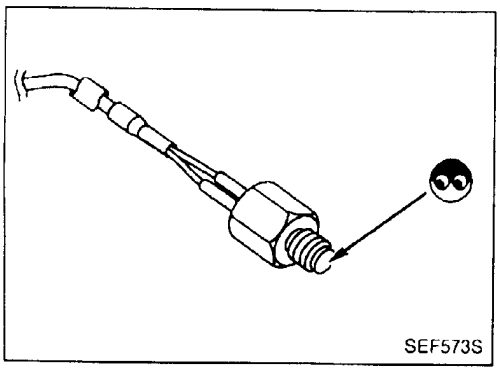
Check ECM (ECCS-D control module) pin terminals for damage or the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

INSPECTION END

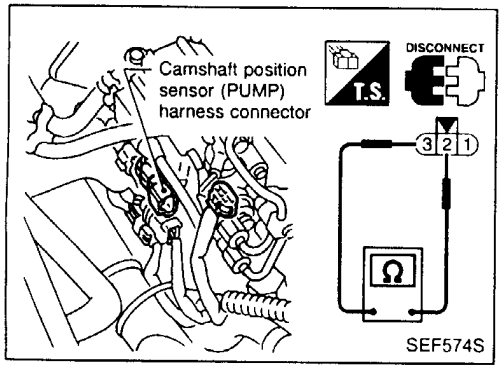
Camshaft Position Sensor (CMPS) (PUMP) (Cont'd)

COMPONENT INSPECTION

Camshaft position sensor (PUMP)

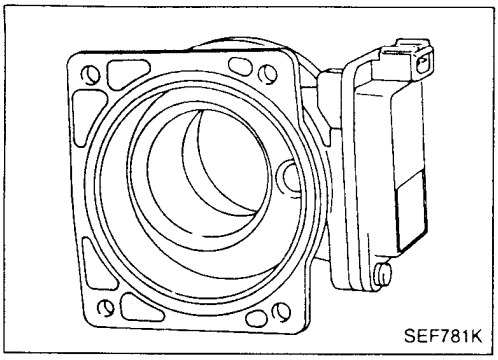

SEF573S

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



SEF574S

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


SEF781K

Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the intake air flow rate by analysing a part of the entire flow. Measurements from the mass air flow sensor are received by the ECM (ECCS-D control module) as an electrical input signal which has a voltage level proportional to the amount of heat emitted from the hot wire placed in the stream of the intake air.

When intake air flows into the intake manifold through a route around the hot wire, the heat generated from the hot wire is convected away by the air. The intensity of heat detected depends on the volume of air flow and in addition, the temperature of the hot wire is automatically controlled to within a defined temperature range °C (°F).

Therefore, when the volume of the air flow is increased it is necessary to supply the hot wire with more electric current in order to maintain the temperature of the hot wire. This enables the ECM (ECCS-D control module) to determine the volume of the air flow by means of the corresponding electric change.

Diagnostic Trouble Code No.	Malfunction is detected when . . .	Check Items (Possible Cause)
12	• An excessively high or low voltage from the sensor is entered to ECM (ECCS-D control module).	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

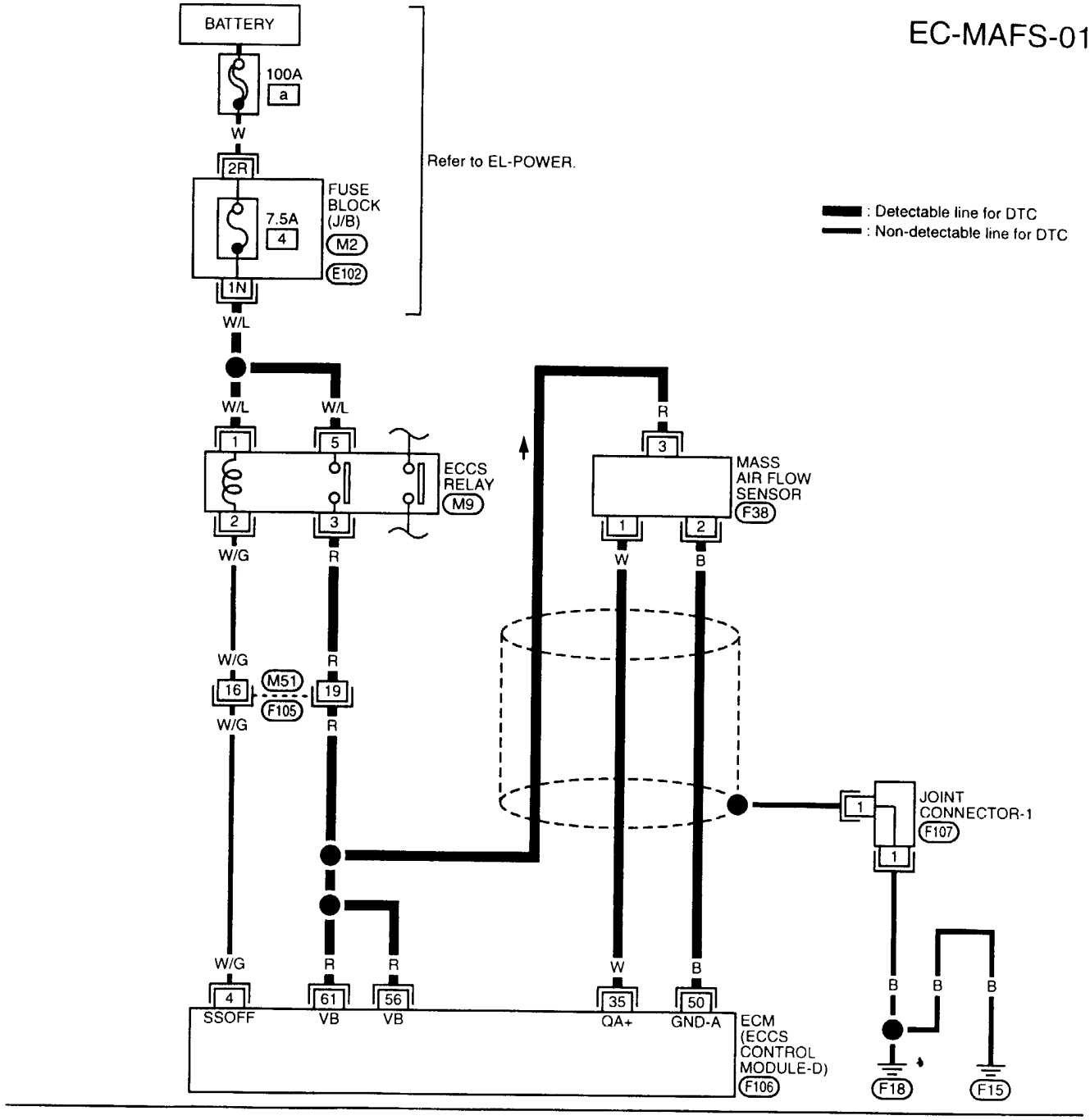
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait for at least 15 seconds.

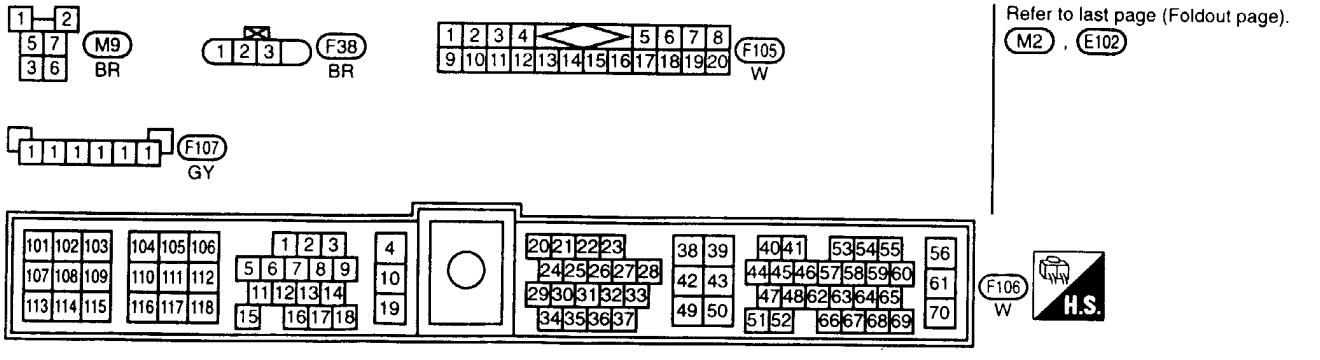
OR

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

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

EC-MAFS-01



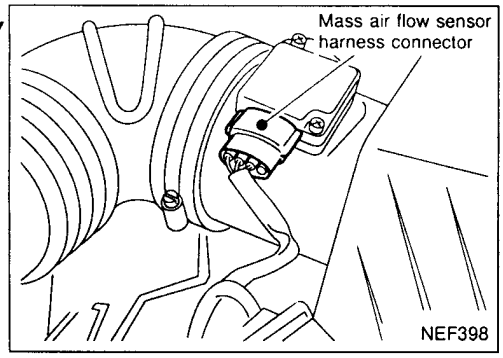


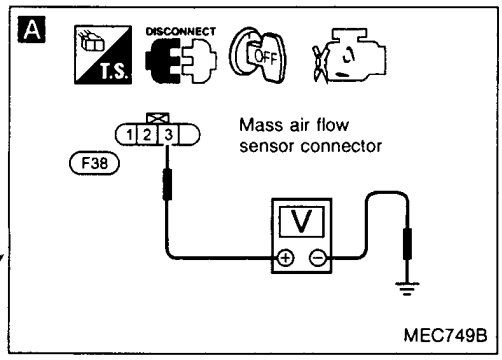
Refer to last page (Foldout page).
M2 , E102

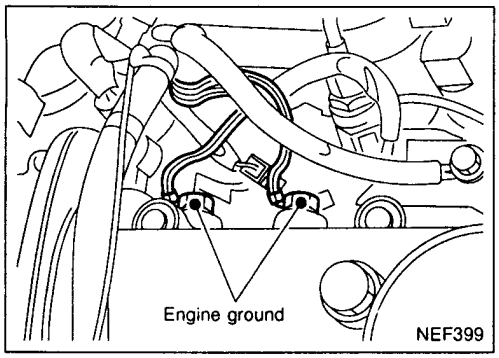
SEF421S

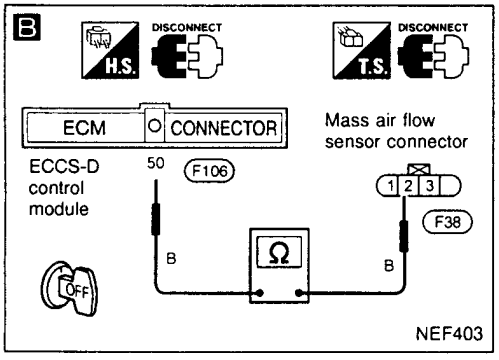
Mass Air Flow Sensor (MAFS) (Cont'd)

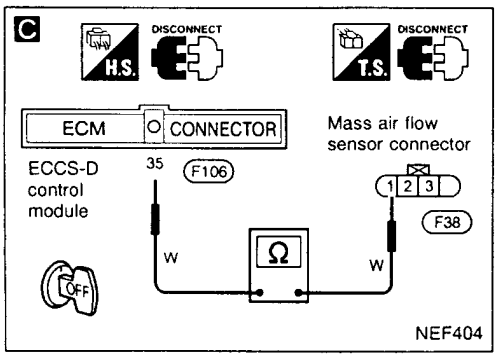
DIAGNOSTIC PROCEDURE











INSPECTION START

A

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

Voltage: Battery positive voltage

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM (ECCS-D control module) harness connector.
3. Loosen and retighten engine ground screws.
4. Check harness continuity between mass air flow sensor connector terminal ② and ECM (ECCS-D control module) terminal ⑤⓪.

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

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between mass air flow sensor connector terminal ① and ECM (ECCS-D control module) connector terminal ③⑤.

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

NG → Repair harness or connectors.

OK

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

NG → Replace mass air flow sensor.

OK

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

Trouble is not fixed.

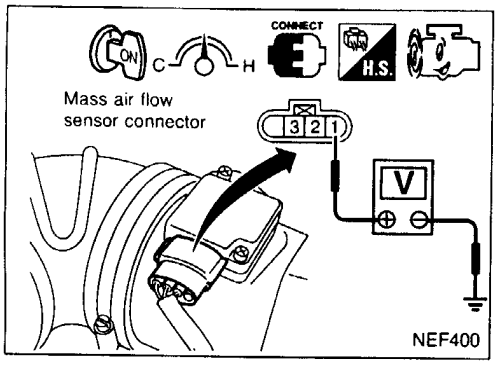
Check ECM (ECCS-D control module) pin terminals for damage or the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

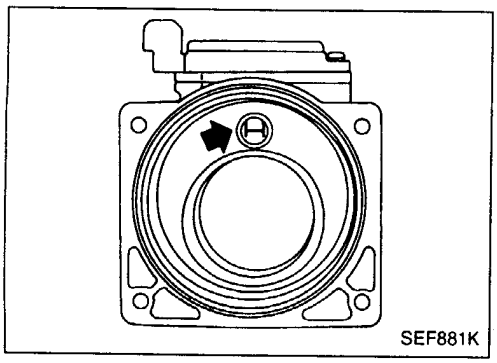
INSPECTION END

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

COMPONENT INSPECTION

Mass air flow sensor

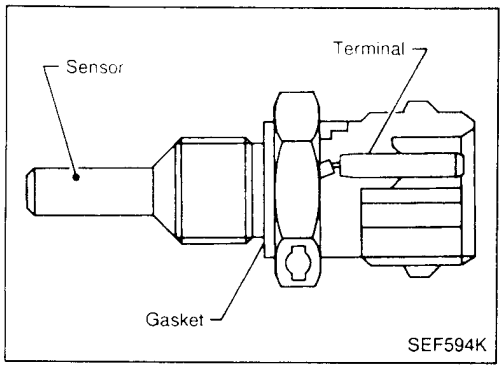


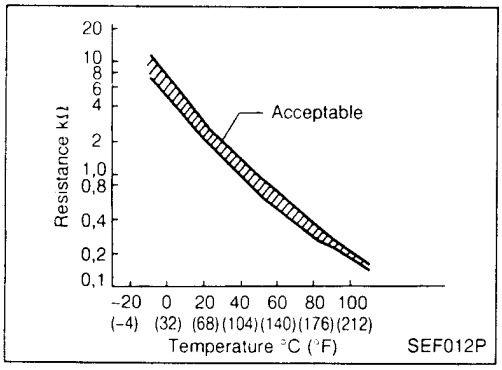


1. Turn ignition switch to "ON" position.
2. Start engine and warm it up sufficiently.
3. Check voltage between mass air flow sensor connector terminal ① and ground.

Conditions	Voltage V
Ignition switch "ON" position (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up sufficiently.)	1.9 - 2.3

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





Engine Coolant Temperature (ECT) Sensor

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

〈Reference data〉

Engine coolant temperature °C (°F)	Voltage (V)	Resistance (kΩ)
-10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.3	0.68 - 1.00
90 (194)	1.0	0.236 - 0.260

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

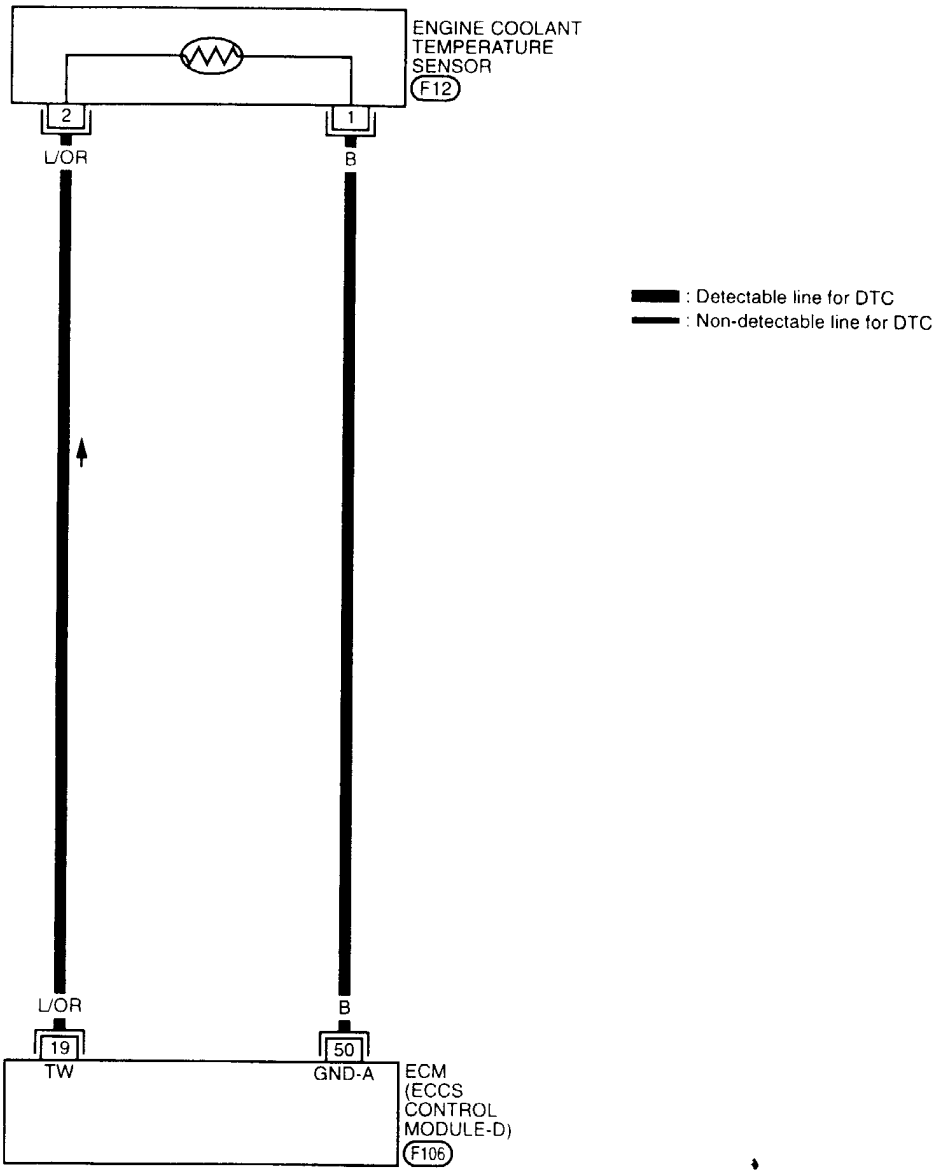
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

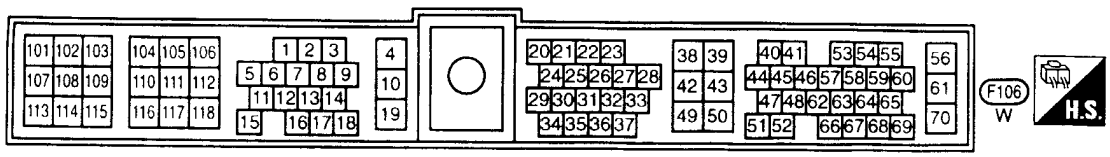
OR

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

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

EC-ECTS-01

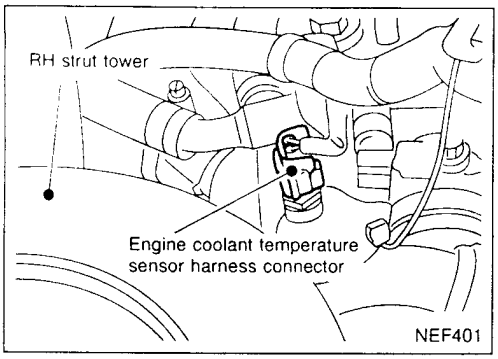


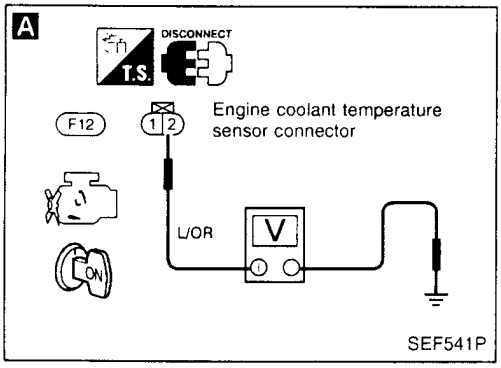


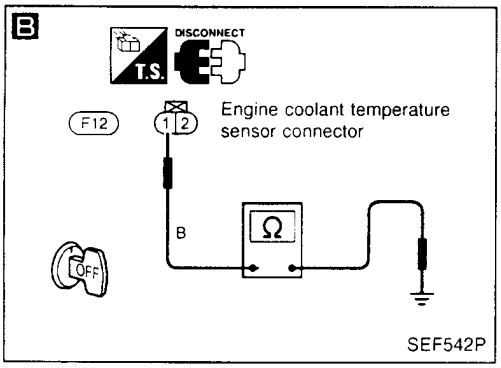
SEF423S

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect engine coolant temperature sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between engine coolant temperature sensor connector terminal ② and ground with CONSULT or tester.

Voltage:
Approximately 4.9V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between engine coolant temperature sensor connector terminal ① and engine ground.

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

NG → Repair harness or connectors.

OK

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

NG → Replace engine coolant temperature sensor.

OK

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

Trouble is not fixed.

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

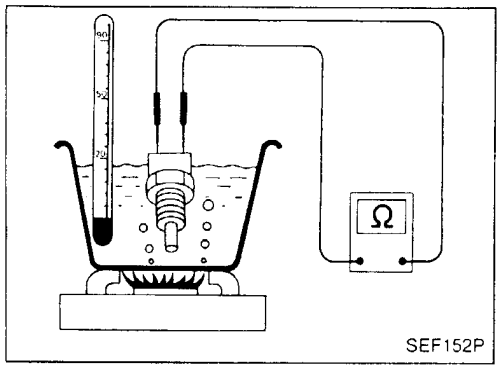
INSPECTION END

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

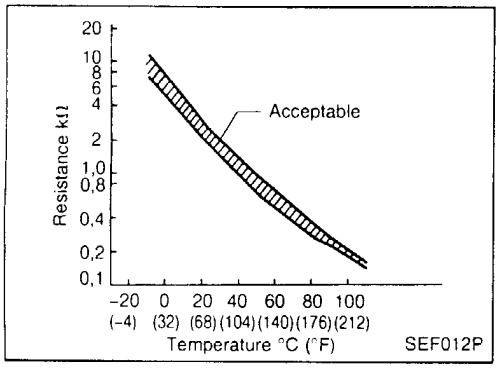
COMPONENT INSPECTION

Engine coolant temperature sensor

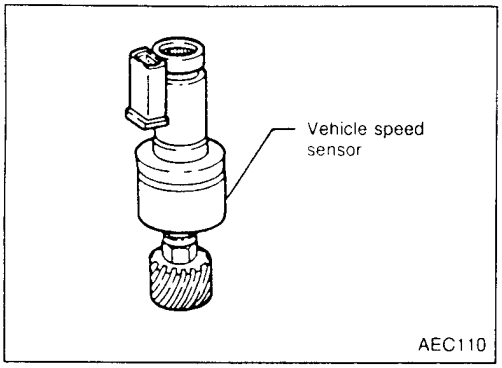
Check resistance as shown in the figure.



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



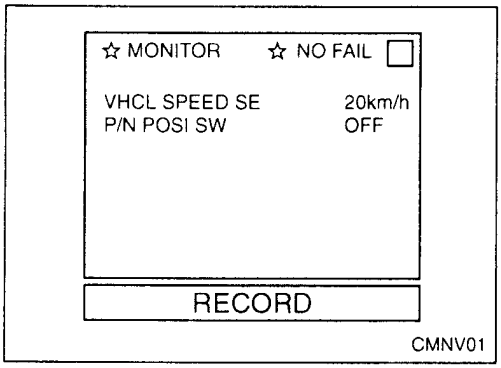
If NG, replace engine coolant temperature sensor.

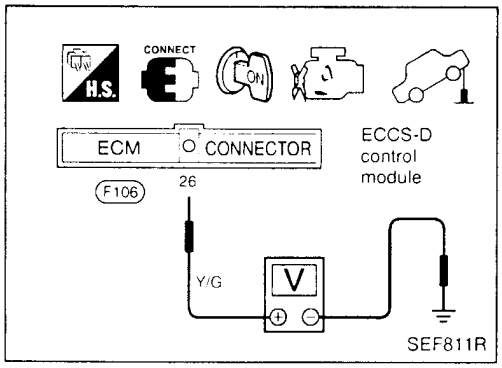


Vehicle Speed Sensor (VSS)

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

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





OVERALL FUNCTION CHECK

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

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

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

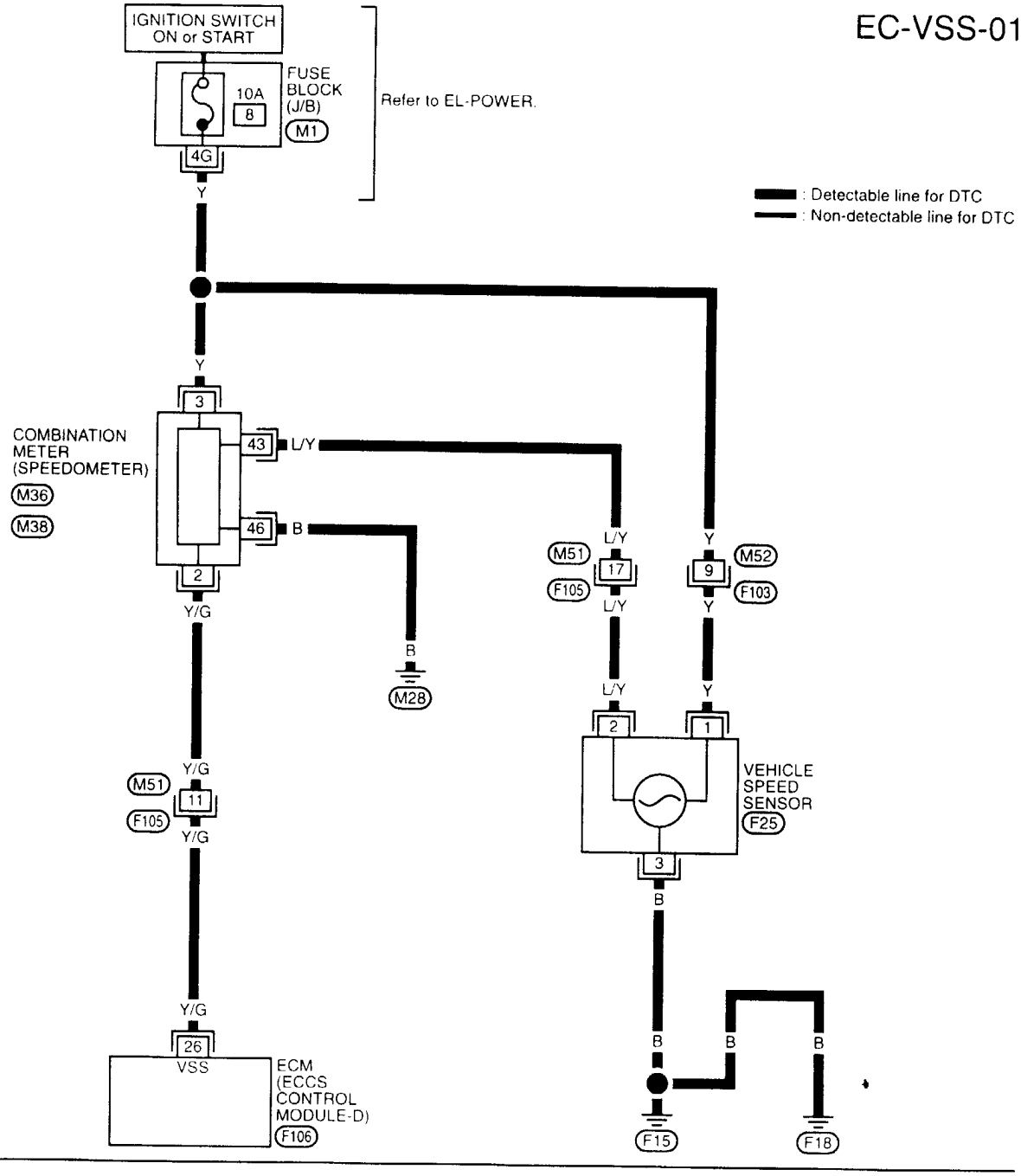
OR

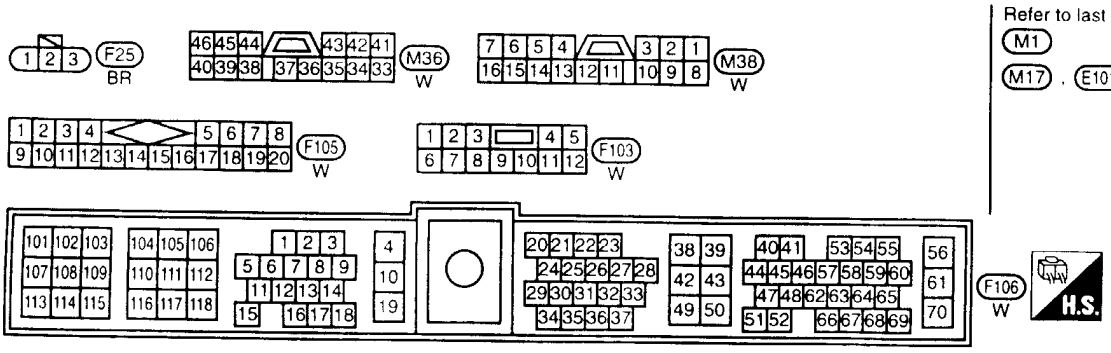
1) Jack up drive wheels.
2) Start engine.
3) Rotate drive wheel by hand.
4) Check voltage between ECM (ECCS-D control module) connector terminal (26) and ground with voltage tester.

Voltage should vary between approx. 0 - 4.2V.

Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01



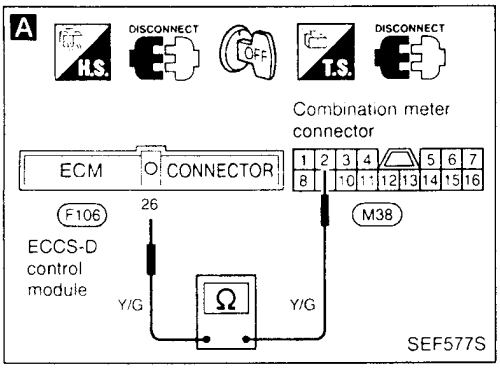


Refer to last page (Foldout page).
M1
M17 , E101

SEF424S

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM (ECCS-D control module) harness connector and combination meter harness connector.
3. Check harness continuity between ECM (ECCS-D control module) connector terminal (26) and combination meter connector terminal (2).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M51), (F105)
- Harness for open or short-circuit between ECM (ECCS-D control module) and combination meter.

If NG, repair harness or connectors.

OK ↓

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions correctly.

NG → Check the following:
- Harness connectors (M51), (F105)
- Harness for open or short-circuit between combination meter and vehicle speed sensor.

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

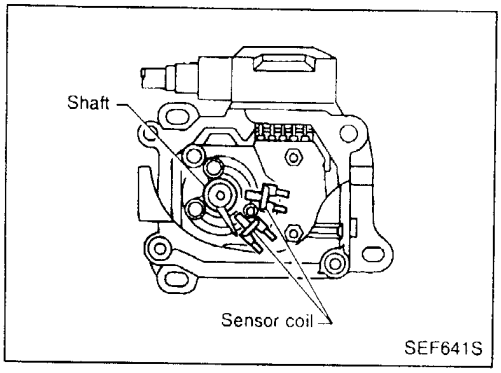
OK ↓

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

Trouble is not fixed. ↓

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

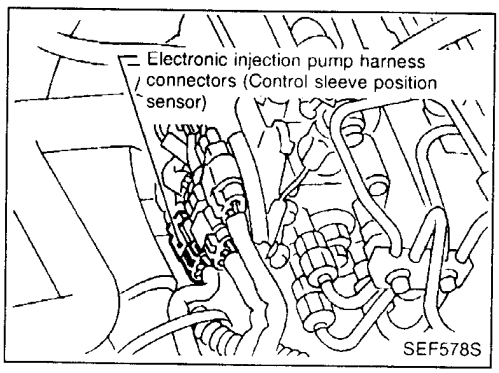
INSPECTION END



Control Sleeve Position Sensor (CSPS)

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

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



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

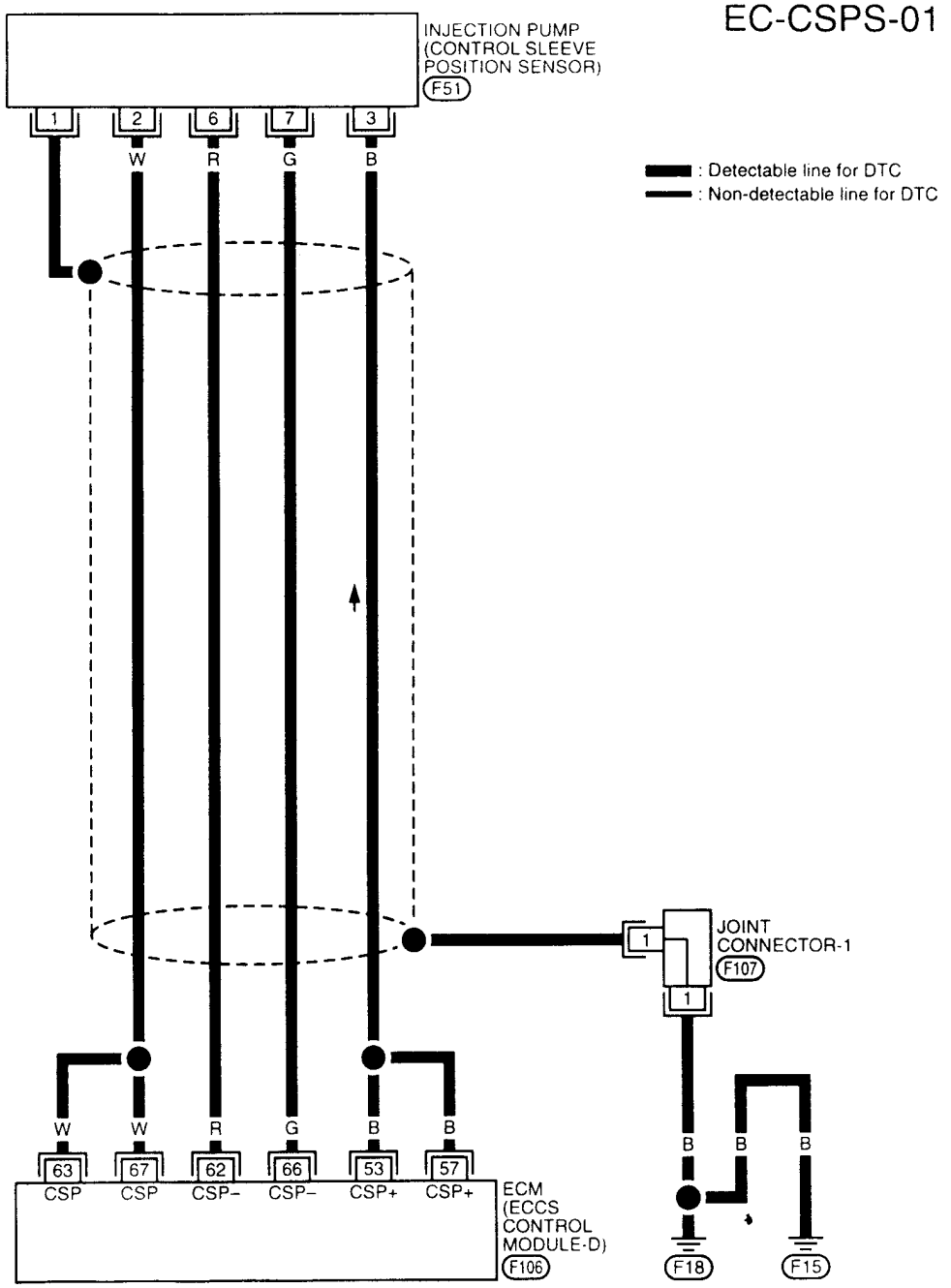
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 2 seconds at idle speed.

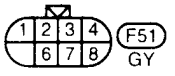
OR

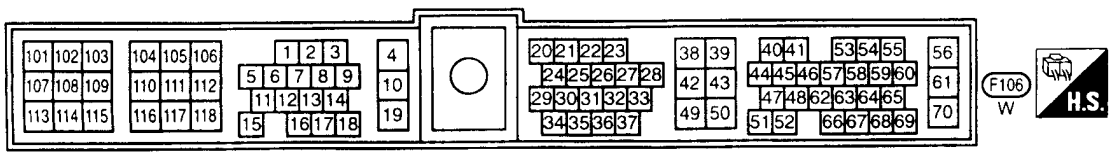
1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)".

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

EC-CSPS-01



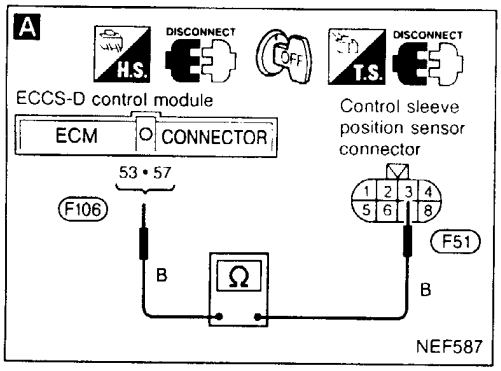


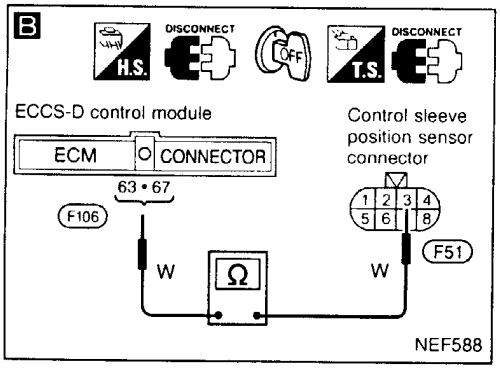


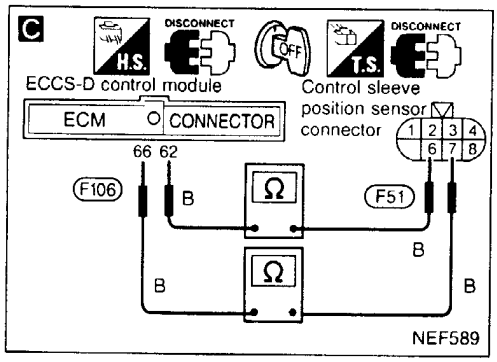
SEF425S

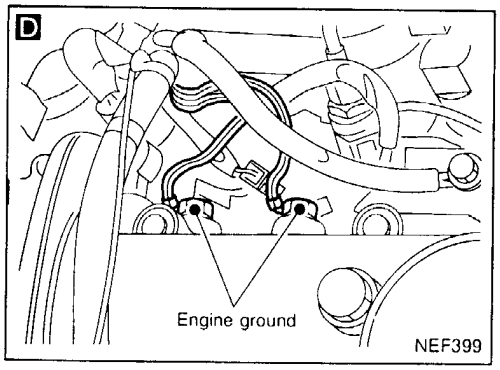
Control Sleeve Position Sensor (CSPS) (Cont'd)

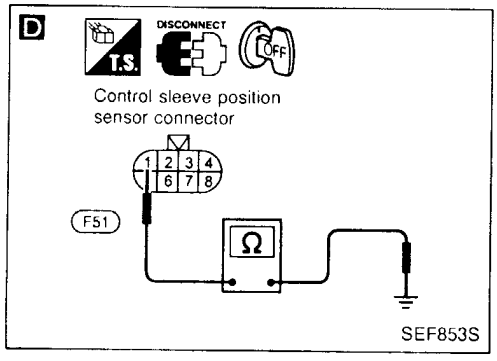
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM (ECCS-D control module) harness connector and electronic injection pump harness connector.
3. Check harness continuity between control sleeve position sensor connector terminal ③ and ECM (ECCS-D control module) connector terminals ⑤③, ⑤⑦.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between control sleeve position sensor connector terminal ② and ECM (ECCS-D control module) terminals ⑥③, ⑥⑦.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

C

CHECK GROUND CIRCUIT – I.

Check harness continuity between control sleeve position sensor connector terminal ⑥ and ECM (ECCS-D control module) connector terminal ⑥②; and control sleeve position sensor connector terminal ⑦ and ECM (ECCS-D control module) connector terminal ⑥⑥.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

D

CHECK GROUND CIRCUIT – II.
1) Loosen and retighten engine ground screws.
2) Check harness continuity between control sleeve position sensor connector terminal ① and engine ground.

Continuity should exist.

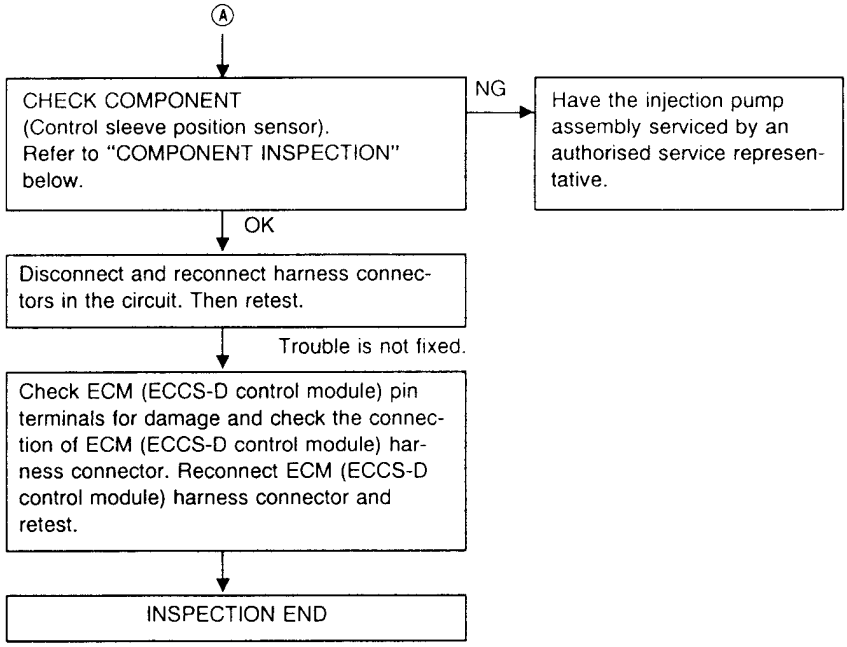
If OK, check harness for short-circuit.

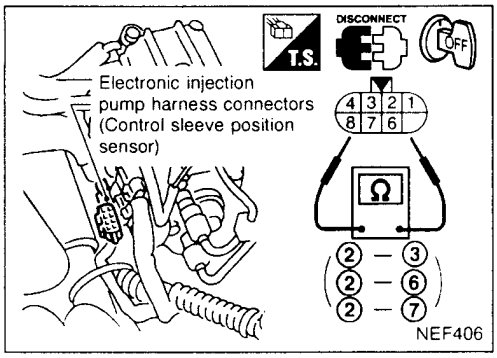
NG → Repair harness or connectors.

OK ↓

Ⓐ

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

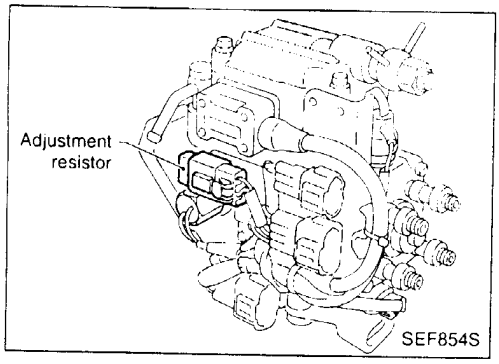




COMPONENT INSPECTION

Control sleeve position sensor

1. Disconnect electronic injection pump harness connector.
2. Check continuity between terminals ② and ③; ② and ⑥ and ② and ⑦.
   Resistance: Approximately 5.8Ω [at 23°C (73°F)]
   If NG, take proper action.



Adjustment Resistor

The adjustment resistor is used to achieve uniform pump characteristics.

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

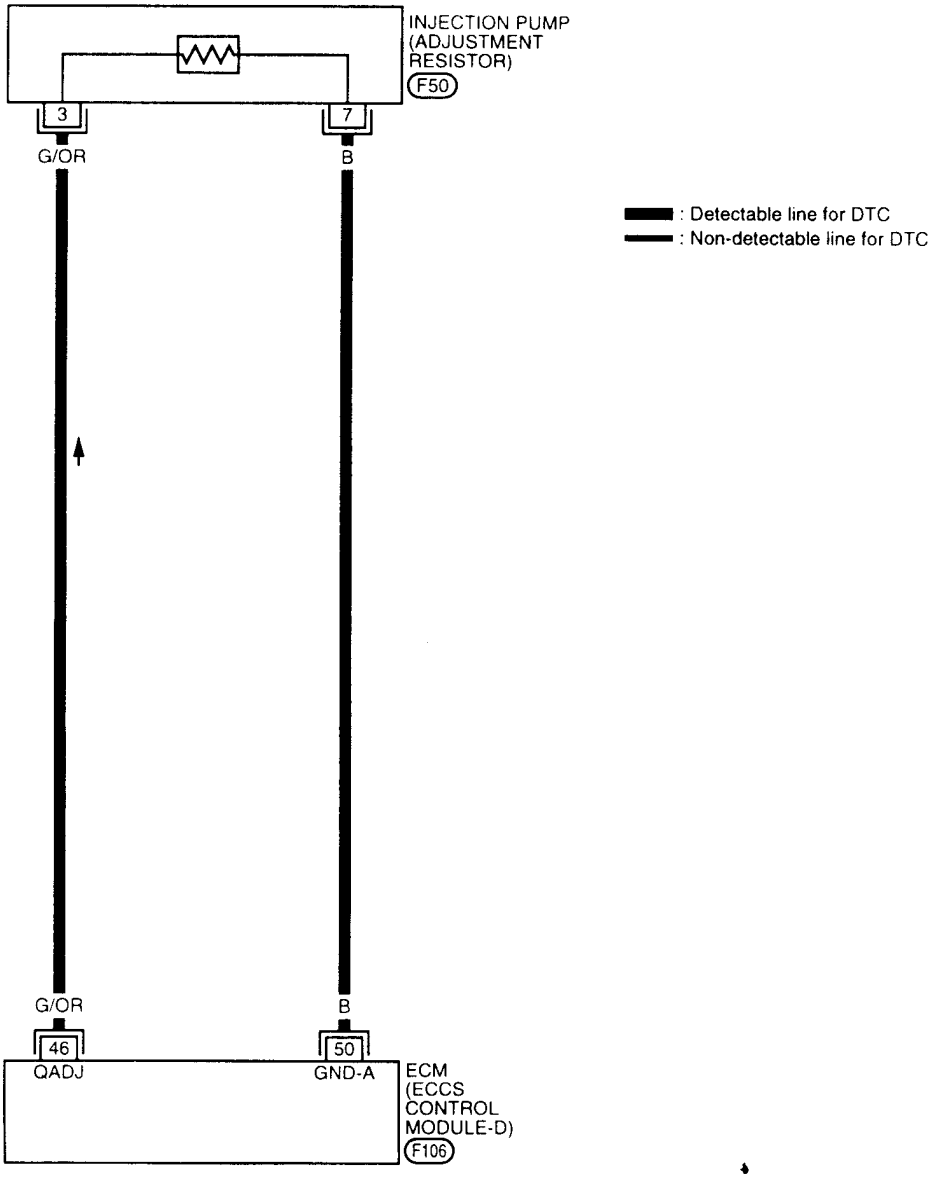
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

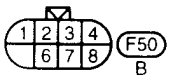
OR

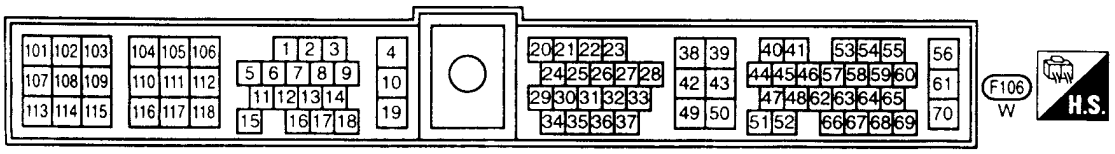
1) Turn ignition switch to "ON" position and wait at least 5 seconds.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform diagnostic test mode II (Self-diagnostic results).

Adjustment Resistor (Cont'd)

EC-ADJRES-01



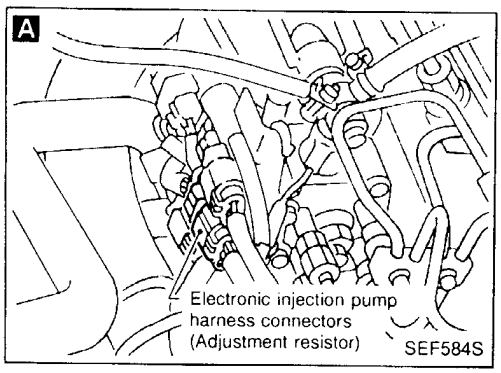


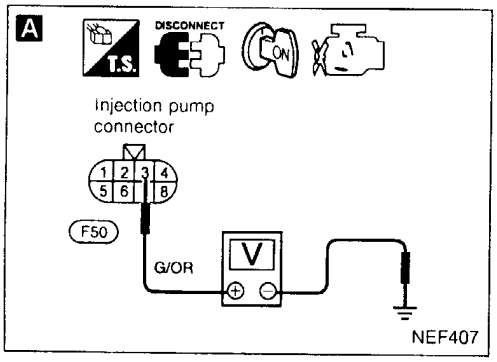


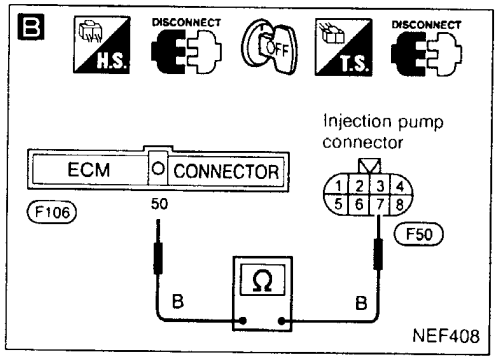
SEF431S

Adjustment Resistor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect electronic injection pump harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between injection pump connector terminal ③ and ground.

Voltage:
Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between injection pump connector terminal ⑦ and ECM connector terminal ㊿.

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

NG → Repair harness or connectors

OK

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

NG → Replace adjustment resistor.

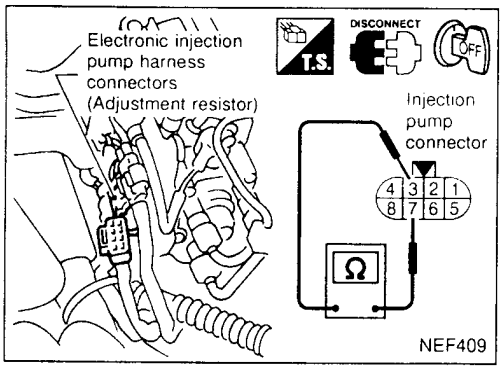
OK

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

Trouble is not fixed.

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector.
Reconnect ECM (ECCS-D control module) harness connector and retest.

INSPECTION END



Adjustment Resistor (Cont'd)

COMPONENT INSPECTION

Adjustment resistor

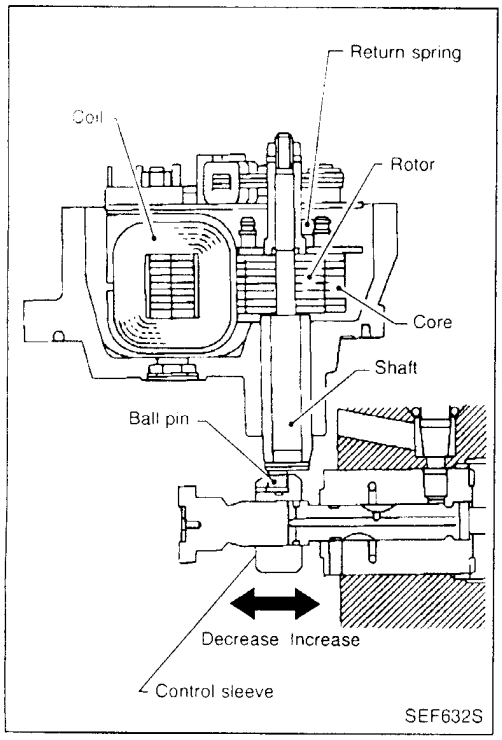
Check resistance between terminals ③ and ⑦.

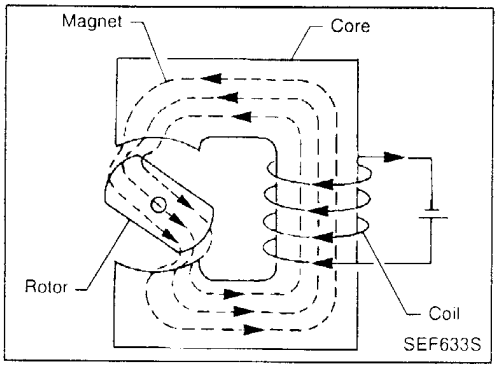
Resistance: Approximately 0.2 - 15.0 kΩ [at 25°C (77°F)]

Resistance value varies with adjustment sensor part numbers.

If NG, replace adjustment resistor.

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





Electric Governor

The electric governor is built into the fuel injection pump. It moves the control sleeve to increase or decrease the amount of fuel injected.

When current flows through the coil, a magnetic force is produced, rotating the rotor. The rotor shaft is installed to the control sleeve via a ball pin which is eccentrically situated in relation to the rotor shaft. With this arrangement, the control sleeve can be moved in relation to rotor rotation.

The rotor's rotating angle is determined by a balanced condition of magnetic force (generated by current flow regulated by means of the ECM (ECCS-D control module)) and tension of return spring (installed to rotor). The larger the current flow through the coil, the greater the rotor's rotating angle. This means that the control sleeve moves to the right, increasing the amount of fuel injected.

The ECM (ECCS-D control module) regulates the current flow through the coil by changing the duty ratio which controls the ON-OFF operation of the electric governor grounding circuit.

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

Electric Governor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If DTC 18, 22, 25 and DTC 15 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 15. (See EC-366.)

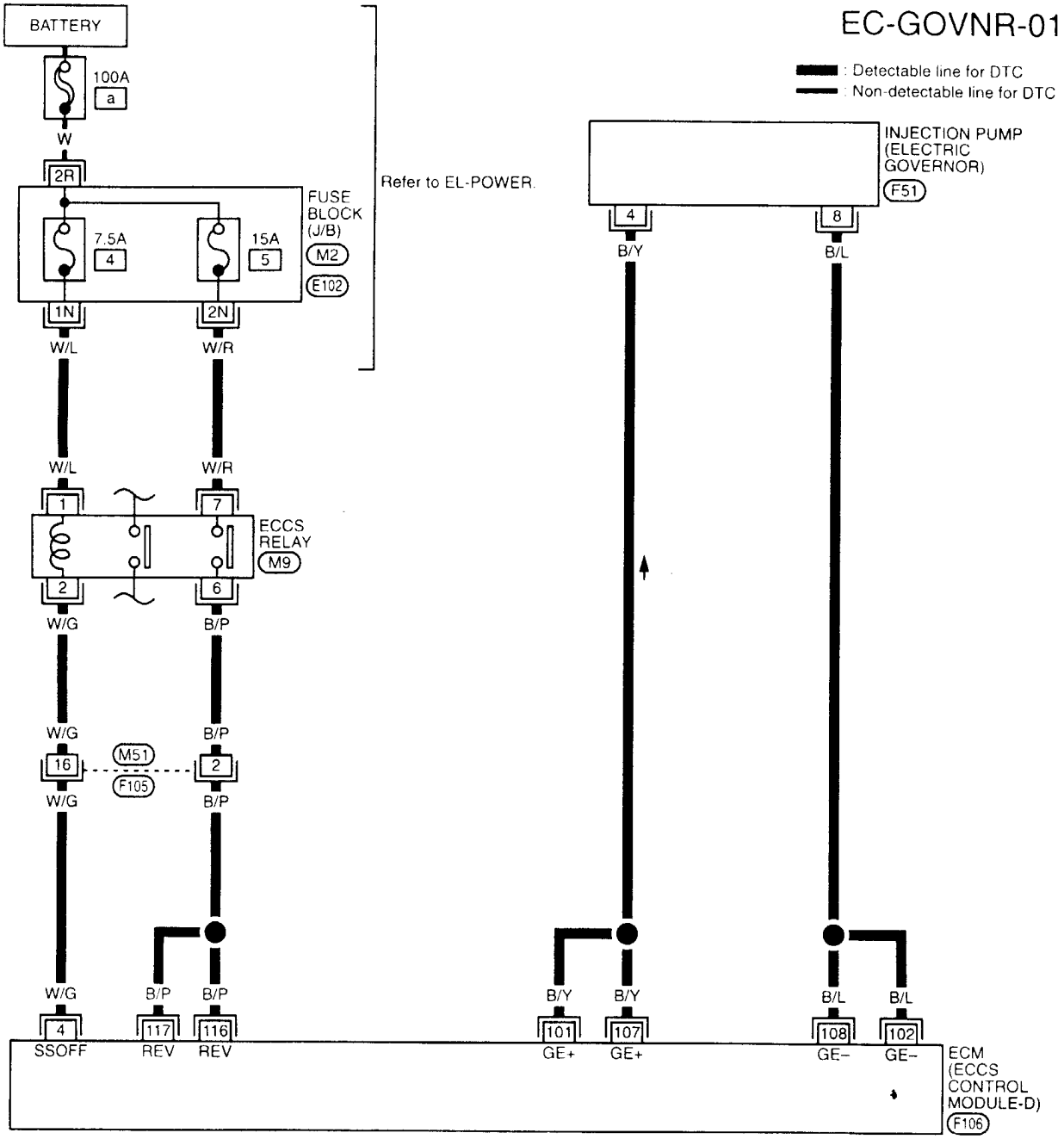
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine and warm it up sufficiently.
3) Run it for 2 seconds at 3,000 rpm. Return engine speed to idle, then increase to 3,000 rpm under no load.

OR

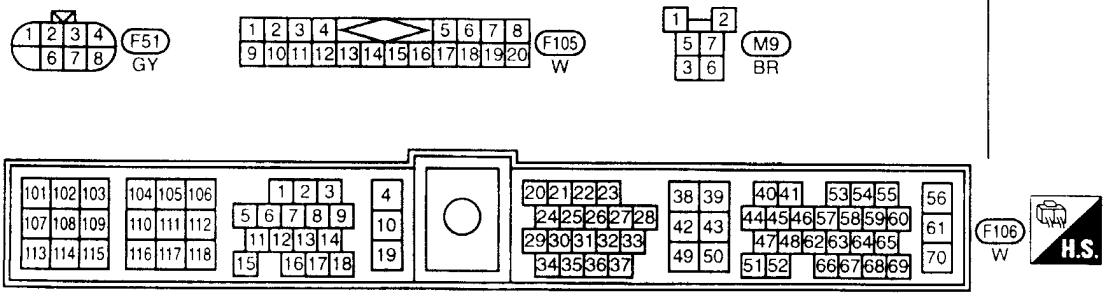
1) Start engine and warm it up sufficiently.
2) Run engine for 2 seconds at 3,000 rpm. Return engine speed to idle, then increase to 3,000 rpm under no load.
3) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic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

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

Electric Governor (Cont'd)



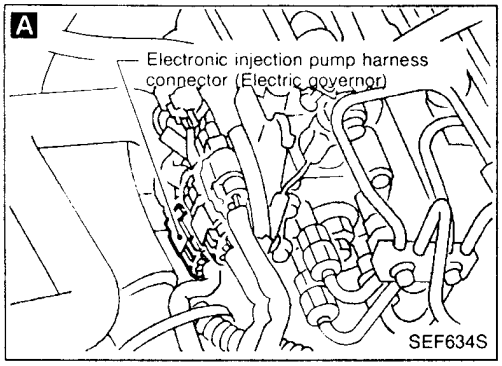
Refer to last page (Foldout page).
M2 , E102

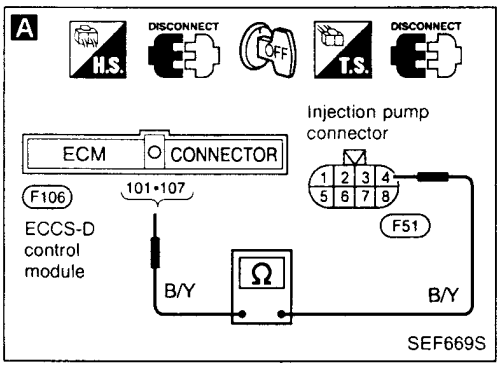


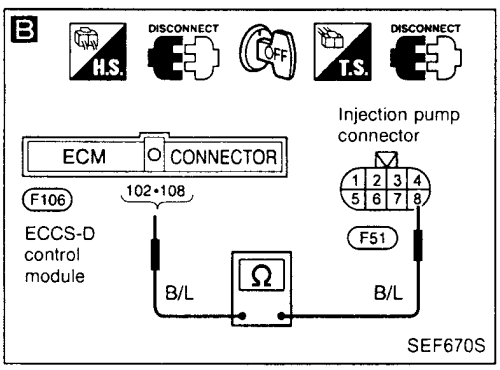
SEF426S

Electric Governor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

CHECK POWER SUPPLY.
Refer to EC-348.

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM (ECCS-D control module) harness connector and electronic injection pump harness connector.
3. Check harness continuity between injection pump connector terminal ④ and ECM (ECCS-D control module) connector terminals (101), (107).
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
Check harness continuity between injection pump connector terminal ⑧ and ECM (ECCS-D control module) connector terminals (102), (108).
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

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

NG → Have the injection pump assembly serviced by an authorised service representative.

OK

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

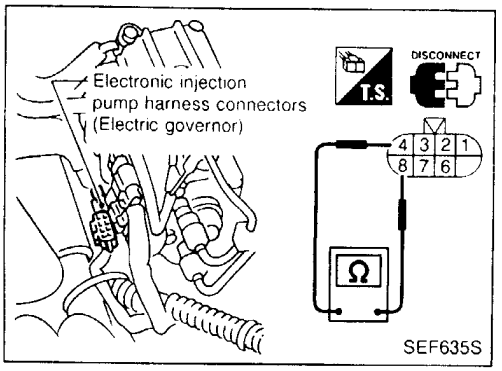
Trouble is not fixed.

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

INSPECTION END

Electric Governor (Cont'd)

COMPONENT INSPECTION

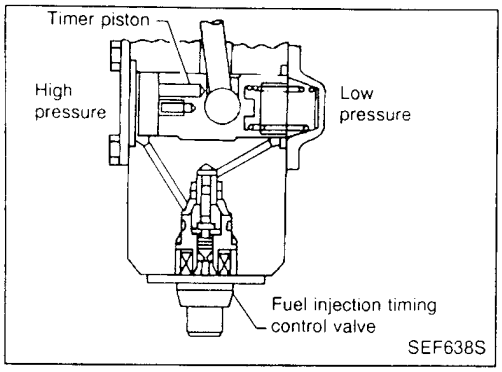


Electric governor

1. Disconnect electronic injection pump harness connector.
2. Check continuity between injection pump connector terminals ④ and ⑧.

   Resistance: Approximately 0.6Ω [at 23°C (73°F)]

   If NG, replace.



Injection Timing Control Valve

The injection timing control valve is built into the fuel injection pump. It controls the timer piston to change the fuel injection timing.
The timing control valve is a solenoid valve located in the line between high-pressure chamber and low-pressure chamber. It changes fuel pressure in the high-pressure chamber.
When current flows through the solenoid (the solenoid turns ON), the timing control valve opens, advancing fuel injection timing. When current does not flow through it, the timing control valve closes, retarding injection timing.
The ECM (ECCS-D control module) emits an ON-OFF duty signal. The longer the OFF-duration, the greater the advance angle. The longer the ON-duration, the greater the retard angle. This means that changing the ON-OFF duty ratio makes it possible to achieve an optimal advance angle and accurately control fuel injection timing.

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC 21 and 34 or 47 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 34 or 47. (See EC-399 or EC-414.)

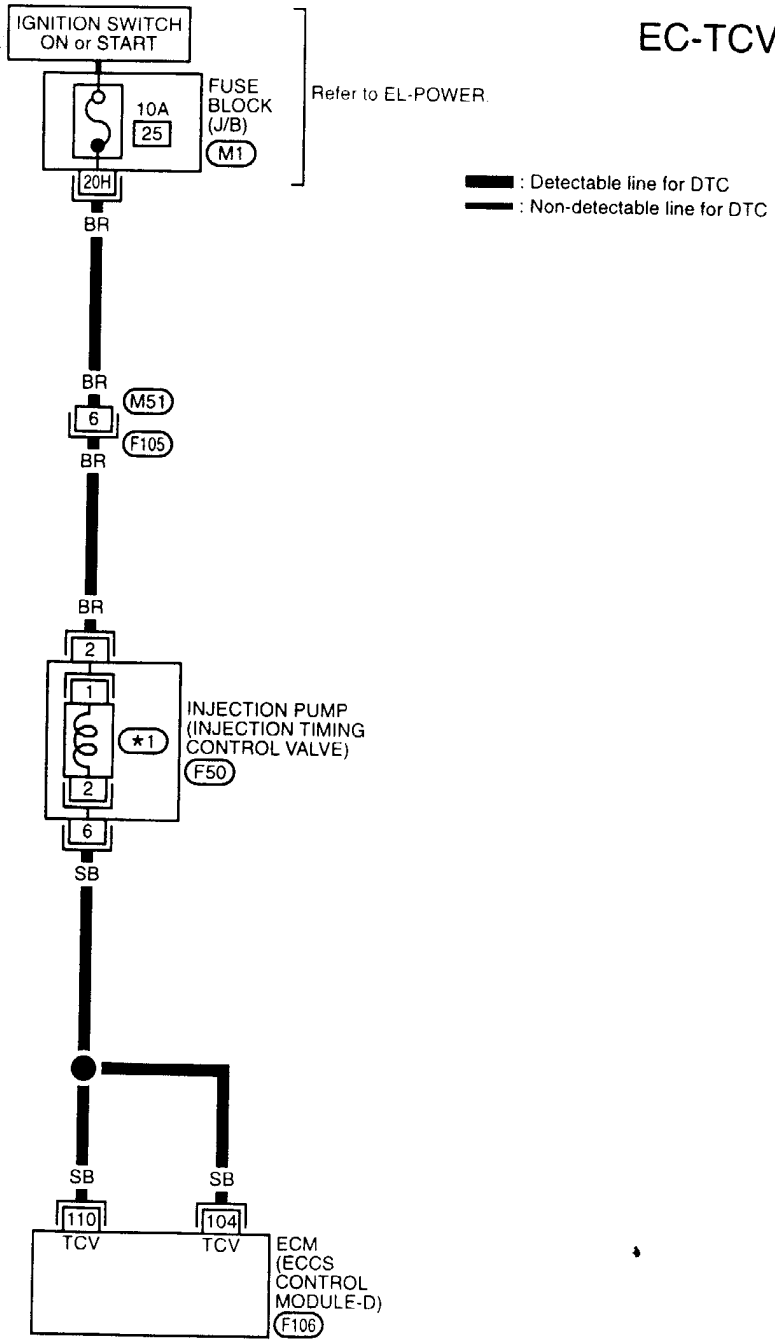
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine and warm it up sufficiently. Run engine for 2 seconds at 3,000 rpm. Return engine speed to idle, then increase to 3,000 rpm under no load.

OR

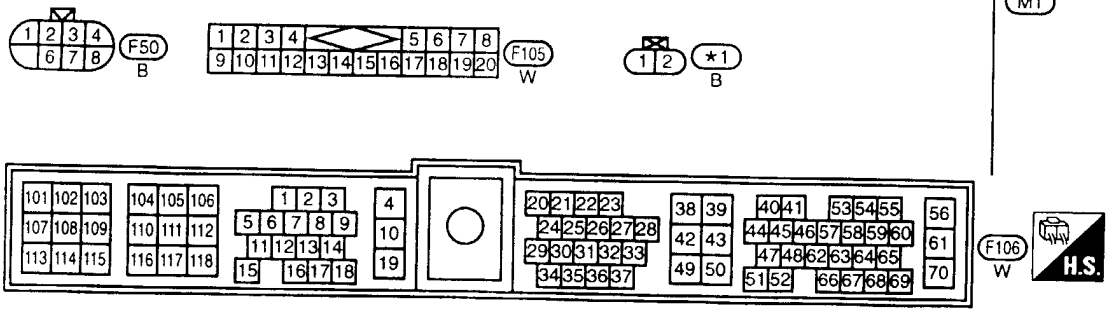
1) Start engine and warm it up sufficiently. Run engine for 2 seconds at 3,000 rpm. Return engine speed to idle, then increase to 3,000 rpm under no load.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic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

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

EC-TCV-01



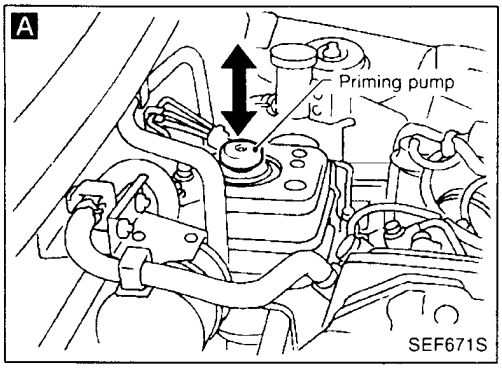
Refer to last page (Foldout page).
M1

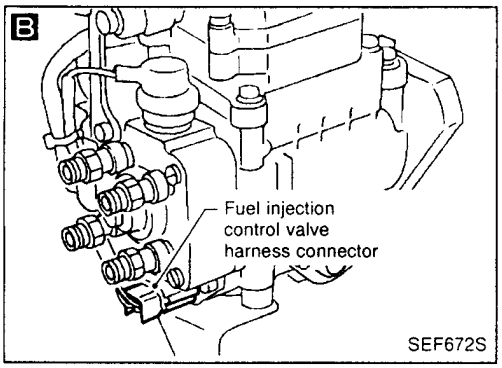


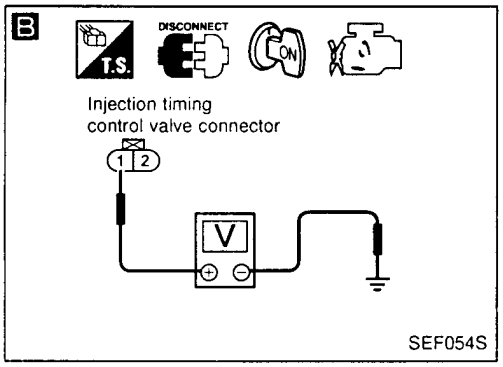
SEF437S

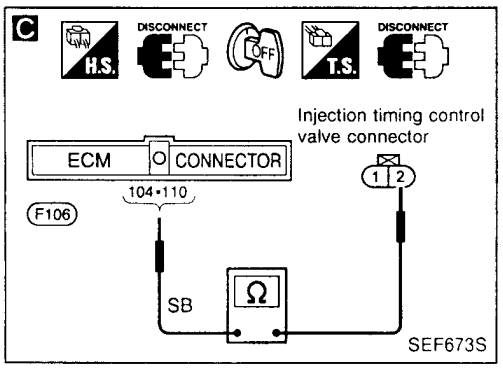
Injection Timing Control Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

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

B

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect injection timing control valve harness connector.
3. Turn ignition switch to "ON" position.
4. Check harness continuity between injection timing control valve connector terminal ① and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following:
- Harness connectors (M51), (F105)
- Electronic injection pump harness connector (F50)
- 10A fuse
- Harness for open or short-circuit between injection timing control valve harness connector and fuse.

If NG, replace fuse or repair harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between injection timing control valve connector terminal ② and ECM (ECCS-D control module) terminals (104), (110).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Electronic injection pump harness connector (F50)
- Harness for open or short-circuit between injection timing control valve and ECM (ECCS-D control module).

If NG, repair harness or connectors.

OK

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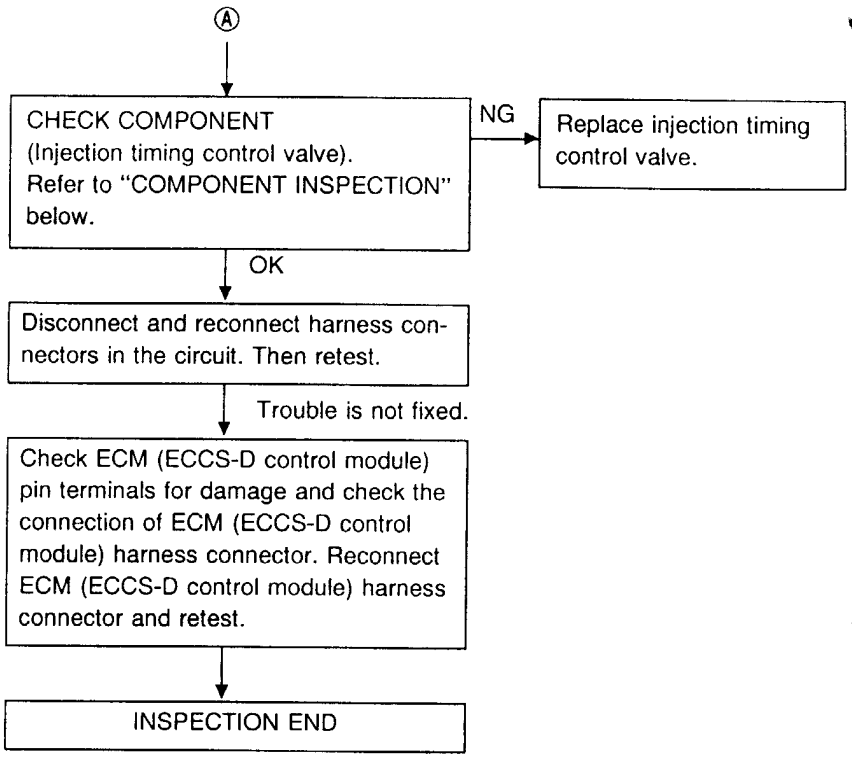
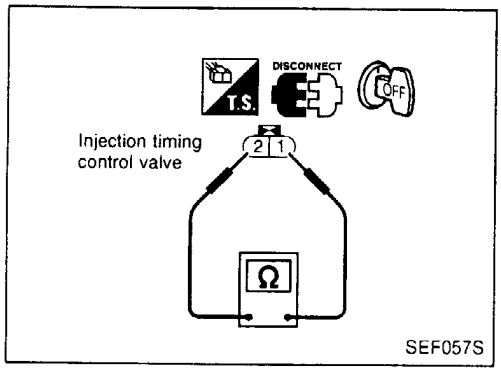
Injection Timing Control Valve (Cont'd)

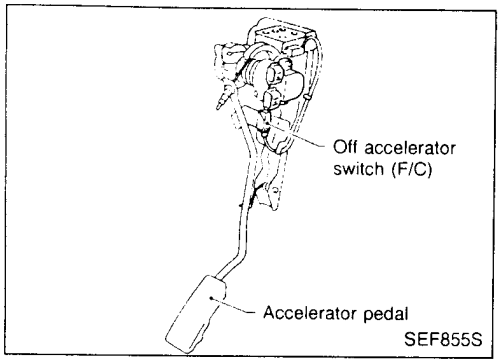




COMPONENT INSPECTION

Injection timing control valve

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



Accelerator Switch (F/C)

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

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

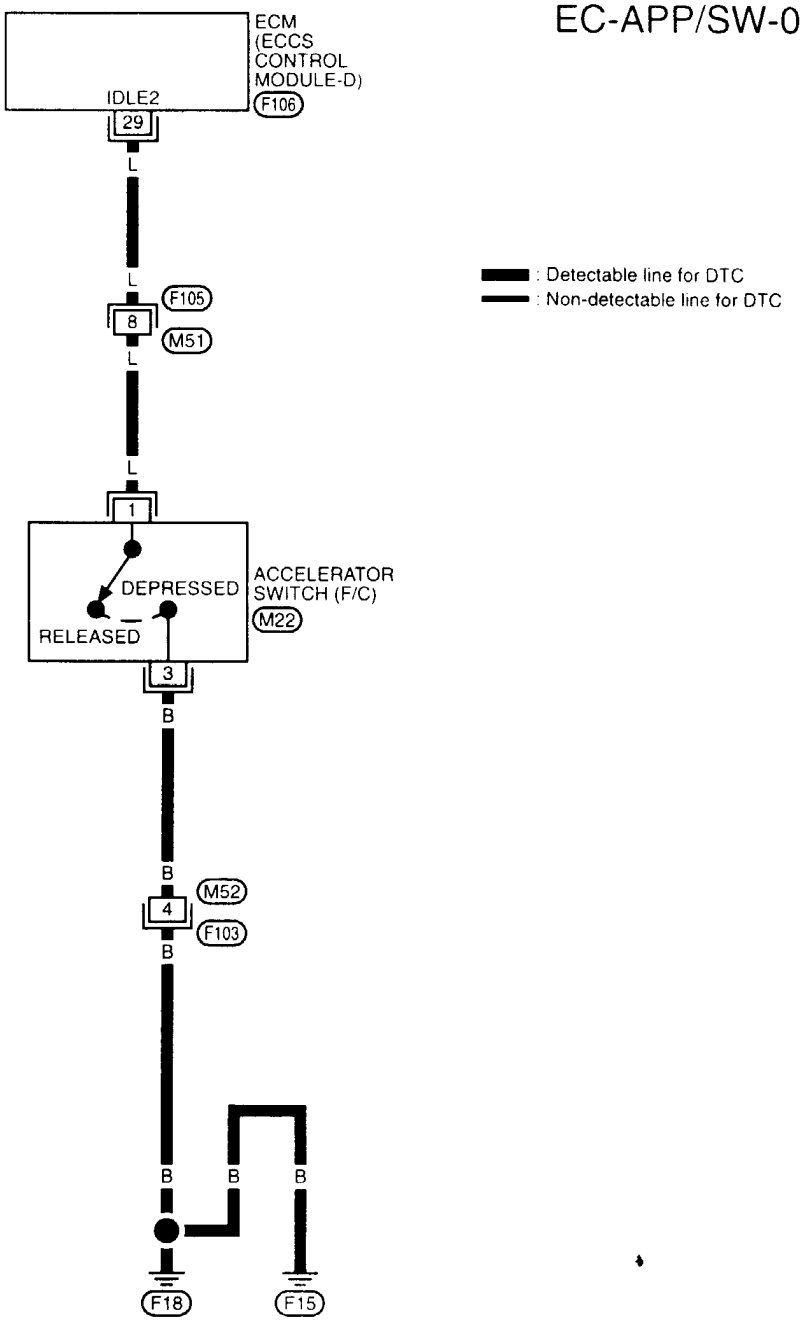
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Depress and release accelerator pedal once for 15 seconds.
3) Repeat step 2 for 26 times.

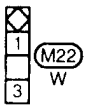
OR

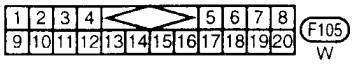
1) Turn ignition switch to "ON" position.
2) Depress and release accelerator pedal once for 15 seconds.
3) Repeat step 2 for 26 times.
4) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
5) Perform "Diagnostic Test Mode II (Self-diagnostic results).

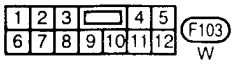
Accelerator Switch (F/C) (Cont'd)

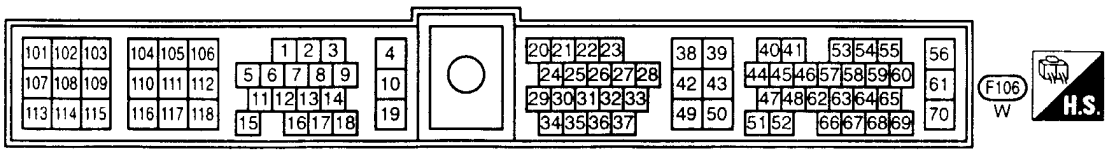
EC-APP/SW-01







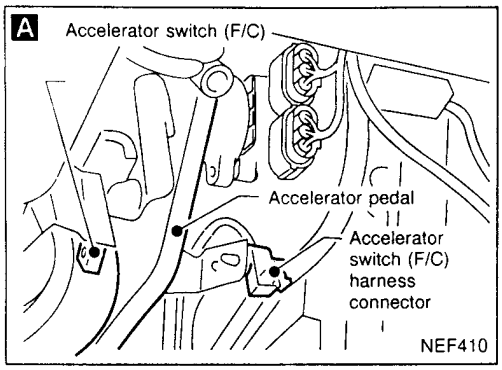


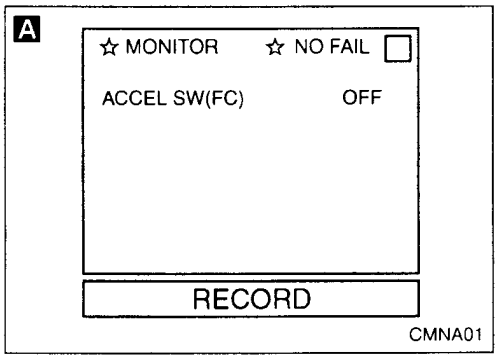


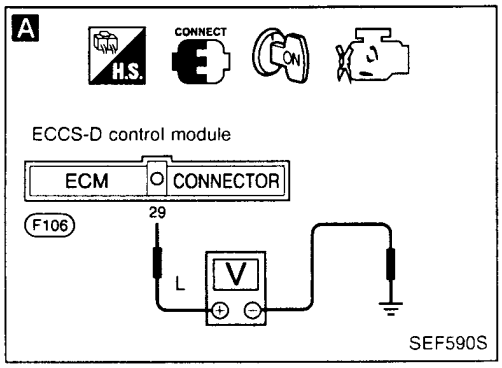
SEF427S

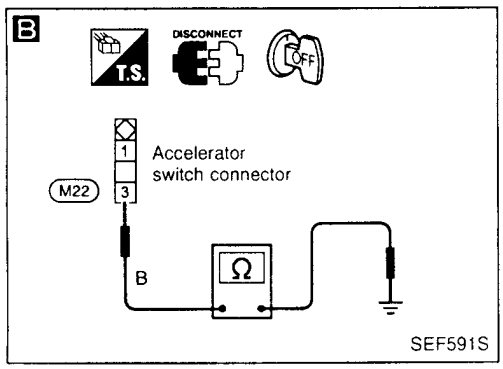
Accelerator Switch (F/C) (Cont'd)

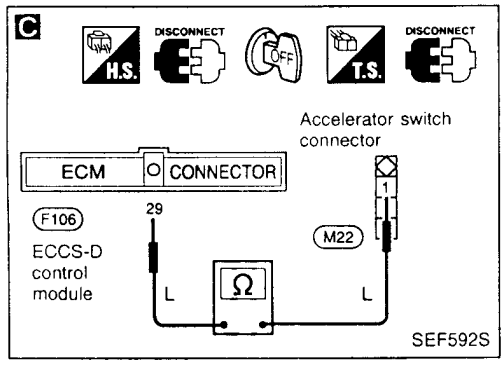
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OK → INSPECTION END

OR

1. Turn ignition switch to "ON" position.
2. Check voltage between ECM (ECCS-D control module) connector terminal (29) and ground.
   Voltage:
   Accelerator pedal released
   Battery voltage
   Accelerator pedal depressed
   Approximately 0V

NG

B

CHECK GROUND CIRCUIT.

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

NG → Check the following:
- Harness connectors (M52), (F103)
- Harness for open or short-circuit between accelerator switch (F/C) and engine ground.

If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM (ECCS-D control module) harness connector.
2. Check harness continuity between ECM (ECCS-D control module) connector terminal (29) and accelerator switch connector terminal (1).
   Continuity should exist.

NG → Check the following:
- Harness connectors (F105), (M51)
- Harness for open or short-circuit between accelerator switch (F/C) and ECM (ECCS-D control module).

OK

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

NG → Replace accelerator switch (F/C).

OK

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

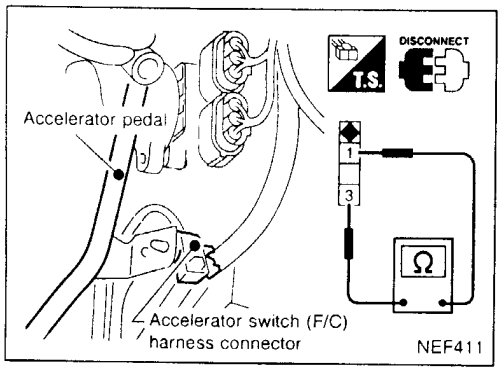
Trouble is not fixed.

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

INSPECTION END

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

COMPONENT INSPECTION



Accelerator switch (F/C)

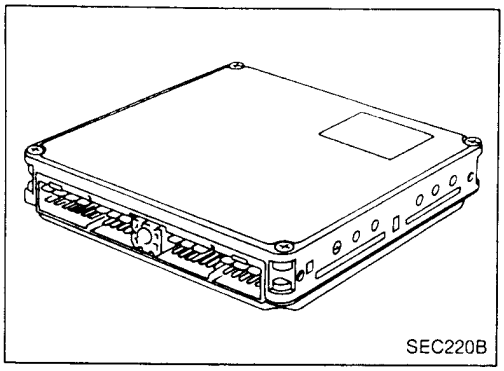
1. Disconnect accelerator switch (F/C) harness connector.
2. Check continuity between accelerator switch connector terminals ① and ③.

Conditions	Continuity
Accelerator pedal released	No
Accelerator pedal depressed	Yes

If NG, replace accelerator pedal assembly.

CAUTION:

- **If accelerator position sensor or ECM (ECCS-D control module) connector is disconnected, perform following operation:**
  - **Select "OFF ACCEL PO SIG" in ACTIVE TEST mode. Touch "CLEAR".**
  - **Start and warm up engine. After engine has warmed up, let engine idle for 10 minutes.**
- **Do not disassemble accelerator pedal assembly.**


SEC220B

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

The ECM (ECCS-D control module) consists of a microcomputer and connectors for signal input and output and for power supply. The module monitors and controls the engine operation.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Item (Possible Cause)
27, 31	• ECM (ECCS-D control module) calculation function is malfunctioning.	• ECM (ECCS-D control module)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

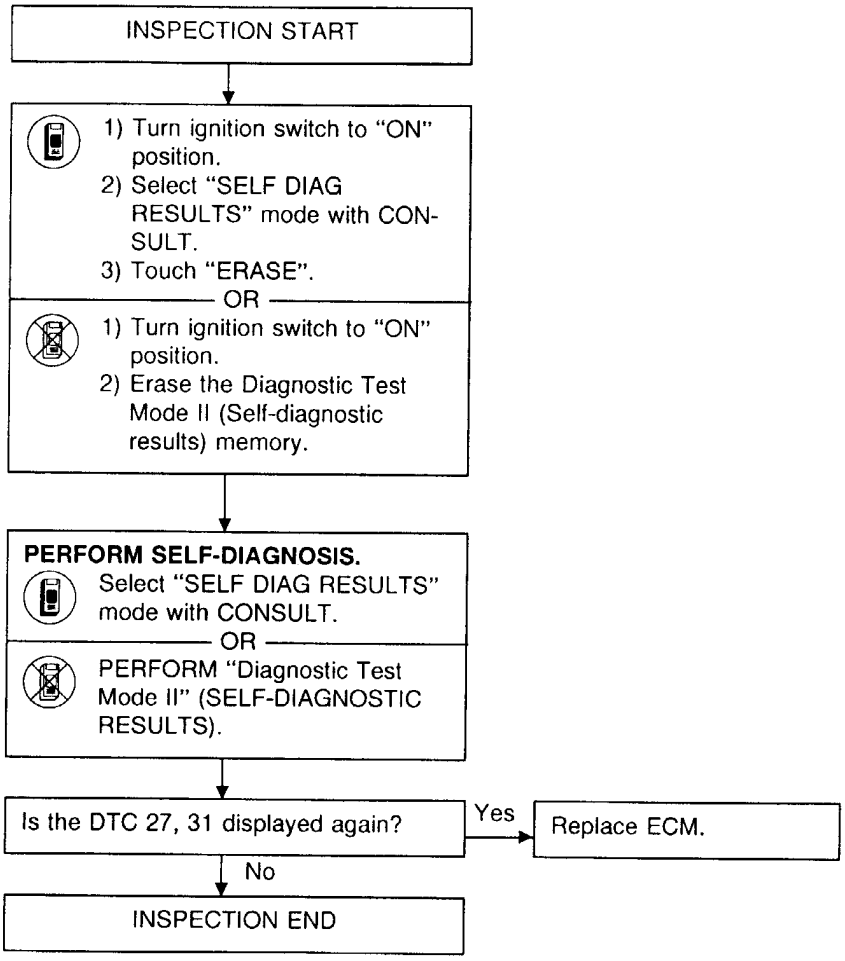
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

OR

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

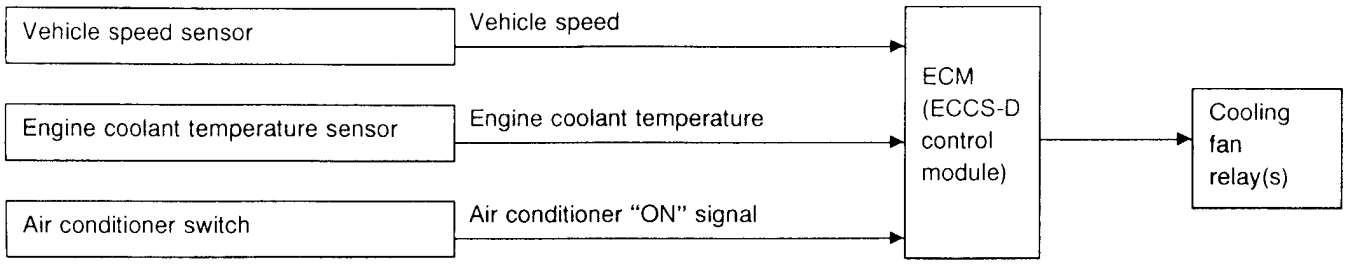
Engine Control Module (ECM)-ECCS-D Control Module (Cont'd)

DIAGNOSTIC PROCEDURE



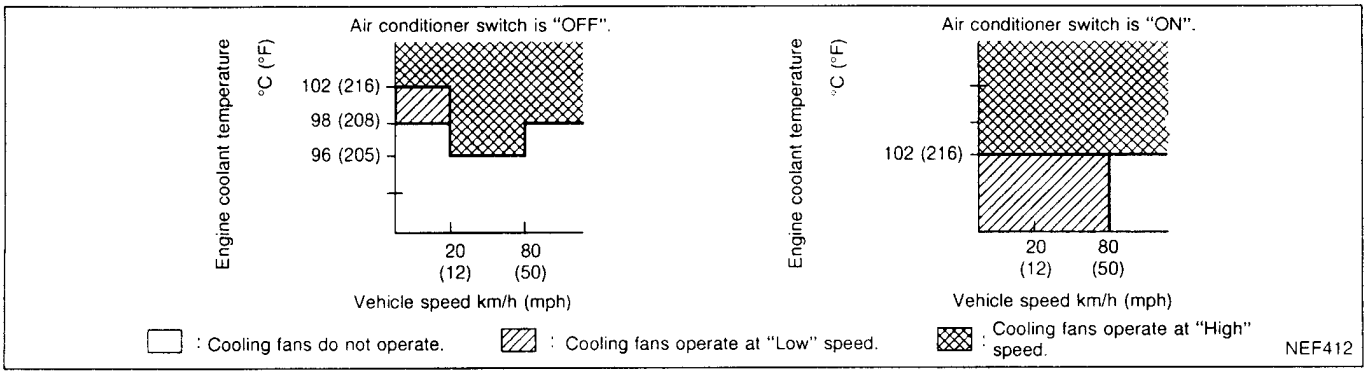
Cooling Fan (Overheat)

SYSTEM DESCRIPTION



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

Operation



ON-BOARD DIAGNOSIS LOGIC

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

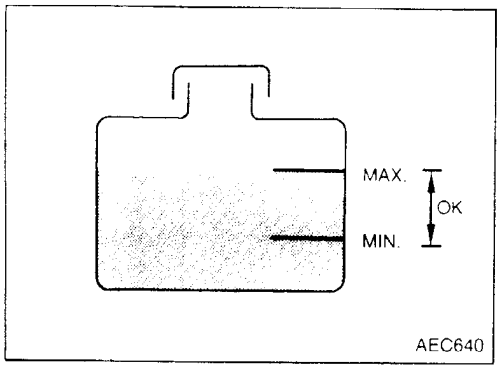
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
28	• Cooling fan does not operate properly (Overheat). • Cooling fan system does not operate properly (Overheat). • Engine coolant was not added to the system using the proper filling method.	• Harness or connectors (The cooling fan circuit is open or shorted.) • Cooling fan • Radiator hose • Radiator • Radiator cap • Water pump • Thermostat • Fan belt • Engine coolant temperator sensor For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-397.

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

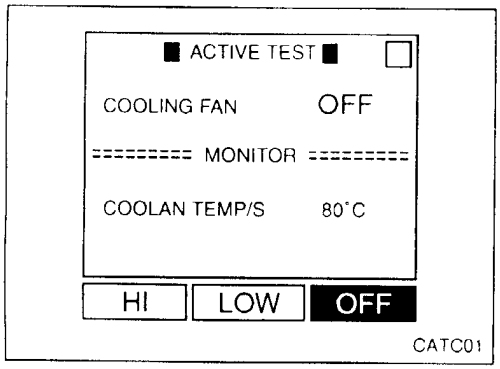
a. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").**
b. **After refilling coolant, run engine to ensure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

Cooling Fan (Overheat) (Cont'd)

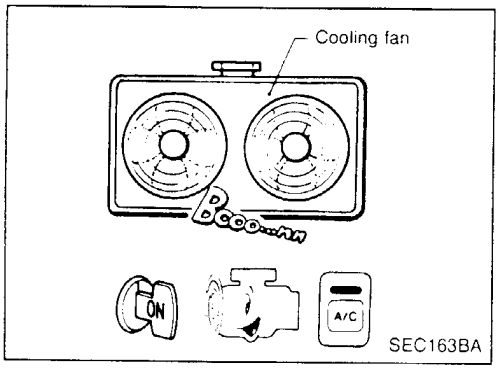
OVERALL FUNCTION CHECK



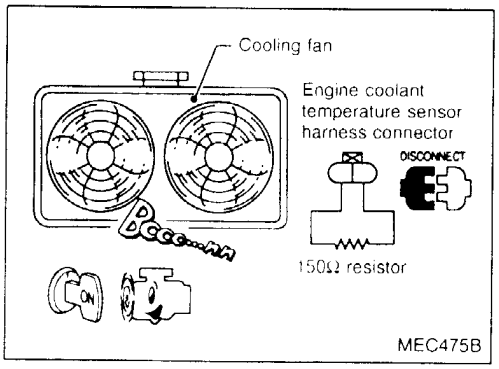
AEC640



CATC01



SEC163BA



MEC475B

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

WARNING:

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

Wrap a thick cloth around the cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-392.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-392.

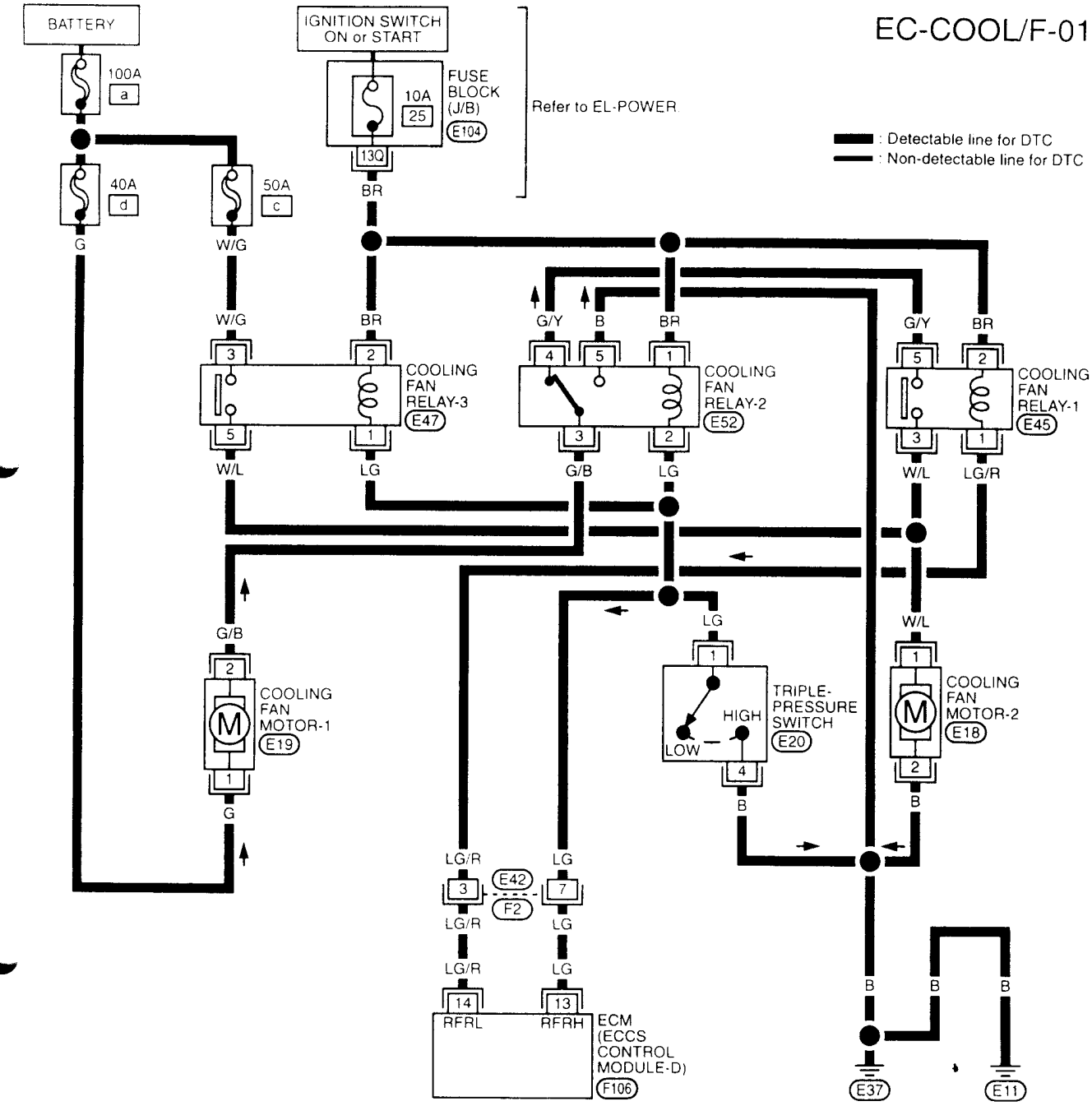
3) Turn ignition switch to "ON" position.
4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT (LOW speed and HI speed).

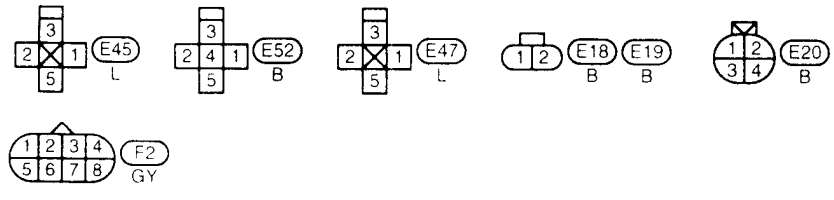
OR

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

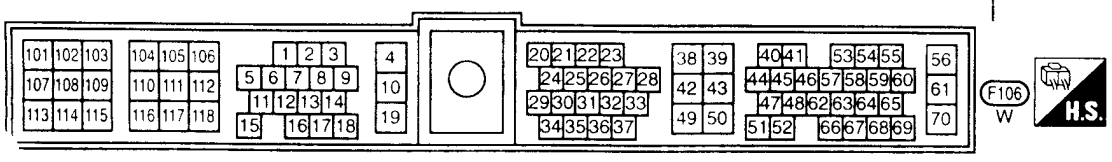
Cooling Fan (Overheat) (Cont'd)

EC-COOL/F-01





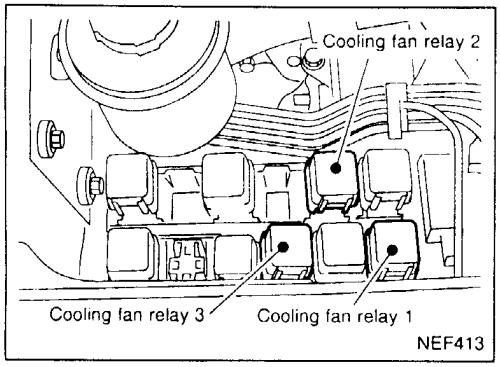
Refer to last page (Foldout page).
E104



SEF441S

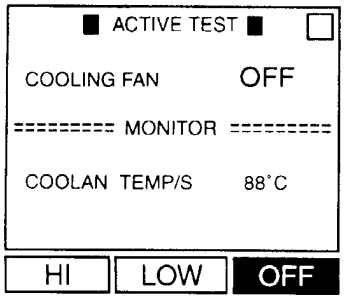
Cooling Fan (Overheat) (Cont'd)

DIAGNOSTIC PROCEDURE



NEF413

A



CATC01A

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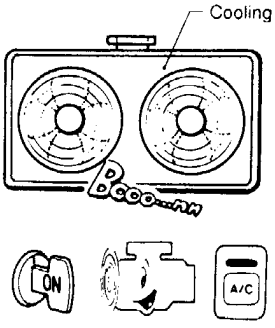

SEC163BA

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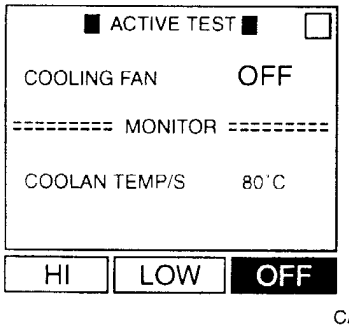
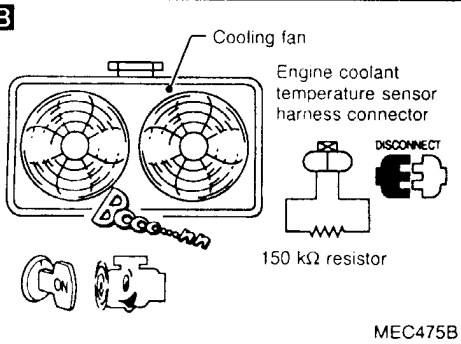


CATC01

B



MEC475B

INSPECTION START

A

CHECK COOLING FAN LOW SPEED OPERATION.

1. Disconnect cooling fan relay-3.
2. Turn ignition switch to "ON" position.
3. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

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

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

OK

B

CHECK COOLING FAN HIGH SPEED OPERATION.

1. Turn ignition switch to "LOCK" position.
2. Reconnect cooling fan relay-3.
3. Disconnect cooling fan relay-1.
4. Turn ignition switch to "ON" position.
5. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

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

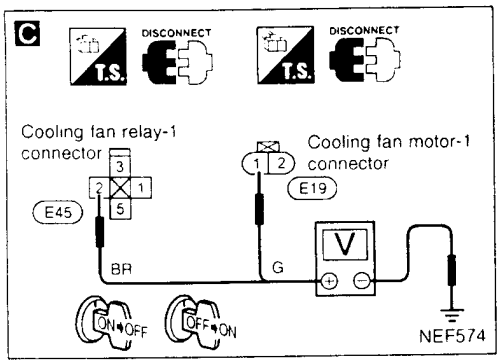
NG → Check cooling fan high speed control circuit. (Go to PROCEDURE B .)

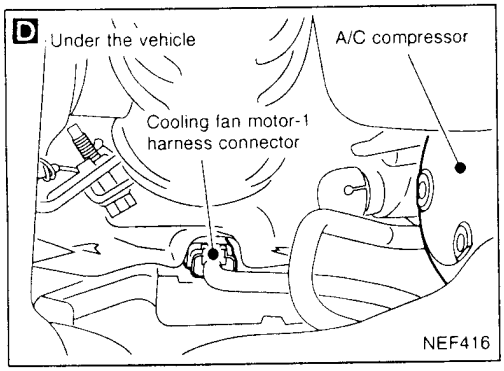
OK

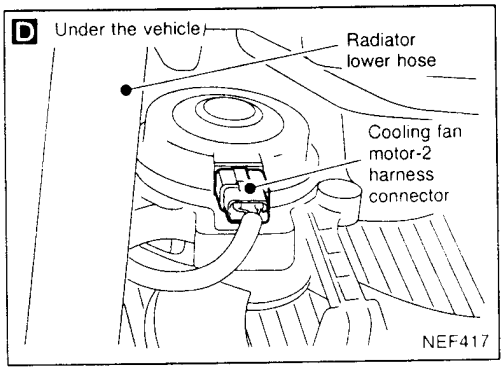
Ⓑ

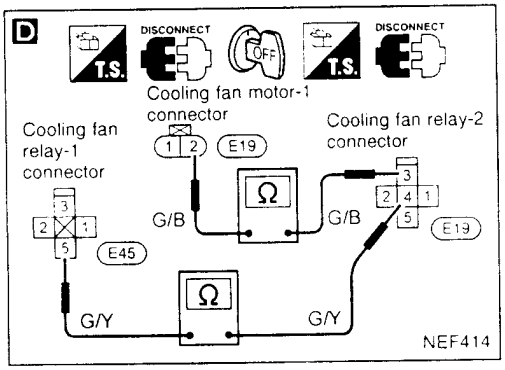
(Go to EC-396.)

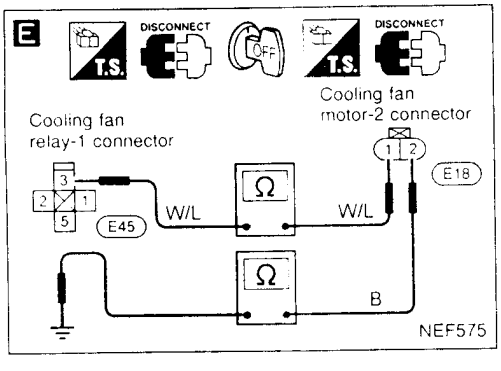
Cooling Fan (Overheat) (Cont'd)











PROCEDURE A

INSPECTION START

C

CHECK POWER SUPPLY.

1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan relay-1 and fan motor-1 connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between cooling fan motor-1 connector terminal ①, fan relay-1 connector terminal ② and ground with CONSULT or voltage tester.

Voltage: Battery voltage

NG → Check the following:
- 10A fuse
- 40A, 100A, fusible links
- Harness for open or short-circuit between cooling fan motor-1 and battery.
- Harness for open or short-circuit between cooling fan relay-1 and fuse.

If NG, replace fuse or fusible links or repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan relay-2 harness connector.

D 3. Check harness continuity between cooling fan relay-1 connector terminal ⑤ and cooling fan relay-2 connector terminal ④; cooling fan motor-1 connector terminal ② and cooling fan relay-2 connector terminal ③.

Continuity should exist.

If OK, check harness for short-circuit.

E 4. Check harness continuity between cooling fan motor-2 connector terminal ① and cooling fan relay-1 connector terminal ③.

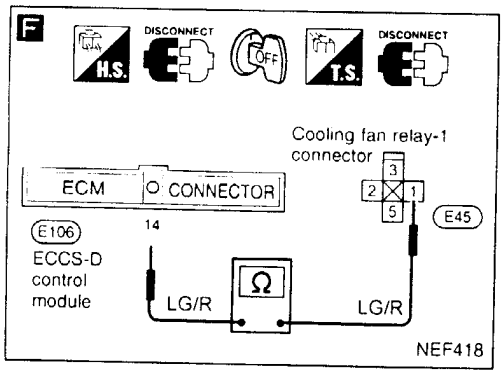
Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

Ⓒ



Ⓒ

F

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM (ECCS-D control module) harness connector.
2. Check harness continuity between ECM (ECCS-D control module) terminal ⑭ and cooling fan relay-1 connector terminal ①.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors E42, F2
- Harness for open or short-circuit between cooling fan relay-1 and ECM (ECCS-D control module)

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-1, 2).
Refer to "COMPONENT INSPECTION", EC-398.

NG → Replace cooling fan relay.

OK ↓

CHECK COMPONENT
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-398.

NG → Replace cooling fan motors.

OK ↓

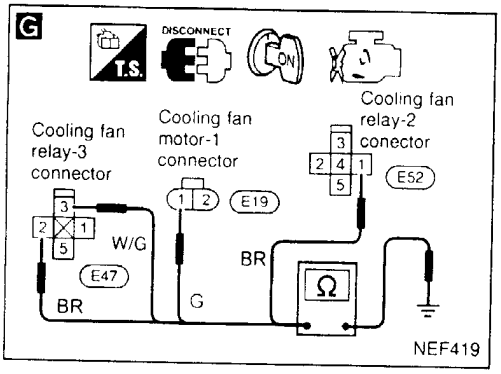
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

↓

INSPECTION END



PROCEDURE B

INSPECTION START ↓

G

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan relay-2, 3 and cooling fan motor-1.
3. Turn ignition switch to "ON" position.
4. Check voltage between cooling fan motor-1 connector terminal ①; cooling fan relay-2 connector terminal ①; cooling fan relay-3 connector terminals ② & ③ and ground with CONSULT or voltage tester.
   Voltage: Battery voltage

NG → Check the following:
- 10A-fuse
- 40A, 100A fusible links
- Harness for open or short between fan motor-1 and fusible link or fan relay-2, 3 and fuse.

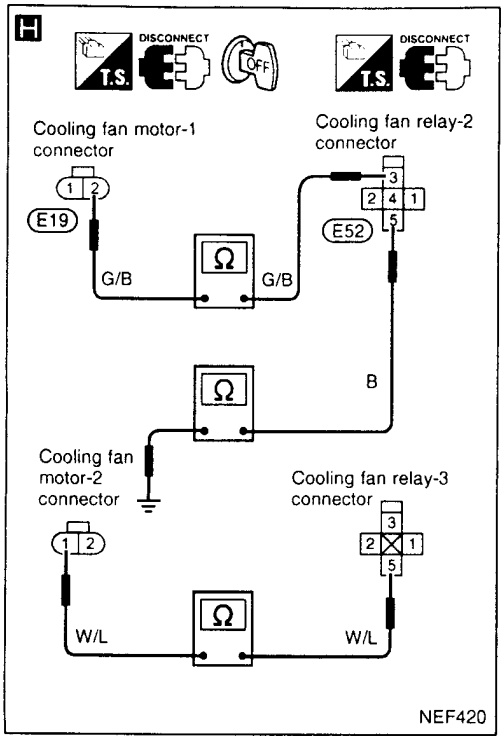
If NG, replace fuse or fusible link or repair harness or connectors.

OK ↓

Ⓓ

Cooling Fan (Overheat) (Cont'd)

H



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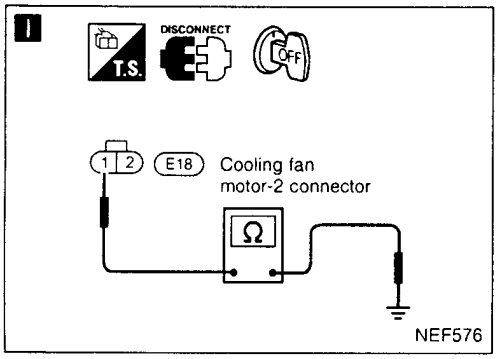

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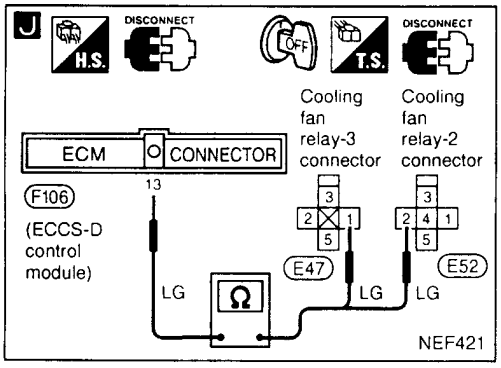


Ⓓ

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

H 3. Check harness continuity between cooling fan motor-1 connector terminal ② and cooling fan relay-2 connector terminal ③; cooling fan motor-2 connector terminal ① and cooling fan relay-3 connector terminal ⑤; cooling fan relay-2 connector terminal ⑤ and ground.
Continuity should exist.
If OK, check harness for short-circuit.

I 4. Check harness continuity between cooling fan motor-2 and ground.

NG → Repair harness or connectors.

OK ↓

J

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM (ECCS-D control module) harness connector.
2. Check harness continuity between ECM (ECCS-D control module) terminal ⑬ and cooling fan relay-3 connector terminal ① & cooling fan relay-2 connector terminal ②.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors E42, F2
- Harness for open or short-circuit between cooling fan relay-2, 3 and ECM.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-2, 3).
Refer to "COMPONENT INSPECTION", EC-398.

NG → Replace cooling fan relays.

OK ↓

CHECK COMPONENTS
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-398.

NG → Replace cooling fan motors.

OK ↓

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

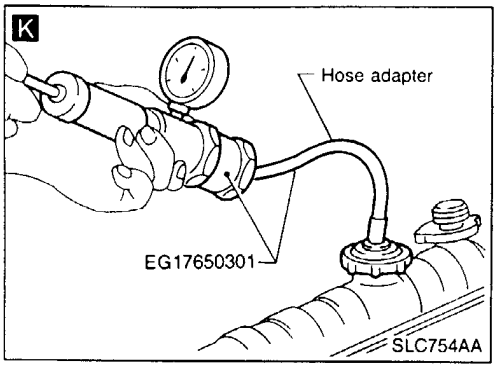
Trouble is not fixed. ↓

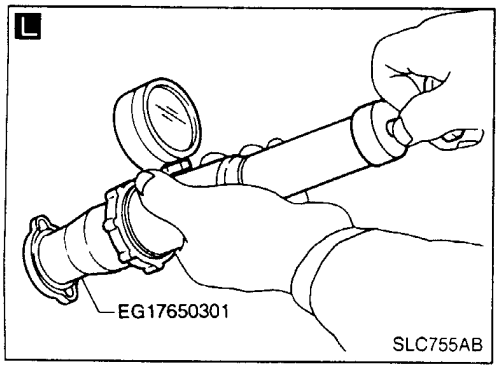
Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

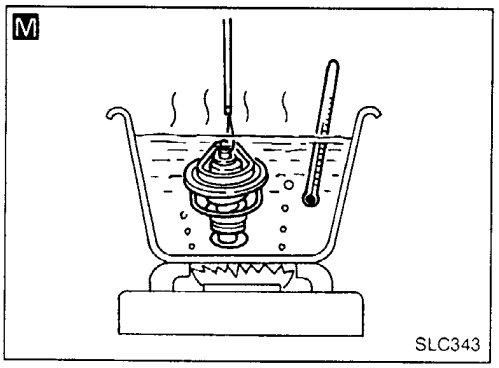
↓

INSPECTION END

Cooling Fan (Overheat) (Cont'd)







Ⓑ

K

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

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

Refer to LC section ("Water Pump").

OK ↓

L

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

NG → Replace radiator cap.

OK ↓

M

CHECK THERMOSTAT.
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.
   Valve opening temperature:
   88°C (190°F) [standard]
   Maximum valve lift:
   10 mm/100°C (0.39 in/212°F)
3. Check if valve is closed at 5°C (41°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-362.

NG → Replace engine coolant temperature sensor.

OK ↓

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

↓

INSPECTION END

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

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

Cooling Fan (Overheat) (Cont'd)

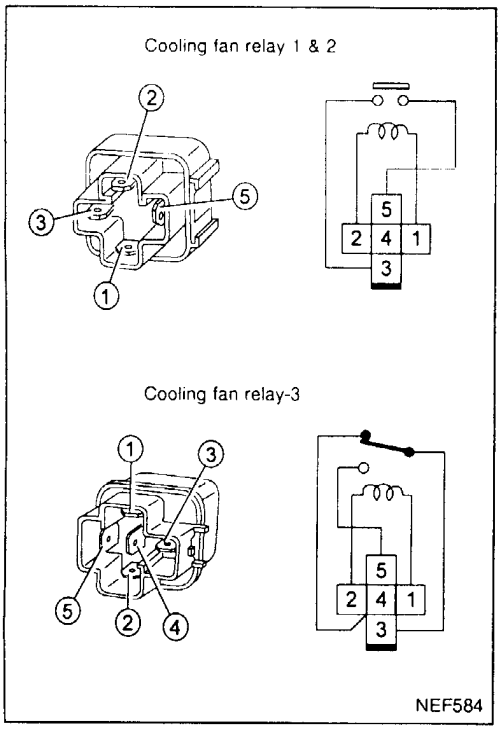
MAIN 12 CAUSES OF OVERHEATING

Engine	Step	Inspection item	Check/Equipment	Condition	Reference page
OFF	1	• Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	50 - 50% coolant mixture	See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section
	4	• Radiator cap	• Pressure tester	59 - 98 kPa (0.6-1.0 kg/cm^2, 9 - 14 psi)	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	5	• Coolant leaks	• Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section
ON*1	7	• Cooling fan	• CONSULT	Operating	See "TROUBLE DIAGNOSIS FOR DTC 28", EC-392.
OFF	8	• Combustion gas leak	• Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	• Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	—
		• Coolant overflow to reservoir tank	• Visual	No overflow during driving and idling	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	See "ENGINE MAINTENANCE" in MA section
OFF	11	• Cylinder head	• Straight gauge feeler gauge	0.1mm (0.004 in) Maximum distortion (warping)	See "Inspection", "CYLINDER HEAD" in EM section
	12	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	See "Inspection", "CYLINDER BLOCK" in EM section

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

Cooling Fan (Overheat) (Cont'd)

COMPONENT INSPECTION

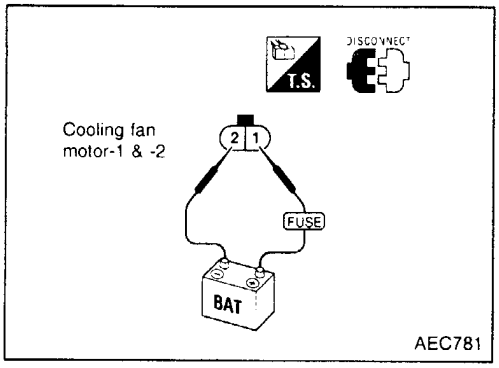


Cooling fan relays-1, -2, -3

Check continuity between terminals ③ and ⑤.

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

If NG, replace cooling fan relay.

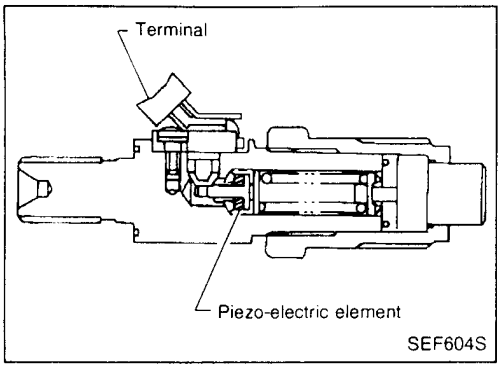


Cooling fan motors-1 and -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(⊕)	(⊖)
Cooling fan motor-1 and -2	①	②

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



Needle Lift Sensor (NLS)

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

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
34	• An improper signal from the sensor is sent to ECM (ECCS-D control module).	• Harness or connectors (The sensor circuit is open or shorted.) • Needle lift sensor • Air in fuel line • Clogging No. 1 injection nozzle

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

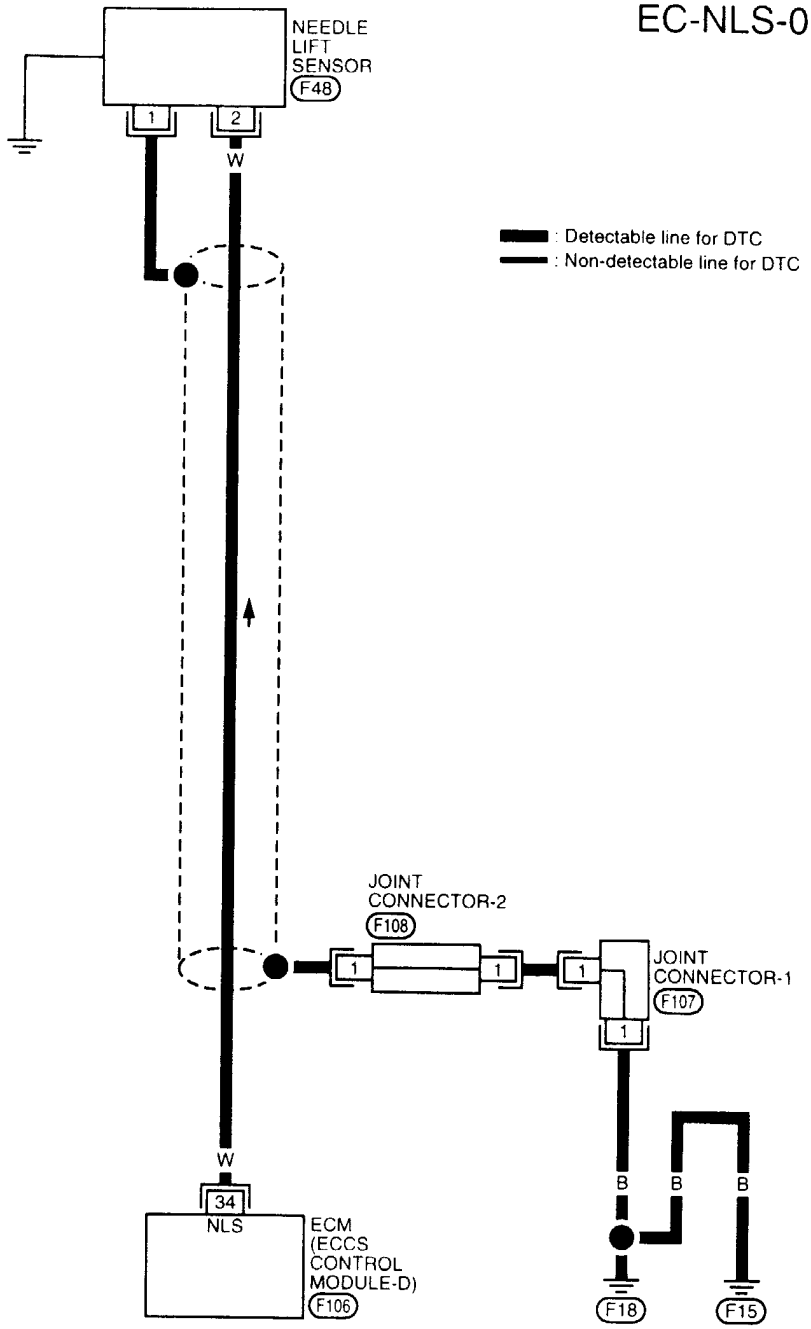
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 15 seconds at idle speed.

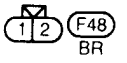
OR

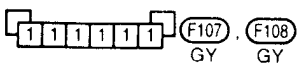
1) Start engine and run it for at least 15 seconds at idle speed.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

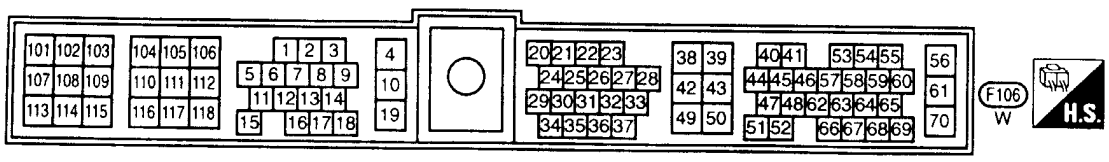
Needle Lift Sensor (NLS) (Cont'd)

EC-NLS-01









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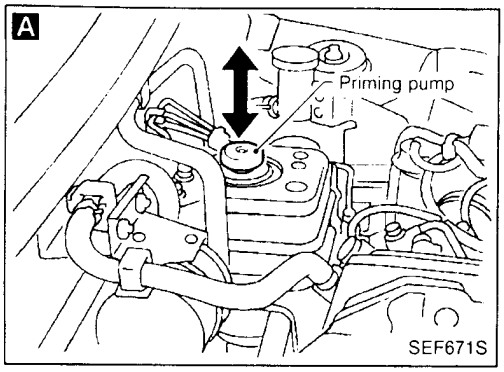
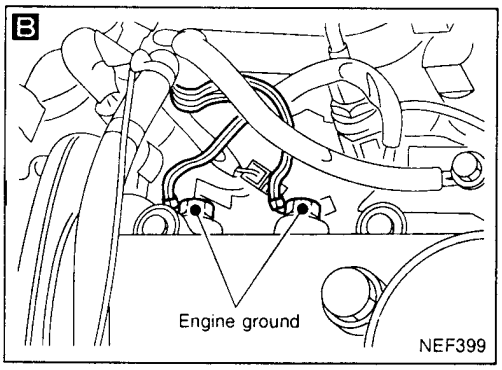
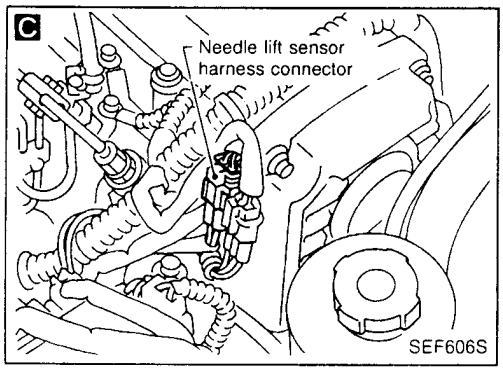
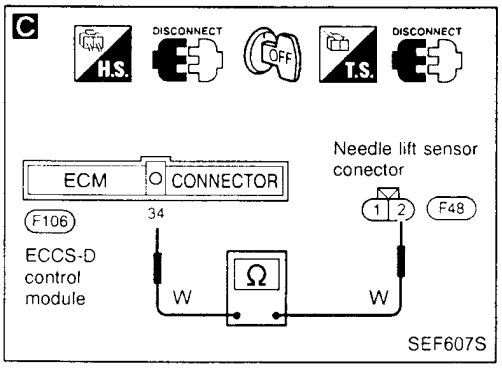
Needle Lift Sensor (NLS) (Cont'd)

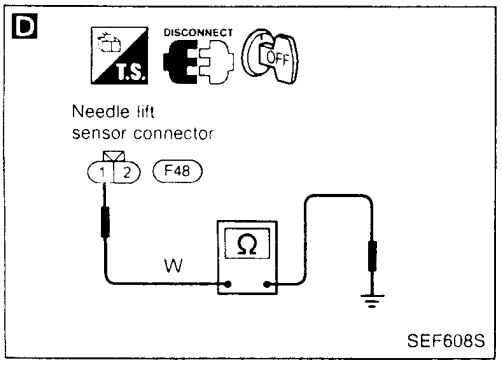
DIAGNOSTIC PROCEDURE











INSPECTION START

A

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

B

Loosen and retighten engine ground screws.

C

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM (ECCS-D control module) harness connector and needle lift sensor harness connector.
3. Check harness continuity between needle lift sensor connector terminal ② and ECM (ECCS-D control module) connector terminal ㉞.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

D

CHECK GROUND CIRCUIT.
Check resistance between needle lift sensor connector terminal ① and engine ground.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

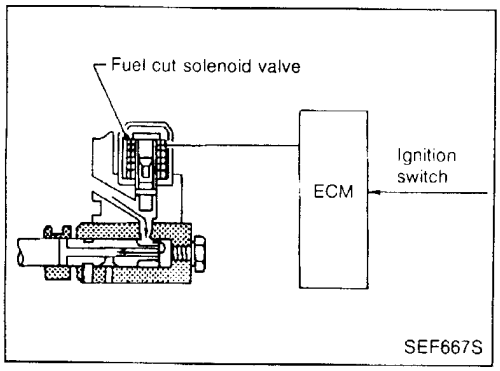
CHECK NO. 1 INJECTION NOZZLE FOR CLOGGING.
Refer to spray pattern test of "INJECTION NOZZLE".
If NG, replace No. 1 injection nozzle.

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

INSPECTION END



Fuel Cut Solenoid Valve

When the ignition switch is OFF, the ECM (ECCS-D control module) turns the fuel cut solenoid valve OFF (under this condition, no current flows through the fuel cut solenoid valve), shutting off fuel supply.
When the engine is not operating due to trouble, the fuel cut solenoid valve may or may not be OFF even when the ignition switch is ON.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
36, 37, 38	• Fuel cut solenoid valve circuit is malfunctioning.	• Main power supply circuit (ECM (ECCS-D control module) terminals (116), (117)) and fuse • Harness or connectors (The solenoid valve circuit is shorted.) • Fuel cut solenoid valve • ECM (ECCS-D control module)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

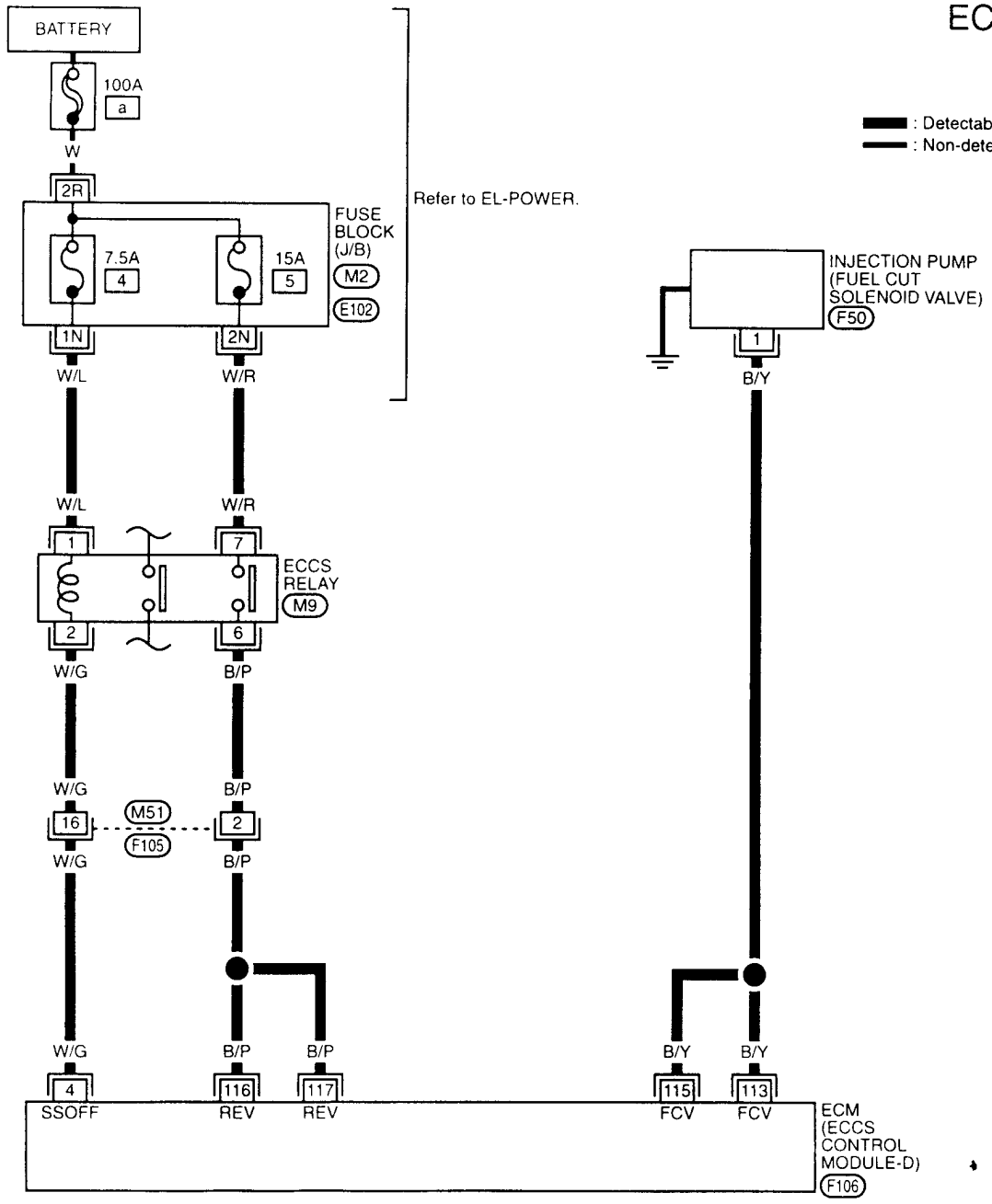
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine.
4) Turn ignition switch to "LOCK" position, wait at least 5 seconds.

OR

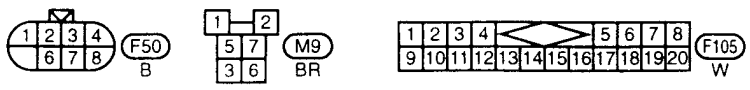
1) Start engine.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

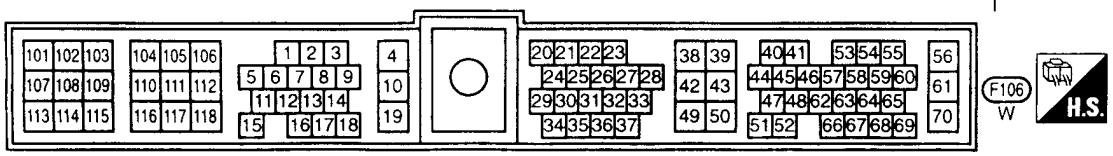
Fuel Cut Solenoid Valve (Cont'd)

EC-FCUT-01



Refer to last page (Foldout page).
M2 , E102





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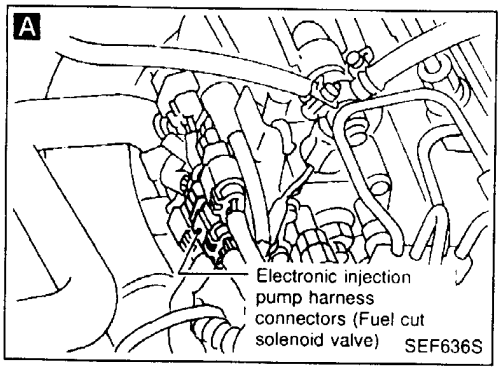
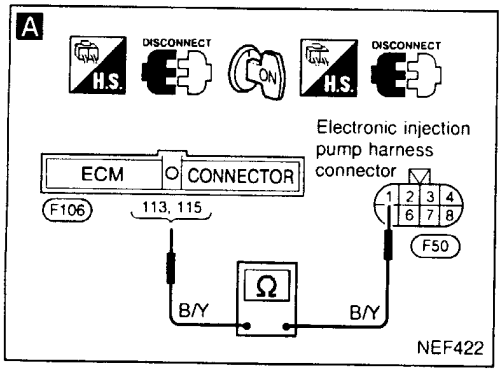
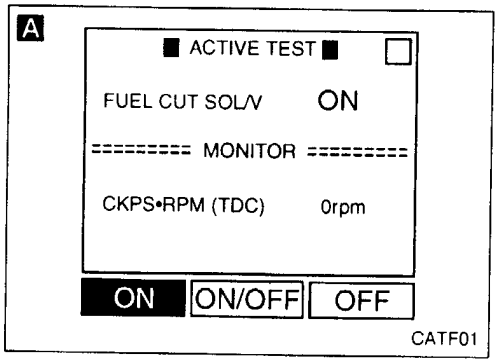
Fuel Cut Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

CHECK POWER SUPPLY.
Check power supply. Refer to EC-348.

A

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "ON" position.
2. Select "FUEL CUT SOL/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "ON" and "OFF" alternately.
4. Check that operating sound is emitted.

NG → Repair harness or connectors.

OR

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM (ECCS-D control module) harness connector and electronic injection pump harness connector.
3. Check harness continuity between terminal ② and ECM (ECCS-D control module) connector terminals (115). **Continuity should exist.** If OK, check harness for short.

OK

CHECK COMPONENT
(Fuel cut solenoid valve).
Refer to "COMPONENT INSPECTION" below.

NG → Replace fuel cut solenoid valve.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

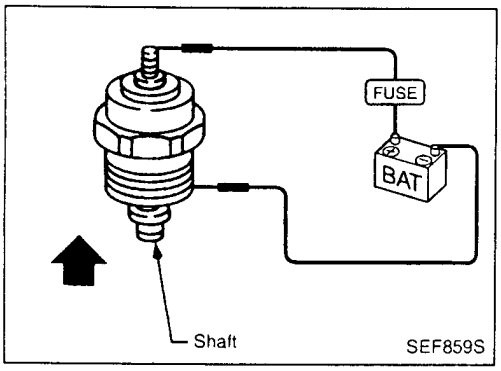
Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Fuel Cut Solenoid Valve (Cont'd)

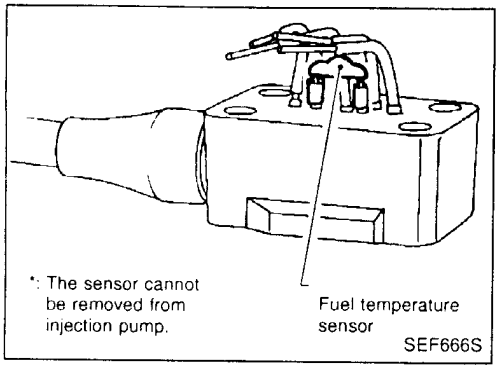
COMPONENT INSPECTION

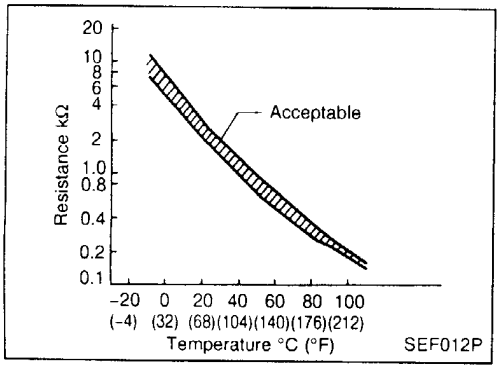


Fuel cut solenoid valve

1. Remove fuel cut solenoid valve.
2. Check for lifting shaft when applying 12V direct current to terminals.

If NG, replace fuel cut solenoid valve.





Fuel Temperature Sensor (FTS)

The fuel temperature sensor is used to detect the fuel temperature in the injection pump. The sensor modifies a voltage signal from the ECM (ECCS-D control module). The modified signal returns to the ECM (ECCS-D control module) as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

〈Reference data〉

Engine coolant temperature °C (°F)	Voltage (V)	Resistance (kΩ)
-20 (-4)	4.6	13.6 - 16.3
20 (68)	3.5	2.3 - 2.5
25 (77)	3.3	1.9 - 2.1
50 (122)	2.2	0.75 - 0.86
60 (140)	1.8	0.538 - 0.624
80 (176)	1.2	0.289 - 0.344

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
42	• An excessively high or low voltage from the sensor is detected by ECM (ECCS-D control module).	• Harness or connectors (The sensor circuit is open or shorted.) • Fuel temperature sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

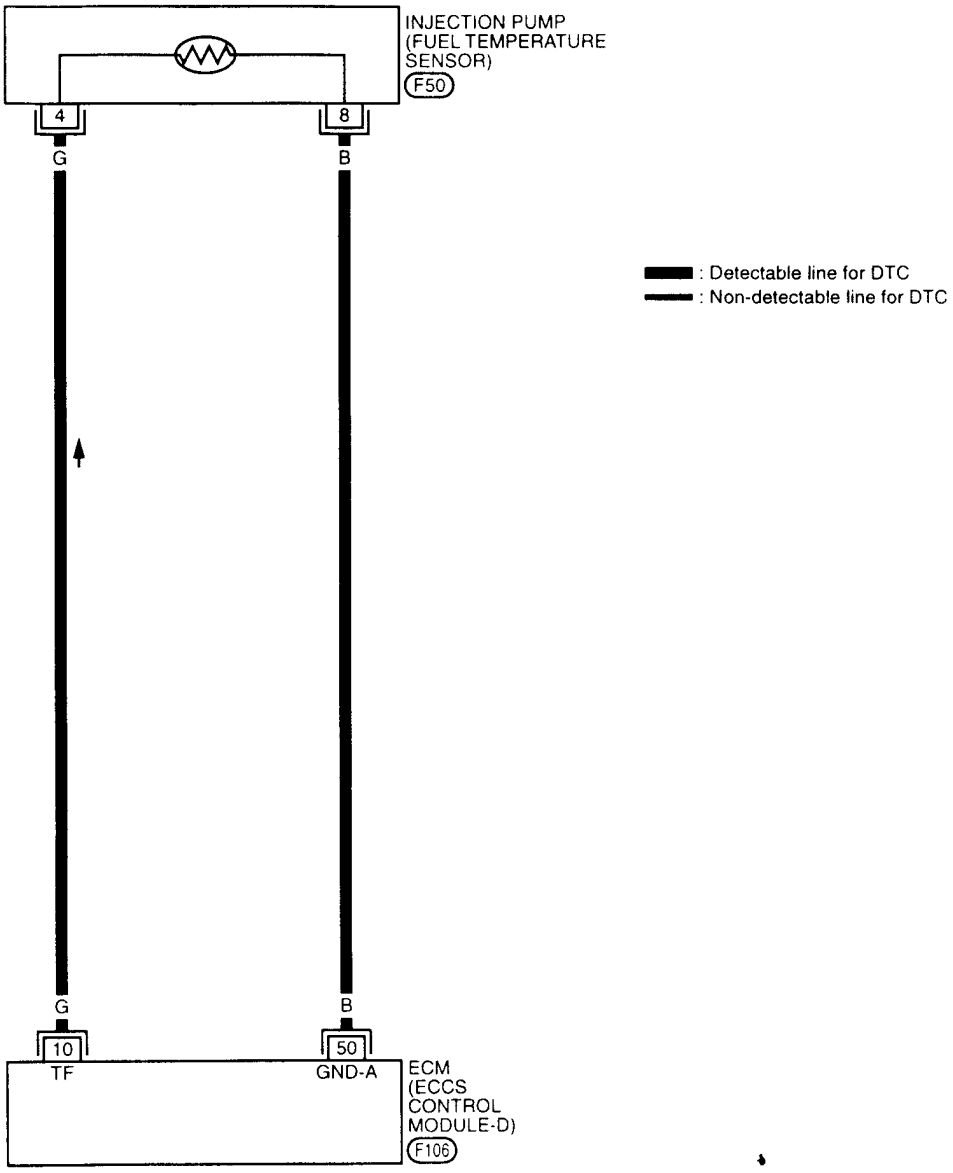
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

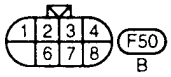
OR

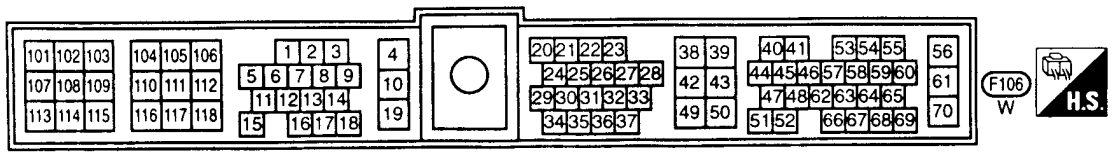
1) Turn ignition switch to "ON" position and wait at least 5 seconds.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Fuel Temperature Sensor (FTS) (Cont'd)

EC-FTS-01



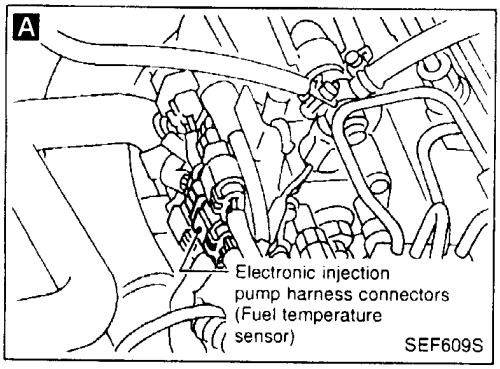


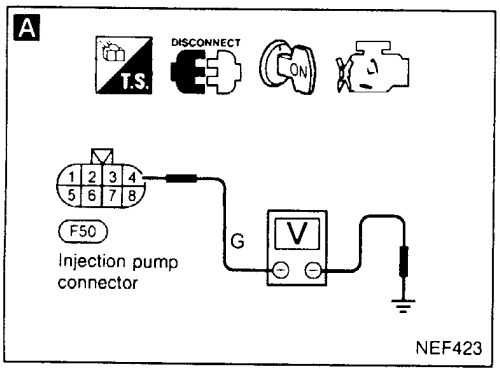


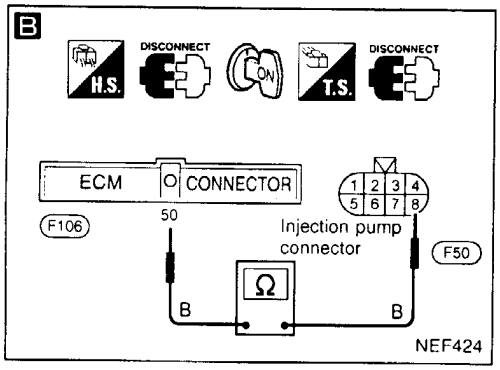
SEF430S

Fuel Temperature Sensor (FTS) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect fuel temperature sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between injection pump connector terminal ④ and ground with CONSULT or voltage tester.

   Voltage:
   Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between injection pump connector terminal ⑧ and ECM (ECCS-D control module) connector terminal ⑤⓪.

   Continuity should exist.

   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT (Fuel temperature sensor). Refer to "COMPONENT INSPECTION" on next page.

NG → Have the injection pump assembly serviced by an authorised service representative.

OK

Disconnect and reconnect harness connectors in the circuits. Then retest.

Trouble is not fixed.

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

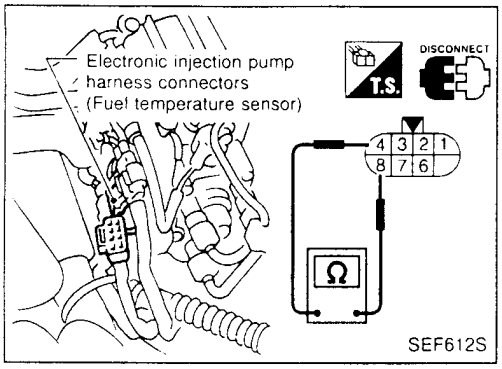
INSPECTION END

Fuel Temperature Sensor (FTS) (Cont'd)

COMPONENT INSPECTION

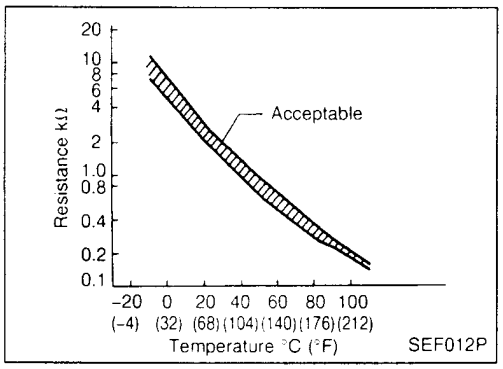
Fuel temperature sensor

Wait until fuel temperature sensor reaches room temperature.
Check resistance between terminals ④ and ⑧.



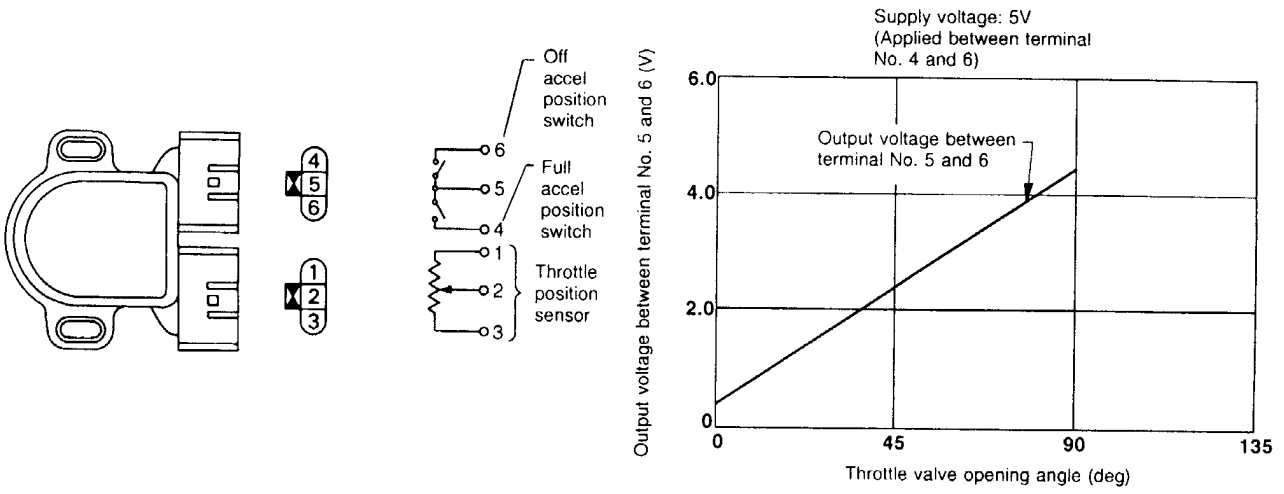
Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.5
25 (77)	1.9 - 2.1
50 (122)	0.75 - 0.86
60 (140)	0.538 - 0.624
80 (176)	0.289 - 0.344

If NG, have the injection pump assembly serviced by an authorised service representative.



Accelerator Position Sensor

The accelerator position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM (ECCS-D control module). The ECM (ECCS-D control module) uses the signal to determine the amount of fuel to be injected.



SEF861S

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
43	• An excessively low or high voltage from the sensor is detected by the ECM (ECCS-D control module).	• Harness or connectors (The sensor circuit is open or shorted.) • Accelerator position sensor • Accelerator position switch • Accelerator switch (F/C)

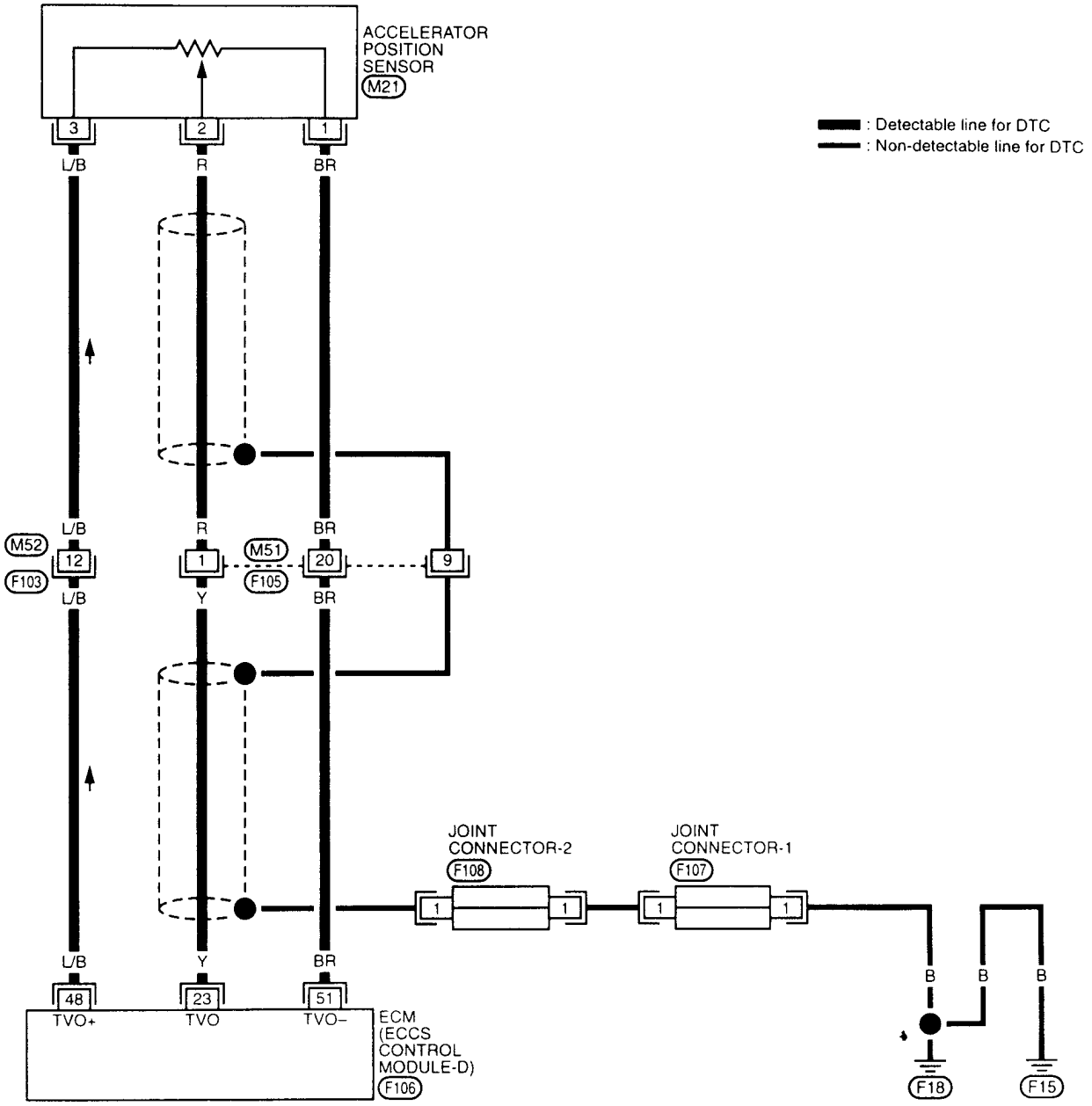
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

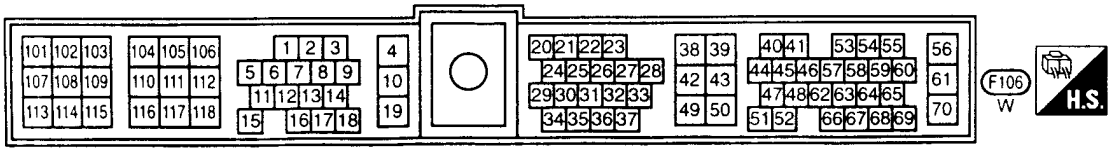
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

OR

1) Turn ignition switch to "ON" position and wait at least 2 seconds.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)".

EC-APS-01

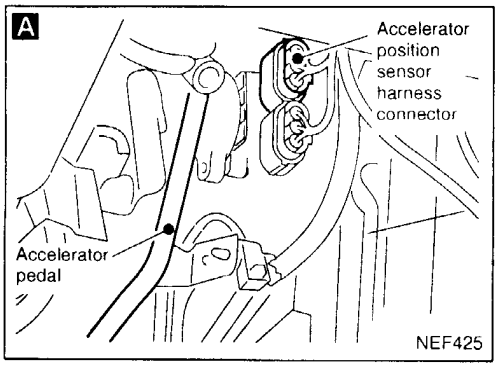


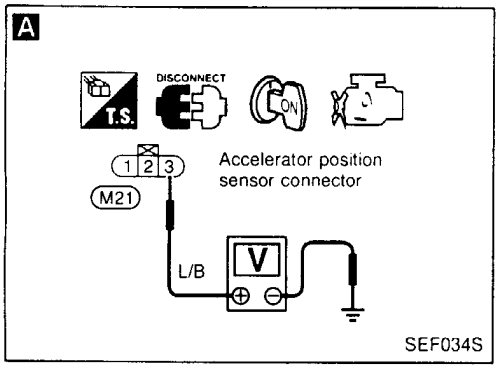


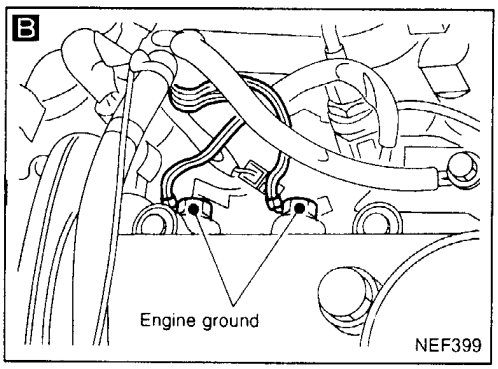
SEF434S

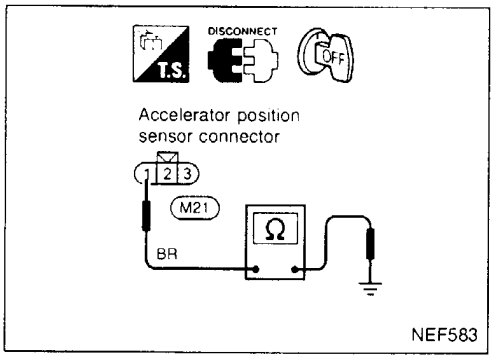
Accelerator Position Sensor (Cont'd)

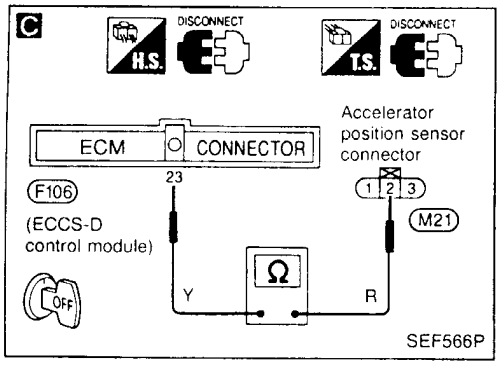
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect accelerator position sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between accelerator position sensor connector terminal ③ and ground with CONSULT or voltage tester.
   Voltage: Approximately 5V

NG → Check the following:
- Harness connectors (M52), (F103)
- Harness for open or short-circuit between ECM (ECCS-D control module) and accelerator position sensor.

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screw.
3. Check harness continuity between accelerator position sensor connector terminal ① and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M51), (F105)
- Harness for open or short-circuit between ECM (ECCS-D control module) and accelerator position sensor.

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM (ECCS-D control module) harness connector.
2. Check harness continuity between ECM (ECCS-D control module) terminal ㉓ and accelerator position sensor connector terminal ② .
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Accelerator position sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace accelerator pedal assembly.

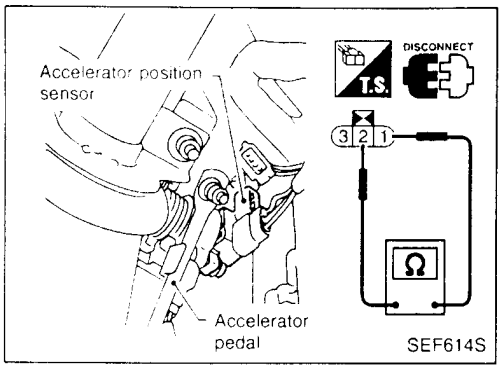
OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

INSPECTION END



Accelerator Position Sensor (Cont'd)

COMPONENT INSPECTION

Accelerator position sensor

1. Disconnect accelerator position sensor harness connector.
2. Make sure that resistance between accelerator position sensor terminals ① and ② changes when opening throttle valve manually.

Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 0.5 kΩ
Partially open	0.5 - 4 kΩ
Completely open	Approximately 4 kΩ

If NG, replace accelerator pedal assembly.

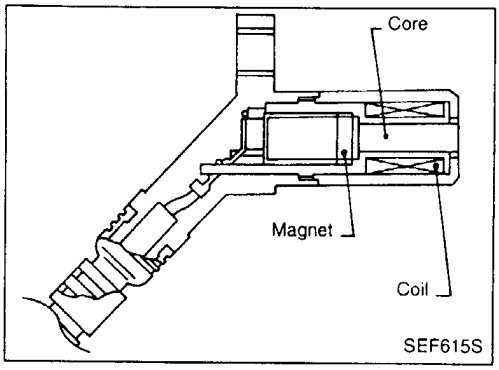
CAUTION:

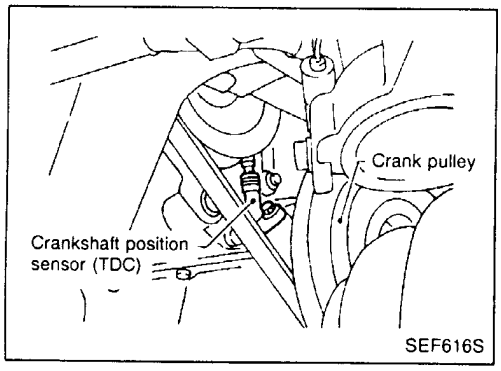
- **If accelerator position sensor or ECM (ECCS-D control module) connector is disconnected, perform following operation:**

Select "OFF ACCEL PO SIG" in ACTIVE TEST mode. Touch "CLEAR".

Start and warm up engine. After engine was warmed up, let engine idle for 10 minutes.

- **Do not disassemble accelerator pedal assembly.**





Crankshaft Position Sensor (TDC)

The crankshaft position sensor (TDC) monitors engine speed by means of signals from the sensing plate (with two protrusions) installed to the crankshaft pulley. The datum signal output is detected at ATDC 70° and sent to the ECM (ECCS-D control module). The sensor signal is used for fuel injection control and fuel injection timing control.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
47	• An incorrect signal from the sensor is detected by ECM (ECCS-D control module) during engine running and cranking.	• Harness or connectors (The sensor circuit is open.) • Crankshaft position sensor (TDC)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

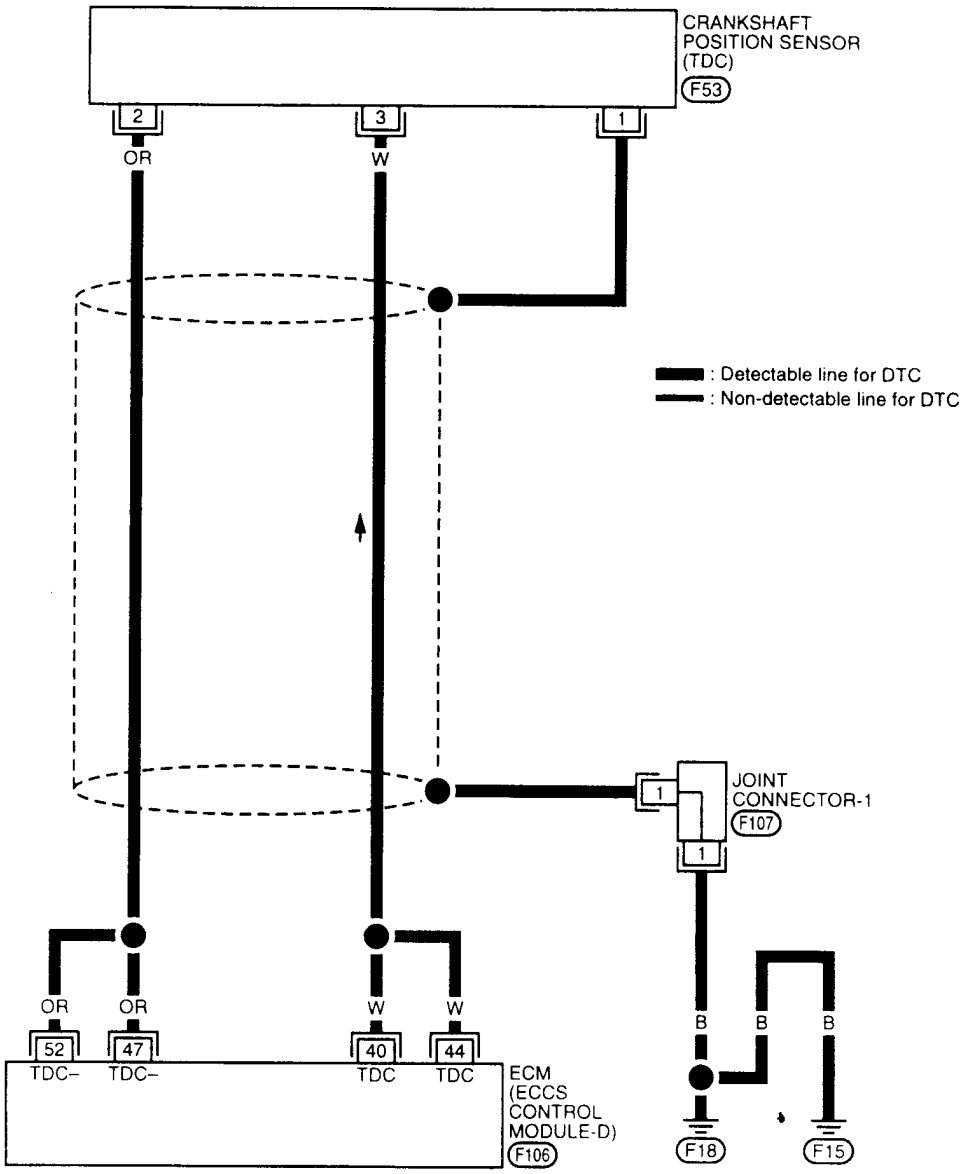
Before performing the following procedure, confirm that battery voltage is more than 10V.

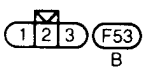
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Turn ignition switch to "START" position and keep it there for more than 0.5 seconds.
3) Start engine and run it for at least 2 seconds at idle speed.

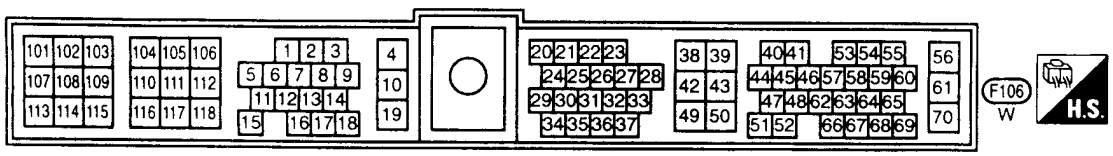
OR

1) Turn ignition switch to "START" position and keep it more than 0.5 seconds.
2) Start engine and run it for at least 2 seconds at idle speed.
3) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

EC-CKPS-01



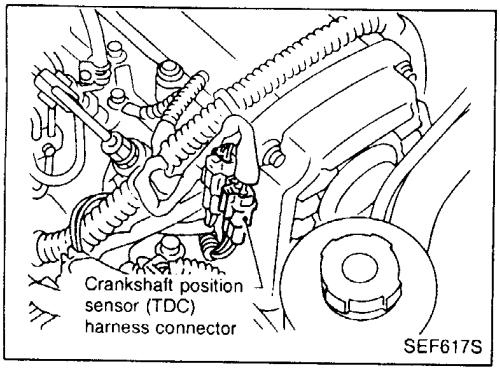


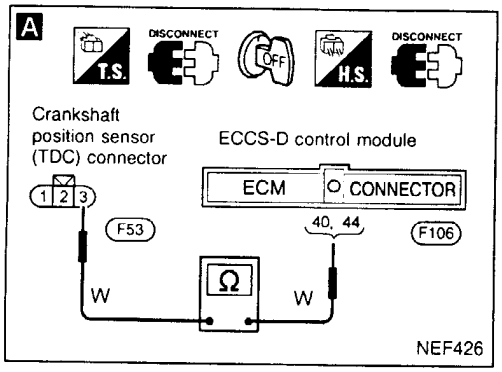


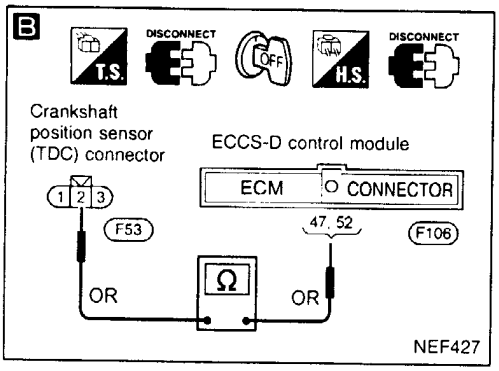
SEF435S

Crankshaft Position Sensor (TDC) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect crankshaft position sensor (TDC) and ECM (ECCS-D control module) harness connectors.
3. Check continuity between ECM (ECCS-D control module) terminal ⑩, ㊹ and crankshaft position sensor (TDC) connector terminal ③.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

Loosen and retighten engine ground screws.

OK

B

CHECK GROUND CIRCUIT.

Check harness continuity between crankshaft position sensor (TDC) connector terminal ② and ECM (ECCS-D control module) connector terminals ㊼, ㊷.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT [Crankshaft position sensor (TDC)]. Refer to "COMPONENT INSPECTION" on next page.

NG → Replace crankshaft position sensor (TDC).

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

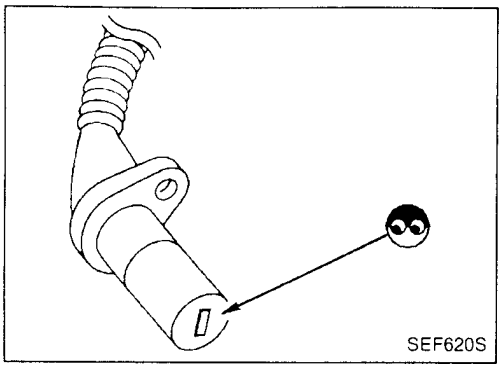
Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

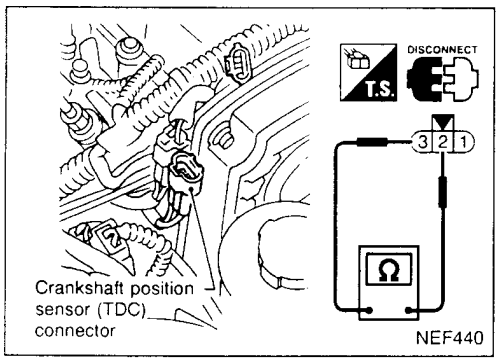
INSPECTION END

Crankshaft Position Sensor (TDC) (Cont'd)

COMPONENT INSPECTION

Crankshaft position sensor (TDC)





1. Disconnect crankshaft position sensor (TDC) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance between crankshaft position sensor (TDC) terminals ② and ③.

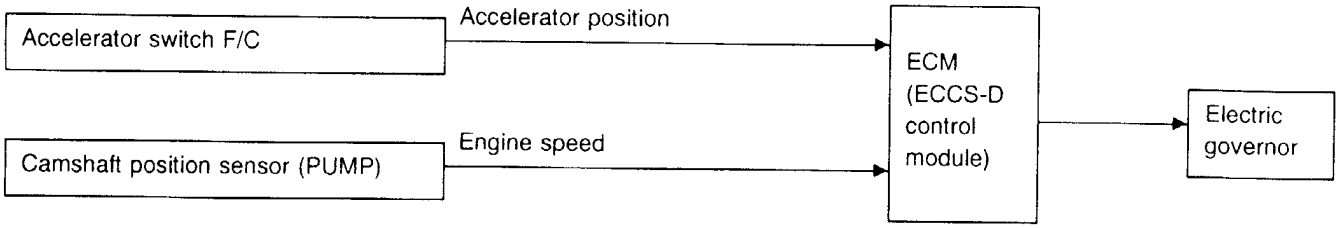
   Resistance: Approximately 1.2 - 1.5kΩ [at 25°C (77°F)]

   If NG, replace crankshaft position sensor (TDC).

Governor Cut Circuit

ON BOARD DIAGNOSIS LOGIC

This diagnostic procedure checks whether or not vuel cut is being performed during deceleration.
Signals from the accelerator switch and camshaft position sensor (PUMP) are sent to the ECM (ECCS-D control module) . The ECM (ECCS-D control module) uses these signals to control the electric governor operation.



Diagnostic Trouble Code No.	Malfunction is detected when	Check Item (Possible Cause)
48	• Accelerator switch circuit is shorted. • Crankshaft position sensor (PUMP) or ECM (ECCS-D control module) is malfunctioning.	• Harness or connectors [Accelerator switch and camshaft position sensor (PUMP) circuits] • Accelerator switch (F/C) • Camshaft position sensor (PUMP) • ECM (ECCS-D control module)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC 48 and 11 or 23 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 11 or 23 (See EC-351 or 383).

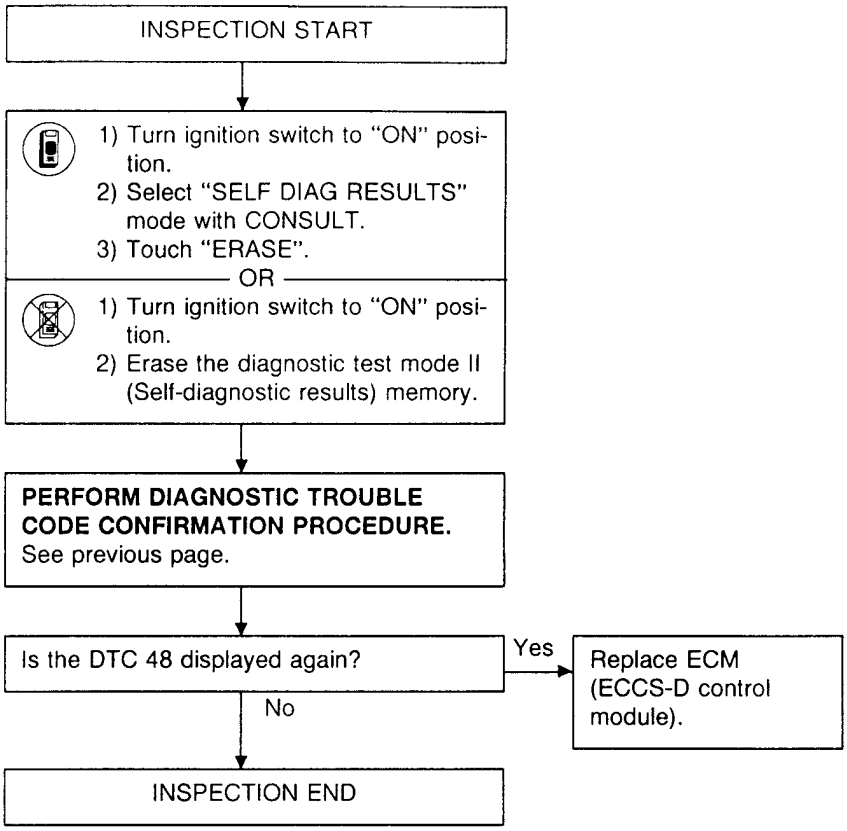
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and run it to 3000 rpm, then quickly release accelerator pedal.

OR

1) Start engine and run it to 3000 rpm, then release accelerator pedal.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)".

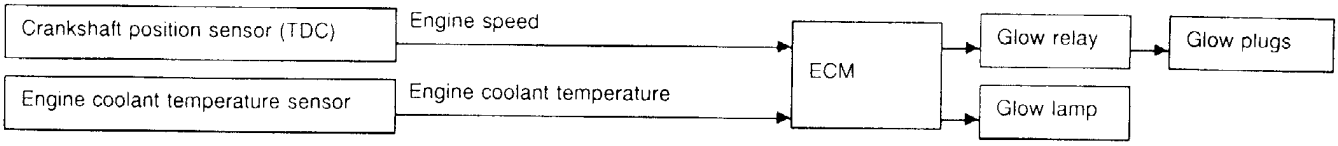
Governor Cut Circuit (Cont'd)

DIAGNOSTIC PROCEDURE



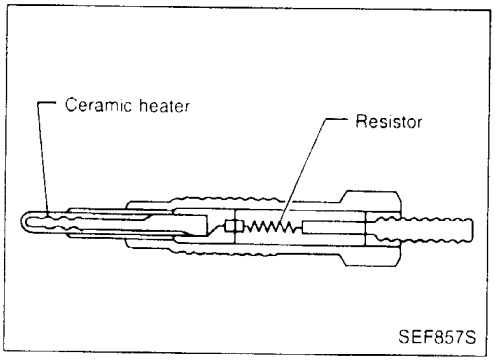
Glow control System

SYSTEM DESCRIPTION



When engine coolant temperature is more than 75°C (167°F), the glow relay turns off, inactivating the quick-glow control until coolant temperature drops below 55°C (131°F).
When coolant temperature is lower than 75°C (167°F):

- Ignition switch ON
  After ignition switch has been turned to ON, the glow relay turns ON for a period of time proportional to engine coolant temperature, allowing current to flow through glow plug.
- Cranking
  The glow relay turns ON, allowing current to flow through glow plug.
- Starting
  After engine has started, current continues to flow through glow plug (after-glow mode) for a time proportional to engine coolant temperature.
  When engine coolant temperature exceeds 50°C (122°F), current flow through glow plug is interrupted.

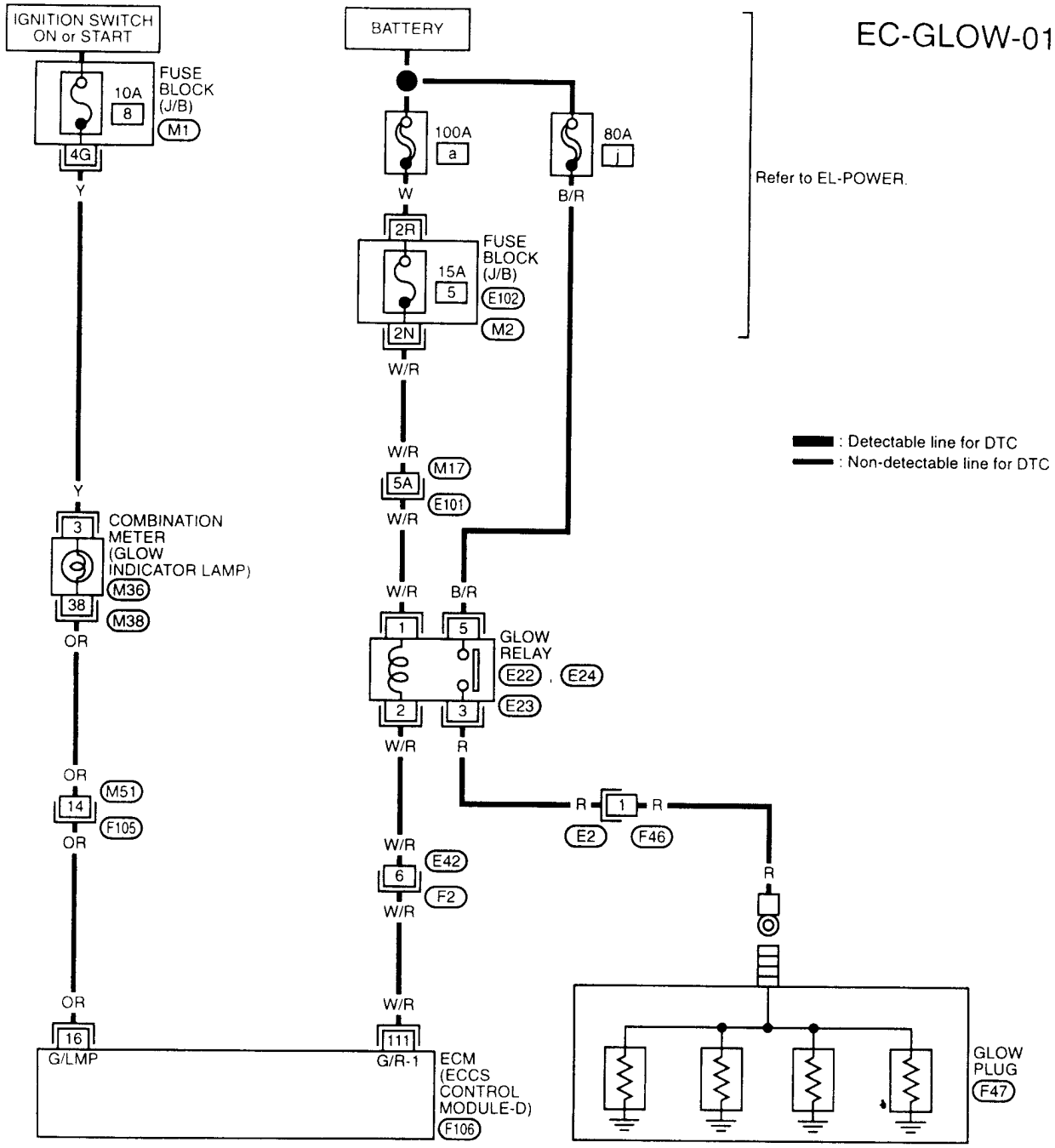


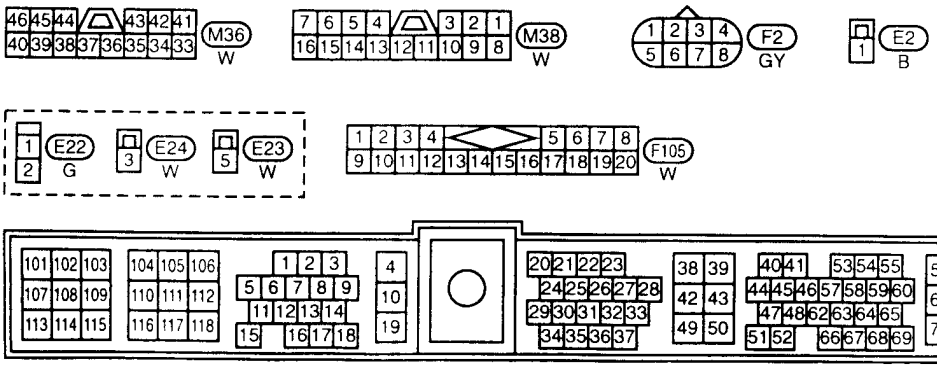
COMPONENT DESCRIPTION

Glow plug

The glow plug is provided with a ceramic heating element to obtain a high-temperature resistance. It glows in response to a signal sent from the ECM (ECCS-D control module), allowing current to flow through the glow plug via the glow relay.

Glow control System (Cont'd)



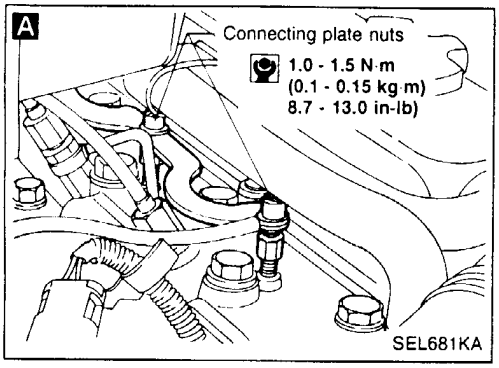


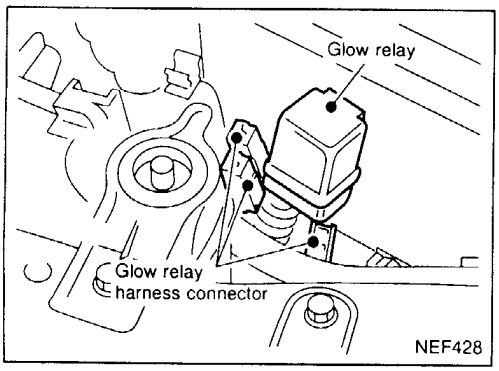
Refer to last page (Foldout page).
M1, M2, E102
E101, M17

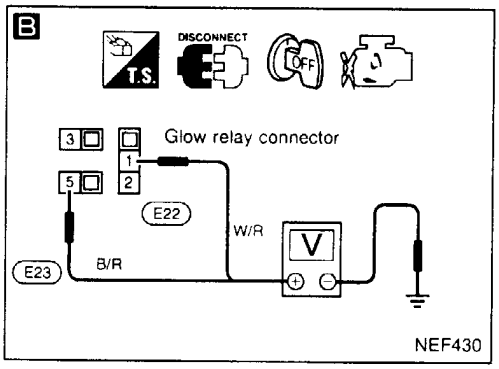
SEF440S

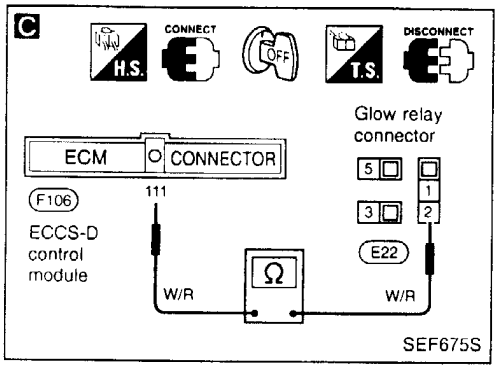
Glow control System (Cont'd)

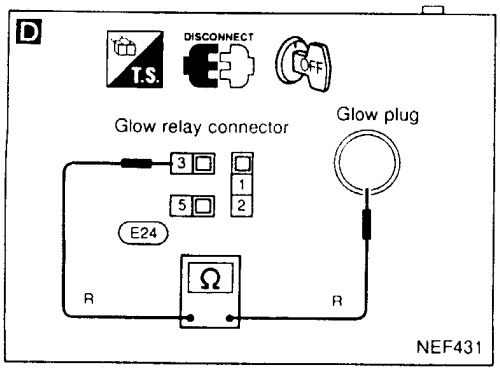
DIAGNOSTIC PROCEDURE











INSPECTION START

Check fuel level, fuel supplying system, starter motor, etc.
NG → Correct.
OK

A

Check that all glow plug connecting plate nuts are installed properly.
NG → Install properly.
OK

CHECK OVERALL FUNCTION.
Check entire glow control system. (Refer to "System Operation Check" on next page.)
OK → CHECK COMPONENT (Glow plug). See page EC-424.
NG

B

CHECK VOLTAGE BETWEEN GLOW RELAY AND GROUND.
Check voltage between glow relay connector terminals ①, ⑤ and ground with tester.
Voltage: Battery voltage
NG → Check the following:
- 15A fuse
- 80A fusible link
- 100A fusible link
- Harness connectors (M17), (101)
- Harness continuity between glow relay and fuse.

If NG, replace fuse or fusible link or repair harness or connectors.

OK

C

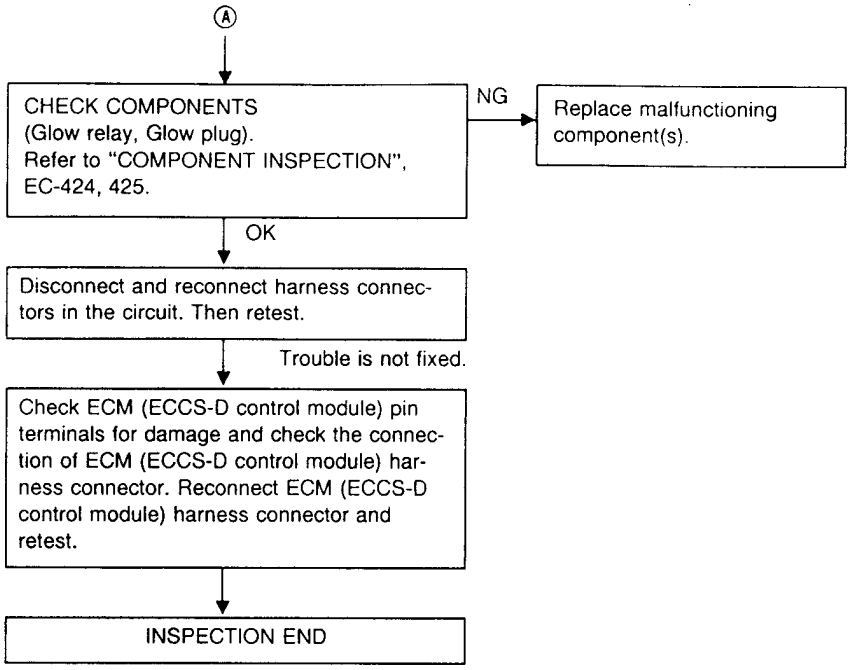
CHECK OUTPUT SIGNAL CIRCUIT.
Check harness continuity between ECM (ECCS-D control module) connector terminal (111) and glow relay connector terminal ②.
Continuity should exist.
If OK, check harness for short-circuit.
NG → Check harness connectors (F2), (E42) Repair harness or connectors.
OK

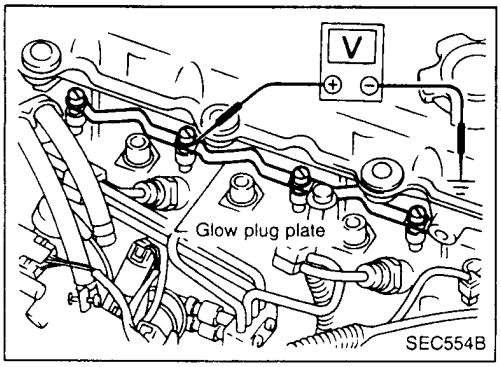
D

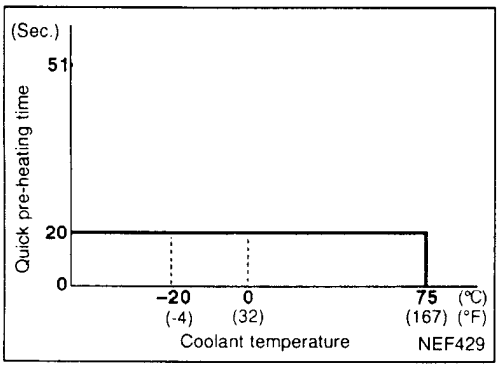
CHECK HARNESS CONTINUITY BETWEEN GLOW RELAY AND GLOW PLUG.
1. Disconnect ECM (ECCS-D control module) harness connector.
2. Disconnect glow relay.
3. Check harness continuity between glow relay connector terminal ③ and glow plug.
Continuity should exist.
If OK, check harness for short-circuit.
NG → Check harness connectors (E2), (F46) Repair harness or connectors.
OK

Ⓐ

Glow control System (Cont'd)







SYSTEM OPERATION CHECK

Set voltmeter between glow plug and engine body.

1. Quick-glow (Pre-glow) system
a. Turn ignition switch to "ON" position.
b. Read voltage.

Voltage:

Battery voltage for about 20* seconds

*** Engine coolant temperature is lower than 75°C (167°F).**

*** Repeatedly turning the ignition switch to "ON" position and to "LOCK" position may change the quick glow (pre-glow) time.**

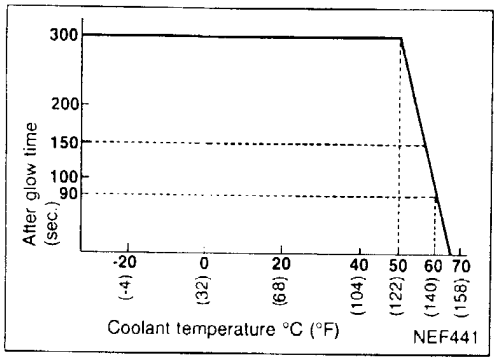
2. Quick-glow (Cranking) system
a. Disconnect "S" terminal from starter motor to prevent engine from cranking.
b. Read voltage when ignition switch is turned to "START" position.

Voltage:

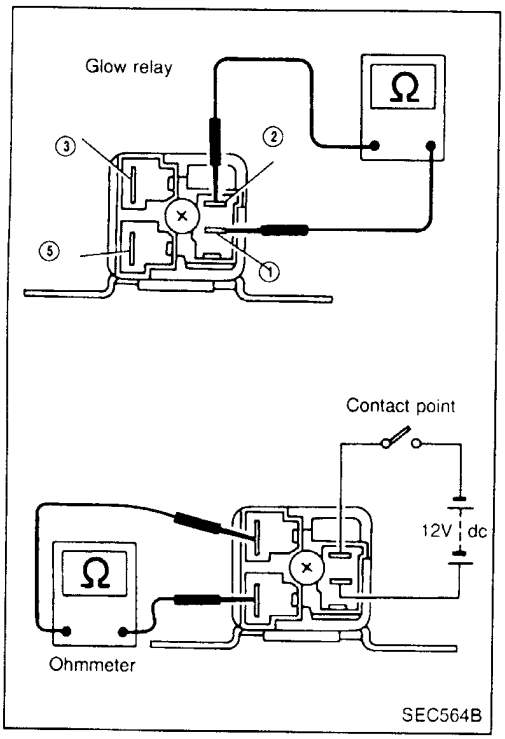
Battery voltage*

*** For about 20 seconds after returning ignition switch to "ON" position.**

Glow control System (Cont'd)



3. After-glow system
a. Connect "S" terminal to starter motor.
b. Start engine and read voltage.
Voltage:
Battery voltage for 5* minutes
*** Engine coolant temperature is lower than 50°C (122°F).**

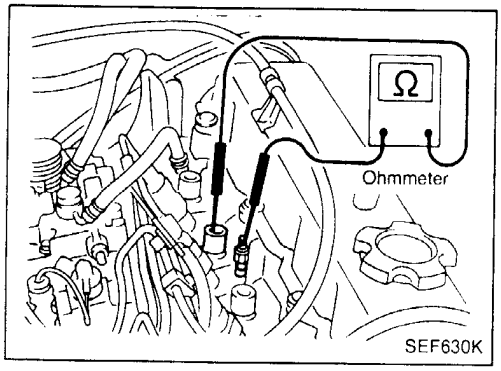


COMPONENT INSPECTION

Glow relay

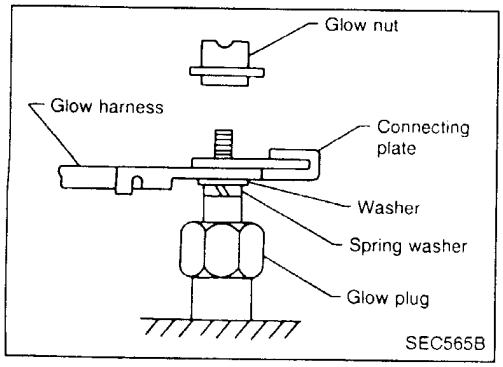
1. Check relay for coil continuity between glow relay terminals ① and ②.
Continuity should exist.
2. Check relay for proper operation by applying 12V dc voltage between glow relay terminals ① and ② and checking continuity between terminals ③ and ⑤.

Coil voltage	Continuity ③ – ⑤	Contact point
0V	No	OFF
12V	Yes	ON



Glow plug

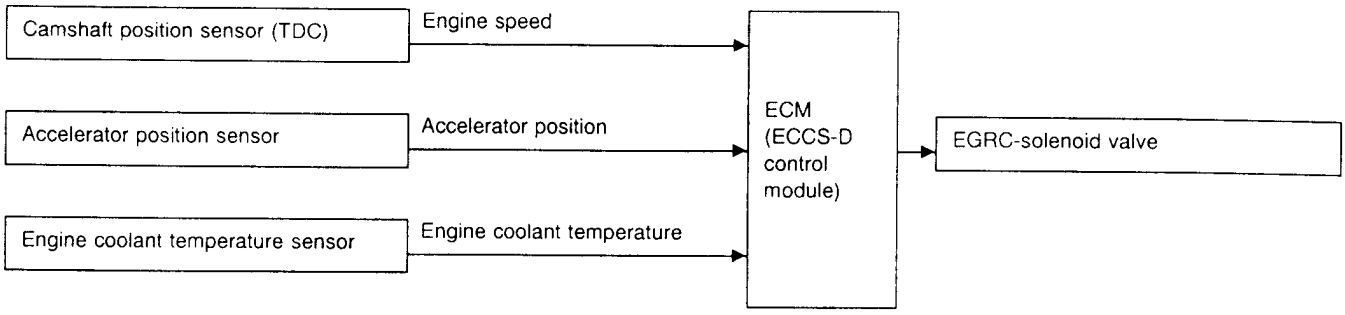
1. Remove glow plug connecting plate.
2. Check each glow plug for continuity.
Continuity should exist:
Approximately 0.5Ω [at 25°C (77°F)]
- If NG, replace glow plug.



3. Install glow plug connecting plate securely.
- **Do not bump glow plug heating element. If it is bumped, replace glow plug with new one. (If glow plug is dropped from a height of 0.1 m (3.94 in) or greater, replace with new one.)**
- **If glow plug installation hole is contaminated with carbon, remove using a reamer or suitable tool.**
- **Hand-tighten glow plug by turning it 2 to 3 times, then tighten using a tool to specified torque.**
: 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)

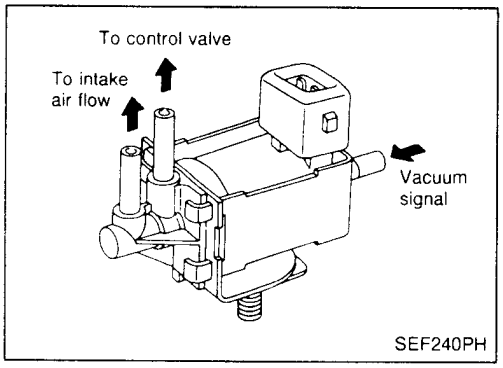
EGRC-Solenoid Valve

SYSTEM DESCRIPTION



The ECM (ECCS-D control module) receives signals sent from the engine coolant temperature sensor, crankshaft position sensor (TDC) and accelerator position sensor to determine engine speed and operating conditions. Based on these signals, the ECM (ECCS-D control module) controls EGR control solenoid valve operation.

Engine coolant temperature °C (°F)	Load	EGRC-solenoid valve	EGR valve	Amount of EGR gas
Below 70 (158)	Any	OFF (Closed)	Fully closed	—
Above 70 (158)	Low load	ON (Open)	Fully open	Large
	High load	OFF (Closed)	Fully closed	—

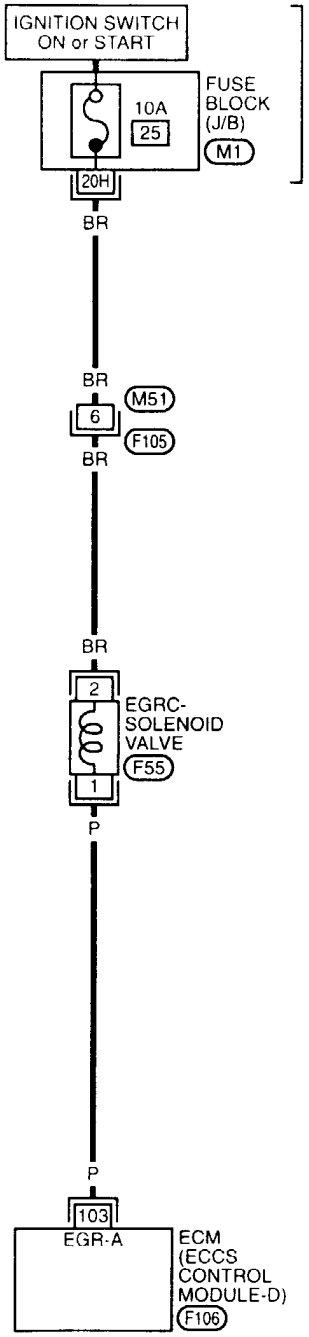


COMPONENT DESCRIPTION

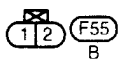
The EGR control solenoid valves control vacuum pressure acting on the EGR valve. The EGR control valve will then be fully opened or fully closed, as required.
Thus, intake air passages are opened or closed in relation to exhaust gas and intake air. Utilizing the relationship between exhaust gas pressure and intake air pressure control, the amount of EGR (exhaust gas recirculated) is regulated in large or small volumes.

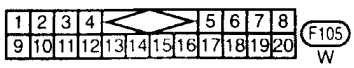
EGRC-Solenoid Valve (Cont'd)

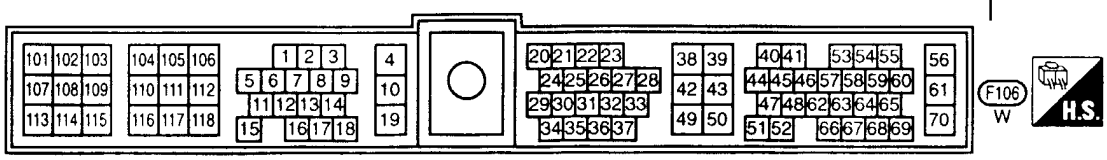
EC-EGRC/V-01



Refer to last page (Foldout page).
M1



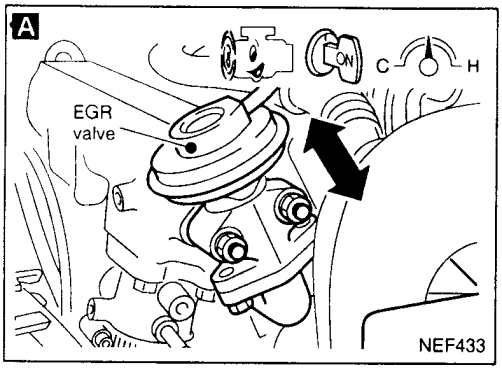


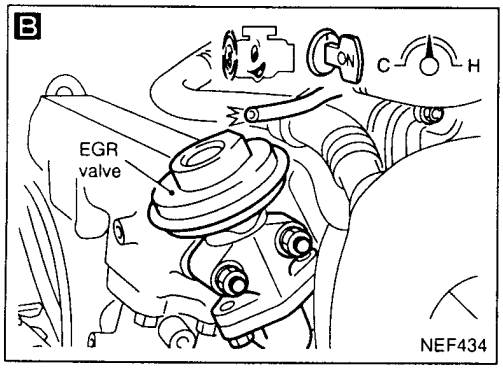


SEF438S

EGRC-Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently.
2. Perform diagnostic test mode II (Self-diagnostic results).
   Make sure that diagnostic trouble code No. 55 is displayed.
3. Make sure that EGR valve spring moves up and down (Use your finger) under the following conditions:
   At idle:
   Spring does not move.
   Racing engine from idle to 2800 rpm:
   Spring moves up and down.

OK → INSPECTION END

NG

B

CHECK VACUUM SOURCES TO EGR VALVE.

1. Disconnect vacuum hoses to EGR valve.
2. Make sure that vacuum exists under the following conditions:
   At idle:
   Vacuum should not exist.
   Racing engine from idle to 2800 rpm:
   Vacuum should exist.

OK → CHECK COMPONENTS (EGR valve). (See page EC-430.)

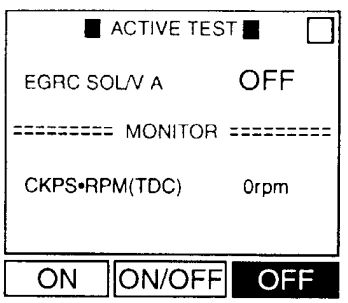
NG → Replace malfunctioning component(s).

NG

Ⓐ

EGRC-Solenoid Valve (Cont'd)

C



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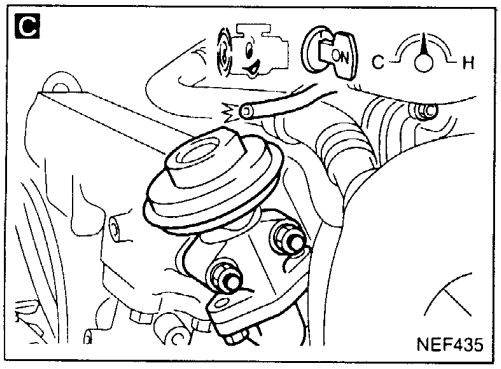

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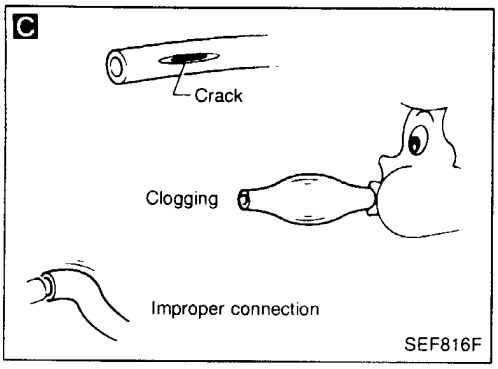
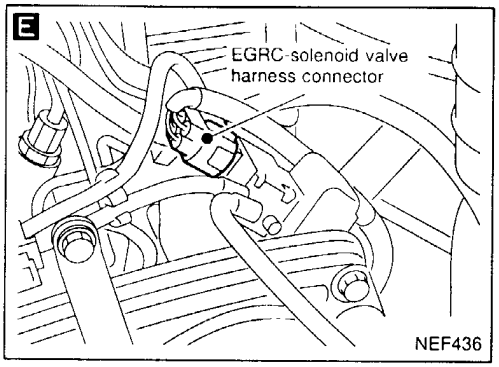


SEF816F

E



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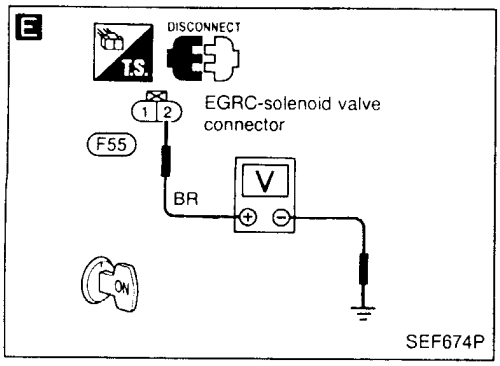


SEF674P

Ⓐ

C **CHECK CONTROL FUNCTION.**

1. Turn ignition switch to "ON" position.
2. Turn EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

1. Check voltage between ECM (ECCS-D control module) terminals (103), and ground with tester under the following conditions:

Voltage:
At idle
Approximately 0.4V
Engine speed is 2,800 rpm
Battery voltage

OK → **D** **CHECK VACUUM HOSE.**
Check vacuum hose for clogging, cracks or improper connection.

NG ↓

E **CHECK POWER SUPPLY.**

1. Turn ignition switch to "LOCK" position.
2. Disconnect EGRC-solenoid valve harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between EGRC solenoid valve connector terminal ② and ground with CONSULT or voltage tester.

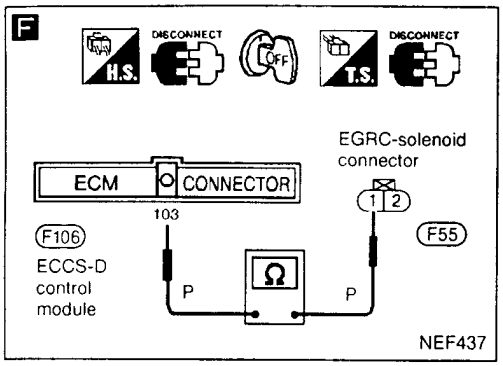
Voltage: Battery voltage

NG → Check the following:
- Harness connectors (M51), (F105)
- 10A fuse
- Harness for open or short-circuit between EGRC-solenoid valve and fuse.

If NG, replace fuse or repair harness or connectors.

OK ↓

Ⓑ



Ⓑ

F

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM (ECCS-D control module) harness connector.
2. Check harness continuity between ECM (ECCS-D control module) connector terminal (103) and (EGRC-solenoid valve connector) terminal ①.

Continuity should exist.

If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENTS (EGRC-solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace malfunctioning component(s).

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

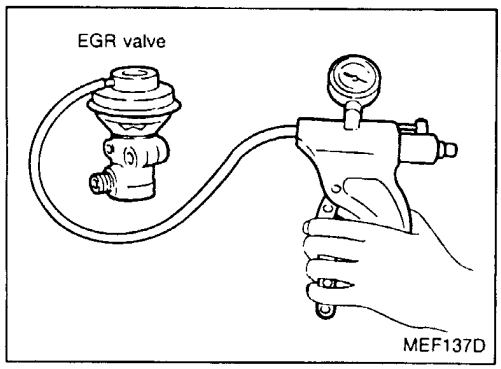
Check ECM (ECCS-D control module) pin terminals for damage or the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

↓

INSPECTION END

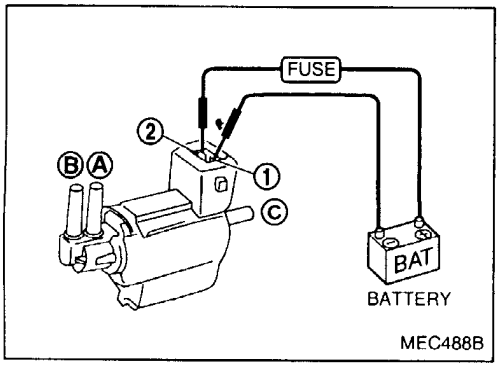
EGRC-Solenoid Valve (Cont'd)

COMPONENT INSPECTION



EGR valve

Apply vacuum to EGR vacuum port with a hand vacuum pump.
EGR valve spring should lift.
If NG, replace EGR valve.



EGRC-solenoid valve

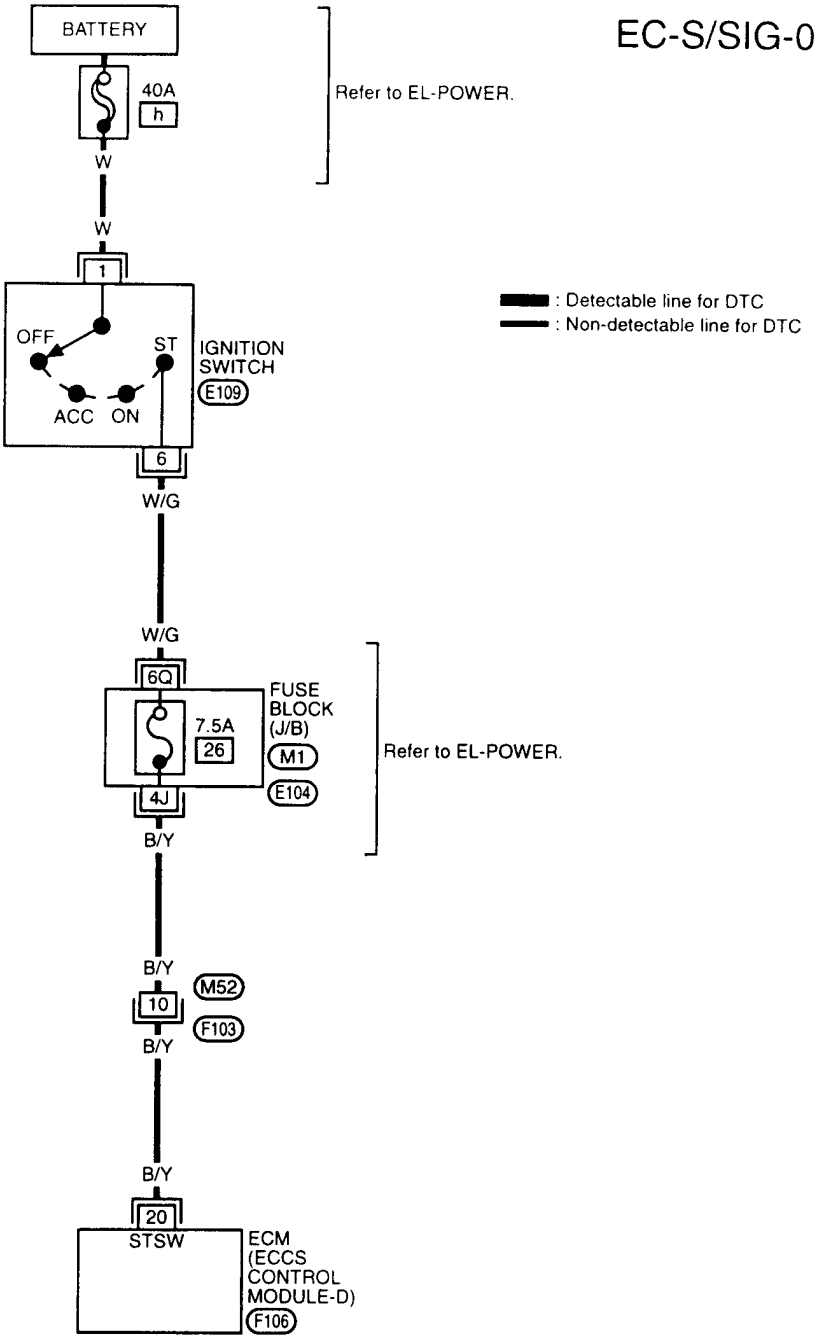
Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.

Start Signal

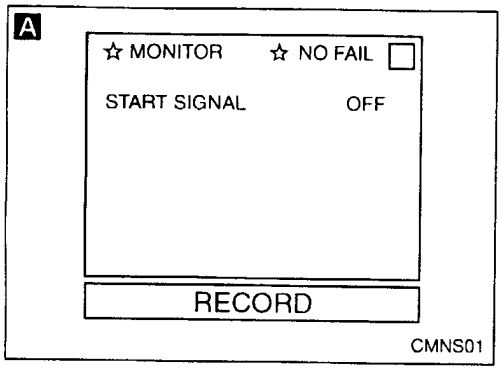
EC-S/SIG-01

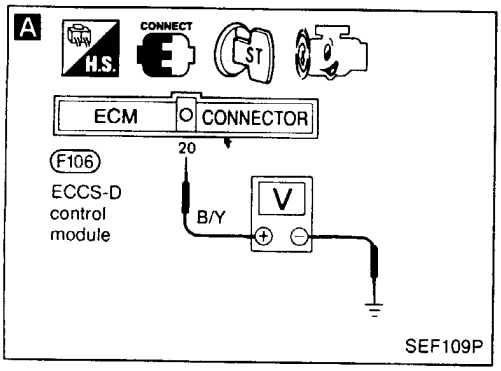


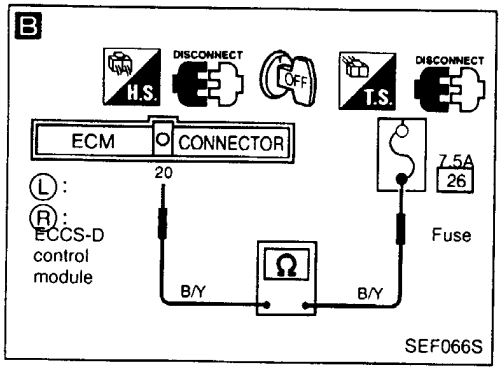
SEF436S

Start Signal (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch to "ON" position.
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OK → INSPECTION END

OR

1. Turn ignition switch to "START" position.
2. Check voltage between ECM (ECCS-D control module) connector terminal ⑳ and ground.

Voltage:
Ignition switch "START" — Battery voltage
Except above — Approximately 0V

NG

Check if 7.5A fuse is OK. → NG → Replace 7.5A fuse.

OK

B

CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch to "LOCK" position.
2) Disconnect ECM (ECCS-D control module) harness connector and 7.5A fuse.
3) Check harness continuity between ECM (ECCS-D control module) connector terminal ⑳ and fuse block.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness or connectors (M52), (F103)
- Harness for open or short-circuit between ECM (ECCS-D control module) and fuse block.

If NG, repair harness or connectors.

OK

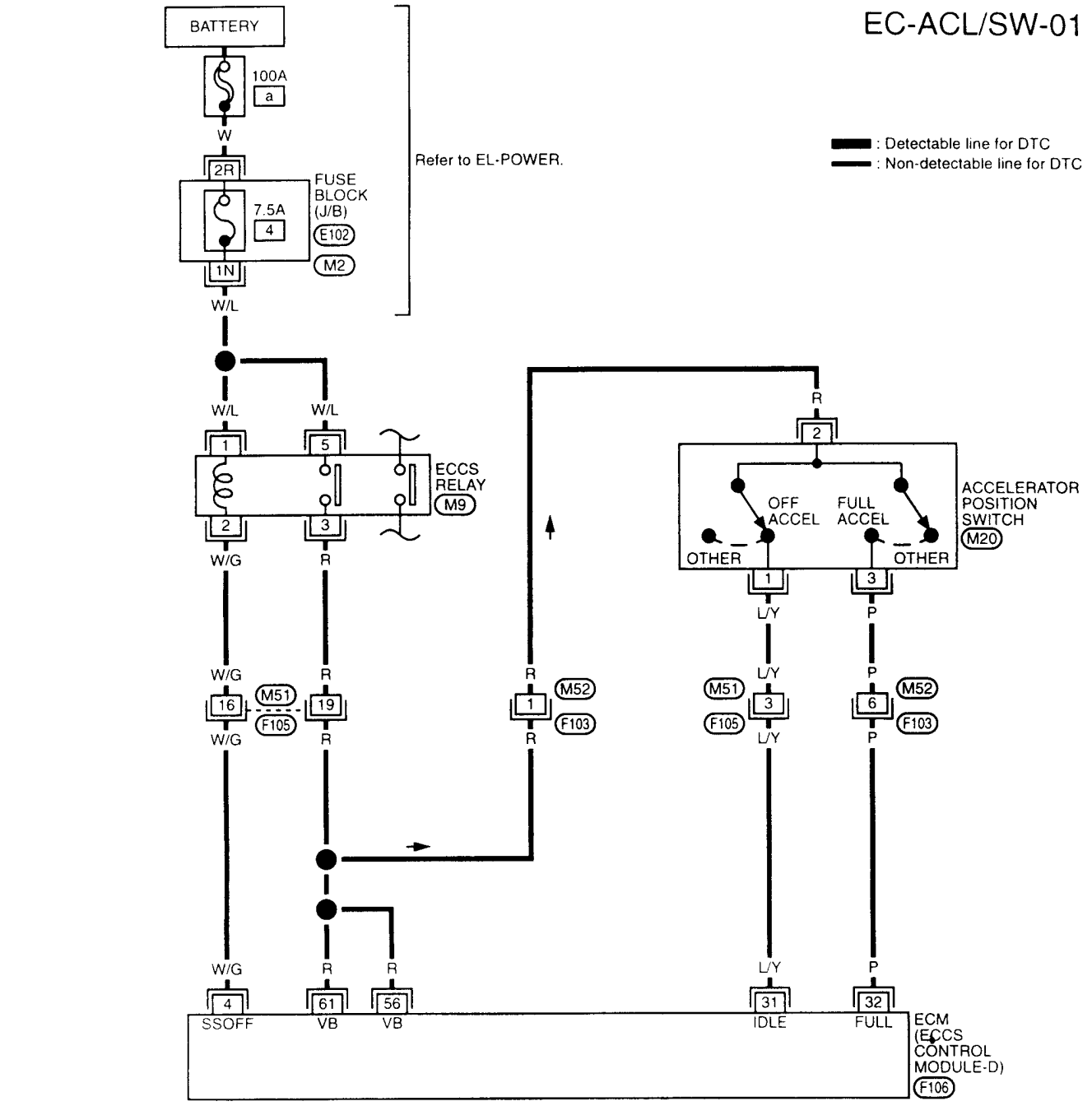
Disconnect and reconnect harness connectors in the circuit. Then retest.

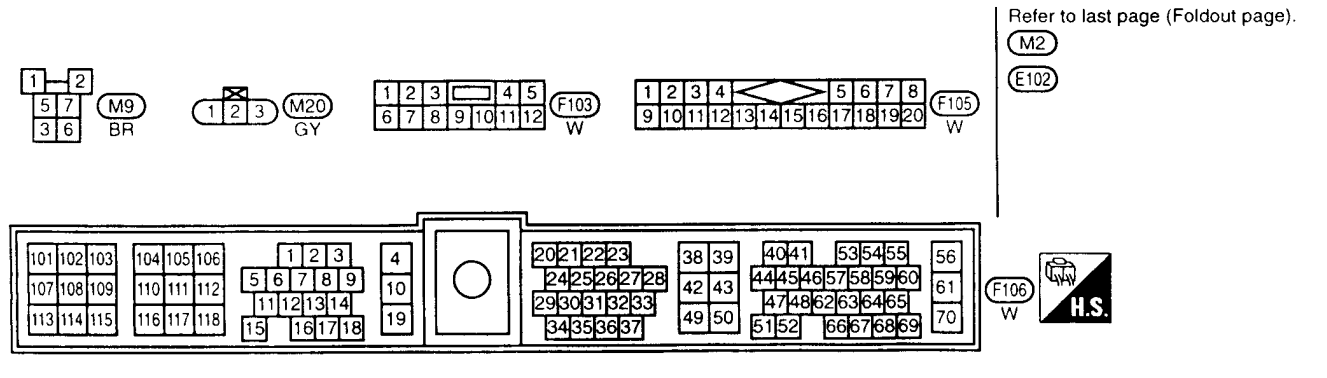
Trouble is not fixed.

Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

INSPECTION END

Accelerator Position Switch

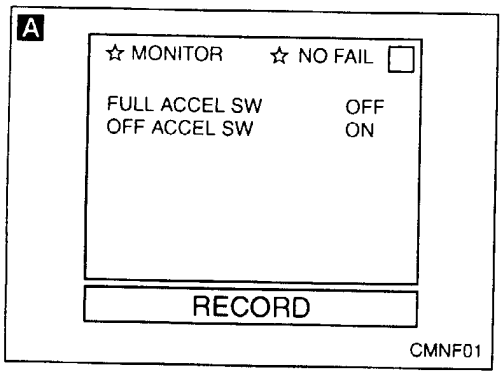


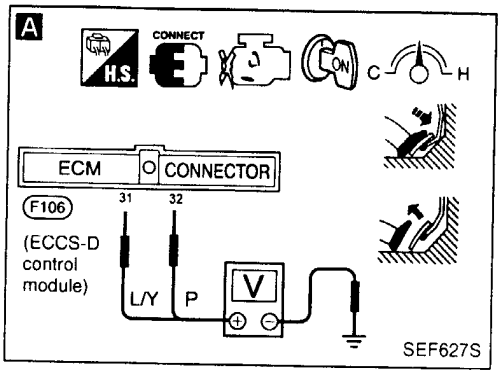


SEF432S

Accelerator Position Switch (Cont'd)

The accelerator position switch detects OFF-accelerator switch signal and Full-accelerator switch signal and sends these signals to the ECM (ECCS-D control module). The ECM (ECCS-D control module) will then determine engine idle conditions. These signals are also used for diagnosing the accelerator position sensor.





DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch to "ON" position.
2. Select "FULL ACCEL SW" and "OFF ACCEL SW" in "DATA MONITOR" mode with CONSULT.
3. Check "FULL ACCEL SW" and "OFF ACCEL SW" signal under the following conditions:

OFF ACCEL SW:
Accelerator pedal released — ON
Accelerator pedal depressed — OFF

FULL ACCEL SW:
Accelerator pedal released — OFF
Accelerator pedal fully depressed — ON

OK → INSPECTION END

— OR —

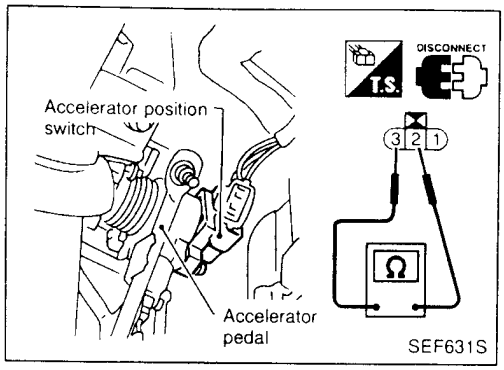
1. Turn ignition switch to "ON" position.
2. Check voltage between ECM (ECCS-D control module) connector terminal (31) and ground under the following conditions:

Voltage:
Accelerator pedal released — Battery voltage
Accelerator pedal fully depressed — Approximately 0V

3. Check voltage between ECM (ECCS-D control module) connector terminal (32) and ground under the following conditions:

Voltage:
Accelerator pedal released — Approximately 0V
Accelerator pedal fully depressed — Battery voltage

NG
Ⓐ



Accelerator Position Switch (Cont'd)

COMPONENT INSPECTION

Accelerator position switch

1. Disconnect accelerator position switch harness connector.
2. Check continuity between accelerator position switch terminals ① and ②.

Conditions	Continuity
Accelerator pedal released	Yes
Accelerator pedal depressed	No

3. Check continuity between accelarator position switch terminals ② and ③.

Conditions	Continuity
Accelerator pedal released	No
Accelerator pedal fully depressed	Yes

If NG, replace accelerator pedal assembly.

CAUTION:

- **If accelerator position sensor or ECM (ECCS-D control module) connector is disconnected, perform following operation:**

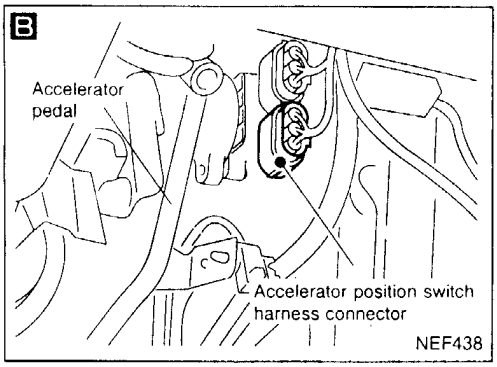
  Select "OFF ACCEL PO SIG" in ACTIVE TEST mode. Touch "CLEAR".

  Start and warm up engine. After engine was warmed up, let engine idle for 10 minutes.

- **Do not disassemble accelerator pedal assembly.**

Accelerator Position Switch (Cont'd)

B



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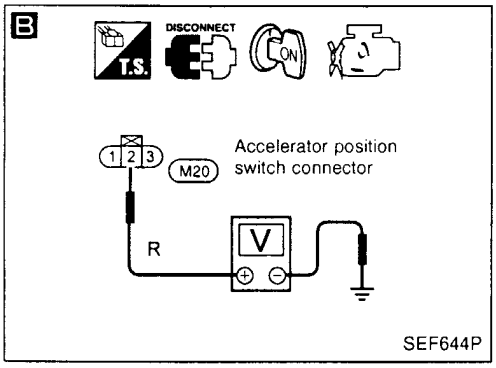

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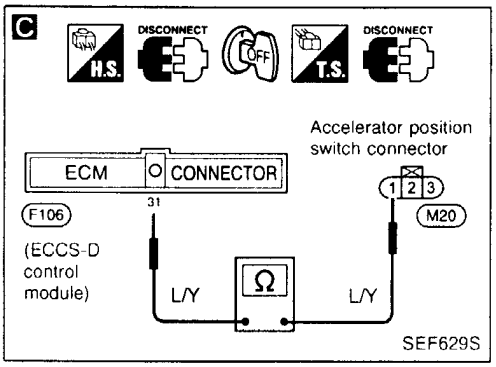

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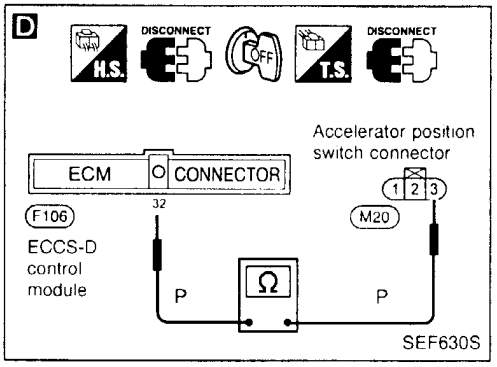


Ⓐ

B

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect accelerator position switch harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between accelerator position switch connector terminal ② and ground with CONSULT or voltage tester.
   Voltage: Battery voltage

NG → Check the following:
- 7.5A fuse in fuse block
- 100A fusible link
- Operation of ECCS relay.
- Harness or connectors (M52), (F103)
- Harness or connectors (M51), (F105)
- Harness for open or short-circuit between ECCS relay and accelerator position switch.

If NG, replace fuse, fusible link or ECCS relay or repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT-I.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM (ECCS-D control module) harness connector.
3. Check harness continuity between accelerator position switch connector terminal ① and ECM (ECCS-D control module) connector terminal (31).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness or connectors (M51), (F105)
- Harness for open or short-circuit between ECM (ECCS-D control module) and accelerator position switch.

If NG, repair harness or connectors

OK ↓

D

CHECK INPUT SIGNAL CIRCUIT-II.
Check harness continuity between accelerator position switch connector terminal ③ and ECM (ECCS-D control module) terminal (32).
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness or connectors (M52), (F103)
- Harness for open or short-circuit between ECM (ECCS-D control module) and accelerator position switch.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (Accelerator position switch).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace accelerator pedal assembly.

OK ↓

Disconnect and reconnect harness connectors in the circuits. Then retest.

Trouble is not fixed. ↓

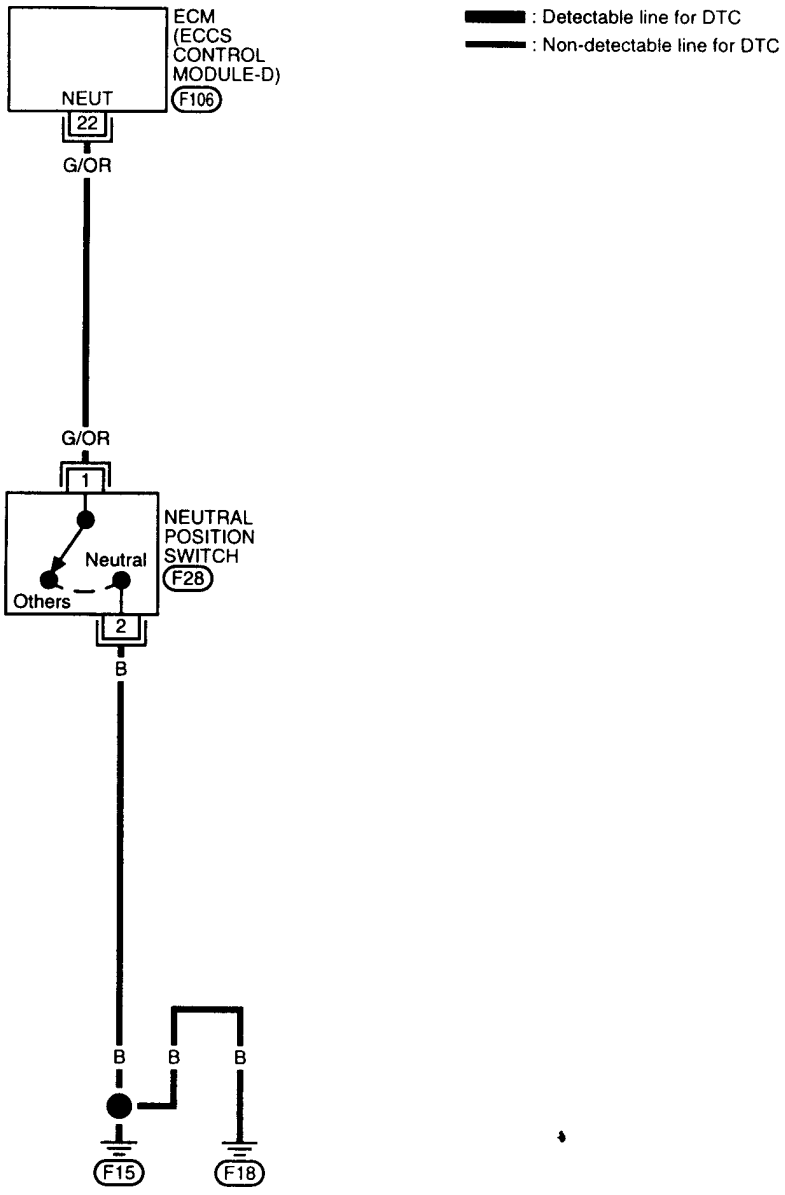
Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

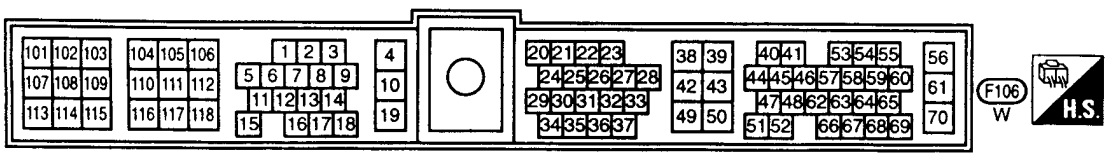
↓

INSPECTION END

Neutral Position Switch

EC-NEUT-01

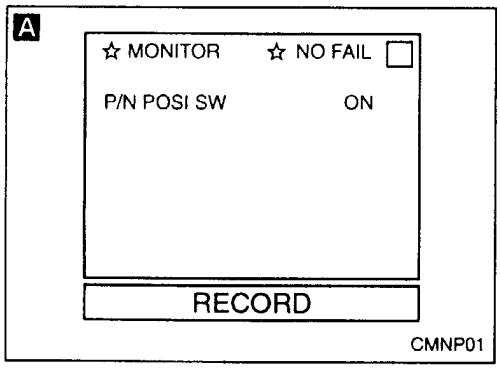


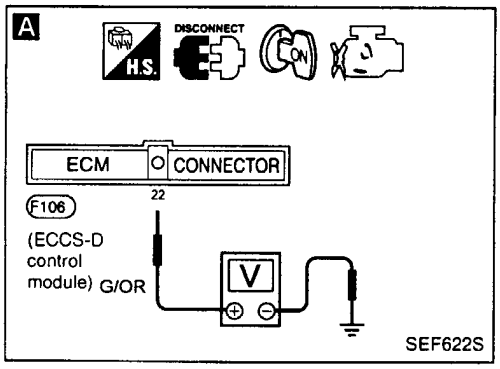


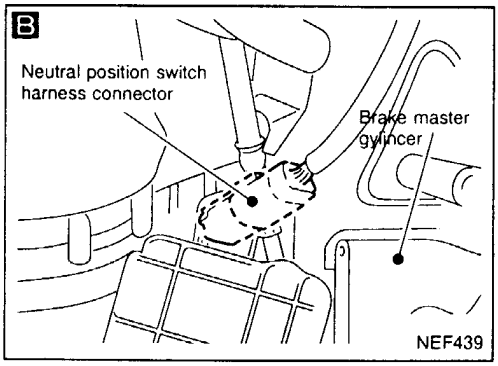
SEF333T

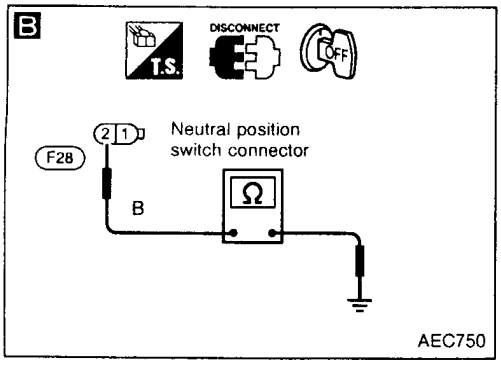
Neutral Position Switch (Cont'd)

When the gear position is in "N", neutral position switch is "ON". The ECM (ECCS-D control module) detects the position because the continuity of the line (the "ON" signal) exists.









DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch to "ON" position.
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT.
3. Check "P/N POSI SW" signal under the following conditions.
   Neutral position: ON
   Except neutral position: OFF

OK → INSPECTION END

OR

2. Check voltage between ECM (ECCS-D control module) connector terminal (22) and ground under the following conditions.
   Voltage:
   Neutral position:
   Approximately 0V
   Except neutral position:
   Battery voltage

NG

B

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect neutral position switch harness connector.
3. Check harness continuity between neutral position switch connector terminal (2) and body ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

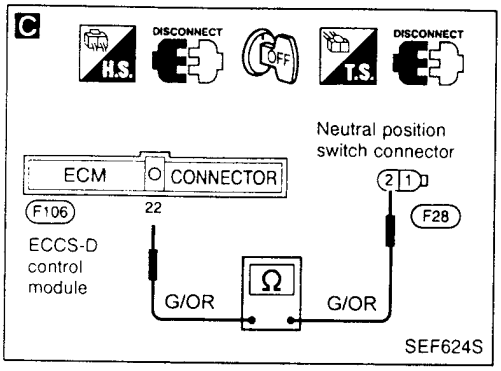
NG → Check the following:
- Harness for open or short-circuit between neutral position switch and body ground.

If NG, repair harness or connectors.

OK

(A)

Neutral Position Switch (Cont'd)



Ⓐ

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM (ECCS-D control module) harness connector.
2. Check harness continuity between ECM (ECCS-D control module) connector terminal ㉒ and neutral position switch connector terminal ①.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM (ECCS-D control module) and neutral position switch.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (Neutral position switch). Refer to MT section.

NG → Replace neutral position switch.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

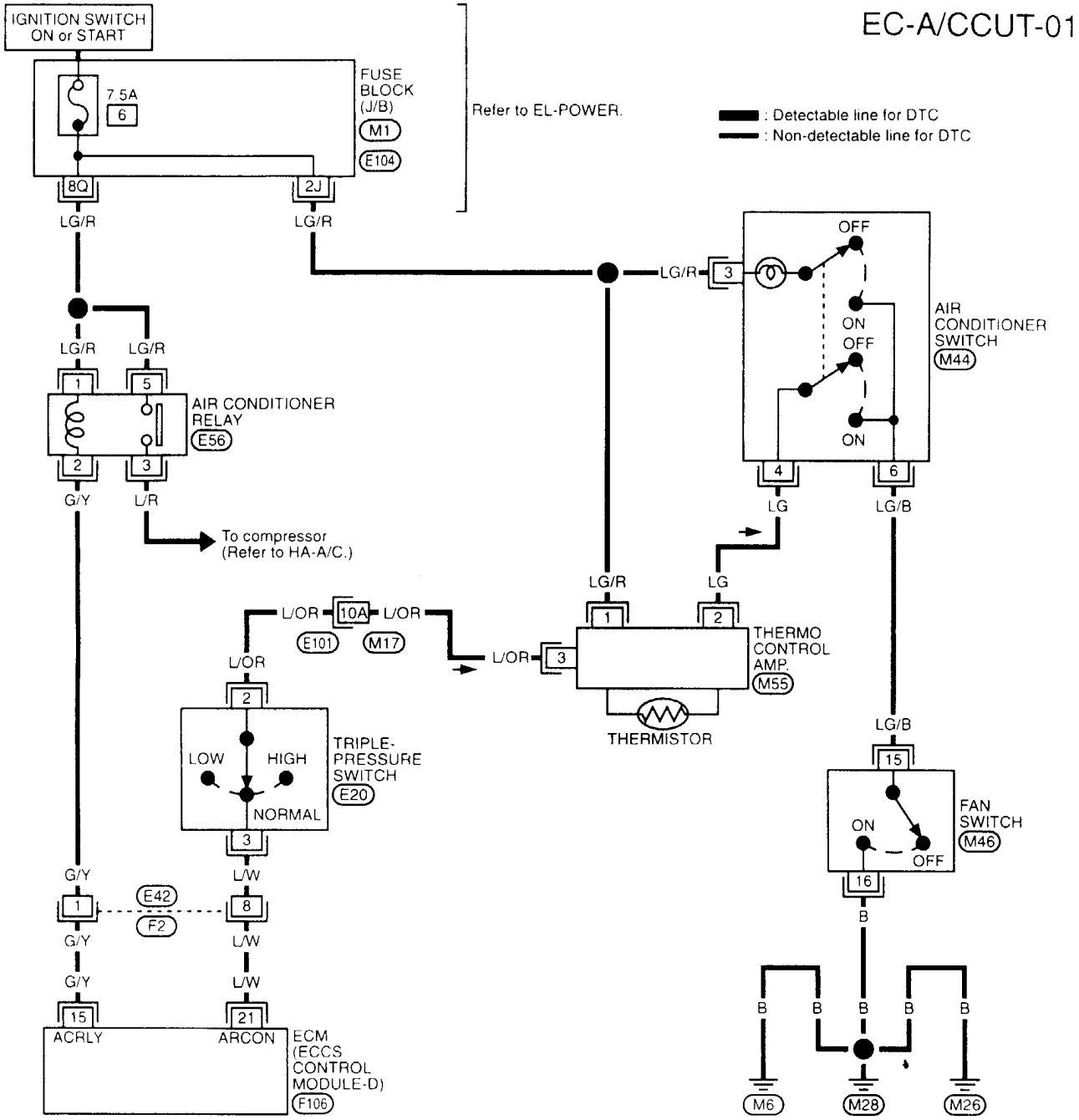
Check ECM (ECCS-D control module) pin terminals for damage and check the connection of ECM (ECCS-D control module) harness connector. Reconnect ECM (ECCS-D control module) harness connector and retest.

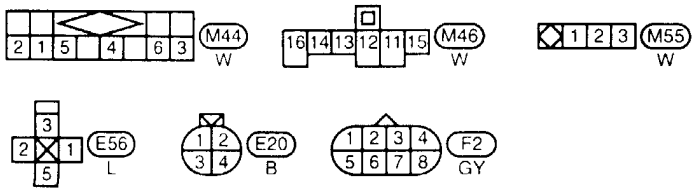
↓

INSPECTION END

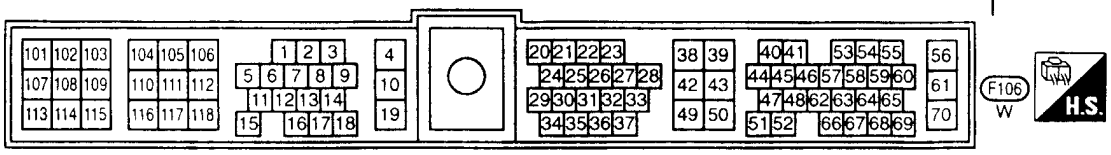
Air Conditioner Control

EC-A/CCUT-01





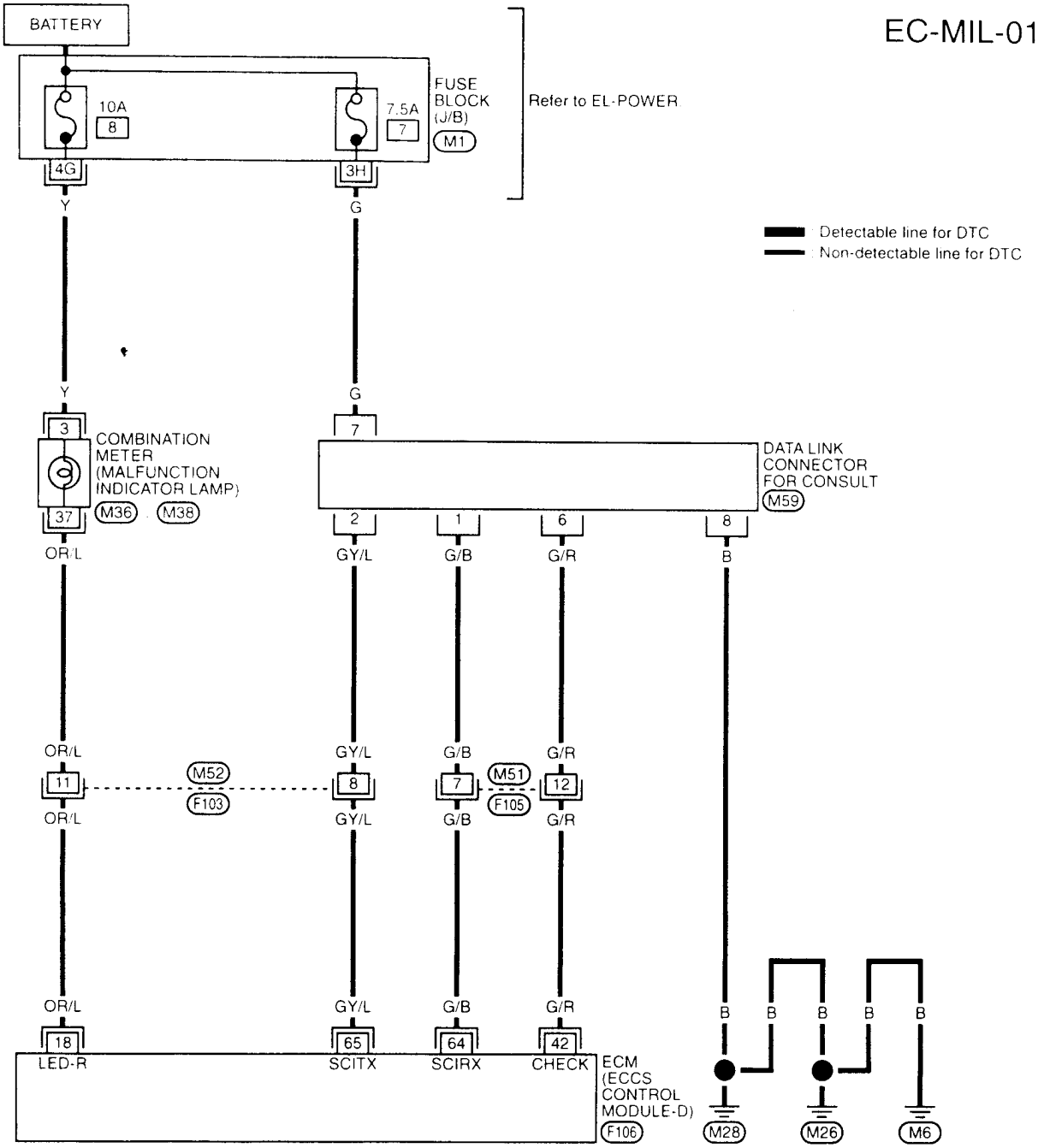
Refer to last page (Foldout page).
M1 , E104
E101 , M17

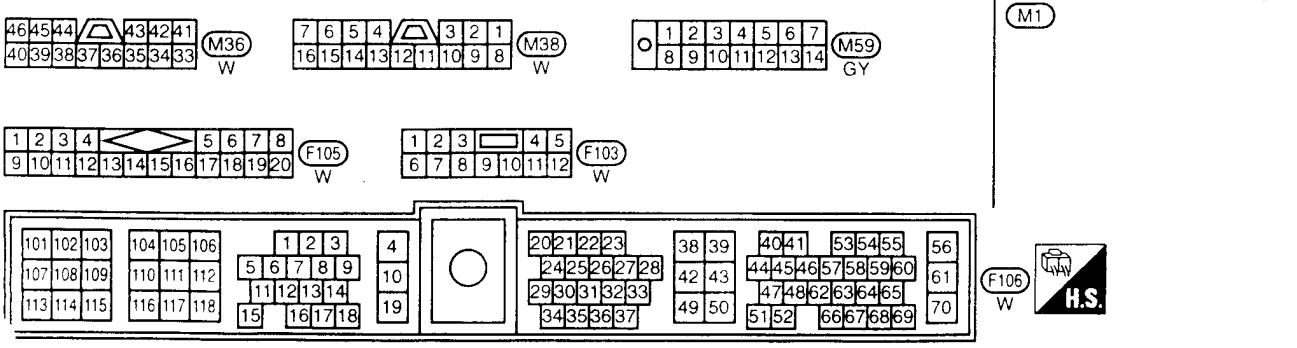


SEF439S

MIL & Data Link Connectors

EC-MIL-01





Refer to last page (Foldout page).
M1

SEF442S

General Specifications

PRESSURE REGULATOR	Fuel pressure at idling kPa (bar, kg/cm^2, psi)
Vacuum hose is connected	Approximately 245 (2.45, 2.5, 36)
Vacuum hose is disconnected	Approximately 294 (2.94, 3.0, 43)

Inspection and Adjustment

Idle speed*1	rpm	Models with daytime light system 800±50
No-load*2		Models without daytime light system 750±50
Air conditioner: ON		900 or more
Ignition timing		10°±2° BTDC
Throttle position sensor idle position*3	V	0.35 - 0.65

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater, fan & rear defogger)

*3: Engine is warmed up sufficiently.

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 2
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 12

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage
Output voltage	V	1.4 - 1.8*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3

FUEL PUMP

Resistance [at 25°C (77°F)]	Ω	Approximately 0.2 - 5

IACV-AAC VALVE

Resistance [at 25°C (77°F)]	Ω	Approximately 10

INJECTOR

Resistance [at 25°C (77°F)]	Ω	Approximately 10 - 14

RESISTOR

Resistance [at 25°C (77°F)]	kΩ	Approximately 2.2

THROTTLE POSITION SENSOR

Accelerator pedal conditions	Resistance kΩ [at 25°C (77°F)]
Completely released	Approximately 0.5*
Partially released	0.5 - 4
Completely depressed	Approximately 4

*: Engine is warmed up sufficiently.

General Specifications

PRESSURE REGULATOR	Fuel pressure at idling kPa (bar, kg/cm^2, psi)
Vacuum hose is connected	Approximately 235 (2.35, 2.4, 34)
Vacuum hose is disconnected	Approximately 294 (2.94, 3.0, 43)

Inspection and Adjustment

Idle speed*1 rpm	Models with daytime light system 825±50
No-load*2 (in "N" position)	Models without daytime light system 750±50
Air conditioner: ON (in "N" position)	M/T: 850 or more A/T: 825 or more
Ignition timing	15°±2° BTDC
Throttle position sensor idle position V	0.35 - 0.65

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear defogger)

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 25°C (77°F)]	Ω	0.5 - 1.0
Secondary resistance [at 25°C (77°F)]	kΩ	Approximately 25

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage	V	1.3 - 1.7*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	3.3 - 6.3

FUEL PUMP

Resistance [at 25°C (77°F)]	Ω	Approximately 0.2 - 5.0

IACV-AAC VALVE

Resistance [at 25°C (77°F)]	Ω	Approximately 10.0

INJECTOR

Resistance [at 25°C (77°F)]	Ω	10 - 14

RESISTOR

Resistance [at 25°C (77°F)]	kΩ	Approximately 2.2

THROTTLE POSITION SENSOR

Throttle valve conditions	Resistance kΩ [at 25°C (77°F)]
Completely closed	Approximately 1
Partially open	1 - 10
Completely open	Approximately 10

KNOCK SENSOR

Resistance [at 25°C (77°F)]	kΩ	532 - 588

General Specifications

ENGINE SPEED

Unit : rpm

Engine	CD20T
Maximum engine speed	5,400

Pump numbers

Engine	Part number	Pump assembly number
CD20T	16700 2J610	NP-VE4/10E2500 LNP13

Pump data is not yet available.
Refer to CALIBRATION STANDARD published by BOSCH.)

Injection Nozzle

INSPECTION AND ADJUSTMENT

Injection nozzle assembly

Unit: kPa (bar, kg/cm^2, psi)

Initial injection pressure	
New	135 - 143
Used	12,259 - 13,239 (122.6 - 132.4, 125 - 135, 1,778 - 1,920)

Adjusting shims

Thickness mm (in)	Parts No.
0.50 (0.0197)	16613-V0700
0.54 (0.0213)	16613-V0702
0.58 (0.0228)	16613-V0704
0.62 (0.0244)	16613-V0706
0.66 (0.0260)	16613-V0708
0.70 (0.0276)	16613-V0710
0.74 (0.0291)	16613-V0712
0.78 (0.0307)	16613-V0714
0.82 (0.0323)	16613-V0716
0.86 (0.0339)	16613-V0718
0.90 (0.0354)	16613-V0720
0.94 (0.0370)	16613-V0722
0.98 (0.0386)	16613-V0724
1.00 (0.0394)	16613-V0760

Inspection and Adjustment

Plunger lift (Injection timing)	mm (in)	0.82 ± 0.07 (0.0323) ± 0.0028

CAMSHAFT POSITION SENSOR (PUMP)

Resistance [at 25°C (77°F)]	Ω	1,600

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage	V	1.9 - 2.3*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

CONTROL SLEEVE POSITION SENSOR

Resistance [at 23°C (73°F)]	Ω	5.8

Inspection and Adjustment (Cont'd)

ADJUSTMENT RESISTOR

Resistance [at 25°C (77°F)] kΩ	0.2 - 15.0

INJECTION TIMING CONTROL VALVE

Resistance [at 20°C (68°F)] Ω	Approximately 11

ELECTRIC GOVERNOR

Resistance [at 23°C (73°F)] Ω	0.6

CRANKSHAFT POSITION SENSOR (TDC)

Resistance [at 25°C (77°F)] Ω	Approximately 1,215 - 1,485

GLOW PLUG

Resistance [at 25°C (77°F)] Ω	0.5

ACCELERATOR POSITION SENSOR

Throttle valve conditions	Resistance kΩ [at 25°C (77°F)]
Completely closed	Approximately 0.5
Partially open	0.5 - 4
Completely open	Approximately 4

FUEL TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.5
25 (77)	1.9 - 2.1
50 (122)	0.75 - 0.86
60 (140)	0.538 - 0.624
80 (176)	0.289 - 0.344

ENGINE CONTROL SYSTEM

SECTION EC

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SR20De/DE

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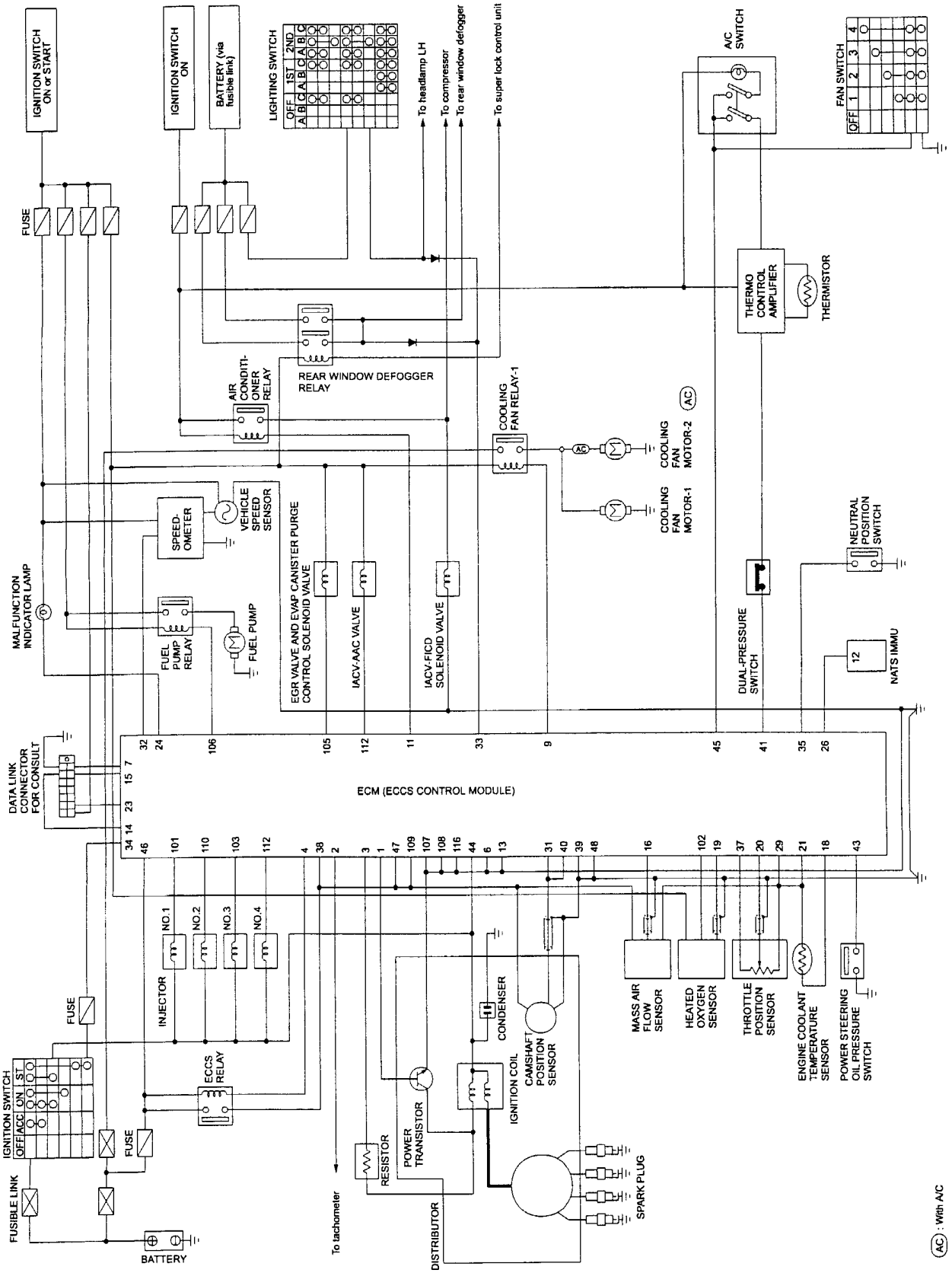
When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.
- See EL section for NATS information and wiring diagram (Australian models only).

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".

For clarification of system component abbreviations and terminology read GI section "SAE J1930 TERMINOLOGY LIST".

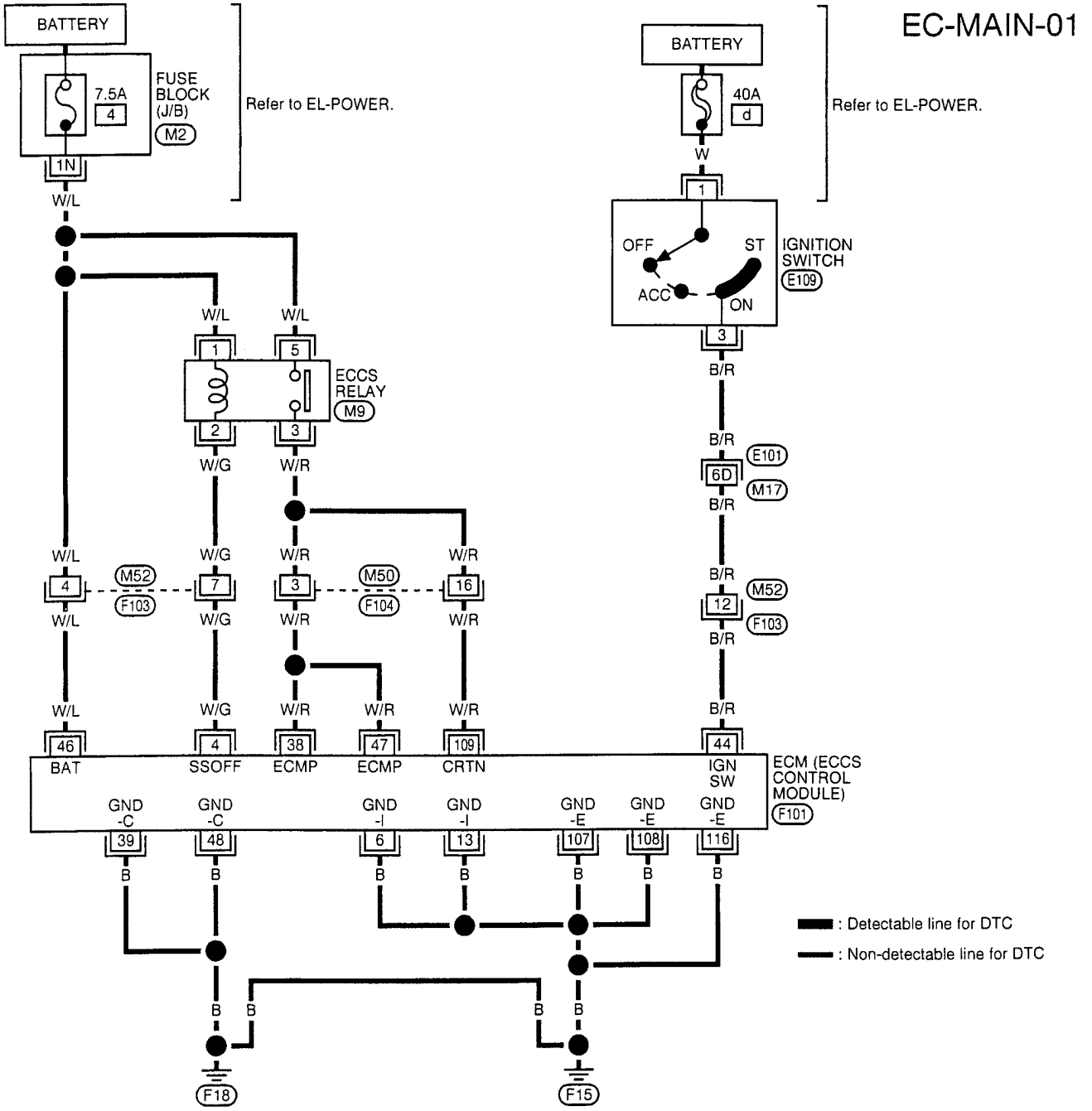
Circuit Diagram

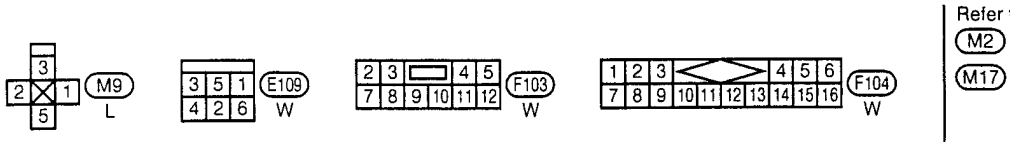


YEC042

Main Power Supply and Ground Circuit

EC-MAIN-01





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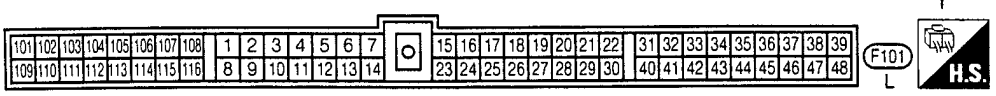
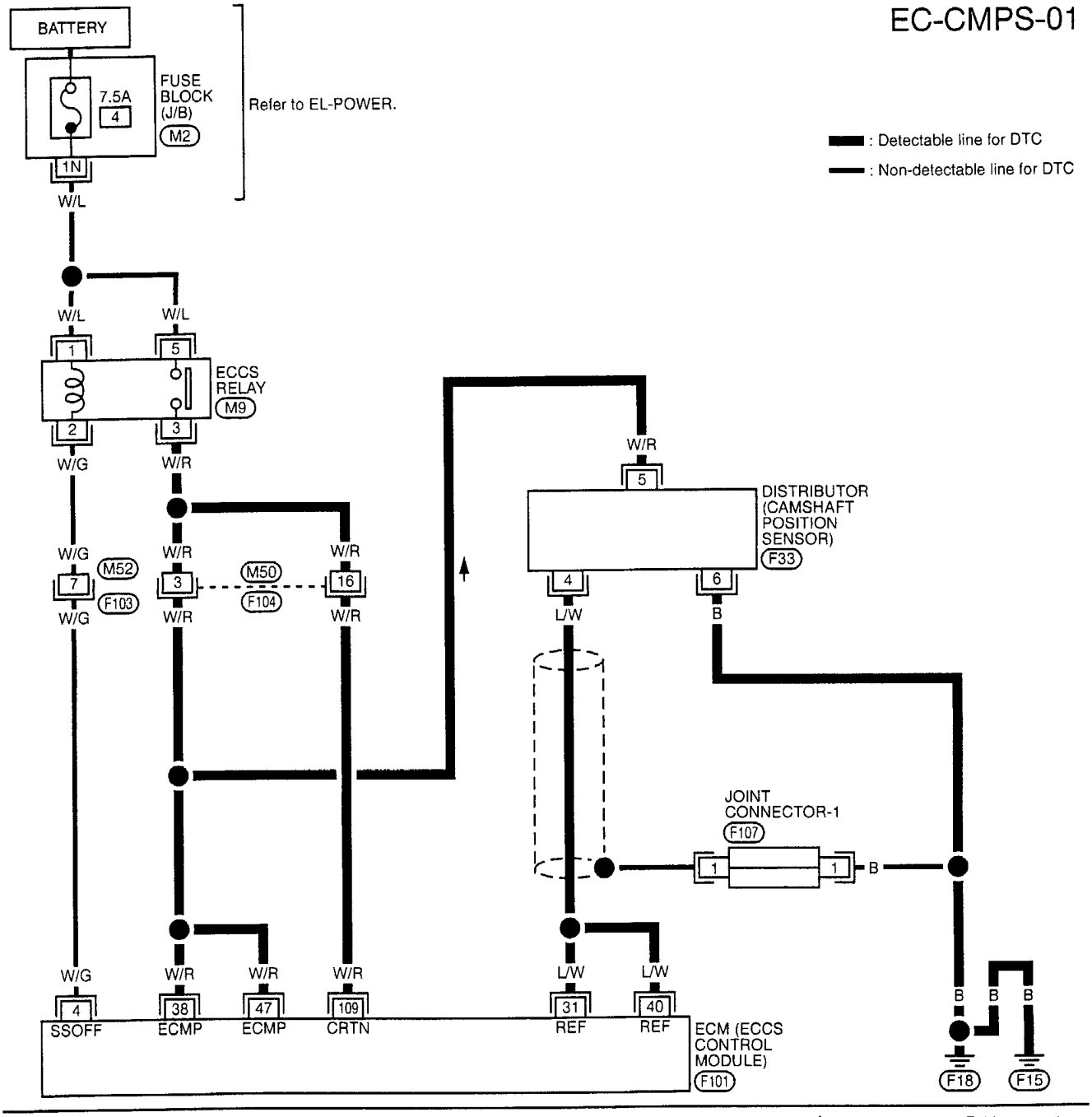
M2
M17 , E101



YEC043

Camshaft Position Sensor (CMPS)

EC-CMPS-01



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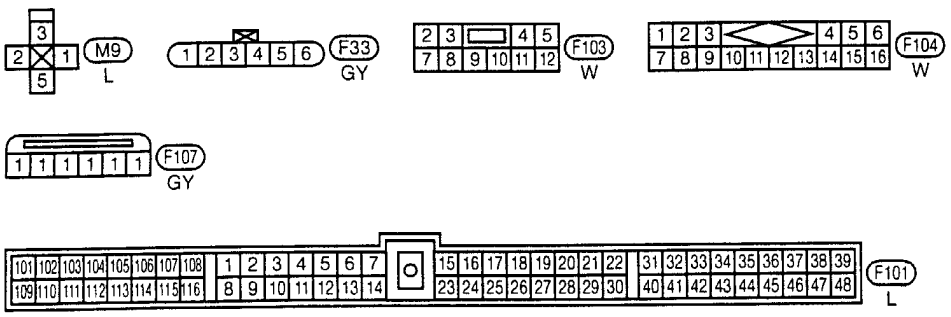
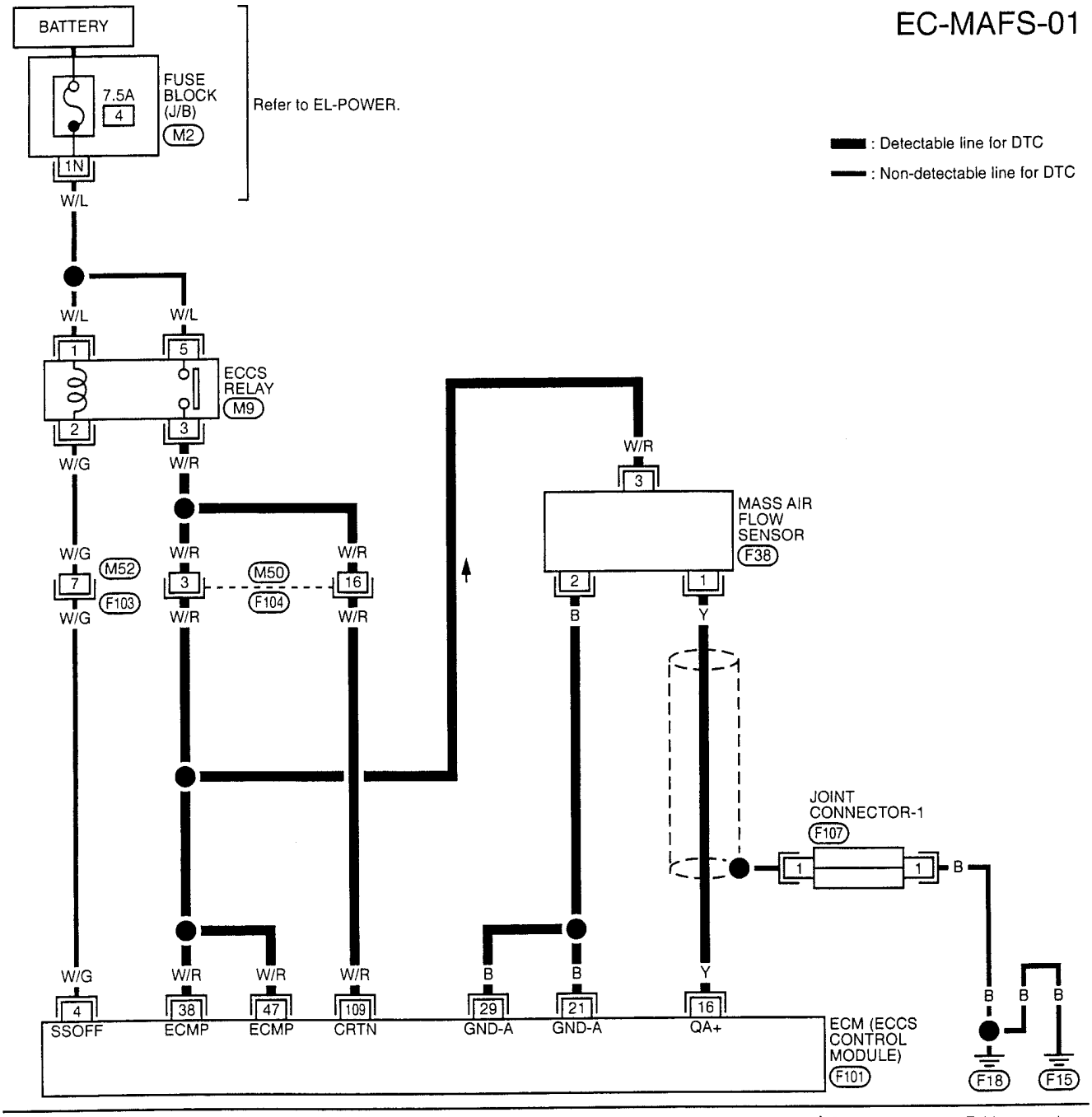
M2



YEC044

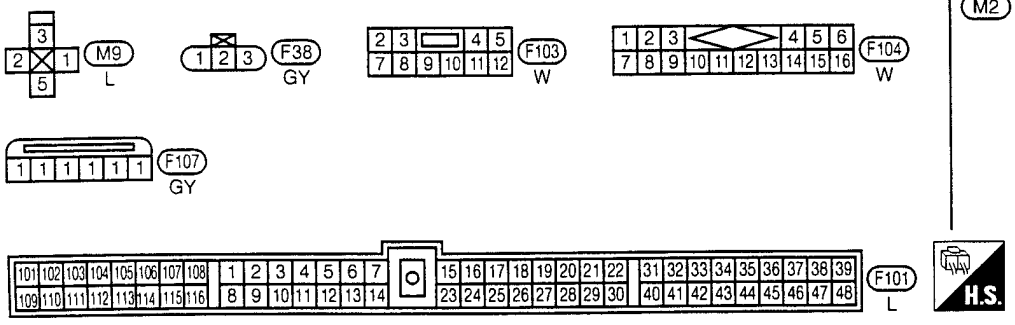
Mass Air Flow Sensor (MAFS)

EC-MAFS-01



Refer to last page (Foldout page).

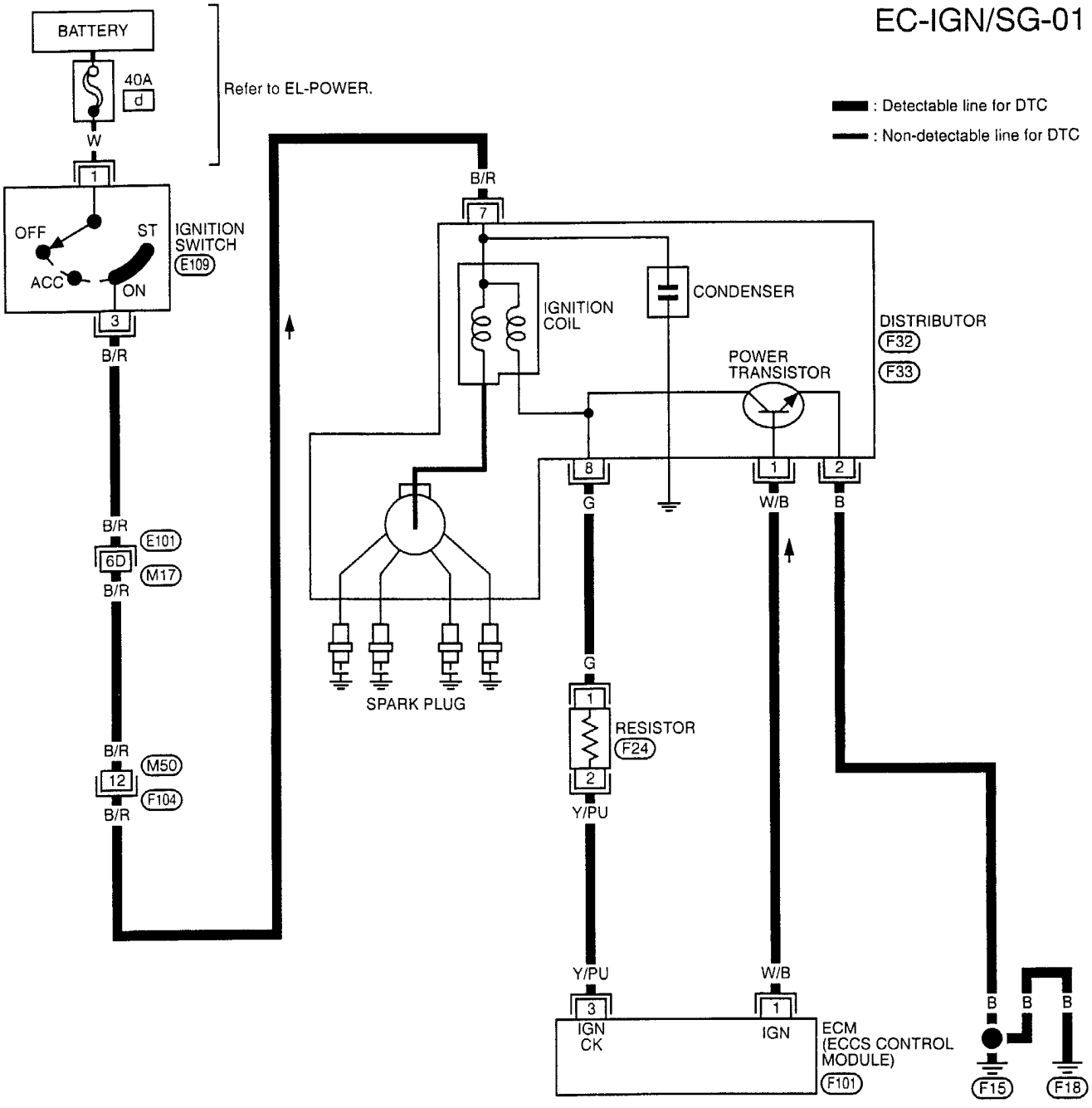
M2



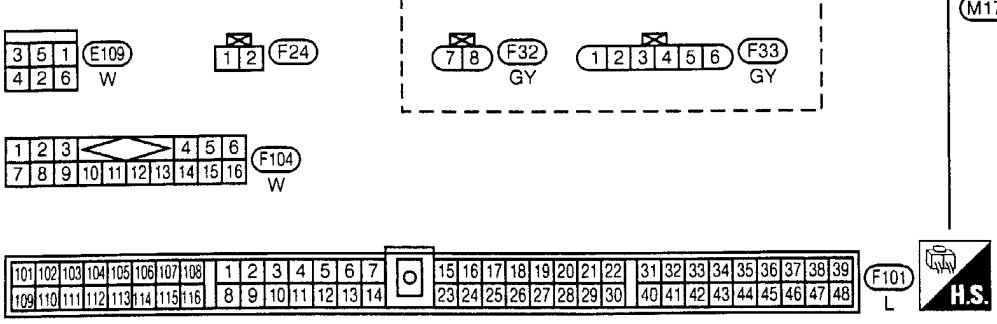
YEC045

Ignition Signal

EC-IGN/SG-01



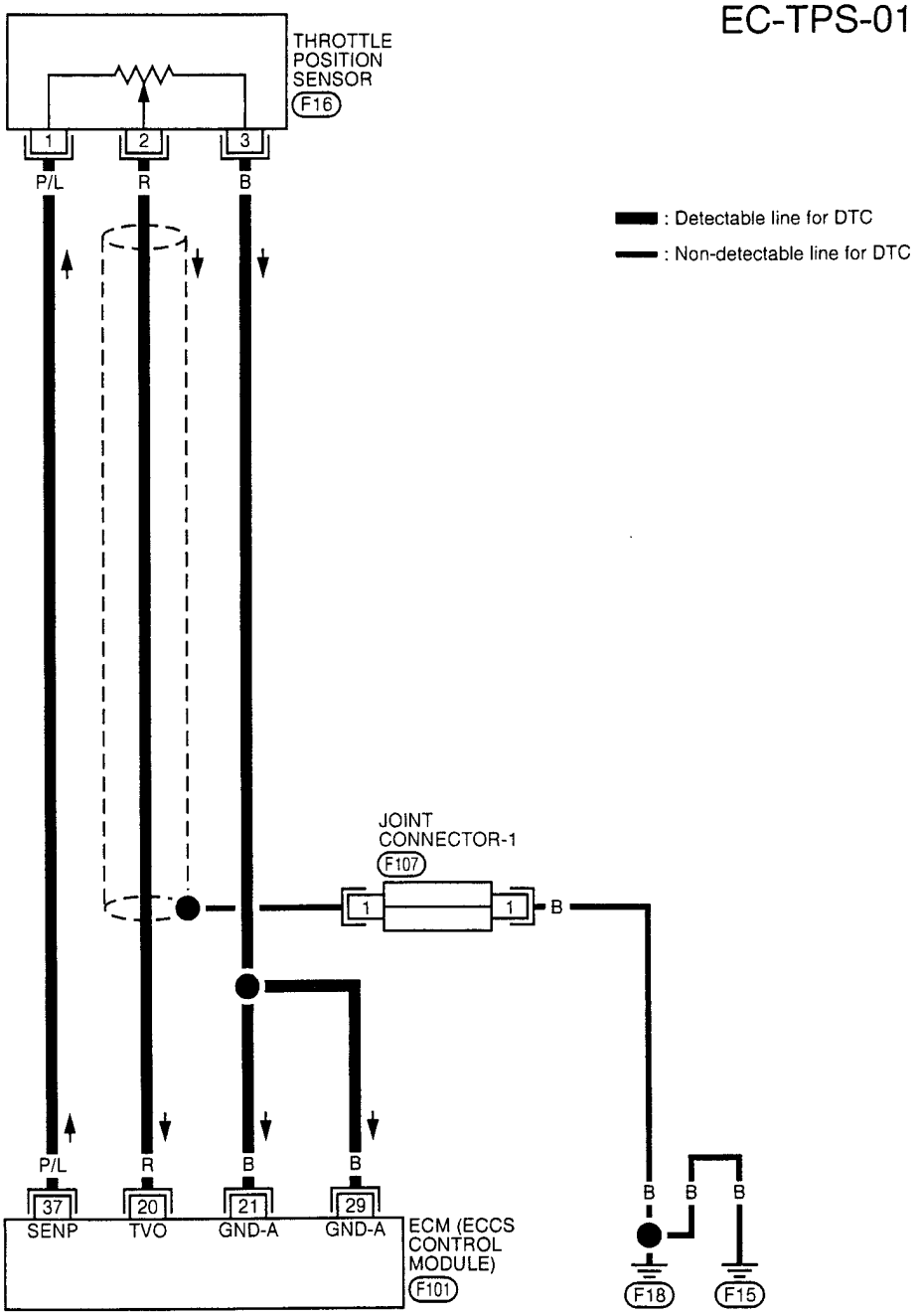
Refer to last page (Foldout page).
M17 , E101

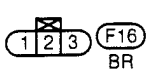


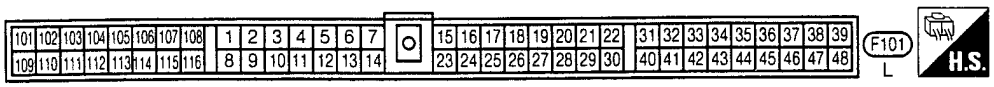
YEC046

Throttle Position Sensor

EC-TPS-01



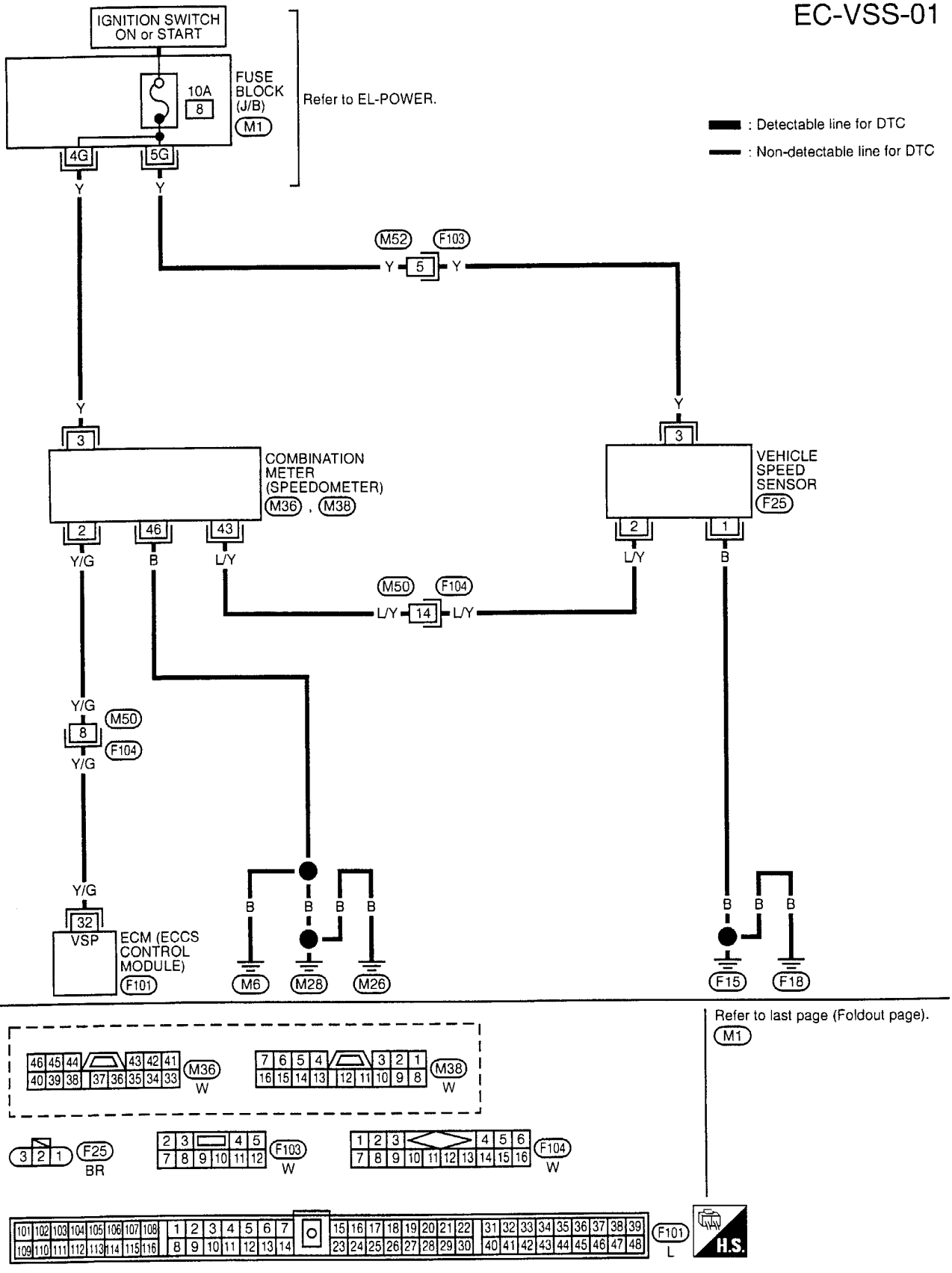




YEC047

Vehicle Speed Sensor (VSS)

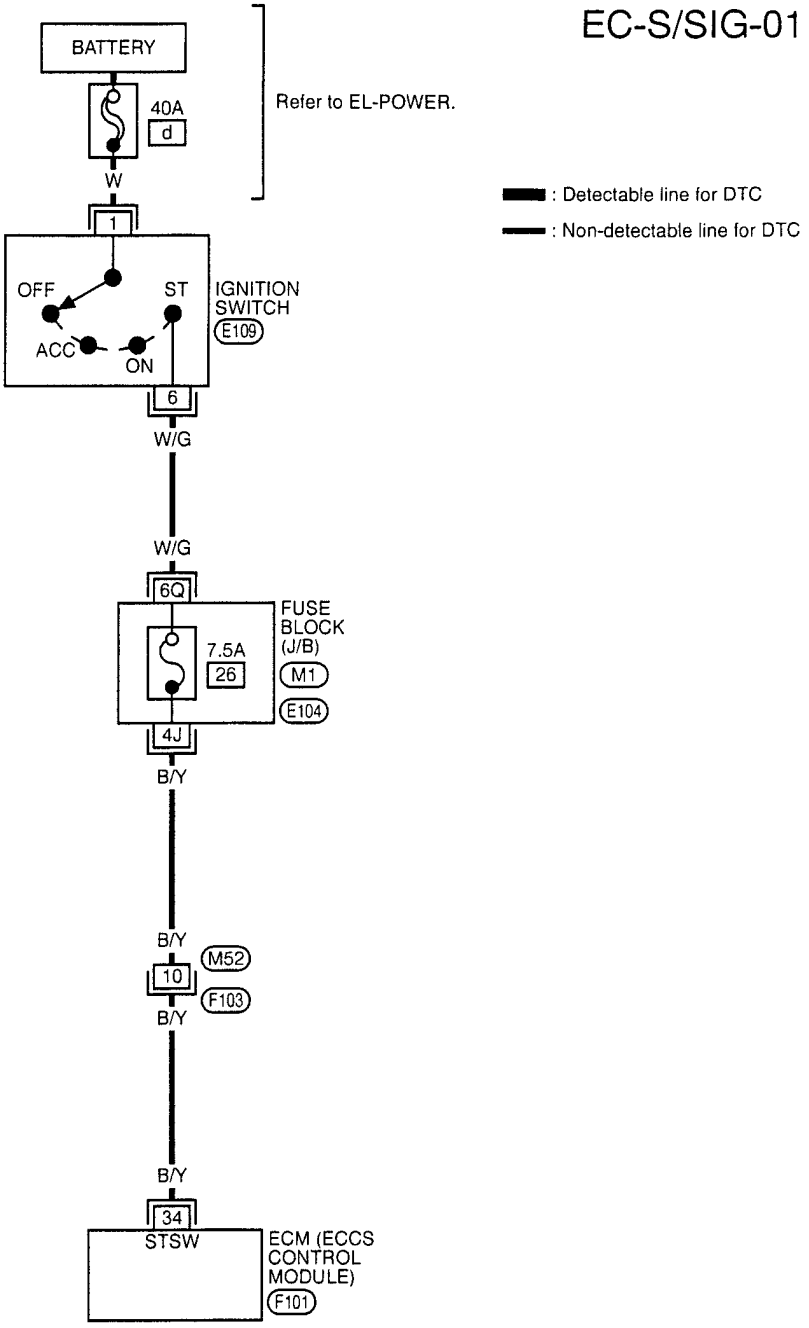
EC-VSS-01



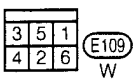
YEC048

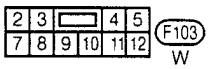
Start Signal

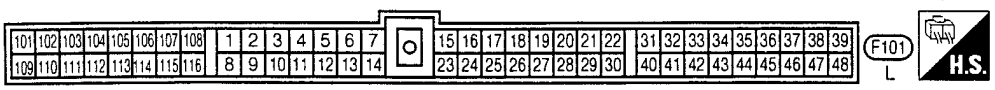
EC-S/SIG-01



Refer to last page (Foldout page).
M1 , E104



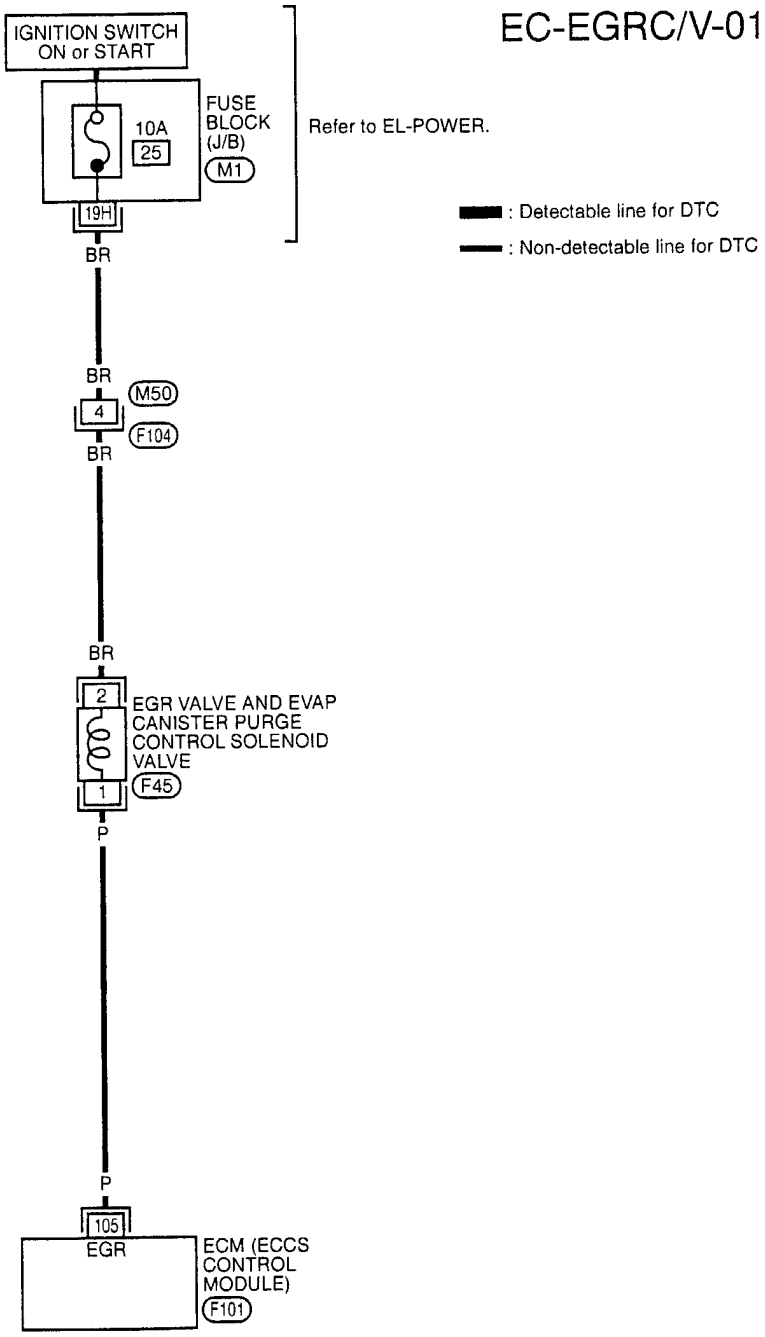




YEC049

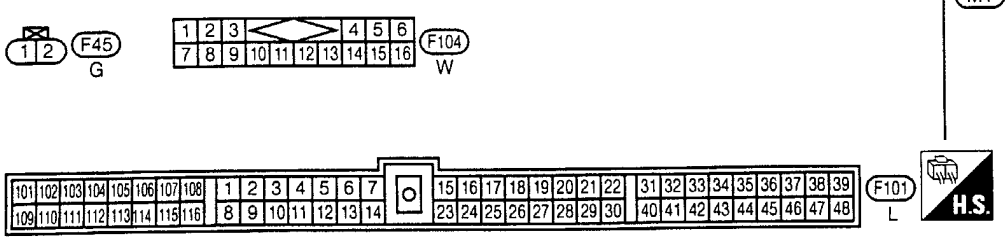
EGR Valve and EVAP Canister Purge Control Solenoid Valve

EC-EGRC/V-01



Refer to last page (Foldout page).

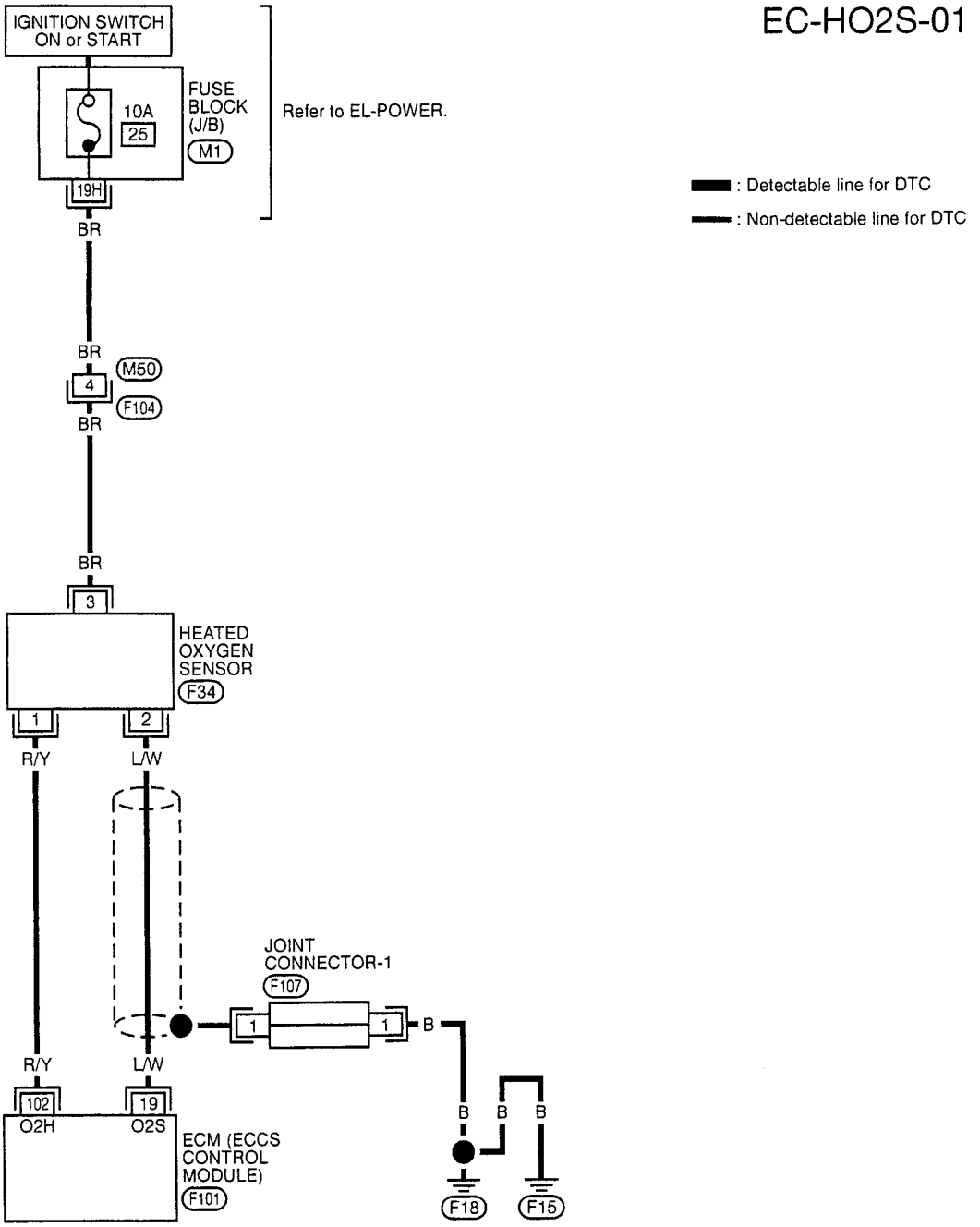
M1

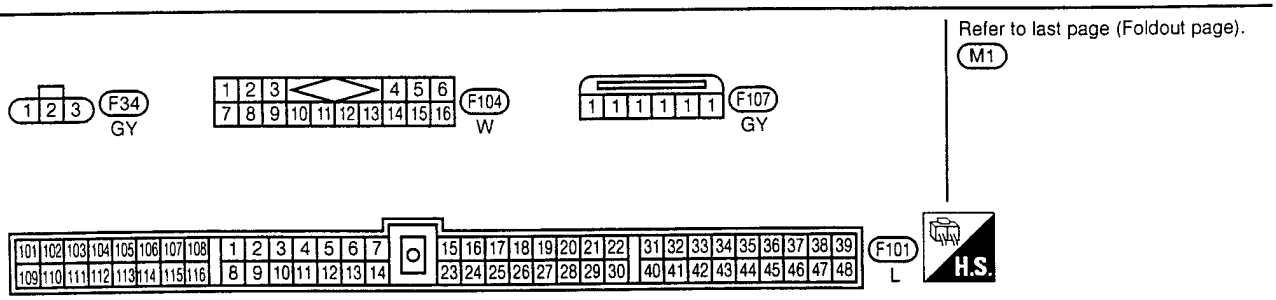


YEC050

Heated Oxygen Sensor (HO2S)

EC-HO2S-01

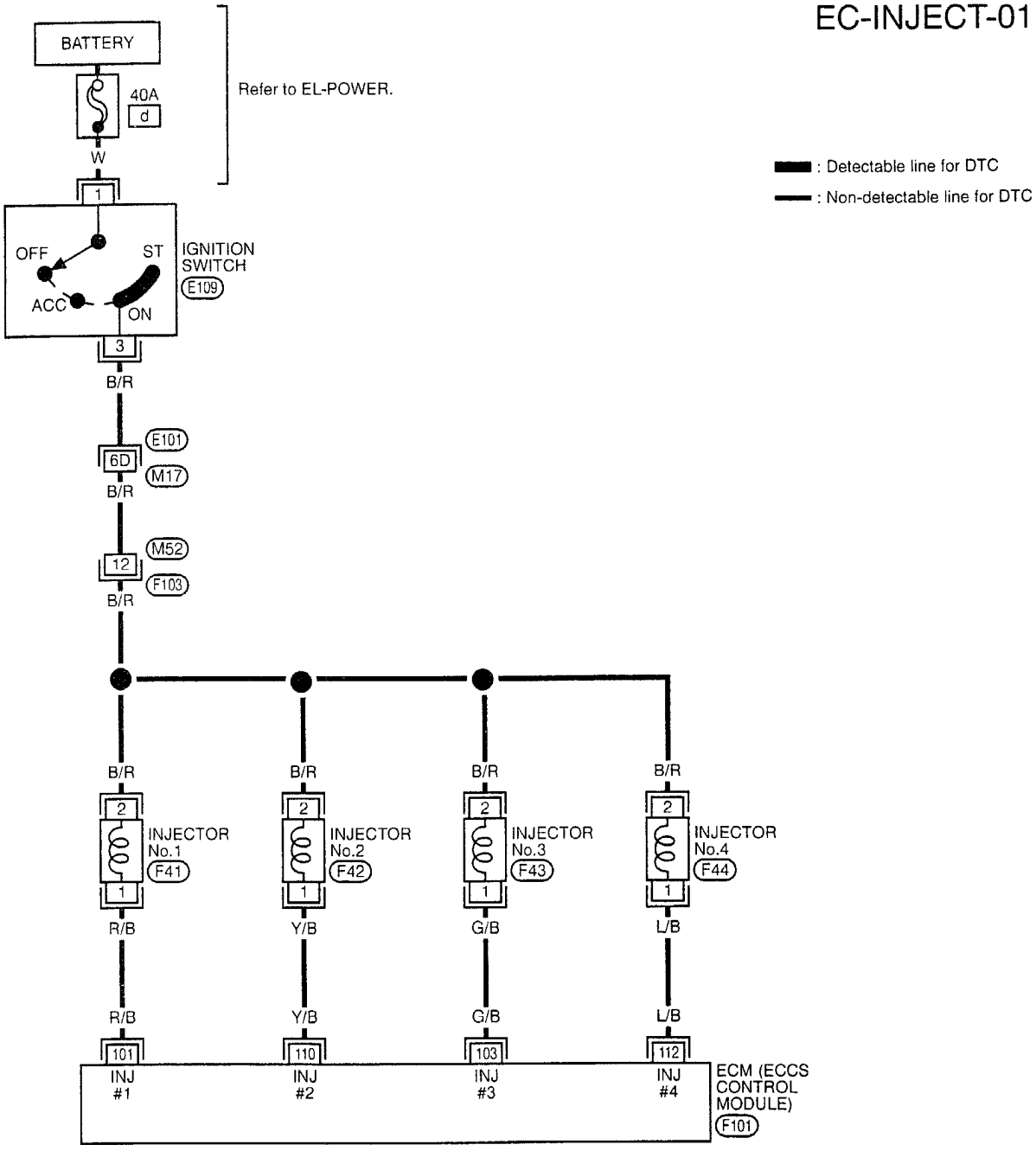




YEC051

Injector

EC-INJECT-01



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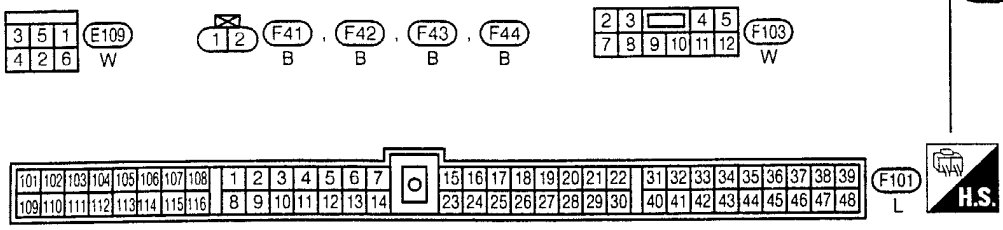
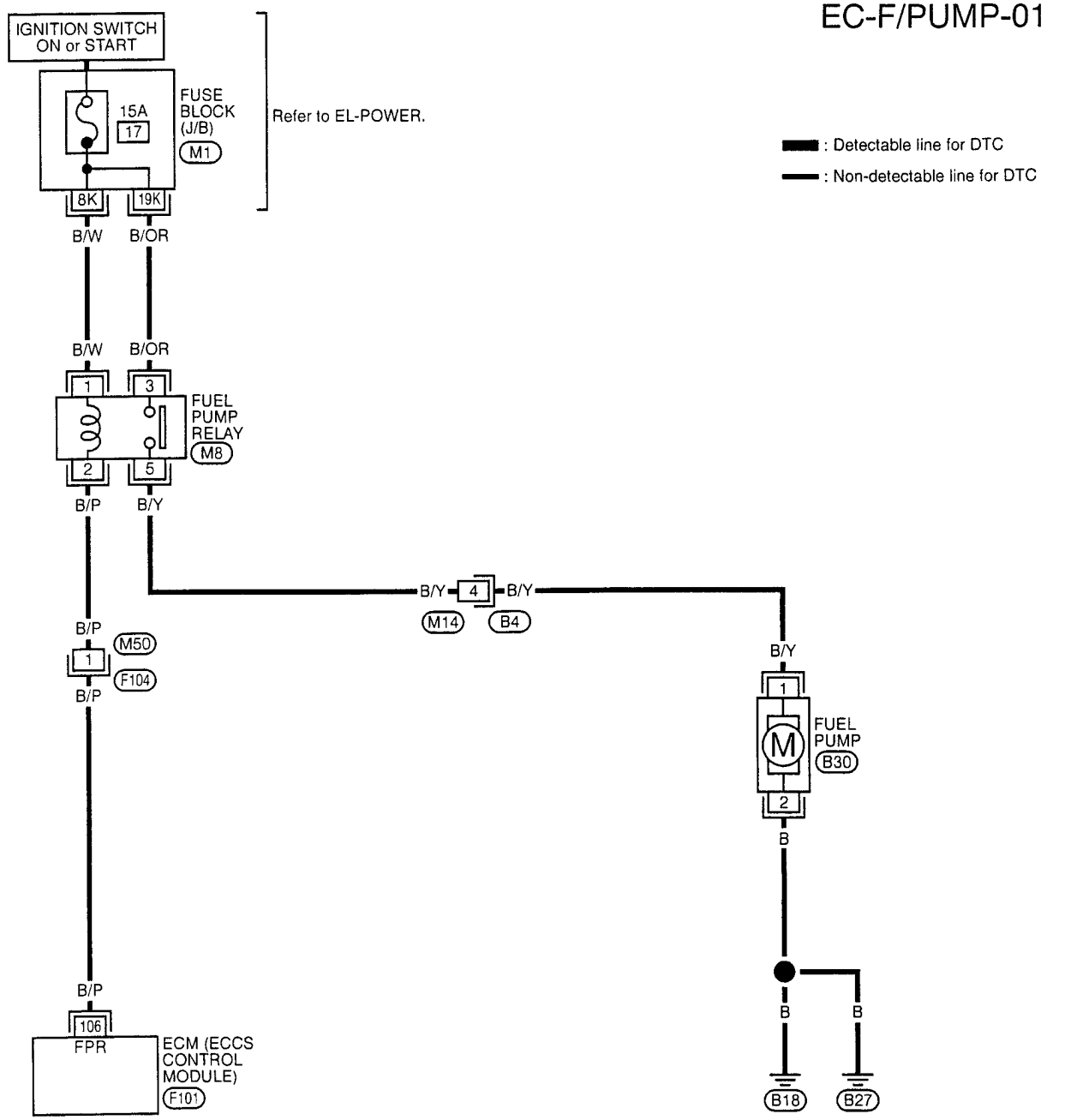
M17 , E101



YEC052

Fuel Pump

EC-F/PUMP-01



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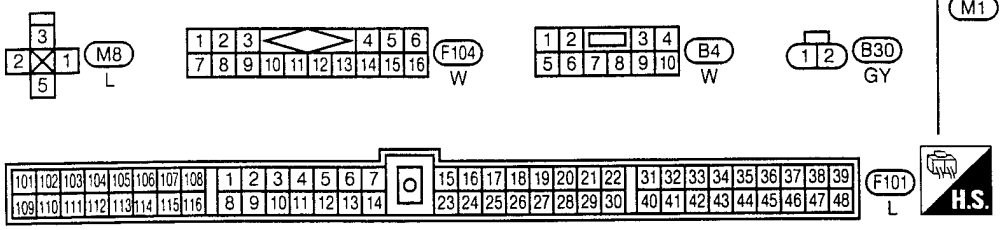
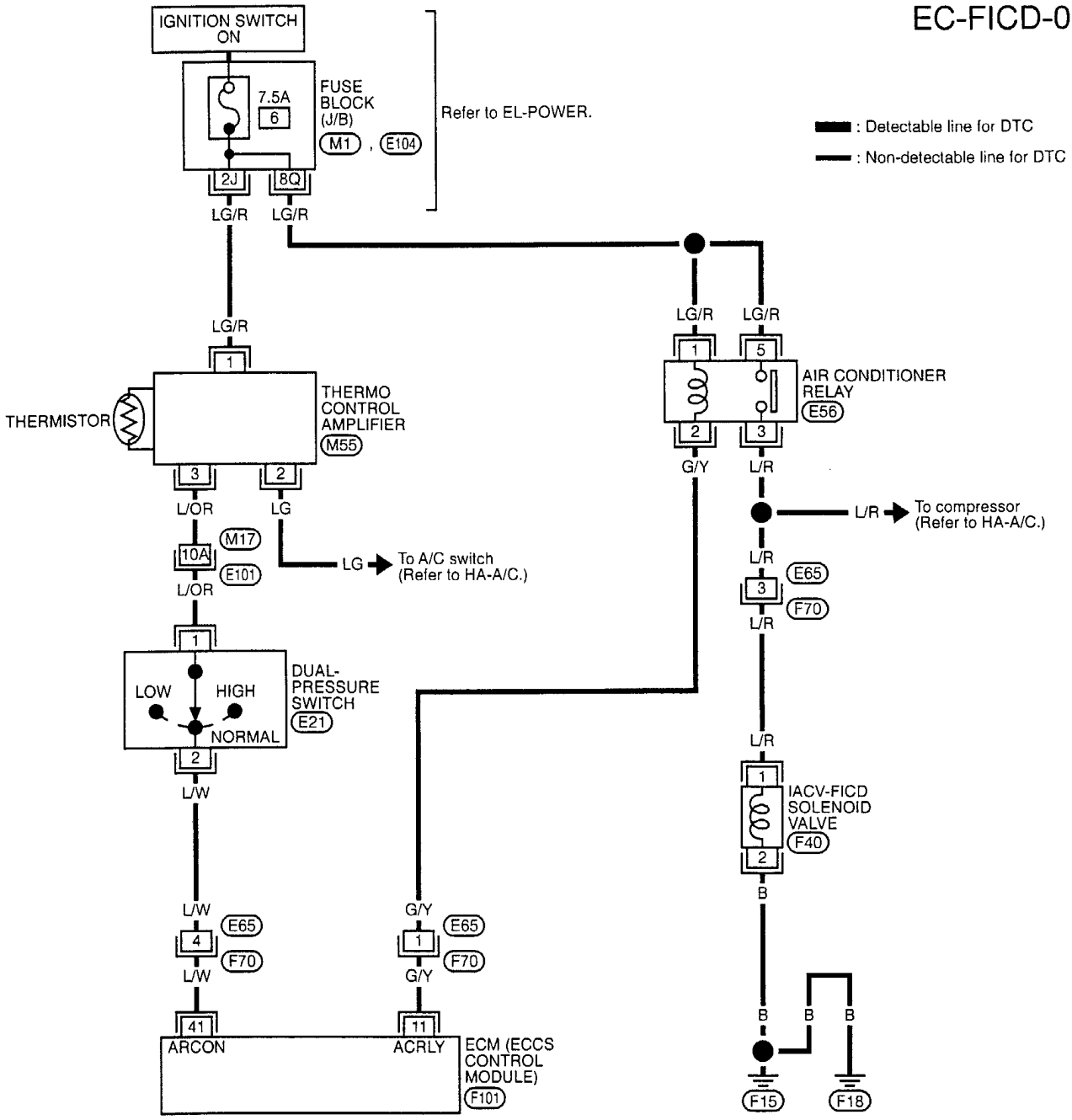


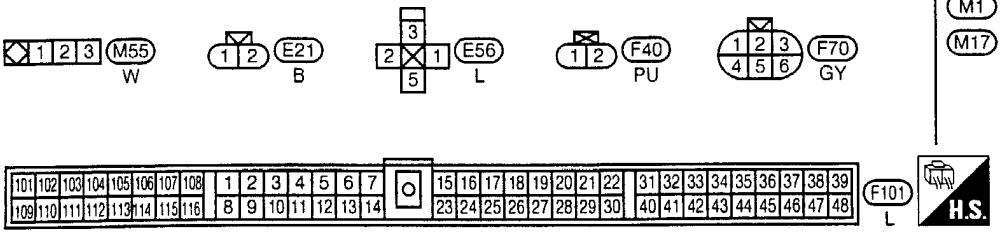
YEC053

IACV-FICD Solenoid Valve

EC-FICD-01



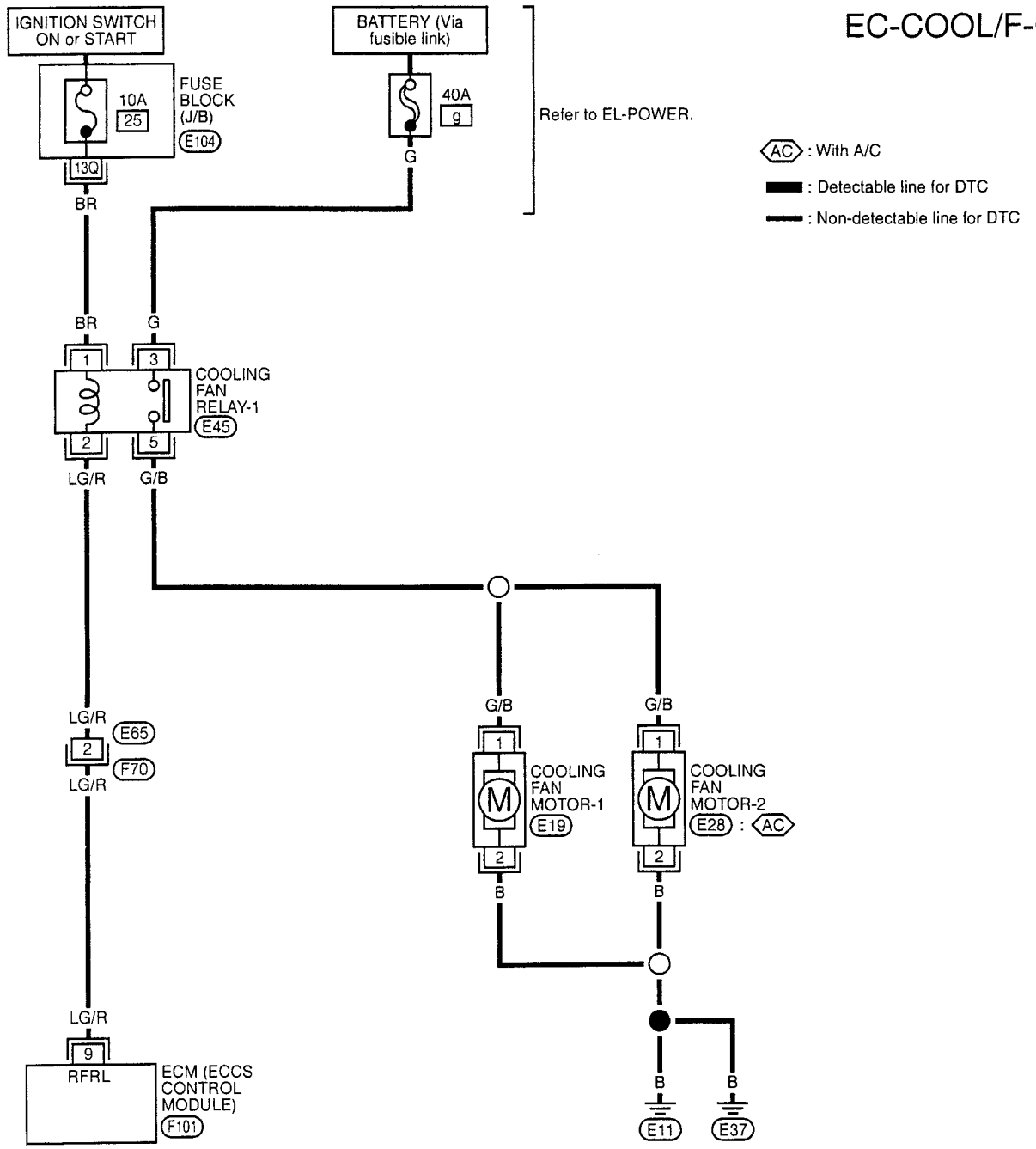
Refer to last page (Foldout page).
M1 , E104
M17 , E101



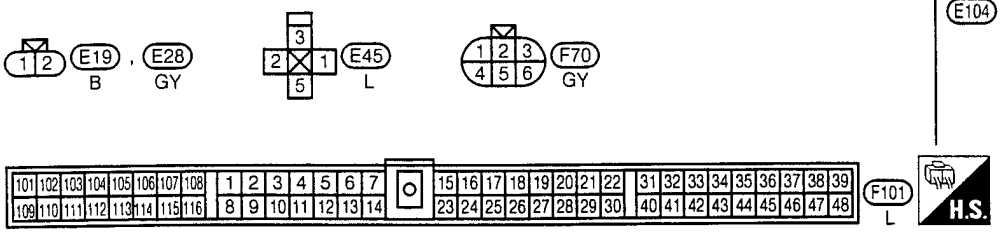
YEC055

Cooling Fan Control

EC-COOL/F-01



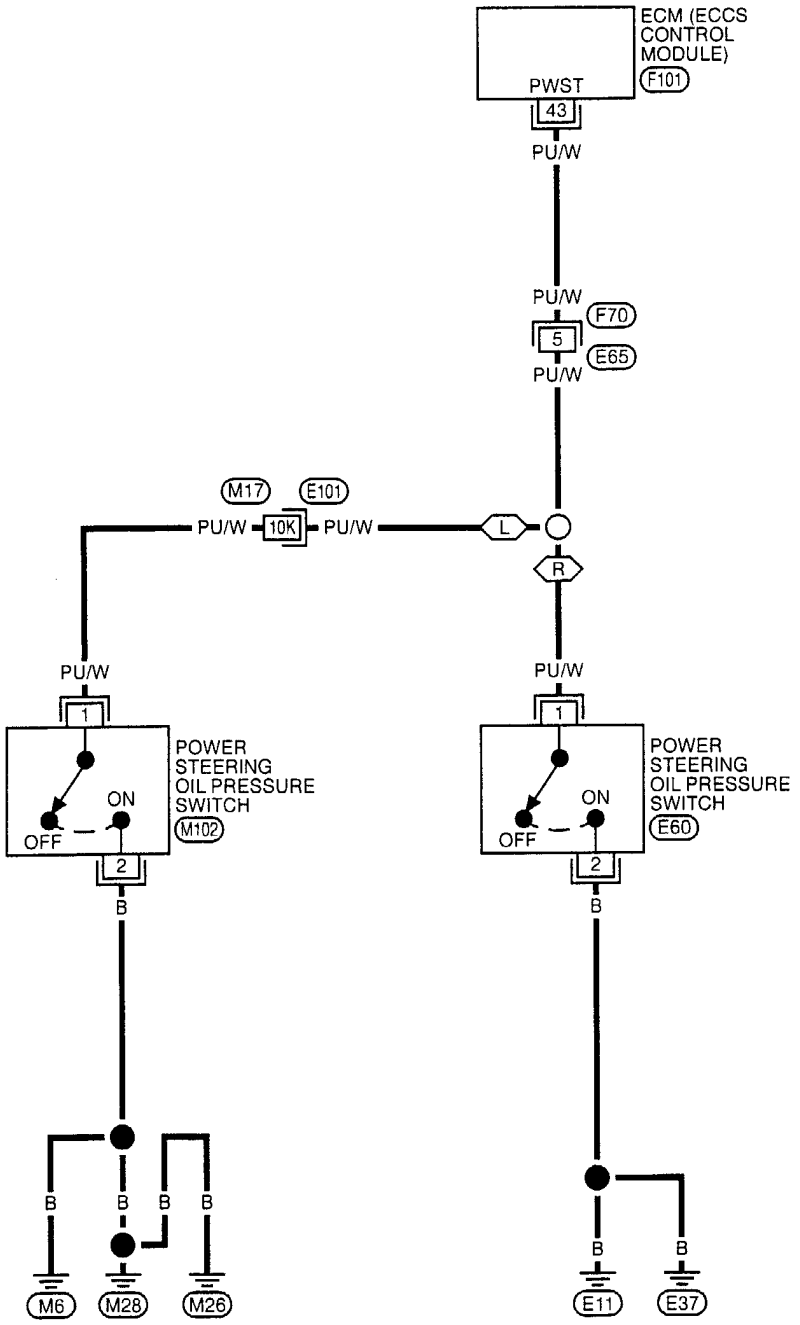
Refer to last page (Foldout page).



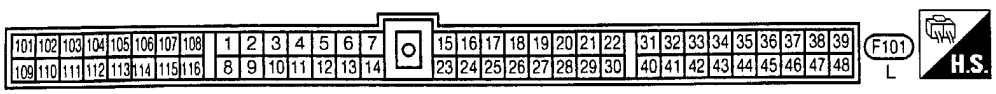
YEC056

Power Steering Oil Pressure Switch

EC-PST/SW-01

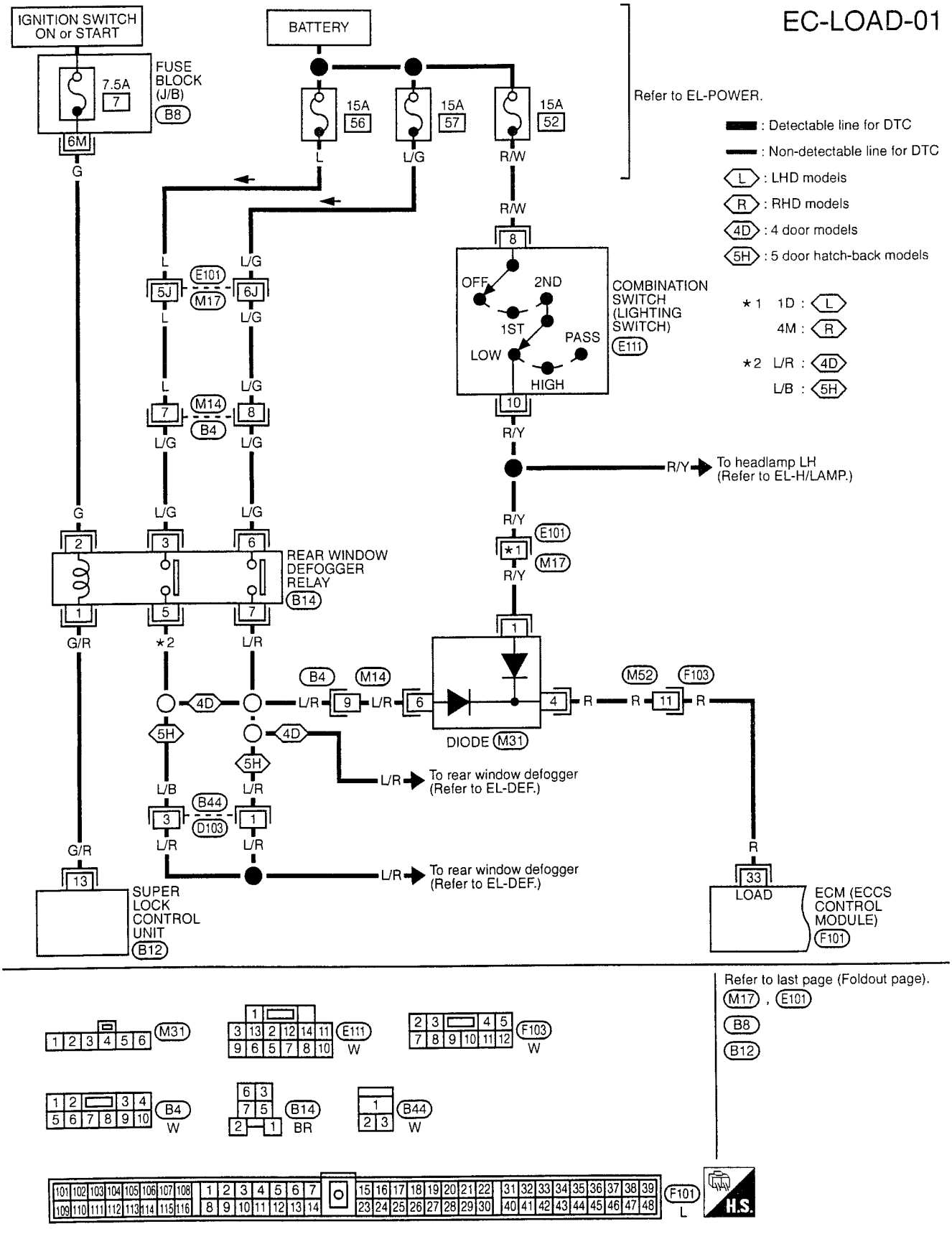


Refer to last page (Foldout page).
M17 , E101

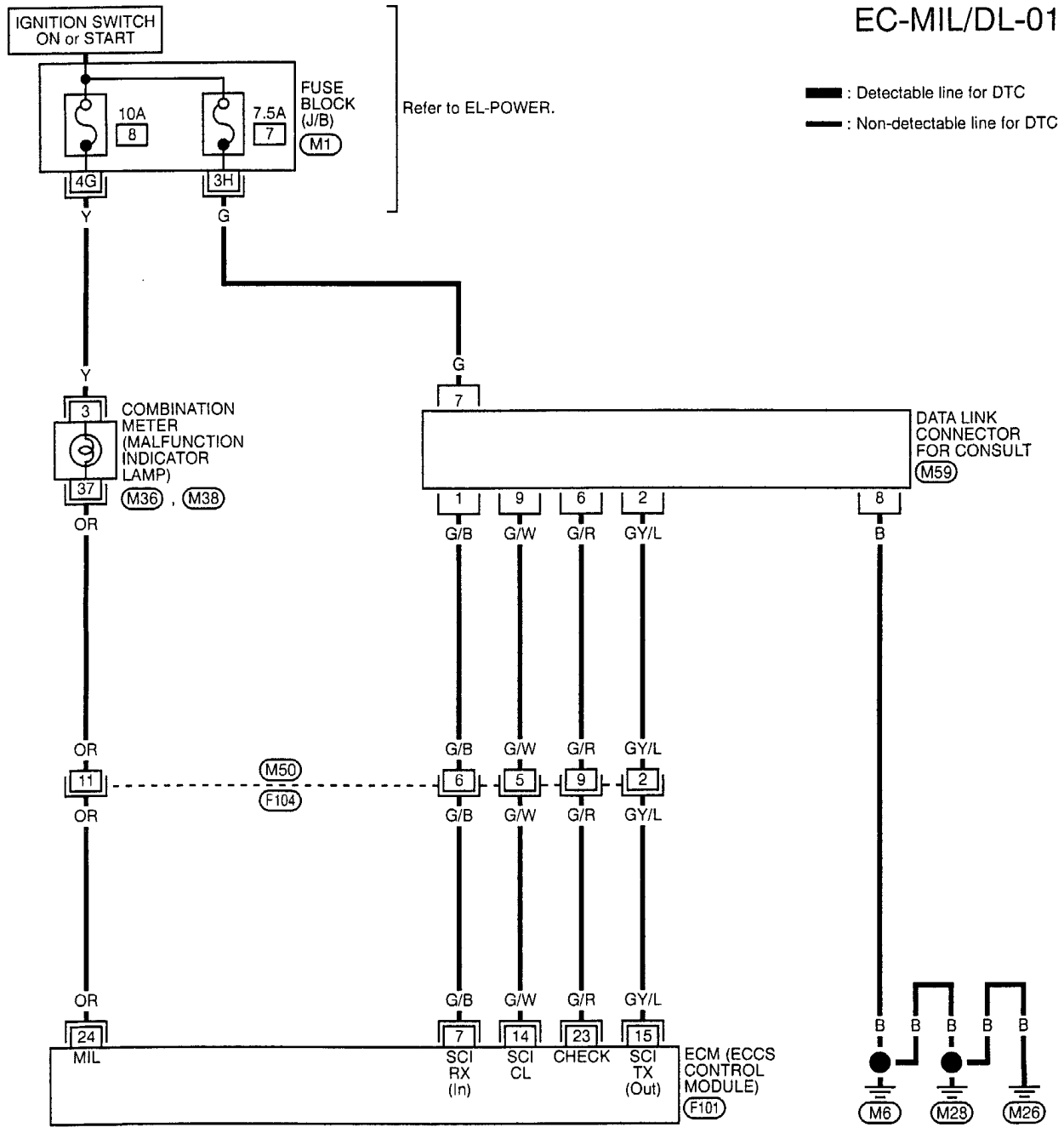


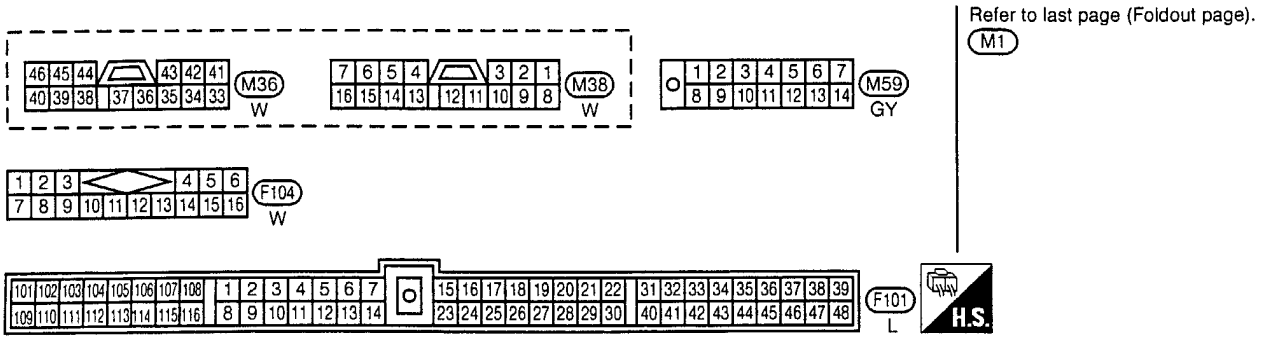
YEC057

Electrical Load Signal



MIL & Data Link Connectors

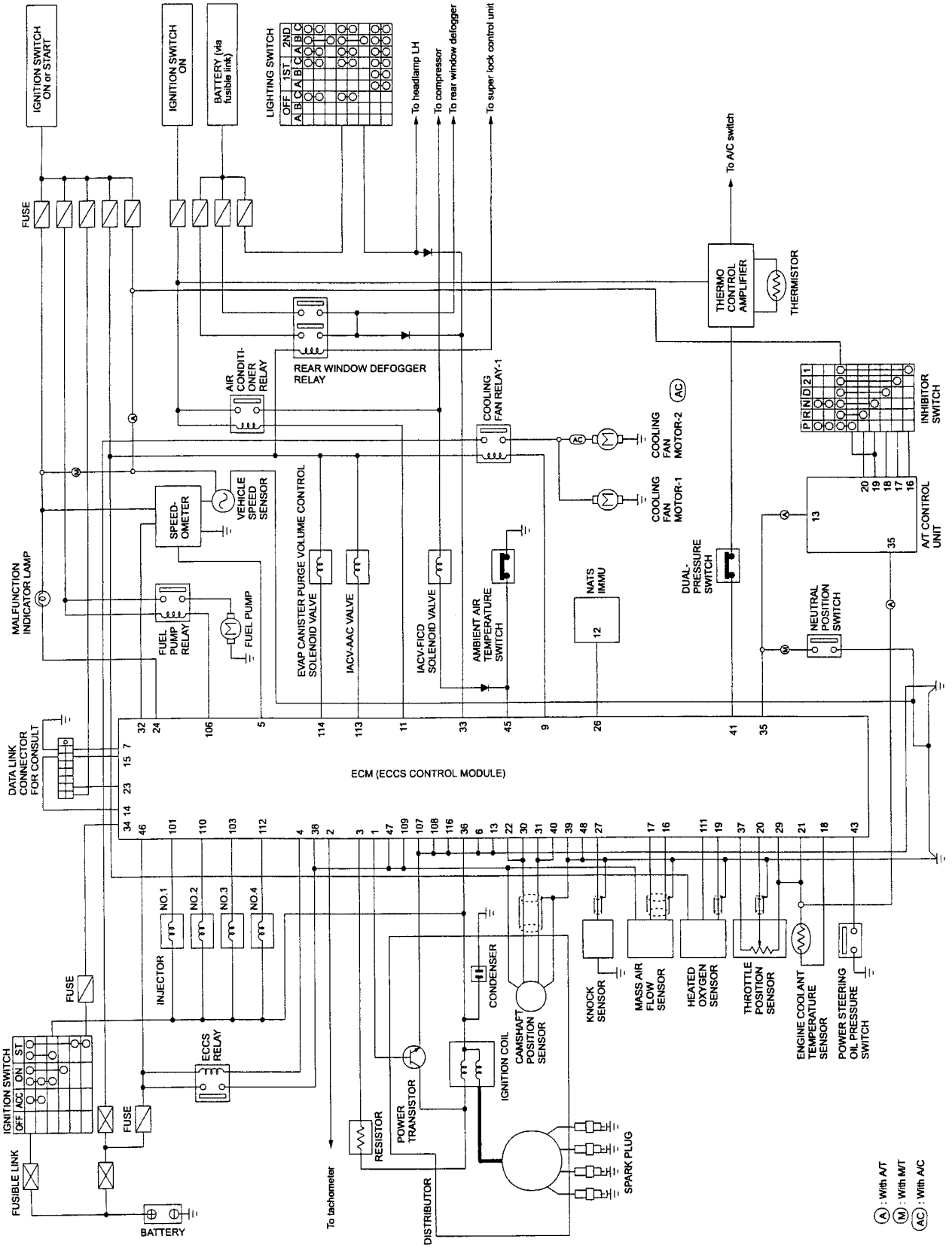




Refer to last page (Foldout page).
M1

YEC060

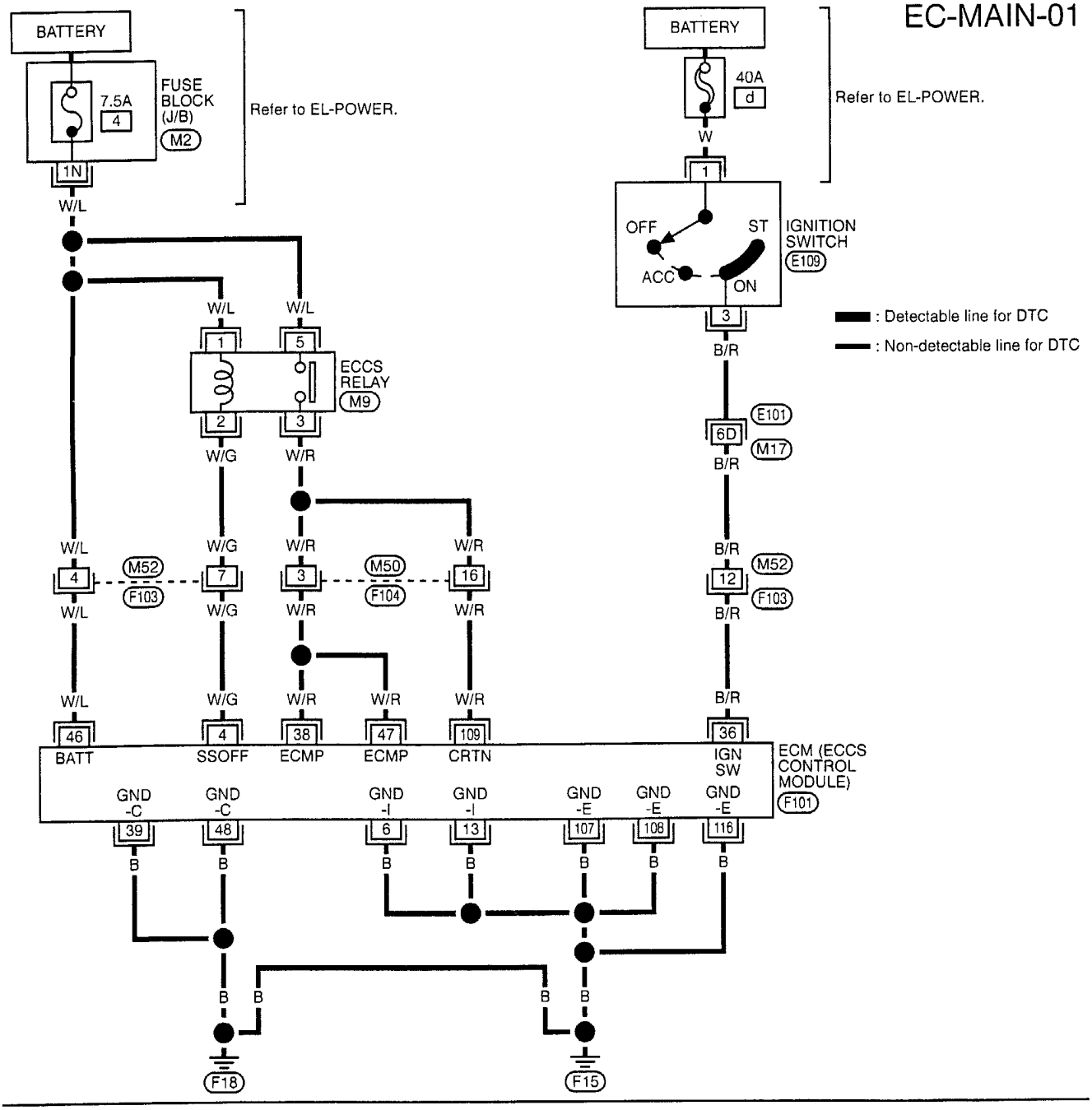
Circuit Diagram



YEC061

Main Power Supply and Ground Circuit

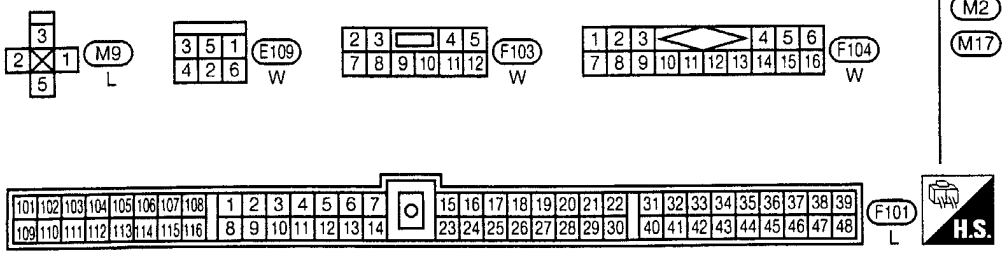
EC-MAIN-01



Refer to last page (Foldout page).

M2

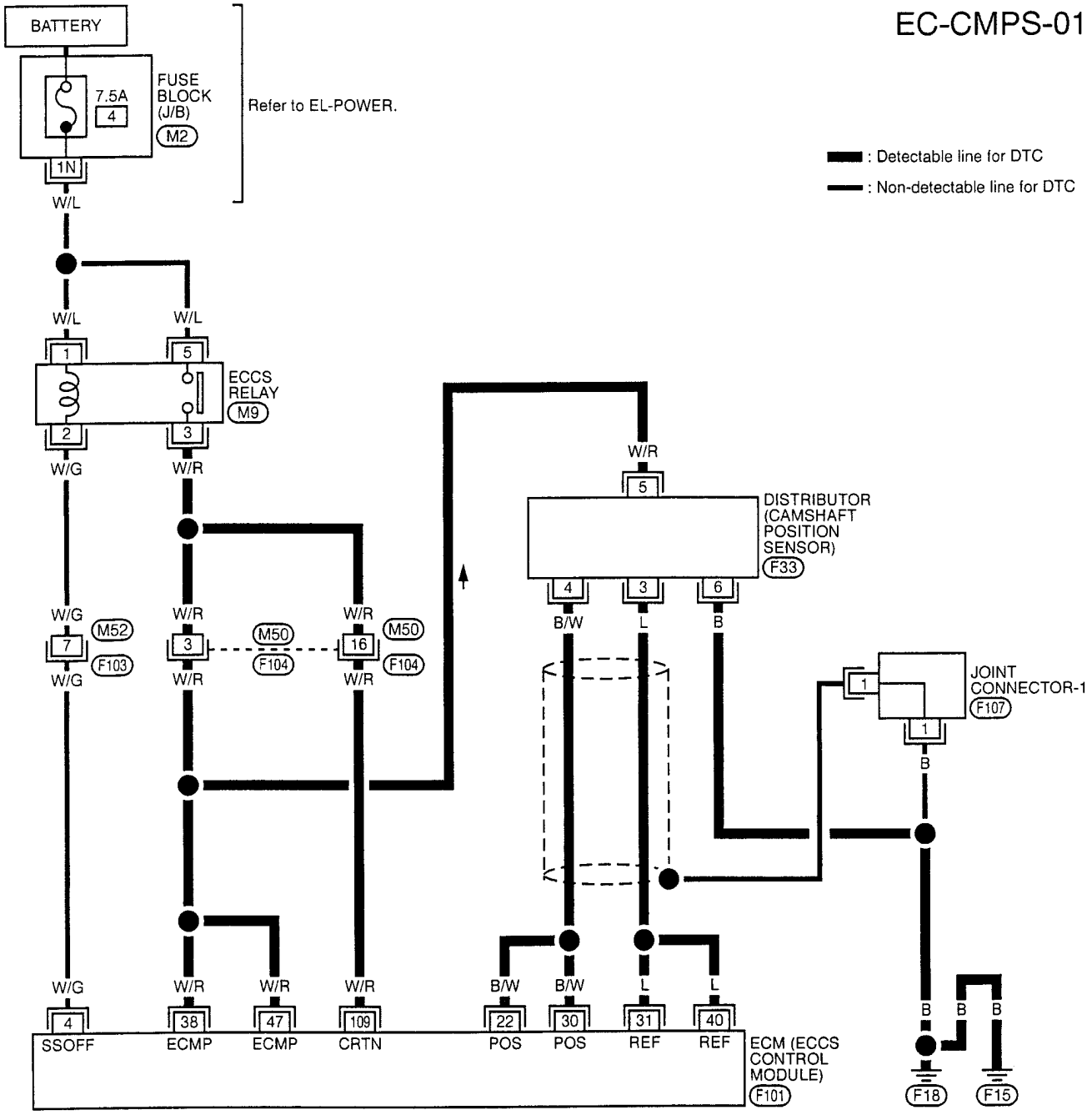
M17 , E101

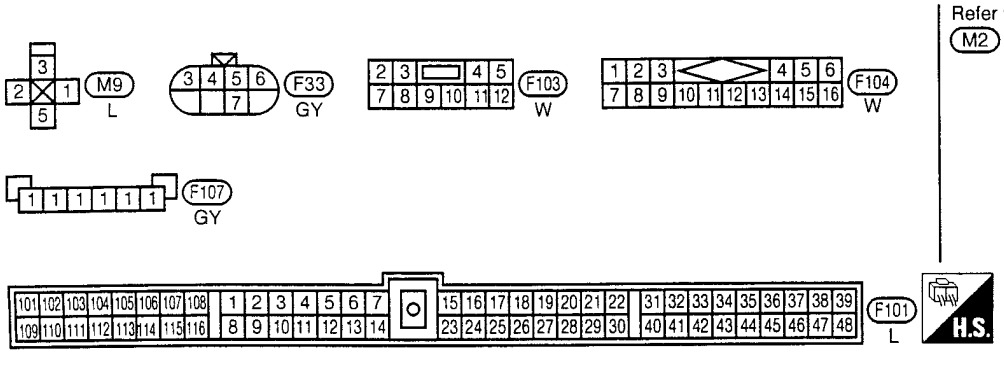


YEC062

Camshaft Position Sensor (CMPS)

EC-CMPS-01



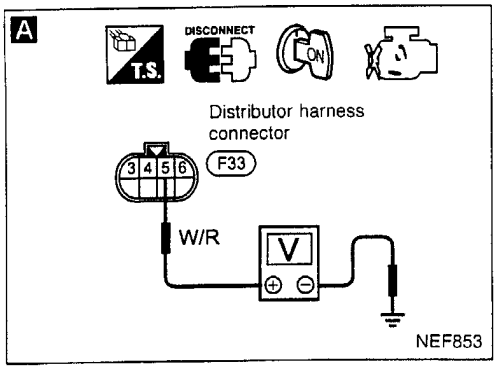


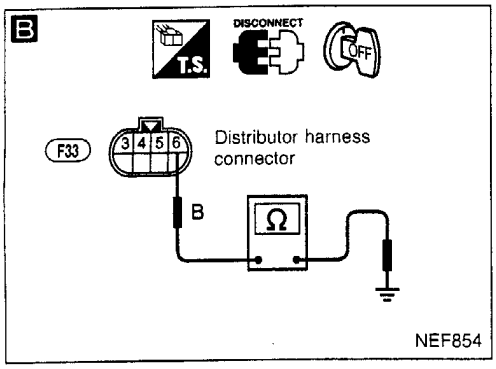
Refer to last page (Foldout page).
M2

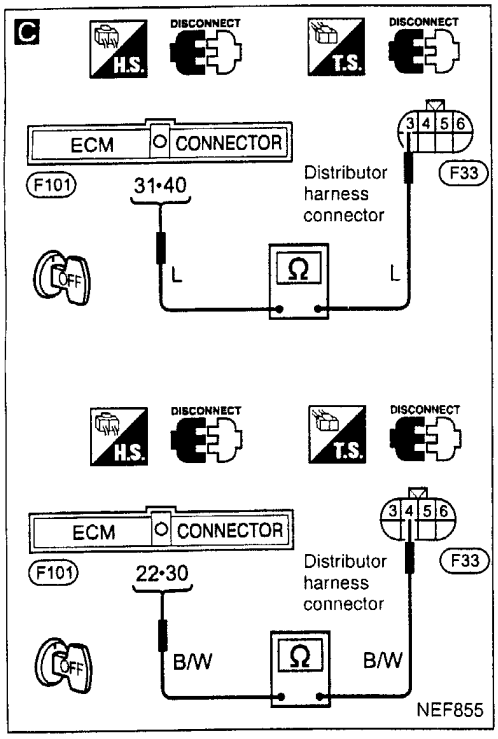
YEC063

Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE (DETECTABLE CIRCUIT)







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect camshaft position sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between camshaft position sensor connector terminal ⑤ and ground with CONSULT or voltage tester.
   Voltage: Battery voltage

NG → Check the following:
- 7.5A fuse in fuse block.
- Operation of ECCS relay.
- Operation of ignition switch.
- Harness connectors M52, F103
- Harness connectors M50, F104
- Harness for open or short-circuit between camshaft position sensor and ECCS relay.
- Harness for open or short-circuit between camshaft position sensor and ECM.

If NG, replace 7.5A fuse or ECCS relay or repair ignition switch, harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between camshaft position sensor connector terminal ⑥ and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connector.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between camshaft position sensor connector terminal ③ and ECM terminals ㉛, ㊵; camshaft position sensor connector terminal ④ and ECM terminals ㉒, ㉚.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT (Camshaft position sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace camshaft position sensor.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

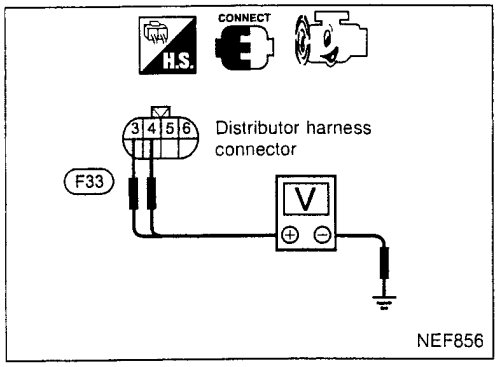
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

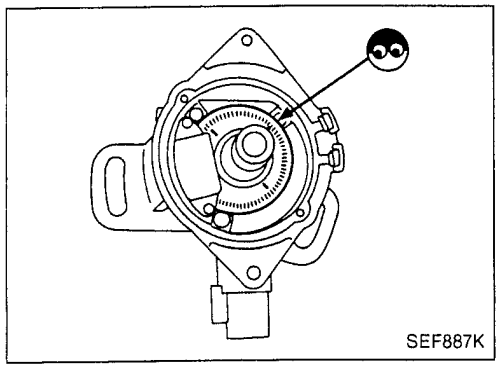
INSPECTION END

Camshaft Position Sensor (CMPS) (Cont'd)

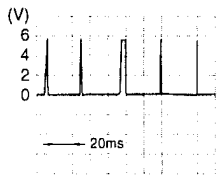
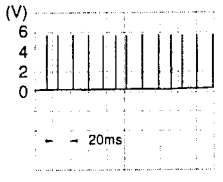
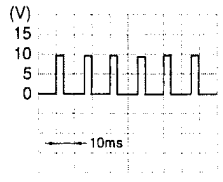
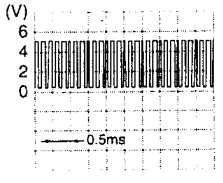
COMPONENT INSPECTION

Camshaft position sensor





1. Start engine and warm it up sufficiently.
2. Check voltage between camshaft position sensor terminals ③, ④ and ground with DC range or check pulse signal with oscilloscope under the following conditions.

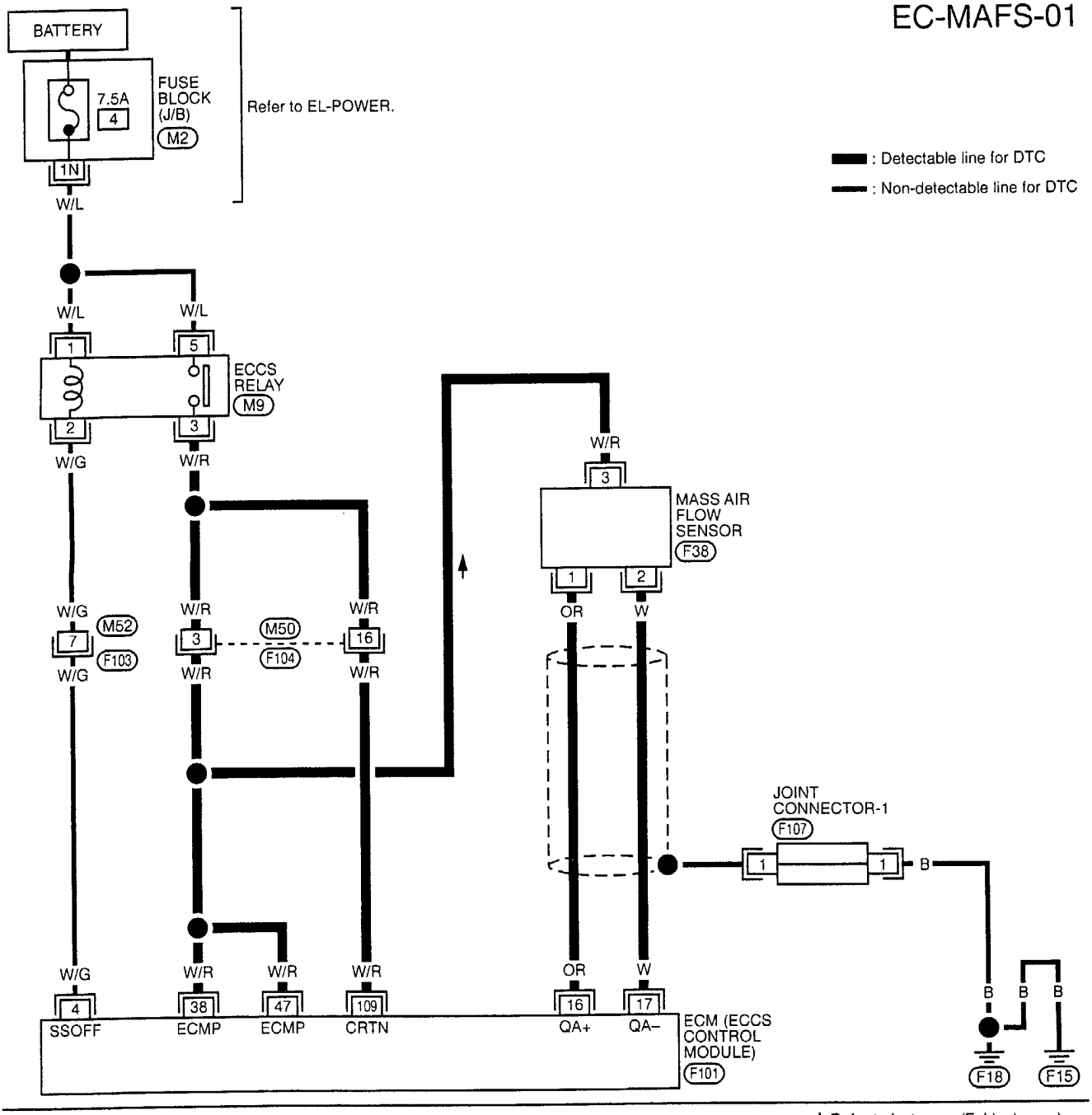
Condition		Idle	2,000 rpm
Terminal ③	Voltage	0.1 - 0.4V	0.1 - 0.4V
	Pulse signal	 NEF355	 NEF356
Terminal ④	Voltage	2.0 - 3.0V	2.0 - 3.0V
	Pulse signal	 NEF349	 NEF354

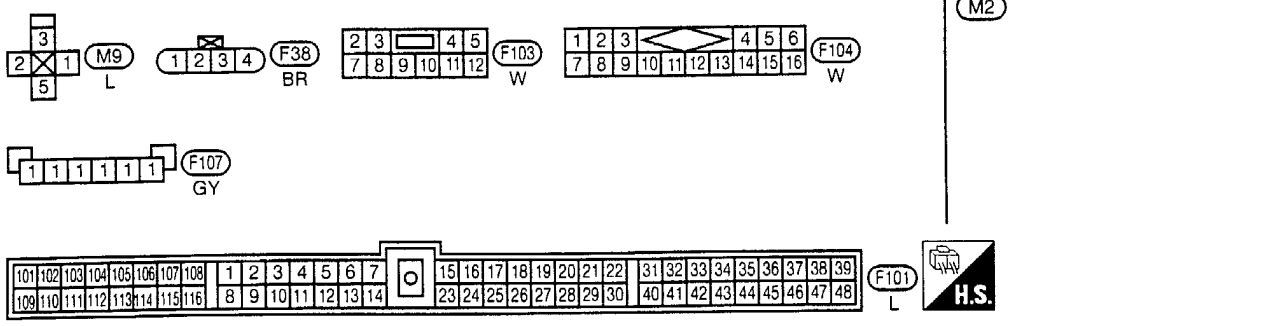
3. If NG, replace distributor assembly with camshaft position sensor.
4. Remove distributor cap. Visually check signal plate for damage or dust.

After this inspection, diagnostic trouble code No. 11 might be displayed with camshaft position sensor functioning properly. Erase the stored memory.

Mass Air Flow Sensor (MAFS)

EC-MAFS-01

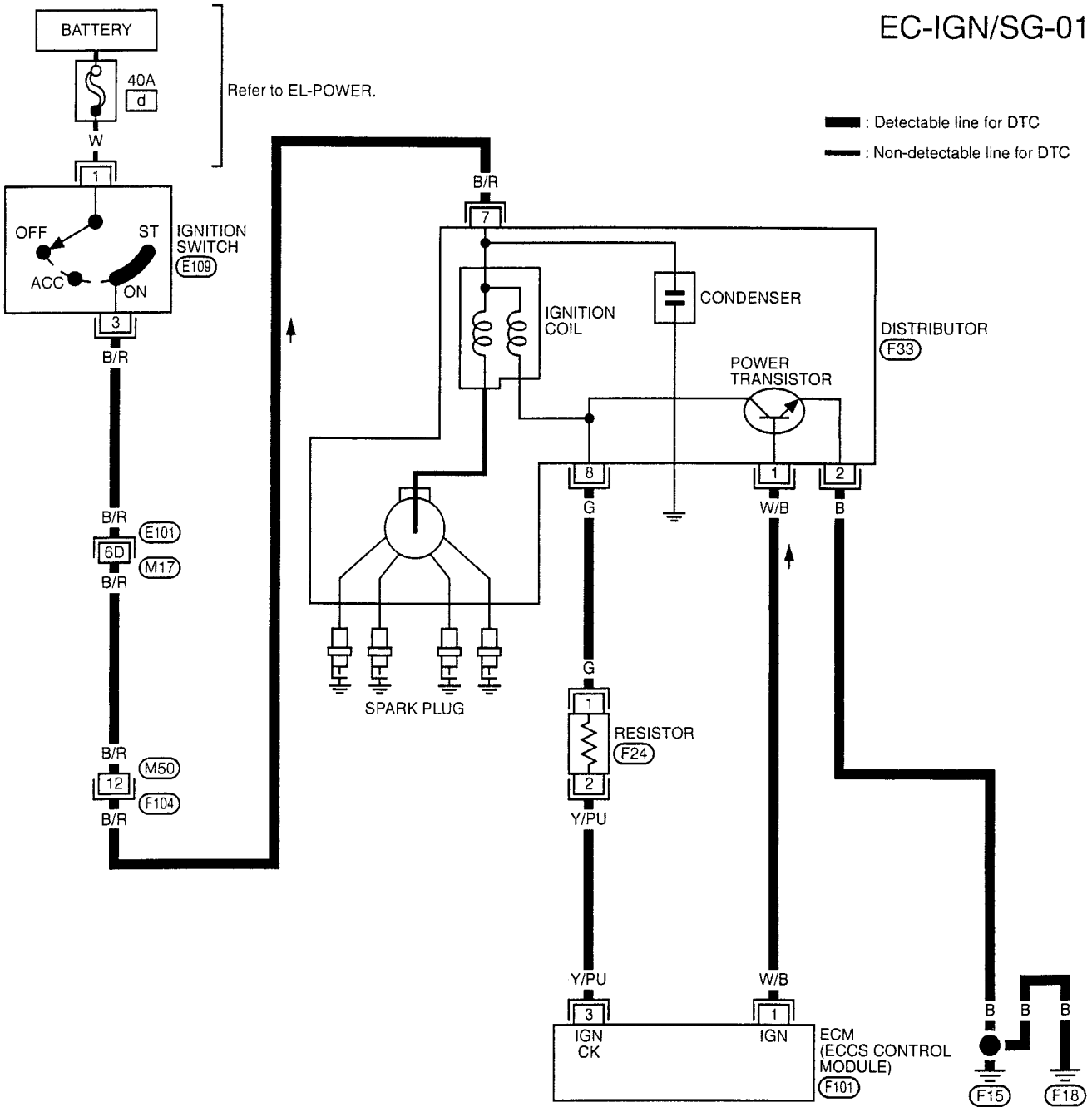




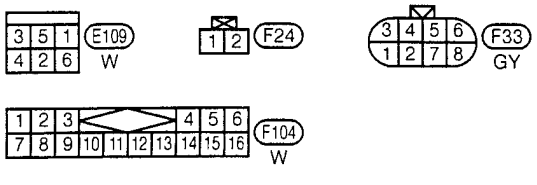
YEC064

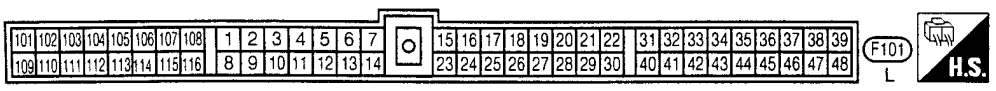
Ignition Signal

EC-IGN/SG-01



Refer to last page (Foldout page).
M17 , E101

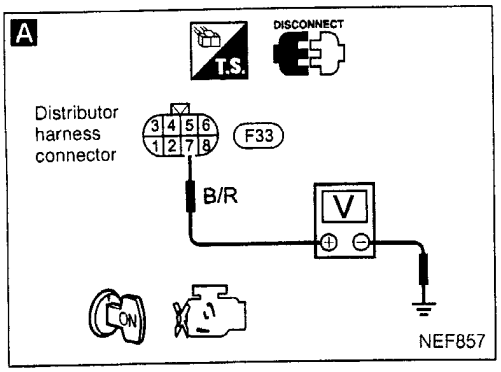


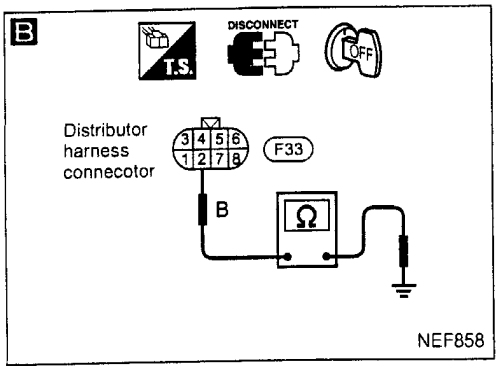


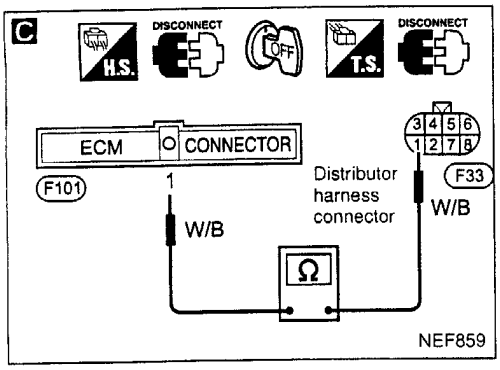
YEC065

Ignition Signal (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

Turn ignition switch to "LOCK" position, and restart engine.
Is engine running?

Yes → Ⓐ

No

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect distributor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between distributor connector terminal ⑦ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following:
- 40A fusible link.
- Operation of ignition switch.
- Harness connectors (E101), (M17)
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ignition coil and ignition switch.

If NG, replace 40A fusible link or repair ignition switch, harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect distributor harness connector.
3. Check harness continuity between distributor connector terminal ② and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal ① and distributor connector terminal ①.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENTS
(Ignition coil, power transistor).
Refer to "COMPONENT INSPECTION", on next page.

NG → Replace malfunctioning component(s).

OK

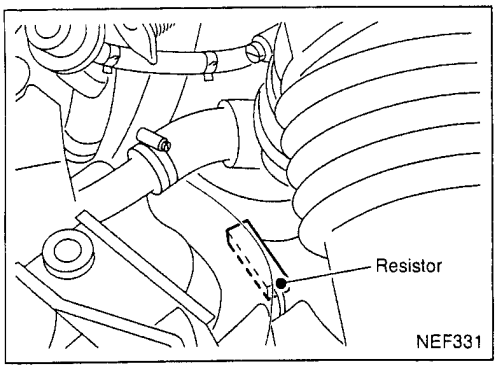
Disconnect and reconnect harness connectors in the circuit. Then retest.

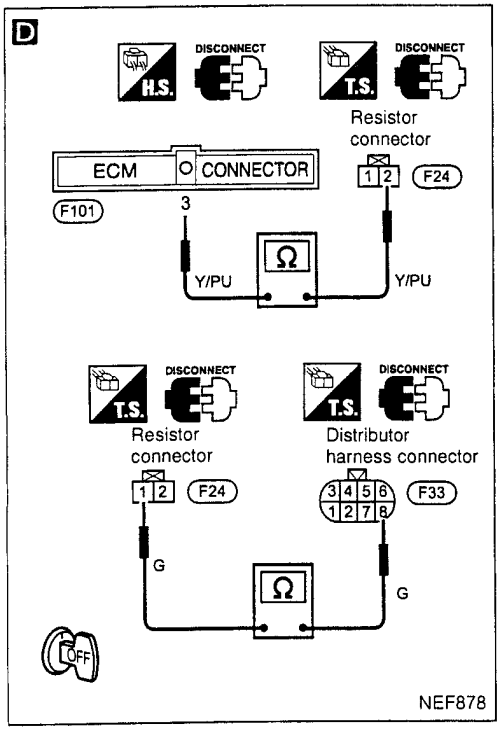
Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Ignition Signal (Cont'd)





Ⓐ

D

CHECK INPUT SIGNAL CIRCUIT.
1. Stop engine.
2. Disconnect distributor harness connector.
3. Disconnect resistor harness connector.
4. Disconnect ECM harness connector.
5. Check harness continuity between ignition coil connector terminal Ⓑ and resistor connector terminal ①; resistor connector terminal ② and ECM connector terminal ③.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT (Resistor).
Refer to "COMPONENT INSPECTION" (EC-224).

NG → Replace resistor.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

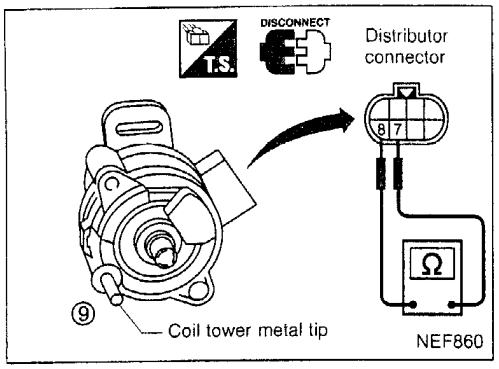
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Ignition Signal (Cont'd)

COMPONENT INSPECTION

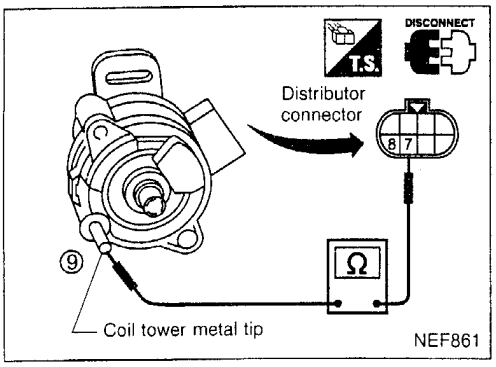


Ignition coil

1. Disconnect distributor harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance [at 25°C (77°F)]
⑦ - ⑧ (Primary coil)	Approximately 2.2 kΩ
⑦ - ⑨ (Secondary coil)	Approximately 25 kΩ

For checking secondary coil, remove distributor cap and measure resistance between coil tower metal tip ⑨ and connector terminal ⑦.
If NG, replace distributor assembly as a unit.

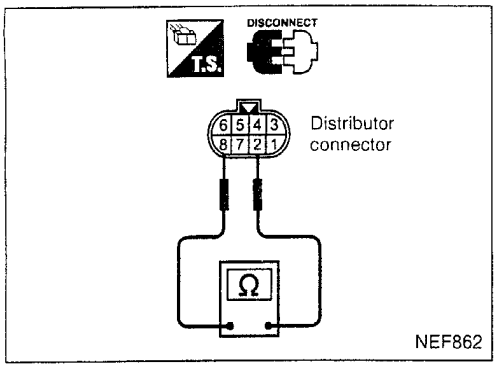


Power transistor

1. Disconnect distributor harness connector.
2. Check power transistor resistance between terminals ② and ⑧.

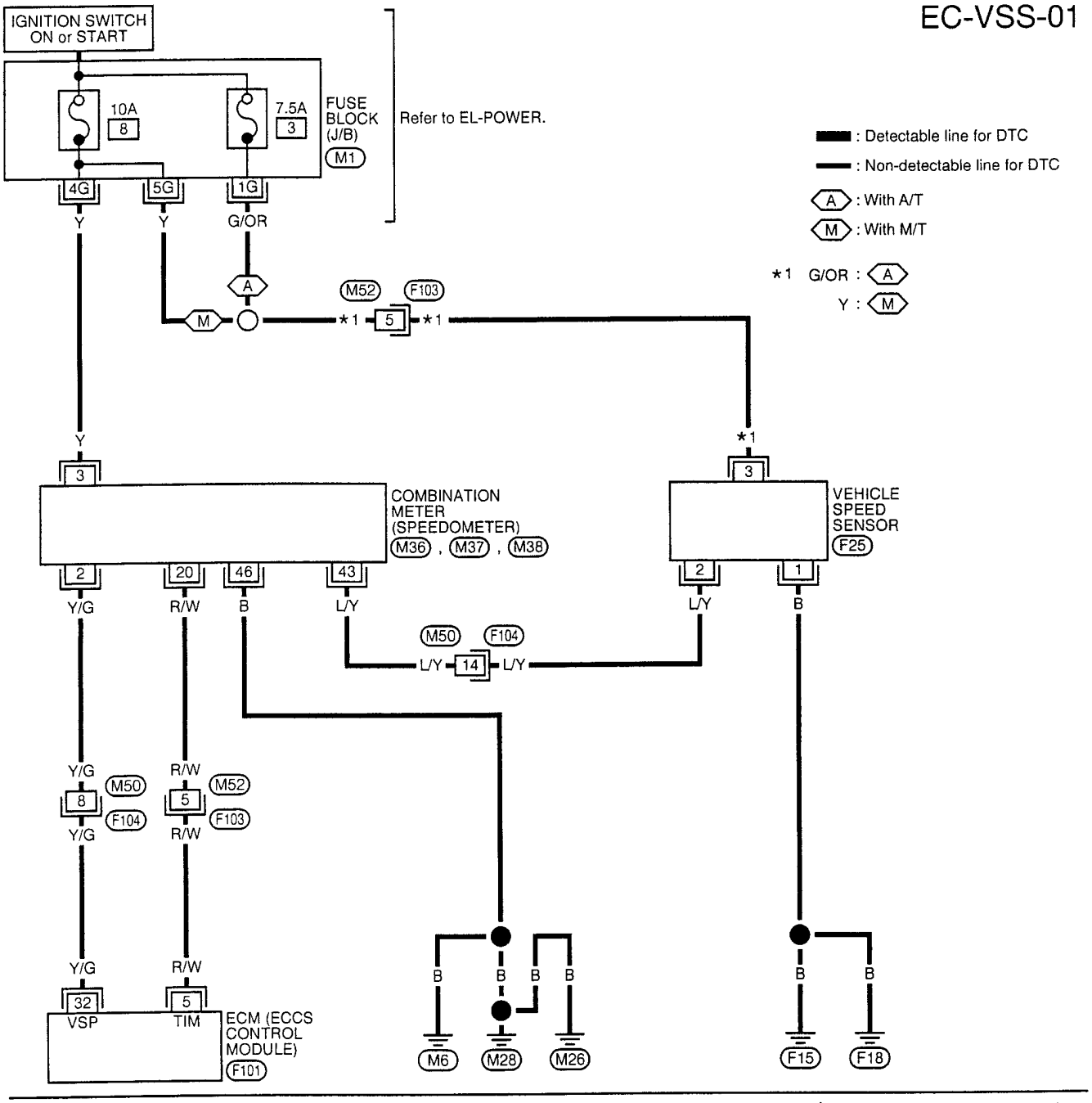
Terminals	Continuity	Result
② and ⑧	Does not exist	OK
	Exist	NG

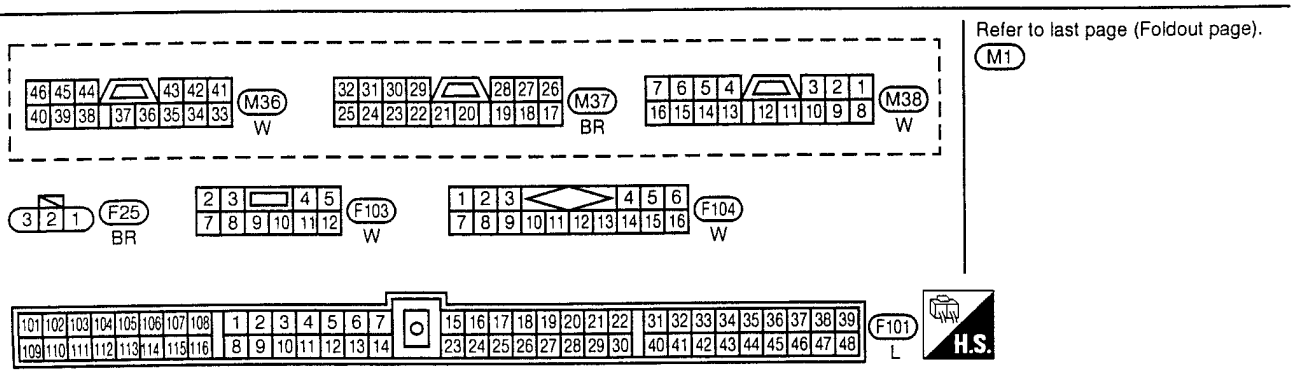
If NG, replace distributor assembly.



Vehicle Speed Sensor (VSS)

EC-VSS-01

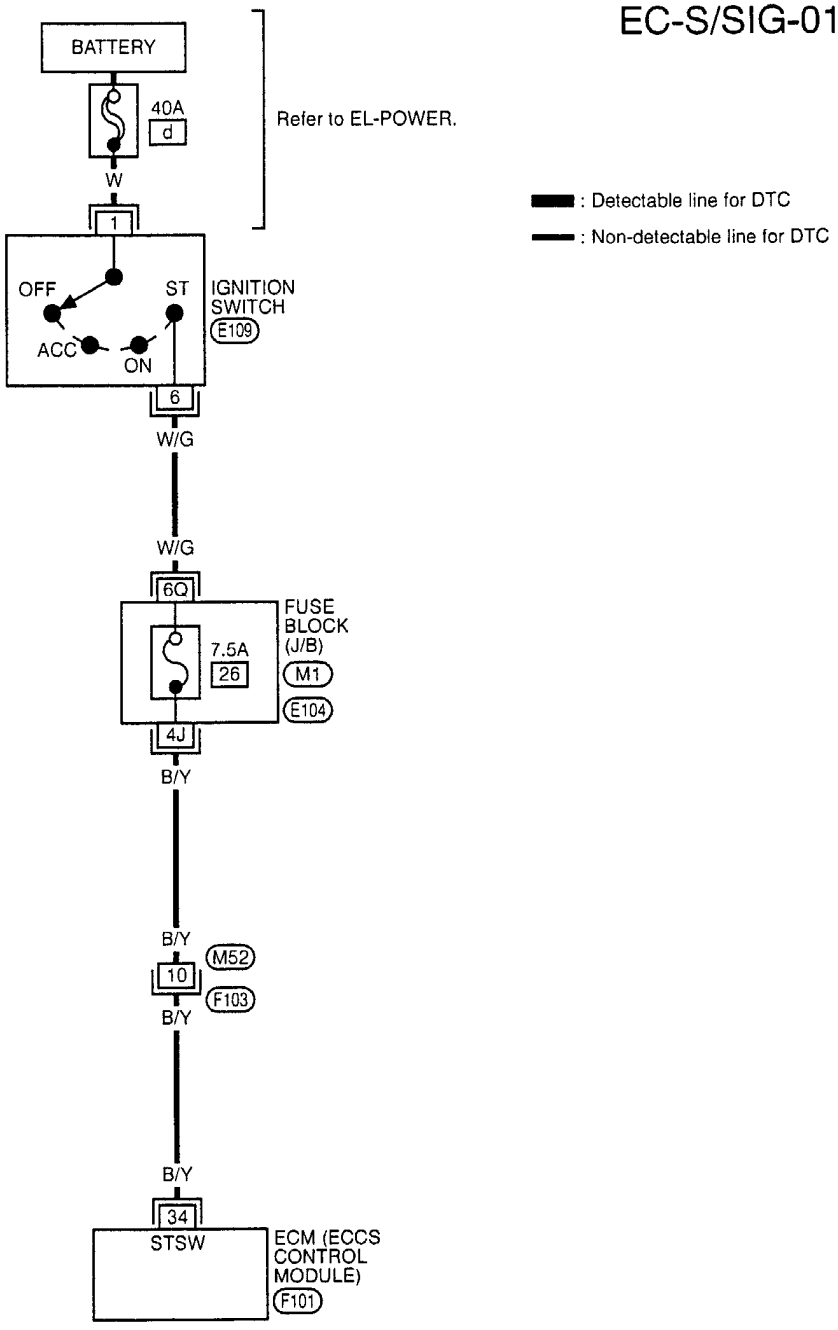




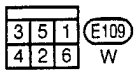
YEC067

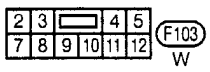
Start Signal

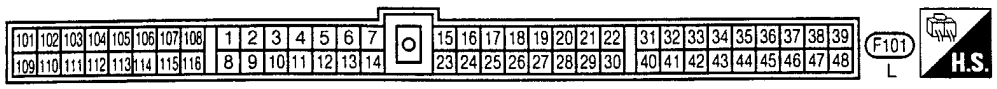
EC-S/SIG-01



Refer to last page (Foldout page).
M1 , E104

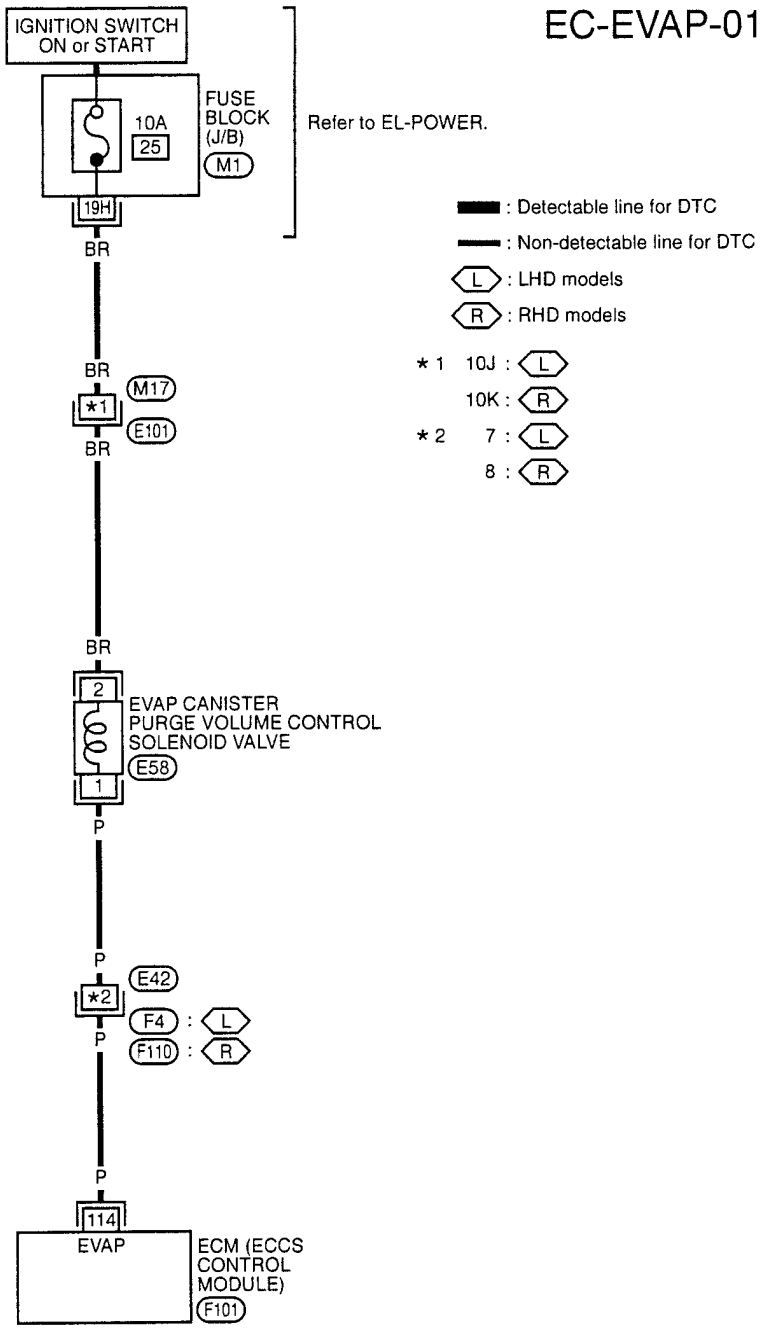


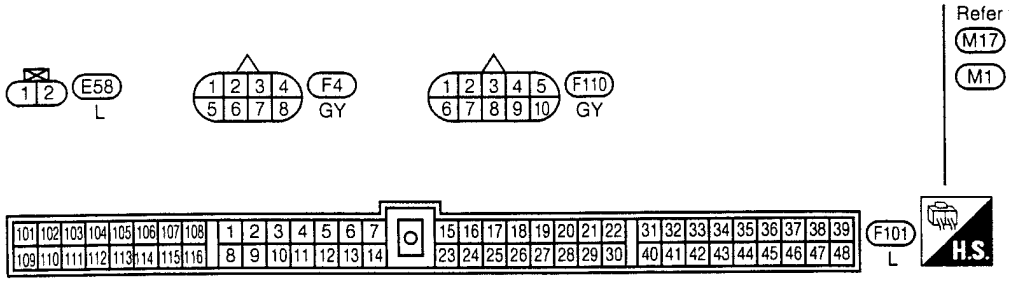




YEC068

EVAP Canister Purge Volume Control Solenoid Valve

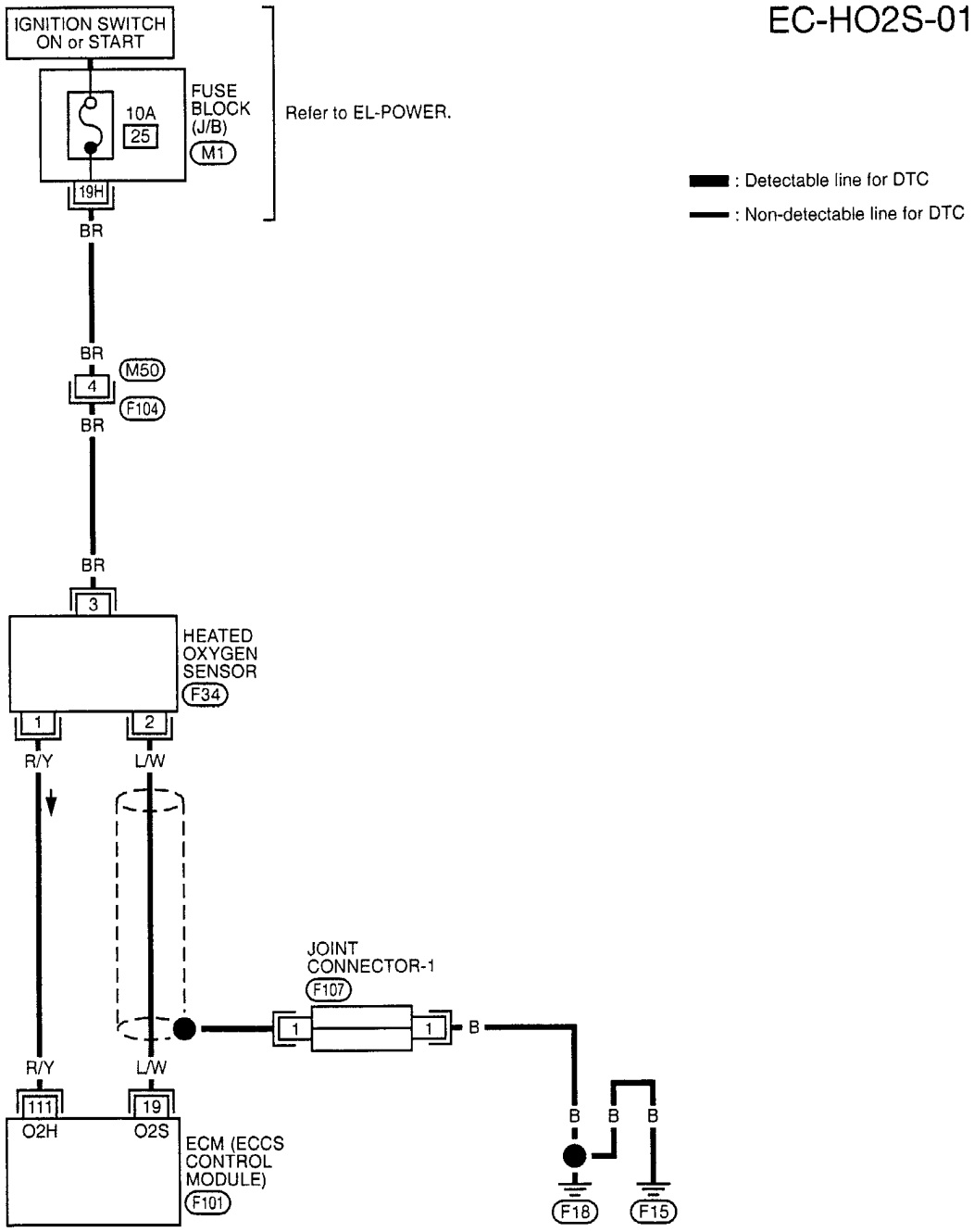




YEC069

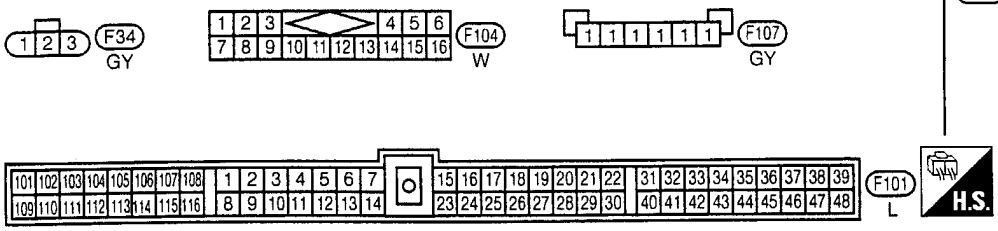
Heated Oxygen Sensor (HO2S)

EC-HO2S-01



Refer to last page (Foldout page).

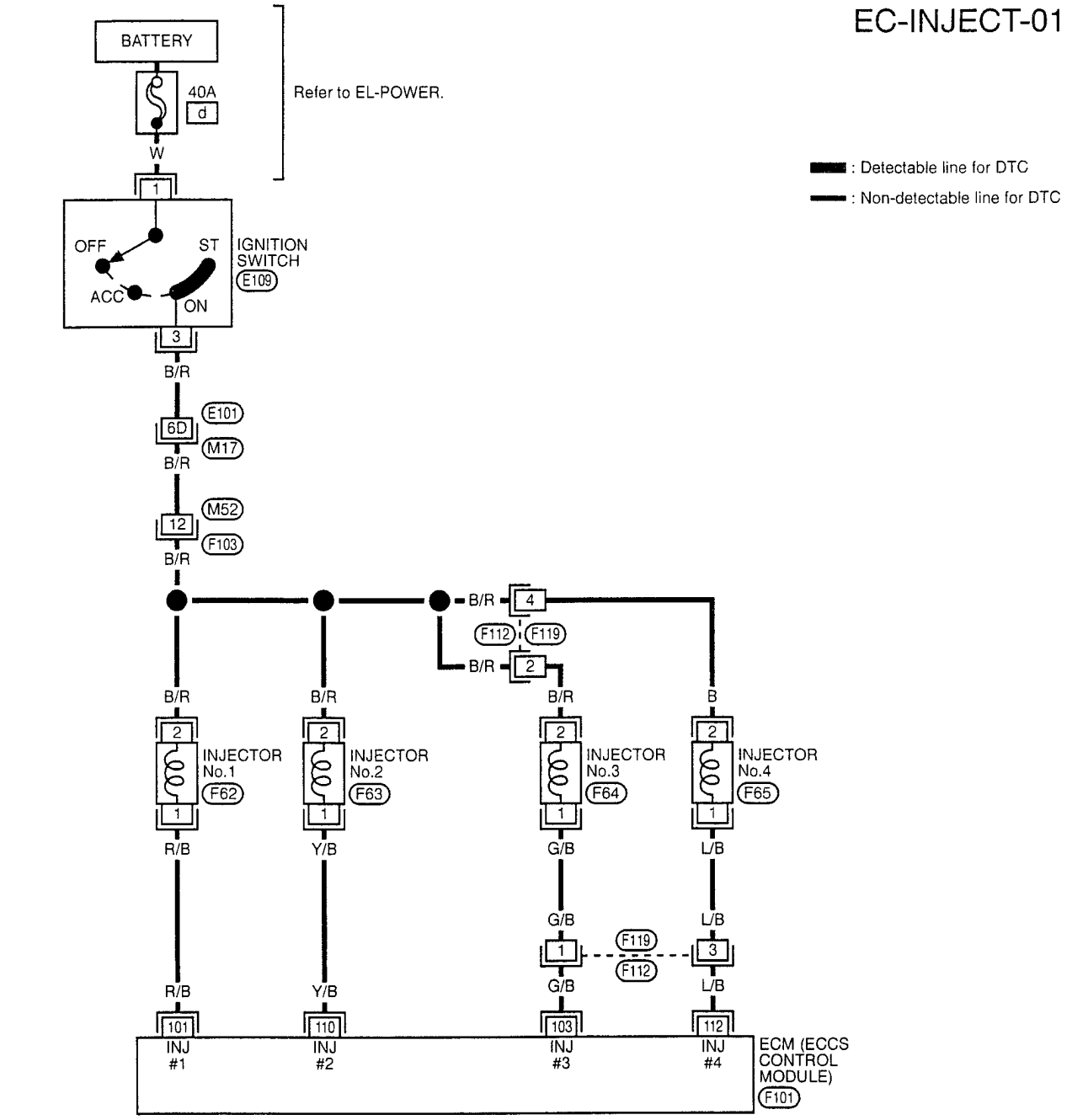
M1



YEC070

Injector

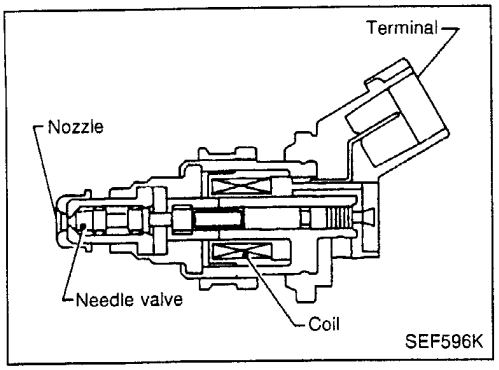
EC-INJECT-01

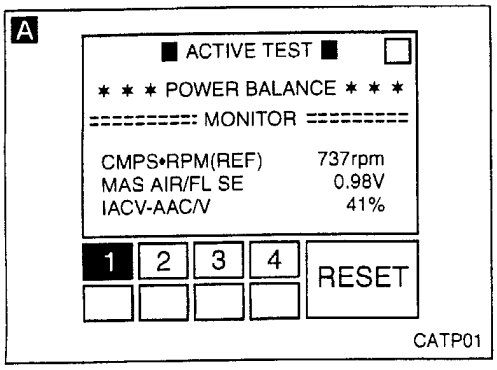


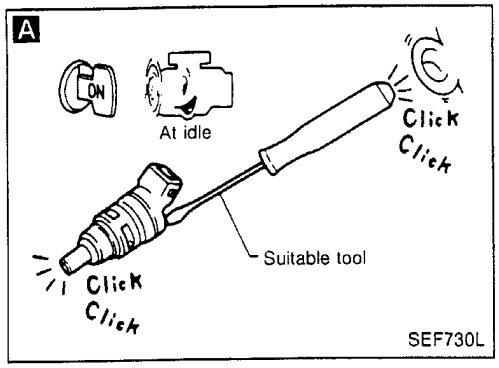
Injector (Cont'd)

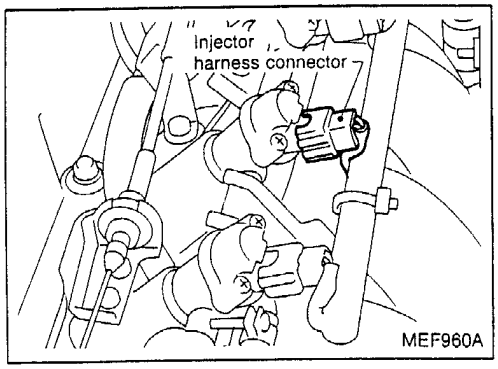
COMPONENT DESCRIPTION

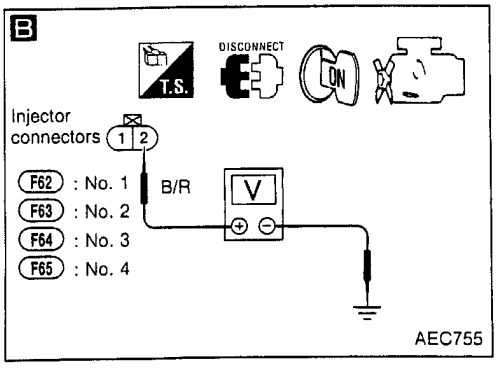
The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.











DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

OR

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between injector harness connector terminal ② and ground with CONSULT or voltage tester.
   Voltage: Battery voltage

NG → Check the following:

- 40A fusible link.
- Operation of ignition switch.
- Harness connectors (E101), (M17)
- Harness connectors (M52), (F103)
- Harness connectors (F112), (F119) ((F64), (F65) only)
- Harness for open or short-circuit between injector and ignition switch.

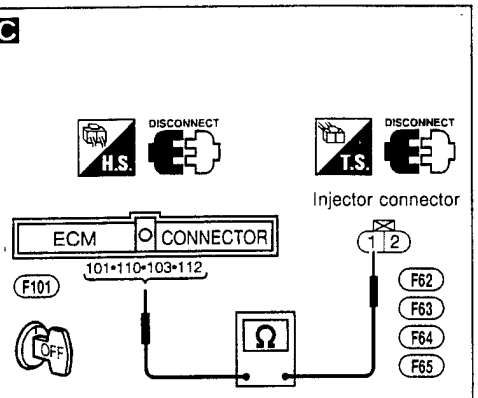
If NG, replace fusible link or repair ignition switch, harness or connectors.

OK

Ⓐ

Injector (Cont'd)

C



ECM (101) — Injector (F62) : No. 1 cylinder
ECM (110) — Injector (F63) : No. 2 cylinder
ECM (103) — Injector (F64) : No. 3 cylinder
ECM (112) — Injector (F65) : No. 4 cylinder

SEF485Q

Ⓐ

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminals ① and ECM connector terminals (101), (110), (103), (112).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (F112), (F119) ((F64), (F65) only)
- Harness for open or short-circuit between ECM and injector.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (Injector).
Refer to "COMPONENT INSPECTION" below.

NG → Replace injector.

OK ↓

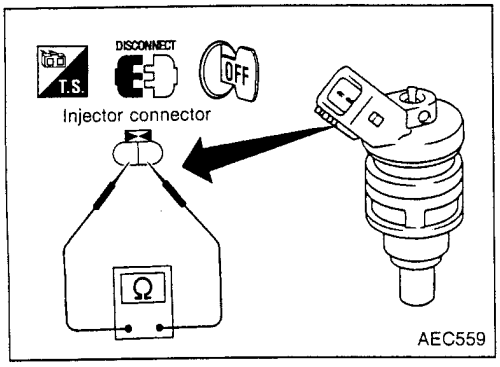
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END



AEC559

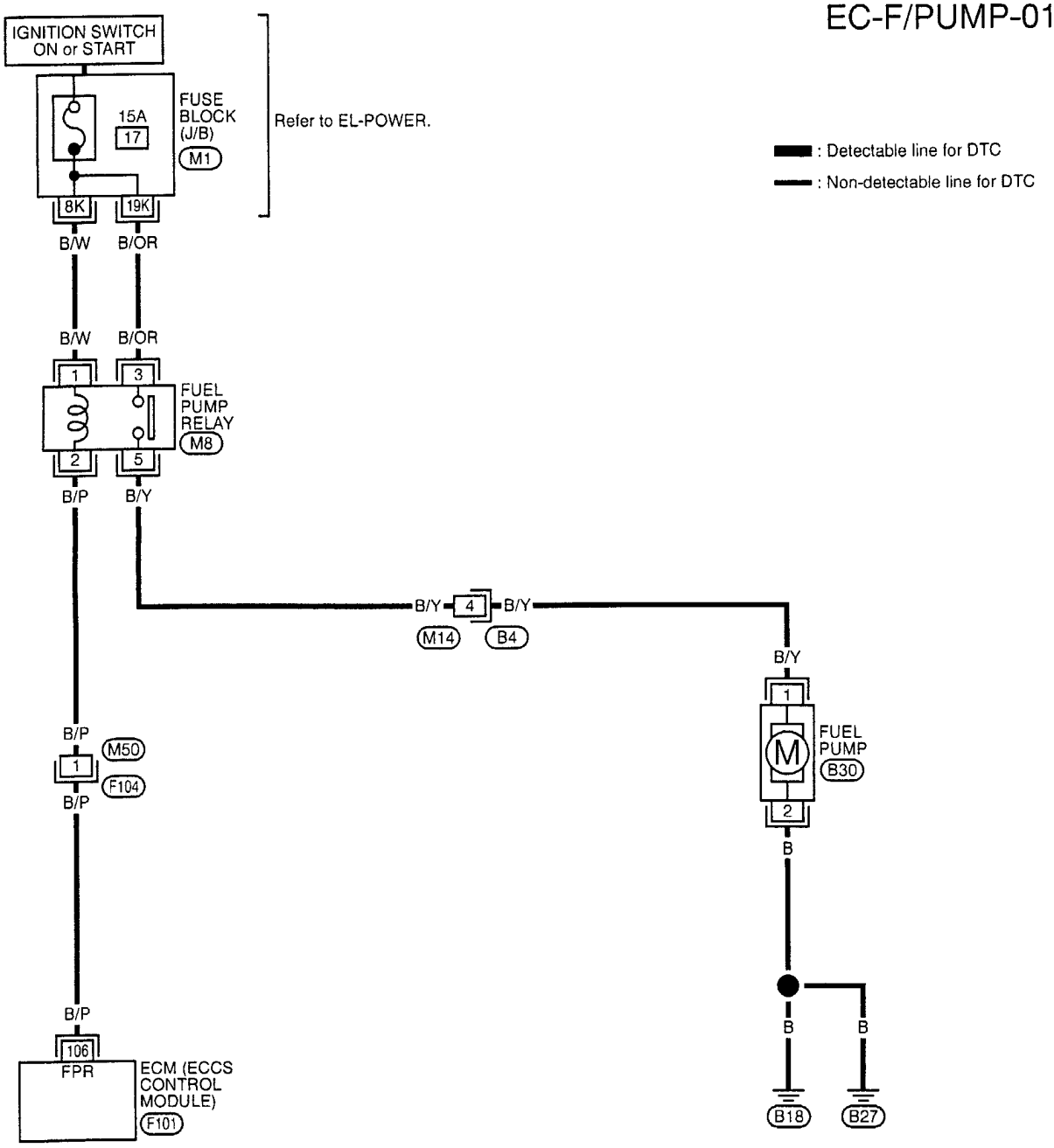
COMPONENT INSPECTION

Injector

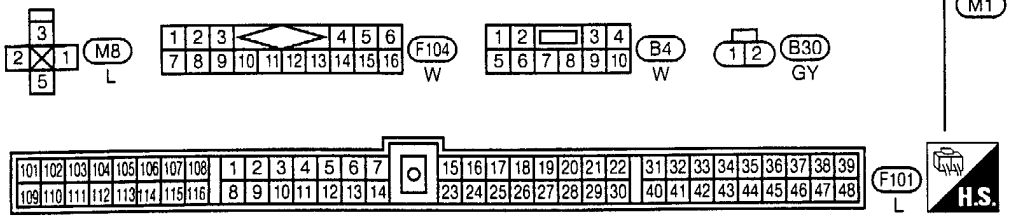
1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 10 - 14Ω [at 25° (77°F)]
   If NG, replace injector.

Fuel Pump

EC-F/PUMP-01



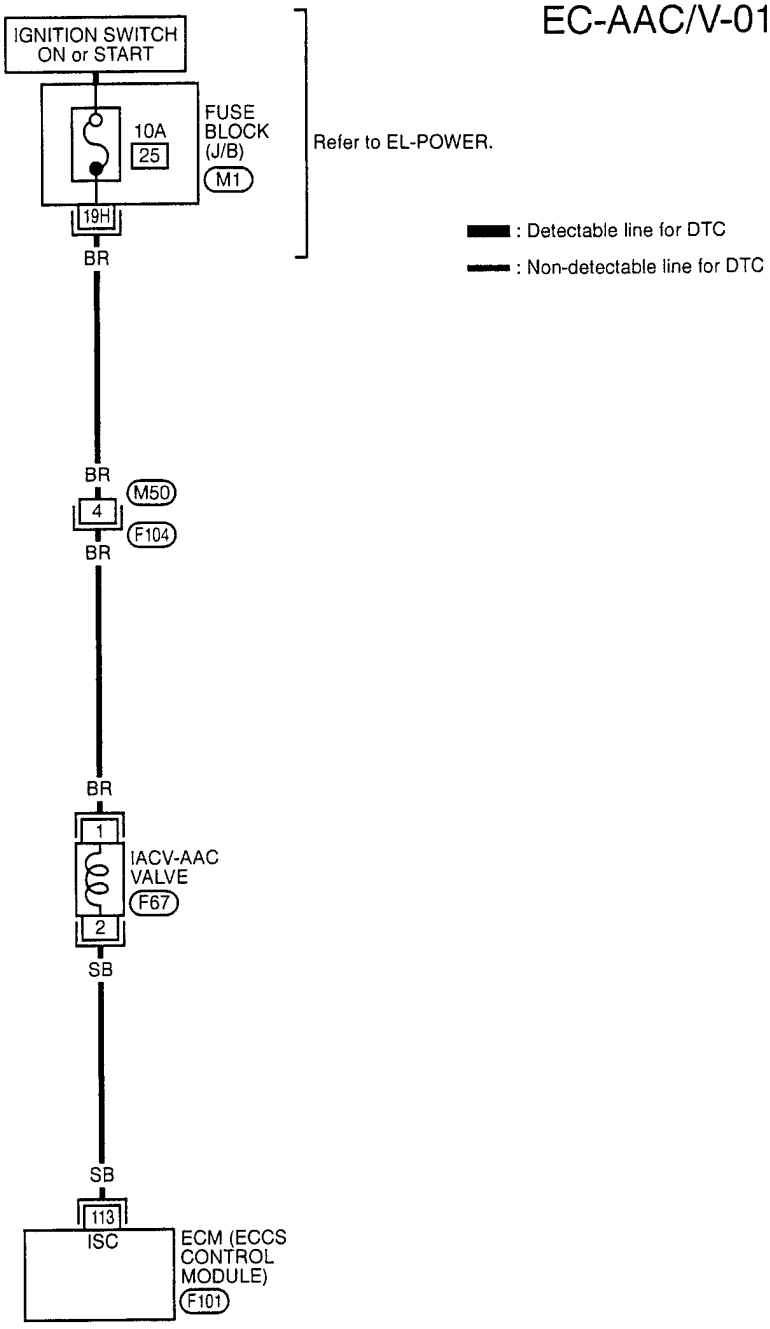
Refer to last page (Foldout page).



YEC072

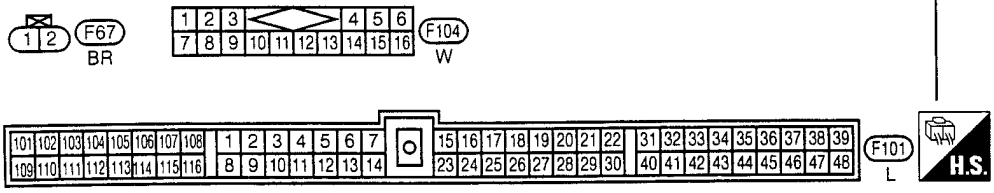
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve

EC-AAC/V-01



Refer to last page (Foldout page).

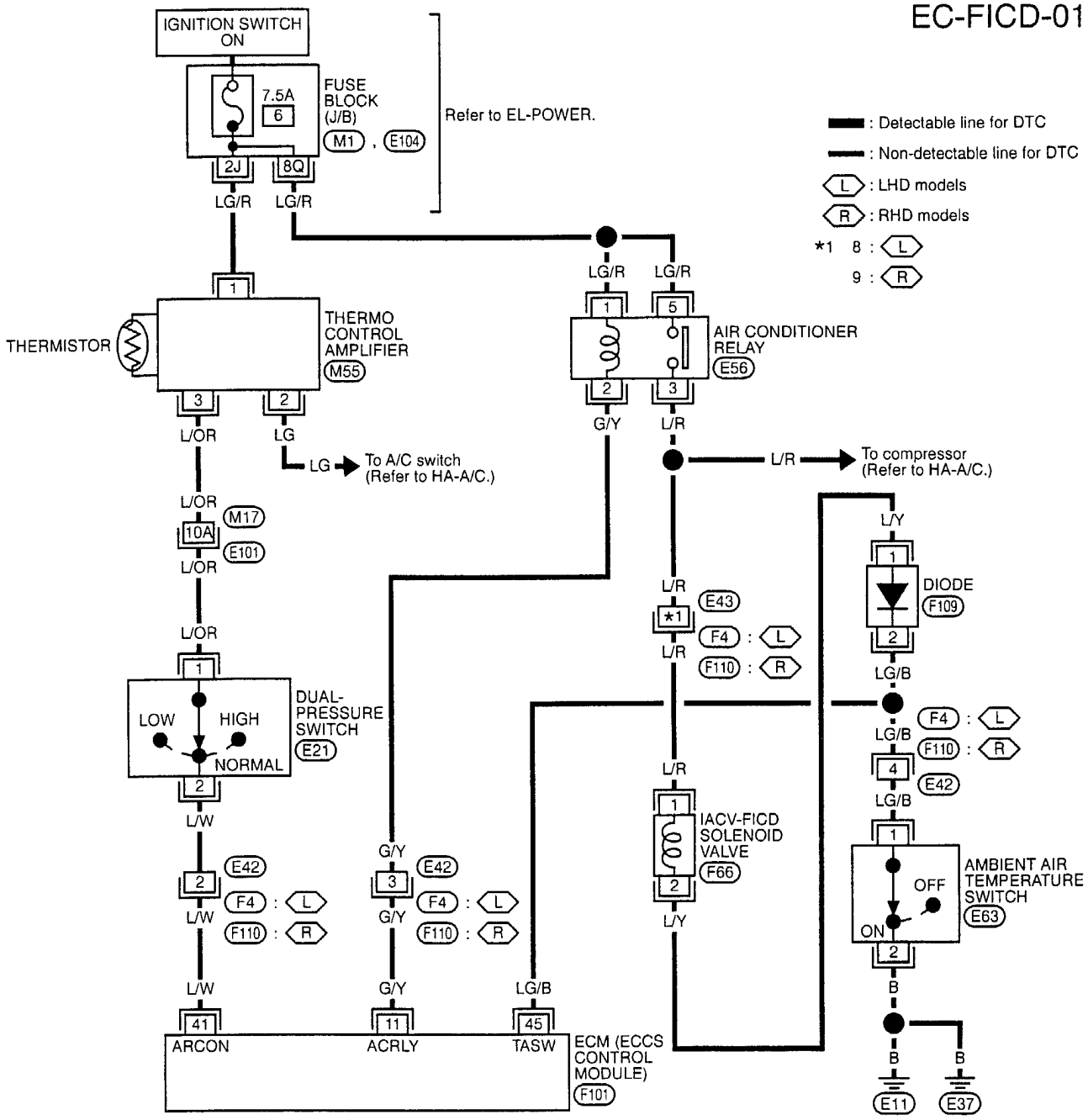
M1

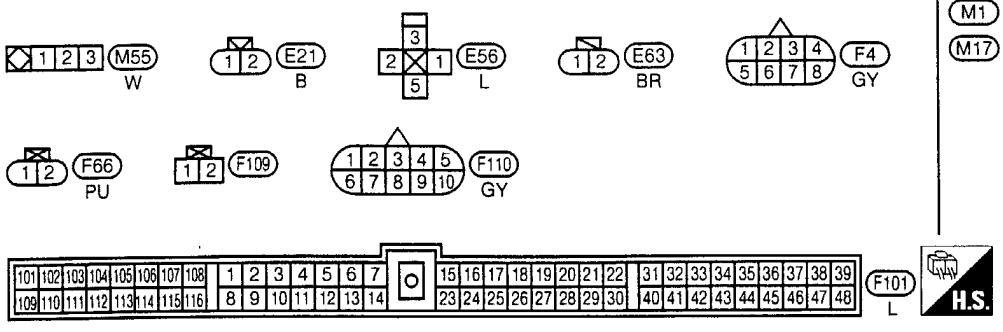


YEC073

Idle Air Control Valve (IACV)-FICD Solenoid Valve

EC-FICD-01



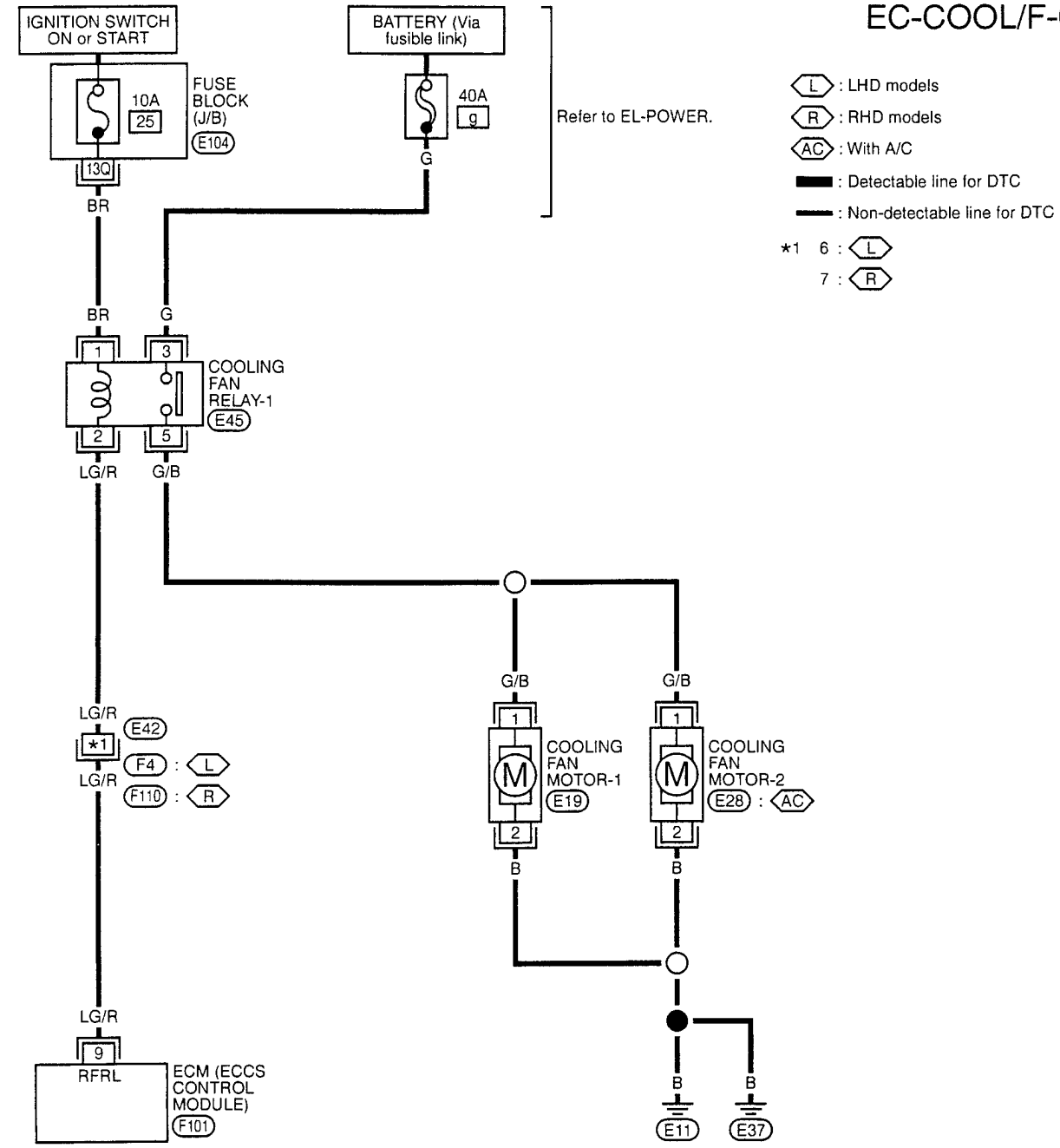


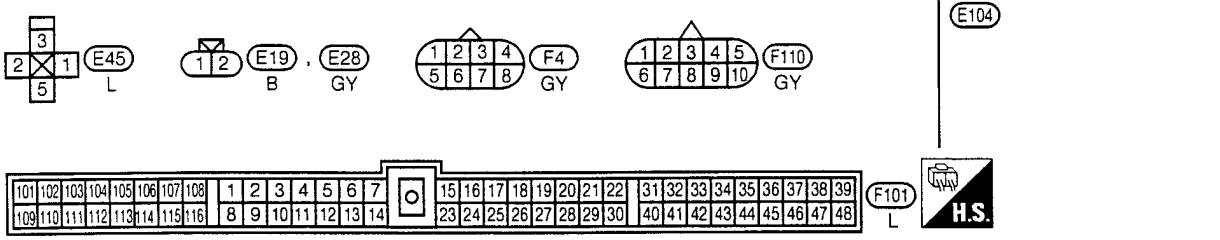
Refer to last page (Foldout page).
M1, E104
M17, E101

YEC074

Cooling Fan Control

EC-COOL/F-01

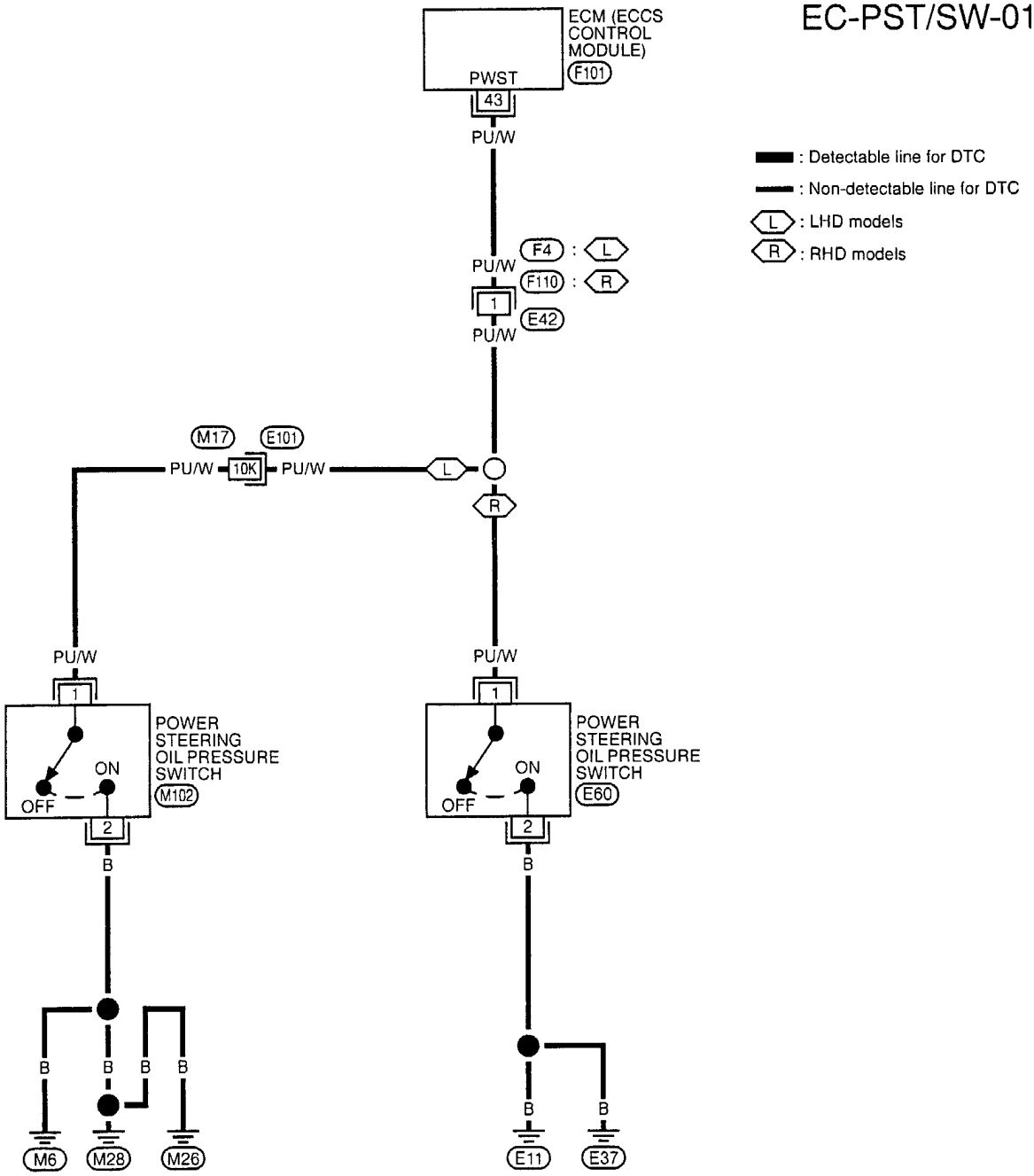




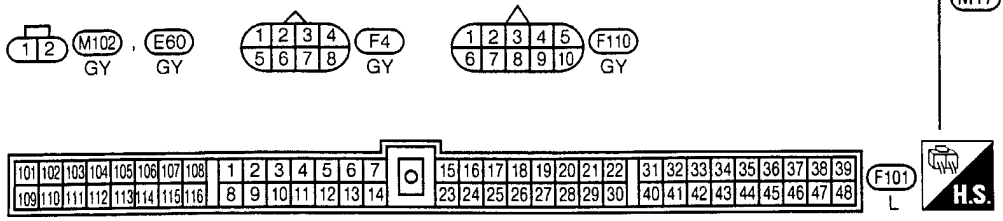
YEC075

Power Steering Oil Pressure Switch

EC-PST/SW-01



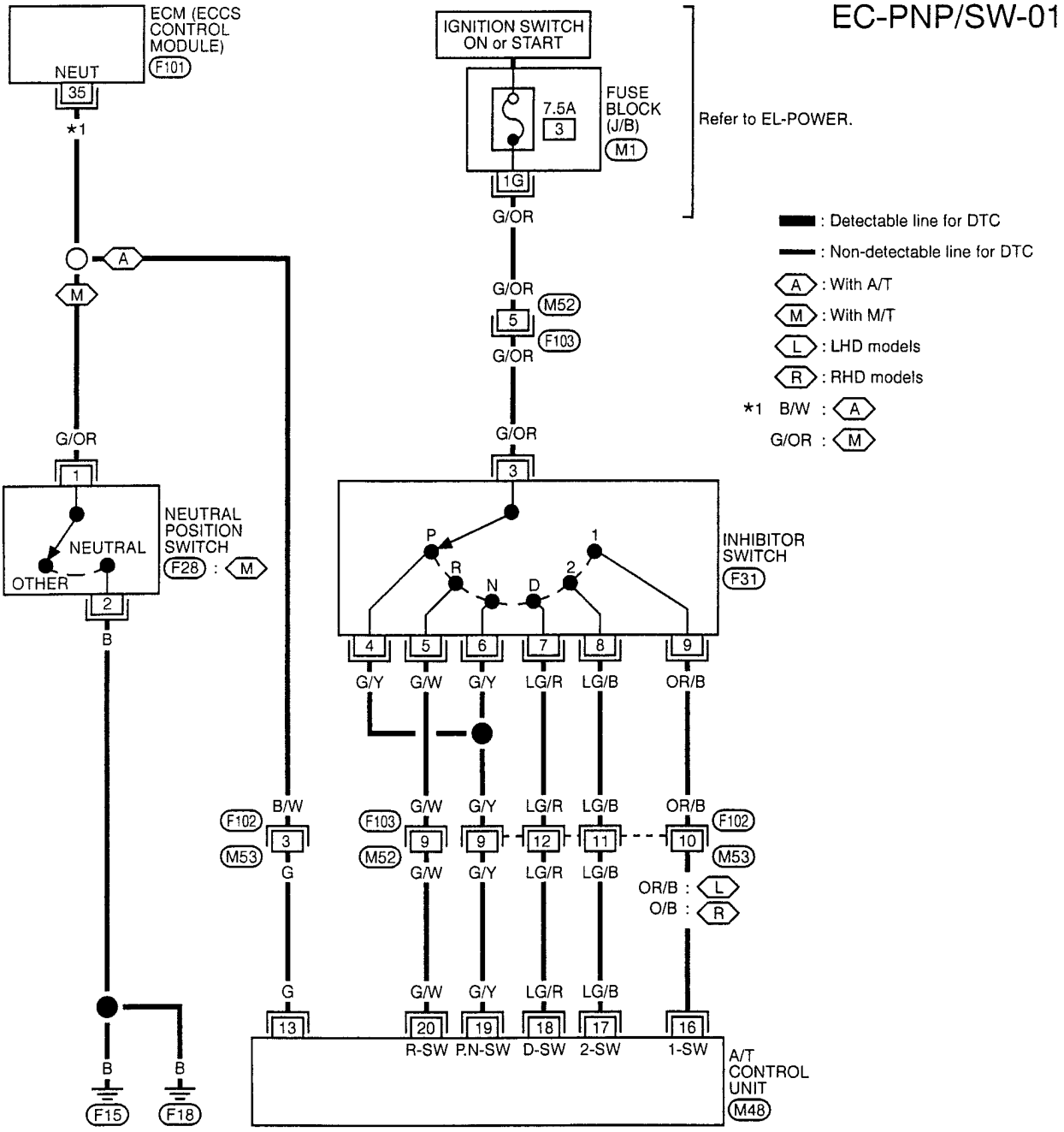
Refer to last page (Foldout page).
M17 , E101



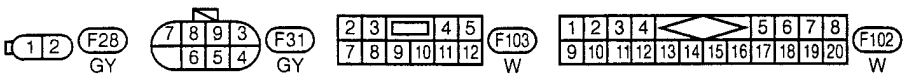
YEC076

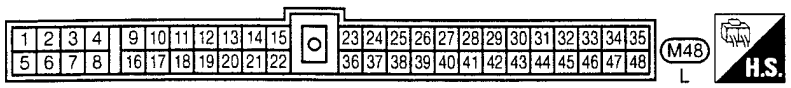
Park/Neutral Position Switch

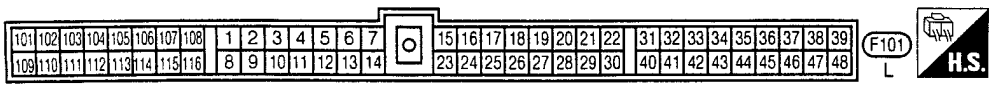
EC-PNP/SW-01



Refer to last page (Foldout page).
M1

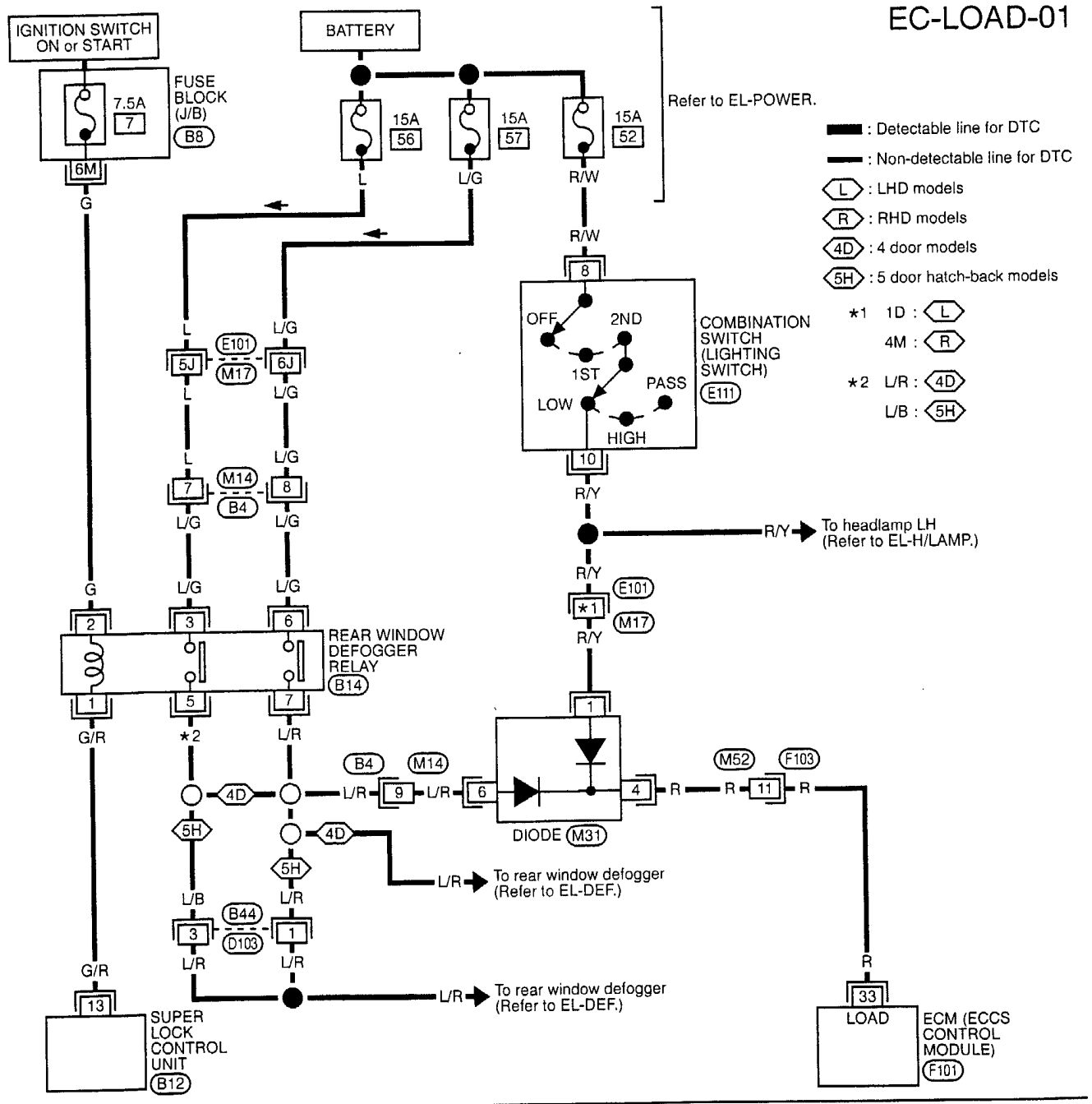




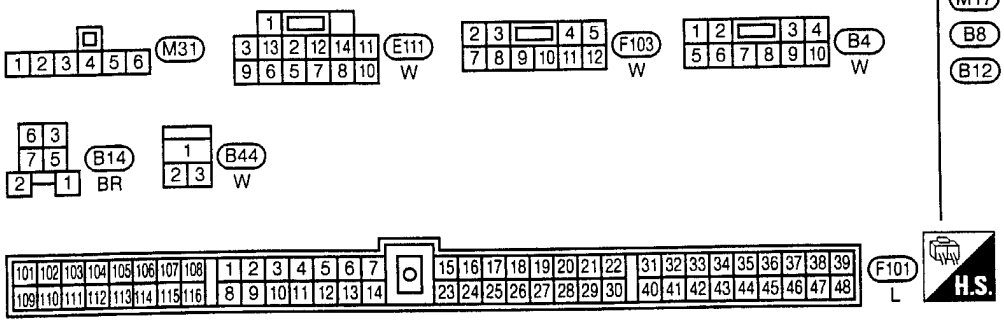


YEC077

Electrical Load Signal



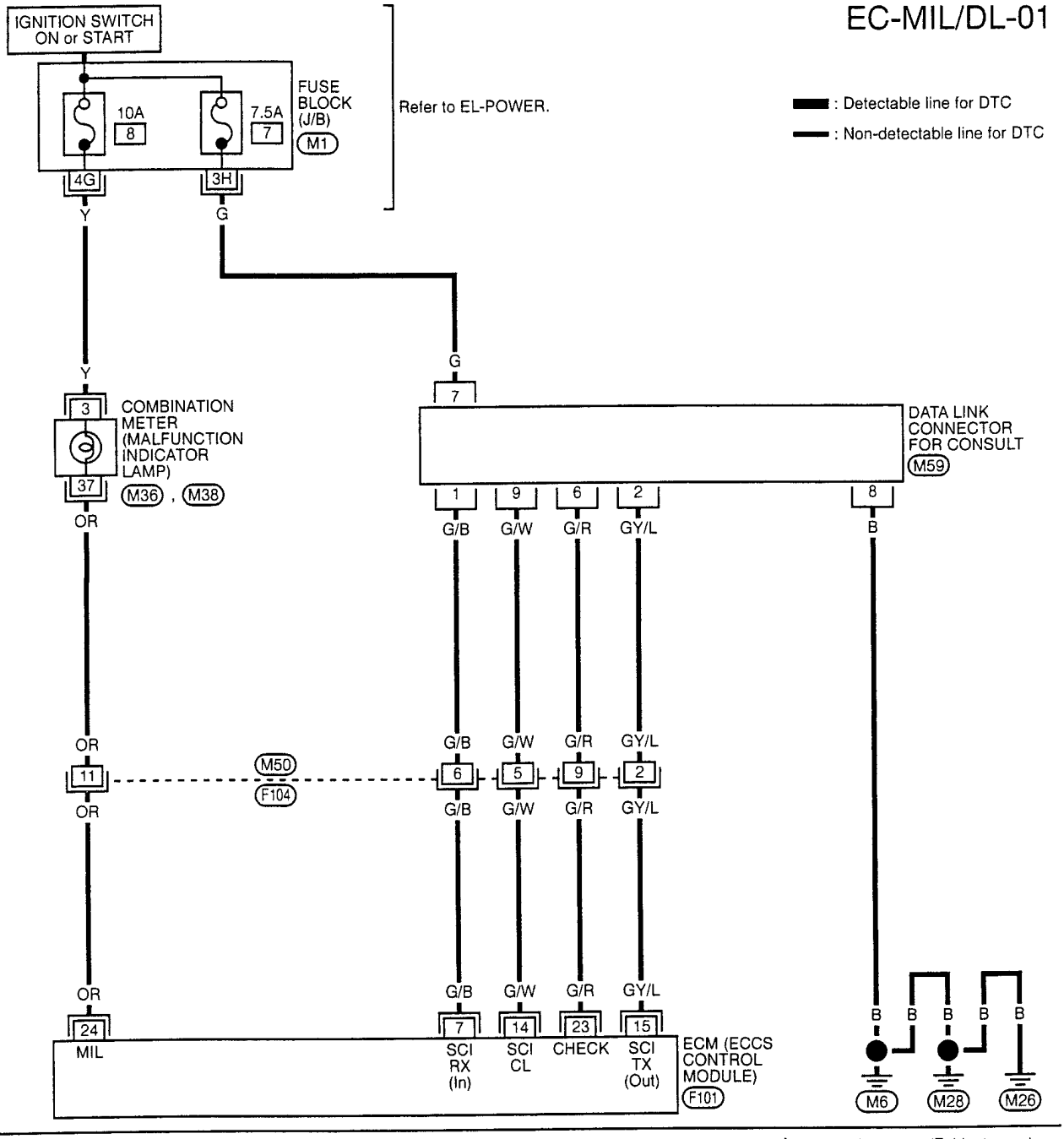
Refer to last page (Foldout page).
M17 , E101
B8
B12



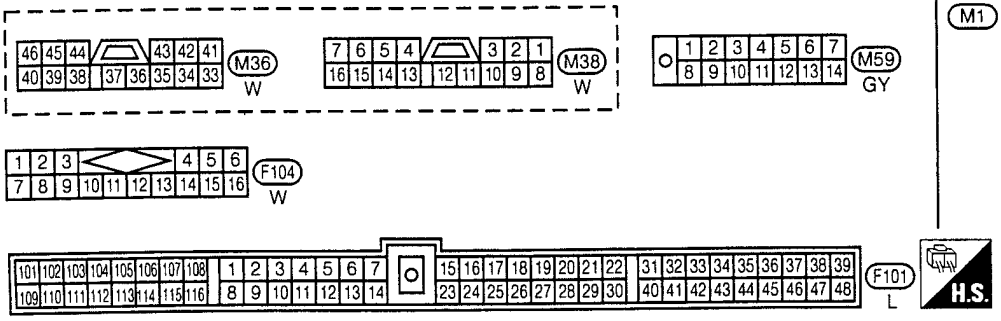
YEC078

Malfunction Indicator Lamp (MIL) & Data Link Connector (DLC) for CONSULT

EC-MIL/DL-01

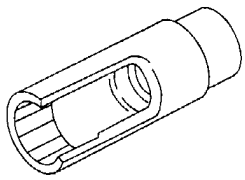


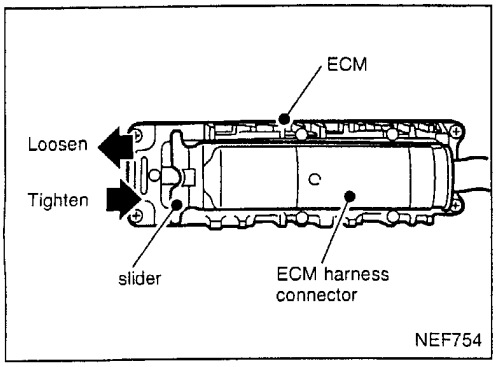
Refer to last page (Foldout page).
M1

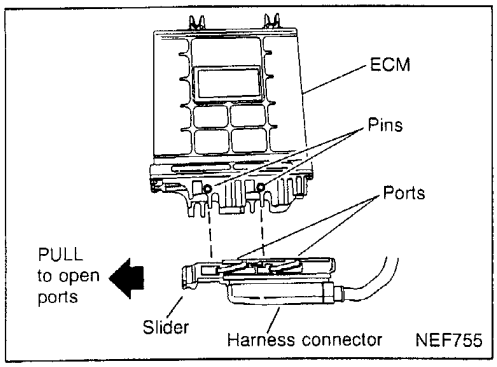


YEC079

Special Service Tools

Tool number Tool name	Description	Engine application		
		GA	SR	CD
KV119E0030 No. 1 injection nozzle holder socket	 NT648	—	—	X



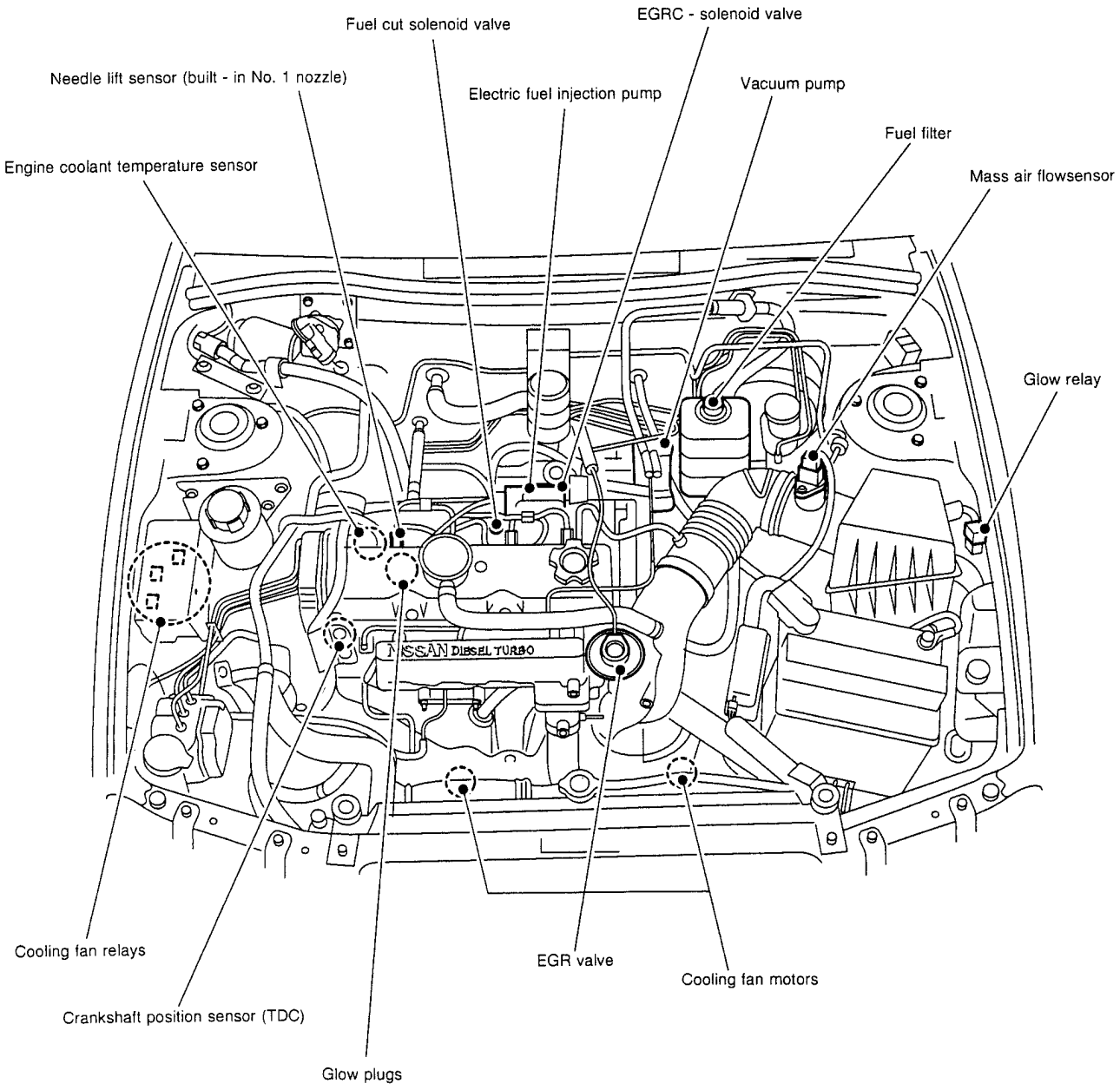


Precautions

- **When connecting ECM harness connector, open the ports on harness connector, then meet the ports with the pins on the ECM as shown. Push slider on harness until it stops.**

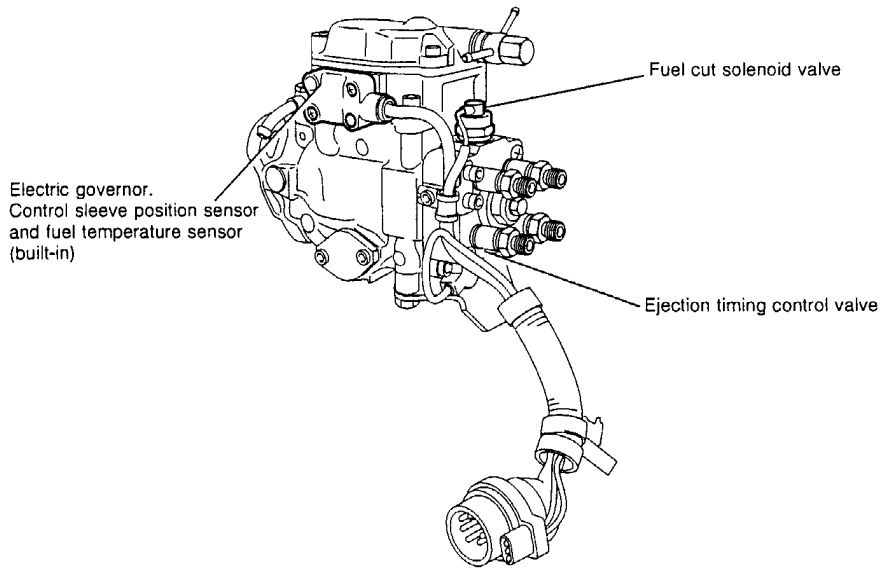
- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

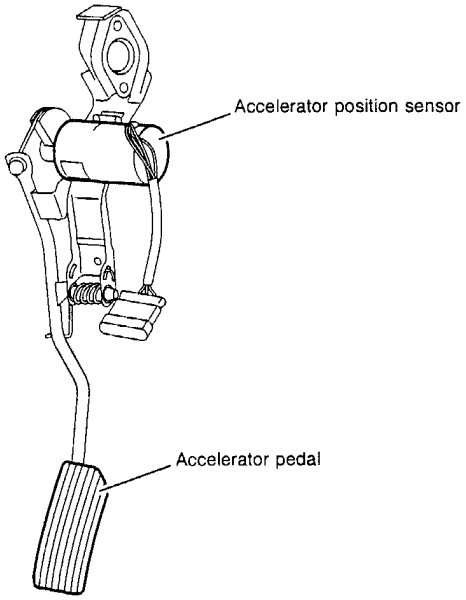
ECCS Component Parts Location

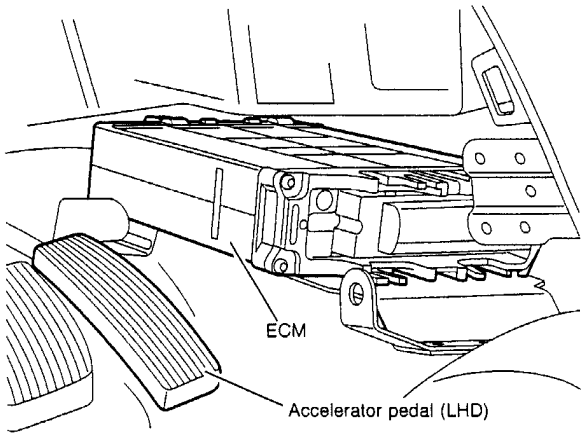


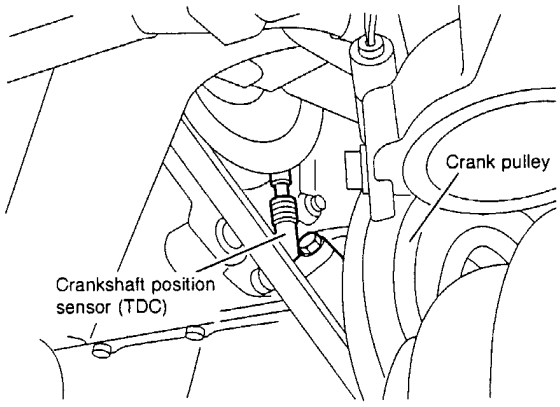
NEF767

ECCS Component Parts Location (Cont'd)



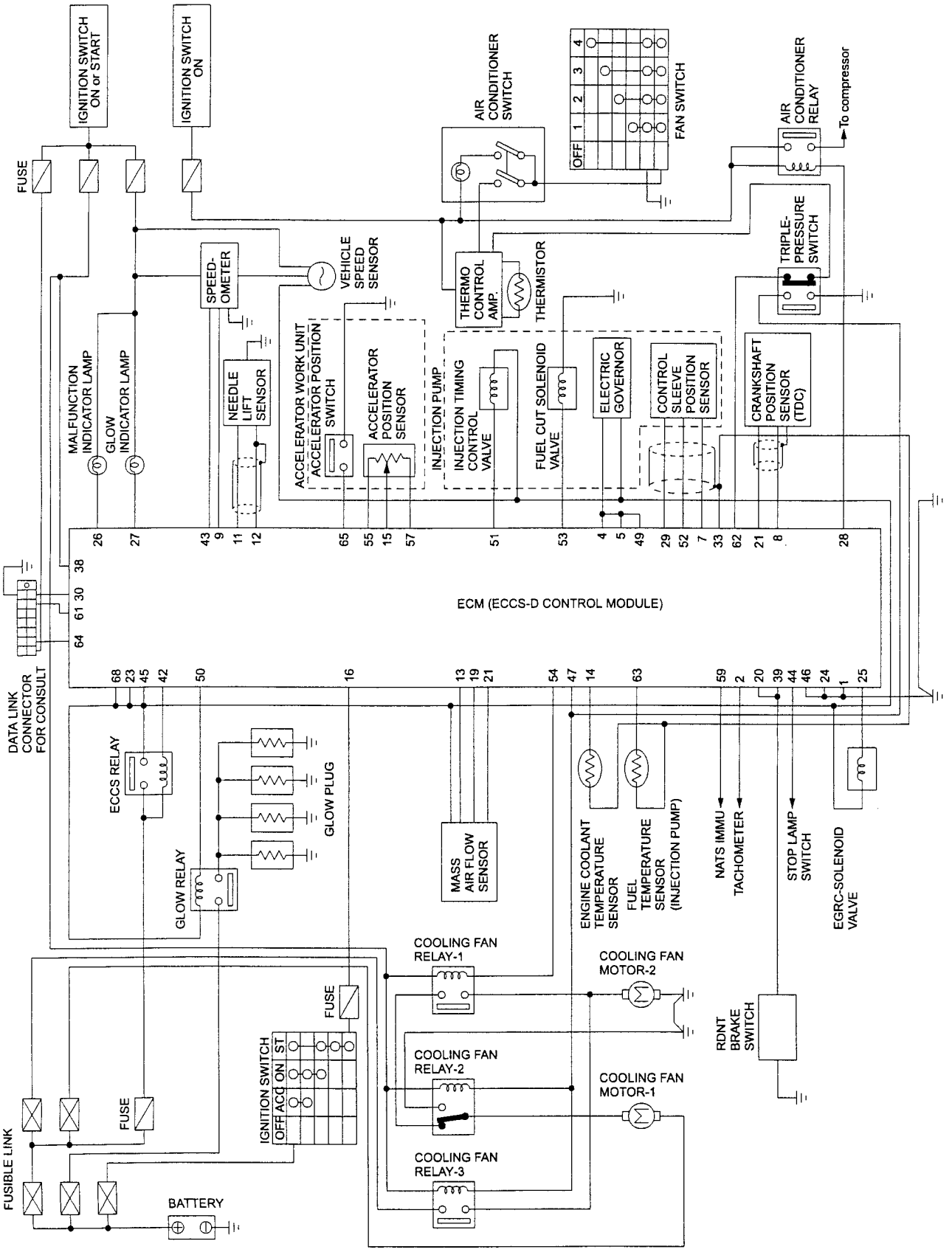






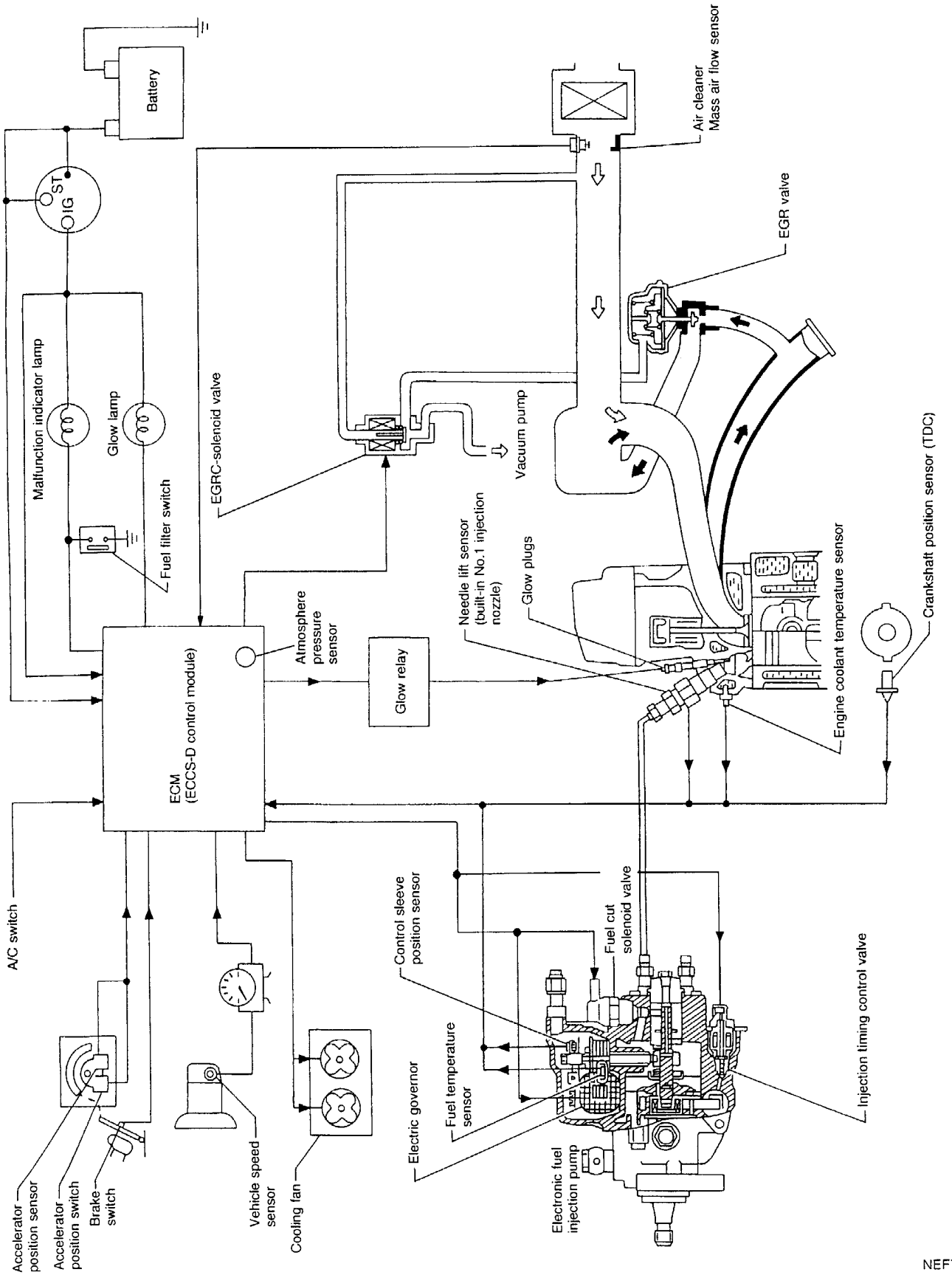
NEF768

Circuit Diagram



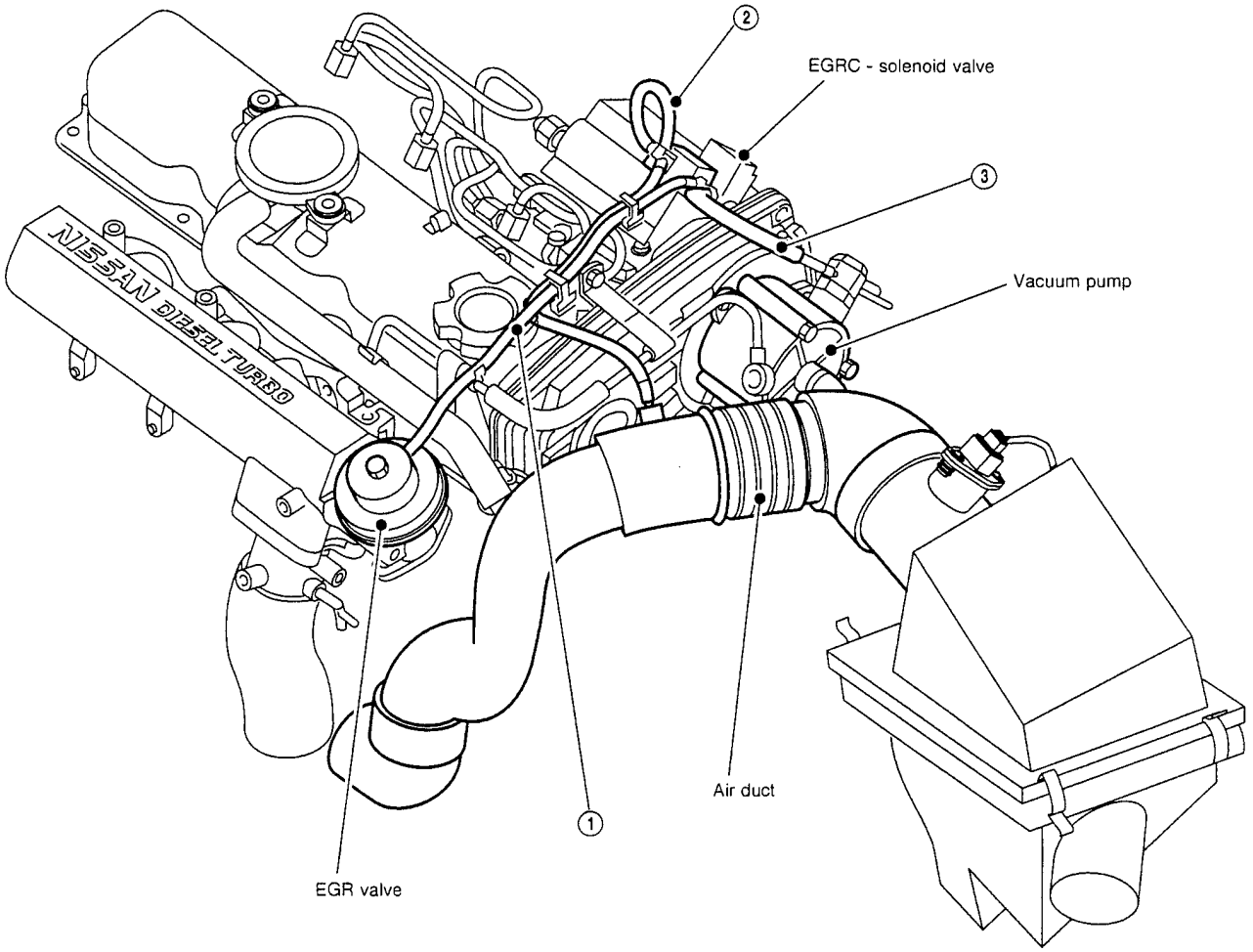
YEC080

System Diagram



NEF769

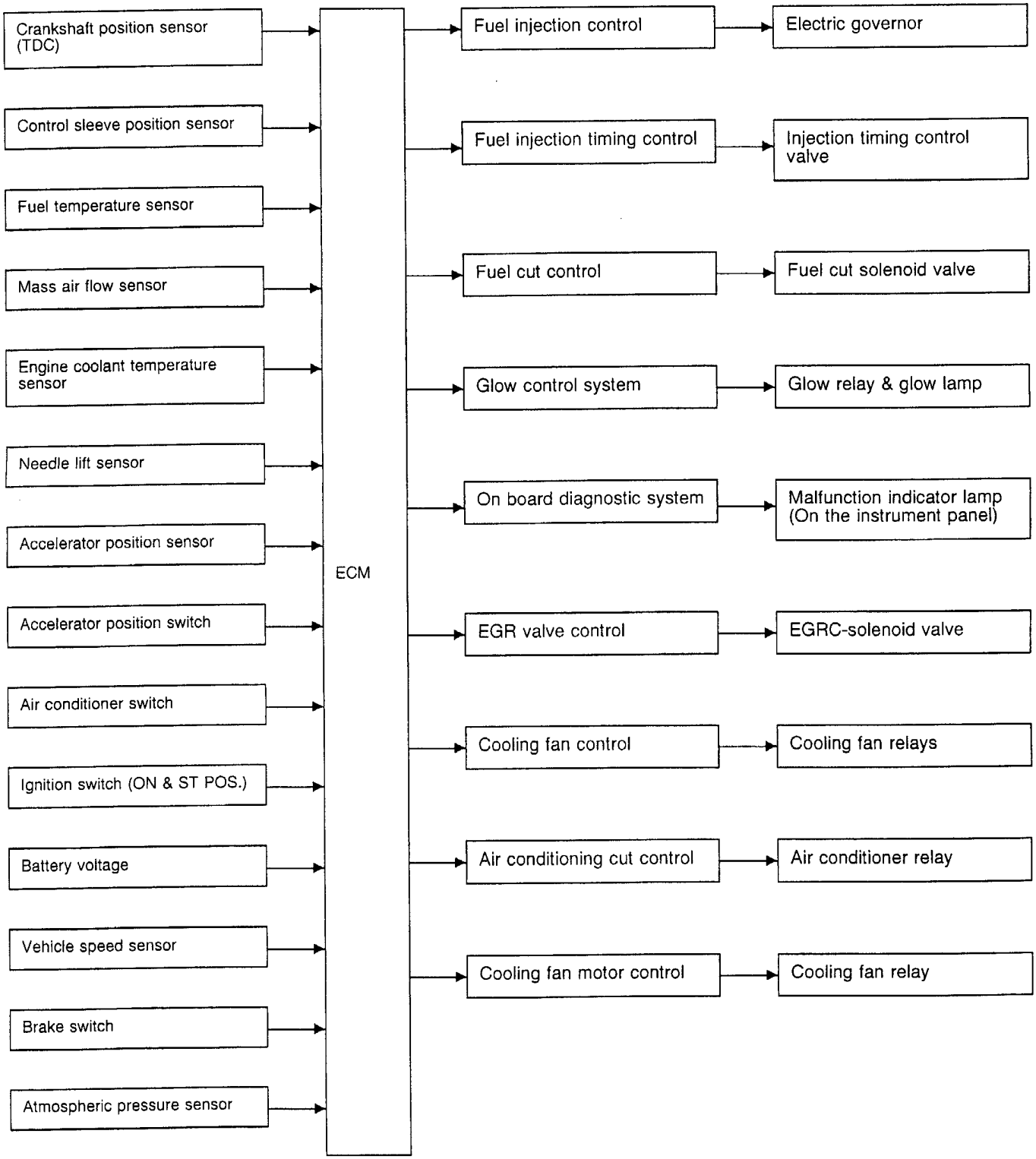
Vacuum Hose Drawing



① EGRC-solenoid valve to EGR valve
② EGRC-solenoid valve to air duct
③ EGRC-solenoid valve to vacuum pump

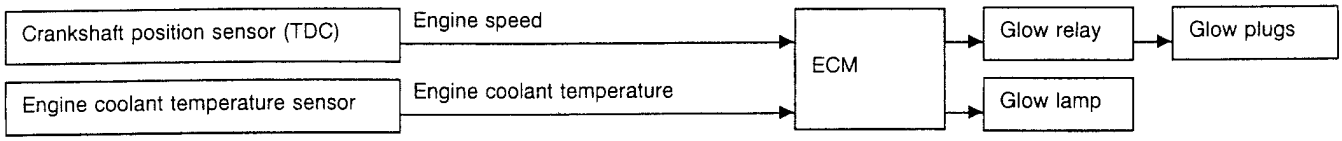
Refer to "System Diagram" on previous page for vacuum control system.

System Chart



Glow Control System

SYSTEM DESCRIPTION



When coolant temperature is lower than 75°C (167°F):

- Ignition switch ON
  After the ignition switch has been turned to ON, the glow relay turns ON for a period of time depending on the engine coolant temperature, allowing current to flow through the glow plugs.
- Starting
  After starting the engine, current will flow through the glow plugs for 300 seconds, or until the coolant temperature exceeds 50°C (122°F).

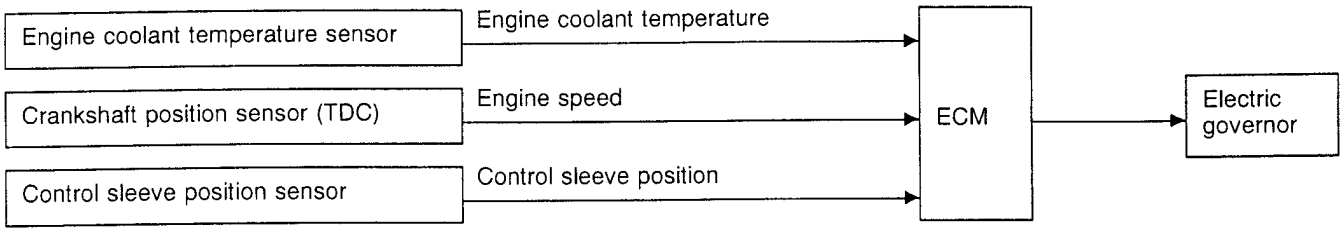
Fuel Injection System

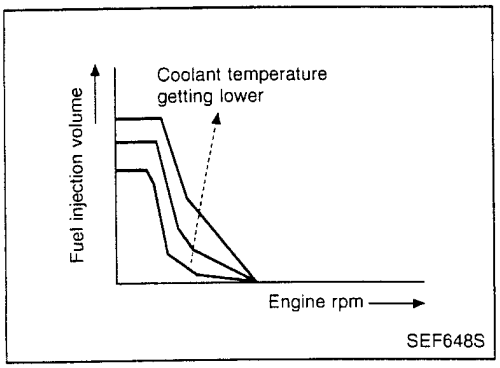
SYSTEM DESCRIPTION

Three types of fuel injection control are provided to accommodate the engine operating conditions; normal control, idle control and start control. The ECM determines the appropriate fuel injection control. Under each control, the amount of fuel injected is compensated to improve engine performance. The ECM performs duty cycle control on the electric governor (built into the fuel injection pump) according to sensor signals to compensate the amount of fuel injected to the preset value.

START CONTROL

Input/output signal line



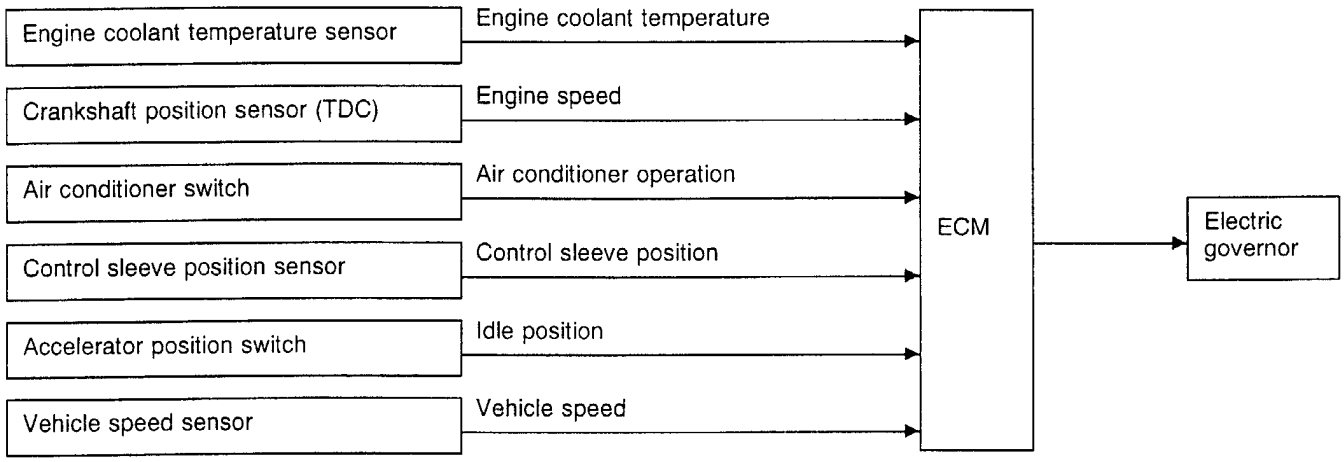


When starting, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed and engine coolant temperature.
For better startability under cool engine conditions, the lower the coolant temperature becomes, the greater the amount of fuel injected. The ECM ends the start control when the engine speed reaches a coolant temperature dependent value.

Fuel Injection System (Cont'd)

IDLE CONTROL

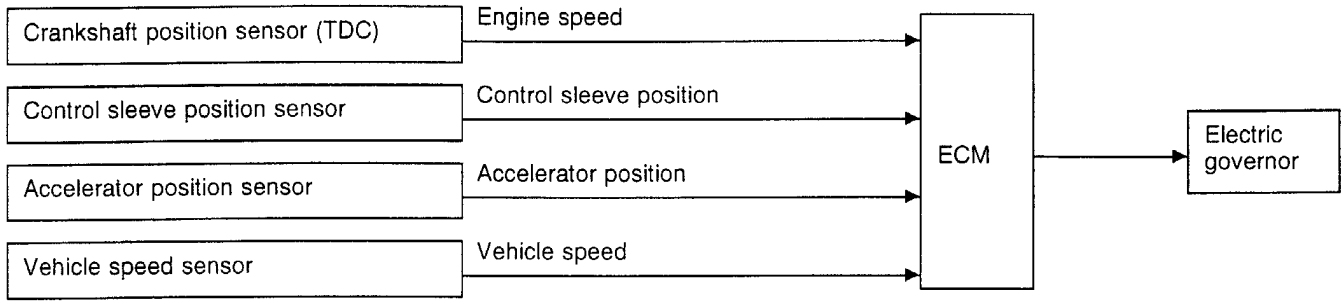
Input/output signal line

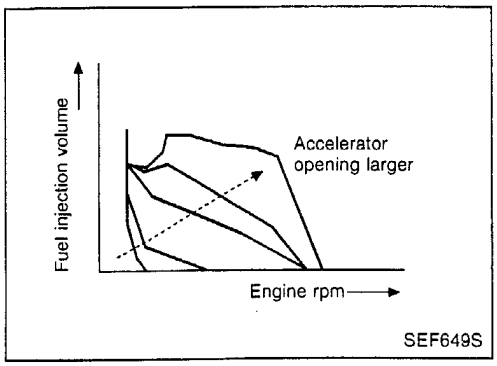


When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. During the first 270s after a cold start, the ECM also provides the system with a fast idle control in response to the engine coolant temperature.

NORMAL CONTROL

Input/output signal line





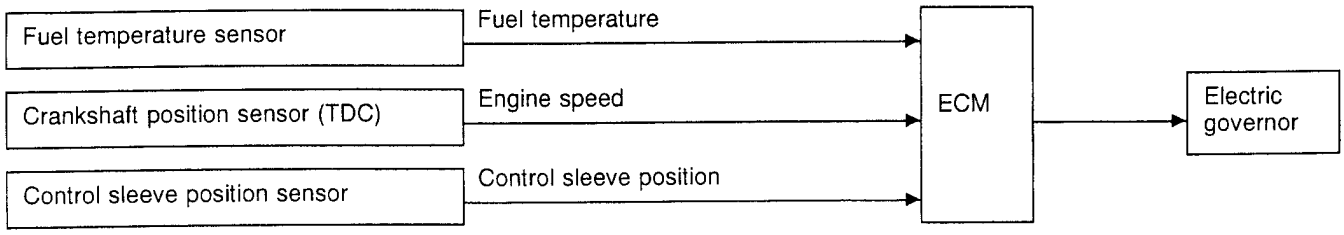
The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor (TDC) detects engine speed and the accelerator position sensor detects accelerator position. These sensors send signals to the ECM.

The fuel injection data, predetermined by correlation between various engine speeds and accelerator positions, are stored in the ECM memory, forming a map. The ECM determines the optimal amount of fuel to be injected using the sensor signals in comparison with the map.

Fuel Injection System (Cont'd)

FUEL TEMPERATURE COMPENSATION

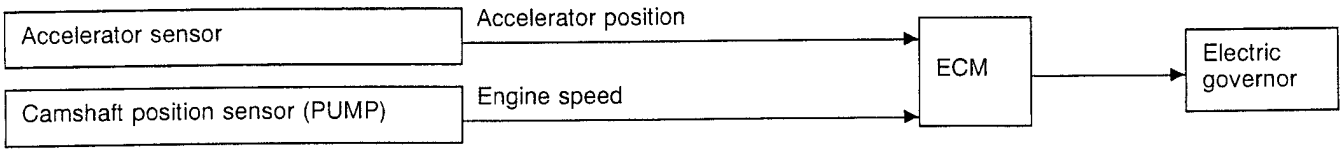
Input/output signal line



The amount of fuel leaking at or around high-pressure parts inside the fuel injection pump varies with fuel temperature and engine speed. This will result in a difference between the target amount of fuel injected and the actual amount. The ECM compensates for the actual amount depending on the signal from the fuel temperature sensor, the control sleeve position sensor and the crankshaft position sensor.

DECELERATION CONTROL

Input/output signal line



The ECM cuts power supply delivery to the electric governor during deceleration for better fuel efficiency. The ECM determines the time of deceleration according to signals from the accelerator sensor and camshaft position sensor (PUMP).

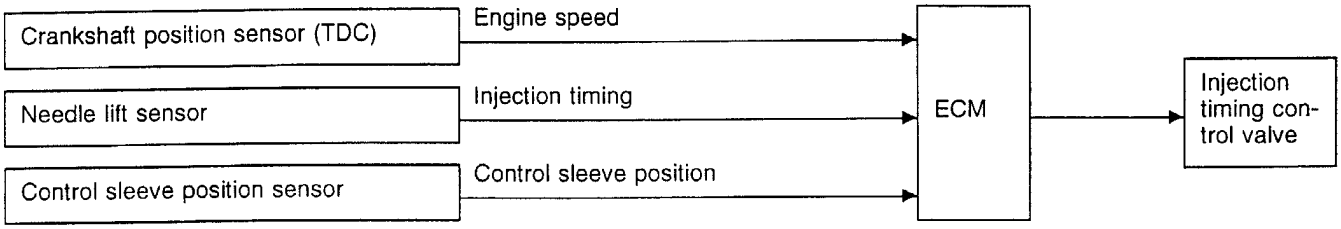
Fuel Injection Timing System

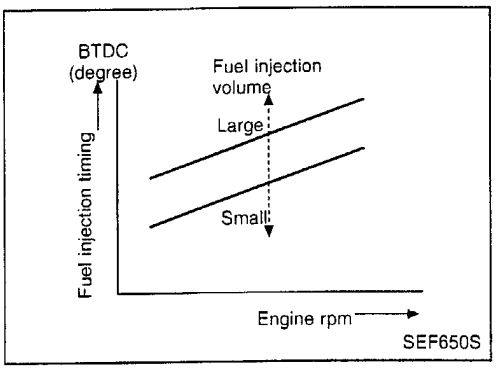
SYSTEM DESCRIPTION

The fuel injection timing system determines the optimal fuel injection timing, based on engine speed, injection quantity, engine coolant temperature and atmospheric pressure. The timing is formed by a basic value (Basic Control) and two correction values. By performing a duty cycle signal on the timing control valve, the ECM allows the valve to provide optimal injection timing. The ECM also performs feedback control on the timing control valve using the signal from the needle lift sensor which detects the actual fuel injection timing.

BASIC CONTROL

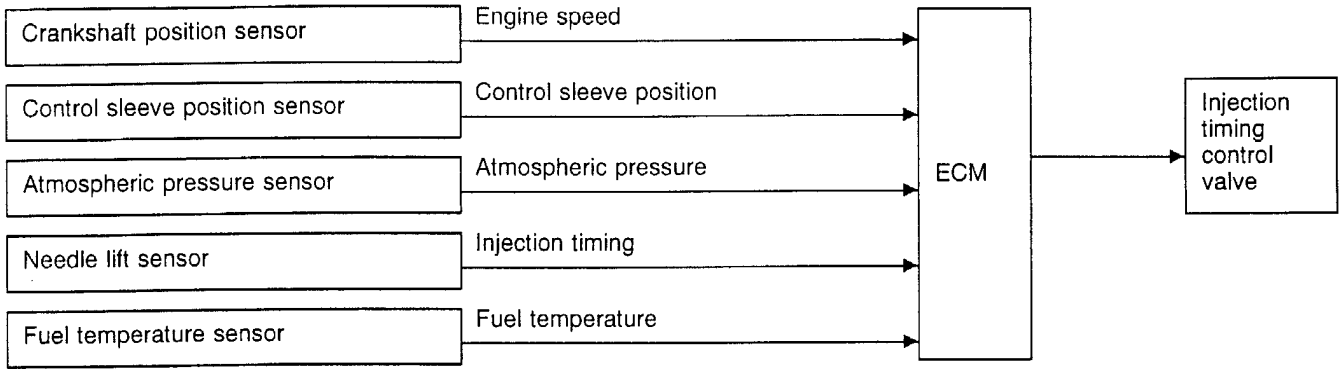
Input/output signal line

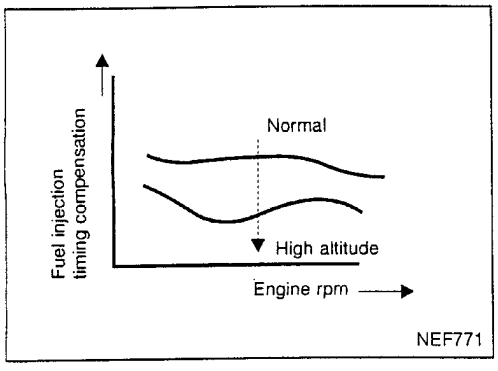




The optimal fuel injection timing data, predetermined in proportion to engine speeds and amount of fuel injected, are stored in the ECM memory. The ECM uses the data to control the fuel injection timing.

HIGH ALTITUDE COMPENSATION



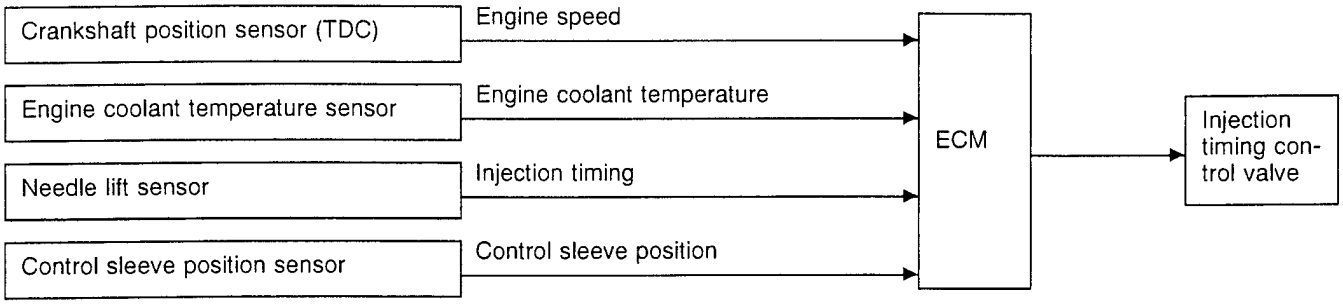


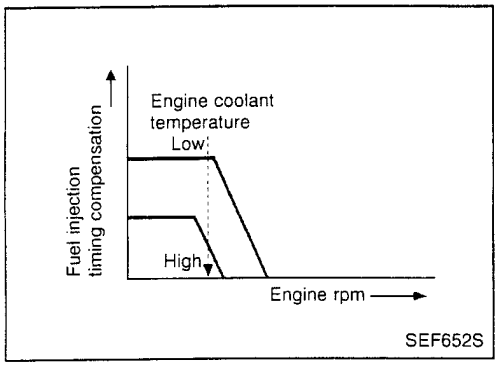
For better drivability in high altitude areas, the fuel injection timing is advanced and the fuel quantity is reduced according to the atmospheric pressure.

Fuel Injection Timing System (Cont'd)

ENGINE COOLANT TEMPERATURE COMPENSATION (During driving)

Input/output signal line

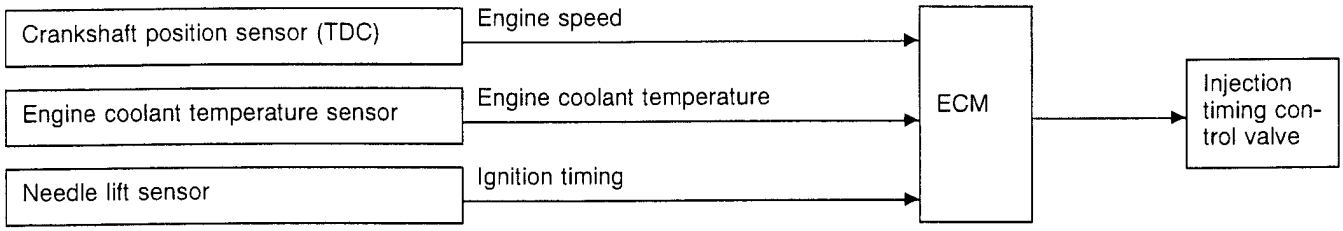


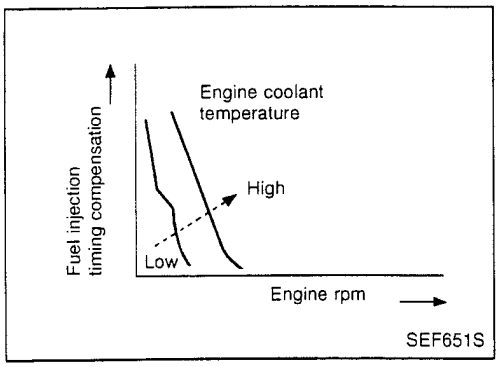


For better exhaust efficiency under cool engine conditions, the fuel injection timing is controlled within a compensation range depending on the engine speed, engine coolant temperature and amount of fuel injected.

ENGINE COOLANT TEMPERATURE COMPENSATION (When starting)

Input/output signal line

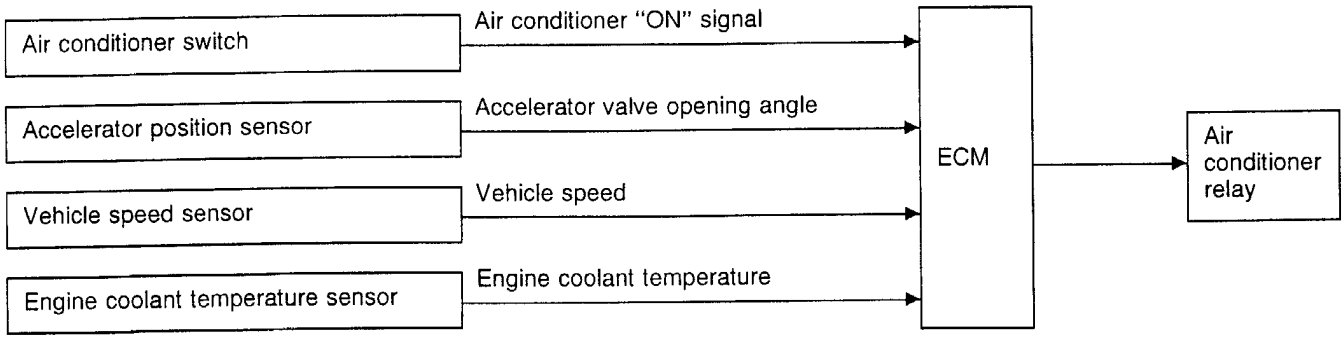




For better startability under cool engine conditions, the fuel injection timing is compensated according to the engine coolant temperature.

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE

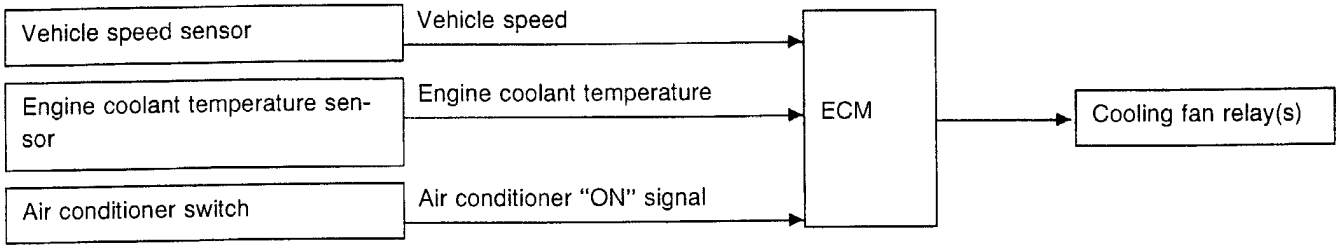


SYSTEM DESCRIPTION

This system improves acceleration when the air conditioner is used.
When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.
When engine coolant temperature becomes excessively high, the air conditioner is turned off. This continues until the coolant temperature returns to normal.

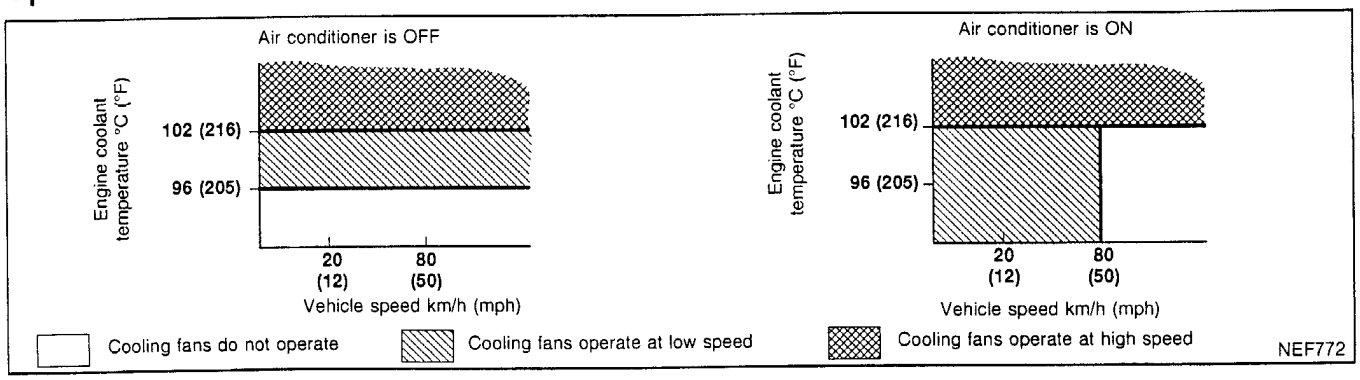
Cooling Fan Control

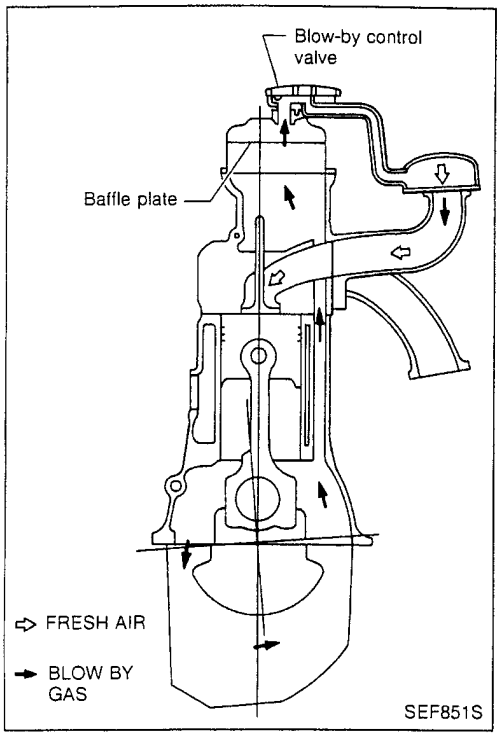
INPUT/OUTPUT SIGNAL LINE



The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal. The control system has 3-step control [OFF/LOW/HIGH].

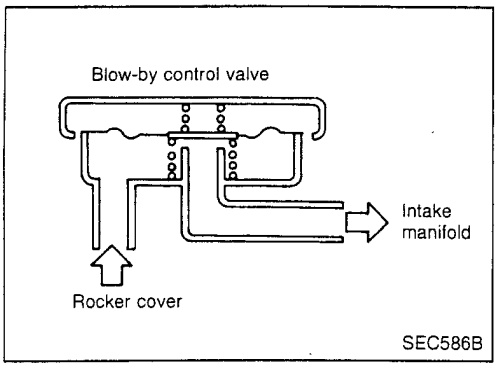
Operation





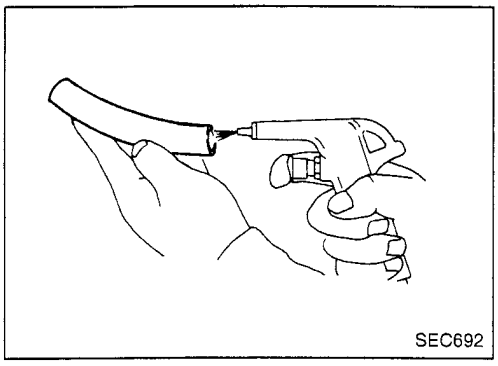
Description

- In this system blow-by gas is sucked into the air inlet pipe through the control valve after oil separation by the oil separator in the rocker cover.



Blow-by Control Valve

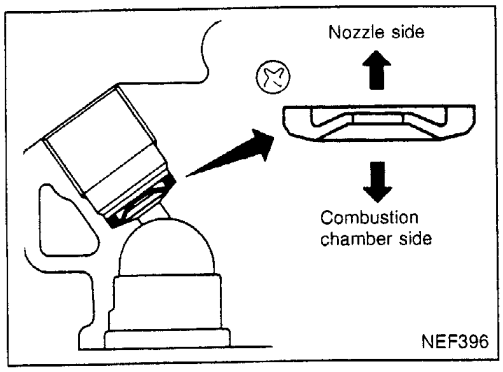
- Check control valve for clogging and abnormalities.

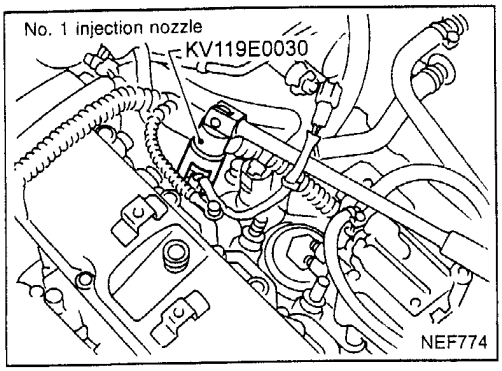


Ventilation Hose

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

CAUTION:
- Do not disassemble injection nozzle assembly. Entrust disassembly or adjustment to BOSCH service shop.
- Plug flare nut with a cap or rag so that no dust enters the nozzle.





Removal and Installation

1. Remove fuel injection tube and spill tube.
2. Remove injection nozzle assembly.

Also remove gasket from nozzle end.

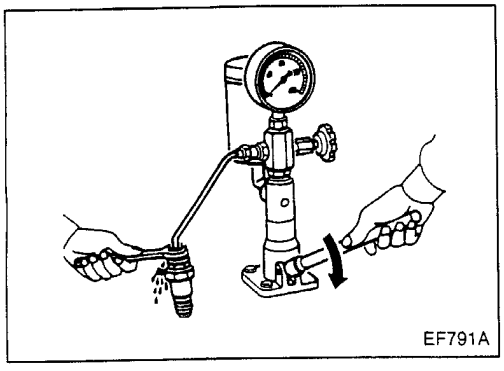
3. Install injection nozzle in the reverse order of removal.

Injection nozzle to engine:
: 59 - 69 N·m (6.0 - 7.0 kg-m, 43 - 51 ft-lb)
Injection nozzle to tube:
: 22 - 25 N·m (2.2 - 2.5 kg-m, 16 - 18 ft-lb)
Spill tube:
: 39 - 49 N·m (4.0 - 5.0 kg-m, 29 - 36 ft-lb)

a. **Always clean the nozzle holes.**
b. **Always use new injection nozzle gasket.**
c. **Note that small washer should be installed in specified direction.**
d. **Bleed air from fuel system.**

Test and Adjustment

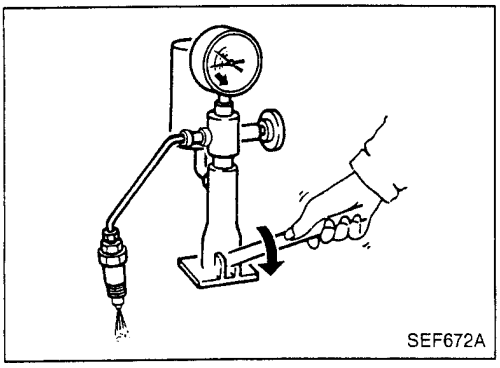
WARNING:
When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to contact your hands or body, and make sure your eyes are properly protected with goggles.



INJECTION PRESSURE TEST

1. Install nozzle to injection nozzle tester and bleed air from flare nut.

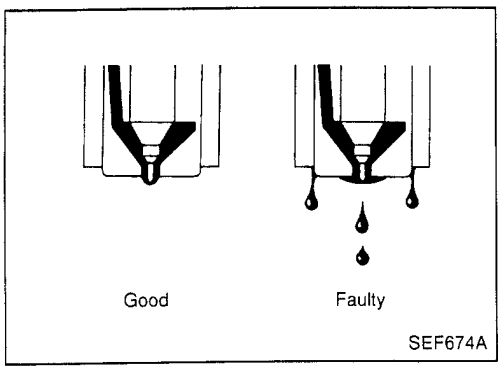
Test and Adjustment (Cont'd)


SEF672A

2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:
Used
14,423 - 15,651 kPa
(144.2 - 156.5 bar,
148 - 159 kg/cm^2, 2,091 - 2,269 psi)
New
15,000 - 16,000 kPa
(150.0 - 160.0 bar,
153 - 163 kg/cm^2, 2,175 - 2,320 psi)

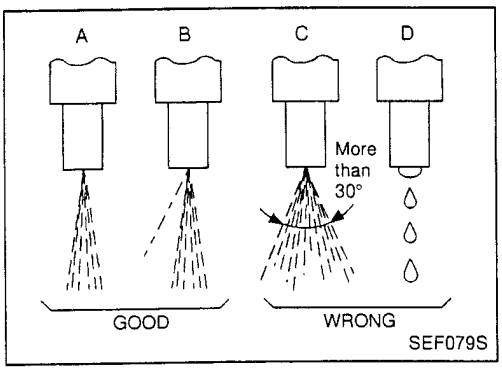
Always check initial injection pressure using a new nozzle. If the pressure is not correct, replace nozzle assembly.



SEF674A

LEAKAGE TEST

1. Maintain the pressure at about 981 to 1,961 kPa (9.8 to 19.6 bar, 10 to 20 kg/cm^2, 142 to 284 psi) below initial injection pressure.
2. Check that there is no dripping from the nozzle tip or around the body.
3. If there is leakage, replace nozzle.



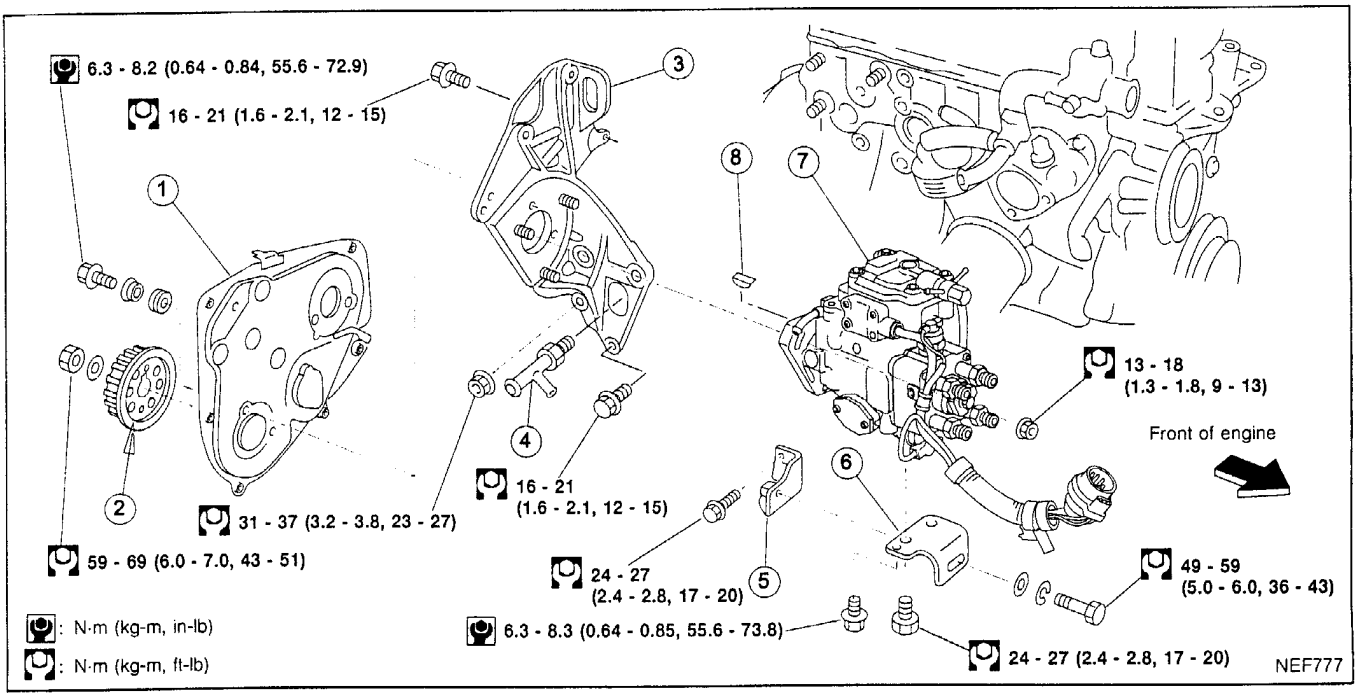
SEF079S

SPRAY PATTERN TEST

1. Check spray pattern by pumping tester handle one full stroke per second.

a. If main spray angle is within 30 degrees as shown, injection nozzle is good.
b. It is still normal even if a thin stream of spray deviates from the main spray (pattern B).

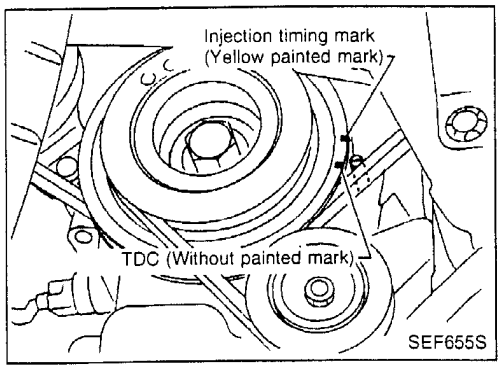
2. Test again and if spray pattern is not corrected, replace nozzle.



① Rear back cover
② Injection pump sprocket
③ Injection pump bracket
④ Water connector
⑤ Bracket
⑥ Bracket
⑦ Electronic fuel injection pump
⑧ Key

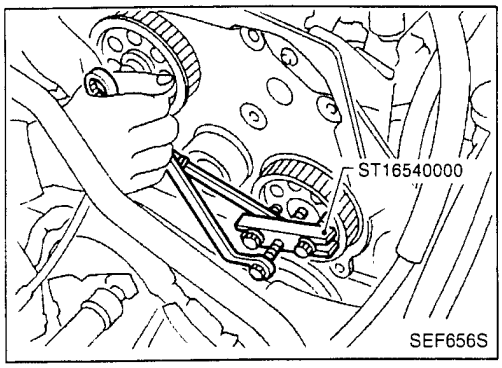
Removal

1. Remove battery.
   Disconnect electronic injection pump harness connectors.

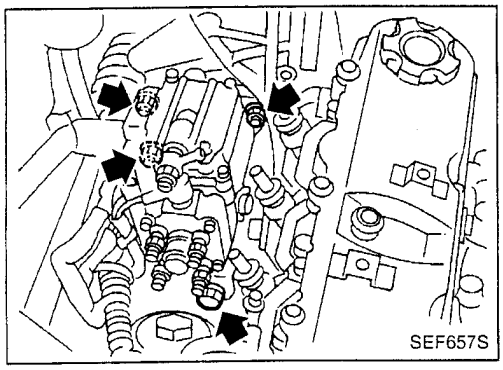


2. Set No. 1 piston at TDC on its compression stroke.
   TDC: Crankshaft pulley notch without painted mark
3. Remove fuel hoses (supply, return and spill) and injection tubes.
4. Remove air duct and injection pump timing belt cover.
5. Remove injection pump timing belt.
   Refer to EM section ("Injection Pump Timing Belt").

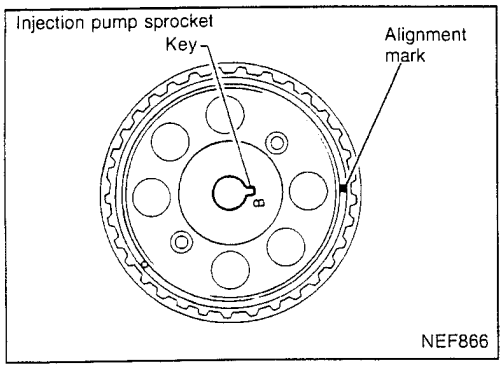
Removal (Cont'd)



6. Remove injection pump sprocket with Tool.
- **Remove key from injection pump shaft and store safely.**

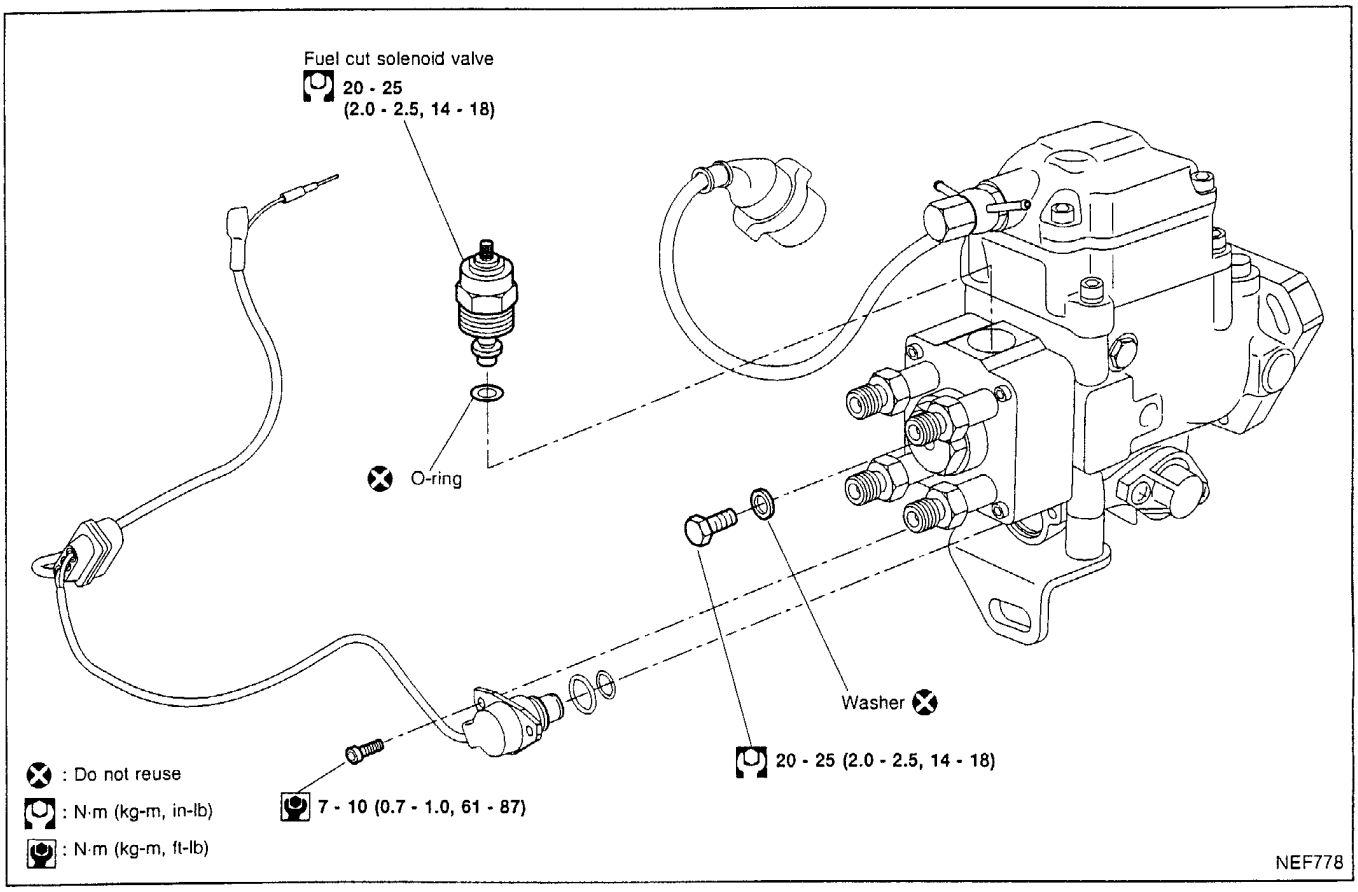


7. Remove injection pump assembly.



Installation

1. Install key on injection pump shaft, then install injection pump sprocket.
2. Install injection pump timing belt.
   Refer to EM section ("Injection Pump Timing Belt").
3. Adjust injection timing.
   Refer to "Basic Inspection", EC-2074.
4. Install all parts removed.



Disassembly and Assembly

CAUTION:

- Do not disassemble the parts not shown in the illustration above.
- Before installing injection timing control valve, apply a coat of diesel fuel to O-ring and its mating area. Insert injection timing control valve straight into bore in fuel pump body. After properly positioning injection timing control valve, visually check for fuel leaks.
- After assembling the parts, erase Diagnostic Trouble Code (DTC), and perform DTC CONFIRMATION PROCEDURE (or OVERALL FUNCTION CHECK).

DTC and MIL Detection Logic

When a malfunction is detected for the first time, the malfunction (DTC) is stored in the ECM memory. The MIL will light up each time the ECM detects a malfunction. However, if the same malfunction is experienced in two consecutive driving patterns and the engine is still running, the MIL will stay lit up. For diagnostic items causing the MIL to light up, refer to "Diagnostic Trouble Code (DTC) Chart", EC-2076.

Diagnostic Trouble Code (DTC)

HOW TO READ DTC

The diagnostic trouble code can be read by the following methods.

1. The number of flashes of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 11, 13, 14, etc.
   These DTCs are controlled by NISSAN.
2. CONSULT Examples: "CRANK POS SEN (TDC)", etc.

- **Output of the trouble code warns that the indicated circuit has a malfunction. However, when using MIL in Mode II there is no indication to determine whether the malfunction is still occurring or has occurred in the past and row returned to normal.**
  CONSULT can identify the timing of a malfunctions and so use of CONSULT (if available) is recommended.
- **DTCs are stored up to a maximum of 7 items that have highest priority in each grouped DTC occured at that time. A new entry of DTC can overwrite an existing entry with a lower priority if the DTC memory is full. If 7 DTCs are read, other remained DTCs can be read after the existing DTC item has been corrected and the DTC is erased.**

HOW TO ERASE DTC

The diagnostic trouble code can be erased by the following methods.

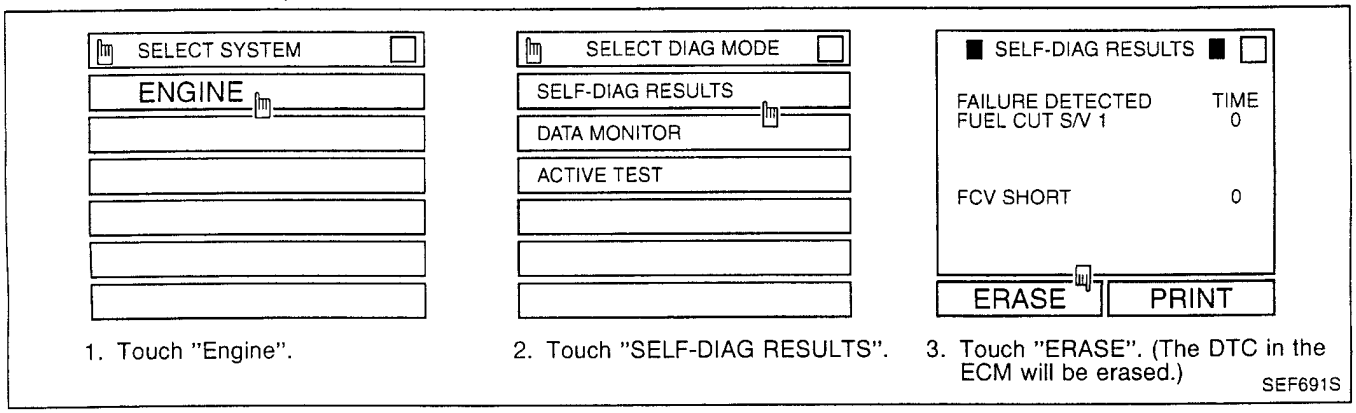
Selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT.

Changing the diagnostic test mode from Diagnostic Test Mode II to Mode I twice. (Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES".)

- **If the battery terminal is disconnected, the diagnostic trouble code will be lost within 24 hours.**
- **When you erase the DTC, using CONSULT is easier and quicker than switching the diagnostic test modes.**
- **Erasing DTC is possible only when the ECM has recognised the DTC item is corrected.**
  If erasing is not possible, turn the ignition switch to the "LOCK" position once. Wait for at least 5 seconds and then turn it "ON" (engine stopped) again.

HOW TO ERASE DTC (With CONSULT)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch to the "LOCK" position once. Wait for at least 5 seconds and then turn it "ON" (Engine stopped) again.
2. Turn CONSULT "ON" and touch "ENGINE".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the ECM will be erased.)



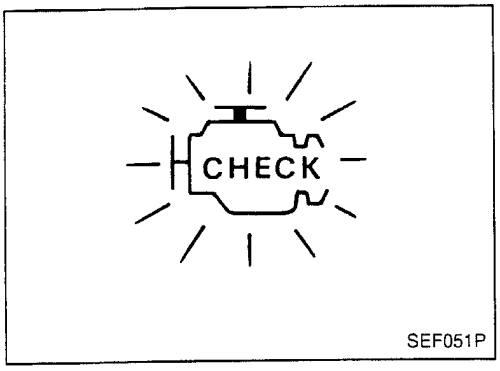
1. Touch "Engine".
2. Touch "SELF-DIAG RESULTS".
3. Touch "ERASE". (The DTC in the ECM will be erased.)

SEF691S

Diagnostic Trouble Code (DTC) (Cont'd)

HOW TO ERASE DTC (No Tools)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch to "LOCK" position once. Wait at least 5 seconds and then turn it "ON" again.
2. Change the diagnostic test mode from Mode II to Mode I twice. When changing modes, wait at least 2 seconds. (Refer to EC-2067.)



Malfunction Indicator Lamp (MIL)

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator lamp does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-2067.

2. When the engine is started, the malfunction indicator lamp should go off.
   If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

If MIL illuminates or flashes irregularly after starting engine, water may have accumulated in fuel filter. Drain water from fuel filter.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The ON BOARD DIAGNOSTIC SYSTEM FUNCTION
The on board diagnostic system has the following three functions:

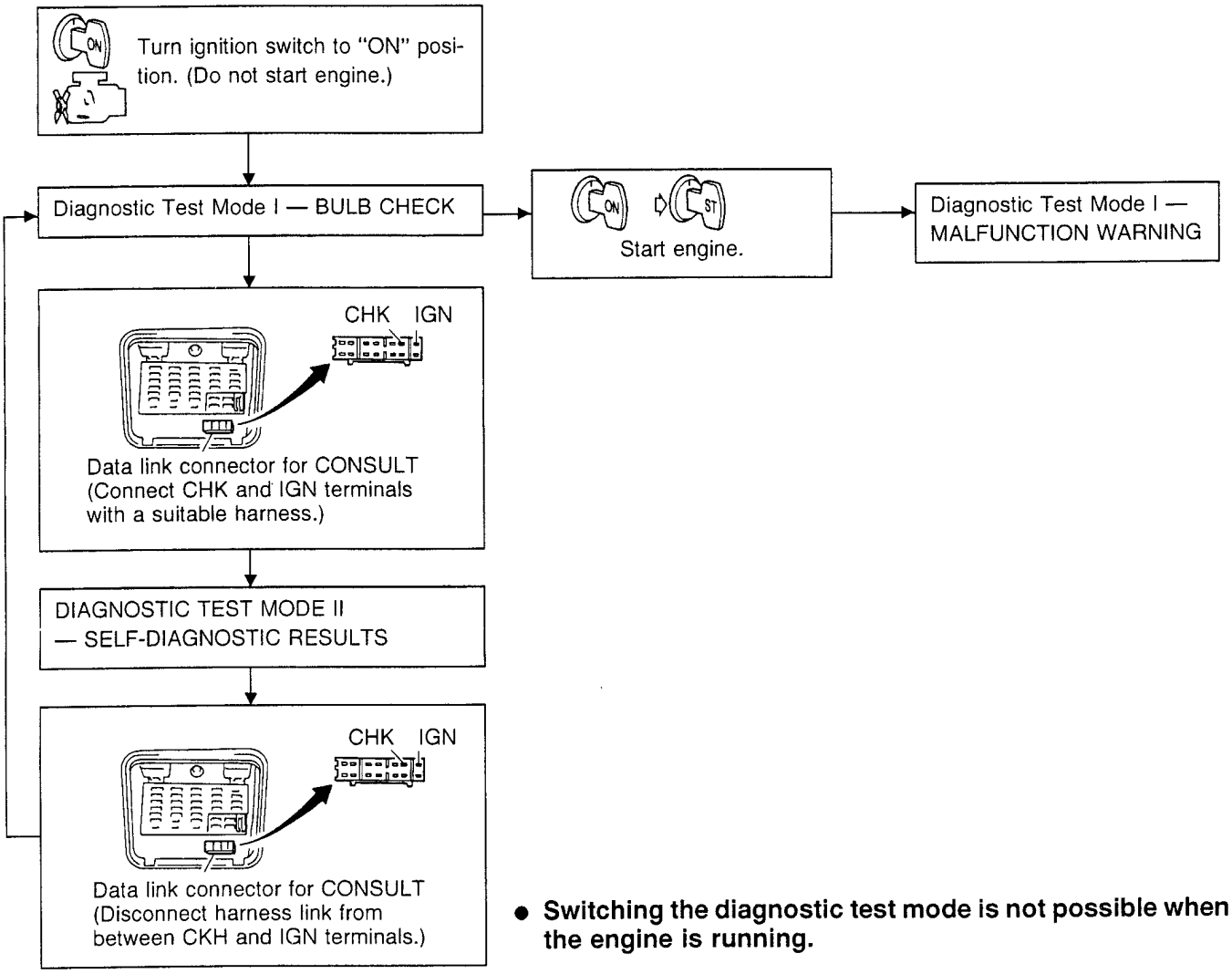
1. BULB CHECK : This function checks the MIL bulb for damage (blown, open circuit, etc.).
2. MALFUNCTION WARNING : This is a usual driving condition. When a malfunction is detected, the MIL will light up to inform the driver that a malfunction has been detected.
3. SELF-DIAGNOSTIC RESULTS : This function allows diagnostic trouble codes to be read.

Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES" on next page.

Condition		Diagnostic Test Mode I	Diagnostic Test Mode II
Ignition switch in "ON" position	Engine stopped	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running	MALFUNCTION WARNING	—

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



- **Switching the diagnostic test mode is not possible when the engine is running.**

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section ("WARNING LAMPS AND CHIME") or see EC-2067.

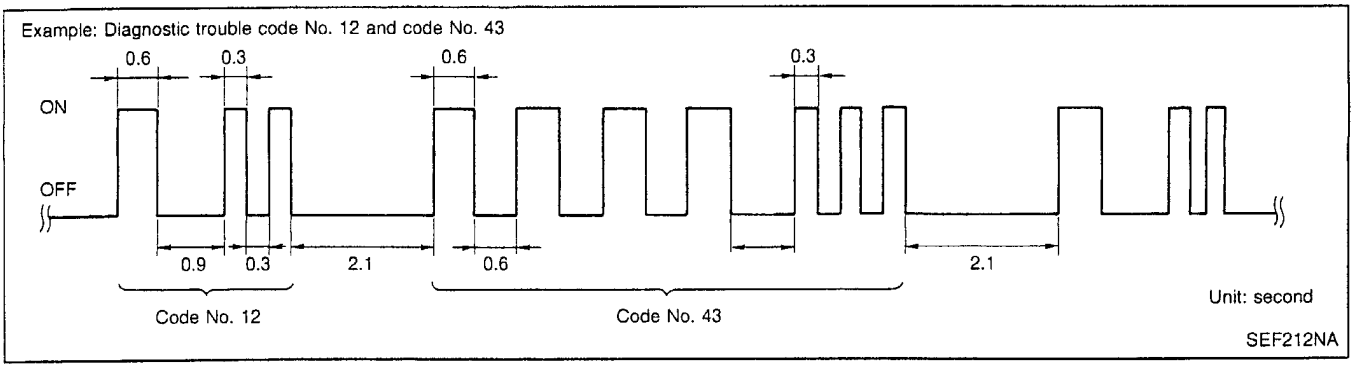
DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning. (The "MIL Illumination" of the "DTC Chart".) Refer to EC-2077.
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 flashes of the MALFUNCTION INDICATOR LAMP as shown below.



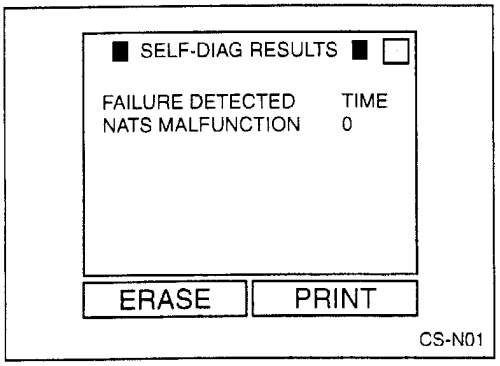
Long (0.6 second) flashes indicate the number of ten digits, and short (0.3 second) flashes indicate the number of single digits. For example, the malfunction indicator lamp flashes 4 times for 0.6 sec and then it flashes three times for about 0.3 sec. This indicates the DTC "43" and refers to the malfunction of the accelerator 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 CHART, EC-2076.)

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 twice from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES" on previous page.)

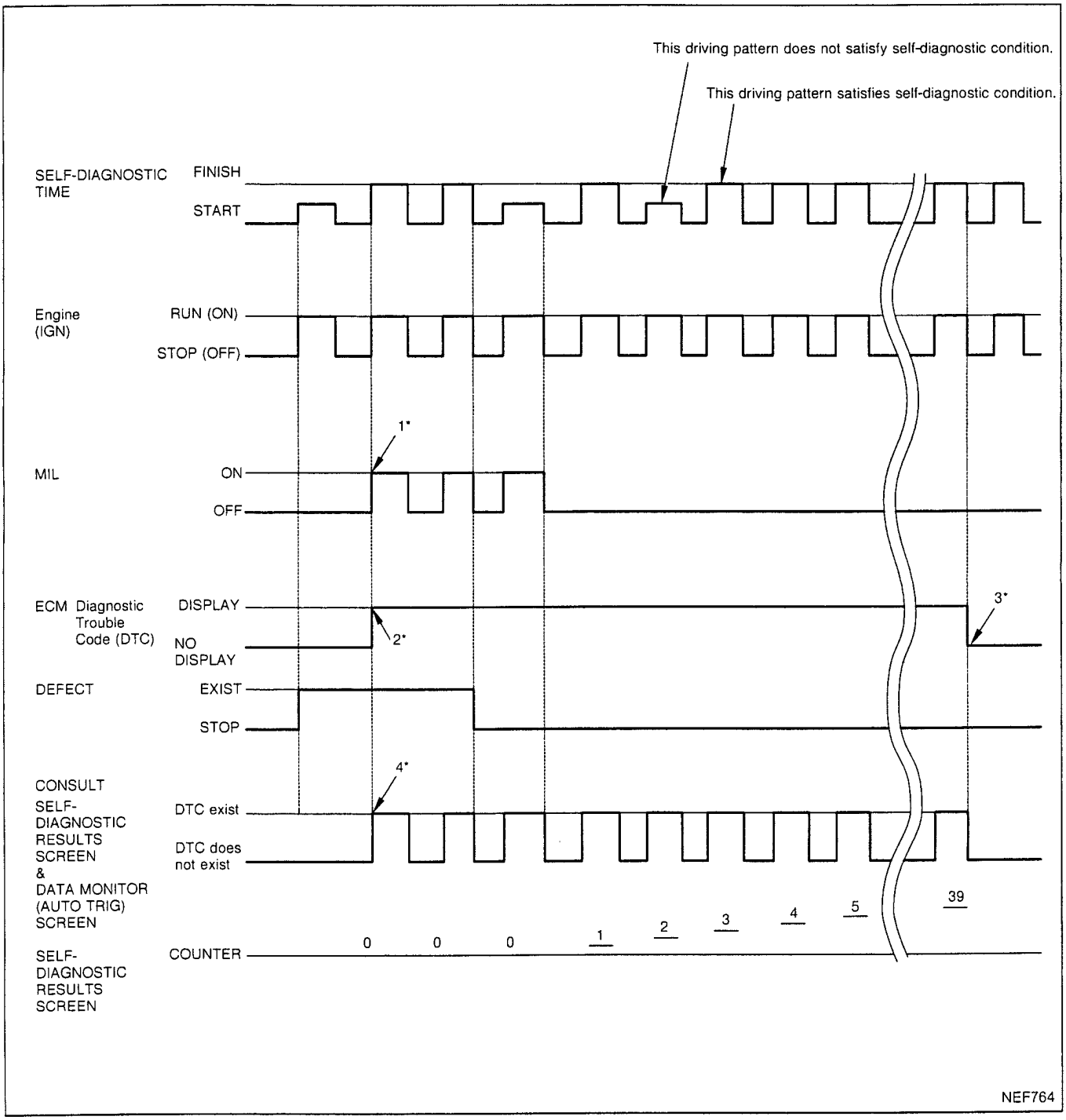
- **If the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**



- **If the MIL blinks or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT using NATS program card (NATS-E940). Refer to EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT.**
- **When replacing ECM, initialisation of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT using NATS program card (NATS-E940).**
  Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NATS initialisation and NATS ignition key ID registration, refer to CONSULT operation manual, NATS.

Malfunction Indicator Lamp (MIL) (Cont'd)

RELATIONSHIP BETWEEN MIL, DTC, CONSULT AND DRIVING PATTERNS



*1: When a malfunction is detected, MIL will light up.

*2: When a malfunction is detected for the first time, the DTC will be stored in ECM.

*3: The DTC will not be displayed any longer after vehicle is driven 40 times without the same malfunction. (The DTC still remains in ECM.)

*4: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.

CONSULT

ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE		
			SELF-DIAG-NOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
ECCS COMPONENT PARTS	INPUT	Camshaft position sensor (PUMP) *1	X *2	X	
		Mass air flow sensor	X	X	
		Engine coolant temperature sensor	X	X	
		Control sleeve position sensor	X	X	X
		Fuel temperature sensor	X	X	
		Vehicle speed sensor	X	X	
		Accelerator position sensor	X	X	
		Accelerator position switch		X	
		Brake lamp switch	X *2	X	
		Crankshaft position sensor (TDC)	X	X	
		Needle lift sensor	X	X	
		Ignition switch (start signal)		X	
		Ignition switch (ON signal)		X	
		Air conditioner switch		X	
		Brake switch		X	
		Battery voltage		X	
	OUTPUT	Injection timing control valve	X	X	X
		Fuel cut solenoid valve	X	X	X
		Air conditioner relay		X	
		Glow relay		X	X
		EGRC-solenoid valve		X	X
		Cooling fan relay		X	X

X: Applicable
*1: Imaginary sensor, which produces secondary engine revolution signal using needle lift sensor pulse.
*2: CONSULT may not display, but self-diagnostic results are available with MIL.

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "Diagnostic Trouble Code (DTC) chart". (See EC-2076.)

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CKPS•RPM (TDC) [rpm]	○	○	• The engine speed computed from the crankshaft position sensor (TDC) signal is displayed.	
CMPS•RPM - PUMP [rpm]	○	○	• The engine speed computed from the camshaft position sensor (PUMP) signal is displayed.	
COOLAN TEMP/S [°C] or [°F]	○	○	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
VHCL SPEED SE [km/h] or [mph]	○	○	• The vehicle speed computed from the vehicle speed sensor signal is displayed.	
FUEL TEMP SEN [°C] or [°F]	○	○	• The fuel temperature (determined by the signal voltage of the fuel temperature sensor) is displayed.	
ACCEL POS SEN [V]	○	○	• The accelerator position sensor signal voltage is displayed.	
OFF ACCEL POS [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the accelerator position switch signal.	
C/SLEEV POS/S [V]	○	○	• The control sleeve position sensor signal voltage is displayed.	
BATTERY VOLT [V]	○	○	• The power supply voltage of ECM is displayed.	
START SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the starter signal.	• After starting the engine, [OFF] is displayed regardless of the starter signal.
AIR COND SIG [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
BRAKE SW [ON/OFF]	○		• Indicates [ON/OFF] condition of the stio lamp switch.	
BRAKE SW2 [ON/OFF]	○		• Indicates [ON/OFF] condition of the stio lamp switch 2.	
IGN SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from ignition switch.	
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.
ACT INJ TIMG [°]	○		• The actual injection timing angle determined by the ECM (an approximate average angle between injection start and end from TDC) is displayed.	
TARGET F/INJ [mm^3/STROKE]	○		• The target fuel injection quantity (determined by the ECM according to the input signal) is indicated.	

NOTE:
Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

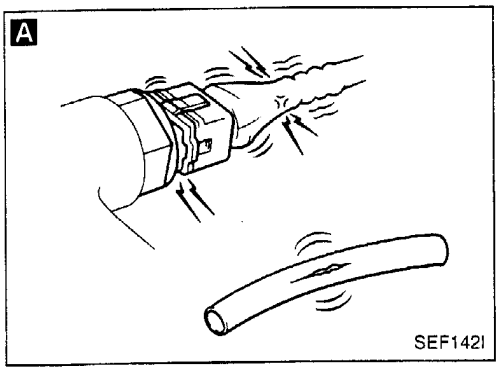
CONSULT (Cont'd)

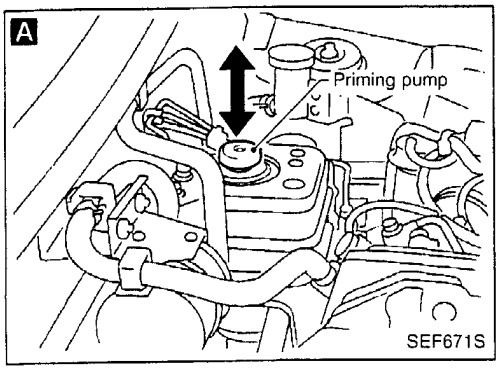
Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
FUEL CUT S/V [ON/OFF]			• The control condition of the fuel cut solenoid valve (determined by ECM according to the input signal) is indicated. • OFF ... Fuel cut solenoid valve is not operating. ON ... Fuel cut solenoid valve is operating.	• When the fuel cut solenoid valve is not operating, fuel supply is shut off.
AIR COND RLY [ON/OFF]		○	• The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
GLOW RLY [ON/OFF]		○	• The glow relay control condition (determined by ECM according to the input signal) is displayed.	
COOLING FAN [LOW/HI/OFF]		○	• Indicates the control condition of the cooling fans (determined by ECM according to the input signal). • LOW ... Operates at low speed. HI ... Operates at high speed. OFF ... Stopped.	
EGRC SOL/V A [ON/OFF]			• The control condition of the EGRC-solenoid valve (determined by ECM according to the input signal) is indicated. • OFF ... EGRC-solenoid valve is not operating. ON ... EGRC-solenoid valve is operating.	

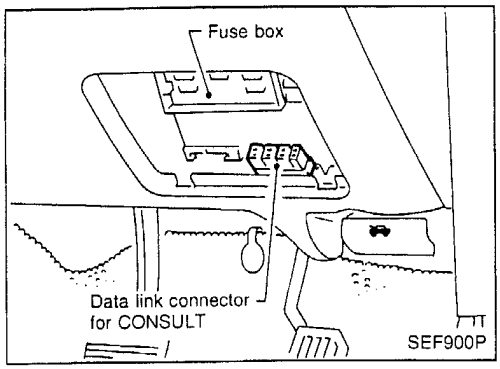
CONSULT (Cont'd)

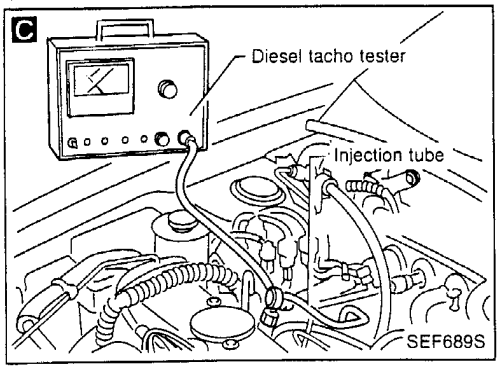
ACTIVE TEST MODE

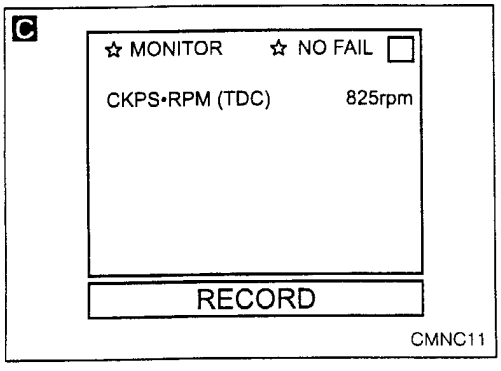
TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
TARGET F/INJ	• Engine: Return to the original trouble condition • Fix the target injection quantity using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Control sleeve position sensor
COOLING FAN	• Ignition switch: ON • Operate the cooling fan at "LOW", "HI" speed and turn "OFF" using CONSULT.	Cooling fan moves at "LOW", "HI" speed and stops.	• Harness and connector • Cooling fan motor
FUEL CUT SOL/V	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
EGRC SOL/V A	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
GLOW RLY	• Ignition switch: ON (Engine stopped) • Turn the glow relay "ON" and "OFF" using CONSULT and listen to operating sound.	Glow relay makes the operating sound.	• Harness and connector • Fuel pump relay
INJ TIMING	• Engine: Return to the original trouble condition • Retard the injection timing using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Adjust initial injection timing











Basic Inspection

Precaution:
Perform Basic Inspection without electrical or mechanical loads applied;

- **Headlamp switch is off,**
- **Air Conditioner switch is off,**
- **Rear defogger switch is off,**
- **Steering wheel is in the straight-ahead position, etc.**

A

BEFORE STARTING

1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:
   - Harness connectors for faulty connections
   - Vacuum hoses for splits, kinks, or faulty connections
   - Wiring for faulty connections, pinches, or cuts
3. Using priming pump, bleed air from fuel system. Refer to "Fuel Filter Check" in MA section.

B

CONNECT CONSULT TO THE VEHICLE.
Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-314.

DOES ENGINE START?

No → Turn ignition switch to the "LOCK" position, wait 5 seconds and then start engine. If engine fails to start, check diagnostic trouble code (DTC).

Yes

Run engine for 10 minutes.

C

CHECK IDLE SPEED.

Read engine idle speed in "DATA MONITOR" mode with CONSULT.
825 rpm ± 25 (in N position)

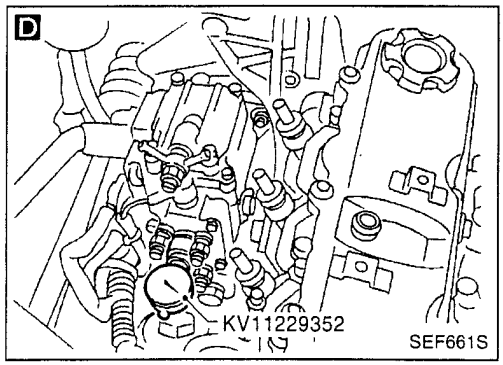
— OR —

Check idle speed using tachometer tester.
825 rpm ± 25 (in N position)

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)

D



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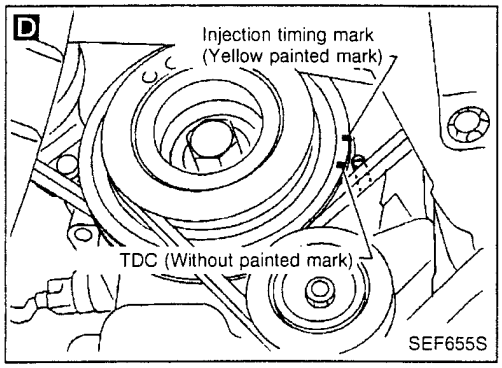
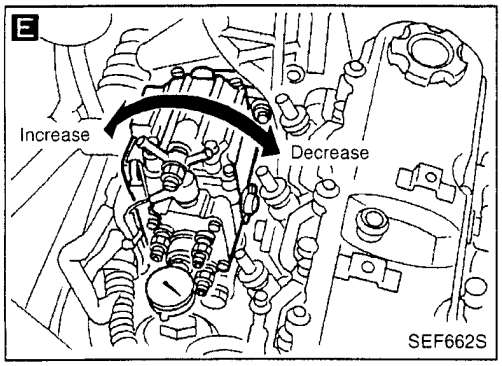


E



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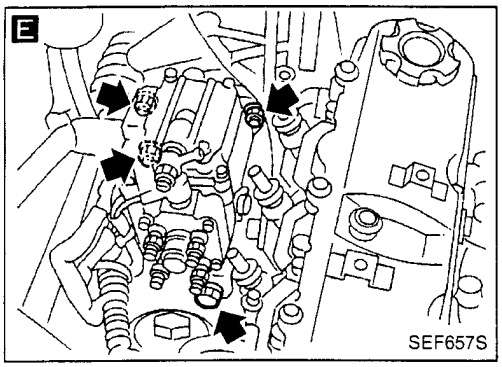

Ⓐ

D

CHECK INJECTION TIMING.

1. Set No. 1 piston at TDC on its compression stroke.
   TDC: Without painted mark
2. Remove injection tubes and air bleeder on the back of injection pump.
3. Set dial gauge so its indicator points to somewhere between 1.0 and 2.0 mm (0.039 and 0.079 in) on the scale.
4. Turn crankshaft 2 turns clockwise and check that dial gauge indicates the same value again.
5. Turn crankshaft counterclockwise about 100 degrees, then turn crankshaft slowly clockwise, and set dial gauge indicator to 0 mm at the position it stops.
6. Turn crankshaft clockwise and set it at TDC using the mark on the crankshaft pulley.
   Pump timing mark: Yellow painted mark
7. Read plunger lift.
   Plunger lift:
   0.89 ± 0.08 mm (0.0350 ± 0.0031 in) at pump timing mark

- **When repeating the checking, start with step 5.**

OK → Bleed air from fuel system.
After this inspection, unnecessary diagnostic trouble code No. might be displayed.
Erase the stored memory in ECM.
Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" (EC-2065).

OK → INSPECTION END

NG

E

Adjusting

1. If plunger lift is not within the specified value, adjust by turning injection pump.

- **If indication is smaller than the specified value, turn pump body away from engine.**
- **If indication is larger than the specified value, turn pump body towards engine.**

2. Tighten injection pump securing bolts and nuts.
   Nut:
   : 20 - 25 N·m
   (2.0 - 2.6 kg-m, 15 - 18 ft-lb)
   Bolt:
   : 25 - 35 N·m
   (2.6 - 3.6 kg-m, 18 - 26 ft-lb)
3. Remove dial gauge and install air bleeder with new washer.
4. Install injection tubes.
   Flare nut:
   : 14 - 20 N·m
   (1.4 - 2.0 kg-m, 10 - 15 ft-lb)
5. Bleed air from fuel system.
   Refer to "Water Draining, Fuel Filter Check and Replacement" of "ENGINE MAINTENANCE" in MA section.

→ Go to **A**

Diagnostic Trouble Code (DTC) Chart

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
12	Mass air flow sensor circuit (MASS AIR FLOW SEN)	• An excessively high or low voltage from the sensor is detected by the ECM.
13	Engine coolant temperature sensor circuit (COOLANT TEMP SEN)	• An excessively high or low voltage from the sensor is detected by the ECM.
14	Vehicle speed sensor circuit (VEHICLE SPEED SEN)	• The almost 0 km/h (0 mph) signal from the sensor is detected by the ECM even when vehicle is being driven.
15	Control sleeve position sensor circuit (CONT SLEEV POS SEN)	• An excessively high or low voltage from the sensor is detected by the ECM. • An incorrect voltage signal from the sensor is detected by the ECM during engine running.
18	Fuel injection feedback 2 (F/INJ F/B 2)	• The fuel injection feedback system (consists of the ECM, electric governor and control sleeve position sensor) does not operate properly.
21	Fuel injection timing feedback (F/INJ TIMG F/B)	• The fuel injection timing feedback system (consists of the ECM, fuel injection timing control valve and needle lift sensor) does not operate properly.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC Confirmation Procedure Quick Ref. *1	Overall Function Check *2	MIL Illumination	Reference Page
• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor	IGN: ON	—	—	EC-2099
• Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor	IGN: ON	—	Lighting up	EC-2103
• Harness or connectors (The sensor circuit is open or shorted.) • Vehicle speed sensor	—	LIFTING	—	EC-2107
• Harness or connectors (The sensor circuit is open or shorted.) • Control sleeve position sensor	RUNNING	—	Lighting up	EC-2110
• Main power supply circuit (ECM terminals (116), (117)) and fuse • Harness or connectors (Electric governor and control sleeve position sensor circuit) • Electronic fuel injection pump • ECM • Electric governor	RUNNING (DRIVING)	—	Lighting up	EC-2114
• Harness or connectors (Injection timing control valve, Needle lift sensor and Crankshaft position sensor (TDC) circuit] • Injection timing control valve • Needle lift sensor • Crankshaft position sensor • Air in fuel line	RUNNING (DRIVING)	—	Lighting up	EC-2119

*1: • This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each TROUBLE DIAGNOSIS FOR DTC.

*2: • The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
• During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
• This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each TROUBLE DIAGNOSIS FOR DTC.

Diagnostic Trouble Code (DTC) Chart (Cont'd)

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
28	Cooling fan (OVER HEAT)	• Cooling fan does not operate properly. (Overheat) • Cooling system does not operate properly. (Overheat) • Engine coolant was not added to the system using the proper filling method.
31	ECM2 (ECM2)	• ECM calculation function is malfunctioning.
34	Needle lift sensor circuit (NEEDLE LIFT SEN)	• An incorrect signal from the sensor is detected by the ECM during engine running.
36	Fuel cut solenoid valve 1 (FUEL CUT S/V 1)	• Fuel cut solenoid valve circuit is shorted. • Fuel cut solenoid valve does not operate properly.
42	Fuel temperature sensor circuit (FUEL TEMP SENSOR)	• An excessively high or low voltage from the sensor is detected by the ECM.
43	Accelerator position sensor circuit (ACCEL POS SENSOR)	• An excessively high or low voltage from the sensor is detected by the ECM.
47	Crankshaft position sensor (TDC) [CRANK POS SEN (TDC)]	• An incorrect signal from the sensor is detected by the ECM during engine running and cranking.
55	No failure (NO SELF DIAGNOSTIC FAILURE INDICATED)	No malfunction is detected by the ECM.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC *1 Confirmation Procedure Quick Ref.	*2 Overall Function Check	MIL Illumination	Reference Page
• Harness or connectors (The cooling fan circuit is open or shorted.) • Cooling fan • Radiator hose • Radiator • Radiator cap • Water pump • Thermostat • Fan belt • Engine coolant temperature For more information, refer to "MAIN 12 CAUSES OF OVERHEATING". (EC-397)	—	IGN: ON (RUNNING)	Lighting up	EC-2114
• ECM	IGN: ON	—	Lighting up	EC-2124
• Harness or connectors (The sensor circuit is open or shorted.) • Needle lift sensor • Air in fuel line • Clogging No. 1 injection nozzle	RUNNING	—	Lighting up	EC-2133
• Harness or connectors (The solenoid valve circuit is open or shorted.) • Fuel cut solenoid valve	RUNNING	—	Lighting up	EC-2136
• Harness or connectors (The sensor circuit is open or shorted.) • Fuel temperature sensor	IGN: ON	—	—	EC-2140
• Harness or connectors (The sensor circuit is open or shorted.) • Accelerator position sensor • Accelerator position switch • Accelerator switch (F/C)	IGN: ON	—	Lighting up	EC-2144
• Harness or connectors (The sensor circuit is open or shorted.) • Crankshaft position sensor (TDC)	RUNNING	—	Lighting up	EC-2151
• No failure	—	—	—	—

*1: • This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

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In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
• During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
• This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

Diagnostic Trouble Code (DTC) Chart (Cont'd)

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
82	Atmospheric pressure sensor *5 (—) *3	• An excessively high or low voltage from the sensor is detected by the ECM.
83	Glow relay circuit (GLOW RELAY)	• Glow relay circuit is open or shorted.
84	ECM (—)*3	• ECM reference voltage (2.5V) is excessively high or low.
85	Air conditioner relay circuit (—)*3	• Air conditioner relay circuit is shorted.
86	EGRC-solenoid valve A (EGR SYS)	• EGRC-solenoid valve A is open or shorted.
87	Brake switch circuits (—)*3	• Brake switch circuits are open or shorted.
91	ECM (—)*3	• ECM version number or switching function is not plausible.
92	ECCS-D relay circuit (—)*3	• ECCS-D relay shut-off time is too late.
93	Ignition switch "ON" signal circuit (—)*3	• Ignition switch "ON" signal is shorted.
94	Ignition timing control valve circuit (INJ TIMING CONT/V)	• Ignition timing control valve circuit is open or shorted.
96	Camshaft position sensor (PUMP)*4 (—)*3	• An improper signal is calculated by the ECM.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC *1 Confirmation Procedure Quick Ref.	*2 Overall Function Check	MIL Illumination	Reference Page
• ECM	IGN: ON	—	—	EC-2124
• Harness or connectors (The glow relay circuit is open or shorted.) • Glow relay	IGN: ON	—	—	EC-2155
• ECM	IGN: ON	—	—	EC-2124
• Harness or connectors (The air conditioner relay circuit is open or shorted.) • Air conditioner relay	IGN: ON	—	—	EC-2163
• Harness or connectors (The EGRC-solenoid valve A circuit is open or shorted.) • EGRC-solenoid valve	RUNNING	—	Lighting up	EC-2166
• Harness or connectors (Brake switch circuits are open or shorted.) • Brake lamp switch • Brake switch 2	RUNNING	—	Lighting up	EC-2173
• ECM	IGN: ON	—	—	EC-2124
• Harness or connectors (The ECCS-D relay circuit is shorted.) • ECCS-D relay • ECM	IGN: ON	—	Lighting up	EC-2124
• Harness or connectors (The ignition "ON" signal circuit is shorted.)	IGN: ON	—	Lighting up	EC-2119
• Harness or connectors (The injection timing control valve circuit is open or shorted.) • Injection timing control valve	IGN: ON	—	Lighting up	EC-2119
• ECM • Needle lift sensor • Low battery voltage	RUNNING	—	Lighting up	EC-2133

*1: • This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

*2: • The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
• During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
• This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

*3: CONSULT may not detect, but self-diagnostic results are available with MIL.

*4: Imaginary sensor, which produces secondary engine revolution signal using needle lift sensor pulse.

*5: The atmospheric pressure sensor is located inside the ECM and is not replaceable.

Diagnostic Trouble Code (DTC) Chart (Cont'd)

ENGINE RELATED ITEMS

Diagnostic trouble code No.	Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" mode)	Malfunction is detected when ...
97	MIL (—)*3	• MIL (malfunction indicator lamp) circuit is open or shorted.
98	GLOW LAMP CIRCUIT (—)*3	• Glow lamp circuit is open or shorted.

Abbreviations for Quick Reference of "DTC CONFIRMATION PROCEDURE"
IGN: ON : Turning the ignition switch ON is required for checking the function of the sensor, switch, solenoid and circuit.
RUNNING : Running engine is required for checking the function of the sensor, switch, solenoid and circuit.
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required.
DRIVING : Driving the vehicle in the specified pattern is required.

Abbreviations for Quick Reference of "OVERALL FUNCTION CHECK"
IGN: ON : Turning the ignition switch ON is required for the ECM to detect a malfunction (if one exists).
RUNNING : Running engine is required for the ECM to detect a malfunction (if one exists).
LIFTING : Lifting up the vehicle, running engine and spinning wheels are required for the ECM to detect a malfunction (if one exists).
DRIVING : Driving the vehicle in the specified pattern is required for the ECM to detect a malfunction (if one exists).

Diagnostic Trouble Code (DTC) Chart (Cont'd)

—: Not applicable

Check Items (Possible Cause)	DTC Confirmation Procedure Quick Ref. *1	Overall Function Check *2	MIL Illumination	Reference Page
• Harness or connectors (The MIL circuit is open or shorted.) • MIL lamp	IGN: ON	—	—	EC-2178
• Harness or connectors (The glow indicator lamp circuit is open or shorted.) • Glow lamp	IGN: ON	—	—	EC-2155

*1: • This is Quick Reference of "DTC CONFIRMATION PROCEDURE".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

*2: • The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.
In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".
When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.
• During an "NG" OVERALL FUNCTION CHECK, the DTC might not be confirmed.
• This is Quick Reference of "OVERALL FUNCTION CHECK".
Details are described in each specific TROUBLE DIAGNOSIS FOR DTC.

*3: CONSULT may not detect, but self-diagnostic results are available with MIL.

Symptom Matrix Chart

SYSTEM — Basic engine control system	SYMPTOM: HARD/NO START/RESTART (EXCP. HA) — NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	ENGINE STALL — AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR — BLACK SMOKE	ABNORMAL SMOKE COLOR — WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator lamp illuminates.	Can be detected by CONSULT?	Fuel cut	Reference page	Feature of symptom, Check point
New CT/CS	AA				AB			AC	AD	AE		AF		AG	AH	AJ	AK	AL	AM	AP		HA					
Injection timing — Advanced	○	○	●	●			○		●					○	○					●				○		EC-2075	
Injection timing — Retarded	○	○	●	●			○			●				○	○						●			○		EC-2075	
Electric injection pump mainframe	●	●	●	●	○	○	○	○	○	●	○	○	○	●	●	○		○		●	○		○	○	○	—	*1
Injection nozzle	○	○	○	○	○	○	○		●	○	○		○	●	●					●						EC-2061	*2
Glow system	○	○	●	●					●												●					EC-2155	
Engine body	○	○	●	●	○	○	○		●	○	○		○	●	●		○	○	○		●					EM-section	*3
EGR system										●	●									●						EC-2166	
Air cleaner and ducts										●	●									●				○		MA-section	*4

● ; High Possibility Item
○; Low Possibility Item
*1: Insufficient or excess amount. Governor malfunction may be the cause.
*2: Depends on open-valve pressure and spray pattern.
*3: Caused mainly by insufficient compression pressure.
*4: Symptom varies depending on off-position of air duct, etc.

Symptom Matrix Chart (Cont'd)

| SYMPTOM | | | | Feature of symptom / Check point | | | |

Symptom Matrix Chart (Cont'd)

SYSTEM — ECCS system

Feature of symptom / Check point			Reference page	Malfunction	New CT/CS	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	AP	AP	HA
																		WHITE SMOKE	BLACK SMOKE	
			EC-2181																	
Start control does not function.				open, short	Start signal circuit	○														
Air conditioner does not stop operating.			EC-440	open, ground short	Air conditioner switch circuit	○														
Air conditioner does not work.				short																
Accelerator position sensor NG signal is output.			EC-2144	open, ground short	Accelerator position switch (idle) circuit		○				○									
				short			○		○	○										
Engine does not stop.			EC-2096	open	Ignition switch circuit (ON signal)	○	○	○												
				short			○													
			EC-2096	open	Power supply for ECM circuit															
				short																
Does not stop operating.			EC-2166	open, short	EGRC-solenoid valve circuit													○		
				ground short																
Glow lamp does not turn on.			EC-2155	open	Glow relay circuit	○	○	○										○		
Glow lamp does not turn off.				short																
Ground short makes engine unable to stop.			EC-2096	open	ECCS relay (Self-shutoff) circuit		○	○												
				short								○	○							
Air conditioner does not operate.			EC-440	open	Air conditioner relay circuit															
Air conditioner does not stop operating.				short						○										
			EC-2173	open	Brake switch circuits															
				short																
			EC-2124	open, short	ECM, Connector circuit	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

SYMPTOM

- Fuel cut
- Can be detected by CONSULT?
- Malfunction indicator lamp illuminates.
- DEAD BATTERY (UNDER CHARGE) — HA
- ABNORMAL SMOKE COLOR — WHITE SMOKE — AP
- ABNORMAL SMOKE COLOR — BLACK SMOKE — AP
- EXCESSIVE OIL CONSUMPTION — AM
- EXCESSIVE FUEL CONSUMPTION — AL
- OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE — AK
- SLOW/NO RETURN TO IDLE — AJ
- IDLING VIBRATION — AH
- ROUGH IDLE/HUNTING — AG
- LOW IDLE — AF
- HI IDLE
- POOR ACCELERATION — AE
- LACK OF POWER — AE
- SPARK KNOCK/DETONATION — AD
- HESITATION/SURGING/FLAT SPOT — AC
- ENGINE STALL — WHEN DECELERATING — AB
- ENGINE STALL — DURING DRIVING — AB
- ENGINE STALL — AT IDLE — AB
- HARD/NO START/RESTART (EXCP. HA) — HARD TO START WHEN ENGINE IS HOT — AA
- HARD/NO START/RESTART (EXCP. HA) — HARD TO START WHEN ENGINE IS COLD — AA
- HARD/NO START/RESTART (EXCP. HA) — NO START (without first firing) — AA
- HARD/NO START/RESTART (EXCP. HA) — NO START (with first firing) — AA

ECCS

CONSULT Reference Value in Data Monitor Mode

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.

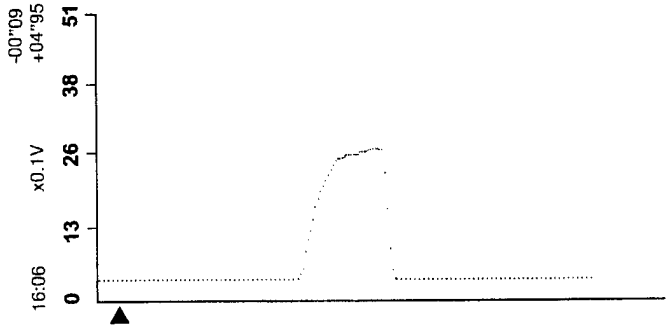
MONITOR ITEM	CONDITION		SPECIFICATION
CKPS•RPM (TDC) CKPS•RPM-PUMP	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
FUEL TEMP SEN	• Engine: After warming up		More than 40°C (104 °F)
ACCEL POS SEN	• Ignition switch: ON (Engine stopped)	Accelerator pedal: release	Approx. 0.40V
		Accelerator pedal: depress	Approx. 3.3V
OFF ACCEL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: release	ON
		Accelerator pedal: slightly open	OFF
C/SLEEV POS/S	• Engine: After warming up		Approx. 2.5V
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: "OFF"	OFF
		Air conditioner switch: "ON" (Compressor operates.)	ON
IGN SW	• Ignition switch: ON → OFF		ON → OFF
MAS AIR/FL SE	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	0.8 - 2.7V
		2,000 rpm	2.2 - 2.8V
ACT INJ TIMG	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load • At sea level	Idle	-0.5 to -1.5°
		2,000 rpm	+2.5° to +3.5°
TARGET F/INJ	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load • At sea level	Idle	8.0 - 8.8 mm^3/stroke
		2,000 rpm	Approx. 7.6 mm^3/stroke
BRAKE SW	• Ignition switch: ON	Brake pedal: released	OFF
		Brake pedal: depressed	ON
BRAKE SW 2	• Ignition switch: ON	Brake pedal: released	OFF
		Brake pedal: depressed	ON
FUEL CUT S/V	• Ignition switch: ON → OFF		ON → OFF
AIR COND RLY	• Air conditioner switch: OFF → ON		OFF → ON
GLOW RLY	• Refer to EC-2161.		
COOLING FAN	• When cooling fan is stopped.		OFF
	• When cooling fan operates at low speed.		LOW
	• When cooling fan operates at high speed.		HI
EGRC SOL/V A	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load • At sea level	Idle	OFF
		2,800 rpm	ON

Major Sensor Reference Graph in Data Monitor Mode

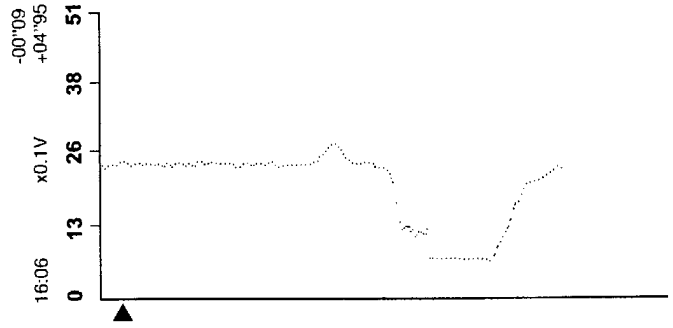
The following are the major sensor reference graphs in "DATA MONITOR" mode.
(Select "HI SPEED" in "DATA MONITOR" with CONSULT.)

ACCEL POS SEN, C/SLEEV POS/S, ACT INJ TIMG

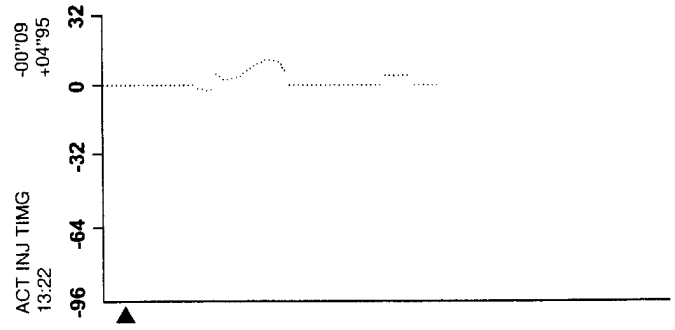
Below is the data for "ACCEL POS SEN", "C/SLEEV POS/S" and "ACT INJ TIMG" when revving engine quickly up to 3,000 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



- "ACCEL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.

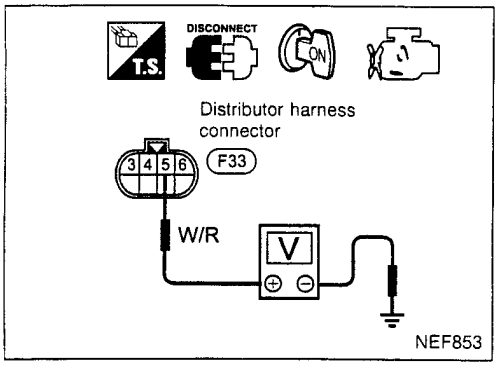


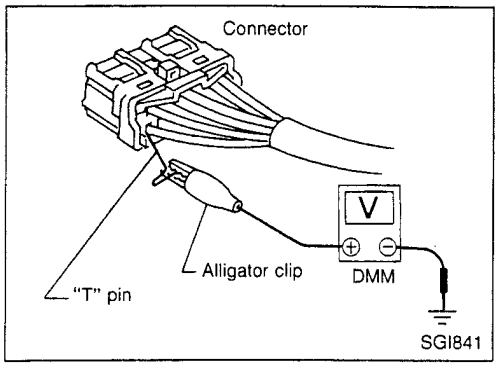
- "C/SLEEV POS/S" should increase when depressing the accelerator pedal and should decrease when the pedal is released.



- "ACT INJ TIMG" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

NEF780





ECM Terminals and Reference Value

PREPARATION

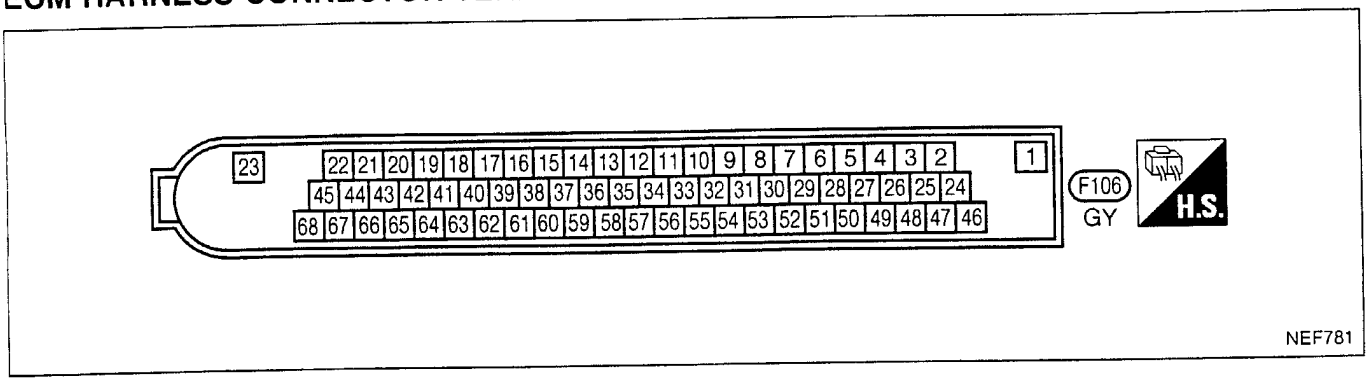
The ECM is located beneath the heater unit. To access the ECM, remove the center console under cover at the passenger side. Perform all voltage measurements with all connectors connected. Since the ECM harness connector cannot be accessed from the backside, voltages should be measured at the nearest connector to the sensors or actuators to be measured.

When measuring:

- Use extreme care not to touch 2 pins at the same time.
- Note that the data is for comparison and may not be exact.
- Use care not to enlarge the opening to keep the seal in good condition.

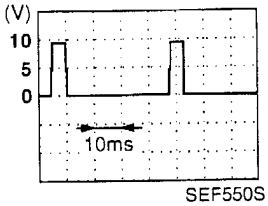
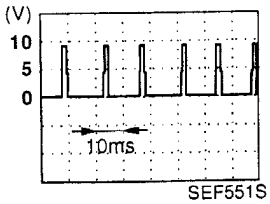
ECM Terminals and Reference Value (Cont'd)

ECM HARNESS CONNECTOR TERMINAL LAYOUT

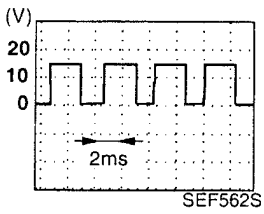
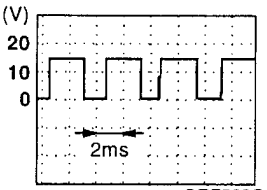
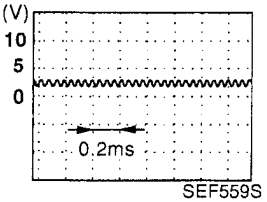
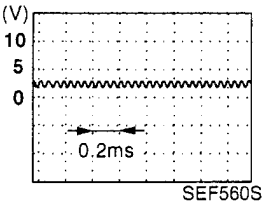
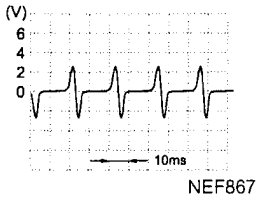
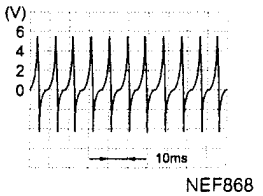


ECM INSPECTION TABLE

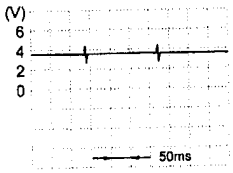
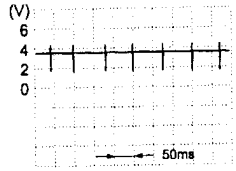
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
1 24 46	B	ECCS ground	Engine is running. └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
2	L/OR	Tachometer	Engine is running. (Warm-up condition) └ Idle speed	Approximately 1.1 - 1.5V  SEF550S
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 1.1 - 1.5V  SEF551S

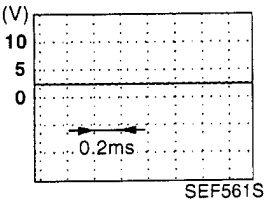
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
4 5 49	B/L	Electric governor ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 10.5V  SEF562S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 10.5  SEF563S
7	B	Control sleeve position sensor power supply	Engine is running. └ Idle speed	Approximately 2.6V  SEF559S
7	R G	Control sleeve position sensor (Power supply)	Engine is running. └ Idle speed	Approximately 2.6V  SEF560S
8	W	Crankshaft position sensor (TDC) (Signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V  NEF867
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0V  NEF868

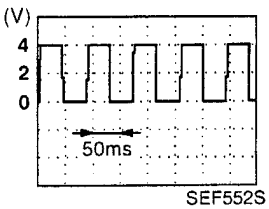
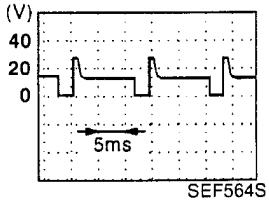
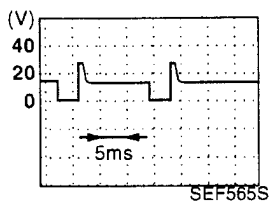
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
11		Needle lift sensor ground	Ignition switch "ON"	Approximately 0V
12	W	Needle lift sensor	Engine is running. (Warm-up condition) └ Idle speed	Approximately 3.8 - 4.0V  NEF869
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 3.8 - 4.0V  NEF870
13	W	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.9 - 2.3V
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	2.5 - 2.9V
14	L/OR	Engine coolant temperature sensor	Engine is running.	0.6 - 4.8V Output voltage varies with engine coolant temperature.
15	Y	Accelerator position sensor	Ignition switch "ON" └ Accelerator pedal released	0.4 - 0.6V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4.0V
16	B/Y	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
19		Mass air flow sensor power supply	Ignition switch "ON"	Approximately 5V
20 39		Brake switch 2	Ignition switch "ON" └ Brake pedal released	Battery voltage (11 -14V)
			Ignition switch "ON" └ Brake pedal depressed	0V
21	OR	Crankshaft position sensor (TDC) ground & mass air flow sensor ground	Engine is running. └ Idle speed	Approximately 0V

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
23 45 68	R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
25	P	EGRC-solenoid valve A	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Engine speed is 2,800 rpm	Approximately 0.3V
26	OR/L	Malfunction indicator lamp	Ignition switch "ON"	Approximately 1.0V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
27	OR	Glow lamp	Ignition switch "ON" └ Glow lamp is "ON".	Approximately 1.0V
			Ignition switch "ON" └ Glow lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)
28	G/Y	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON"	Approximately 0.4V
			Engine is running. └ A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
29	W	Control sleeve position sensor (Reference signal)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.6V  SEF561S
30	G/R	Data link connector for CONSULT	Engine is running. └ Idle speed (CONSULT is connected and turned on)	Approximately 0V
61	G/B			Approximately 4 - 9V
64	GY/L			Approximately 0V
33	B	Sensors' ground	Engine is running. └ Idle speed	Approximately 0V
38	BR	Ignition switch	Ignition switch "LOCK"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ECM Terminals and Reference Value (Cont'd)

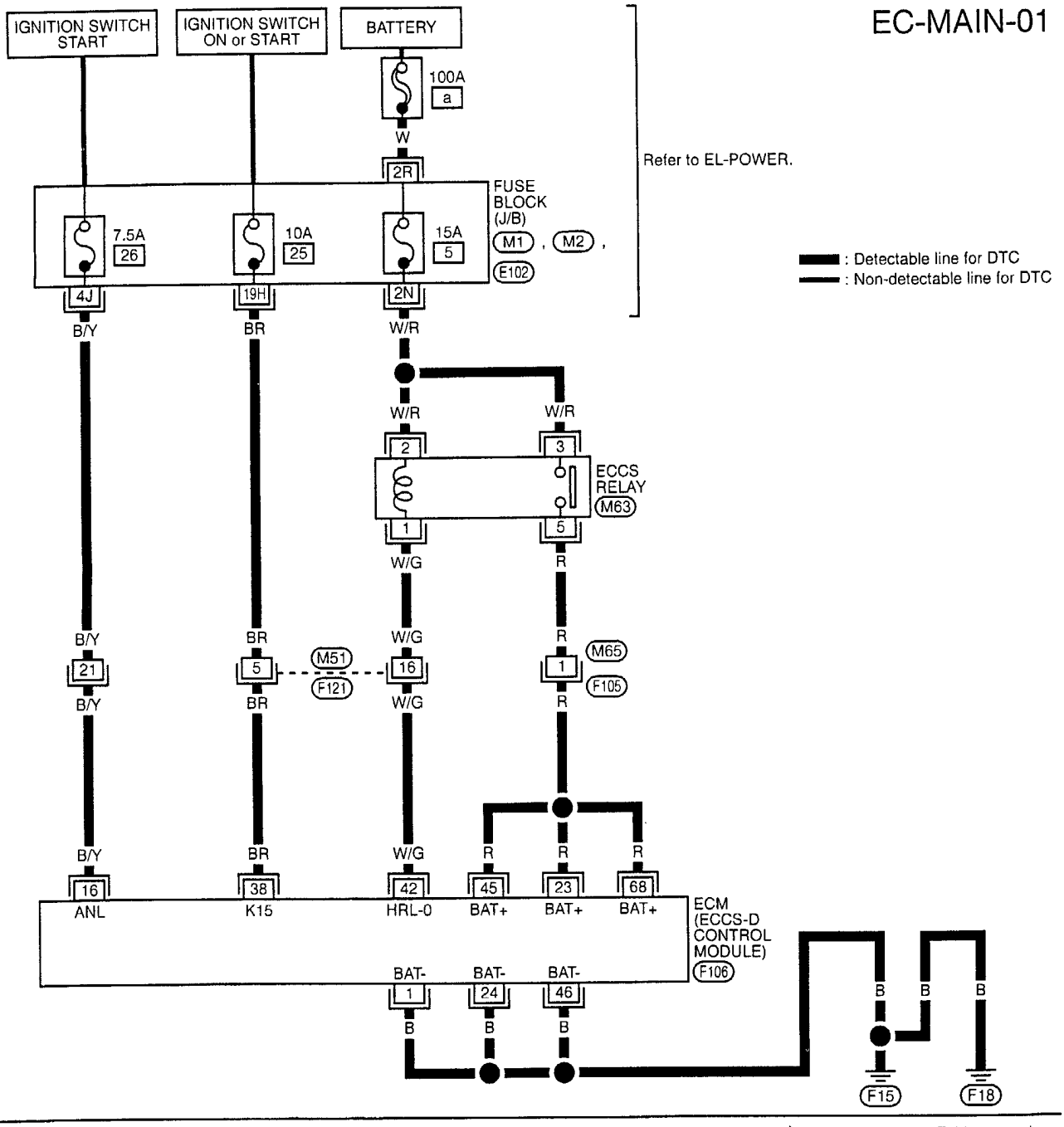
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
42	W/G	ECCS relay (Self-shut-off)	Engine is running. Ignition switch "LOCK" └ For a few seconds after turning ignition switch to the "LOCK" position	0 - 1V
			Ignition switch "LOCK" └ Following a few seconds delay after turning ignition switch to the "LOCK" position	BATTERY VOLTAGE (11 - 14V)
43	Y/G	Vehicle speed sensor	Engine is running. ├ Lift up the vehicle. ├ In 2nd gear position └ Vehicle speed is 40 km/h (25 mph)	0 - Approximately 4.2V  SEF552S
44		Stop lamp switch	Ignition switch "ON" └ Brake pedal released	0V
			Ignition switch "ON" └ Brake pedal depressed	Battery voltage (11 - 14V)
47		Cooling fan relay (High speed)	Engine is running. └ Cooling fan operates. (Air conditioning "ON")	0V
			Engine is running. └ Cooling fan does not operate. (Air conditioning "OFF")	Battery voltage (11 - 14V)
50	W/R	Glow relay	Refer to "Glow control System".	
51	SB	Injection timing control valve	Engine is running. (Warm-up condition) └ Idle speed	Approximately 9V  SEF564S
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	Approximately 8V  SEF565S

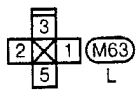
ECM Terminals and Reference Value (Cont'd)

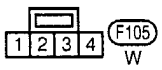
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
53	B/Y	Fuel cut solenoid valve	Ignition switch "LOCK"	Approximately 0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
54	LG	Cooling fan relay (High speed)	Engine is running. — Cooling fan is not operating. └ Cooling fan is operating at low speed.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating at high speed.	Approximately 0.5V
54	LG/R	Cooling fan relay (Low speed)	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating.	Approximately 0.4V
55	BR	Accelerator position sensor ground	Engine is running. └ Idle speed	Approximately 0V
57	L/B	Accelerator position sensor power supply	Ignition switch "ON"	Approximately 5V
59		Immobilizer communication	Ignition switch "ON"	BATTERY VOLTAGE (4 - 14V)
62	L/OR	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)
63	G	Fuel temperature sensor	Engine is running.	0.6 - 4.8V Output voltage varies with fuel temperature.
65	L/Y	Accelerator position switch (Idle)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0V
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 2.7V

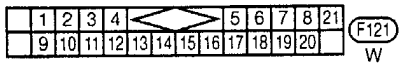
Main Power Supply and Ground Circuit

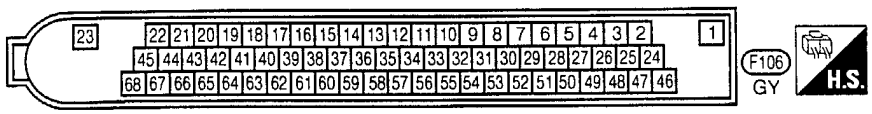
EC-MAIN-01







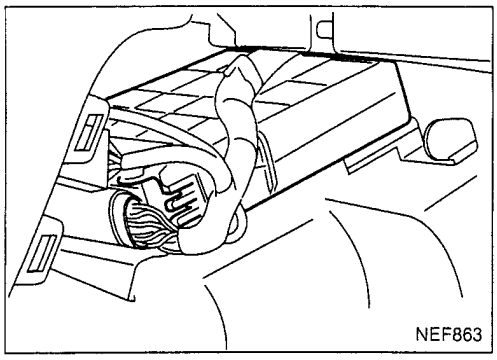


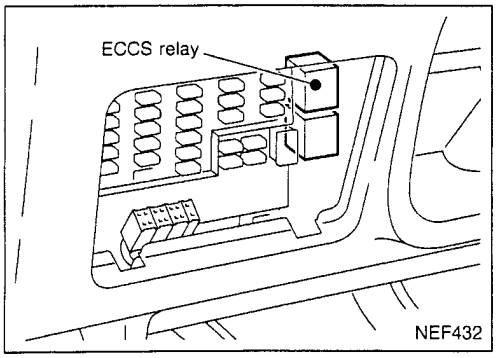


Refer to last page (Foldout page).
M1
M2 , E102

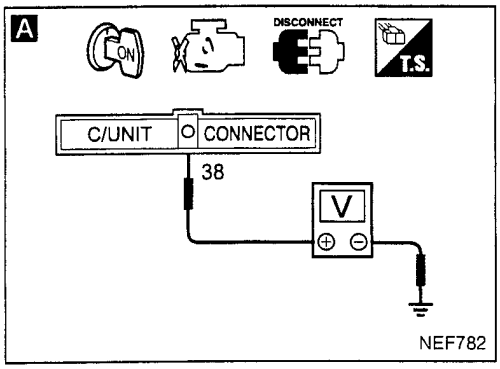
YEC025

Main Power Supply and Ground Circuit (Cont'd)

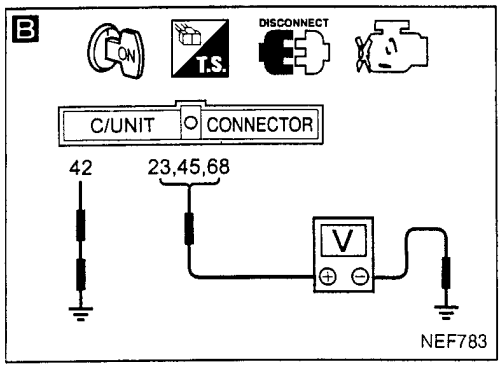

NEF863



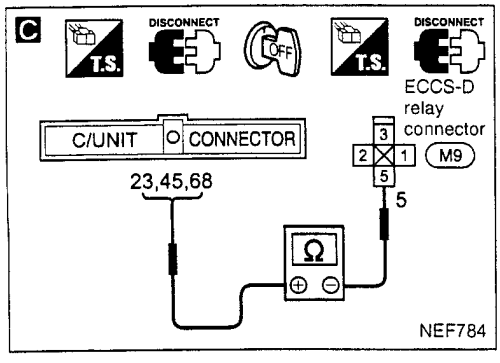
NEF432



NEF782



NEF783



NEF784

INSPECTION START

Start engine.
Is engine running?

No → **A**

CHECK POWER SUPPLY-I.
1. Disconnect ECM harness connector.
2. Turn ignition switch to "ON" position.
3. Check voltage between ECM connector terminal (38) and ground
   Voltage: Battery voltage

If NG, check the following:
- 10A fuse
- Harness connectors (M51), (F121)
- Harness for open or short-circuit between ECM and ignition switch.

If NG, replace 10A fuse or repair harness or connectors.

OK

Yes

1. Stop engine.
2. Disconnect ECM harness connector.
3. Turn ignition switch to "ON" position.

B

CHECK POWER SUPPLY-II.
1. Short between ECM connector terminal (42) and engine ground with a jump wire.
2. Check voltage between ECM terminals (23), (45), (68) and ground.
   Voltage: Battery voltage

OK → Go to **G** "CHECK GROUND CIRCUIT" on page EC-2098.

NG

C

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM
Check harness continuity between ECM connector terminals (23), (45) (68) and ECCS relay connector terminal (5).
Continuity should exist.
If OK, check harness for short.

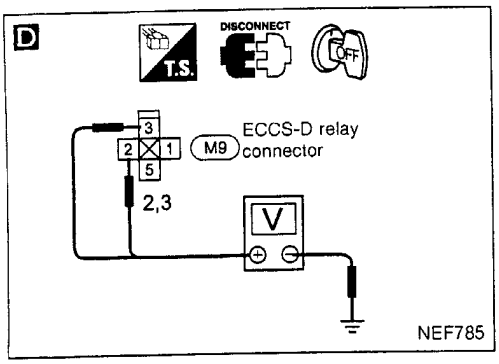
NG → Check the following:
- Harness connectors (M65), (F105)
- Harness for open or short-circuit between ECCS relay and ECM.

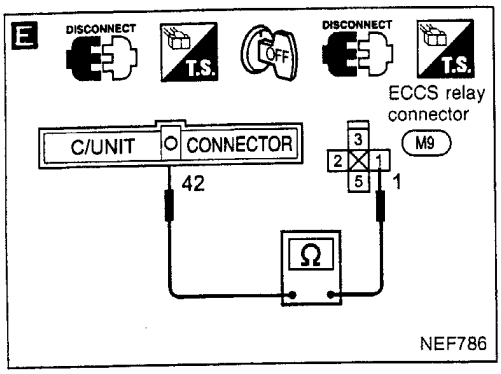
If NG, repair harness or connectors.

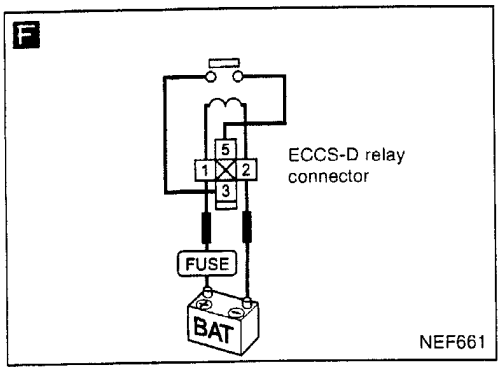
OK

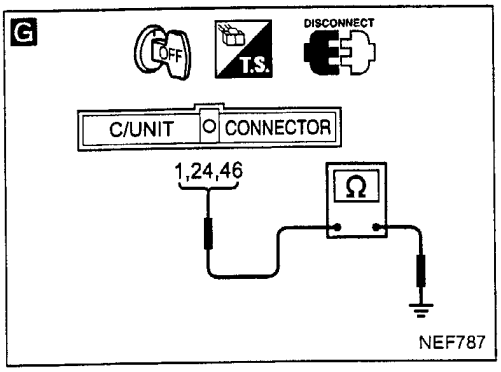
Ⓐ

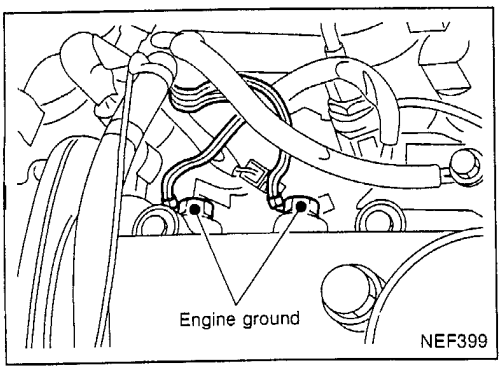
Main Power Supply and Ground Circuit (Cont'd)











Ⓐ

D

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.
Check voltage between ECCS relay connector terminals ②, ③ and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following:
- 15A fuse
- 100A fusible link.
- Harness for open or short-circuit between ECCS relay and battery.

If NG, replace fuses or fusible link or repair harness or connectors.

OK ↓

E

CHECK OUTPUT SIGNAL CIRCUIT.
Check harness continuity between ECM connector terminal ㊷ and ECCS relay connector terminal ①.
Continuity should exist.
If OK, check harness for short-circuit.

NG → ● Check harness connectors (M51), (F121)
Repair harness or connectors.

OK ↓

F

CHECK ECCS RELAY.
1. Apply 12V direct current between ECCS relay connector terminals ① and ②.
2. Check continuity between ECCS relay connector terminals ③ and ⑤.
   12V (① - ②) applied:
   Continuity exists.
   No voltage applied:
   No continuity

NG → Replace ECCS relay.

OK ↓

G

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between ECM connector terminals ①, ㉔, ㊻ and engine ground.
   Continuity should exist.
   If resistance is too high, loosen, clean and retighten engine ground.
   If OK, check harness for short-circuit.

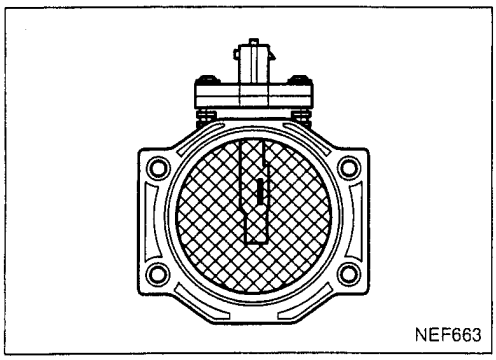
NG → Repair harness or connectors.

OK ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector.

↓

INSPECTION END


NEF663

Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the amount of intake air by analysing a part of the entire flow. When intake air flows into the intake manifold, heat is withdrawn from the hot film. By regulating the electrical current that flows through the hot film, the ECM maintains the hot film temperature on a constant level. The amount of electric current that is needed to keep the hot film on a constant temperature level is proportional to the mass of air that flows into the engine.

Diagnostic Trouble Code No.	Malfunction is detected when . . .	Check Items (Possible Cause)
12	• An excessively high or low voltage from the sensor is entered to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

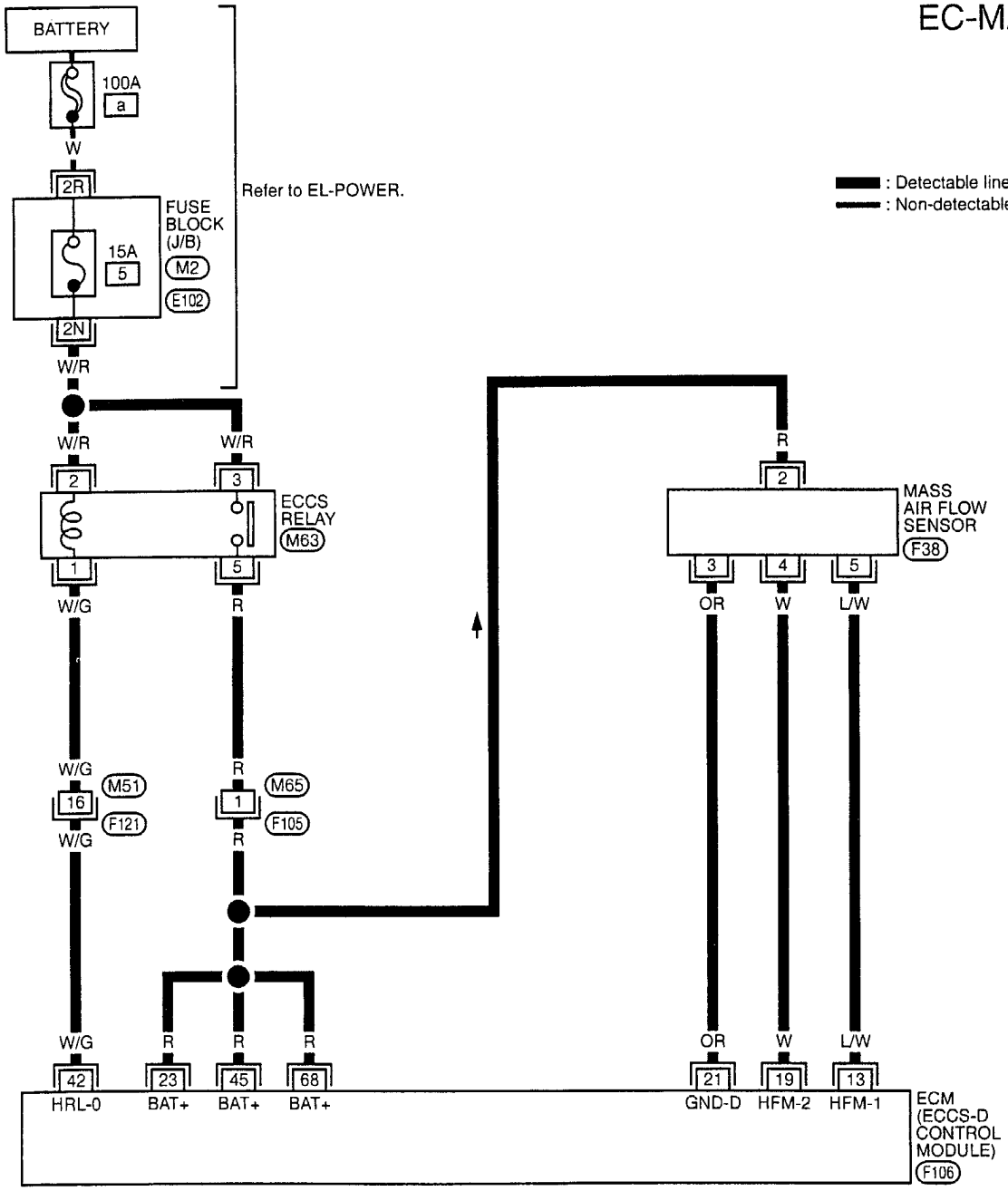
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait for at least 20 seconds.

OR

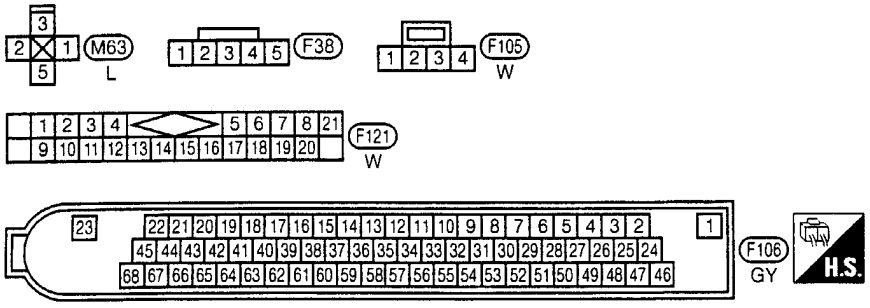
1) Start engine and wait for at least 20 seconds.
2) Turn ignition switch to "LOCK" position, wait for at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Mass Air Flow Sensor (MAFS) (Cont'd)

EC-MAFS-01



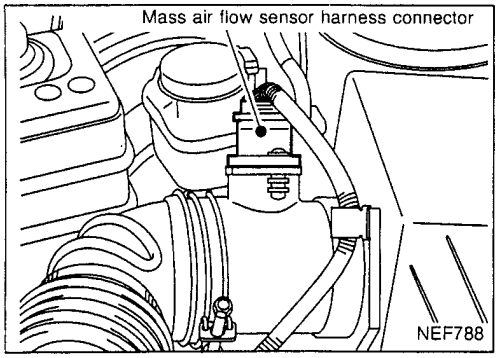
Refer to last page (Foldout page).
M2 , E102

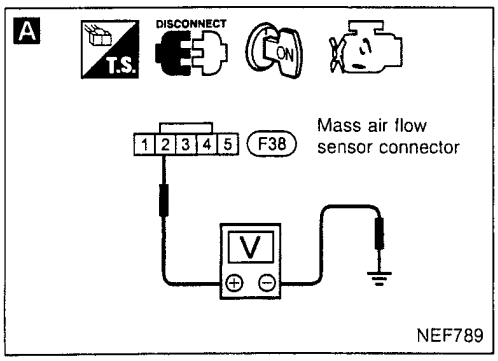


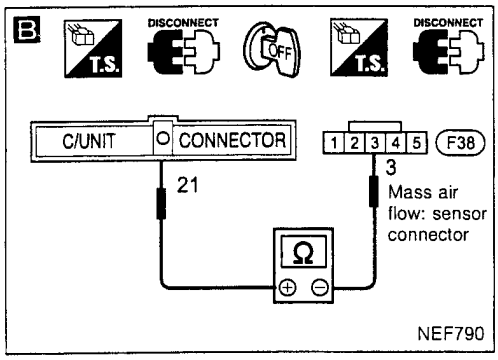
YEC026

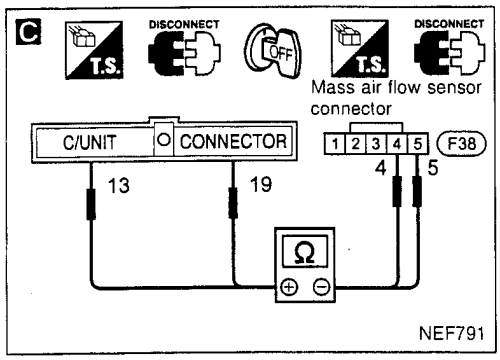
Mass Air Flow Sensor (MAFS) (Cont'd)

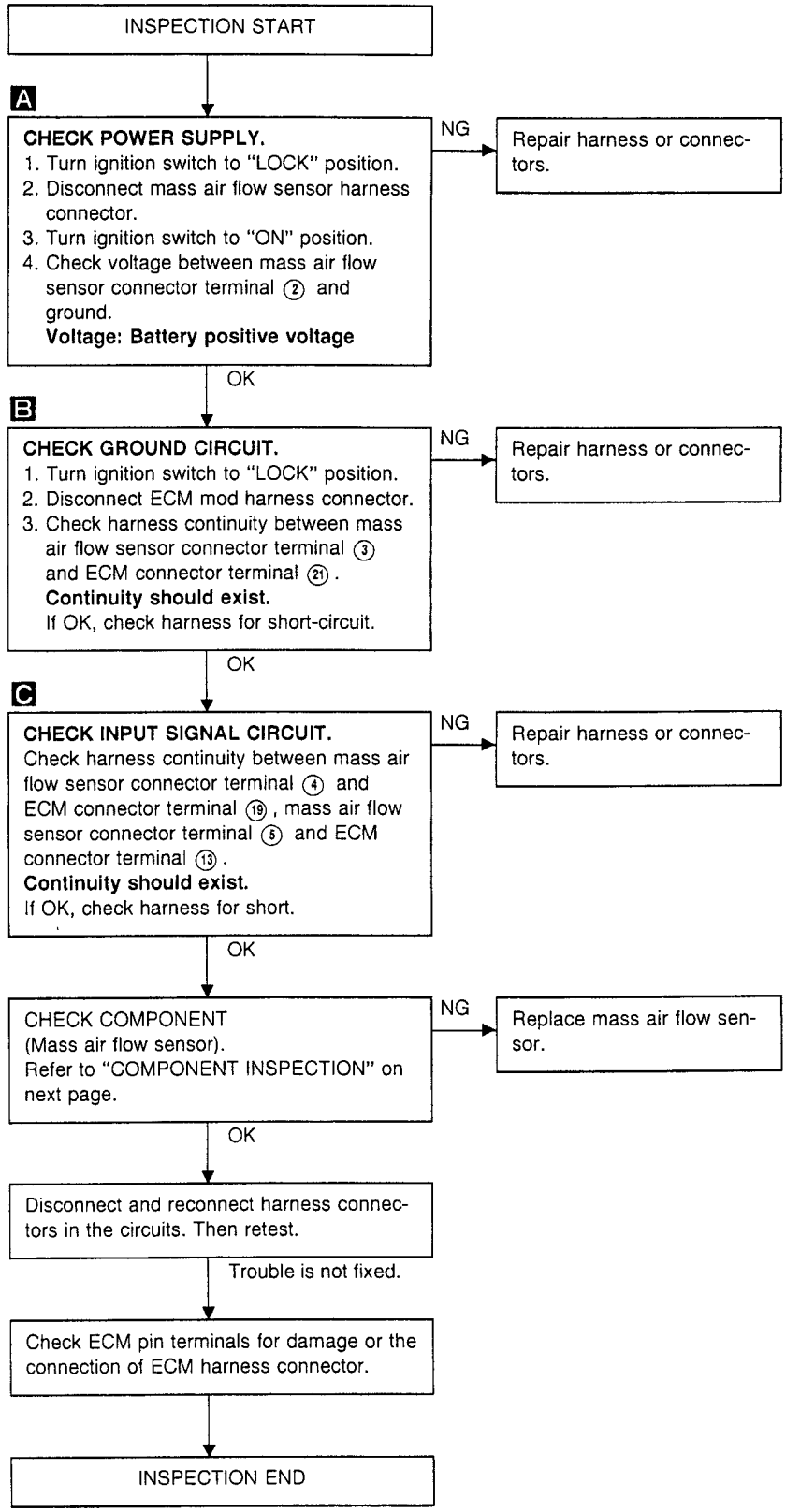
DIAGNOSTIC PROCEDURE





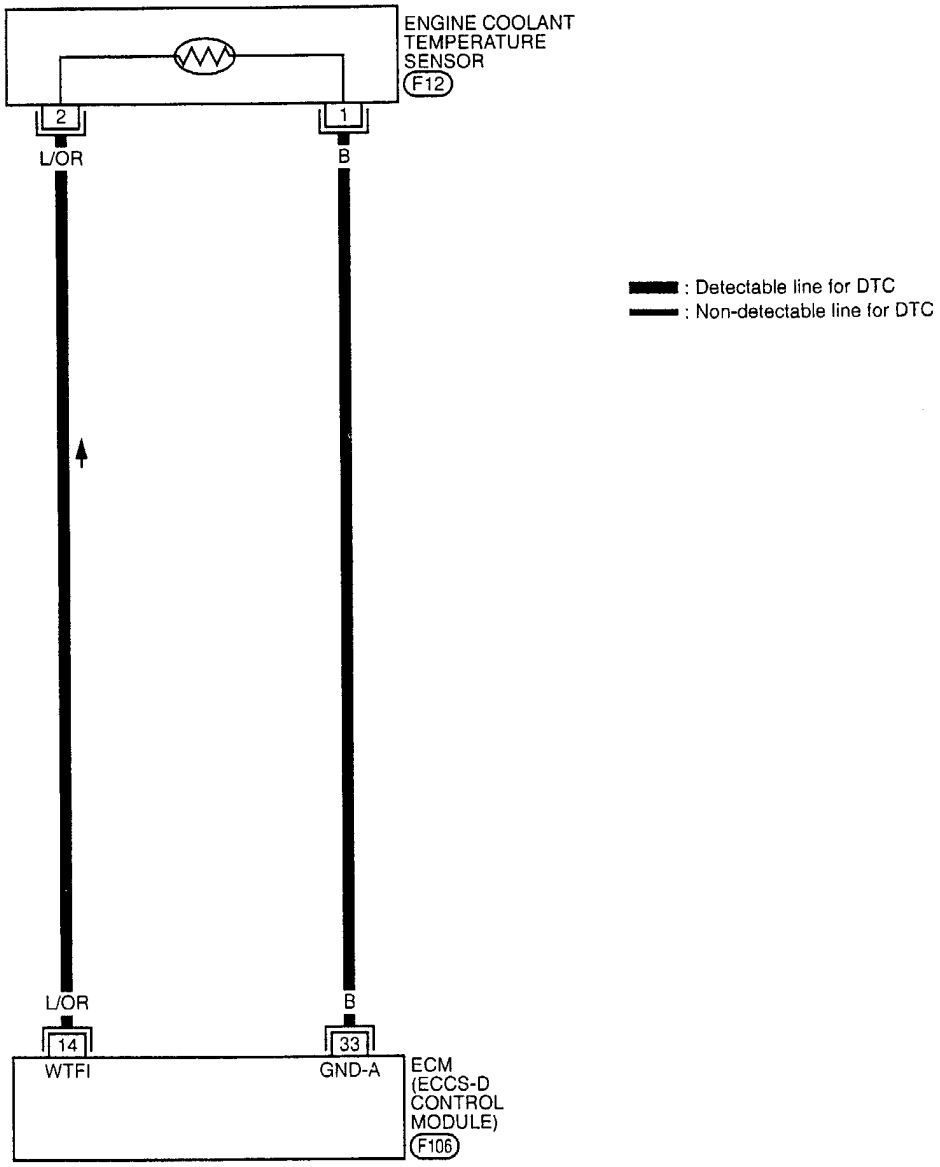


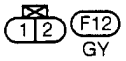


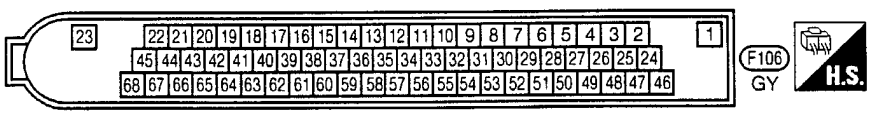


Engine Coolant Temperature (ECT) Sensor (Cont'd)

EC-ECTS-01



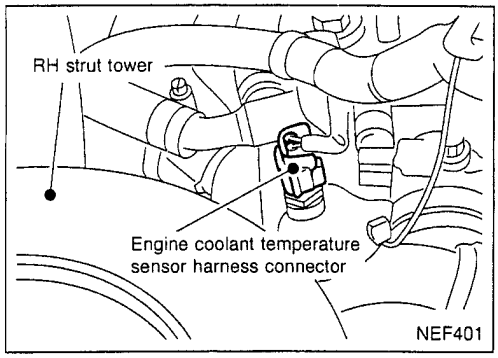


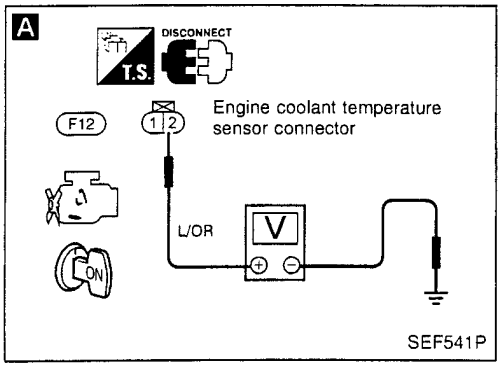


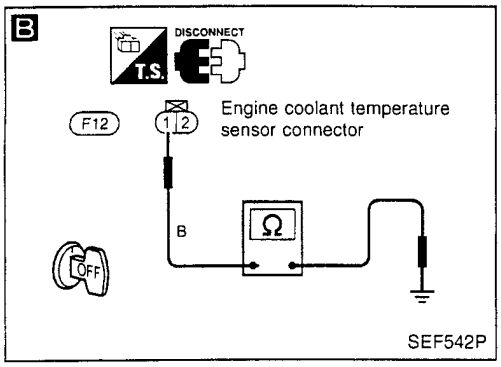
YEC027

Engine Coolant Temperature (ECT) Sensor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect engine coolant temperature sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between engine coolant temperature sensor connector terminal ② and ground with CONSULT or tester.

Voltage:
Approximately 4.9V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between engine coolant temperature sensor connector terminal ① and engine ground.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Engine coolant temperature sensor).
Refer to "COMPONENT INSPECTION"
on next page.

NG → Replace engine coolant temperature sensor.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

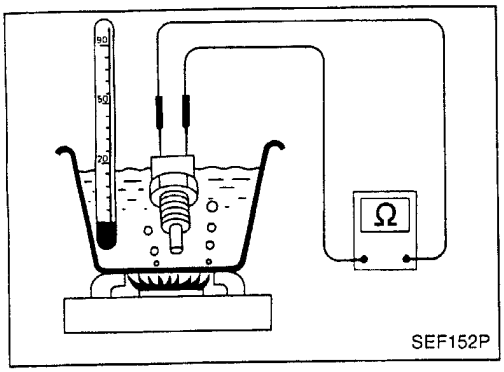
INSPECTION END

Engine Coolant Temperature (ECT) Sensor (Cont'd)

COMPONENT INSPECTION

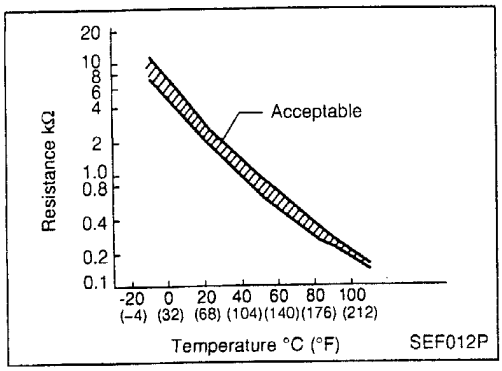
Engine coolant temperature sensor

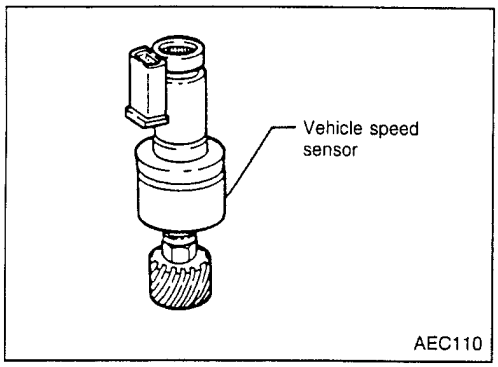
Check resistance as shown in the figure.



Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
90 (194)	0.236 - 0.260

If NG, replace engine coolant temperature sensor.

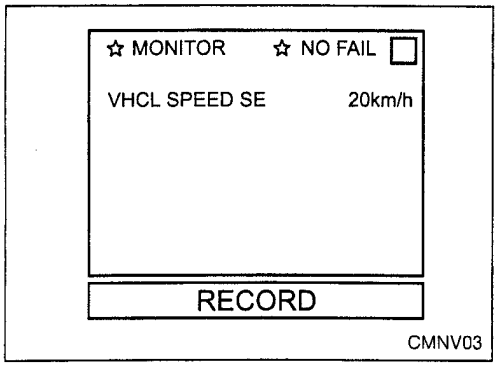




Vehicle Speed Sensor (VSS)

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
14	• The almost 0 km/h (0 mph) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	• Harness or connector (The vehicle speed sensor circuit is open or shorted.) • Vehicle speed sensor



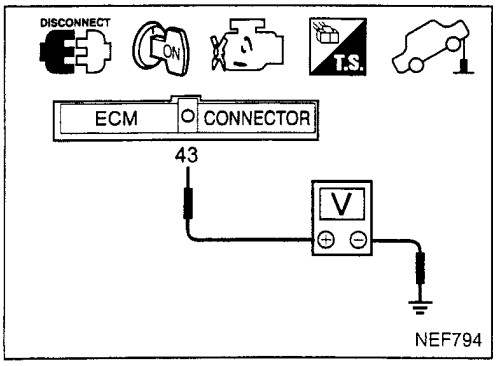
OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a DTC might not be confirmed.

1) Jack up drive wheels.
2) Start engine.
3) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.

The vehicle speed on CONSULT should be able to exceed 10 km/h (6 mph) when rotating wheels with suitable gear position.

OR



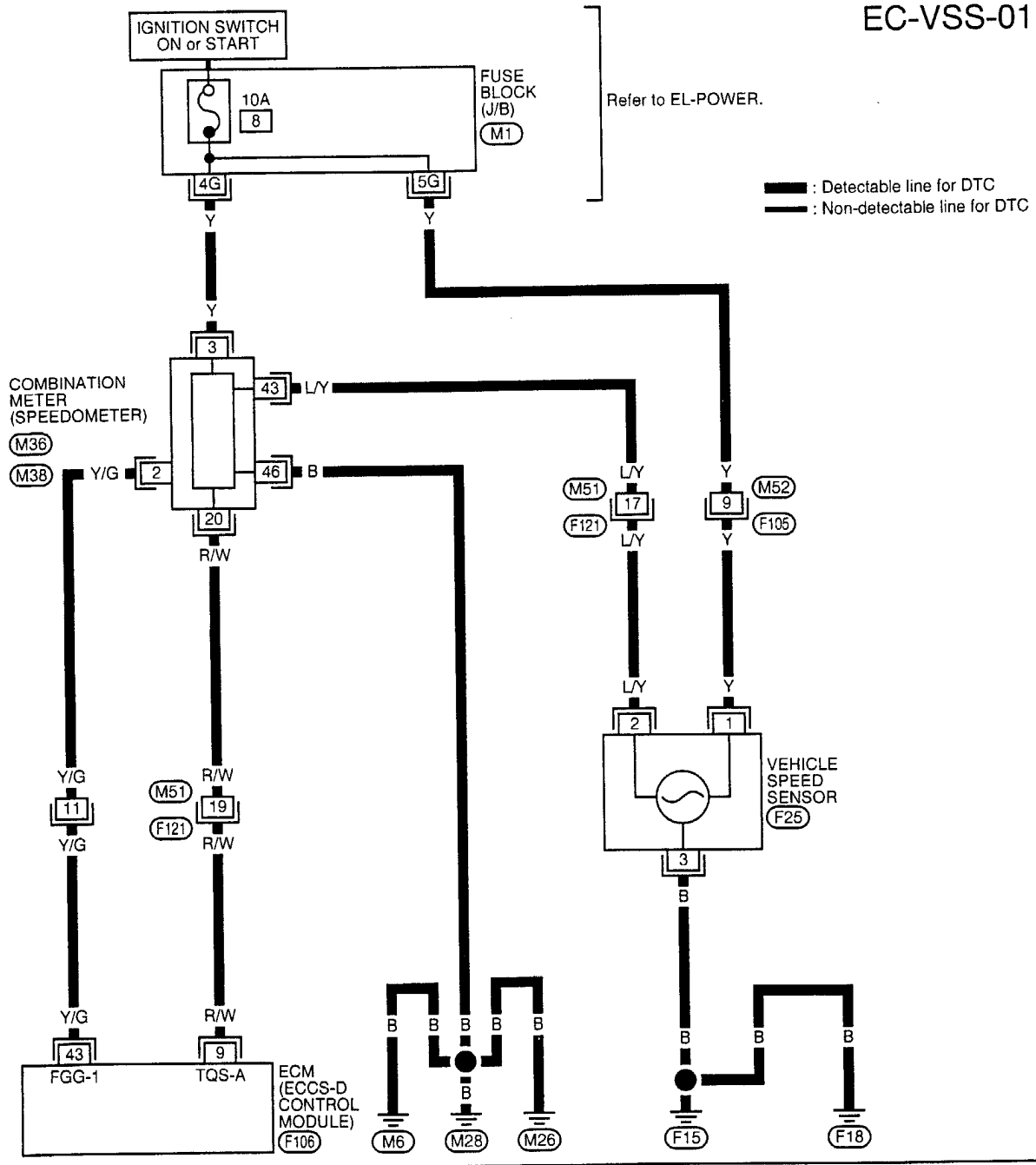
1) Jack up drive wheels.
2) Start engine.
3) Rotate drive wheel by hand.
4) Check voltage between ECM connector terminal ㊸ and ground with voltage tester.

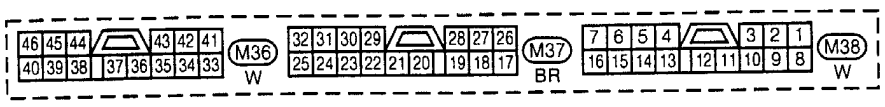
Voltage should vary between approx. 0 - 0.6V.

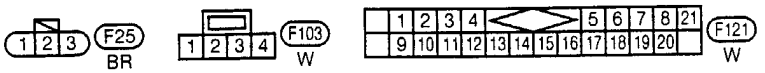
TROUBLE DIAGNOSIS FOR DTC 14

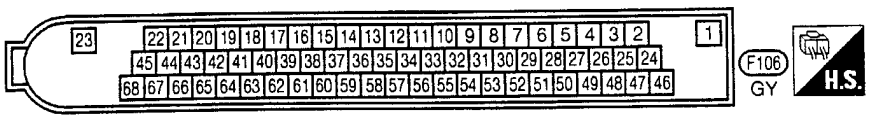
Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01









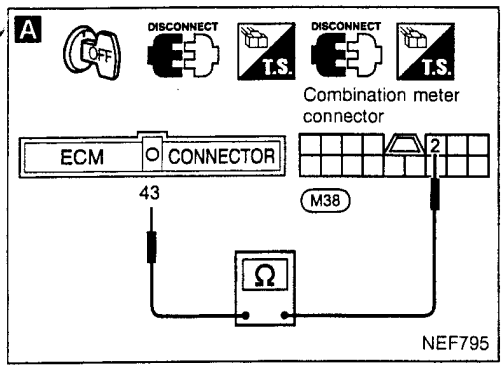
Refer to last page (Foldout page).

M1

YEC028

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM connector terminal (43) and combination meter connector terminal (2).

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M51), (F121)
- Harness for open or short-circuit between ECM and combination meter.

If NG, repair harness or connectors.

OK

CHECK SPEEDOMETER FUNCTION. Make sure that speedometer functions correctly.

NG → Check the following:
- Harness connectors (M51), (F121)
- Harness for open or short-circuit between combination meter and vehicle speed sensor.

If NG, repair harness or connectors.
Check vehicle speed sensor and its circuit. Refer to EL section.

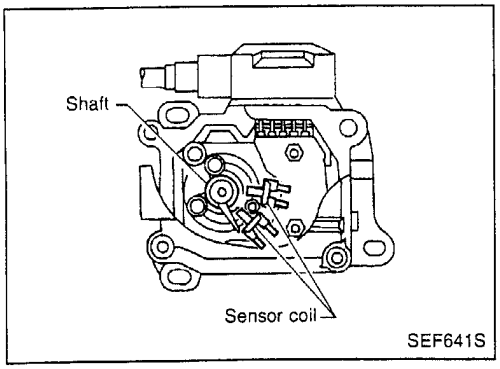
OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

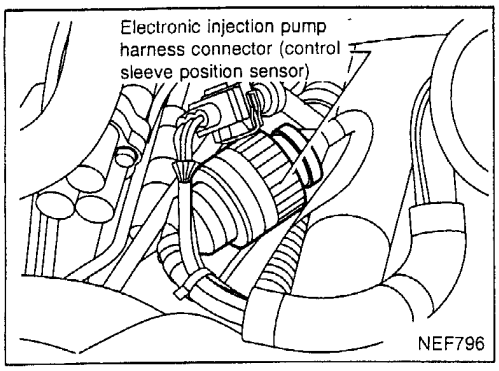
INSPECTION END



Control Sleeve Position Sensor (CSPS)

The control sleeve position sensor is installed on the electric governor. It senses the position of control sleeve (rotor angle) while the control sleeve is being driven by the electric governor, and feeds it back to the ECM.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
15	• An excessively high or low voltage from the sensor is detected by ECM. ..... • An incorrect voltage signal from the sensor is detected by ECM during engine running.	• Harness or connectors (The control sleeve position sensor circuit is open or shorted.) • Control sleeve position sensor



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

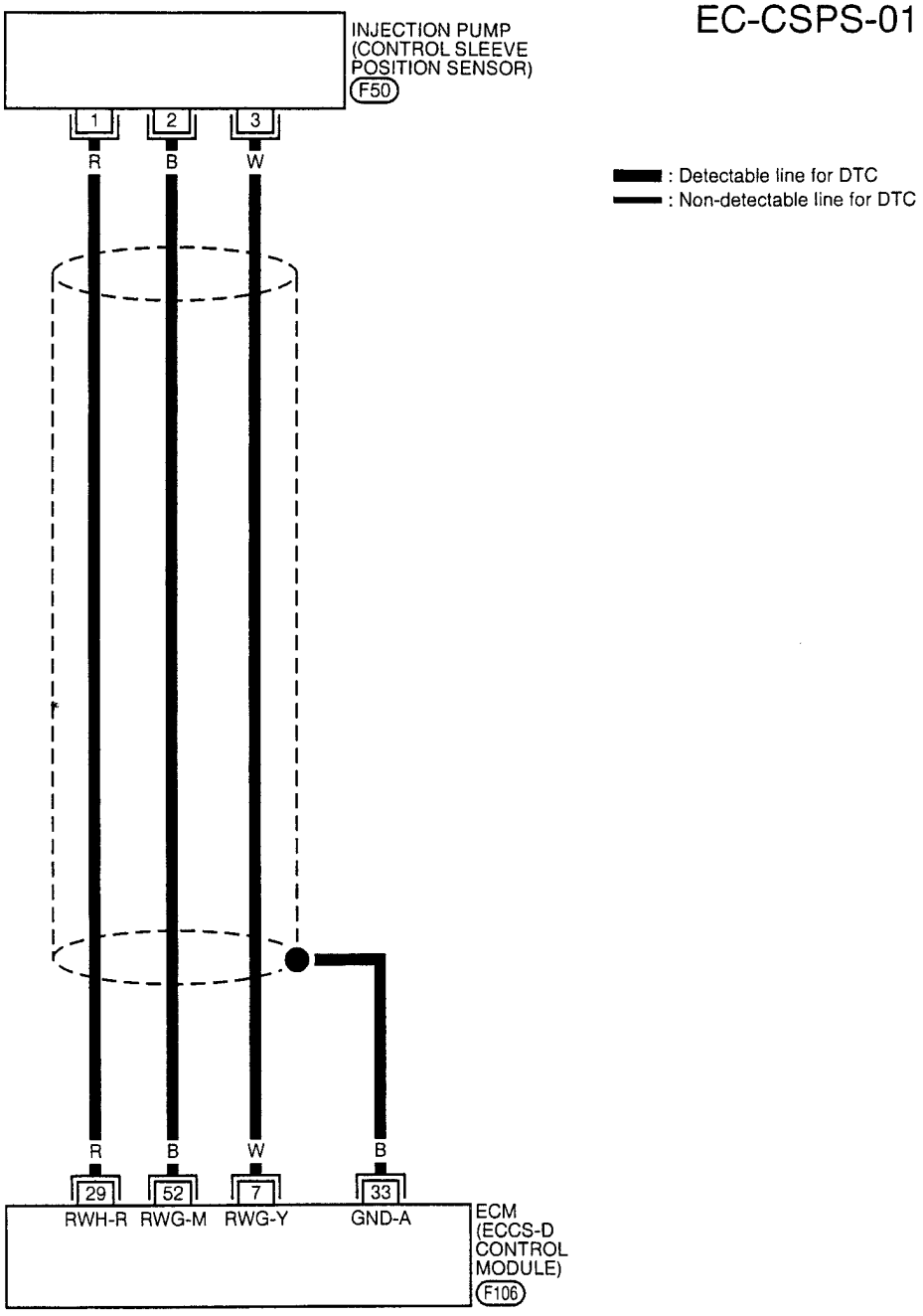
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 2 seconds at idle speed.

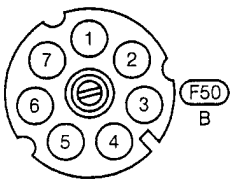
OR

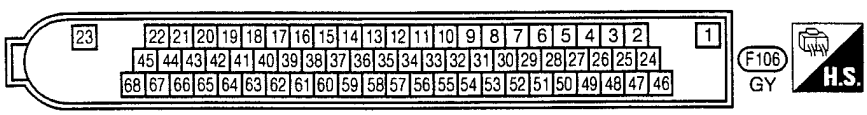
1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)".

Control Sleeve Position Sensor (CSPS) (Cont'd)

EC-CSPS-01



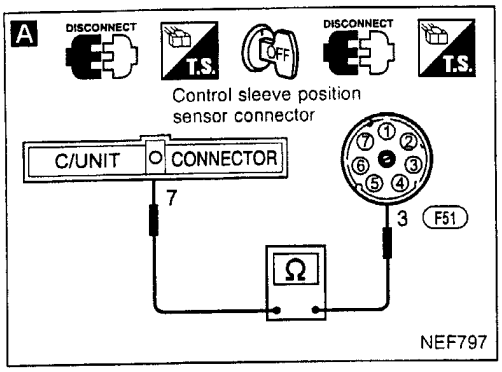


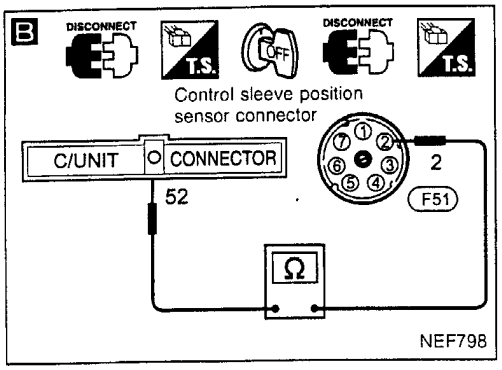


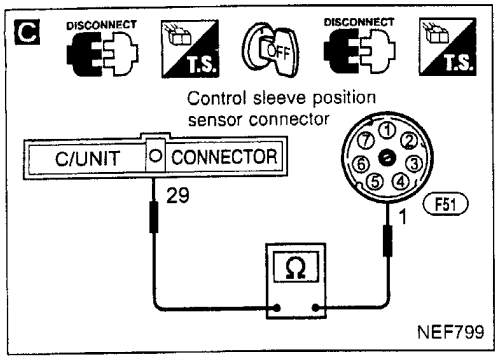
YEC029

Control Sleeve Position Sensor (CSPS) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between control sleeve position sensor connector terminal ③ and ECM connector terminal ⑦.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

B

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between control sleeve position sensor connector terminal ② and ECM terminal ⑫.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

C

CHECK REFERENCE SIGNAL CIRCUIT.
Check harness continuity between control sleeve position sensor connector terminal ① and ECM connector terminal ㉘

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Control sleeve position sensor).
Refer to "COMPONENT INSPECTION" EC-2113.

NG → Have the injection pump assembly serviced by an authorised service representative.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

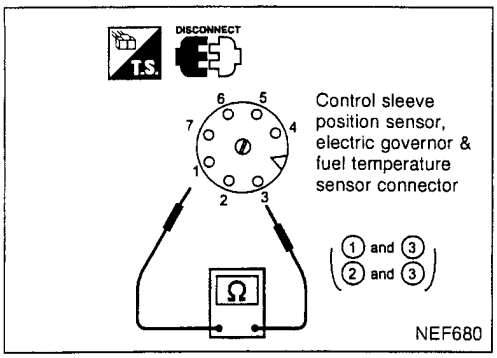
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

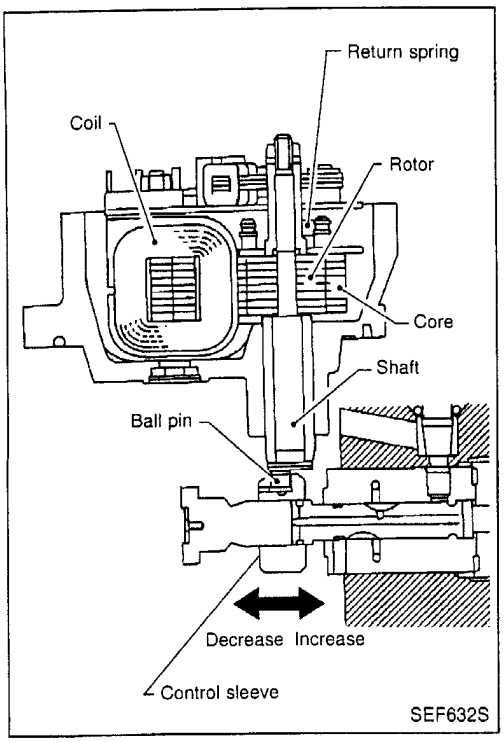
Control Sleeve Position Sensor (CSPS) (Cont'd)

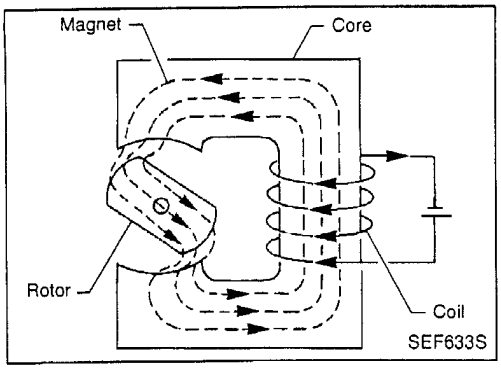
COMPONENT INSPECTION

Control sleeve position sensor



1. Disconnect electronic injection pump harness connector.
2. Check continuity between terminals ① and ③, ② and ③.
   Resistance: Approximately 6.0Ω [at 25°C (77°F)]
   If NG, take proper action.





Electric Governor

The electric governor is built into the fuel injection pump. It moves the control sleeve to increase or decrease the amount of fuel injected.

When current flows through the coil, a magnetic force is produced, rotating the rotor. The rotor shaft is installed to the control sleeve via a ball pin which is eccentrically situated in relation to the rotor shaft. With this arrangement, the control sleeve can be moved in relation to rotor rotation.

The rotor's rotating angle is determined by a balanced condition of magnetic force (generated by current flow regulated by means of the ECM) and tension of return spring (installed to rotor). The larger the current flow through the coil, the greater the rotor's rotating angle. This means that the control sleeve moves to the right, increasing the amount of fuel injected.

The ECM regulates the current flow through the coil by changing the duty cycle ratio which controls the ON-OFF operation of the electric governor grounding circuit.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
18	• Fuel injection feedback system does not operate properly. [This system consists essentially of ECM, electric governor and control sleeve position sensor.]	• Main power supply circuit (ECM connector terminals ㉓, ㊺), ㊽ and fuse • Harness or connectors (Electric governor and control sleeve position sensor circuit) • Electric governor • ECM

Electric Governor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine above 1,200 rpm.
3) Run it for 2 seconds above 1,200 rpm. Return engine speed to idle.

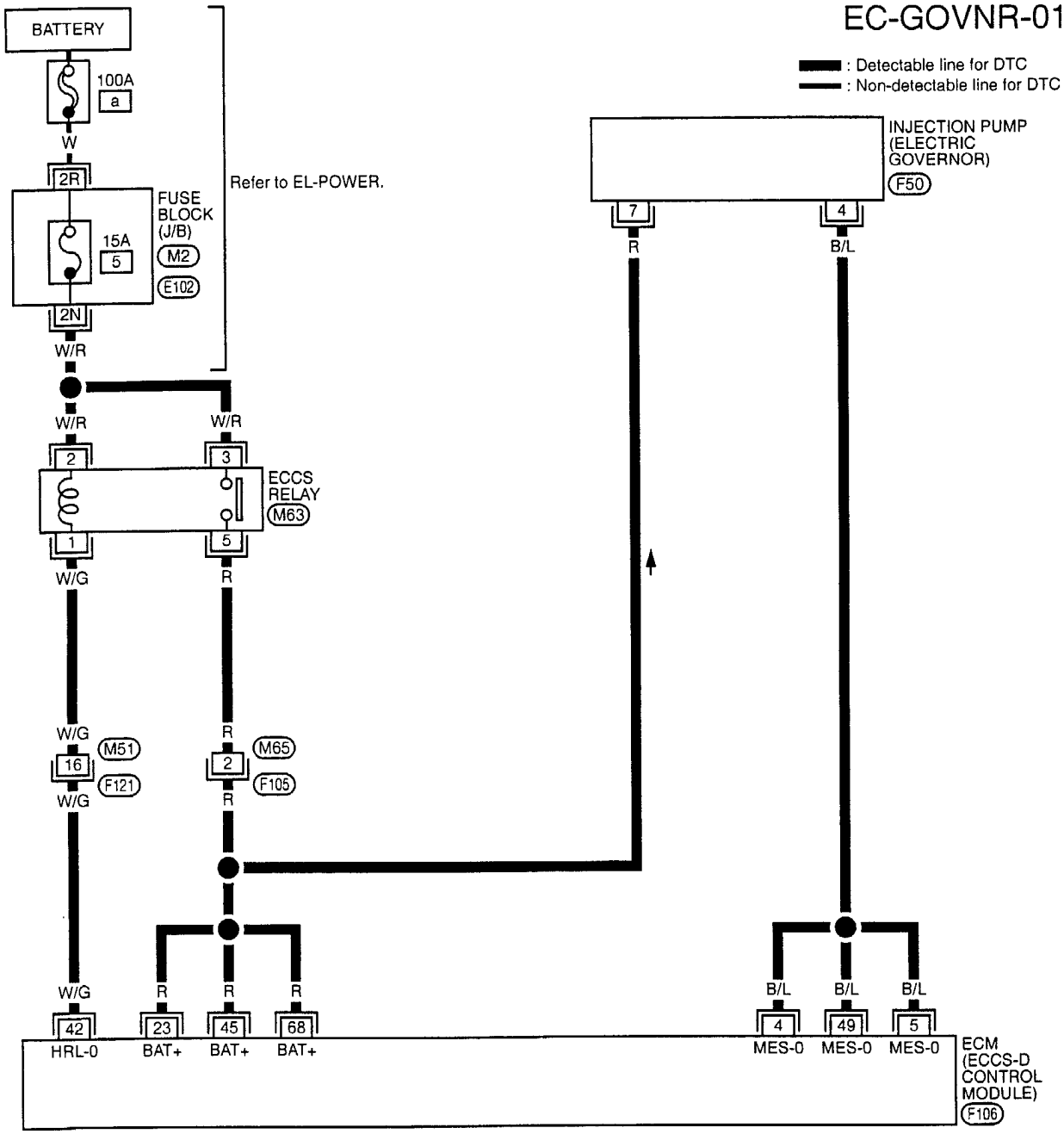
OR

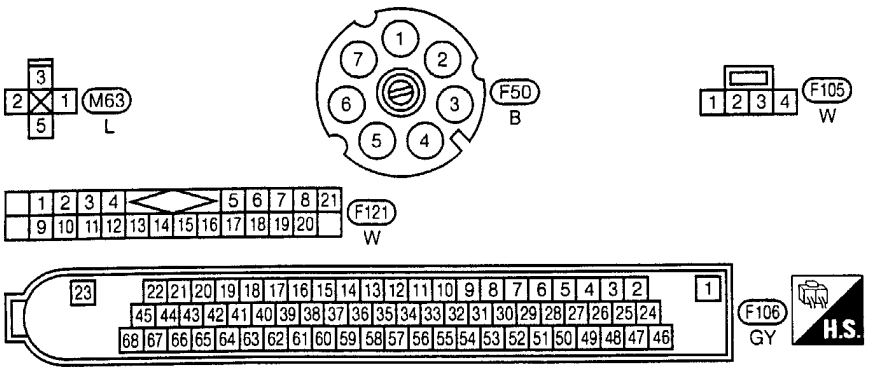
1) Start engine above 1,200 rpm.
2) Run engine for 2 seconds above 1,200 rpm. Return engine speed to idle.
3) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Note: If malfunction occurs intermittently, conduct suitable driving pattern for 10 minutes. This makes it possible to determine DTC.

Electric Governor (Cont'd)

EC-GOVNR-01





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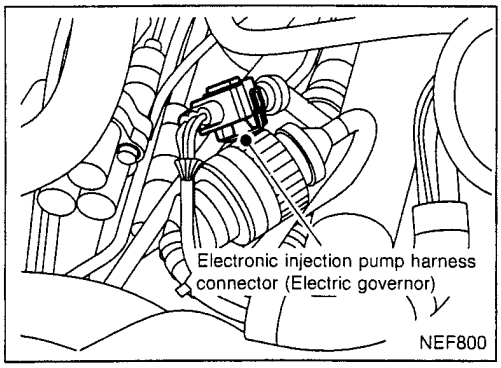
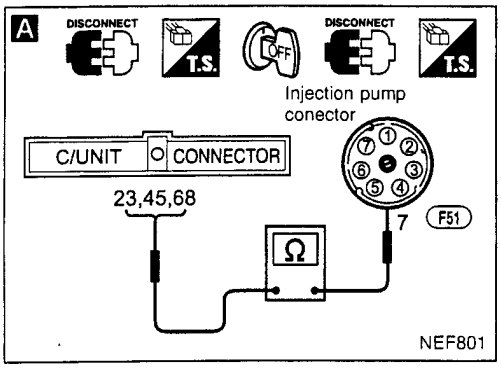
M2 , E102

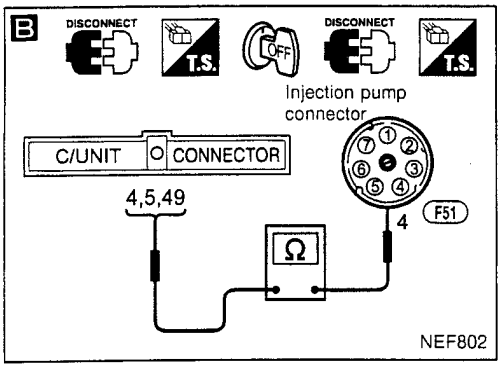
YEC030

Electric Governor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

CHECK MAIN POWER SUPPLY.
Refer to EC-2096.

↓

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between injection pump connector terminal ⑦ and ECM connector terminals ㉓, ㊺, ㊽.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

↓ OK

B

CHECK GROUND CIRCUIT.
Check harness continuity between injection pump connector terminal ④ and ECM connector terminals ④, ⑤, ㊾.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

↓ OK

CHECK COMPONENT
(Electric governor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Have the injection pump assembly serviced by an authorised service representative.

↓ 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.

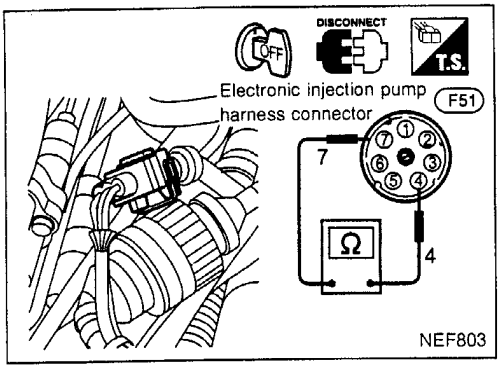
↓

INSPECTION END

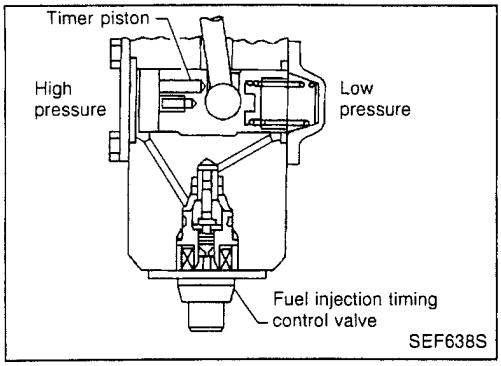
Electric Governor (Cont'd)

COMPONENT INSPECTION

Electric governor



1. Disconnect electronic injection pump harness connector.
2. Check continuity between injection pump connector terminals ④ and ⑦.
   Resistance: Approximately 1.0Ω [at 25°C (77°F)]
   If NG, replace.



Injection Timing Control Valve

The injection timing control valve is built into the fuel injection pump. It controls the timer piston to change the fuel injection timing.
The timing control valve is a solenoid valve located in the line between high-pressure chamber and low-pressure chamber. It changes fuel pressure in the high-pressure chamber.
When current flows through the solenoid (the solenoid turns ON), the timing control valve opens, advancing fuel injection timing. When current does not flow through it, the timing control valve closes, retarding injection timing.
The ECM emits an ON-OFF duty cycle signal. The longer the OFF-duration, the greater the advance angle. The longer the ON-duration, the greater the retard angle. This means that changing the ON-OFF duty cycle ratio makes it possible to achieve an optimal advance angle and accurately control fuel injection timing.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
21	• Injection timing feedback system does not operate properly. (This system consists essentially of ECM, injection timing control valve and needle lift sensor.)	• Harness or connectors [Injection timing control valve, needle lift sensor, crankshaft position sensor (TDC) circuits] • Injection timing control valve • Needle lift sensor • Crankshaft position sensor (TDC) • Air in fuel line
94	• Injection timing control valve circuit it open or shorted.	• Harness or connectors (The Injection timing control valve is open or shorted.) • Injection timing control valve

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC 21 and 34 or 47 are displayed, perform TROUBLE DIAGNOSIS FOR DTC 34 or 47. (See EC-2133 or EC-2151.)

1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine. Run engine for 10 seconds at idle.

OR

1) Start engine. Run engine for 10 seconds at idle.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Note: If malfunction occurs intermittently, conduct suitable driving pattern for 10 minutes. This makes it possible to determine DTC.

Injection Timing Control Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE 94 CONFIRMATION PROCEDURE

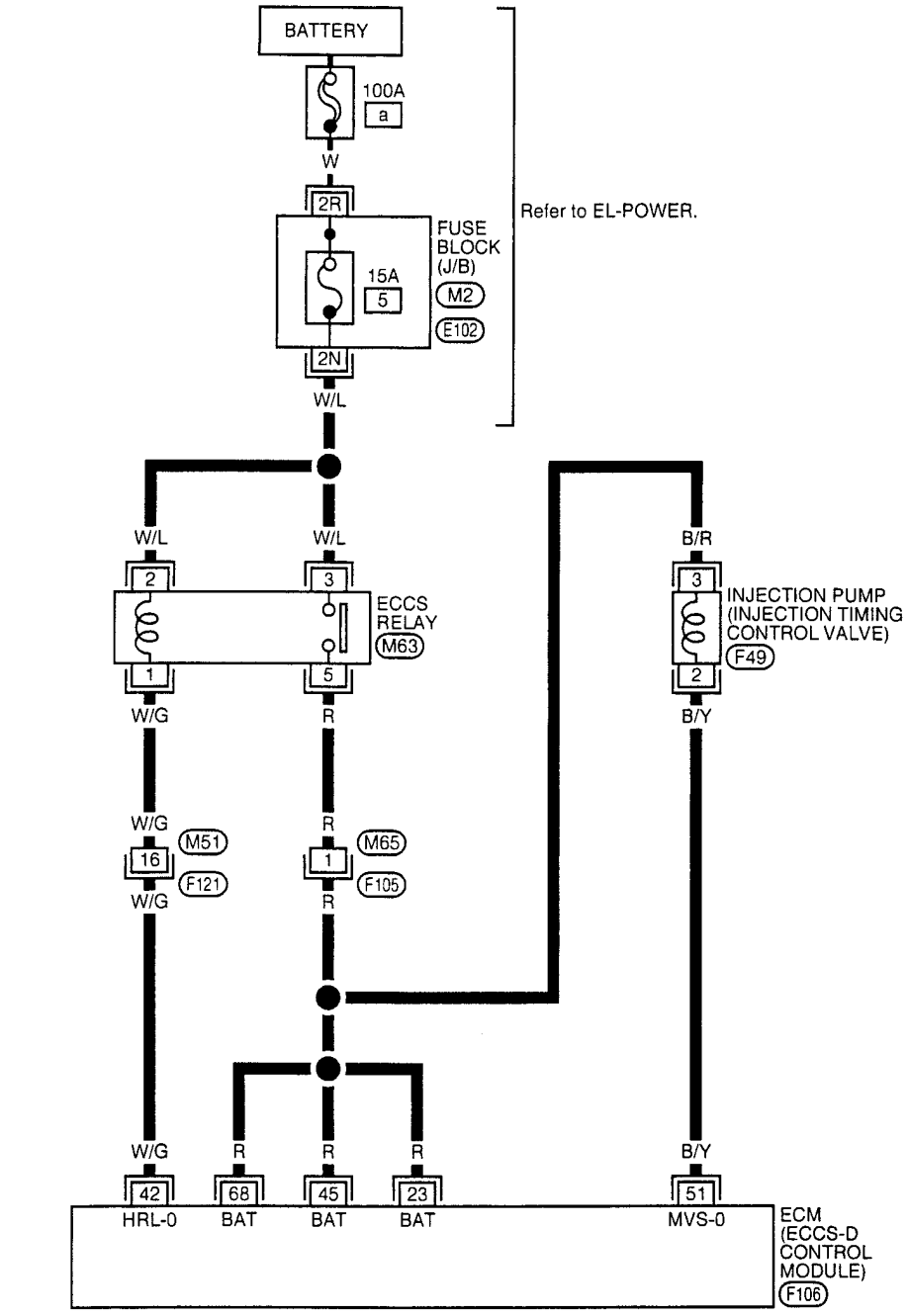
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

OR

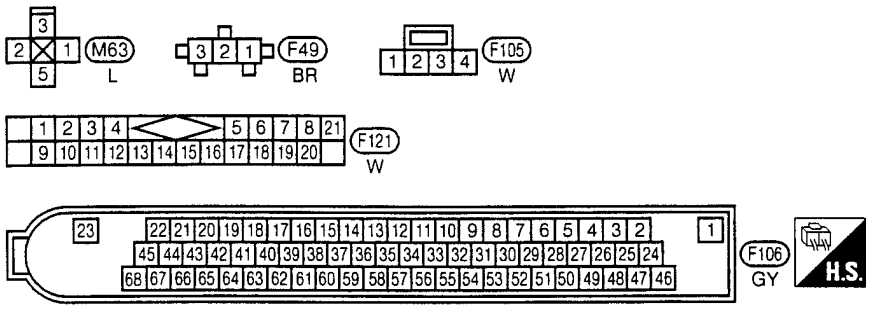
1) Turn ignition switch to "ON" position.
2) Wait at least 2 seconds.
3) Turn ignition switch to "LOCK" position, wait at least 5 seconds and turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Injection Timing Control Valve (Cont'd)

EC-TCV-01



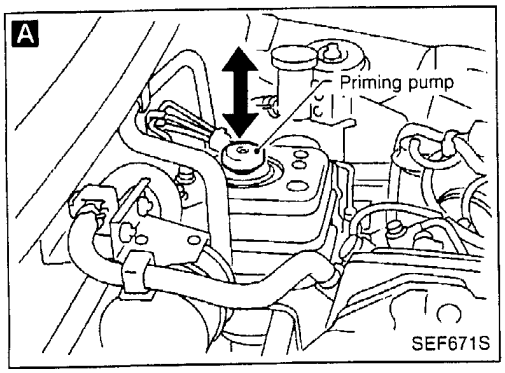
Refer to last page (Foldout page).
M2 , E102

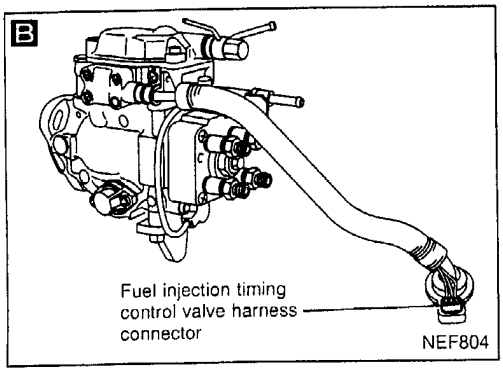


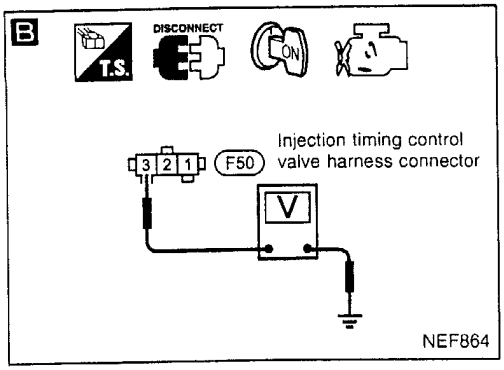
YEC031

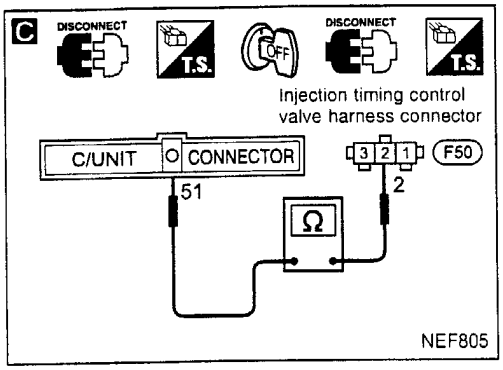
Injection Timing Control Valve (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK FOR AIR IN FUEL FILTER.

1. Move priming pump up and down to purge air from fuel filter.
2. Perform "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".

B

CHECK POWER SUPPLY.

1. Turn ignition switch to "LOCK" position.
2. Disconnect injection timing control valve harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between injection timing control valve connector terminal ③ and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following:
- Harness connectors M65, F105
- Electronic injection pump harness connector F49
- 10A fuse
- Harness for open or short-circuit between injection timing control valve harness connector and ECCS relay.

If NG, repair harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between injection timing control valve connector terminal ② and ECM terminals ㊶.

Continuity should exist.

If OK, check harness for short-circuit.

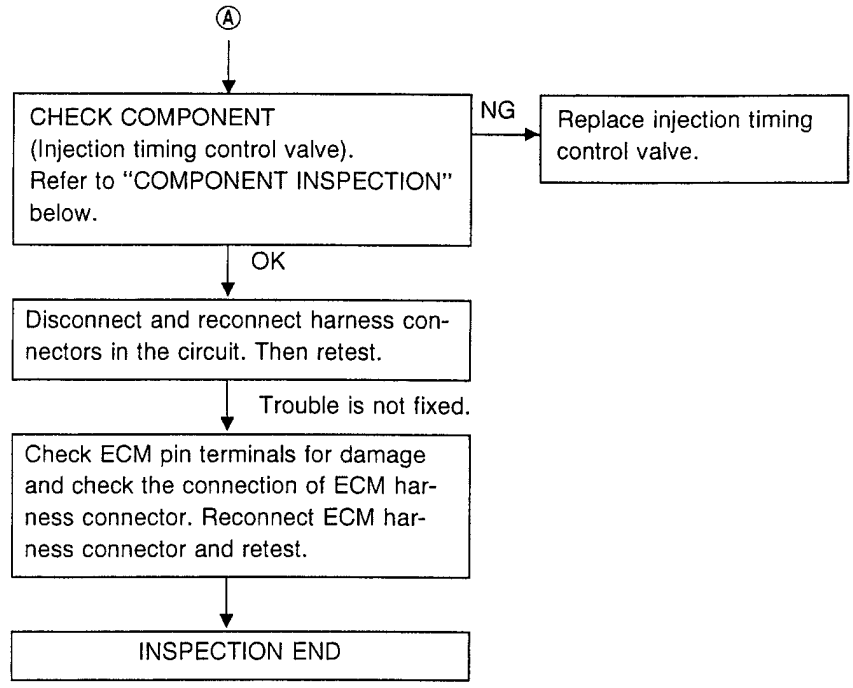
NG → Check the following:
- Electronic injection pump harness connector F49
- Harness for open or short-circuit between injection timing control valve and ECM.

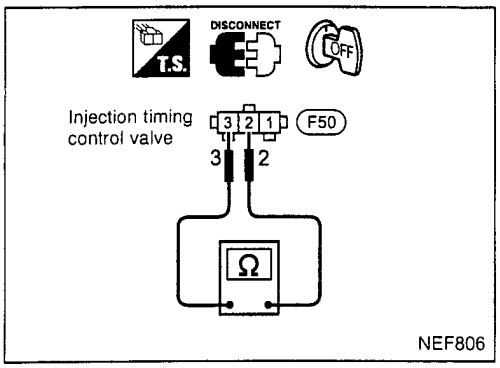
If NG, repair harness or connectors.

OK

Ⓐ

Injection Timing Control Valve (Cont'd)

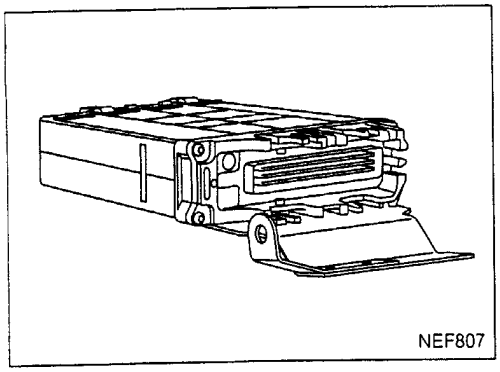




COMPONENT INSPECTION

Injection timing control valve

1. Disconnect injection timing control valve harness connector.
2. Check resistance between terminals ② and ③.
   Resistance: Approximately 15Ω [at 25°C (77°F)]
   If NG, replace injection timing control valve.


NEF807

Engine Control Module (ECM)

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The module monitors and controls the engine operation.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Item (Possible Cause)
31	• ECM calculation function is malfunctioning.	• ECM *
82	• An excessively high or low voltage from the atmospheric pressure sensor is detected by the ECM.	• ECM *
84	• ECM reference voltage (2.5V) is excessively high or low.	• ECM *
91	• ECM version number or switching function is not plausible.	• ECM *
93	• Ignition switch "ON" signal evaluation circuit in ECM is malfunctioning.	• ECM *

* Actually inspecting the ECM inside circuit is impossible. Then, ECM may be replaced.

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

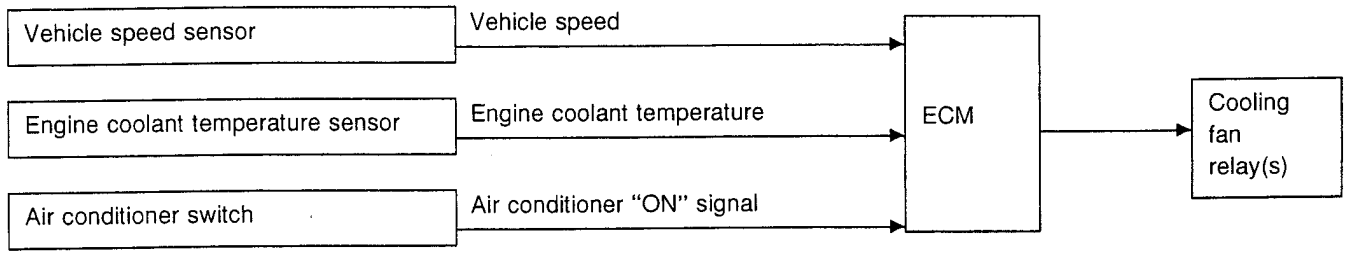
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

— OR —

1) Turn ignition switch to "ON" position.
2) Wait at least 2 seconds.
3) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

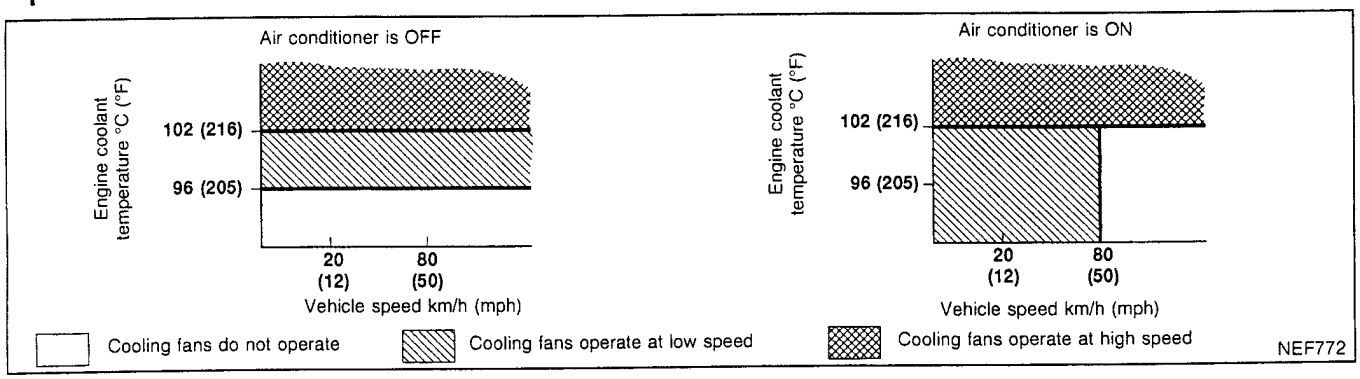
Cooling Fan (Overheat)

SYSTEM DESCRIPTION



The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, air conditioner system pressure and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF]. This system indirectly relates to diagnostic trouble code 28 (Overheat).

Operation



ON-BOARD DIAGNOSIS LOGIC

This diagnosis continuously monitors the engine coolant temperature.
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
28	• An excessive high engine coolant temperature sensor signal is detected by the ECM. (Overheat)	• Harness or connectors (The cooling fan circuit is open or shorted.) • Cooling fan • Radiator hose • Radiator • Radiator cap • Water pump • Thermostat • Fan belt • Engine coolant temperature sensor For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-397.

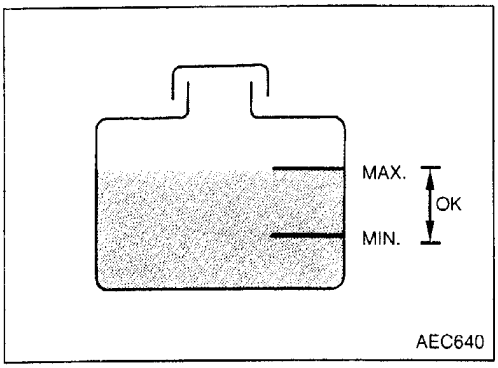
CAUTION:
When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.

a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").

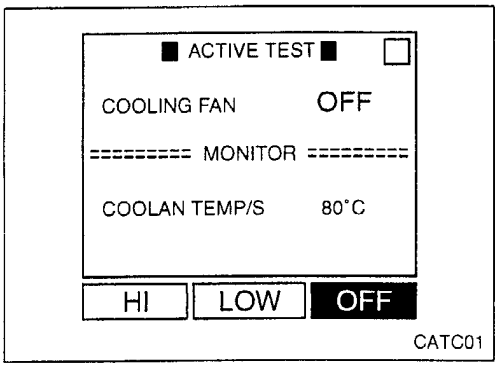
b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

Cooling Fan (Overheat) (Cont'd)

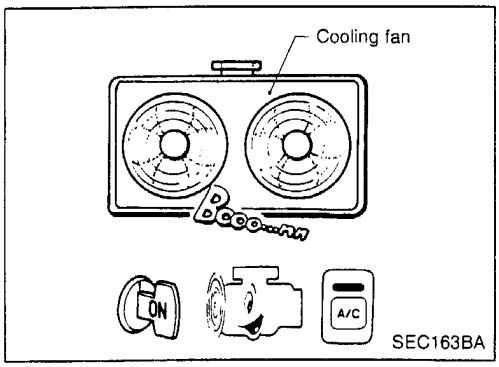
OVERALL FUNCTION CHECK



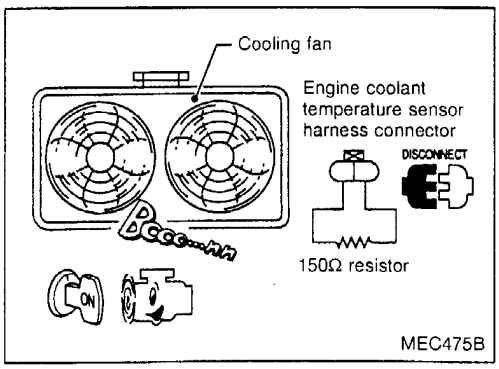
AEC640



CATC01



SEC163BA



MEC475B

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around the cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-2128.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-2128.

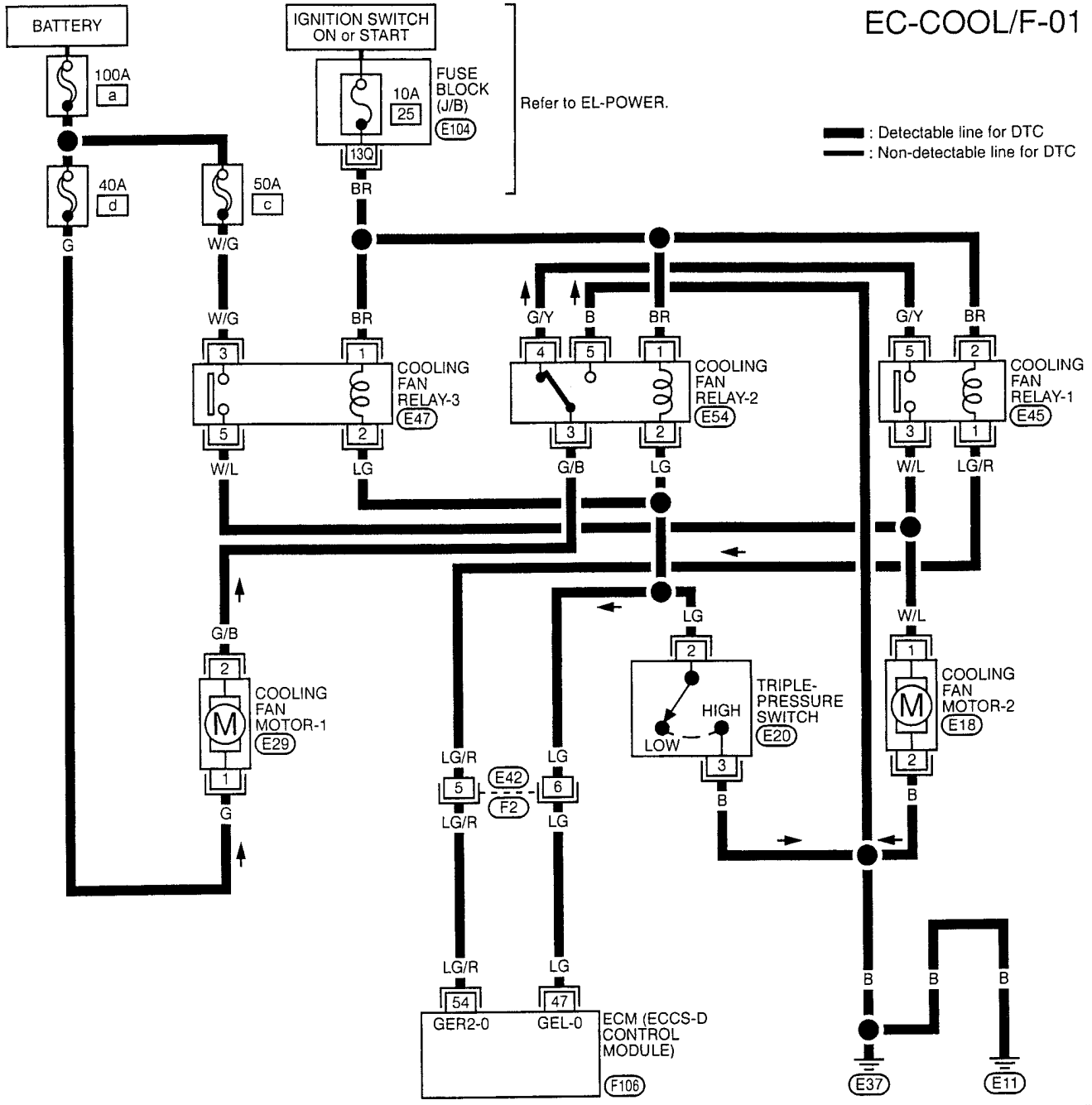
3) Turn ignition switch to "ON" position.
4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT (LOW speed and HI speed).

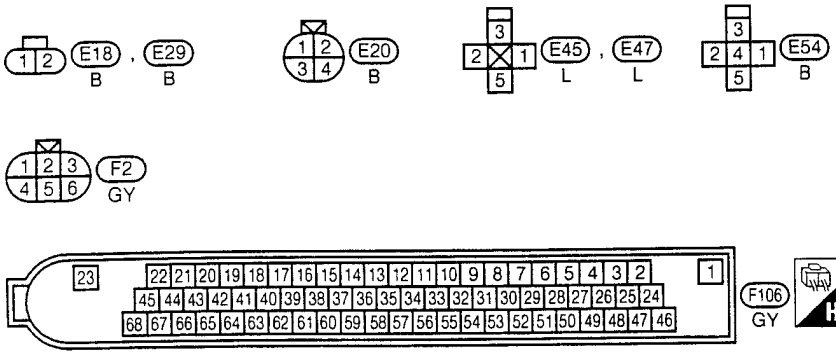
OR

3) Start engine.
   Be careful not to overheat engine.
4) Set temperature control lever to full cold position.
5) Push Air Conditioner switch to "ON" position.
6) Turn blower fan switch to "ON" position.
7) Run engine at idle for a few minutes with Air Conditioner operating.
   Be careful not to overheat engine.
8) Make sure that both cooling fans operate at low speed.
9) Turn ignition switch to "LOCK" position.
10) Push Air Conditioner switch and blower fan switch to "OFF" position.
11) Disconnect engine coolant temperature sensor harness connector.
12) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
13) Restart engine and make sure that both cooling fans operate at higher speed than low speed.
    Be careful not to overheat engine.

Cooling Fan (Overheat) (Cont'd)

EC-COOL/F-01



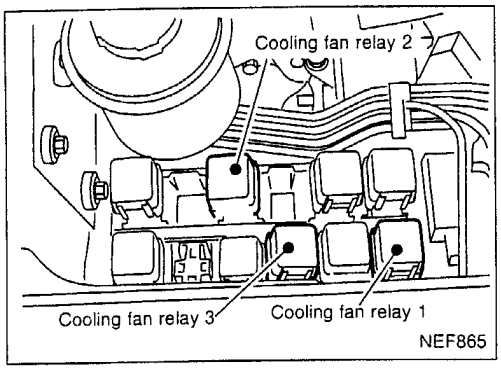


Refer to last page (Foldout page).
E104

YEC106

Cooling Fan (Overheat) (Cont'd)

DIAGNOSTIC PROCEDURE



NEF865

INSPECTION START

A

CHECK COOLING FAN LOW SPEED OPERATION.

1. Disconnect cooling fan relay-3.
2. Turn ignition switch to "ON" position.
3. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

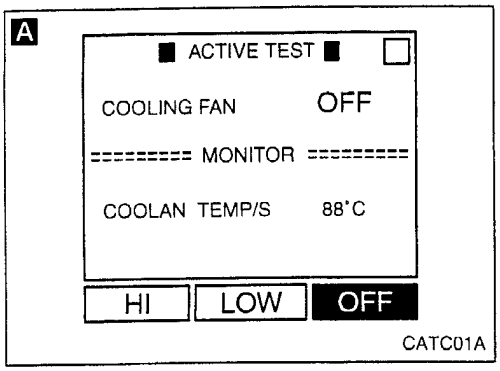
OR

2. Start engine.
3. Set temperature lever at full cold position.
4. Turn Air Conditioner switch to "ON" position.
5. Turn blower fan switch to "ON" position.
6. Run engine at idle speed for a few minutes with Air Conditioner operating.
7. Make sure that both cooling fans operate at low speed.

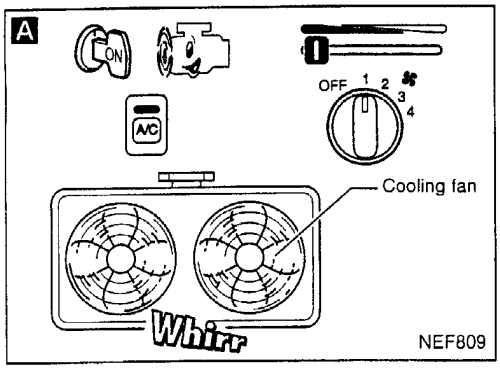
NG → Check cooling fan low speed control circuit. (Go to PROCEDURE A .)

OK

A



CATC01A



NEF809

B

CHECK COOLING FAN HIGH SPEED OPERATION.

1. Turn ignition switch to "LOCK" position.
2. Reconnect cooling fan relay-3.
3. Disconnect cooling fan relay-1.
4. Turn ignition switch to "ON" position.
5. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

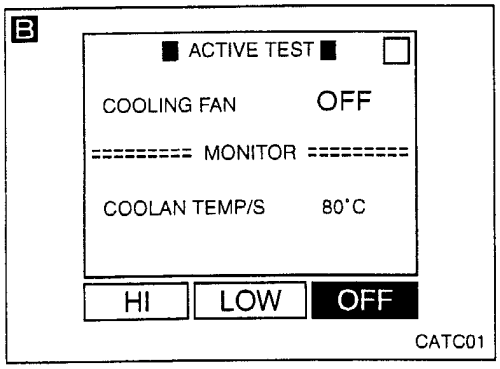
4. Turn Air Conditioner switch and blower fan switch to "OFF" position.
5. Disconnect engine coolant temperature sensor harness connector.
6. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
7. Restart engine and make sure that both cooling fans operate at higher speed than low speed.

NG → Check cooling fan high speed control circuit. (Go to PROCEDURE B .)

OK

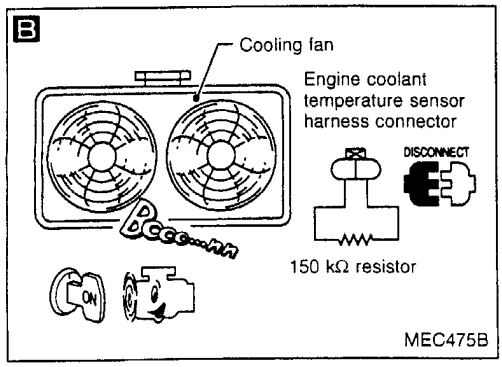
Ⓑ
(Go to EC-396.)

B



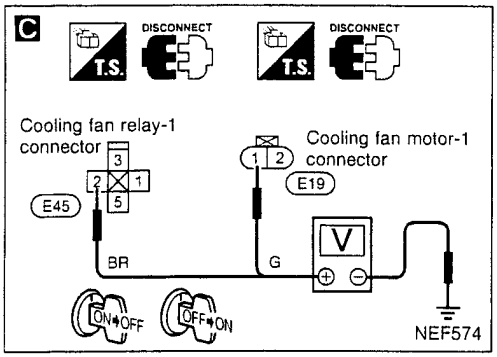
CATC01

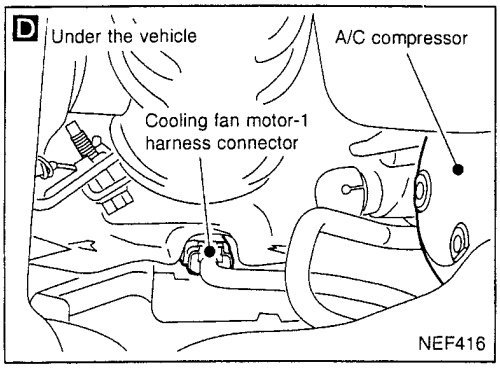
B

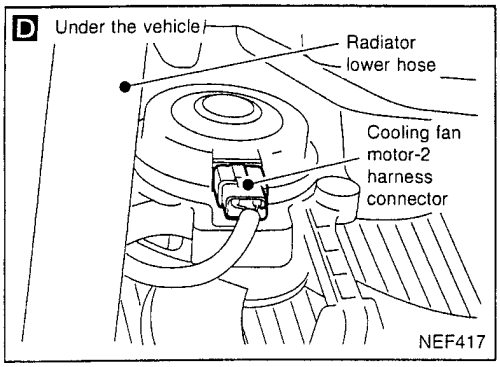


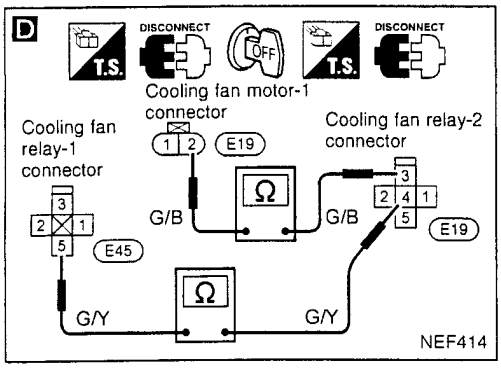
MEC475B

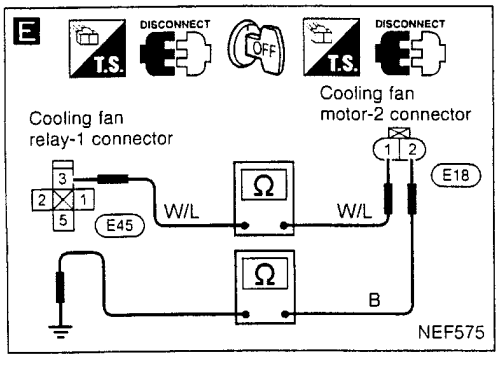
Cooling Fan (Overheat) (Cont'd)











PROCEDURE A

INSPECTION START

C

CHECK POWER SUPPLY.

1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan relay-1 and fan motor-1 connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between cooling fan motor-1 connector terminal ①, fan relay-1 connector terminal ② and ground.

Voltage: Battery voltage

NG → Check the following:
- 10A fuse
- 40A, 100A, fusible links
- Harness for open or short-circuit between cooling fan motor-1 and battery.
- Harness for open or short-circuit between cooling fan relay-1 and fuse.

If NG, replace fuse or fusible links or repair harness or connectors.

OK

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan relay-2 harness connector.

D 3. Check harness continuity between cooling fan relay-1 connector terminal ⑤ and cooling fan relay-2 connector terminal ④; cooling fan motor-1 connector terminal ② and cooling fan relay-2 connector terminal ③.

Continuity should exist.

If OK, check harness for short-circuit.

E 4. Check harness continuity between cooling fan motor-2 connector terminal ① and cooling fan relay-1 connector terminal ③. **Continuity should exist.**

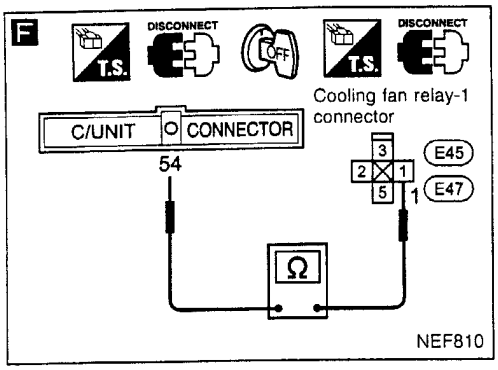
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

Ⓒ

Cooling Fan (Overheat) (Cont'd)



Ⓒ

F

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (54) and cooling fan relay-1 connector terminal ①.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (E42), (F2)
- Harness for open or short-circuit between cooling fan relay-2 and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-1, 2).
Refer to "COMPONENT INSPECTION", EC-2132.

NG → Replace cooling fan relay.

OK ↓

CHECK COMPONENT
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-2132.

NG → Replace cooling fan motors.

OK ↓

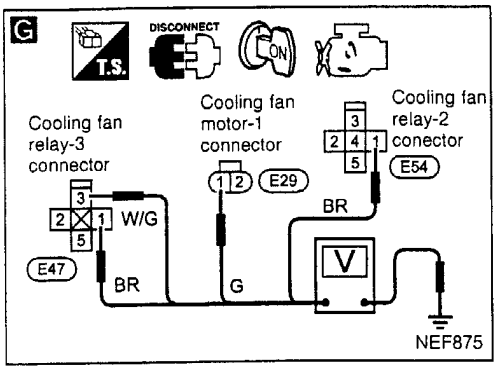
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END



PROCEDURE B

INSPECTION START ↓

G

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan relay-2, 3 and cooling fan motor-1.
3. Turn ignition switch to "ON" position.
4. Check voltage between cooling fan motor-1 connector terminal ①; cooling fan relay-2 connector terminal ①; cooling fan relay-3 connector terminals ① & ③ and ground.
   Voltage: Battery voltage

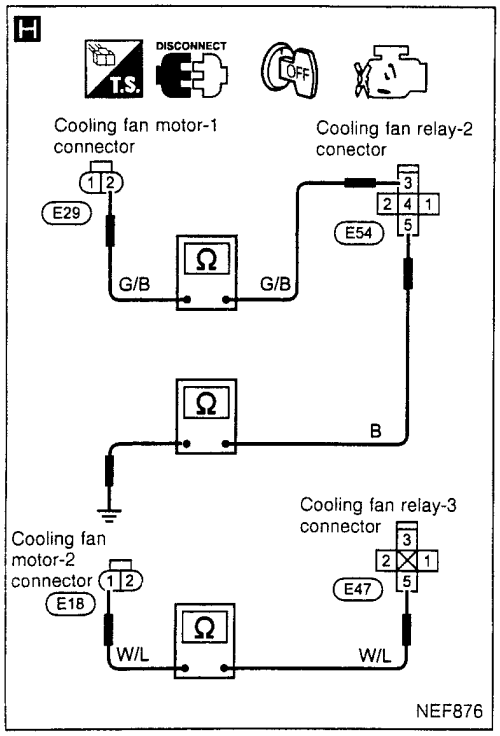
NG → Check the following:
- 10A-fuse
- 40A, 100A fusible links
- Harness for open or short between fan motor-1 and fusible link or fan relay-2, 3 and fuse.

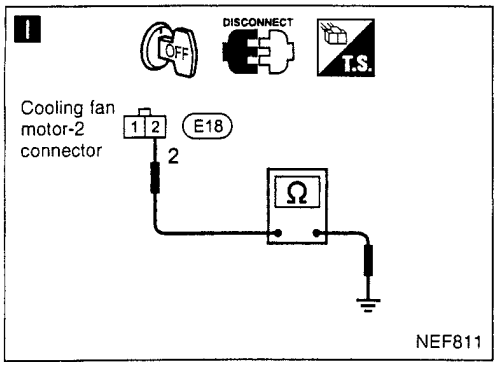
If NG, replace fuse or fusible link or repair harness or connectors.

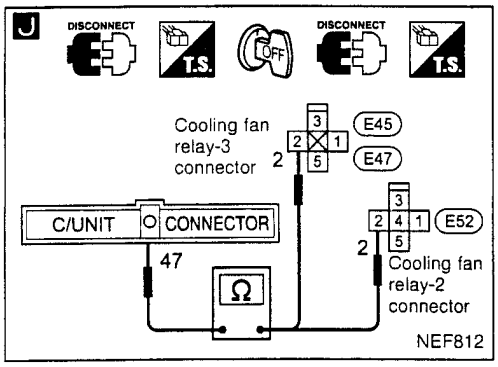
OK ↓

Ⓓ

Cooling Fan (Overheat) (Cont'd)







Ⓓ

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan motor-1 connector terminal ② and cooling fan relay-2 connector terminal ③; cooling fan motor-2 connector terminal ① and cooling fan relay-3 connector terminal ⑤; cooling fan relay-2 connector terminal ⑤ and ground.
   Continuity should exist.
   If OK, check harness for short-circuit.
4. Check harness continuity between cooling fan motor-2 terminal ② and ground.

NG → Repair harness or connectors.

OK ↓

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㊼ and cooling fan relay-3 connector terminal ② & cooling fan relay-2 connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors E42, F2
- Harness for open or short-circuit between cooling fan relay-2, 3 and ECM.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-2, 3).
Refer to "COMPONENT INSPECTION", EC-2132.

NG → Replace cooling fan relays.

OK ↓

CHECK COMPONENTS
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-2132.

NG → Replace cooling fan motors.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

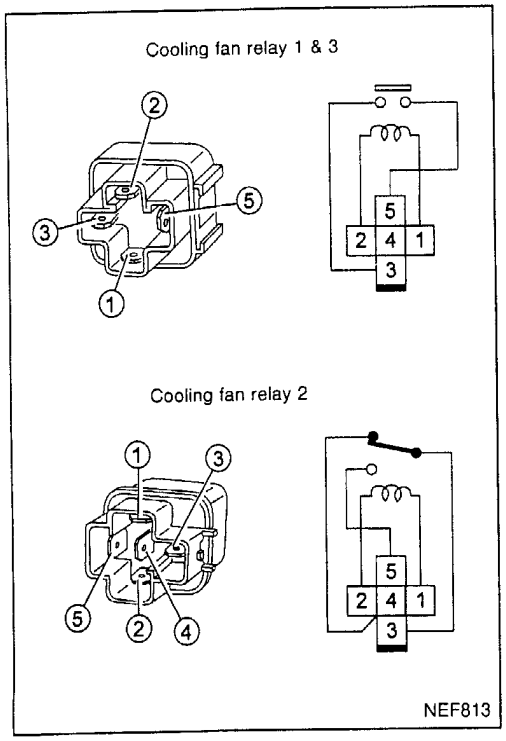
Trouble is not fixed ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Cooling Fan (Overheat) (Cont'd)

COMPONENT INSPECTION



Cooling fan relays-1, -2, -3

Check continuity between terminals ③ and ⑤.

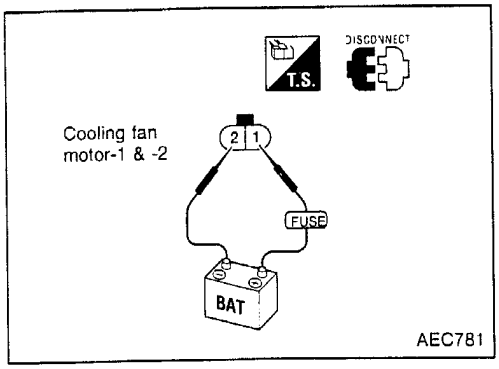
Conditions	Continuity
12V direct current supply between relay terminals ① and ②	Yes
No current supply	No

If NG, replace cooling fan relay.

Cooling fan relay-2

Check continuity between terminals ③ and ④.

Conditions	Continuity
No current supply	Yes
12V direct current supply between relay terminals ① and ②	No

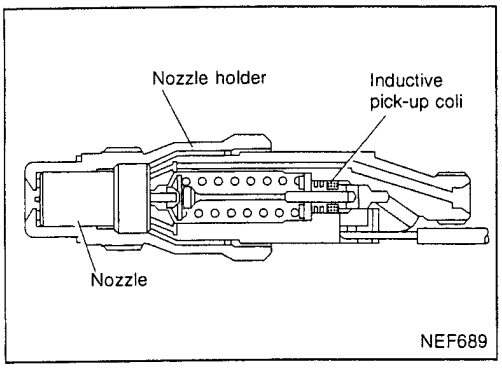


Cooling fan motors-1 and -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(⊕)	(⊖)
Cooling fan motor-1 and -2	①	②

Cooling fan motor should operate.
If NG, replace cooling fan motor.



Needle Lift Sensor (NLS)

The needle lift sensor is built into the No. 1 nozzle. Its inductive pick-up element senses the lifting of the injection nozzle needle and thus the start of injection. The signal is evaluated by the ECM and compared with the target timing. Deviations in timing, for example caused by changes in fuel temperature, are sensed by the ECM and corrected.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
34	• An improper signal from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Needle lift sensor • Air in fuel line • Clogging No. 1 injection nozzle

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: Before DTC confirmation, be sure to check battery voltage is above 9V.

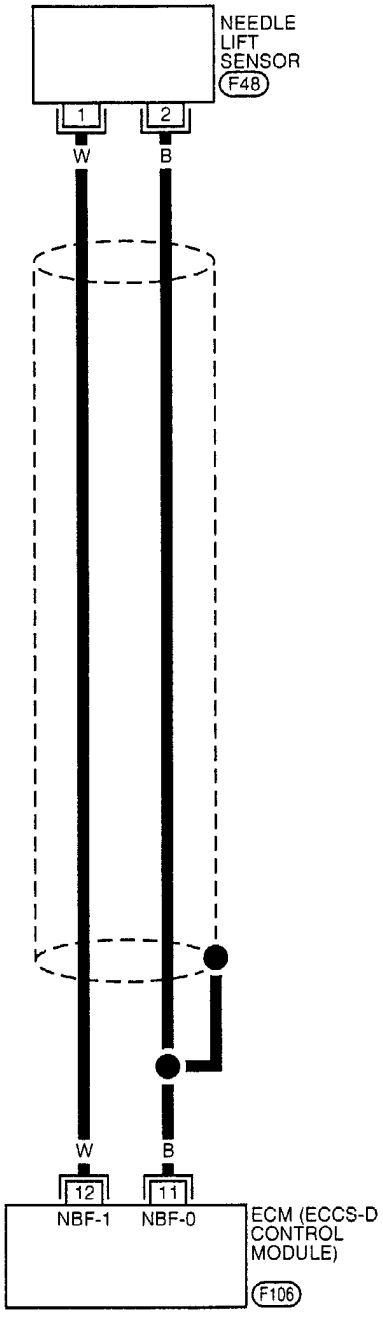
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for 2 seconds above 1,200 rpm.

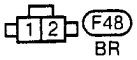
OR

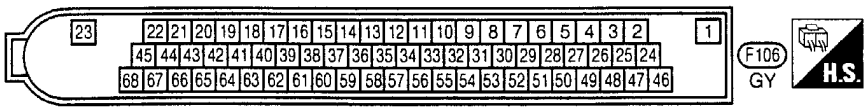
1) Start engine and run it for 2 15 seconds above 1,200 rpm.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Needle Lift Sensor (NLS) (Cont'd)

EC-NLS-01



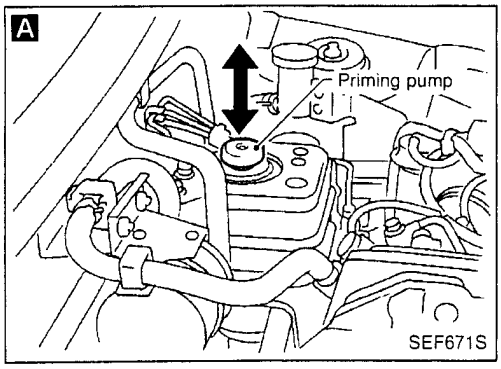


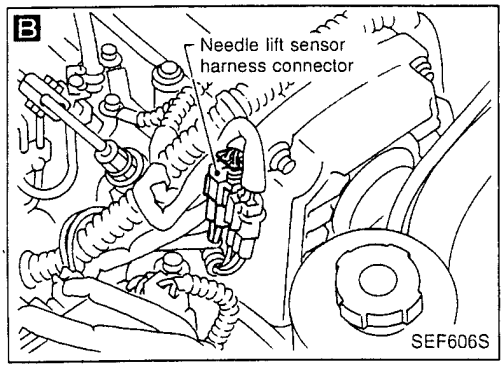


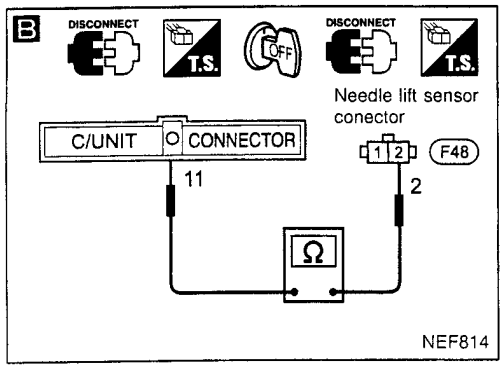
YEC033

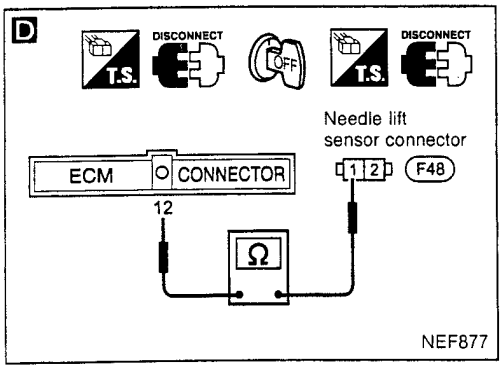
Needle Lift Sensor (NLS) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK FOR AIR IN FUEL FILTER.
1. Move priming pump up and down to purge air from fuel filter.
2. Perform "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and needle lift sensor harness connector.
3. Check harness continuity between needle lift sensor connector terminal ② and ECM connector terminal ⑪.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

D

CHECK GROUND CIRCUIT.
Check resistance between needle lift sensor connector terminal ① and ECM connector terminal ⑫.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

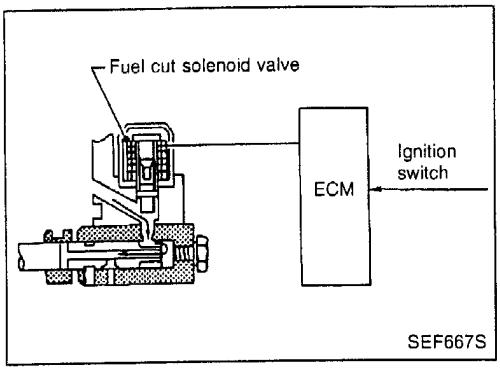
CHECK NO. 1 INJECTION NOZZLE FOR CLOGGING.
Refer to spray pattern test of "INJECTION NOZZLE".
If NG, replace No. 1 injection nozzle.

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END



Fuel Cut Solenoid Valve

When the ignition switch is OFF, the ECM turns the fuel cut solenoid valve OFF (under this condition, no current flows through the fuel cut solenoid valve), shutting off fuel supply.
When the engine is not operating due to trouble, the fuel cut solenoid valve may be OFF even when the ignition switch is ON.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
36	• Fuel cut solenoid valve circuit is malfunctioning.	• Harness or connectors (The solenoid valve circuit is open or shorted.) • Fuel cut solenoid valve

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If DTC 13 or 47 is displayed at the same time, perform TROUBLE DIAGNOSIS FOR DTC13 OR 47 first.

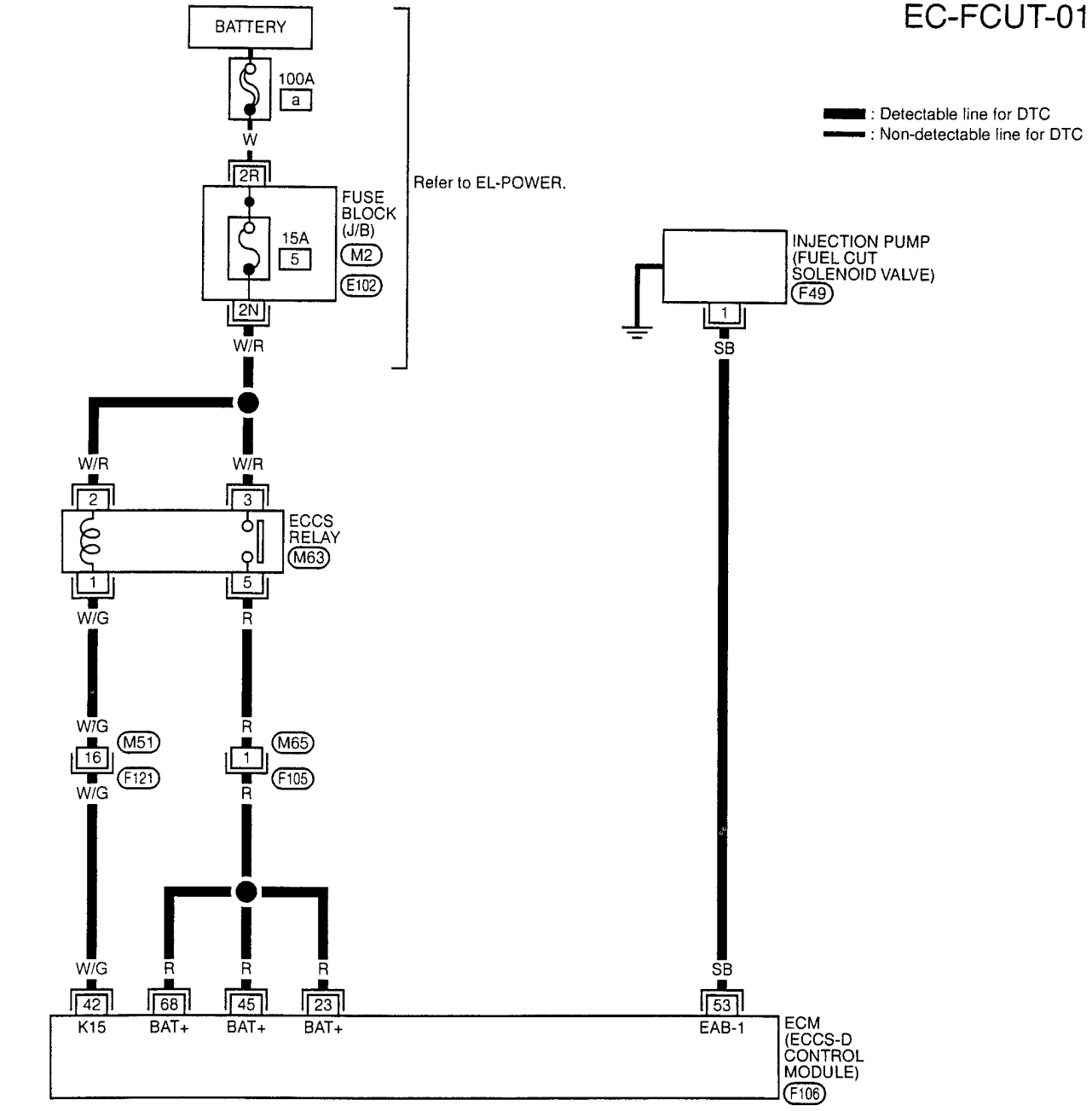
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine. (If no start, circuit is open).
4) Warm engine up sufficiently.
5) Turn ignition switch to "LOCK" position and wait at least 5 seconds.
6) Start engine and rev it up above 1,300 rpm. Release pedal and wait at least 3 seconds.

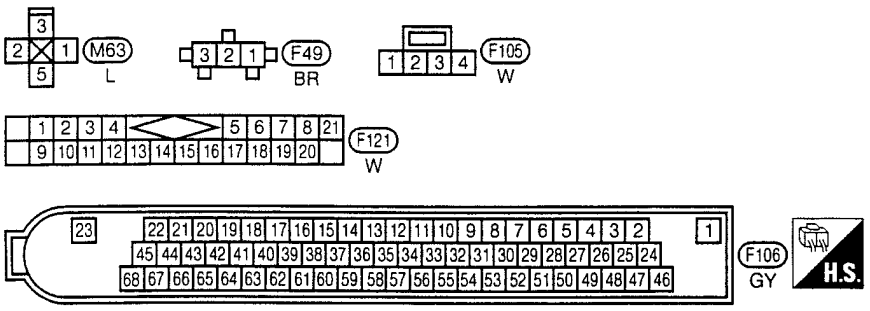
OR

1) Start engine. (If no start, circuit is open).
2) Warm engine up sufficiently.
3) Turn ignition switch to "LOCK" position and wait at least 5 seconds.
4) Start engine and rev it up above 1,300 rpm. Release pedal and wait at least 3 seconds.
5) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
6) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Fuel Cut Solenoid Valve (Cont'd)

EC-FCUT-01



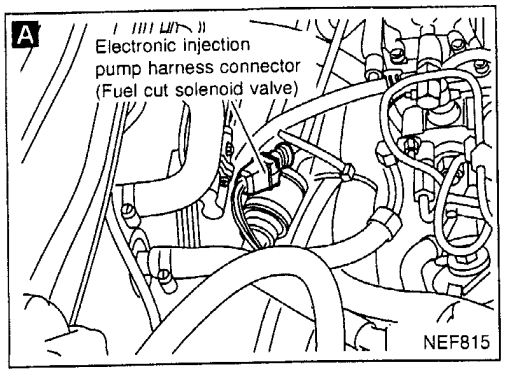


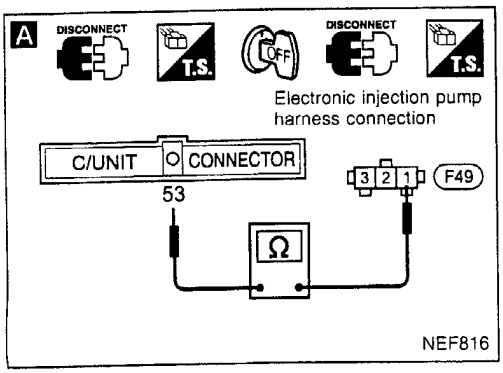
Refer to last page (Foldout page).
M2 , E102

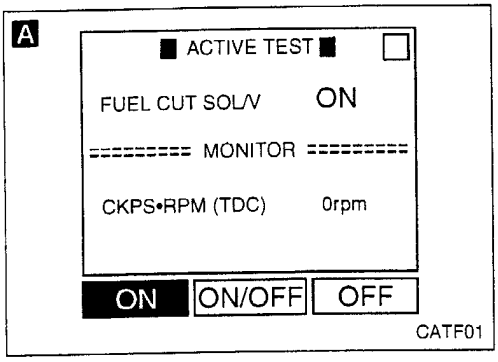
YEC034

Fuel Cut Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

CHECK MAIN POWER SUPPLY.
Check power supply. Refer to EC-2098.

A

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "ON" position.
2. Select "FUEL CUT SOL/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "ON" and "OFF" alternately.
4. Check that operating sound is emitted.

NG → Repair harness or connectors.

OR

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between fuel cut solenoid valve connector terminal ① and ECM connector terminal ㊸.
   Continuity should exist.
   If OK, check harness for short.

OK

CHECK COMPONENT
(Fuel cut solenoid valve).
Refer to "COMPONENT INSPECTION" below.

NG → Replace fuel cut solenoid valve.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

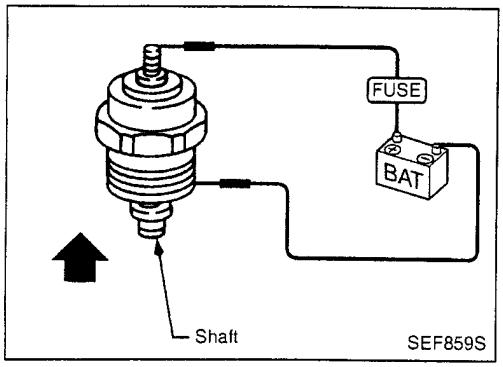
Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Fuel Cut Solenoid Valve (Cont'd)

COMPONENT INSPECTION



Fuel cut solenoid valve

1. Remove fuel cut solenoid valve.
2. Check for lifting shaft when applying 12V direct current to terminals.

If NG, replace fuel cut solenoid valve.

Fuel Temperature Sensor (FTS)

The fuel temperature sensor is used to detect the fuel temperature in the injection pump. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.
The sensor is built into the inside electrical circuit of the injection pump.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
42	• An excessively high or low voltage from the sensor is detected by ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Fuel temperature sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

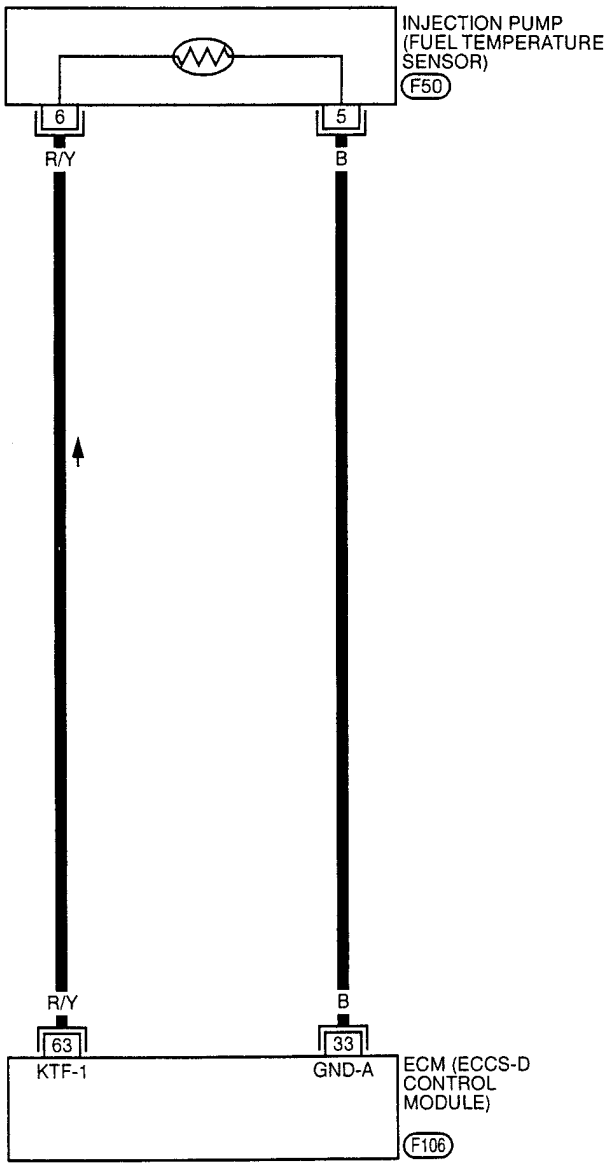
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

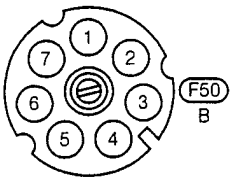
OR

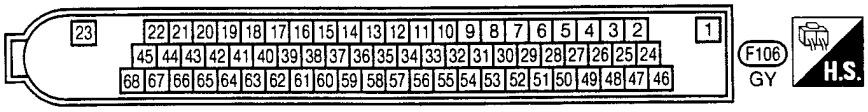
1) Turn ignition switch to "ON" position and wait at least 5 seconds.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Fuel Temperature Sensor (FTS) (Cont'd)

EC-FTS-01



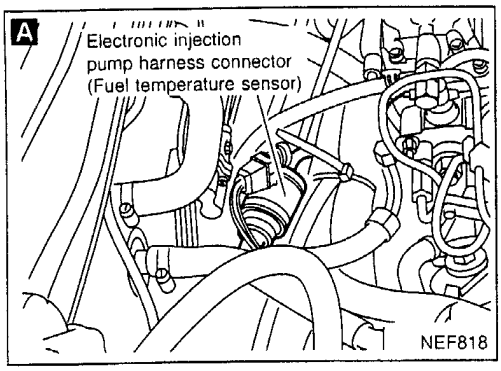


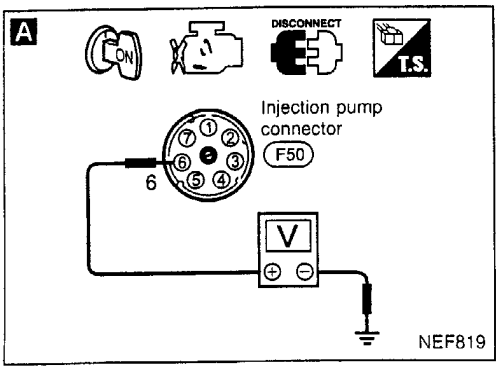


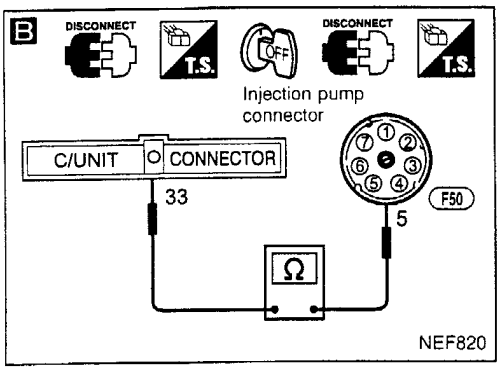
YEC035

Fuel Temperature Sensor (FTS) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect fuel temperature sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between injection pump connector terminal ⑥ and ground with CONSULT or voltage tester.

Voltage:
Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between injection pump connector terminal ⑤ and ECM connector terminal ㉝.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Fuel temperature sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Have the injection pump assembly serviced by an authorised service representative.

OK

Disconnect and reconnect harness connectors in the circuits. Then retest.

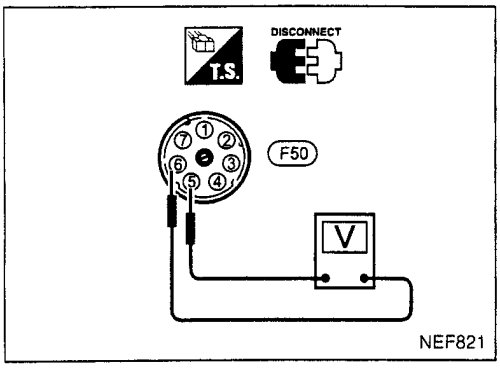
Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Fuel Temperature Sensor (FTS) (Cont'd)

COMPONENT INSPECTION



Fuel temperature sensor

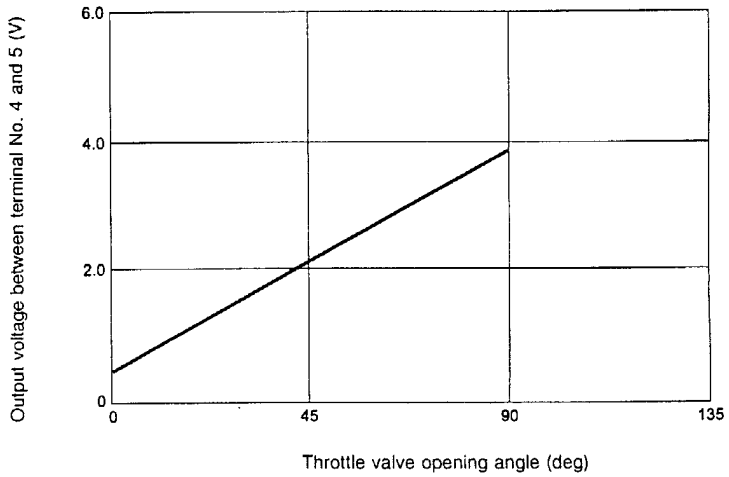
Wait until fuel temperature sensor reaches room temperature.
Check resistance between terminals ⑤ and ⑥.

Fuel temperature °C (°F)	Resistance kΩ
25 (77)	Approximately 1.9

If NG, have the injection pump assembly serviced by an authorised service representative.

Accelerator Position Sensor & Switch

The accelerator position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.



NEF822

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
43	• An excessively low or high voltage from the sensor is detected by the ECM.	• Harness or connectors (The sensor or switch circuit is open or shorted.) • Accelerator position sensor • Accelerator position switch

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Depress accelerator pedal fully and keep it for at least 1 second. Then release it and wait at least 5 seconds.

OR

1) Turn ignition switch to "ON" position.
2) Depress accelerator pedal fully and keep it for at least 1 second. Then release it and wait at least 5 seconds.
3) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Accelerator Position Sensor & Switch (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (For accelerator stiching)

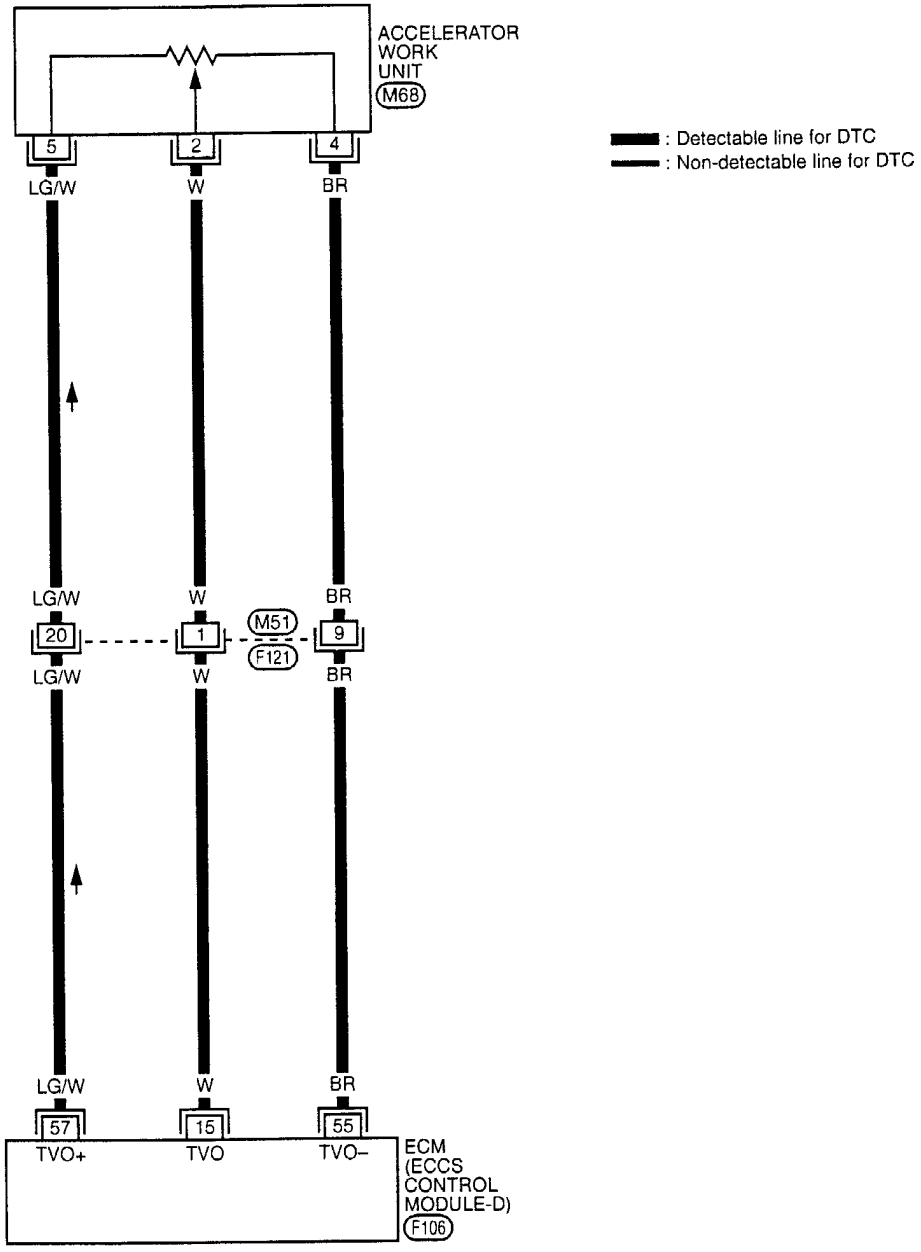
1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and rev it up above 1,300 rpm.
4) Depress brake pedal immediately after releasing accelerator pedal and keep it at least 5 seconds.

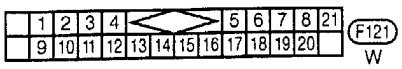
OR

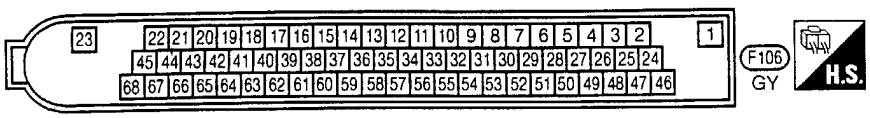
1) Start engine and rev it up above 1,300 rpm.
2) Depress brake pedal immediately after releasing accelerator pedal and keep it at least 5 seconds.
3) Turn ignition switch to the "LOCK" position, wait at least 5 seconds and then turn to the "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

Accelerator Position Sensor & Switch (Cont'd)

EC-APS-01



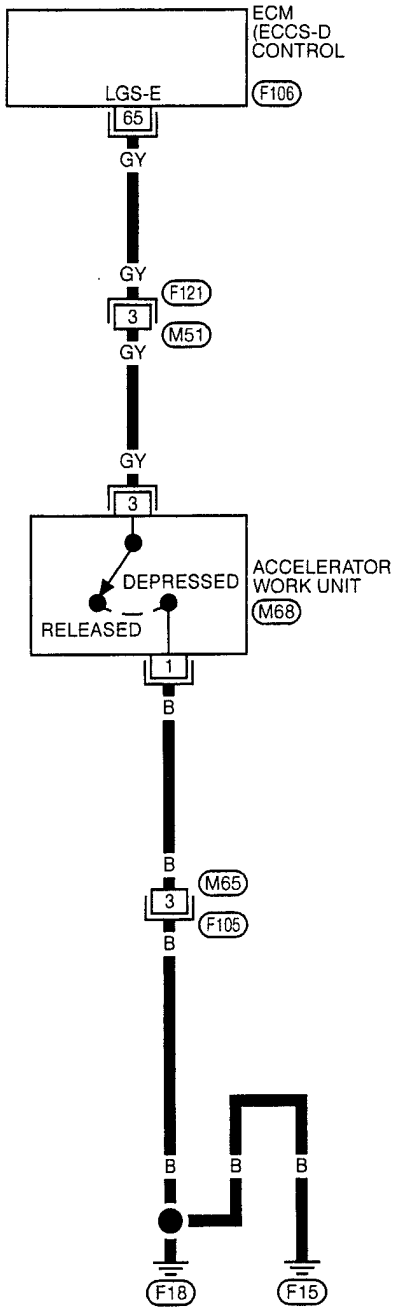




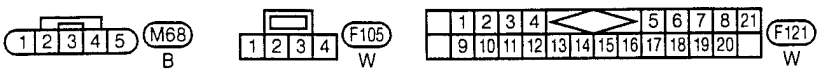
YEC096

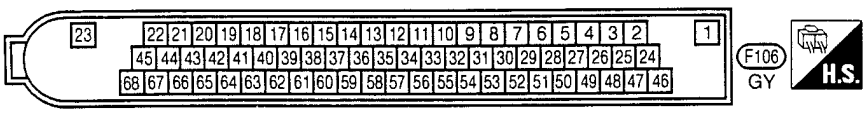
Accelerator Position Sensor & Switch (Cont'd)

EC-APP/SW-01



: Detectable line for DTC
: Non-detectable line for DTC

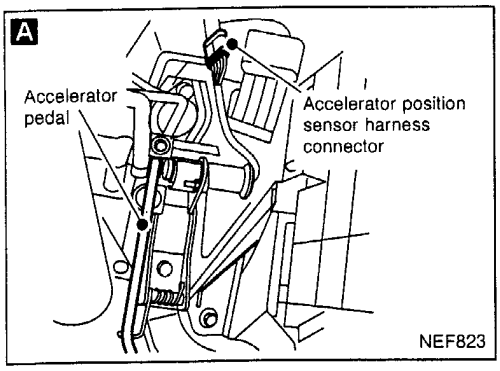


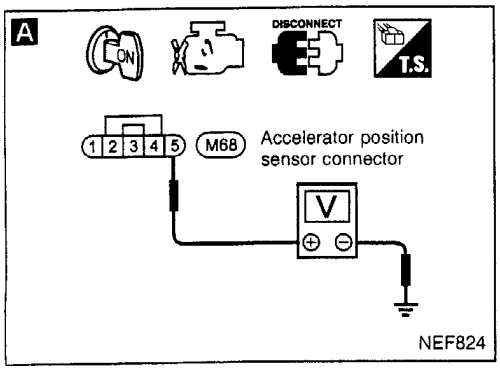


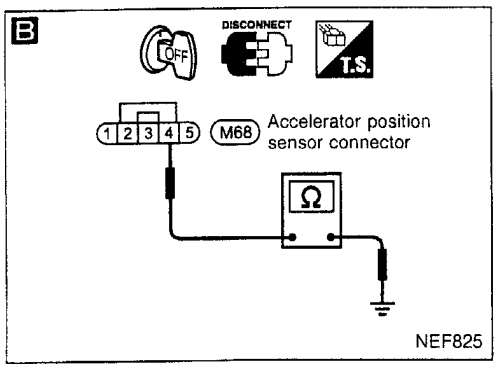
YEC032

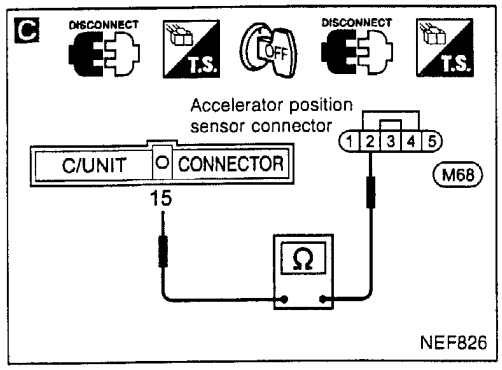
Accelerator Position Sensor & Switch (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START
(Accelerator position sensor)

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect accelerator position sensor harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between accelerator position sensor connector terminal ⑤ and ground with CONSULT or voltage tester.
   Voltage: Approximately 5V

NG → Check the following:
- Harness connectors (M51), (F121)
- Harness for open or short-circuit between ECM and accelerator position sensor.

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between accelerator position sensor connector terminal ④ and engine ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M51), (F121)
- Harness for open or short-circuit between ECM and accelerator position sensor.

If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑮ and accelerator position sensor connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Accelerator position sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace accelerator pedal assembly.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

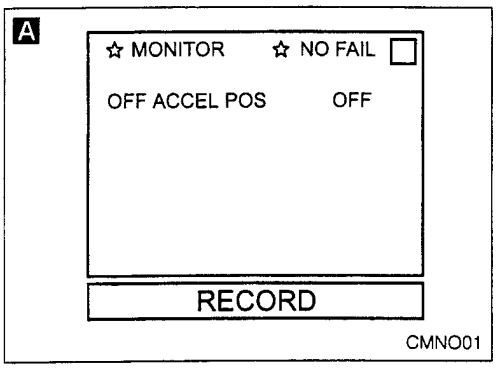
Trouble is not fixed.

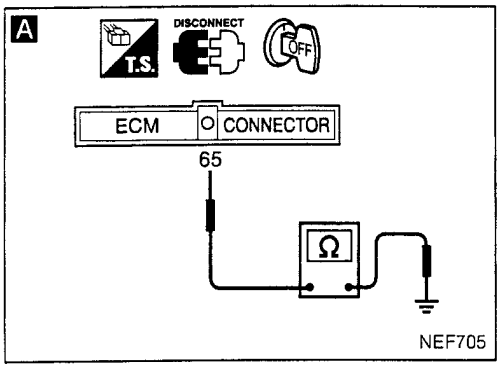
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

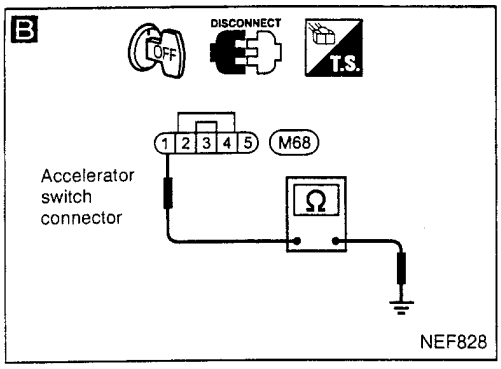
INSPECTION END

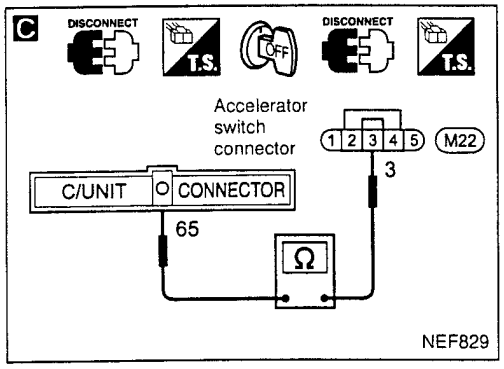
Accelerator Position Sensor & Switch (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START
(Accelerator position switch)

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch to "ON" position.
2. Check "OFF ACCEL POS" in "DATA MONITOR" mode with CONSULT.
   Accelerator pedal released:
   ON
   Accelerator pedal depressed:
   OFF

OK → INSPECTION END

OR

1. **Turn ignition switch to "LOCK" position.**
2. **Check continuity between ECM connector terminal (65) and ground.**
   Continuity:
   Accelerator pedal released:
   Yes
   Accelerator pedal depressed:
   No

NG

B

CHECK GROUND CIRCUIT.

1. Disconnect accelerator switch harness connector.
2. Check harness continuity between accelerator switch connector terminal (1) and engine ground.
   Continuity should exist.

NG → Check the following:
- Harness connectors (M65), (F105)
- Harness for open circuit between accelerator switch and engine ground.

If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.

Check harness continuity between ECM connector terminal (65) and accelerator switch connector terminal (3).
Continuity should exist.

NG → Check the following:
- Harness connectors (F105), (M51)
- Harness for open or short-circuit between accelerator switch and ECM

OK

CHECK COMPONENT
(Accelerator switch).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace accelerator switch.

OK

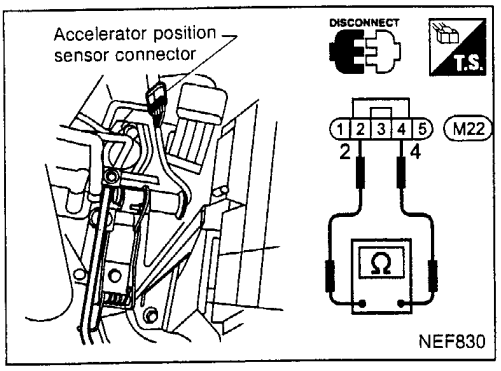
Disconnect and reconnect harness connectors in the circuit. Then retest.

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

Accelerator Position Sensor & Switch (Cont'd)



COMPONENT INSPECTION

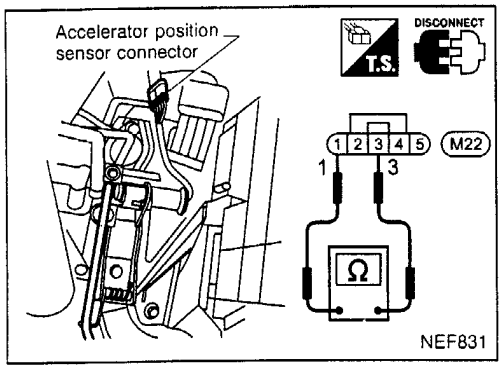
Accelerator position sensor

1. Disconnect accelerator position sensor harness connector.
2. Make sure that resistance between accelerator position sensor terminals ② and ④ changes when opening throttle valve manually.

Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 1.2 kΩ
Partially open	1.2 - 1.9 kΩ
Completely open	Approximately 1.9 kΩ

If NG, replace accelerator pedal assembly.

CAUTION:
- **Do not disassemble accelerator pedal assembly.**



COMPONENT INSPECTION

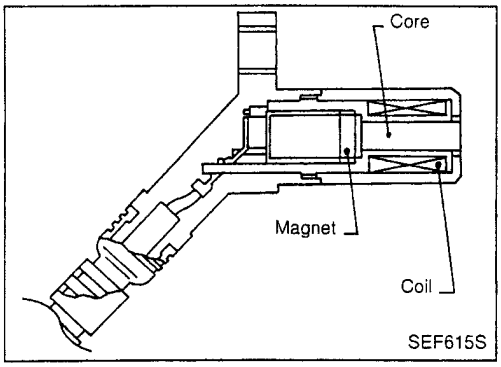
Accelerator switch

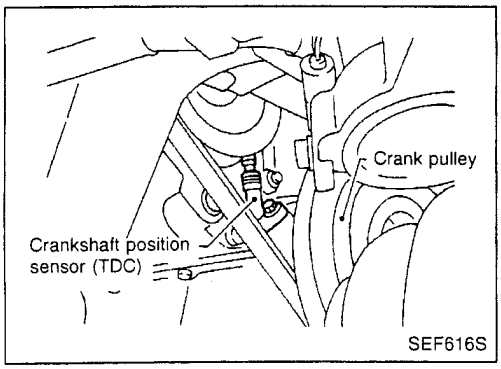
1. Disconnect accelerator switch harness connector.
2. Check continuity between accelerator switch connector terminals ① and ③.

Conditions	Continuity
Accelerator pedal released	No
Accelerator pedal depressed	Yes

If NG, replace accelerator pedal assembly.

CAUTION:
- **Do not disassemble accelerator pedal assembly.**





Crankshaft Position Sensor (TDC)

The crankshaft position sensor (TDC) monitors engine speed by means of signals from the sensing plate (with two protrusions) installed to the crankshaft pulley. The datum signal output is detected at ATDC 70° and sent to the ECM. The sensor signal is used for fuel injection control and fuel injection timing control.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
47	• An incorrect signal from the sensor is detected by ECM during engine running and cranking.	• Harness or connectors (The sensor circuit is open.) • Crankshaft position sensor (TDC)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Before performing the following procedure, confirm that battery voltage is more than 9V.

If DTC 34 is displayed at the same time, perform trouble diagnosis for DTC34 first.

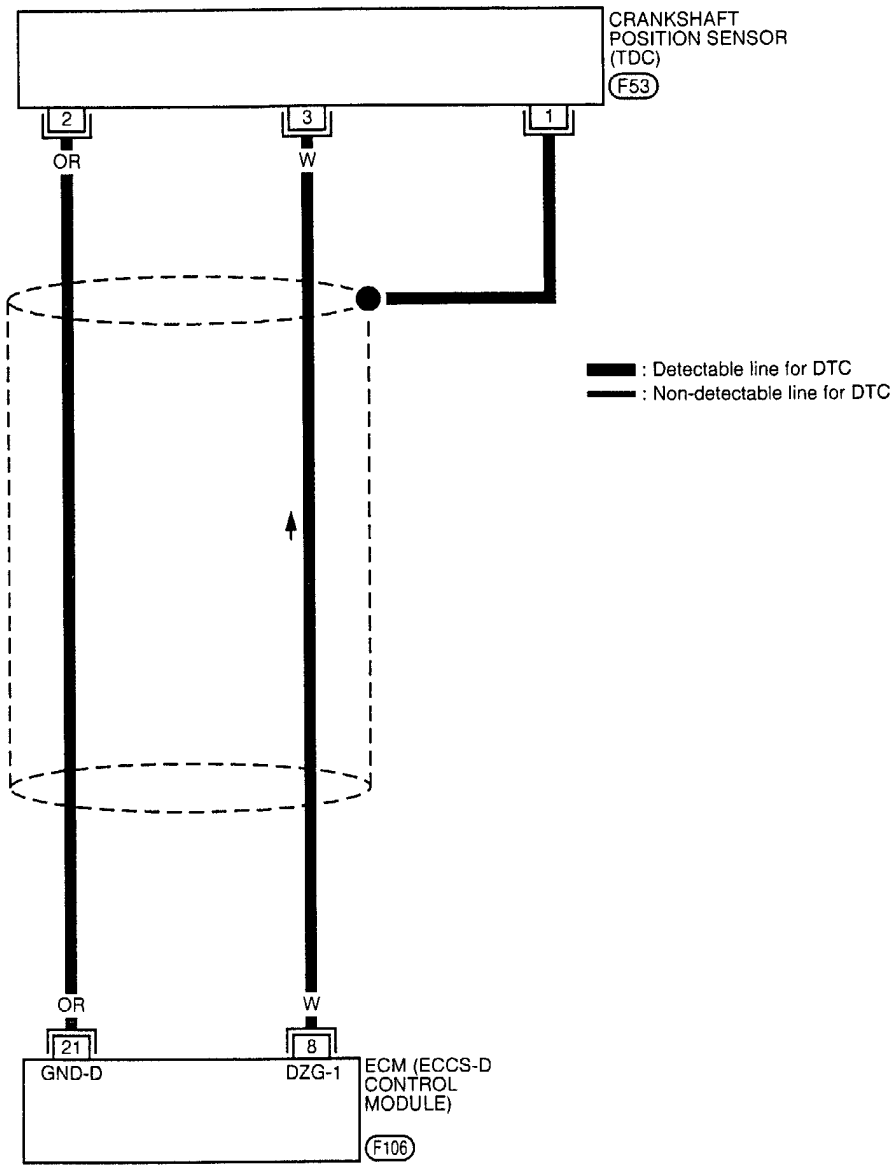
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 3 seconds above 1,200 rpm.

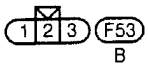
OR

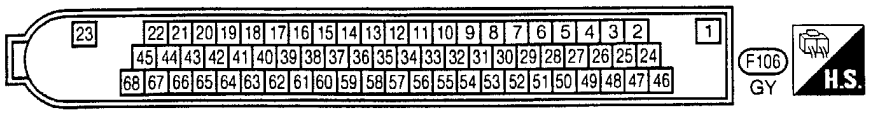
1) Start engine and run it for at least 3 seconds above 1,200 rpm.
2) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Crankshaft Position Sensor (TDC) (Cont'd)

EC-CKPS-01



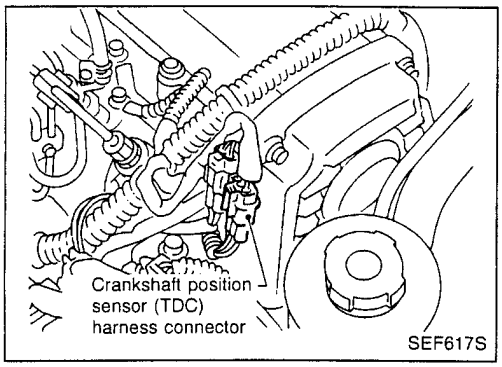


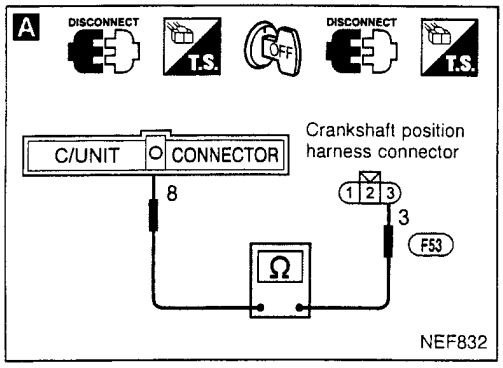


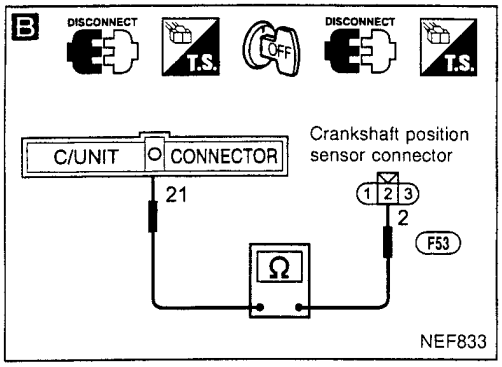
YEC037

Crankshaft Position Sensor (TDC) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect crankshaft position sensor (TDC) and ECM harness connectors.
3. Check continuity between ECM terminal ⑧ and crankshaft position sensor (TDC) connector terminal ③.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

Loosen and retighten engine ground screws.

OK

B

CHECK GROUND CIRCUIT.
Check harness continuity between crankshaft position sensor (TDC) connector terminal ② and ECM connector terminal ㉑.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT [Crankshaft position sensor (TDC)]. Refer to "COMPONENT INSPECTION" on next page.

NG → Replace crankshaft position sensor (TDC).

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed

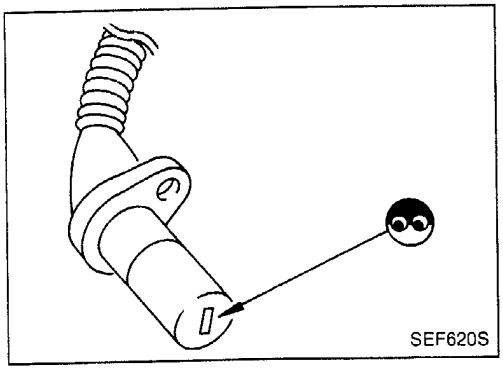
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

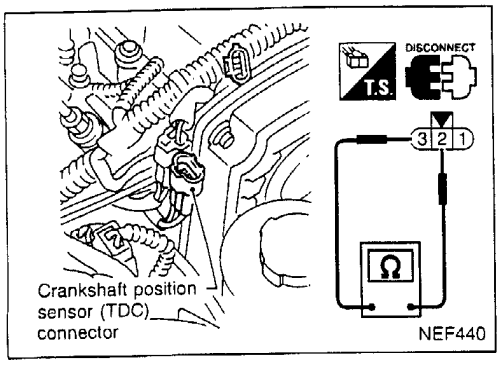
INSPECTION END

Crankshaft Position Sensor (TDC) (Cont'd)

COMPONENT INSPECTION

Crankshaft position sensor (TDC)

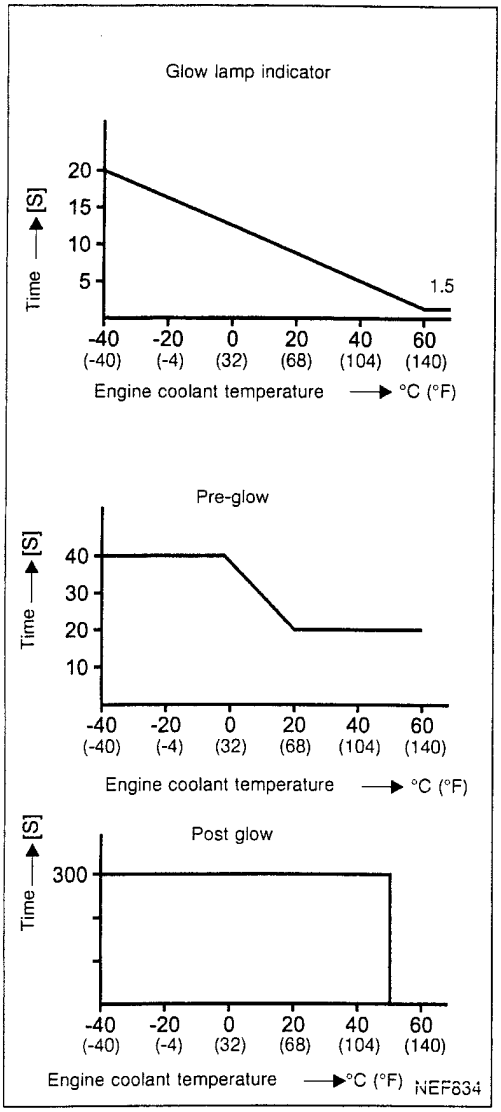

SEF620S



1. Disconnect crankshaft position sensor (TDC) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance between crankshaft position sensor (TDC) terminals ② and ③.

   Resistance: Approximately 1.2 - 1.5kΩ [at 25°C (77°F)]

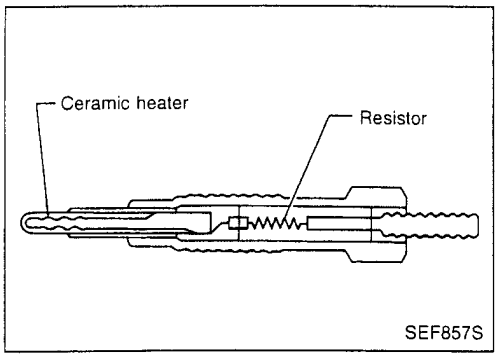
   If NG, replace crankshaft position sensor (TDC).



Glow Control System

When coolant temperature is lower than 75°C (167°F):

- Ignition switch ON
  After ignition switch has been turned to ON, the glow relay turns ON for a period of time depending on engine coolant temperature, allowing current to flow through the glow plugs.
- Starting
  After starting the engine, current will flow through the glow plugs for 300 seconds, or until the coolant temperature exceeds 50°C (122°F).



COMPONENT DESCRIPTION

Glow plug

The glow plug is provided with a ceramic heating element to obtain a high-temperature resistance. It glows in response to a signal sent from the ECM, allowing current to flow through the glow plug via the glow relay.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
83	• Glow relay signal circuit is open or shorted.	• Harness or connectors (The glow relay signal circuit is open or shorted) • Glow relay
98	• Glow indicator lamp circuit is open or shorted.	• Harness or connectors (The glow indicator lamp circuit is open or shorted.) • Glow lamp

Glow Control System (Cont'd)

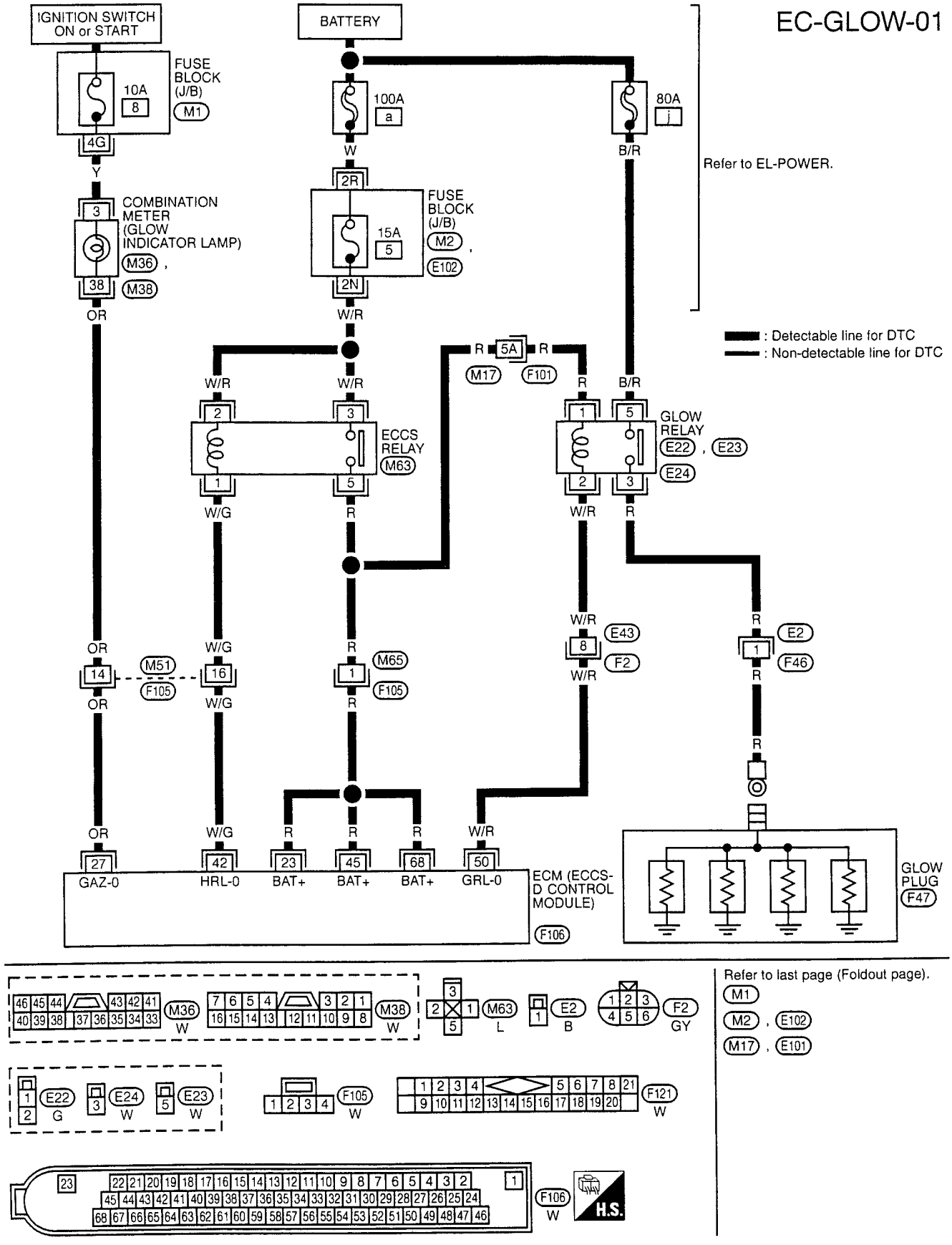
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch to "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.

OR

1) Turn ignition switch to "ON" position, and wait for at least 5 seconds.
2) Turn ignition switch off, wait for at least 5 seconds and then turn on.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Glow Control System (Cont'd)

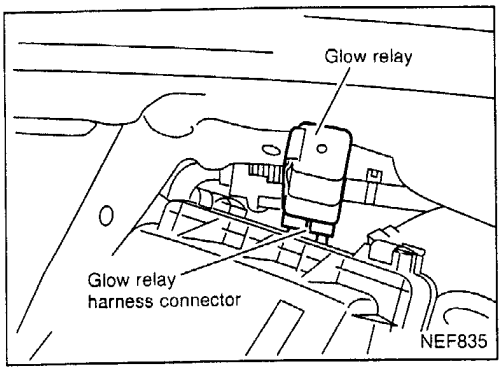


Refer to last page (Foldout page).
M1
M2, E102
M17, E101

YEC038

Glow Control System (Cont'd)

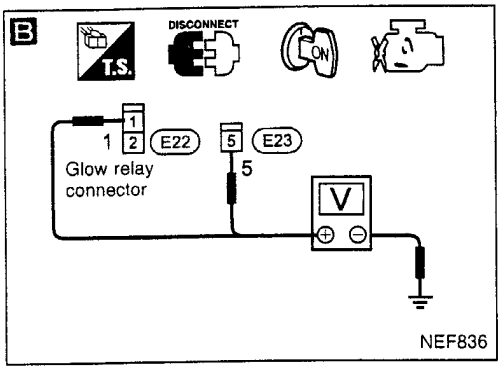
DIAGNOSTIC PROCEDURE



INSPECTION START
(Glow relay signal circuit)

CHECK MAIN POWER SUPPLY.
Check power supply to ECCS-D relay.
Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY" (EC-2096).

B



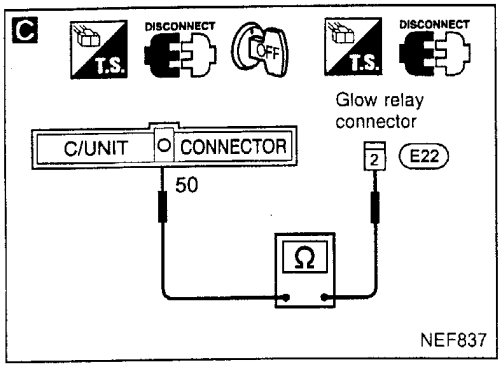
CHECK POWER SUPPLY.
1. Turn ignition switch to the "LOCK" position.
2. Disconnect glow relay.
3. Turn ignition switch to the "ON" position.
4. Check voltage between glow relay connector terminals ①, ⑤ and ground with tester.
   Voltage: Battery voltage

NG → Check the following:
- 5A fuse
- 80A fusible link
- Harness connectors (M17), (F101)
- Harness continuity between glow relay and fuse.

If NG, replace fuse or fusible link or repair harness or connectors.

OK ↓

C



CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to the "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM connector terminal (50) and glow relay connector terminal ②.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check harness connectors (F2), (E43)
Repair harness or connectors.

OK ↓

CHECK GLOW PLUG AND GLOW RELAY.
Refer to "COMPONENT INSPECTION" (EC-2161, 2162).

NG → Replace glow plug or glow relay.

OK ↓

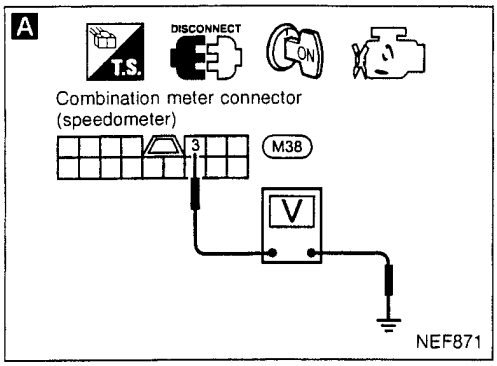
Disconnect and reconnect harness connectors in the circuit. Then retest.

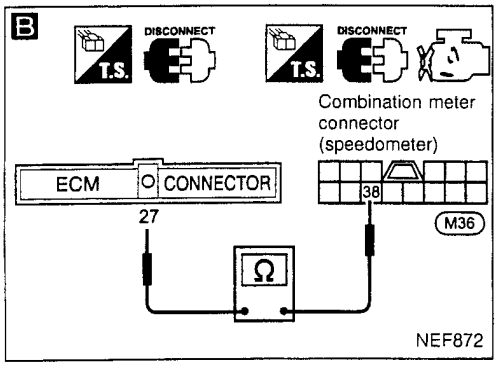
Trouble is not fixed ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Glow Control System (Cont'd)





INSPECTION START
(Glow indicator lamp circuit)

A

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect combination meter harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between combination meter harness connector terminal ③ and body ground.
   Voltage: Battery voltage

NG → Check the following:
- Harness for open or short-circuit between combination meter and battery.
- 10A fuse

If NG, replace fuse or repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM connector terminal ㉗ and combination meter connector terminal ㊳.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and combination meter.

If NG, repair harness or connectors.

OK ↓

CHECK GLOW INDICATOR LAMP.
Make sure that glow indicator lamp is not burnt out.

NG → Replace glow indicator lamp.

OK ↓

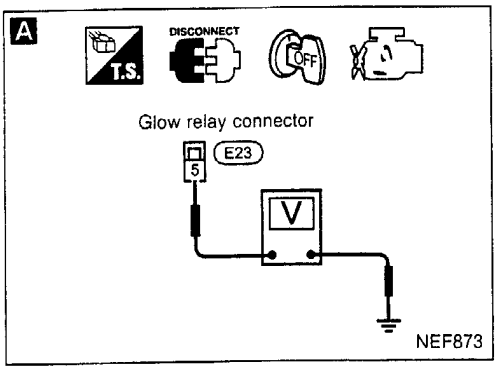
Disconnect and reconnect harness connectors in the circuit. Then retest.

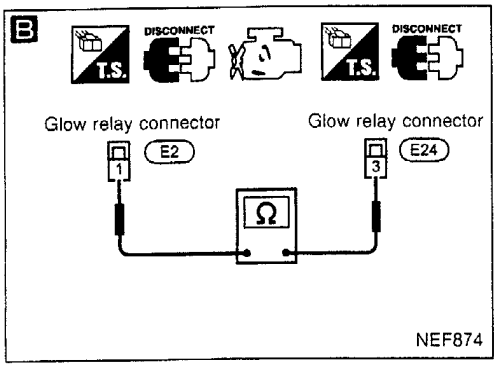
Trouble is not fixed ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Glow Control System (Cont'd)





INSPECTION START
(Glow plug circuit)

A

CHECK POWER SUPPLY-I.
1. Turn ignition switch to "LOCK" position.
2. Disconnect glow relay harness connector.
3. Check voltage between glow relay harness connector terminal ⑤ and engine ground.
Voltage: Battery voltage

NG → Check the following:
- Harness for open or short-circuit between Glow relay and battery.
- 80A fusible link

If NG, replace fusible link and repair harness connectors.

OK

B

CHECK POWER SUPPLY-II.
1. Disconnect glow plug harness connector.
2. Check harness continuity between glow plug harness connector and glow relay harness connector terminal ③. **Continuity should exist.**
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between glow plug and glow relay.

If NG, repair harness or connector.

OK

CHECK GLOW PLUG AND GLOW RELAY.
Refer to "COMPONENT INSPECTION" (EC-2161, 2162).

NG → Replace glow plug or glow relay.

OK

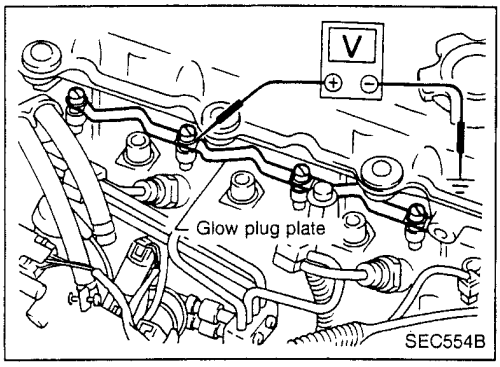
Disconnect and reconnect harness connectors in the circuit. Then retest.

INSPECTION END

Glow Control System (Cont'd)

SYSTEM OPERATION CHECK

Set voltmeter between glow plug and engine body.



1. Pre-glow control system

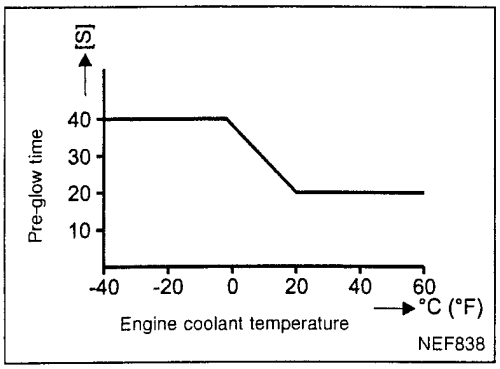
a. Turn ignition switch to "ON" position.

b. Read voltage.

Voltage:

Battery voltage for an engine coolant temperature dependent time.

*** Repeatedly turning the ignition switch to "ON" position and to "LOCK" position may change the pre-glow time.**



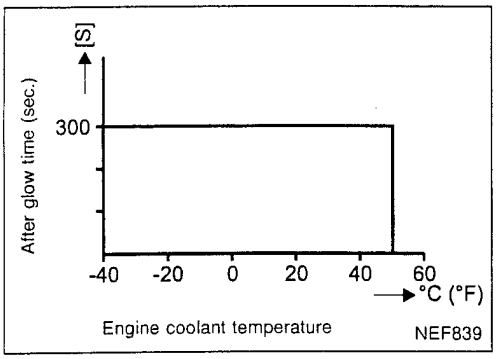
2. After-glow system

Start engine and read voltage.

Voltage:

Battery voltage for 5* minutes

*** Engine coolant temperature is lower than 50°C (122°F).**



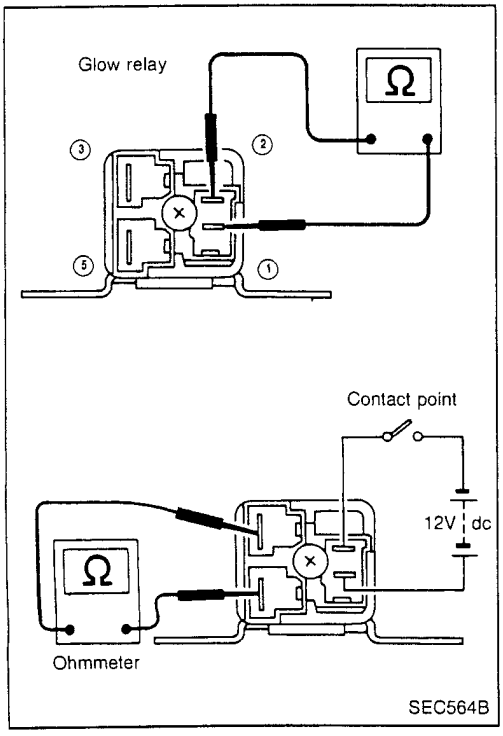
COMPONENT INSPECTION

Glow relay

1. Check relay for coil continuity between glow relay terminals ① and ②.

Continuity should exist.

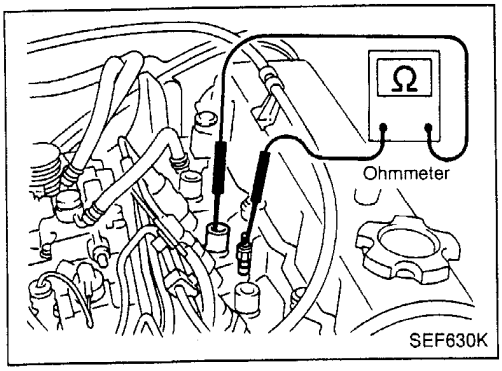
2. Check relay for proper operation by applying 12V dc voltage between glow relay terminals ① and ② and checking continuity between terminals ③ and ⑤.



Coil voltage	Continuity ③ and ⑤	Contact point
0V	No	OFF
12V	Yes	ON

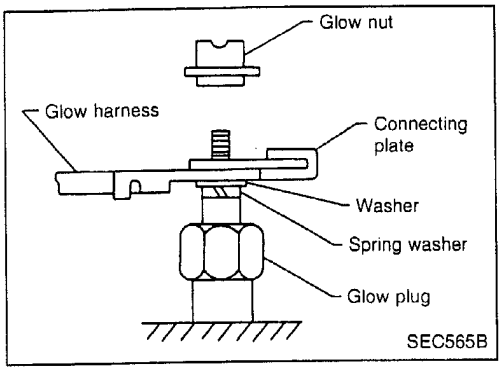
Glow Control System (Cont'd)

Glow plug



1. Remove glow plug connecting plate.
2. Check each glow plug for continuity.
   Continuity should exist:
   Approximately 0.5Ω [at 25°C (77°F)]

- If NG, replace glow plug.



3. Install glow plug connecting plate securely.

- **Do not bump glow plug heating element. If it is bumped, replace glow plug with new one. (If glow plug is dropped from a height of 0.1 m (3.94 in) or greater, replace with new one.)**
- **If glow plug installation hole is contaminated with carbon, remove using a reamer or suitable tool.**
- **Hand-tighten glow plug by turning it 2 to 3 times, then tighten using a tool to specified torque.**

  : 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)

Air Conditioner Cut Control

The Air Conditioner relay is controlled by the ECM. During the following conditions, the ECM will cut the power supply towards the air conditioner relay:

- Starting engine
- Quick acceleration from low speed
- Undershooting of idle speed
- High engine coolant temperature [above 107°C (225°F)].
- Malfunctioning of engine speed sensor, accelerator position sensor or vehicle speed sensor when engine speed is below 2,100 rpm.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
85	• Air conditioner relay signal circuit is shorted.	• Harness or connectors (The air conditioner relay signal circuit is shorted). • Air conditioner relay

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

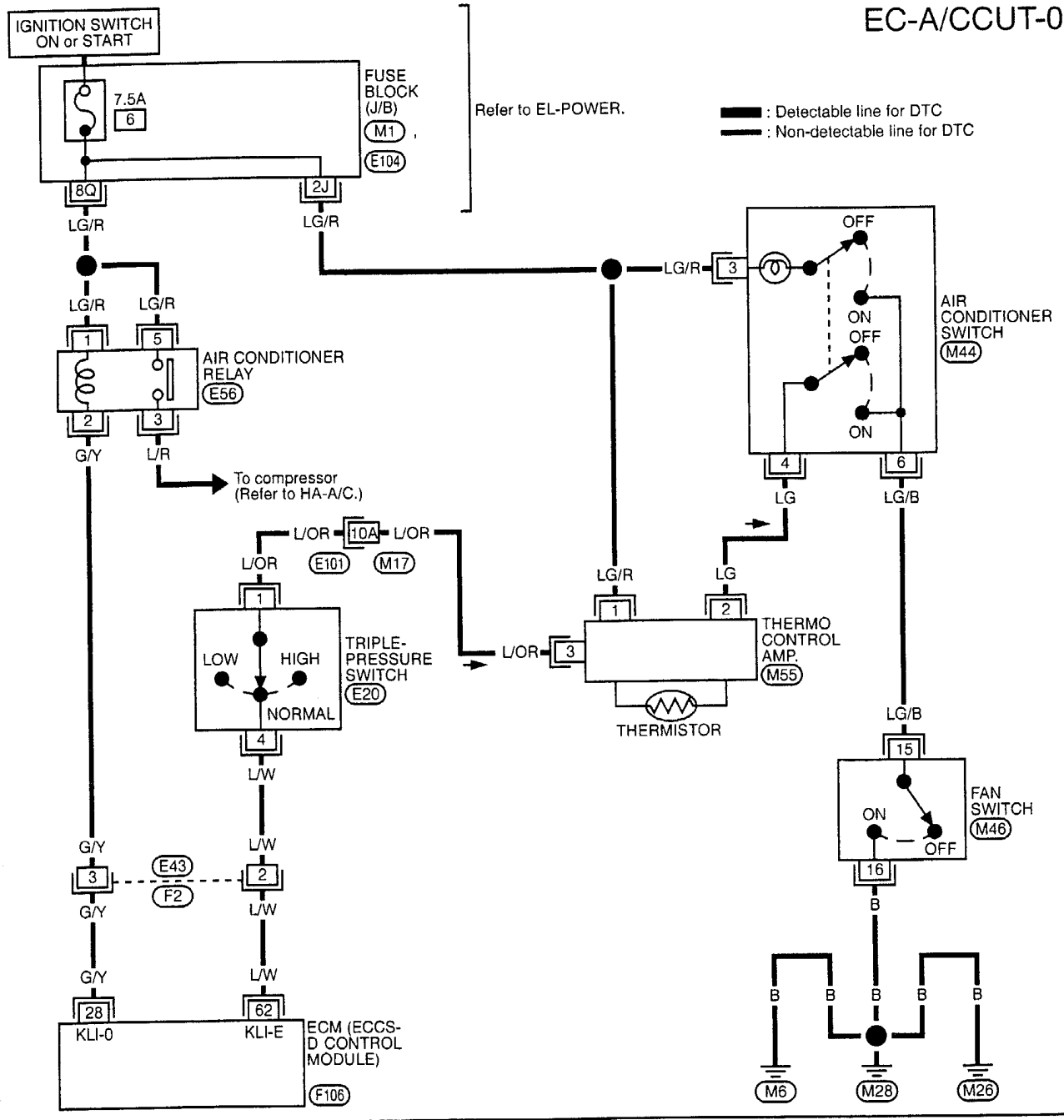
1) Turn ignition switch and air conditioner switch to the "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

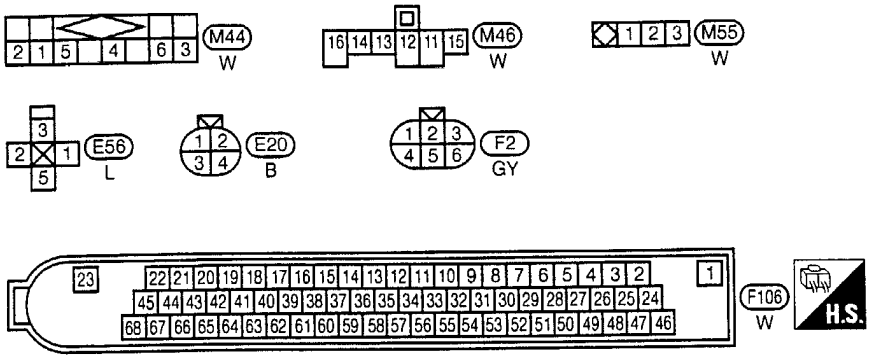
OR

1) Turn ignition switch and air conditioner switch to the "ON" position.
2) Turn ignition switch to the "LOCK" position, wait at least 5 seconds and then turn to the "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Air Conditioner Cut Control (Cont'd)

EC-A/CCUT-01





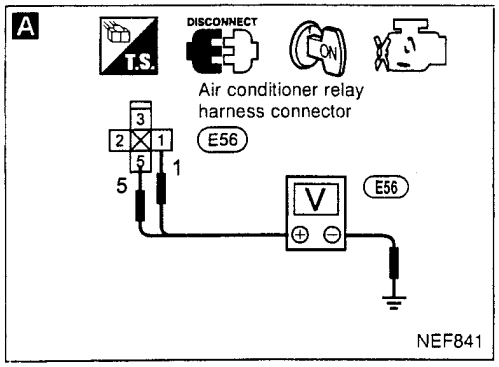
Refer to last page (Foldout page).

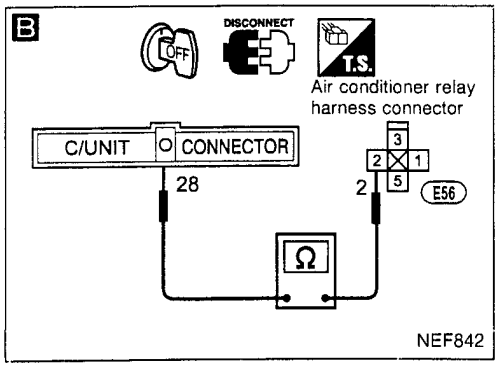
M1 , E104

M17 , E101

YEC040

Air Conditioner Cut Control (Cont'd)





INSPECTION START
(Air conditioner relay signal circuit)

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect air conditioner relay harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between air conditioner relay connector terminals ①, ⑤ and engine ground.
Voltage: Battery voltage

NG → Check the following:
- Harness and connectors for open or short-circuit between ignition switch and air conditioner relay.
- Fuse

If NG, replace or repair the parts affected.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM harness connector terminal ㉘ and air conditioner relay harness connector terminal ②.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and air conditioner relay.

If NG, repair harness or connectors.

OK

CHECK AIR CONDITIONER RELAY.
Refer to HA section for inspection.

NG → Replace air conditioner relay.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

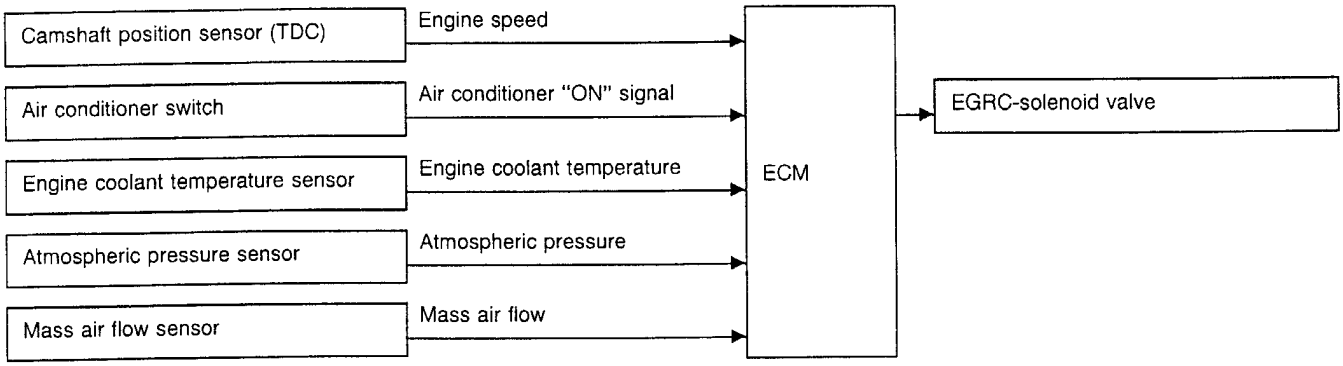
Trouble is not fixed

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

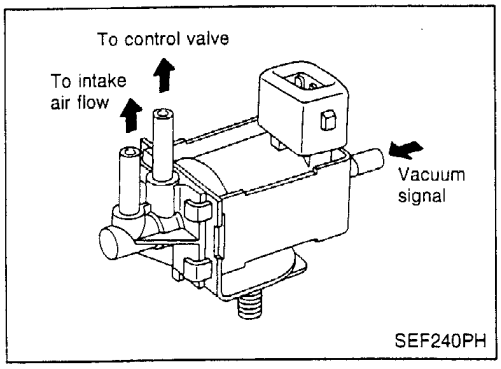
EGRC-Solenoid Valve

SYSTEM DESCRIPTION



The ECM receives signals sent from the engine coolant temperature sensor, crankshaft position sensor (TDC) , atmospheric pressure sensor, mass air flow sensor and air conditioner switch to determine engine speed and operating conditions. Based on these signals, the ECM controls the EGR control solenoid valve operation.
No EGR operation will take place when the engine coolant temperature is below 70°C (158°F), when idling, at starting and during a period of time after starting the engine (70 - 200 seconds, depending on engine coolant temperature).

Engine coolant temperature °C (°F)	Load	EGRC-solenoid valve	EGR valve	Amount of EGR gas
Below 70 (158)	Any	OFF (Closed)	Fully closed	—
Above 70 (158)	Low load	ON (Open)	Fully open	Large
	High load	OFF (Closed)	Fully closed	—



COMPONENT DESCRIPTION

The EGR control solenoid valves control vacuum pressure acting on the EGR valve. The EGR control valve will then be fully opened or fully closed, as required.
Thus, intake air passages are opened or closed in relation to exhaust gas and intake air. Utilizing the relationship between exhaust gas pressure and intake air pressure control, the amount of EGR (exhaust gas recirculated) is regulated in large or small volumes.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
86	• EGRC-solenoid valve A circuit is shorted.	• Harness or connectors (EGRC-solenoid valve A circuit is open or shorted). • EGRC solenoid valve A

EGRC-Solenoid Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

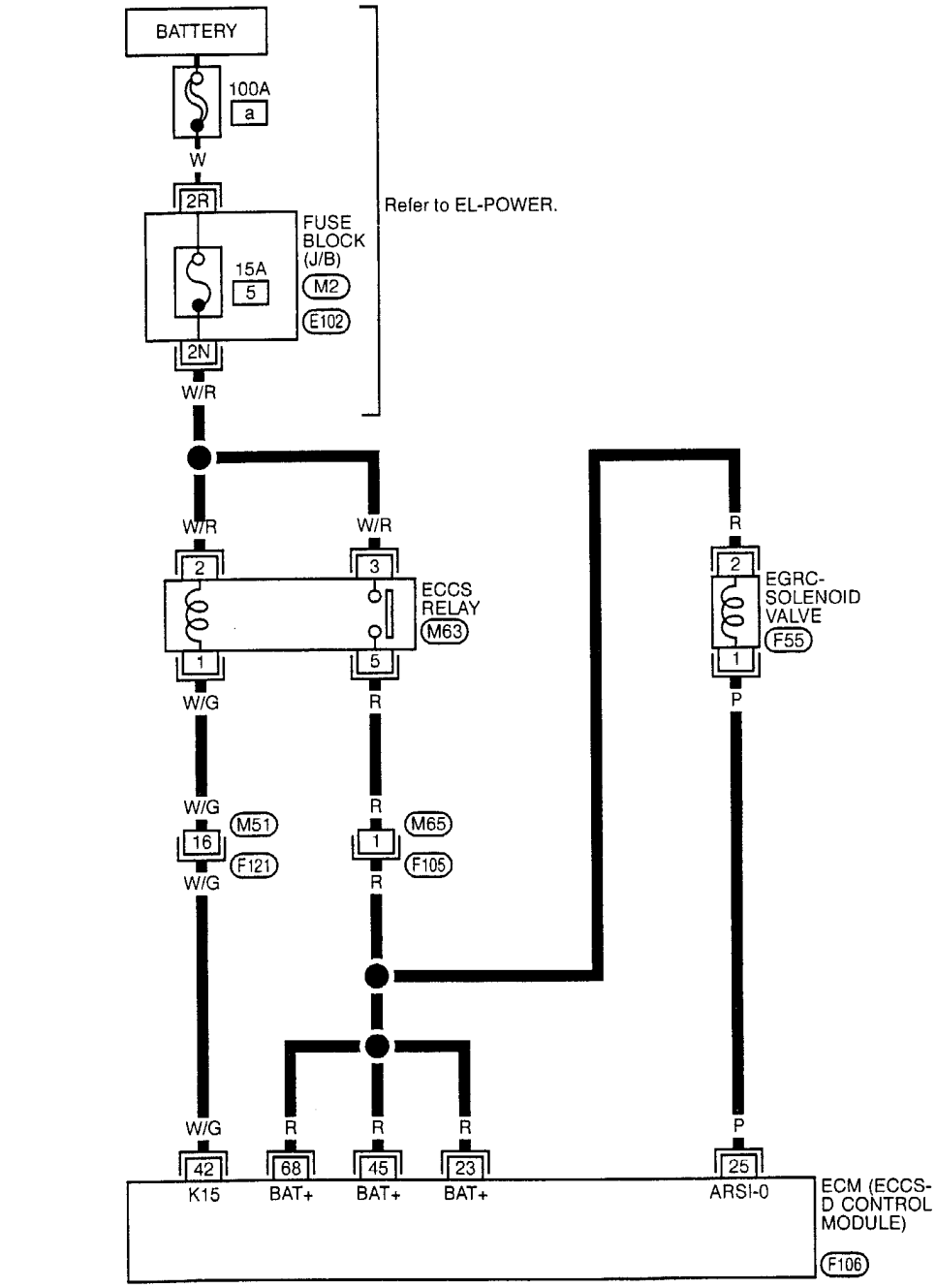
1) Turn ignition switch to the "ON" position.
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

OR

1) Turn ignition switch to the "ON" position and wait at least 2 seconds.
2) Turn ignition switch to the "LOCK" position, wait at least 5 seconds and then turn to the "ON" position.
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

EGRC-Solenoid Valve (Cont'd)

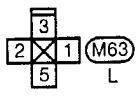
EC-EGRC/V-01

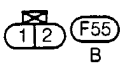


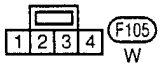
Refer to last page (Foldout page).

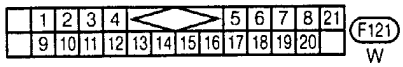
M2

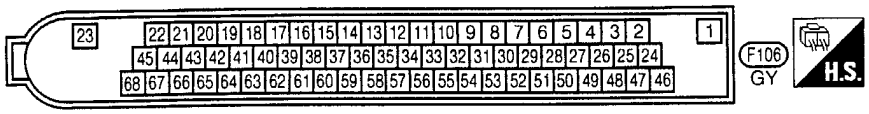
E102







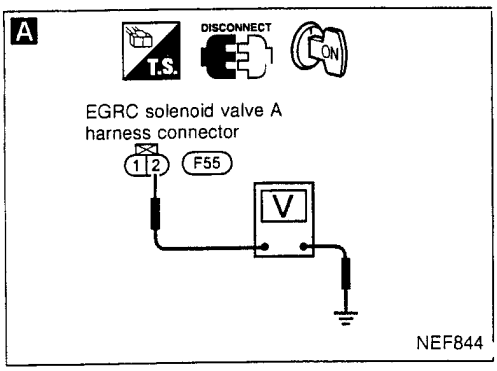


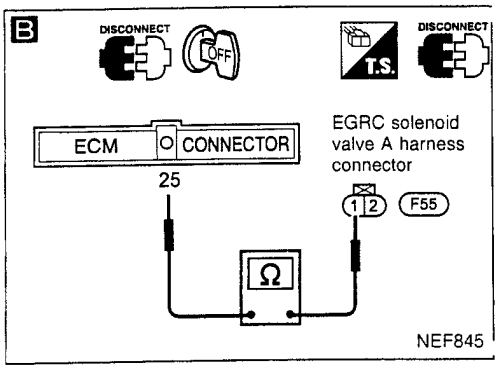


YEC039

EGRC-Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START
(Circuit for EGRC-solenoid valve A)

↓

CHECK MAIN POWER SUPPLY.
Refer to Trouble Diagnosis for main power supply (EC-2096)

↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch to the "LOCK" position.
2. Disconnect EGRC-solenoid valve A harness connector.
3. Turn ignition switch to the "ON" position.
4. Check voltage between connector terminal ② and engine ground.
   Voltage: Battery voltage

NG → Check the following:
- Harness continuity between ECCS-D relay and EGRC-solenoid valve A connector.

If NG, repair harness or connectors.

OK ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to the "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM harness connector terminal ㉕ and EGRC solenoid valve A connector terminal ①.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short between ECM and solenoid valve.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENTS
(EGRC-solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace malfunctioning component(s).

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed ↓

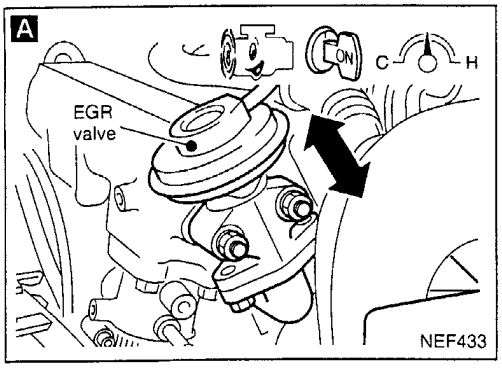
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

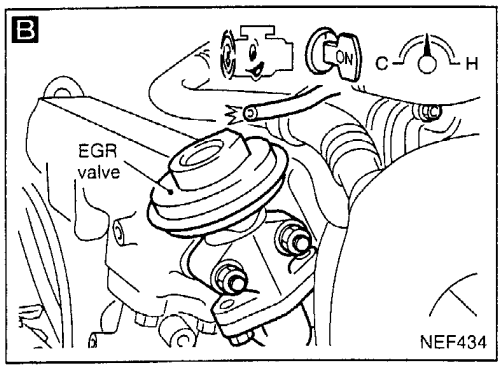
↓

INSPECTION END

EGRC-Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START
EGR CONTROL OPERATION

A

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently. (Air conditioner is "OFF").
2. Perform diagnostic test mode II (Self-diagnostic results). Make sure that diagnostic trouble code No. 55 is displayed.
3. Make sure that EGR diaphragm moves up and down (Use your finger or a suitable tool) under the following conditions:

At idle:
Spring does not move.
Racing engine from idle to 2800 rpm:
Spring moves up and down.

OK → INSPECTION END

NG

B

CHECK VACUUM SOURCES TO EGR VALVE.

1. Disconnect vacuum hoses to EGR valve.
2. Make sure that vacuum exists under the following conditions:

At idle:
Vacuum should not exist.
Racing engine from idle to 2800 rpm:
Vacuum should exist.

OK → CHECK COMPONENTS (EGR valve). (See page EC-2172.)

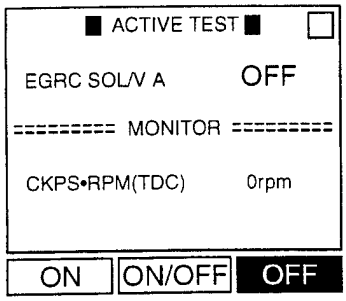
NG → Replace malfunctioning component(s).

NG

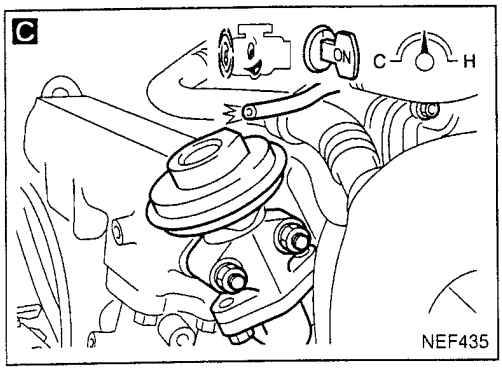
Ⓐ

EGRC-Solenoid Valve (Cont'd)

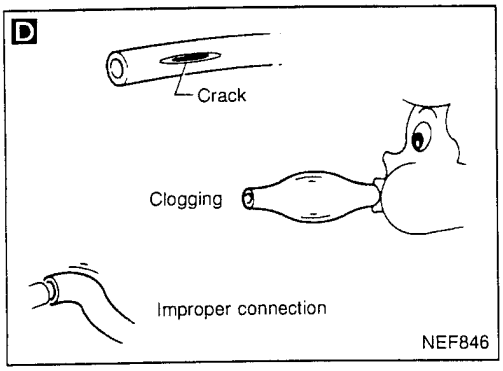
C



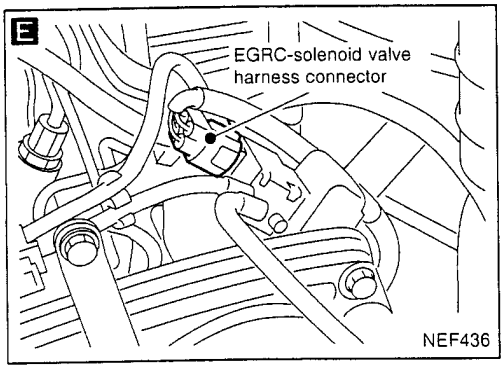
C



D



E



Ⓐ

C

CHECK CONTROL FUNCTION.

1. Turn ignition switch to "ON" position.
2. Turn EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

1. Check voltage between EGRC solenoid valve connector terminal ①, and ground with tester under the following conditions:

Voltage:
At idle
Battery voltage
Engine speed is 2,800 rpm
Approximately 0.4V

OK → D

CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connection.

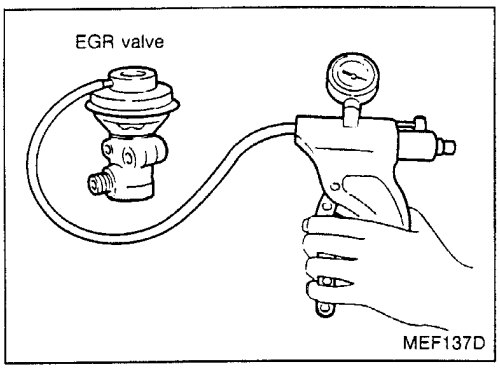
NG → E

Perform electrical circuit inspection.
Refer to preceding page.

OK → Ⓑ

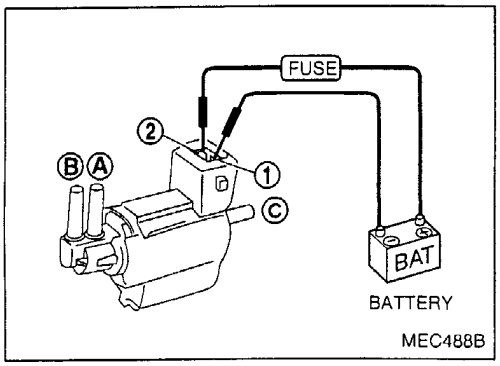
EGRC-Solenoid Valve (Cont'd)

COMPONENT INSPECTION



EGR valve

Apply vacuum to EGR vacuum port with a hand vacuum pump.
EGR valve spring should lift.
If NG, replace EGR valve.



EGRC-solenoid valve

Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.

Brake Switch

The ECM recieves signals from two brake switches. One is a conventional brake lamp switch, the other is refferred to as a redundant (RDNT) brake switch.
In case the accelerator pedal does not return to the idle position (pedal sticks), the driver will react by depressing the brake. In this (emergency) situation, the ECM will disregard the accelerator pedal signal and bring back the engine speed to 1200 rpm.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
87	• Brake switch circuits are open or shorted.	• Harness or connectors (Brake switch circuits are open or shorted.) • Stop lamp switch • RDNT brake switch

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

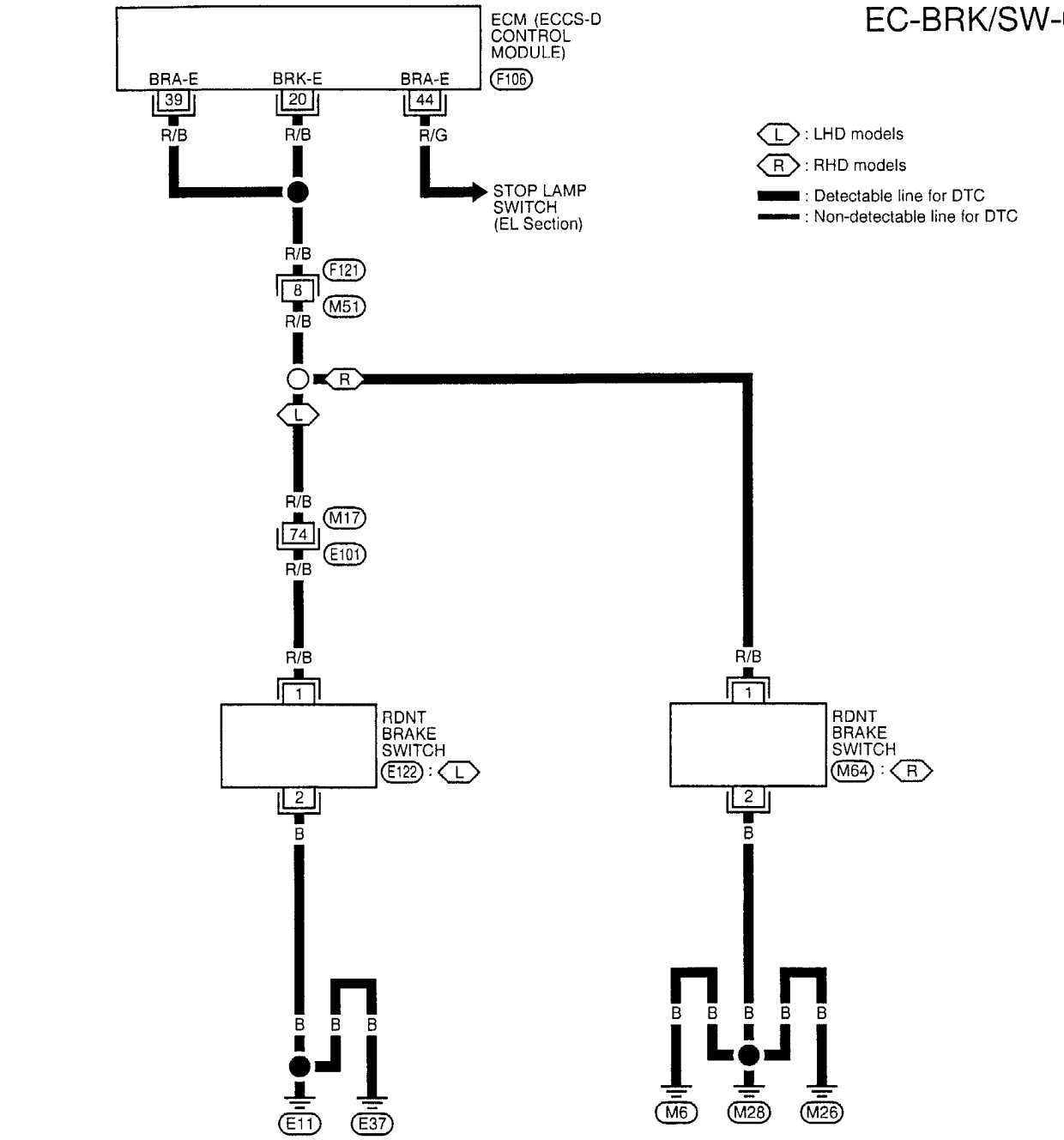
1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Depress brake pedal for at least 1 minute.

OR

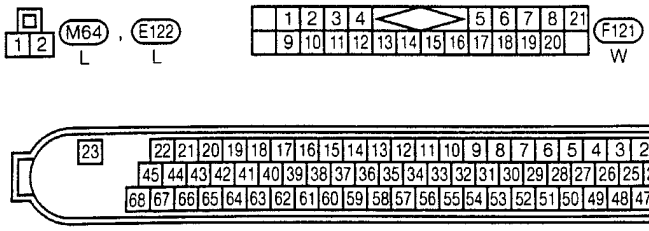
1) Turn ignition switch to "ON" position.
2) Depress brake pedal for at least 1 minute.
3) Turn ignition switch to "LOCK" position, wait at least 5 seconds and then turn to "ON" position.
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results).

Brake Switch (Cont'd)

EC-BRK/SW-01

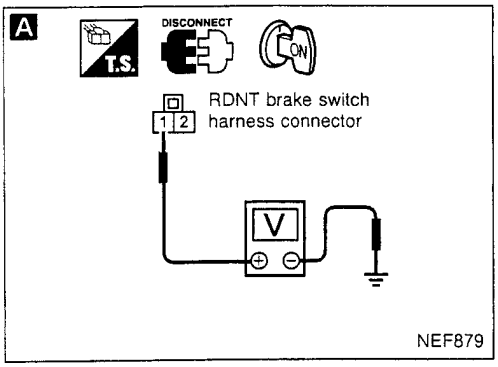


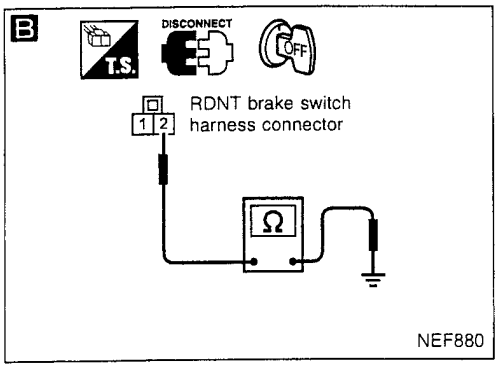
Refer to last page (Foldout page).
M17 , E101



YEC015

Brake Switch (Cont'd)





INSPECTION START
(RDNT brake switch)

A

CHECK POWER SUPPLY.
1. Turn ignition switch to "LOCK" position.
2. Disconnect RDNT brake switch harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between RDNT brake switch harness connector terminal ① and body ground.
   Voltage: Battery voltage

NG → Check the following:
- Harness connectors (F121), (M51)
- Harness connectors (M17), (E101) (LHD models)
- Harness for open or short-circuit between RDNT brake switch harness connector terminal ① and ECM connector terminal (20), (39).

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check harness continuity between RDNT brake switch harness connector terminal ② and body ground.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT.
(RDNT brake switch)
Refer to "COMPONENT INSPECTION" (EC-2176).

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

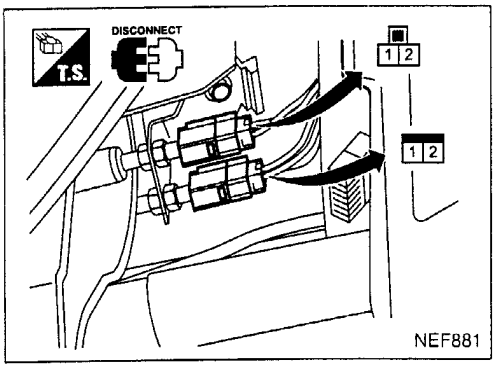
Trouble is not fixed

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Brake Switch (Cont'd)

COMPONENT INSPECTION



Stop lamp switch and RDNT brake switch

1. Turn ignition switch to "LOCK" position.
2. Disconnect switch harness connectors.
3. Check continuity between terminals ① and ②.

Continuity:

Brake pedal	Stop lamp switch	RDNT brake switch
Released	No	No
Depressed	Yes	Yes

If NG, replace stop lamp switch or RDNT brake switch.

ECCS-D Relay

The ECCS-D Relay shuts off the main power supply to the ECM within 5 seconds after the ignition switch has turned to the "LOCK" position.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
92	• ECCS-D relay shut-off time is too late.	• Harness or connectors (The ECCS-D relay circuit is shorted). • ECCS-D relay • ECM

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch to the "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Turn ignition switch to the "LOCK" position and wait at least 5 seconds.
3) Turn ignition switch to the "ON" position and wait at least 2 seconds.

OR

1) Turn ignition switch to the "ON" position.
2) Turn it to the "LOCK" position, wait at least 5 seconds.
3) Turn ignition switch to the "ON" position and perform "Diagnostic Test Mode II" (Self-diagnostic results).

DIAGNOSTIC PROCEDURE

Refer to "Trouble Diagnosis for Power Supply" (EC-2096) for ECCS-D relay circuit inspection.

MIL & Data Link Connectors

Malfunction indicator lamp (MIL) circuit is monitored for open or short-circuit. If the circuit is malfunctioning, MIL can not report it but CONSULT can.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible cause)
97	• MIL circuit is open or shorted.	• Harness or connectors (MIL circuit is open or shorted). • MIL lamp • ECM

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch to "ON" position and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 2 seconds at idle speed.

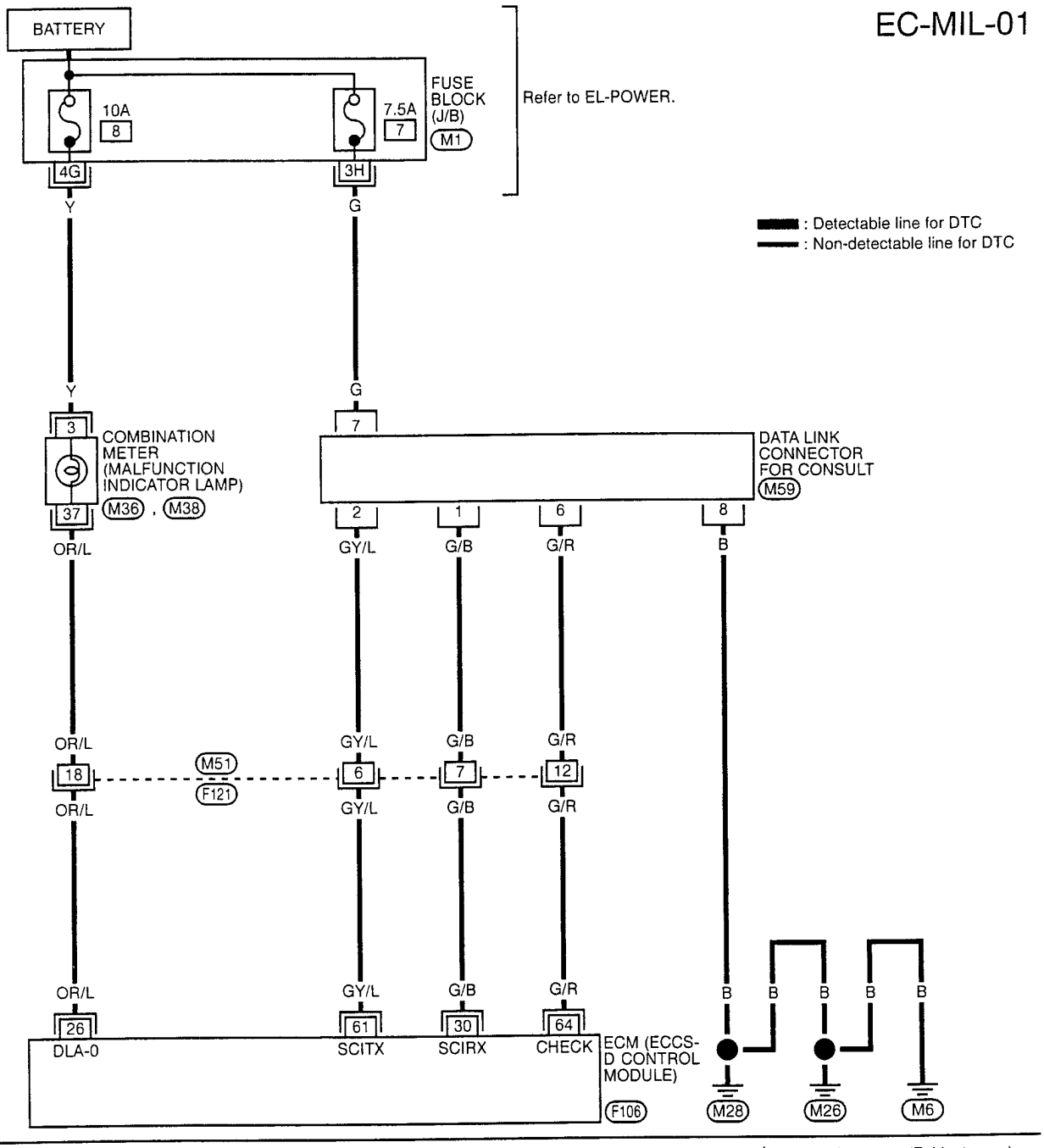
OR

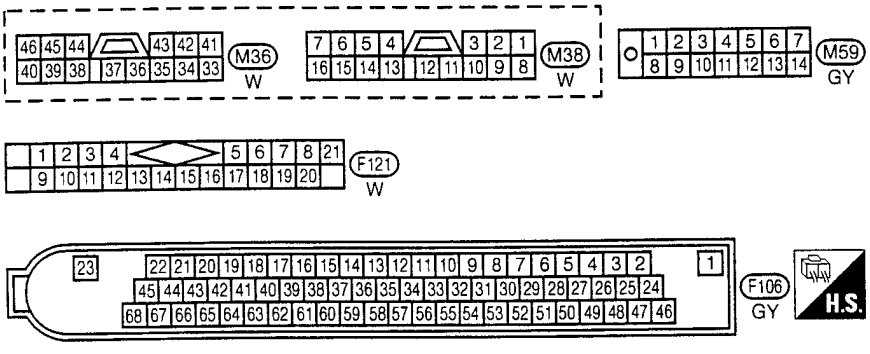
OVERALL FUNCTION CHECK

1) Turn ignition switch to "ON" position.
2) Check that MIL lits on.

MIL & Data Link Connectors (Cont'd)

EC-MIL-01



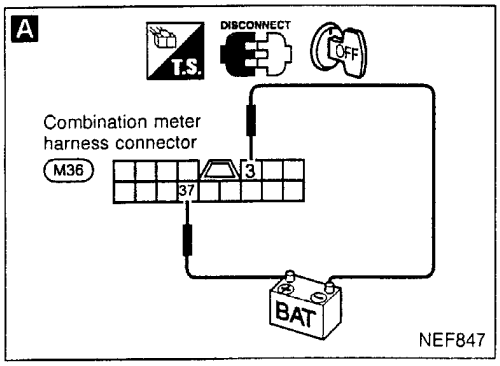


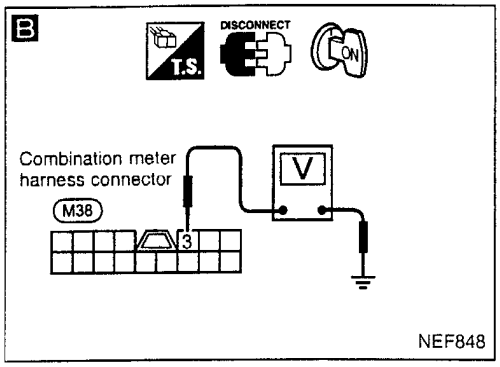
Refer to last page (Foldout page).
M1

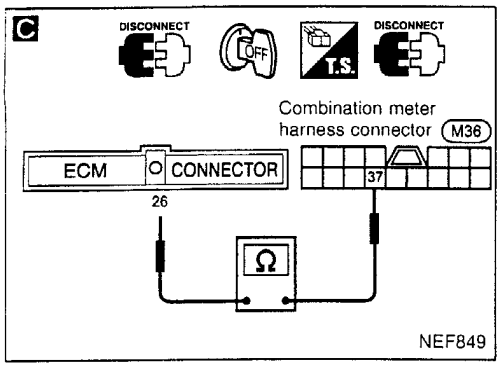
YEC041

MIL & Data Link Connectors (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START
(MIL circuit)

A

CHECK MIL BULB.
1. Turn ignition switch to "LOCK" position.
2. Disconnect combination meter harness connector.
3. Apply battery voltage between combination meter terminal ③ and ㊲.
4. Check that MIL lits on.

NG → Replace MIL bulb.

OK

B

CHECK POWER SUPPLY.
1. Turn ignition switch to "ON" position.
2. Check voltage between combination meter terminal ③ and body ground.
Voltage: Battery voltage

NG → Check the following:
- Harness for open or short-circuit between combination meter and ignition switch.
- 10A fuse

If NG, repair or replace harness or fuse.

OK

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check continuity between combination meter connector terminal ㊲ and ECM connector terminal ㉖.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness and connectors for open or short-circuit between ECM and combination meter.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

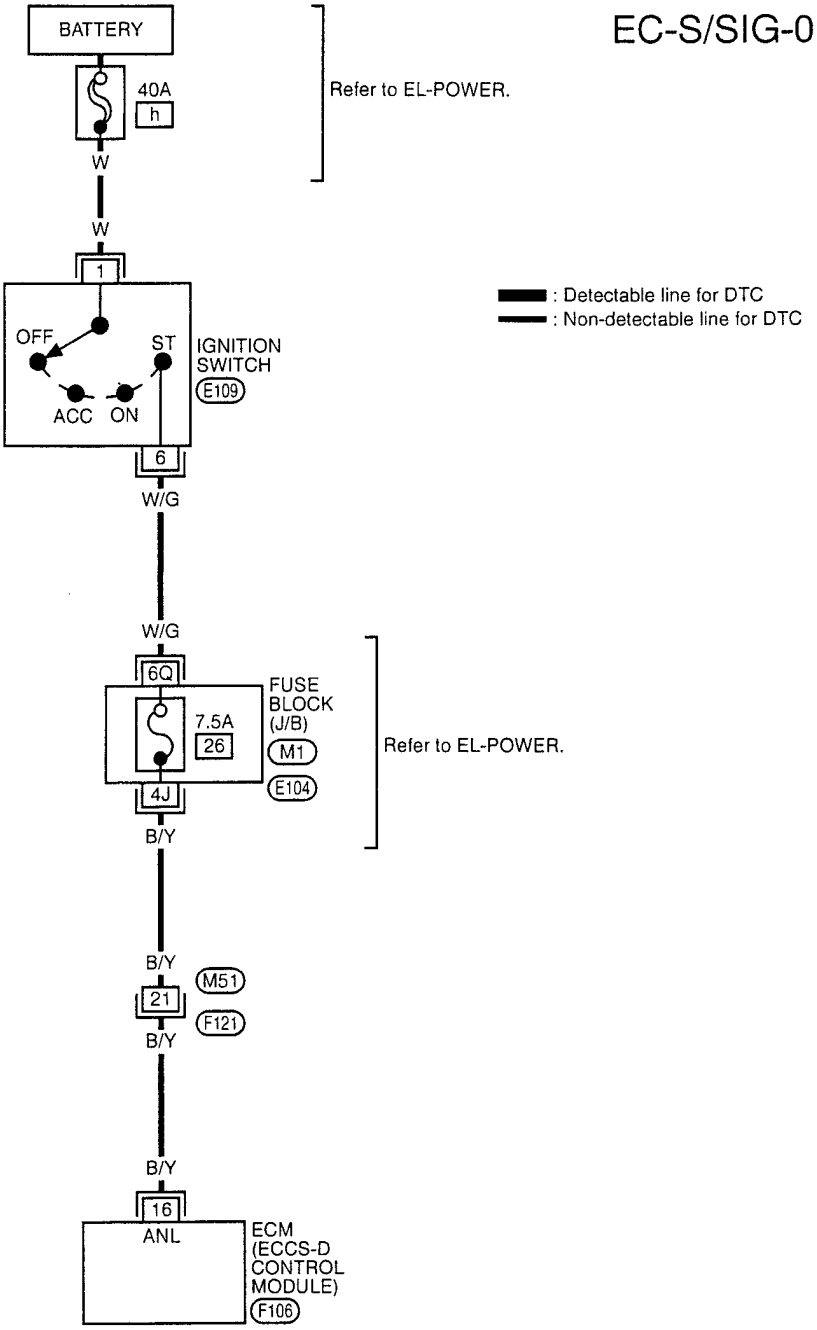
Trouble is not fixed

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Start Signal

EC-S/SIG-01



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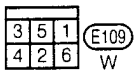
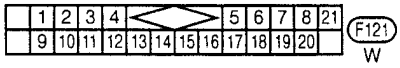
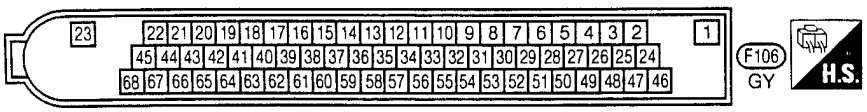
(M1), (E104)





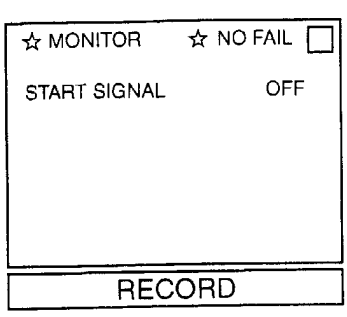


YEC100

Start Signal (Cont'd)

DIAGNOSTIC PROCEDURE

A



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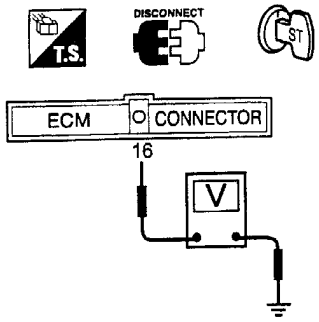

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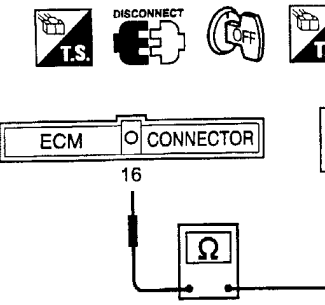

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch to "ON" position.
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OK → INSPECTION END

OR

1. Turn ignition switch to the "LOCK" position.
2. Disconnect ECM harness connector.
3. Turn ignition switch to "START" position.
4. Check voltage between ECM connector terminal ⑯ and ground.

Voltage:
Ignition switch "START" — Battery voltage
Except above — Approximately 0V

NG

Check if 7.5A fuse is OK. NG → Replace 7.5A fuse.

OK

B

CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch to "LOCK" position.
2) Disconnect 7.5A fuse.
3) Check harness continuity between ECM connector terminal ⑯ and fuse block.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness or connectors (M51), (F121)
- Harness for open or short-circuit between ECM and fuse block.

If NG, repair harness or connectors.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

General Specifications

Unit : rpm

Engine		CD20T
Maximum engine speed		5,400
Idle speed	A/C ON	825 ± 25
	A/C OFF	825 ± 25

Pump numbers

Engine	Part number	Pump assembly number
CD20T	16700 2J620	NP-VE4/ 10E2200L736

Pump data is not yet available.
Refer to CALIBRATION STANDARD published by BOSCH.)

Injection Nozzle

INSPECTION AND ADJUSTMENT

Injection nozzle assembly

Unit: kPa (bar, kg/cm^2, psi)

Initial injection pressure	
New	14,423 - 15,651 (144.2 - 156.5, 148 - 159, 2,091 - 2,269)
Used	15,000 - 16,000 (150.0 - 160.0, 153 - 163, 2,175 - 2,320)

Inspection and Adjustment

Plunger lift (Injection timing) mm (in)	0.89 ± 0.08

MASS AIR FLOW SENSOR

Supply voltage V	5.0V
Output voltage V	1.9 - 2.3*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

CONTROL SLEEVE POSITION SENSOR

Resistance [at 25°C (77°F)] Ω	6.0

Inspection and Adjustment (Cont'd)

INJECTION TIMING CONTROL VALVE

Resistance [at 25°C (77°F)]	Ω	Approximately 15

ELECTRIC GOVERNOR

Resistance [at 25°C (77°F)]	Ω	1.0

CRANKSHAFT POSITION SENSOR (TDC)

Resistance [at 25°C (77°F)]	Ω	Approximately 1,215 - 1,485

GLOW PLUG

Resistance [at 25°C (77°F)]	Ω	0.5

ACCELERATOR POSITION SENSOR

Throttle valve conditions	Resistance kΩ [at 25°C (77°F)]
Completely closed	Approximately 1.2
Partially open	1.2 - 1.9
Completely open	Approximately 1.9

FUEL TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
25 (77)	Approximately 1.9

<SUPPLEMENT-III> (For wagon models)

ENGINE CONTROL SYSTEM

SECTION EC

EC

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SR20De/DE

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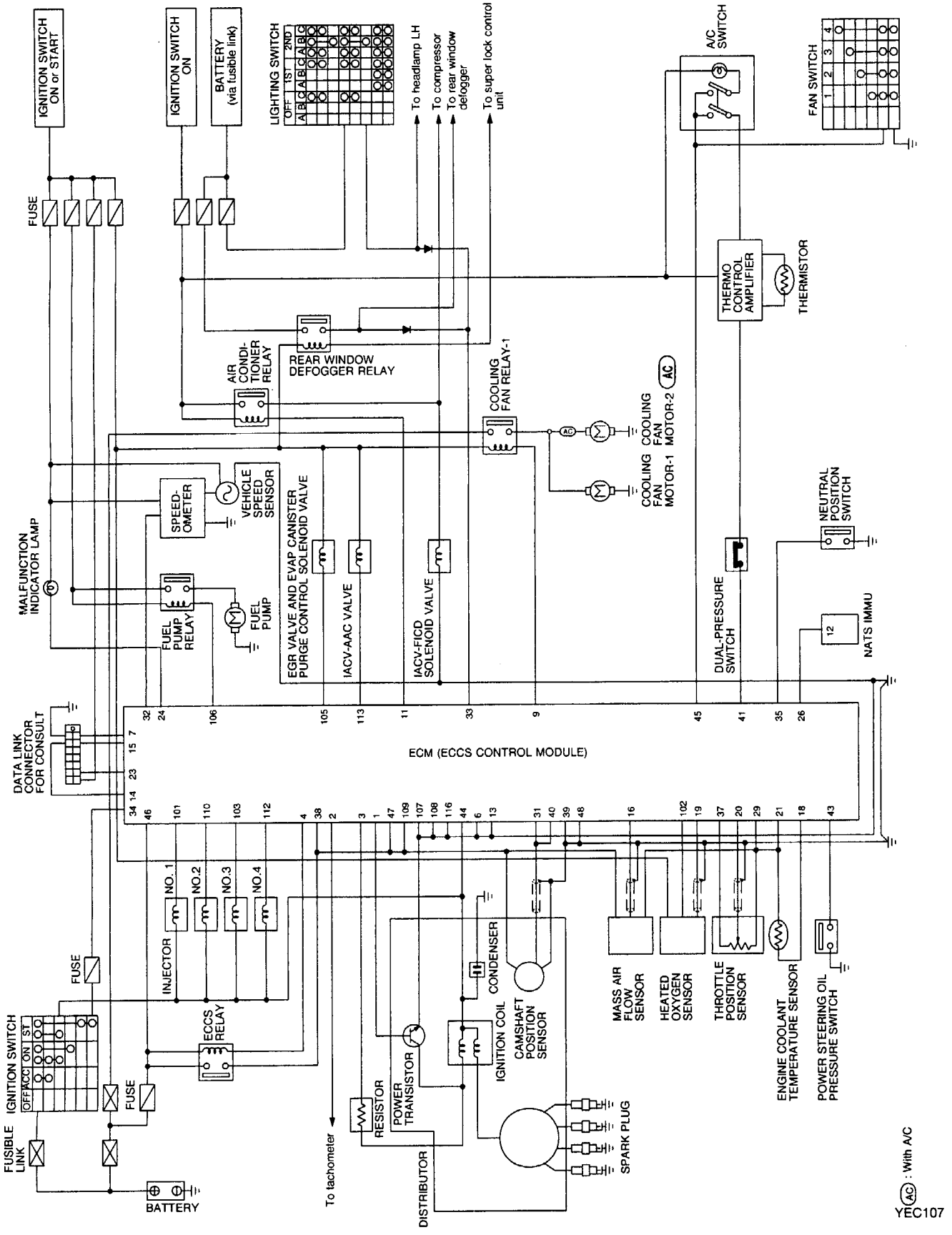
When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

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".

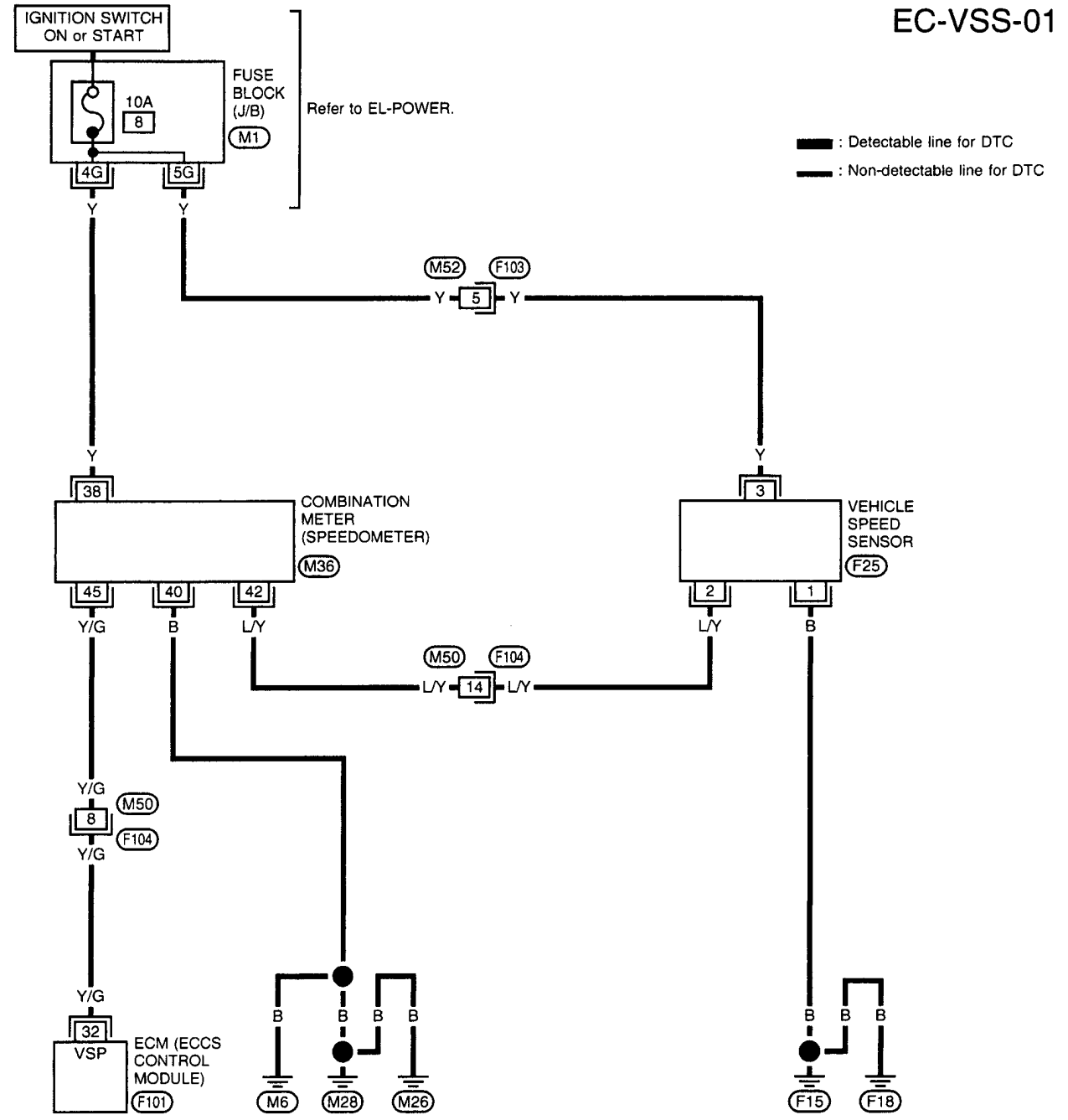
For clarification of system component abbreviations and terminology read GI section "SAE J1930 TERMINOLOGY LIST".

Circuit Diagram



Vehicle Speed Sensor (VSS)

EC-VSS-01



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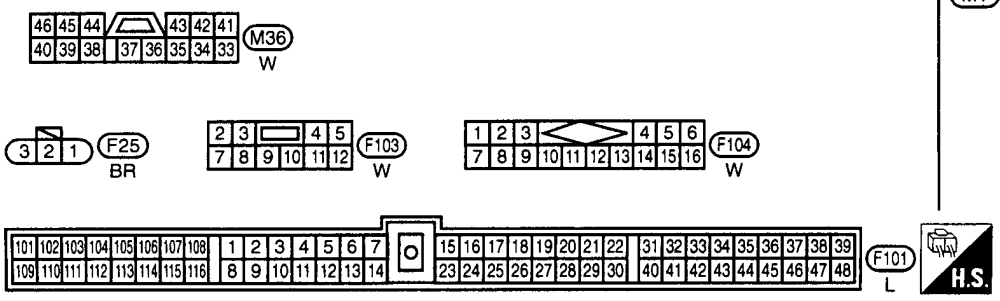
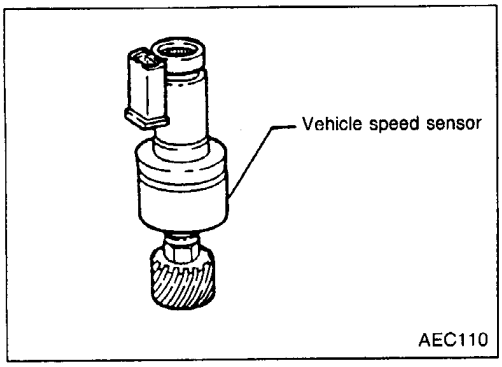
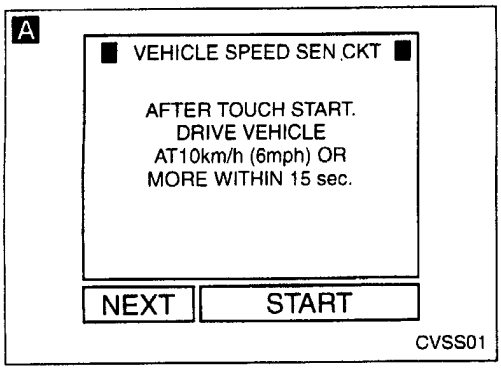


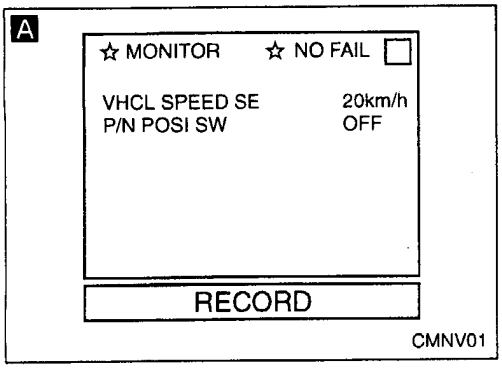
YEC112

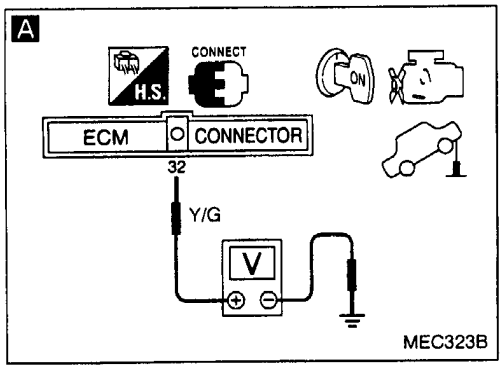
Vehicle Speed Sensor (VSS) (Cont'd)

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.









DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Jack up drive wheels.
2. Perform "VEHICLE SPEED SEN CKT" in "FUNCTION TEST" mode with CONSULT.

OR

2. Read "VHCL SPEED SE" signal in "DATA MONITOR" mode with CONSULT.
CONSULT value should be the same as the speedometer indication.

OR

2. Turn ignition switch to "ON" position.
3. Rotate drive wheel by hand.
4. Check voltage between ECM connector terminal (32) and body ground.
Voltage should vary between approx. 0 - 4.2V.

OK → INSPECTION END

NG

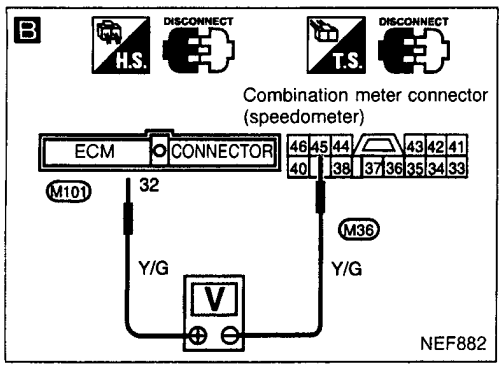
CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

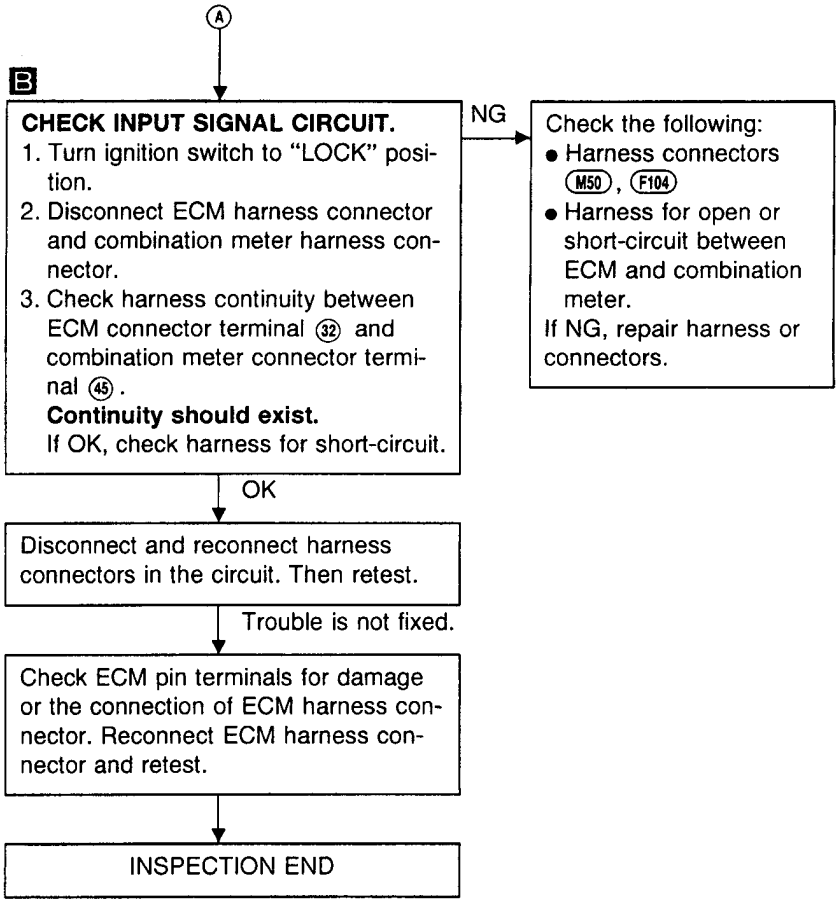
NG → Check vehicle speed sensor and circuit. (Refer to "Inspection/ Speedometer and Vehicle Speed Sensor" of "METER AND GAUGES" in EL section.)

OK

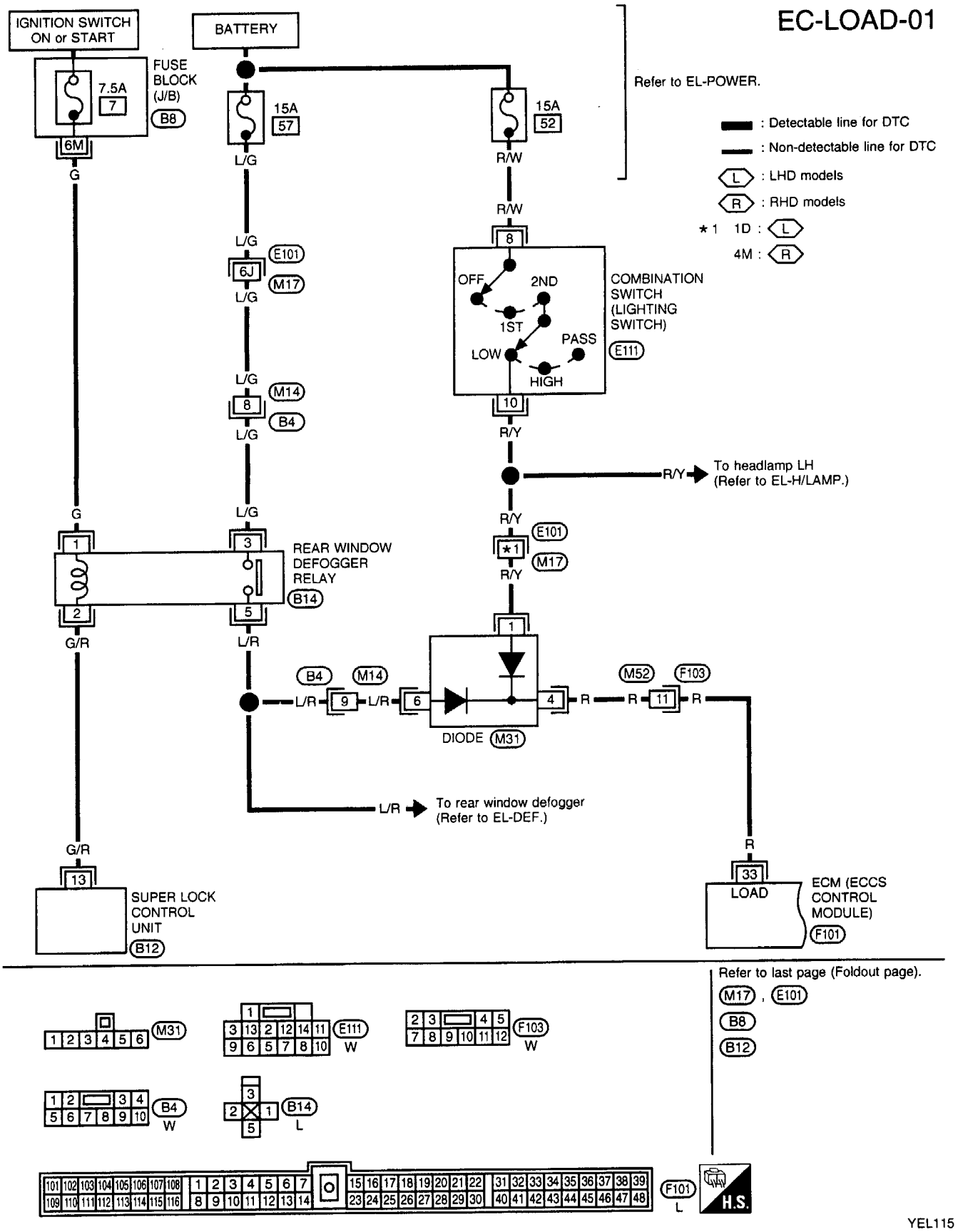
Ⓐ

Vehicle Speed Sensor (VSS) (Cont'd)



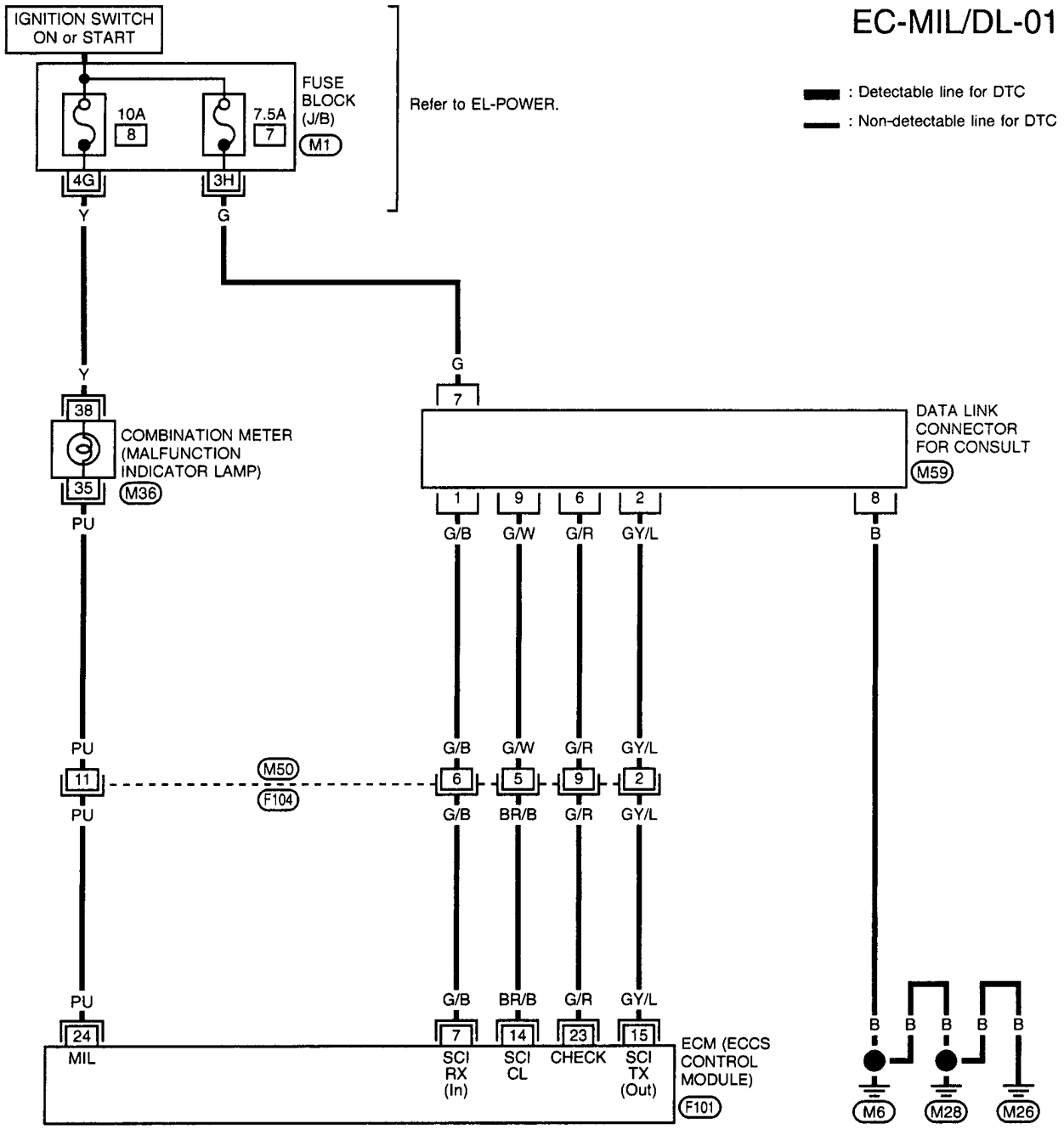


Electrical Load Signal



YEL115

MIL & Data Link Connectors



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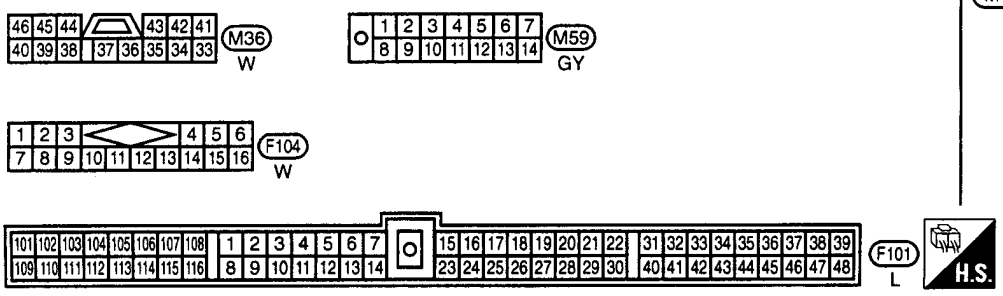
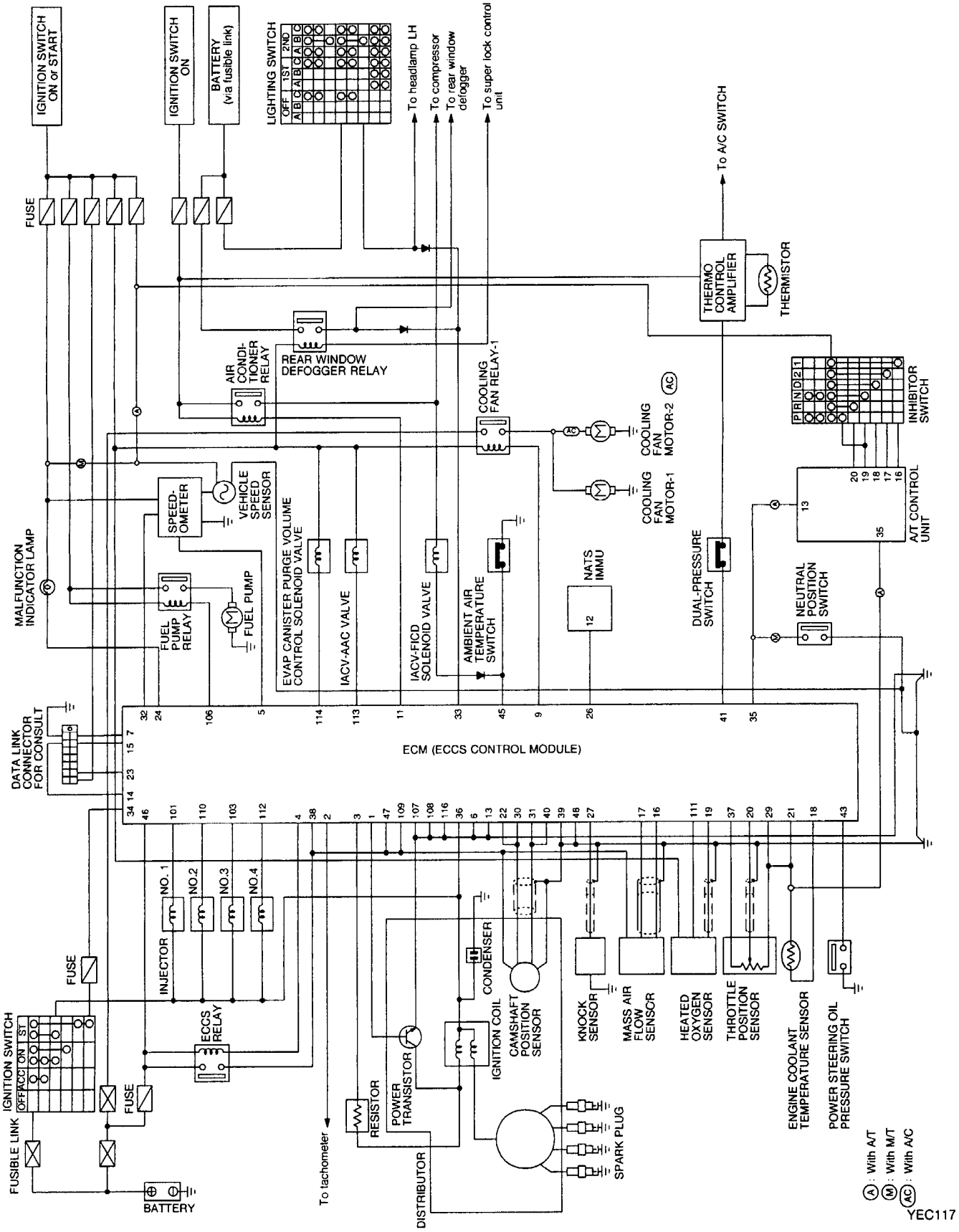


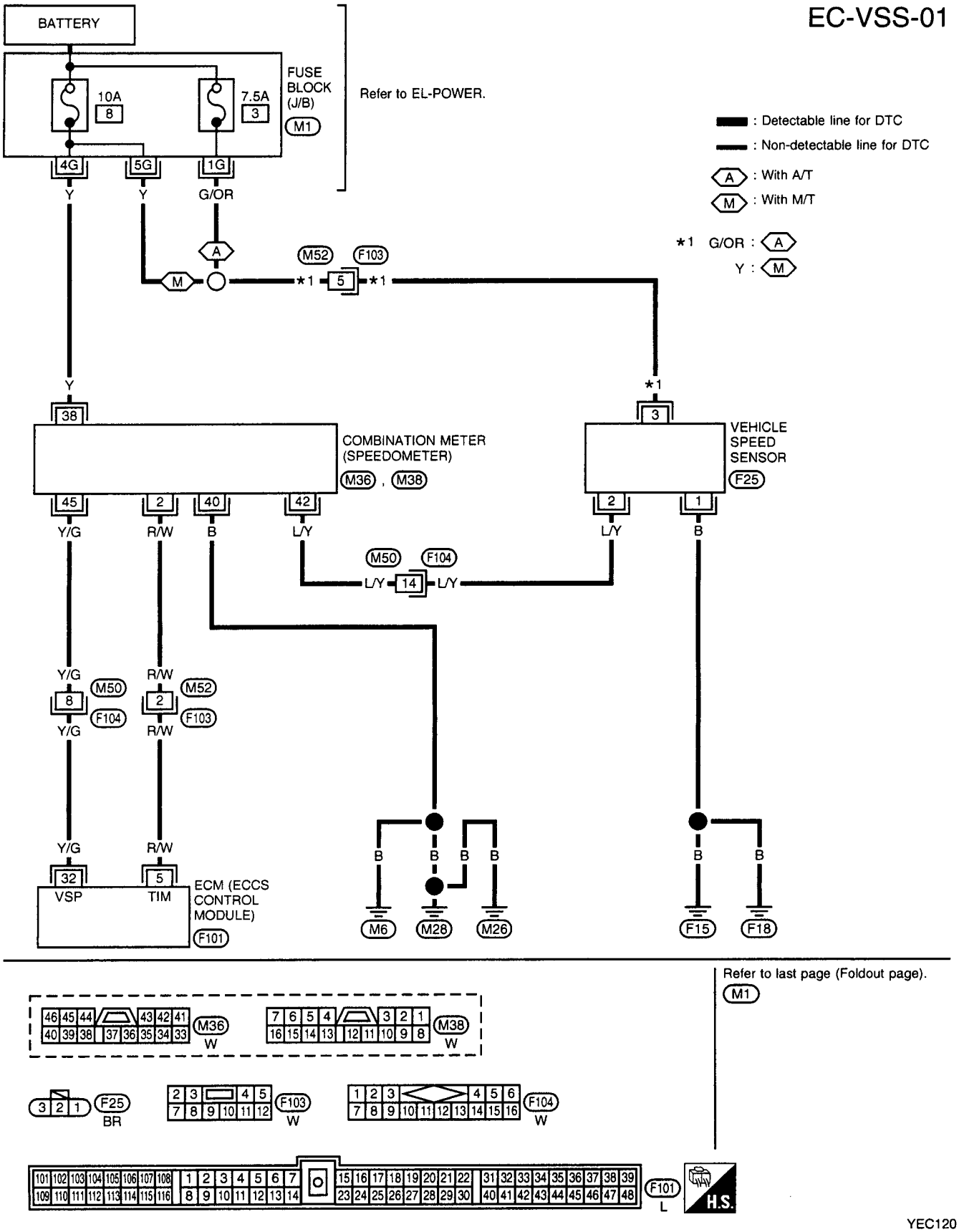
YEC116

Circuit Diagram



Vehicle Speed Sensor (VSS)

EC-VSS-01

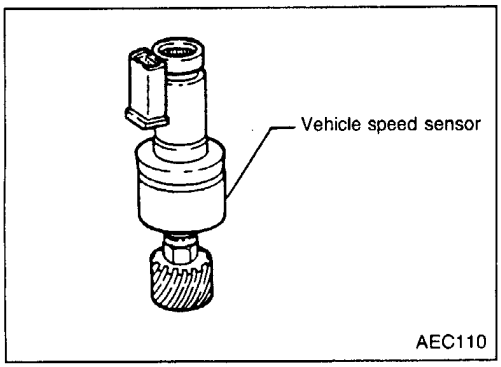


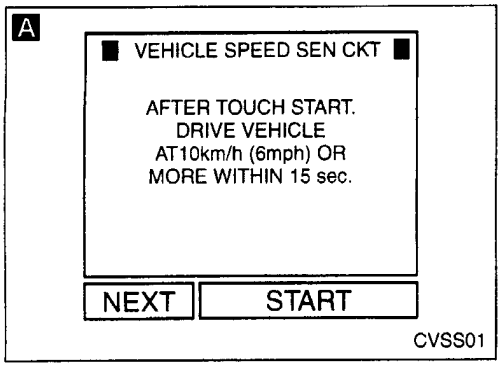
Refer to last page (Foldout page).
M1

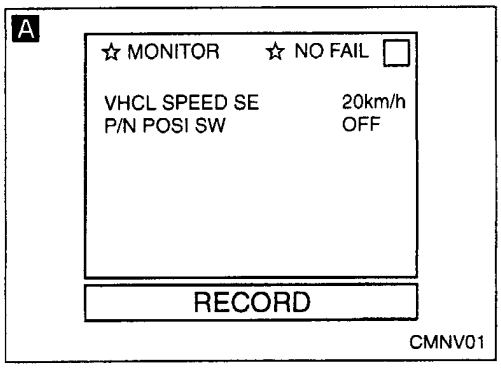
YEC120

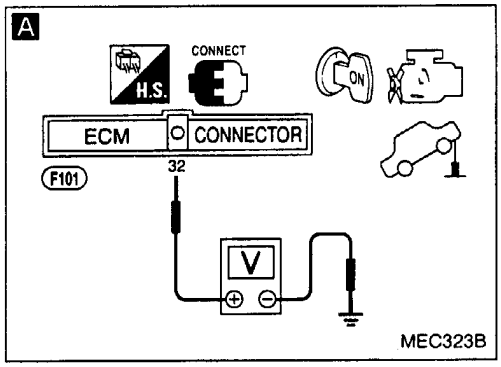
Vehicle Speed Sensor (VSS) (Cont'd)

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.









DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Jack up drive wheels.
2. Perform "VEHICLE SPEED SEN CKT" in "FUNCTION TEST" mode with CONSULT.

OR

2. Read "VHCL SPEED SE" signal in "DATA MONITOR" mode with CONSULT.
CONSULT value should be the same as the speedometer indication.

OR

2. Turn ignition switch to "ON" position.
3. Rotate drive wheel by hand.
4. Check voltage between ECM connector terminal (32) and body ground.
Voltage should vary between approx. 0 - 4.2V.

OK → INSPECTION END

NG

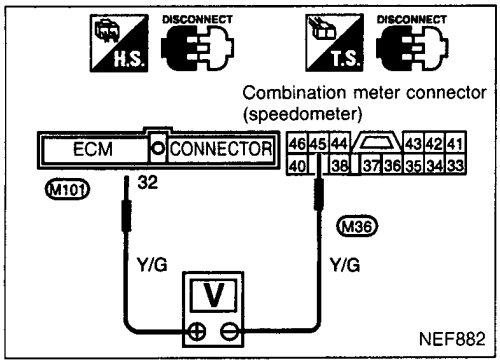
CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check vehicle speed sensor and circuit. (Refer to "Inspection/ Speedometer and Vehicle Speed Sensor" of "METER AND GAUGES" in EL section.)

OK

Ⓐ

Vehicle Speed Sensor (VSS) (Cont'd)



Ⓐ

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM connector terminal (32) and combination meter connector terminal (45).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M50), (F104)
- Harness for open or short-circuit between ECM and combination meter.

If NG, repair harness or connectors.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

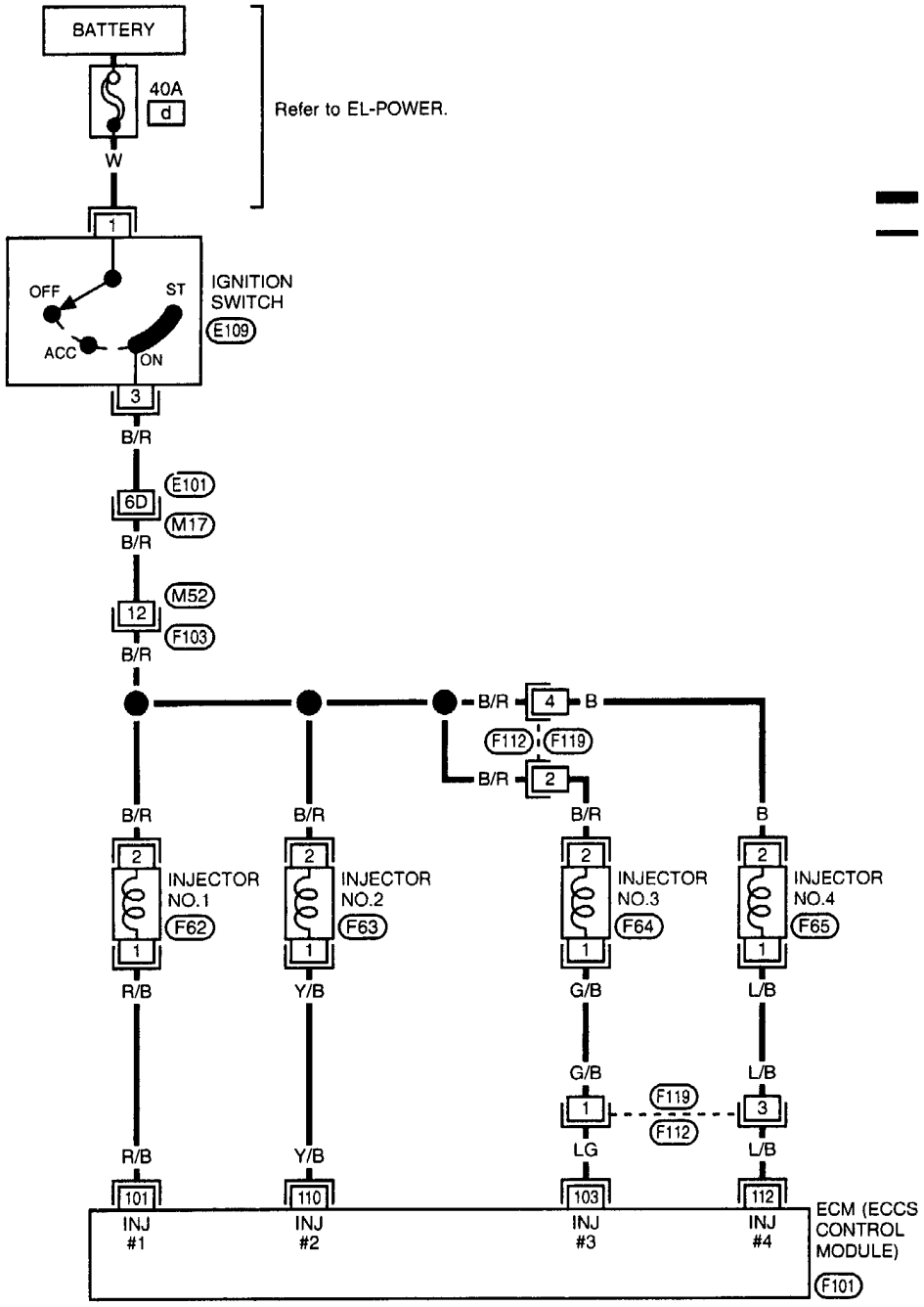
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Injector

EC-INJECT-01



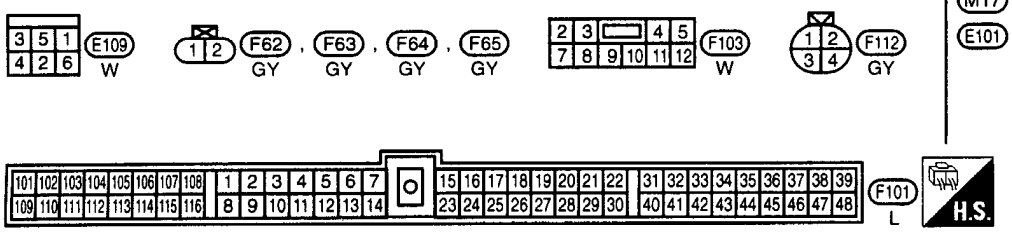
: Detectable line for DTC

: Non-detectable line for DTC

Refer to last page (Foldout page).

M17

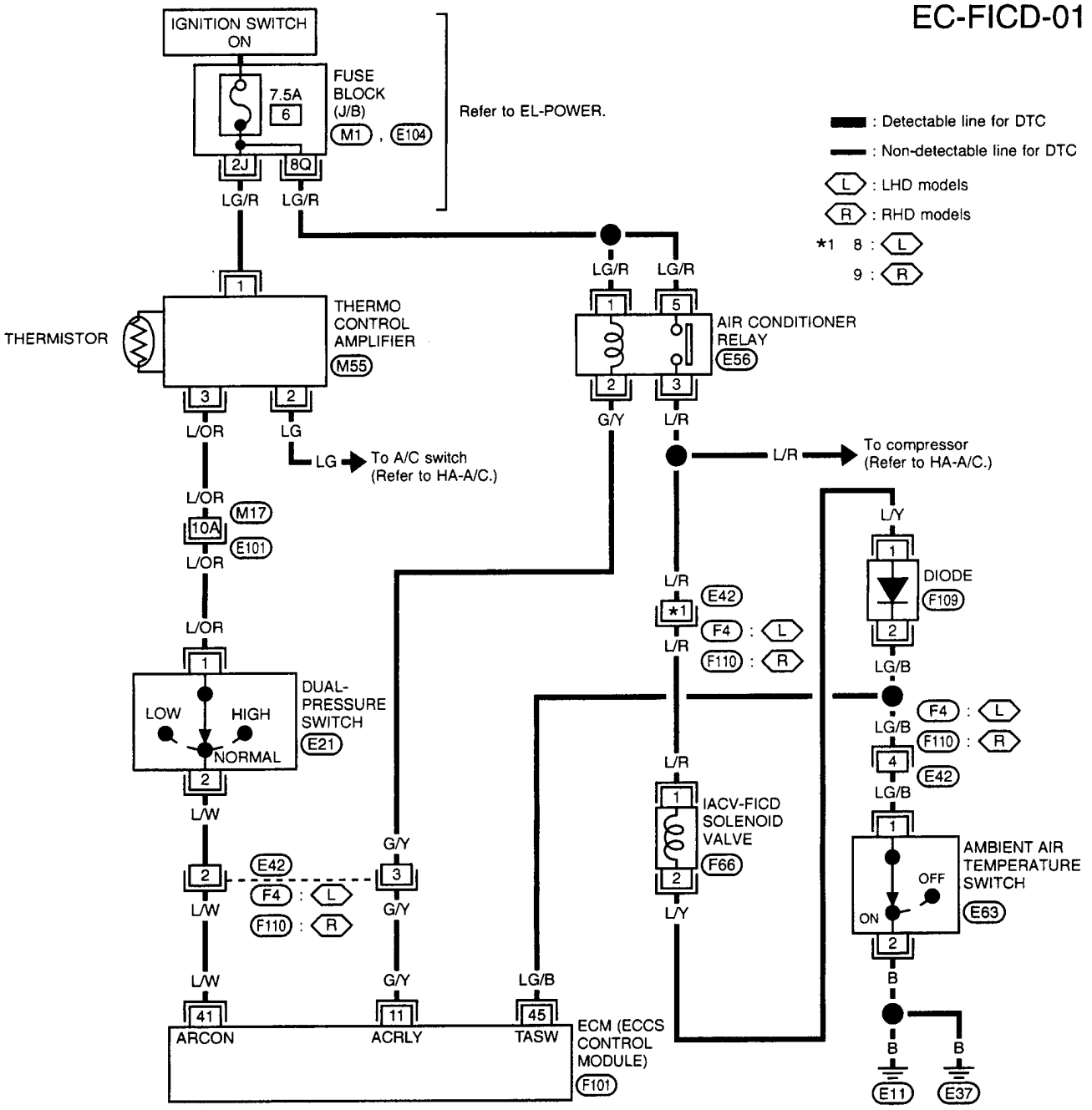
E101

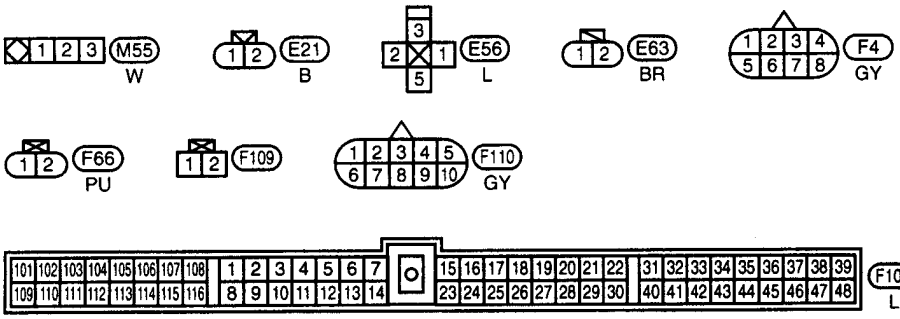


YEC121

Idle Air Control Valve (IACV)-FICD Solenoid Valve

EC-FICD-01

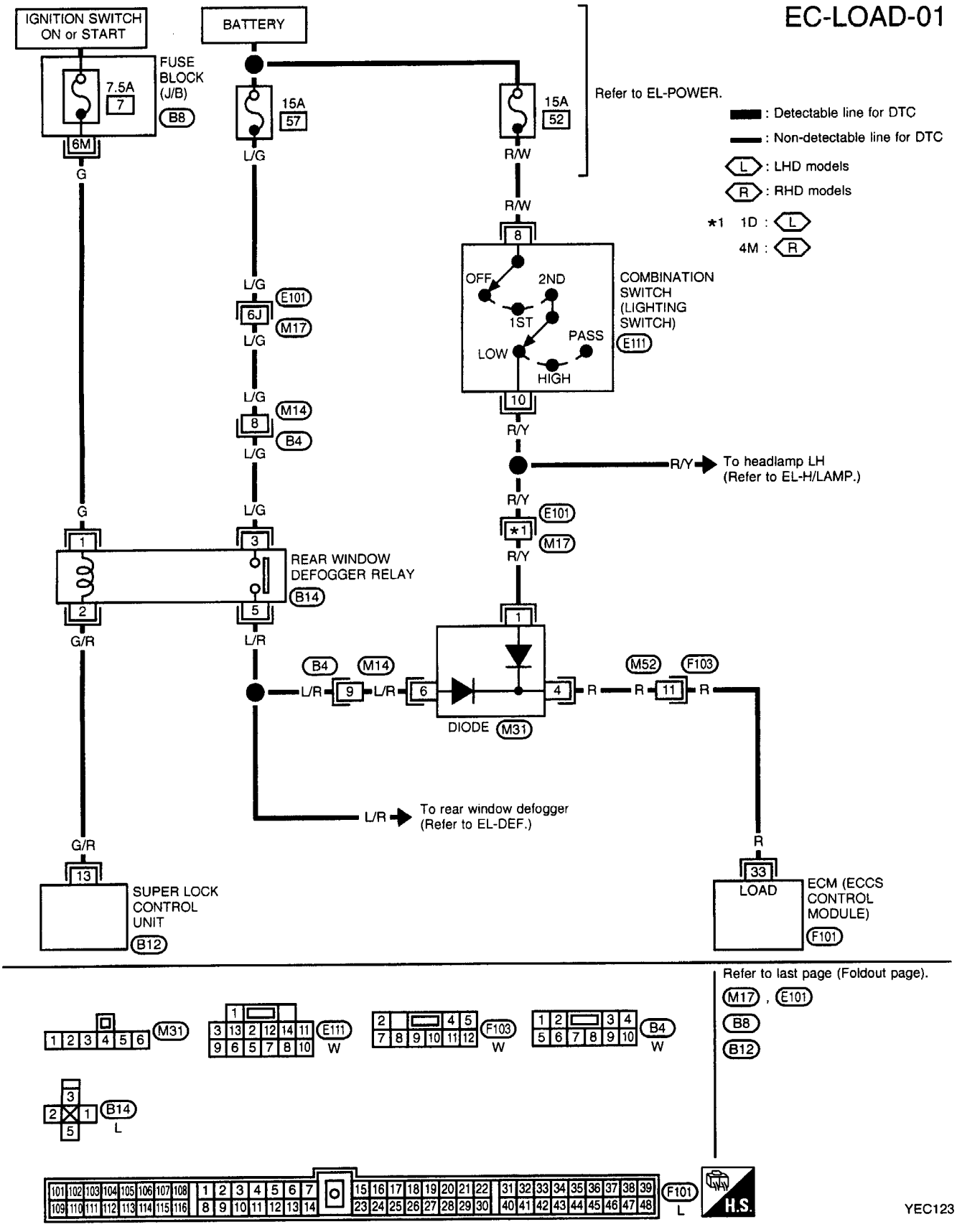




Refer to last page (Foldout page).
M1 , E104
M17 , E101

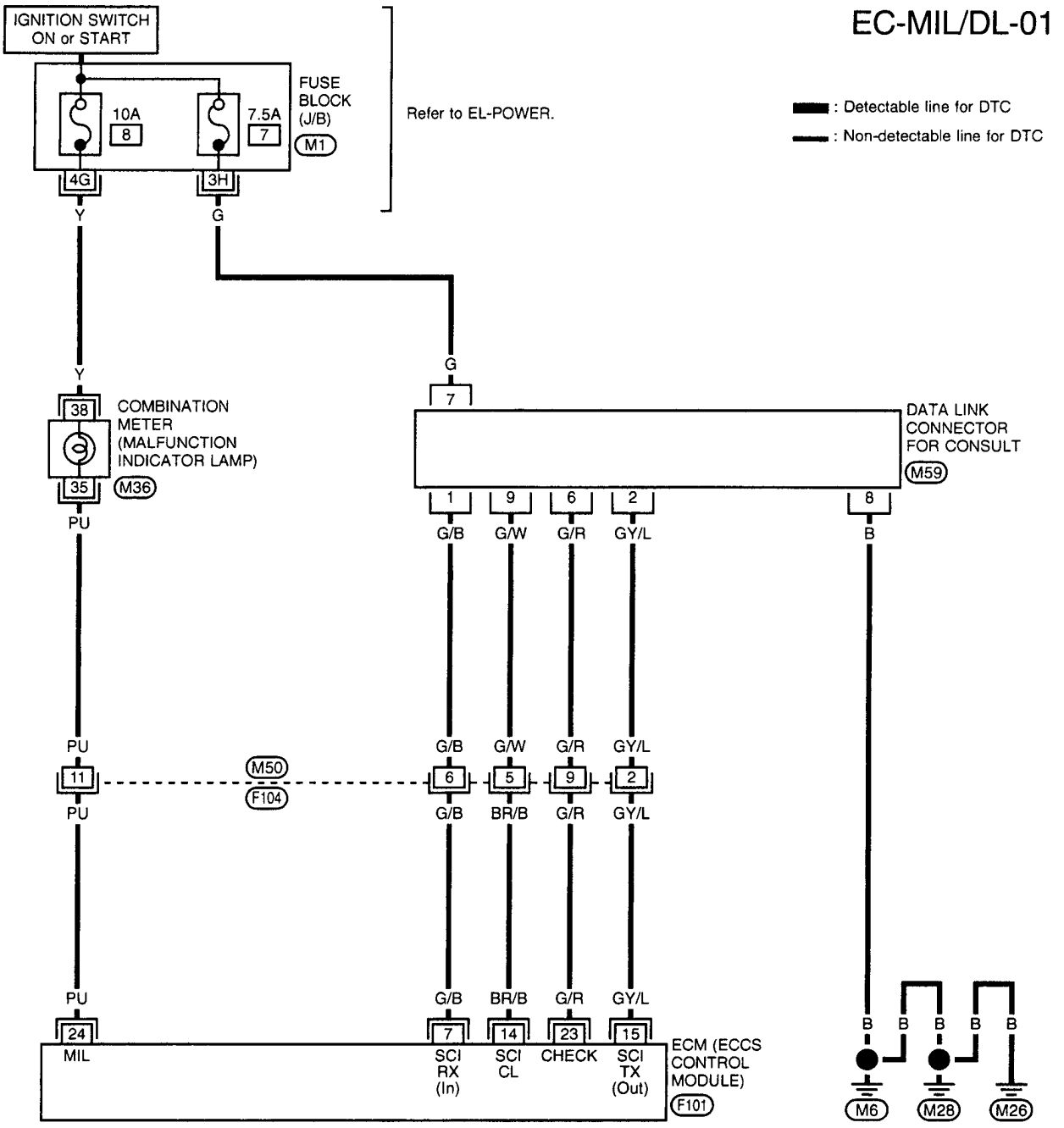
YEC122

Electrical Load Signal



YEC123

Malfunction Indicator Lamp (MIL) & Data Link Connector (DLC) for CONSULT



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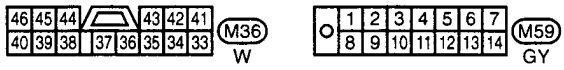
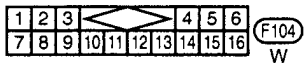
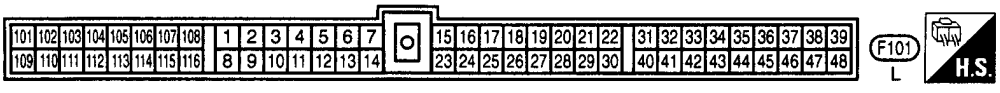
M1

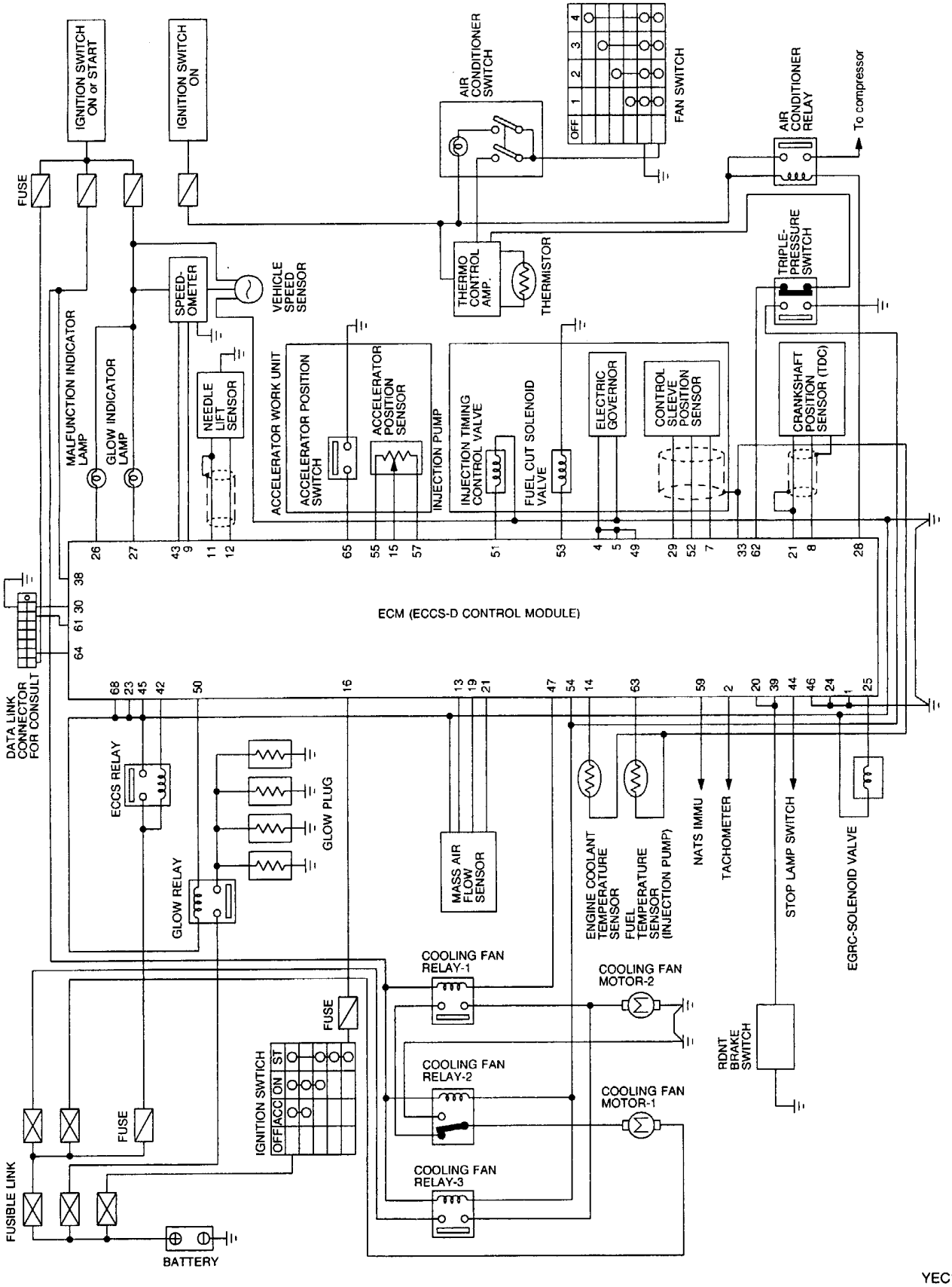






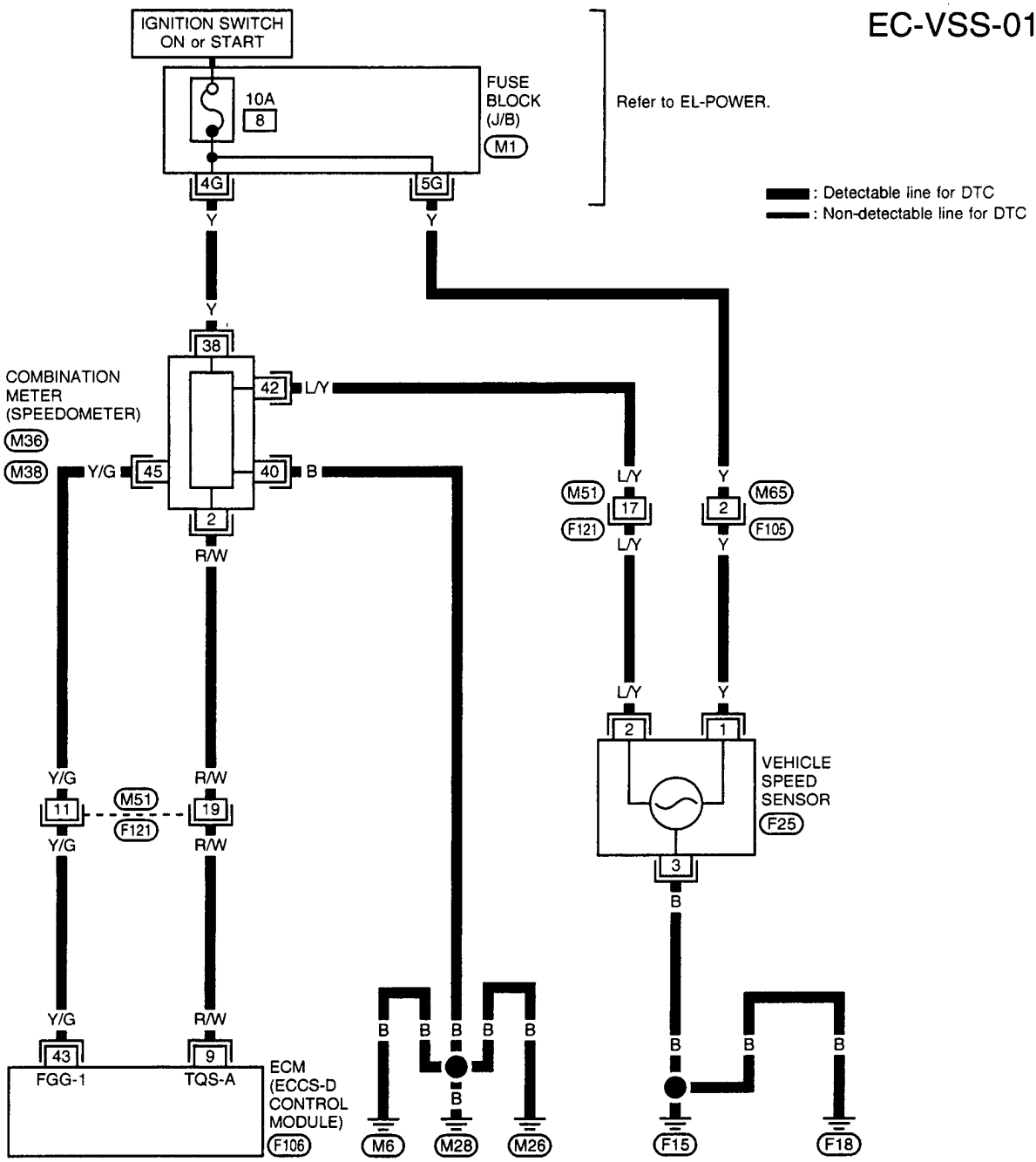
YEC124

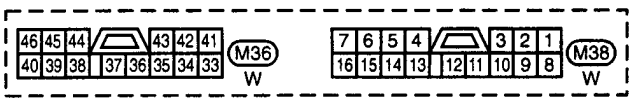
Circuit Diagram

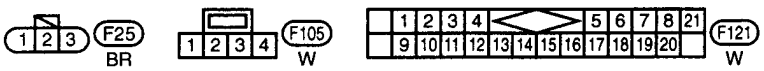


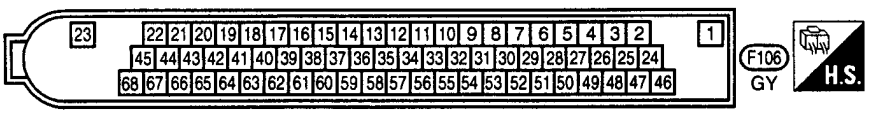
Vehicle Speed Sensor (VSS)

EC-VSS-01







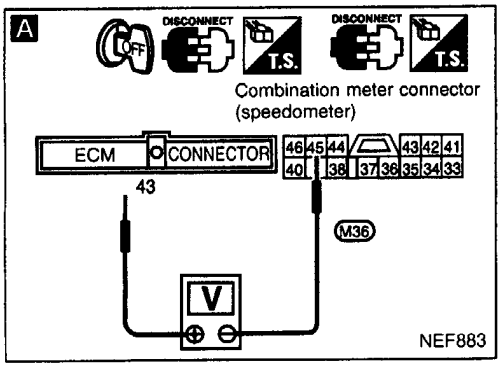


Refer to last page (Foldout page).
M1

YEC127

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM connector terminal (43) and combination meter connector terminal (45).
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M51), (F121)
- Harness for open or short-circuit between ECM and combination meter.

If NG, repair harness or connectors.

OK ↓

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions correctly.

NG → Check the following:
- Harness connectors (M51), (F121)
- Harness for open or short-circuit between combination meter and vehicle speed sensor.

If NG, repair harness or connectors.
Check vehicle speed sensor and its circuit. Refer to EL section.

OK ↓

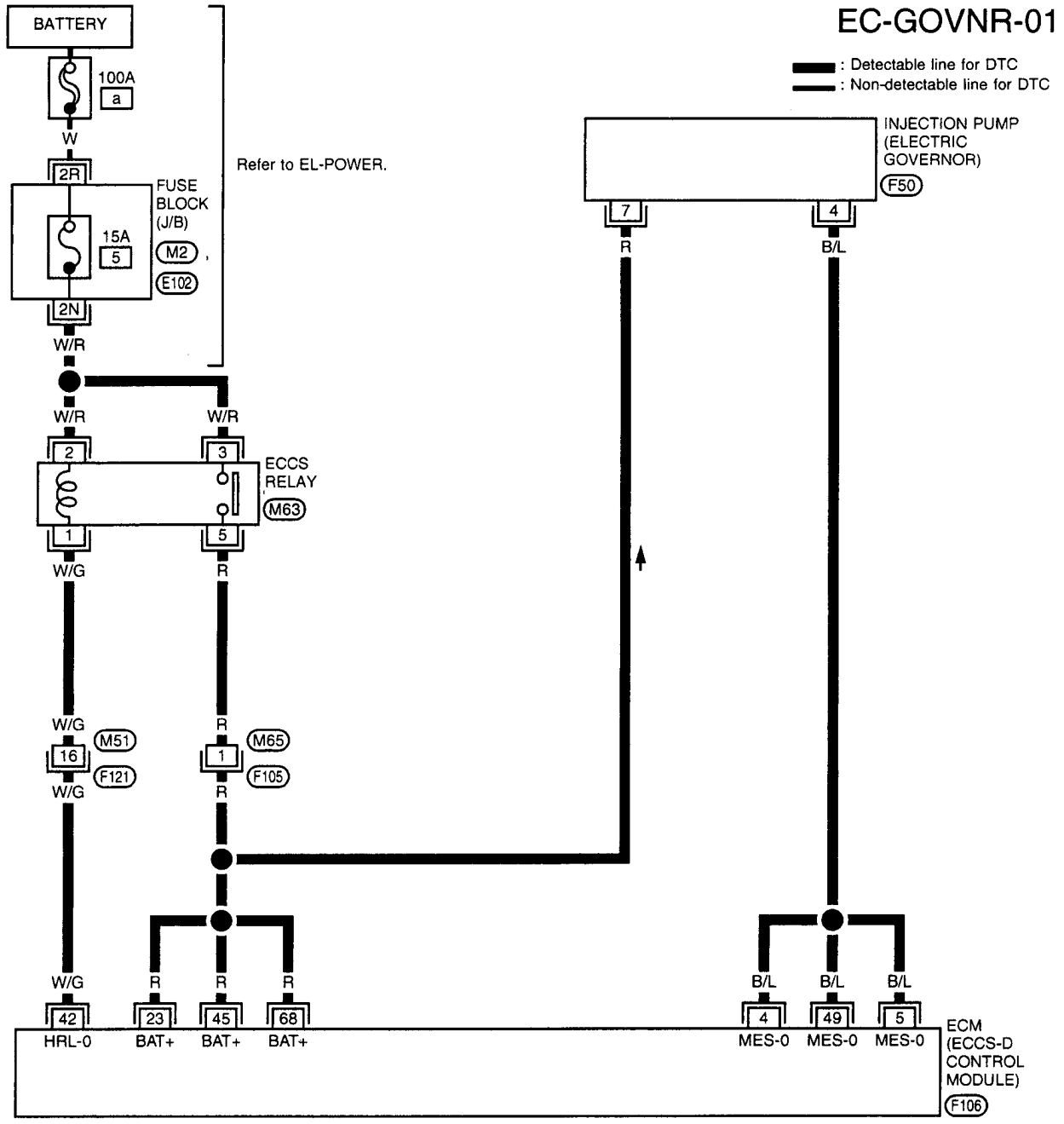
Disconnect and reconnect harness connectors in the circuit. Then retest.

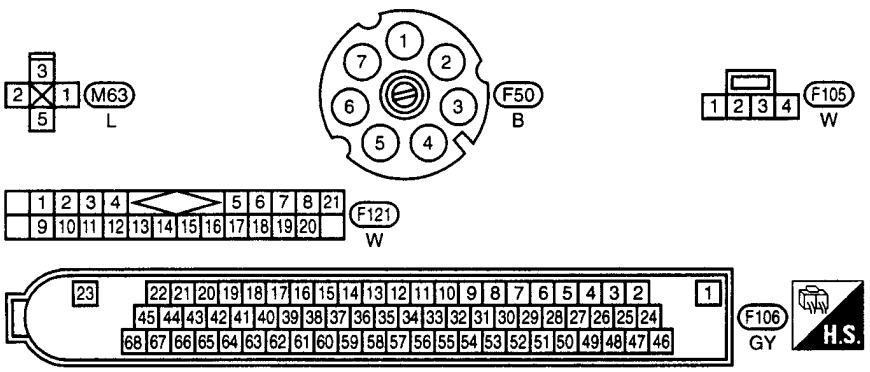
Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Electric Governor



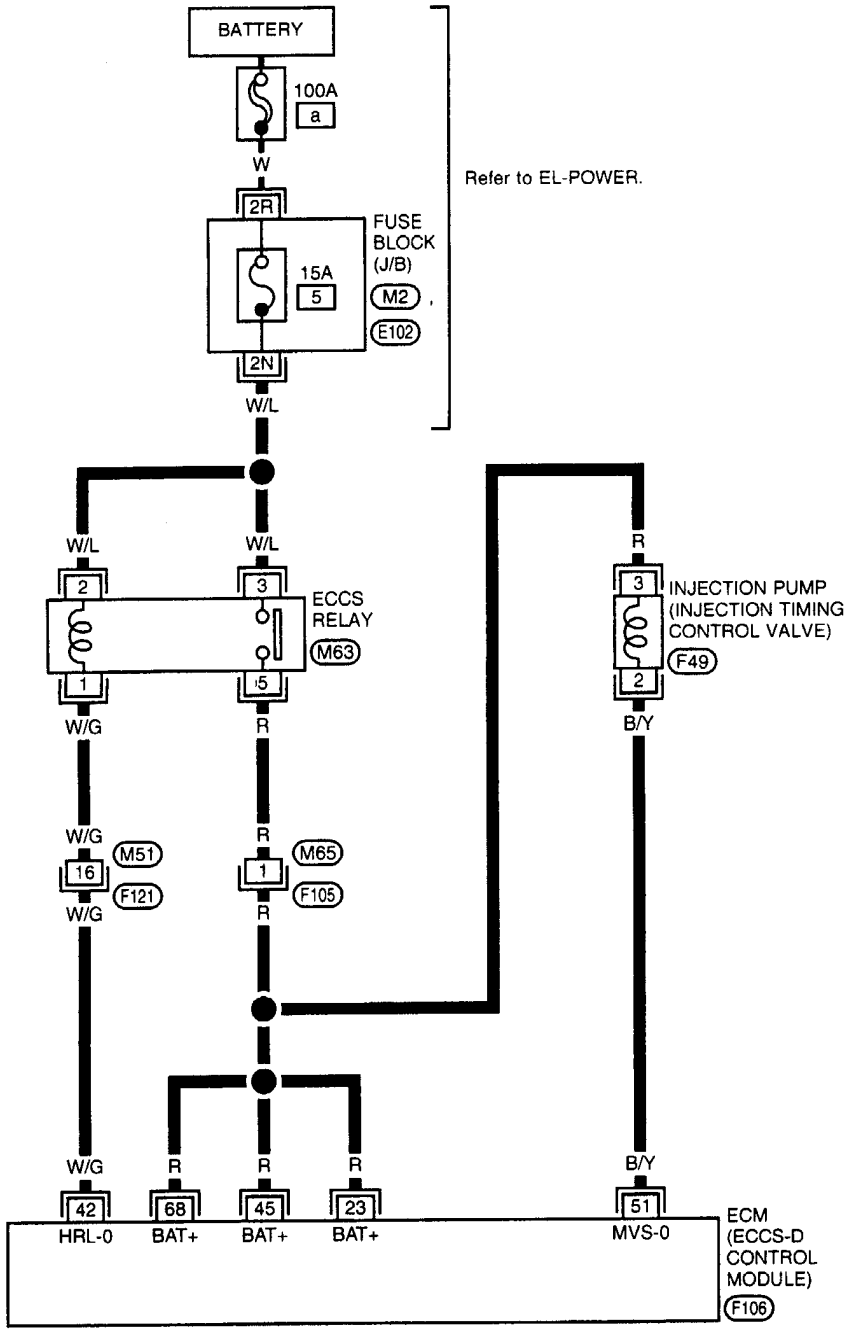


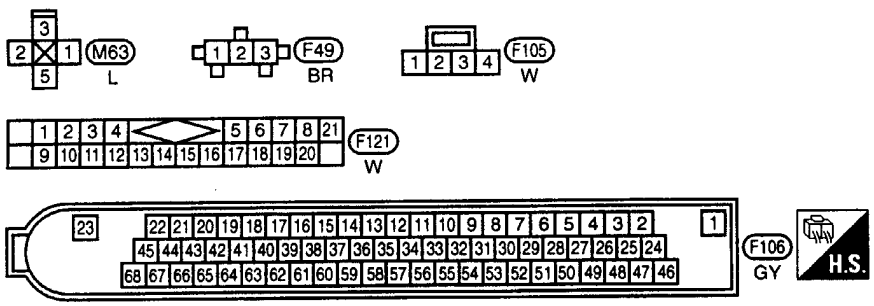
Refer to last page (Foldout page).
M2 , E102

YEC128

Injection Timing Control Valve

EC-TCV-01



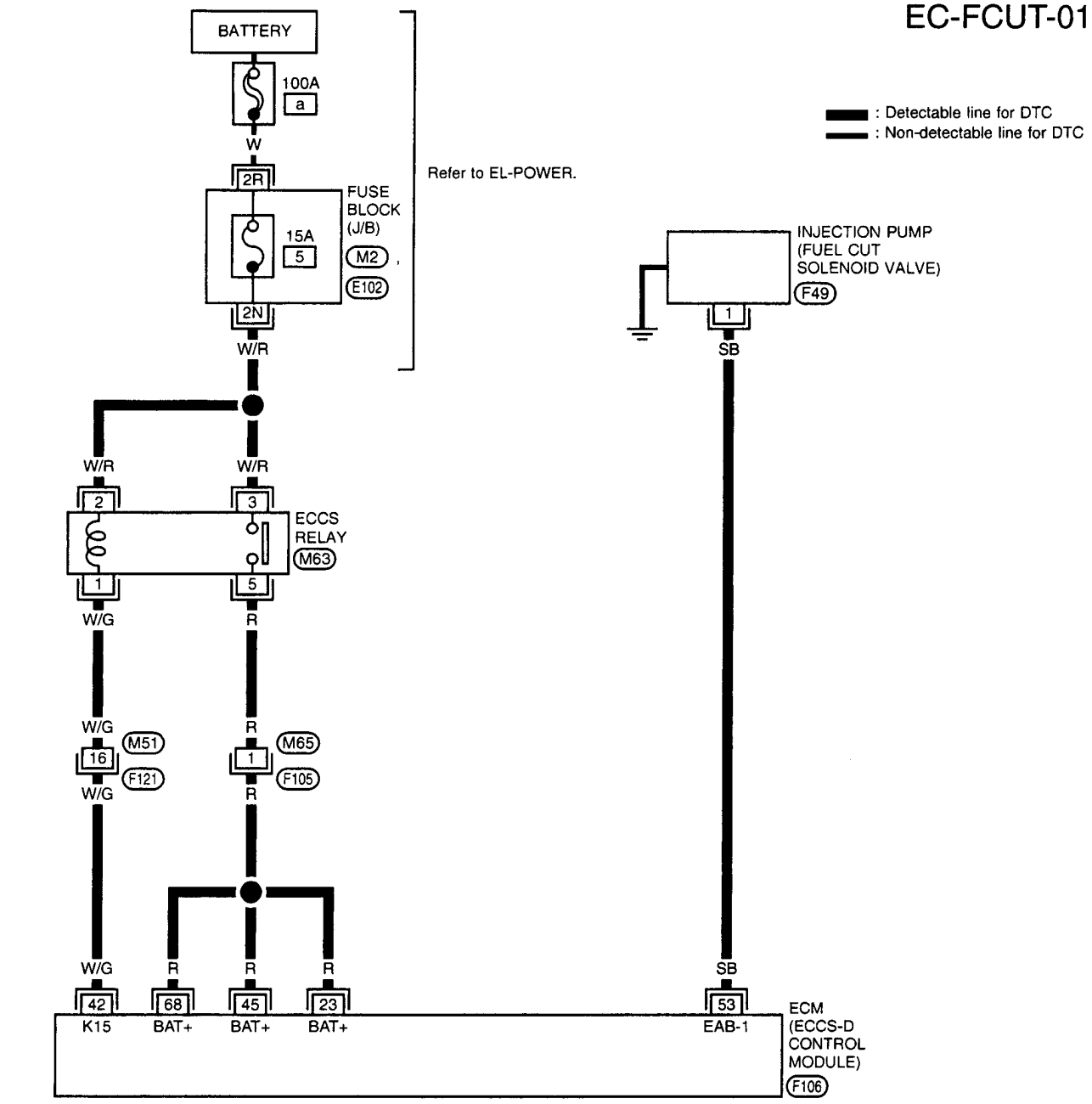


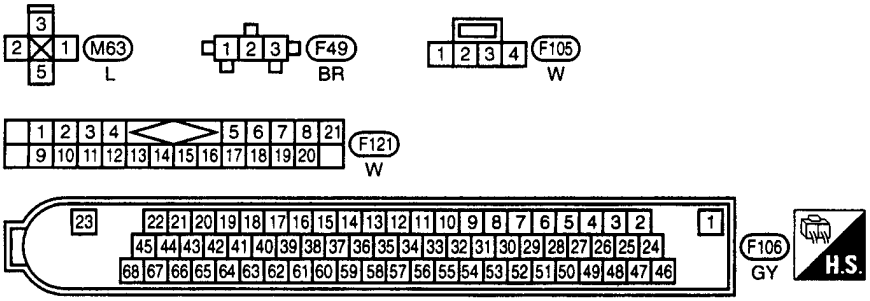
Refer to last page (Foldout page).
M2 , E102

YEC136

Fuel Cut Solenoid Valve

EC-FCUT-01



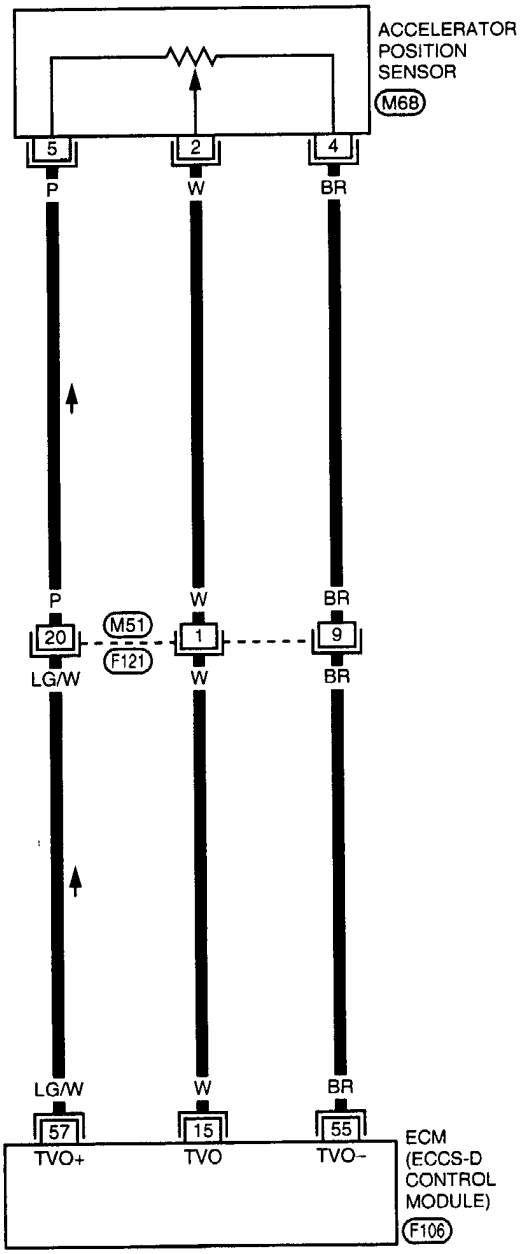


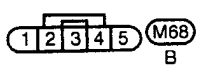
Refer to last page (Foldout page).
M2 , E102

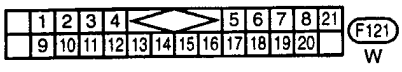
YEC137

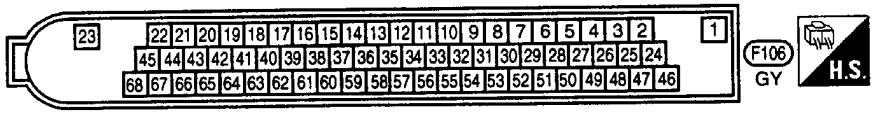
Accelerator Position Sensor & Switch

EC-APS-01





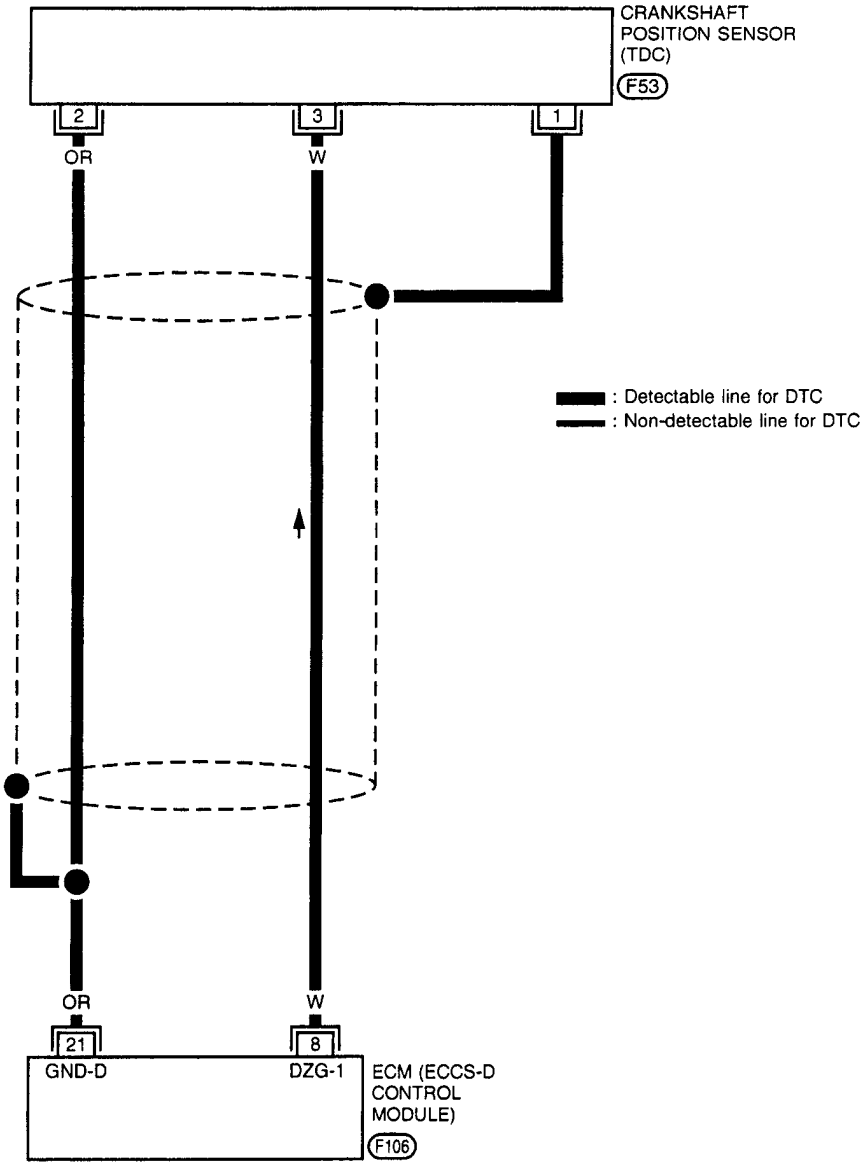


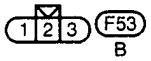


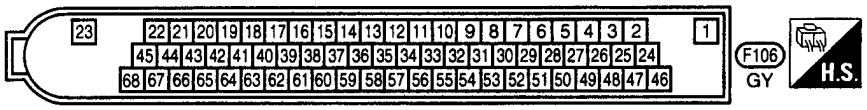
YEC130

Crankshaft Position Sensor (TDC)

EC-CKPS-01



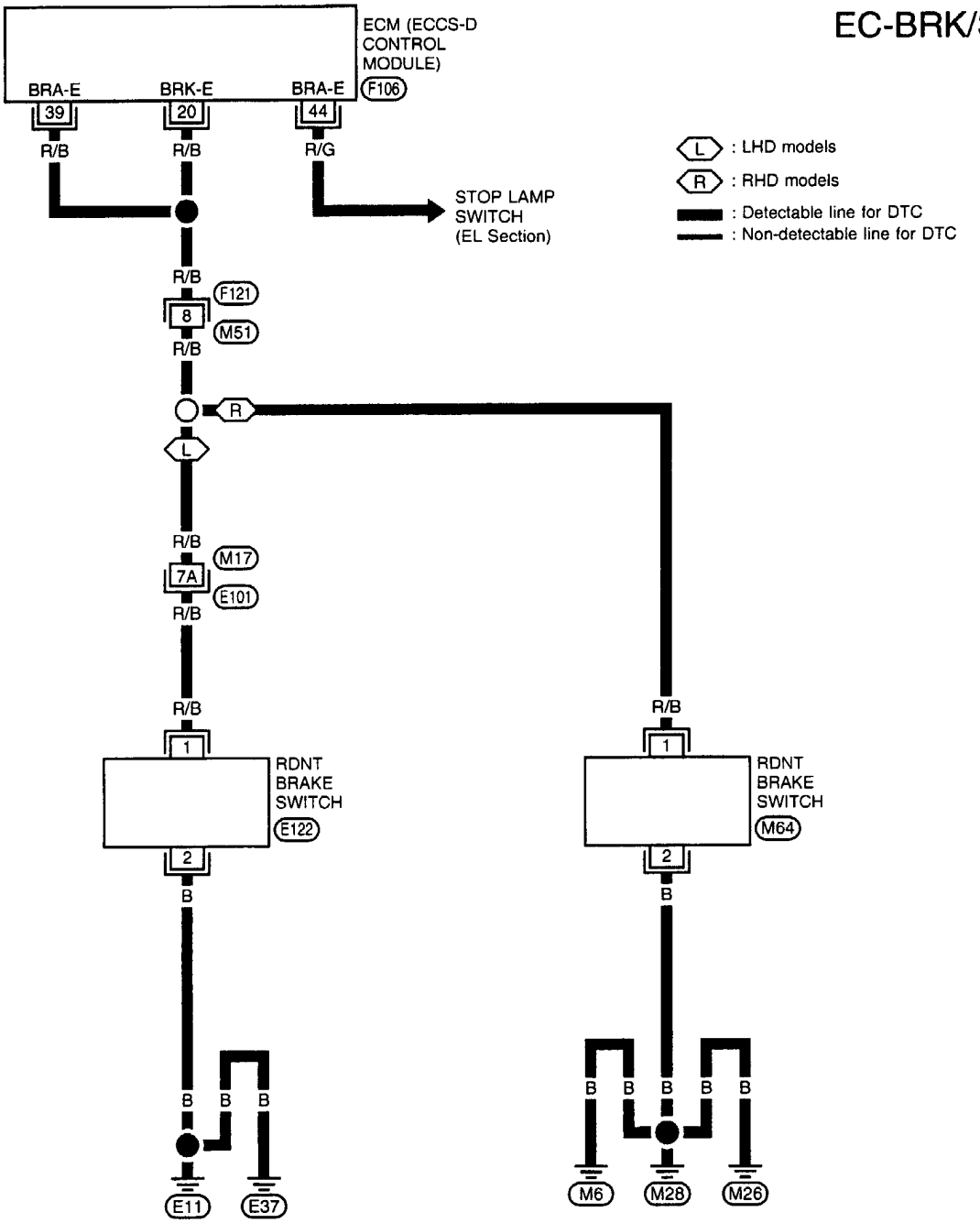




YEC131

Brake Switch

EC-BRK/SW-01



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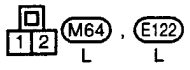
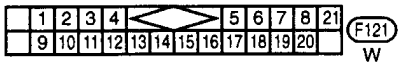
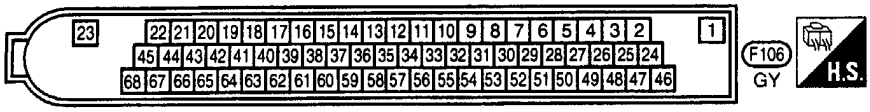
M17 , E101



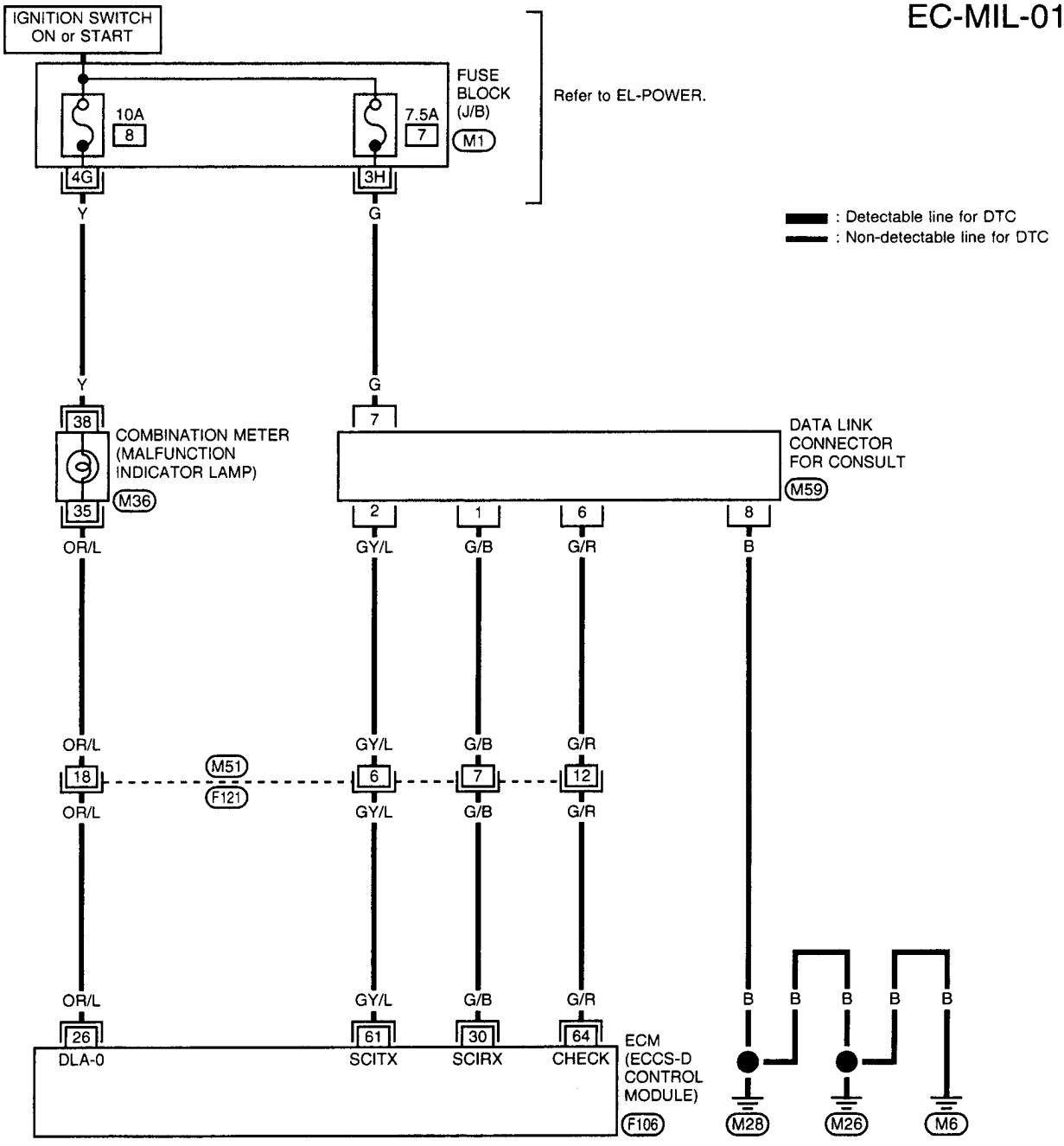




YEC135

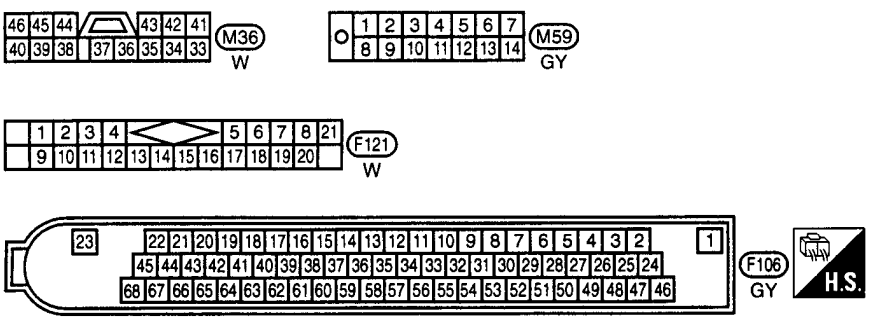
MIL & Data Link Connectors

EC-MIL-01



Refer to last page (Foldout page).

M1



YEC134

ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

FE

CONTENTS

PREPARATION 1
Special Service Tool 1

GA16DE, SR20De/DE

ACCELERATOR CONTROL SYSTEM 2
Adjusting Accelerator Cable 3
Adjusting Kickdown Switch (A/T models only) 3

CD20T

ACCELERATOR CONTROL SYSTEM 4
Adjusting Accelerator Cable 4

GA16DE, SR20De/DE, CD20T

FUEL SYSTEM 5
Fuel Pump and Gauge 6
EXHAUST SYSTEM 8

<SUPPLEMENT-I> **(For Africa, Middle East & Australia)**
EXHAUST SYSTEM 1002

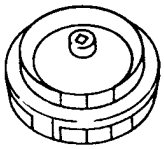
<SUPPLEMENT-II>

CD20T

ACCELERATOR CONTROL SYSTEM 2002
Adjusting Accelerator Cable 2002

<SUPPLEMENT-III> **(For wagon models)**
EXHAUST SYSTEM 3002

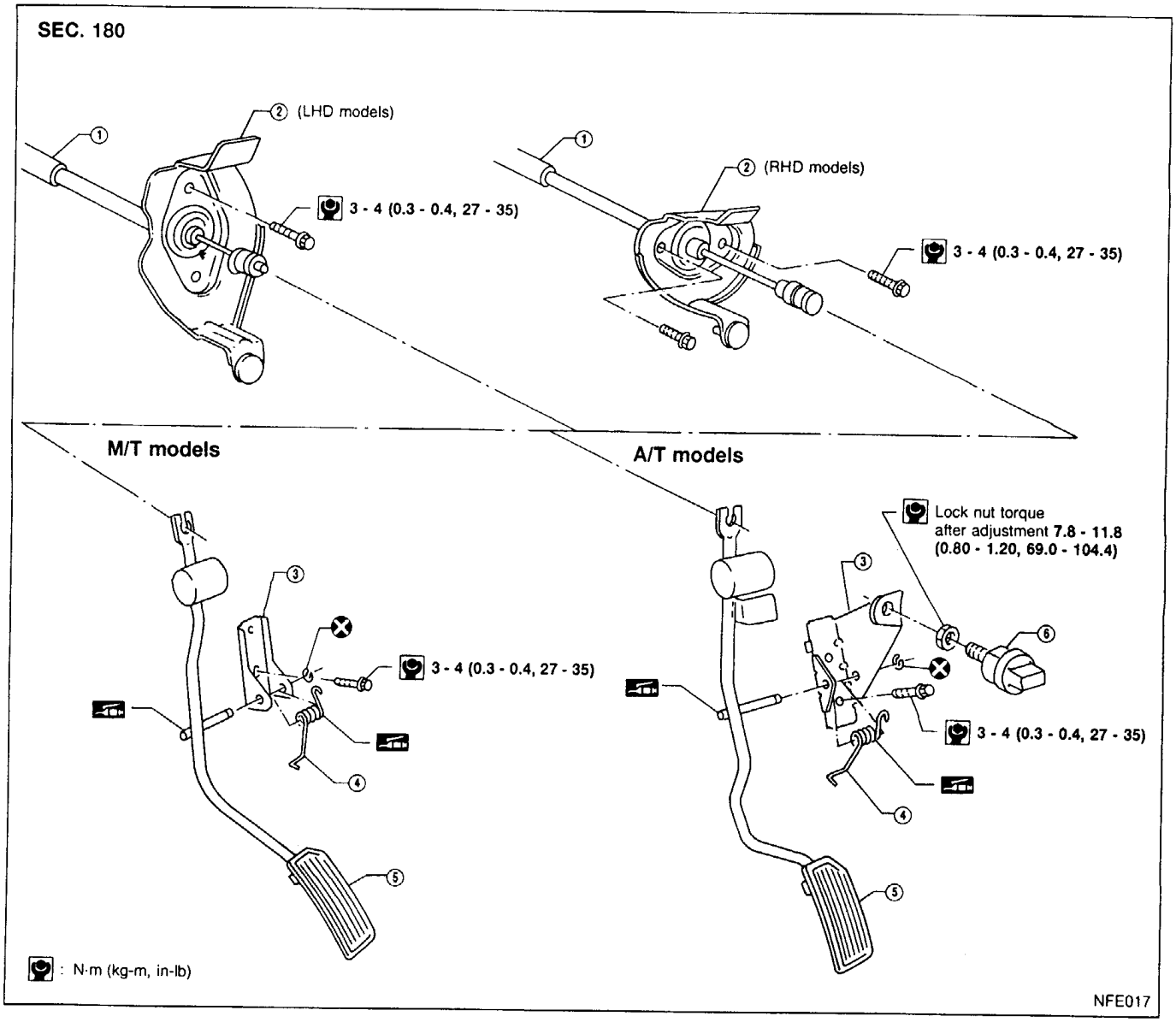
Special Service Tool

Tool number Tool name	Description	
KV999G0010 Fuel tank lock ring socket	 NT057	Removing and installing fuel tank lock ring

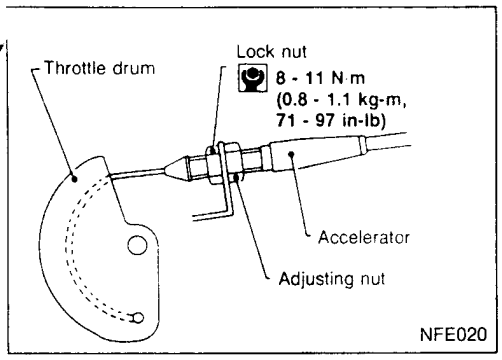
CAUTION:

- When removing accelerator cable, mark location to indicate lock nut's initial position.
- Check that throttle valve is completely open when accelerator pedal is fully depressed. Check that throttle valve returns to idle position when accelerator pedal is released.
- Check accelerator control does not interfere with any adjacent parts.
- When connecting accelerator cable, be careful not to twist or scratch cable.

SEC. 180

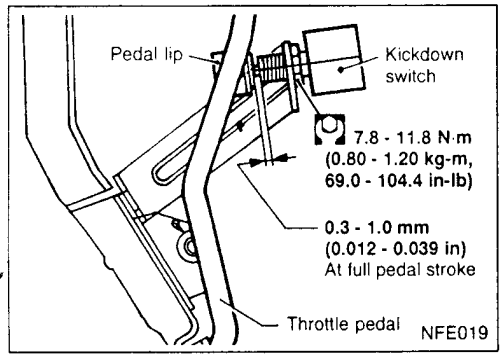


① Accelerator cable
② Cable bracket
③ Pedal bracket
④ Return spring
⑤ Accelerator pedal
⑥ Kickdown switch



Adjusting Accelerator Cable

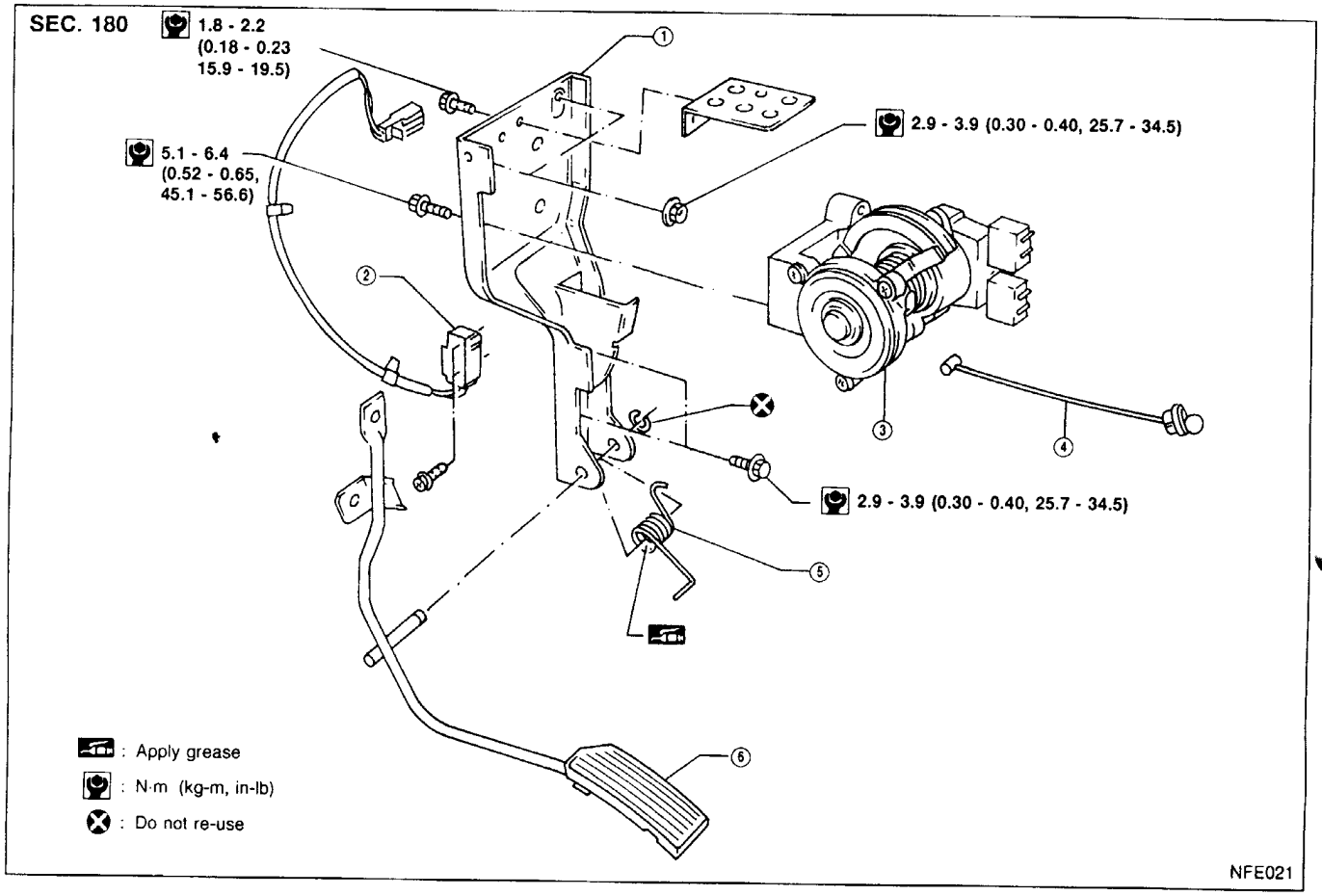
1. Loosen lock nut, and tighten adjusting nut until throttle drum starts to move.
2. From that position turn back adjusting nut 1.5 to 2 turns, and secure lock nut.



Adjusting Kickdown Switch (A/T models only)

1. Fully depress the accelerator pedal.
2. Adjust the clearance between the kickdown switch and pedal lip as indicated.

Adjusting Accelerator Cable



① Pedal bracket
② Accelerator switch
③ Accelerator position sensor
④ Accelerator cable
⑤ Return spring
⑥ Accelerator pedal

- **After connecting accelerator position sensor harness connector of CD engine models (if previously removed), perform following operations:**

  With "OFF ACCEL PO SIG" in ACTIVE TEST mode showing on display, touch CLEAR.

  Start and warm up engine. After engine has warmed up; idle for 10 minutes.

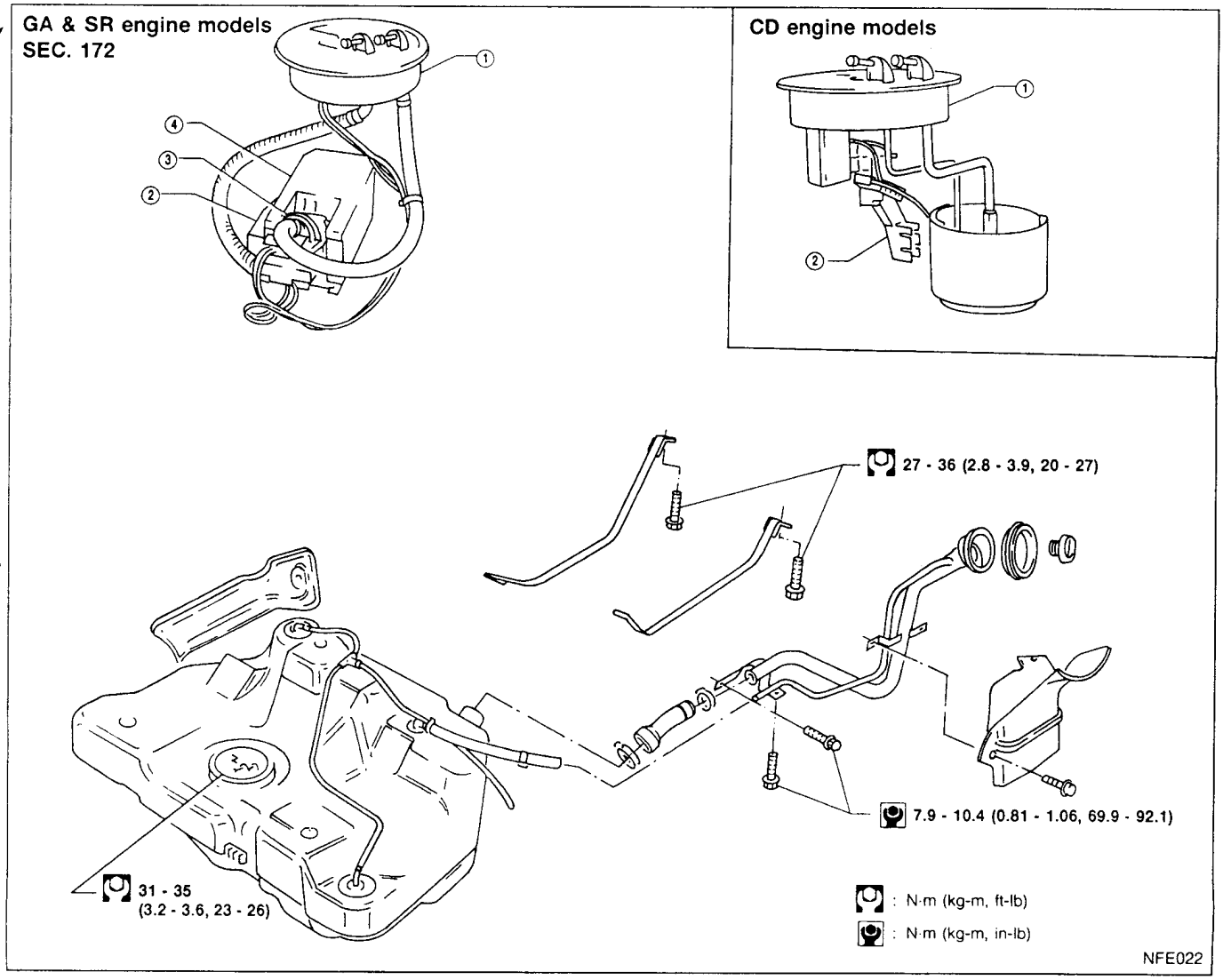
- **If MIL illuminates after engine has started, refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" in EC section for instructions.**

WARNING:
When replacing fuel line parts, be sure to observe the following:

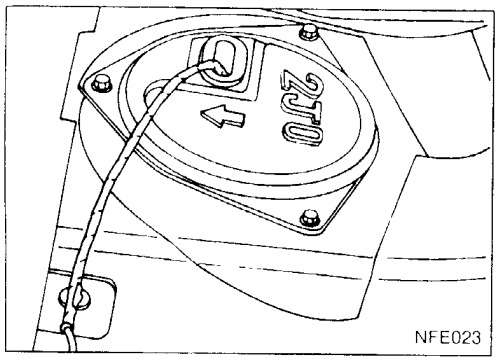
- Display a "CAUTION: INFLAMMABLE" sign in workshop.
- Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to disconnect battery ground cable before conducting service operations.
- Be sure to furnish workshop with a CO_2 fire extinguisher.
- Pour drained fuel into an explosion-proof container then ensure container lid is installed securely.

CAUTION:

- For ECCS engine models, release fuel pressure from fuel line. Refer to EC section ("Fuel Pressure Release", "BASIC SERVICE PROCEDURE").
- Do not disconnect any fuel line unless absolutely necessary.
- Plug hose and pipe openings to prevent entry of dust or dirt.
- Always replace top lid seal and hose clamps with new ones.
- Do not kink or twist hoses and tubes during installation.
- Do not tighten hose clamps excessively because this could cause damage to the hose.
- Ensure fuel check valve is installed in the correct orientation. Refer to EC section ("FUEL CHECK VALVE", "EVAPORATIVE EMISSION SYSTEM").
- After installation, run engine and check for fuel leaks at connections.



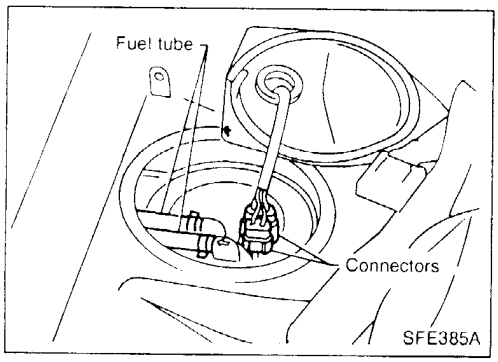
① Top lid
② Fuel gauge
③ Fuel pump
④ Fuel chamber



Fuel Pump and Gauge

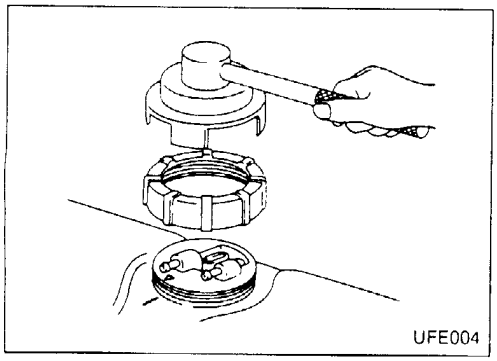
REMOVAL

1. Release fuel pressure from fuel line.
   Refer to EC section ("Fuel Pressure Release", "BASIC SERVICE PROCEDURE").
2. Remove inspection hole cover located under the rear seat.



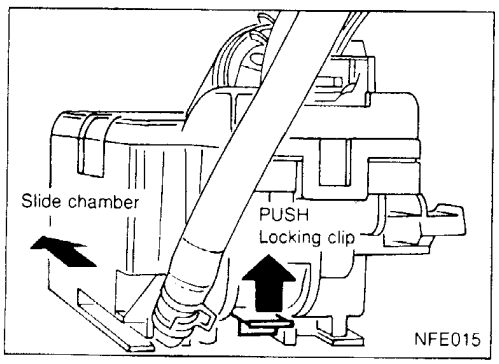
3. Remove fuel filler lid.
4. Disconnect fuel outlet, return tube and connectors.

CAUTION:
Mark the fuel tubes to ensure correct position during installation.



5. Using SST KV999G0010, remove fuel gauge locking ring.
6. Lift the top plate from the fuel tank.

CAUTION:
- **Do not disconnect fuel hoses from top plate. Top plate has to be removed together with fuel chamber assy.**
- **For CD20T models the fuel gauge sender unit is attached to the top plate.**

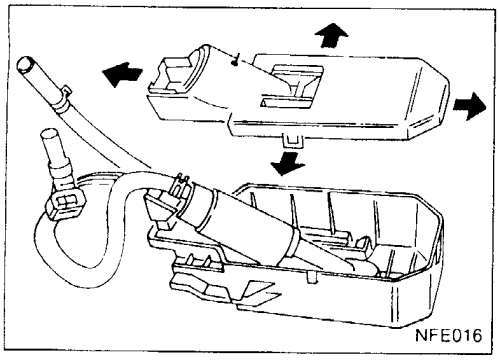


GA16DE & SR20De/DE models only:

7. Remove fuel pump with fuel tank chamber assy as follows:

a. Push the locking clip upwards and slide the pump chamber assy towards the rear of the vehicle.
b. Lift the pump chamber assy from the bracket.
c. Carefully remove the pump chamber assy and top plate from the tank.

CAUTION:
While removing the pump chamber assy lift the fuel gauge sender float, to prevent it from bending.



8. Take off the fuel pump chamber lid by opening out the 4 clips. Remove the fuel pump from the fuel pump chamber.
9. Remove the fuel gauge sender unit from the chamber by lifting the clip and sliding the sender unit upwards.

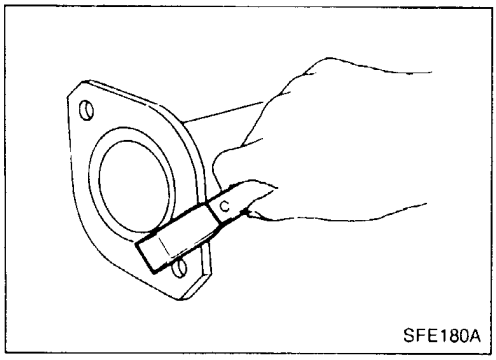
Fuel Pump and Gauge (Cont'd)

INSTALLATION

Installation is reverse procedure of removal.

CAUTION:

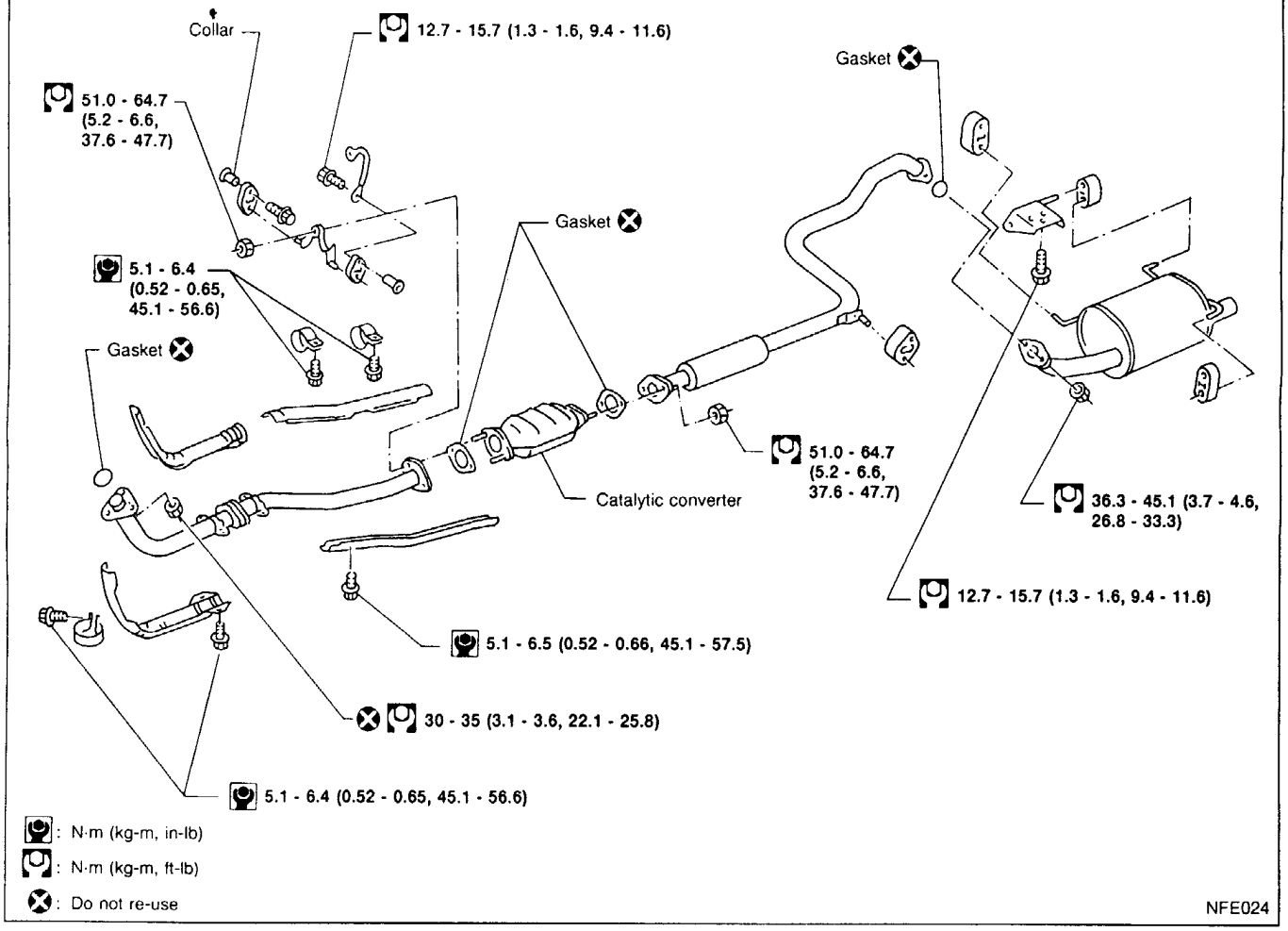
- **Always use a new top plate seal.**
- **Use the alignment marks to position the top plate.**
- **Tighten to specified torque.**



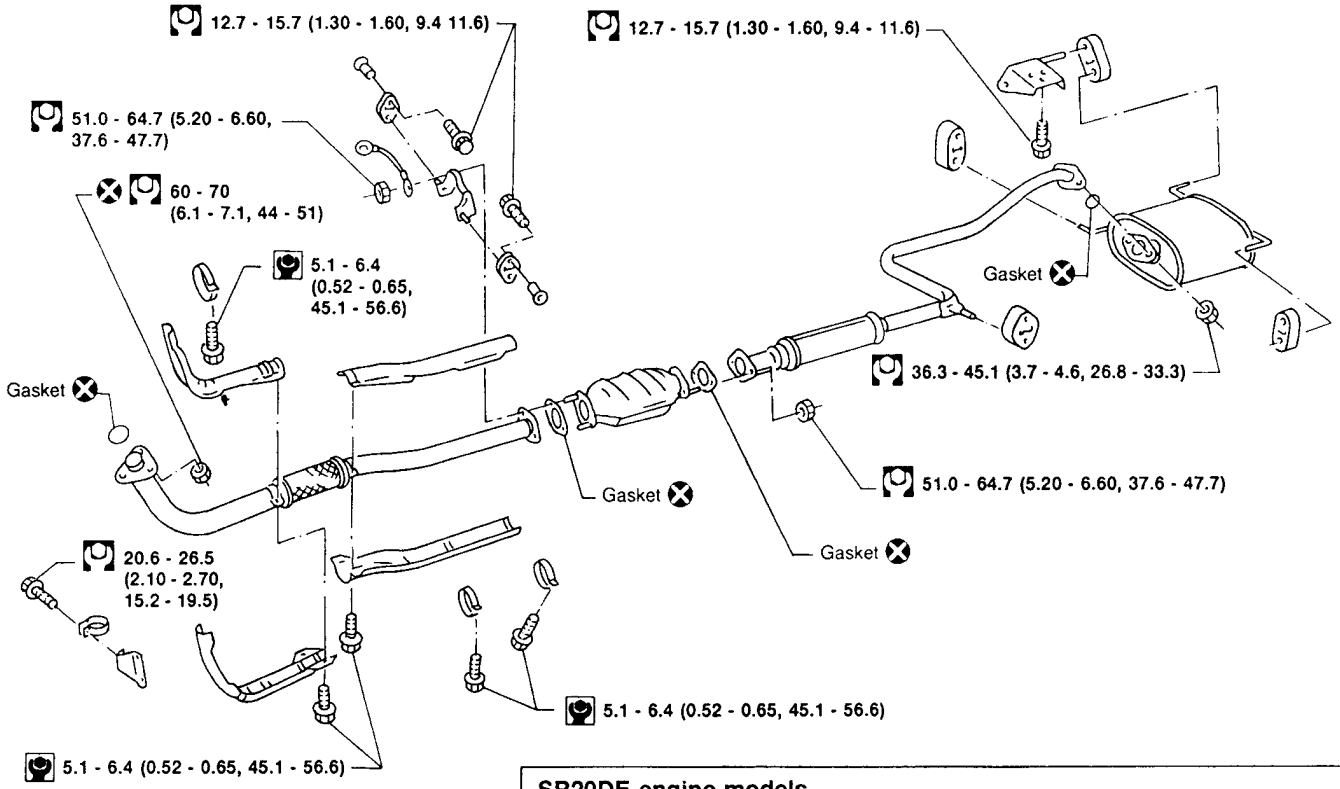
CAUTION:

- Always replace exhaust gaskets with new ones when reassembling.
  Scrape off all residue of old gasket from flange surface.
- With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.
- After installation, check to ensure that mounting brackets and mounting insulators are free from undue stress. If any of the above parts are not installed properly, excessive noise or vibration may be transmitted to the vehicle body.

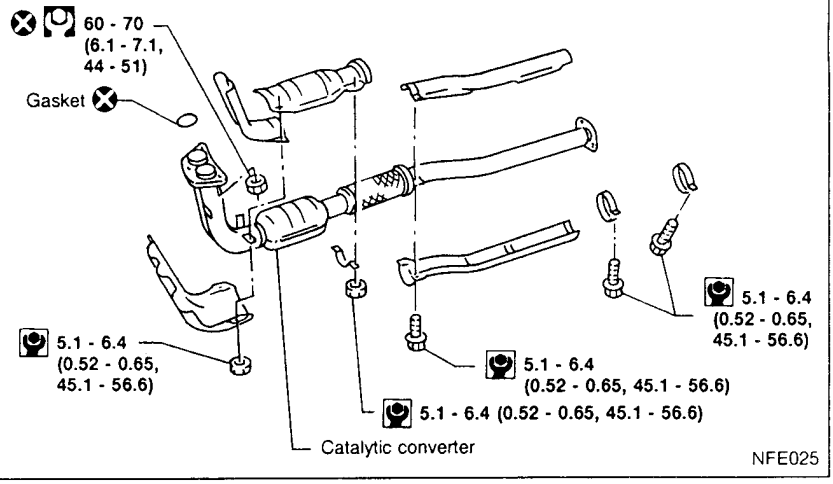
GA16DE engine models
SEC. 200•208



SR20De engine models
SEC. 200•208



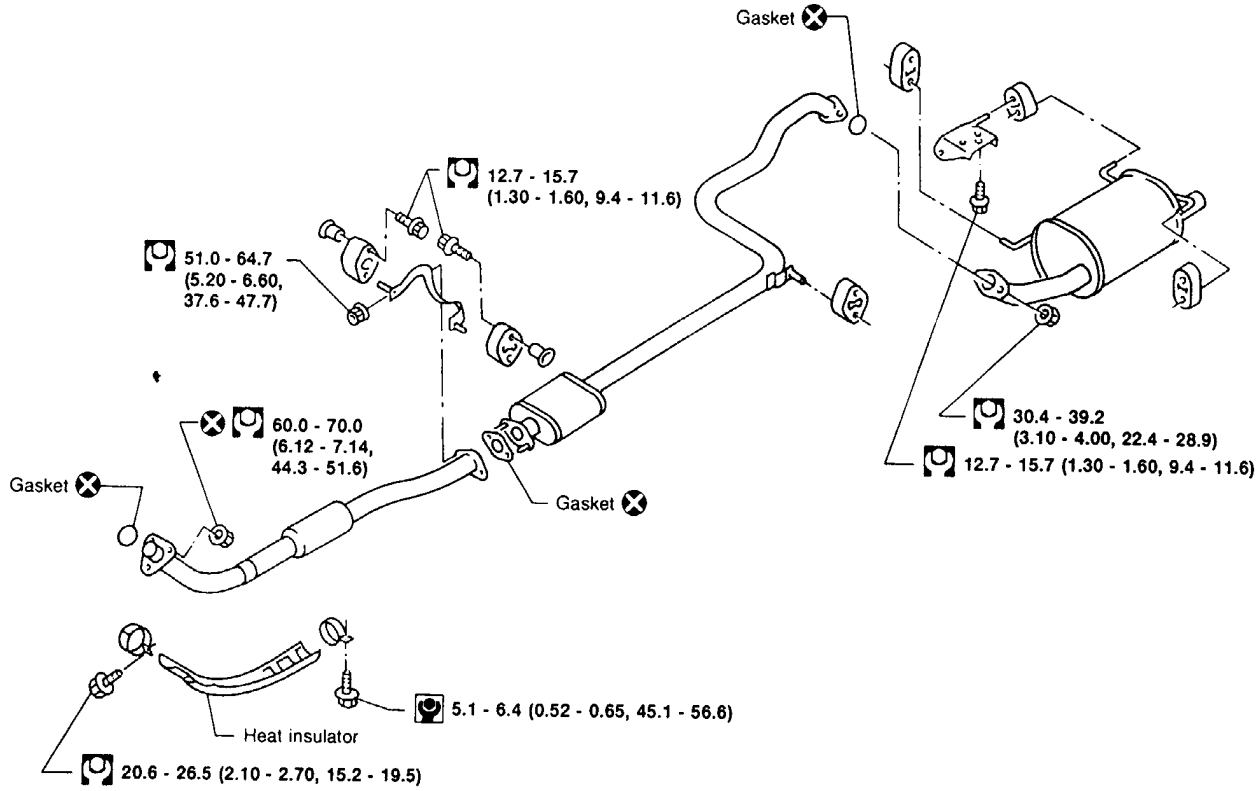
SR20DE engine models



NFE025

: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)
: Do not re-use

CD engine model
SEC. 200•208



<SUPPLEMENT-II>

ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

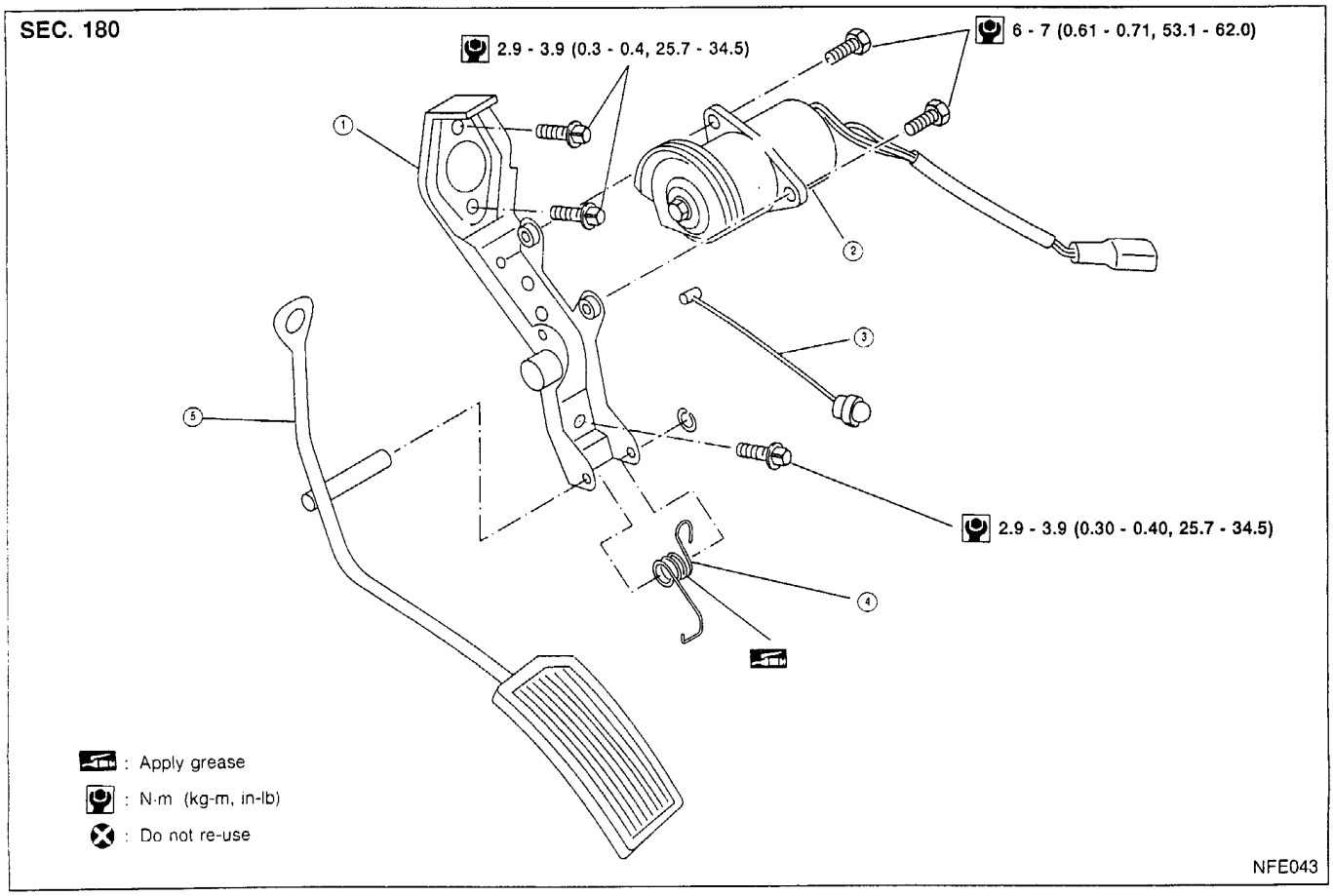
SECTION FE

CONTENTS

CD20T

ACCELERATOR CONTROL SYSTEM 2002
Adjusting Accelerator Cable 2002

Adjusting Accelerator Cable



① Pedal bracket
② Accelerator position sensor
③ Accelerator cable
④ Return spring
⑤ Accelerator pedal

- If MIL illuminates after engine has started, refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" in EC section for instructions.

<SUPPLEMENT-III> (For wagon models)

ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

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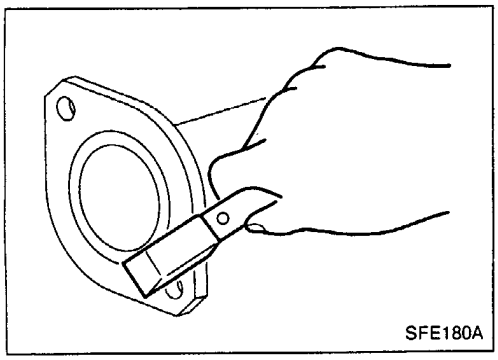
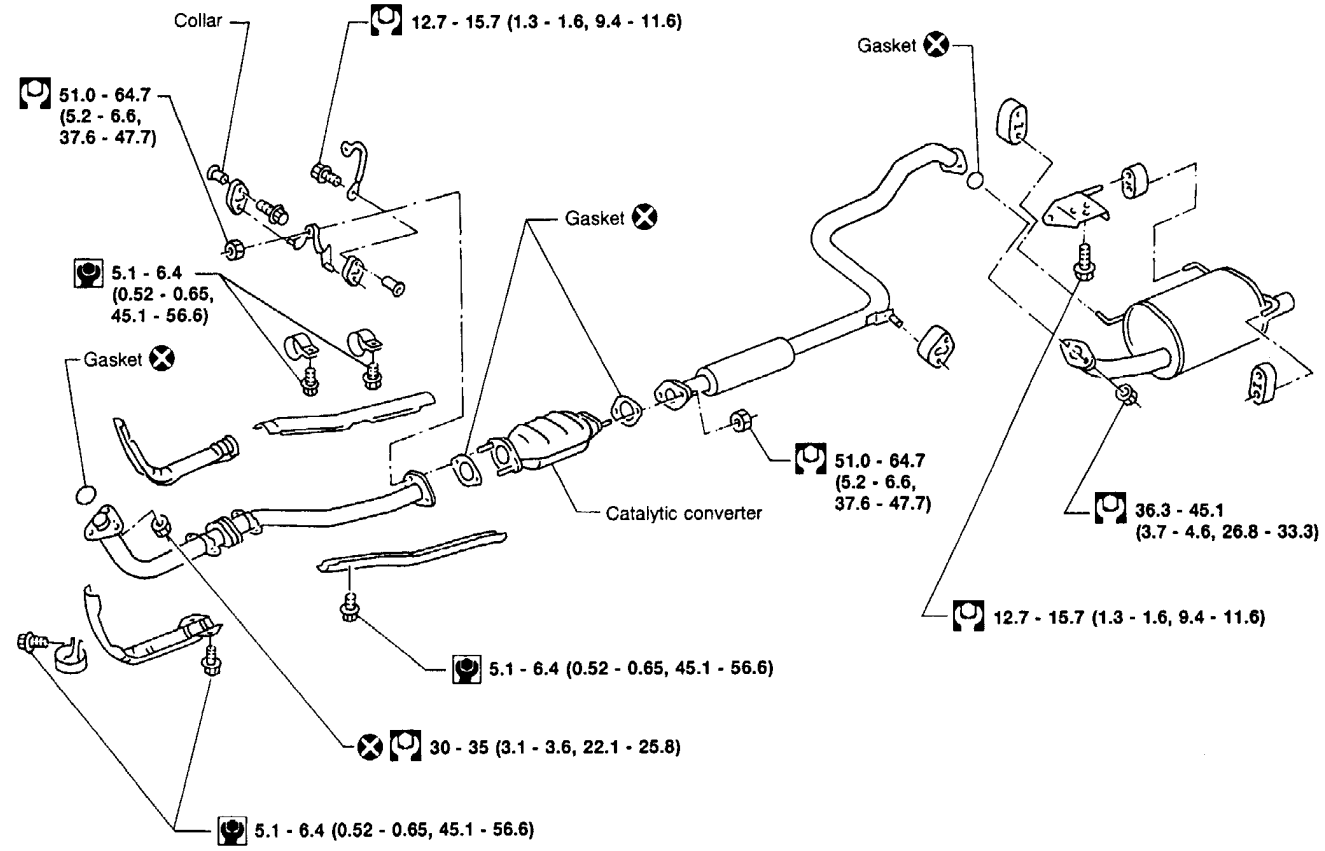
EXHAUST SYSTEM 3002


SFE180A

CAUTION:

- **Always replace exhaust gaskets with new ones when reassembling.**
  Scrape off all residue of old gasket from flange surface.
- **With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.**
- **After installation, check to ensure that mounting brackets and mounting insulators are free from undue stress. If any of the above parts are not installed properly, excessive noise or vibration may be transmitted to the vehicle body.**

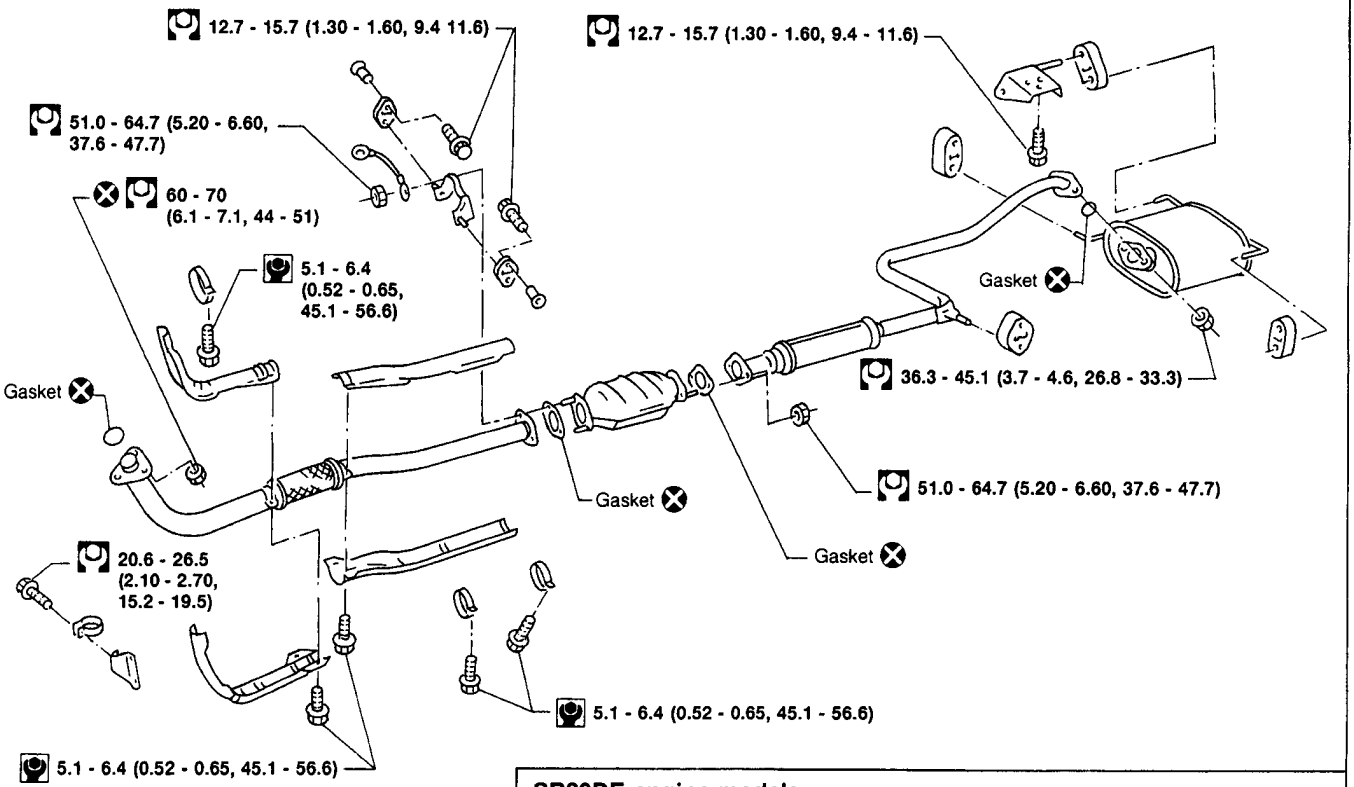
GA16DE engine models
SEC. 200•208



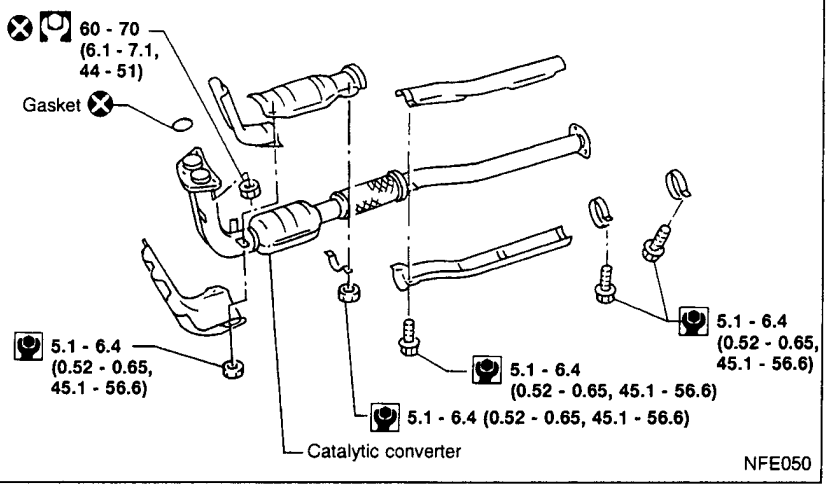
: N·m (kg-m, in-lb)
: N·m (kg-m, ft-lb)
: Do not re-use

NFE049

SR20De engine models
SEC. 200•208



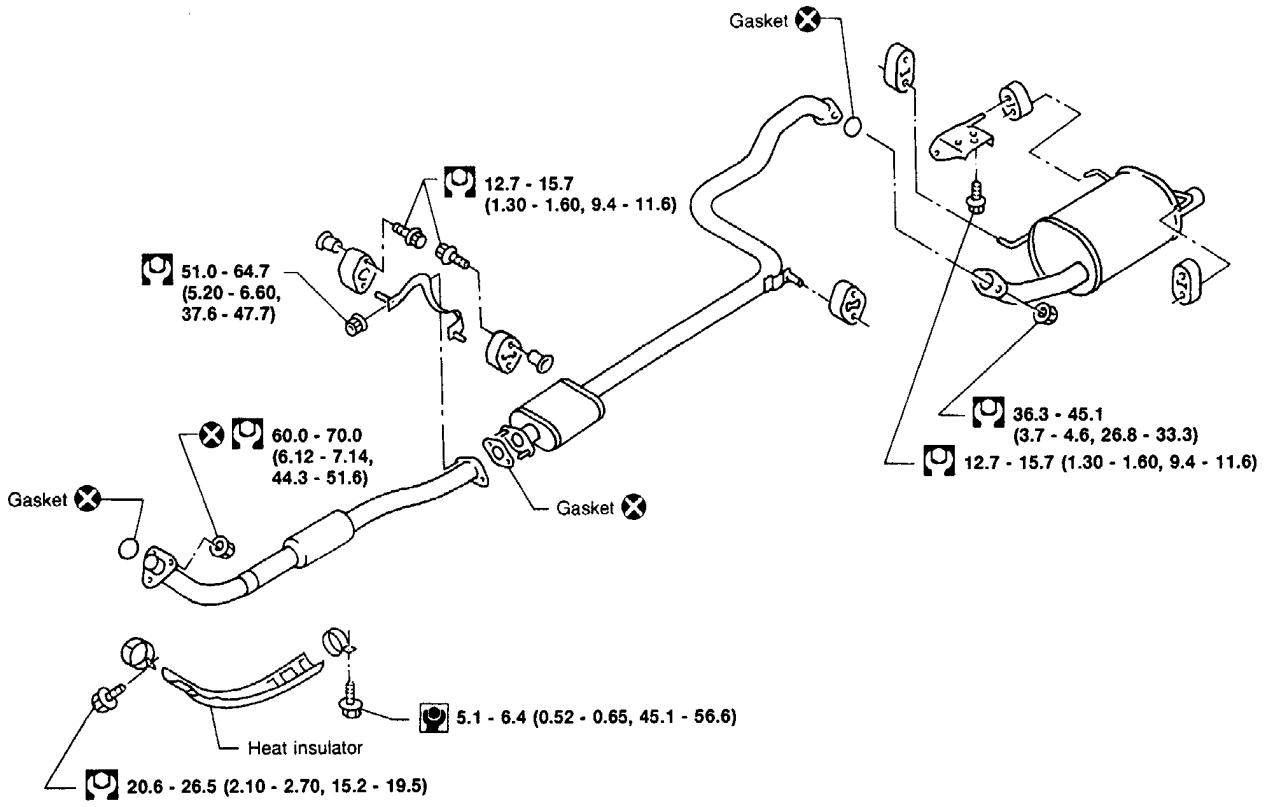
SR20DE engine models



: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)
: Do not re-use

NFE050

CD engine model
SEC. 200•208



CLUTCH

SECTION CL

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<COMBINED EDITION>

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- Preparation 1

CLUTCH SYSTEM — Hydraulic Type 2

CLUTCH SYSTEM — Mechanical Type 3

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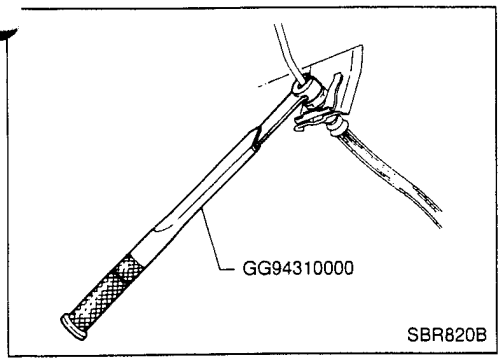
NO CHANGES

<SUPPLEMENT-II>
NO CHANGES

<SUPPLEMENT-III>
NO CHANGES



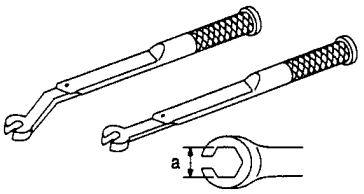
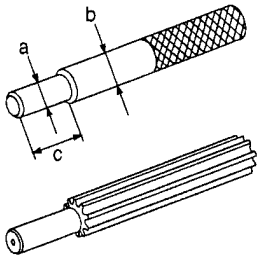
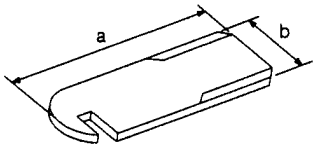
Precautions

- **Recommended fluid is brake fluid "DOT 4".**
- **Do not reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **When removing and installing clutch piping, use Tool.**
- **Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and clutch damper.**
- **Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.**

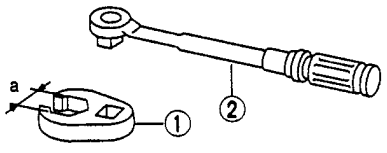
WARNING:
After cleaning clutch disc, wipe it with a dust collector. Do not use compressed air.

Preparation

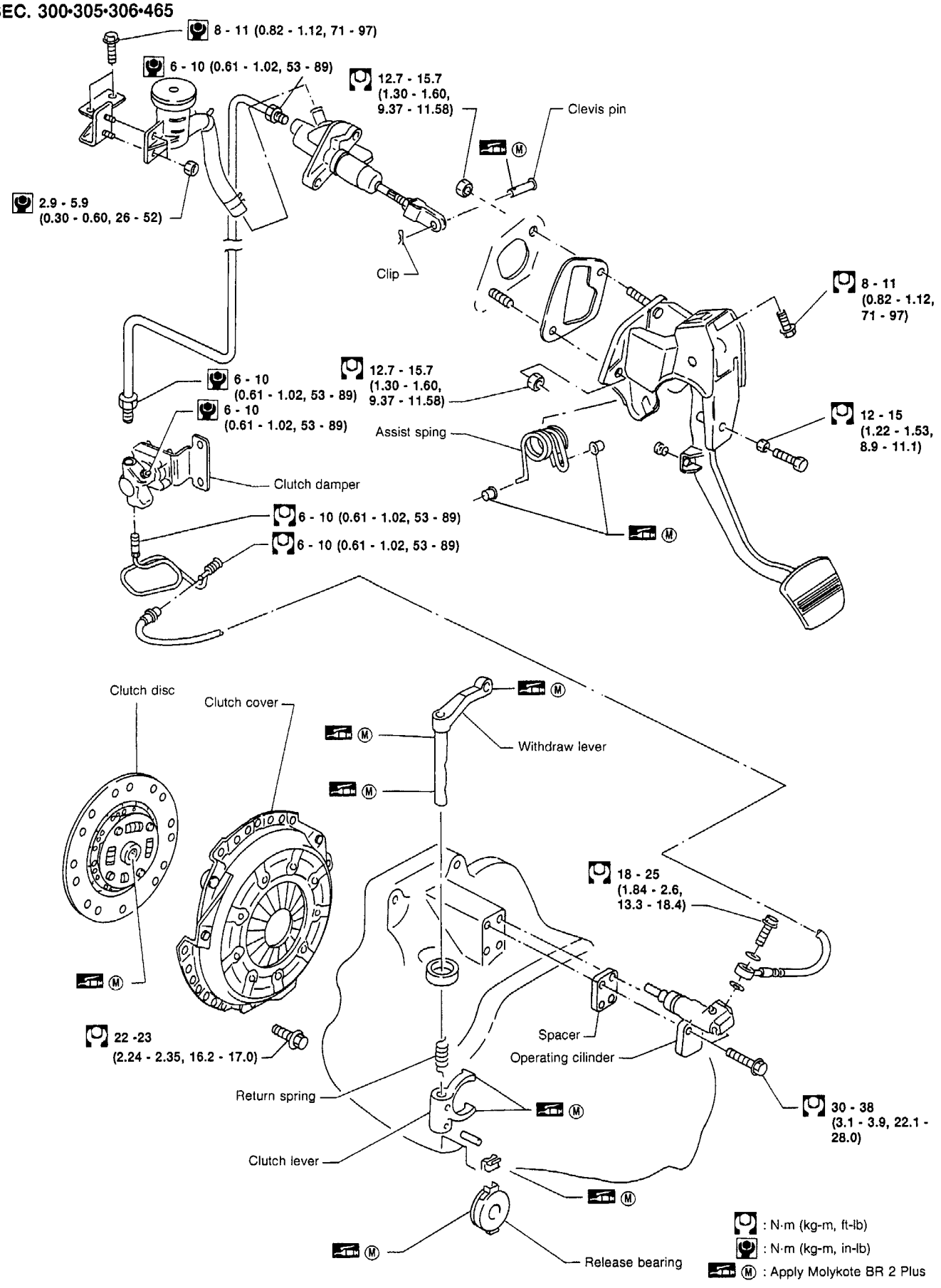
SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
GG94310000 Flare nut torque wrench	 NT406	Removing and installing clutch piping **a: 10 mm (0.39 in)**
KV30101600 (New) KV30101000 (Former) Clutch aligning bar	 NT645	Installing clutch cover and clutch disc **a: 15.9 mm (0.626 in) dia.** **b: 17.9 mm (0.705 in) dia.** **c: 40 mm (1.57 in)**
ST20050240 Diaphragm spring adjusting wrench	 NT404	Adjusting unevenness of diaphragm spring of clutch cover **a: 150 mm (5.91 in)** **b: 25 mm (0.98 in)**

COMMERCIAL SERVICE TOOLS

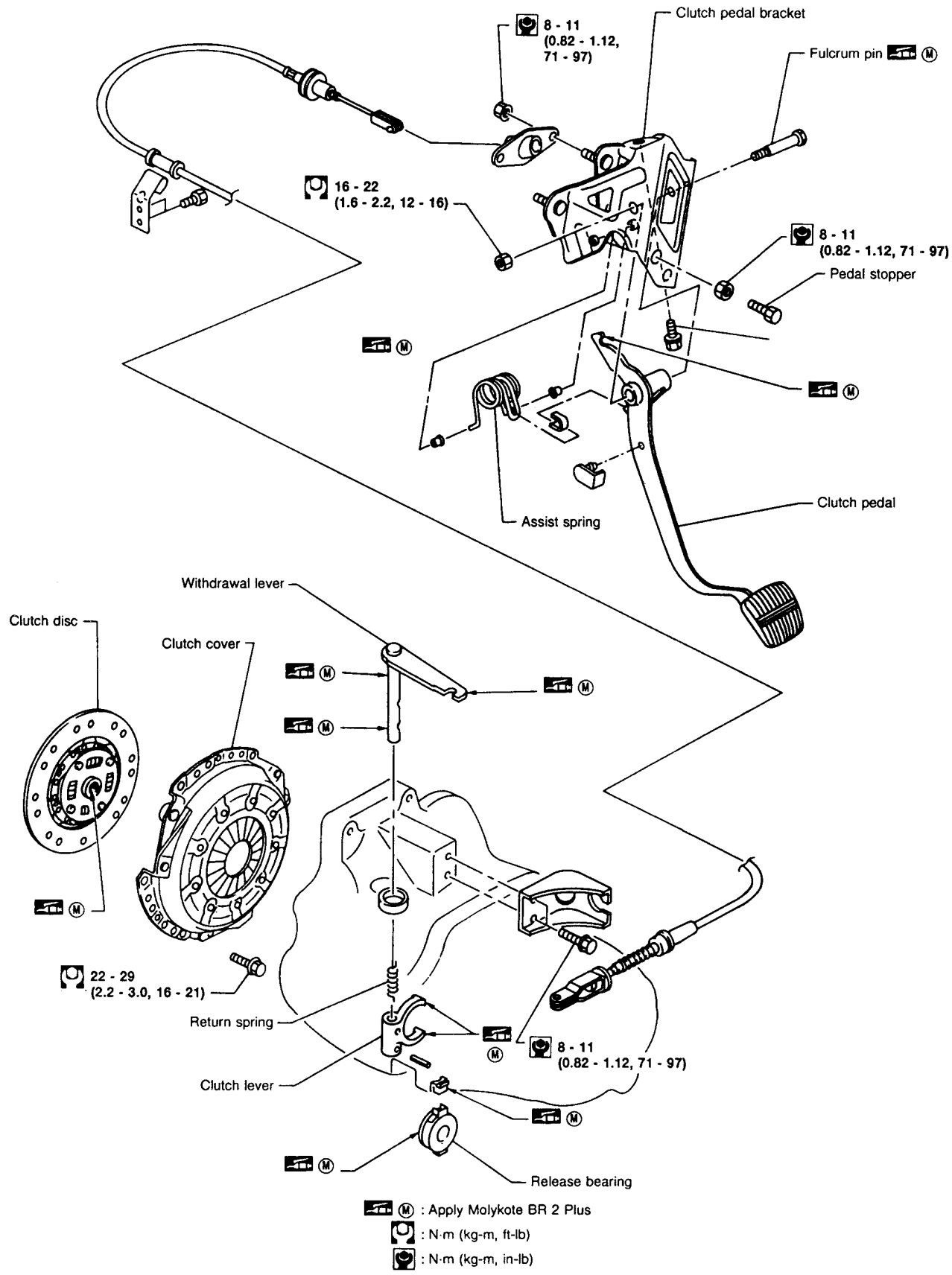
Tool name	Description	
Equivalent to GG94310000 ① Flare nut crows foot ② Torque wrench	 NT360	Removing and installing clutch piping **a: 10 mm (0.39 in)**

SEC. 300•305•306•465

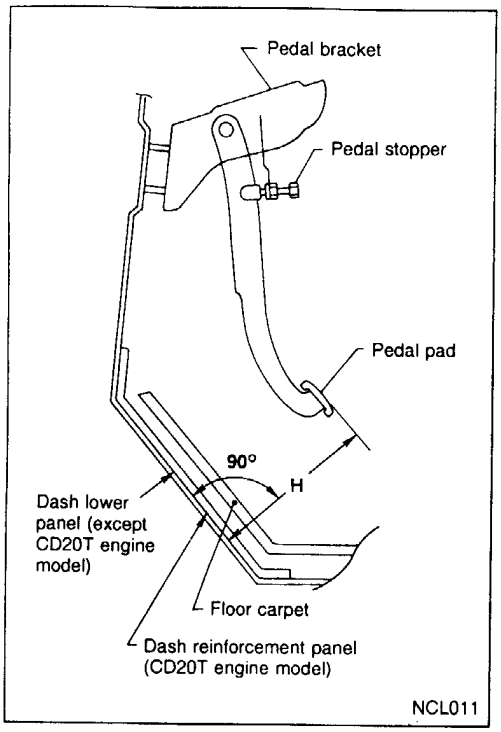


NCL004

SEC. 300•307•465

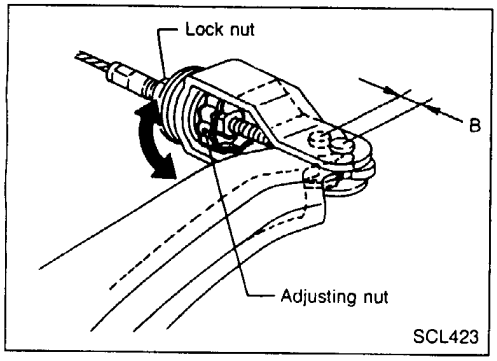


UCL001



Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper.
   Pedal height "H":
   Refer to SDS, CL-15.

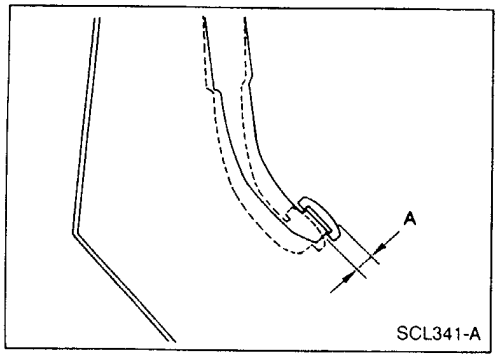


— For mechanical type —

2. Adjust withdrawal lever play "B" according to the following procedure.

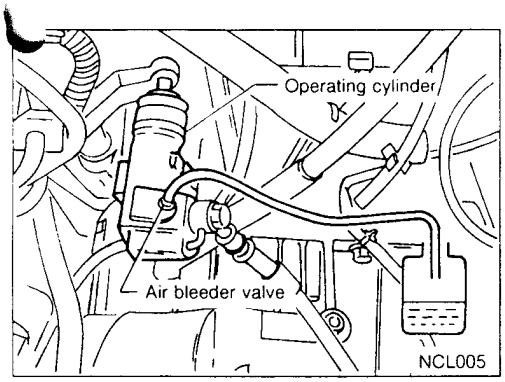
CAUTION:
When the clutch cable is replaced with a new one, fully depress the clutch pedal 50 times as a break-in procedure (to prestretch the clutch cable), before adjustment as described below.

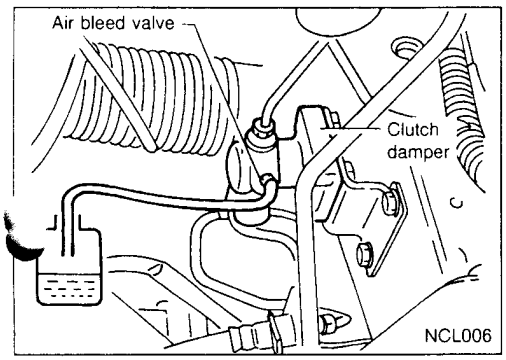
a. Push withdrawal lever by hand until resistance is felt, and then tighten adjusting nut.
b. Turn back adjusting nut 2.5 to 3.5 turns, and then tighten lock nut.
   Withdrawal lever play "B":
   2.5 - 3.5 mm (0.098 - 0.138 in)
   Lock nut:
   : 3 - 4 N·m (0.3 - 0.4 kg-m, 26 - 35 in-lb)



— For hydraulic type and mechanical type —

3. As a final check, measure pedal free travel "A" at center of pedal pad.
   Pedal free travel "A":
   Refer to SDS, CL-15.





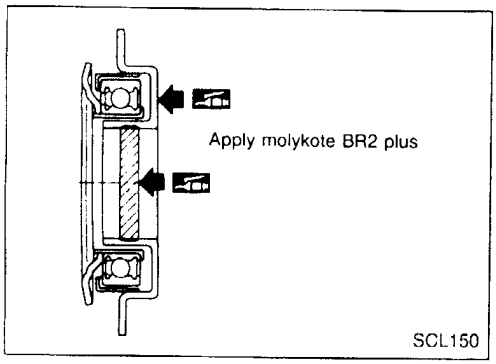
Bleeding Procedure — Hydraulic system

1. Bleed air from clutch operating cylinder according to the following procedure.

Carefully monitor fluid level at master cylinder during bleeding operation.

a. Top up reservoir with recommended brake fluid.
b. Connect a transparent vinyl tube to air bleeder valve of clutch operating cylinder.
c. Fully depress clutch pedal several times.
d. With clutch pedal depressed, open bleeder valve to release air.
e. Repeat steps (c) through (e) above until brake fluid flows from air bleeder valve without air bubbles.

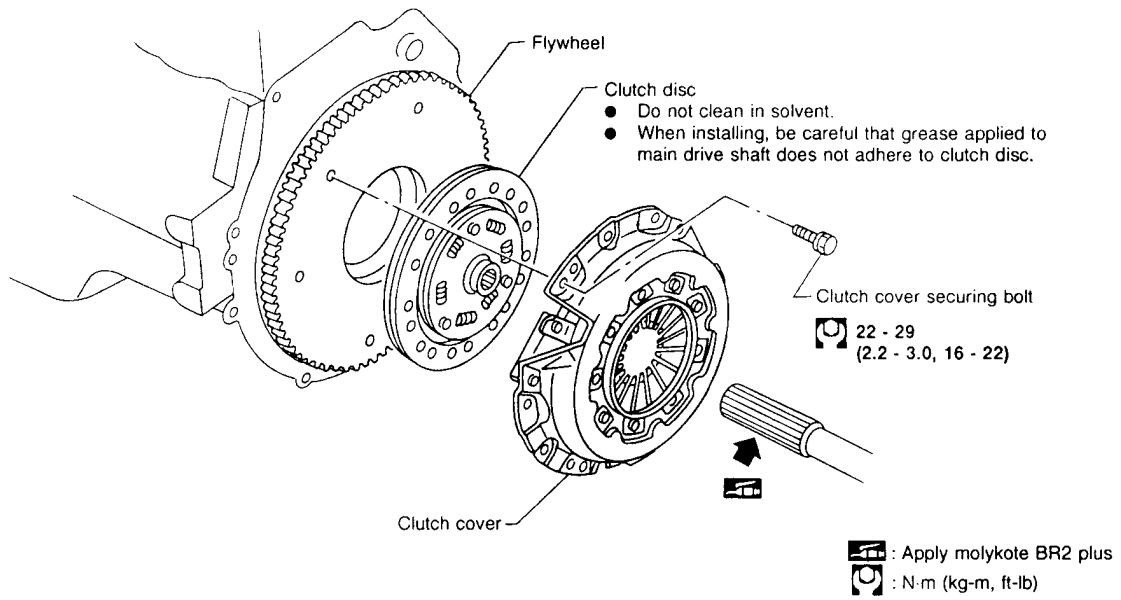
2. Bleed air from clutch damper according to the above procedure.
3. Repeat the above bleeding procedures 1 and 2 several times.

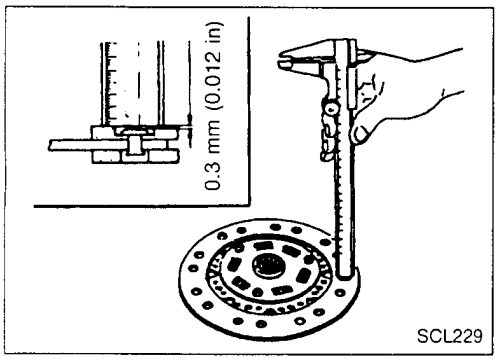


LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.
- **Too much lubricant might damage clutch disc facing.**

SEC. 300



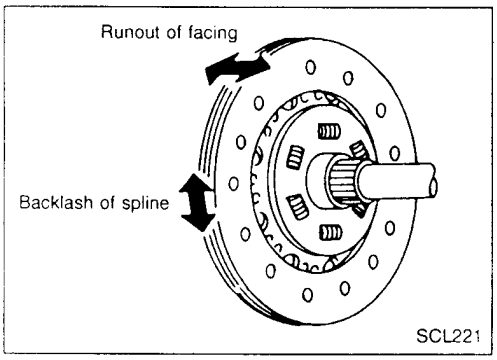


Clutch Disc

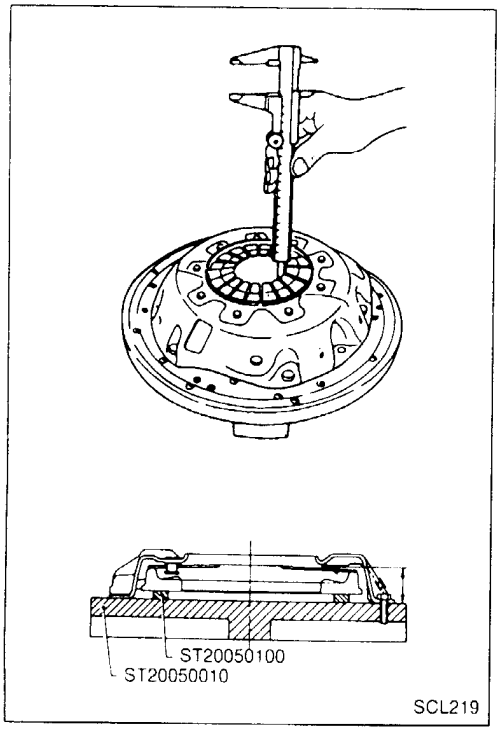
INSPECTION

Check clutch disc for wear of facing.

Wear limit of facing surface to rivet head:
0.3 mm (0.012 in)



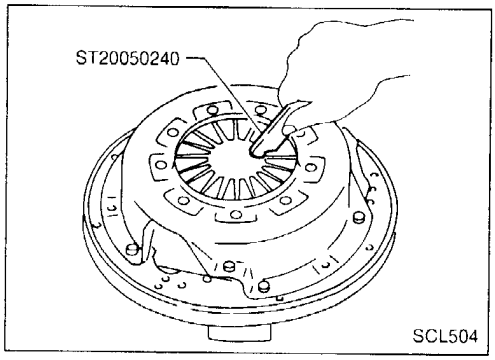
- Check clutch disc for backlash of spline and runout of facing.
  Maximum backlash of spline (at outer edge of disc):
  C200S 0.8 mm (0.031 in)
  C215S/C225S 0.9 mm (0.035 in)
  Runout limit:
  1.0 mm (0.039 in)
  Distance of runout check point (from hub center):
  C200S 95 mm (3.74 in)
  C215S 102.5 mm (4.04 in)
  C225S 107.5 mm (4.23 in)
- Check clutch disc for burns, discoloration or oil or grease contamination. Replace if necessary.



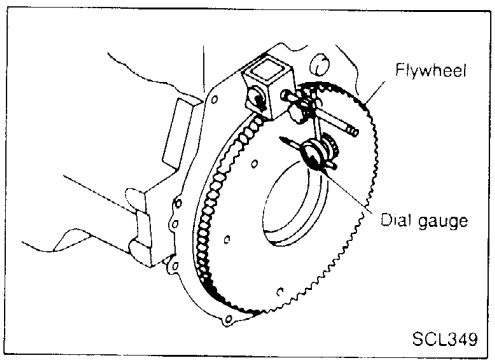
Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.
- Set 0.2 mm (0.008 in) feeler gauges on distance pieces (ST20050100) when checking diaphragm spring height.
  Diaphragm spring height "A":
  L200K 31 - 33 mm (1.22 - 1.30 in)
  L215K 30.5 - 32.5 mm (1.201 - 1.280 in)
  225 33.5 - 35.5 mm (1.32 - 1.40 in)
- Check thrust rings for wear or damage by shaking cover assembly and listening for chattering noise, or lightly hammering on rivets for a slightly cracked noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight burns or discoloration. Repair pressure plate with emery paper.
- Check pressure plate and clutch disc contact surface for deformation or damage. Replace if necessary.



- Adjust unevenness of diaphragm spring with Tool.
  Uneven limit:
  0.8 mm (0.031 in)

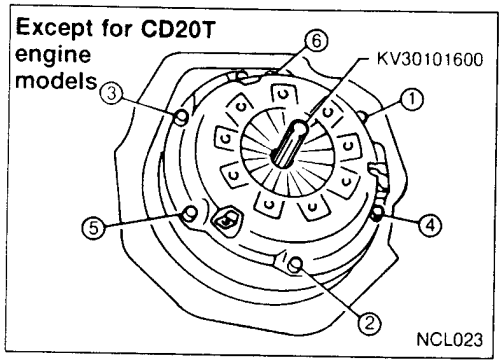


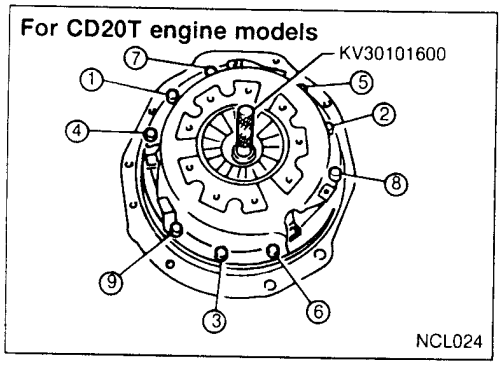
FLYWHEEL INSPECTION

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.
  Runout (Total indicator reading):
  Flywheel
  Less than 0.15 mm (0.0059 in)

Clutch Cover and Flywheel (Cont'd)

INSTALLATION





- Insert Tool into clutch disc hub when installing clutch cover and disc.
- Tighten bolts to specified torque.
  Tightening procedure
  a. **Tighten all bolts, in numerical order, to 10 - 20 Nm (1.0 - 2.0 kg-m, 7 - 14 ft-lb).**
  b. **Tighten all bolts, in numerical order, to 22 - 29 Nm (2.2 - 3.0 kg-m, 16 - 22 ft-lb).**
- Do not allow grease to contaminate clutch facing.

General Specifications

CLUTCH CONTROL SYSTEM

Engine	Except for CD20T	CD20T
Type of clutch control	Mechanical	Hydraulic

CLUTCH DAMPER

Inner diameter	mm (in)	19.05 (3/4)

CLUTCH MASTER CYLINDER

Inner diameter	mm (in)	15.87 (5/8)

CLUTCH OPERATING CYLINDER

Inner diameter	mm (in)	17.46 (11/16)

CLUTCH DISC

Unit: mm (in)

Engine	GA16DE	SR20DE, SR20De	CD20T
Model	C200S	C215S	C225S
Facing size (Outer dia. x inner dia. x thickness)	200 x 134 x 3.5 (7.87 x 5.28 x 0.138)	215 x 145 x 3.5 (8.46 x 5.71 x 0.138)	225 x 150 x 3.5 (8.86 x 5.91 x 0.138)
Thickness of disc assembly with load	7.7 - 8.3 (0.303 - 0.327) with 3780 N (385.6 kg, 849.7 lb)	7.7 - 8.3 (0.303 - 0.327) with 4904 N (500 kg, 1102 lb)	7.6 - 8.0 (0.299 - 0.315) with 3923 N (400 kg, 882 lb)

CLUTCH COVER

Engine		GA16DE	SR20DE, SR20De	CD20T
Model		L200K	L215K	225
Full-load	N (kg, lb)	3780 (385.6, 849.7)	4904 (500, 1102)	4413 (450, 992)

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

Applied model	Except for CD20T engine models		CD20T engine models	
	RHD	LHD	RHD	LHD
Pedal height "H"*	159 - 169 (6.26 - 6.65)	153 - 163 (6.02 - 6.42)	156 - 166 (6.14 - 6.54)	149 - 159 (5.87 - 6.26)
Pedal free travel "A" (at pedal pad)	11 - 15 (0.43 - 0.59)		9 - 16 (0.35 - 0.63)	
Withdrawal lever play "B"	2.5 - 3.5 (0.098 - 0.138)		—	

*: Measured from surface of dash reinforcement panel to surface of pedal pad.

CLUTCH DISC

Unit: mm (in)

Disc model	C200S	C215S	C225S
Wear limit of facing surface to rivet head	0.3 (0.012)		
Runout limit of facing	1.0 (0.039)		
Distance of runout check point (from hub center)	95 (3.74)	102.5 (4.04)	107.5 (4.23)
Maximum backlash of spline (at outer edge of disc)	0.8 (0.031)	0.9 (0.035)	

CLUTCH COVER

Unit: mm (in)

Cover model	L200K	L215K	225
Diaphragm spring height	31 - 33 (1.22 - 1.30)	30.5 - 32.5 (1.201 - 1.280)	33.5 - 35.5 (1.32 - 1.40)
Uneven limit of diaphragm spring toe height	0.8 (0.031)		0.7 (0.028)

MANUAL TRANSAXLE

SECTION MT

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RS5F31A

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- Final Drive 51
- Shift Control Components 54
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ADJUSTMENT 58
- Differential Side Bearing Preload 58

ASSEMBLY 60

RS5F31A & RS5F32A

SERVICE DATA AND SPECIFICATIONS (SDS) ... 64
- General Specifications — RS5F31A and RS5F32A 64
- Inspection and Adjustment — RS5F31A 65
- Inspection and Adjustment — RS5F32A 67

<SUPPLEMENT-I> (For Africa, Middle East & Australia)

NO CHANGES

<SUPPLEMENT-II>

ON-VEHICLE SERVICE 2002
Position Switch Check 2002

RS5F32A

MAJOR OVERHAUL 2003
Case Components 2003

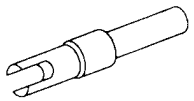
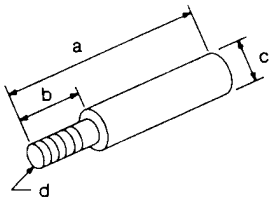
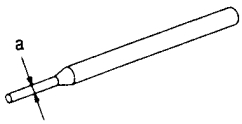
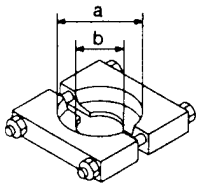
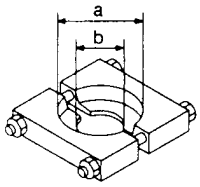
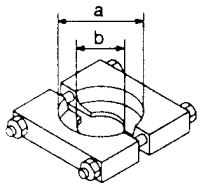
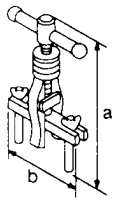
<SUPPLEMENT-III> (For wagon models)

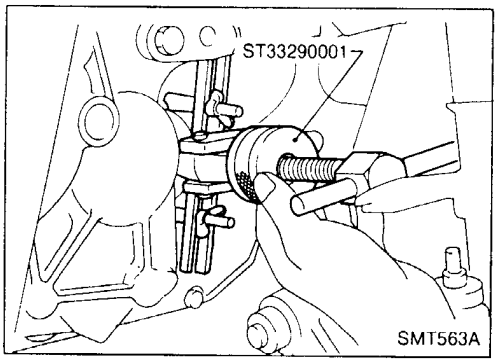
NO CHANGES

RS5F31A & RS5F32A

SERVICE DATA AND SPECIFICATIONS (SDS) 2004
General Specifications — RS5F31A and RS5F32A 2004

Special Service Tools

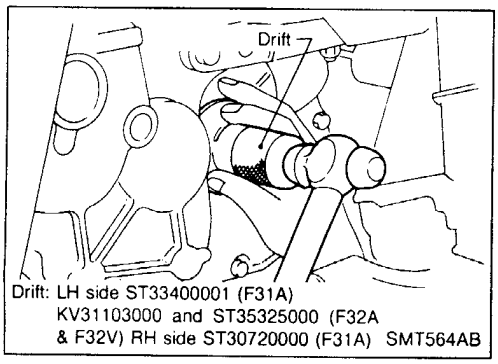
Tool number Tool name	Description	
KV38105900 (For F31A) KV38107700 (For F32A) Preload adapter	 NT087	Measuring turning torque of final drive assembly Measuring total turning torque Measuring clearance between side gear and differential case with washer Selecting differential side bearing adjusting shim (Use with KV38106000.)
KV38106000 Height gauge adapter (differential side bearing)	 NT418	Selecting differential side bearing adjusting shim (Use with KV38105900 or KV38107700.) **a: 140 mm (5.51 in)** **b: 40 mm (1.57 in)** **c: 16 mm (0.63 in) dia.** **d: M8 x 1.25P**
KV32101000 Pin punch	 NT410	Removing and installing retaining pin **a: 4 mm (0.16 in) dia.**
ST22730000 Puller	 NT411	Removing mainshaft front and rear bearing inner race (F31A) Removing 5th main gear **a: 82 mm (3.23 in) dia.** **b: 30 mm (1.18 in) dia.**
ST30031000 Puller	 NT411	Removing differential side bearing inner race (F31A) Removing 3rd and 4th synchronizer Measuring wear of 2nd & 3rd baulk ring (F32A) **a: 90 mm (3.54 in) dia.** **b: 50 mm (1.97 in) dia.**
ST30021000 Puller	 NT411	Removing 5th synchronizer **a: 110 mm (4.33 in) dia.** **b: 68 mm (2.68 in) dia.**
ST33290001 Puller	 NT414	Removing differential oil seal Removing mainshaft front bearing outer race (F31A) Removing differential side bearing outer race **a: 250 mm (9.84 in)** **b: 160 mm (6.30 in)**



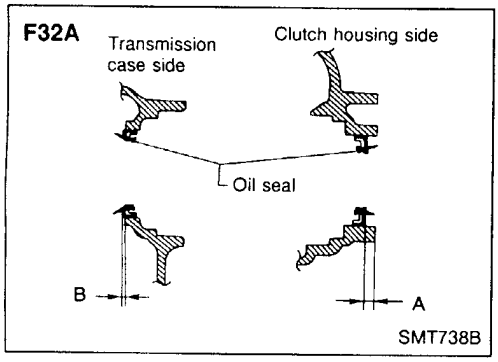
Replacing Oil Seal

DIFFERENTIAL OIL SEAL

1. Drain gear oil from transaxle.
2. Remove drive shafts — Refer to section FA.
3. Remove differential oil seal.



4. Install differential oil seal.
- **Apply multi-purpose grease to seal lip of oil seal before installing.**
5. Install drive shafts — Refer to section FA.



— F32A —

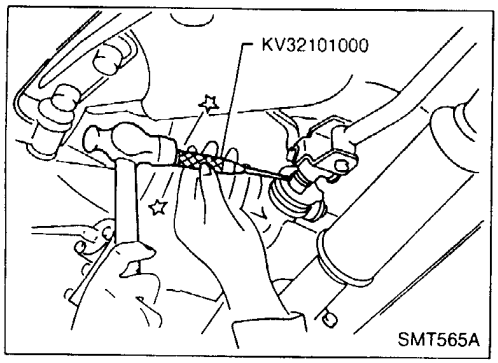
- **Install differential oil seal so that dimension "A" and "B" are within specifications.**

Unit: mm (in)

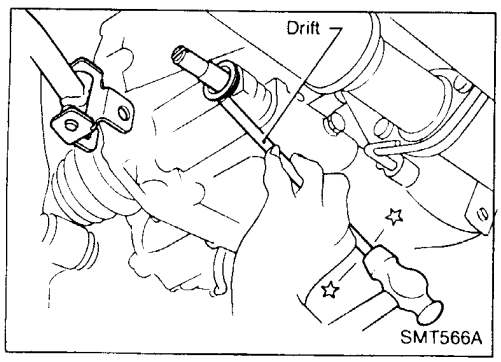
Item	A	B
F32A	5.9 - 6.1 (0.232 - 0.240)	0.5 (0.020) or less

STRIKING ROD OIL SEAL

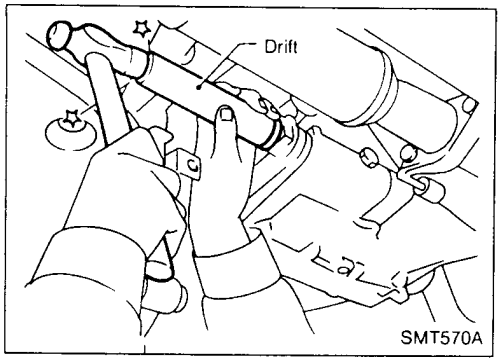
1. Remove transaxle control rod from yoke.
2. Remove retaining pin of yoke.
- **Be careful not to damage boot.**



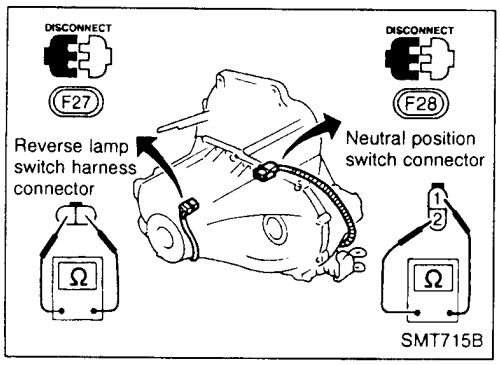
3. Remove striking rod oil seal.



Replacing Oil Seal (Cont'd)



4. Install striking rod oil seal.
- **Apply multi-purpose grease to seal lip of oil seal before installing.**



Position Switch Check

REVERSE LAMP SWITCH

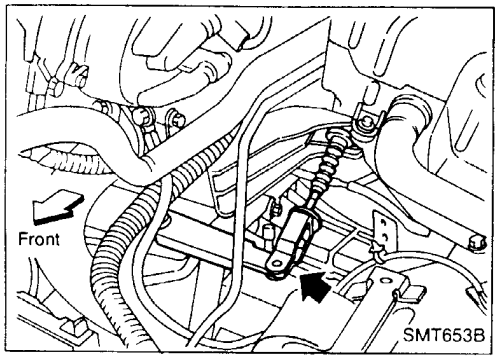
- Check continuity.

Gear position	Continuity
Reverse	Yes
Except reverse	No

NEUTRAL SWITCH

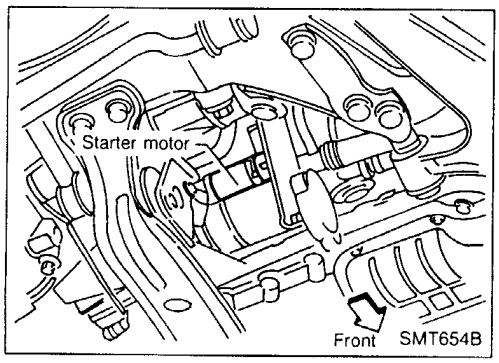
- Check continuity.

Gear position	Continuity
Neutral	Yes
Except neutral	No

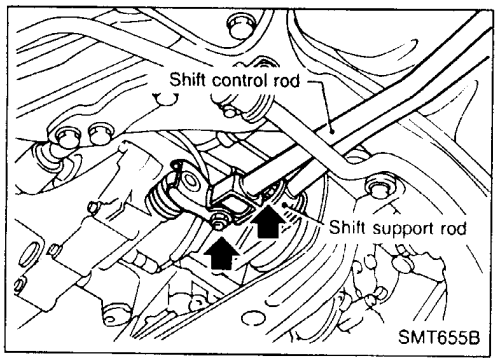


Removal

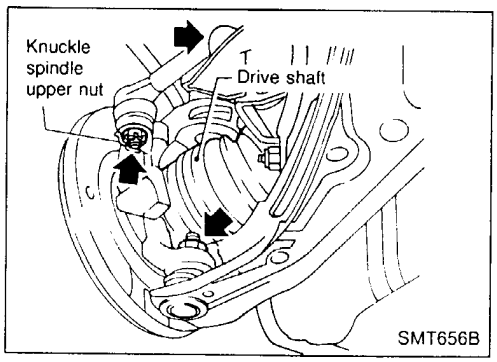
1. Remove battery negative terminal.
2. Remove air duct.
3. Disconnect clutch control cable from transaxle (except CD20T models).
4. Remove clutch operating cylinder from transaxle (CD20T models).
5. Disconnect reverse lamp switch, speedometer sensor, neutral switch and ground harness connectors.



6. Remove starter motor from transaxle.

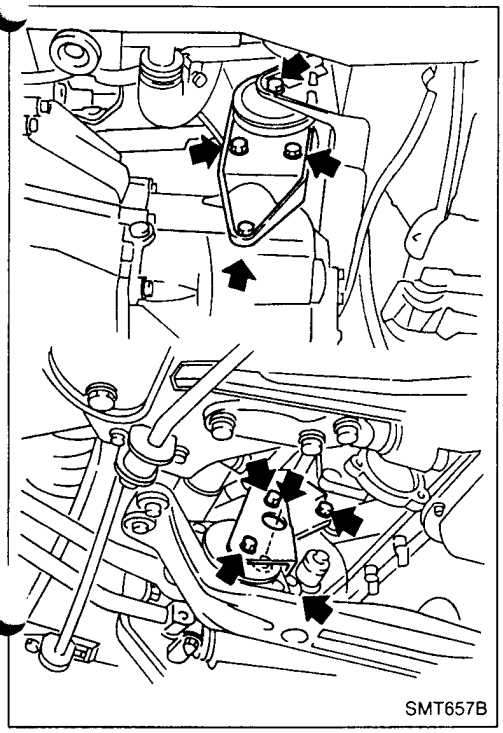


7. Remove shift control rod and support rod from transaxle.
8. Drain gear oil from transaxle.
9. Remove exhaust front tube.



10. Draw out drive shafts from transaxle — Refer to section FA.

Removal (Cont'd)

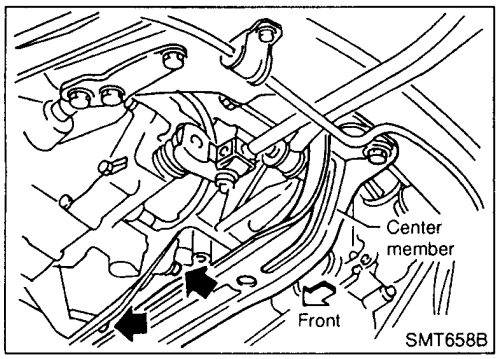

SMT657B

11. Support engine by placing a jack under oil pan.

CAUTION:

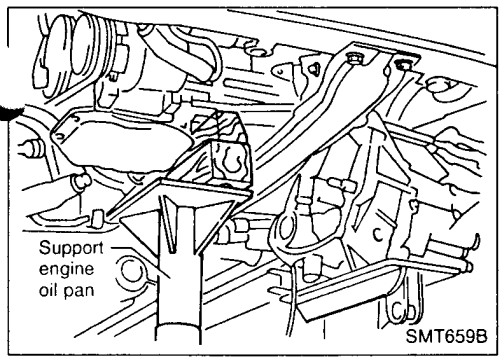
Do not place jack under oil pan drain plug.

12. Remove rear and LH mounts.



SMT658B

13. Raise jack for access to lower housing bolts. Remove bolts. Lower jack.

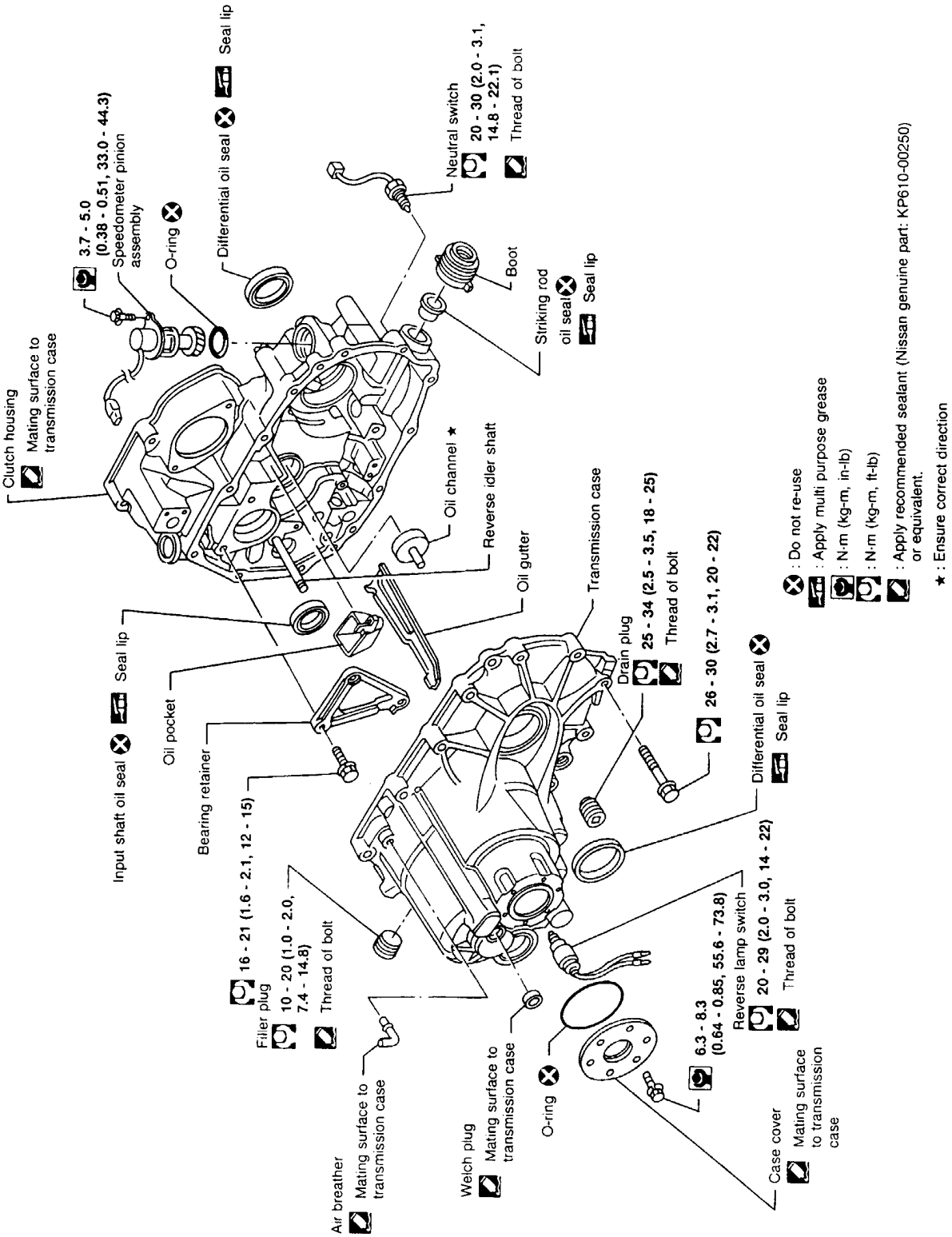


SMT659B

14. Remove bolts securing transaxle.
15. Lower transaxle while supporting it with a jack.

Case Components

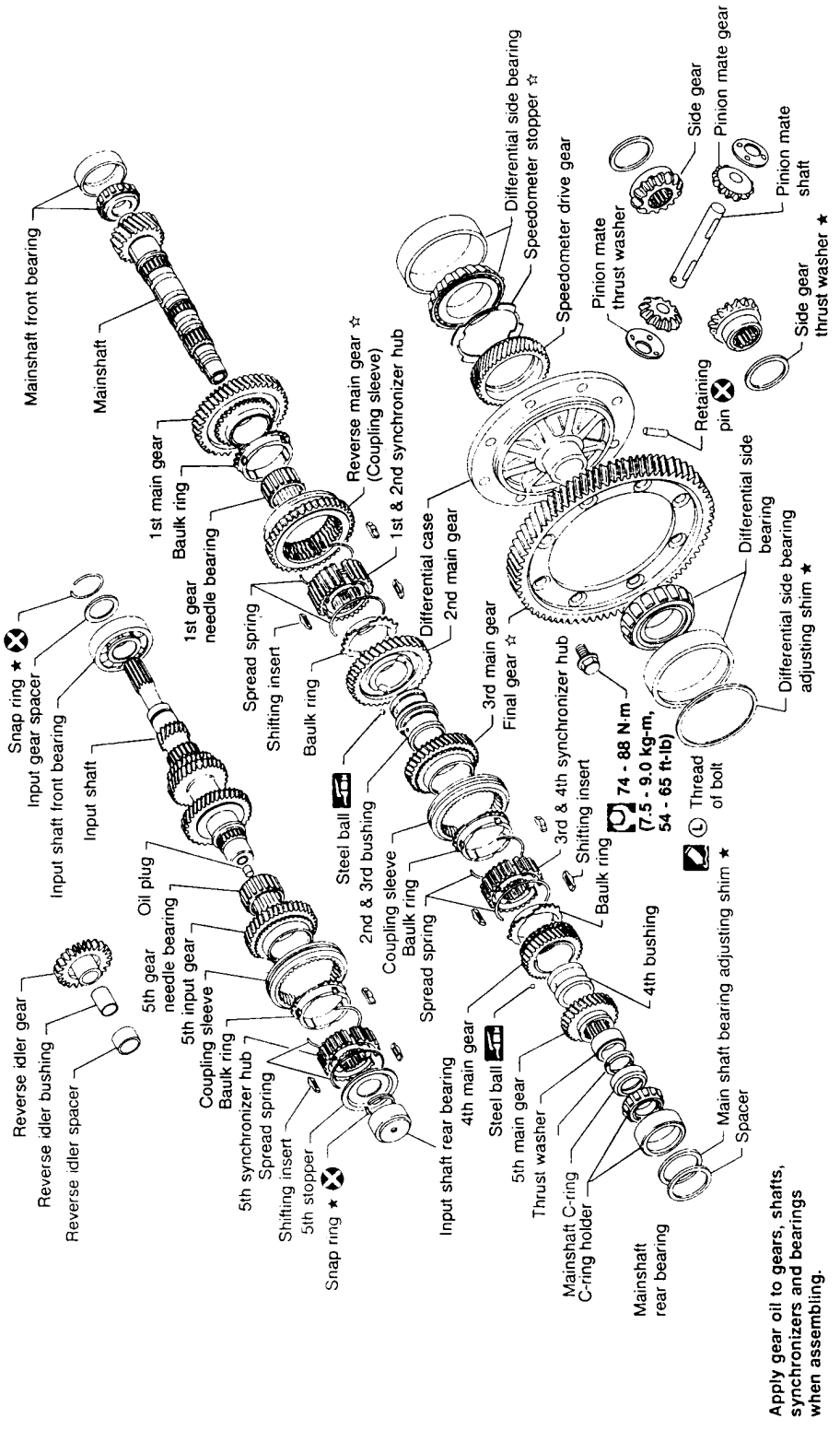
SEC. 321



NMT019

Gear Components

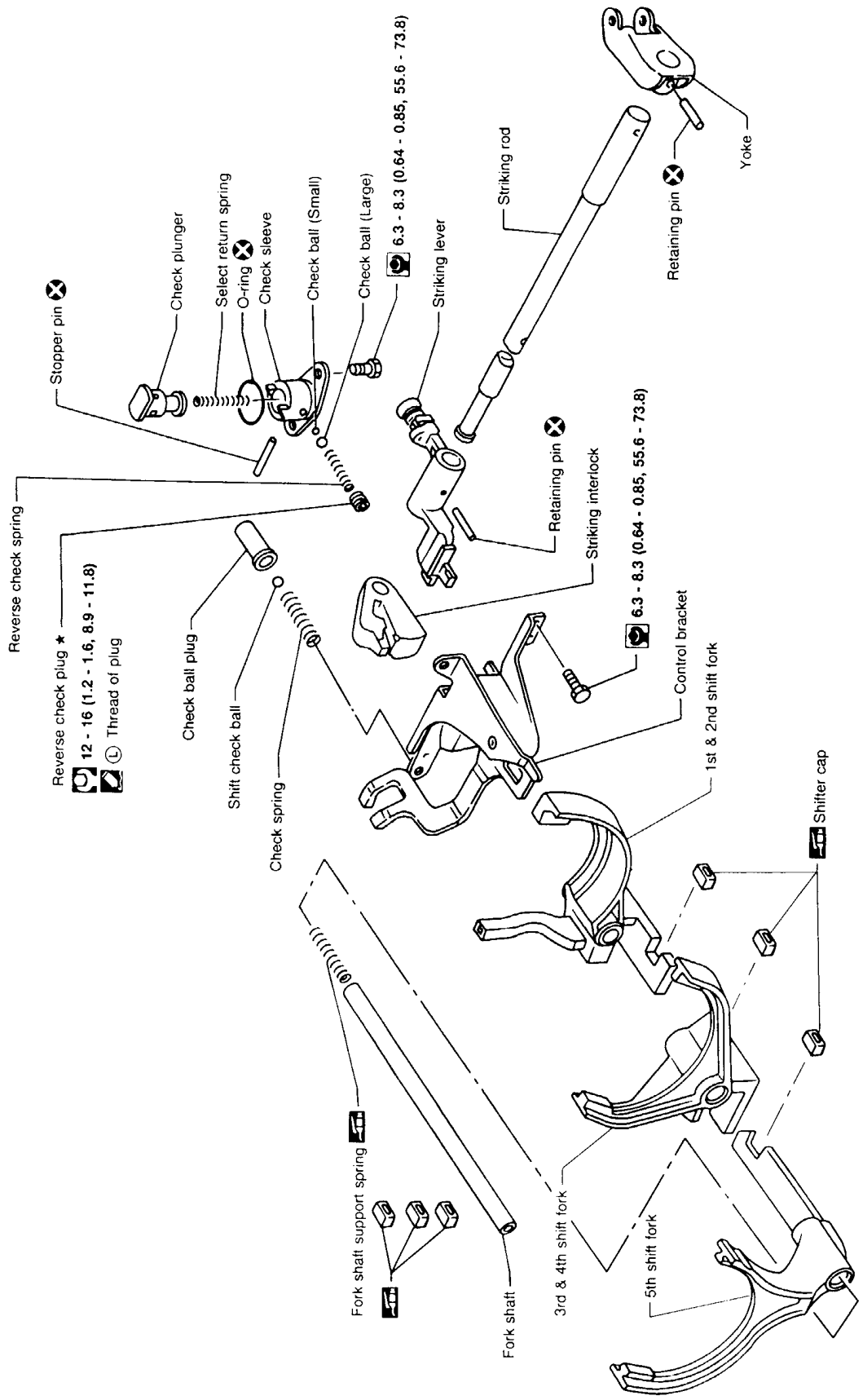
SEC. 322



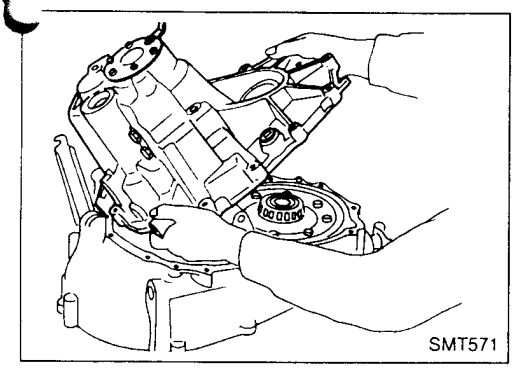
NMT020

Shift Control Components

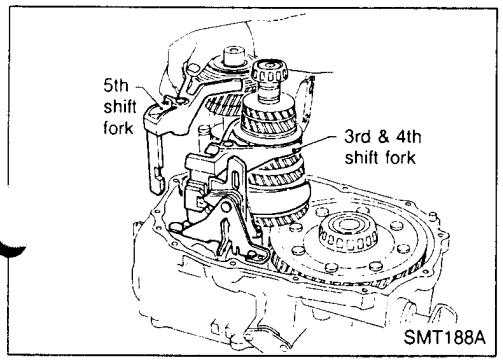
SEC. 328



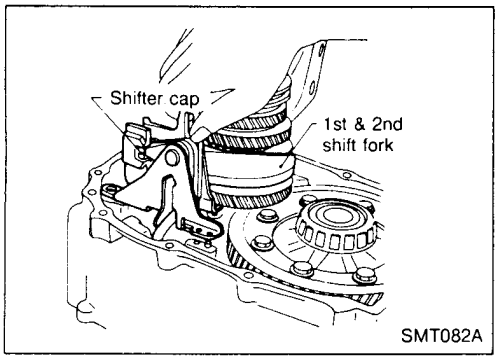
NMT021



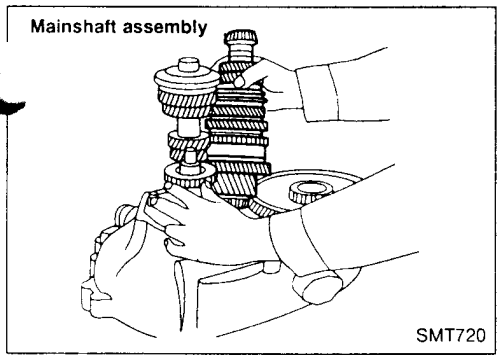
1. Remove transmission case while slightly tilting it to prevent 5th shift fork from interfering with case.



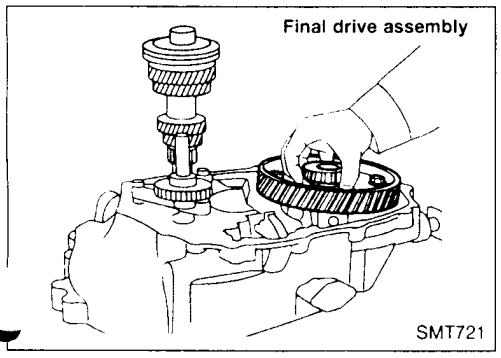
2. Draw out reverse idler spacer and fork shaft, then remove 5th and 3rd & 4th shift forks.
- **Be careful not to lose shifter cap.**

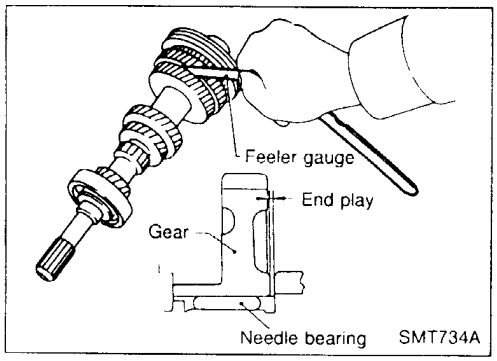


3. Remove control bracket with 1st & 2nd shift fork.
- **Be careful not to lose shifter cap.**



4. Remove gear components from clutch housing.
a. Remove mainshaft and final drive assembly.
- **Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.**





Input Shaft and Gears

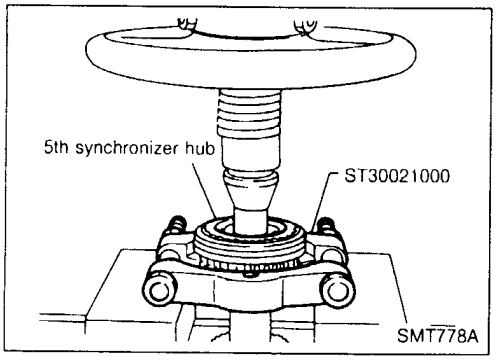
DISASSEMBLY

1. Before disassembly, check 5th input gear end play.

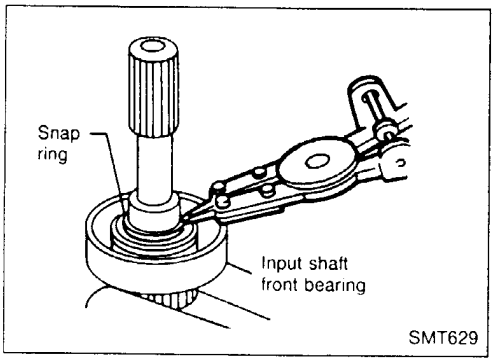
Gear end play

Gears	End play mm (in)
5th input gear	0.18 - 0.31 (0.0071 - 0.0122)

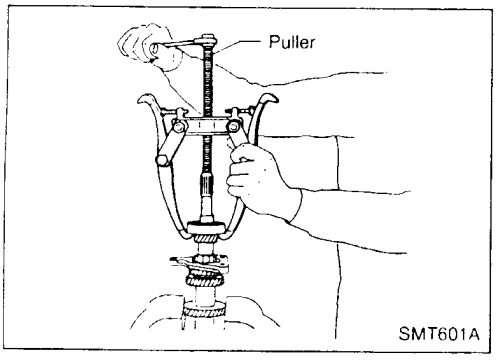
- If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring groove — Refer to "Assembly".



2. Remove snap ring and 5th stopper.
3. Remove 5th synchronizer, 5th input gear and 5th gear needle bearing.



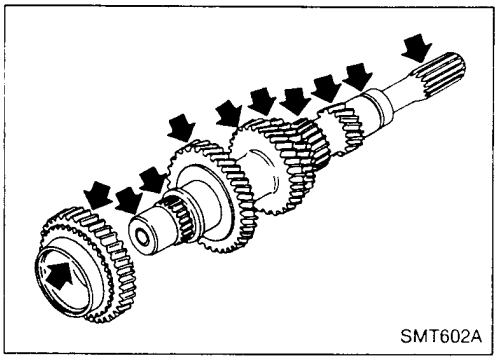
4. Remove snap ring of input shaft front bearing and input gear spacer.



5. Pull out input shaft front bearing.
6. Remove bearing retainer.

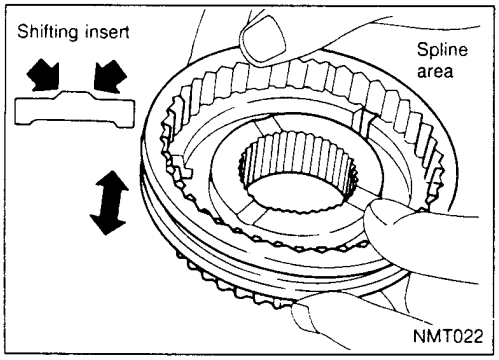
Input Shaft and Gears (Cont'd)

INSPECTION


SMT602A

Gear and shaft

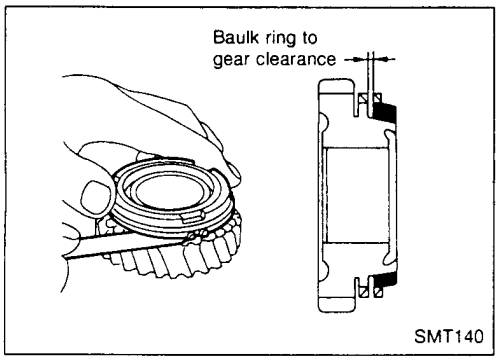
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



NMT022

Synchronizer

- Check spline area of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.



SMT140

- Measure clearance between baulk ring and gear.

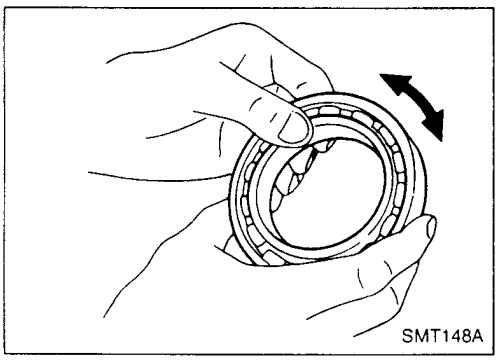
Clearance between baulk ring and gear:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

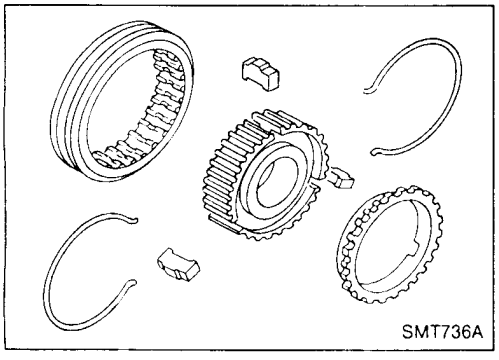
Wear limit

0.7 mm (0.028 in)


SMT148A

Bearing

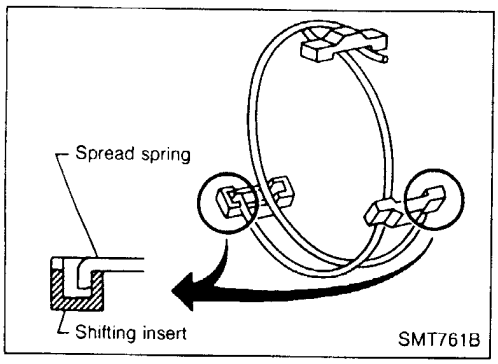
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.


SMT736A

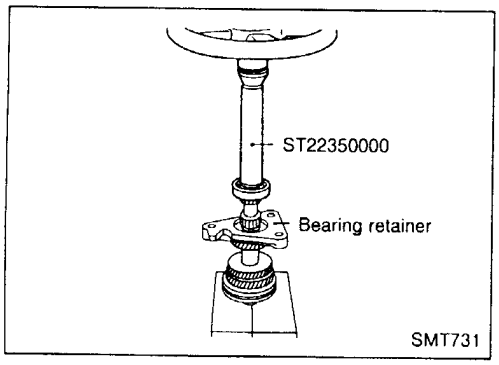
ASSEMBLY

1. Assemble 5th synchronizer.

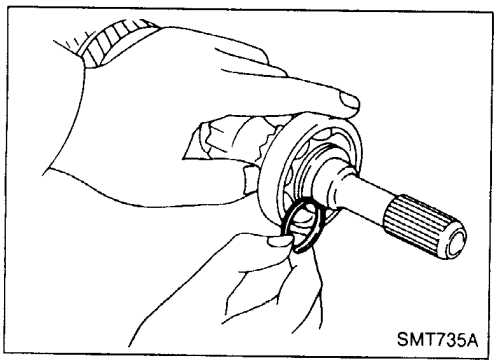
Input Shaft and Gears (Cont'd)



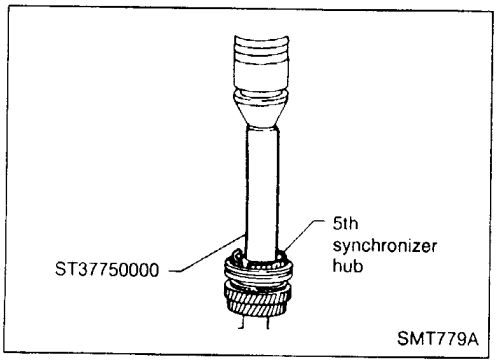
- **Be careful not to hook front and rear ends of spread spring to the same shifting insert.**



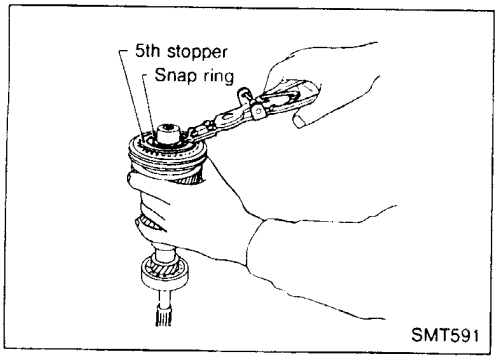
2. Install bearing retainer.
3. Press on input shaft front bearing.
4. Install input gear spacer.



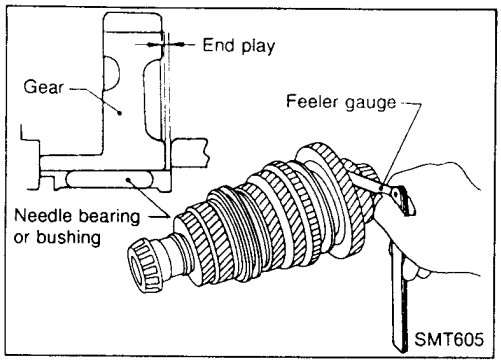
5. Select correct snap ring of input shaft front bearing to minimize clearance of groove in input shaft and then install it.
   Allowable clearance of groove:
   0 - 0.1 mm (0 - 0.004 in)
   Snap ring of input shaft front bearing:
   Refer to SDS, MT-65



6. Install 5th gear needle bearing, 5th input gear, 5th synchronizer and 5th stopper.
7. Measure gear end play as a final check — Refer to "Disassembly".



8. Select correct snap ring of 5th synchronizer hub to minimize clearance of groove in input shaft and install it.
   Allowable clearance of groove:
   0 - 0.1 mm (0 - 0.004 in)
   Snap ring of 5th synchronizer:
   Refer to SDS, MT-65

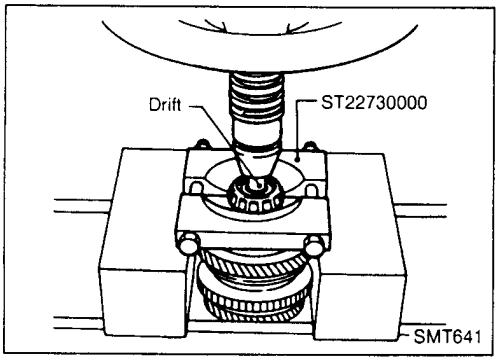


Mainshaft and Gears

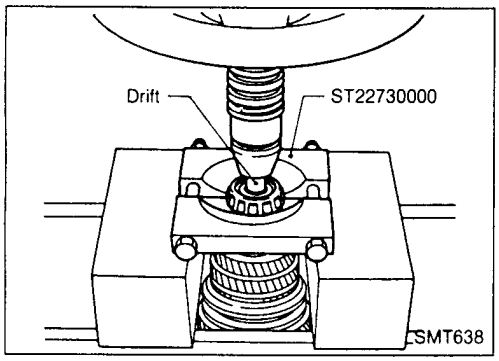
DISASSEMBLY

1. Before disassembly, check 1st, 2nd, 3rd and 4th main gear end plays.
   Gear end play
   Refer to SDS, MT-65

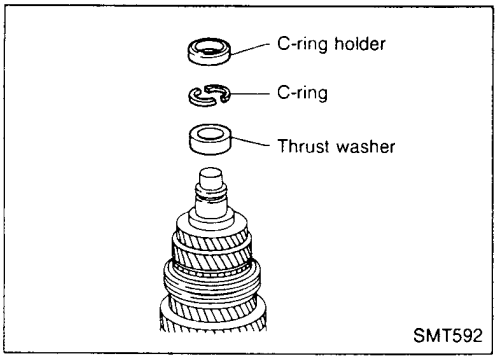
- If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of C-ring groove — Refer to "Assembly"



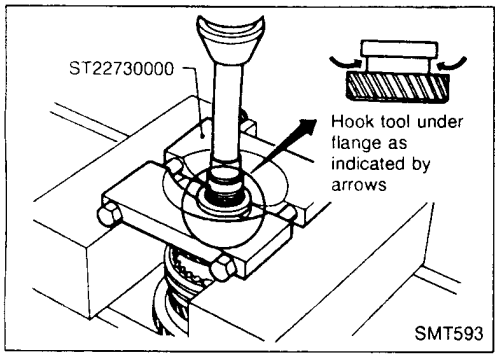
2. Press out mainshaft front bearing.



3. Press out mainshaft rear bearing.

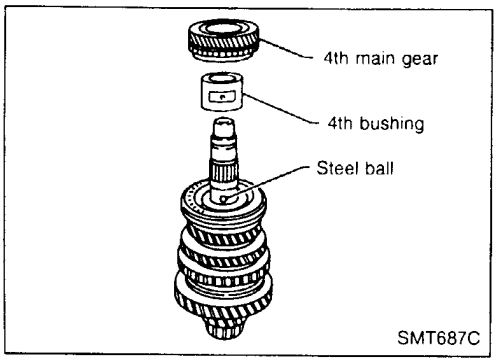


4. Remove C-rings, C-ring holder and thrust washer.

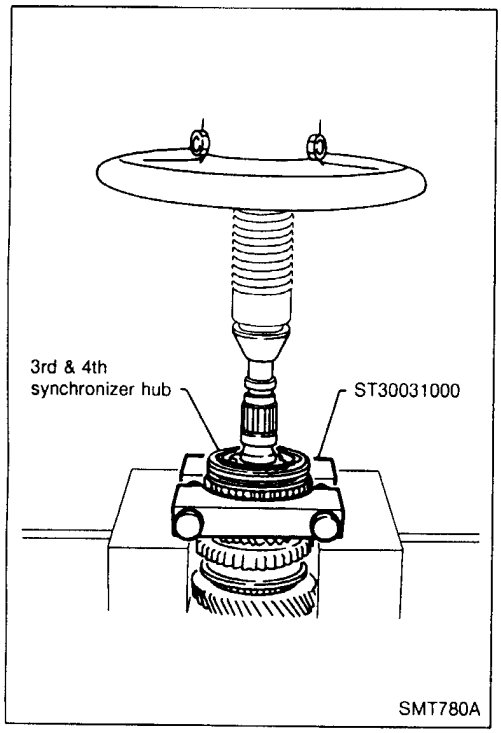


5. Press out 5th main gear.

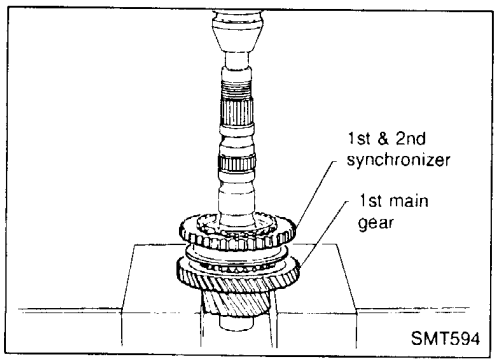
Mainshaft and Gears (Cont'd)



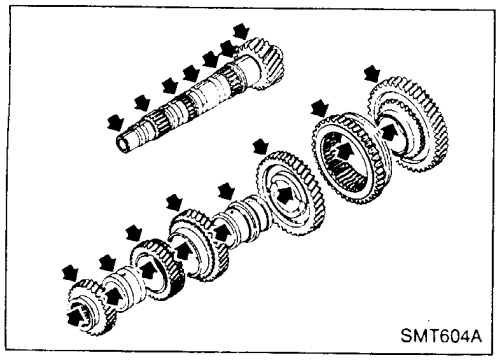
6. Remove 4th main gear, 4th bushing and steel ball.
- **Be careful not to lose steel ball.**



7. Remove 3rd & 4th synchronizer, 3rd main gear, 2nd & 3rd bushing, steel ball and 2nd main gear.
- **Be careful not to lose steel ball.**



8. Remove 1st & 2nd synchronizer and 1st main gear, then remove 1st gear needle bearing.



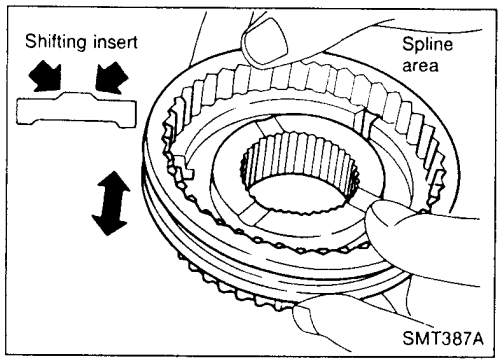
INSPECTION

Gear and shaft

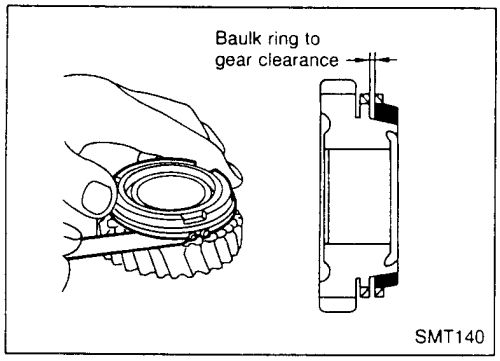
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

Mainshaft and Gears (Cont'd)

Synchronizer



- Check spline area of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.



- Measure clearance between baulk ring and gear.

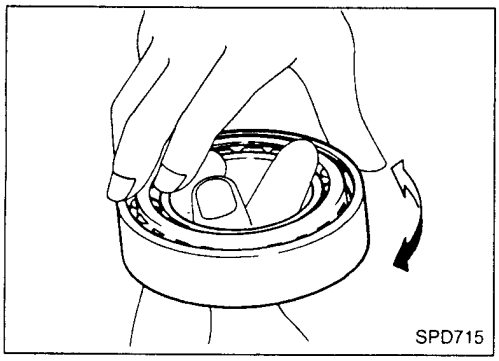
Clearance between baulk ring and 1st-4th main gears:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

0.7 mm (0.028 in)

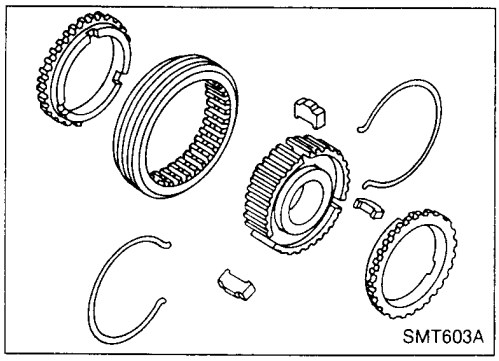


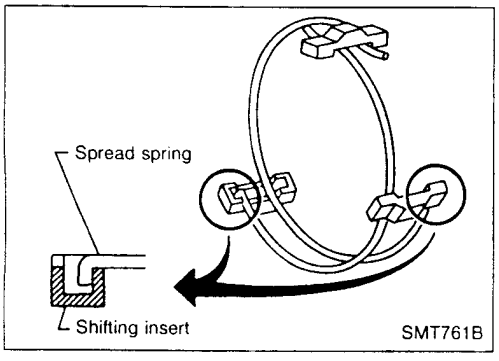
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing tapered roller bearing, replace outer and inner race as a set.**

ASSEMBLY

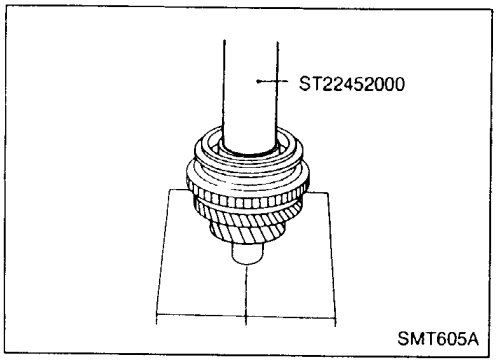
1. Assemble 1st & 2nd and 3rd & 4th synchronizers.



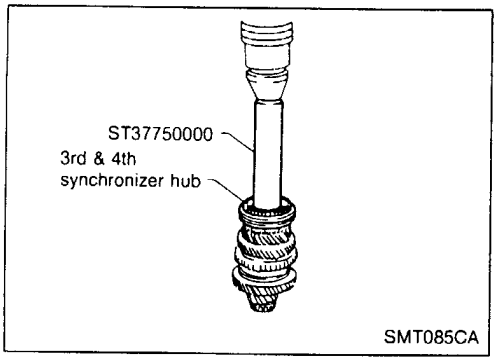


- **Be careful not to hook front and rear ends of spread spring to the same shifting insert.**

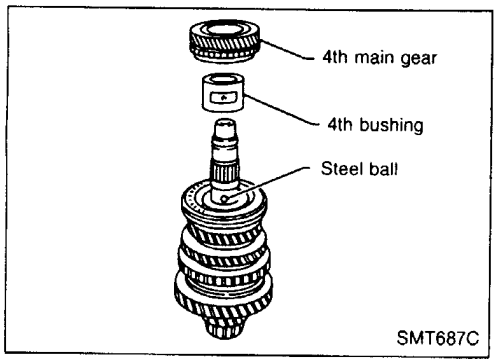
Mainshaft and Gears (Cont'd)



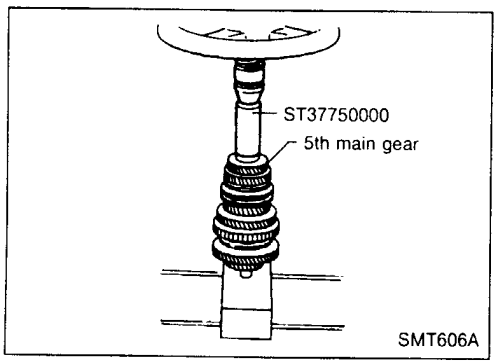
2. Install 1st gear needle bearing and 1st main gear.
3. Press on 1st & 2nd synchronizer.



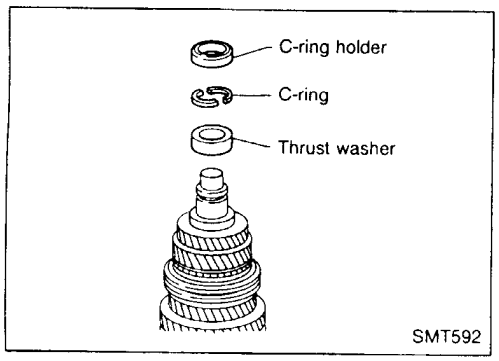
4. Install steel ball, 2nd main gear, 2nd & 3rd bushing, 3rd main gear and 3rd & 4th synchronizer.
- **Apply multi-purpose grease to steel ball before installing it.**
- **2nd & 3rd bushing has a groove in which steel ball fits.**



5. Install steel ball, 4th bushing and 4th main gear.
- **Apply multi-purpose grease to steel ball before installing it.**
- **4th bushing has a groove in which steel ball fits.**

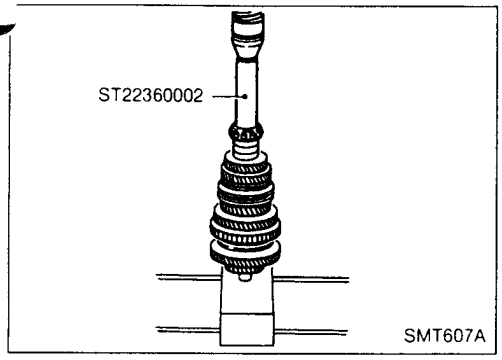


6. Press on 5th main gear.

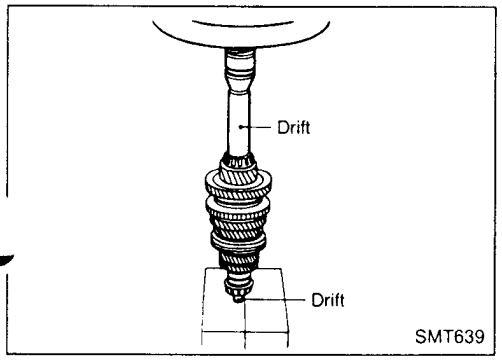


7. Install thrust washer.
8. Select correct C-ring to minimize clearance of groove in mainshaft and install it.
   Allowable clearance of groove:
   0 - 0.1 mm (0 - 0.004 in)
   Mainshaft C-ring:
   Refer to SDS, MT-65
9. Install C-ring holder.

Mainshaft and Gears (Cont'd)



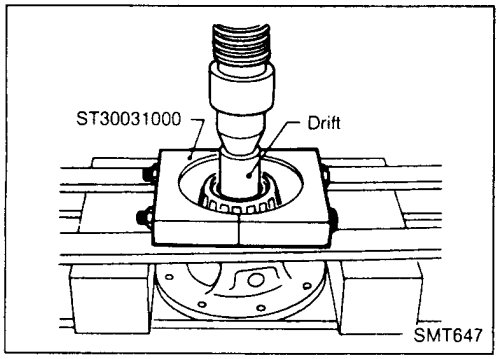
10. Press on mainshaft rear bearing.



11. Press on mainshaft front bearing.
12. Measure gear end play as a final check — Refer to "Disassembly".

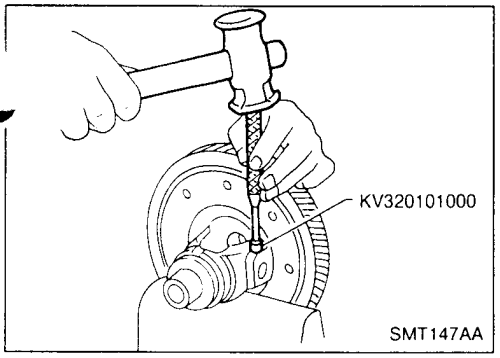
Final Drive

DISASSEMBLY



1. Remove final gear.
2. Remove speedometer drive gear by cutting it.
3. Press out differential side bearings.

- **Be careful not to mix up the right and left bearings.**

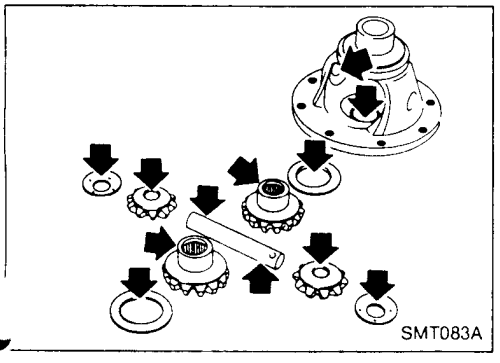


4. Drive out retaining pin and draw out pinion mate shaft.
5. Remove pinion mate gears and side gears.

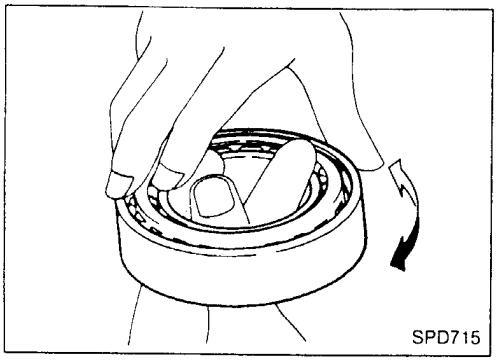
INSPECTION

Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.

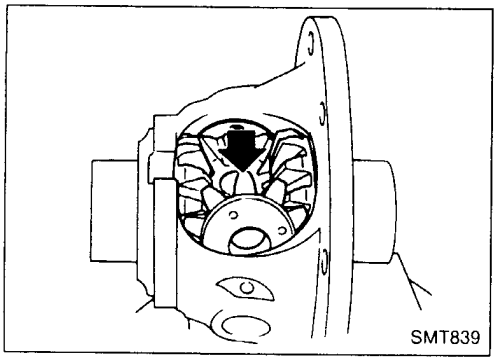


Final Drive (Cont'd)


SPD715

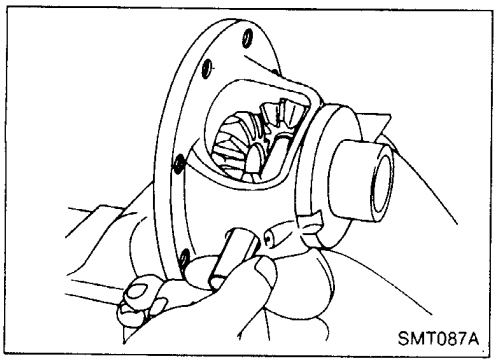
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing tapered roller bearing, replace outer and inner race as a set.**

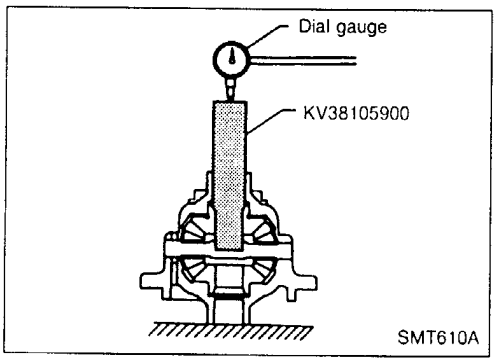

SMT839

ASSEMBLY

1. Attach side gear thrust washers to side gears, then install pinion mate washers and pinion mate gears in place.


SMT087A

2. Insert pinion mate shaft.
- **When inserting, be careful not to damage pinion mate thrust washers.**



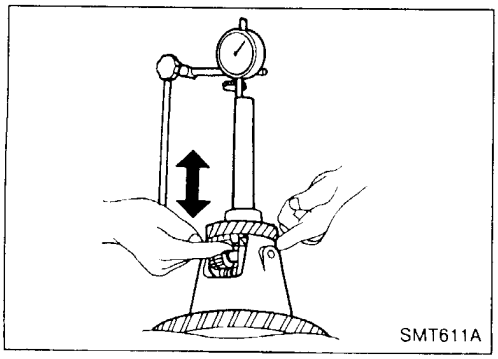
SMT610A

3. Measure clearance between side gear and differential case with washers following the procedure below:

a. Set Tool and dial indicator on side gear.

b. Move side gear up and down to measure dial indicato deflection. Always measure indicator deflection on both side gears.

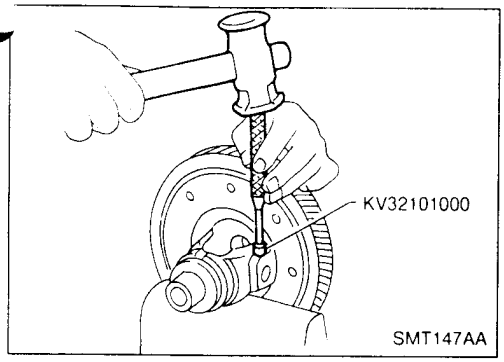
Clearance between side gear and differential case with washers:
0.3 mm (0.012 in) or less


SMT611A

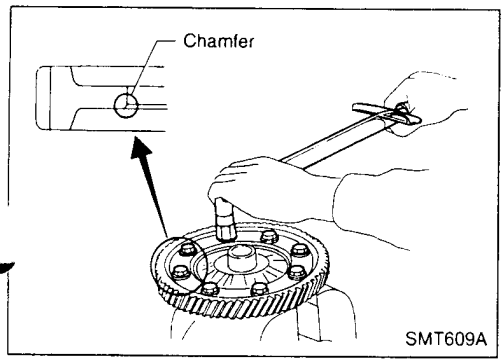
c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washer:
Refer to SDS, MT-65

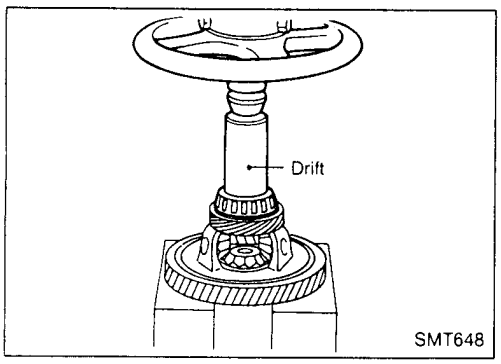
Final Drive (Cont'd)



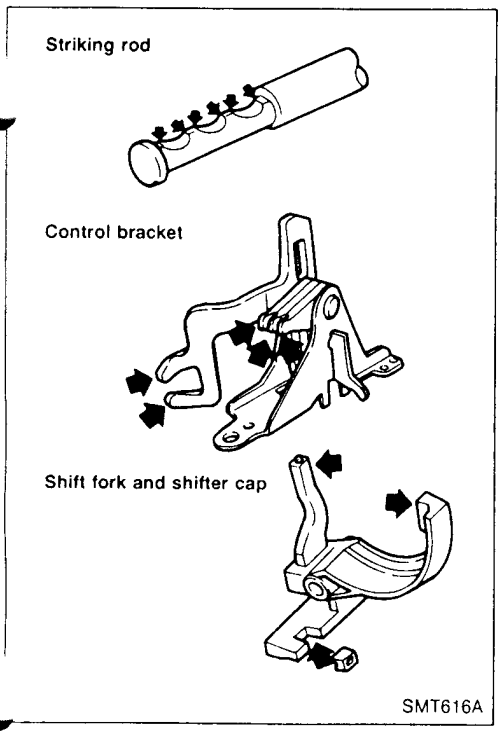
4. Install retaining pin.
- **Make sure that retaining pin is flush with case.**



5. Install final gear.
- **Apply locking sealant to final gear fixing bolts before installing them.**
6. Install speedometer drive gear and stopper.



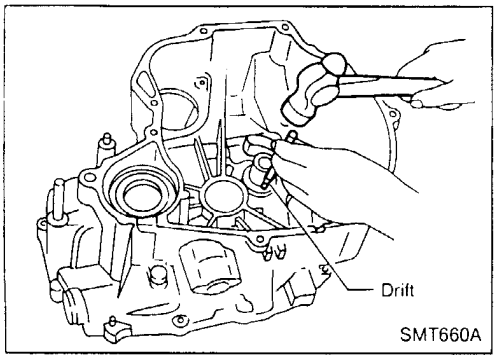
7. Press on differential side bearings.



Shift Control Components

INSPECTION

- Check contact surface and sliding surface for wear, scratches, projections or other damage.

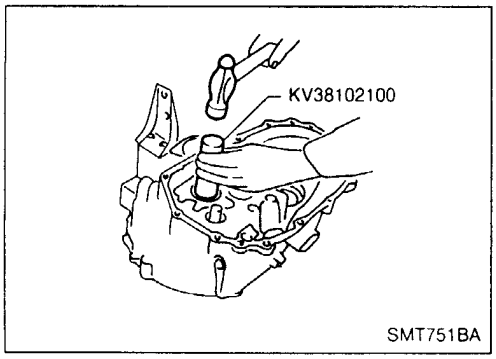


Case Components

REMOVAL AND INSTALLATION

Input shaft oil seal

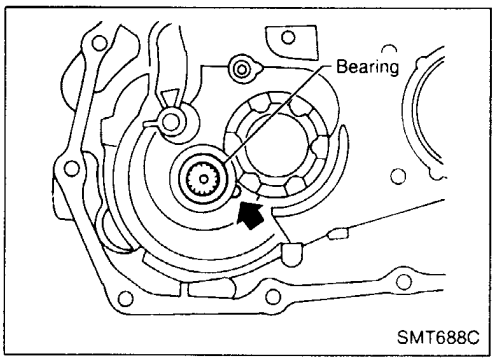
1. Drive out oil seal.



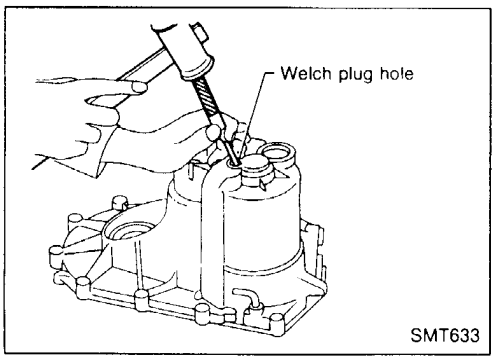
2. Install new oil seal.
- **Apply multi-purpose grease to seal lip of oil seal before installing.**

Input shaft rear bearing

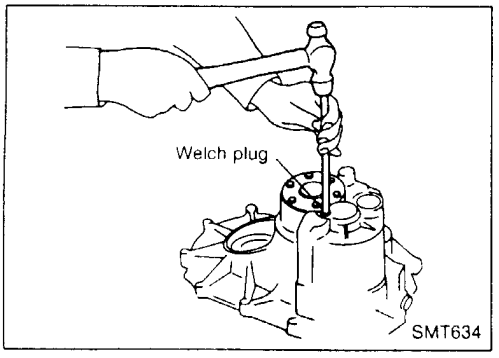
1. Remove welch plug from transmission case.



2. Remove input shaft rear bearing by tapping it from welch plug hole.

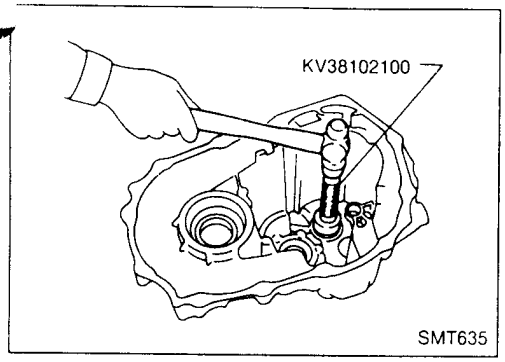


3. Install welch plug.
- **Apply recommended sealant to mating surface of transmission case.**



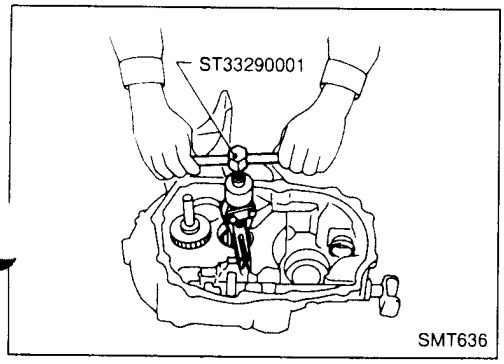
Case Components (Cont'd)

4. Install input shaft rear bearing.



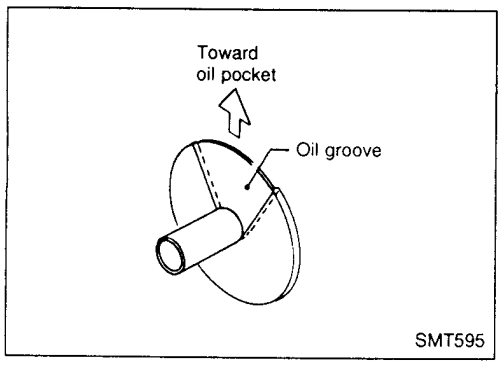
Mainshaft front bearing outer race and oil channel

1. Remove mainshaft front bearing outer race.
2. Remove oil channel.



3. Install oil channel.

- **Ensure the oil groove in oil channel always faces toward oil pocket when installing it on clutch housing.**



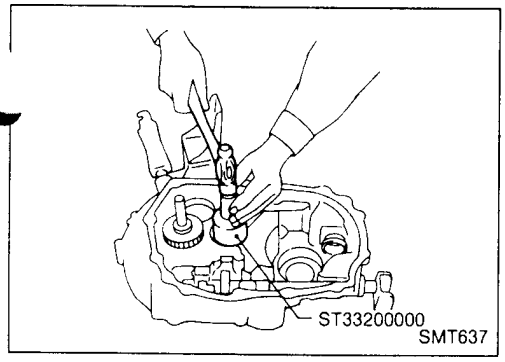
4. Install mainshaft front bearing outer race.

Mainshaft rear bearing outer race

- **Refer to "ADJUSTMENT".**

Differential side bearing outer race

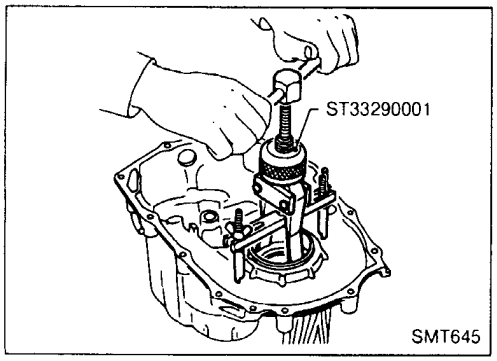
- **Refer to "ADJUSTMENT".**



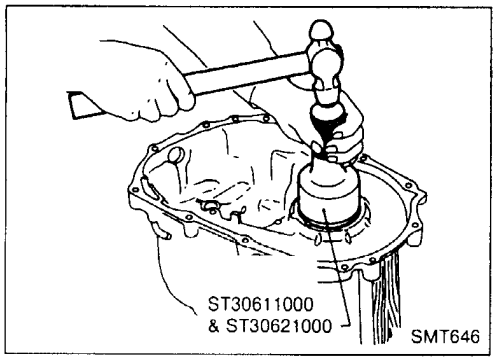
Differential Side Bearing Preload

If any of the following parts are replaced, adjust differential side bearing preload.

- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**

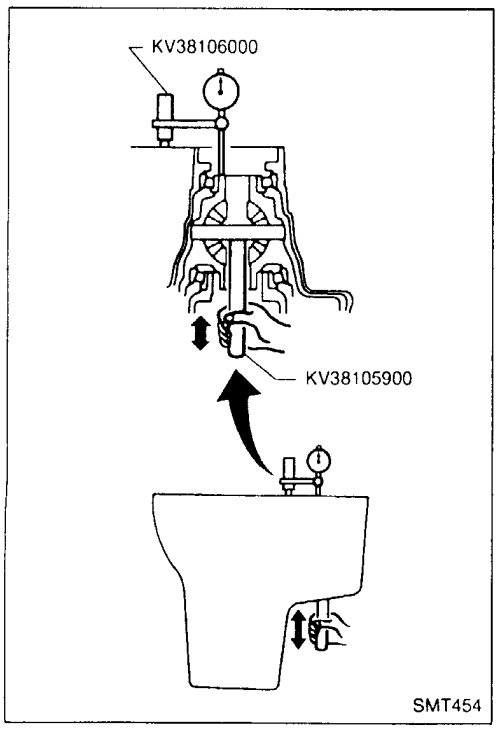


1. Remove differential side bearing outer race (transmission case side) and shim.



2. Reinstall differential side bearing outer race without shim.
3. Install final drive assembly on clutch housing.
4. Install transmission case on clutch housing.

- **Tighten transmission case fixing bolts to the specified torque. Page MT-8**

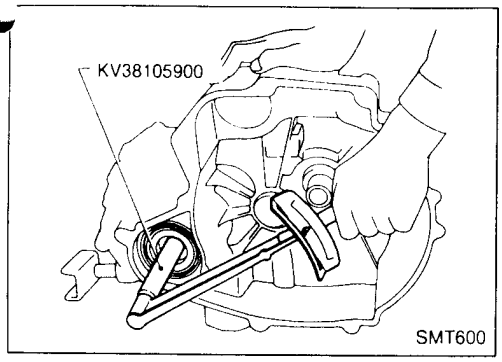


5. Set dial indicator on front end of differential case.
6. Insert Tool all the way into differential side gear.
7. Move Tool up and down and measure dial indicator deflection.
8. Select shim with SDS table as a guide.
9. Install selected shim and differential side bearing outer race.
10. Check differential side bearing turning torque.

a. Install final drive assembly on clutch housing.
b. Install transmission case on clutch housing.

- **Tighten transmission case fixing bolts to the specified torque. Page MT-8**

Differential Side Bearing Preload



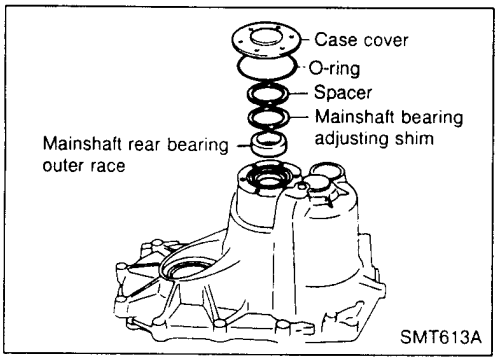
c. Measure turning torque of final drive assembly.
Turning torque of final drive assembly (New bearing):
2.0 - 7.8 N·m (20 - 80 kg-cm; 17 - 69 in-lb)

- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque is close to the specified range.**
- **Changes in turning torque of final drive assembly per revolution should be within 1.0 N·m (10 kg-cm, 8.7 in-lb) without binding.**

Mainshaft Bearing Preload

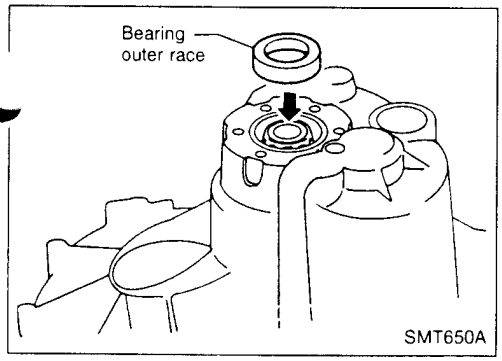
If any of the following parts are replaced, adjust mainshaft bearing preload.

- **Mainshaft**
- **Mainshaft bearings**
- **Clutch housing**
- **Transmission case**

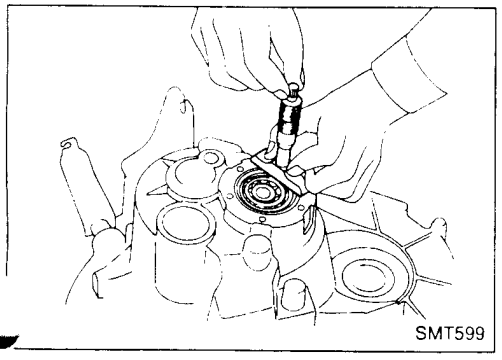


1. Remove case cover, O-ring, spacer, mainshaft bearing adjusting shim and mainshaft rear bearing outer race from transmission case.
2. Install mainshaft assembly on clutch housing.
3. Install transmission case on clutch housing.

- **Tighten transmission case fixing bolts to the specified torque. Page MT-10**



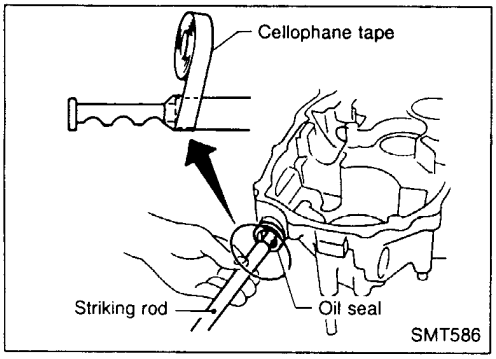
4. Reinstall mainshaft rear bearing outer race on inner race.



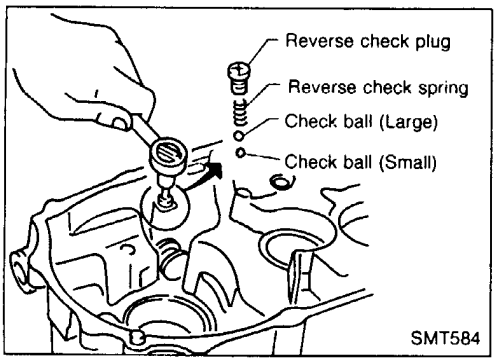
5. Measure distance from transmission case to bearing outer race.

- **Make sure that bearing is seated correctly.**

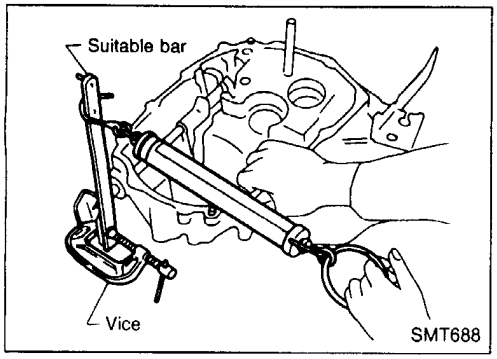
6. Select shim with SDS table as a guide.
7. Check total turning torque after assembling — Refer to "ASSEMBLY".



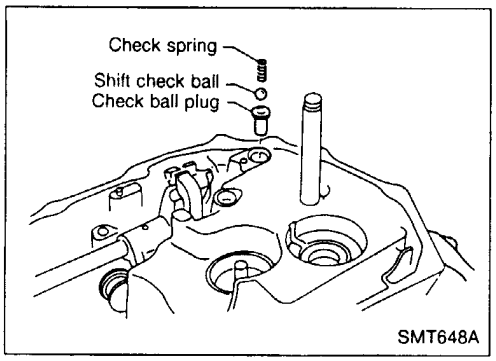
1. Install striking rod, lever and interlock.
- **When inserting striking rod into clutch housing, tape edges of striking rod to avoid damaging oil seal lip.**



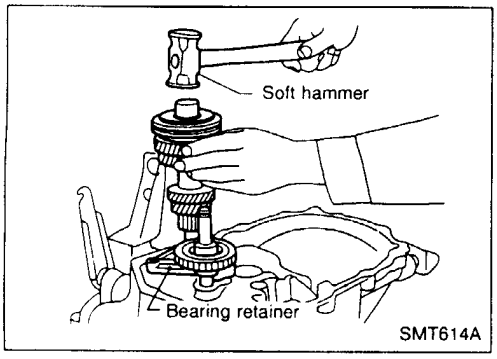
2. Install reverse check sleeve assembly.
3. Install check balls, reverse check spring and reverse check plug.



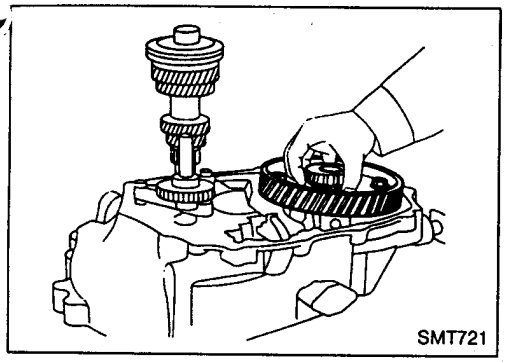
4. Check reverse check force.
   Reverse check force:
   4.9 - 7.4 N·m (50 - 75 kg-cm; 43 - 65 in-lb)
- If not within specification, select another check plug having a different length and reinstall it.
  Reverse check plug:
  Refer to SDS, MT-65
5. Install selected reverse check plug.
- **Apply locking sealant to thread of plug before installing it.**



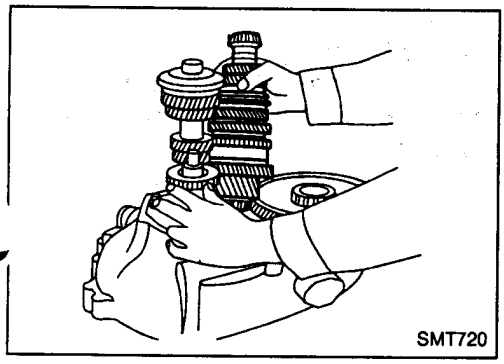
6. Install check ball plug, shift check ball and check spring.
7. Install oil pocket.



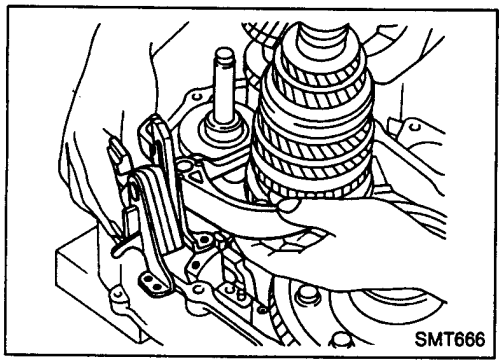
8. Install gear components onto clutch housing.
a. Install input shaft assembly and reverse idler gear.
- **Take care not to damage oil seal lip with splines of input shaft while shaft is being inserted into clutch housing.**



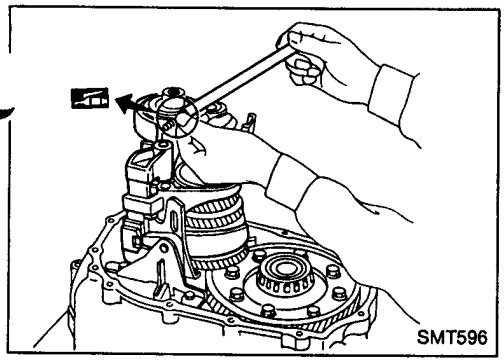
b. Install final drive assembly.



c. Install mainshaft assembly.
- **Take care not to damage oil channel when inserting mainshaft into clutch housing.**

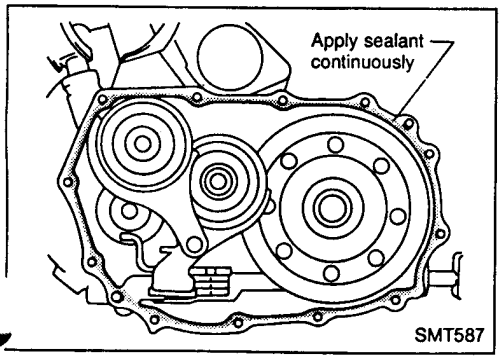


9. Apply grease to shifter caps, then install it to control bracket. Install control bracket with 1st & 2nd shift fork.
10. Install 3rd & 4th and 5th shift forks.

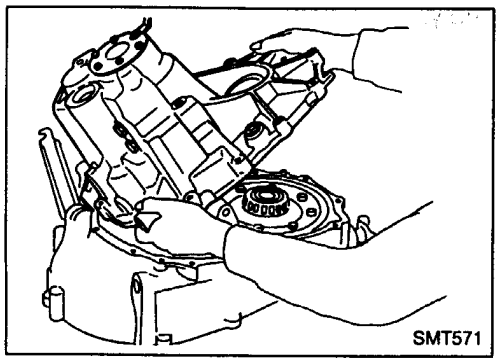


11. Insert fork shaft.
- **Apply multi-purpose grease to support spring before installing.**

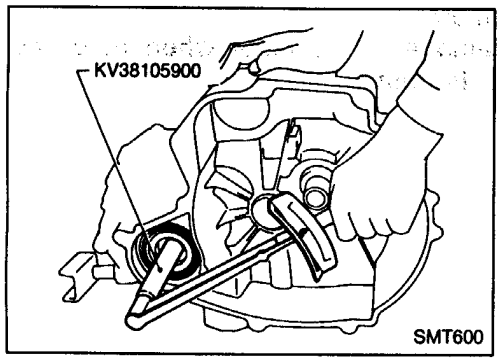
12. Install reverse idler spacer.



13. Apply recommended sealant to mating surface of clutch housing.


SMT571

14. Install transmission case on clutch housing.
15. Fit and tighten bolts to correct torque.
- **Tighten transmission case fixing bolts to the specified torque. Page MT-8**

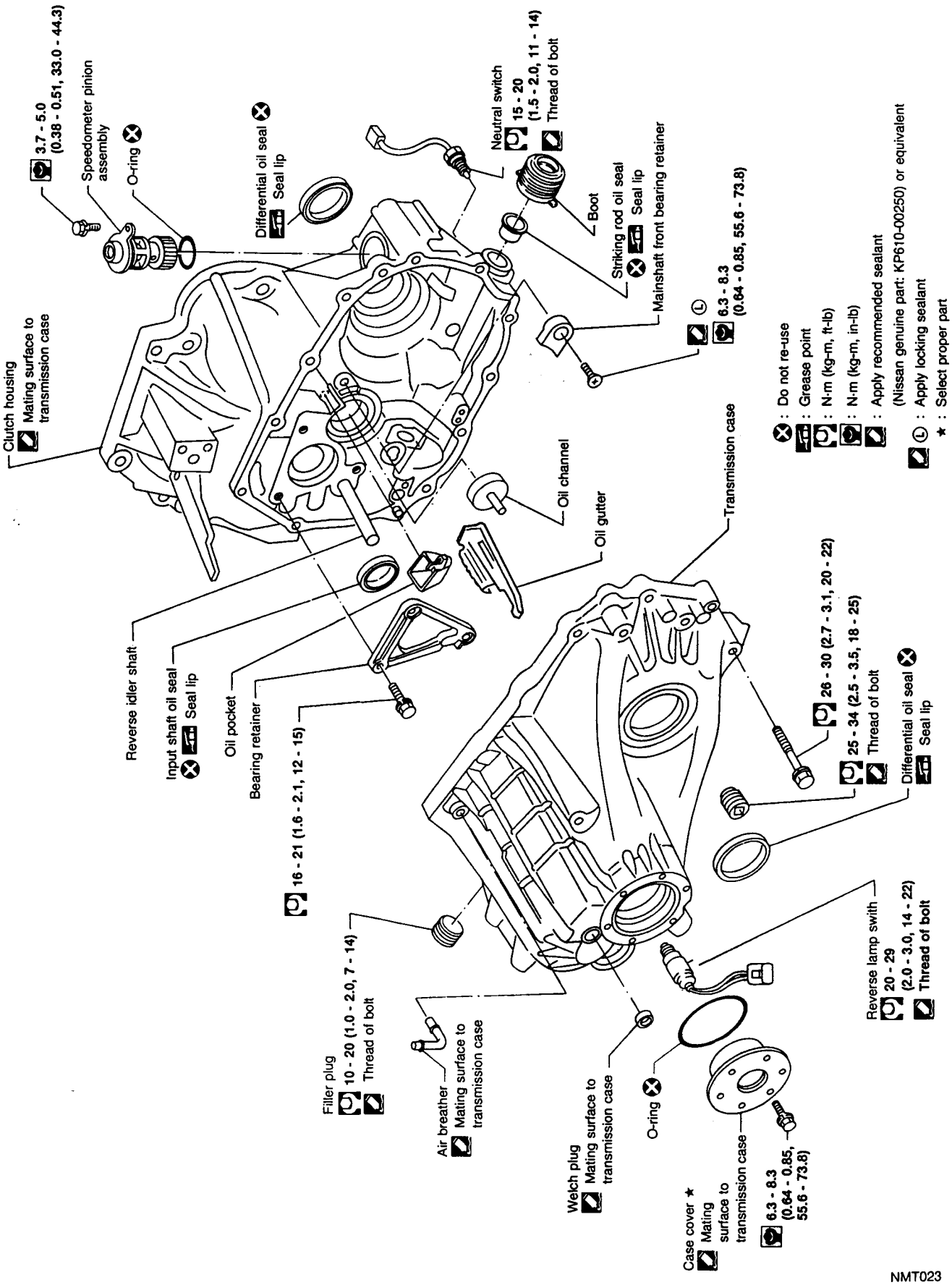


SMT600

16. Measure total turning torque.
Total turning torque (New bearing):
3.9 - 13.7 N·m (40 - 140 kg-cm, 35 - 122 in-lb)
- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque is close to the specified range.**

Case Components

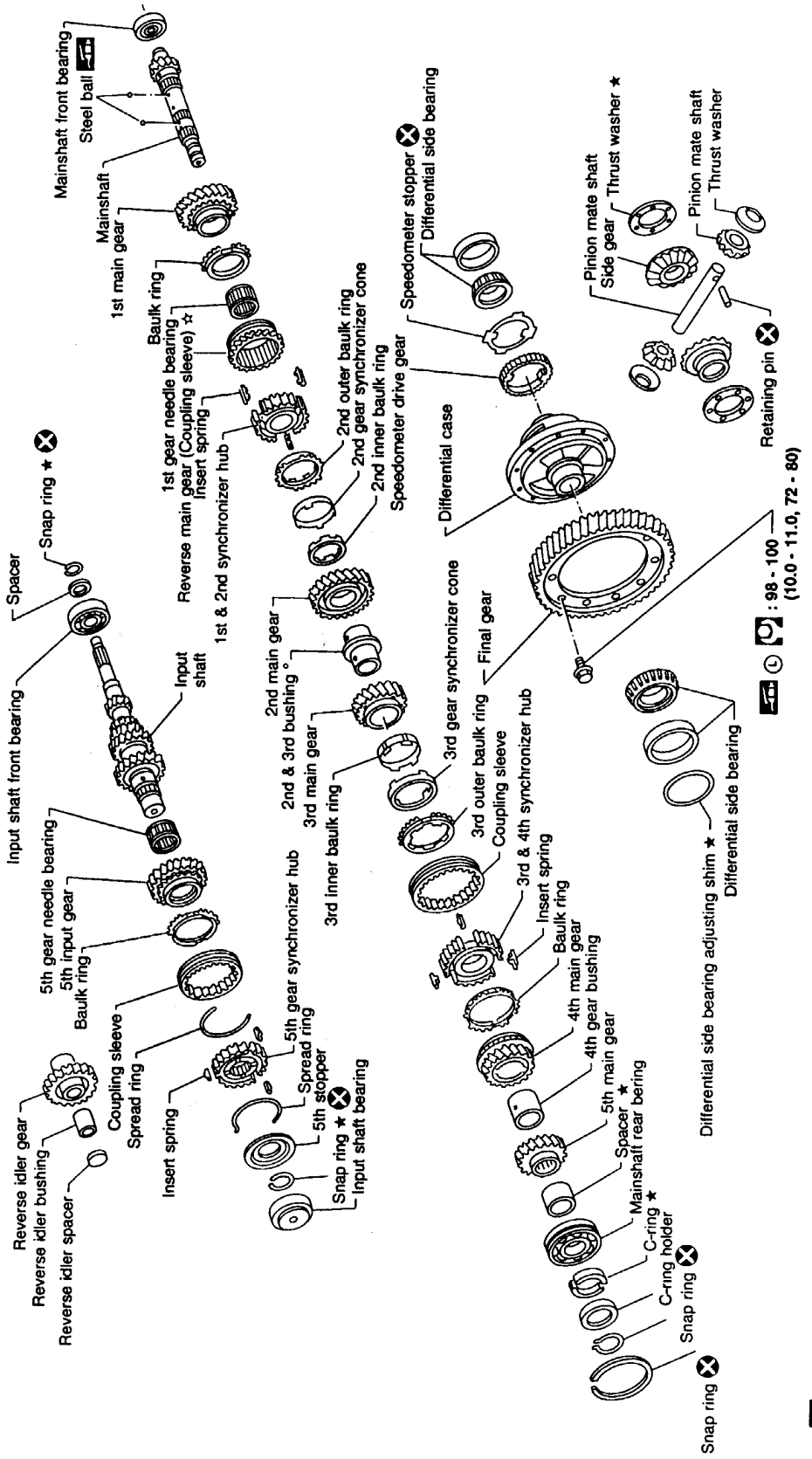
SEC. 321



NMT023

Gear Components

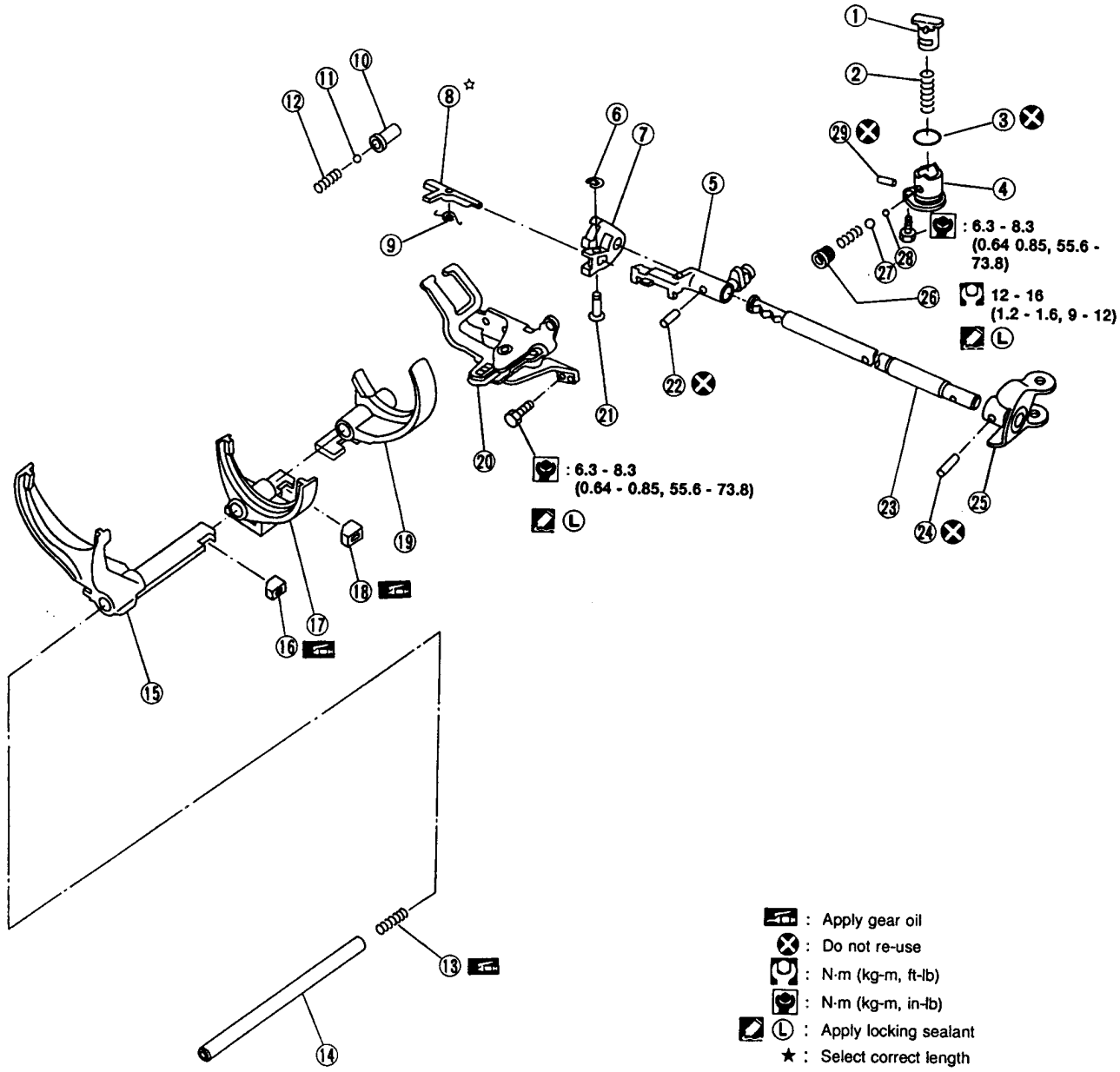
SEC. 322



NMT024

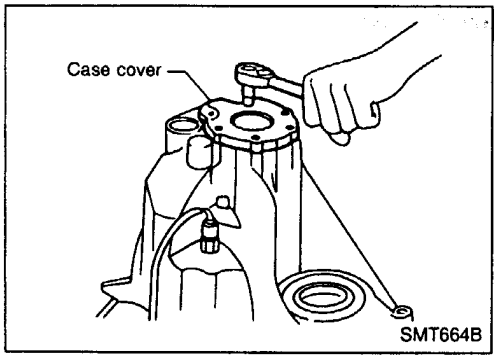
Shift Control Components

SEC. 328

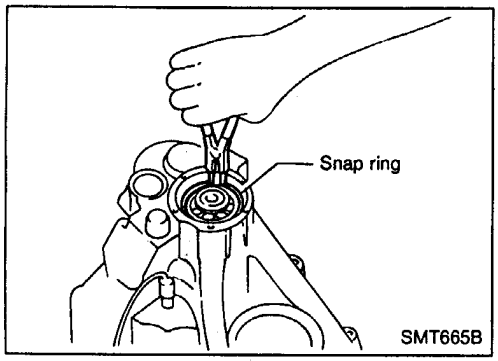


NMT025

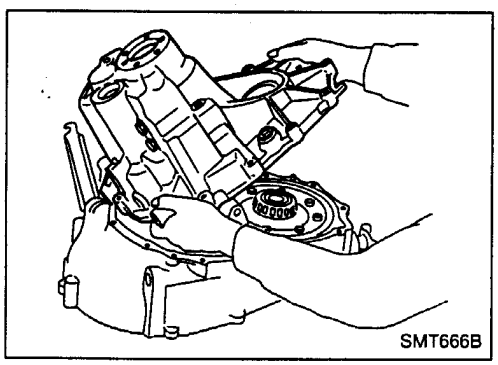
① Check plunger
② Select return spring
③ O-ring
④ Check sleeve
⑤ Striking lever
⑥ Snap ring
⑦ Striking interlock
⑧ Reverse brake cam
⑨ Reverse brake cam spring
⑩ Check ball plug
⑪ Shift check ball
⑫ Check spring
⑬ Fork shaft support spring
⑭ Fork shaft
⑮ 5th shift fork
⑯ Shifter cap
⑰ 3rd & 4th shift fork
⑱ Shifter cap
⑲ 1st & 2nd shift fork
⑳ Control bracket
㉑ Control bracket pin
㉒ Retaining pin
㉓ Striking rod
㉔ Retaining pin
㉕ Yoke
㉖ Reverse check plug
㉗ Check ball (Large)
㉘ Check ball (Small)
㉙ Stopper pin



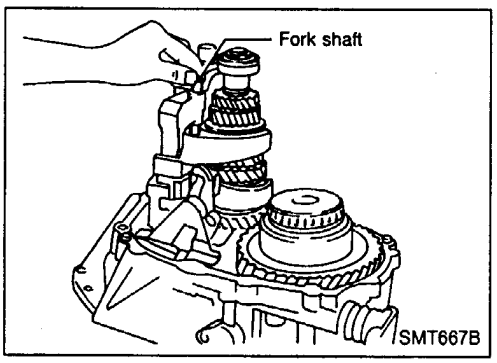
1. Remove case cover.



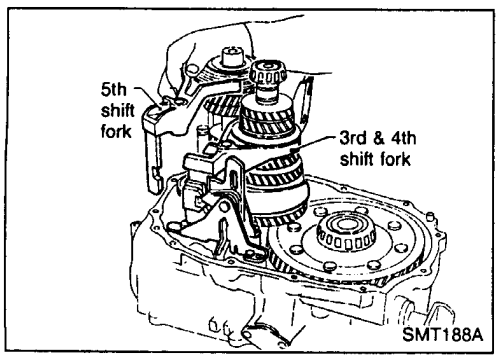
2. Remove mainshaft bearing snap ring.



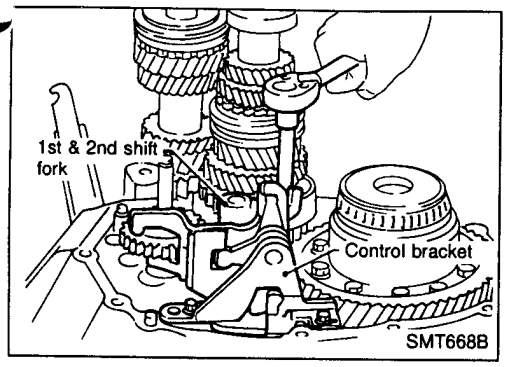
3. Remove transmission case while slightly tilting it to prevent 5th shift fork from interfering with case.



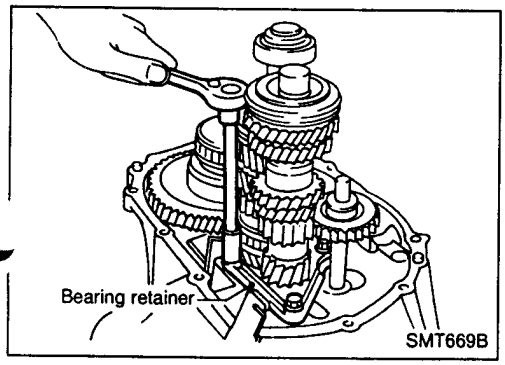
4. Draw out reverse idler spacer and fork shaft.



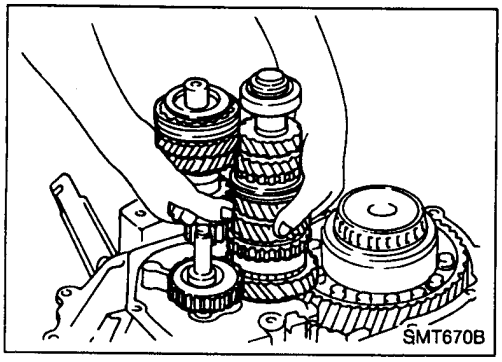
5. Remove 5th and 3rd & 4th shift forks.
- **Be careful not to lose shifter cap.**



6. Remove control bracket with 1st & 2nd shift fork.



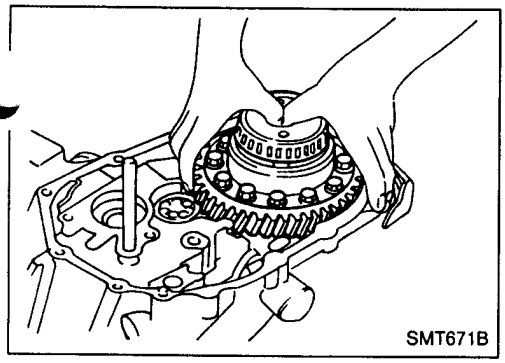
7. Remove gear components from clutch housing.
a. Remove input shaft front bearing retainer securing bolts.



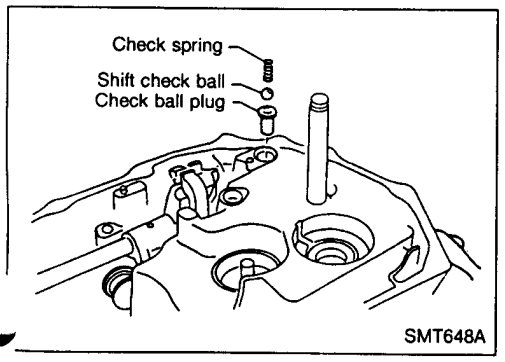
b. Remove input shaft with bearing retainer, mainshaft assembly and reverse idler gear.

- **Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.**
- **Do not draw out reverse idler shaft from clutch housing because these fittings will be loose.**

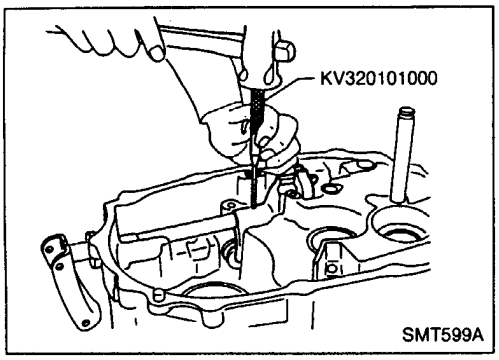
When removing input shaft, be careful not to scratch oil seal lip with shaft spline.



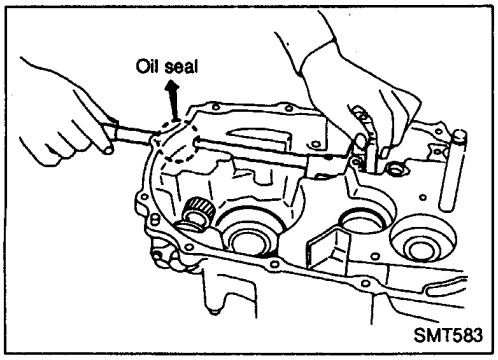
c. Remove final drive assembly.



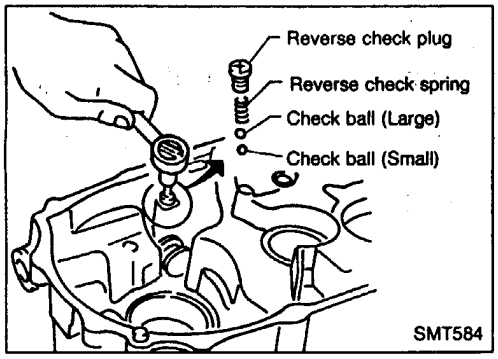
8. Remove oil pocket, shift check ball, check spring and check ball plug.



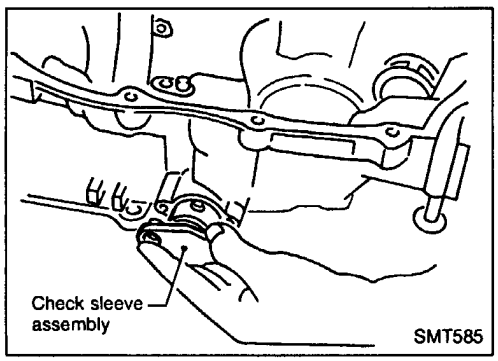
9. Drive retaining pin out of striking lever, then remove striking rod, striking lever and striking interlock.
- **Ensure striking lever is positioned so that retaining pin does not foul clutch housing during removal.**



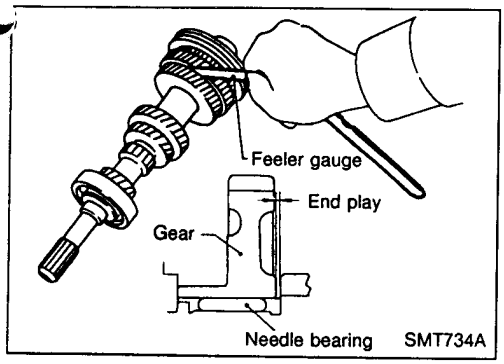
- **Be careful not to damage oil seal lip, when removing striking rod. If necessary, tape edges of striking rod.**



10. Remove reverse check plug, then detach reverse check spring and check balls.



11. Remove check sleeve assembly.



Input Shaft and Gears

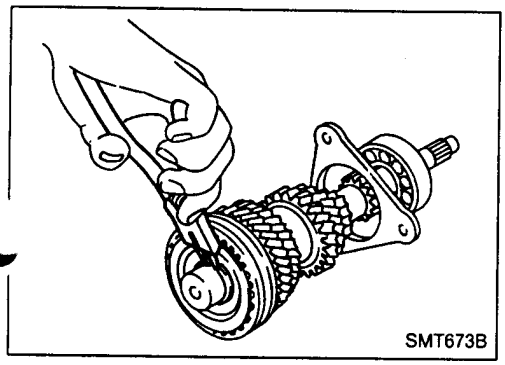
DISASSEMBLY

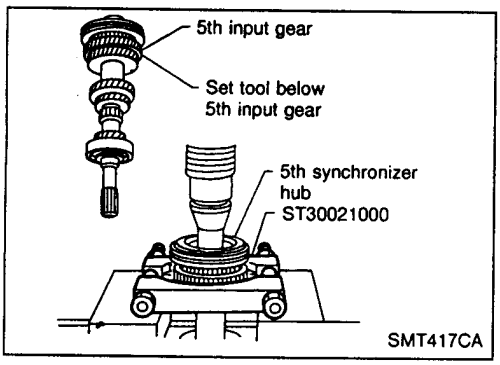
1. Before disassembly, check 5th input gear end play.

Gears	End play mm (in)
5th input gear	0.18 - 0.31 (0.0071 - 0.0122)

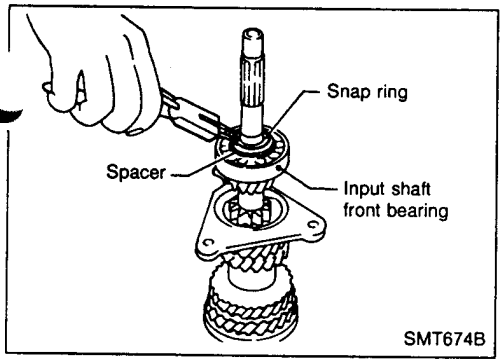
- If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring groove — Refer to "Assembly".

2. Remove snap ring and 5th stopper.

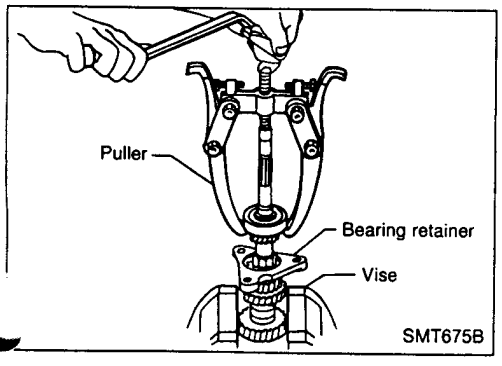




3. Remove 5th synchronizer, 5th input gear and 5th gear needle bearing.



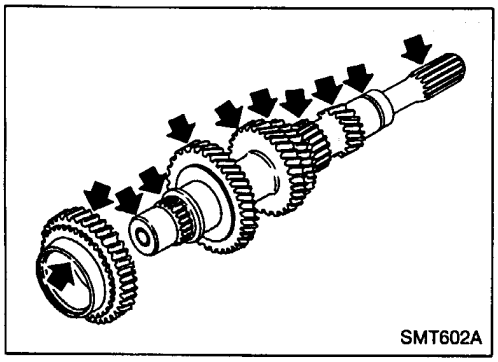
4. Remove snap ring of input shaft front bearing and input gear spacer.



5. Pull out input shaft front bearing.
6. Remove bearing retainer.

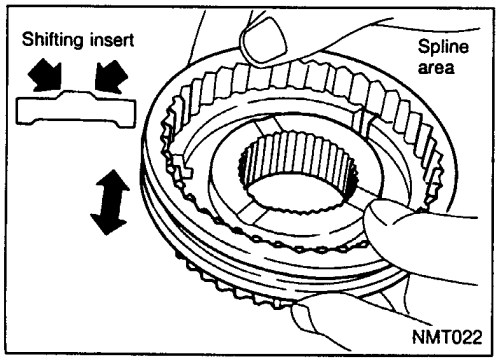
Input Shaft and Gears (Cont'd)

INSPECTION


SMT602A

Gear and shaft

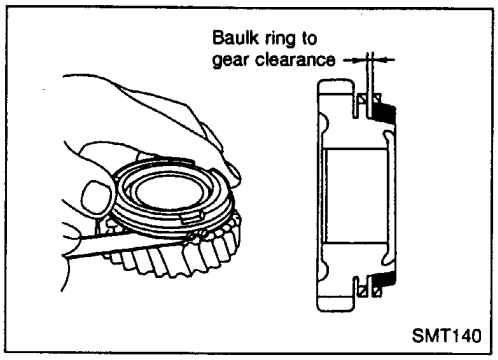
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



NMT022

Synchronizer

- Check spline area of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for wear or deformation.



SMT140

- Measure clearance between baulk ring and gear.

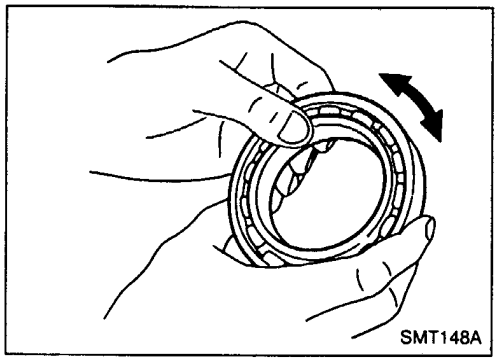
  Clearance between baulk ring and 5th input gear:

  Standard

  1.0 - 1.35 mm (0.0394 - 0.0531 in)

  Wear limit

  0.7 mm (0.028 in)


SMT148A

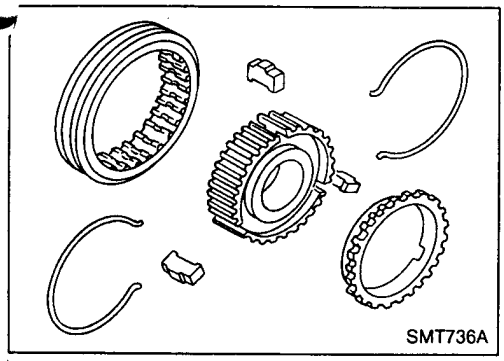
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

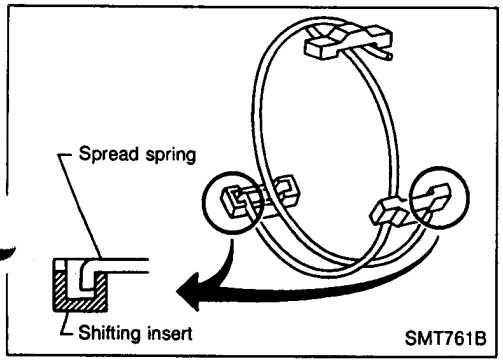
Input Shaft and Gears (Cont'd)

ASSEMBLY

1. Assemble 5th synchronizer.

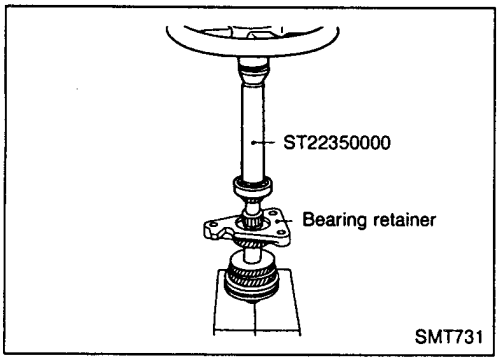

SMT736A

- **Be careful not to hook front and rear ends of spread spring to the same shifting insert.**



SMT761B

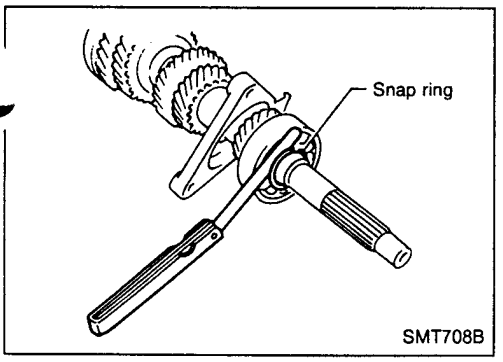
2. Install bearing retainer.
3. Press on input shaft front bearing.
4. Install input gear spacer.



SMT731

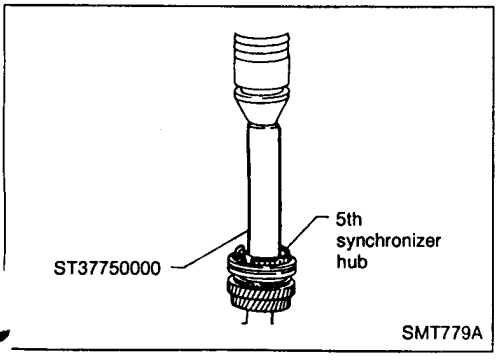
5. Select correct snap ring of input shaft front bearing to minimize clearance of groove in input shaft and then install it.
   Allowable clearance of groove:
   0 - 0.1 mm (0 - 0.004 in)

Snap rings of input shaft front bearing:
Refer to SDS, MT-67.



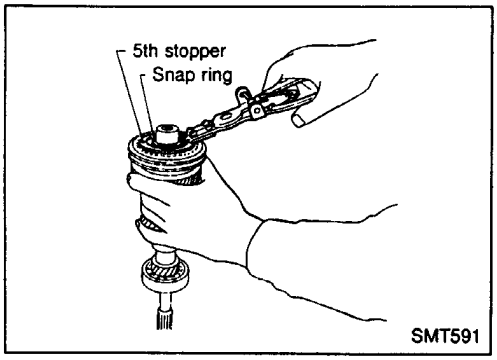
SMT708B

6. Install 5th gear needle bearing, 5th input gear, 5th synchronizer and 5th stopper.
7. Measure gear end play as a final check — Refer to "Disassembly".



SMT779A

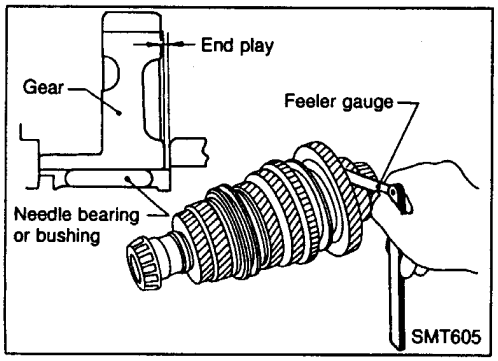
Input Shaft and Gears (Cont'd)



8. Select correct snap ring of 5th synchronizer hub to minimize clearance of groove in input shaft and install it.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

Snap rings of 5th synchronizer:
Refer to SDS, MT-67.



Mainshaft and Gears

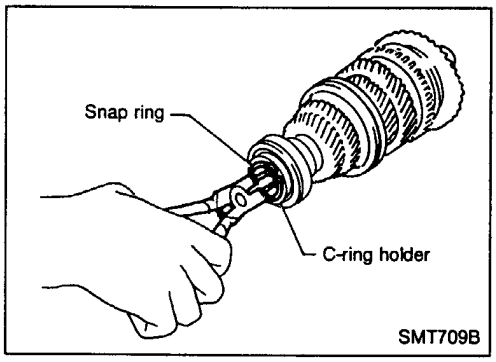
DISASSEMBLY

1. Before disassembly, measure gear end play.

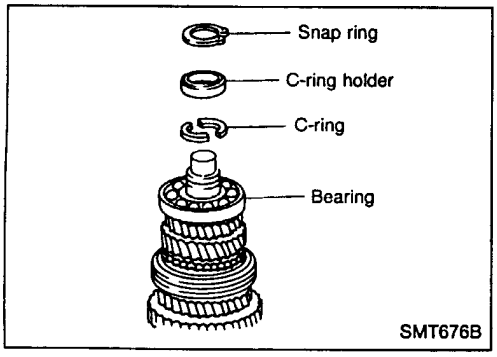
Gear end play:

Gears	End play mm (in)
1st main gear	0.18 - 0.31 (0.0071 - 0.0122)
2nd-4th main gear	0.20 - 0.30 (0.0079 - 0.0118)

- If end play is not within the specified limit, disassemble and check the parts.

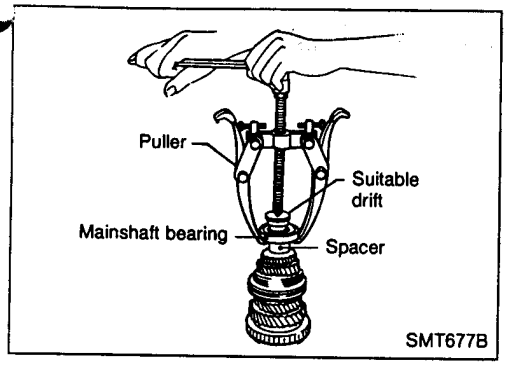


2. Remove mainshaft rear bearing snap ring, C-ring holder and C-rings.

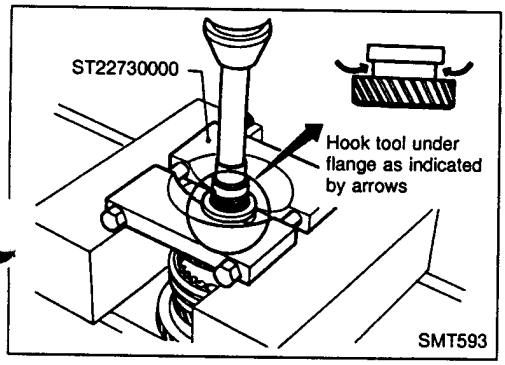


Mainshaft and Gears (Cont'd)

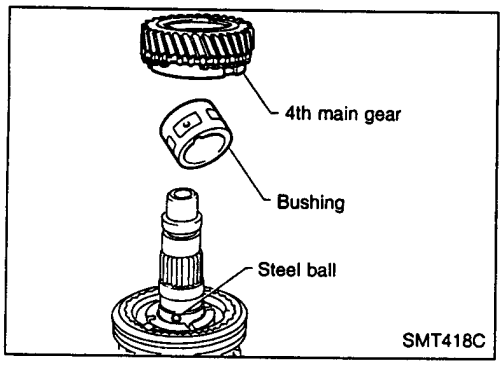
3. Remove mainshaft bearing and spacer.



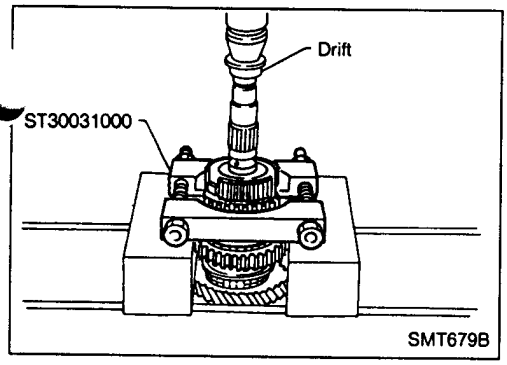
4. Remove 5th main gear.



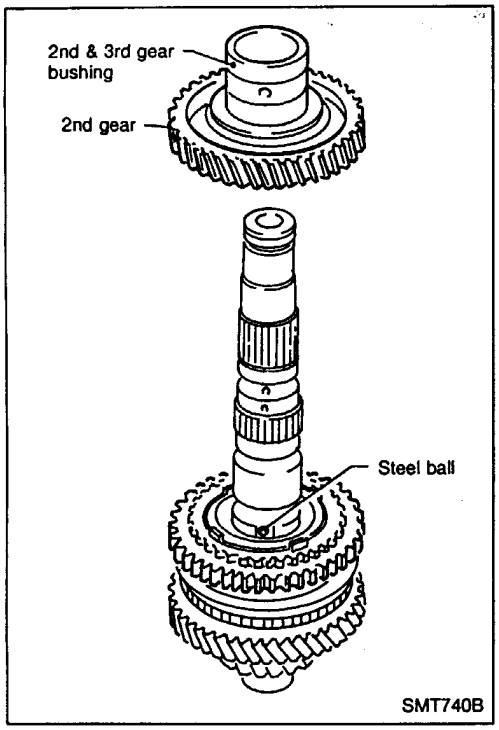
5. Remove 4th main gear, 4th gear bushing and steel ball.
- **Take care not to lose steel ball.**



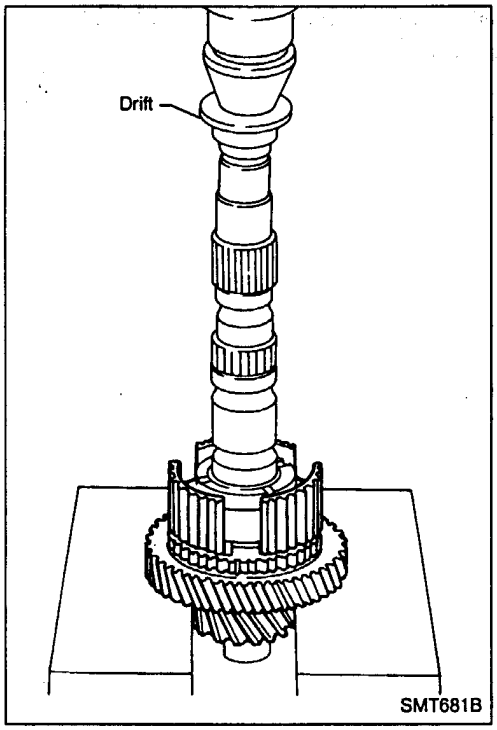
6. Remove 3rd & 4th synchronizer and 3rd main gear.



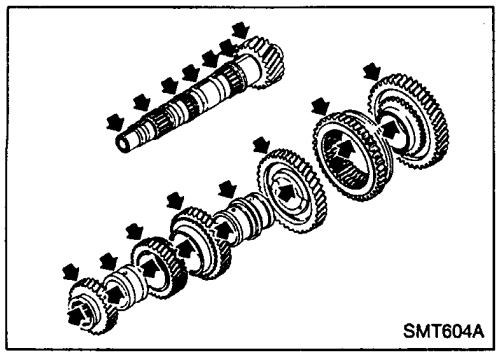
Mainshaft and Gears (Cont'd)



7. Remove 2nd & 3rd bushing and 2nd gear.
- **Take care not to lose the steel ball.**



8. Remove 1st & 2nd synchronizer hub and 1st main gear.



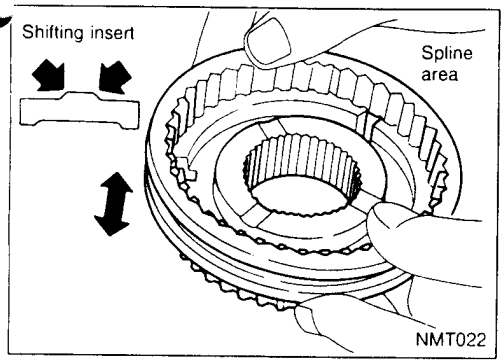
INSPECTION

Gear and shaft

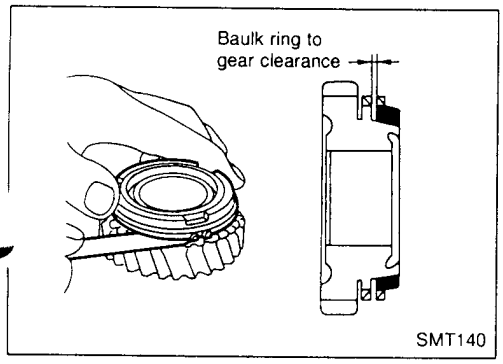
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

Mainshaft and Gears (Cont'd)

Synchronizer

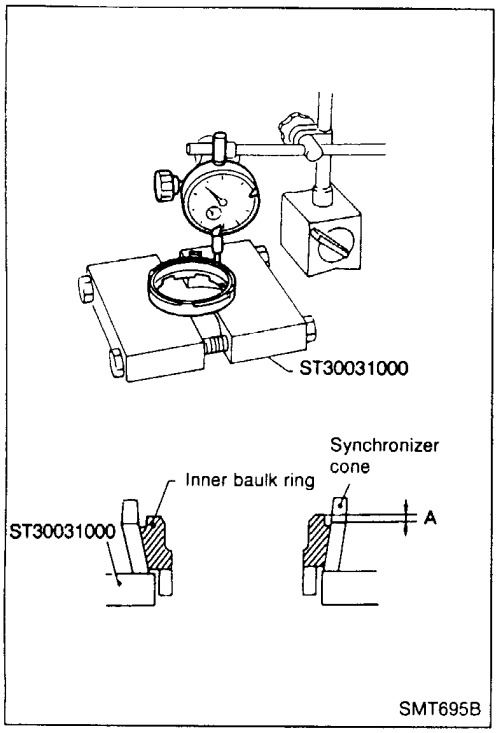


- Check spline area of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for deformation.



- Measure clearance between baulk ring and gear.
  Clearance between baulk rings and gears, for 1st and 4th gears only:
  Standard
  1.0 - 1.35 mm (0.0394 - 0.0531 in)
  Wear limit
  0.7 mm (0.028 in)
- **2nd and 3rd gears have inner and outer baulk rings and so have different measurements.**

Mainshaft and Gears (Cont'd)



- Measure wear of 2nd and 3rd baulk ring.

a. Place baulk rings in position on synchronizer cone.
b. While holding baulk ring against synchronizer cone as far as it will go, measure dimensions "A" and "B".

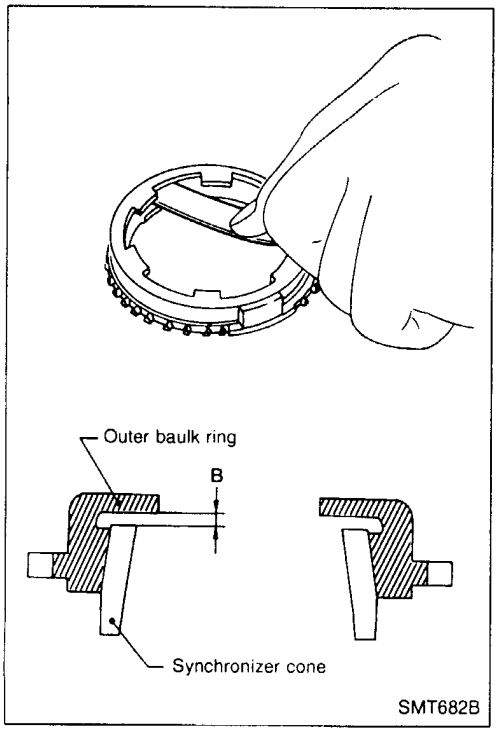
Standard:

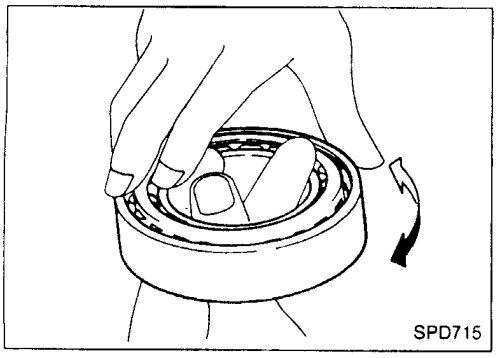
A 0.7 - 0.9 mm (0.028 - 0.035 in)
B 0.6 - 1.1 mm (0.024 - 0.043 in)

Wear limit:

0.2 mm (0.008 in)

c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.





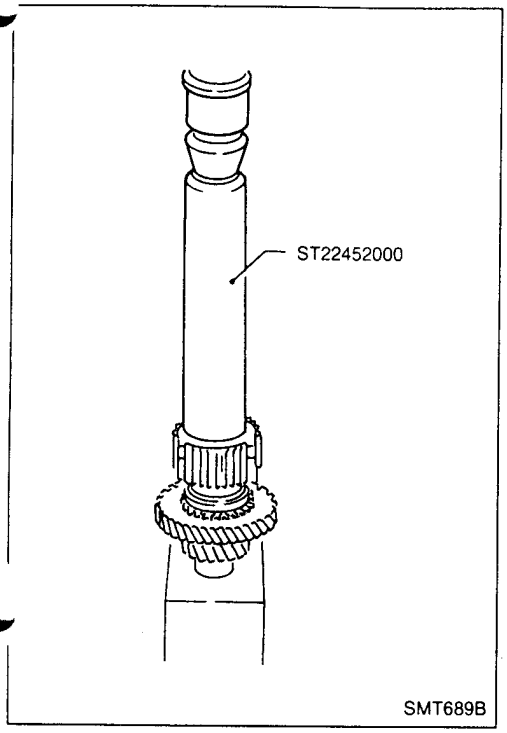
Bearing

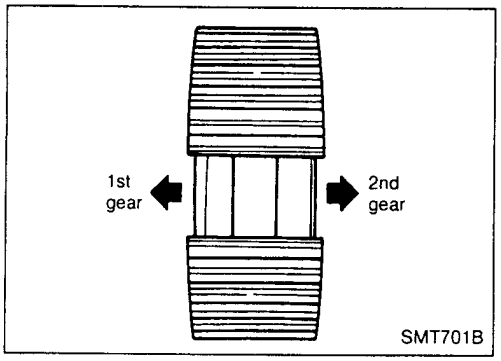
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **The mainshaft front bearing cannot be re-used. It must be replaced once removed.**

Mainshaft and Gears (Cont'd)

ASSEMBLY

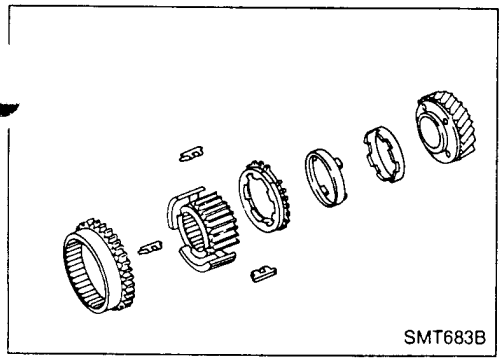
1. Install 1st gear needle bearing, 1st main gear and baulk ring.
2. Press on 1st & 2nd synchronizer hub.



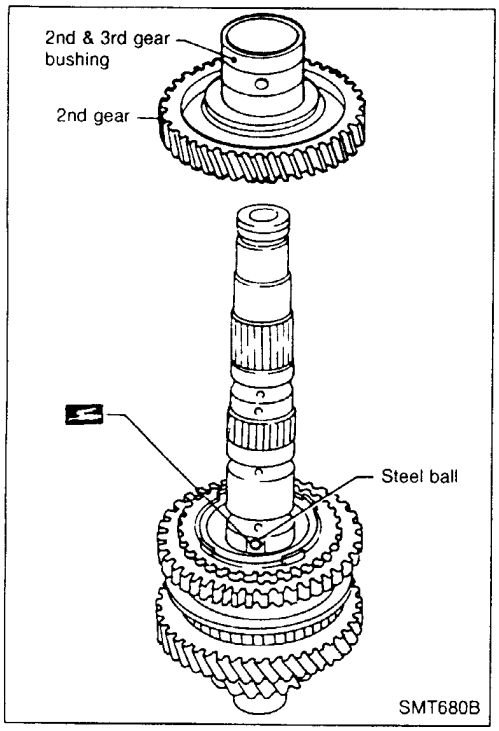


- **Ensure correct fitting of 1st & 2nd synchronizer hub.**

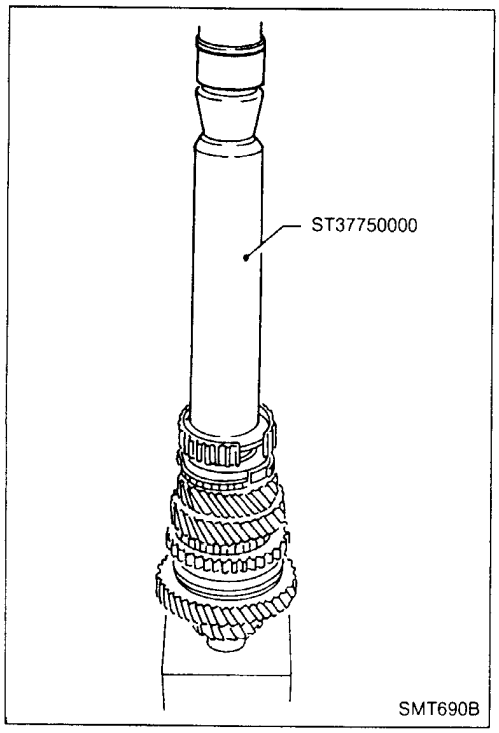
3. Install 2nd synchronizer cone, outer & inner baulk ring and 1st & 2nd coupling sleeve.



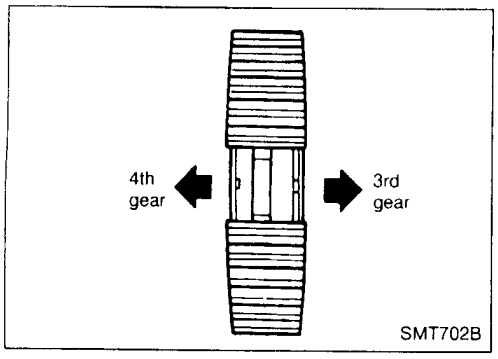
Mainshaft and Gears (Cont'd)



4. Install steel ball, 2nd main gear, 2nd & 3rd bushing.
- **Apply gear oil to 2nd & 3rd gear bushing.**
- **Apply multi-purpose grease to steel ball before installing it.**
- **2nd & 3rd bushing has a groove in which steel ball fits.**

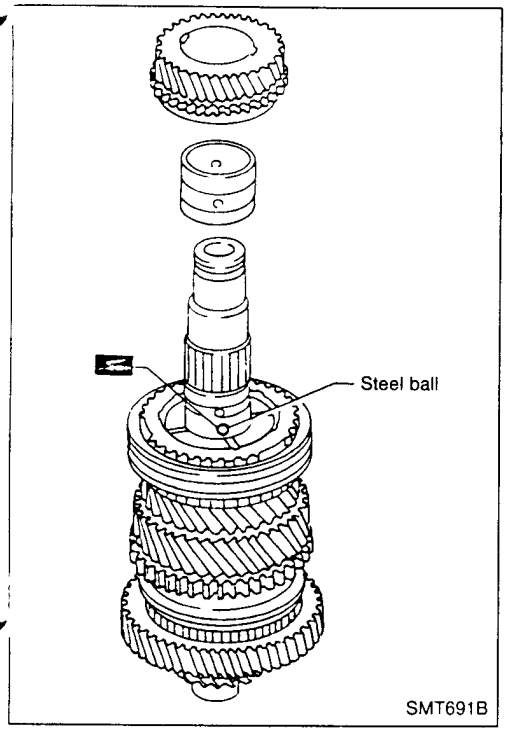


5. Install 3rd main gear, synchronizer cone, and outer & inner baulk ring.
6. Press on 3rd & 4th synchronizer hub.

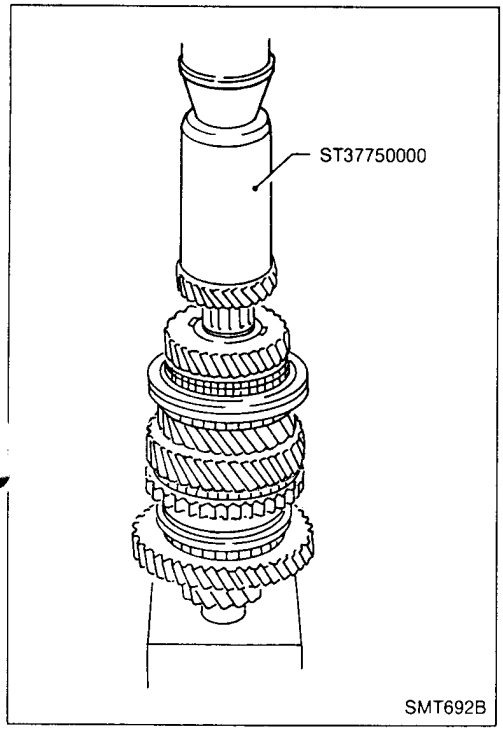


7. Install 3rd & 4th coupling sleeve and 4th baulk ring.
- **Ensure correct fitting of 3rd & 4th synchronizer hub.**

Mainshaft and Gears (Cont'd)

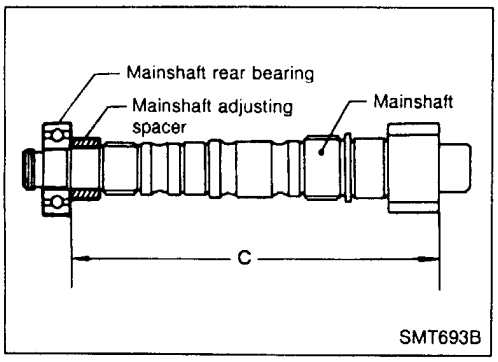


8. Install steel ball, 4th bushing and 4th main gear.
- **Apply multi-purpose grease to steel ball before installing it.**
- **4th bushing has a groove in which steel ball fits.**

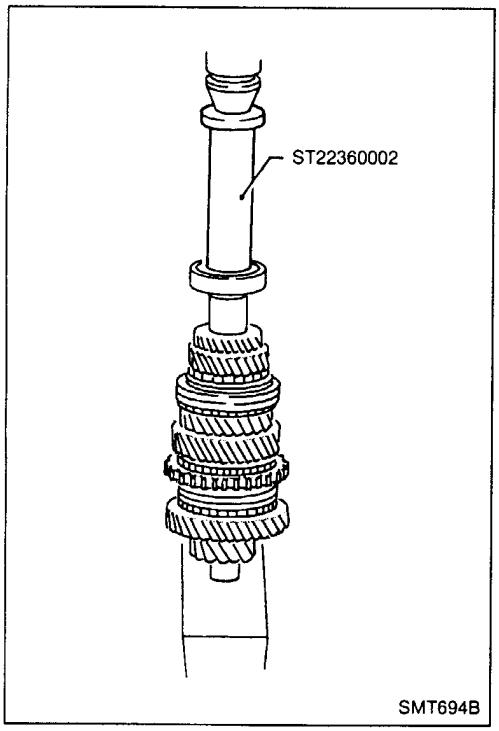


9. Press on 5th main gear.

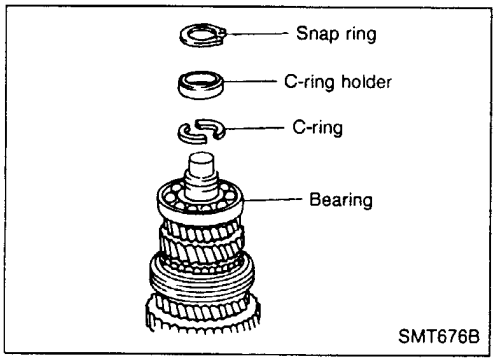
Mainshaft and Gears (Cont'd)



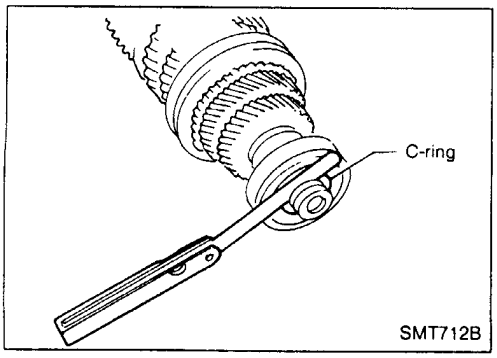
10. Install spacer and measure distance "C".
11. Select proper mainshaft bearing spacer to give correct bearing distance.
    Bearing distance "C":
    230.15 - 230.25 mm (9.0610 - 9.0649 in)
    Spacers available:
    Refer to SDS, MT-68.



12. Press on mainshaft rear bearing.



13. Select proper C-ring to minimize clearance of groove in mainshaft and install it.
    Allowable clearance of groove:
    0 - 0.1 mm (0 - 0.004 in)
    Mainshaft C-rings:
    Refer to SDS, MT-67.

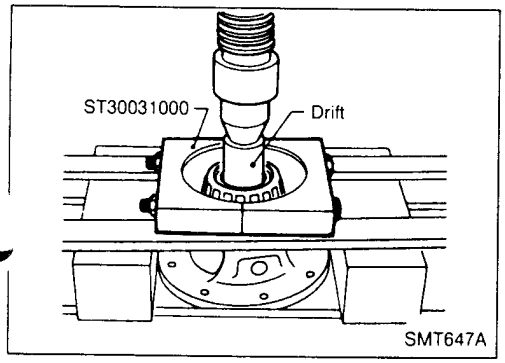


14. Install C-ring holder and snap ring.
15. Measure gear end play as a final check — Refer to "Disassembly".

Final Drive

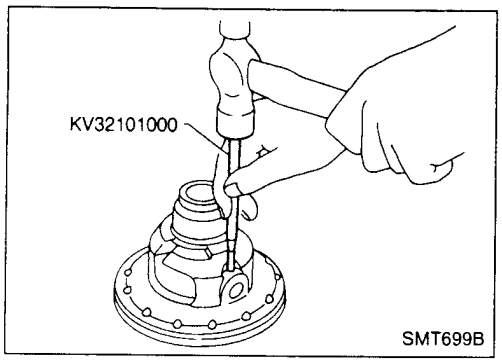
DISASSEMBLY

1. Remove final gear.



2. Remove speedometer drive gear by cutting it.
3. Press out differential side bearings.

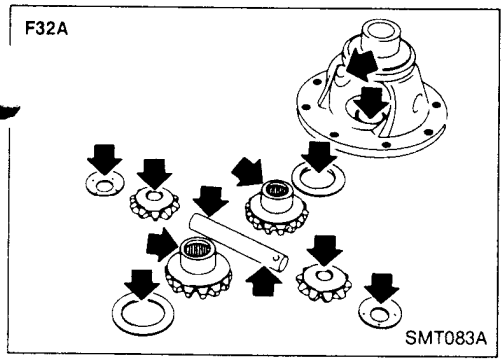
- **Be careful not to mix up the right and left bearings.**



4. Drive out retaining pin and draw out pinion mate shaft.
5. Remove pinion mate gears and side gears.

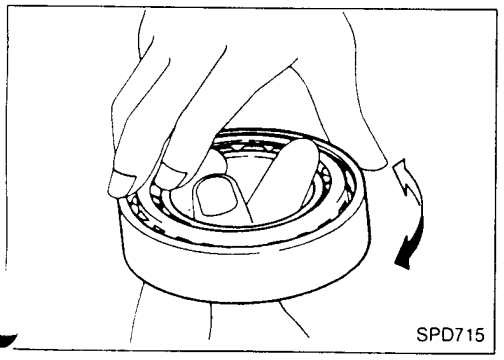
INSPECTION

Gear, washer, shaft and case



- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.

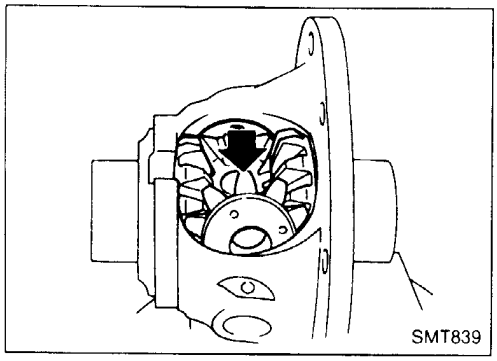
Bearing



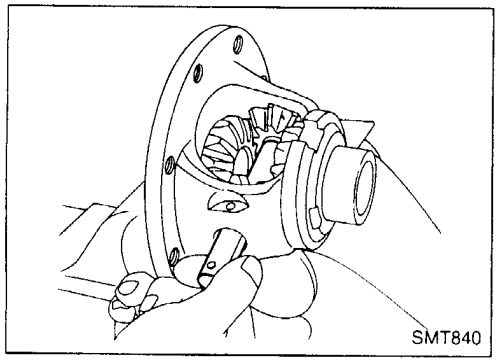
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing tapered roller bearing, replace outer and inner race as a set.**

Final Drive (Cont'd)

ASSEMBLY

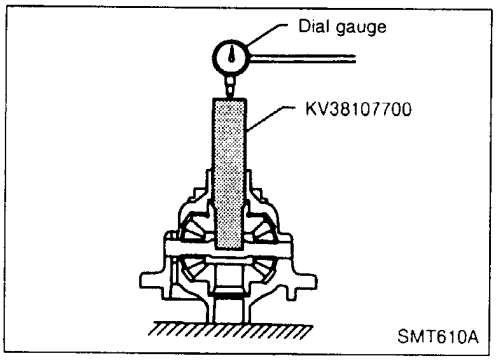


1. Attach side gear thrust washers to side gears, then install pinion mate washers and pinion mate gears in place.



2. Insert pinion mate shaft.

- **When inserting, be careful not to damage pinion mate thrust washers.**



3. Measure clearance between side gear and differential case with washers using the following procedure:

a. Set Tool and dial indicator on side gear.

b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

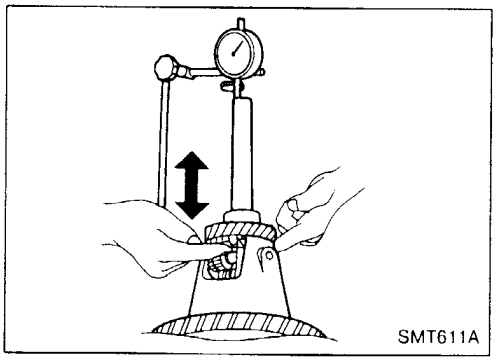
Clearance between side gear and differential case with washers:

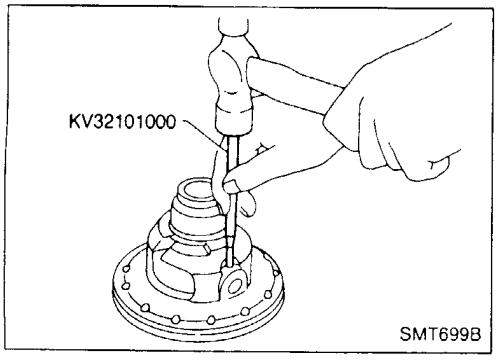
0.1 - 0.2 mm (0.004 - 0.008 in)

c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washers:

Refer to SDS, MT-68.

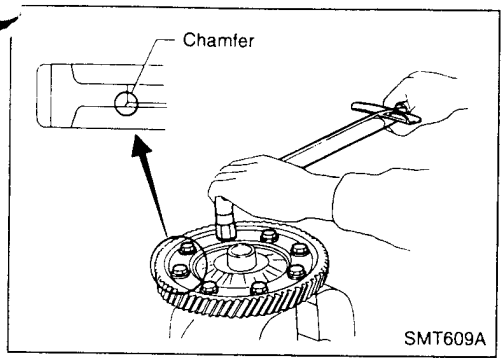




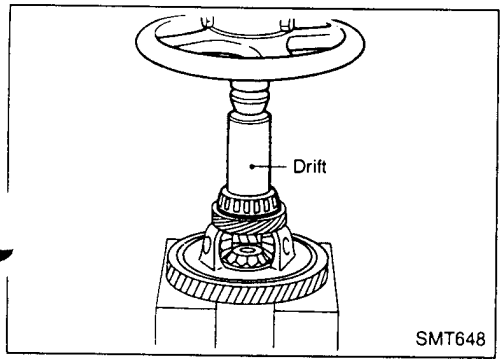
4. Install retaining pin.

- **Make sure that retaining pin is flush with case.**

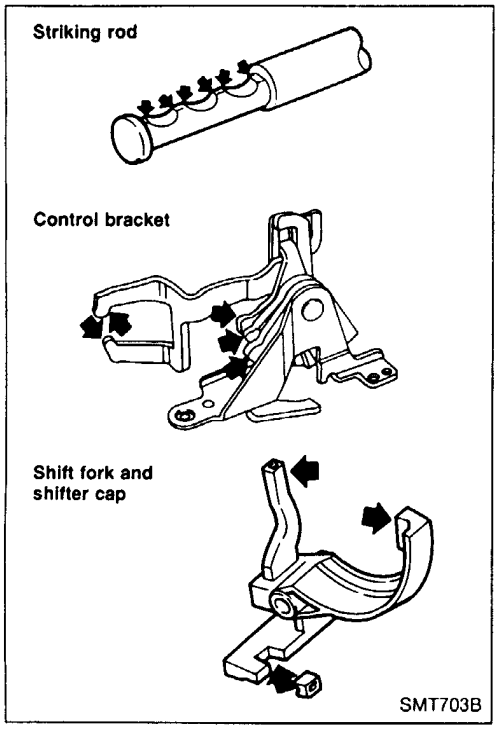
Final Drive (Cont'd)

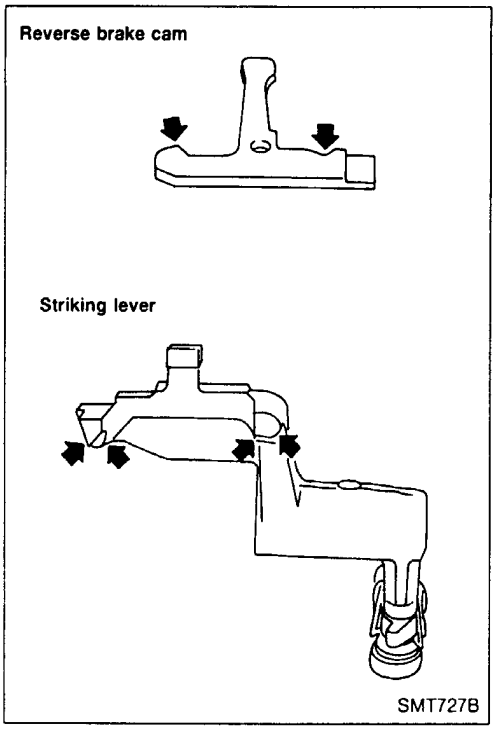


5. Install final gear.
- **Apply locking sealant to final gear fixing bolts before installing them.**
6. Install speedometer drive gear.



7. Press on differential side bearings.





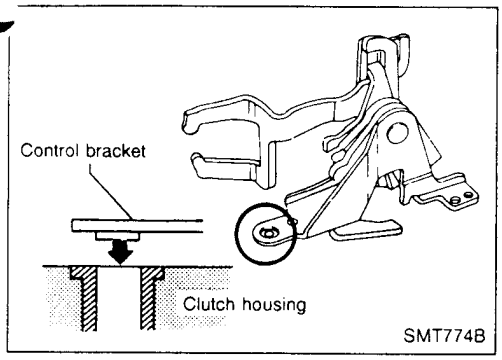
Shift Control Components

INSPECTION

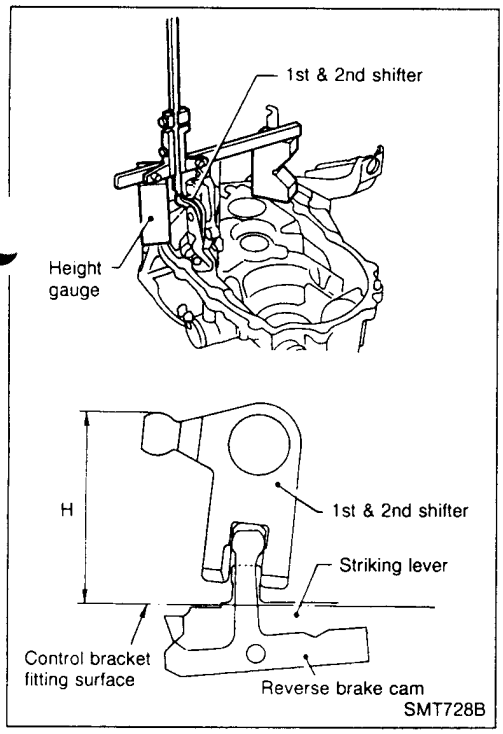
- Check contact surface and sliding surface for wear, scratches, projections or other damage.

Shift Control Components (Cont'd)

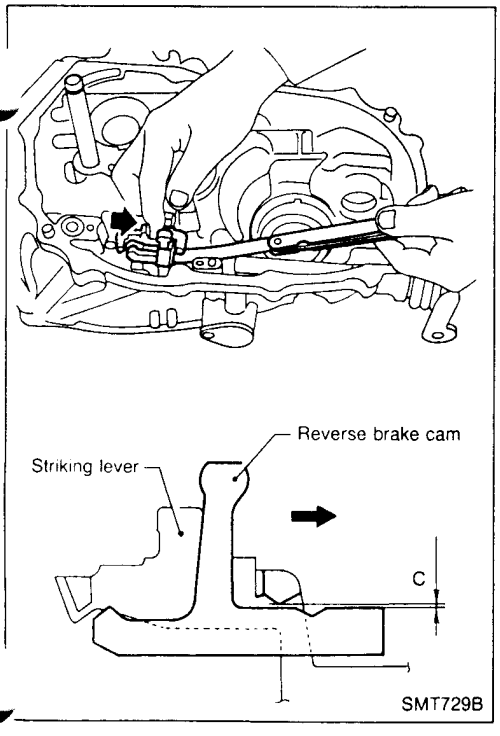
ADJUSTMENT OF INPUT SHAFT BRAKING MECHANISM



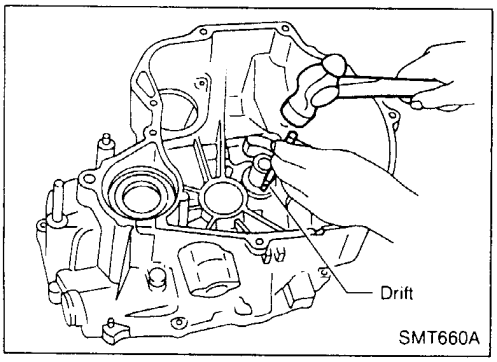
1. Install striking lever & rod, striking interlock assembly and control bracket on clutch housing exactly.



2. Measure maximum height "H" while shifting from neutral to reverse position.
   Maximum height "H":
   67.16 - 67.64 mm (2.6441 - 2.6630 in)



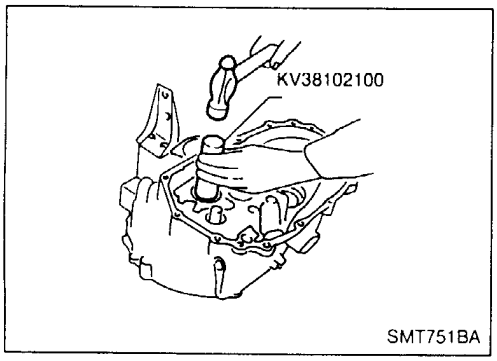
3. Remove control bracket from clutch housing.
4. Measure clearance "C" between reverse brake cam and striking lever at reverse position.
   Clearance "C":
   0.05 - 0.125 mm (0.0020 - 0.0044 in)
5. If height "H" and clearance "C" are not within specifications, replace control bracket, striking lever and striking interlock assembly as a set.



Case Components

REMOVAL AND INSTALLATION

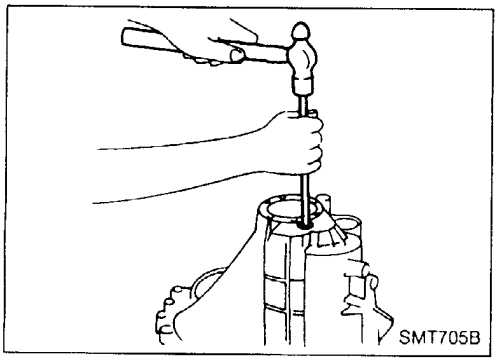
Input shaft oil seal



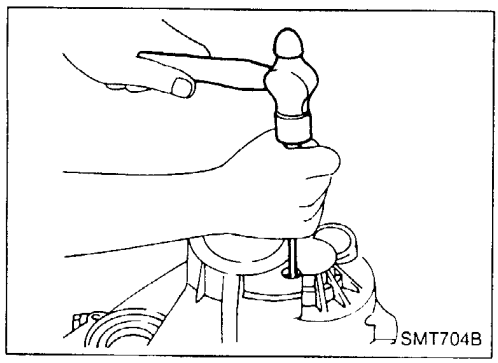
- **Apply multi-purpose grease to seal lip of oil seal before installing.**

Input shaft rear bearing

1. Remove welch plug from transmission case.

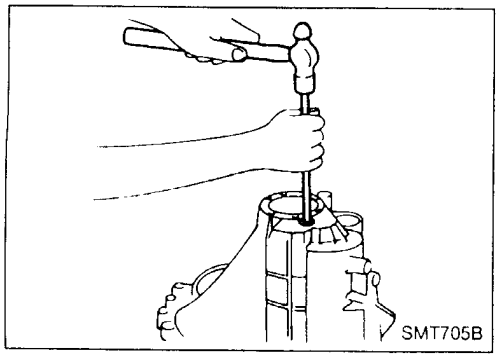


2. Remove input shaft rear bearing by tapping it from welch plug hole.

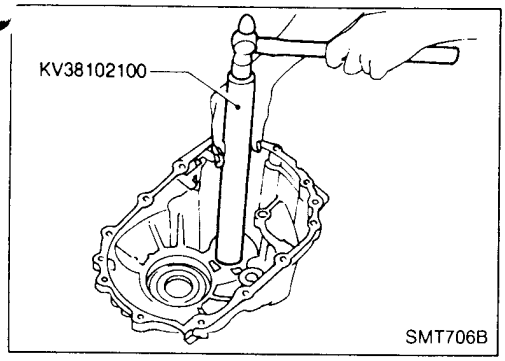


3. Install welch plug.

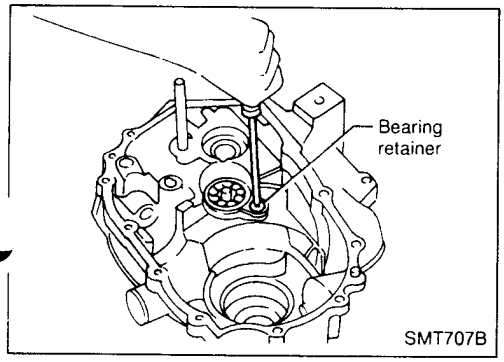
- **Apply recommended sealant to mating surface of transmission case.**



Case Components (Cont'd)

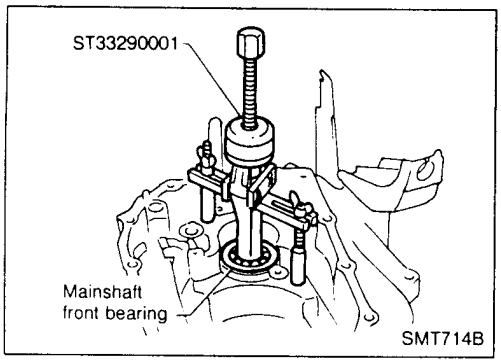


4. Install input shaft rear bearing.

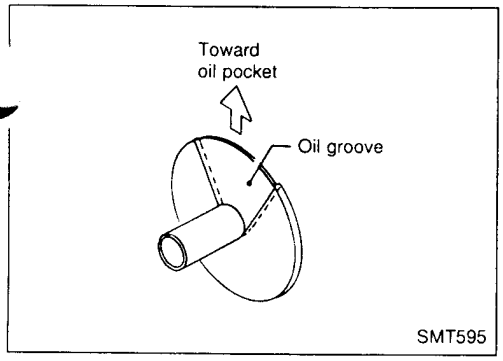


Mainshaft front bearing and oil channel

1. Remove mainshaft front bearing retainer.

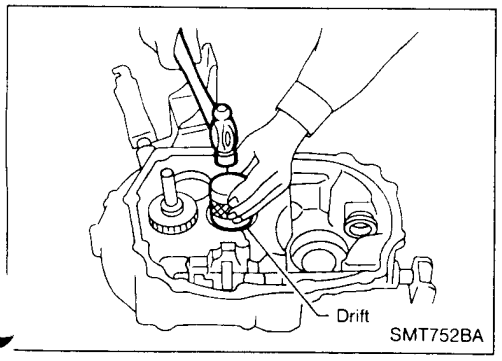


2. Remove mainshaft front bearing.
3. Remove oil channel.



4. Install oil channel.

- **Ensure that oil groove in oil channel always faces toward oil pocket when installing it on clutch housing.**



5. Install mainshaft front bearing.
6. Install mainshaft front bearing retainer.

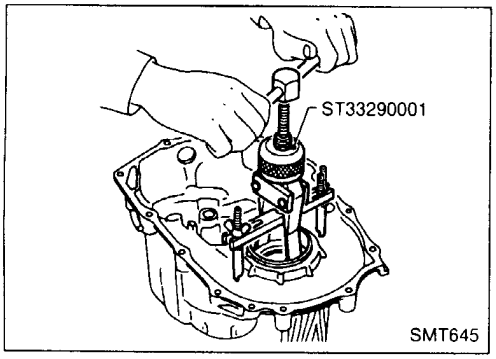
Differential side bearing outer race

- **Refer to "ADJUSTMENT".**

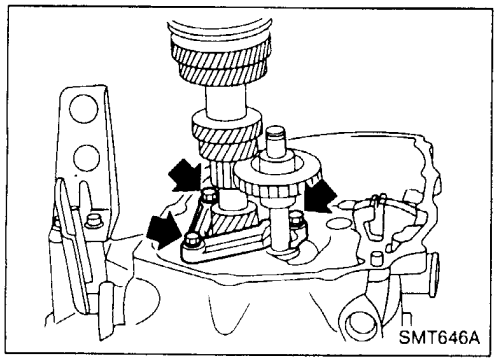
Differential Side Bearing Preload

If any of the following parts are replaced, adjust differential side bearing preload.

- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**

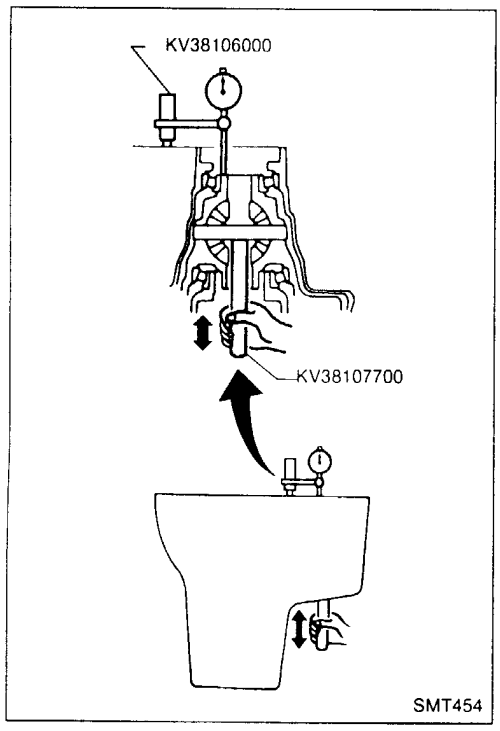


1. Remove differential side bearing outer race (transmission case side) and shim.



2. Reinstall differential side bearing outer race without shim.
3. Install final drive assembly on clutch housing.
4. Install transmission case on clutch housing.

- **Tighten transmission case fixing bolts to the specified torque.**



5. Set dial indicator on front end of differential case.
6. Insert Tool all the way into differential side gear.
7. Move Tool up and down and measure dial indicator deflection.
8. Select shim of proper thickness using SDS table as a guide.

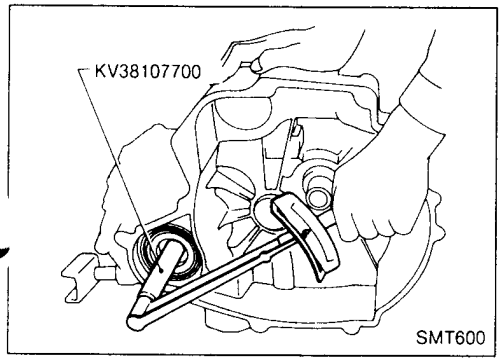
Differential side bearing adjusting shims:
Refer to SDS MT-68.

Differential Side Bearing Preload (Cont'd)

9. Install selected shim and differential side bearing outer race.
10. Check differential side bearing turning torque.

a. Install final drive assembly on clutch housing.
b. Install transmission case on clutch housing.

- **Tighten transmission case fixing bolts to the specified torque. Page MT-8**

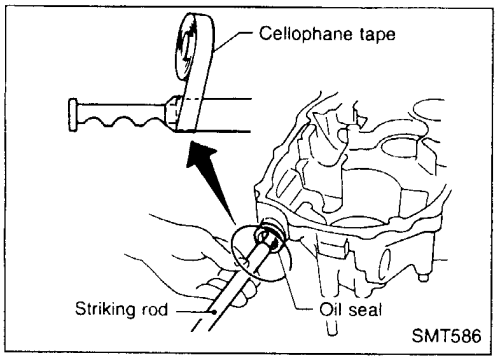


c. Measure turning torque of final drive assembly.

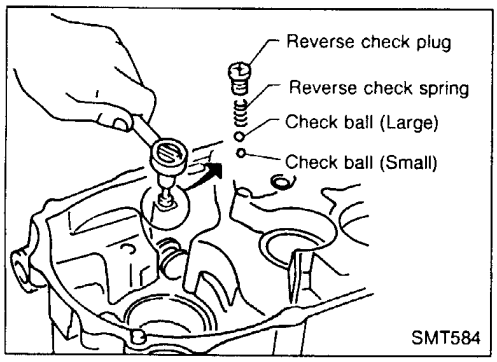
Turning torque of final drive assembly (New bearing):

2.9 - 6.9 N·m (30 - 70 kg-cm, 26 - 61 in-lb)

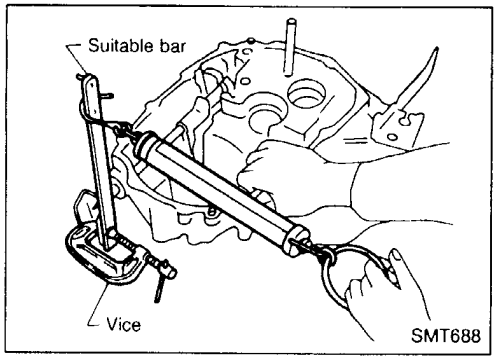
- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque is close to the specified range.**
- **Changes in turning torque of final drive assembly per revolution should be within 1.0 N·m (10 kg-cm, 8.7 in-lb) without binding.**



1. Install striking rod, lever and interlock.
- **When inserting striking rod into clutch housing, tape edges of striking rod to avoid damaging oil seal lip.**



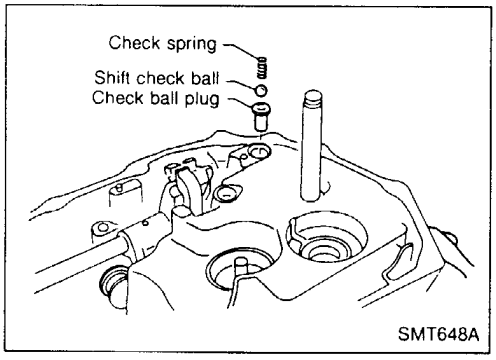
2. Install reverse check sleeve assembly.
3. Install check balls, reverse check spring and reverse check plug.



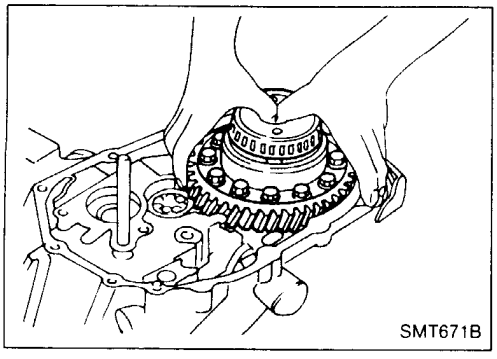
4. Check reverse check force.
   Reverse check force:
   4.9 - 7.4 N·m
   (50 - 75 kg-cm, 43 - 65 in-lb)
- If not within specification, select another check plug having a different length and reinstall it.

Available reverse check plugs:
Refer to SDS MT-67.

5. Install selected reverse check plug.
- **Apply locking sealant to thread of plug before installing it.**

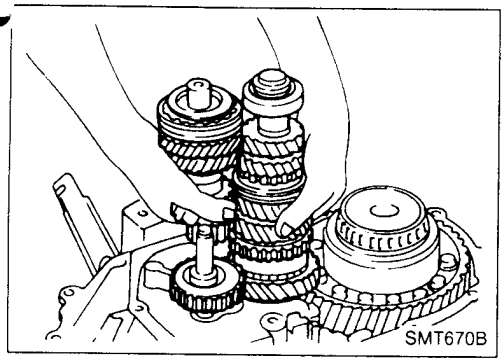


6. Install check ball plug, shift check ball and check spring.
7. Install oil pocket.



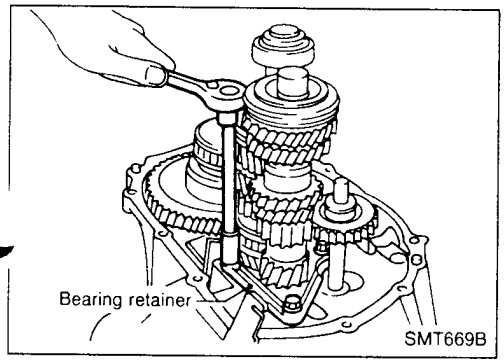
8. Install gear components onto clutch housing.

a. Install final drive assembly.

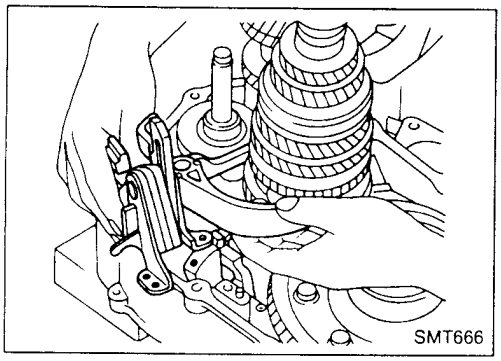


b. Install input shaft assembly with bearing retainer, mainshaft assembly and reverse idler gear.

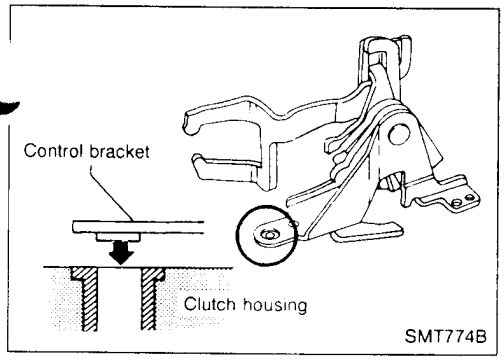
- **Be careful not to damage oil seal lip with splines of input shaft while shaft is being inserted into clutch housing.**
- **Be careful not to damage oil channel when inserting mainshaft into clutch housing.**



c. Install input shaft front bearing retainer.

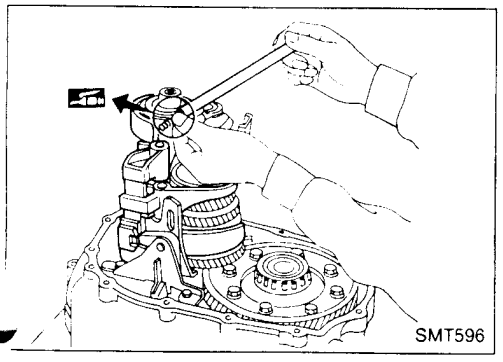


9. Apply grease to shifter caps, then install it to control bracket. Install control bracket with 1st & 2nd shift fork.



- **Ensure control bracket is seated correctly on clutch housing.**

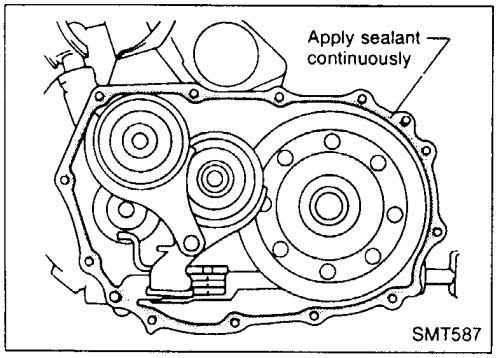
10. Install 3rd & 4th and 5th shift forks.



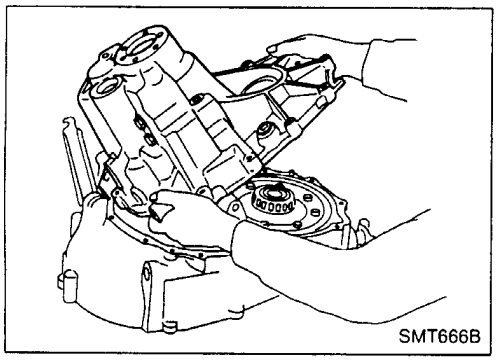
11. Insert fork shaft.

- **Apply multi-purpose grease to support spring before installing.**

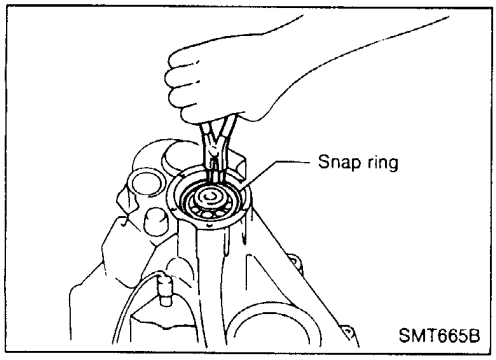
12. Install reverse idler spacer.



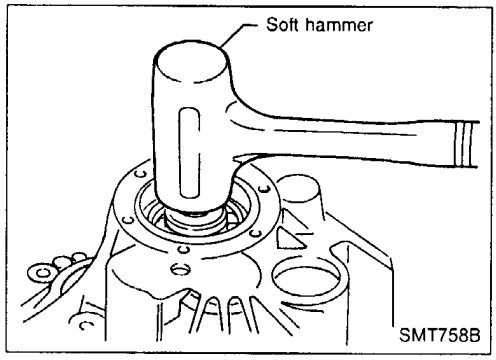
13. Apply recommended sealant to mating surface of clutch housing.



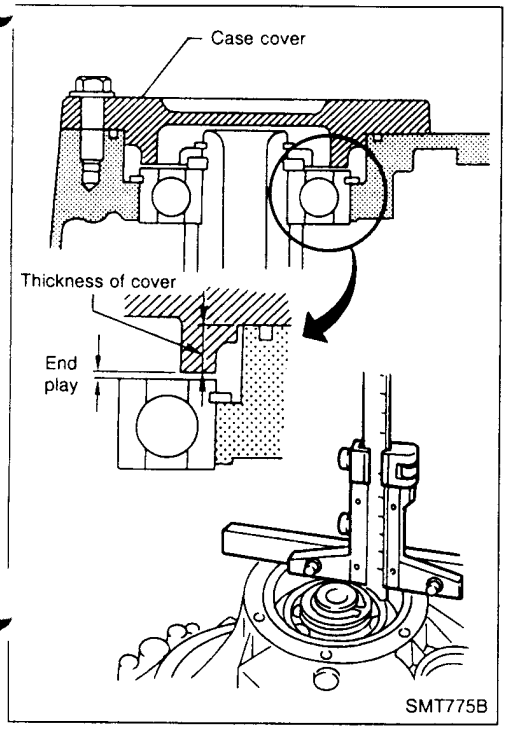
14. Install transmission case on clutch housing.



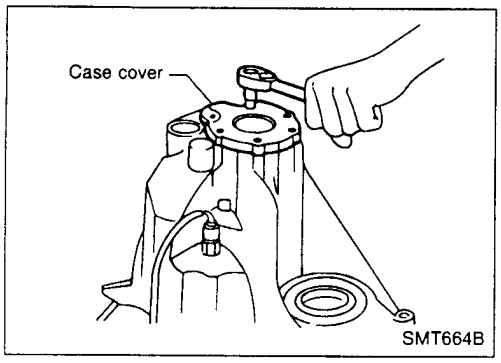
15. Install mainshaft front bearing snap ring.



16. Tap mainshaft with a soft hammer to ensure mainshaft rear bearing snap ring contacts the surface of transmission case.



17. Select case cover using the following procedure.
a. Measure distance between case cover fitting surface and mainshaft rear bearing outer race.
Clearance "C" between the end of case cover and main shaft rear bearing outer race (Main shaft end play):
0 - 0.1 mm (0 - 0.004 in)
b. Select case cover so that clearance "C" will be specified clearance.
Case cover:
Refer to SDS MT-69.



18. Install O-ring and case cover on transmission case.
- **Apply recommended sealant to mating surface of transmission case.**

General Specifications — RS5F31A and RS5F32A

TRANSAXLE

Engine			CD20T	GA16DE	SR20De	SR20DE
Transaxle model			RS5F32A	RS5F31A	RS5F32A	RS5F32A
Transaxle model code number			2J614	2J005	2J006	2J007
Number of speeds			5			
Synchromesh type			Warner			
Shift pattern			NMT031			
Gear ratio	1st		3.0625	3.3333	3.0625	3.0625
	2nd		1.8261	1.9545	1.8261	1.8261
	3rd		1.2069	1.2857	1.2069	1.2857
	4th		0.9268	0.9750	0.9268	0.9750
	5th		0.7333	0.7556	0.7333	0.7556
	Reverse		3.1538	3.4167	3.1538	3.1538
Number of teeth	Input gear	1st	16	15	16	16
		2nd	23	22	23	23
		3rd	29	28	29	28
		4th	41	40	41	40
		5th	45	45	45	45
		Rev.	13	12	13	13
	Main gear	1st	49	50	49	49
		2nd	42	43	42	42
		3rd	35	36	35	36
		4th	38	39	38	39
		5th	33	34	33	34
		Rev.	41	41	41	41
	Reverse idler gear		31	30	31	31
Oil capacity (Reference)		ℓ (Imp pt)	3.6 - 3.8 (6-3/8 - 6-3/4)	2.9 - 3.2 (5-1/8 - 5-5/8)	3.6 - 3.8 (6-3/8 - 6-3/4)	
Oil level		mm(in)	57 - 62 (2.244 - 2.441)	57 - 66 (2.244 - 2.598)	40 - 45 (1.575 - 1.772)	

FINAL GEAR

Engine		GA16DE	SR20De	SR20DE	CD20T
Final gear ratio		4.0556	4.1765	4.3750	3.8889
Number of teeth	Final gear/ Pinion	73/18	71/17	70/16	70/18
	Side gear/ Pinion	16/10	14/10	14/10	14/10

Inspection and Adjustment — RS5F31A

GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.18 - 0.31 (0.0071 - 0.0122)
2nd main gear	0.20 - 0.30 (0.0079 - 0.0118)
3rd main gear	0.20 - 0.30 (0.0079 - 0.0118)
4th main gear	0.20 - 0.30 (0.0079 - 0.0118)
5th input gear	0.18 - 0.31 (0.0071 - 0.0122)

CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	Standard	Wear limit
1st & 2nd	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)
3rd & 4th	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)
5th	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)

AVAILABLE CHECK PLUGS

Reverse check plug

Reverse check turning torque (At striking rod)	4.9 - 7.4 N·m (50 - 75 kg-cm, 43 - 65 in-lb)
Length mm (in)	Part number
8.3 (0.327)	32188-M8001*
7.1 (0.280)	32188-M8002
7.7 (0.303)	32188-M8003
8.9 (0.350)	32188-M8004

* Standard check plug

AVAILABLE SNAP RINGS

Input shaft front bearing

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.27 (0.0500)	32204-M8004
1.33 (0.0524)	32204-M8005
1.39 (0.0547)	32204-M8006
1.45 (0.0571)	32204-M8007

Input shaft 5th synchronizer hub

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
2.00 (0.0787)	32311-M8812
2.05 (0.0807)	32311-M8813
2.10 (0.0827)	32311-M8814
2.15 (0.0846)	32311-M8815
2.20 (0.0866)	32311-M8816
2.25 (0.0886)	32311-M8817
2.30 (0.0906)	32311-M8818

AVAILABLE C-RINGS

Mainshaft C-ring

Allowable clearance		0 - 0.1 mm (0 - 0.004 in)	
Thickness mm (in)	Part number	Thickness mm (in)	Part number
3.63 (0.1429)	32348-M8800	4.12 (0.1622)	32348-M8807
3.70 (0.1457)	32348-M8801	4.19 (0.1650)	32348-M8808
3.77 (0.1484)	32348-M8802	4.26 (0.1677)	32348-M8809
3.84 (0.1512)	32348-M8803	4.33 (0.1705)	32348-M8810
3.91 (0.1539)	32348-M8804	4.40 (0.1732)	32348-M8811
3.98 (0.1567)	32348-M8805	4.47 (0.1760)	32348-M8812
4.05 (0.1594)	32348-M8806	4.54 (0.1787)	32348-M8813

AVAILABLE WASHERS

Differential side gear thrust washer

Allowable clearance between side gear and differential case with washer	0.1 mm or less
Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

Inspection and Adjustment — RS5F31A (Cont'd)

AVAILABLE SHIMS — MAINSHAFT AND DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload

Unit: mm (in)

Mainshaft bearing preload: T_1*1	0.18 - 0.27 (0.0071 - 0.0106)
Differential side bearing preload: T_2*2	0.24 - 0.32 (0.0094 - 0.0126)

*1: Install mainshaft bearing adjusting shims which are "distance from case to bearing outer race" + "T_1" – "2.5 mm (0.098 in)" (Thickness of spacer) in thickness.
*2: Install differential side bearing adjusting shims which are "deflection of differential case" + "T_2" in thickness.

Turning torque (New bearing)

Unit: N·m (kg-cm, in-lb)

Final drive only	2.0 - 7.8 (20 - 80, 17 - 69)
Total	3.9 - 13.7 (40 - 140, 35 - 122)

Mainshaft bearing adjusting shims

Thickness mm (in)	Part number
0.10 (0.0039)	32137-M8000
0.15 (0.0059)	32137-M8001
0.20 (0.0079)	32137-M8002
0.25 (0.0098)	32137-M8003
0.30 (0.0118)	32137-M8004
0.35 (0.0138)	32137-M8005
0.40 (0.0157)	32137-M8006
0.45 (0.0177)	32137-M8007
0.50 (0.0197)	32137-M8008
0.55 (0.0217)	32137-M8009
0.60 (0.0236)	32137-M8010
0.65 (0.0256)	32137-M8011
0.70 (0.0276)	32137-M8012
0.75 (0.0295)	32137-M8013
0.80 (0.0315)	32137-M8014
0.85 (0.0335)	32137-M8015
0.90 (0.0354)	32137-M8016
0.95 (0.0374)	32137-M8017
1.00 (0.0394)	32137-M8018

Differential side bearing adjusting shims

Thickness mm (in)	Part number
0.44 (0.0173)	38454-M8000
0.48 (0.0189)	38454-M8001
0.56 (0.0220)	38454-M8003
0.60 (0.0236)	38454-M8004
0.64 (0.0252)	38454-M8005
0.68 (0.0268)	38454-M8006
0.72 (0.0283)	38454-M8007
0.76 (0.0299)	38454-M8008
0.80 (0.0315)	38454-M8009
0.84 (0.0331)	38454-M8010
0.88 (0.0346)	38454-M8011

Inspection and Adjustment — RS5F32A

GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.18 - 0.31 (0.0071 - 0.0122)
2nd main gear	0.20 - 0.30 (0.0079 - 0.0118)
3rd main gear	0.20 - 0.30 (0.0079 - 0.0118)
4th main gear	0.20 - 0.30 (0.0079 - 0.0118)
5th input gear	0.18 - 0.31 (0.0071 - 0.0122)

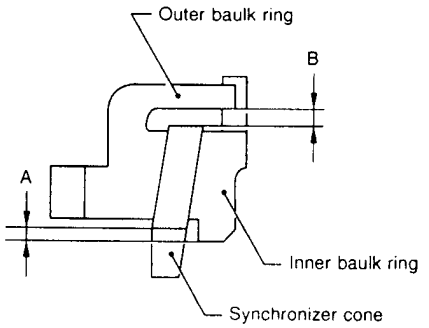
CLEARANCE BETWEEN BAULK RING AND GEAR

1st, 4th, 5th baulk ring

Unit: mm (in)

Standard	Wear limit	
1st	0.95 - 1.45(0.0374 - 0.0571)	0.7 (0.028)
4th	0.90 - 1.45 (0.0354 - 0.0571)	
5th	0.90 - 1.50 (0.0354 - 0.0591)	

2nd and 3rd baulk ring



NMT026

Dimension	Standard	Wear limit
A	0.7 - 0.9 (0.028 - 0.035)	0.2 (0.008)
B	0.6 - 1.1 (0.024 - 0.043)	

AVAILABLE CHECK PLUGS

Reverse check plug

Reverse check turning torque (At striking rod)	4.9 - 7.4 N·m (50 - 75 kg-cm, 43 - 65 in-lb)
Length mm (in)	Part number
8.3 (0.327)	32188-M8001*
7.1 (0.280)	32188-M8002
7.7 (0.303)	32188-M8003
8.9 (0.350)	32188-M8004

* Standard check plug

AVAILABLE SNAP RINGS

Input shaft front bearing

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.27 (0.0500)	32204-M8004
1.33 (0.0524)	32204-M8005
1.39 (0.0547)	32204-M8006
1.45 (0.0571)	32204-M8007

Input shaft 5th synchronizer hub

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
2.00 (0.0787)	32311-M8812
2.05 (0.0807)	32311-M8813
2.10 (0.0827)	32311-M8814
2.15 (0.0846)	32311-M8815
2.20 (0.0866)	32311-M8816
2.25 (0.0886)	32311-M8817
2.30 (0.0906)	32311-M8818

AVAILABLE C-RINGS

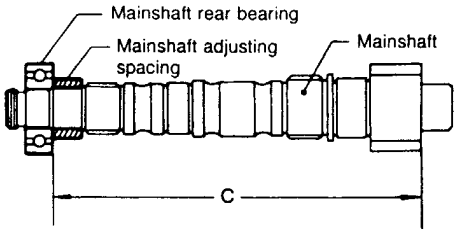
Mainshaft C-ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
4.45 (0.1752)	32348-50J00
4.52 (0.1780)	32348-50J01
4.59 (0.1807)	32348-50J02
4.66 (0.1835)	32348-50J03
4.73 (0.1862)	32348-50J04
4.80 (0.1890)	32348-50J05
4.87 (0.1917)	32348-50J06
4.94 (0.1945)	32348-50J07

Inspection and Adjustment — RS5F32A (Cont'd)

AVAILABLE SPACERS

Mainshaft bearing adjusting spacer



SMT693B

Bearing distance: C	230.15 - 230.25 mm (9.0610 - 9.0649 in)
Thickness mm (in)	Part number
18.91 (0.7445)	32347-50J00
18.98 (0.7472)	32347-50J01
19.05 (0.7500)	32347-50J02
19.12 (0.7528)	32347-50J03
19.19 (0.7555)	32347-50J04
19.26 (0.7583)	32347-50J05
19.33 (0.7610)	32347-50J06
19.40 (0.7638)	32347-50J07
19.47 (0.7665)	32347-50J08

AVAILABLE WASHERS

Differential side gear thrust washer

Allowable clearance between side gear and differential case with washer		0.1 - 0.2 mm (0.004 - 0.008 in)
	Thickness mm (in)	Part number
F32A	0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
	0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
	0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
	0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
	0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

AVAILABLE SHIMS — DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload (Re-used bearing)

Unit: mm (in)

Differential side bearing preload: T*	0.25 - 0.30 (0.0098 - 0.0118)

* Install shims which are "deflection of differential case" + "T" in thickness.

Turning torque (New bearing)

Unit: N·m (kg-cm, in-lb)

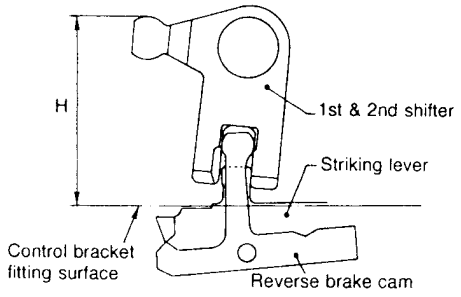
Final drive	2.9 - 6.9 (30 - 70, 26 - 61)

Differential side bearing adjusting shims

Thickness mm (in)	Part number
0.44 (0.0173)	38454-M8000
0.48 (0.0189)	38454-M8001
0.56 (0.0220)	38454-M8003
0.60 (0.0236)	38454-M8004
0.64 (0.0252)	38454-M8005
0.68 (0.0268)	38454-M8006
0.72 (0.0283)	38454-M8007
0.76 (0.0299)	38454-M8008
0.80 (0.0315)	38454-M8009
0.84 (0.0331)	38454-M8010
0.88 (0.0346)	38454-M8011

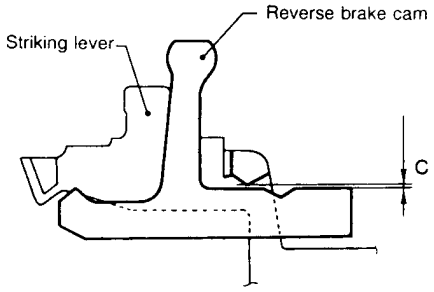
Inspection and Adjustment — RS5F32A (Cont'd)

INPUT SHAFT BRAKING MECHANISM



SMT735B

Maximum height "H" between the control bracket fitting surface and 1-2 shifter mm (in)	67.16 - 67.64 (2.6441 - 2.6630)



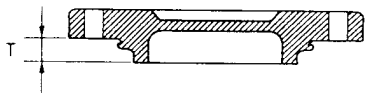
SMT736B

Clearance "C" between reverse brake cam and striking lever mm (in)	0.05 - 0.125 (0.0020 - 0.0049)

MAINSHAFT END PLAY

Mainshaft end play (Clearance between end of case cover and mainshaft rear bearing outer race)	0 - 0.1 mm (0 - 0.004 in)

Case cover



SMT760B

Thickness "T" mm (in)	Part No.
10.78 (0.4244)	32131-50J00
10.83 (0.4264)	32131-50J01
10.88 (0.4283)	32131-50J02
10.93 (0.4303)	32131-50J03
10.98 (0.4323)	32131-50J04
11.03 (0.4343)	32131-50J05

<SUPPLEMENT-II>

MANUAL TRANSAXLE

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RS5F32A

MAJOR OVERHAUL 2003
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RS5F31A & RS5F32A

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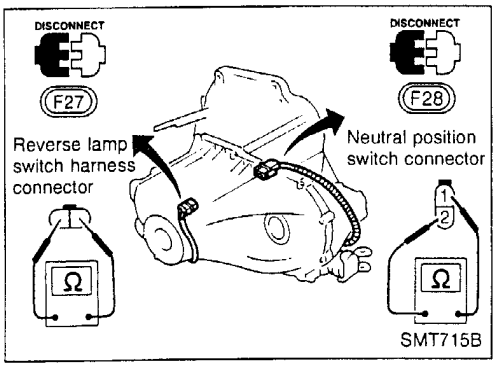
General Specifications — RS5F31A and RS5F32A 2004



Position Switch Check

REVERSE LAMP SWITCH

- Check continuity.

Gear position	Continuity
Reverse	Yes
Except reverse	No

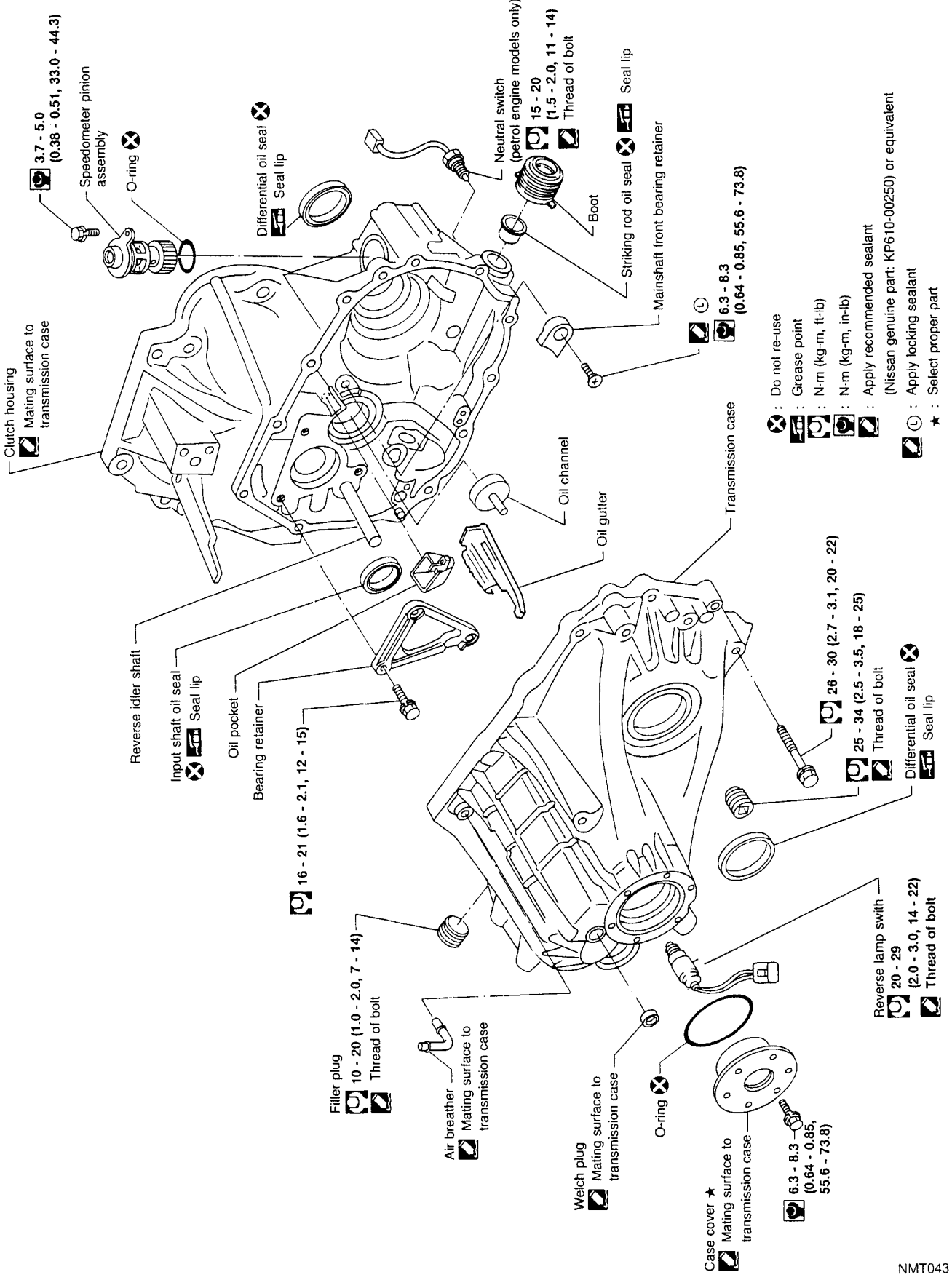
NEUTRAL SWITCH (petrol engine models only)

- Check continuity.

Gear position	Continuity
Neutral	Yes
Except neutral	No

Case Components

SEC. 321



NMT043

General Specifications — RS5F31A and RS5F32A

TRANSAXLE

Engine			CD20T	GA16DE	SR20De	SR20DE
Transaxle model			RS5F32A	RS5F31A	RS5F32A	RS5F32A
Transaxle model code number			2J605	2J066	2J016	2J707
Number of speeds			5			
Synchromesh type			Warner			
Shift pattern			NMT031			
Gear ratio	1st		3.0625	3.3333	3.0625	3.0625
	2nd		1.8261	1.9545	1.8261	1.8261
	3rd		1.2069	1.2857	1.2069	1.2857
	4th		0.9268	0.9750	0.9268	0.9750
	5th		0.7333	0.7556	0.7556	0.7556
	Reverse		3.1538	3.4167	3.1538	3.1538
Number of teeth	Input gear	1st	16	15	16	16
		2nd	23	22	23	23
		3rd	29	28	29	28
		4th	41	40	41	40
		5th	45	45	45	45
		Rev.	13	12	13	13
	Main gear	1st	49	50	49	49
		2nd	42	43	42	42
		3rd	35	36	35	36
		4th	38	39	38	39
		5th	33	34	34	34
		Rev.	41	41	41	41
	Reverse idler gear		31	30	31	31
Oil capacity (Reference)		ℓ (Imp pt)	3.6 - 3.8 (6-3/8 - 6-3/4)	2.9 - 3.2 (5-1/8 - 5-5/8)	3.6 - 3.8 (6-3/8 - 6-3/4)	
Oil level		mm(in)	57 - 62 (2.244 - 2.441)	57 - 66 (2.244 - 2.598)	40 - 45 (1.575 - 1.772)	

FINAL GEAR

Engine		GA16DE	SR20De	SR20DE	CD20T
Final gear ratio		4.1667	4.1765	4.3750	4.0588
Number of teeth	Final gear/ Pinion	75/18	71/17	70/16	69/17
	Side gear/ Pinion	16/10	14/10	14/10	14/10

AUTOMATIC TRANSAXLE

SECTION AT

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<SUPPLEMENT-III> (For wagon models)

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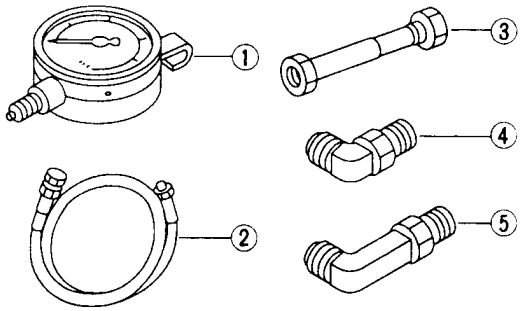
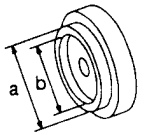
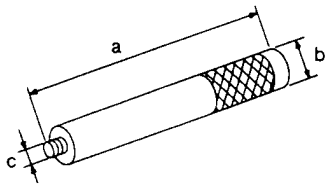
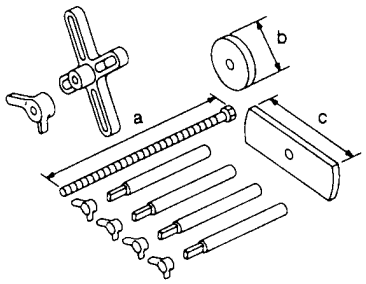
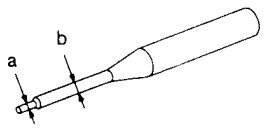
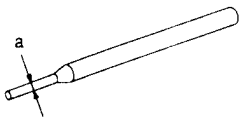
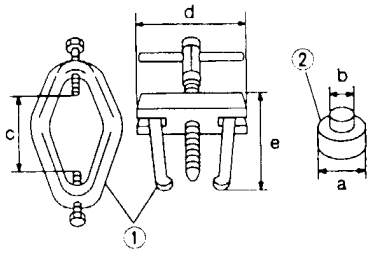
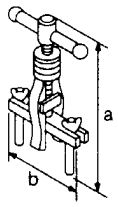
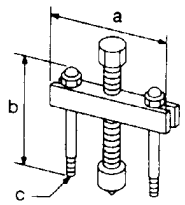
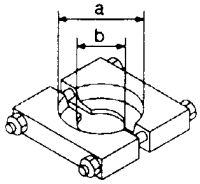
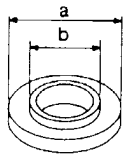
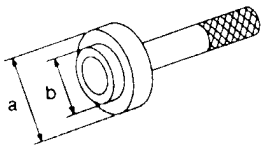
When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

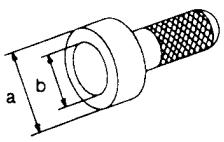
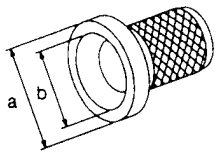
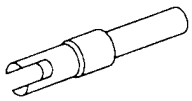
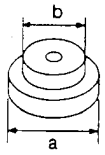
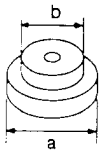
Special Service Tools

Tool number Tool name	Description	
ST2505S001 Oil pressure gauge set ① ST25051001 Oil pressure gauge ② ST25052000 Hose ③ ST25053000 Joint pipe ④ ST25054000 Adapter ⑤ ST25055000 Adapter	 NT097	Measuring line pressure and governor pressure
KV31103000 Drift	 NT105	Installing differential side oil seal (Use with ST35325000) **a: 59 mm (2.32 in) dia.** **b: 49 mm (1.93 in) dia.**
ST35325000 Drift	 NT417	Installing differential side oil seal (Use with KV31103000) **a: 215 mm (8.46 in)** **b: 25 mm (0.98 in) dia.** **c: M12 x 1.5P**
KV31103200 Clutch spring compressor	 NT425	Removing and installing clutch return spring **a: 179 mm (7.05 in)** **b: 76 mm (2.99 in) dia.** **c: 174 mm (6.85 in)**
ST23540000 Pin punch	 NT442	Removing and installing parking rod plate and manual plate **a: 2.3 mm (0.091 in) dia.** **b: 4 mm (0.16 in) dia.**
KV32101000 Pin punch	 NT410	Installing throttle lever and manual shaft retaining pins Removing and installing differential pinion mate shaft lock pin. **a: 4 mm (0.16 in) dia.**

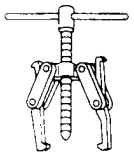
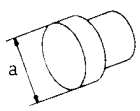
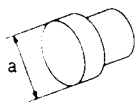
Special Service Tools (Cont'd)

Tool number Tool name	Description	
ST3306S001 Differential side bearing puller set ① ST33051001 Puller ② ST33061000 Adapter	 NT413	Removing differential side bearing inner race **a: 39 mm (1.54 in) dia.** **b: 29.5 mm (1.161 in) dia.** **c: 130 mm (5.12 in)** **d: 135 mm (5.31 in)** **e: 100 mm (3.94 in)**
KV381054S0 (ST33290001) Puller	 NT414	• Removing differential side oil seal • Removing idler gear bearing outer race • Removing differential side bearing outer race • Removing needle bearing from bearing retainer **a: 250 mm (9.84 in)** **b: 160 mm (6.30 in)**
ST27180001 Puller	 NT424	• Removing idler gear • Removing output gear **a: 100 mm (3.94 in)** **b: 110 mm (4.33 in)** **c: M8 x 1.25P**
ST30031000 Puller	 NT411	Removing reduction pinion gear bearing inner race **a: 90 mm (3.54 in) dia.** **b: 50 mm (1.97 in) dia.**
ST35272000 Drift	 NT426	• Installing reduction pinion gear bearing inner race • Installing idler gear bearing inner race **a: 72 mm (2.83 in) dia.** **b: 35.5 mm (1.398 in) dia.**
ST37830000 Drift	 NT427	Installing idler gear bearing outer race **a: 62 mm (2.44 in) dia.** **b: 39 mm (1.54 in) dia.**

Special Service Tools (Cont'd)

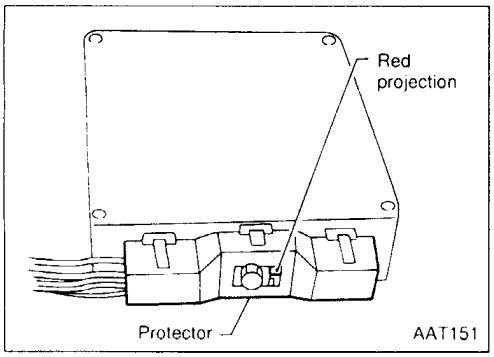
Tool number Tool name	Description	
ST35271000 Drift	 NT115	• Installing idler gear • Installing output gear **a: 72 mm (2.83 in) dia.** **b: 44 mm (1.73 in) dia.**
ST33400001 Drift	 NT086	• Installing oil pump housing oil seal • Installing output gear bearing outer race onto bearing retainer **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**
KV38105710 Preload adapter	 NT087	• Measuring turning torque of final drive assembly • Measuring clearance between side gear and differential case with washer • Selecting differential side bearing adjusting shim
ST35321000 Drift	 NT073	Installing output shaft bearing **a: 49 mm (1.93 in) dia.** **b: 41 mm (1.61 in) dia.**
ST30633000 Drift	 NT073	Installing differential side bearing outer race **a: 67 mm (2.64 in) dia.** **b: 49 mm (1.93 in) dia.**

Commercial Service Tools

Tool name	Description	
Puller	 NT077	• Removing idler gear bearing inner race • Removing and installing band servo piston snap ring
Drift	 NT109	Removing idler gear bearing inner race **a: 34 mm (1.34 in) dia.**
Drift	 NT109	Installing needle bearing onto bearing retainer **a: 36 mm (1.42 in) dia.**

Service Notice

- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transaxle is disassembled.
- When connecting A/T control unit harness connector, tighten bolt until red projection is in-line with connector.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in order on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended ATF to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during reassembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- After overhaul, refill the transaxle with new ATF.
- After removing drain plug, A/T fluid still remains in torque converter and A/T fluid cooling system.
  Always follow the procedures under "Changing A/T Fluid" in the MA section when changing A/T fluid.



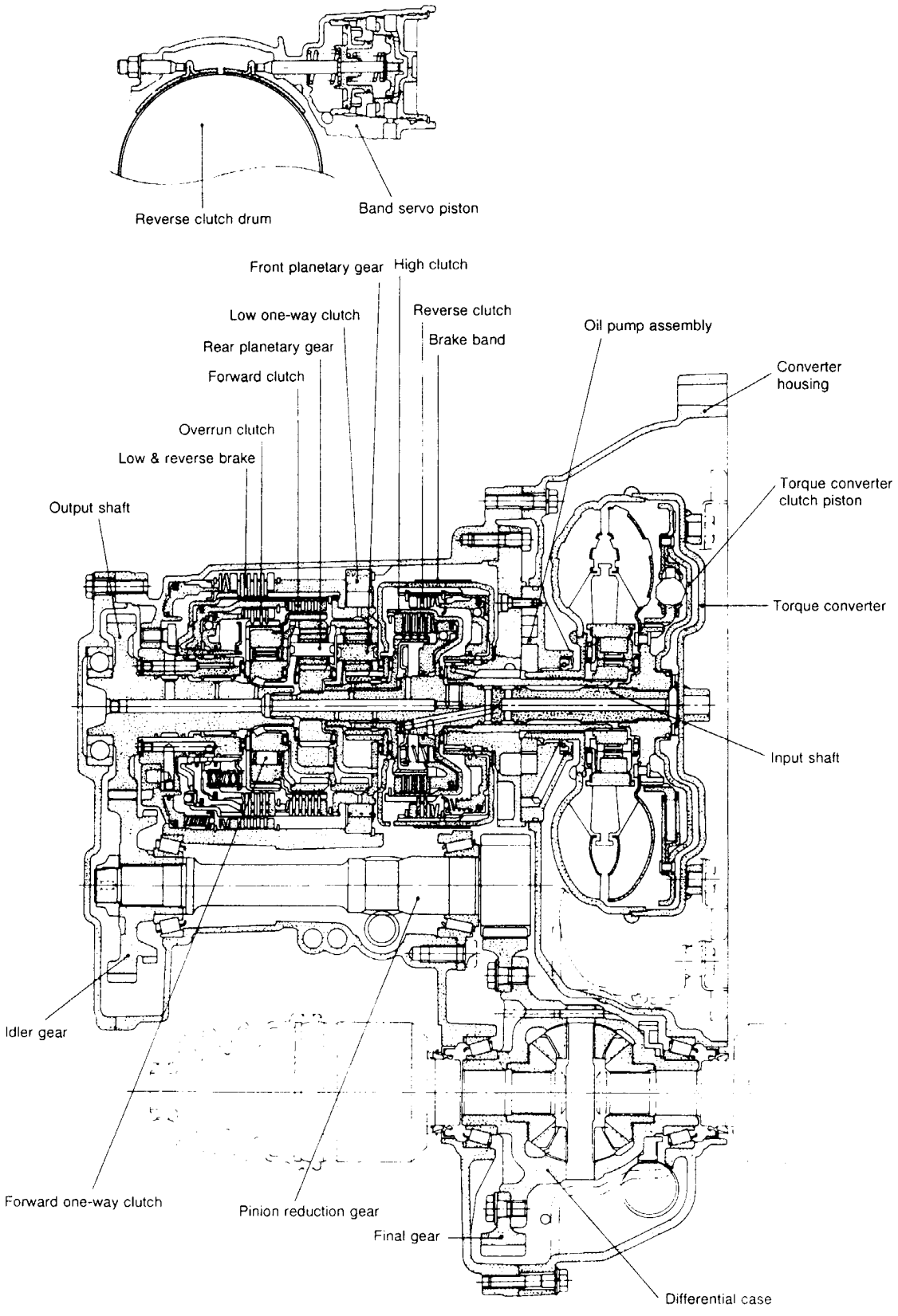
Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and, where fitted, on the instrument panel on the passenger side), seat belt pre-tensioners, 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:

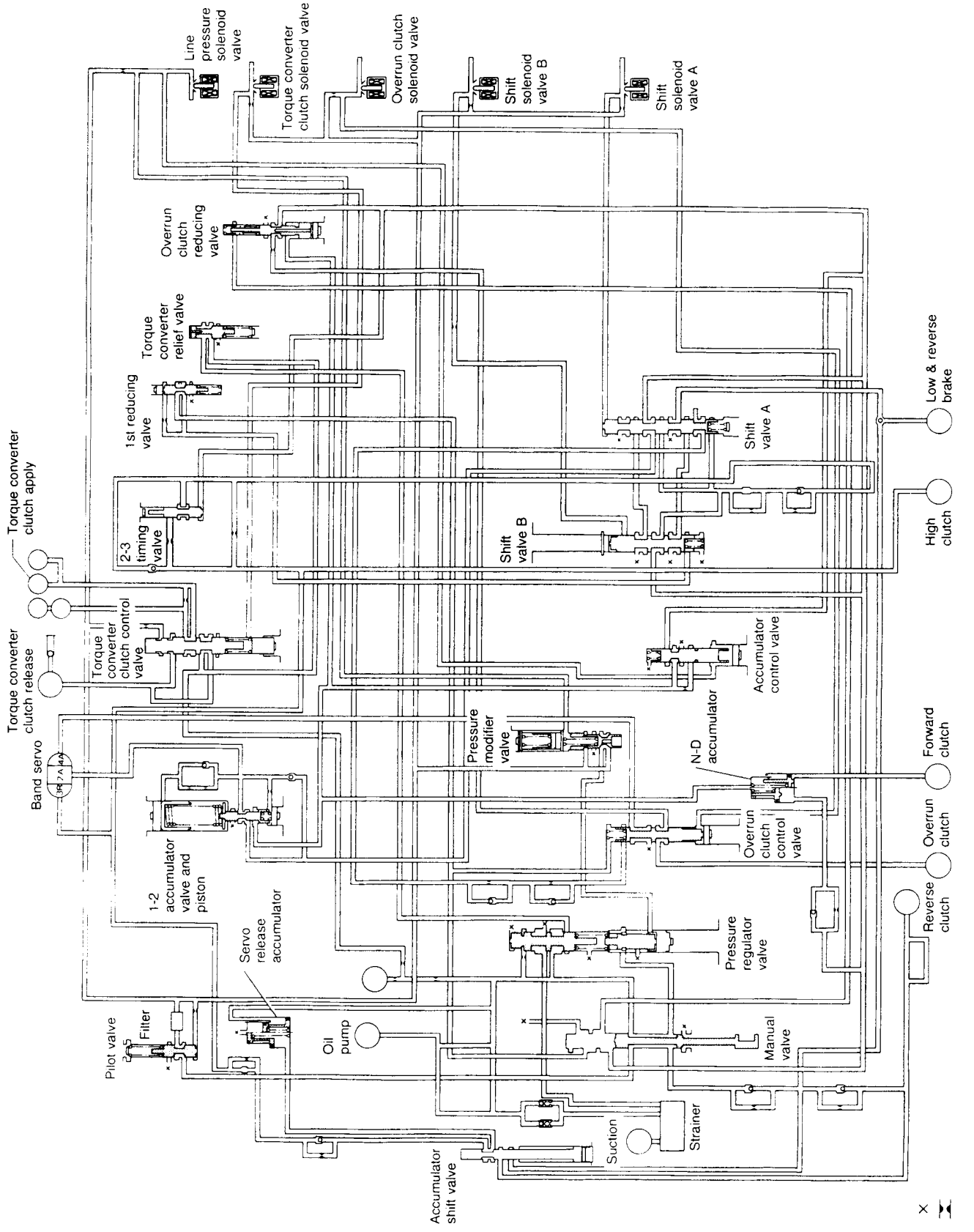
- **To avoid rendering the SRS inoperative, (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation), all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.**

Cross-sectional View



NAT003

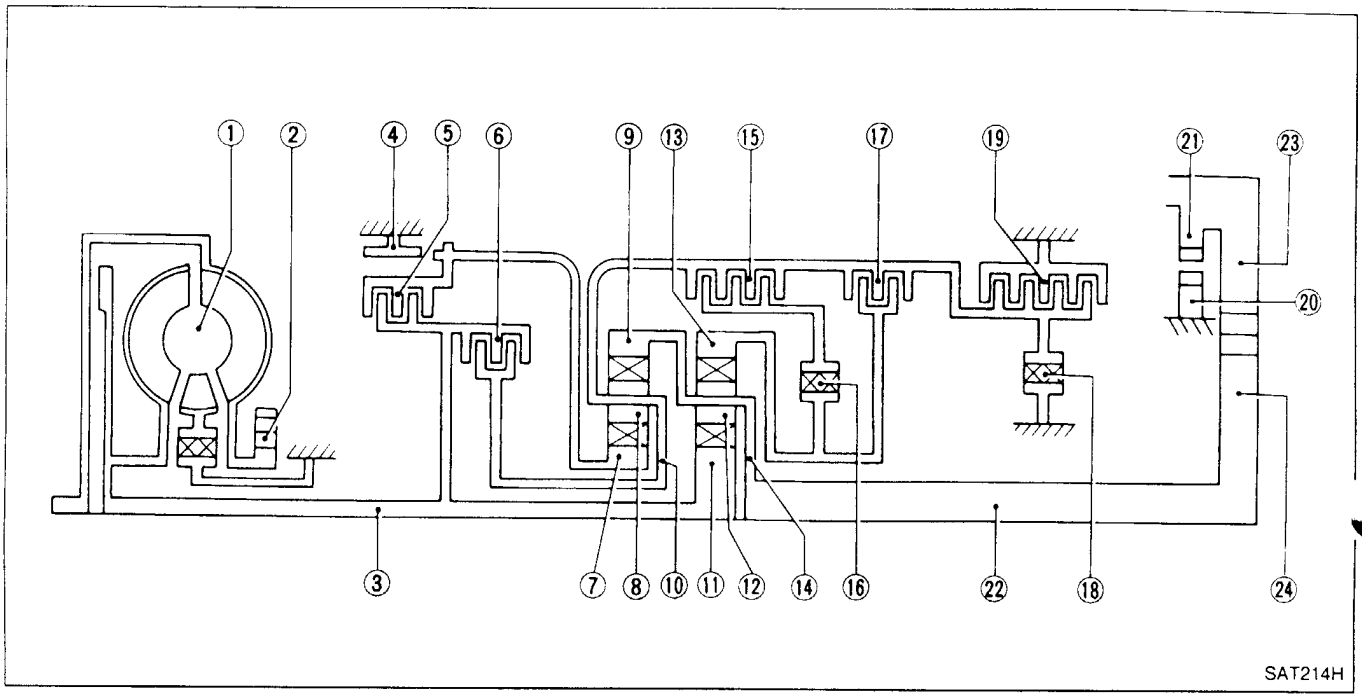
Hydraulic Control Circuit



NAT167

Shift Mechanism

CONSTRUCTION



① Torque converter
② Oil pump
③ Input shaft
④ Brake band
⑤ Reverse clutch
⑥ High clutch
⑦ Front sun gear
⑧ Front pinion gear
⑨ Front internal gear
⑩ Front planetary carrier
⑪ Rear sun gear
⑫ Rear pinion gear
⑬ Rear internal gear
⑭ Rear planetary carrier
⑮ Forward clutch
⑯ Forward one-way clutch
⑰ Overrun clutch
⑱ Low one-way clutch
⑲ Low & reverse brake
⑳ Parking pawl
㉑ Parking gear
㉒ Output shaft
㉓ Idle gear
㉔ Output gear

FUNCTION OF CLUTCH AND BRAKE

Clutch and brake components	Abbr.	Function
⑤ Reverse clutch	R/C	To transmit input power to front sun gear ⑪.
⑥ High clutch	H/C	To transmit input power to front planetary carrier ⑩.
⑮ Forward clutch	F/C	To connect front planetary carrier ⑩ with forward one-way clutch ⑯.
⑰ Overrun clutch	O/C	To connect front planetary carrier ⑩ with rear internal gear ⑬.
④ Brake band	B/B	To lock front sun gear ⑦.
⑯ Forward one-way clutch	F/O.C	When forward clutch ⑮ is engaged, to stop rear internal gear ⑬ from rotating in opposite direction against engine revolution.
⑱ Low one-way clutch	L/O.C	To stop front planetary carrier ⑩ from rotating in opposite direction against engine revolution.
⑲ Low & reverse brake	L & R/B	To lock front planetary carrier ⑩.

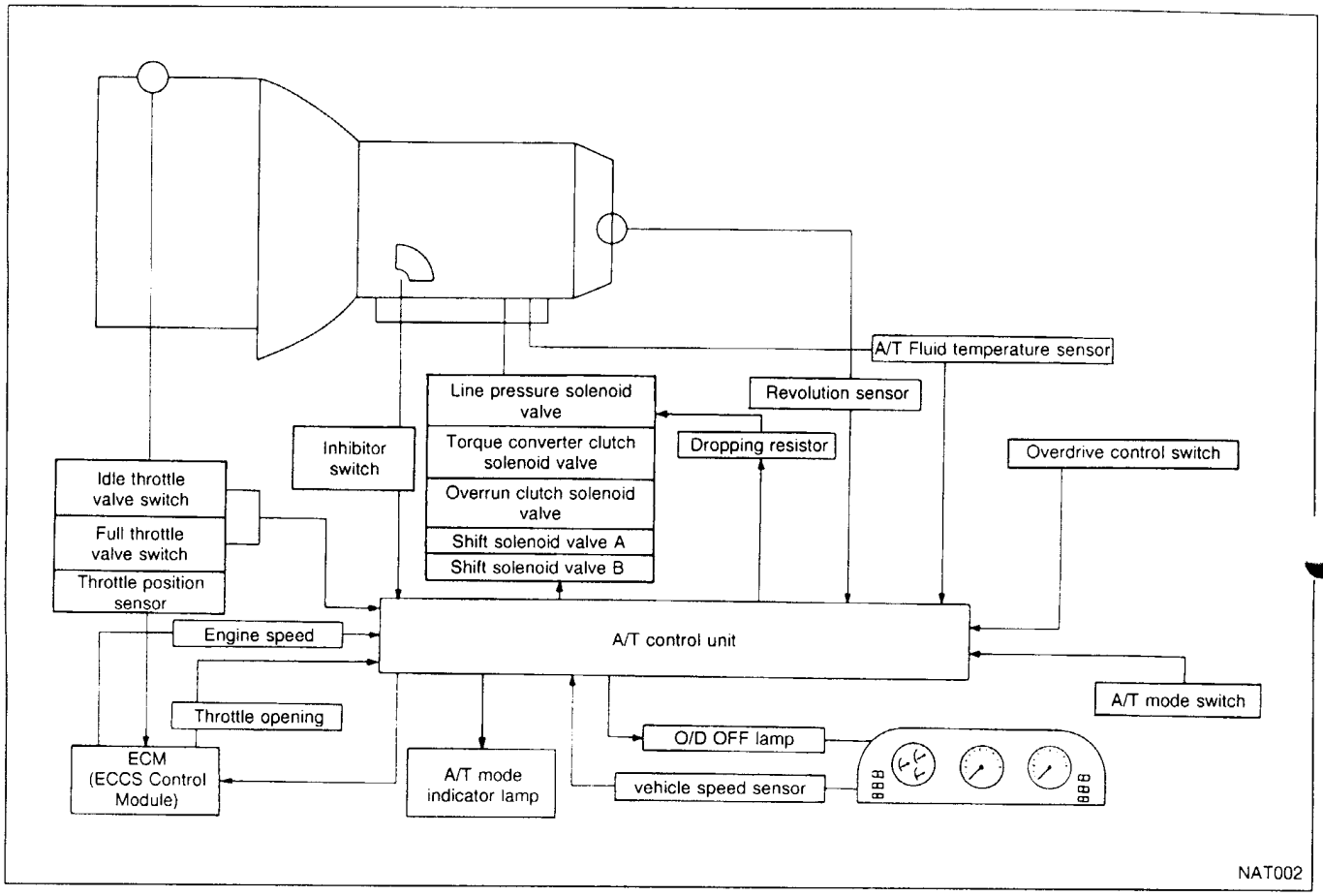
Shift Mechanism (Cont'd)

OPERATION OF CLUTCH AND BRAKE

Shift position		⑤ Reverse clutch	⑥ High clutch	⑮ Forward clutch	⑰ Overrun clutch	Band servo			⑯ Forward one-way clutch	⑱ Low one-way clutch	⑲ Low & reverse brake	Lock-up	Remarks
						2nd apply	3rd release	4th apply					
P													PARK POSITION
R		○									○		REVERSE POSITION
N													NEUTRAL POSITION
D*4	1st			○	*1 ◎				●	●			Automatic shift 1 ↔ 2 ↔ 3 ↔ 4
	2nd			○	*1 ◎	○			●				
	3rd		○	○	*1 ◎	*2 ⊗	⊗		●			*1 ○	
	4th		○	⊗		*3 ⊗	⊗	○				○	
2	1st			○	◎				●	●			Automatic shift 1 ↔ 2
	2nd			○	○	○			●				
1	1st			○	○				●		○		Locks (held stationary) in 1st speed 1 ← 2
	2nd			○	○	○			●				

*1 : Operates when overdrive control switch is set to "OFF".
*2 : Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, brake band does not contract because oil pressure area on the "release" side is greater than that on the "apply" side.
*3 : Oil pressure is applied to 4th "apply" side in condition *2 above, and brake band contracts.
*4 : A/T will not shift to 4th when overdrive switch is set in "OFF" position.
○ : Operates
● : Operates during "progressive" acceleration.
⊗ : Operates but does not affect power transmission.
◎ : Operates when throttle opening is less than 1/16.
⊛ : Operates when throttle opening is less than 1/16, but does not affect engine brake.

Control System



A/T CONTROL UNIT FUNCTION

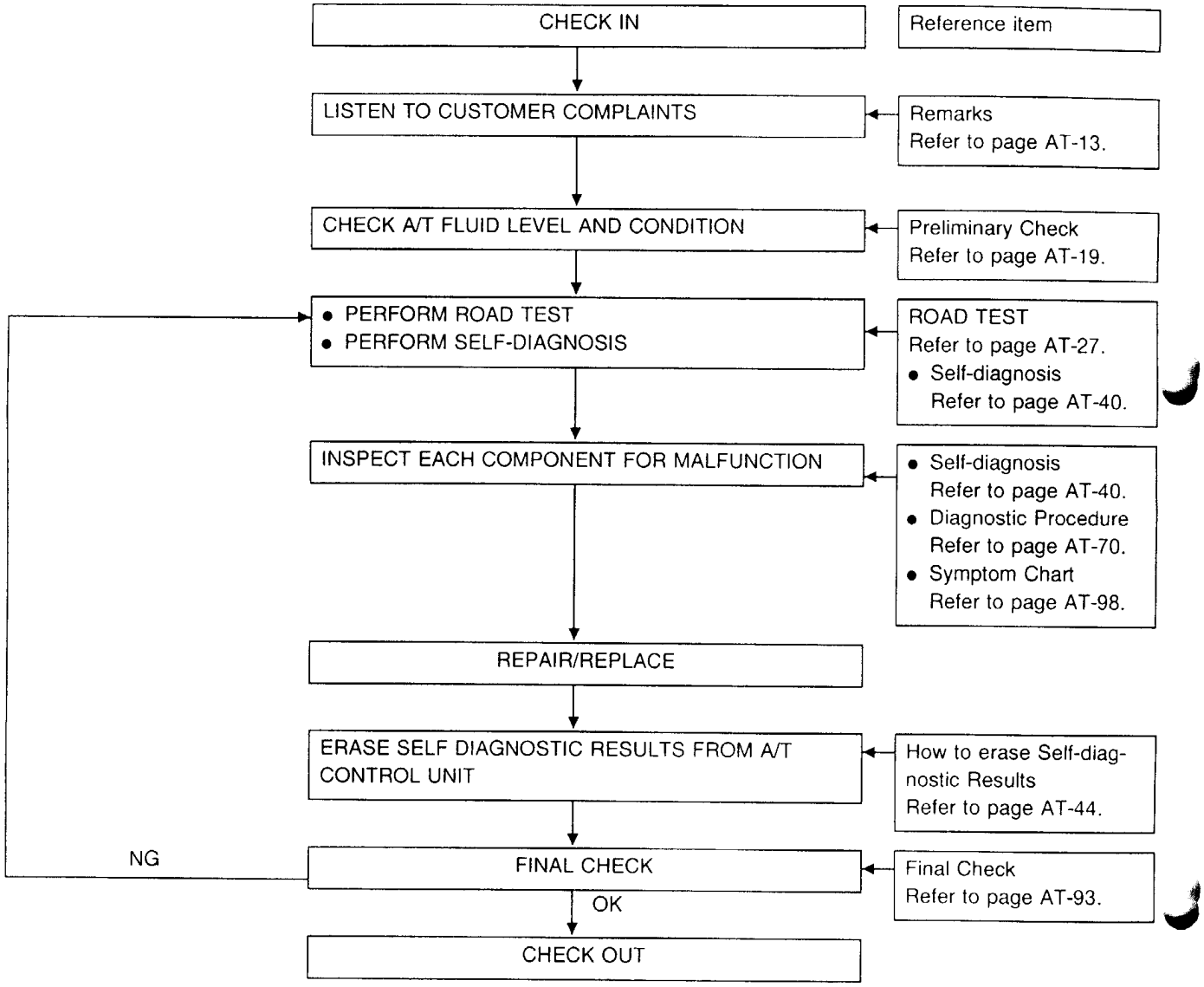
The A/T control unit receives signals sent from various switches and sensors. The control unit then determines required line pressure, shifting point, lock-up operation, engine brake operation. The unit sends required signals to the respective solenoids.

INPUT/OUTPUT SIGNAL OF A/T CONTROL UNIT

	Sensors and solenoid valves	Function
Input	Inhibitor switch	Detects selector lever position and sends a signal to A/T control unit.
	Throttle position sensor	Detects throttle valve position and sends a signal to A/T control unit.
	Closed throttle position switch	Detects throttle valve's fully-closed position and sends a signal to A/T control unit.
	Wide open throttle position switch	Detects a throttle valve position of greater than 1/2 of full throttle and sends a signal to A/T control unit.
	Engine speed signal	From ECM (ECCS control module).
	A/T Fluid temperature sensor	Detects transmission fluid temperature and sends a signal to A/T control unit.
	Revolution sensor	Detects output shaft rpm and sends a signal to A/T control unit.
	Vehicle speed sensor	Used as an auxiliary vehicle speed sensor. Sends a signal when revolution sensor (installed on transmission) malfunctions.
	A/T mode switch	Detects SPORT, AUTO or SNOW position selected and sends a signal to A/T control unit.
	Overdrive control switch	Sends a signal, which prohibits a shift to D_4 (Overdrive) position, to the A/T control unit.
Output	Shift solenoid valve A/B	Selects shifting point suited to driving conditions in relation to a signal sent from A/T control unit.
	Line pressure solenoid valve	Regulates (or decreases) line pressure suited to driving conditions in relation to a signal sent from A/T control unit.
	Torque converter clutch solenoid valve	Regulates (or decreases) lock-up pressure suited to driving conditions in relation to a signal sent from A/T control unit.
	Overrun clutch solenoid valve	Controls an "engine brake" effect suited to driving conditions in relation to a signal sent from A/T control unit.
	SPORT indicator lamp	The indicator lamp blinks for about 8 seconds.

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

INFORMATION FROM CUSTOMER

KEY POINTS
WHAT ..... Vehicle & A/T model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Symptoms

Customer name MR/MS	Model & Year	VIN
Trans. model	Engine	Mileage
Incident Date	Manuf. Date	In Service Date
Frequency	☐ Continuous ☐ Intermittent (times a day)	
Symptoms	☐ Vehicle does not move. (☐ Any position ☐ Particular position)	
	☐ No up-shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)	
	☐ No down-shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)	
	☐ Lockup malfunction	
	☐ Shift point too high or too low.	
	☐ Shift shock or slip (☐ N → D ☐ Lockup ☐ Any drive position)	
	☐ Noise or vibration	
	☐ No kickdown	
	☐ No pattern select	
	☐ Others ( )	
SPORT indicator lamp	Flickers for about 8 seconds.	
	☐ Come on	☐ Come off

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

DIAGNOSTIC WORKSHEET

1.	☐ Read the Fail-safe Remarks and listen to customer complaints.	AT-13
2.	☐ CHECK A/T FLUID ☐ Leakage (Follow specified procedure) ☐ Fluid condition ☐ Fluid level	AT-19
3.	☐ Perform all ROAD TEST and mark required procedures.	AT-27
	3-1 Check before engine is started. ☐ SELF-DIAGNOSTIC PROCEDURE — Mark detected items. A/T control unit-diagnosis system ☐ Revolution sensor ☐ Vehicle speed sensor ☐ Throttle position sensor ☐ Shift solenoid valve A ☐ Shift solenoid valve B ☐ Overrun clutch solenoid valve ☐ Torque converter clutch solenoid valve ☐ A/T Fluid temperature sensor and A/T control unit power source ☐ Engine speed signal ☐ Line pressure solenoid valve ☐ Battery ☐ Others	AT-40
	3-2. Check at idle ☐ Diagnostic Procedure 1 (SPORT indicator lamp come on for 2 seconds.) ☐ Diagnostic Procedure 2 (SPORT or SNOW mode indicator lamps came on.) ☐ Diagnostic Procedure 3 (OD OFF indicator lamp came on.) ☐ Diagnostic Procedure 4 (SPORT indicator lamp came on when acc. pedal was depressed.) ☐ Diagnostic Procedure 5 (Engine starts only in P and N position) ☐ Diagnostic Procedure 6 (In P position, vehicle does not move when pushed) ☐ Diagnostic Procedure 7 (In N position, vehicle moves) ☐ Diagnostic Procedure 8 (Select shock. N → R position) ☐ Diagnostic Procedure 9 (Vehicle creeps backward in R position) ☐ Diagnostic Procedure 10 (Vehicle creeps forward in D, 2 or 1 position)	AT-70
4.	☐ Perform the Diagnostic Procedures marked in ROAD TEST. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the components inspection orders.)	AT-27
5.	Perform FINAL CHECK. If NG, go back to "CHECK A/T FLUID". ☐ Stall test — Mark possible damaged components/others. ☐ Torque converter one-way clutch ☐ Reverse clutch ☐ Forward clutch ☐ Overrun clutch ☐ Forward one-way clutch ☐ Low & reverse brake ☐ Low one-way clutch ☐ Engine ☐ Line pressure is low ☐ Clutches and brakes except high clutch and brake band are OK ☐ Pressure test — Suspected parts:	AT-93

Remarks

FAIL-SAFE

The A/T control unit has an electronic Fail-Safe (limp home) mode to allow the vehicle to be driven even if a major electrical input or output device circuit is damaged.
In this condition, the vehicle always runs in third gear with the shift lever in positions "1", "2" or "D". Customer may say "Sluggish, poor acceleration."
When Fail-Safe operation occurs, the next time the key is turned to the ON position, the SPORT indicator lamp will blink for about 8 seconds. (For diagnosis, refer to AT-70).

Fail-Safe may be activated even if all electrical circuits are undamaged in case the vehicle is driven under extreme conditions (such as excessive wheel spinning and emergency braking suddenly after).
In this case, normal shift pattern can be returned by turning the ignition key OFF for 3 seconds and then back ON.
The flashing of the SPORT indicator lamp for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions by chance.
Always follow the "WORK FLOW" (Refer to AT-12).
The SELF-DIAGNOSIS results will be as follows:

The first SELF-DIAGNOSIS will indicate the damage of the vehicle speed sensor or the revolution sensor.
During the next SELF-DIAGNOSIS performed after checking the sensors, no damages will be indicated.

Diagnosis by CONSULT

NOTICE

1. The CONSULT electrically displays shift timing and lock-up timing (that is, operation timing of each solenoid).
   Check for time difference between actual shift timing and the CONSULT display. If the difference is noticeable, mechanical parts (except solenoids, sensors, etc.) may be malfunctioning. Check mechanical parts using applicable diagnostic procedures.
2. Shift schedule (which implies gear position) displayed on CONSULT and that indicated in Service Manual may differ slightly. This occurs because of the following reasons:
   - Actual shift schedule has more or less tolerance or allowance,
   - Shift schedule indicated in Service Manual refers to the point where shifts start, and
   - Gear position displayed on CONSULT indicates the point where shifts are completed.
3. Shift solenoid valve "A" or "B" is displayed on CONSULT at the start of shifting. Gear position is displayed upon completion of shifting (which is computed by A/T control unit).
4. Additional CONSULT information can be found in the Operation Manual supplied with the CONSULT unit.

SELF-DIAGNOSTIC RESULT TEST MODE

Item	Display	Description	Remarks
No failure	****NO FAILURE****	• No failure has been detected.	
Initial start	*INITIAL START*	• This is NOT a malfunction message. [Whenever shutting off a power supply to the control unit, this message appears on the screen.]	
Vehicle speed sensor 1 (A/T) (Revolution sensor)	CAR SPEED SEN1·A/T	• No signal input from vehicle speed sensor 1 during traveling due to disconnection, or input of abnormal signal.	
Vehicle speed sensor 2 (Meter)	CAR SPEED SEN2·MTR	• No signal input from vehicle speed sensor 2 during traveling due to disconnection, or input of abnormal signal.	
Throttle position sensor	THROTTLE SENSOR	• Throttle position sensor signal voltage is abnormally high. • Throttle position sensor signal voltage is abnormally low with idle switch OFF or full switch ON.	
Shift solenoid valve A	SHIFT SOLENOID A	• Specified voltage is not applied to solenoid due to disconnection or short circuit.	
Shift solenoid valve B	SHIFT SOLENOID B	• Specified voltage is not applied to solenoid due to disconnection or short circuit.	
Overrun clutch solenoid valve	OVERRUN CLUTCH SOL	• Specified voltage is not applied to solenoid due to disconnection or short circuit.	
T/C clutch solenoid valve	LOCK-UP SOLENOID	• Specified voltage is not applied to solenoid due to disconnection or short circuit.	
Battery voltage/A/T Fluid temperature sensor	BATT/FLUID TEMP SEN	• Supply voltage to control unit is abnormally low during traveling. • Oil temperature signal voltage is abnormally high (oil temperature is low) during traveling.	To be displayed in case of abnormality and no recording is made
Engine speed signal	ENGINE REV SIGNAL	• Engine rpm is abnormally low during traveling.	
Line pressure solenoid valve	LINE PRESSURE SOL	• Specified voltage is not applied to solenoid due to disconnection or short circuit.	
A/T control unit (ROM)	CONTROL UNIT (ROM)	• Control unit memory (ROM) is malfunctioning.	
A/T control unit (RAM)	CONTROL UNIT (RAM)	• Control unit memory (RAM) is malfunctioning.	

Diagnosis by CONSULT (Cont'd)

DATA MONITOR DIAGNOSTIC TEST MODE

Item	Display	Monitor item		Description	Remarks
		ECM input signals	Main signals		
Vehicle speed sensor 1 (A/T) (Revolution sensor)	CAR/S SE1 [km/h] or [mph]	X	—	• Vehicle speed computed from signal of revolution sensor is displayed.	When racing engine in "N" or "P" position with vehicle stationary, CONSULT data may not indicate 0 km/h (0 mph).
Vehicle speed sensor 2 (Meter)	CAR/S SE2 [km/h] or [mph]	X	—	• Vehicle speed computed from signal of vehicle speed sensor is displayed.	Vehicle speed display may not be accurate under approx. 10 km/h (6 mph). It may not indicate 0 km/h (0 mph) when vehicle is stationary.
Throttle position sensor	THROTTLE SEN [V]	X	—	• Throttle position sensor signal voltage is displayed.	
A/T Fluid temperature sensor	FLUID TEMP SEN [V]	X	—	• A/T Fluid temperature sensor signal voltage is displayed. • Signal voltage lowers as fluid temperature rises.	
Battery voltage	BATTERY VOLT [V]	X	—	• Source voltage of control unit is displayed.	
Engine speed	ENGINE REV [rpm]	X	X	• Engine speed, computed from engine speed signal, is displayed.	Engine speed display may not be accurate under approx. 800 rpm. It may not indicate 0 rpm even when engine is not running.
Overdrive control switch	SLCT LEVER SW [ON/OFF]	X	—	• ON/OFF state computed from signal of overdrive SW is displayed.	
SPORT mode switch	POWER SHIFT SW [ON/OFF]	X	—	• ON/OFF state computed from signal of overdrive SW is displayed.	
P/N position switch	N-RANGE SW [ON/OFF]	X	—	• ON/OFF state computed from signal of "P"/"N" position SW is displayed.	
R position switch	R-RANGE SW [ON/OFF]	X	—	• ON/OFF state computed from signal of "R" position SW is displayed.	
D position switch	D-RANGE SW [ON/OFF]	X	—	• ON/OFF state computed from signal of "D" position SW is displayed.	
2 position switch	2-RANGE SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of "2" position SW, is displayed.	
1 position switch	1-RANGE SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of "1" position SW, is displayed.	
Closed throttle position switch	IDLE SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of closed throttle position SW, is displayed.	
Wide open throttle position switch	FULL THRTL SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of wide open throttle position SW, is displayed.	
SNOW mode switch	HOLD SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of SNOW mode SW, is displayed.	
Gear position	GEAR	—	X	• Gear position data used for computation by control unit, is displayed.	
Selector lever position	RANGE	—	X	• Selector lever position data, used for computation by control unit, is displayed.	• A specific value used for control is displayed if fail-safe is activated due to error.

Diagnosis by CONSULT (Cont'd)

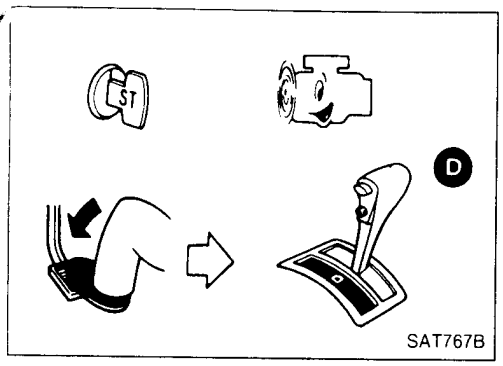
Item	Display	Monitor item		Description	Remarks
		ECM input signals	Main signals		
Vehicle speed	VEHICLE SPEED [km/h] or [mph]	—	X	• Vehicle speed data, used for computation by control unit, is displayed.	
Throttle position	THRTL OPENING [/8]	—	X	• Throttle position data, used for computation by control unit, is displayed.	• A specific value used for control is displayed if fail-safe is activated due to error.
Line pressure duty	LINE PRES DTY [%]	—	X	• Control value of line pressure solenoid valve, computed by control unit from each input signal, is displayed.	
Torque converter clutch solenoid valve duty	LOCK-UP DTY [%]	—	X	• Control value of torque converter clutch solenoid valve, computed by control unit from each input signal, is displayed.	
Shift solenoid valve A	SHIFT SOL A [ON/OFF]	—	X	• Control value of shift solenoid valve A, computed by control unit from each input signal, is displayed.	Control value of solenoid is displayed even if solenoid circuit is disconnected. The "OFF" signal is displayed if solenoid circuit is shorted.
Shift solenoid valve B	SHIFT SOL B [ON/OFF]	—	X	• Control value of shift solenoid valve B, computed by control unit from each input signal, is displayed.	
Overrun clutch solenoid valve	OVERRUN/C S/V [ON/OFF]	—	X	• Control value of overrun clutch solenoid valve computed by control unit from each input signal is displayed.	
Self-diagnosis display lamp (SPORT mode indicator lamp)	POWER SFT LMP [ON/OFF]	—	X	• Control status of SPORT mode indicator lamp is displayed.	

X: Applicable
—: Not applicable

DATA ANALYSIS

Item	Display form	Meaning
Torque converter clutch solenoid valve duty	Approximately 4% ↓ Approximately 94%	Lock-up "OFF" ↓ Lock-up "ON"
Line pressure solenoid valve duty	Approximately 29% ↓ Approximately 94%	Low line-pressure (Small throttle opening) ↓ High line-pressure (Large throttle opening)
Throttle position sensor	Approximately 0.5V	Fully-closed throttle
	Approximately 4V	Fully-open throttle
A/T Fluid temperature sensor	Approximately 1.5V ↓ Approximately 0.5V	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]

Gear position	1	2	3	4
Shift solenoid valve A	ON	OFF	OFF	ON
Shift solenoid valve B	ON	ON	OFF	OFF

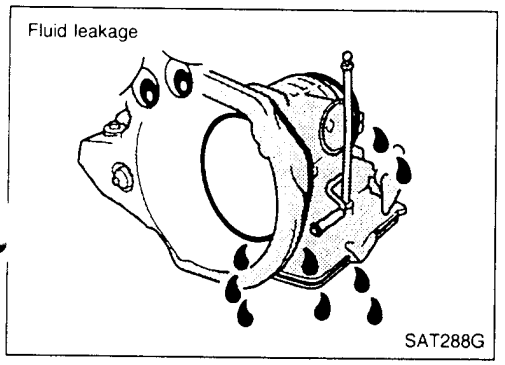


Preliminary Check

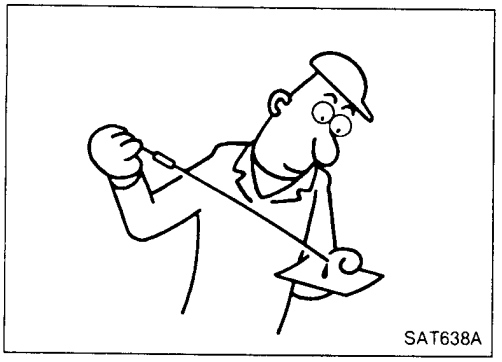
A/T FLUID CHECK

Fluid leakage check

1. Clean area suspected of leaking, — for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in "D" position and wait a few minutes.
3. Stop engine.



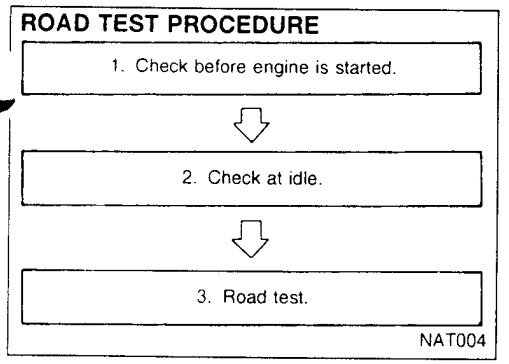
4. Check for fresh leakage.



Fluid condition check

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling — Overheating

Fluid level check — Refer to section MA (CHASSIS AND BODY MAINTENANCE)

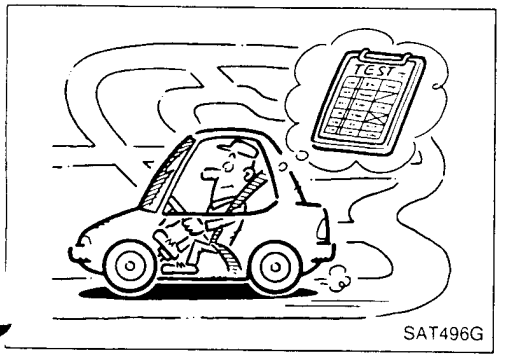


ROAD TEST

Description

- The purpose of this road test is to determine overall performance of automatic transaxle and analyze causes of problems.
- The road test consists of the following three parts:

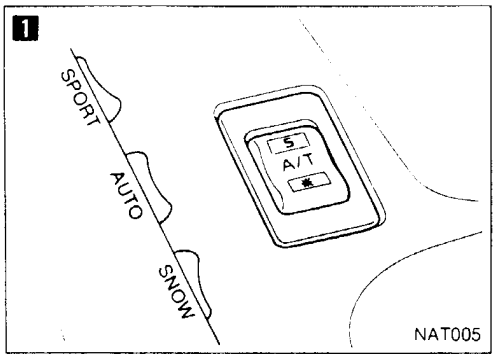
1. Check before engine is started
2. Check at idle
3. Road test



- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items. Troubleshoot items which check out No Good after road test. Refer to "Self-diagnosis" and "Diagnostic Procedure", AT-40, and AT-70.

Preliminary Check (Cont'd)

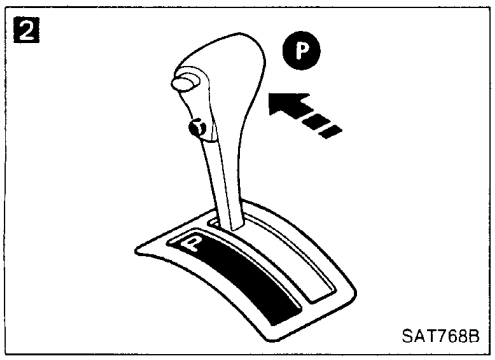
1. Check before engine is started



1. Park vehicle on flat surface.
2. Turn ignition switch to "LOCK" position.

1

Set A/T mode switch to "AUTO" position.



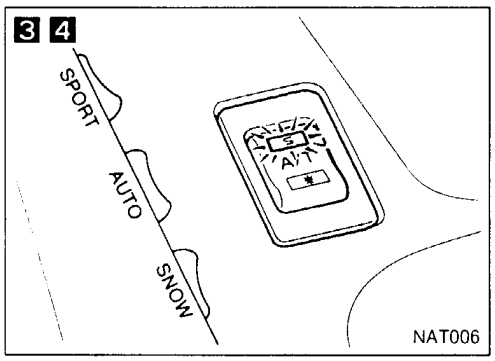
2

1. Move selector lever to "P" position.
2. Turn ignition switch to "ON" position.
   (Do not start engine.)

3

Does SPORT indicator lamp come on for about 2 seconds? — No → Go to Diagnostic Procedure 1, AT-70.

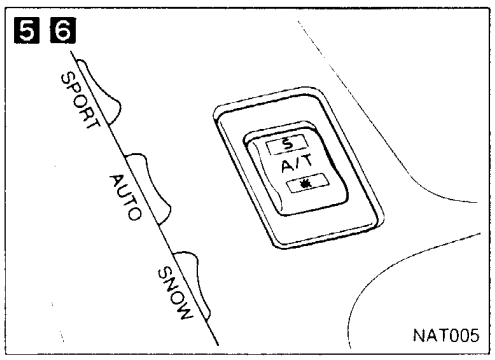
Yes



4

Does SPORT indicator lamp flash for about 8 seconds? — Yes → Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE, AT-40.

No



5

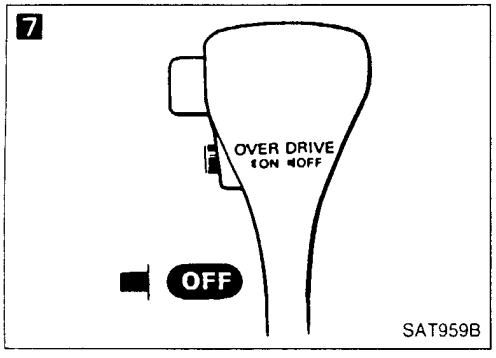
1. Set A/T mode switch to "SPORT" position.
2. Does SPORT indicator lamp come on? — No → Go to Diagnostic Procedure 2, AT-71.

Yes

6

1. Set A/T mode switch to "SNOW" position.
2. Does SNOW indicator lamp come on? — No → Go to Diagnostic Procedure 2, AT-71.

Yes



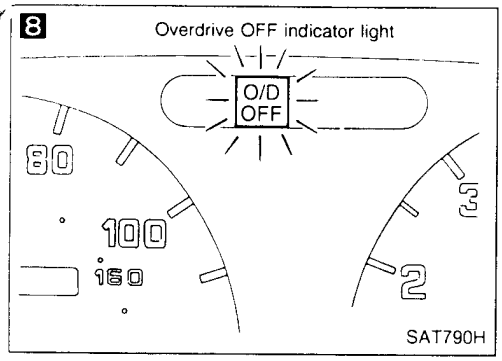
7

Set overdrive control switch to "OFF" position.

Ⓐ

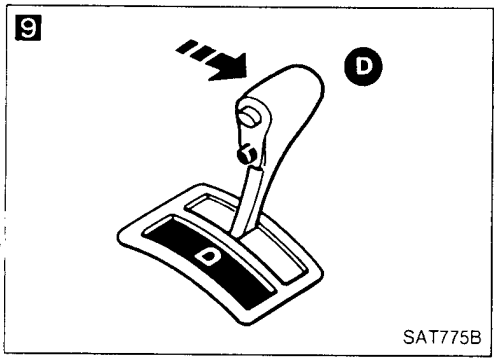
Preliminary Check (Cont'd)

8 Overdrive OFF indicator light



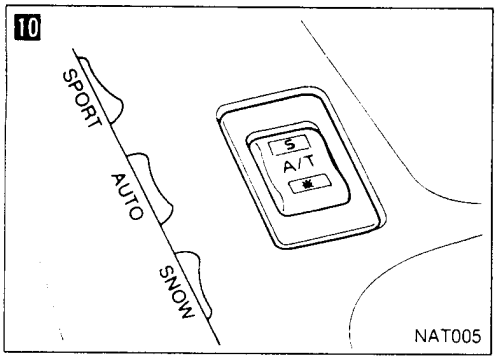
SAT790H

9



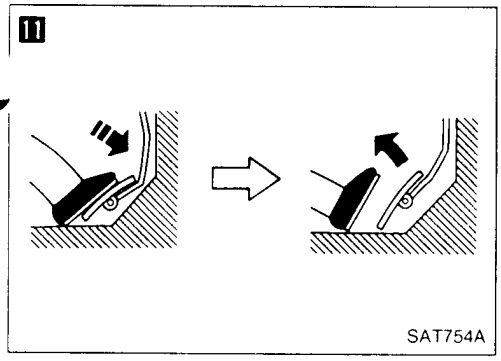
SAT775B

10



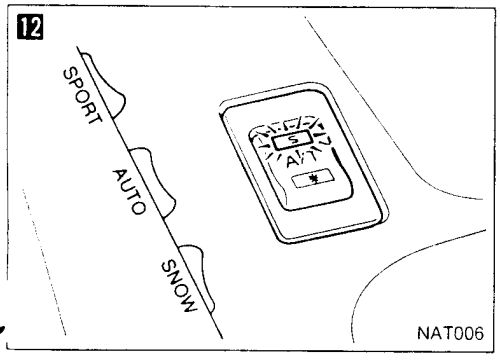
NAT005

11



SAT754A

12



NAT006

Ⓐ

8 Does O/D OFF indicator lamp come on?

No → Go to Diagnostic Procedure 3, AT-71.

Yes

9 Move selector lever to "D" position.

10 Set A/T mode switch to "AUTO" position.

11 Depress and release accelerator pedal quickly.

12 Does SPORT indicator lamp come on for about 3 seconds after accelerator pedal is depressed?

No → Go to Diagnostic Procedure 4, AT-71.

Yes

Turn ignition switch to "LOCK" position.

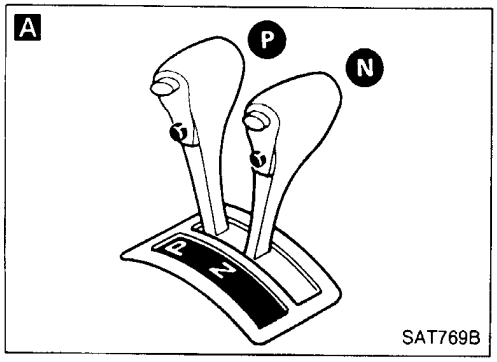
Perform self-diagnosis.
— Refer to SELF-DIAGNOSIS PROCEDURE and note NG items, AT-40.

Go to "ROAD TEST — Check at idle", AT-27.

Preliminary Check (Cont'd)

2. Check at idle

A



1. Park vehicle on flat surface.
2. Move selector lever to "P" position.
3. Turn ignition switch to "LOCK" position.
4. Turn ignition switch to "START" position.

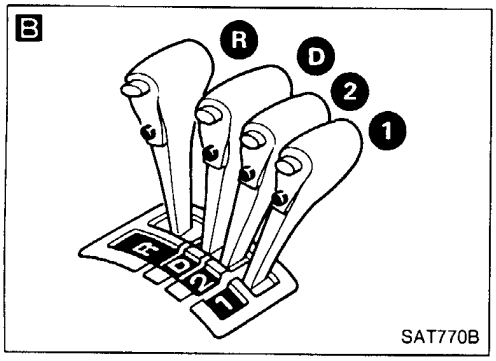
Does engine start?

No → Go to Diagnostic Procedure 5, AT-72.

Yes

Turn ignition switch to "ACC" position.

B



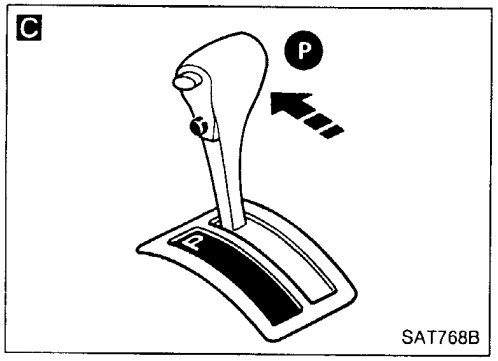
1. Move selector lever to "D", "1", "2" or "R" position.
2. Turn ignition switch to "START" position.

Does engine start?

Yes → Go to Diagnostic Procedure 5, AT-72.

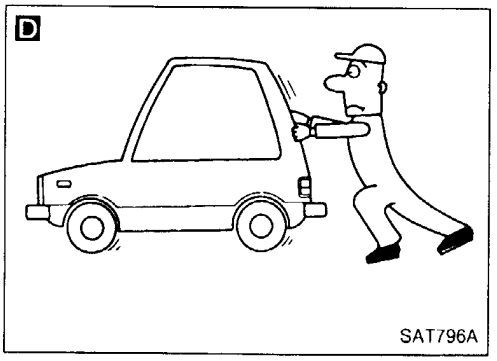
No

C



1. Move selector lever to "P" position.
2. Turn ignition switch to "LOCK" position.
3. Release parking brake.

D

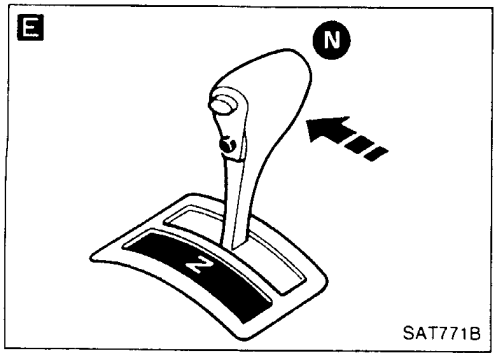


1. Push vehicle forward or backward.
2. Does vehicle move when it is pushed forward or backward?

Yes → Go to Diagnostic Procedure 6, AT-72.

No

E



1. Apply parking brake.
2. Move selector lever to "N" position.
3. Start engine.
4. Release parking brake.
5. Does vehicle move forward or backward?

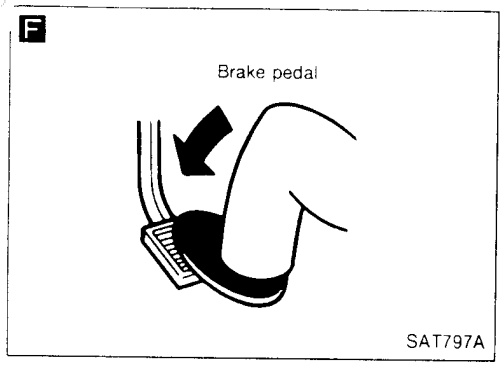
Yes → Go to Diagnostic Procedure 7, AT-73.

No

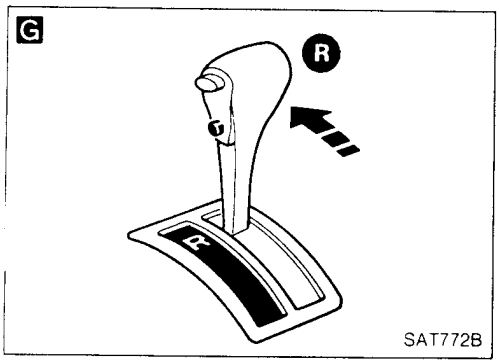
Ⓐ

Preliminary Check (Cont'd)

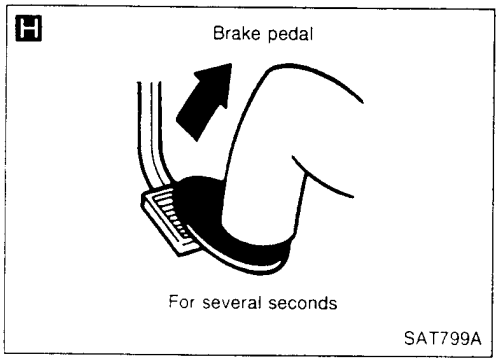
F



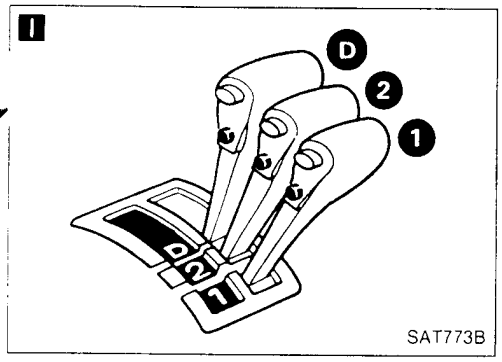
G



H



I



Ⓐ

F

Apply foot brake.

G

1. Move selector lever to "R" position.
2. Is there large shock when changing from "N" to "R" position?

No → Go to Diagnostic Procedure 8, AT-74.

Yes

H

1. Release foot brake for several seconds.
2. Does vehicle creep backward when foot brake is released?

No → Go to Diagnostic Procedure 9, AT-75.

Yes

I

1. Move selector lever to "D", "2" and "1" positions and check if vehicle creeps forward.
2. Does vehicle creep forward in all three ranges?

No → Go to Diagnostic Procedure 10, AT-76.

Yes

Go to Road test, AT-27.

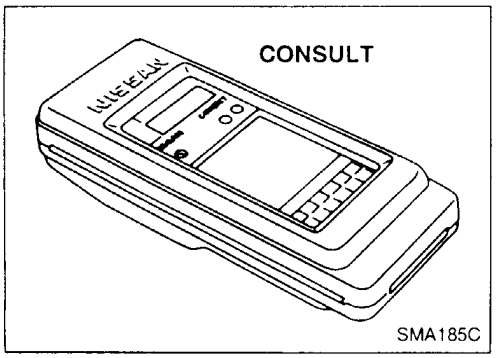
Preliminary Check (Cont'd)

3. Road test

- Check all items listed in Parts 1 through 3.

With CONSULT

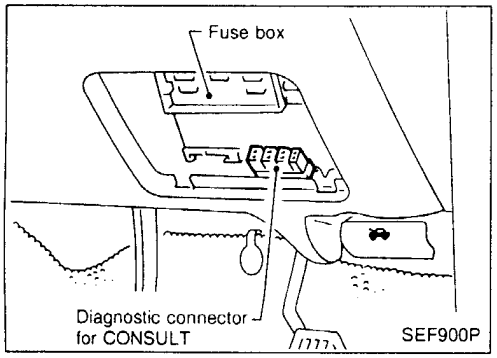
- Using CONSULT, carry out road test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per "Shift Schedule".



SMA185C

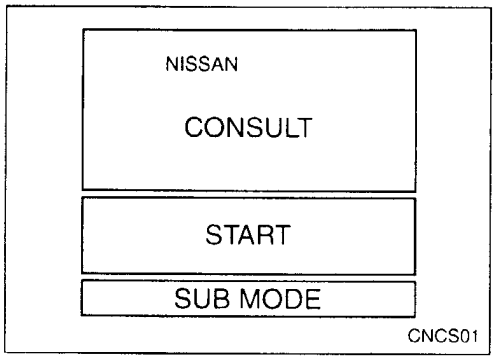
CONSULT setting procedure

1. Turn the ignition switch to the "LOCK" position.
2. Connect "CONSULT" to Data link connector for CONSULT.



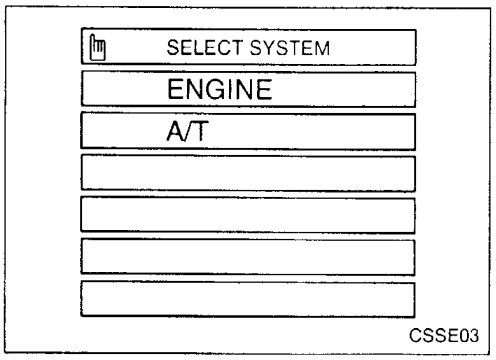
SEF900P

3. Turn the ignition switch to the "ON" position.
4. Touch "START".



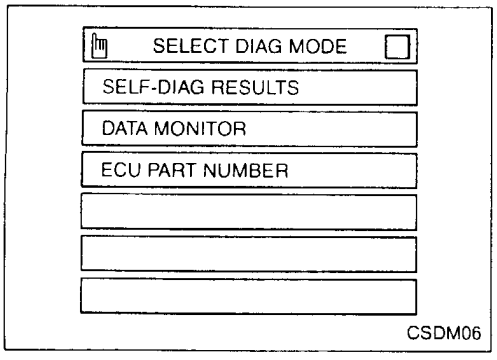
CNCS01

5. Touch "A/T".



CSSE03

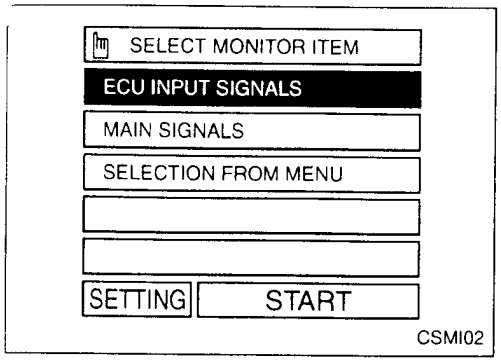
6. Touch "DATA MONITOR".



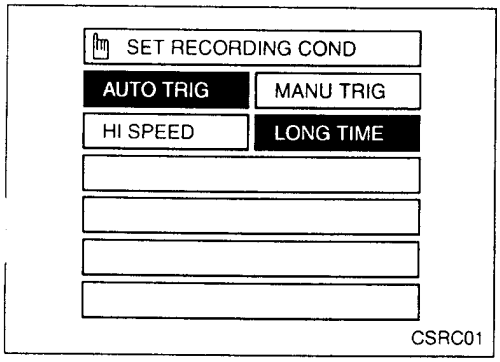
CSDM06

Preliminary Check (Cont'd)

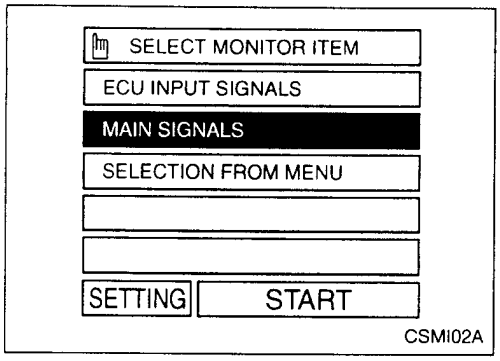
7. Touch "SETTING" to set recording condition.



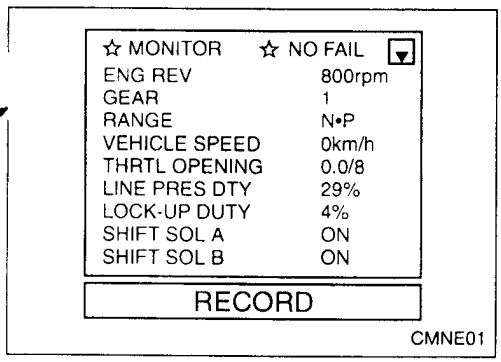
8. Touch "LONG TIME" and "ENTER" key.



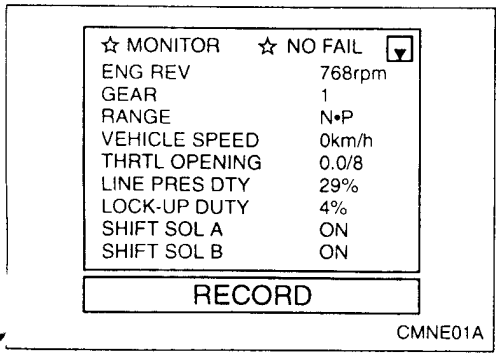
9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".
10. Touch "START".



11. When performing road test, touch "RECORD".

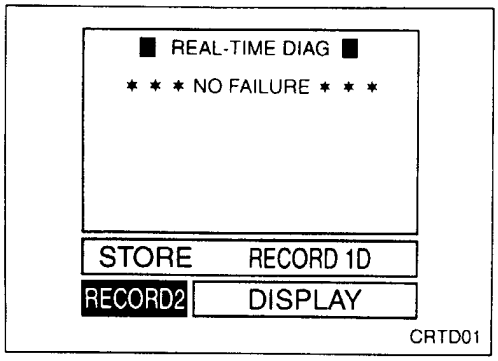


12. After finishing road test part 1, touch "STOP".

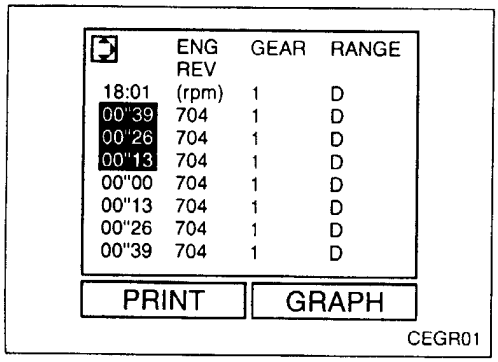


Preliminary Check (Cont'd)

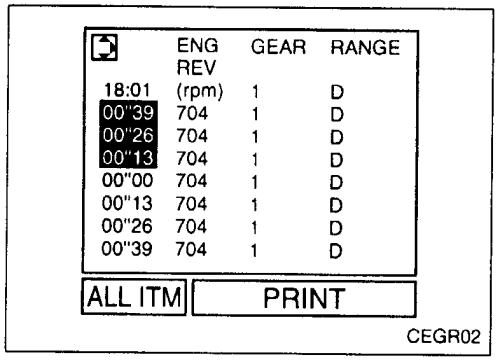
13. Touch "DISPLAY".



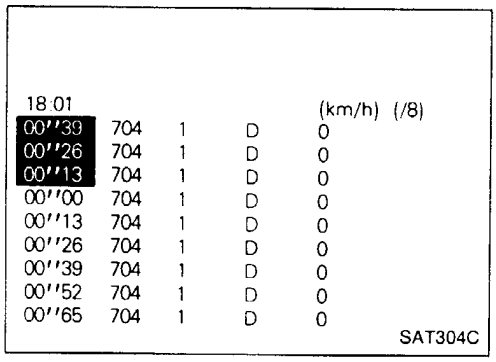
14. Touch "PRINT".



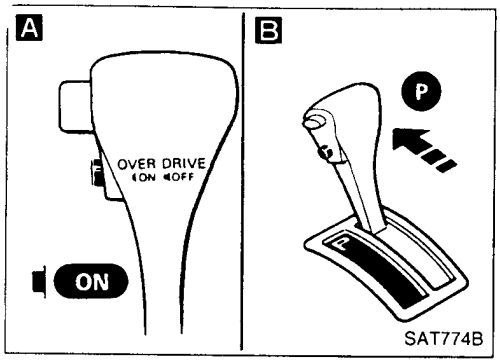
15. Touch "PRINT" again.

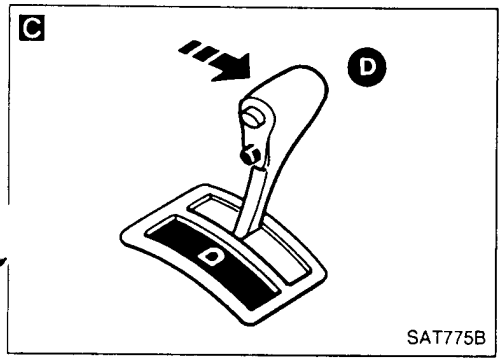


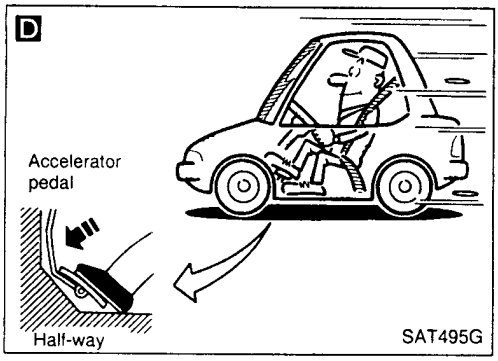
16. Check the monitor data printed out.
17. Continue road test part 2 and 3.

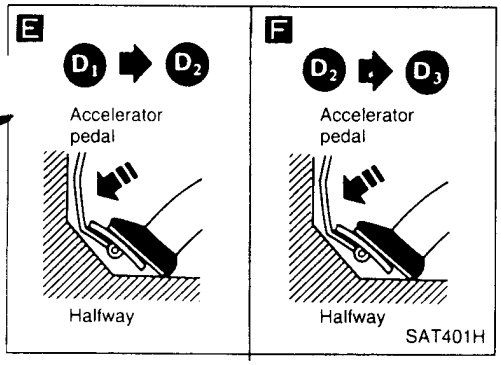


Preliminary Check (Cont'd)









Without CONSULT

- Throttle position can be controlled by voltage across terminals ㉞ and ㉟ of A/T control unit.

Road test — Part 1

1. Drive vehicle for about 10 minutes to warm engine oil and ATF up to operating temperature.
   ATF operating temperature:
   50 - 80°C (122 - 176°F)

↓

A B

1. Park vehicle on flat surface.
2. Set overdrive control switch to "ON" position.
3. Move selector lever to "P" position.
4. Start engine.

↓

C

Move selector lever to "D" position.

↓

D

Accelerate vehicle by slowly and constantly depressing accelerator pedal halfway.

↓

Does vehicle start from D_1?
Read gear position.
No → Go to Diagnostic Procedure 11, AT-77.

Yes ↓

E

Does A/T shift from D_1 to D_2 at the specified speed?
Read gear position, throttle opening and vehicle speed.
Specified speed when shifting from D_1 to D_2:
Refer to Shift schedule, AT-31.
No → Go to Diagnostic Procedure 12, AT-78.

Yes ↓

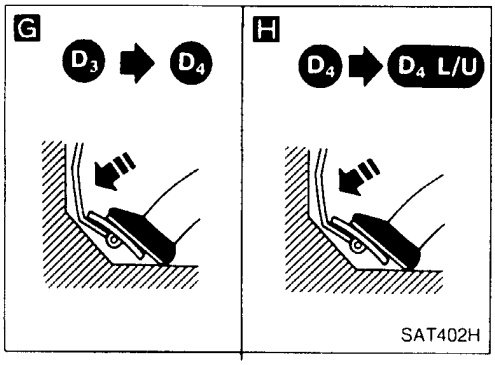
F

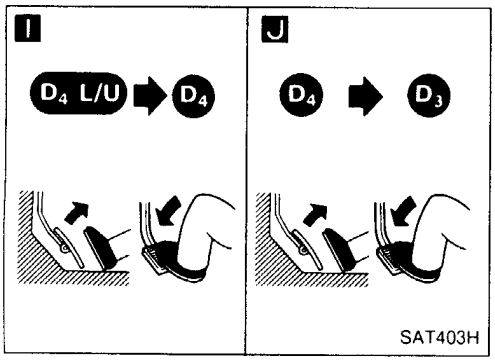
Does A/T shift from D_2 to D_3 at the specified speed?
Read gear position, throttle position and vehicle speed.
Specified speed when shifting from D_2 to D_3:
Refer to Shift schedule, AT-31.
No → Go to Diagnostic Procedure 13, AT-79.

Yes ↓

Ⓐ

Preliminary Check (Cont'd)





Ⓐ

G

Does A/T shift from D_3 to D_4 at the specified speed?

Read gear position, throttle position and vehicle speed.

Specified speed when shifting from D_3 to D_4:

Refer to Shift schedule, AT-31.

No → Go to Diagnostic Procedure 14, AT-80.

Yes

H

Does A/T perform lock-up at the specified speed?

Read vehicle speed, throttle position when torque converter clutch solenoid valve duty becomes 94%.

Specified speed when lock-up occurs:

Refer to Shift schedule, AT-31.

No → Go to Diagnostic Procedure 15, AT-81.

Yes

Does A/T hold lock-up condition for more than 30 seconds?

No → Go to Diagnostic Procedure 16, AT-82.

Yes

I

1. Release accelerator pedal and lightly apply foot brake.
2. Is lock-up released when accelerator pedal is released and foot brake is applied?

Read torque converter clutch solenoid valve duty 94% → 4%.

No → Go to Diagnostic Procedure 17, AT-82.

Yes

J

1. Decelerate vehicle by applying foot brake lightly.
2. Does engine speed return to idle smoothly when A/T is shifted from D_4 to D_3?

Read gear position and engine speed.

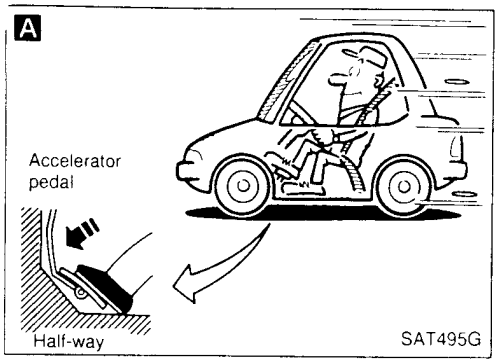
No → Go to Diagnostic Procedure 18, AT-83.

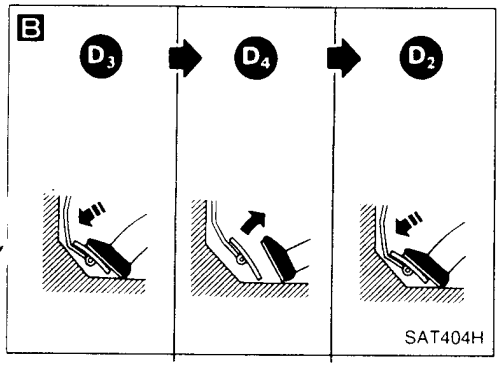
Yes

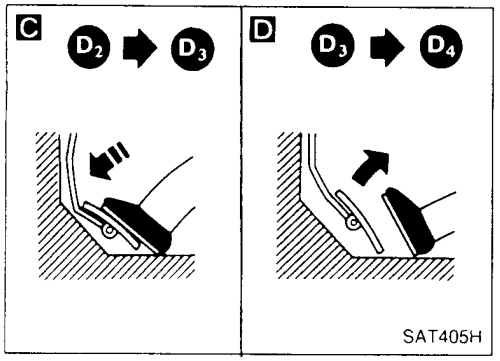
1. Stop vehicle.
2. Go to "Road test — Part 2", AT-29.

Preliminary Check (Cont'd)

Road test — Part 2







1. Confirm overdrive control switch is in "ON" position.
2. Confirm selector lever is in "D" position.

↓

A

1. Accelerate vehicle by half throttle again.
2. Does vehicle start from D_1?

Read gear position.

No → Go to Diagnostic Procedure 18, AT-83.

↓ Yes

B

1. Accelerate vehicle to 80 km/h (50 mph).
2. Release accelerator pedal and then quickly depress it fully.
3. Does A/T shift from D_4 to D_2 as soon as accelerator pedal is depressed fully?

Read gear position and throttle position.

No → Go to Diagnostic Procedure 12, AT-78.

↓ Yes

C

Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle position and vehicle speed.
Specified speed when shifting from D_2 to D_3:
Refer to Shift schedule, AT-31.

No → Go to Diagnostic Procedure 13, AT-79.

↓ Yes

D

1. Release accelerator pedal after shifting from D_2 to D_3.
2. Does A/T shift from D_3 to D_4 and does vehicle decelerate by engine brake?

Read gear position, throttle position and vehicle speed.

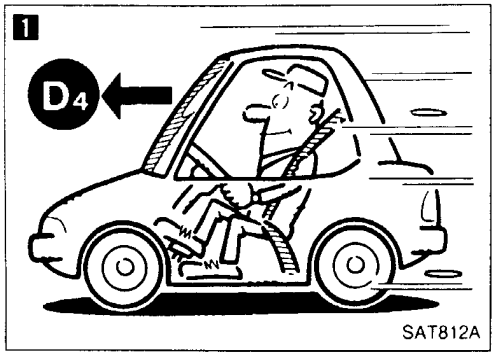
No → Go to Diagnostic Procedure 14, AT-80.

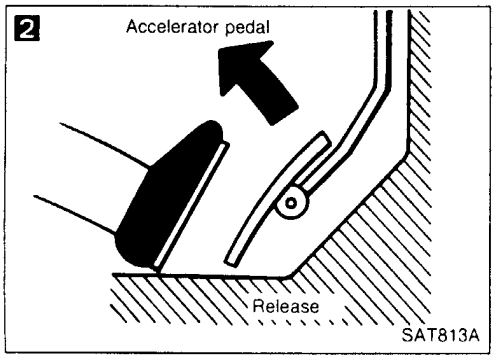
↓ Yes

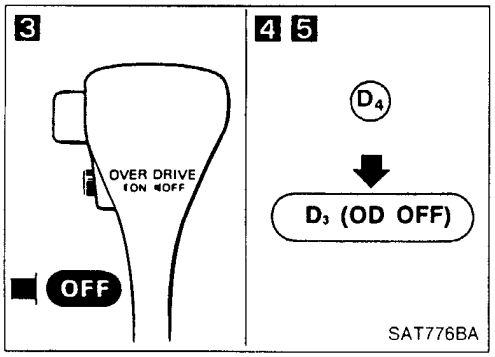
1. Stop vehicle.
2. Go to "Road test — Part 3", AT-30.

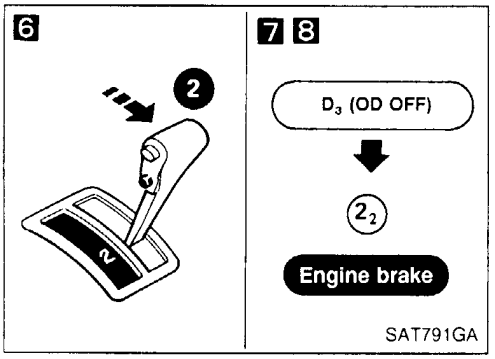
Preliminary Check (Cont'd)

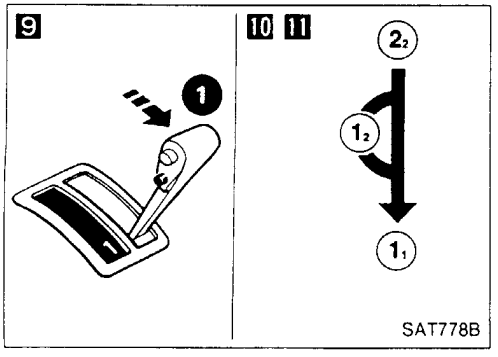
Cruise test — Part 3











1. Confirm overdrive control switch is in "ON" position.
2. Confirm selector lever is in "D" position.

1 Accelerate vehicle using half-throttle to D_4.

2 Release accelerator pedal.

3 Set overdrive control switch to "OFF" position while driving in D_4 position.

4 Does A/T shift from D_4 to D_3? **Read gear position and vehicle speed.** — No → Go to Diagnostic Procedure 20, AT-84.

Yes

5 Does vehicle decelerate by engine brake? — No → Go to Diagnostic Procedure 18, AT-83.

Yes

6 Move selector lever from "D" to "2" position while driving in D_3.

7 Does A/T shift from D_3 to 2_2? **Read gear position.** — No → Go to Diagnostic Procedure 18, AT-83.

Yes

8 Does vehicle decelerate by engine brake? — No → Go to Diagnostic Procedure 18, AT-83.

Yes

9 **10**
1. Move selector lever from "2" to "1" position while driving in 2_2.
2. Does A/T shift from 2_2 to 1_1 position? **Read gear position.** — No → Go to Diagnostic Procedure 18, AT-83.

Yes

11 Does vehicle decelerate by engine brake? — No → Go to Diagnostic Procedure 18, AT-83.

Yes

1. Stop vehicle.
2. Perform self-diagnosis. — Refer to SELF-DIAGNOSTIC PROCEDURE, AT-40.

Shift Schedule

Vehicle speed when shifting gears

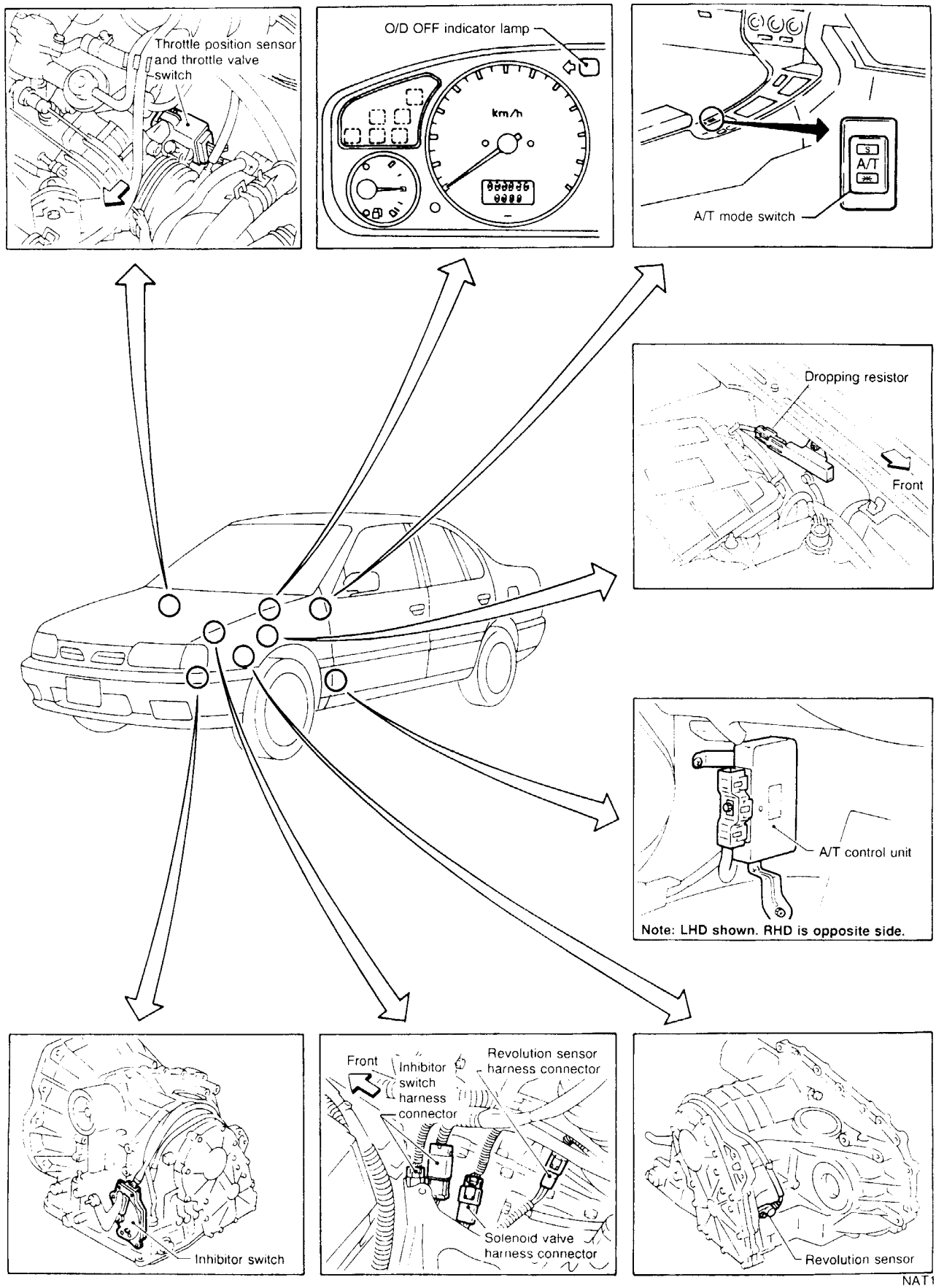
Throttle position	Shift pattern	Vehicle speed km/h (mph)					
		$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$
Full throttle	Auto (Normal)	49 - 57 (30 - -35)	93 - 101 (58 - 63)	148 - 156 (92 - 97)	144 - 152 (89 - 94)	83 - 91 (52 - 57)	41 - 49 (27 - 29)
	Sport	49 - 57 (32 - 34)	93 - 101 (58 - 63)	148 - 156 (92 - 97)	144 - 152 (89 - 94)	83 - 91 (52 - 57)	41 - 49 (27 - 29)
Half throttle	Auto (Normal)	25 - 33 (16 - 21)	54 - 62 (34 - 39)	90 - 98 (56 - 61)	70 - 78 (43 - 48)	34 - 42 (21 - 26)	9 - 17 (7 - 9)
	Sport	33 - 41 (21 - 25)	69 - 77 (40 - 45)	110 - 118 (68 - 73)	79 - 87 (49 - 54)	35 - 43 (22 - 27)	9 - 17 (7 - 9)

Vehicle speed when performing lock-up

Throttle position	Overdrive control switch (Shift position)	Shift pattern	Vehicle speed km/h (MPH)	
			Lock-up "ON"	Lock-up "OFF"
2/8	ON [D_4]	Auto (Normal)	79 - 87 (49 - 54)	61 - 69 (38 - 43)
		Sport	79 - 87 (49 - 54)	61 - 69 (38 - 43)
	OFF [D_3]	Auto (Normal)	96 - 104 (60 - 65)	93 - 101 (58 - 63)
		Sport	96 - 104 (60 - 65)	93 - 101 (58 - 63)

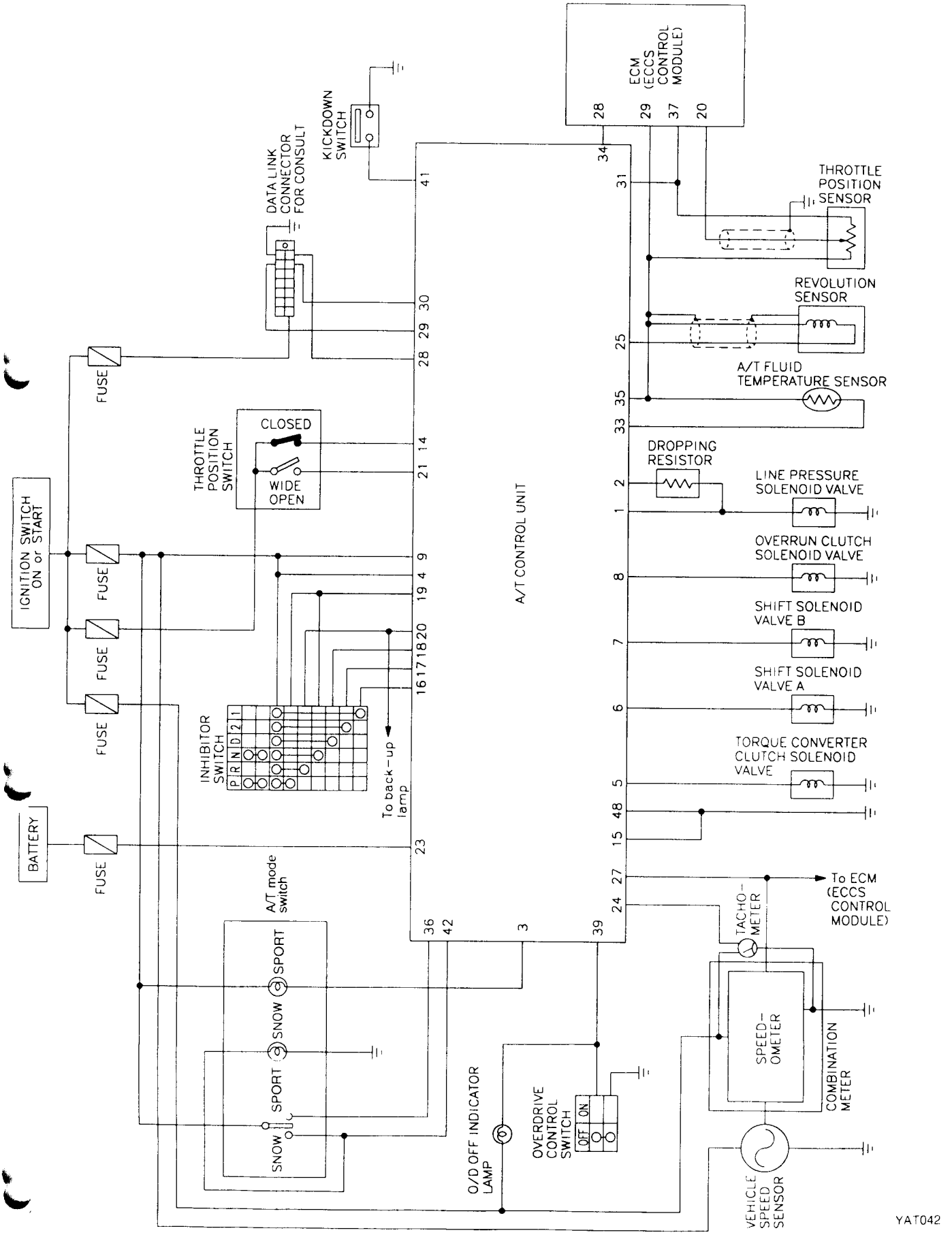
Note:
- Make sure that lock-up is released under the following conditions:
  - Throttle opening 0/8
  - Vehicle speed is less than 120 km/h (75 mph)
- Perform lock-up inspection after warming up engine.
- Lock-up vehicle speed may vary depending on the driving conditions and circumstances.

A/T Electrical Parts Location



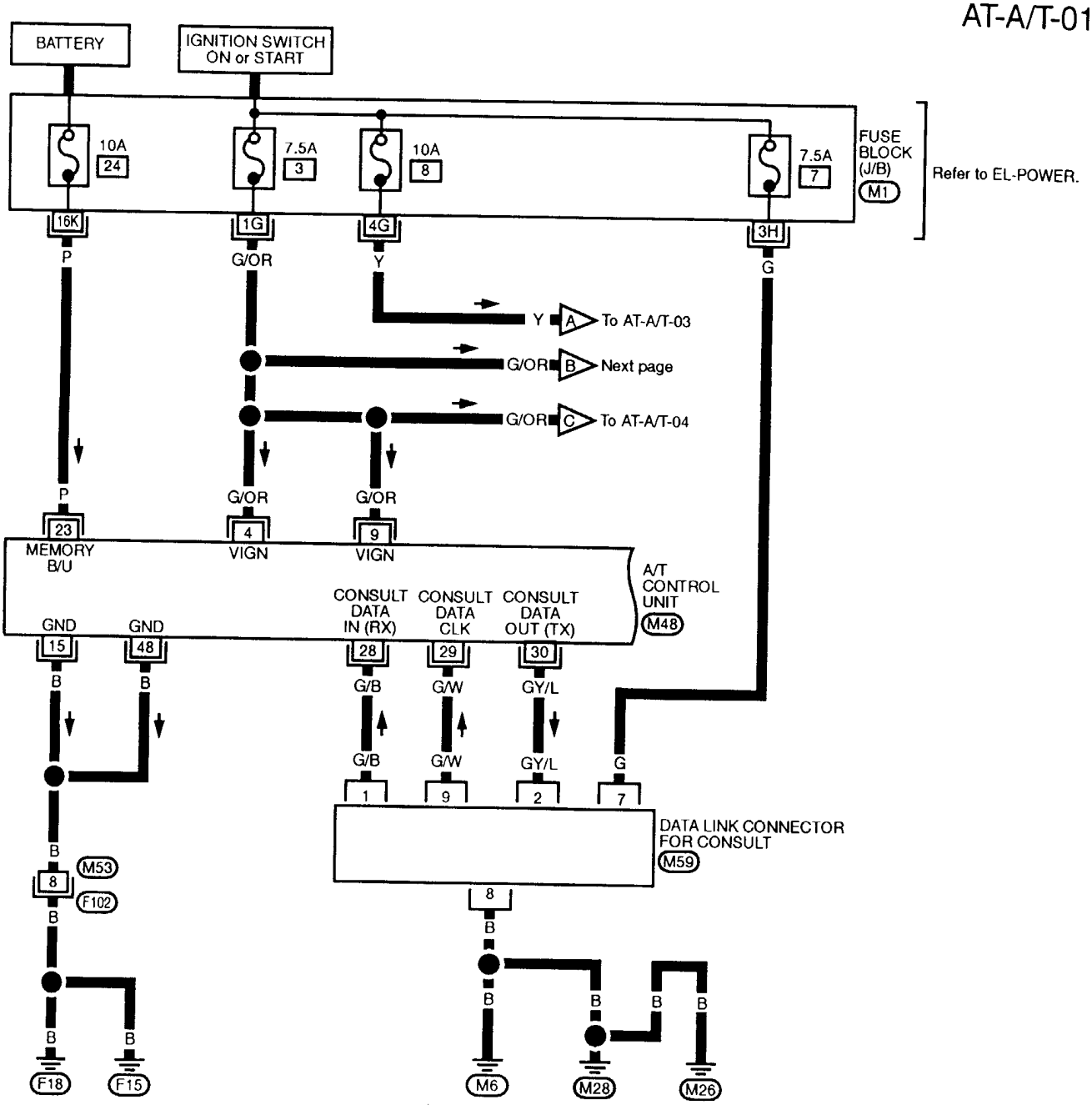
NAT16

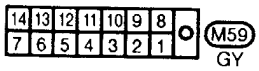
Circuit Diagram for Quick Pinpoint Check

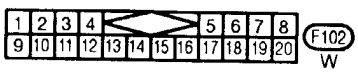


Wiring Diagram — AT —

AT-A/T-01





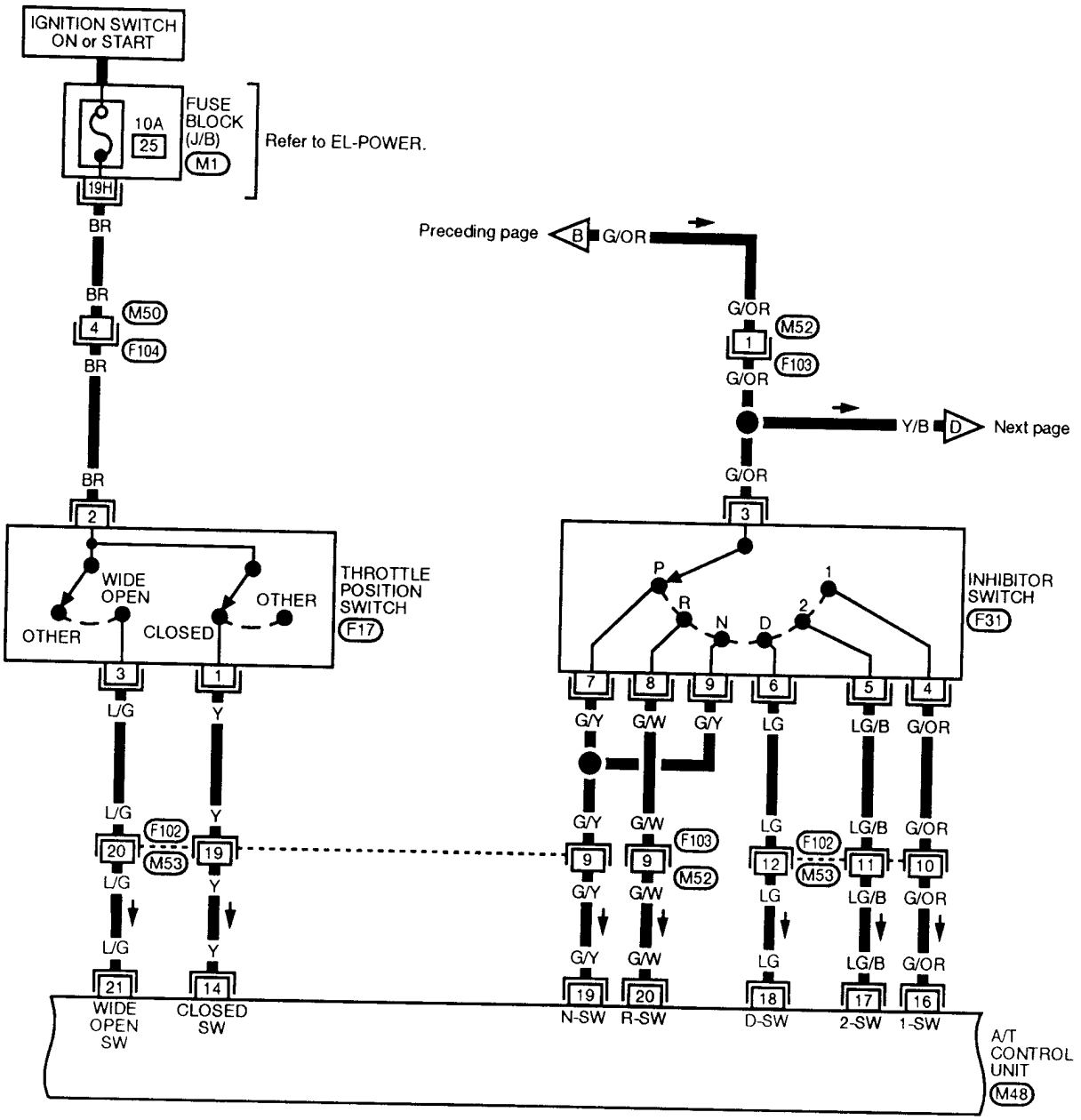


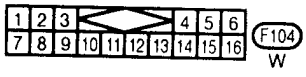
Refer to last page (Foldout page).
M1
M48

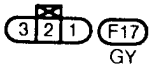
YAT036

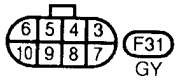
Wiring Diagram — AT — (Cont'd)

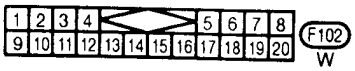
AT-A/T-02

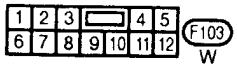












Refer to last page (Foldout page).

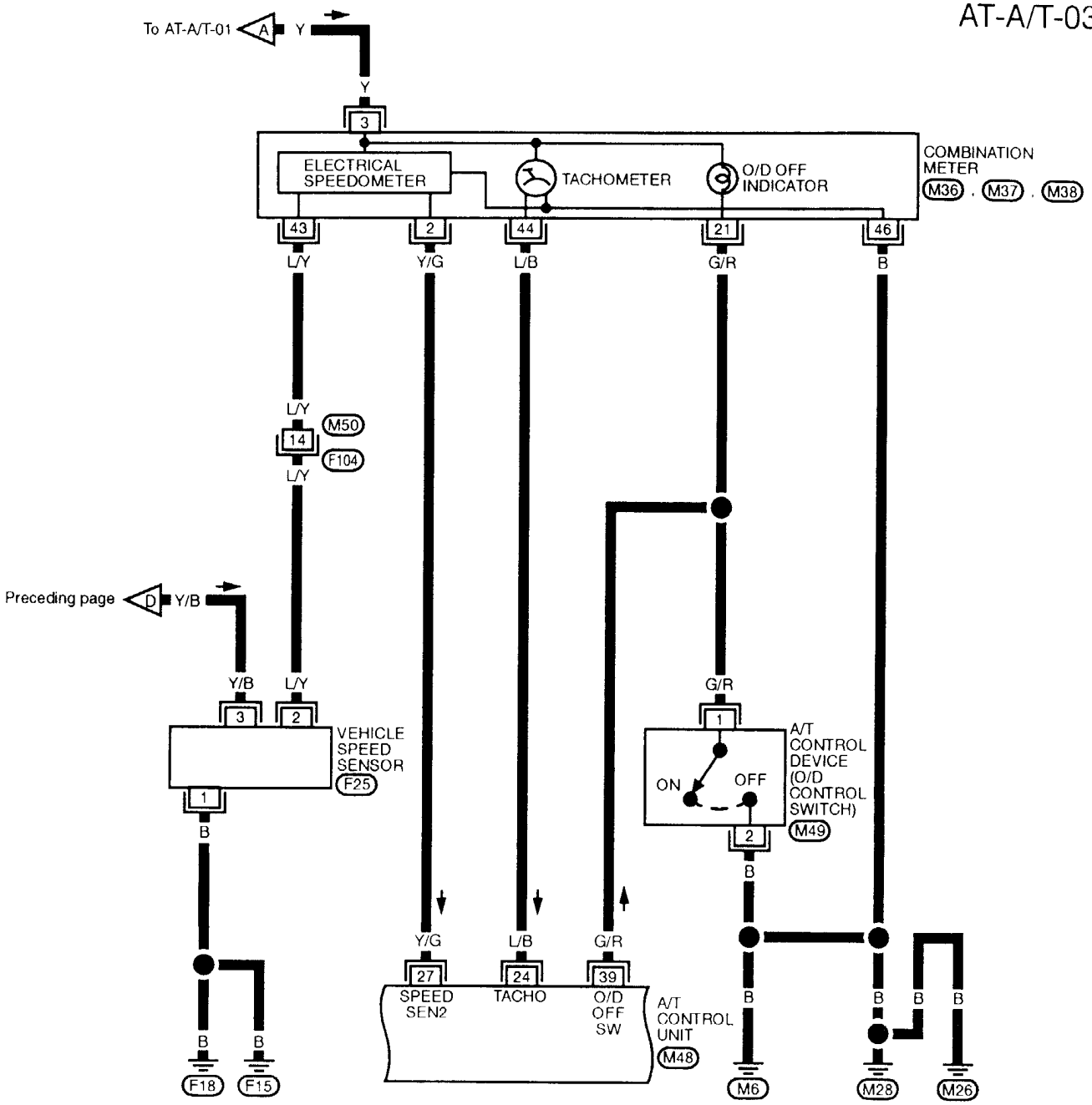
M1

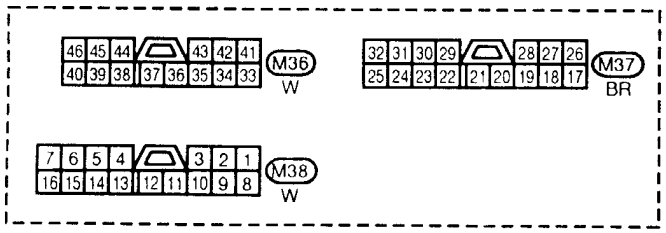
M48

YAT037

Wiring Diagram — AT — (Cont'd)

AT-A/T-03





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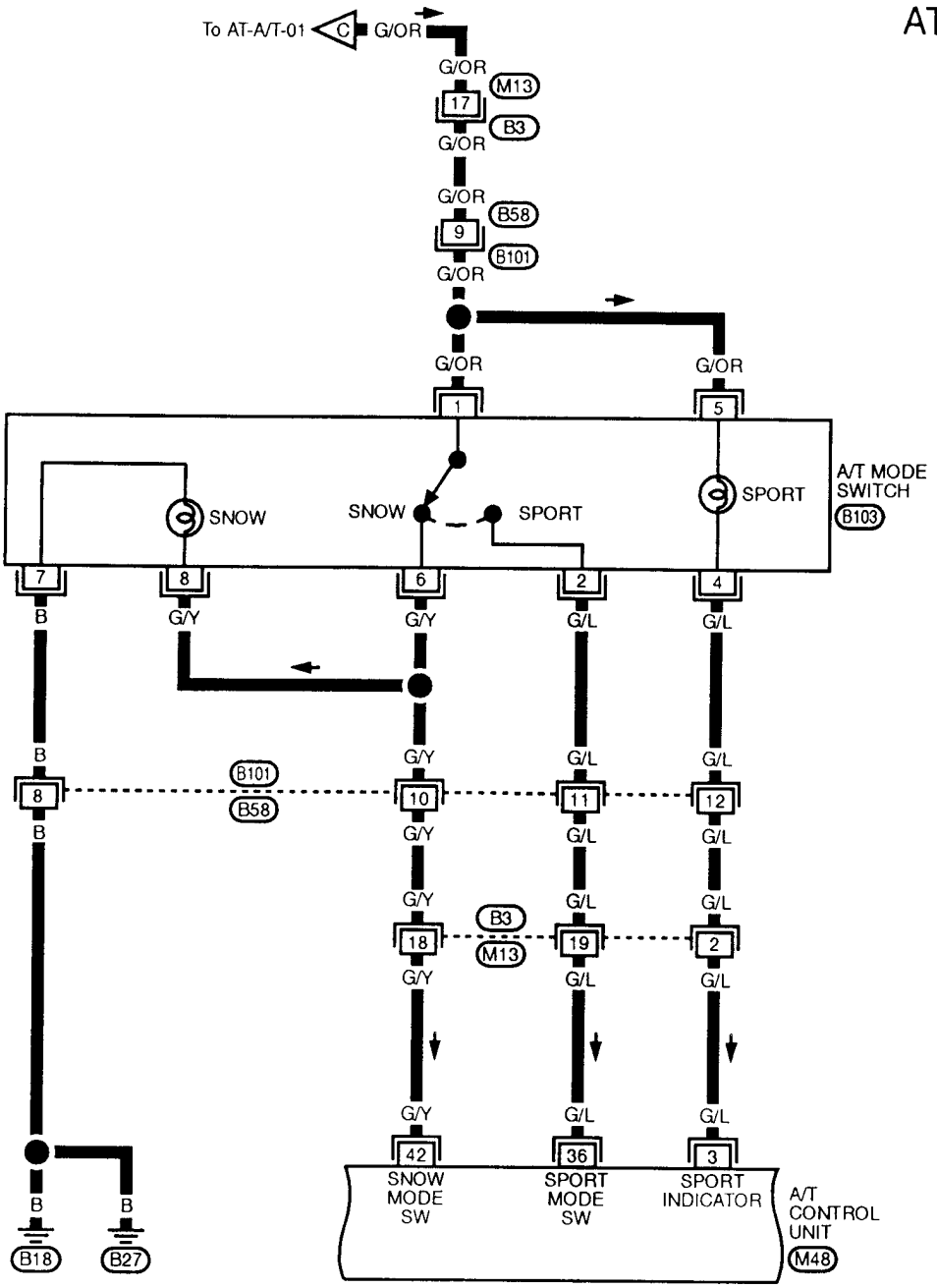
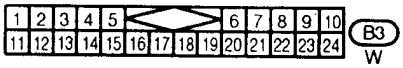
M48

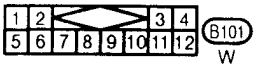
YAT03

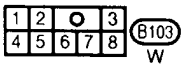
Wiring Diagram — AT — (Cont'd)

AT-A/T-04









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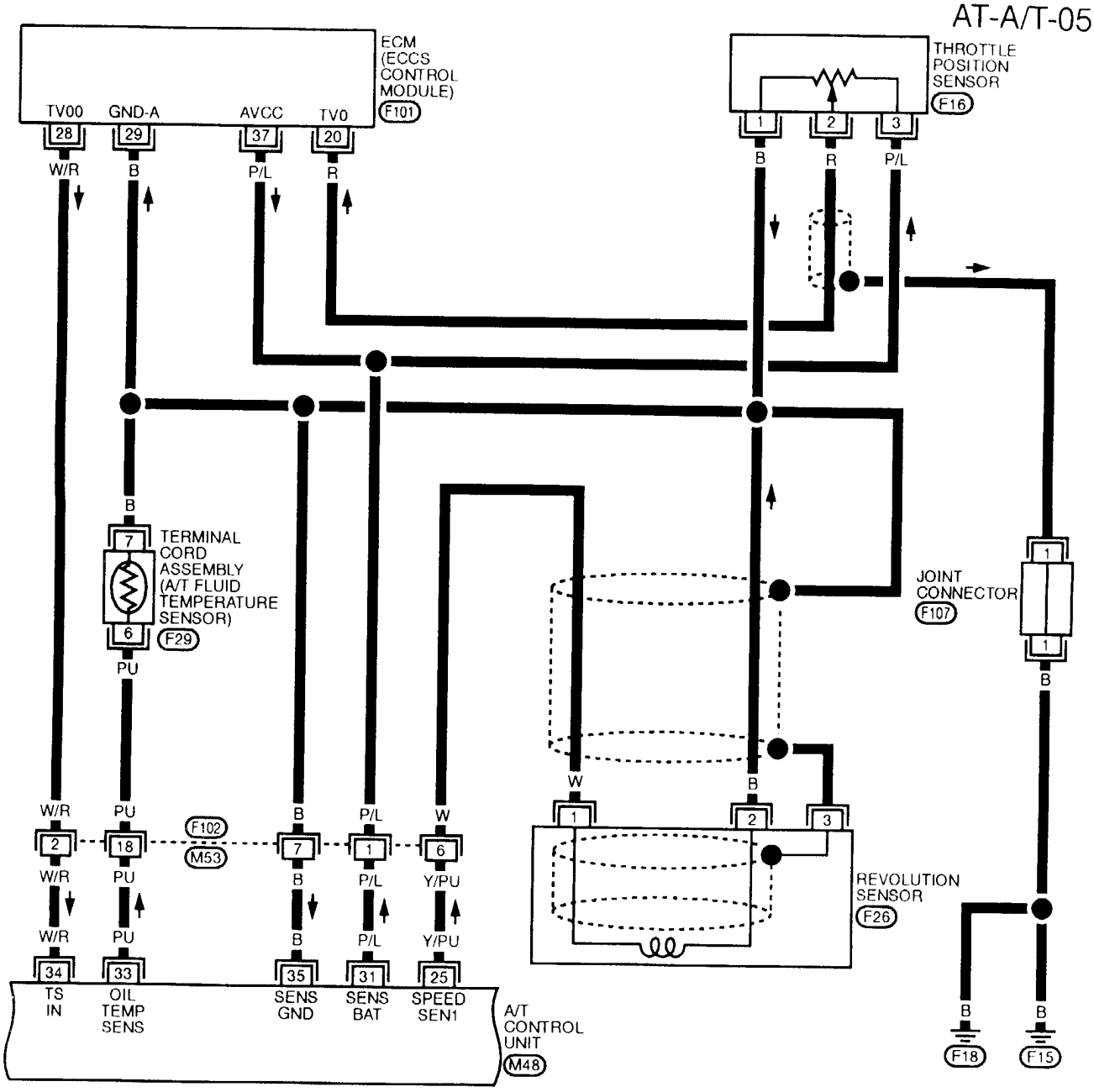
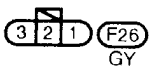
M48

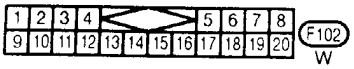
YAT039

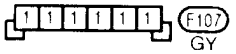
Wiring Diagram — AT — (Cont'd)

AT-A/T-05









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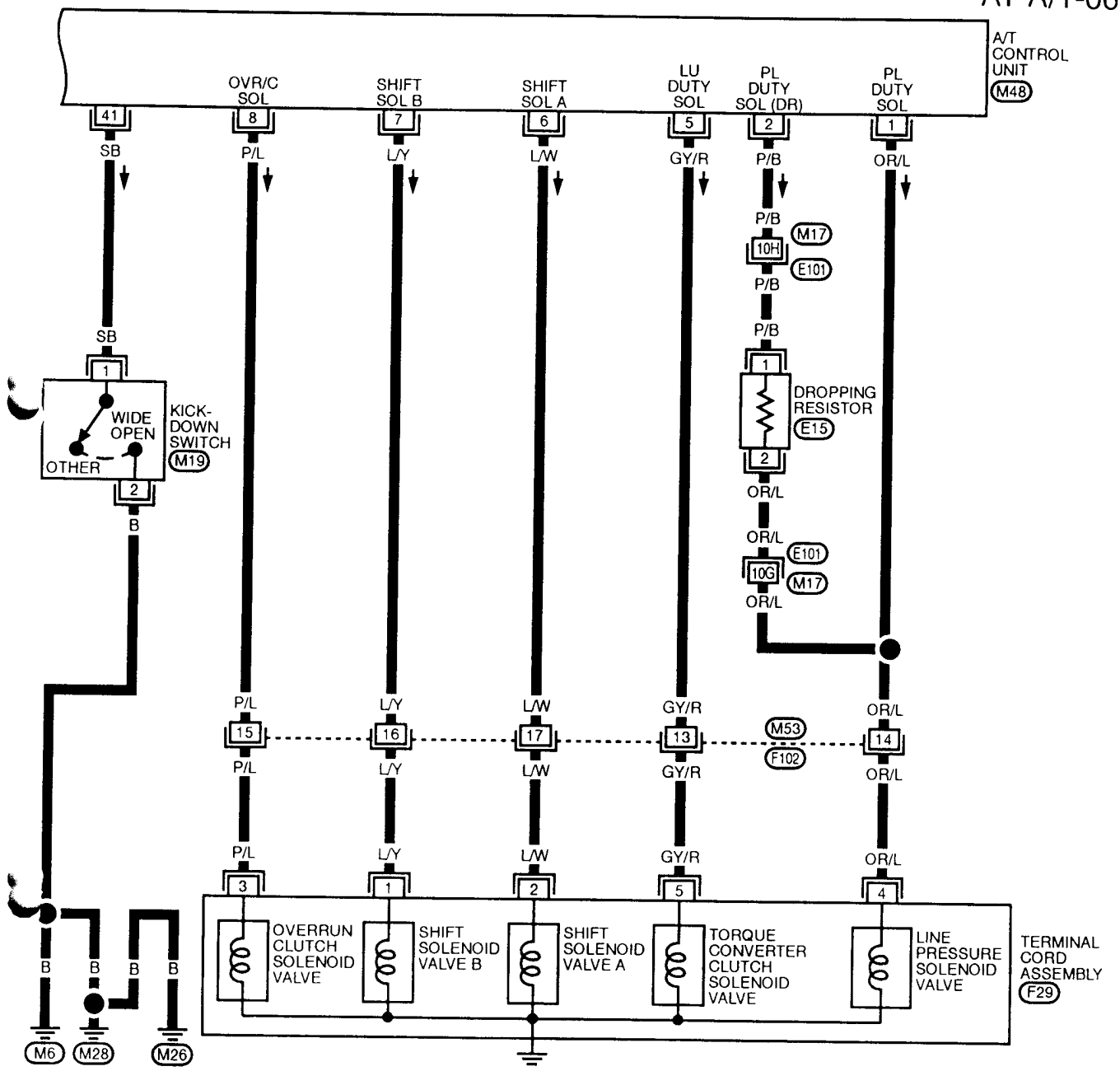
M48
F101

YAT040

Wiring Diagram — AT — (Cont'd)

AT-A/T-06



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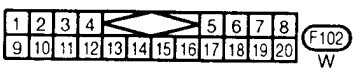
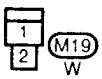
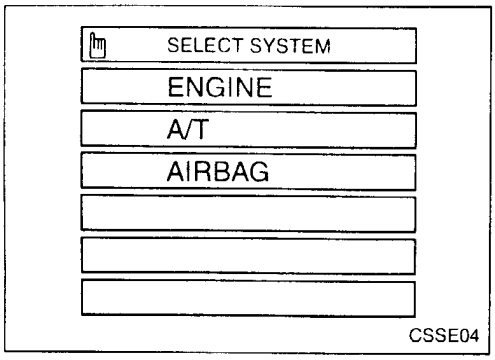
M17 , E101
M48





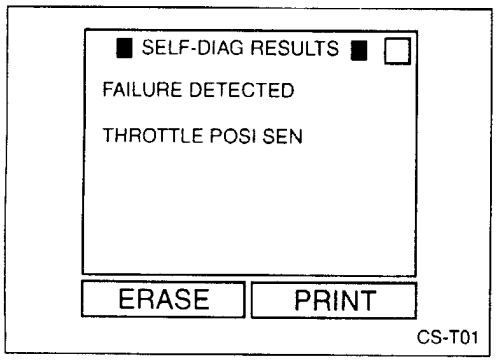
YAT041



Self-diagnosis

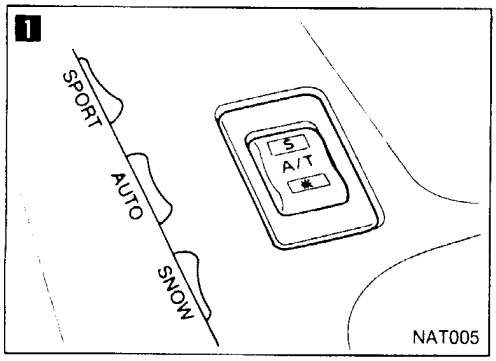
SELF-DIAGNOSTIC PROCEDURE
(With CONSULT)

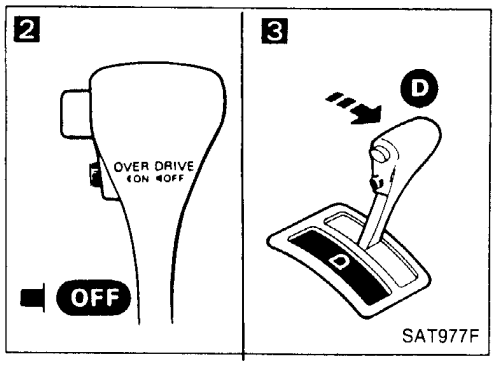
1. Turn on CONSULT.
2. Touch "A/T".

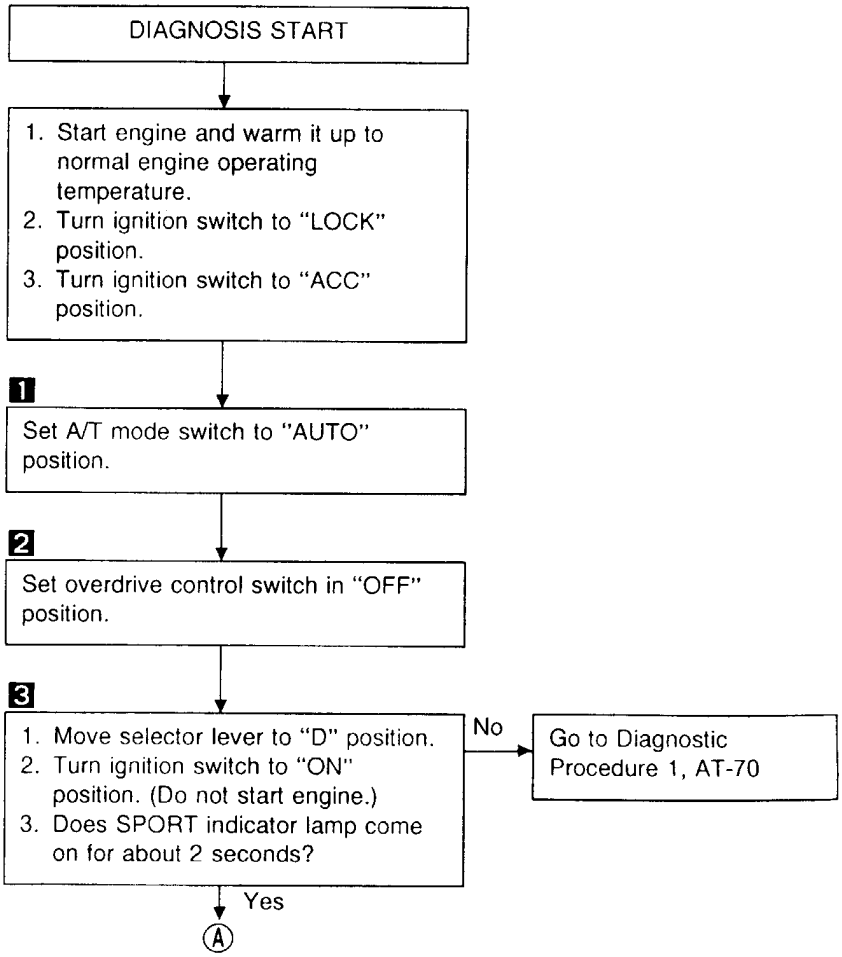


3. Touch "SELF-DIAG RESULTS".
   CONSULT performs REAL-TIME SELF-DIAGNOSIS.

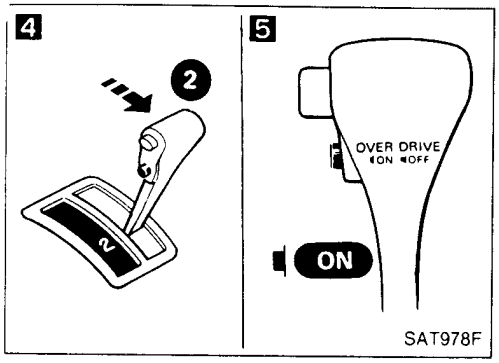
SELF-DIAGNOSTIC PROCEDURE
(Without CONSULT)

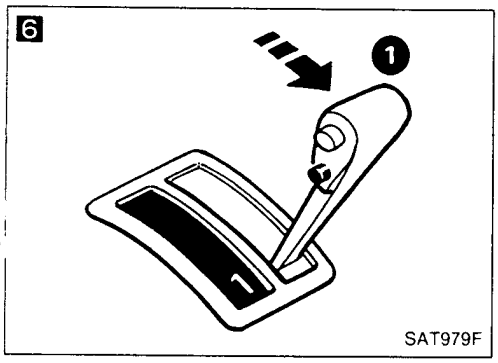


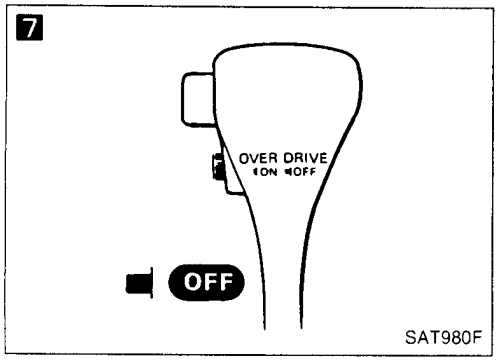


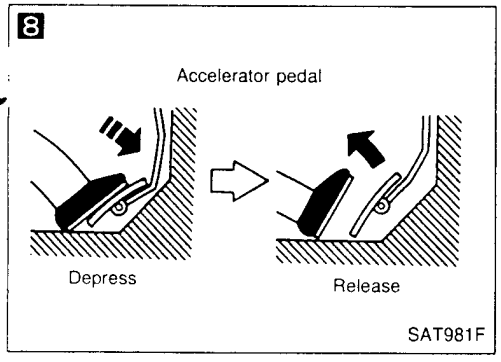


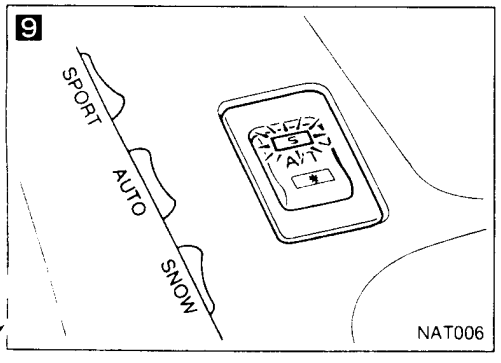
Self-diagnosis (Cont'd)











Ⓐ

4 5

1. Move selector lever to "2" position.
2. Set overdrive control switch in "ON" position.

6

1. Move selector lever to "1" position.

7

Set overdrive control switch in "OFF" position.

8

Depress accelerator pedal fully and release it.

9

Check power indicator lamp.
Refer to JUDGEMENT OF SELF-DIAGNOSIS CODE on next page.

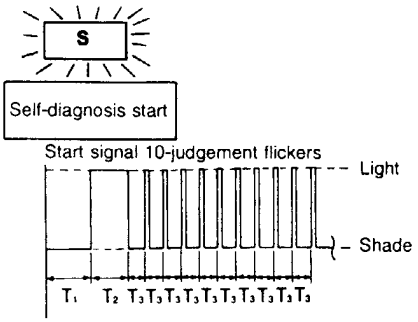
DIAGNOSIS END

Self-diagnosis (Cont'd)

JUDGEMENT OF SELF-DIAGNOSIS CODE

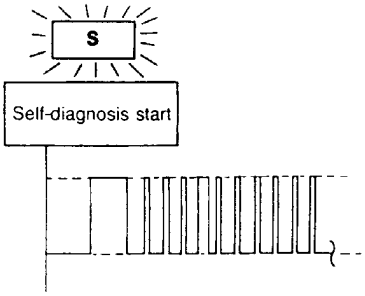
SPORT indicator lamp

All judgement flickers are same.



All circuits that can be confirmed by self-diagnosis are normal. NAT068

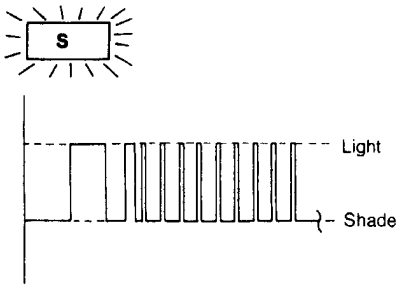
4th jugdement flicker is longer than others.



Shift solenoid valve A circuit is short-circuited or disconnected

➡ **Go to SHIFT SOLENOID VALVE A CIRCUIT CHECK, AT-51.** NAT072

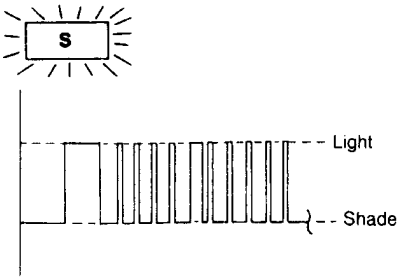
1st judgement flicker is longer than others.



Revolution sensor circuit is short-circuited or disconnected.

➡ **Go to REVOLUTION SENSOR CIRCUIT CHECK, AT-45.** NAT069

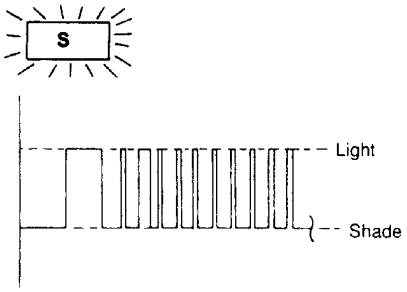
5th judgement flicker is longer than others.



Shift solenoid valve B circuit is short-circuited or disconnected.

➡ **Go to SHIFT SOLENOID VALVE B CIRCUIT CHECK, AT-53.** NAT073

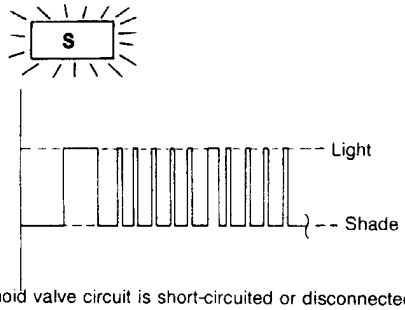
2nd judgement flicker is longer than others.



Vehicle speed sensor circuit is short-circuited or disconnected.

➡ **Go to VEHICLE SPEED SENSOR CIRCUIT CHECK, AT-47.** NAT070

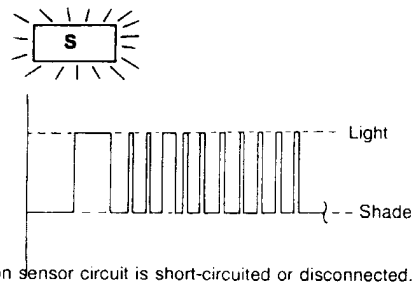
6th judgement flicker is longer than others.



Overrun clutch solenoid valve circuit is short-circuited or disconnected.

➡ **Go to OVERRUN CLUTCH SOLENOID VALVE CIRCUIT CHECK, AT-55.** NAT074

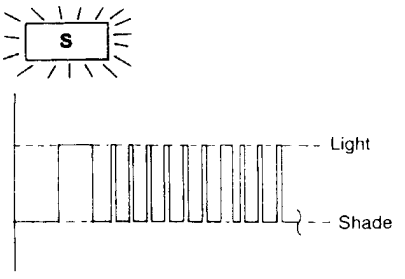
3rd judgement flicker is longer than others:



Throttle position sensor circuit is short-circuited or disconnected.

➡ **Go to THROTTLE SPEED SENSOR CIRCUIT CHECK, AT-49.** NAT071

7th judgement flicker is longer than others.



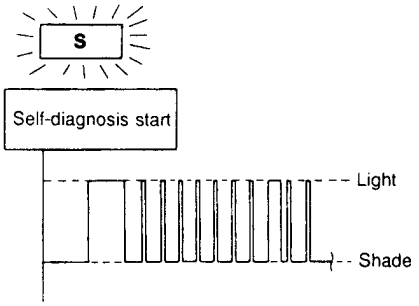
Torque converter clutch solenoid valve circuit is short-circuited or disconnected.

➡ **Go to TORQUE CONVERTER CLUTCH SOLENOID VALVE CIRCUIT CHECK, AT-57.** NAT075

t_1 = 2.5 seconds t_2 = 2.0 seconds t_3 = 1.0 second

SPORT indicator lamp

8th judgement flicker is longer than others.

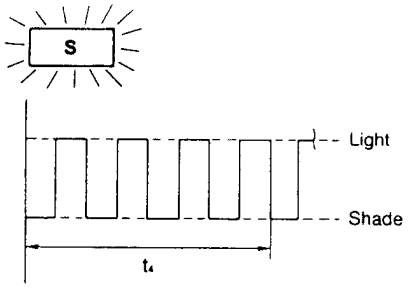


Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.

➡ **Go to A/T FLUID TEMPERATURE SENSOR AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS, AT-59.**

NAT076

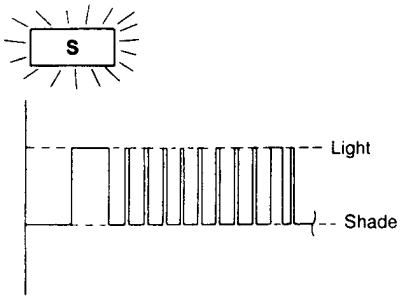
Flickers as shown below.



Battery power is low.
Battery has been disconnected for a long time.
Battery is connected conversely.
(When reconnecting A/T control unit connectors. — This is not a problem.)

NAT079

9th judgement flicker is longer than others

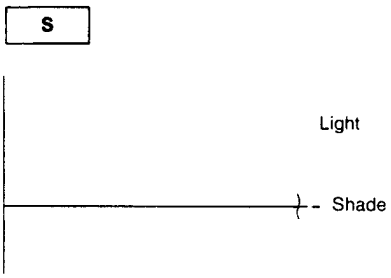


Engine speed signal circuit is short-circuited or disconnected.

➡ **Go to ENGINE SPEED SIGNAL CIRCUIT CHECK, AT-62.**

NAT077

Does not come on.

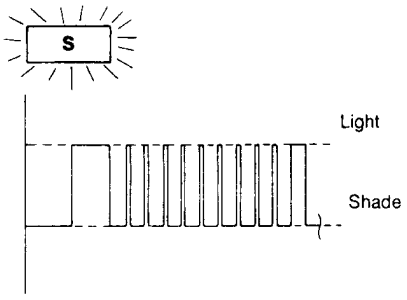


Inhibitor switch, overdrive switch or throttle valve switch circuit is disconnected or A/T control unit is damaged.

➡ **Go to INHIBITOR, OVERDRIVE AND THROTTLE VALVE SWITCH CIRCUIT CHECKS, AT-66.**

NAT189

10th judgement flicker is longer than others.



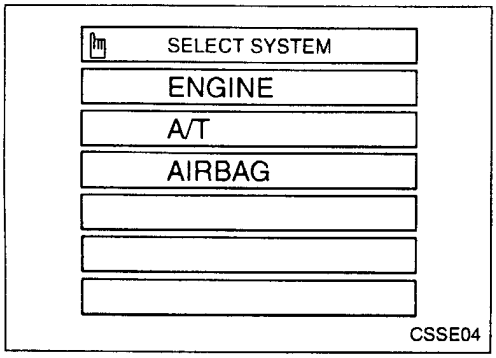
Line pressure solenoid valve circuit is short-circuited or disconnected.

➡ **Go to LINE PRESSURE SOLENOID VALVE CIRCUIT CHECK, AT-64.**

NAT078

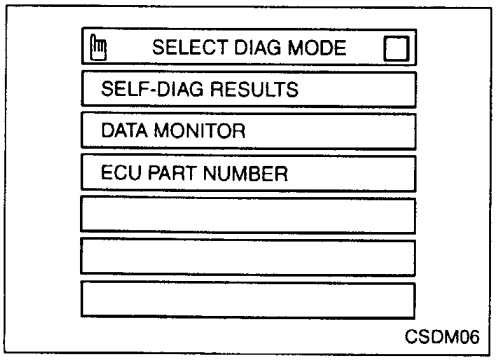
t_4 = 1.0 second

Self-diagnosis (Cont'd)

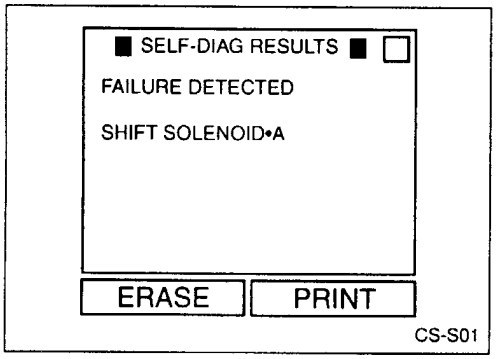


HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Without CONSULT)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch to the "LOCK" position once. Wait for at least 3 seconds and then turn it "ON" again.
2. Turn CONSULT "ON", and touch "A/T".



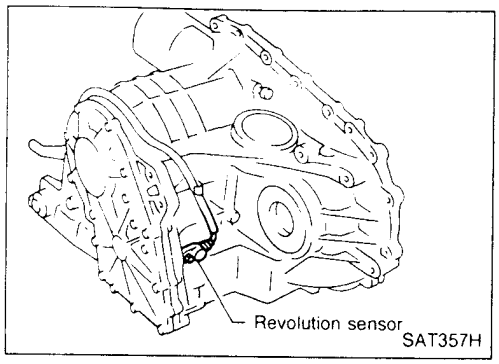
3. Touch "SELF-DIAG RESULTS".

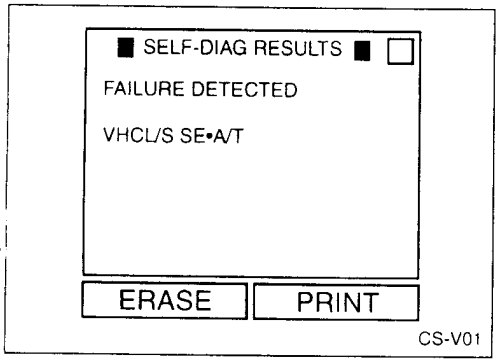


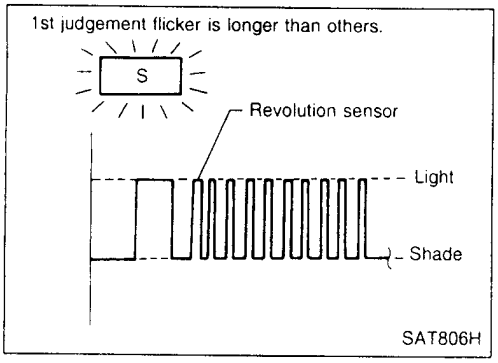
4. Touch "ERASE". (The self-diagnostic results will be erased.)

HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Without CONSULT)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch to the "LOCK" position once. Wait for at least 3 seconds and then turn it "ON" again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)". Refer to AT-40.
3. Turn ignition switch to the "LOCK" position. (The self-diagnostic results will be erased.)







Self-diagnosis (Cont'd)

VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR) CIRCUIT CHECK

Parts description

The revolution sensor detects the revolution of the idler gear parking pawl lock gear and emits a pulse signal. The pulse signal is sent to the A/T control unit which converts it into vehicle speed.

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
CAR SPEED SEN1·A/T 1st judgement flicker	• A/T control unit does not receive the proper voltage signal from the sensor.	• Harness or connectors (The sensor circuit is open or shortcircuited.) • Revolution sensor

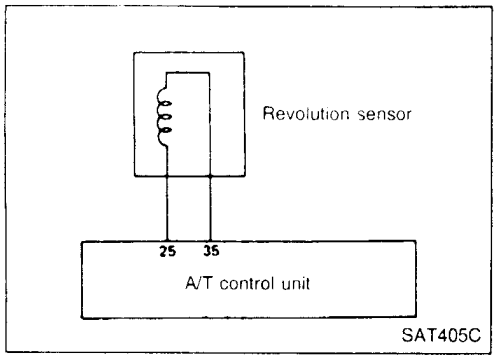
Diagnostic trouble code detecting condition

1) Start engine.
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Drive vehicle under the following conditions:
   Selector lever in "D", vehicle speed higher than 30 km/h (19 mph), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.

OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D", vehicle speed higher than 30 km/h (19 mph), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)



CHECK REVOLUTION SENSOR. — Refer to "Electrical Components Inspection", AT-85.

NG → Repair or replace revolution sensor.

OK ↓

A

CHECK INPUT SIGNAL.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "VHCL/S SE·A/T" ("CAR/S SE1·A/T") while driving. Check the value changes according to driving speed.

OR

1. Start engine.
2. Check voltage between A/T control unit conector terminal (25), and ground while driving. (Measure with AC range.)

Voltage:

At 0 km/h (0 mph):
0V

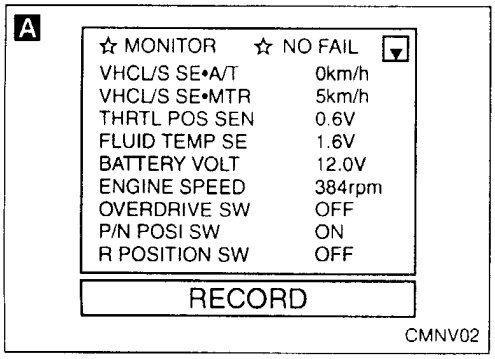
AT 30 km/h (19 mph):
1V or more

(Voltage rises gradually in response to vehicle speed.)

NG → Check the following items:
- Harness connectors (M53) and (F102)
- Harness continuity between A/T control unit and revolution sensor (Main harness)
- Harness continuity between revolution sensor and ECM (Main harness)
- Ground circuit for ECM — Refer to EC section.

If NG, repair harness or conectors.

OK ↓

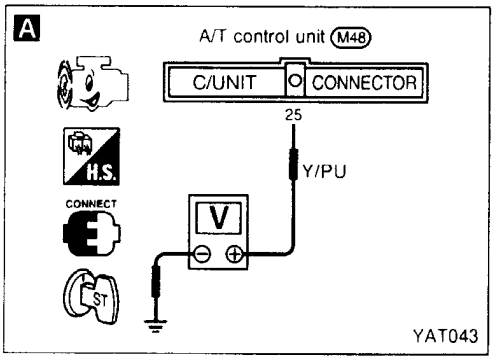


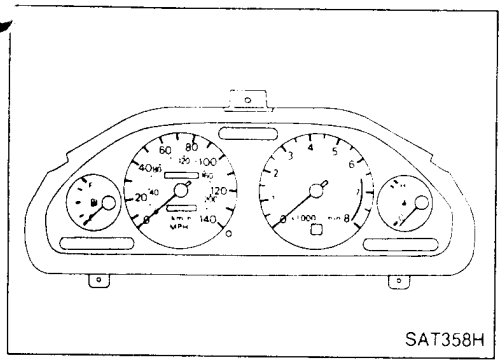
Perform self-diagnosis again after driving for a while.

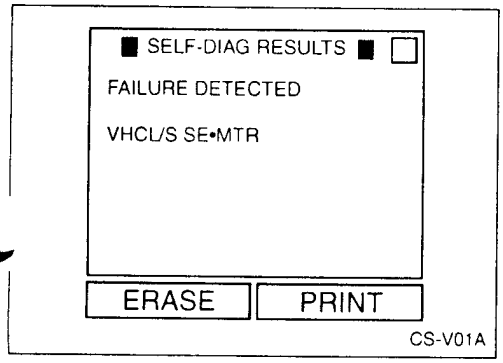
NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

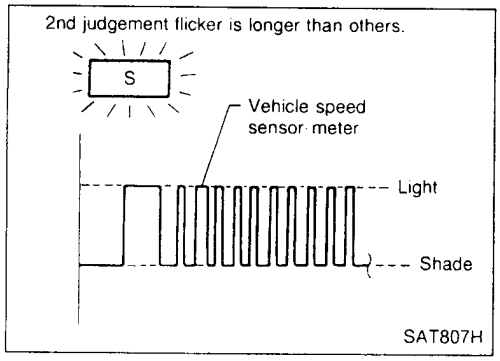
INSPECTION END




SAT358H



CS-V01A



SAT807H

Self-diagnosis (Cont'd)

VEHICLE SPEED SENSOR·MTR CIRCUIT CHECK

Parts description

The vehicle speed sensor·MTR is built into the speedometer assembly. The sensor functions as an auxiliary device to the revolution sensor when it is malfunctioning. The A/T control unit will then use a signal sent from the vehicle speed sensor·MTR.

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
CAR SPEED SEN2·MTR 2nd judgement flicker	• A/T control unit does not receive the correct voltage signal from the sensor.	• Harness or connectors (The sensor circuit is open or shortcircuited.) • Vehicle speed sensor

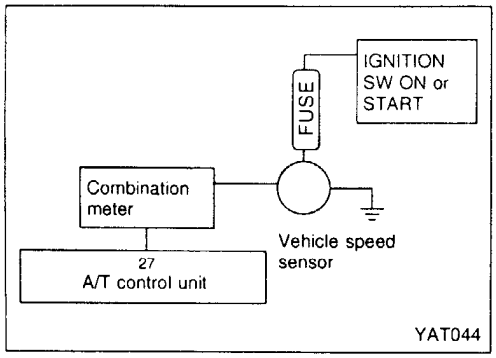
Diagnostic trouble code detecting condition

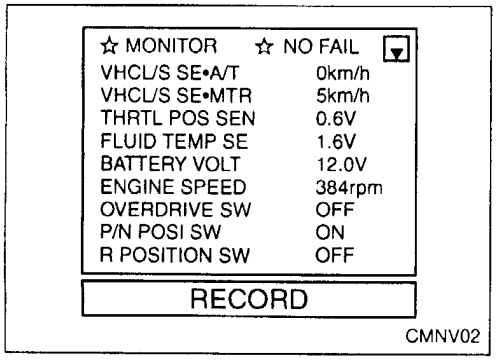
1) Start engine.
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Drive vehicle under the following conditions:
   Selector lever in "D" and vehicle speed higher than 20 km/h (12 mph).

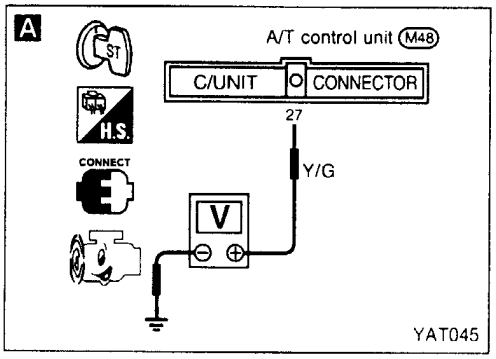
OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" and vehicle speed higher than 20 km/h (12 mph).
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)







A

CHECK INPUT SIGNAL.

1. Start engine.
2. Select "EC UNPUT SIGNALS" in Data Monitor.
3. Read out the value of "VHCL/S SE-MTR" ("CAR/S SE2 MTR") while driving.
   Check the value changes according to driving speed.

NG → Check the following items:
- Vehicle speed sensor and ground circuit for vehicle speed sensor — Refer to EL section.
- Harness continuity between A/T control unit and vehicle speed sensor detection circuity in the combination meter (Main harness)

If NG, repair harness or connectors.

OR

1. Start engine.
2. Check voltage between A/T control unit connector terminal (27) and ground while driving at 2 to 3 km/h (1 to 2 mph) for 1 m (3 ft) or more.
   Voltage:
   Varies from 0V to 5V

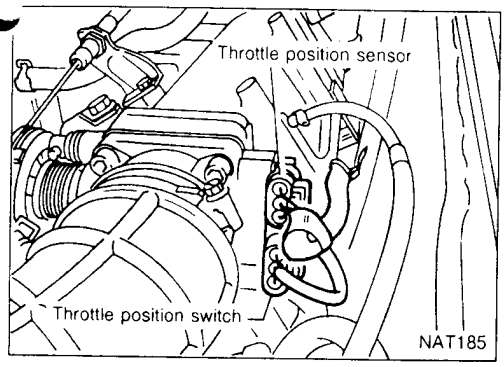
OK ↓

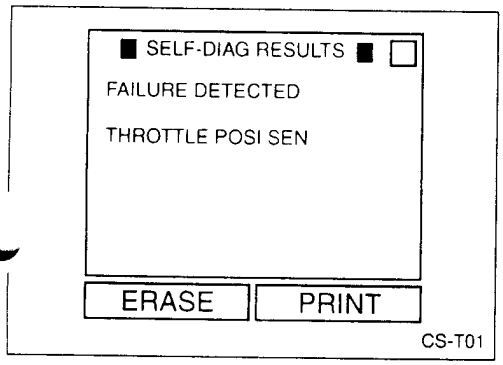
Perform self-diagnosis again after driving for a while.

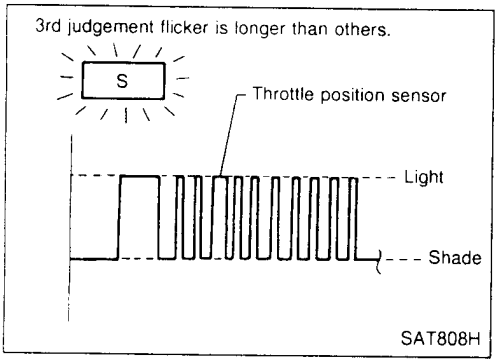
NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END







Self-diagnosis (Cont'd)

TROTTLE POSITION SENSOR CIRCUIT CHECK

Parts description

The throttle position sensor detects the throttle valve position and sends a signal to the A/T control unit.

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
THROTTLE SENSOR 3rd judgement flicker	• A/T control unit receives an excessively low or high voltage from the sensor.	• Harness or connectors (The seonsor circuit is open or shortcircuited.) • Throttle position sensor

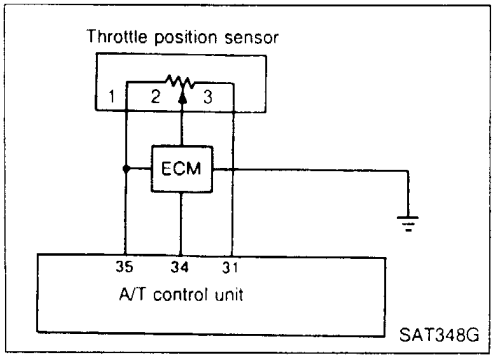
Diagnostic trouble code detecting condition

1) Start engine.
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Drive vehicle under the following conditions:
   Selector lever in "D", vehicle speed higher than 10 km/h (6 mph), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.

OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D", vehicle speed higher than 10 km/h (6 mph), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)



Perform diagnostic test mode II (self-diagnostic results) for engine control.

NG → Check throttle position sensor circuit for engine control. — Refer to EC section.

OK ↓

A

CHECK INPUT SIGNAL

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "THRTL POS SEN" ("THROTTLE SEN").

Voltage:
Fully-closed throttle:
Approximately 0.5V
Fully-open throttle:
Approximately 4V

NG → Check harness continuity between ECM and A/T control unit regarding throttle position sensor circuit. (Main harness)
- Check harness connectors (M53) and (F102).

If NG, repair harness or connectors.

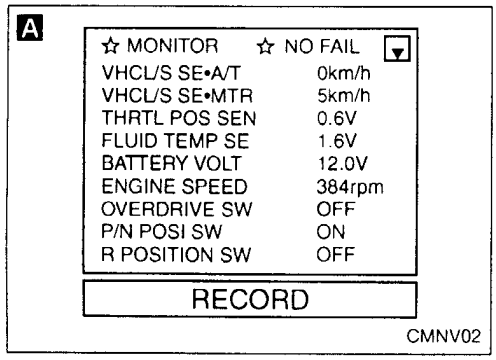
— OR —

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between A/T control unit terminals (34) and (35) while accelerator pedal is depressed slowly.

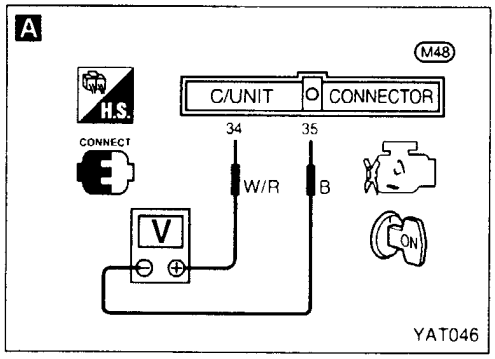
Voltage:
Fully-closed throttle:
Approximately 0.5V
Fully-open throttle:
Approximately 4V
(Voltage rises gradually in response to throttle position)

OK ↓

A



A



CHECK THROTTLE POSITION SWITCH.
Refer to "CHECK THROTTLE POSITION SWITCH CIRCUIT", "Self-diagnosis" AT-40.

NG → Repair or replace damaged parts.

OK ↓

Perform self-diagnosis again after driving for a while.

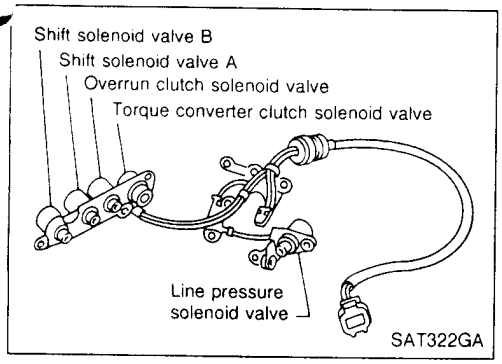
NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

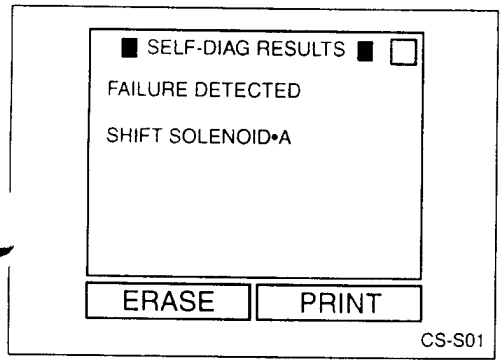
OK ↓

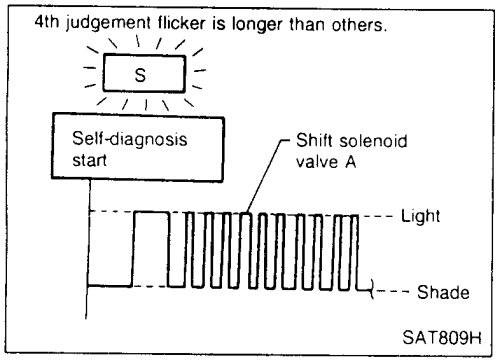
INSPECTION END

Self-diagnosis (Cont'd)

SHIFT SOLENOID VALVE A CIRCUIT CHECK







Parts description

Shift solenoid valves A and B are turned "ON" or "OFF" by the A/T control unit in response to signals sent from the inhibitor switch, vehicle speed and throttle position sensors. Gears will then be shifted to the optimum position.

Gear position	1	2	3	4
Shift solenoid valve A	ON	OFF	OFF	ON
Shift solenoid valve B	ON	ON	OFF	OFF

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
SHIFT SOLENOID A 4th judgement flicker	• A/T control unit detects an incorrect voltage drop when it tries to operate the solenoid valve.	• Harness or connectors (The solenoid circuit is open or shortcircuited.) • Shift solenoid valve A

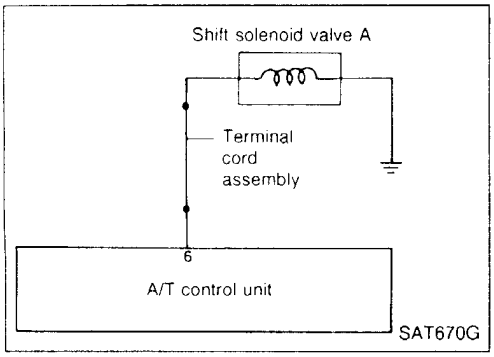
Diagnostic trouble code detecting condition

1) Start engine.
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Drive vehicle in $D_1 \rightarrow D_2$ position.

OR

1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2$ position.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)



A

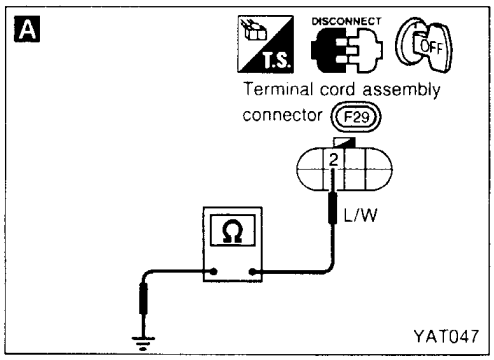
CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector terminal ② and ground.
   Resistance: 20 - 30 Ω

NG →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Harness connectors (M53) and (F102)
   - Shift solenoid valve A — Refer to "Electrical Components Inspection", AT-85.
   - Harness continuity of terminal cord assembly

If NG, repair harness or connectors.

OK ↓



B

CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect A/T control unit harness connector.
3. Check resistance between terminal cord assembly connector terminal ② and A/T control unit connector terminal ⑥.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

NG → Repair or replace harness or between A/T control unit and terminal cord assembly. (Main harness)

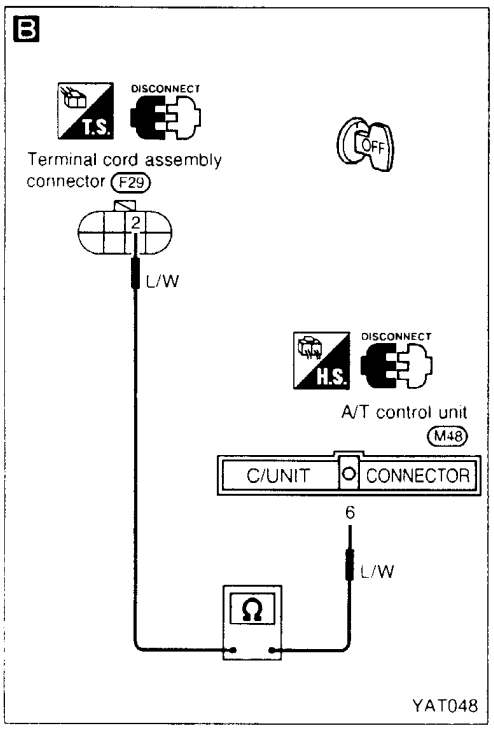
OK ↓

Perform self-diagnosis after driving for a while.

NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

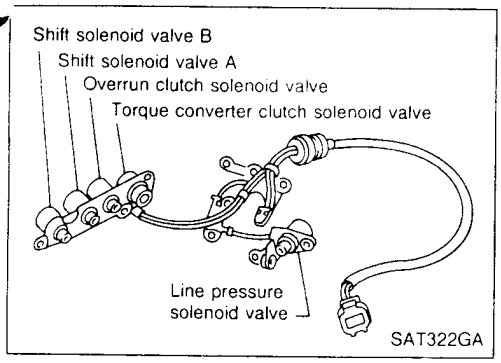
OK ↓

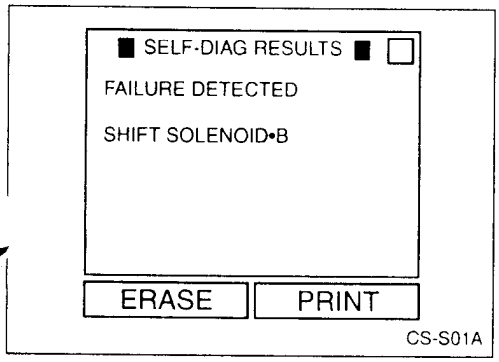
INSPECTION END

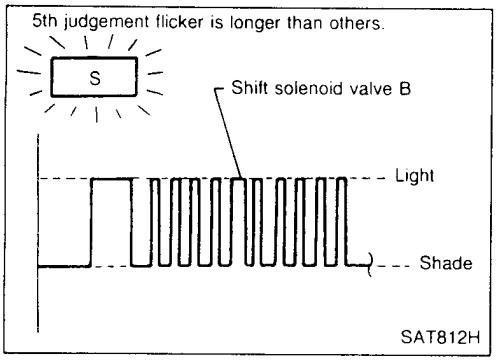


Self-diagnosis (Cont'd)

SHIFT SOLENOID VALVE B CIRCUIT CHECK







Parts description

Shift solenoid valves A and B are turned "ON" or "OFF" by the A/T control unit in response to signals sent from the inhibitor switch, vehicle speed and throttle position sensors. Gears will then be shifted to the optimum position.

Gear position	1	2	3	4
Shift solenoid valve A	ON	OFF	OFF	ON
Shift solenoid valve B	ON	ON	OFF	OFF

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
SHIFT SOLENOID B 5th judgement flicker	• A/T control unit detects the an incorrect voltage drop when it tries to operate the solenoid valve.	• Harness or connectors (The solenoid circuit is open or shortcircuited.) • Shift solenoid valve B

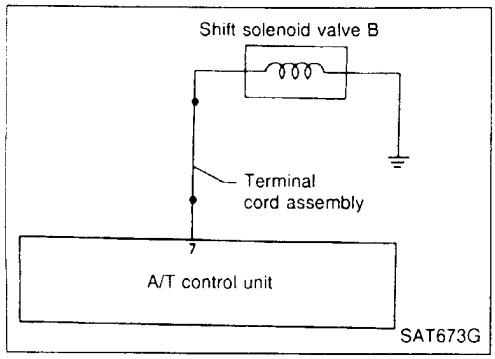
Diagnostic trouble code detecting condition

1) Start engine.
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3$ position.

OR

1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3$ position.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)



A

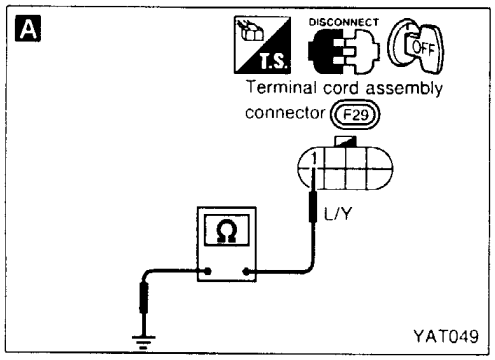
CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector terminal ① and ground.
   Resistance: 20 - 30 Ω

NG →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Harness connectors (M53) and (F102)
   - Shift solenoid valve A — Refer to "Electrical Components Inspection", AT-85.
   - Harness continuity of terminal cord assembly

If NG, repair harness or connectors.

OK ↓



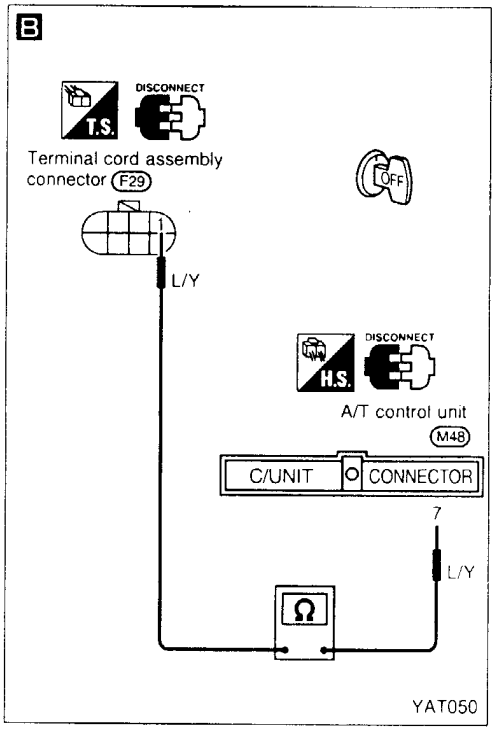
B

CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect A/T control unit harness connector.
3. Check resistance between terminal cord assembly connector terminal ① and A/T control unit connector terminal ⑦.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

NG → Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

OK ↓

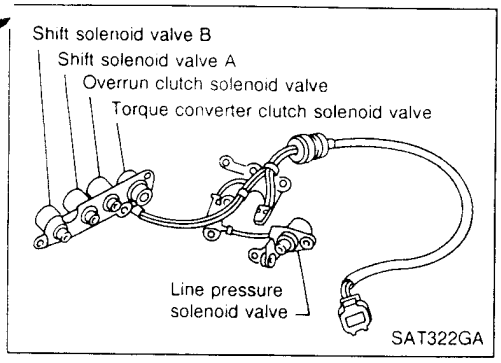


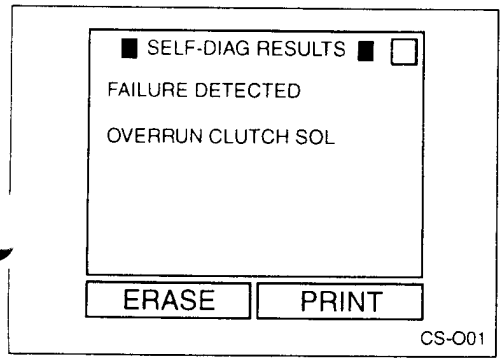
Perform self-diagnosis after driving for a while.

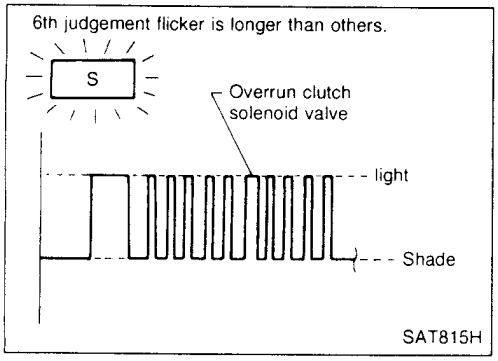
NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END







Self-diagnosis (Cont'd)

OVERRUN CLUTCH SOLENOID VALVE CIRCUIT CHECK

Parts description

The overrun clutch solenoid valve is activated by the A/T control unit in response to signals sent from the inhibitor switch, overdrive control switch, vehicle speed and throttle position sensors. The overrun clutch operation will then be controlled.

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
OVERRUN CLUTCH SOL 6th judgement flicker	• A/T control unit detects an incorrect voltage drop when it tries to operate the solenoid valve.	• Harness or connectors (The solenoid circuit is open or shortcircuited.) • Overrun clutch solenoid valve

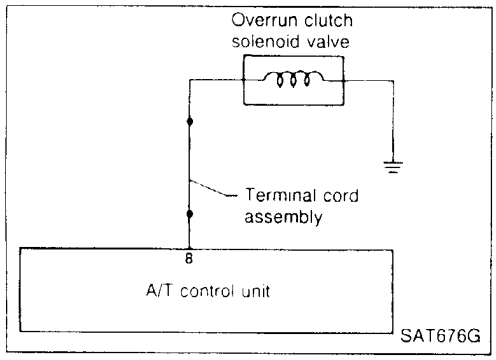
Diagnostic trouble code detecting condition

1) Start engine.
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Drive vehicle under the following conditions:
   Selector lever in "D", overdrive control switch in "OFF" position and vehicle speed higher than 10 km/h (6 mph).

OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D", overdrive control switch in "OFF" position and vehicle speed higher than 10 km/h (6 mph).
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)



A

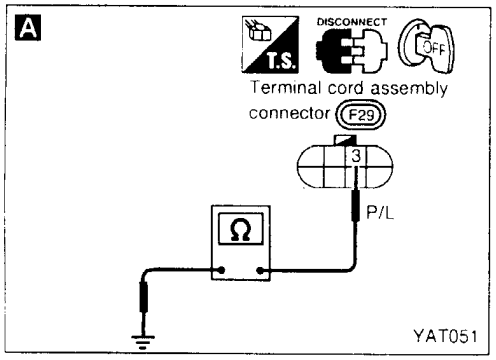
CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector terminal ③ and ground.
   Resistance: 20 - 30 Ω

NG →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Harness connectors (M53) and (F102)
   - Overrun clutch solenoid valve. — Refer to "Electrical Components Inspection", AT-85.
   - Harness continuity of terminal cord assembly

If NG, repair harness or connectors.

OK ↓



B

CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect A/T control unit harness connector.
3. Check resistance between terminal cord assembly connector terminal ③ and A/T control unit connector terminal ⑧.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

NG → Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

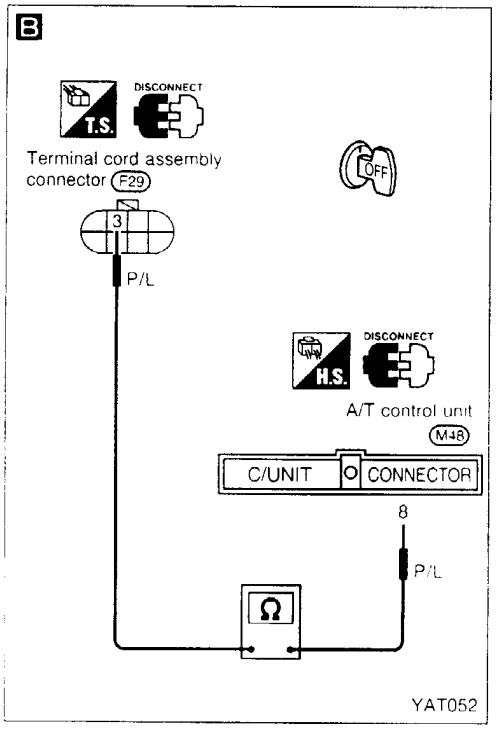
OK ↓

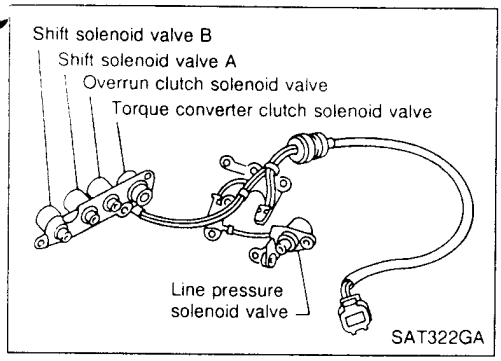
Perform self-diagnosis after driving for a while.

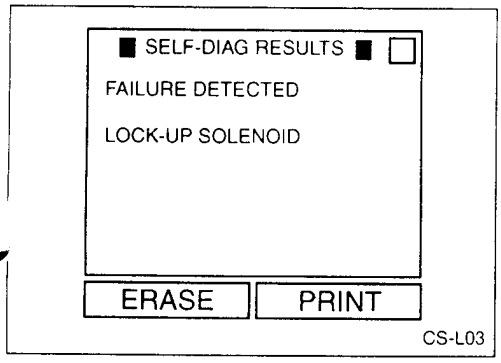
NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

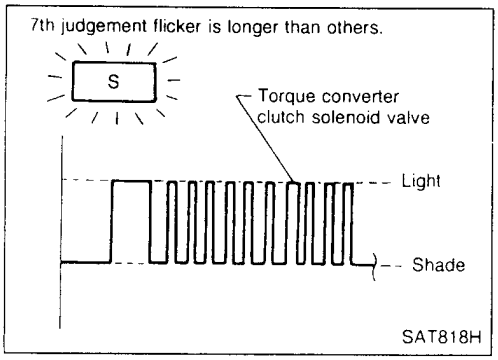
OK ↓

INSPECTION END









Self-diagnosis (Cont'd)

TORQUE CONVERTER CLUTCH SOLENOID VALVE CIRCUIT CHECK

Parts description

The torque converter clutch solenoid valve is activated, with the gear in D_4, by the A/T control unit in response to signals sent from the vehicle speed and throttle position sensors. Lock-up piston operation will then be controlled.
Lock-up operation, however, is prohibited when ATF temperature is too low.

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
LOCK-UP SOLENOID 7th judgement flicker	• A/T control unit detects an incorrect voltage drop when it tries to operate the solenoid valve.	• Harness or connectors (The solenoid circuit is open or shortcircuited.) • T/C clutch solenoid valve

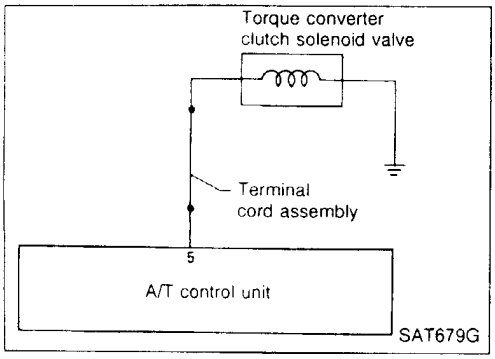
Diagnostic trouble code detecting condition

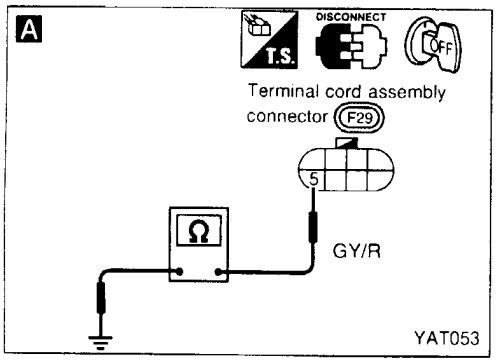
1) Turn ignition switch "ON".
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$ lock-up position.

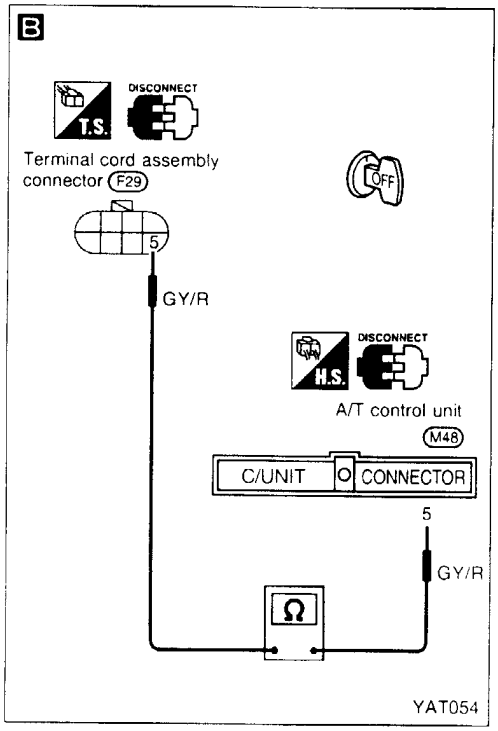
OR

1) Turn ignition switch "ON".
2) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$ lock-up position.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)







A

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector terminal ⑤ and ground.
   Resistance: 10 - 16 Ω

NG →
1. Remove oil pan. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Harness connectors M53 and F102
   - Torque converter clutch solenoid valve — Refer to "Electrical Components Inspection", AT-85.
   - Harness continuity of terminal cord assembly

   If NG, repair harness or connectors.

OK ↓

B

CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect A/T control unit harness connector.
3. Check resistance between terminal cord assembly connector terminal ⑤ and A/T control unit terminal ⑤.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

NG → Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

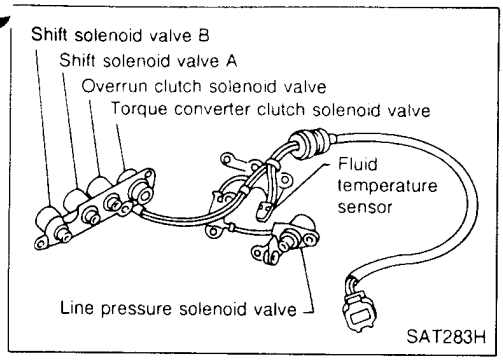
OK ↓

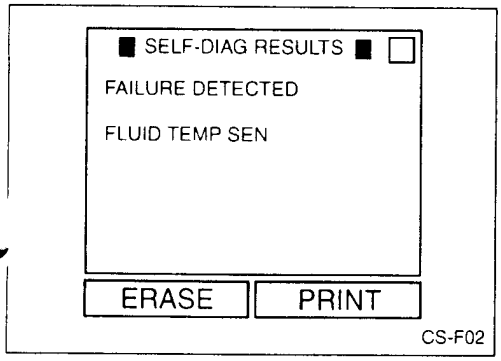
Perform self-diagnosis after driving for a while.

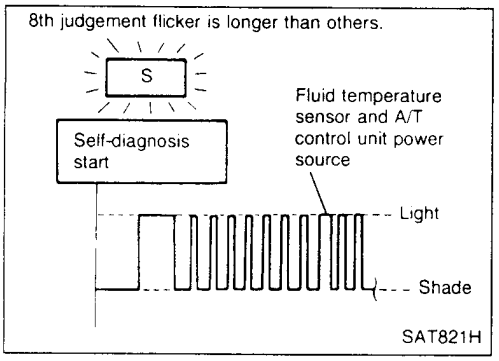
NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END







Self-diagnosis (Cont'd)

A/T FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS

Parts description

The A/T fluid temperature sensor detects the ATF temperature and sends a signal to the A/T control unit.

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
BATT/FLUID TEMP 8th judgement flicker	• A/T control unit receives an excessively low or high voltage from the sensor.	• Harness or connectors (The sensor circuit is open or shortcircuited.) • Fluid temperature sensor

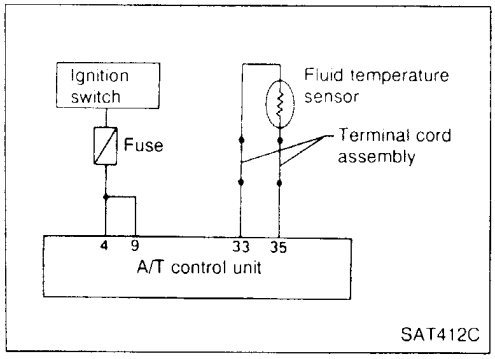
Diagnostic trouble code detecting condition

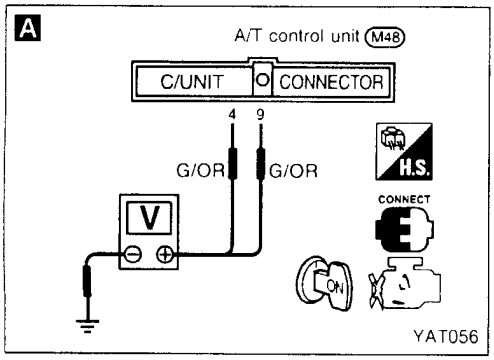
1) Start engine.
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Drive vehicle under the following conditions:
   Selector lever in D, vehicle speed higher than 10 km/h (6 mph), throttle opening greater than 1/8 of the full open position, engine speed higher than 450 rpm and driving for more than 10 minutes.

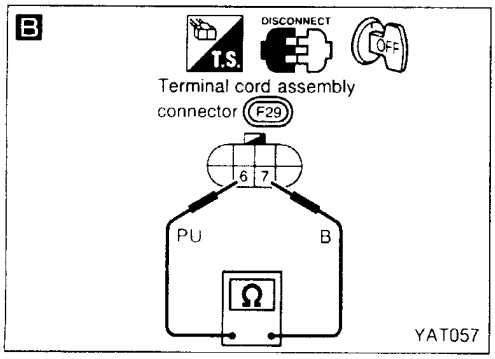
OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in D, vehicle speed higher than 10 km/h (6 mph), throttle opening greater than 1/8 of the full open position, engine speed higher than 450 rpm and driving for more than 10 minutes.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)







A

CHECK A/T CONTROL UNIT POWER SOURCE.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between A/T control unit connectors terminals ④, ⑨ and ground.

Battery voltage should exist.

NG → Check the following items:

- Harness connectors (M53) and (F102)
- Harness continuity between ignition switch and A/T control unit (Main harness)
- Ignition switch and fuse — Refer to EL section.

If NG, replace fuse or repair ignition switch, harness or connectors.

OK ↓

B

CHECK A/T FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY.

1. Turn ignition switch to "LOCK" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector terminals ⑥ and ⑦ when A/T is cold.

Resistance:
Cold [20°C (68°F)]
Approximately 2.5 kΩ

4. Reinstall any part removed.

NG →

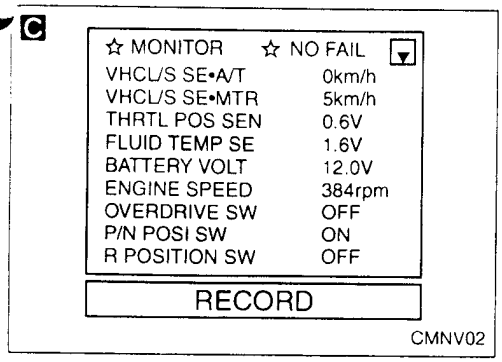
1. Remove oil pan.
2. Check the following items:

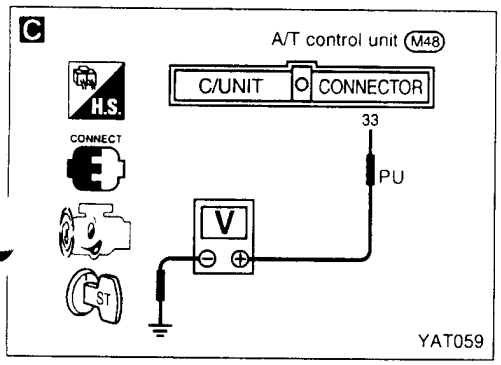
- A/T Fluid temperature sensor — Refer to "Electrical Components Inspection", AT-85.
- Harness continuity of terminal cord assembly

OK ↓

Ⓐ

Self-diagnosis (Cont'd)





Ⓐ

CHECK INPUT SIGNAL OF FLUID TEMPERATURE SENSOR.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "FLUID TEMP SE".

Voltage:
Cold [20°C (68°F)] → Hot [80°C (176°F)]:
Approximately 1.5V → 0.5V

NG → Check the following items:
- Harness connectors M53 and F102
- Harness continuity between A/T control unit and terminal cord assembly (Main harness)
- A/T fluid temperature sensor (Terminal cord assembly F29).

If NG, replace A/T fluid temperature sensor or repair harness or connectors.

OR

1. Start engine.
2. Check voltage between A/T control unit connector terminal 33 and ground while warming up A/T.

Voltage:
Cold [20°C (68°F)] → Hot [80°C (176°F)]:
Approximately 1.5V → 0.5V

OK

Perform self-diagnosis after driving for a while.

NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END

Self-diagnosis (Cont'd)

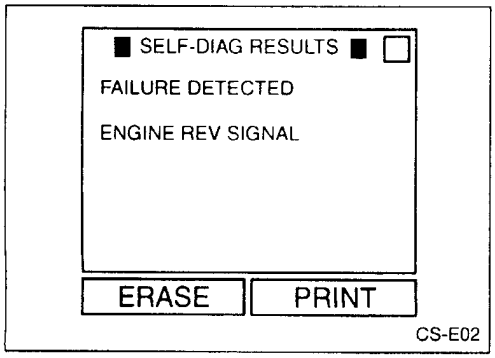
ENGINE SPEED SIGNAL CIRCUIT CHECK

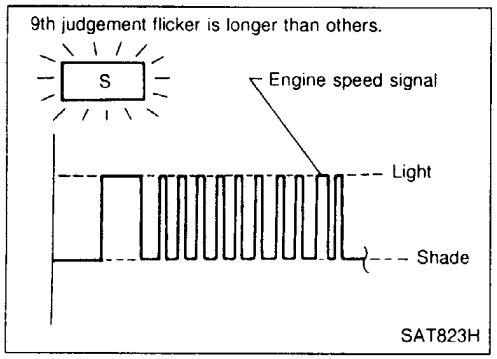
Parts description

The engine speed signal is sent from the TACHOMETER to the A/T control unit.

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
ENGINE REV SIGNAL 9th judgement flicker	• A/T control unit does not receive the proper voltage signal from TACHOMETER	• Harness or connectors (The sensor circuit is open or shortcircuited.)





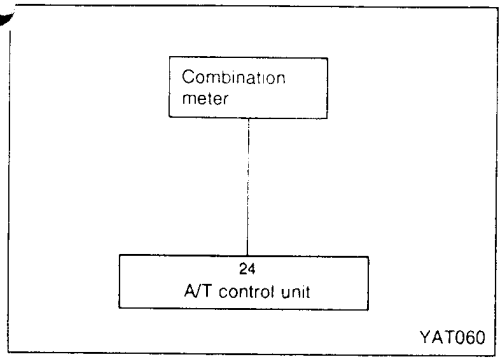
Diagnostic trouble code detecting condition

1) Start engine.
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) Drive vehicle under the following conditions:
   Selector lever in "D", vehicle speed higher than 10 km/h (6 mph), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 seconds.

OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D", vehicle speed higher than 10 km/h (6 mph), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 seconds.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)



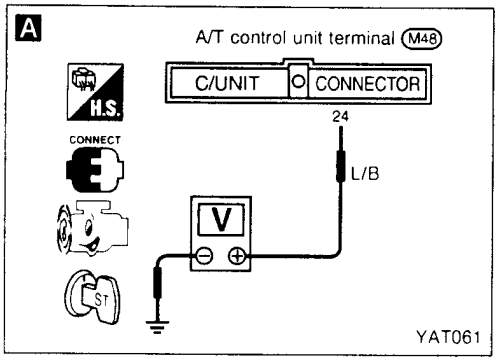
A

☆ MONITOR	☆ NO FAIL
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.6V
FLUID TEMP SE	1.6V
BATTERY VOLT	12.0V
ENGINE SPEED	384rpm
OVERDRIVE SW	OFF
P/N POSI SW	ON
R POSITION SW	OFF

RECORD

CMNV02

A



A

CHECK INPUT SIGNAL.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "ENGINE SPEED". Check engine speed changes according to throttle position.

NG → Check the following items:
- Harness continuity between A/T control unit and combination meter.
- 10A fuse in fuse block [8].
- Condition and operation of ignition switch
- Power supply to combination meter connector (M38) terminal (3).

If NG, replace 10A fuse or repair ignition switch, harness or connectors.

OR

1. Start engine.
2. Check voltage between A/T control unit connector terminal (24) and ground.

Voltage: 0.9V

OK ↓

Perform self-diagnosis again after driving for a while.

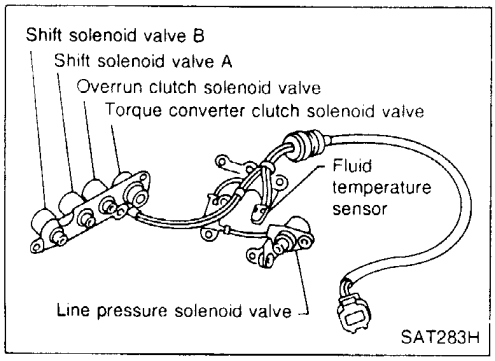
NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

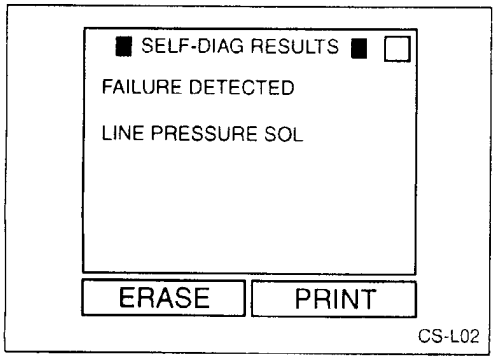
OK ↓

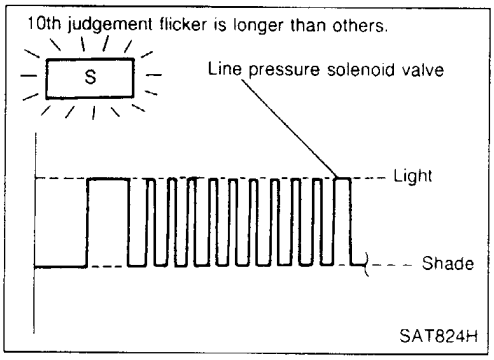
INSPECTION END

Self-diagnosis (Cont'd)

LINE PRESSURE SOLENOID VALVE CIRCUIT CHECK







Parts description

The line pressure solenoid valve regulates the oil pump discharge pressure to suit the driving condition in response to a signal sent from the A/T control unit.

Trouble judgement conditions

Diagnostic trouble code	Malfunction is detected when ...	Check item (Possible cause)
LINE PRESSURE SOL 10th judgement flicker	• A/T control unit detects the improper voltage drop when it tries to operate the solenoid valve.	• Harness or connectors (The solenoid circuit is open or shortcircuited.) • Line pressure solenoid valve

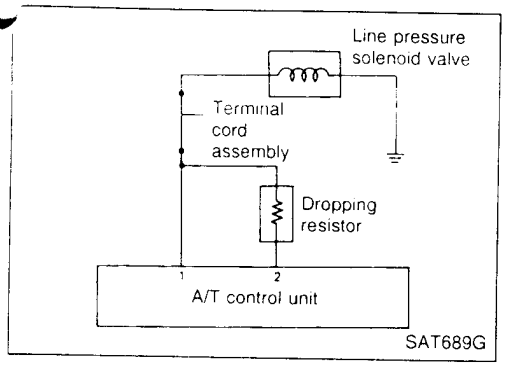
Diagnostic trouble code detecting condition

1) Start engine.
2) Select "SELF-DIAG RESULTS" mode with CONSULT.
3) With brake pedal depressed, shift the lever from P → N → D → N → P.

OR

1) Start engine.
2) With brake pedal depressed, shift the lever from P → N → D → N → P.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSIS PROCEDURE (Without CONSULT), AT-40.

Self-diagnosis (Cont'd)



A

CHECK GROUND CIRCUIT.

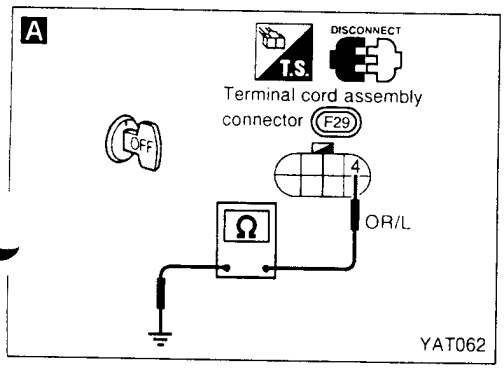
1. Turn ignition switch to "LOCK" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector terminal ④ and ground.

Resistance: 2.5 - 5Ω

NG →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Line pressure solenoid valve — Refer to "Electrical Components Inspection", AT-85.
   - Harness continuity of terminal cord assembly.

OK ↓



B

CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect A/T control unit harness connector.
3. Check resistance between terminal cord assembly connector terminal ④ and A/T control unit terminal ②.

Resistance: 11.2 - 12.8Ω

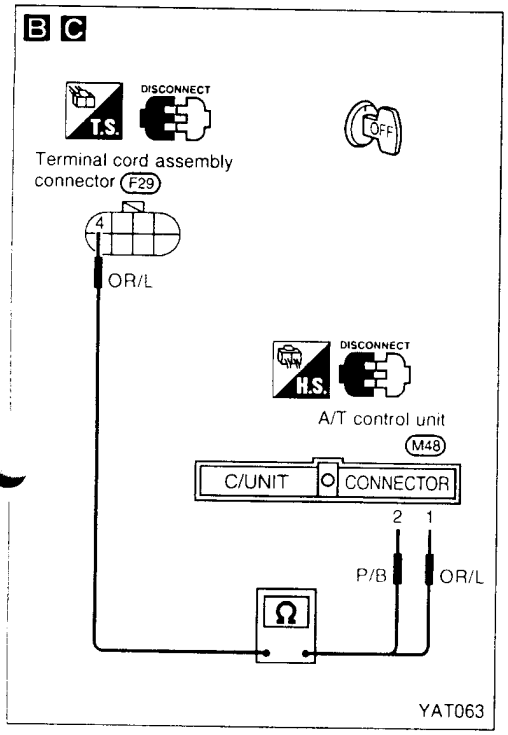
NG →

Check the following items:

- Harness connectors M53, F102 and M17, E101
- Dropping resistor — E15 Refer to "Electrical Components Inspection", AT-85.
- Harness continuity between A/T control unit ② and terminal cord assembly (Main harness)

If NG, replace dropping resistor or repair harness or connectors.

OK ↓



C

CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Check resistance between terminal cord assembly connector terminal ④ and A/T control unit terminal ①.

Resistance:
Approximately 0Ω

3. Reinstall any part removed.

NG →

Repair or replace harness between A/T control unit connector terminal ① and terminal cord assembly.

OK ↓

Perform self-diagnosis after driving for a while.

NG →

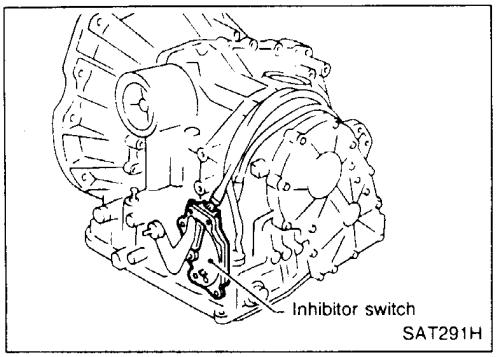
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

Self-diagnosis (Cont'd)

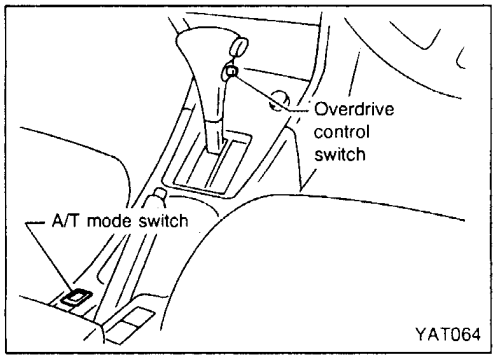
INHIBITOR, OVERDRIVE CONTROL, AND THROTTLE POSITION SWITCH CIRCUIT CHECKS



Parts description

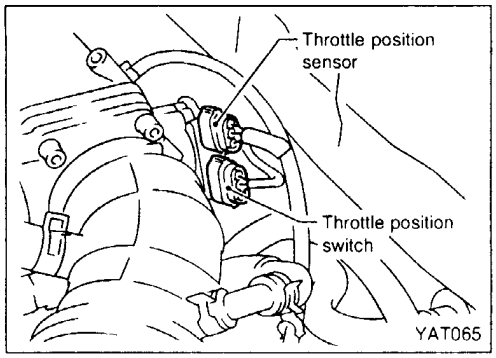
Inhibitor switch

Detects the selector lever position and sends a signal to the A/T control unit.



Overdrive control switch

Detects the overdrive switch positions (ON or OFF) and sends a signal to the A/T control unit.

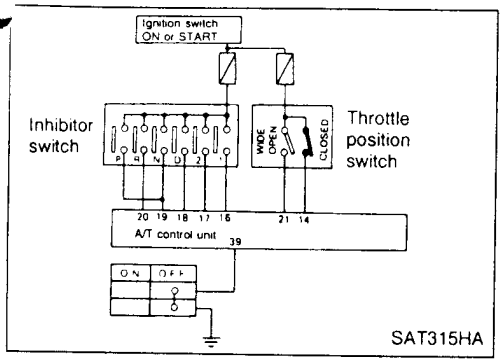


Throttle position switch

Consists of a wide-open throttle position switch and a closed throttle position switch.

The wide-open position switch sends a signal to the A/T control unit when the throttle valve is at the full throttle position (fully open). The closed throttle position switch sends a signal to the A/T control unit when the throttle valve is fully closed.

Self-diagnosis (Cont'd)



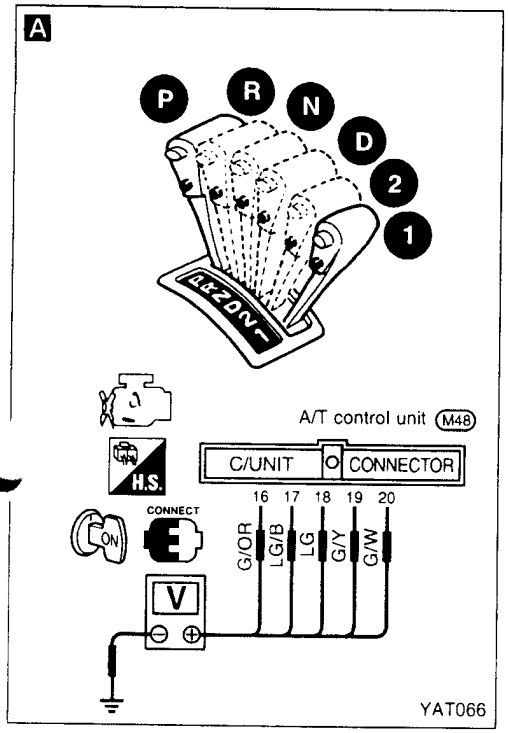
A

☆ MONITOR	☆ NO FAIL
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.6V
FLUID TEMP SE	1.6V
BATTERY VOLT	12.0V
ENGINE SPEED	384rpm
OVERDRIVE SW	OFF
P/N POSI SW	ON
R POSITION SW	OFF

RECORD

CMNV02

A



A

CHECK INHIBITOR SWITCH CIRCUIT.

NG → Check the following items:
- 7.5A fuse in fuse block [3].
- Harness connectors (M53), (F102) and (M52), (F103)
- Condition and operation of ignition switch.
- Inhibitor switch — Refer to "Electrical Components Inspection", AT-85.
- Harness continuity between ignition switch and inhibitor switch (Main harness)
- Harness continuity between inhibitor switch and A/T control unit (Main harness)

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "R, N, D, 1 and 2 POSITION SWITCHES" ("N, R, D, 2 and 1-RANGE SW") moving selector lever to each position. Check the signal of the selector lever position is indicated properly.

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between A/T control unit connector terminals (16), (17), (18), (19), (20) and ground while moving selector lever through each position.

Voltage:
B: Battery voltage
0: 0V

Lever position	Terminal No.				
	(19)	(20)	(18)	(17)	(16)
P, N	**B**	0	0	0	0
R	0	**B**	0	0	0
D	0	0	**B**	0	0
2	0	0	0	**B**	0
1	0	0	0	0	**B**

OK → Ⓐ

Self-diagnosis (Cont'd)

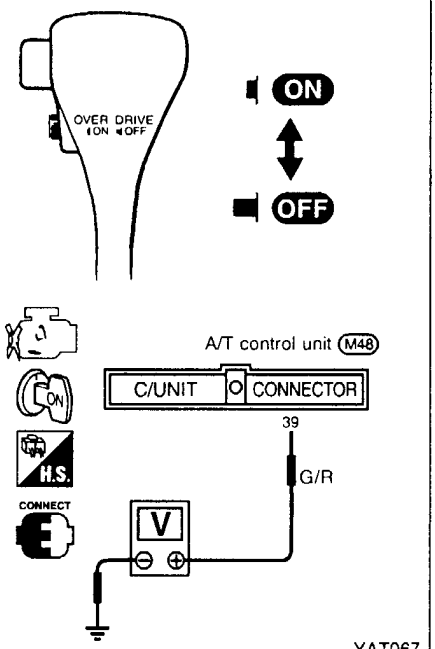
B

☆ MONITOR	☆ NO FAIL
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.6V
FLUID TEMP SE	1.6V
BATTERY VOLT	12.0V
ENGINE SPEED	384rpm
OVERDRIVE SW	OFF
P/N POSI SW	ON
R POSITION SW	OFF

RECORD

CMNV02

B



YAT067

Ⓐ

C

CHECK OVERDRIVE CONTROL SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "OVERDRIVE SWITCH".
   Check the signal of the overdrive control switch is indicated properly.
   (Overdrive switch "ON" displayed on CONSULT means overdrive "OFF".)

OR

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Check voltage between A/T control unit connector terminal (39) and ground when overdrive control switch is "ON" and "OFF".

Switch position	Voltage
ON	Battery voltage
OFF	1V or less

OK

Ⓑ

NG

Check the following items:

- 10A fuse in fuse block [8].
- Power supply to combination meter connector (M38) terminal (3).
- OD OFF indicator lamp.
- Ignition switch operation.
- Overdrive control switch — Refer to "Electrical Components Inspection", AT-85.
- Harness continuity between A/T control unit and overdrive control switch (Main harness)
- Harness continuity of ground circuit for overdrive control switch (Main harness)

If NG, replace overdrive switch, indicator lamp or 10A fuse, or repair ignition switch harness or connectors.

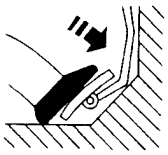
C

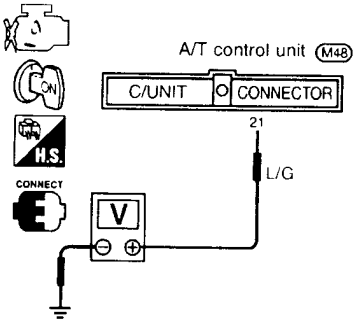
☆ MONITOR	☆ NO FAIL
D POSITION WS	OFF
2 POSITION SW	OFF
1 POSITION SW	OFF
ASCD•CRUISE	OFF
ASCD•OD CUT	OFF
KICKDOWN SW	OFF
POWERSHIFT SW	OFF
CLOSED THL/SW	OFF
W/O THRL/P-SW	OFF

RECORD

CMND01

C





YAT069

Ⓑ

C

CHECK THROTTLE POSITION SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "CLOSED THL/SW" and "W/O THRL/P-SW" depressing and releasing accelerator pedal.
   Check the signal of throttle position switch is indicated correctly.

Accelerator pedal condition	Data monitor	
	CLOSED THL/SW	W/O THRL/P-SW
Released	ON	OFF
Fully depressed	OFF	ON

NG → Check the following items:
- Throttle position switch Refer to "Electrical Components Inspection", AT-91.
- Harness for short or open between throttle position switch and A/T control unit (Main harness)
- 10A fuse is fuse block 25.
- Harness connectors M53, F102 and M50, F104.
- Condition and operation of ignition switch.

If NG, replace 10A fuse or throttle position switch or repair ignition switch, harness or connectors.

OR

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Check voltage between A/T control unit terminal ⑭, ㉑ and ground while depressing, and releasing accelerator pedal slowly.
   (after warming up engine)

Accelerator pedal condition	Voltage	
	Rerminal No. ⑭	Terminal No. ㉑
Released	Battery voltage	1V or less
Fully depressed	1V or less	Battery voltage

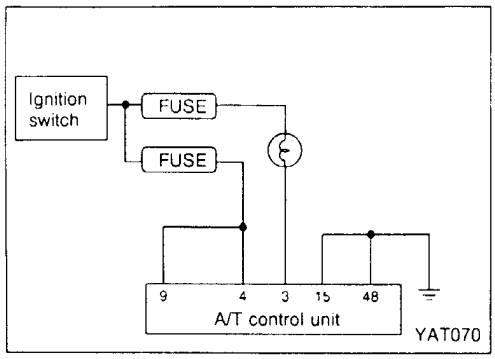
OK

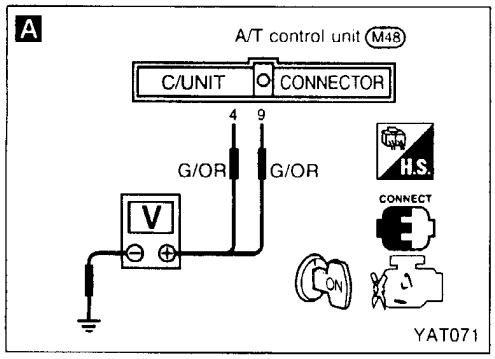
Perform self-diagnosis again after driving for a while.

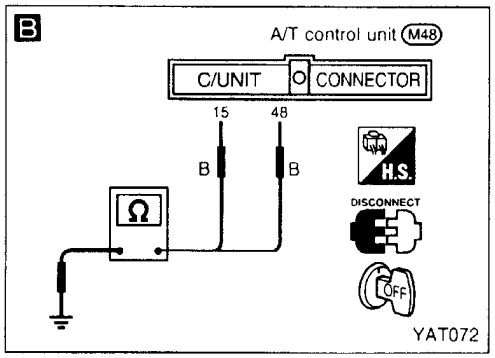
NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

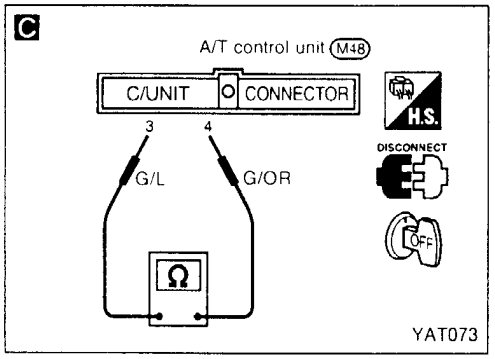
OK

INSPECTION END









Diagnostic Procedure 1

SYMPTOM:
SPORT indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON".

A

CHECK A/T CONTROL UNIT POWER SOURCE.
1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between A/T control unit connector terminals ④, ⑨ and ground.
   Battery voltage should exist.

NG → Check the following items:
- 7.5A fuse in fuse block [3].
- Harness continuity between ignition switch and A/T control unit (Main harness)
- Ignition switch — Refer to EL section.

OK ↓

B

CHECK A/T CONTROL UNIT GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect A/T control unit harness connector.
3. Check resistance between A/T control unit connector terminals ⑮, ㊽ and ground.
   Resistance:
   Approximately 0Ω

NG → Check the following:
- Harness continuity between A/T control unit and ground.
- Harness connectors (M53) and (F102).

If NG, repair harness or connectors.

OK ↓

C

CHECK LAMP CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check resistance between A/T control unit connectors terminals ③ and ④.
   Resistance: 50 - 100Ω
3. Reinstall any part removed.

NG → Check the following items:
- Harness connectors (M13), (B3) and (B58), (B101)
- SPORT indicator lamp — Refer to EL section.
- Harness continuity between ignition switch and SPORT indicator lamps (Main harness)
- Harness continuity between SPORT indicator lamp and A/T control unit

If NG, replace fuses, SPORT indicator lamp or repair harness or connectors.

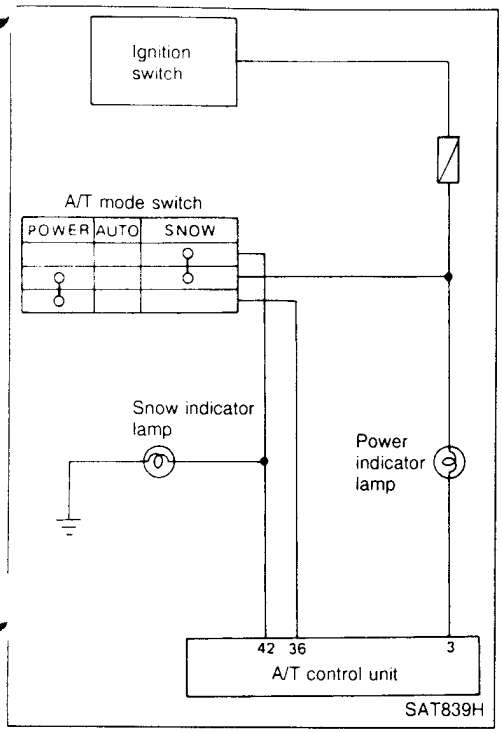
OK ↓

Check again.

NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END



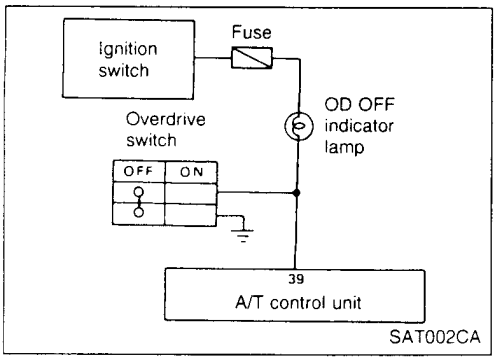
Diagnostic Procedure 2

SYMPTOM:
SPORT or SNOW indicator lamp does not come on when turning A/T mode switch to the appropriate position.

Is Diagnostic Procedure 1 OK?
- No → Go to Diagnostic Procedure 1, AT-70.
- Yes ↓

Check the following items:
- A/T mode switch
- SNOW indicator lamp
- Harness continuity between ignition switch and A/T mode switch
- Harness continuity between A/T mode switch and A/T control unit

NG → Repair or replace damaged parts.

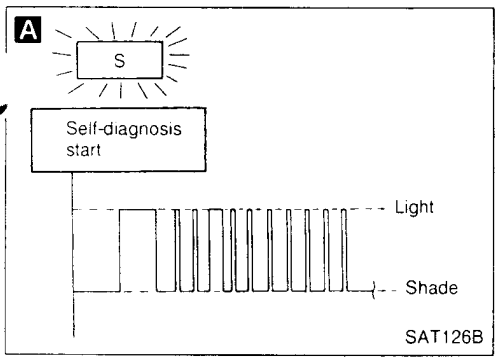


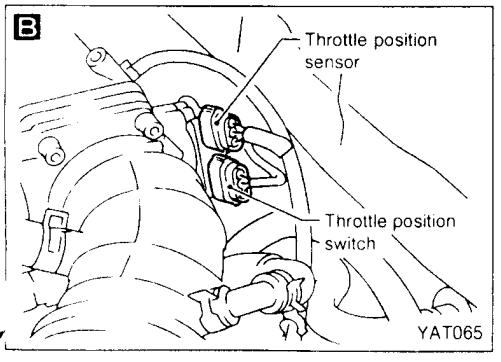
Diagnostic Procedure 3

SYMPTOM:
OD OFF indicator lamp does not come on when setting overdrive control switch to "OFF" position.

Check the following items:
- Overdrive control switch
- O/D OFF indicator lamp
- Harness continuity between ignition switch and O/D OFF indicator lamp

NG → Repair or replace damaged parts.





Diagnostic Procedure 4

SYMPTOM:
SPORT indicator lamp does not come on for about 3 seconds when depressing and releasing accelerator pedal fully.

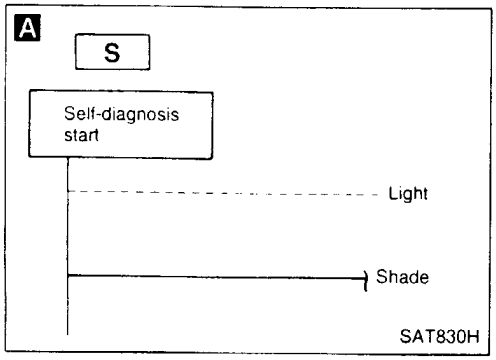
A

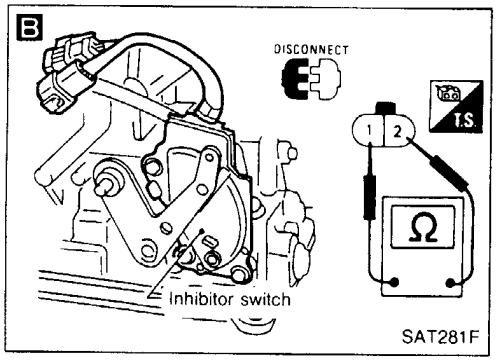
Does self-diagnosis show damage to throttle position sensor circuit?
- No → Check throttle position sensor circuit. — Refer to "Self-diagnosis", AT-40.
- Yes ↓

B

Check throttle position sensor. — Refer to EC section.
- NG → Repair or replace throttle position sensor.
- OK ↓

1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.





Diagnostic Procedure 5

SYMPTOM:

Engine cannot be started with selector lever in "P" or "N" position. Or engine can be started with selector lever in "D", "2", "1" or "R" position.

Does "ECM INPUT SIGNALS" in Data Monitor show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis", AT-40.

OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No

B

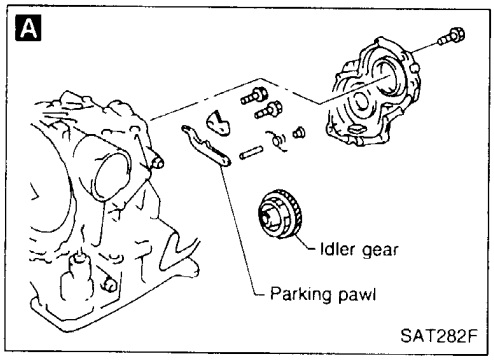
Check continuity of inhibitor switch 2-pin connector. — Refer to "Electrical Components Inspection", AT-85. — NG → Repair or replace inhibitor switch.

OK

Check starting system. — Refer to EL section. — NG → Repair or replace damaged parts.

OK

INSPECTION END



Diagnostic Procedure 6

SYMPTOM:

Vehicle moves when it is pushed forward or backward with selector lever in "P" position.

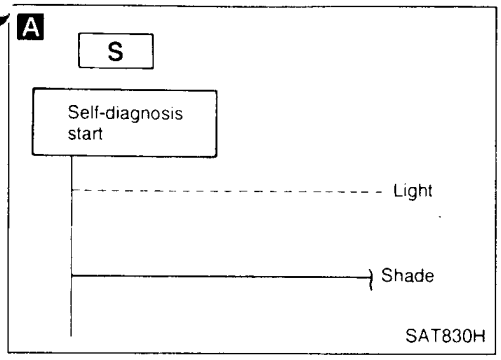
A

Check parking components. — Refer to "DISASSEMBLY" and "ASSEMBLY", AT-112, 185. — NG → Repair or replace damaged parts.

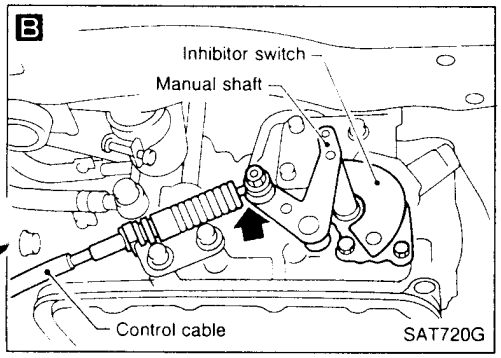
OK

INSPECTION END

A



B



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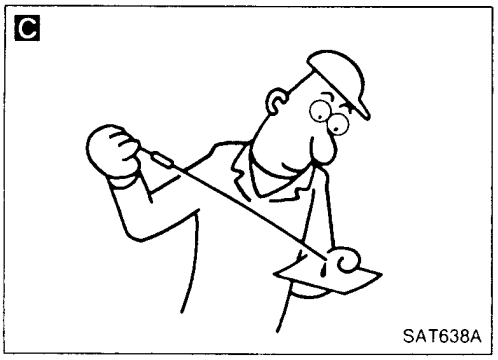

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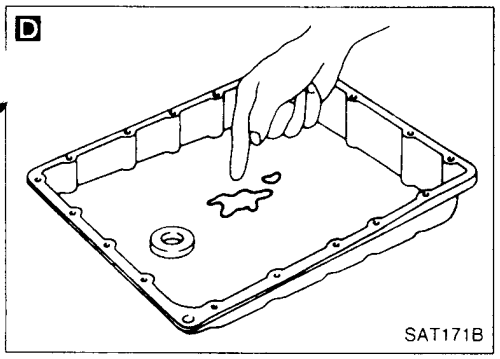


Diagnostic Procedure 7

SYMPTOM:

Vehicle moves forward or backward when selecting "N" position.

Does "ECM INUT SIGNALS" in Data Monitor show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis", AT-40.

OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No ↓

Check control cable. — Refer to "ON-VEHICLE SERVICE", AT-102. — NG → B → Adjust control cable. — Refer to "ON-VEHICLE SERVICE", AT-102.

OK ↓

C

Check A/T fluid level again. — NG → Refill ATF.

OK ↓

D

1. Remove oil pan.
2. Check A/T fluid condition. — NG →
   1. Disassemble A/T.
   2. Check the following items:
      - Forward clutch assembly
      - Overrun clutch assembly
      - Reverse clutch assembly

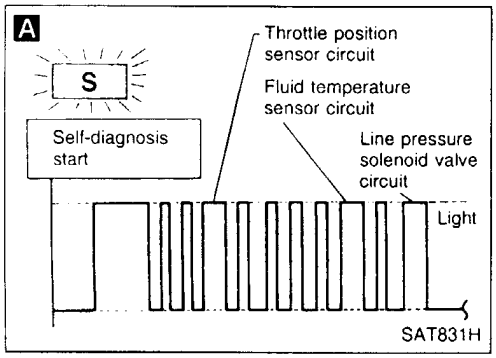
OK ↓

Check again. — NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

A



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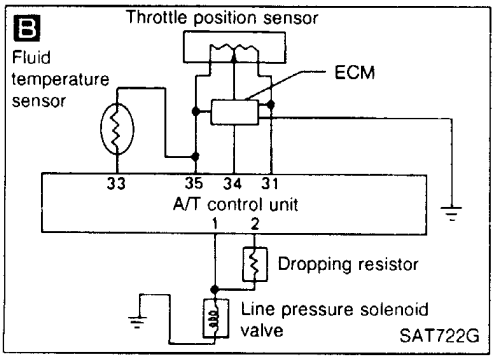

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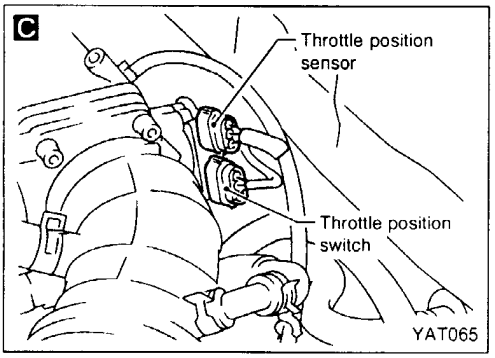

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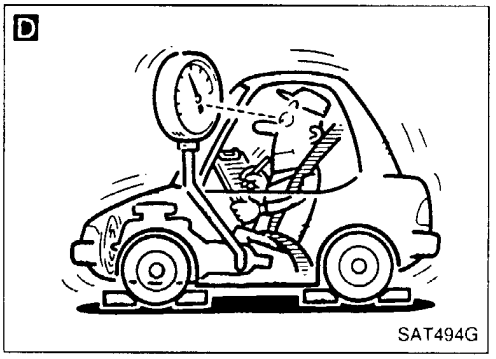


Diagnostic Procedure 8

SYMPTOM:

There is large shock when changing from "N" to "R" position.

A

Does self-diagnosis show damage to throttle position sensor, line pressure solenoid valve or fluid temperature sensor circuit?

Yes → B

B

Check damaged circuit. — Refer to "Self-diagnosis", AT-40.

No

C

Check throttle position sensor. — Refer to EC section.

NG → Repair or replace throttle position sensor.

OK

D

Check line pressure at idle with selector lever in "D" position. — Refer to "PRESSURE TESTING", AT-96.

NG →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
   - Line pressure solenoid valve

OK

Check again.

NG →

1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

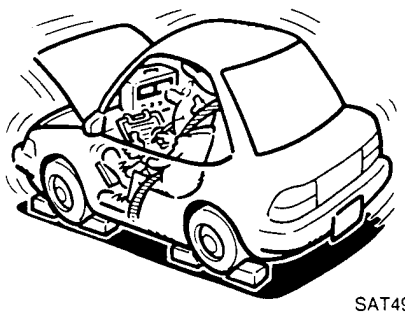
OK

INSPECTION END

A

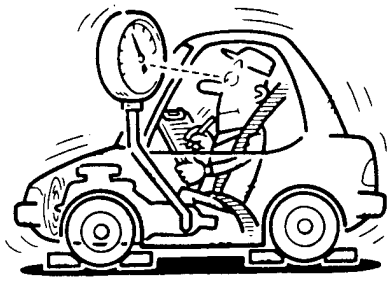
SAT638A

B



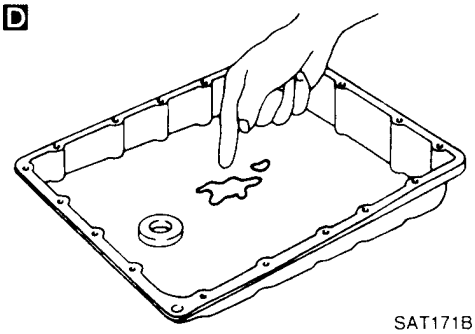
SAT493G

C



SAT494G

D



SAT171B

Diagnostic Procedure 9

SYMPTOM:

Vehicle does not creep backward when selecting "R" position.

1

Check A/T fluid level again.

NG → Refill ATF. → Ⓐ

OK ↓

2

Check stall revolution with selector lever in "1" and "R" positions.

NG in both "1" and "R" positions → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
- Oil pump assembly
- Torque converter
- Reverse clutch assembly
- High clutch assembly
- Low & reverse brake assembly
- Low one-way clutch

OK ↓

OK in "1" position NG in "R" position → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
- Oil pump assembly
- Torque converter
- Reverse clutch assembly
- High clutch assembly

C

Check line pressure at idle with selector lever in "R" position. — Refer to "PRESSURE TESTING", AT-96.

NG → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
- Oil pump assembly

OK ↓

D

1. Remove oil pan.
2. Check fluid condition.

NG → Ⓐ

OK ↓

Check again.

NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

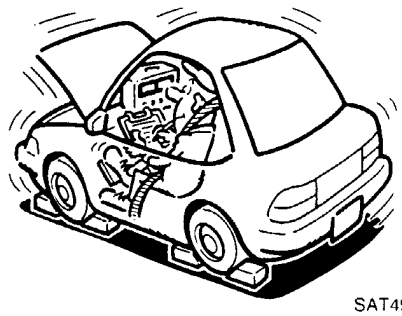
OK ↓

INSPECTION END

A

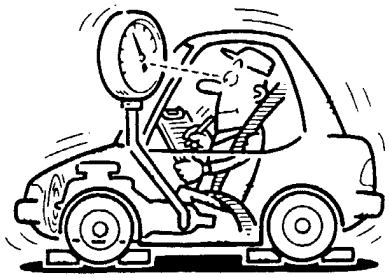
SAT638A

B



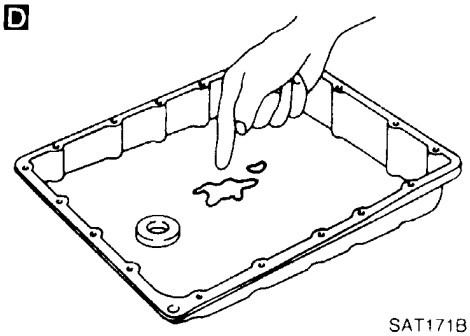
SAT493G

C



SAT494G

D



SAT171B

Diagnostic Procedure 10

SYMPTOM:

Vehicle does not creep forward when selecting "D", "2" or "1" position.

A

Check A/T fluid level again.

NG → Refill ATF.

OK

B

Check stall revolution with selector lever in "D" position. — Refer to "STALL TESTING", AT-93.

NG → Ⓐ

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
- Oil pump assembly
- Forward clutch assembly
- Forward one-way clutch
- Low one-way clutch
- Low & reverse brake assembly
- Torque converter

OK

C

Check line pressure at idle with selector lever in "D" position. — Refer to "PRESSURE TESTING", AT-96.

OK

NG

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
- Oil pump assembly

D

1. Remove oil pan.
2. Check A/T fluid condition.

NG → Ⓐ

OK

Check again.

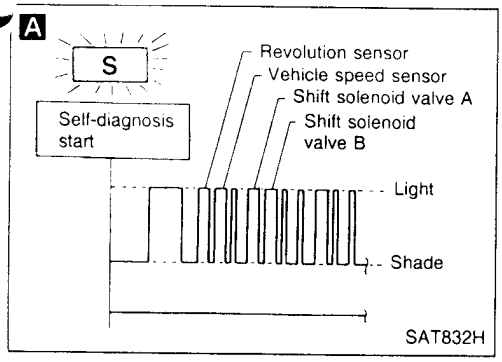
NG

1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END

A



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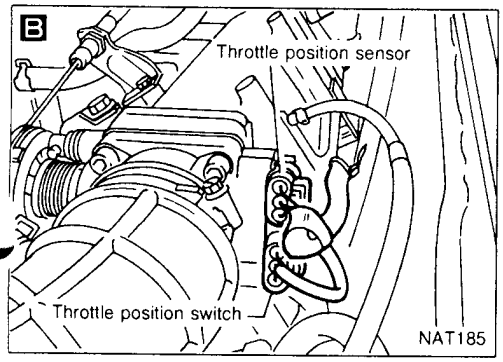

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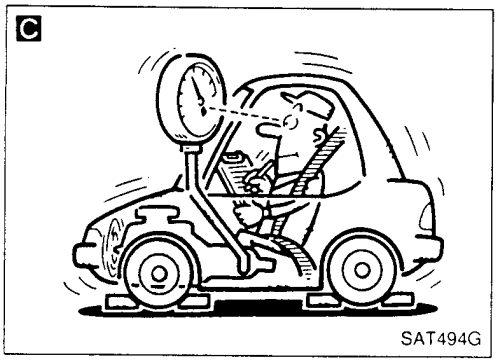

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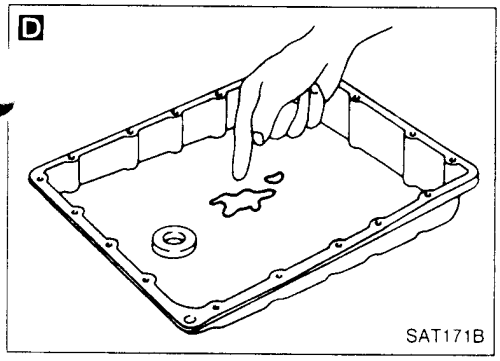


Diagnostic Procedure 11

SYMPTOM:

Vehicle cannot be started from D_1 on Cruise test — Part 1.

Is Diagnostic Procedure 9 OK?
- No → Go to Diagnostic Procedure 9, AT-75.
- Yes ↓

A

Does self-diagnosis show damage to revolution sensor, vehicle speed sensor, shift solenoid valve A or B after cruise test?
- Yes → Check damaged circuit. — Refer to "Self-diagnosis", AT-40.
- No ↓

B

Check throttle position sensor. — Refer to EC section.
- NG → Repair or replace throttle position sensor.
- OK ↓

C

Check line pressure at stall point with selector lever in "D" position. — Refer to "PRESSURE TESTING", AT-96.
- NG →
  1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
  2. Check the following items:
     - Shift valve A
     - Shift valve B
     - Shift solenoid valve A
     - Shift solenoid valve B
     - Pilot valve
     - Pilot filter
  3. Disassemble A/T.
  4. Check the following items:
     - Forward clutch assembly
     - Forward one-way clutch
     - Low one-way clutch
     - High clutch assembly
     - Torque converter
     - Oil pump assembly
- OK ↓

D

1. Remove oil pan.
2. Check A/T fluid condition.

- NG → (same items as above)
- OK ↓

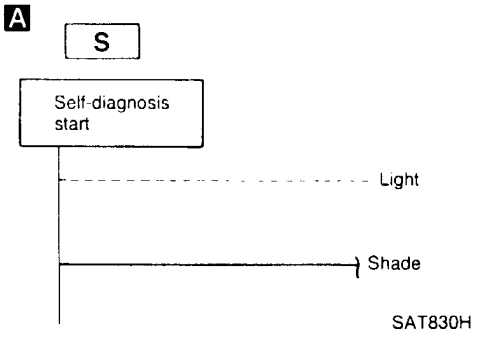
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Shift valve A
   - Shift valve B
   - Shift solenoid valve A
   - Shift solenoid valve B
   - Pilot valve
   - Pilot filter

- OK → (same items as above)
- OK ↓

Check again.
- NG →
  1. Perform A/T control unit input/output signal inspection.
  2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.
- OK ↓

INSPECTION END

A



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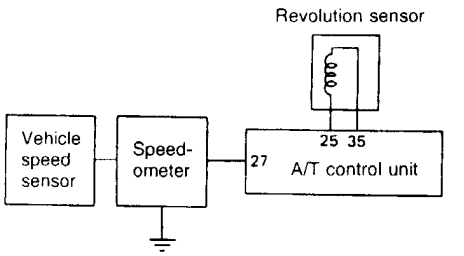

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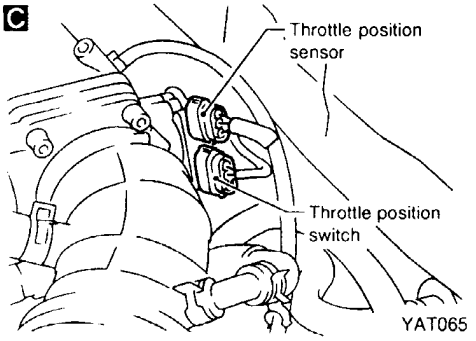

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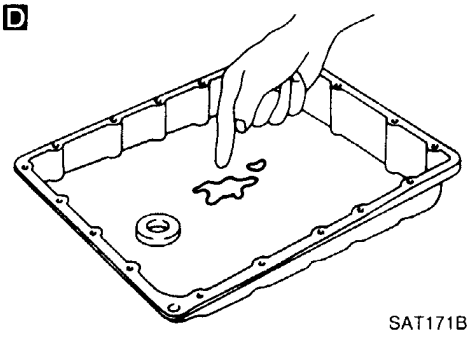


Diagnostic Procedure 12

SYMPTOM:

A/T does not shift from D_1 to D_2 at the specified speed.
A/T does not shift from D_4 when depressing accelerator pedal fully at the specified speed.

Are Diagnostic Procedures 10 and 11 OK?
- No → Go to Diagnostic, Procedure 10 or 11, AT-76, 77.
- Yes ↓

Does "ECM INPUT SIGNALS" in Data Monitor show damage to inhibitor switch circuit?
- Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis", AT-40.

OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No ↓

B

Check revolution sensor and vehicle speed sensor circuit. — Refer to "Self-diagnosis", AT-40.
- NG → Repair or replace revolution sensor and vehicle speed sensor circuits.
- OK ↓

C

Check throttle position sensor. — Refer to EC section.
- NG → Repair or replace throttle position sensor.
- OK ↓

D

1. Remove oil pan.
2. Check A/T fluid condition.

- NG →
  1. Remove control valve. — Refer to "ON-VEHICLE SERVICE", AT-101.
  2. Check the following items:
     - Shift valve A
     - Shift solenoid valve A
     - Pilot valve
     - Pilot filter
  3. Disassemble A/T.
  4. Check the following items:
     - Servo piston assembly
     - Brake band
     - Oil pump assembly
- OK ↓

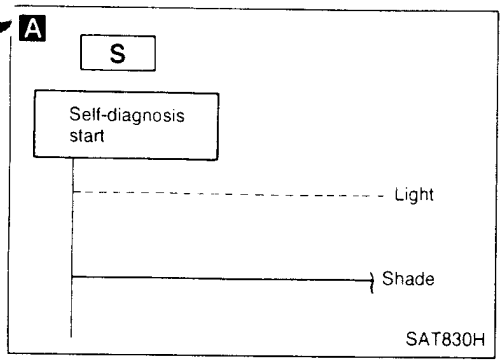
1. Remove control valve. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items.
   - Shift valve A
   - Shift solenoid valve A
   - Pilot valve
   - Pilot filter

OK ↓

Check again.
- NG →
  1. Perform A/T control unit input/output signal inspection.
  2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.
- OK ↓

INSPECTION END

A



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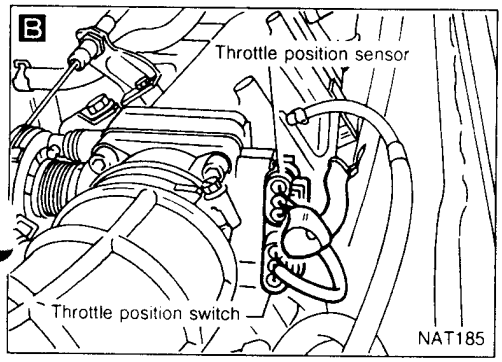

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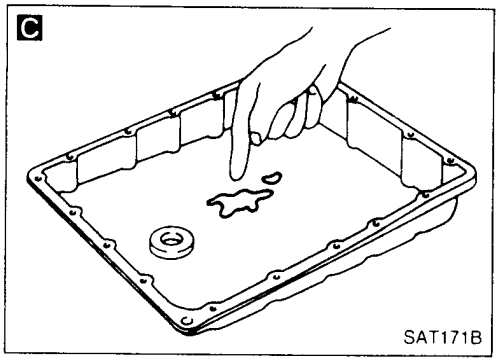


Diagnostic Procedure 13

SYMPTOM:

A/T does not shift from D_2 to D_3 at the specified speed.

Are Diagnostic Procedures 10 and 11 OK? — No → Go to Diagnostic Procedure 10 or 11, AT-76, 77.

Yes

Does "ECM INPUT SIGNALS" in Data Monitor show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis", AT-40.

OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No

B

Check throttle position sensor. — Refer to EC section. — NG → Repair or replace throttle position sensor.

OK

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- Servo piston assembly
- High clutch assembly
- Oil pump assembly

OK

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter

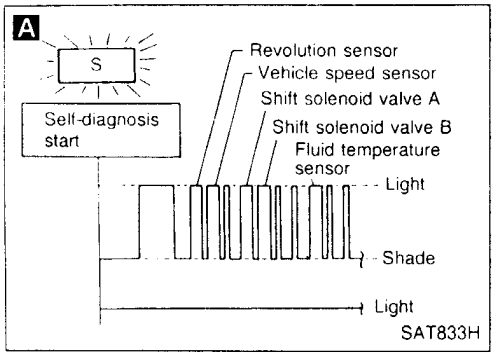
OK

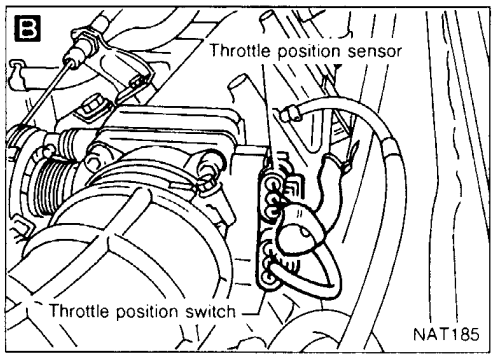
OK

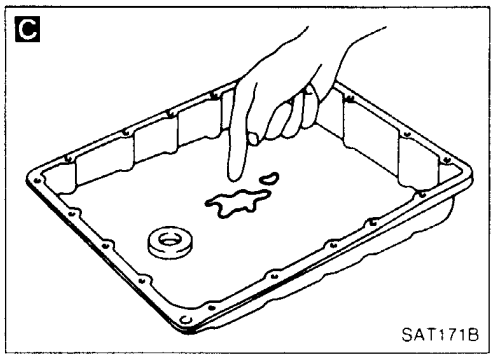
Check again. — NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END







Diagnostic Procedure 14

SYMPTOM:

A/T does not shift from D_3 to D_4 at the specified speed.
A/T must be warm before D_3 to D_4 shift will occur.

Are Diagnostic Procedures 10 and 11 OK?
- No → Go to Diagnostic Procedure 10 or 11, AT-76, 77.
- Yes ↓

A

Does self-diagnosis show damage to any of the following after cruise test: inhibitor switch, overdrive switch, shift solenoid valve A, B, revolution sensor, vehicle speed sensor or fluid temperature sensor circuit?
- Yes → Check damaged circuit. — Refer to "Self-diagnosis", AT-40.
- No ↓

B

Check throttle position sensor. — Refer to EC section.
- NG → Repair or replace throttle position sensor.
- OK ↓

C

1. Remove oil pan.
2. Check A/T fluid condition.

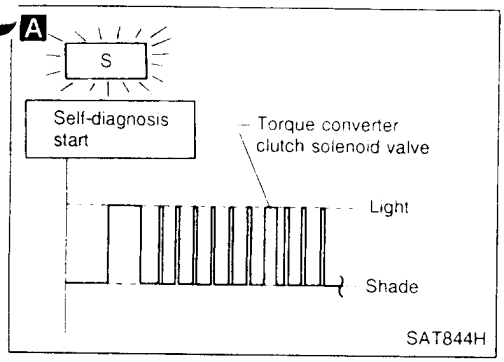
- NG → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
  2. Check the following items:
  - Shift valve B
  - Overrun clutch control valve
  - Shift solenoid valve B
  - Pilot valve
  - Pilot filter
  3. Disassemble A/T.
  4. Check the following items:
  - Servo piston assembly
  - Brake band
  - Torque converter
  - Oil pump assembly
- OK ↓

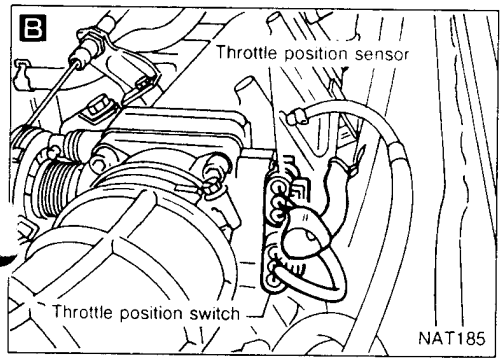
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items.
- Shift valve B
- Overrun clutch control valve
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK ↓

Check again.
- NG → 1. Perform A/T control unit input/output signal inspection.
  2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.
- OK ↓

INSPECTION END





Diagnostic Procedure 15

SYMPTOM:

A/T does not perform lock-up at the specified speed.

A

Does self-diagnosis show damage to torque converter clutch solenoid valve circuit after cruise test?

Yes → Check torque converter clutch solenoid valve circuit. — Refer to "Self-diagnosis", AT-40.

No

B

Check throttle position sensor. — Refer to EC section.

NG → Repair or replace throttle position sensor.

OK

1. Remove control valve. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check following items:
   - Torque converter clutch control valve
   - Torque converter relief valve
   - Torque converter clutch solenoid valve
   - Pilot valve
   - Pilot filter

NG → Repair or replace damaged parts.

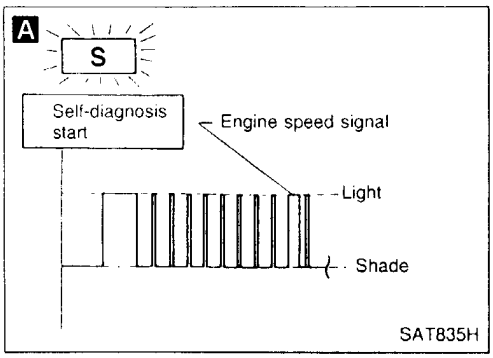
OK

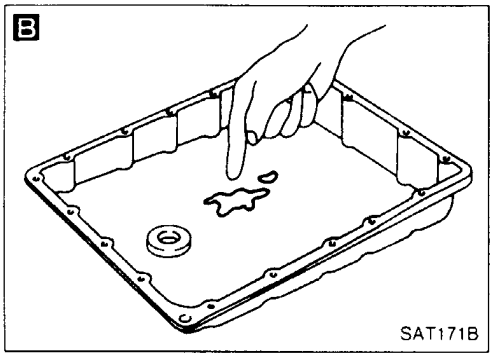
Check again.

NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END





Diagnostic Procedure 16

SYMPTOM:

A/T does not hold lock-up condition for more than 30 seconds.

A

Does self-diagnosis show damage to engine speed signal circuit after cruise test?

Yes → Check engine speed signal circuit. — Refer to "Self-diagnosis", AT-40.

No

B

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
- Torque converter clutch control valve
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check torque converter and oil pump assembly.

OK

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
- Torque converter clutch control valve
- Pilot valve
- Pilot filter

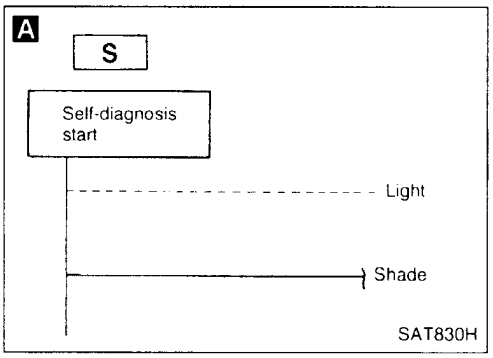
OK ← OK

Check again.

NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END



Diagnostic Procedure 17

SYMPTOM:

Lock-up is not released when accelerator pedal is released

Does "ECM INPUT SIGNALS" in Data Monitor show damage to closed throttle position switch circuit?

Yes → Check closed throttle position switch circuit. — Refer to "Self-diagnosis", AT-40.

OR

A

Does self-diagnosis show damage to closed throttle position switch circuit?

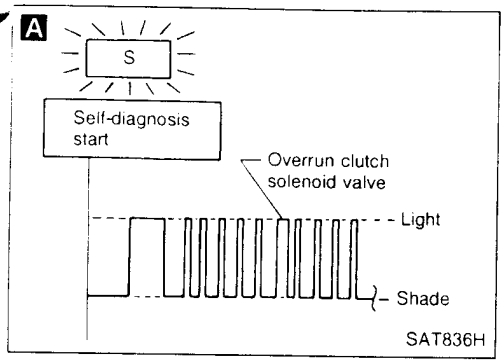
No

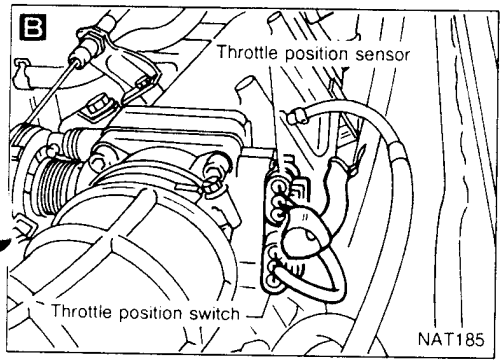
Check again.

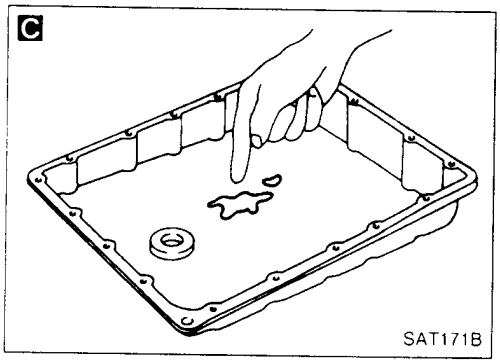
NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END







Diagnostic Procedure 18

SYMPTOM:

With accelerator pedal released:

- **Engine does not smoothly return to idle when A/T shifts from D_4 to D_3.**
- **Vehicle does not decelerate by engine brake when turning overdrive switch OFF except for the Middle East.**
- **Vehicle does not decelerate by engine brake when changing selector lever from "D" to "2" position.**

A

Does self-diagnosis show damage to overrun clutch solenoid valve circuit after cruise test?

Yes → Check overrun clutch solenoid valve circuit. — Refer to "Self-diagnosis", AT-40.

No

B

Check throttle position sensor. — Refer to EC section.

NG → Repair or replace throttle position sensor.

OK

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Overrun clutch control valve
   - Overrun clutch reducing valve
   - Overrun clutch solenoid valve
3. Disassemble A/T.
4. Check the following items:
   - Overrun clutch assembly
   - Oil pump assembly

OK

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Overrun clutch control valve
   - Overrun clutch reducing valve
   - Overrun clutch solenoid valve

OK

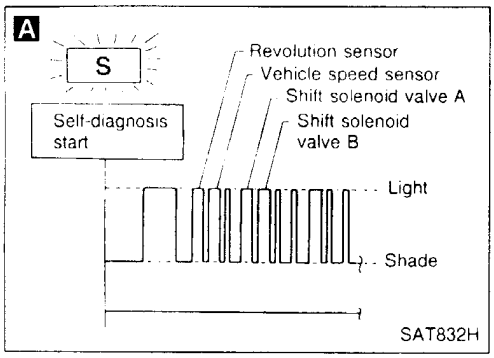
OK

Check again.

NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END



Diagnostic Procedure 19

SYMPTOM:

Vehicle does not start from D_1 on Cruise test — Part 2.

A

Does self-diagnosis show damage to revolution sensor, vehicle speed sensor, shift solenoid valve A or B after cruise test?

Yes → Check damaged circuit. — Refer to "Self-diagnosis", AT-40.

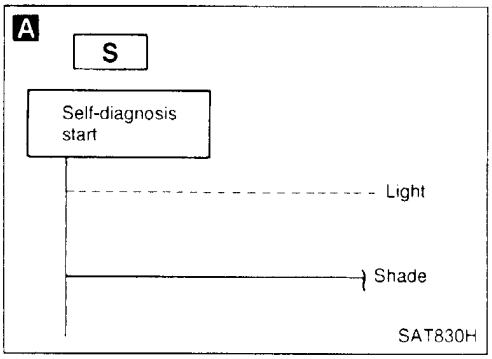
No ↓

Check again.

NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

Go to Diagnostic Procedure 11, AT-77.



Diagnostic Procedure 20

SYMPTOM:

A/T does not shift from D_4 to D_3 when changing overdrive control switch to "OFF" position.

Does "ECM INPUT SIGNALS" in Data Monitor show damage to overdrive control switch circuit?

Yes → Check overdrive control switch circuit. — Refer to "Self-diagnosis", AT-40.

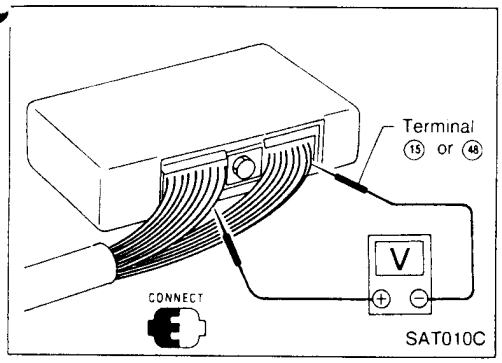
OR

A

Does self-diagnosis show damage to overdrive control switch circuit?

No ↓

Go to Diagnostic Procedure 13, AT-79.

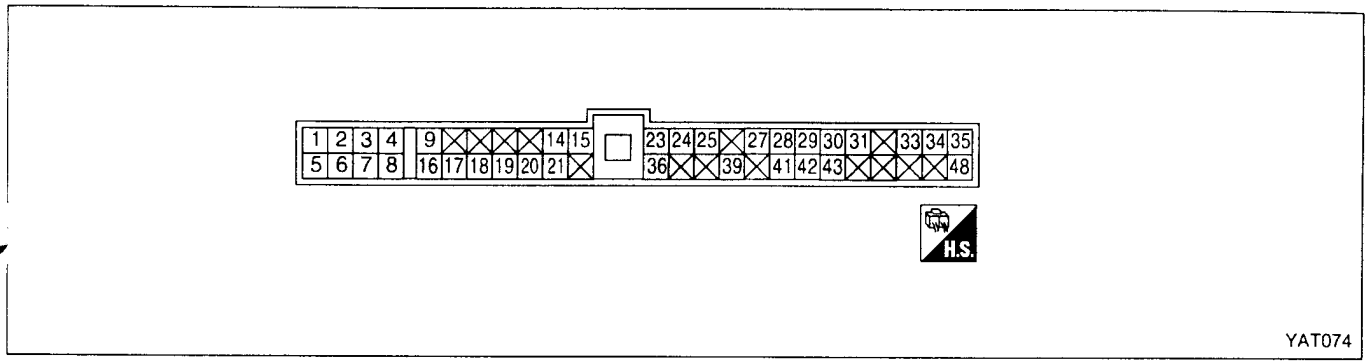


Electrical Components Inspection

INSPECTION OF A/T CONTROL UNIT

- Measure voltage between each terminal and terminal ⑮ or ㊽ by following "A/T CONTROL UNIT INSPECTION TABLE".

- Pin connector terminal layout



A/T CONTROL UNIT INSPECTION TABLE

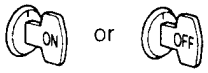
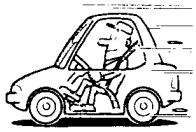
(Data are reference values.)

Terminal No.	Item	Condition		Judgement standard
1	Line pressure solenoid valve		When releasing accelerator pedal after warming up engine.	1.5 - 2.5V
			When depressing accelerator pedal fully after warming up engine.	0.5V or less
2	Line pressure solenoid valve (with dropping resistor)		When releasing accelerator pedal after warming up engine.	5 - 14V
			When depressing accelerator pedal fully after warming up engine.	0.5V or less
3	A/T SPORT mode indicator lamp		When setting A/T mode switch in "SPORT" position.	Battery voltage
			When setting A/T mode switch in other positions.	1V or less
4	Power source		When turning ignition switch to "ON".	Battery voltage
			When turning ignition switch to "OFF".	1V or less

Electrical Components Inspection (Cont'd)

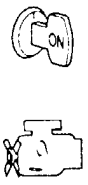
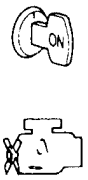
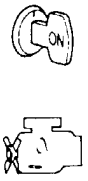
Terminal No.	Item	Condition		Judgement standard
5	Torque converter clutch solenoid valve		When A/T performs lock-up.	8 - 15V
			When A/T does not perform lock-up.	1V or less
6	Shift solenoid valve A		When shift solenoid valve A operates. (When driving in "D_1" or "D_4".)	Battery voltage
			When shift solenoid valve A does not operate. (When driving in "D_2" or "D_3".)	1V or less
7	Shift solenoid valve B		When shift solenoid valve B operates. (When driving in "D_1" or "D_2".)	Battery voltage
			When shift solenoid valve B does not operate. (When driving in "D_3" or "D_4".)	1V or less
8	Overrun clutch solenoid valve		When overrun clutch solenoid valve operates.	Battery voltage
			When overrun clutch solenoid valve does not operate.	1V or less
9	Power source		Same as No. 4	
10	—		—	—
11	—		—	—
12	—		—	—
13	—		—	—
14	Closed throttle position switch (in throttle position switch)		When releasing accelerator pedal after warming up engine.	Battery voltage
			When depressing accelerator pedal after warming up engine.	1V or less
15	Ground		—	—
16	Inhibitor "1" position switch		When setting selector lever to "1" position.	Battery voltage
			When setting selector lever to other positions.	1V or less
17	Inhibitor "2" position switch		When setting selector lever to "2" position.	Battery voltage
			When setting selector lever to other positions.	1V or less
18	Inhibitor "D" position switch		When setting selector lever to "D" position.	Battery voltage
			When setting selector lever to other positions.	1V or less

Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition		Judgement standard
19	Inhibitor "N" or "P" position switch		When setting selector lever to "N" or "P" position.	Battery voltage
			When setting selector lever to other positions.	1V or less
20	Inhibitor "R" position switch		When setting selector lever to "R" position.	Battery voltage
			When setting selector lever to other positions.	1V or less
21	Wide open throttle position switch (in throttle position switch)		When depressing accelerator pedal more than half-way after warming up engine.	Battery voltage
			When releasing accelerator pedal after warming up engine.	1V or less
22	—		—	—
23	Power source (Back-up)		When turning ignition switch to "OFF".	Battery voltage
			When turning ignition switch to "ON".	Battery voltage
24	Engine speed signal		When engine runs at idle speed.	0.9V
			When engine runs at 4,000 rpm.	Approximately 3.7V
25	Revolution sensor (Measure in AC position)		When vehicle cruises at 30 km/h (19 mph).	1V or more Voltage rises gradually in response to vehicle speed.
			When vehicle parks.	0V
26	—		—	—
27	Vehicle speed sensor		When moving vehicle at 2 to 3 km/h (1 to 2 mph) for 1 m (3 ft) or more.	Varies between less than 1V and more than 4.5V
28*	—		—	—
29*	—		—	—
30*	—		—	—
31	Throttle position sensor (Power source)		—	4.5 - 5.5V
32	—		—	—

*: These terminals are connected to the data link connector for CONSULT.

Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition		Judgement standard
33	A/T Fluid temperature sensor		When ATF temperature is 20°C (68°F).	Approximately 1.5V
			When ATF temperature is 80°C (176°F).	Approximately 0.5V
34	Throttle position sensor		When depressing accelerator pedal slowly after warming up engine. (Voltage rises gradually in response to throttle position.)	Fully-closed throttle: Approximately 0.5V Fully-open throttle: Approximately 4V
35	Throttle position sensor (Ground)		—	—
36	A/T mode switch		When setting A/T mode switch in "SPORT" position.	Battery voltage
			When setting A/T mode switch in other positions.	1V or less
37	—		—	—
38	—		—	—
39	Overdrive OFF switch		When setting overdrive switch in "ON" position.	Battery voltage
			When setting overdrive switch in "OFF" position.	1V or less
40	—		—	—
41	Kick down switch		When depressing accelerator pedal	1V or less
			When releasing accelerator pedal	Battery voltage
42	A/T SNOW mode switch		When setting A/T mode switch in "SNOW" position.	Battery voltage
			When setting A/T mode switch in other positions.	1V or less
43	—		—	—
44	—		—	—
45	—		—	—
46	—		—	—
47	—		—	—
48	Ground		—	—

Electrical Components Inspection (Cont'd)

SOLENOID VALVES AND FLUID TEMPERATURE SENSOR

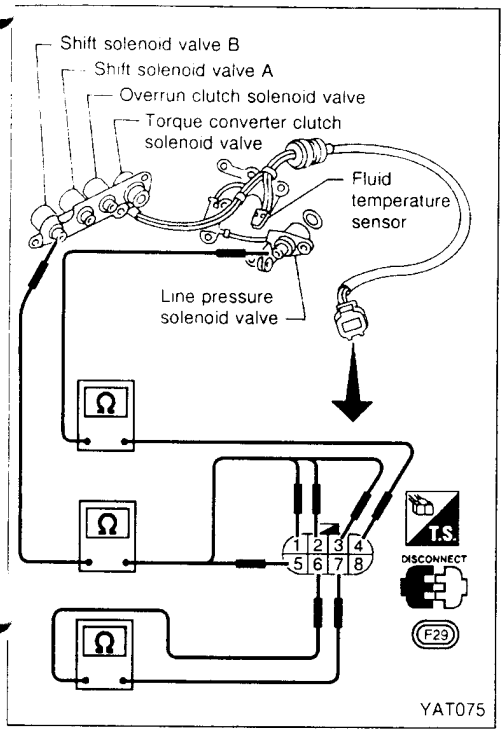
- For removal and installation, refer to "ON-VEHICLE SERVICE", AT-101.

Solenoid valves

Resistance check

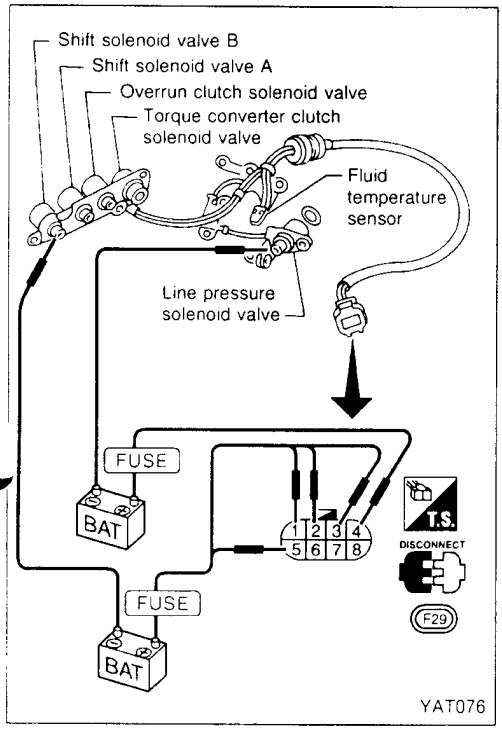
- Check resistance between terminal cord assembly connector (F29) terminals.

Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	②	Ground (Bracket)	20 - 30Ω
Shift solenoid valve B	①		
Overrun clutch solenoid valve	③		
Line pressure solenoid valve	④		2.5 - 5Ω
Torque converter clutch solenoid valve	⑤		10 - 16Ω



Operation check

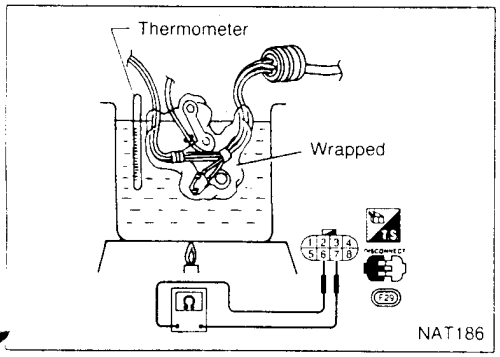
- Check solenoid valve by listening for its operating sound while applying battery voltage to the relevant terminal cord assembly connector (F29) terminal and ground (bracket).



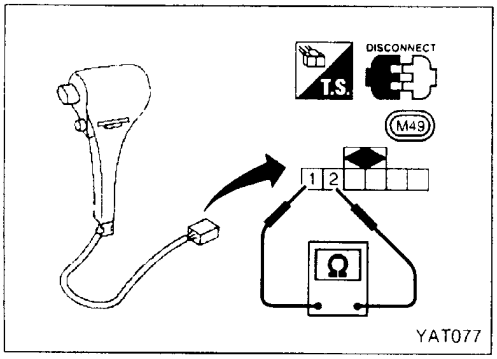
A/T Fluid temperature sensor

Check resistance between terminal cord assembly connector (F29) terminals ⑥ and ⑦ while changing temperature as shown at left.

Temperature °C (°F)	Resistance (Approx.)
20 (68)	2.5 kΩ
80 (176)	0.3 kΩ



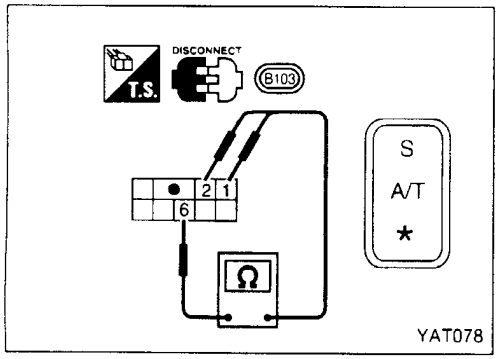
Electrical Components Inspection (Cont'd)



OVERDRIVE CONTROL SWITCH

- Check continuity between two terminals.

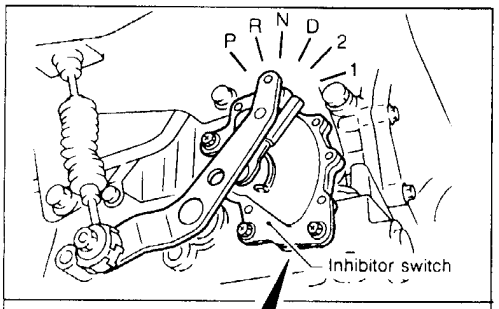
OD switch position	Continuity
ON	No
OFF	Yes

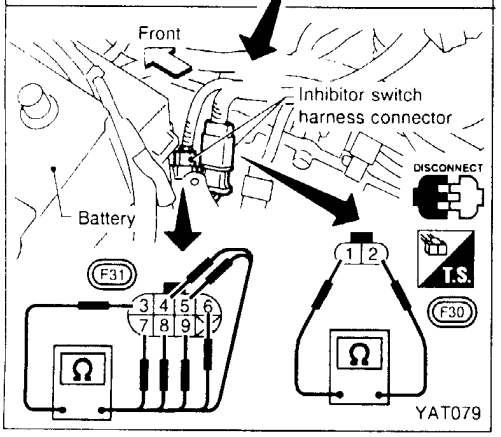


A/T MODE SWITCH

- Check continuity between A/T mode switch terminals ① and ②; and between terminals ① and ⑥.

Switch position		Terminal No.	Continuity
SPORT	ON	① — ②	Yes
	OFF		No
SNOW	ON	① — ⑥	Yes
	OFF		No



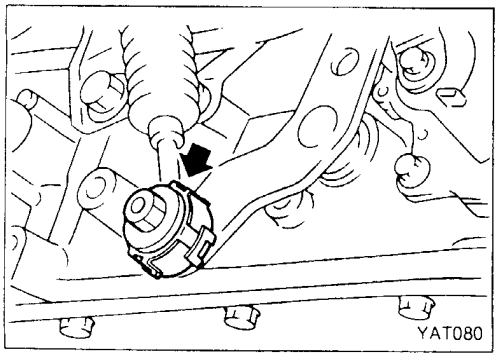


INHIBITOR SWITCH

1. Check continuity between inhibitor switch terminals ① and ②; and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each position.

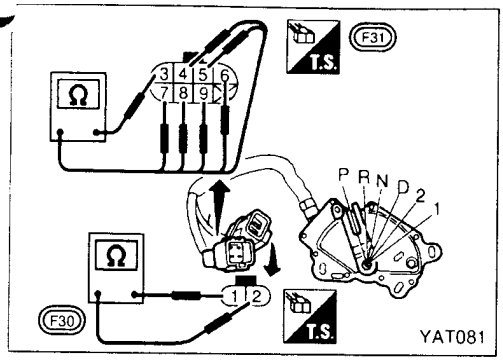
Lever position	Terminal No.	
P	③ — ⑦	① — ②
R	③ — ⑧	
N	③ — ④	① — ②
D	③ — ⑥	
2	③ — ⑤	
1	③ — ④	

Continuity should exist only between terminals indicated, for each lever position.

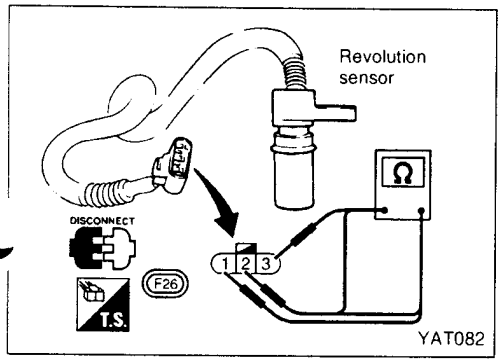


2. If NG, check again with control cable disconnected from manual shaft of A/T assembly. — Refer to step 1.
3. If OK on step 2, adjust control cable. — Refer to "ON-VEHICLE SERVICE", AT-102.

Electrical Components Inspection (Cont'd)



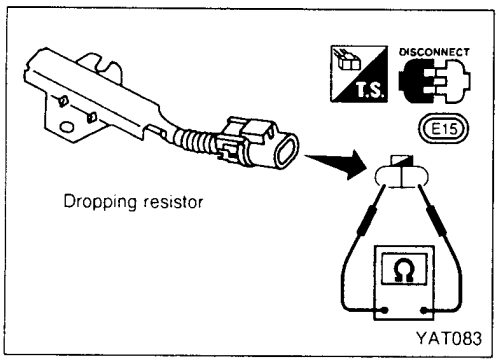
4. If NG on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminals. — Refer to step 1.
5. If OK on step 4, adjust inhibitor switch. — Refer to "ON-VEHICLE SERVICE", AT-101.
6. If NG on step 4, replace inhibitor switch.



REVOLUTION SENSOR

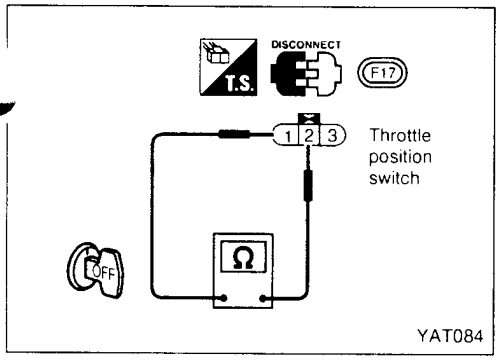
- For removal and installation, refer to "ON-VEHICLE SERVICE", AT-101.
- Check resistance between revolution sensor terminals ①, ② and ③.

Terminal No.		Resistance
①	②	500 - 650Ω
②	③	No continuity
①	③	No continuity



DROPPING RESISTOR

- Check resistance between dropping resistor terminals.
  Resistance: 11.2 - 12.8Ω



THROTTLE POSITION SWITCH

Closed throttle position switch (idle position)

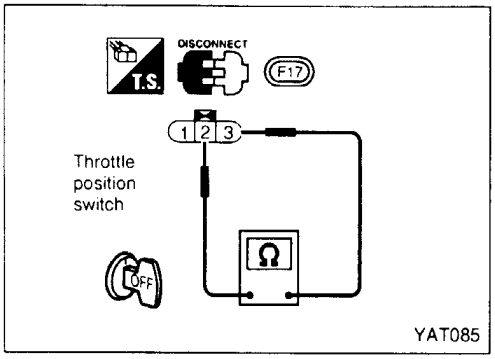
- Check continuity between throttle position switch terminals ① and ②.

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

- To adjust closed throttle position switch perform "Basic Inspection", "TROUBLE DIAGNOSIS-Basic Inspection" in EC-section.

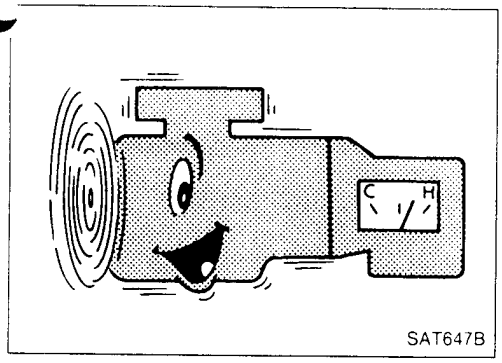
Electrical Components Inspection (Cont'd)

Wide open throttle position switch



- Check continuity between throtle position switch terminals ② and ③.

Accelerator pedal condition	Continuity
Released	No
Depressed	Yes



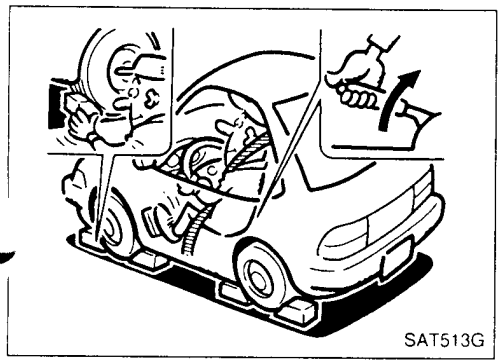
SAT647B

Final Check

STALL TESTING

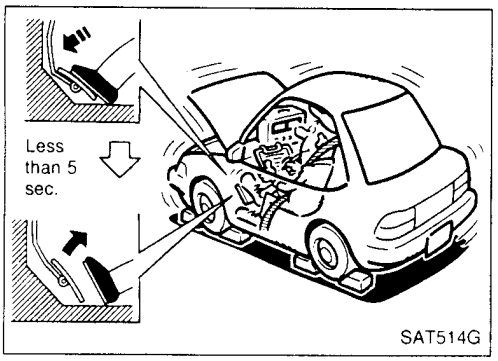
Stall test procedure

1. Check A/T and engine fluid levels. If necessary, add. fluid.
2. Drive vehicle for about 10 minutes to warm engine oil and ATF up to operating temperature.
   ATF operating temperature:
   50 - 80°C (122 - 176°F)


SAT513G

3. Set parking brake and chock wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to put a mark on point of specified engine rpm on indicator.**

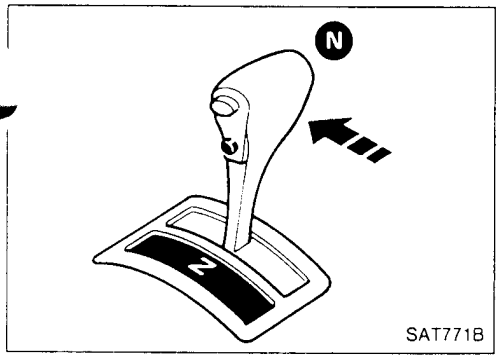


SAT514G

5. Start engine, apply foot brake, and place selector lever in "D" position.
6. Accelerate to wide-open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.

- **During test, never hold throttle wide-open for more than 5 seconds.**

Stall revolution:
SR20De engine model 1900 - 2200 rpm



SAT771B

8. Shift selector lever to "N" position.
9. Cool off ATF.

- **Run engine at idle for at least one minute.**

10. Repeat tests following steps 5 through 9 with selector lever in "2", "1" and "R" positions.

Final Check (Cont'd)

JUDGEMENT OF STALL TEST

The test result and possible damaged components relating to each result are shown in the illustration. In order to pinpoint the possible damaged components, follow the WORK FLOW shown in AT-12.

Note

Stall revolution is too high in "D" or "2" position:

- Slippage occurs in 1st gear but not in 2nd and 3rd gears. ..... Low one-way clutch slippage
- Slippage occurs at the following gears:
  1st through 3rd gears in "D" position and engine brake functions with A/T mode switch set to "SPORT".
  1st and 2nd gears in "2" position and engine brake functions with accelerator pedal released (fully closed throttle). ..... Forward clutch or forward one-way clutch slippage

Stall revolution is too high in "R" position:

- Engine brake does not function in "1" position. ..... Low & reverse brake slippage
- Engine brake functions in "1" position. ..... Reverse clutch slippage

Stall revolution within specifications:

- Vehicle does not achieve speed of more than 80 km/h (50 mph). ..... One-way clutch seizure in torque converter housing

  CAUTION:
  Be careful since automatic fluid temperature increases abnormally.
- Slippage occurs in 3rd and 4th gears in "D" position. ..... High clutch slippage
- Slippage occurs in 2nd and 4th gear in "D" position. ..... Brake band slippage

Stall revolution less than specifications:

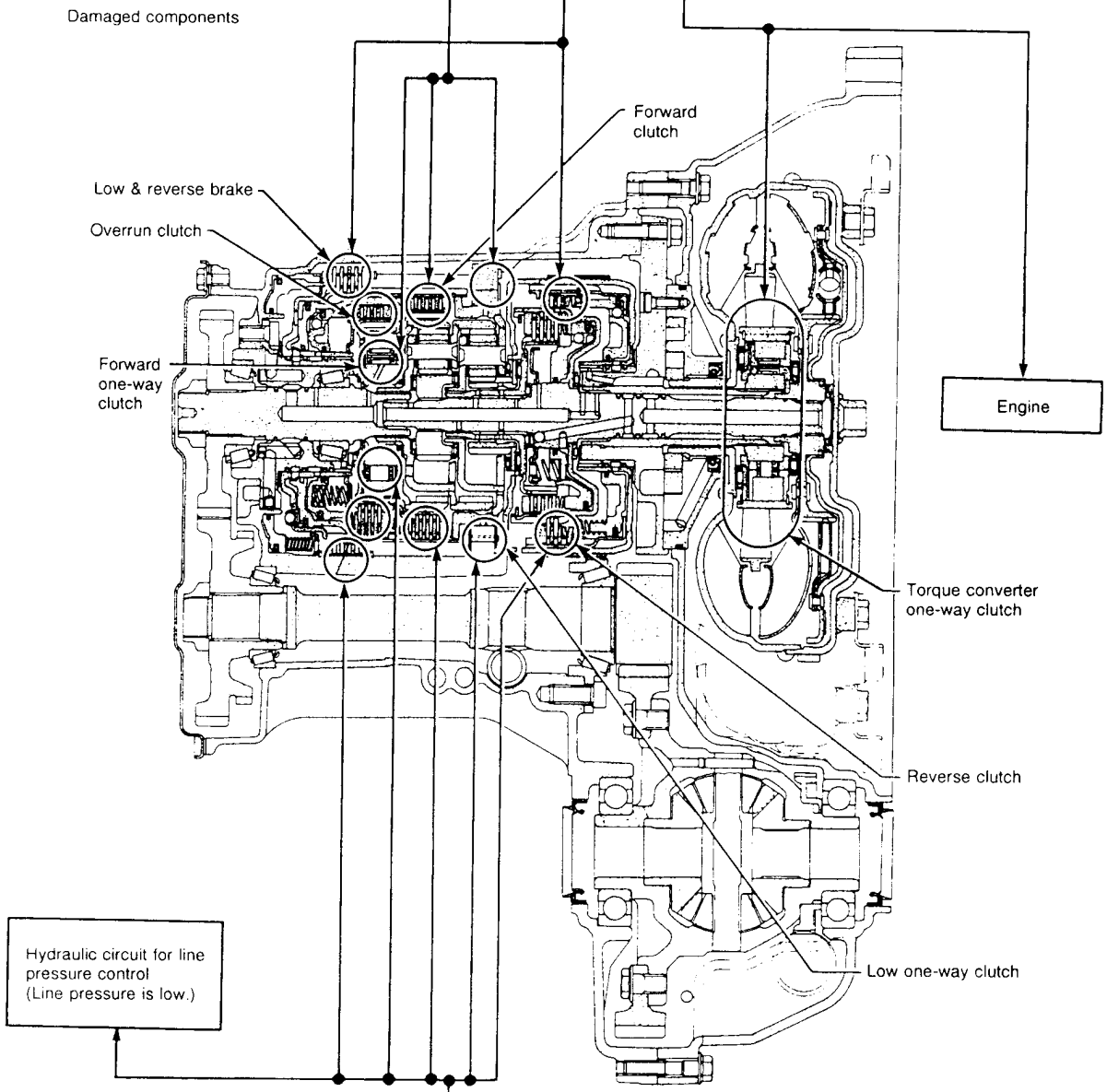
- Poor acceleration during starts. ..... One-way clutch seizure in torque converter

Final Check (Cont'd)

Judgement of stall test

Selector lever position	Judgement		
D	H	O	L
2	H	O	L
1	H	O	L
R	O	H	L

O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.



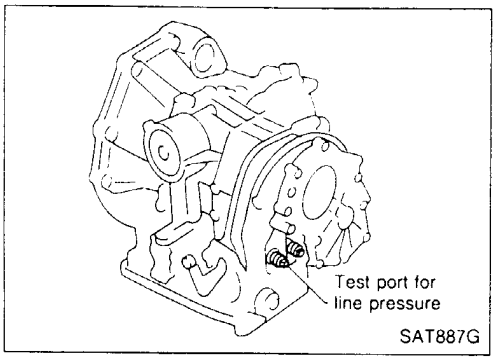
Selector lever position	Judgement	
D	H	O
2	H	O
1	H	O
R	H	O

Clutches and brakes except high clutch and brake band are OK (Condition of high clutch and brake band cannot be confirmed by stall test.)

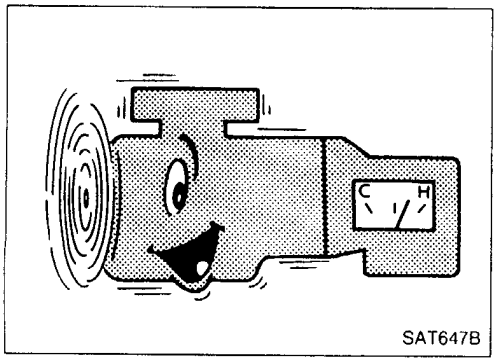
SAT871H

Final Check (Cont'd)

PRESSURE TESTING

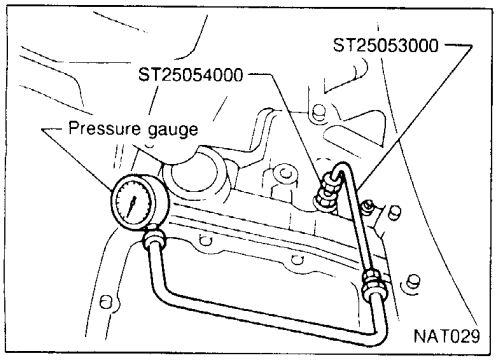


- Location of pressure test ports.
- **Always replace pressure plugs as they are self-sealing bolts.**

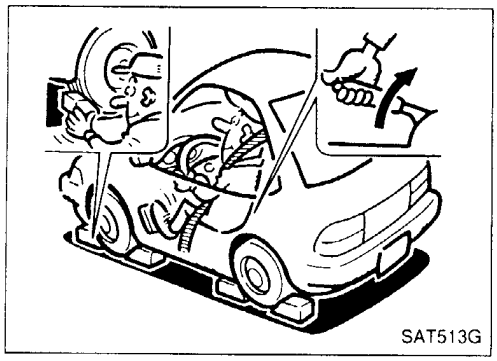


Line pressure test procedure

1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Warm up engine until engine oil and ATF reach operating temperature after vehicle has been driven approx. 10 minutes.
   ATF operating temperature:
   50 - 80°C (122 - 176°F)

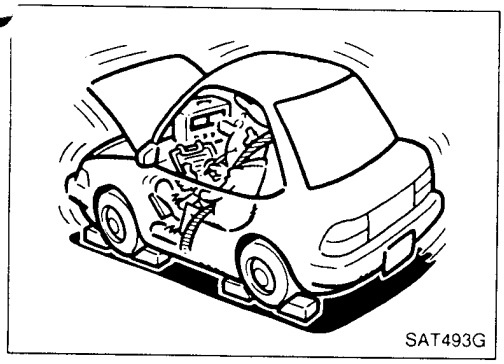


3. Install pressure gauge to corresponding line pressure port.



4. Set parking brake and block wheels.
- **Continue to depress brake pedal fully while line pressure test is being performed at stall speed.**

Final Check (Cont'd)



5. Start engine and measure line pressure at idle and stall speed.

- **When measuring line pressure at stall speed, follow the stall test procedure.**

Line pressure: Refer to SDS, AT-207

JUDGEMENT OF LINE PRESSURE TEST

	Judgement	Suspected parts
At idle	Line pressure is low in all positions.	• Oil pump wear • Pressure regulator valve or plug sticking • Spring for pressure regulator valve damaged • Fluid pressure leakage between oil strainer and pressure regulator valve
	Line pressure is low in particular position.	• Fluid pressure leakage between manual valve and particular clutch • For example: If line pressure is low in "R" and "1" positions but is normal in "D" and "2" positions, fluid leakage exists at or around low & reverse brake circuit.
	Line pressure is high.	• Mal-adjustment of throttle sensor • A/T Fluid temperature sensor damaged • Line pressure solenoid valve sticking • Short circuit of line pressure solenoid valve circuit • Pressure modifier valve sticking • Pressure regulator valve or plug sticking
At stall speed	Line pressure is low.	• Mal-adjustment of throttle sensor • Line pressure solenoid valve sticking • Short circuit of line pressure solenoid valve circuit • Pressure regulator valve or plug sticking • Pressure modifier valve sticking • Pilot valve sticking

Symptom Chart

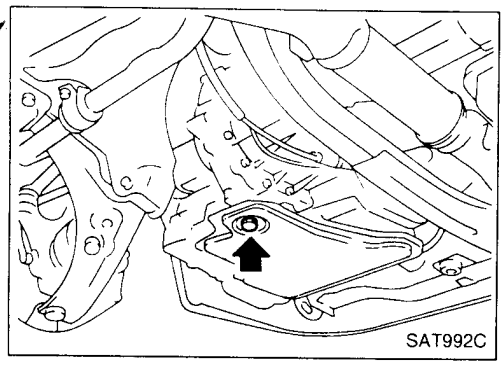
Reference page (AT-)		ON vehicle									OFF vehicle					
	Reference page (AT-)	19, 101	90	45, 47, 62	95	100, 51	53, 64	57, 55	59, 100	100	128	147, 151	156	156	162	—
Reference page (AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transaxle must be removed from the vehicle.	Fluid level / Control cable	Inhibitor switch / Throttle position sensor (Adjustment)	Revolution sensor and vehicle speed sensor / Engine speed signal	Engine idling rpm / Line pressure	Control valve assembly / Shift solenoid valve A	Shift solenoid valve B / Line pressure solenoid valve	Torque converter clutch solenoid valve / Overrun clutch solenoid valve	A/T Fluid temperature sensor / Accumulator N-D	Accumulator servo release / Ignition switch and starter	Torque converter / Oil pump	Reverse clutch / High clutch	Forward clutch / Forward one-way clutch	Overrun clutch / Low one-way clutch	Low & reverse brake / Brake band	Parking components
72	Engine does not start in "N", "P" positions.	2	3							1						
72	Engine starts in positions other than "N" and "P".	1	2													
—	Transaxle noise in "P" and "N" positions.	1	3	4 5	2						⑦ ⑥					
72	Vehicle moves when changing into "P" position or parking gear does not disengage when shifted out of "P" position.	1														②
72	Vehicle runs in "N" position.	1										③	②	④		
75	Vehicle will not run in "R" position (but runs in "D", "2" and "1" positions). Clutch slips. Very poor acceleration.	1			2	4	3					⑤ ⑥	⑦	⑧	⑨	
—	Vehicle braked when shifting into "R" position.	1 2			3	5	4					⑥	⑧	⑨	⑦	
—	Sharp shock in shifting from "N" to "D" position.		2	5	1 3	7	6		4 8				⑨			
—	Vehicle will not run in "D" and "2" positions (but runs in "1" and "R" positions).	1												②		
78	Vehicle will not run in "D", "1", "2" positions (but runs in "R" position). Clutch slips. Very poor acceleration.	1			2	4	3		5			⑥ ⑦	⑧ ⑨	⑩		
—	Clutches or brakes slip somewhat in starting.	1 2	3		4	6	5		7		⑫ ⑪	⑨	⑧		⑩	
—	Excessive creep.				1											
78	No creep at all.	1			2	3					⑥ ⑤		④			
—	Failure to change gear from "D_1" to "D_2".	2	1	5		4 3									⑥	
—	Failure to change gear from "D_2" to "D_3".	2	1	5		4	3					⑥			⑦	
—	Failure to change gear from "D_3" to "D_4".	2	1	4		3			5						⑥	
78, 79, 80	Too high a gear change point from "D_1" to "D_2", from "D_2" to "D_3", from "D_3" to "D_4".		1	2		3	4									
—	Gear change directly from "D_1" to "D_3" occurs.	1								2					③	
—	Engine stops when shifting lever into "R", "D", "2" and "1".				1	3		2			④					
—	Too sharp a shock in change from "D_1" to "D_2".		1		2	4			5	3					⑥	

Symptom Chart (Cont'd)

Reference page (AT-)		ON vehicle									OFF vehicle					
		19, 101	90	45, 47, 62	95	100, 51	53, 64	57, 55	59, 100	100	128	147, 151	156	156	162	—
Reference page (AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transaxle must be removed from the vehicle.	Fluid level Control cable	Inhibitor switch Throttle position sensor (Adjustment)	Revolution sensor and vehicle speed sensor Engine speed signal	Engine idling rpm Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B Line pressure solenoid valve	Torque converter clutch solenoid valve Overrun clutch solenoid valve	A/T Fluid temperature sensor Accumulator N-D	Accumulator servo release Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking components
—	Too sharp a shock in change from "D_2" to "D_3".		1		2	3						④			⑤	
—	Too sharp a shock in change from "D_3" to "D_4".		1		2	3								⑤	④	
—	Almost no shock or clutches slipping in change from "D_1" to "D_2".	1	2		3	5				4					⑥	
—	Almost no shock or slipping in change from "D_2" to "D_3".	1	2		3	4						⑤			⑥	
—	Almost no shock or slipping in change from "D_3" to "D_4".	1	2		3	4						⑤			⑥	
—	Vehicle braked by gear change from "D_1" to "D_2".	1										② ④		⑤	③	
—	Vehicle braked by gear change from "D_2" to "D_3".	1													②	
—	Vehicle braked by gear change from "D_3" to "D_4".	1										④	③	②		
—	Maximum speed not attained. Acceleration poor.	1	2			5 3	4				⑪ ⑩	⑥ ⑦			⑨ ⑧	
—	Failure to change gear from "D_4" to "D_3".	1	2			6 4	5	3						⑧	⑦	
—	Failure to change gear from "D_3" to "D_2" or from "D_4" to "D_2".	1	2			5 3	4					⑥			⑦	
—	Failure to change gear from "D_2" to "D_1" or from "D_3" to "D_1".	1	2			5 3	4					⑦		⑥	⑧	
—	Gear change shock felt during deceleration by releasing accelerator pedal.		1		2	4		3								
—	Too high a change point from "D_4" to "D_3", from "D_3" to "D_2", from "D_2" to "D_1".		1	2												
—	Kickdown does not operate when depressing pedal in "D_4" within kickdown vehicle speed.		1	2		3	4									
—	Kickdown operates or engine overruns when depressing pedal in "D_4" beyond kickdown vehicle speed limit.		2	1		3	4									
—	Races extremely fast or slips in changing from "D_4" to "D_3" when depressing pedal.	1	2		3	5	4					⑥	⑦			
—	Races extremely fast or slips in changing from "D_1" to "D_2" when depressing pedal.	1	2		3	6 5	4						⑧		⑦	
—	Races extremely fast or slips in changing from "D_3" to "D_2" when depressing pedal.	1	2		3	5	4		8			⑨	⑦		⑥	
—	Races extremely fast or slips in changing from "D_4" or "D_3" to "D_1" when depressing pedal.	1	2		3	5	4						⑥ ⑦	⑧		
—	Vehicle will not run in any position.	1 2			3		4				⑨ ⑤	⑥			⑧ ⑦	⑩

Symptom Chart (Cont'd)

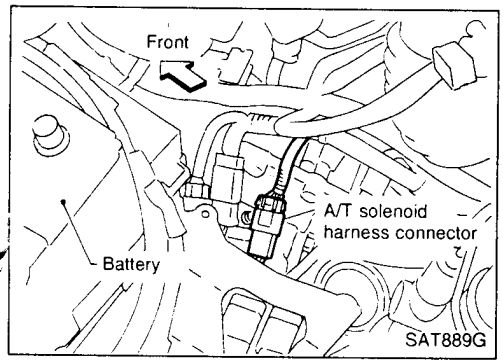
Reference page (AT-)		ON vehicle									OFF vehicle					
		19, 101	90	45, 47, 62	95	100, 51	53, 64	57, 55	59, 100	100	128	147, 151	156	156	162	—
Reference page (AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transaxle must be removed from the vehicle.	Fluid level Control cable	Inhibitor switch Throttle position sensor (Adjustment)	Revolution sensor and vehicle speed sensor Engine speed signal	Engine idling rpm Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B Line pressure solenoid valve	Torque converter clutch solenoid valve Overrun clutch solenoid valve	A/T Fluid temperature sensor Accumulator N-D	Accumulator servo release Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking components
—	Transaxle noise in "D", "2", "1" and "R" positions.	1 .	. .	. .	. .	. .	. .	. .	. .	. .	② .	. .	. .	. .	. .	.
83	Failure to change from "D_3" to "2_2" when changing lever into "2" position.	. 7	1 2	. .	. .	6 5	4 .	. 3	. .	. .	. .	. .	. .	⑨ .	. ⑧	.
—	Gear change from "2_2" to "2_3" in "2" position.	. .	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.
83	Engine brake does not operate in "1" position.	. 2	1 3	4 .	. .	6 5	. .	. 7	. .	. .	. .	. .	. .	⑧ .	⑨ .	.
—	Gear change from "1_1" to "1_2" in "1" position.	. 2	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.
—	Does not change from "1_2" to "1_1" in "1" position.	. .	1 .	2 .	. .	4 3	. .	. 5	. .	. .	. .	. .	. .	⑥ .	⑦ .	.
—	Large shock changing from "1_2" to "1_1" in "1" position.	. .	. .	. .	. .	1 .	. .	. .	. .	. .	. .	. .	. .	. .	② .	.
—	Transaxle overheats.	1 .	. 3	. .	2 4	6 .	. 5	. .	. .	. .	⑭ ⑦	⑧ ⑨	⑪ .	⑫ .	⑬ ⑩	.
—	ATF shoots out during operation. White smoke emitted from exhaust pipe during operation.	1 .	. .	. .	. .	. .	. .	. .	. .	. .	. .	② ③	⑤ .	⑥ .	⑦ ④	.
—	Offensive smell at fluid charging pipe.	1 .	. .	. .	. .	. .	. .	. .	. .	. .	② ③	④ ⑤	⑦ .	⑧ .	⑨ ⑥	.
—	Torque converter is not locked up.	. .	3 1	2 4	. 6	8 .	. .	7 .	5 .	. .	⑨ .	. .	. .	. .	. .	.
—	Lock-up piston slip.	1 .	. 2	. .	. 3	6 .	. 5	4 .	. .	. .	⑦ .	. .	. .	. .	. .	.
82	Lock-up point is extremely high or low.	. .	. 1	2 .	. .	4 .	. .	3 .	. .	. .	. .	. .	. .	. .	. .	.
—	A/T does not shift to "D_4" when driving with overdrive switch "ON".	. .	2 1	3 .	. 8	6 4	. .	. 5	7 .	. .	. .	. .	. .	⑩ .	. ⑨	.
—	Engine is stopped at "R", "D", "2" and "1" positions.	1 .	. .	. .	. .	5 4	3 .	2 .	. .	. .	. .	. .	. .	. .	. .	.


SAT992C

Control Valve Assembly and Accumulator

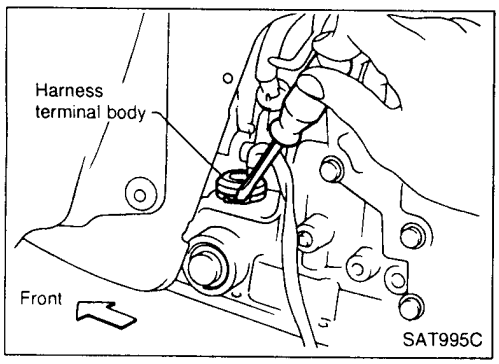
REMOVAL

1. Drain ATF from transaxle.
2. Remove oil pan and gasket.



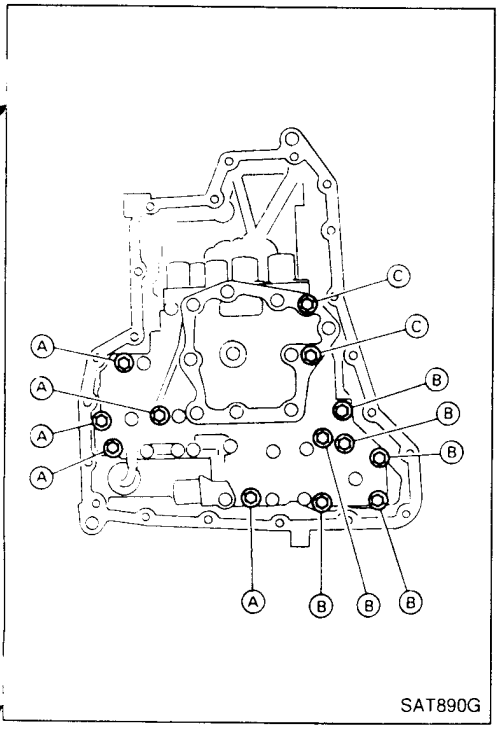
SAT889G

3. Disconnect A/T solenoid harness connector.



SAT995C

4. Remove stopper ring from A/T solenoid harness terminal body.
5. Remove A/T solenoid harness by pushing terminal body into transmission case.



SAT890G

6. Remove control valve assembly by removing fixing bolts.

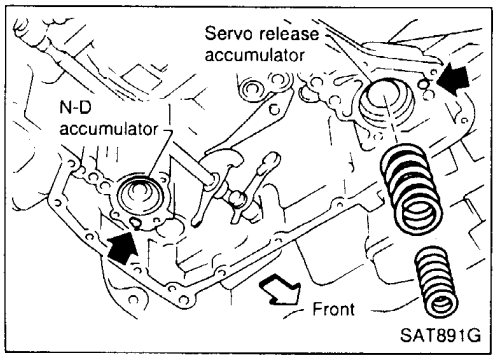
Bolt length, number and location:

Bolt symbol	A	B	C
Bolt length "ℓ" mm (in)	40.0 (1.575)	33.0 (1.299)	43.5 (1.713)
Number of bolts	5	6	2

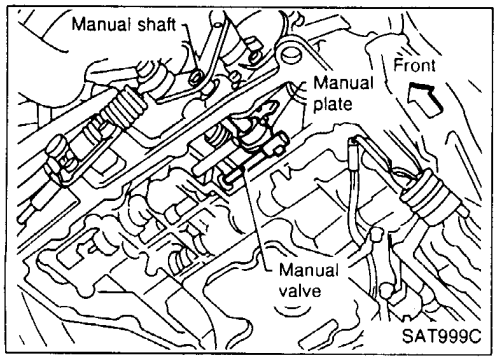
- **Be careful not to drop manual valve and servo release accumulator return springs.**

7. Disassemble and inspect control valve assembly if necessary — Refer to AT-133.

Control Valve Assembly and Accumulator (Cont'd)



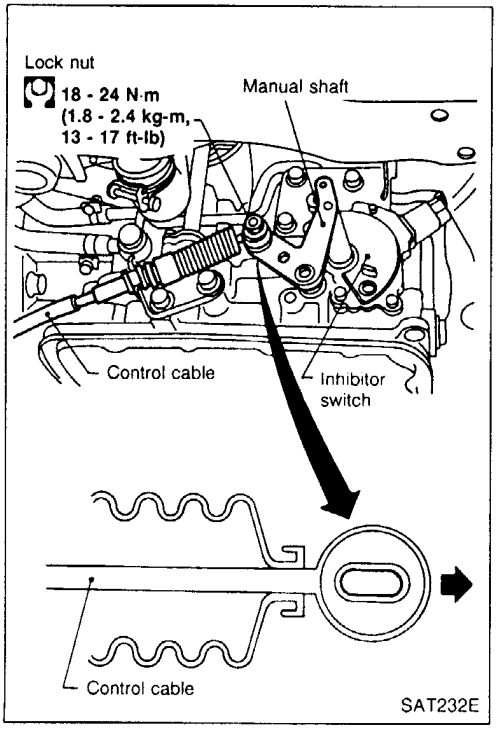
8. Remove servo release and N-D accumulators by applying compressed air if necessary.
- **Hold each piston with a rag.**



INSTALLATION

- **Set manual shaft in Neutral position, then align manual plate with groove in manual valve.**
- **After installing control valve assembly to transmission case, make sure that selector lever can be moved to all positions.**

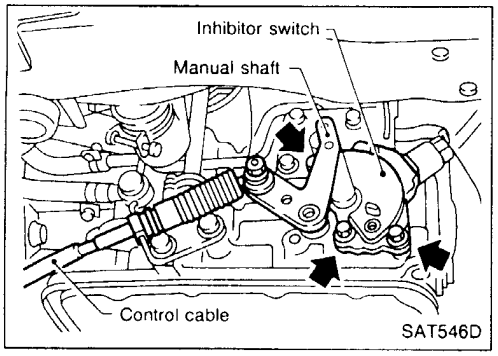
Control Cable Adjustment



Move selector lever from the "P" position to the "1" position. You should be able to feel the detents in each position. If the detents cannot be felt or the pointer indicating the position is improperly aligned, the control cable needs adjustment.

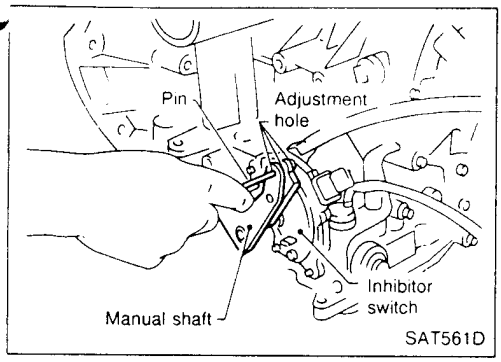
1. Place selector lever in "P" position.
2. Loosen control cable lock nut and place manual shaft in "P" position.
3. Pull control cable in the direction of the arrow shown in the illustration by specified force.
   Specified force: 6.9 N (0.7 kg, 1.5 lb)
4. Return control cable in the opposite direction of the arrow for 1.0 mm (0.039 in).
5. Tighten control cable lock nut.
6. Move selector lever from "P" position to "1" position and make sure that selector lever can be moved smoothly and without any sliding noise.
7. Apply grease to contacting areas of selector lever and control cable. Install any part removed.

Inhibitor Switch Adjustment



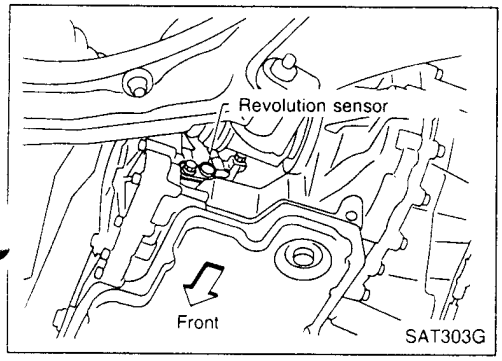
1. Remove control cable end from manual shaft.
2. Set manual shaft in "N" position.
3. Loosen inhibitor switch fixing bolts.

Inhibitor Switch Adjustment (Cont'd)



4. Insert 4.0 mm (0.157 in) dia. pin into adjustment hole in both inhibitor switch and manual shaft as near vertically as possible.
5. Tighten inhibitor switch fixing bolts.
6. Remove pin from adjustment hole after adjusting inhibitor switch.
7. Reinstall any part removed.
8. Adjust control cable — Refer to AT-102.
9. Check continuity of inhibitor switch — Refer to AT-90.

Revolution Sensor Replacement

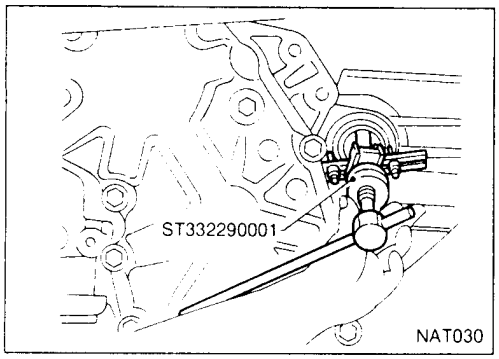


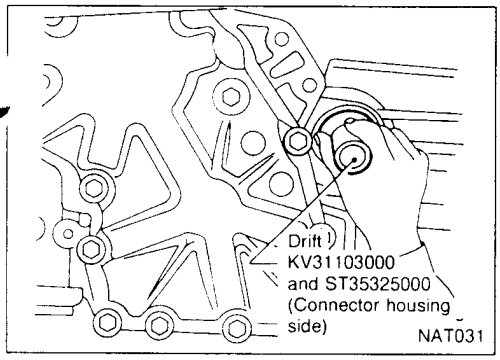
1. Disconnect revolution sensor harness connector.
2. Remove revolution sensor from A/T.
3. Reinstall any part removed.

- **Always use new sealing parts.**

Differential Side Oil Seal Replacement

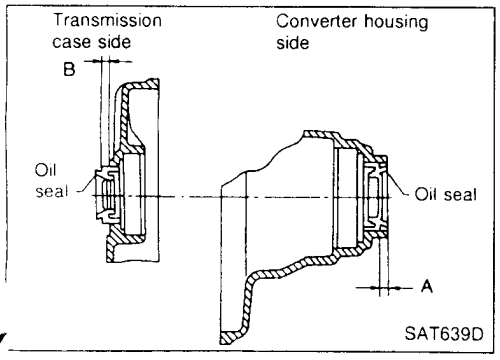
1. Remove drive shaft assemblies. — Refer to section FA, ("Removal", "FRONT AXLE-Drive Shaft").
2. Remove oil seals.





3. Install oil seals.

- **Apply ATF to oil seal surface before installing.**

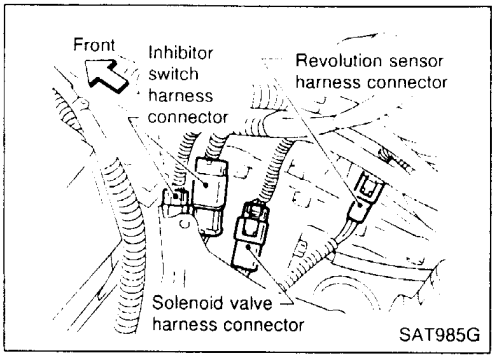


- **Install oil seals so that dimensions "A" and "B" are within specifications.**

Unit: mm (in)

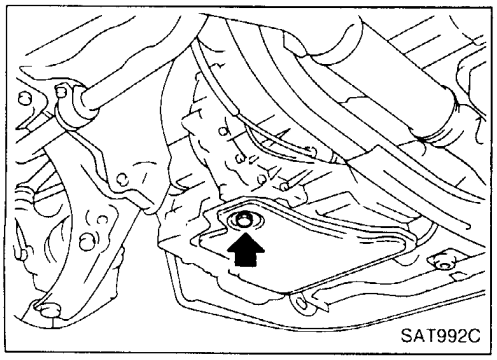
A	B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less

4. Reinstall any part removed.

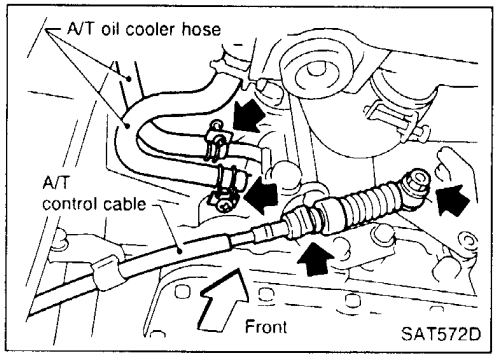


Removal

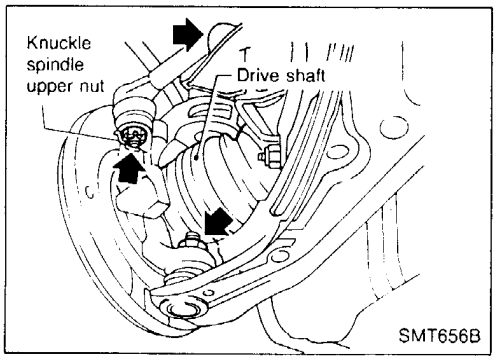
- Remove battery and bracket.
- Remove air duct.
- Disconnect solenoid valve harness connector, inhibitor switch harness connector and revolution sensor harness connector.



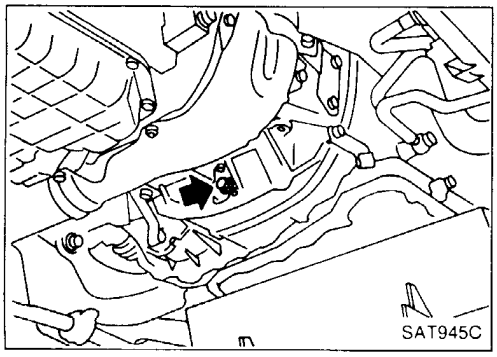
- Drain ATF from transaxle.



- Disconnect control cable from transaxle.
- Disconnect oil cooler hoses.

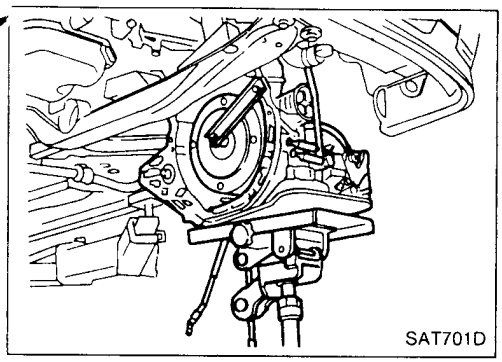


- Remove drive shafts — Refer to "Section FA", ("Removal", "FRONT AXLE-Drive Shaft").
- Remove front exhaust tube.
- Remove starter motor from transaxle.



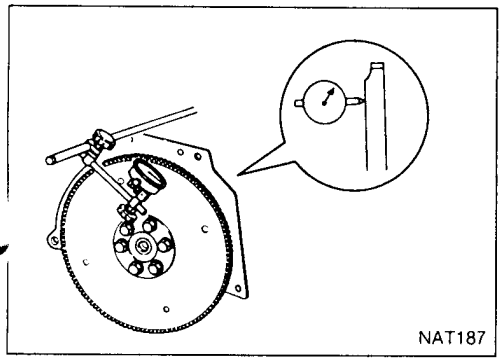
- Remove rear plate cover.
- Remove bolts securing torque converter to drive plate.
  Rotate crankshaft for access to securing bolts.
- Support engine by placing a jack under oil pan.
  Do not place jack under oil pan drain plug.

Removal (Cont'd)



- Support transaxle with a jack.
- Remove mountings from transaxle.
- Remove bolts fixing A/T to engine.
- Lower transaxle while supporting it with a jack.

Installation

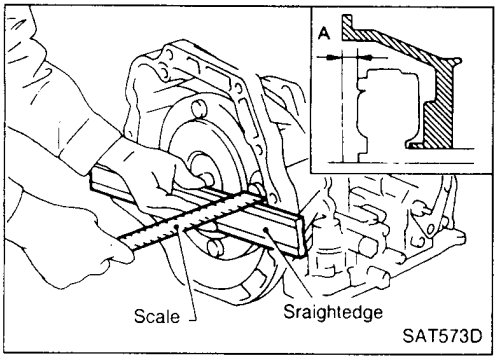


- Check drive plate runout

CAUTION:
Do not allow any magnetic materials to contact the ring gear teeth.

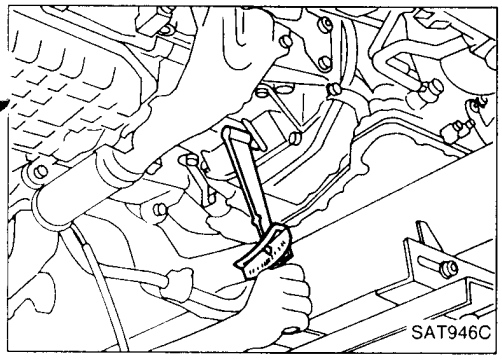
Maximum allowable runout:
Refer to EM section ("Inspection", "CYLINDER BLOCK")

If this runout is out of specification, replace drive plate with ring gear.



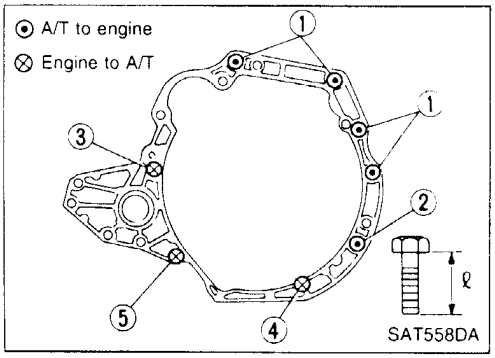
- When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.

Distance "A":
15.9 mm (0.626 in) or more



- Install torque converter to drive plate.
- **After installing converter to drive plate, rotate crankshaft several turns and check to be sure that transaxle rotates freely without binding.**

Installation (Cont'd)



- Tighten bolts fixing transaxle

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "ℓ" mm (in)
①	70 - 79 (7.1 - 8.1, 51 - 59)	55 (2.17)
②	70 - 79 (7.1 - 8.1, 51 - 59)	50 (1.97)
③	70 - 79 (7.1 - 8.1, 51 - 59)	65 (2.56)
④	16 - 21 (1.6 - 2.1, 12 - 15)	35 (1.38)
⑤	16 - 21 (1.6 - 2.1, 12 - 15)	45 (1.77)

- Reinstall any part removed.
- Adjust control cable. Refer to AT-102.
- Check continuity of inhibitor switch. Refer to AT-102.
- Refill transaxle with ATF and check fluid level.
- Move selector lever through all positions to be sure that transaxle operates correctly. With parking brake applied, idle engine. Move selector lever through "N" to "D", to "2", to "1" and "R" positions. A slight shock should be felt through the hand gripping the selector each time the transaxle is shifted.
- Perform road test, AT-27.

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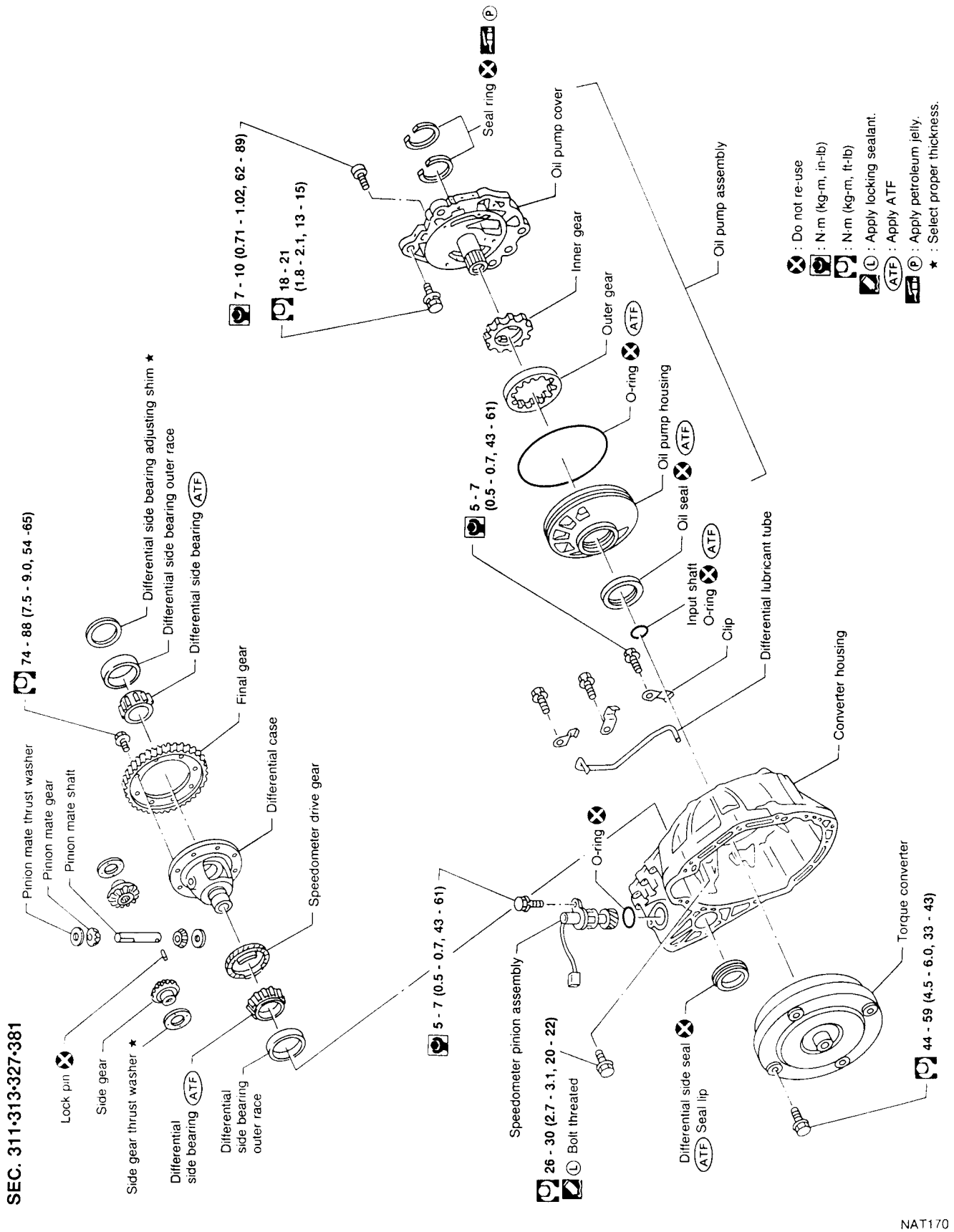
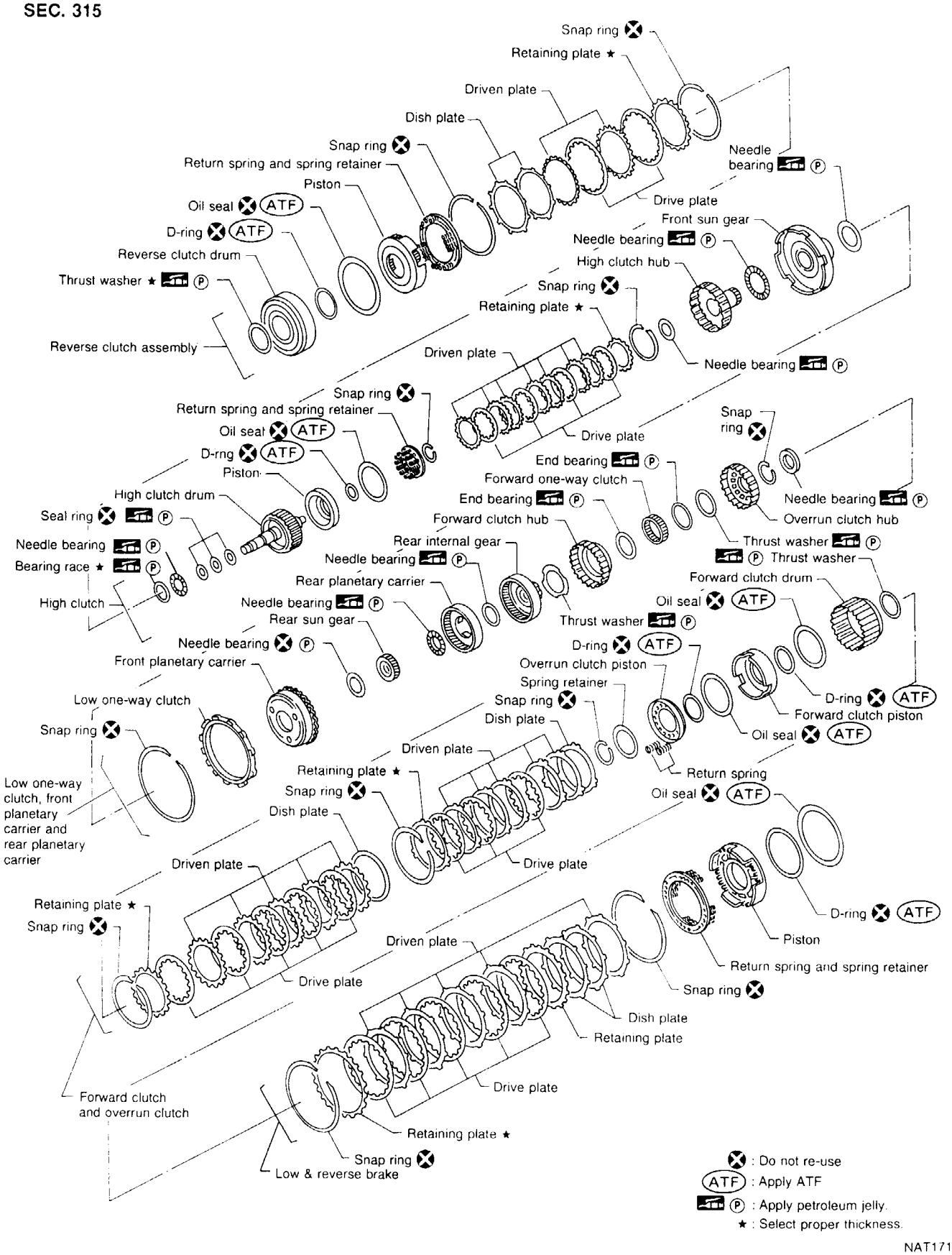
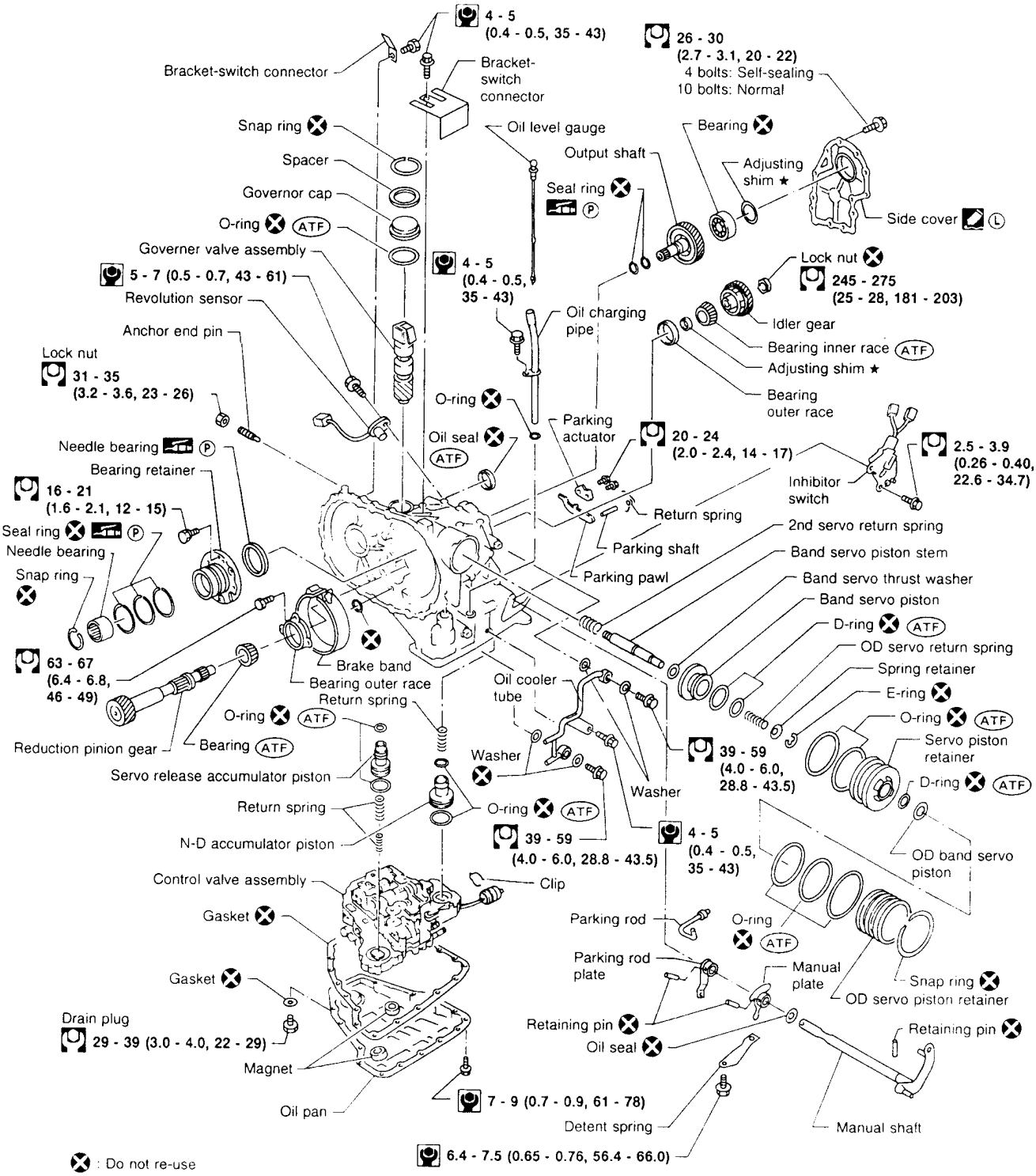

SEC. 311•313•327•381
Pinion mate thrust washer
Pinion mate gear
Pinion mate shaft
Lock pin
Side gear
Side gear thrust washer ★
Differential side bearing (ATF)
Differential side bearing outer race
Differential side bearing adjusting shim ★
Differential side bearing outer race
Differential side bearing (ATF)
Final gear
Differential case
Speedometer drive gear
74 - 88 (7.5 - 9.0, 54 -65)
7 - 10 (0.71 - 1.02, 62 - 89)
18 - 21 (1.8 - 2.1, 13 - 15)
Seal ring (P)
Oil pump cover
Inner gear
Outer gear (ATF)
O-ring
Oil pump housing
Oil seal (ATF)
Input shaft
O-ring (ATF)
Clip
Differential lubricant tube
Oil pump assembly
5 - 7 (0.5 - 0.7, 43 - 61)
5 - 7 (0.5 - 0.7, 43 - 61)
Converter housing
O-ring
Speedometer pinion assembly
26 - 30 (2.7 - 3.1, 20 - 22)
(L) Bolt threated
Differential side seal
(ATF) Seal lip
Torque converter
44 - 59 (4.5 - 6.0, 33 - 43)
: Do not re-use
: N·m (kg-m, in-lb)
: N·m (kg-m, ft-lb)
(L) : Apply locking sealant.
(ATF) : Apply ATF
(P) : Apply petroleum jelly.
★ : Select proper thickness.
NAT170

SEC. 315



NAT171

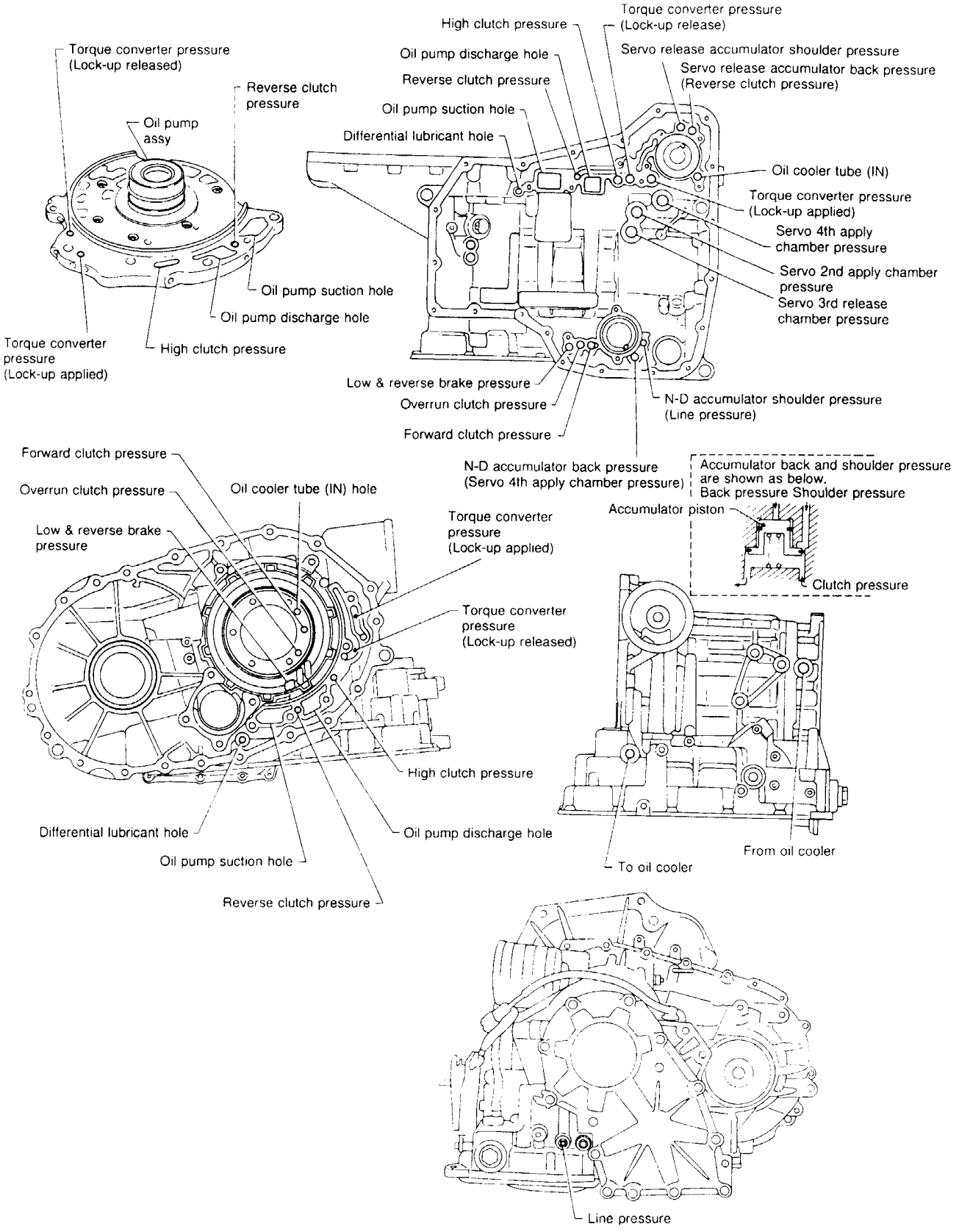
SEC. 310•311•312•314•315•317•319



: Do not re-use
: N·m (kg-m, in-lb)
: N·m (kg-m, ft-lb)
L : Apply locking sealant.
ATF : Apply ATF
P : Apply petroleum jelly.
★ : Select proper thickness.

NAT172

Oil Channel



NAT173

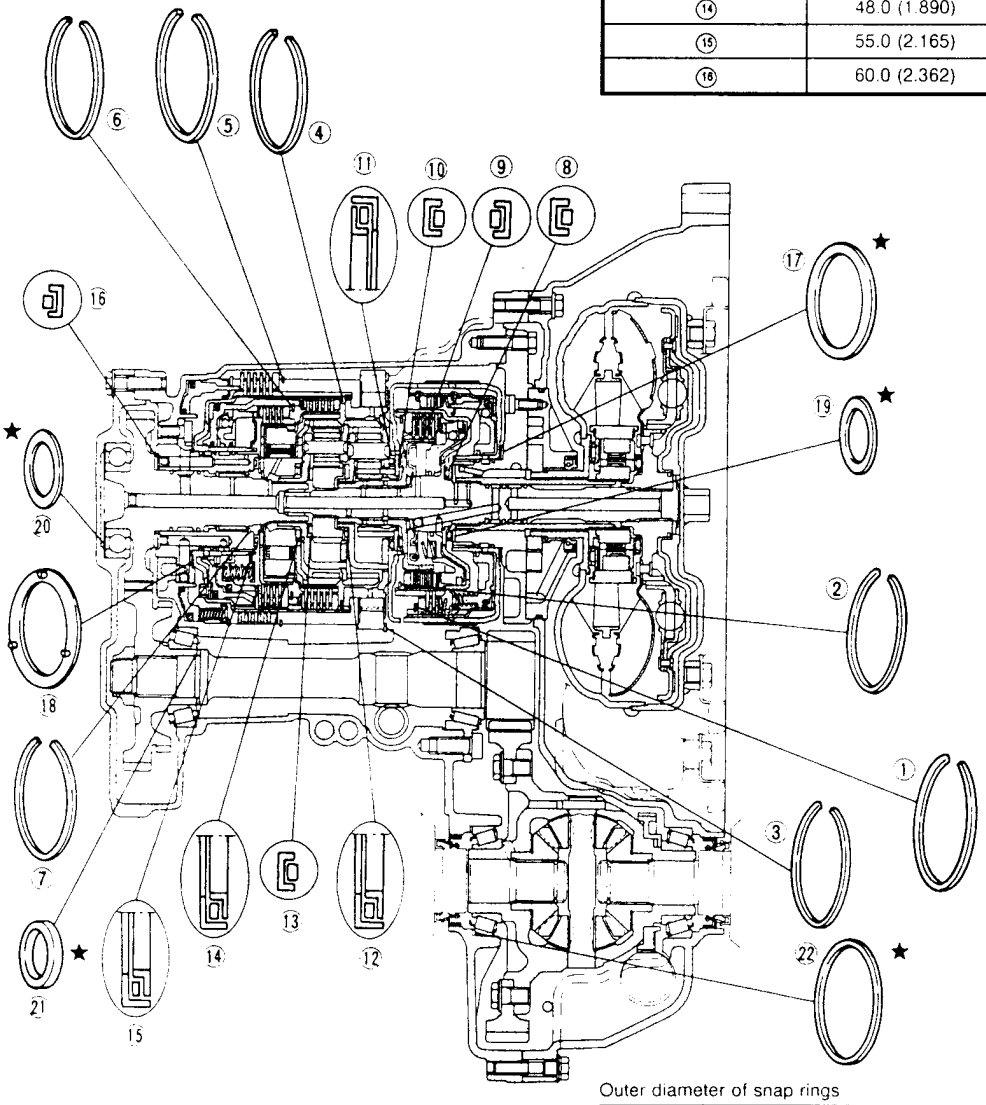
Locations of Adjusting Shims, Needle Bearings, Thrust Washers and Snap Rings

Outer diameter and color of thrust washers

Item number	Outer diameter mm (in)	Color
⑰	72.0 (2.835)	Black
⑱	78.5 (3.091)	

Outer & inner diameter of needle bearings

Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑧	47.0 (1.850)	32.0 (1.260)
⑨	35.0 (1.378)	20.0 (0.787)
⑩	60.0 (2.362)	42.0 (1.654)
⑪	60.0 (2.362)	45.0 (1.772)
⑫	47.0 (1.850)	30.0 (1.181)
⑬	42.6 (1.677)	26.0 (1.024)
⑭	48.0 (1.890)	33.5 (1.319)
⑮	55.0 (2.165)	40.5 (1.594)
⑯	60.0 (2.362)	40.0 (1.575)



★ : Select proper thickness.

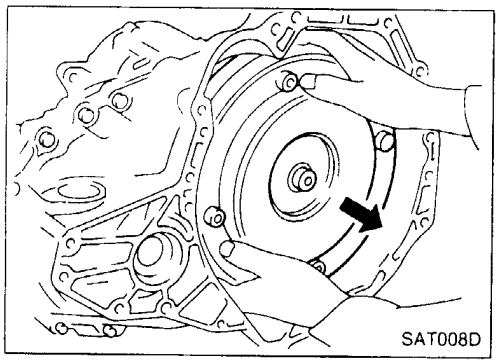
Outer & inner diameter of bearing race and adjusting shims

Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑲	48.0 (1.890)	33.0 (1.299)
⑳	72.0 (2.835)	61.0 (2.402)
㉑	34.5 (1.358)	26.1 (1.028)
㉒	68.0 (2.677)	60.0 (2.362)

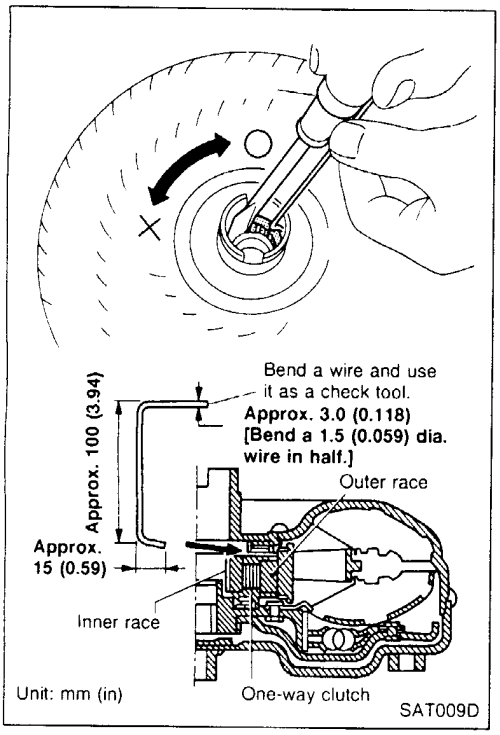
Outer diameter of snap rings

Item number	Outer diameter mm (in)
①	142.0 (5.59)
②	113.0 (4.45)
③	162.4 (6.39)
④	135.4 (5.33)
⑤	161.5 (6.36)
⑥	126.0 (4.96)
⑦	40.5 (1.594)

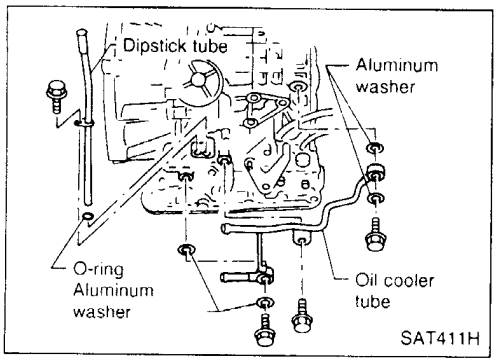
NAT174



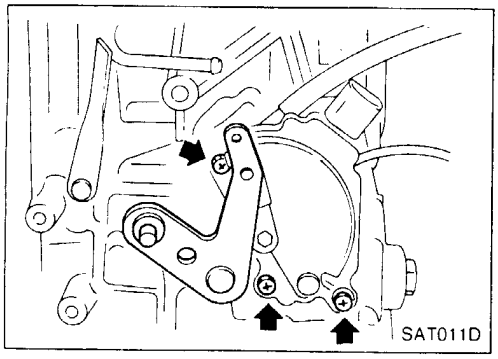
1. Drain ATF through drain plug.
2. Remove torque converter.



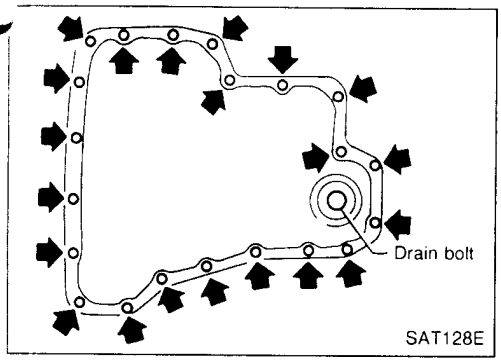
3. Check torque converter one-way clutch using check tool as shown at left.
a. Insert check tool into the groove of bearing support built into one-way clutch outer race.
b. While fixing bearing support with check tool, rotate one-way clutch spline using flat-bladed screwdriver.
c. Check inner race rotates clockwise only. If not, replace torque converter assembly.



4. Remove dipstick tube and oil cooler tube.

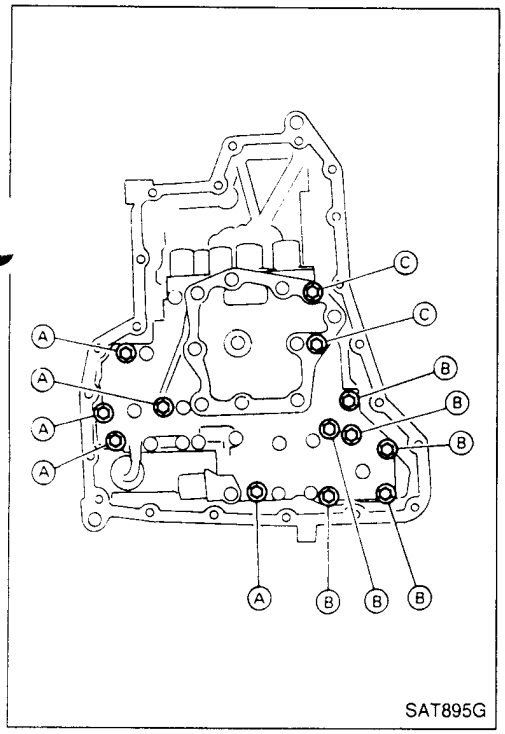


5. Set manual lever to "P" position.
6. Remove inhibitor switch.



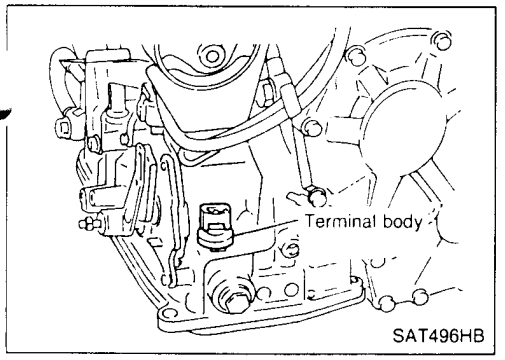
7. Remove oil pan and oil pan gasket.
- **Do not reuse oil pan bolts.**

8. Check foreign materials in oil pan to help determine cause of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up which can cause valves, servo, and clutches to stick and may inhibit pump pressure.



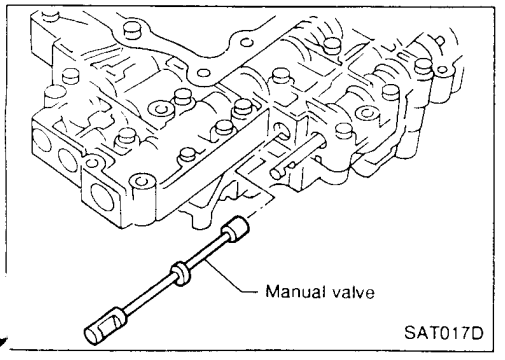
9. Remove control valve assembly according to the following procedures:

a. Remove control valve assembly mounting bolts Ⓐ, Ⓑ and Ⓒ.

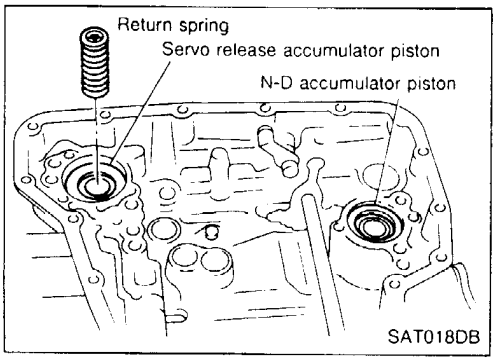


b. Remove stopper ring from terminal body.

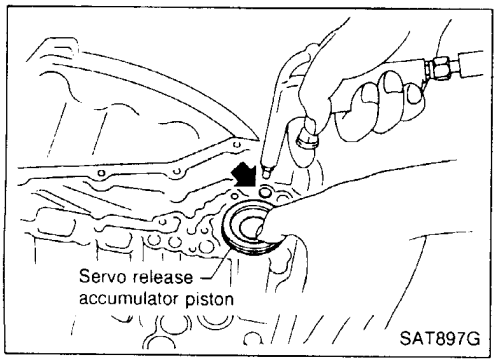
c. Push terminal body into transmission case and draw out solenoid harness.



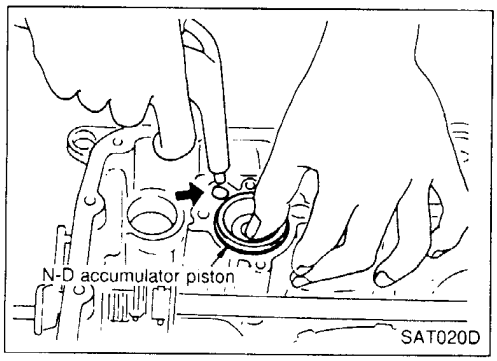
10. Remove manual valve from control valve assembly as a precaution.



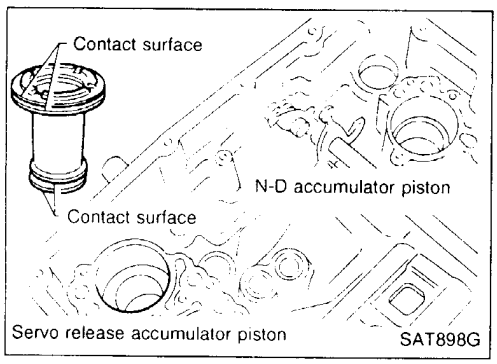
11. Remove return spring from servo release accumulator piston.



12. Remove servo release accumulator piston with compressed air.
13. Remove O-rings from servo release accumulator piston.



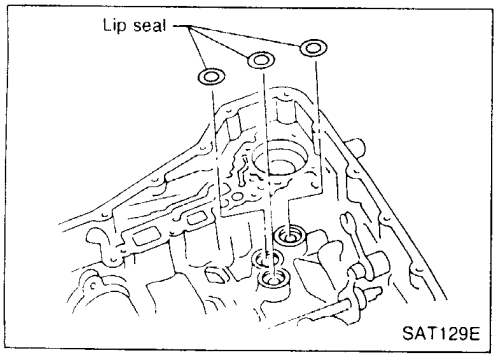
14. Remove N-D accumulator piston and return spring with compressed air.
15. Remove O-rings from N-D accumulator piston.



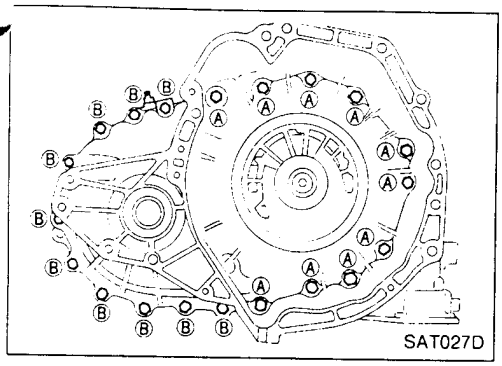
16. Check accumulator pistons and contact surface of transmission case for damage.
17. Check accumulator return springs for damage and free length.

Unit: mm (in)

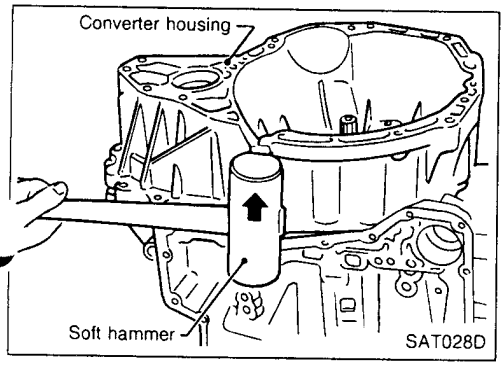
Spring		Free length	Outer diameter
Servo release accumulator spring	Outer	52.5 (2.067)	21.1 (0.831)
	Inner	52.0 (2.047)	13.1 (0.516)
N-D accumulator spring		45.0 (1.772)	27.6 (1.087)



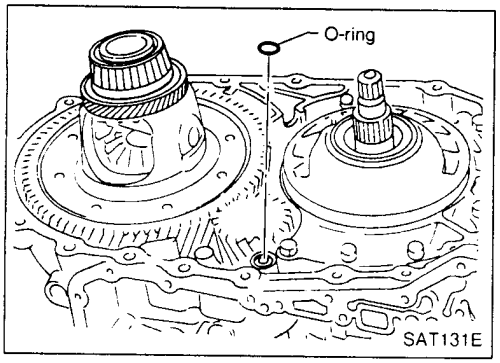
18. Remove lip seals from band servo oil port.



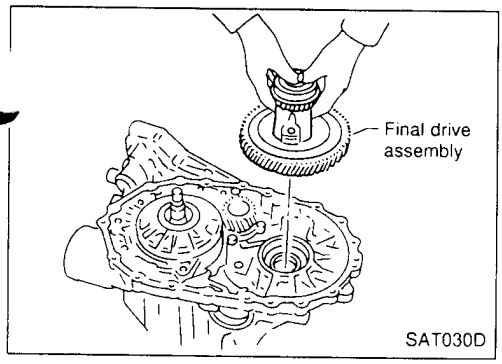
19. Remove converter housing according to the following procedures.
a. Remove converter housing mounting bolts Ⓐ and Ⓑ.



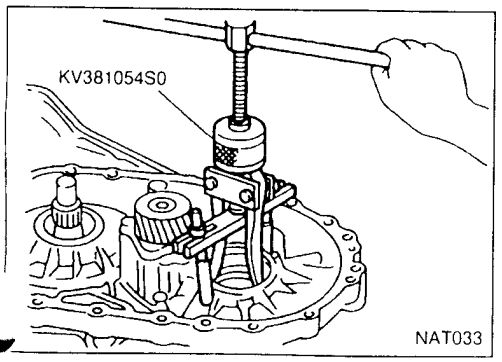
b. Remove converter housing.



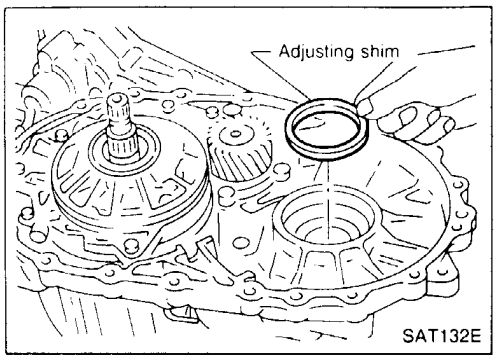
c. Remove O-ring from differential oil port.



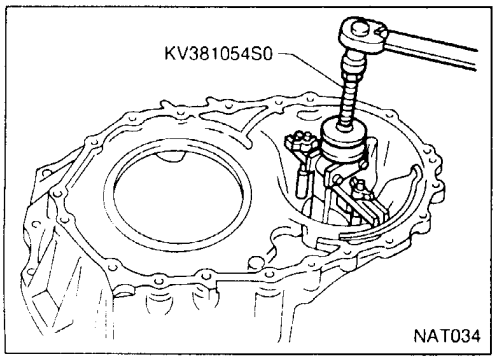
20. Remove final drive assembly from transmission case.



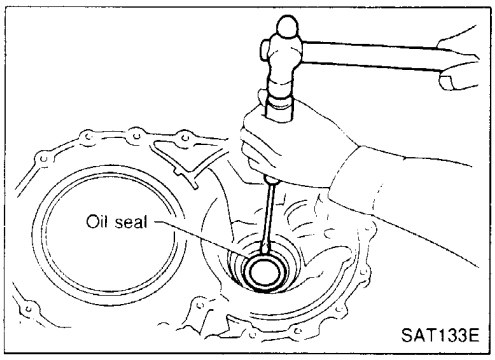
21. Remove differential side bearing outer race from transmission case.



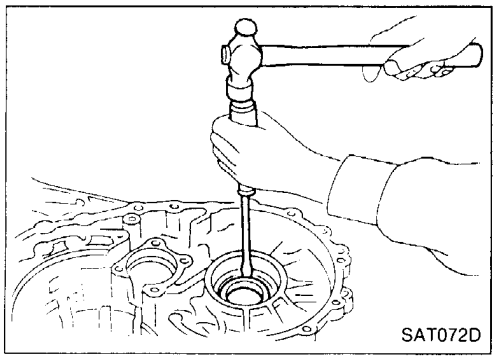
22. Remove differential side bearing adjusting shim from transmission case.



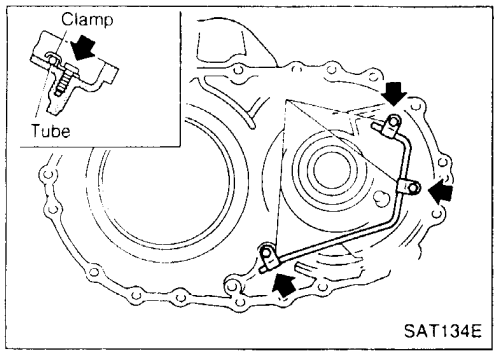
23. Remove differential side bearing outer race from converter housing.



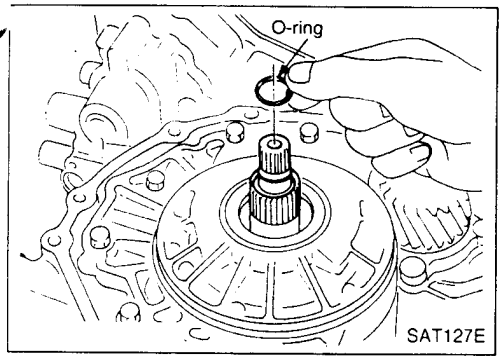
24. Remove oil seal from converter housing using a screwdriver.
- **Be careful not to damage case.**



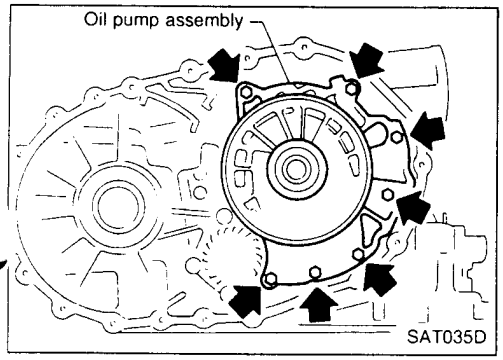
25. Remove side oil seal from transmission case using a screwdriver.



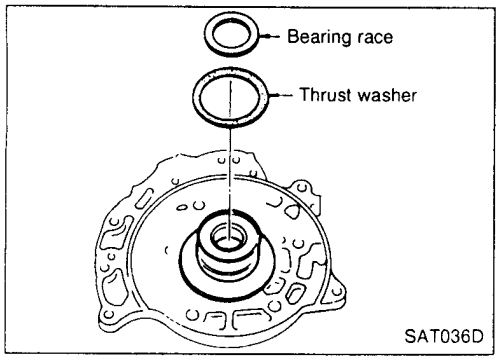
26. Remove oil tube from converter housing.



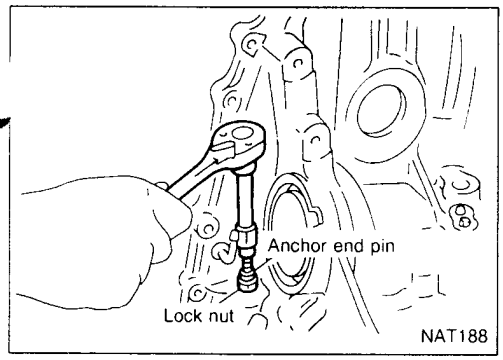
27. Remove oil pump according to the following procedures.
a. Remove O-ring from input shaft.



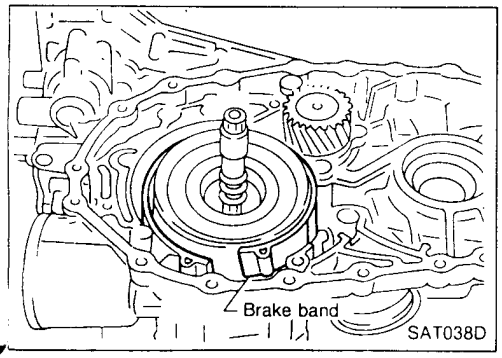
b. Remove oil pump assembly from transmission case.



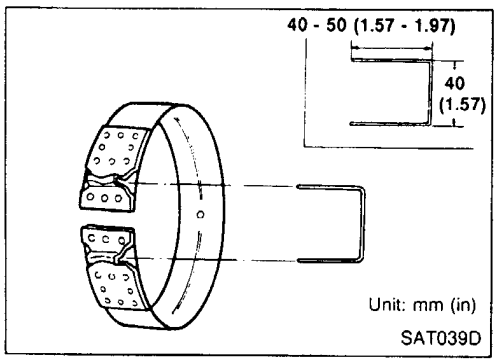
c. Remove thrust washer and bearing race from oil pump assembly.



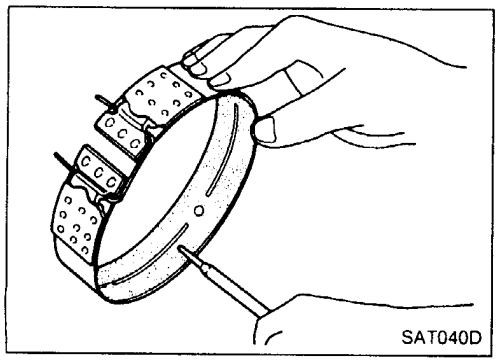
28. Remove brake band according to the following procedures:
a. Loosen lock nut, then back off anchor end pin.
- Do not reuse anchor end pin.



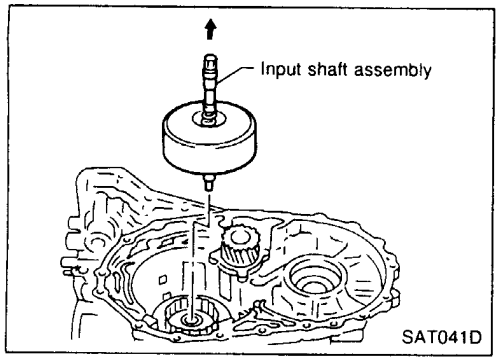
b. Remove brake band from transmission case.



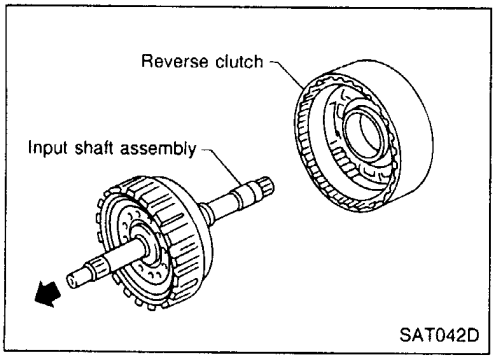
- **To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. When removing the brake band, always secure it with a clip as shown in the figure at left.**
  Leave the clip in position after removing the brake band.



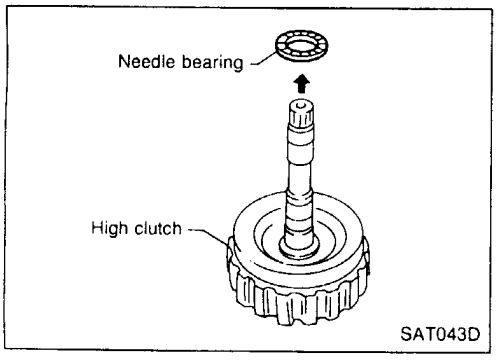
c. Check brake band facing for damage, cracks, wear or burns.



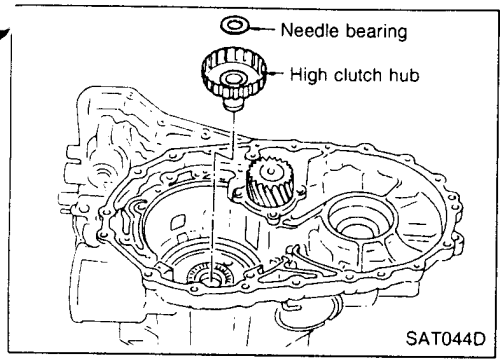
29. Remove input shaft assembly (high clutch) and reverse clutch according to the following procedures:
a. Remove input shaft assembly (high clutch) with reverse clutch.



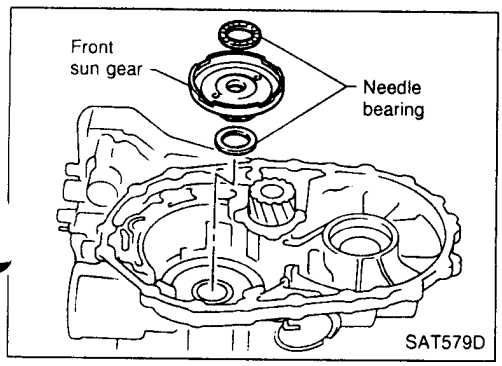
b. Remove input shaft assembly (high clutch) from reverse clutch.



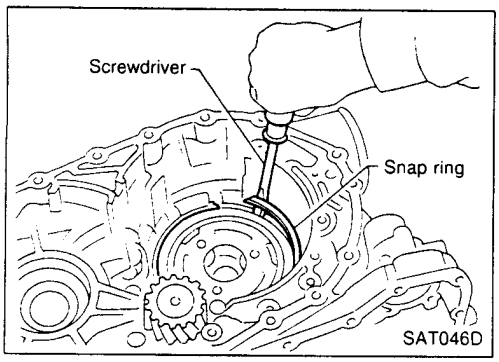
c. Remove needle bearing from high clutch drum.
d. Check input shaft assembly and needle bearing for damage or wear.



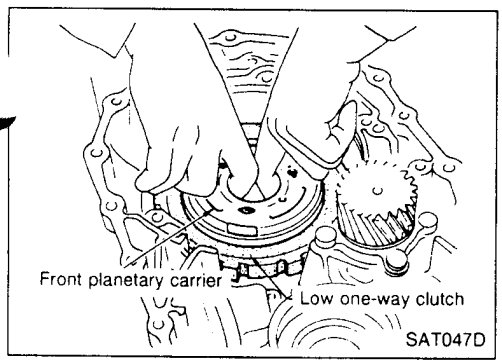
30. Remove high clutch hub and needle bearing from transmission case.
31. Check high clutch hub and needle bearing for damage or wear.



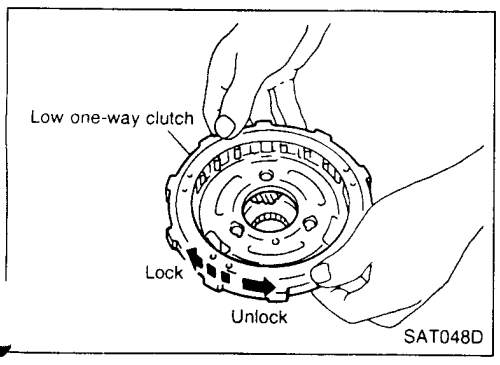
32. Remove front sun gear and needle bearings from transmission case.
33. Check front sun gear and needle bearings for damage or wear.



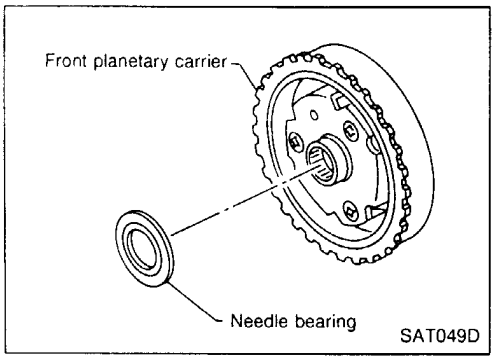
34. Remove front planetary carrier assembly and low one-way clutch according to the following procedures:
a. Remove snap ring using a screwdriver.



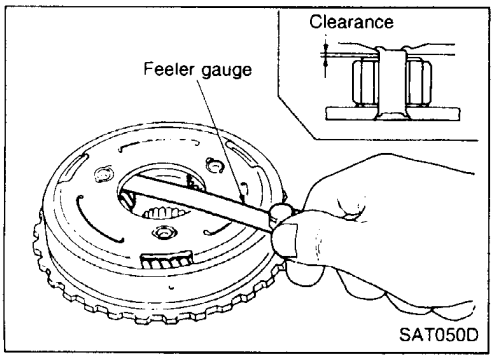
b. Remove front planetary carrier with low one-way clutch.



c. Check that low one-way clutch rotates in the direction of the arrow and locks in the opposite direction.
d. Remove low one-way clutch from front planetary carrier by rotating it in the direction of unlock.



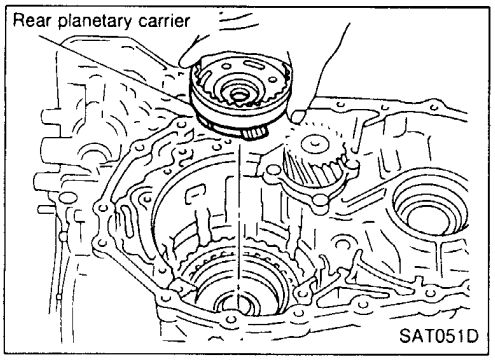
e. Remove needle bearing from front planetary carrier.



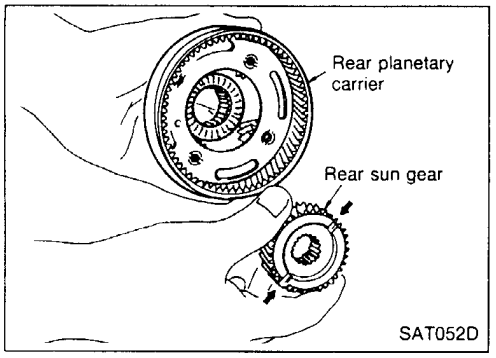
f. Check front planetary carrier, low one-way clutch and needle bearing for damage or wear.
g. Check clearance between pinion washer and planetary carrier using feeler gauge.

Standard clearance:
0.15 - 0.70 mm (0.0059 - 0.0276 in)
Allowable limit:
0.80 mm (0.0315 in)

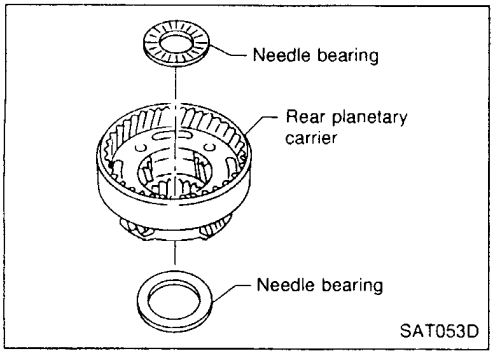
Replace front planetary carrier if the clearance exceeds allowable limit.



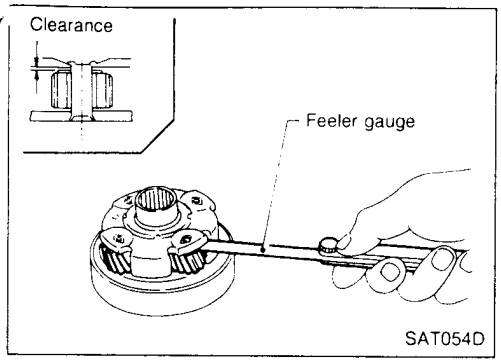
35. Remove rear planetary carrier assembly and rear sun gear according to the following procedures:
a. Remove rear planetary carrier assembly from transmission case.



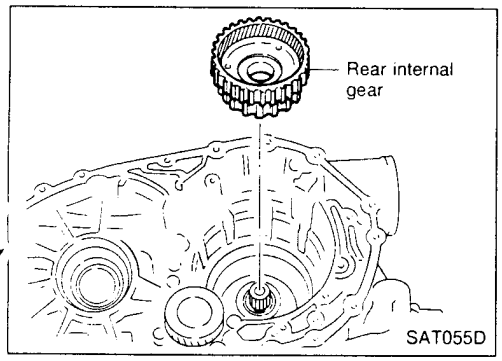
b. Remove rear sun gear from rear planetary carrier.



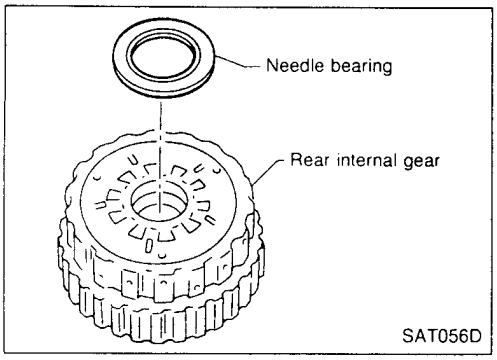
c. Remove needle bearings from rear planetary carrier assembly.



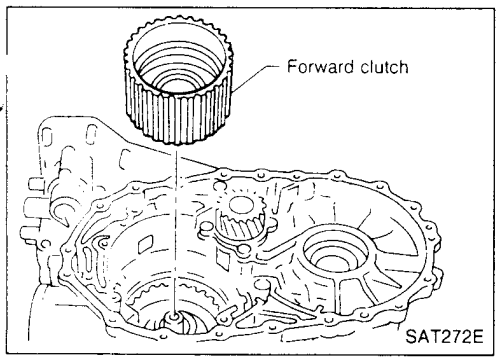
d. Check rear planetary carrier, rear sun gear and needle bearings for damage or wear.
e. Check clearance between pinion washer and rear planetary carrier using feeler gauge.
   Standard clearance:
   0.15 - 0.70 mm (0.0059 - 0.0276 in)
   Allowable limit:
   0.80 mm (0.0315 in)
   Replace rear planetary carrier if the clearance exceeds allowable limit.



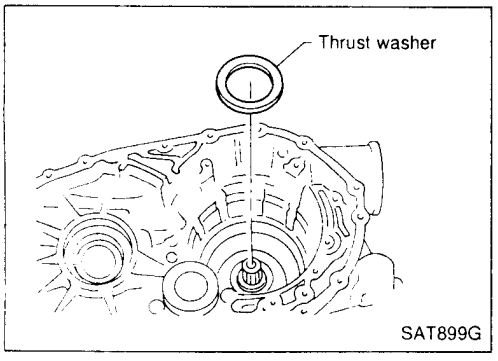
36. Remove rear internal gear from transmission case.



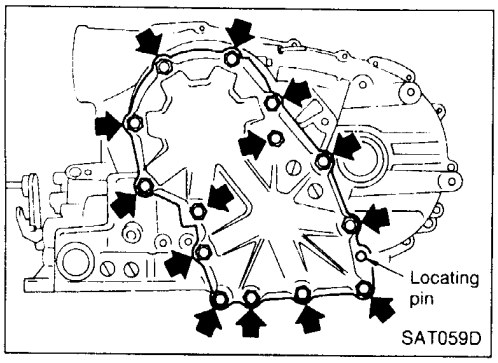
37. Remove needle bearing from rear internal gear.
38. Check needle bearing for damage or wear.



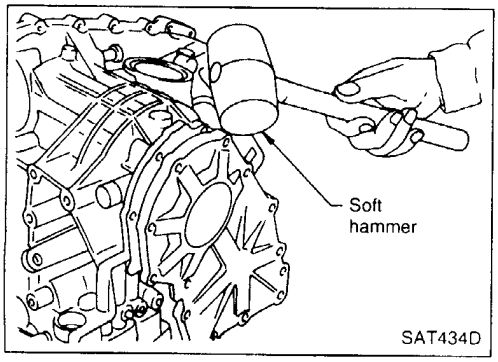
39. Remove forward clutch assembly from transmission case.



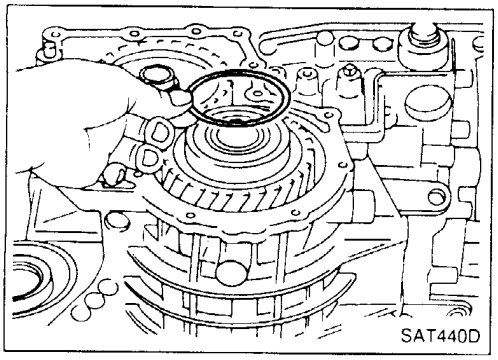
40. Remove thrust washer from transmission case.



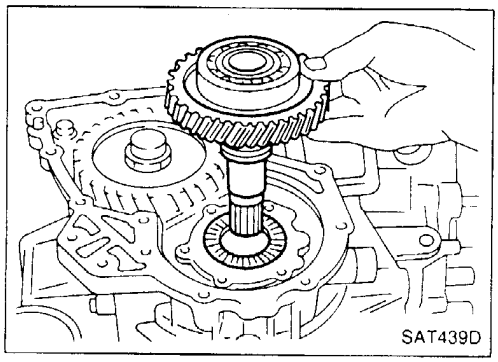
41. Remove output shaft assembly according to the following procedures:
a. Remove side cover bolts.



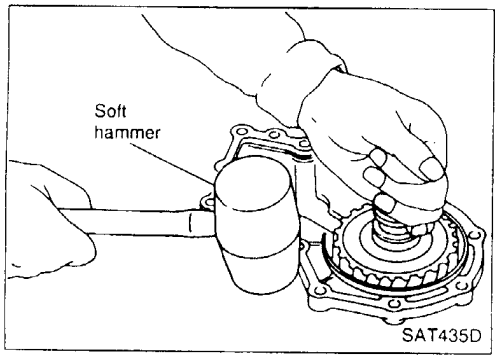
b. Remove side cover by lightly tapping it with a soft hammer.
- **Take care output shaft assembly does not drop out when removing cover.**



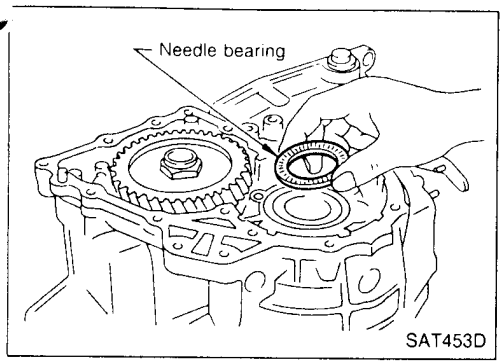
c. Remove adjusting shim.



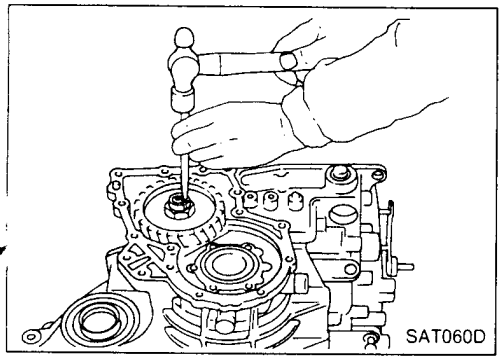
d. Remove output shaft assembly.



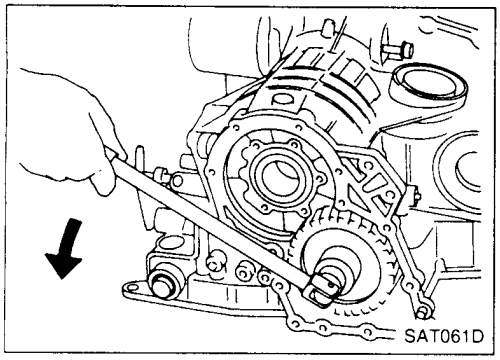
- If output shaft assembly was removed together with side cover, separate by tapping the cover lightly with a soft hammer.



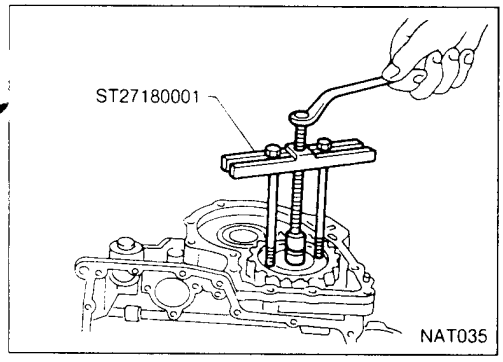
e. Remove needle bearing.



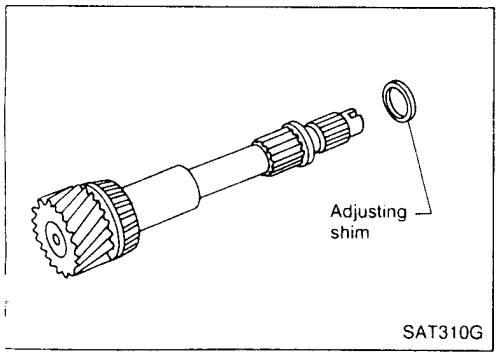
42. Disassemble reduction gear according to the following procedures:
a. Set manual shaft to position "P" to fix idler gear.
b. Unlock idler gear lock nut using a pin punch.



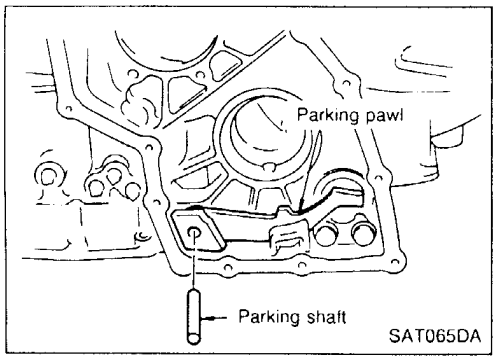
c. Remove idler gear lock nut.
- **Do not reuse idler gear lock nut.**



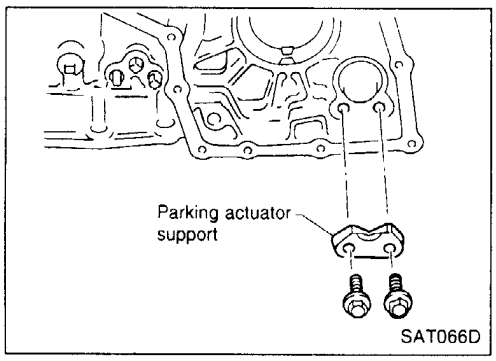
d. Remove idler gear with puller.



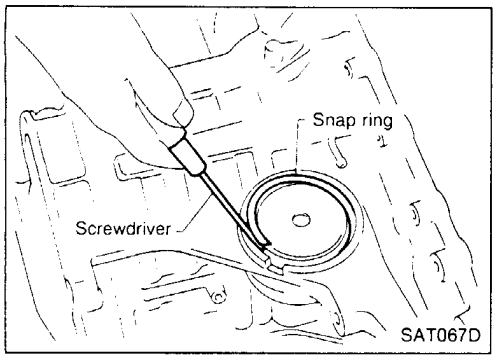
e. Remove reduction gear.
f. Remove adjusting shim from reduction gear.



43. Draw out parking shaft and remove parking pawl from transmission case.
44. Check parking pawl and shaft for damage or wear.

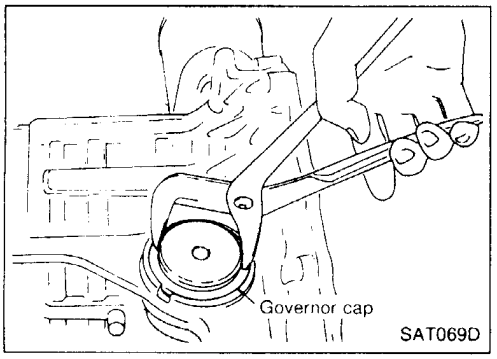


45. Remove parking actuator support from transmission case.
46. Check parking actuator support for damage or wear.

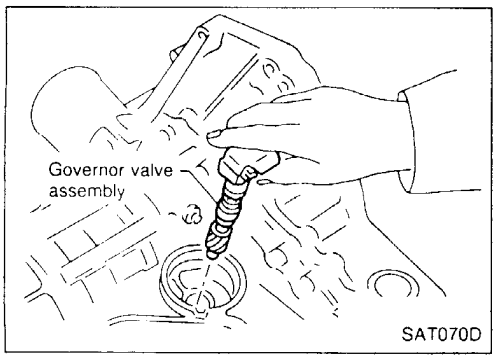


47. Remove governor valve assembly according to the following procedures.

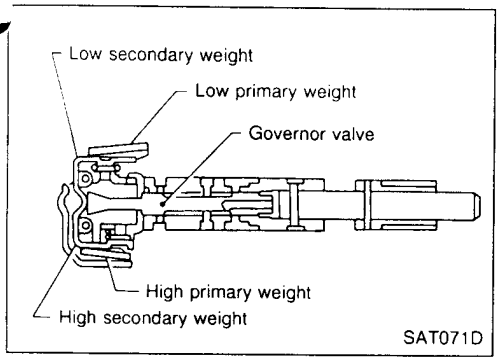
a. Remove snap ring using a screwdriver.



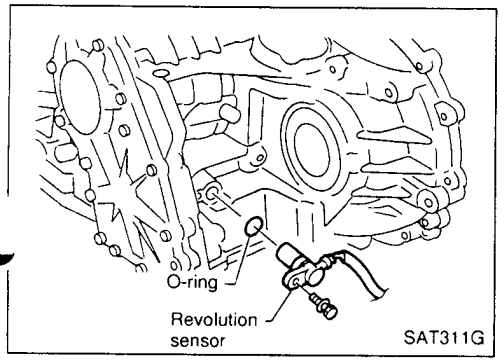
b. Remove governor cap using water pump pliers.
c. Remove O-ring from governor cap.



d. Remove governor valve assembly.

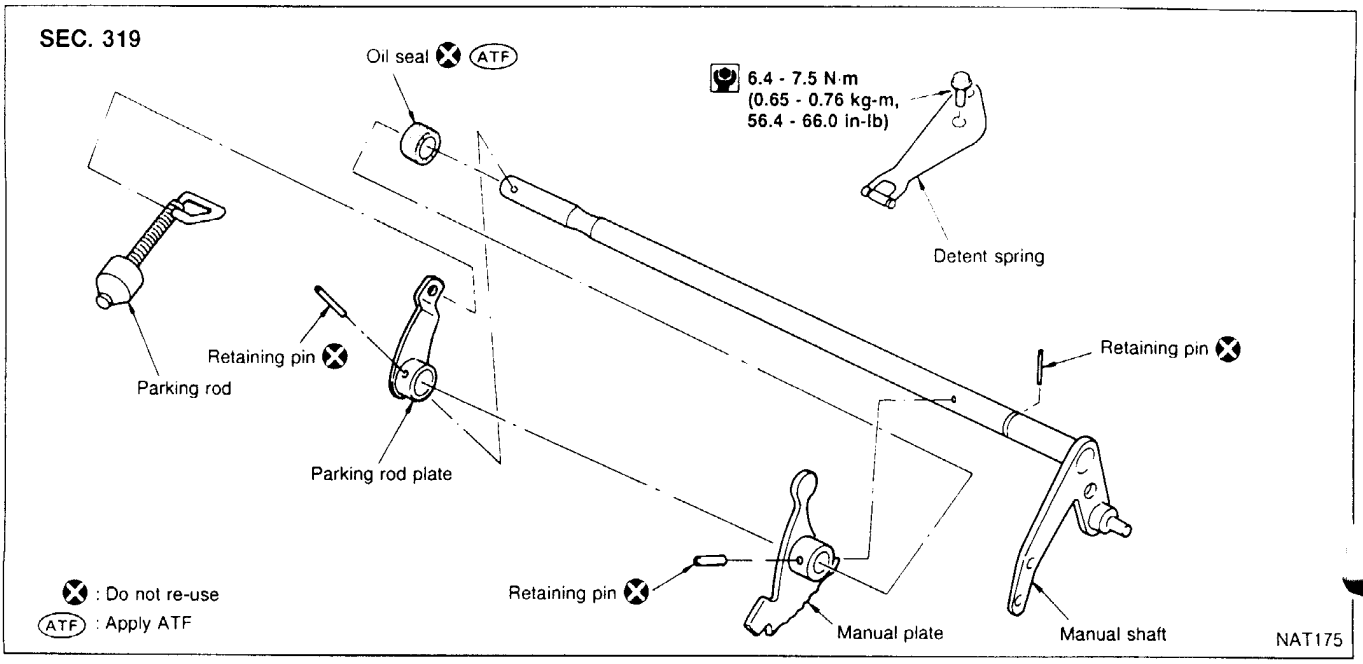


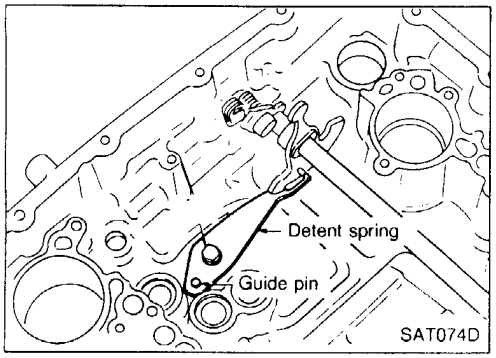
e. With low primary weight closed, place top of governor valve assembly down to make sure governor valve properly lowers under its own weight.
f. Place top of governor assembly down. Operate both low and high secondary weights to make sure governor valve functions properly.



48. Remove revolution sensor from transmission case.

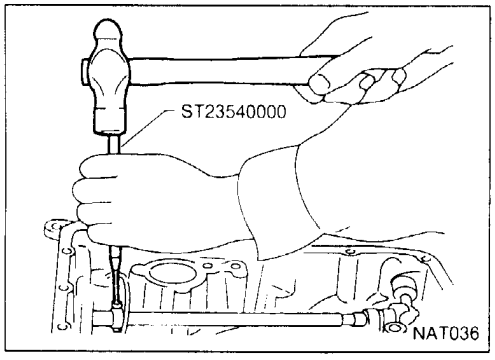
Manual Shaft



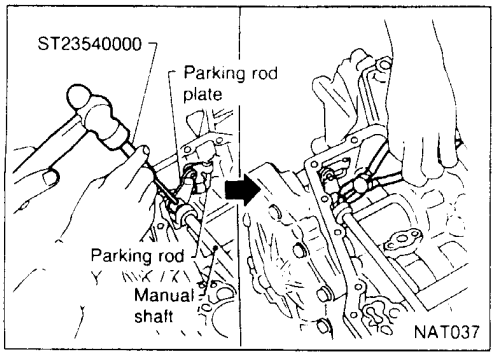


REMOVAL

1. Remove detent spring from transmission case.

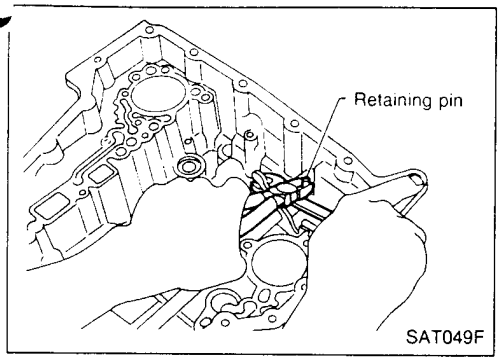


2. Drive out manual plate retaining pin.

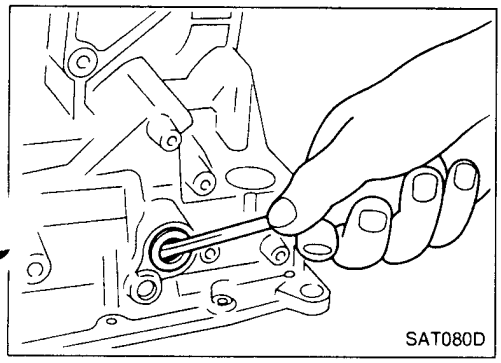


3. Drive and pull out parking rod plate retaining pin.
4. Remove parking rod plate from manual shaft.
5. Draw out parking rod from transmission case.

Manual Shaft (Cont'd)



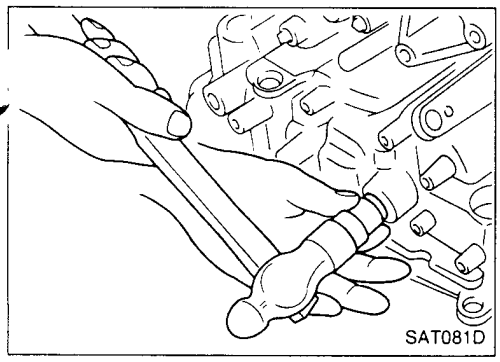
6. Pull out manual shaft retaining pin.
7. Remove manual shaft and manual plate from transmission case.



8. Remove manual shaft oil seal.

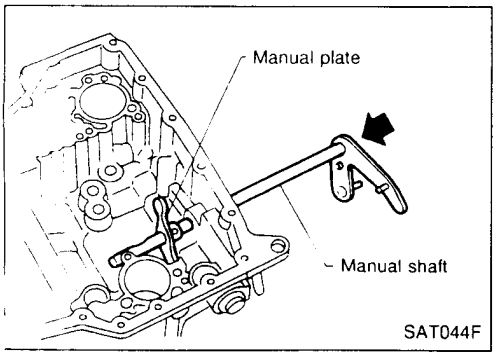
INSPECTION

- Check component parts for wear or damage. Replace if necessary.



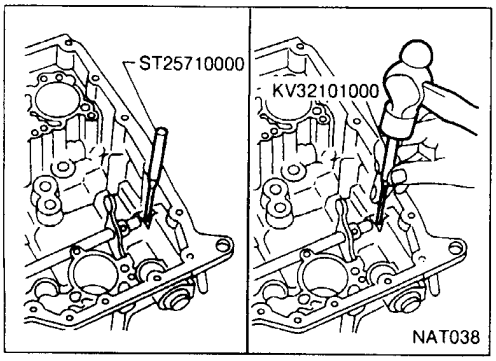
INSTALLATION

1. Install manual shaft oil seal.
- **Apply ATF to outer surface of oil seal.**

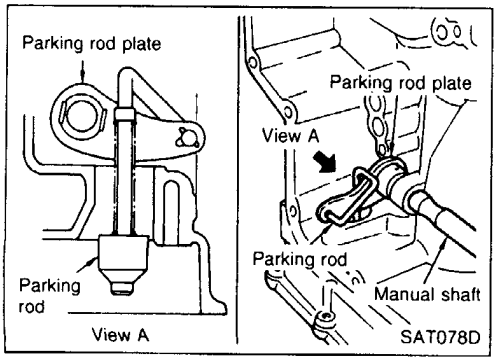


2. Install manual shaft and manual plate.

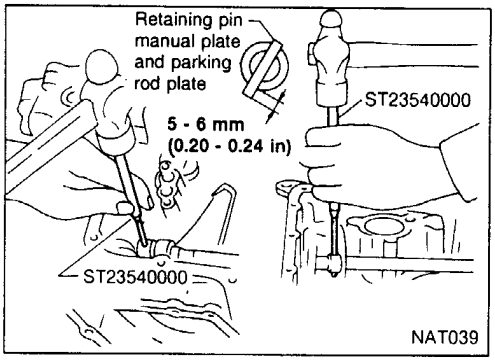
Manual Shaft (Cont'd)



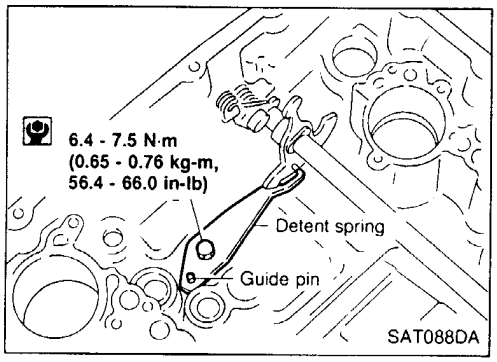
3. Align groove of manual shaft and hole of transmission case.
4. Install manual shaft retaining pin.



5. Install parking rod to parking rod plate.
6. Set parking rod assembly onto manual shaft.

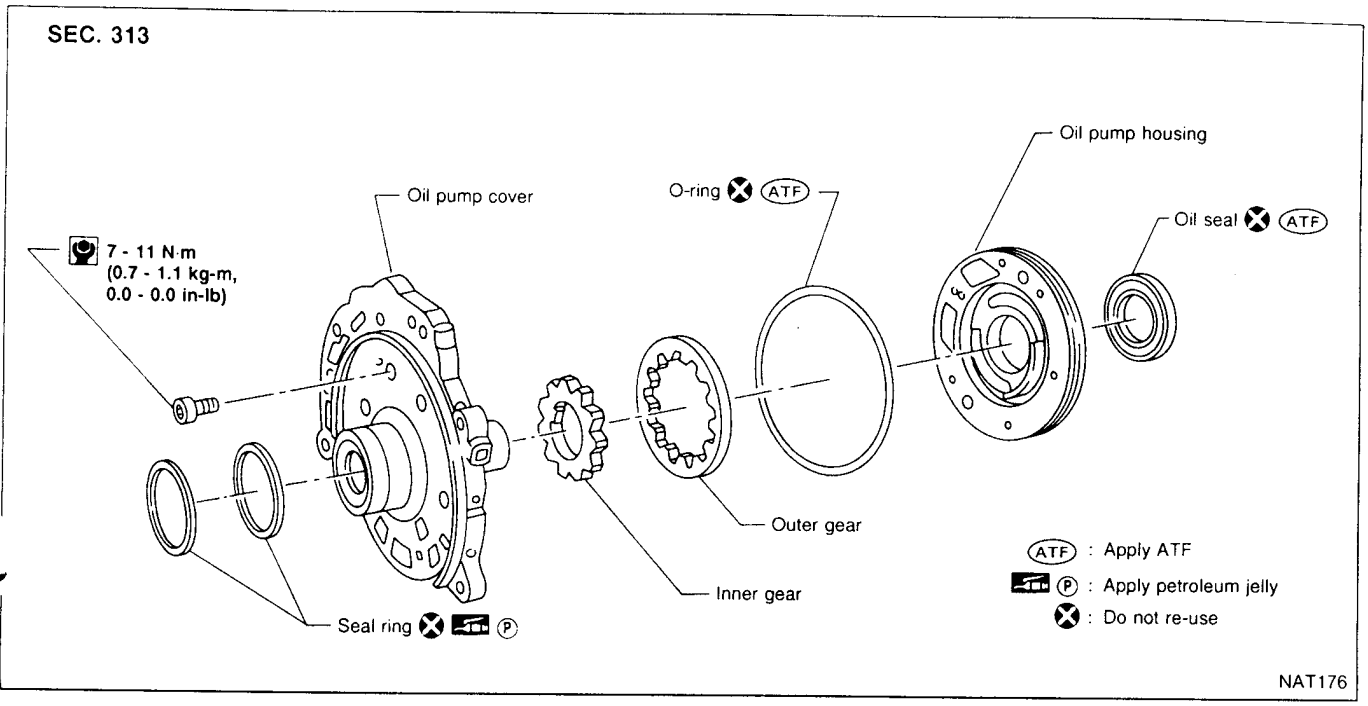


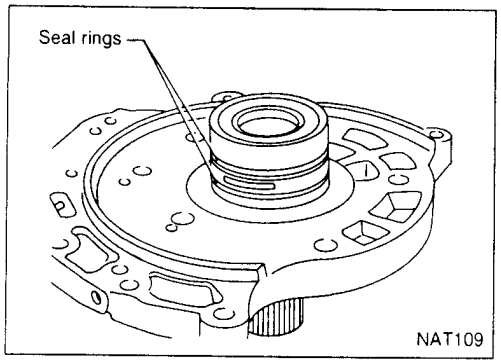
7. Drive in manual plate retaining pin and parking rod plate retaining pin.



8. Install detent spring.

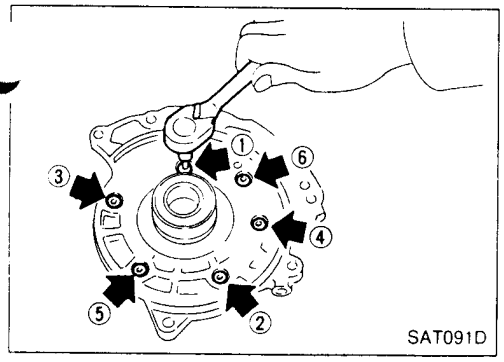
Oil Pump



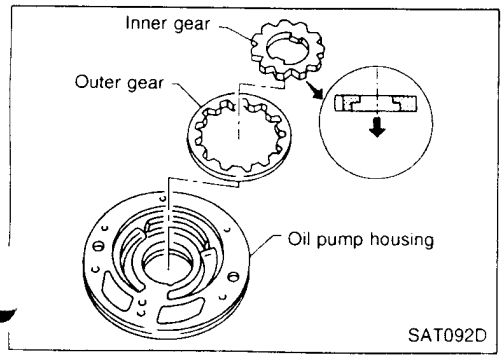


DISASSEMBLY

1. Remove seal rings.

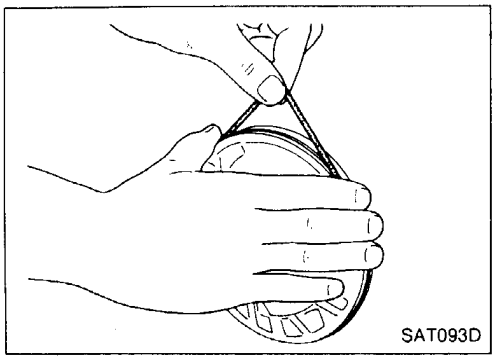


2. Loosen bolts in numerical order and remove oil pump cover.

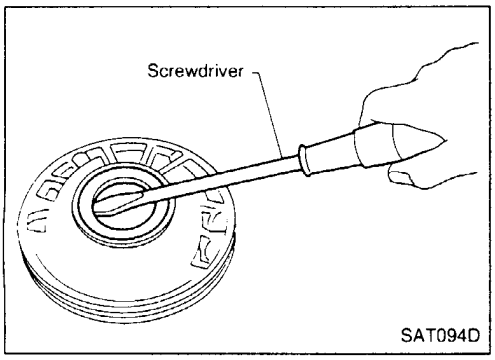


3. Remove inner and outer gear from oil pump housing.

Oil Pump (Cont'd)


SAT093D

4. Remove O-ring from oil pump housing.



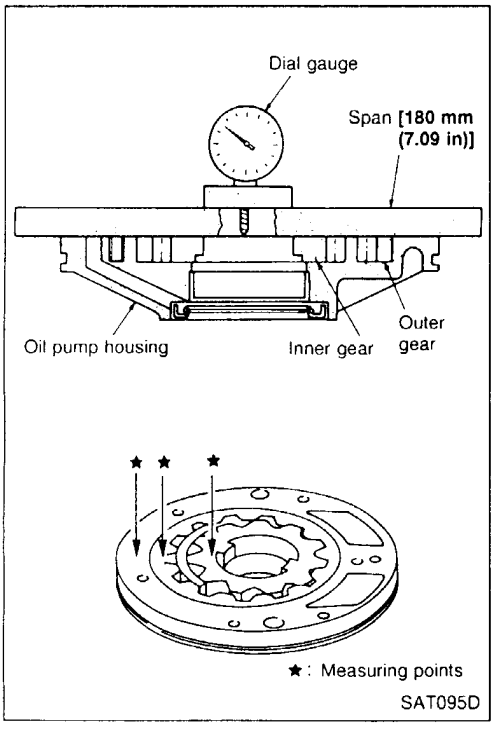
SAT094D

5. Remove oil pump housing oil seal.

INSPECTION

Oil pump housing, oil pump cover, inner gear and outer gear

- Check for wear or damage.

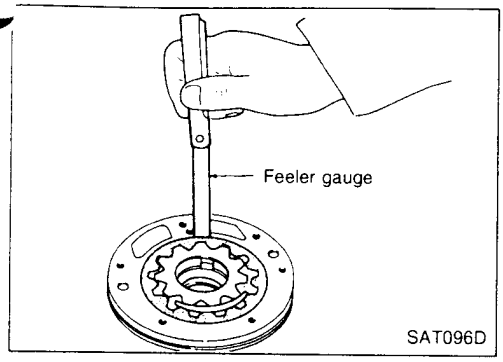


SAT095D

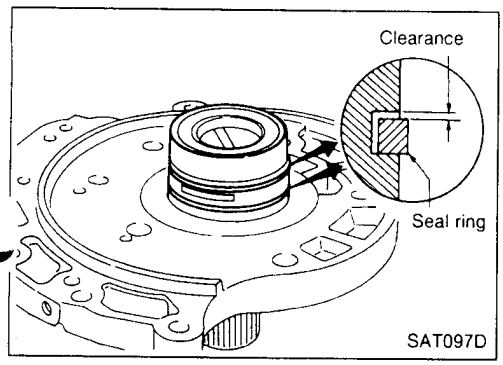
Side clearance

- Measure side clearance between end of oil pump housing and inner and outer gears in at least four places along their circumferences. Maximum measured values should be within specified range.
  Standard clearance:
  0.02 - 0.04 mm (0.0008 - 0.0016 in)
- If clearance is less than standard, select inner and outer gear as a set so that clearance is within specifications.
  Inner and outer gear:
  Refer to SDS, AT-211
- If clearance is more than standard, replace whole oil pump assembly except oil pump cover.

Oil Pump (Cont'd)

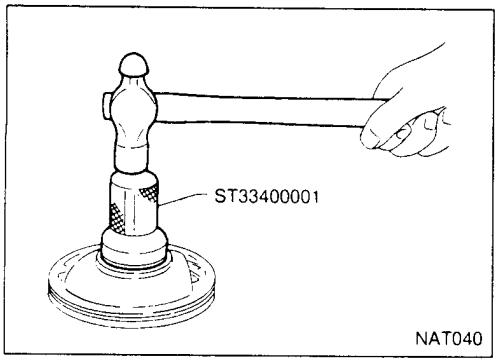


- Measure clearance between outer gear and oil pump housing.
  Standard clearance:
  0.08 - 0.15 mm (0.0031 - 0.0059 in)
  Allowable limit:
  0.15 mm (0.0059 in)
- If not within allowable limit, replace whole oil pump assembly except oil pump cover.



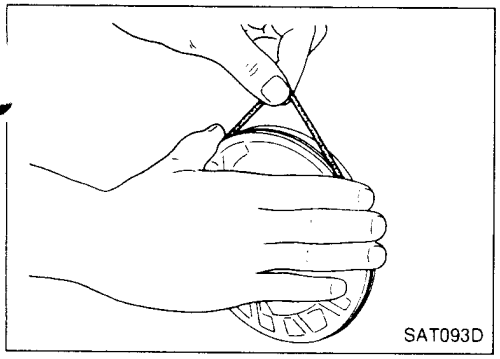
Seal ring clearance

- Install new seal rings onto oil pump cover.
- Measure clearance between seal ring and ring groove.
  Standard clearance:
  0.10 - 0.25 mm (0.0039 - 0.0098 in)
  Allowable limit:
  0.25 mm (0.0098 in)
- If not within allowable limit, replace oil pump cover assembly.

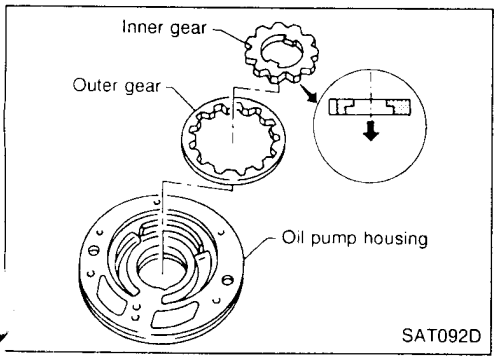


ASSEMBLY

1. Install oil seal on oil pump housing.

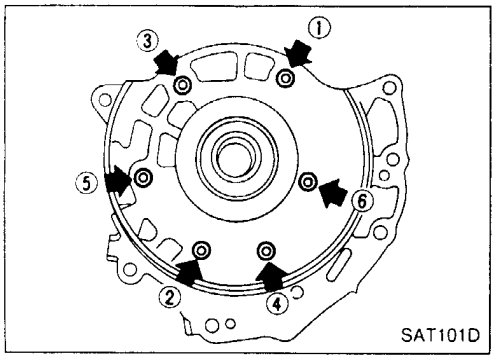


2. Install O-ring on oil pump housing.
- **Apply ATF to O-ring.**

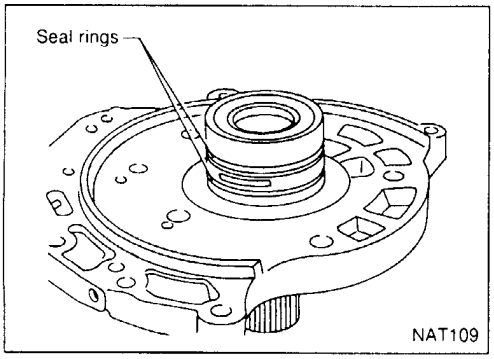


3. Install inner and outer gears on oil pump housing.
- **Take care with the direction of the inner gear.**

Oil Pump (Cont'd)



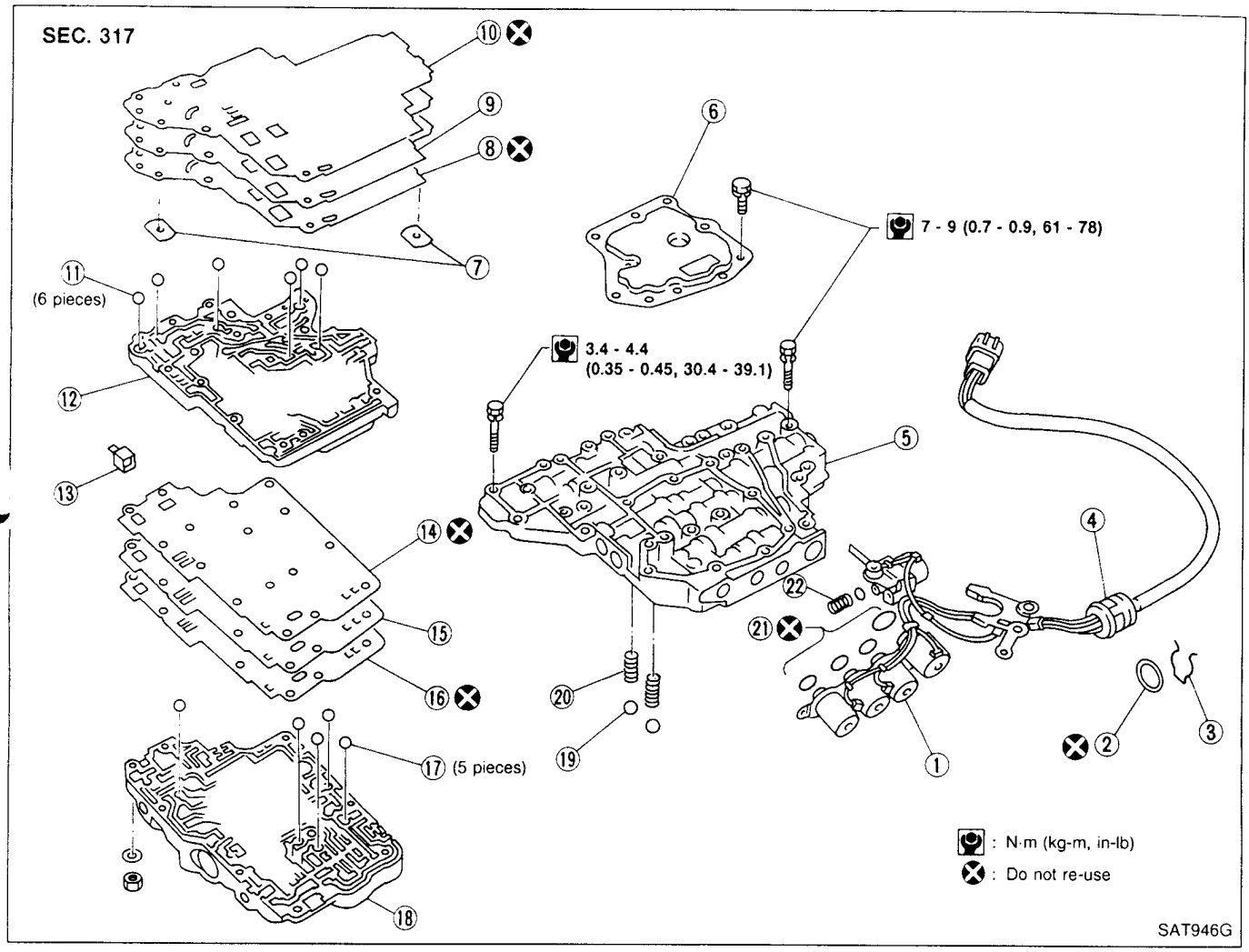
4. Install oil pump cover on oil pump housing.
a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly on oil pump housing assembly, then remove masking tape.
b. Tighten bolts in numerical order.



5. Install new seal rings carefully after packing ring groove with petroleum jelly.

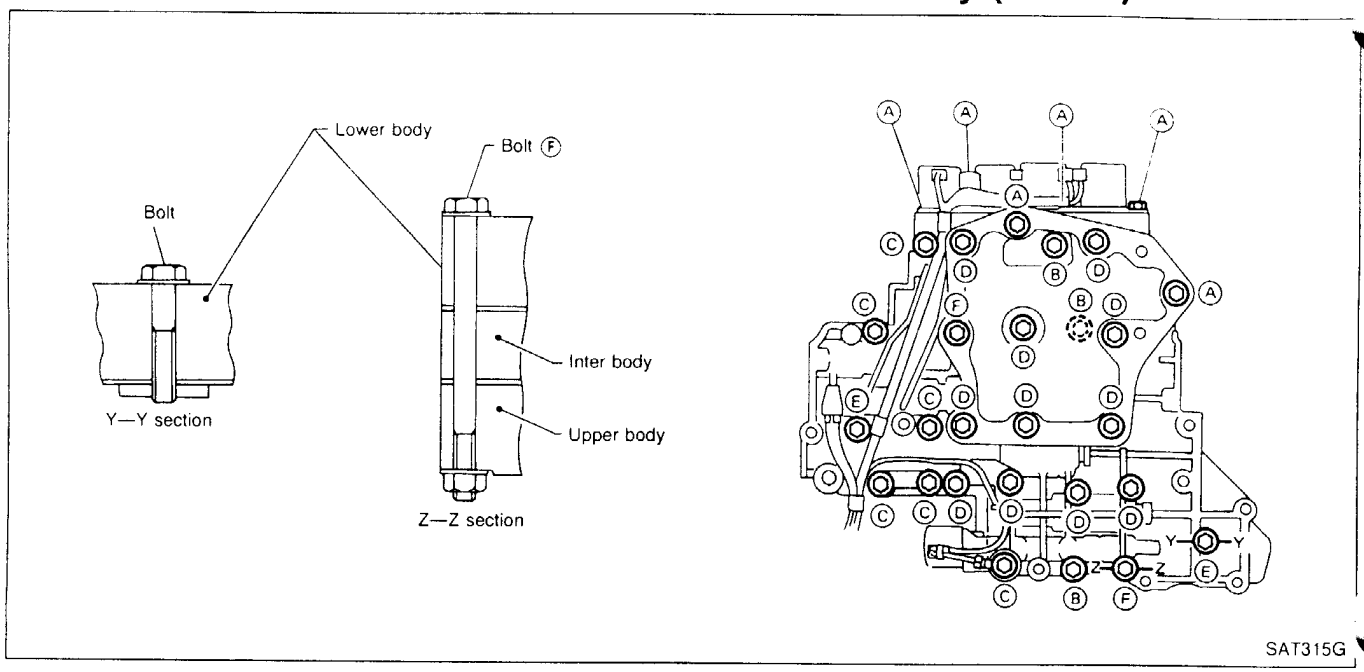
- **Do not spread gap of seal ring excessively while installing. It may deform the ring.**

Control Valve Assembly



① Solenoid valve assembly
② O-ring
③ Clip
④ Terminal body
⑤ Control valve lower body
⑥ Oil strainer
⑦ Support plate
⑧ Lower inter separating gasket
⑨ Separating plate
⑩ Lower separating gasket
⑪ Steel ball
⑫ Control valve inter body
⑬ Pilot filter
⑭ Upper inter separating gasket
⑮ Separating plate
⑯ Upper separating gasket
⑰ Steel ball
⑱ Control valve upper body
⑲ Check ball
⑳ Oil cooler relief valve spring
㉑ O-ring
㉒ Line pressure solenoid valve spring

Control Valve Assembly (Cont'd)



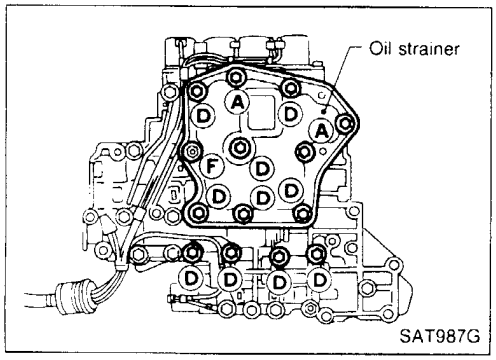
DISASSEMBLY

- Disassemble upper, inter and lower bodies.

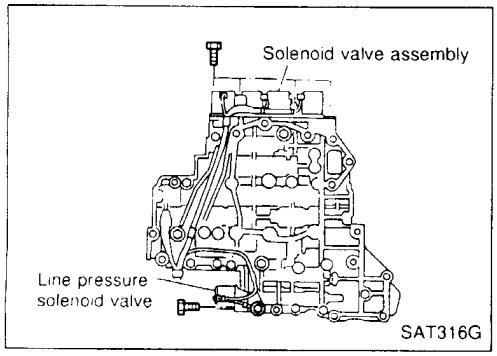
Bolt length, number and location:

Bolt symbol	A	B	C	D	E	F
Bolt length "ℓ" mm (in)	13.5 (0.531)	58.0 (2.283)	40.0 (1.575)	66.0 (2.598)	33.0 (1.299)	78.0 (3.071)
Number of bolts	6	3	6	11	2	2

F: Reamer bolt with nut



a. Remove bolts Ⓐ, Ⓓ and Ⓕ, and remove oil strainer from control valve assembly.

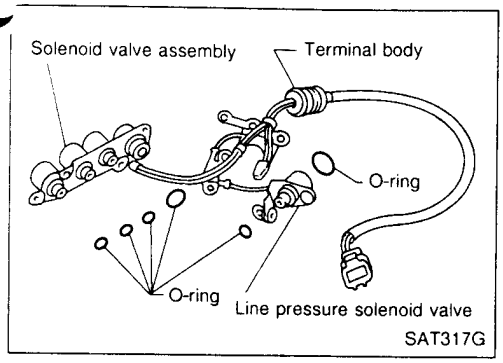


b. Remove solenoid valve assembly and line pressure solenoid valve from control valve assembly.

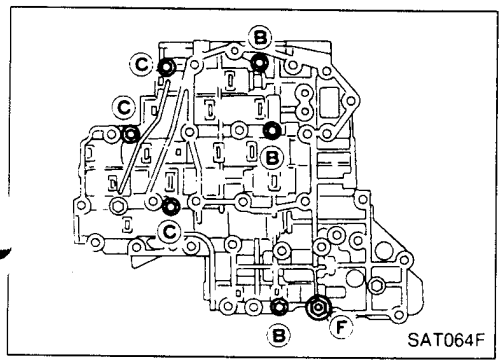
- **Be careful not to lose the line pressure solenoid valve spring.**

Control Valve Assembly (Cont'd)

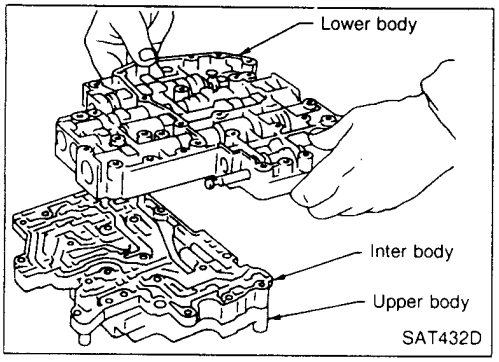
c. Remove O-rings from solenoid valves and terminal body.



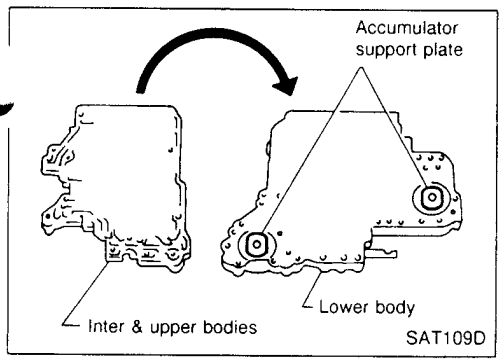
d. Place upper body facedown, and remove bolts Ⓑ, Ⓒ and Ⓕ.



e. Remove lower body from inter body.

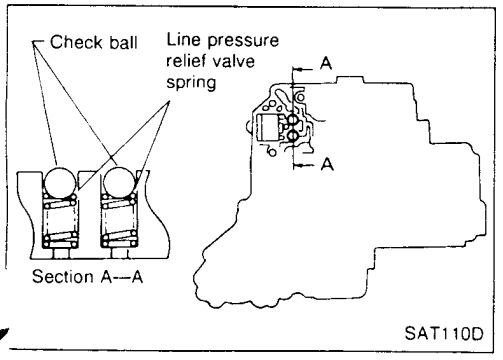


f. Turn over lower body (with accumulator support plates).

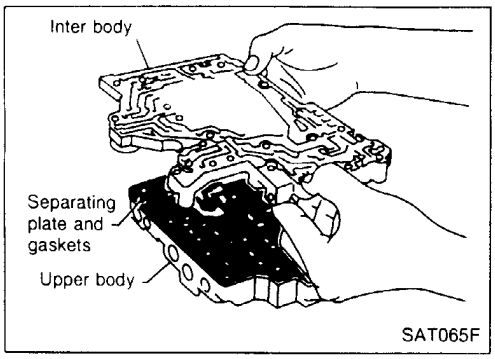


g. Remove bolts Ⓔ, separating plate and separating gaskets from lower body.
h. Remove steel balls and relief valve springs from lower body.

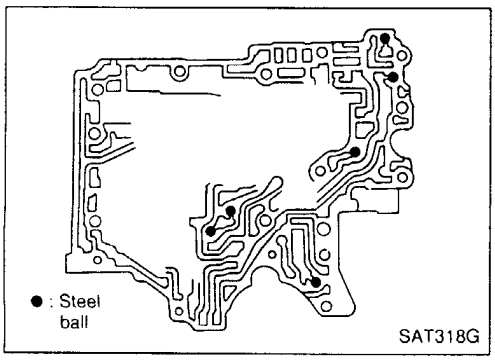
- **Be careful not to lose steel balls and relief valve springs.**



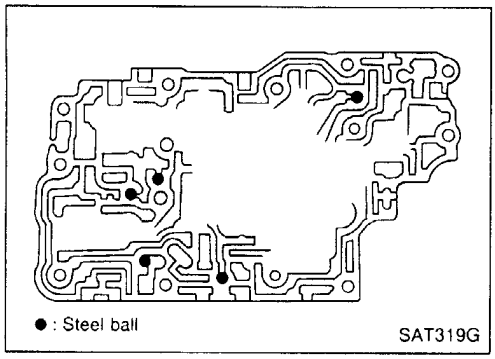
Control Valve Assembly (Cont'd)



i. Remove inter body from upper body.
j. Remove pilot filter, separating plate and gaskets from upper body.



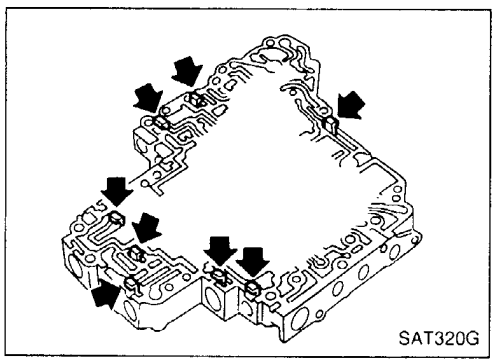
k. Check to see that steel balls are correctly located in inter body and then remove them from inter body.
- **Be careful not to lose steel balls.**



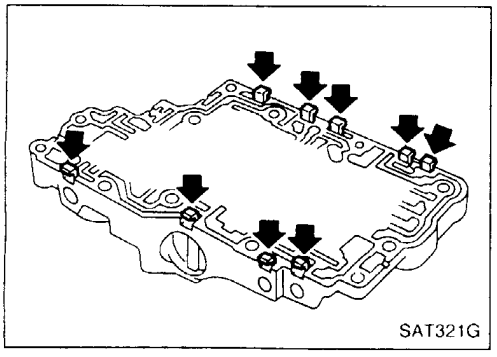
l. Check to see that steel balls are correctly located in upper body and then remove them from upper body.
- **Be careful not to lose steel balls.**

INSPECTION

Lower and upper bodies



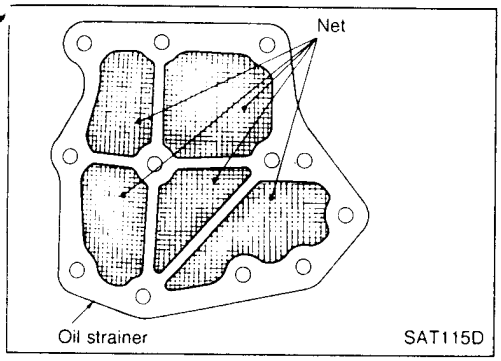
- Check to see that retainer plates are correctly located in lower body.



- Check to see that retainer plates are correctly located in upper body.

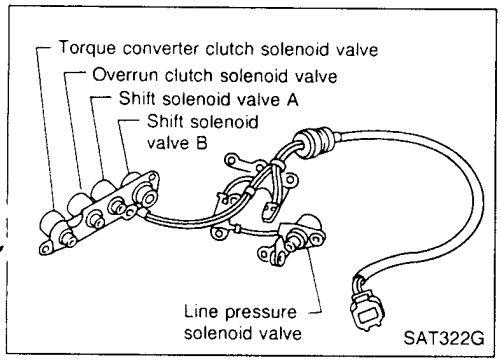
Control Valve Assembly (Cont'd)

Oil strainer



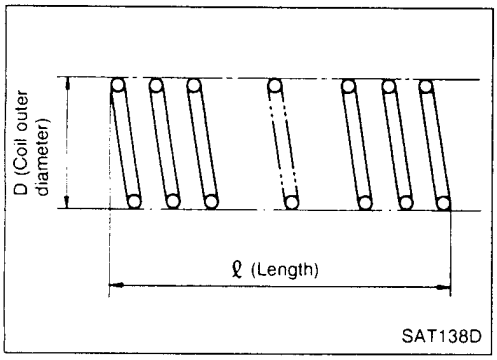
- Check wire netting of oil strainer for damage.

Shift solenoid valves A and B, line pressure solenoid valve, torque converter clutch solenoid valve and overrun clutch solenoid valve



- Measure resistance — Refer to "Electrical Components Inspection", AT-85.

Oil cooler relief valve spring

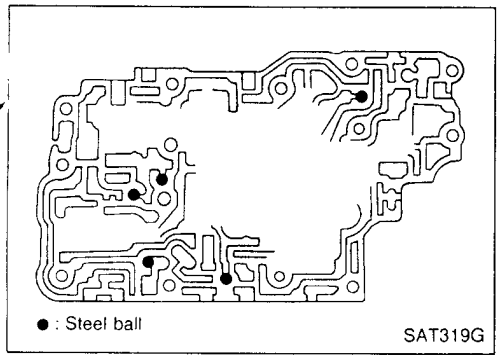


- Check springs for damage or deformation.
- Measure free length and outer diameter.
  Inspection standard:
  Refer to SDS, AT-207.

ASSEMBLY

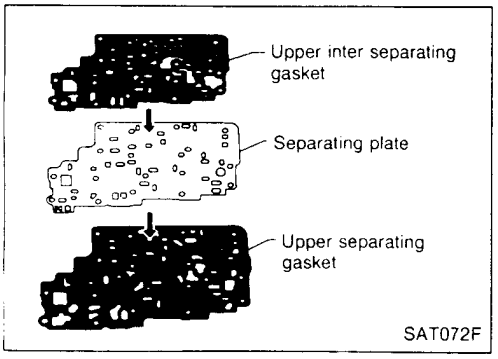
1. Install upper, inter and lower body.

a. Place oil circuit of upper body face up. Install steel balls in their correct locations.

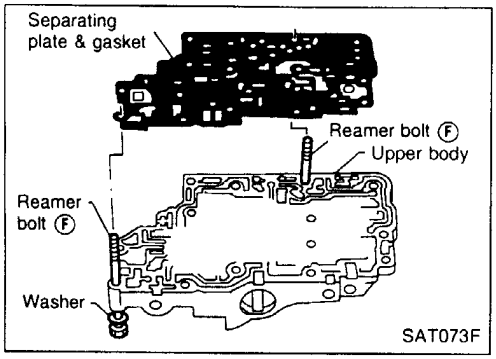


b. Install upper separating gasket, upper inter separating gasket and upper separating plate in order shown in illustration.

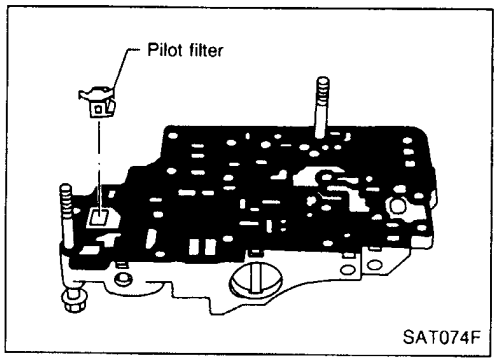
- **Always use new gaskets.**



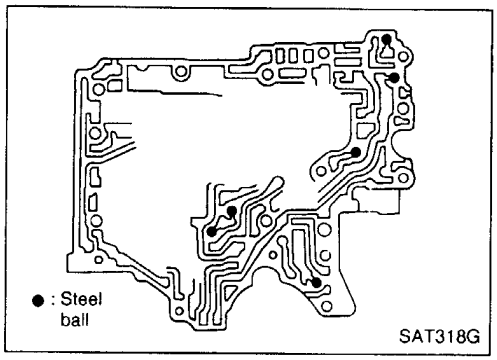
Control Valve Assembly (Cont'd)



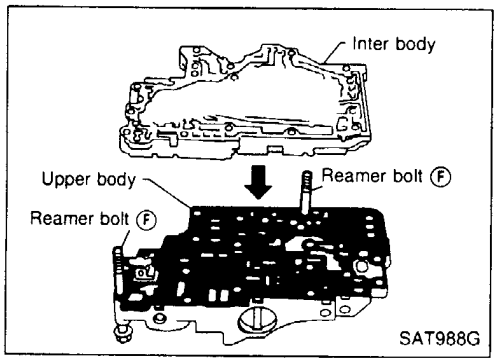
c. Install reamer bolts Ⓕ from bottom of upper body and install separating plate and gaskets as a set on upper body using reamer bolts as guides.



d. Install pilot filter.

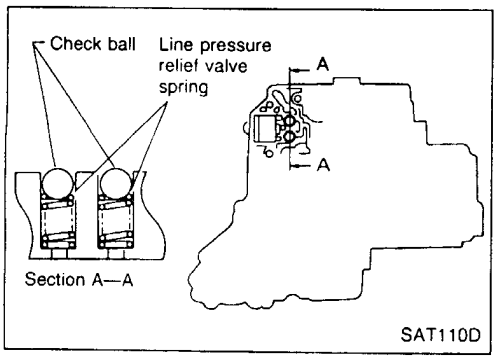


e. Place inter body as shown in the illustration. Install steel balls in their correct locations.



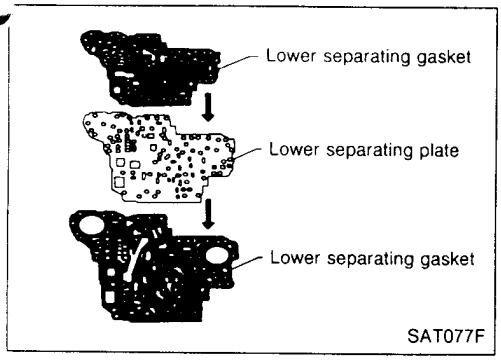
f. Install inter body on upper body using reamer bolts Ⓕ as guides.

- **Be careful not to dislocate or drop steel balls.**

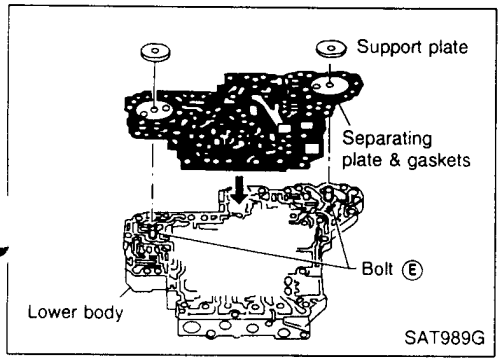


g. Install steel balls and relief valve springs in their correct locations in lower body.

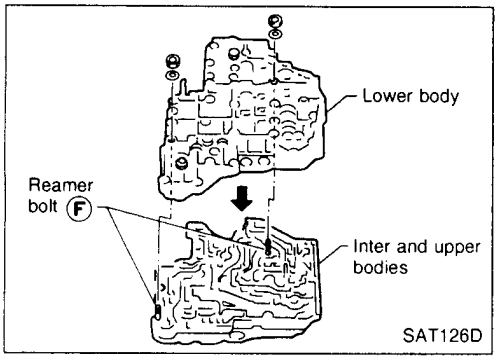
Control Valve Assembly (Cont'd)



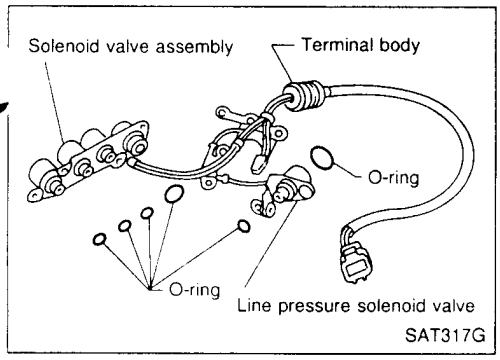
h. Install lower separating gasket, inner separating gasket and lower separating plate in order shown in the illustration.



i. Install bolts Ⓔ from bottom of lower body and install separating plate and gaskets as a set on lower body using bolts Ⓔ as guides.
j. Install support plates on lower body.

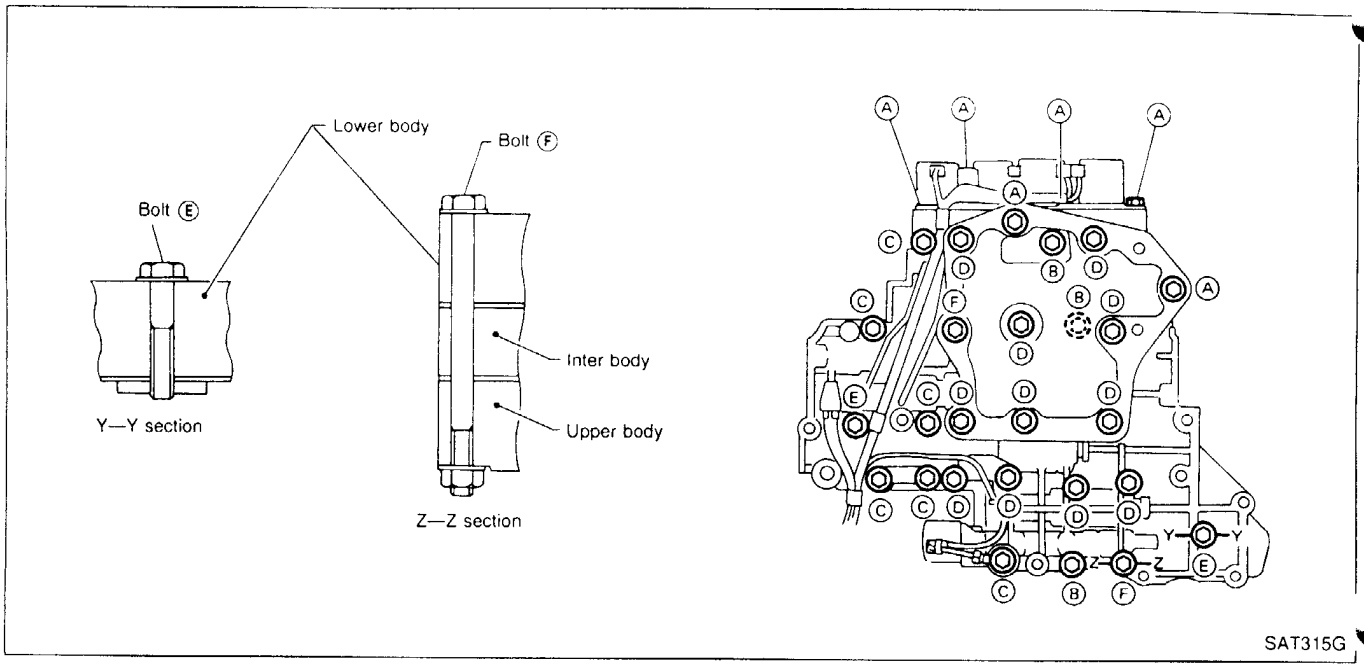


k. Install lower body on inter body using reamer bolts Ⓕ as guides and tighten reamer bolts Ⓕ slightly.



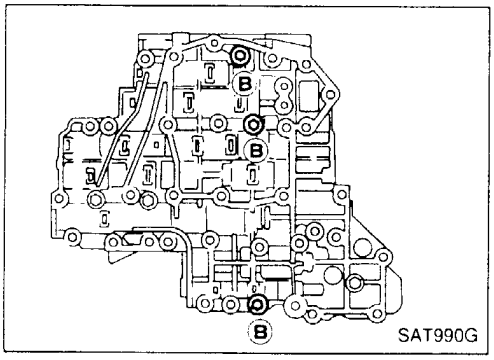
2. Install O-rings to solenoid valves and terminal body.
- **Apply ATF to O-rings.**

Control Valve Assembly (Cont'd)

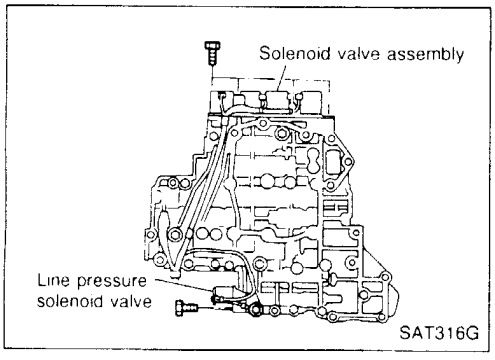


Bolt length, number and location:

Bolt symbol	A	B	C	D	E	F
Bolt length "ℓ" mm(in)	13.5 (0.531)	58.0 (2.283)	44.0 (1.732)	66.0 (2.598)	33.0 (1.299)	78.0 (3.071)
Number of bolts	6	3	6	11	2	2

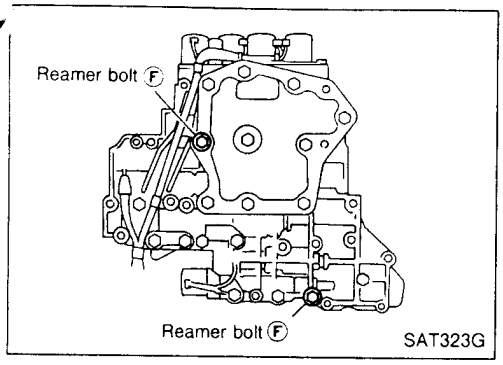


3. Install and tighten bolts.
a. Install and tighten bolts Ⓑ to specified torque.

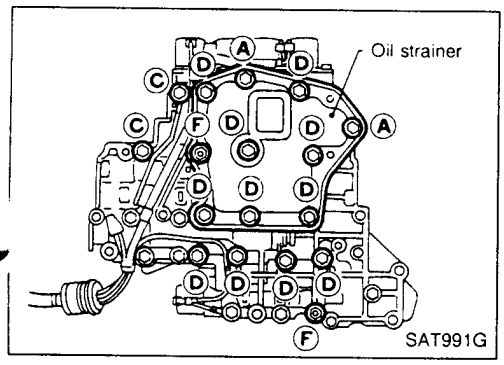


b. Install solenoid valve assembly and line pressure solenoid valve to lower body.

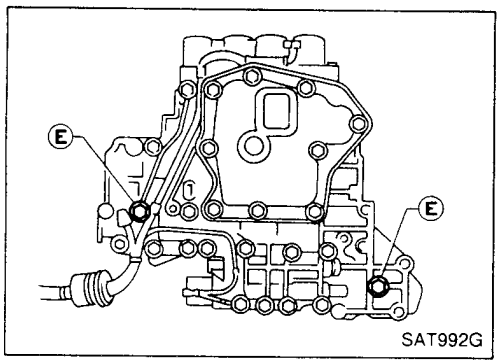
Control Valve Assembly (Cont'd)



c. Remove reamer bolts Ⓕ and set oil strainer on control valve assembly.
d. Reinstall reamer bolts Ⓕ from lower body side.



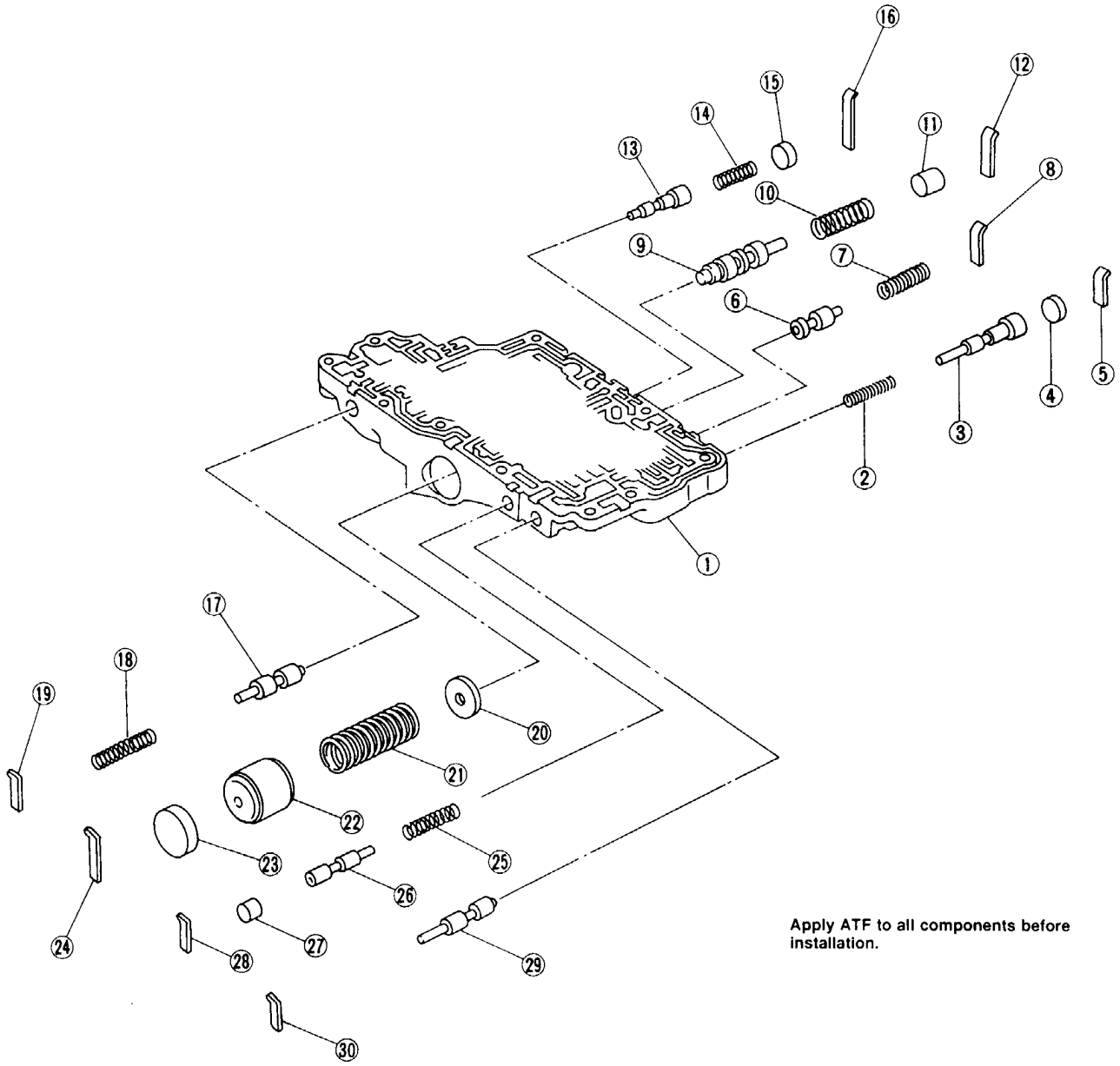
e. Tighten bolts Ⓐ, Ⓒ, Ⓓ and Ⓕ to specified torque.



f. Tighten bolts Ⓔ to specified torque.

Control Valve Upper Body

SEC. 317



Numbers preceding valve springs correspond with those shown in SDS table on page AT-207.

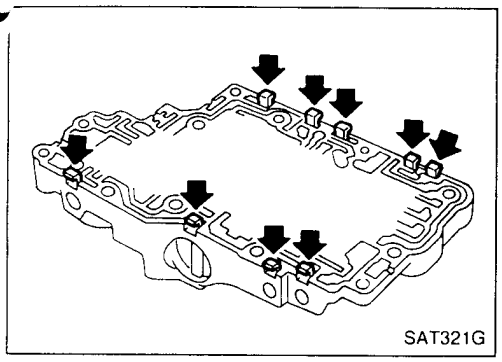
① Control valve upper body
② Return spring
③ Overrun clutch reducing valve
④ Plug
⑤ Retainer plate
⑥ Torque converter relief valve
⑦ Return spring
⑧ Retainer plate
⑨ Torque converter clutch control valve
⑩ Return spring
⑪ Plug
⑫ Retainer plate
⑬ 1-2 accumulator valve
⑭ Return spring
⑮ Plug
⑯ Retainer plate
⑰ Pilot valve
⑱ Return spring
⑲ Retainer plate
⑳ 1-2 accumulator retainer plate
㉑ Return spring
㉒ 1-2 accumulator piston
㉓ Plug
㉔ Retainer plate
㉕ Return spring
㉖ 1st reducing valve
㉗ Plug
㉘ Retainer plate
㉙ 2-3 timing valve
㉚ Retainer plate

Control Valve Upper Body (Cont'd)

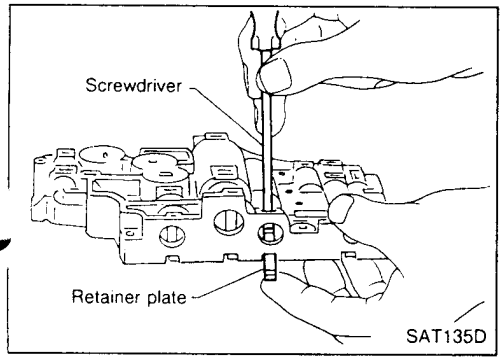
DISASSEMBLY

1. Remove valves at retainer plates.

- **Do not use a magnetic "hand".**


SAT321G

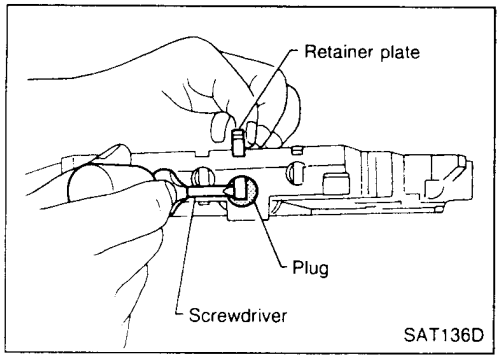
a. Use a screwdriver to pry out retainer plates.



SAT135D

b. Remove retainer plates while holding spring, plugs or sleeves.

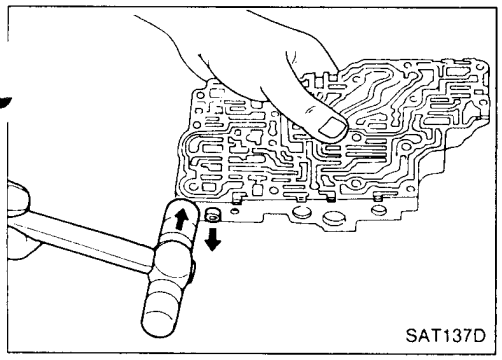
- **Remove plugs slowly to prevent internal parts from jumping out.**



SAT136D

c. Place mating surface of valve body face down, and remove internal parts.

- **If a valve is hard to remove, place valve body face down and lightly tap it with a soft hammer.**
- **Be careful not to drop or damage valves and sleeves.**


SAT137D

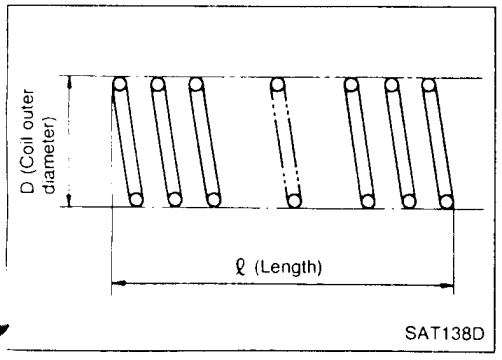
INSPECTION

Valve spring

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
  Inspection standard:
  Refer to SDS, AT-207.
- Replace valve springs if deformed or fatigued.

Control valves

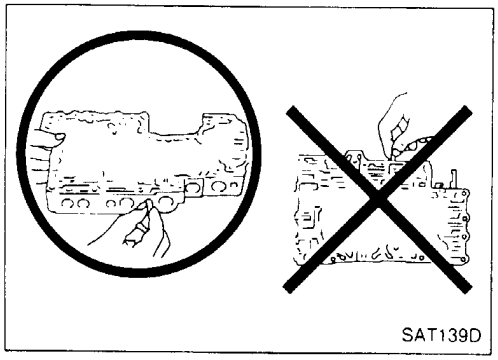
- Check sliding surfaces of valves, sleeves and plugs.



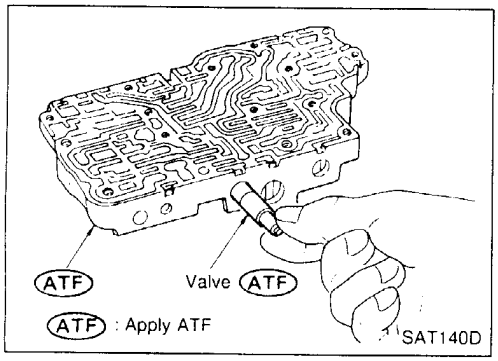
SAT138D

Control Valve Upper Body (Cont'd)

ASSEMBLY

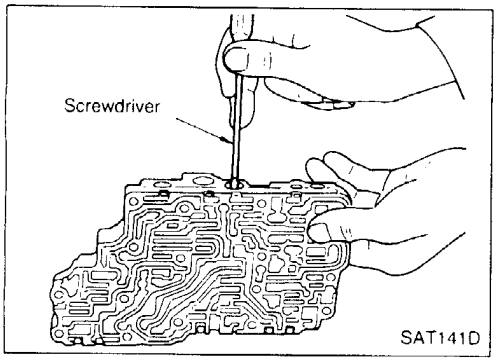

SAT139D

- **Lay control valve body down when installing valves. Do not stand the control valve body upright.**



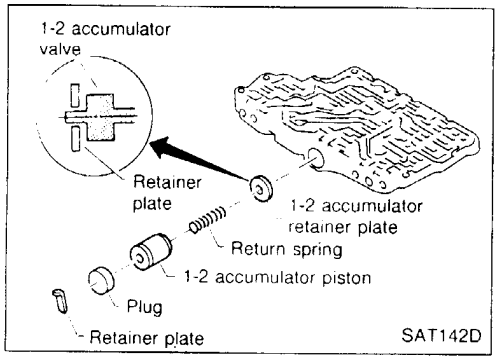
SAT140D

1. Lubricate the control valve body and all valves with ATF. Install control valves by sliding them carefully into their bores.
- **Be careful not to scratch or damage valve body.**



SAT141D

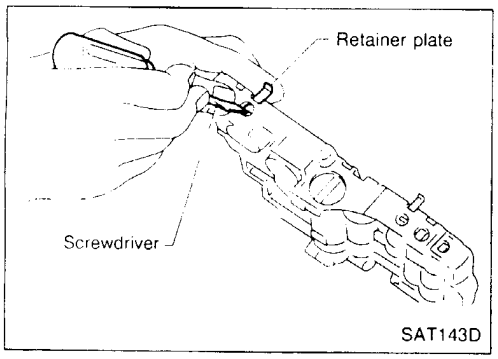
- Wrap a small screwdriver with vinyl tape and use it to insert the valves into their proper positions.



SAT142D

1-2 accumulator valve

- Install 1-2 accumulator valve and then align 1-2 accumulator retainer plate with 1-2 accumulator valve from opposite side of control valve body.
- Install return spring, 1-2 accumulator piston and plug.

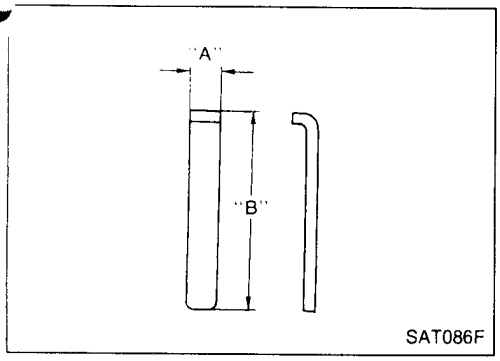


SAT143D

2. Install retainer plates.
- Install retainer plate while pushing plug or return spring.

Control Valve Upper Body (Cont'd)

Retainer plate



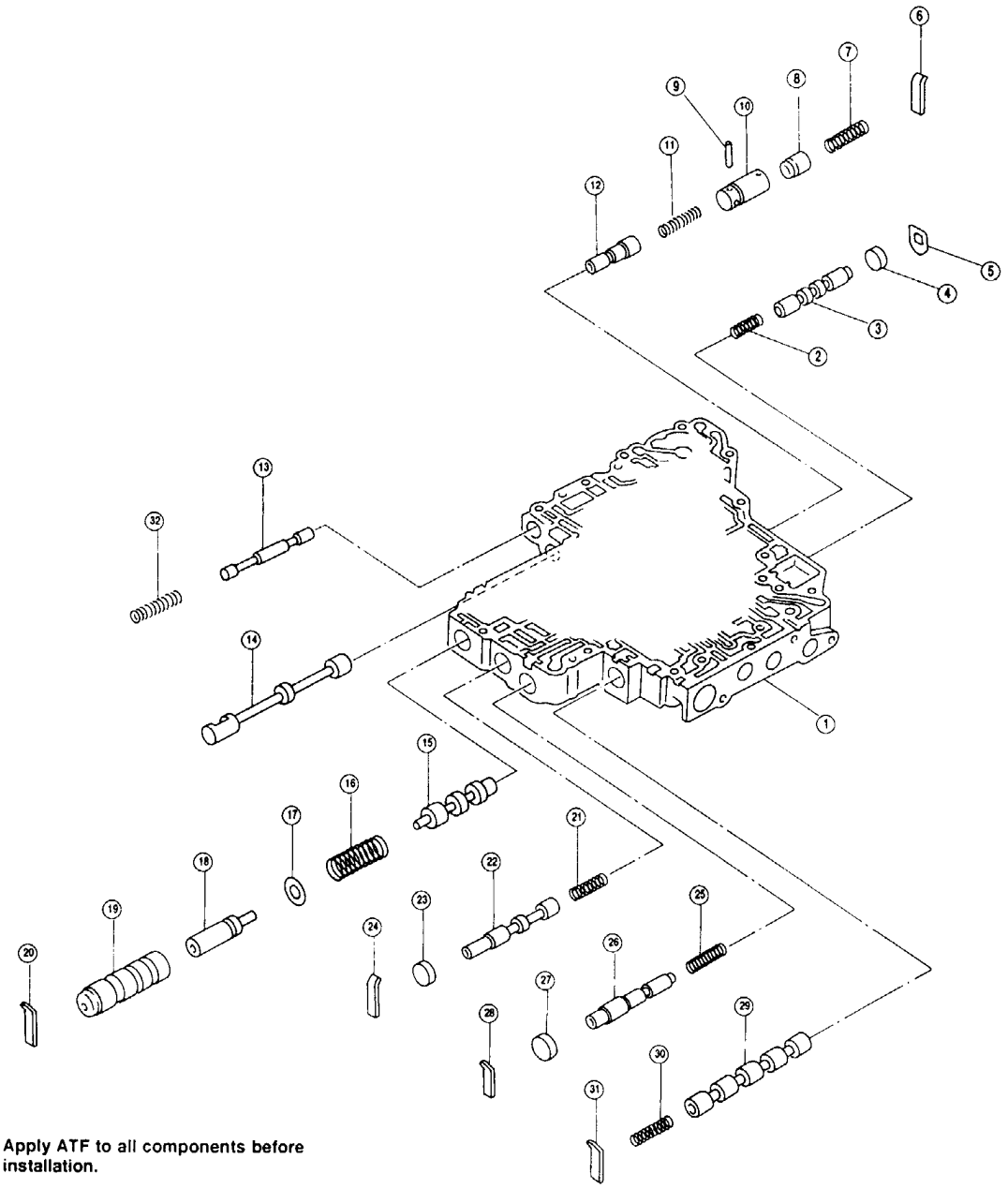
Unit: mm (in)

Name of control valve	Length A	Length B
Pilot valve	6.0 (0.236)	21.5 (0.846)
1-2 accumulator valve		38.5 (1.516)
1-2 accumulator piston valve		
1st reducing valve		21.5 (0.846)
Overrun clutch reducing valve		24.0 (0.945)
Torque converter relief valve		21.5 (0.846)
Torque converter clutch control valve		28.0 (1.102)
2-3 timing valve		

- Install retainer plates in correct locations.

Control Valve Lower Body

SEC. 317



Apply ATF to all components before installation.

NAT178

Numbers preceding valve springs correspond with those shown in SDS table on page AT-207.

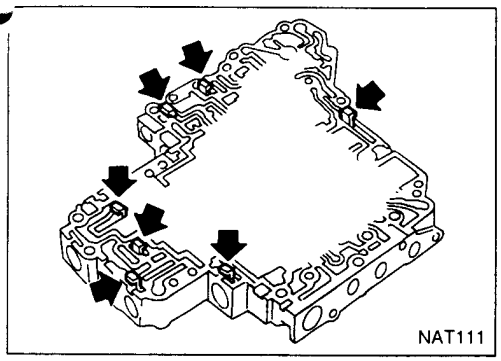
① Control valve lower body
② Return spring
③ Shift valve B
④ Plug
⑤ Retainer plate
⑥ Retainer plate
⑦ Return spring
⑧ Piston
⑨ Parallel pin
⑩ Sleeve
⑪ Return spring
⑫ Pressure modifier valve
⑬ Accumulator shift valve
⑭ Manual valve
⑮ Pressure regulator valve
⑯ Return spring
⑰ Spring seat
⑱ Plug
⑲ Sleeve
⑳ Retaining plate
㉑ Return spring
㉒ Overrun clutch control valve
㉓ Plug
㉔ Retaining plate
㉕ Return spring
㉖ Accumulator control valve
㉗ Plug
㉘ Retainer plate
㉙ Shift valve A
㉚ Return spring
㉛ Retainer plate
㉜ Return spring

Control Valve Lower Body (Cont'd)

DISASSEMBLY

Remove valves at retainer plate.

For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.


NAT111

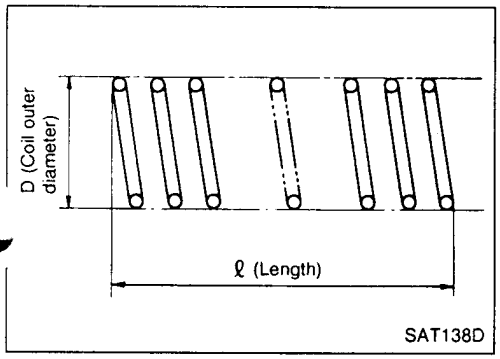
INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.

  Inspection standard:

  Refer to SDS, AT-207.
- Replace valve springs if deformed or fatigued.



SAT138D

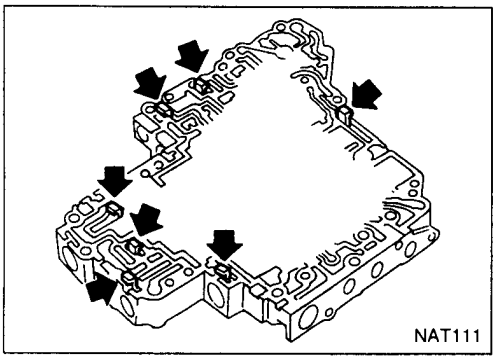
Control valves

- Check sliding surfaces of control valves, sleeves and plugs for damage.

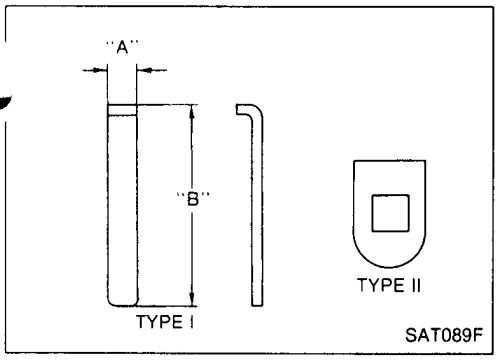
ASSEMBLY

- Install control valves.

  For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.


NAT111

Retainer plate



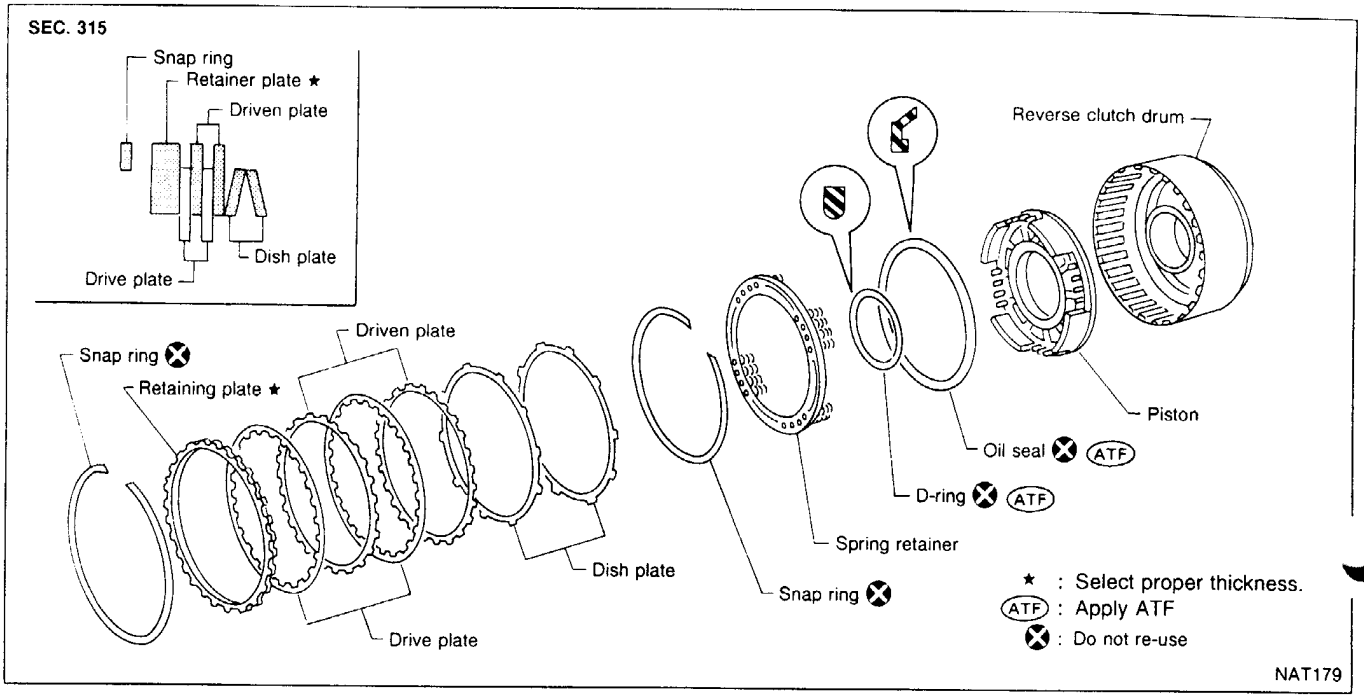
SAT089F

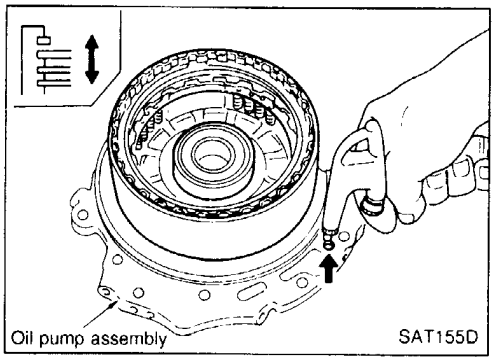
Unit: mm (in)

Name of control valve	Length A	Length B	Type
Pressure regulator valve	28.0 (1.102)	6.0 (0.236)	I
Accumulator control valve			
Shift valve A			
Overrun clutch control valve			
Pressure modifier valve			
Shift valve B	—	—	II

- Install retainer plates in correct locations.

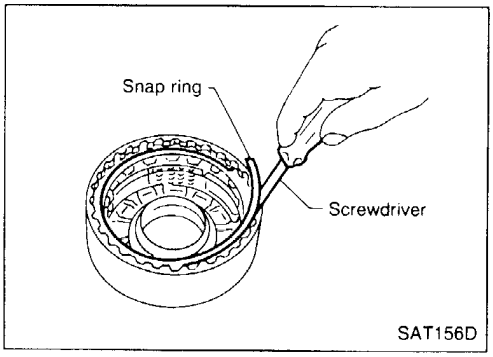
Reverse Clutch





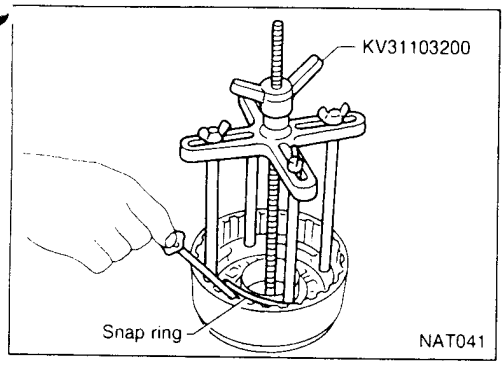
DISASSEMBLY

1. Check operation of reverse clutch.
a. Install seal ring onto drum support of oil pump cover and install reverse clutch assembly. Apply compressed air to oil hole.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.



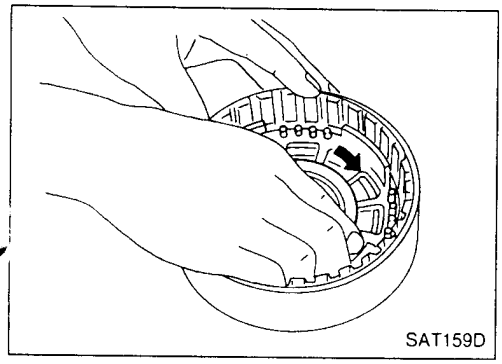
2. Remove snap ring.
3. Remove drive plates, driven plates, retaining plate, and dish plates.

Reverse Clutch (Cont'd)

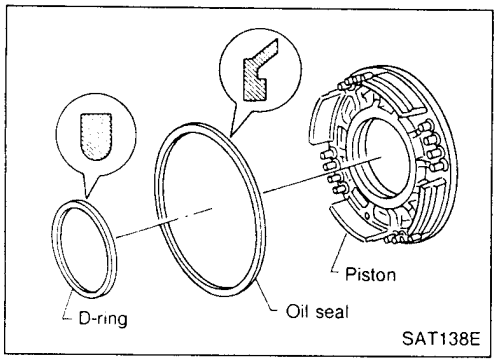


4. Set Tool on spring retainer and remove snap ring from reverse clutch drum while compressing return springs.
- **Set Tool directly above springs.**
- **Do not expand snap ring excessively.**

5. Remove spring retainer and return springs.
- **Do not remove return springs from spring retainer.**



6. Remove piston from reverse clutch drum by turning it.

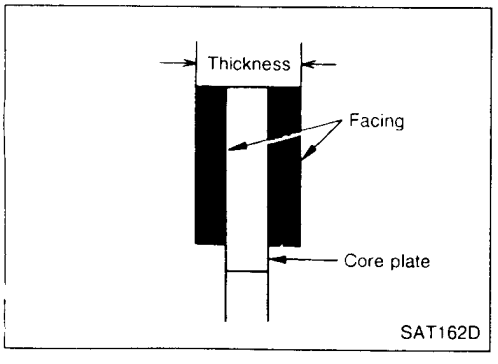


7. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring, spring retainer and return springs

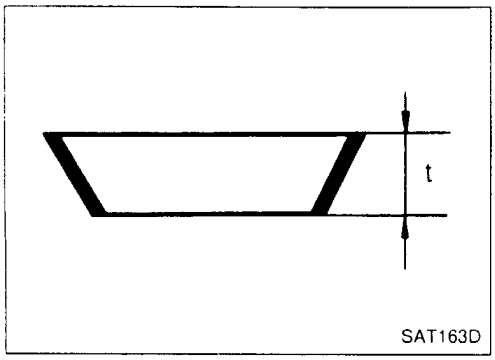
- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**



Reverse clutch drive plates

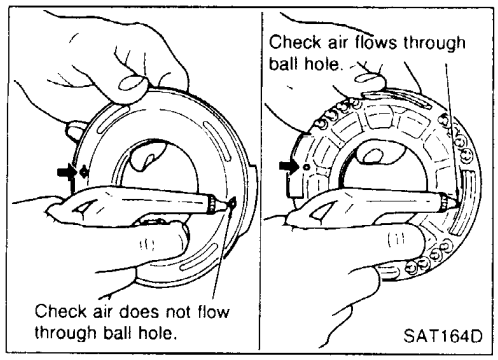
- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  Thickness of drive plate:
  Standard value: 2.0 mm (0.079 in)
  Wear limit: 1.8 mm (0.071 in)
- If not within wear limit, replace.

Reverse Clutch (Cont'd)



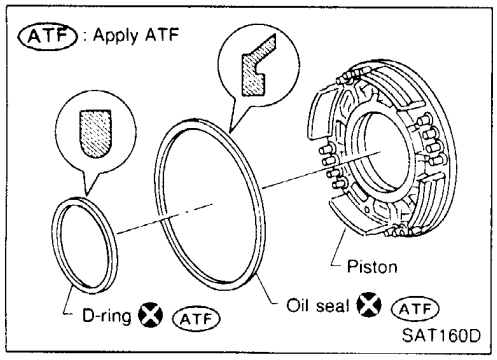
Reverse clutch dish plates

- Check for deformation or damage.
- Measure thickness of dish plate.
  Thickness of dish plate "t": 2.8 mm (0.110 in)
- If deformed or fatigued, replace.



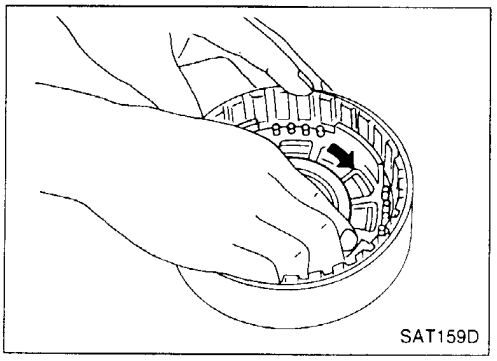
Reverse clutch piston

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring to make sure that there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure air leaks past ball.

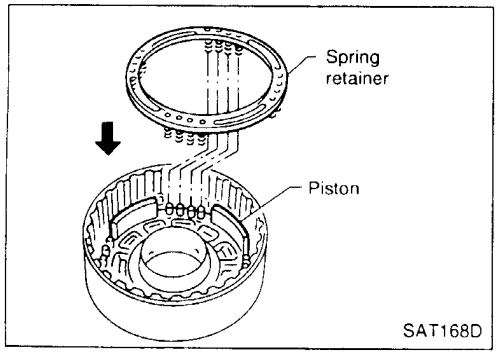


ASSEMBLY

1. Install D-ring and oil seal on piston.
- **Take care with the direction of the oil seal.**
- **Apply ATF to both parts.**

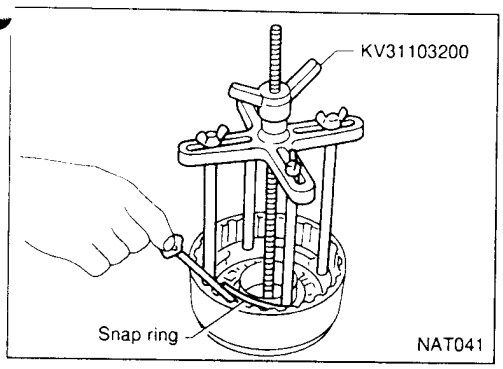


2. Install piston assembly by turning it slowly.
- **Apply ATF to inner surface of drum.**

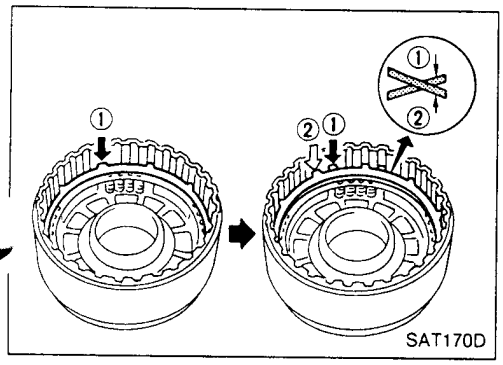


3. Install return springs and spring retainer on piston.

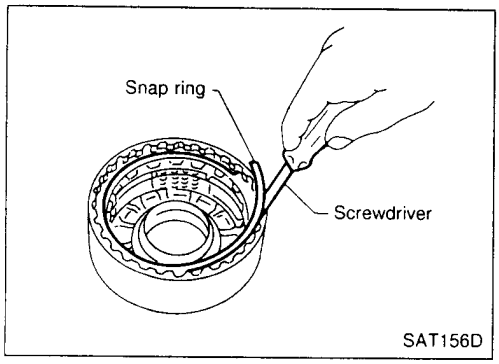
Reverse Clutch (Cont'd)



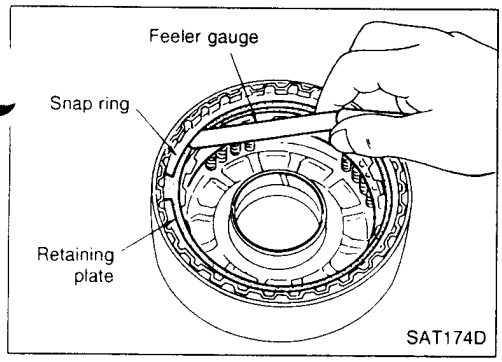
4. Set Tool on spring retainer and install snap ring while compressing return springs.
- **Set Tool directly above return springs.**



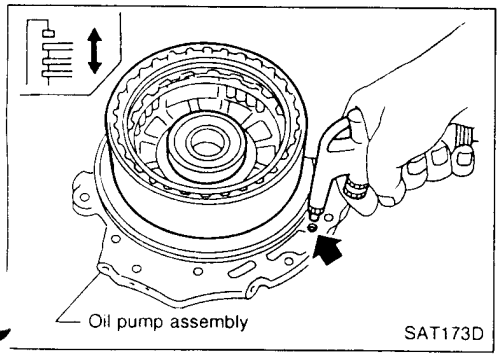
5. Install drive plates, driven plates, retaining plate and dish plates.
- **Do not align the projections of any two dish plates.**
- **Take care with the order and direction of plates.**



6. Install snap ring.



7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard: 0.5 - 0.8 mm (0.020 - 0.031 in)
   Allowable limit: 1.2 mm (0.047 in)
   Retaining plate:
   Refer to SDS, AT-208.

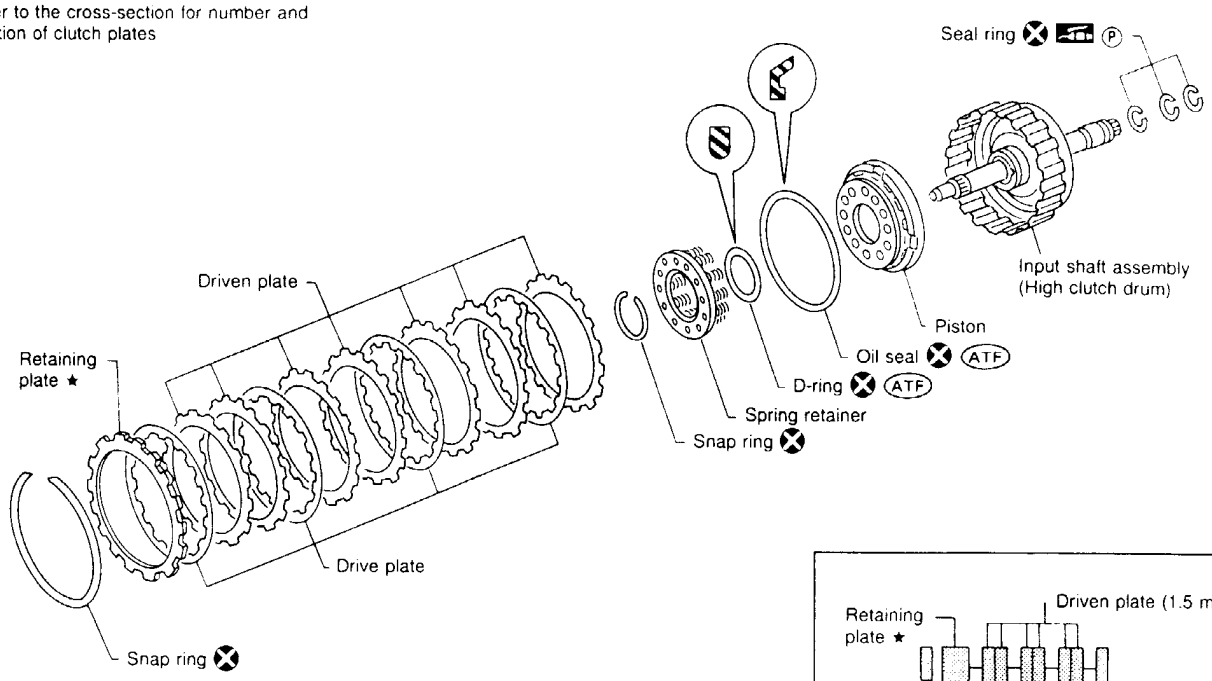


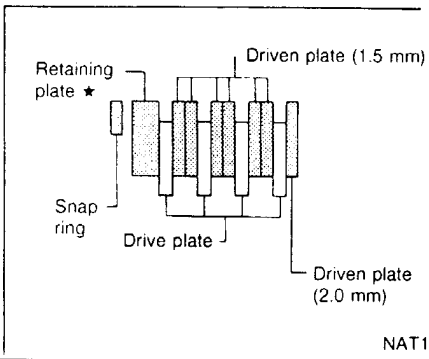
8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" in "Reverse Clutch".

High Clutch

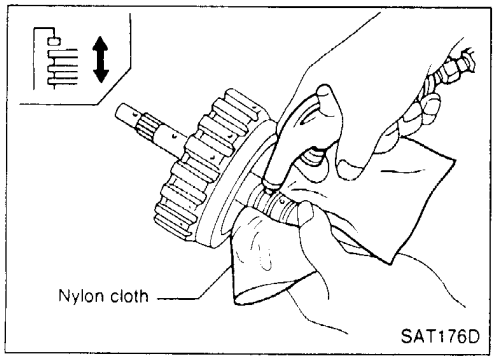
SEC. 315

Refer to the cross-section for number and position of clutch plates



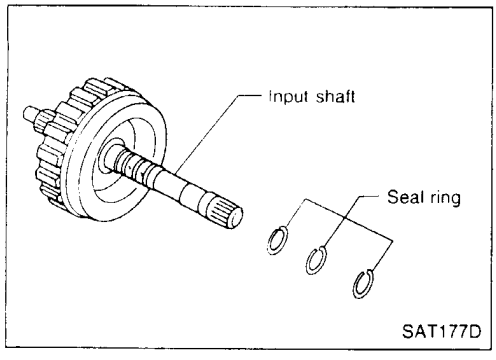


: Apply petroleum jelly.
ATF : Apply ATF
★ : Select correct thickness.
: Do not re-use



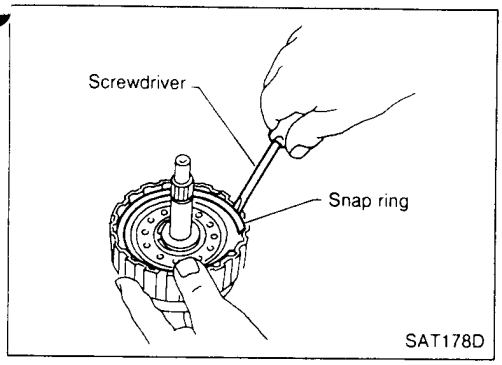
1. Check operation of high clutch.
a. Apply compressed air to oil hole of input shaft.
- **Block hole on opposite side of input shaft.**

b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

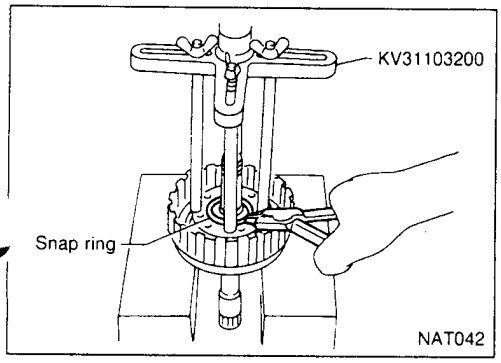


2. Remove seal rings from input shaft.
- Always replace when removed.

High Clutch (Cont'd)

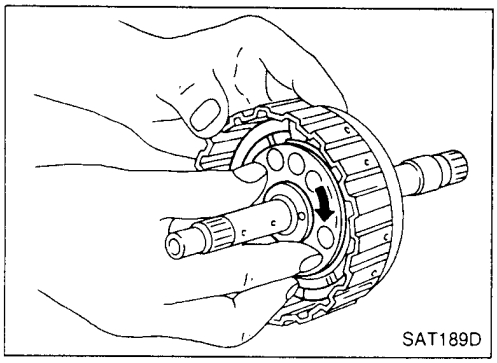


3. Remove snap ring.
4. Remove drive plates, driven plates, retaining plate and dish plate.

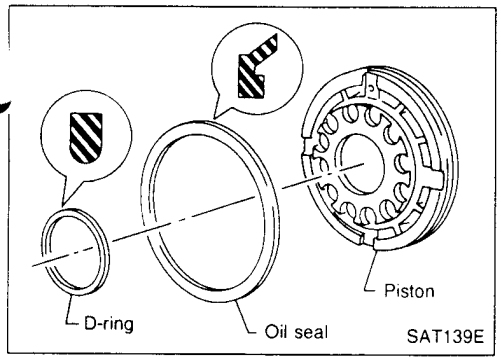


5. Set Tool on spring retainer and remove snap ring from high clutch drum while compressing return springs.
- **Set Tool directly above springs.**
- **Do not expand snap ring excessively.**

6. Remove spring retainer and return springs.
- **Do not remove return spring from spring retainer.**



7. Remove piston from high clutch drum by turning it.



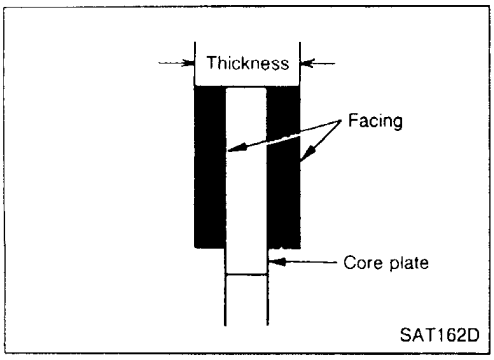
8. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring, spring retainer and return springs

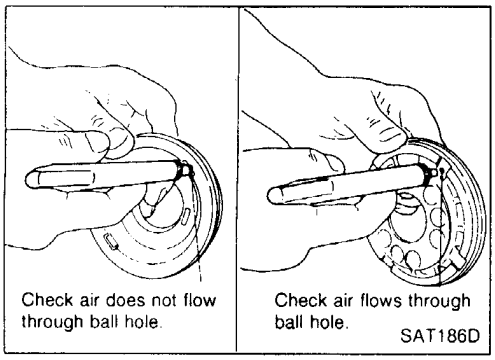
- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**

High Clutch (Cont'd)



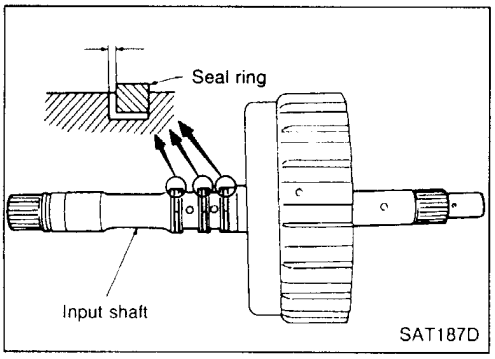
High clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  Thickness of drive plate:
  Standard value: 1.6 mm (0.063 in)
  Wear limit: 1.4 mm (0.055 in)
- If not within wear limit, replace.



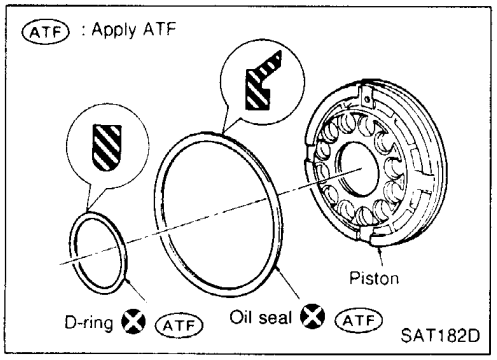
High clutch piston

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring to make sure that there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure air leaks past ball.



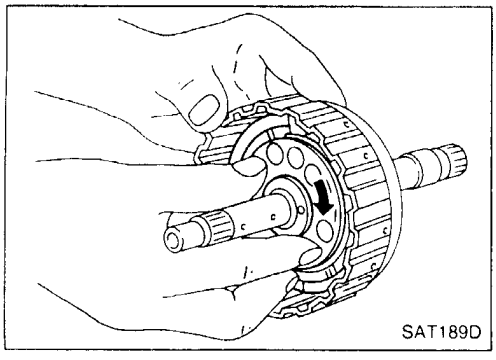
Seal ring clearance

- Install new seal rings onto input shaft.
- Measure clearance between seal ring and ring groove.
  Standard clearance:
  0.08 - 0.23 mm (0.0031 - 0.0091 in)
  Allowable limit:
  0.23 mm (0.0091 in)
- If not within wear limit, replace input shaft assembly.



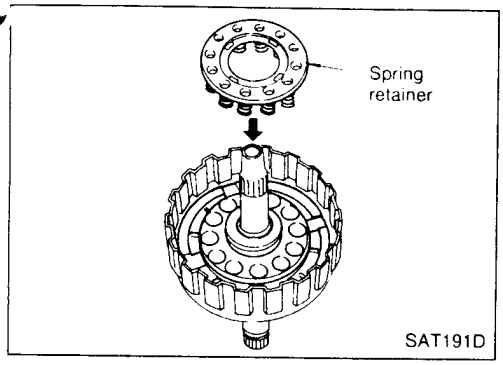
ASSEMBLY

1. Install D-ring and oil seal on piston.
- **Take care with the direction of the oil seal.**
- **Apply ATF to both parts.**

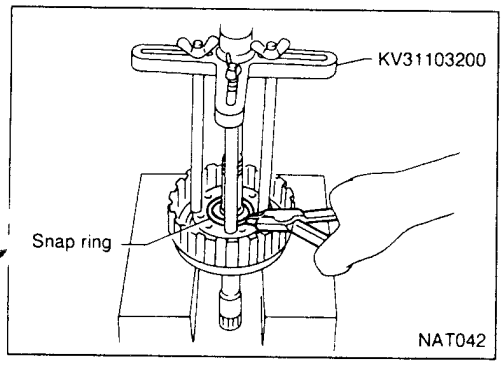


2. Install piston assembly by turning it slowly.
- **Apply ATF to inner surface of drum.**

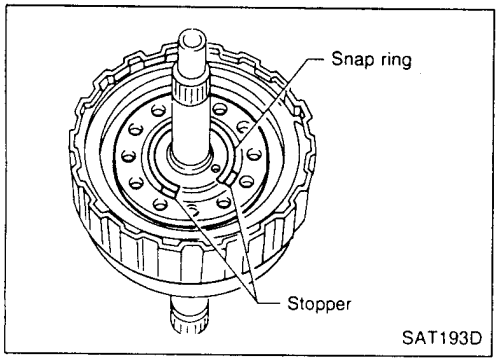
High Clutch (Cont'd)



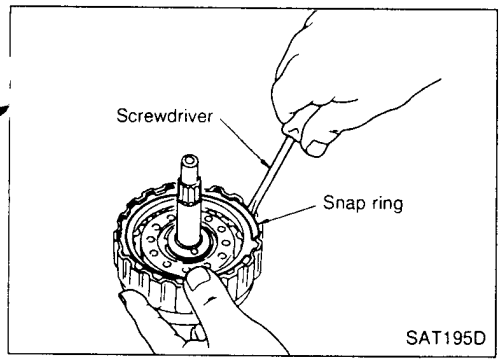
3. Install return springs and spring retainer on piston.



4. Set Tool on spring retainer and install snap ring while compressing return springs.
- **Set Tool directly above return springs.**



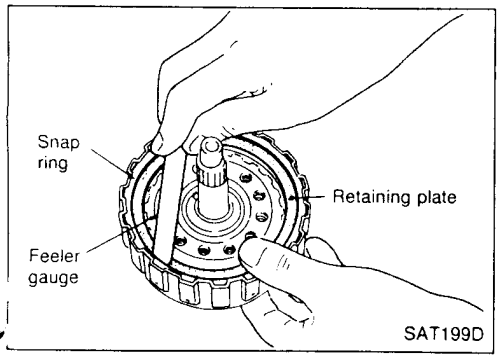
- **Do not align snap ring gap with spring retainer stopper.**



5. Install drive plates, driven plates, retaining plate and dish plate.

Take care with the order and direction of plates.

6. Install snap ring.



7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance:

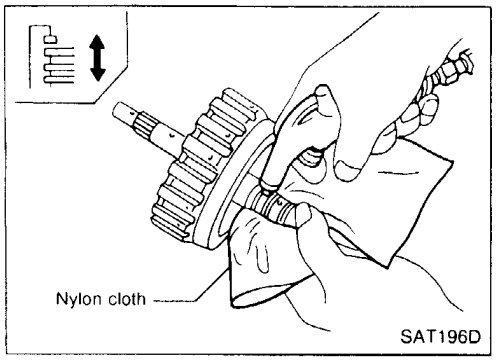
Standard: 1.4 - 1.8 mm (0.055 - 0.071 in)

Allowable limit: 2.6 mm (0.102 in)

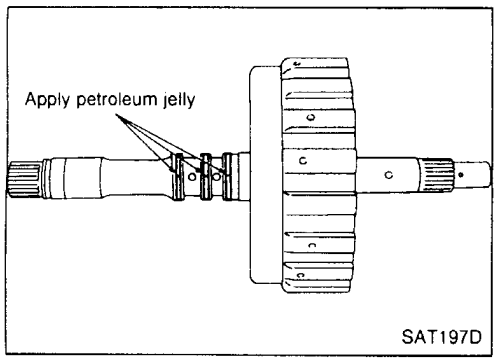
Retaining plate:

Refer to SDS, AT-208.

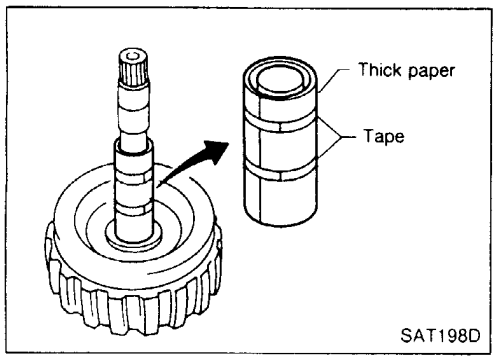
High Clutch (Cont'd)



8. Check operation of high clutch.
   Refer to "DISASSEMBLY" in "High Clutch", AT-118.

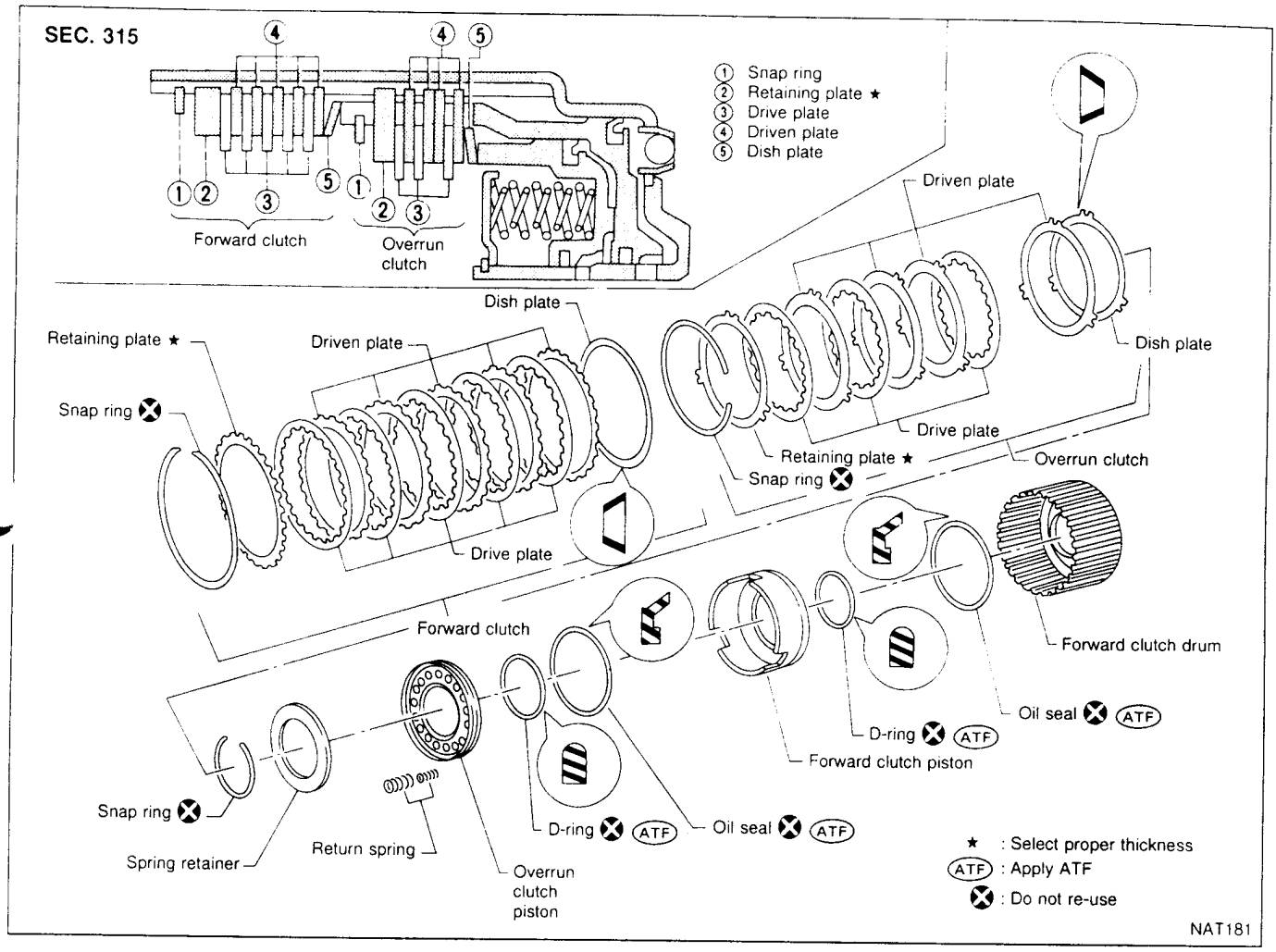


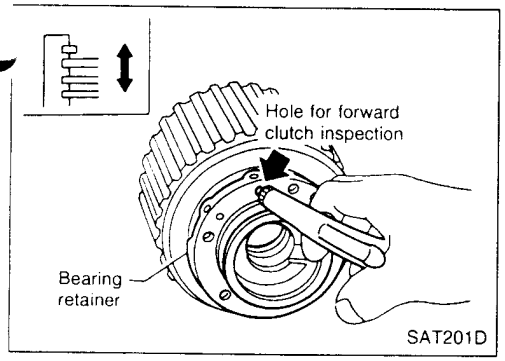
9. Install seal rings to input shaft.
- **Apply petroleum jelly to seal rings.**

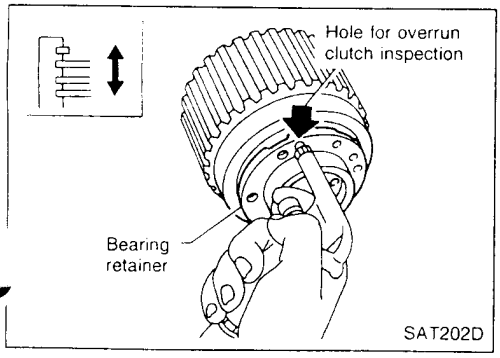


- **Roll paper around seal rings to prevent seal rings from spreading.**

Forward Clutch and Overrun Clutch





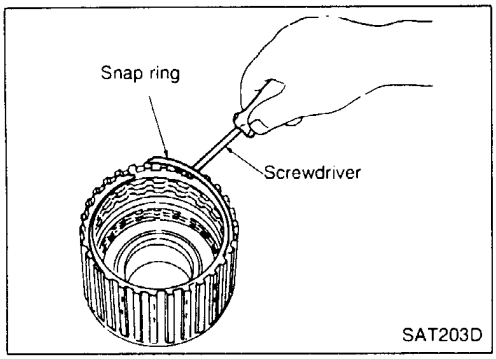


DISASSEMBLY

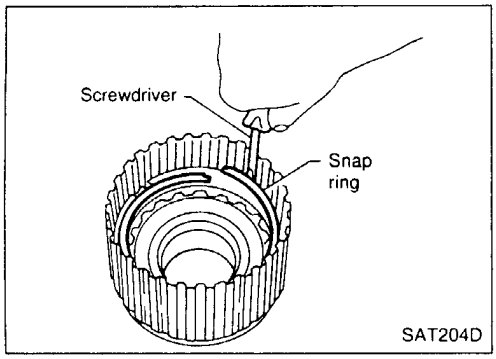
1. Check operation of forward clutch and overrun clutch.
a. Install bearing retainer on forward clutch drum.
b. Apply compressed air to oil hole of forward clutch drum.
c. Check to see that retaining plate moves to snap ring.

d. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

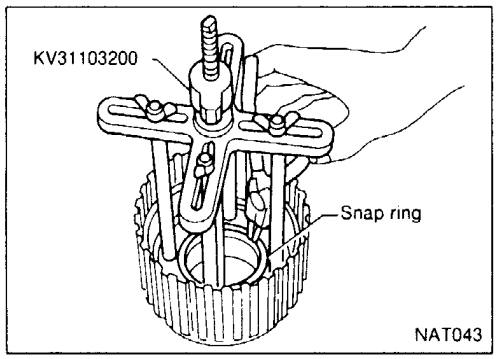
Forward Clutch and Overrun Clutch (Cont'd)



2. Remove snap ring for forward clutch.
3. Remove drive plates, driven plates, retaining plate and dish plate for forward clutch.

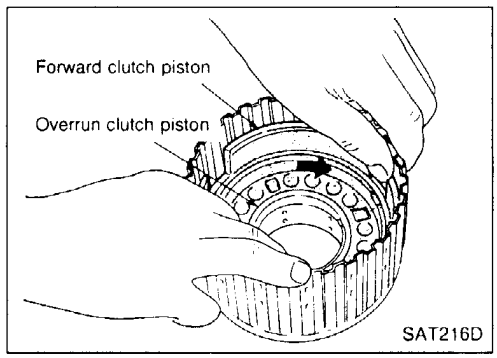


4. Remove snap ring for overrun clutch.
5. Remove drive plates, driven plates, retaining plate and dish plate for overrun clutch.

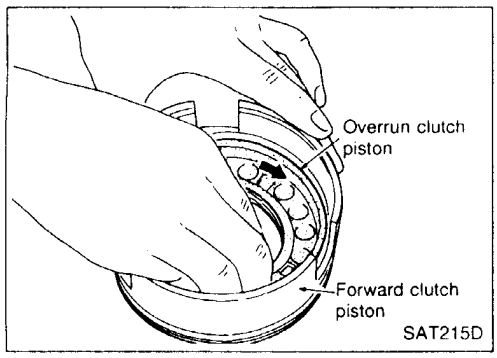


6. Set Tool on spring retainer and remove snap ring from forward clutch drum while compressing return springs.
- **Set Tool directly above return springs.**
- **Do not expand snap ring excessively.**

7. Remove spring retainer and return springs.
- **Do not remove return springs from spring retainer.**



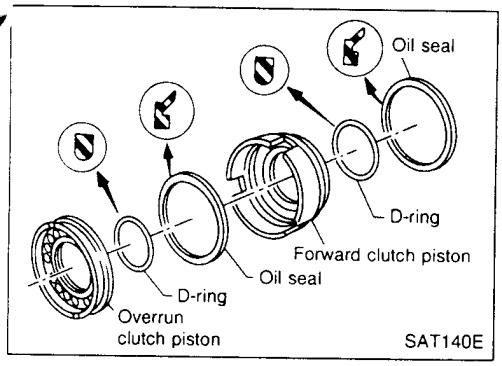
8. Remove forward clutch piston with overrun clutch piston from forward clutch drum by turning it.



9. Remove overrun clutch piston from forward clutch piston by turning it.

Forward Clutch and Overrun Clutch (Cont'd)

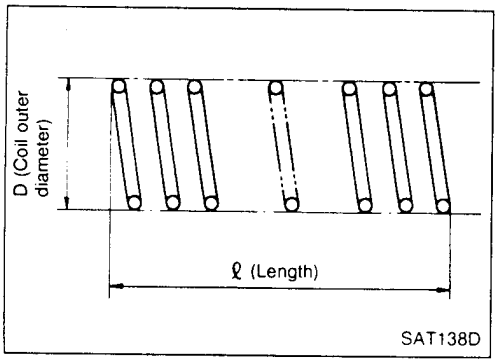
10. Remove D-rings and oil seals from forward clutch piston and overrun clutch piston.



INSPECTION

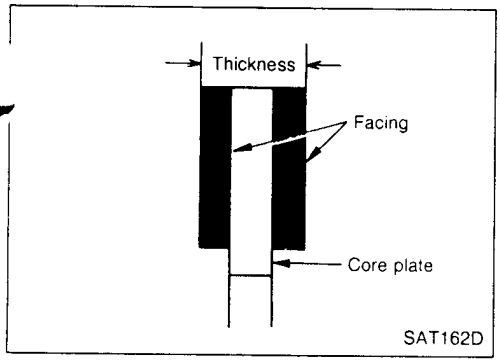
Snap rings and spring retainer

- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**



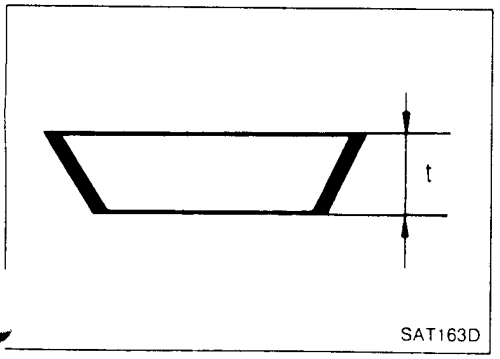
Forward clutch and overrun clutch return springs

- Check for deformation or damage.
- Measure free length and outer diameter.
  Inspection standard:
  Refer to SDS, AT-210.
- Replace if deformed or fatigued.



Forward clutch and overrun clutch drive plates

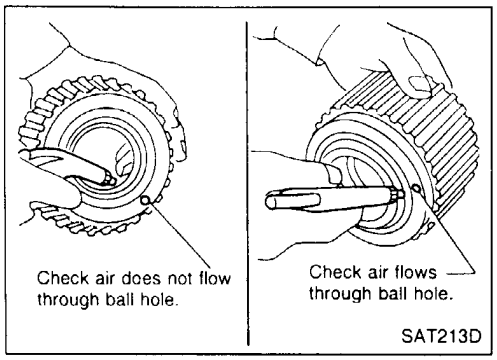
- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  Thickness of drive plate:
  Forward clutch
  Standard value: 1.8 mm (0.071 in)
  Wear limit: 1.6 mm (0.063 in)
  Overrun clutch
  Standard value: 1.6 mm (0.063 in)
  Wear limit: 1.4 mm (0.055 in)
- If not within wear limit, replace.



Forward clutch and overrun clutch dish plates

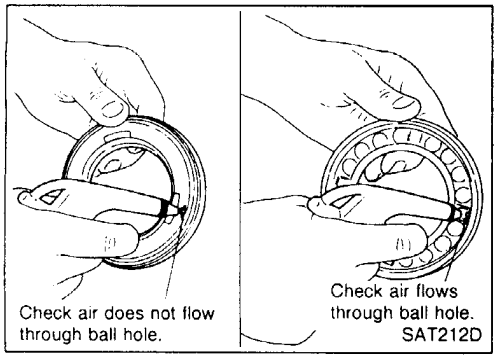
- Check for deformation or damage.
- Measure thickness of dish plate.
  Thickness of dish plate "t":
  Forward clutch: 2.5 mm (0.098 in)
  Overrun clutch: 2.15 mm (0.0846 in)
- If deformed or fatigued, replace.

Forward Clutch and Overrun Clutch (Cont'd)



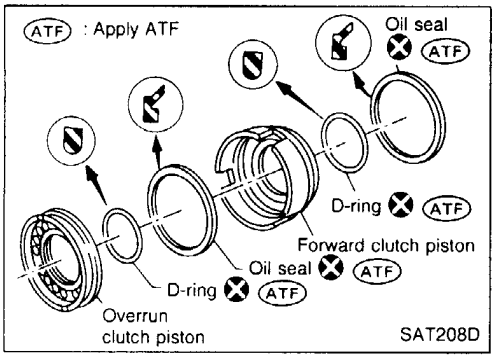
Forward clutch drum

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole from outside of forward clutch drum to make sure air leaks past ball.
- Apply compressed air to oil hole from inside of forward clutch drum to make sure there is no air leakage.



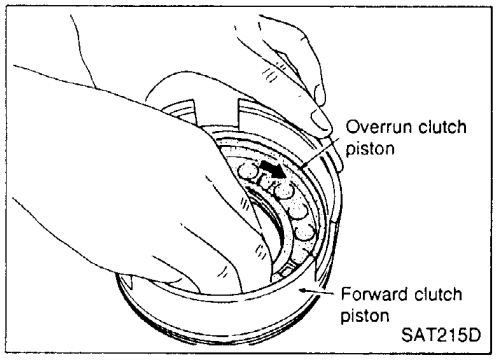
Overrun clutch piston

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring to make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure air leaks past ball.

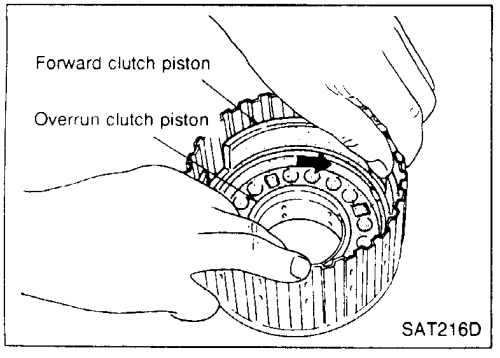


ASSEMBLY

1. Install D-rings and oil seals on forward clutch piston and overrun clutch piston.
- **Take care with direction of oil seal.**
- **Apply ATF to both parts.**

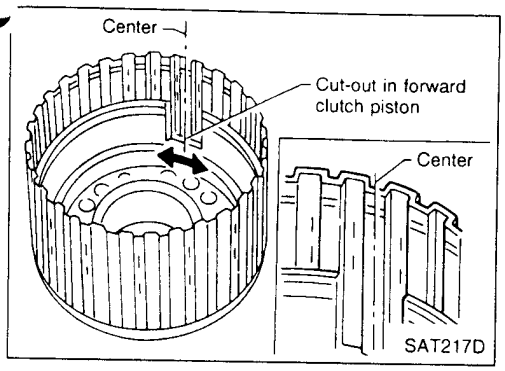


2. Install overrun clutch piston assembly on forward clutch piston while turning it slowly.
- **Apply ATF to inner surface of forward clutch piston.**

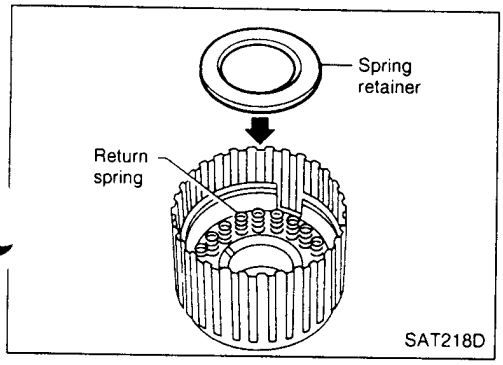


3. Install forward clutch piston assembly on forward clutch drum while turning it slowly.
- **Apply ATF to inner surface of drum.**

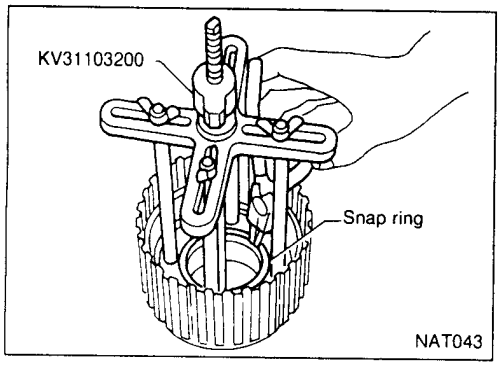
Forward Clutch and Overrun Clutch (Cont'd)



4. Align notch in forward clutch piston with groove in forward clutch drum.

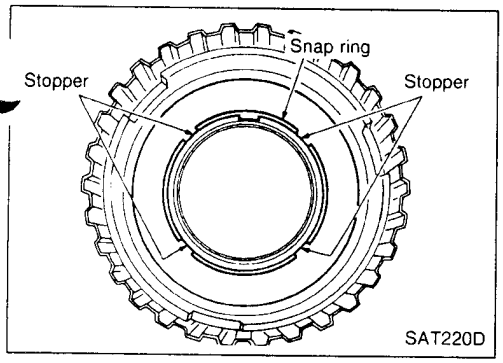


5. Install return spring on piston.
6. Install spring retainer on return springs.

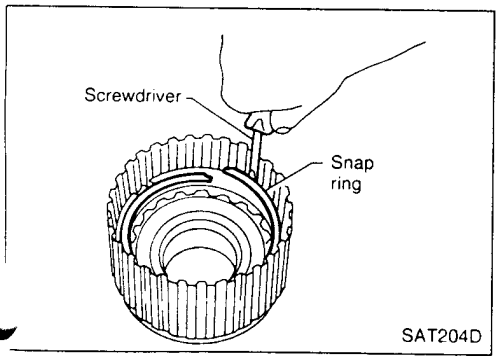


7. Set Tool on spring retainer and install snap ring while compressing return springs.

- **Set Tool directly above return springs.**

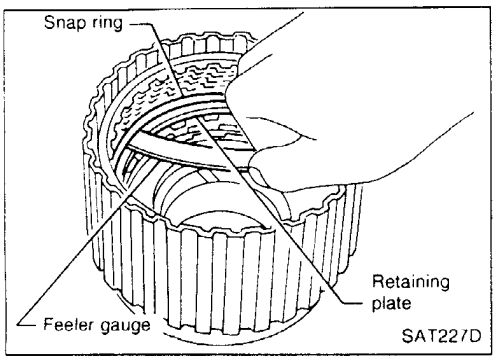


- **Do not align snap ring gap with spring retainer stopper.**

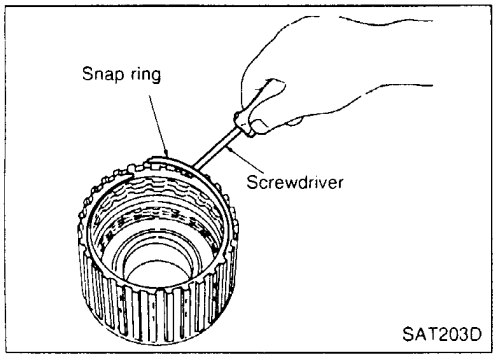


8. Install drive plates, driven plates, retaining plate and dish plate for overrun clutch.
9. Install snap ring for overrun clutch.

Forward Clutch and Overrun Clutch (Cont'd)

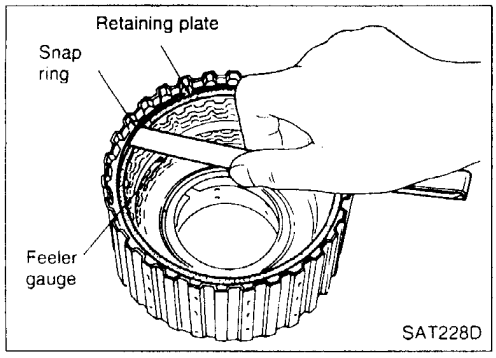


10. Measure clearance between overrun clutch retaining plate and snap ring.
    If not within allowable limit, select proper retaining plate.
    Specified clearance:
    Standard: 1.0 - 1.4 mm (0.039 - 0.055 in)
    Allowable limit: 2.0 mm (0.079 in)
    Overrun clutch retaining plate:
    Refer to SDS, AT-208.

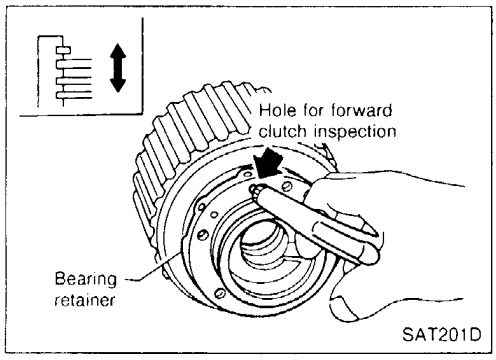


11. Install drive plates, driven plates, retaining plate and dish plate for forward clutch.
- **Take care with the order and direction of plates.**

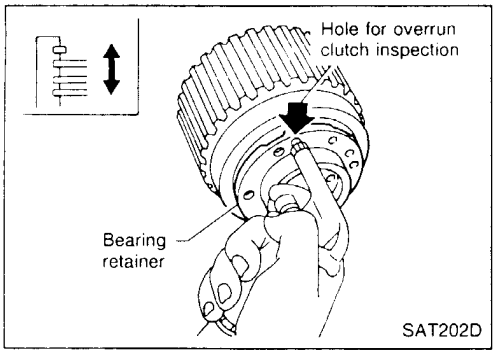
12. Install snap ring for forward clutch.



13. Measure clearance between forward clutch retaining plate and snap ring.
    If not within allowable limit, select proper retaining plate.
    Specified clearance:
    Standard: 0.45 - 0.85 mm (0.0177 - 0.0335 in)
    Allowable limit: 1.85 mm (0.0728 in)
    Forward clutch retaining plate:
    Refer to SDS, AT-208.

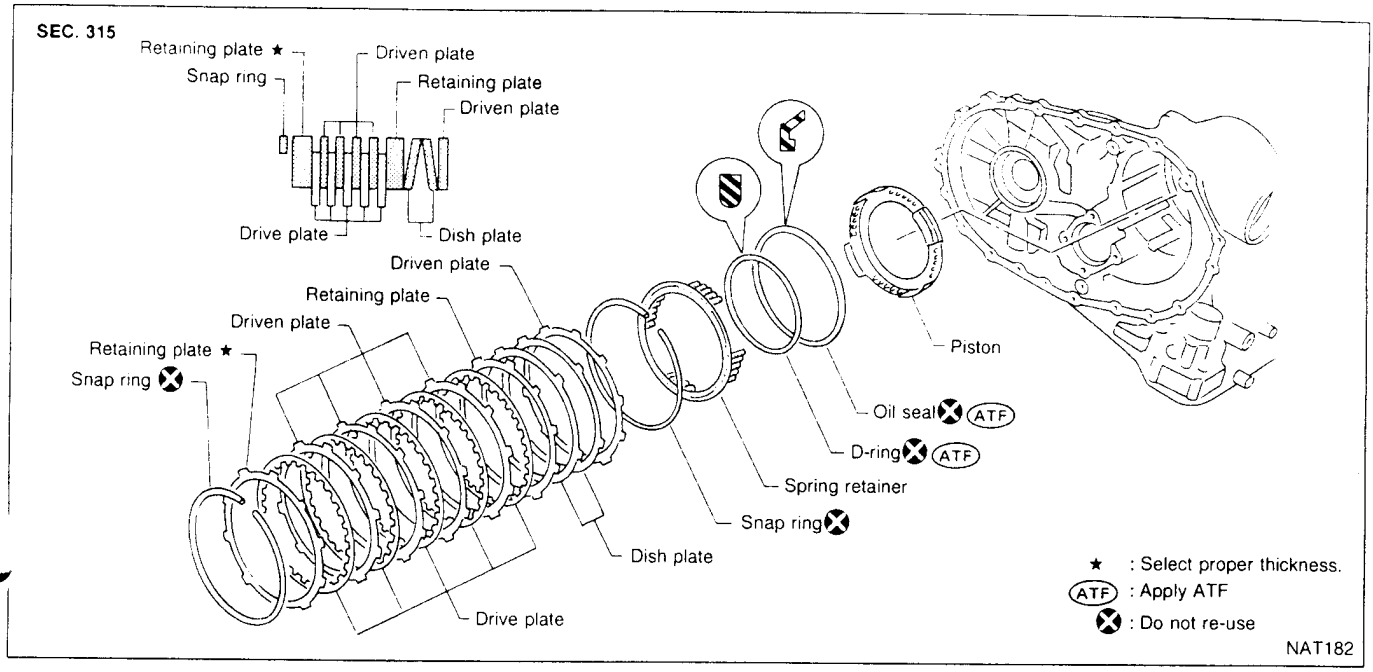


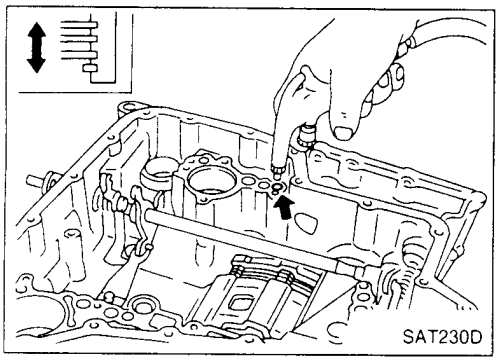
14. Check operation of forward clutch.
    Refer to "DISASSEMBLY" in "Forward Clutch and Overrun Clutch".



15. Check operation of overrun clutch.
    Refer to "DISASSEMBLY" in "Forward Clutch and Overrun Clutch".

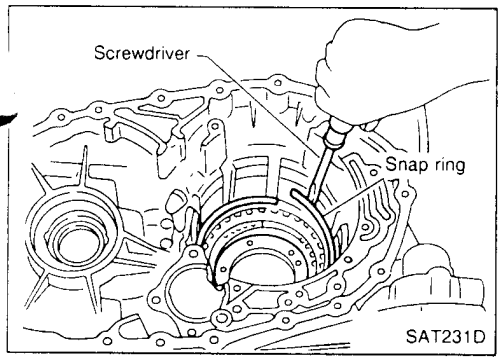
Low & Reverse Brake



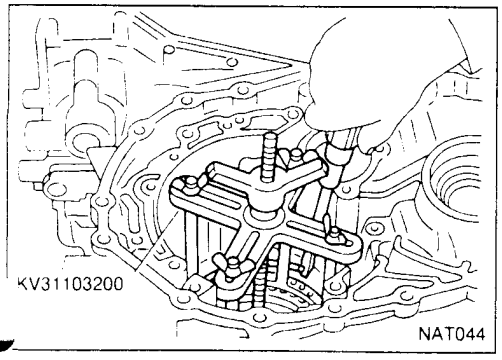


DISASSEMBLY

1. Check operation of low & reverse brake.
a. Apply compressed air to oil hole of transmission case.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.



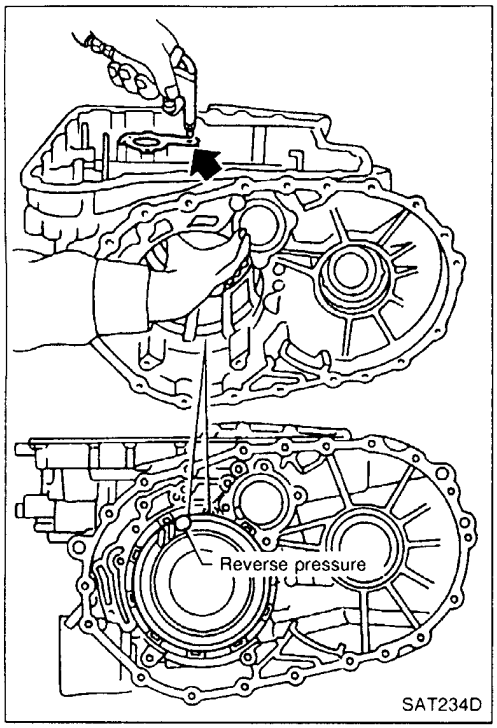
2. Stand transmission case.
3. Remove snap ring.
4. Remove drive plates, driven plates, retaining plate from transmission case.



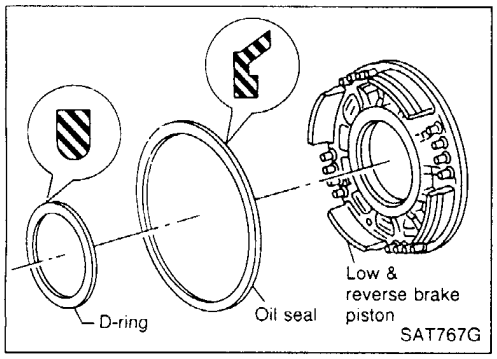
5. Set Tool on spring retainer and remove snap ring while compressing return springs.
- **Set Tool directly above return springs.**
- **Do not expand snap ring excessively.**

6. Remove spring retainer and return springs.
- **Do not remove return springs from spring retainer.**

Low & Reverse Brake (Cont'd)



7. Apply compressed air to oil hole of transmission case while holding piston.
8. Remove piston from transmission case by turning it.

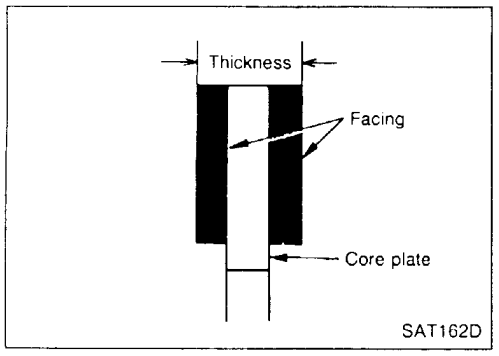


9. Remove D-ring and oil seal from piston.

INSPECTION

Low & reverse clutch snap ring, spring retainer and return springs

- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**

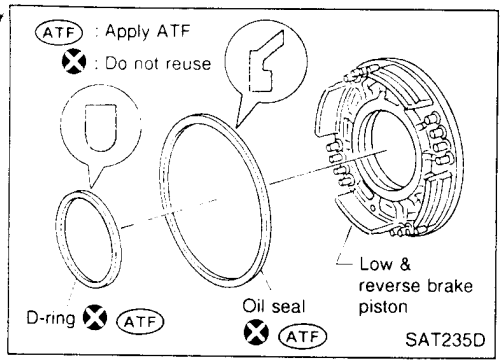


Low & reverse brake drive plate

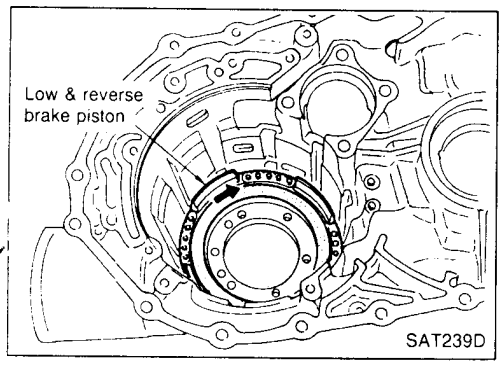
- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  Thickness of drive plate:
  Standard value: 2.0 mm (0.079 in)
  Wear limit: 1.8 mm (0.071 in)
- If not within wear limit, replace.

Low & Reverse Brake (Cont'd)

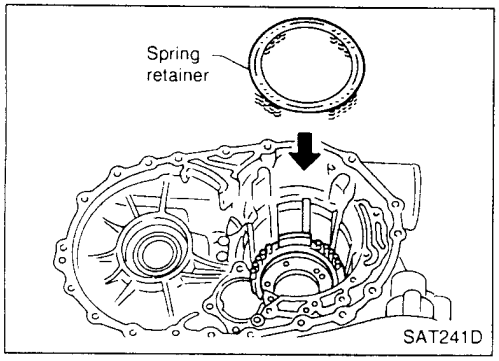
ASSEMBLY



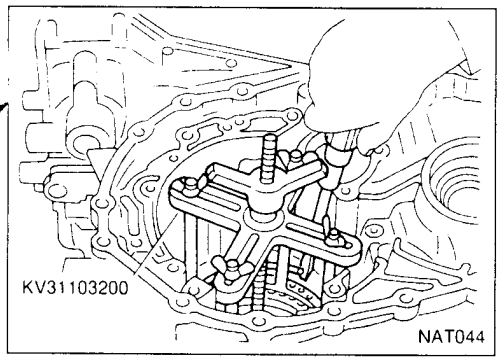
1. Install D-ring and oil seal on piston.
- **Take care with the direction of the oil seal.**
- **Apply ATF to both parts.**



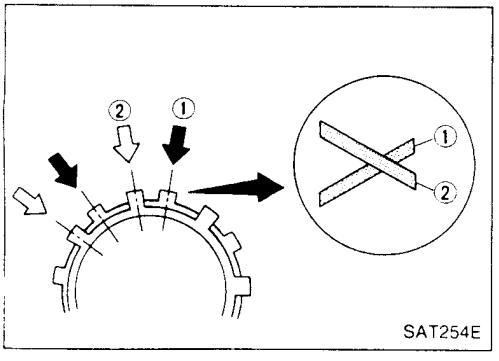
2. Stand transmission case.
3. Install piston assembly on transmission case while turning it slowly.
- **Apply ATF to inner surface of transmission case.**



4. Install return springs and spring retainer on piston.

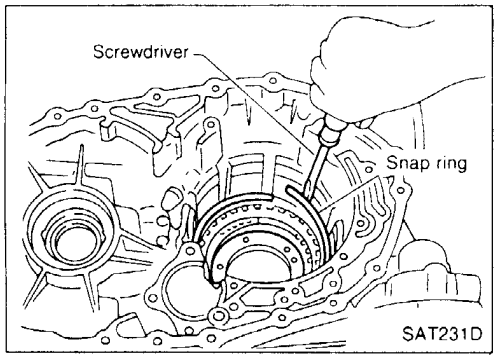


5. Install snap ring while compressing return springs.
- **Set Tool directly above return springs.**

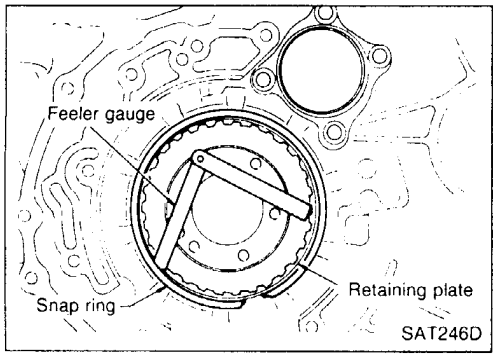


6. Install drive plates, driven plates, retaining plates and dished plates.
- **Do not align the projections on the two dished plates.**
- **Make sure to put the plates in the correct order and direction.**

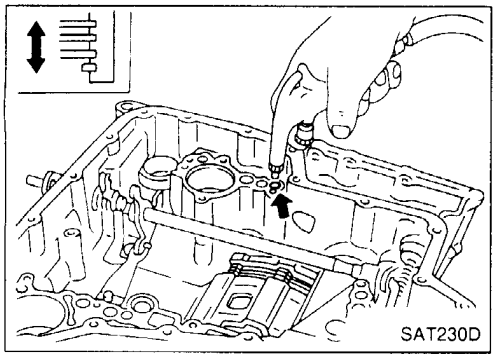
Low & Reverse Brake (Cont'd)



7. Install snap ring.

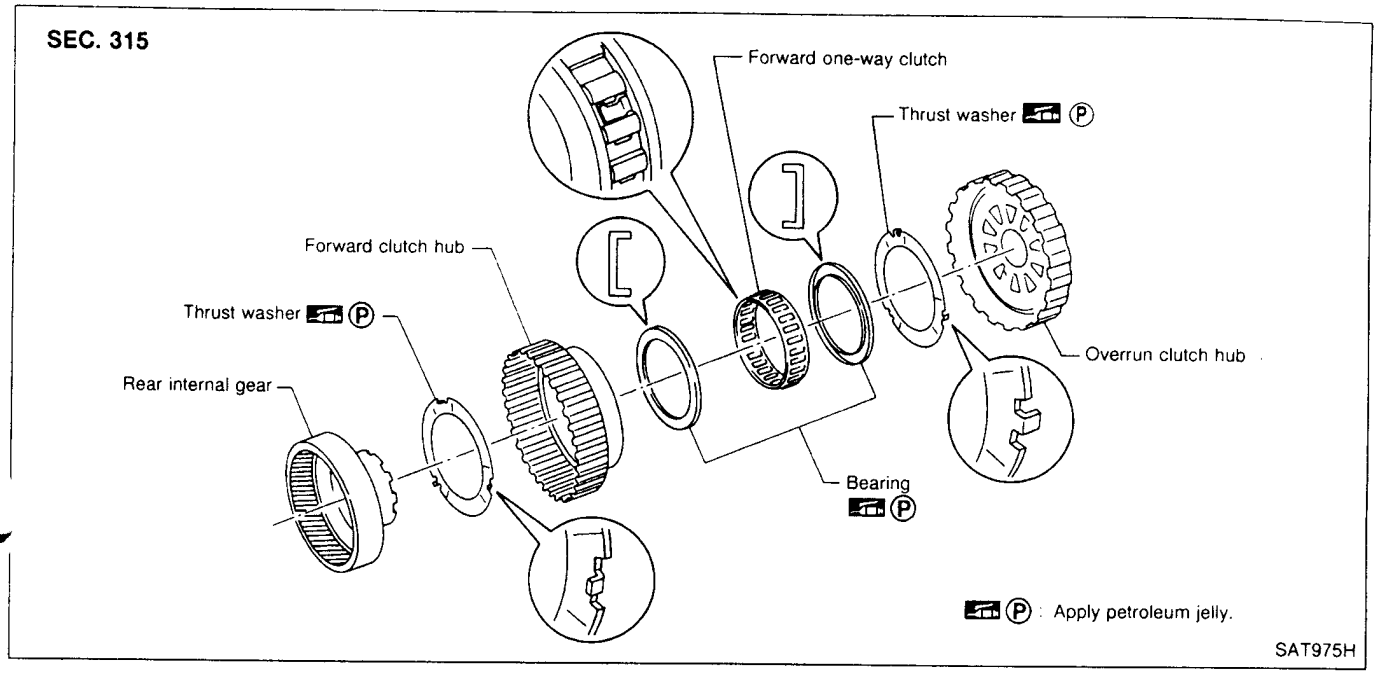


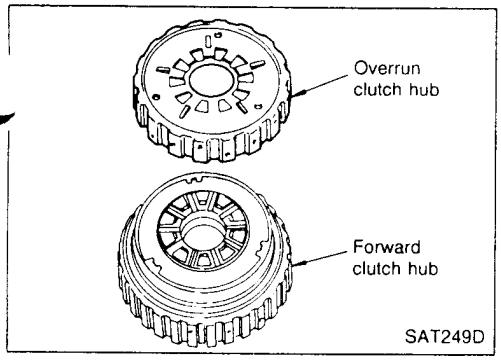
8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate (front side).
   Specified clearance:
   Standard: 1.4 - 1.8 mm (0.055 - 0.071 in)
   Allowable limit:
   2.8 mm (0.110 in)
   Retaining plate:
   Refer to SDS, AT-210.



9. Check operation of low & reverse brake.

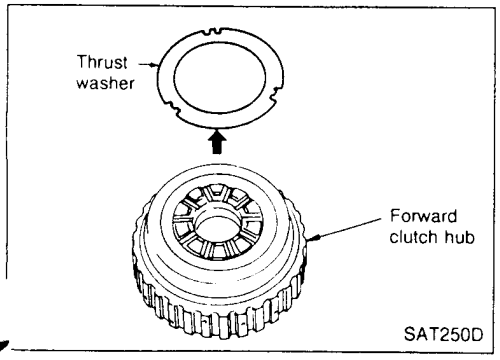
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub





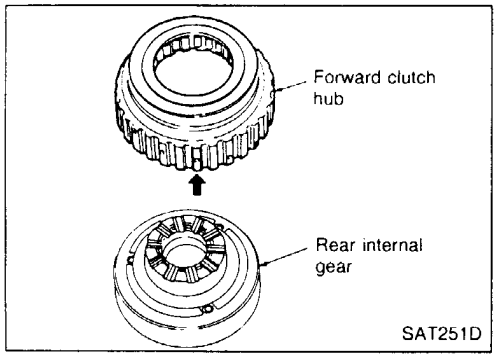
DISASSEMBLY

1. Remove snap ring from overrun clutch hub.
2. Remove overrun clutch hub from forward clutch hub.

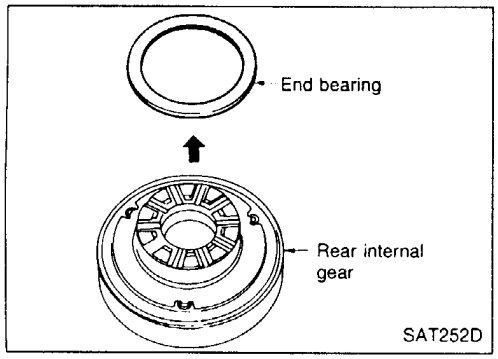


3. Remove thrust washer from forward clutch hub.

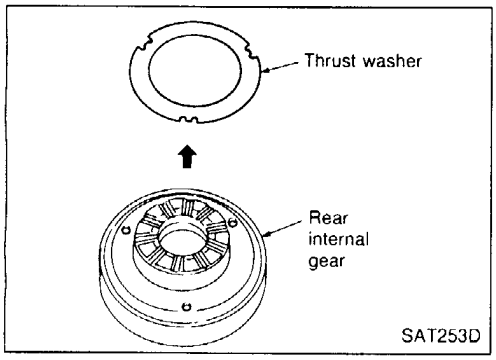
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



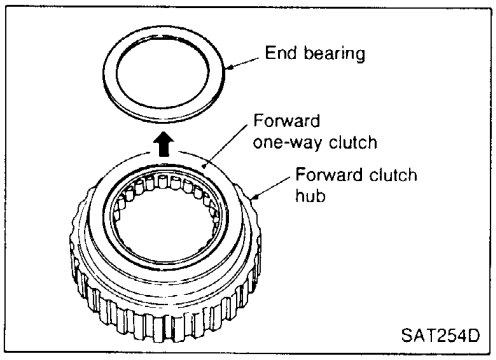
4. Remove forward clutch hub from rear internal gear.



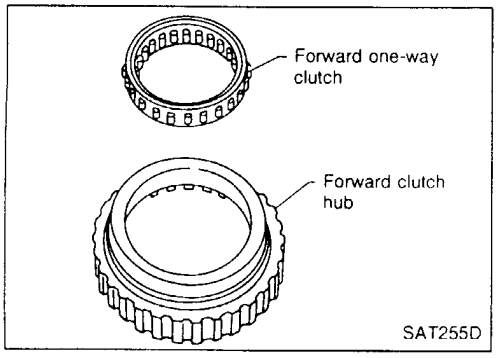
5. Remove end bearing from rear internal gear.



6. Remove thrust washer from rear internal gear.



7. Remove end bearing from forward one-way clutch.



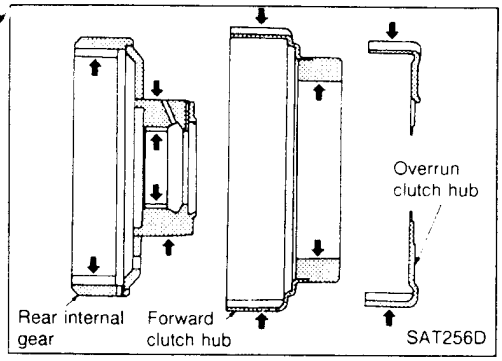
8. Remove one-way clutch from forward clutch hub.

Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)

INSPECTION

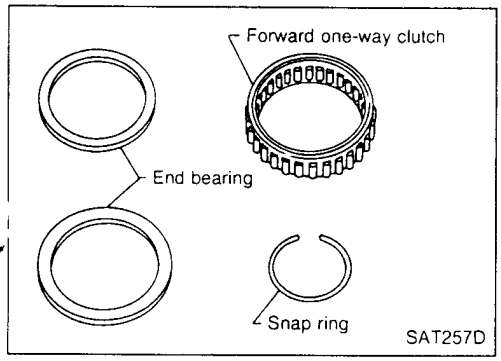
Rear internal gear, forward clutch hub and overrun clutch hub

- Check rubbing surface for wear or damage.



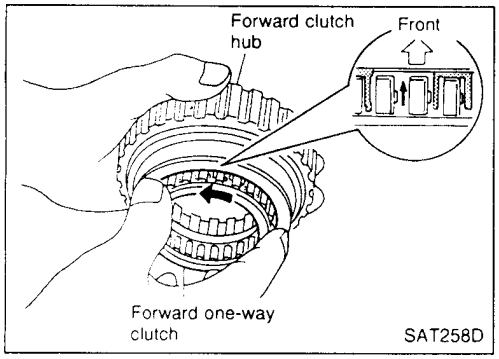
Snap ring, end bearings and forward one-way clutch

- Check snap ring and end bearings for deformation and damage.
- Check forward one-way clutch for wear and damage.

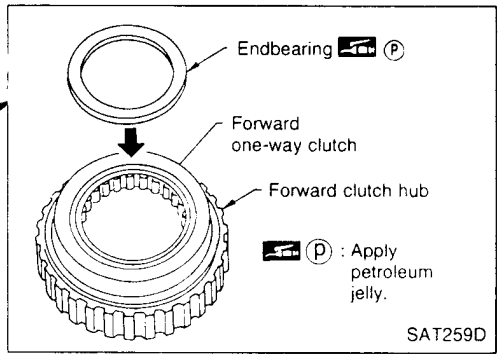


ASSEMBLY

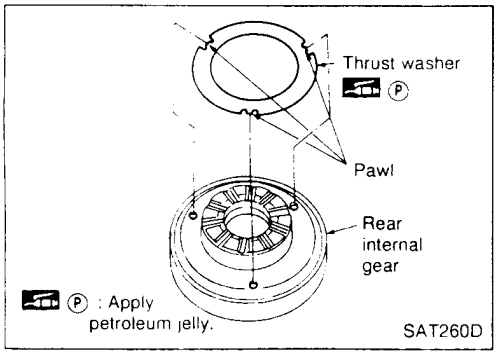
1. Install forward one-way clutch on forward clutch.
- **Take care with the direction of the forward one-way clutch.**



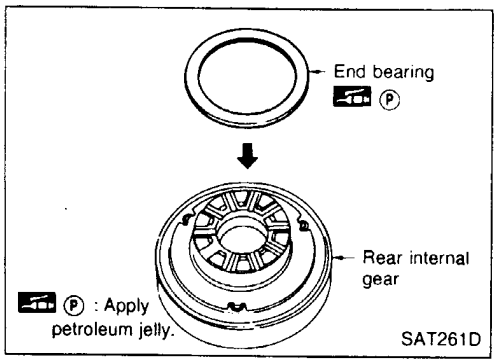
2. Install end bearing on forward one-way clutch.
- **Apply petroleum jelly to end bearing.**



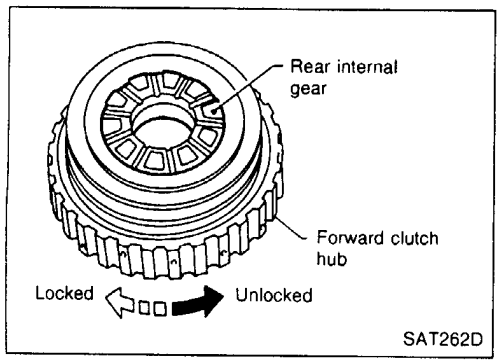
3. Install thrust washer on rear internal gear.
- **Apply petroleum jelly to thrust washer.**
- **Align pawls of thrust washer with holes of rear internal gear.**



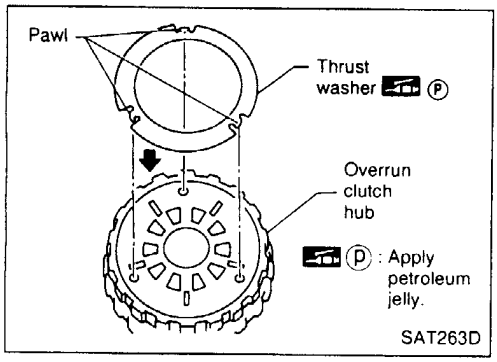
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



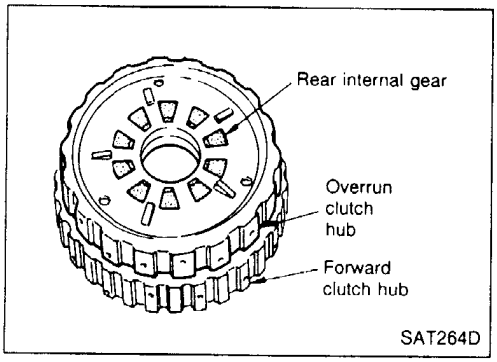
4. Install end bearing on rear internal gear.
- **Apply petroleum jelly to end bearing.**



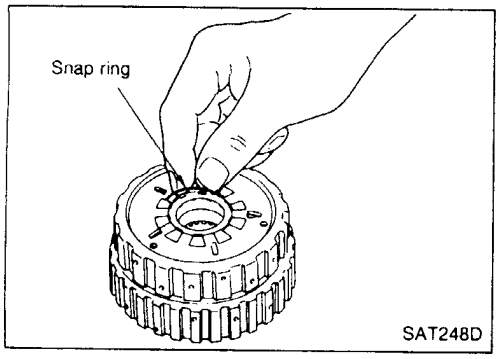
5. Install forward clutch hub on rear internal gear.
- **Check operation of forward one-way clutch.**



6. Install thrust washer on overrun clutch hub.
- **Apply petroleum jelly to thrust washer.**
- **Align pawls of thrust washer with holes of overrun clutch hub.**

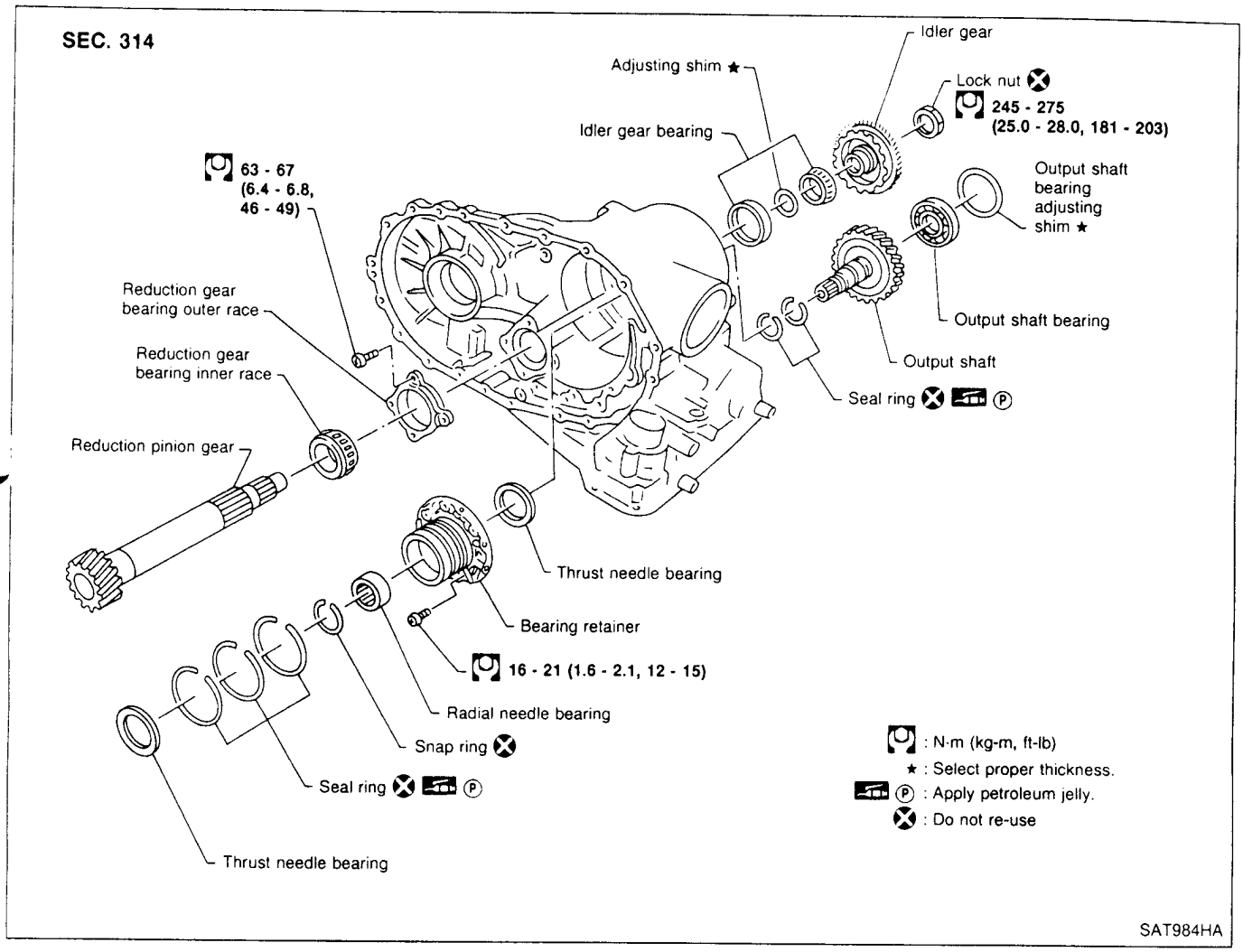


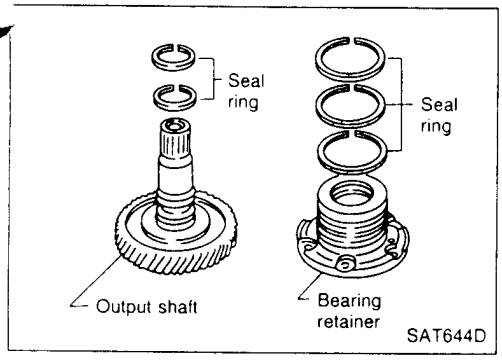
7. Install overrun clutch hub on rear internal gear.
- **Align projections of rear internal gear with holes of overrun clutch hub.**



8. Install snap ring to groove of rear internal gear.

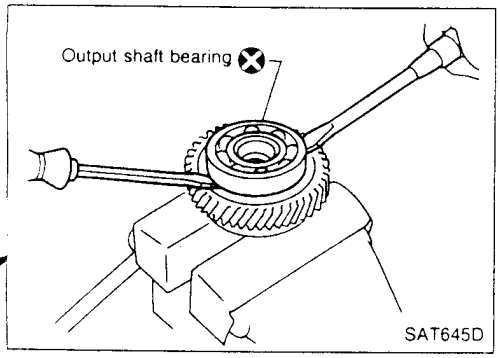
Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer





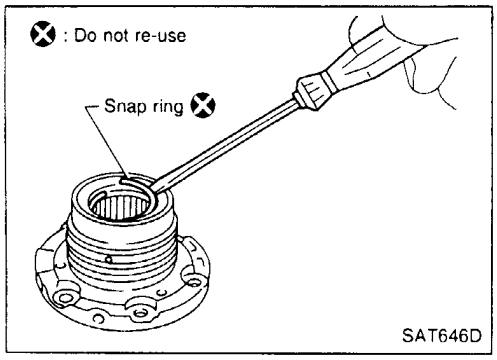
DISASSEMBLY

1. Remove seal rings from output shaft and bearing retainer.

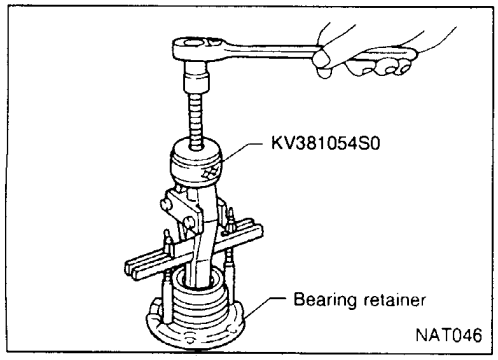


2. Remove output shaft bearing with screwdrivers.
- **Always replace bearing with a new one when removed.**
- **Do not damage output shaft.**

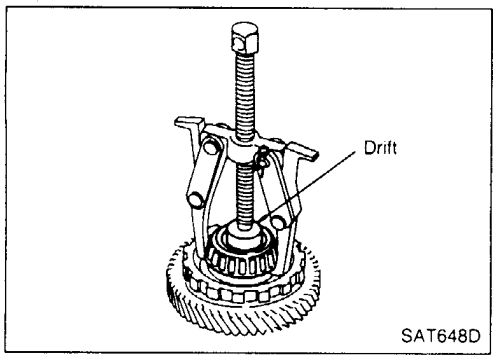
Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)



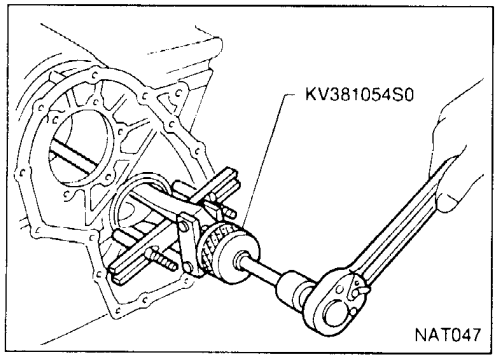
3. Remove snap ring from bearing retainer.



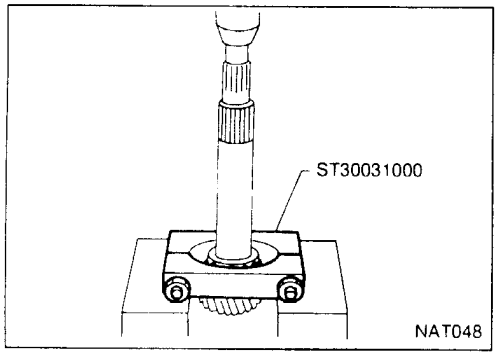
4. Remove needle bearing from bearing retainer.



5. Remove idler gear bearing inner race from idler gear.

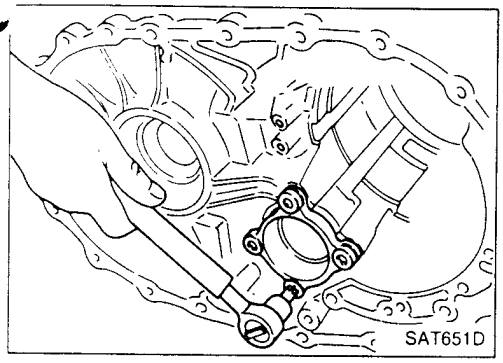


6. Remove idler gear bearing outer race from transmission case.



7. Press out reduction gear bearing inner race from reduction gear.

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)

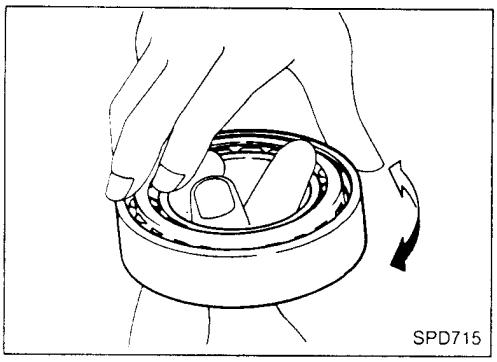


8. Remove reduction gear bearing outer race from transmission case.

INSPECTION

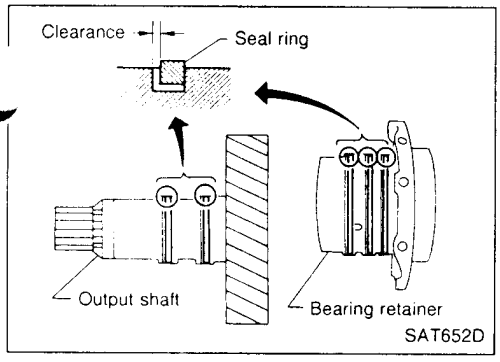
Output shaft, idler gear and reduction gear

- Check shafts for cracks, wear or bending.
- Check gears for wear, chips and cracks.



Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**

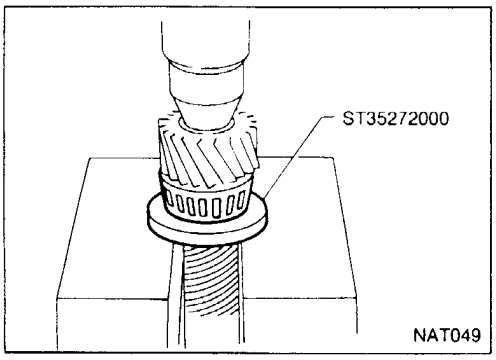


Seal ring clearance

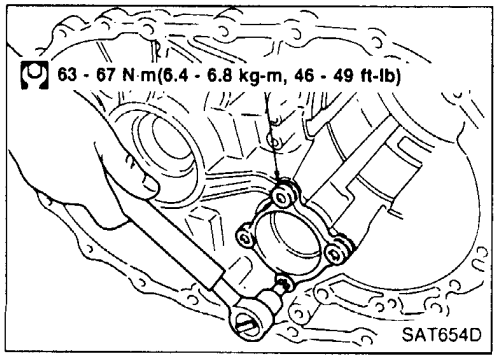
- Install new seal rings to output shaft.
- Measure clearance between seal ring and ring groove of output shaft.
  Standard clearance:
  0.10 - 0.25 mm (0.0039 - 0.0098 in)
  Allowable limit:
  0.25 mm (0.0098 in)
- If not within allowable limit, replace output shaft.
- Install new seal rings to bearing retainer.
- Measure clearance between seal ring and ring groove of bearing retainer.
  Standard clearance:
  0.10 - 0.25 mm (0.0039 - 0.0098 in)
  Allowable limit:
  0.25 mm (0.0098 in)
- If not within allowable limit, replace bearing retainer.

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)

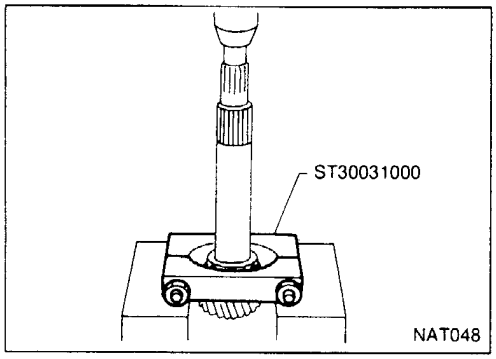
ASSEMBLY



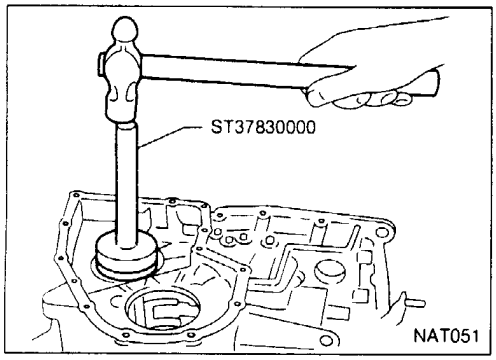
1. Press reduction gear bearing inner race on reduction gear.



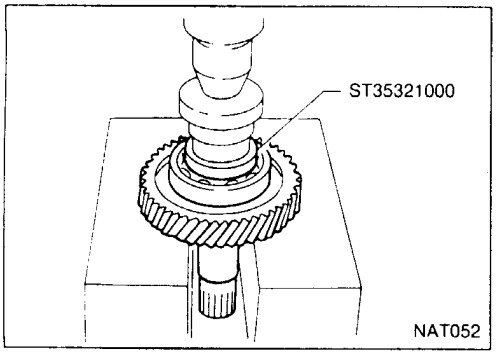
2. Install reduction gear bearing outer race on transmission case.



3. Press idler gear bearing inner race on idler gear.

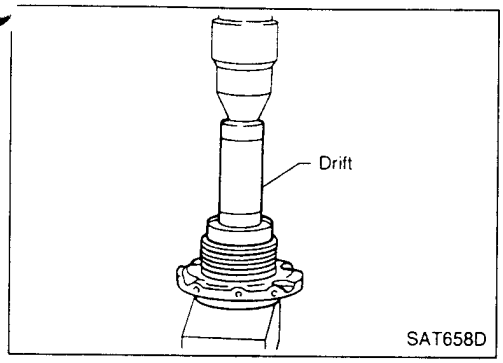


4. Install idler gear bearing outer race on transmission case.

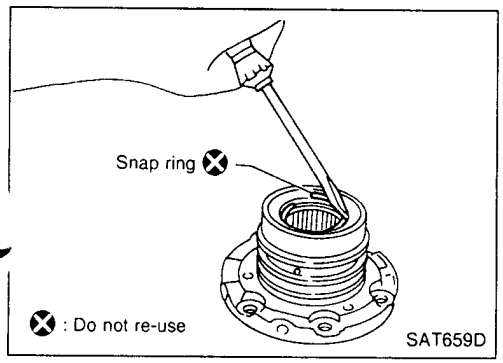


5. Press output shaft bearing on output shaft.

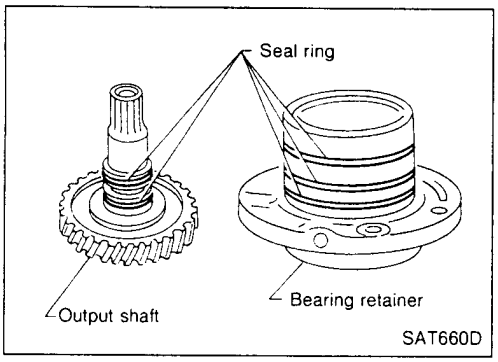
Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)



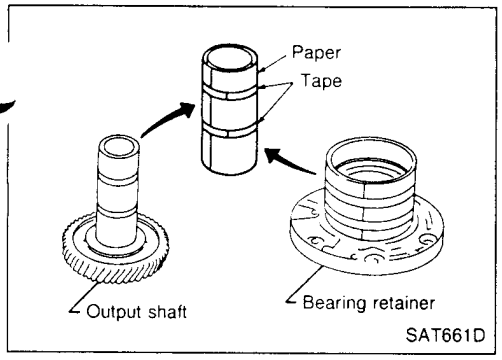
6. Press needle bearing on bearing retainer.



7. Install snap ring to bearing retainer.

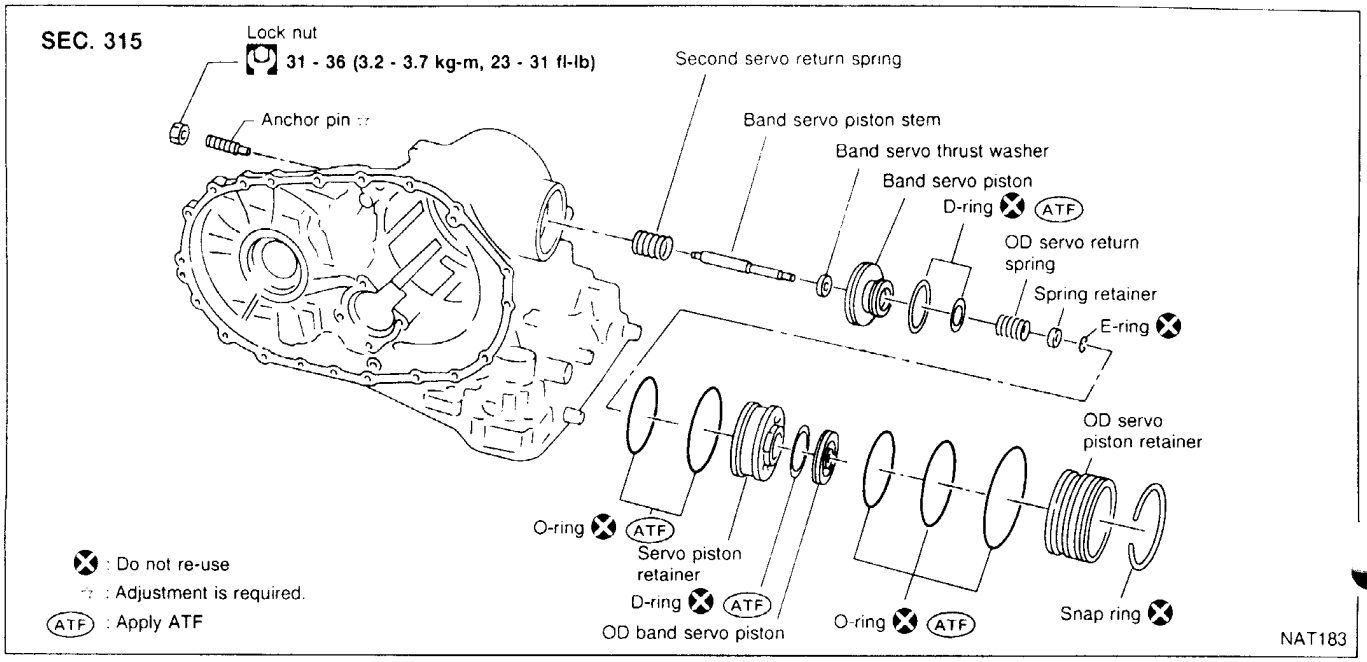


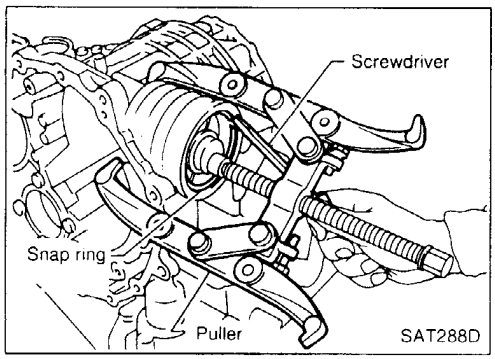
8. Install new seal rings to output shaft and bearing retainer carefully after packing ring grooves with petroleum jelly.



- **Roll paper around seal rings to prevent seal rings from spreading.**

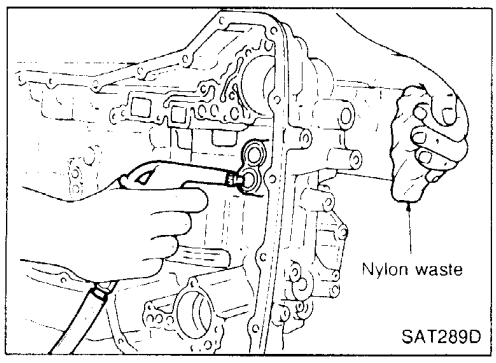
Band Servo Piston Assembly



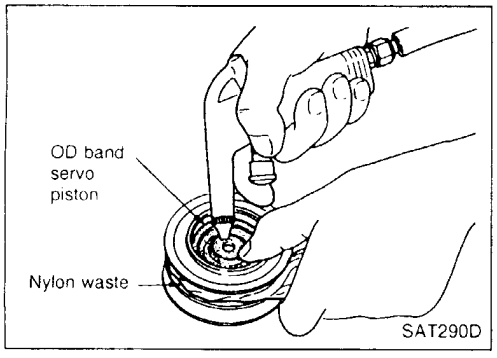


DISASSEMBLY

1. Remove band servo piston snap ring.



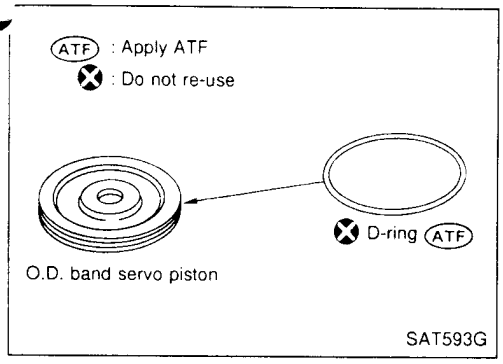
2. Apply compressed air to oil hole in transmission case to remove OD servo piston retainer and band servo piston assembly.
- **Hold band servo piston assembly with a rag.**



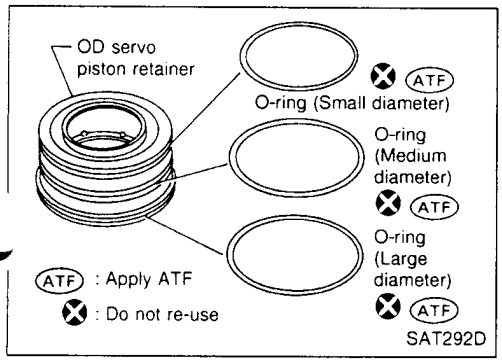
3. Apply compressed air to oil hole in OD servo piston retainer to remove OD band servo piston from retainer.
- **Hold OD band servo piston while applying compressed air.**

Band Servo Piston Assembly (Cont'd)

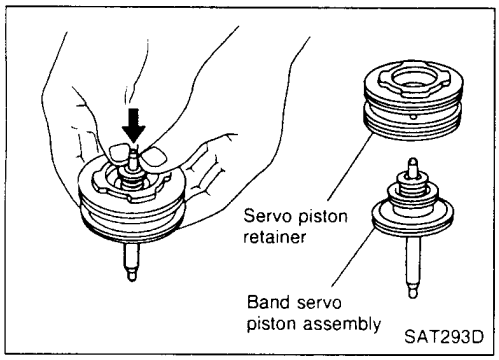
4. Remove D-ring from OD band servo piston.



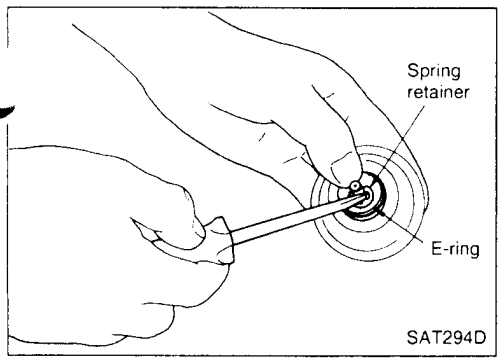
5. Remove O-rings from OD servo piston retainer.



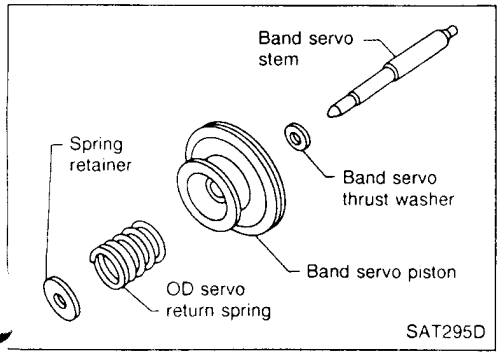
6. Remove band servo piston assembly from servo piston retainer by pushing it forward.



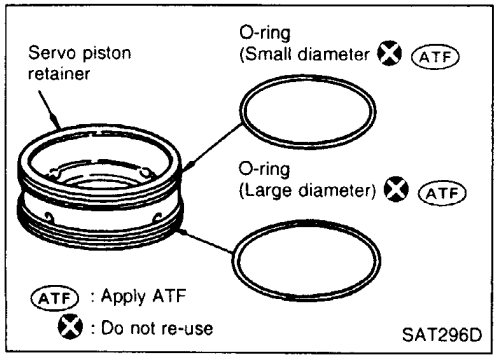
7. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.



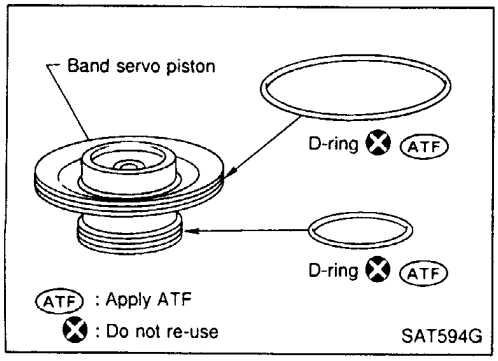
8. Remove OD servo return spring, band servo thrust washer and band servo piston stem from band servo piston.



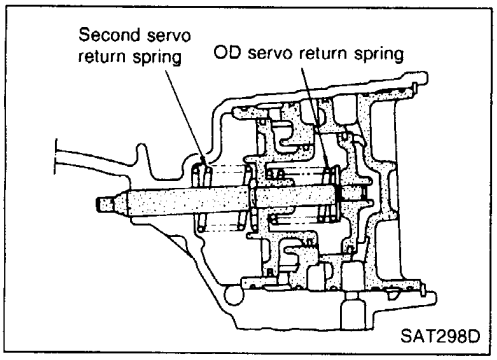
Band Servo Piston Assembly (Cont'd)



9. Remove O-rings from servo piston retainer.



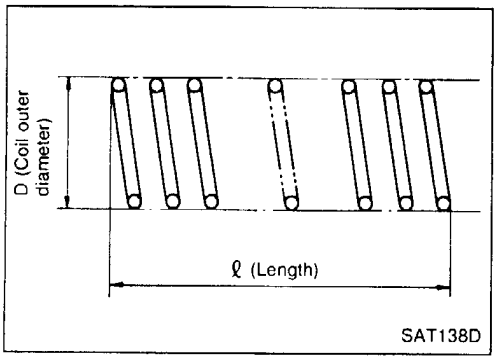
10. Remove D-rings from band servo piston.



INSPECTION

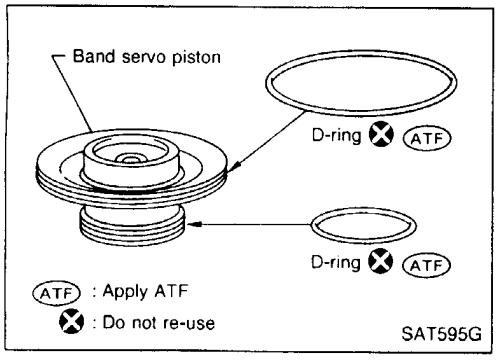
Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



Return springs

- Check for deformation or damage.
- Measure free length and outer diameter.
  Inspection standard:
  Refer to SDS, AT-214

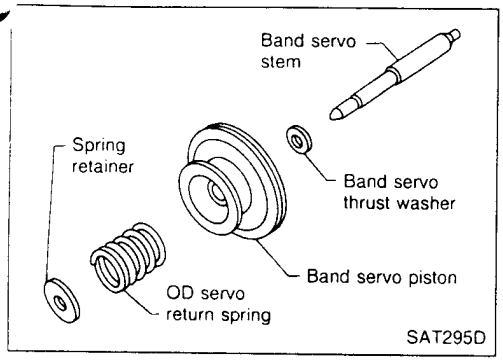


ASSEMBLY

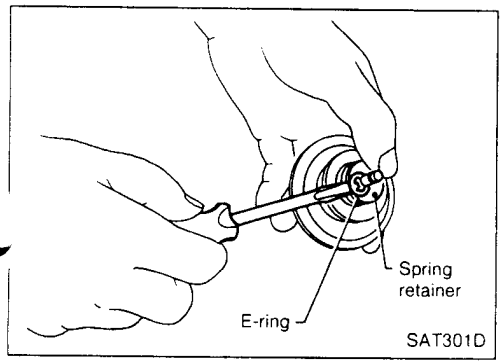
1. Install D-rings to servo piston retainer.

- **Apply ATF to O-rings.**
- **Pay attention to position of each O-ring.**

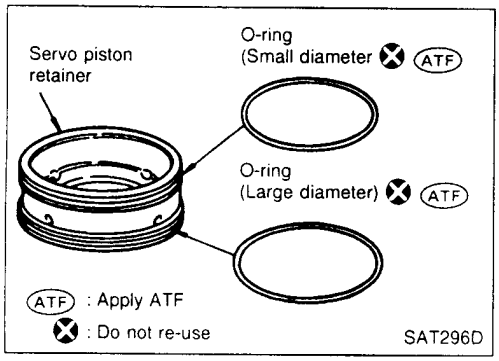
Band Servo Piston Assembly (Cont'd)



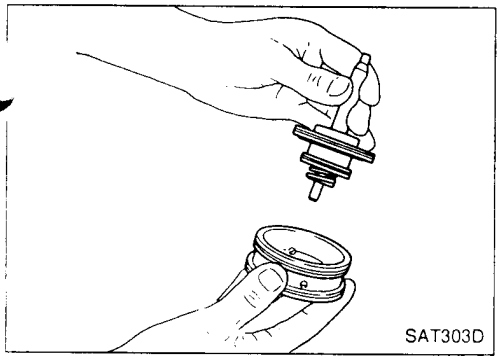
2. Install band servo piston stem, band servo thrust washer, OD servo return spring and spring retainer to band servo piston.



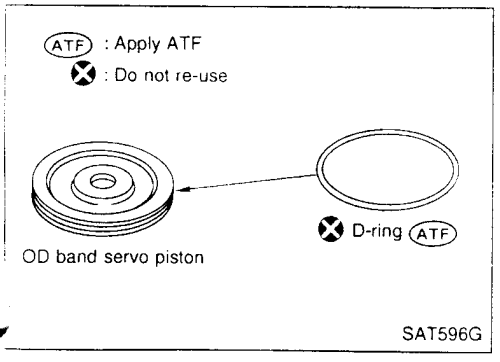
3. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



4. Install O-rings to servo piston retainer.
- **Apply ATF to O-rings.**
- **Pay attention to the positions of the O-rings.**

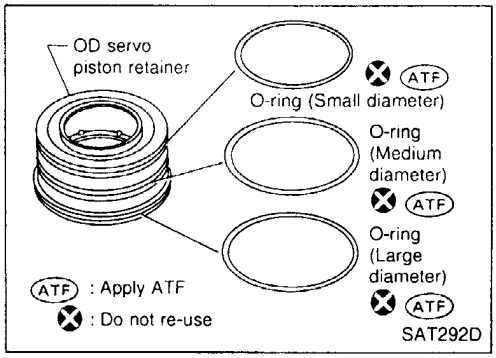


5. Install band servo piston assembly to servo piston retainer by pushing it inward.

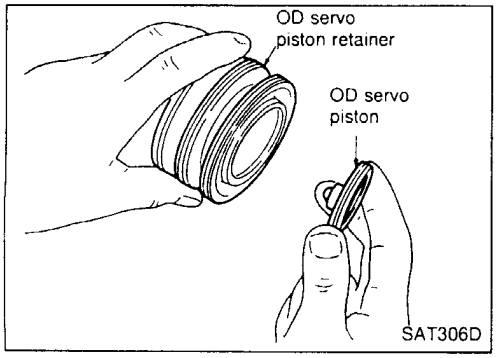


6. Install D-ring to OD band servo piston.
- **Apply ATF to D-ring.**

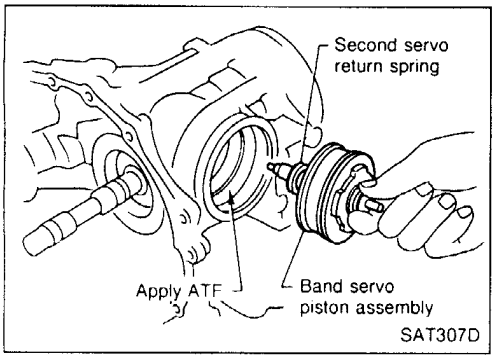
Band Servo Piston Assembly (Cont'd)



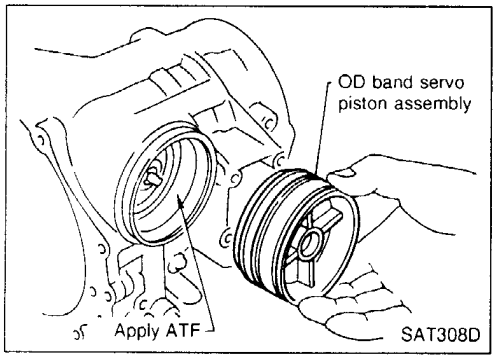
7. Install O-rings to OD servo piston retainer.
- **Apply ATF to O-rings.**
- **Pay attention to the positions of the O-rings.**



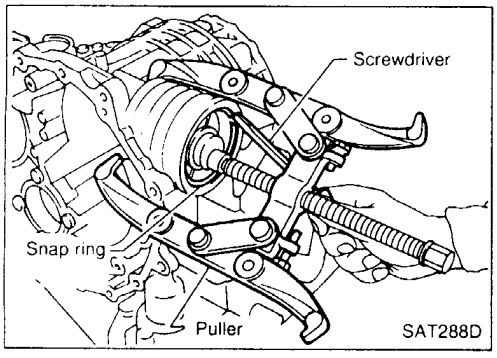
8. Install OD band servo piston to OD servo piston retainer.



9. Install band servo piston assembly and 2nd servo return spring to transmission case.
- **Apply ATF to O-ring of band servo piston and transmission case.**

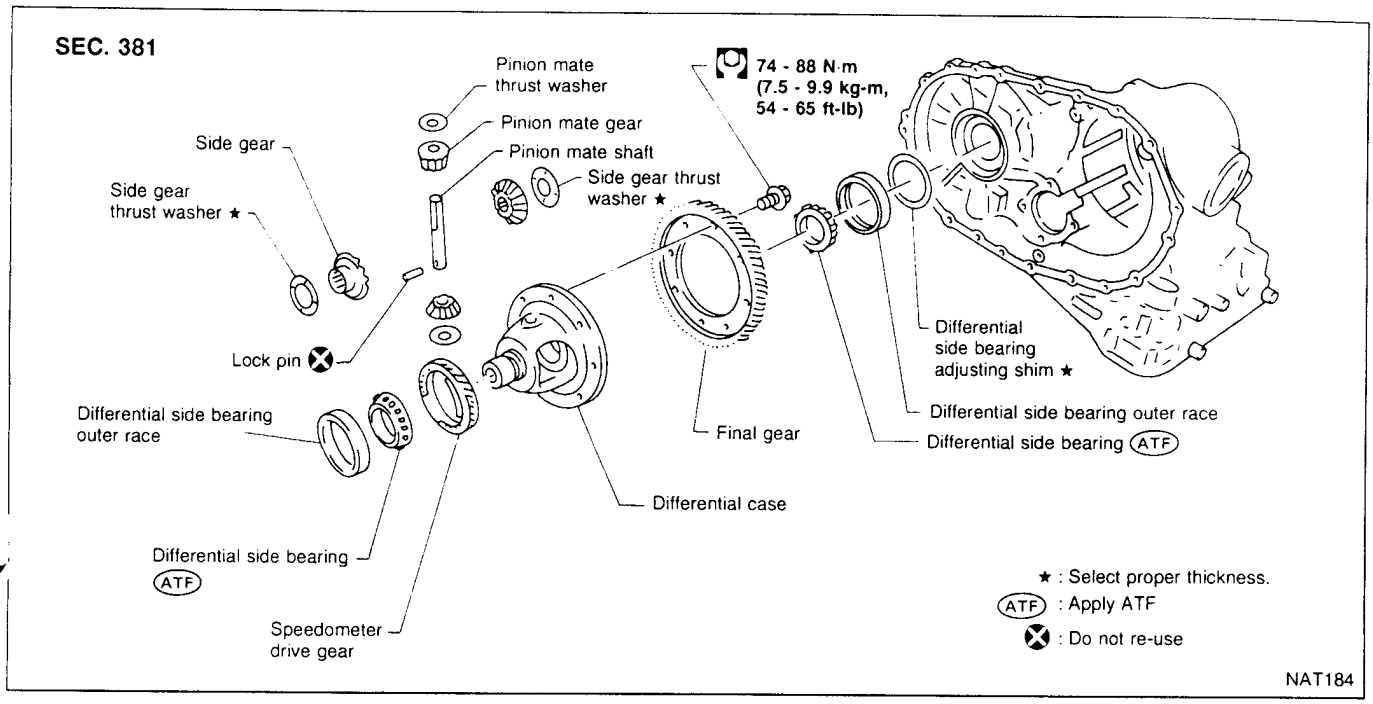


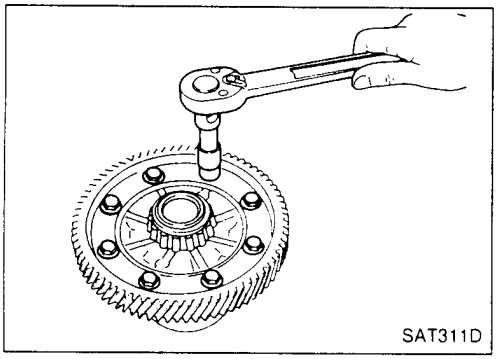
10. Install OD band servo piston assembly to transmission case.
- **Apply ATF to O-ring of band servo piston and transmission case.**



11. Install band servo piston snap ring to transmission case.

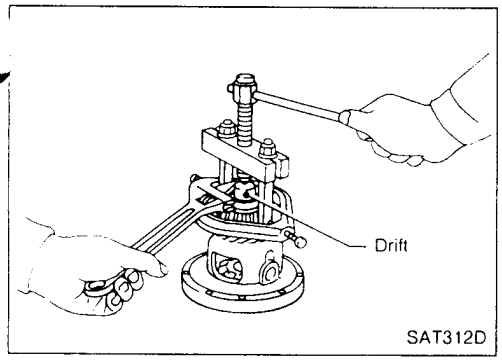
Final Drive



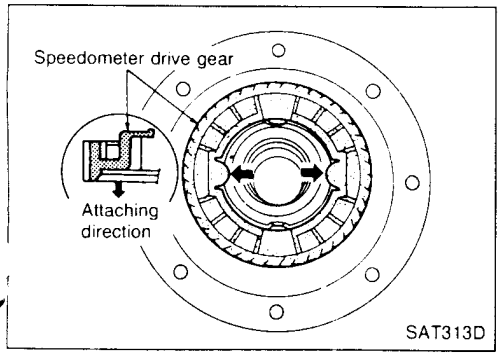


DISASSEMBLY

1. Remove final gear.

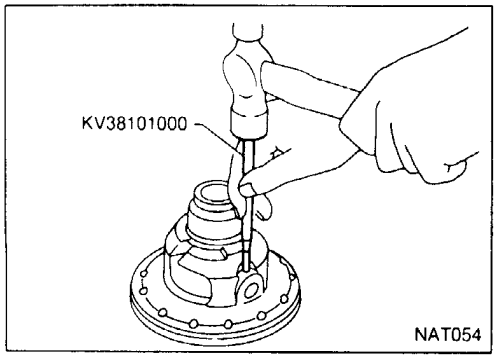


2. Press out differential side bearings.
- **Be careful not to mix up the right and left bearings.**

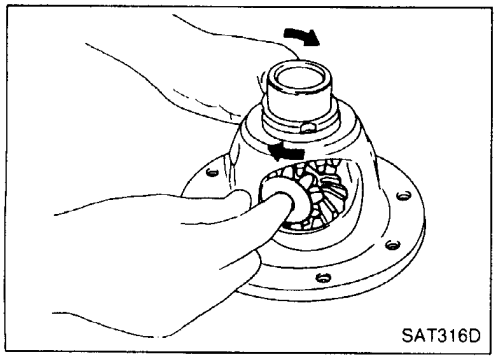


3. Remove speedometer drive gear.

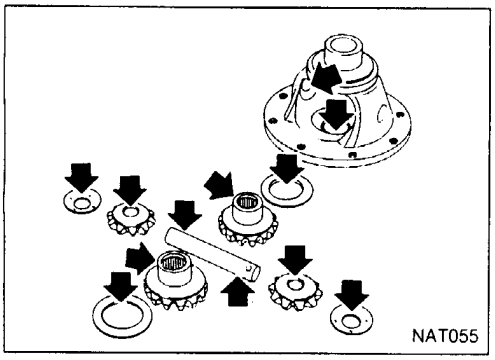
Final Drive (Cont'd)



4. Drive out pinion mate shaft lock pin.



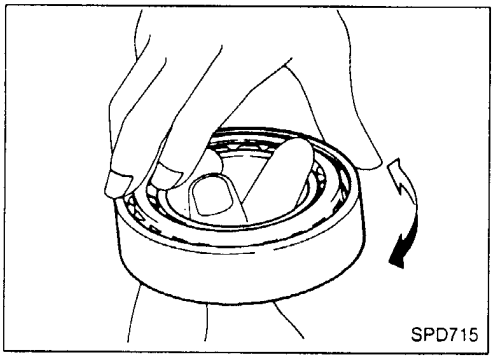
5. Draw out pinion mate shaft from differential case.
6. Remove pinion mate gears and side gears.



INSPECTION

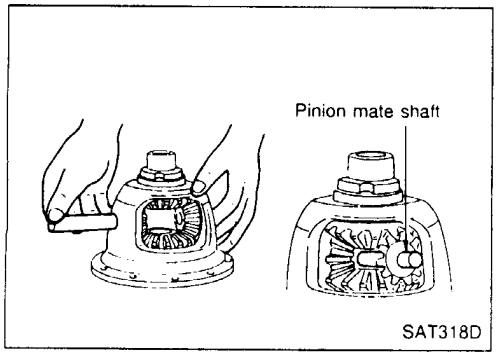
Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



Bearings

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**

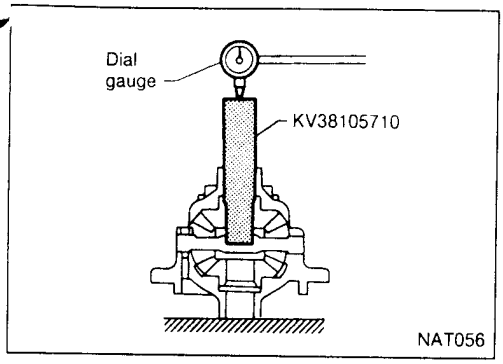


ASSEMBLY

1. Install side gear and thrust washers in differential case.
2. Install pinion mate gears and thrust washers in differential case while rotating them.

- **Apply ATF to any parts.**

Final Drive (Cont'd)

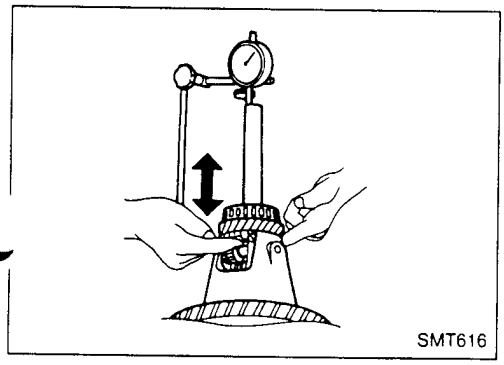


3. Measure clearance between side gear and differential case with washers using the following procedure.

a. Set Tool and dial indicator on side gear.

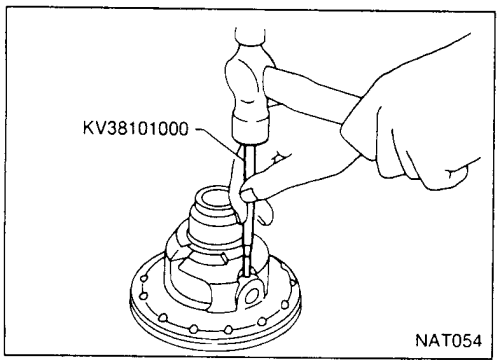
b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

Clearance between side gear and differential case with washers:
0.1 - 0.2 mm (0.004 - 0.008 in)



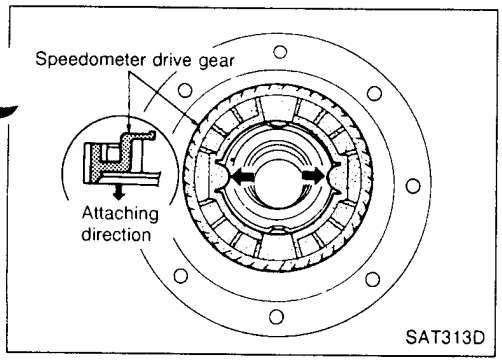
c. If not within specifications, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washer:
Refer to SDS, AT-211.



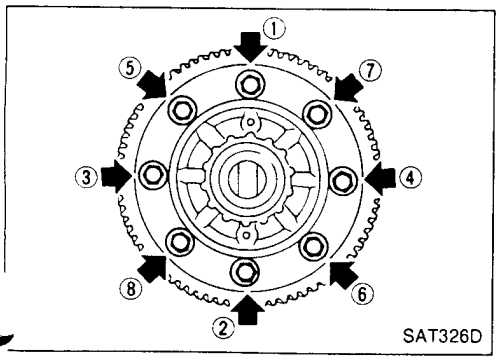
4. Install lock pin.

- **Make sure that retaining pin is flush with case.**



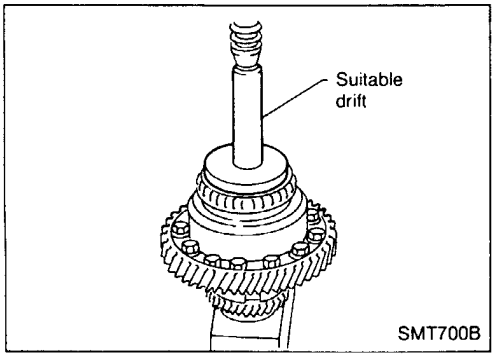
5. Install speedometer drive gear on differential case.

- **Align the projection of speedometer drive gear with the groove of differential case.**

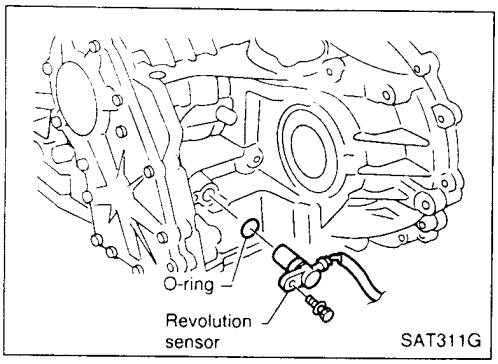


6. Install final gear and tighten fixing bolts in numerical order.

Final Drive (Cont'd)

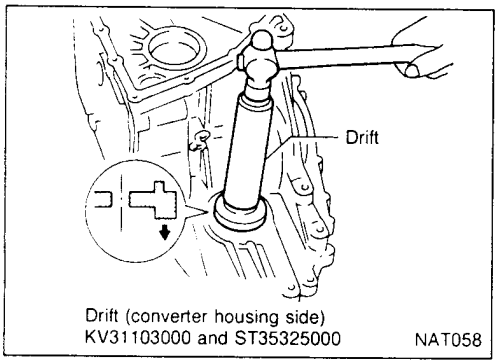


7. Press on differential side bearings.

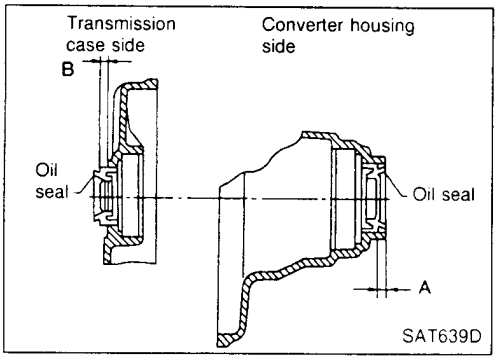


Assembly 1

1. Install revolution sensor onto transmission case.
Always use new O-rings.

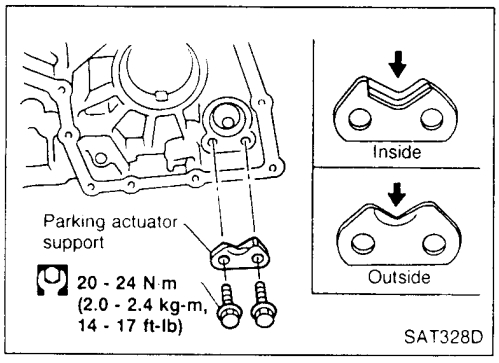


2. Install differential side oil seals on transmission case and converter housing, so that "A" and "B" are within specifications.

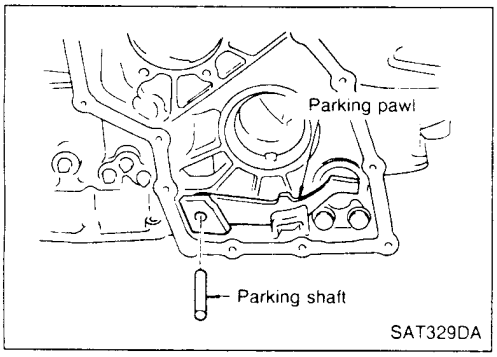


Unit: mm (in)

A	B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less



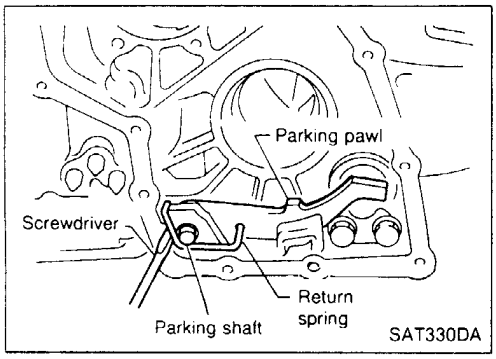
3. Install parking actuator support to transmission case.
- **Pay attention to direction of parking actuator support.**



4. Install parking pawl on transmission case and fix it with parking shaft.

Assembly 1 (Cont'd)

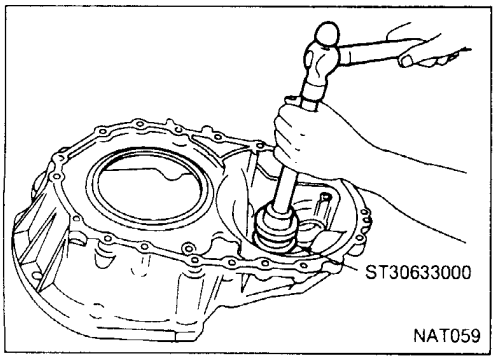
5. Install return spring.



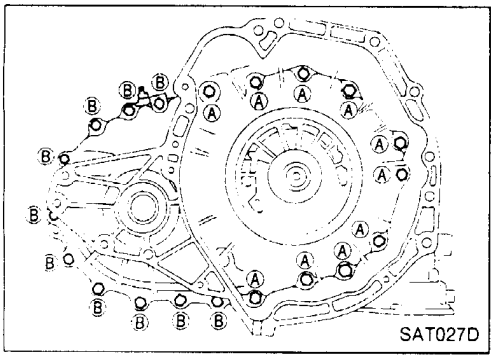
Adjustment 1

DIFFERENTIAL SIDE BEARING PRELOAD

1. Install differential side bearing outer race without adjusting shim on transmission case.
2. Install differential side bearing outer race on converter housing.

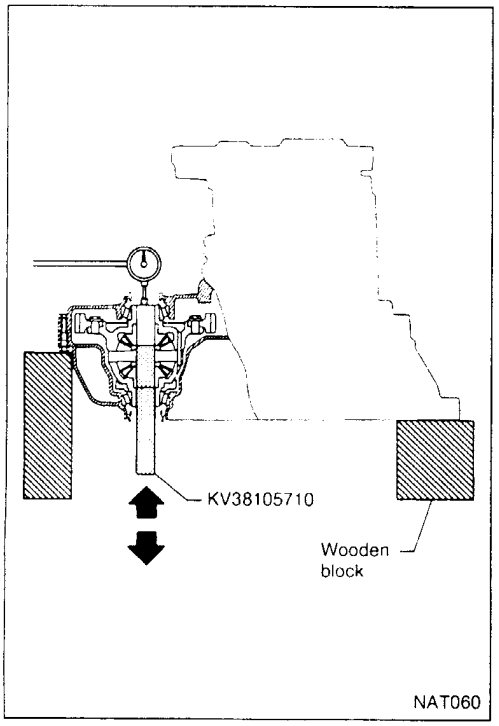


3. Place final drive assembly on transmission case.
4. Install transmission case on converter housing and tighten transmission case fixing bolts Ⓐ and Ⓑ to the specified torque.

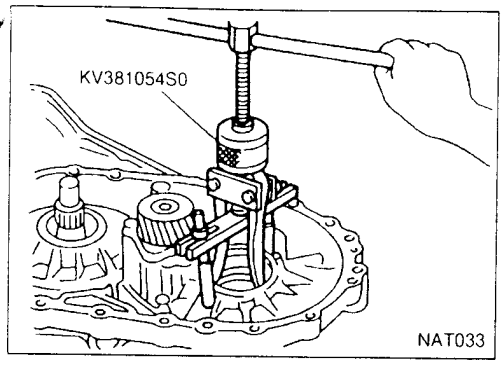


5. Attach dial indicator on differential case at transmission case side.
6. Insert Tool into differential side gear from converter housing.
7. Move Tool up and down and measure dial indicator deflection.
8. Select proper thickness of differential side bearing adjusting shim(s) using SDS table as a guide.

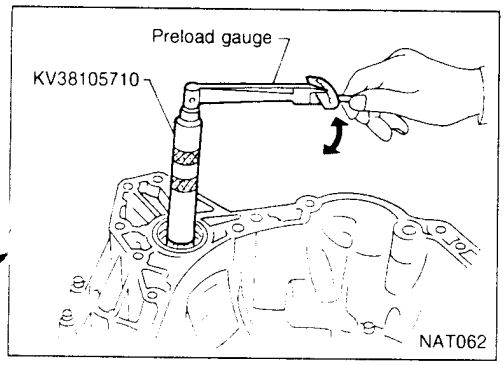
Differential side bearing adjusting shim:
Refer to SDS, AT-212.



Adjustment 1 (Cont'd)



9. Remove converter housing from transmission case.
10. Remove final drive assembly from transmission case.
11. Remove differential side bearing outer race from transmission case.
12. Reinstall differential side bearing outer race and shim(s) selected from SDS table on transmission case.
13. Reinstall converter housing on transmission case and tighten transmission case fixing bolts to the specified torque.



14. Insert Tool into differential case and measure turning torque of final drive assembly.

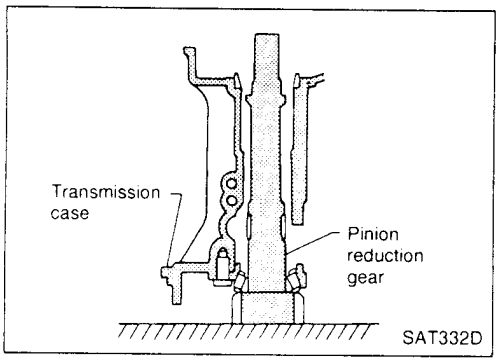
- **When measuring turning torque, turn final drive assembly in both directions several times to seat bearing rollers correctly.**

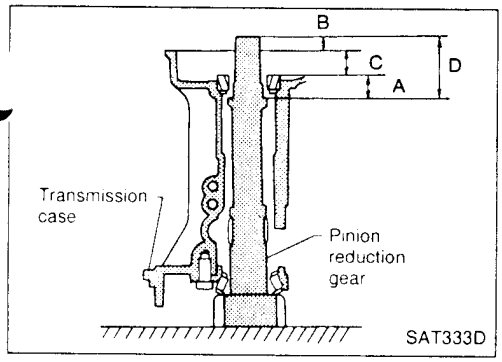
  Turning torque of final drive assembly (New bearing):
  0.49 - 1.08 N·m (5.0 - 11.0 kg-cm, 4.3 - 9.5 in-lb)
- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque is close to the specified range.**

REDUCTION GEAR BEARING PRELOAD

1. Remove transmission case and final drive assembly from converter housing.
2. Select proper thickness of reduction gear bearing adjusting shim using the following procedures:

a. Place reduction gear on transmission case as shown.

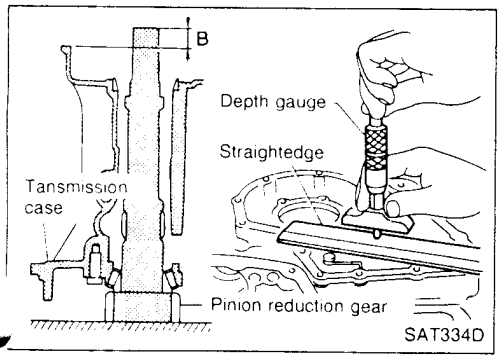




b. Place idler gear bearing on transmission case.
c. Measure dimensions "B", "C" and "D" and calculate dimension "A".

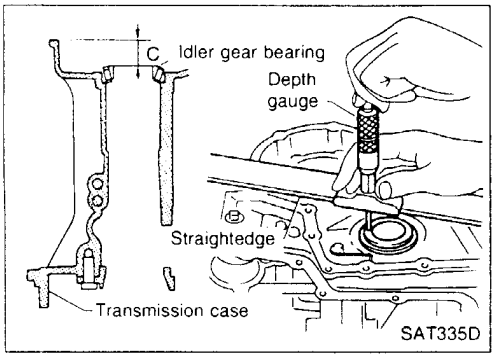
A = D – (B + C)

"A": Distance between the surface of idler gear bearing inner race and the adjusting shim mating surface of reduction gear.

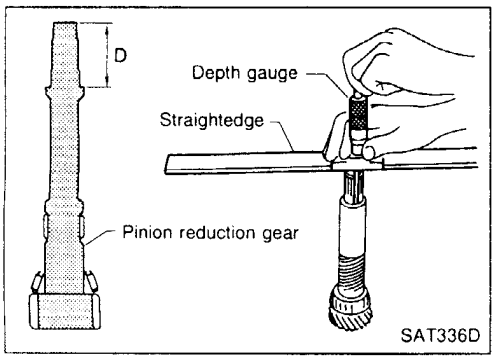


- Measure dimension "B" between the end of reduction gear and the surface of transmission case.
- **Measure dimension "B" in at least two places.**

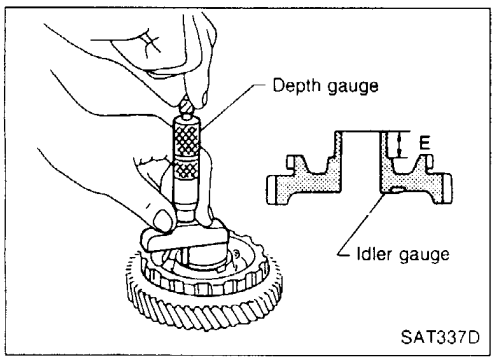
Adjustment 1 (Cont'd)



- Measure dimension "C" between the surface of idler gear bearing inner race and the surface of transmission case.
- **Measure dimension "C" in at least two places.**

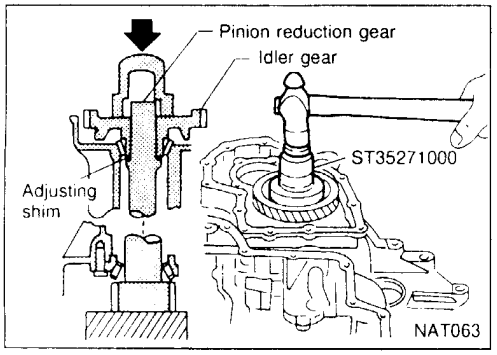


- Measure dimension "D" between the end of reduction gear and the adjusting shim mating surface of reduction gear.
- **Measure dimension "D" in at least two places.**
- Calculate dimension "A"
  A = D – (B + C)



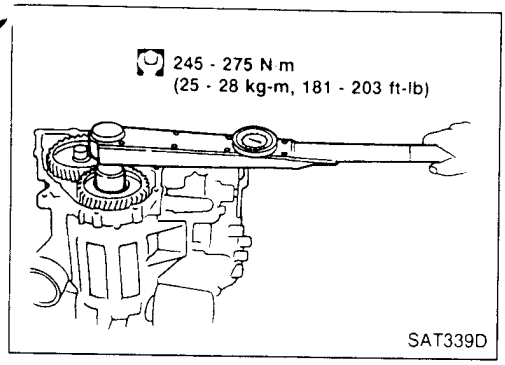
d. Measure dimension "E" between the end of idler gear and the idler gear bearing inner race mating surface of idler gear.
- **Measure dimension "E" in at least two places.**

e. Calculate "T" and select proper thickness of reduction gear bearing adjusting shim using SDS table as a guide.
   T = A – E
   Reduction gear bearing adjusting shim:
   Refer to SDS, AT-213.

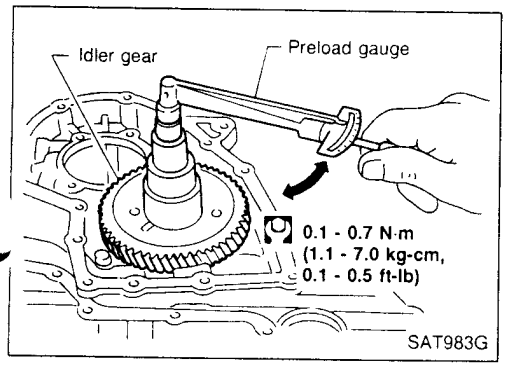


3. Install reduction gear and reduction gear bearing adjusting shim selected in step 2-e on transmission case.
4. Press idler gear bearing inner race on idler gear.
5. Press idler gear on reduction gear.
- **Press idler gear so that idler gear can be locked by parking pawl.**

Adjustment 1 (Cont'd)



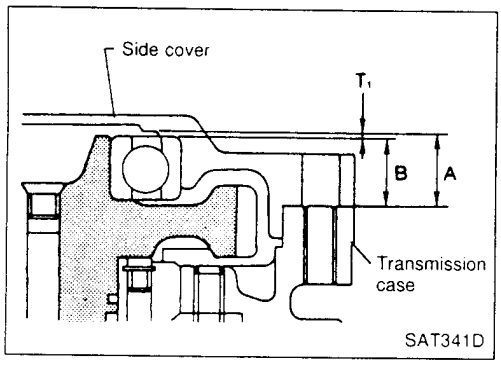
6. Tighten idler gear lock nut to the specified torque.
- **Lock idler gear with parking pawl when tightening lock nut.**



7. Measure turning torque of reduction gear.
- **When measuring turning torque, turn reduction gear in both directions several times to seat bearing rollers correctly.**

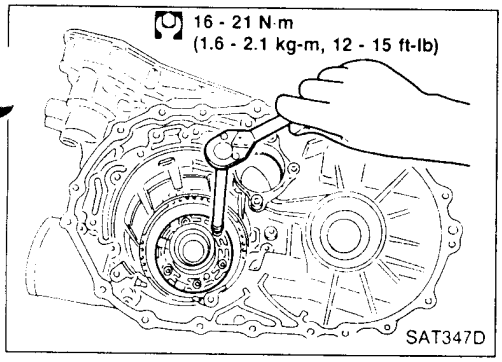
  Turning torque of reduction gear:

  0.1 - 0.7 N·m (1.0 - 7.1 kg-cm, 0.87 - 6.20 in-lb)
- **If turning torque is out of specification, decrease or increase thickness of reduction gear bearing adjusting shim.**

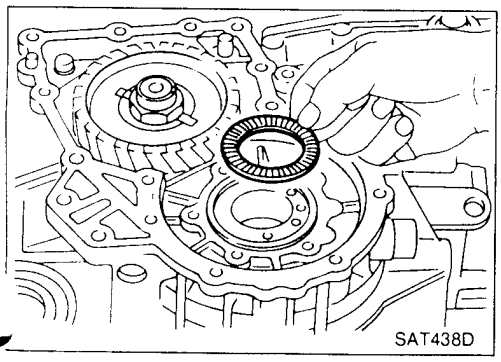


OUTPUT SHAFT END PLAY

- Measure clearance between side cover and the end of the output shaft bearing.
- Select proper thickness of adjusting shim so that clearance is within specifications.

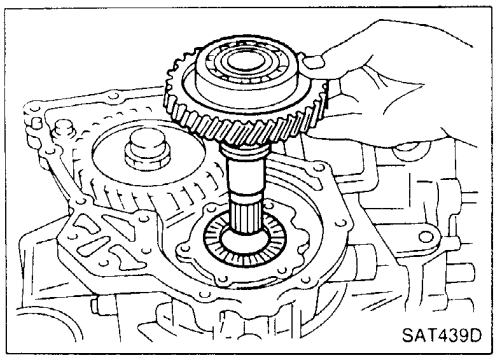


1. Install bearing retainer for output shaft.

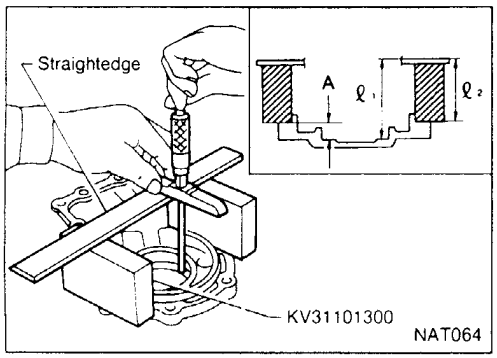


2. Install output shaft thrust needle bearing on bearing retainer.

Adjustment 1 (Cont'd)



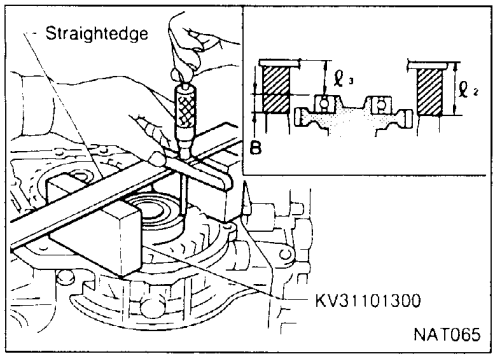
3. Install output shaft on transmission case.



4. Measure dimensions "ℓ_1" and "ℓ_2" at side cover and then calculate dimension "A".

- **Measure dimension "ℓ_1" and "ℓ_2" in at least two places.**

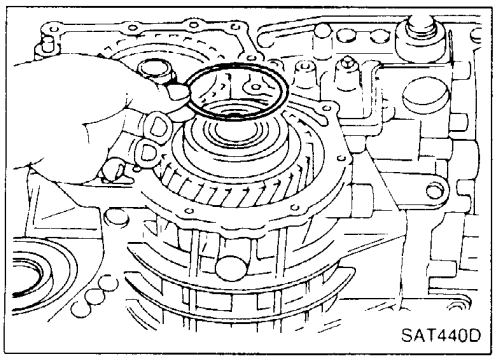
"A": Distance between transmission case fitting surface and adjusting shim mating surface.
$A = \ell_1 - \ell_2$ ℓ_2: Height of gauge



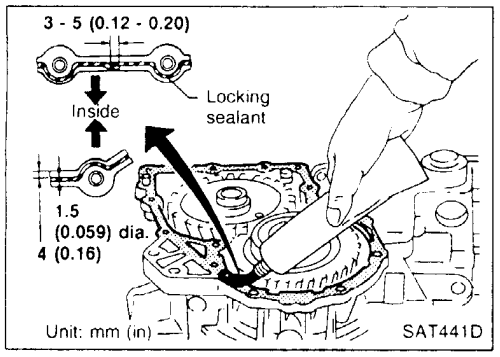
5. Measure dimensions "ℓ_2" and "ℓ_3" and then calculate dimension "B".

- **Measure "ℓ_2" and "ℓ_3" in at least two places.**

"B": Distance between the end of output shaft bearing outer race and the side cover fitting surface of transmission case.
$B = \ell_2 - \ell_3$ ℓ_2: Height of gauge

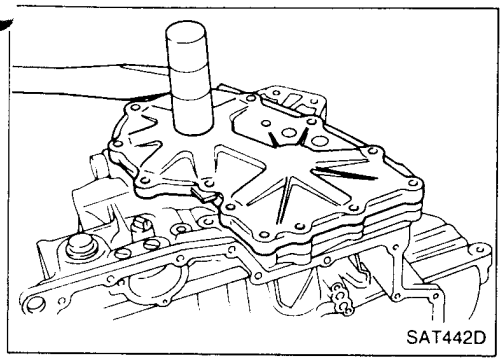


6. Select proper thickness of adjusting shim so that output shaft end play (clearance between side cover and output shaft bearing) is within specifications.
   Output shaft end play (A – B):
   0 - 0.5 mm (0 - 0.020 in)
   Output shaft end play adjusting shim:
   Refer to SDS, AT-214.
7. Install adjusting shim on output shaft bearing.

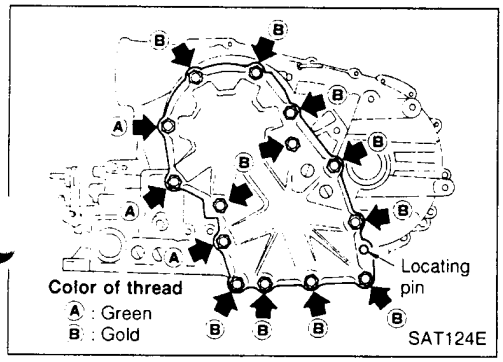


8. Apply locking sealant to transmission case as shown in illustration.

Adjustment 1 (Cont'd)


SAT442D

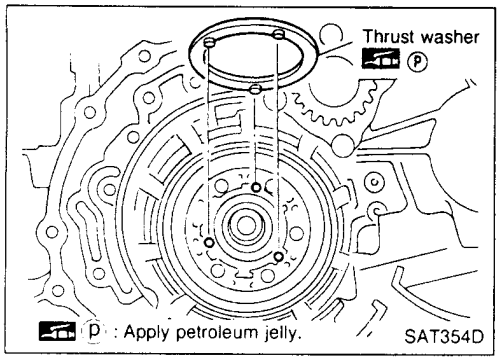
9. Install side cover on transmission case.
- **Apply locking sealant to the mating surface of transmission case.**



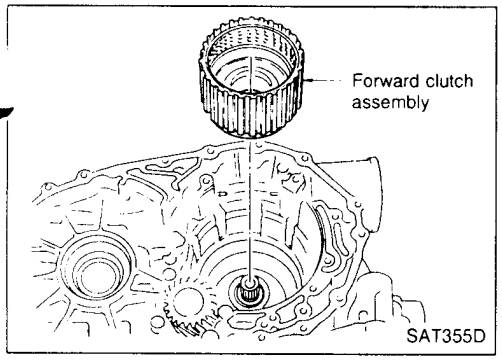
10. Tighten side cover fixing bolts to specified torque.
- **Do not mix bolts Ⓐ and Ⓑ.**
- **Always replace bolts Ⓐ as they are self-sealing bolts.**

Assembly 2

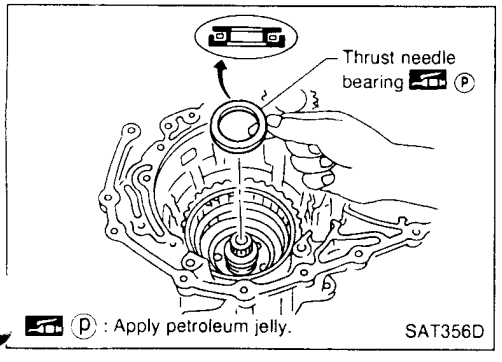
1. Remove paper rolled around bearing retainer.
2. Install thrust washer on bearing retainer.
- **Apply petroleum jelly to thrust washer.**



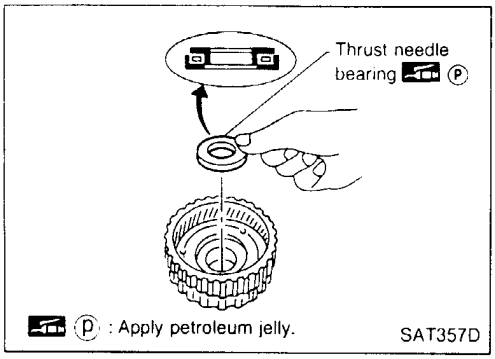
3. Install forward clutch assembly.
- **Align teeth of low & reverse brake drive plates before installing.**
- **Make sure that bearing retainer seal rings are not spread.**



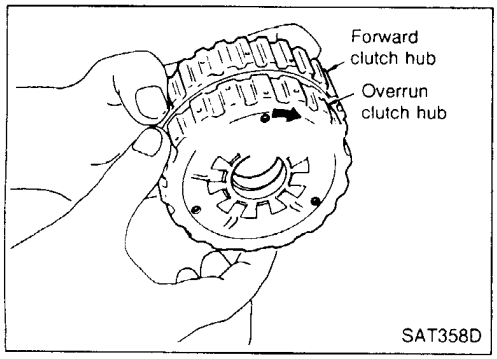
4. Install thrust needle bearing on bearing retainer.
- **Apply petroleum jelly to thrust bearing.**
- **Pay attention to direction of thrust needle bearing.**



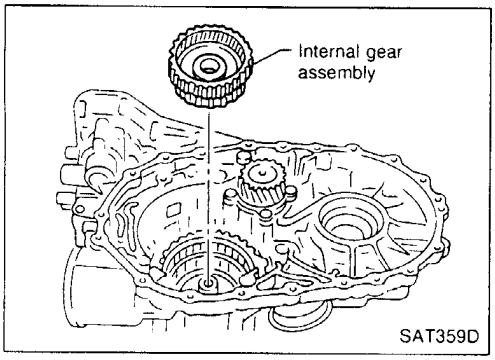
Assembly 2 (Cont'd)



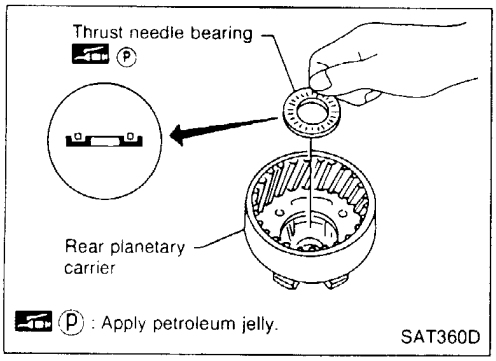
5. Install thrust needle bearing on rear internal gear.
- **Apply petroleum jelly to thrust needle bearing.**
- **Pay attention to direction of thrust needle bearing.**



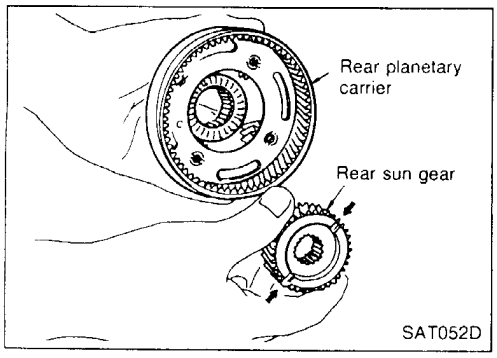
6. Hold forward clutch hub and turn overrun clutch hub. Check overrun clutch hub for directions of lock and unlock.
- If not as shown in illustration, check installed direction of forward one-way clutch.



7. Install rear internal gear assembly.
- **Align teeth of forward clutch and overrun clutch drive plate.**



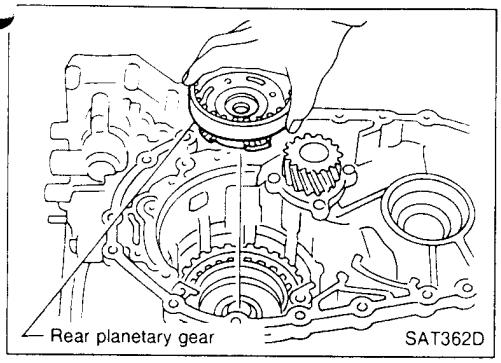
8. Install needle bearing on rear planetary carrier.
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



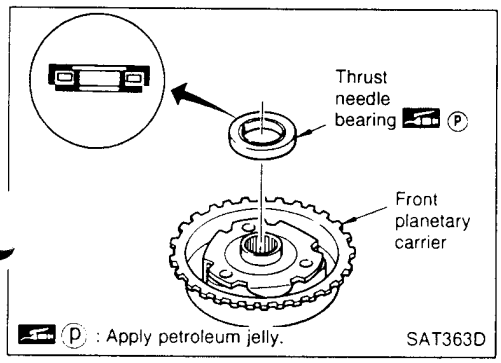
9. Install rear sun gear on rear planetary carrier.
- **Pay attention to direction of rear sun gear.**

Assembly 2 (Cont'd)

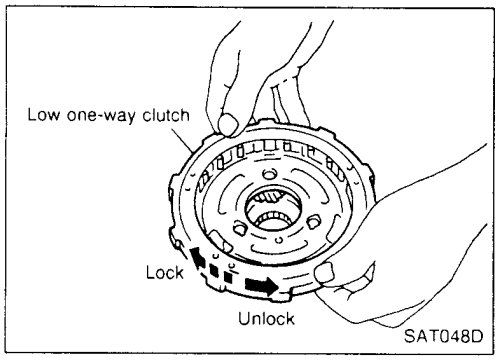
10. Install rear planetary carrier on transmission case.



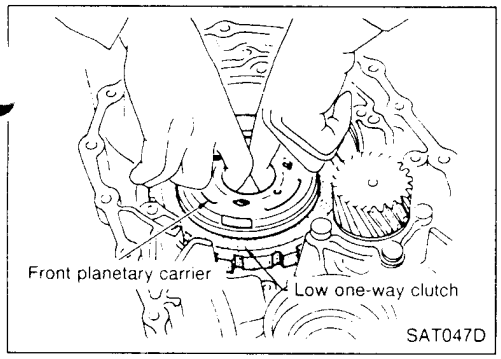
11. Install thrust needle bearing on front planetary carrier.
- **Apply petroleum jelly to thrust needle bearing.**
- **Pay attention to direction of thrust needle bearing.**



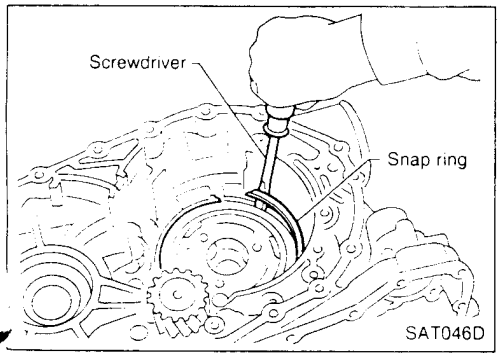
12. Install low one-way clutch to front planetary carrier by turning it in the direction of the arrow as shown.
13. While holding front planetary carrier, turn low one-way clutch. Check low one-way clutch for correct directions of lock and unlock.



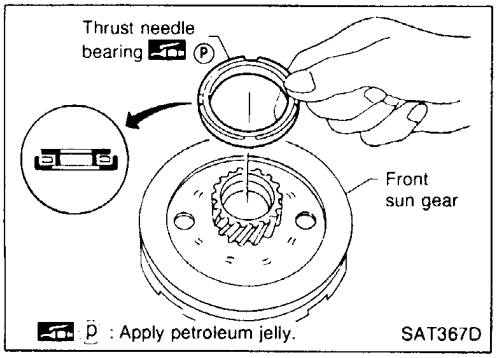
14. Install front planetary carrier assembly on transmission case.



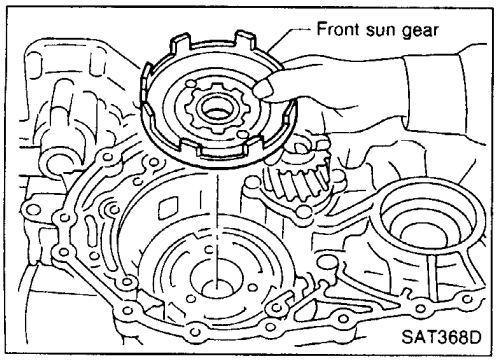
15. Install snap ring with screwdriver.
- **If forward clutch and bearings are not installed correctly, snap ring will not fit groove of transmission case.**



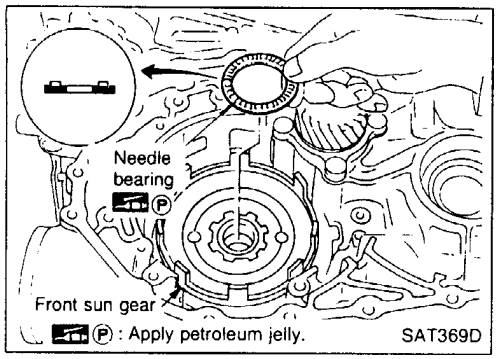
Assembly 2 (Cont'd)



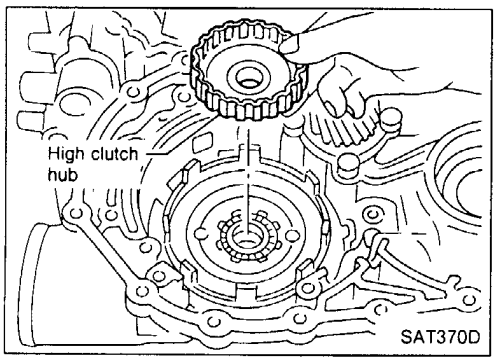
16. Install needle bearing on front sun gear.
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



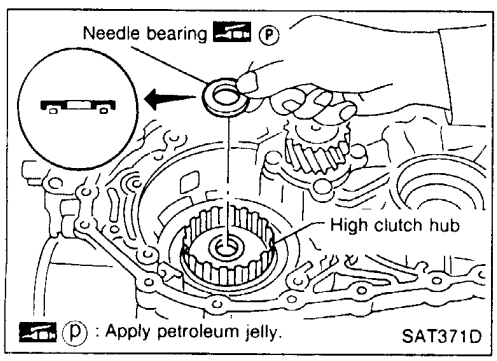
17. Install front sun gear on front planetary carrier.



18. Install needle bearing on front sun gear.
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**

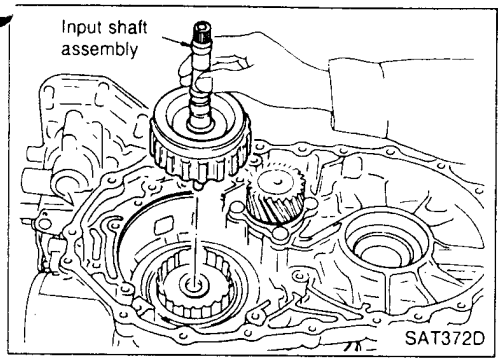


19. Install high clutch hub on front sun gear.

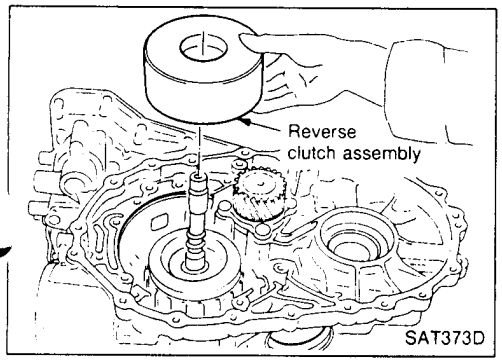


20. Install needle bearing on high clutch hub.
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**

Assembly 2 (Cont'd)



21. Remove paper rolled around input shaft.
22. Install input shaft assembly.
- **Align teeth of high clutch drive plates before installing.**

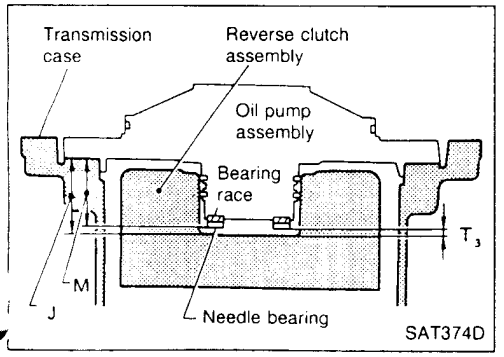


23. Install reverse clutch assembly.
- **Align teeth of reverse clutch drive plates before installing.**

Adjustment 2

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

Part name	Total end play	Reverse clutch end play
Transmission case	•	•
Overrun clutch hub	•	•
Rear internal gear	•	•
Rear planetary carrier	•	•
Rear sun gear	•	•
Front planetary carrier	•	•
Front sun gear	•	•
High clutch hub	•	•
High clutch drum	•	•
Oil pump cover	•	•
Reverse clutch drum	•	•

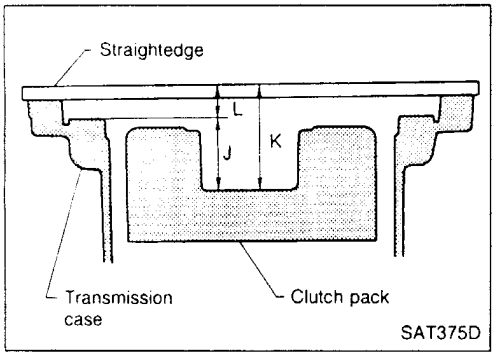


TOTAL END PLAY

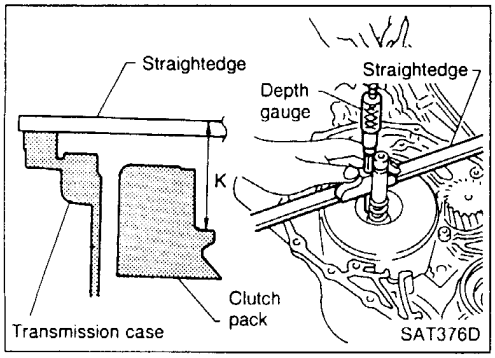
- Measure clearance between reverse clutch drum and needle bearing for oil pump cover.
- Select proper thickness of bearing race so that end play is within specifications.

Adjustment 2 (Cont'd)

1. Measure dimensions "K" and "L" and then calculate dimension "J".

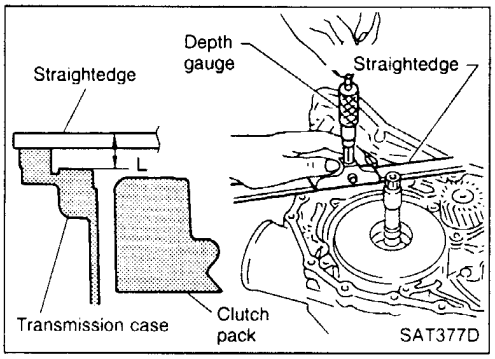


a. Measure dimension "K".

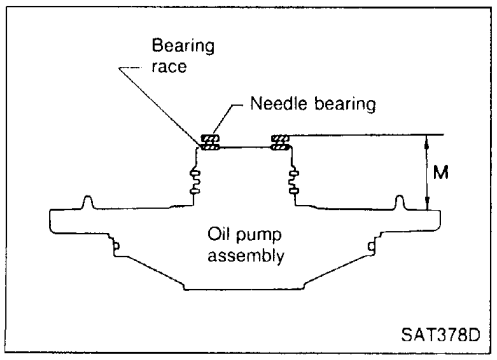


b. Measure dimension "L".
c. Calculate dimension "J".

"J": Distance between oil pump fitting surface of transmission case and needle bearing mating surface of high clutch drum.
J = K – L

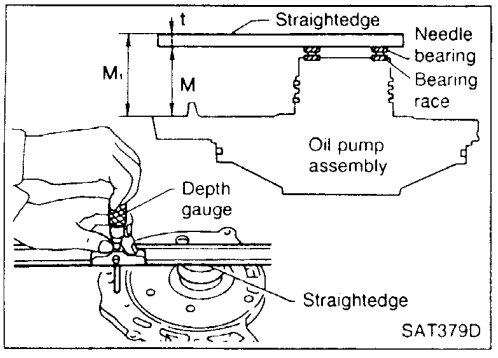


2. Measure dimension "M".
a. Place bearing race and needle bearing on oil pump assembly.

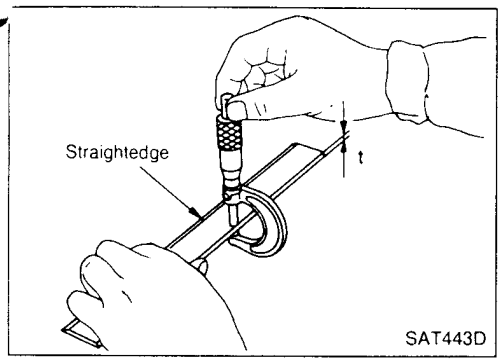


b. Measure dimension "M".

"M": Distance between transmission case fitting surface and needle bearing on oil pump cover.
"M_1": Indication of gauge.



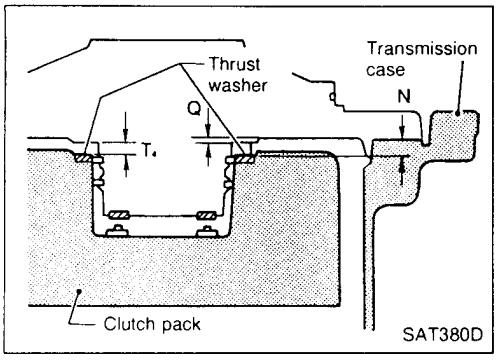
Adjustment 2 (Cont'd)



c. Measure thickness of straightedge "t".
   $M = M_1 - t$

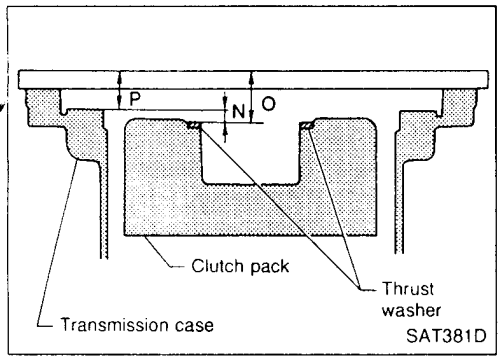
3. Adjust total end play "T_3".
   $T_3 = J - M$
   Total end play "T_3":
   0.25 - 0.55 mm (0.0098 - 0.0217 in)

- Select proper thickness of bearing race so that total end play is within specifications.
  Bearing races:
  Refer to SDS, AT-214.

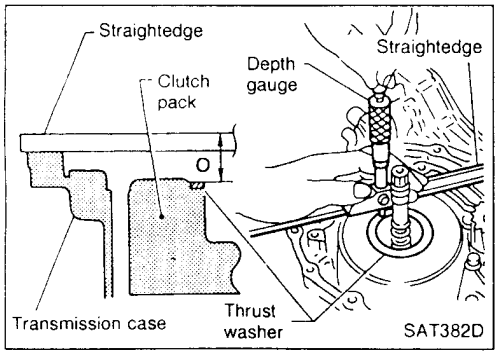


REVERSE CLUTCH END PLAY

- Measure clearance between oil pump cover and thrust washer for reverse clutch drum.
- Select proper thickness of thrust washer so that end play is within specifications.

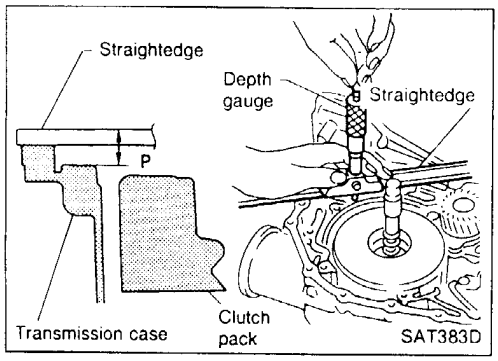


1. Measure dimensions "O" and "P" and then calculate dimension "N".



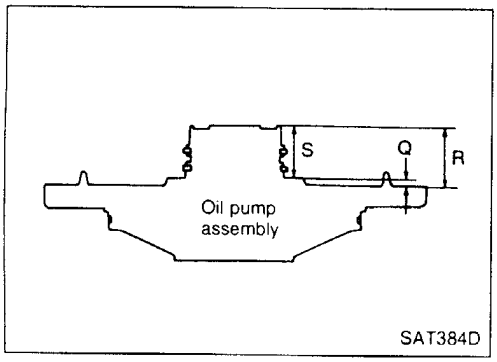
a. Place thrust washer on reverse clutch drum.
b. Measure dimension "O".

Adjustment 2 (Cont'd)

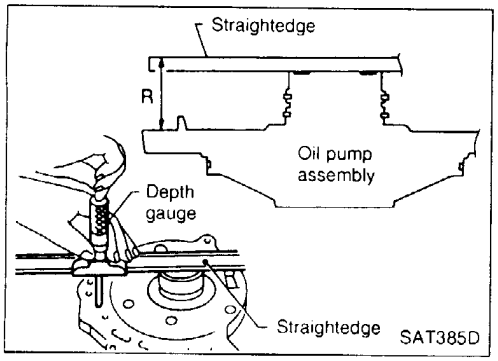


c. Measure dimension "P".
d. Calculate dimension "N".

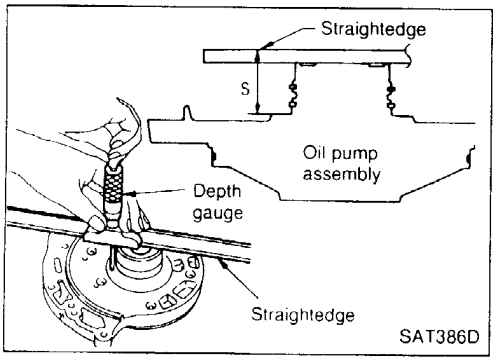
"N": Distance between oil pump fitting surface of transmission case and thrust washer on reverse clutch drum.
N = O – P



2. Measure dimensions "R" and "S" and then calculate dimension "Q".



a. Measure dimension "R".

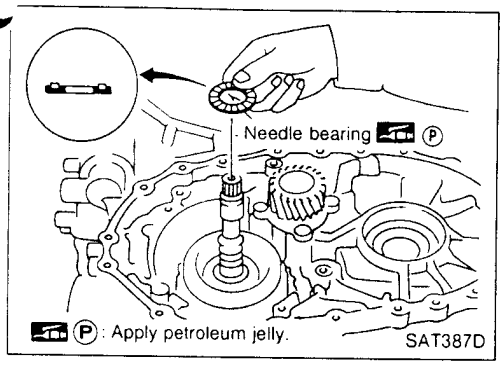


b. Measure dimension "S".
c. Calculate dimension "Q".

"Q": Distance between transmission case fitting surface and thrust washer mating surface.
Q = R – S

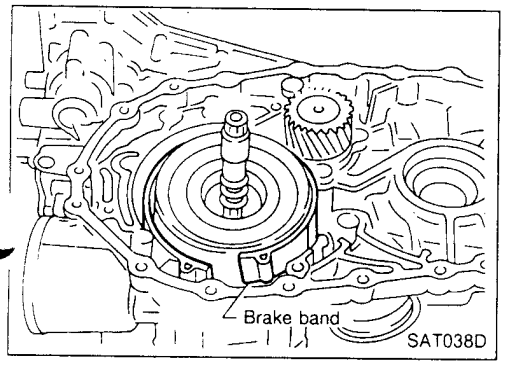
3. Adjust reverse clutch end play "T_4".
T_4 = N – Q
Reverse clutch end play:
0.65 - 1.00 mm (0.0256 - 0.0394 in)

- Select proper thickness of thrust washer so that reverse clutch end play is within specifications.
Thrust washer:
Refer to SDS, AT-214.

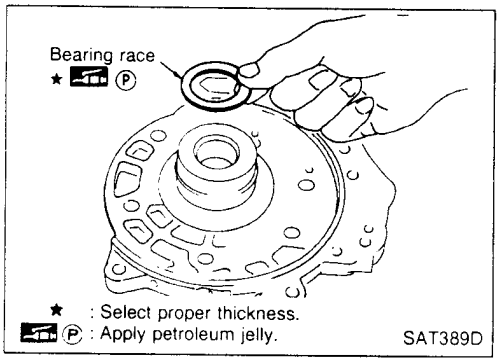


Assembly 3

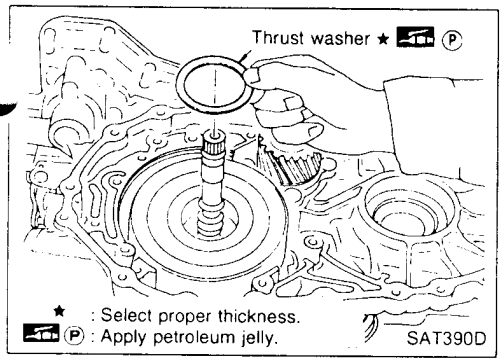
1. Remove reverse clutch assembly and install needle bearing on high clutch assembly.
- **Pay attention to direction of needle bearing.**
2. Install reverse clutch assembly.



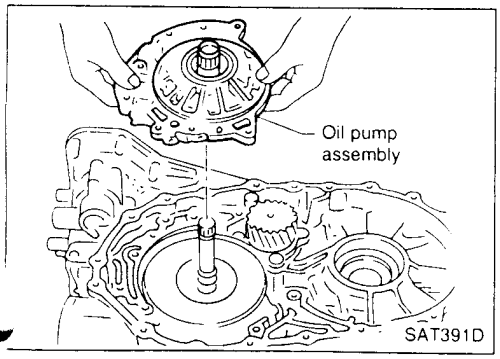
3. Install anchor end pin, washer and lock nut on transmission case.
4. Place brake band on periphery of reverse clutch drum. Then, tighten anchor end pin just enough so that brake band is fitted on periphery of reverse clutch drum uniformly.



5. Place bearing race selected in total end play adjustment step on oil pump cover.
- **Apply petroleum jelly to bearing race.**

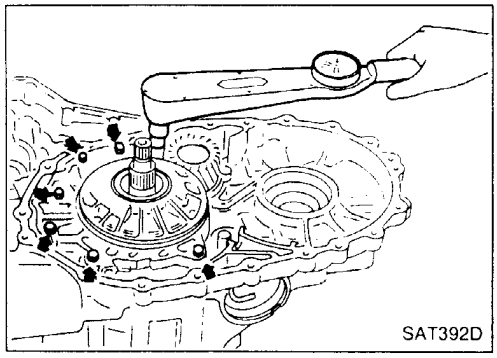


6. Place thrust washer selected in reverse clutch end play step on reverse clutch drum.
- **Apply petroleum jelly to thrust washer.**

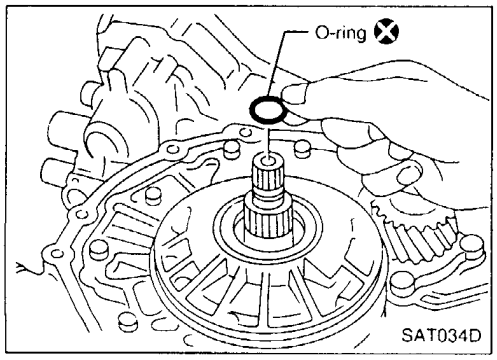


7. Install oil pump assembly on transmission case.

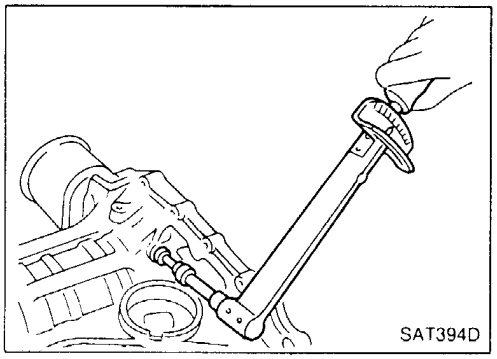
Assembly 3 (Cont'd)



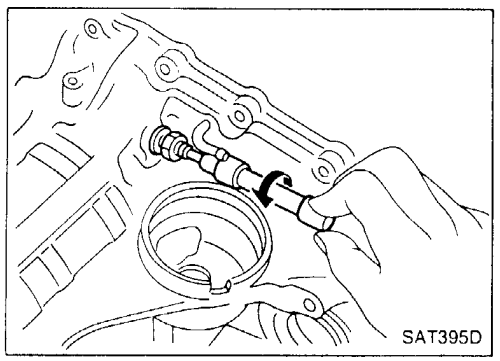
8. Tighten oil pump fixing bolts to specified torque.



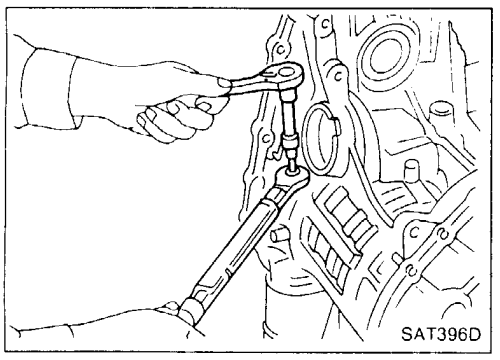
9. Install O-ring to input shaft.
- **Apply ATF to O-ring.**



10. Adjust brake band.
a. Tighten anchor end pin to specified torque.
Anchor end pin:
: 4 - 6 N·m (0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)

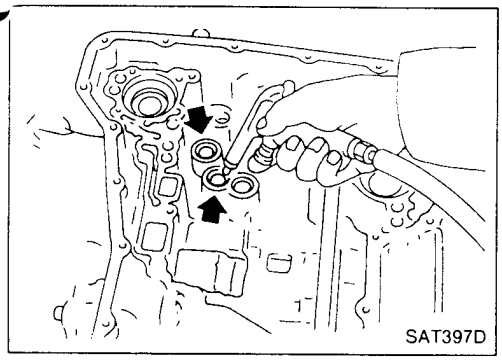


b. Back off anchor end pin two and a half turns.

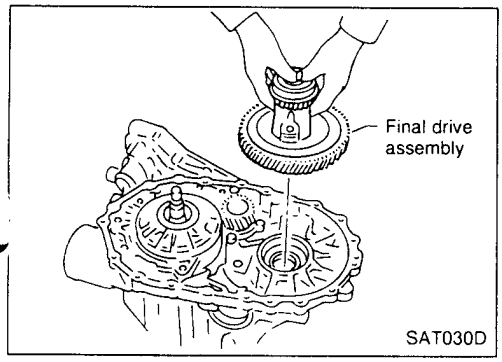


c. While holding anchor end pin, tighten lock nut.

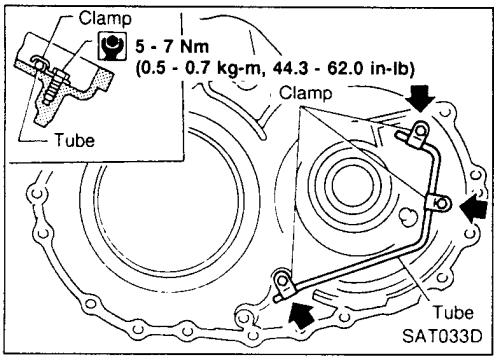
Assembly 3 (Cont'd)



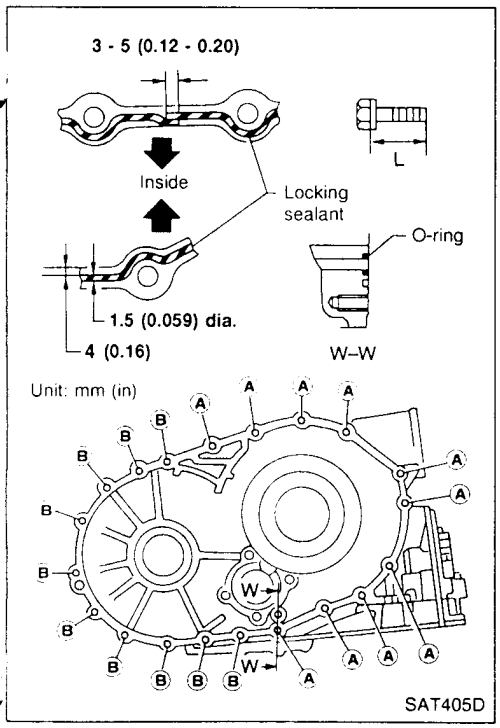
11. Apply compressed air to oil holes of transmission case and check operation of brake band.



12. Install final drive assembly on transmission case.



13. Install oil tube on converter housing.

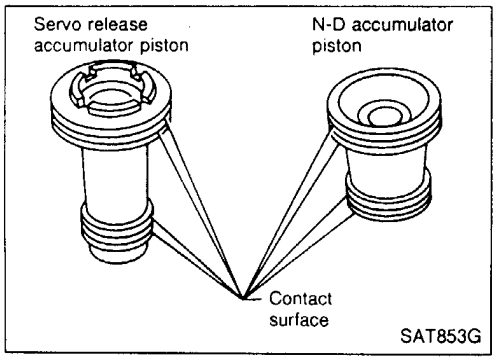


14. Install O-ring on differential oil port of transmission case.
15. Install converter housing on transmission case.

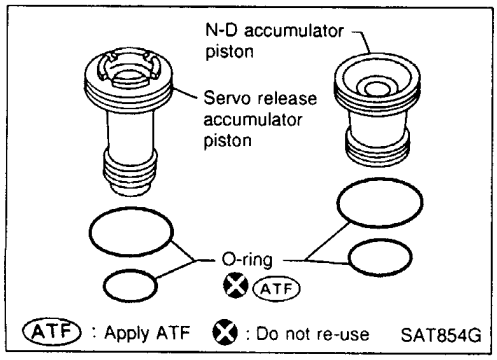
- **Apply locking sealant to mating surface of converter housing.**

Bolt	Length mm (in)
Ⓐ	30 (1.18)
Ⓑ	40 (1.57)

Assembly 3 (Cont'd)

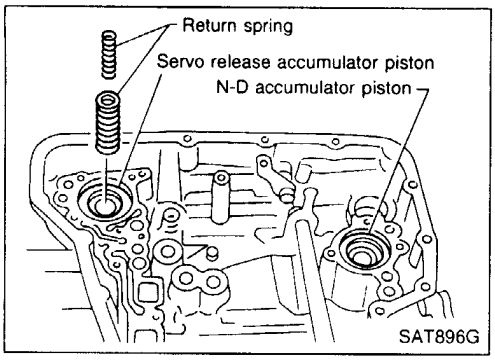


16. Install accumulator piston.
a. Check contact surface of accumulator piston for damage.



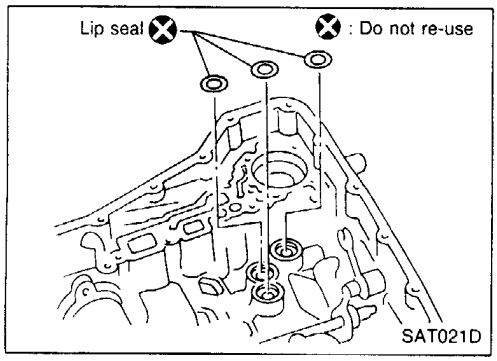
b. Install O-rings on accumulator piston.
- Apply ATF to O-rings.

Accumulator piston O-rings:
Refer to SDS, AT-214.



c. Install accumulator pistons and return springs on transmission case.
- **Apply ATF to inner surface of transmission case.**

Return springs:
Refer to SDS, AT-214.



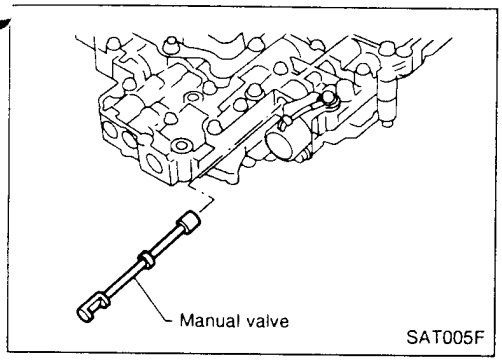
17. Install lip seals for band servo oil holes on transmission case.
- **Apply petroleum jelly to lip seals.**

Assembly 3 (Cont'd)

18. Install control valve assembly.

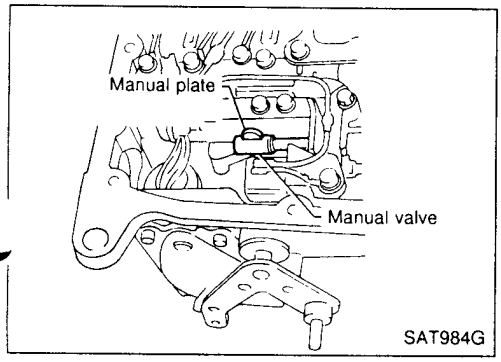
a. Insert manual valve into control valve assembly.

- **Apply ATF to manual valve.**

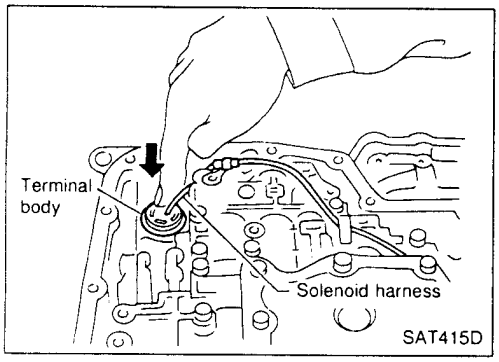


b. Set manual shaft in Neutral position.

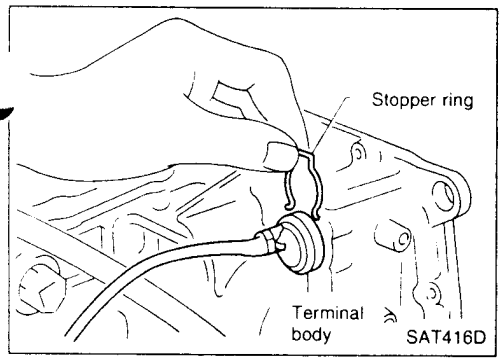
c. Install control valve assembly on transmission case while aligning manual valve with manual plate.



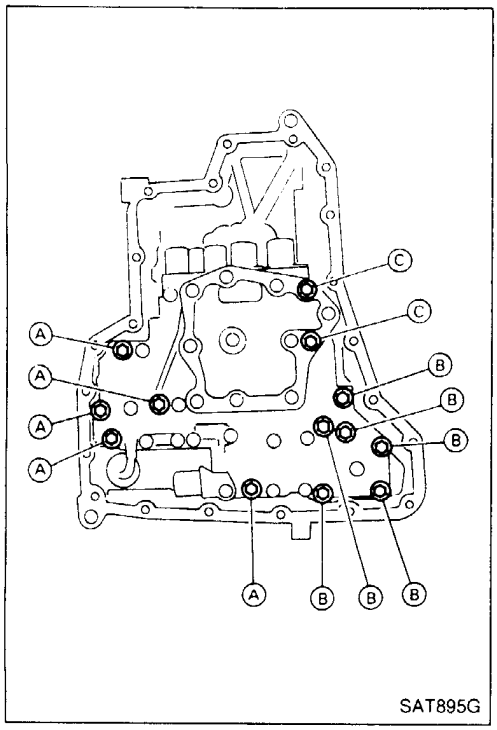
d. Pass solenoid harness through transmission case and install terminal body on transmission case by pushing it.



e. Install clip to terminal body.



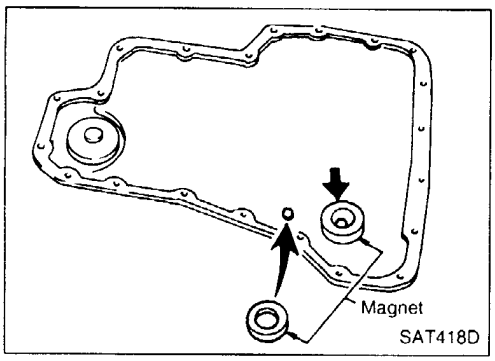
Assembly 3 (Cont'd)



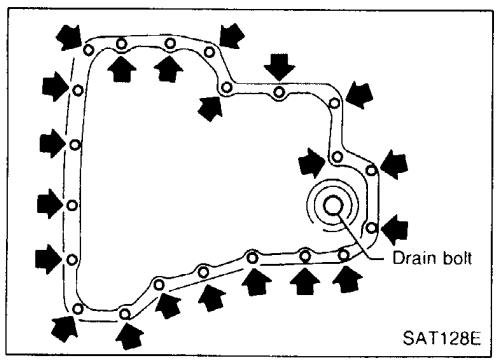
f. Tighten bolts Ⓐ, Ⓑ and Ⓒ.

Bolt length, number and location

Bolt symbol	Ⓐ	Ⓑ	Ⓒ
Bolt length "ℓ" mm (in)	40.0 (1.575)	33.0 (1.299)	43.5 (1.713)
Number of bolts	5	6	2

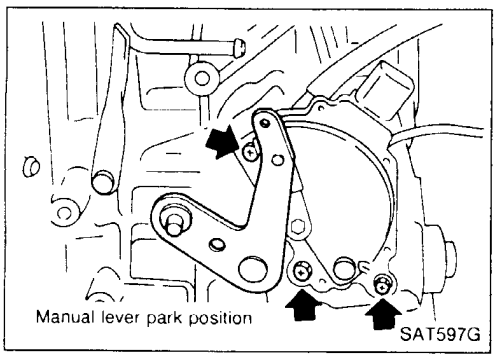


19. Install oil pan.
a. Attach magnet to oil pan.



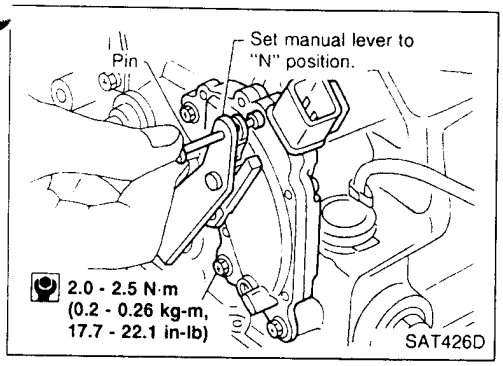
b. Install new oil pan gasket on transmission case.
c. Install oil pan on transmission case.
- **Always replace oil pan bolts as they are self-sealing bolts.**
- **Tighten the four bolts in a criss-cross pattern to prevent dislocation of gasket.**

d. Tighten drain plug to specified torque.

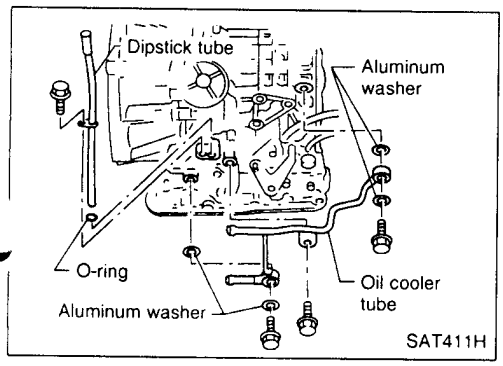


20. Install inhibitor switch.
a. Set manual lever in "P" position.
b. Temporarily install inhibitor switch on manual shaft.
c. Move selector lever to "N" position.

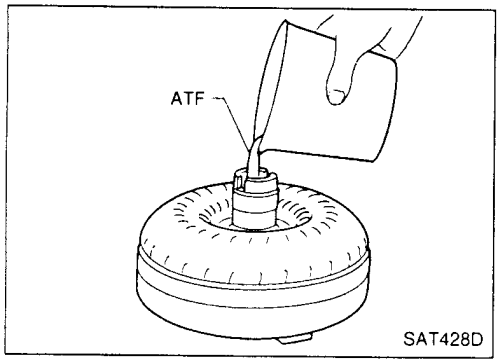
Assembly 3 (Cont'd)



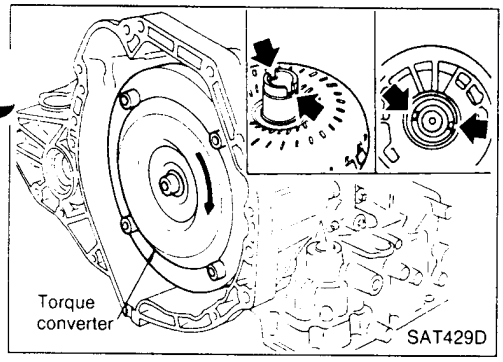
d. Insert 4.0 mm (0.157 in) dia. pin into adjustment hole in both inhibitor switch and manual shaft as near vertically as possible.
e. Tighten inhibitor switch fixing bolts.
f. Remove pin from adjustment hole after adjusting inhibitor switch.



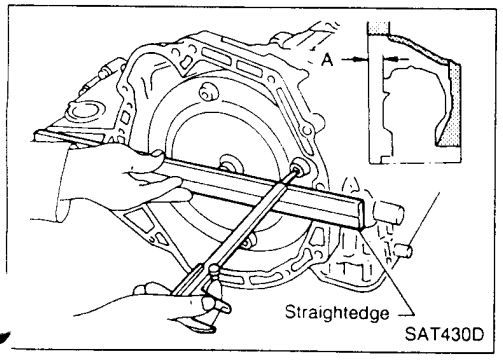
21. Install dipstick tube and oil cooler tube to transmission case.



22. Install torque converter.
a. Pour ATF into torque converter.
- **Approximately 1 liter (7/8 Imp qt) of fluid is required for a new torque converter.**
- **When reusing old torque converter, add the same amount of fluid as was drained.**



b. Install torque converter while aligning notches of torque converter with notches of oil pump.



c. Measure distance "A" to check that torque converter is in correct position.
Distance "A":
15.9 mm (0.626 in) or more

General specifications

Engine	SR20De
Automatic transaxle model	RE4F03A
Automatic transaxle assembly	
Model code number	35X00
Transaxle gear ratio	
1st	2.8611
2nd	1.5622
3rd	1.0000
4th	0.6979
Reverse	2.3103
Final drive	4.0721
Recommended oil	Genuine Nissan ATF or equivalent
Oil capacity ℓ (Imp qt)	7.0 (6-1/8)

Specifications and Adjustments

VEHICLE SPEED WHEN SHIFTING GEARS

Throttle position	Shift pattern	Vehicle speed km/h (mph)					
		$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$
Full throttle	Auto (Normal)	49 - 57 (30 - 35)	93 - 101 (58 - 63)	148 - 156 (92 - 97)	144 - 152 (89 - 94)	83 - 91 (52 - 57)	41 - 49 (27 - 29)
	Sport	49 - 57 (32 - 34)	93 - 101 (58 - 63)	148 - 156 (92 - 97)	144 - 152 (89 - 94)	83 - 91 (52 - 57)	41 - 49 (27 - 29)
Half throttle	Auto (Normal)	25 - 33 (16 - 21)	54 - 62 (34 - 39)	90 - 98 (56 - 61)	70 - 78 (43 - 48)	34 - 42 (21 - 26)	9 - 17 (7 - 9)
	Sport	33 - 41 (21 - 25)	69 - 77 (40 - 45)	110 - 118 (68 - 73)	79 - 87 (49 - 54)	35 - 43 (22 - 27)	9 - 17 (7 - 9)

VEHICLE SPEED WHEN PERFORMING LOCK-UP

Throttle position	OD switch (Shift range)	Shift pattern	Vehicle speed km/h (mph)	
			Lock-up "ON"	Lock-up "OFF"
2/8	ON [D_4]	Auto (Normal)	79 - 87 (48 - 53)	61 - 69 (37 - 42)
		Sport	79 - 87 (54 - 59)	61 - 69 (39 - 44)
	OFF [D_3]	Auto (Normal)	96 - 104 (60 - 65)	93 - 101 (58 - 63)
		Sport	96 - 104 (60 - 65)	93 - 101 (58 - 63)

STALL REVOLUTION

Engine	Stall revolution rpm
SR20	1,900 - 2,200

LINE PRESSURE

Engine speed rpm	Line pressure kPa (bar, kg/cm^2, psi)			
	R position	D position	2 position	1 position
Idle	853 (8.53, 9.1, 124)	500 (5.00, 5.6, 73)	500 (5.00, 6.1, 73)	500 (5.00, 6.1, 73)
Stall	1,863 (18.63, 17.5, 270)	1,098 (10.98, 11.3, 159)	1,098 (10.98, 11.3, 159)	1,098 (10.98, 11.3, 159)

CONTROL VALVES

Control valve return springs

Unit: mm (in)

Parts			Part No.	Free length	Outer diameter
Upper body	⑱	Pilot valve spring	31742-80X14	36.0 (1.417)	8.1 (0.319)
	⑭	1-2 accumulator valve spring	31742-80X10	20.5 (0.807)	7.0 (0.276)
	㉑	1-2 accumulator piston spring	31742-33X02	48.77 (1.920)	19.6 (0.772)
	㉕	1st reducing valve spring	31742-80X05	27.0 (1.063)	7.0 (0.276)
	②	Overrun clutch reducing valve spring	31742-80X06	37.5 (1.476)	7.0 (0.276)
	⑦	Torque converter relief valve spring	31742-33X00	31.0 (1.220)	8.9 (0.350)
	⑩	Torque converter clutch control valve	31742-80X17	39.5 (1.555)	11.0 (0.433)
	—	Oil cooler relief valve spring	31872-31X00	17.02 (0.6701)	8.0 (0.315)
Lower body	㉞	Line pressure solenoid valve spring	31742-80X11	17.0 (0.669)	10.7 (0.421)
	⑱	Pressure regulator valve spring	31742-80X13	45.0 (1.772)	15.0 (0.591)
	㉓	Overrun clutch control valve spring	31762-80X00	21.7 (0.854)	7.0 (0.276)
	㉗	Accumulator control valve spring	31742-80X02	22.0 (0.866)	6.5 (0.256)
	㉜	Shift valve A spring	31762-80X00	21.7 (0.854)	7.0 (0.276)
	②	Shift valve B spring	31762-80X00	21.7 (0.854)	7.0 (0.276)
	⑦	Pressure modifier valve spring	31742-41X15	30.5 (1.201)	9.8 (0.386)
	⑪		31742-80X16	32.0 (1.260)	6.9 (0.272)

Specifications and Adjustments (Cont'd)

CLUTCHES AND BRAKES

Model			RE4F03A	
Reverse clutch				
Number of drive plates			2	
Number of driven plates			2	
Drive plate thickness		mm (in)		
Standard			2.0 (0.079)	
Allowable limit			1.8 (0.071)	
Clearance		mm (in)		
Standard			0.5 - 0.8 (0.020 - 0.031)	
Allowable limit			1.2 (0.047)	
Thickness of retaining plates			Thickness mm (in)	Part number
			4.4 (0.173)	31537-31X00
			4.6 (0.181)	31537-31X01
			4.8 (0.189)	31537-31X02
			5.0 (0.197)	31537-31X03
			5.2 (0.205)	31537-31X04
High clutch				
Number of drive plates			4	
Number of driven plates	Thickness	1.5 mm	6	
		2.0 mm	1	
Drive plate thickness		mm (in)		
Standard			1.6 (0.063)	
Allowable limit			1.4 (0.055)	
Clearance		mm (in)		
Standard			1.4 - 1.8 (0.055 - 0.071)	
Allowable limit			2.6 (0.102)	
Thickness of retaining plates			Thickness mm (in)	Part number
			3.6 (0.142)	31537-31X10
			3.8 (0.150)	31537-31X11
			4.0 (0.157)	31537-31X12
			4.2 (0.165)	31537-31X13
			4.4 (0.173)	31537-31X14
			4.6 (0.181)	31537-31X15
			4.8 (0.189)	31537-31X16
			5.0 (0.197)	31537-31X17

Specifications and Adjustments (Cont'd)

Model		RE4F03A	
Forward clutch			
Number of drive plates		5	
Number of driven plates		5	
Drive plate thickness	mm (in)		
Standard		1.8 (0.071)	
Allowable limit		1.6 (0.063)	
Clearance	mm (in)		
Standard		0.45 - 0.85 (0.0177 - 0.0335)	
Allowable limit		1.85 (0.0728)	
Thickness of retaining plate		Thickness mm (in)	Part number
		3.6 (0.142)	31537-31X60
		3.8 (0.150)	31537-31X61
		4.0 (0.157)	31537-31X62
		4.2 (0.165)	31537-31X63
		4.4 (0.173)	31537-31X64
		4.6 (0.181)	31537-31X65
Overrun clutch			
Number of drive plates		3	
Number of driven plates		4	
Drive plate thickness	mm (in)		
Standard		1.6 (0.063)	
Allowable limit		1.4 (0.055)	
Clearance	mm (in)		
Standard		1.0 - 1.4 (0.039 - 0.055)	
Allowable limit		2.0 (0.079)	
Thickness of retaining plate		Thickness mm (in)	Part number
		3.6 (0.142)	31567-31X79
		3.8 (0.150)	31567-31X80
		4.0 (0.157)	31567-31X81
		4.2 (0.165)	31567-31X82
		4.4 (0.173)	31567-31X83

Specifications and Adjustments (Cont'd)

Model		RE4F03A	
Low & reverse brake			
Number of drive plates		5	
Number of driven plates		5	
Drive plate thickness	mm (in)		
Standard		2.0 (0.079)	
Allowable limit		1.8 (0.071)	
Clearance	mm (in)		
Standard		1.4 - 1.8 (0.055 - 0.071)	
Allowable limit		2.8 (0.110)	
Thickness of retaining plate		Thickness mm (in)	Part number
		3.6 (0.142)	31667-31X10
		3.8 (0.150)	31667-31X11
		4.0 (0.157)	31667-31X12
		4.2 (0.165)	31667-31X13
		4.4 (0.173)	31667-31X14
		4.6 (0.181)	31667-31X15
Brake band			
Anchor end bolt tightening torque	N·m (kg-m, in-lb)	4 - 6 (0.4 - 0.6, 35.4 - 53.1)	
Number of returning revolutions for anchor end bolt		2.5 ± 0.125	
Lock nut tightening torque	N·m (kg-m, ft-lb)	31 - 42 (3.2 - 4.3, 23 - 31)	

Clutch and brake return springs

Unit: mm (in)

Parts		Free length	Outer diameter
Forward clutch (Overrun clutch) (16 pcs)	Outer	26.6 (1.047)	10.6 (0.417)
	Inner	26.3 (1.035)	7.7 (0.303)
High clutch (16 pcs)		18.6 (0.732)	8.0 (0.315)
Reverse clutch (12 pcs)		19.7 (0.776)	11.1 (0.437)

Specifications and Adjustments (Cont'd)

OIL PUMP

Oil pump side clearance mm (in)	0.02 - 0.04 (0.0008 - 0.0016)	
Thickness of inner gears and outer gears	Inner gear	
	Thickness mm (in)	Part number
	9.99 - 10.00 (0.3933 - 0.3937)	31346-31X00
	9.98 - 9.99 (0.3929 - 0.3933)	31346-31X01
	9.97 - 9.98 (0.3925 - 0.3929)	31346-31X02
	Outer gear	
	Thickness mm (in)	Part number
	9.99 - 10.00 (0.3933 - 0.3937)	31347-31X00
	9.98 - 9.99 (0.3929 - 0.3933)	31347-31X01
	9.97 - 9.98 (0.3925 - 0.3929)	31347-31X02
Clearance between oil pump housing and outer gear mm (in)		
Standard	0.08 - 0.15 (0.0031 - 0.0059)	
Allowable limit	0.15 (0.0059)	
Oil pump cover seal ring clearance mm (in)		
Standard	0.10 - 0.25 (0.0039 - 0.0098)	
Allowable limit	0.25 (0.0098)	

INPUT SHAFT

Input shaft seal ring clearance mm (in)	
Standard	0.08 - 0.23 (0.0031 - 0.0091)
Allowable limit	0.23 (0.0091)

PLANETARY CARRIER

Clearance between planetary carrier and pinion washer mm (in)	
Standard	0.15 - 0.70 (0.0059 - 0.0276)
Allowable limit	0.80 (0.0315)

FINAL DRIVE

Differential side gear clearance

Clearance between side gear and differential case with washer mm (in)	0.1 - 0.2 (0.004 - 0.008)

Differential side gear thrust washers

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

Bearing preload

Differential side bearing preload "T" mm (in)	0.04 - 0.09 (0.0016 - 0.0035)

Turning torque

Turning torque of final drive assembly N·m (kg-cm, in-lb)	0.49 - 1.08 (5.0 - 11.0, 4.3 - 9.5)

Differential side bearing adjusting shims

Thickness mm (in)	Part number
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	31499-21X10
0.56 (0.0220)	31499-21X11
0.60 (0.0236)	31499-21X12
0.64 (0.0252)	31499-21X13
0.68 (0.0268)	31499-21X14
0.72 (0.0283)	31499-21X15
0.76 (0.0299)	31499-21X16
0.80 (0.0315)	31499-21X17
0.84 (0.0331)	31499-21X18
0.88 (0.0346)	31499-21X19
0.92 (0.0362)	31499-21X20
1.44 (0.0567)	31499-21X21

Specifications and Adjustments (Cont'd)

Table for selecting differential side bearing adjusting shim(s)

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.31 - 0.35 (0.0122 - 0.0138)	0.40 (0.0157)
0.35 - 0.39 (0.0138 - 0.0154)	0.44 (0.0173)
0.39 - 0.43 (0.0154 - 0.0169)	0.48 (0.0189)
0.43 - 0.47 (0.0169 - 0.0185)	0.52 (0.0205)
0.47 - 0.51 (0.0185 - 0.0201)	0.56 (0.0220)
0.51 - 0.55 (0.0201 - 0.0217)	0.60 (0.0236)
0.55 - 0.59 (0.0217 - 0.0232)	0.64 (0.0252)
0.59 - 0.63 (0.0232 - 0.0248)	0.68 (0.0268)
0.63 - 0.67 (0.0248 - 0.0264)	0.72 (0.0283)
0.67 - 0.71 (0.0264 - 0.0280)	0.76 (0.0299)
0.71 - 0.75 (0.0280 - 0.0295)	0.80 (0.0315)
0.75 - 0.79 (0.0295 - 0.0311)	0.84 (0.0331)
0.79 - 0.83 (0.0311 - 0.0327)	0.88 (0.0346)
0.83 - 0.87 (0.0327 - 0.0343)	0.92 (0.0362)
0.87 - 0.91 (0.0343 - 0.0358)	0.48 (0.0189) + 0.48 (0.0189)
0.91 - 0.95 (0.0358 - 0.0374)	0.48 (0.0189) + 0.52 (0.0205)
0.95 - 0.99 (0.0374 - 0.0390)	0.52 (0.0205) + 0.52 (0.0205)
0.99 - 1.03 (0.0390 - 0.0406)	0.52 (0.0205) + 0.56 (0.0220)
1.03 - 1.07 (0.0406 - 0.0421)	0.56 (0.0220) + 0.56 (0.0220)
1.07 - 1.11 (0.0421 - 0.0437)	0.56 (0.0220) + 0.60 (0.0236)
1.11 - 1.15 (0.0437 - 0.0453)	0.60 (0.0236) + 0.60 (0.0236)
1.15 - 1.19 (0.0453 - 0.0469)	0.60 (0.0236) + 0.64 (0.0252)
1.19 - 1.23 (0.0469 - 0.0484)	0.64 (0.0252) + 0.64 (0.0252)
1.23 - 1.27 (0.0484 - 0.0500)	0.64 (0.0252) + 0.68 (0.0268)
1.27 - 1.31 (0.0500 - 0.0516)	0.68 (0.0268) + 0.68 (0.0268)
1.31 - 1.35 (0.0516 - 0.0531)	0.68 (0.0268) + 0.72 (0.0283)
1.35 - 1.39 (0.0531 - 0.0547)	1.44 (0.0567)
1.39 - 1.43 (0.0547 - 0.0563)	0.72 (0.0283) + 0.76 (0.0299)
1.43 - 1.47 (0.0563 - 0.0579)	0.76 (0.0299) + 0.76 (0.0299)
1.47 - 1.51 (0.0579 - 0.0594)	0.76 (0.0299) + 0.80 (0.0315)
1.51 - 1.55 (0.0594 - 0.0610)	0.80 (0.0315) + 0.80 (0.0315)
1.55 - 1.59 (0.0610 - 0.0626)	0.80 (0.0315) + 0.84 (0.0331)
1.59 - 1.63 (0.0626 - 0.0642)	0.84 (0.0331) + 0.84 (0.0331)
1.63 - 1.67 (0.0642 - 0.0657)	0.84 (0.0331) + 0.88 (0.0346)
1.67 - 1.71 (0.0657 - 0.0673)	0.88 (0.0346) + 0.88 (0.0346)
1.71 - 1.75 (0.0673 - 0.0689)	0.88 (0.0346) + 0.92 (0.0362)
1.75 - 1.79 (0.0689 - 0.0705)	0.92 (0.0362) + 0.92 (0.0362)
1.79 - 1.83 (0.0705 - 0.0720)	0.44 (0.0173) + 1.44 (0.0567)
1.83 - 1.87 (0.0720 - 0.0736)	0.48 (0.0189) + 1.44 (0.0567)
1.87 - 1.91 (0.0736 - 0.0752)	0.52 (0.0205) + 1.44 (0.0567)
1.91 - 1.95 (0.0752 - 0.0768)	0.56 (0.0220) + 1.44 (0.0567)

REDUCTION GEAR

Bearing preload

Reduction gear bearing preload mm (in)	0.05 (0.0020)

Turning torque

Turning torque of reduction gear N·m (kg-cm, in-lb)	0.10 - 0.70 (1.0 - 7.1, 0.87 - 6.20)

Specifications and Adjustments (Cont'd)

Reduction gear bearing adjusting shims

Thickness mm (in)	Part number
1.74 (0.0685)	31438-31X16
1.78 (0.0701)	31438-31X17
1.82 (0.0717)	31438-31X18
1.86 (0.0732)	31438-31X19
1.90 (0.0748)	31438-31X20
1.92 (0.0756)	31439-31X60
1.94 (0.0764)	31438-31X21
1.96 (0.0772)	31439-31X61
1.98 (0.0780)	31438-31X22
2.00 (0.0787)	31439-31X62
2.02 (0.0795)	31438-31X23
2.04 (0.0803)	31439-31X63
2.06 (0.0811)	31438-31X24
2.08 (0.0819)	31439-31X64
2.10 (0.0827)	31438-31X60
2.12 (0.0835)	31439-31X65
2.14 (0.0843)	31438-31X61
2.16 (0.0850)	31439-31X66
2.18 (0.0858)	31438-31X62
2.20 (0.0866)	31439-31X67
2.22 (0.0874)	31438-31X63
2.24 (0.0882)	31439-31X68
2.26 (0.0890)	31438-31X64
2.28 (0.0898)	31439-31X69
2.30 (0.0906)	31438-31X65
2.34 (0.0921)	31438-31X66
2.38 (0.0937)	31438-31X67
2.42 (0.0953)	31438-31X68
2.46 (0.0969)	31438-31X69
2.50 (0.0984)	31438-31X70
2.54 (0.1000)	31438-31X71
2.58 (0.1016)	31438-31X72
2.62 (0.1031)	31438-31X73
2.66 (0.1047)	31438-31X74

Table for selecting reduction gear bearing adjusting shim

Unit: mm (in)

Dimension "T"	Suitable shim(s)
1.77 - 1.81 (0.0697 - 0.0713)	1.74 (0.0685)
1.81 - 1.85 (0.0713 - 0.0728)	1.78 (0.0701)
1.85 - 1.89 (0.0728 - 0.0744)	1.82 (0.0717)
1.89 - 1.93 (0.0744 - 0.0760)	1.86 (0.0732)
1.93 - 1.96 (0.0760 - 0.0772)	1.90 (0.0748)
1.96 - 1.98 (0.0772 - 0.0780)	1.92 (0.0756)
1.98 - 2.00 (0.0780 - 0.0787)	1.94 (0.0764)
2.00 - 2.02 (0.0787 - 0.0795)	1.96 (0.0772)
2.02 - 2.04 (0.0795 - 0.0803)	1.98 (0.0780)
2.04 - 2.06 (0.0803 - 0.0811)	2.00 (0.0787)
2.06 - 2.08 (0.0811 - 0.0819)	2.02 (0.0795)
2.08 - 2.10 (0.0819 - 0.0827)	2.04 (0.0803)
2.10 - 2.12 (0.0827 - 0.0835)	2.06 (0.0811)
2.12 - 2.14 (0.0835 - 0.0843)	2.08 (0.0819)
2.14 - 2.16 (0.0843 - 0.0850)	2.10 (0.0827)
2.16 - 2.18 (0.0850 - 0.0858)	2.12 (0.0835)
2.18 - 2.20 (0.0858 - 0.0866)	2.14 (0.0843)
2.20 - 2.22 (0.0866 - 0.0874)	2.16 (0.0850)
2.22 - 2.24 (0.0874 - 0.0882)	2.18 (0.0858)
2.24 - 2.26 (0.0882 - 0.0890)	2.20 (0.0866)
2.26 - 2.28 (0.0890 - 0.0898)	2.22 (0.0874)
2.28 - 2.30 (0.0898 - 0.0906)	2.24 (0.0882)
2.30 - 2.32 (0.0906 - 0.0913)	2.26 (0.0890)
2.32 - 2.34 (0.0913 - 0.0921)	2.28 (0.0898)
2.34 - 2.37 (0.0921 - 0.0933)	2.30 (0.0906)
2.37 - 2.41 (0.0933 - 0.0949)	2.34 (0.0921)
2.41 - 2.45 (0.0949 - 0.0965)	2.38 (0.0937)
2.45 - 2.49 (0.0965 - 0.0980)	2.42 (0.0953)
2.49 - 2.53 (0.0980 - 0.0996)	2.46 (0.0969)
2.53 - 2.57 (0.0996 - 0.1012)	2.50 (0.0984)
2.57 - 2.61 (0.1012 - 0.1028)	2.54 (0.1000)
2.61 - 2.65 (0.1028 - 0.1043)	2.58 (0.1016)
2.65 - 2.69 (0.1043 - 0.1059)	2.62 (0.1031)
2.69 - 2.73 (0.1059 - 0.1075)	2.66 (0.1047)

OUTPUT SHAFT

Seal ring clearance

Output shaft seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

End play

Output shaft end play mm (in)	0 - 0.5 (0 - 0.020)

Output shaft adjusting shims

Thickness mm (in)	Part number
0.56 (0.0220)	31438-31X46
0.96 (0.0378)	31438-31X47
1.36 (0.0535)	31438-31X48

BEARING RETAINER

Seal ring clearance

Bearing retainer seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

TOTAL END PLAY

Total end play mm (in)	0.25 - 0.55 (0.0098 - 0.0217)

Bearing race for adjusting total end play

Thickness mm (in)	Part number
0.6 (0.024)	31435-31X01
0.8 (0.031)	31435-31X02
1.0 (0.039)	31435-31X03
1.2 (0.047)	31435-31X04
1.4 (0.055)	31435-31X05
1.6 (0.063)	31435-31X06
1.8 (0.071)	31435-31X07
2.0 (0.079)	31435-31X08

REVERSE CLUTCH END PLAY

Reverse clutch end play mm (in)	0.65 - 1.00 (0.0256 - 0.0394)

Thrust washers for adjusting reverse clutch end play

Thickness mm (in)	Part number
0.65 (0.0256)	31508-31X00
0.80 (0.0315)	31508-31X01
0.95 (0.0374)	31508-31X02
1.10 (0.0433)	31508-31X03
1.25 (0.0492)	31508-31X04
1.40 (0.0551)	31508-31X05

ACCUMULATOR

O-ring

Unit: mm (in)

Accumulator	Diameter (Small)	Diameter (Large)
Servo release accumulator	26.9 (1.059)	44.2 (1.740)
N-D accumulator	34.6 (1.362)	39.4 (1.551)

Return spring

Unit: mm (in)

Accumulator		Free length	Outer diameter
Servo release accumulator spring	Outer	52.5 (2.067)	21.1 (0.831)
	Inner	52.0 (2.047)	13.1 (0.516)
N-D accumulator spring		45.0 (1.772)	27.6 (1.087)

BAND SERVO

Return spring

Unit: mm (in)

Return spring	Free length	Outer diameter
2nd servo return spring	32.5 (1.280)	25.9 (1.020)
OD servo return spring	31.0 (1.220)	21.7 (0.854)

REMOVAL AND INSTALLATION

Unit: mm (in)

Distance between end of converter housing and torque converter	15.9 (0.626) or more

AUTOMATIC TRANSAXLE

SECTION AT

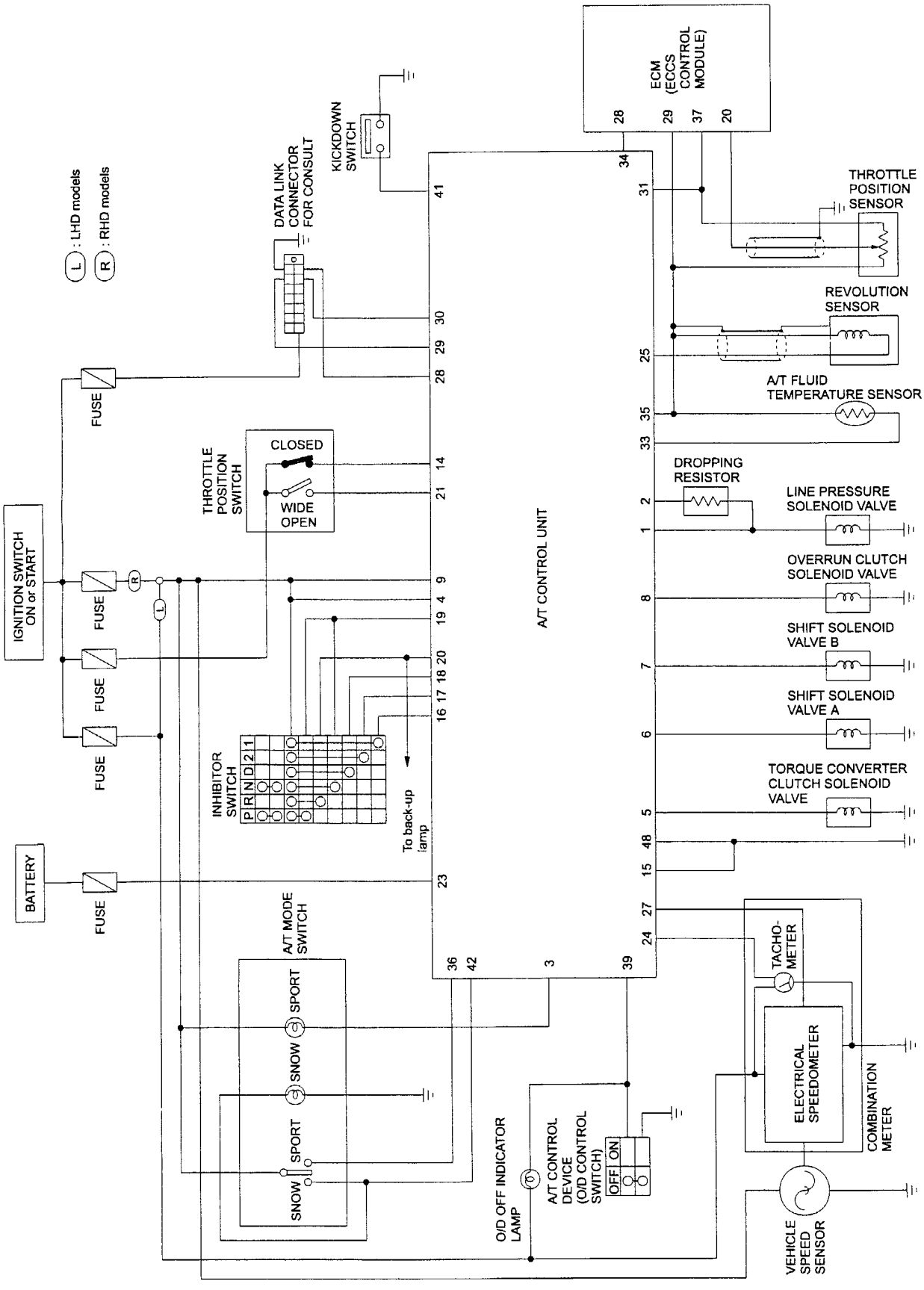
CONTENTS

TROUBLE DIAGNOSES 2002
Circuit Diagram for Quick Pinpoint Check 2002
Wiring Diagram — AT — 2003
Self-diagnosis 2009
Diagnostic Procedure 1 2013
Electrical Components Inspection 2014

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".

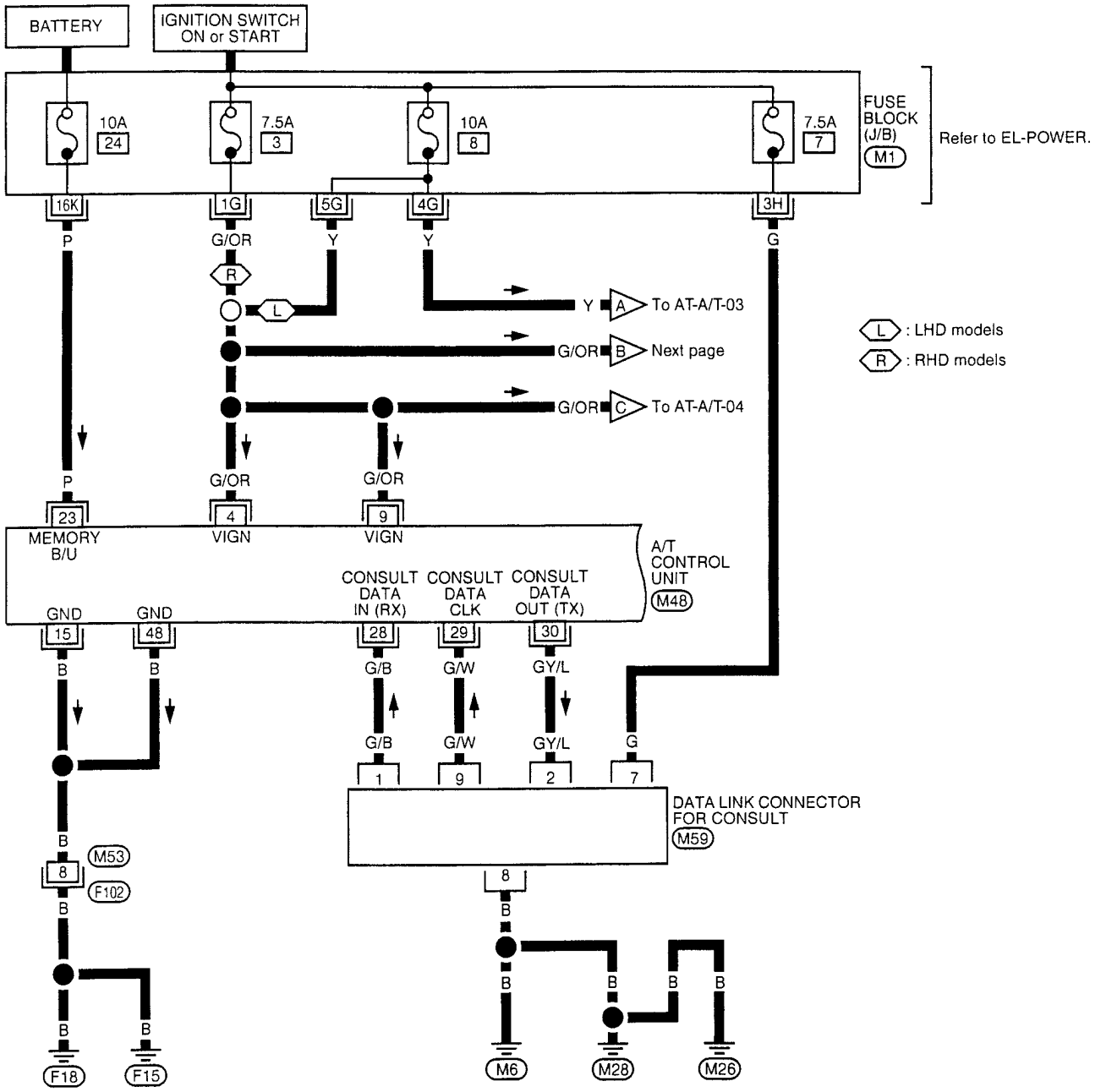
Circuit Diagram for Quick Pinpoint Check

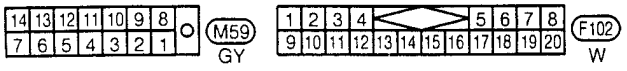


YAT092

Wiring Diagram — AT —

AT-A/T-01





Refer to last page (Foldout page).
M1
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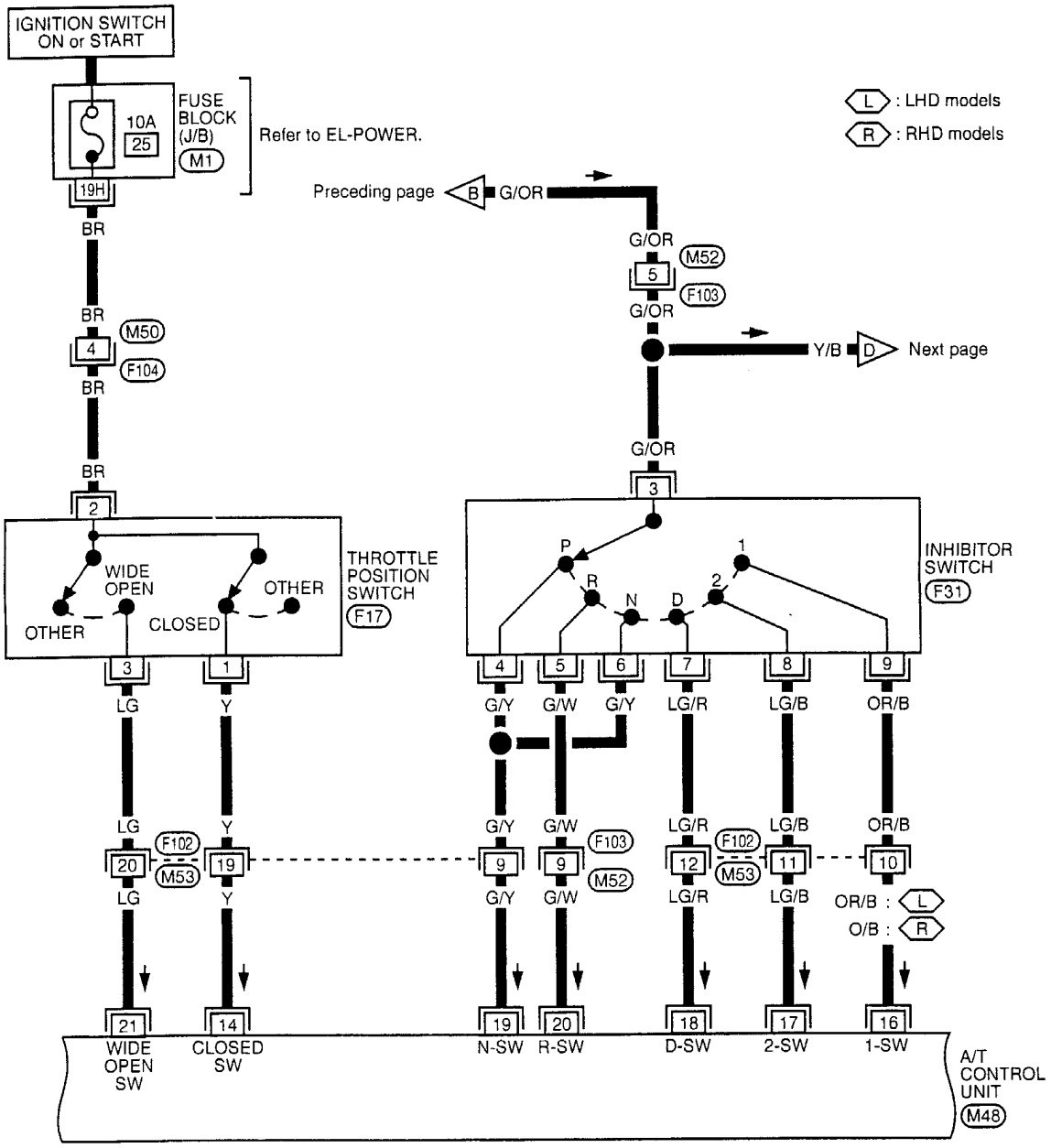
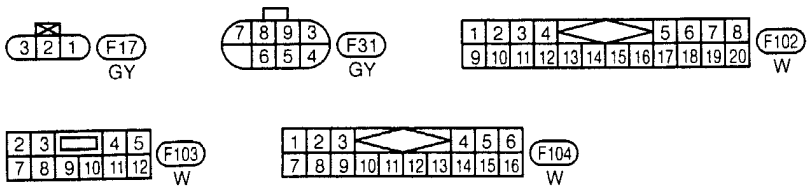
YAT093

Wiring Diagram — AT — (Cont'd)

AT-A/T-02





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M1

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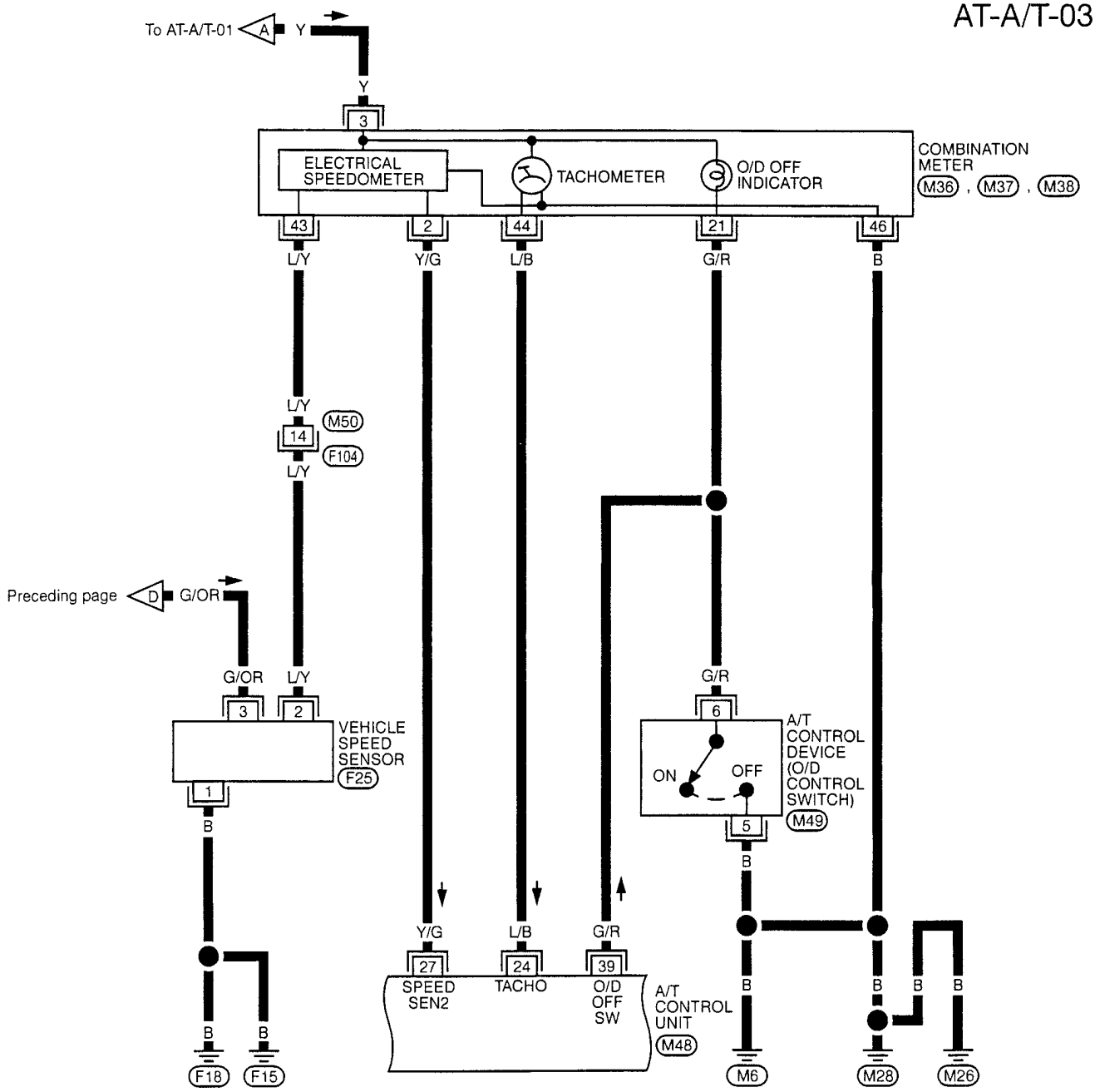
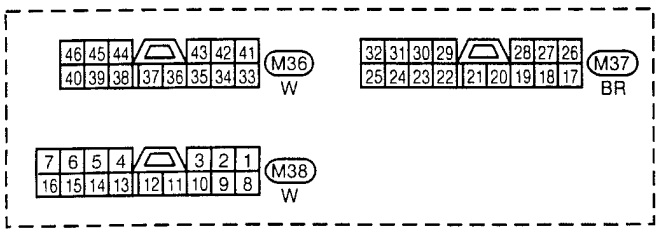
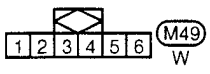
YAT094

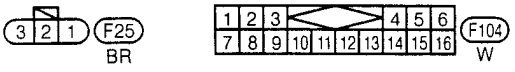
Wiring Diagram — AT — (Cont'd)

AT-A/T-03









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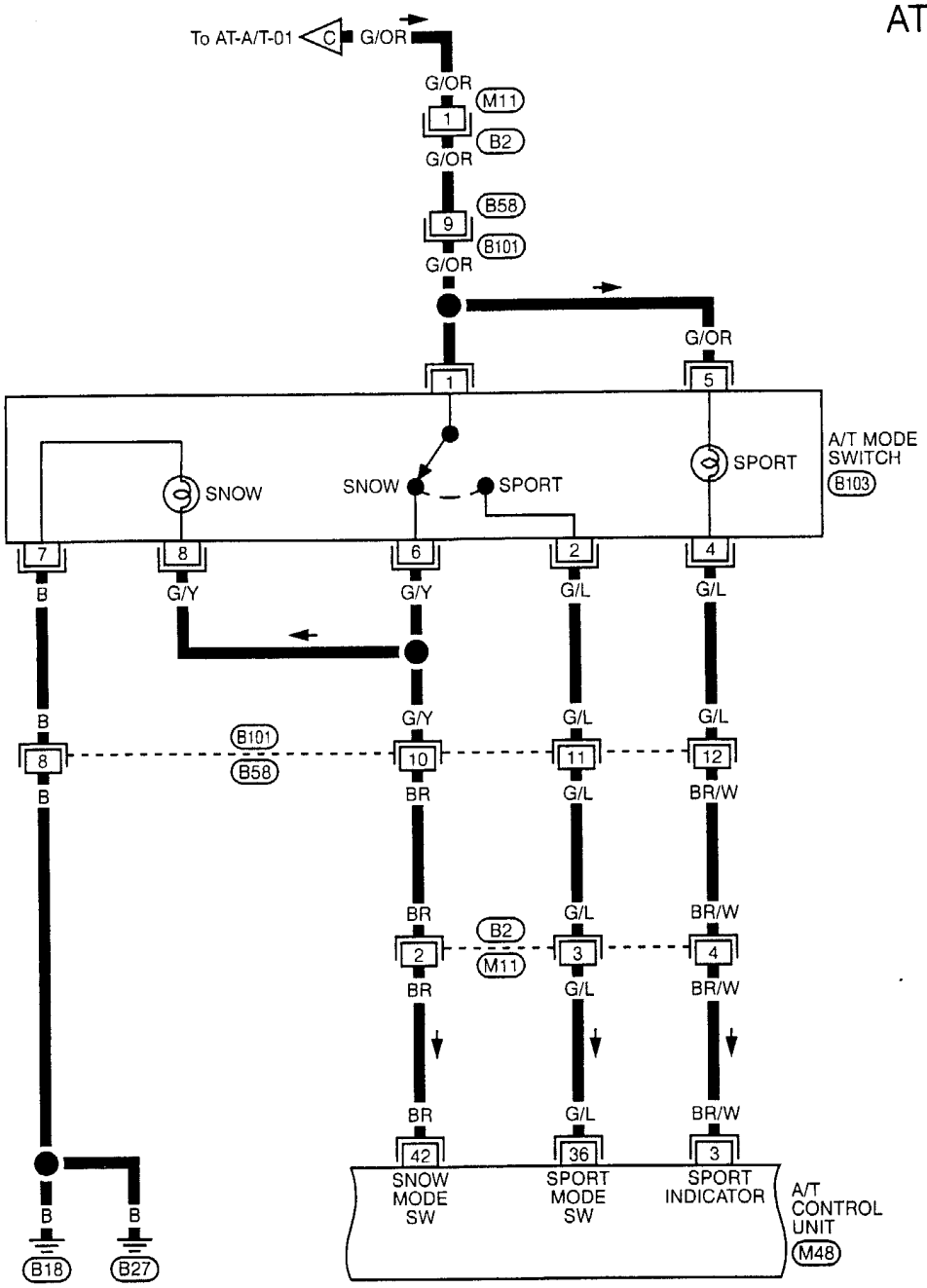
YAT095

Wiring Diagram — AT — (Cont'd)

AT-A/T-04



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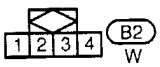
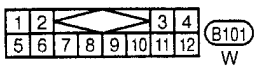
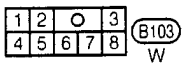


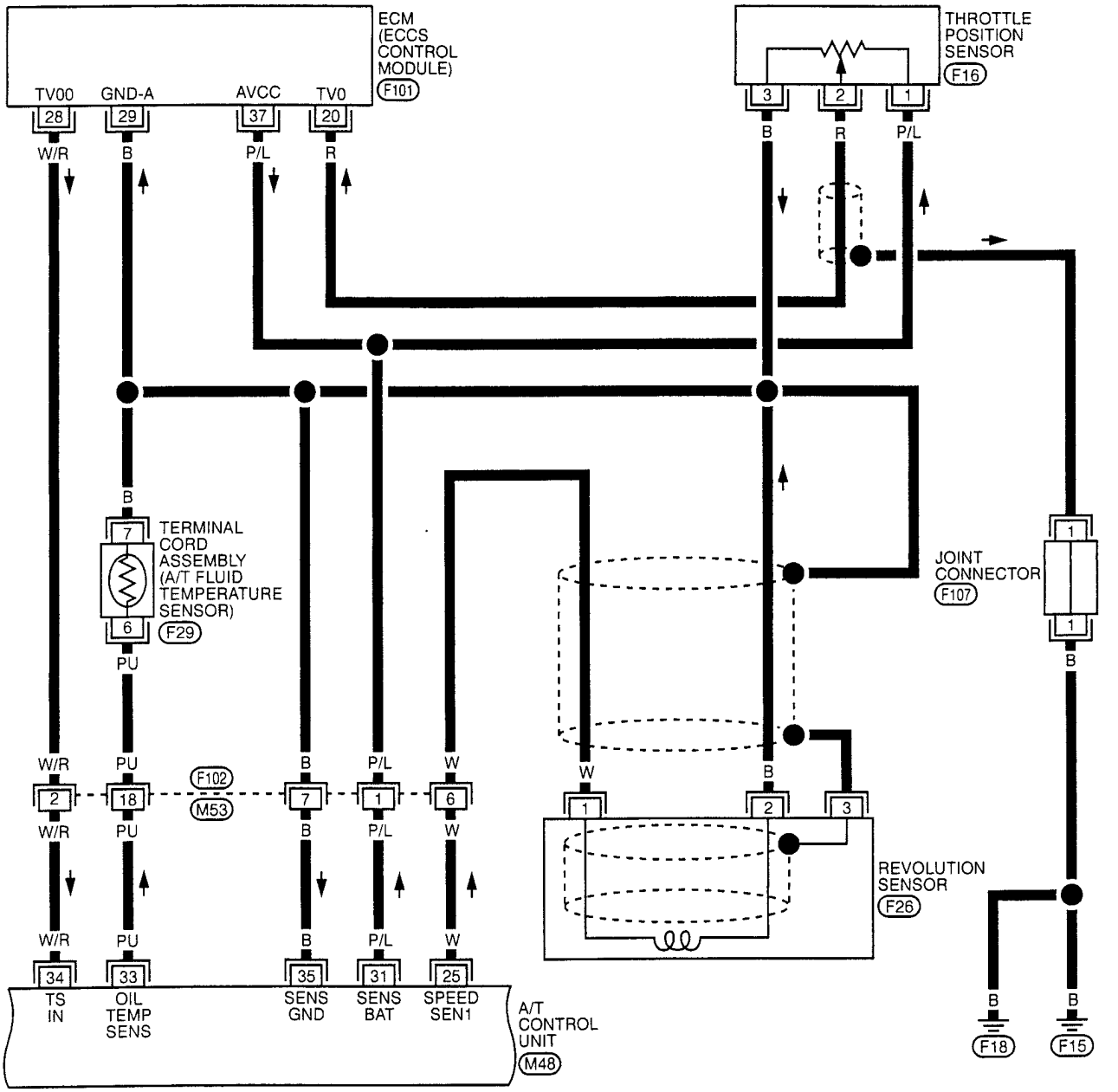


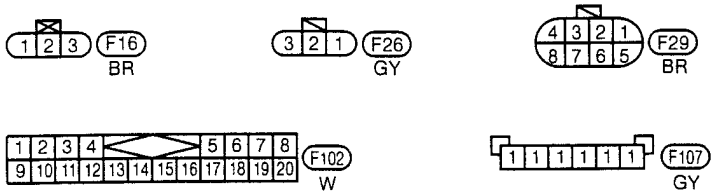


YAT096

Wiring Diagram — AT — (Cont'd)

AT-A/T-05





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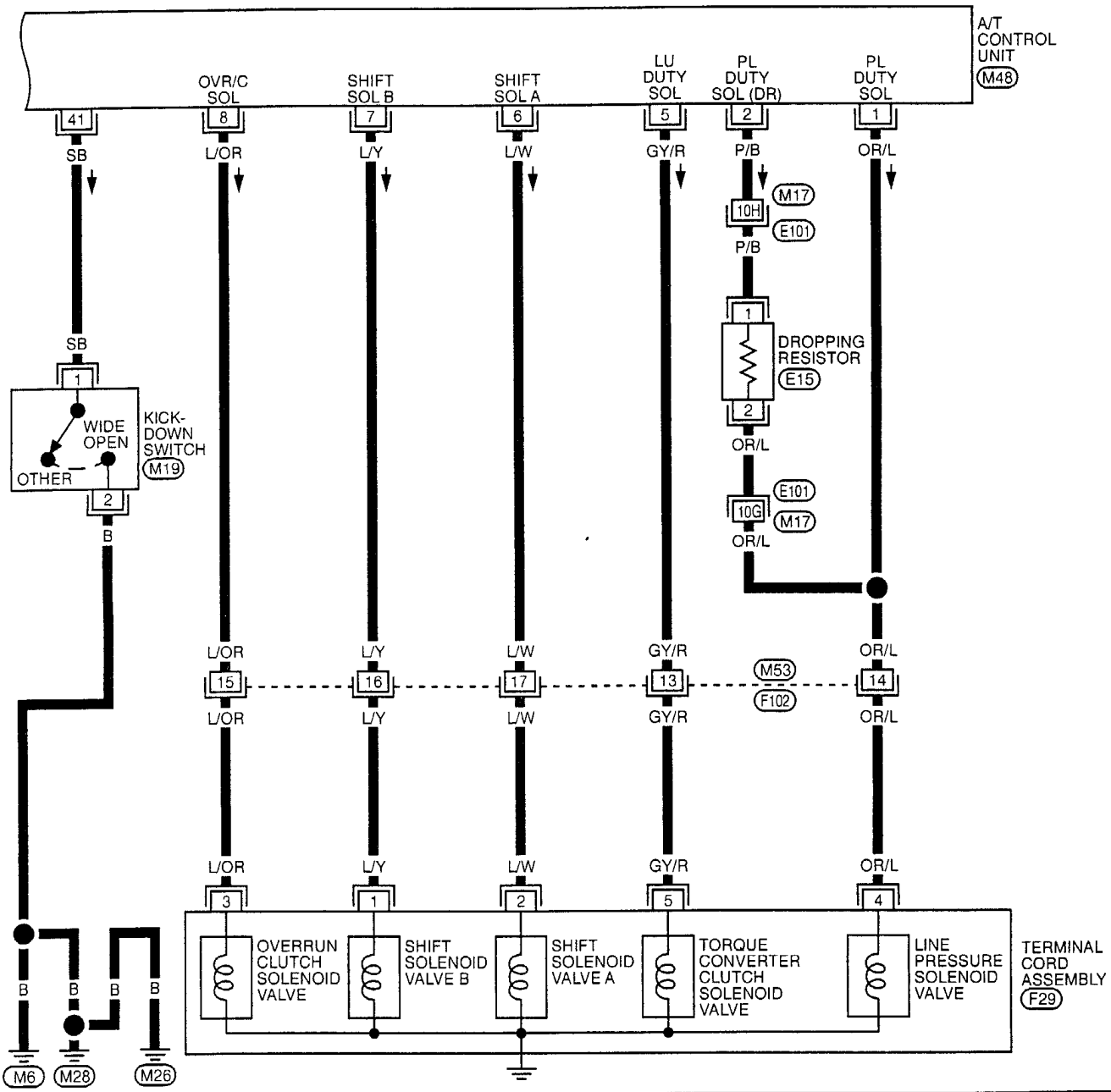
F101

YAT097

Wiring Diagram — AT — (Cont'd)

AT-A/T-06



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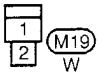
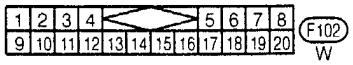
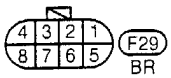






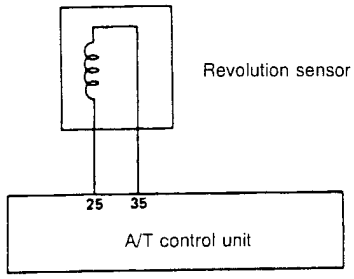
YAT098

A

☆ MONITOR	☆ NO FAIL
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.6V
FLUID TEMP SE	1.6V
BATTERY VOLT	12.0V
ENGINE SPEED	384rpm
OVERDRIVE SW	OFF
P/N POSI SW	ON
R POSITION SW	OFF

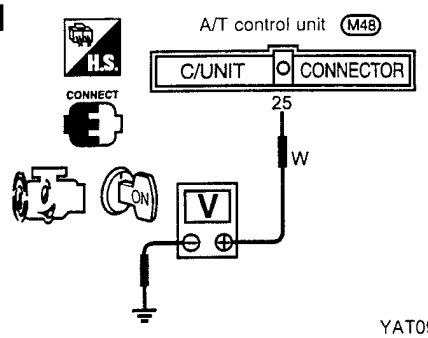
RECORD

CMNV02



SAT405C

A



YAT099

Self-diagnosis

CHECK REVOLUTION SENSOR. — Refer to "Electrical Components Inspection".

NG → Repair or replace revolution sensor.

OK ↓

A

CHECK INPUT SIGNAL.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "VHCL/S SE·A/T" ("CAR/S SE1·A/T") while driving. Check the value changes according to driving speed.

OR

1. Start engine.
2. Check voltage between A/T control unit connector terminal (25) and ground while driving. (Measure with AC range.)

Voltage:

At 0 km/h (0 mph):
0V
At 30 km/h (19 mph):
1V or more
(Voltage rises gradually in response to vehicle speed.)

NG → Check the following items:
- Harness connectors (M53) and (F102)
- Harness continuity between A/T control unit and revolution sensor (Main harness)
- Harness continuity between revolution sensor and ECM (Main harness)
- Ground circuit for ECM — Refer to EC section.

If NG, repair harness or connectors.

OK ↓

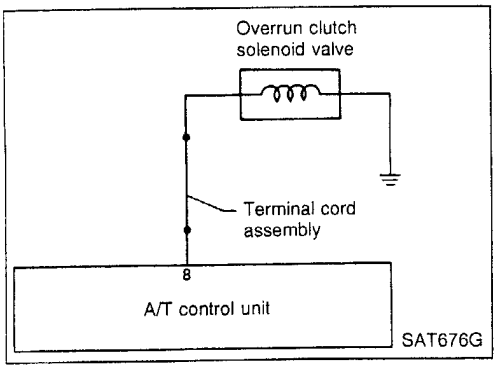
Perform self-diagnosis again after driving for a while.

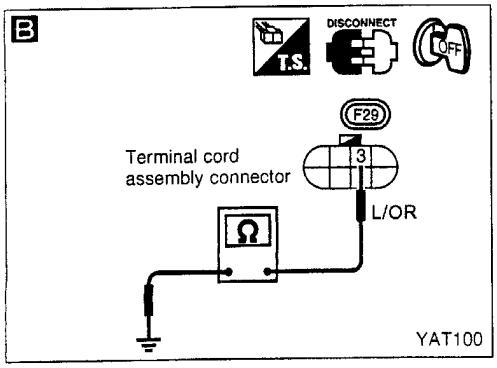
NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

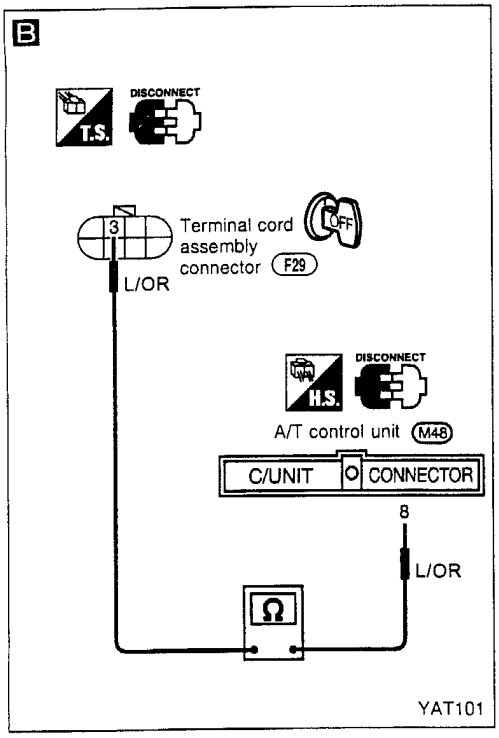
OK ↓

INSPECTION END

Self-diagnosis (Cont'd)







A

CHECK GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal cord assembly connector terminal ③ and ground.
   Resistance: 20 - 30 Ω

NG →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE", AT-101.
2. Check the following items:
   - Harness connectors M53 and F102
   - Overrun clutch solenoid valve. — Refer to "Electrical Components Inspection".
   - Harness continuity of terminal cord assembly

If NG, repair harness or connectors.

OK ↓

B

CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect A/T control unit harness connector.
3. Check resistance between terminal cord assembly connector terminal ③ and A/T control unit connector terminal ⑧.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

NG → Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

OK ↓

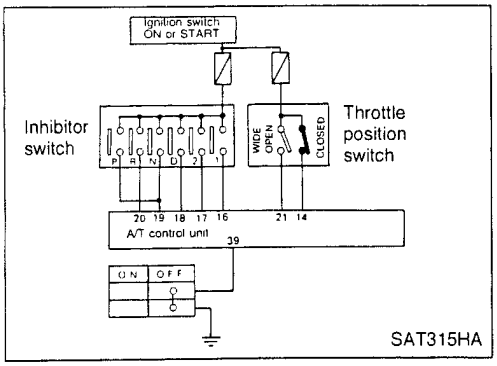
Perform self-diagnosis after driving for a while.

NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

Self-diagnosis (Cont'd)



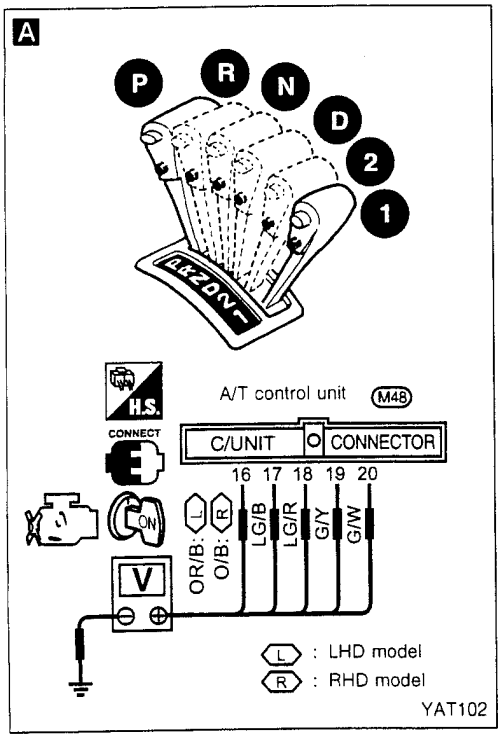
A

☆ MONITOR	☆ NO FAIL
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.6V
FLUID TEMP SE	1.6V
BATTERY VOLT	12.0V
ENGINE SPEED	384rpm
OVERDRIVE SW	OFF
P/N POSI SW	ON
R POSITION SW	OFF

RECORD

CMNV02

A



A

CHECK INHIBITOR SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "R, N, D, 1 and 2 POSITION SWITCHES" ("N, R, D, 2 and 1-RANGE SW") moving selector lever to each position. Check the signal of the selector lever position is indicated properly.

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between A/T control unit connector terminals ⑯, ⑰, ⑱, ⑲, ⑳ and ground while moving selector lever through each position.

Voltage:
B: Battery voltage
0: 0V

Lever position	Terminal No.				
	⑲	⑳	⑱	⑰	⑯
P, N	**B**	0	0	0	0
R	0	**B**	0	0	0
D	0	0	**B**	0	0
2	0	0	0	**B**	0
1	0	0	0	0	**B**

OK → Ⓐ

NG → Check the following items:

- 7.5A fuse in fuse block 3 (RHD models).
- 10A fuse in fuse block 8 (LHD models).
- Harness connectors M53, F102 and M52, F103
- Condition and operation of ignition switch.
- Inhibitor switch — Refer to "Electrical Components Inspection".
- Harness continuity between ignition switch and inhibitor switch (Main harness)
- Harness continuity between inhibitor switch and A/T control unit (Main harness)

Self-diagnosis (Cont'd)

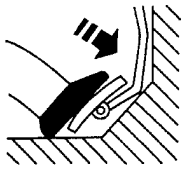
C

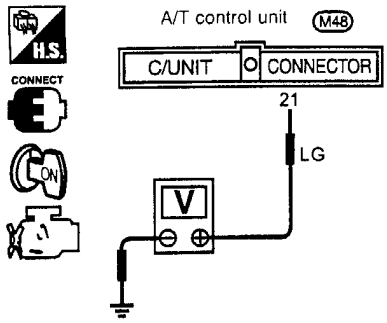
☆ MONITOR	☆ NO FAIL
D POSITION SW	OFF
2 POSITION SW	OFF
1 POSITION SW	OFF
ASCD•CRUISE	OFF
ASCD•OD CUT	OFF
KICKDOWN SW	OFF
POWERSHIFT SW	OFF
CLOSED THL/SW	OFF
W/O THRL/P-SW	OFF

RECORD

CMND01

C





YAT103

Ⓐ

C

CHECK THROTTLE POSITION SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "CLOSED THL/SW" and "W/O THRL/P-SW" depressing and releasing accelerator pedal.
   Check the signal of throttle position switch is indicated correctly.

Accelerator pedal condition	Data monitor	
	CLOSED THL/SW	W/O THRL/P-SW
Released	ON	OFF
Fully depressed	OFF	ON

OR

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Check voltage between A/T control unit terminal ⑭, ㉑ and ground while depressing, and releasing accelerator pedal slowly.
   (after warming up engine)

Accelerator pedal condition	Voltage	
	Terminal No. ⑭	Terminal No. ㉑
Released	Battery voltage	1V or less
Fully depressed	1V or less	Battery voltage

NG → Check the following items:
- Throttle position switch Refer to "Electrical Components Inspection".
- Harness for short or open between throttle position switch and A/T control unit (Main harness)
- 10A fuse is fuse block 25.
- Harness connectors M53, F102 and M50, F104.
- Condition and operation of ignition switch.

If NG, replace 10A fuse or throttle position switch or repair ignition switch, harness or connectors.

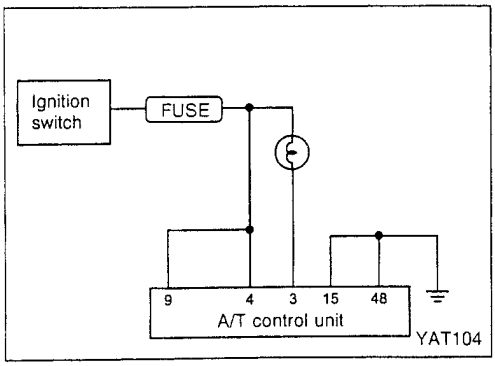
OK ↓

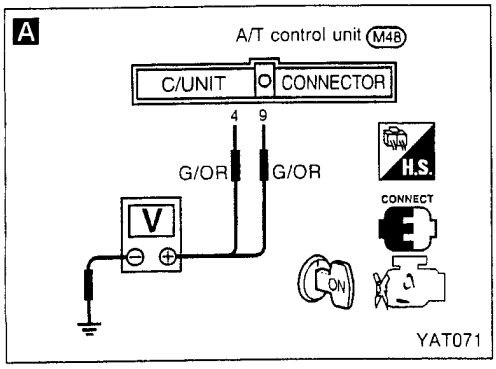
Perform self-diagnosis again after driving for a while.

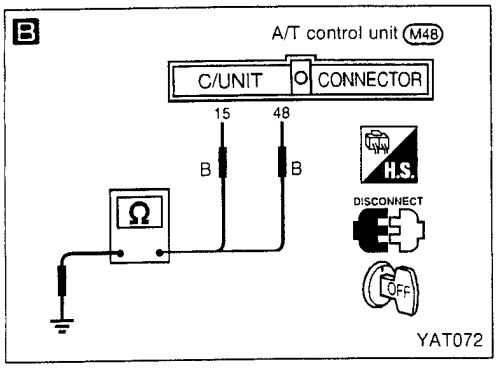
NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

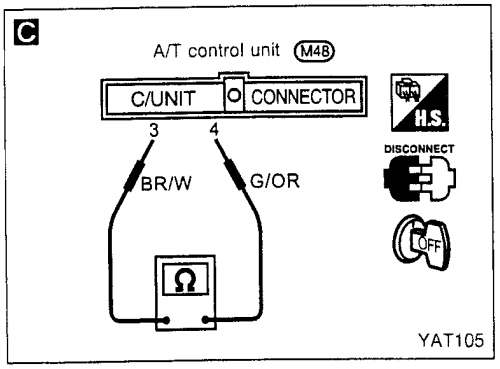
OK ↓

INSPECTION END









Diagnostic Procedure 1

SYMPTOM:
SPORT indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON".

A

CHECK A/T CONTROL UNIT POWER SOURCE.
1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between A/T control unit connector terminals ④, ⑨ and ground.
   Battery voltage should exist.

NG → Check the following items:
- 7.5A fuse in fuse block 3 (RHD models).
- 10A fuse in fuse block 8 (LHD models).
- Harness continuity between ignition switch and A/T control unit (Main harness)
- Ignition switch — Refer to EL section.

OK ↓

B

CHECK A/T CONTROL UNIT GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect A/T control unit harness connector.
3. Check resistance between A/T control unit connector terminals ⑮, ㊽ and ground.
   Resistance:
   Approximately 0Ω

NG → Check the following:
- Harness continuity between A/T control unit and ground.
- Harness connectors M53 and F102.

If NG, repair harness or connectors.

OK ↓

C

CHECK LAMP CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Check resistance between A/T control unit connectors terminals ③ and ④.
   Resistance: 50 - 100Ω
3. Reinstall any part removed.

NG → Check the following items:
- Harness connectors M13, B3 and B58, B101
- SPORT indicator lamp — Refer to EL section.
- Harness continuity between ignition switch and SPORT indicator lamps (Main harness)
- Harness continuity between SPORT indicator lamp and A/T control unit

If NG, replace fuses, SPORT indicator lamp or repair harness or connectors.

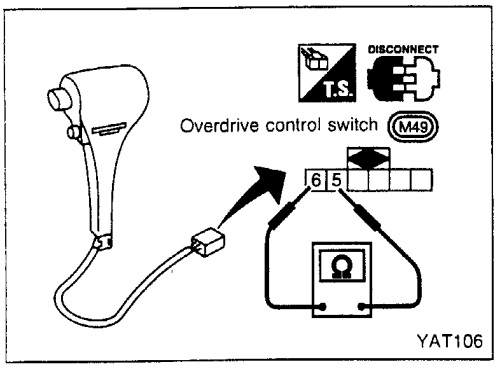
OK ↓

Check again.

NG →
1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

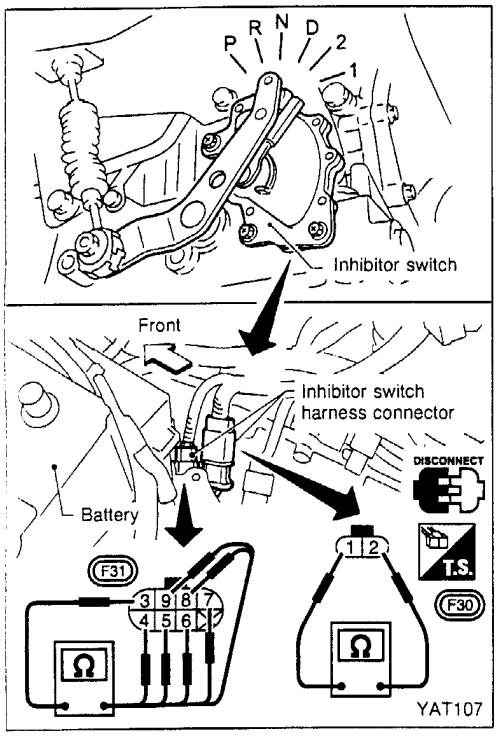


Electrical Components Inspection

OVERDRIVE CONTROL SWITCH

- Check continuity between two terminals.

OD switch position	Continuity
ON	No
OFF	Yes

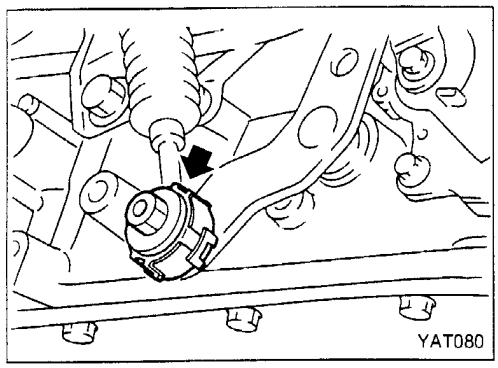


INHIBITOR SWITCH

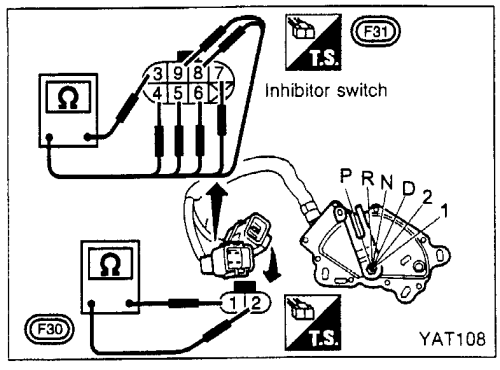
1. Check continuity between inhibitor switch terminals ① and ②; and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each position.

Lever position	Terminal No.	
P	③ — ④	① — ②
R	③ — ⑤	
N	③ — ⑥	① — ②
D	③ — ⑦	
2	③ — ⑧	
1	③ — ⑨	

Continuity should exist only between terminals indicated, for each lever position.



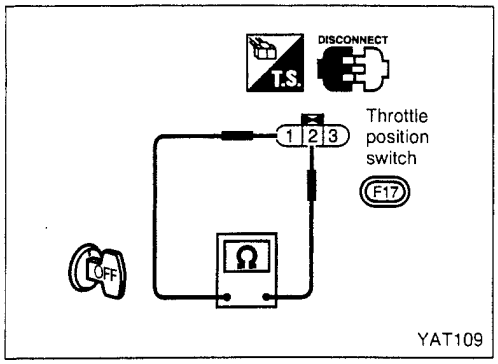
2. If NG, check again with control cable disconnected from manual shaft of A/T assembly. — Refer to step 1.
3. If OK on step 2, adjust control cable. — Refer to "ON-VEHICLE SERVICE".



4. If NG on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminals. — Refer to step 1.
5. If OK on step 4, adjust inhibitor switch. — Refer to "ON-VEHICLE SERVICE".
6. If NG on step 4, replace inhibitor switch.

Electrical Components Inspection (Cont'd)

THROTTLE POSITION SWITCH



Closed throttle position switch (idle position)

- Check continuity between throttle position switch terminals ③ and ②.

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

- To adjust closed throttle position switch perform "Basic Inspection", "TROUBLE DIAGNOSIS-Basic Inspection" in EC-section.

<SUPPLEMENT-III> (For wagon models)

AUTOMATIC TRANSAXLE

SECTION AT

CONTENTS

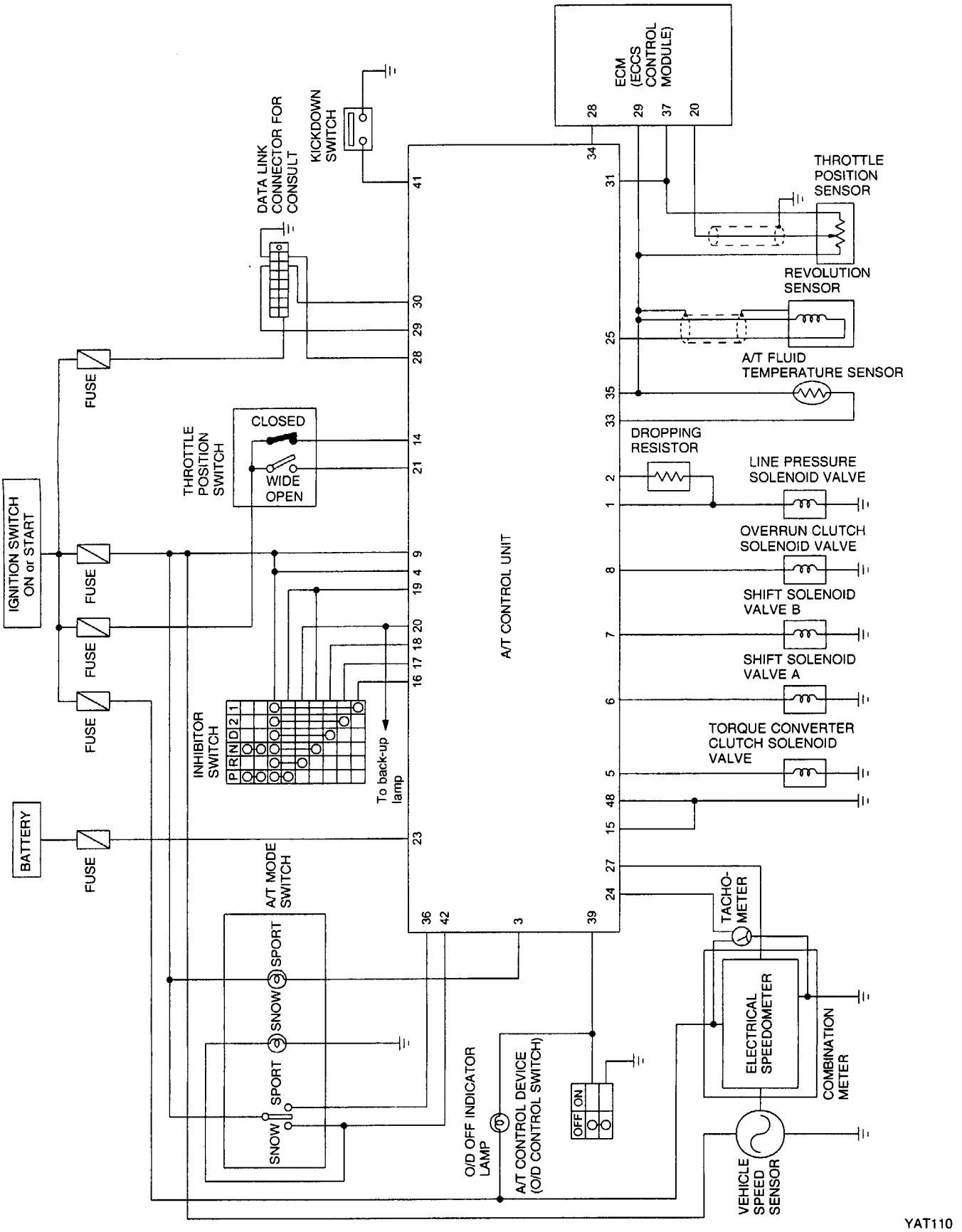
TROUBLE DIAGNOSES 3002
Circuit Diagram for Quick Pinpoint Check..... 3002
Wiring Diagram — AT — 3003
Diagnostic Procedure 1 3009

AT

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".

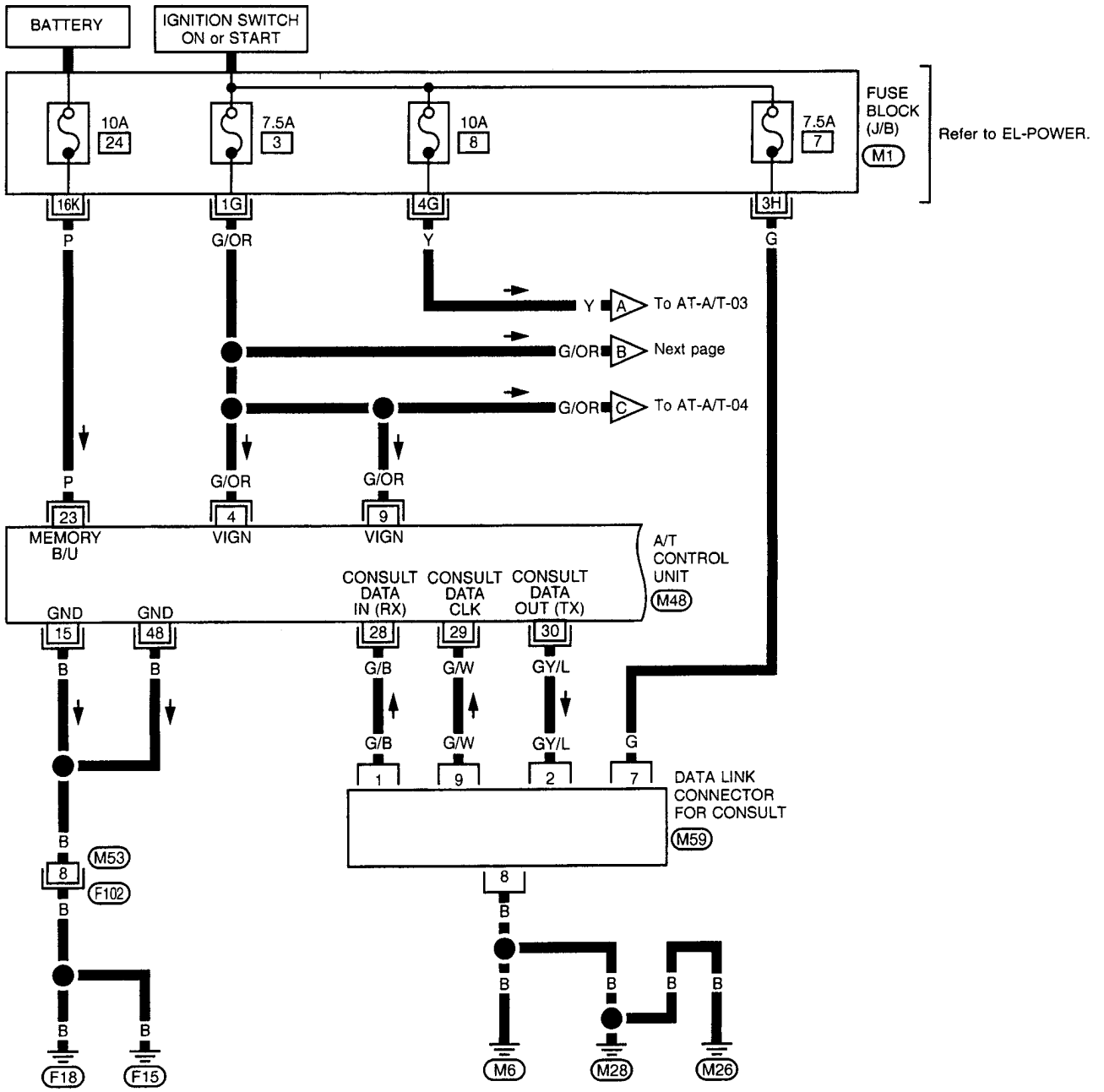
Circuit Diagram for Quick Pinpoint Check

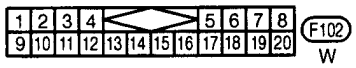


YAT110

Wiring Diagram — AT —

AT-A/T-01





Refer to last page (Foldout page).

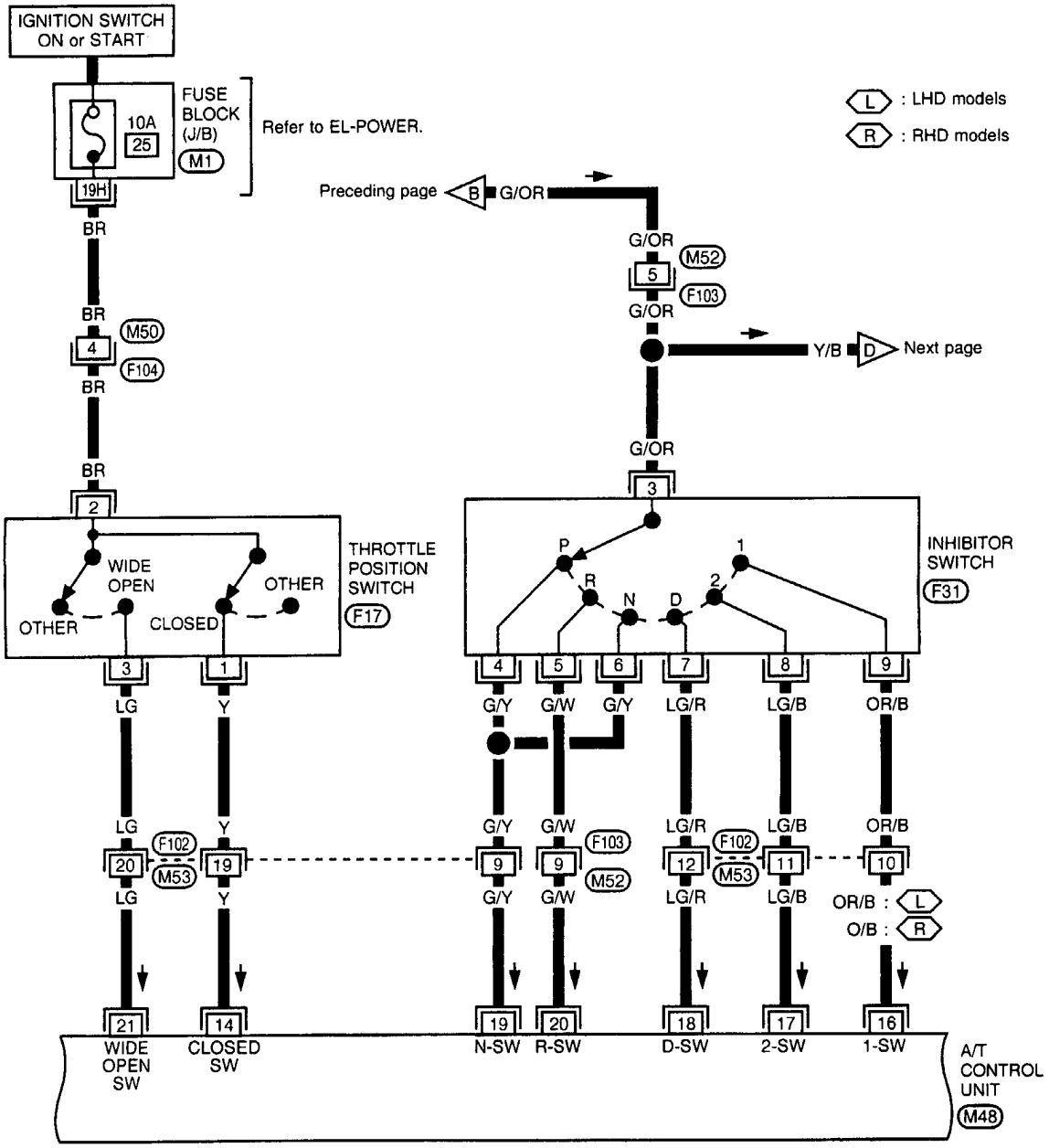
M1

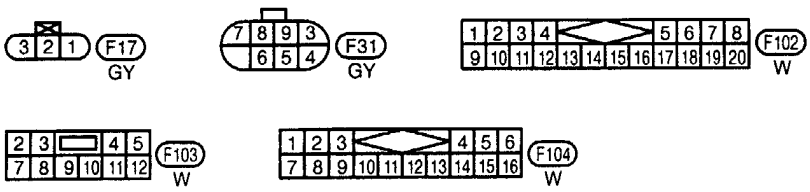
M48

YAT111

Wiring Diagram — AT — (Cont'd)

AT-A/T-02





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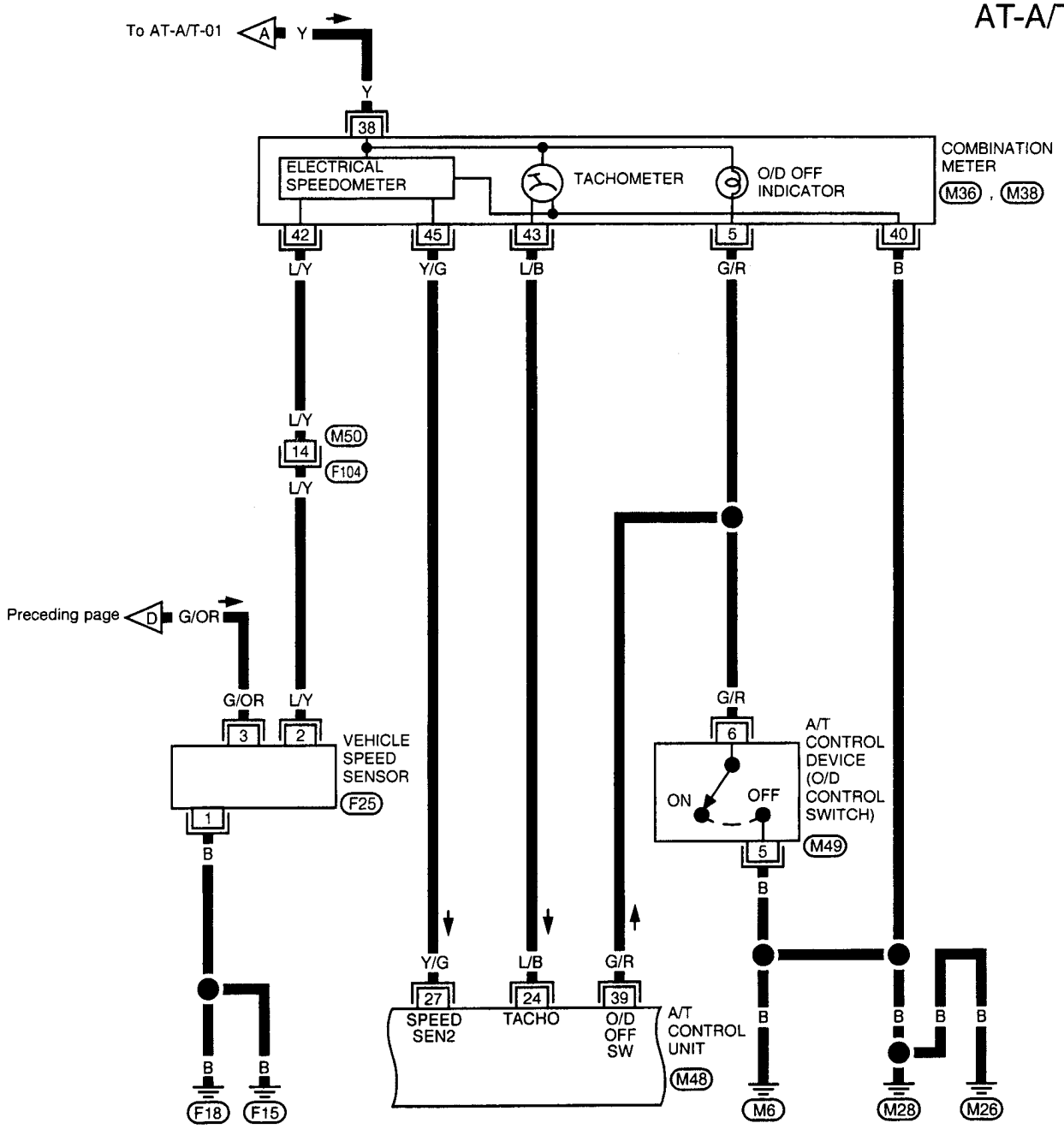
M1

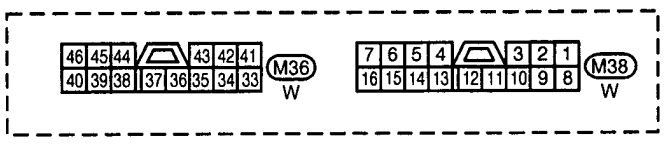
M48

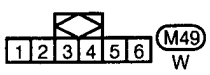
YAT094

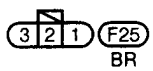
Wiring Diagram — AT — (Cont'd)

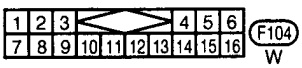
AT-A/T-03











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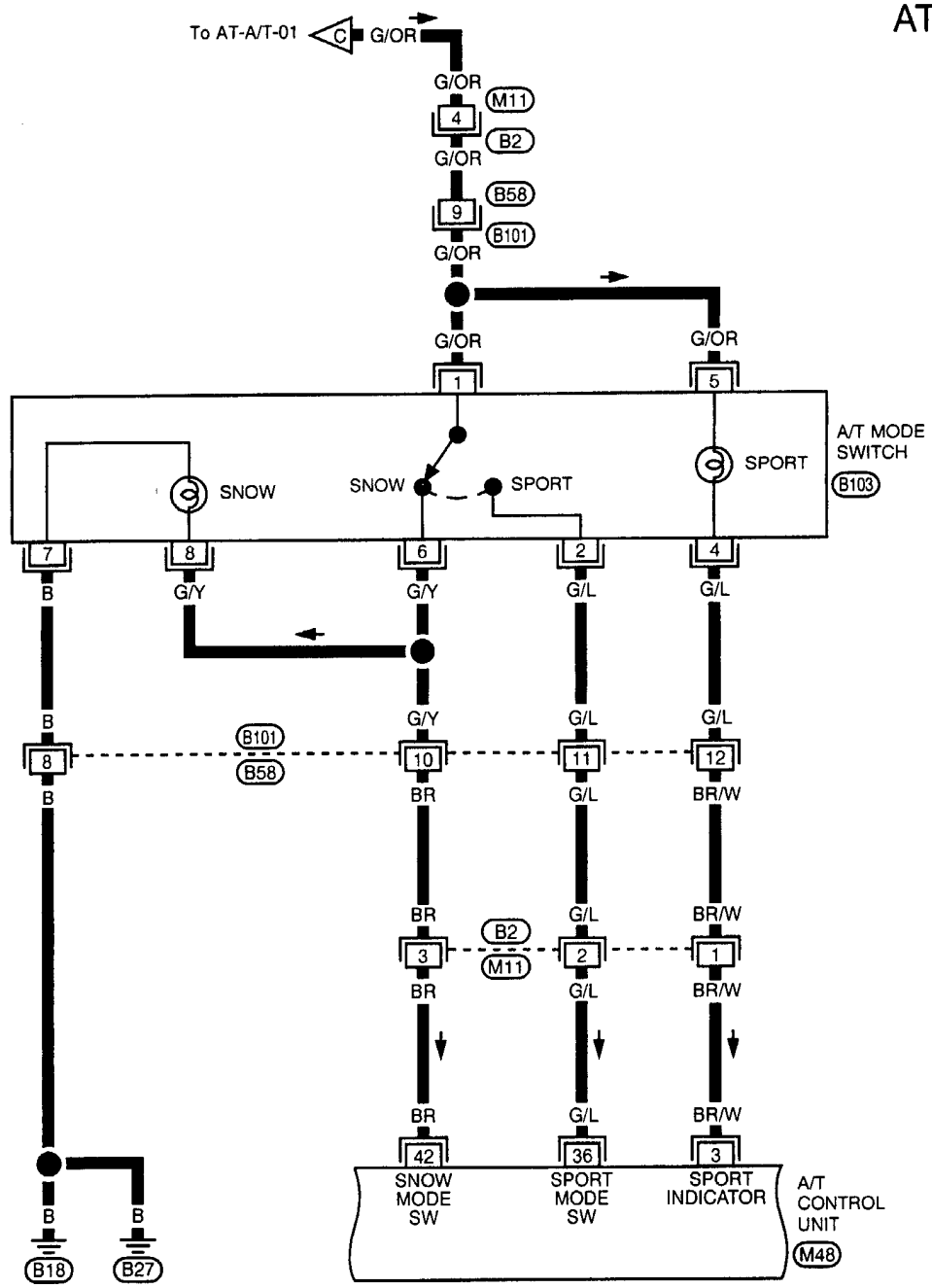
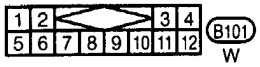
M48

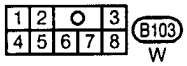
YAT112

Wiring Diagram — AT — (Cont'd)

AT-A/T-04







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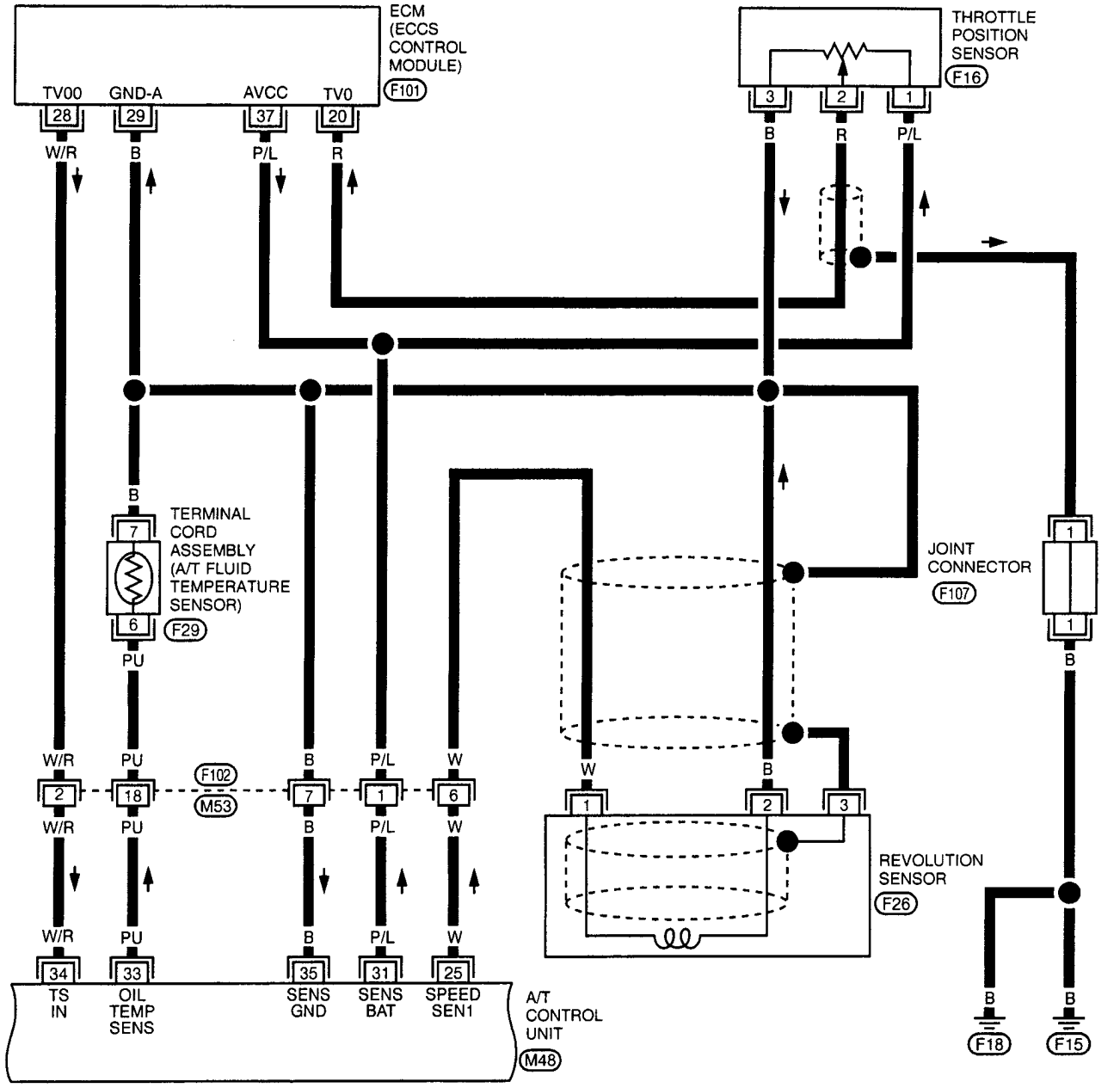
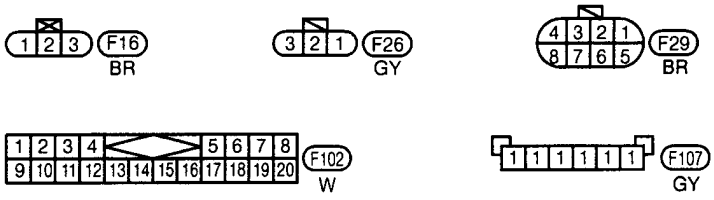
M48

YAT113

Wiring Diagram — AT — (Cont'd)

AT-A/T-05





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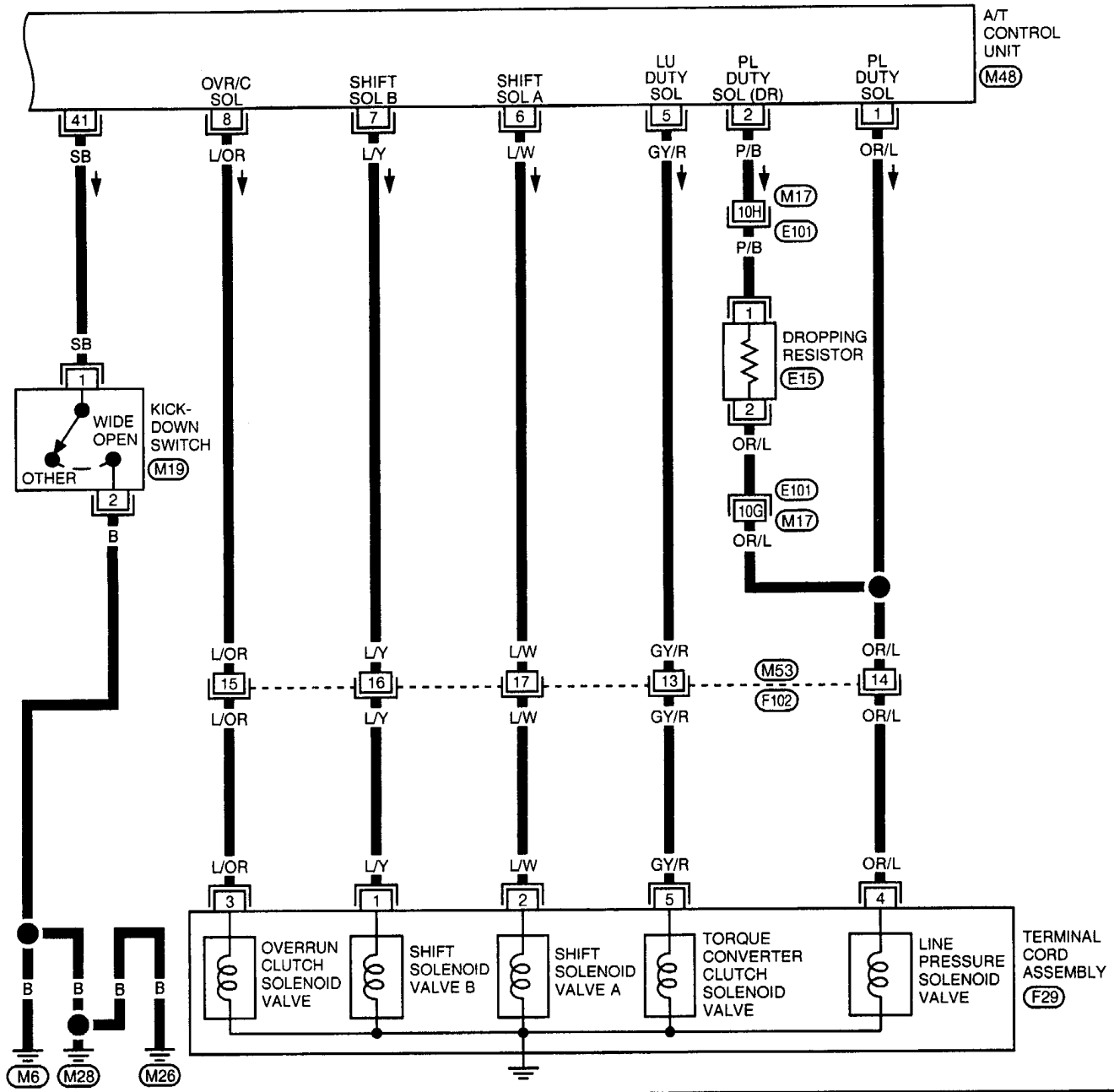
M48

F101

YAT097

Wiring Diagram — AT — (Cont'd)

AT-A/T-06



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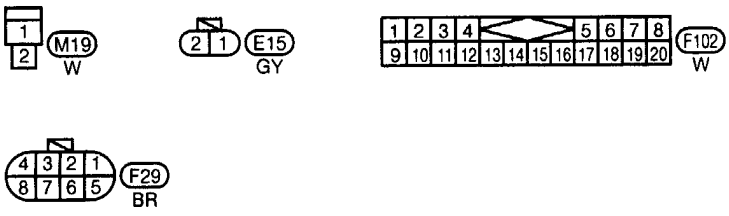
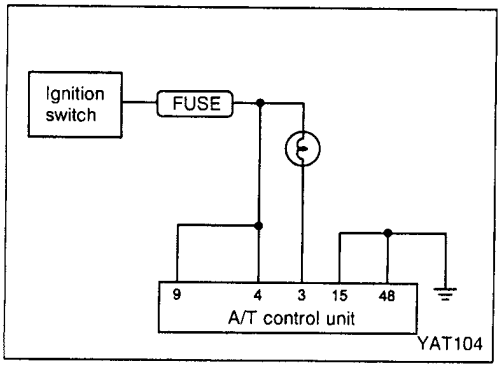
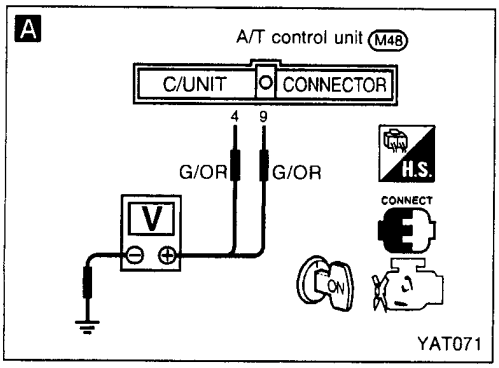
M17 , E101

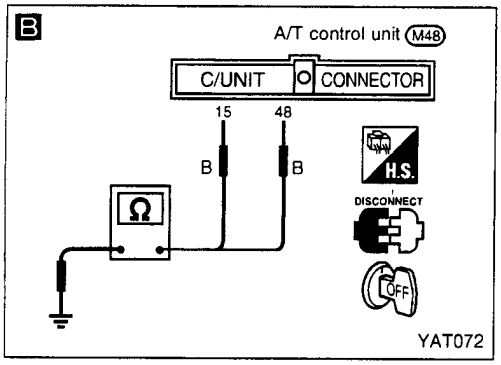
M48

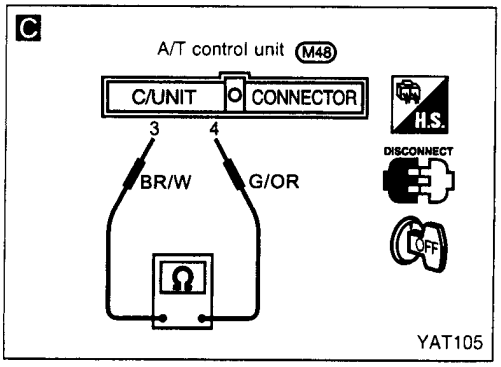


YAT098









Diagnostic Procedure 1

SYMPTOM:

SPORT indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON".

A

CHECK A/T CONTROL UNIT POWER SOURCE.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between A/T control unit connector terminals ④, ⑨ and ground.

Battery voltage should exist.

NG → Check the following items:
- 7.5A fuse in fuse block [3].
- Harness continuity between ignition switch and A/T control unit (Main harness)
- Ignition switch — Refer to EL section.

OK ↓

B

CHECK A/T CONTROL UNIT GROUND CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Disconnect A/T control unit harness connector.
3. Check resistance between A/T control unit connector terminals ⑮, ㊽ and ground.

Resistance:

Approximately 0Ω

NG → Check the following:
- Harness continuity between A/T control unit and ground.
- Harness connectors (M53) and (F102).

If NG, repair harness or connectors.

OK ↓

C

CHECK LAMP CIRCUIT.

1. Turn ignition switch to "LOCK" position.
2. Check resistance between A/T control unit connectors terminals ③ and ④.

Resistance: 50 - 100Ω

3. Reinstall any part removed.

NG → Check the following items:
- Harness connectors (M13), (B3) and (B58), (B101)
- SPORT indicator lamp — Refer to EL section.
- Harness continuity between ignition switch and SPORT indicator lamps (Main harness)
- Harness continuity between SPORT indicator lamp and A/T control unit

If NG, replace fuses, SPORT indicator lamp or repair harness or connectors.

OK ↓

Check again.

NG → 1. Perform A/T control unit input/output signal inspection.
2. If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

FRONT AXLE & FRONT SUSPENSION

SECTION FA

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<COMBINED EDITION>

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- Special Service Tools 1

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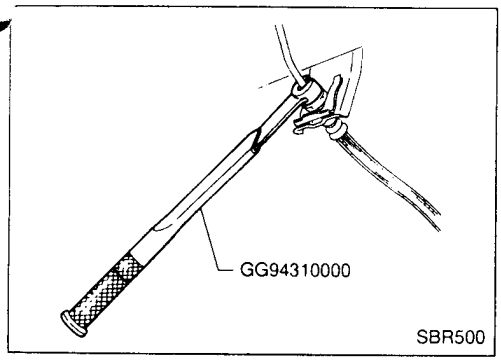
NO CHANGES

<SUPPLEMENT-II>

NO CHANGES

<SUPPLEMENT-III> (For wagon models)

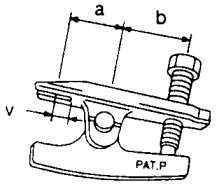
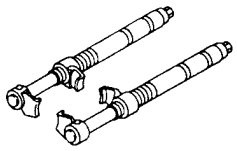
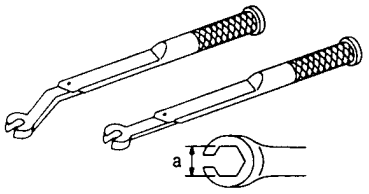
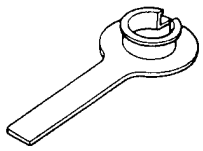
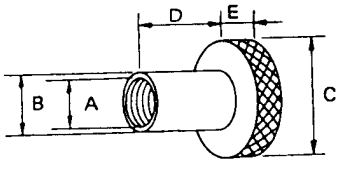
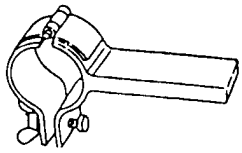
SERVICE DATA AND SPECIFICATIONS (SDS) 3002
- General Specifications 3002
- Inspection and Adjustment 3003



Precautions

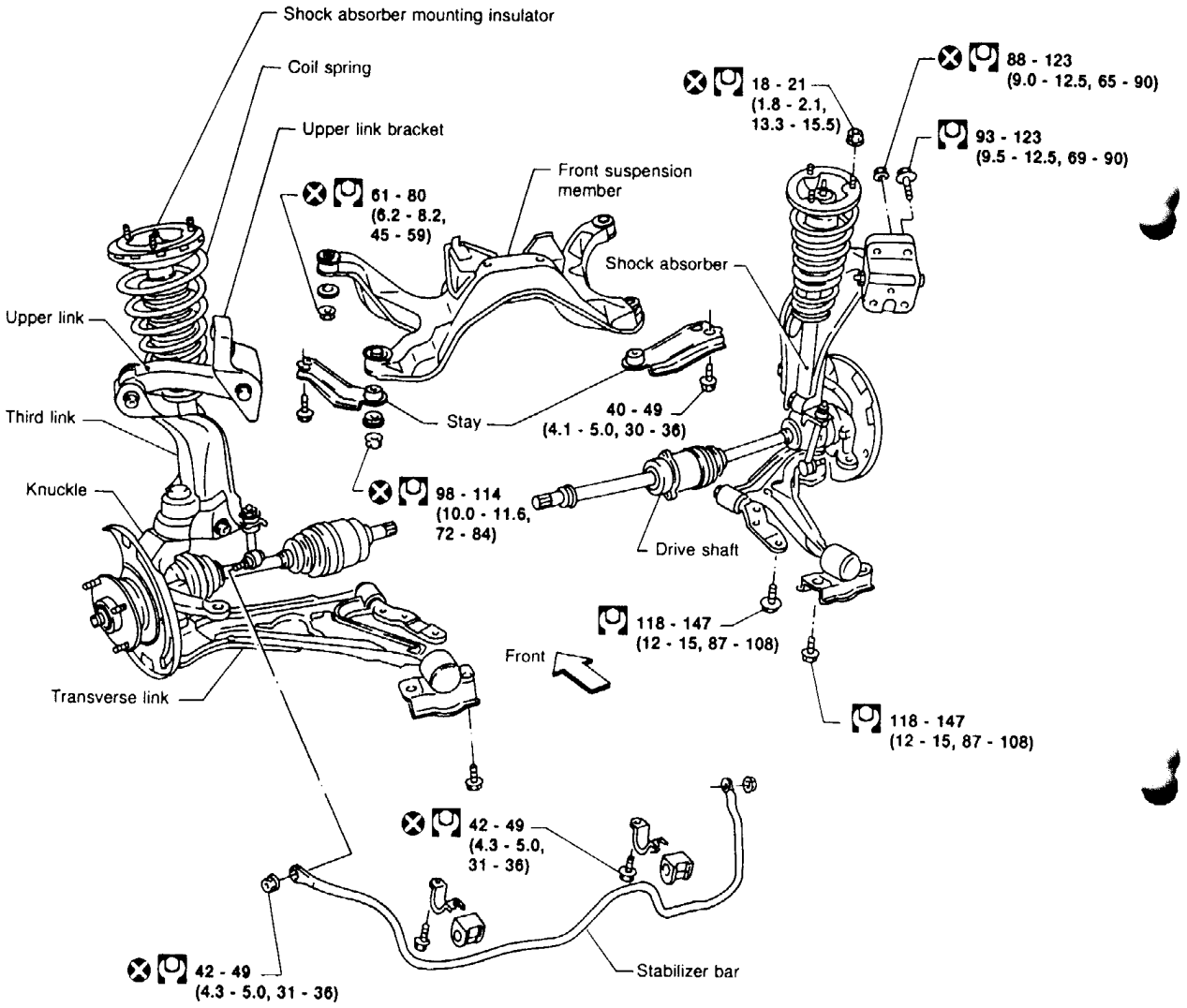
- When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
  *: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Use Tool when removing or installing brake tubes.

Special Service Tools

Tool number Tool name	Description	
HT72520000 Ball joint remover	 NT546	Removing tie-rod outer end and lower ball joint **a: 33 (1.30)** **b: 50 (1.97)** **v: 11.5 (0.453)** **Unit: mm (in)**
HT71780000 Spring compressor	 NT144	Removing and installing coil spring
GG94310000 Flare nut torque wrench	 NT406	Removing and installing brake piping **a: 10 mm (0.39 in)**
KV38106700 KV38106800 Differential side oil seal protector	 NT147	Installing drive shaft LH : KV38106700 RH : KV38106800
IM23600800 Attachment Wheel alignment	 NT148	Measure wheel alignment **A: Screw M24 x 1.5** **B: 35 (1.38) dia.** **C: 65 (2.56) dia.** **D: 56 (2.20)** **E: 12 (0.47)** Unit: mm (in)
ST35652000 Strut attachment	 NT145	Fixing strut assembly

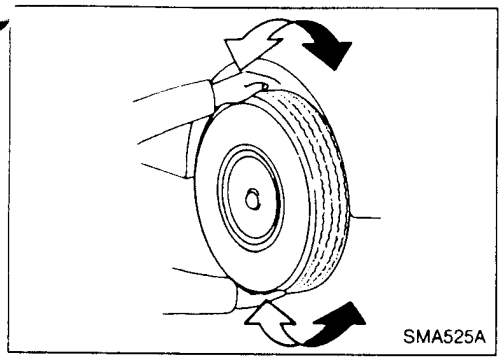
SEC. 391•400•401

When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
*** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**



: N·m (kg-m, ft-lb)

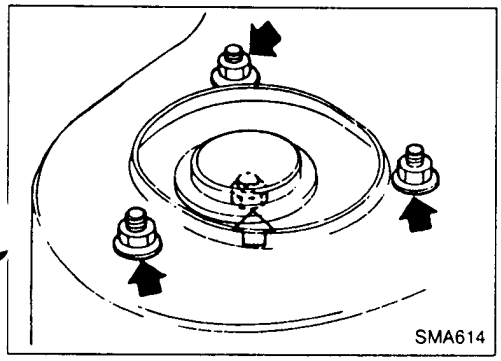
NFA028


SMA525A

Front Axle and Front Suspension Parts

Check front axle and front suspension parts for looseness, cracks, wear or other damage.

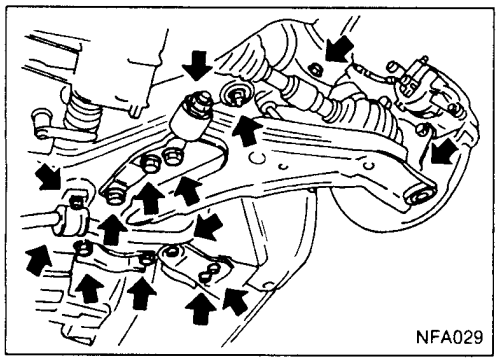
- Shake each front wheel to check for excessive play.
- Ensure that new cotter pins are used, and are correctly fitted.

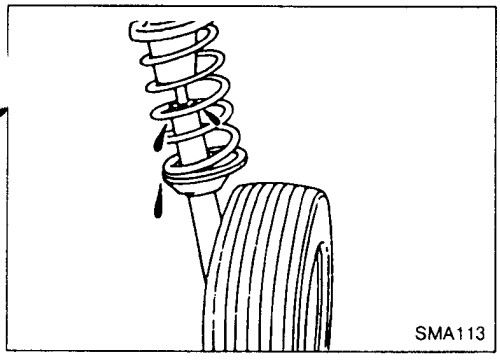

SMA614

- Retighten all axle and suspension nuts and bolts to the specified torque.

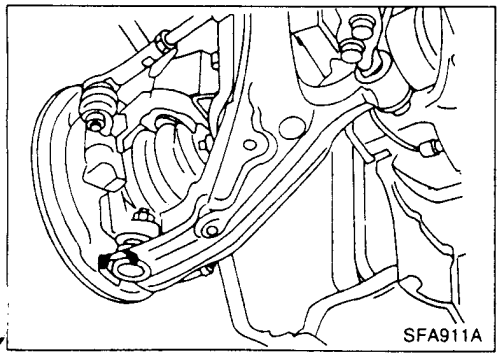
  Tightening torque:

  Refer to FRONT SUSPENSION (FA-23)


NFA029

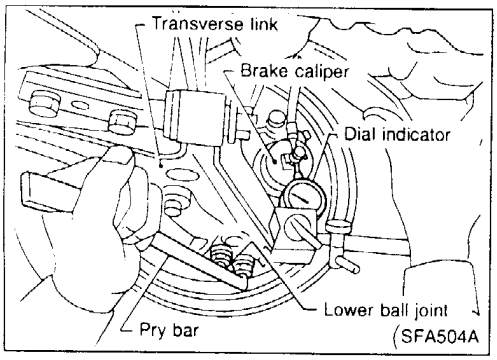

SMA113

- Check strut (shock absorber) for oil leakage or other damage.


SFA911A

- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.

Front Axle and Front Suspension Parts (Cont'd)

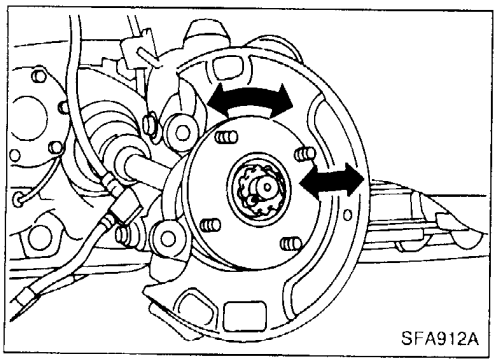


- Check suspension ball joint end play.

a. Jack up front of vehicle and set the stands.
b. Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
c. Make sure front wheels are straight and brake pedal is depressed.
d. Place a pry bar between transverse link and inner rim of road wheel.
e. While raising and releasing pry bar, observe maximum dial indicator value.

Vertical end play:
0 mm (0 in)

f. If ball joint movement is beyond specifications, remove and recheck it.

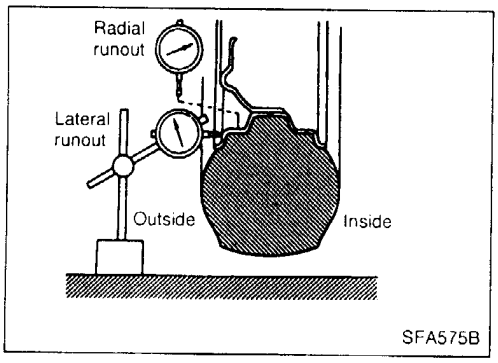


Front Wheel Bearing

- Check that wheel bearings operate smoothly.
- Check axial end play.

Axial end play:
0.05 mm (0.0020 in) or less

- If axial end play is not within specification or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to FRONT AXLE – Wheel Hub and Knuckle. (FA-8)



Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection (Unladen*).
*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

PRELIMINARY INSPECTION

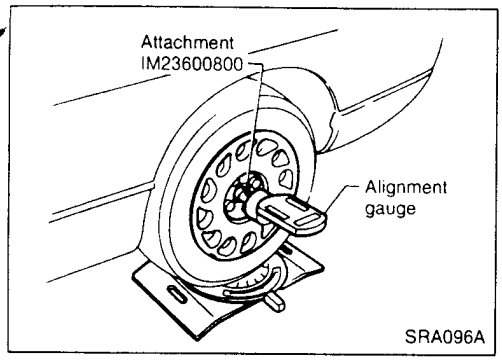
1. Check tires for wear and incorrect inflation pressures.
2. Check wheel runout.

Wheel runout:
Refer to SDS (FA-33)

3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.
6. Check that front shock absorbers work correctly by using the standard bounce test.
7. Check vehicle posture (Unladen).

Front Wheel Alignment (Cont'd)

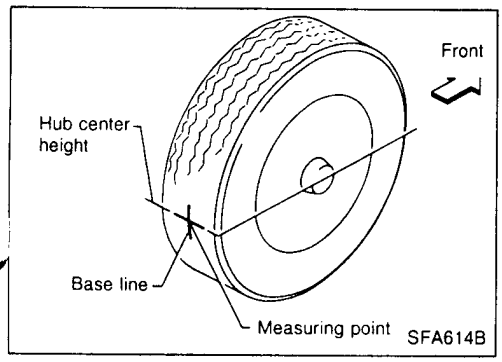
CAMBER, CASTER AND KINGPIN INCLINATION



Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.
   Camber, Caster and Kingpin inclination:
   Refer to SDS (FA-33)
2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.

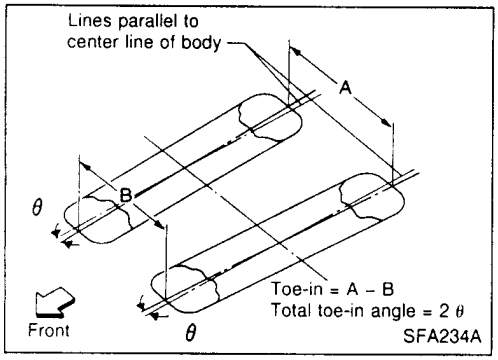
TOE-IN



Measure toe-in using following procedure:
WARNING:

- **Always perform following procedure on a flat surface.**
- **Ensure the way in front of the vehicle is clear before pushing it.**

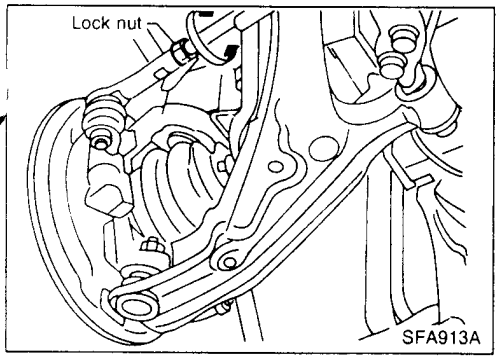
1. Bounce front of vehicle up and down to stabilize the posture.
2. Push the vehicle straight ahead for about 5 m (16 ft).
3. Put a mark on base line of the tread (rear side) at the same height as hub center to be a measuring point.



4. Measure distance "A" (rear side).
5. Push the vehicle slowly forwards to turn the wheels around 180 degrees.

If the wheels have passed 180 degrees, try the above procedure again from the beginning. Never push vehicle backward.

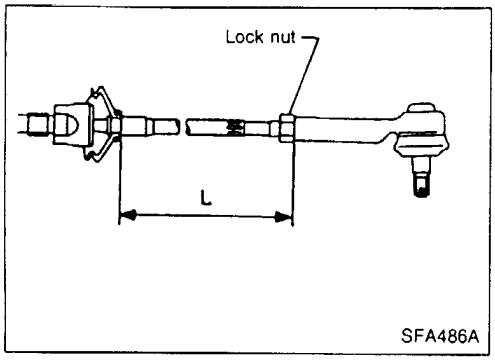
6. Measure distance "B" (front side).
   Toe-in (A – B):
   Refer to SDS (FA-33)



7. Adjust toe-in by varying the length of steering tie-rods.

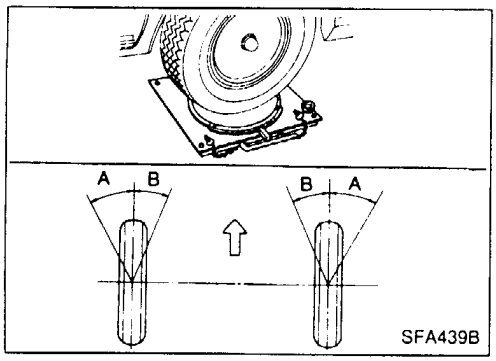
a. Loosen lock nuts.

Front Wheel Alignment (Cont'd)



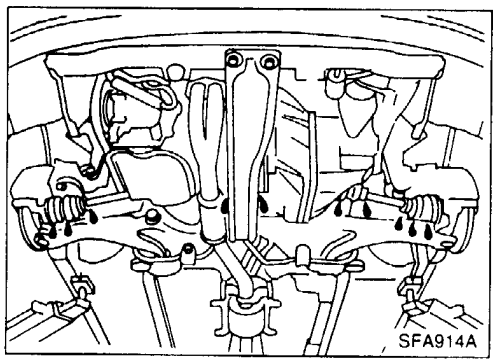
b Adjust toe-in by screwing tie-rods in and out.
Standard length "L":
Refer to ST-section

c Tighten lock nuts to specified torque.
Lock nut tightening torque:
Refer to ST-section



FRONT WHEEL TURNING ANGLE

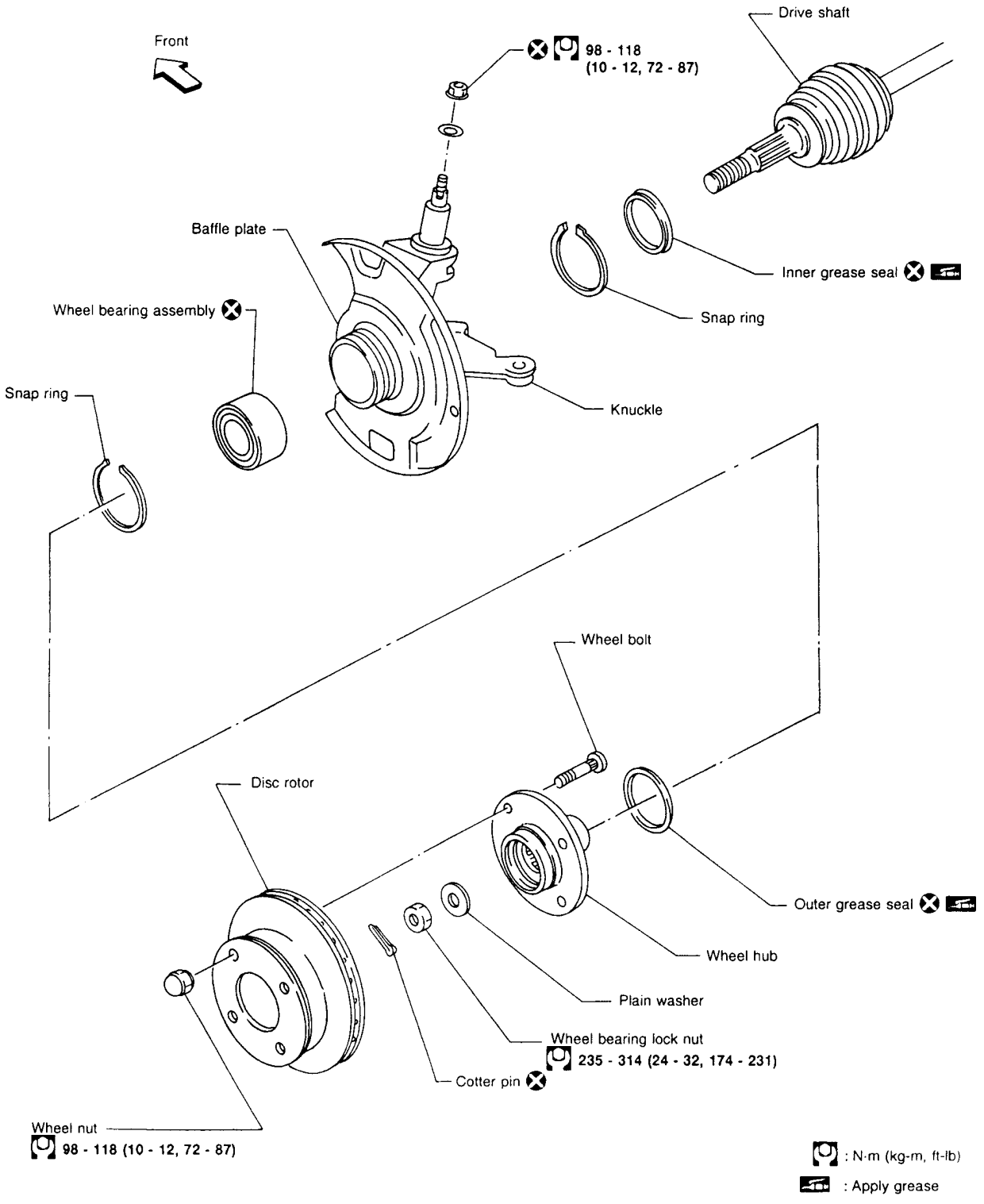
1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.
2. Rotate steering wheel all the way right and left; measure turning angle.
Wheel turning angle (Full turn):
Refer to SDS (FA-33)



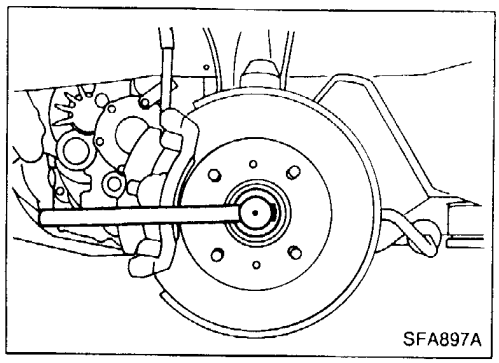
Drive Shaft

Check for grease leakage or other damage.

SEC. 400



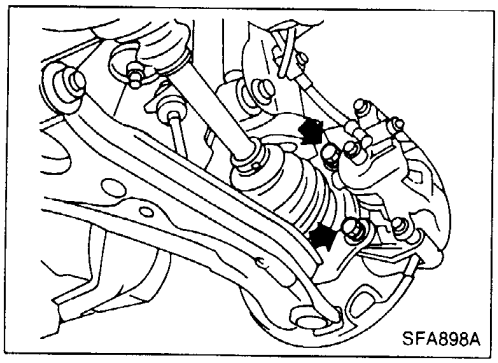
NFA030



Wheel Hub and Knuckle

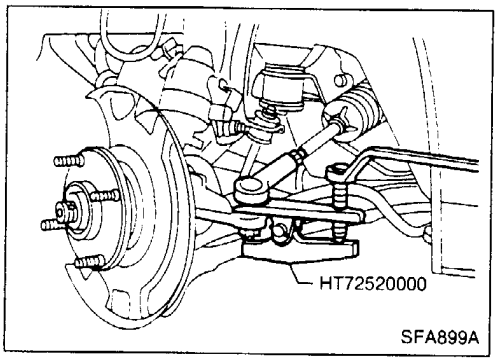
REMOVAL

- Remove wheel bearing lock nut.



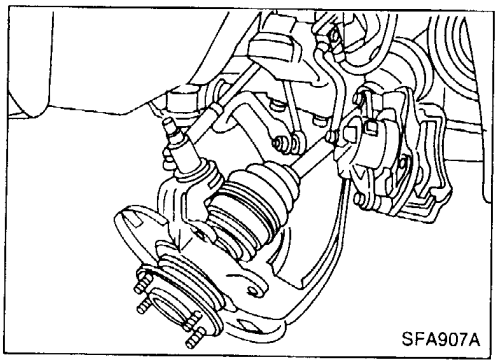
- Remove brake caliper assembly and rotor.

Brake hose need not be disconnected from brake caliper.
In this case, suspend the caliper assembly with a wire so as not to stretch the brake hose.
Be careful not to depress the brake pedal, to prevent the piston from popping out.
Make sure brake hose is not twisted.

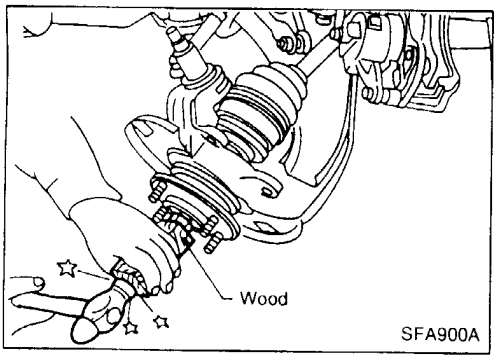


- Separate tie-rod from knuckle with tool.

Install stud nut inverted on stud bolt to prevent damage to stud bolt.



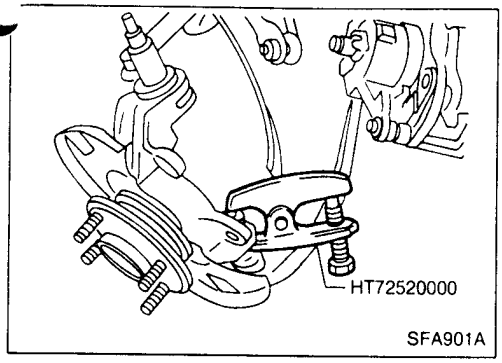
- Remove kingpin cap and securing nut. Separate kingpin from knuckle.



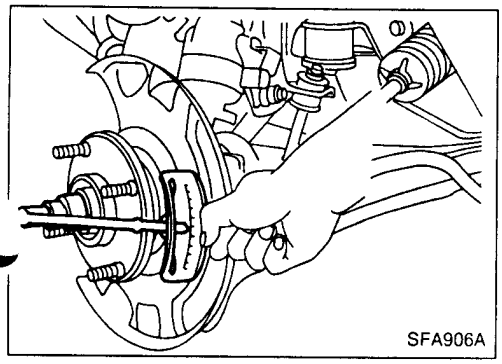
- Separate drive shaft from knuckle with drift.

When removing drive shaft, cover drive shaft boots with waste cloth to prevent damage to them.

Wheel Hub and Knuckle (Cont'd)

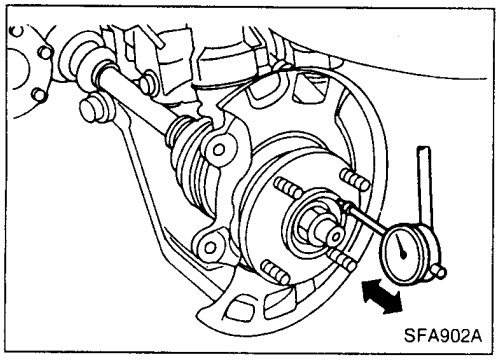


- Remove ball joint securing nut. Separate from knuckle using Tool (as for tie-rod).

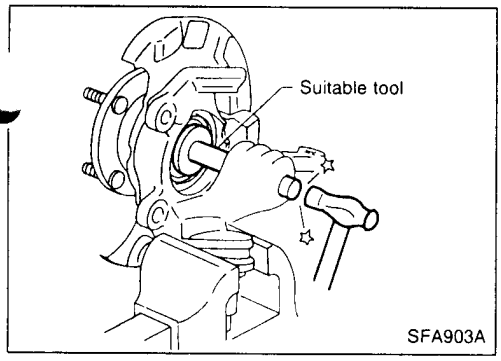


INSTALLATION

- Install knuckle with wheel hub.
- Tighten wheel bearing lock nut.
  :235 - 314 N·m
  (24 - 32 kg-m, 174 - 231 ft-lb)
- Check that wheel bearings operate smoothly.



- Check wheel bearing axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less.

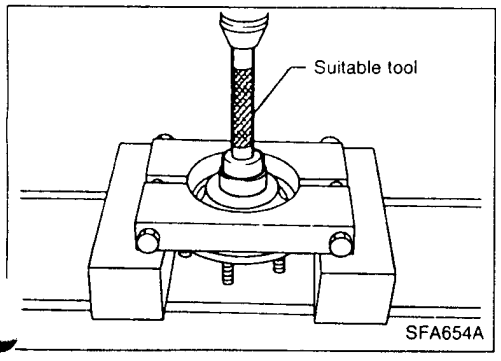


DISASSEMBLY

CAUTION:
When removing wheel hub or wheel bearing from knuckle, replace wheel bearing assembly (outer race, inner races and grease seals) with a new one.

Wheel Hub

Drive out hub with inner race (outside) from knuckle with a suitable tool.

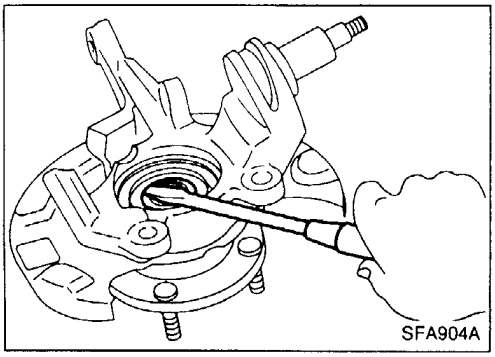


Wheel Bearing

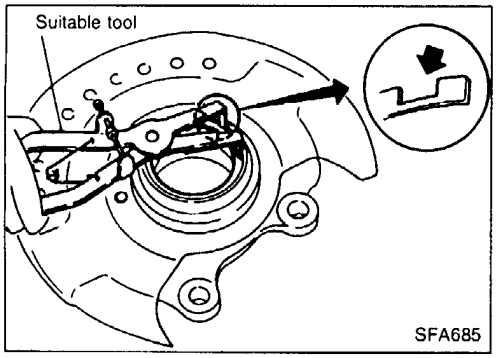
When replacing wheel bearing, replace complete wheel bearing assembly (including inner and outer races).

- Remove bearing inner race (outside), then remove outer grease seal.

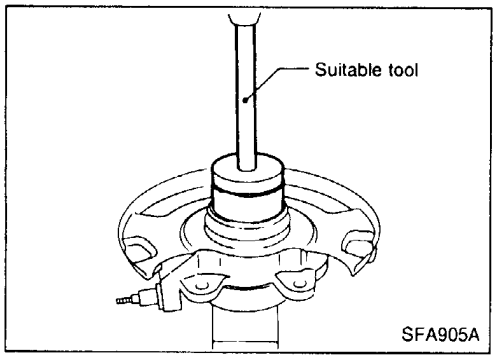
Wheel Hub and Knuckle (Cont'd)



- Remove inner grease seal from knuckle.



- Remove inner and outer snap rings.



- Press out bearing outer race.

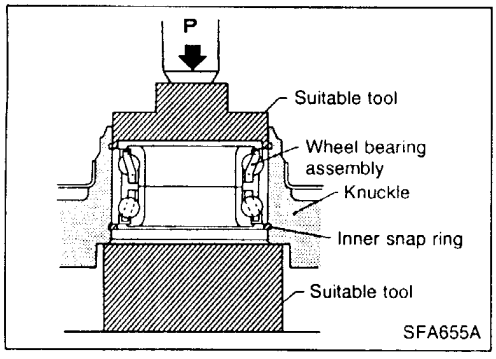
INSPECTION

Wheel Hub and Knuckle

Check wheel hub and knuckle for cracks by using a magnetic exploration or dyeing test.

Snap Ring

Check snap ring for wear or cracks. Replace if necessary.



ASSEMBLY

1. Install inner snap ring into groove of knuckle.
2. Press new wheel bearing assembly into knuckle until it contacts snap ring.
   Maximum load P:
   49 kN (5 t, 5.5 US ton, 4.9 Imp ton)

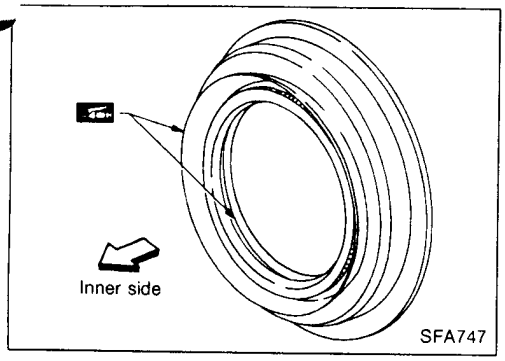
Caution:

- **Do not press inner race of wheel bearing assembly.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.**

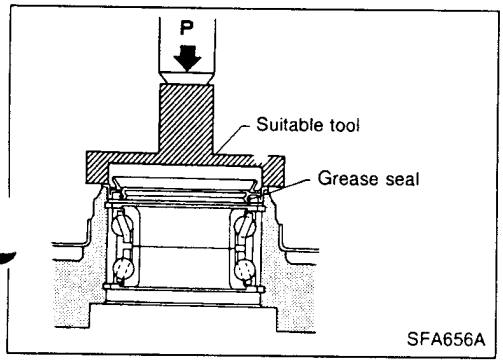
3. Install outer snap ring into groove of knuckle.

Wheel Hub and Knuckle (Cont'd)

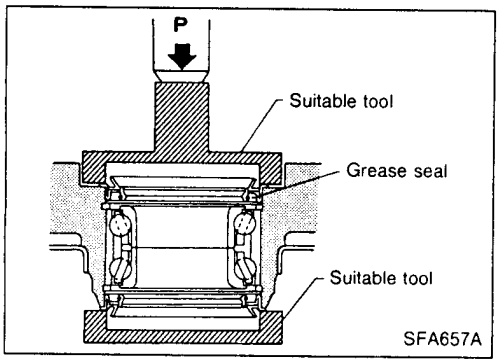
4. Pack grease seal lip with multi-purpose grease.



5. Install outer grease seal.

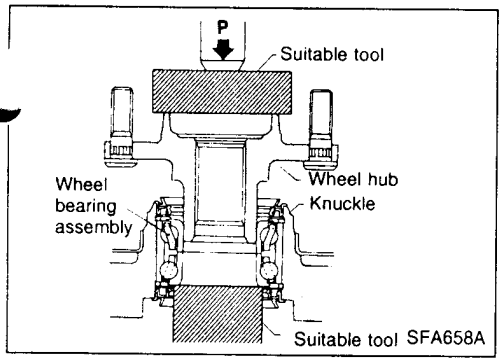


6. Install inner grease seal.



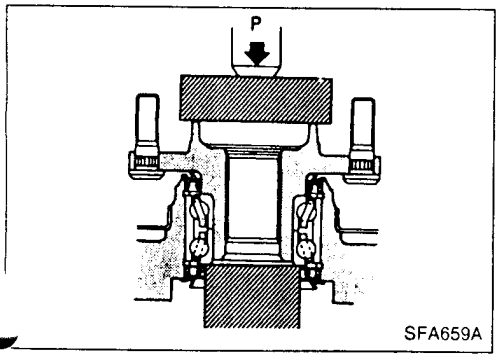
7. Press wheel hub into knuckle.
   Maximum load P:
   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

Be careful not to damage grease seal.

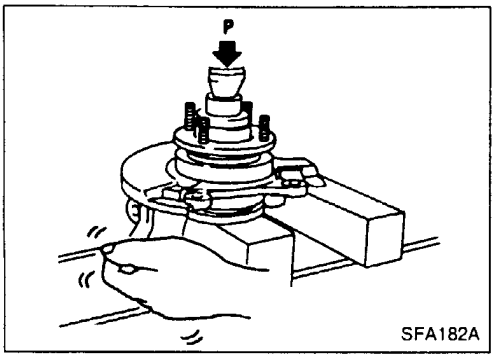


8. Check bearing operation.

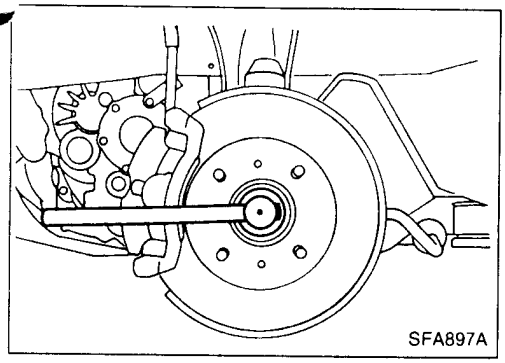
a. Add load P with press.
   Load P:
   34.3 - 49.0 kN
   (3.5 - 5.0 ton, 3.9 - 5.5 US ton, 3.44 - 4.92 Imp ton)



Wheel Hub and Knuckle (Cont'd)



b. Spin knuckle several turns in both directions.
c. Make sure that wheel bearings operate smoothly.

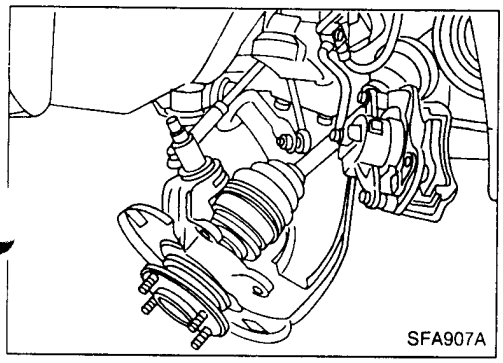


Drive shaft

REMOVAL

- Remove wheel bearing lock nut.
- Remove brake caliper assembly and rotor.

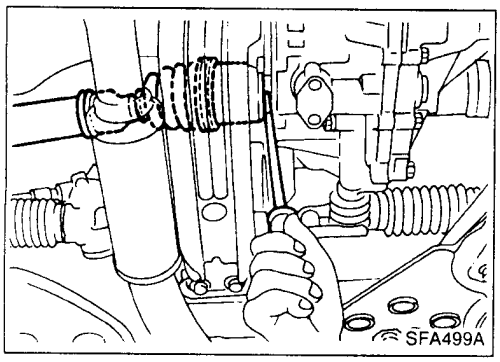
Brake hose need not be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Do not pull or twist brake hose.



- Remove tie-rod ball joint.
- Remove upper knuckle nut.
- Separate drive shaft from knuckle by lightly tapping it. If it is hard to remove, use a puller.

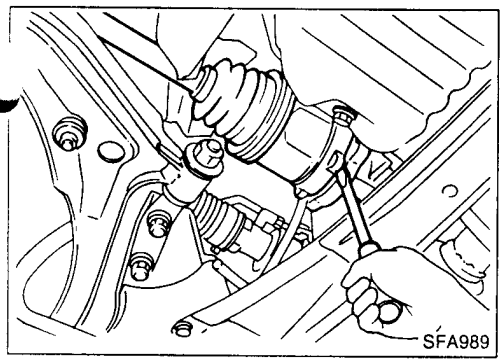
When removing drive shaft, cover drive shaft boots with waste cloth to prevent damage to them.

Refer to FRONT AXLE – Wheel Hub and Knuckle. (FA-8)

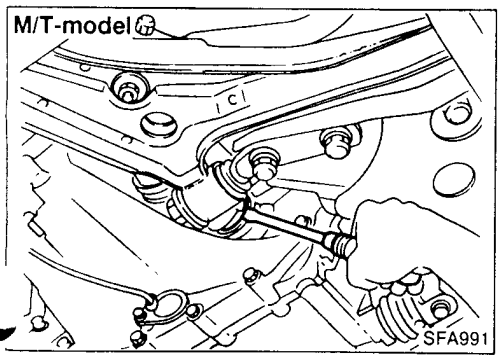


1. Remove right drive shaft from transaxle.

– Models without support bearing –



– Models with support bearing –

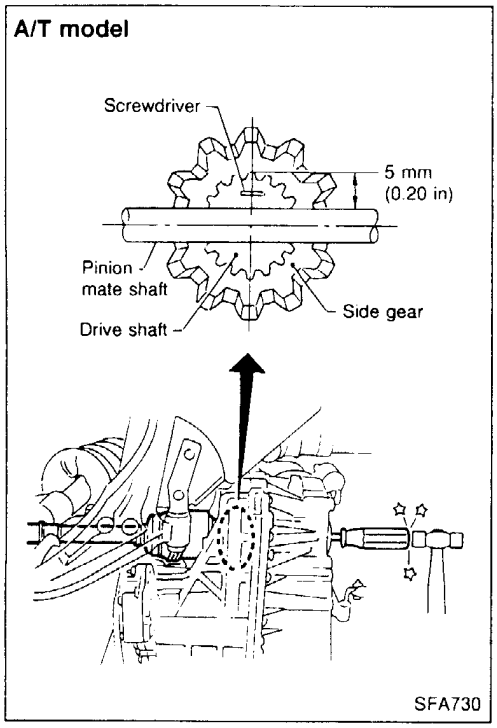


2. Remove left drive shaft from transaxle.

– For M/T models –

Drive shaft (Cont'd)

A/T model

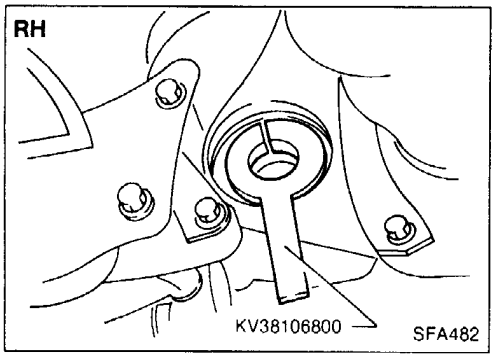


– For A/T models –

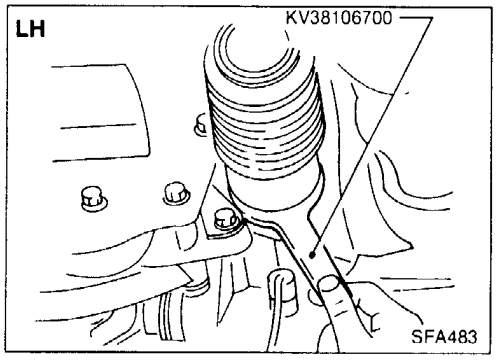
- Remove left drive shaft with a suitable tool.

Be careful not to damage pinion mate shaft and side gear.

RH



LH



INSTALLATION

Transaxle Side

1. Install a new oil seal to transaxle. Refer to section MT or AT.
2. Set Tool along the inner circumference of oil seal.
3. Insert drive shaft into transaxle. Be sure to correctly align the splines and then withdraw Tool.
4. Push drive shaft, then press-fit circular clip on the drive shaft into circular clip groove of side gear.
5. After its insertion, try to pull the flange out of the slide joint by hand. If it pulls out, the circular clip is not properly meshed with the side gear.

Wheel Side

- Install drive shaft into knuckle.
- Tighten upper knuckle nut and wheel bearing lock nut. Refer to section Installation in FRONT AXLE – Wheel Hub and Knuckle. (FA-8)

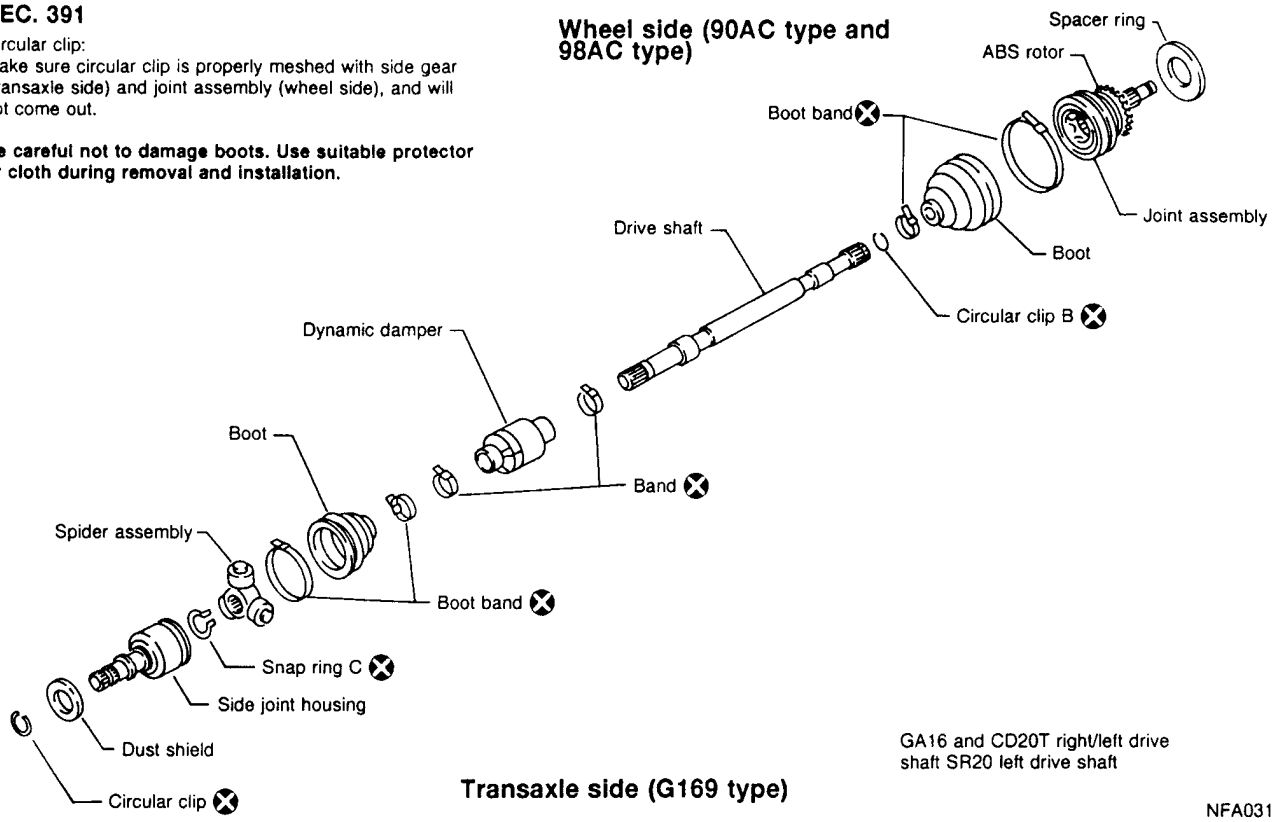
Drive Shaft

COMPONENTS

SEC. 391

Circular clip:
Make sure circular clip is properly meshed with side gear (transaxle side) and joint assembly (wheel side), and will not come out.

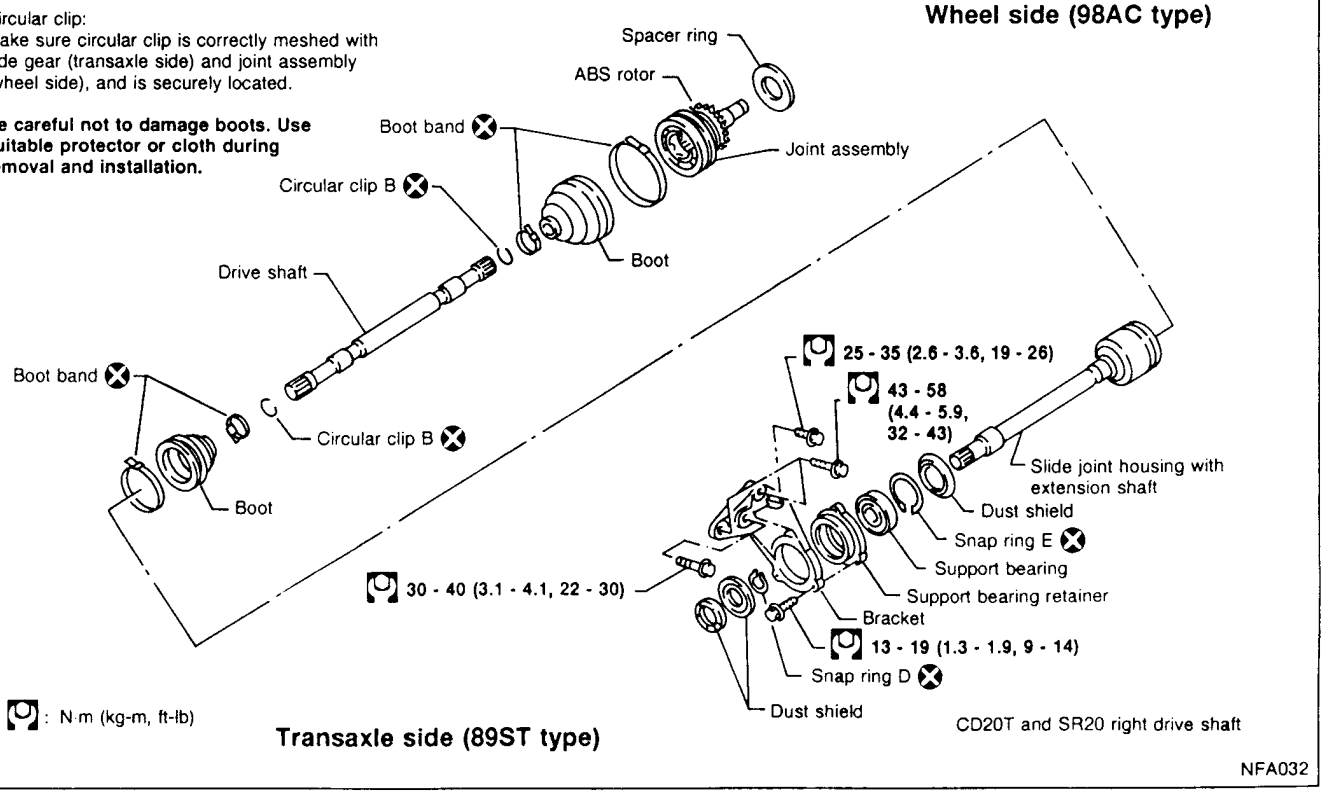
Be careful not to damage boots. Use suitable protector or cloth during removal and installation.



SEC. 391

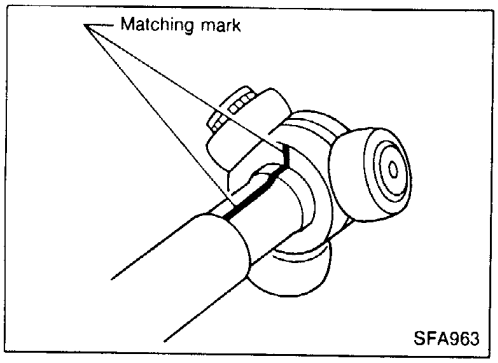
Circular clip:
Make sure circular clip is correctly meshed with side gear (transaxle side) and joint assembly (wheel side), and is securely located.

Be careful not to damage boots. Use suitable protector or cloth during removal and installation.



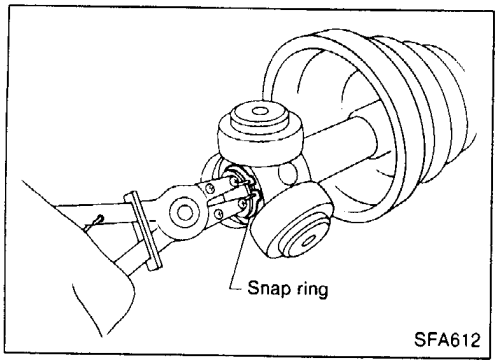
Drive Shaft (Cont'd)

DISASSEMBLY



TRANSAXLE SIDE (G169 type)

1. Remove boot bands.
2. Put matching marks on slide joint housing and drive shaft before separating joint assembly.
3. Put matching marks on spider assembly and drive shaft.

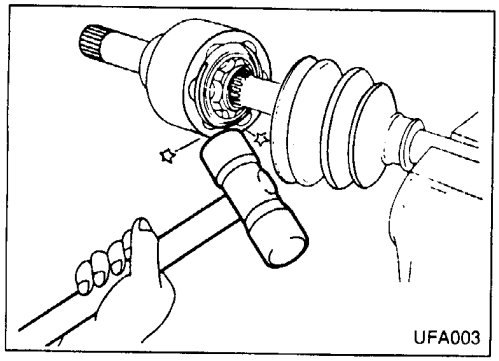


4. Pry off snap ring, then remove spider assembly.

CAUTION:
Do not disassemble spider assembly.

5. Draw out boot.

Cover drive shaft serration with tape to prevent damage to the boot.

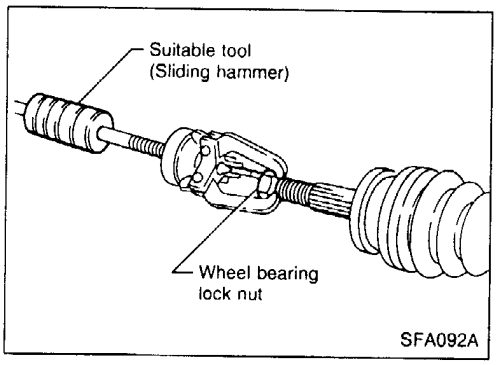


Transaxcle Side (89ST type)

CAUTION:
The double offset type joint cannot be disassembled.

1. Remove boot bands.
2. Put matching marks on joint housing and drive shaft before separating them.
3. Tap the housing sharply with a hammer to separate.
4. Remove the boot.

Cover drive shaft serration with tape so as not to damage the boot.



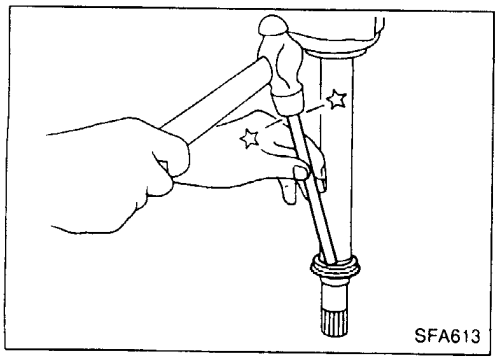
Wheel Side (90AC and 98AC type)

CAUTION:
The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
- Separate joint assembly with a suitable tool.

Be careful not to damage threads on drive shaft.

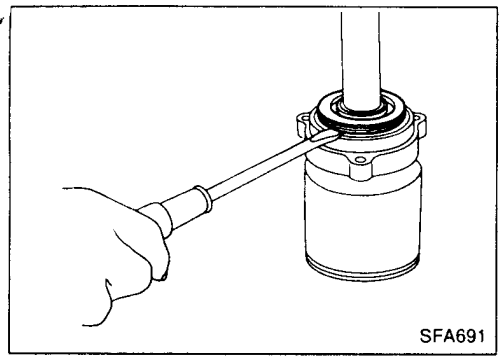
- Draw out boot.



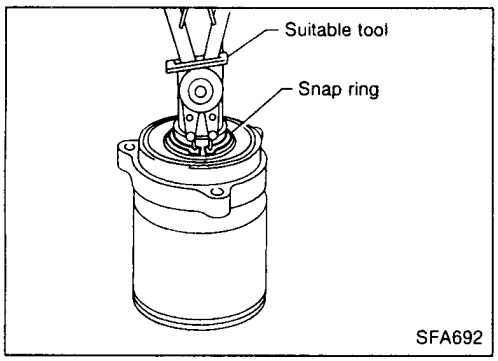
Support Bearing

- Remove outer dust shield.

Drive Shaft (Cont'd)

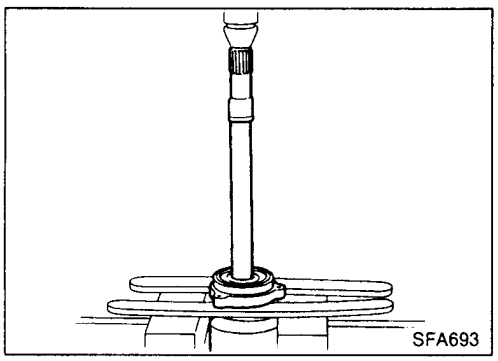

SFA691

- Remove inner dust shield.

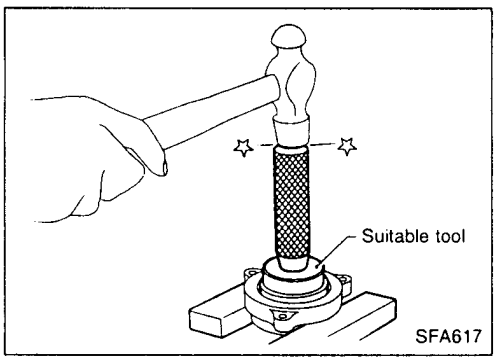


SFA692

- Pry off snap ring.


SFA693

- Press support bearing assembly out of drive shaft.



SFA617

- Press support bearing out of retainer.

Drive Shaft (Cont'd)

INSPECTION

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

Drive Shaft

Replace drive shaft if it is twisted or cracked.

Boot

Check boot for fatigue, cracks or wear. Replace boot with new boot bands.

Joint Assembly (Transaxle side)

- Check spider assembly for needle bearing and washer damage. Replace if necessary. (G169 type)
- Check roller surfaces for scratches, wear or other damage. Replace if necessary. (G169 type)
- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play. (89ST type)
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

Joint Assembly (Wheel side)

Replace joint assembly if it is deformed or damaged.

Support Bearing

Make sure bearing rolls freely, and is free from noise, cracks, pitting or wear.

Support Bearing Bracket

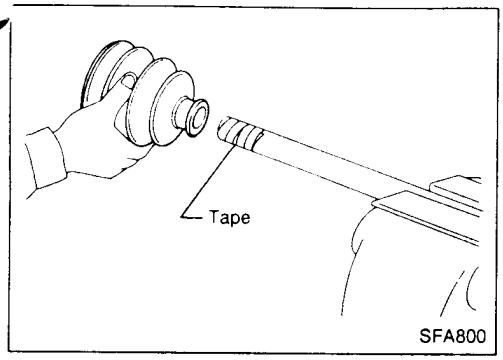
Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

ASSEMBLY

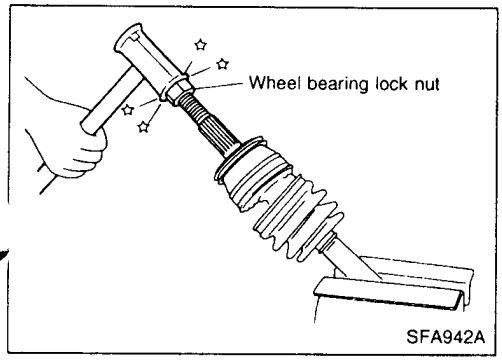
- **After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.**
- **Use NISSAN GENUINE GREASE or equivalent after every overhaul.**

Drive Shaft (Cont'd)

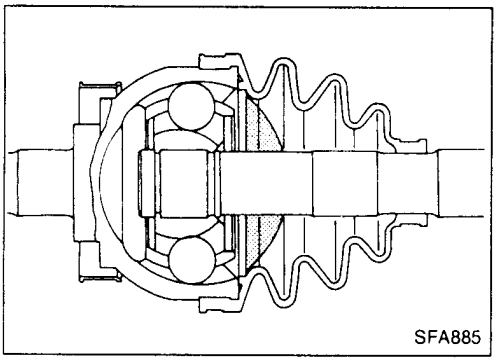
Wheel Side (90AC and 98AC type)



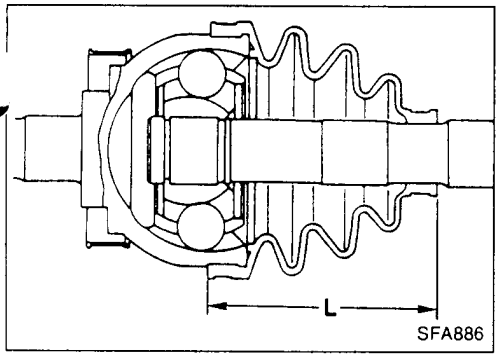
1. Install boot and new small boot band on drive shaft.
Cover drive shaft serration with tape so as not to damage boot during installation.



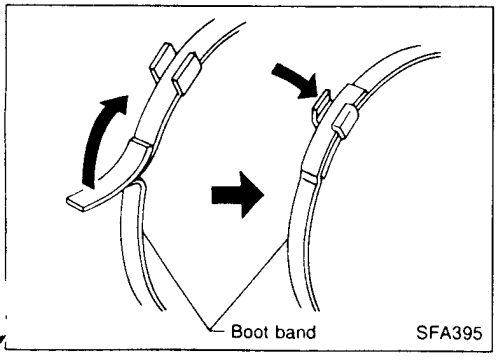
2. Set joint assembly onto drive shaft by lightly tapping it.
Install joint assembly securely, ensuring marks which were made during disassembly are correctly aligned.



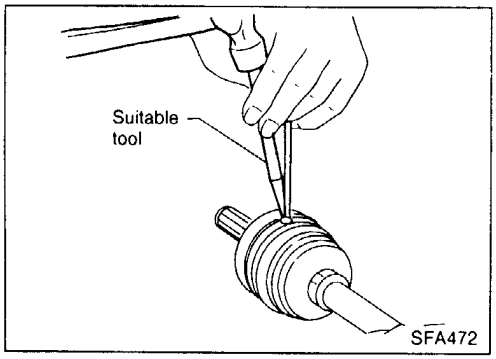
3. Pack drive shaft with specified amount of grease.
Specified amount of grease:
90AC type
80 - 110 mℓ (2.8 - 3.9 Imp fl oz)
98AC type
110 - 130 mℓ (3.9 - 4.6 Imp fl oz)

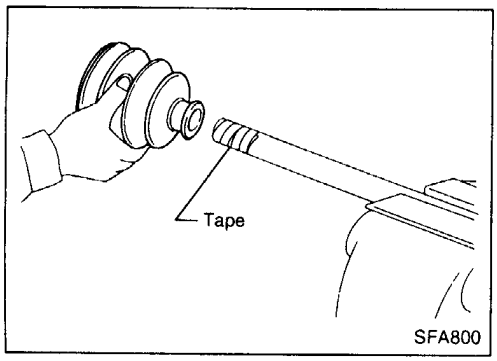


4. Make sure that boot is correctly installed on the drive shaft groove.
Set boot so that it does not swell and deform when its length is "L ".
Length "L":
90AC type
89 - 91 mm (3.50 - 3.58 in)
98AC type
96 - 98 mm (3.78 - 3.86 in)



5. Lock new larger and smaller boot bands securely with a suitable tool.

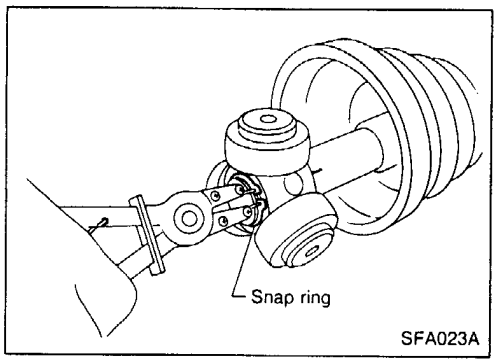




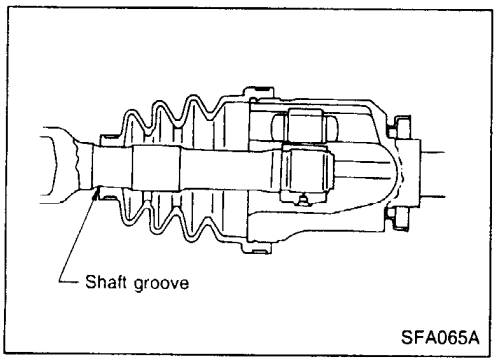
Transaxle Side

(G169 type)

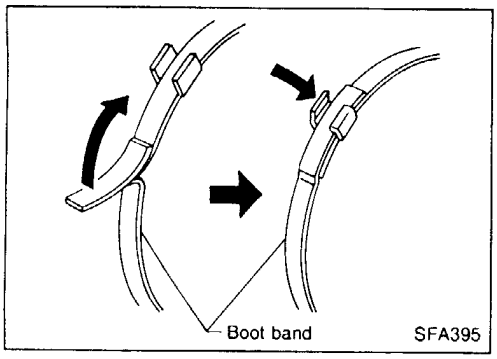
1. Install boot and new small boot band on drive shaft.
Cover drive shaft serration with tape to prevent damage to boot during installation.



2. Install spider assembly securely, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring.



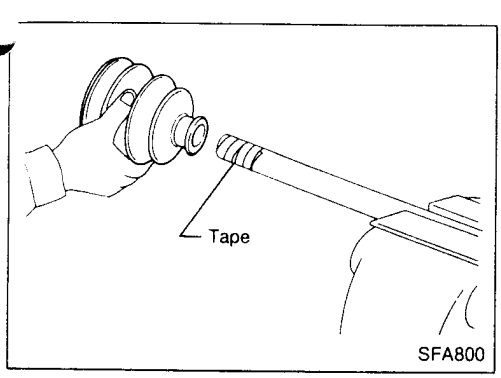
4. Pack drive shaft with specified amount of grease.
Specified amount of grease:
GI69 type
155 - 165 mℓ (5.5 - 5.8 Imp fl. oz)
5. Install slide joint housing.
6. Make sure that boot is properly installed on the drive shaft groove.
Set boot so that it does not swell and deform.



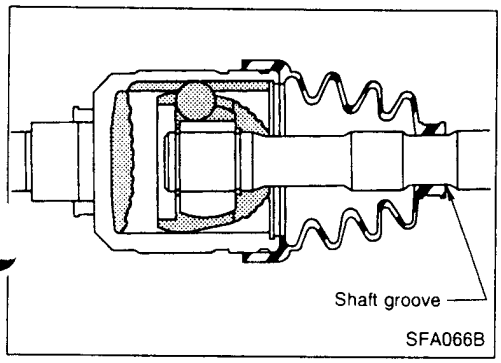
7. Lock new larger and smaller boot bands securely with a suitable tool.

Drive Shaft (Cont'd)

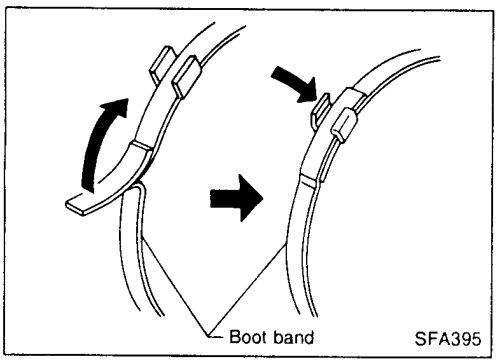
(89ST type)



1. Install boot and new small boot band on drive shaft.
Cover drive shaft serration with tape so as not to damage boot during installation.

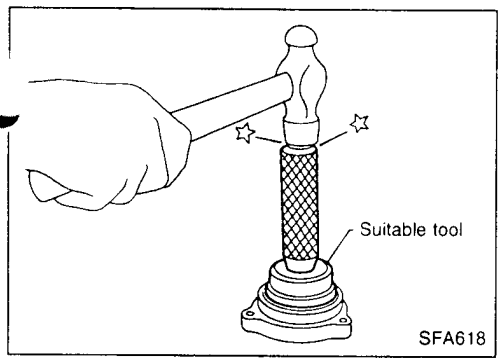


2. Pack drive shaft with specified amount of grease.
Specified amount of grease:
89ST type
175 - 185 mℓ (6.2 - 6.5 Imp fl oz)
3. Install slide joint housing.
4. Make sure that boot is properly installed on the drive shaft groove.
Set boot so that it does not swell and deform.

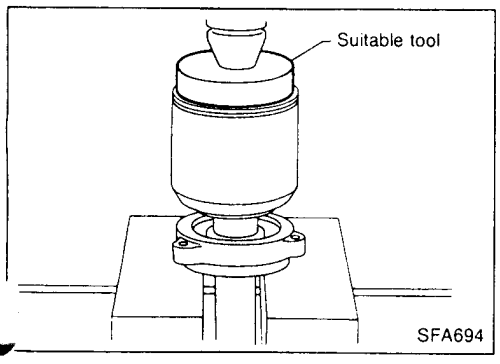


5. Lock new larger and smaller boot bands securely with a suitable tool.

Support Bearing

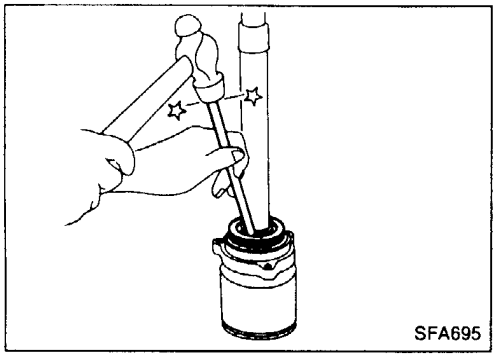


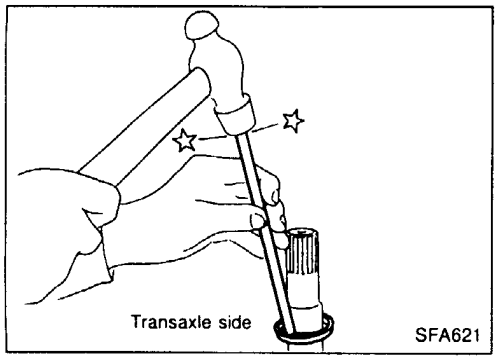
- Press bearing into retainer.



- Press drive shaft into bearing.

Drive Shaft (Cont'd)

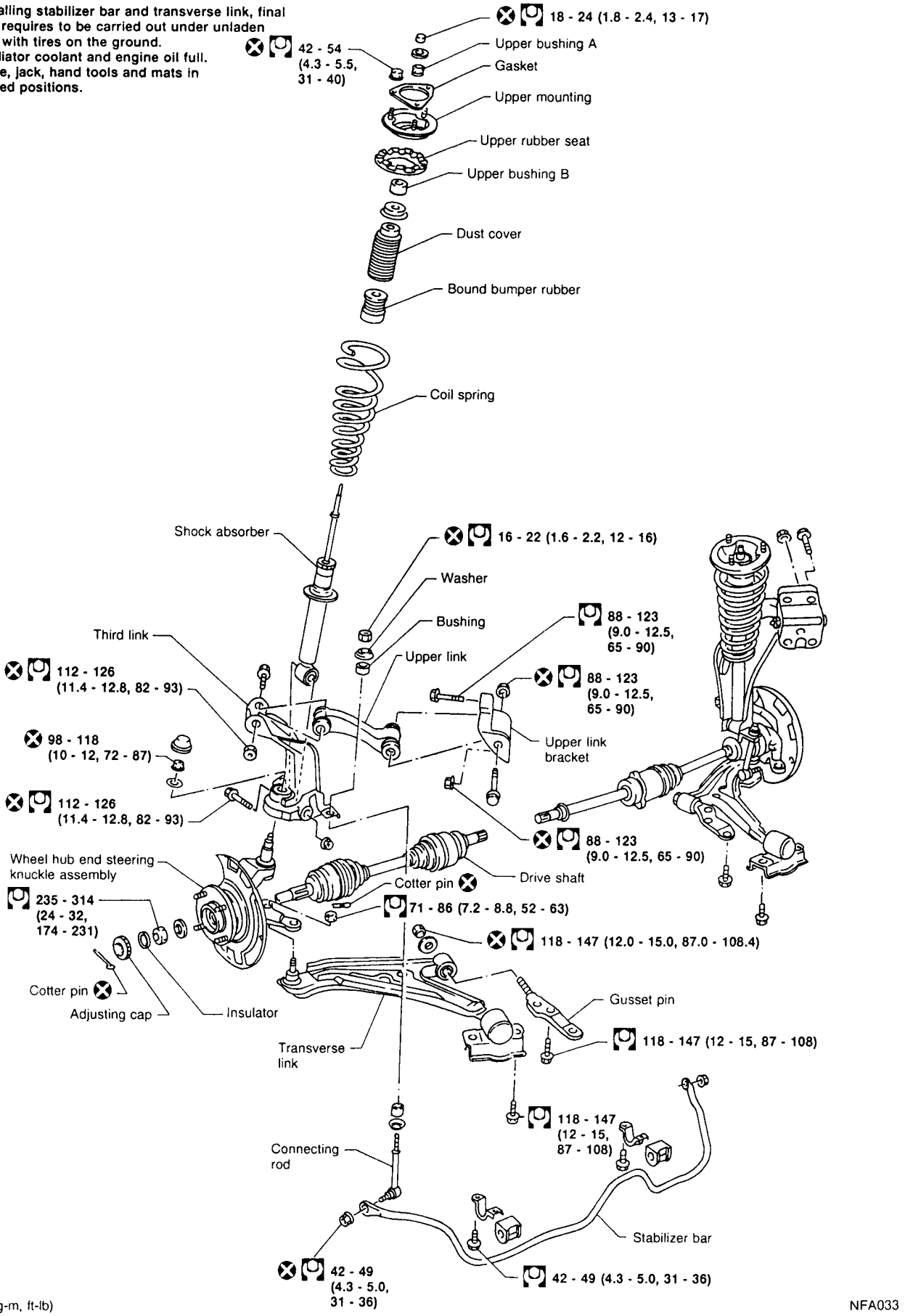




- Install snap ring.
- Install new dust shield..

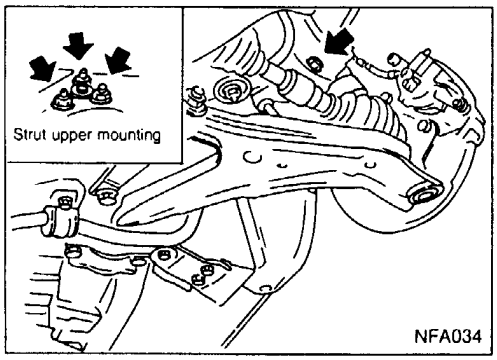
SEC. 391•400•401

When installing stabilizer bar and transverse link, final tightening requires to be carried out under unladen condition* with tires on the ground.
*** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**



: N·m (kg-m, ft-lb)

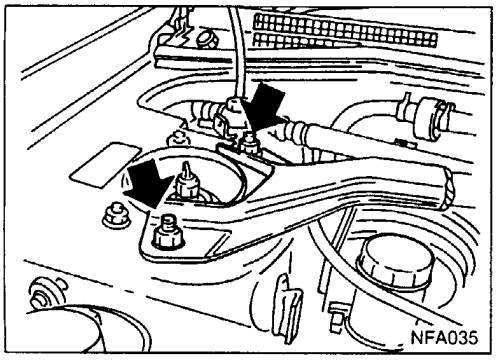
NFA033



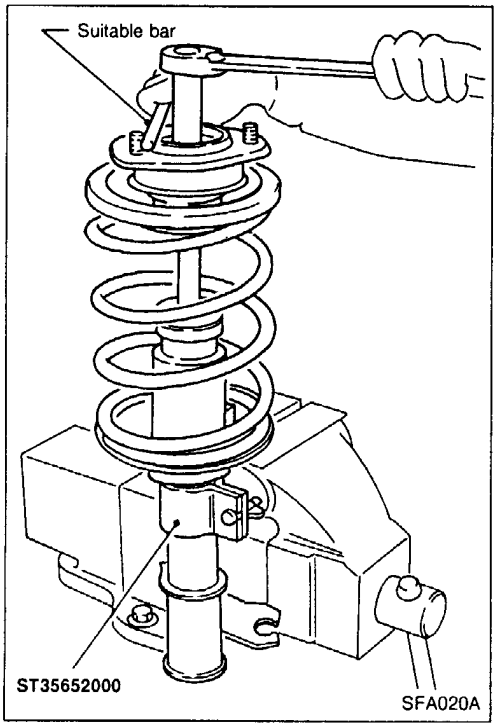
Coil Spring and Shock Absorber

REMOVAL

- Remove shock absorber fixing bolt and nut (to hoodledge).
- **Do not remove piston rod lock nut.**

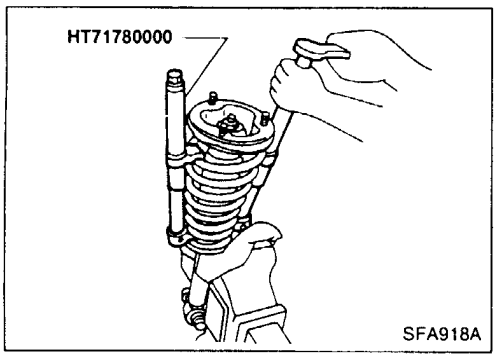


- Tower bar (SRi/GT only)
  Remove tower bar.



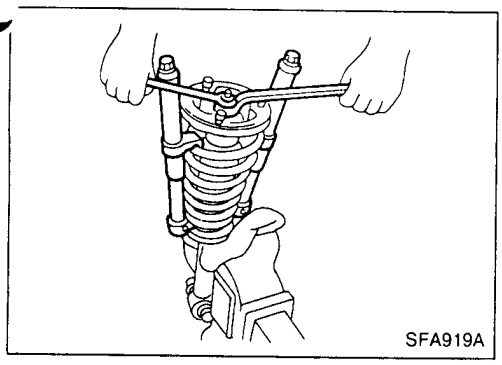
DISASSEMBLY

1. Set shock absorber on vise, then loosen piston rod lock nut.
- **Do not remove piston rod lock nut.**



2. Compress spring with Tool so that shock absorber mounting insulator can be turned by hand.

Coil Spring and Shock Absorber (Cont'd)


SFA919A

3. Remove piston rod lock nut.

INSPECTION

Shock Absorber Assembly

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

Mounting Insulator and Rubber Parts

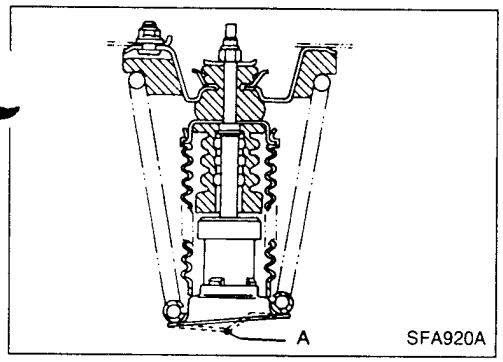
- Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration. Replace if necessary.

Coil Spring

- Check for cracks, deformation or other damage. Replace if necessary.

Tower Bar

- Check for cracks, bending or other damage. Replace if necessary.

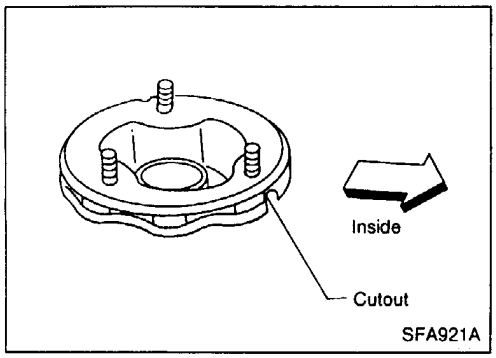


SFA920A

ASSEMBLY

- When shock absorber is installed, it must be positioned so that arrow point A faces rearward on LH side, and forward on RH side.

Coil Spring and Shock Absorber (Cont'd)



- Install upper spring seat with its cutout facing the inside of the vehicle.

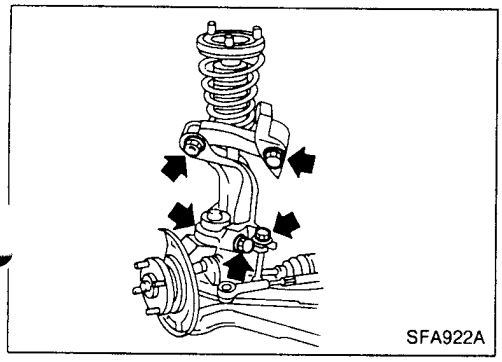
Third Link and Upper Link

REMOVAL

CAUTION:

Kingpin bearing usually does not require maintenance. If any of the following symptoms are noted, replace kingpin bearing assembly.

- **Growling noise is emitted from kingpin bearing during operation.**
- **Kingpin bearing drags or turns roughly when steering knuckle is turned by hand.**


SFA922A

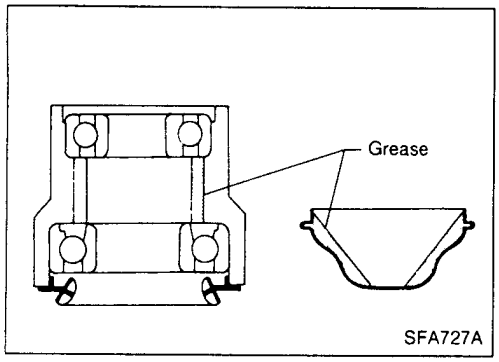
1. Remove cap and kingpin nut.
2. Remove shock absorber fixing nut and upper link fixing bolts.
3. Remove stabilizer connecting rod.
4. Remove third link and upper link.

INSTALLATION

Third Link

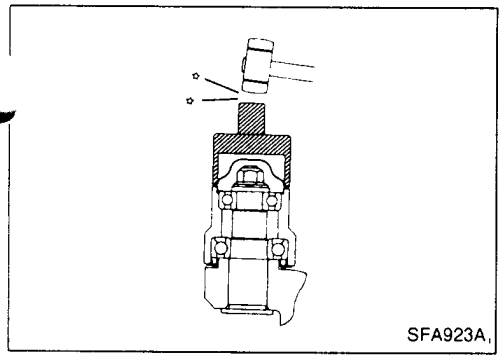
- Pack kingpin housing and cap with multi-purpose grease.
  Grease capacity:

Kingpin housing	**4 g (0.14 oz)**
Cap	**10 g (0.35 oz)**



SFA727A

- Install third link and cap.

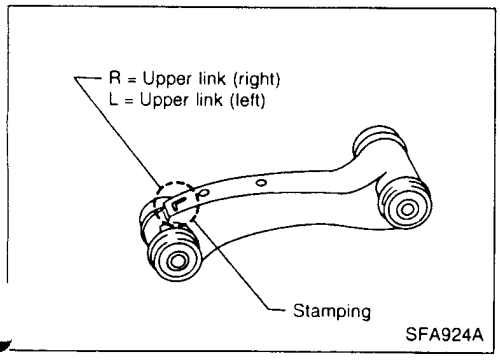

SFA923A

Upper Link

- Upper link has "L" or "R" stamped on it as shown.

Upper link bushings cannot be disassembled.

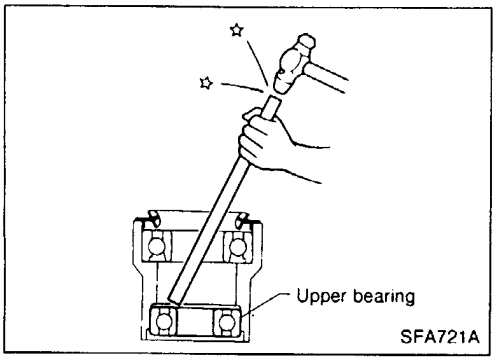
- When installing upper link, make sure that parts are in their correct positions.
- Bushings have in-built play of between 0.5 to 1.0 mm (0.020 to 0.039 in).



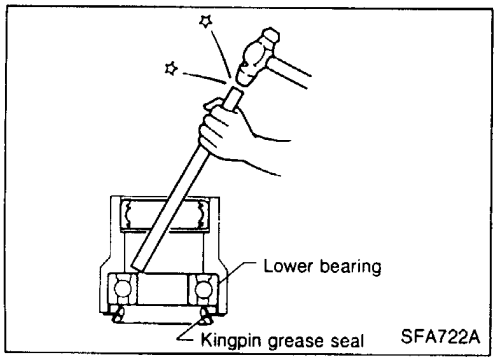
SFA924A

Third Link and Upper Link (Cont'd)

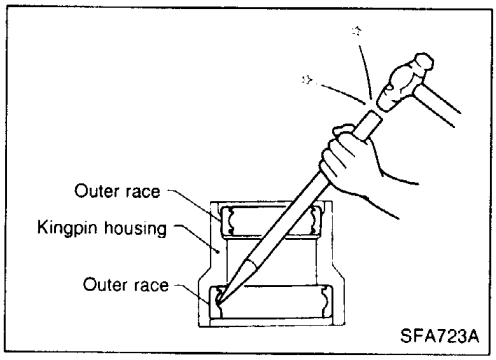
DISASSEMBLY



- Remove upper bearing (inner race and ball).

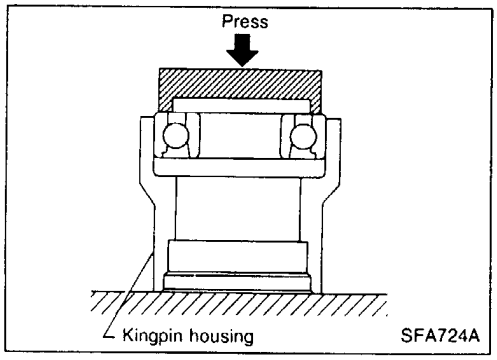


- Remove kingpin grease seal.
- Remove lower bearing (inner race and ball).

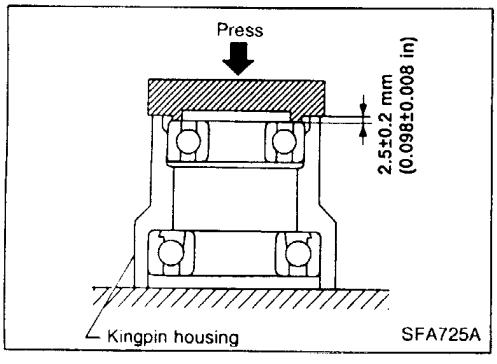


- Remove upper and lower outer race.
- **Be careful not to damage kingpin housing.**

ASSEMBLY

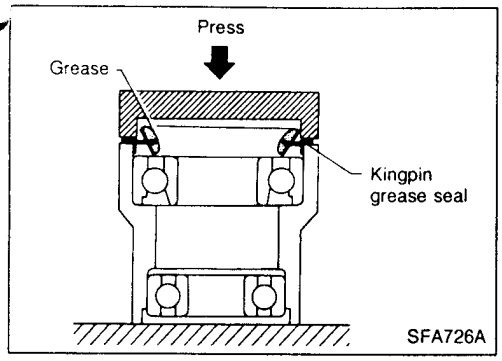


- Install lower bearing.

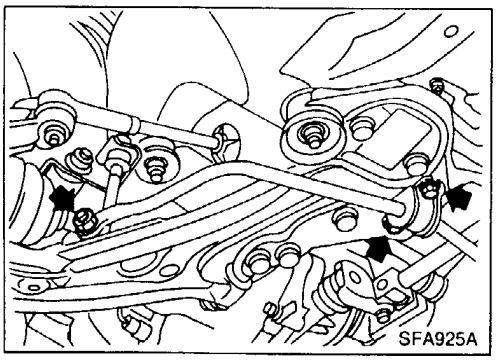


- Install upper bearing.

Third Link and Upper Link (Cont'd)



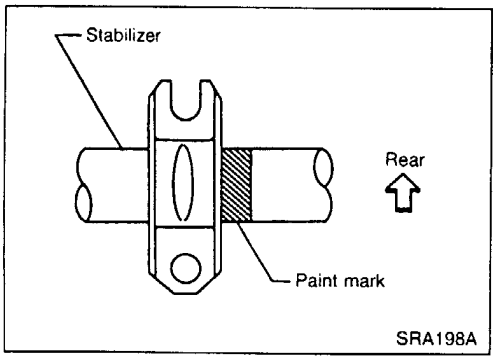
- Install lower oil seal.
- Apply multi-purpose grease to oil seal lip.


SFA925A

Stabilizer Bar

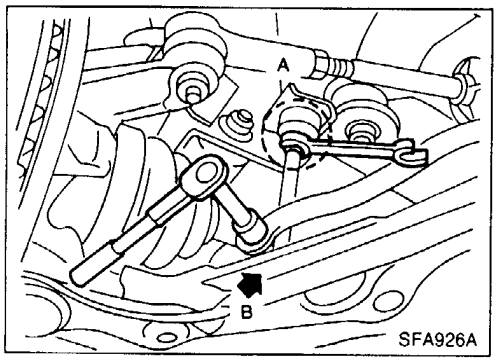
REMOVAL AND INSTALLATION

- Remove stabilizer bar.



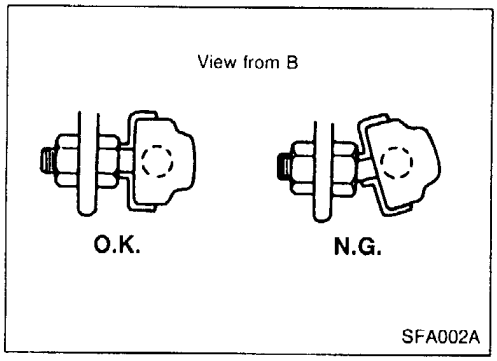
SRA198A

- When installing stabilizer, make sure that paint mark and clamp face in their correct directions.



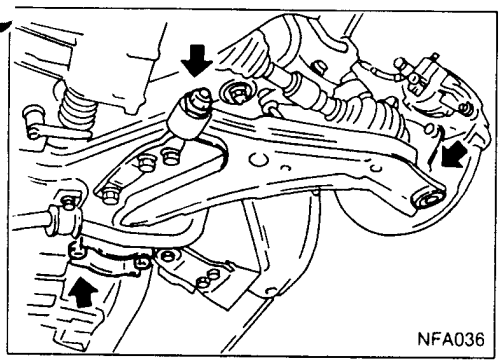
SFA926A

- When removing and installing stabilizer bar, hold part A as shown.



SFA002A

- Install stabilizer bar with ball joint socket correctly located.



Transverse Link and Ball Joint

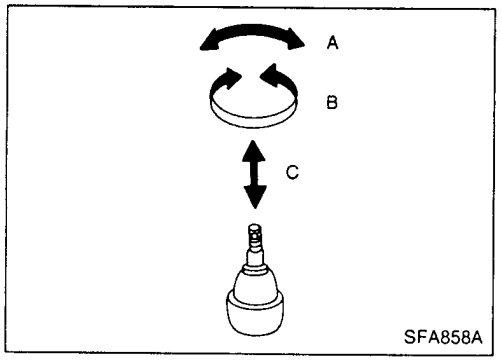
REMOVAL AND INSTALLATION

- Remove tension rod, ball joint and transverse link assembly.
- During installation, final tightening must be done at curb weight with tires on ground.
- After installation, check wheel alignment.
  Refer to "Front Wheel Alignment" of CHECK AND ADJUSTMENT – On-vehicle. (FA-4)

INSPECTION

Transverse Link

- Check transverse link for damage, cracks or deformation. Replace it if necessary.
- Check rubber bushing for damage, cracks and deformation. Replace transverse link if necessary.



Lower Ball Joint

- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace transverse link assembly.

Swing force and turning torque

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

Swing force "A":
(measuring point: cotter pin hole of ball stud)
7.8 - 54.9 N (0.8 - 5.6 kg, 1.8 - 12.3 lb)
Turning torque "B":
0.5 - 3.4 N·m (5 - 35 kg-cm, 4.3 - 30.4 in-lb)
Vertical end play "C":
0 mm (0 in)

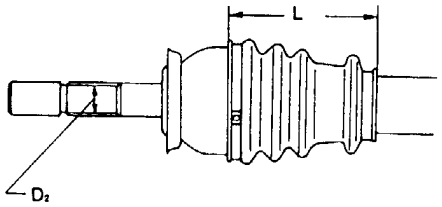
General Specifications

Susension type	Independent MacPherson strut with coil spring
Strut type	Double-acting hydraulic
Stabilizer bar	Standard equipment

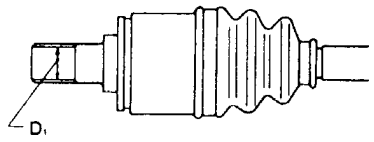
DRIVE SHAFT

Applied model	GA16DE	SR20DE, SR20De, CD20T	
	RH/LH	RH	LH
Joint type			
Transaxle side	GI69	89ST	GI69
Wheel side	90AC	98AC	
Diameter (Serration) mm (in)			
Transaxle side "D_1"	26 (1.02)		
Wheel side "D_2"	28 (1.10)		
Grease			
Quality	Nissan genuine grease or equivalent		
Capacity mℓ (Imp fl oz)			
Transaxle side	155 - 165 (5.5 - 5.8)	175 - 185 (6.2 - 6.5)	
Wheel side	80 - 110 (2.8 - 3.9)	110 - 130 (3.9 - 4.6)	
Boot length mm (in)			
Wheel side "L"	89 - 91 (3.50 - 3.58)	96 - 98 (3.78 - 3.86)	

Wheel side



Transaxle side



SFA928A

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Applied model				175/70 R14, 185/65 R14 (CD20T)	185/65 R14 (except CD20T)	195/60 R15
Camber		Degree minute	Minimum	-0°45′		
			Nominal	0°		
			Maximum	0°45′		
Caster		Degree minute	Minimum	1°00′		
			Nominal	1°45′		
			Maximum	2°30′		
Kingpin inclination		Degree minute	Minimum	13°45′		
			Nominal	14°30′		
			Maximum	15°15′		
Total toe-in			Minimum	0 (0)		
	Distance (A - B)	mm (in)	Nominal	1 (0.04)		
			Maximum	2 (0.08)		
	Angle (left plus right)	Degree minute	Minimum	0°		
			Nominal	0°6′		
			Maximum	0°12′		
Wheel turning angle						
	Full turn *2 Inside	Degree minute	Nominal	32° - 36°	35° - 39°	30° - 35°
	Full turn *2 Outside	Degree minute	Nominal	28° - 32°	30° - 34°	28° - 32°

*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

WHEEL BEARING

Wheel bearing axial end play limit mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb)	235 - 314 (24 - 32, 174 - 231)

LOWER BALL JOINT

Ball stud swinging force at cotter pin hole N (kg, lb)	7.8 - 54.9 (0.8 - 5.6, 1.8 - 12.3)
Ball stud rotating torque N·m (kg-cm, in-lb)	0.5 - 3.4 (5 - 35, 4.3 - 30.4)
Ball stud axial end play limit mm (in)	0 (0)

WHEEL RUNOUT

Wheel type		Aluminum	Steel
Radial runout limit	mm (in)	0.3 (0.012)	0.5 (0.020)
Lateral runout limit	mm (in)	0.3 (0.012)	0.8 (0.031)

<SUPPLEMENT-III> (For wagon models)

FRONT AXLE & FRONT SUSPENSION

SECTION FA

CONTENTS

SERVICE DATA AND SPECIFICATIONS (SDS) 3002
General Specifications 3002
Inspection and Adjustment 3003

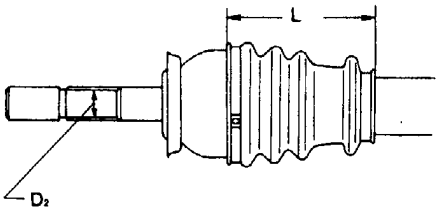
General Specifications

Suspension type	Independent MacPherson strut with coil spring
Strut type	Double-acting hydraulic
Stabilizer bar	Standard equipment

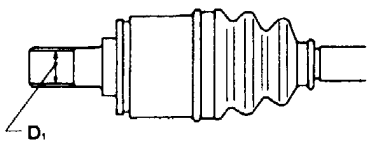
DRIVE SHAFT

Applied model	GA16DE	SR20DE, SR20De, CD20T	
	RH/LH	RH	LH
Joint type			
Transaxle side	GI69	89ST	GI69
Wheel side	90AC	98AC	
Diameter (Serration) mm (in)			
Transaxle side "D_1"	26 (1.02)		
Wheel side "D_2"	28 (1.10)		
Grease			
Quality	Nissan genuine grease or equivalent		
Capacity mℓ (Imp fl oz)			
Transaxle side	155 - 165 (5.5 - 5.8)	175 - 185 (6.2 - 6.5)	
Wheel side	80 - 110 (2.8 - 3.9)	110 - 130 (3.9 - 4.6)	
Boot length mm (in)			
Wheel side "L"	89 - 91 (3.50 - 3.58)	96 - 98 (3.78 - 3.86)	

Wheel side



Transaxle side



SFA928A

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Applied model				185/65 HR15	195/60 VR15
Camber		Degree minute	Minimum	−0°45′	
			Nominal	0°	
			Maximum	0°45′	
Caster		Degree minute	Minimum	1°10′	
			Nominal	1°55′	
			Maximum	2°40′	
Kingpin inclination		Degree minute	Minimum	13°45′	
			Nominal	14°30′	
			Maximum	15°15′	
Total toe-in			Minimum	0 (0)	
	Distance (A - B)		Nominal	1 (0.04)	
		mm (in)	Maximum	2 (0.08)	
	Angle (left plus right)		Minimum	0°	
		Degree minute	Nominal	0°6′	
			Maximum	0°12′	
Wheel turning angle					
	Full turn *2 Inside	Degree minute	Nominal	32° - 36°	
	Full turn *2 Outside	Degree minute	Nominal	28° - 32°	

*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
*2: Wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

WHEEL BEARING

Wheel bearing axial end play limit mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb)	235 - 314 (24 - 32, 174 - 231)

LOWER BALL JOINT

Ball stud swinging force at cotter pin hole N (kg, lb)	7.8 - 54.9 (0.8 - 5.6, 1.8 - 12.3)
Ball stud rotating torque N·m (kg-cm, in-lb)	0.5 - 3.4 (5 - 35, 4.3 - 30.4)
Ball stud axial end play limit mm (in)	0 (0)

WHEEL RUNOUT

Wheel type		Aluminum	Steel
Radial runout limit	mm (in)	0.3 (0.012)	0.5 (0.020)
Lateral runout limit	mm (in)	0.3 (0.012)	0.8 (0.031)

REAR AXLE & REAR SUSPENSION

SECTION RA

CONTENTS

<COMBINED EDITION>

PRECAUTIONS AND PREPARATION 1
- Precautions 1
- Special Service Tools 1
- Commercial Service Tools 1

REAR SUSPENSION SYSTEM 2

ON-VEHICLE SERVICE 3
- Rear Axle and Rear Suspension Parts 3
- Rear Wheel Bearing 3
- Rear Wheel Alignment 4

REAR AXLE 5
- Wheel Hub 5

REAR SUSPENSION 7
- Removal and Installation 8
- Coil Spring and Shock Absorber 9
- Torsion Beam, Lateral Link and Control Rod 10

SERVICE DATA AND SPECIFICATIONS (SDS) ... 12
- General Specifications 12
- Inspection and Adjustment 12

<SUPPLEMENT-I> (For Africa, Middle East & Australia)

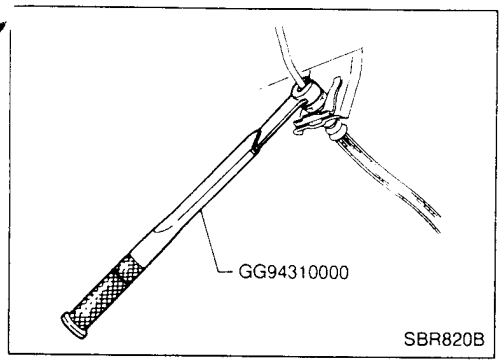
NO CHANGES

<SUPPLEMENT-II>

NO CHANGES

<SUPPLEMENT-III>

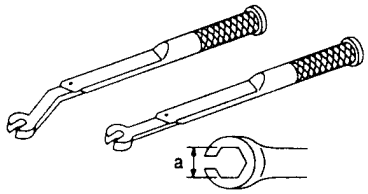
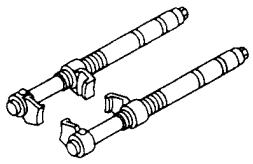
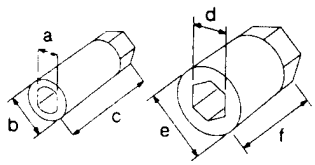
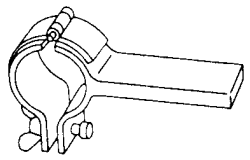
NO CHANGES



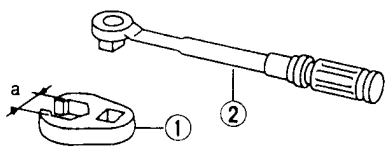
Precautions

- When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
  *: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- Use flare nut wrench when removing or installing brake tubes.
- After installing removed suspension parts, check wheel alignment.
- Do not jack up at the trailing arm and lateral link.
- Always torque brake lines when installing.

Special Service Tools

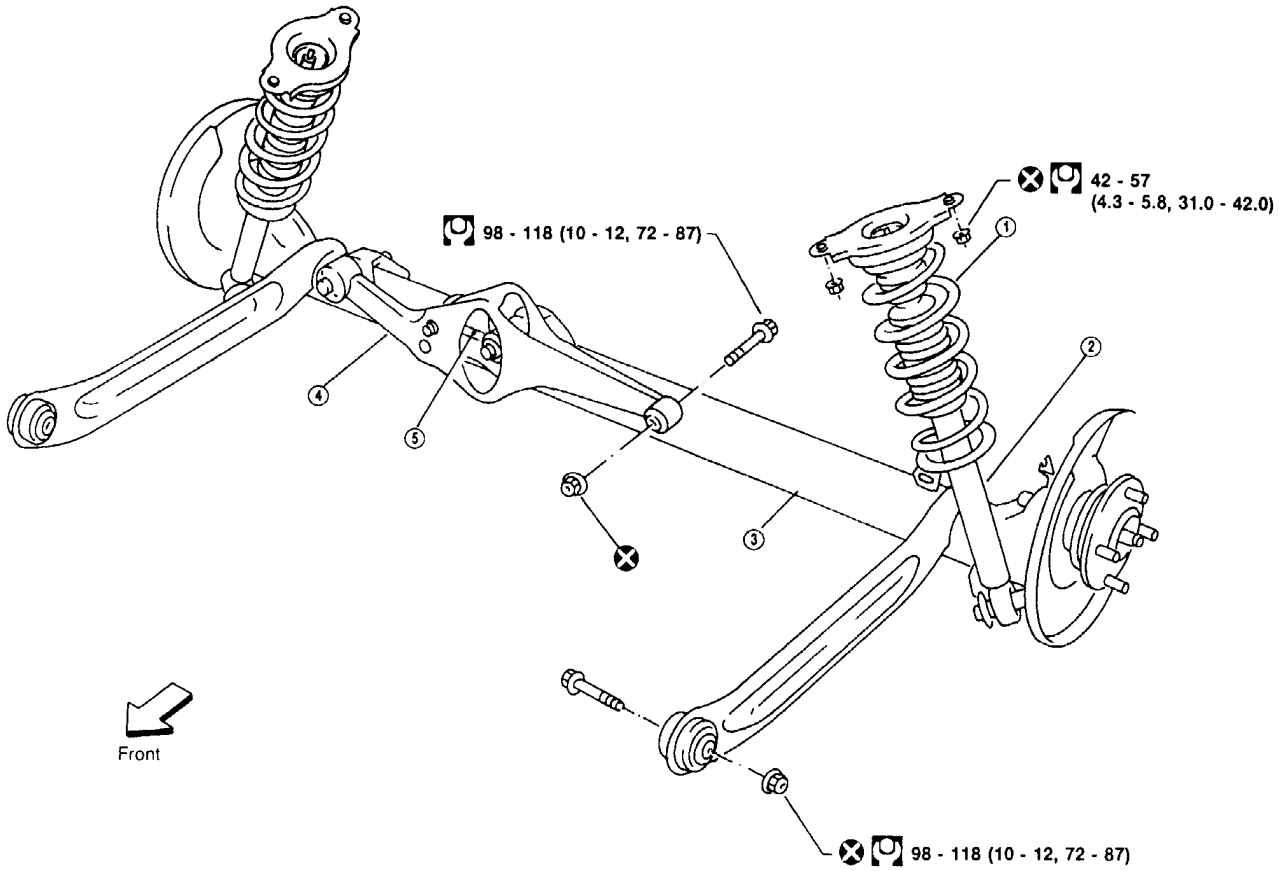
Tool number Tool name	Description	
GG94310000 Flare nut torque wrench	 NT406	Removing and installing brake piping **a: 10 mm (0.39 in)**
HT71780000 Spring compressor	 NT144	Removing and installing coil spring
KV40106400 Piston rod lock nut wrench	 NT369	A : 5 mm (0.20) B : 16.2 mm (0.64 in) DIA C : 52 mm (2.05 in) D : 14 mm (0.55 in) C : 25.4 mm (1.00 in) DIA F : 55 mm (2.17 in)
ST35652000 Shock absorber attachment	 NT145	Fixing strut assembly

Commercial Service Tools

Tool name	Description	
Equivalent to GG94310000 ① Flare nut crows foot ② Torque wrench	 NT360	Removing and installing brake piping **a: 10 mm (0.39 in)**

SEC. 431

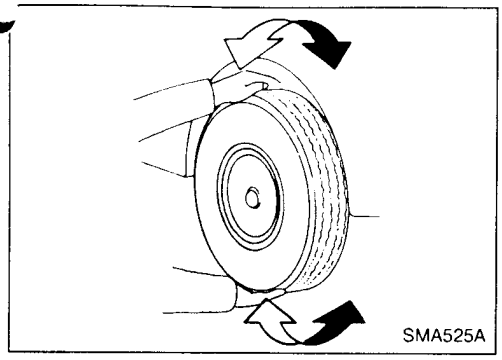
When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



: Do not re-use
: N·m (kg-m, ft-lb)

NRA004

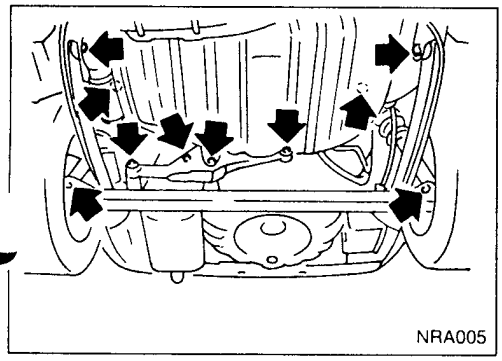
① Coil spring
② Shock absorber
③ Torsion beam
④ Lateral link
⑤ Control rod


SMA525A

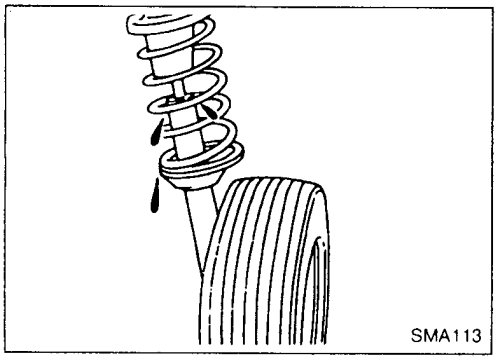
Rear Axle and Rear Suspension Parts

Check axle and suspension parts for excessive play, wear or damage.

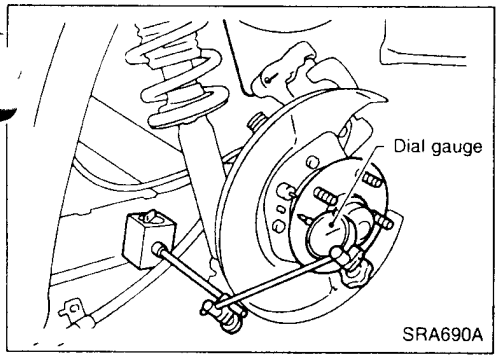
- Shake each rear wheel to check for excessive play.


NRA005

- Retighten all nuts and bolts to the specified torque.
  Tightening torque:
  Refer to REAR SUSPENSION (RA-7).


SMA113

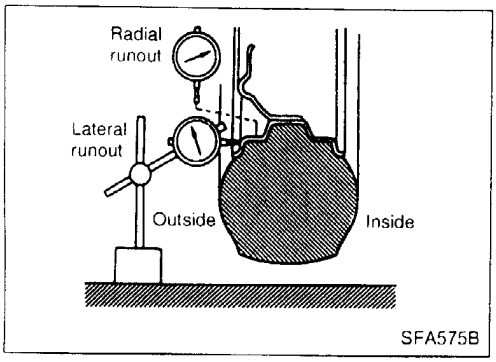
- Check shock absorber for oil leakage or other damage.



SRA690A

Rear Wheel Bearing

- Check axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less
- Check that wheel hub bearings operate smoothly.
- Check tightening torque of wheel bearing lock nut.
  : 187 - 234 N·m (19.1 - 23.9, 137.9 - 172.6)
- Replace wheel bearing assembly if there is axial end play or wheel bearing does not turn smoothly.
  Refer to REAR AXLE — Wheel Hub (RA-5).

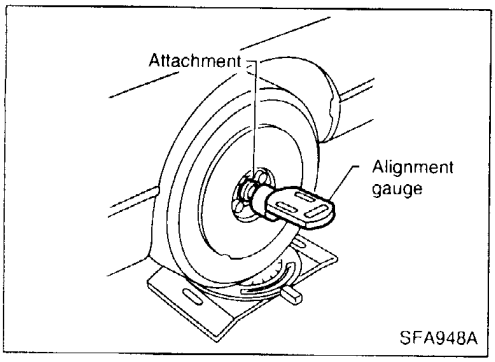


Rear Wheel Alignment

PRELIMINARY INSPECTION

Make following checks. Adjust, repair or replace if necessary.

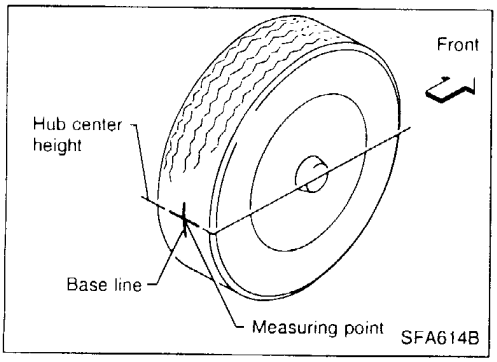
- Check tires for wear and for improper inflation.
- Check rear wheel bearings for excessive play.
- Check wheel runout.
  Wheel runout: Refer to SDS in FA section.
- Check that rear shock absorber functions correctly.
- Check rear axle and rear suspension parts for excessive play.
- Check vehicle posture (Unladen*).
  *: Fuel, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



CAMBER

Camber is preset at factory and cannot be adjusted.
Camber:
Refer to SDS (RA-12).

- If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.



TOE-IN

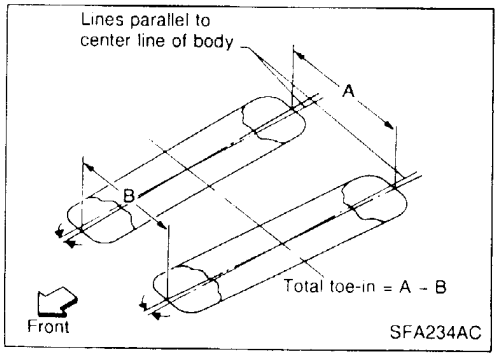
Toe-in is preset at factory and cannot be adjusted.
Measure toe-in using following procedure. If out of specification, inspect and replace any damaged or worn rear suspension parts.
WARNING:

- **Always perform following procedure on a flat surface.**
- **Make sure that no person is in front of the vehicle before pushing it.**

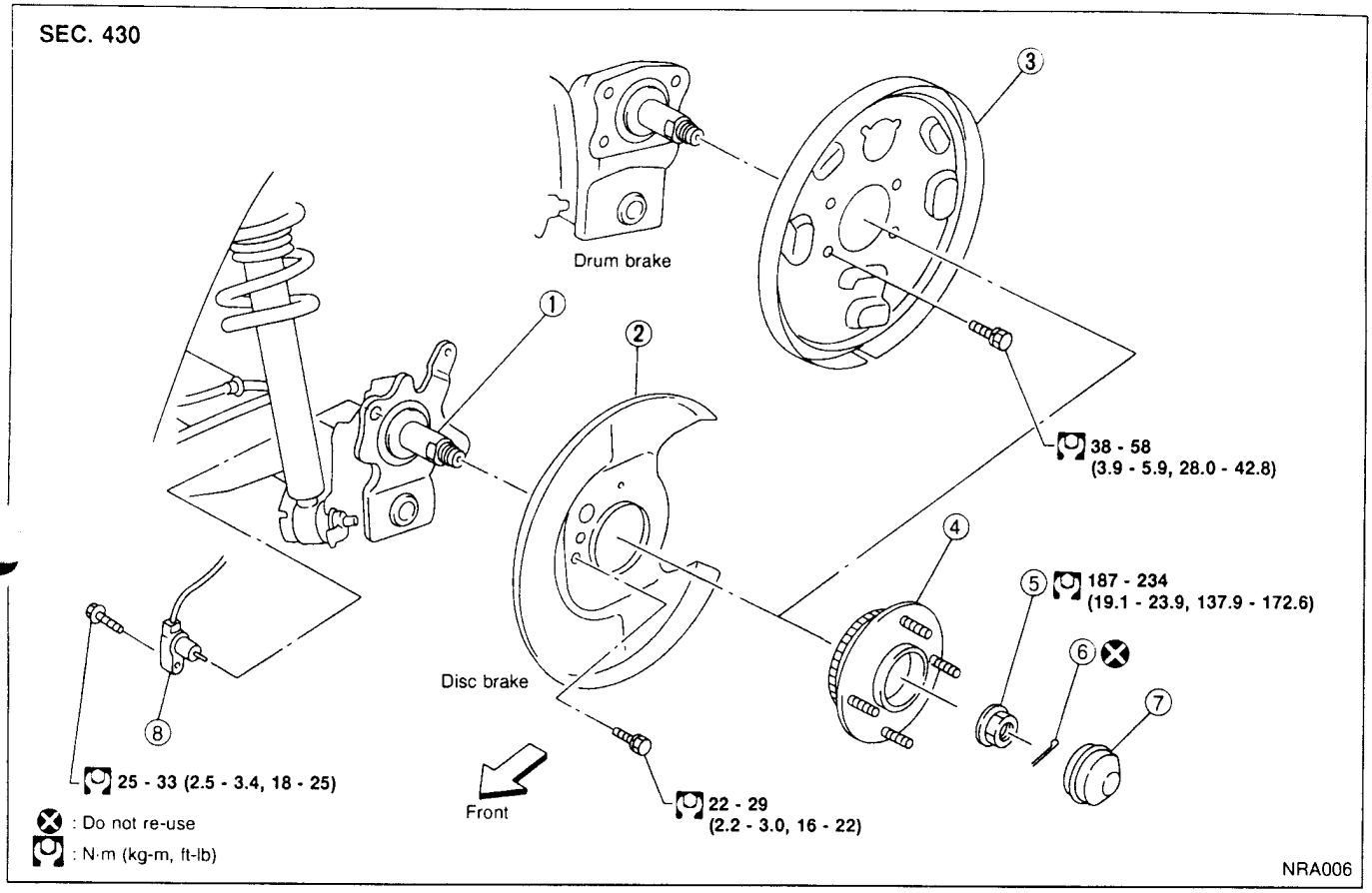
1. Bounce rear of vehicle up and down to stabilize the posture.
2. Push the vehicle straight ahead about 5 m (16 ft).
3. Put a mark on base line of the tread (rear side) of both tires at the same height of hub center. This mark is a measuring point.
4. Measure distance "A" (rear side).
5. Push the vehicle slowly ahead to rotate the wheels 180 degrees (1/2 turn).

If the wheels have rotated more than 180 degrees (1/2 turn), try the above procedure again from the beginning. Never push vehicle backward.

6. Measure distance "B" (front side).
   Total toe-in:
   Refer to SDS, RA-12.



Wheel Hub



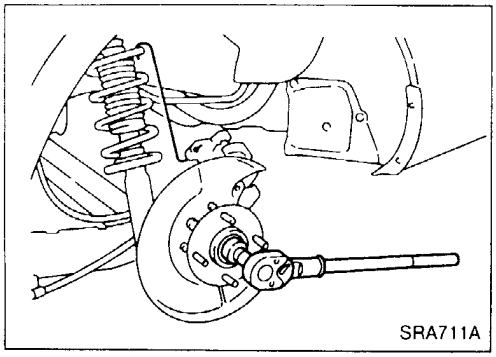
① Spindle
② Baffle plate
③ Back plate
④ Wheel hub bearing
⑤ Wheel bearing lock nut
⑥ Cotter pin
⑦ Hub cap
⑧ ABS sensor

REMOVAL

CAUTION:

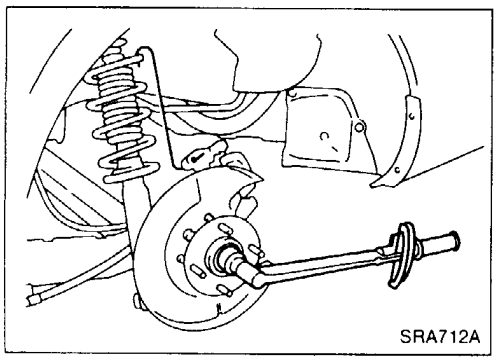
- **Before removing the rear wheel hub assembly, disconnect the ABS wheel sensor from the assembly. Then move it away from the hub assembly. Failure to do so may result in damage to the sensor wires and the sensor becoming inoperative.**
- **Wheel hub bearing does not require maintenance. If any of the following symptoms are noted, replace wheel hub bearing assembly.**
- Growling noise is emitted from wheel hub bearing during operation.
- Wheel hub bearing drags or turns roughly. This occurs when turning hub by hand after bearing lock nut is tightened to specified torque.

Wheel Hub (Cont'd)


SRA711A

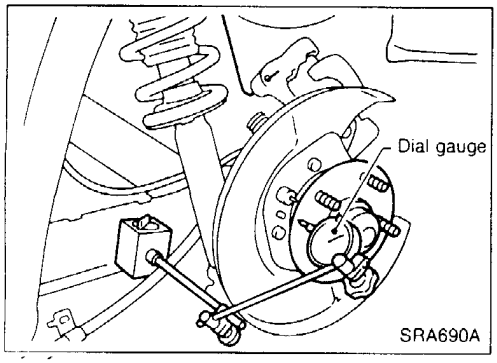
1. Remove brake caliper assembly.
2. Remove wheel bearing lock nut.
3. Remove brake rotor (models with disc brake) or brake drum (models with drum brakes).
4. Remove wheel hub bearing from spindle.

Brake hose does not need to be disconnected from brake caliper.
Suspend caliper assembly with wire so as not to stretch brake hose.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.


SRA712A

INSTALLATION

- Install wheel hub bearing.
- Tighten wheel bearing lock nut.
  Before tightening, apply oil to threaded portion of rear spindle and both sides of plain washer.
  : 187 - 234 (19.1 - 23.9, 137.9 - 172.6)
- Check that wheel bearings operate smoothly.



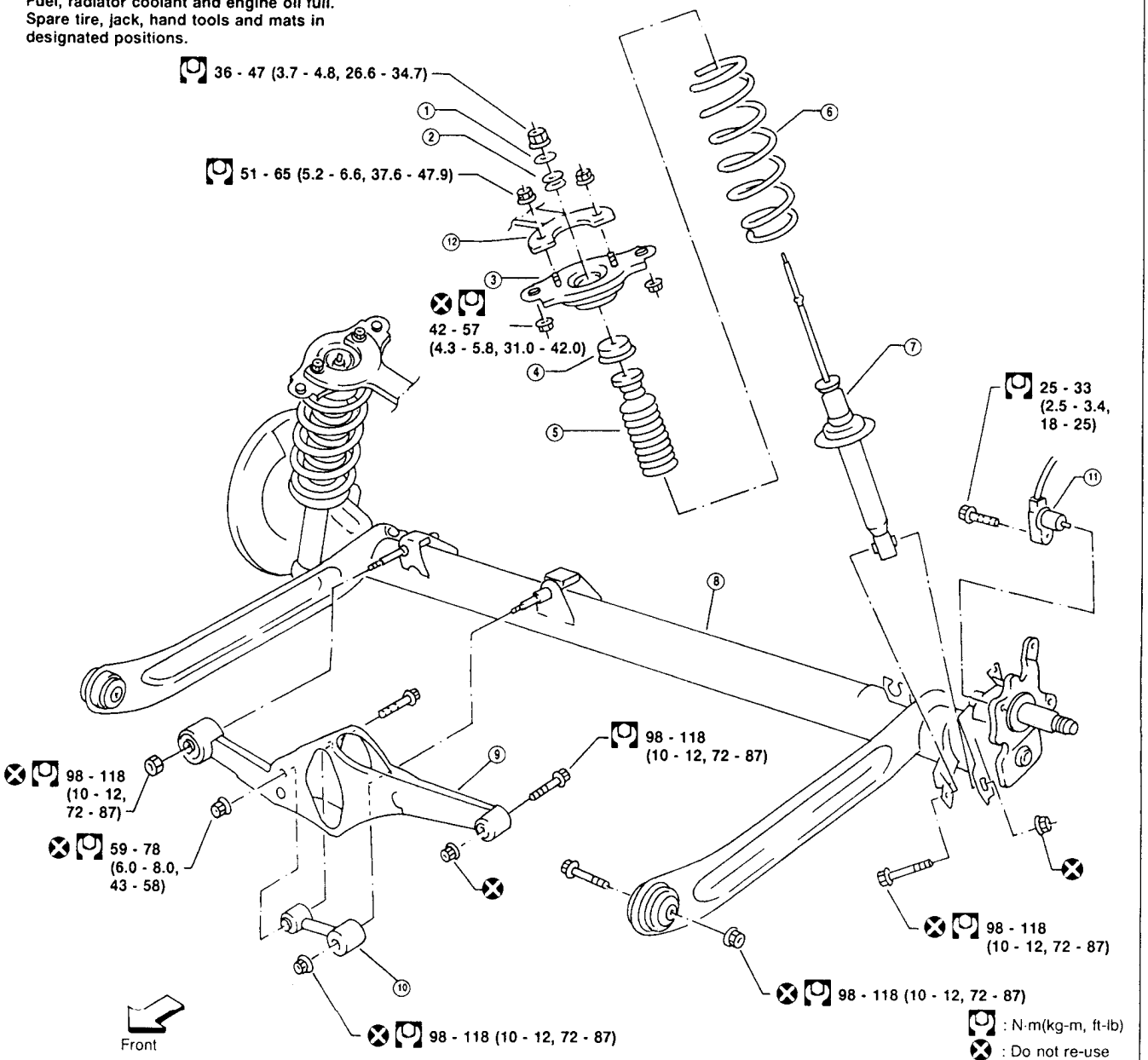
SRA690A

- Check wheel hub bearing axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less

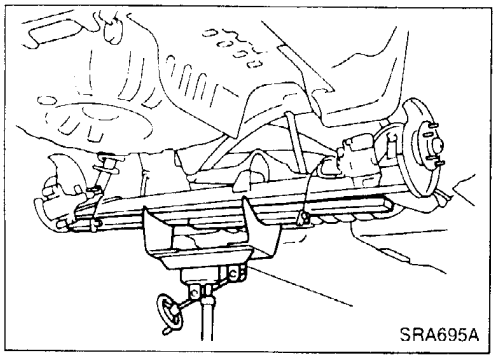
SEC. 431

When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



① Washer
② Bushing
③ Shock absorber mounting bracket
④ Bound bumper cover
⑤ Bound bumper
⑥ Coil spring
⑦ Shock absorber
⑧ Torsion beam
⑨ Lateral link
⑩ Control rod
⑪ ABS sensor
⑫ Strut bar (4-dr SRi & GT models)


SRA695A

Removal and Installation

CAUTION:

- **Before removing the rear suspension assembly, disconnect the ABS wheel sensor from the assembly. Failure to do so may result in damage to the sensor wires and the sensor becoming inoperative.**
- Remove suspension assembly.

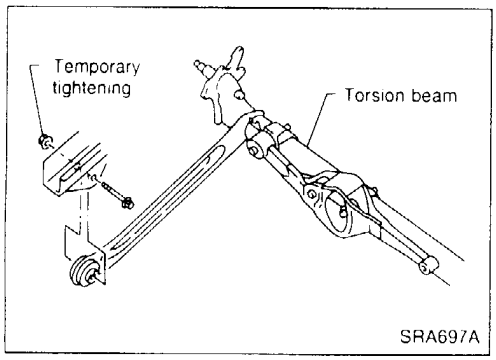
1. Disconnect brake hydraulic lines and parking brake cable at toggle lever. (Models with drum brakes.)
- Drain brake fluid before disconnecting brake lines.
2. Disconnect parking brake cable from caliper and remove brake caliper and rotor. (Models with disc brakes.)

Suspend caliper assembly with wire so as not to stretch brake hose.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.

3. Using a transmission jack, raise torsion beam a little, and remove nuts and bolts from the trailing arm, shock absorber assembly (lower side) and lateral link.
4. Lower transmission jack, and remove suspension.

4-dr SRi & GT models:

5. Remove luggage compartment trim. Refer to BT section.
6. Remove strut bar securing nuts.
7. Remove strut securing nuts from below. Remove strut assembly.



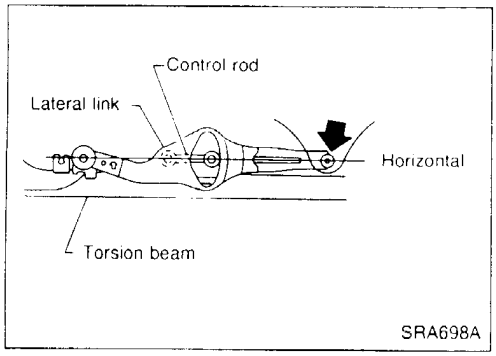
SRA697A

- Install suspension assembly.

CAUTION:

Refill with new brake fluid "DOT 4".
Never reuse drained brake fluid.

1. Attach torsion beam, at trailing arm and lateral link, to vehicle. Do not tighten bolts at this time.



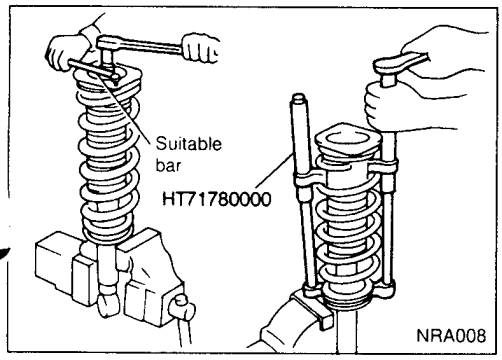
SRA698A

2. Using a transmission jack, place lateral link and control rod horizontally against torsion beam. Tighten lateral link on vehicle.
3. Attach shock absorber assembly to vehicle. Then tighten the lower side of shock absorber assembly.
4. Lower torsion beam to fully extended position. Remove transmission jack and tighten torsion beam, at trailing arm, to specified torque. **Refer to RA-7.**
5. Install brake hydraulic lines and tighten flare nuts.
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

Coil Spring and Shock Absorber

REMOVAL

Remove shock absorber upper and lower fixing nuts.
Do not remove piston rod lock nut on vehicle.

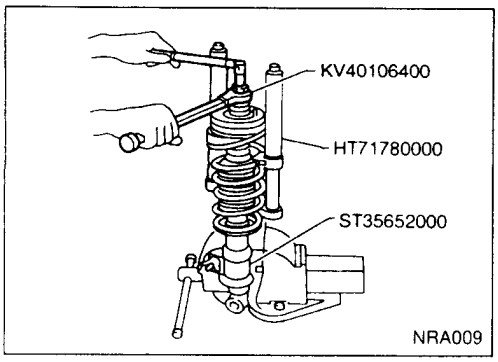


DISASSEMBLY

1. Set shock absorber in vise with attachment, then **loosen** piston rod lock nut.

Do not remove piston rod lock nut at this time.

2. Compress spring with Tool so that the shock absorber upper spring seat can be turned by hand.



3. Remove piston rod lock nut.

INSPECTION

Shock absorber assembly

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

Upper rubber seat and bushing

Check rubber parts for deterioration or cracks.
Replace if necessary.

Coil spring

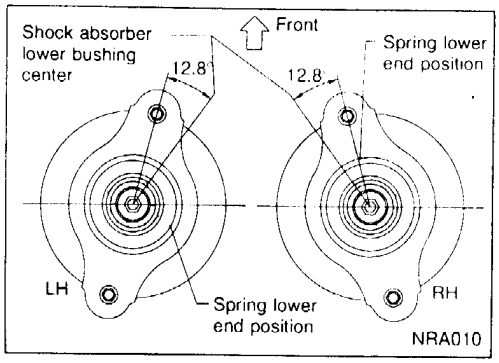
Check for cracks, deformation or other damage. Replace if necessary.

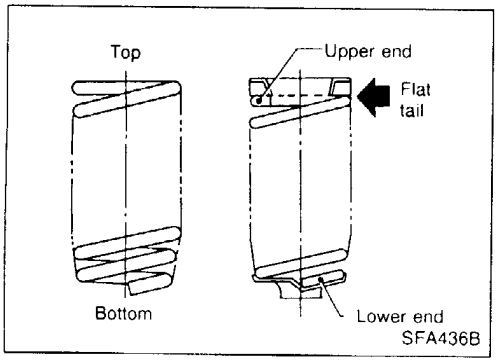
Strut bar (4-dr SRi & GT models)
Check for cracks, deformation or other damage. Replace if necessary.

Coil Spring and Shock Absorber (Cont'd)

ASSEMBLY

- Locate upper spring seat as shown.



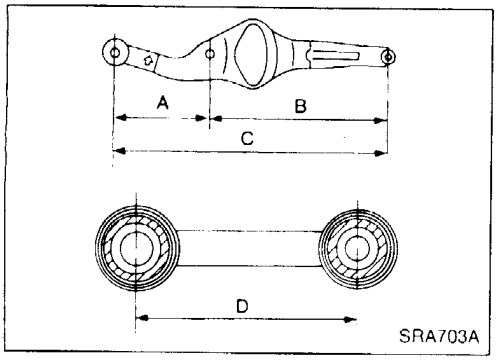


- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)
- When installing coil spring on shock absorber, it must be positioned as shown in figure at left.

Torsion Beam, Lateral Link and Control Rod

DISASSEMBLY

- Remove torsion beam assembly. Refer to Removal and Installation in REAR SUSPENSION (RA-8).
- Remove lateral link and control rod from torsion beam.



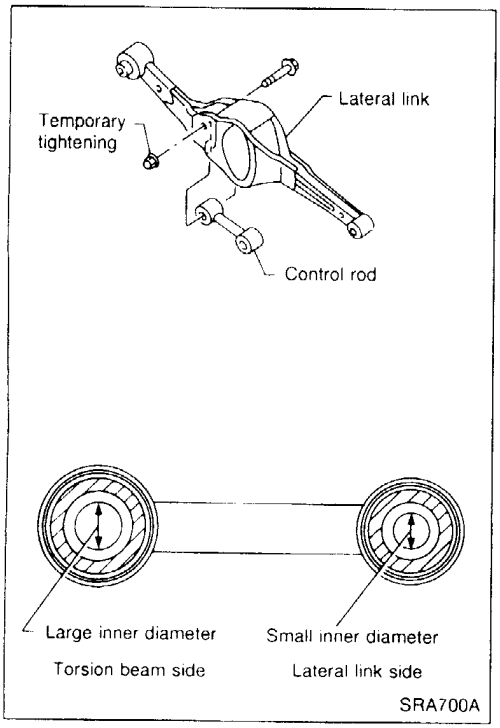
INSPECTION

- Check for cracks, distortion or other damage. Replace if necessary.

  Standard length:

  A 207 - 208 mm (8.15 - 8.19 in)
  B 394 - 395 mm (15.51 - 15.55 in)
  C 601 - 603 mm (23.66 - 23.74 in)
  D 106 - 108 mm (4.17 - 4.25 in)

- Check all rubber parts for wear, cracks or deformation. Replace if necessary.

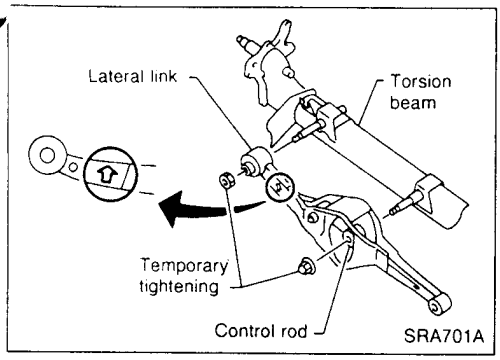


ASSEMBLY

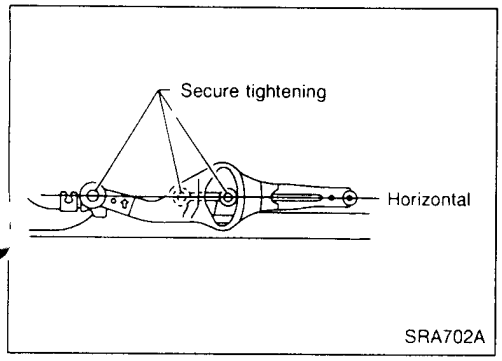
1. Temporarily assemble lateral link and control rod.

- When installing the control rod, connect the bush with the smaller inner diameter to the lateral link.

Torsion Beam, Lateral Link and Control Rod (Cont'd)



2. Temporarily install lateral link and control rod on torsion beam.
- When installing, place lateral link with the arrow topside.



3. Place lateral link and control rod horizontally against torsion beam, and tighten to the specified torque.
4. Install torsion beam assembly. Refer to Removal and Installation in REAR SUSPENSION (RA-8).

General Specifications

Suspension type	Multi-link beam suspension
Shock absorber type	Double-acting hydraulic
Stabilizer	Standard equipment

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

Camber	Minimum	−1°45′ (−1.75°)
Degree minute (Decimal degree)	Nominal	−1°00′ (−1.00°)
	Maximum	−0°15′ (−0.25°)
Total toe-in	Minimum	−3 (−0.12)
Distance (A−B) mm (in)	Nominal	1 (0.04)
	Maximum	5 (0.20)
Angle (left plus right)	Minimum	−16′ (−0.27°)
Degree minute (Decimal degree)	Nominal	5′ (0.08°)
	Maximum	26′ (0.43°)

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

WHEEL BEARING

Wheel bearing axial end play mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb)	187 - 234 (19.1 - 23.9, 137.9 - 172.6)

BRAKE SYSTEM

SECTION BR

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Removal and Installation....2002
Wiring Diagram — ABS —....2003
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Circuit diagram for Quick Pinpoint Check....2008

<SUPPLEMENT-III> (For wagon models)

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ABS Hydraulic Circuit....3002
System components....3003
Removal and Installation....3003
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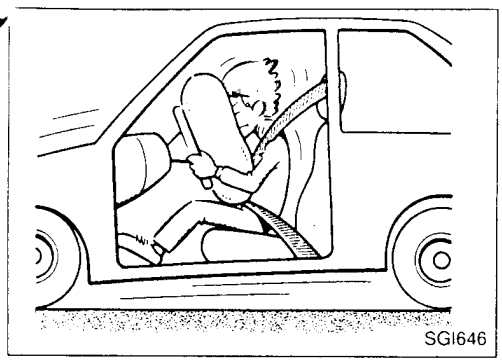
When you read wiring diagrams:
- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.
- See EL section for NATS information and wiring diagram.

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".


SGI646

Precautions

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) "AIR BAG" (DUAL AIR BAG SYSTEM)

The Supplemental Restraint System "Air Bag" used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation) all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual.**

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) "AIR BAG" (SINGLE AIR BAG SYSTEM)

The Supplemental Restraint System "Air Bag" used along with a seat belt, helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag module (located in the center of the steering wheel), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation) all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual.**

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of an air bag module (located in the center of the steering wheel and on the instrument panel on the passenger side, where fitted), seat belt pre-tensioners, 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.**
- **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.**

Precautions (Cont'd)

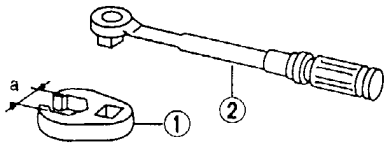
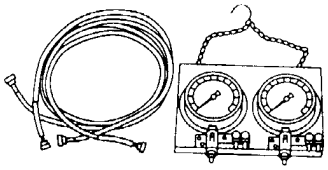
BRAKE SYSTEM

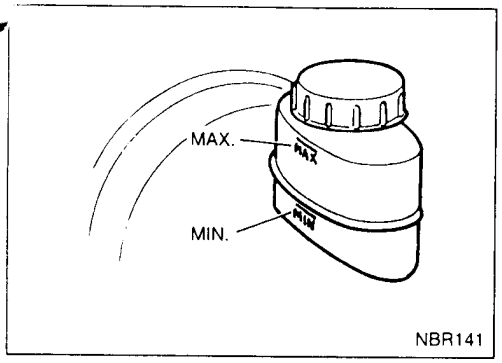
- Use only "DOT 4" fluid from a sealed container.
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- To clean master cylinder parts, disc brake caliper parts or wheel cylinder parts, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.
- Use flare nut wrench when removing and installing brake tubes.
- Always torque brake lines when installing.

WARNING:

- Clean brakes with a vacuum dust collector to minimize risk of health hazard from airborne materials.
- Avoid prolonged and repeated skin contact with brake fluid.
- Wear protective clothing, including impervious gloves.
- Where there is a risk of eye contact, eye protection should be worn — for example chemical goggles or face shield.

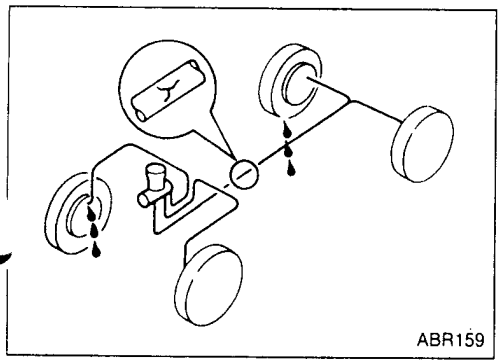
Commercial Service Tools

Tool name	Description	
① Flare nut crows foot ② Torque wrench	 NT360	Removing and installing each brake piping **a: 11 mm (0.43 in)**
Brake fluid pressure gauge	 NT151	Measuring brake fluid pressure



Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is low, check brake system for leaks.
- If brake warning lamp comes on and fluid level is above "MIN" mark, check brake fluid level switch and parking brake switch.

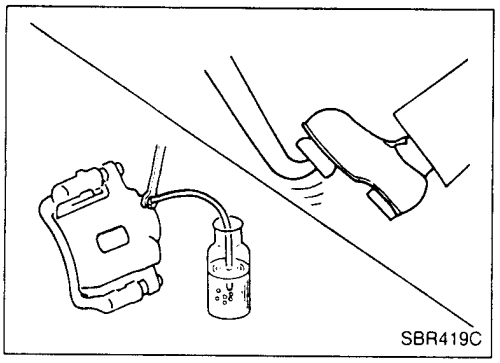


Checking Brake Line

CAUTION:

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

1. Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
2. Check for oil leakage by fully depressing brake pedal while engine is running.

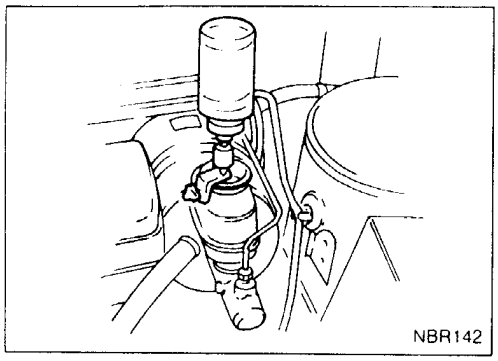


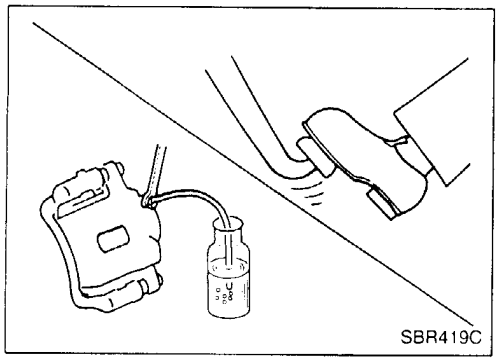
Changing Brake Fluid

CAUTION:

- **Refill with new brake fluid "DOT 4".**
- **Always keep fluid level higher than minimum line on reservoir tank.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**

1. Refill reservoir with new brake fluid.
2. Connect a vinyl tube to each air bleeder valve.
3. Drain brake fluid from each air bleeder valve by depressing brake pedal.
4. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to "Bleeding Procedure", BR-4.





Bleeding Procedure

CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **If master cylinder is suspected to have air inside, bleed air from master cylinder first. Refer to "Installation", "MASTER CYLINDER", BR-13.**
- **Fill reservoir with new brake fluid "DOT 4". Make sure it is full at all times while bleeding air out of system.**
- **Place a container under master cylinder to avoid spillage of brake fluid.**
- **For models with ABS, turn ignition switch to the off position and remove ABS fuse or battery cable.**
- Bleed air in the following order:

  RHD models

  Left rear brake → Right front brake → Right rear brake → Left front brake

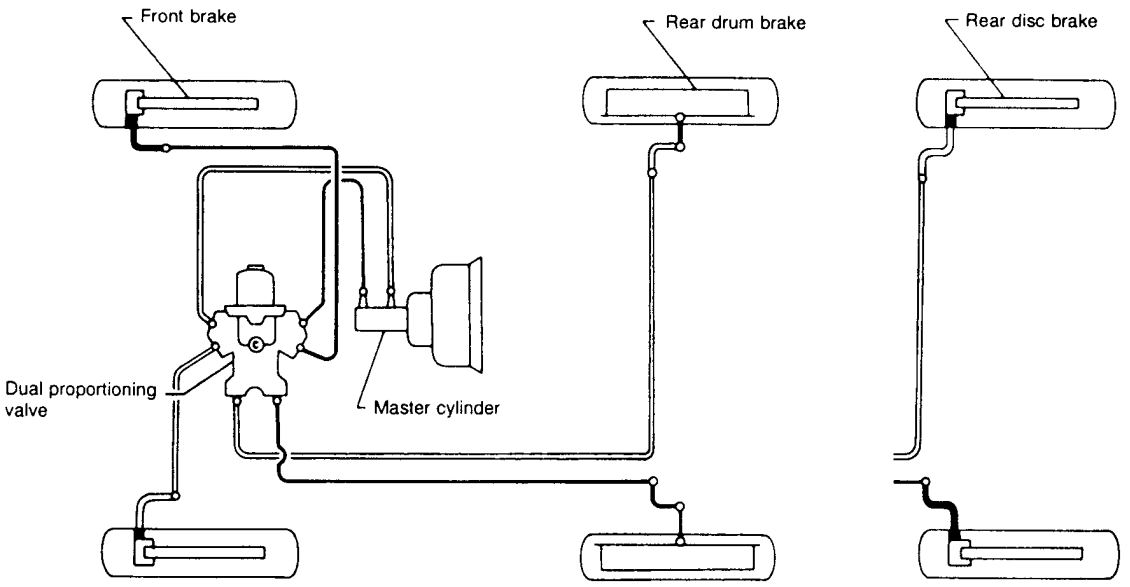
  LHD models

  Right rear brake → Left front brake → Left rear brake → Right front brake.

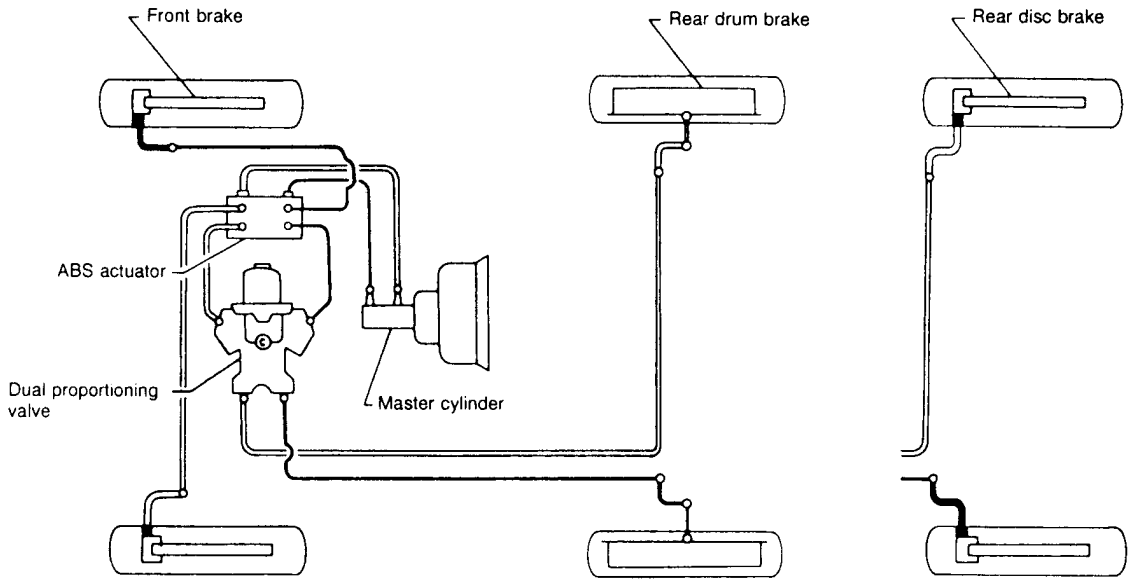
1. Connect a transparent vinyl tube to air bleeder valve.
2. Fully depress brake pedal several times.
3. With brake pedal depressed, open air bleeder valve to release air.
4. Close air bleeder valve.
5. Release brake pedal slowly.
6. Repeat steps 2. through 5. until clear brake fluid comes out of air bleeder valve.
7. Tighten air bleeder valve.

   : 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)

Without anti-lock brake system

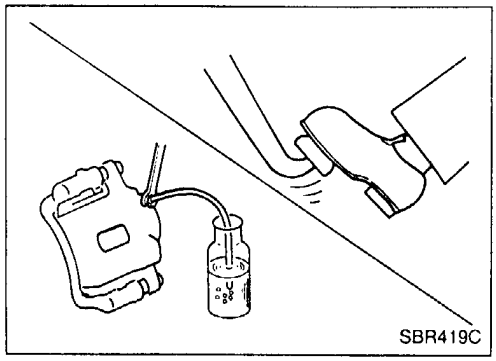


With anti-lock brake system



Primary line
Secondary line

NBR143



Removal

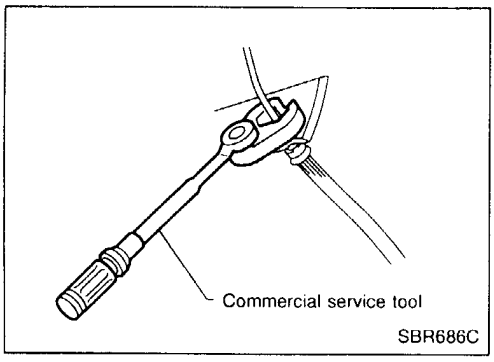
CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **All hoses and tubes must be free from excessive bending, twisting and pulling.**

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Remove flare nut securing brake tube to hose, then withdraw lock spring.
4. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.

Inspection

Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.

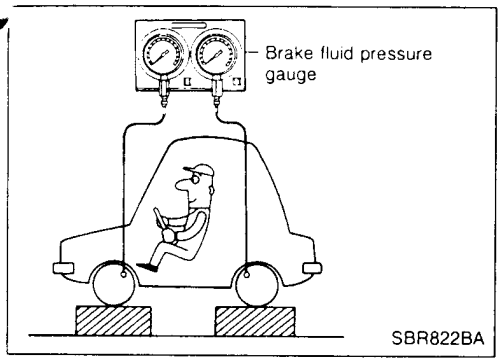


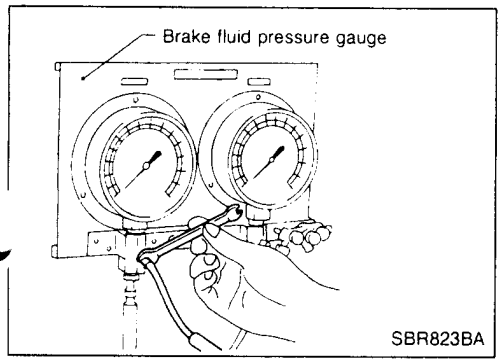
Installation

CAUTION:

- **Refill with new brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**

1. Tighten all flare nuts and connecting bolts.
   Flare nut:
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
   Connecting bolt:
   : 17 - 20 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)
2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to "Bleeding Procedure", BR-4.





Dual Proportioning Valve

INSPECTION

CAUTION:

- **Carefully monitor brake fluid level at master cylinder.**
- **Use new brake fluid "DOT 4".**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.**
- **Depress pedal slowly when raising front brake pressure.**
- **Check rear brake pressure at least 2 seconds after front brake pressure reaches specified value.**
- **For models with ABS remove ABS fuse before checking.**

1. Connect brake fluid pressure gauge to air bleeders of front and rear brakes on either LH or RH side.
2. Bleed air from the Tool.
3. Check rear brake pressure by depressing brake pedal (increasing front brake pressure).

Unit: kPa (bar, kg/cm^2, psi)

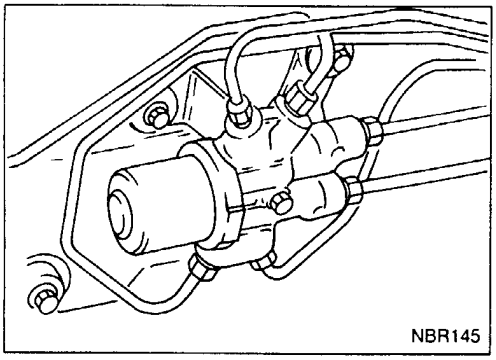
Applied pressure (Front brake)	5,394 (53.9, 55, 782)

Applied model	Dual proportioning valve part number	Output pressure (Rear brake)
Rear disc brake without ABS	46400 64J00	3138 - 3531 (31.4 - 35.3, 32 - 36, 455 - 512)
Rear disc brake with ABS (except SR20DE)	46400 43001	3138 - 3531 (31.4 - 35.3, 32 - 36, 455 - 512)
Rear drum brake without ABS	46400 2J3001	3727 - 4119 (37.3 - 41.2, 38 - 42, 540 - 597)
Rear drum brake with ABS	46400 2J200	3727 - 4119 (37.3 - 41.2, 38 - 42, 540 - 597)
SR20DE (with ABS)	46400 2J001	4021 - 4413 (40.2 - 44.1, 41 - 45, 583 - 640)

If output pressure is out of specifications, replace dual proportioning valve.

4. Bleed air after disconnecting the Tool. Refer to "Bleeding Procedure", BR-4.

Dual Proportioning Valve (Cont'd)


NBR145

REMOVAL

CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **All tubes must be free from excessive bending, twisting and pulling.**

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Loosen flare nut.
4. Remove proportioning valve mounting bolt, then remove flare nut.

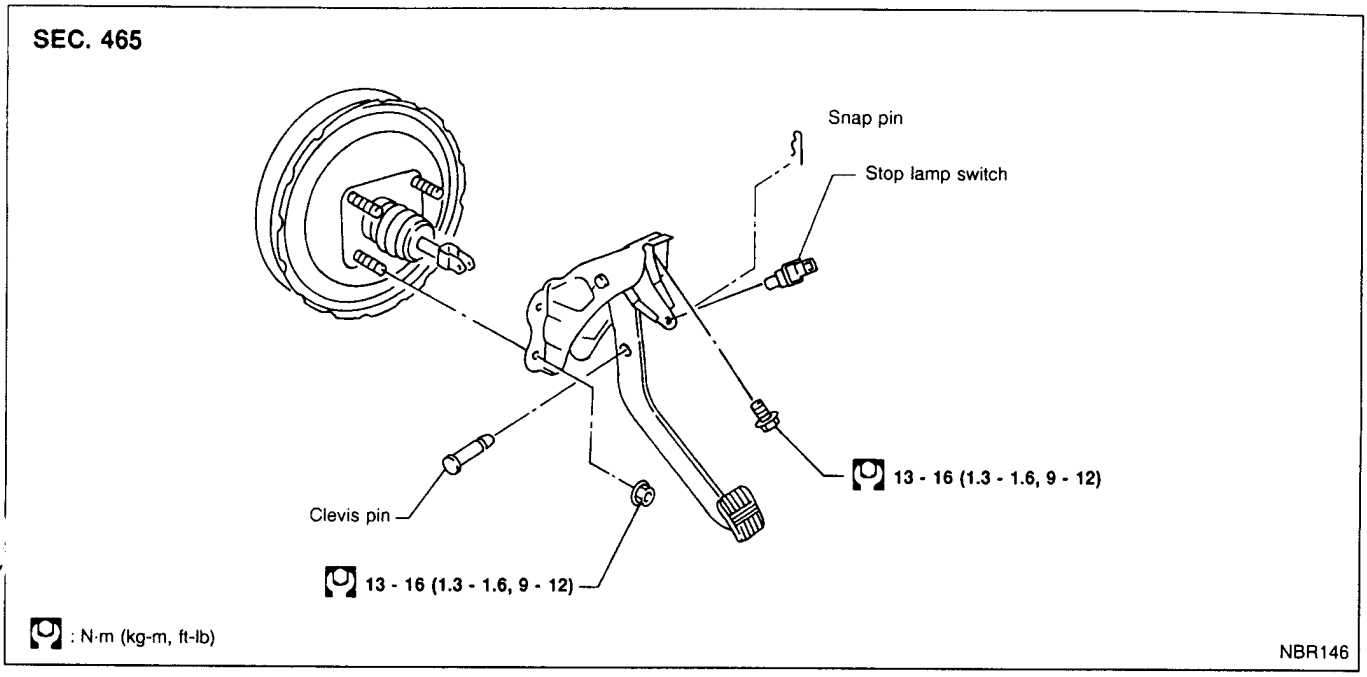
INSTALLATION

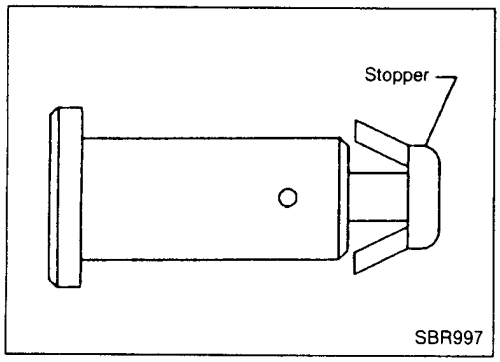
CAUTION:

- **Refill with new brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**

1. Temporarily fit flare nut to proportioning valve.
2. Tighten proportioning valve mounting bolt, then tighten flare nut with wooden block placed between proportioning valve and dash panel.
   Flare nut:
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
   Mounting bolt:
   : 5.1 - 8.8 N·m (0.52 - 0.9 kg-m, 45 - 78 in-lb)
3. Refill until new brake fluid comes out of each air bleeder valve.
4. Bleed air. Refer to "Bleeding Procedure", BR-4.

Removal and Installation

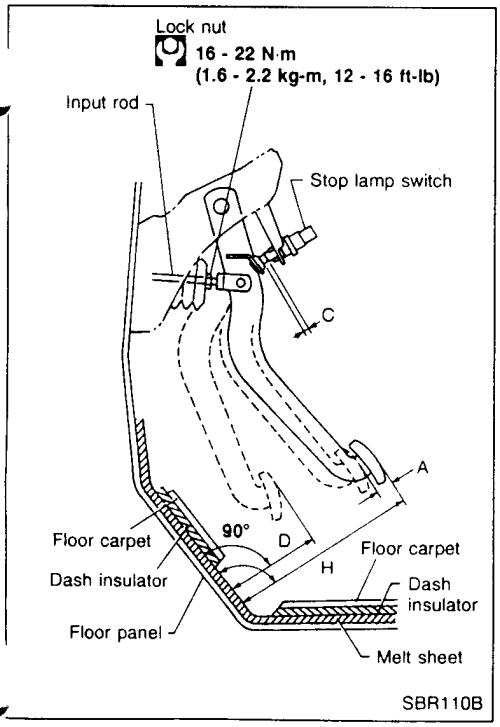




Inspection

Check brake pedal for following items:

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion
- Crack or deformation of clevis pin stopper.



Adjustment

Check brake pedal free height from dash reinforcement panel. Adjust if necessary.

H: Free height
Refer to SDS
D: Depressed height
Refer to SDS
Under force of 490 N (50 kg, 110 lb) with engine running
A: Pedal free play
Refer to SDS

Adjustment (Cont'd)

1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.
2. Check pedal free play.

Make sure that stop lamps go off when pedal is released.

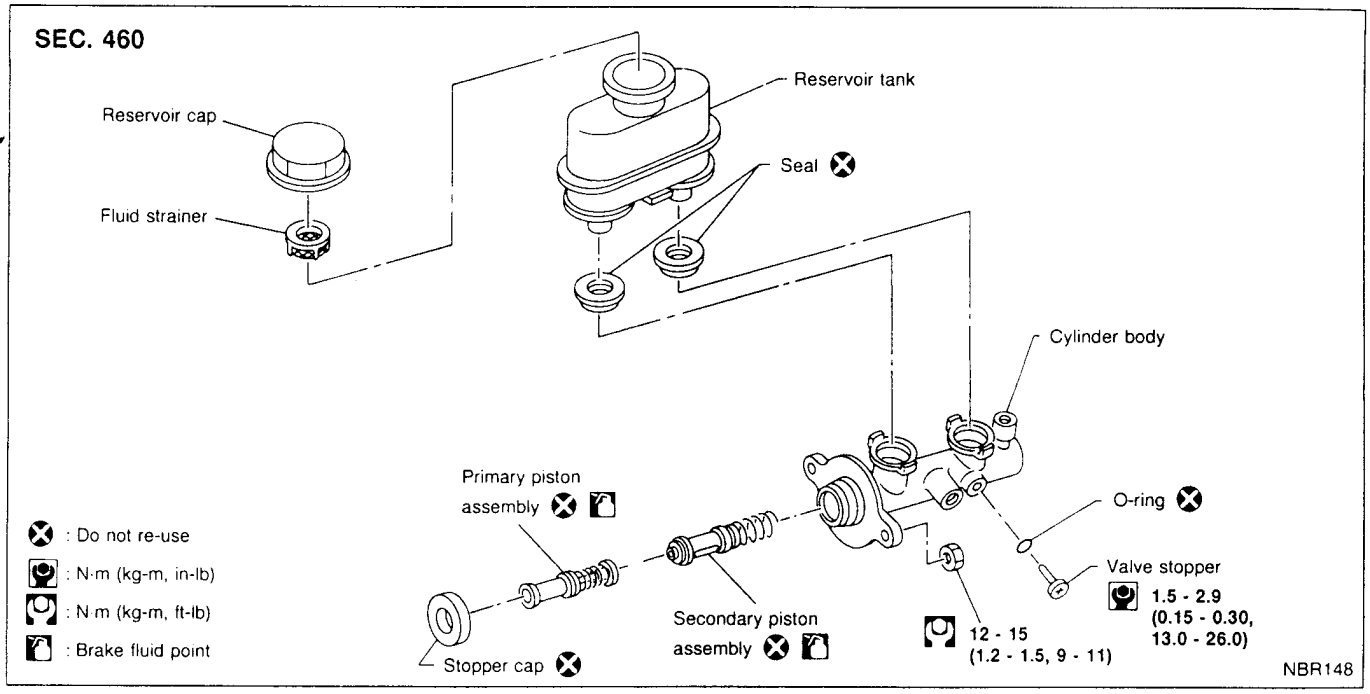
3. Check brake pedal's depressed height while engine is running.
   If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.

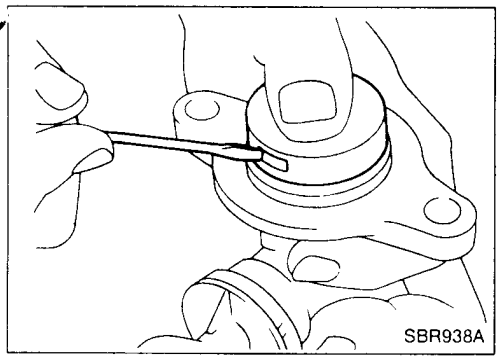
Removal

CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **In the case of brake fluid leakage from the master cylinder, disassemble the cylinder. Then check piston cups for deformation or scratches and replace necessary parts.**

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake pipe flare nuts.
4. Remove master cylinder mounting nuts.

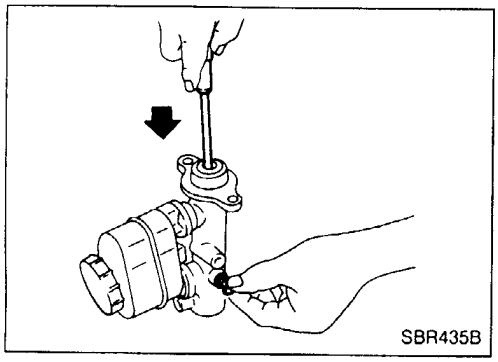




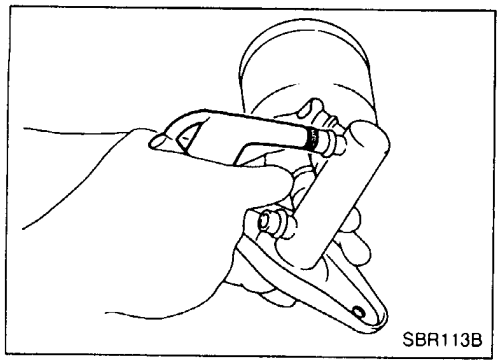
Disassembly

1. Bend claws of stopper cap outward.

Disassembly (Cont'd)


SBR435B

2. Remove valve stopper while piston is pushed into cylinder. Take care not to scratch cylinder bore.


SBR113B

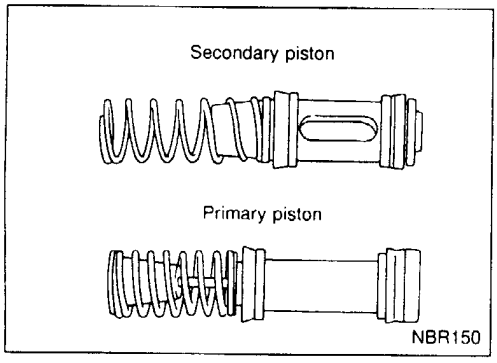
3. Remove piston assemblies.

If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.

4. Draw out reservoir tank.

Inspection

Check master cylinder inner wall for pin holes or scratches. Replace if damaged.



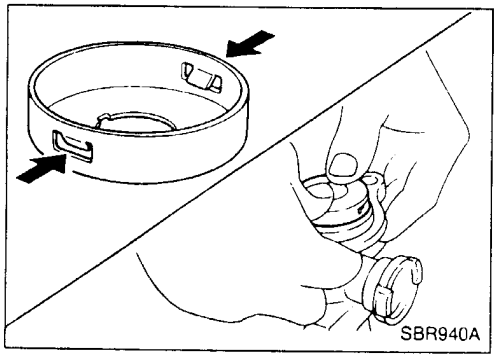
NBR150

Assembly

Wash all parts carefully in new "DOT 4" brake fluid.

1. Insert secondary piston assembly. Then insert primary piston assembly.

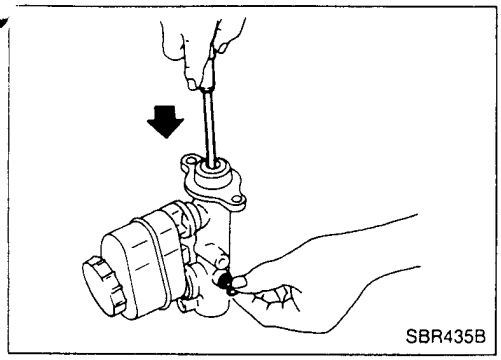
- **Pay attention to direction of piston cups in figure at left. Also, insert pistons squarely to avoid scratches on cylinder bore.**
- **Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body.**


SBR940A

2. Install stopper cap.

Before installing stopper cap, ensure that claws are bent inward.

3. Push reservoir tank seals into cylinder body.
4. Push reservoir tank into cylinder body.



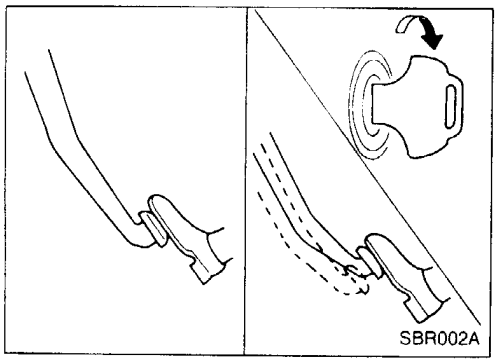
5. Install valve stopper while piston is pushed into cylinder.

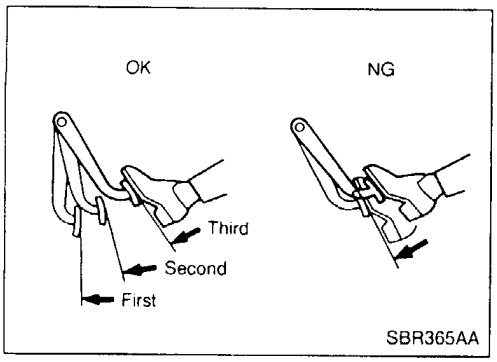
Installation

CAUTION:

- **Refill with new brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**

1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Torque mounting nuts.
   : 12 - 15 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)
3. Loosely assemble brake tubes to master cylinder. (Do not tighten tube nuts.)
4. Fill up reservoir tank with new brake fluid.
5. Have driver depress brake pedal slowly several times until no air comes out of master cylinder at the tube nut/cylinder part loose joint.
6. Tighten flare nuts.
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
7. Bleed air from brake system. Refer to "Bleeding Procedure", BR-4.





On-vehicle Service

OPERATING CHECK

- Depress brake pedal several times with engine off. After exhausting vacuum, make sure there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.

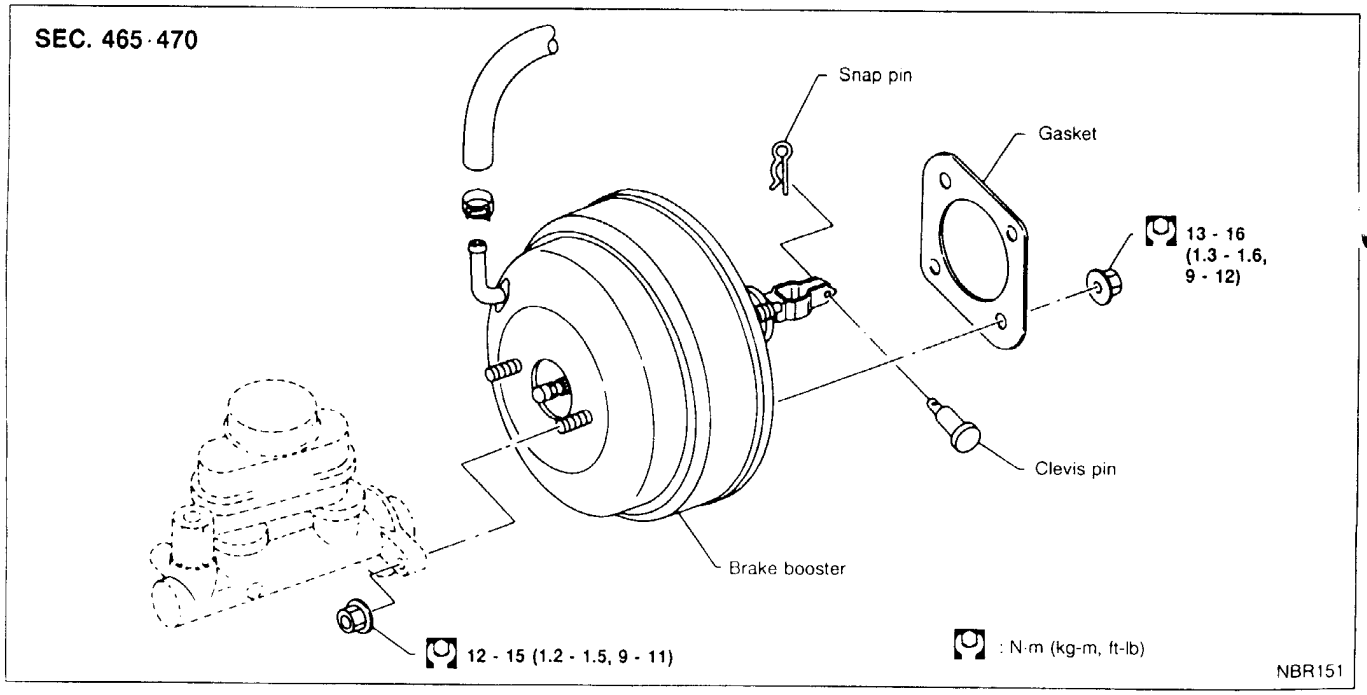
AIRTIGHT CHECK

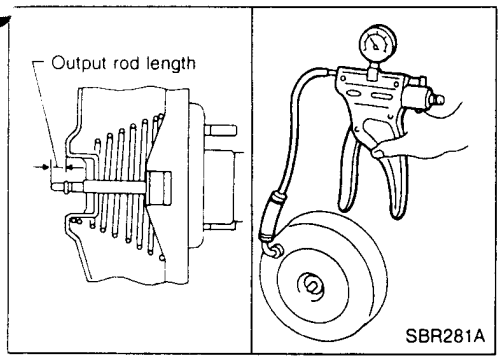
- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. Booster is airtight if pedal stroke is less each time.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. The pedal stroke should not change after holding pedal down for **30 seconds**.

Removal

CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **Be careful not to deform or bend brake pipes, during removal of booster.**

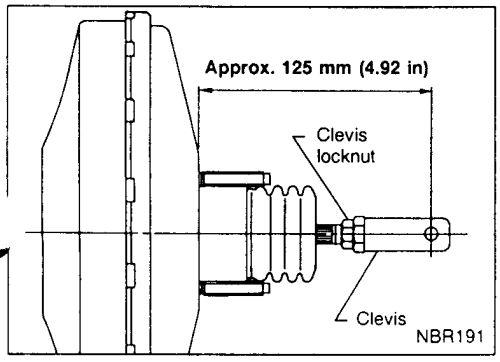




Inspection

OUTPUT ROD LENGTH CHECK

1. Supply brake booster with vacuum of −66.7 kPa (−667 mbar, −500 mmHg, −19.69 inHg) using a hand vacuum pump.
2. Check output rod length.
   Specified length:
   10.275 - 10.525 mm (0.4045 - 0.4144 in)

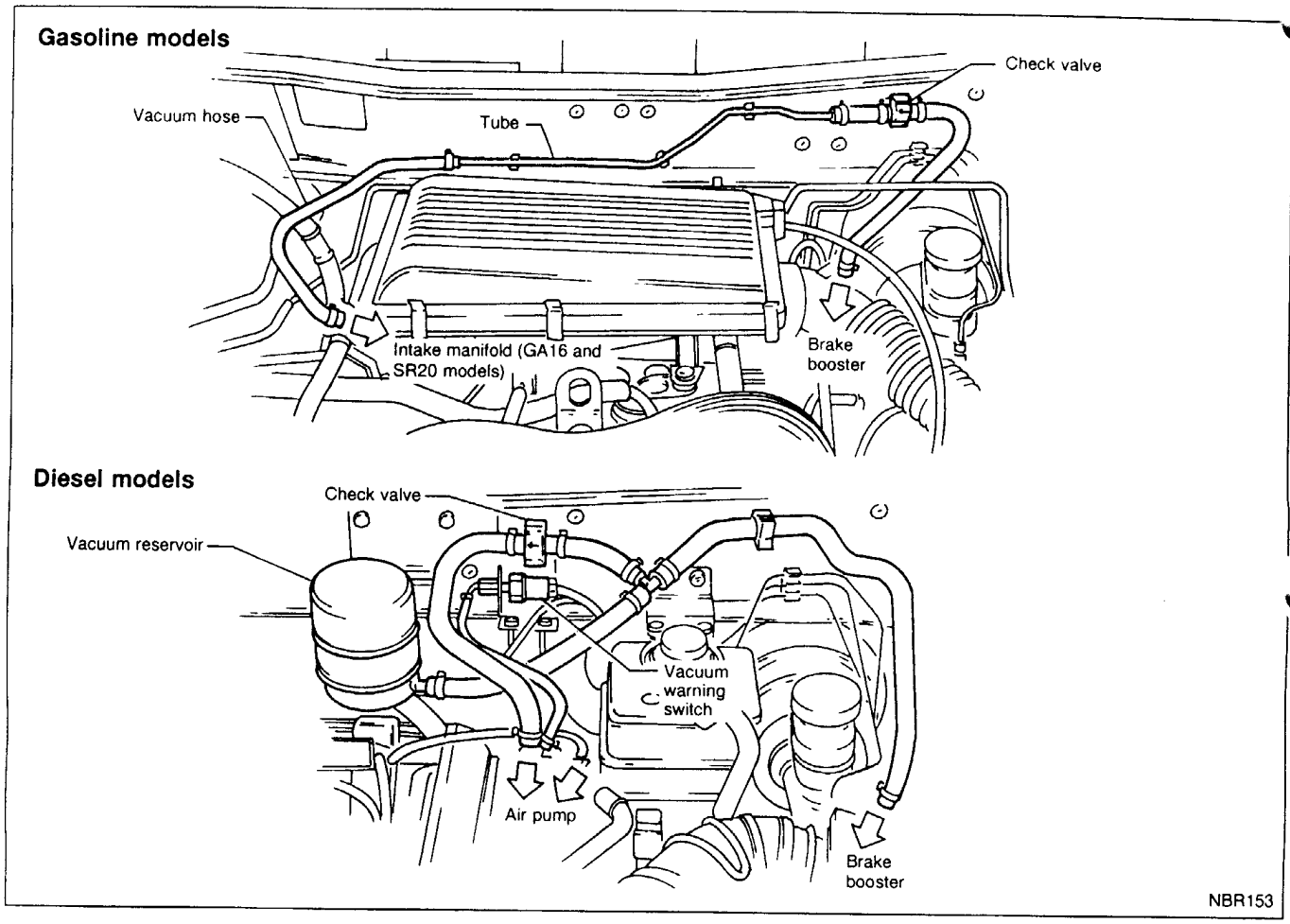


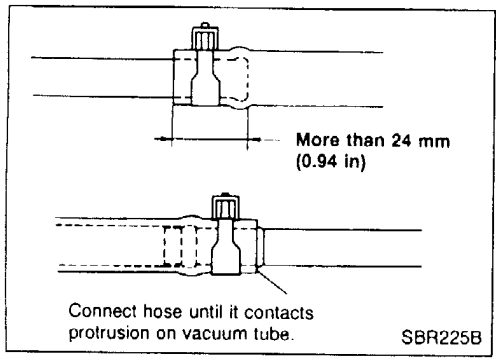
Installation

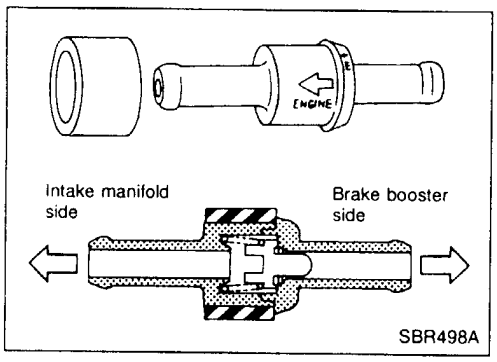
CAUTION:

- **Be careful not to deform or bend brake pipes during installation of booster.**
- **Replace clevis pin if damaged.**
- **Refill with new brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**

1. Before fitting booster, temporarily adjust clevis to dimension shown.
2. Fit booster, then secure mounting nuts (brake pedal bracket to booster) lightly.
3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.
   Specification:
   : 13 - 16 N·m (1.3 - 1.6 kg-m, 9 - 12 ft-lb)
5. Install master cylinder. Refer to BR-13.
6. Bleed air. Refer to "Bleeding Procedure", BR-4.
7. Adjust pedal height to specification. Refer to SDS (BR-80) Retighten clevis locknut.
   Specification:
   : 16 - 22 N·m (1.6 - 2.2 kg-m, 12 - 16 ft-lb)







Removal and Installation

CAUTION:

When installing vacuum hoses, pay attention to the following points.

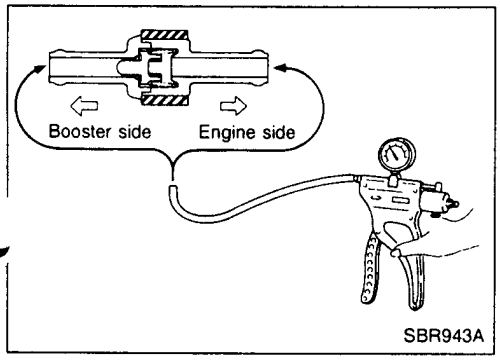
- **Do not apply any oil or lubricants to vacuum hose and check valve.**
- **Insert vacuum tube into vacuum hose as shown.**

- **Install check valve, paying attention to its direction.**

Inspection

HOSES AND CONNECTORS

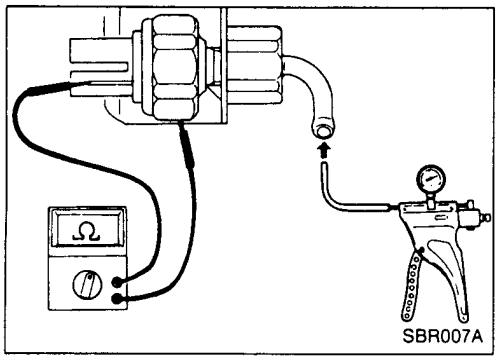
Check vacuum lines, connections and check valve for air tightness, improper attachment, chafing and deterioration.



CHECK VALVE

Check vacuum with a vacuum pump.

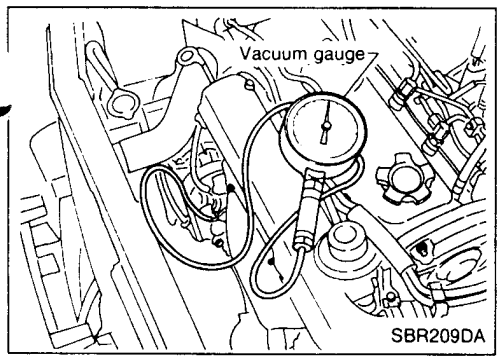
Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.



VACUUM WARNING SWITCH (Diesel engine models)

Test continuity through vacuum warning switch with an ohmmeter and vacuum pump.

Vacuum condition	Continuity
Less than 26.7 kPa (267 mbar, 200 mmHg, 7.87 inHg)	Yes
33.3 kPa (333 mbar, 250 mmHg, 9.84 inHg) or more	No



VACUUM PUMP

1. Install vacuum gauge.
2. Run engine at 1,000 rpm or more.
3. Check vacuum.

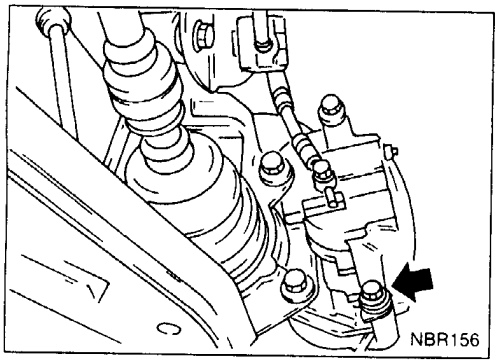
Specified vacuum:

86.6 kPa (866 mbar, 650 mmHg, 25.59 inHg) or more

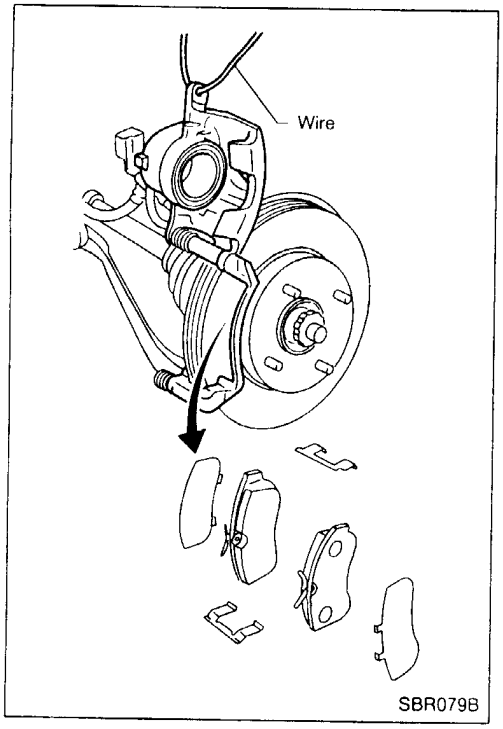
Pad Replacement

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne materials.
CAUTION:

- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.**
- **If shims are rusted or show peeling of the rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**

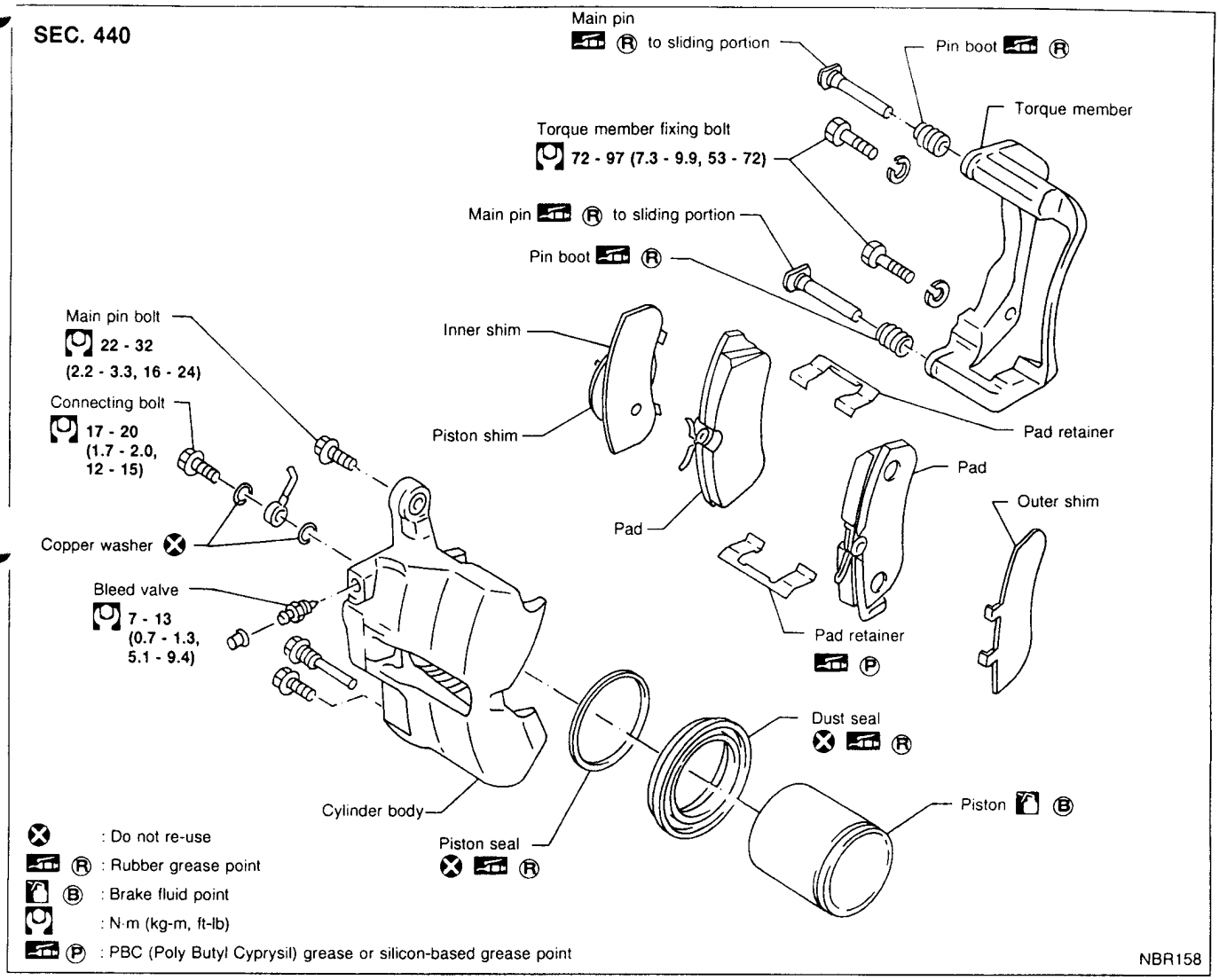


1. Remove master cylinder reservoir cap.
2. Remove pin bolt.



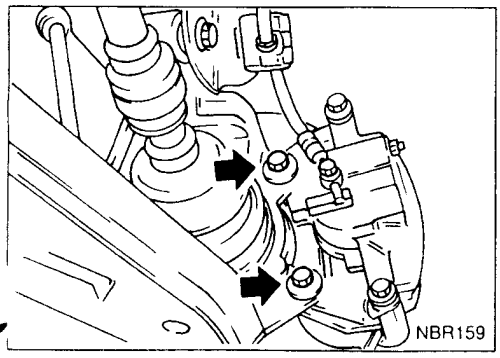
3. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.
   Standard pad thickness:
   11 mm (0.43 in)
   Pad wear limit:
   2.0 mm (0.079 in)

Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

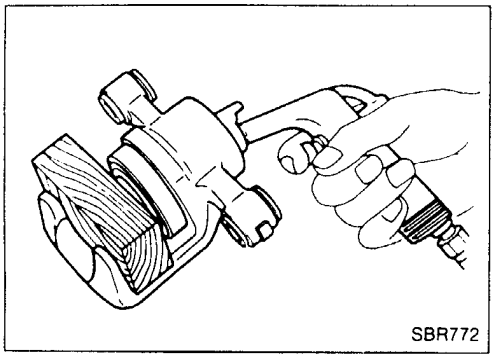


Removal

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne materials.
CAUTION:
Suspend caliper assembly with wire so as not to stretch brake hose.



Remove torque member fixing bolts and connecting bolt.
It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly.


SBR772

Disassembly

WARNING:
Do not place your fingers in front of piston.
CAUTION:
Do not scratch or score cylinder wall.
1. Push out piston with dust seal with compressed air.
2. Remove piston seal with a suitable tool.

Inspection — Caliper

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

CAUTION:
Use brake fluid to clean. Never use mineral oil.

PISTON

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.
CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

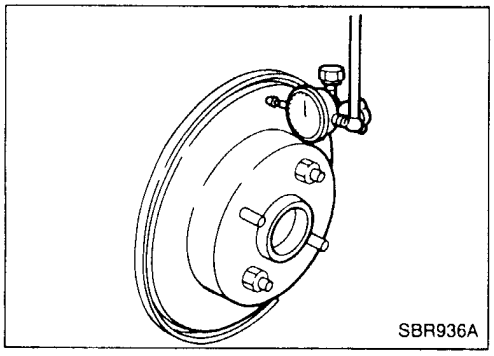
SLIDE PIN, PIN BOLT AND PIN COVER

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

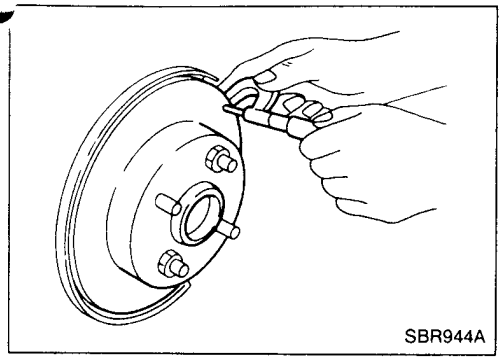

SBR936A

RUNOUT

1. Secure rotor to wheel hub with two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

Make sure that axial end play is within the specifications before measuring. Refer to section FA.

Rotor repair limit:
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)


SBR944A

THICKNESS

Rotor repair limit:

Standard thickness

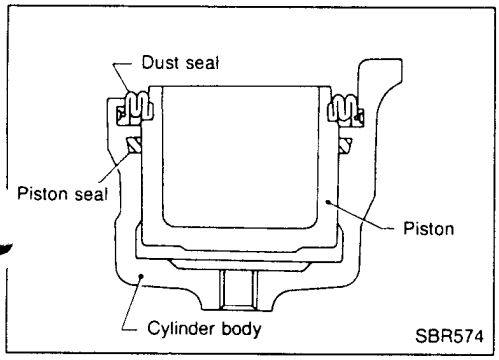
22 mm (0.87 in)

Minimum thickness

20.0 mm (0.787 in)

Thickness variation (At least 8 positions)

Maximum 0.02 mm (0.0008 in)



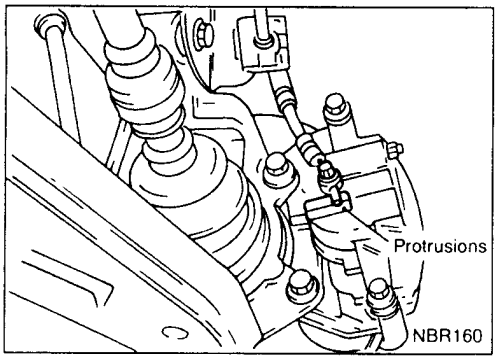
SBR574

Assembly

CAUTION:

Always use new piston seal.

1. Insert new piston seal into groove in cylinder body
2. With dust seal fitted to piston, insert dust seal into groove on cylinder body and install piston.
3. Properly secure dust seal.



NBR160

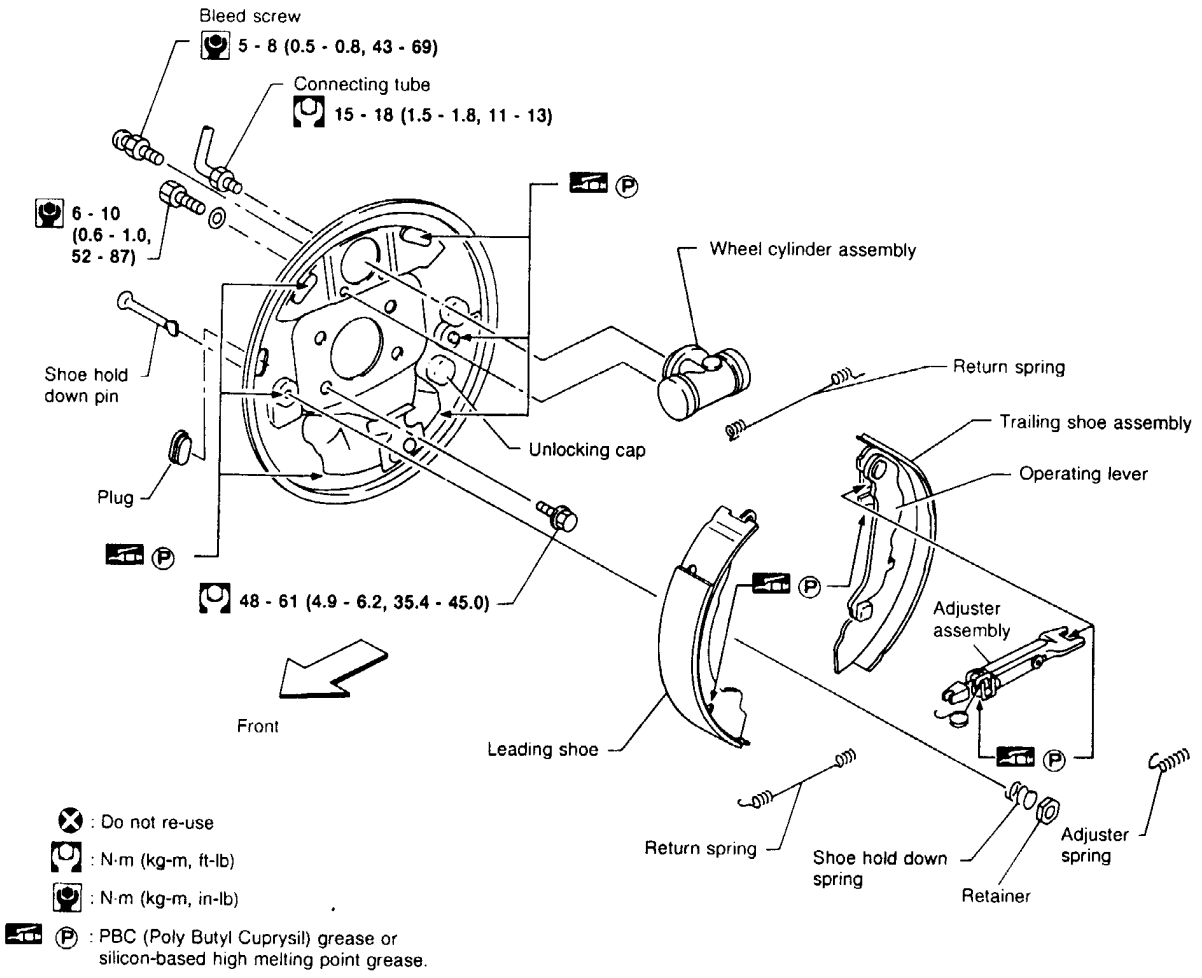
Installation

CAUTION:

- **Refill with new brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**

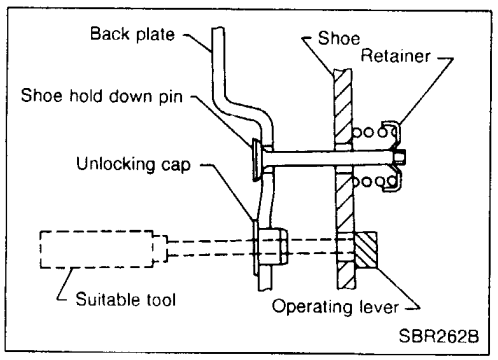
1. Install brake hose to caliper securely.
2. Install all parts and secure all bolts.
3. Bleed air. Refer to "Bleeding Procedure" BR-4

SEC. 441



Removal

WARNING:
Clean brake lining with a vacuum dust collector to minimize the hazard of airborne materials.
CAUTION:
Make sure parking brake lever is released completely.

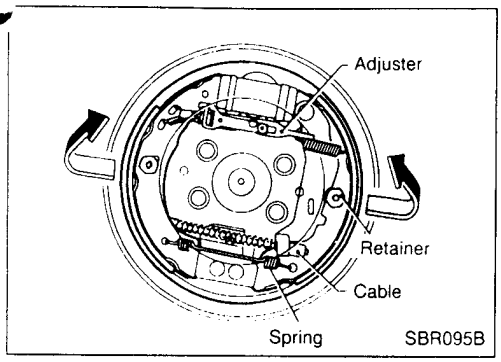


1. Release parking brake lever fully, then remove drum.

If drum is hard to remove, the following procedures should be carried out:

a. Remove unlocking cap from back plate.
b. Insert a suitable tool through unlocking cap hole and hole in shoe until tool contacts operating lever.
c. Lightly hit suitable tool to make clearance between brake shoe and drum as shown.

Removal (Cont'd)

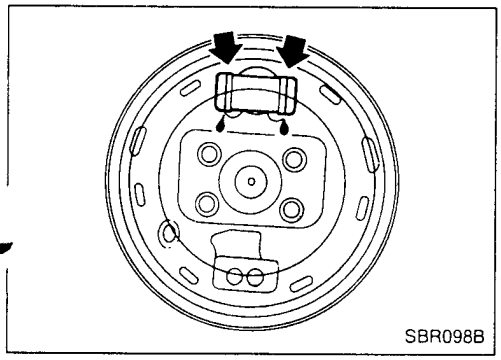


2. After removing brake shoe retainer, remove spring by rotating shoes.

Be careful not to damage parking brake cable when separating it.

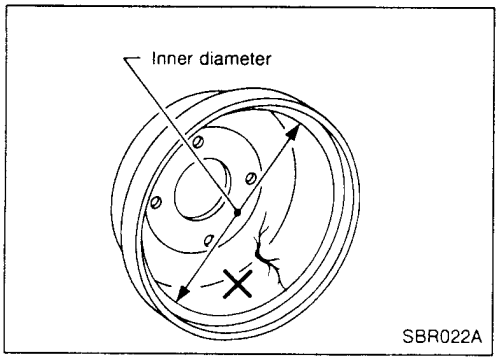
3. Remove adjuster assembly.
4. Disconnect parking brake cable from operating lever.

Inspection — Wheel Cylinder



- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.

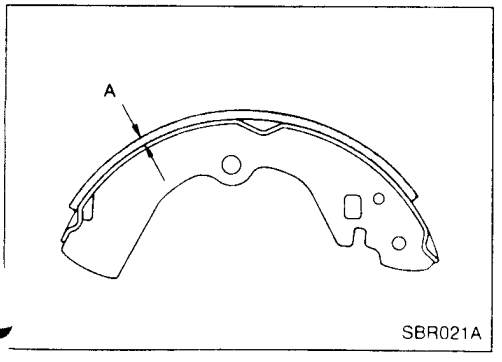
Inspection — Drum



Standard inner diameter
228.6 mm (9 in)
Maximum inner diameter:
230 mm (9.06 in)
Out-of-roundness:
0.03 mm (0.0012 in) or less

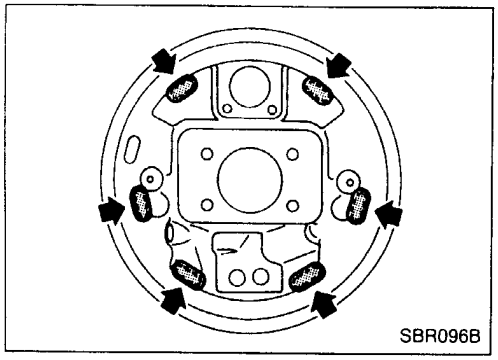
- Contact surface should be fine finished with No. 120 to 150 emery paper.
- Using a drum lathe, turn brake drum to improve inner surface finish if it shows scoring, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for correct contact pattern.

Inspection — Lining



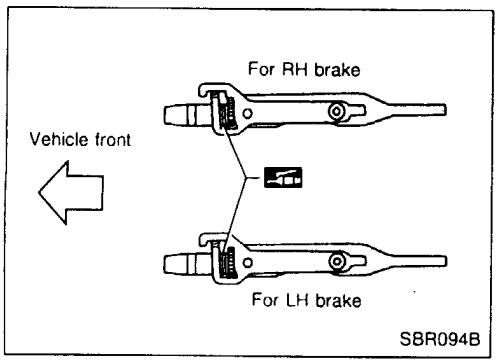
Check lining thickness.

Standard lining thickness:
Trailing 4.85 mm (0.191 in)
Leading 4.85 mm (0.191 in)
Lining wear limit (A):
1.5 mm (0.059 in)


SBR096B

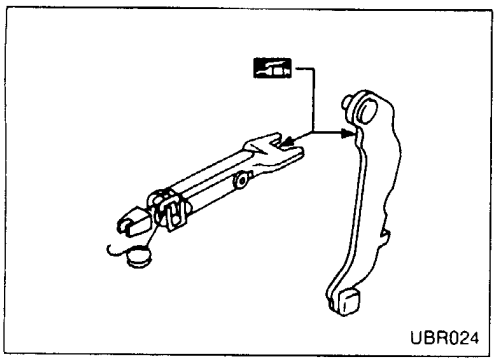
Installation

1. Apply brake grease to the contact areas shown at left.

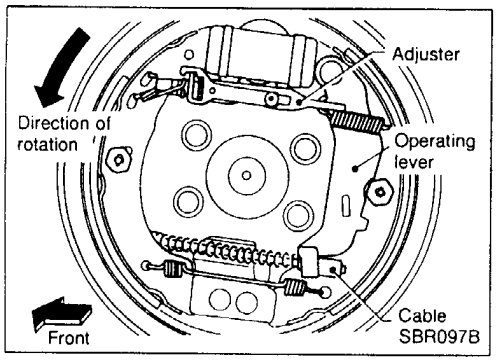


SBR094B

2. Shorten adjuster by rotating it.
Pay attention to direction of adjuster assembly.
3. Connect parking brake cable to operating lever.


UBR024

4. Apply brake grease where adjuster assembly contacts operating lever.
5. Install all parts.



SBR097B

6. Check all parts are installed properly.
Pay attention to direction of adjuster assembly.
7. Install brake drum.
8. When installing new wheel cylinder, bleed air. Refer to "Bleeding procedure" BR-4.

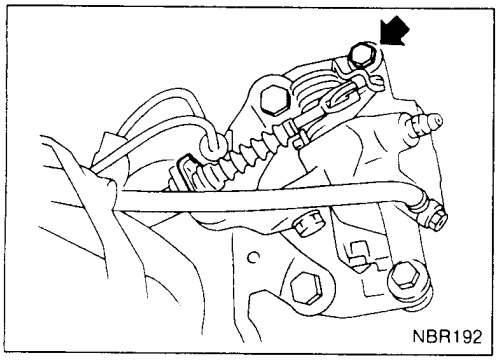
Shoe Clearance Adjustment

- With both drums fitted, adjust shoe clearance by depressing brake pedal fully more than 5 times. This will ensure automatic adjuster is set correctly.
- Check that there is no drag between brake shoes and drum when brake pedal is released.
- Adjust parking brake lever. Refer to "Adjustment" in "PARKING BRAKE CONTROL".

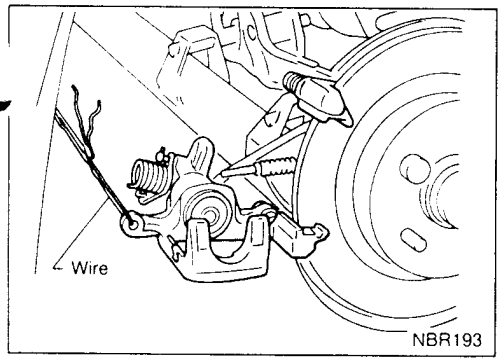
Pad Replacement

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne materials.
CAUTION:

- **When cylinder body is open, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.**
- **If shims are rusted or show peeling of rubber coat, replace them with new shims.**
- **It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.**

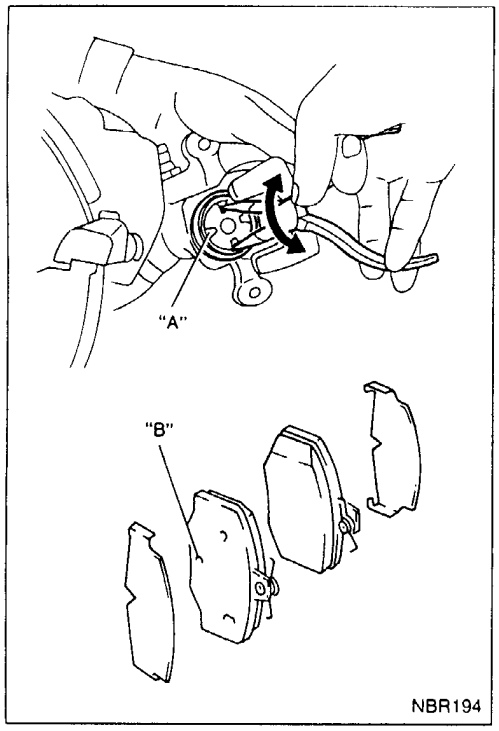


1. Remove master cylinder reservoir cap.
2. Remove brake cable mounting bracket bolt.
3. Disconnect cable and bracket.
4. Remove upper pin bolt.



5. Open cylinder body downward. Then remove pads and inner and outer shims.
   Standard pad thickness:
   9.3 mm (0.366 in)
   Pad wear limit:
   2.0 mm (0.079 in)

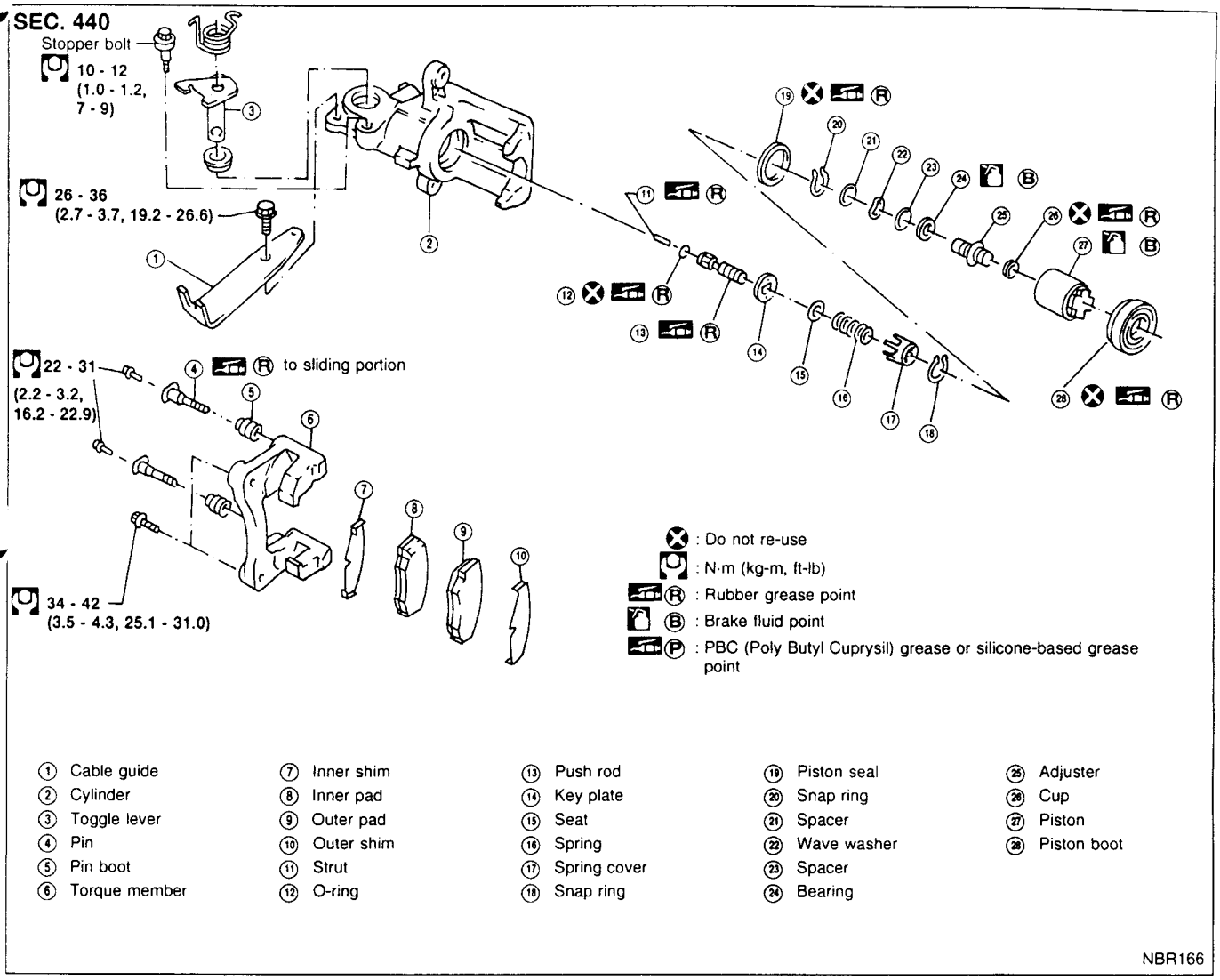
Pad Replacement (Cont'd)



6. When installing new pads, push piston into cylinder body by gently turning piston clockwise.

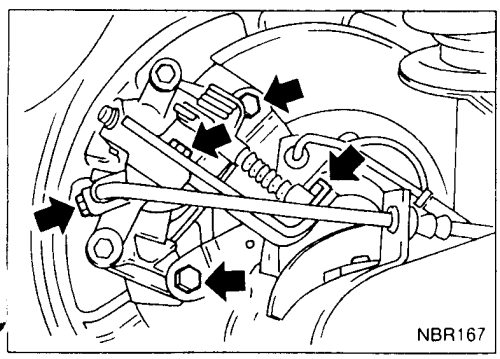
Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

7. After fully retracting piston by turning clockwise, finally turn anti-clockwise up to 1/4 turn to align piston slot "A" with pad peg "B".



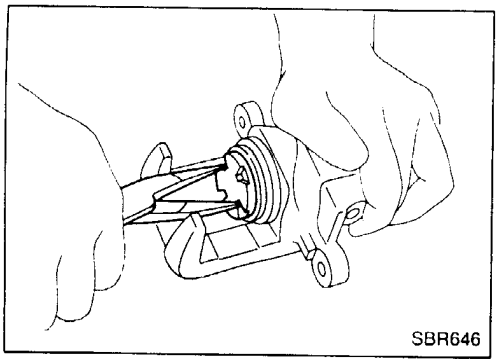
Removal

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne materials.
CAUTION:
Suspend caliper assembly with wire so as not to stretch brake hose.



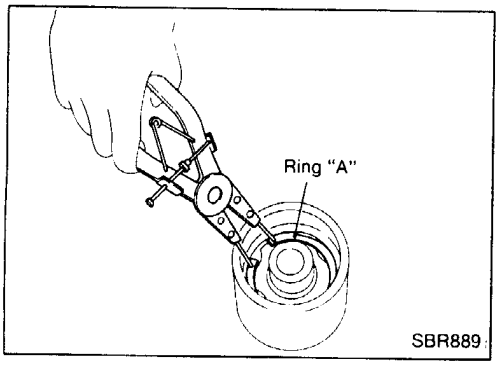
1. Remove brake cable mounting bracket bolt and lock spring.
2. Remove torque member fixing bolts and connecting bolt.

It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly.

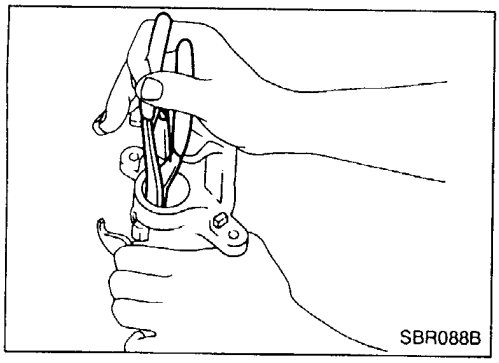


Disassembly

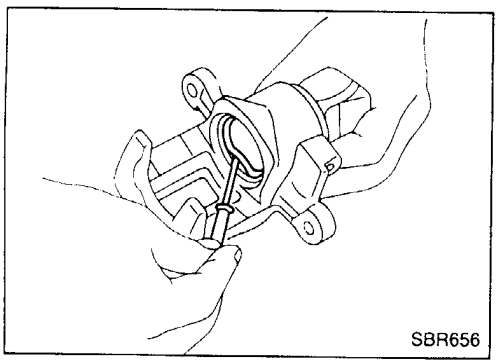
1. Remove piston by turning it counterclockwise with suitable long nose pliers.



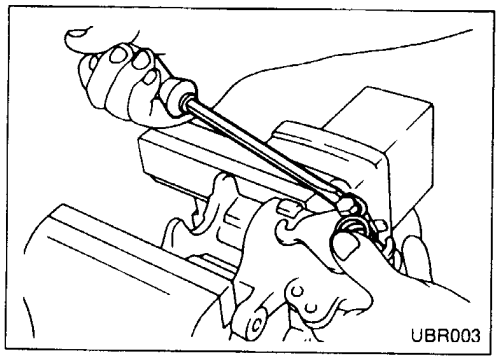
2. Pry off ring A from piston with suitable pliers and remove adjusting nut.



3. Disassemble cylinder body.
a. Pry off ring B with suitable pliers, then remove spring cover, spring and seat.
b. Pry off ring C, then remove key plate, push rod and rod.



c. Remove piston seal.
Be careful not to damage cylinder body.



4. Remove return spring, stopper bolt and lever.

Inspection — Caliper

CAUTION:
Use brake fluid to clean cylinder. Never use mineral oil.

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

TORQUE MEMBER

Check for wear, cracks or other damage. Replace if necessary.

PISTON

Check piston for score, rust, wear, damage or presence of foreign materials.
Replace if any of the above conditions are observed.
CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

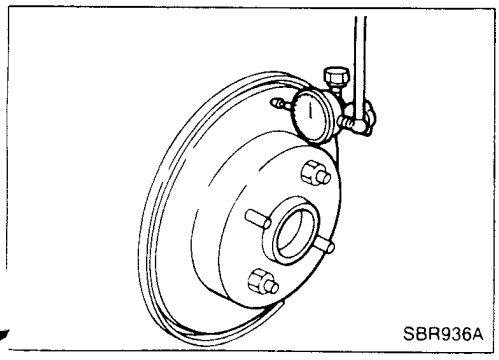
PIN AND PIN BOOT

Check for wear, cracks or other damage.
Replace if any of the above conditions are observed.

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

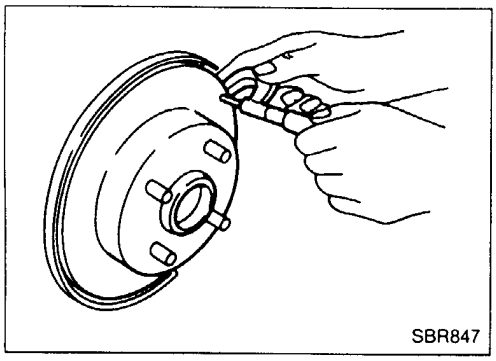

SBR936A

RUNOUT

Make sure that axial end play is within the specifications before measuring. Refer to section RA.
Then check runout with a dial indicator.

Rotor repair limit:
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)

Inspection — Rotor (Cont'd)

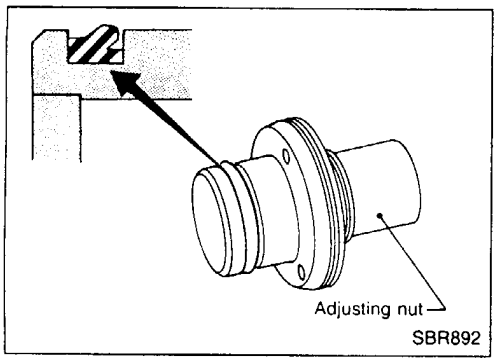


THICKNESS

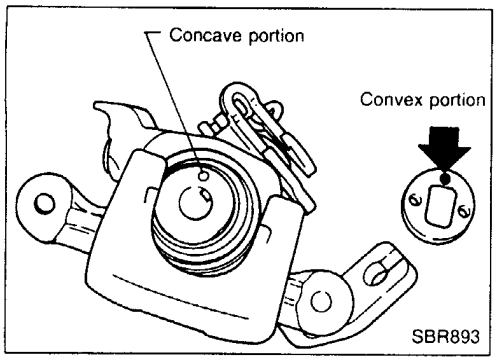
Rotor repair limit:
Standard thickness
10.0 mm (0.394 in)
Minimum thickness
9.0 mm (0.354 in)
Thickness variation (At least 8 positions)
Maximum 0.02 mm (0.0008 in)

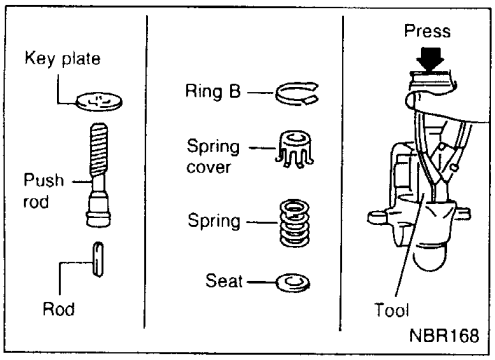
Assembly

1. Install cup in the specified direction.

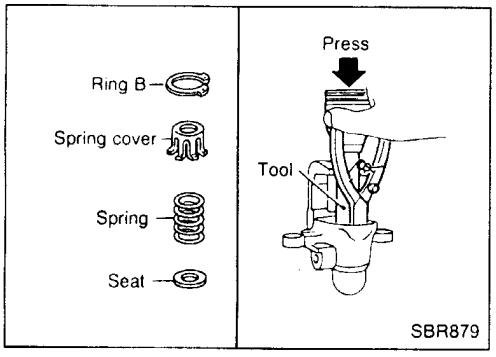


2. Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.

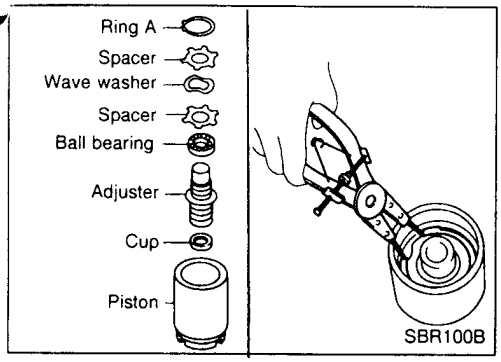




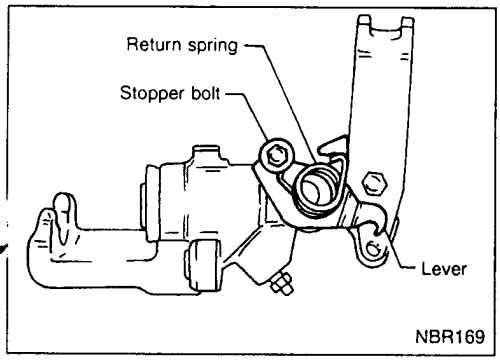
3. Install seat, spring, spring cover and ring "B" with suitable press and drift.



Assembly (Cont'd)



4. Install cup, adjuster, bearing, spacers, washers and ring "A" with a suitable tool.



5. Fit lever and tighten stopper bolt.
6. Fit return spring in the order shown.

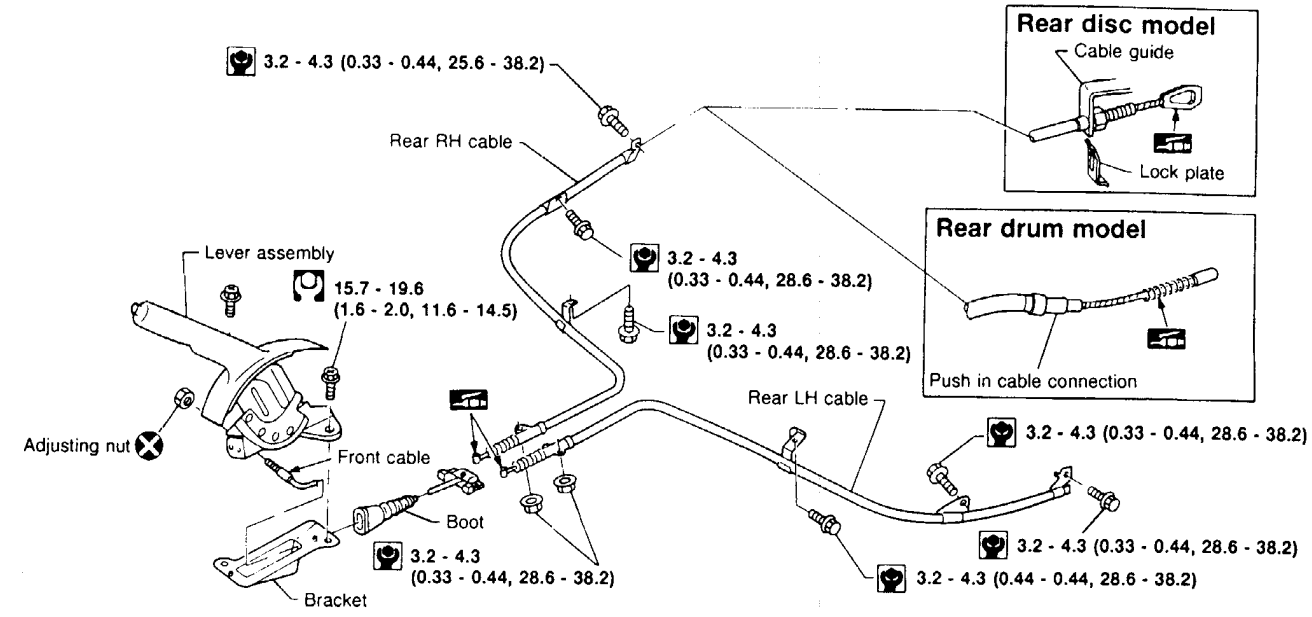
Installation

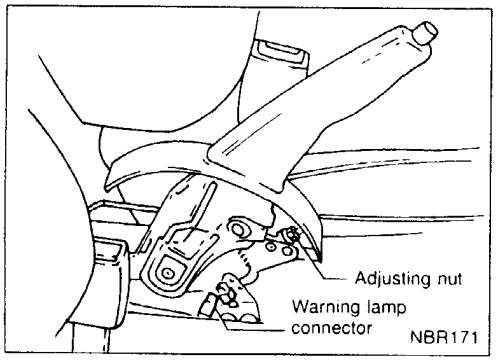
CAUTION:

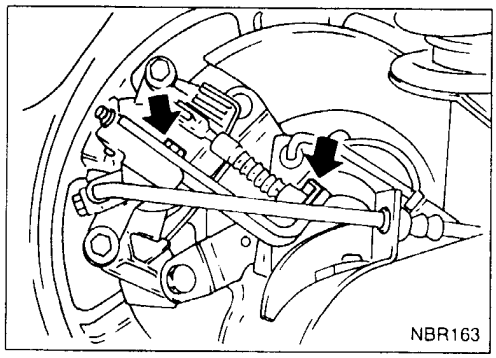
- **Refill with new brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**

1. Install brake hose to caliper securely.
2. Install all parts and secure all bolts.
3. Bleed air. Refer to "Bleeding Procedure" BR-4.

SEC. 443







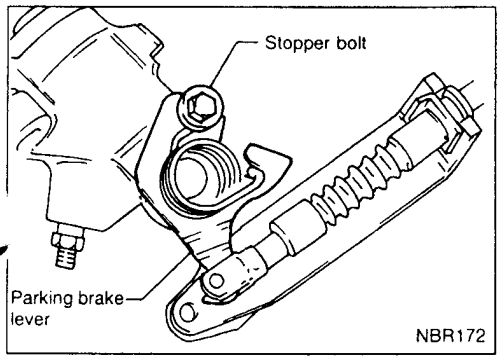
Removal and Installation

1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove bolts, slacken off and remove adjusting nut.

4. Remove cable mounting bracket and lock plate (disc brake only).
   For drum brake models, refer to "Removal" in "REAR DRUM BRAKE".

Inspection

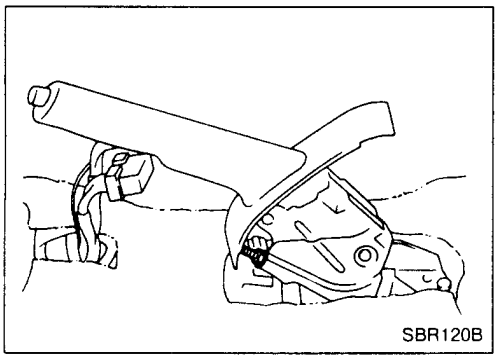
1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.



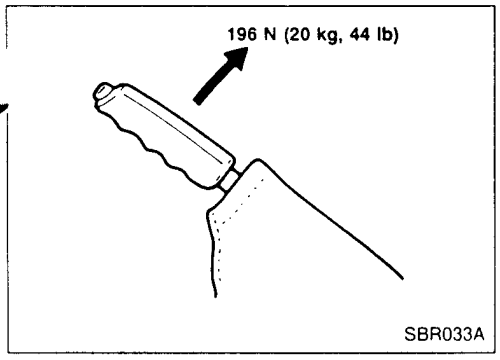
Adjustment

Pay attention to the following points after ajdustment.

a. There is no drag when control lever is being released.
b. Parking brake lever returns to stopper bolt when control lever for rear disc brake models is released.



1. Loosen parking brake cable.
2. Depress brake pedal fully more than 5 times.
3. Adjust control lever by turning adjusting nut.



4. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches: 6 - 8

5. Bend parking brake warning lamp switchplate so that brake warning lamp comes on when ratchet at parking brake lever is pulled 1 - 2 notches and goes out when fully released.

Purpose

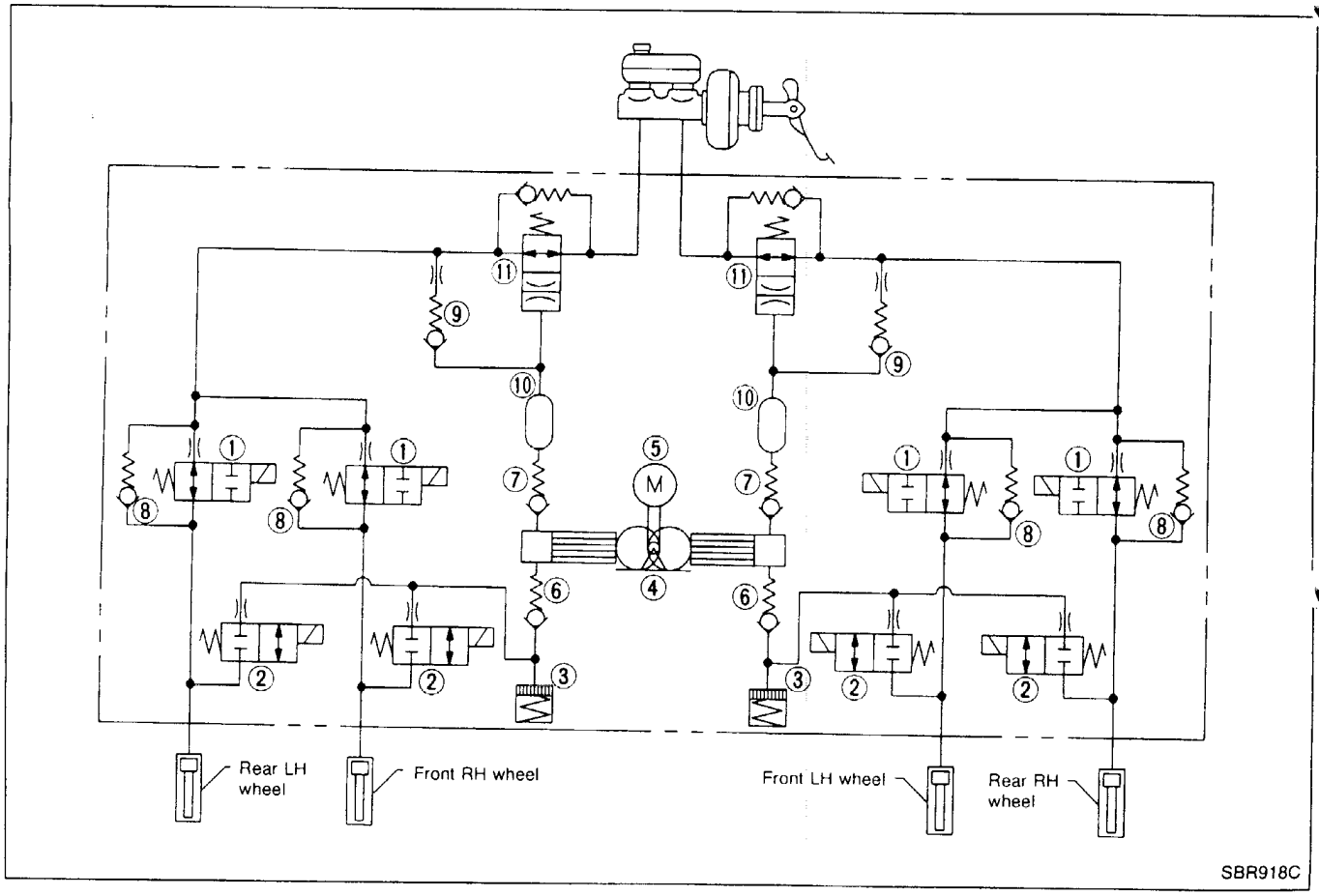
The Anti-Lock Brake System (ABS) consists of electronic and hydraulic components. It allows for control of braking force so that locking of the wheels can be avoided.
The ABS:

1) Provides improved steering control during braking (by preventing front wheel lock).
2) Provides improved vehicle stability and skid prevention during braking (by avoiding rear wheel lock).

Operation

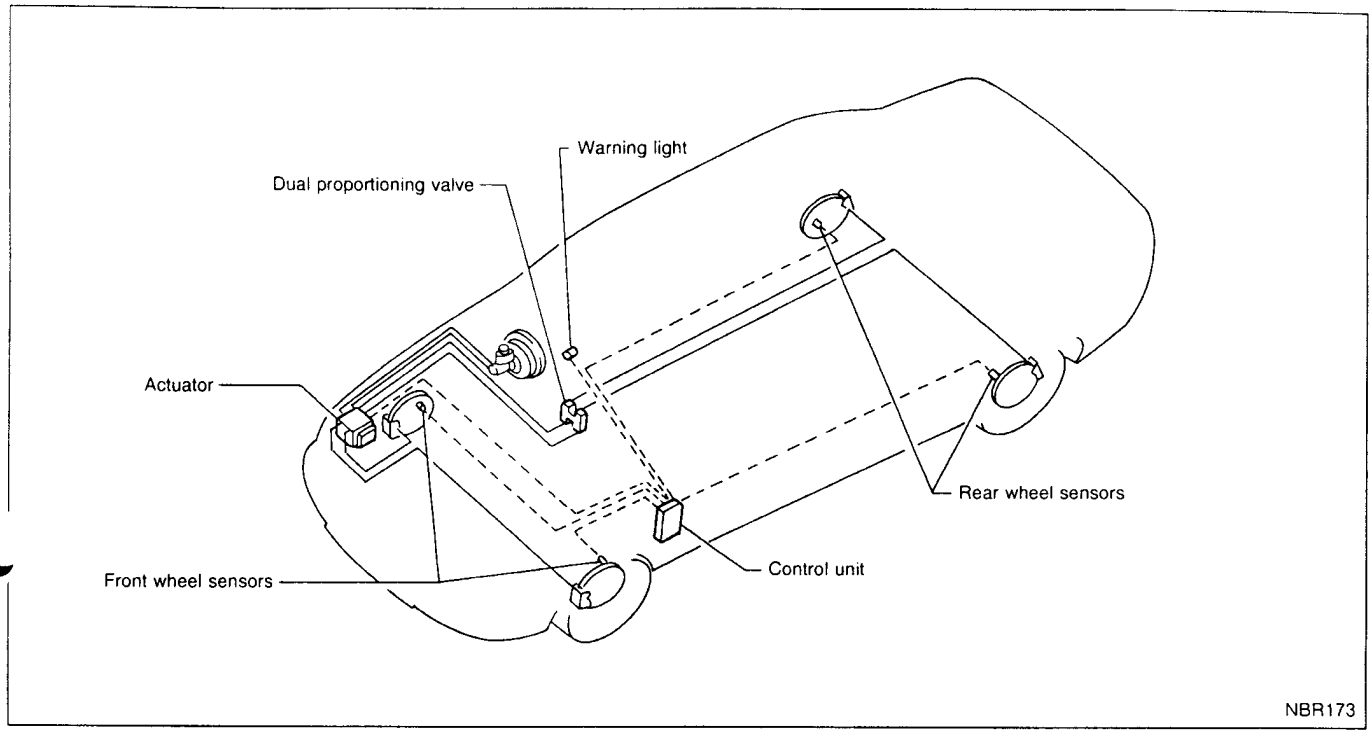
- When the vehicle speed is less than 10 km/h (6 mph) this system does not work.
- The Anti-Lock Brake System (ABS) has self-test capabilities. The system turns on the ABS warning light for 1 second after turning the ignition switch to the "ON" position. The system performs another test the first time the vehicle reaches 6 km/h (4 mph). A mechanical noise may be heard as the ABS performs a self-test. This is a normal part of the self-test feature. If a malfunction is found during this check, the ABS warning light will come on.
- During ABS operation, a mechanical noise may be heard. This is a normal operating condition.

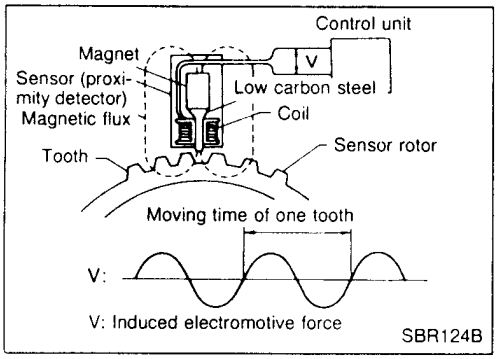
ABS Hydraulic Circuit

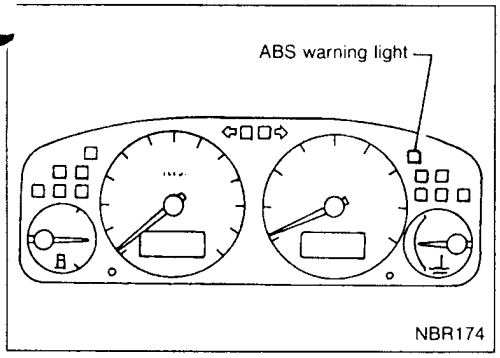


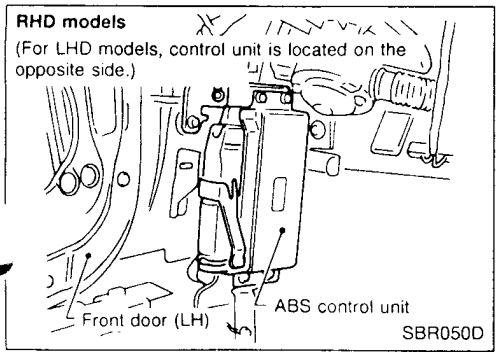
① Inlet solenoid valve
② Outlet solenoid valve
③ Reservoir
④ Pump
⑤ Motor
⑥ Inlet valve
⑦ Outlet valve
⑧ Bypass check valve
⑨ Check valve
⑩ Damper
⑪ Gradient switch

System Components









System Description

SENSOR

The sensor unit consists of a gear-shaped sensor rotor and an electro-magnetic proximity detector. The proximity detector ("pick-up") contains a bar magnet around which a coil is wound. The detector is installed on the back side of the brake rotor. An alternating voltage is generated in the coil of the proximity detector as each tooth of the rotor cuts the magnetic field of the detector core. The frequency and amplitude of the voltage increases in proportion to the rotational speed of the rotor.

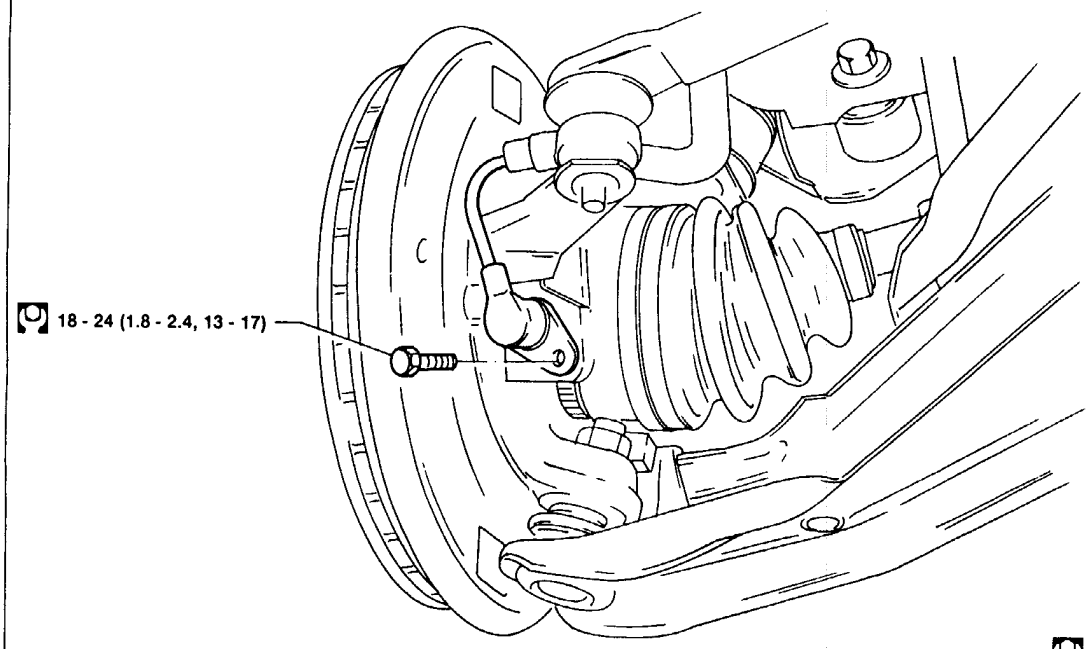
CONTROL UNIT

The control unit determines the wheel rotating speed from the signal sent from the sensor, a corresponding control signal is then output from the control unit in the form of a DC current to the actuator solenoid valve. The ABS control unit also controls ON-OFF operation of the valve relay and motor relay. If any electrical malfunction should be detected in the system, the control unit causes the warning lamp to light up. In this condition, the ABS will be deactivated by the control unit, and the vehicle's brake system reverts to normal operation.

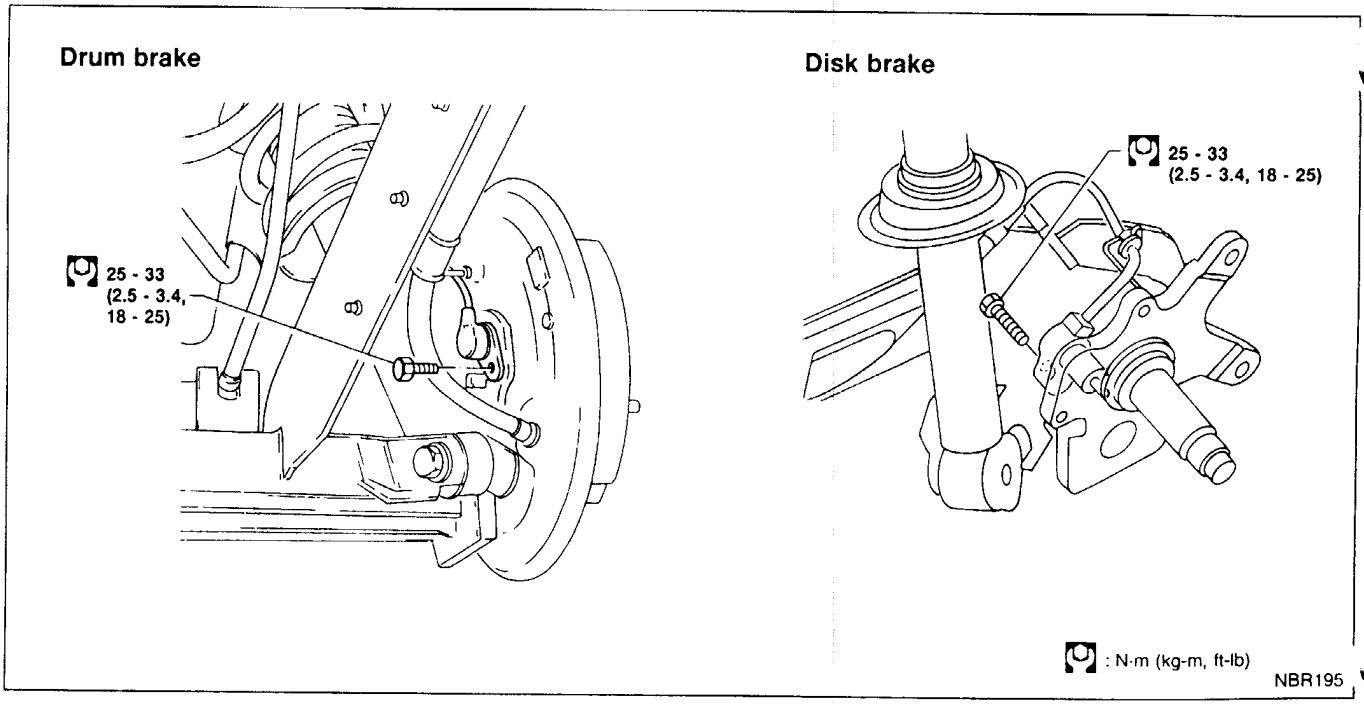
Removal and Installation

CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.
When removing the front or rear wheel hub assembly, disconnect the ABS wheel sensor from the assembly and move it away. Failure to do so may result in damage to the sensor or wiring making it inoperative.

FRONT WHEEL SENSOR

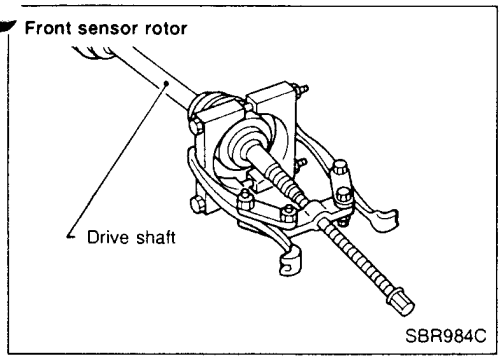


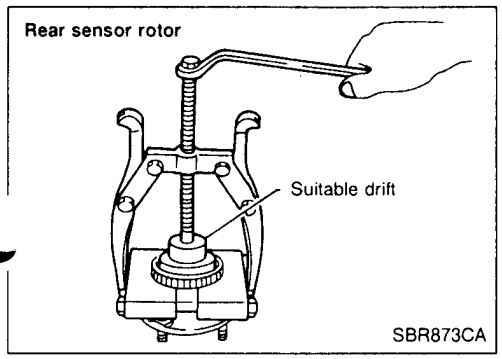
REAR WHEEL SENSOR



Removal and Installation (Cont'd)

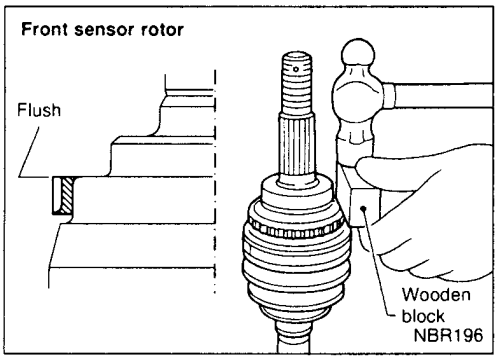
SENSOR ROTOR





Removal

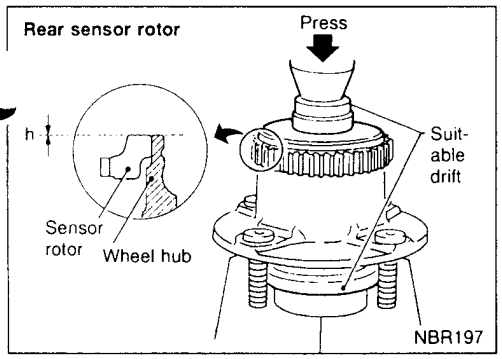
1. Remove the drive shaft and rear wheel hub. Refer to FA section ("Drive Shaft", FRONT AXLE") and RA section ("Wheel Hub", REAR AXLE").
2. Remove the sensor rotor using suitable puller, drift and bearing replacer.



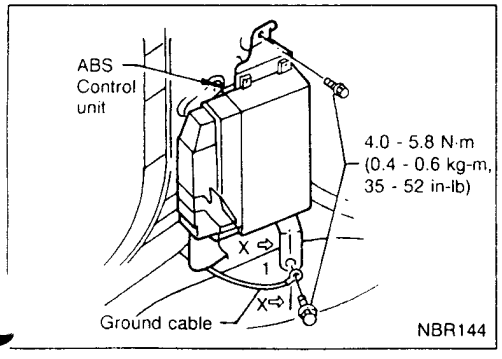
Installation

Install the sensor rotor. For front sensor rotor, use hammer and wooden block. For rear sensor rotor, use suitable drift and press.

- Always replace sensor rotor with new one.
- Ensure sensor rotor is completely flush with surface indicated on drive shaft.



- Pay attention to the flush position of rear sensor rotor as shown in figure.
  h: −0.3 to +0.3 mm (−0.012 to +0.012 in)



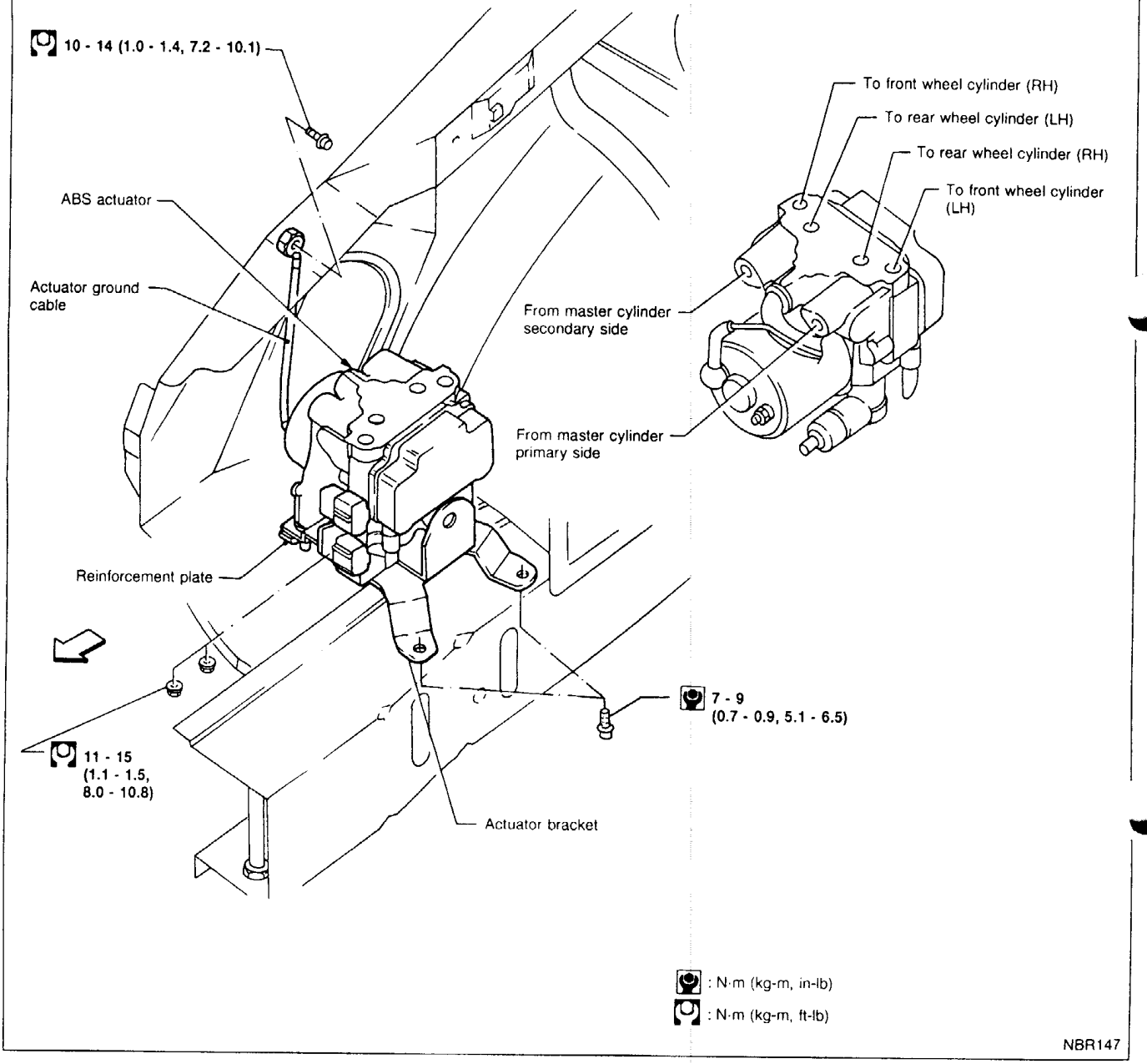
CONTROL UNIT

Location: Passenger side, behind dash side lower finisher.

- **Make sure that the sensor shield ground cable is secured with mounting bolt.**

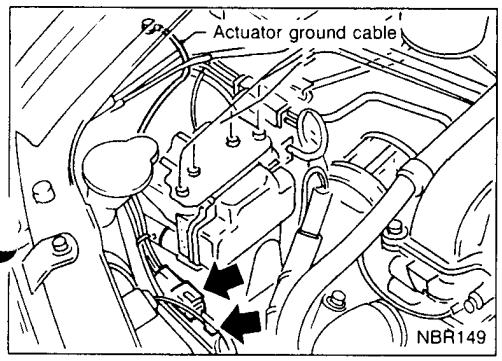
Removal and Installation (Cont'd)

ABS ACTUATOR

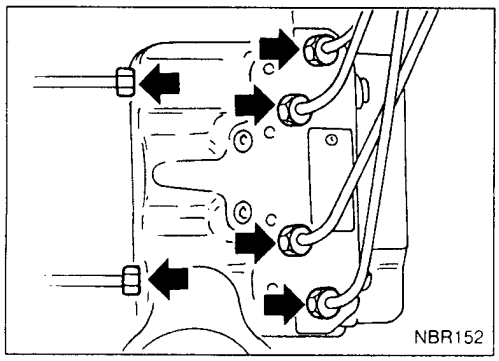


Removal and Installation (Cont'd)

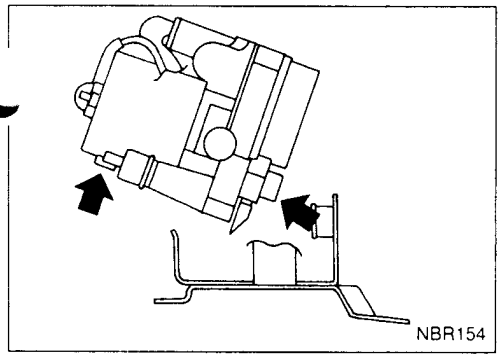
1. Disconnect battery cable.
2. Drain brake fluid. Refer to BR-3.



3. Disconnect the electrical harness connectors from ABS actuator bracket.
   Disconnect actuator ground cable from inner fender.
4. Identify each brake pipe with corresponding actuator port hole and mark them accordingly.



5. Disconnect brake pipes and move them away from actuator. Do not force brake pipes so as to kink them or bend them excessively.



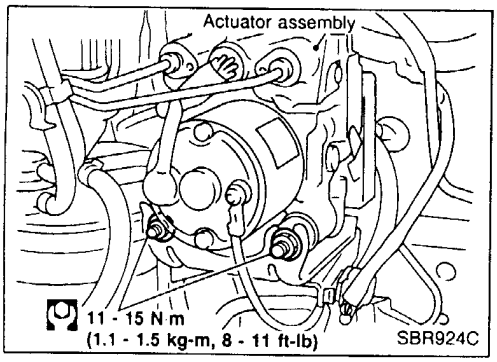
6. Remove left hand side front wheel and inner fender splash guard. Remove actuator bracket mounting nuts and bolts and remove actuator and actuator bracket as an assembly.
7. Loosen/remove mounting nuts between actuator and bracket.
8. Lift out ABS actuator as shown.

Removal and Installation (Cont'd)

CAUTION:

After installation, pay attention to the following points:

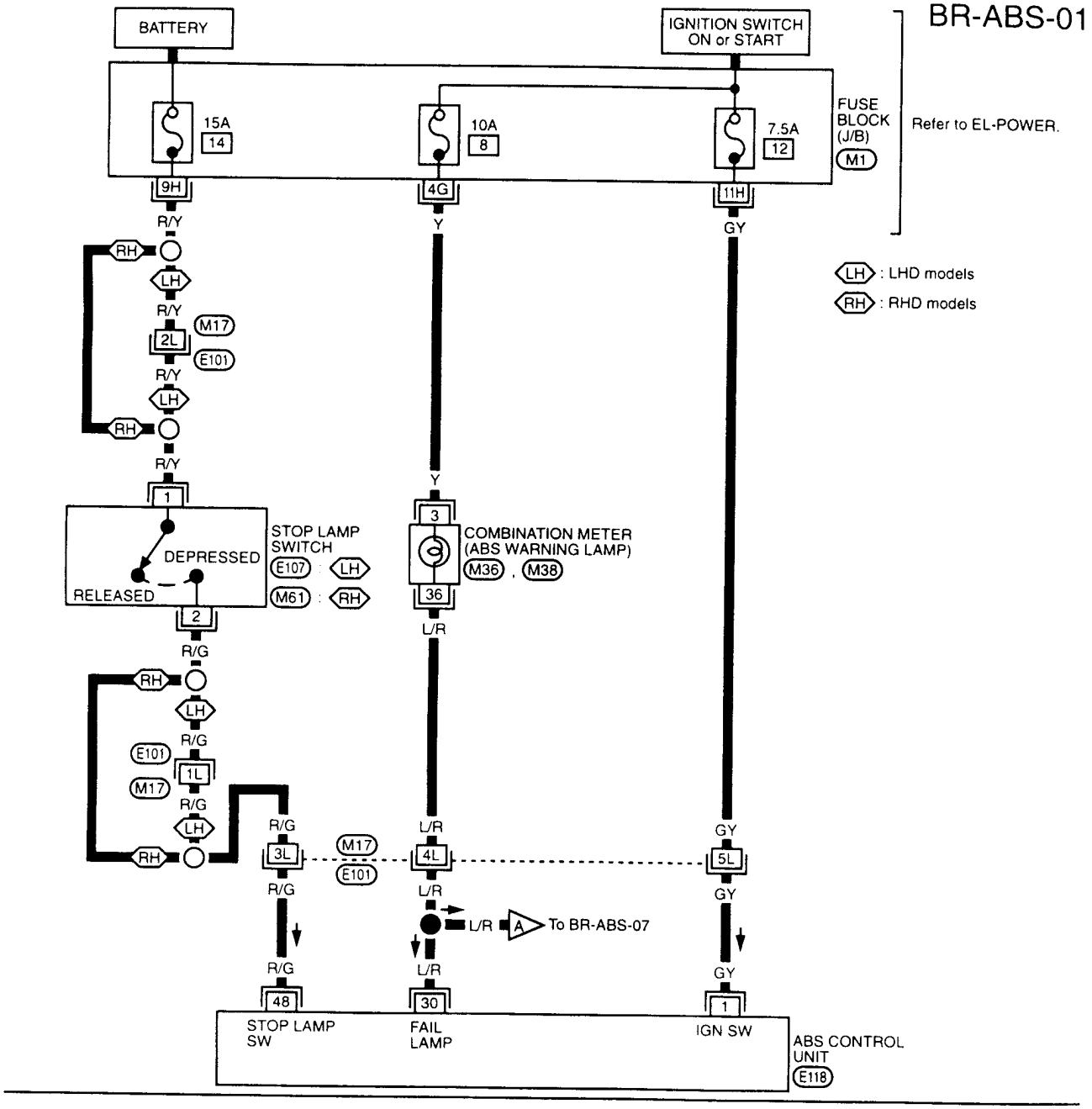
- **Refill brake fluid and bleed air. Refer to "CHECK AND ADJUSTMENT", BR-3 and "AIR BLEEDING", BR-4, respectively.**

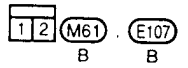


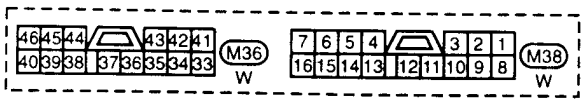
- The installation procedure is as follows:

1. Install actuator on bracket without tightening fixings.
2. Attach and tighten actuator ground cable.
3. Assemble brake tubes to actuator without tightening tube nuts. Ensure that correct tubes are connected to each port.
4. Fully tighten actuator and bracket fixings to specified torque.
5. Fully tighten brake tube nuts to specified torque.
6. Secure harness connectors and battery cable.

Wiring Diagram — ABS —





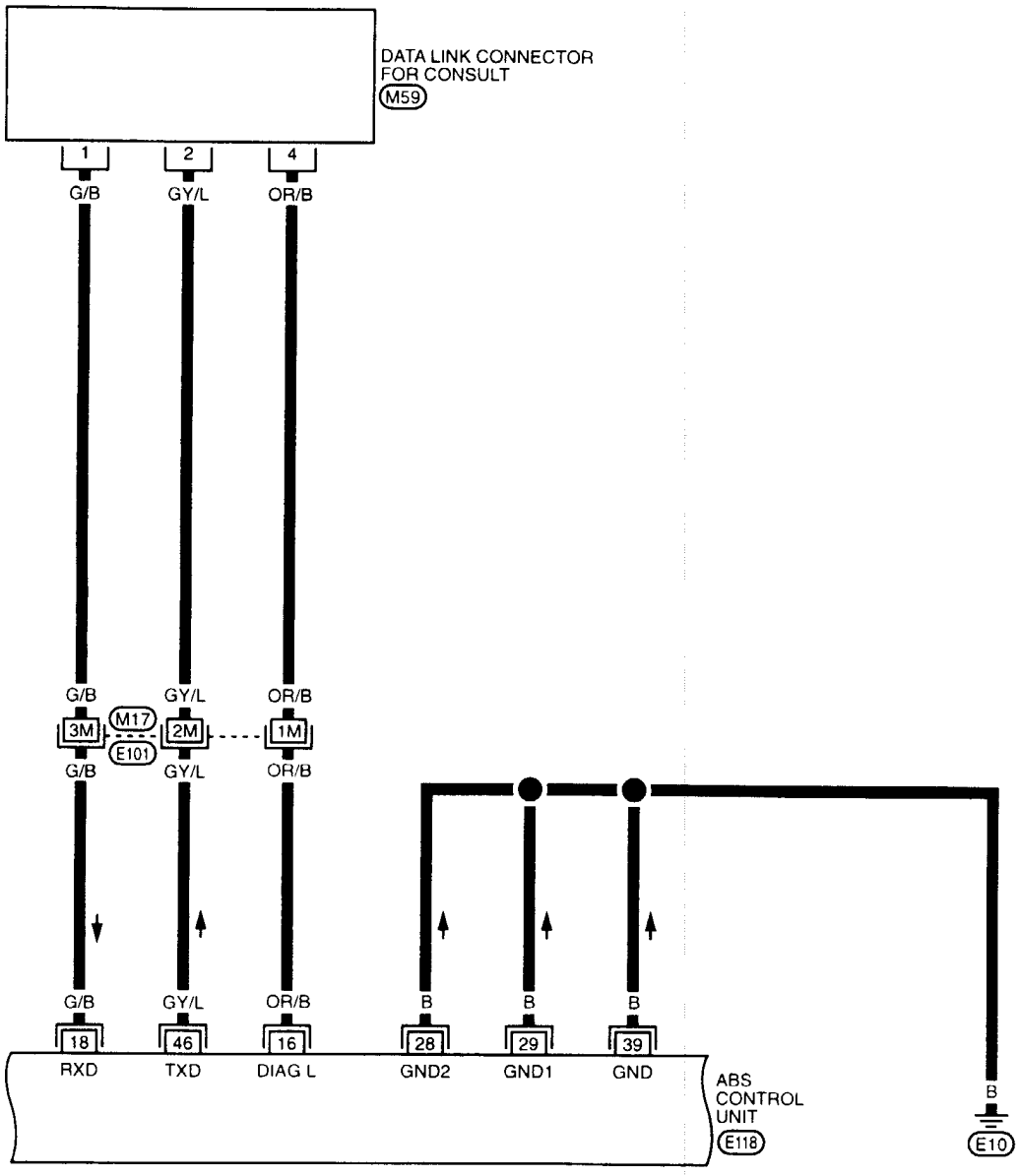


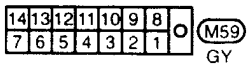
Refer to last page (Foldout page).
M17, E101
M1
E118

YBR042

Wiring Diagram — ABS — (Cont'd)

BR-ABS-02



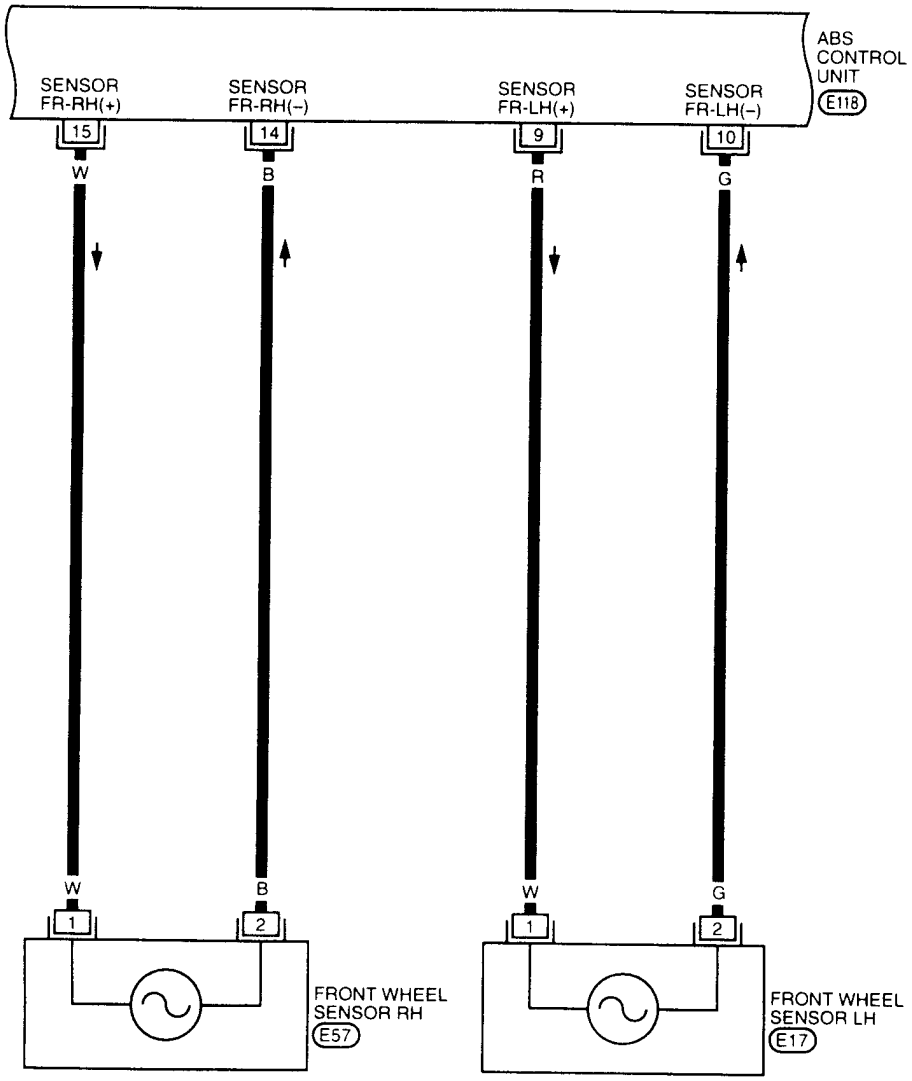


Refer to last page (Foldout page).
M17 , E101
E118

YBR043

Wiring Diagram — ABS — (Cont'd)

BR-ABS-03



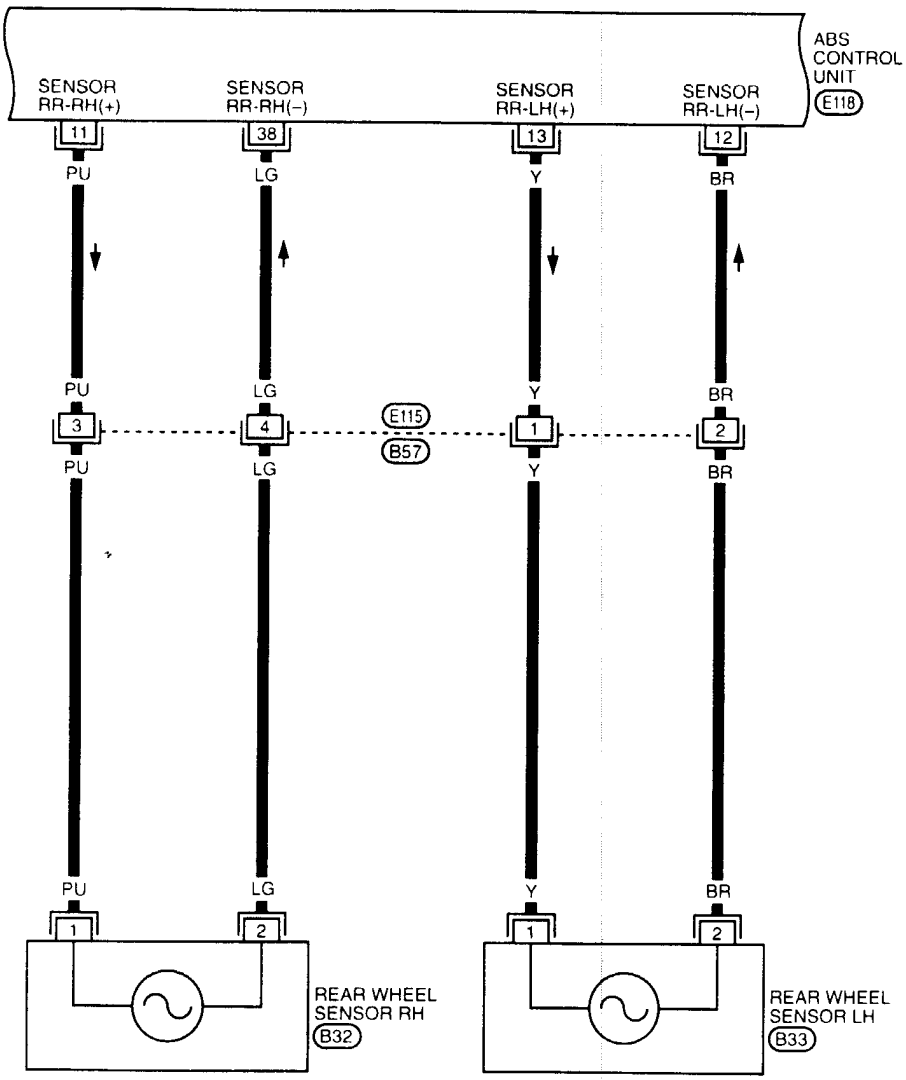
1 2 E57 , E17
GY BR

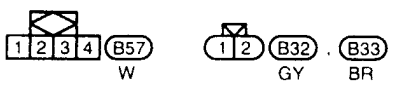
Refer to last page (Foldout page).
E118

YBR044

Wiring Diagram — ABS — (Cont'd)

BR-ABS-04





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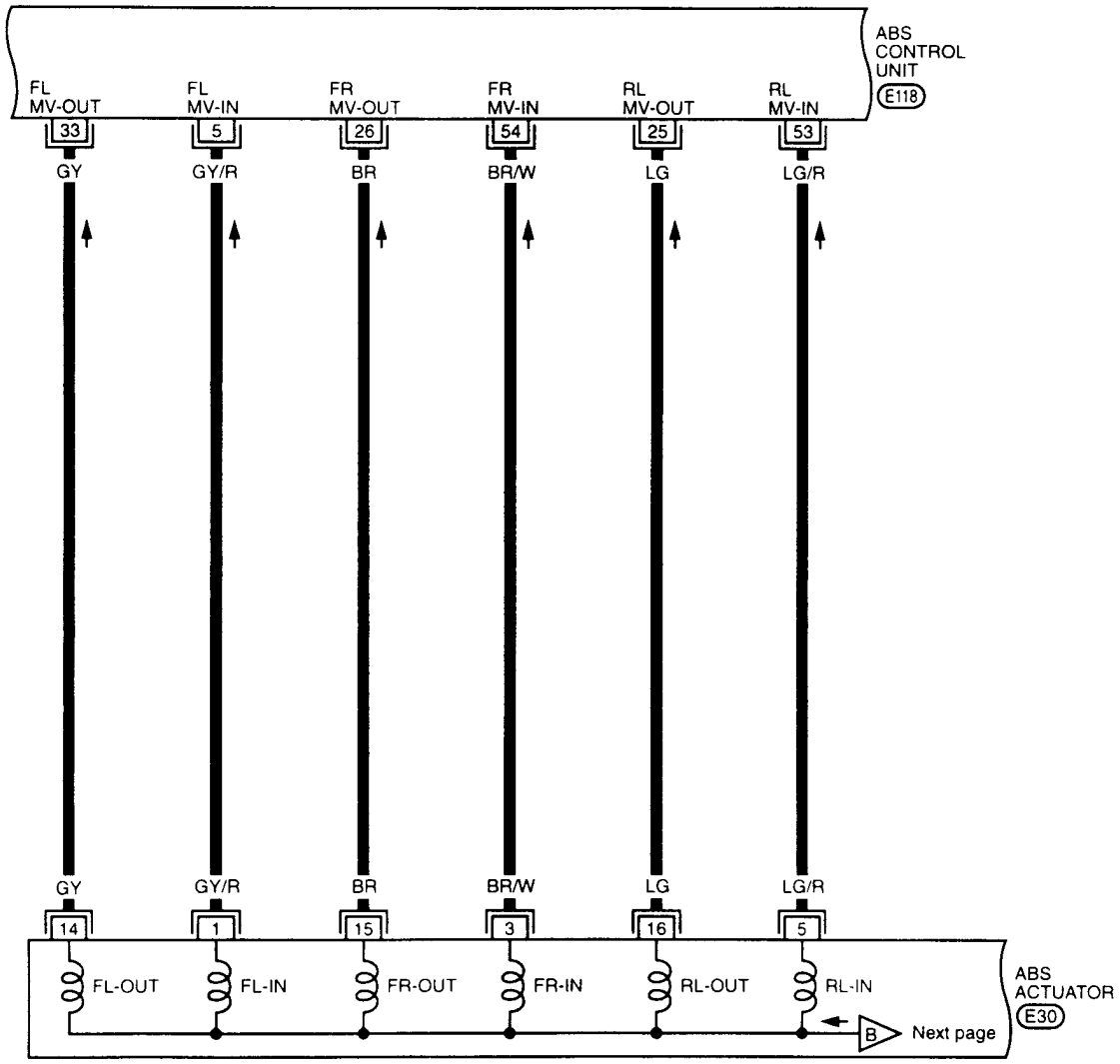
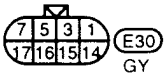
E118

YBR045

Wiring Diagram — ABS — (Cont'd)

BR-ABS-05



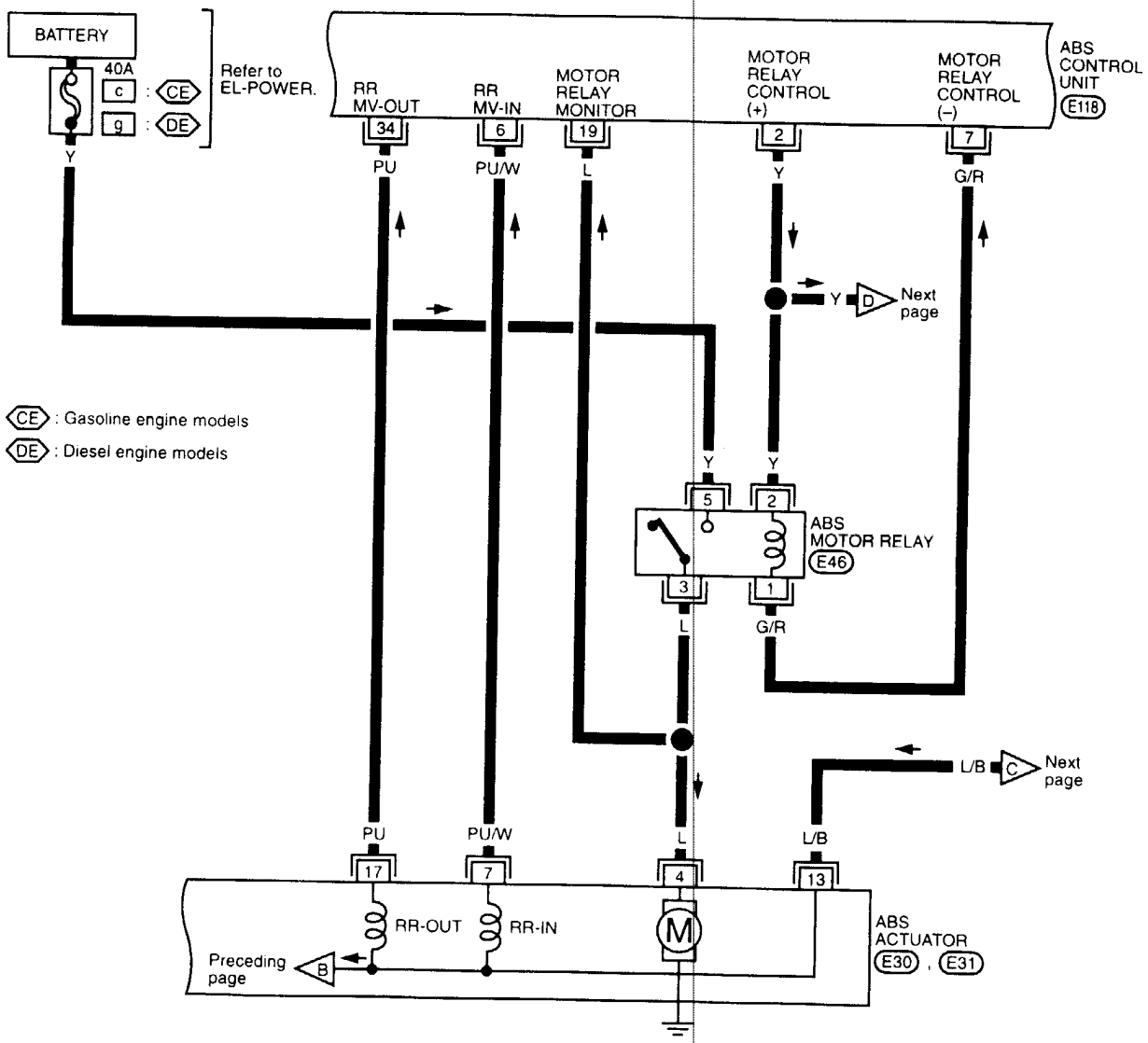


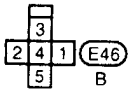
Refer to last page (Foldout page).
E118

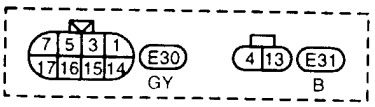
YBR046

Wiring Diagram — ABS — (Cont'd)

BR-ABS-06





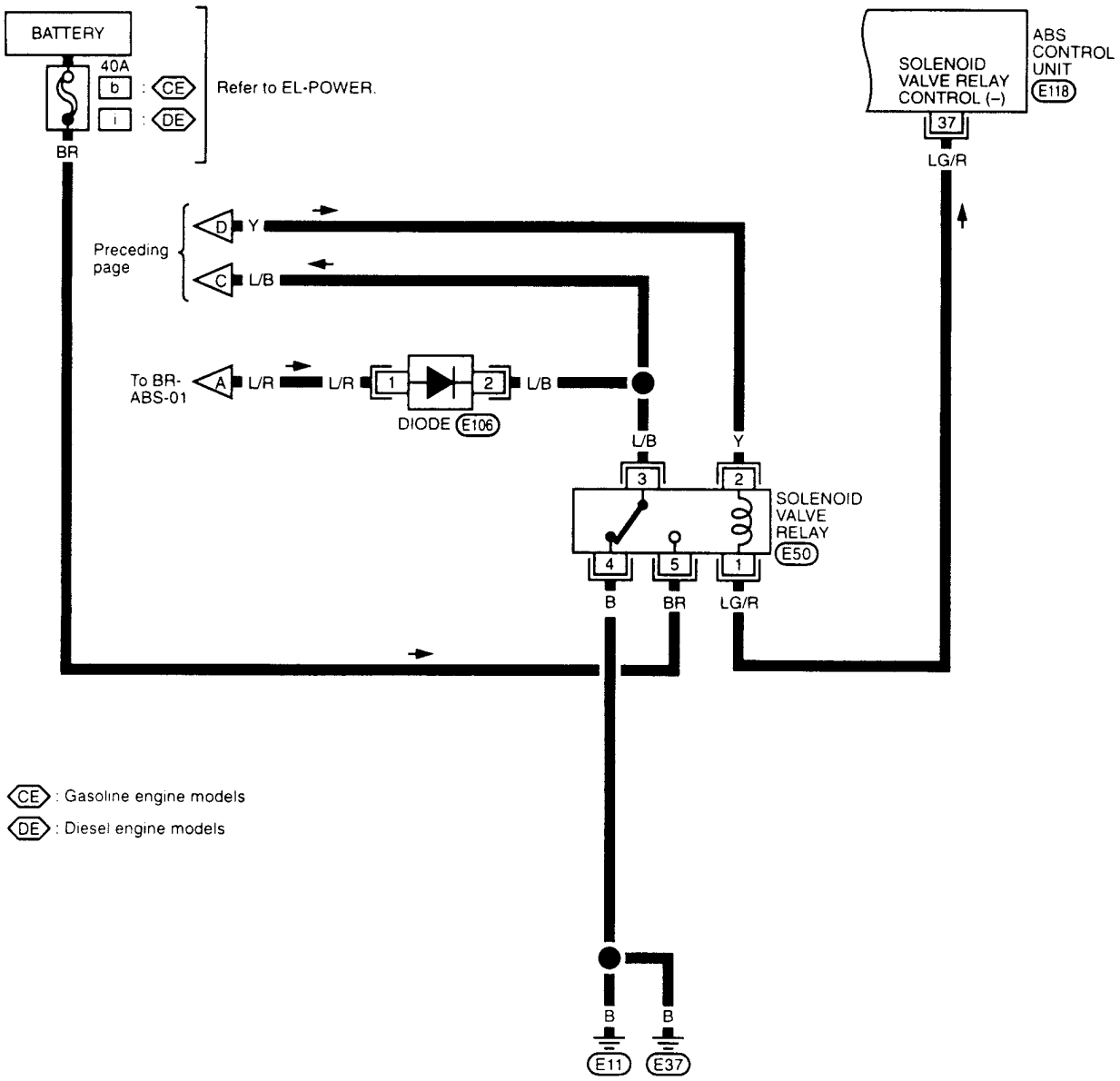


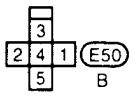
Refer to last page (Foldout page).
E118

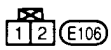
YBR047

Wiring Diagram — ABS — (Cont'd)

BR-ABS-07







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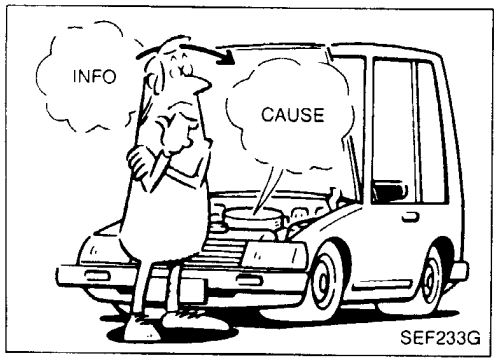
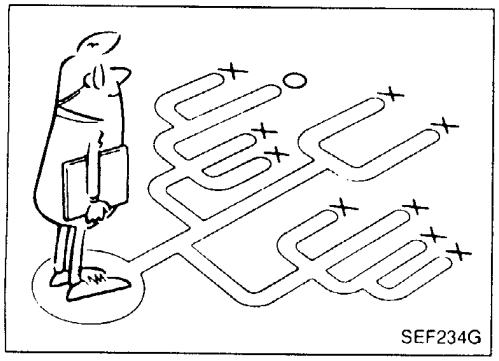
E118

YBR048



SEF233G


SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The ABS system has an electronic control unit to control major braking functions. The control unit accepts input signals from sensors and utilises the data to instantly drive the actuators. It is essential that both input and output signals are correct and stable. It is also important to check for conventional problems: such as air leaks in booster lines, lack of brake fluid, or other problems with the brake system.

It is much more difficult to diagnose a problem that occurs intermittently rather than catastrophically. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the unnecessary replacement of good parts.

A visual check may not be sufficient to find the cause of the problems, so a road test should also be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a ABS complaint. The customer is a very good source of information on such problems; especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

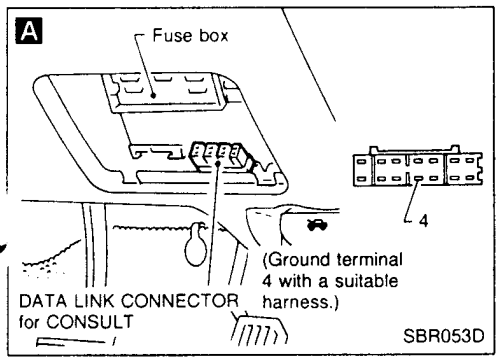
Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an ABS controlled vehicle.

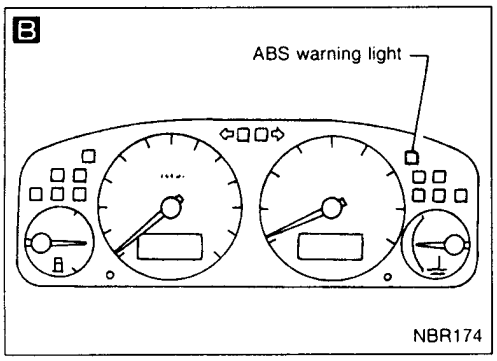
Self-diagnosis

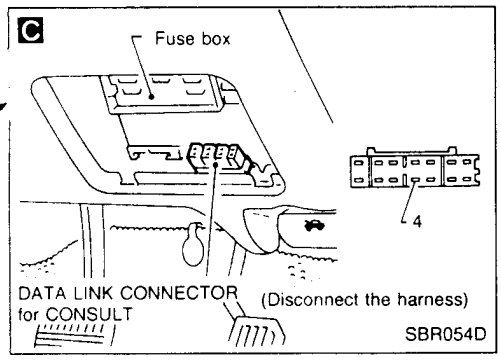
FUNCTION

- When a problem occurs in the ABS, the warning lamp on the instrument panel comes on. To start the self-diagnostic results mode, ground the self-diagnostic (check) terminal located on "Data Link Connector for CONSULT". The location of the malfunction is indicated by the warning lamp flashing.

SELF-DIAGNOSIS PROCEDURE







Drive vehicle over 30 km/h (20 mph) for at least one minute.

↓

Turn ignition switch to the "LOCK" position.

↓

A

Ground terminal "4" of "DATA LINK CONNECTOR for CONSULT" with a suitable harness.

↓

Turn ignition switch to "ON" position while grounding terminal "4". **Do not depress brake pedal.**

↓

B

After 3.6 seconds, the warning lamp starts flashing to indicate the malfunction code No. (See NOTE.)

↓

Verify the location of the malfunction with the malfunction code chart. Refer to BR-51. Then make the necessary repairs following the diagnostic procedures.

↓

After the malfunctions are repaired, erase the malfunction codes stored in the control unit. Refer to BR-51.

↓

Rerun the self-diagnostic results mode to verify that the malfunction codes have been erased.

↓

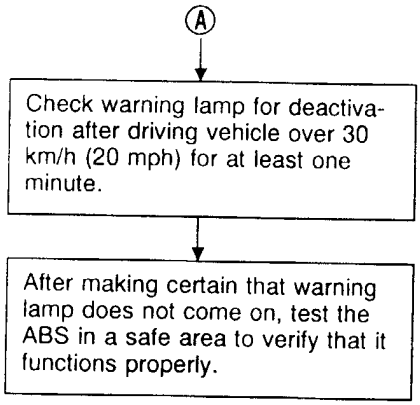
C

Disconnect the check terminal from the ground. The self-diagnostic results mode is now complete.

↓

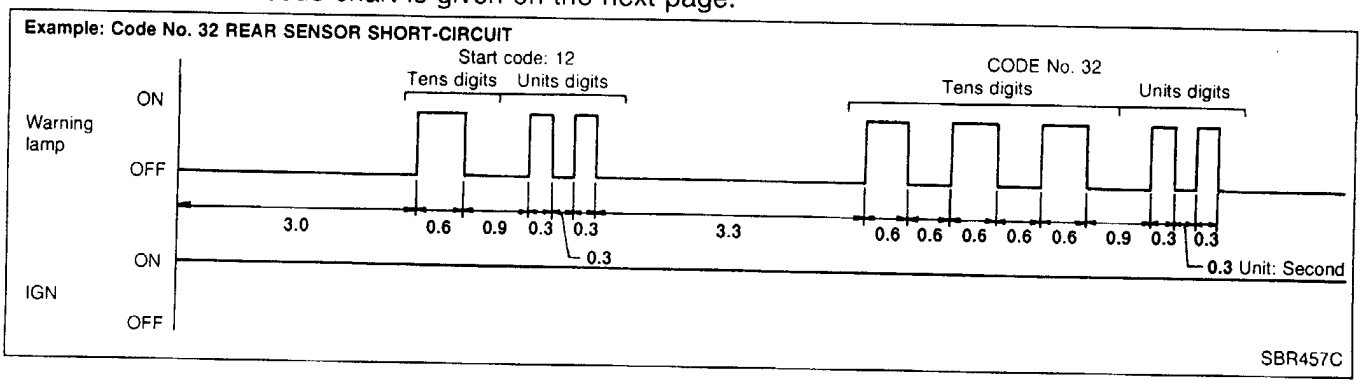
Ⓐ

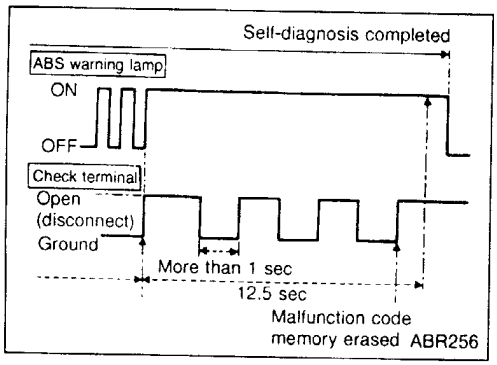
NOTE: The indication terminates after five minutes. However, when the ignition switch is turned from off to on, the indication starts flashing again.



HOW TO READ SELF-DIAGNOSTIC RESULTS (Malfunction codes)

- Determine the code No. by counting the number of times the warning lamp flashes on and off.
- When several malfunctions occur at one time, up to three code numbers can be stored; the latest malfunction will be indicated first.
- The indication begins with the start code 12. After that a maximum of three code numbers appear in the order of the latest one first. The indication then returns to the start code 12 to repeat (the indication will stay on for five minutes at the most).
- The malfunction code chart is given on the next page.





HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)

1. Disconnect the check terminal from ground (ABS warning lamp will stay lit).
2. Within 12.5 seconds, ground the check terminal 3 times. Each terminal ground must last more than 1 second. The ABS warning lamp goes out after the erase operation has been completed.
3. Perform self-diagnosis again. Refer to BR-49. Only the start-code should appear, no malfunction codes.

MALFUNCTION CODE/SYMPTOM CHART

Refer to BR-51.

Self-diagnosis (Cont'd)

MALFUNCTION CODE/SYMPTOM CHART

Code No. (No. of warning lamp flashes)	Malfunctioning part	Diagnostic procedure
45	Actuator front left outlet solenoid valve	3
46	Actuator front left inlet solenoid valve	3
41	Actuator front right outlet solenoid valve	3
42	Actuator front right inlet solenoid valve	3
51	Actuator rear right outlet solenoid valve	3
52	Actuator rear right inlet solenoid valve	3
55	Actuator rear left outlet solenoid valve	3
56	Actuator rear left inlet solenoid valve	3
25	Front left sensor (open-circuit)	4
26	Front left sensor (short-circuit)	4
21	Front right sensor (open-circuit)	4
22	Front right sensor (short-circuit)	4
35	Rear left sensor (open-circuit)	4
36	Rear left sensor (short-circuit)	4
31	Rear right sensor (open-circuit)	4
32	Rear right sensor (short-circuit)	4
18	Sensor rotor	4
61	Actuator motor or motor relay	5
63	Solenoid valve relay	6
57	Power supply (Low voltage)	7
71	Control unit	8
Warning lamp stays on when ignition switch is turned on	Control unit power supply circuit Warning lamp bulb circuit Control unit or control unit connector Solenoid valve relay stuck Power supply for solenoid valve relay coil	2
Warning lamp stays on, during self-diagnosis	Control unit	—
Warning lamp does not come on when ignition switch is turned on	Fuse, warning lamp bulb or warning lamp circuit Control unit	1
Warning lamp does not come on during self-diagnosis	Control unit	—
Pedal vibration and noise	—	9
Long stopping distance	—	10
Unexpected pedal action	—	11
ABS does not work	—	12
ABS works frequently	—	13

CONSULT

CONSULT APPLICATION TO ABS

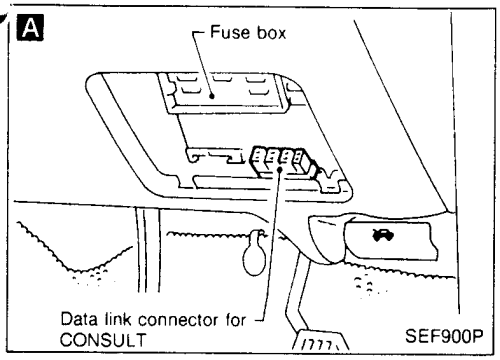
ITEM	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
Front right wheel sensor	X	X	—
Front left wheel sensor	X	X	—
Rear right wheel sensor	X	X	—
Rear left wheel sensor	X	X	—
Stop lamp switch	—	X	—
Front right inlet solenoid valve	X	X	X
Front right outlet solenoid valve	X	X	X
Front left inlet solenoid valve	X	X	X
Front left outlet solenoid valve	X	X	X
Rear right inlet solenoid valve	X	X	X
Rear left inlet solenoid valve	X	X	X
Rear right outlet solenoid valve	X	X	X
Rear left outlet solenoid valve	X	X	X
Actuator solenoid valve relay	X	X	—
Actuator motor relay (ABS MOTOR is shown on the Data Monitor screen.)	X	X	X
ABS warning lamp	—	X	—
Battery voltage	X	X	—

X: Applicable
—: Not applicable

ECU part number mode

Ignore the ECU part number displayed in the ECU PART NUMBER MODE. Refer to parts catalog to order the ECU.

A



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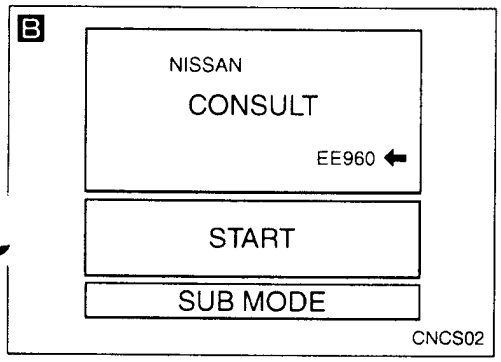

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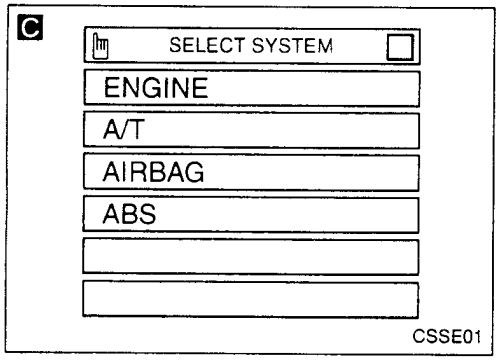

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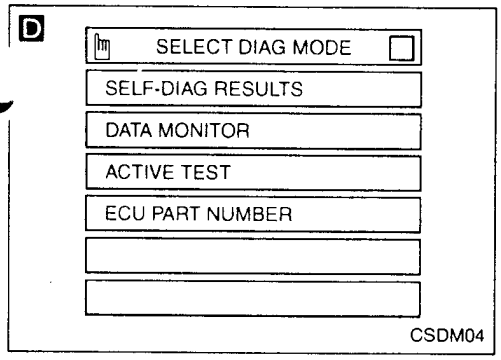
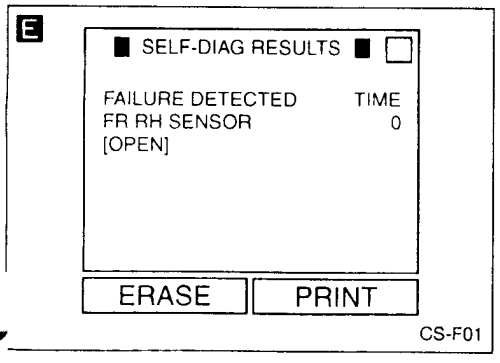


E



CONSULT Inspection Procedure

SELF-DIAGNOSIS PROCEDURE

A

1) Turn ignition switch to the "LOCK" position.
2) Connect CONSULT to Data Link Connector for CONSULT.

1) Start engine.
2) Drive vehicle over 30 km/h (20 mph) for at least one minute.

B 1) Stop vehicle with engine running and touch "START" on CONSULT screen.
← **Program card EE960**
C 2) Touch "ABS".
D E 3) Touch "SELF-DIAG RESULTS".
- **The screen shows maximum three malfunctions.**
- **Does the screen show the detected malfunction?**

No → WARNING LAMP INSPECTION
Check warning lamp and the circuit and repair if necessary.

Yes

MALFUNCTION REPAIR
Make the necessary repairs following the diagnostic procedures.

After repairing the malfunctions, start engine. Then erase the self-diagnostic results stored in the control unit by toucing "ERASE".
Are the self-diagnostic results erased?

No → (back to MALFUNCTION REPAIR)

Yes

Check warning lamp for deactivation after driving vehicle over 30 km/h (20 mph) for at least one minute.
Does the warning lamp activate?

Yes → Go to A above.

No

End

Note: "SELF-DIAG RESULTS" screen shows the detected malfunction and the times of ignition switch on and off after it occurred.

CONSULT Inspection Procedure (Cont'd)

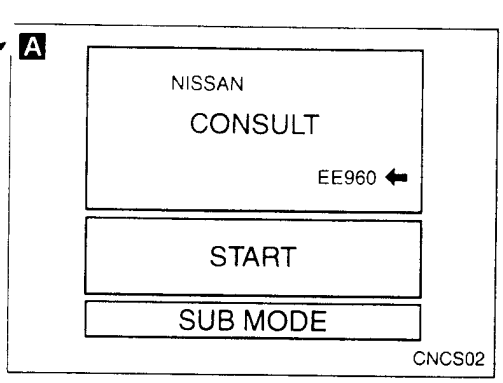
SELF-DIAGNOSTIC RESULTS MODE

Diagnostic item	Diagnostic item is detected when . . .	Diagnostic procedure
FR RH SENSOR [OPEN]	• Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.)	4
FR LH SENSOR [OPEN]	• Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.)	4
RR RH SENSOR [OPEN]	• Circuit for rear right sensor is open. (An abnormally high input voltage is entered.)	4
RR LH SENSOR [OPEN]	• Circuit for rear left sensor is open. (An abnormally high input voltage is entered.)	4
FR RH SENSOR [SHORT]*1	• Circuit for front right wheel sensor is shorted. (An abnormally low input voltage is entered.)	4
FR LH SENSOR [SHORT]*1	• Circuit for front left wheel sensor is shorted. (An abnormally low input voltage is entered.)	4
RR RH SENSOR [SHORT]*1	• Circuit for rear right sensor is shorted. (An abnormally low input voltage is entered.)	4
RR LH SENSOR [SHORT]*1	• Circuit for rear left sensor is shorted. (An abnormally low input voltage is entered.)	4
ABS SENSOR [ABNORMAL SIGNAL]	• Teeth damage on sensor rotor or improper installation of wheel sensor. (Abnormal wheel sensor signal is entered.)	4
FR RH IN ABS SOL [OPEN]	• Circuit for front right inlet solenoid valve is open. (An abnormally low output voltage is entered.)	3
FR LH IN ABS SOL [OPEN]	• Circuit for front left inlet solenoid valve is open. (An abnormally low output voltage is entered.)	3
RR RH IN ABS SOL [OPEN]	• Circuit for rear right inlet solenoid valve is open. (An abnormally low output voltage is entered.)	3
RR LH IN ABS SOL [OPEN]	• Circuit for rear left inlet solenoid valve is open. (An abnormally low output voltage is entered.)	3
FR RH IN ABS SOL [SHORT]	• Circuit for front right inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	3
FR LH IN ABS SOL [SHORT]	• Circuit for front left inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	3
RR RH IN ABS SOL [SHORT]	• Circuit for rear right inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	3
RR LH IN ABS SOL [SHORT]	• Circuit for rear left inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	3
FR RH OUT ABS SOL [OPEN]	• Circuit for front right outlet solenoid valve is open. (An abnormally low output voltage is entered.)	3
FR LH OUT ABS SOL [OPEN]	• Circuit for front left outlet solenoid valve is open. (An abnormally low output voltage is entered.)	3
RR RH OUT ABS SOL [OPEN]	• Circuit for rear right outlet solenoid valve is open. (An abnormally low output voltage is entered.)	3
RR LH OUT ABS SOL [OPEN]	• Circuit for rear left outlet solenoid valve is open. (An abnormally low output voltage is entered.)	3
FR RH OUT ABS SOL [SHORT]	• Circuit for front right outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	3
FR LH OUT ABS SOL [SHORT]	• Circuit for front left outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	3
RR RH OUT ABS SOL [SHORT]	• Circuit for rear right outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	3
RR LH OUT ABS SOL [SHORT]	• Circuit for rear left outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	3
ABS ACTUATOR RELAY [FAILURE]	• Actuator solenoid valve relay is ON, even control unit sends off signal. • Actuator solenoid valve relay is OFF, even control unit sends on signal.	6
ABS MOTOR [FAILURE]	• Circuit for actuator motor is open or shorted. • Actuator motor relay is stuck.	5
BATTERY VOLT [VB-LOW]	• Power source voltage supplied to ABS control unit is abnormally low.	7
CONTROL UNIT	• Function of calculation in ABS control unit has failed.	8

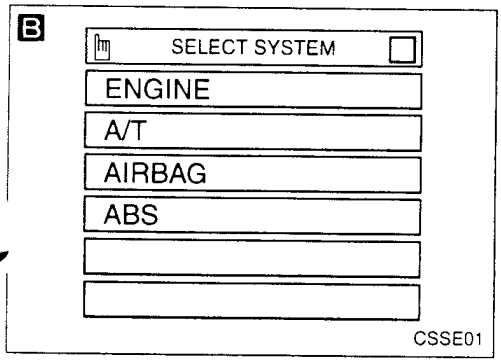
*1 Be sure to confirm the ABS warning lamp illuminates when the ignition switch is turned ON after repairing the shorted sensor circuit, but the lamp goes out when driving the vehicle over 30 km/h (20 mph) for one minute in accordance with SELF-DIAGNOSIS PROCEDURE.

CONSULT Inspection Procedure (Cont'd)

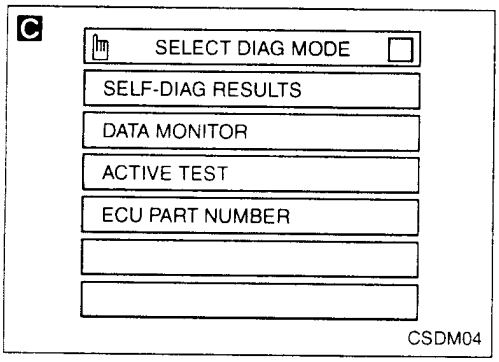
DATA MONITOR PROCEDURE



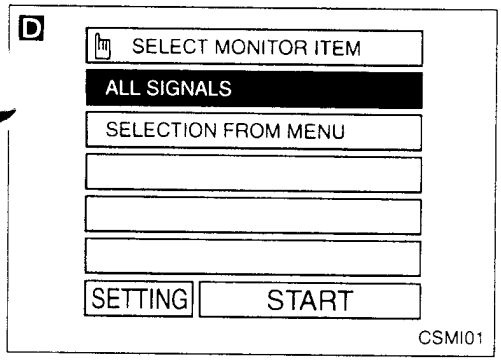
1) Turn ignition switch to the off position.
2) Connect CONSULT to Data Link Connector for CONSULT.
3) Turn ignition switch to the on position.

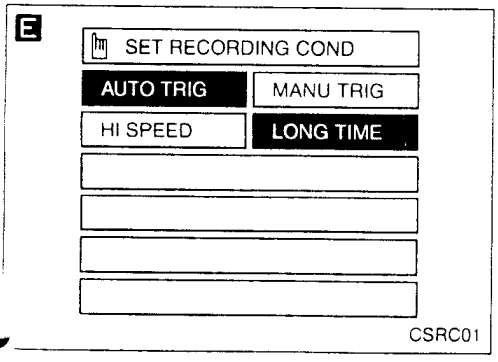


A 1) Touch "START" on CONSULT screen.
B 2) Touch "ABS".
C 3) Touch "DATA MONITOR".



D 1) Touch "SETTING" on "SELECT MONITOR ITEM" screen.
E 2) Touch "LONG TIME" on "SET RECORDING COND" screen. Touch ENTER.
D 3) Touch "START" on "SELECT MONITOR ITEM".





CONSULT Inspection Procedure (Cont'd)

ACTIVE TEST PROCEDURE

- When conducting Active test, vehicle must be stationary.
- When ABS warning lamp stays on, never conduct Active test.

1) Turn ignition switch to the "LOCK" position.
2) Connect CONSULT to Data Link Connector for CONSULT.
3) Start engine.

↓

A 1) Touch "START" on CONSULT screen.
B 2) Touch "ABS".
C 3) Touch "ACTIVE TEST".

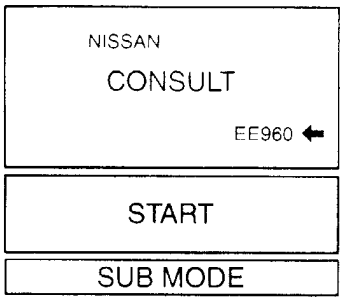
↓

D 1) Select active test item by touching screen.
E 2) Touch "START".

↓

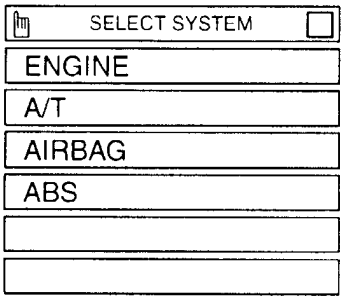
Carry out the active test by touching screen key.

A



CNCS02

B



CSSE01

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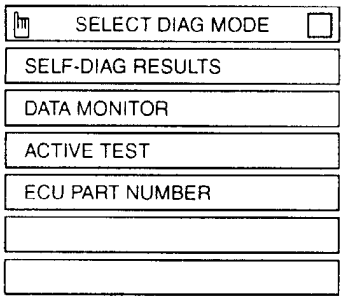
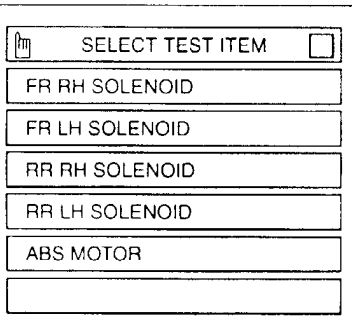


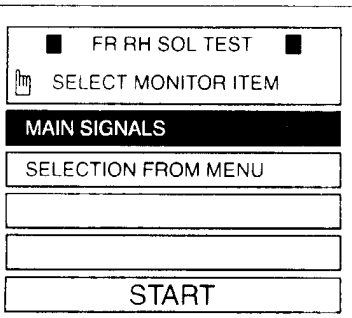
CSDM04

D



CSTI01

E



CFRS01

DATA MONITOR MODE

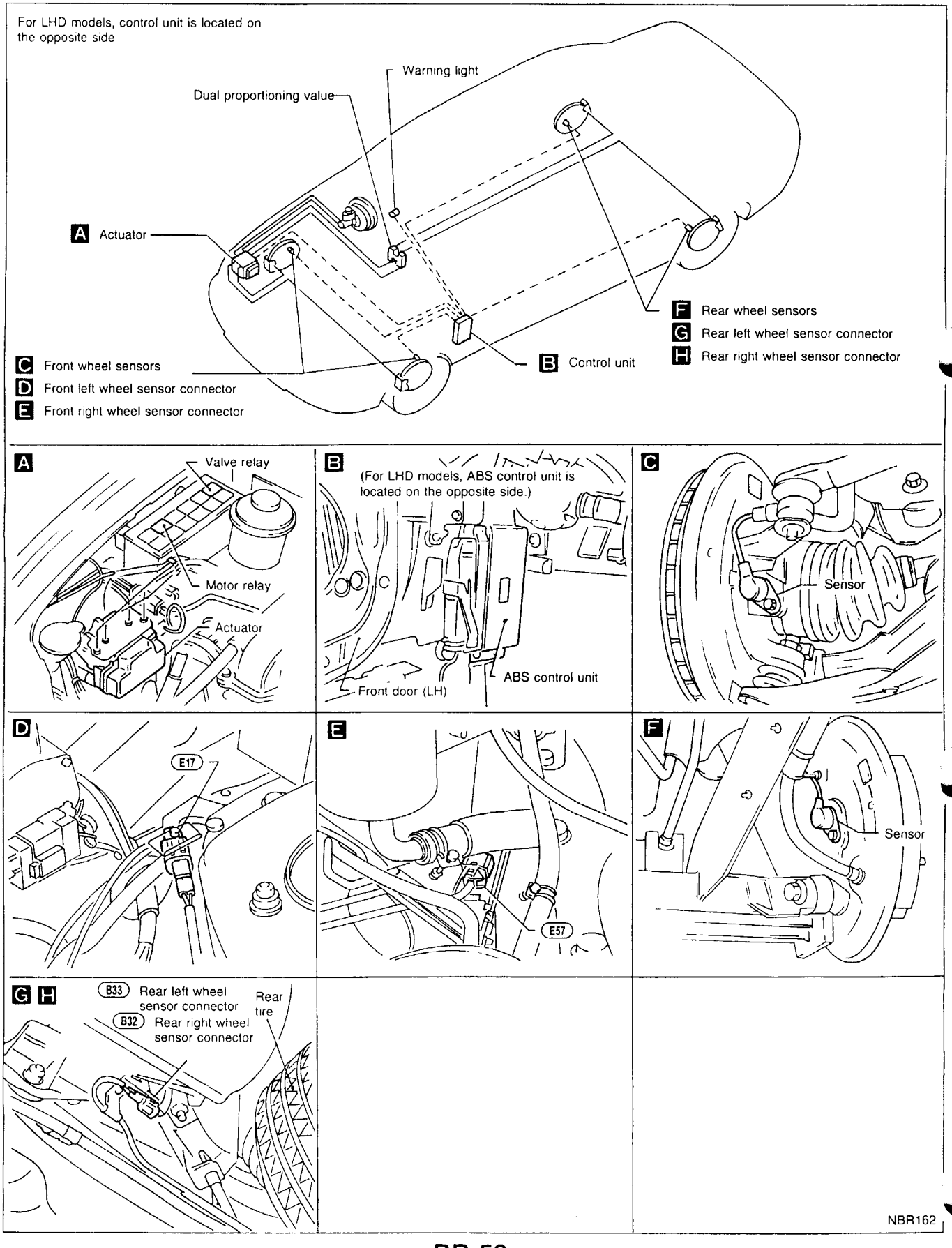
MONITOR ITEM	CONDITION	SPECIFICATION
FR RH SENSOR FR LH SENSOR REAR RH SENSOR REAR LH SENSOR	Drive vehicle. (Each wheel is rotating.)	Almost the same speed as speedometer.
STOP LAMP SW	Brake is depressed.	Depress the pedal: ON Release the pedal: OFF
FR RH IN SOL FR RH OUT SOL FR LH IN SOL FR LH OUT SOL RR RH IN SOL RR RH OUT SOL RR LH IN SOL RR LH OUT SOL	Engine is running.	Operating conditions for each solenoid valve are indicated. ABS is not operating: OFF
ACTUATOR RLY	Ignition switch is set to the "ON" position or engine is running.	Ignition switch in the "ON" position (Engine stops): OFF Engine running: ON
MOTOR RELAY		ABS is not operating: OFF ABS is operating: ON
WARNING LAMP		Warning lamp is turned on: ON Warning lamp is turned off: OFF
BATTERY VOLT		Power supply voltage for control unit

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT
FR RH SOLENOID FR LH SOLENOID RR RH SOLENOID RR LH SOLENOID	Engine is running.	Brake fluid pressure control operation IN SOL / OUT SOL UP (Increase): OFF / OFF KEEP (Hold): ON / OFF DOWN (Decrease): ON / ON
ABS MOTOR		ABS actuator motor ON: Motor runs OFF: Motor stops

Note: Active test will automatically stop ten seconds after the test starts. (LIMIT SIGNAL monitor shows ON.)

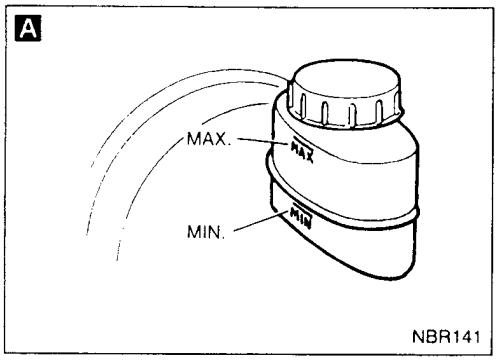
Component Parts and Harness Connector Location



NBR162

Preliminary Check

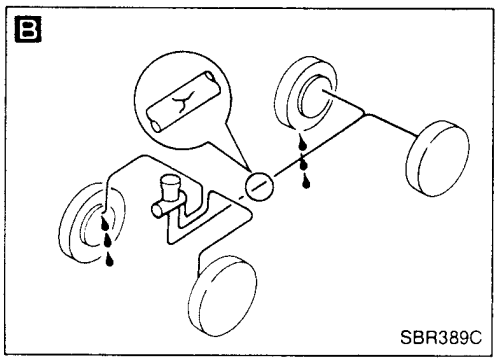
A



Check brake fluid level in reservoir tank.

Low fluid level may indicate brake pad wear or leakage from brake line.

B



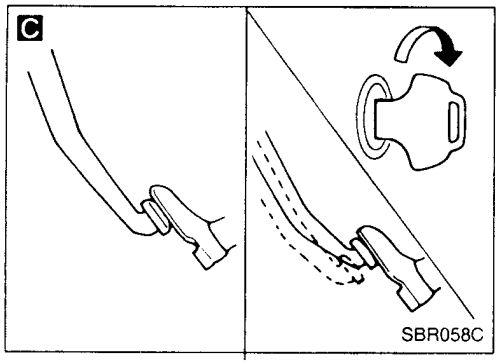
Check brake line for leakage. NG → Repair.

OK

C

Check brake booster for operation and air tightness. Refer to BR-14. NG → Replace.

OK



Check brake pads and rotor. Refer to BR-18, 20, 23, 25, 29. NG → Replace.

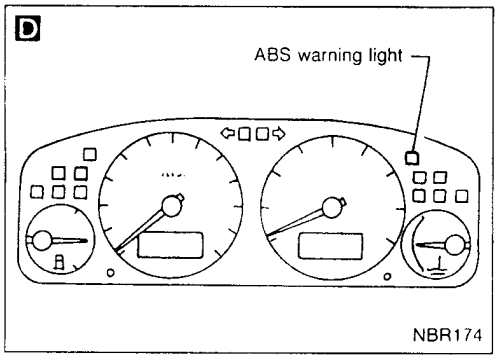
OK

A

Check brake fluid level in reservoir tank. NG → Fill up brake fluid.

OK

D



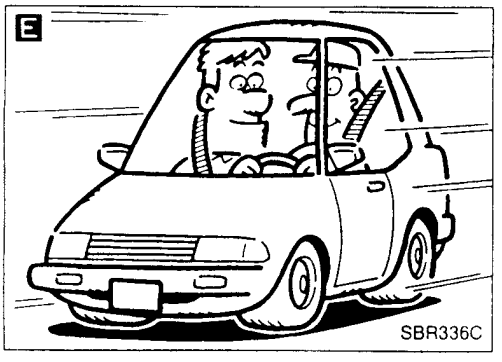
Check warning lamp activation. When ignition switch is turned on, warning lamp turns on. NG → Check fuse, warning lamp bulb and warning lamp circuit.

OK

Check warning lamp for deactivation. When ignition switch is turned on, warning lamp turns on, then deactivates after 1 second. NG → Go to Self-diagnosis, BR-49.

OK

E

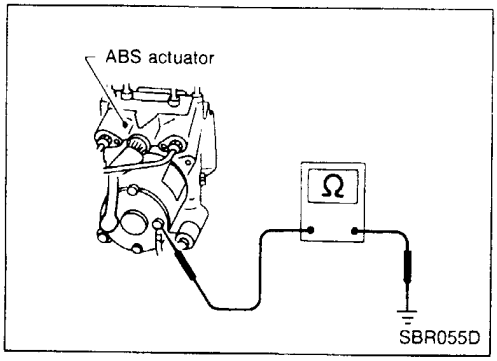


Drive vehicle at 30 km/h (20 mph) for at least one minute.

Ensure warning lamp remains off while driving. NG → Go to Self-diagnosis, BR-49.

OK

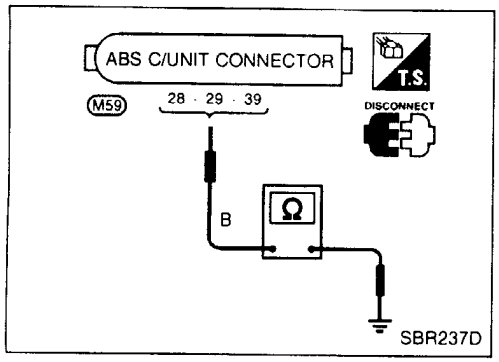
END



Ground Circuit Check

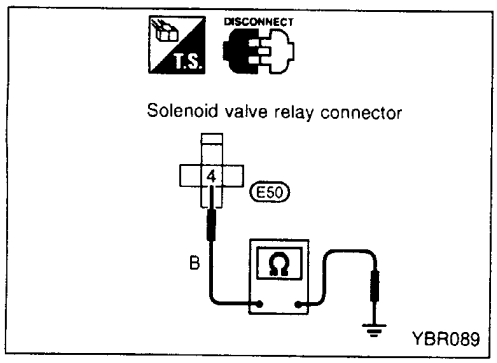
ACTUATOR MOTOR GROUND

- Check resistance between actuator motor ground terminal and body ground.
  Resistance: 0Ω



CONTROL UNIT GROUND

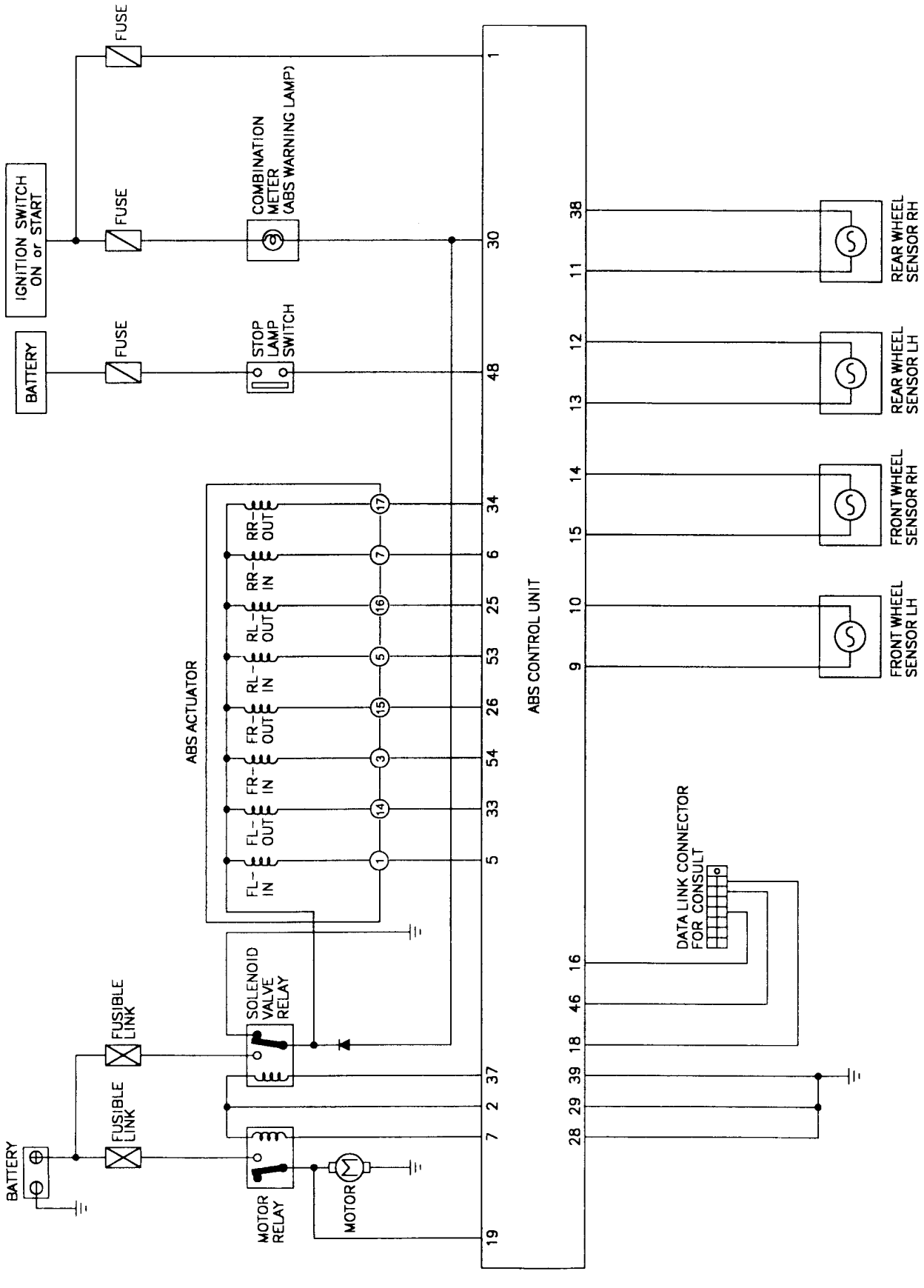
- Check resistance between ABS control unit connector terminals ㉘, ㉙, ㉚ and ground.
  Resistance: 0Ω



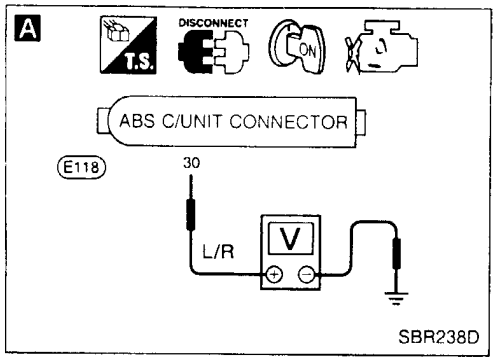
SOLENOID VALVE RELAY GROUND

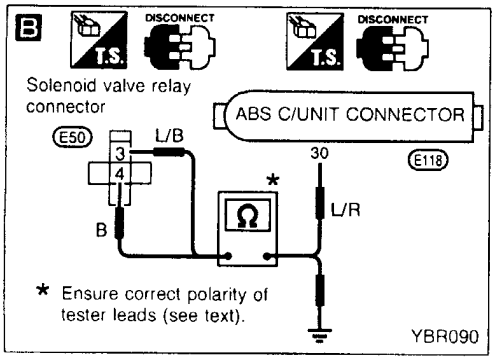
- Check resistance between solenoid valve relay connector terminal ④ and ground.
  Resistance: 0Ω

Circuit Diagram for Quick Pinpoint Check



MBR049





Diagnostic Procedure 1 (Not self-diagnostic item)

Warning lamp does not come on when ignition switch is turned on.

WARNING LIGHT CIRCUIT CHECK

Check 10A fuse [8] for warning lamp.
For fuse layout, refer to BR-41.

NG → Replace fuse.

OK ↓

Check warning lamp bulb.

NG → Replace bulb.

OK ↓

A

1. Install 10A fuse and bulb.
2. Disconnect connector from ABS control unit and remove solenoid valve relay.
3. Check voltage between ABS control unit connector terminal (30) and ground after turning ignition switch to the "ON" position.

Battery voltage should exist after turning ignition switch to the "ON" position.

NG → Check harness connectors (M17), (E101) and continuity between ABS control unit and ABS warning lamp.
If NG, repair harness or connectors.

OK ↓

B

- Check continuity between solenoid valve relay connector and ABS control unit terminals.

Solenoid valve relay	Control unit
* (3) ⊖	(30) ⊕
(4)	Ground

Continuity should exist.
Note: Pay attention to tester polarity.*

NG → Check diode (E106) and harness continuity between ABS control unit and solenoid valve relay.
If NG, replace diode or repair harness or connectors.

OK ↓

SOLENOID VALVE RELAY CHECK

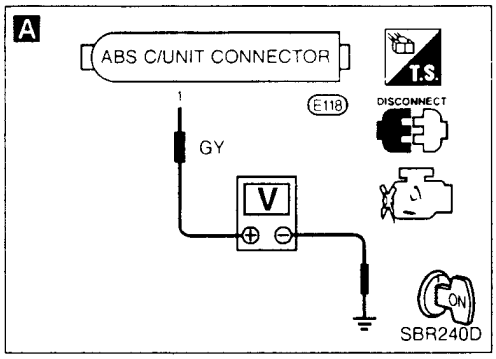
Refer to SOLENOID VALVE RELAY in Electrical Components Inspection, BR-78.

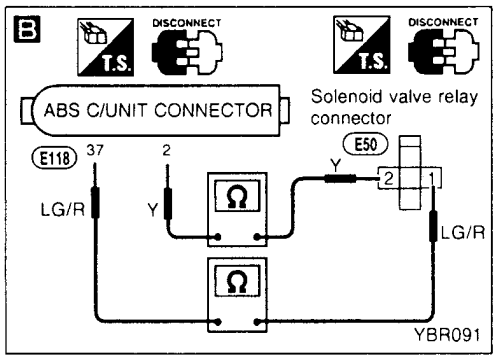
NG → Replace solenoid valve relay.

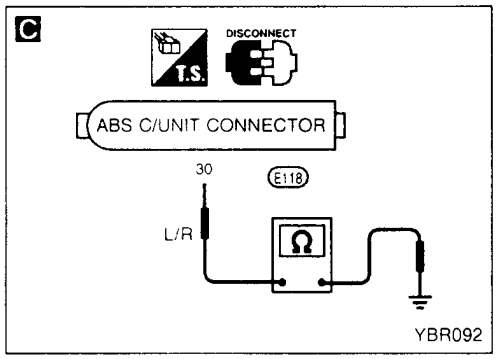
OK ↓

Go to Diagnostic Procedure 7 BR-74.

*: **Specifications may vary depending on the type of tester. Before performing this inspection, refer to the instruction manual of the tester.**







Diagnostic Procedure 2 (Not self-diagnostic item)

Warning lamp stays on when ignition switch is turned on.

CONTROL UNIT POWER SUPPLY CIRCUIT — NG → (Go to Ⓑ on BR-64.)

Check 7.5A fuse [12] for control unit.
For fuse layout, refer to BR-41.

OK ↓

A

1. Disconnect connector from ABS control unit.
2. Check voltage between ABS control unit connector terminal ① and ground after turning ignition switch to the "ON" position.
   Battery voltage should exist.

NG → Check harness connectors (M17), (E101) and continuity between ABS control unit and fuse block. If NG, repair harness or connector.

OK ↓

B

SOLENOID VALVE RELAY COIL POWER SUPPLY CIRCUIT — NG → Repair harness or connector.

1. Turn ignition switch to the "LOCK" position. Remove solenoid valve relay.
2. Check continuity between ABS control unit connector terminals and solenoid valve relay connector terminals.

ABS Control unit	Solenoid valve relay
②	②
㊲	①

Continuity should exist.

OK ↓

SOLENOID VALVE RELAY CHECK — NG → Replace solenoid valve relay.

Refer to SOLENOID VALVE RELAY in Electrical Components Inspection, BR-78.

OK ↓

C

GROUND-SHORT CHECK OR WARNING LAMP CIRCUIT. — NG → Locate cause of short-circuit to ground and repair harness or connector.

1. Turn ignition switch to the "LOCK" position.
2. Disconnect connector from ABS control unit and remove solenoid valve relay.
3. Check continuity between ABS control unit connector terminal ㉚ and body ground.
   Continuity should not exist.

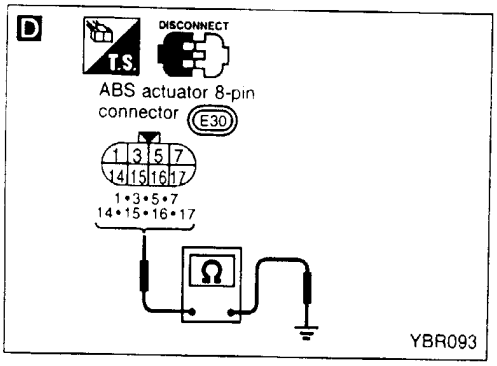
OK ↓

Ⓐ

(Go to next page.)

Diagnostic Procedure 2 (Cont'd)

D



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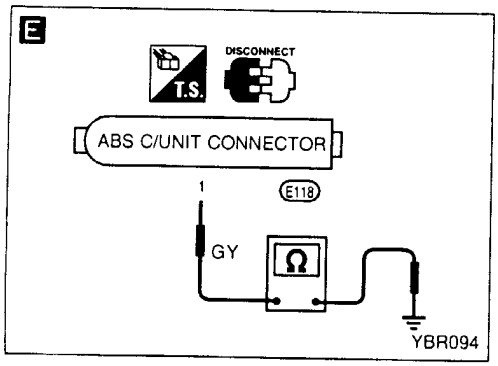
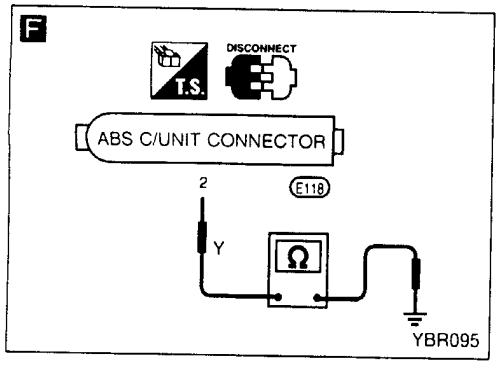


F



Ⓐ

D

SOLENOID VALVE CIRCUIT — NG → Replace ABS actuator.

1. Disconnect ABS actuator 8-pin connector.
2. Check continuity between each ABS actuator 8-pin connector terminal and body ground.
   Continuity should not exist.

OK ↓

Check ABS control unit pin terminals for damage or the connection of ABS control unit harness connector.
Reconnect ABS control unit harness connector. Then retest.

Ⓑ

Replace 7.5A fuse.
Does the fuse blow out when ignition switch is turned to the "ON" position? — No → Inspection end

Yes ↓

E

CONTROL UNIT POWER SUPPLY CIRCUIT — NG → Locate cause of short-circuit to ground and repair harness or connector.

1. Disconnect ABS control unit connector.
2. Check continuity between ABS control unit connector terminal ① and body ground.
   Continuity should not exist.

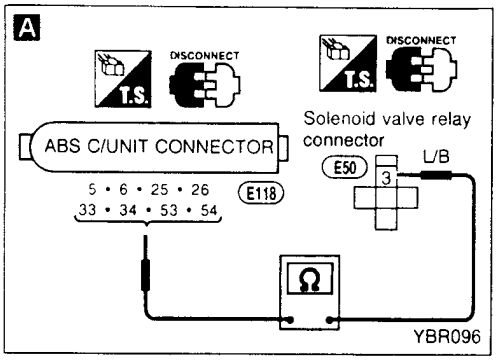
OK ↓

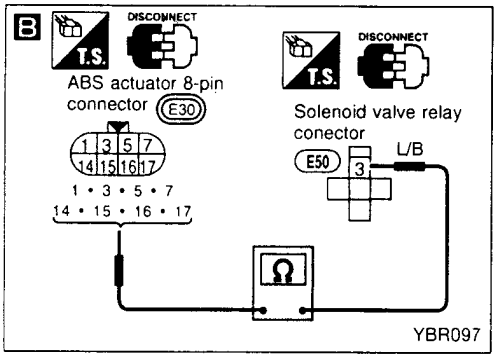
F

Check continuity between ABS control unit connector terminal ② and body ground.
Continuity should not exist. — NG → Locate cause of short-circuit to ground and repair harness or connector.

OK ↓

Check ABS control unit pin terminals for damage or the connection of ABS control unit harness connector.
Reconnect ABS control unit harness connector. Then retest.





Diagnostic Procedure 3

ABS ACTUATOR SOLENOID VALVE (Malfunction code No. 41, 42, 45, 51, 52, 46, 55, 56)

1. Disconnect connectors from control unit, ABS actuator and remove solenoid valve relay. Check terminals for damage or loose connections. Then reconnect connectors and solenoid valve relay.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes ↓

A

ABS ACTUATOR SOLENOID VALVE CHECK

1. Disconnect connector from ABS control unit and remove solenoid valve relay.
2. Check resistance between ABS control unit connector terminals and solenoid valve relay (E50) terminal ③.

Code No.	ABS Control unit	Solenoid valve relay	Resistance
41	㉖	③	4.4 - 6.0Ω
45	㉝	③	
51	㉞	③	
55	㉕	③	
42	㊹	③	8.5 - 11.0Ω
46	⑤	③	
52	⑥	③	
56	㊸	③	

OK → Ⓐ (Go to next page.)

NG ↓

B

1. Disconnect ABS actuator 8-pin connector.
2. Check resistance between ABS actuator 8-pin connector (ABS actuator side) terminals and solenoid valve relay (E50) terminal ③.

Code No.	ABS actuator	Solenoid valve relay	Resistance
41	⑮	③	4.4 - 6.0Ω
45	⑭	③	
51	⑰	③	
55	⑯	③	
42	③	③	8.5 - 11.0Ω
46	①	③	
52	⑦	③	
56	⑤	③	

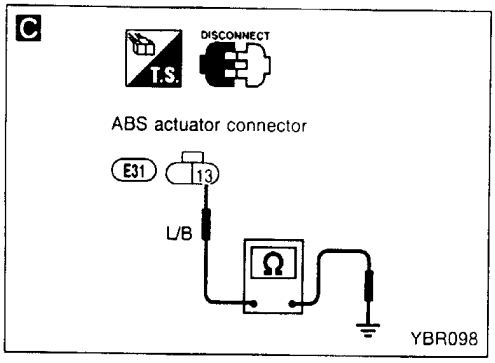
OK → Repair harness and connector between ABS control unit connector and ABS actuator 8-pin connector.

NG ↓

Replace ABS actuator.

Diagnostic Procedure 3 (Cont'd)

C



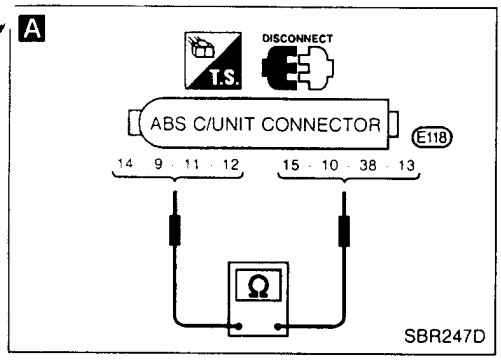
Ⓐ

C

1. Disconnect ABS actuator 2-pin connector (E31).
2. Check continuity between ABS actuator 2-pin connector (E31) terminal (13) and ground.
   Continuity should exist.

OK → Go to Diagnostic Procedure 7 BR-74.

NG → Go to Diagnostic Procedure 6 BR-72.



Diagnostic Procedure 4

WHEEL SENSOR OR ROTOR (Malfunction code No. 21, 22, 25, 26, 31, 32, 35, 36 or 18)

1. Disconnect connectors from ABS control unit and wheel sensor according to malfunction code No.
   Check terminals for damage or loose connections. Then reconnect connectors.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes ↓

A

WHEEL SENSOR ELECTRICAL CHECK

NG → Ⓐ (See next page.)

1. Disconnect ABS control unit connnector.
2. Check resistance between ABS control unit connector terminals.
   Code No. 21 or 22 (Front RH wheel)
   Terminals ⑭ and ⑮
   Code No. 25 or 26 (Front LH wheel)
   Terminals ⑨ and ⑩
   Code No. 31 or 32 (Rear RH wheel)
   Terminals ⑪ and ㊳
   Code No. 35 or 36 (Rear LH wheel)
   Terminals ⑫ and ⑬
   Resistance: 0.8 - 1.2 kΩ

OK ↓

Note

CHECK WHEEL SENSOR.

NG → Note: Replace wheel sensor.

Refer to WHEEL SENSOR in Electrical Components Inspection BR-78.

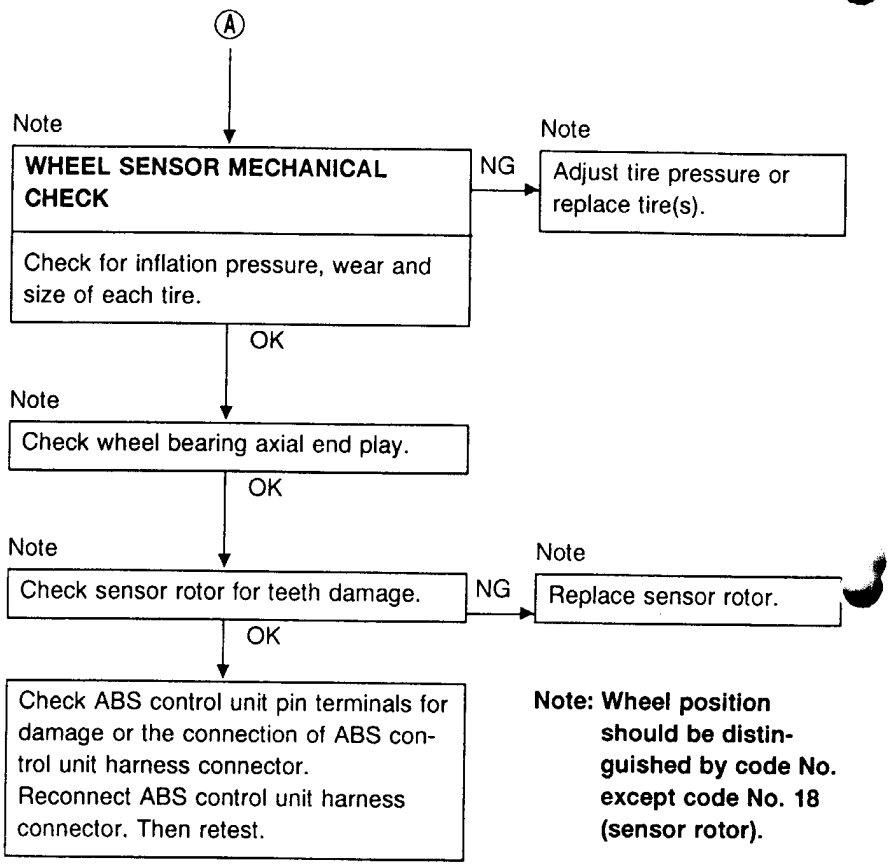
OK ↓

Note

Repair harness and connectors between ABS control unit connector and wheel sensor connector.

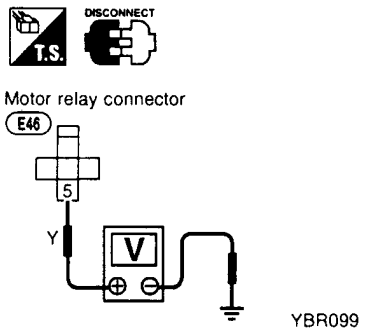
Note: Wheel position should be distinguished by code No. except code No. 18 (sensor rotor).

Diagnostic Procedure 4 (Cont'd)

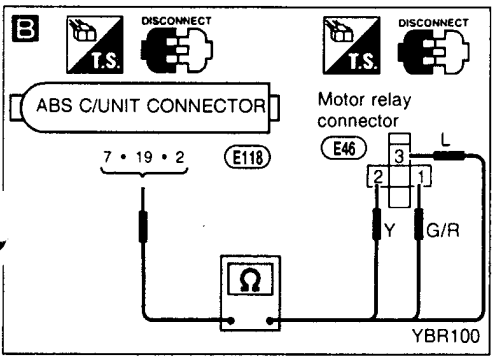


Note: Wheel position should be distinguished by code No. except code No. 18 (sensor rotor).

A



B



Diagnostic Procedure 5

MOTOR RELAY OR MOTOR (Malfunction code No. 61) turned on.

MOTOR POWER SUPPLY CIRCUIT

Check 40A fusible link C (CE), g (DE) for motor relay.
For fusible link layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓑ (Next page.)

OK ↓

1. Disconnect connectors from ABS control unit and ABS actuator. Check terminals for damage or loose connection.
   Then reconnect connectors.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes ↓

A

1. Remove motor relay (E46).
2. Check voltage between motor relay connector terminal ⑤ and ground.
   Battery voltage should exist.

NG → Check 40A fusible link and harness continuity between battery supply and ABS motor relay connector.
If NG, replace 40A fusible link or repair harness or connectors.

OK ↓

B

CIRCUIT CHECK

1. Remove motor relay and disconnect ABS control unit connector.
2. Check continuity between ABS control unit connector terminals and motor relay connector (E46) terminals.

ABS control unit	ABS motor relay
⑦	①
⑲	③
②	②

NG → Repair harness and connectors.

OK ↓

MOTOR RELAY CHECK

Refer to MOTOR RELAY in Electrical Components Inspection, BR-78.

NG → Replace motor relay.

OK ↓

ACTUATOR MOTOR GROUND CHECK

Refer to ACTUATOR MOTOR GROUND in Ground Circuit Check, BR-60.

NG → Repair harness and terminals.

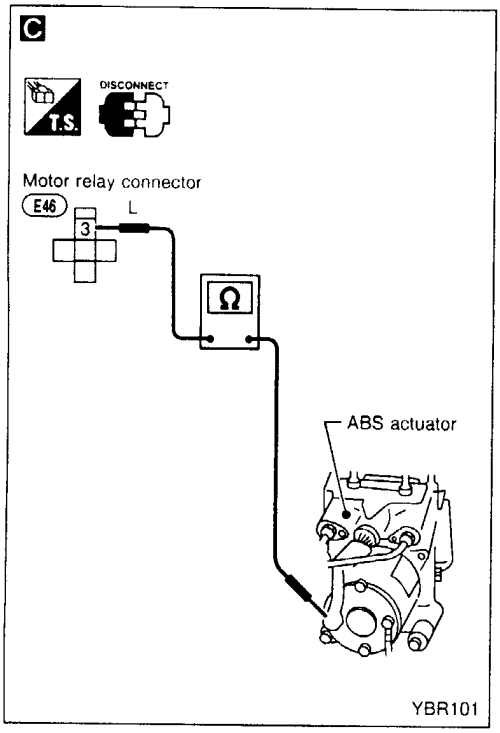
OK ↓

Ⓐ

(Go to next page.)

Diagnostic Procedure 5 (Cont'd)

C



Ⓐ

C

MOTOR RELAY CIRCUIT

1. Remove motor relay.
2. Check continuity between motor relay connector (E46) terminal ③ and actuator motor positive terminal.

Continuity should exist.

NG → Check connection of ABS actuator 2-pin connector (E31). Repair harness or connectors

OK ↓

D

MOTOR CHECK

1. Disconnect actuator motor terminals.
2. Apply battery voltage to motor terminals.

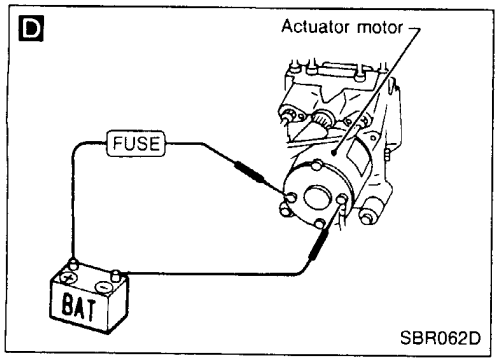
Motor should operate.
Do not connect wire for more than 5 seconds.

NG → Replace ABS actuator.

OK ↓

Go to Diagnostic Procedure 7, BR-74.

D



Ⓑ

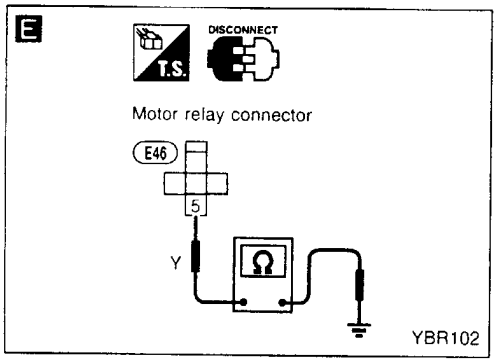
Replace fusible link.

Does the fusible link blow out when ignition switch is turned to the "ON" position?

No → Inspection end

OK ↓

E



E

MOTOR POWER SUPPLY CIRCUIT

1. Disconnect battery cable and remove motor relay.
2. Check continuity between motor relay connector (E46) terminal ⑤ and ground.

Continuity should not exist.

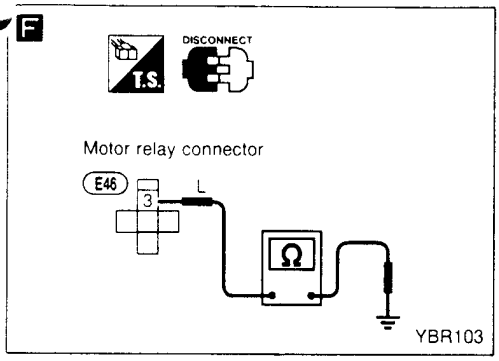
NG → Locate cause of short-circuit and repair harness or connector.

NG ↓

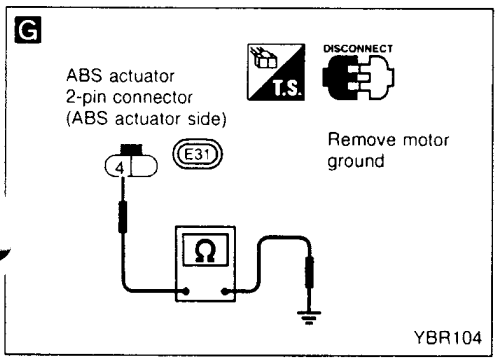
Ⓒ

Diagnostic Procedure 5 (Cont'd)

F



G



Ⓒ

F

1. Remove motor relay and disconnect ABS control unit connector and ABS actuator connector.
2. Check continuity between motor relay connector (E46) terminal ③ and ground.
Continuity should not exist.

NG → Locate cause of short-circuit and repair harness or connectors

OK

G

1. Remove motor ground.
2. Check continuity between ABS actuator 2-pin connector (E31) terminal ④ and ground.
Continuity should not exist.

NG → Replace ABS actuator.

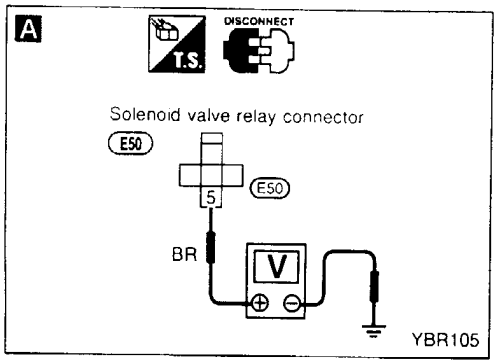
OK

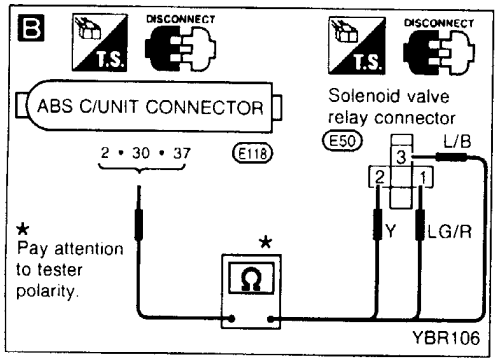
MOTOR CHECK

Go to D in Diagnostic Procedure 5 (preceding page).

OK

Check ABS control unit pin terminals for damage or the connection of ABS control unit harness connector.
Reconnect ABS control unit harness connector. Then retest.





Diagnostic Procedure 6

SOLENOID VALVE RELAY (Malfunction code No. 63)

SOLENOID VALVE POWER SUPPLY CHECK

Check 40A fusible link [b] (Gasoline engine) or [i] (Diesel engine). For fusible link layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓐ (See next page.)

OK ↓

1. Disconnect connectors from ABS control unit and ABS actuator. Check terminals for damage or loose connection.
   Then reconnect connectors.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes ↓

GROUND CIRCUIT CHECK

Refer to CONTROL UNIT GROUND and ACTUATOR GROUND in Ground Circuit Check, BR-60.

NG → Repair harness and connectors.

OK ↓

A

SOLENOID VALVE POWER SUPPLY CHECK

1. Remove solenoid valve relay.
2. Check voltage between solenoid valve relay connector (E50) terminal ⑤ and ground.
   Battery voltage should exist.

NG → Repair harness and connector.

OK ↓

B

CIRCUIT CHECK

1. Remove solenoid valve relay and disconnect ABS control unit connector.
2. Check continuity between ABS control unit connector terminals and solenoid valve relay connector (E50) terminals.

ABS control unit	Solenoid valve relay
㊲	①
㉚*	③
②	②

Continuity should exist.
Note: Pay attention to tester polarity.*

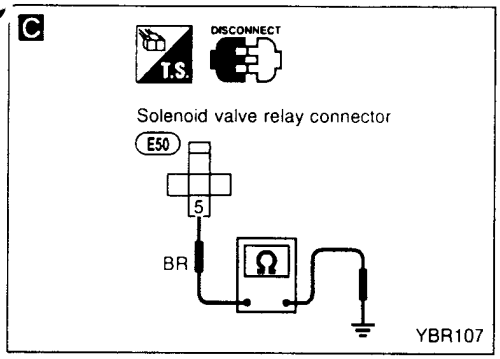
NG → Check diode (E106).
If NG, replace diode or repair harness or connectors.

OK ↓

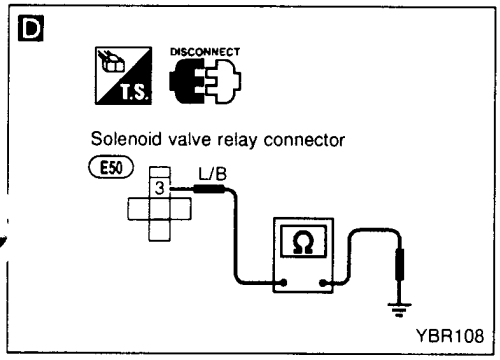
Ⓑ

Diagnostic Procedure 6 (Cont'd)

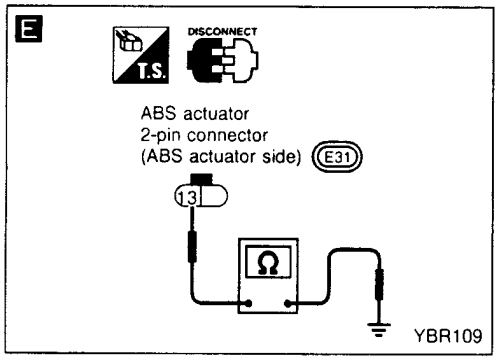
C



D



E



Ⓑ

SOLENOID VALVE RELAY CHECK

Refer to SOLENOID VALVE RELAY in Electrical Components Inspection, BR-78.

NG → Replace solenoid valve relay.

OK ↓

Go to diagnostic procedure 3, BR-65.

Ⓐ

Replace fusible link.
Does the fusible link blow out when ignition switch is turned to the "ON" position?

No → Inspection end

Yes ↓

C

RELAY UNIT POWER SUPPLY CIRCUIT

1. Disconnect battery cable and remove solenoid valve relay.
2. Check continuity between solenoid valve relay connector E50 terminal ⑤ and ground.
   Continuity should not exist.

NG → Locate cause of short-circuit and repair harness or connector.

OK ↓

D

1. Remove solenoid valve relay and disconnect ABS control unit connector.
2. Check continuity between solenoid valve relay connector E50 terminal ③ and ground.
   Continuity should not exist.

NG → Locate cause of short-circuit and repair harness or connector.

OK ↓

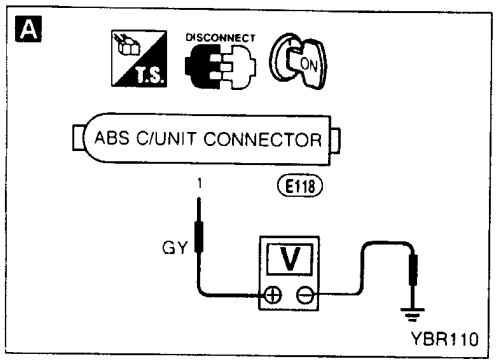
E

1. Disconnect ABS actuator 2-pin connector E31.
2. Check continuity between ABS actuator 2-pin connector E31 (ABS actuator side) terminal ⑬ and ground.
   Continuity should not exist.

NG → Replace ABS actuator.

OK ↓

Go to Diagnostic Procedure 3, BR-65.



Diagnostic Procedure 7

POWER SUPPLY (Low voltage) (Malfunction code No. 57)

1. Disconnect ABS control unit connectors.
   Check terminals for damage or loose connections. Then, reconnect connectors.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes

A

CONTROL UNIT POWER SUPPLY CHECK

Ng → Ⓐ (See below.)

1. Disconnect ABS control unit connector.
2. Check voltage between ABS control unit connector terminal ① and ground.
   Battery voltage should exist when ignition switch is turned to the "ON" position.

OK

CONTROL UNIT CIRCUIT CHECK

NG → Repair harness and connectors.

Refer to CONTROL UNIT GROUND in Ground Circuit Check, BR-60.

OK

Check ABS control unit pin terminals for damage or the connection of ABS control unit harness connector.
Reconnect ABS control unit harness connector. Then retest.

Ⓐ

Check 7.5A fuse [12]. Refer to POWER SUPPLY ROUTING in EL section.

NG → Replace fuse.

OK

Check continuity between battery and ABS control unit connector terminal ①.

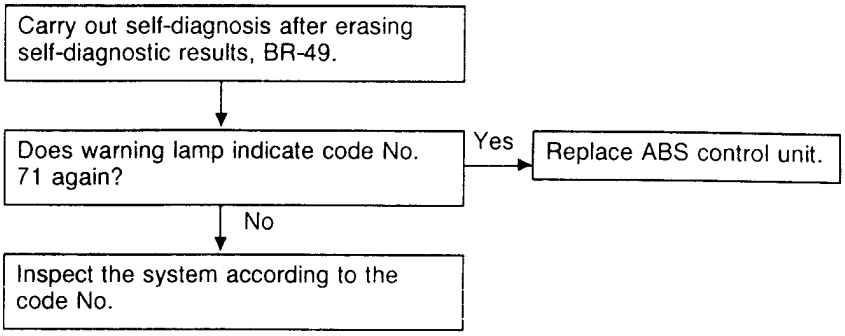
NG → Check harness connectors (M17), (E101).
If NG, repair harness or connectors.

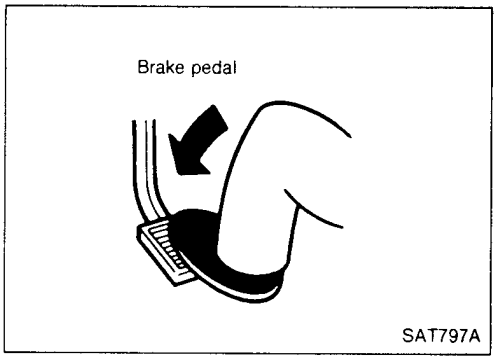
OK

Check battery. Refer to BATTERY in EL section.

Diagnostic Procedure 8

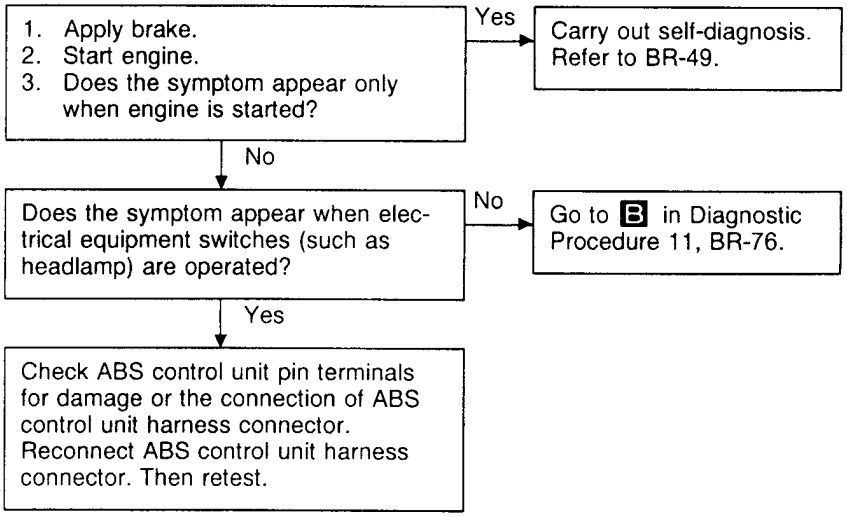
CONTROL UNIT
(Malfunction code No. 71)





Diagnostic Procedure 9

SYMPTOM: Pedal vibration and noise



Note: ABS may operate and cause vibration under any of the following conditions.

- **Applying brake gradually when shifting or operating clutch.**
- **Low friction (slippery) road.**
- **High speed cornering.**
- **Driving over bumps and pot holes.**
- **Engine speed is over 5,000 rpm with vehicle stopped.**

Diagnostic Procedure 10

SYMPTOM: Long stopping distance

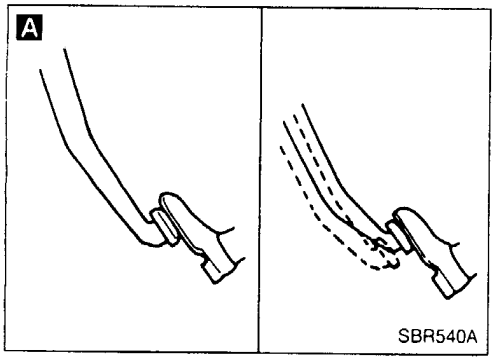
Remove ABS fuse and check whether stopping distance is still long.

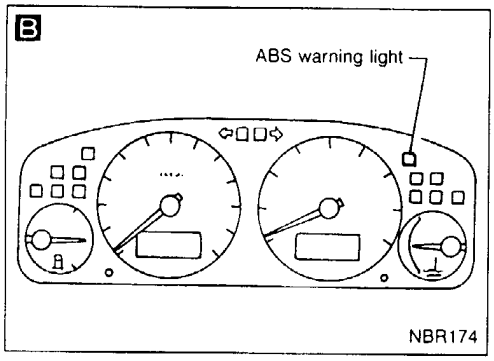
No → Go to B in Diagnostic Procedure 11, BR-76.

Yes ↓

Perform Preliminary Check and air bleeding.

Note: Stopping distance may be longer than that for vehicles without ABS when road condition is slippery.





Diagnostic Procedure 11

SYMPTOM: Unexpected pedal action

A

Check brake pedal stroke. Is stroke excessively large?

Yes → Perform Preliminary Check, refer to BR-59.

No ↓

Disconnect ABS relay box 6-pin connector and check whether brake is effective.

No → Perform Preliminary Check, refer to BR-59.

Yes ↓

B

Ensure warning lamp remains off while driving.

NG → Carry out self-diagnosis. Refer to BR-49.

OK ↓

CHECK WHEEL SENSOR.

NG → Repair.

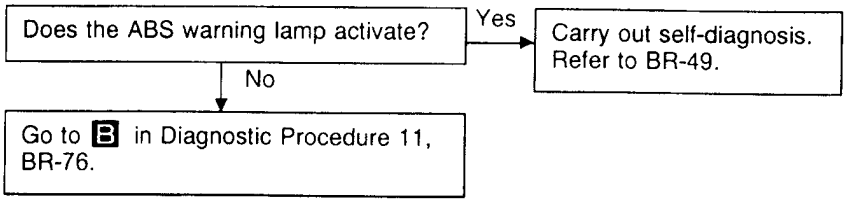
1. Check wheel sensor connector for terminal damage or loose connection.
2. Perform wheel sensor mechanical check.
   Refer to B in Diagnostic Procedure 4, BR-67.

OK ↓

Check ABS control unit pin terminals for damage or the connection of ABS control unit harness connector. Reconnect ABS control unit harness connector. Then retest.

Diagnostic Procedure 12

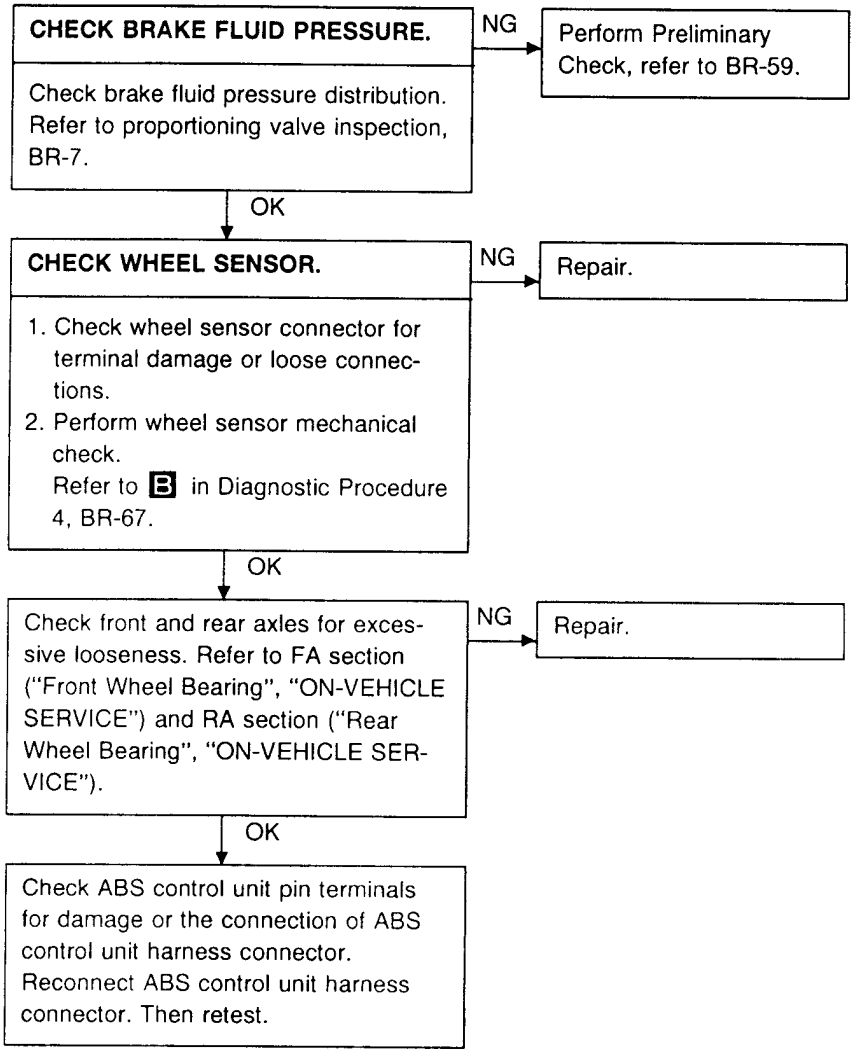
SYMPTOM: ABS does not work.



Note: ABS does not work when vehicle speed is under 10 km/h (6 mph).

Diagnostic Procedure 13

SYMPTOM: ABS works frequently.

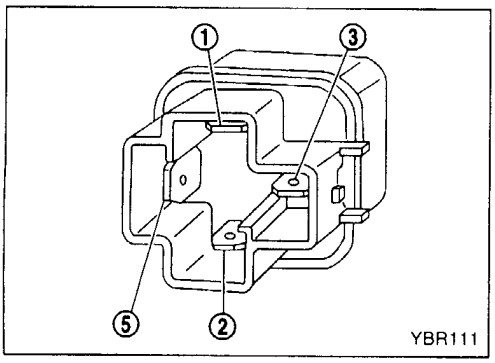


Electrical Components Inspection

WHEEL SENSOR

Check resistance for each sensor.

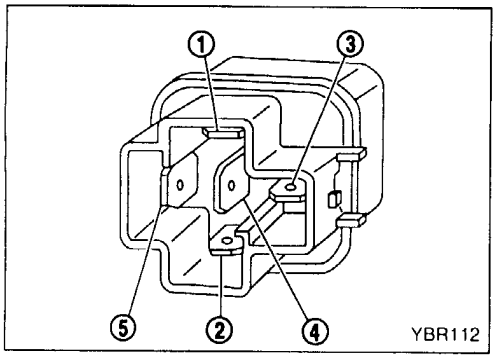
Resistance: 0.8 - 1.2 kΩ



ABS MOTOR RELAY

Condition	Continuity exists between terminals ③ and ⑤?
Battery voltage not applied between terminals ① and ②.	No
Battery voltage applied between terminals ① and ②.	Yes

While applying battery voltage to relay terminals, insert fuse into the circuit's positive supply.



SOLENOID VALVE RELAY

Condition	Continuity existence between terminals ③ and ④	Continuity existence between terminals ③ and ⑤
Battery voltage not applied between terminals ① and ②.	Yes	No
Battery voltage applied between terminals ② and ①.	No	Yes

While applying battery voltage to relay terminals, insert fuse into the circuit's positive supply.

General Specifications

Applied model	GA16DE, CD20T (Without ABS/With ABS)	SR20De		SR20DE (With ABS)
		Drum type rear brake (Without ABS/With ABS)	Disc type rear brake (Without ABS/With ABS)	
Front brake	CL25VG	CL25VG		CL25VGB
Brake model	disc brake	disc brake		disc brake
Cylinder bore diameter mm (in)	57.2 (2.252)	57.2 (2.252)		57.2 (2.252)
Pad length x width x thickness mm (in)	113.1 x 45.5 x 11 (4.45 x 1.791 x 0.43)	113.1 x 45.5 x 11 (4.45 x 1.791 x 0.43)		109 x 47 x 11 (4.29 x 1.85 x 0.43)
Rotor outer diameter x thickness mm (in)	257 x 22 (10.12 x 0.87)	257 x 22 (10.12 x 0.87)		280 x 22 (11.02 x 0.87)
Rear brake	LT23X	LT23X	CL9HCG	CL9HC9
Brake model	drum brake	drum brake	disc brake	disc brake
Cylinder bore diameter mm (in)	20.64 (13/16)	20.64 (13/16)	34.4 (1.354)	34.4 (1.354)
Lining or pad length x width x thickness mm (in)	thickness 4.85 (0.191)	thickness 4.85 (0.191)	79.8 x 38.5 x 9.3 (3.14 x 1.52 x 0.37)	79.8 x 38.5 x 9.3 (3.14 x 1.52 x 0.37)
Drum inner diameter or rotor outer diameter x thickness mm (in)	228.6 (9.0)	228.6 (9.0)	258 x 10 (10.2 x 0.39)	258 x 10 (10.2 x 0.39)
Master cylinder	25.40			
Cylinder bore diameter mm (in)	(1.00)			
Control valve	Dual proportioning valve	Dual proportioning valve		Dual proportioning valve
Valve model				
Split point [kPa (bar, kg/cm^2, psi)] x reducing ratio	2,940 (29.4, 29.99, 426.3) x 0.4	2,940 (29.4, 29.99, 426.3) x 0.4	1,960 (19.6, 19.99, 284.2) x 0.4	3,430 (34.3, 34.99, 497.4) x 0.4
Brake booster	ASJE			
Booster model	M195T			
Diaphragm diameter mm (in)	Primary: 203.2 (8.0)		Secondary: 177.8 (7.0)	
Specified brake fluid	DOT 4			

Inspection and Adjustment

DISC BRAKE

Unit: mm (in)

Brake model	CL25VBG	CL25VG	CL9HCG
Pad wear limit			
Minimum thickness	2.0 (0.079)		
Rotor repair limit	20.0	20.0	9.0
Minimum thickness	(0.787)	(0.787)	(0.354)
Maximum runout	0.07 (0.0028)		
Maximum thickness variation	0.02 (0.0008)		

DRUM BRAKE

Unit: mm (in)

Brake model	Rear
	LT23X
Lining wear limit	
Minimum thickness	1.5 (0.059)
Drum repair limit	
Maximum inner diameter	230.0 (9.055)
Out-of-round	0.03 (0.0012) or less

BRAKE PEDAL

Unit: mm (in)

Applied model		RHD	LHD
Free height			
M/T		160 - 170 (6.30 - 6.69)	151 - 161 (5.94 - 6.34)
A/T		169 - 179 (6.65 - 7.05)	160 - 170 (6.30 - 6.69)
Depressed height			
[under force of 490 N (50 kg, 110 lb) with engine running]	M/T	80 - 90 (3.15 - 3.54)	71 - 81 (2.80 - 3.19)
	A/T	89 - 99 (3.50 - 3.90)	80 - 91 (3.15 - 3.54)

PARKING BRAKE CONTROL

Control type	Center lever
Number of notches	
[under force of 196 N (20 kg, 44 lb)]	6 - 8
Number of notches when warning switch comes on	1 - 2

BRAKE SYSTEM

SECTION BR

CONTENTS

ANTI-LOCK BRAKE SYSTEM 2002
Removal and Installation 2002
Wiring Diagram — ABS — 2003

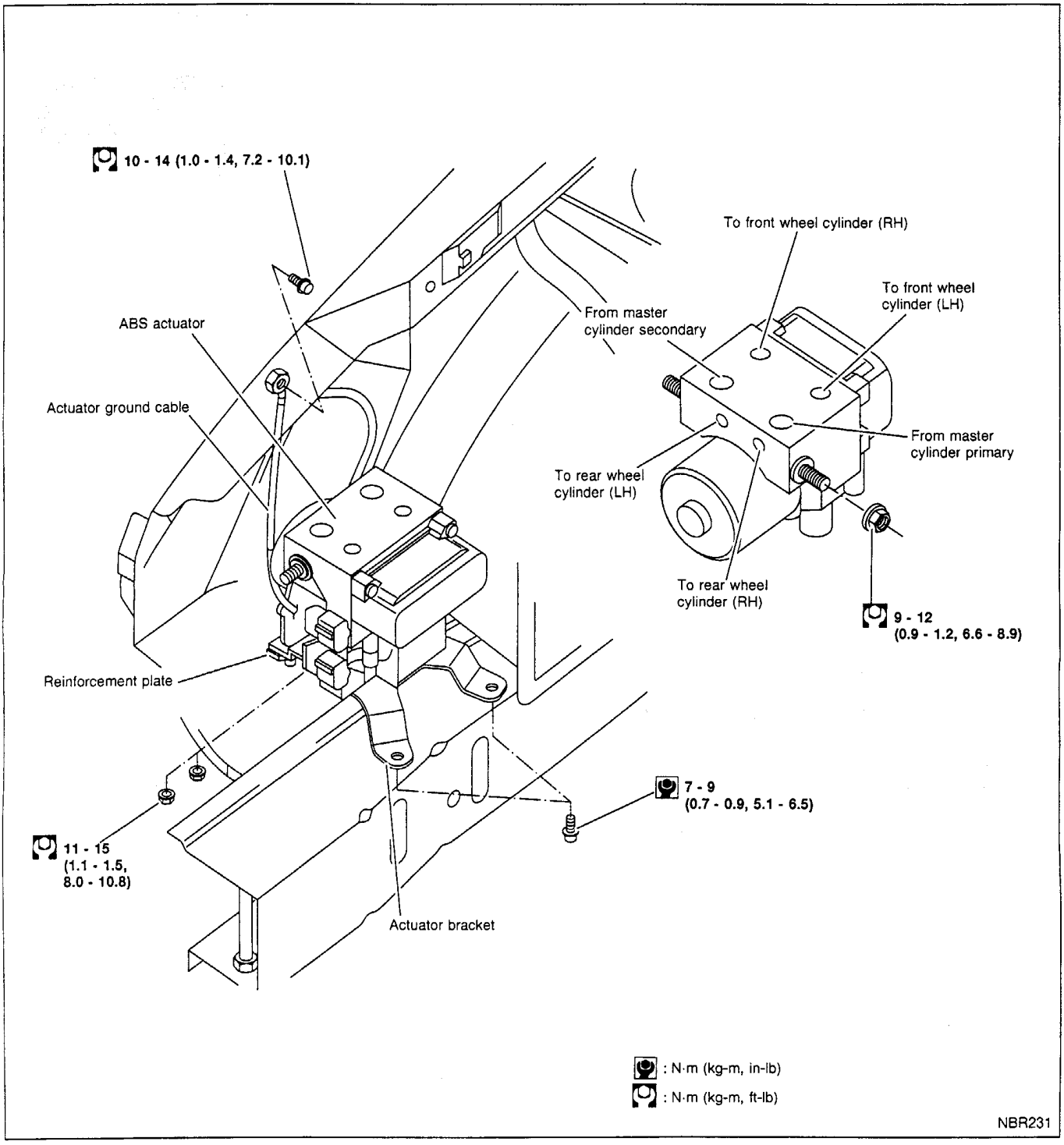
TROUBLE DIAGNOSES 2008
Circuit diagram for Quick Pinpoint Check 2008

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

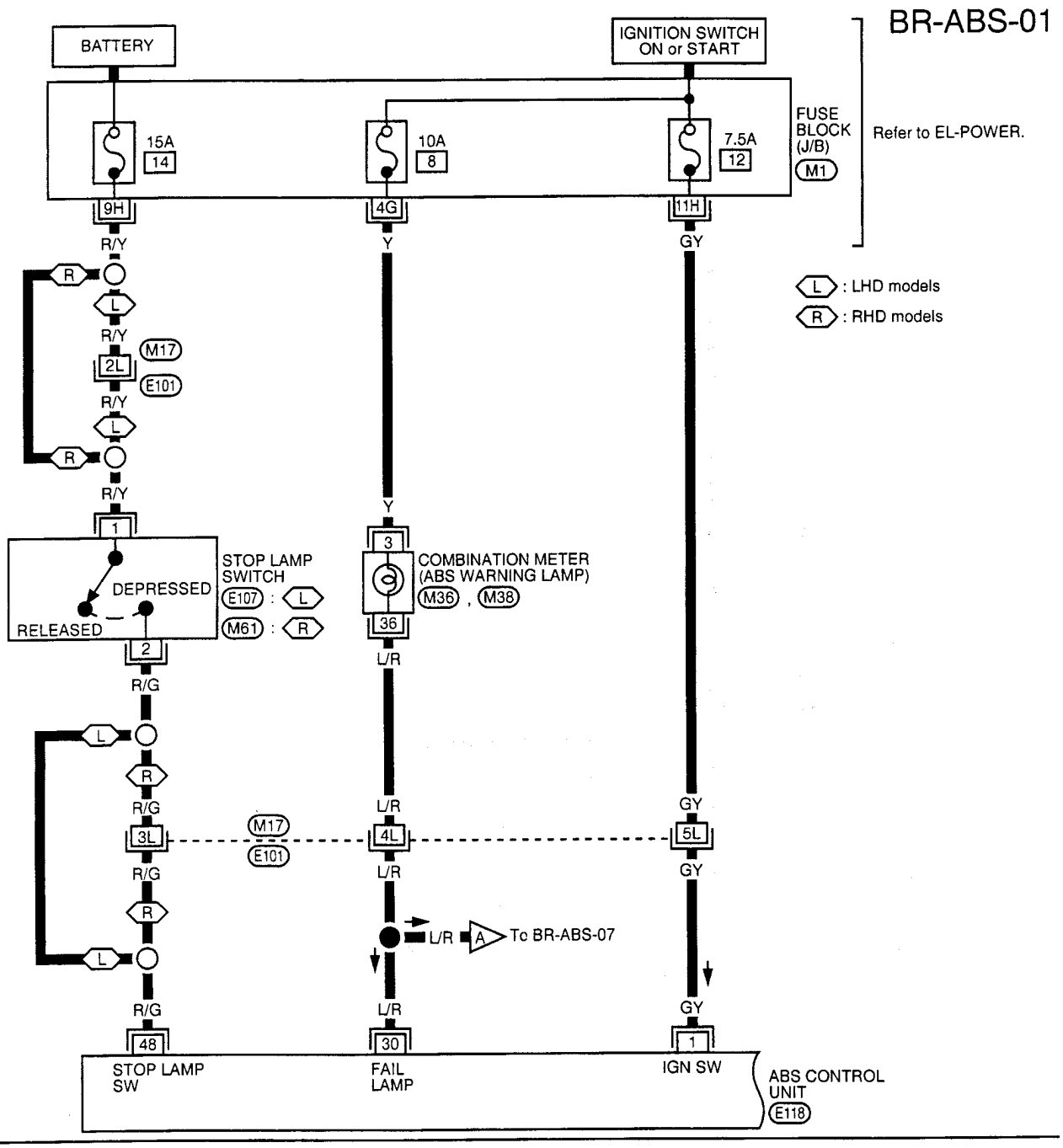
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

Removal and Installation

ABS ACTUATOR



Wiring Diagram — ABS —

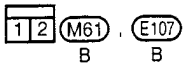


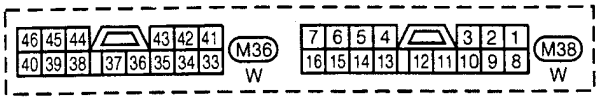
Refer to last page (Foldout page).

M17 , E101

M1

E118

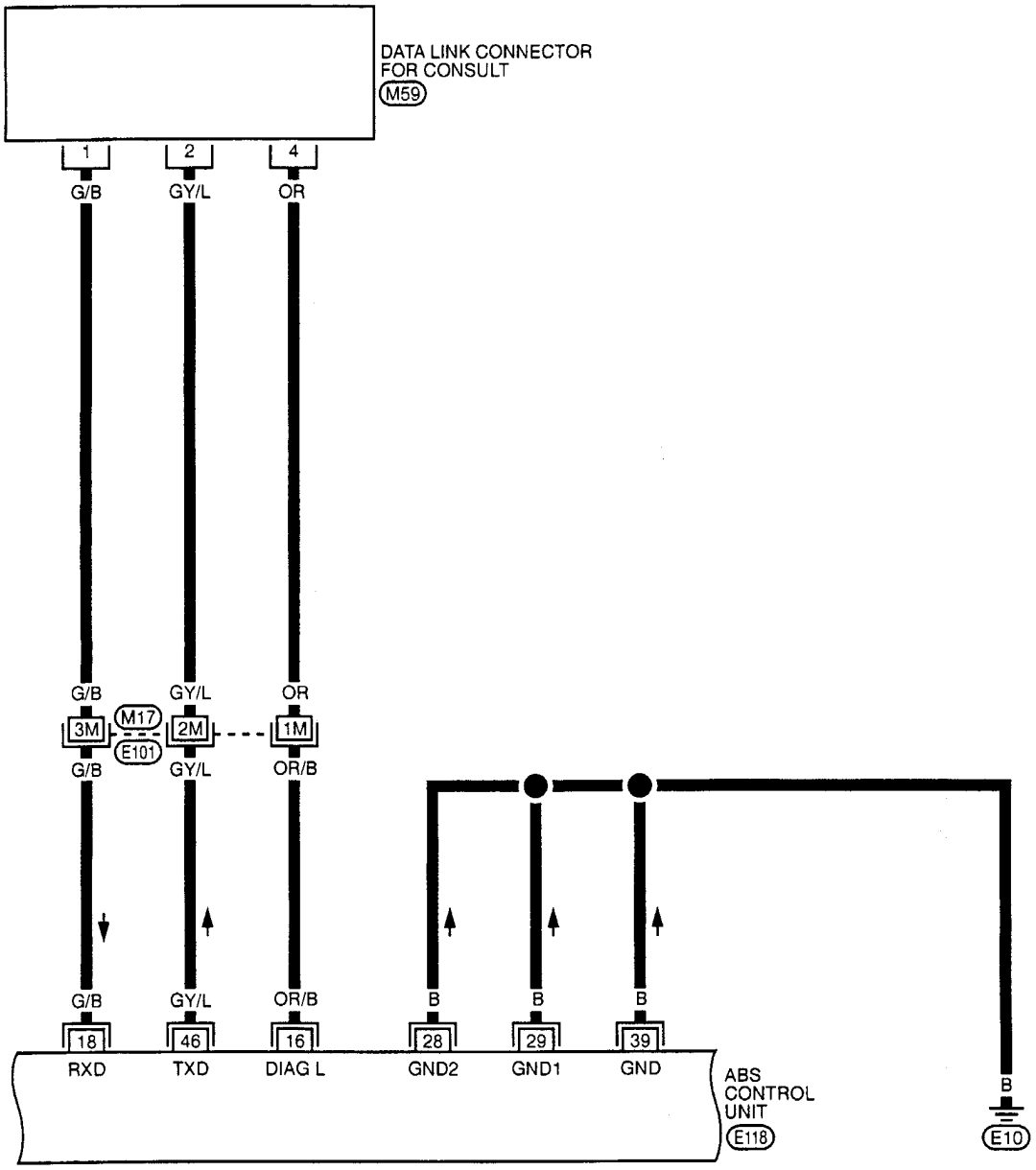


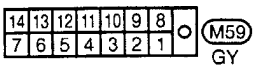


YBR129

Wiring Diagram — ABS — (Cont'd)

BR-ABS-02



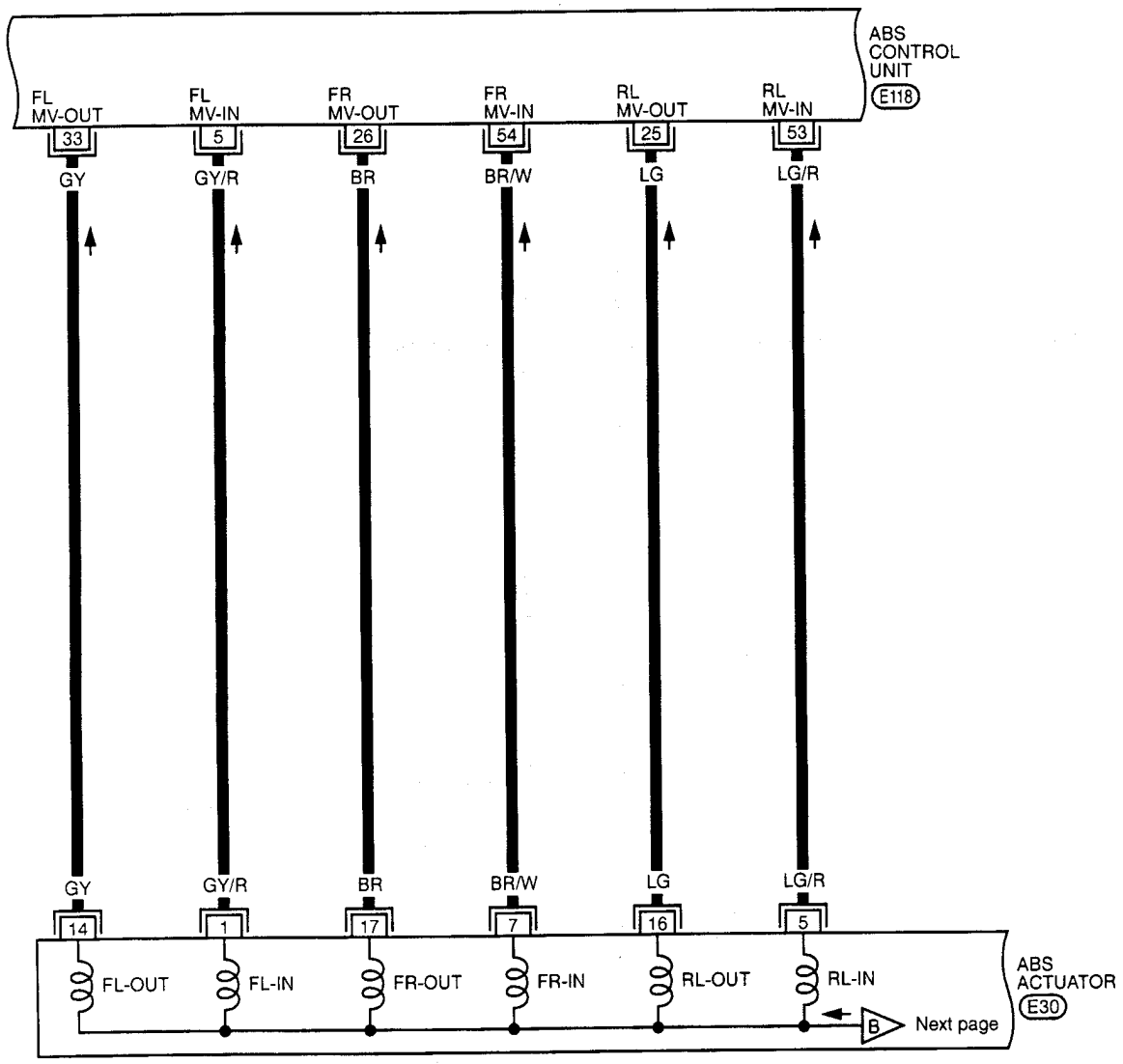


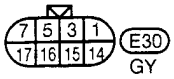
Refer to last page (Foldout page).
M17 , E101
E118

YBR130

Wiring Diagram — ABS — (Cont'd)

BR-ABS-05



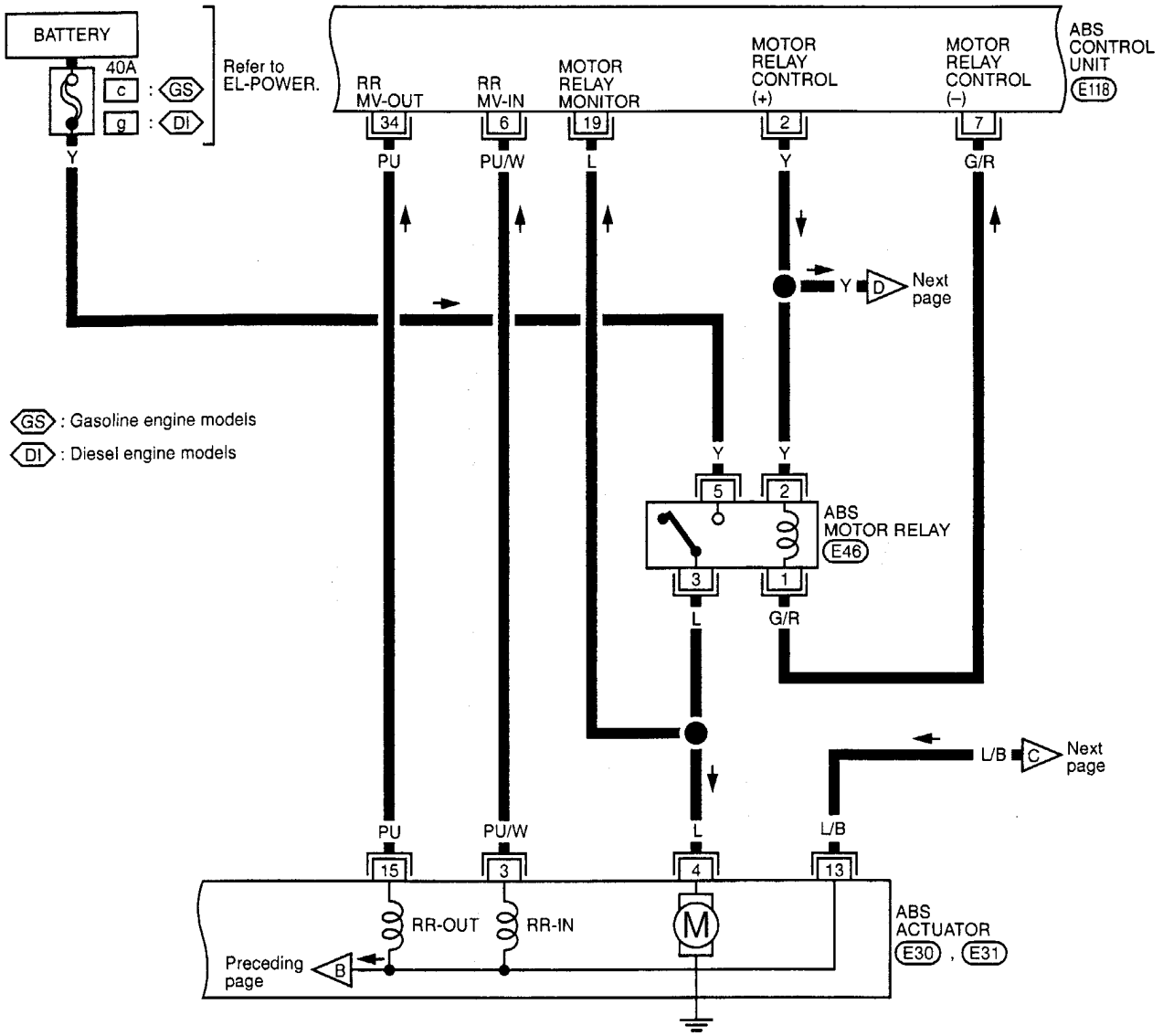


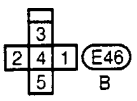
Refer to last page (Foldout page).
E118

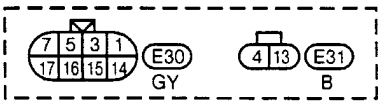
YBR131

Wiring Diagram — ABS — (Cont'd)

BR-ABS-06





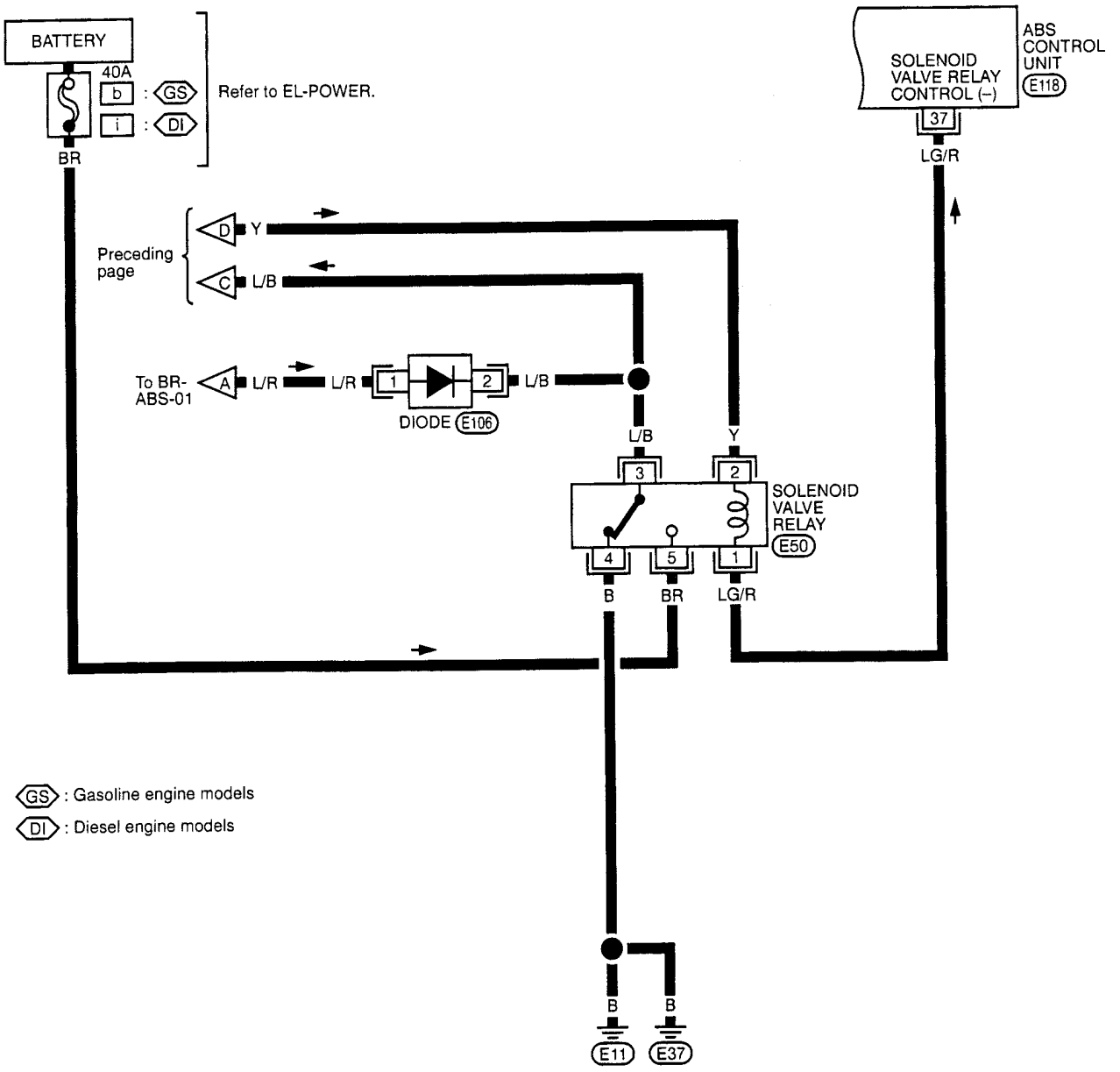


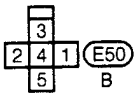
Refer to last page (Foldout page).
E118

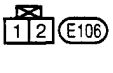
YBR132

Wiring Diagram — ABS — (Cont'd)

BR-ABS-07



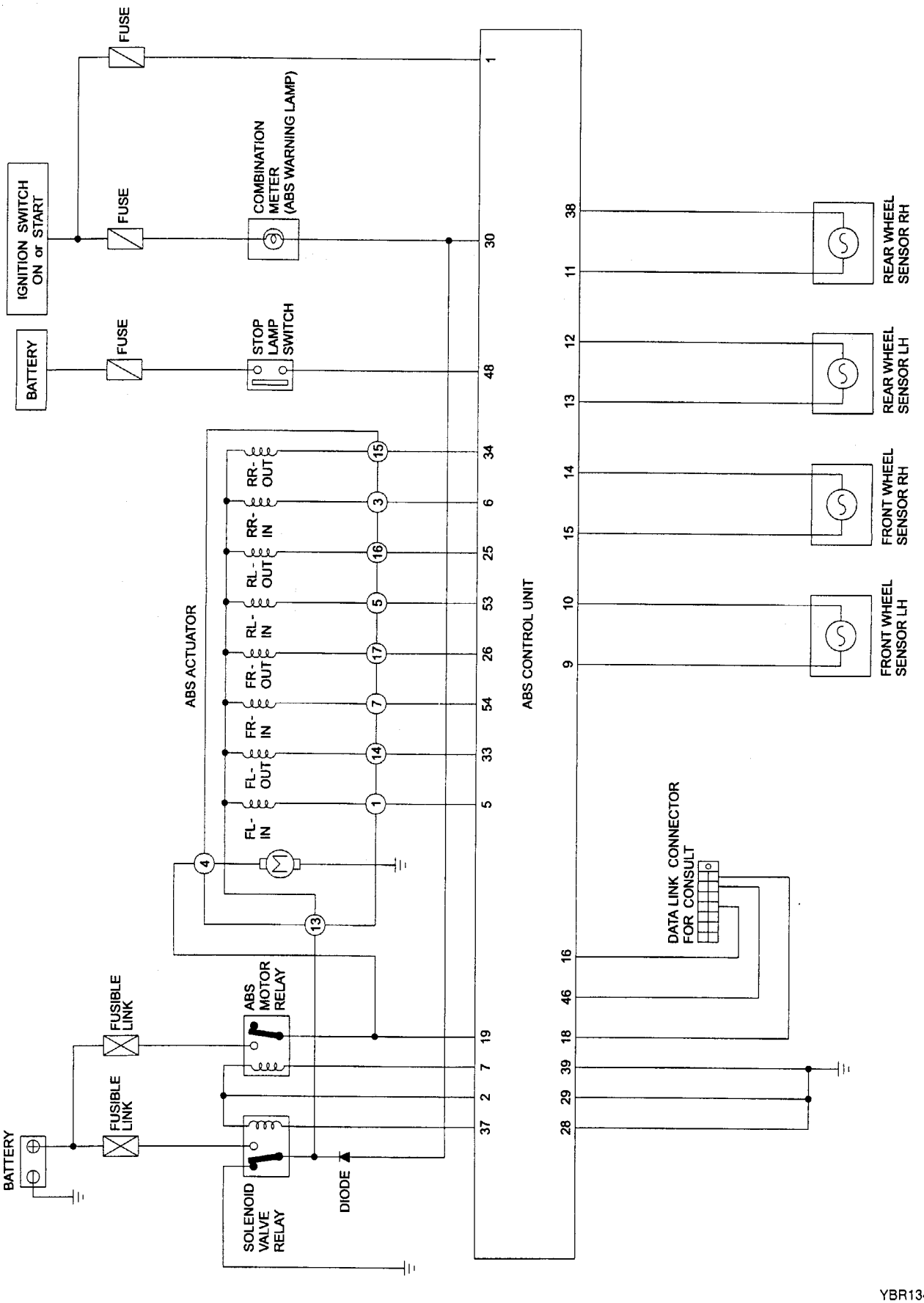




Refer to last page (Foldout page).
E118

YBR133

Circuit Diagram for Quick Pinpoint Check



YBR134

BRAKE SYSTEM

SECTION BR

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System components 3003
Removal and Installation 3003
Wiring Diagram — ABS — 3006
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Circuit diagram for Quick Pinpoint Check 3010
Ground Circuit Check 3011
Diagnostic Procedure 1
(Not self-diagnostic item) 3011
Diagnostic Procedure 2
(Not Self-diagnostic item) 3012
Diagnostic Procedure 3 3013
Diagnostic Procedure 4 3015
Diagnostic Procedure 7 3016

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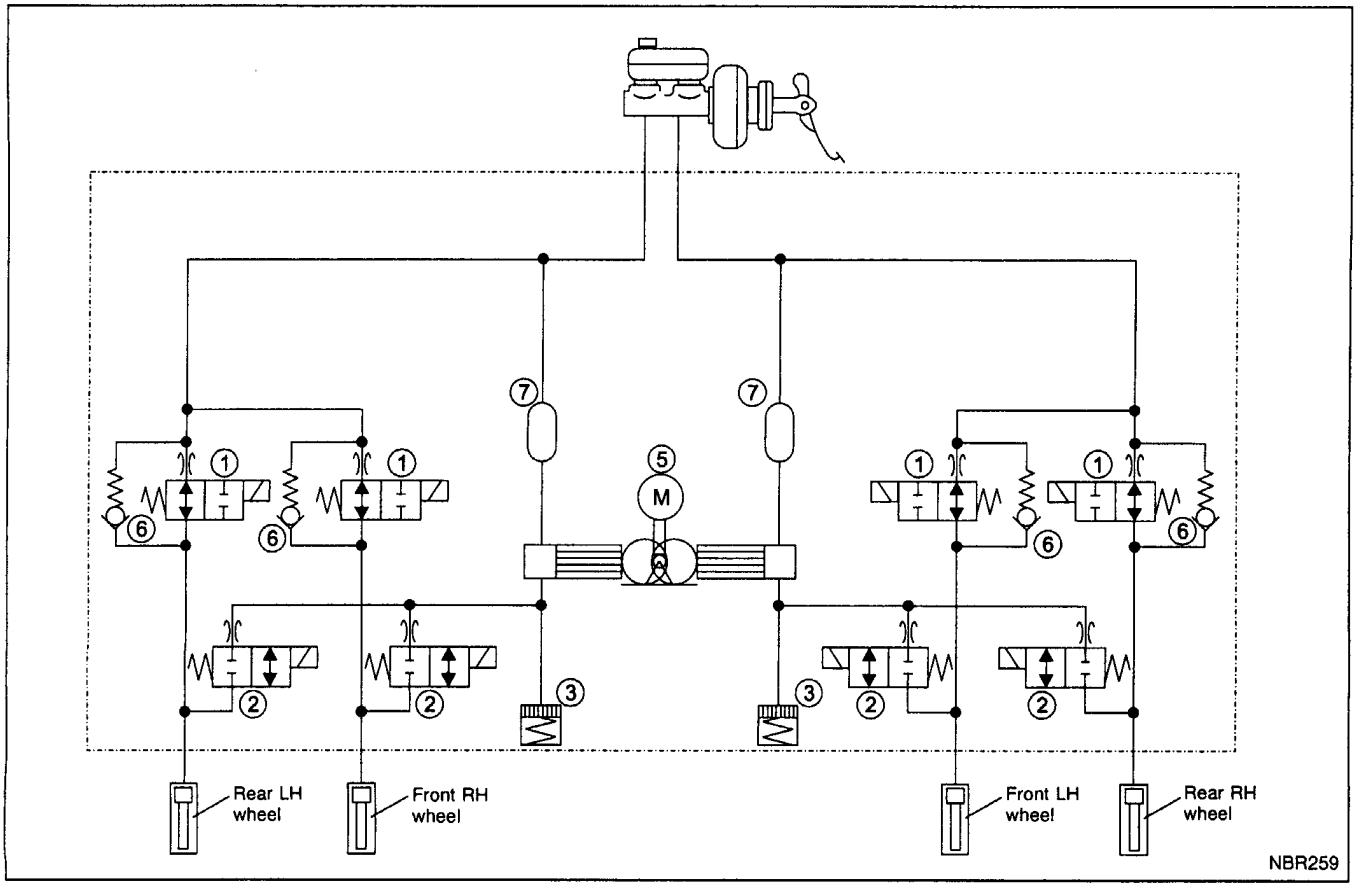
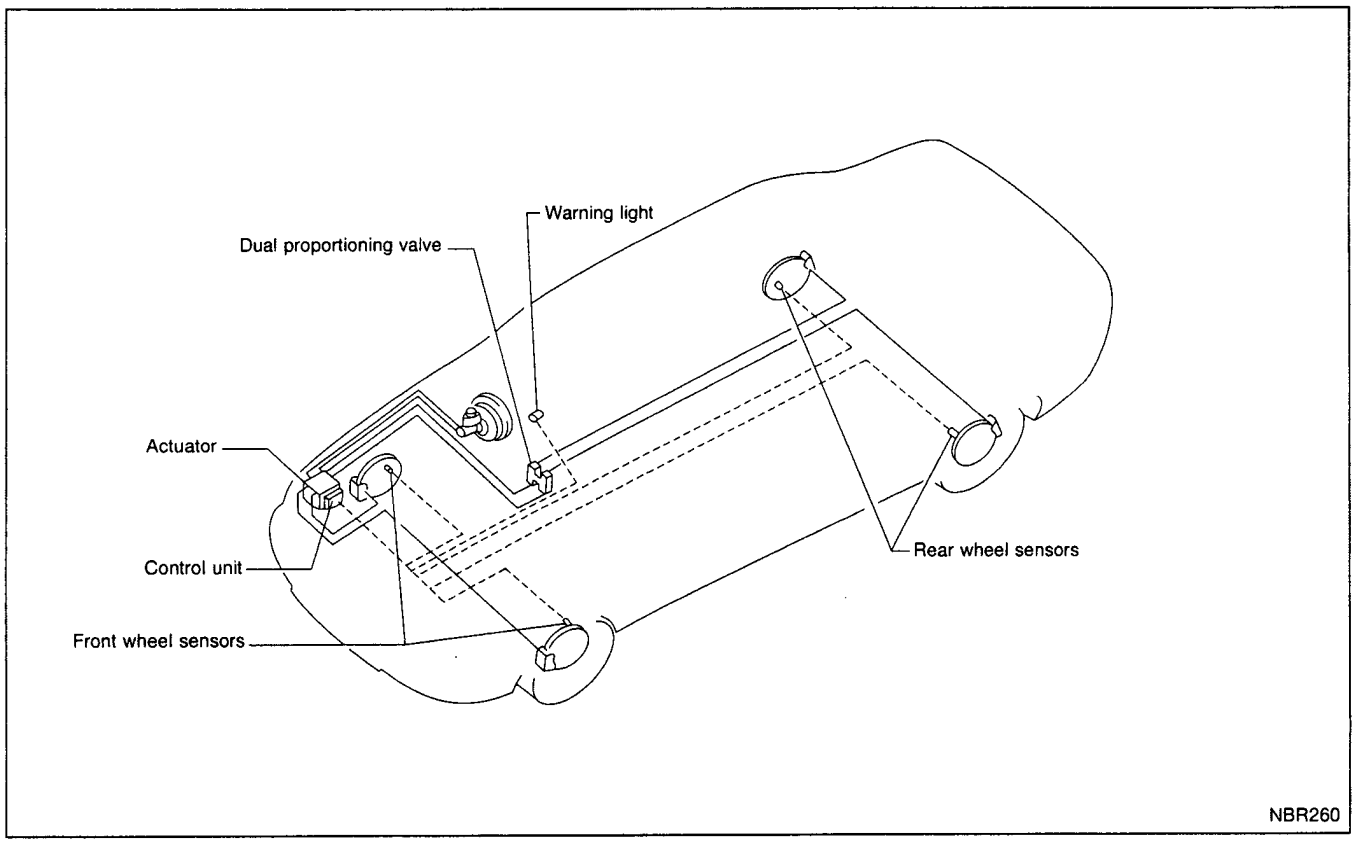
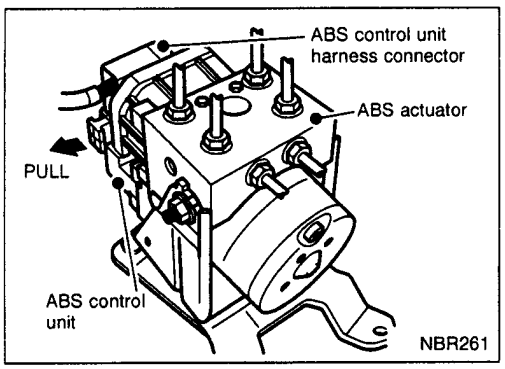
ABS Hydraulic Circuit



① Inlet solenoid valve
② Outlet solenoid valve
③ Reservoir
④ Pump
⑤ Motor
⑥ Bypass check valve
⑦ Damper

System Components





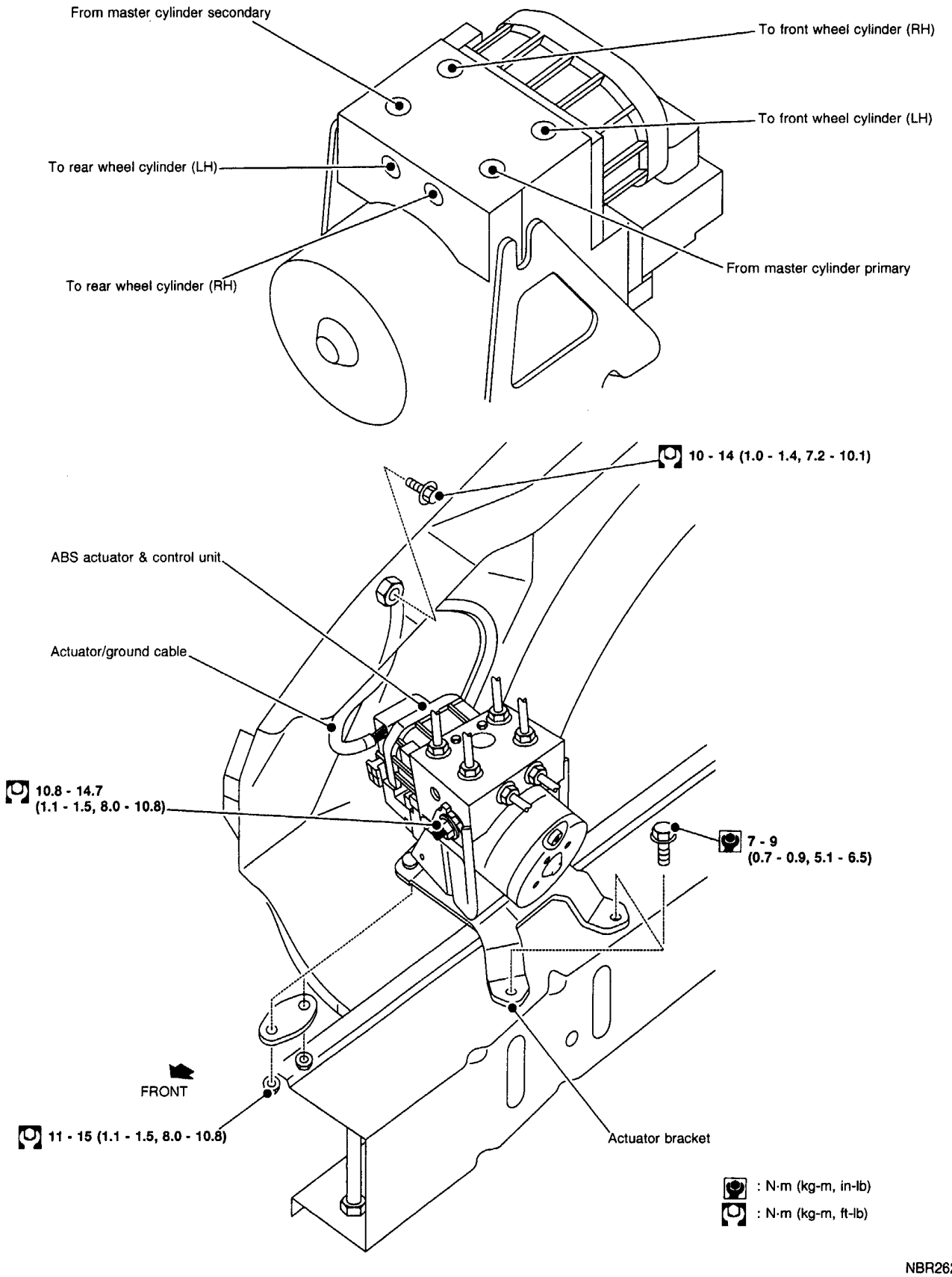
Removal and Installation

CONTROL UNIT

Location: Built-in ABS actuator.
When disconnecting the harness connector, pull the lever as shown figure.

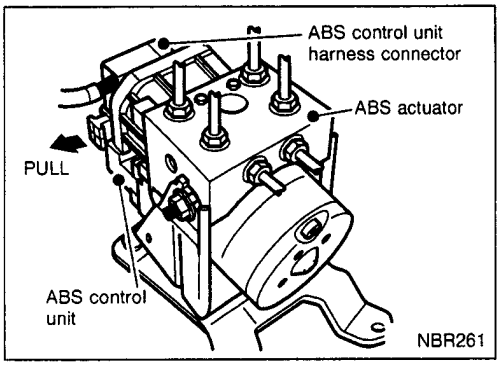
Removal and Installation (Cont'd)

ABS ACTUATOR

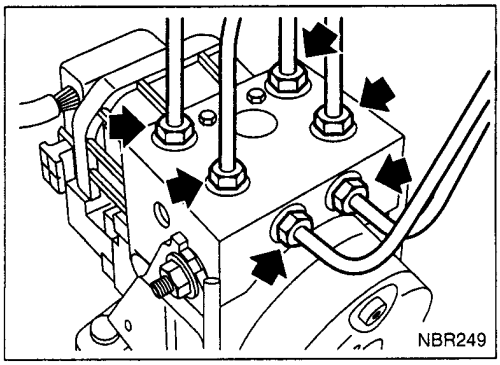


Removal and Installation (Cont'd)

1. Disconnect battery cable.
2. Drain brake fluid. Refer to BR-3.



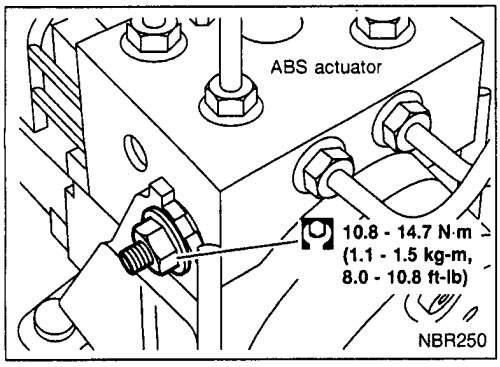
3. Disconnect the electrical harness connectors from ABS control unit.
4. Identify each brake pipe with corresponding actuator port hole and mark them accordingly.



5. Disconnect brake pipes and move them away from actuator. Do not force brake pipes so as to kink them or bend them excessively.
   Ensure that brake fluid does not come into contact with any parts.
6. Loosen/remove mounting nuts between actuator and bracket.

CAUTION:
After installation, pay attention to the following points:

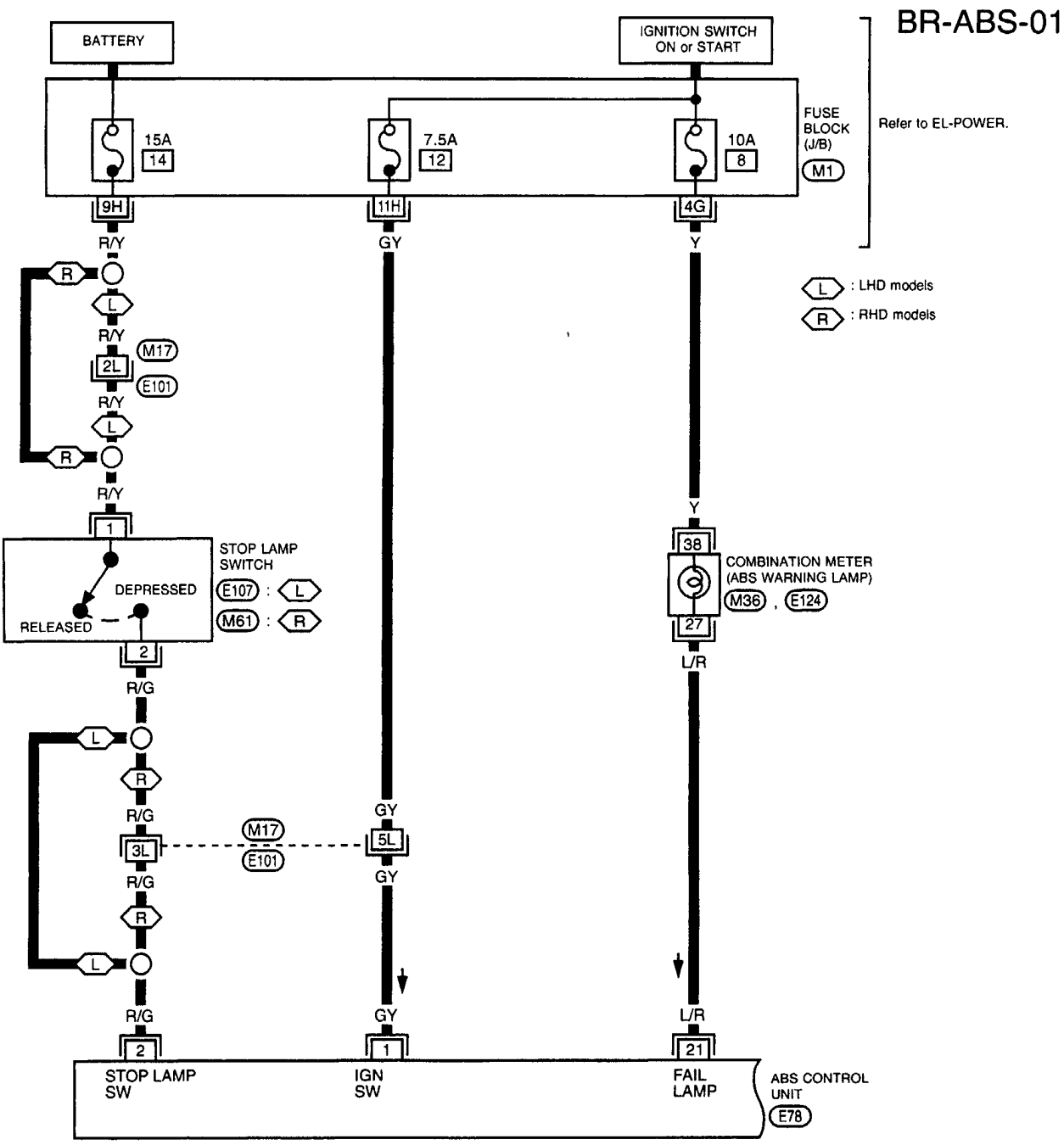
- **Refill brake fluid and bleed air. Refer to "CHECK AND ADJUSTMENT", BR-3 and "AIR BLEEDING", BR-4, respectively.**

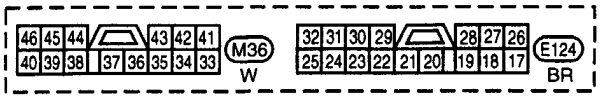


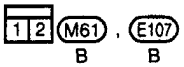
- The installation procedure is as follows:

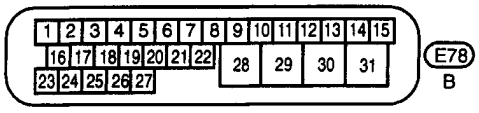
1. Install actuator on bracket without tightening fixings.
2. Assemble brake tubes to actuator without tightening tube nuts. Ensure that correct tubes are connected to each port.
3. Fully tighten actuator and bracket fixings to specified torque.
4. Fully tighten flare nuts to specified torque, BR-6.
5. Secure ABS control unit harness connector and battery cable.

Wiring Diagram — ABS —









Refer to last page (Foldout page).

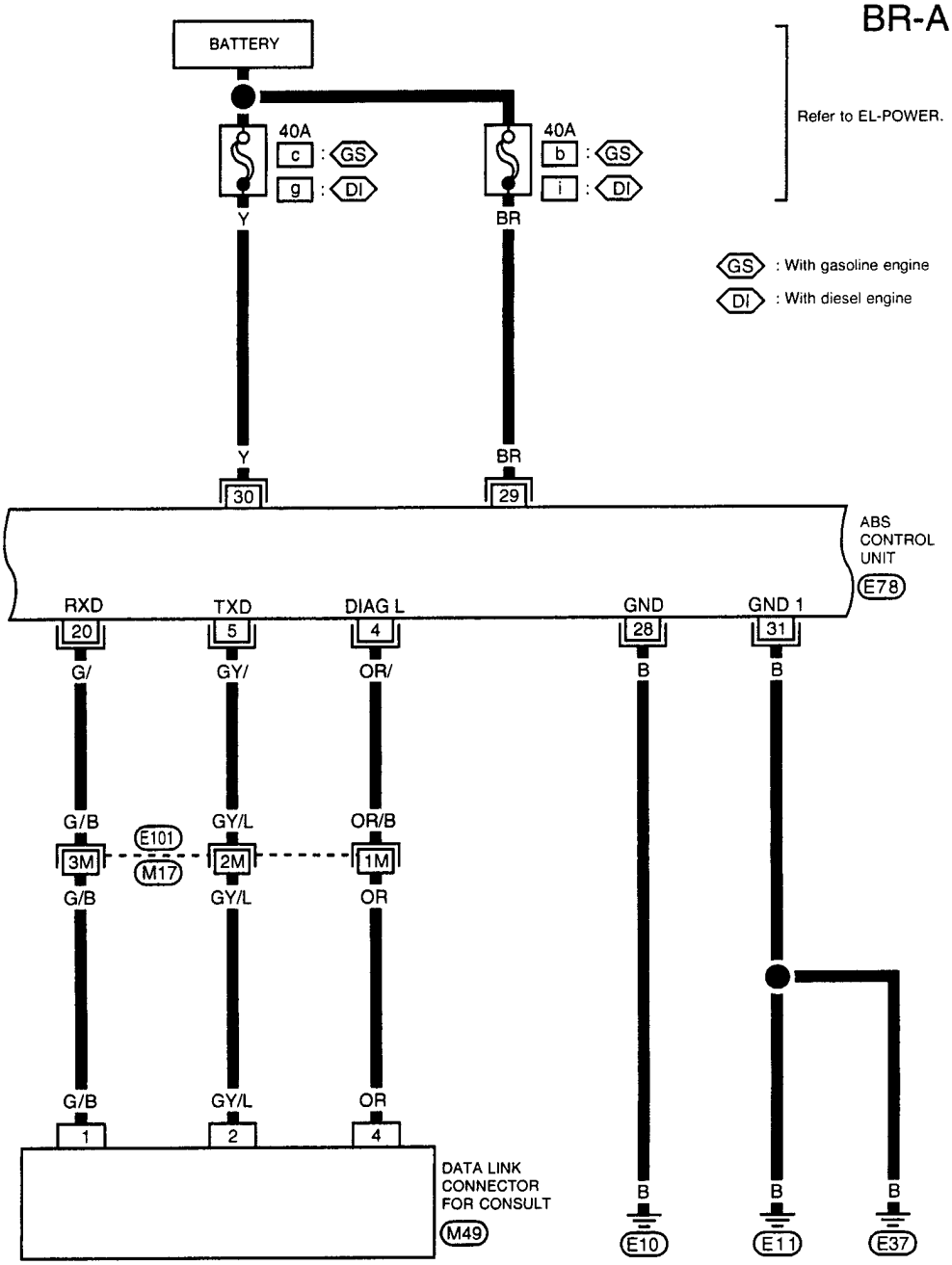
M17 , E101

M1

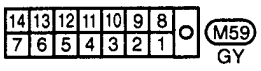
YBR138

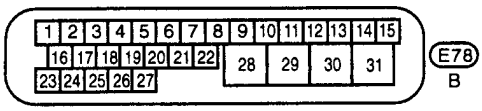
Wiring Diagram — ABS — (Cont'd)

BR-ABS-02



Refer to last page (Foldout page).
M17 , E101

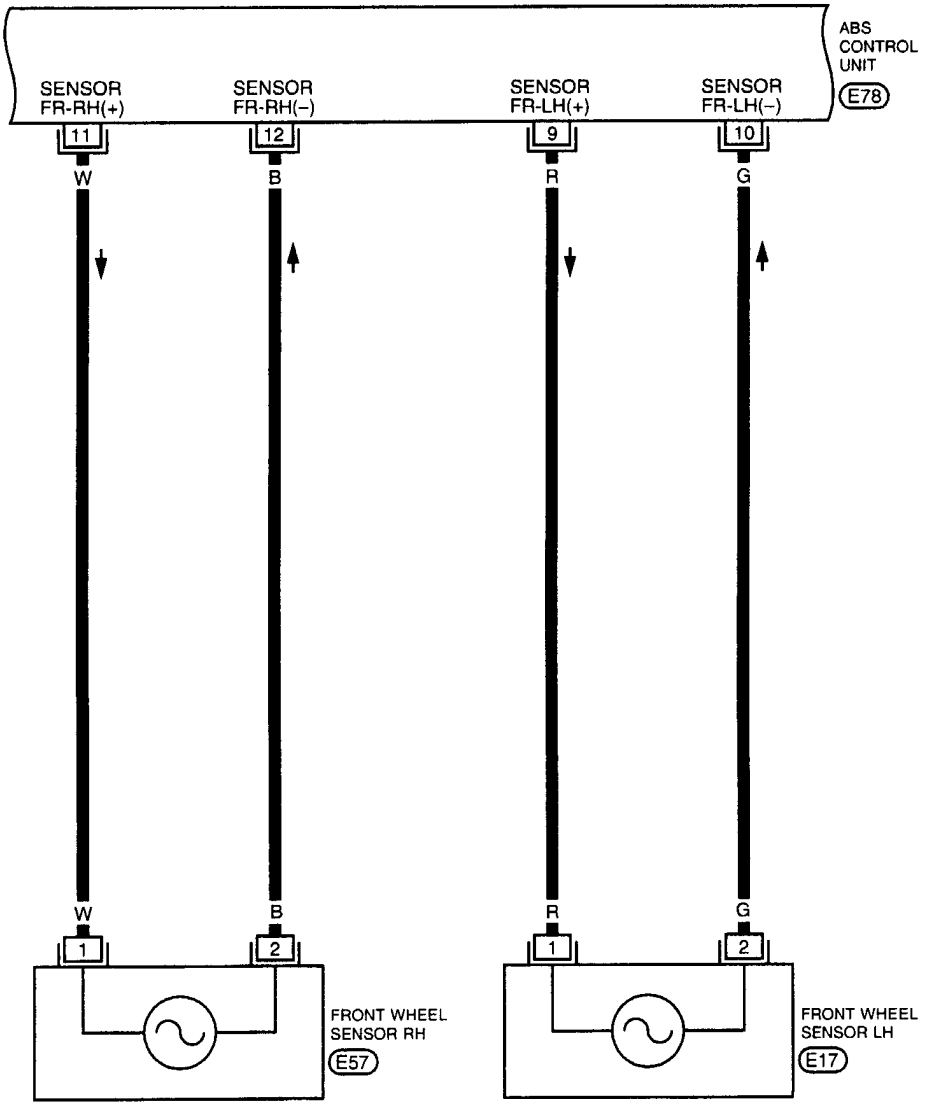


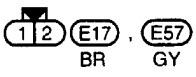


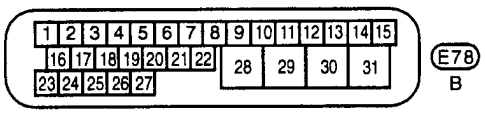
YBR139

Wiring Diagram — ABS — (Cont'd)

BR-ABS-03



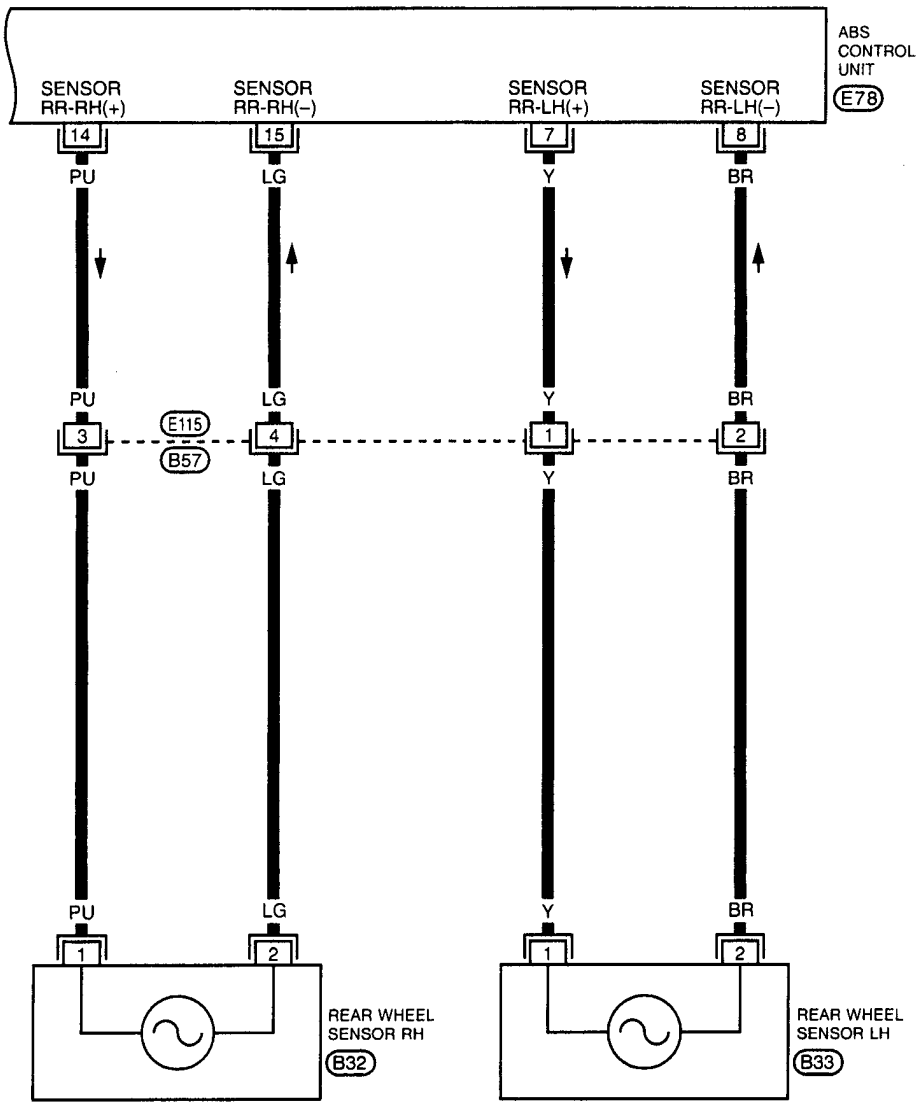


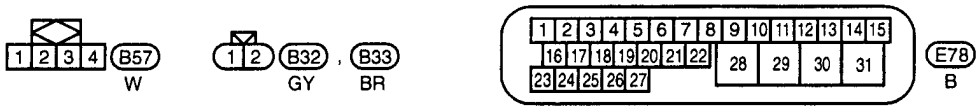


YBR140

Wiring Diagram — ABS — (Cont'd)

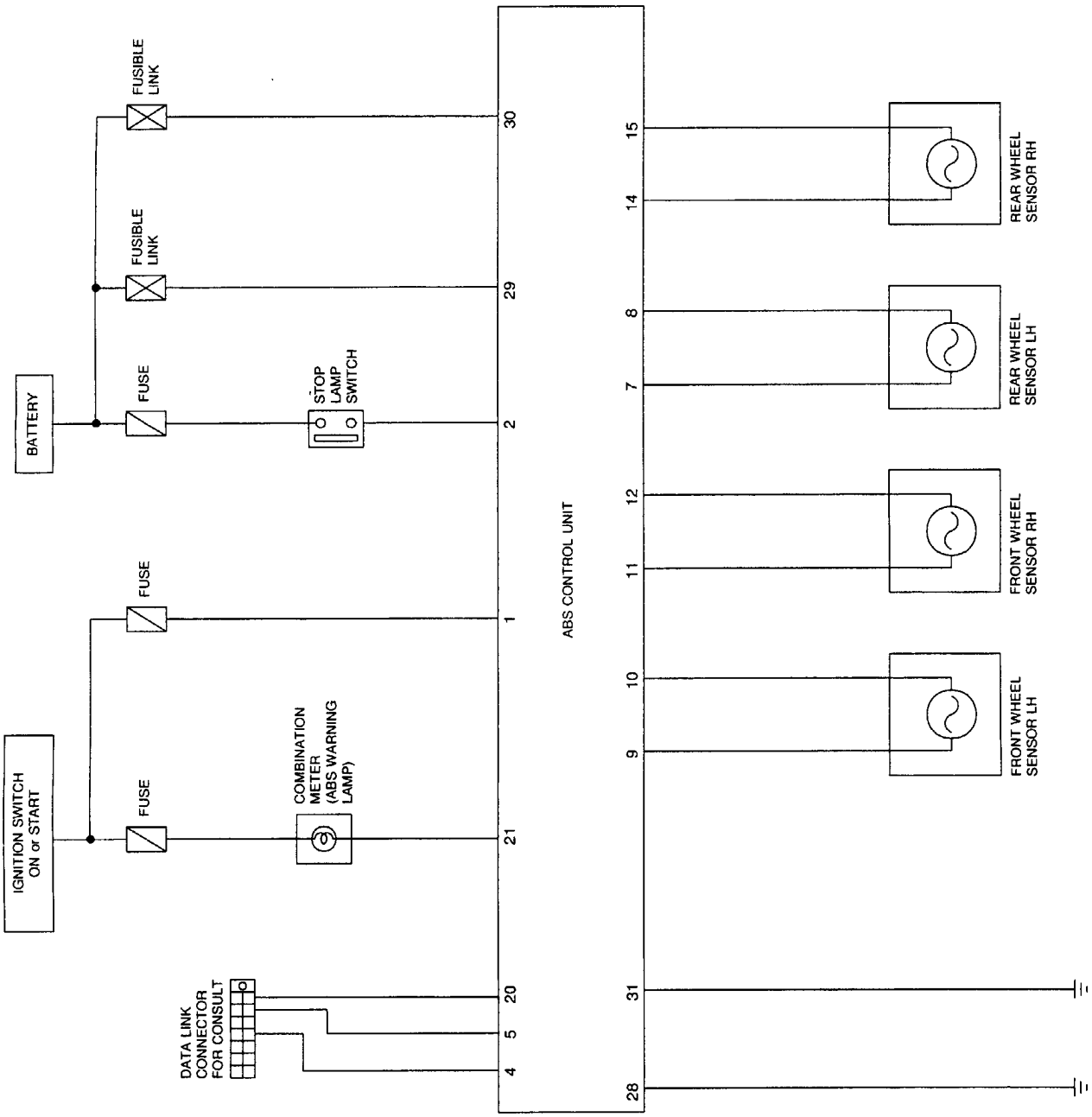
BR-ABS-04



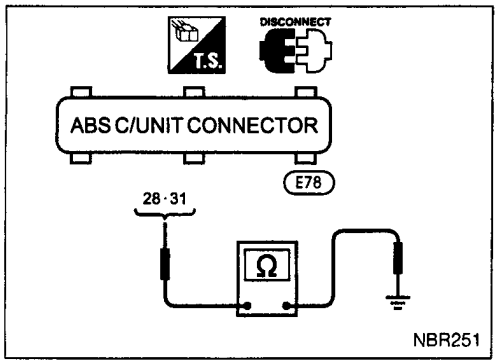


YBR141

Circuit Diagram for Quick Pinpoint Check



YBR142

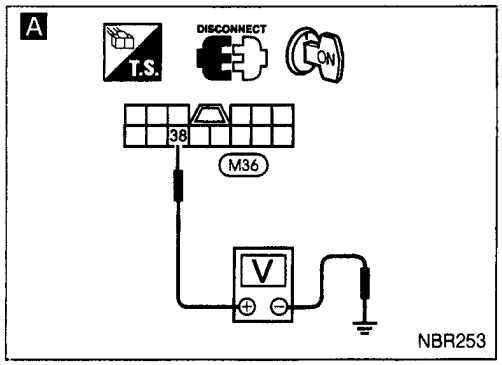


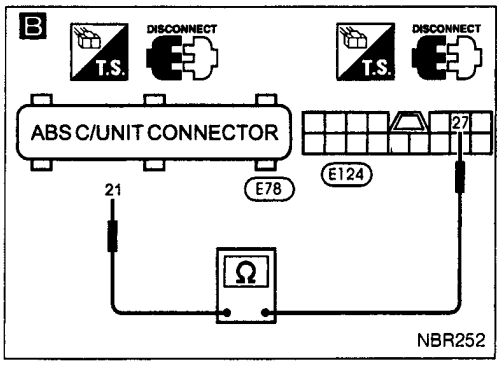
Ground circuit Check

CONTROL UNIT GROUND

- Check continuity between ABS control unit harness connector terminals (28), (31) and ground.

Continuity should exist





Diagnostic Procedure 1 (Not self-diagnostic item)

Warning lamp does not come on when ignition switch is turned on.

WARNING LIGHT CIRCUIT CHECK

Check 10A fuse for warning lamp. For fuse layout, refer to Power supply routing in EL section.

NG → Replace 10A fuse.

OK ↓

Check ABS warning lamp bulb.

NG → Replace bulb.

OK ↓

A

1. Install 10A fuse and bulb.
2. Disconnect combination meter harness connector.
3. Check voltage between combination meter connector terminal (38) and ground after turning ignition switch to "ON" position.

Battery voltage should exist after turning ignition switch to "ON" position.

NG → Check the following:
- Combination meter harness connector
- Harness for open or short circuit between combination meter harness connector and 10A power supply fuse

If NG, repair harness or connectors.

OK ↓

B

- Turn ignition switch to "LOCK" position.
- Check continuity between combination meter and ABS control unit harness connector terminal.

Combination meter	ABS control unit
(27)	(21)

Continuity should exist.

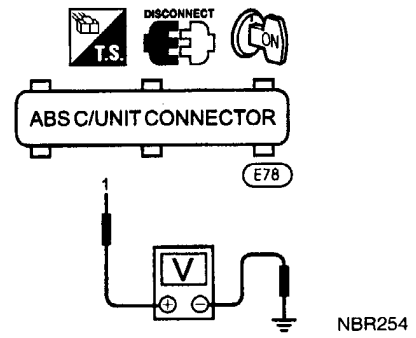
NG → Check the following:
- Combination meter harness connector
- ABS control unit harness connector
- Open or short circuit between combination meter and ABS control unit harness connector

If NG, repair harness or connectors.

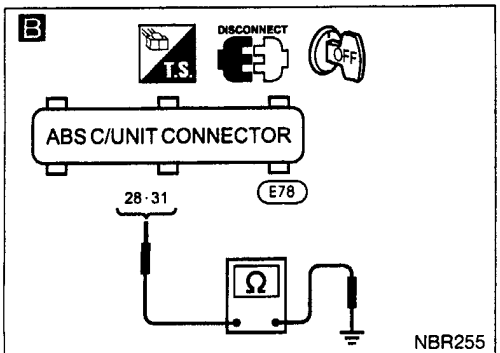
OK ↓

Go to Diagnostic Procedure 7.

A



B



Diagnostic Procedure 2 (Not Self-diagnostic item)

Warning lamp stays on or does not come on when ignition switch is turned to on position.

INSPECTION START

A

CHECK POWER SUPPLY I

1. Disconnect ABS control unit harness connector.
2. Turn ignition switch "ON".
3. Check voltage between ABS control unit harness connector terminal ① and body ground.
   Battery voltage should exist.

NG → Check the following:
- 10A fuse
- Harness connectors (M17), (E101)
- Harness for open or short circuit between ABS control unit and fuse

If NG, replace fuse or repair harness or connector.

OK ↓

B

CHECK GROUND CIRCUIT

Check continuity between ABS control unit harness connector terminals (28), (31) and ground.
Continuity should exist.

NG → Check harness for open or short between ABS control unit harness connector and ground .
If NG, repair harness or connector.

OK ↓

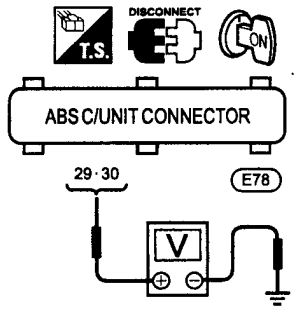
Replace ABS actuator (with ABS control unit).

OK → Inspection end.

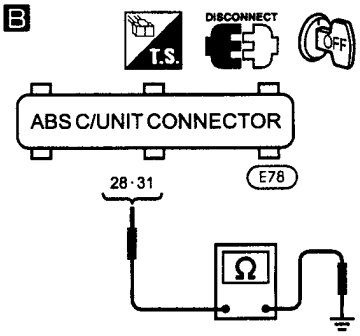
NG ↓

Check ABS control unit harness connector pin terminals for damage or the connection of ABS control unit harness connector. Reconnect ABS control unit harness connector, then retest.

A



B



Diagnostic Procedure 3

ACTUATOR SOLENOID VALVES AND MOTOR (Malfunction code No. 41, 42, 45, 46, 55, 56, 61)

INSPECTION START

1. Disconnect connector from ABS control unit. Check terminals for damage or loose connections. Then reconnect connector.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes

A

CHECK POWER SUPPLY

1. Disconnect ABS control unit harness connector.
2. Turn ignition switch "ON".
3. Check voltage between ABS control unit harness connector terminals (29), (30) and ground.
   Battery voltage should exist.

NG → Check the following:
- 40A fusible links
- Harness for open or short between ABS control unit and fusible link

If NG, replace fusible link, repair harness or connector.

OK

B

CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF" or "LOCK".
2. Check harness continuity between ABS control unit harness connector terminals (28), (31) and ground.

Continuity should exist.

NG → Repair harness or connector.

OK

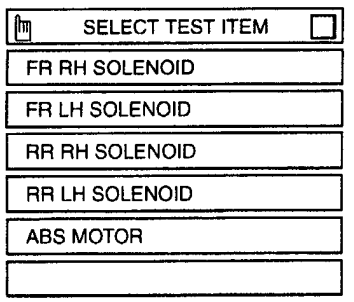
Reconnect ABS control unit harness connector.

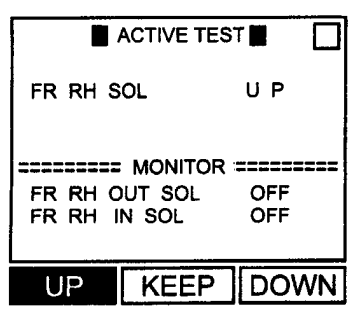
OK

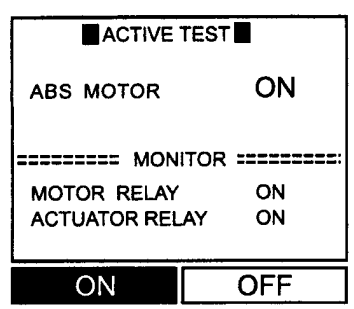
(A)

Diagnostic Procedure 3 (Cont'd)

C







Ⓐ

C

ABS ACTUATOR SOLENOID VALVE AND MOTOR CHECK (With CONSULT)

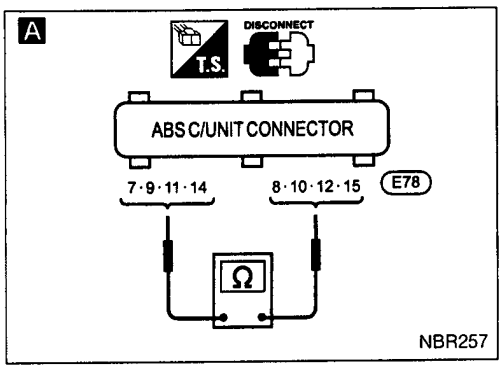
NG → Replace ABS actuator (with ABS control unit).

1. Select "ACTIVE TEST" mode with CONSULT.
2. Perform each test then touch "UP", "DOWN" or "ON", "OFF" alternatively.
3. Check that operating sound or operation on CONSULT screen. (For detail, refer to BR-56.)

Malfunction Code No.	"ACTIVE TEST" item	Malfunction item
45	FR LH SOL	Front left outlet sol
46		Front left inlet sol
41	FR RH SOL	Front right outlet solenoid valve
42		Front right inlet sol
55	RR LH SOL	Rear left outlet sol
56		Rear left inlet sol
51	RR RH SOL	Rear right outlet sol
52		Rear right inlet sol
61	ABS MOTOR	ABS actuator motor

OK

Check ABS control unit pin terminals for damage or the connection of ABS control unit harness connector. Reconnect ABS control unit harness connector, then retest.



Diagnostic Procedure 4

WHEEL SENSOR OR ROTOR (Malfunction code No. 21, 22, 25, 26, 31, 32, 35, 36 or 18)

INSPECTION START

1. Disconnect harness connector from ABS control unit and wheel sensor corresponding to malfunction code No. indicated (Refer to malfunction code table BR-51).
   Check terminals for damage or loose connections, then reconnect connectors.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes

A

WHEEL SENSOR ELECTRICAL CHECK

1. Disconnect harness connector from ABS control unit.
2. Check resistance between ABS control unit connector terminals.
   Code No. 21 or 22 (Front RH wheel)
   Terminals ⑪ and ⑫
   Code No. 25 or 26 (Front LH wheel)
   Terminals ⑨ and ⑩
   Code No. 31 or 32 (Rear RH wheel)
   Terminals ⑭ and ⑮
   Code No. 35 or 36 (Rear LH wheel)
   Terminals ⑦ and ⑧
   Resistance: 0.8 - 1.2 kΩ

OK → Ⓐ (See BR-68.)

NG

Note

CHECK WHEEL SENSOR.

Refer to WHEEL SENSOR in Electrical Components Inspection BR-78.

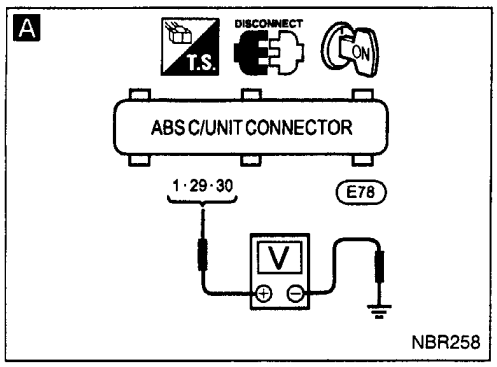
NG → Note: Replace wheel sensor.

OK

Note

Repair harness and connectors between ABS control unit connector and wheel sensor connector.

Note: Wheel position should be distinguished by code No. except code No. 18 (sensor rotor).



Diagnostic Procedure 7

POWER SUPPLY (Low voltage) (Malfunction code No. 57)

INSPECTION START

1. Disconnect ABS control unit connector. Check terminals for damage or connections, then reconnect connectors.
2. Carry out self-diagnosis again.
Does warning lamp activate again?

No → Inspection end

Yes

A

ABS CONTROL UNIT POWER SUPPLY CHECK

1. Disconnect ABS control unit connector.
2. Check voltage between ABS control unit harness connector terminals ①, ㉙, ㉚ and ground.
Battery voltage should exist when ignition switch is turned to ON position.

NG → Ⓐ (See below.)

OK

ABS CONTROL UNIT GROUND CHECK

- Refer to CONTROL UNIT GROUND in Ground Circuit Check.

NG → Check the following:
- Harness connector M513
- Harness connector M17, E101
- Harness for open circuit between ABS control unit and ABS ground

If NG, repair harness or connectors.

OK

Check ABS control unit pin terminals for damage or the connection of ABS control unit harness connector. Reconnect ABS control unit harness connector, then retest.

Ⓐ

Check 7.5A fuse. Refer to Power supply routing in EL section.

NG → Replace 7.5A fuse.

OK

Check 40A fusible link. Refer to Power supply routing in EL section.

NG → Replace 40A fusible link.

OK

- Disconnect battery, then turn ignition switch to "ON" position.

Check continuity between battery harness terminal and ABS control unit connector terminals ①, ㉙, ㉚.
Continuity should exist.

NG → Check the following:
- Harness connector E78
- 40A fusible link
- 7.5A fuse
- Harness for open circuit between ABS control unit and fuse, fusible link

If NG, replace fuse or fusible link, harness or connectors.

OK

Reconnect battery.

OK

Check battery. Refer to BATTERY in EL section.

STEERING SYSTEM

SECTION ST

CONTENTS

<COMBINED EDITION>

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- Precautions 1
- Preparation 1

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- Checking Steering Wheel Play 3
- Checking Neutral Position on Steering Wheel 3
- Front Wheel Turning Angle 3
- Checking Gear Housing Movement 3

ON-VEHICLE INSPECTION (Power steering) 4
- Checking and Adjusting Drive Belts 4
- Checking Fluid Level 4
- Checking Fluid Leakage 4
- Bleeding Hydraulic System 4
- Checking Steering Wheel Turning Force 5
- Checking Hydraulic System 6

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- Disassembly 17
- Inspection 17
- Assembly 19

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- Inspection and Adjustment 23

<SUPPLEMENT-I> **(For Africa, Middle East & Australia)**
NO CHANGES

<SUPPLEMENT-II>
NO CHANGES

<SUPPLEMENT-III>
NO CHANGES

Precautions

SUPPLEMENTAL RESTRAINT SYSTEM "AIR BAG"

The Supplemental Restraint System "Air Bag" helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag (located in the center of the steering wheel), G-sensor, a control 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:

a. **To avoid rendering the SRS inoperative (which could lead to personal injury or severe disability in the event of a severe frontal collision) all maintenance must be performed by an authorized NISSAN dealer.**
b. **Incorrect maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
c. **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".**

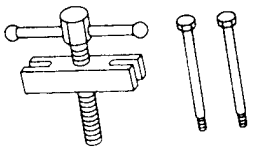
STEERING SYSTEM

- **Before disassembly, thoroughly clean the outside of the unit.**
- **Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.**
- **When disassembling parts, be sure to place them in order on a part rack so they can be reinstalled in their correct positions.**
- **Only use nylon cloths or paper towels to clean parts. Do not use rags or other materials containing lint. Residual debris may damage the system.**
- **Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.**
- **Before assembly, apply a coat of recommended ATF* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.**
- **Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.**

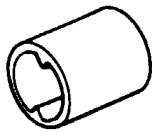
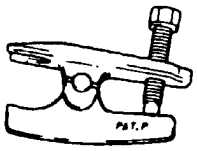
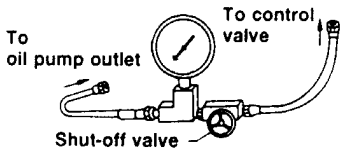
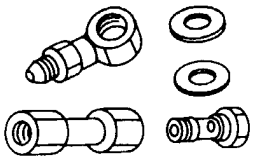
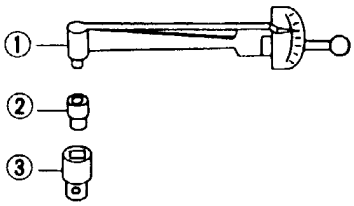
***: Automatic transmission fluid**

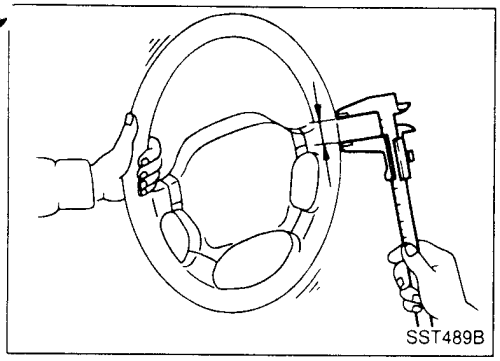
Preparation

SPECIAL SERVICE TOOL

Tool number Tool name	Description
ST27180001 Steering wheel puller	 NT170 Removing and installing steering wheel

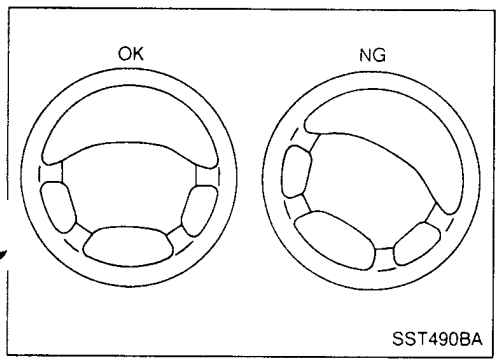
SPECIAL SERVICE TOOLS

Tool number Tool name	Description
KV48100700 Torque adapter	 Measuring pinion rotating torque
HT72520000 Ball joint remover	 Removing ball joint
ST27091000 Pressure gauge	 Measuring oil pressure
KV48102500 Pressure gauge adapter	 Measuring oil pressure
ST3127S000 ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter	 Measuring turning torque



Checking Steering Wheel Play

1. With wheels in a straight-ahead position, check steering wheel play.
   Steering wheel play:
   35 mm (1.38 in) or less
2. If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.



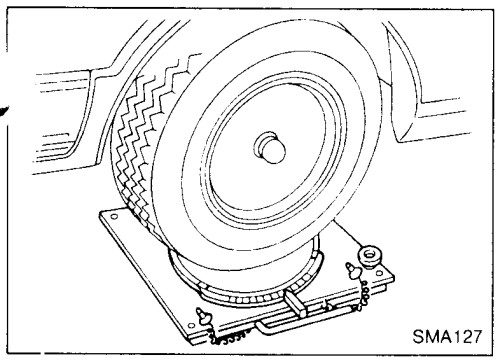
Checking Neutral Position on Steering Wheel

Pre-checking

- Make sure that wheel alignment is correct.
  Wheel alignment:
  Refer to SDS in FA section
- Verify that the steering gear is centered before removing the steering wheel.

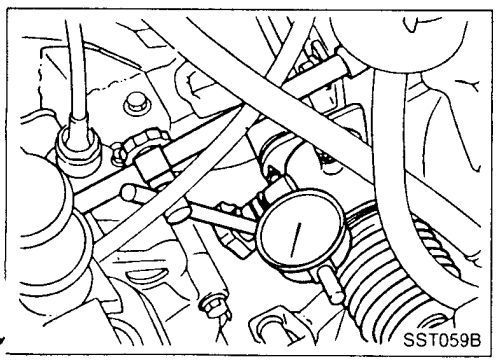
Checking

1. Check that the steering wheel is in the neutral position when driving straight ahead.
2. If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
3. If the neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in the neutral position.



Front Wheel Turning Angle

1. Rotate steering wheel all the way right and left; measure turning angle.
   Turning angle of full turns:
   Refer to SDS in FA section
2. If it is not within specification, check rack stroke.
   Rack stroke "S":
   Refer to SDS (ST-23)

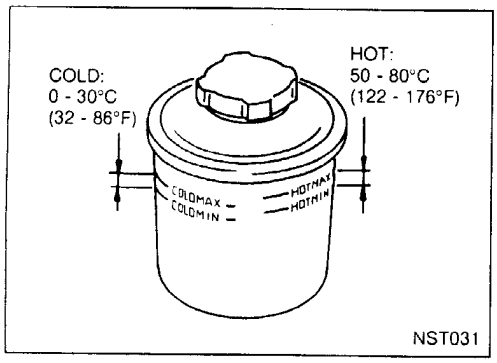


Checking Gear Housing Movement

1. Check the movement of steering gear housing during stationary steering on a dry paved surface.
- Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement.
  Turn off ignition key while checking.
  Movement of gear housing:
  ±2 mm (±0.08 in) or less
2. If movement exceeds the limit, replace mount insulator after confirming correct installation of gear housing clamps.

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.

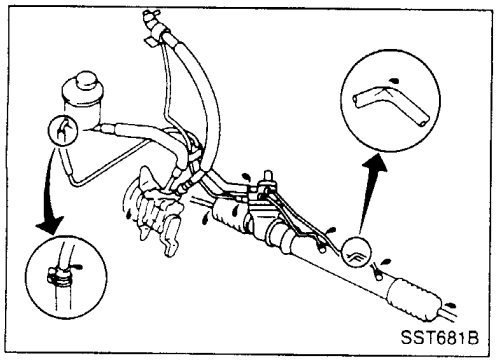


Checking Fluid Level

Check fluid level.
Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "DEXRON™" type.**



Checking Fluid Leakage

Check the lines for security, leaks, cracks, damage, loose connections, chafing or deterioration.

1. Run engine between idle speed and 1,000 rpm.

Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).

2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.

Do not overtighten connector as this can damage O-ring, washer and connector.

Bleeding Hydraulic System

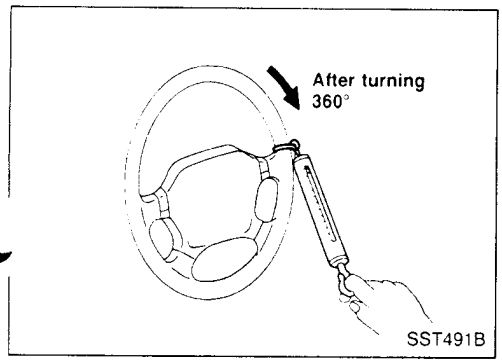
1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Then quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   Repeat step 2 above.

Bleeding Hydraulic System (Cont'd)

- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

a. Generation of air bubbles in reservoir tank
b. Generation of clicking noise in oil pump
c. Excessive buzzing in oil pump

While the vehicle is stationary or while moving the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this steering system, and it will not affect performance or durability of the system.



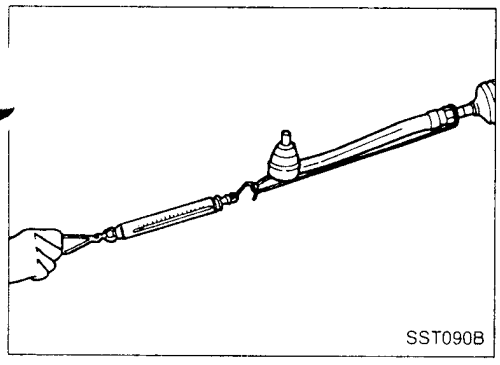
Checking Steering Wheel Turning Force

1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

Tires need to be inflated to normal pressure.

4. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

   Steering wheel turning force:
   44.1 N (4.5 kg, 9.9 lb) or less

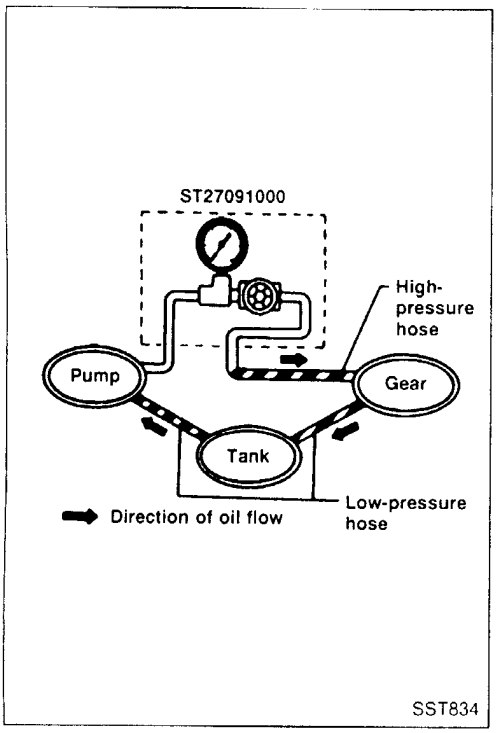


5. If steering wheel turning force is out of specification, check rack sliding force to detect condition of steering gear assembly.

a. Disconnect steering column lower joint and knuckle arms from the gear.
b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.
c. While pulling tie-rod slowly from the neutral position, make sure rack sliding force is within specification.

   Rack sliding force:
   284 N (29 kg, 64 lb) or less

6. If rack sliding force is not within specification, replace steering gear assembly.



Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
2. Run engine.

Make sure temperature of fluid in tank rises to 100°C (212°F).

WARNING:

Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, oil pressure in oil pump will increase to relief pressure, resulting in an abnormal rise in oil temperature.

3. Check pressure with steering wheel fully turned to left and right positions with engine idling at 1,000 rpm.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

Oil pump maximum standard pressure:

GA: 7,649 - 8,238 kPa
(76.5 - 82.4 bar, 78 - 84 kg/cm², 1,109 - 1,194 psi)

SR & CD: 7,748 - 8,532 kPa
(77.5 - 85.3 bar, 79 - 87 kg/cm², 1123 - 1237 psi)

4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.

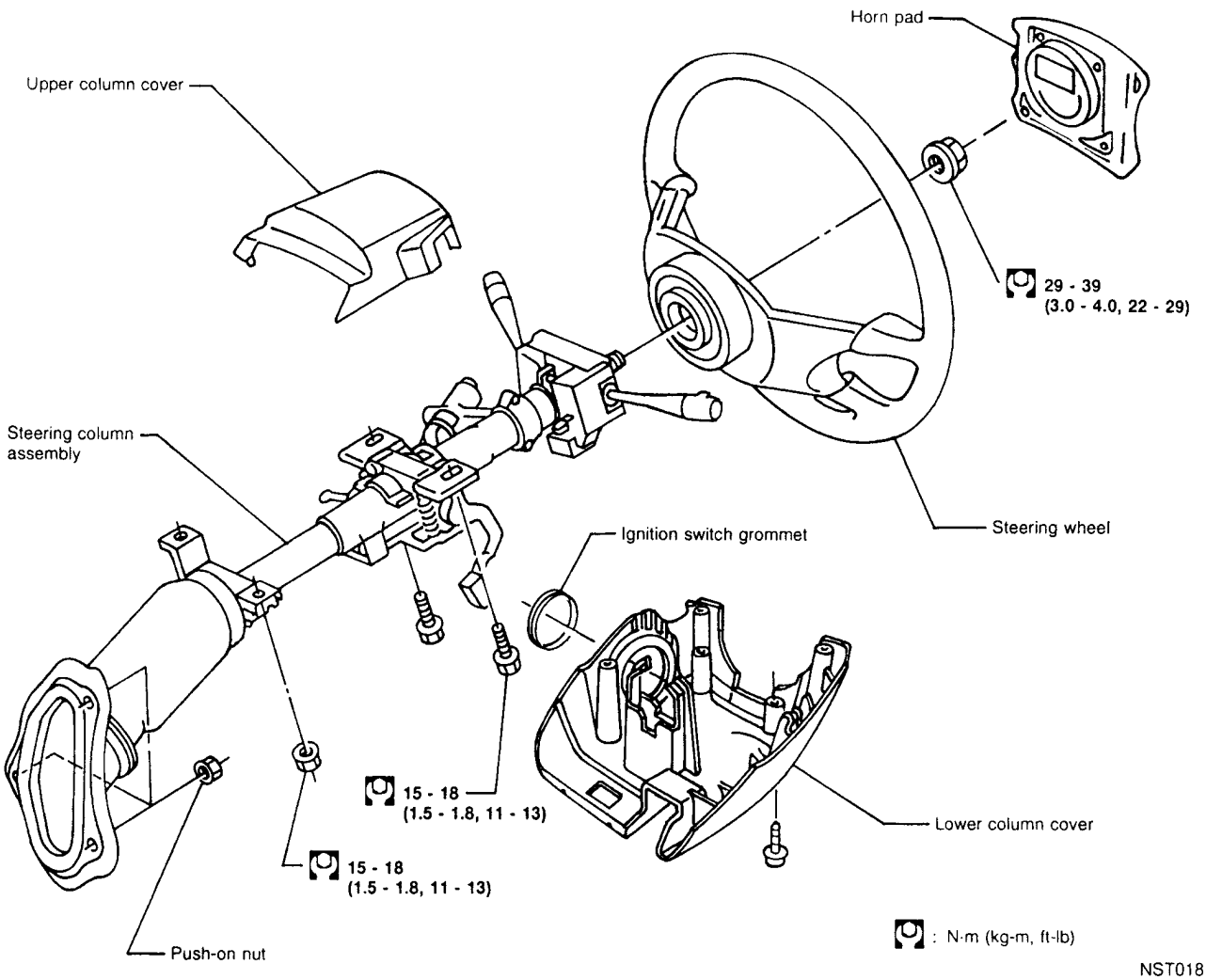
- When pressure reaches standard pressure, gear is damaged.
- When pressure remains below standard pressure, pump is damaged.

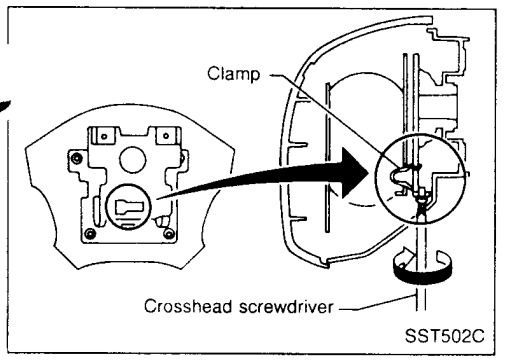
CAUTION:

Do not close shut-off valve for more than 15 seconds.

5. If oil pressure is higher than standard pressure, check oil pump flow control valve (GA engine models only).
6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

SEC. 484•487•488

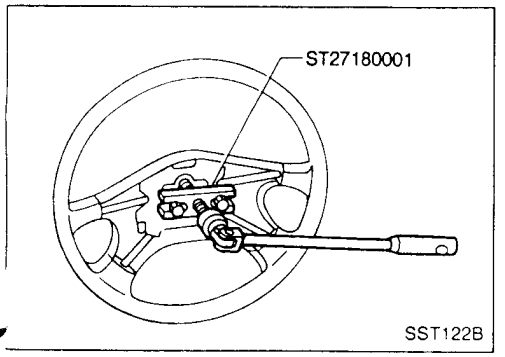




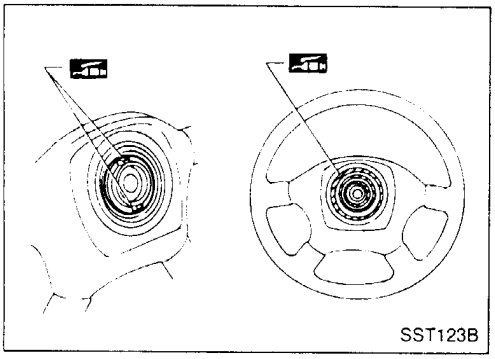
Removal

STEERING WHEEL

1. Pull out horn pad.



2. Remove steering wheel with Tool.

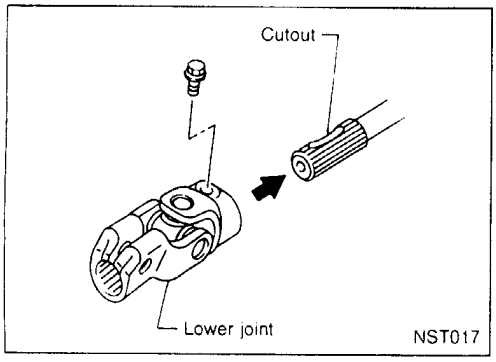

SST123B

Installation

STEERING WHEEL

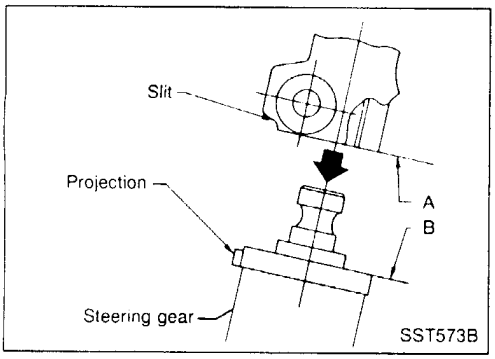
When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.

- Do not apply grease to bore of wheel.



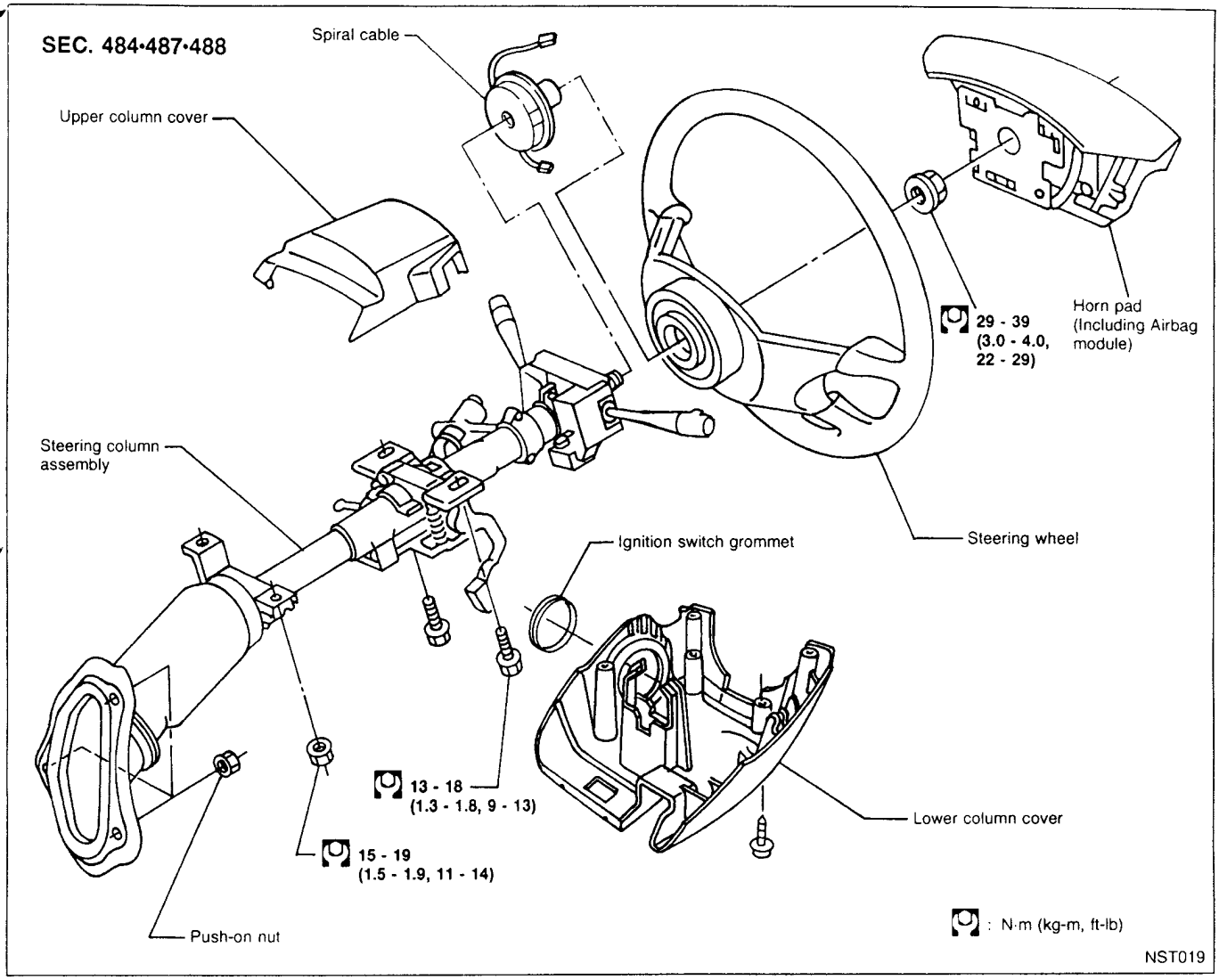
STEERING COLUMN

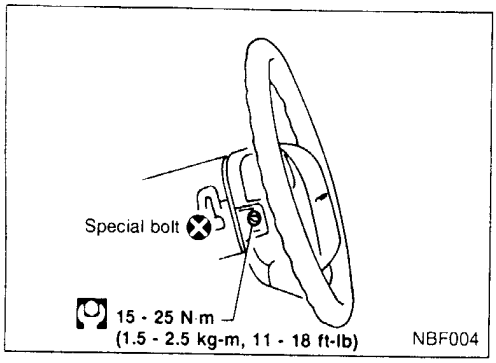
- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.
- When attaching lower joint, be sure tightening bolt faces cut-out area.



- Align slit of lower joint with projection on dust cover. Insert joint until surface A contacts surface B.

CAUTION:
After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal. Be sure that the steering wheel is in a neutral position when driving straight ahead.

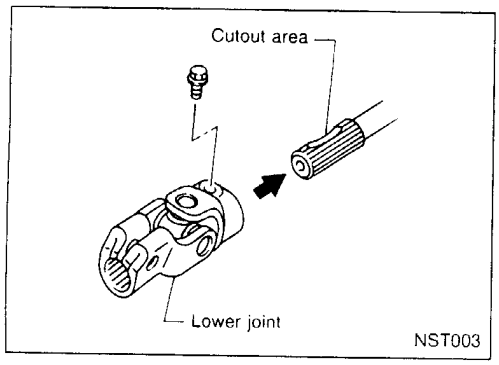

SEC. 484•487•488
Spiral cable
Upper column cover
29 - 39
(3.0 - 4.0,
22 - 29)
Horn pad
(Including Airbag
module)
Steering column
assembly
Steering wheel
Ignition switch grommet
13 - 18
(1.3 - 1.8, 9 - 13)
Lower column cover
15 - 19
(1.5 - 1.9, 11 - 14)
Push-on nut
: N·m (kg-m, ft-lb)
NST019



Removal and Installation

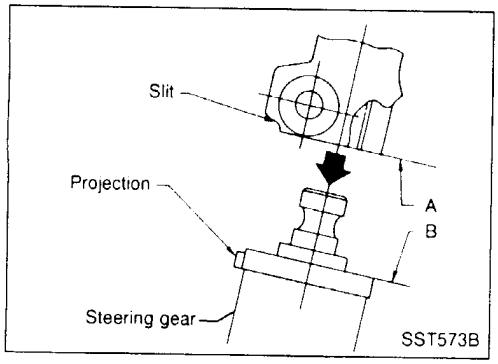
STEERING WHEEL

- Remove screws from both sides of steering wheel and pull out horn pad. Refer to RS section for Air Bag Module and Spiral Cable Removal.
- Align spiral cable correctly when installing steering wheel. Refer to RS-section.



STEERING COLUMN

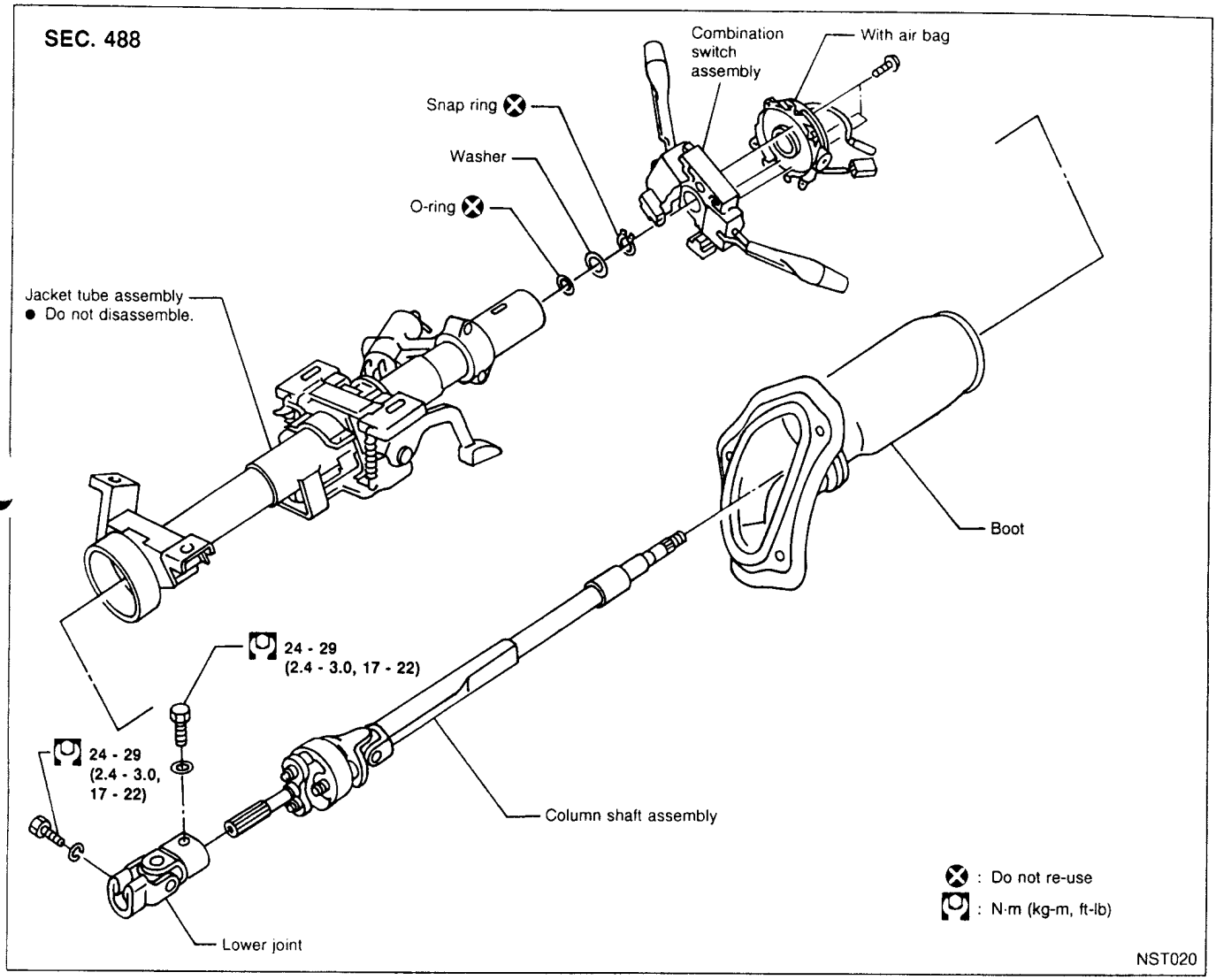
- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.
- When attaching coupling joint, be sure tightening bolt faces cutout portion.



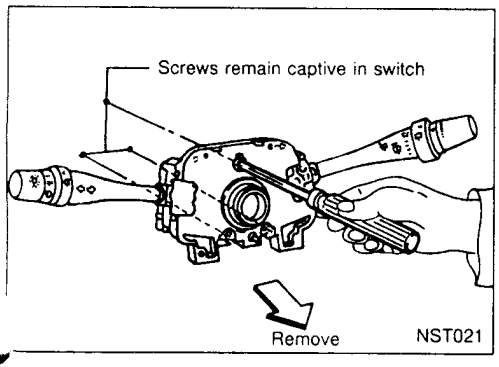
- Align slit of lower joint with projection on dust cover. Insert joint until surface A contacts surface B.

CAUTION:
After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal. Be sure that the steering wheel is in a neutral position when driving straight ahead.

Disassembly and Assembly

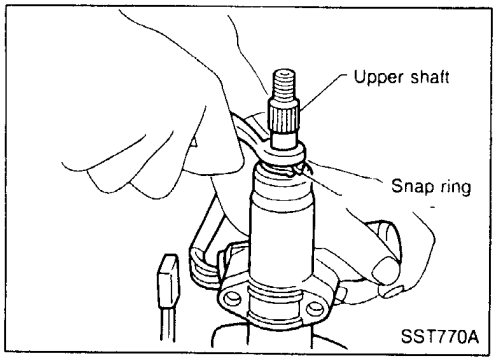


WARNING:
Refer to 'PRECAUTIONS" (on page ST-1) and to RS section for spiral cable servicing information.

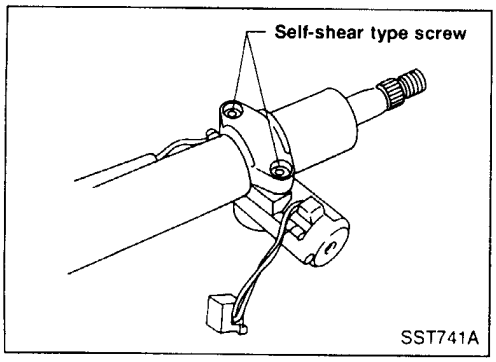


- To remove combination switch, remove attaching screws, disconnect harnesses and remove switch.

Disassembly and Assembly (Cont'd)

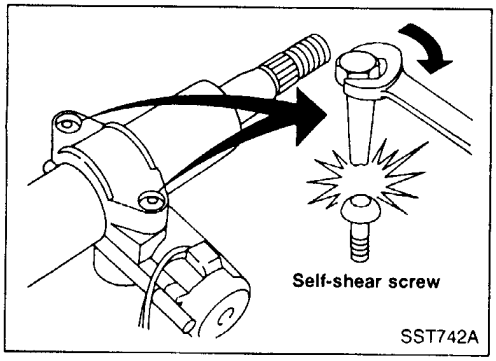


- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring on upper shaft with a suitable tool.

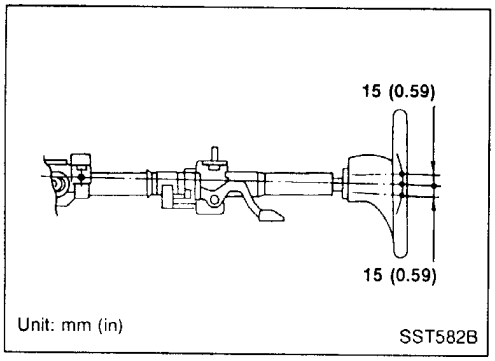


- Steering lock

a. Break self-shear type screws with a drill or other appropriate tool.

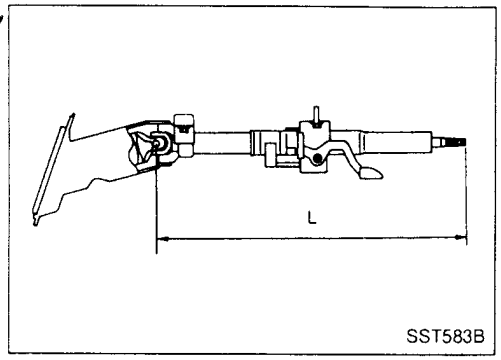


b. Install self-shear type screws and then cut off self-shear type screw heads.



Tilt mechanism

- After installing steering column, check tilt mechanism operation.



Inspection

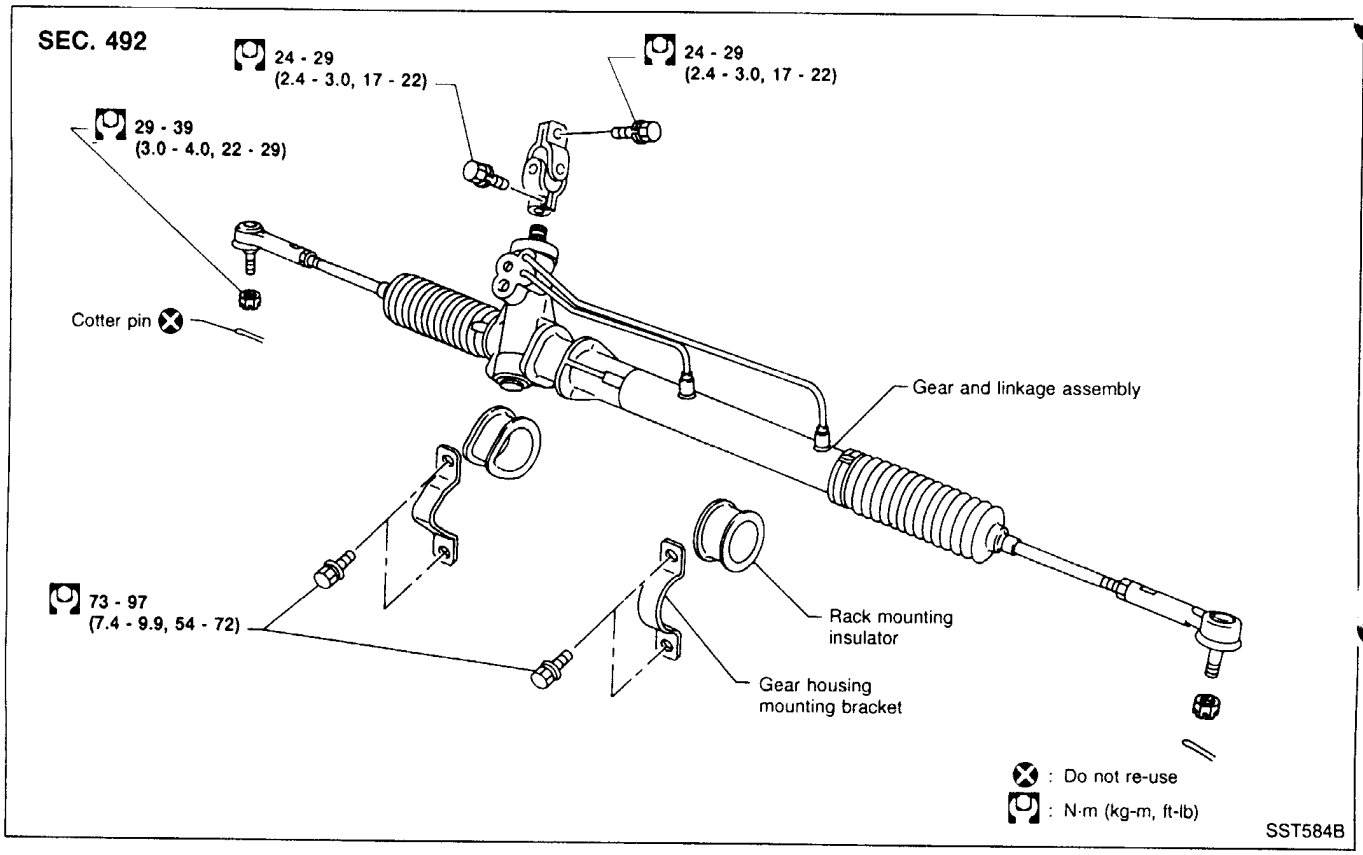
- When steering wheel does not turn smoothly, check the steering column as follows and replace damaged parts.

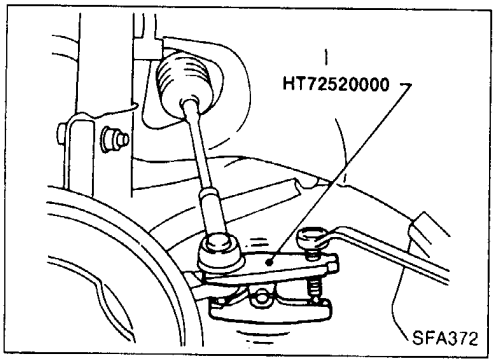
a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.

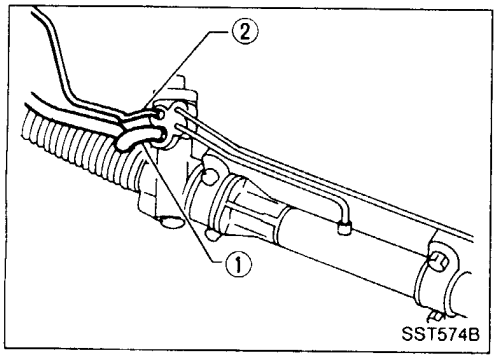
b. Check jacket tube for deformation or breakage. Replace if necessary.

- When the vehicle is involved in a light collision, check column length "L". If it is not within specifications, replace steering column as an assembly.

Column length "L":
536.0 - 538.0 mm (21.10 - 21.18 in)







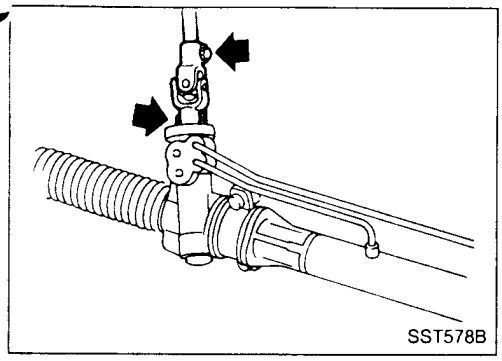
Removal

- Detach tie-rod outer sockets from knuckle arms with Tool.

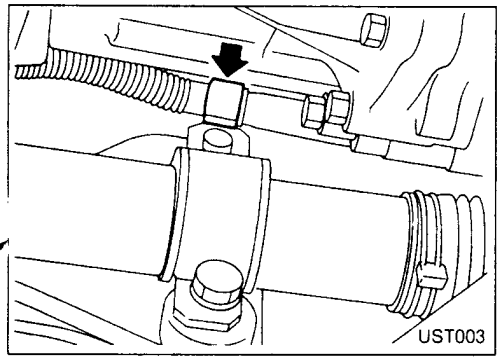
CAUTION:

- **The rotation of the spiral cable (SRS "Air bag" component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.**
- **Remove the steering wheel before removing the steering lower joint to avoid damaging the SRS spiral cable.**
- Remove low and high pressure connectors ① and ②.
- Remove exhaust front tube.

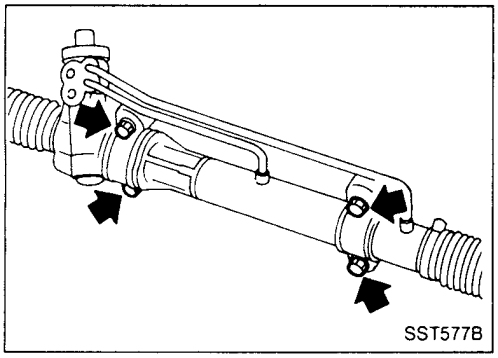
Removal (Cont'd)



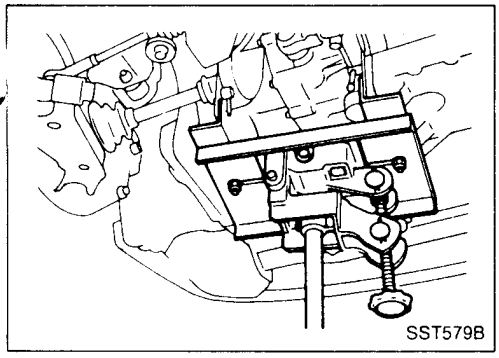
- Remove dust cover from steering lower joint. Remove joint.



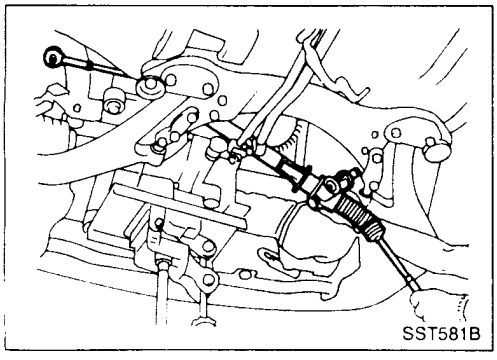
- Remove harness from subframe mounting bracket.



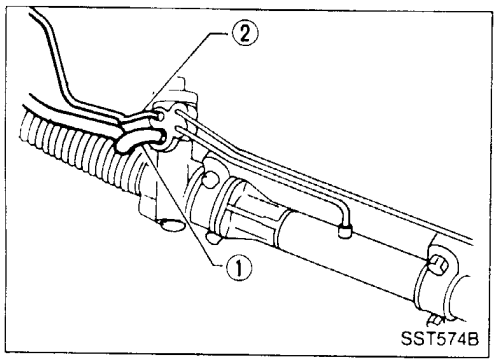
- Remove gear housing brackets.



- Support transmission housing with engine jack.
- Remove center member with engine mounting rear bracket.



- Displace transfer tube over harness mounting bracket. Slide gear to left side of vehicle, lower and remove from right side as illustrated.



Installation

- Install pipe connector.
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damage connector O- ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the correct O-ring.

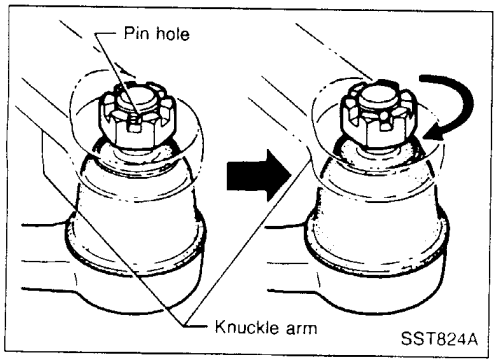
  Connector tightening torque:

  Low-pressure side "①"

  20 - 25 N·m (2.0 - 2.6 kg-m, 14 - 19 ft-lb)

  High-pressure side "②"

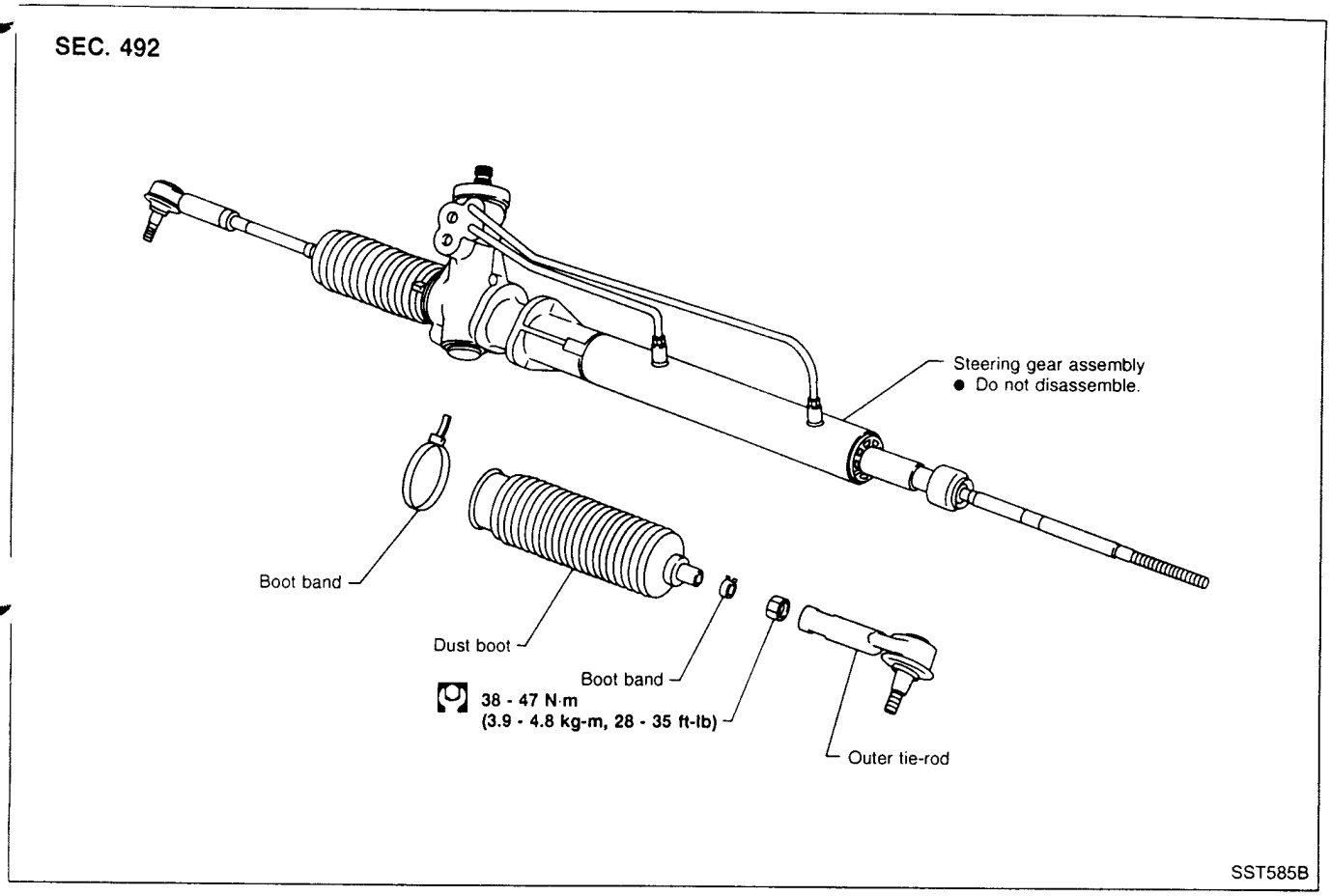
  15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)
- Ensure that steering gear is correctly aligned in housing brackets, and that transfer tubes do not foul bulkhead or subframe.

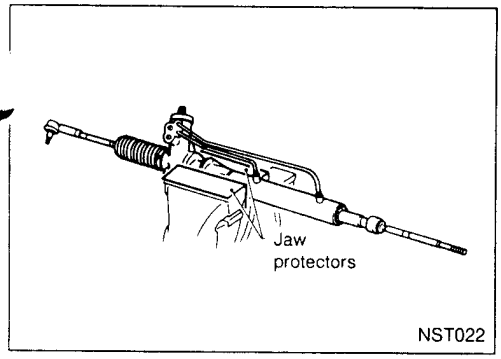


- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

CAUTION:
Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).

SEC. 492





Disassembly

Always use soft jaws when clamping steering gear housing in a vise. Handle gear housing carefully, as it is made of aluminum.

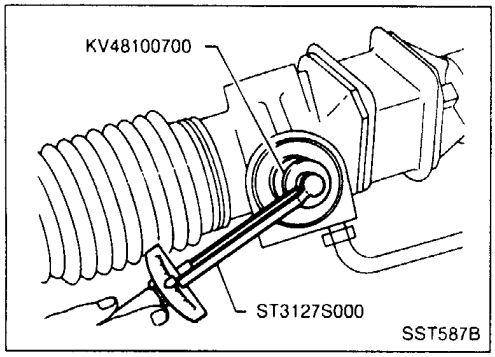
1. Remove outer tie-rod.
2. Remove dust boot.

Inspection

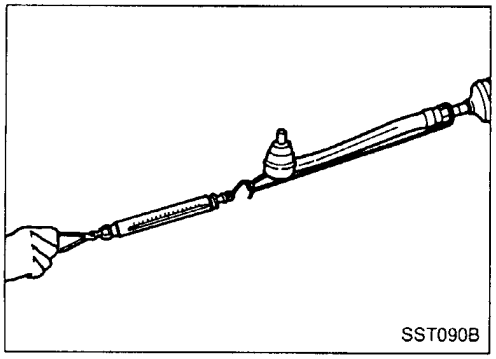
Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "Dexron™" type, and blow dry with compressed air, if available.

Inspection (Cont'd)

STEERING GEAR ASSEMBLY



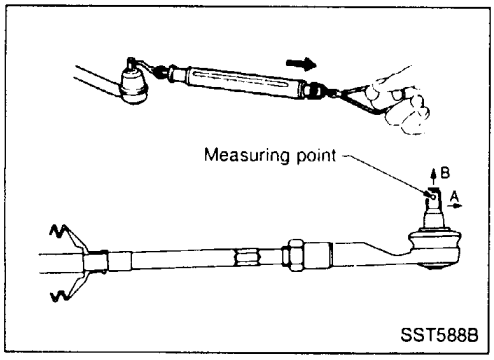
- Check for smooth operation through a full stroke.
- Check rack and tie-rod for cracks, deformation or other damage.
- Check pinion rotating torque.
  Pinion rotating torque:
  0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)



- Check rack sliding force.
  Rack sliding force:
  284 N (29 kg, 64 lb) or less

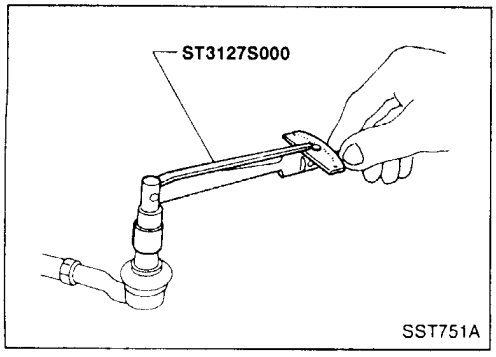
BOOT

Check condition of boot. If cracked, replace it.



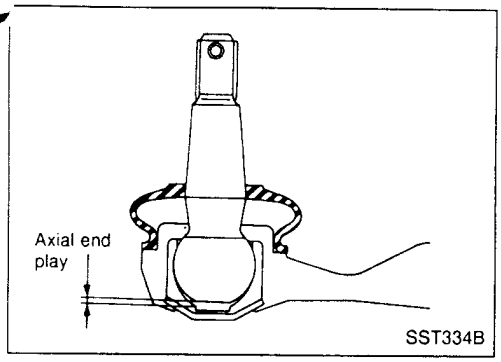
TIE-ROD OUTER AND INNER SOCKET

- Check ball joint for swinging force.
  A Tie-rod outer ball joint:
  3.3 - 67 N
  (0.34 - 6.8 kg, 0.74 - 15.1 lb)
  B Tie-rod inner ball joint:
  0.3 - 24.5 N
  (0.03 - 2.5 kg, 0.07 - 5.5 lb)



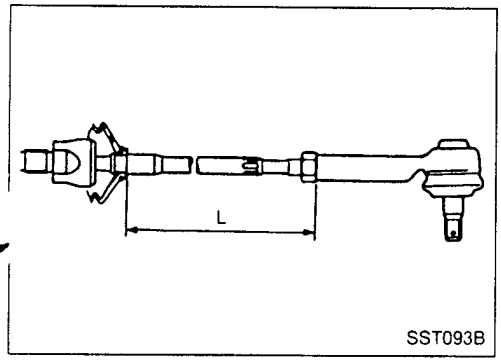
- Check ball joint for rotating torque.
  Tie-rod outer ball joint:
  0.15 - 2.9 N·m
  (1.5 - 30 kg-cm, 1.3 - 26.0 in-lb)

Inspection (Cont'd)

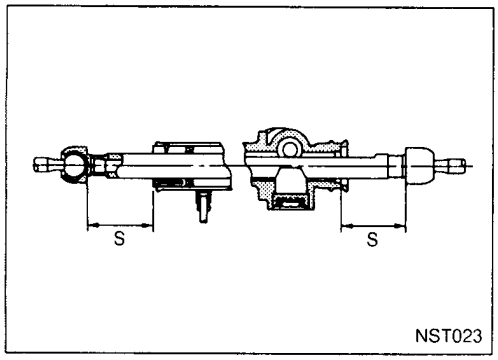


- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  0 mm (0 in)
  Tie-rod inner ball joint:
  0 mm (0 in)
- Check condition of dust cover. If cracked excessively, replace it.

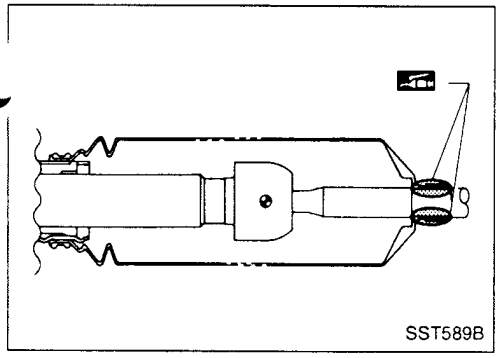
Assembly



1. Tighten outer socket lock nut.
   Tie-rod length "L":
   Refer to SDS (ST-24)

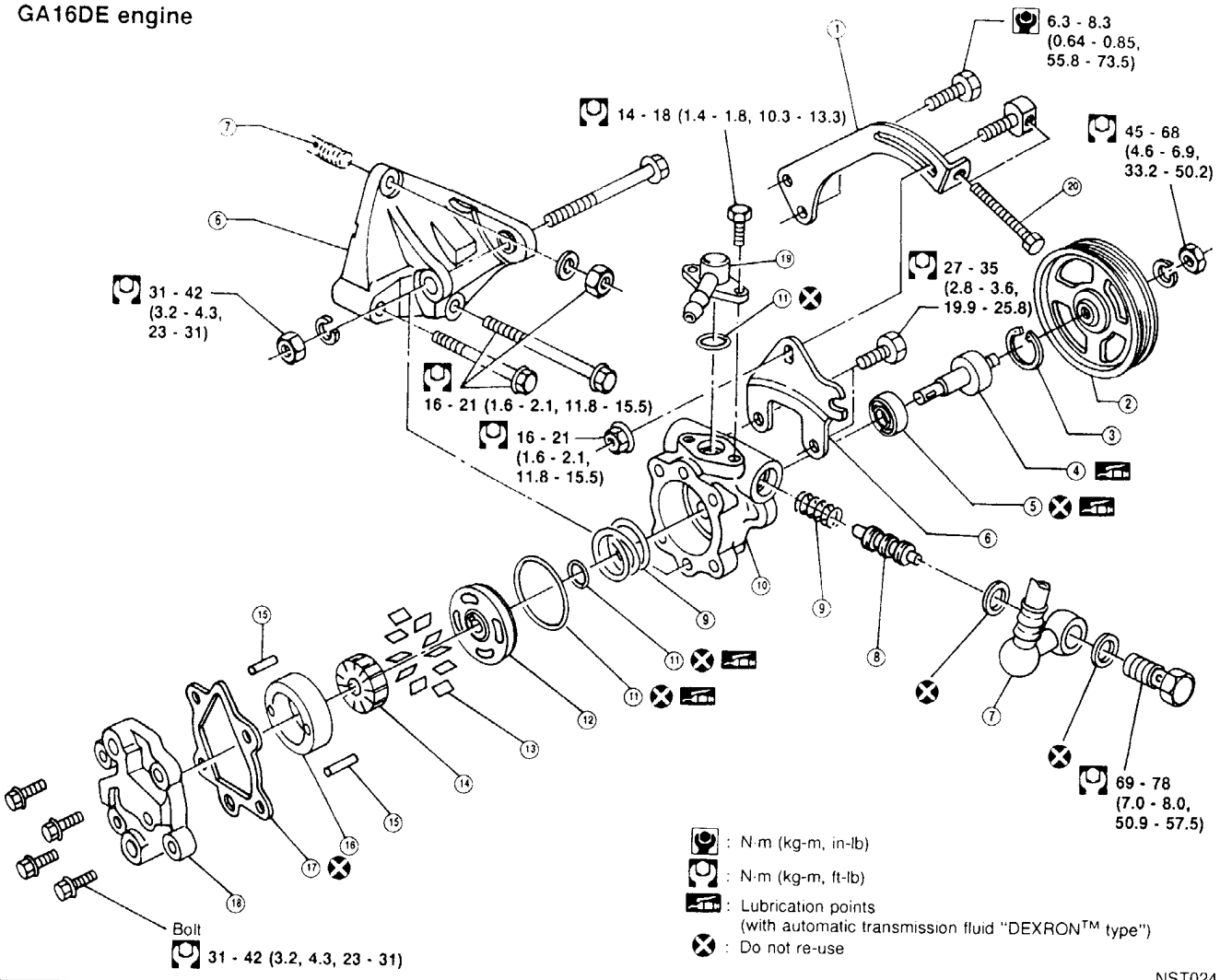


2. Measure rack stroke.
   Rack stroke "S":
   Refer to SDS (ST-23)



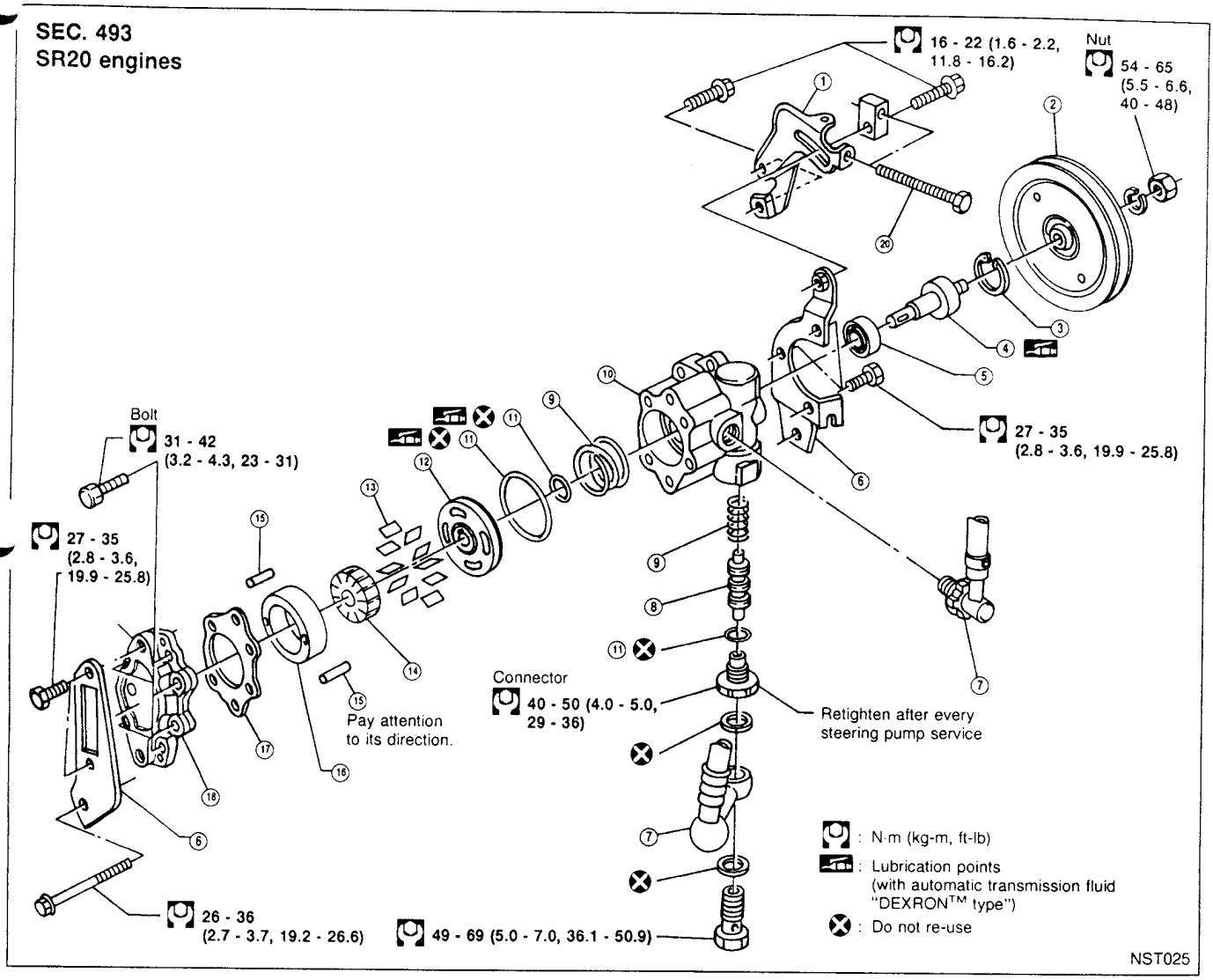
3. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.

SEC. 493
GA16DE engine



① Adjusting bracket
② Pulley
③ Snap ring
④ Drive shaft
⑤ Oil seal
⑥ Mounting bracket
⑦ Hose connection
⑧ Flow control valve
⑨ Spring
⑩ Front housing
⑪ O-ring
⑫ Front side plate
⑬ Vanes
⑭ Rotor
⑮ Pin
⑯ Cam ring
⑰ Gasket
⑱ Rear housing
⑲ Suction pipe
⑳ Adjusting bolt

SEC. 493
SR20 engines



① Adjusting bracket
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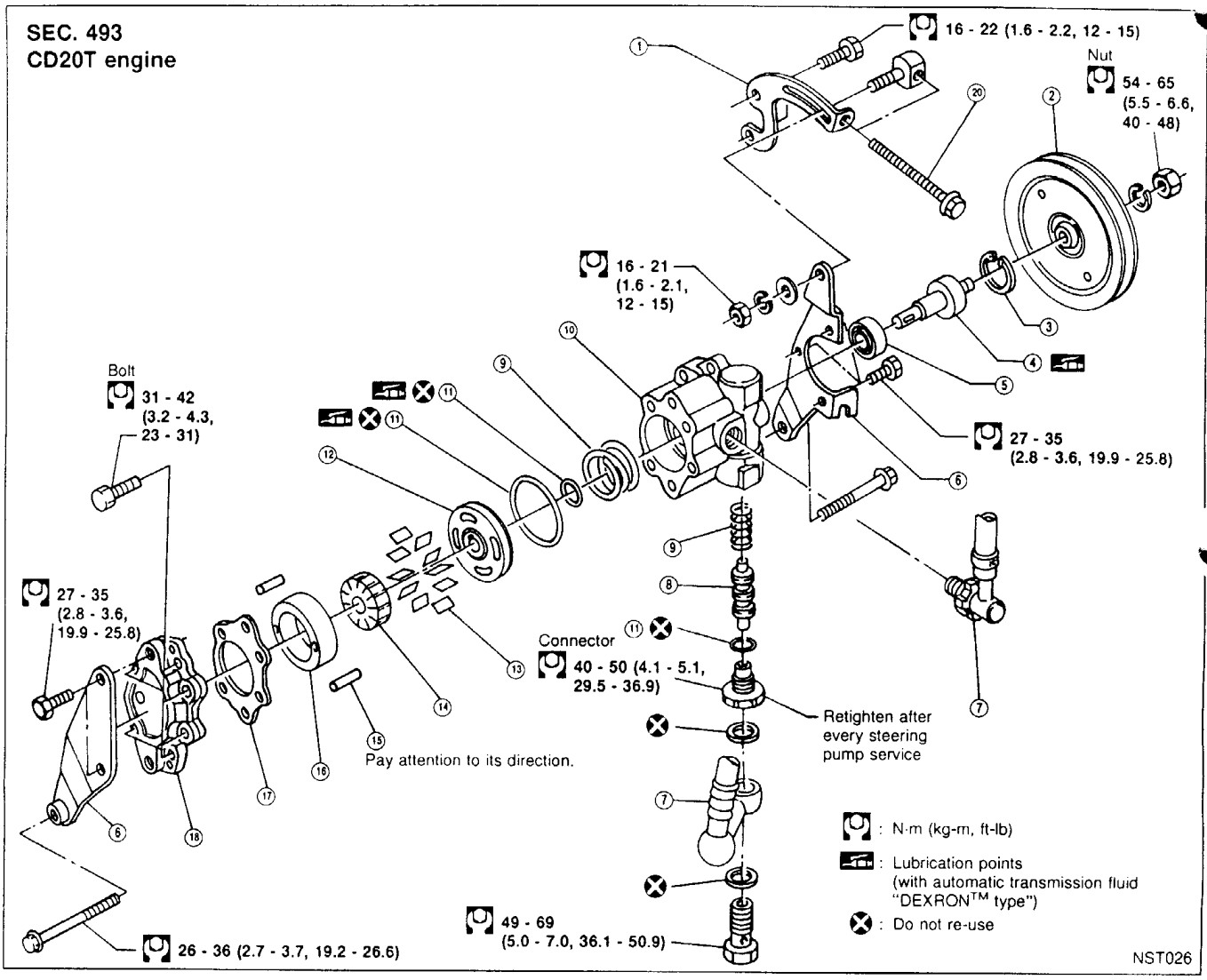
⑭ Rotor
⑮ Pin
⑯ Cam ring
⑰ Gasket
⑱ Rear housing
⑲ Suction pipe
⑳ Adjusting bolt



① Adjusting bracket
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⑮ Pin
⑯ Cam ring
⑰ Gasket
⑱ Rear housing
⑲ Suction pipe
⑳ Adjusting bolt

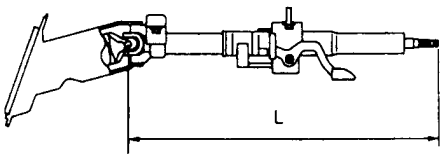
General Specifications

Applied model	2WD	
	14" tire	15" tire
Steering model	Power steering	
Steering gear type	PR25T	
Steering overall gear ratio	16.7	
Turn of steering wheel (Lock to lock)	2.9	2.7
Steering column type	Tilt / collapsible	

Inspection and Adjustment

STEERING WHEEL AND COLUMN

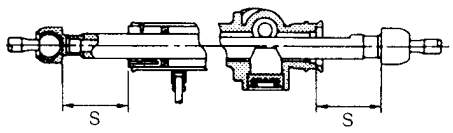
ɔlied model	Tilt
eering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	35 (1.38) or less
Steering column length "L" mm (in)	536 - 538 (21.10 - 21.18 in)



SST583B

STEERING GEAR

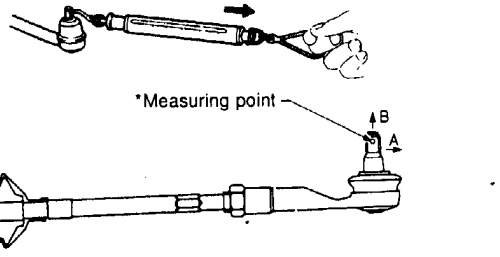
Steering gear type	Power PR25T	
	14'' tire	15'' tire
Rack stroke "S" mm (in)	72.5 (2.85)	68.0
Pinion rotating torque N·m (kg-cm, in-lb)	0.8 - 1.3 (8 - 13, 6.9 - 11.3)	
Rack sliding force N (kg, lb)	284 (29, 64) or less	
Steering wheel turning force (Measured at one full turn from neutral) N (kg, lb)	44.1 (4.5, 9.9) or less	
Fluid capacity (Approximate) ℓ (Imp qt)	0.9 (3/4)	
Oil pump relief pressure kPa (bar, kg/cm^2, psi)	GA: 7,649 - 8,238 (76.5 - 82.4, 78 - 84, 1,109 - 1,194) SR: 7,748 - 8,532 (77.5 - 85.3, 79 - 87, 1,123 - 1,237) CD: 7,748 - 8,532 (77.5 - 85.3, 79 - 87, 1,123 - 1,237)	



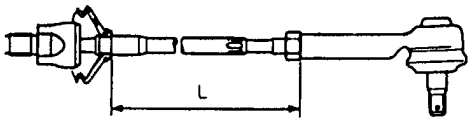
NST023

STEERING LINKAGE

Steering gear type		Power PR25T
Movement of gear housing mm (in)		±2 (±0.08) or less
Tie-rod outer ball joint		
A	Swinging force at cotter pin hole N (kg, lb)	3.3 - 67 (0.34 - 6.8, 0.74 - 15.1 lb)
	Rotating torque N·m (kg-cm, in-lb)	0.15 - 2.4 (1.5 - 30, 1.3 - 26.0)
	Axial end play mm (in)	0 (0)
Tie-rod inner ball joint		
B	Swinging force* N (kg, lb)	0.3 - 24.5 (0.03 - 2.5, 0.07 - 5.5)
	Axial end play mm (in)	0 (0)
Tie-rod standard length "L" mm (in)		183.6 (7.23)



SST588B



SST093B

<SUPPLEMENT-II>

RESTRAINT SYSTEM

SECTION RS

CONTENTS

PRECAUTION 2002
Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" .. 2002
SUPPLEMENTAL RESTRAINT SYSTEM (SRS) 2003
Precautions for SRS "Air Bag" and "Seat Belt Pre-tensioner" Service 2003
Special Service Tools 2004
Description 2005
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Maintenance Items 2007
Removal and Installation — Diagnosis Sensor Unit and Satellite Sensor 2008
Removal — Side Air Bag Module 2009
Installation — Side Air Bag Module 2010
Disposal of Air Bag Module and Seat Belt Pre-tensioner 2011
TROUBLE DIAGNOSES — Supplemental Restraint System (SRS) 2012
How to Perform Trouble Diagnoses for Quick and Accurate Repair 2012
Schematic 2013
Wiring Diagram — SRS — 2014
Self-diagnosis 2018

RS

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

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".

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
If the vehicle is equipped with side air bag (Supplemental Restraint System), the side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (which is also a component of the air bag system for a frontal collision), wiring harness, warning lamp (which is also a component of the air bag system for a frontal collision).

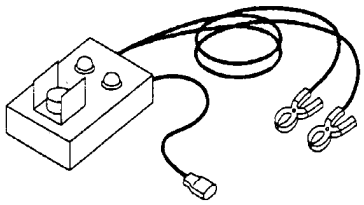
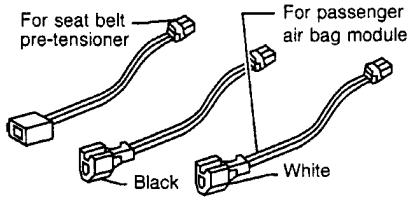
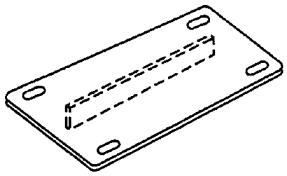
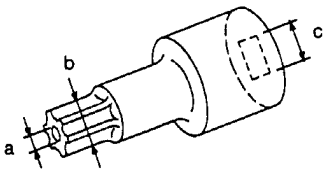
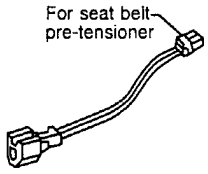
WARNING:

- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation), all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual. SRS wiring harnesses are covered with yellow insulation (either just before the harness connectors or for the complete harness), for easy identification.**

Precautions for SRS "Air Bag" and "Seat Belt Pre-tensioner" Service

- Before servicing the SRS, turn ignition switch to " LOCK" position, disconnect both battery cables and wait at least 3 minutes.
  For approximately 3 minutes after the cables are removed, it is still possible for the air bag and seat belt pre-tensioner to deploy. Therefore, do not work on any SRS connectors or wires until at least 3 minutes have passed.
- Diagnosis sensor unit must always be installed with their arrow marks "⇦" pointing towards the front of the vehicle for proper operation. Also check diagnosis sensor unit for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place it with the pad side facing upward.
- Do not use old bolts after removing any SRS parts; replace with new ones. Conduct self-diagnosis to check entire SRS for correct operation.
- After air bag inflates, the front instrument panel assembly should be replaced if damaged.
- After side airbag inflates, the seat should be replaced.

Special Service Tools

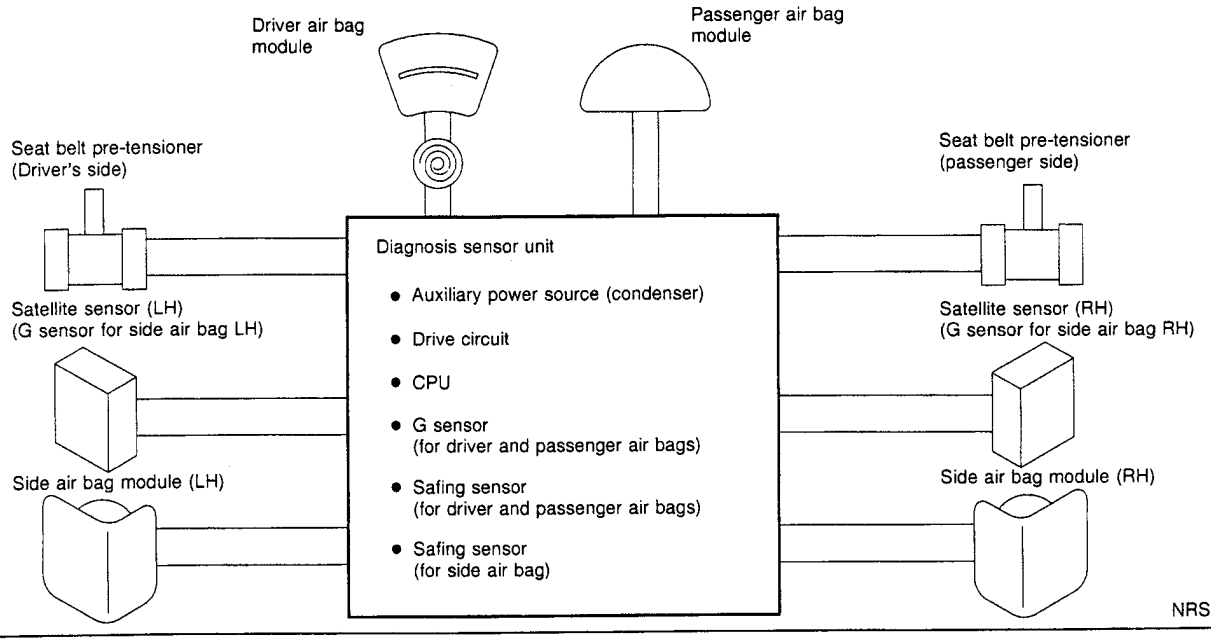
Tool number Tool name	Description	
KV991072S0 Air bag deployment kit KV99106400 Deployment tool	 NT357	Disposing of air bag module
KV991065S0 Deployment tool adapters	 NRS030	
KV99105300 Air bag module bracket	 NRS031	Anchoring air bag module
HT61961000 and HT62152000 combined *Special torx bit	 NT361	Use for special bolts [TAMPER RESISTANT TORX (Size T50)] **a: 3.5 (0.138) dia.** **b: 8.5 - 8.6 (0.335 - 0.339) dia.** **c: approx. 10 (0.39) sq.** Unit: mm (in)
KV999R0040 Deployment tool adapters for seat belt pre-tensioner	 NRS032	

*: Special tool or commercial equivalent

Description

The air bag and seat belt pre-tensioner deploy if the diagnosis sensor unit activates while the ignition switch is in "ON" or "START" position.

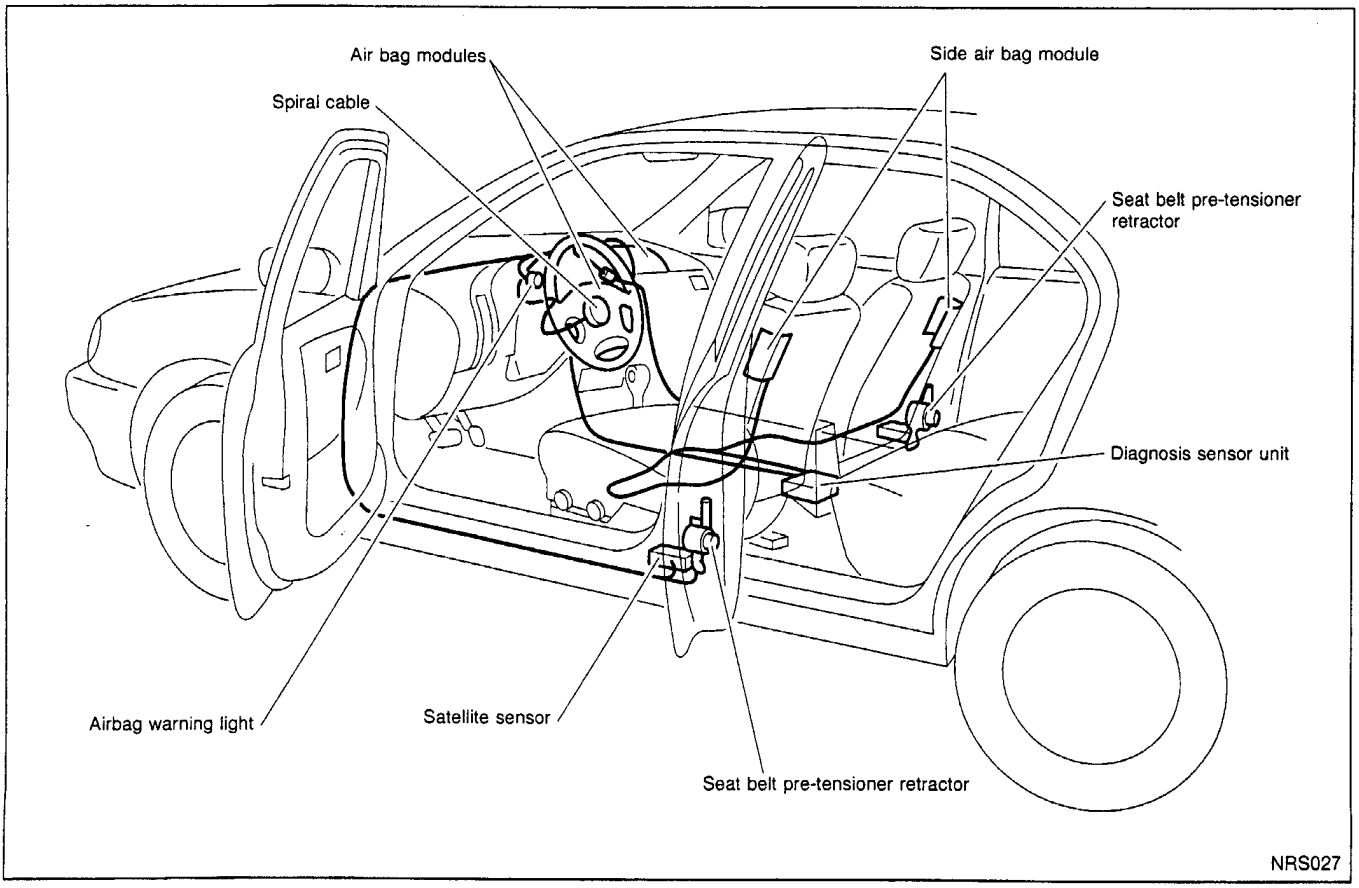
SRS configurations vary with vehicle depending on optional equipment and destination

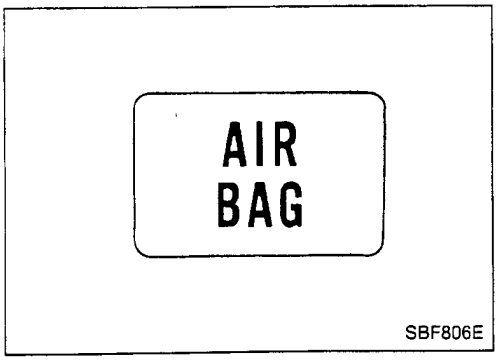


The collision modes for which supplemental restraint systems are activated are different among the SRS systems. For example, the driver air bag module and passenger air bag module are activated in a frontal collision but not in a side collision.
SRS configurations which are activated for some collision modes are as follows;

SRS configuration	Frontal collision	Left side collision	Right side collision
Driver air bag module	○	—	—
Passenger air bag module	○	—	—
Seat belt pre-tensioner (Driver side)	○	—	—
Seat belt pre-tensioner (Passenger side)	○	—	—
Side air bag module (LH)	—	○	—
Side air bag module (RH)	—	—	○

SRS Component Parts Location





Maintenance Items

1. Check operation of "AIR BAG" warning lamp.
   After turning ignition key to "ON" position, the "AIR BAG" warning lamp illuminates. The "AIR BAG" warning lamp will go off after about 7 seconds if no malfunction is detected.
   If any of the following warning lamp conditions occurs, immediately check the air bag system. Refer to RS-26 for details.
- The "AIR BAG" warning lamp does not illuminate when the ignition switch is turned "ON".
- The "AIR BAG" warning lamp does not go off about 7 seconds after the ignition switch is turned "ON".
- The "AIR BAG" warning lamp goes off about 7 seconds after the ignition switch is turned "ON", but comes on again or flashes.

2. Visually check SRS components.

(1) Diagnosis sensor unit
- Check diagnosis sensor unit and bracket for dents, cracks or deformities.
- Check connectors for damage, and terminals for deformities.

(2) Air bag module and steering wheel
- Remove air bag module from steering wheel or instrument panel. Check harness cover and connectors for damage, terminals for deformities, and harness for binding.
- Install driver air bag module to steering wheel to check fit and alignment with the wheel.
- Check steering wheel for excessive free play (Refer to ST section).
- Install passenger side air bag module to instrument panel to check fit and alignment with the instrument panel.
- Install side air bag module to seatback to check fit and alignment with the seat.

(3) Spiral cable
- Check spiral cable for dents, cracks, or deformities.
- Check connectors and protective tape for damage.
- Check steering wheel for noise, binding or heavy operation.

(4) Main harness and air bag harness
- Check connectors for poor connections, damage, and terminals for deformities.
- Check harnesses for binding, chafing or cuts.

(5) Seat belt pre-tensioner
- Check harness and connectors for damage, terminals for deformities, and harness for binding.
- Check belts for damage and anchors for loose mounting.
- Check retractor for smooth operation.
- Perform self-diagnosis for seat belt pre-tensioner using CONSULT. Refer to "Self-diagnosis" for details. (RS-27)

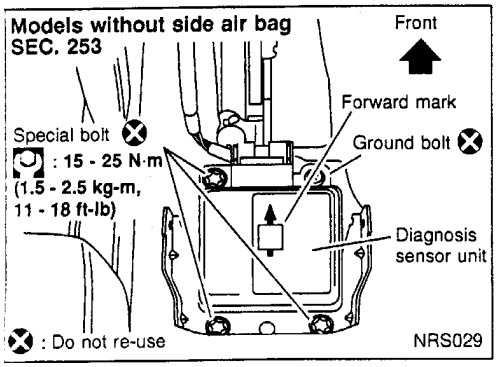
(6) Satellite sensor
- Check satellite sensor (including bracket portion) for dents, cracks or deformities.
- Check connectors for damage, and terminals for deformities.

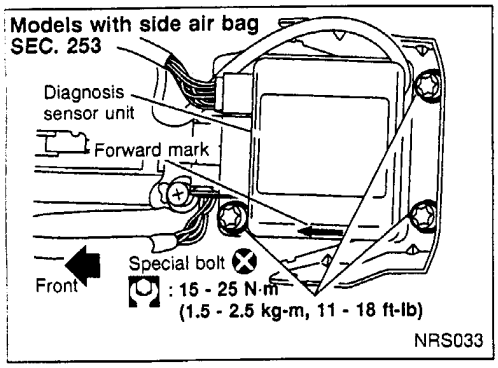
CAUTION:
Replace previously used special bolts, ground bolt and nuts coated with bonding agent and also the anchor bolt with new ones.

Removal and Installation — Diagnosis Sensor Unit and Satellite Sensor

CAUTION:

- **Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait at least 3 minutes.**
- **The special bolts and nuts are coated with bonding agent. Do not reuse old bolts and nuts after removal; replace with new ones.**
- **Check diagnosis sensor unit for proper installation.**
- **Check diagnosis sensor unit/satellite sensor to ensure it is free of deformities, dents, cracks or rust. If it shows any visible signs of damage (dropped, hit, etc.), replace it with a new one.**
- **Check diagnosis sensor unit/satellite sensor brackets to ensure they are free of deformities or rust. The satellite sensor and bracket must not be dismantled.**
- **Do not carry the satellite sensor assembly by its harness.**
- **Store the satellite sensors in a clean and dry place.**
- **If water gets into the satellite sensor case:**
  - Do not reuse the sensor case again.





REMOVAL OF DIAGNOSIS SENSOR UNIT

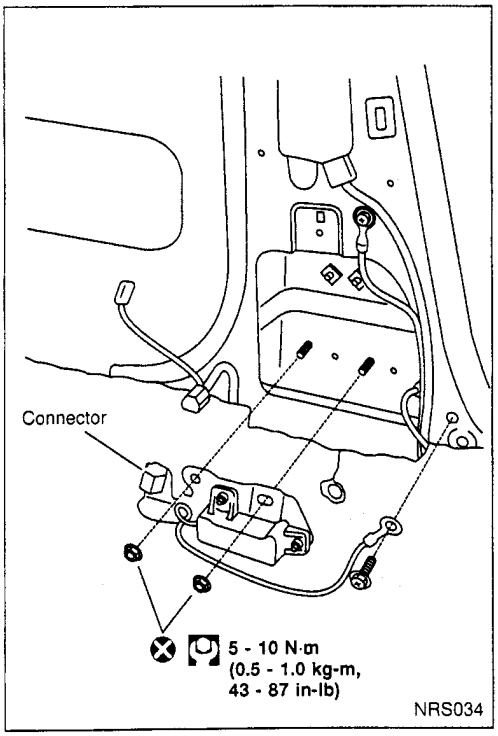
1. Disconnect driver and passenger air bag module connectors. Also, disconnect seat belt pre-tensioner connector.
2. Remove rear console box. Refer to "INSTRUMENT PANEL" in BT section.
3. Disconnect diagnosis sensor unit connector.
4. Remove ground bolt and also remove special bolts using the TAMPER RESISTANT TORX (Size T50), from diagnosis sensor unit.
   Then remove the diagnosis sensor unit.

NOTE:

- **To install, reverse the removal procedure sequence.**
- **After replacement, perform self-diagnosis for SRS. Refer to "Self-diagnosis" for details. (RS-26)**

Removal and Installation — Diagnosis Sensor Unit and Satellite Sensor (Cont'd)

REMOVAL OF SATELLITE SENSOR



1. Remove seat belt retractor. Refer to "Front Seat Belt" in RS section of Service Manual for details.
2. Disconnect satellite sensor connector.
3. Remove nuts and bolt from satellite sensor unit. Then remove the satellite sensor.

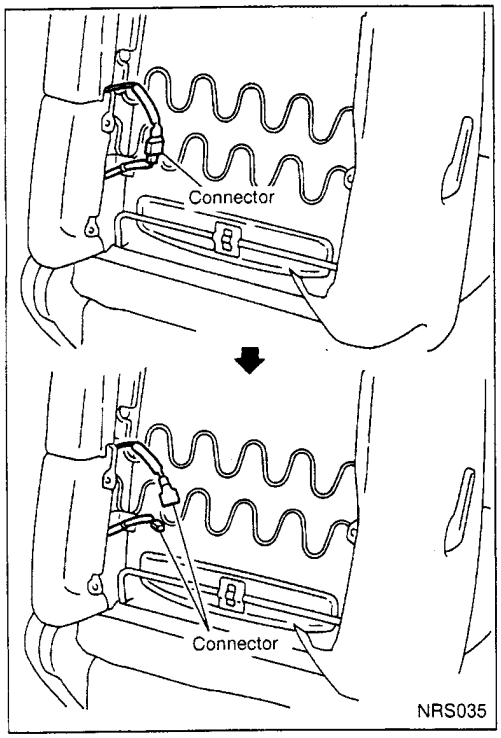
NOTE:

- **To install, reverse the removal procedure sequence.**

Removal — Side Air Bag Module

CAUTION:

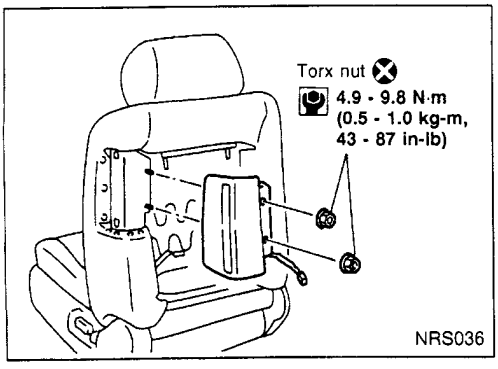
- **Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait at least 3 minutes.**
- **Always work form the rear of air bag module.**



1. Remove seatback finisher.

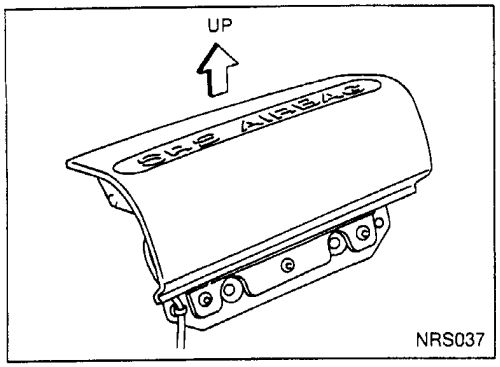
- **When using a clip removal tool to remove the seatback finisher, take care not to damage the air bag harness.**

2. Disconnect side air bag module connector.



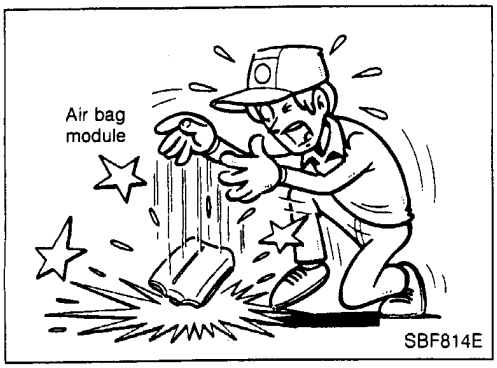
3. Remove torx nuts from air bag module. Air bag module can then be removed.

Removal — Side Air Bag Module (Cont'd)



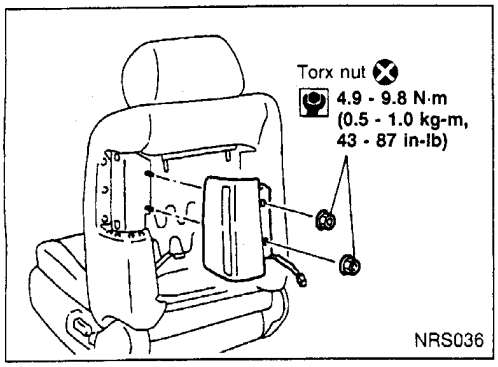
CAUTION:

- **Always place air bag module with pad side facing upward.**
- **Do not attempt to disassemble air bag module.**
- **The torx nuts are coated with bonding agent. Do not use old nuts after removal; replace with new ones.**
- **Do not insert any foreign objects (screwdriver, etc.) into air bag module connector.**

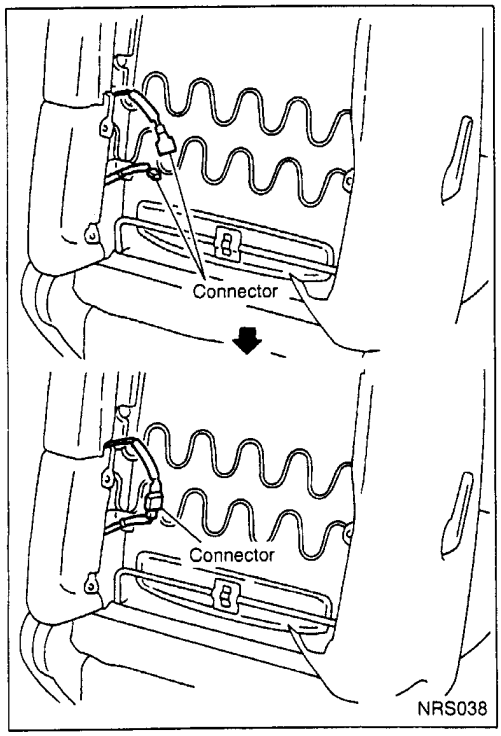


- **Replace air bag module if it has been dropped or sustained an impact.**
- **Do not expose the air bag module to temperatures exceeding 90°C (194°F).**
- **Do not allow oil, grease or water to come in contact with the air bag module.**
- **After air bag inflates, the front seat should be replaced if damaged.**

Installation — Side Air Bag Module



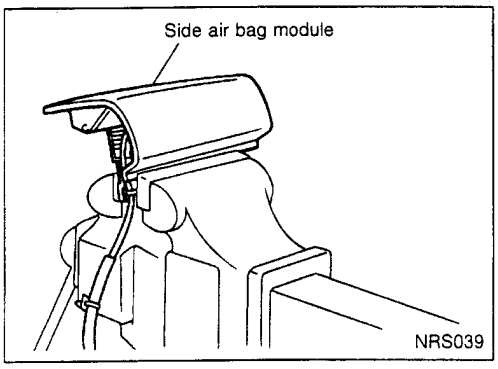
1. Install side air bag module on front seat with new torx nuts.



2. Connect side air bag module connector.
3. Install seatback finisher with new clips.
   - **Ensure harness is not caught between seatback finisher and seatback.**
4. Connect both battery cables.
5. Conduct self-diagnosis, RS-26, to ensure SRS operates properly. (Use CONSULT or air bag warning lamp.)

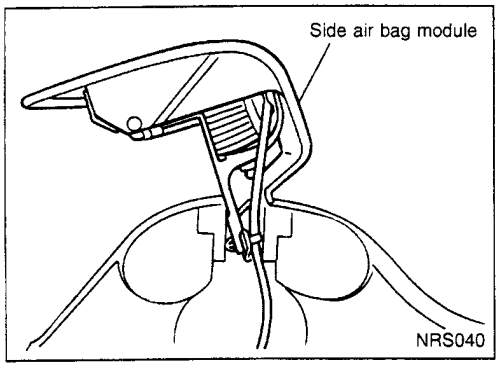
Disposal of Air Bag Module and Seat Belt Pre-tensioner

- Before disposing of air bag module and seat belt pre-tensioner, or vehicles equipped with such systems, deploy the systems. If such systems have already been deployed due to an accident, dispose of them as indicated in "DISPOSING OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER" (RS-18).
- When deploying the air bag module and seat belt pre-tensioner, always use the Special Service Tool; Deployment tool KV99106400.
- When deploying the air bag module and seat belt pre-tensioner, stand at least 5 m (16 ft) away from the deployment component.
- When deploying the air bag module and seat belt pre-tensioner, a fairly loud noise is made, followed by smoke being released. The smoke is not poisonous, however, be careful not to inhale smoke since it irritates the throat and can cause choking.
- Due to heat, leave air bag module unattended for more than 30 minutes after deployment. Also leave seat belt pre-tensioner unattended for more than 10 minutes after deployment.
- Be sure to wear gloves when handling a deployed air bag module and seat belt pre-tensioner.
- Never apply water to a deployed air bag module and seat belt pre-tensioner.
- Wash your hands clean after finishing work.
- Place the vehicle outdoors with an open space of at least 6 m (20 ft) on all sides when deploying air bag module and seat belt pre-tensioner while mounted in the vehicle.
- Use a voltmeter to make sure the vehicle battery is fully charged.



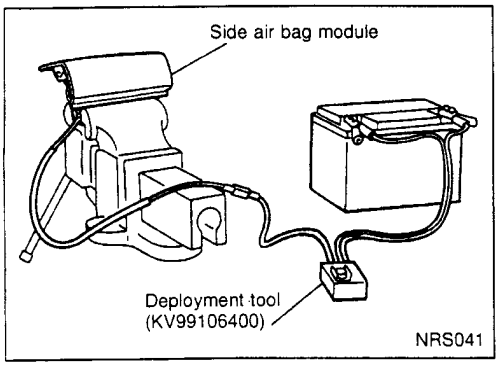
Deployment of side air bag module (outside of vehicle)

1. Firmly anchor side air bag module in a vise.



- **The side air bag module must be installed in an oblique direction, not in a vertical direction. Refer to the figure at the left.**

2. Connect deployment tool (SST: KV99106400) to side air bag module connector.



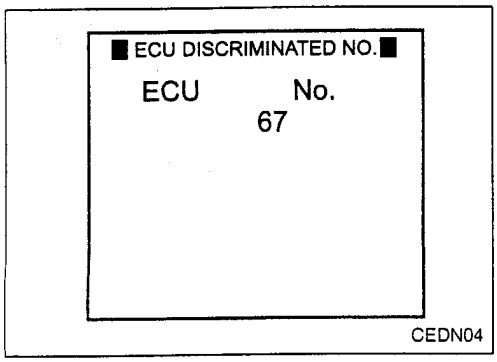
3. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
4. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
5. Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the side air bag module will deploy.

CAUTION:
When deploying the side air bag module, stand at least 5 m (16 ft) away from the side air bag module.

How to Perform Trouble Diagnoses for Quick and Accurate Repair

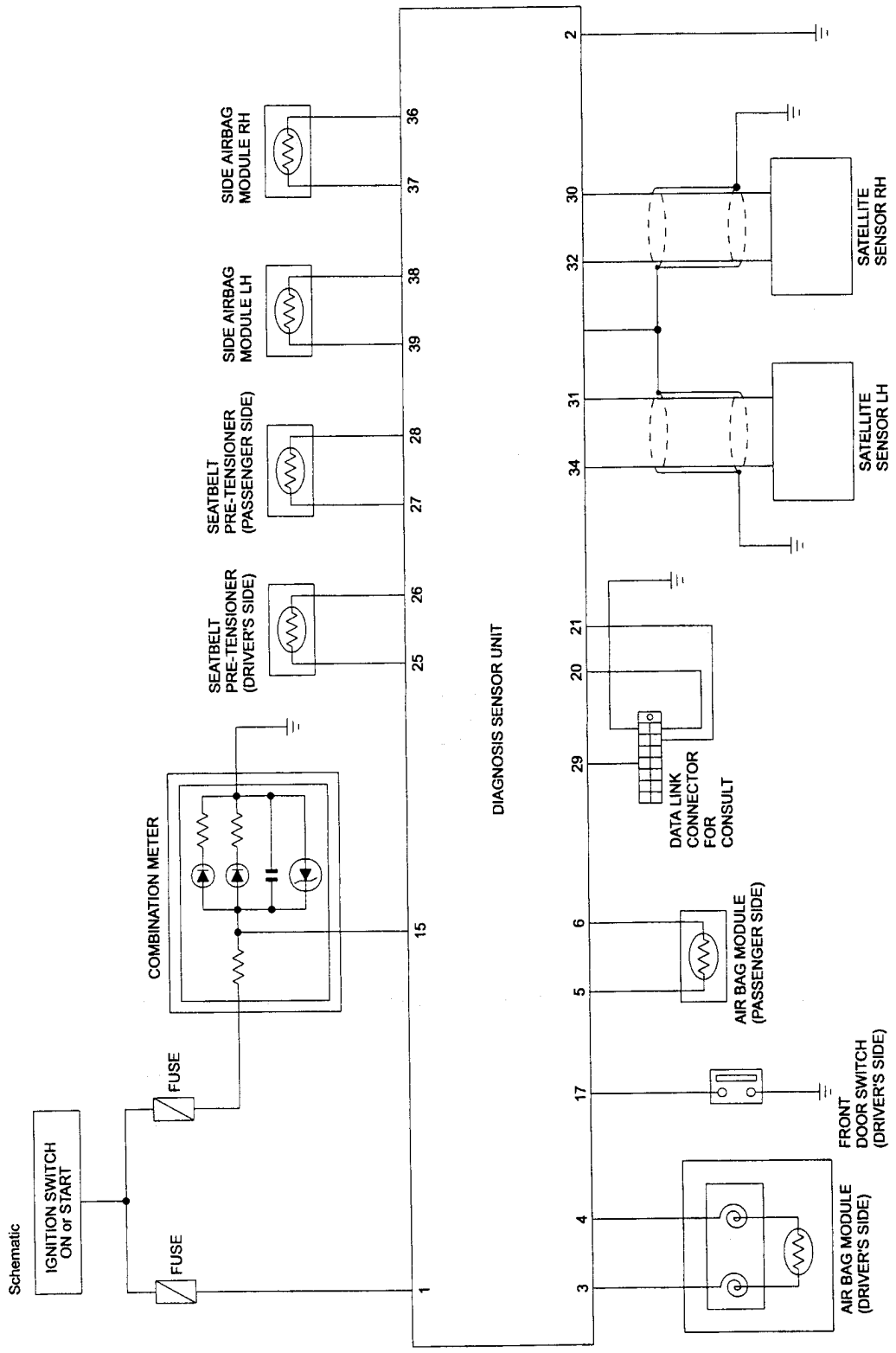
DIAGNOSIS MODE FOR CONSULT

- SELF-DIAG [CURRENT]
  A current Self-diagnosis result (also indicated by the warning lamp flashes in the Diagnosis mode and User mode) is displayed on the CONSULT screen in real time. This refers to a malfunctioning part requiring repairs.
- SELF-DIAG [PAST]
  Diagnosis results previously stored in the memory (also indicated by the warning lamp flashes in the Diagnosis mode) are displayed on the CONSULT screen. The stored results are not erased until memory erasing is executed.
- TROUBLE DIAG RECORD
  With TROUBLE DIAG RECORD, diagnosis results previously erased by a reset operation can be displayed on the CONSULT screen.



- ECU DISCRIMINATED NO. (Only for air bag equipped model).
  The diagnosis sensor unit for each vehicle model is assigned with its own, individual classification number. This number will be displayed on the CONSULT screen, as shown at left. When replacing the diagnosis sensor unit, refer to the part number for the compatibility. After installation, replacement with a correct unit can be checked by confirming this classification number on the CONSULT screen.
  For NISSAN model P11, the diagnosis sensor unit classification number assigned is 67.

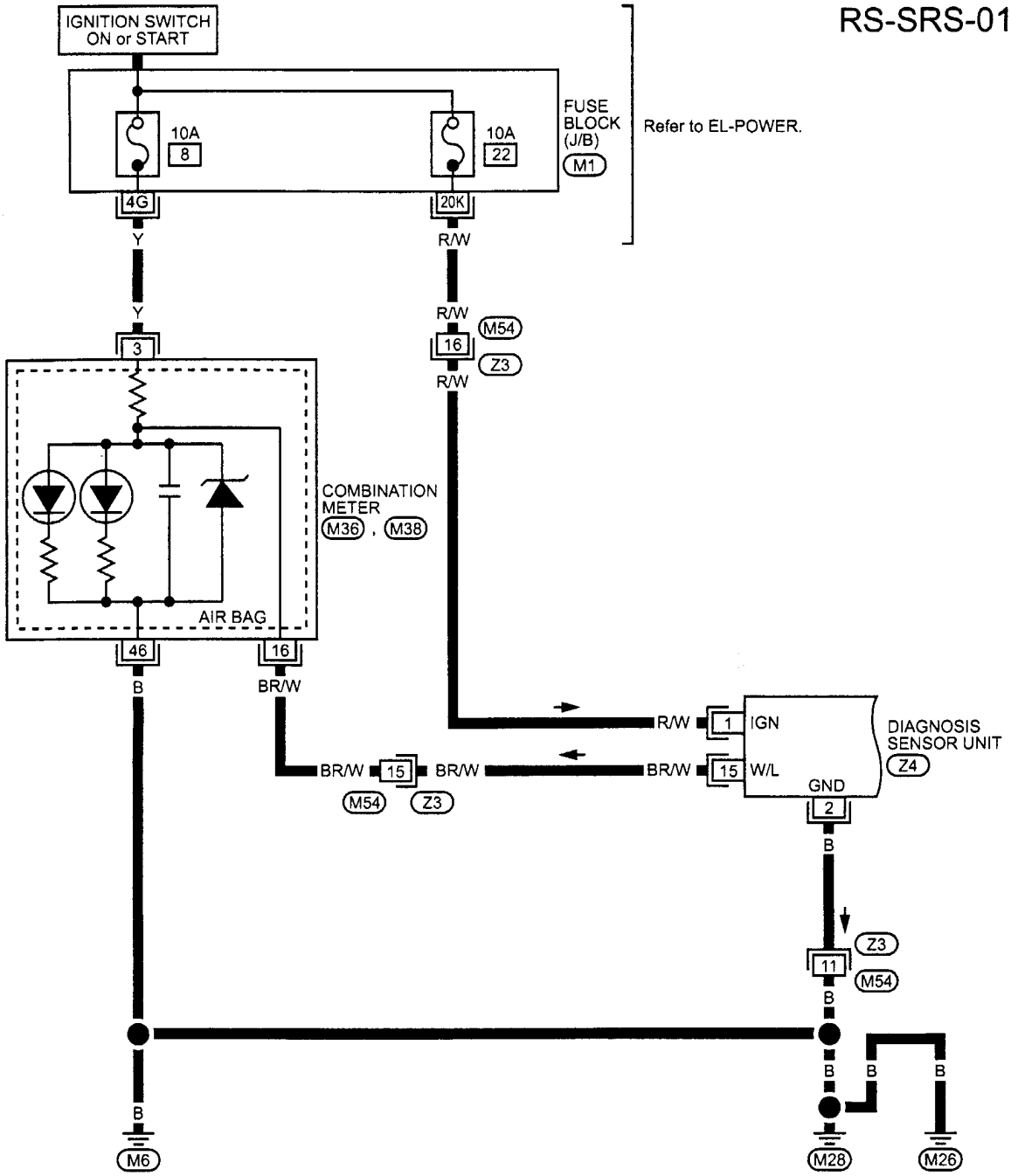
Schematic

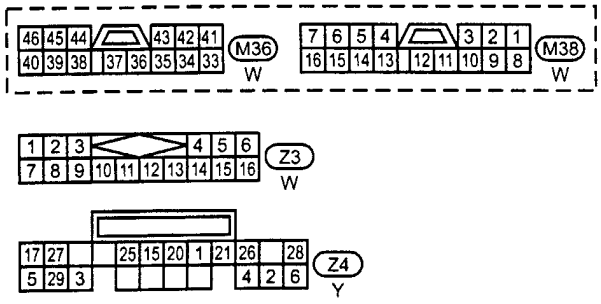


YRS014

Wiring Diagram — SRS —

RS-SRS-01



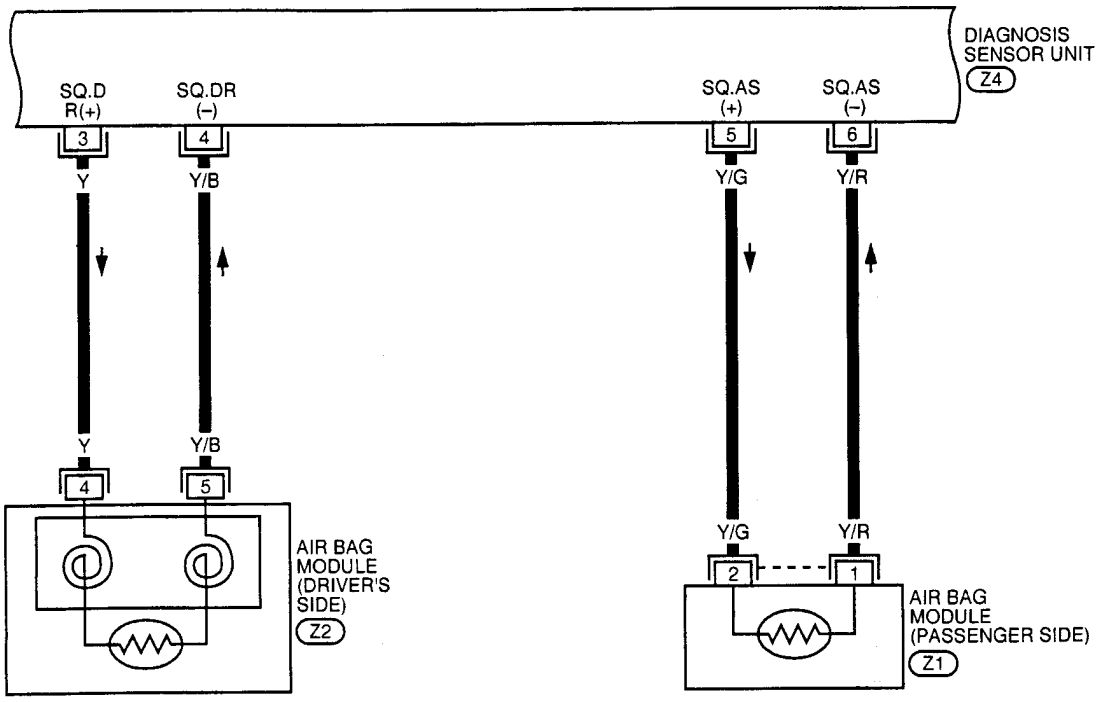


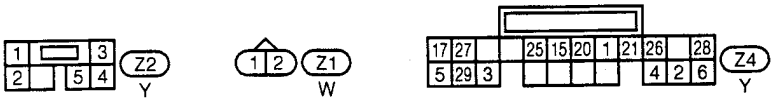
Refer to last page (Foldout page).
M1

YRS015

Wiring Diagram — SRS — (Cont'd)

RS-SRS-02

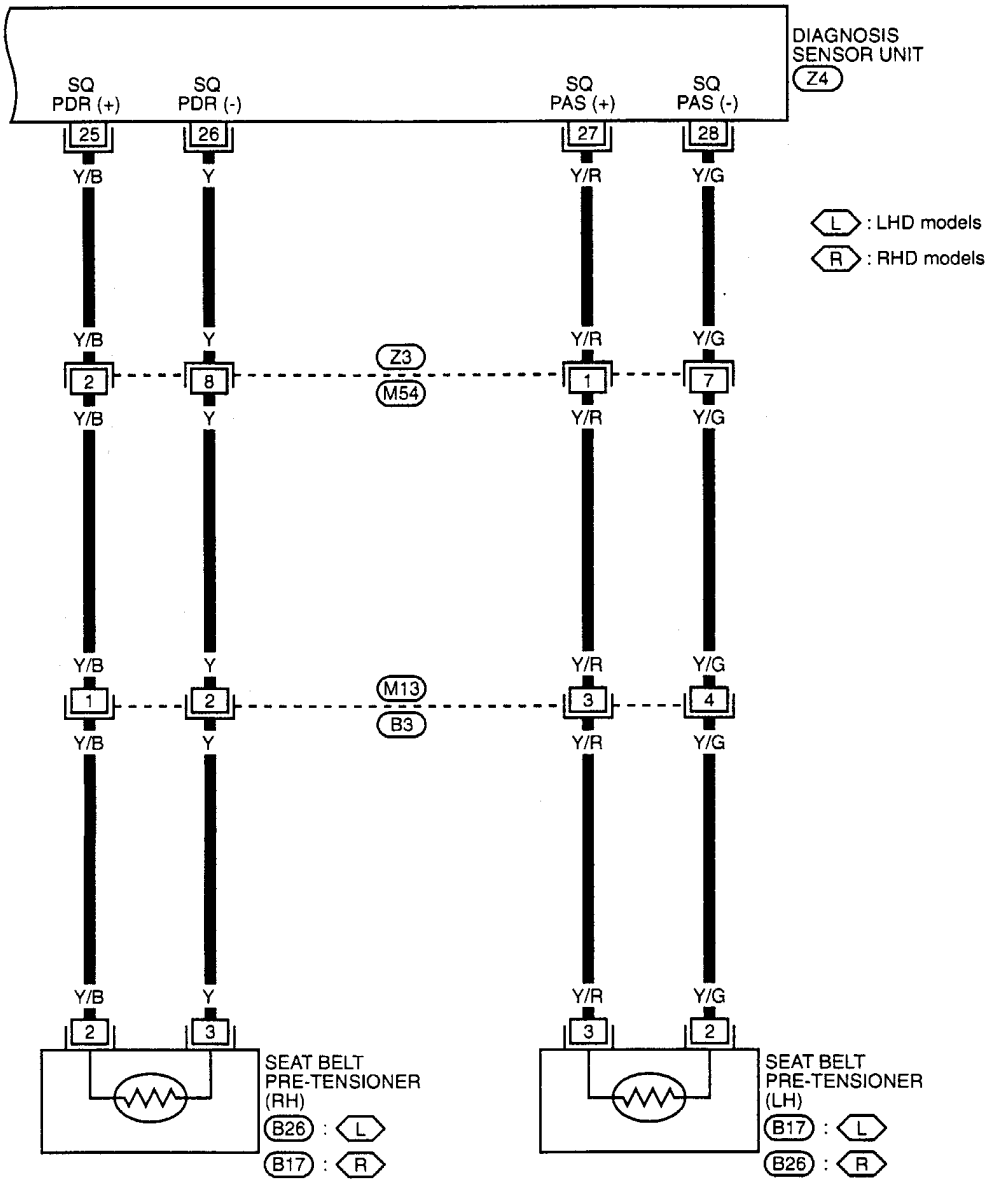


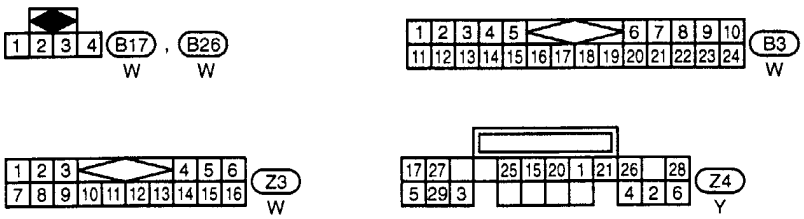


YRS016

Wiring Diagram — SRS — (Cont'd)

RS-SRS-04

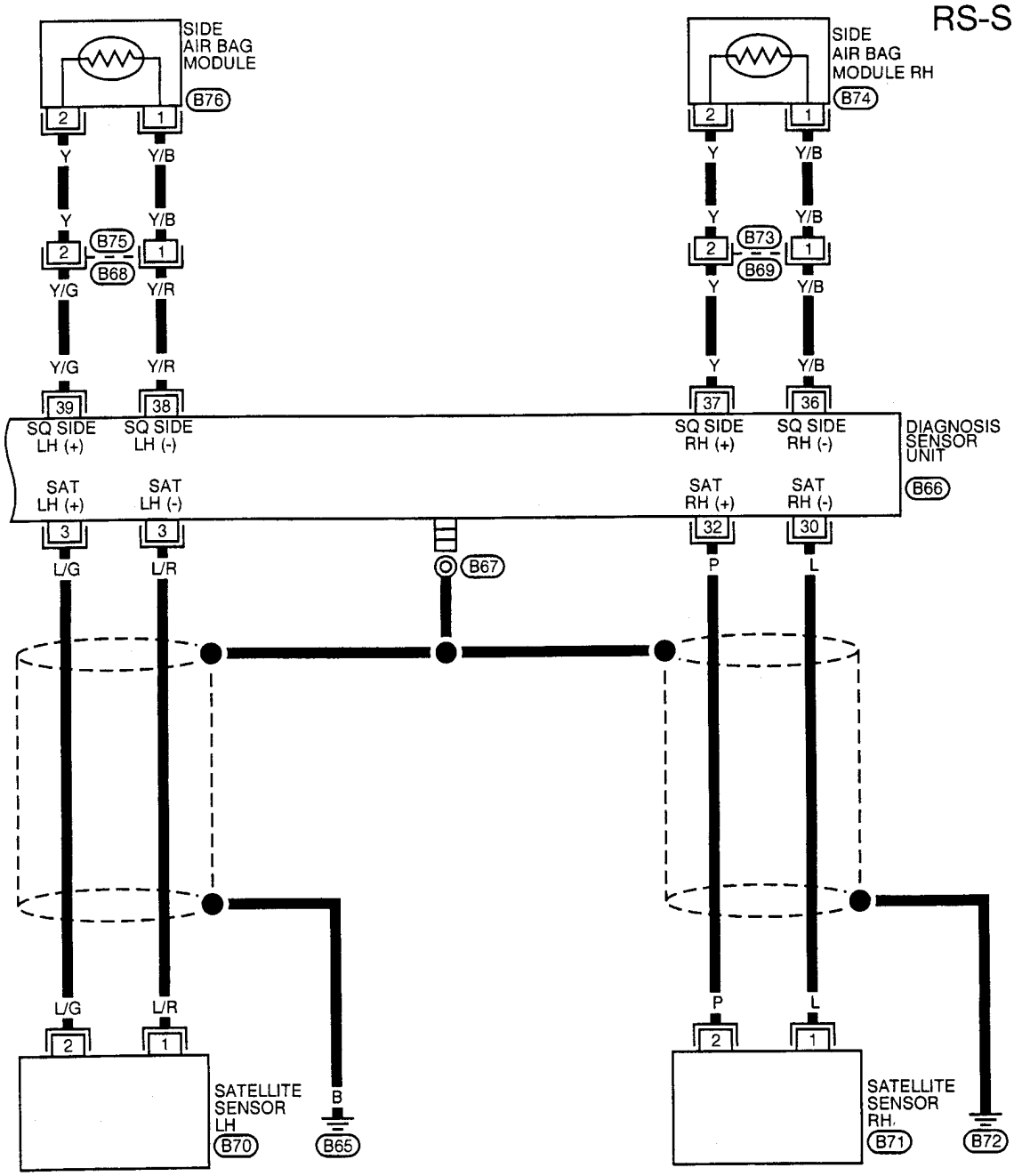


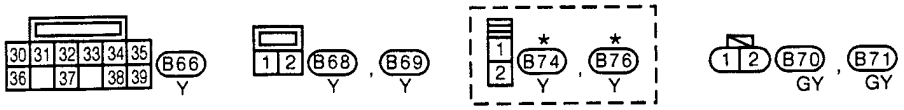


YRS018

Wiring Diagram — SRS — (Cont'd)

RS-SRS-05





★: This connector is not shown in "HARNESS LAYOUT" of EL section.

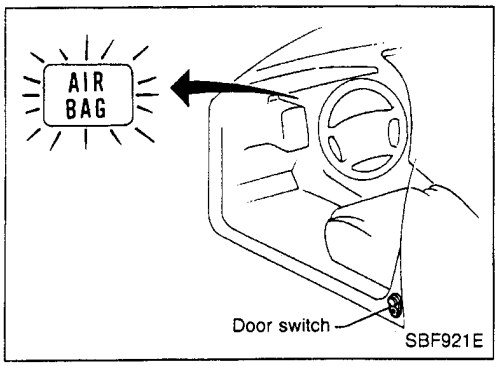
YRS020

Self-diagnosis

CONSULT DIAGNOSTIC CODE CHART

Diagnostic item	Explanation	Repair order Recheck SRS at each replacement.
DA (SIDE MODULE LH [OPEN])	• Side air bag module (LH) circuit is open.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace side air bag module (LH). (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit.
BD (SIDE MODULE LH [VB-SHORT])	• Side air bag module (LH) circuit is shorted to some power supply circuit.	
DC (SIDE MODULE LH [GND-SHORT])	• Side air bag module (LH) circuit is shorted to ground.	
DD (SIDE MODULE LH [SHORT])	• Side air bag module (LH) circuits are shorted to each other.	
7A (SIDE MODULE RH [OPEN])	• Side air bag module (RH) circuit is open.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace side air bag module (RH). (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit.
7B (SIDE MODULE RH [VB-SHORT])	• Side air bag module (RH) circuit is shorted to some power supply circuit.	
7C (SIDE MODULE RH [GND-SHORT])	• Side air bag module (RH) circuit is shorted to ground.	
7D (SIDE MODULE RH [SHORT])	• Side air bag module (RH) circuits are shorted to each other.	
91, 92 (SATELLITE SENS LH [UNIT FAIL]) 93 (SATELLITE SENS LH [COMM FAIL])	• Satellite sensor (LH)	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace the satellite sensor (LH). 4. Replace the diagnosis sensor unit.
81, 82 (SATELLITE SENS RH [UNIT FAIL]) 83 (SATELLITE SENS RH [COMM FAIL])	• Satellite sensor (RH)	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace the satellite sensor (RH). 4. Replace the diagnosis sensor unit.

Self-diagnosis (Cont'd)



DIAGNOSTIC PROCEDURE 3 (without CONSULT)

Inspecting SRS malfunctioning parts by using "AIR BAG" warning lamp — Diagnosis mode

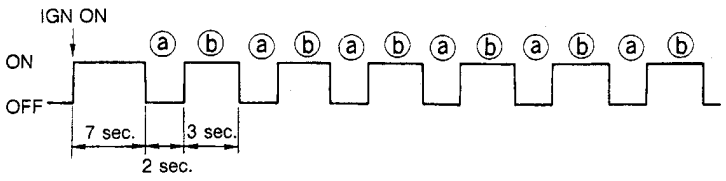
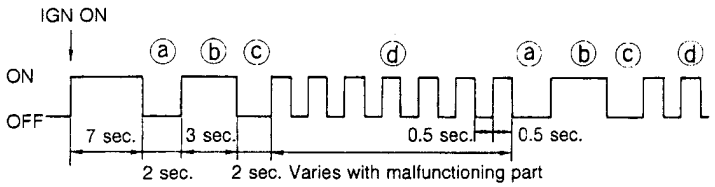
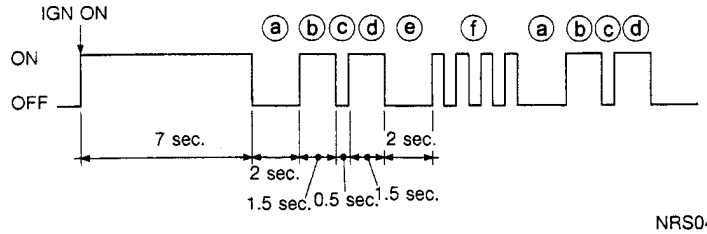
NOTE:

SRS will not enter Diagnosis mode if no malfunction is detected in User mode.

1. Open driver's door.
2. Turn ignition switch from the "LOCK" to the "ON" position.
3. Press driver's door switch at least 5 times within 7 seconds after turning ignition switch to the "ON" position.
   SRS is now in Diagnosis mode.
4. "AIR BAG" warning lamp operates in diagnosis mode as follows:

NOTE:

If SRS does not enter Diagnosis mode even though malfunction is detected in User mode, go to DIAGNOSTIC PROCEDURE 10, page RS-40.

No.	"AIR BAG" warning lamp operation — Diagnosis mode —		SRS condition
1	 MRS100A	ⓐ through ⓑ are repeated.	Intermittent problem has been detected in the past. Go to DIAGNOSTIC PROCEDURE 7 (RS-36).
2	 MRS099A	ⓐ through ⓓ are repeated. NOTE: ⓐ — Interval I ⓑ — Start signal (Start signal identifies display modes) ⓒ — Interval II ⓓ — Indicates malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	The system has problem and needs to be repaired.
3	 NRS042	ⓐ through ⓕ are repeated. NOTE: ⓑ ⓒ, ⓓ — Side air bag marker (For identifying side air bag malfunctioning) ⓕ — Indicates malfunctioning part. The number of flash varies with malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	

5. Malfunctioning part is indicated by the number of flashes (part ⓓ or ⓕ). Compare the number of flashes to WARNING LAMP FLASH CODE CHART, page RS-2020, and locate malfunctioning part.
6. Turn ignition switch to the "LOCK" position, and disconnect both battery cables.

Self-diagnosis (Cont'd)

7. Repair the system as outlined by the "Repair order" in WARNING LAMP FLASH CODE CHART that corresponds to the flash code. For replacement procedure of component parts, refer to Maintenance items, page RS-2007.
8. After repairing the system, conduct DIAGNOSTIC PROCEDURE 5, page RS-2021.

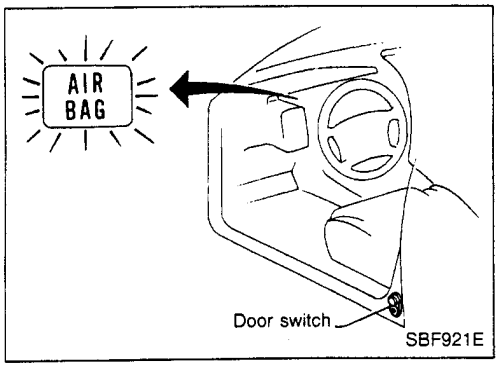
AIR BAG WARNING LAMP FLASH CODE CHART

Warning lamp	# of flashes	Explanation	Repair order *Recheck SRS at each replacement.
"AIR BAG" warning lamp	0	• No malfunction is detected.	—
	2 (Flash code ⓓ)	• The driver's air bag module circuit is malfunctioning.	1. Visually check the wiring harness connections. 2. Replace the spiral cable. 3. Replace the driver's air bag module. (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit. 5. Replace the air bag harness.
	7 (Flash code ⓓ)	• The diagnosis sensor unit is malfunctioning.	1. Visually check the wiring harness connections. 2. Replace the diagnosis sensor unit. 3. Replace the air bag harness. 4. Replace the main harness.
	8 (Flash code ⓓ)	• The front passenger air bag module circuit is malfunctioning.	1. Visually check the wiring harness connections. 2. Replace the front passenger air bag module. (Before disposal, it must be deployed.) 3. Replace the diagnosis sensor unit. 4. Replace the air bag harness.
	1 (Flash code ⓕ)	• The side air bag module (RH) circuit is malfunctioning.	1. Visually check the wiring harness connections. 2. Replace the air bag harness. 3. Replace side air bag module (RH). (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit.
	2 (Flash code ⓕ)	• The side air bag module (LH) circuit is malfunctioning.	1. Visually check the wiring harness connections. 2. Replace the air bag harness. 3. Replace side air bag module (LH). (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit.
	3 (Flash code ⓕ)	• The satellite sensor (RH) is malfunctioning.	1. Visually check the wiring harness connections. 2. Replace the air bag harness. 3. Replace the satellite sensor (RH). 4. Replace the diagnosis sensor unit.
	4 (Flash code ⓕ)	• The satellite sensor (LH) is malfunctioning.	1. Visually check the wiring harness connections. 2. Replace the air bag harness. 3. Replace the satellite sensor (LH). 4. Replace the diagnosis sensor unit.

* Follow the procedures in numerical order when repairing malfunctioning parts. Confirm whether malfunction is eliminated using the air bag warning lamp (in user mode) or CONSULT each time repair is finished. If malfunction is still observed, proceed to the next step. When malfunction is eliminated, further repair work is not required.

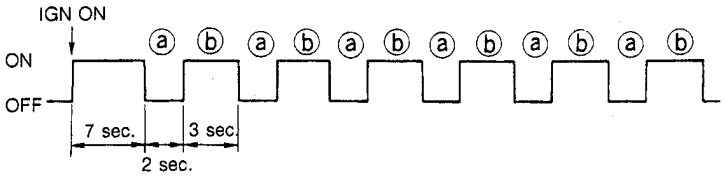
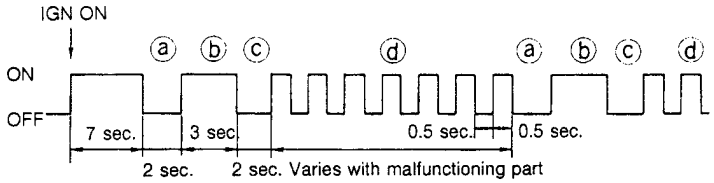
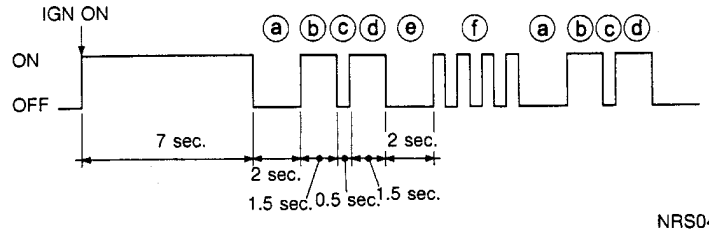
Self-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE 5 (without CONSULT)



Final checking after repairing SRS by using "AIR BAG" warning lamp — Diagnosis mode and User mode

1. After repairing SRS connect both battery cables.
2. Open driver's door.
3. Turn ignition switch from the "LOCK" to the "ON" position.
4. Press driver's door switch at least 5 times within 7 seconds after turning ignition switch "ON".
   SRS is now in Diagnosis mode.
5. "AIR BAG" warning lamp operates in Diagnosis mode as follows:

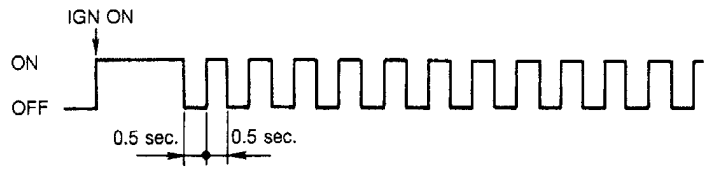
No.	"AIR BAG" warning lamp operation — Diagnosis mode —		SRS condition
1	 MRS100A	ⓐ through ⓑ are repeated.	No current malfunction is detected or repair is completed. No further action is necessary.
2	 MRS099A	ⓐ through ⓓ are repeated. NOTE: ⓐ — Interval I ⓑ — Start signal (Start signal identifies display modes) ⓒ — Interval II ⓓ — Indicates malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	The system has problem and needs to be repaired.
3	 NRS042	ⓐ through ⓕ are repeated. NOTE: ⓑ ⓒ, ⓓ — Side air bag marker (For identifying side air bag malfunctioning) ⓕ — Indicates malfunctioning part. The number of flash varies with malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	

Self-diagnosis (Cont'd)

NOTE:
When diagnosis sensor unit is replaced with a new one, "AIR BAG" warning lamp will operate in the User mode. Checking "AIR BAG" warning lamp operation in Diagnosis mode is not required. Go to step 6.

5. If "AIR BAG" warning lamp operates as shown in No. 1 at the chart on the previous page, turn ignition switch to the "LOCK" position to reset from Diagnostic mode to User mode.
   If "AIR BAG" warning lamp operates as shown in No. 2 at the chart on the previous page, the malfunctioning part is not repaired completely, or another malfunctioning part is detected. Go to DIAGNOSTIC PROCEDURE 3, page RS-2019, and repair malfunctioning part completely.
6. Turn ignition switch to the "ON" position. "AIR BAG" warning lamp operates in User mode. Compare "Air BAG" warning lamp operation to the chart below.

NOTE:
If switching Diagnosis mode to User mode is required while malfunction is being detected, turn ignition switch from "OFF" to "ON". Then press driver's door switch at least 5 times within 7 seconds after turning ignition switch "ON". SRS is now in User mode.

"AIR BAG" warning lamp operation — User mode —	SRS condition	Reference item
MRS095A	No malfunction is detected. No further action is necessary.	—
 MRS096A	The system has problem and needs to be repaired as indicated.	Go to DIAGNOSTIC PROCEDURE 2, or 3 (RS-27, 29 or 2019).
MRS097A	Air bag is deployed.	Go to COLLISION DIAGNOSIS (RS-41).
	Fuse for diagnosis sensor unit is malfunctioning and needs to be repaired.	Go to DIAGNOSTIC PROCEDURE 8 (RS-39).
MRS098A	Diagnosis sensor unit or "AIR BAG" warning lamp circuit is shorted or open and needs to be repaired.	Go to DIAGNOSTIC PROCEDURE 9 (RS-39).

Self-diagnosis (Cont'd)

INTERMITTENT PROBLEM DIAGNOSTIC CODE CHART

Diagnostic item	Explanation	Repair order Recheck SRS at each replacement.
NO SELF DIAGNOSTIC FAILURE INDICATED.	• No malfunction is detected.	—
DA (SIDE MODULE LH [OPEN])	• Side air bag module (LH) circuit is open.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace side air bag module (LH). (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit.
DB (SIDE MODULE LH [VB-SHORT])	• Side air bag module (LH) circuit is shorted to some power supply circuit.	
DC (SIDE MODULE LH [GND-SHORT])	• Side air bag module (LH) circuit is shorted to ground.	
DD (SIDE MODULE LH [SHORT])	• Side air bag module (LH) circuits are shorted to each other.	
7A (SIDE MODULE RH [OPEN])	• Side air bag module (RH) circuit is open.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace side air bag module (RH). (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit.
7B (SIDE MODULE RH [VB-SHORT])	• Side air bag module (RH) circuit is shorted to some power supply circuit.	
7C (SIDE MODULE RH [GND-SHORT])	• Side air bag module (RH) circuit is shorted to ground.	
7D (SIDE MODULE RH [SHORT])	• Side air bag module (RH) circuits are shorted to each other.	
91, 92 (SATELLITE SENS LH [UNIT FAIL]) 93 (SATELLITE SENS LH [COMM FAIL])	● Satellite sensor (LH)	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace the satellite sensor (LH). 4. Replace the diagnosis sensor unit.
81, 82 (SATELLITE SENS RH [UNIT FAIL]) 83 (SATELLITE SENS RH [COMM FAIL])	● Satellite sensor (RH)	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace the satellite sensor (RH). 4. Replace the diagnosis sensor unit.

* Follow the procedures in numerical order when repairing malfunctioning parts. Confirm whether malfunction is eliminated using the air bag warning lamp (in user mode) or CONSULT each time repair is finished. If malfunction is still observed, proceed to the next step. When malfunction is eliminated, further repair work is not required.

RESTRAINT SYSTEM

SECTION RS

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SEAT BELTS 3002
Rear Seat Belt 3002
TROUBLE DIAGNOSES — Supplemental Restraint System (SRS) 3004
Wiring Diagram — SRS — 3004

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

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".

Rear Seat Belt

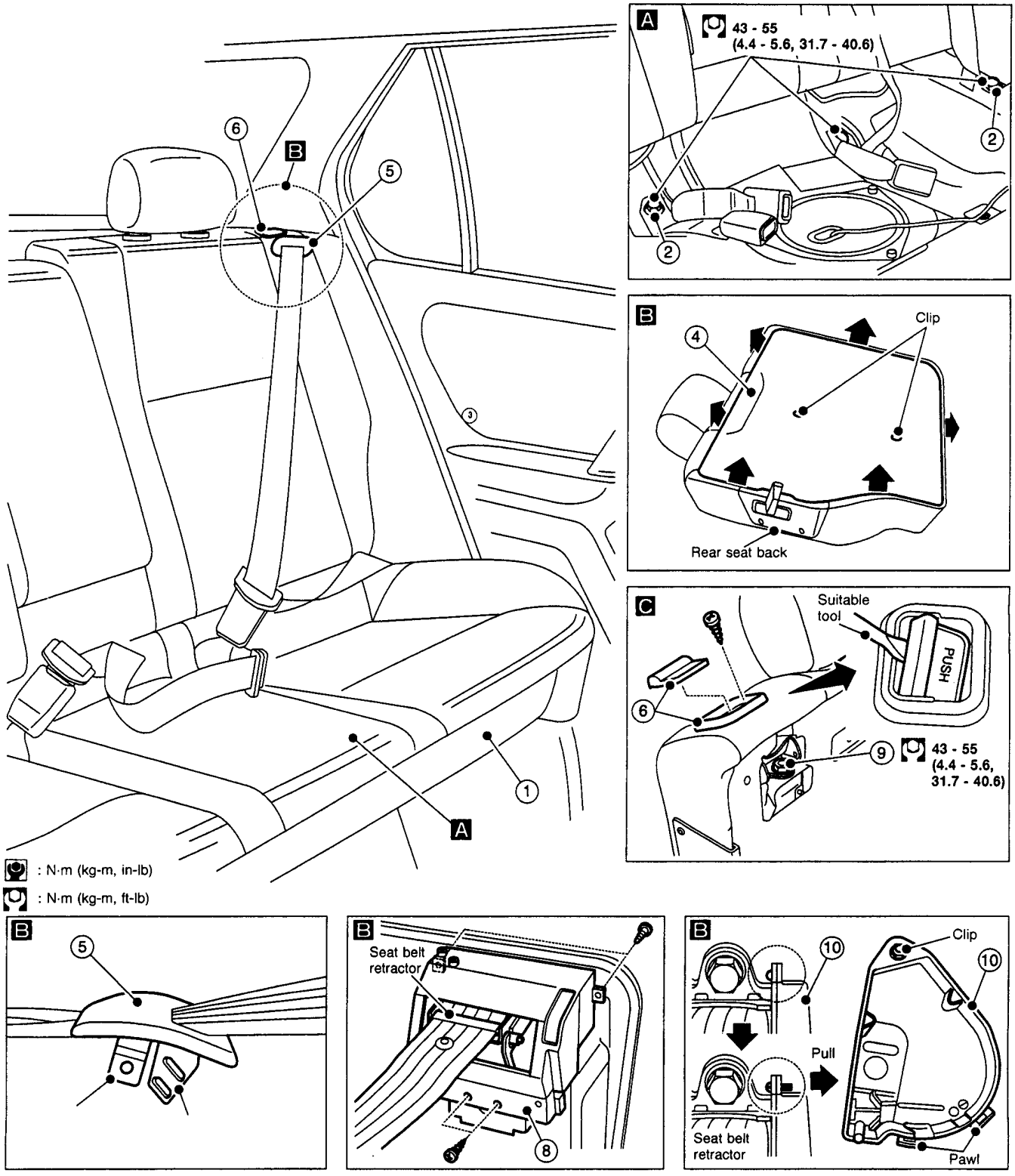
MODELS WITH 2-POINT CENTER SEAT BELT

① Remove rear seat cushion. Refer to "SEAT" in BT-section for details.
② Remove each anchor bolt.
③ Fold down rear seat back.
④ Remove rear seat back carpet and clips.
⑤ Remove seat belt retractor escutcheon.
⑥ Unclip rear seat back lock release button then remove the lock release escutcheon.
⑦ Remove fabric covering portion of the seat belt retractor.
⑧ Remove the seat belt retractor cover.
⑨ Loosen the seat belt retractor anchor bolt, then remove the seat belt retractor.
⑩ Remove interlock cable end from the seat belt retractor. (If necessary)

MODELS WITH 3-POINT CENTER SEAT BELT

The procedure is same as 2-point center seat belt models.
When removing 3-point center seat belt, the procedure ⑥ should be skipped.

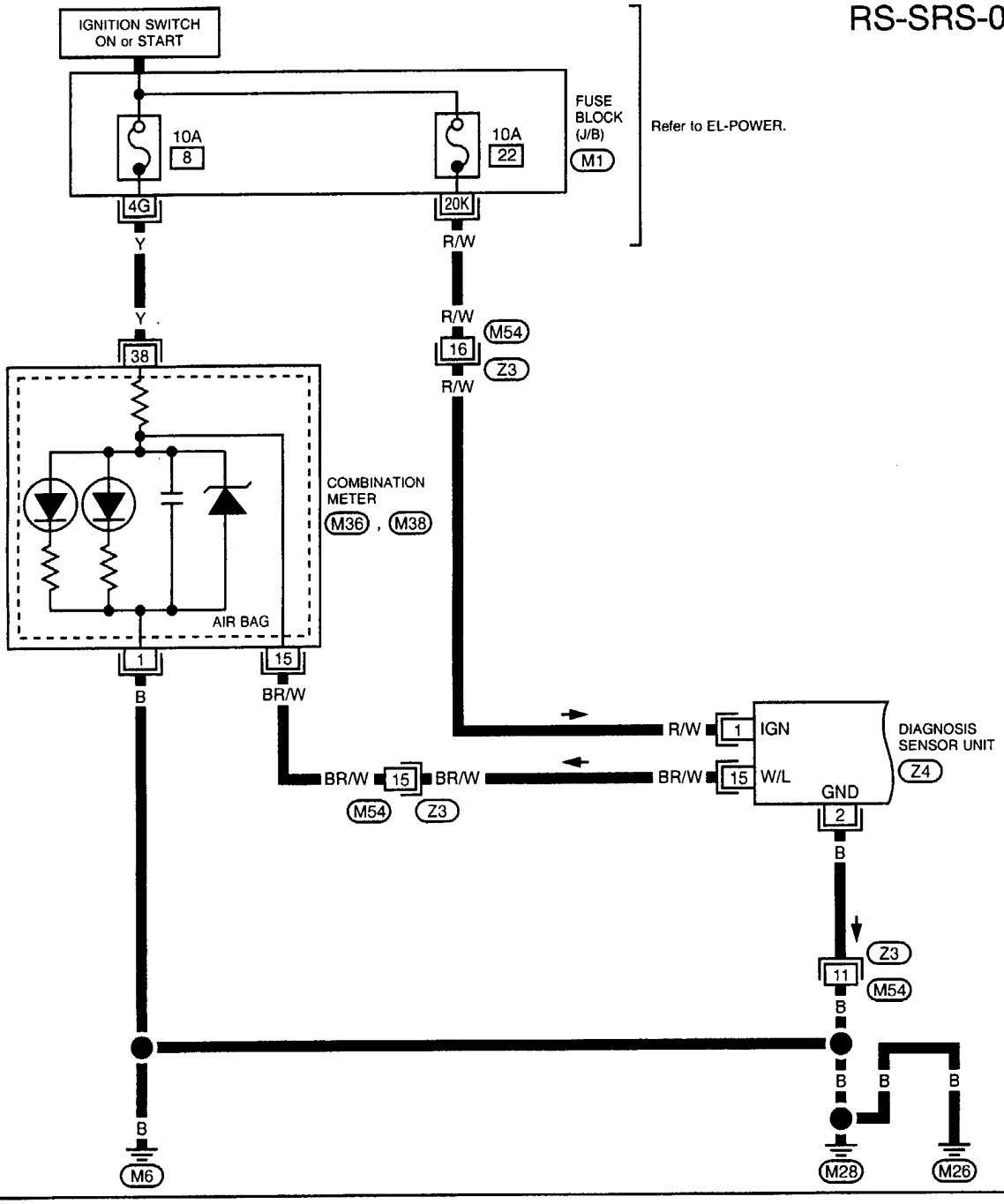
Rear Seat Belt (Cont'd)



NBF290

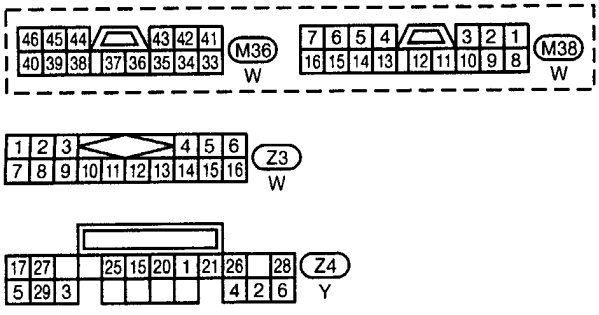
Wiring Diagram — SRS —

RS-SRS-01



Refer to last page (Foldout page).

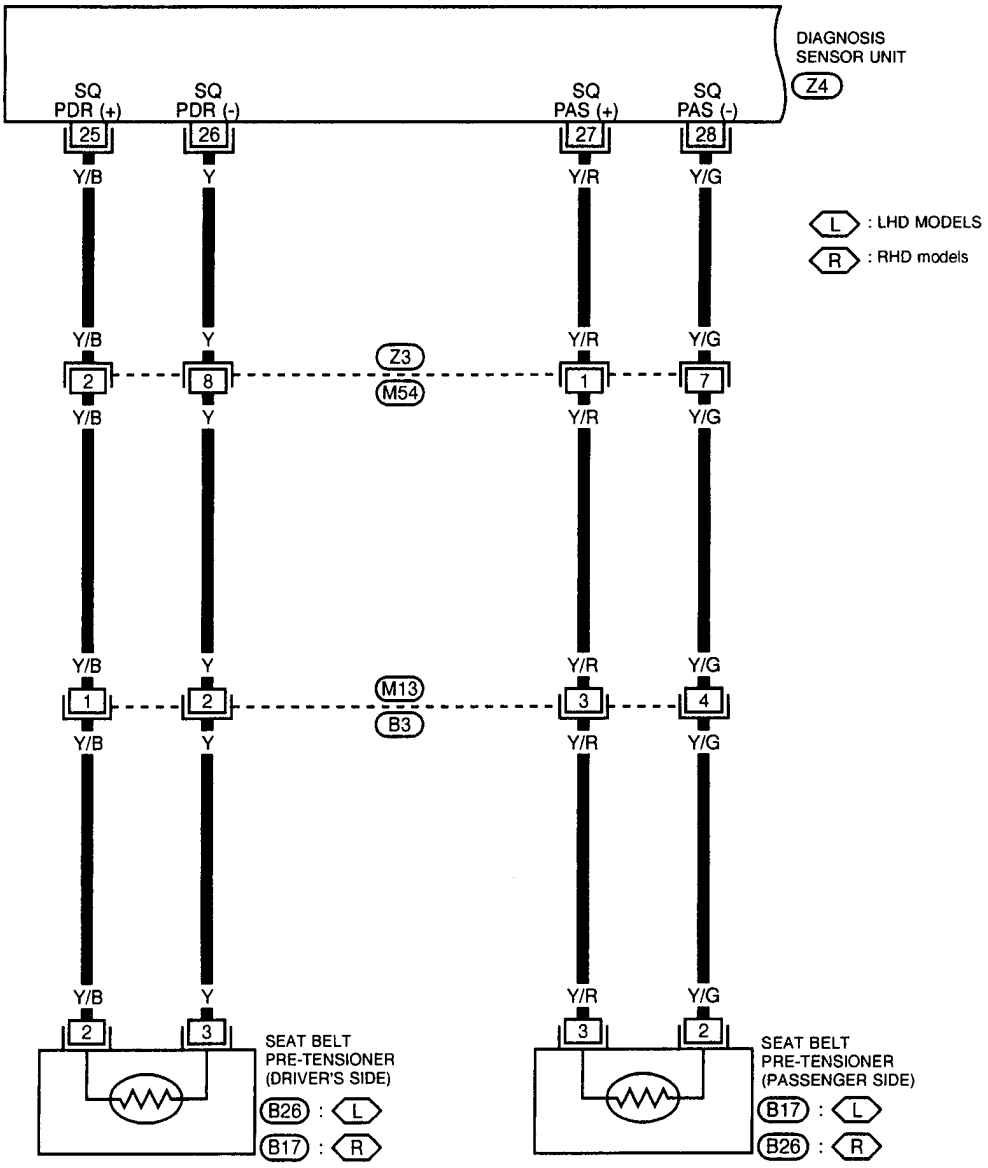
M1

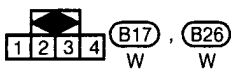


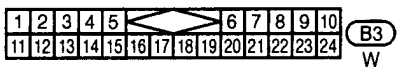
YRS021

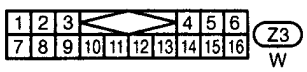
Wiring Diagram — SRS — (Cont'd)

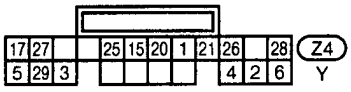
RS-SRS-04











YRS022

RESTRAINT SYSTEM

SECTION RS

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<COMBINED EDITION>

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When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

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".

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.

WARNING:

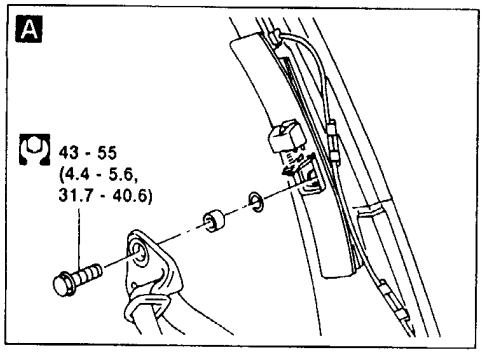
- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death (in the event of a collision which would result in air bag inflation), all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual. SRS wiring harnesses are covered with yellow insulation (either just before the harness connectors or for the complete harness), for easy identification.**

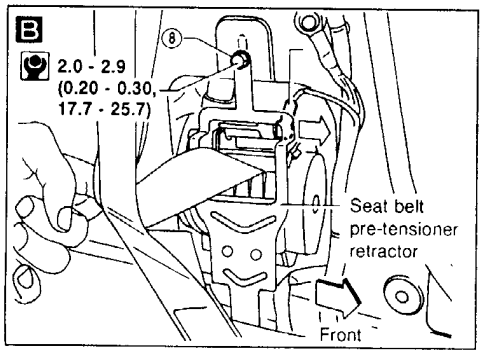
CAUTION:

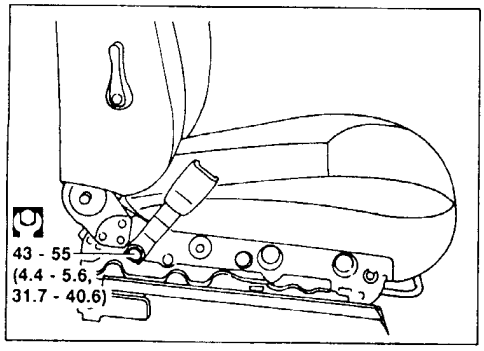
- **Before removing the seat belt assembly, turn the ignition switch off, disconnect both battery cables and wait at least 10 minutes.**
- **Do not disassemble buckle or seat belt assembly.**
- **Replace anchor bolts if they are deformed or worn out.**
- **Never oil tongue and buckle.**
- **If any component of seat belt assembly or buckle is questionable, do not repair. Replace the whole seat belt or buckle assembly.**
- **If webbing is cut, frayed, or damaged, replace seat belt assembly.**
- **When replacing seat belt assembly, use a genuine seat belt assembly.**
- **After any collision, inspect all seat belt assemblies, including retractors and all associated components (i.e., guide rail set).**

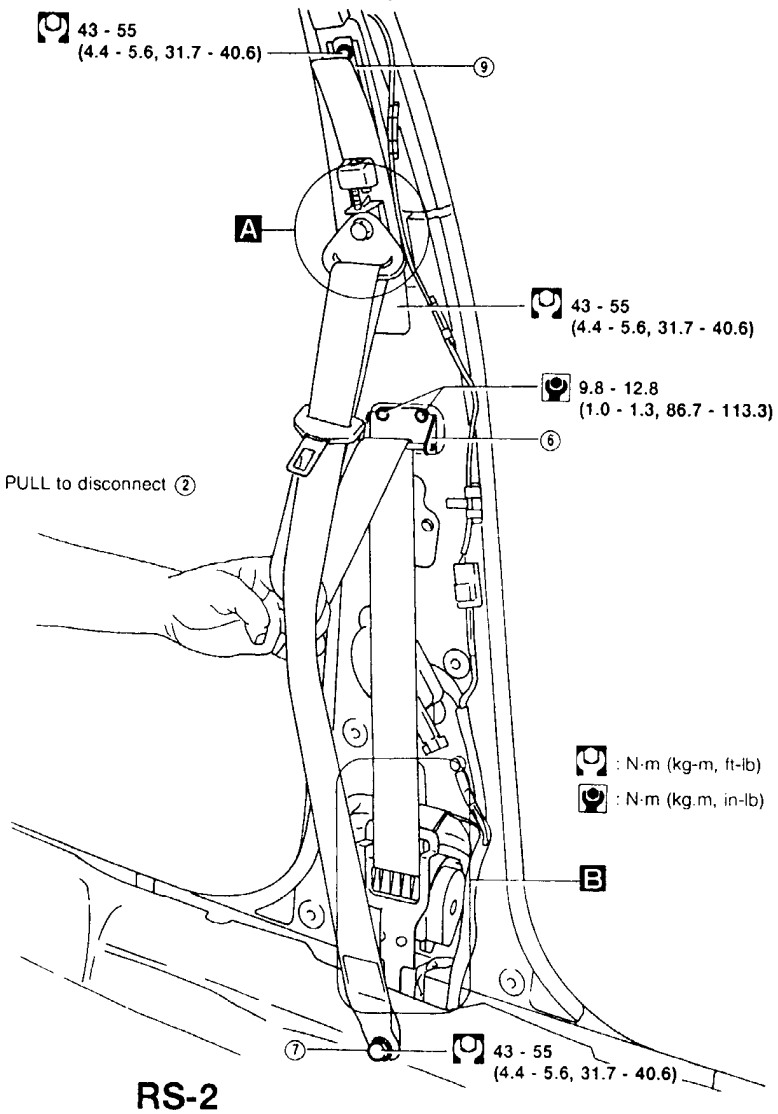
Front Seat Belt

① Remove center pillar lower garnish. Refer to "INTERIOR TRIM" in BT section for details.
② Disconnect seat belt pre-tensioner subharness connector from the main harness.
③ Remove the cover of the shoulder adjustment.
④ Remove the seat belt from the shoulder adjuster.
⑤ Remove center pillar upper garnish. Refer to "INTERIOR TRIM" in BT section for details.
⑥ Remove bolts securing sash guide, then remove sash guide.
⑦ Remove the seat belt pre-tensioner retractor anchor bolt.
⑧ Remove the screw securing seat belt pre-tensioner retractor, then remove seat belt and seat belt pre-tensioner retractor.
⑨ Remove shoulder adjustment, taking care not to damage plastic garnish.





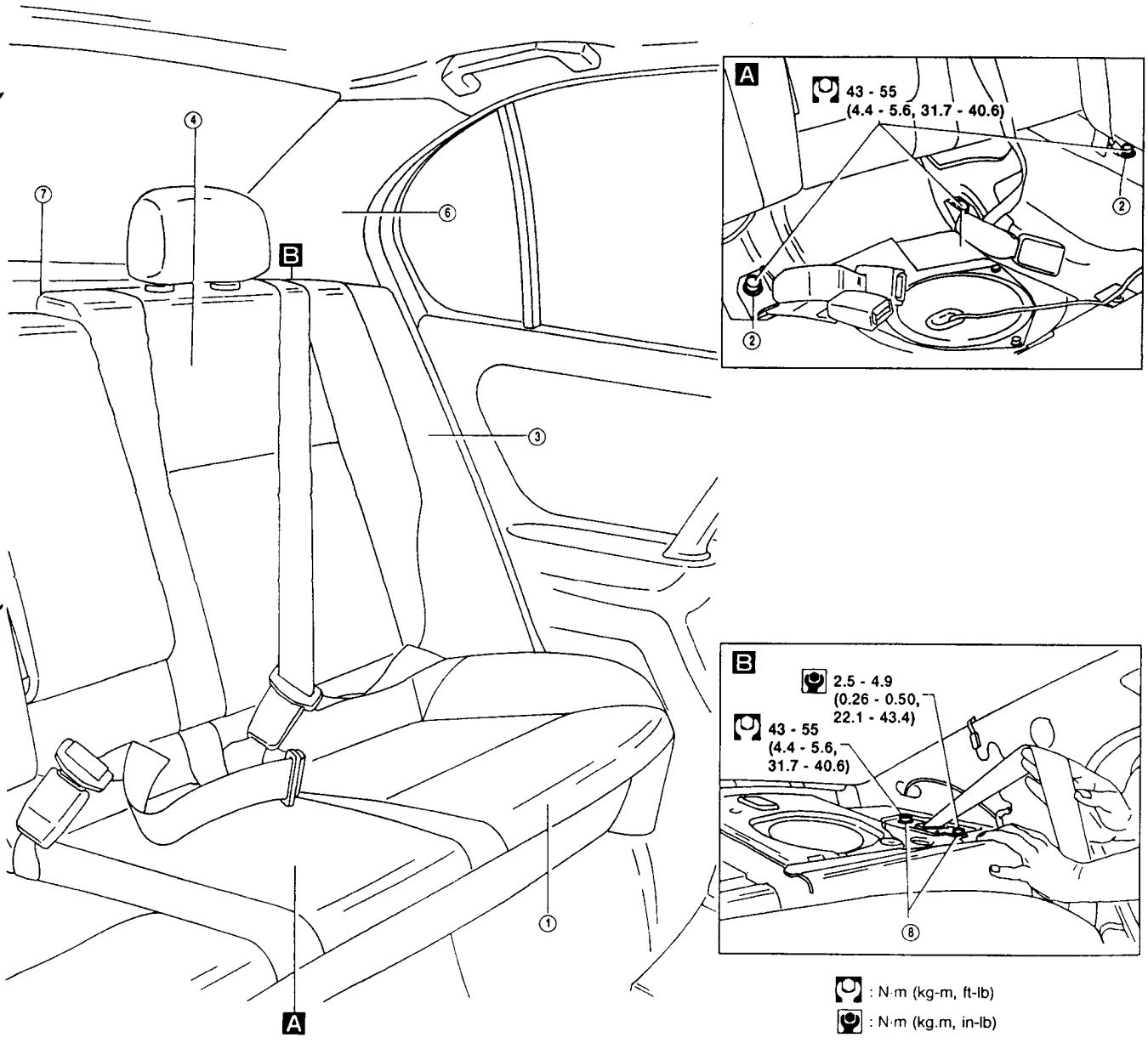




Rear Seat Belt (4-door models)

MODELS WITH 2-POINT CENTER SEAT BELT

① Remove rear seat cushion. Refer to "SEAT" in BT-section for details.
② Remove each anchor bolt.
③ Remove both sides of the back of the seat.
④ Fold down rear seat.
⑤ Remove high mounted stop lamp from parcel shelf (where fitted).
⑥ Remove rear pillar garnish.
⑦ Remove the parcel shelf.
⑧ Remove the bolts securing the left and right seat belt retractor.



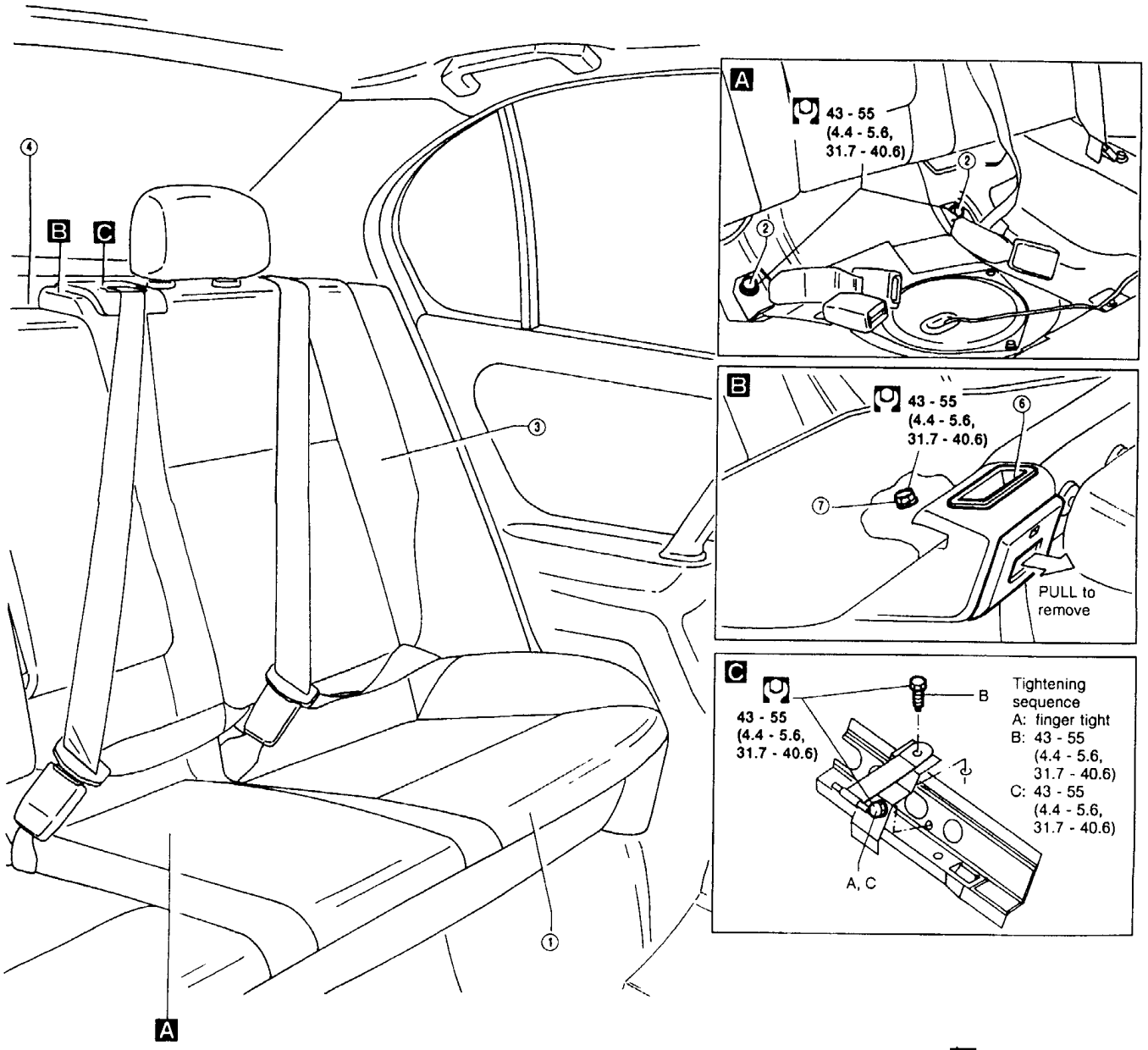
NRS002

Rear Seat Belt (4-door models) (Cont'd)

MODELS WITH 3-POINT CENTER SEAT BELT:

For outboard seat belts refer to "models with 2 point center seat belt"

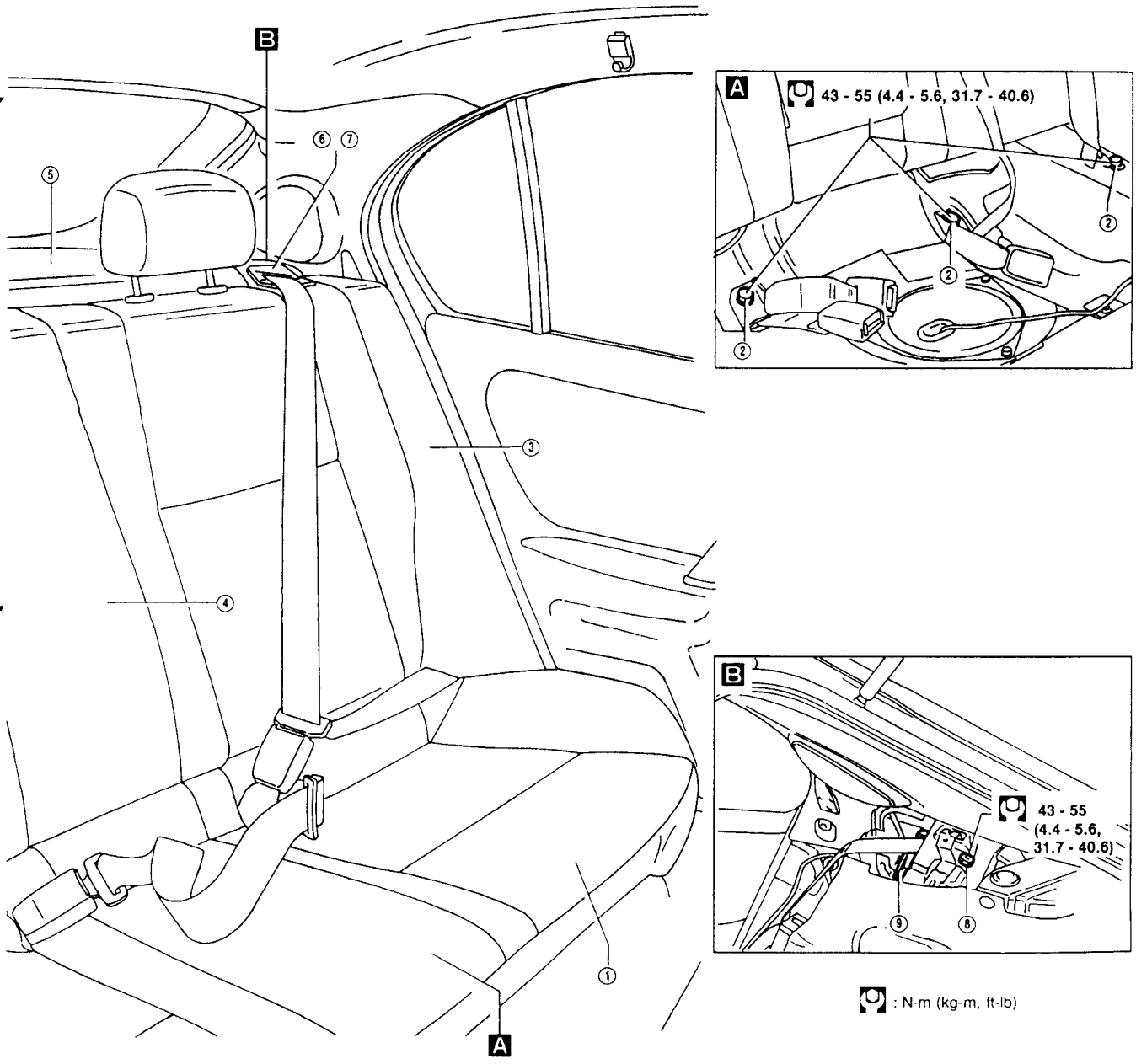
① Remove rear seat cushion. Refer to "SEAT" in BT-section for details.
② Remove anchor bolts.
③ Fold down LH-side backrest.
④ Remove finisher located behind the armrest (where fitted).
⑤ Remove trim on the rearside of the backrest.
⑥ Remove finisher.
⑦ Remove anchor bolt.
⑧ Pull the retractor out of the backrest.



NRS003

Rear Seat Belt (5-door models)

① Remove rear seat cushion. Refer to "SEAT" in BT-section for details.
② Remove anchor bolts.
③ Remove side cushion.
④ Fold down rear seat.
⑤ Remove parcel shelf.
⑥ Remove side trim (1 screw).
⑦ Remove side garnish (5 screws).
⑧ Remove anchor bolts.
⑨ Remove retractor.
⑩ Remove the belt through the side trim.

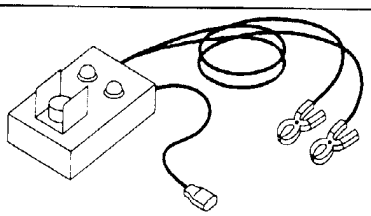
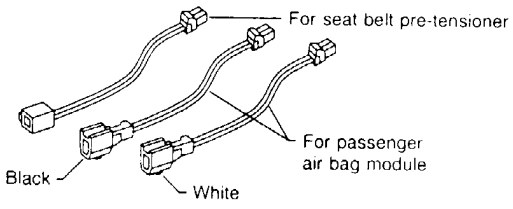
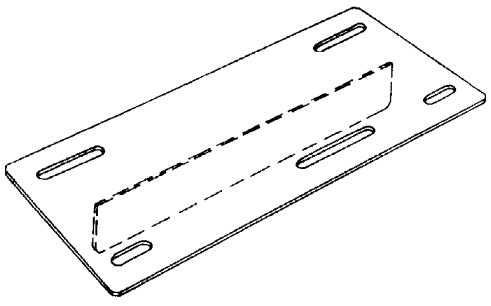
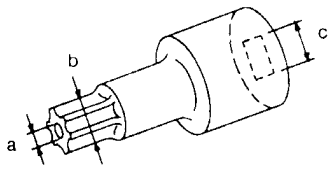


NRS004

Precautions for SRS "Air Bag" and "Seat Belt Pre-tensioner" Service

- Do not use a circuit tester to check SRS circuits unless instructed to do so in this Service Manual.
- Before servicing the SRS, turn ignition switch to " LOCK" position, disconnect both battery cables and wait at least 3 minutes.
  For approximately 3 minutes after the cables are removed, it is still possible for the air bag and seat belt pre-tensioner to deploy. Therefore, do not work on any SRS connectors or wires until at least 10 minutes have passed.
- Diagnosis sensor unit must always be installed with their arrow marks "◇" pointing towards the front of the vehicle for proper operation. Also check diagnosis sensor unit for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place it with the pad side facing upward.
- Do not use old bolts after removing any SRS parts; replace with new ones. Conduct self-diagnosis to check entire SRS for correct operation.
- After air bag inflates, the front instrument panel assembly should be replaced if damaged.

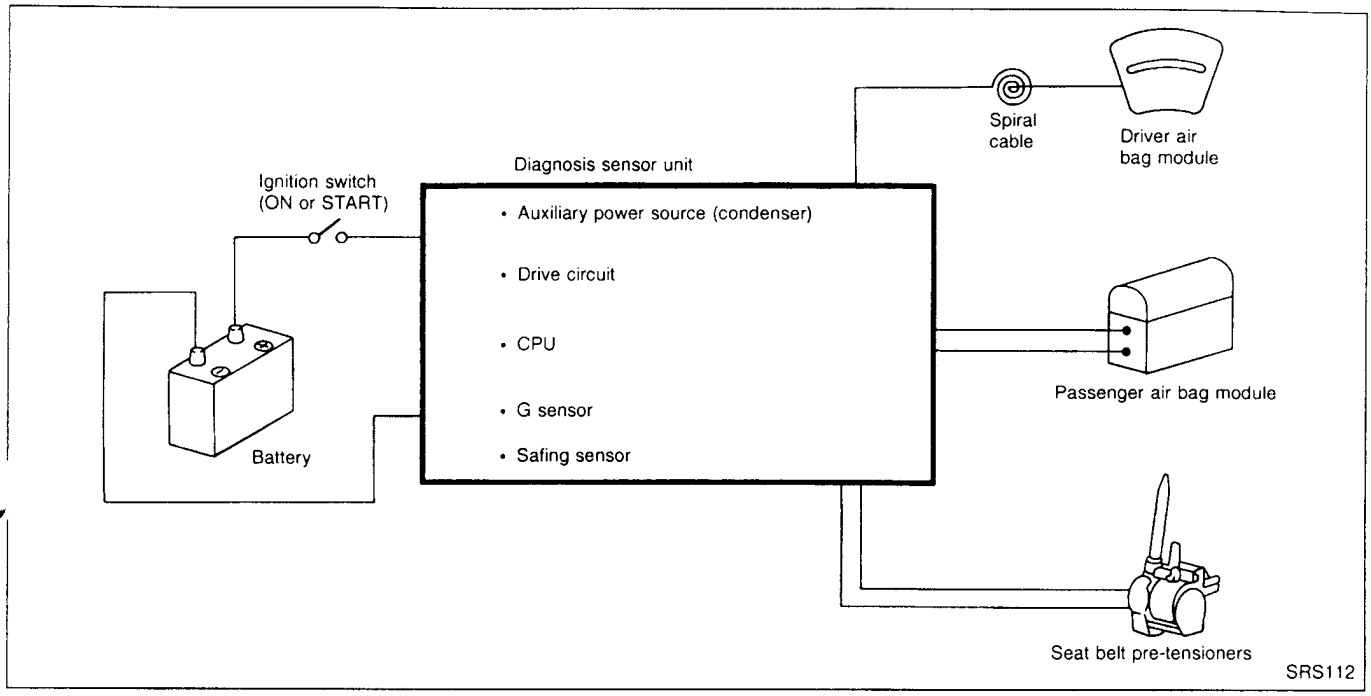
Special Service Tools

Tool number Tool name	Description
KV991072S0 Air bag deployment kit KV99106400 Deployment tool	Disposing of air bag module  NT357
KV991065S0 and KV999R0040 Deployment tool adapters	 NT353
KV99105300 Air bag module bracket	Anchoring air bag module  NRS016
HT61961000 and HT62152000 combined *Special torx bit	Use for special bolts [TAMPER RESISTANT TORX (Size T50)]  **a: 3.5 (0.138) dia.** **b: 8.5 - 8.6 (0.335 - 0.339) dia.** **c: approx. 10 (0.39) sq.** NT361 Unit: mm (in)

*: Special tool or commercial equivalent

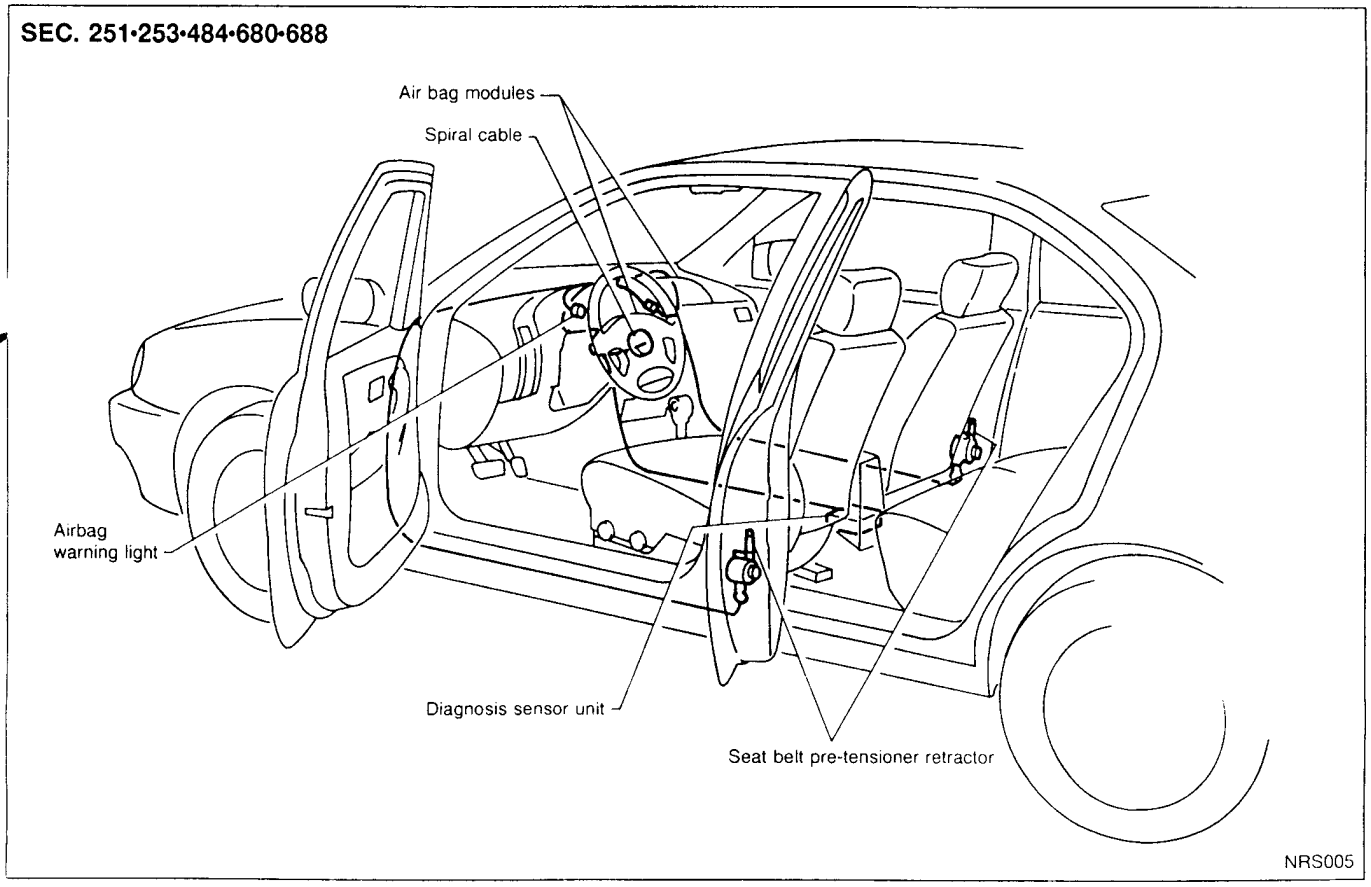
Description

The air bag and seat belt pre-tensioner deploy if the diagnosis sensor unit activates while the ignition switch is in "ON" or "START" position.



SRS Component Parts Location

SEC. 251•253•484•680•688



Maintenance Items

1. Check operation of "AIR BAG" warning lamp.
   After turning ignition key to "ON" position, the "AIR BAG" warning lamp illuminates. The "AIR BAG" warning lamp will go off after about 7 seconds if no malfunction is detected.
   If any of the following warning lamp conditions occurs, immediately check the air bag system. Refer to RS-26 for details.
- The "AIR BAG" warning lamp does not illuminate when the ignition switch is turned "ON".
- The "AIR BAG" warning lamp does not go off about 7 seconds after the ignition switch is turned "ON".
- The "AIR BAG" warning lamp goes off about 7 seconds after the ignition switch is turned "ON", but comes on again or flashes.

2. Visually check SRS components

(1) Diagnosis sensor unit
- Check diagnosis sensor unit and bracket for dents, cracks or deformities.
- Check connectors for damage, and terminals for deformities.

(2) Air bag module and steering wheel
- Remove air bag module from steering wheel or instrument panel. Check harness cover and connectors for damage, terminals for deformities, and harness for binding.
- Install driver side air bag module to steering wheel to check fit and alignment with the wheel.
- Check steering wheel for excessive free play (Refer to ST-section).
- Install passenger side air bag module to instrument panel to check fit and alignment with the instrument panel.

(3) Spiral cable
- Check spiral cable for dents, cracks, or deformities.
- Check connectors and protective tape for damage.
- Check steering wheel for noise, binding or heavy operation.

(4) Main harness and air bag harness
- Check connectors for poor connections, damage, and terminals for deformities.
- Check harnesses for binding, chafing or cuts.

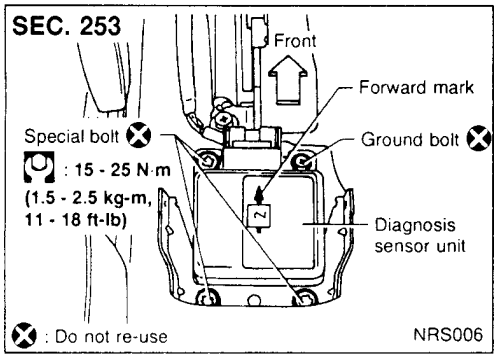
CAUTION:
Replace previously used screws with new ones.

(5) Seat belt pre-tensioner
- Check harness and connectors for damage, terminals for deformities, and harness for binding.
- Check belts for damage and anchors for loose mounting.
- Check retractor for smooth operation.
- Perform self-diagnosis for seat belt pre-tensioner using CONSULT. Refer to "Self-diagnosis" for details. (RS-26)

Removal and Installation — Diagnosis Sensor Unit and Seat Belt Pre-tensioner

CAUTION:

- Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait at least 10 minutes.
- The special bolts are coated with bonding agent while the other bolt is for ground. Do not use old bolts after removal; replace with new ones.
- Check diagnosis sensor unit for proper installation.
- Check diagnosis sensor unit to ensure it is free of deformities, dents, cracks or rust. If it shows any visible signs of damage, replace it with a new one.
- Check diagnosis sensor unit brackets to ensure they are free of deformities or rust.
- Replace diagnosis sensor unit and/or seat belt pre-tensioner if it has been dropped or sustained an impact.
- Do not attempt to disassemble seat belt pre-tensioner.
- Do not expose seat belt pre-tensioner to temperatures exceeding 80°C (176°F).
- Whenever seat belts (equipped with pre-tensioner) are moved, ensure that cylinder faces down. Do not hold cylinder.

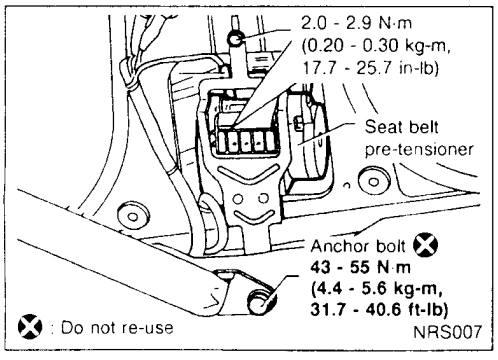


REMOVAL OF DIAGNOSIS SENSOR UNIT

1. Disconnect driver and passenger air bag module connectors. Also, disconnect seat belt pre-tensioner connector.
2. Remove lower instrument center panel. Refer to "INSTRUMENT PANEL" in BT section.
3. Disconnect diagnosis sensor unit connector.
4. Remove ground bolt and also remove special bolts using the TAMPER RESISTANT TORX (Size T50), from diagnosis sensor unit.
   Then remove the diagnosis sensor unit.

NOTE:

- To install, reverse the removal procedure sequence.
- After replacement, perform self-diagnosis for SRS. Refer to "Self-diagnosis" for details. (RS-26)



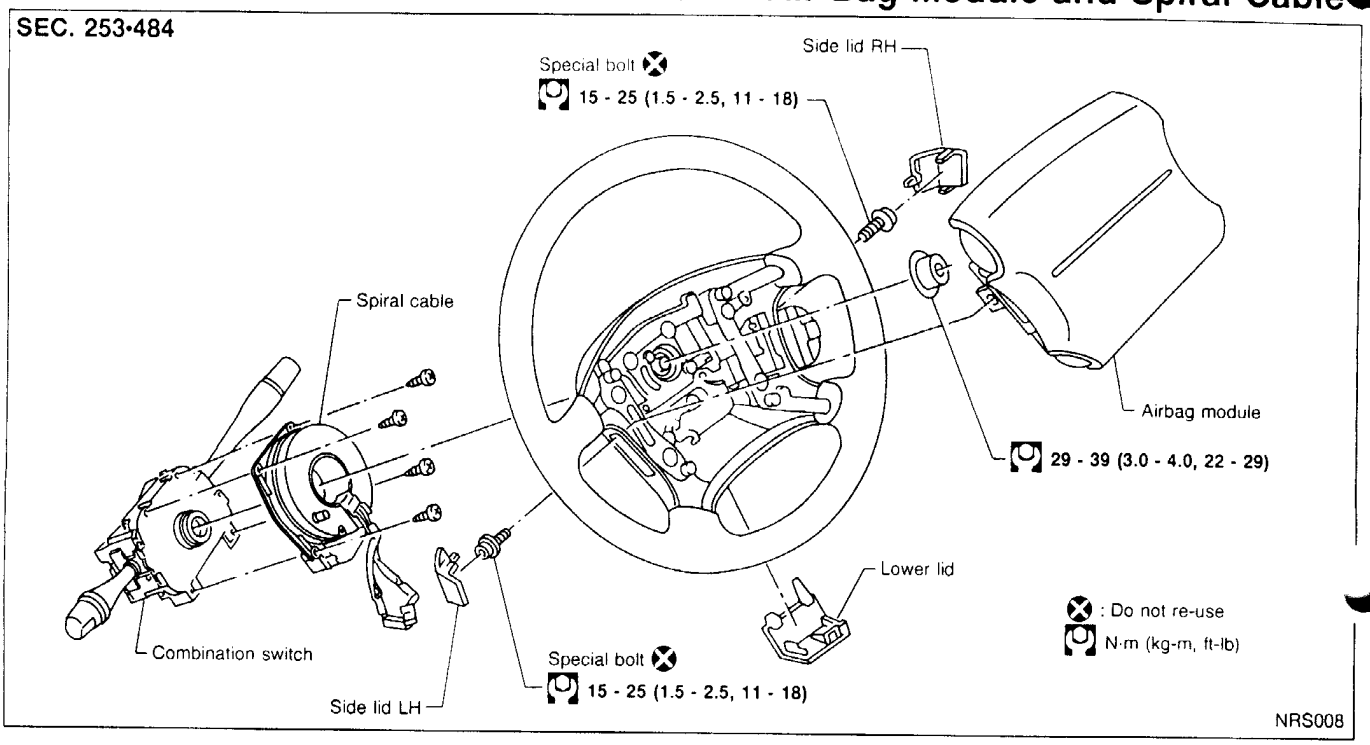
REMOVAL OF SEAT BELT PRE-TENSIONER

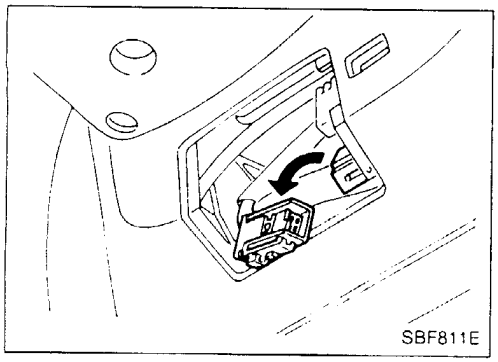
For removal of seat belt pre-tensioner, refer to "Front Seat Belt" for details. (RS-2)

NOTE:

- To install, reverse the removal procedure sequence.
- After replacement, perform self-diagnosis for seat belt pre-tensioner. Refer to "Self-diagnosis" for details. (RS-26)

Removal — Air Bag Module and Spiral Cable

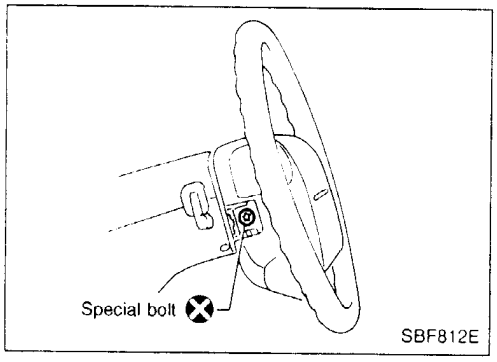




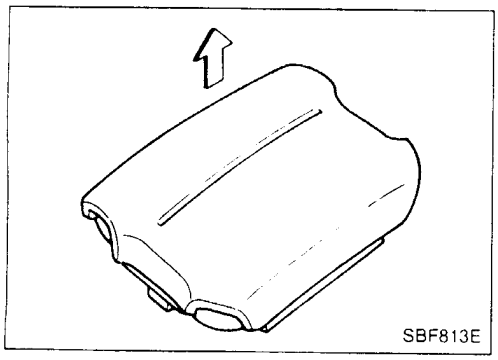
CAUTION:

- **Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait for at least 10 minutes.**
- **Always work from the side of air bag module.**

1. Remove lower lid from steering wheel, and disconnect air bag module connector.



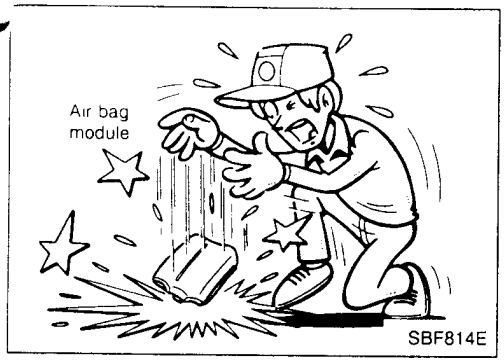
2. Remove side lid. Using the TAMPER RESISTANT TORX (Size T50), remove left and right special bolts. Air bag module can then be removed.



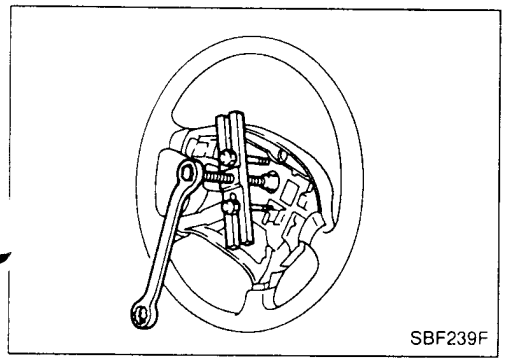
CAUTION:

- **Always place air bag module with pad side facing upward.**
- **Do not attempt to disassemble air bag module.**
- **The special bolts are coated with bonding agent. Do not use old bolts after removal; replace with new ones.**

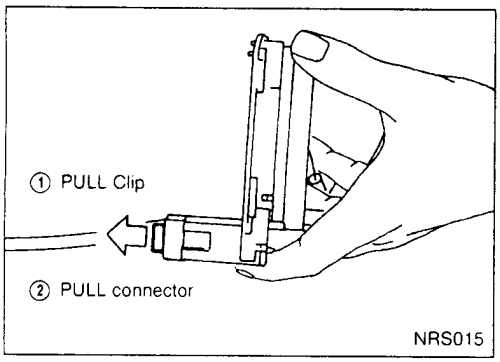
Removal — Air Bag Module and Spiral Cable (Cont'd)



- **Replace air bag module if it has been dropped or sustained an impact.**
- **Do not expose the air bag module to temperatures exceeding 90°C (194°F).**
- **Do not allow oil, grease or water to come in contact with the air bag module.**



3. Set steering wheel in the neutral position, with the front wheels straight ahead.
4. Disconnect horn connector and remove nut.
5. Using steering wheel puller, remove steering wheel. Be careful not to over-tighten puller bolt on steering wheel.
6. Remove steering column cover.



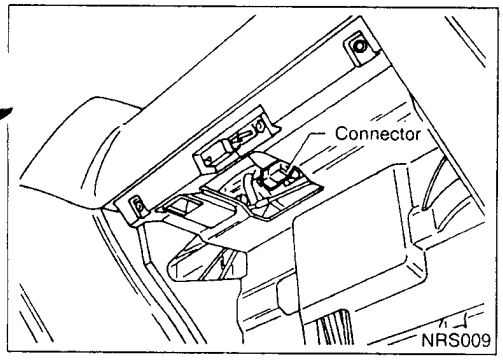
7. Disconnect connector and remove the four screws. The spiral cable can then be removed.

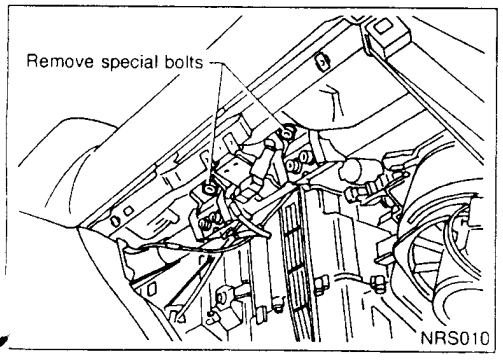
Removal — Front Passenger Air Bag Module

CAUTION:

- **Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait for at least 10 minutes.**
- **Always work from the side of or under air bag module.**

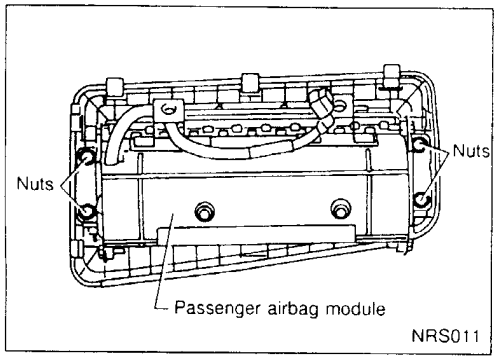
1. Remove glove box.
2. Disconnect inflator connector.





3. Remove lower instrument panel.
4. Remove upper special bolts, as indicated.

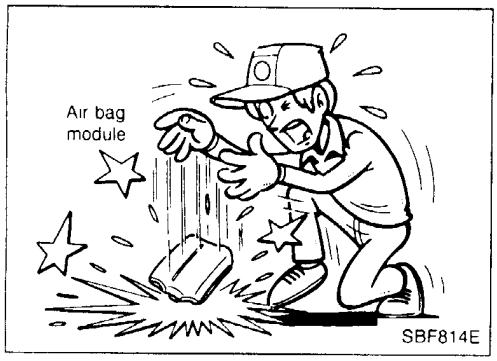
Removal — Front Passenger Air Bag Module (Cont'd)



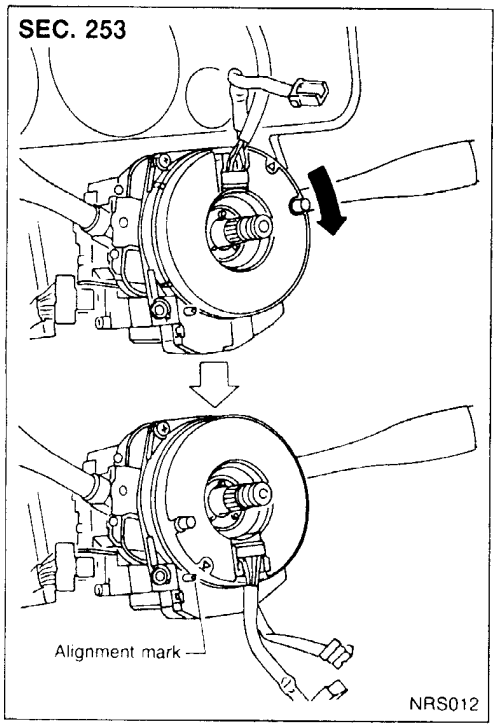
5. Remove nuts holding the passenger air bag module to the instrument panel.
6. Remove the passenger air bag module.

CAUTION:

- **Always place air bag module with pad side facing sideward.**
- **Do not attempt to disassemble air bag module.**
- **The special bolts are coated with bonding agent. Do not use old bolts after removal; replace with new coated bolts.**



- **Replace air bag module if it has been dropped or sustained an impact.**
- **After air bag inflates, the front instrument panel should be replaced, if damaged.**
- **Do not expose the air bag module to temperatures exceeding 90°C (194°F).**
- **Do not allow oil, grease or water to come in contact with the air bag module.**



Installation — Air Bag Module and Spiral Cable

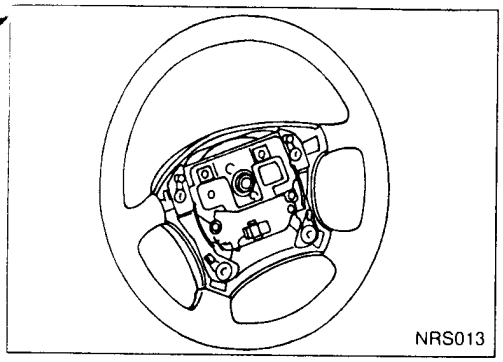
1. Set the front wheels in the straight-ahead position.
2. Turn spiral cable clockwise until resistance is felt. Then, back spiral cable off approximately 2.5 turns until the alignment marks meet as shown.

CAUTION:

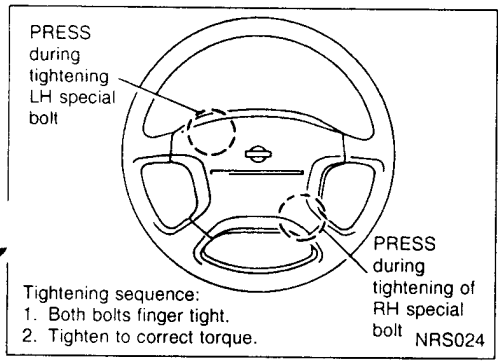
- **The spiral cable may snap during steering operation if the cable is installed incorrectly.**
- **Also, with the steering linkage disconnected, the cable may snap by turning the steering wheel beyond the limited number of turns. (The spiral cable can be turned up to 2.5 turns from the neutral position to both the right and left direction.)**

3. Connect spiral cable connector and install steering column cover.

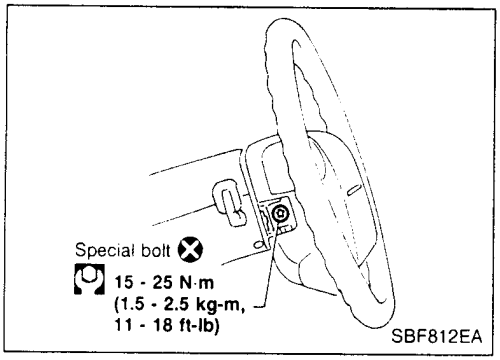
Installation — Air Bag Module and Spiral Cable (Cont'd)



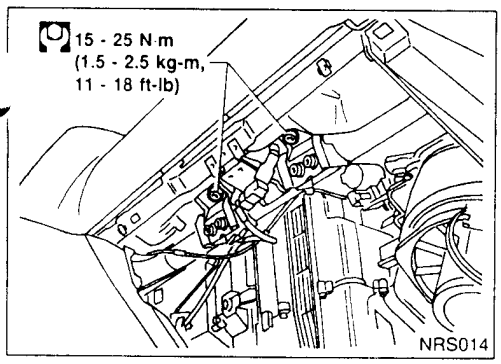
4. Fit steering wheel, align to guide pins, pull spiral cable harnesses through wheel.
5. Connect horn harness and locate spiral cable harnesses in retainers in steering wheel.
6. Tighten nut.
   : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)



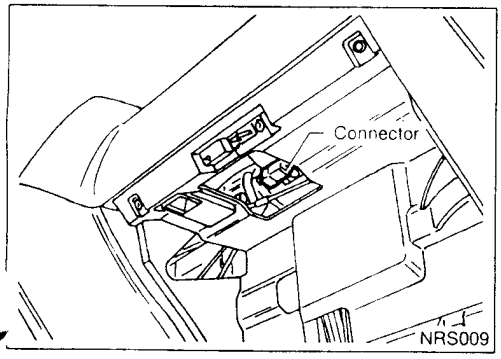
7. Position air bag module and tighten with new special bolts, as shown.
8. Connect air bag module connector.
9. Install all lids.
10. Connect both battery cables.
11. Conduct self-diagnosis to ensure entire SRS operates correctly. (Use CONSULT or warning lamp check.)



Installation — Front Passenger Air Bag Module



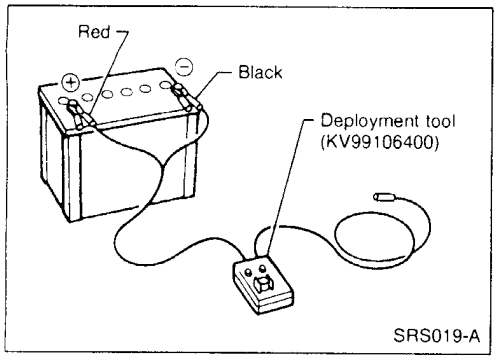
- **Always work from the side of or under air bag module.**
1. Install front passenger air bag module.
- **Ensure harness is not caught between rear of air bag module and steering member.**
2. Install lower instrument panel.



3. Connect air bag module connector.
4. Install glove box.
5. Connect both battery cables.
6. Conduct self-diagnosis to ensure entire SRS operates correctly. (Use CONSULT or warning lamp check). Refer to "Self-diagnosis" for details. (RS-26)

Disposal of Air Bag Module and Seat Belt Pre-tensioner

- Before disposing of air bag module and seat belt pre-tensioner, or vehicles equipped with such systems, deploy the systems. If such systems have already been deployed due to an accident, dispose of as indicated in "DISPOSING OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER" (RS-18).
- When deploying the air bag module and seat belt pre-tensioner, always use the Special Service Tool; Deployment tool KV99106400.
- When deploying the air bag module and seat belt pre-tensioner, stand at least 5 m (16 ft) away from the deployment component.
- Due to heat, leave air bag module unattended for more than 30 minutes after deployment. Also leave seat belt pre-tensioner unattended for more than 10 minutes after deployment.
- Be sure to wear gloves when handling a deployed air bag module and seat belt pre-tensioner.
- Never apply water to a deployed air bag module and seat belt pre-tensioner.
- Wash your hands clean after finishing work.
- If deploying an Air Bag Module or Seat Belt Pre-tensioner while mounted in the vehicle, place the vehicle outdoors with an open space of at least 6 m (20 ft) on all sides.
- Use a voltmeter to make sure the vehicle battery is fully charged.



CHECKING DEPLOYMENT TOOL

Connecting to battery

CAUTION:

The battery must show voltage of 9.6V or more.

Remove the battery from the vehicle and place it on dry wood blocks approximately 5 m (16 ft) away from the vehicle.

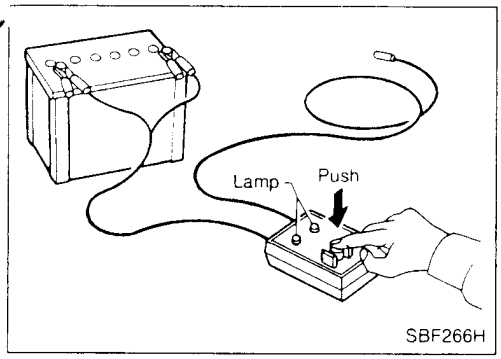
- Wait 10 to 12 minutes after the vehicle battery is disconnected before proceeding.
- Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.

Make sure the polarity is correct. The right side lamp in the tool, marked "deployment tool power", should glow with a green light. If the right side lamp glows red, reverse the connections to the battery.

Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)

Deployment tool check

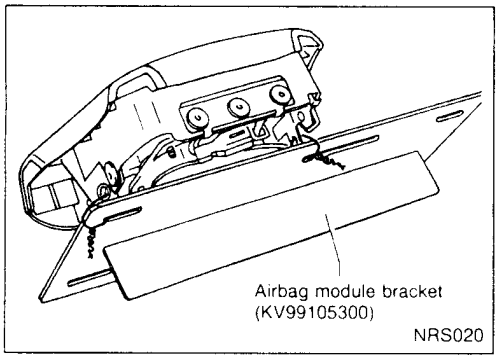
Press the deployment tool switch to the "ON" position. The left side lamp in the tool, marked "air bag connector voltage" should illuminate. If it does not illuminate, replace the tool.



Air bag deployment tool lamp illumination chart (Battery connected)

Switch operation	Left side lamp, green* "AIR BAG CONNECTOR VOLTAGE"	Right side lamp, green* "DEPLOYMENT TOOL POWER"
OFF	OFF	ON
ON	ON	ON

*: If this lamp glows red, the tool is connected to the battery incorrectly. Reverse the connections and make sure the lamp glows green.



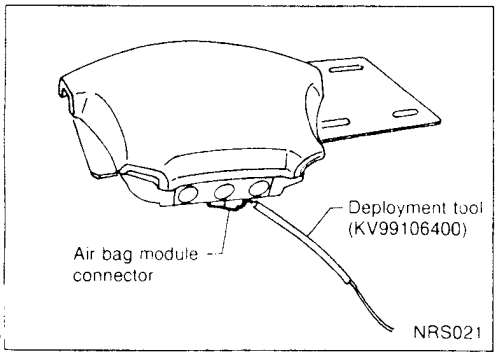
DEPLOYMENT PROCEDURES FOR AIR BAG MODULE AND SEAT BELT PRE-TENSIONER (OUTSIDE OF VEHICLE)

Deploying air bag module and seat belt pre-tensioner while mounted in vehicle may damage the vehicle. Deploy air bag module and seat belt pre-tensioner as a unit outside of the vehicle except when disposing of vehicle.
Anchor air bag module and seat belt pre-tensioner in a vise secured to a firm foundation during deployment.

Deployment of driver air bag module (outside of vehicle)

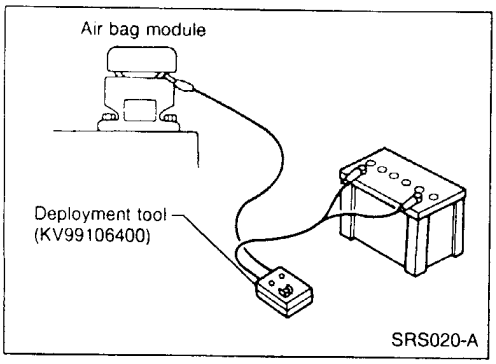
1. Secure the driver air bag module on air bag module bracket (SST: KV99105300), using wire.

CAUTION:
Use wire of at least 1 mm (0.04 in) diameter.



2. Firmly anchor the air bag module bracket in a vise.
3. Connect deployment tool (SST: KV99106400) to the air bag module connector.

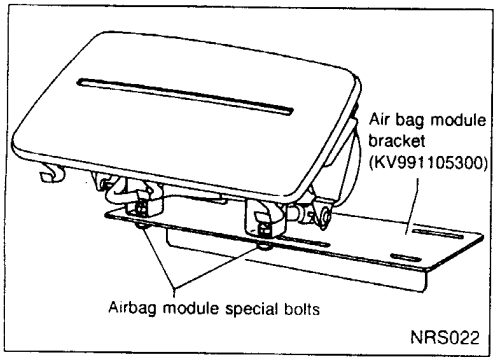
Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)



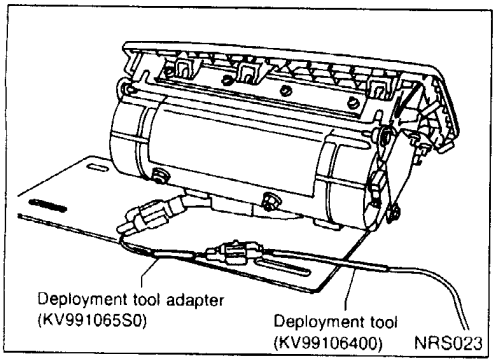
4. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
5. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
6. Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the air bag module will deploy.

CAUTION:
When deploying the air bag module, stand at least 5 m (16 ft) away from the air bag module.

Deployment of passenger air bag module (outside of vehicle)



1. Secure the passenger air bag module on the air bag module bracket (SST: KV99105300), using the modules special bolts.

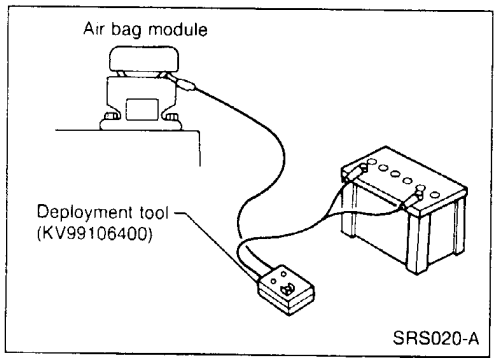


2. Firmly anchor the air bag module bracket in a vise.

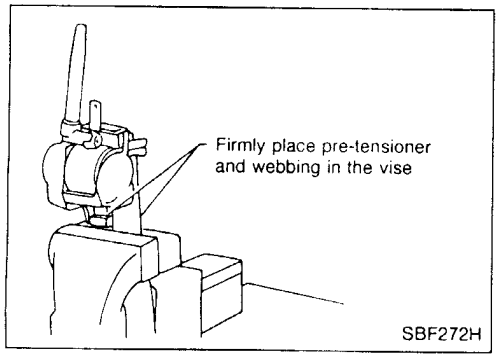
CAUTION:
Make sure the air bag module lid is facing away from you during deployment.

3. Connect deployment tool adapter (SST: KV991065S0-A) to deployment tool (SST: KV99106400) connector and connector of the air bag module.
4. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
5. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
6. Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the air bag module will deploy.

CAUTION:
When deploying the air bag module, stand at least 5 m (16 ft) away from the air bag module. Preferably stand to the side of the module.



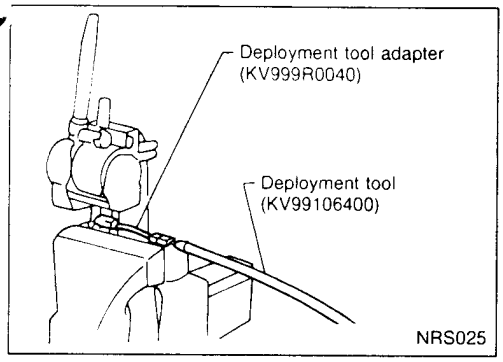
Deployment of seat belt pre-tensioner (outside of vehicle)



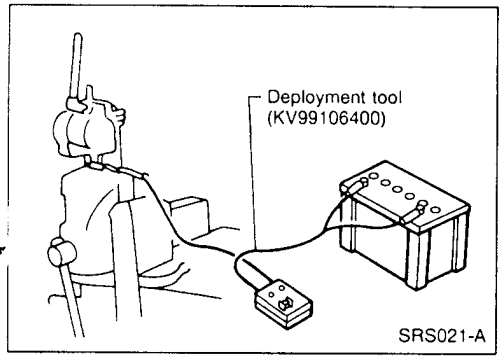
1. Firmly anchor seat belt pre-tensioner in a vise.

CAUTION:
Ensure bracket and webbing are placed in the vise.

Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)

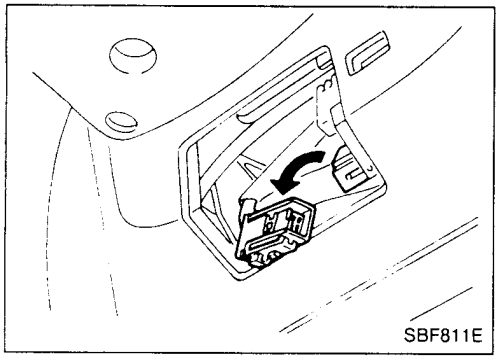


2. Connect deployment tool adapter (SST: KV999R0040) to deployment tool (SST: KV99106400) connector and seat belt pre-tensioner connector.



3. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
4. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
5. Press the button on the deployment tool. The left side lamp on the tool, marked "seat belt pre-tensioner connector voltage", will illuminate and the seat belt pre-tensioner will deploy.

CAUTION:
When deploying the seat belt pre-tensioner, stand at least 5 m (16 ft) away from the seat belt pre-tensioner.

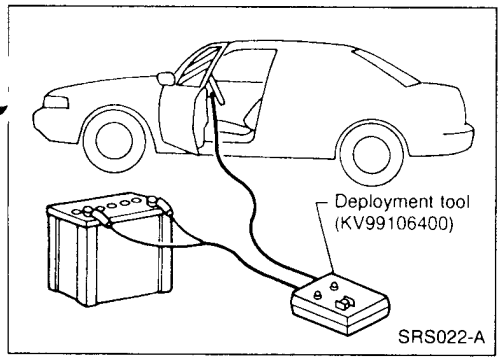


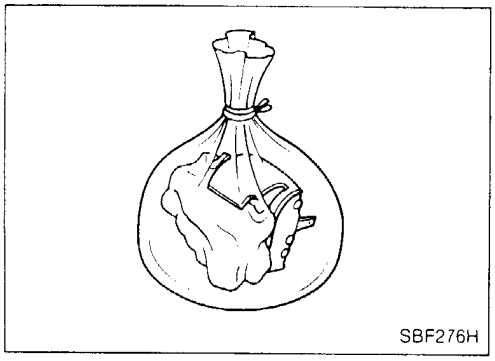
DEPLOYMENT OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER WHILE MOUNTED IN VEHICLE

When disposing of a vehicle, deploy air bag modules and seat belt pre-tensioners while they are mounted in vehicle.

CAUTION:
When deploying air bag module or seat belt pre-tensioner, ensure vehicle is empty.

1. Disconnect the vehicle battery ground cable and wait 10 minutes.
2. Disconnect air bag modules and seat belt pre-tensioners connector.
3. Connect deployment tool (SST: KV99106400) to air bag module or seat belt pre-tensioner.
   For front passenger air bag module and seat belt pre-tensioner, attach deployment tool adapters (SST: KV991065S0-A) to the tool connector.
4. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
5. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
6. Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the air bag module or seat belt pre-tensioner will deploy.




SBF276H

Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)

DISPOSING OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER

Deployed air bag modules and seat belt pre-tensioners are very hot. Before disposing of air bag module, and seat belt pre-tensioner, wait at least 30 minutes, and 10 minutes, respectively. Seal them in a plastic bag before disposal.

CAUTION:

- **Never apply water to a deployed air bag module and seat belt pre-tensioner.**
- **Be sure to wear gloves when handling a deployed air bag module and seat belt pre-tensioner.**
- **No poisonous gas is produced upon air bag module deployment. However, be careful not to inhale gas since it irritates throat and can cause choking.**
- **Do not attempt to disassemble air bag module and seat belt pre-tensioner.**
- **Air bag module and seat belt pre-tensioner cannot be re-used.**
- **Wash your hands clean after finishing work.**

How to Perform Trouble Diagnoses for Quick and Accurate Repair

A good understanding of the malfunction conditions can make troubleshooting faster and more accurate. In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

INFORMATION FROM CUSTOMER

WHAT ..... Vehicle model
WHEN ..... Date, Frequencies
WHERE .... Road conditions
HOW ..... Operating conditions, Symptoms

PRELIMINARY CHECK

Check that the following parts are in good order.

- Battery [Refer to MA section ("GENERAL MAINTENANCE").]
- Fuse [Refer to EL section ("Fuse", "POWER SUPPLY ROUTING").]
- System component-to-harness connections

DIAGNOSIS FUNCTION

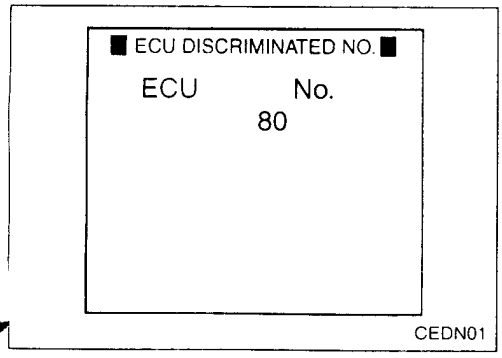
The SRS self-diagnosis results can be read by using "AIR BAG" warning lamp and/or CONSULT. The reading of these results is accomplished using one of two modes — "User mode" and "Diagnosis mode". The User mode is exclusively prepared for the customer (driver). This mode warns the driver of a system malfunction through the operation of the "AIR BAG" warning lamp.
The Diagnosis mode allows the technician to locate and inspect the malfunctioning part.
The mode applications for the "AIR BAG" warning lamp and CONSULT are as follows:

	User mode	Diagnosis mode	Display type
"AIR BAG" warning lamp	X	X	ON-OFF operation
CONSULT		X	Monitoring

- Seat belt pre-tensioner system can only be diagnosed by CONSULT.

DIAGNOSIS MODE FOR CONSULT

- SELF-DIAG [CURRENT]
  A current Self-diagnosis result (also indicated by the number of warning lamp flashes in the Diagnosis mode) is displayed on the CONSULT screen in real time. This refers to a malfunctioning part requiring repairs.
- SELF-DIAG [PAST]
  Diagnosis results previously stored in the memory (also indicated by the warning lamp flashes in the User mode) are displayed on the CONSULT screen. The stored results are not erased until memory erasing is executed.
- TROUBLE DIAG RECORD
  With TROUBLE DIAG RECORD, diagnosis results previously erased by a reset operation can be displayed on the CONSULT screen.



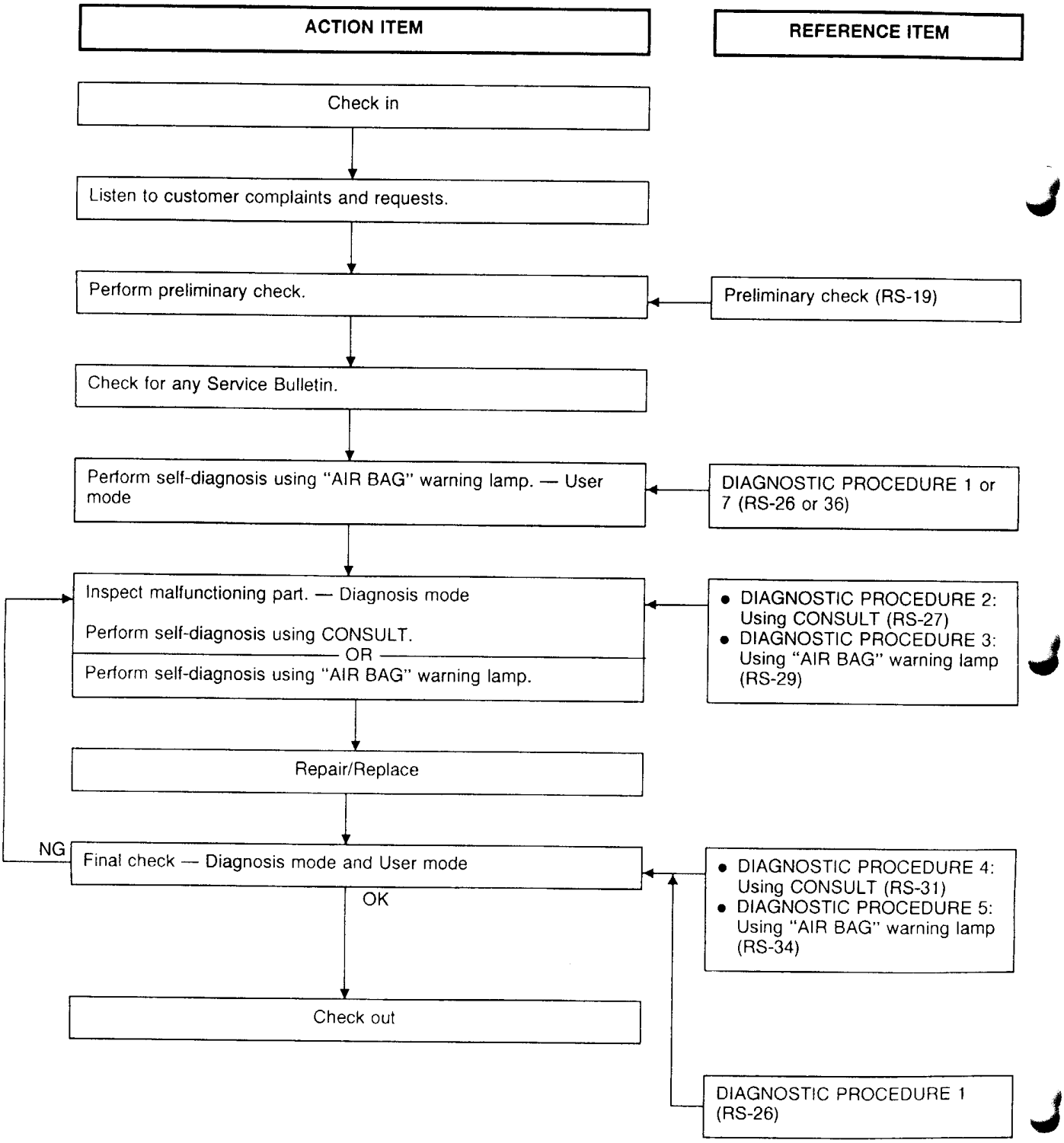
- ECU DISCRIMINATED NO. (Only for air bag equipped model).
  The diagnosis sensor unit for each vehicle model is assigned with its own, individual classification number. This number will be displayed on the CONSULT screen, as shown at left. When replacing the diagnosis sensor unit, refer to the part number for the compatibility. After installation, replacement with a correct unit can be checked by confirming this classification number on the CONSULT screen.
  For NISSAN model P11, the diagnosis sensor unit classification number assigned is 80.

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

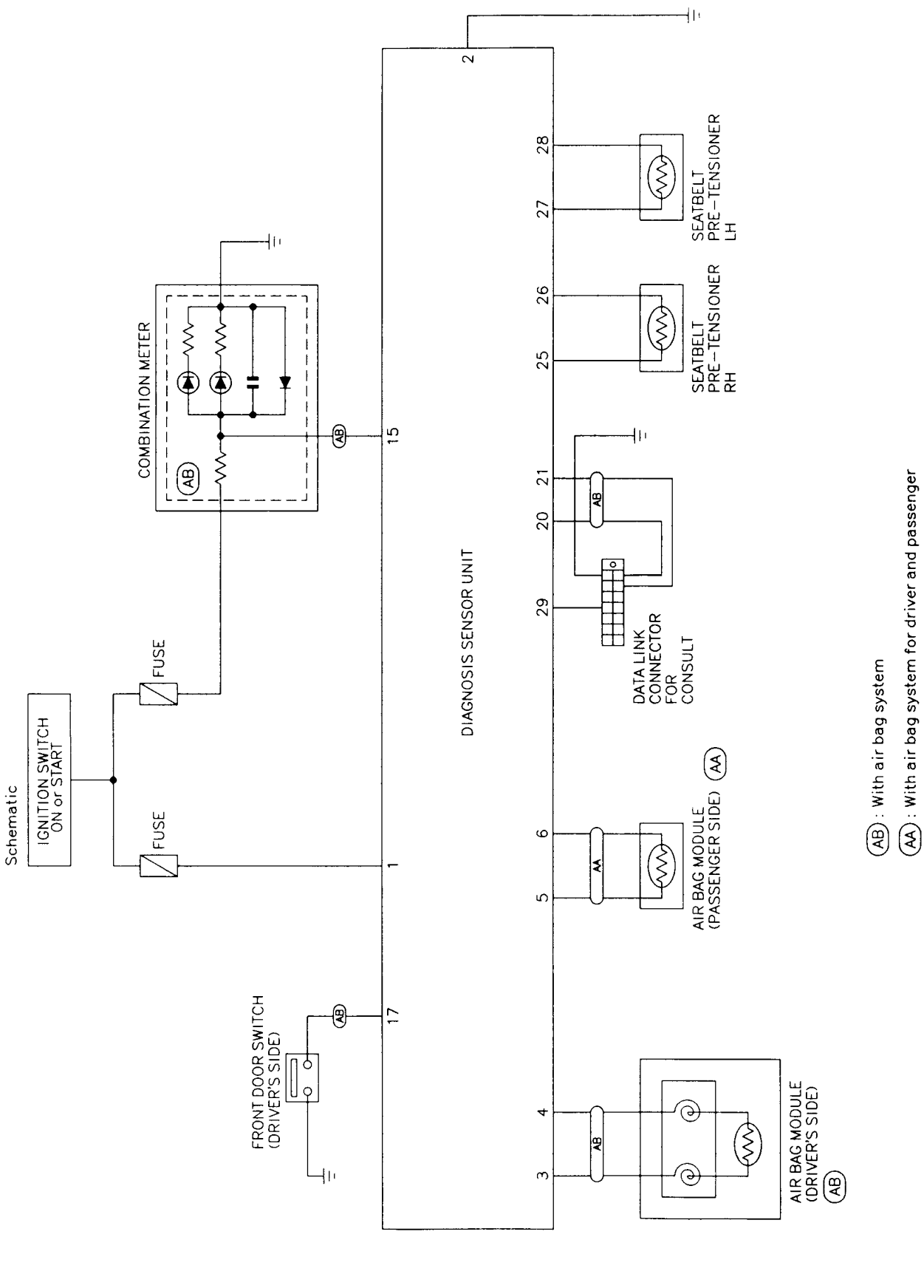
CAUTION:

- Do not use a circuit tester to check SRS harness connectors unless instructed to do so in this Service Manual. The SRS wiring harnesses are covered with yellow insulation (either just before the harness connectors or for complete harness) for easy identification.
- Do not attempt to repair, splice or modify the SRS wiring harness. If the harness is damaged, replace it with a new one.
- Keep ground portion clean.

WORK FLOW



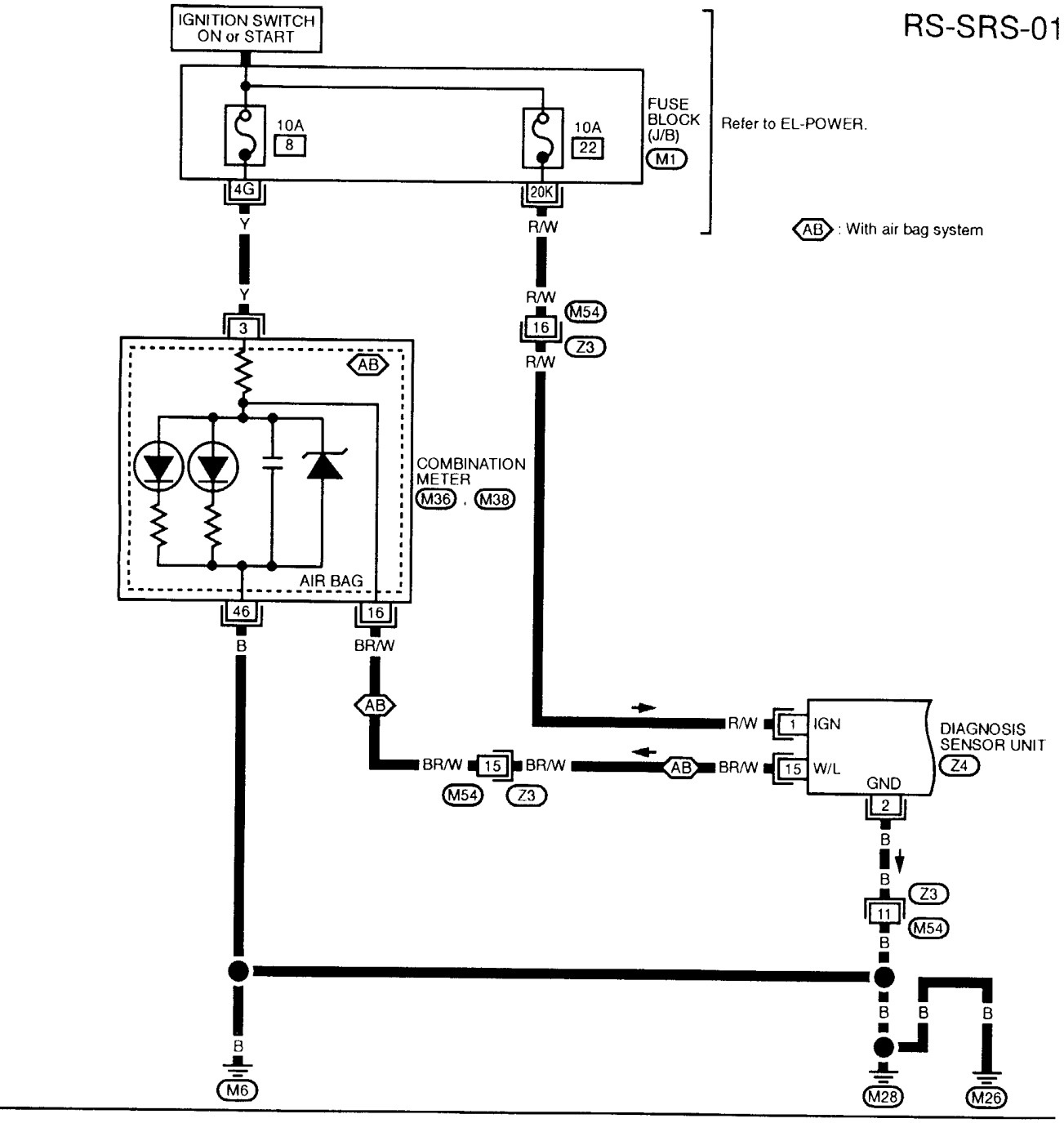
Schematic

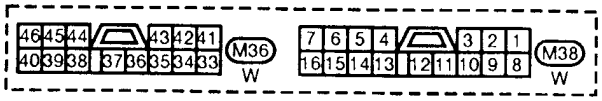


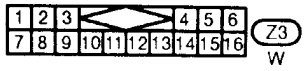
YRS005

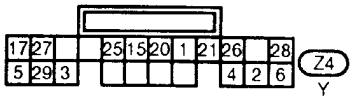
Wiring Diagram —SRS—

DUAL AIR BAG SYSTEM







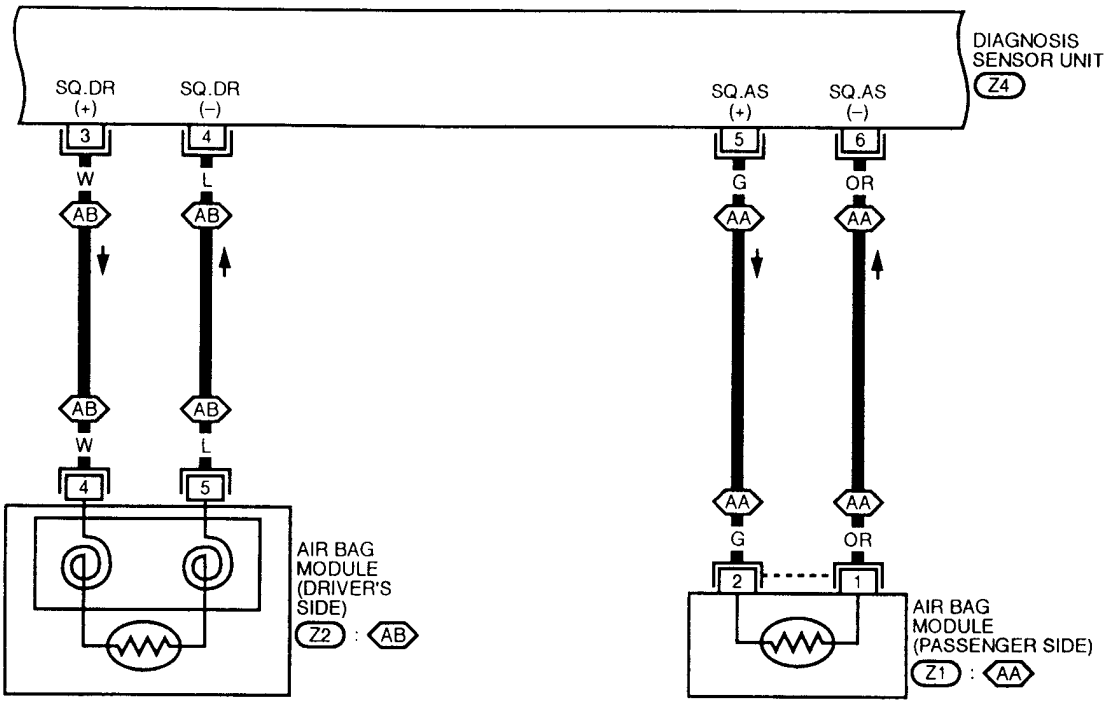


Refer to last page (Foldout page).
M1

YRS001

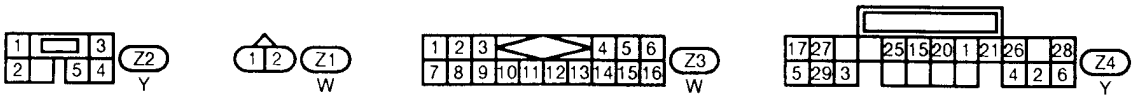
Wiring Diagram —SRS— (Cont'd)

RS-SRS-02



AB : With air bag system

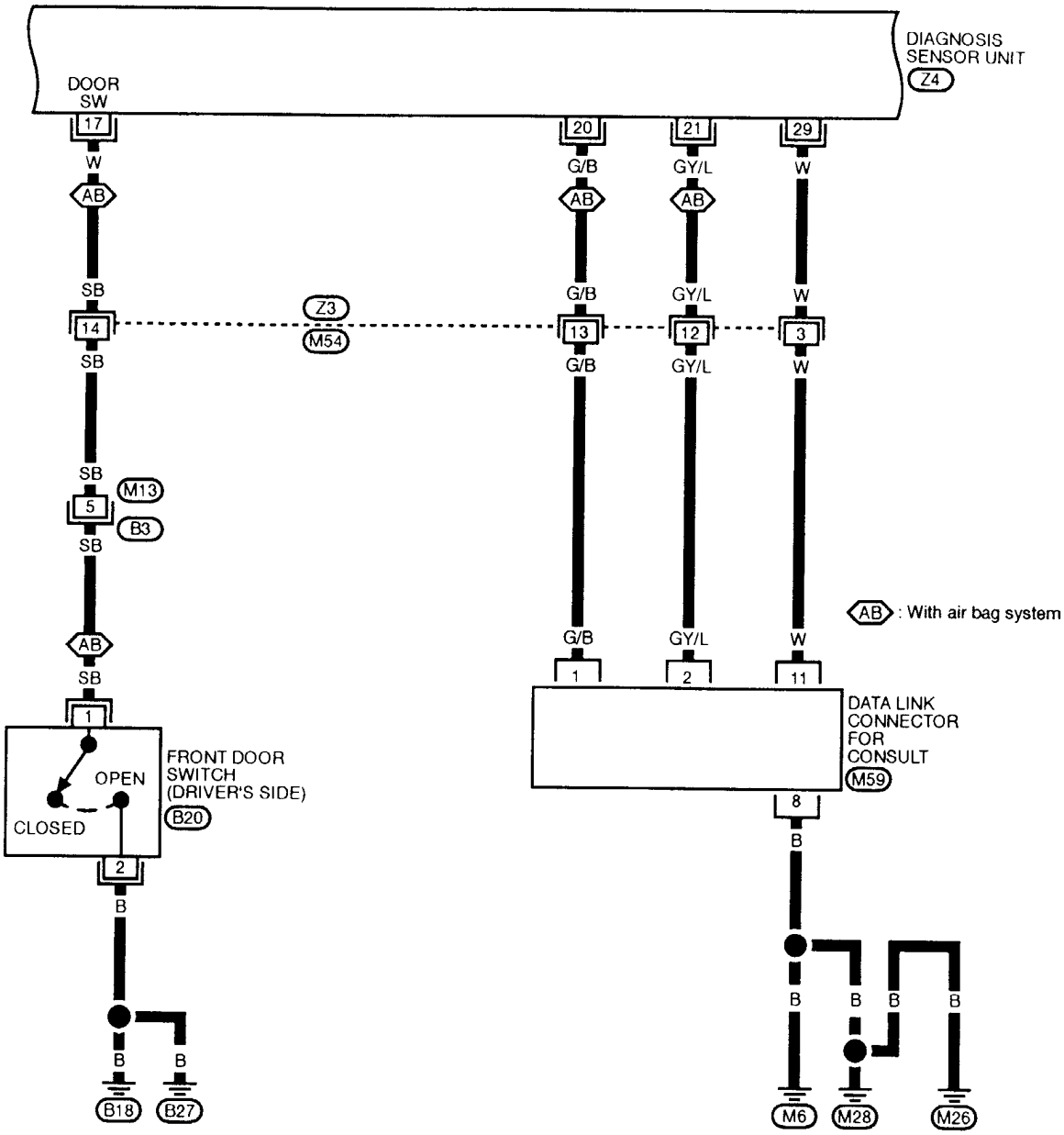
AA : With air bag system for driver and passenger

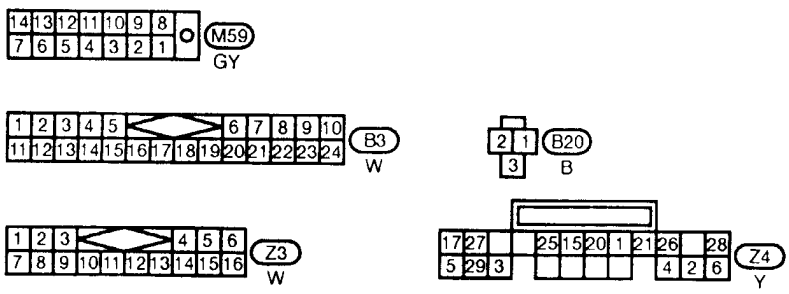


YRS002

Wiring Diagram —SRS— (Cont'd)

RS-SRS-03

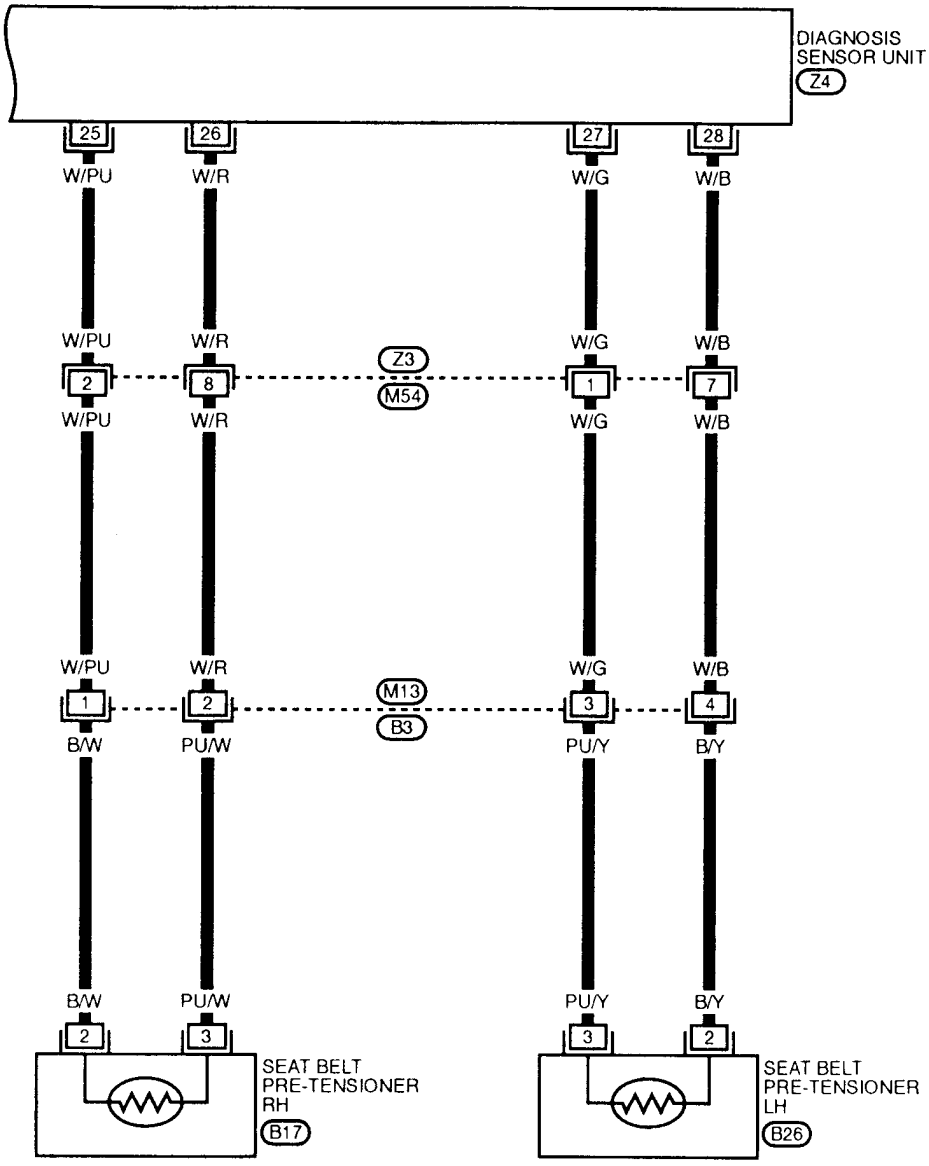


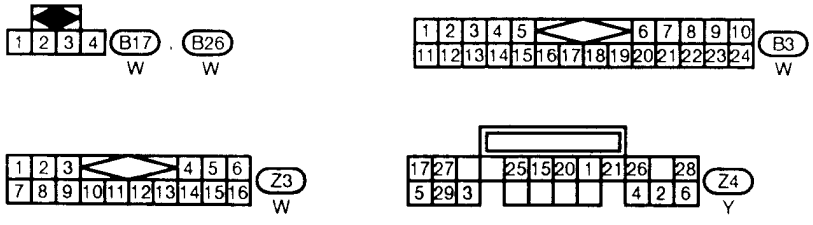


YRS003

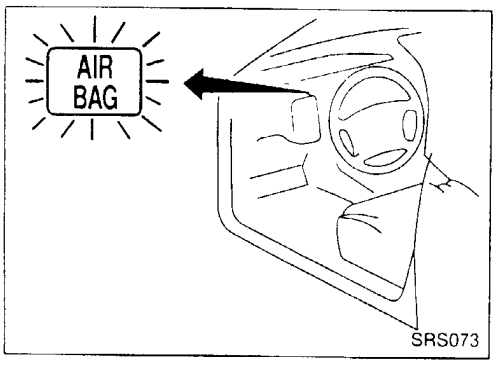
Wiring Diagram —SRS— (Cont'd)

RS-SRS-04





YRS004



Self-diagnosis

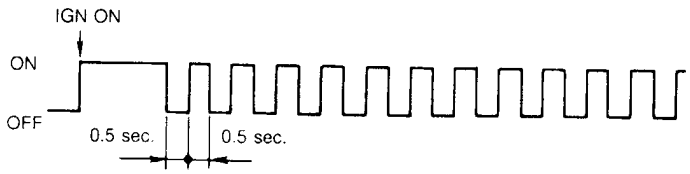
DIAGNOSTIC PROCEDURE 1

Checking SRS operation by using "AIR BAG" warning lamp — User mode

NOTE:

Seat belt pre-tensioner system cannot be checked by "AIR BAG" warning lamp.

1. After turning ignition switch from the "LOCK" to "ON" position, "AIR BAG" warning lamp operates.
2. Compare "AIR BAG" warning lamp operation to the chart below.

"AIR BAG" warning lamp operation — User mode —	SRS condition	Reference item
MRS095A	No malfunction is detected. No further action is necessary.	—
 MRS096A	The system has problem and needs to be repaired as indicated.	Go to DIAGNOSTIC PROCEDURE 2, or 3 (RS-27 or 29).
MRS097A	Air bag is deployed.	Go to COLLISION DIAGNOSIS (RS-41).
	Fuse for diagnosis sensor unit or circuit is malfunctioning and needs to be repaired.	Go to DIAGNOSTIC PROCEDURE 8 (RS-39).
MRS098A	Diagnosis sensor unit or "AIR BAG" warning lamp circuit is shorted or open and needs to be repaired.	Go to DIAGNOSTIC PROCEDURE 9 (RS-39).

NOTE:

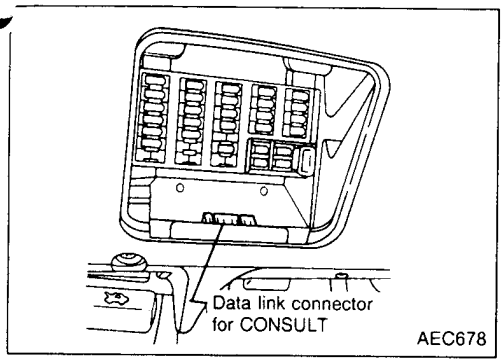
If "AIR BAG" warning lamp operates differently from the operations shown above, refer to "AIR BAG" warning lamp operation — Diagnosis mode —, DIAGNOSTIC PROCEDURE 5, RS-34. Then repair as necessary.

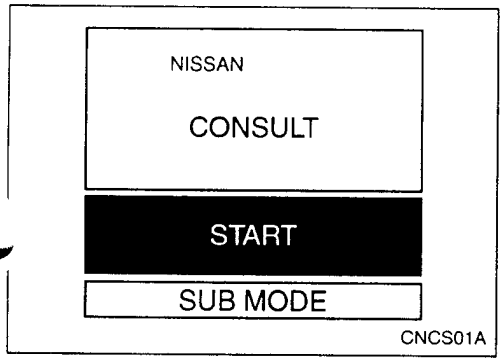
Self-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE 2 (with CONSULT)

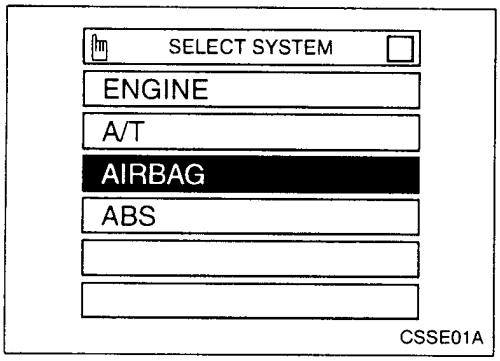
Inspecting SRS malfunctioning parts by using CONSULT — Diagnosis mode

1. Turn ignition switch to the "LOCK" position.
2. Connect "CONSULT" to Data link connector.

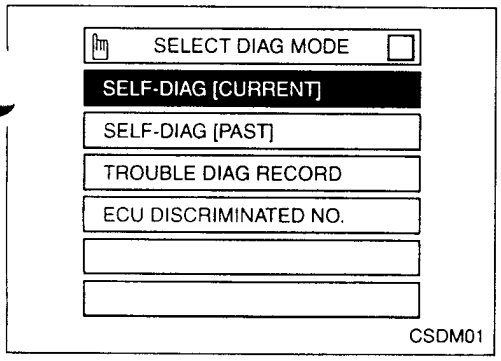




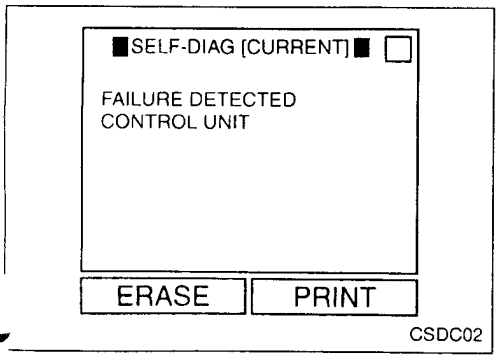
3. Turn ignition switch to the "ON" position.
4. Touch "START".



5. Touch "AIRBAG".

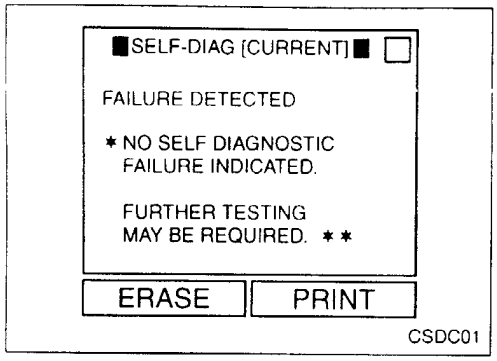


6. Touch "SELF-DIAG [CURRENT]".



7. Diagnostic codes are displayed on "SELF-DIAG [CURRENT]".

Self-diagnosis (Cont'd)



- If no self-diagnostic failure is detected on "SELF-DIAG [CURRENT]" but malfunction is detected by the "AIR BAG" warning lamp, go to DIAGNOSTIC PROCEDURE 6, page RS-35.

8. Touch "PRINT".
9. Compare diagnostic codes to the CONSULT DIAGNOSTIC CODE CHART, page RS-28.
10. Touch "BACK" key of CONSULT until SELECT SYSTEM appears, then turn off CONSULT.
11. Turn ignition switch to the "LOCK" position, then disconnect CONSULT and both battery cables.
12. Repair the system as outlined by the "Repair order" in CONSULT DIAGNOSTIC CODE CHART, that corresponds to the problem code. For replacement procedure of component parts, refer to RS-8.
13. After repairing the system, conduct DIAGNOSTIC PROCEDURE 4, page RS-31.

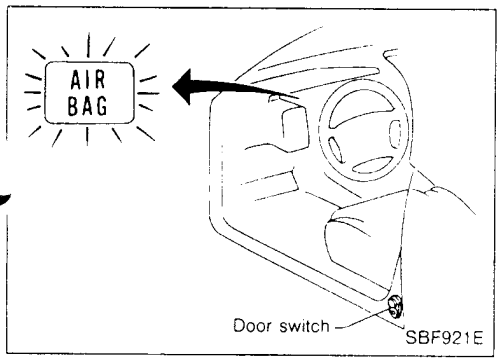
CONSULT DIAGNOSTIC CODE CHART

Diagnostic item	Explanation	Repair order Recheck SRS at each replacement.
NO SELF DIAGNOSTIC FAILURE INDICATED.	• No malfunction is detected.	—
AIRBAG MODULE [OPEN]	• Driver's air bag module circuit is open. (including the spiral cable)	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace driver's air bag module. (Before disposing of it, it must be deployed.) 4. Replace the diagnosis sensor unit. 5. Replace the spiral cable.
AIRBAG MODULE [VB-SHORT]	• Driver's air bag module circuit is shorted to a power supply circuit. (including the spiral cable)	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace driver's air bag module. (Before disposing of it, it must be deployed.)
AIRBAG MODULE [GND-SHORT]	• Driver's air bag module circuit is shorted to ground. (including the spiral cable)	
AIRBAG MODULE [SHORT]	• Driver's air bag module circuits are shorted to each other.	
ASSIST A/B MODULE [VB/SHORT]	• Front passenger air bag module circuit is shorted to a power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace the diagnosis sensor unit.
ASSIST A/B MODULE [OPEN]	• Front passenger air bag module circuit is open.	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace front passenger air bag module. (Before disposal of it, it must be deployed.) 4. Replace the diagnosis sensor unit.
ASSIST A/B MODULE [GND-SHORT]	• Front passenger air bag module circuit is shorted to ground.	
ASSIST A/B MODULE [SHORT]	• Front passenger air bag module circuits are shorted to each other.	

Self-diagnosis (Cont'd)

Diagnostic item	Explanation	Repair order Recheck SRS at each replacement.
DRIVE PRE-TENSION [OPEN/VB-SHORT]	The circuit for the driver's pre-tensioner is open or shorted to a power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the driver's seat belt. (Before disposing, it must be deactivated.) 3. Replace the diagnosis sensor unit. 4. Replace the air bag harness.
DRIVE PRE-TENSION [GND-SHORT]	The circuit for the driver's pre-tensioner is shorted to ground.	
ASSIST PRE-TENSION [OPEN/VB-SHORT]	The circuit for the front passenger pre-tensioner is open or shorted to a power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the front passenger seat belt. (Before disposing, it must be deactivated.) 3. Replace the diagnosis sensor unit. 4. Replace the air bag harness.
ASSIST PRE-TENSION [GND-SHORT]	The circuit for the front passenger pre-tensioner is shorted to ground.	
CONTROL UNIT	• Low battery voltage or diagnosis sensor unit is out of order.	1. Charge battery. 2. Visually check wiring harness connections. 3. Replace diagnosis sensor unit. 4. Replace air bag harness.

Follow the procedures in numerical order when repairing malfunctioning parts. Confirm whether malfunction is eliminated using the air bag warning lamp (in user mode) or CONSULT each time repair is finished. If malfunction is still observed, proceed to the next step. When malfunction is eliminated, further repair work is not required.



DIAGNOSTIC PROCEDURE 3 (without CONSULT)

Inspecting SRS malfunctioning parts by using "AIR BAG" warning lamp — Diagnosis mode

NOTE:

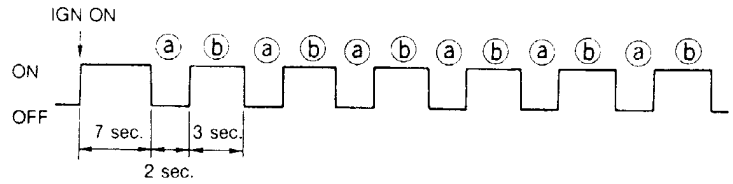
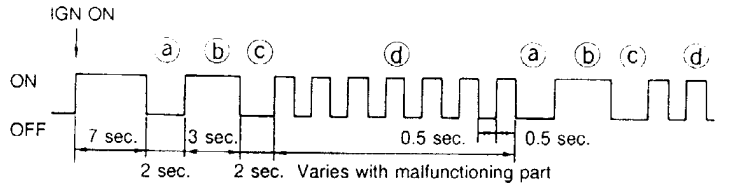
SRS will not enter Diagnosis mode if no malfunction is detected in User mode.

1. Open driver's door.
2. Turn ignition switch from the "LOCK" to the "ON" position.
3. Press driver's door switch at least 5 times within 7 seconds after turning ignition switch to the "ON" position.
   SRS is now in Diagnosis mode.
4. "AIR BAG" warning lamp operates in diagnosis mode as follows:

NOTE:

If SRS does not enter Diagnosis mode even though malfunction is detected in User mode, go to DIAGNOSTIC PROCEDURE 10, page RS-40.

Self-diagnosis (Cont'd)

No.	"AIR BAG" warning lamp operation — Diagnosis mode —	SRS condition
1	 MRS100A ⓐ through ⓑ are repeated.	Intermittent problem has been detected in the past. Go to DIAGNOSTIC PROCEDURE 7 (RS-36).
2	 MRS099A ⓐ through ⓓ are repeated. NOTE: ⓐ — Interval I ⓑ — Start signal (Start signal identifies display modes) ⓒ — Interval II ⓓ — Indicates malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	The system has problem and needs to be repaired.

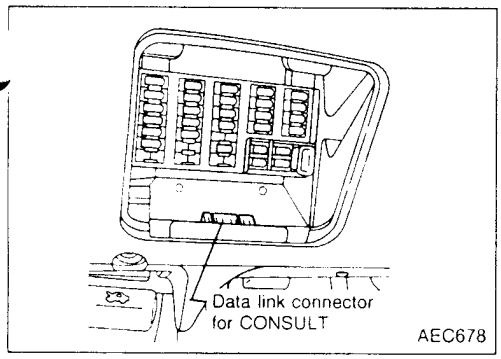
5. Malfunctioning part is indicated by the number of flashes (part ⓓ). Compare the number of flashes to WARNING LAMP FLASH CODE CHART, page RS-31, and locate malfunctioning part.
6. Turn ignition switch to the "LOCK" position, and disconnect both battery cables.
7. Repair the system as outlined by the "Repair order" in WARNING LAMP FLASH CODE CHART that corresponds to the flash code. For replacement procedure of component parts, refer to RS-8.
8. After repairing the system, conduct DIAGNOSTIC PROCEDURE 5, page RS-34.

Self-diagnosis (Cont'd)

AIR BAG WARNING LAMP FLASH CODE CHART

Warning lamp	Flash code ⓓ (# of flashes)	Explanation	Repair order *Recheck SRS at each replacement.
"AIR BAG" warning lamp	0	• No malfunction is detected.	—
	2	• The driver's air bag module circuit is out of order.	1. Visually check the wiring harness connections. 2. Replace the spiral cable. 3. Replace the driver's air bag module. (Before disposing of it, it must be deployed.) 4. Replace the diagnosis sensor unit. 5. Replace the air bag harness.
	7	• The diagnosis sensor unit is out of order.	1. Visually check the wiring harness connections. 2. Replace the diagnosis sensor unit. 3. Replace the air bag harness. 4. Replace the main harness.
	8	• The front passenger air bag module circuit is out of order.	1. Visually check the wiring harness connections. 2. Replace the front passenger air bag module. (Before disposing of it, it must be deployed.) 3. Replace the diagnosis sensor unit. 4. Replace the air bag harness.

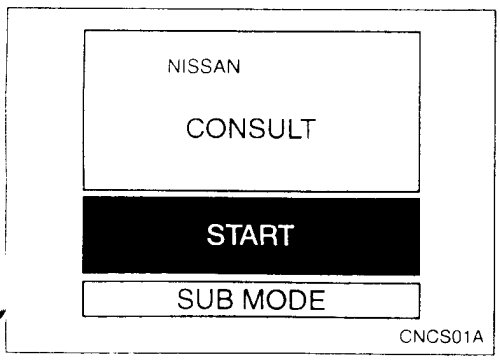
* Follow the procedures in numerical order when repairing malfunctioning parts. Confirm whether malfunction is eliminated using the air bag warning lamp (in user mode) or CONSULT each time repair is finished. If malfunction is still observed, proceed to the next step. When malfunction is eliminated, further repair work is not required.



DIAGNOSTIC PROCEDURE 4 (with CONSULT)

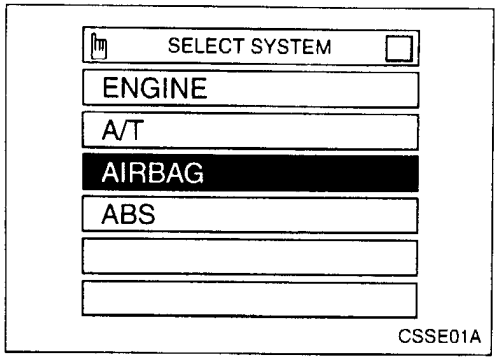
Final checking after repairing SRS by using CONSULT — Diagnosis mode

1. After repairing SRS, connect both battery cables.
2. Connect CONSULT to Data link connector.
3. Turn ignition switch from the "LOCK" to the "ON" position.

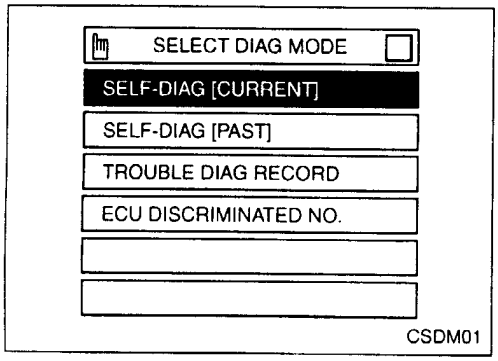


4. Touch "START".

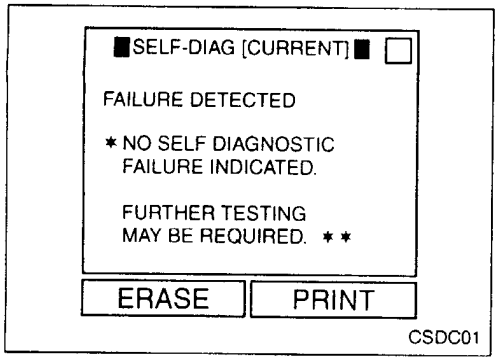
Self-diagnosis (Cont'd)



5. Touch "AIRBAG".

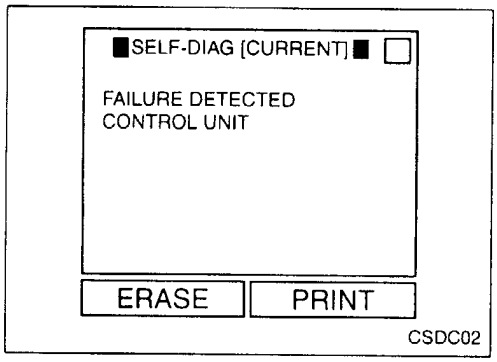


6. Touch "SELF-DIAG [CURENT]".



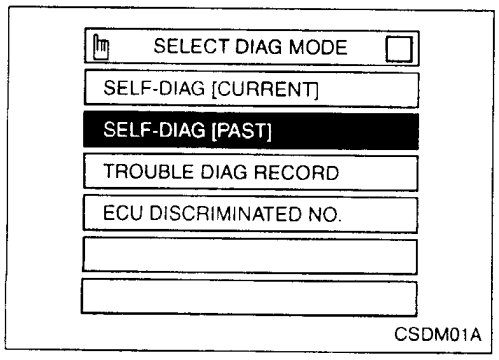
7. If no malfunction is detected on "SELF-DIAG [CURRENT]", repair of SRS is completed. When the malfunction was only in seat belt pre-tensioner system, go to step 11. When the malfunction was not only in seat belt pre-tensioner system, touch "ERASE".

NOTE:
Touch "ERASE" to erase problem (Trouble code) retained in memory. Otherwise, CONSULT still senses problem in memory when step 13 (Air bag warning lamp operation check) is performed. As a result, the "AIR BAG" warning lamp will still indicate a malfunction in the system.



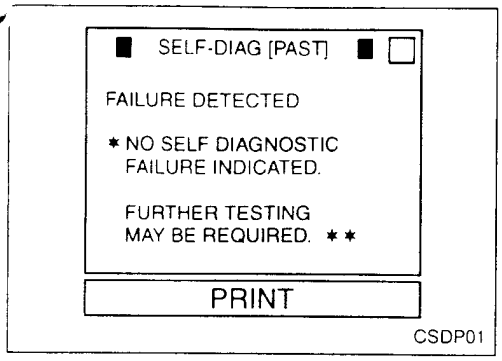
- **If any problem code was displayed on "SELF-DIAG [CURRENT]", the malfunctioning part is not repaired completely or another malfunctioning part is detected. Go to DIAGNOSTIC PROCEDURE 2, page RS-27, and repair malfunctioning part completely.**

8. Touch "BACK" key of CONSULT.



9. Touch "SELF-DIAG [PAST]".

Self-diagnosis (Cont'd)

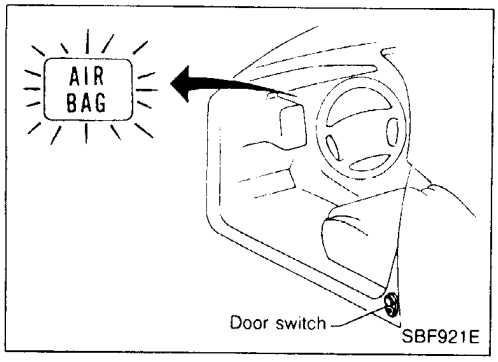


10. Check that no self-diagnostic failure is detected on "SELF-DIAG [PAST]".

NOTE:
Past malfunction for seat belt pre-tensioner system will not be displayed on "SELF-DIAG [PAST]".

11. Touch "BACK" key of CONSULT until SELECT SYSTEM appears, turn off CONSULT, then disconnect CONSULT.
12. Turn ignition switch to the "LOCK" position.
13. Go to DIAGNOSTIC PROCEDURE 1, page RS-26 to check SRS operation by using "AIR BAG" warning lamp with User mode.

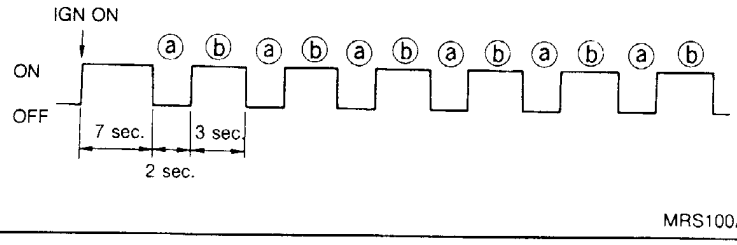
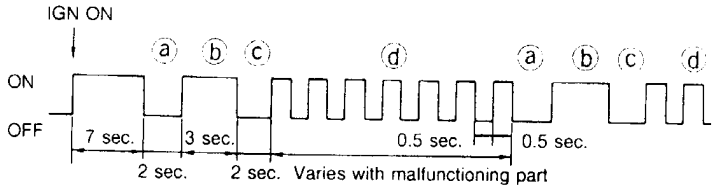
Self-diagnosis (Cont'd)



DIAGNOSTIC PROCEDURE 5 (without CONSULT)

Final checking after repairing SRS by using "AIR BAG" warning lamp — Diagnosis mode and User mode

1. After repairing SRS connect both battery cables.
2. Open driver's door.
3. Turn ignition switch from the "LOCK" to the "ON" position.
4. "AIR BAG" warning lamp operates in Diagnosis mode as follows:

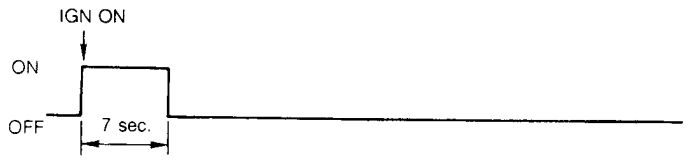
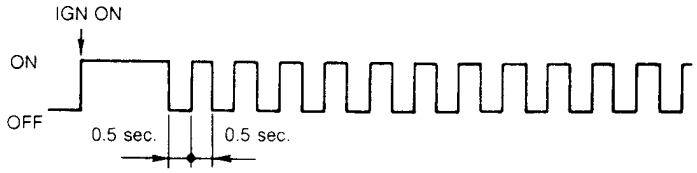
No.	"AIR BAG" warning lamp operation — Diagnosis mode —	SRS condition
1	 MRS100A ⓐ through ⓑ are repeated.	No malfunction is detected or repair is completed. No further action is necessary.
2	 MRS099A ⓐ through ⓓ are repeated. NOTE: ⓐ — Interval I ⓑ — Start signal (Start signal identifies display modes) ⓒ — Interval II ⓓ — Indicates malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	The system has problem and needs to be repaired.

NOTE:
When diagnosis sensor unit is replaced with a new one, "AIR BAG" warning lamp will operate in the User mode. Checking "AIR BAG" warning lamp operation in Diagnosis mode is not required. Go to step 6.

5. If "AIR BAG"warning lamp operates as shown in No. 1 in the chart above, turn ignition switch to the "LOCK" position to reset from Diagnostic mode to User mode.
   If "AIR BAG" warning lamp operates as shown in No. 2 in chart above, the malfunctioning part is not repaired completely, or another malfunctioning part is detected. Go to DIAGNOSTIC PROCEDURE 3, page RS-29, and repair malfunctioning part completely.
6. Turn ignition switch to the "ON" position. "AIR BAG" warning lamp operates in User mode. Compare "Air BAG" warning lamp operation to the chart below.

NOTE:
If switching Diagnosis mode to User mode is required while malfunction is being detected, turn ignition switch from the "LOCK" to the "ON" position. Then press driver's door switch at least 5 times within 7 seconds after turning ignition switch to the "ON" position.
SRS is now in User mode.

Self-diagnosis (Cont'd)

"AIR BAG" warning lamp operation — User mode —	SRS condition	Reference item
 MRS095A	No malfunction is detected. No further action is necessary.	—
 MRS096A	The system has problem and needs to be repaired as indicated.	Go to DIAGNOSTIC PROCEDURE 2, or 3 (RS-27 or 29).
MRS097A	Air bag is deployed.	Go to COLLISION DIAGNOSIS (RS-41).
	Fuse for diagnosis sensor unit is malfunctioning and needs to be repaired.	Go to DIAGNOSTIC PROCEDURE 8 (RS-39).
MRS098A	Diagnosis sensor unit or "AIR BAG" warning lamp circuit is shorted or open and needs to be repaired.	Go to DIAGNOSTIC PROCEDURE 9 (RS-39).

DIAGNOSTIC PROCEDURE 6 (Continued from DIAGNOSTIC PROCEDURE 2)

Inspecting SRS malfunctioning record

Is it the first time for maintenance of SRS?

Yes → "SELF-DIAG [CURRENT]" (which was previously entered) is still retained in memory. Go to DIAGNOSTIC PROCEDURE 4 (RS-31).

Yes ↓

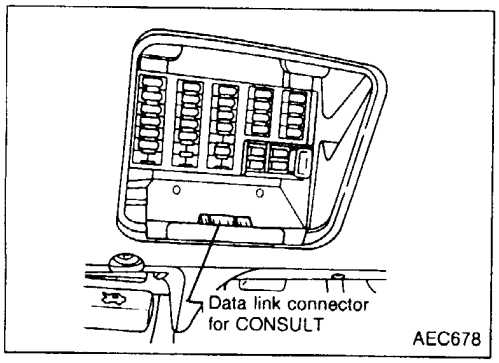
Go to DIAGNOSTIC PROCEDURE 7 (RS-36).

Self-diagnosis (Cont'd)

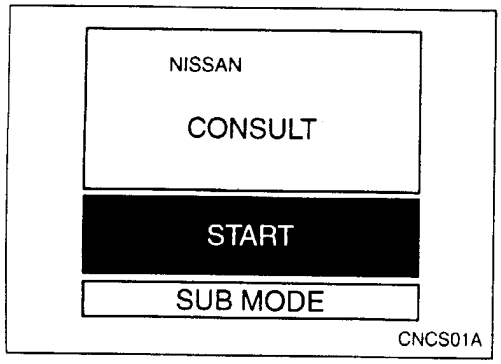
DIAGNOSTIC PROCEDURE 7 (with CONSULT)

Inspecting SRS intermittent problem by using CONSULT — Diagnosis mode

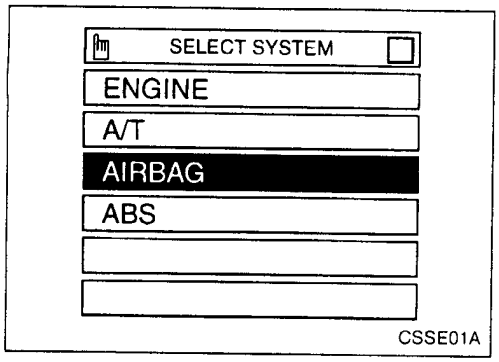
1. Turn ignition switch to the "LOCK" position.
2. Connect "CONSULT" to Data link connector.



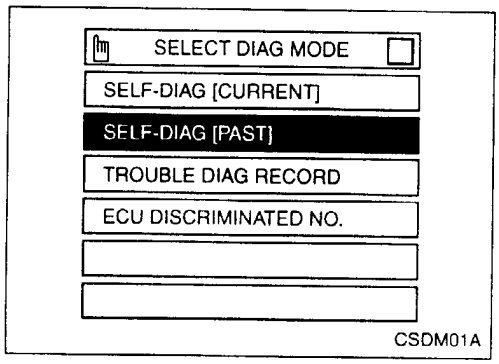
3. Turn ignition switch to the "ON" position.
4. Touch "START".



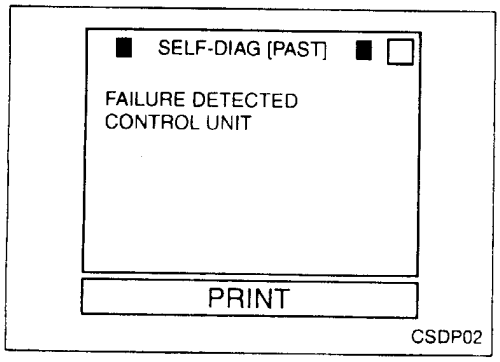
5. Touch "AIRBAG".



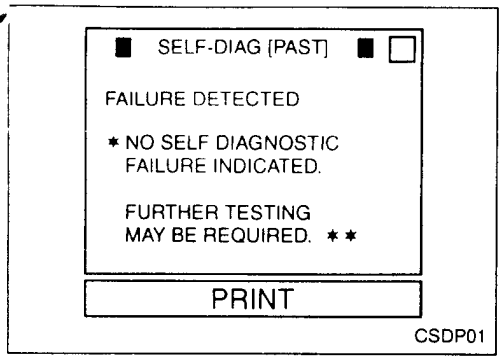
6. Touch "SELF-DIAG [PAST]".



7. If diagnostic codes are displayed on "SELF-DIAG [PAST]", go to step 10.



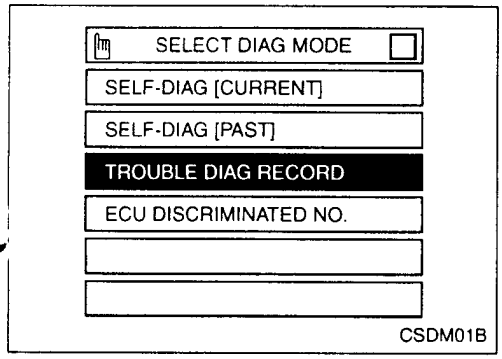
Self-diagnosis (Cont'd)



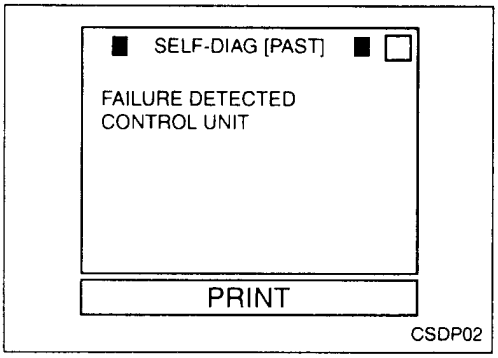
If no self-diagnostic failure is detected on "SELF-DIAG [PAST]", touch "BACK" and go back to "SELECT DIAG MODE".

NOTE:

Past malfunction for seat belt pre-tensioner system will not be displayed on "SELF-DIAG [PAST]".



8. Touch "TROUBLE DIAG RECORD".



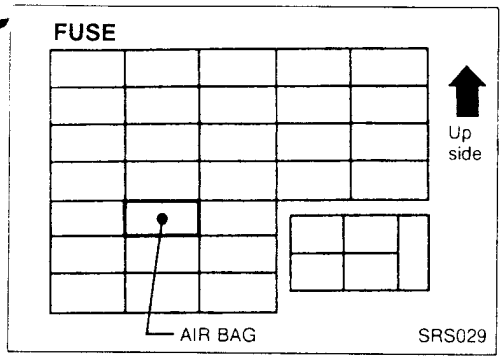
9. Diagnostic code is displayed on "TROUBLE DIAG RECORD".
10. Touch "PRINT".
11. Compare diagnostic codes to the INTERMITTENT PROBLEM DIAGNOSTIC CODE CHART, page RS-38.
12. Touch "BACK" key of CONSULT until SELECT SYSTEM appears, then turn off CONSULT.
13. Turn ignition switch to the "LOCK" position, then disconnect CONSULT and both battery cables.
14. Repair the system as outlined by the "Repair order" in INTERMITTENT PROBLEM DIAGNOSTIC CODE CHART, that corresponds to the problem code. For replacement procedure of components parts, refer to RS-8.
15. Go to DIAGNOSTIC PROCEDURE 4, page RS-31.

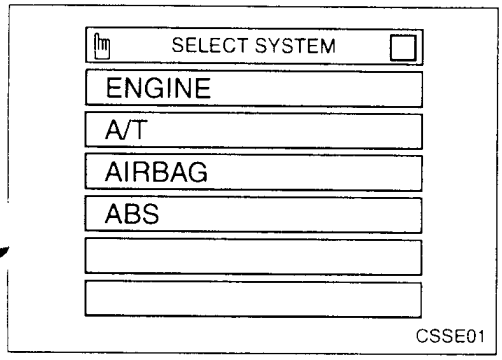
Self-diagnosis (Cont'd)

INTERMITTENT PROBLEM DIAGNOSTIC CODE CHART

Diagnostic item	Explanation	Repair order Recheck SRS at each replacement.
NO SELF DIAGNOSTIC FAILURE INDICATED.	• No malfunction is detected.	—
AIRBAG MODULE [OPEN]	• Driver's air bag module circuit is open. (including the spiral cable)	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace driver's air bag module. (Before disposing of it, it must be deployed.) 4. Replace the diagnosis sensor unit. 5. Replace the spiral cable.
AIRBAG MODULE [VB-SHORT]	• Driver's air bag module circuit is shorted to a power supply circuit. (including the spiral cable)	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace driver's air bag module. (Before disposing of it, it must be deployed.)
AIRBAG MODULE [GND-SHORT]	• Driver's air bag module circuit is shorted to ground. (including the spiral cable)	
AIRBAG MODULE [SHORT]	• Driver's air bag module circuits are shorted to each other.	
ASSIST A/B MODULE [VB/SHORT]	• Front passenger air bag module circuit is shorted to a power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace the diagnosis sensor unit.
ASSIST A/B MODULE [OPEN]	• Front passenger air bag module circuit is open.	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace front passenger air bag module. (Before disposal of it, it must be deployed.) 4. Replace the diagnosis sensor unit.
ASSIST A/B MODULE [GND-SHORT]	• Front passenger air bag module circuit is shorted to ground.	
ASSIST A/B MODULE [SHORT]	• Front passenger air bag module circuits are shorted to each other.	
CONTROL UNIT	• Diagnosis sensor unit is out of order.	• Replace the diagnosis sensor unit.
INDEFINITE FAILURES [AIR BAG]	• Low battery or SRS system voltage	• Go to DIAGNOSTIC PROCEDURE 4 (RS-31) after charging battery.

* Follow the procedures in numerical order when repairing malfunctioning parts. Confirm whether malfunction is eliminated using the air bag warning lamp (in user mode) or CONSULT each time repair is finished. If malfunction is still observed, proceed to the next step. When malfunction is eliminated, further repair work is not required.





Trouble Diagnoses for Air Bag Warning Lamp

DIAGNOSTIC PROCEDURE 8

SYMPTOM: "AIR BAG" warning lamp does not turn off.

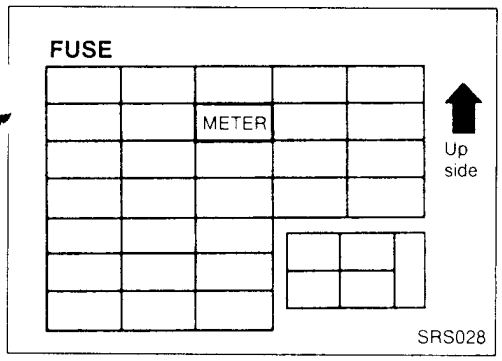
Is air bag module deployed?
- Yes → Replace air bag module and diagnosis sensor unit. Refer to COLLISION DIAGNOSIS, (RS-41).
- No ↓

Is 10A SRS "Air Bag" fuse OK?
- No → Replace 10A fuse.
- Yes ↓

Connect CONSULT and touch "START".
- Is "AIRBAG" displayed on CONSULT?
  - No → Replace diagnosis sensor unit.
  - Yes ↓

Is harness connection between warning lamp and diagnosis sensor unit OK?
- No → Connect warning lamp and diagnosis sensor unit properly. If warning lamp still does not go off, replace harness.
- Yes ↓

Replace diagnosis sensor unit.



DIAGNOSTIC PROCEDURE 9

SYMPTOM: "AIR BAG" warning lamp does not turn on.

Is 10A warning lamp fuse OK?
- No → Replace 10A fuse.
- Yes ↓

Is warning lamp LED OK?
- No → Replace warning lamp LED.
- Yes ↓

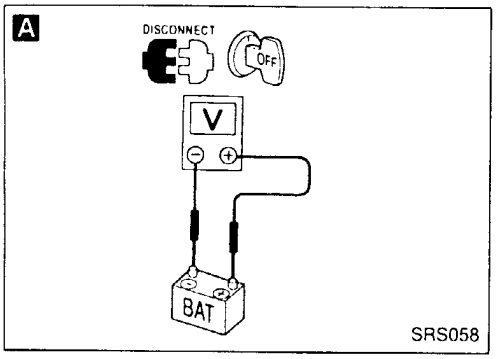
1. Disconnect diagnosis sensor unit connector.
2. Turn the ignition key to ON position.
- Does warning lamp turn on?
  - No → Connect warning lamp and diagnosis sensor unit properly. If warning lamp still does not come on, replace harness.
  - Yes ↓

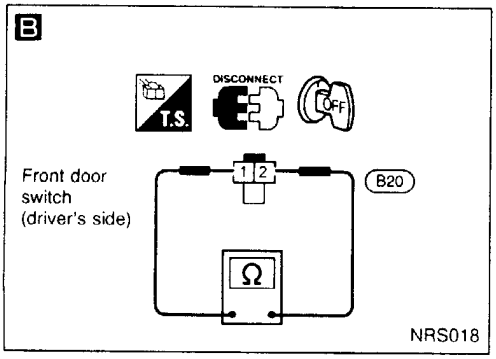
Replace diagnosis sensor unit.

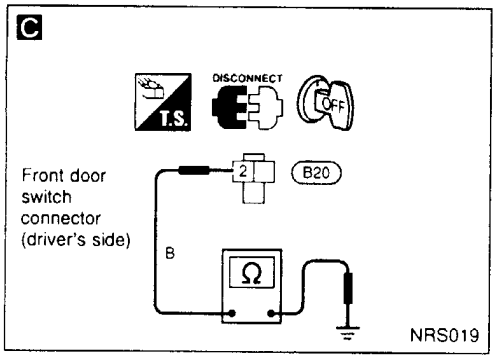
Trouble Diagnoses for Air Bag Warning Lamp (Cont'd)

DIAGNOSTIC PROCEDURE 10

SYMPTOM: SRS does not enter Diagnosis mode.







A

Disconnect both battery cables and check battery voltage using circuit tester.
- Is battery voltage more than 9V?

No → Charge battery.

Yes ↓

B

Remove driver's door switch and check continuity between driver's door switch connector terminals ① and ② under the following conditions:

Condition	Continuity
Door switch is depressed (Door is closed).	YES
Door switch is released (Door is open).	NO

No → Replace driver's door switch.

Yes ↓

C

Check harness continuity between driver's door switch connector terminal ② and body ground.
- Does continuity exist?

No → Replace or repair harness.

Yes ↓

Replace diagnosis sensor unit.

↓

Go to DIAGNOSTIC PROCEDURE 3.

To repair the SRS, perform the following steps.

When SRS is activated in a collision:

① Replace the diagnosis sensor unit.
② Remove the air bag modules.
③ Check the SRS components using the table shown below:
- Replace any SRS components showing visible signs of damage (dents, cracks, deformation).

④ Conduct self-diagnosis. Refer to "Self-diagnosis" for details (RS-26). Ensure the remainder of the SRS is operating properly.
⑤ Install new air bag modules.
⑥ Conduct self-diagnosis again.

When SRS is not activated in a collision:

① Check the SRS components using the table shown below:
- Replace any SRS components showing visible signs of damage (dents, cracks, deformation).

② Conduct self-diagnosis using CONSULT and "AIR BAG" warning lamp. Refer to "Self-diagnosis" for details (RS-26). Ensure entire SRS operates properly.

SRS inspection

Part	SRS is activated	SRS is NOT activated
Air bag module (driver and passenger side)	REPLACE Install with new bolts.	1. Remove air bag module. Check harness cover and connectors for damage, terminals for deformities, and harness for binding. 2-1. Install driver air bag module into the steering wheel to check fit and alignment with the wheel. 2-2. Install passenger air bag module into the instrument panel to check fit with the instrument panel. 3. No damage found, reinstall with new bolts. 4. If damaged—REPLACE. Air bag must be deployed before discarding.
Seat belt pre-tensioner assembly	REPLACE Install with new bolts.	1. Remove seat belt pre-tensioners. Check harness cover and connectors for damage, terminals for deformities, and harness for binding. 2. Check belts for damage and anchors for loose mounting. 3. Check retractor for smooth operation. 4. If no damage is found, reinstall with new bolts. 5. If damaged—REPLACE.
Diagnosis sensor unit	REPLACE Install with new bolts.	1. Check case and bracket for dents, cracks or deformities. 2. Check connectors for damage, and terminals for deformities. 3. If no damage is found, reinstall with new bolts. 4. If damaged—REPLACE.
Instrument panel	1. Check instrument panel for bending, deformities, or cracks. 2. Check passenger side air bag module brackets for dents, cracks or deformities. 3. If no damage is found, reinstall with new bolts. 4. If damaged—REPLACE.	
Steering wheel	1. Visually check steering wheel for deformities. 2. Check harness (built into steering wheel) and connectors for damage, and terminals for deformities. 3. Install air bag module to check fit or alignment with steering wheel. 4. Check steering wheel for excessive free play. 5. If no damage is found, reinstall with new bolts. 6. If damaged—REPLACE.	
Spiral cable	1. Visually check spiral cable and combination switch for damage. 2. Check connectors, flat cable and protective tape for damage. 3. Check steering wheel for noise, binding or heavy operation. 4. If no damage is found, reinstall with new bolts. 5. If damaged—REPLACE.	
Harness and Connectors	1. Check connectors for poor connection, damage, and terminals for deformities. 2. Check harness for binding, chafing, cuts, or deformities. 3. If no damage is found, reinstall the harness and connectors. 4. Damaged—REPLACE damaged section of harness. Do not attempt to repair, splice or modify any SRS harness.	

BODY & TRIM

SECTION BT

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<COMBINED EDITION>

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BT

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★ **For seat belt, refer to MA and RS section.**
★ **For wiring diagrams of body electrical systems, refer to EL section.**

Service Notice

- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installing. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" (Dual Air Bag System)

The Supplemental Restraint System "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 Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation) all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual. SRS wiring harnesses are covered with yellow insulation (either just before the harness connectors or for the complete harness) for easy identification.**

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" (Single Air Bag System)

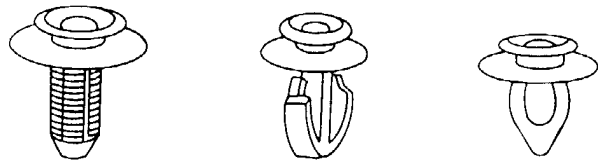
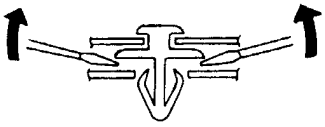
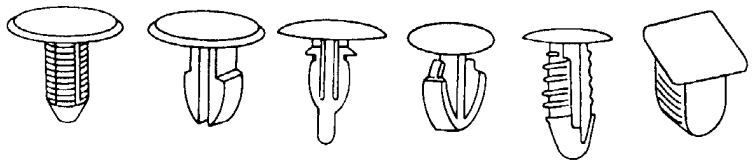
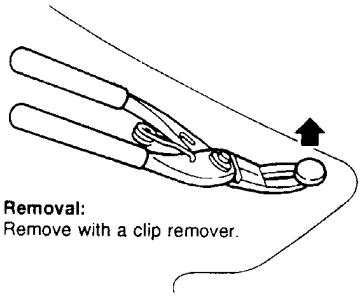
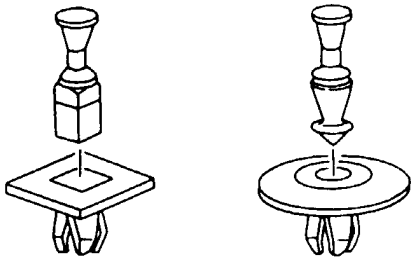
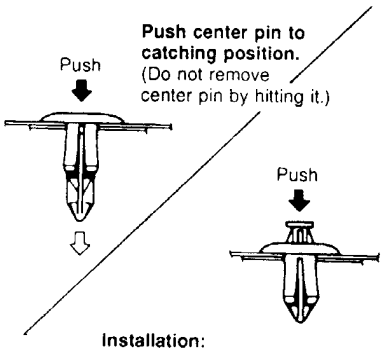
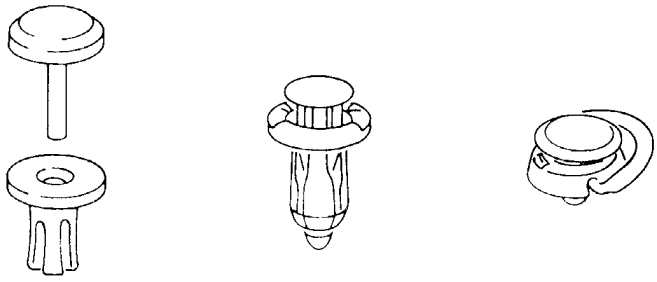
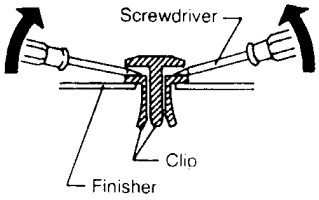
The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag module (located in the center of the steering wheel), seat belt pre-tensioner control unit, seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

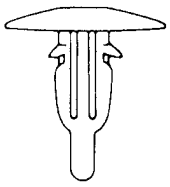
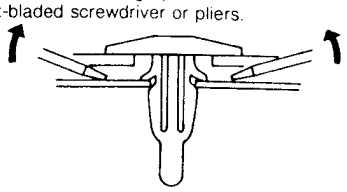
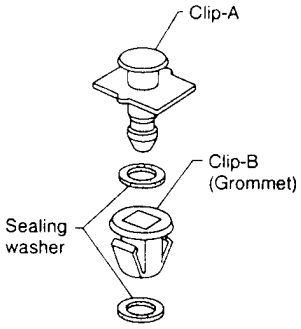
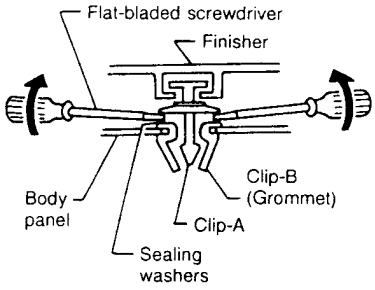
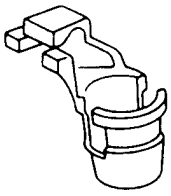
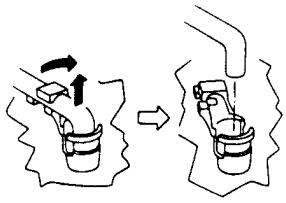
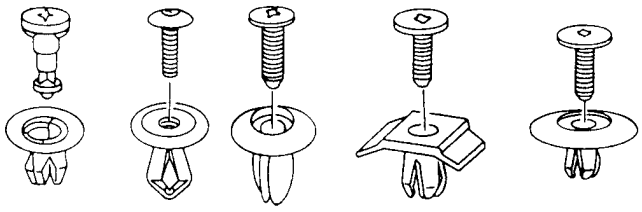
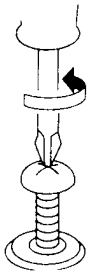
- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation) all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS.**

Clip and Fastener

- Clips and fasteners in BT section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

Symbol No.	Shapes	Removal & Installation
C101	 SBF302H	**Removal:** Remove by bending up with flat-bladed screwdrivers or clip remover.  SBF367BA
C103	 SBT095	 **Removal:** Remove with a clip remover. SBF423H
C203	 SBF258G	 **Push center pin to catching position.** (Do not remove center pin by hitting it.) Push Push **Installation:** SBF708E
C205	 MBT080A	**Removal:**  Screwdriver Clip Finisher SBF638C

Clip and Fastener (Cont'd)

CE117	 SBF174D	**Removal:** Remove by bending up with a flat-bladed screwdriver or pliers.  SBF175DA
CF118	 SBF151D	**Removal:**  SBF259G
CR103	 SBF768B	**Removal:** Holder portion of clip must be spread out to remove rod  SBF770B
CS101	 SBF078B	**Removal:** 1. Screw out with a Phillips screwdriver. 2. Remove female portion with flat-bladed screw-driver.  SBF992G

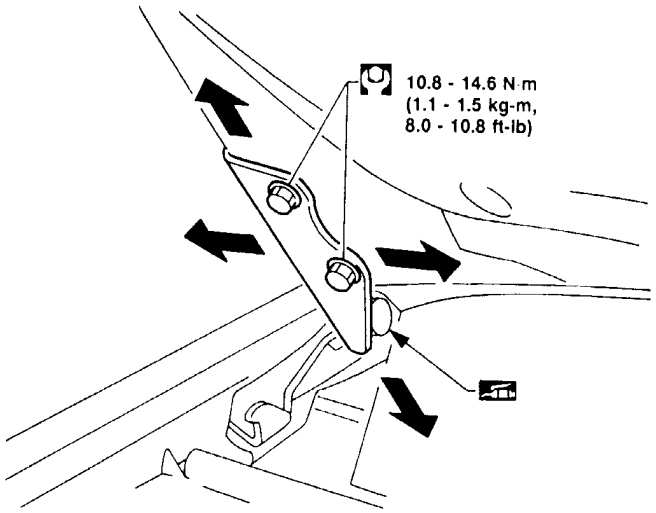
Body Front End

- When removing or installing hood, place a cloth or other padding on hood. This prevents vehicle body from being scratched.
- Bumper fascia is made of plastic. Do not use excessive force and be sure to keep oil away from it.
- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.

REMOVAL — Front bumper assembly

① Remove screws securing fog lamp to fog lamp rim.
② Remove screws securing bumper fascia to fog lamp.
③ Remove clips (C205) securing bumper fascia to engine undercover.
④ Remove screws and clips (C205) securing left and right sides of front fender protector.
⑤ Remove screws securing radiator core support to bumper fasia.
⑥ Remove screws securing left and right front fenders to bumper fascia.
⑦ Remove clips (CS101) securing retainer to bumper fascia.
⑧ Extract bumper fascia assembly.

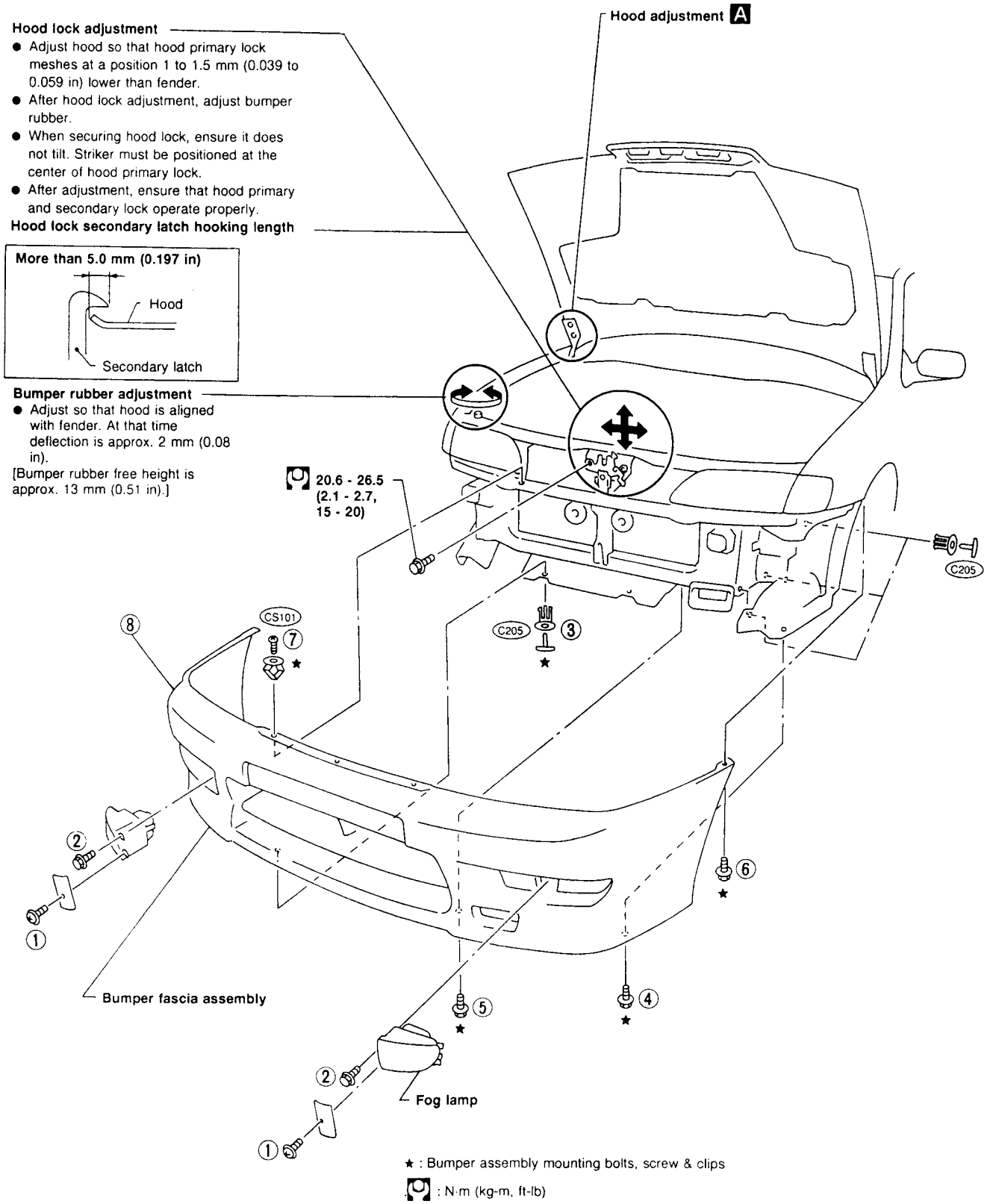
A



YBT001

Body Front End (Cont'd)

SEC. 261•620•623•650•656

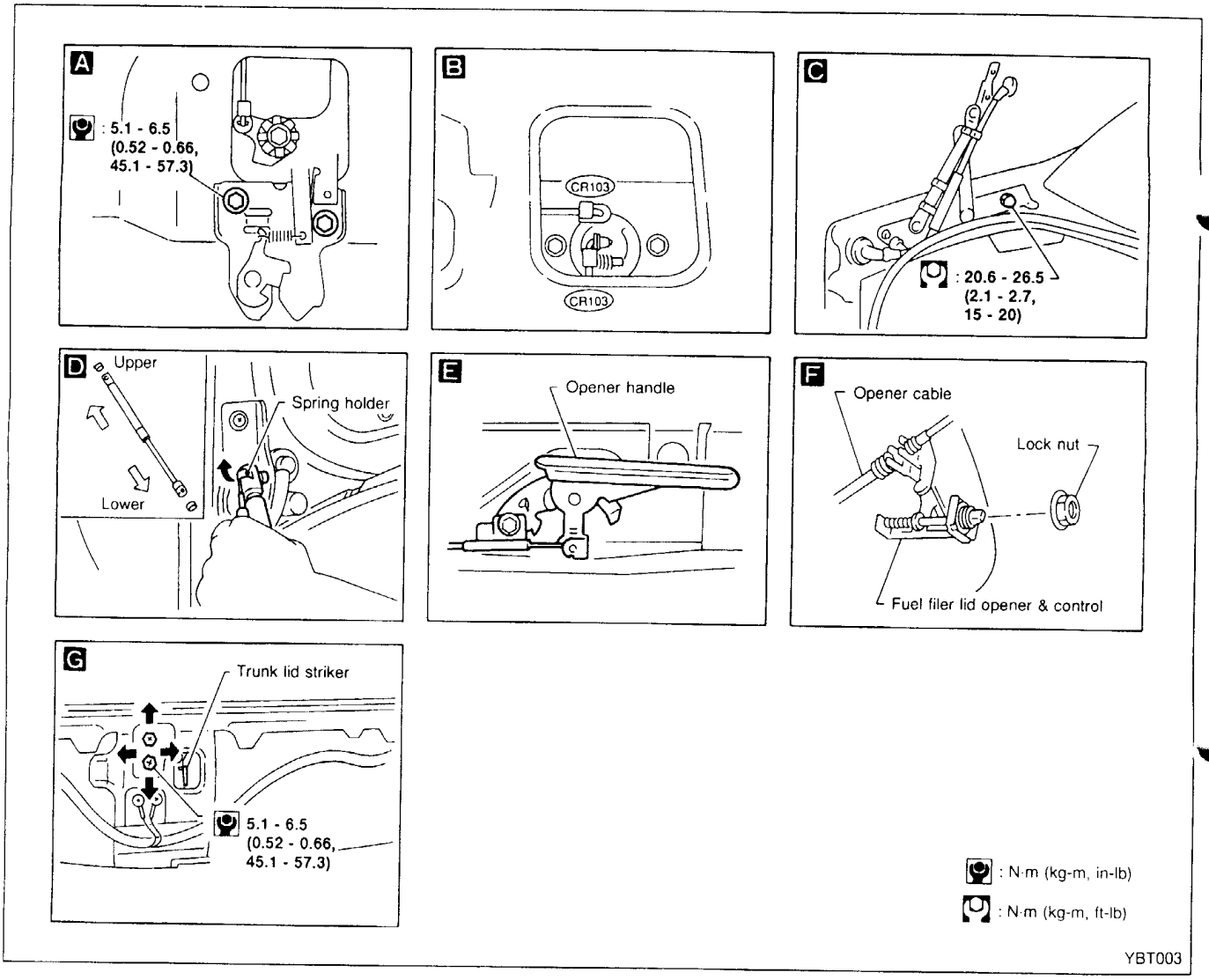


YBT002

Body Rear End and Opener

4-DOOR SEDAN

- When removing or installing trunk lid, place a cloth or other padding on rear fender. This prevents vehicle body from being scratched.
- Bumper fascia is made of plastic. Do not use excessive force and be sure to keep oil away from it.
- Trunk lid adjustment: Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid and fuel filler lid open smoothly.

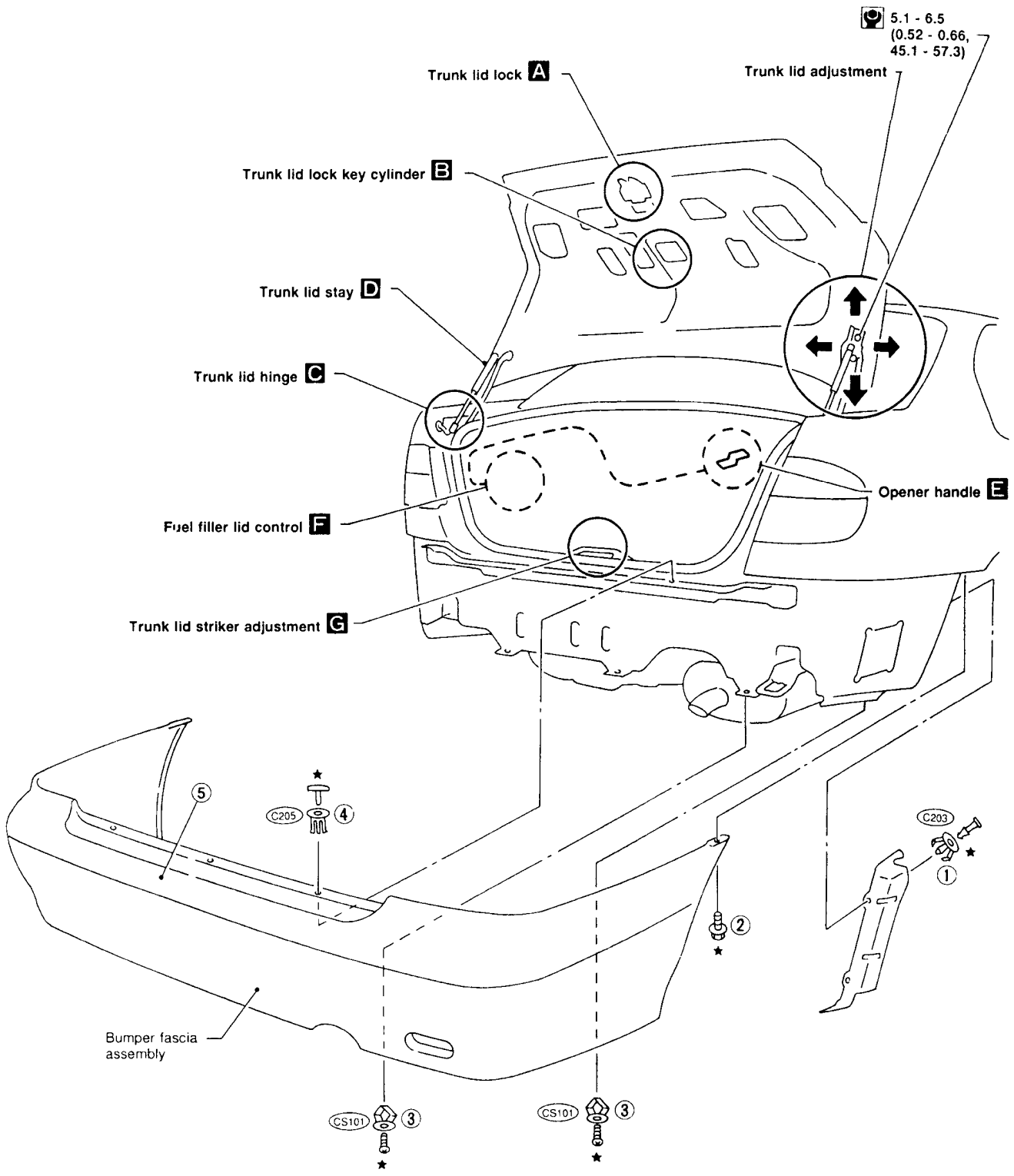


REMOVAL — Screws bumper assembly

① Remove clips (C203) securing left and right chipping protector.
② Remove screws securing bumper fascia to left and right rear fenders.
③ Remove clips (CS101) securing bumper fascia to rear panel.
④ Remove clips (C205) securing bumper fascia to rear panel upper.
⑤ Extract bumper fascia assembly.

Body Rear End and Opener (Cont'd)

SEC. 843•844•850•998



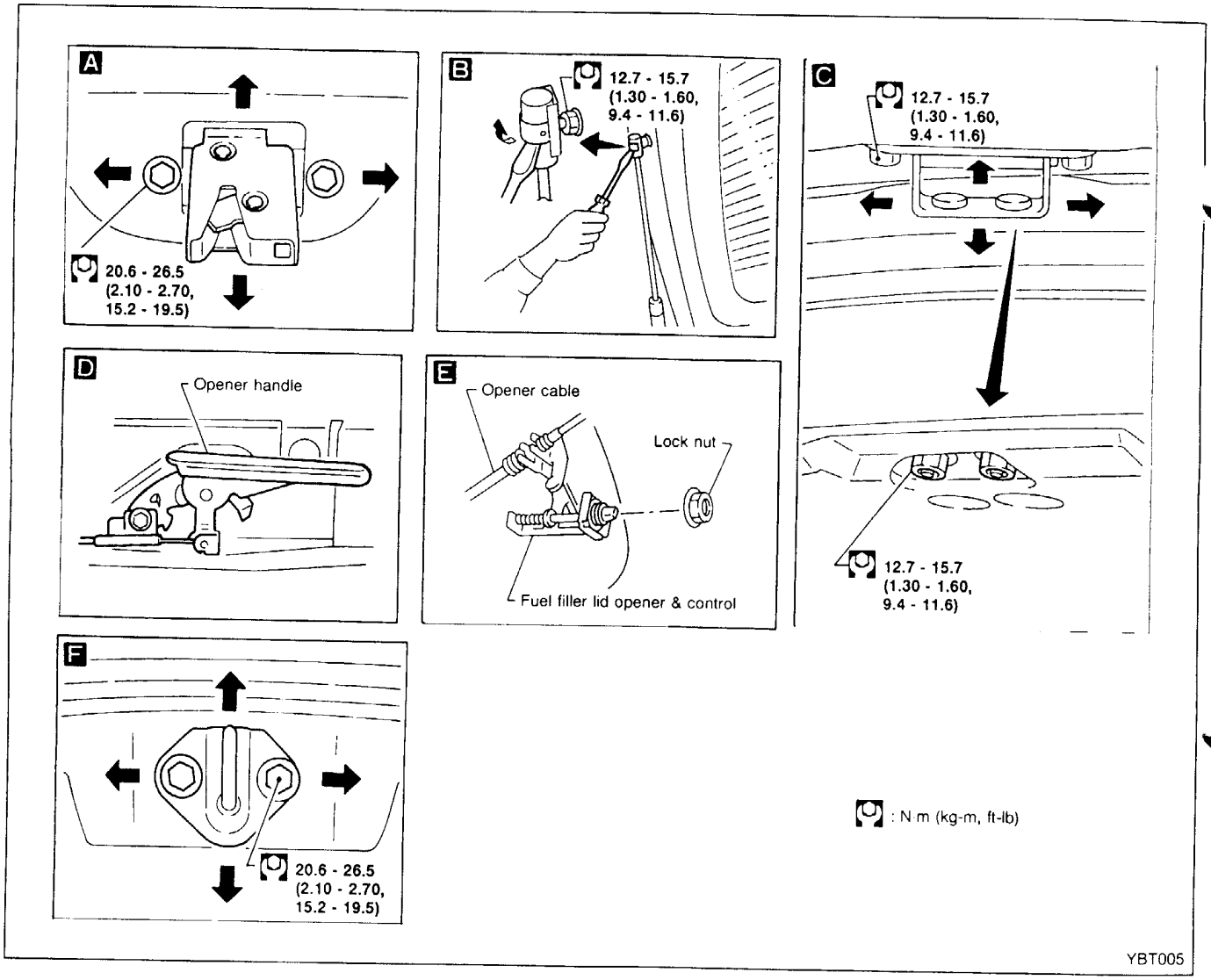
YBT004

5-DOOR HATCHBACK

- Back door adjustment: Adjust at hinge-body portion for proper back door fit.
- Back door lock system adjustment: Adjust lock & striker so that they are in the center. After adjustment, check back door lock operation.

WARNING:

- **Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.**
- **The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.**
- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that back door and fuel filler lid open smoothly.

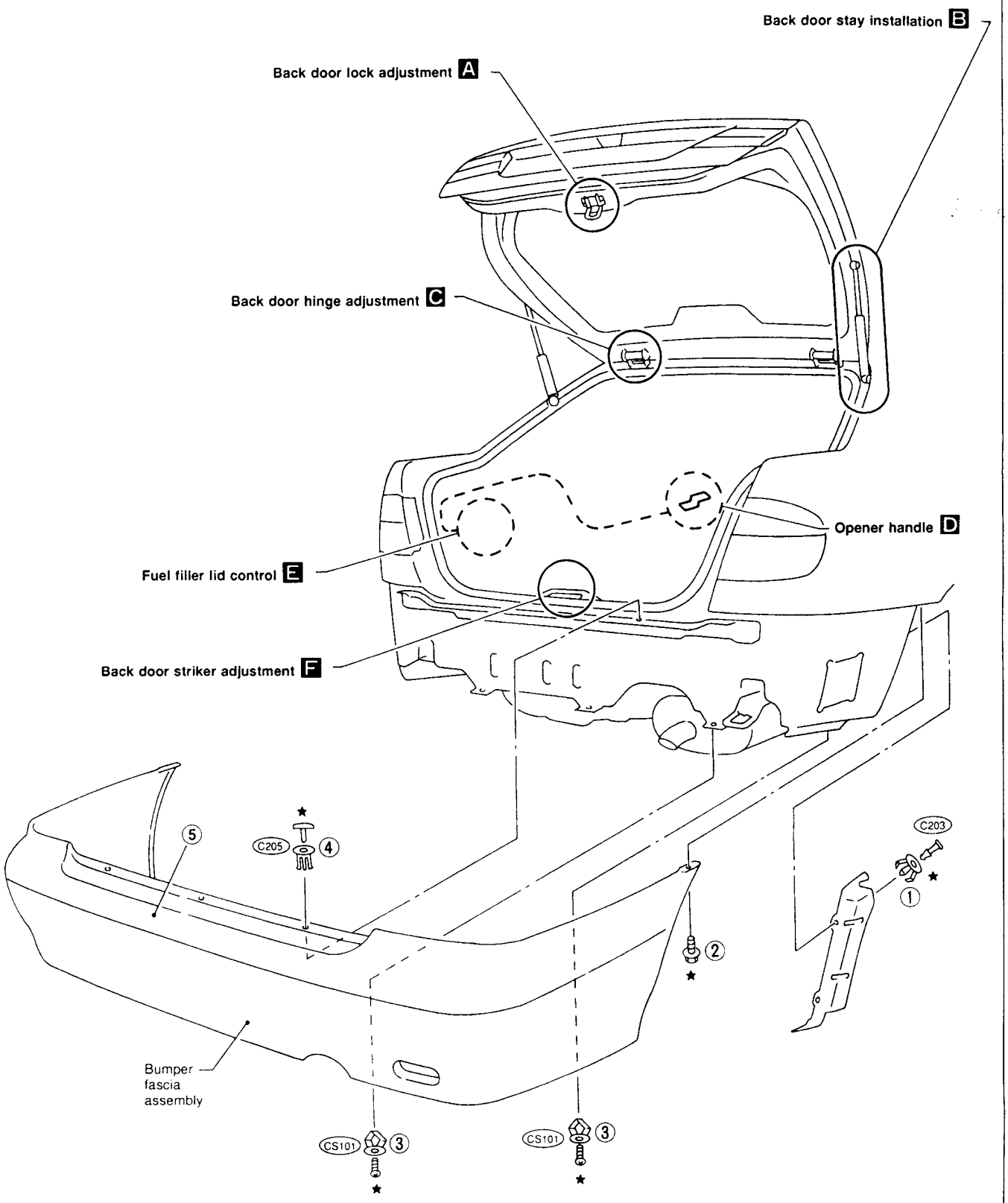


REMOVAL — Rear bumper assembly

① Remove clips C203 securing left and right chipping protector.
② Remove screws securing bumper fascia to left and right rear fenders.
③ Remove clips CS101 securing bumper fascia to rear panel.
④ Remove clips C205 securing bumper fascia to rear panel upper.
⑤ Extract bumper fascia assembly.

Body Rear End and Opener (Cont'd)

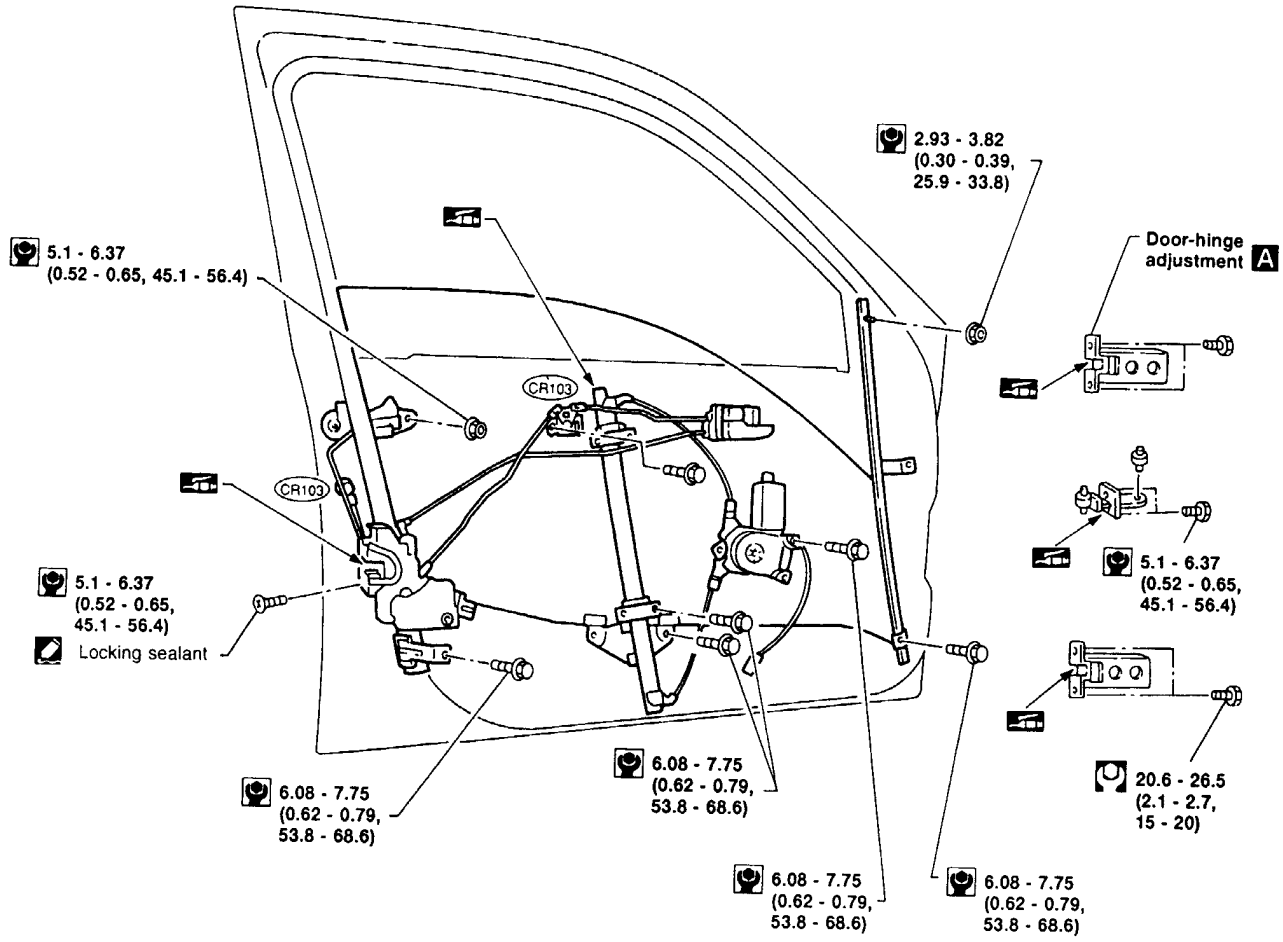
SEC. 850•900•905

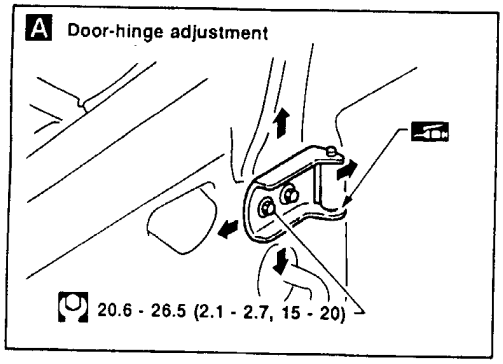


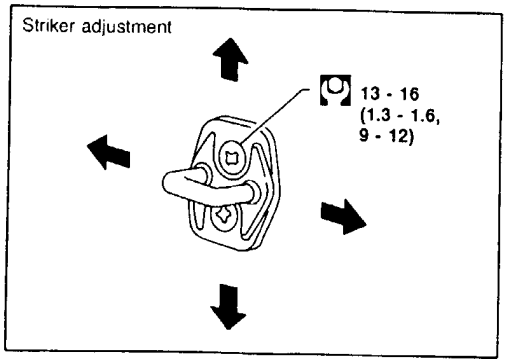
Front Door

- For removal of door trim, refer to "Door Trim" in "INTERIOR TRIM" for details, BT-19.
- After adjusting door or door lock, check door lock operation.

SEC. 800•803•805





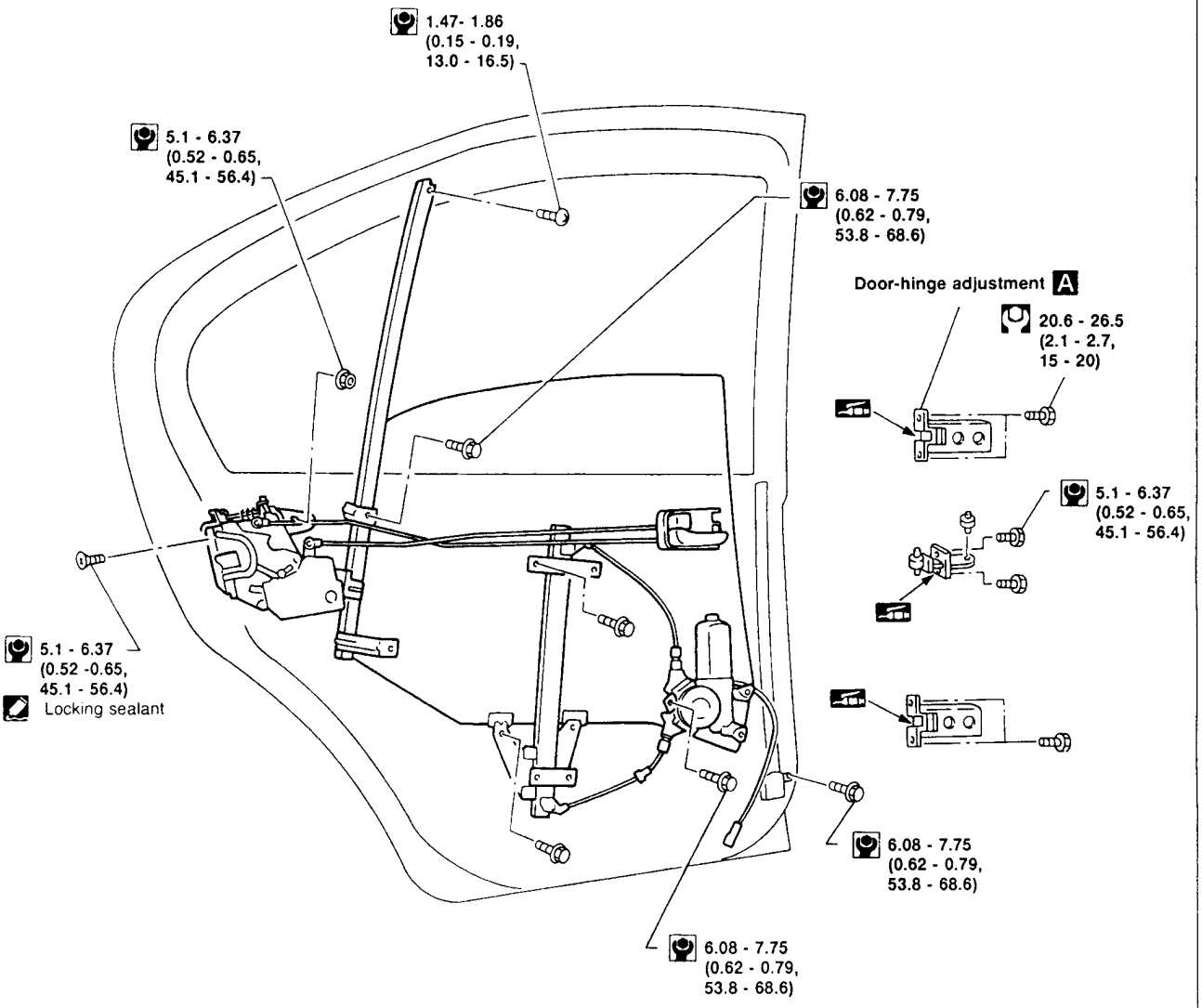


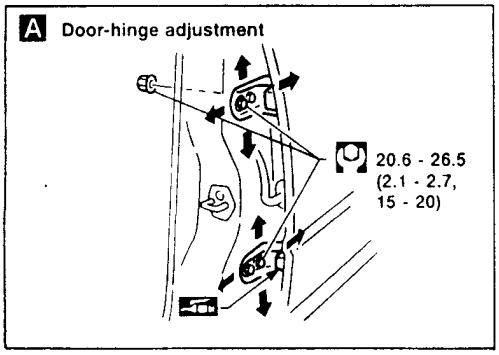
: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)
: Apply grease

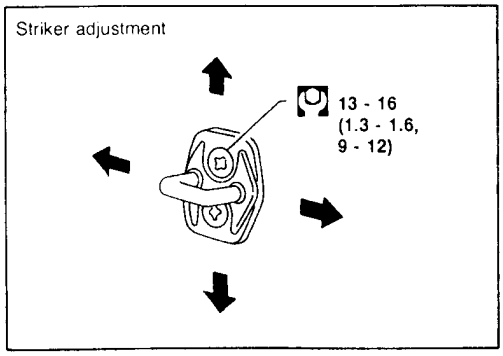
YBT007

Rear Door

SEC. 820•823•825







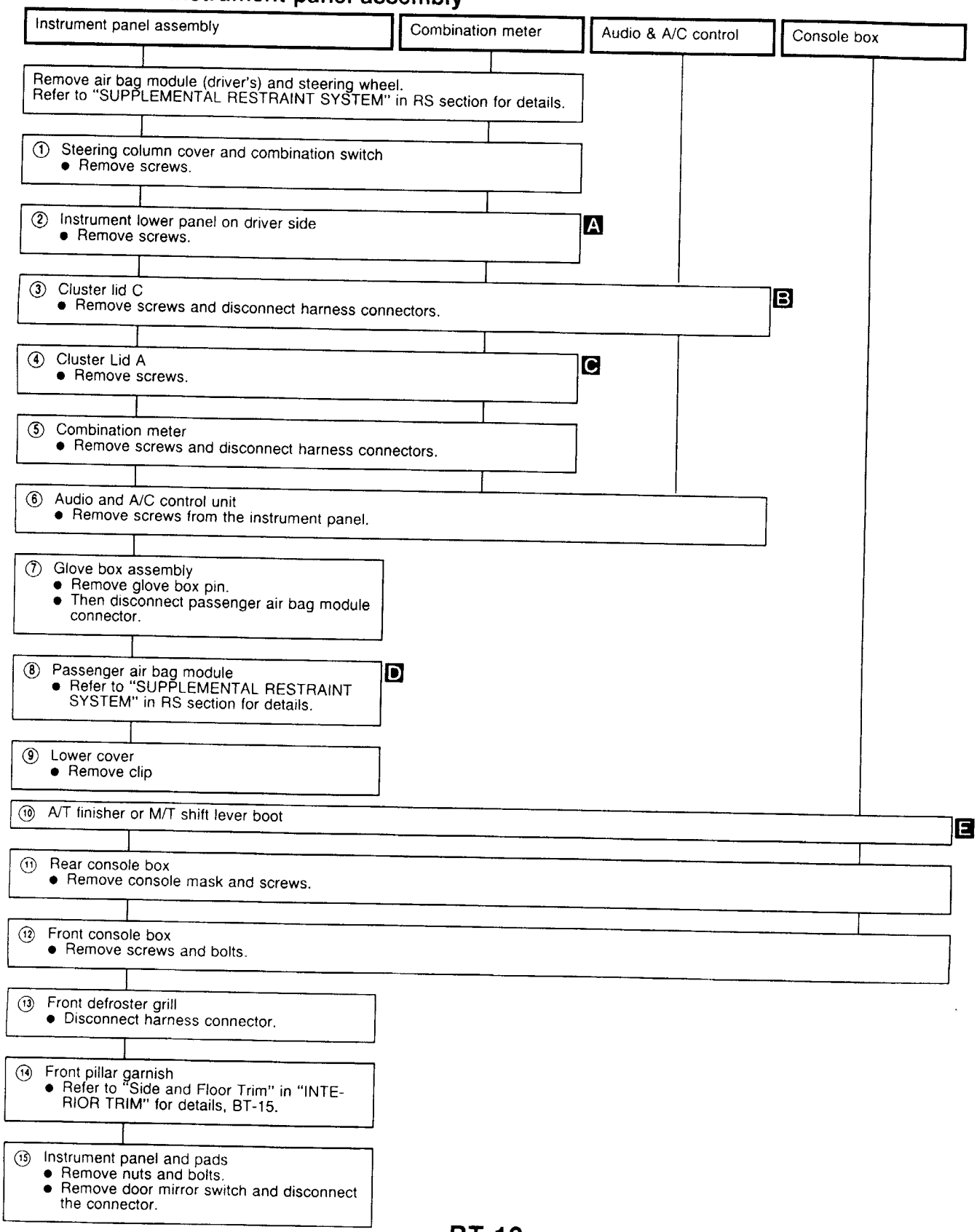
: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)
: Apply grease

YBT008

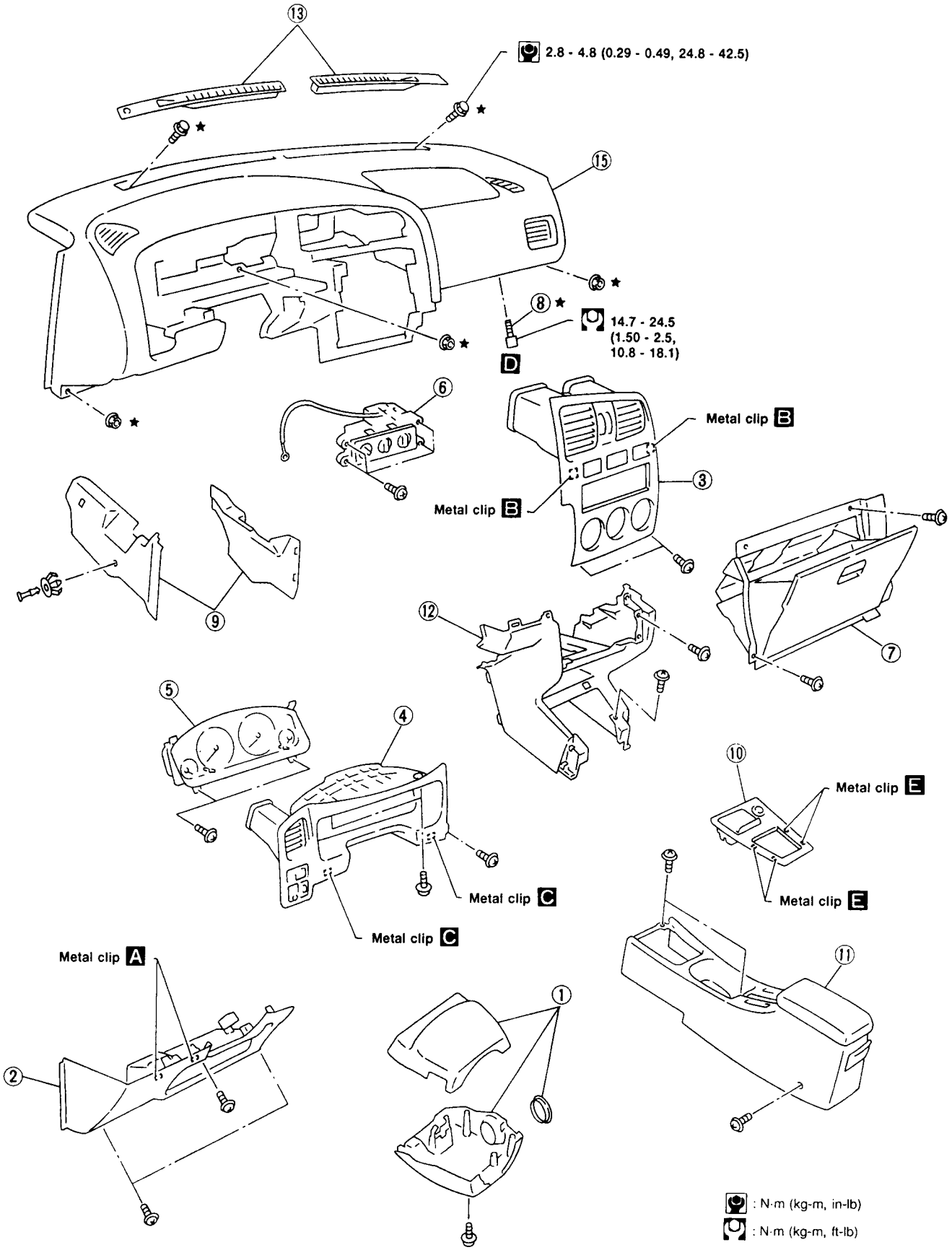
CAUTION:

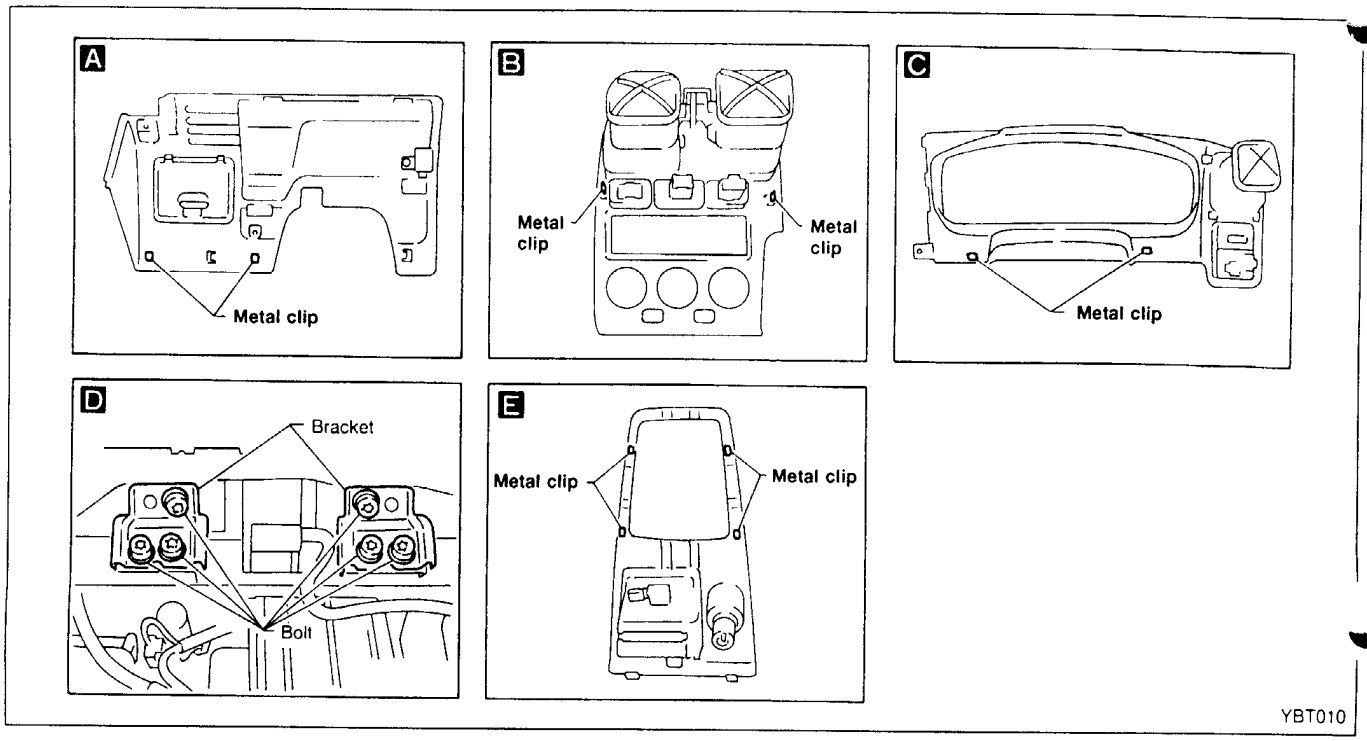
- **Disconnect both battery cables in advance.**
- **Disconnect air bag system line in advance.**
- **Never tamper with or force air bag lid open, as this may adversely affect air bag performance.**
- **Be careful not to scratch pad and other parts.**

REMOVAL — Instrument panel assembly



SEC. 248•251•272•487•680•685•969




A
Metal clip
B
Metal clip
Metal clip
C
Metal clip
D
Bracket
Bolt
E
Metal clip
Metal clip
YBT010

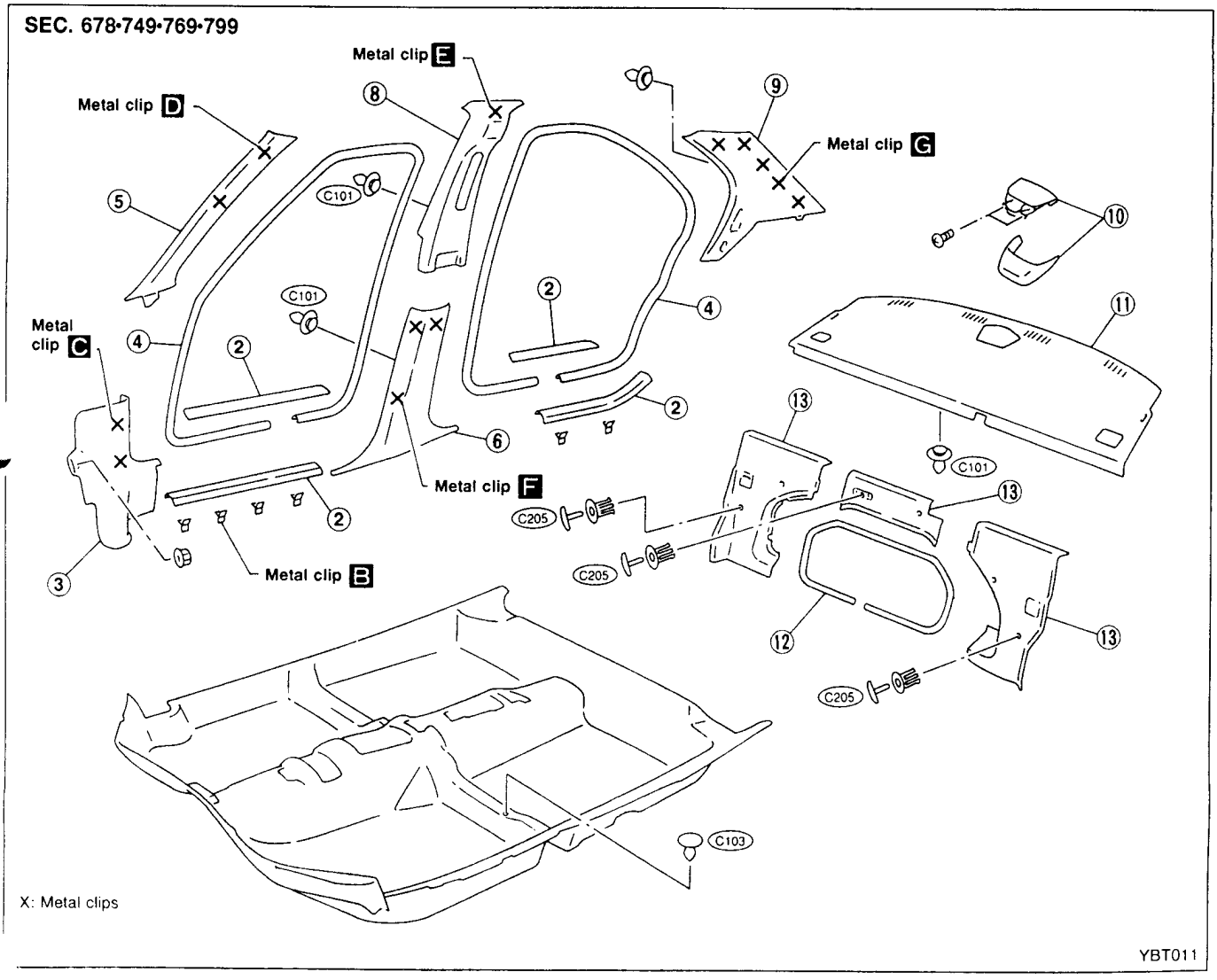
Side and Floor Trim

CAUTION:
Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.

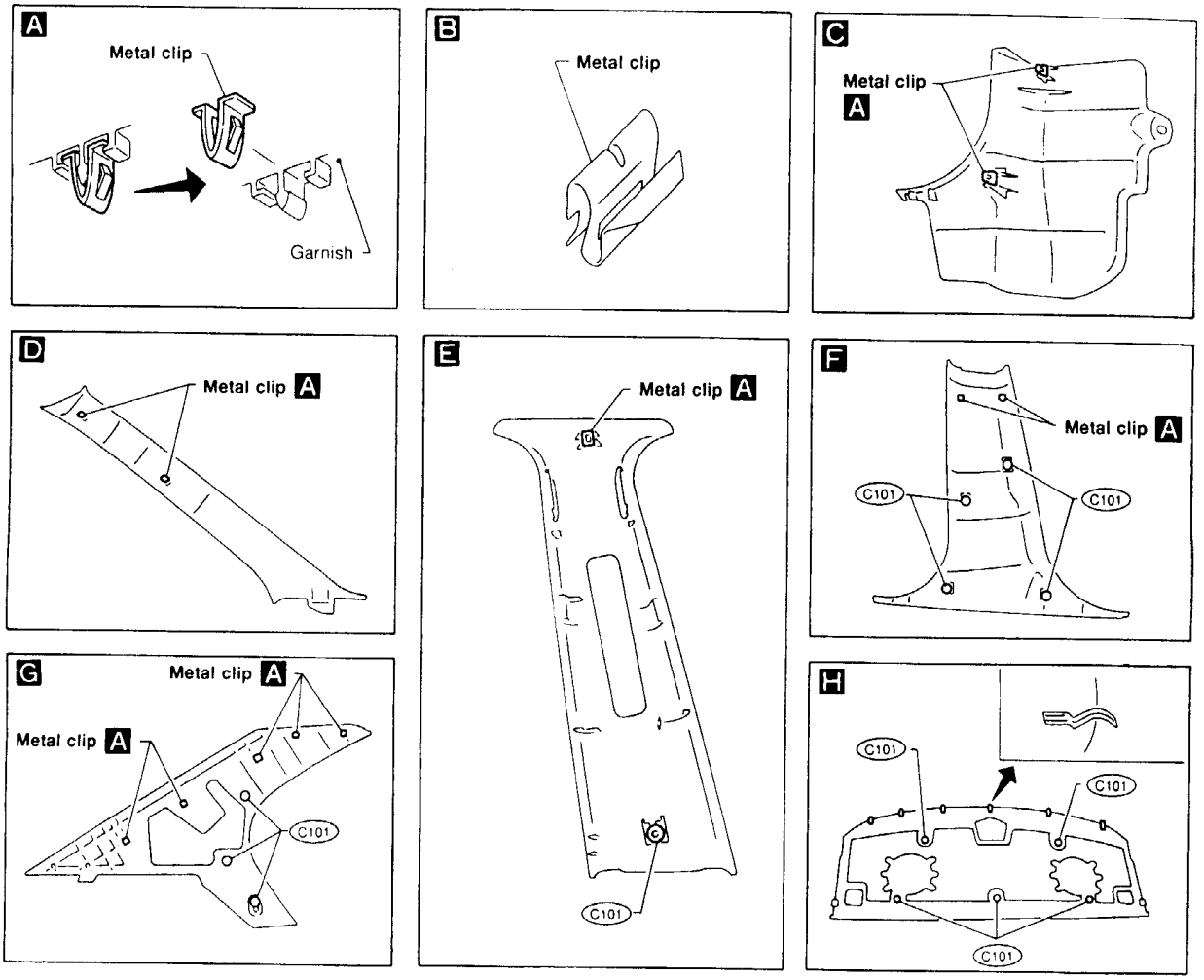
REMOVAL — Body side trim

4-door sedan

① Remove front and rear seats. Refer to "SEAT" for details, BT-32.
② Remove front and rear kicking plates.
③ Remove dash side lower finishers.
④ Remove front and rear body side welts.
⑤ Remove front pillar garnishes.
⑥ Remove center pillar lower garnishes.
⑦ Remove front seat belt shoulder adjustment anchor bolt covers and anchor bolts (Refer to "SEAT BELTS" in RS section for anchor bolt details).
⑧ Remove center pillar upper garnishes.
⑨ Remove rear pillar garnishes.
⑩ High-mount stop lamp.
⑪ Remove rear parcel shelf finisher.
⑫ Remove welt.
⑬ Remove seatback finisher.



Side and Floor Trim (Cont'd)



YBT012

Side and Floor Trim (Cont'd)

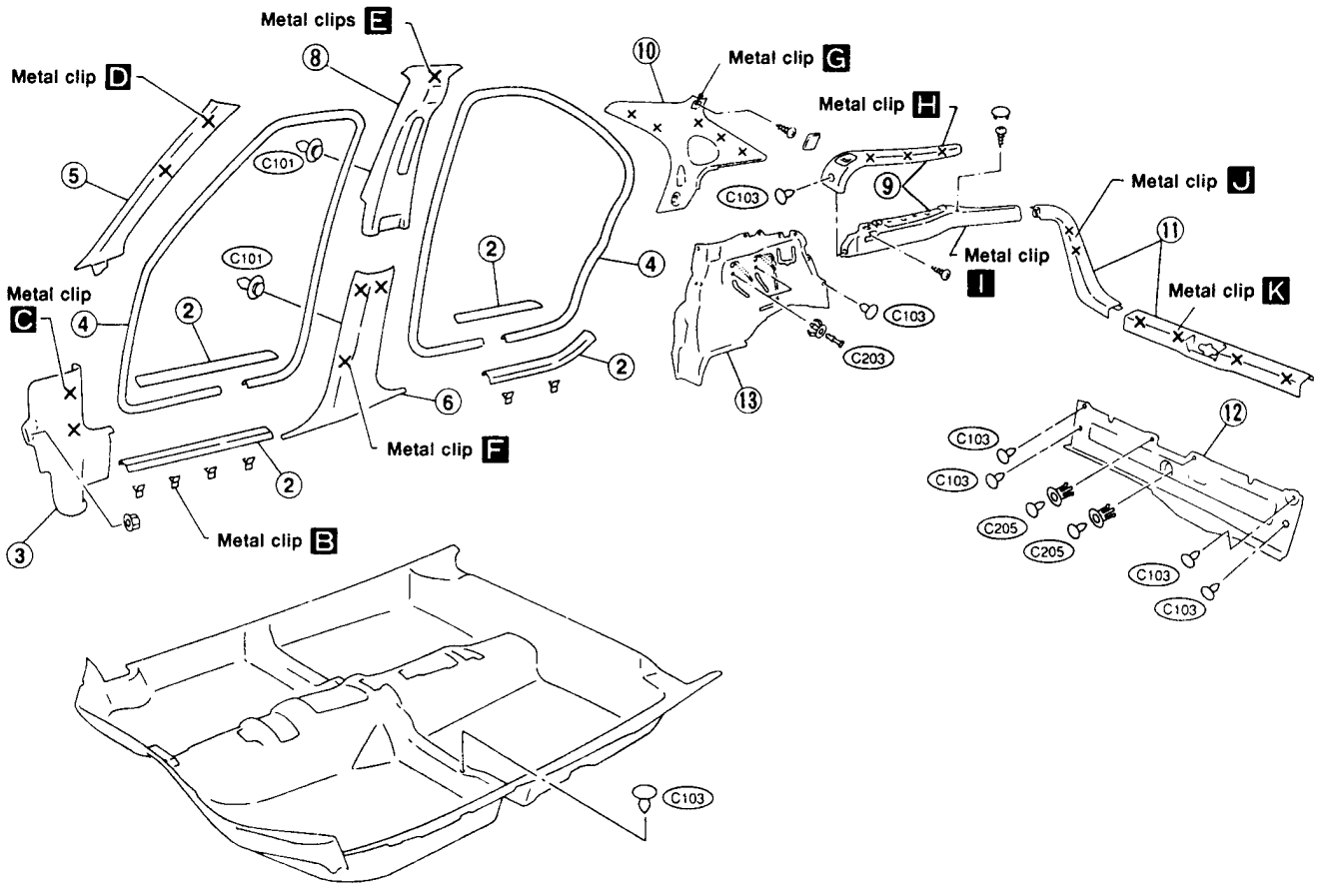
REMOVAL — Body side trim

5-door hatchback

- Remove parcel shelf before removing body side trim.

① Remove front and rear seats. Refer to "SEAT" for details, BT-32.
② Remove front and rear kicking plates.
③ Remove dash side lower finishers.
④ Remove front and rear body side welts.
⑤ Remove front pillar garnishes.
⑥ Remove center pillar lower garnishes.
⑦ Remove front seat belt shoulder adjustment anchor bolt covers and anchor bolts (Refer to "SEAT BELTS" in RS section for anchor bolt details).
⑧ Remove center pillar upper garnishes.
⑨ Remove rear parcel shelf side finishers.
⑩ Remove rear pillar finishers.
⑪ Remove luggage room rear plate.
⑫ Remove luggage room rear finisher.
⑬ Remove luggage room side lower finishers.

SEC. 678•749•769•799

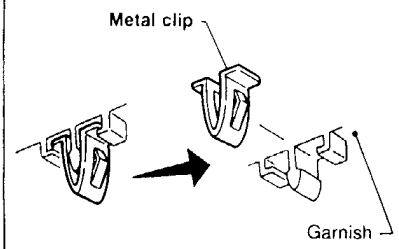


X : Metal clips

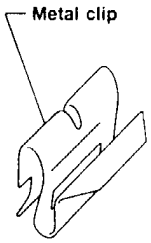
YBT013

Side and Floor Trim (Cont'd)

A



B



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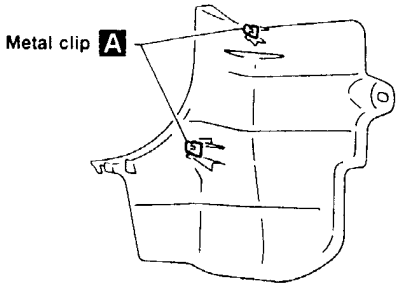

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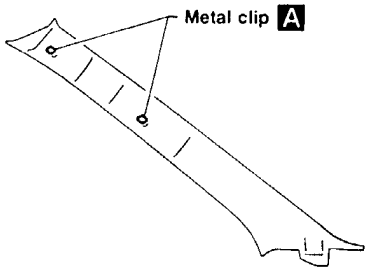

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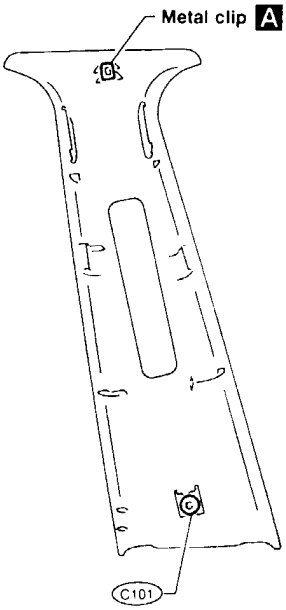

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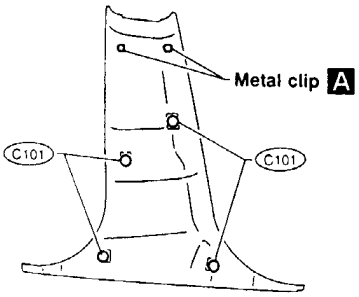
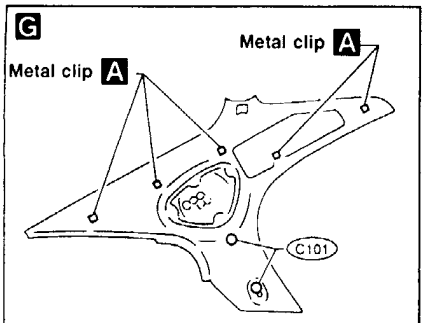
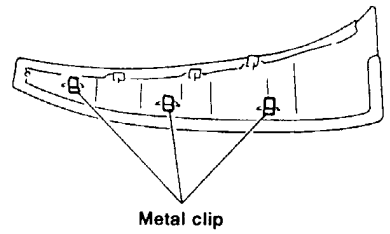


G



H



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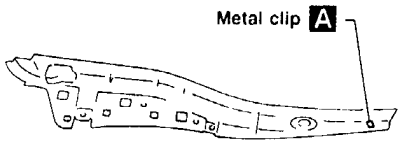

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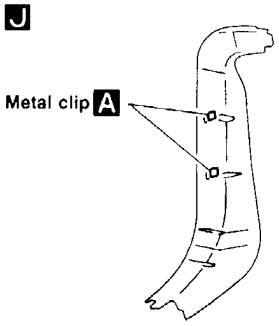

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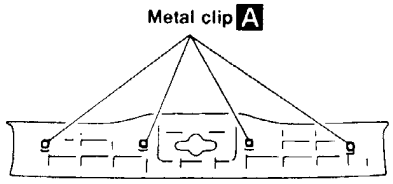


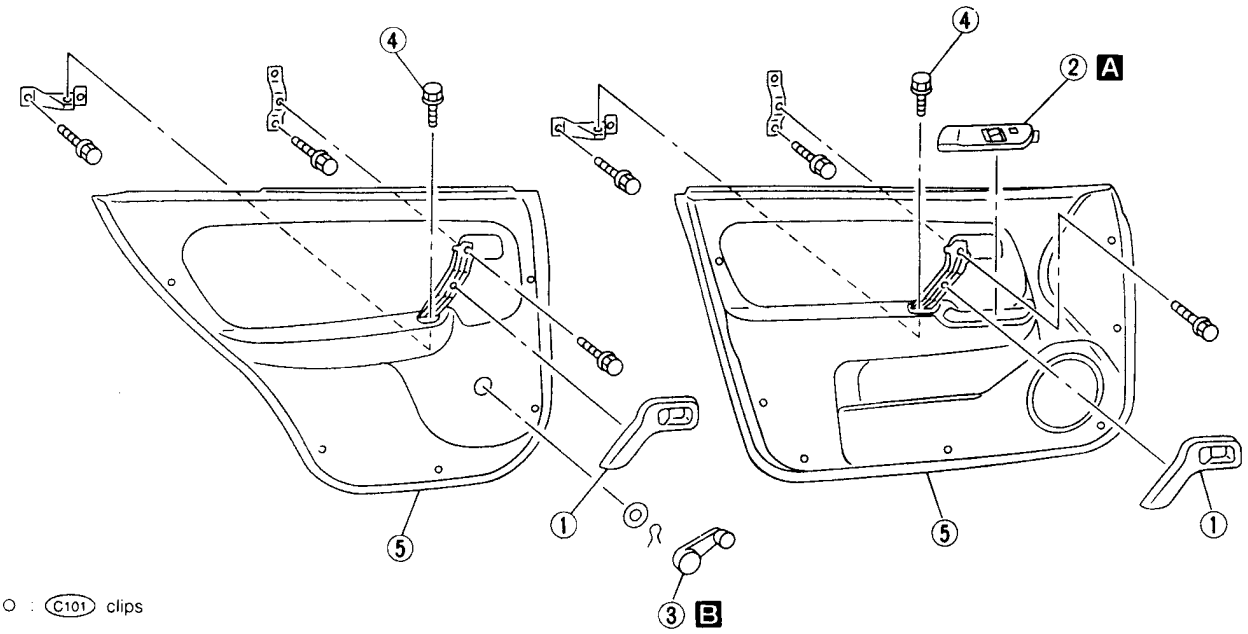
YBT014

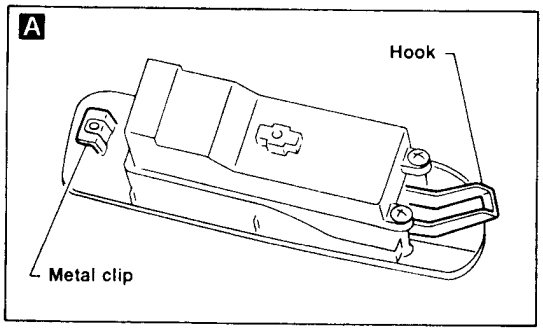
Door Trim

REMOVAL — Door trim

① Remove pull handle.
② Remove window regulator handle (Manual window models).
③ Remove power window switch assembly and disconnect the connector (Power window models).
④ Remove bolts, screws and clips (C101) securing door finisher.
⑤ Lift out door finisher.

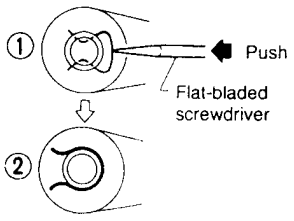
SEC. 251•267•809•828





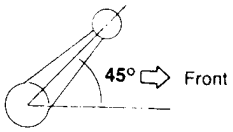
B Manual window regulator handle

Removal



Squeeze the regulator handle clip in place with a screwdriver and remove the regulator handle from the regulator shaft.
Set the regulator handle clip as shown in figure ①.

Installation



Push the regulator handle to install it into the regulator shaft.
Install the regulator handle in place as shown in the figure with the window completely closed.

YBT015

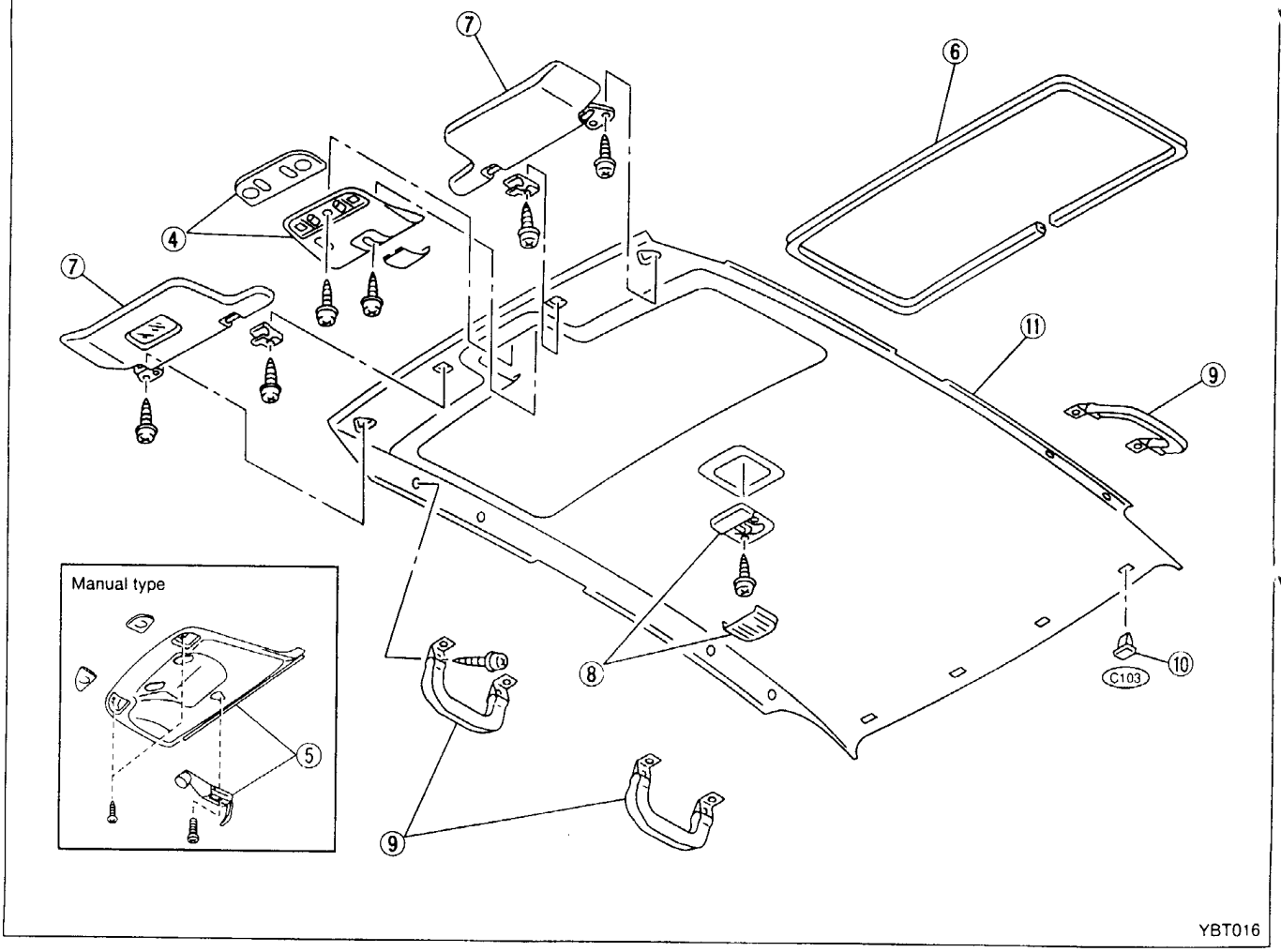
Roof Trim

REMOVAL — Headlining

4-door sedan

① Remove front and rear seats. Refer to "SEAT" for details, BT-32.
② Remove front and rear seat belts. Refer to "SEAT BELTS" in RS section for details.
③ Remove body side trim. Refer to "Side and Floor Trim" for details, BT-15.
④ Remove sunroof switch. (Models equipped with electric sunroof)
⑤ Remove handle and lamp cover. (Models equipped with manual sunroof)
⑥ Remove sunroof welt. (Models equipped with sunroof)
⑦ Remove sun visors.
⑧ Remove interior lamp assembly.
⑨ Remove assist grips.
⑩ Remove clips (C103) securing headlining.
⑪ Remove headlining.

SEC. 264•738•963•964



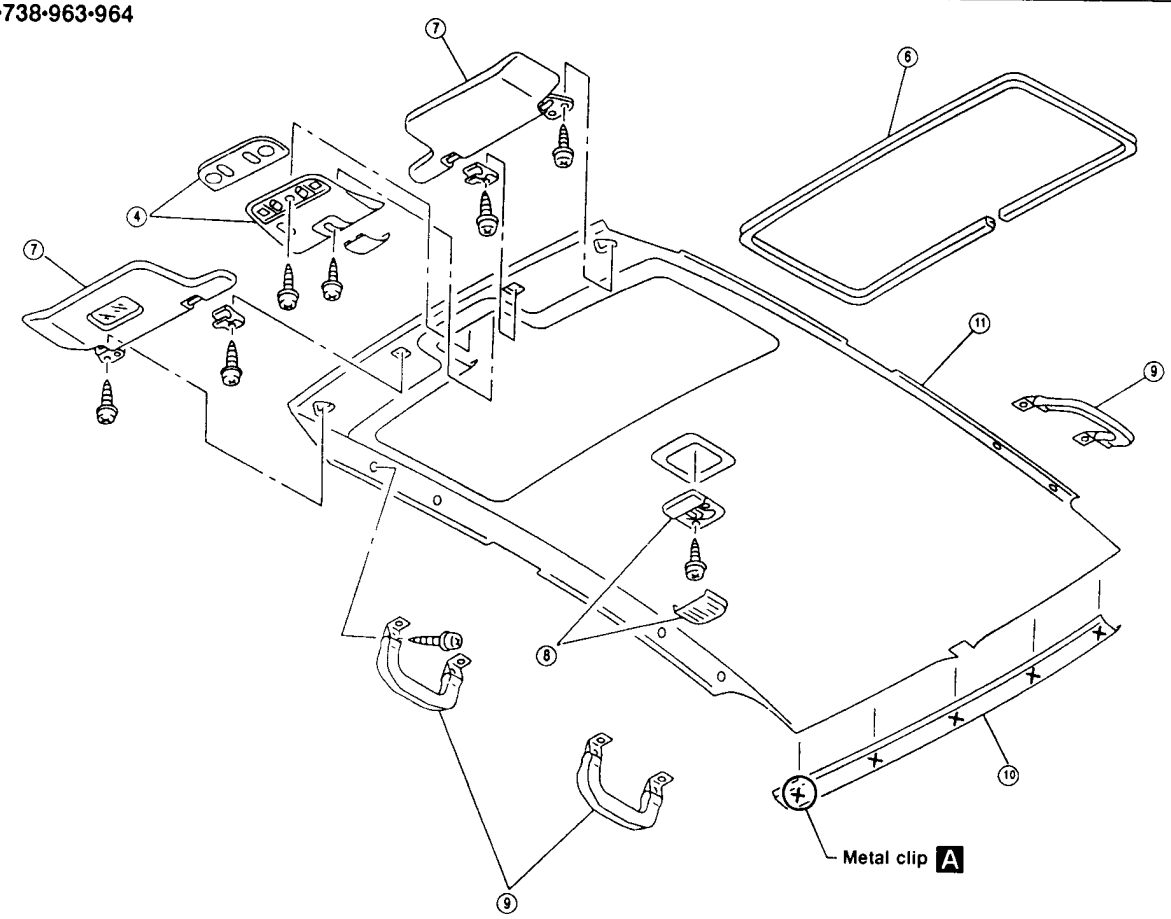
Roof Trim (Cont'd)

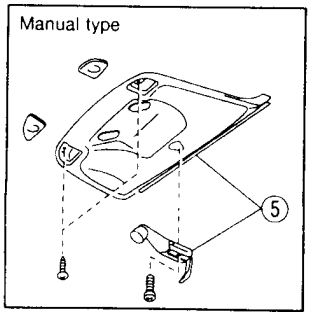
REMOVAL — Headlining

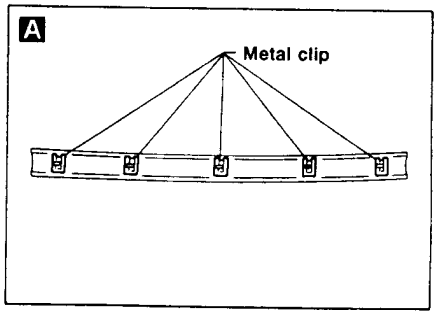
5-door hatchback

① Remove front and rear seats. Refer to "SEAT" for details, BT-32.
② Remove front and rear seat belts. Refer to "SEAT BELTS" in RS section for details.
③ Remove body side trim. Refer to "Side and Floor Trim" for details, BT-15.
④ Remove sunroof switch. (Models equipped with electric sunroof)
⑤ Remove handle and lamp cover. (Models equipped with manual sunroof)
⑥ Remove sunroof welt. (Models equipped with sunroof)
⑦ Remove sun visors.
⑧ Remove interior lamp assembly.
⑨ Remove assist grips.
⑩ Remove roof rear garnish.
⑪ Remove headlining.

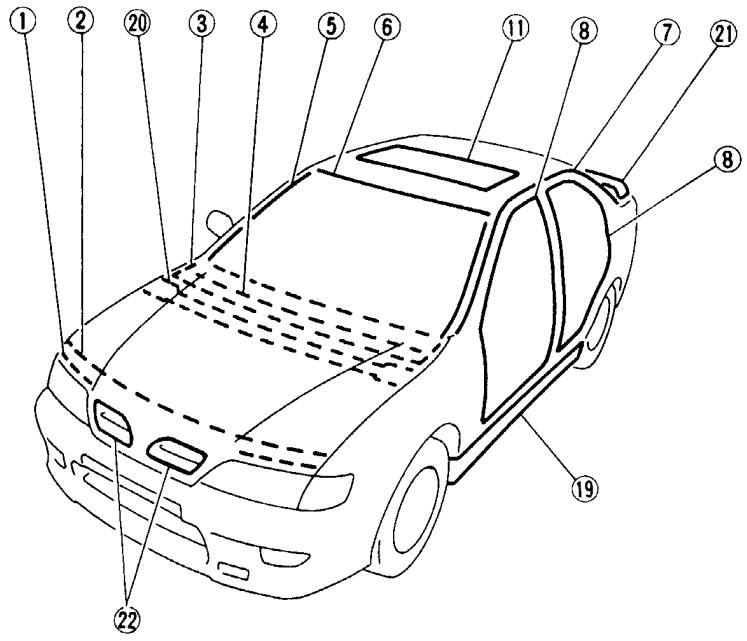
SEC. 264•738•963•964

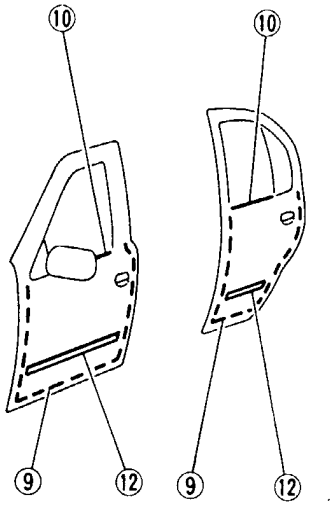


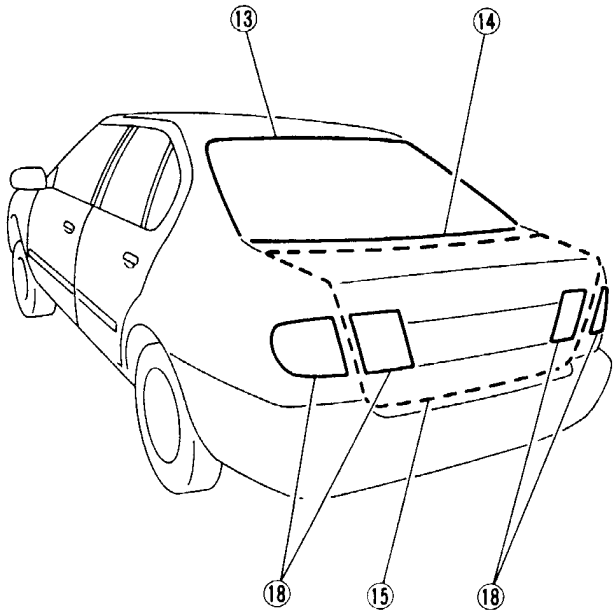


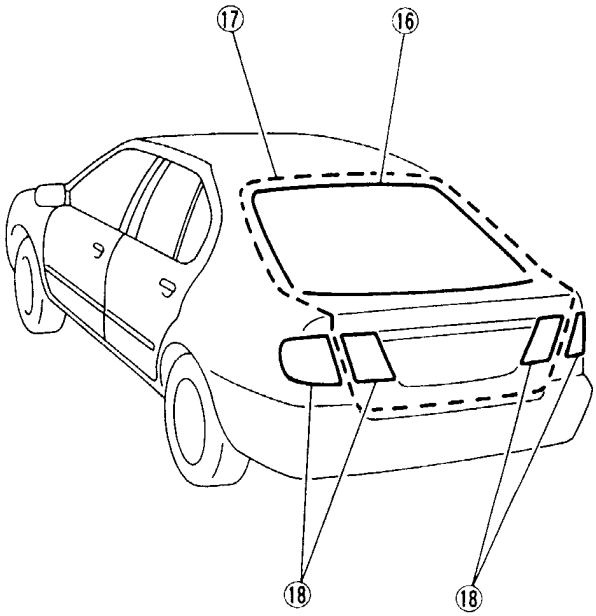


YBT017





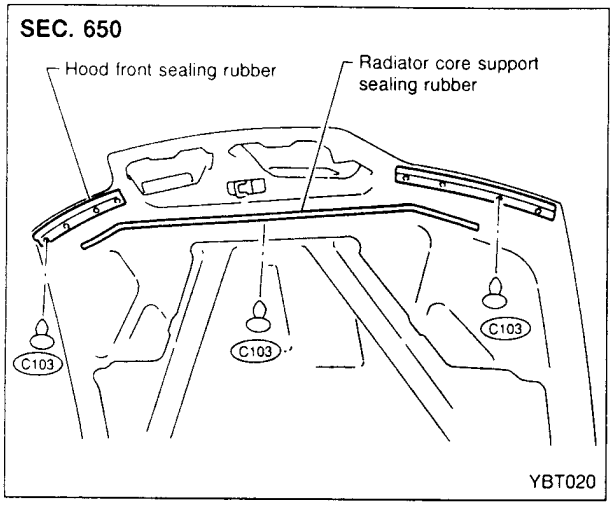




YBT031

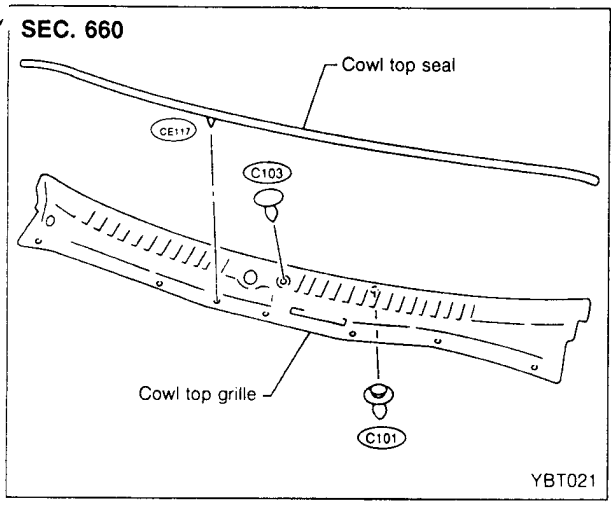
① ② Hood front sealing rubber

SEC. 650



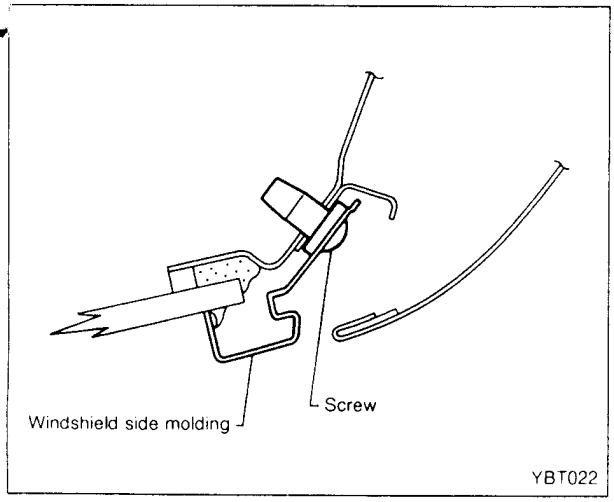
③ ④ Cowl top seal and cowl top grille

SEC. 660



⑤ Windshield side molding

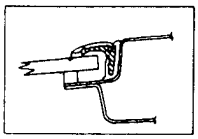
Mounted with screws.

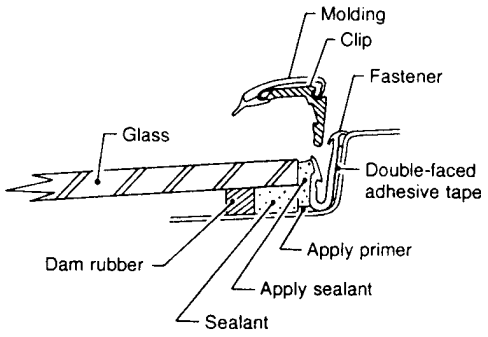


⑥ Windshield upper molding

SEC. 720

1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set moulding fastener and apply primer to body panel, and apply sealant to body.

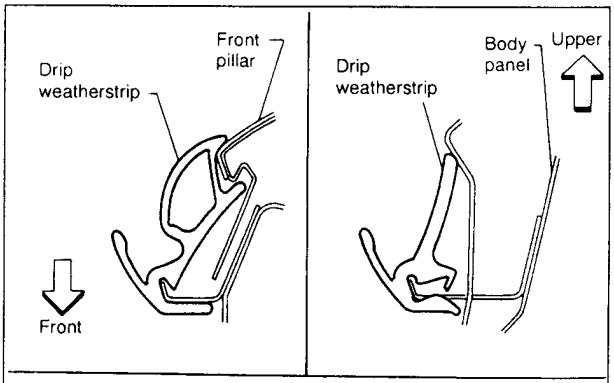




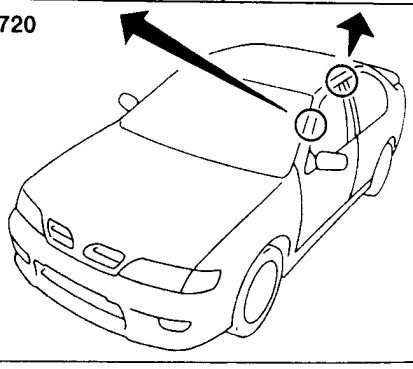
4. Install molding by aligning the molding mark located on center with vehicle center. Be sure to install tightly so that there is no gap around the corner.

SBF342H

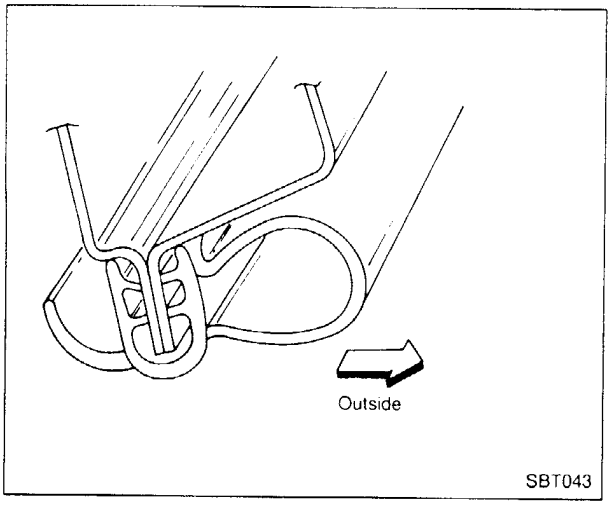
⑦ Drip weatherstrip



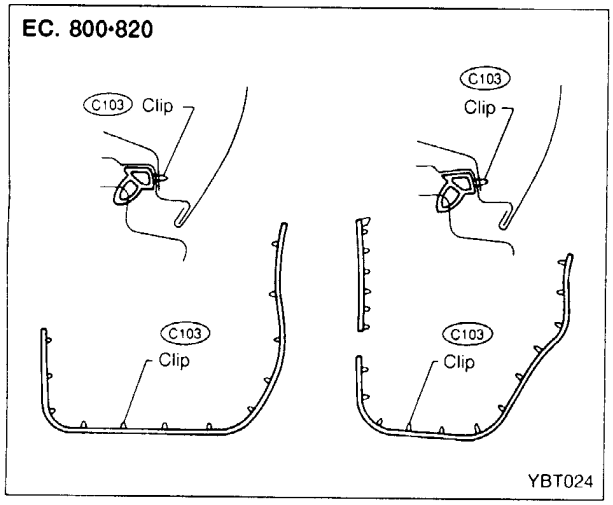
SEC. 720



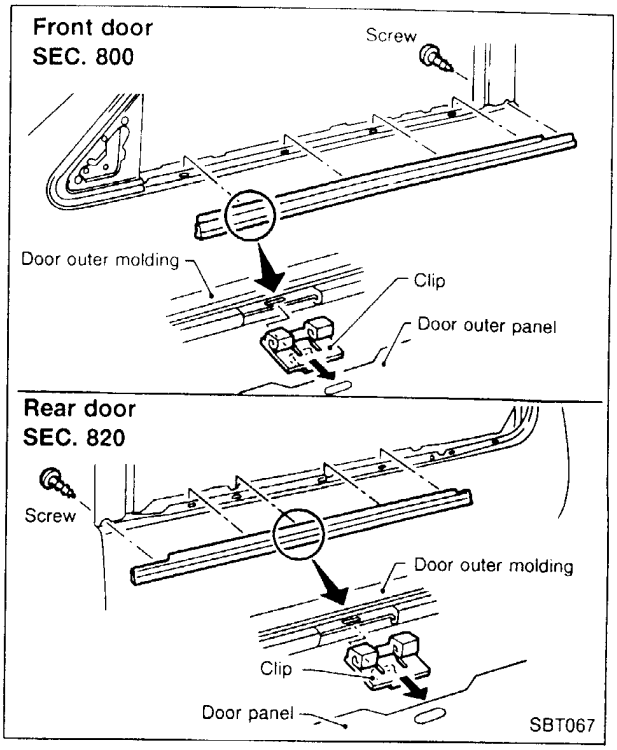
⑧ Body side welt



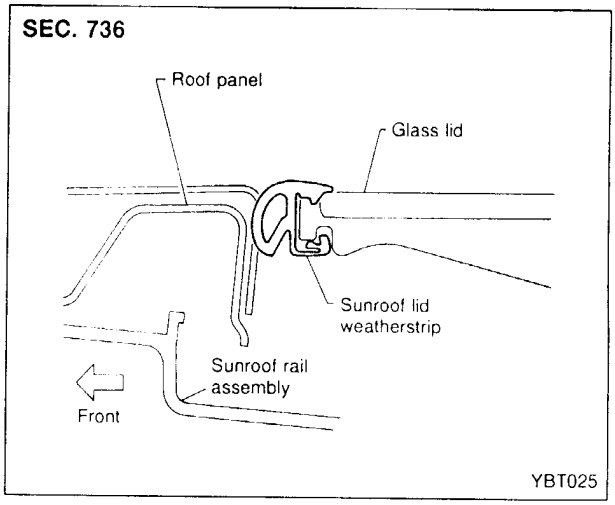
⑨ Door weatherstrip



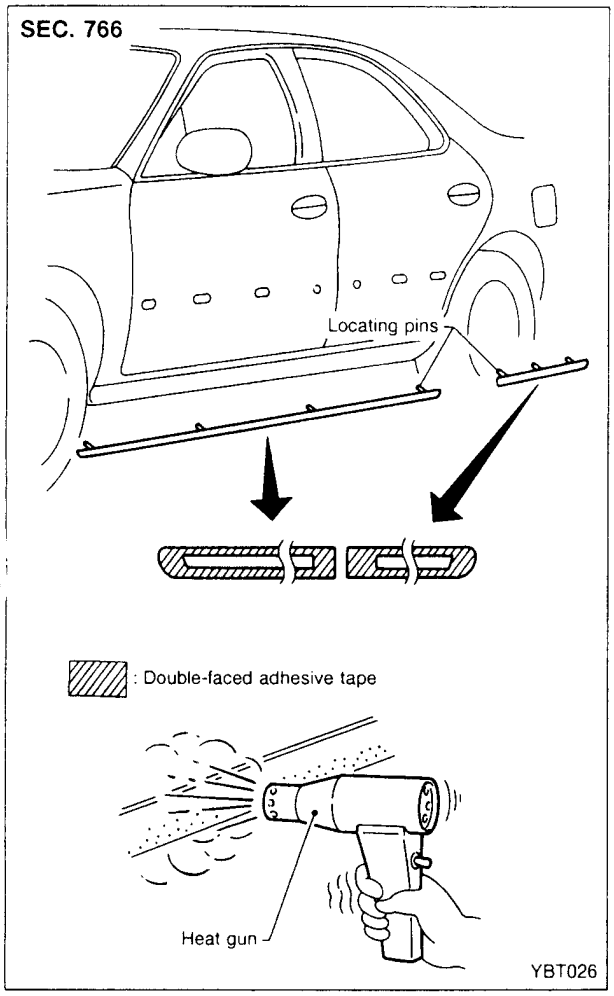
⑩ Door outside molding



⑪ Sunroof lid weatherstrip



⑫ Side guard molding

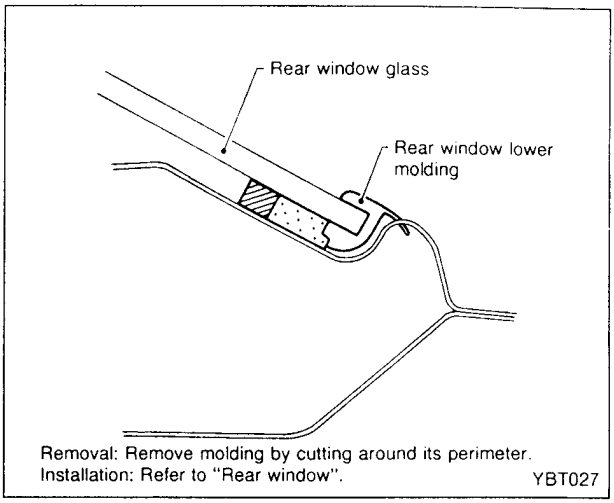


- **With a vehicle coated with Hard Clear Coat, use double-faced 3M adhesive tape Product No. 5572 or equivalent, after priming with 3M primer Product No. N-200 or C-100 or equivalent.**

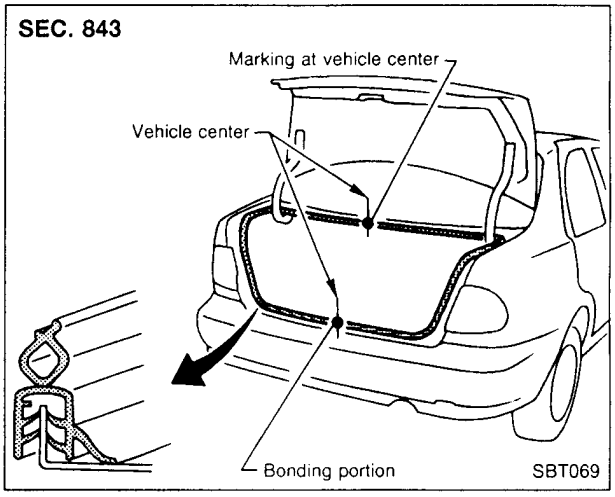
⑬ Rear window upper molding

Basically the same as windshield upper molding.
Refer to ⑥ Windshield upper molding.

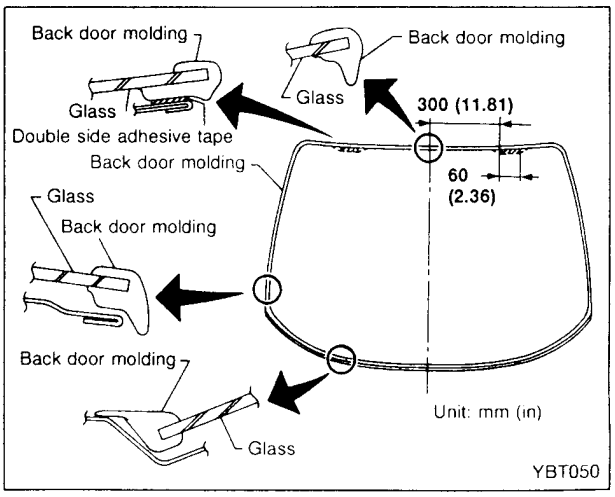
⑭ Rear window lower molding



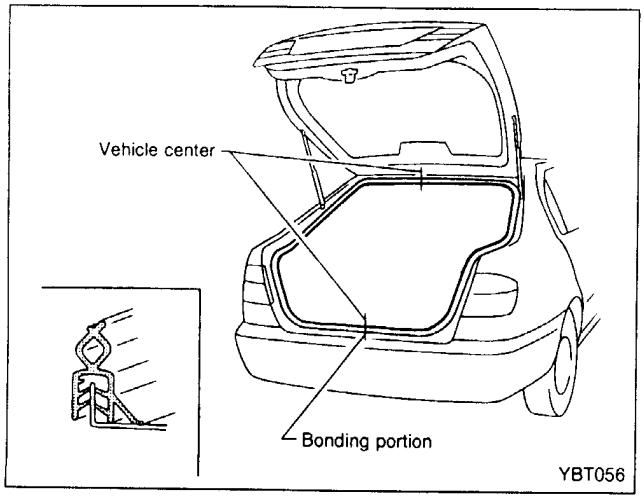
⑮ Trunk lid weatherstrip



⑯ Back door window molding



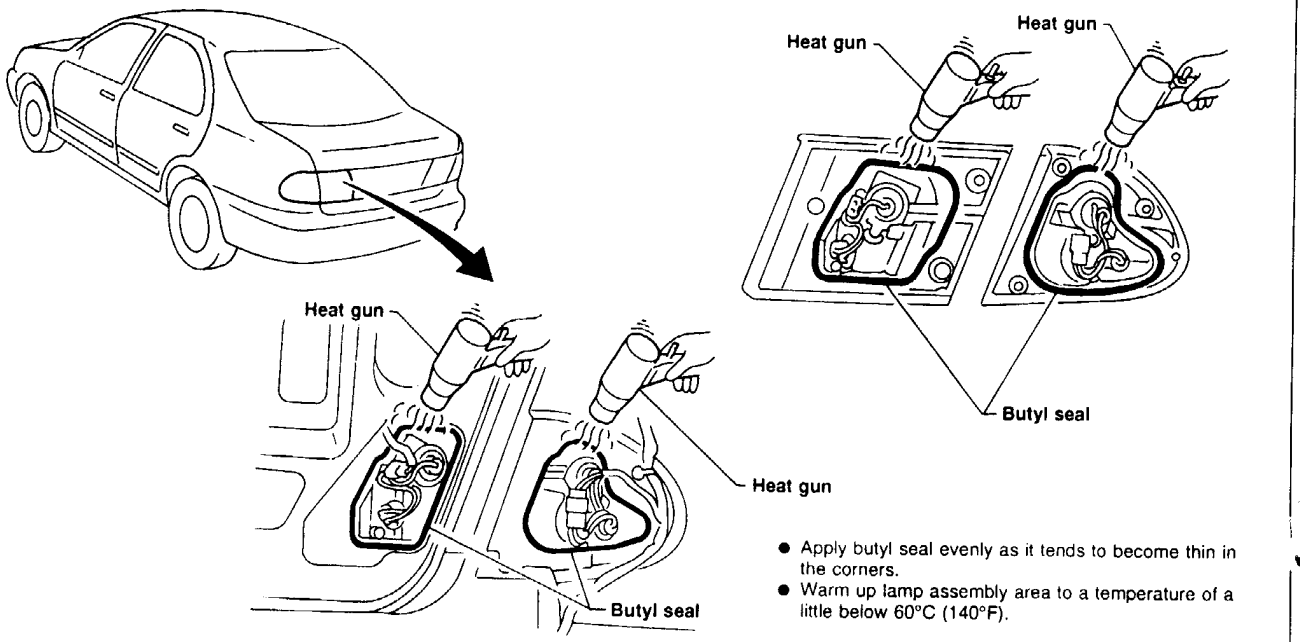
⑰ Back door weatherstrip



⑱ Rear combination lamp

- Rear combination lamps are installed with nuts and butyl sealant.

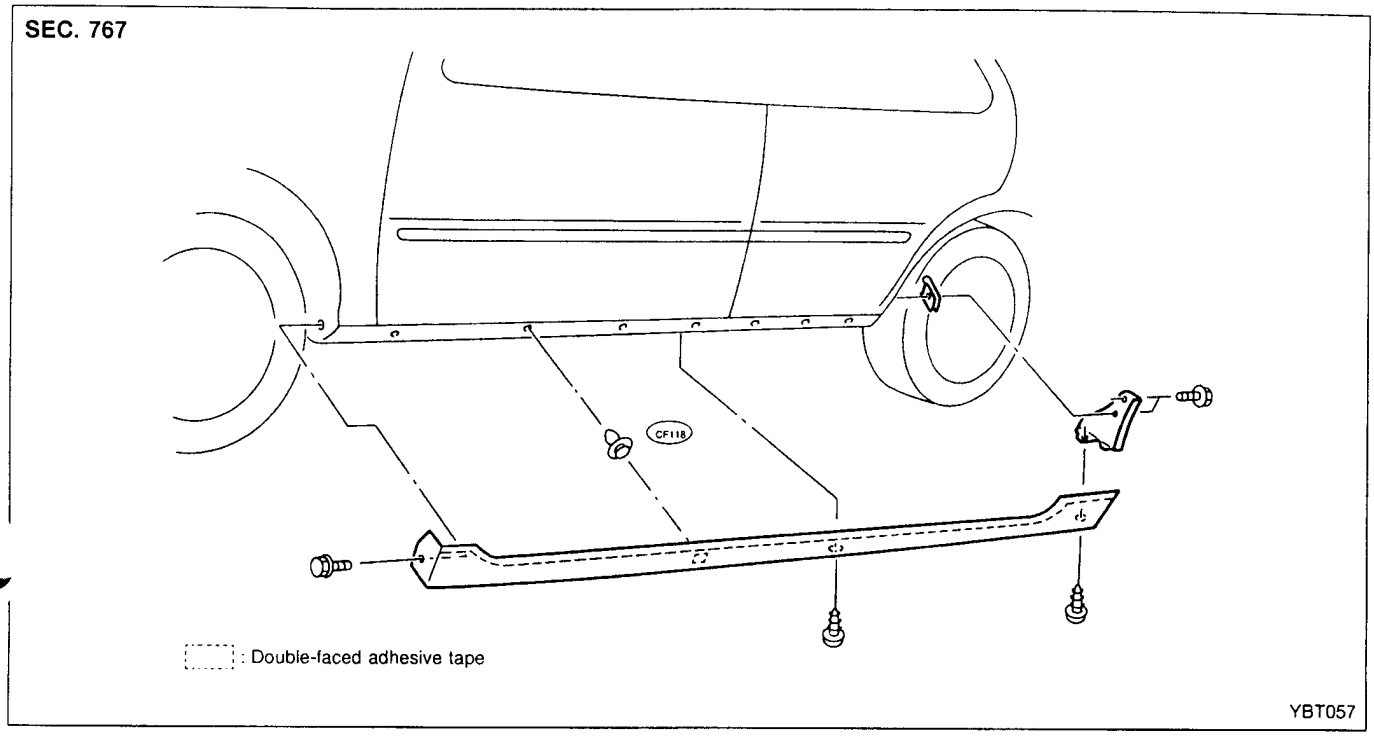
SEC. 265



- Apply butyl seal evenly as it tends to become thin in the corners.
- Warm up lamp assembly area to a temperature of a little below 60°C (140°F).

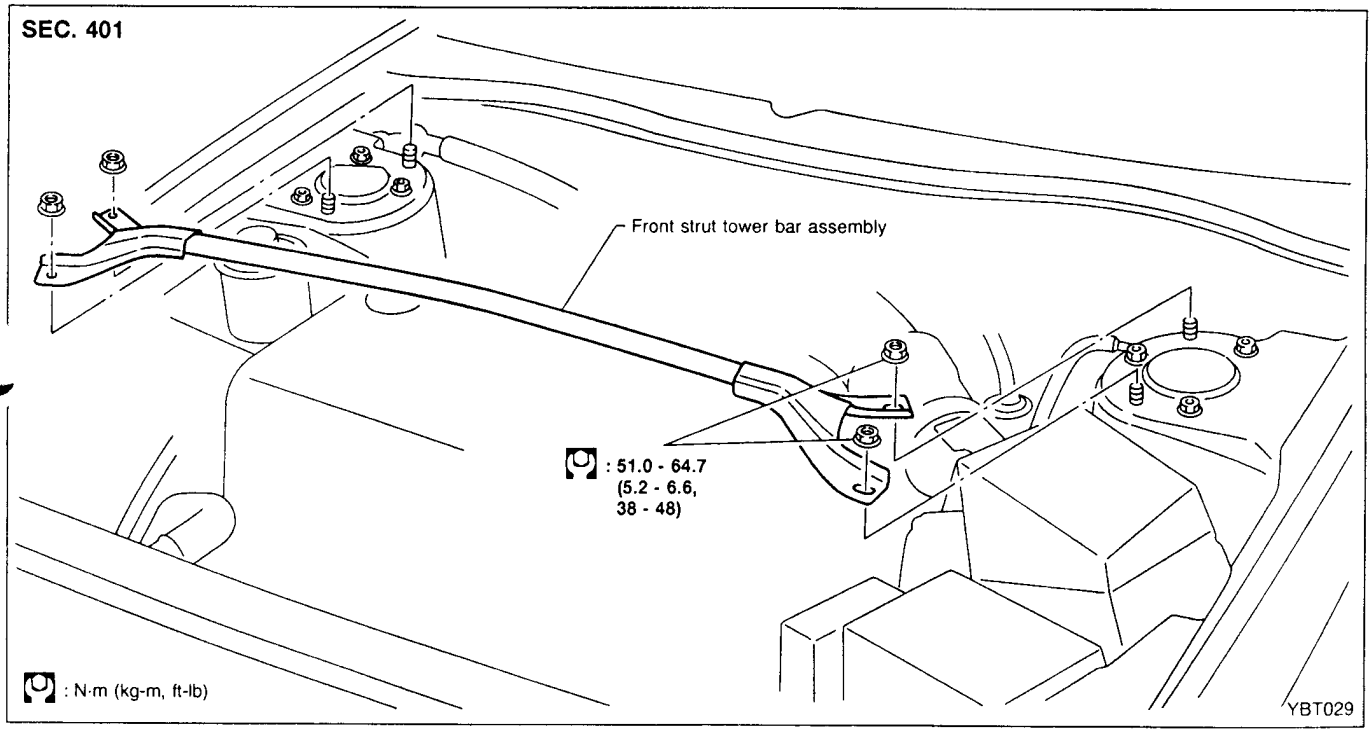
⑲ Center mud guard

SEC. 767



⑳ Front strut tower bar assembly

SEC. 401

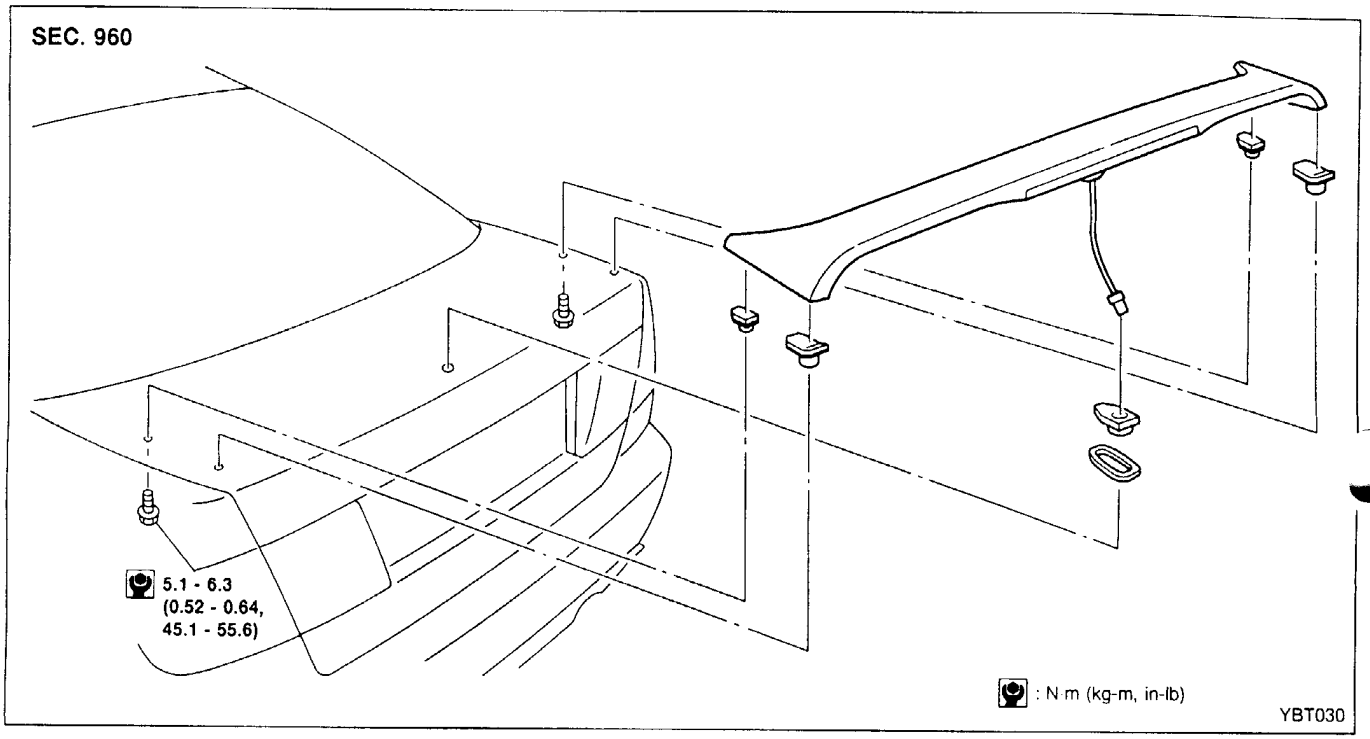


CAUTION:
Do not remove front strut tower bar assembly while vehicle is jacked up.

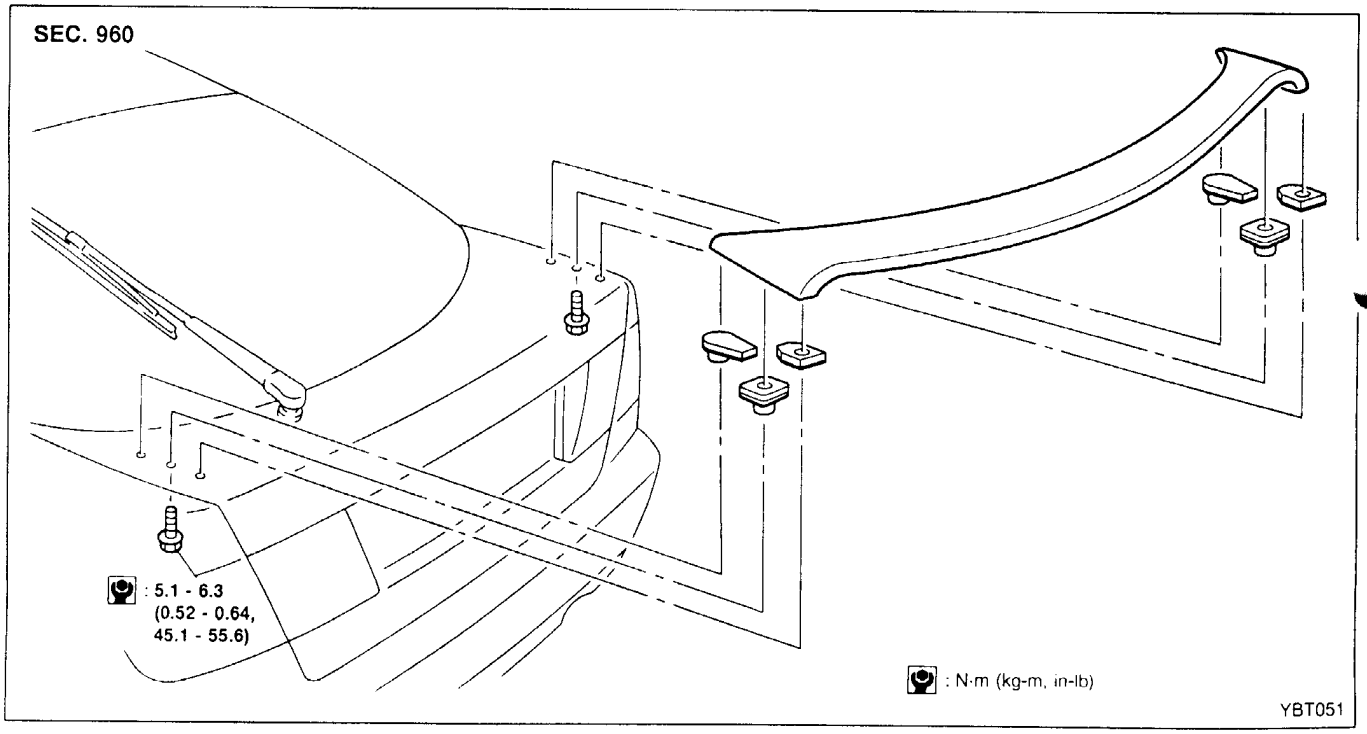
㉑ Rear air spoiler

- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

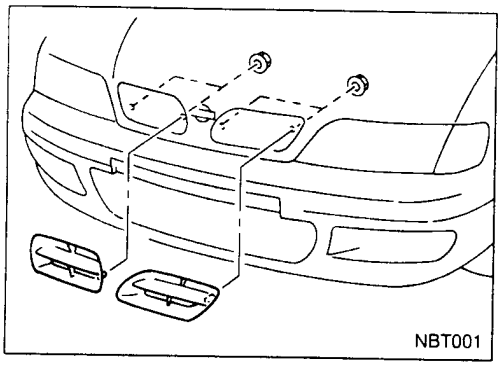
4-door sedan



5-door hatchback



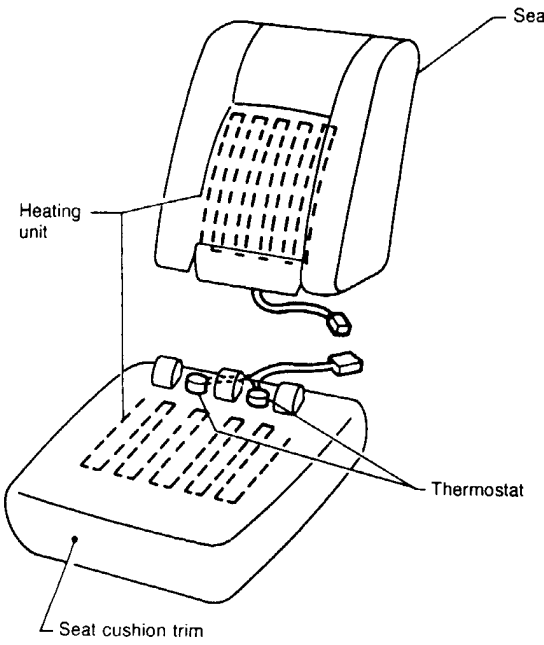
㉒ Front hood grille



Heated Seat

- When handling seat, be extremely careful not to scratch heating unit.
- To replace heating unit, seat trim and pad should be separated.
- Do not use any organic solvent, such as thinner, benzene, alcohol, gasoline, etc. to clean trims.

Seatback heating unit removal & installation



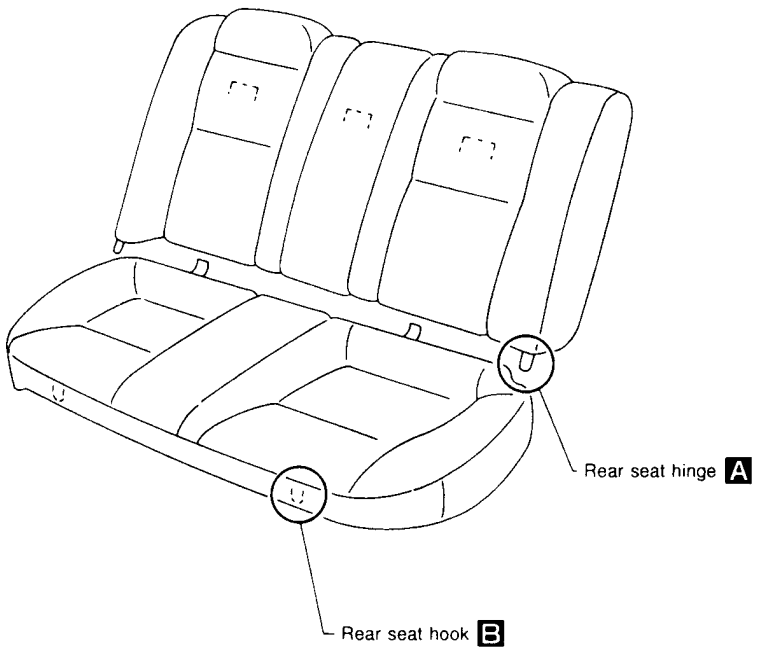
Trim temperature °C (°F)	Increasing to 35 - 45 (95 - 113)	Decreasing to 15 - 25 (59 - 77)
Thermostat operation	OFF	ON

SBF424H

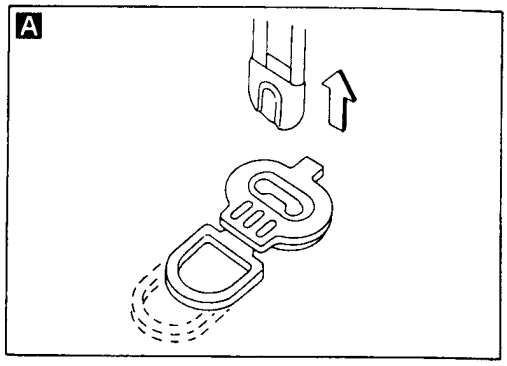
★ **For Wiring Diagram, refer to "HEATED SEAT" in EL section.**

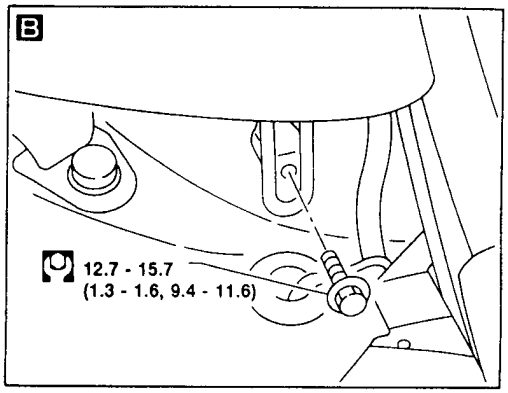
Rear Seat

Type 1
SEC. 880



: N·m (kg-m, ft-lb)

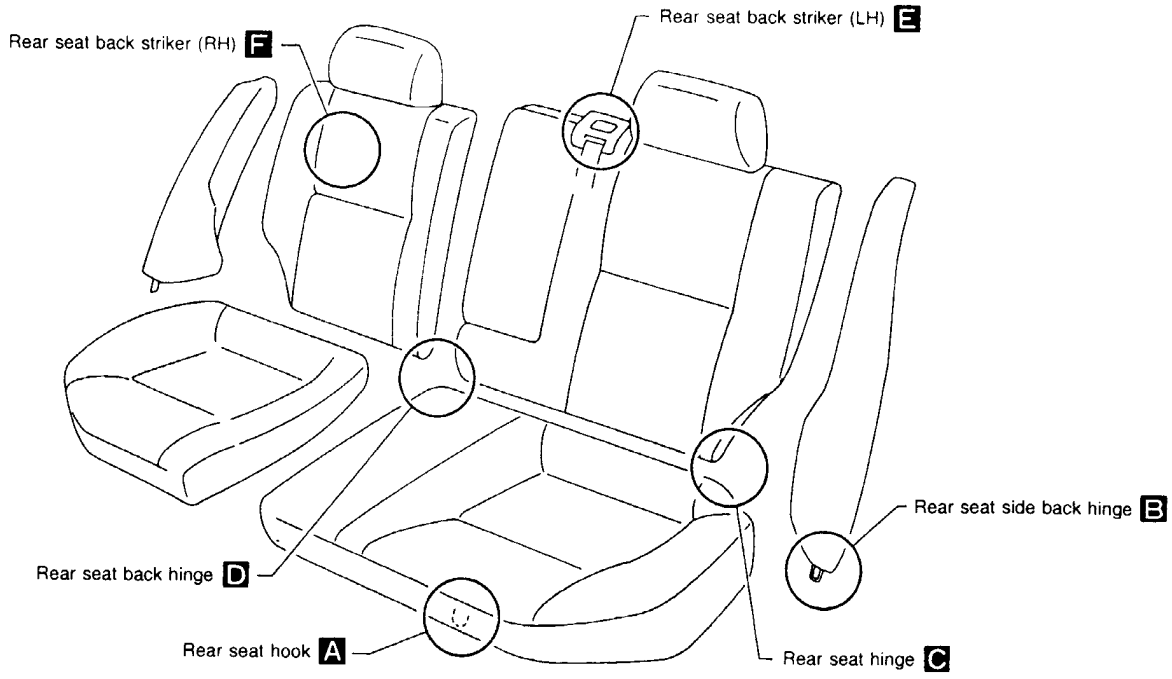


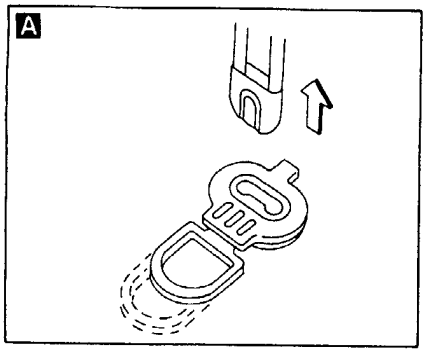


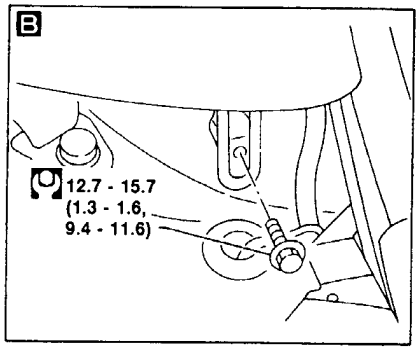
YBT054

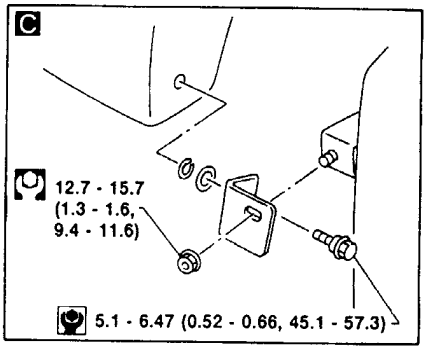
Rear Seat (Cont'd)

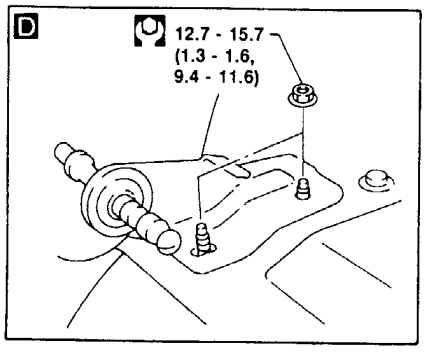
Type 2
SEC. 880

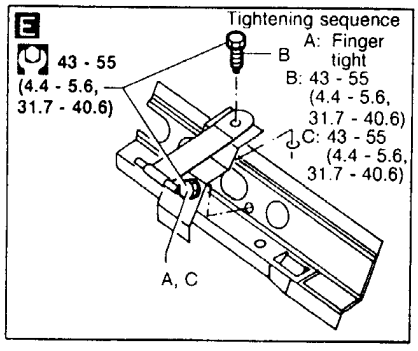


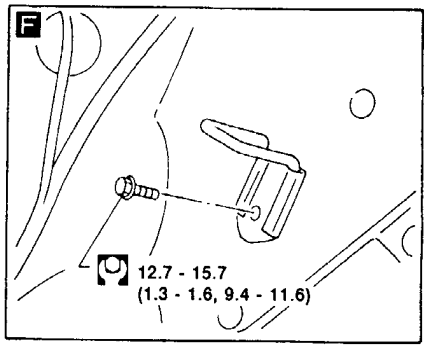












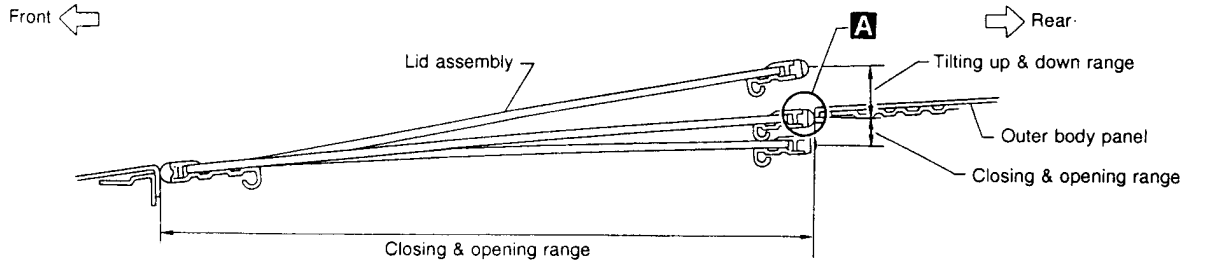
: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)

YBT055

ADJUSTMENT

Install motor & limit SW assembly and sunroof rail assembly in the following sequence:

1. Arrange equal lengths of link and wire assemblies on both sides of sunroof opening.
2. Connect sunroof connector to sunroof switch and positive (+) power supply.
3. Set lid assembly to fully closed position **A** by operating open/tilt sunroof switch.
4. Fit outer side of lid assembly to the surface of roof on body outer panel.
5. Remove motor, and keep sunroof switch pressed to rear side until motor pinion gear reaches the end of its rotating range.
6. Install motor.
7. Check that motor drive gear fits properly in wires.
8. Press front side of sunroof switch to check lid assembly for normal tilting.
9. Check sunroof lid assembly for normal operations (tilt-up, tilt-down, open, and close).

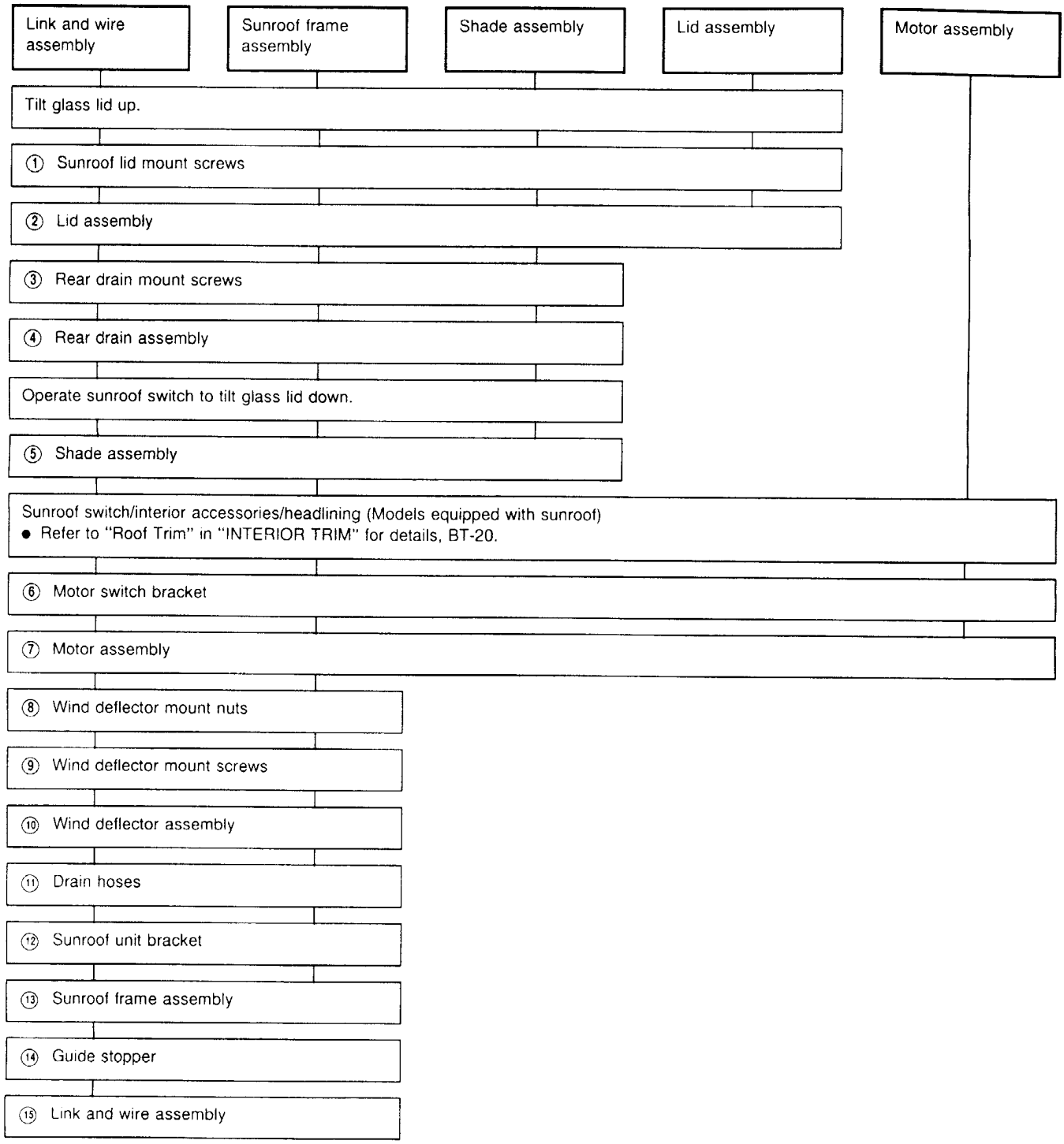


SBF920F

REMOVAL

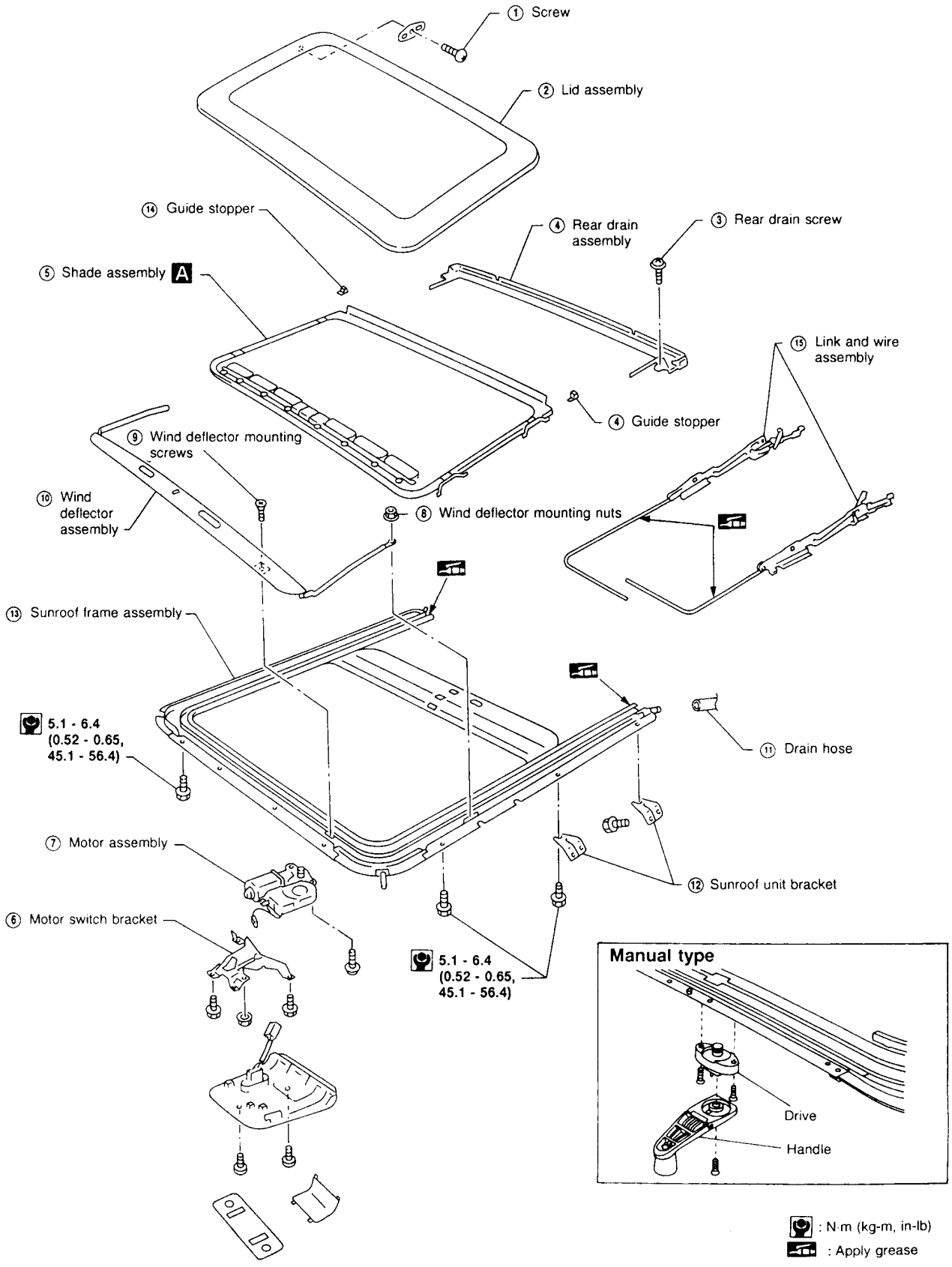
- After any adjustment, check sunroof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to cause damage.
- It is desirable for easy installation to mark each point before removal.

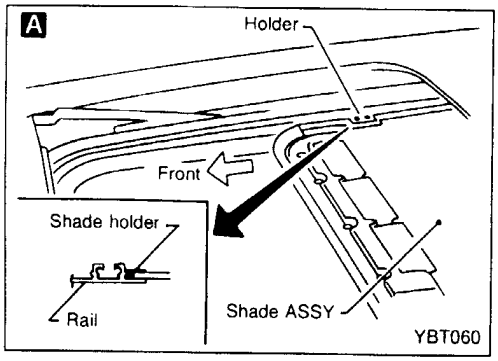
CAUTION:
Always work with a helper.



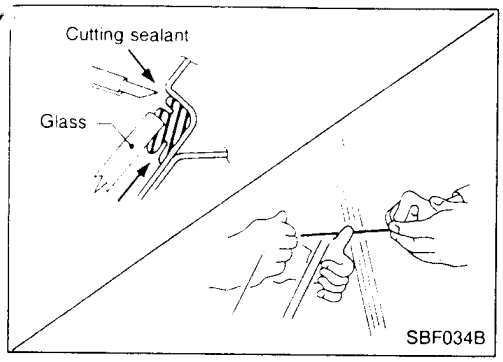
★ **For Wiring Diagram, refer to "ELECTRIC SUNROOF" in EL section.**

SEC. 736





A Using flat-bladed screwdriver, pry shade assembly holder off rail. Then pull shade assembly forward to remove it from rail.



REMOVAL

After removing moldings, remove glass.

CAUTION:

Be careful not to scratch glass when removing.

INSTALLATION

- **Use genuine Nissan Sealant kit or equivalent. Follow instructions supplied with kit.**
- **After installing the glass, the vehicle should remain stationary until the sealant hardens.**

WARNING:

Keep heat and open flames away from work area as primers are flammable.

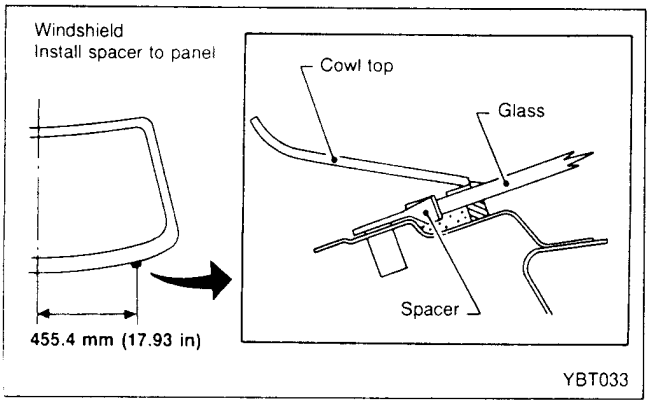
CAUTION:

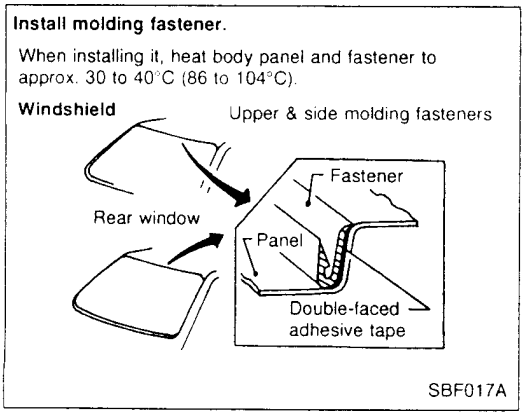
Advise user not to drive the vehicle on rough roads until sealant has properly vulcanized.

- **Do not use sealant which is past its usable term.**
- **Do not leave cartridge unattended with its cap open.**
- **Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.**
- **Molding must be installed securely so that it is in position and leaves no gap.**

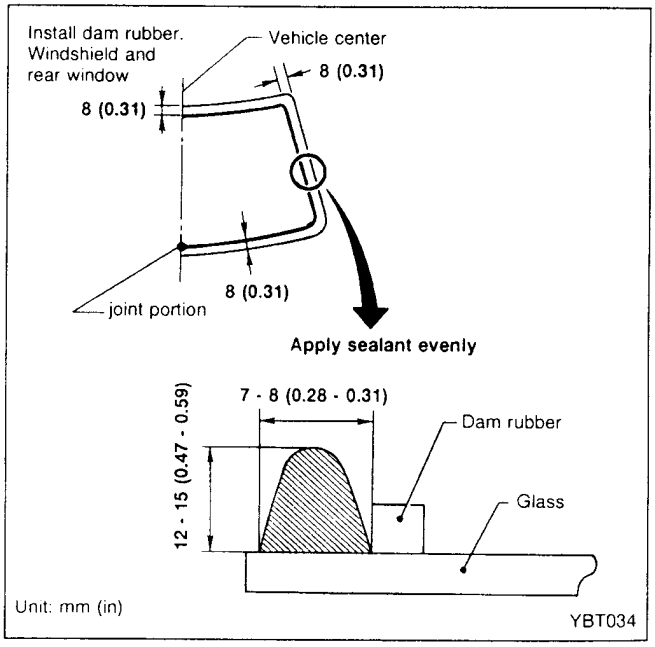
Windshield and Rear Window

Body side





Glass side



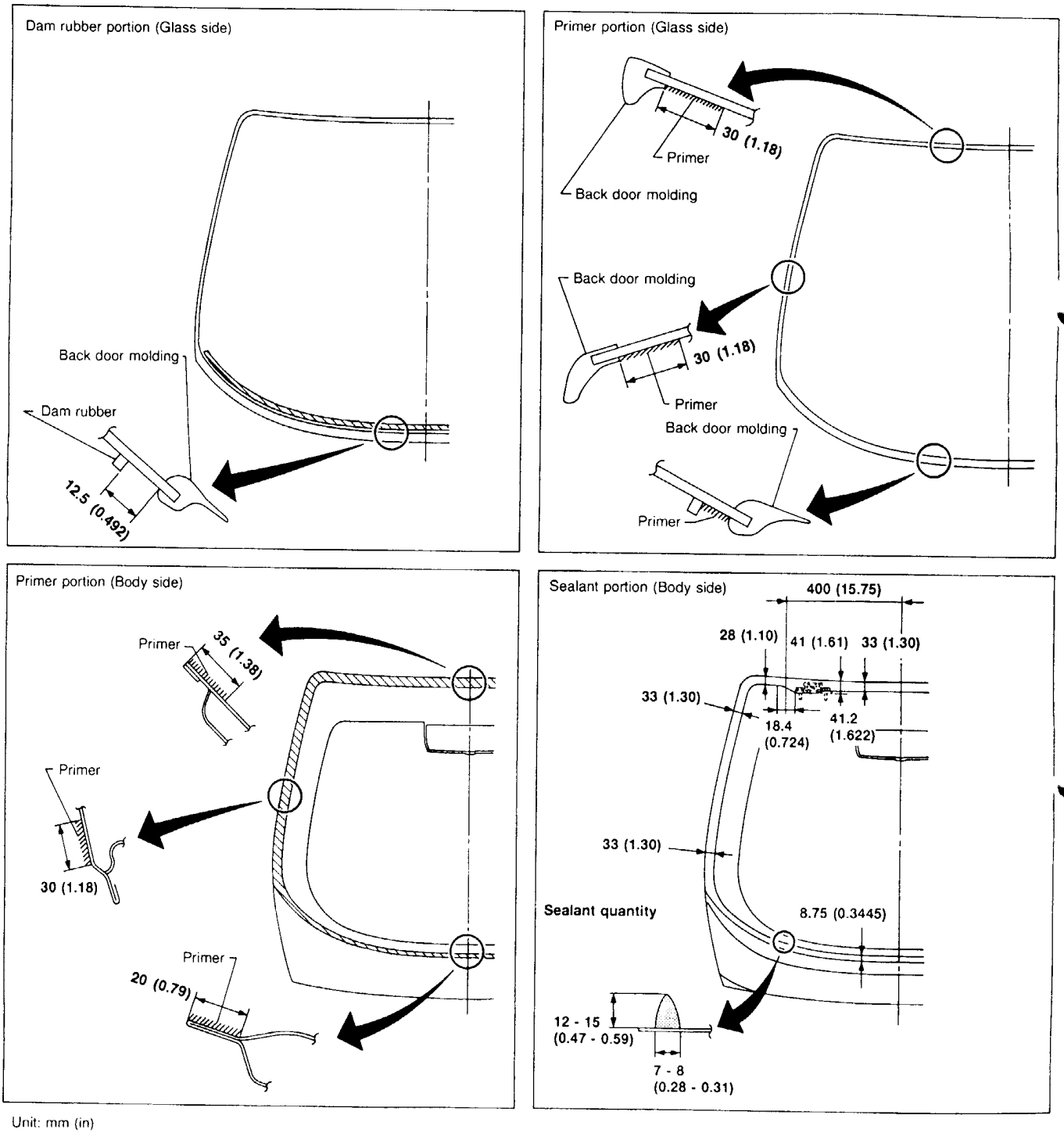
REPAIRING WATER LEAKS FOR WINDSHIELD

Leaks can be repaired without removing and reinstalling glass.

If water is leaking between caulking material and body or glass, determine the extent of leakage. This can be determined by applying water while pushing glass outward.

To stop the leak, apply primer (if necessary) and then sealant to the leak point.

Back Door Window



Unit: mm (in)

YBT035

Door Mirror

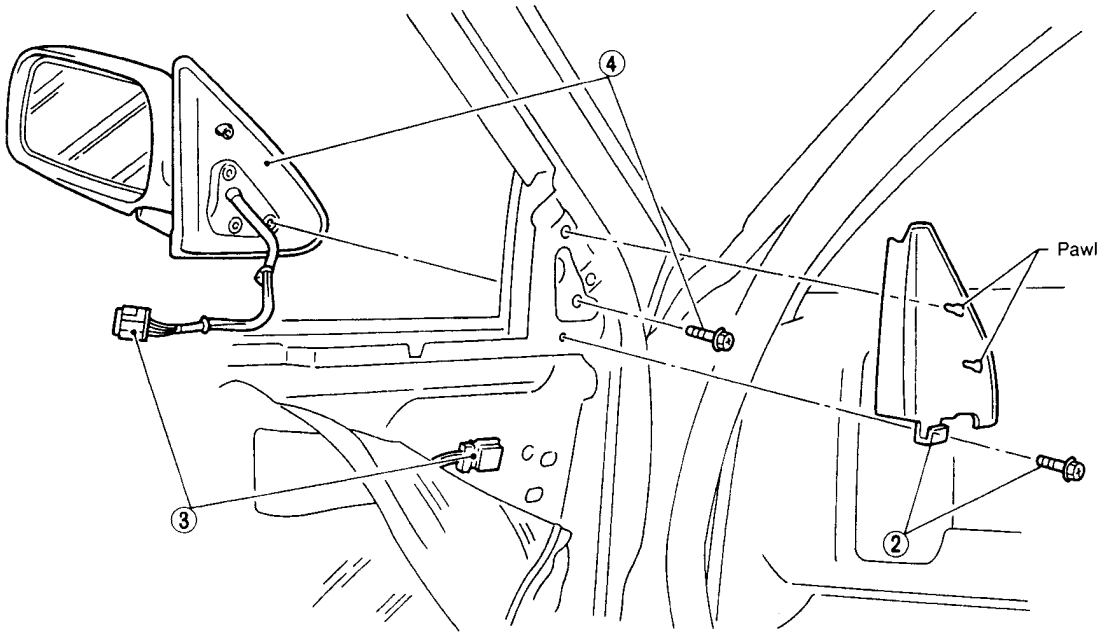
CAUTION:
Be careful not to scratch door rearview mirror body.

★ **For Wiring Diagram, refer to "POWER DOOR MIRROR" in EL section.**

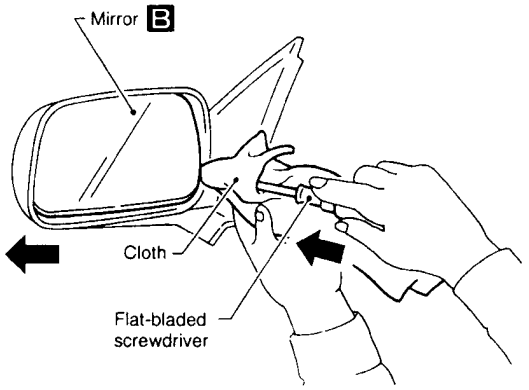
REMOVAL — Door mirror

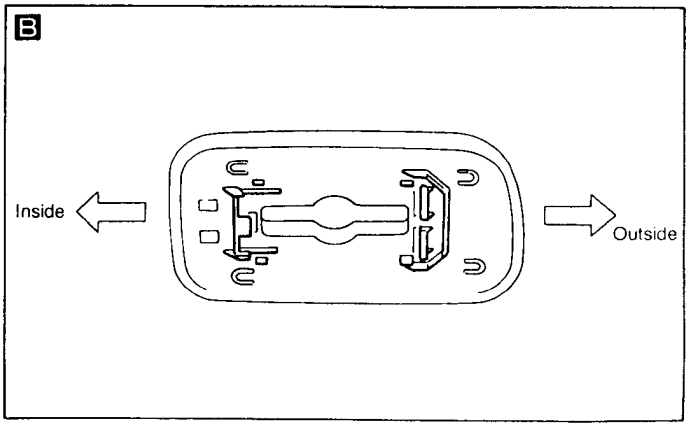
① Remove door trim. Refer to "Door Trim" for details, BT-19.
② Remove inner cover from front corner of door.
③ Disconnect door mirror harness connector.
④ Remove bolts securing door mirror, then remove door mirror assembly.

SEC. 963



Removal:
- Wrap flat-blade of screwdriver with a cloth to prevent scratching. Do not insert too far. Push mirror away from car to release.



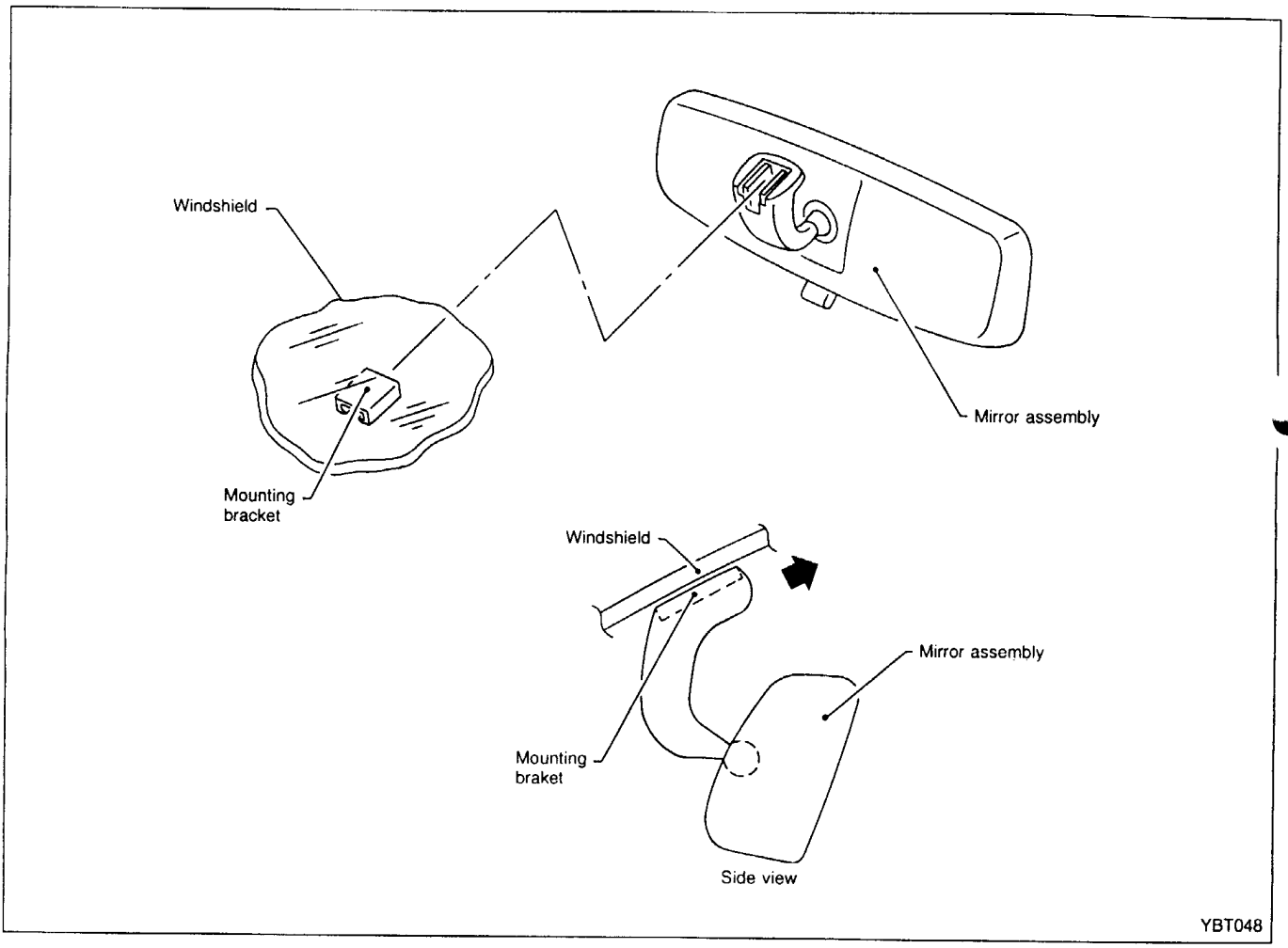


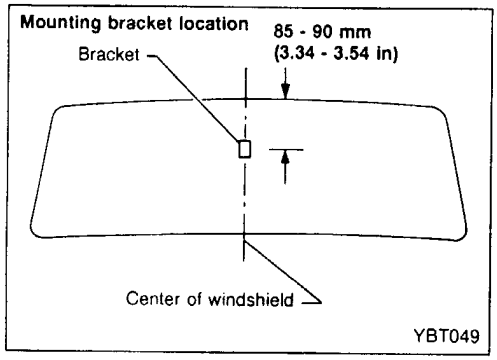
YBT036

Rearview Mirror

REMOVAL

Remove rearview mirror by pushing deflect spring with screwdriver as shown in the figure.

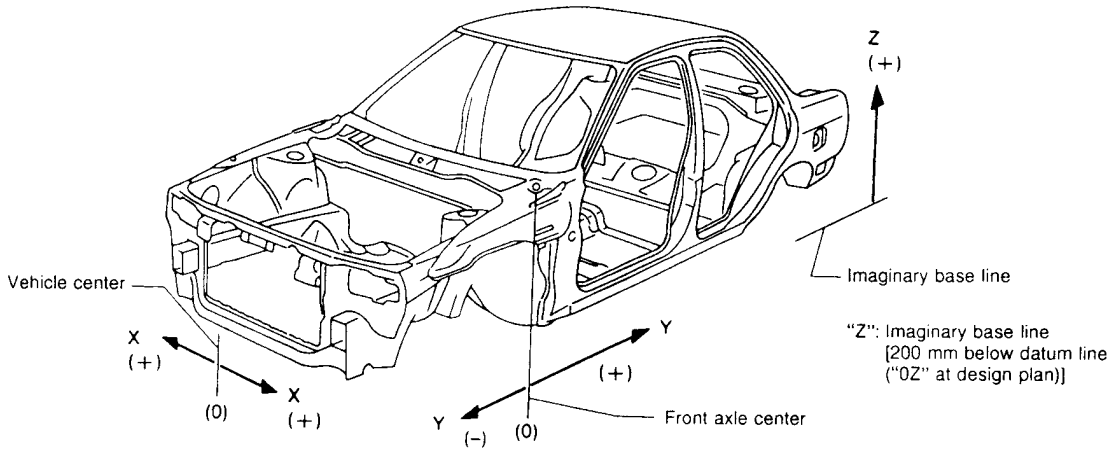




INSTALLATION

1. Install mounting bracket as follows:
(1) Determine mounting bracket position on windshield by measuring from top of windshield to top of mounting bracket as shown in the figure.
(2) Mark location on outside of windshield with wax pencil or equivalent.
(3) Clean attaching point on inside of windshield with an alcohol-saturated paper towel.
(4) Sand bonding surface of mounting bracket with sandpaper (No. 320 or No. 360).
(5) Clean bonding surface of mounting bracket with an alcohol-saturated paper towel.
(6) Apply Loctite Adhesive 11067-2 or equivalent to bonding surface of mounting bracket.
(7) Install mounting bracket at premarked position and press mounting bracket against glass for 30 to 60 seconds.
(8) After five minutes, wipe off excess adhesive with an alcohol-moistened paper towel.
2. Install rearview mirror.

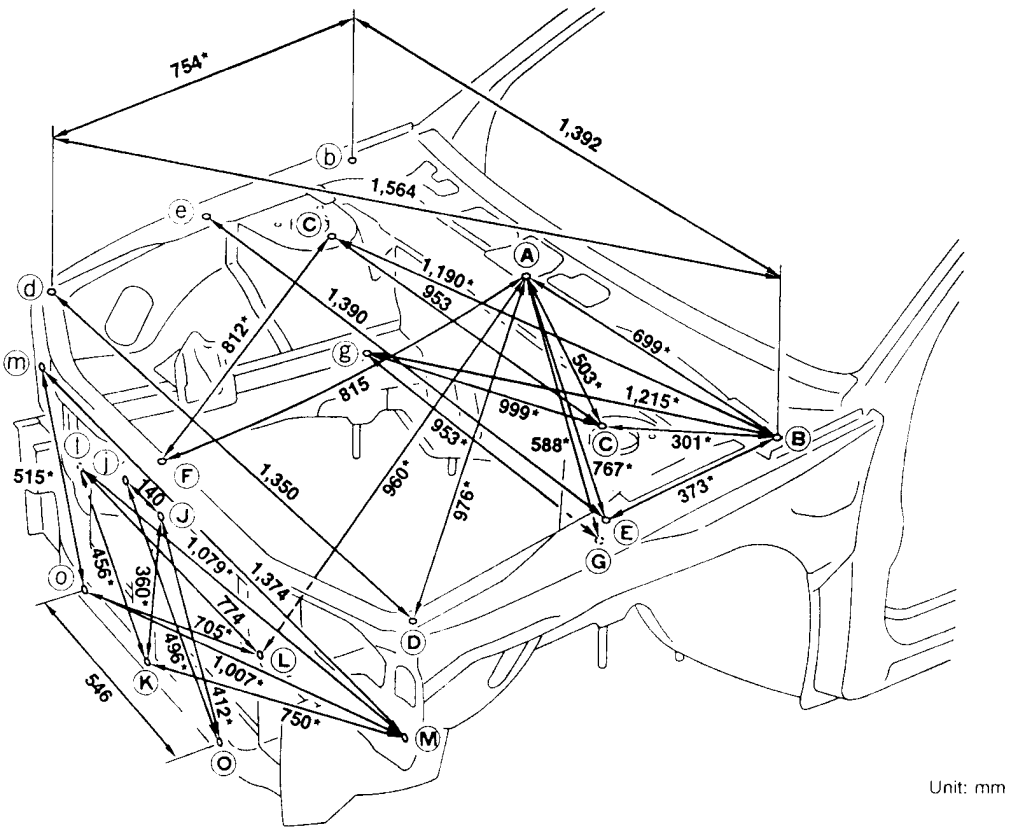
- All dimensions indicated in figures are actual ones.
- When using a tracking gauge, adjust both pointers to equal length. Then check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.
- The coordinates of the measurement points are the distances measured from the standard line of "X", "Y" and "Z".



SBF874GB

Engine Compartment

MEASUREMENT



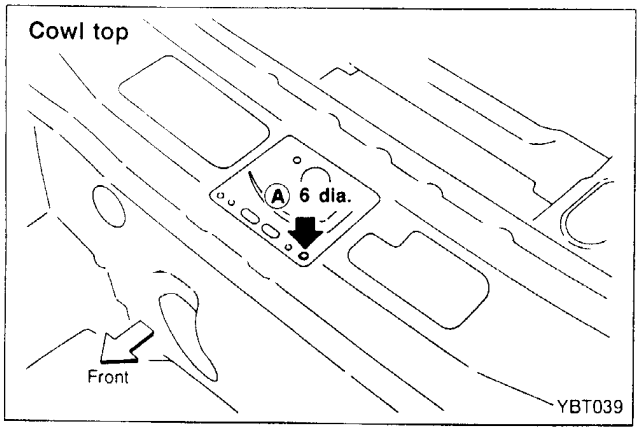
YBT038

Engine Compartment (Cont'd)

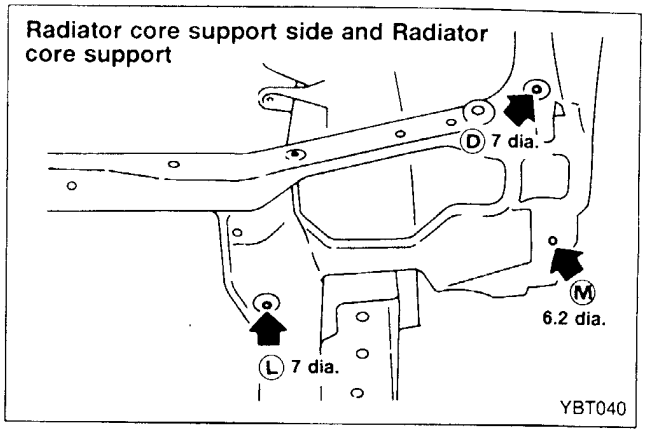
MEASUREMENT POINTS

Unit: mm

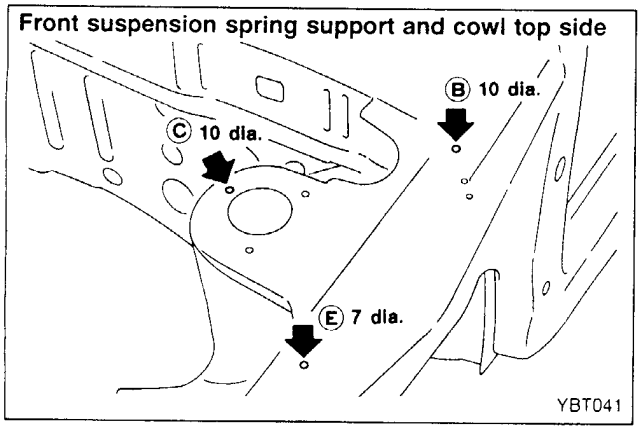
Cowl top



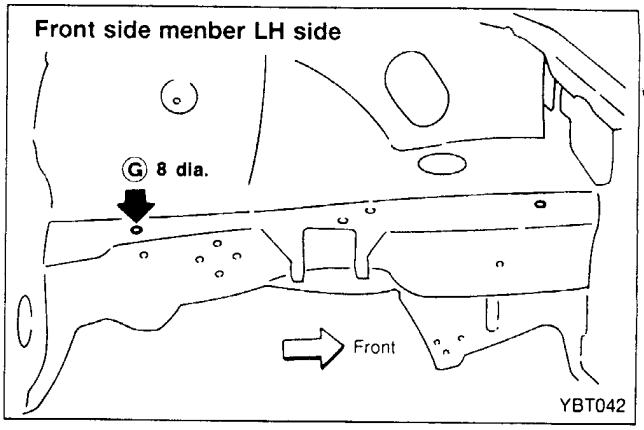
Radiator core support side and Radiator core support



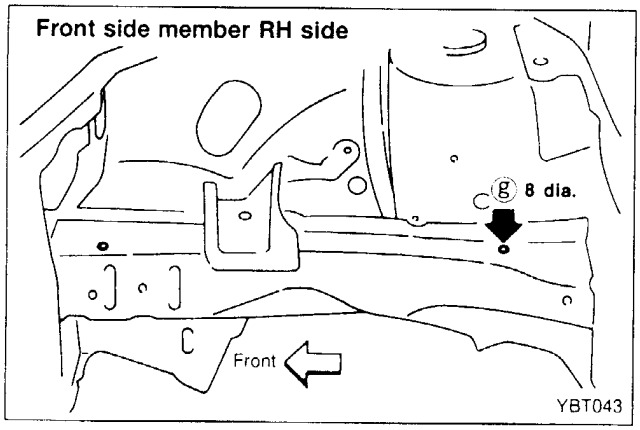
Front suspension spring support and cowl top side



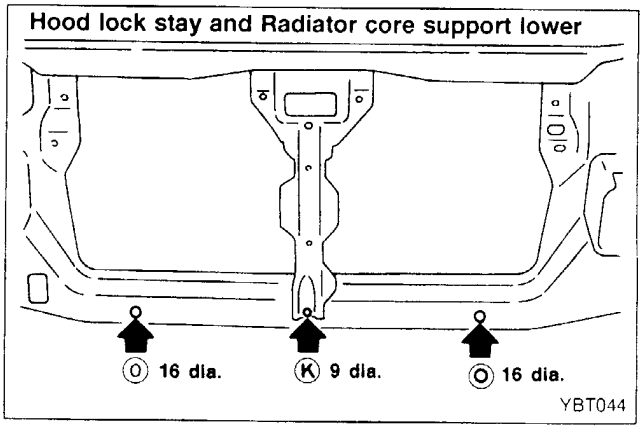
Front side menber LH side



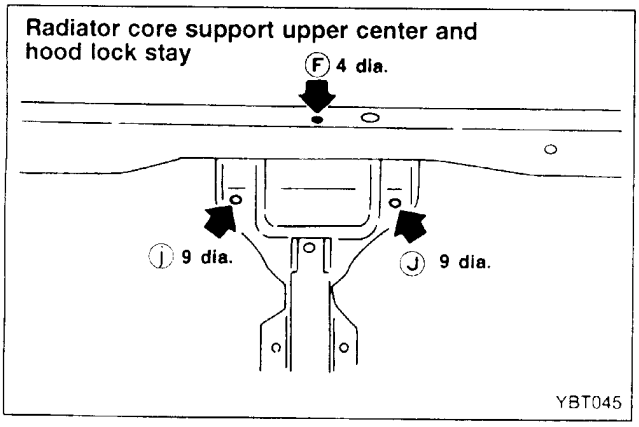
Front side member RH side



Hood lock stay and Radiator core support lower

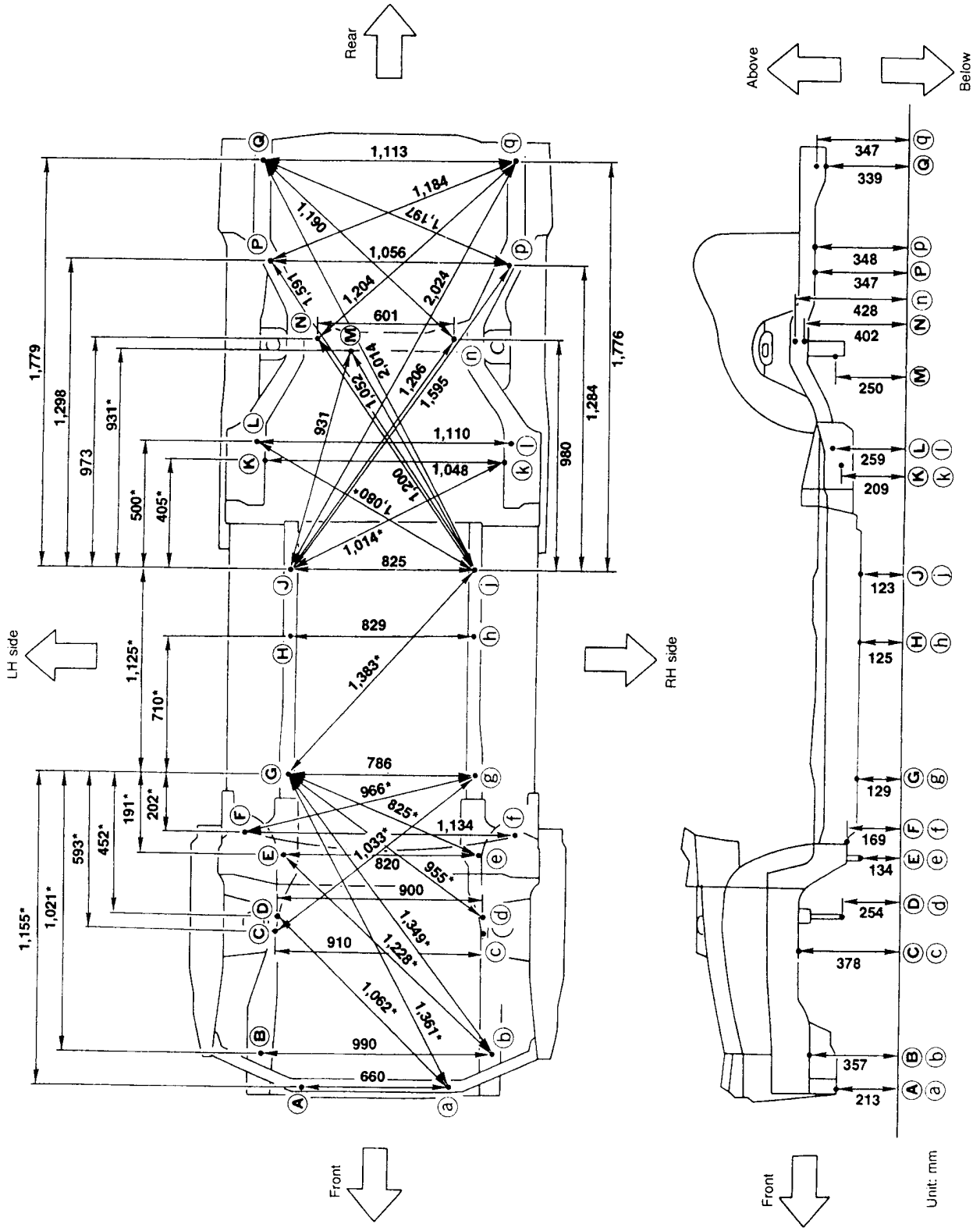


Radiator core support upper center and hood lock stay



Underbody

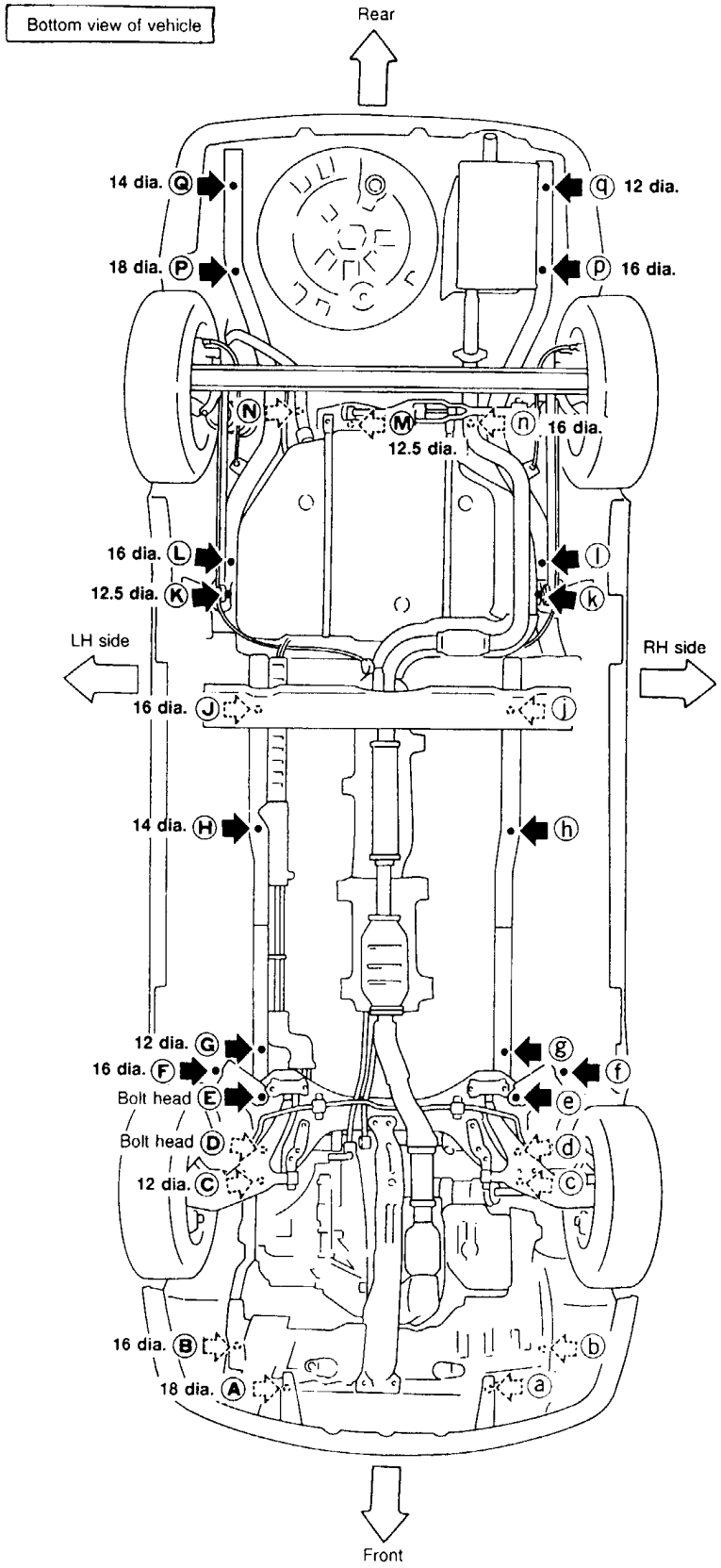
MEASUREMENT



YBT046

Underbody (Cont'd)

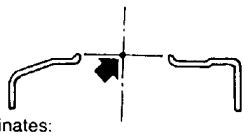
MEASUREMENT POINTS



Front coordinates	Rear coordinates
Ⓐ, ⓐ	Ⓙ, ⓙ
x : 330	x : 412.5
y : –650	y : 1,625
z : 213	z : 123.2
Ⓑ, ⓑ	Ⓚ, ⓚ
x : 495	x : 524
y : –490	y : 2,005
z : 356.6	z : 209
Ⓒ, ⓒ	Ⓛ, ⓛ
x : 455	x : 555
y : –35	y : 2,085
z : 377.6	z : 259
Ⓓ, ⓓ	Ⓜ
x : 450	x : 145
y : 70	y : 2,507
z : 254	z : 250
Ⓔ, ⓔ	Ⓝ
x : 410	x : 300
y : 310	y : 2,550
z : 133.8	z : 402.3
Ⓕ, ⓕ	ⓝ
x : 587	x : –300
y : 405	y : 2,550
z : 169.4	z : 428.3
Ⓖ, ⓖ	Ⓟ
x : 393	x : 512
y : 500	y : 2,900
z : 128.6	z : 346.5
Ⓗ, ⓗ	ⓟ
x : 414.5	x : –544
y : 1,210	y : 2,882
z : 124.9	z : 347.7
	Ⓠ
	x : 542
	y : 3,385.6
	z : 339.4
	ⓠ
	x : –570.5
	y : 3,380
	z : 346.5

Unit: mm

Front and rear strut tower centers



Coordinates:

Ⓡ, ⓡ
x : 527.3
y : –5.1
z : 780.1

Ⓢ, ⓢ
x : 478
y : 2,522
z : 527.3

Front Ⓡ, ⓡ 88 dia.
Rear Ⓢ, ⓢ 60.8 dia.

YBT047

<SUPPLEMENT-II>

BODY & TRIM

SECTION BT

CONTENTS

PRECAUTIONS 2002
Service Notice 2002
Supplemental Restraint system (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" .. 2002

SEAT 2003
Front Seat 2003

★ **For seat belt, refer to MA and RS section.**
★ **For wiring diagrams of body electrical systems, refer to EL section.**

Service Notice

- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installing. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, 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 the Service Manual.

If the vehicle is equipped with side air bag as the Supplemental Restraint System, the side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (which is one of components of air bags for a frontal collision), wiring harness, warning lamp (which is one of components of air bags for a frontal collision).

WARNING:

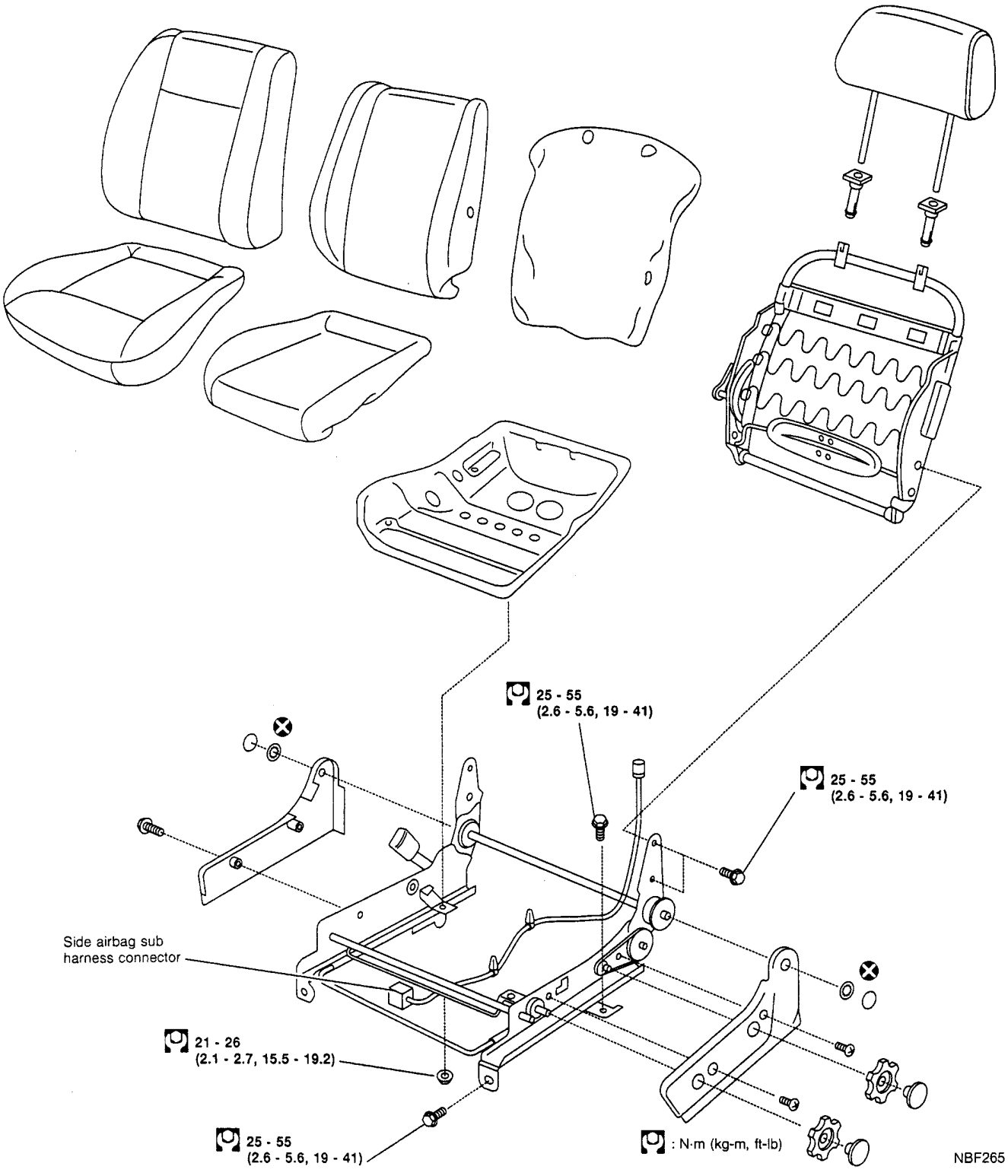
- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation) all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual. SRS wiring harnesses are covered with yellow insulation (either just before the harness connectors or for the complete harness) for easy identification.**

- When removing or installing seats with side air bag module, be sure to disconnect or connect side air bag sub harness connector.
- When removing or installing the seat trim, handle it carefully to keep dirt out and avoid damage.

★ **For Wiring Diagram, refer to "POWER SEAT" in EL section.**

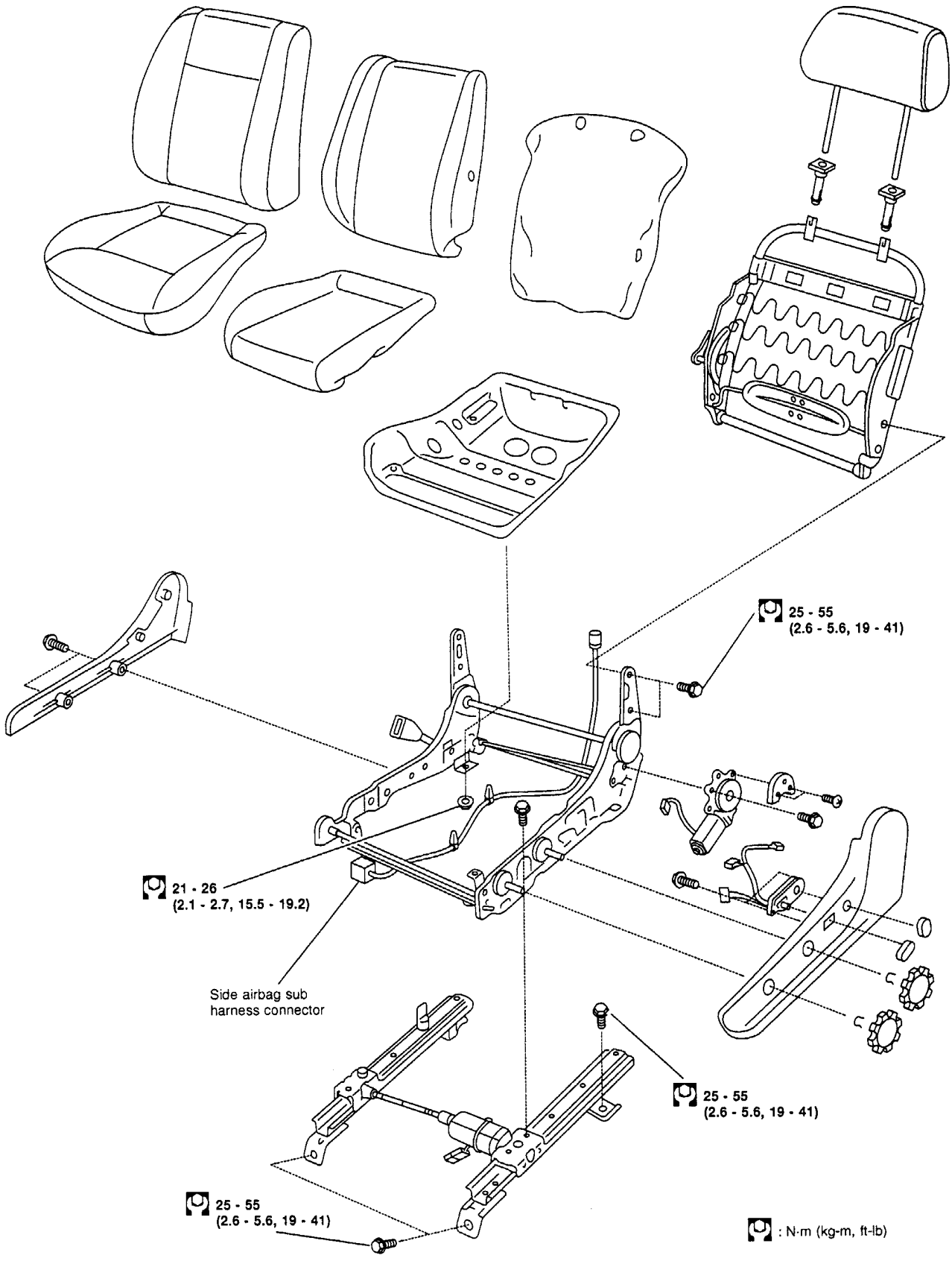
Front Seat

Manual seat



Front Seat (Cont'd)

Power Seat



NBF266

BODY & TRIM

SECTION BT

CONTENTS

BODY END 3002
Body Rear End and Opener 3002
INTERIOR TRIM 3004
Side and Floor Trim 3004
Roof Trim 3006
Luggage Room Trim 3008
Back Door Trim 3009
EXTERIOR 3010
SEAT 3013
Rear Seat 3013
WINDSHIELD AND WINDOWS 3014
Windshield and Back Door Window 3014
Side Window 3016

★ **For seat belt, refer to MA and RS section.**
★ **For wiring diagrams of body electrical systems, refer to EL section.**

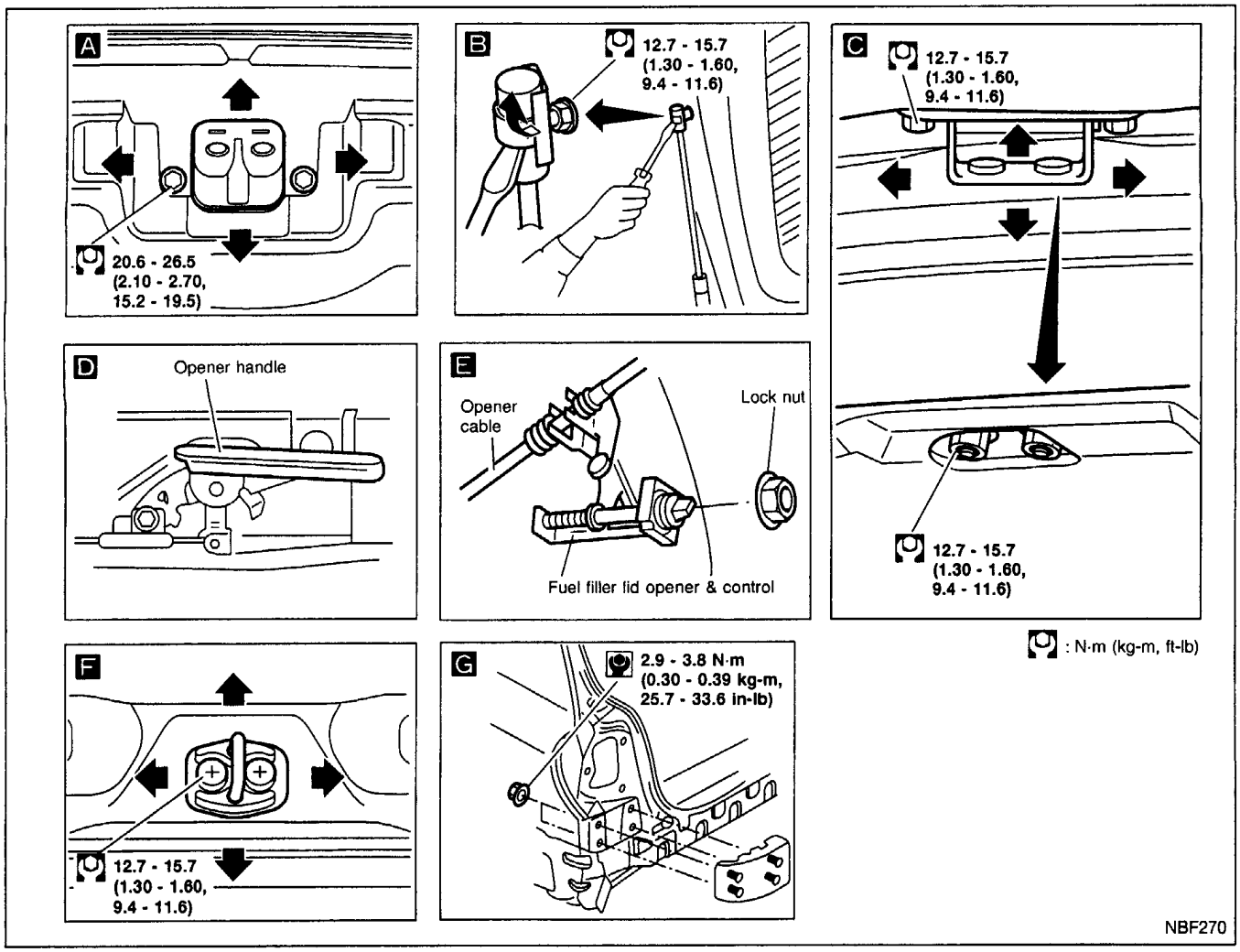
Body Rear End and Opener

WAGON

- Back door adjustment: Adjust at hinge-body portion for proper back door fit.
- Back door lock system adjustment: Adjust lock & striker so that they are in the center. After adjustment, check back door lock operation.

WARNING:

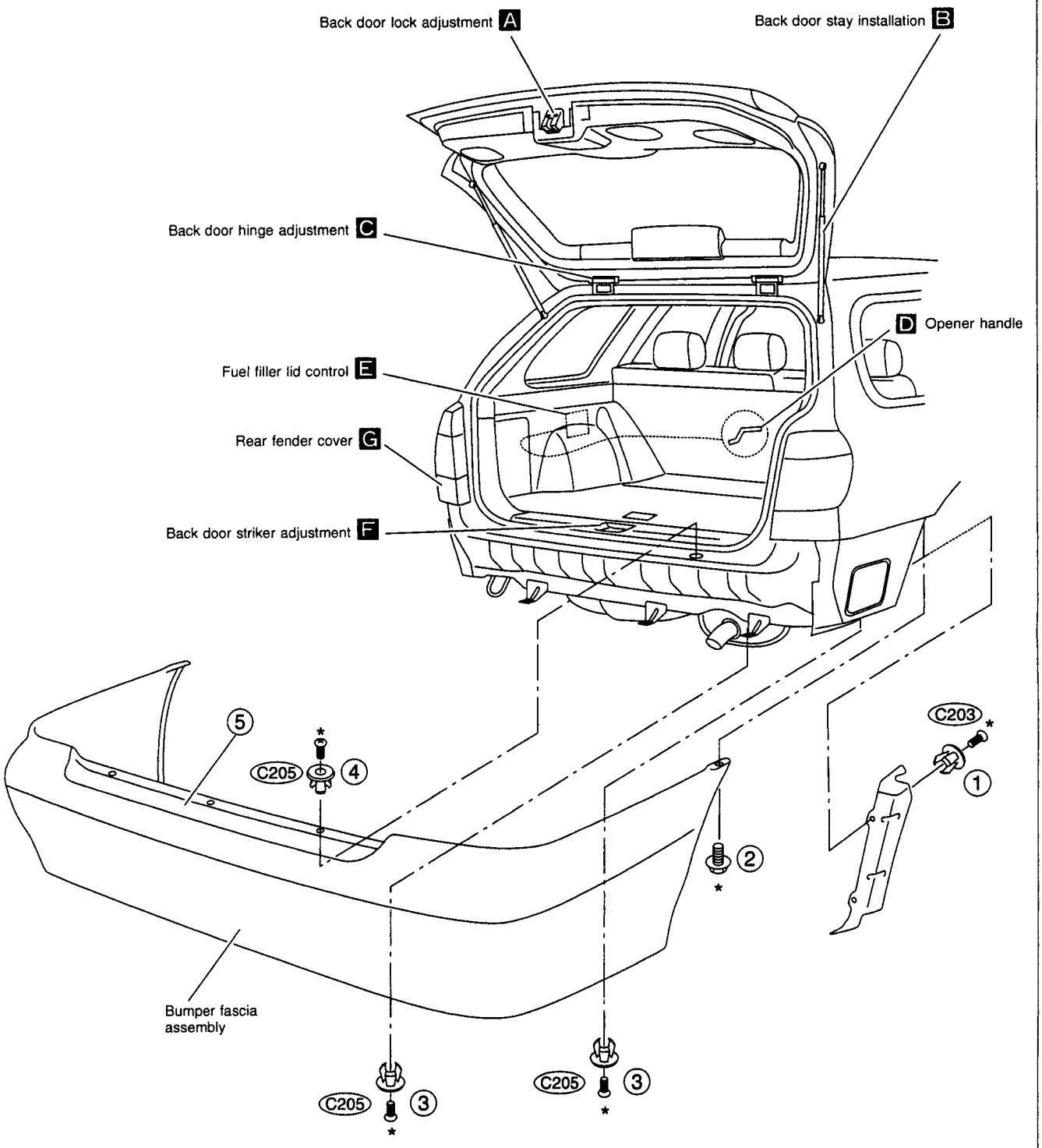
- **Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.**
- **The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.**
- Fuel filler lid opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that back door and fuel filler lid open smoothly.



REMOVAL — Rear bumper assembly

① Remove clips C203 securing left and right chipping protector.
② Remove screws securing bumper fascia to left and right rear fenders.
③ Remove clips C205 (small) securing bumper fascia to rear panel.
④ Remove clips C205 (large) securing bumper fascia to rear panel upper.
⑤ Extract bumper fascia assembly.

Body Rear End and Opener (Cont'd)



* : Bumper assembly mounting clips and screws.

NBF271

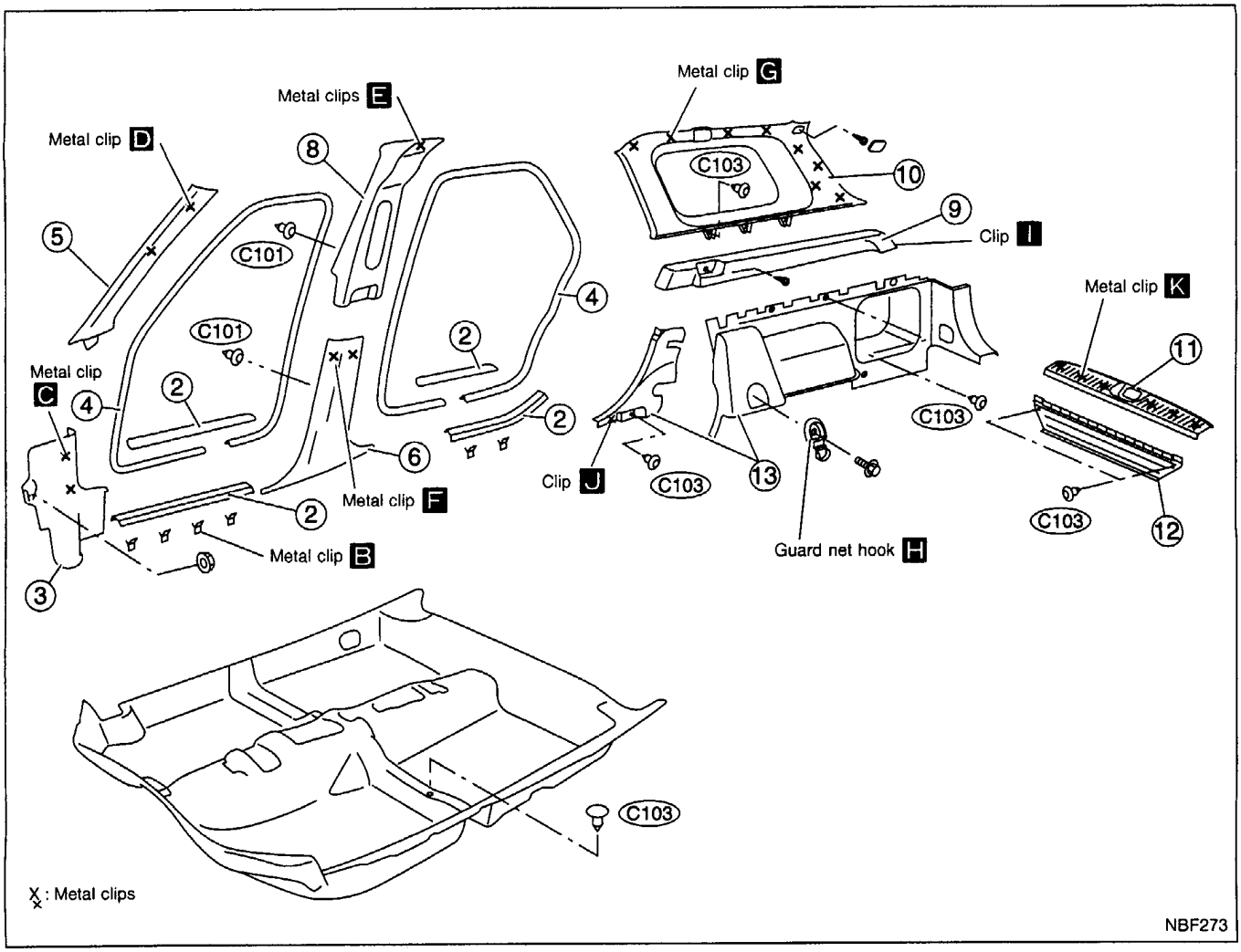
Side and Floor Trim

REMOVAL — Body side trim

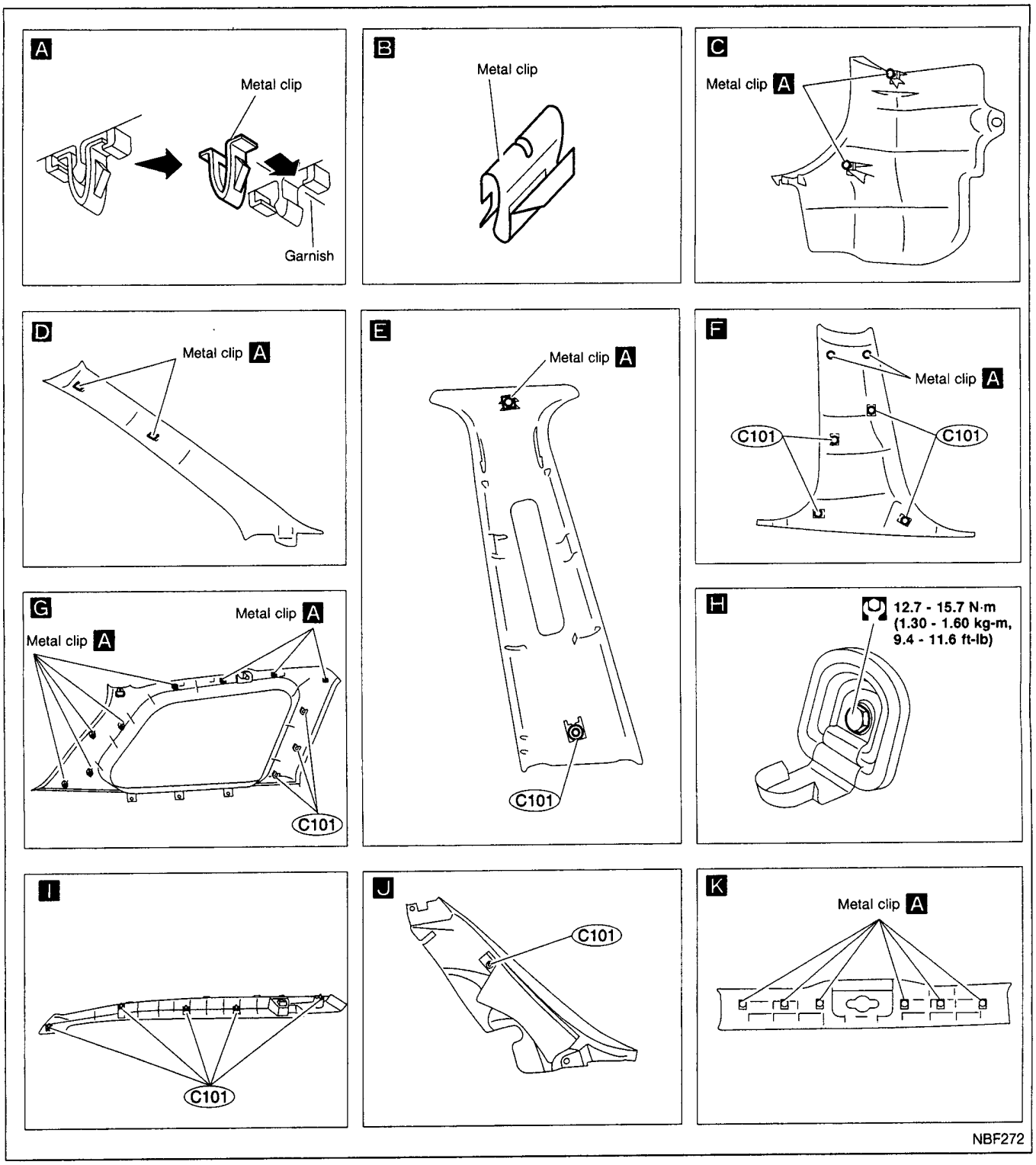
Wagon

- Remove parcel shelf before removing body side trim.

① Remove front and rear seats. Refer to "SEAT" for details, BT-2003, BT-3013.
② Remove front and rear kicking plates.
③ Remove dash side lower finishers.
④ Remove front and rear body side welts.
⑤ Remove front pillar garnishes.
⑥ Remove center pillar lower garnishes.
⑦ Remove front seat belt shoulder adjustment anchor bolt covers and anchor bolts (Refer to "SEAT BELTS" in RS section for anchor bolt details).
⑧ Remove center pillar upper garnishes.
⑨ Remove luggage room side center finisher.
⑩ Remove luggage room side upper finisher.
⑪ Remove luggage room rear plate.
⑫ Remove luggage room rear finisher.
⑬ Remove luggage room side lower finisher.



Side and Floor Trim (Cont'd)



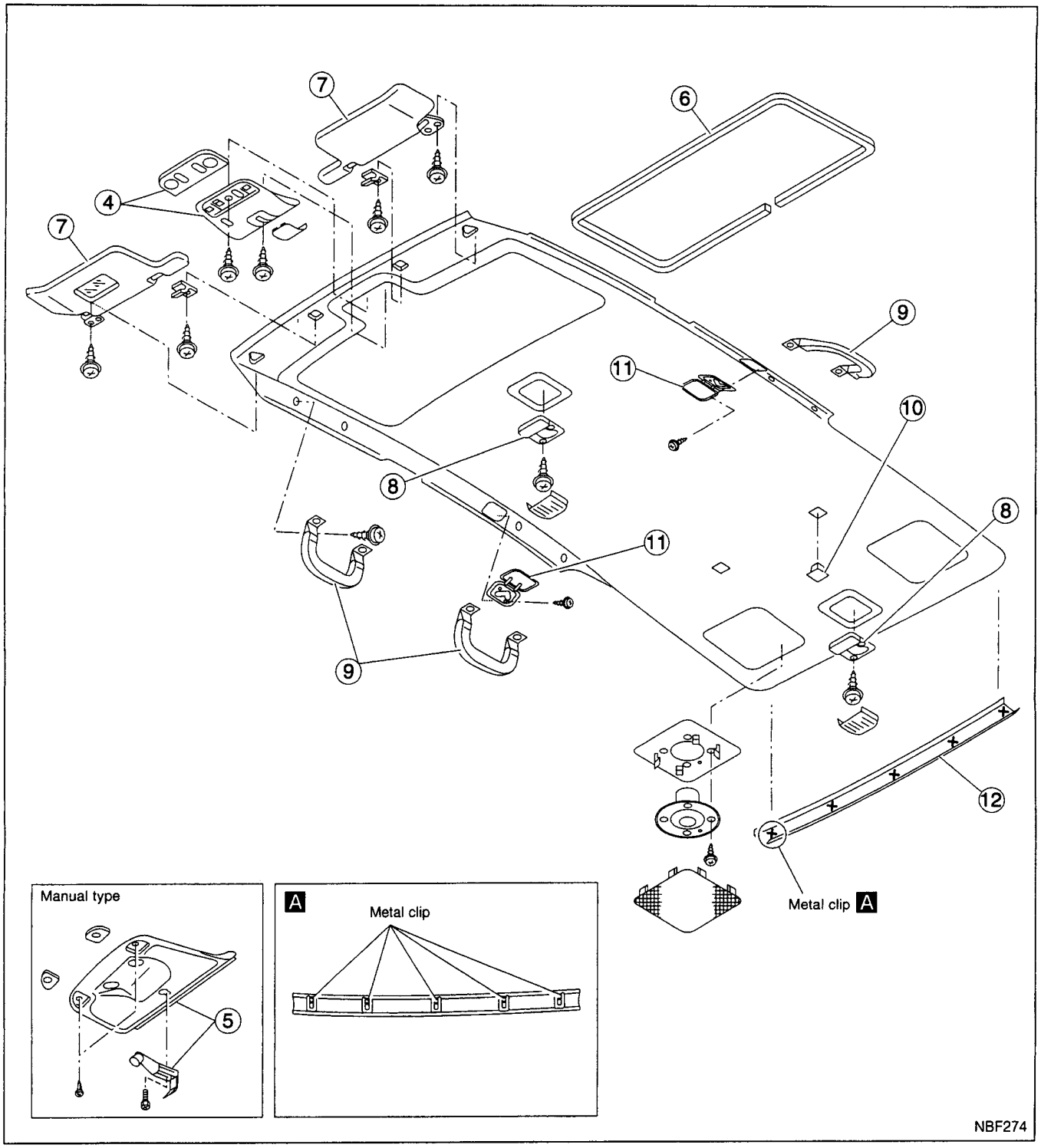
Roof Trim

REMOVAL — Headlining

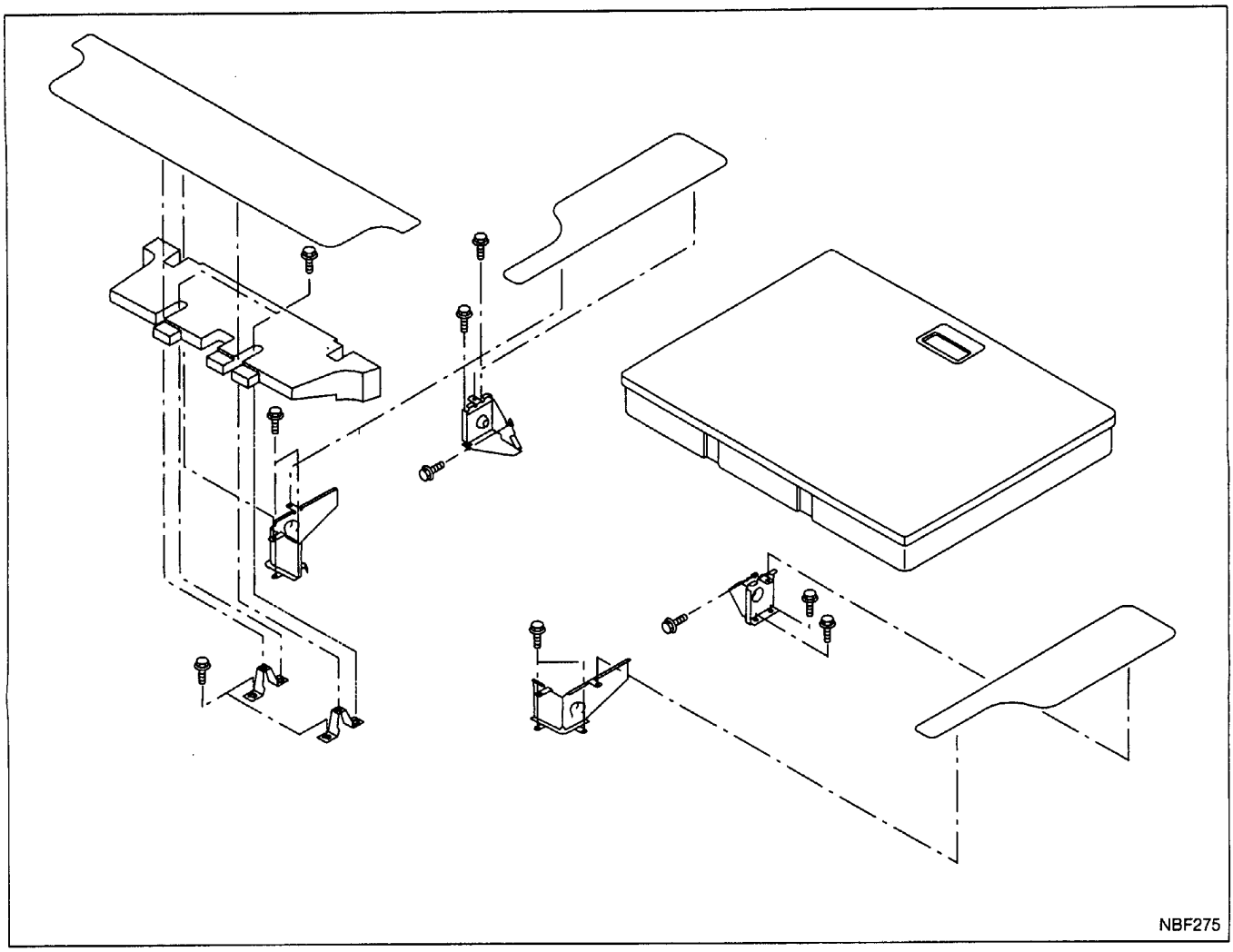
Wagon

① Remove front and rear seats. Refer to "SEAT" for details, BT-2003, BT-3013.
② Remove front and rear seat belts. Refer to "SEAT BELTS" in RS section for details.
③ Remove body side trim. Refer to "Side and Floor Trim" for details, BT-3005.
④ Remove sunroof switch. (Models equipped with electric sunroof)
⑤ Remove handle and lamp cover. (Models equipped with manual sunroof)
⑥ Remove sunroof welt. (Models equipped with sunroof)
⑦ Remove sun visors.
⑧ Remove interior lamp (center) and interior lamp (rear).
⑨ Remove assist grips.
⑩ Remove clips.
⑪ Remove luggage net escutcheons.
⑫ Remove root rear garnish.
⑬ Remove headlining.

Roof Trim (Cont'd)



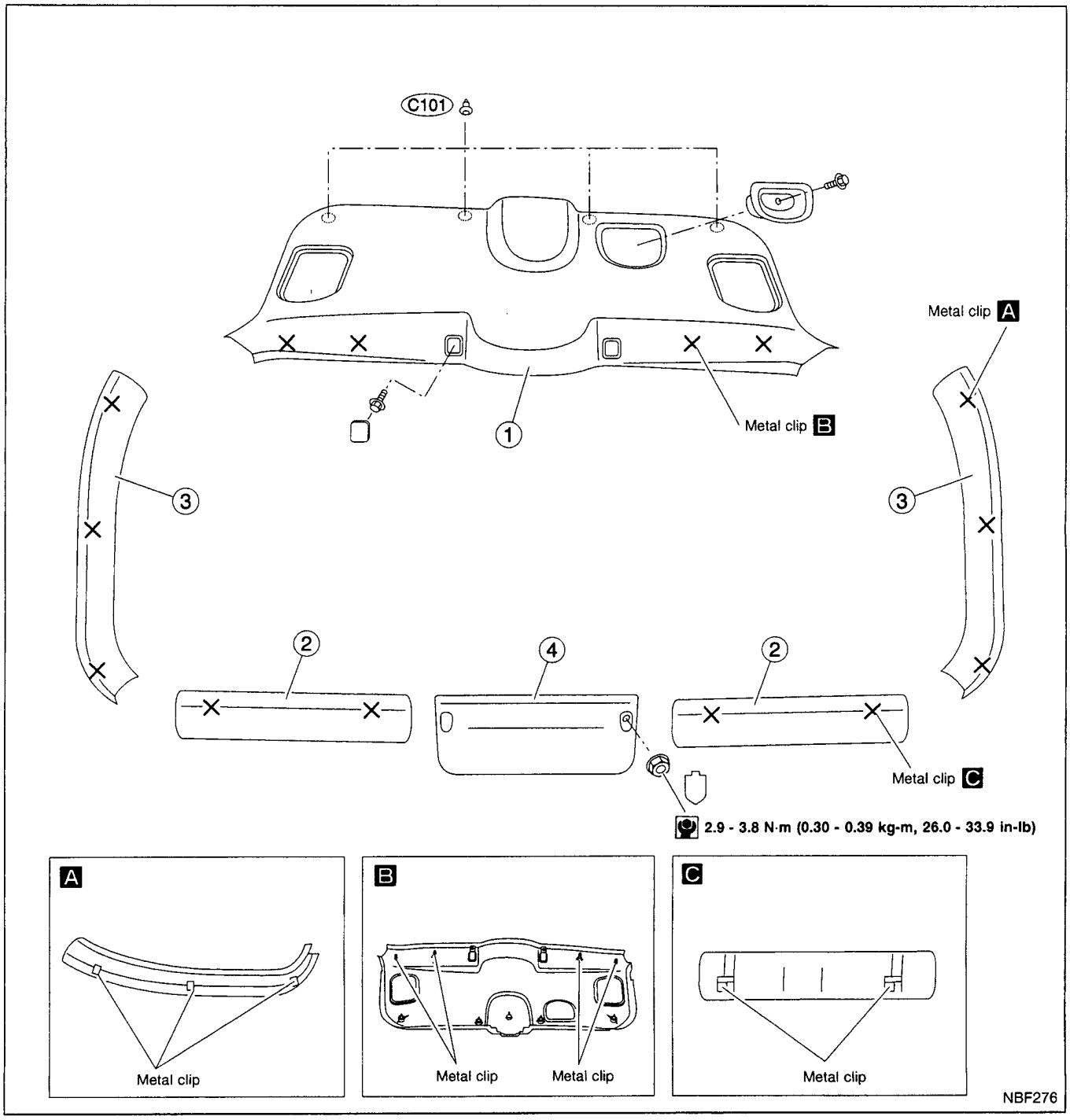
Luggage Room Trim

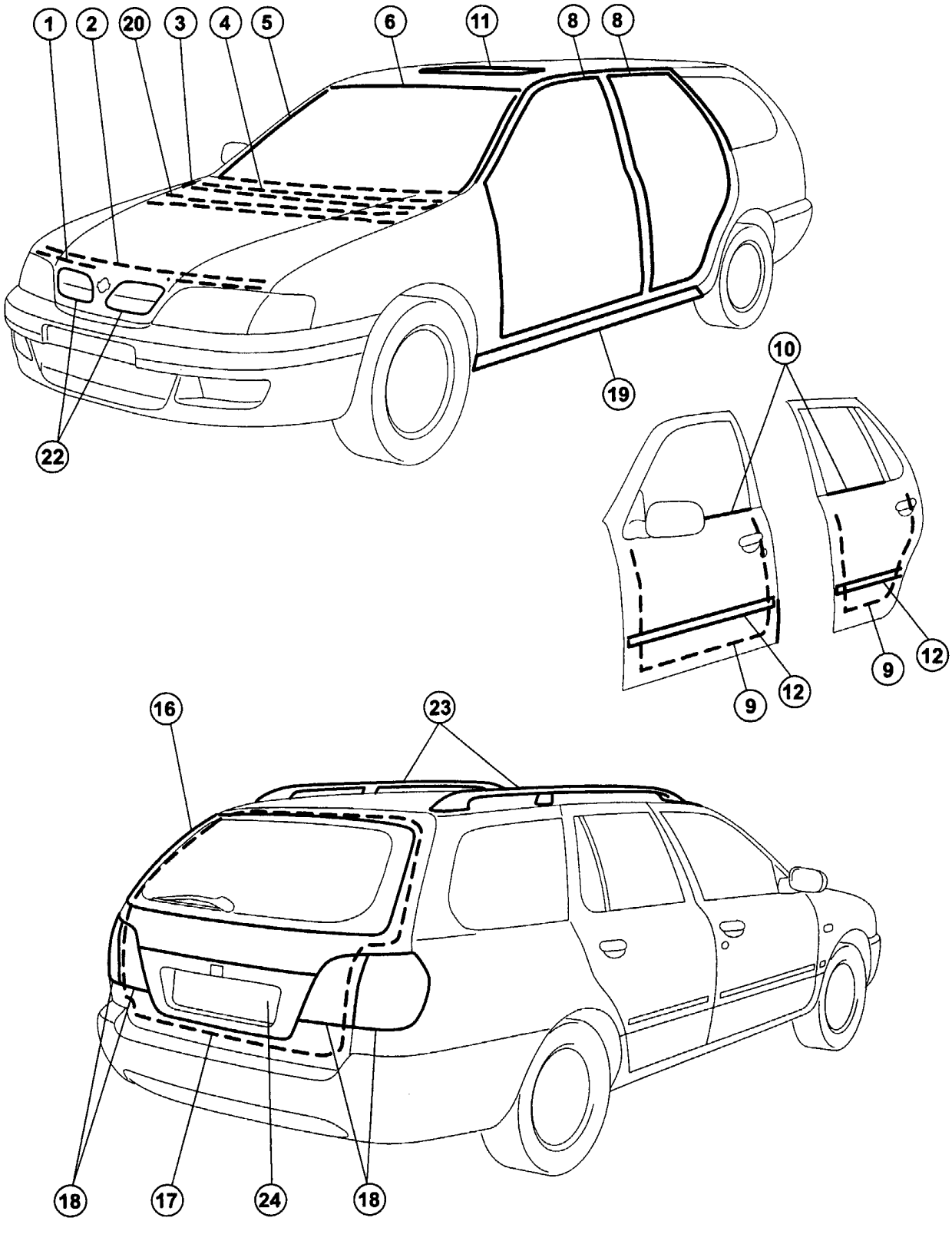


Back Door Trim

REMOVAL — Back door trim

① Remove back door lower finisher.
② Remove back door upper finisher.
③ Remove back door side finisher.
④ Remove high-mounted stop lamp.



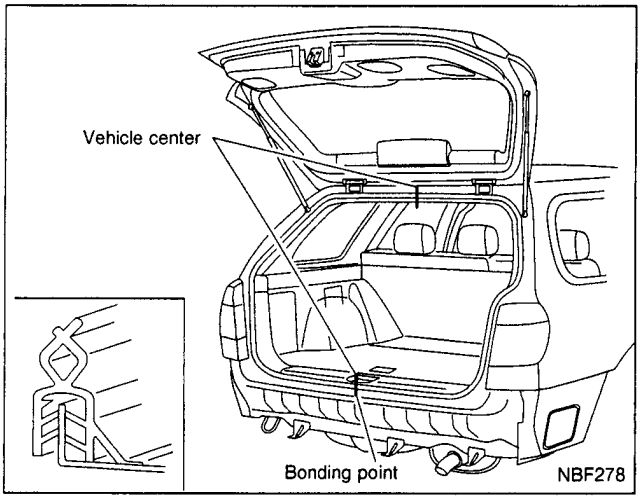


NBF277

⑯ Back door window molding

See "Back door window". Refer to BT-3015.

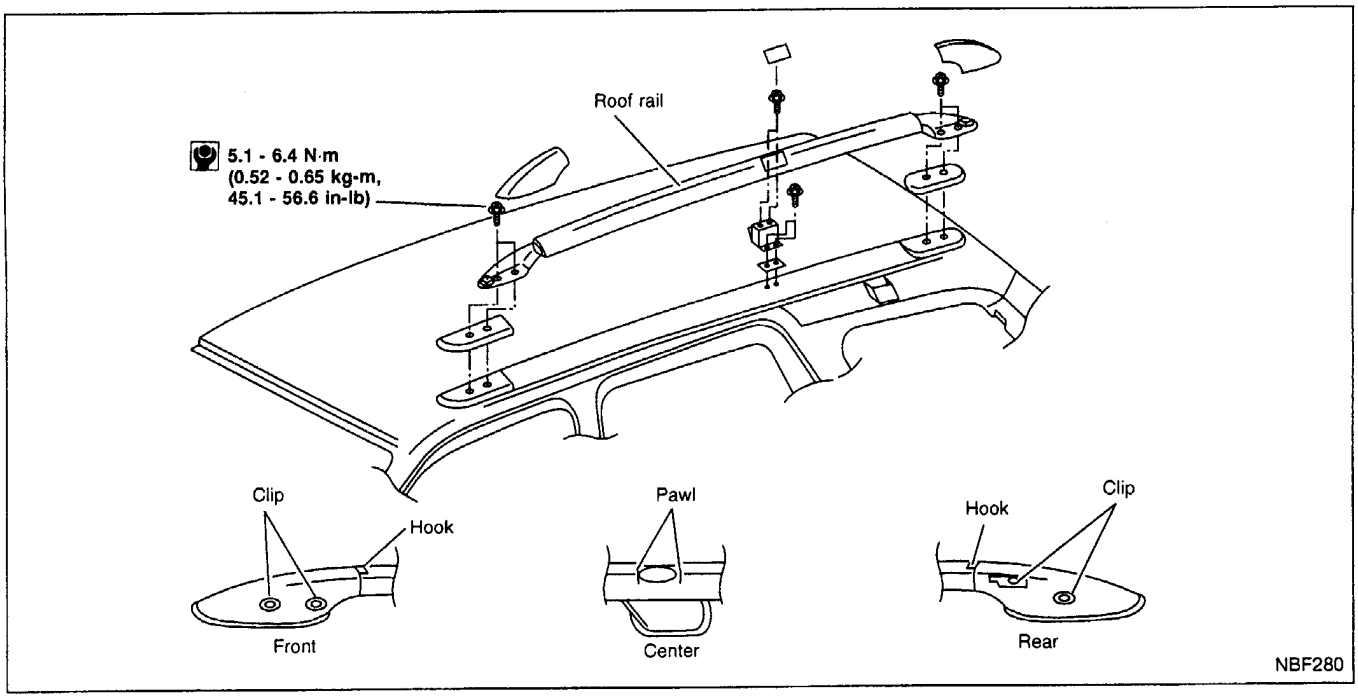
⑰ Back door weatherstrip



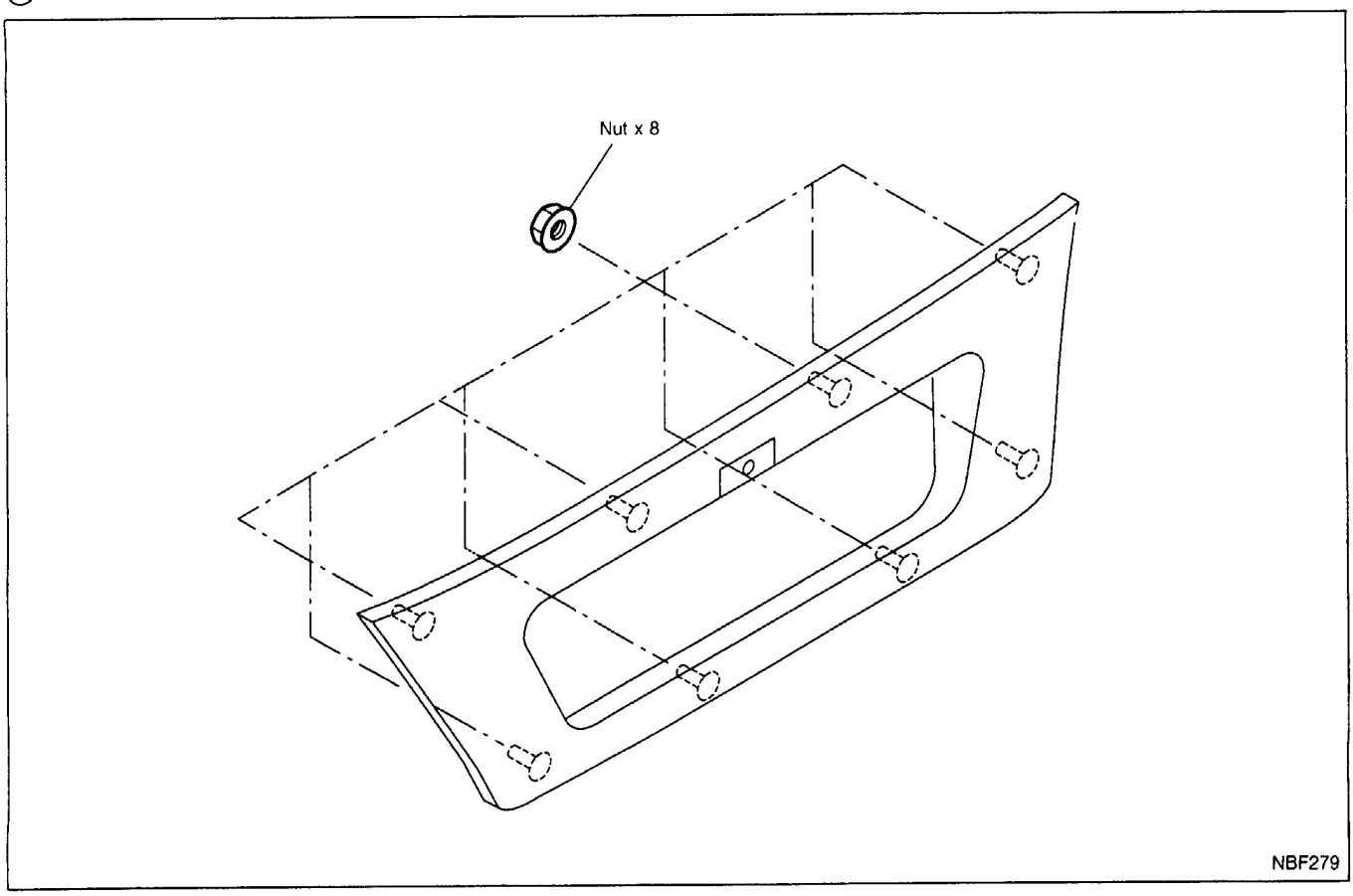
⑱ Rear combination lamp

- Rear combination lamps are installed with nuts and butyl sealant, as used for 5-door hatchback models, refer to BT-28.
  When removing inside rear combination lamp (installed on back door), first remove back door finisher. (See next page)

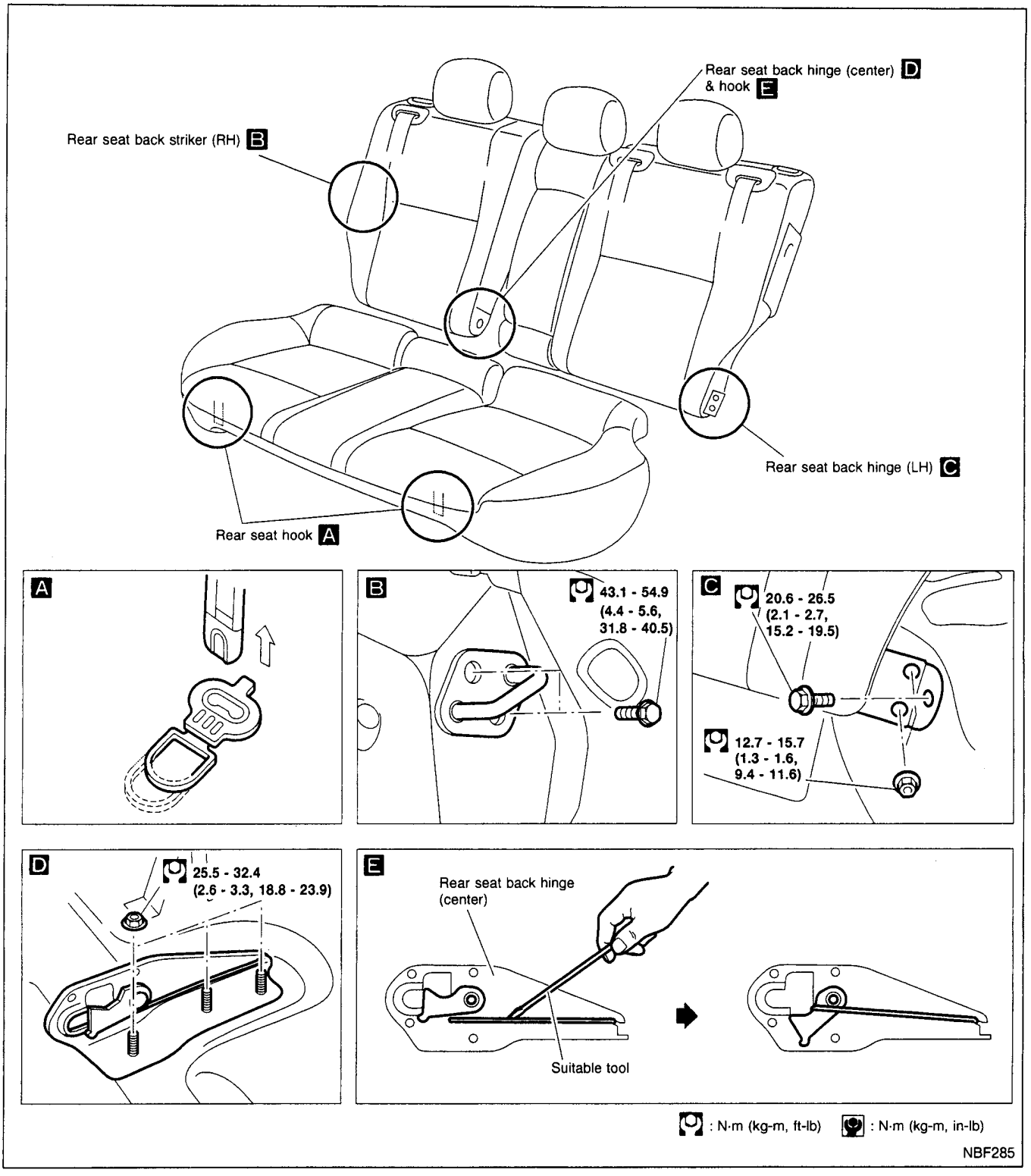
㉓ Roof rail

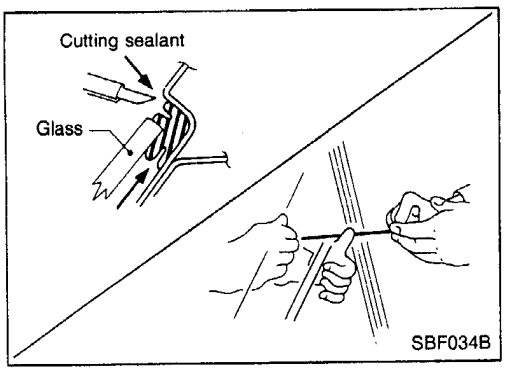


㉔ Back door finisher



Rear Seat


Rear seat back striker (RH) B
Rear seat back hinge (center) D
& hook E
Rear seat back hinge (LH) C
Rear seat hook A
A
B
43.1 - 54.9
(4.4 - 5.6,
31.8 - 40.5)
C
20.6 - 26.5
(2.1 - 2.7,
15.2 - 19.5)
12.7 - 15.7
(1.3 - 1.6,
9.4 - 11.6)
D
25.5 - 32.4
(2.6 - 3.3, 18.8 - 23.9)
E
Rear seat back hinge
(center)
Suitable tool
: N·m (kg-m, ft-lb)
: N·m (kg-m, in-lb)
NBF285



Windshield and Back Door Window

REMOVAL

After removing moldings, remove glass.

CAUTION:

Be careful not to scratch glass when removing.

INSTALLATION

- **Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.**
- **After installation, the vehicle should remain stationary for about 24 hours.**

WARNING:

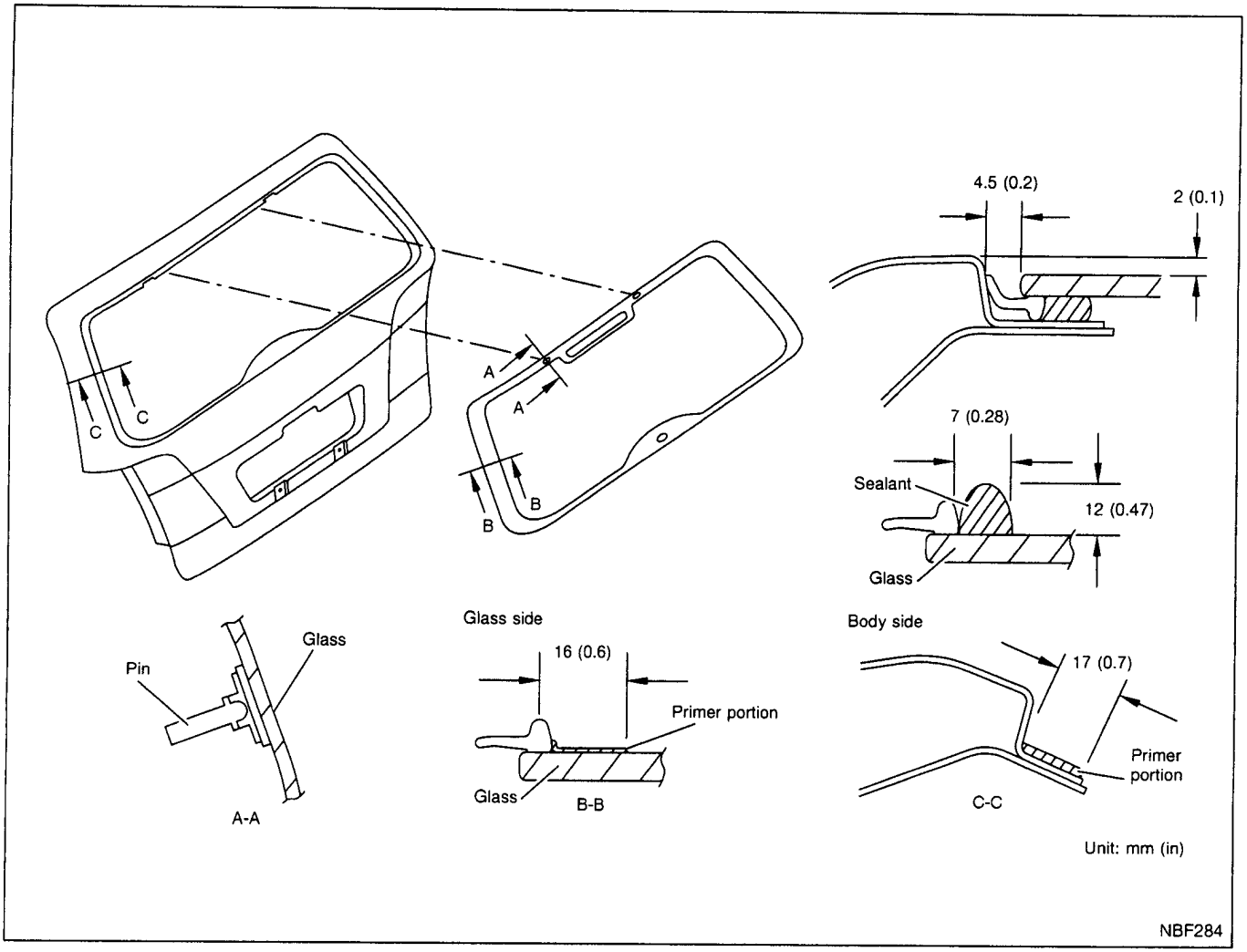
Keep heat and open flames away as primers are flammable.

CAUTION:

Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

- **Do not use sealant which is past its usable term.**
- **Do not leave cartridge unattended with its cap open.**
- **Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.**
- **Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.**
- **Molding must be installed securely so that it is in position and leaves no gap.**

Back door window



REPAIRING WATER LEAKS FOR WINDSHIELD

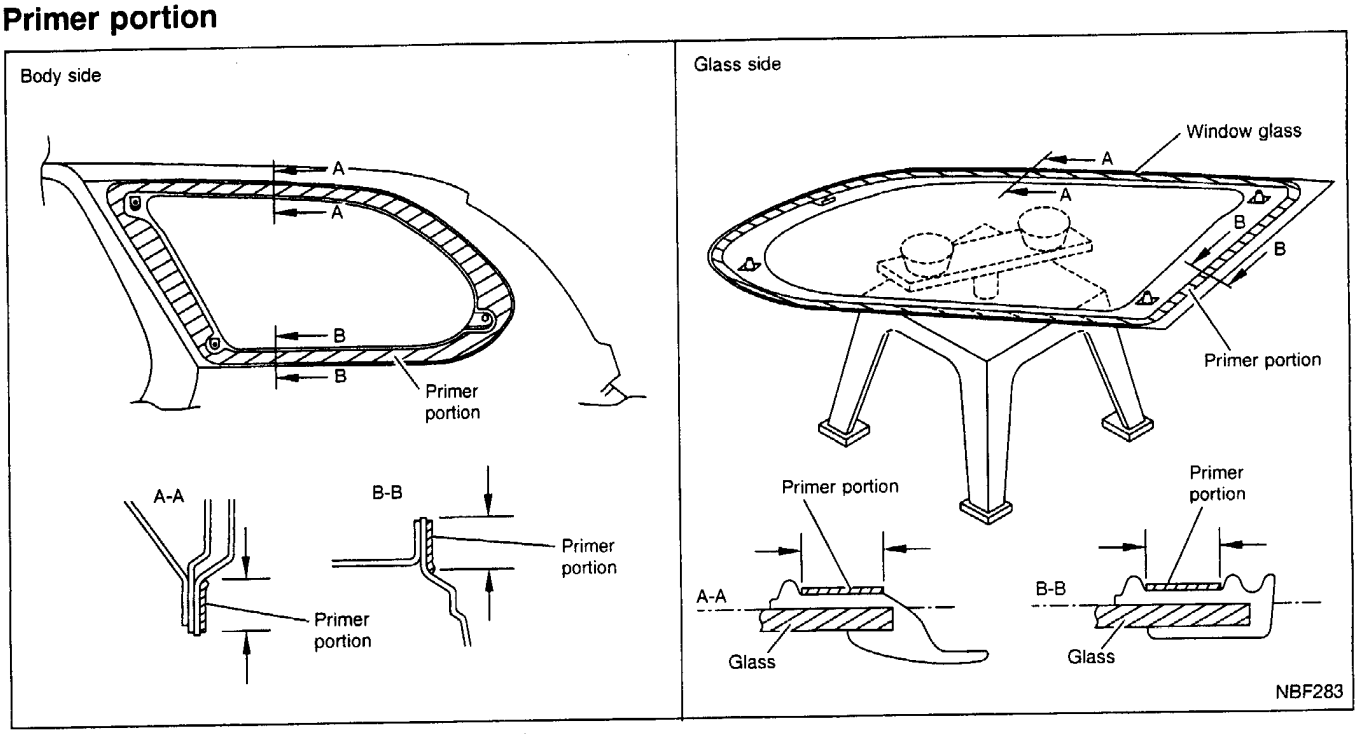
Leaks can be repaired without removing and reinstalling glass.

If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.

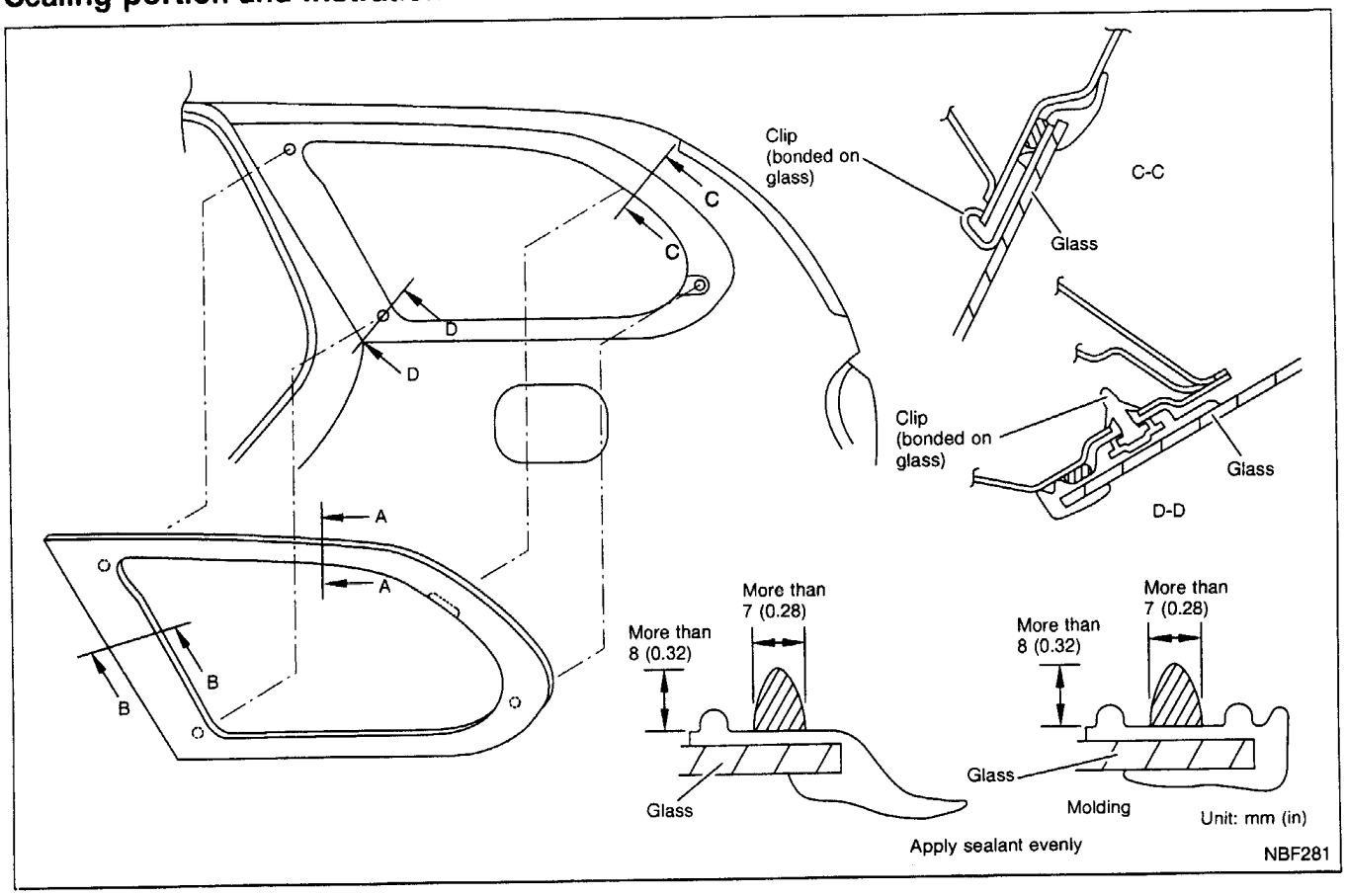
To stop the leak, apply primer (if necessary) and then sealant to the leak point.

Side Window

Primer portion



Sealing portion and instration



HEATER & AIR CONDITIONER

SECTION HA

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<COMBINED EDITION>

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- Diagnostic Procedure 2 2011
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<SUPPLEMENT-III>

NO CHANGES

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

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".

Supplemental Restraint System (SRS) "AIR BAG" (Dual Air Bag System)

The Supplemental Restraint System "Air Bag" used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation) all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual. SRS wiring harnesses are covered with yellow insulation (either just before the harness connectors or for the complete harness) for easy identification.**

Supplemental Restraint System (SRS) "AIR BAG" (Single Air Bag System)

The Supplemental Restraint System "Air Bag" used along with a seat belt, helps to reduce the risk or severity of injury to the driver in a frontal collision. The Supplemental Restraint System consists of an air bag module (located in the center of the steering wheel), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation) all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual.**

Precautions for Working with HFC-134a (R-134a)

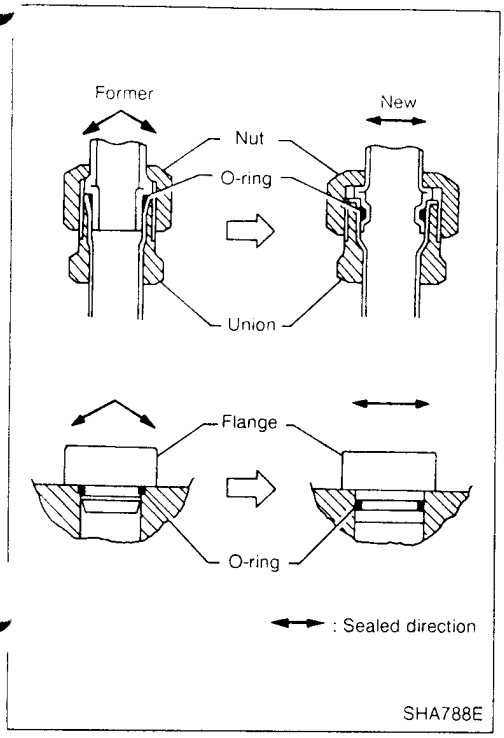
WARNING:

- CFC-12 (R-12) refrigerant and HFC-134a (R-134a) refrigerant are not compatible. These refrigerants must never be mixed, even in the smallest amounts. If the refrigerants are mixed, compressor failure is likely to occur.
- Use only specified lubricant for the HFC-134a (R-134a) A/C system and HFC-134a (R-134a) components. If lubricant other than that specified is used, compressor failure is likely to occur.
- The specified HFC-134a (R-134a) lubricant rapidly absorbs moisture from the atmosphere. The following handling precautions must be observed:
  - a: When removing refrigerant components from a vehicle, immediately cap (seal) the component to minimize the entry of moisture from the atmosphere.
  - b: When installing refrigerant components to a vehicle, do not remove the caps (unseal) until just before connecting the components. Connect all refrigerant loop components as quickly as possible to minimize the entry of moisture into system.
  - c: Only use the specified lubricant from a sealed container. Immediately reseal containers of lubricant. Without proper sealing, lubricant will become moisture saturated and should not be used.
  - d: Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Remove R-134a from the A/C system, using certified service equipment meeting requirements of SAE J2210 (R-134a recycling equipment), or J2209 (R-134a recovery equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.
  - e: Do not allow lubricant (Nissan A/C System Oil Type S) to come in contact with styrofoam parts. Damage may result.

General Refrigerant Precautions

WARNING:

- Do not release refrigerant into the air. Use approved recovery/recycling equipment to capture the refrigerant every time an air conditioning system is discharged.
- Always wear eye and hand protection (goggles and gloves) when working with any refrigerant or air conditioning system.
- Do not store or heat refrigerant containers above 52°C (126°F).
- Do not heat a refrigerant container with an open flame; if container warming is required, place the bottom of the container in a warm pail of water.
- Do not intentionally drop, puncture, or incinerate refrigerant containers.
- Keep refrigerant away from open flames: poisonous gas will be produced if refrigerant burns.
- Refrigerant will displace oxygen, therefore be certain to work in well ventilated areas to prevent suffocation.
- Do not introduce compressed air to any refrigerant container or refrigerant component.



Precautions for Refrigerant Connection

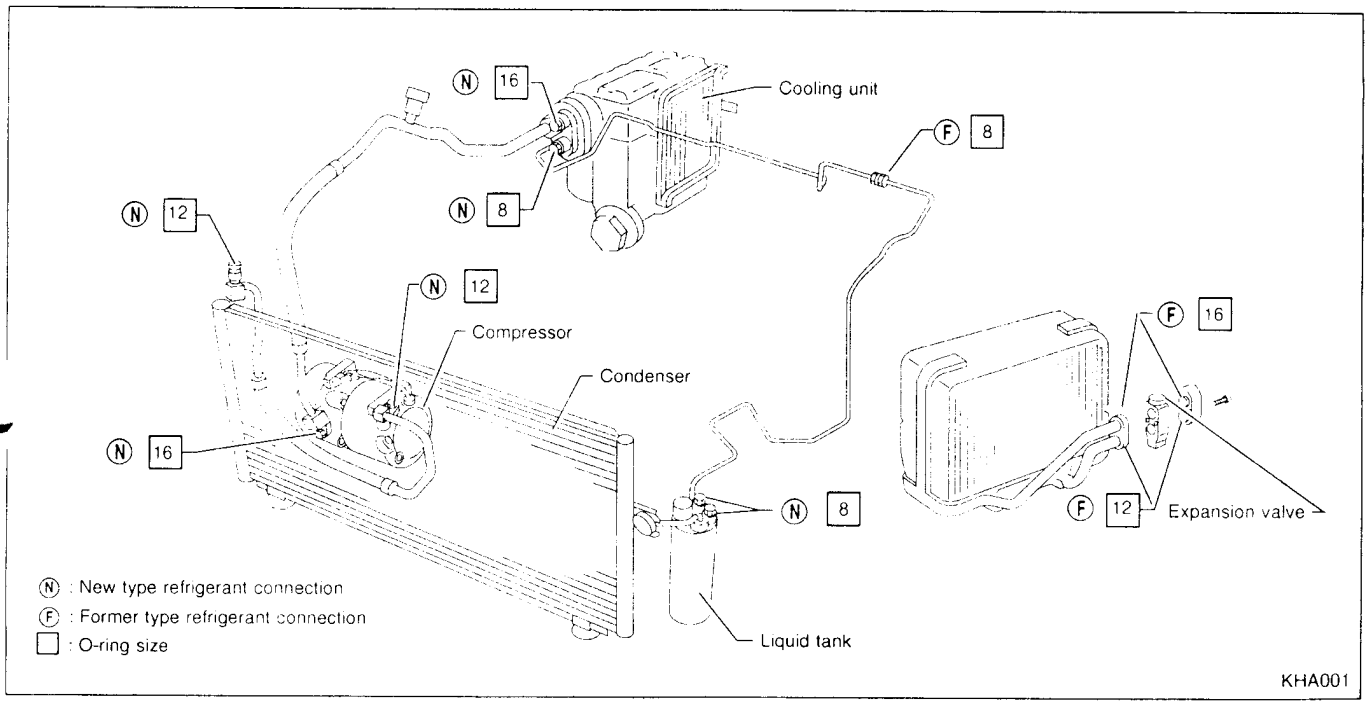
A new type refrigerant connection has been introduced to all refrigerant lines except the following portions.

- Expansion valve to cooling unit
- Liquid tank to condenser

FEATURES OF NEW TYPE REFRIGERANT CONNECTION

- The O-ring has been relocated. It has also been provided with a groove for proper installation. This eliminates the chance of the O-ring being caught in, or damaged by, the mating part. The sealing direction of the O-ring is now set vertically in relation to the contacting surface of the mating part to improve sealing characteristics.
- The reaction force of the O-ring will not occur in the direction that causes the joint to pull out, thereby facilitating piping connections.

O-RING AND REFRIGERANT CONNECTION



CAUTION:

The new and former refrigerant connections use different O-ring configurations. Do not confuse O-rings since they are not interchangeable. If a wrong O-ring is installed, refrigerant will leak at, or around, the connection.

O-ring part numbers

Ⓝ 8: 92471 N8210	Ⓝ 16: 92473 N8210	Ⓕ 12: 92475 71L00
Ⓝ 12: 92472 N8210	Ⓕ 8: 92470 N8200	Ⓕ 16: 92475 72L00

Precautions for Refrigerant Connection (Cont'd)

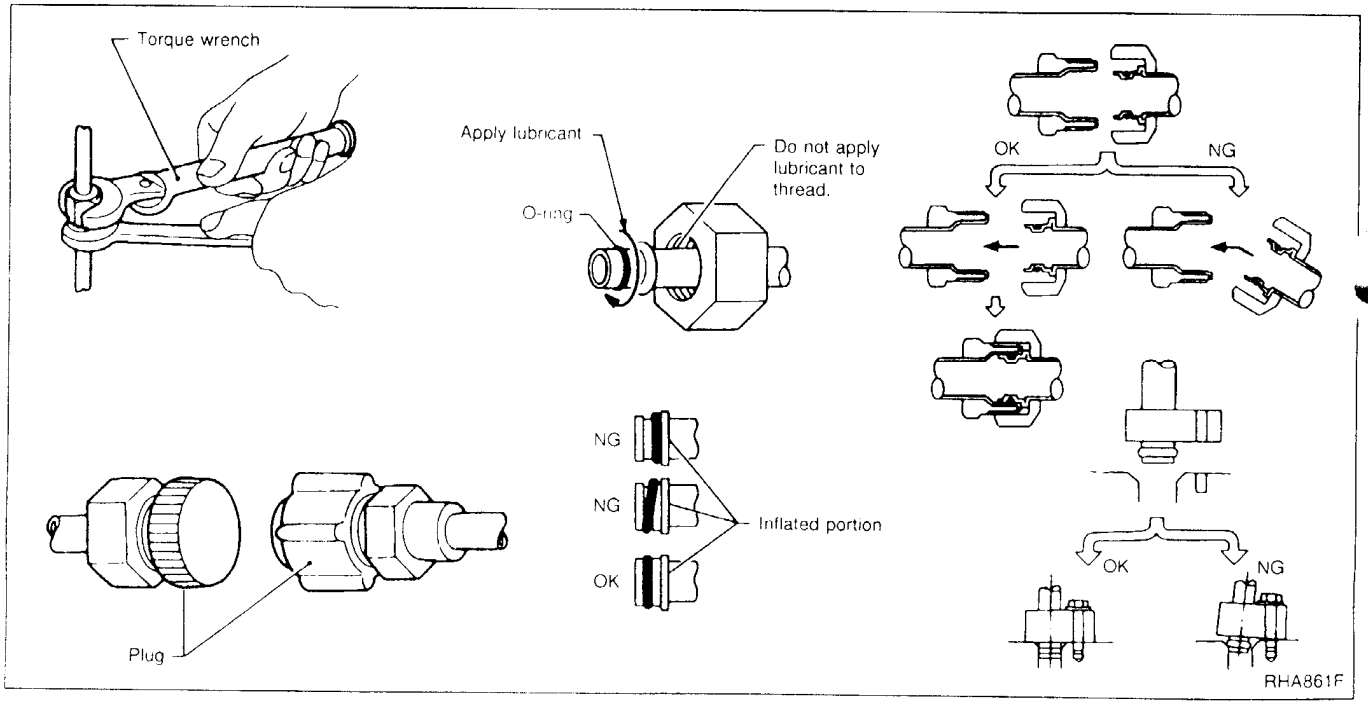
WARNING:

Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric pressure. Then gradually loosen the discharge side hose fitting and remove it.

CAUTION:

When replacing or cleaning refrigerant cycle components, observe the following:

- When the compressor is removed, store it in the same position as it is when mounted on the car. Failure to do so will cause lubricant to enter the low pressure chamber.
- When connecting tubes, always use a torque wrench and a back-up wrench.
- After disconnecting tubes, immediately plug all openings to prevent entry of dirt and moisture.
- When installing an air conditioner in the vehicle, connect the pipes as the final stage of the operation. Do not remove the seal caps of pipes and other components until just before connection.
- Allow components stored in cool areas to warm to ambient temperature before removing seal caps. This prevents condensation from forming inside A/C components.
- Thoroughly remove moisture from the refrigeration system before charging the refrigerant.
- Always replace used O-rings.
- When connecting tube, apply lubricant to circle of the O-rings shown in illustration. Be careful not to apply lubricant to threaded portion.
  Lubricant name: Nissan A/C System Oil Type R
  Part number: KLH00-PAGR0
- O-ring must be closely attached to dented portion of tube.
- When replacing the O-ring, be careful not to damage O-ring and tube.
- Connect tube until you hear it click, then tighten the nut or bolt by hand until snug.
  Make sure that the O-ring is installed to tube correctly.
- After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.

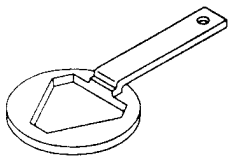
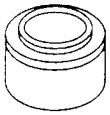


Precautions for Servicing Compressor

- Plug all openings to prevent moisture and foreign matter from entering.
- When the compressor is removed, store it in the same position as it is when mounted on the car.
- When replacing or repairing compressor, follow "Maintenance of Lubricant Quantity in Compressor" exactly. Refer to HA-57.
- Keep friction surfaces between clutch and pulley clean. If the surface is contaminated, with lubricant, wipe it off by using a clean waste cloth moistened with thinner.
- After compressor service operation, turn the compressor shaft by hand more than five turns in both directions. This will equally distribute lubricant inside the compressor. After the compressor is installed, let the engine idle and operate the compressor for one hour.
- After replacing the compressor magnet clutch, apply voltage to the new one and check for normal operation.

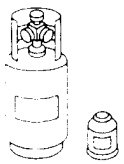
Special Service Tools

CR-14 compressor

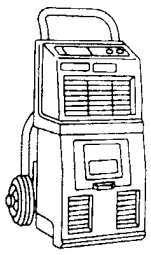
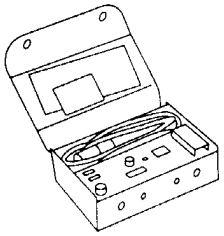
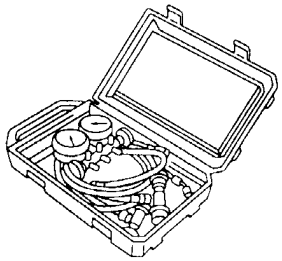
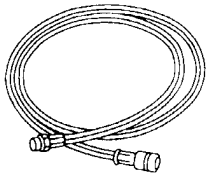
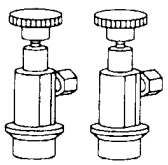
Tool number Tool name	Description	
KV99106700 Clutch disc wrench	 NT351	Removing shaft nut and clutch disc
KV99106800 Pulley installer	 NT352	Installing pulley

HFC-134a (R-134a) Service Tools and Equipment

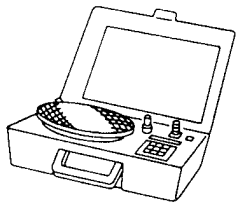
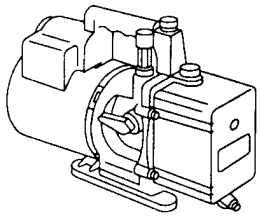
Never mix HFC-134a refrigerant and/or its specified lubricant with CFC-12 (R-12) refrigerant and/or its lubrication oil.
Separate and non-interchangeable service equipment must be used for each type of refrigerant/lubricant.
Refrigerant container fittings, service hose fittings and service equipment fittings (equipment which handles refrigerant and/or lubricant) are different between CFC-12 (R-12) and HFC-134a (R-134a). This is to avoid mixed use of the refrigerants/lubricant.
Adapters that convert one size fitting to another must never be used: refrigerant/lubricant contamination will occur and compressor failure will result.

Tool name	Description	Note
HFC-134a (R-134a) refrigerant	 NT196	Container color: Light blue Container marking: HFC-134a (R-134a) Fitting size: Thread size • large container 1/2"-16 ACME

HFC-134a (R-134a) Service Tools and Equipment (Cont'd)

Tool name	Description	Note
Nissan A/C System Oil Type R (Part No.: KLH00-PAGR0)	NT197	Type: Poly alkyline glycol oil (PAG), type R Application: HFC-134a (R-134a) vane rotary compressors (Nissan only) Capacity: 40 mℓ (1.4 Imp fl oz)
Recovery/Recycling/ Recharging equipment	 NT195	Function: Refrigerant Recovery and Recycling and Recharging
Electrical leak detector	 NT198	Power supply: • DC 12 V (Cigarette lighter)
Manifold gauge set (with hoses and couplers)	 NT199	Identification: • The gauge face indicates R-134a. Fitting size: Thread size • 1/2"-16 ACME
Service hoses • High side hose • Low side hose • Utility hose	 NT201	Hose color: • Low hose: Blue with black stripe • High hose: Red with black stripe • Utility hose: Yellow with black stripe or green with black stripe Hose fitting to gauge: • 1/2"-16 ACME
Service couplers • High side coupler • Low side coupler	 NT202	Hose fitting to service hose: • M14 x 1,5 fitting is optional or permanently attached.

HFC-134a (R-134a) Service Tools and Equipment (Cont'd)

Tool name	Description	Note
Refrigerant weight scale	 NT200	For measuring of refrigerant Fitting size: Thread size • 1/2"-16 ACME
Vacuum pump (Including the isolator valve)	 NT203	Capacity: • Air displacement: 4 CFM • Micron rating: 20 microns • Oil capacity: 482 g (17 oz) Fitting size: Thread size • 1/2"-16 ACME

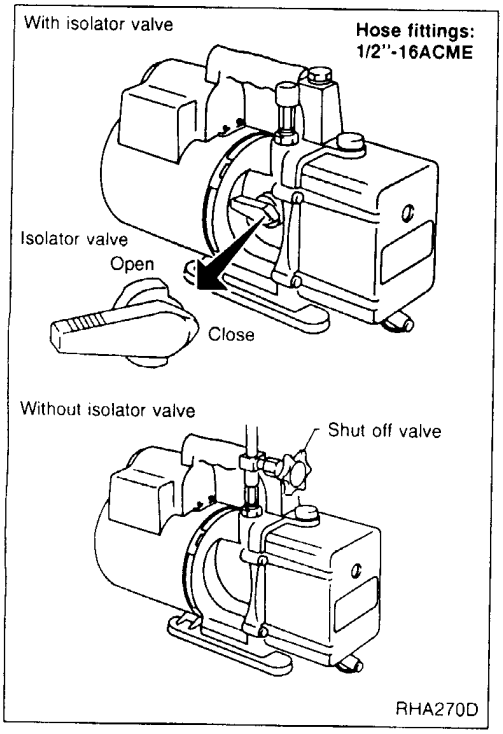
Precautions for Service Equipment

RECOVERY/RECYCLING/RECHARGING EQUIPMENT

Be certain to follow the manufacturer's instructions for machine operation and machine maintenance. Never introduce any refrigerant other than that specified into the machine.

ELECTRONIC LEAK DETECTOR

Be certain to follow the manufacturer's instructions for tester operation and tester maintenance.



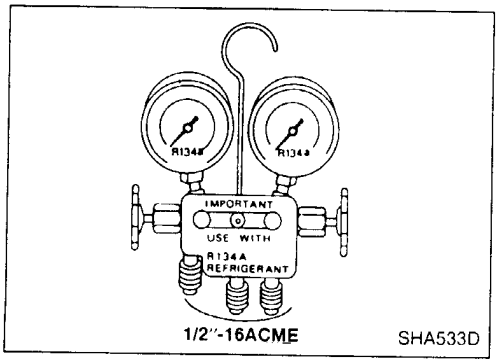
VACUUM PUMP

The lubricant contained inside the vacuum pump is not compatible with the specified lubricant for HFC-134a (R-134a) A/C systems. The vent side of the vacuum pump is exposed to atmospheric pressure, so the vacuum pump lubricant may migrate out of the pump into the service hose. This is possible when the pump is switched off after evacuation (vacuuming) and hose is connected to it.

To prevent this migration, use a manual valve placed near the hose-to-pump connection, as follows:

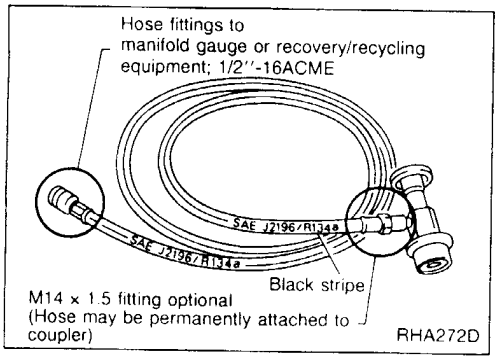
- Usually vacuum pumps have a manual isolator valve as part of the pump. Close this valve to isolate the service hose from the pump.
- For pumps without an isolator, use a hose equipped with a manual shut-off valve near the pump end. Close the valve to isolate the hose from the pump.
- If the hose has an automatic shut off valve, disconnect the hose from the pump. As long as the hose is connected, the valve is open and lubricating oil may migrate.

Some one-way valves open when vacuum is applied and close under a no vacuum condition. Such valves may restrict the pump's ability to pull a deep vacuum and are not recommended.



MANIFOLD GAUGE SET

Be certain that the gauge face indicates R-134a or 134a. Be sure the gauge set has 1/2"-16 ACME threaded connections for service hoses. Confirm the set has been used only with refrigerant HFC-134a (R-134a) and specified lubricants.



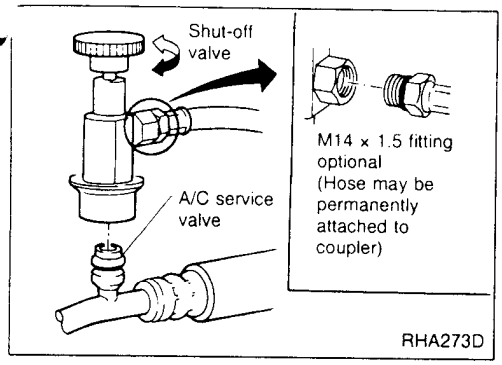
SERVICE HOSES

Be certain that the service hoses display the markings described (colored hose with black stripe). All hoses must include positive shut off devices (either manual or automatic) near the end of the hoses opposite the manifold gauge.

Precautions for Service Equipment (Cont'd)

SERVICE COUPLERS

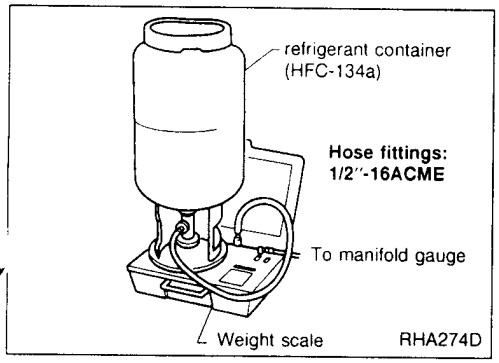
Never attempt to connect HFC-134a (R-134a) service couplers to an CFC-12 (R-12) A/C system. The HFC-134a (R-134a) couplers will not properly connect to the CFC-12 (R-12) system. However, if an improper connection is attempted, discharging and contamination may occur.



Shut off valve rotation	A/C service valve
Clockwise	Open
Counterclockwise	Close

REFRIGERANT WEIGHT SCALE

Verify that no refrigerant other than HFC-134a (R-134a) and specified lubricants have been used with the scale. If the scale controls refrigerant flow electronically, the hose fitting must be 1/2"-16 ACME.



CHARGING CYLINDER

Using a charging cylinder is not recommended. Refrigerant may be vented into air from cylinder's top valve when filling the cylinder with refrigerant. Also, the accuracy of the cylinder is generally less than that of an electronic scale or of quality recycle/recharge equipment.

Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flow is in the standard pattern. Refrigerant flows through the compressor, condenser, liquid tank, evaporator and back to the compressor.
The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION

The compressor cycles on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.

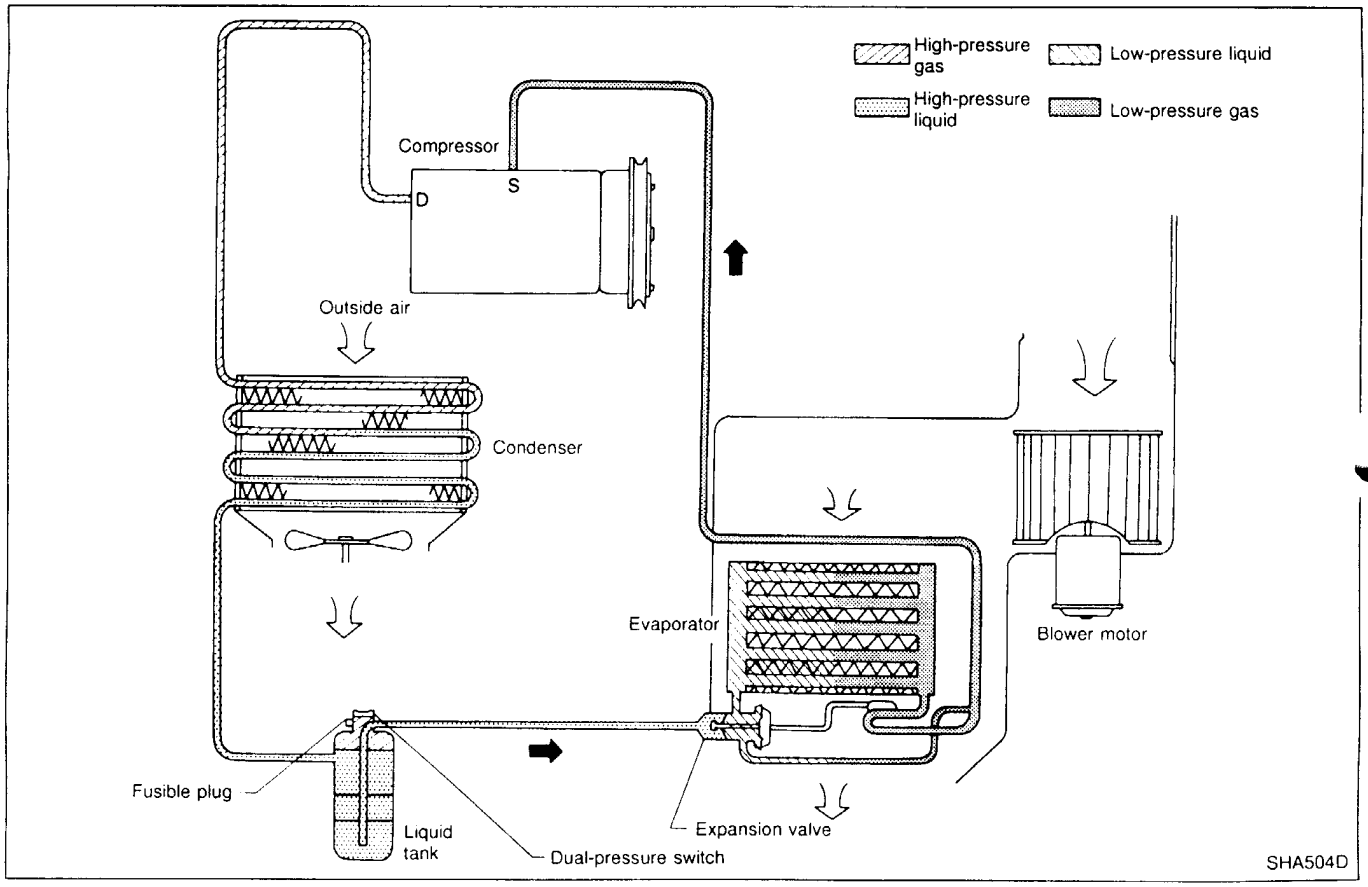
REFRIGERANT SYSTEM PROTECTION

Dual-pressure switch

The dual-pressure switch is located on the liquid tank. If the system pressure rises or falls out of specifications, the switch opens to interrupt compressor clutch operation.

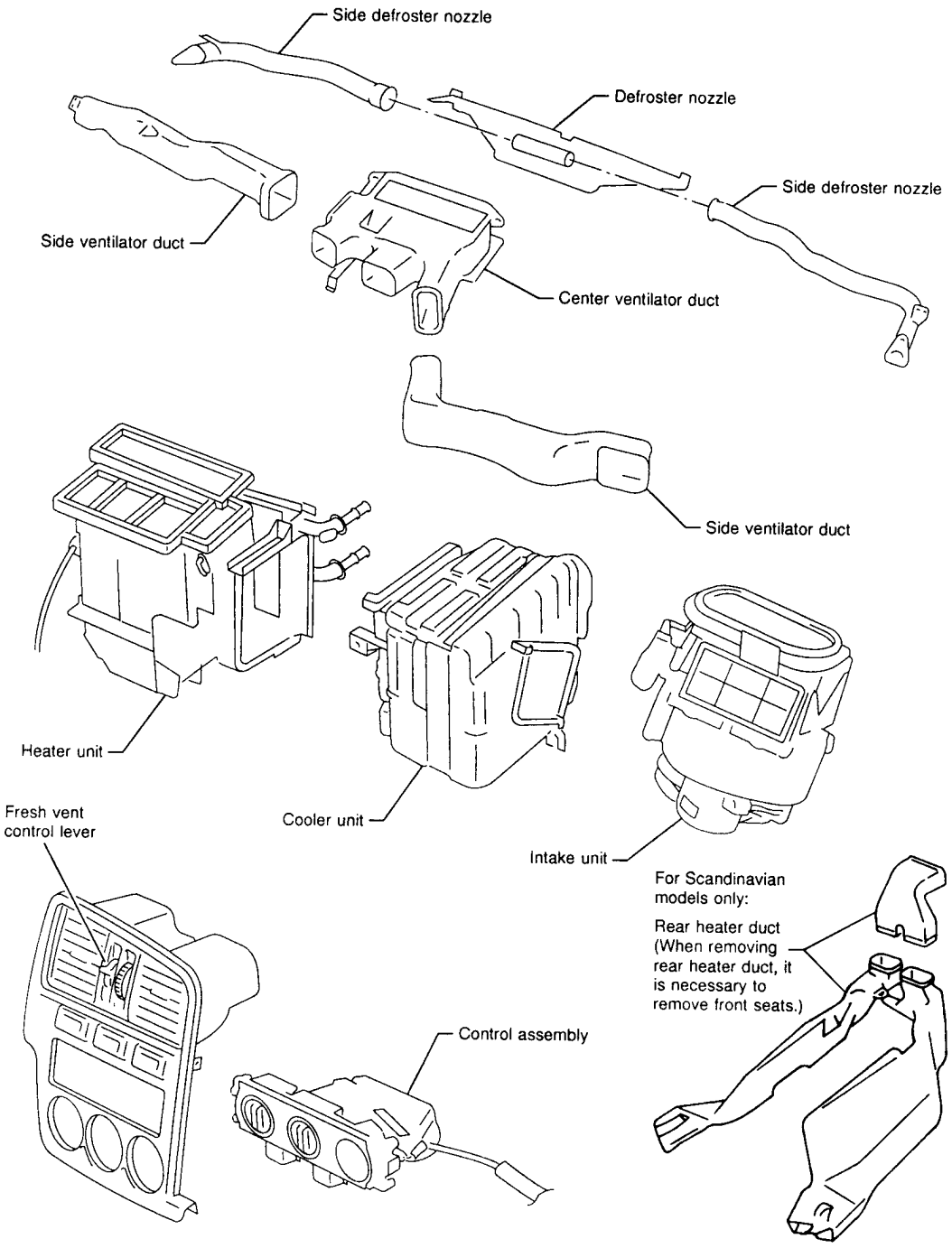
Fusible plug

Open at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace liquid tank.



Component Layout

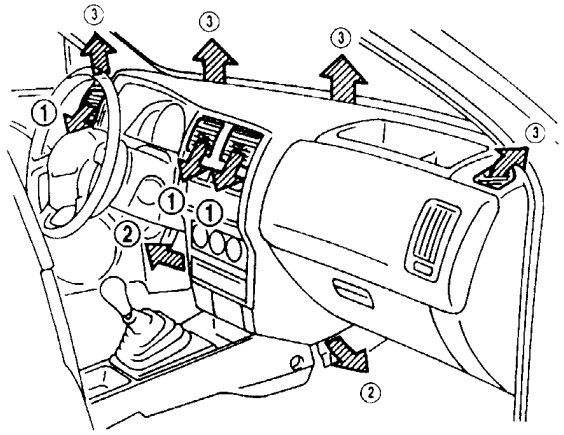
SEC. 270•271•272•273

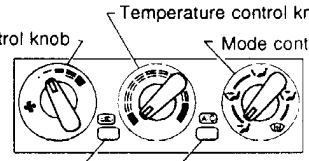


KHA002

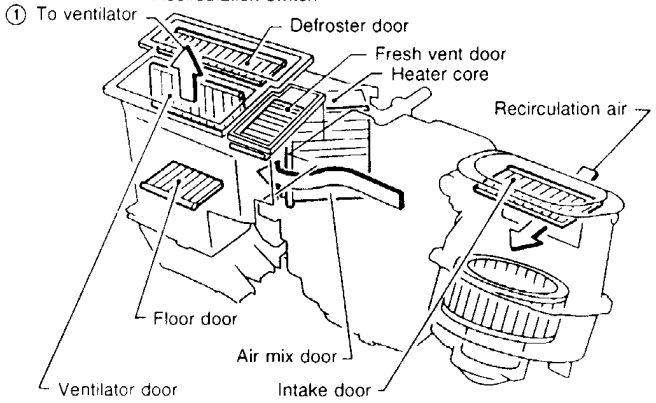
Discharge Air Flow

① : Ventilation ③ : Defroster
② : Foot

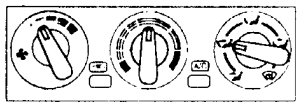


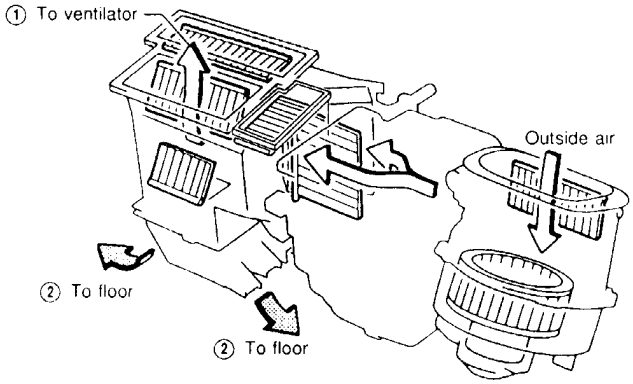


Ventilation (ventilation switch "ON")



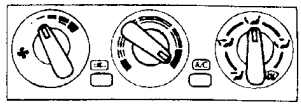
Bi-level (ventilation switch "OFF")

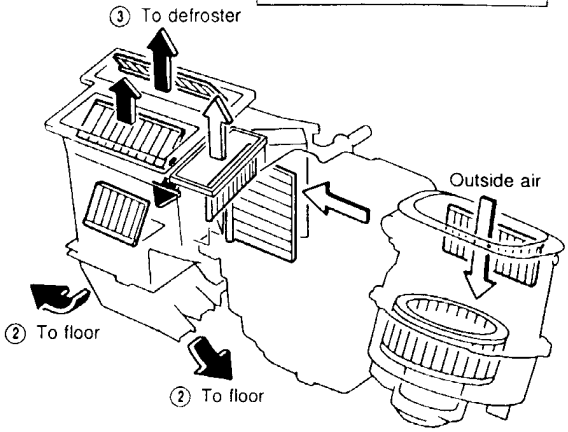




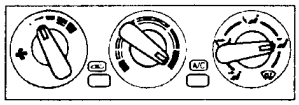
This illustration is for LHD models.
The layout for RHD models is symmetrically opposite.

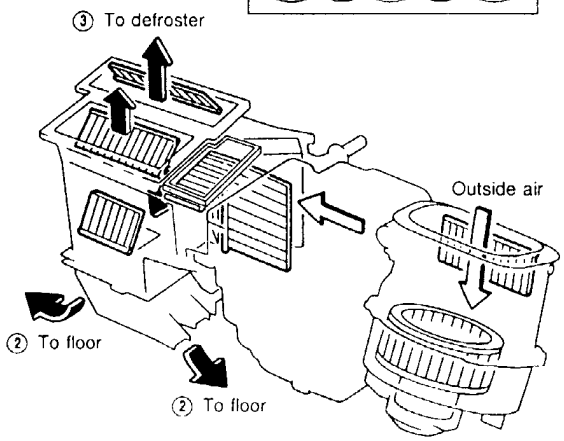
Floor



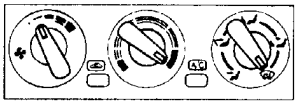


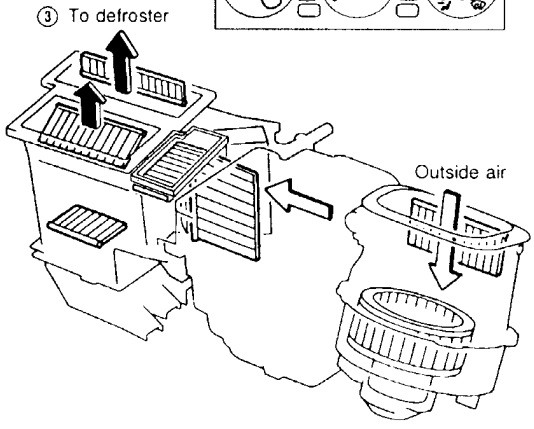
Floor and defroster





Defroster

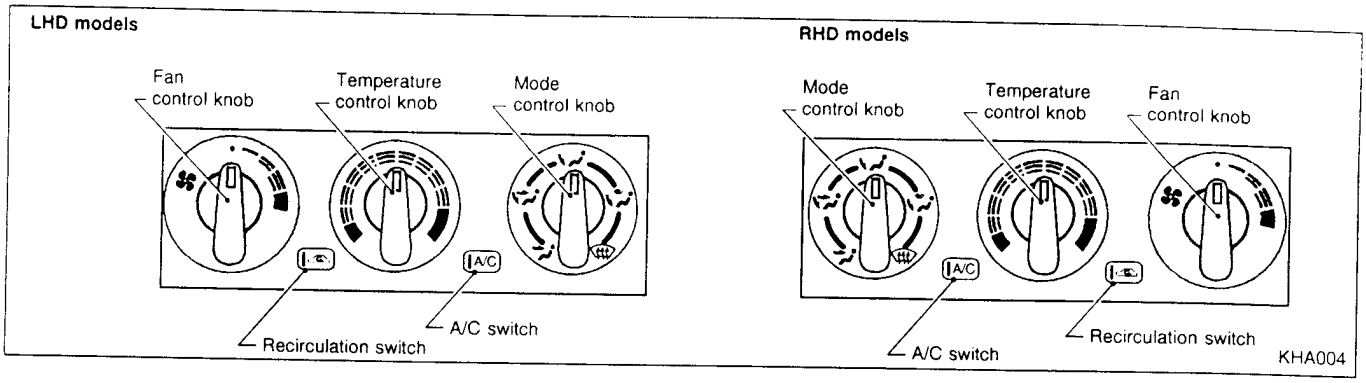




: Air passed through heater core
: Mixed air (+)
: Air not passed through heater core

KHA003

Control Operation



FAN CONTROL KNOB

This knob turns the fan ON and OFF, and controls fan speed.

MODE CONTROL KNOB

This knob controls the outlet air flow.

TEMPERATURE CONTROL KNOB

This knob allows adjustment of the temperature of the outlet air.

RECIRCULATION (REC) SWITCH

OFF position:
Outside air is drawn into the passenger compartment.
ON position:
Interior air is recirculated inside the vehicle.
The indicator lamp will also light.

AIR CONDITIONER SWITCH

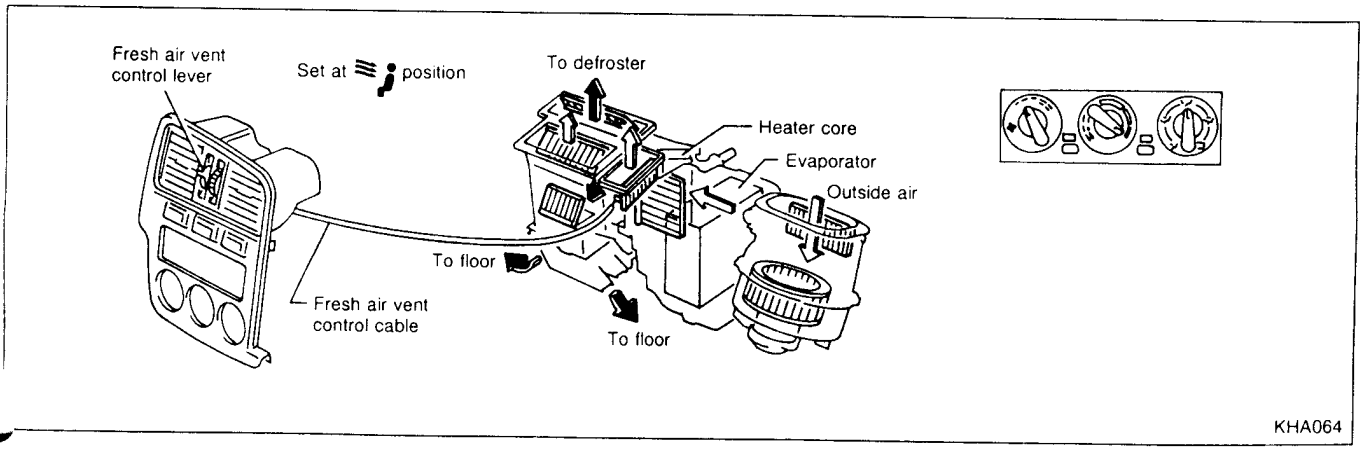
The air conditioner switch controls the A/C system. When the switch is depressed with the fan ON, the compressor will turn ON. The indicator lamp will also light.

The air conditioner cooling function operates only when the engine is running.

Air Flow

FRESH VENT SYSTEM

This system is controlled by means of the fresh air vent lever which is mechanically linked to the fresh vent door by the control cable.
Fresh vent air always comes from the center vent in any mode when the fresh air vent lever is set at the position.



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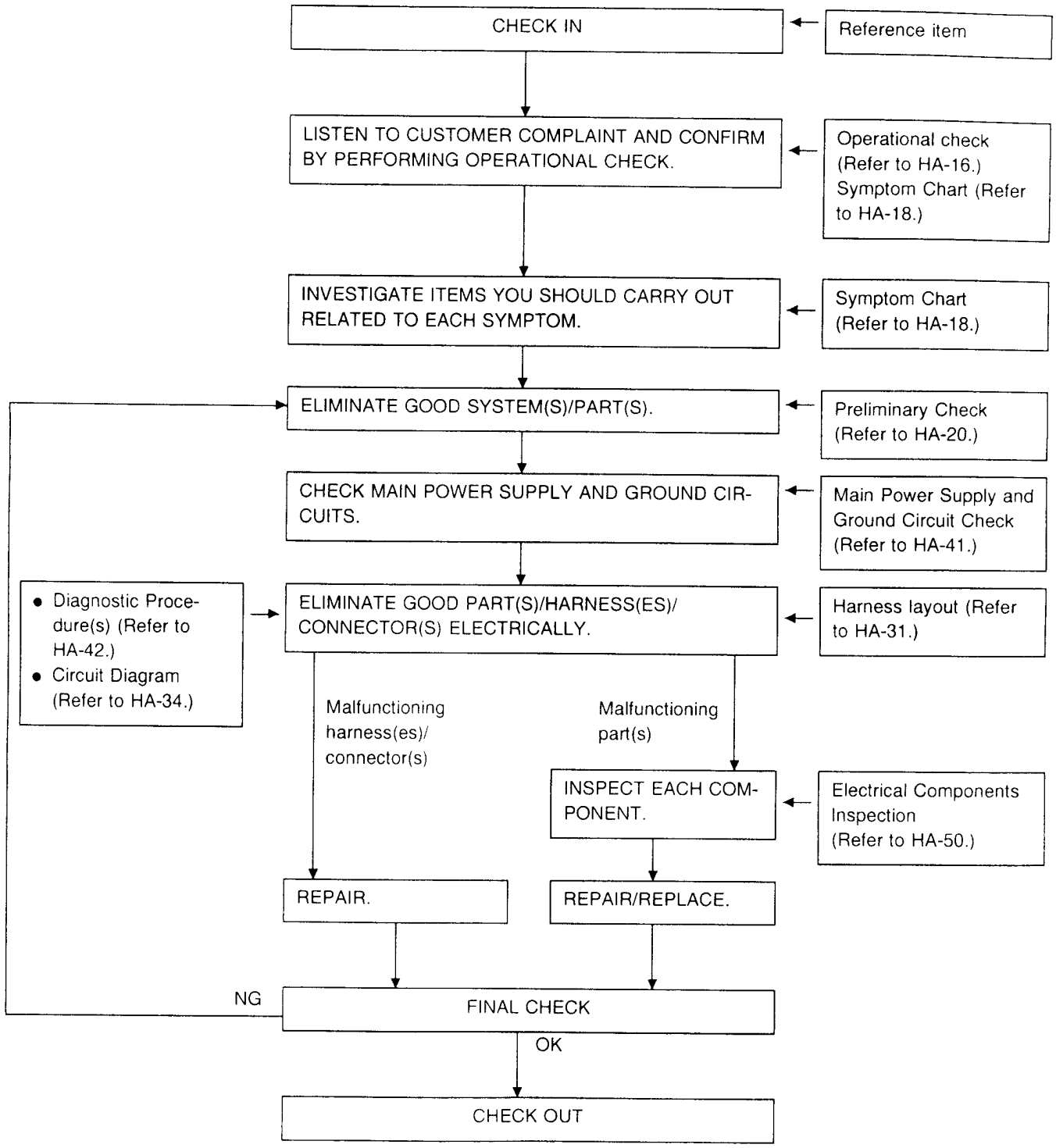
How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW

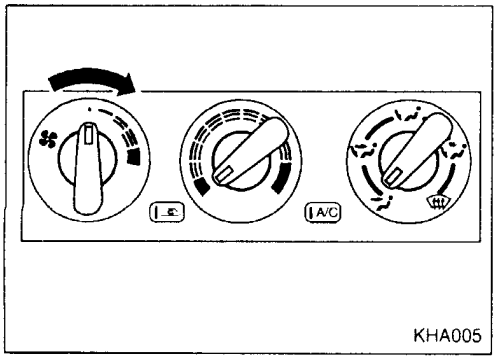


Operational Check

The purpose of the operational check is to confirm that the system operates as it should. The systems which are checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase.

CONDITIONS:

Engine running at normal operating temperature.

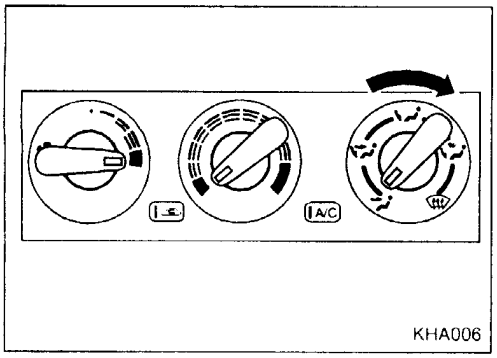


KHA005

PROCEDURE:

1. Check blower

1) Turn fan control knob to 1-speed.
   Blower should operate on 1-speed.
2) Then turn fan control knob to 2-speed.
3) Continue checking blower speed until all four speeds are checked.
4) Leave blower on 4-speed.



KHA006

2. Check discharge air.

1) Turn mode control knob.

Discharge air flow

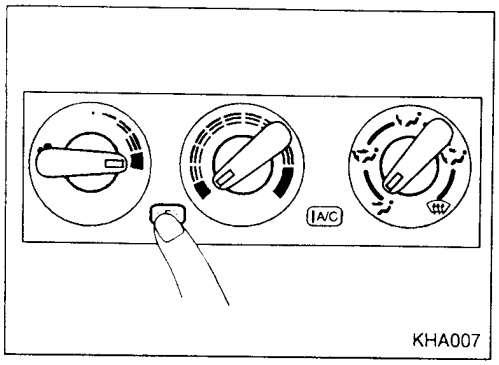
Switch mode/ indicator	Air outlet/distribution		
	Face	Foot	Defroster
	100%	—	—
	60%	40%	—
	15%*	65%	20%
	15%*	55%	30%
	15%*	—	85%

* Face air from SIDE VENT only

KHA032

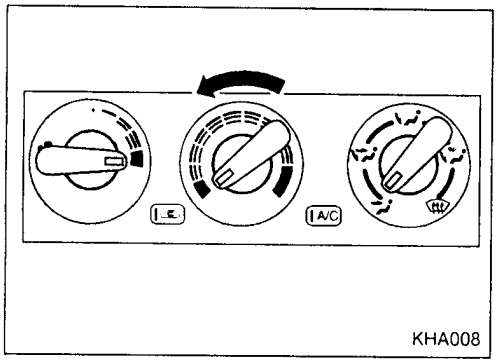
2) Confirm that discharge air comes out according to the air distribution table at left.
   Refer to "Discharge Air Flow" in "DESCRIPTION" (HA-12).

Operational Check (Cont'd)



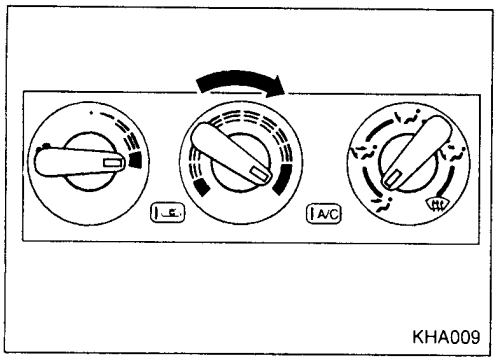
3. Check recirculation

1) Press recirculation switch.
   Recirculation indicator should light.
2) Listen for intake door position change (you should hear blower sound change slightly).



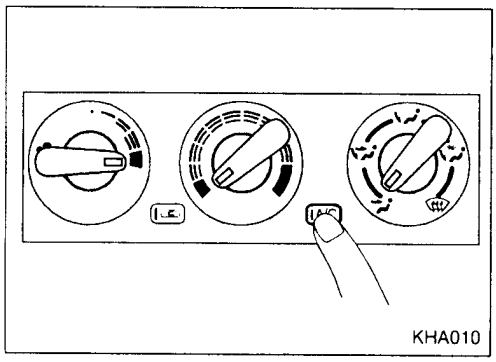
4. Check temperature decrease

1) Turn temperature control knob to full cold.
2) Check for cold air at discharge air outlets.



5. Check temperature increase

1) Turn temperature control knob to full hot.
2) Check for hot air at discharge air outlets.



6. Check air conditioner switch

Turn fan control knob to the desired (1 to 4-speed) position and push the air conditioner switch to turn ON the air conditioner.
The indicator light should come on when air conditioner is ON.

Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	Preliminary Check				Diagnostic Procedure			Main Power Supply and Ground Circuit Check		
REFERENCE PAGE	HA-20	HA-21	HA-22	HA-23	HA-42	HA-44	HA-46	HA-41	HA-41	HA-41
SYMPTOM	Preliminary check 1	Preliminary check 2	Preliminary check 3	Preliminary check 4	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	15A Fuses	7.5A fuses	Thermo control amp.
A/C does not blow cold air.	❶				○		○	○	○	○
Blower motor does not rotate.	❶				❷			○		
Insufficient heating				❶	○					
Air outlet does not change.		❶								
Intake door does not change.						❶			○	○
Magnet clutch does not operate when A/C switch and fan switch are ON.	❶						❷	○	○	○
Noise			❶							

❶, ❷ : The number means checking order.
○ : As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

Symptom Chart (Cont'd)

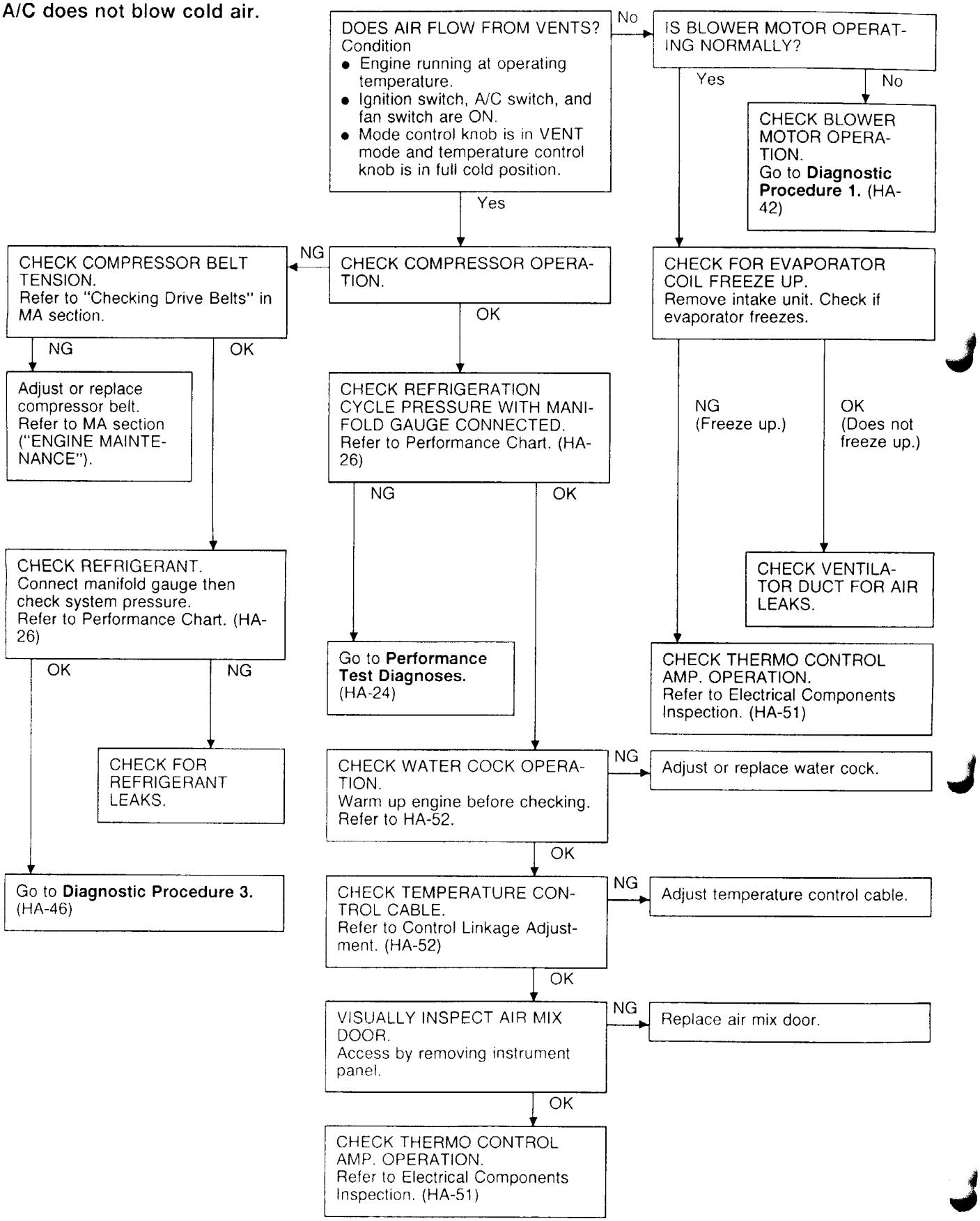
Electrical Components Inspection

	Blower motor	Blower resistor	A/C switch	Recirculation switch	Fan switch	A/C relay	Thermo control amp.	Dual/Triple-pressure switch	Thermal protector / Compressor	ECM (ECCS control module), ECM (ECCS-D Engine control module)	Illumination system	Harness
HA-50	○	○	○		○	○	○	○	○	○		○
HA-50	○	○			○							○
HA-50												○
HA-51												○
HA-50				○								○
HA-51			○		○	○	○	○	○	○		○
HA-51												
HA-51-52												
HA-51												
Refer to EC section												
Refer to EL section												
—												

Preliminary Check

PRELIMINARY CHECK 1

A/C does not blow cold air.



PRELIMINARY CHECK 2

Air outlet does not change.

TURN IGNITION SWITCH AND FAN SWITCH ON. DOES AIR COME OUT NORMALLY FROM EACH DUCT WHEN EACH MODE SWITCH IS PUSHED?

No → Adjust mode control cable.

Discharge air flow

Switch mode/ indicator	Air outlet/distribution		
	Face	Foot	Defroster
	100%	—	—
	60%	40%	—
	15%*	65%	20%
	15%*	55%	30%
	15%*	—	85%

* Face air from SIDE VENT only

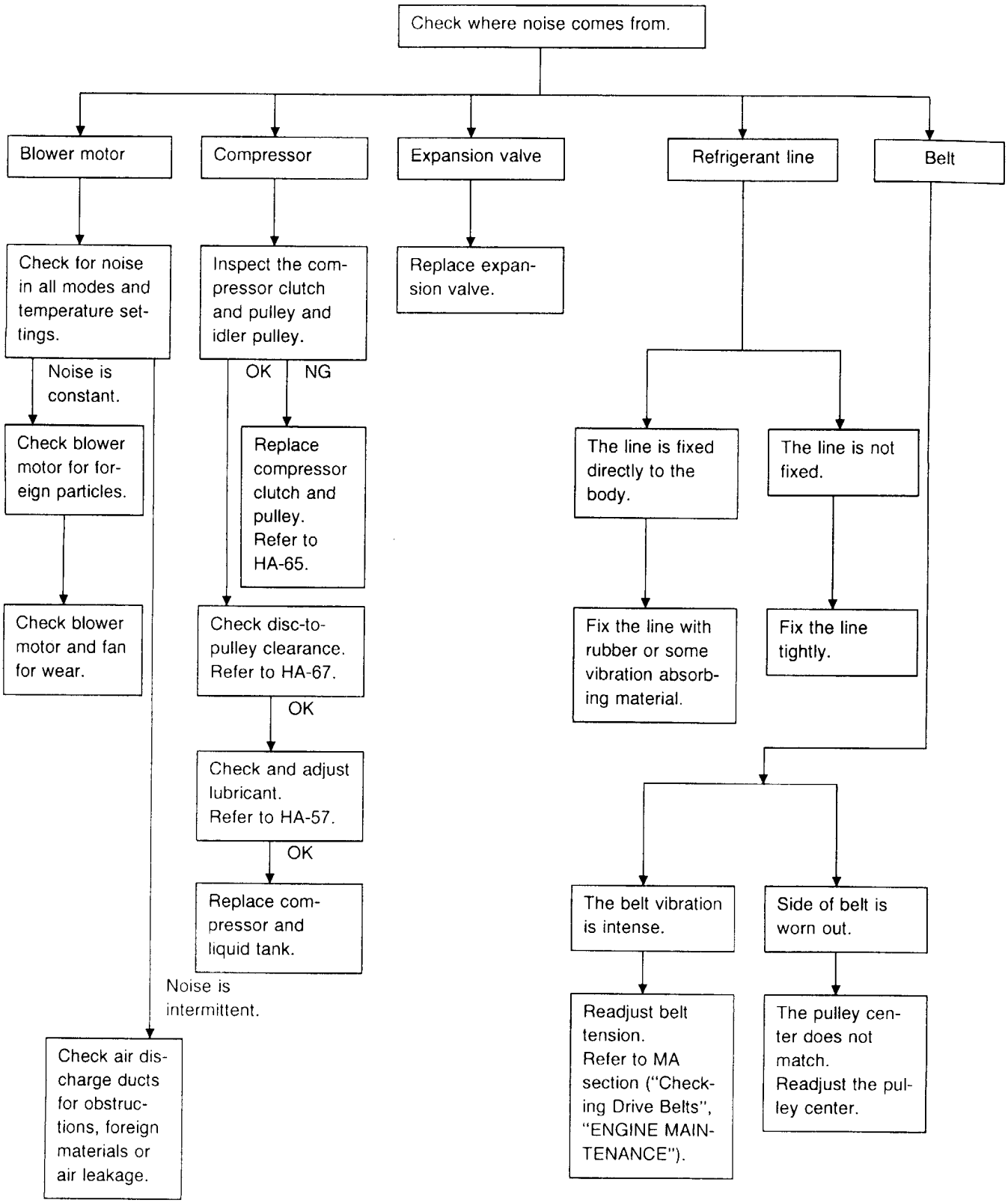
Yes

INSPECTION END

Preliminary Check (Cont'd)

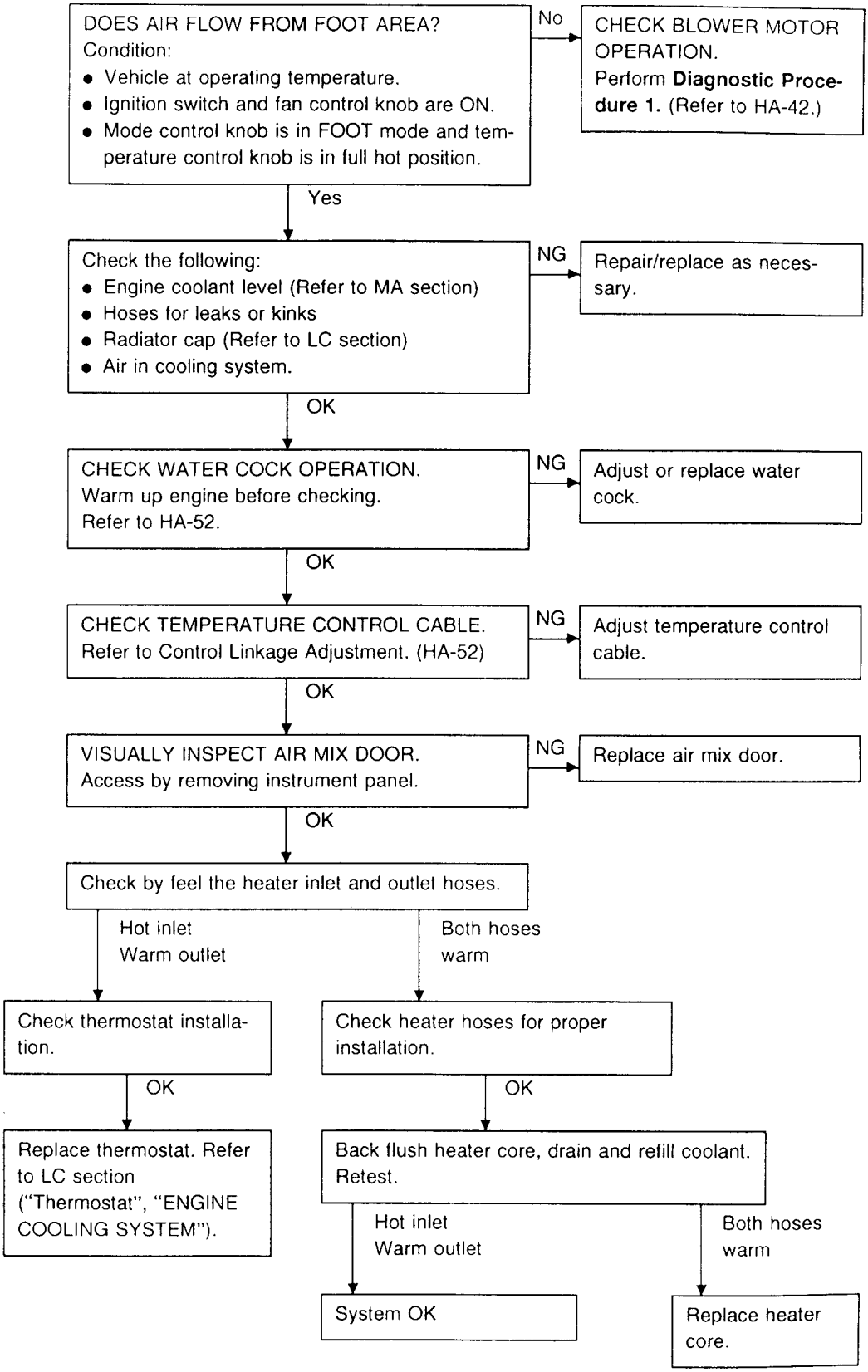
PRELIMINARY CHECK 3

Noise



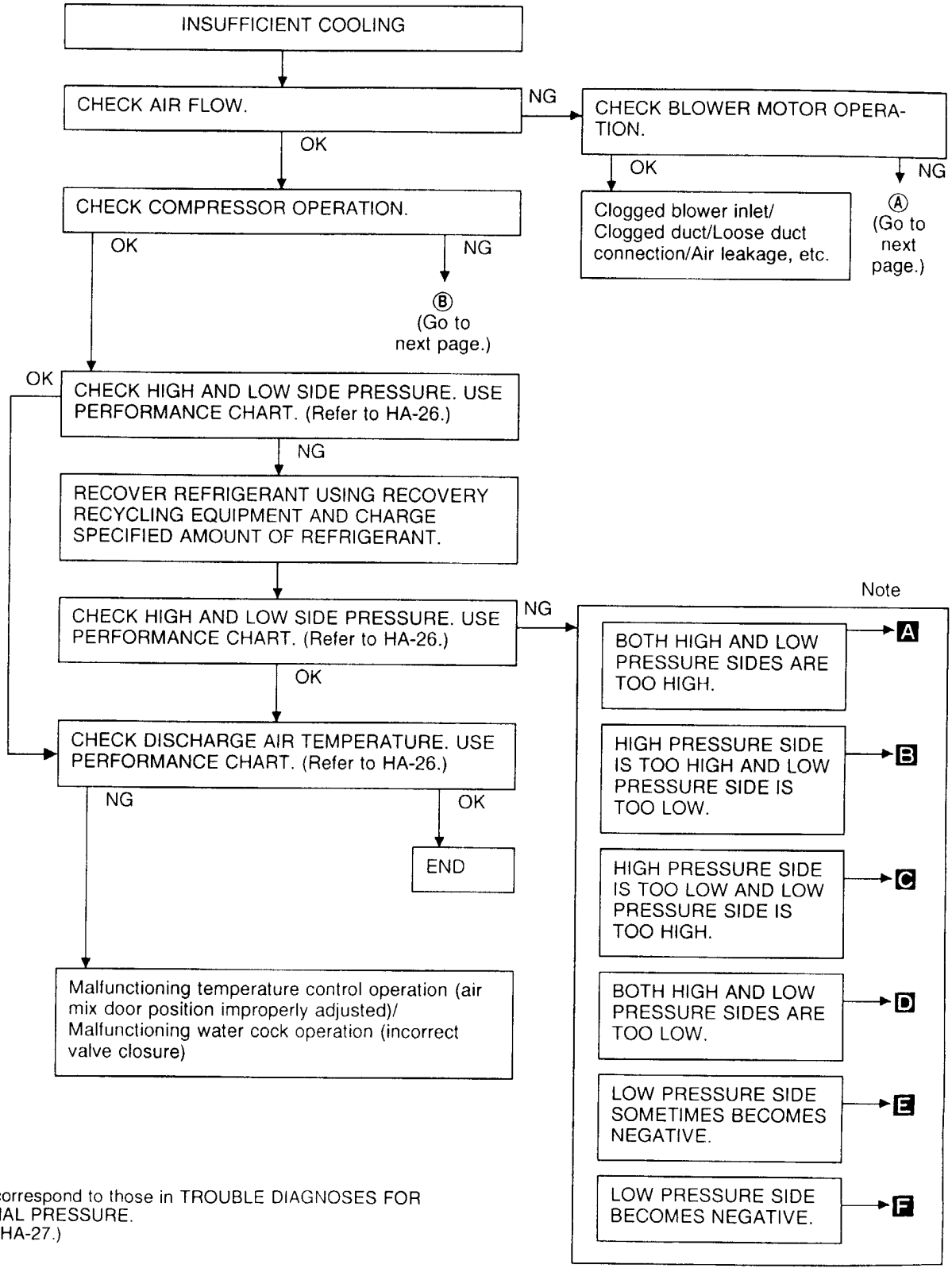
PRELIMINARY CHECK 4

Insufficient heating



Performance Test Diagnoses

INSUFFICIENT COOLING



Note: A-F correspond to those in TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE.
(Refer to HA-27.)

Performance Test Diagnoses (Cont'd)

Ⓐ

- Malfunctioning blower motor fan
  - Loose fan/Improper contact of fan and case/Deformed fan
- Malfunctioning electrical circuit
  - Discontinued wiring or component circuits or poor connection/ Malfunctioning resistor, amplifier, etc./ Burned out fuse or low battery voltage
- Malfunctioning blower motor internal circuit

Ⓑ

- Magnet clutch does not engage.
  - CHECK MAGNET CLUTCH (coil circuit, disc-to-pulley clearance).
  - CHECK ELECTRICAL CIRCUIT (wiring, components circuit).
  - CHECK ACTIVATION OF SAFETY/PROTECTION DEVICES (such as pressure switch, etc.).
- Magnet clutch slipping
  - Malfunctioning internal parts of clutch, compressor
  - Foreign particles on clutch frictional surface or excessive disc clearance
  - Malfunctioning electrical circuit (poor connection, low battery voltage, etc.)
- Belt slipping
  - CHECK COMPRESSOR BELT AND BELT TENSION.

A/C Performance Chart

TEST CONDITION

Testing must be performed as follows:

Vehicle location: Indoors or in shade (in a well ventilated place)
Doors: Closed
Door window: Open
Temp lever position: Max COLD
Mode switch position: Ventilation
Intake switch position: Recirculation
Fan switch position: Max
Engine speed: Idling 825-850 rpm

TEST READING (RHD & LHD MODELS)

Recirculating-to-discharge air temperature table

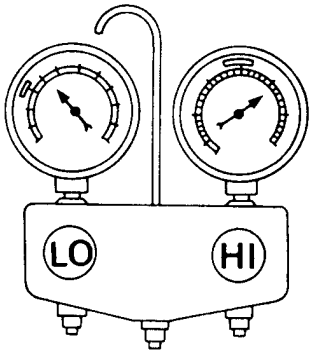
Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	6.4 - 8.0 (44 - 46)
	25 (77)	10.6 - 12.4 (51 - 54)
	30 (86)	14.6 - 17.0 (58 - 63)
	35 (95)	19.0 - 22.0 (66 - 72)
	40 (104)	23.3 - 27.2 (74 - 81)
60 - 70	20 (68)	8.0 - 9.6 (46 - 49)
	25 (77)	12.4 - 14.6 (54 - 58)
	30 (86)	17.0 - 19.7 (63 - 67)
	35 (95)	22.0 - 24.9 (72 - 77)
	40 (104)	27.2 - 30.2 (81 - 86)

Ambient air temperature-to-operating pressure table

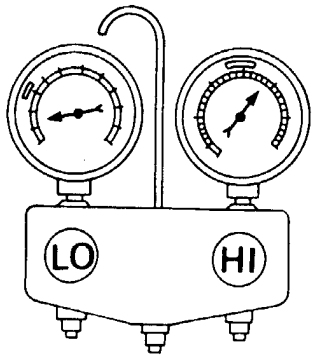
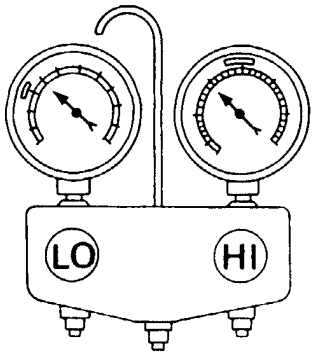
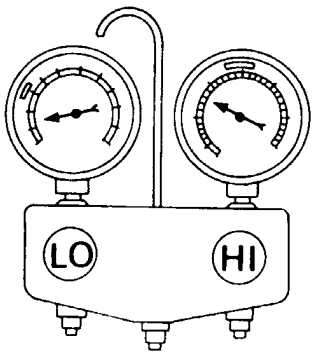
Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm^2, psi)	Low-pressure (Suction side) kPa (bar, kg/cm^2, psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	736 - 902 (7.36 - 9.02, 7.5 - 9.2, 107 - 131)	118 - 186 (1.18 - 1.86, 1.2 - 1.9, 17 - 27)
	25 (77)	873 - 1098 (8.73 - 10.98, 8.9 - 11.2, 127 - 159)	137 - 216 (1.37 - 2.16, 1.4 - 2.2, 20 - 31)
	30 (86)	1,079 - 1,275 (10.79 - 12.75, 11.0 - 13.0, 156 - 185)	157 - 245 (1.57 - 2.45, 1.6 - 2.5, 23 - 36)
	35 (95)	1,304 - 1,608 (13.04 - 16.08, 13.3 - 16.4, 189 - 233)	206 - 304 (2.06 - 3.04, 2.1 - 3.1, 30 - 44)
	40 (104)	1,550 - 1,912 (15.50 - 19.13, 15.8 - 19.5, 225 - 277)	255 - 363 (2.55 - 3.63, 2.6 - 3.7, 37 - 53)

Trouble Diagnoses for Abnormal Pressure

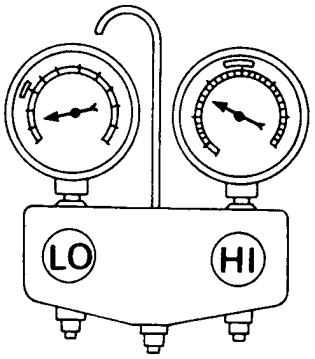
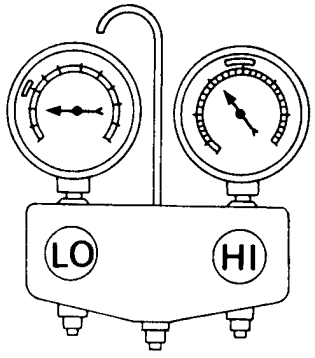
Whenever the system's high and/or low side pressure is abnormal, diagnose using a manifold gauge. The marker above the gauge scale in the following tables indicates the standard (normal) pressure range. Since the standard (normal) pressure, differs from vehicle to vehicle, refer to HA-26 ("Ambient air temperature-to-operating pressure table").

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high and low-pressure sides are too high. A  AC359A	• Pressure is reduced soon after water is splashed on condenser.	Excessive refrigerant charge in refrigeration cycle	Reduce refrigerant until specified pressure is obtained.
	Air suction by cooling fan is insufficient.	Insufficient condenser cooling performance ↓ ① Condenser fins are clogged. ② Improper cooling fan rotation.	• Clean condenser. • Check and repair cooling fan as necessary.
	• Low-pressure pipe is not cold. • When compressor is stopped high-pressure value quickly drops by approximately 196 kPa (2.0 bar, 2 kg/cm^2, 28 psi). It then decreases gradually thereafter.	Poor heat exchange in condenser (After compressor operation stops, high pressure decreases too slowly.) ↓ Air in refrigeration cycle	Evacuate repeatedly and recharge system.
	Engine tends to overheat.	Engine cooling systems malfunction.	Check and repair each engine cooling system.
	• An area of the low-pressure pipe is colder than areas near the evaporator outlet. • Plates are sometimes covered with frost.	• Excessive liquid refrigerant on low-pressure side • Excessive refrigerant discharge flow • Expansion valve is open a little compared with the specification. ↓ ① Improper thermal valve installation ② Improper expansion valve adjustment	Replace expansion valve.

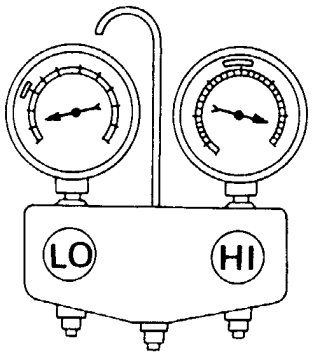
Trouble Diagnoses for Abnormal Pressure (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
High-pressure side is too high and low-pressure side is too low. B  AC360A	Upper side of condenser and high-pressure side are hot, however, liquid tank is not so hot.	High-pressure tube or parts located between compressor and condenser are clogged or crushed.	• Check and repair or replace malfunctioning parts. • Check lubricant for contamination.
High-pressure side is too low and low-pressure side is too high. C  AC356A	High and low-pressure sides become equal soon after compressor operation stops.	Compressor pressure operation is incorrect. ↓ Damage inside compressor packings	Replace compressor.
	No temperature difference between high and low-pressure sides	Compressor operation is incorrect. ↓ Damage inside compressor packings	Replace compressor.
Both high- and low-pressure sides are too low. D  AC353A	• There is a big temperature difference between liquid tank outlet and inlet. Outlet temperature is extremely low. • Liquid tank inlet and expansion valve are frosted.	Liquid tank inside is clogged a little.	• Replace liquid tank. • Check lubricant for contamination.
	• Temperature of expansion valve inlet is extremely low as compared with areas near liquid tank. • Expansion valve inlet may be frosted. • Temperature difference occurs somewhere in high-pressure side	High-pressure pipe located between liquid tank and expansion valve is clogged.	• Check and repair malfunctioning parts. • Check lubricant for contamination.

Trouble Diagnoses for Abnormal Pressure (Cont'd)

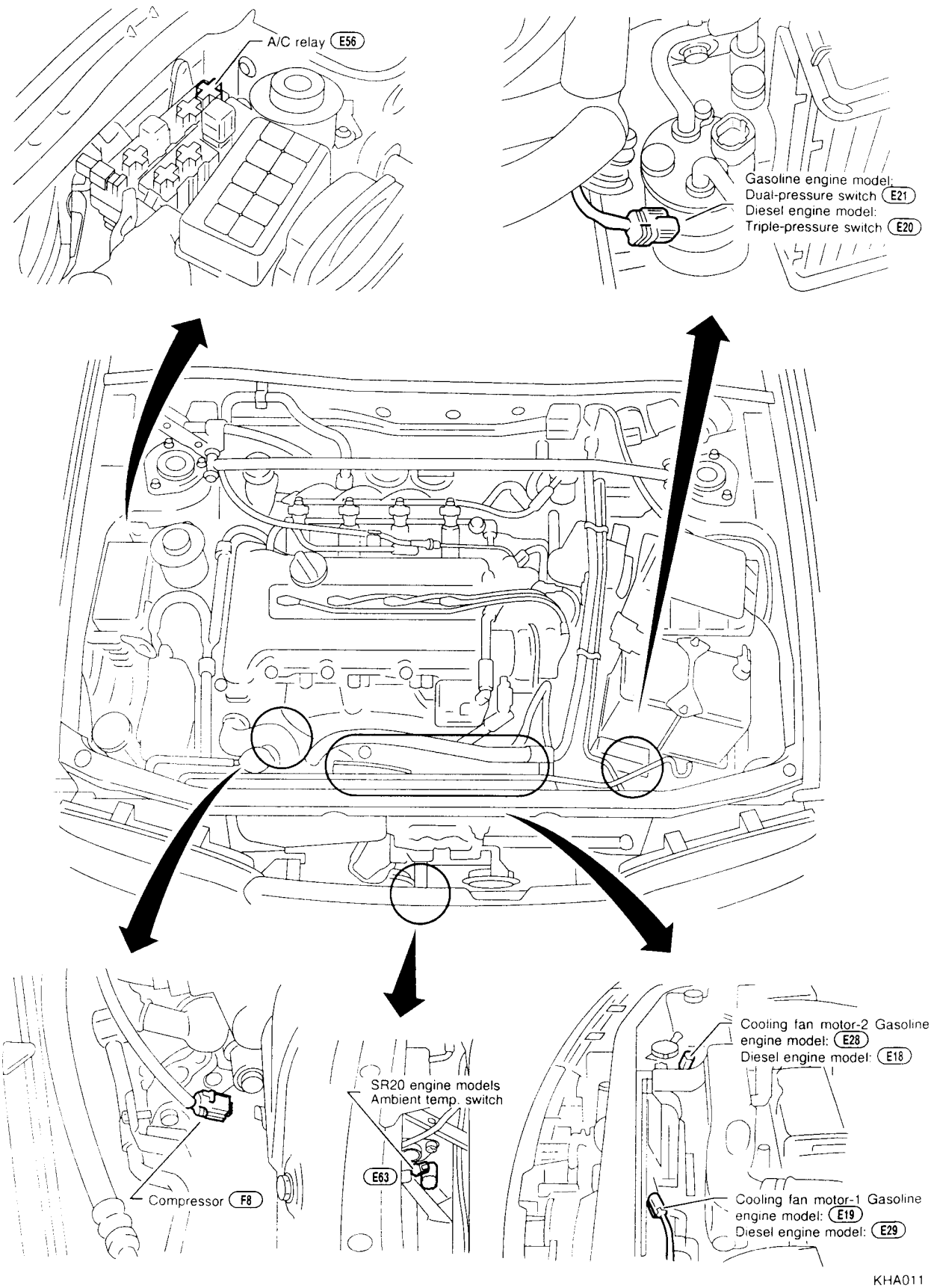
Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high- and low-pressure sides are too low. D  AC353A	There is a big temperature difference between expansion valve inlet and outlet while the valve itself is frosted.	Expansion valve closes a little compared with the specification. ↓ ① Improper expansion valve adjustment ② Malfunctioning thermal valve ③ Outlet and inlet may be clogged.	• Remove foreign particles by using compressed air. • Check lubricant for contamination.
	An area of the low-pressure pipe is colder than areas near the evaporator outlet.	Low-pressure pipe is clogged or crushed.	• Check and repair malfunctioning parts. • Check lubricant for contamination.
	Air flow volume is not enough or is too low.	Compressor operation is incorrect. ↓ Damaged inside compressor packings	Replace compressor.
Low-pressure side sometimes becomes negative. E  AC354A	• Air conditioning system does not function and does not cyclically cool the compartment air. • The system constantly functions for a certain period of time after compressor is stopped and restarted.	Refrigerant does not discharge cyclically. ↓ Moisture is frozen at expansion valve outlet and inlet. ↓ Water is mixed with refrigerant.	• Drain water from refrigerant or replace refrigerant. • Replace liquid tank.

Trouble Diagnoses for Abnormal Pressure (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Low-pressure side becomes negative. F  AC362A	Liquid tank or front/rear side of expansion valve's pipe is frosted or dewed.	High-pressure side is closed and refrigerant does not flow. ↓ Expansion valve or liquid tank is frosted.	Leave the system at rest until no frost is present. Start it again to check whether or not the problem is caused by water or foreign particles. • If water is the cause, initial cooling is okay, then the water freezes causing a blockage. Drain water from refrigerant or replace refrigerant. • If due to foreign particles, remove expansion valve and remove the particles with dry and compressed air (not shop air). • If either of the above methods cannot correct the problem, replace expansion valve. • Replace liquid tank. • Check lubricant for contamination.

Harness Layout

ENGINE COMPARTMENT

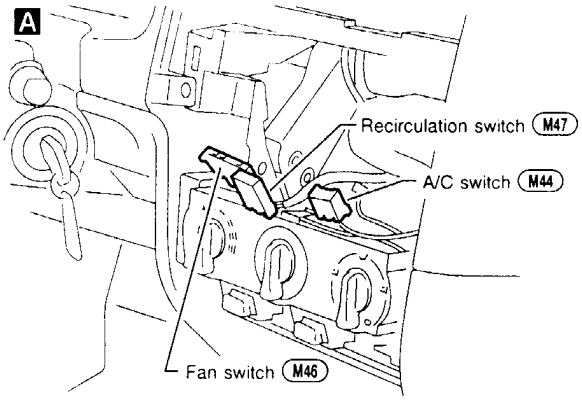


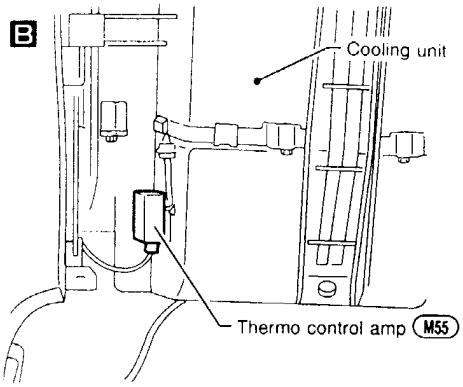
KHA011

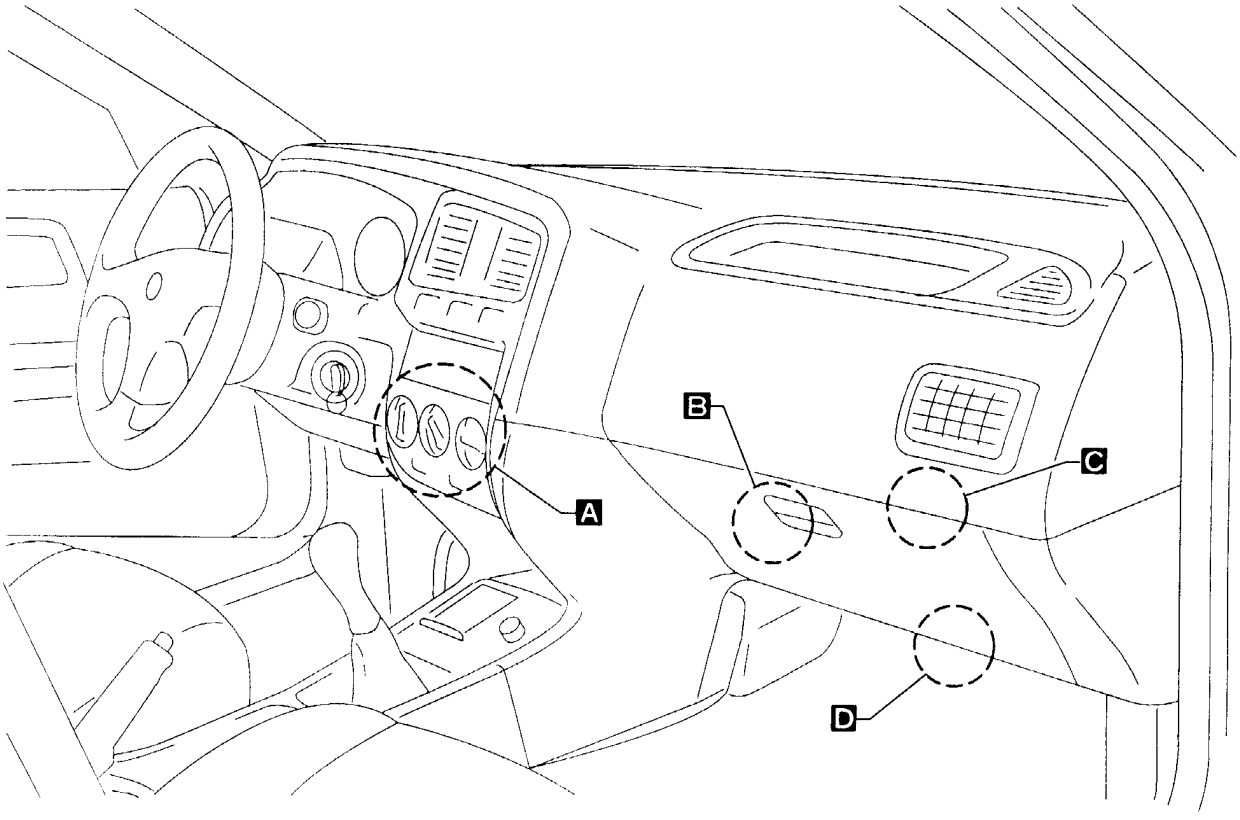
Harness Layout (Cont'd)

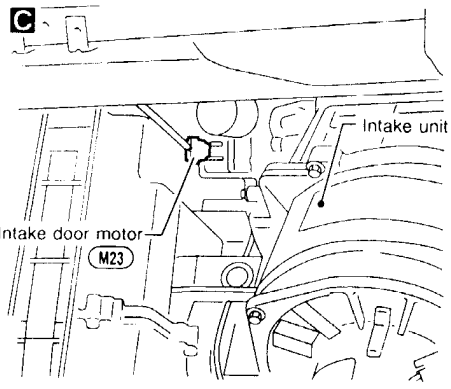
PASSENGER COMPARTMENT

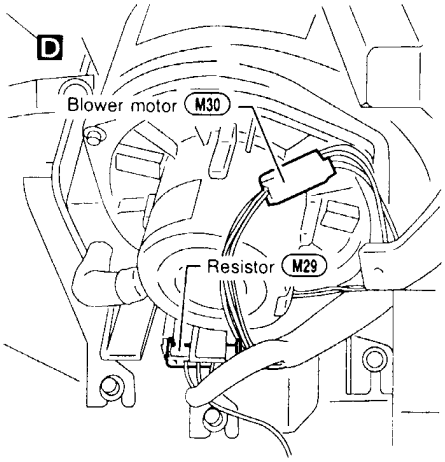
LHD models







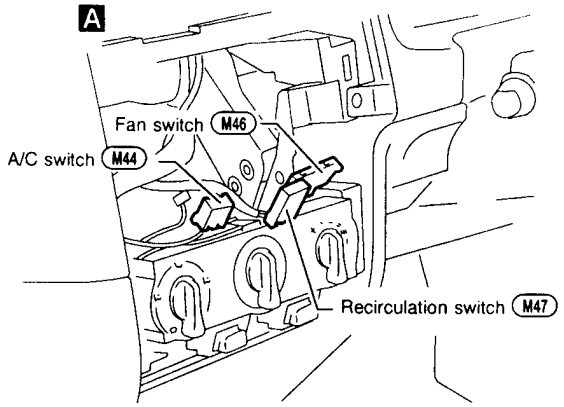


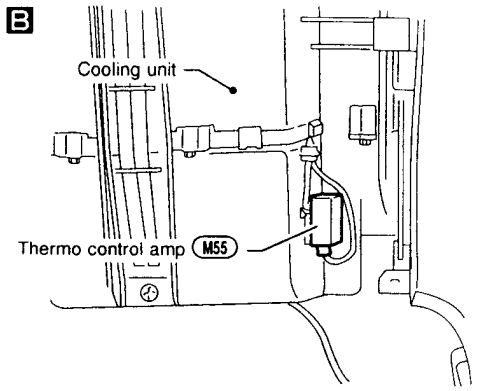


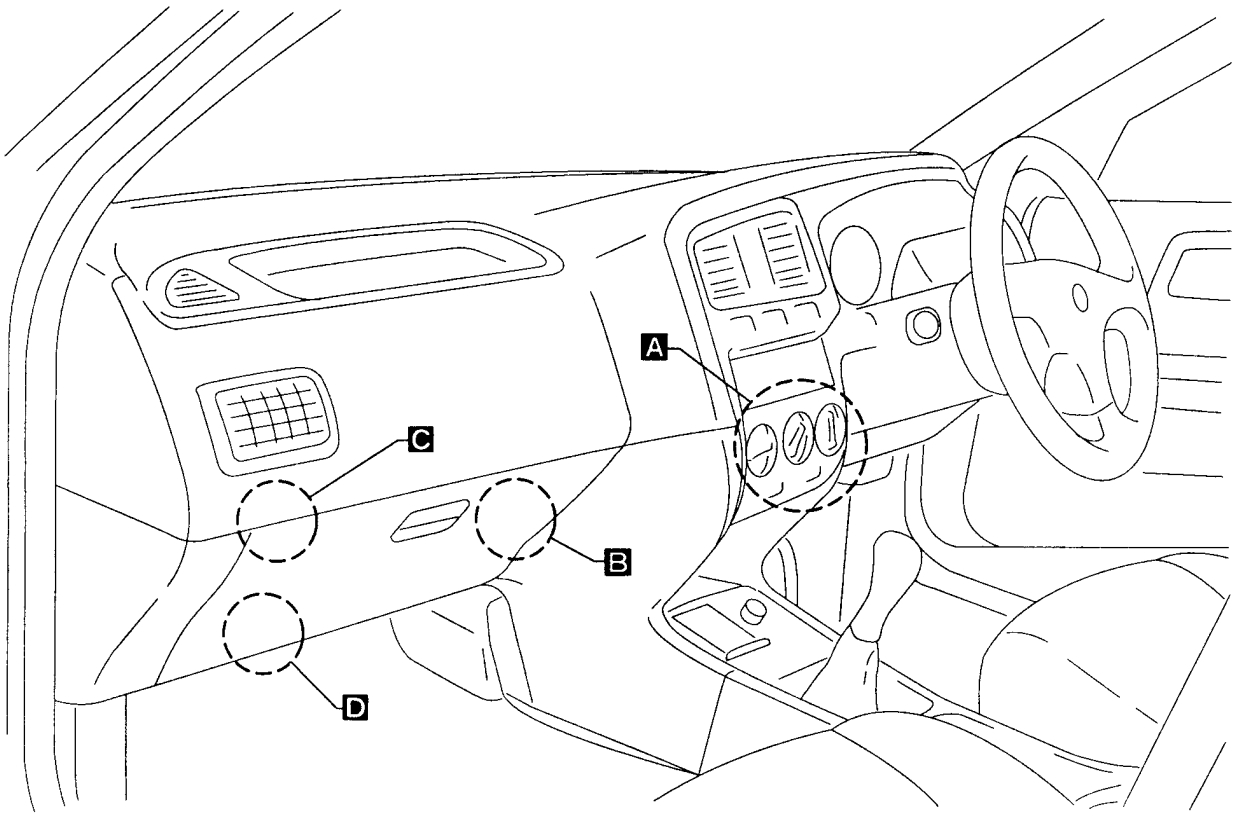
KHA012

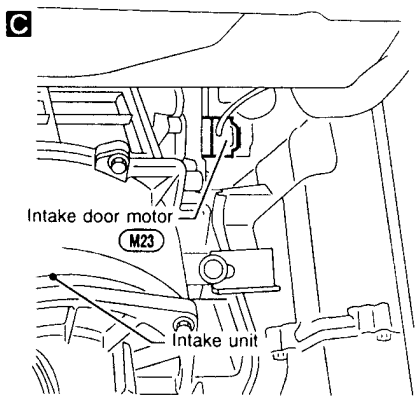
Harness Layout (Cont'd)

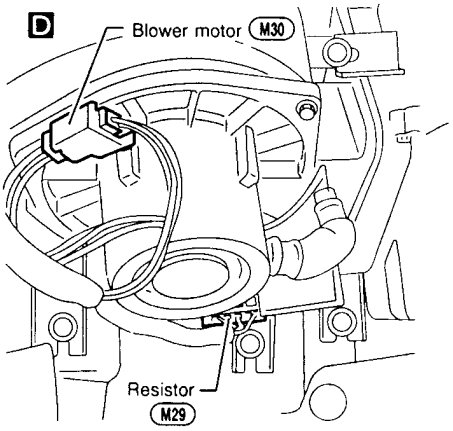
RHD models





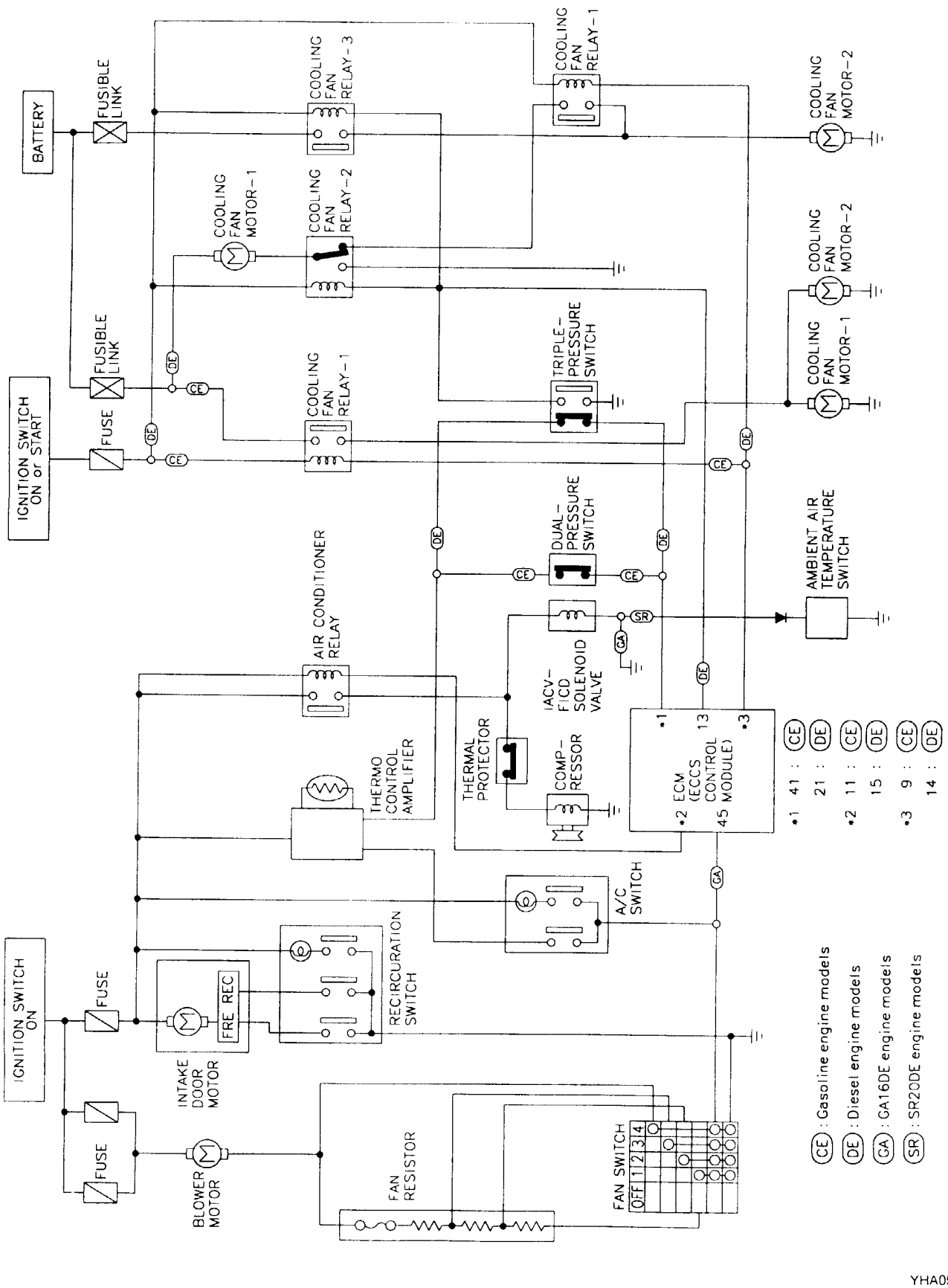






KHA013

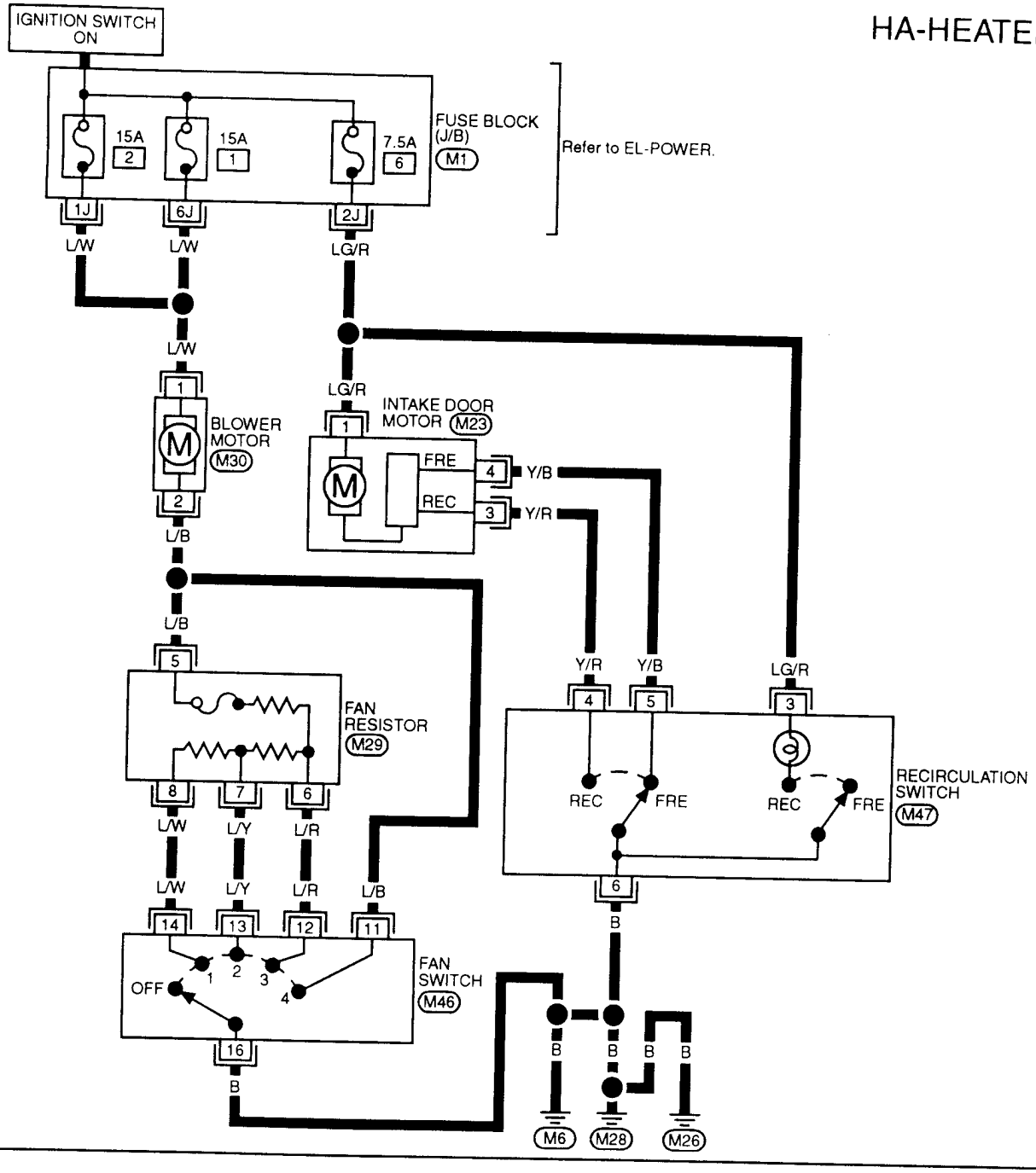
Circuit Diagram — Air Conditioner

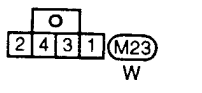


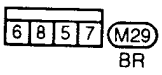
YHA050

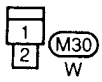
Wiring Diagram — HEATER —

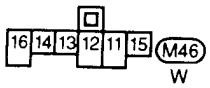
HA-HEATER-01

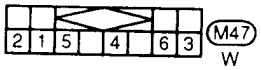










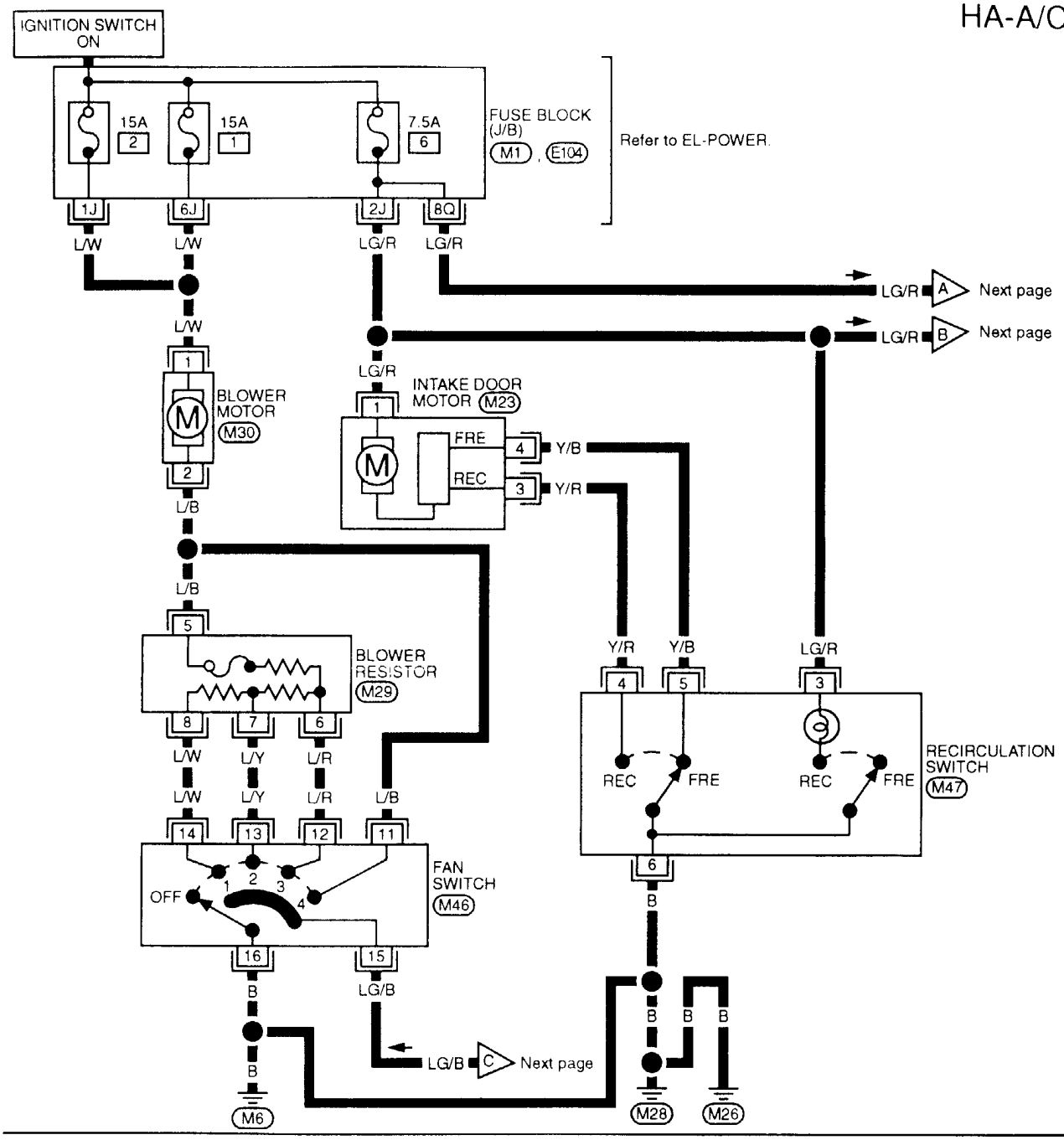


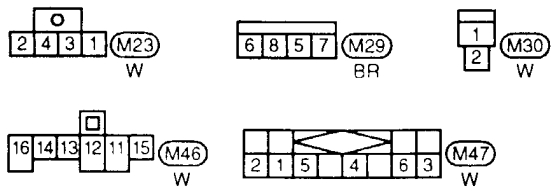
Refer to last page (Foldout page).
M1

YHA044

Wiring Diagram — A/C —

HA-A/C-01





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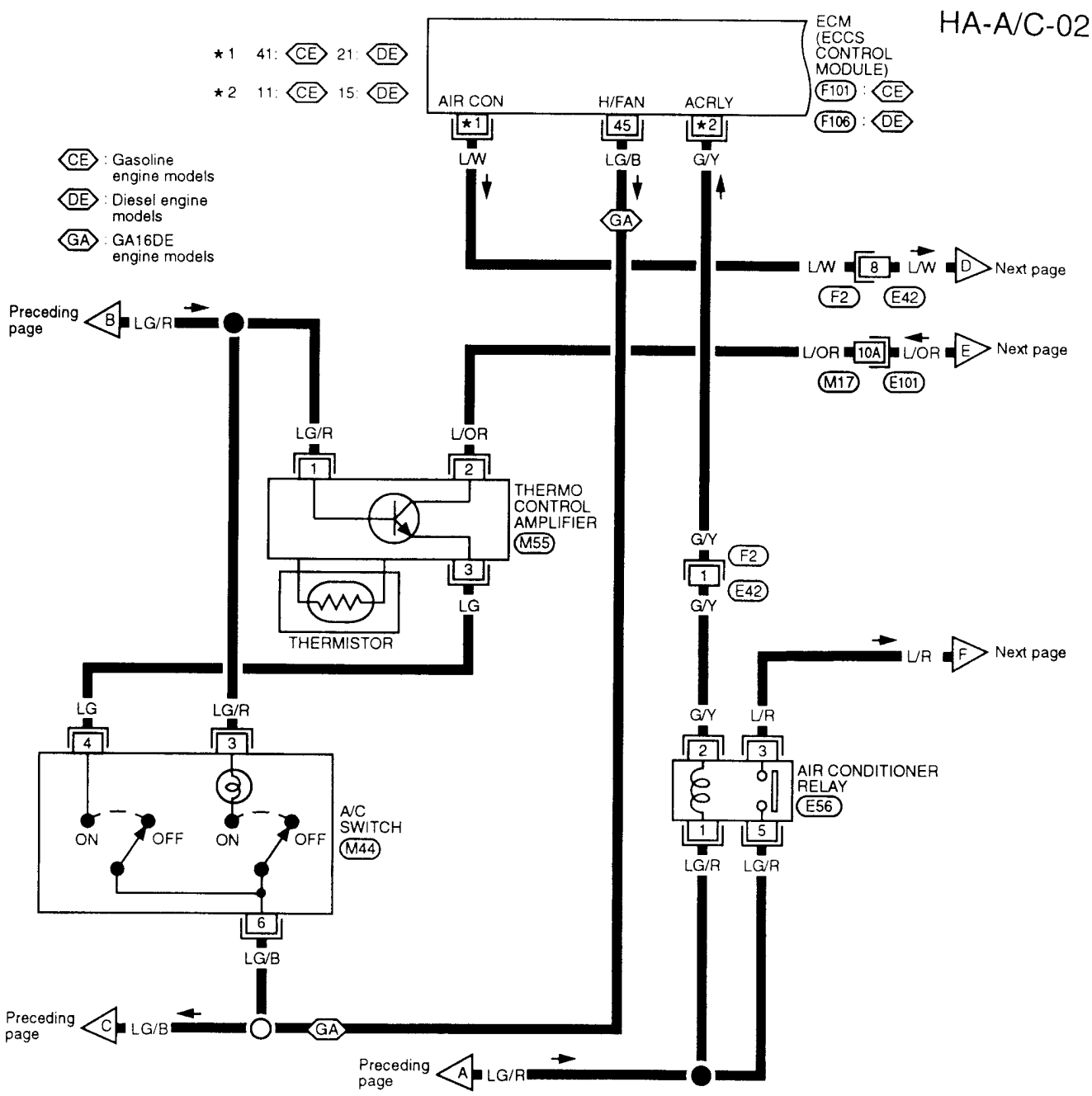
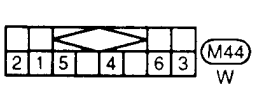
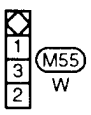
M1
E104

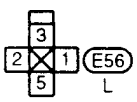
YHA045

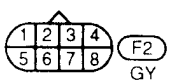
Wiring Diagram — A/C — (Cont'd)











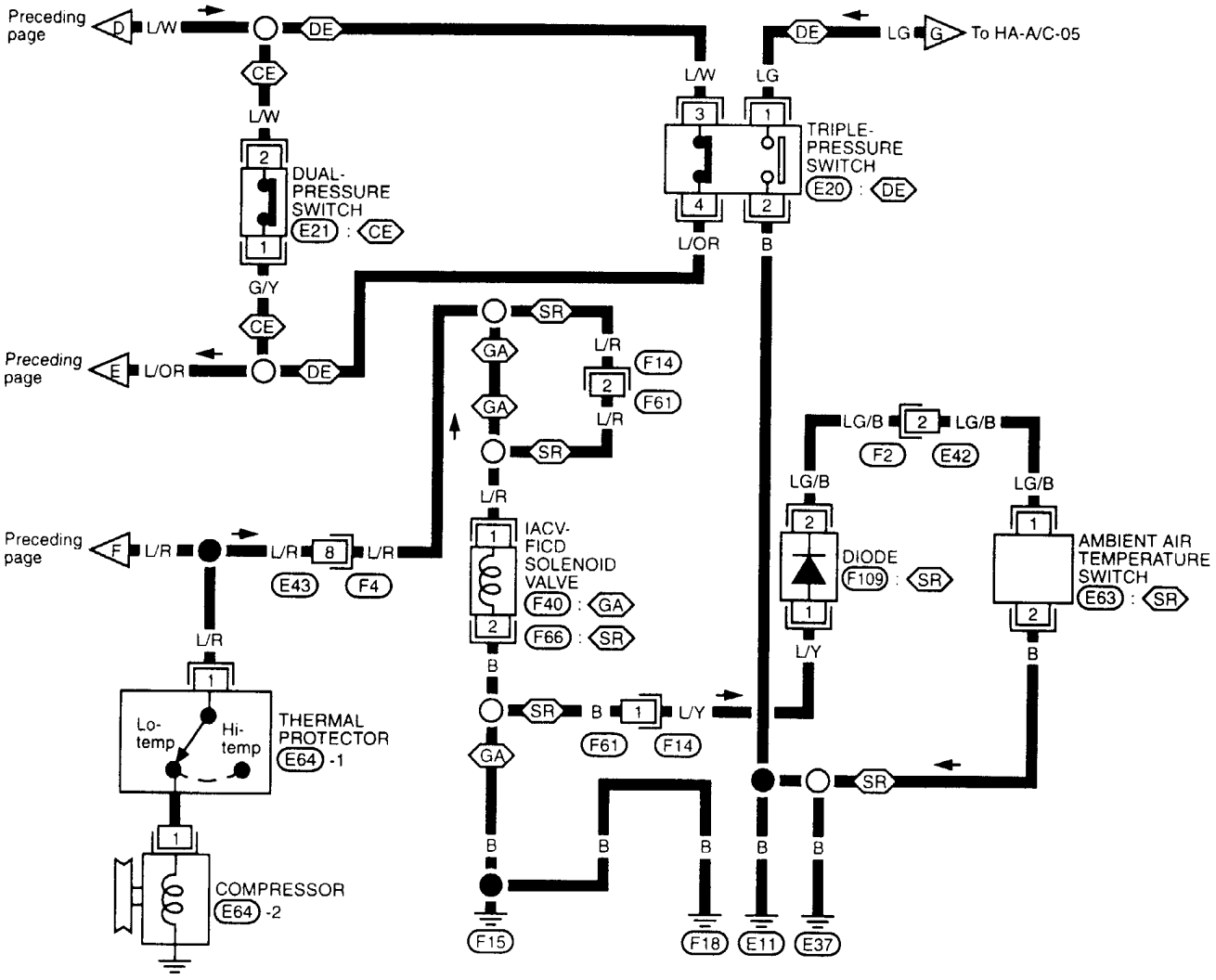
Refer to last page (Foldout page).
M17 , E101
F101
F106

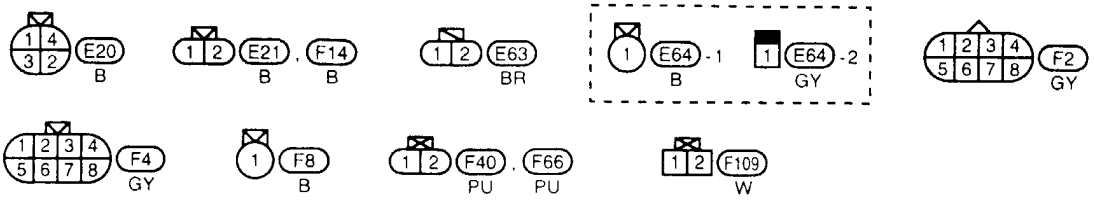
YHA046

Wiring Diagram — A/C — (Cont'd)

HA-A/C-03

CE : Gasoline engine models
DE : Diesel engine models
SR : SR20DE engine models
GA : GA16DE engine models

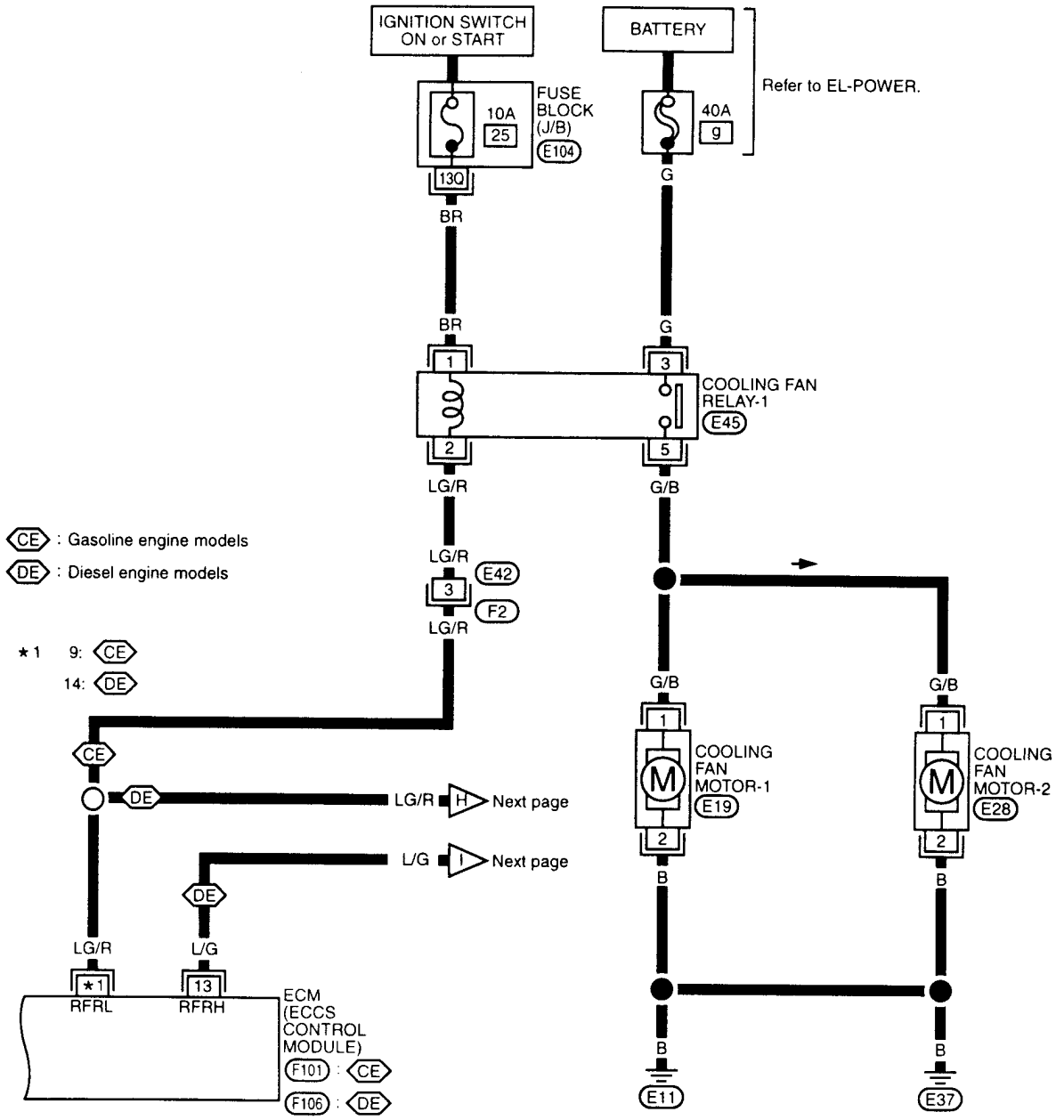


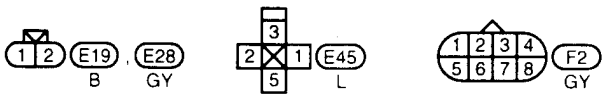


YHA047

Wiring Diagram — A/C — (Cont'd)

HA-A/C-04





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E104

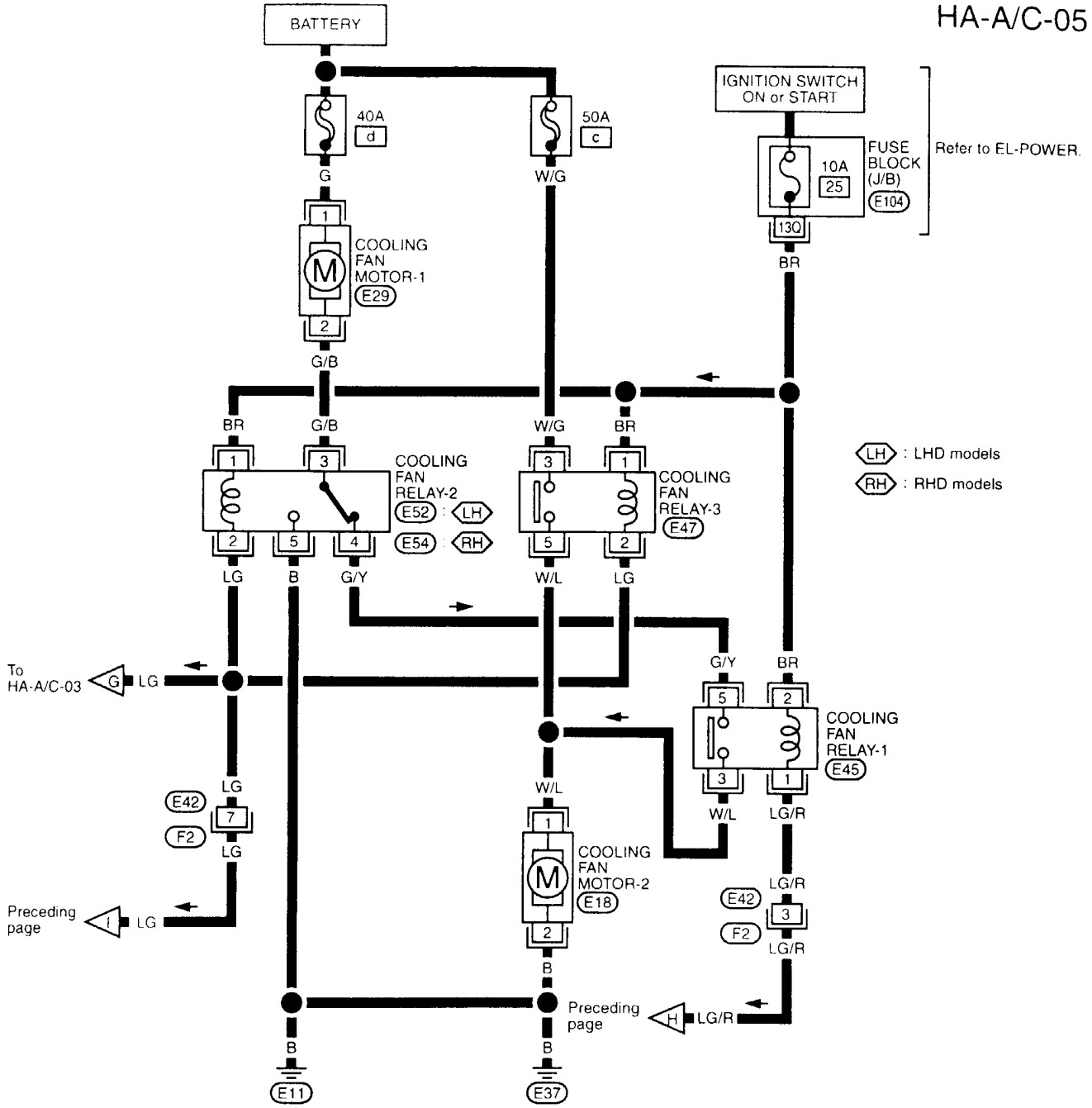
F101

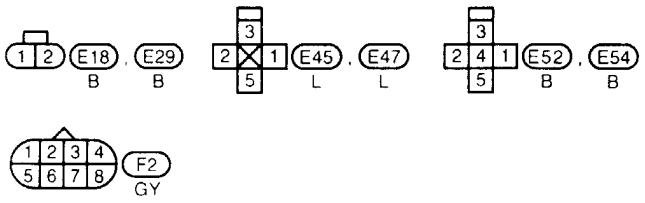
F106

YHA048

Wiring Diagram — A/C — (Cont'd)

HA-A/C-05





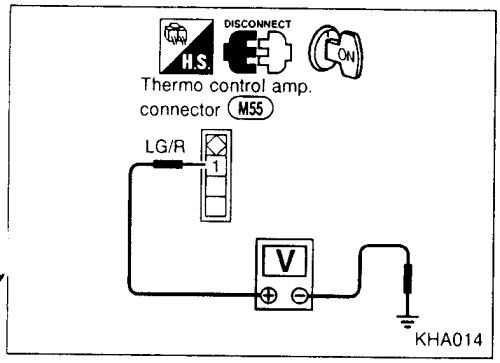
Refer to last page (Foldout page).
E104

YHA049

Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.
Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.



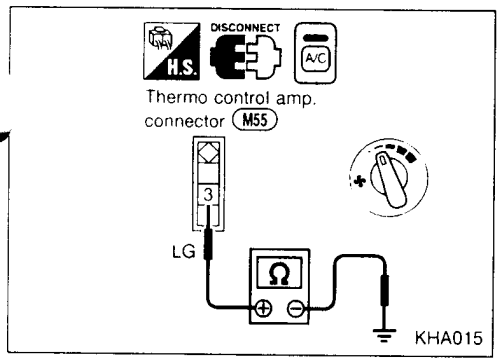
THERMO CONTROL AMP. CHECK

Check power supply circuit for thermo control amp. with ignition switch ON.

1. Disconnect thermo control amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ① and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
①	Body ground	Approx. 12V

If NG, replace 7.5A fuse or repair harness and connectors.



Turn A/C and fan switches ON. Check body ground circuit for thermo control amp.

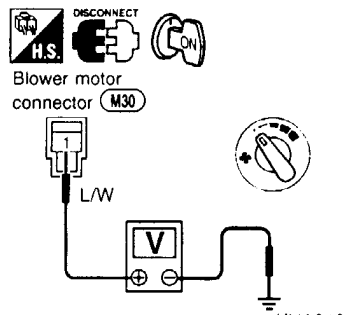
1. Disconnect thermo control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between Thermo control amp connector terminal No. ③ and body ground.

Ohmmeter terminal		Continuity
⊕	⊖	
③	Body ground	Yes

If NG, replace thermo control amp.

	INCIDENT	Flow chart No.
1	Fan fails to rotate.	1
2	Fan does not rotate at 1-speed.	2
3	Fan does not rotate at 2-speed.	3
4	Fan does not rotate at 3-speed.	4
5	Fan does not rotate at 4-speed.	5

A



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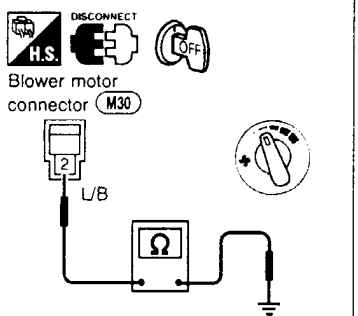

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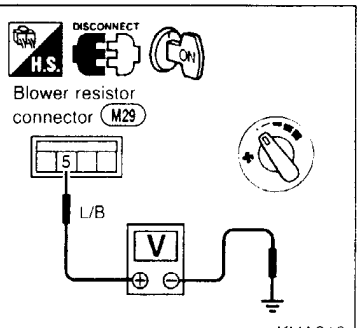

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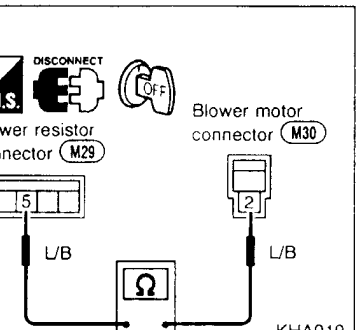


Diagnostic Procedure 1

SYMPTOM: Blower motor does not rotate.

- **Perform PRELIMINARY CHECK 1 before referring to the following flow chart.**

5

Check if blower motor rotates properly at each fan speed.
Conduct checks as per flow chart at left.

4 → Ⓔ
3 → Ⓓ
2 → Ⓒ
→ Ⓑ (Go to next page.)

A

1

CHECK POWER SUPPLY FOR BLOWER MOTOR.
Disconnect blower motor harness connector.
- Turn ignition switch and Fan switch "ON".

Do approx. 12 volts exist between blower motor harness connector terminal No. ① and body ground?

No → Check 15A (No. 1 and No. 2) fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.) If NG, replace 15A fuse

Yes

B

Turn ignition switch "OFF"
Check circuit continuity between blower motor harness connector terminal No. ② and body ground.
With fan switch "ON" continuity should exist.

NG → Reconnect blower motor harness connector.

OK

CHECK BLOWER MOTOR.
(Refer to Electrical Components Inspection.) (HA-50)

NG

Replace blower motor.

C

CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.
- Turn ignition switch "ON".
- Disconnect fan resistor harness connector.

Do approx. 12 volts exist between blower resistor harness connector terminal No. ⑤ and body ground?

No → • Turn ignition switch "OFF". Disconnect blower motor harness connector.

Yes

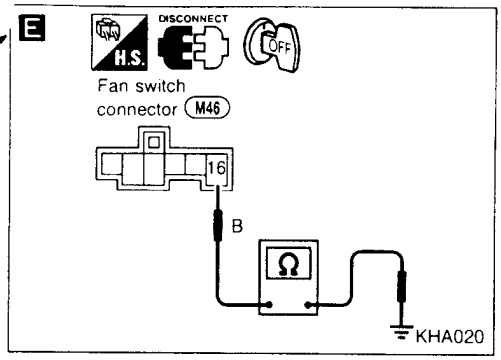
D

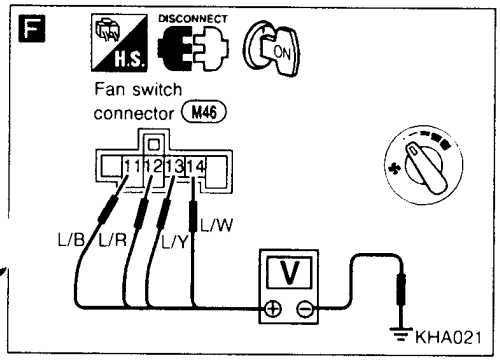
Note: Check circuit continuity between blower motor harness connector terminal No. ② and fan resistor harness connector terminal No. ⑤.
Continuity should exist.
If OK, check harness for short-circuit.

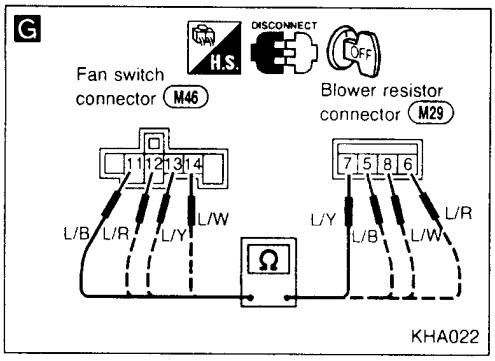
Ⓐ (Go to next page.)

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)







Ⓐ

E

Note
- Turn ignition switch "OFF".
- Disconnect fan switch connector.

Check circuit continuity between fan switch harness connector terminal No. ⑯ and body ground.
Continuity should exist

OK

CHECK BLOWER RESISTOR AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.) (HA-50)

2 → Ⓑ
3 → Ⓒ
4 → Ⓓ

OK

NG → Replace Blower resistor.

Ⓔ

Reconnect Blower resistor harness connector.

1 2 3 4 5

F

CHECK FAN SWITCH CIRCUIT.
- Turn ignition switch "ON".

Do approx. 12 volts exist between each fan switch harness connector terminal and body ground?

Flow chart No.	Terminal No. (+)	Terminal No. (−)	Voltage
2	⑭	Body ground	Approx. 12V
3	⑬		
4	⑫		
5	⑪		

Yes

No

G

Note
- Turn ignition switch "OFF".
- Disconnect fan resistor harness connector.

Check circuit continuity between each fan switch harness connector terminal and fan resistor harness connector terminal:

Terminal No.		Continuity
Fan switch	Resistor	
⑪	⑤	Yes
⑫	⑥	
⑬	⑦	
⑭	⑧	

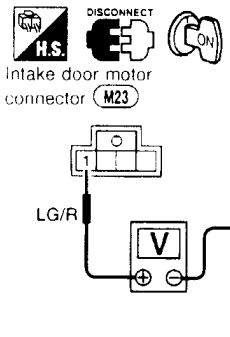
If OK, check harness for short circuit

CHECK FAN SWITCH AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.) (HA-50)

NG → Replace fan switch.

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

A



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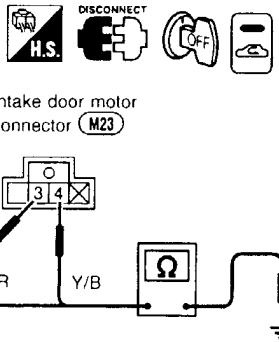

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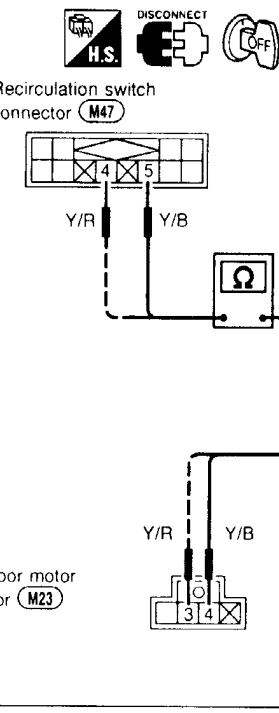


Diagnostic Procedure 2

SYMPTOM: Intake door does not change.

A

CHECK POWER SUPPLY FOR INTAKE DOOR MOTOR.
Disconnect intake door motor harness connector.
- Turn ignition switch "ON".

Do approx. 12 volts exist between intake door motor harness connector terminal No. ① and body ground?

No → Check 7.5A (No. 6) fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.) If NG, replace fuse.

Yes ↓

B

CHECK BODY GROUND CIRCUIT FOR INTAKE DOOR MOTOR.
- Turn ignition switch OFF.
- Turn recirculation switch ON.

Does continuity exist between intake door motor harness connector terminal ③ and body ground?
- Turn recirculation switch OFF.

Does continuity exist between intake door motor harness connector terminal ④ and body ground?

No → Disconnect recirculation switch harness connector.

C

Note: Check continuity between recirculation switch harness connector terminals ④ and ⑤ and intake door motor harness terminals ③ and ④ respectively.
Continuity should exist.
If OK, check harness for short circuit.

OK ↓

Ⓐ (Go to next page.)

Yes ↓

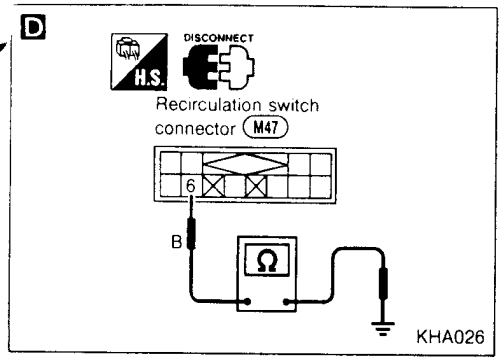
CHECK INTAKE DOOR LINKAGE.
Refer to Control Linkage Adjustment. (HA-52)

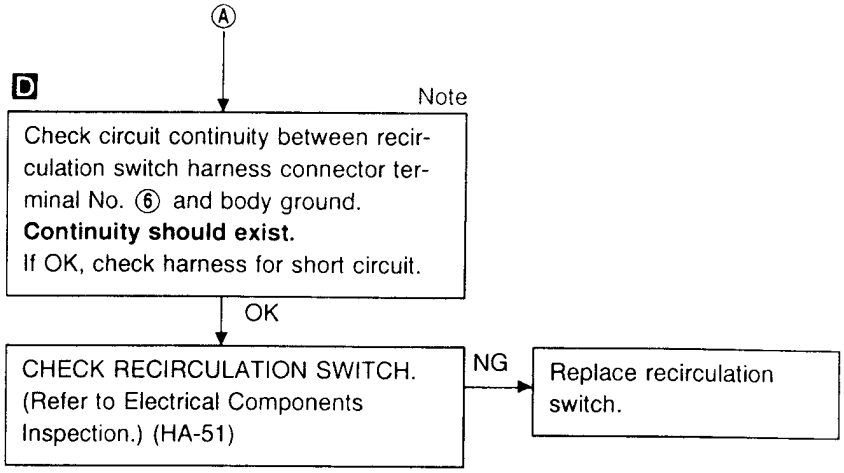
OK ↓

Replace intake door motor.

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

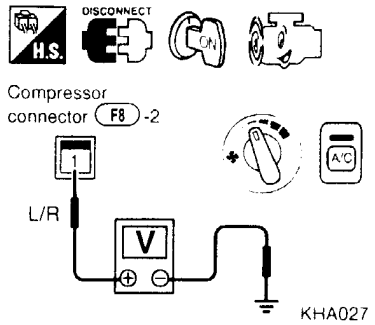
Diagnostic Procedure 2 (Cont'd)





Note:
If the result is NG after checking circuit continuity, repair harness or connector.

A



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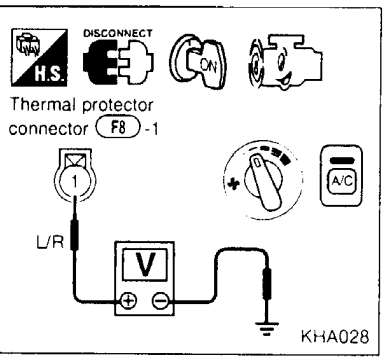

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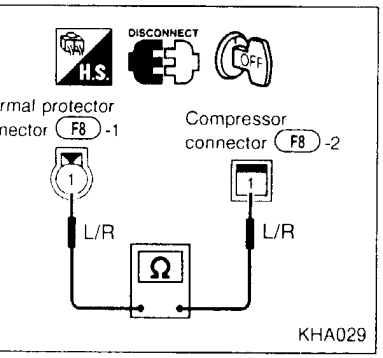

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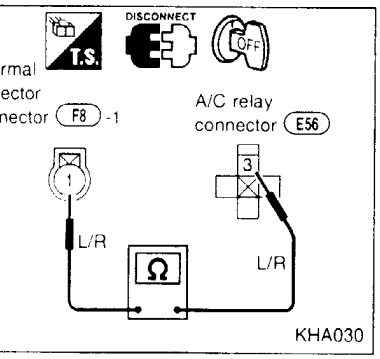
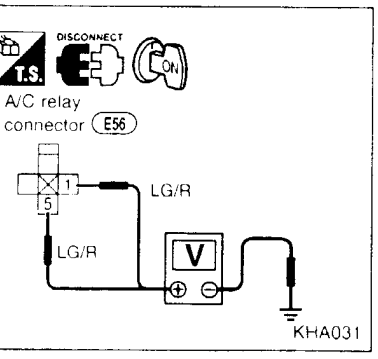


E



Diagnostic Procedure 3

SYMPTOM: Magnet clutch does not engage when A/C switch and fan switch are ON.

- **Perform PRELIMINARY CHECK 1 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR COMPRESSOR.
- Disconnect compressor harness connector.
- Turn ignition switch "ON" and run engine.
- Turn A/C switch and fan switch "ON".

Do approx. 12 volts exist between compressor harness connector terminal ① and body ground?

Yes → Check magnet clutch coil.

NG → Replace magnet clutch. Refer to HA-65.

No ↓

B

CHECK POWER SUPPLY FOR THERMAL PROTECTOR.
Disconnect thermal protector harness connector.
Do approx. 12V exist between thermal protector harness terminal ① and body ground?

Yes → **C**

CHECK THERMAL PROTECTOR.
- Turn ignition switch "OFF".

Check circuit continuity between thermal protector harness connector terminal ① and compressor harness terminal ①.
Continuity should exist.
If OK, check harness for short circuit.

NG → Replace thermal protector.

No ↓

Disconnect A/C relay.

D

Note
- Turn ignition switch "OFF".

CHECK CIRCUIT CONTINUITY BETWEEN A/C RELAY HARNESS CONNECTOR TERMINAL ③ AND THERMAL PROTECTOR HARNESS CONNECTOR TERMINAL ①.
Continuity should exist.
If OK, check harness for short circuit.
If NG, check harness connectors E42 and F2

OK ↓

E

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
- Turn ignition switch "ON".

Do approx. 12 volts exist between A/C relay harness terminals ①, ⑤ and body ground?

No → CHECK POWER SUPPLY CIRCUIT AND 7.5A (No. 6) FUSES AT FUSE BLOCK.
Refer to EL section ("Wiring Diagram", "POWER SUPPLY ROUTING").
If NG, replace 7.5A fuse.

Yes ↓

CHECK A/C RELAY AFTER DISCONNECTING IT.
Refer to HA-51.

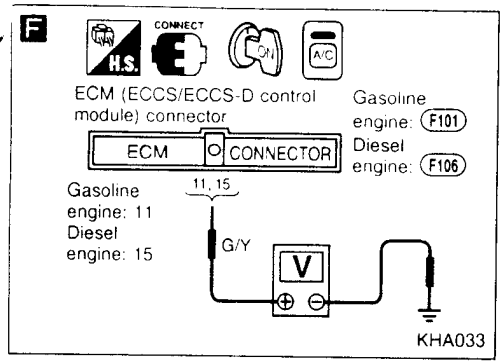
NG → Replace A/C relay.

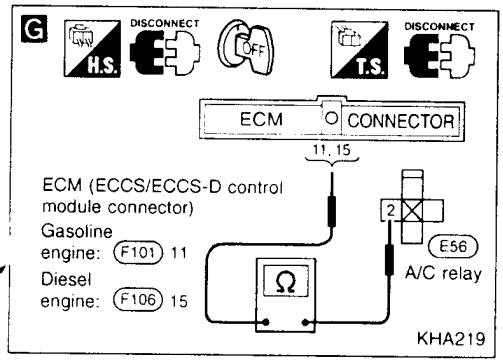
OK ↓

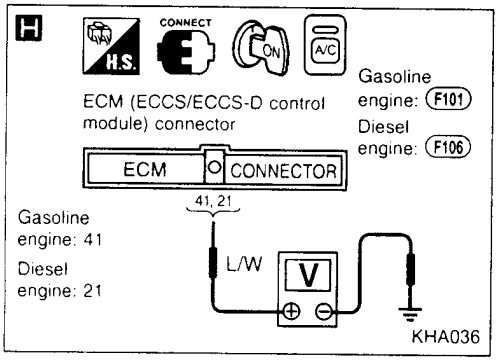
Ⓐ

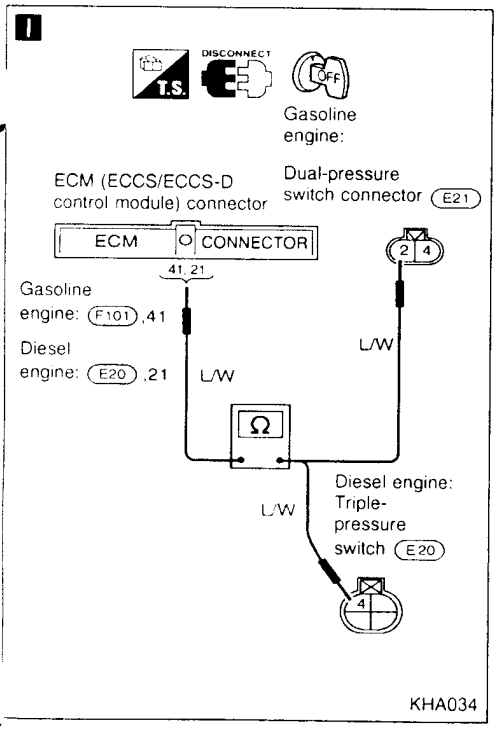
Note:
If the result is NG after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 3 (Cont'd)









Ⓐ

Reconnect A/C relay.

F

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between ECM (ECCS/ECCS-D control module) harness connector terminal ⑪ or ⑮ and body ground?

No → • Turn ignition switch "OFF". Disconnect A/C relay. Disconnect ECM (ECCS/ECCS-D control module) harness connector.

Yes

G

Note

CHECK CIRCUIT CONTINUITY BETWEEN A/C RELAY HARNESS TERMINAL ② AND ECM (ECCS/ECCS-D CONTROL MODULE) HARNESS TERMINAL ⑪ or ⑮.

Continuity should exist.

If OK, check harness for short circuit.
If NG, check connectors E42 and F2.

H

• Turn A/C switch "OFF".
CHECK VOLTAGE FOR ECM (ECCS/ECCS-D control module).
Do approx. 12 volts exist between ECM (ECCS/ECCS-D control module) harness connector terminals ㊶, or ㉑ and body ground?

No → CHECK ECM (ECCS/ECCS-D control module). Refer to EC section.

Yes

Disconnect ECM (ECCS/ECCS-D control module) harness connector.
Disconnect dual-pressure/triple-pressure switch harness connector.

I

Note

CHECK CIRCUIT CONTINUITY BETWEEN ECM (ECCS/ECCS-D CONTROL MODULE) HARNESS TERMINAL ㊶ or ㉑ AND DUAL/TRIPLE-PRESSURE SWITCH HARNESS TERMINAL ② or ③.

Continuity should exist.

If OK, check harness for short-circuit.
If NG, check harness connectors E42, F2

OK

CHECK DUAL/TRIPLE-PRESSURE SWITCH. Refer to HA-51,52.

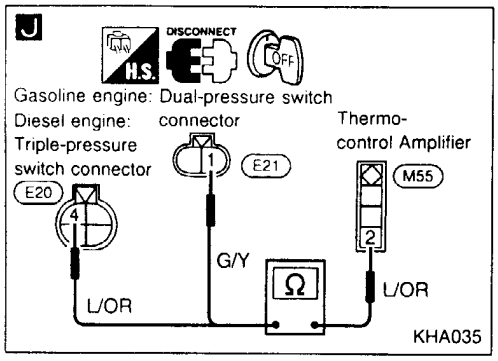
NG → Replace dual/triple-pressure switch.

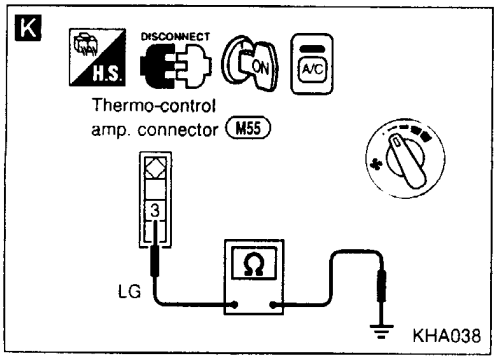
OK

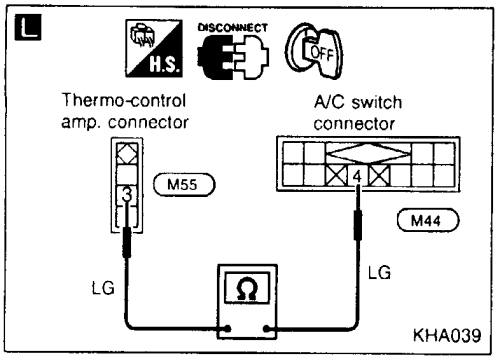
Disconnect thermo control amp. harness connector.

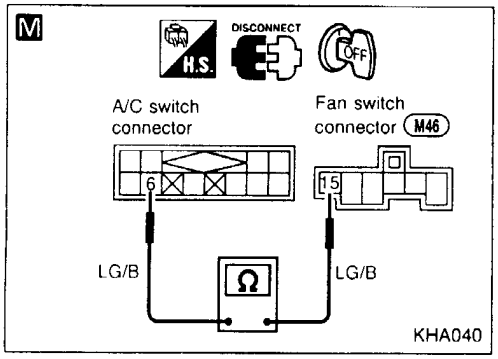
Ⓑ

Diagnostic Procedure 3 (Cont'd)









Ⓑ

J Note

CHECK CIRCUIT CONTINUITY BETWEEN DUAL-PRESSURE SWITCH CONNECTOR TERMINAL ① (GASOLINE ENGINES) / TRIPLE-PRESSURE SWITCH CONNECTOR TERMINAL ④ (Diesel engines) and THERMO-CONTROL AMP. HARNESS CONNECTOR TERMINAL .

Continuity should exist.

If OK, check harness for short-circuit.

If NG check harness connectors (M17) and (E101)

OK ↓

Reconnect thermo-control amp. harness connector.

Note

CHECK POWER SUPPLY FOR THERMO-CONTROL AMP.
Refer to HA-41.

K

CHECK BODY GROUND CIRCUIT FOR THERMO CONTROL AMP.
- Turn ignition switch "OFF".
- Disconnect thermo-control amp. harness connector.
- Turn A/C switch "ON"
- Turn fan switch "ON"

Does continuity exist between thermo-control amp. harness connector terminal ③ and body ground?

Yes → Replace thermo-control amp.

No ↓

Disconnect A/C switch harness connector.

L Note

CHECK CIRCUIT CONTINUITY BETWEEN THERMO-CONTROL AMP. HARNESS CONNECTOR TERMINAL ③ AND A/C SWITCH HARNESS CONNECTOR TERMINAL ④.

Continuity should exist.

If OK, check harness for short-circuit.

OK ↓

CHECK A/C SWITCH.
Refer to HA-50.

NG → Replace A/C switch.

OK ↓

Disconnect fan switch harness connector.

M Note

CHECK CIRCUIT CONTINUITY BETWEEN A/C SWITCH HARNESS CONNECTOR TERMINAL ⑥ AND FAN SWITCH HARNESS CONNECTOR TERMINAL ⑮.

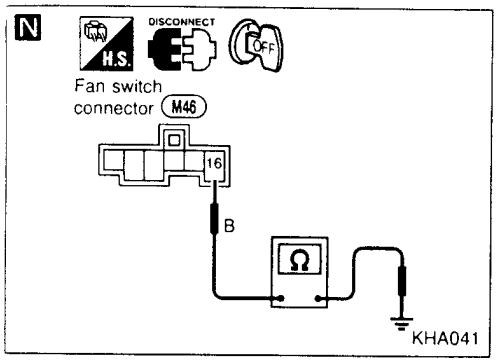
Continuity should exist.

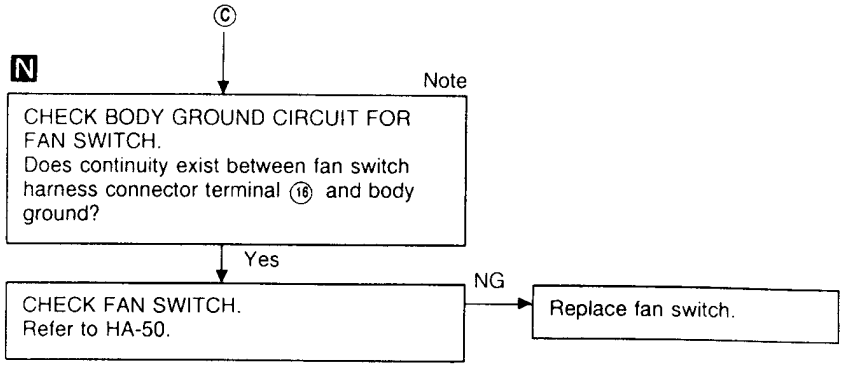
OK ↓

Ⓒ

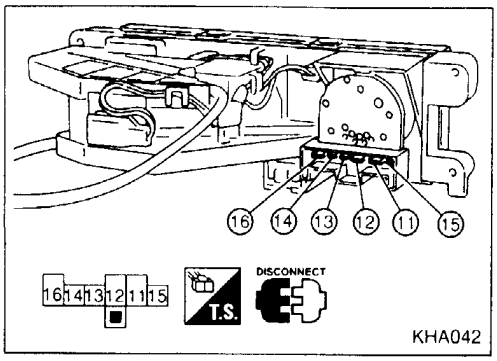
Note:
If the result is NG or No after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 3 (Cont'd)





Note:
If the result is No after checking circuit continuity, repair harness or connector.

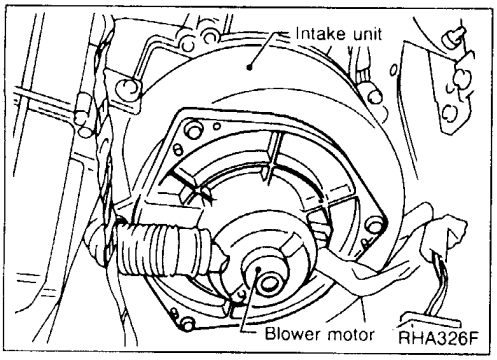


Electrical Components Inspection

FAN SWITCH

Check continuity between component terminals at each switch position.

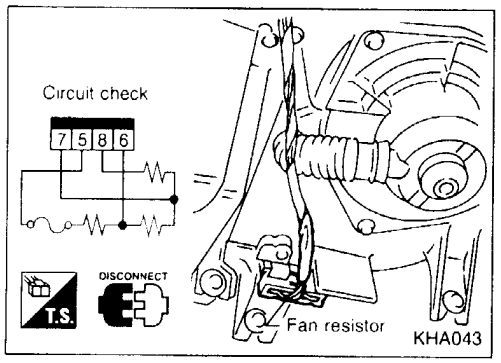
LEVER POSITION	Continuity between terminals
OFF	
1	⑭ — ⑯ — ⑮
2	⑬ — ⑯ — ⑮
3	⑫ — ⑯ — ⑮
4	⑪ — ⑯ — ⑮



BLOWER MOTOR

Confirm smooth rotation of the blower motor.

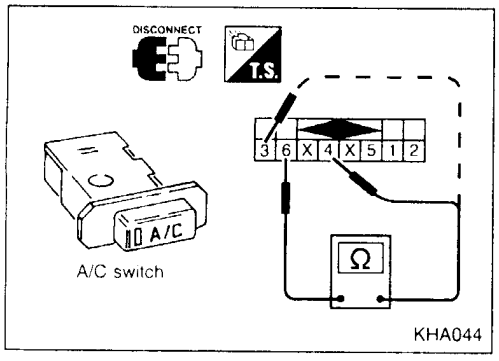
- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check resistance between component terminals.

Terminal No.		Resistance
⊕	⊖	
⑧	⑤	Approx. 2.5 - 2.8Ω
⑦		Approx. 1.4 - 1.6Ω
⑥		Approx. 0.5 - 0.6Ω

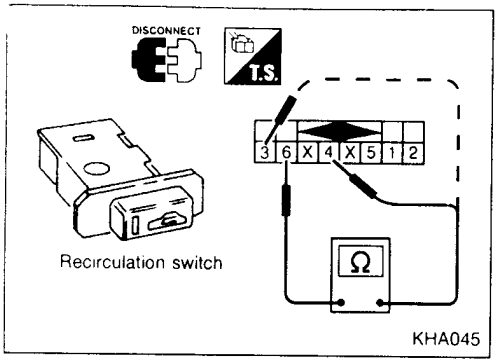


A/C SWITCH

Check continuity between terminals at each switch position.

Switch condition	Terminal No.		Continuity
A/C	⊕	⊖	
ON	③	⑥	Yes
OFF			No
ON	④	⑥	Yes
OFF			No

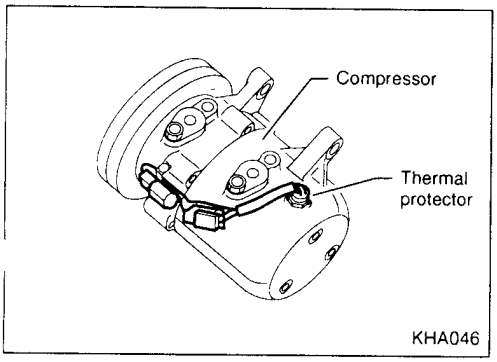
Electrical Components Inspection (Cont'd)



RECIRCULATION SWITCH

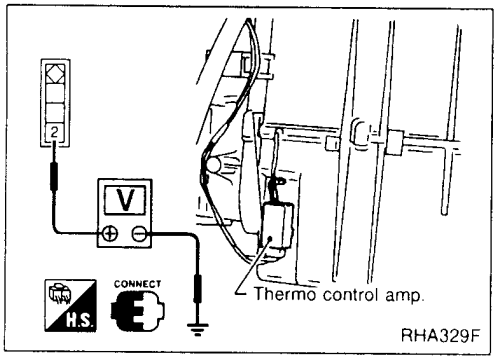
Check continuity between terminals at each switch position.

Terminal No.		Recirculation switch condition	Continuity
⊕	⊖		
③	⑥	ON	Yes
		OFF	No
④	⑥	ON	Yes
		OFF	No



THERMAL PROTECTOR

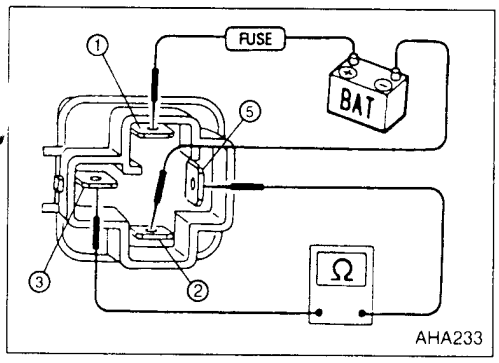
Temperature of compressor °C (°F)	Compressor operation
Increasing to approx. 145 - 155 (293 - 311)	Turn OFF
Decreasing to approx. 130 - 140 (266 - 284)	Turn ON



THERMO CONTROL AMP.

1. Run engine, and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

Evaporator outlet air temperature °C (°F)	Thermo amp. operation	Tester
Decreasing to 2.5 - 3.5 (37 - 38)	Turn OFF	Approx. 12V
Increasing to 4.0 - 5.0 (39 - 41)	Turn ON	Approx. 0V

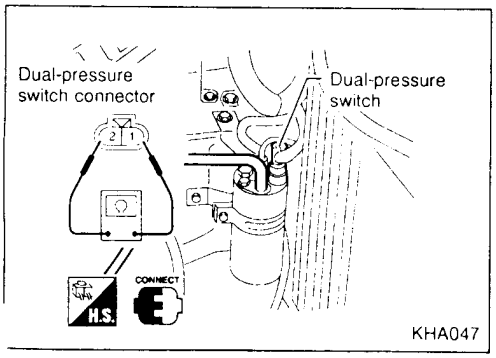


A/C RELAY

Check continuity between A/C relay terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between A/C relay (coil side) terminals ① and ②	Yes
No current supply	No

If NG, replace relay.

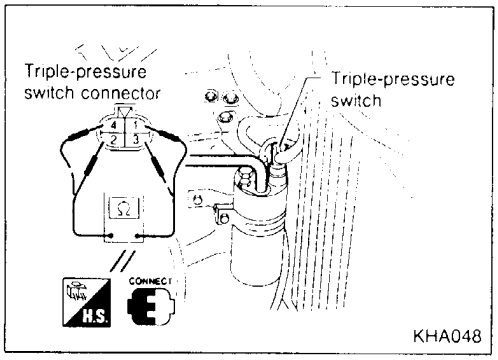


DUAL-PRESSURE SWITCH

	ON kg/cm² (kPa, psi)	OFF kg/cm² (kPa, psi)
Low-pressure side	Increasing to 1.6 - 2.2 (157 - 216, 23 - 31)	Decreasing to 1.5 - 2.1 (147 - 206, 21 - 30)
High-pressure side	Decreasing to 14 - 18 (1373 - 1765, 199 - 256)	Increasing to 27 - 29 (2648 - 2844, 384 - 412)

Electrical Components Inspection (Cont'd)

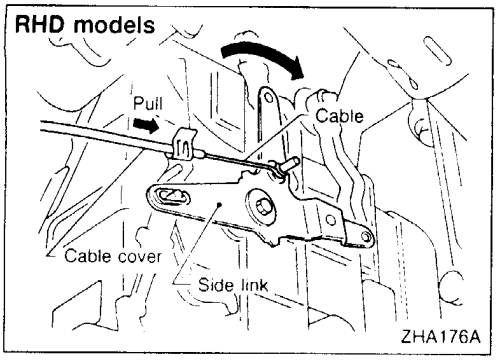
TRIPLE-PRESSURE SWITCH

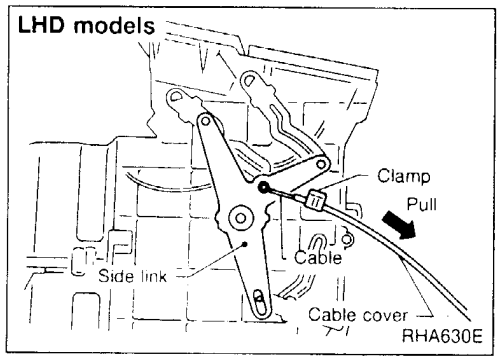


Connector terminal no's:	ON kg/cm² (kPa, psi)	OFF kg/cm² (kPa, psi)
Low-pressure side ③ - ④	Increasing to 1.6 - 2.3 (157 - 226, 23 - 33)	Decreasing to 1.55 - 2.05 (152.0 - 201.0, 22.0 - 29.2)
Middle-pressure ① - ② (For fan motor operation)	Increasing to 15 - 17 (1471 - 1669, 213 - 242)	Decreasing to 12 - 14 (1177 - 1373, 171 - 199)
High-pressure side ③ - ④	Decreasing to 19 - 25 (1863 - 2452, 270 - 356)	Increasing to 27 - 29 (2648 - 2844, 384 - 412)

Control Linkage Adjustment

MODE CONTROL CABLE

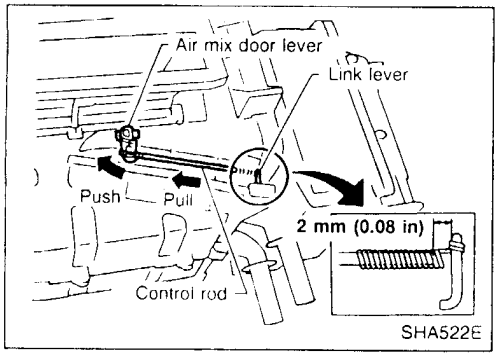




1. For RHD models, turn the mode control knob to the VENT position.
   For LHD models, turn the mode control knob to the DEF position.
2. For RHD models, set the side link in the VENT position by hand.
   For LHD models, set the side link in the DEF position by hand.
3. Pull on the cable cover in the direction of the arrow, then clamp it.

After positioning control cable, check that it operates correctly.

WATER COCK CONTROL ROD



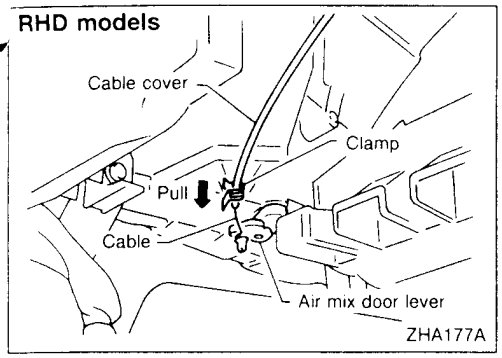
- **When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever and then adjust control rod. Reconnect temperature control cable and readjust it. (Refer to TEMPERATURE CONTROL CABLE.)**

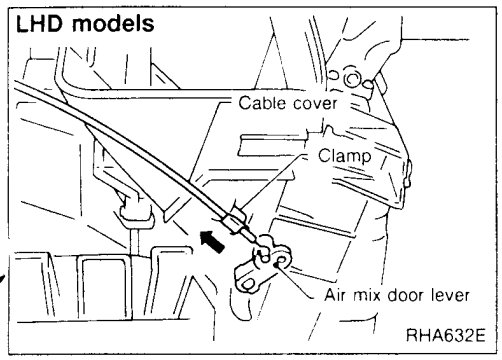
1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.

After connecting control rod, check it operates correctly.

Control Linkage Adjustment (Cont'd)

TEMPERATURE CONTROL CABLE

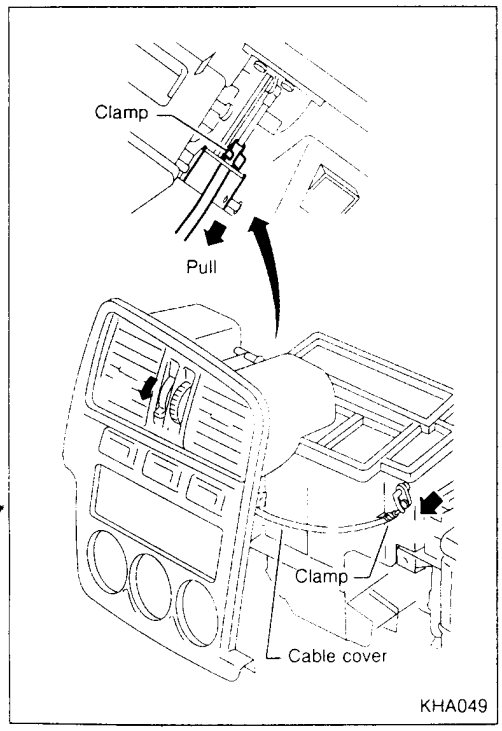




1. For RHD models, move the temperature control knob to the full cold position.
   For LHD models, move the temperature control knob to the full hot position.
2. For RHD models, set the air mix door lever in the full cold position.
   For LHD models, set the air mix door lever in the full hot position.
3. Pull on the cable cover in the direction of the arrow, then clamp it.

After positioning control cable, check that it operates correctly.

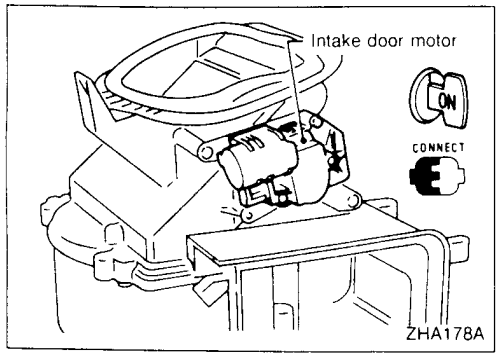
FRESH VENT CONTROL CABLE



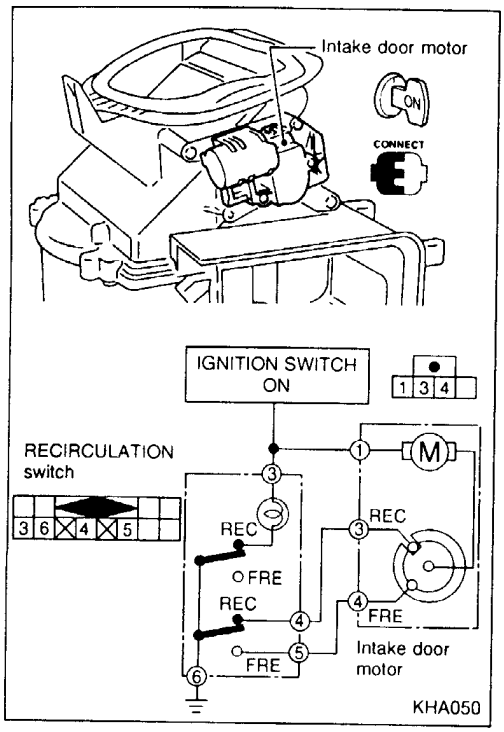
1. Turn the fresh vent control knob to the shut position.
2. Set the fresh vent door lever in shut position.
3. Adjust the position of the cable cover for proper operation, then secure to the clamps.

After positioning control cables, check that it operates correctly.

INTAKE DOOR MOTOR



1. Install intake door motor on intake unit.
   Ensure that the intake door motor lever is fitted into the slit portion of intake door link.
2. Connect the intake door motor harness connector.
3. Turn ignition switch to "ON" position.
4. Check that intake door operates properly when REC switch is turned ON and OFF.



System Description

INTAKE DOOR MOTOR

The intake door motor is installed on the intake unit. Using a link it opens and closes the intake door.

When RECIRCULATION switch is ON, the ground line of the intake door motor is switched from terminal ④ to ③. When RECIRCULATION switch is OFF, the ground line of the intake door motor is switched from terminal ③ to ④. The internal contacts of the intake door motor turn with the motor, when they reach the limit position the contacts disengage and current ceases to flow so that the motor will stop. The motor always turns in the same direction.

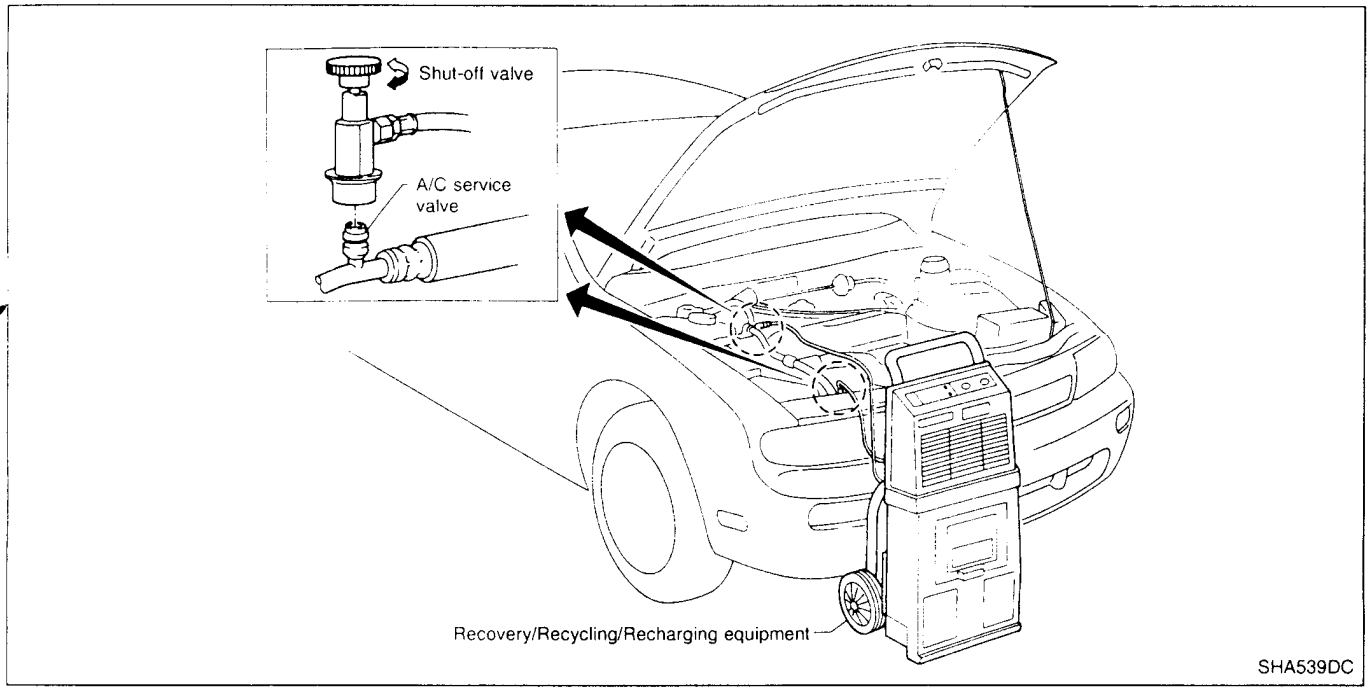
HFC-134a (R-134a) Service Procedure

SETTING OF SERVICE TOOLS AND EQUIPMENT

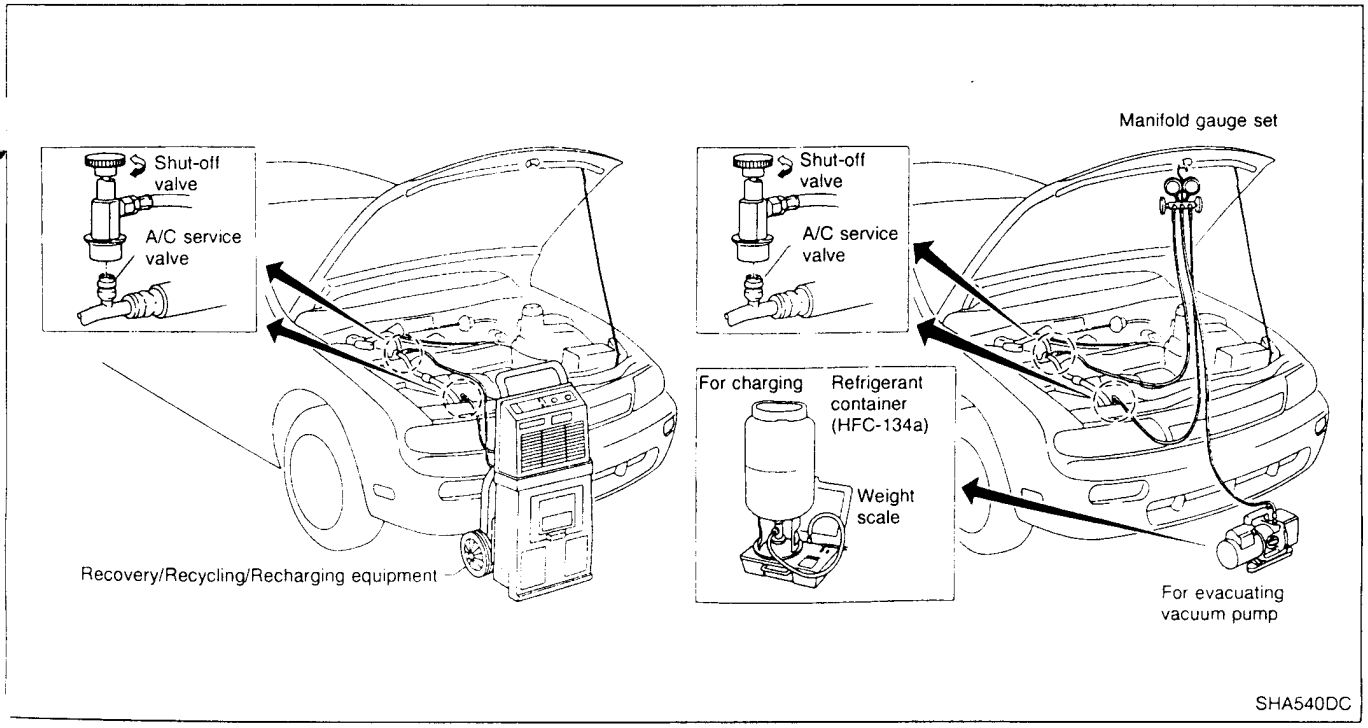
DISCHARGING REFRIGERANT

WARNING:

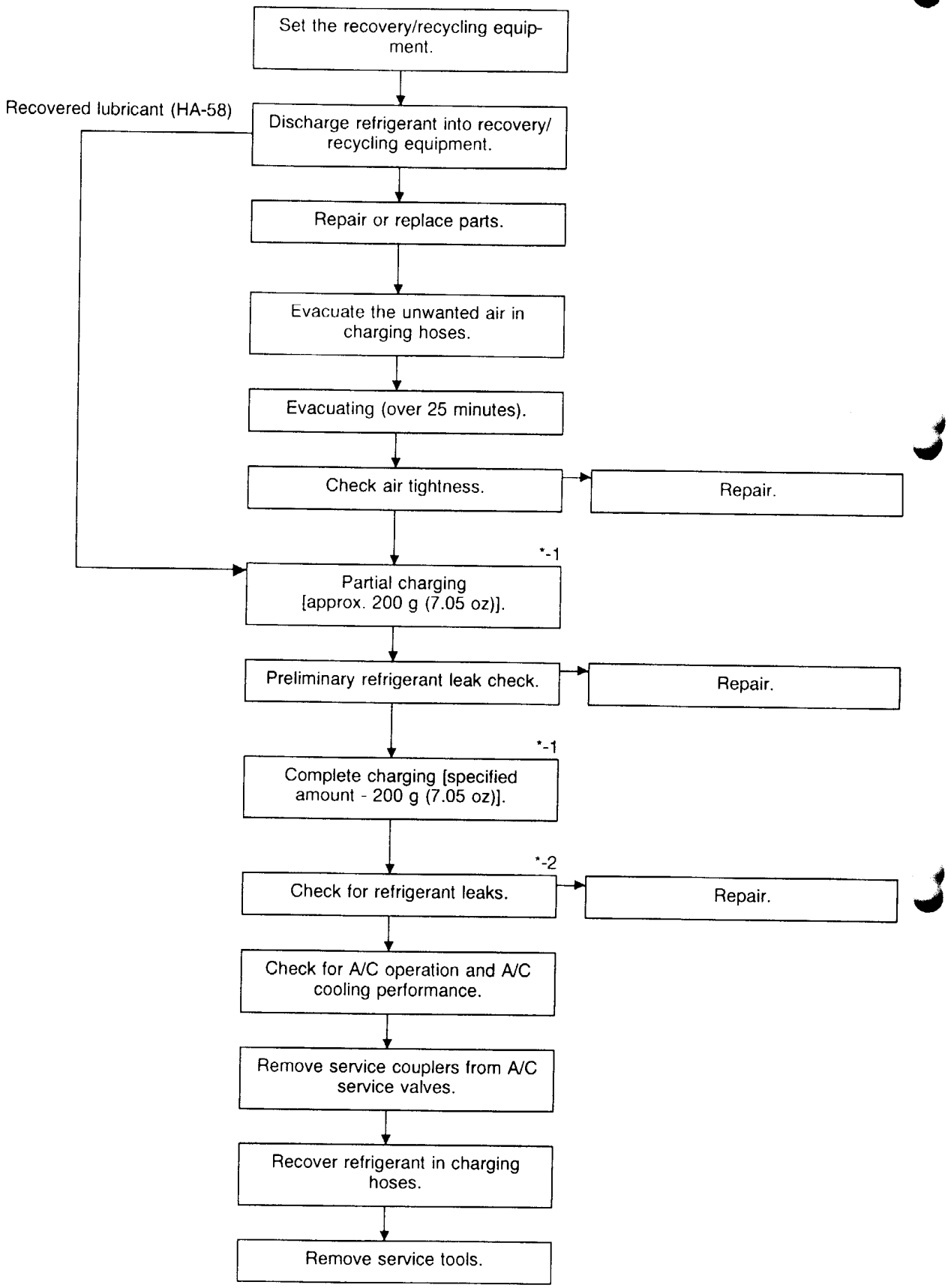
Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Remove HFC-134a (R-134a) from A/C system using certified service equipment meeting requirements of HFC-134a (R-134a) recycling equipment or HFC-134a (R-134a) recovery equipment. If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.



EVACUATING SYSTEM AND CHARGING REFRIGERANT



HFC-134a (R-134a) Service Procedure (Cont'd)



Note: *-1 Before charging refrigerant, ensure engine is off.
*-2 Before checking for leaks, start engine to activate air conditioning system then turn it off. Service valve caps must be attached to valves (to prevent leakage).

Maintenance of Lubricant Quantity in Compressor

The lubricant in the compressor circulates through the system with the refrigerant. Add lubricant to compressor when replacing any component or after a large gas leakage has occurred. It is important to maintain the specified amount.
If lubricant quantity is not maintained correctly, the following malfunctions may result:

- Lack of lubricant: May lead to a seized compressor
- Excessive lubricant: Inadequate cooling (thermal exchange interference)

LUBRICANT

Name: Nissan A/C System Oil Type R
Part number: KLH00-PAGR0

CHECKING AND ADJUSTING

Adjust the lubricant quantity according to the flowchart shown below:

START

Can lubricant return operation be performed?
- A/C system works properly.
- There is no evidence of a large amount of lubricant leakage.

Yes → Perform lubricant return operation, proceeding as follows:

1. Start engine, and set the following conditions:
   - **Test condition**
     Engine speed: Idling to 1,200 rpm
     A/C or AUTO switch: ON
     Blower speed: Max. position
     Temp. control: Optional [Set so that intake air temperature is 25 to 30°C (77 to 86°F).]
2. **Next item is for V-5 or V-6 compressor. Connect the manifold gauge, and check that the high pressure side pressure is 588 kPa (5.9 bar, 6 kg/cm^2, 85 psi) or higher.**
   If less than the reference level, attach a cover to the front face of the condenser to raise the pressure.
3. Perform lubricant return operation for about 10 minutes.
4. Stop engine.

CAUTION:
If excessive lubricant leakage is noted, do not perform the lubricant return operation.

No

Should the compressor be replaced?

No

Yes

Ⓐ (Go to next page.)

Is there any part to be replaced? (Evaporator, condenser, liquid tank or in case there is evidence of a large amount of lubricant leakage.)

Yes → After replacing any of the following major components, add the correct amount of lubricant to the system:

Amount of lubricant to be added

Part replaced	Lubricant to be added to system Amount of lubricant mℓ (Imp fl oz)	Remarks
Evaporator	75 (2.6)	—
Condenser	75 (2.6)	—
Liquid tank	5 (0.2)	Add if compressor is not replaced. *1
In case of refrigerant leak	30 (1.1)	Large leak
	—	Small leak*2

*1: If compressor is replaced, addition of lubricant is included in the flow chart.
*2: If refrigerant leak is small, no addition of lubricant is needed.

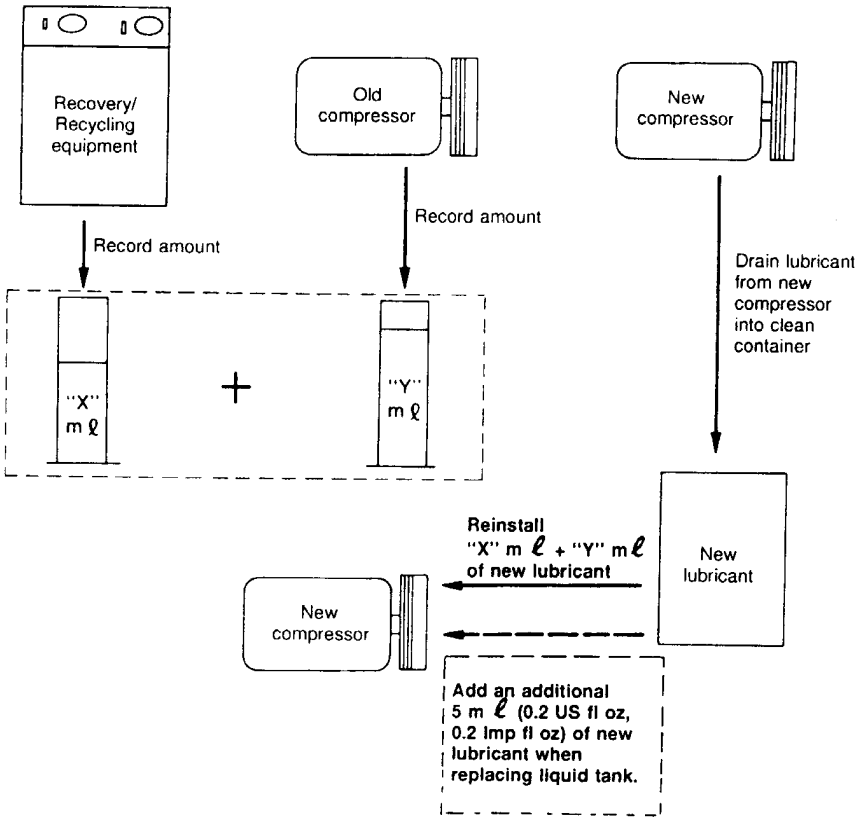
No

Carry out the A/C performance test.

Maintenance of Lubricant Quantity in Compressor (Cont'd)

Ⓐ

1. Discharge refrigerant into the refrigerant recovery/recycling equipment. Measure lubricant discharged into the recovery/recycling equipment.
2. Remove the drain plug of the "old" (removed) compressor (applicable only to V-5, V-6 or DKS-16H compressor). Drain the lubricant into a graduated container and record the amount of drained lubricant.
3. Remove the drain plug and drain the lubricant from the "new" compressor into a separate, clean container.
4. Measure an amount of new lubricant installed equal to amount drained from "old" compressor. Add this lubricant to "new" compressor through the suction port opening.
5. Measure an amount of new lubricant equal to the amount recovered during discharging. Add this lubricant to "new" compressor through the suction port opening.
6. Torque the drain plug.
   V-5 or V-6 compressor: 18 - 19 N·m (1.8 - 1.9 kg-m, 13 - 14 ft-lb)
   DKS-16H compressor: 14 - 16 N·m (1.4 - 1.6 kg-m, 10 - 12 ft-lb)
7. If the liquid tank also needs to be replaced, add an additional 5 mℓ (0.2 Imp fl oz) of lubricant at this time.
   Do not add this 5 mℓ (0.2 Imp fl oz) of lubricant if only replacing the compressor.



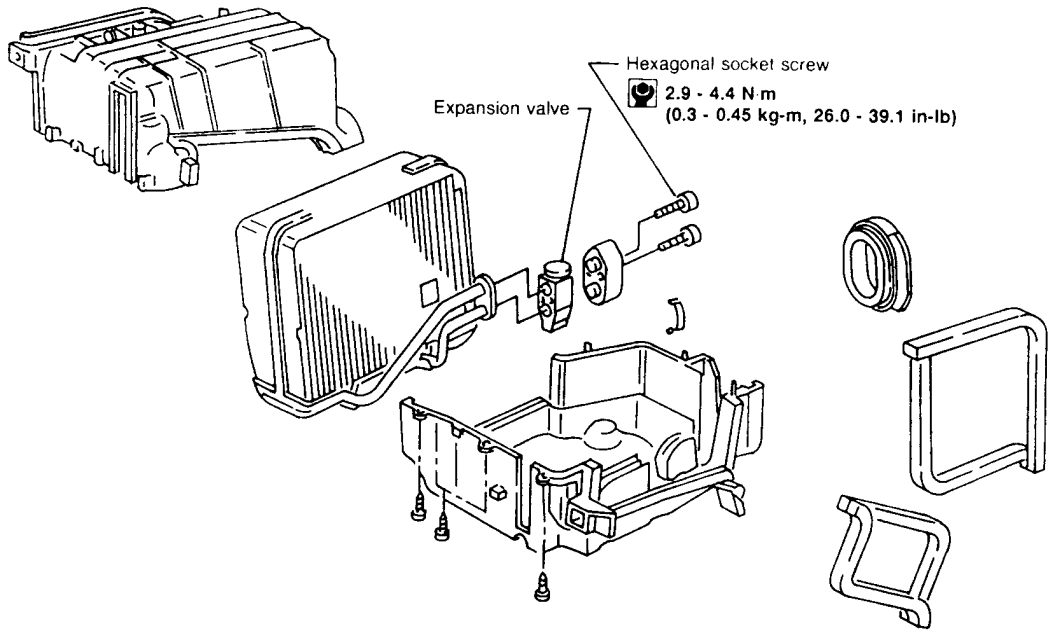
RHA065DD

Refrigerant Lines

- Refer to page HA-4 regarding "Precautions for Refrigerant Connection".

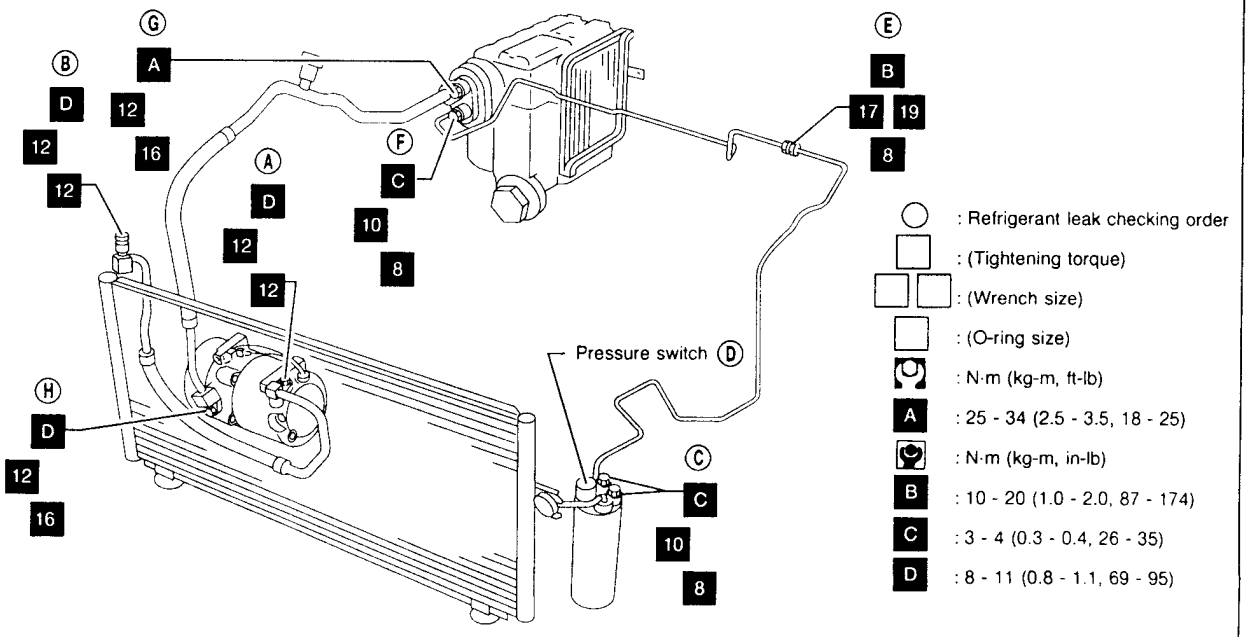
LHD MODELS

SEC. 271•274•276



KHA051

SEC. 271•274•276

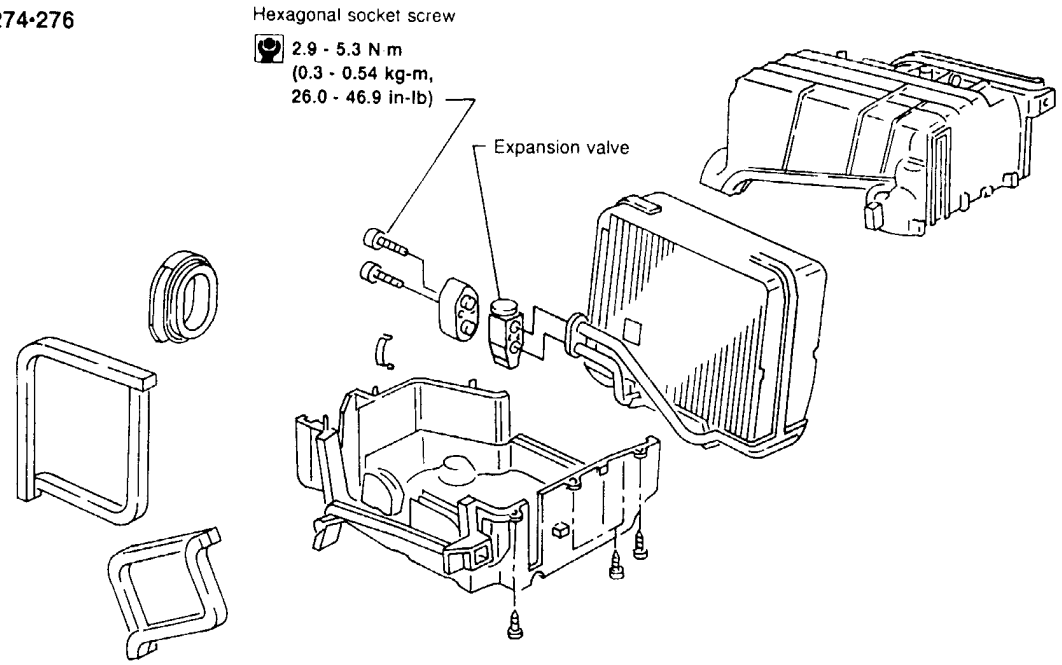


KHA052

Refrigerant Lines (Cont'd)

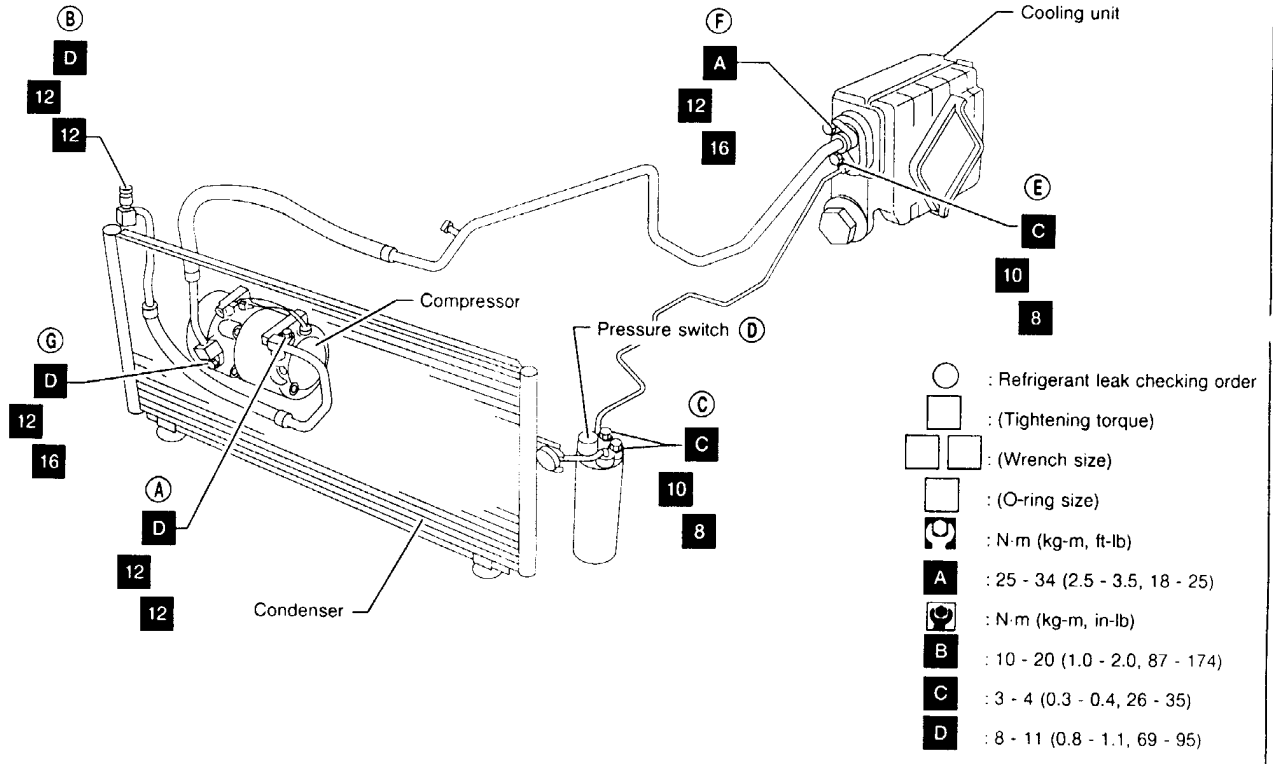
RHD MODELS

SEC. 271•274•276



KHA053

SEC. 271•274•276

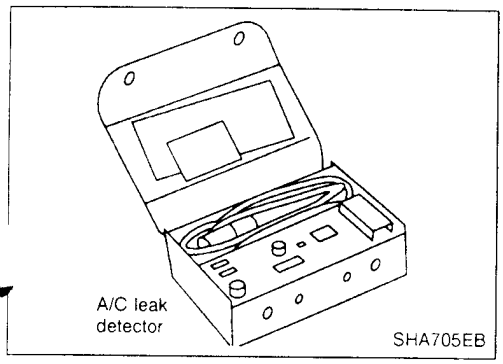


KHA054

Checking Refrigerant Leaks

PRELIMINARY CHECK

Perform a visual inspection of all refrigeration parts, fittings, hoses, and components for signs of A/C lubricant leakage, damage and corrosion.

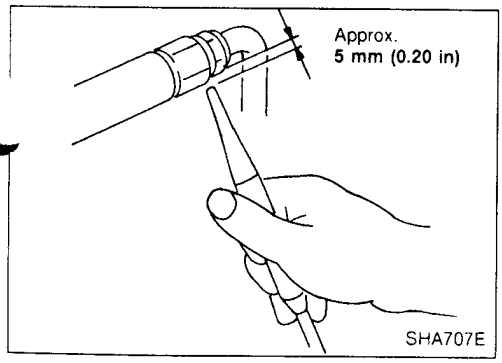


PRECAUTIONS FOR HANDLING LEAK DETECTOR

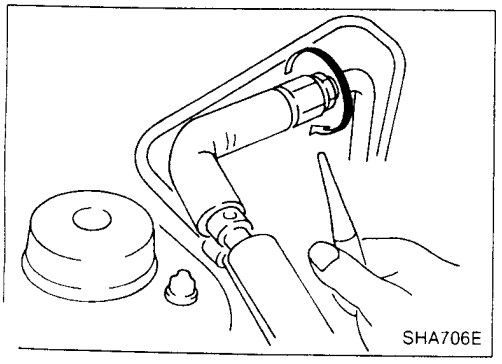
When performing a refrigerant leak check, use a A/C leak detector or equivalent. Ensure that the instrument is calibrated and set properly per the operating instructions.

The leak detector is a delicate device. In order to use the leak detector properly, read the operating instructions and perform any specified maintenance.

Other gases in the work area or substances on the A/C components, for example, anti-freeze, windshield washer fluid, solvents and cleaners, may falsely trigger the leak detector. Make sure the surfaces to be checked are clean. Do not allow the sensor tip of the detector to come into contact with any substance. This can also cause false readings and may damage the detector.

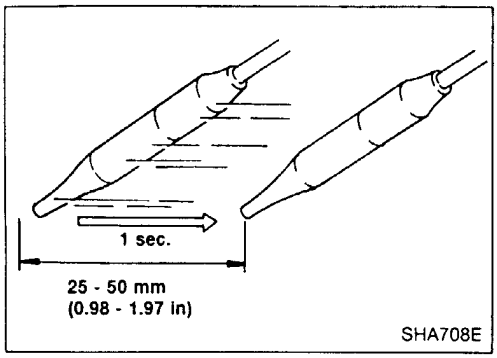


1. Position probe approximately 5 mm (0.20 in) away from point to be checked.



2. When testing, circle each fitting completely with probe.

Checking Refrigerant Leaks (Cont'd)

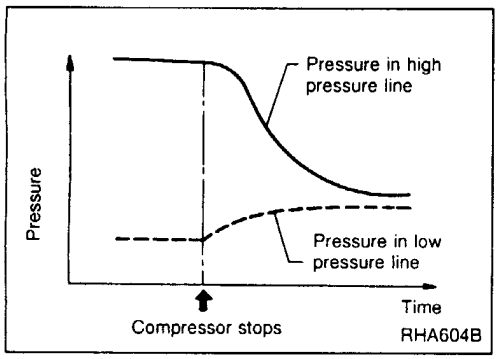


3. Move probe along component approximately 25 to 50 mm (0.98 to 1.97 in)/sec.

CHECKING PROCEDURE

To prevent inaccurate or false readings, make sure there is no refrigerant vapor or tobacco smoke in the vicinity of the vehicle. Perform the leak test in calm area (low air/wind movement so that the leaking refrigerant is not dispersed).

1. Charge the system with the specified amount of refrigerant.
2. Run the engine with the A/C compressor ON for at least 2 minutes.
3. Stop engine.

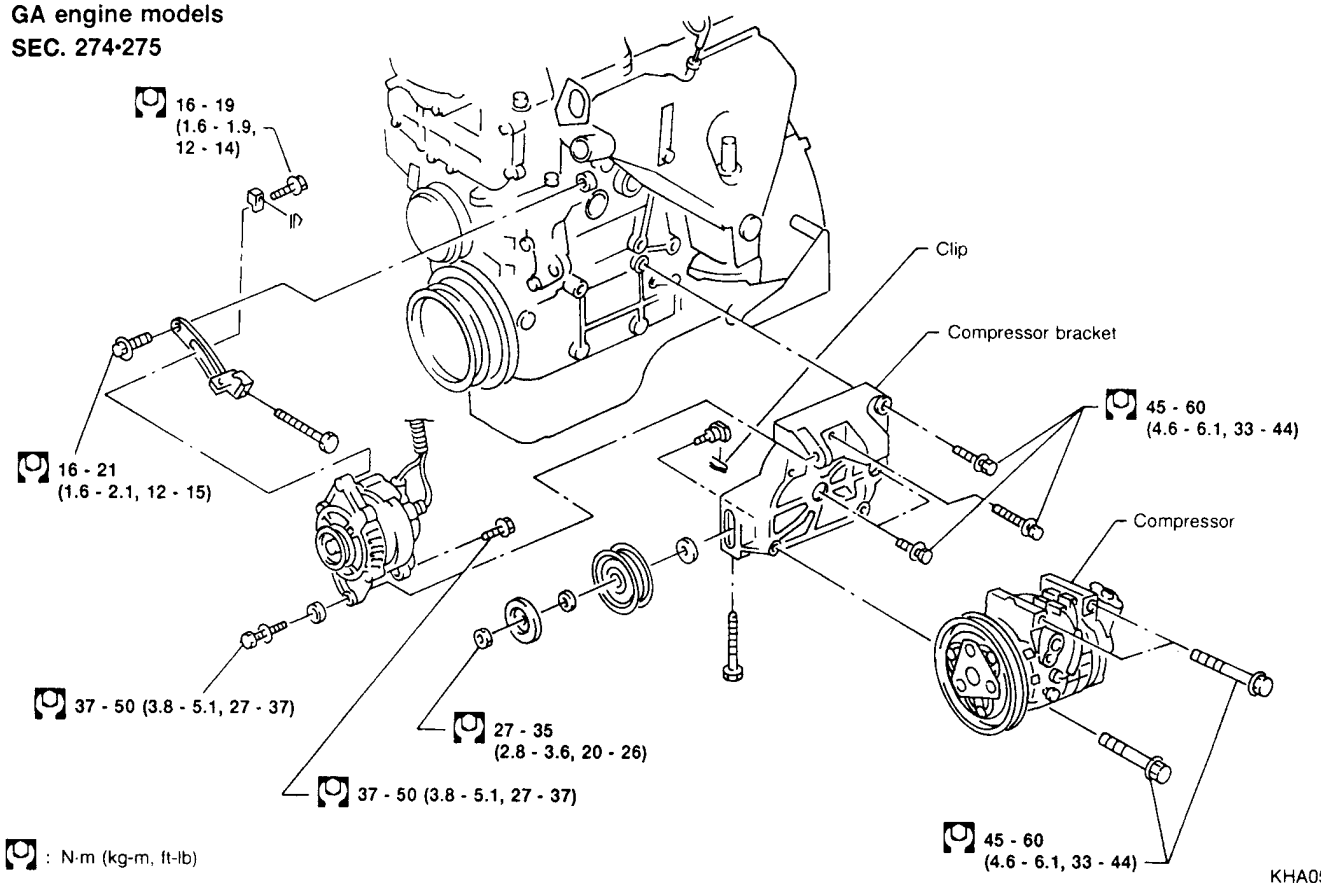


Refrigerant leaks should be checked immediately after stopping the engine. Begin with the leak detector on the high pressure line. The pressure in the high pressure line will gradually drop after refrigerant circulation stops and pressure in the low pressure line will gradually rise, as shown in the graph. Leaks are more easily detected when pressure is high.

4. Conduct the leak test from the high side to the low side at points Ⓐ through Ⓗ (Refer to HA-59, LHD models); Ⓐ through Ⓖ (Refer to HA-60, RHD models).
   Perform a leak check for the following areas carefully. Clear the component to be checked and move the leak detector probe completely around the connection/component.
   - **Compressor**
     Check the fitting of high and low pressure hoses, relief valve and shaft seal.
   - **Liquid tank**
     Check the pressure switch, tube fitting and the fusible plug mounts.
   - **Service valves**
     Check all around the service valves. Ensure service valve caps are secured on the service valves (to prevent leaks).
   - **Cooling unit**
     Turn blower fan on "High" for at least 15 seconds to dissipate any refrigerant trace in the cooling unit. Insert the leak detector probe into the drain hose immediately after stopping the engine. (Keep the probe inserted for at least ten seconds.)
5. If leak detector detects a leak, confirm the leak using soapy water.

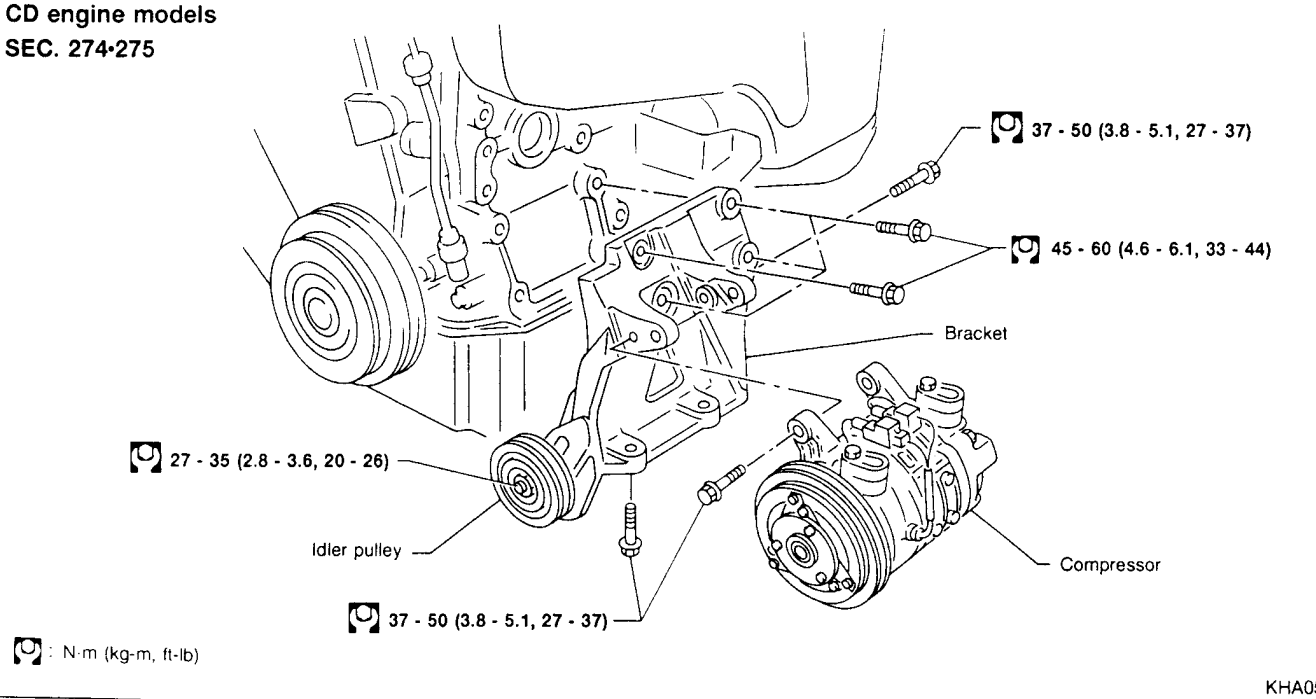
Compressor Mounting

GA engine models
SEC. 274•275



: N·m (kg-m, ft-lb)

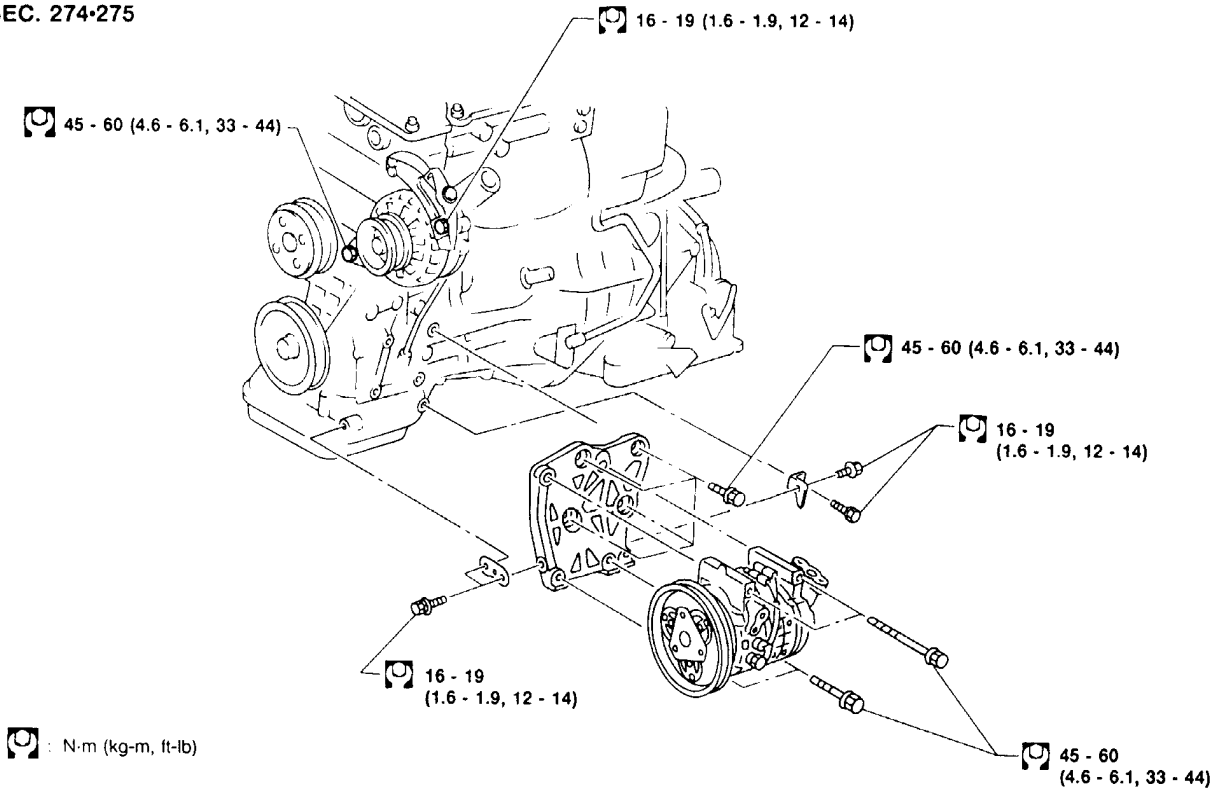
CD engine models
SEC. 274•275



: N·m (kg-m, ft-lb)

Compressor Mounting (Cont'd)

SR engine models
SEC. 274•275



Belt Tension

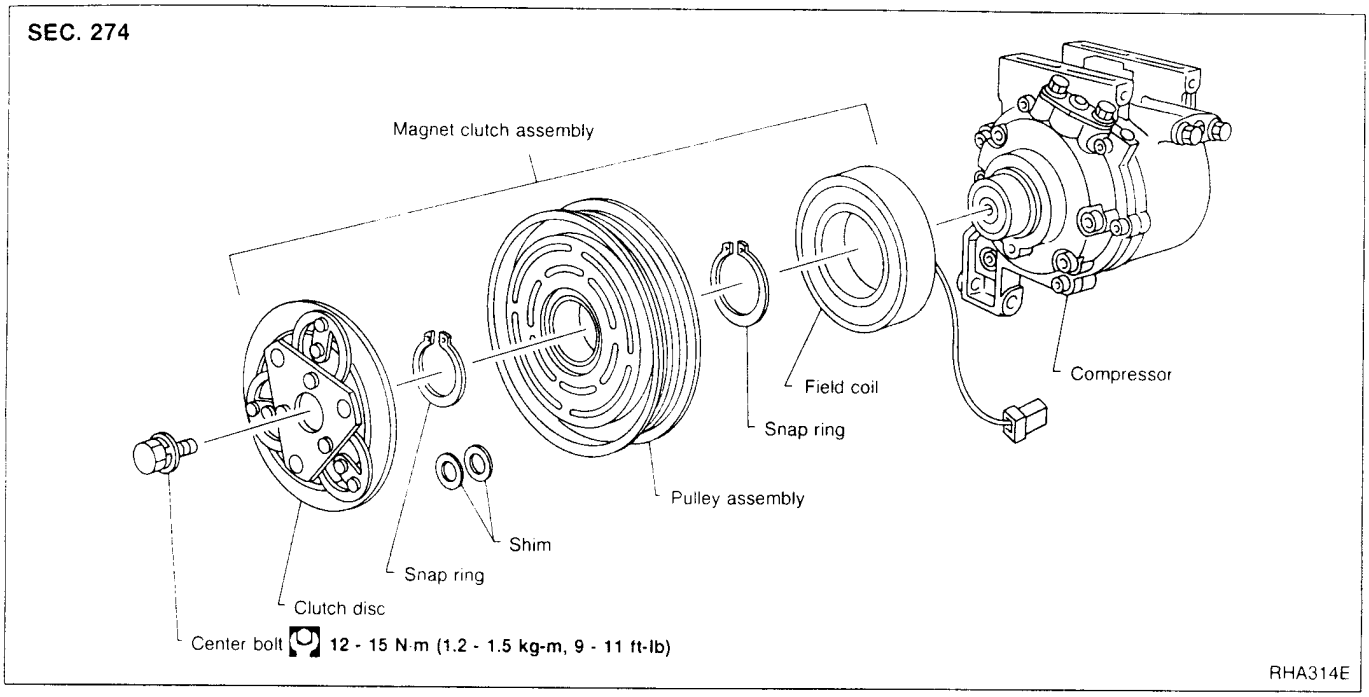
- Refer to MA section.

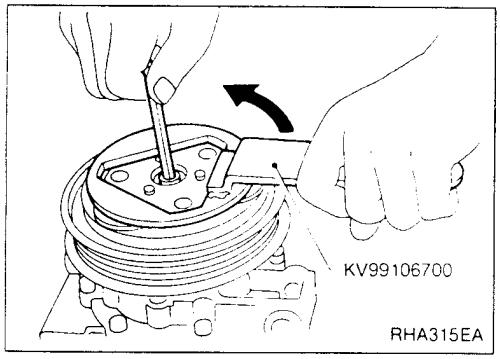
Fast Idle Control Device (FICD)

- Refer to EC section.

Compressor — Model CR-14 (Calsonic make)

SEC. 274

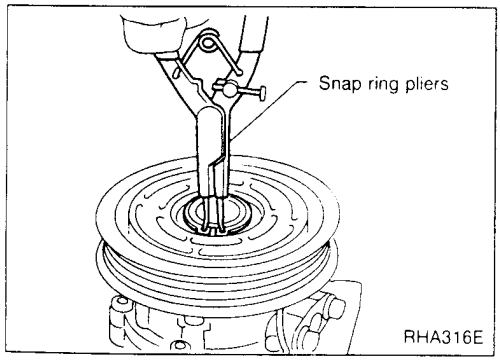




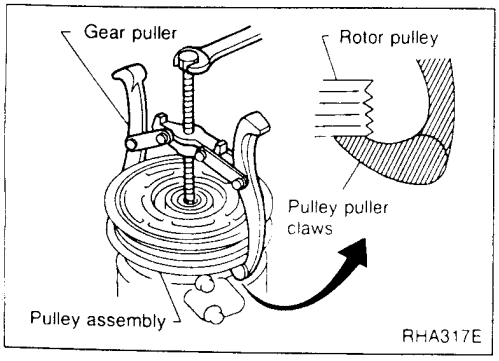
Compressor Clutch

REMOVAL

- When removing center bolt, hold clutch disc with clutch disc wrench.
- Take off clutch disc.

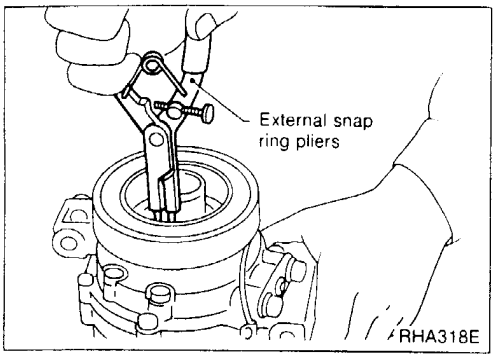


- Remove snap ring (which secures rotor pulley) by using external snap ring pliers.

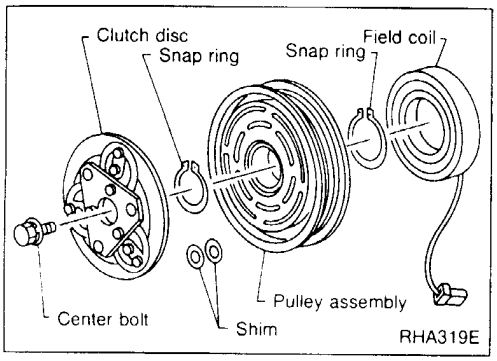


- Pulley removal
  Position the center pulley puller on the end of the drive shaft, and remove the pulley assembly using any commercially available pulley puller.
  To prevent the pulley groove from being deformed, the puller claws should be positioned onto the edge of the pulley assembly.

Compressor Clutch (Cont'd)



- Remove snap ring (which secures field coil) by using external snap ring pliers.



INSPECTION

Clutch disc

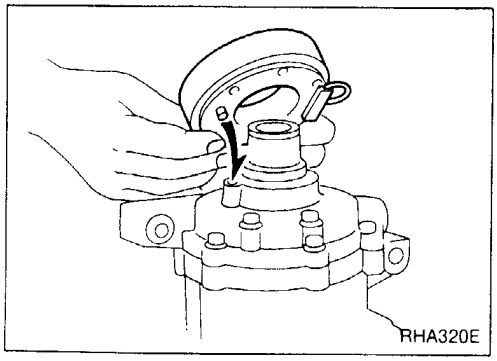
If the contact surface shows signs of damage due to excessive heat, the clutch disc and pulley should be replaced.

Pulley

Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and clutch disc should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

Coil

Check coil for loose connection or cracked insulation.

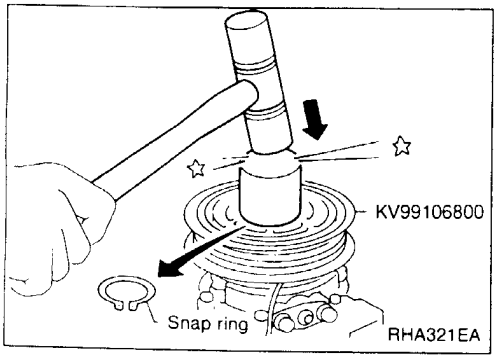


INSTALLATION

- Position the field coil.

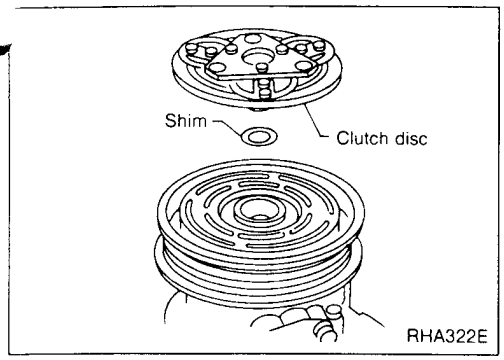
Be sure to align the coil's pin with the hole in compressor's front head.

- Install snap ring (which secures field coil) by using external snap ring pliers.

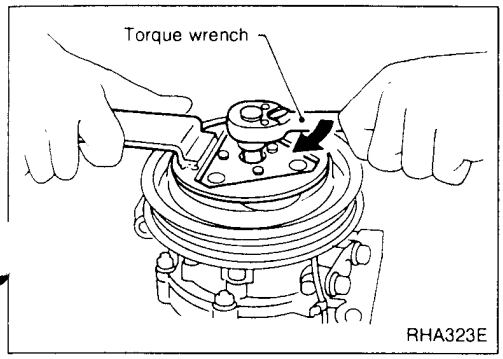


- Position and install pulley assembly securely by using plastic hammer.
- Install snap ring (which secures rotor pulley) by using external snap ring pliers.

Compressor Clutch (Cont'd)

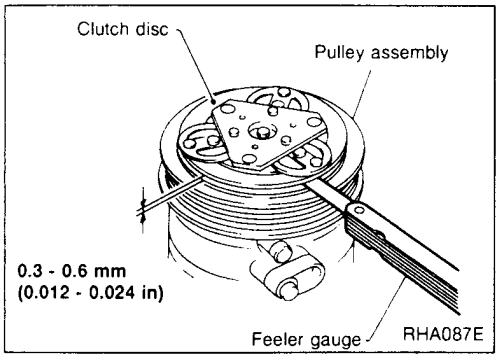


- Install the clutch disc on the drive shaft, together with the original shim(s). Press the disc down by hand.



- Using the clutch wrench disc to prevent clutch disc rotation, tighten the bolt to 12 to 15 N·m (1.2 to 1.5 kg-m, 9 to 11 ft-lb) torque.

After tightening the bolt, check that the pulley rotates smoothly.

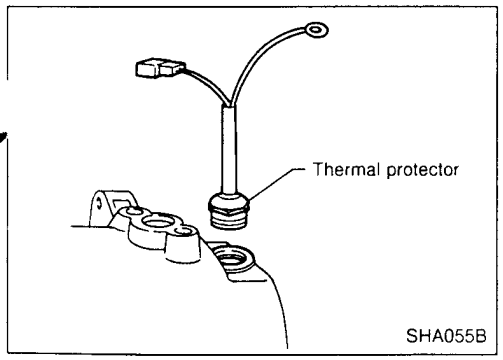


- Check clearance around the entire periphery of clutch disc.
  Disc-to-pulley clearance:
  0.3 - 0.6 mm (0.012 - 0.024 in)
  If the specified clearance is not obtained, replace adjusting spacer and readjust.

BREAK-IN OPERATION

When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times. Break-in operation raises the level of transmitted torque.

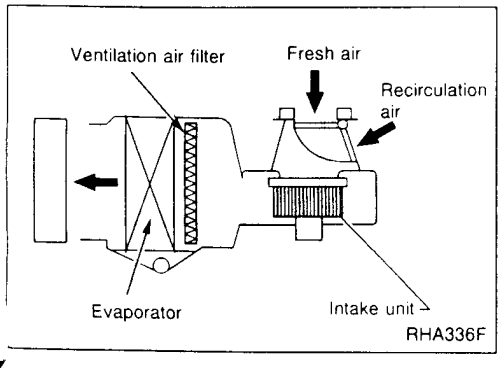
Thermal Protector



INSPECTION

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.

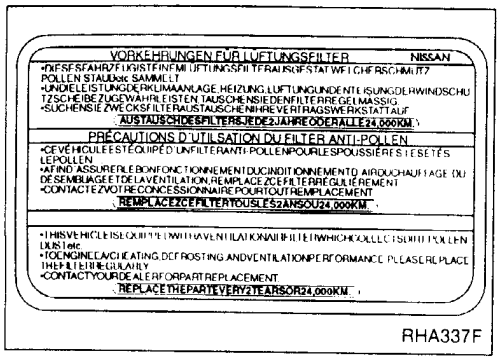
Ventilation Air Filter



FUNCTION

Air inside passenger compartment is kept clean at either recirculation or fresh mode by installing ventilation air filter into cooling unit.

Ventilation Air Filter (Cont'd)

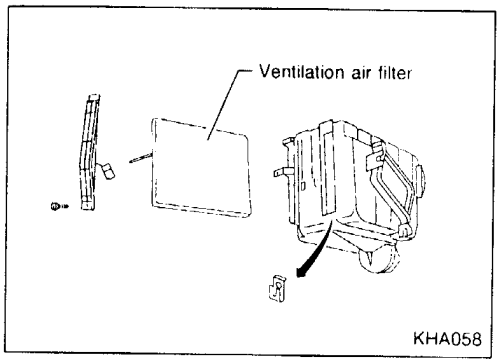


RHA337F

REPLACEMENT TIMING

Replace ventilation air filter every 2 years or 24,000 km (15,000 miles).

Caution label is fixed inside the glove box.



KHA058

REPLACEMENT PROCEDURES

- Remove instrument lower cover with glove box. Refer to BT section.
- Take out ventilation air filter which is secured with one clip, from cooling unit.
- Replace with new one and reinstall instrument lower cover and glove box.

General Specifications

COMPRESSOR

Model	SR20DE engine
	CALSONIC make CR-14
Type	Vane rotary
Displacement cm^3 (cu in)/Rev	144 (8.79)
Direction of rotation	Clockwise (Viewed from drive end)
Drive belt	GA engine model: Poly V SR engine model: Poly V CD engine model: Type A

LUBRICANT

Model	CALSONIC make CR-14
Name	Nissan A/C System Oil Type R
Part number	KLH00-PAGR0
Capacity m (Imp fl oz)	
Total in system	180 (6.3)
Compressor (Service parts) charging amount	180 (6.3)

REFRIGERANT

Type	HFC-134a
Capacity kg (lb)	0.60 ± 0.05

Inspection and Adjustment

ENGINE IDLING SPEED

When A/C is ON
Refer to EC section.

BELT TENSION

Refer to Checking Drive Belts (MA section).

COMPRESSOR

Model	CR-14
Clutch disc-to-pulley clearance mm (in)	0.3 - 0.6 (0.012 - 0.024)

HEATER & AIR CONDITIONER

SECTION HA

CONTENTS

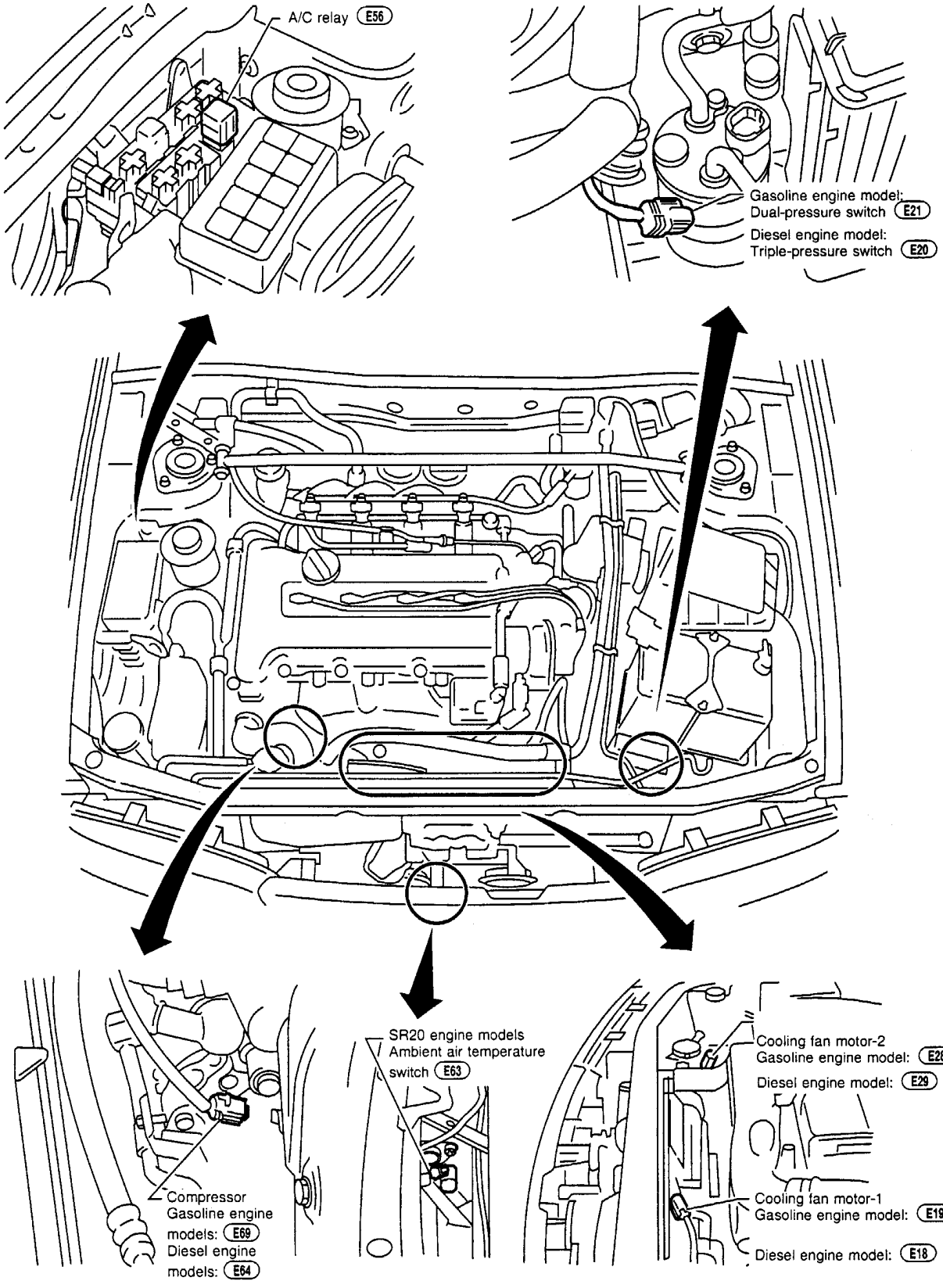
TROUBLE DIAGNOSES 2002
Harness Layout 2002
Circuit Diagram — Air Conditioner 2003
Wiring Diagram — HEATER — 2004
Wiring Diagram — AC — 2005
Main Power Supply and Ground Circuit Check 2010
Diagnostic Procedure 2 2011
Diagnostic Procedure 3 2013
Electrical Components Inspection 2017
System Description 2017

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**
- **See EL section for NATS information and wiring diagram.**

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".

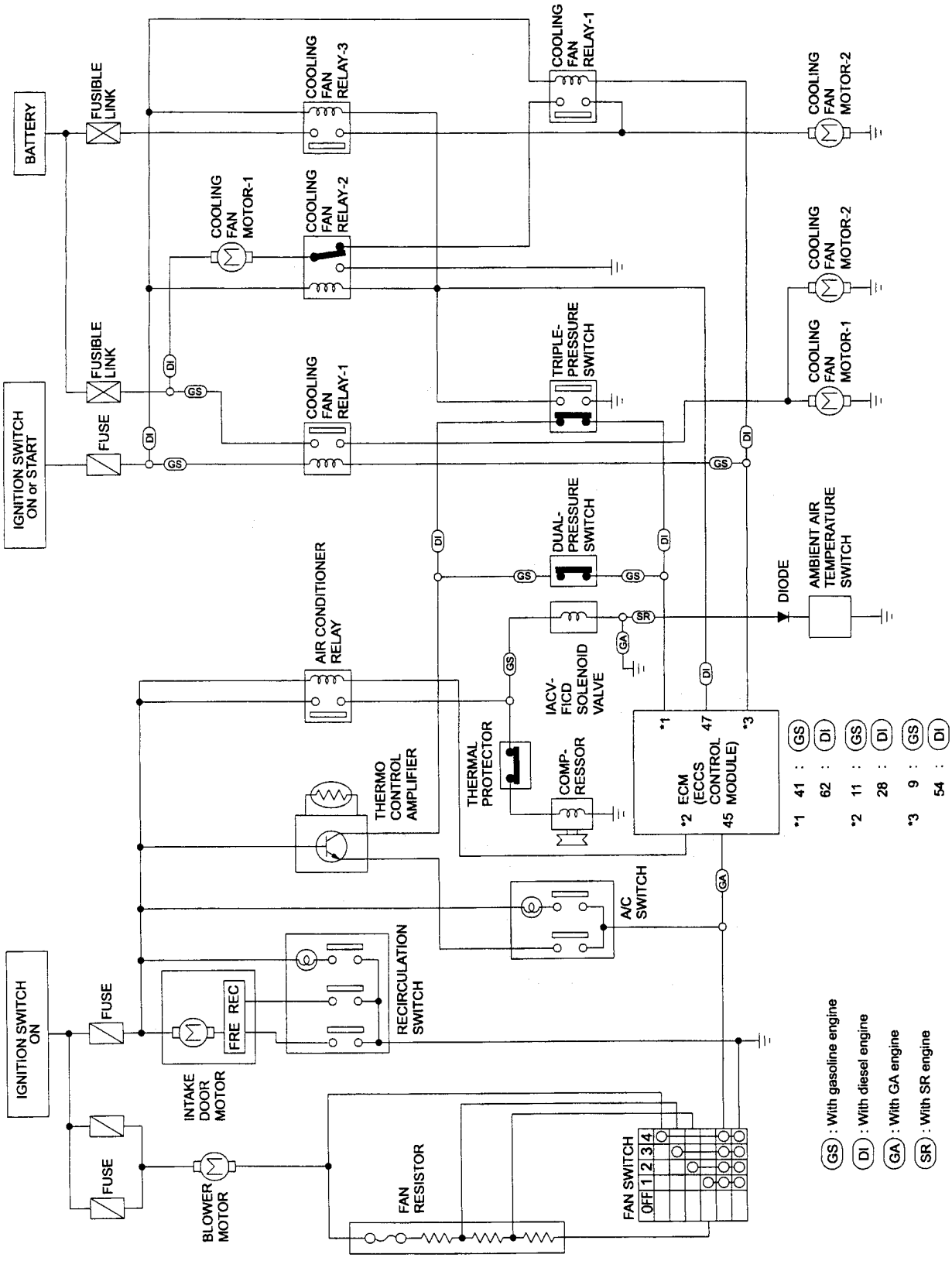
Harness Layout

ENGINE COMPARTMENT



YHA121

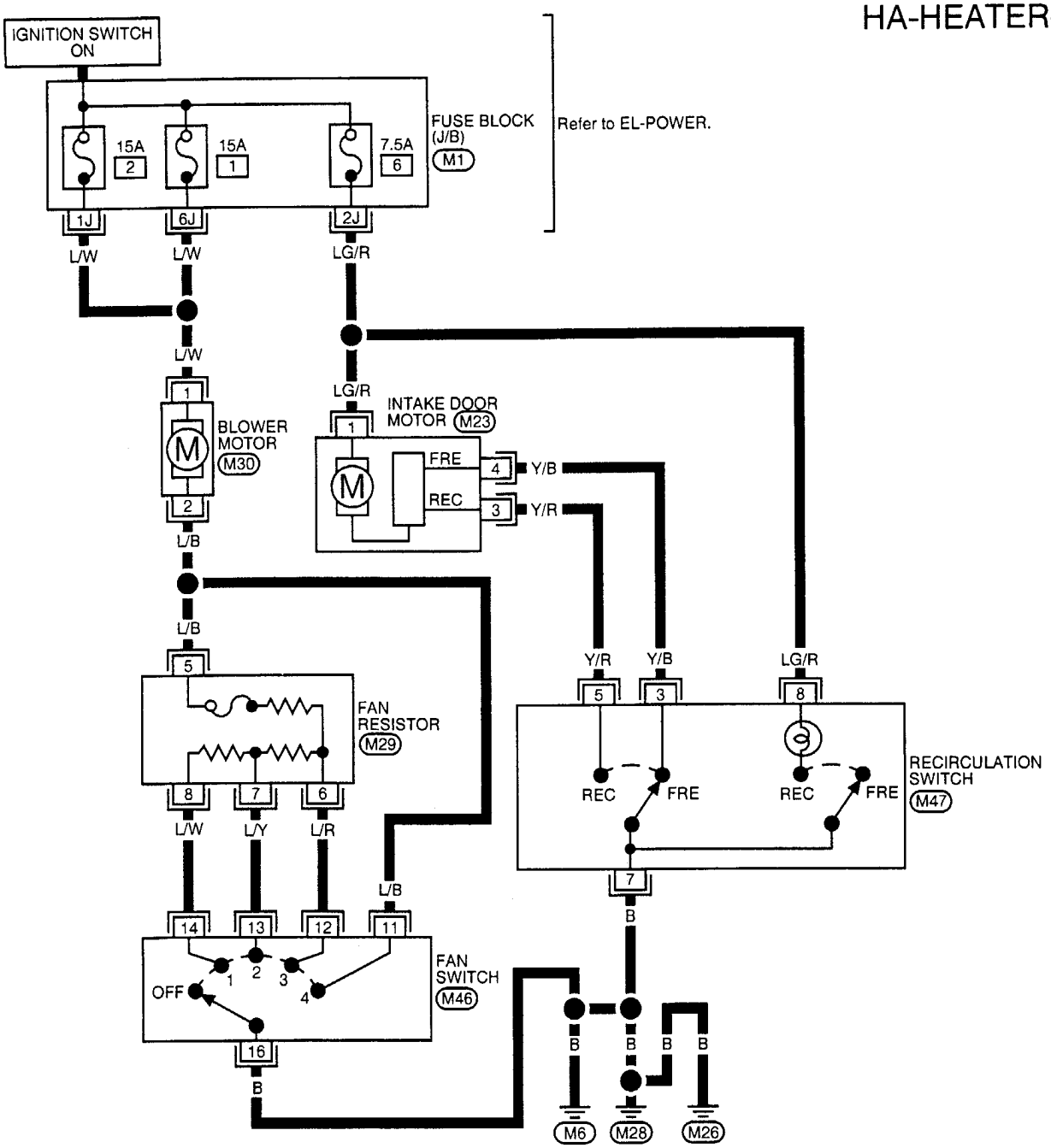
Circuit Diagram — Air Conditioner

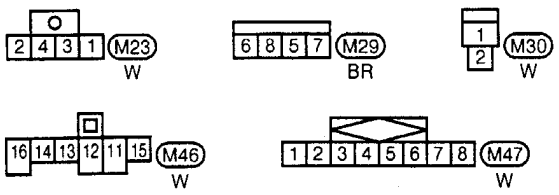


YHA114

Wiring Diagram — HEATER —

HA-HEATER-01



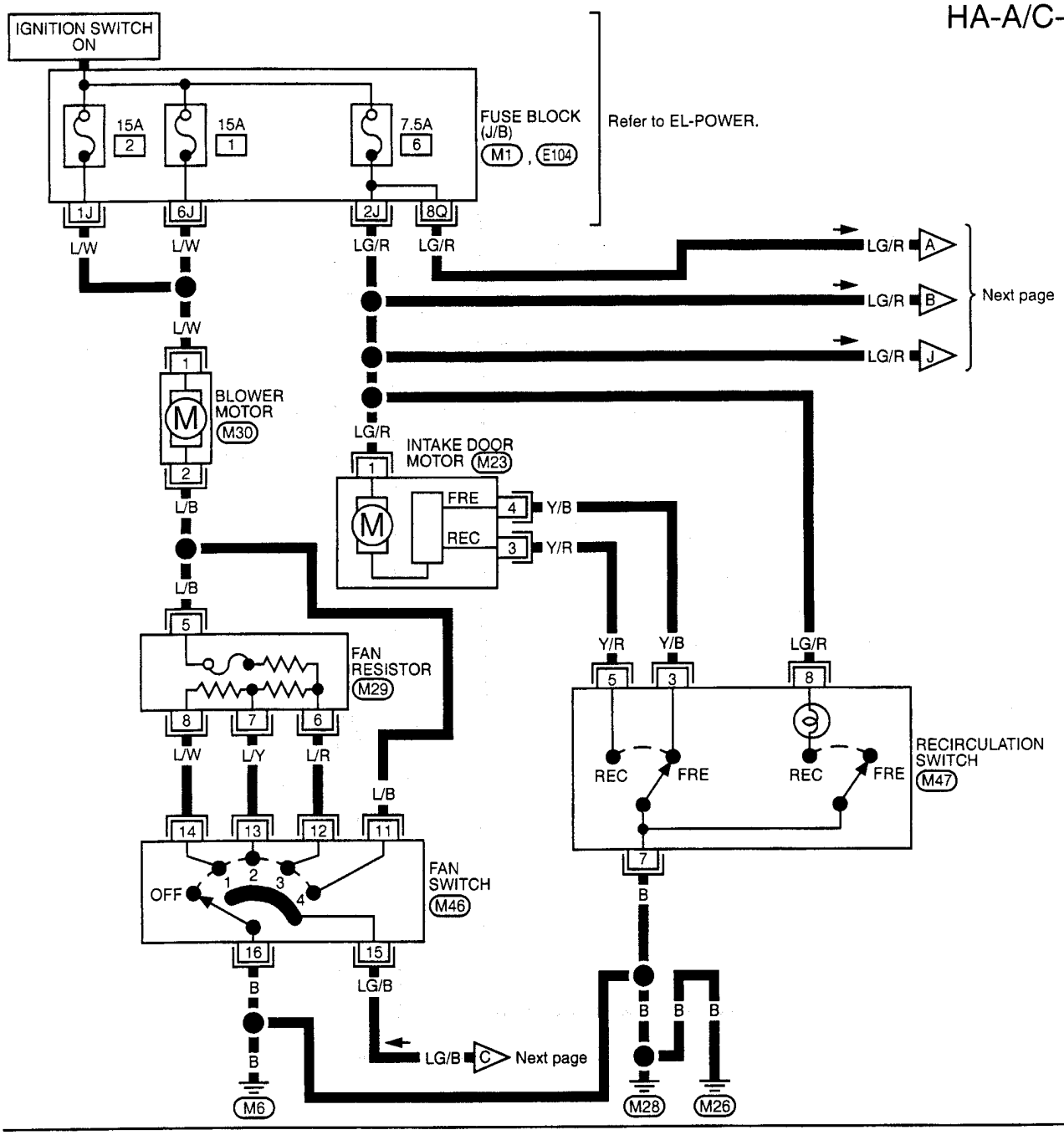


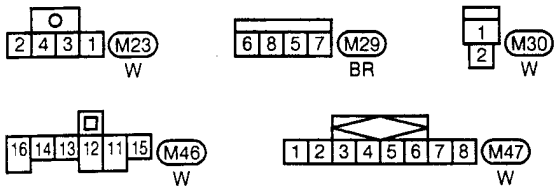
Refer to last page (Foldout page).
M1

YHA115

Wiring Diagram — A/C —

HA-A/C-01



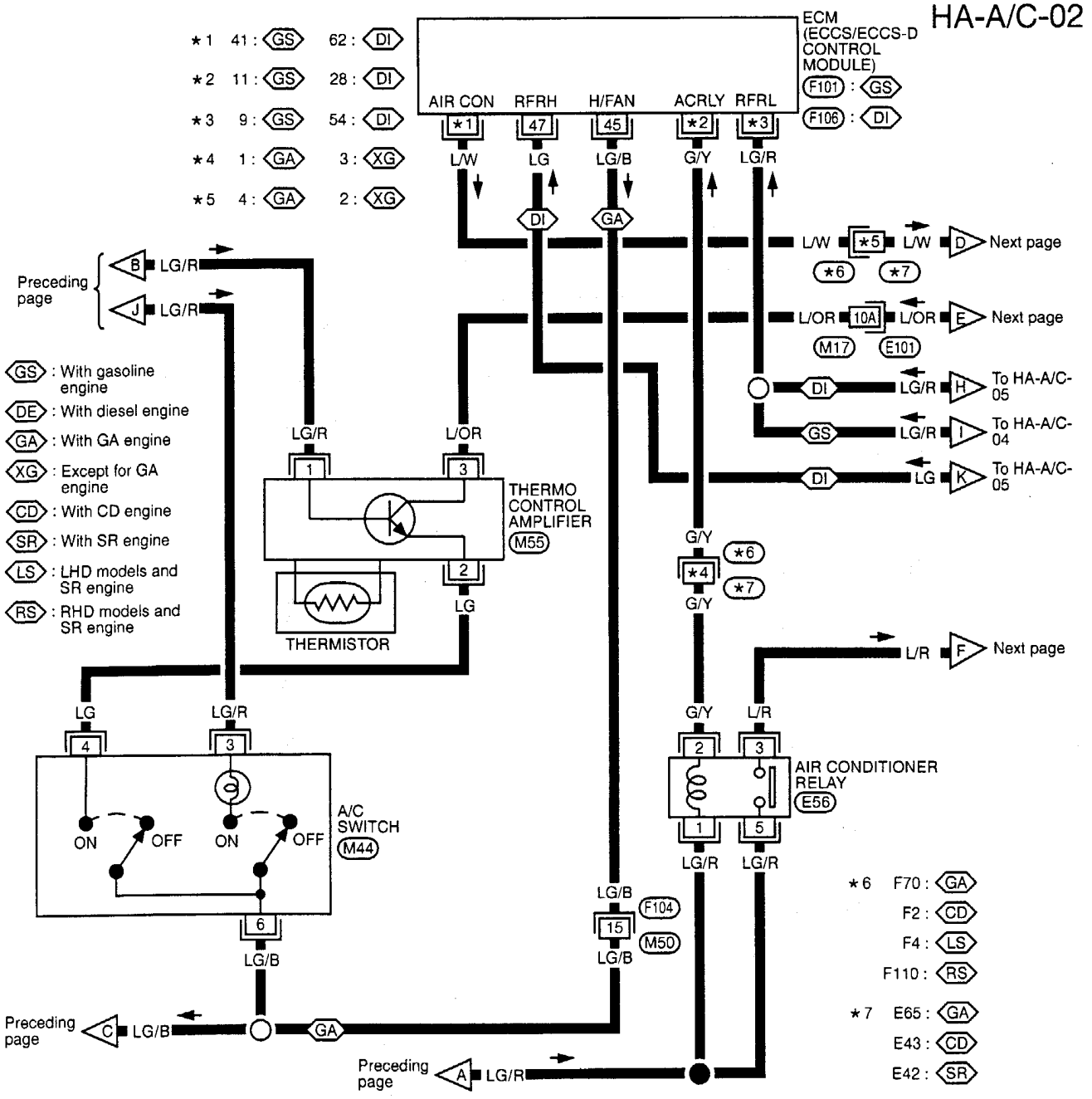


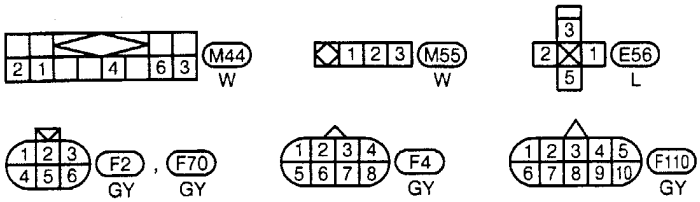
Refer to last page (Foldout page).
M1
E104

YHA116

Wiring Diagram — A/C — (Cont'd)

HA-A/C-02





Refer to last page (Foldout page).
M17 , E101
F101
F106

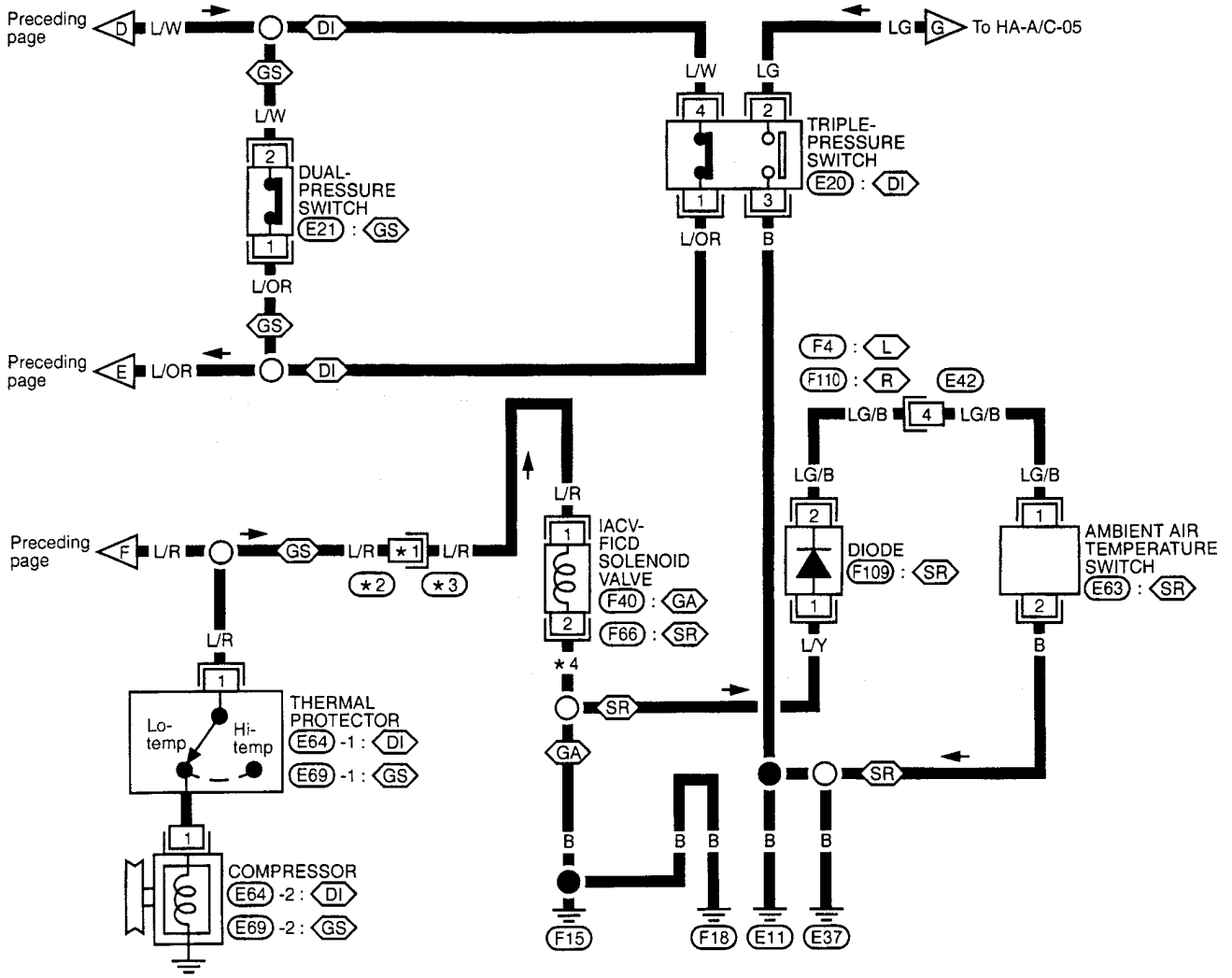
YHA117

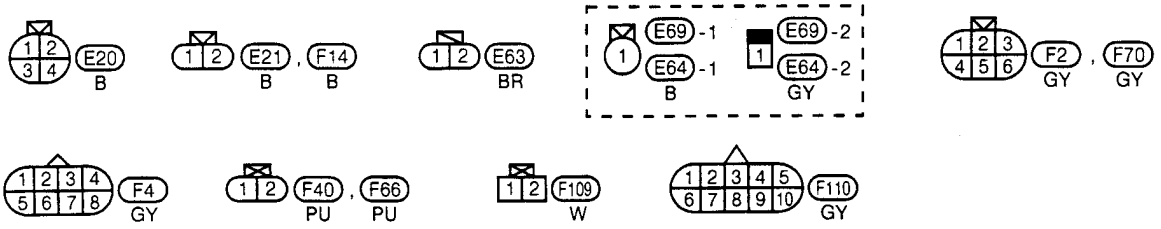
Wiring Diagram — A/C — (Cont'd)

HA-A/C-03

GS : With gasoline engine
DI : With diesel engine
SR : With SR engine
GA : With GA engine
L : LHD models
R : RHD models
LS : LHD models and SR engine
RS : RHD models and SR engine

*1 3 : GA
8 : LS
9 : RS
*2 E65 : GA
E42 : SR
*3 F70 : GA
F4 : LS
F110 : RS
*4 B : GA
L/Y : GA

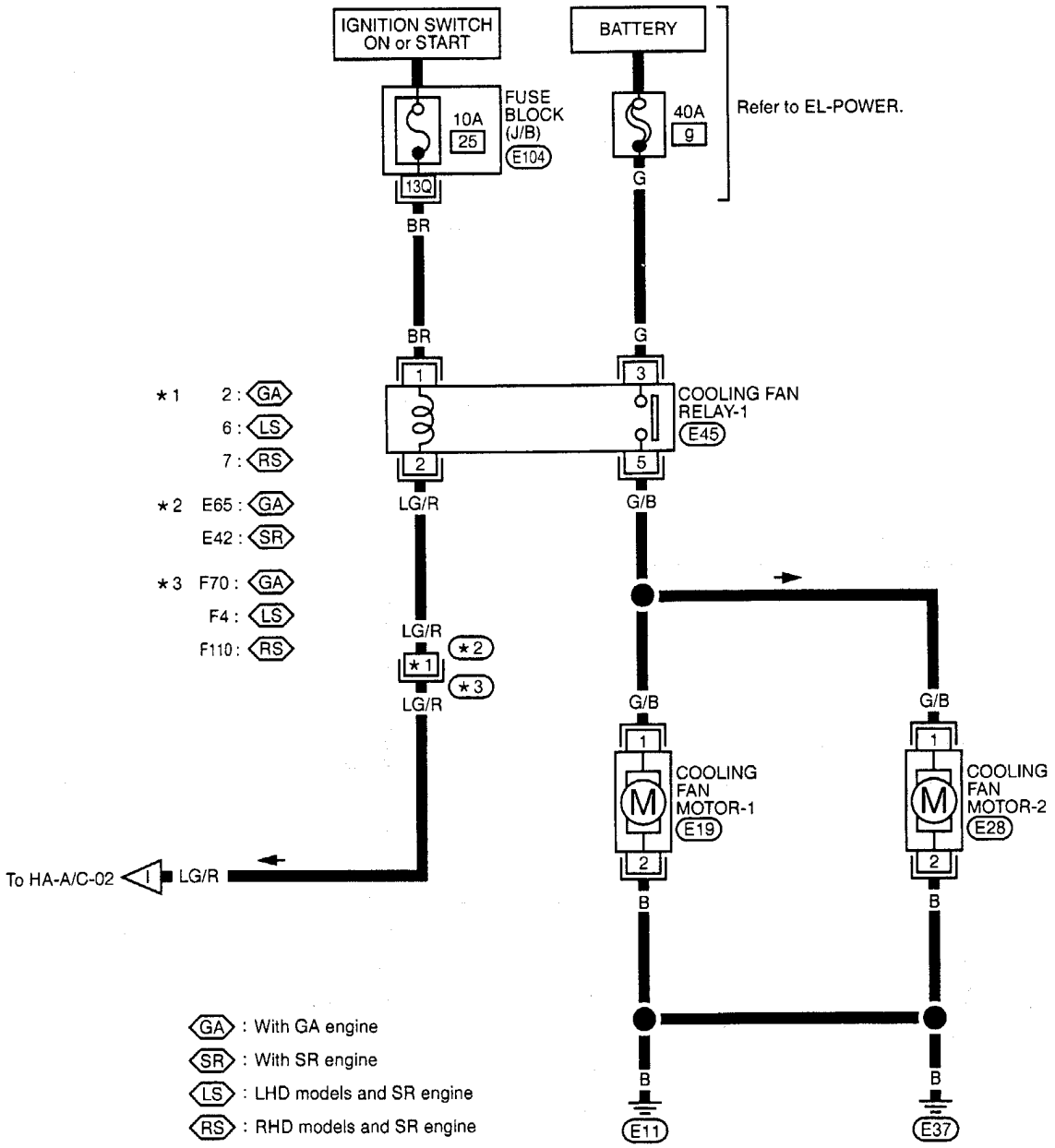


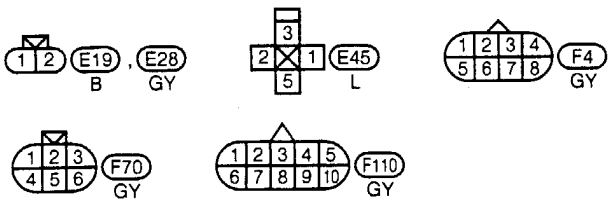


YHA118

Wiring Diagram — A/C — (Cont'd)

HA-A/C-04

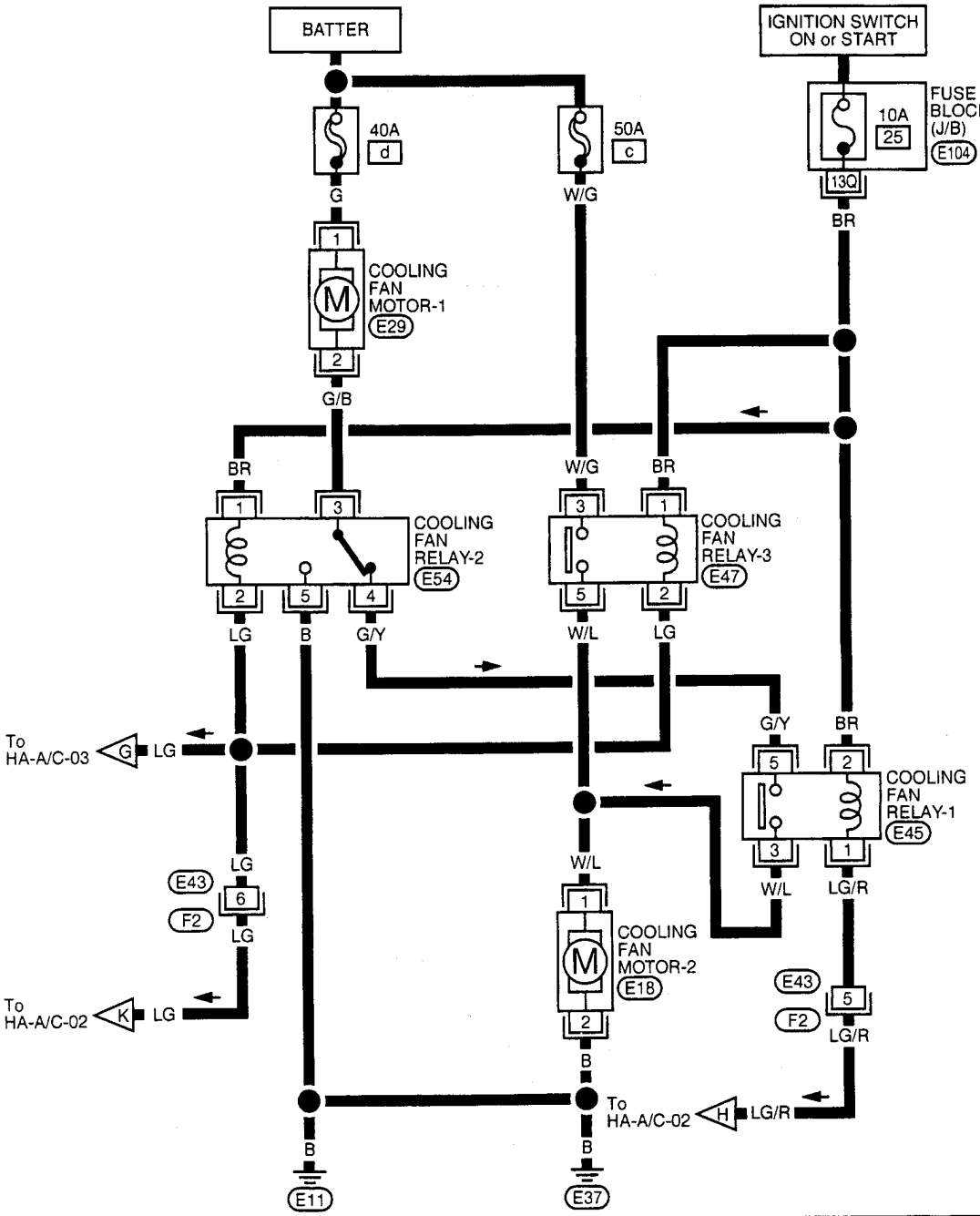




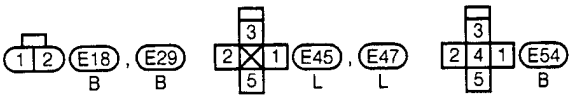
Refer to last page (Foldout page).
E104

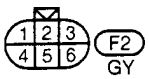
YHA119

Wiring Diagram — A/C — (Cont'd)



Refer to last page (Foldout page).
E104



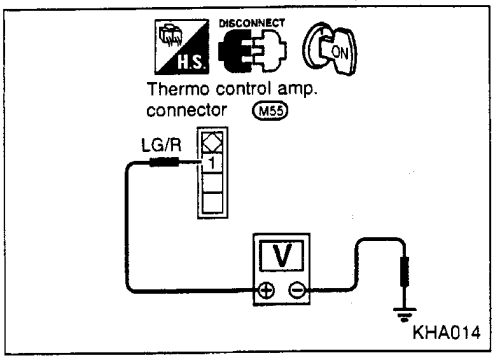


YHA120

Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.
Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.



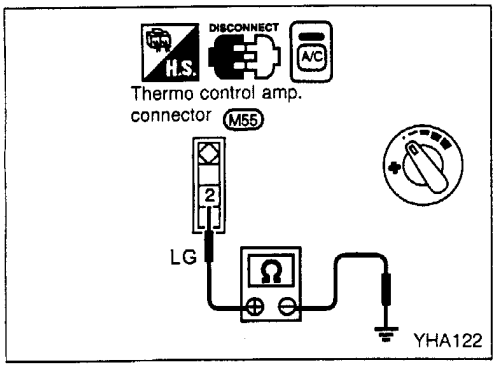
THERMO CONTROL AMP. CHECK

Check power supply circuit for thermo control amp. with ignition switch ON.

1. Disconnect thermo control amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ① and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
①	Body ground	Approx. 12V

If NG, replace 7.5A fuse or repair harness and connectors.



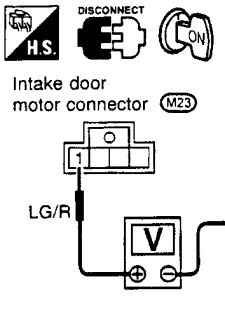
Turn A/C and fan switches ON. Check body ground circuit for thermo control amp.

1. Disconnect thermo control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between Thermo control amp connector terminal No. ② and body ground.

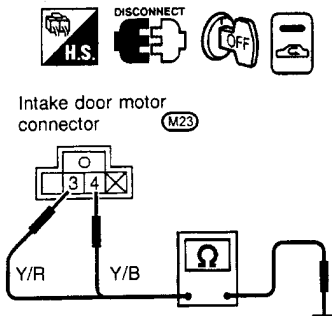
Ohmmeter terminal		Continuity
⊕	⊖	
②	Body ground	Yes

If NG, replace thermo control amp.

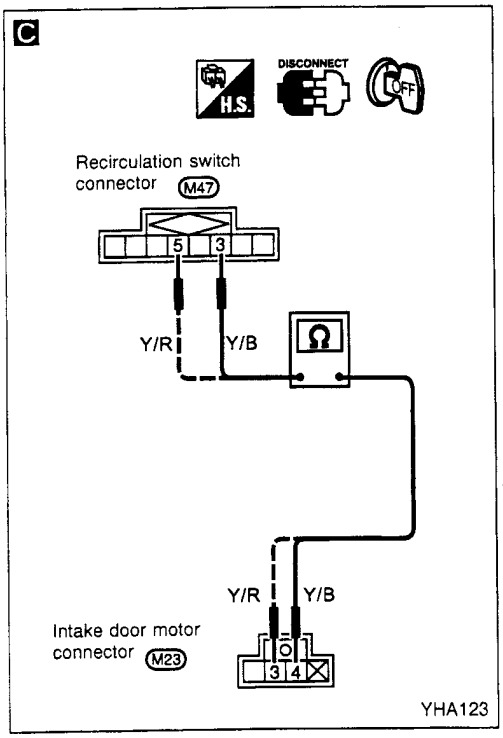
A



B



C



Diagnostic Procedure 2

SYMPTOM: Intake door does not change.

A

CHECK POWER SUPPLY FOR INTAKE DOOR MOTOR.
Disconnect intake door motor harness connector.
- Turn ignition switch "ON".

Does approx. 12 volts exist between intake door motor harness connector terminal No. ① and body ground?

No → Check 7.5A (No. 6) fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.) If NG, replace fuse.

Yes ↓

B

CHECK BODY GROUND CIRCUIT FOR INTAKE DOOR MOTOR.
- Turn ignition switch OFF.
- Turn recirculation switch ON.

Does continuity exist between intake door motor harness connector terminal ③ and body ground?
- Turn recirculation switch OFF.

Does continuity exist between intake door motor harness connector terminal ④ and body ground?

No → Disconnect recirculation switch harness connector.

C

Note: Check continuity between recirculation switch harness connector terminals ⑤ and ③ and intake door motor harness terminals ③ and ④ respectively. **Continuity should exist.** If OK, check harness for short circuit.

OK ↓

Ⓐ (Go to next page.)

Yes ↓

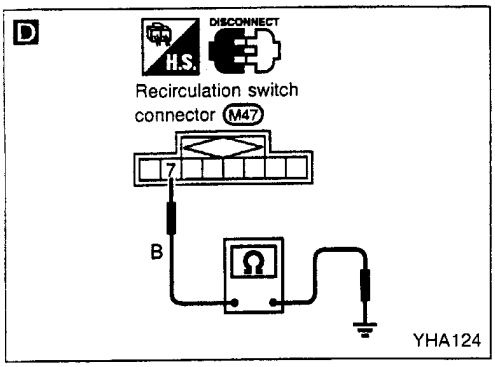
CHECK INTAKE DOOR LINKAGE.
Refer to Control Linkage Adjustment.

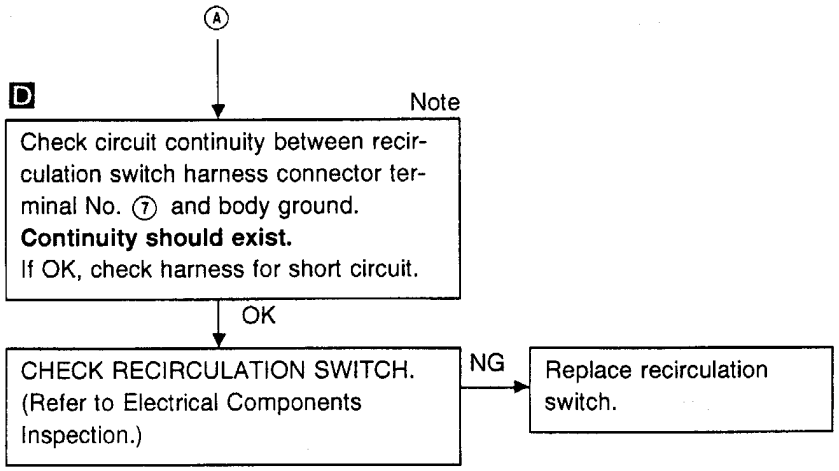
OK ↓

Replace intake door motor.

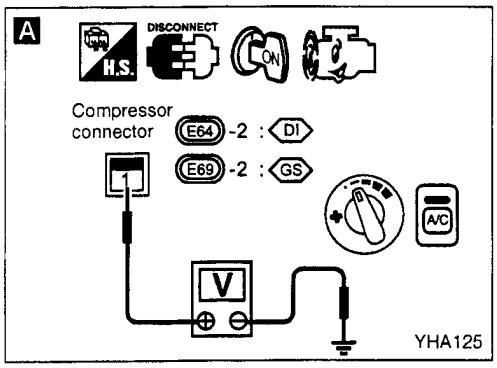
Note:
If the result is NG after checking circuit continuity, repair harness or connector.

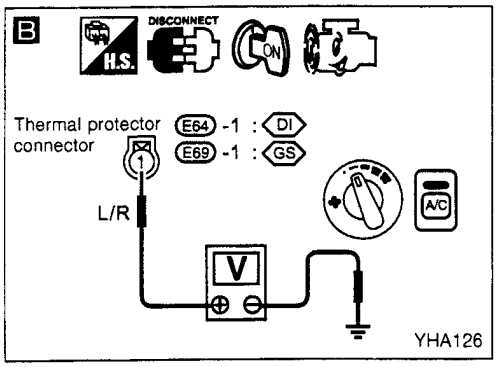
Diagnostic Procedure 2 (Cont'd)

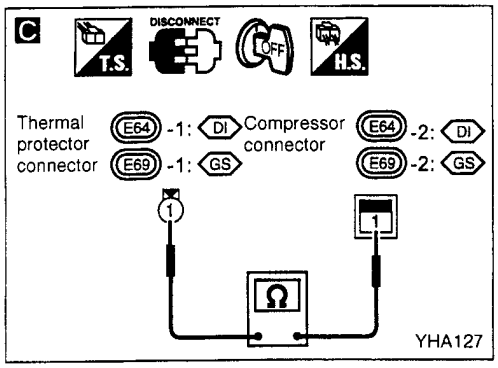


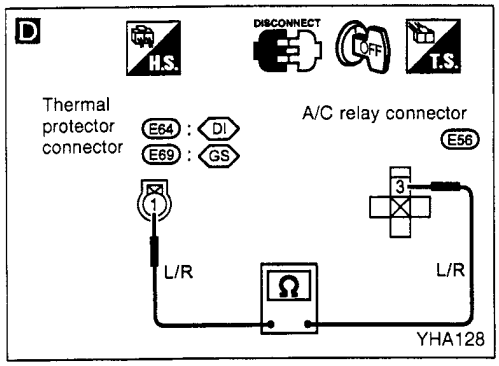


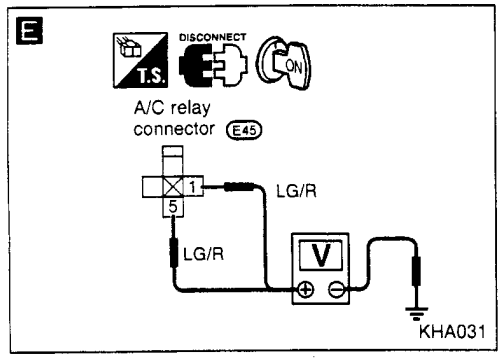
Note:
If the result is NG after checking circuit continuity, repair harness or connector.











Diagnostic Procedure 3

SYMPTOM: Magnet clutch does not engage when A/C switch and fan switch are ON.

- **Perform PRELIMINARY CHECK 1 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR COMPRESSOR.
- Disconnect compressor harness connector.
- Turn ignition switch "ON" and run engine.
- Turn A/C switch and fan switch "ON".

Does approx. 12 volts exist between compressor harness connector terminal ① and body ground?

Yes → Check magnet clutch coil.
NG → Replace magnet clutch. Refer to HA-65, 1021.

No ↓

B

CHECK POWER SUPPLY FOR THERMAL PROTECTOR.
Disconnect thermal protector harness connector.
Does approx. 12V exist between thermal protector harness terminal ① and body ground?

Yes → **C**

CHECK THERMAL PROTECTOR.
- Turn ignition switch "OFF".

Check circuit continuity between thermal protector harness connector terminal ① and compressor harness terminal ①.
Continuity should exist.
If OK, check harness for short circuit.

NG → Replace thermal protector.

No ↓

Disconnect A/C relay. ↓

D

Note
- Turn ignition switch "OFF".

CHECK CIRCUIT CONTINUITY BETWEEN A/C RELAY HARNESS CONNECTOR TERMINAL ③ AND THERMAL PROTECTOR HARNESS CONNECTOR TERMINAL ①.
Continuity should exist.
If OK, check harness for short circuit.

OK ↓

E

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
- Turn ignition switch "ON".

Does approx. 12 volts exist between A/C relay harness terminals ①, ⑤ and body ground?

No → CHECK POWER SUPPLY CIRCUIT AND 7.5A (No. 6) FUSES AT FUSE BLOCK.
Refer to EL section ("Wiring Diagram", "POWER SUPPLY ROUTING").
If NG, replace 7.5A fuse.

Yes ↓

CHECK A/C RELAY AFTER DISCONNECTING IT.

NG → Replace A/C relay.

OK ↓

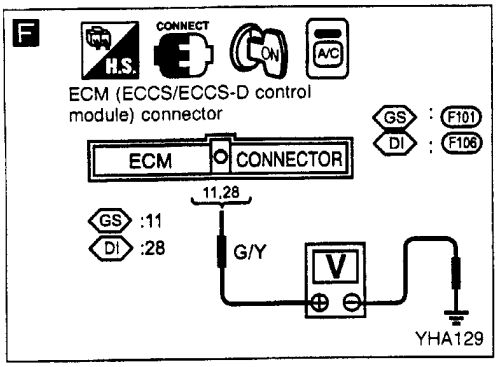
Ⓐ

DI : Diesel engine models
GS : Gasoline engine models

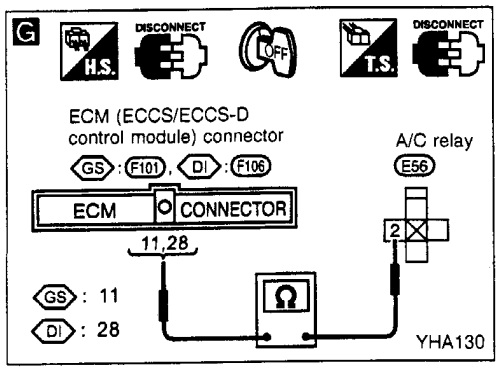
Note:
If the result is NG after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 3 (Cont'd)

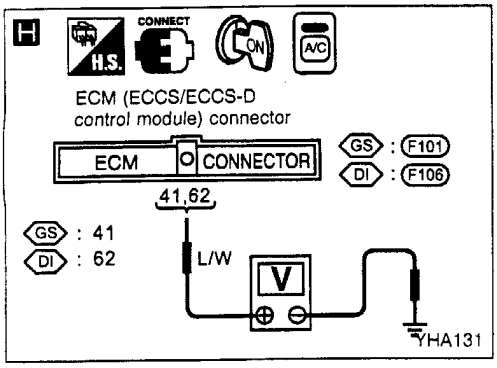
F



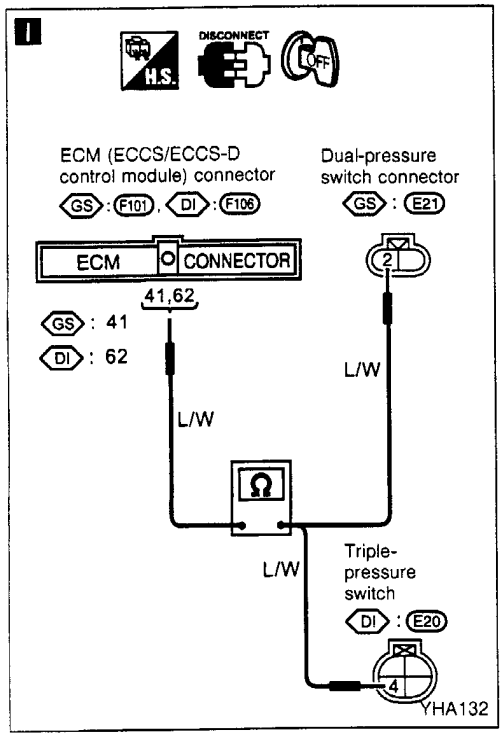
G



H



I



Ⓐ

Reconnect A/C relay.

F

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Does approx. 12 volts exist between ECM (ECCS/ECCS-D control module) harness connector terminal ⑪ or ㉘ and body ground?

No → ● Turn ignition switch "OFF". Disconnect A/C relay. Disconnect ECM (ECCS/ECCS-D control module) harness connector.

Yes

G — Note

CHECK CIRCUIT CONTINUITY BETWEEN A/C RELAY HARNESS TERMINAL ② AND ECM (ECCS/ECCS-D CONTROL MODULE) HARNESS TERMINAL ⑪ or ㉘.
Continuity should exist.
If OK, check harness for short circuit.
If NG, check connectors.

H

● Turn A/C switch "OFF".
CHECK VOLTAGE FOR ECM (ECCS/ECCS-D control module).
Does approx. 12 volts exist between ECM (ECCS/ECCS-D control module) harness connector terminals ㊶, or ㊷ and body ground?

No → CHECK ECM (ECCS/ECCS-D control module). Refer to EC section.

Yes

Disconnect ECM (ECCS/ECCS-D control module) harness connector.
Disconnect dual-pressure/triple-pressure switch harness connector.

I — Note

CHECK CIRCUIT CONTINUITY BETWEEN ECM (ECCS/ECCS-D CONTROL MODULE) HARNESS TERMINAL ㊶ or ㊷ AND DUAL/PRESSURE SWITCH HARNESS CONNECTOR TERMINAL ② or TRIPLE-PRESSURE SWITCH HARNESS CONNECTOR TERMINAL ④.
Continuity should exist.
If OK, check harness for short-circuit.
If NG, check harness connectors.

OK

CHECK DUAL/TRIPLE-PRESSURE SWITCH.

NG → Replace dual/triple-pressure switch.

OK

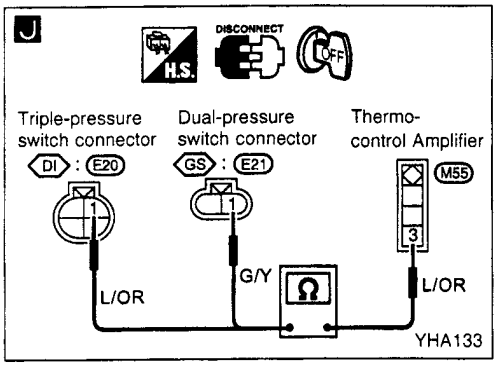
Disconnect thermo control amp. harness connector.

Ⓑ

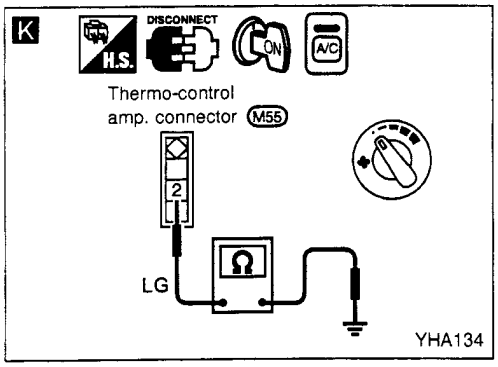
DI : Diesel engine models
GS : Gasoline engine models

Diagnostic Procedure 3 (Cont'd)

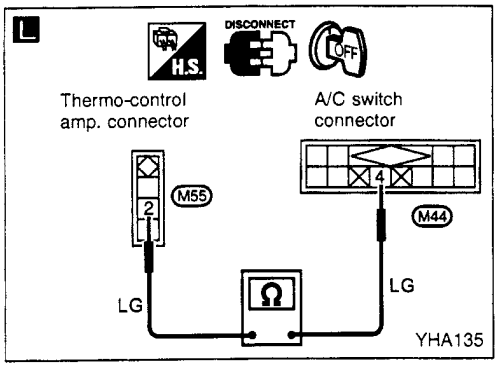
J



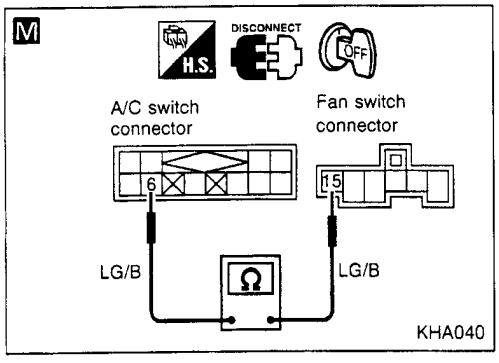
K



L



M



Ⓑ

J Note

CHECK CIRCUIT CONTINUITY BETWEEN DUAL-PRESSURE SWITCH CONNECTOR TERMINAL ① (Gasoline engines) / TRIPLE-PRESSURE SWITCH CONNECTOR TERMINAL ① (Diesel engines) and THERMO-CONTROL AMP. HARNESS CONNECTOR TERMINAL.
Continuity should exist.
If OK, check harness for short-circuit.
If NG check harness connectors (M17) and (E101).

OK ↓

Reconnect thermo-control amp. harness connector.

Note

CHECK POWER SUPPLY FOR THERMO-CONTROL AMP.
Refer to HA-2010.

K

CHECK BODY GROUND CIRCUIT FOR THERMO CONTROL AMP.
- Turn ignition switch "OFF".
- Disconnect thermo-control amp. harness connector.
- Turn A/C switch "ON"
- Turn fan switch "ON"

Does continuity exist between thermo-control amp. harness connector terminal ② and body ground?

Yes → Replace thermo-control amp.

No ↓

Disconnect A/C switch harness connector.

L Note

CHECK CIRCUIT CONTINUITY BETWEEN THERMO-CONTROL AMP. HARNESS CONNECTOR TERMINAL ② AND A/C SWITCH HARNESS CONNECTOR TERMINAL ④.
Continuity should exist.
If OK, check harness for short-circuit.

OK ↓

CHECK A/C SWITCH.

NG → Replace A/C switch.

OK ↓

Disconnect fan switch harness connector.

M Note

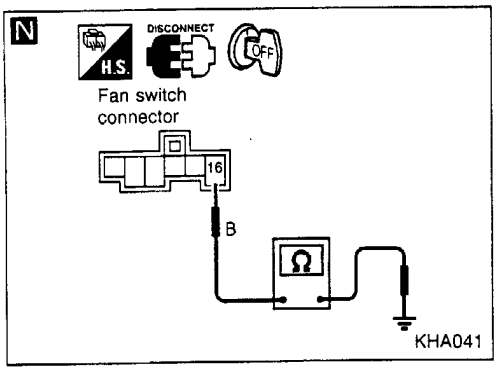
CHECK CIRCUIT CONTINUITY BETWEEN A/C SWITCH HARNESS CONNECTOR TERMINAL ⑥ AND FAN SWITCH HARNESS CONNECTOR TERMINAL ⑮.
Continuity should exist.

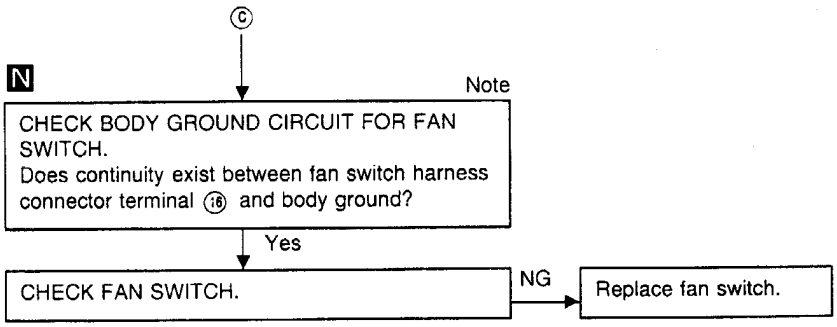
OK ↓

Ⓒ

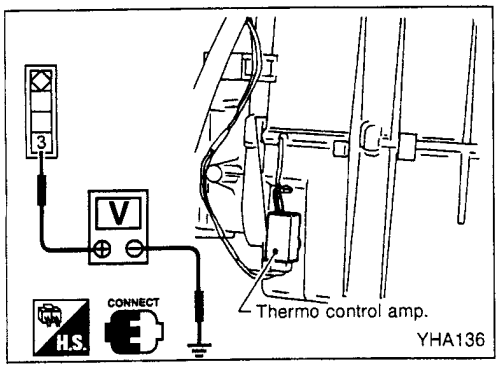
Note:
If the result is NG or No after checking circuit continuity, repair harness or connector.

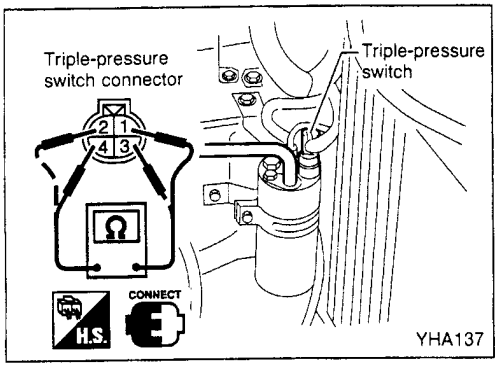
Diagnostic Procedure 3 (Cont'd)





Note:
If the result is No after checking circuit continuity, repair harness or connector.





Electrical Components Inspection

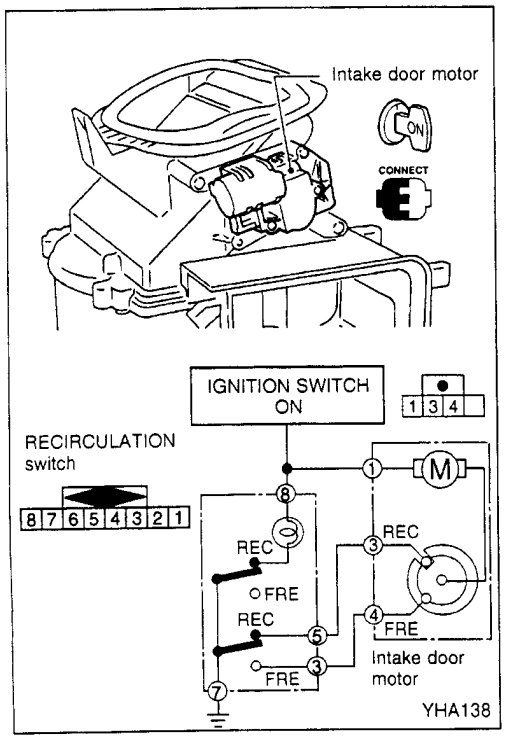
THERMO CONTROL AMP.

1. Run engine, and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

Evaporator outlet air temperature °C (°F)	Thermo amp. operation	Tester
Decreasing to 2.5 - 3.5 (37 - 38)	Turn OFF	Approx. 12V
Increasing to 4.0 - 5.0 (39 - 41)	Turn ON	Approx. 0V

TRIPLE-PRESSURE SWITCH

Connector terminal No's:	ON kg/cm² (kPa, psi)	OFF kg/cm² (kPa, psi)
Low-pressure side ③ - ②	Increasing to 1.6 - 2.3 (157 - 226, 23 - 33)	Decreasing to 1.55 - 2.05 (152.0 - 201.0, 22.0 - 29.2)
Middle-pressure ① - ④ (For fan motor operation)	Increasing to 15 - 17 (1471 - 1669, 213 - 242)	Decreasing to 12 - 14 (1177 - 1373, 171 - 199)
High-pressure side ③ - ②	Decreasing to 19 - 25 (1863 - 2452, 270 - 356)	Increasing to 27 - 29 (2648 - 2844, 384 - 412)



System Description

INTAKE DOOR MOTOR

The intake door motor is installed on the intake unit. Using a link it opens and closes the intake door.
When RECIRCULATION switch is ON, the ground line of the intake door motor is switched from terminal ④ to ③. When RECIRCULATION switch is OFF, the ground line of the intake door motor is switched from terminal ③ to ④. The internal contacts of the intake door motor turn with the motor, when they reach the limit position the contacts disengage and current ceases to flow so that the motor will stop. The motor always turns in the same direction.

ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**

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".

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HEATER AND AIR CONDITIONER ..... **HA SECTION**

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and, where fitted, on the instrument panel on the passenger side), seat belt pre-tensioners, 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.**
- **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.**

Description

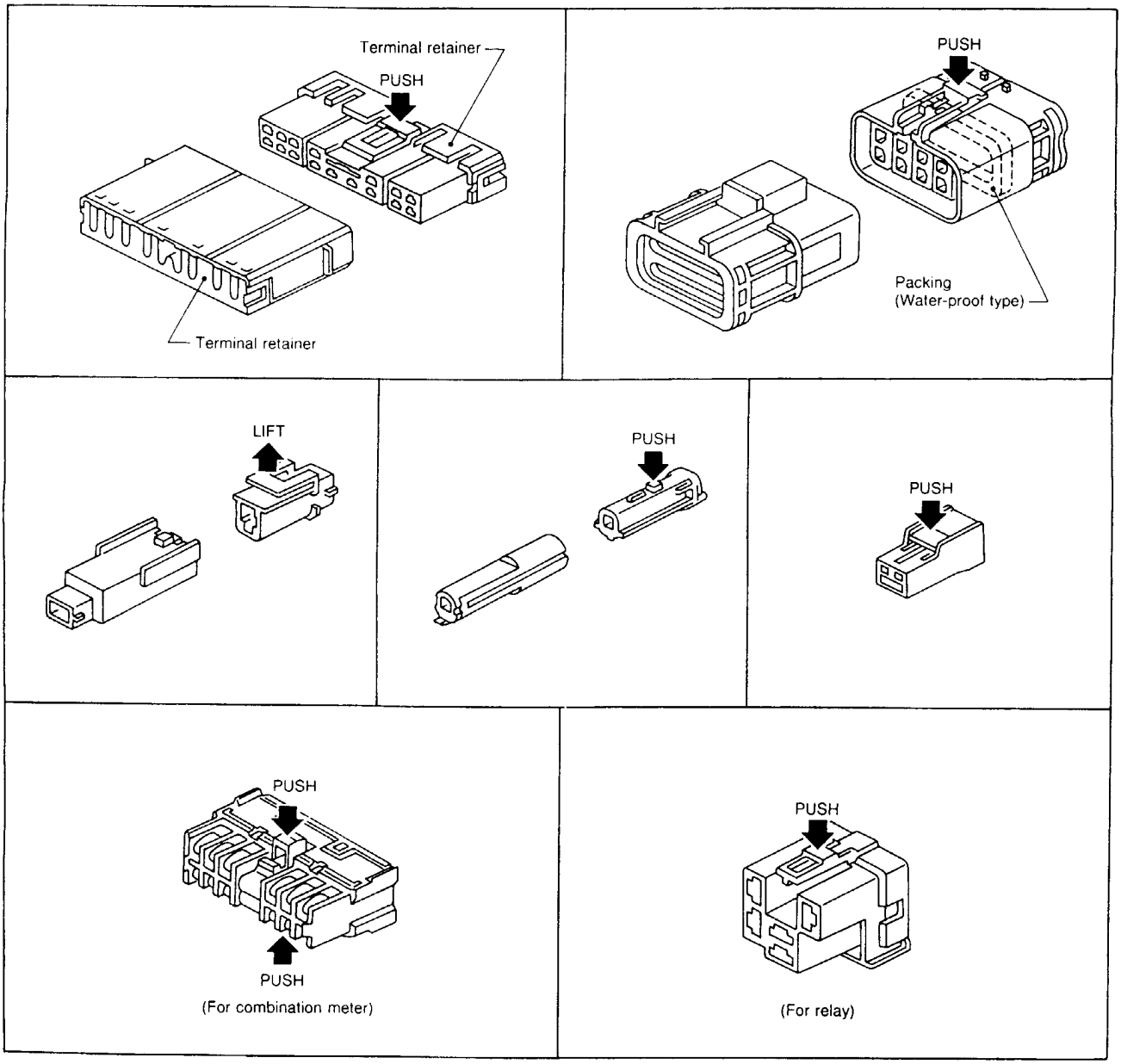
HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental looseness or disconnection.
- The connector can be disconnected by pushing or lifting the locking section.

CAUTION:

Do not pull the harness when disconnecting the connector.

[Example]

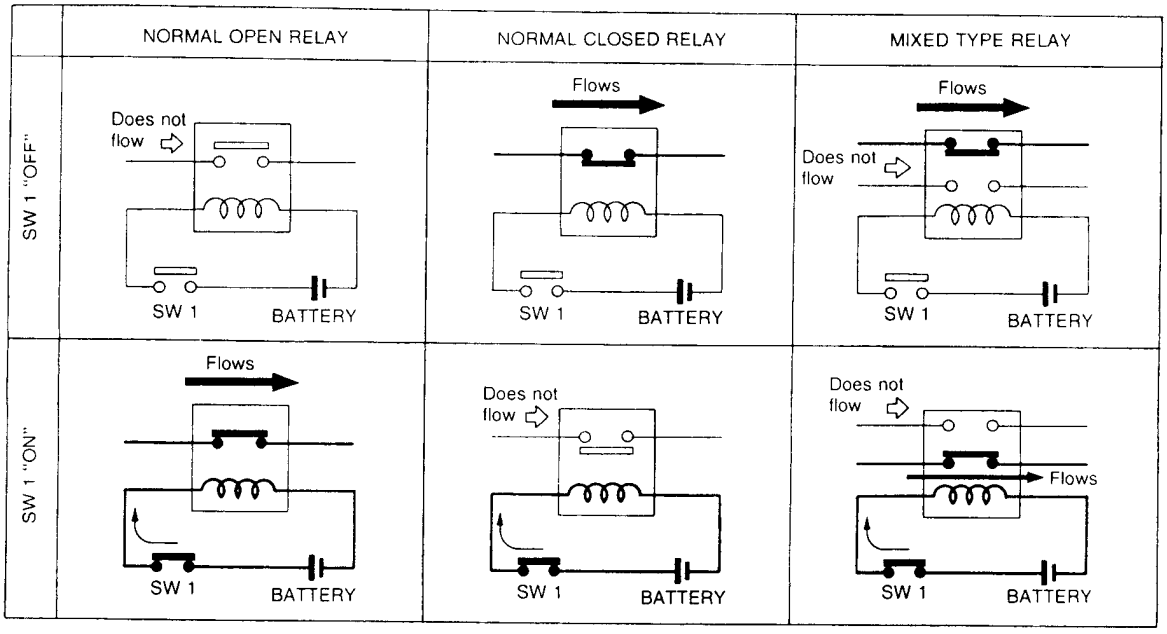


SEL769D

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

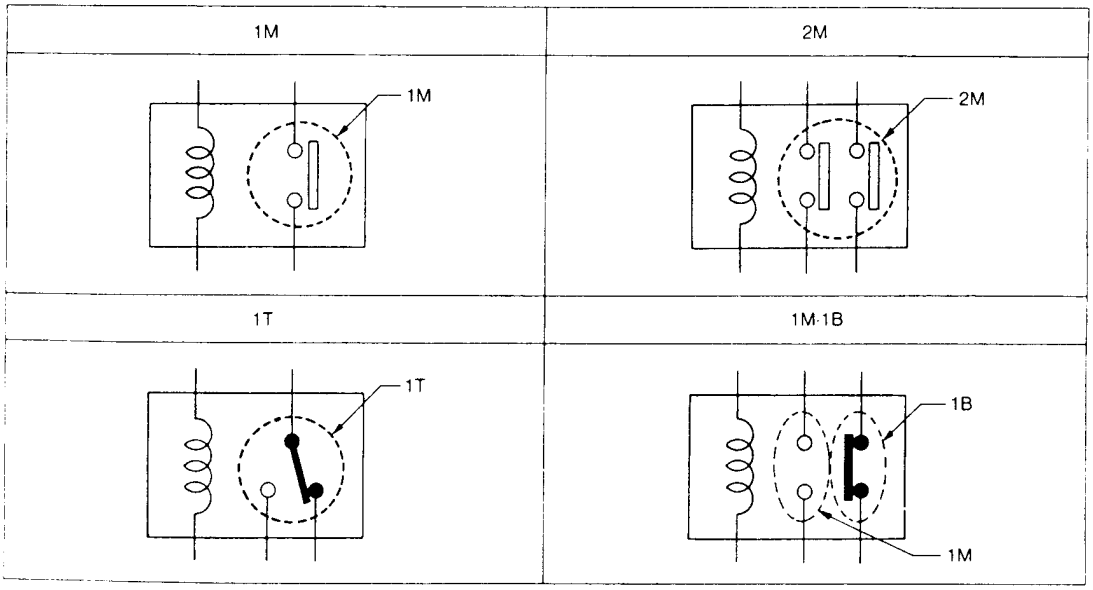
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

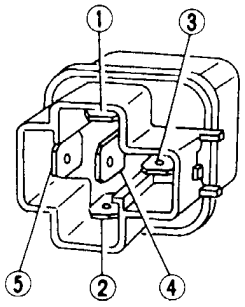
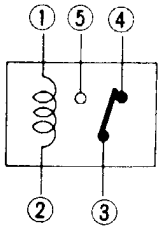
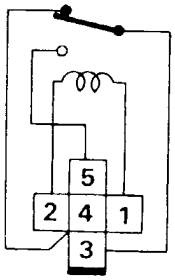
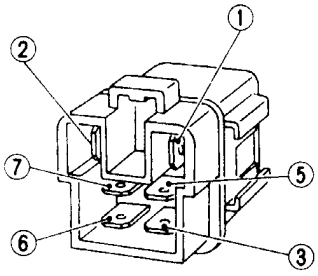
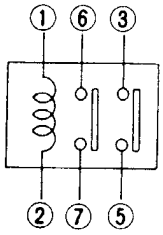
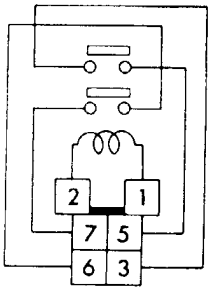
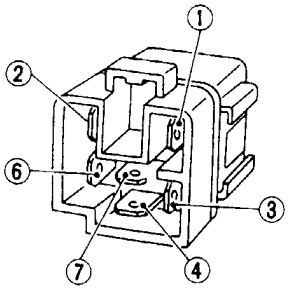
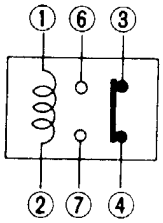
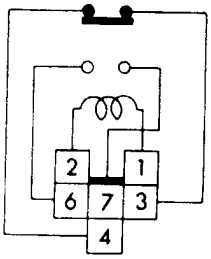
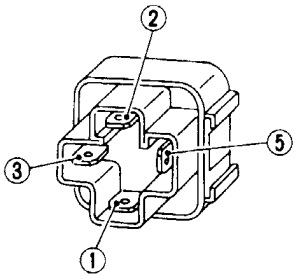
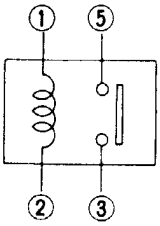
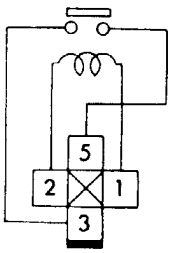
TYPE OF STANDARDIZED RELAYS

1M	.....	1 Make	2M	.....	2 Make
1T	.....	1 Transfer	1M·1B	.....	1 Make 1 Break



SEL882H

Description (Cont'd)

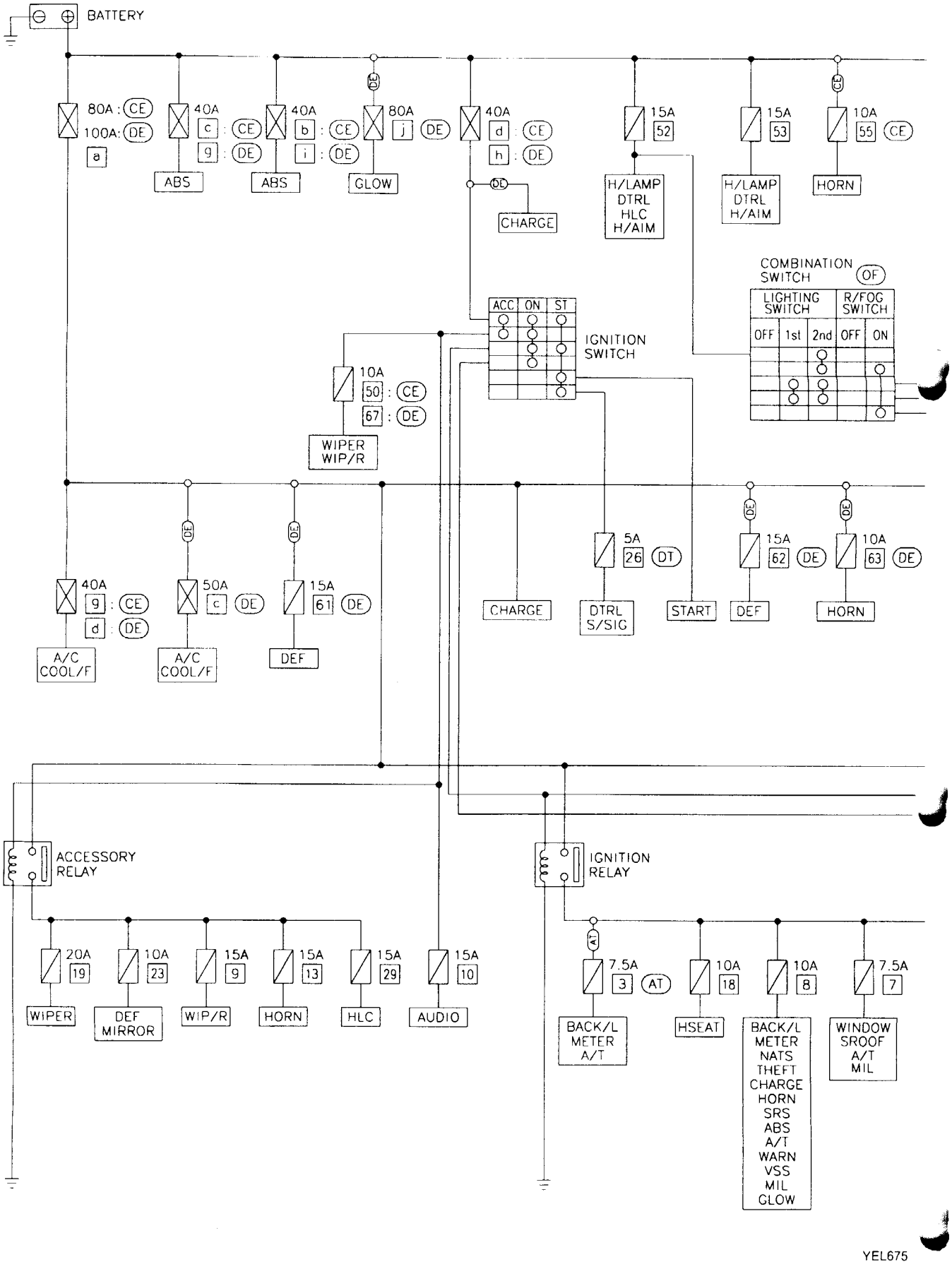
Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
2M				BROWN
1M-1B				GRAY
1M				BLUE

The arrangement of terminal numbers on the actual relays may differ from those shown above.

SEL661TA

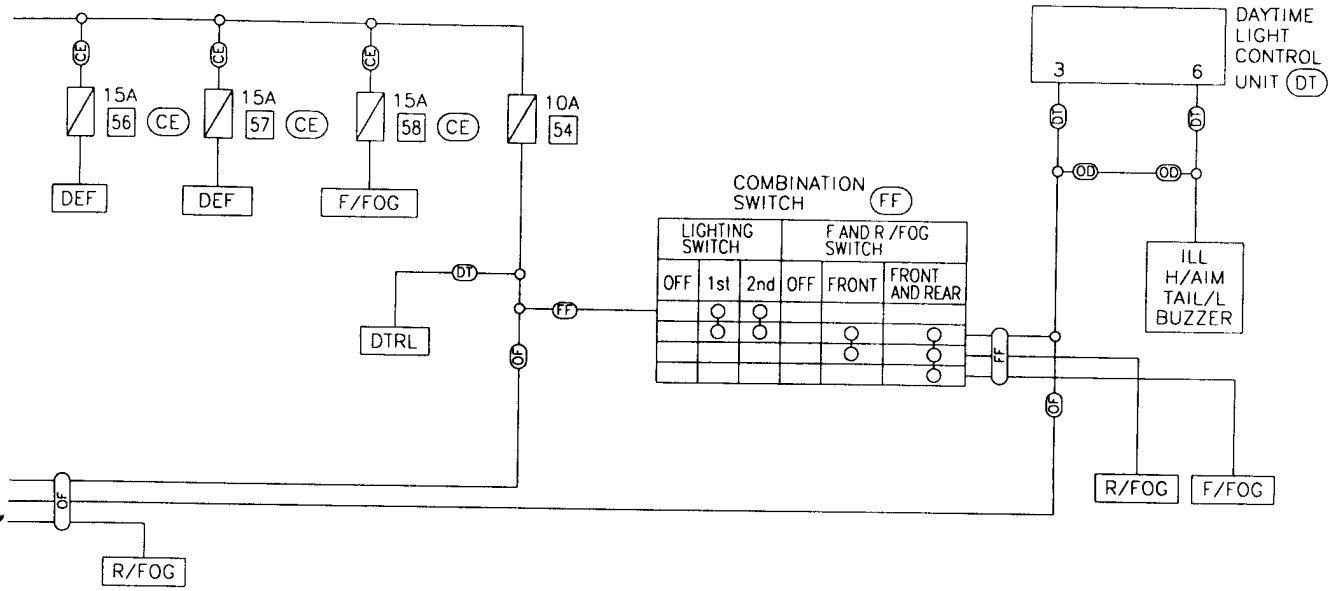
Note

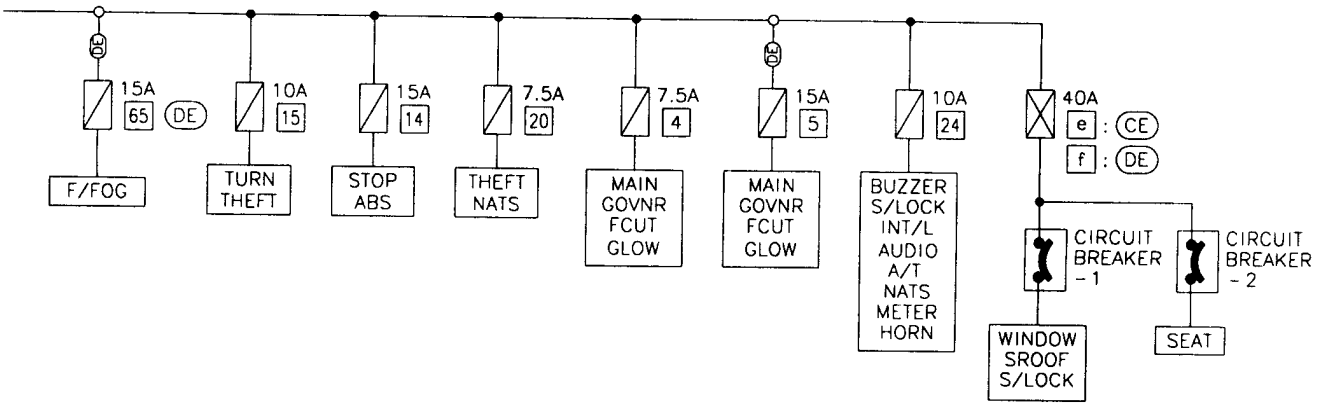
Schematic

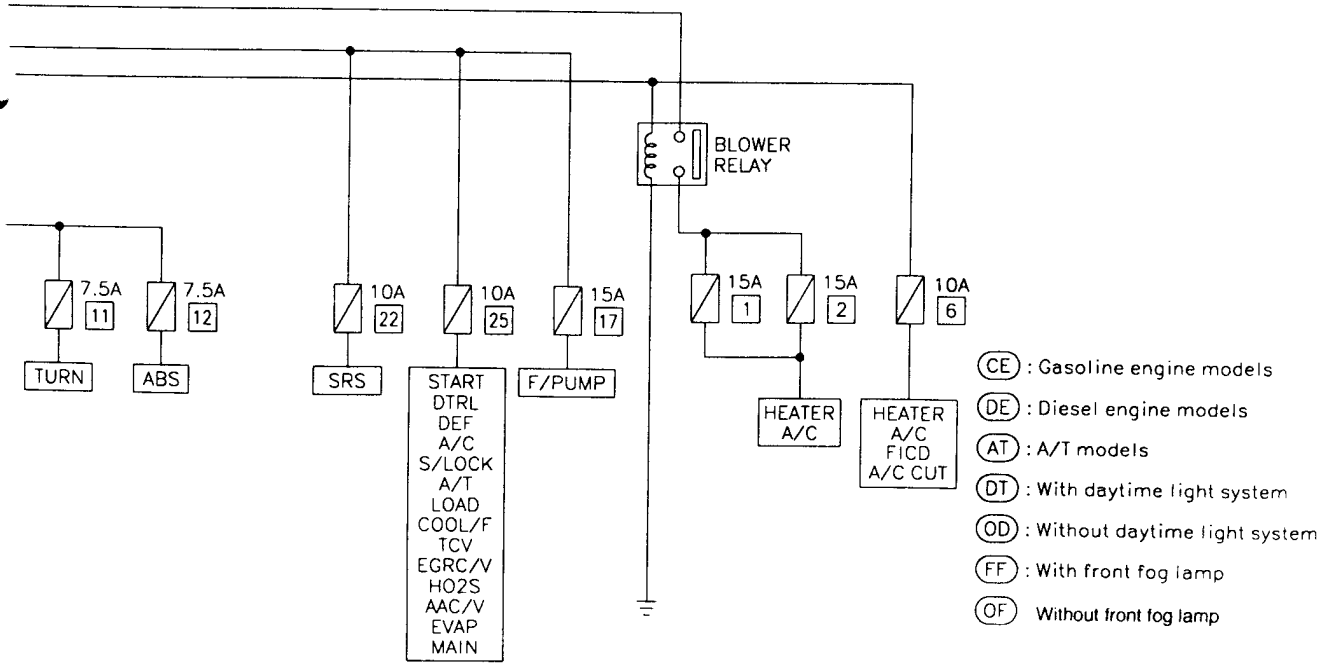


YEL675

Schematic (Cont'd)





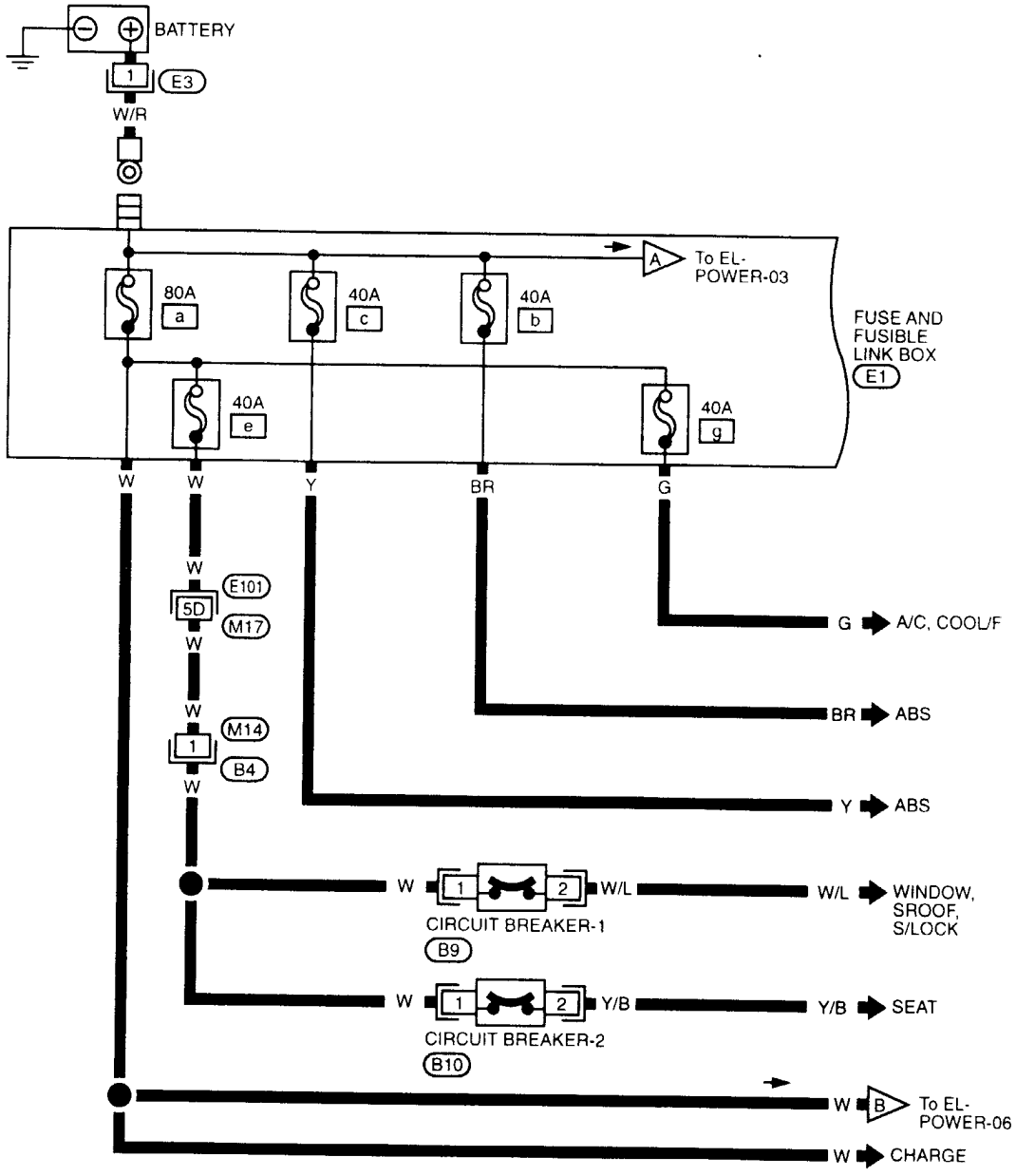


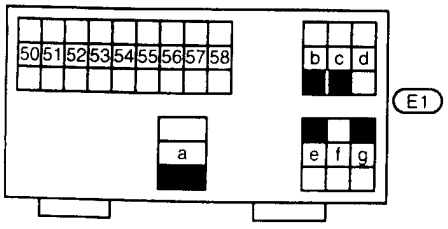
YEL676

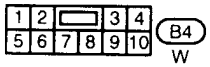
Wiring Diagram — POWER —

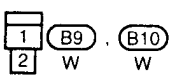
GASOLINE ENGINE MODELS

EL-POWER-01









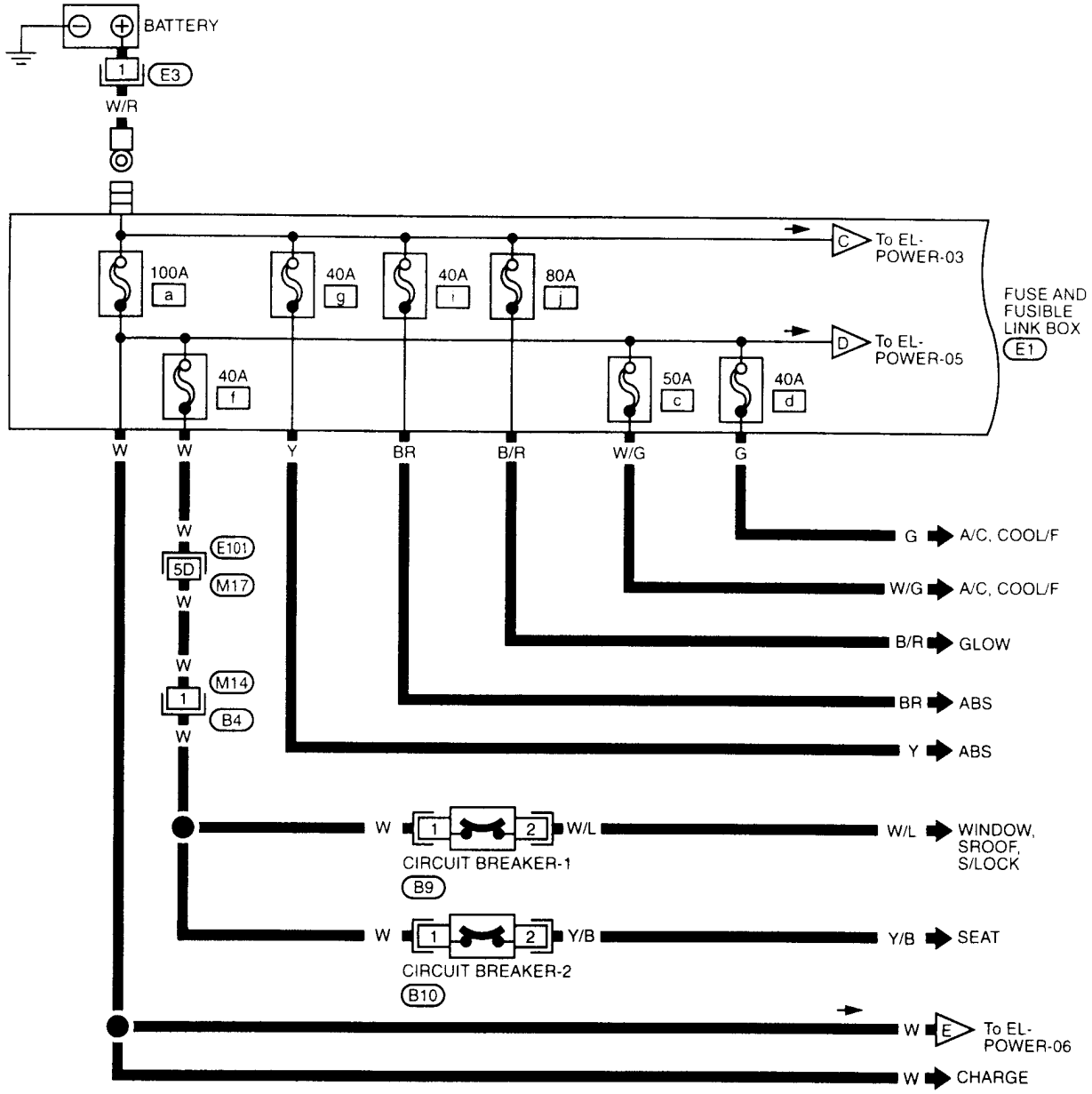
Refer to last page (Foldout page).
M17 , E101

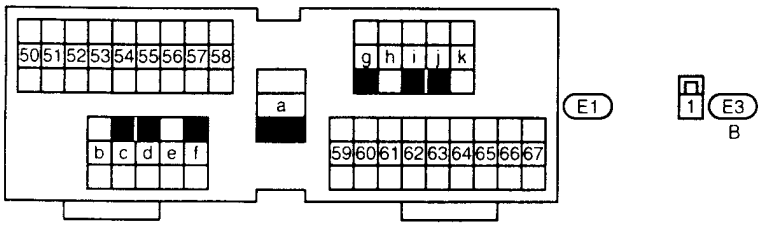
YEL661

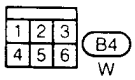
Wiring Diagram — POWER — (Cont'd)

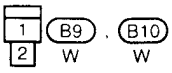
DIESEL ENGINE MODELS

EL-POWER-02







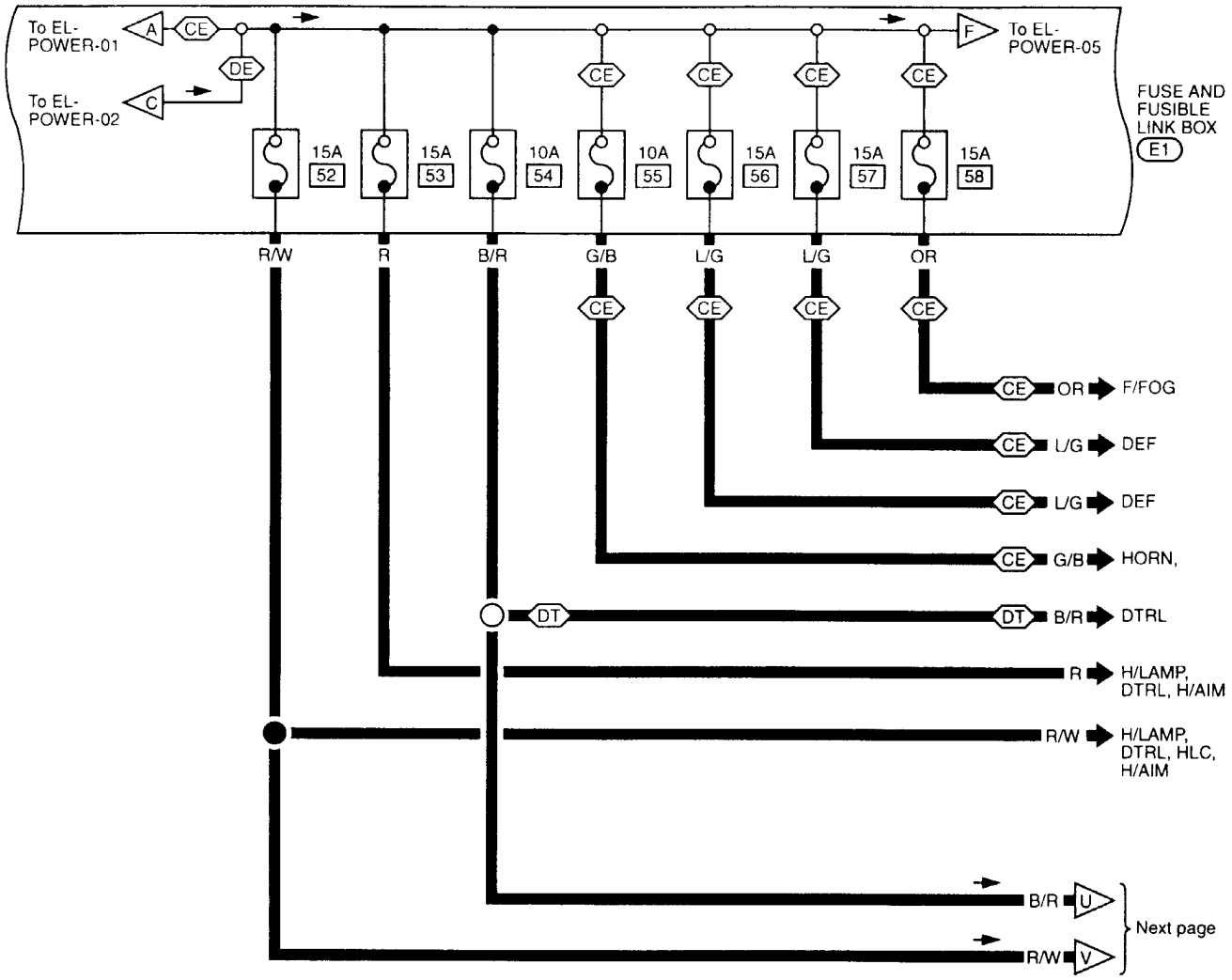


Refer to last page (Foldout page)
M17 , E101

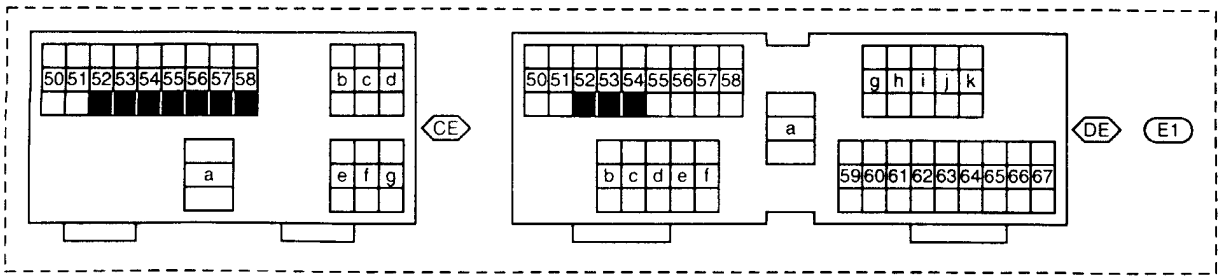
YEL662

Wiring Diagram — POWER — (Cont'd)

EL-POWER-03



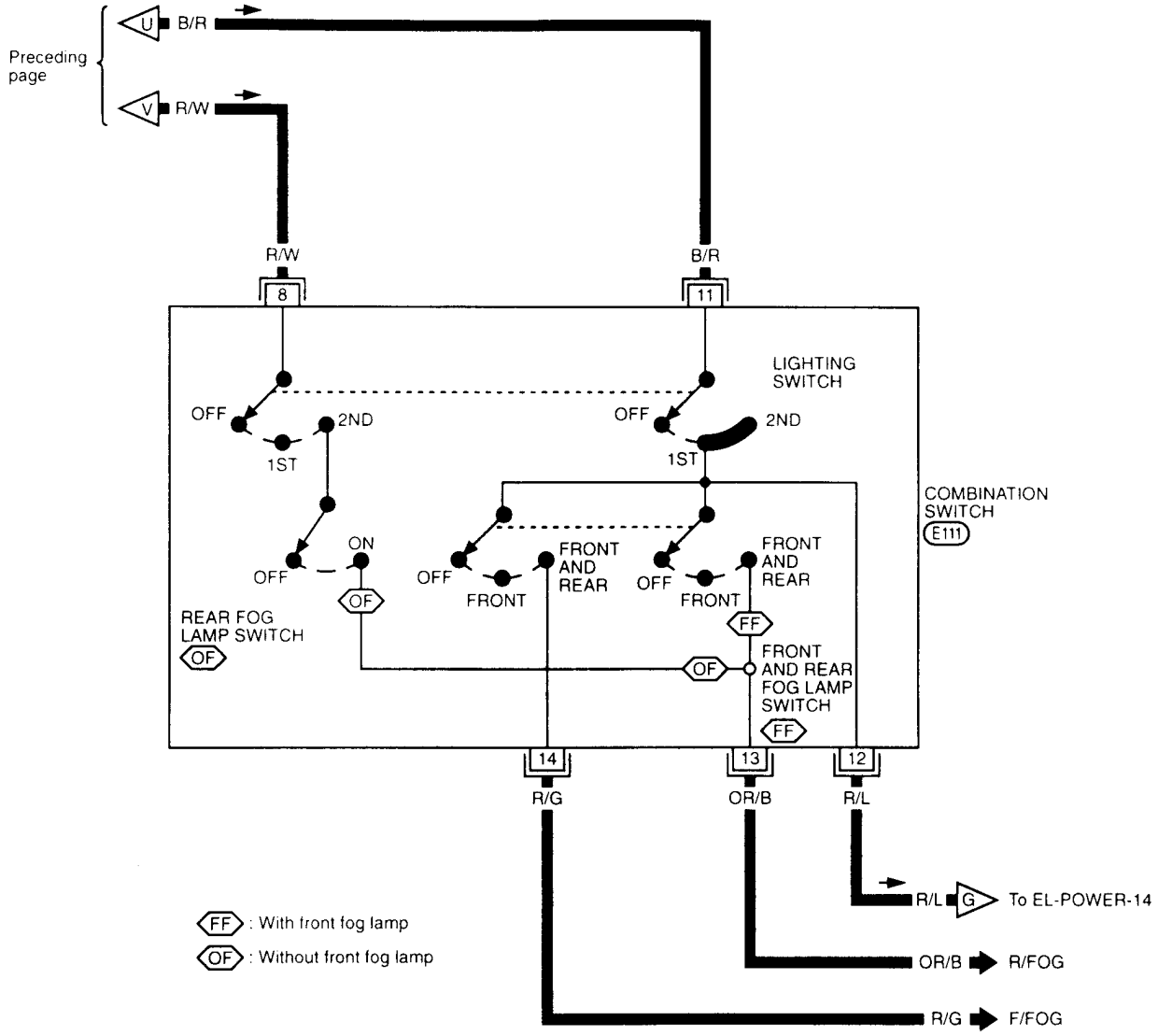
CE : Gasoline engine models
DE : Diesel engine models
DT : With daytime light system

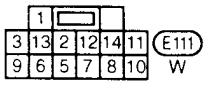


YEL663

Wiring Diagram — POWER — (Cont'd)

EL-POWER-04

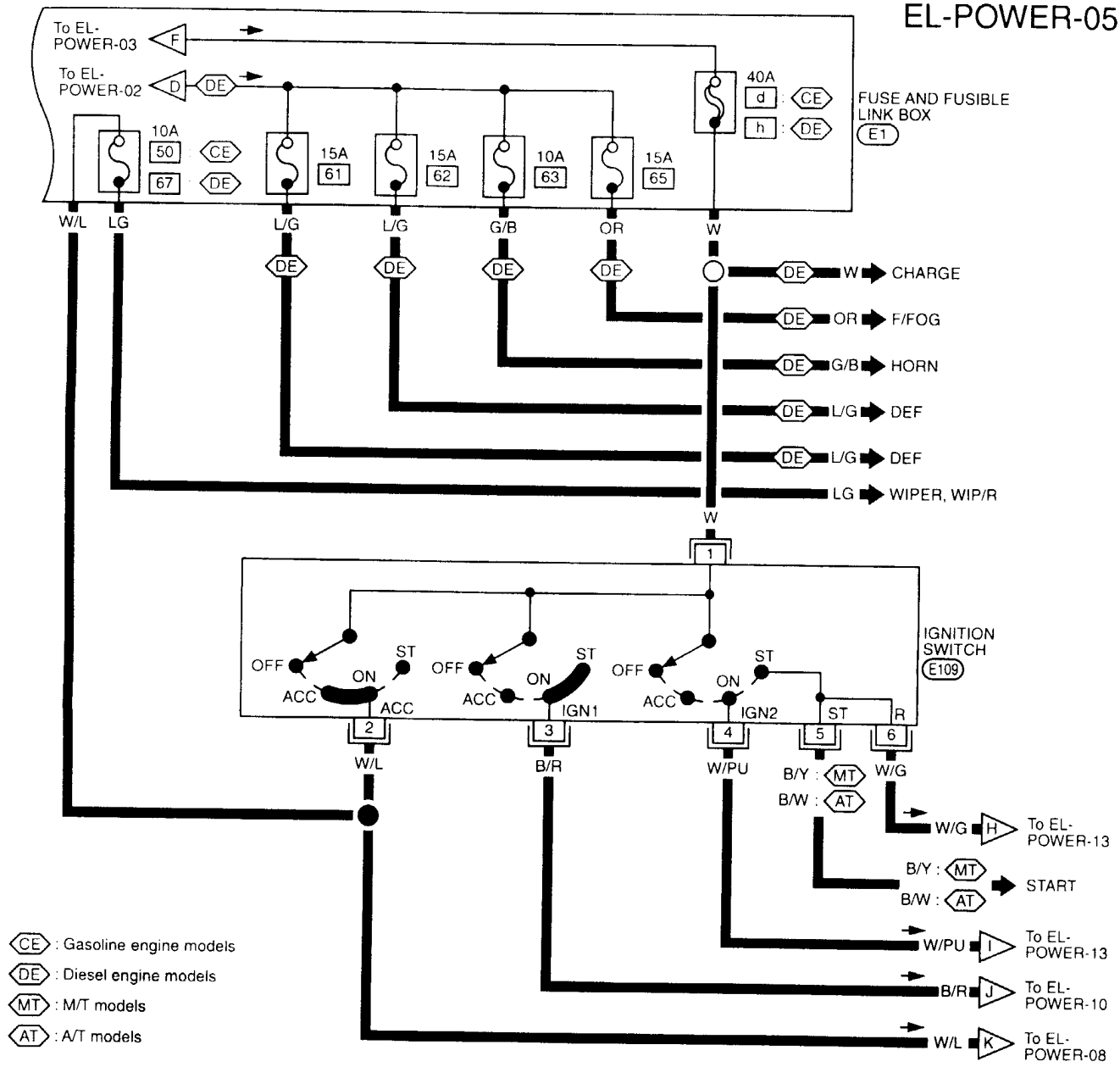


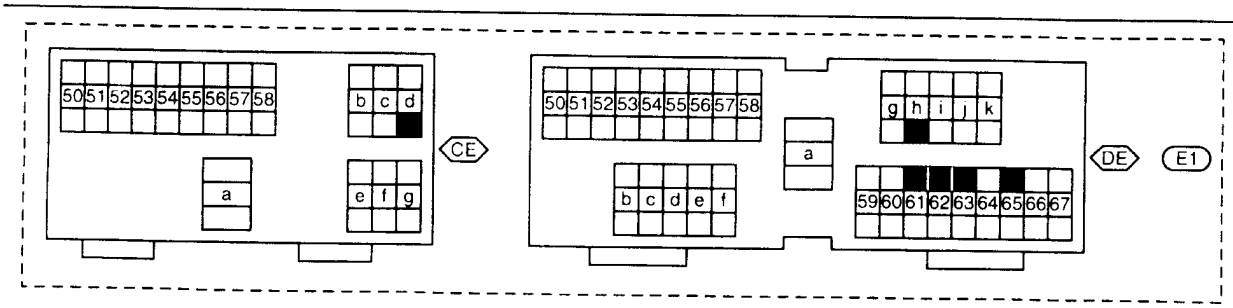


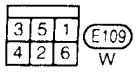
YEL664

Wiring Diagram — POWER — (Cont'd)

EL-POWER-05



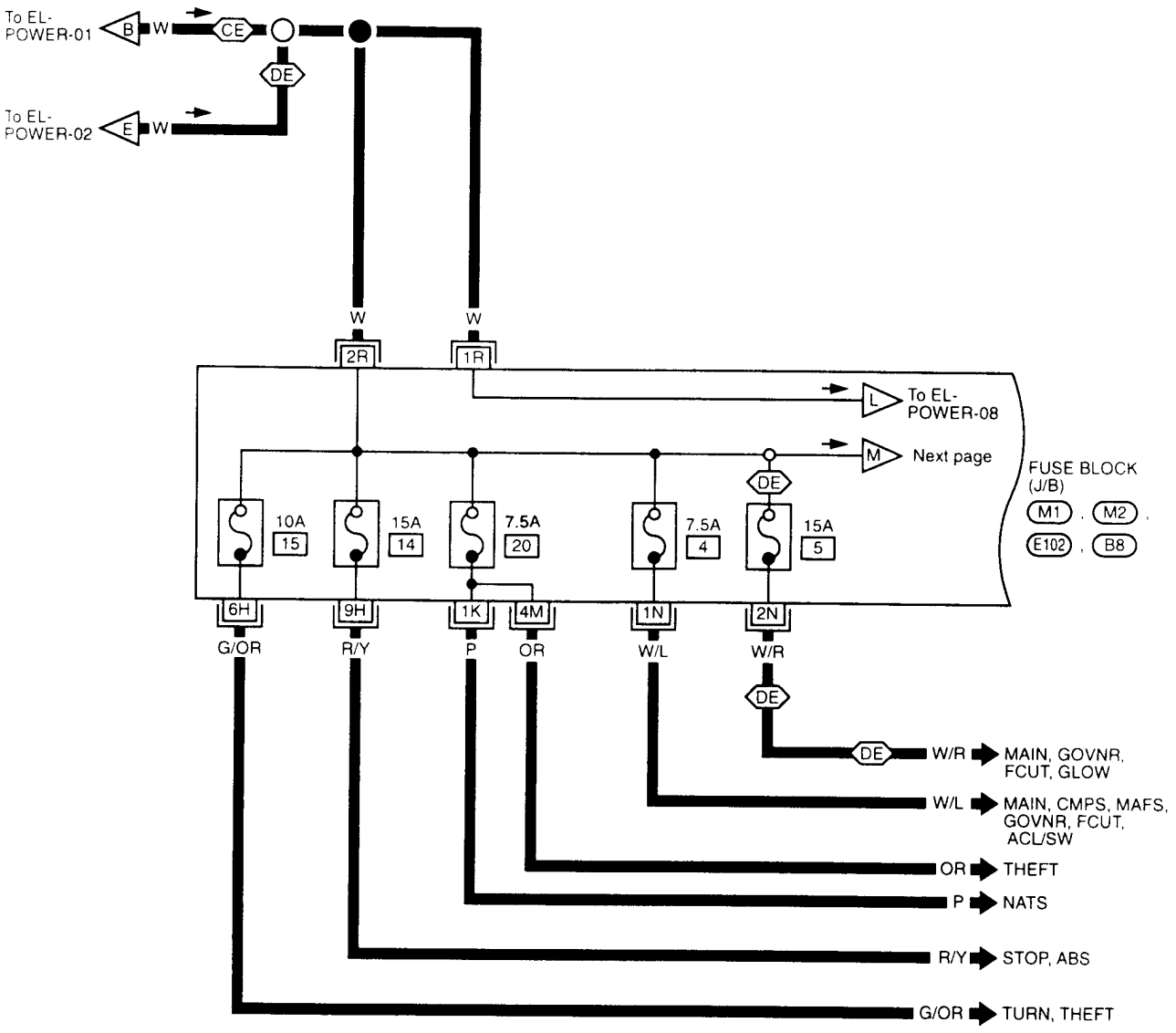




YEL665

Wiring Diagram — POWER — (Cont'd)

EL-POWER-06



CE : Gasoline engine models

DE : Diesel engine models

Refer to last page (Foldout page).

M1

M2

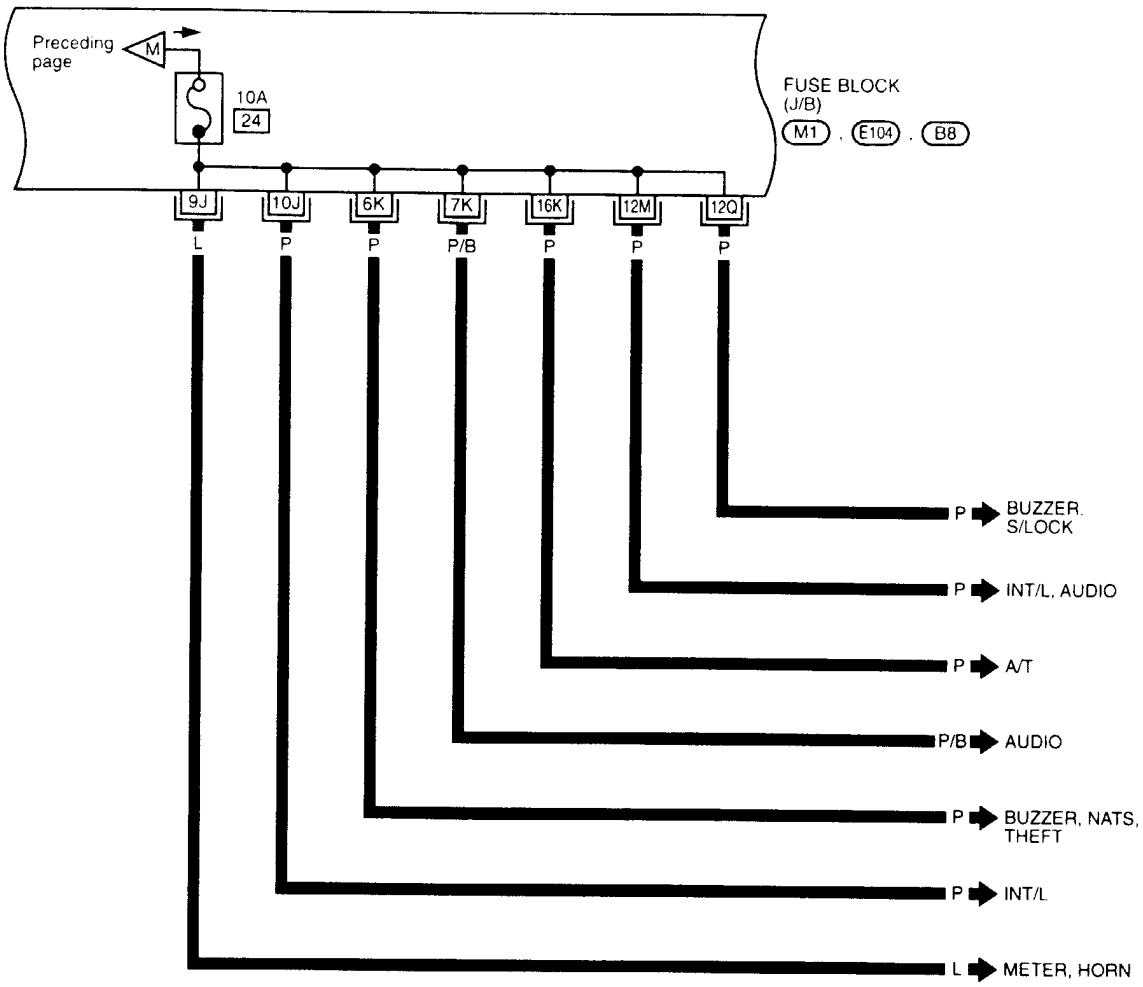
E102

B8

YEL666

Wiring Diagram — POWER — (Cont'd)

EL-POWER-07



Refer to last page (Foldout page).

M1

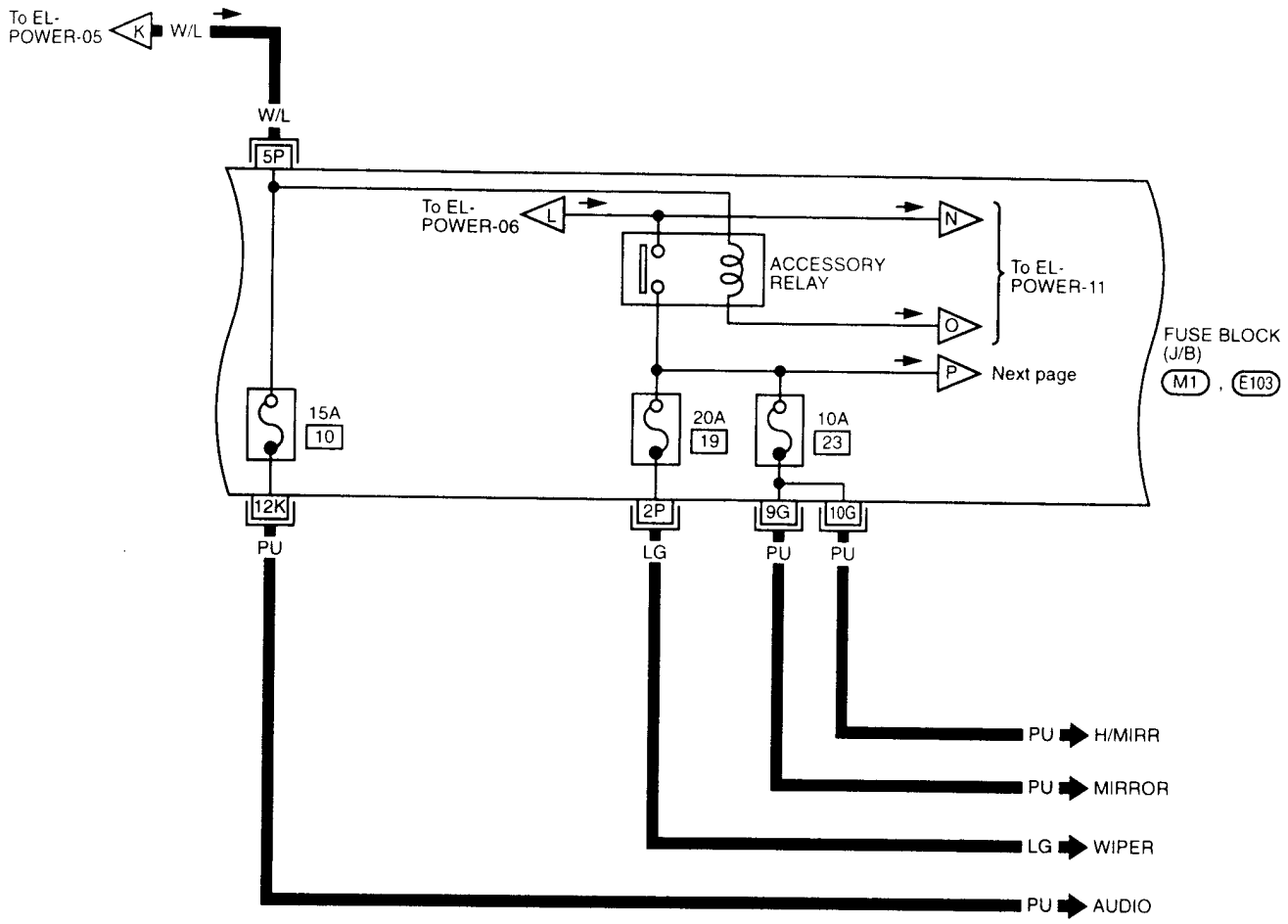
E104

B8

YEL667

Wiring Diagram — POWER — (Cont'd)

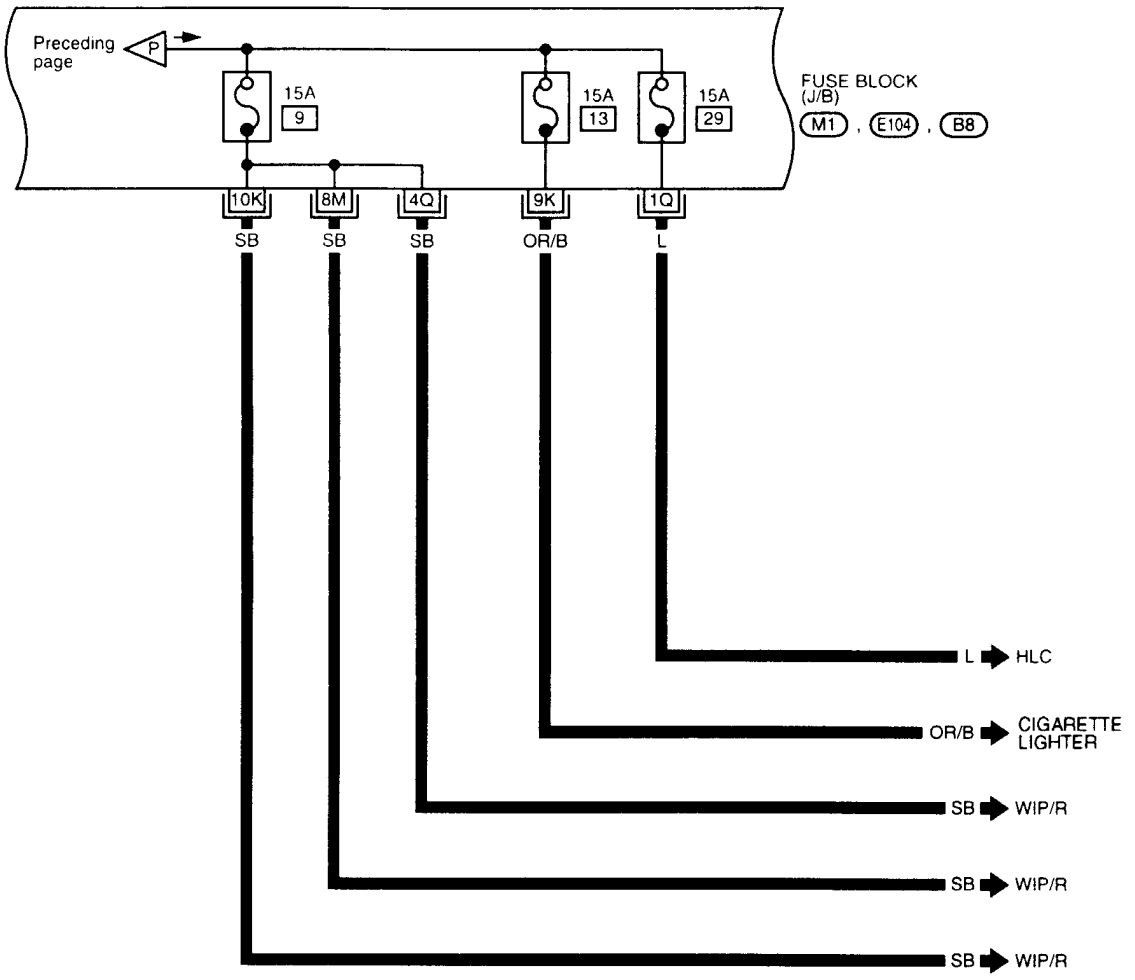
EL-POWER-08



Refer to last page (Foldout page).
M1
E103

YEL668

EL-POWER-09

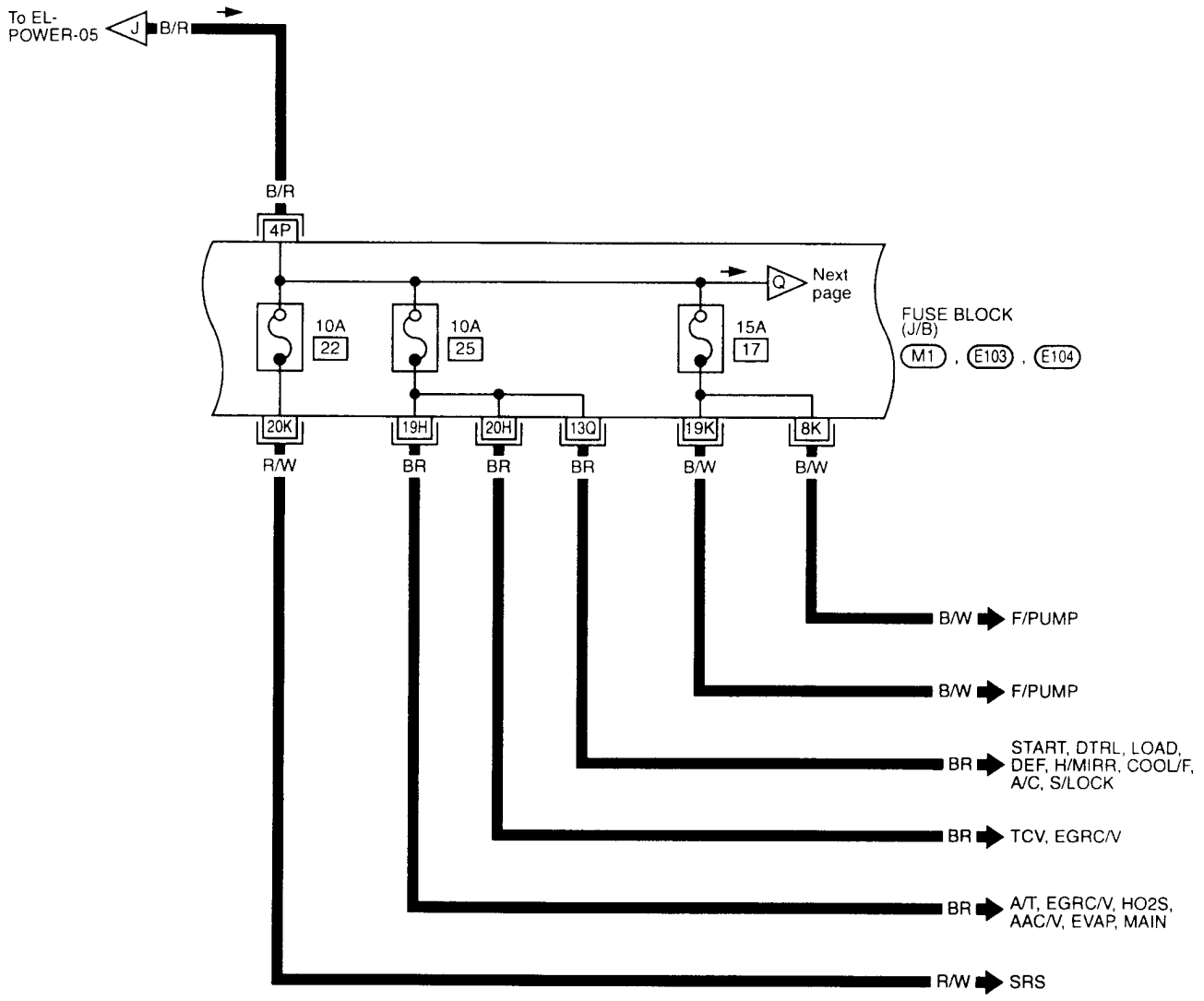


Refer to last page (Foldout page).
M1
E104
B8

YEL669

Wiring Diagram — POWER — (Cont'd)

EL-POWER-10

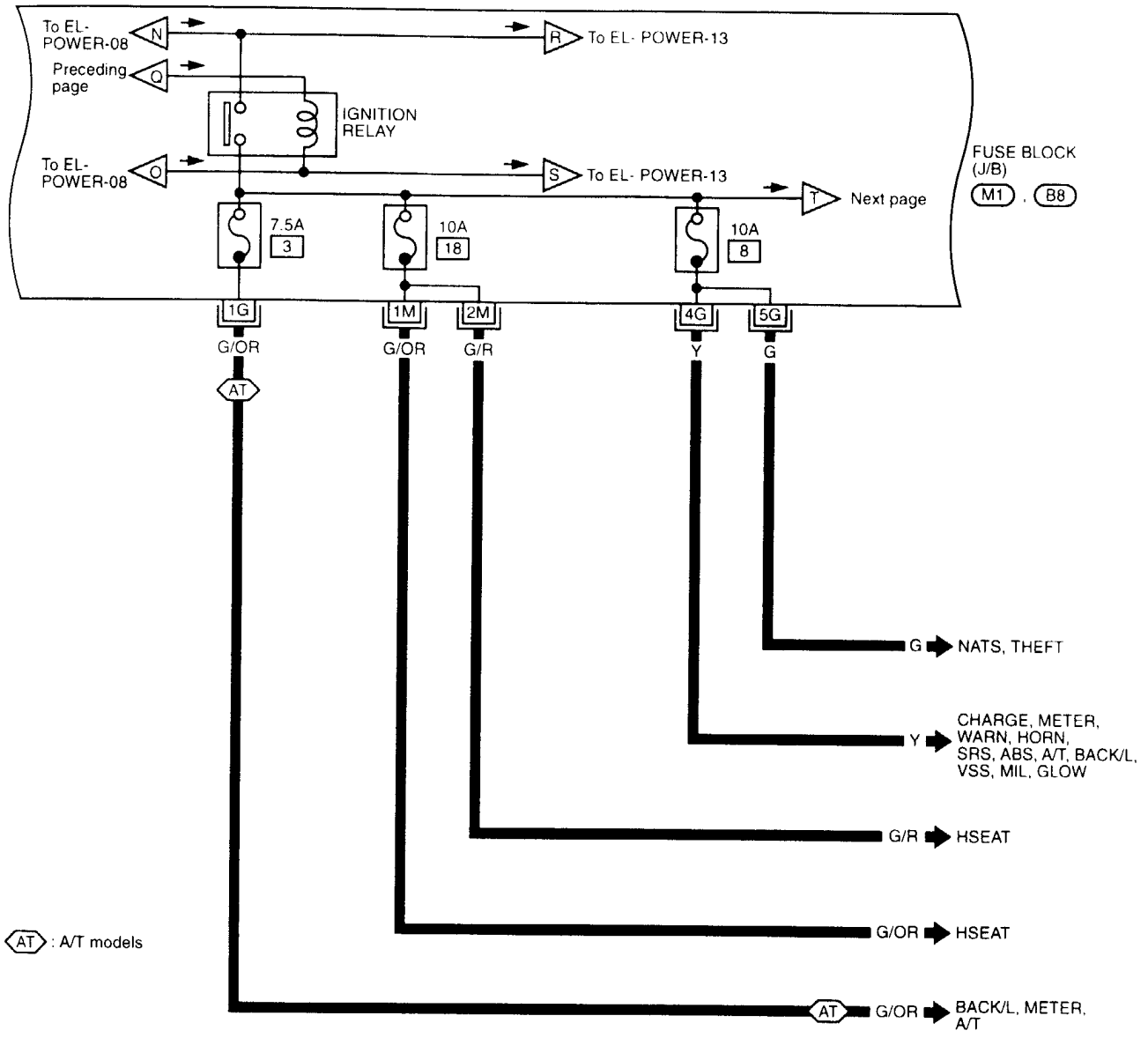


Refer to last page (Foldout page).
M1
E103
E104

YEL670

Wiring Diagram — POWER — (Cont'd)

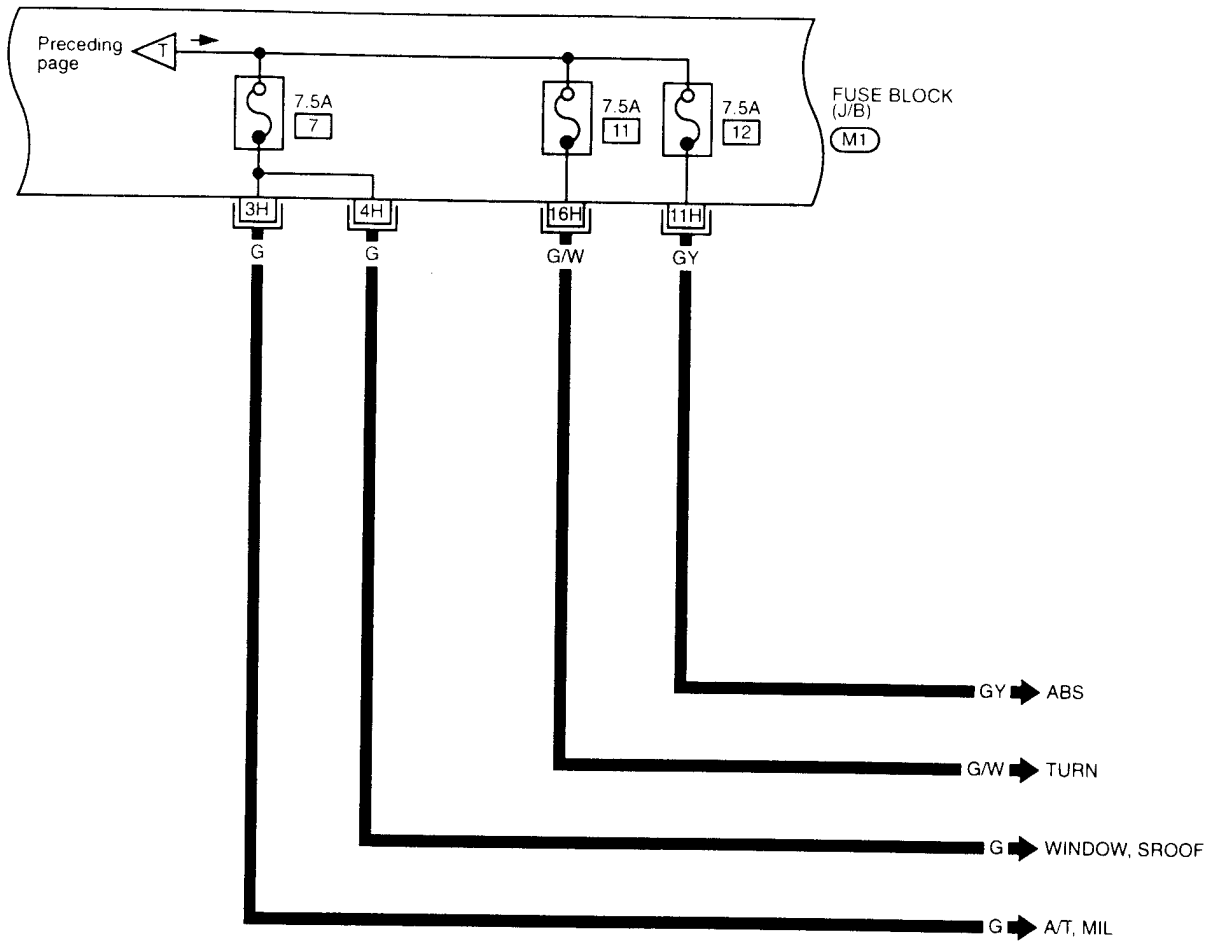
EL-POWER-11



Refer to last page (Foldout page).
M1
B8

YEL671

EL-POWER-12

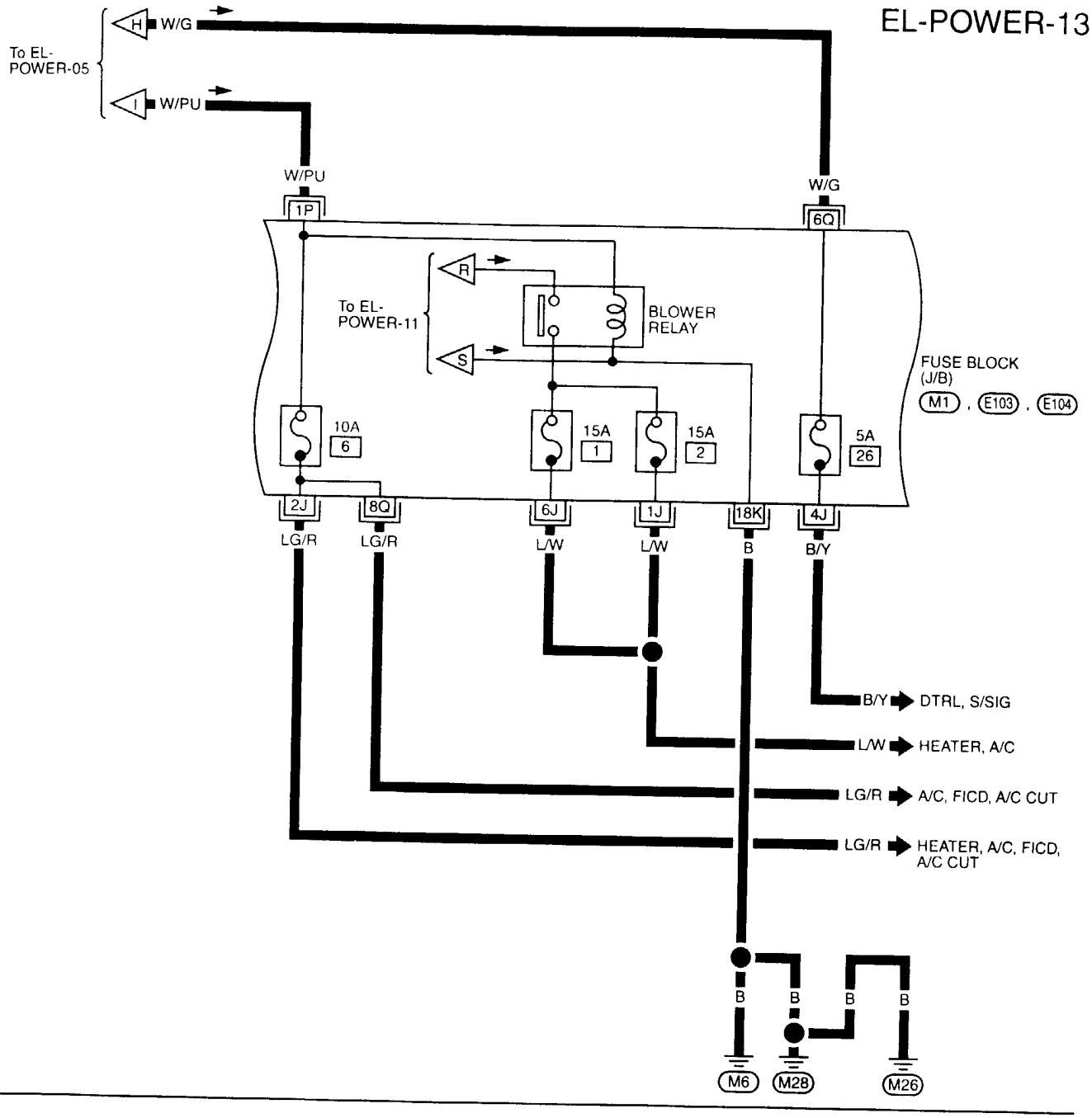


Refer to last page (Foldout page).
M1

YEL672

Wiring Diagram — POWER — (Cont'd)

EL-POWER-13

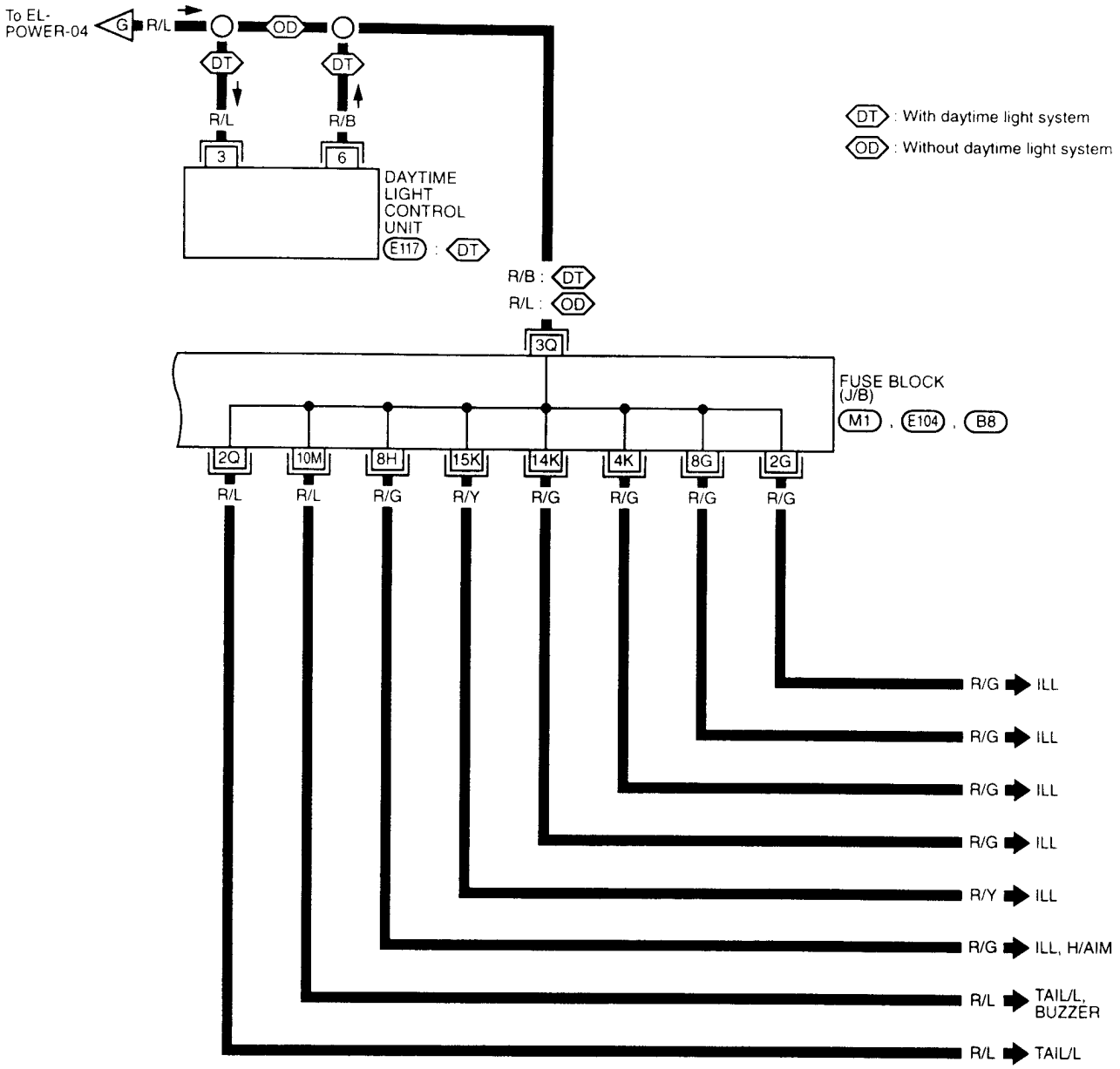


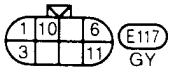
Refer to last page (Foldout page).
M1
E103
E104

YEL673

Wiring Diagram — POWER — (Cont'd)

EL-POWER-14





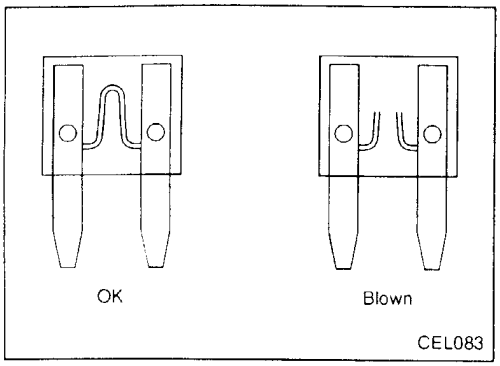
Refer to last page (Foldout page).

M1

E104

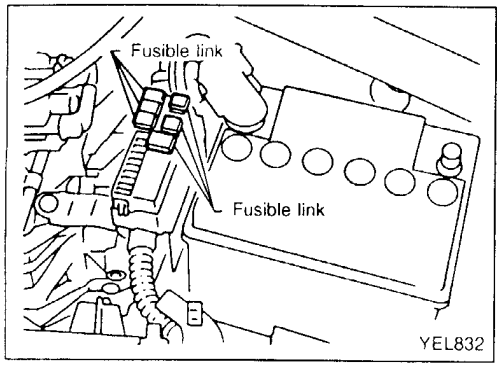
B8

YEL674



Fuse

- If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
- Use fuse of specified rating. Never use fuse of more than specified rating.
- Do not partially install fuse; always insert it into fuse holder properly.
- Remove fuse for clock if vehicle is not used for a long period of time.

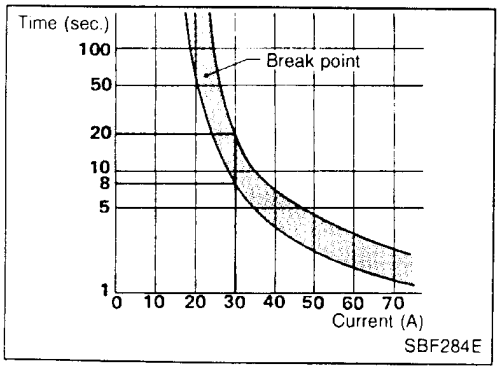


Fusible Link

A melted fusible link can be detected by visual inspection. If its condition is questionable, use circuit tester or test lamp.

CAUTION:

- **If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.**
- **Never wrap outside of fusible link with vinyl tape. Important: Never let fusible link touch any other wiring harness or vinyl or rubber parts.**



Circuit Breaker

For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.

- Power window
- Power door lock
- Electric sun roof
- Power seat

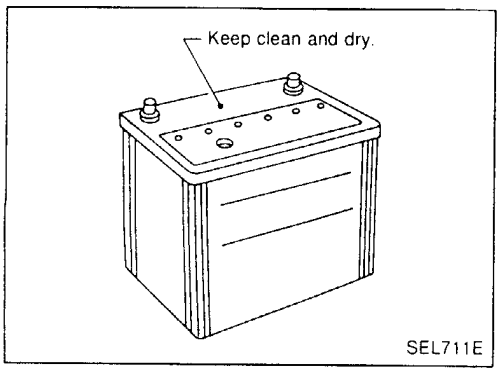
GROUND	CONNECT TO	CONN. NO.	CELL CODE
M6/M26/M28	COMBINATION METER (HIGH BEAM INDICATOR)	M37	EL-HEAD, EL-DTRL
	COMBINATION METER (TURN)	M37	EL-TURN
	COMBINATION METER (REAR FOG LAMP)	M37	EL-R/FOG
	COMBINATION METER (SPEEDOMETER)	M36	EC-VSS, EL-METER
	COMBINATION METER (TACHOMETER)	M36	EL-METER
	COMBINATION METER (WATER TEMP GAUGE)	M36	EL-METER
	COMBINATION METER (FUEL GAUGE)	M36	EL-METER
	COMBINATION METER (AIR BAG WARNING LAMP)	M36	RS-SRS, EL-WARN
	COMBINATION METER (CLOCK ILLUMINATION)	M36	EL-ILL, EL-HORN
	BLOWER RELAY (IN FUSE BLOCK)	M1	EL-POWER
	COMBINATION FLASHER UNIT	M33	EL-TURN
	SPOT LAMP	R5	EL-INT/L
	VANITY MIRROR LAMP	R2	EL-INT/L
	ILLUMINATION CONTROL UNIT	M3	EL-ILL
	REAR WINDOW DEFOGGER SWITCH	M57	EL-ILL, EL-DEF
	A/T CONTROL DEVICE	M49	AT-A/T, EL-ILL
	A/C SWITCH	M44	HA-A/C, EL-ILL
	INTAKE DOOR SWITCH	M47	HA-HETER, HA-A/C, EL-ILL
	ASH TRY ILLUMINATION	M40	EL-ILL
	HEATER ILLUMINATION	M45	EL-ILL
	ORN ILLUMINATION	M56	EL-ILL
	HAZARD SWITCH	M58	EL-ILL
	GLOVE BOX LAMP SWITCH	M24	EL-ILL
	FRONT WIPER MOTOR (LHD models)	M101	EL-WIPER
	REAR WIPER AMPLIFIER	M32	EL-WIP/R
	CIGARETTE LIGHTER SOCKET	M39	EL-HORN
	AUDIO	M42	EL-AUDIO
	SUN ROOF SWITCH	R4	EL-SROOF
	DOOR MIRROR REMOTE CONTROL SWITCH	M5	EL-MIRROR
	NATS IMMU	M34	EL-NATS
	DOOR LOCK ACTUATOR ASSEMBLY (TRUNK) (SEDAN models)	T12	EL-S/LOCK
	FAN SWITCH	M46	HA-HEATER, HA-A/C, EC-LOAD, EC-A/C CUT
	AIR BAG DIAGNOSIS SENSOR UNIT	Z4	RS-SRS
	DATA LINK CONNECTOR FOR CONSULT	M59	EC-MIL, AT-A/T RS-SRS
	KICK DOWN SWITCH	M19	AT-A/T
	SHIELD WIRE (HEATED OXYGEN SENSOR)	F34	EC-H02S
	POWER STEERING OIL PRESSURE SWITCH (LHD models)	M102	EC-PST/SW
E11/E37	FRONT COMBINATION LAMP LH	E5	EL-HEAD, EL-DTRL, EL-TAIL/L
	FRONT COMBINATION LAMP RH (HEAD LAMP)	E32	EL-HEAD, EL-DTRL, EL-TAIL/L

GROUND	CONNECT TO	CONN. NO.	CELL CODE
E11/E37	DAYTIME LIGHT CONTROL UNIT	E117	EL-DTRL
	HEAD LAMP AIMING MOTOR LH	E4	EL-H/AIM
	HEAD LAMP AIMING MOTOR RH	M33	EL-H/AIM
	FRONT TURN SIGNAL LAMP LH	E8	EL-TURN, EL-THEFT
	FRONT TURN SIGNAL LAMP RH	E36	EL-TURN, EL-THEFT
	SIDE TURN SIGNAL LAMP LH	E9	EL-TURN, EL-THEFT
	SIDE TURN SIGNAL LAMP RH	E51	EL-TURN, EL-THEFT
	FRONT FOG LAMP LH	E6	EL-F/FOG
	FRONT FOG LAMP RH	E34	EL-F/FOG
	COMBINATION SWITCH (TRIP COMPUTER SWITCH)	E114	EL-METER
	SEDIMENTER SENSOR (CD engine)	E13	EL-WARN
	WASHER LEVEL SWITCH	E39	EL-WARN
	BRAKE FLUID LEVEL SWITCH	E14	EL-WARN
	FRONT WIPER MOTOR	E62	EL-WIPER
	COMBINATION SWITCH (FRONT WIPER SWITCH)	E114	EL-WIPER
	COMBINATION SWITCH (WASHER SWITCH)	E114	EL-WIPER, EL-WIP/R EL-HLC
	FRONT WIPER AMPLIFIER	E16	EL-WIPER
F15/F18	INHIBITOR SWITCH	F30	EL-START
	VEHICLE SPEED SENSOR	F25	EC-VSS, AT-A/T, EL-METER
	IACV-FICD SOLENOID VALVE (GA engine)	F66	EC-FICD, HA-A/C
	IACV-FICD SOLENOID VALVE (SR engine)	F40	EC-FICD, HA-A/C
	A/T CONTROL UNIT	M48	AT-A/T
	SHIELD WIRE (THROTTLE POSITION SENSOR)	F16	EC-TPS, AT-A/T
	ECM (ECCS CONTROL MODULE) (SR-GA engine)	F101	EC-MAIN
	ECM (ECCS CONTROL MODULE) (CD engine)	F106	EC-MAIN
	SHIELD WIRE (CAMSHAFT POSITION SENSOR)	F33	EC-CMPS
	MASS AIR FLOW SENSOR	F38	EC-MAFS
	DISTRIBUTOR	F33	EC-IGN/SG
	NEUTRAL POSITION SWITCH	F28	EC-PNP/SW, EC-NEUT
	SHIELD WIRE (KNOCK SENSOR) (SR20De engine)	F22	EC-KS
	SHIELD WIRE (KNOCK SENSOR) (SR20DE engine)	F69	EC-KS
	SHIELD WIRE (CAMSHAFT POSITION SENSOR) (CD engine)	F49	EC-CMPS
	SHIELD WIRE (CONTROL SLEEVE POSITION SENSOR) (CD engine)	F57	EC-CSPS
	ACCELERATOR SWITCH (CD engine)	M22	EC-APP/SW
E11/E37	REAR WIPER RELAY	E52	EL-WIP/R
	HEAD LAMP WIPER RELAY	E53	EL-HLC
	HEAD LAMP WIPER MOTOR LH	E7	EL-HLC
	HEAD LAMP WIPER MOTOR RH	E35	EL-HLC

GROUND	CONNECT TO	CONN. NO.	CELL CODE
	HOOD SWITCH	E12	EL-THEFT
	SOLENOID VALVE RELAY	E50	BR-ABS
	TRIPLE PRESSURE SWITCH (CD engine)	E20	EC-COOL/F, HA-A/C
	COOLING FAN MOTOR-1	E19	EC-COOL/F, HA-A/C
	COOLING FAN MOTOR-2	E28	EC-COOL/F, HA-A/C
	COOLING FAN RELAY-2	E54	HA-A/C
	POWER STEERING OIL PRESSURE SWITCH (RHD models)	E60	EC-PST/SW
F15/F18	SHIELD WIRE (NEEDLE LIFT SENSOR) (CD engine)	F48	EC-NLS
	SHIELD WIRE (ACCELERATOR POSITION SENSOR) (CD engine)	M21	EC-APS
	SHIELD WIRE (CRANK SHAFT POSITION SENSOR)	F53	EC-CKPS
F9	ALTERNATOR	F10	EL-CHARGE
B18/B27	THEFT WARNING CONTROL UNIT	B6	EL-THEFT
	ULTRASONIC CANSEL SWITCH	B102	EL-THEFT
	TRUNK ROOM LAMP SWITCH	T10	EL-THEFT
	KEY CYLINDER SWITCH (Driver side)	D9	EL-THEFT, EL-SHOCK
	KEY CYLINDER SWITCH (Passenger side)	D17	EL-THEFT, EL-SHOCK
	DOOR LOCK ACTUATOR (Driver side)	D7	EL-THEFT, EL-SHOCK
	DOOR LOCK ACTUATOR (Passenger side)	D16	EL-THEFT, EL-SHOCK
	REAR DOOR LOCK ACTUATOR LH	D21	EL-THEFT, EL-SHOCK
	REAR DOOR LOCK ACTUATOR RH	D25	EL-THEFT, EL-SHOCK
	SUPER LOCK CONTROL UNIT	B11	EL-SHOCK
	A/T MODE SWITCH	B103	AT-A/T
	FUEL PUMP	B30	EC-F/PUMP
B36/B39 (5-HATCH BACK models)	REAR COMBINATION LAMP LH	B46	EL-TAIL, EL-TURN EL-THEFT, EL-STOP
	REAR COMBINATION LAMP RH	B49	EL-TAIL, EL-TURN EL-THEFT, EL-STOP
D110/B48 (5-HATCH BACK models)	LICENCE PLATE LAMP	D106	EL-TAIL
	HIGH MOUNTED STOP LAMP	D114	EL-STOP
	REAR COMBINATION LAMP LH	D104	EL-BACK/L, EL-R/FOG
	REAR COMBINATION LAMP RH	D109	EL-BACK/L, EL-R/FOG
	LUGGAGE ROOM LAMP SWITCH	D105	EL-INT/L, EL-THEFT
	REAR WIPER MOTOR	D107	EL-WIP/R
	REAR WINDOW DEFOGGER	B47	EL-DEF
	DOOR LOCK ACTUATOR (Back door)	D108	EL-S/LOCK, EL-THEFT
T3/T4 (SEDAN models)	REAR COMBINATION LAMP LH	T2	EL-TAIL, EL-TURN EL-THEFT, EL-STOP
	REAR COMBINATION LAMP RH	T5	EL-TAIL, EL-TURN EL-THEFT, EL-TURN

CAUTION:

- **If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.**
- **After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.**
- **Never add distilled water through the hole used to check specific gravity.**

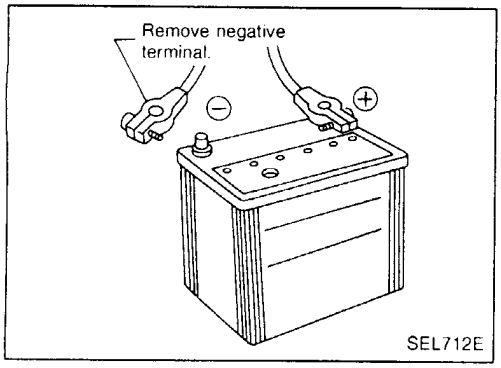


How to Handle Battery

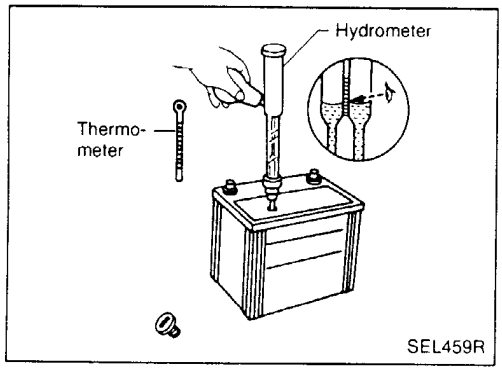
METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level.



- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)



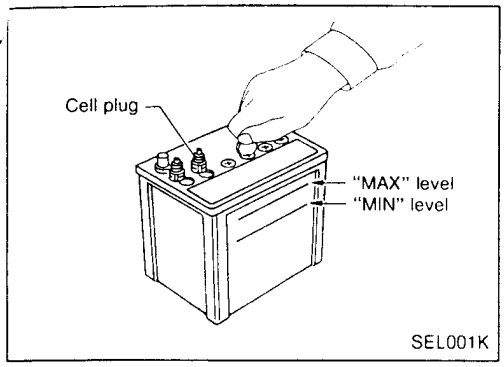
- Check the charge condition of the battery.
  Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent overdischarge.

CHECKING ELECTROLYTE LEVEL

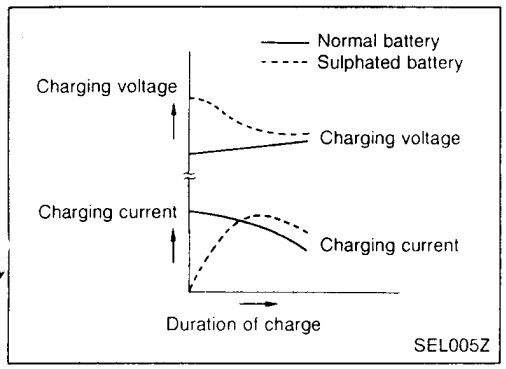
WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

How to Handle Battery (Cont'd)

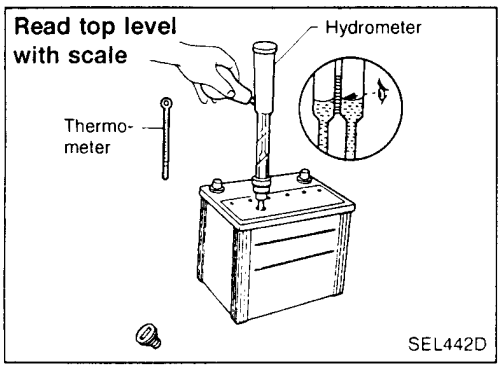


- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



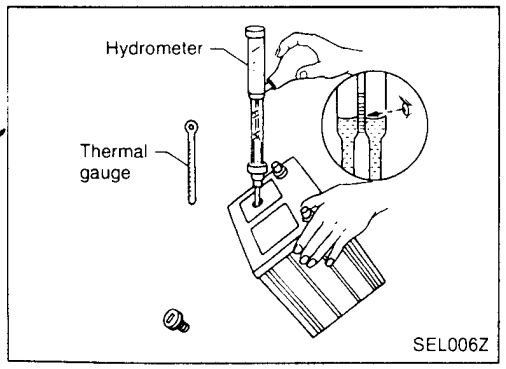
SULPHATION

A battery will be completely discharged if it is left unattended for a long time and the specific gravity becomes less than 1.100. This may result in sulphation on the cell plates.
To find if a discharged battery has been "sulphated", pay attention to its voltage and current when charging it. As shown in the figure at left, if the battery has been "sulphated", less current and higher voltage may be observed in the initial stage of charging.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.



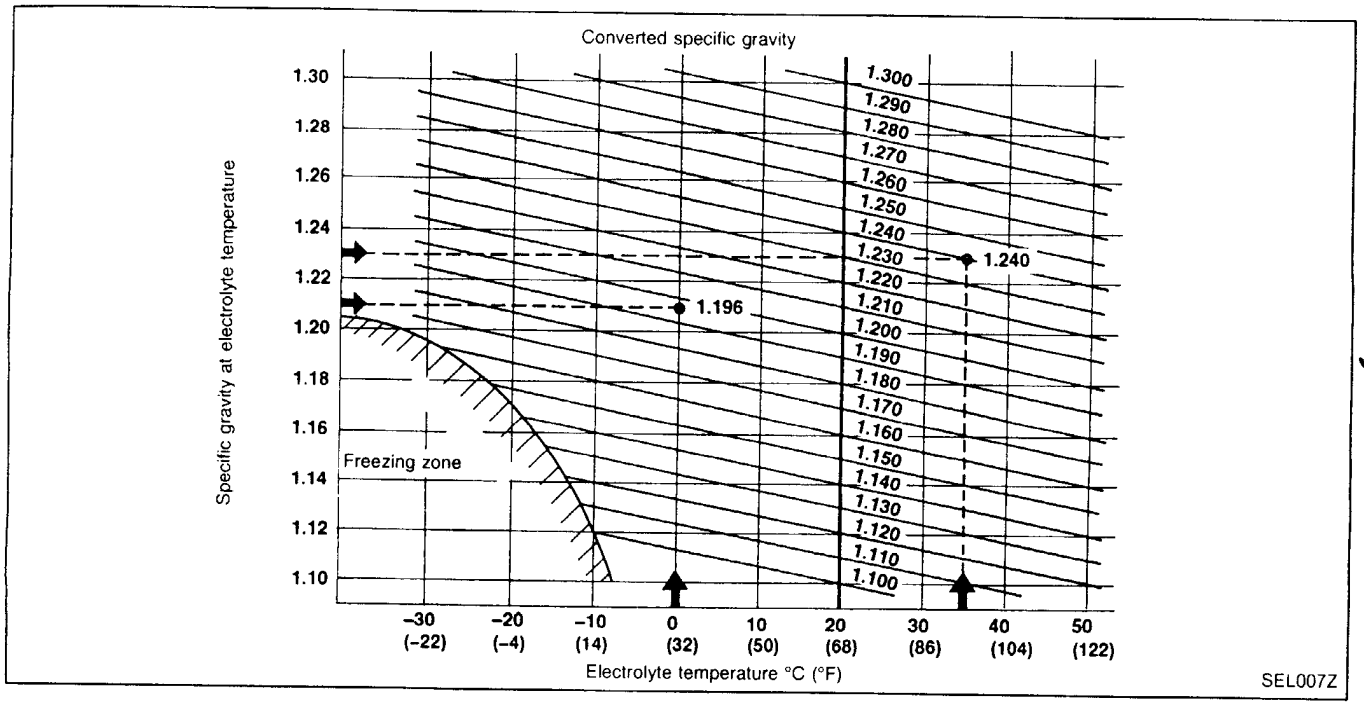
- When electrolyte level is low, tilt battery case for easy measurement.

How to Handle Battery (Cont'd)

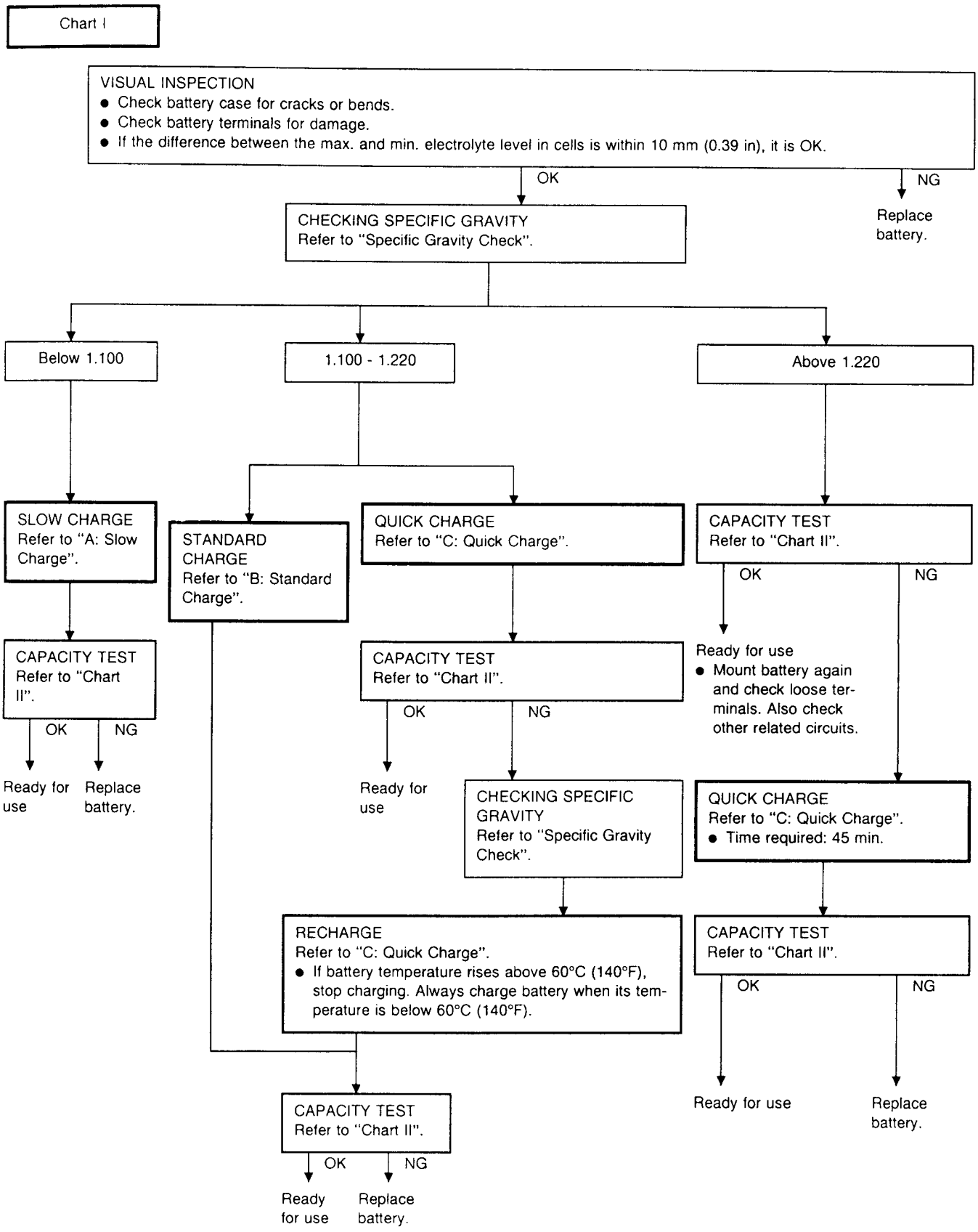
2. Convert into specific gravity at 20°C (68°F).

Example:

- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



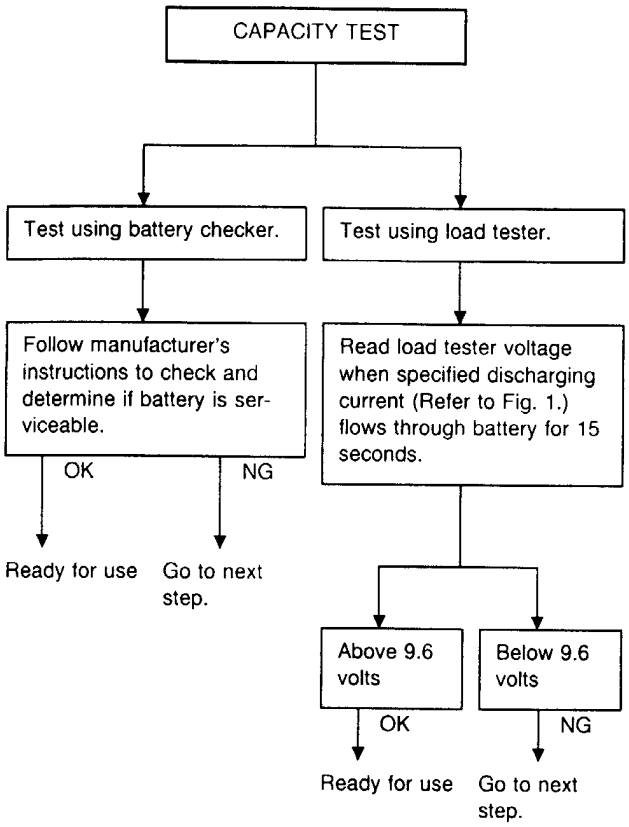
Battery Test and Charging Chart



* "STANDARD CHARGE" is recommended if the vehicle is in storage after charging.

Battery Test and Charging Chart (Cont'd)

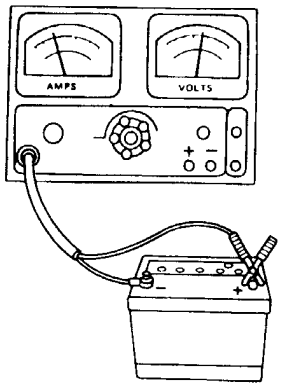
Chart II



- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load Tester)

Type	Current (A)
55D23L	180
80D26L	195
95D31L	240



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Battery Test and Charging Chart (Cont'd)

A: SLOW CHARGE

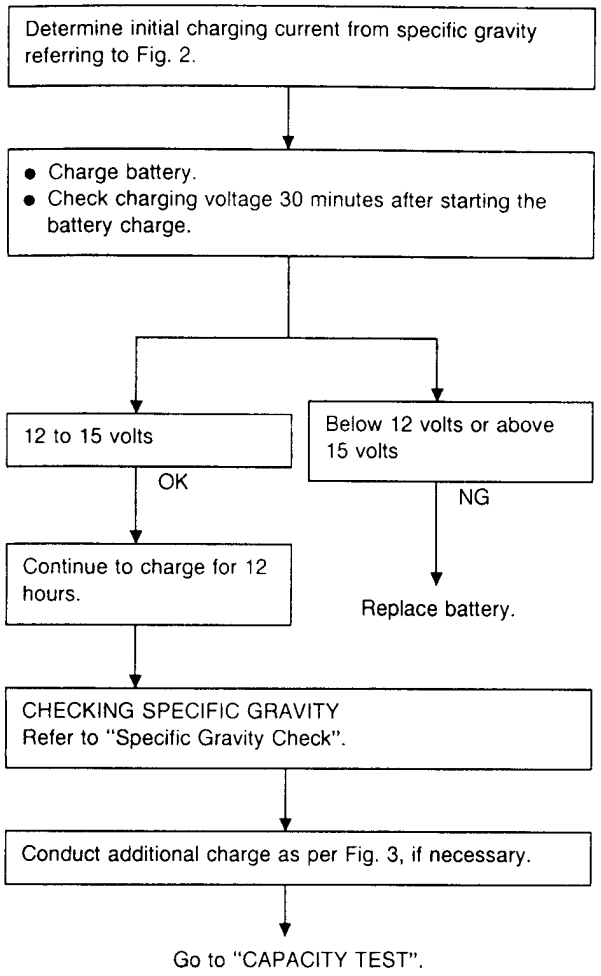
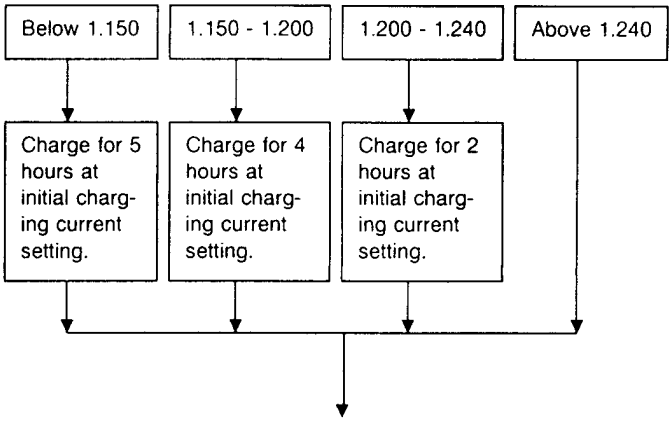


Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

CONVERTED SPECIFIC GRAVITY	BATTERY TYPE		
	55D23L	80D26L	95D31L
Below 1.100	7.0 (A)	8.0 (A)	10.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 3 ADDITIONAL CHARGE (Slow charge)



CAUTION:

- **Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
- **Keep battery away from open flame while it is being charged.**
- **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
- **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**
- **Remove cell caps during charging.**

Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE

Determine initial charging current from specific gravity, referring to Fig. 4.

↓

Charge battery for 8 hours.

↓

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

↓

Conduct additional charge as per Fig. 5, if necessary.

↓

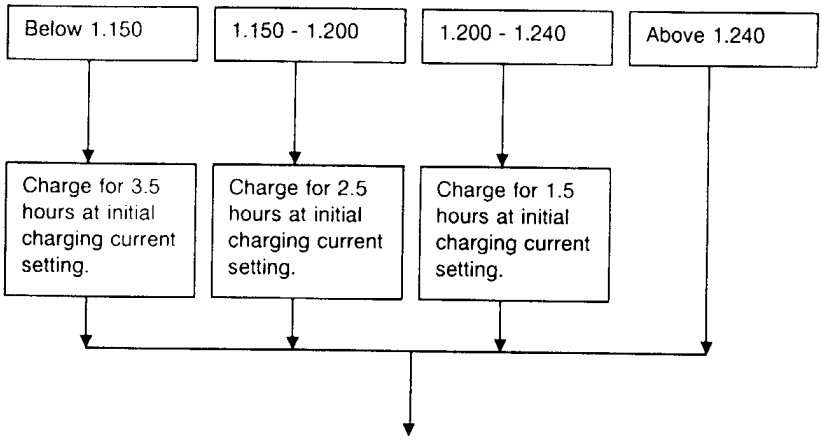
Go to "CAPACITY TEST".

Fig. 4 INITIAL CHARGING CURRENT SETTING (Standard charge)

CONVERTED SPECIFIC GRAVITY	BATTERY TYPE		
	55D23L	80D26L	95D31L
1.100 - 1.130	6.0 (A)	7.0 (A)	9.0 (A)
1.130 - 1.160	5.0 (A)	6.0 (A)	8.0 (A)
1.160 - 1.190	4.0 (A)	5.0 (A)	7.0 (A)
1.190 - 1.220	3.0 (A)	4.0 (A)	5.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 5 ADDITIONAL CHARGE (Standard charge)



CAUTION:

- **Do not use standard charge method on a battery whose specific gravity is less than 1.100.**
- **Set charging current to value specified in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
- **Keep battery away from open flame while it is being charged.**
- **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
- **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**
- **Remove cell caps during charging.**

Battery Test and Charging Chart (Cont'd)

C: QUICK CHARGE

Determine initial charging current setting and charging time from specific gravity, referring to Fig. 6.

↓

Charge battery.

↓

Go to "CAPACITY TEST".

Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

BATTERY TYPE		55D23L 80D26L	95D31L
CURRENT [A]		20 (A)	30 (A)
CONVERTED SPECIFIC GRAVITY	1.100 - 1.130	2.5 hours	
	1.130 - 1.160	2.0 hours	
	1.160 - 1.190	1.5 hours	
	1.190 - 1.220	1.0 hours	
	Above 1.220	0.75 hours (45 min.)	

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

CAUTION:

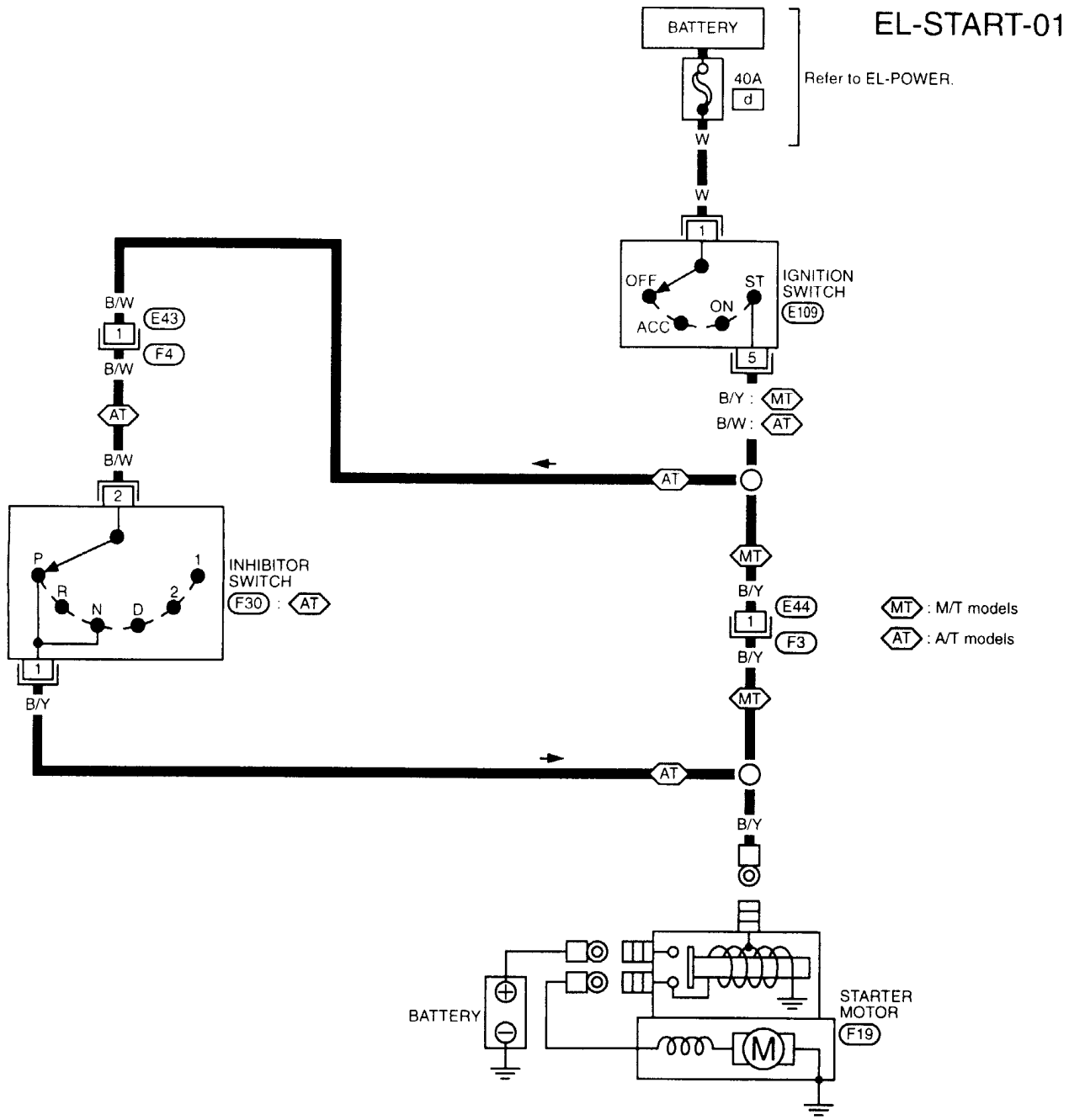
- **Do not use quick charge method on a battery whose specific gravity is less than 1.100.**
- **Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
- **Keep battery away from open flame while it is being charged.**
- **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
- **Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.**
  If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
- **Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.**

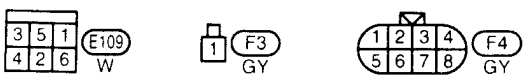
Service Data and Specifications (SDS)

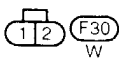
Applied model		GA/SR engines		CD20T
Type		55D23L	80D26L	95D31L
Capacity	V-AH	12 - 48	12 - 55	12 - 64

Wiring Diagram — START —

GASOLINE ENGINE MODELS







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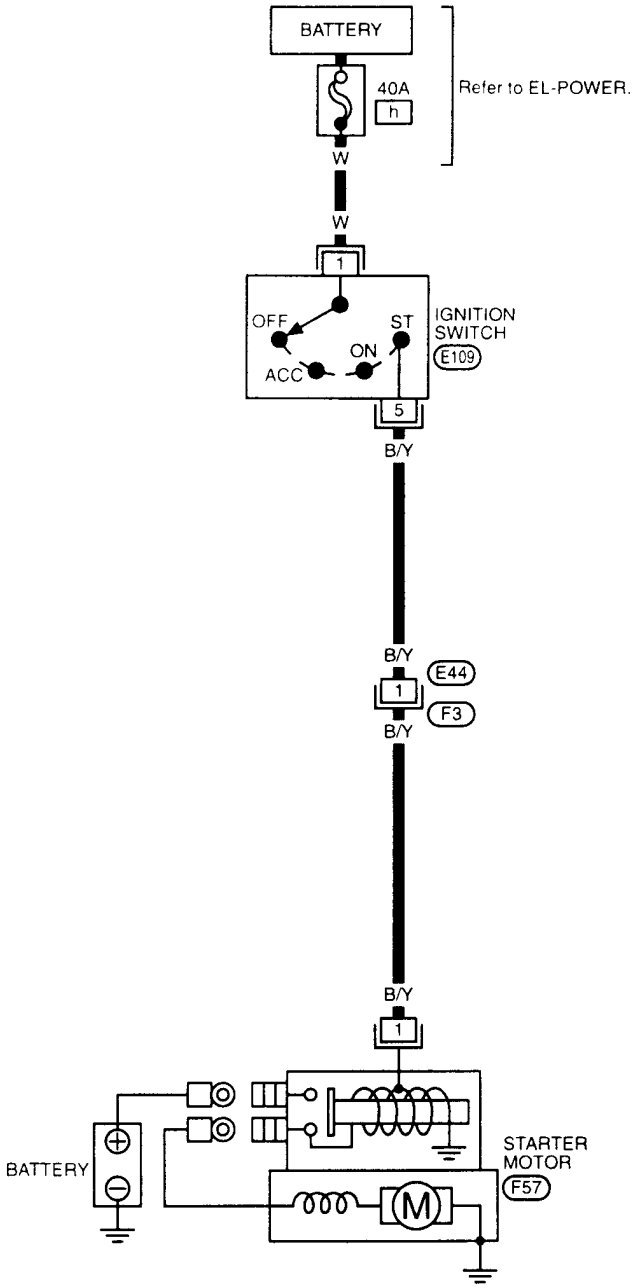
Wiring Diagram — START — (Cont'd)

DIESEL ENGINE MODELS

EL-START-02



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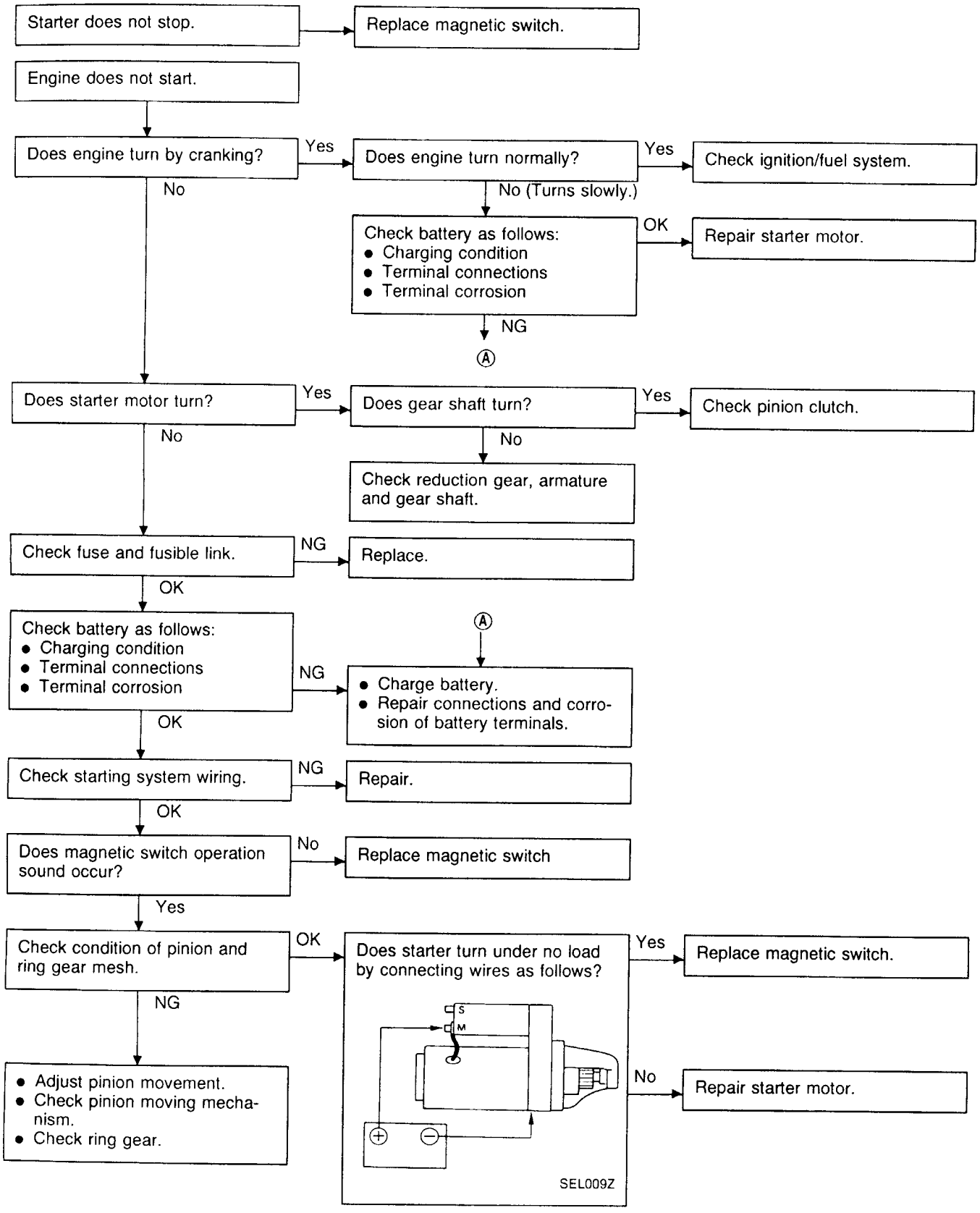
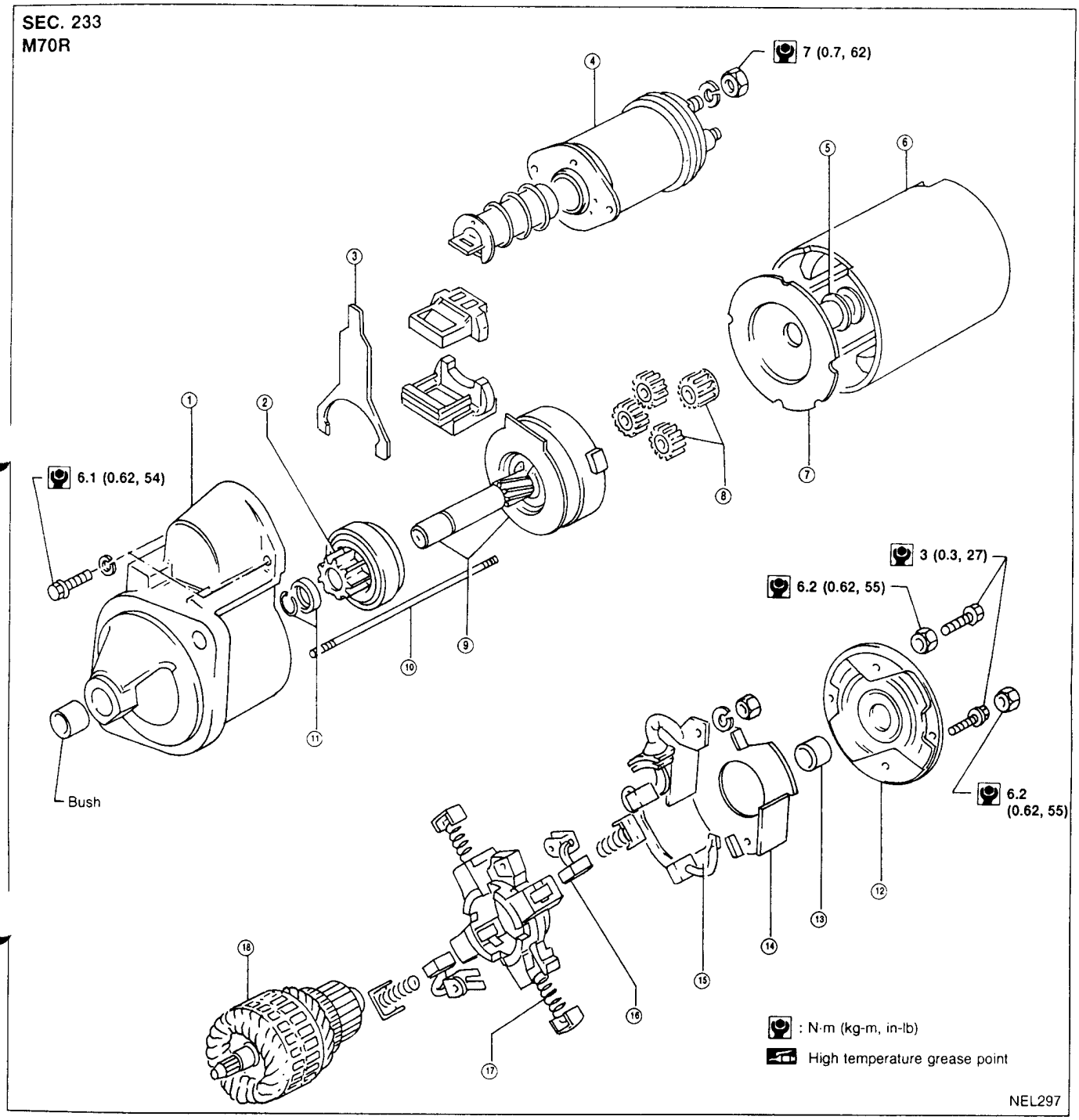
Trouble Diagnoses

If any abnormality is found, immediately disconnect battery negative terminal.



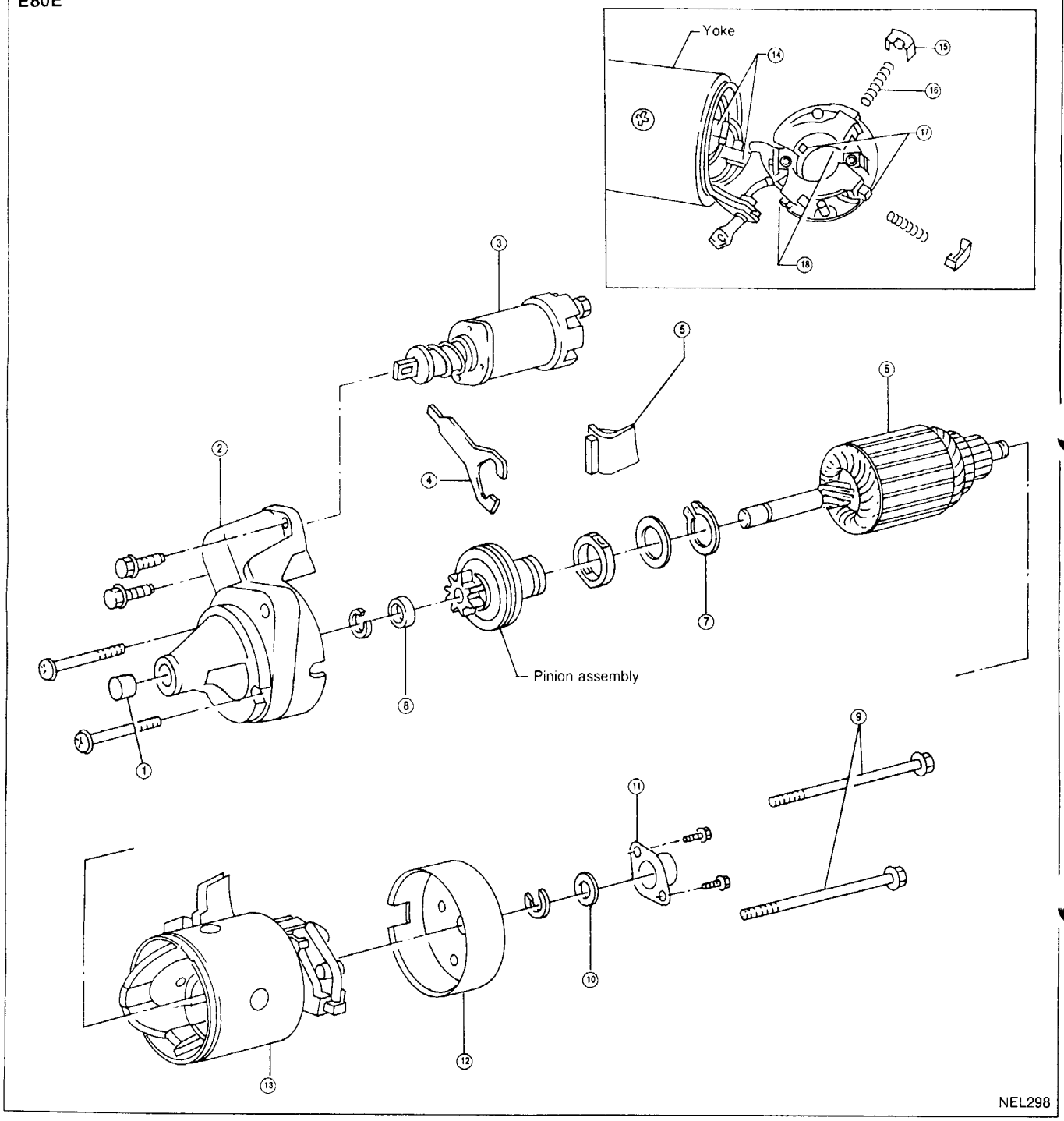
Construction



① Gear case
② Pinion assembly
③ Shift lever
④ Magnetic switch assembly
⑤ Bush
⑥ Yoke
⑦ Centre bracket
⑧ Planetary gear assembly
⑨ Pinion shaft assembly
⑩ Through bolts
⑪ Pinion stopper
⑫ Rear cover
⑬ Bush
⑭ Brush holder
⑮ Brush (+)
⑯ Brush (−)
⑰ Brush spring
⑱ Armature.

Construction (Cont'd)

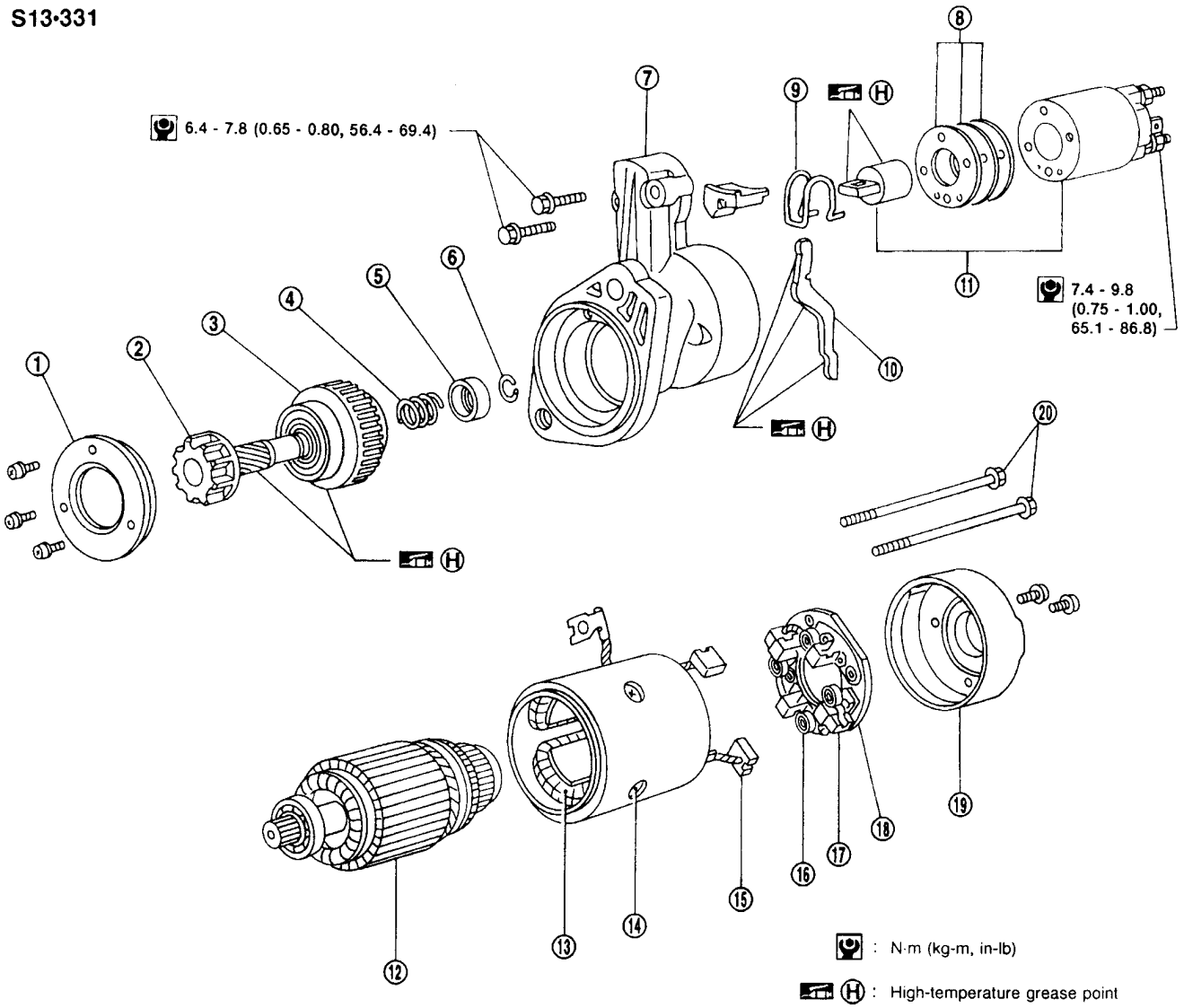
SEC. 233
E80E



① Bush
② Gear case
③ Magnetic switch assembly
④ Shift lever
⑤ Support block
⑥ Armature
⑦ Circlip
⑧ Pinion stopper
⑨ Through bolts
⑩ Spacer
⑪ Dust cover
⑫ Rear cover
⑬ Yoke
⑭ Field coils
⑮ Brush holder
⑯ Brush spring
⑰ Brush (+)
⑱ Brush (–)

Construction (Cont'd)

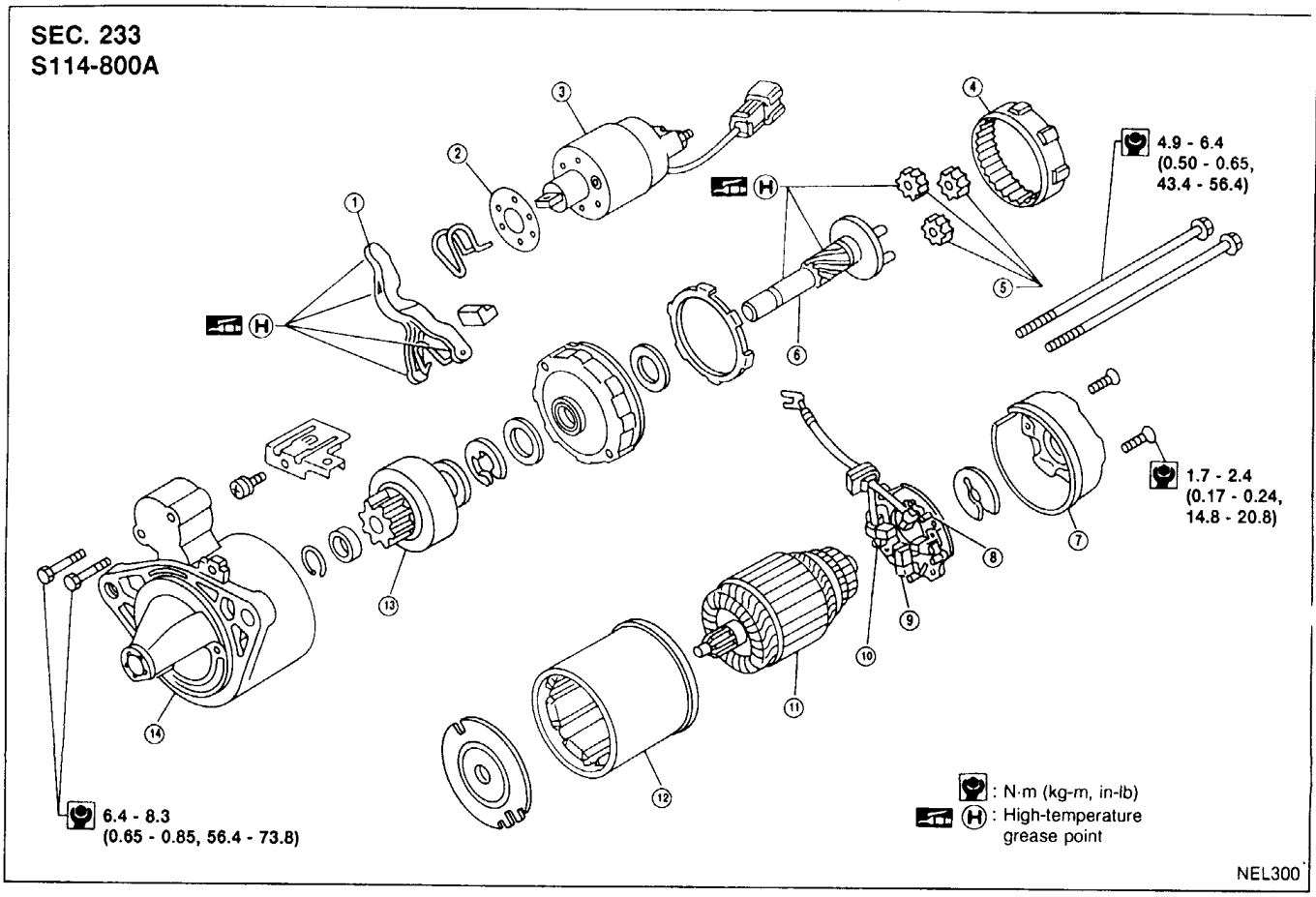
SEC. 233
S13•305
S13•331



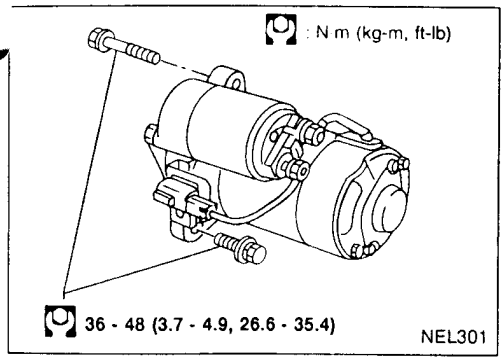
① Bearing retainer
② Pinion shaft
③ Clutch assembly
④ Return spring
⑤ Pinion stopper
⑥ Stopper clip
⑦ Gear case
⑧ Adjusting plates
⑨ Torsion spring
⑩ Shift lever
⑪ Magnetic switch assembly
⑫ Armature assembly
⑬ Field coil
⑭ Yoke
⑮ Brush (+)
⑯ Brush spring
⑰ Brush (–)
⑱ Brush holder
⑲ Rear cover
⑳ Through-bolt

Construction (Cont'd)

SEC. 233
S114-800A



① Shift lever
② Adjusting plate
③ Magnetic switch assembly
④ Internal gear
⑤ Planetary gear
⑥ Pinion shaft
⑦ Rear cover
⑧ Brush spring
⑨ Brush (–)
⑩ Brush (+)
⑪ Armature
⑫ Yoke
⑬ Pinion assembly
⑭ Gear case



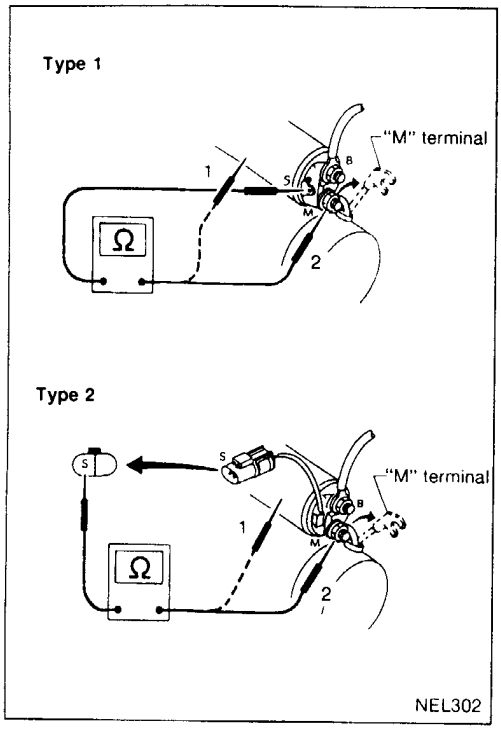
Removal and Installation

Removal

1. Remove battery negative cable from battery.
2. Remove intake air duct.
3. Remove starter motor mounting bolts.
4. Remove battery cable from starter motor.
5. Disconnect harness connector from starter motor harness.
6. Remove intake manifold support bracket.
7. Remove starter motor from under the vehicle.

Installation

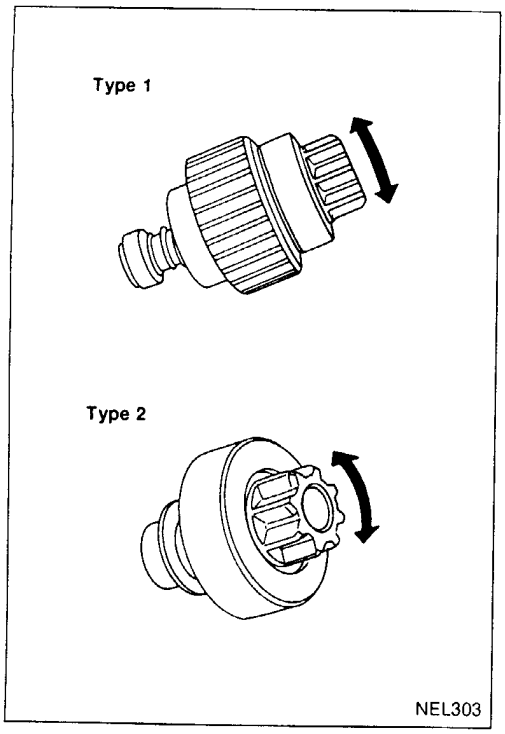
- Installation is reverse order of removal.



Magnetic Switch Check

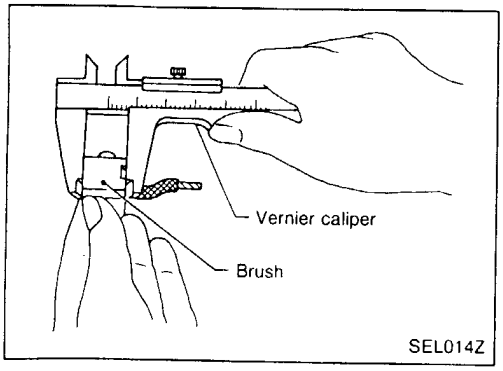
- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

1. Continuity test (between "S" terminal and switch body).
- No continuity ... Replace.
2. Continuity test (between "S" terminal and "M" terminal).
- No continuity ... Replace.



Pinion/Clutch Check

1. Inspect pinion teeth.
- Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect reduction gear teeth.
- Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
3. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
- If it locks or rotates in both directions, or unusual resistance is evident. ... Replace.



Brush Check

BRUSH

Check wear of brush.

Wear limit length:
Refer to SDS (EL-46).

- Excessive wear ... Replace.

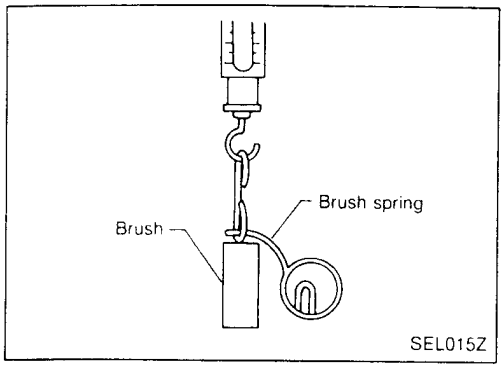
Brush Check (Cont'd)

BRUSH SPRING PRESSURE

Check brush spring pressure with brush spring detached from brush.

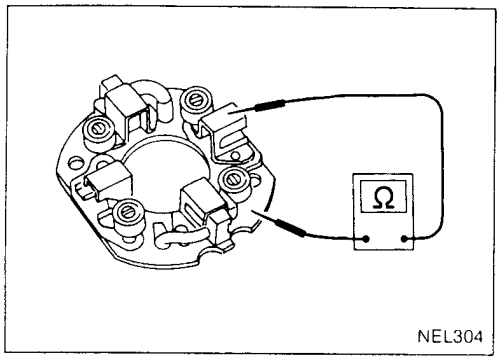
Spring pressure (with new brush):
Refer to SDS (EL-46).

- Not within the specified values ... Replace.



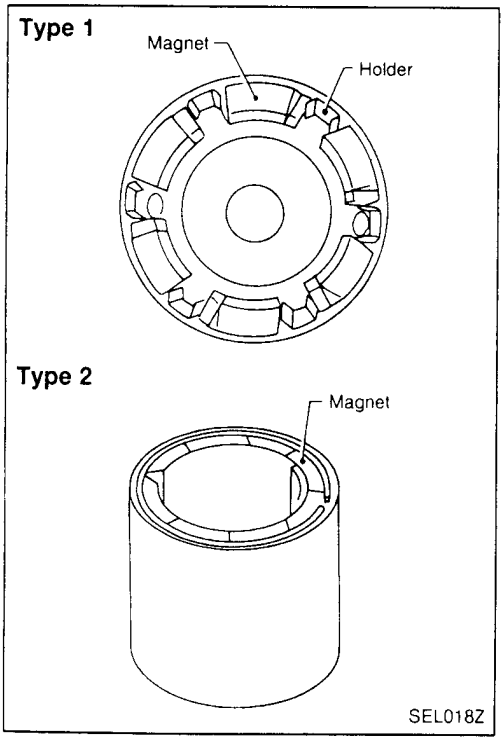
BRUSH HOLDER

1. Perform insulation test between brush holder (positive side) and its base (negative side).
- Continuity exists. ... Replace.
2. Check brush to see if it moves smoothly.
- If brush holder is damaged or deformed, replace it; clear sliding surface if dirty.



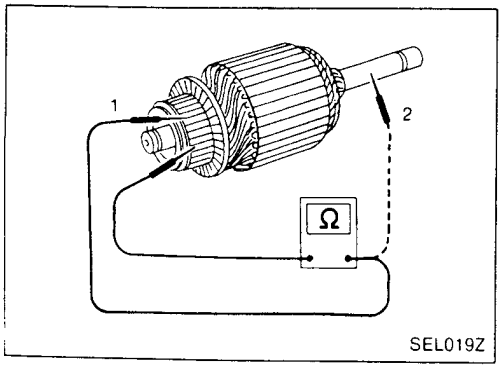
Yoke Check

Magnet is secured to yoke by bonding agent. Check magnet to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.
Holder may move slightly as it is only inserted and not bonded.
CAUTION:
Do not clamp yoke in a vice or strike it with a hammer.

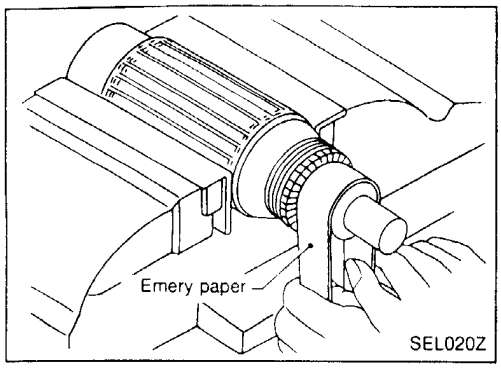


Armature Check

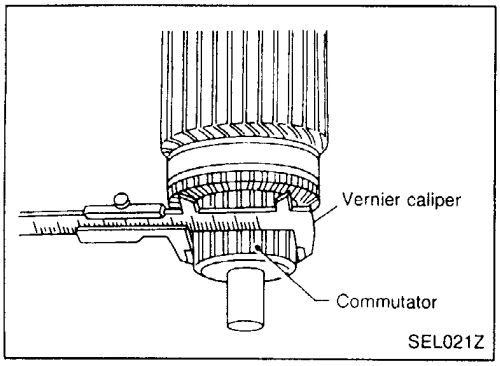
1. Continuity test (between two segments side by side).
- No continuity ... Replace.
2. Insulation test (between each commutator bar and shaft).
- Continuity exists. ... Replace.



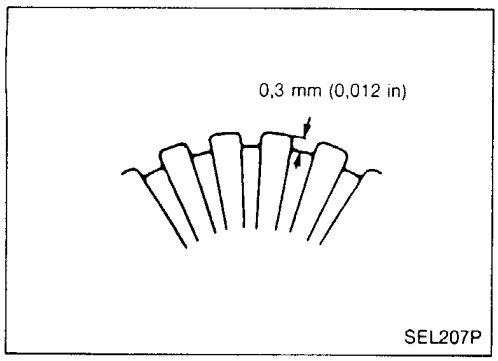
Armature Check (Cont'd)



3. Check commutator surface.
- Rough ... Sand lightly with No. 500 - 600 emery paper.

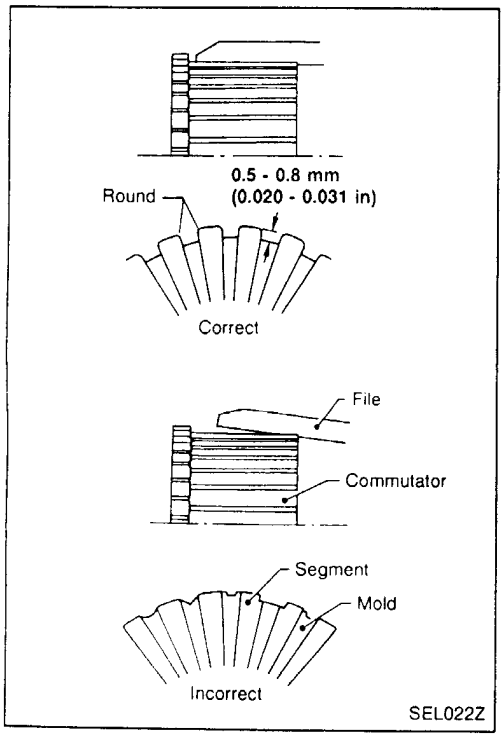


4. Check diameter of commutator.
   Commutator minimum diameter:
   Refer to SDS (EL-46).
- Less than specified value ... Replace.



M70R, E80E

5. Check depth of insulating mica from commutator surface.
- Less than 0.3 mm (0.012 in) ... Replace.

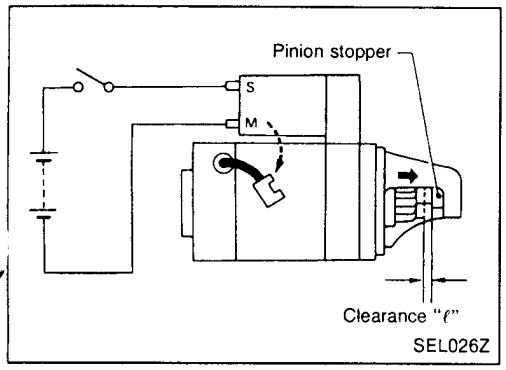


S13-305, S13-301, S114-800A

6. Check depth of insulating mold from commutator surface.
- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in)

Assembly

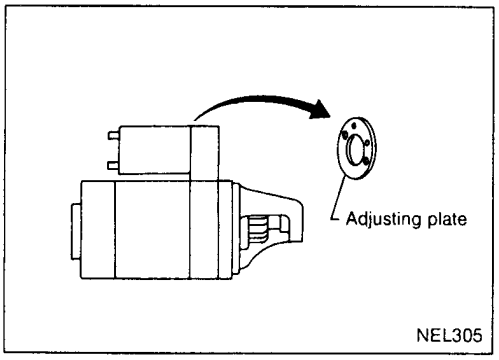
Apply high-temperature grease to lubricate the bearing, gears and frictional surface when assembling the starter.
Carefully observe the following instructions.



PINION PROTRUSION LENGTH ADJUSTMENT

With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "ℓ" between the front edge of the pinion and the pinion stopper.

Clearance "ℓ":
Refer to SDS (EL-46).



- Not in the specified value ... Adjust by selecting the correct adjusting plate.

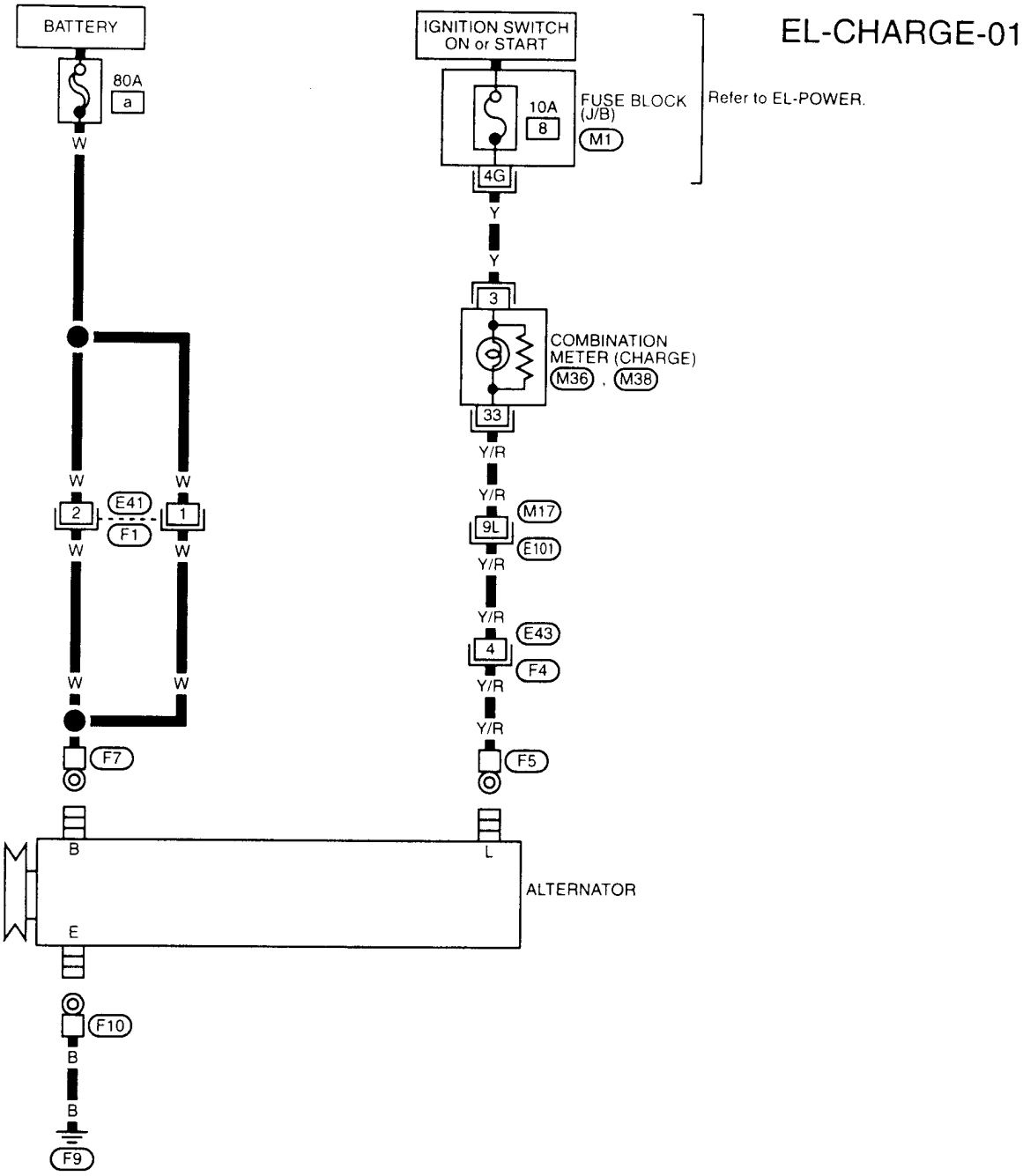
Service Data and Specifications (SDS)

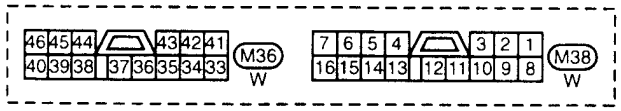
STARTER

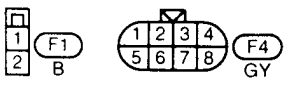
Type		M70R	E80E	S13-305	S13-331	S114-800A
		Magneti Marelli		Hitachi		
		Reduction	Non-Reduction	Reduction		
Applied model		SR20	GA16 except North Europe	CD20T except North Europe	CD20T North Europe only	GA16 North Europe only
System voltage	V	12				
No load						
Terminal voltage	V	11.5		11.0		
Current	A	115	75	Less than 140		Less than 90
Revolution	rev/min	More than 4500	More than 10000	More than 3900		More than 2750
Min. commutator dia.	mm(in)	28.8 (1.134)		35.5 (1.398)		28 (1.102)
Min. brush length	mm(in)	5.0 (0.197)		11.0 (0.433)		10.5 (0.413)
Brush spring tension	N(kg, lb)	14.3 - 25.2 (1.46 - 2.57, 3.22 - 5.69)	14.8 - 24.0 (1.51 - 2.45, 3.33 - 5.40)	28.4 - 34.3 (2.90 - 3.50, 6.39 - 7.72)		12.7 - 17.7 (1.29 - 1.80, 2.84 - 3.97)
Clearance between bearing & armature shaft	mm(in)	—		Less than 0.2 (0.008)		
Clearance "l" between pinion front edge & pinion stopper	mm (in)	0 - 3.0 (0 - 0.118)		0.3 - 2.0 (0.012 - 0.079)	0.3 - 0.8 (0.012 - 0.031)	0.3 - 2.5 (0.012 - 0.098)

Wiring Diagram — CHARGE —

GASOLINE ENGINE MODELS





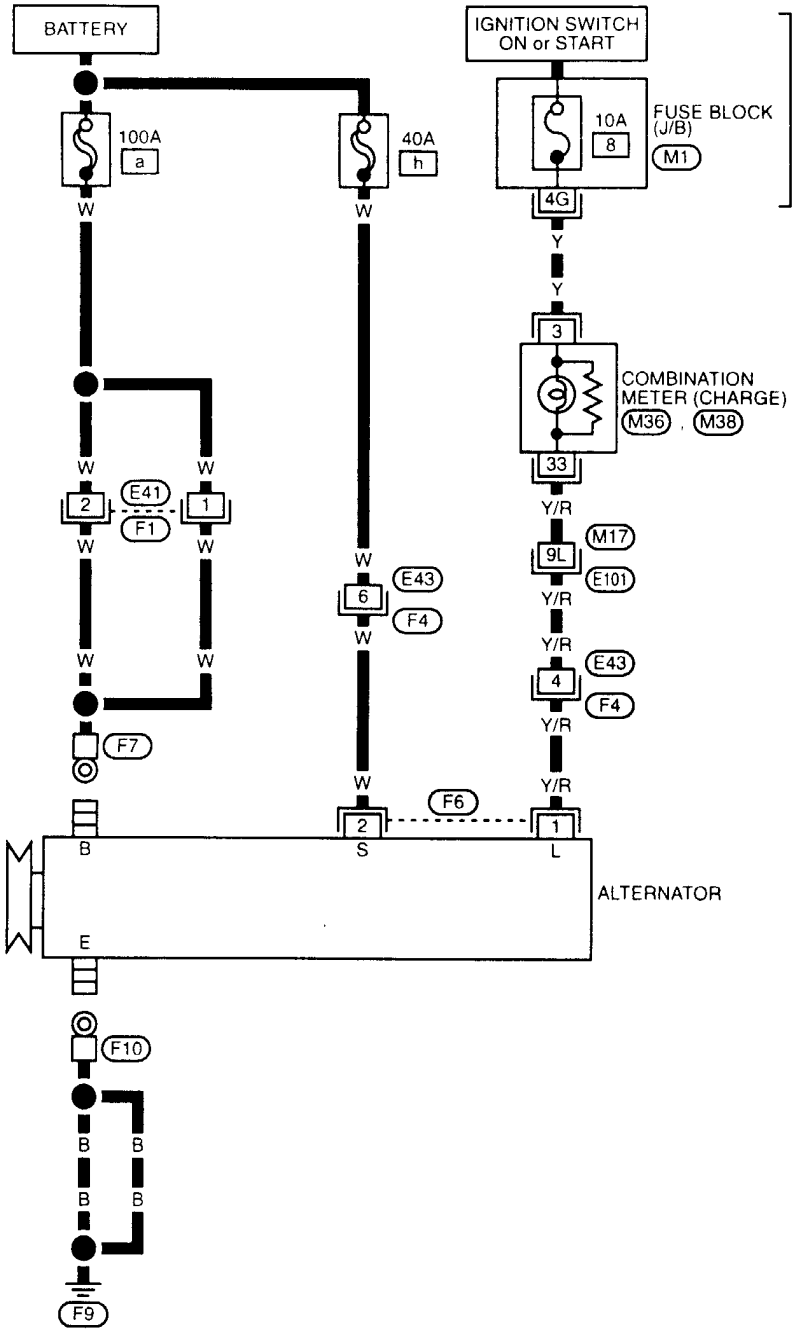


Refer to last page (Foldout page).
M1
M17 , E101

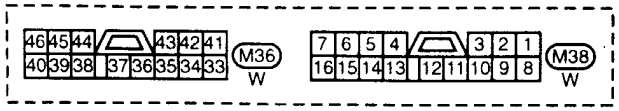
YEL679

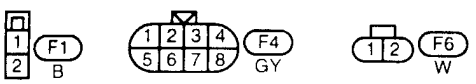
Wiring Diagram — CHARGE — (Cont'd)

DIESEL ENGINE MODELS



EL-CHARGE-02





Refer to last page (Foldout page).
M17 , E101
M1

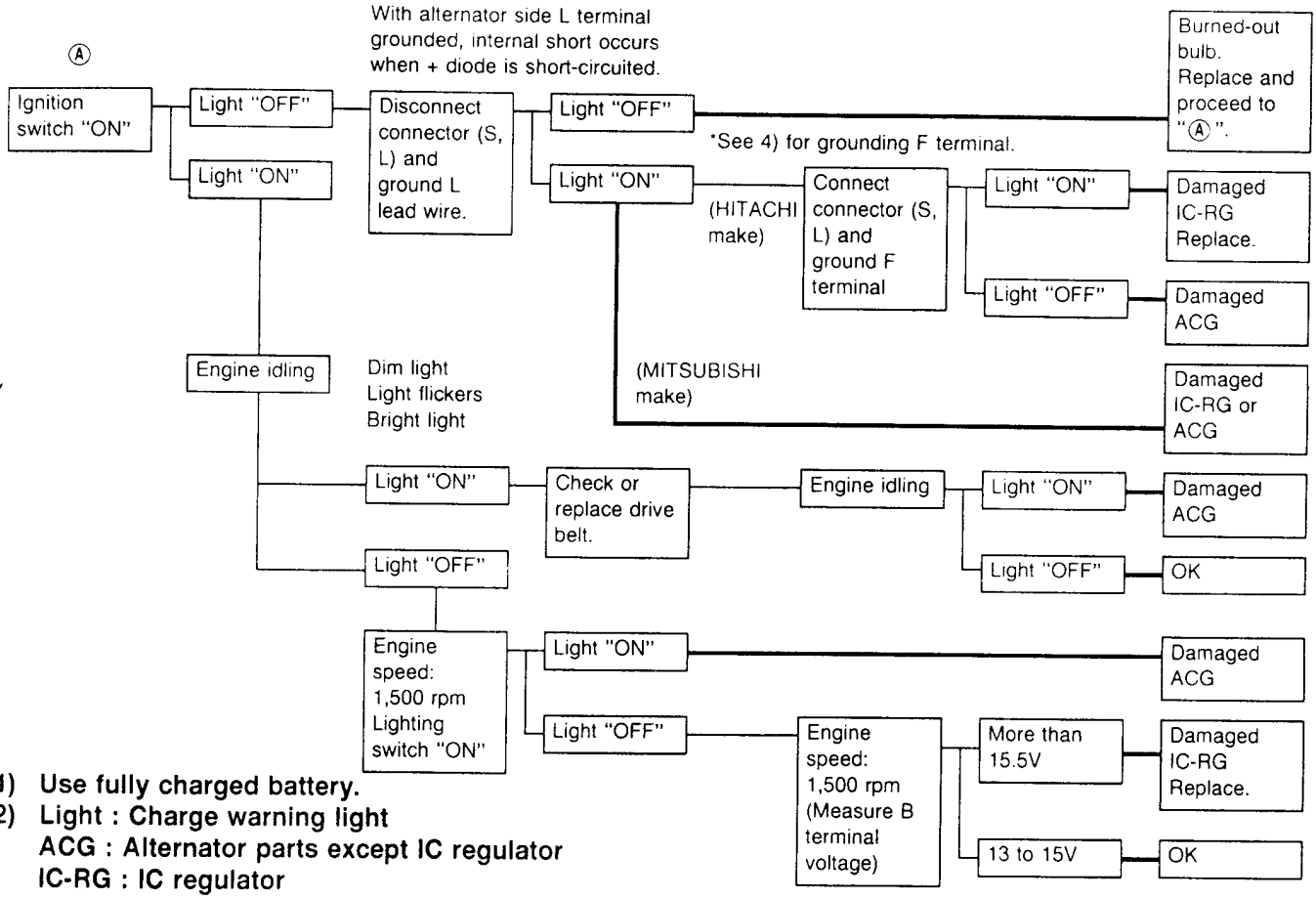
YEL680

Trouble Diagnoses

Before conducting an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the Inspection Table.

Before starting, inspect the fusible link.

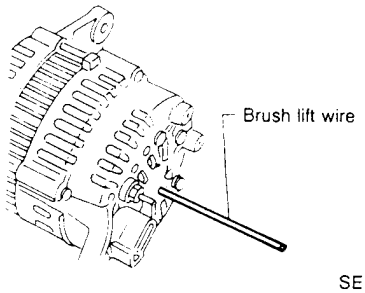
WITH IC REGULATOR



1) **Use fully charged battery.**
2) **Light : Charge warning light**
   ACG : Alternator parts except IC regulator
   IC-RG : IC regulator
   OK : IC-alternator is in good condition.
3) **When reaching "Damaged ACG", remove alternator from vehicle and disassembly, inspect and correct or replace faulty parts.**
4) ***Method of grounding F terminal (HITACHI make only)**

Gasoline engine model

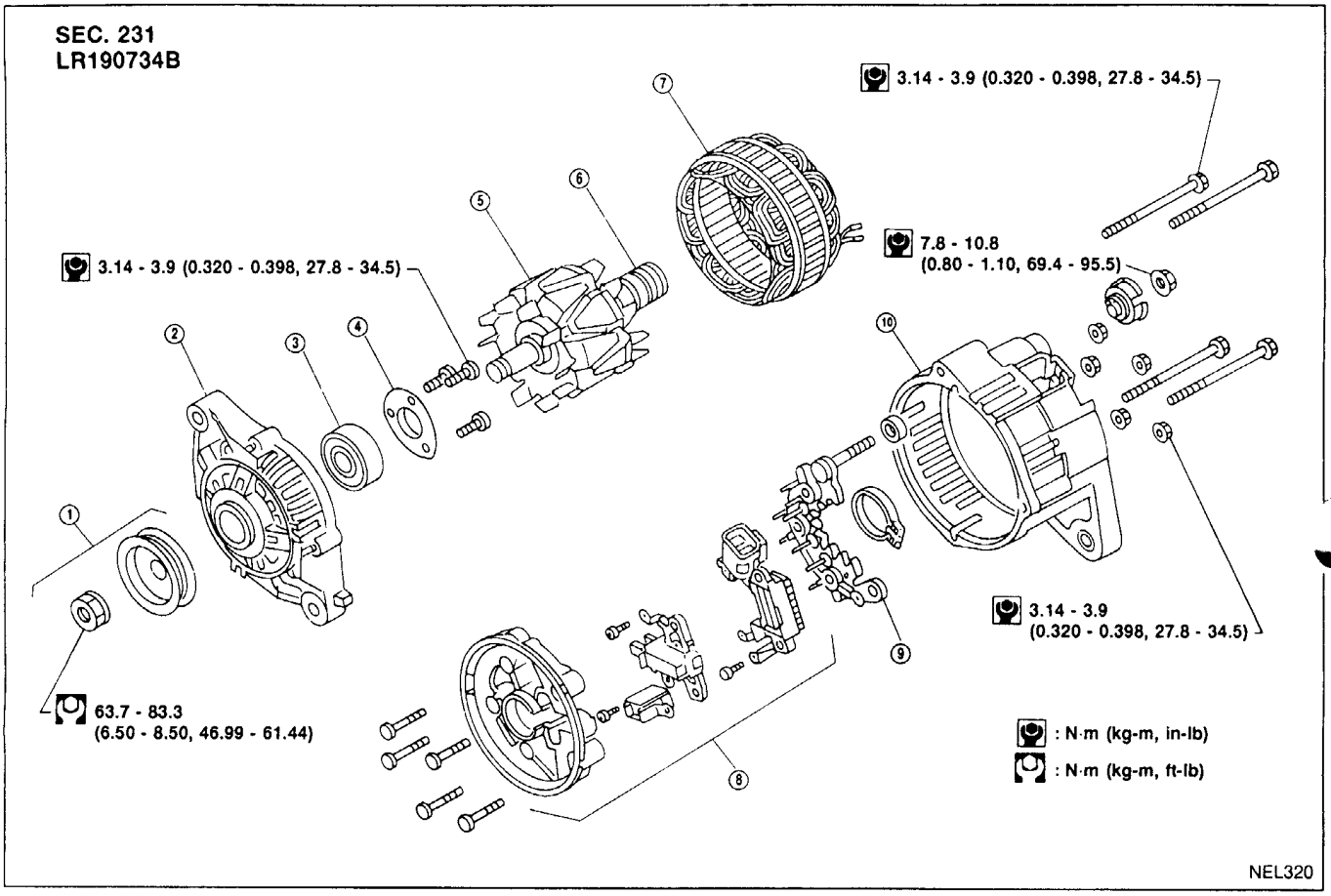
Contact tip of wire with brush and attach wire to alternator body.



SEL030Z

5) **Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.**

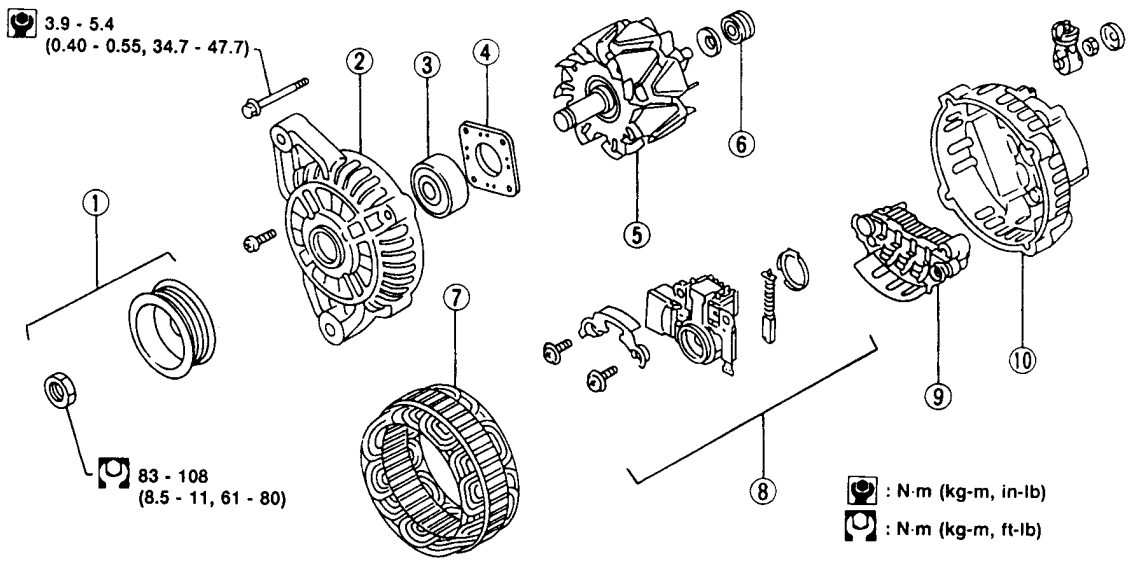
Construction



① Pulley assembly
② Front cover
③ Front bearing
④ Retainer
⑤ Rotor
⑥ Slip ring
⑦ Stator
⑧ IC voltage regulator assembly
⑨ Diode assembly
⑩ Rear cover

Construction (Cont'd)

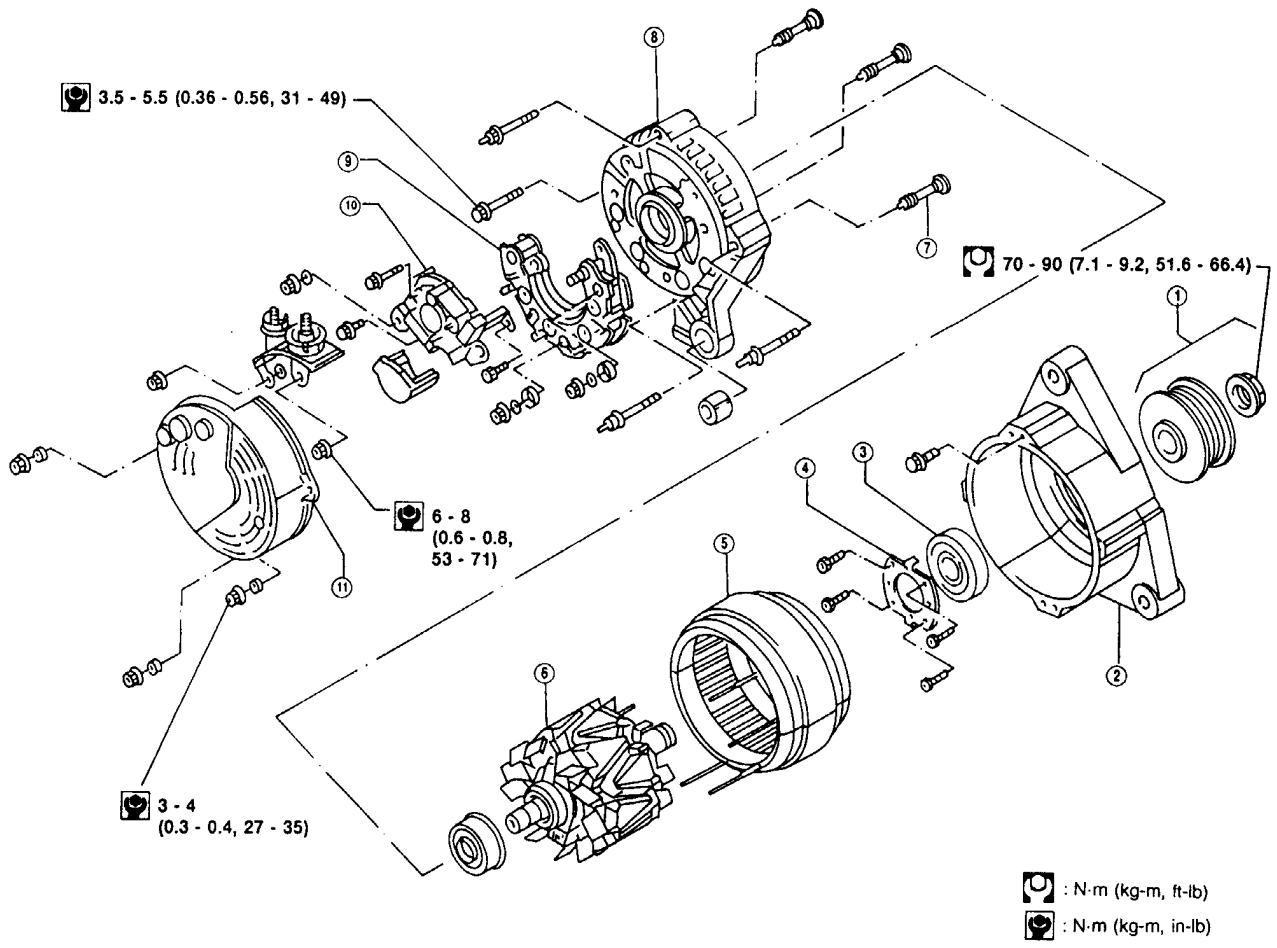
SEC. 231
A2TA4091



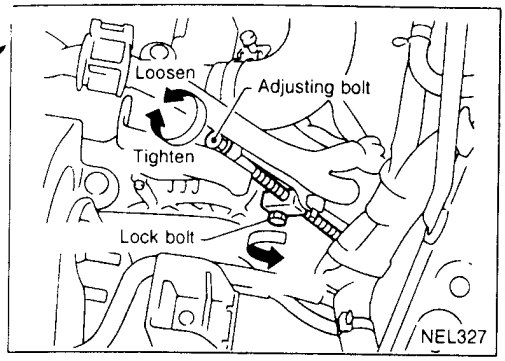
① Pulley assembly
② Front cover
③ Front bearing
④ Bearing retainer
⑤ Rotor
⑥ Rear bearing
⑦ Stator
⑧ IC voltage regulator assembly
⑨ Diode assembly
⑩ Rear cover

Construction (Cont'd)

SEC. 231
A1151-80A

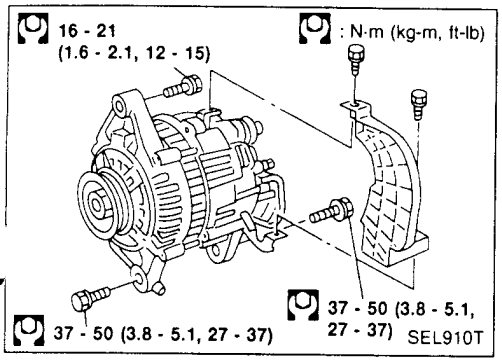


① Pulley assembly
② Front cover
③ Front bearing
④ Bearing retainer
⑤ Stator
⑥ Rotor
⑦ Special bolt
⑧ Rear cover
⑨ Diode assembly
⑩ Brush holder
⑪ Dust cover



Removal and Installation

1. Loosen lock bolt.
2. Remove RH undertray.
3. Loosen alternator mounting bolt and remove drive belt.
4. Remove lock bolt and adjust.
5. Remove harness connectors.
6. Remove alternator mounting bolt.
7. Support engine with jack, and remove front engine mounting bolt.
8. Remove alternator.



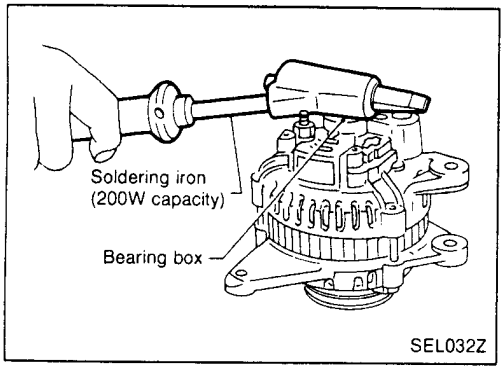
Disassembly

REAR COVER REMOVAL

CAUTION:

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat bearing box section with a 200W soldering iron.

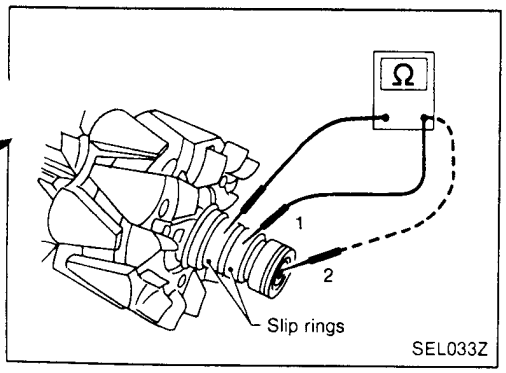
Do not use a heat gun, as it can damage diode assembly.



REAR BEARING

CAUTION:

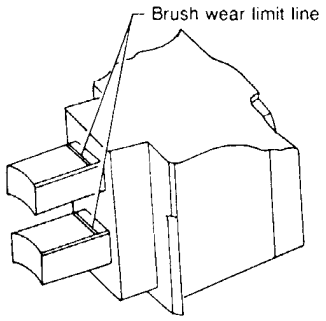
- **Do not reuse rear bearing after removal. Replace with a new one.**
- **Do not lubricate rear bearing outer race.**



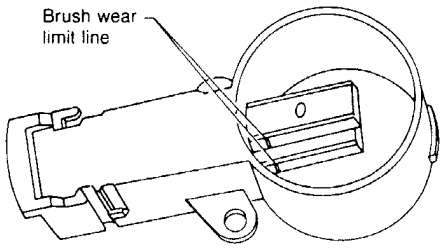
Rotor Check

1. Resistance test
   Resistance: Refer to SDS (EL-57).
   - Not within the specified values ... Replace rotor.
2. Insulator test
   - Continuity exists ... Replace rotor.
3. Check slip ring for wear.
   Slip ring minimum outer diameter:
   Refer to SDS (EL-57).
   - Not within the specified values ... Replace rotor.

Type 1



Type 2

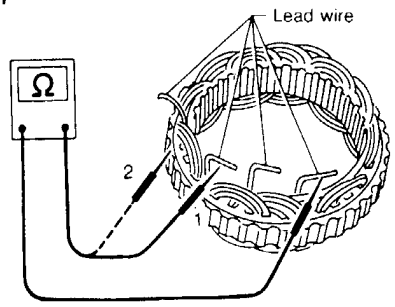


SEL034Z

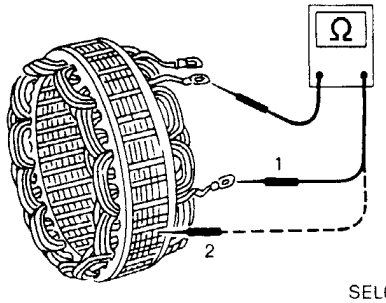
Brush Check

1. Check smooth movement of brush.
   - Not smooth ... Check brush holder and clean.
2. Check brush for wear.
   - Replace brush if it is worn down to the limit line.

Type 1



Type 2



SEL037Z

Stator Check

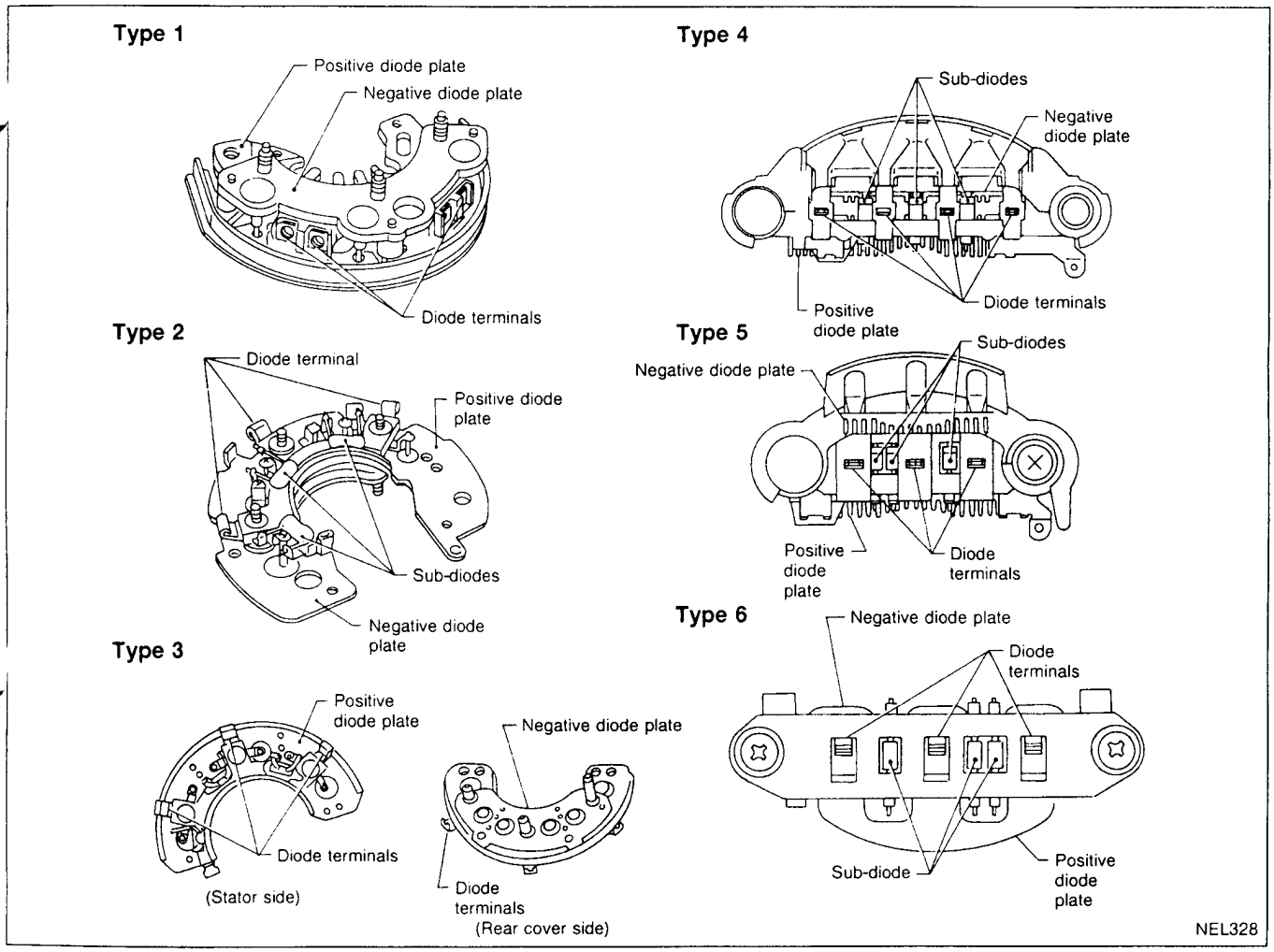
1. Continuity test
   - No continuity ... Replace stator.
2. Ground test
   - Continuity exists ... Replace stator.

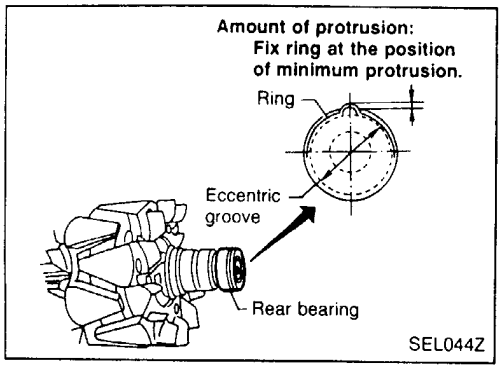
Diode Check

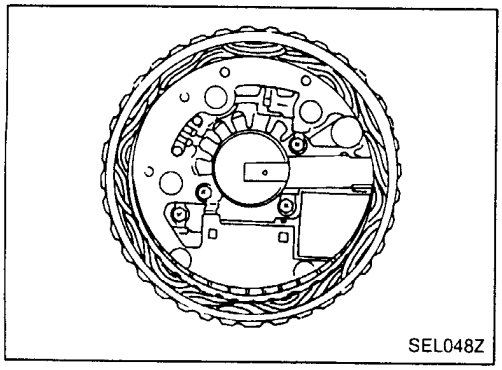
MAIN DIODES

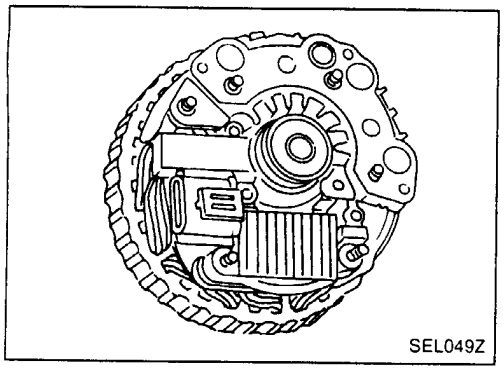
- Use an ohmmeter to check condition of diodes as indicated in chart below.
- If any of the test results is not satisfactory, replace diode assembly.

	Ohmmeter probes		Judgement
	Positive ⊕	Negative ⊖	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Diode conducts in only one direction.
	Diode terminals	Positive diode plate	
Diodes check (Negative side)	Negative diode plate	Diode terminals	Diode conducts in only one direction.
	Diode terminals	Negative diode plate	









Assembly

RING FITTING IN REAR BEARING

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

CAUTION:
Do not reuse rear bearing after removal.

REAR COVER INSTALLATION

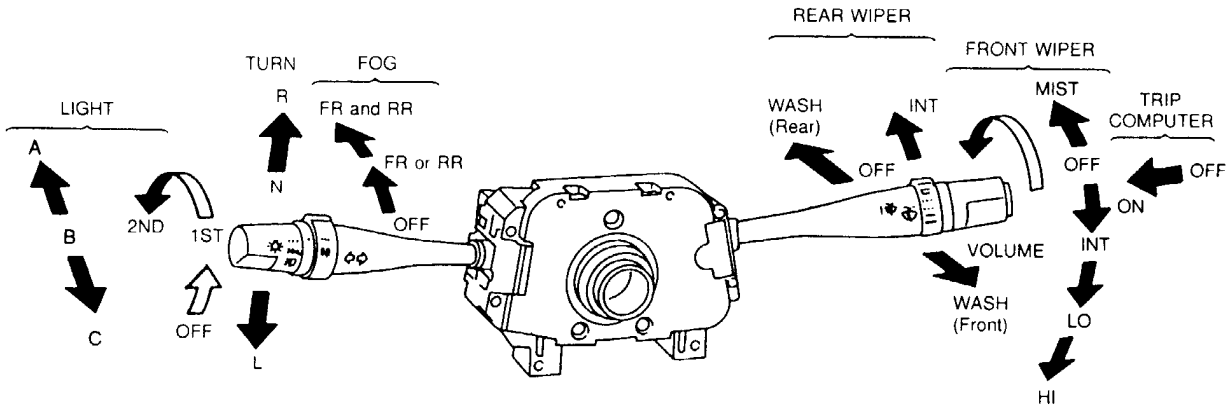
(1) Fit brush assembly, diode assembly, regulator assembly and stator.
(2) Push brushes up with fingers and install them to rotor.
Take care not to damage slip ring sliding surface.

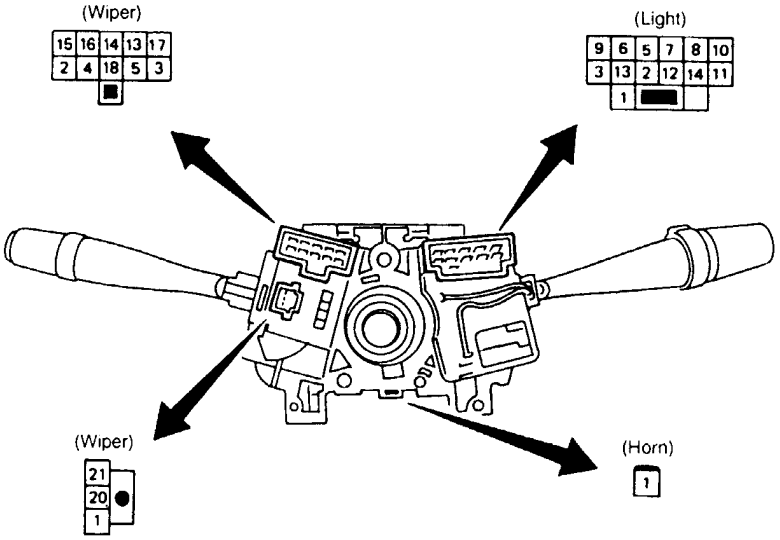
Service Data and Specifications (SDS)

ALTERNATOR

Type	A1151-80A	A2TA4091	LR190-734B
	Magneti Marelli	Mitsubishi	Hitachi
Applied model	SR20 & GA16 engines	SR20 + A/T & Aircon only	CD20T
Nominal rating V-A	12-80		12-90
Ground polarity	Negative		
Minimum revs under no-load (When 13.5V is applied) rev/min	1300	1000	
Hot output current (when 13.5V is applied) A/rev/min	81/600	77/5000	90/5000
Regulated output voltage V	14.1-14.7		
Brush minimum length mm(in)	5.0 (0.12)		6.0 (0.24)
Brush spring pressure N(g, oz)	1.1-2.7 (112.2-275.4, 3.96-9.70)	4.6-5.8 (469.2-591.6, 16.55-20.87)	1.0-3.5 (102.0-357.0, 3.60-12.59)
Slip ring minimum diameter mm(in)	25.4(1.0)	22.1(0.87)	31.6(1.24)
Rotor coil resistance at 20°C (68°F)	—	2.6-3.0	2.3-2.5

Combination Switch/Check





LIGHTING SWITCH
(With rear fog lamp)

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○				○	○	○
6			○				○	○	○
7							○	○	○
8			○				○	○	○
9			○				○	○	○
10							○	○	○
⊠							○	○	○
11				○	○	○	○	○	○
12				○	○	○	○	○	○
13								○	○

LIGHTING SWITCH
(With front and rear fog lamp)

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○			○	○	○	○
6			○			○	○	○	○
7							○	○	○
8			○			○	○	○	○
9			○			○	○	○	○
10							○	○	○
11				○	○	○	○	○	○
12				○	○	○	○	○	○
⊠				○	○	○	○	○	○
13					○	○	○	○	○
14					○	○	○	○	○

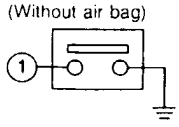
WIPER AND WASHER SWITCH

	FRONT					WASH			REAR		REAR			TRIP	
	MIST	OFF	INT	LO	HI	FR/WASH	OFF	RR/WASH	OFF	ON	OFF	INT	ON	OFF	ON
13		○	○												
14	○	○	○	○											
15			○												
16					○										
17	○		○	○	○										
18						○		○							
1												○			
2										○			○		
3						○	○								
4						○		○		○		○	○		
5							○		○						○
21															○

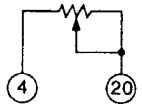
TURN SIGNAL SWITCH

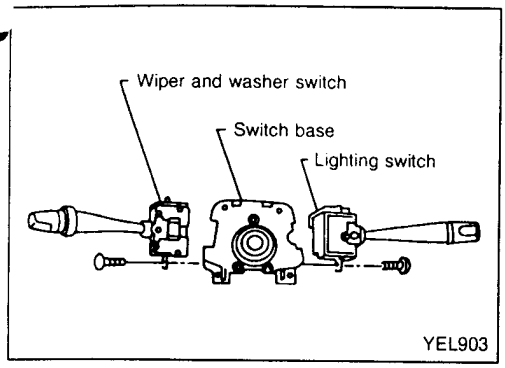
	L	N	R
1	○		○
2			
3	○		○

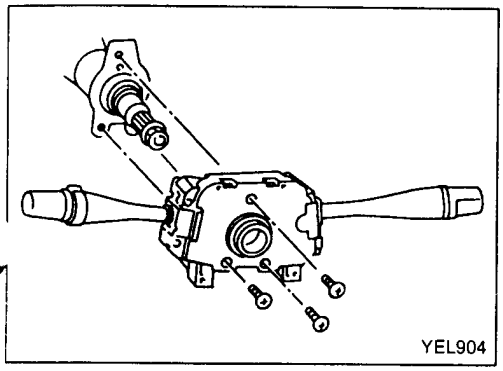
HORN SWITCH
(Without air bag)



INTERMITTENT WIPER VOLUME





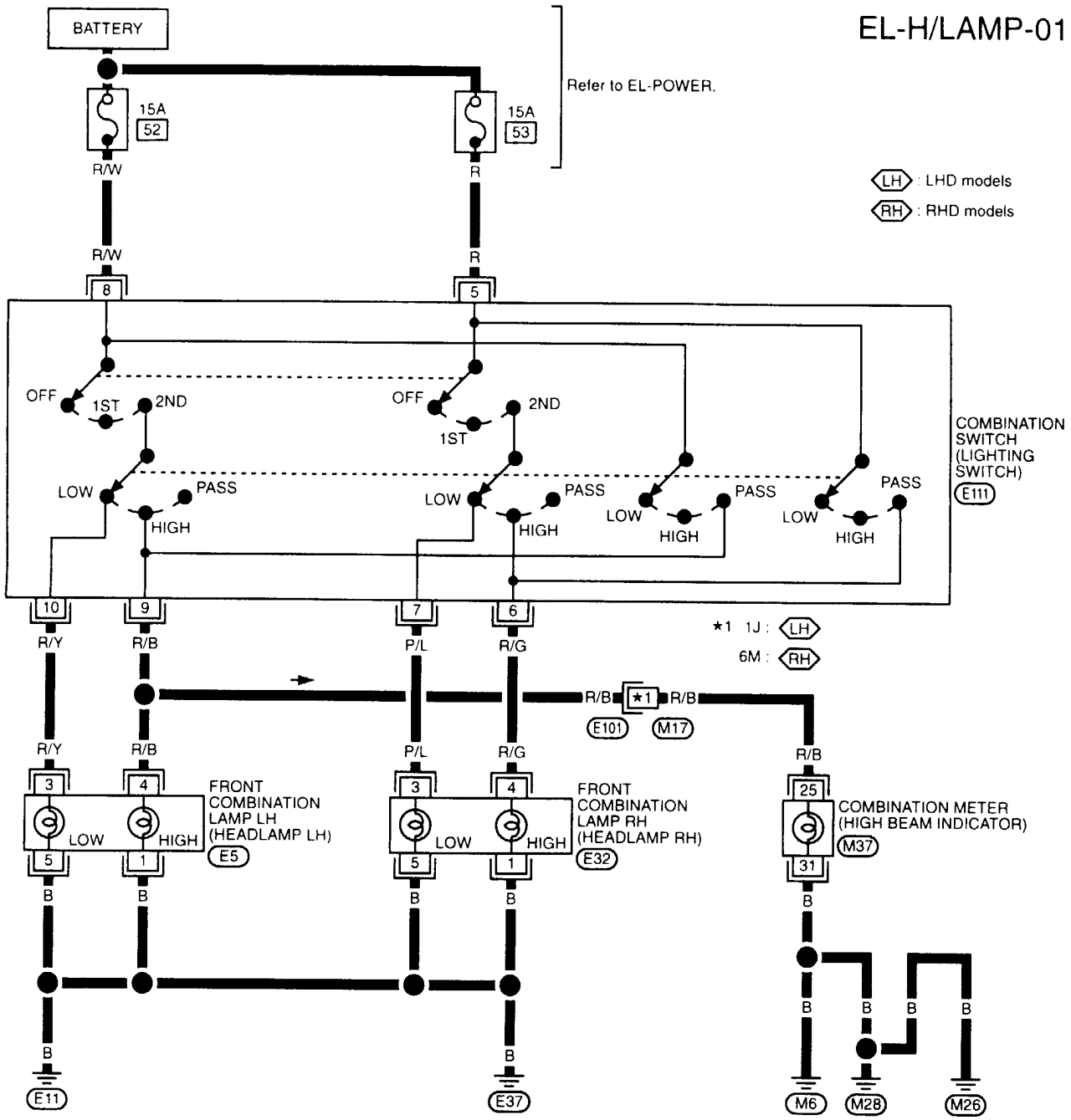


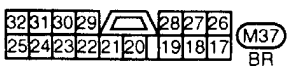
Replacement

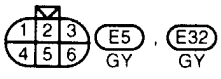
For removing/installing air bag module and spiral cable, refer to RS section.

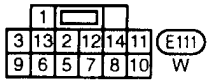
- Each switch can be replaced without removing combination switch base.
- To remove combination switch base, remove base attaching screw.

Wiring Diagram — H/LAMP —









Refer to last page (Foldout page).
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YEL681

Trouble Diagnoses

Symptom	Possible cause	Repair order
LH headlamp does not operate.	1. Bulb 2. LH headlamp ground 3. 15A fuse 4. Lighting switch	1. Check bulb. 2. Check LH headlamp ground. (Terminal ① and ⑤) 3. Check 15A fuse (No. 52, located in fusible link and fuse box). 4. Check lighting switch.
RH headlamp does not operate.	1. Bulb 2. RH headlamp ground 3. 15A fuse 4. Lighting switch	1. Check bulb. 2. Check RH headlamp ground. (Terminal ① and ⑤) 3. Check 15A fuse (No. 53, located in fusible link and fuse box). 4. Check lighting switch.
LH high beam does not operate, but LH low beam operates.	1. Bulb 2. Open in LH high beam circuit 3. Lighting switch	1. Check bulb. 2. Check R/B wire between lighting switch and LH headlamp for an open circuit. 3. Check lighting switch.
LH low beam does not operate, but LH high beam operates.	1. Bulb 2. Open in LH low beam circuit 3. Lighting switch	1. Check bulb. 2. Check R/Y wire between lighting switch and LH headlamp for an open circuit. 3. Check lighting switch.
RH high beam does not operate, but RH low beam operates.	1. Bulb. 2. Open in RH high beam circuit 3. Lighting switch.	1. Check bulb. 2. Check R/G wire between lighting switch and RH headlamp for an open circuit. 3. Check lighting switch.
RH low beam does not operate, but RH high beam operates.	1. Bulb 2. Open in RH low beam circuit 3. Lighting switch	1. Check bulb. 2. Check P/L wire between lighting switch and RH headlamp for an open circuit. 3. Check lighting switch.
High beam indicator does not work.	1. Bulb 2. High beam indicator ground 3. Open in high beam circuit	1. Check bulb in combination meter. 2. Check combination meter ground. (Terminal ㉛) 3. Check R/B wire between lighting switch and combination meter for an open circuit.

System Description

The headlamp system on vehicles for North Europe contains a daytime light unit. The unit activates the following whenever the engine is running with the lighting switch in the OFF position:

- Low beam headlamps
- Clearance, license, tail and illumination lamps

Power is supplied at all times

- through 15A fuse (No. 52, located in the fusible link and fuse box)
- to daytime light unit terminal ⑦ and
- to lighting switch terminal ⑧.

Power is also supplied at all times

- through 15A fuse (No. 53, located in the fusible link and fuse box)
- to daytime light unit terminal ⑤ and
- to lighting switch terminal ⑤.

Power is also supplied at all times

- through 10A fuse (No. 54, located in the fusible link and fuse box)
- to daytime light unit terminal ① and
- to lighting switch terminal ⑪.

With the ignition switch is in the ON or START position, power is supplied

- through 10A fuse (No. 25, located in the fuse block)
- to daytime light unit terminal ⑫.

With the ignition switch in the START position, power is supplied

- through 5A fuse (No. 26, located in the fuse block)
- to daytime light unit terminal ⑧.

Ground is supplied to daytime light unit terminal ⑩ through body grounds E37 and E11.

HEADLAMP OPERATION (Daytime light cancel operation)

Power is supplied at all times

- through 10A fuse (No. 54, located in the fuse and fusible link box)
- to lighting switch terminal ⑪.

When the lighting switch is turned to the 1st or 2nd position

- through lighting switch terminal ⑫,
- to daytime light unit terminal ③.

Then daytime light will be canceled. And the lighting system operation will be the same as for no daytime light system.

DAYTIME LIGHT OPERATION

With the engine running and the lighting switch in the OFF position, power is supplied

- from alternator terminal Ⓛ
- to daytime light unit terminal ②
- through daytime light unit terminal ⑨
- to terminal ③ of LH headlamp
- through daytime light unit terminal ⑪
- to terminal ③ of RH headlamp
- through daytime light unit terminal ⑥
- to tail lamp and illumination.

Ground is supplied to terminal ① and ⑤ of each headlamp through body grounds E37 and E11.
Ground is also supplied to terminal ⑩ of daytime light unit through body grounds E37 and E11.

Operation (Daytime light system)

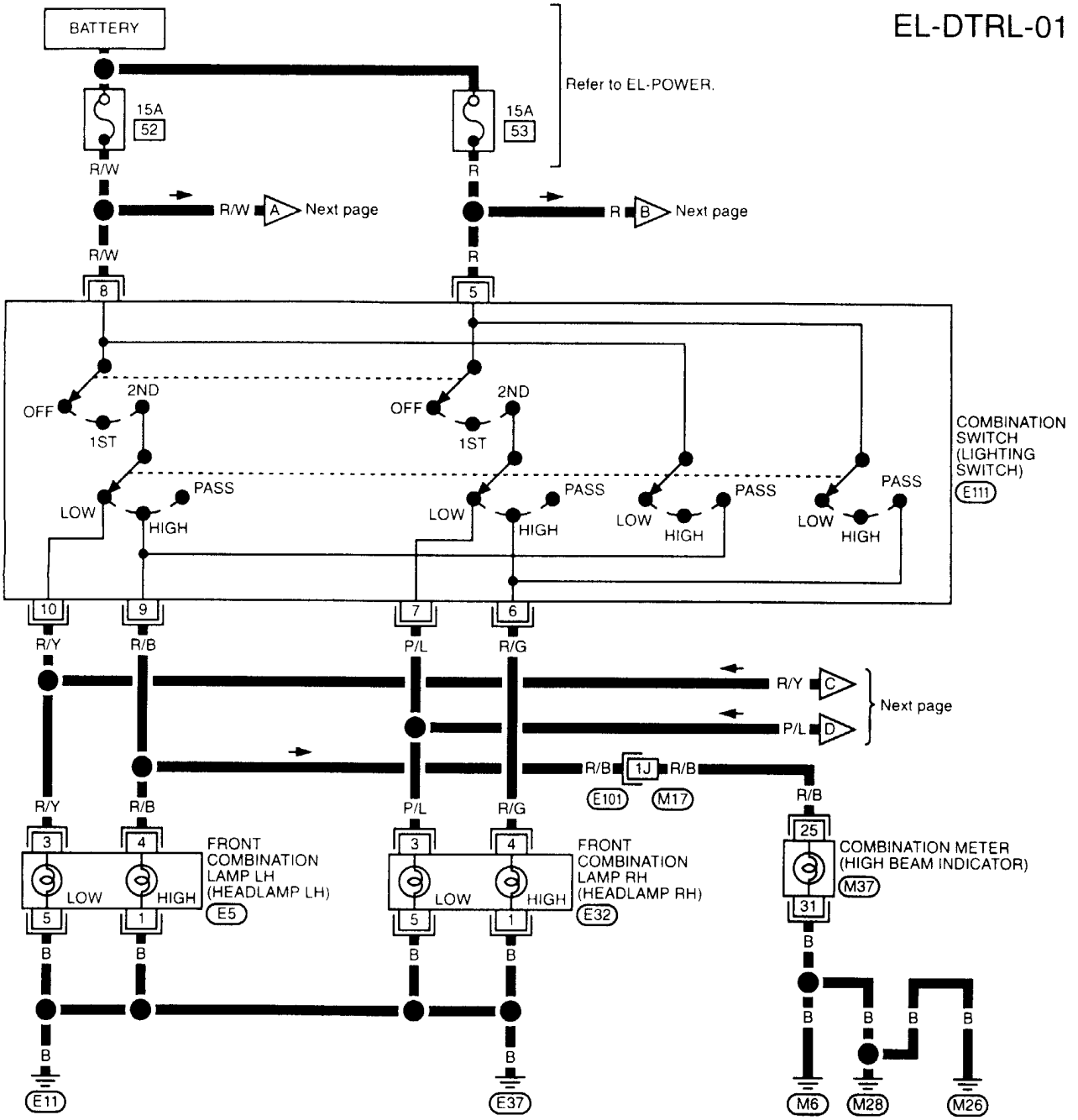
The headlamps' low beam, clearance, license, tail and illumination lamps automatically turn on after starting the engine with lighting switch in "OFF" position.
Lighting switch operations other than the above are the same as conventional light systems.

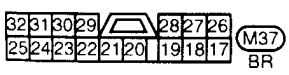
Engine		With engine stopped									With engine running								
Lighting switch		OFF			1ST			2ND			OFF			1ST			2ND		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Headlamp	High beam	X	X	○	X	X	○	○	X	○	X	X	○	X	X	○	○	X	○
	Low beam	X	X	X	X	X	X	X	○	X	○	○	○	X	X	X	X	○	X
Clearance and tail lamp		X	X	X	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
License and instrument illumination lamp		X	X	X	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

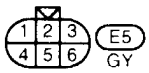
○ : Lamp "ON"
X : Lamp "OFF"
┐ : Added functions

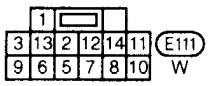
Wiring Diagram — DTRL —

EL-DTRL-01









Refer to last page (Foldout page).
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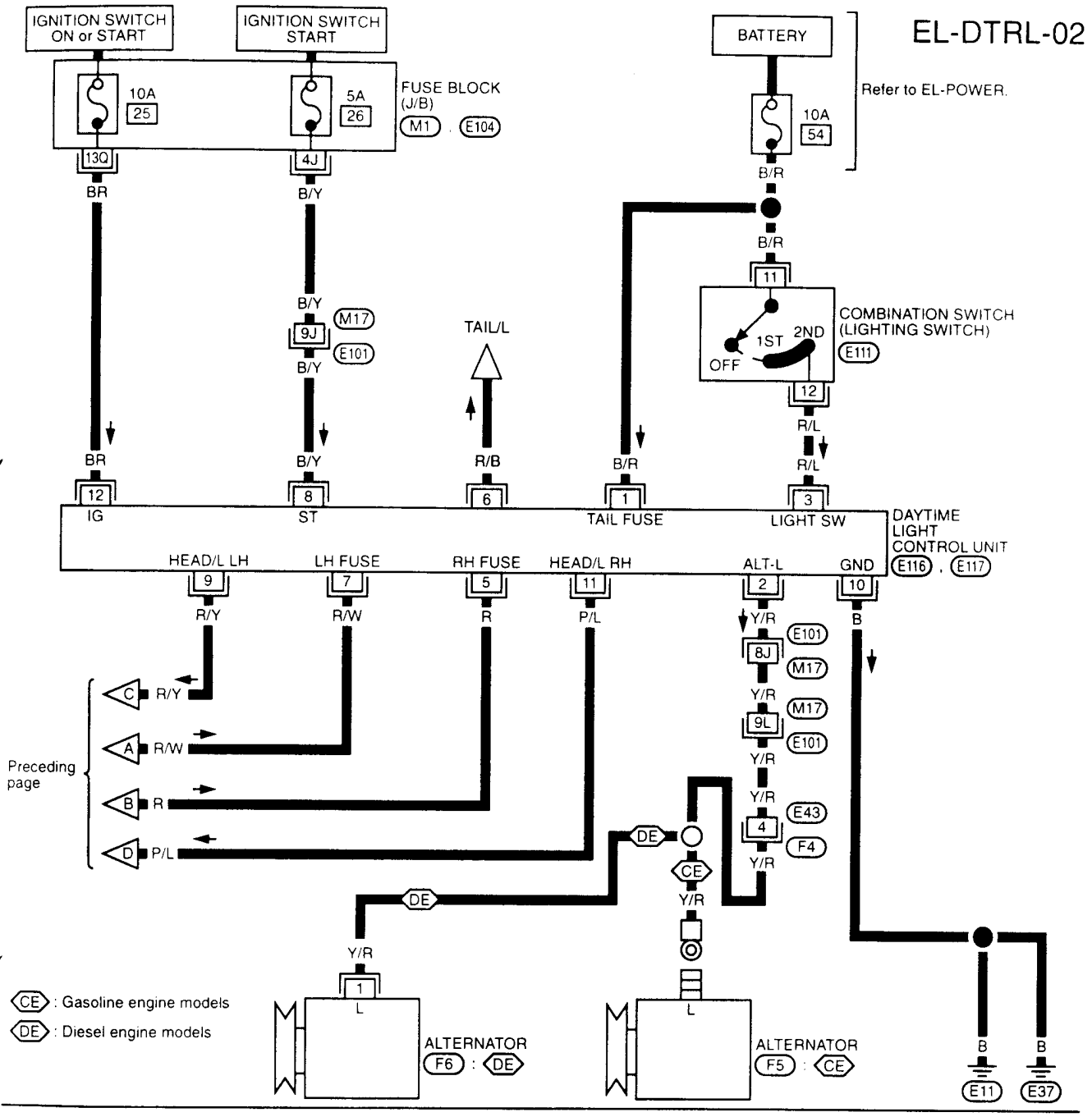
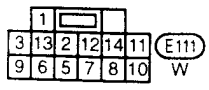
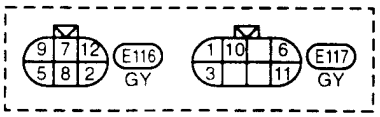
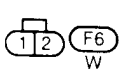
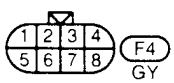
Wiring Diagram — DTRL — (Cont'd)











Refer to last page (Foldout page).
M17 , E101
M1
E104

YEL683

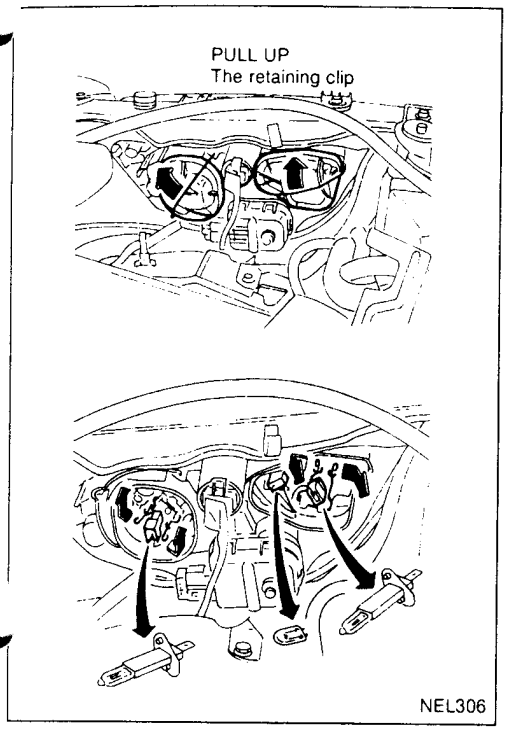
Trouble Diagnoses (Daytime Light)

DAYTIME LIGHT CONTROL UNIT INSPECTION TABLE

(Input/output operation signal)

Terminal No.	Connections	INPUT (I)/ OUTPUT (O)	Operated condition		Voltage (V) (Approximate values)
1	Power source for illumination & tail lamp	—	—		12
2	Alternator "L" terminal	I	Engine	Running	12
				Stopped	0
3	Lighting switch	I	1ST·2ND position		12
			OFF		0
5	Power source for headlamp RH	—	—		12
6	Illumination & tail lamp	O	ON (daytime light operating*)		12
			OFF		0
7	Power source for headlamp LH	—	—		12
8	Start signal	I	Ignition switch	START	12
				ON, ACC or OFF	0
9	Headlamp LH	O	ON (daytime light operating*)		12
			OFF		0
10	Ground	—	—		—
11	Headlamp RH	O	ON (daytime light operating*)		12
			OFF		0
12	Power source	—	Ignition switch	ON or START	12
				ACC or OFF	0

*: Daytime light operating: Lighting switch in "OFF" position with engine running.



Bulb Replacement

The headlamp is a semi-sealed beam type which uses a replaceable halogen bulb. The bulb can be replaced from the engine compartment side without removing the headlamp body.

- **Grasp only the plastic base when handling the bulb. Never touch the glass envelope.**

1. Disconnect the battery cable.
2. Pull up the retaining clip and pull off the plastic cover.
3. Remove connector.
4. Push and turn the retaining pins away from the bulb.
5. Remove the headlight bulb. Do not shake or rotate the bulb when removing it.
6. Install the new bulb in the reverse order of removal.

CAUTION:

- **Do not leave headlamp reflector without bulb for a long period of time. Dust, moisture, smoke, etc. entering headlamp body may affect the performance of the headlamp. Remove headlamp bulb from the headlamp reflector just before a replacement bulb is installed.**

Bulb Specifications

Item	Wattage (W)
Semi-sealed beam High/Low	55/55

Aiming Adjustment

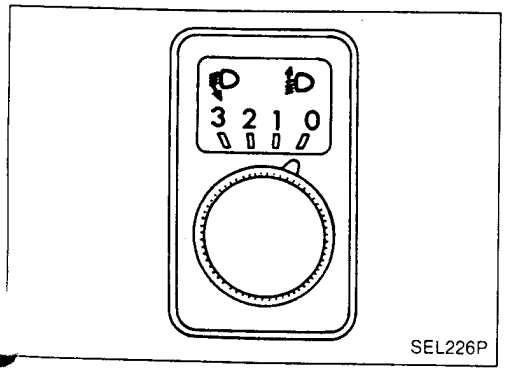
When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. Aimers should be in good repair, calibrated and operated in accordance with respective operation manuals.

If any aimer is not available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

CAUTION:

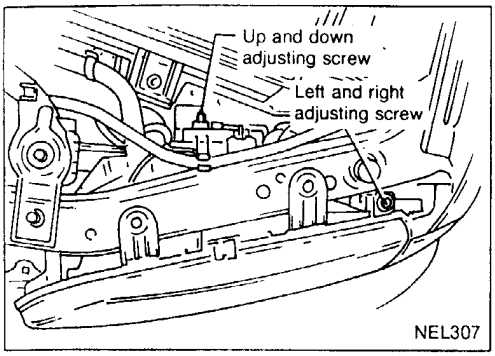
- **Keep all tires inflated to correct pressures.**
- **Place vehicle and tester on one and same flat surface.**
- **See that vehicle is unloaded (except for full levels of coolant, engine oil and fuel, and spare tire, jack and tools). Have the driver or equivalent weight placed in driver's seat.**



CAUTION:

Be sure aiming switch is set to "0" when performing aiming adjustment on vehicles equipped with headlamp aiming control.

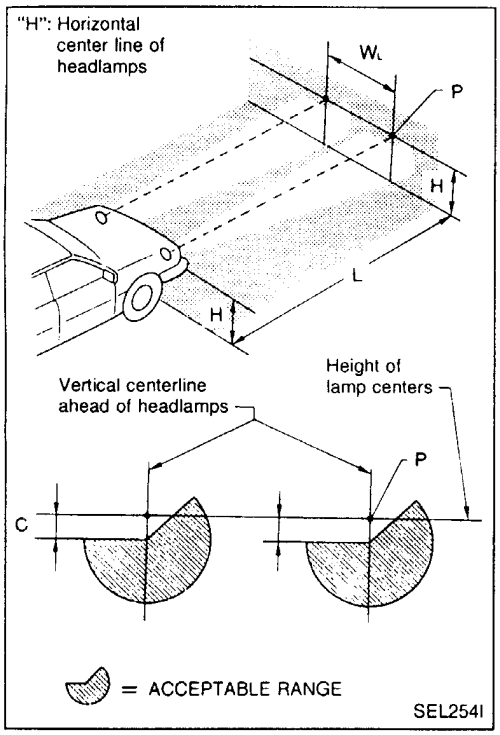
Aiming Adjustment (Cont'd)



LOW BEAM

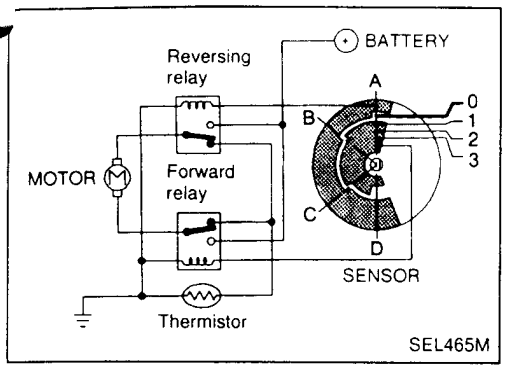
1. Turn headlamp low beam on.
2. Use adjusting screws to perform aiming adjustment.

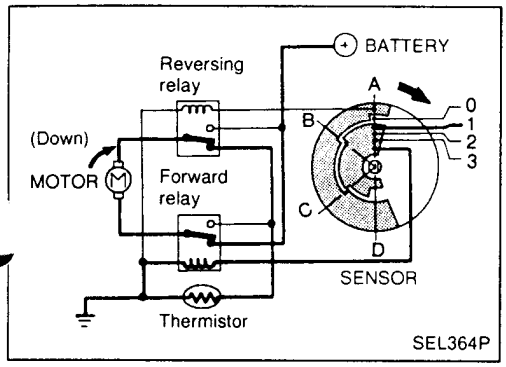
- **First tighten the adjusting screw all the way and then make adjustment by loosening the screw.**

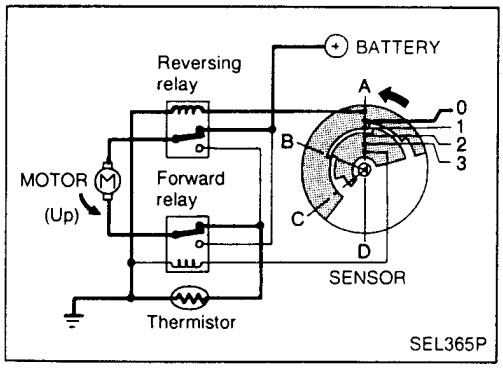


- **Adjust headlamps so that main axis of light is parallel to center line of body and is aligned with point P shown in illustration.**
- **Figure to the left shows headlamp aiming pattern for driving on right side of road; for driving on left side of road, aiming pattern is reversed.**
- **Dotted lines in illustration show center of headlamp.**

"H": Horizontal center line of headlamps
"W_L": Distance between each headlamp center
"L": 5,000 mm (196.85 in)
"C": 65 mm (2.56 in)







System Description

CIRCUIT OPERATION

[Example]

Aiming switch "0"

- When the aiming switch is set to "0", the motor will not start. This is because the power terminals are positioned at the nonconductive section of the sensor's rotary unit.

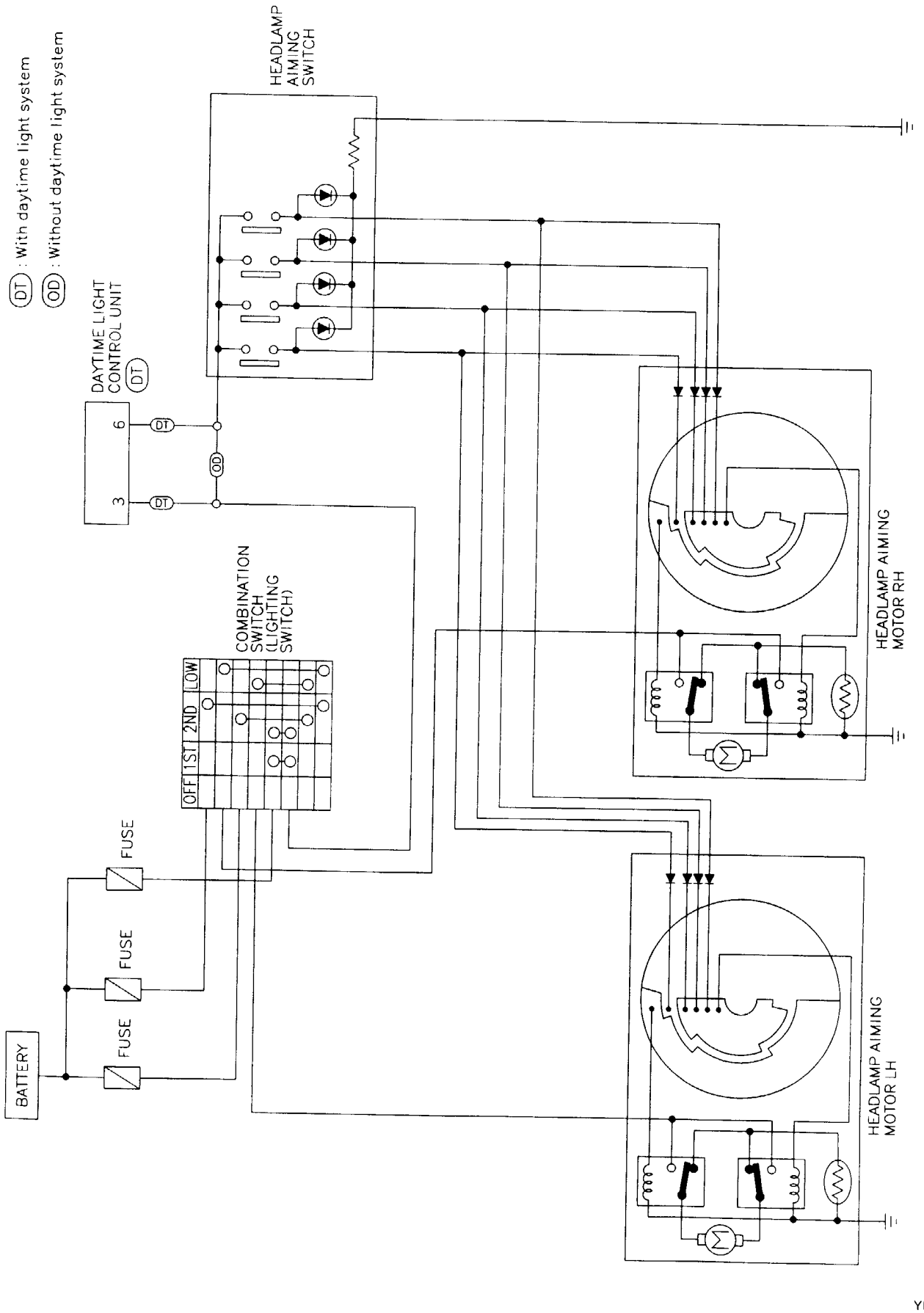
Aiming switch "0" → "1"

- When the aiming switch is moved from "0" to "1", the sensor's conductive section activates the relay. Power is supplied through the relay to the motor. The headlamps will then move in the "DOWN" direction.
- The motor continues to rotate while the rotary unit of the sensor moves from point A to point B.
- The power terminals will then be positioned at the nonconductive section, disconnecting the power to the motor. The motor will then stop.

Aiming switch "1" → "0"

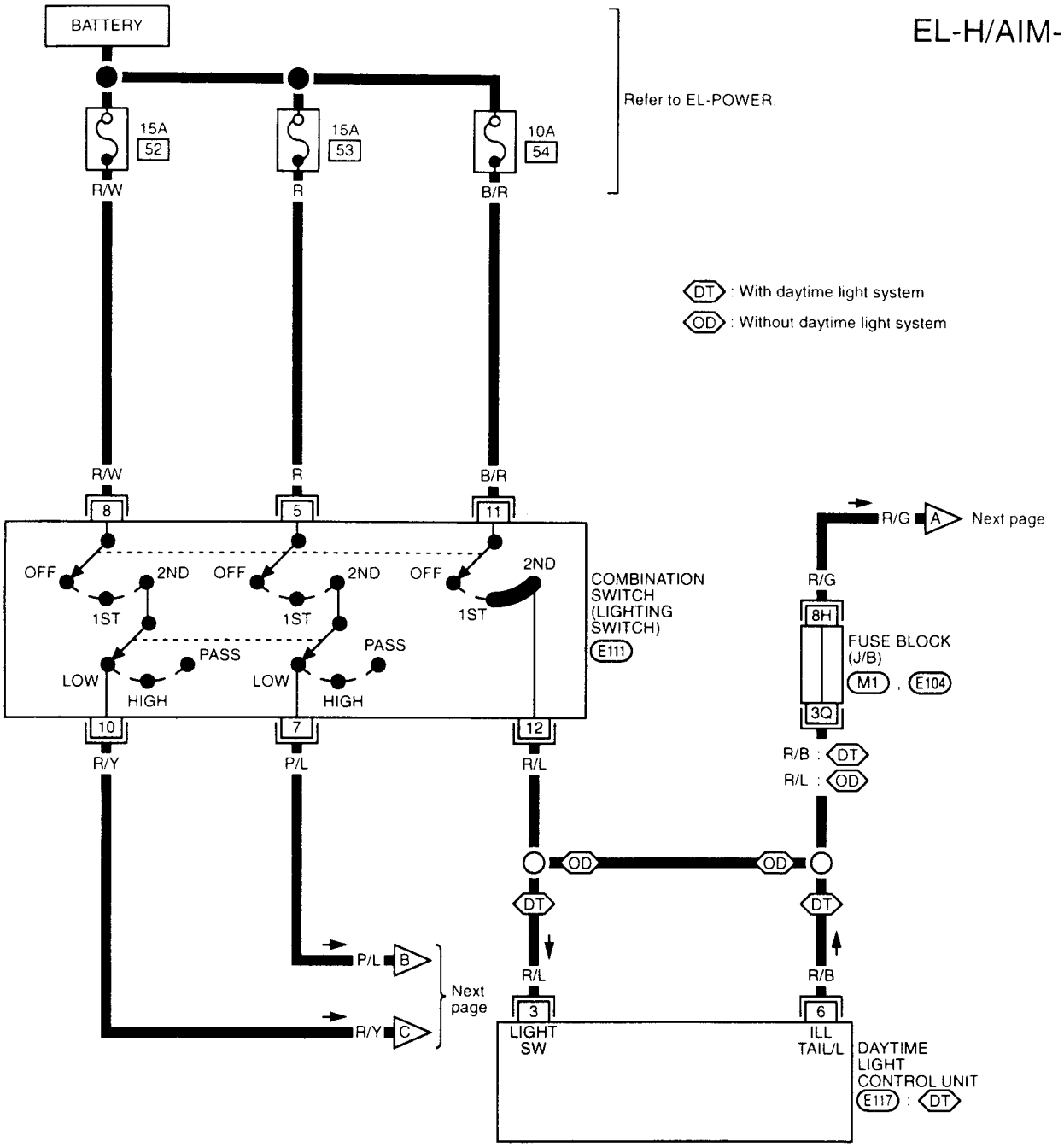
- When the aiming switch is moved from "1" to "0", the sensor's conductive section activates the relay. Power is supplied through the relay to the motor. The motor will rotate to move the headlamps in the "UP" direction.
- When the rotary unit of the sensor moves from point B to point A, the motor will stop.

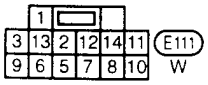
Schematic

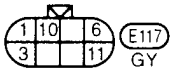

(DT) : With daytime light system
(OD) : Without daytime light system
HEADLAMP AIMING SWITCH
DAYTIME LIGHT CONTROL UNIT
DT
6
3
OD
COMBINATION SWITCH (LIGHTING SWITCH)
OFF
1ST
2ND
LOW
FUSE
FUSE
FUSE
BATTERY
HEADLAMP AIMING MOTOR RH
HEADLAMP AIMING MOTOR LH
YEL686

Wiring Diagram — AIM —

EL-H/AIM-01





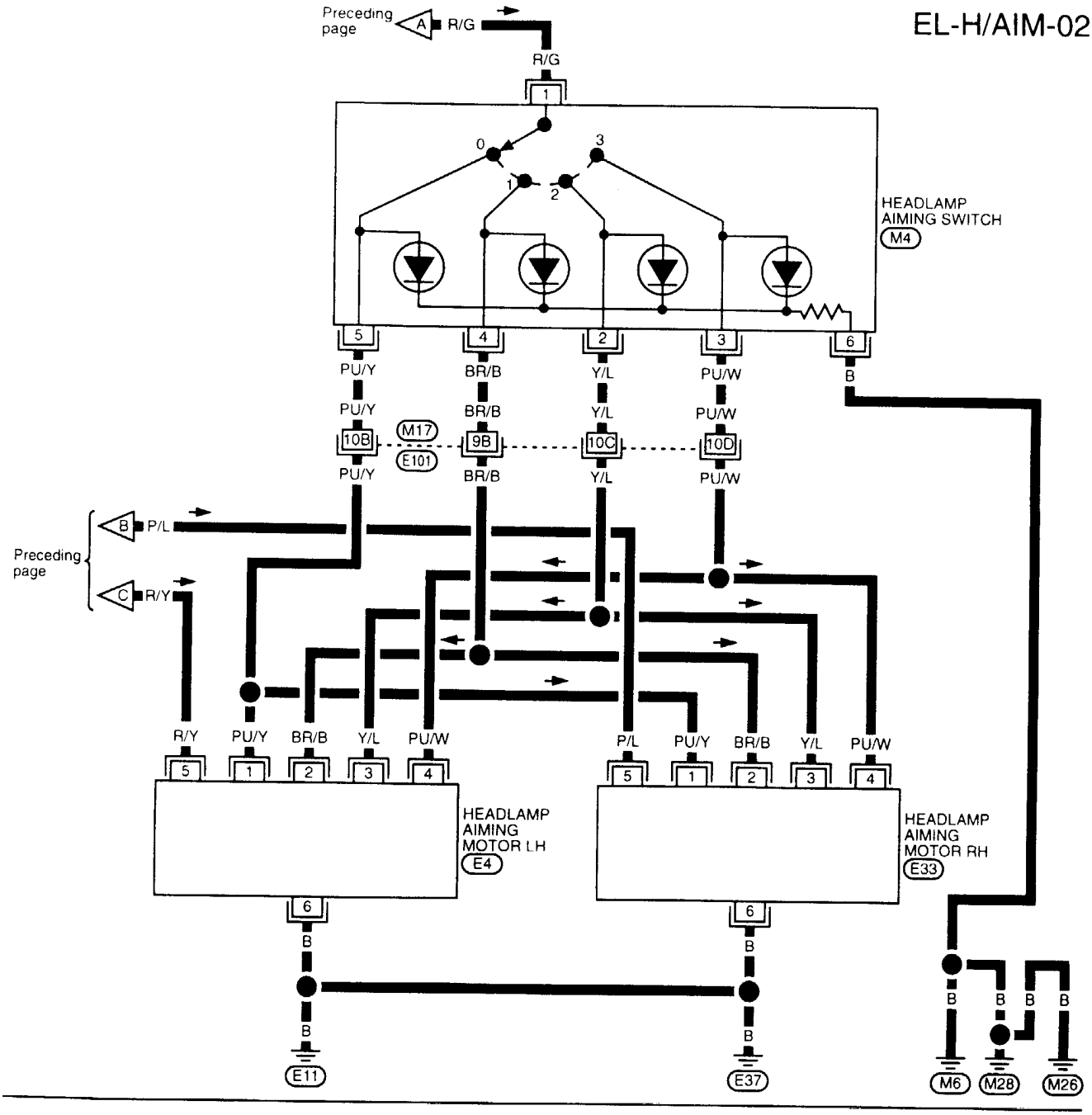


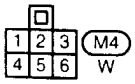
Refer to last page (Foldout page).
M1
E104

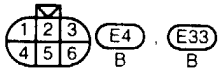
YEL684

Wiring Diagram — AIM — (Cont'd)

EL-H/AIM-02





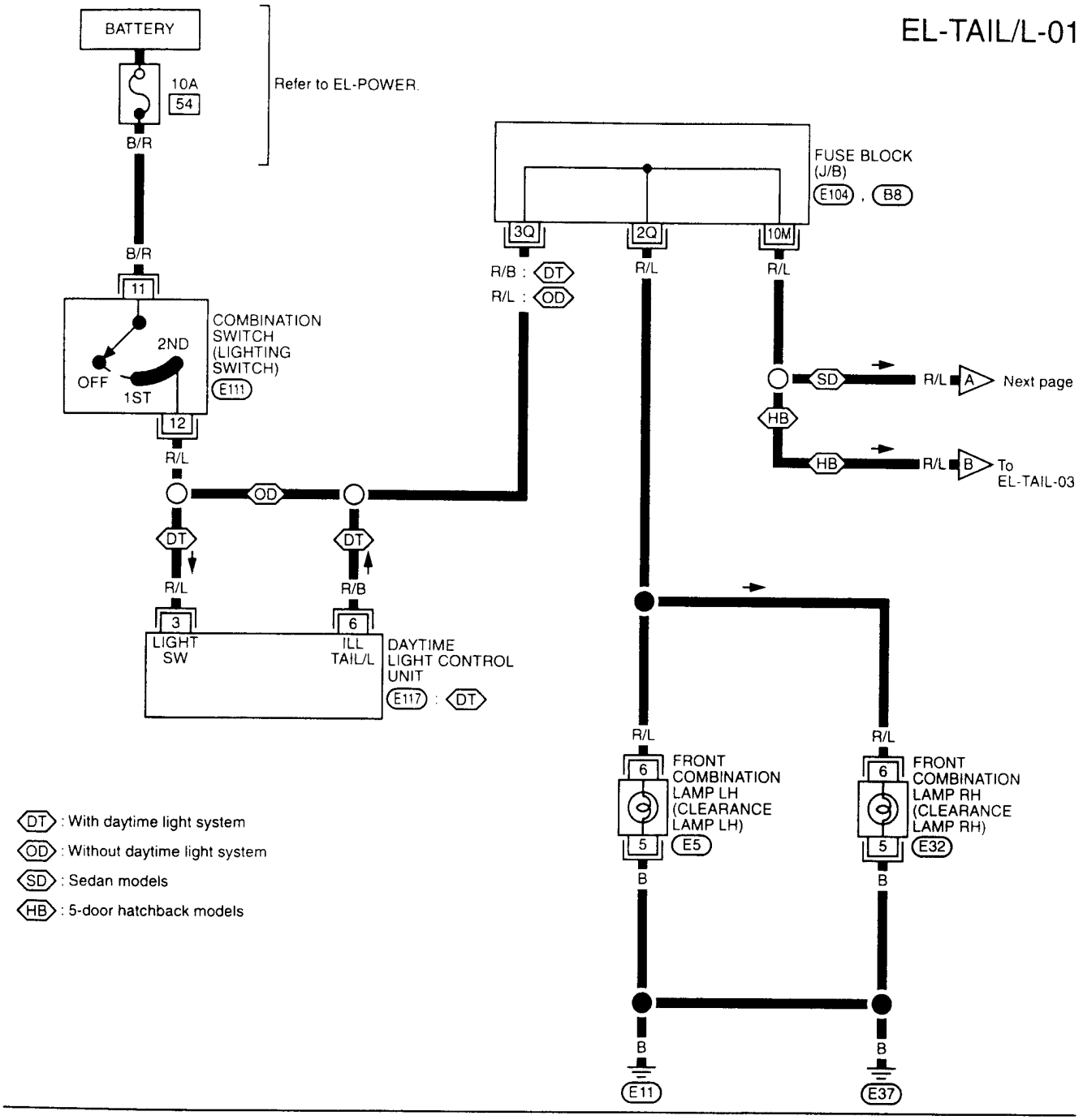


Refer to last page (Foldout page).
M17 , E101

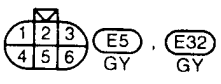
YEL685

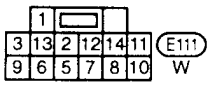
Clearance, License and Tail Lamps/Wiring Diagram — TAIL/L —

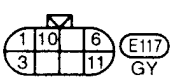
EL-TAIL/L-01



DT : With daytime light system
OD : Without daytime light system
SD : Sedan models
HB : 5-door hatchback models





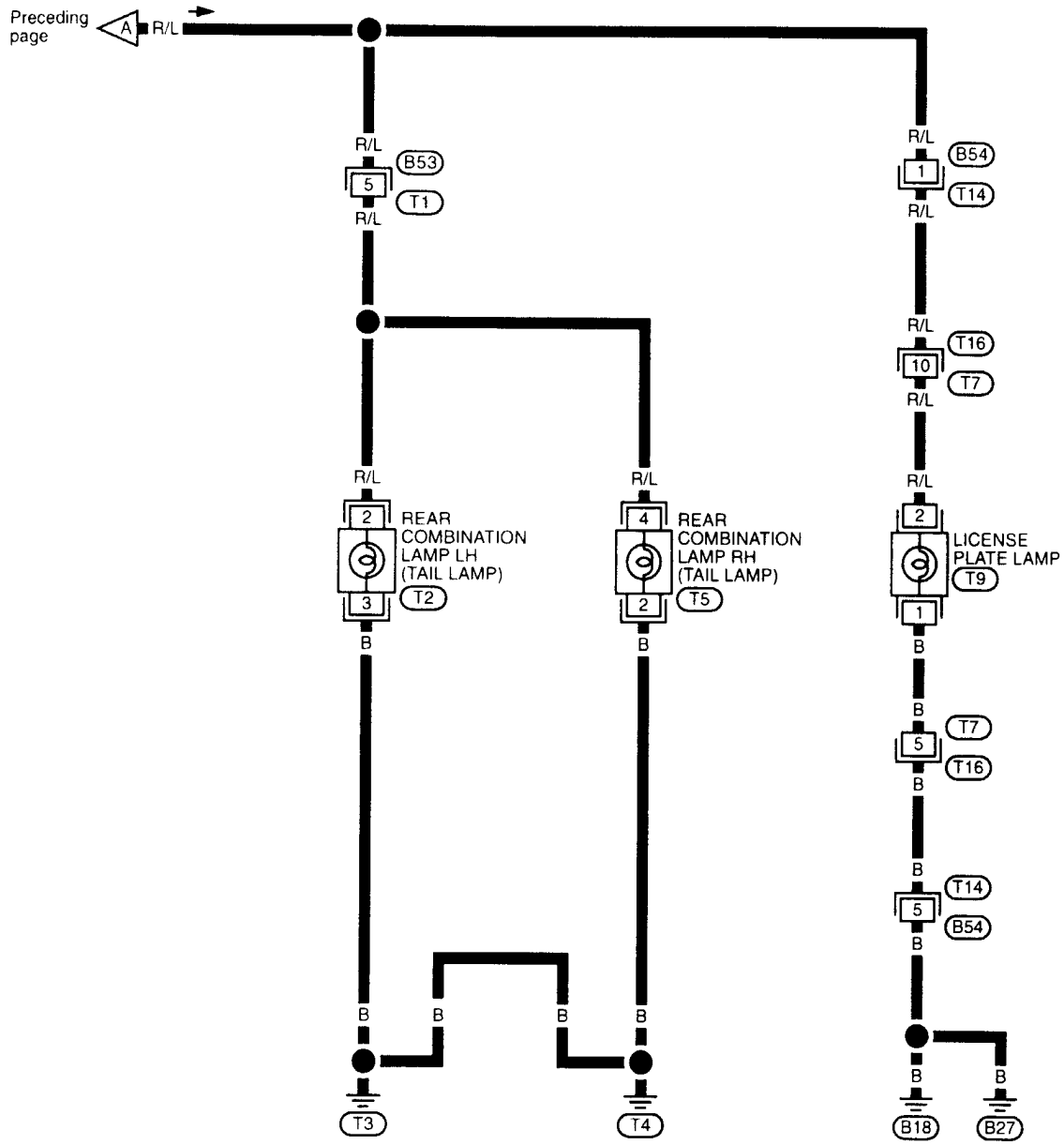


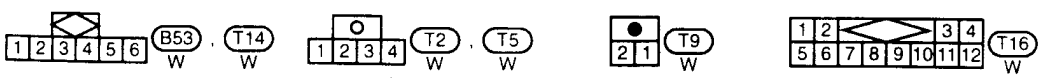
Refer to last page (Foldout page).
E104
B8

YEL687

Clearance, License and Tail Lamps/Wiring Diagram — TAIL/L — (Cont'd)

EL-TAIL/L-02

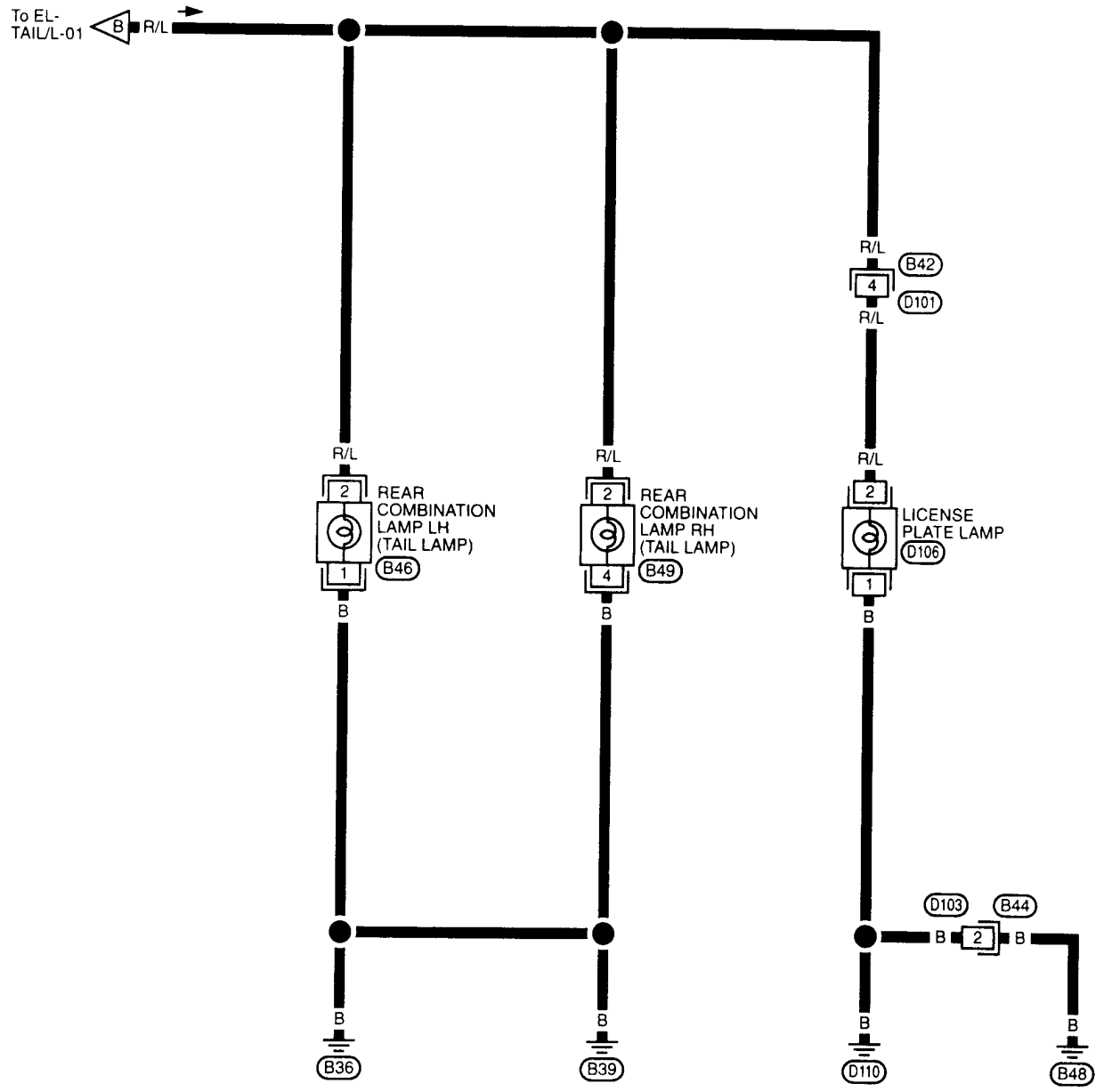


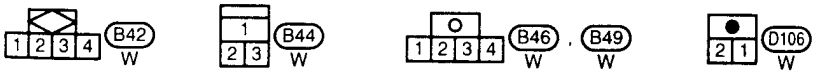


YEL688

Clearance, License and Tail Lamps/Wiring Diagram — TAIL/L — (Cont'd)

EL-TAIL/L-03

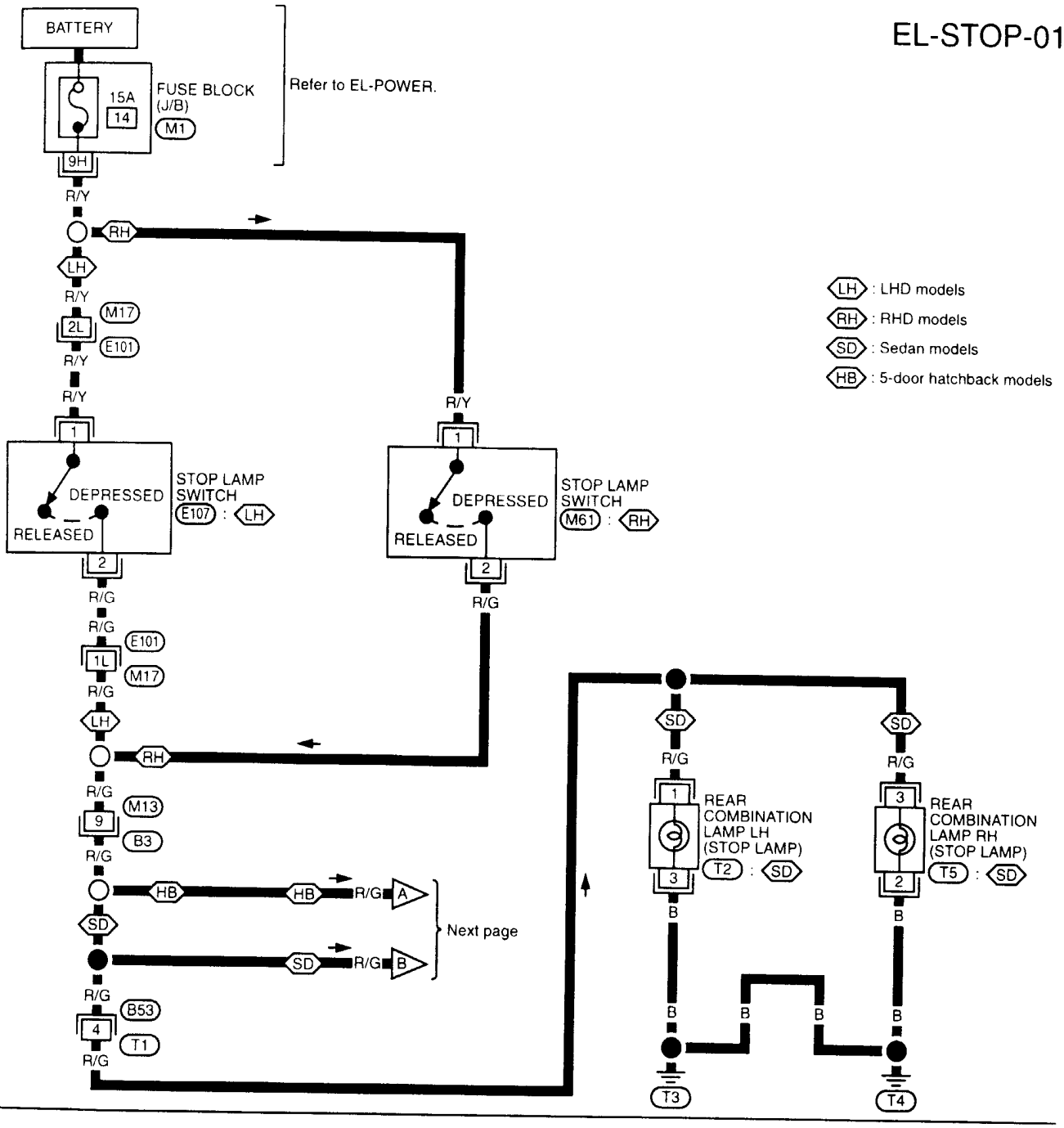


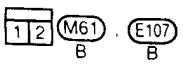


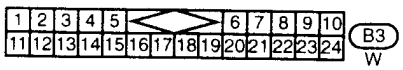
YEL689

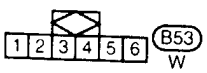
Stop Lamp/Wiring Diagram — STOP/L —

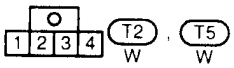
EL-STOP-01









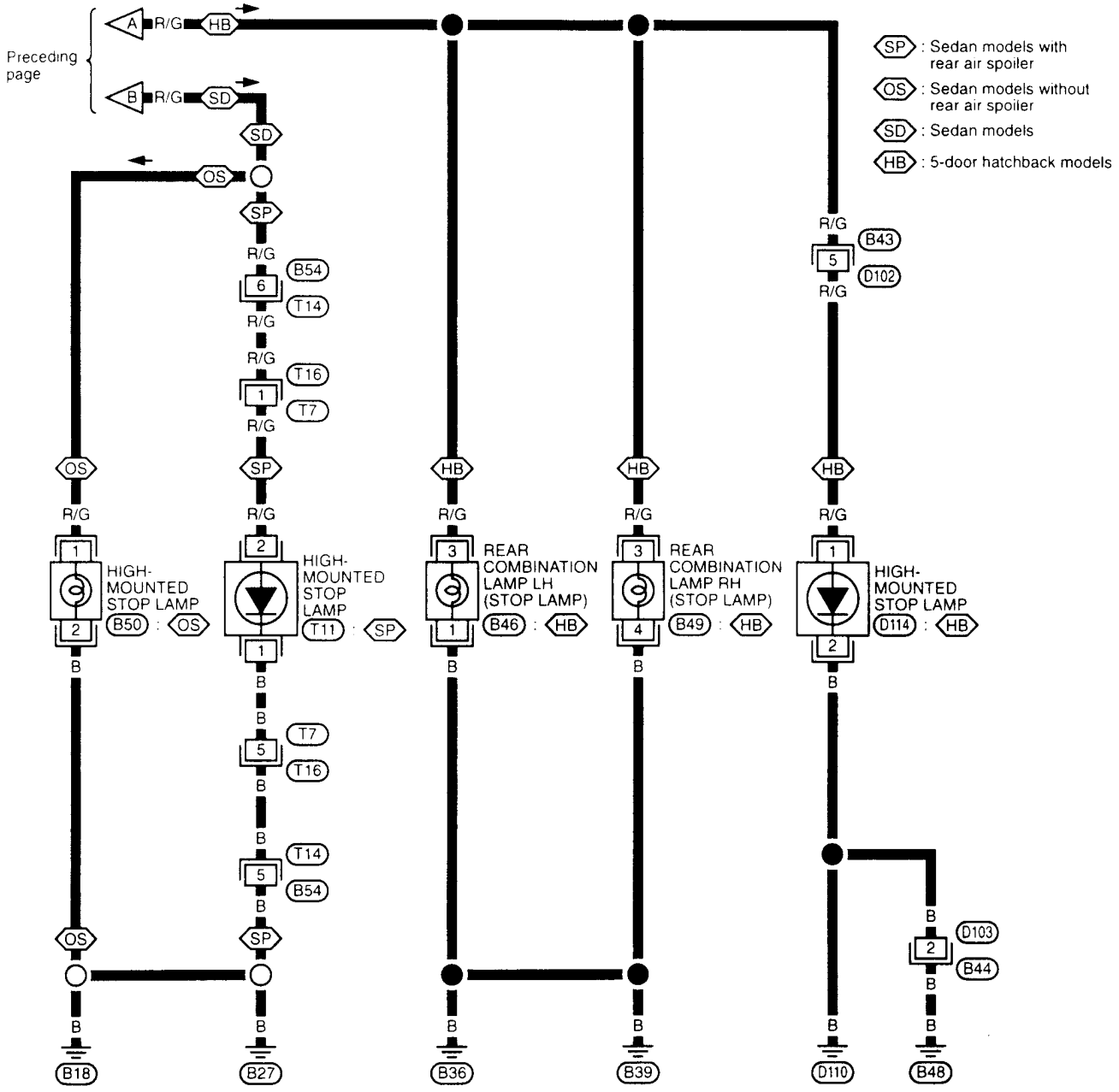


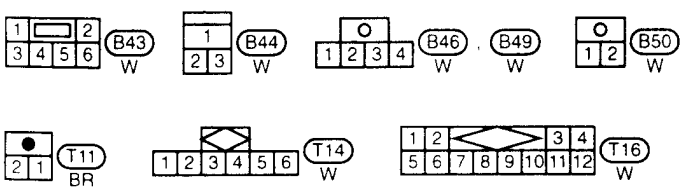
Refer to last page (Foldout page).
M17 , E101
M1

YEL694

Stop Lamp/Wiring Diagram — STOP/L — (Cont'd)

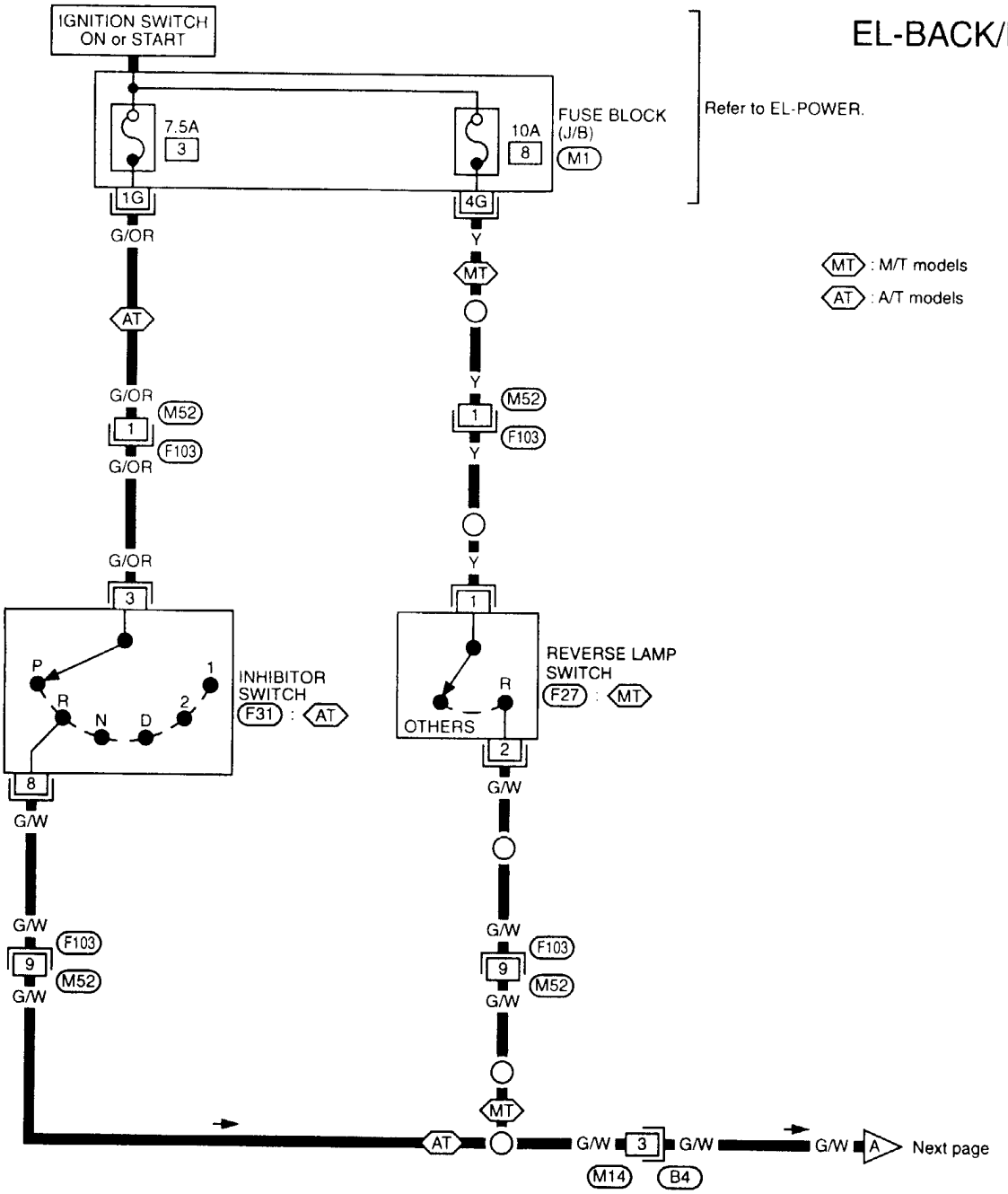
EL-STOP-02

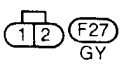


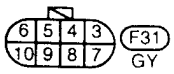


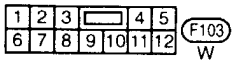
YEL695

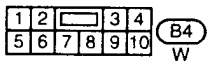
Back-up Lamp/Wiring Diagram — BACK/L —









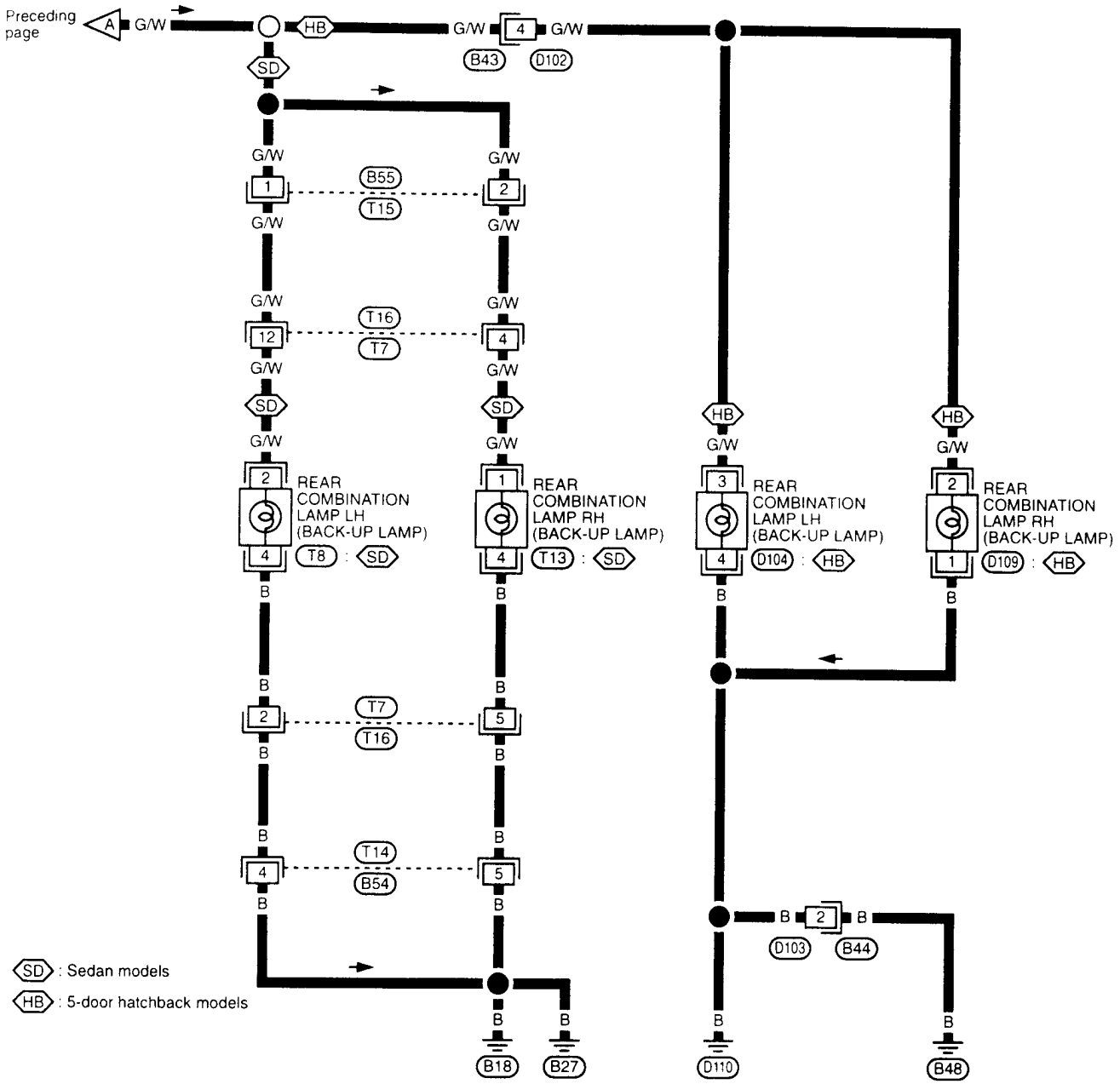


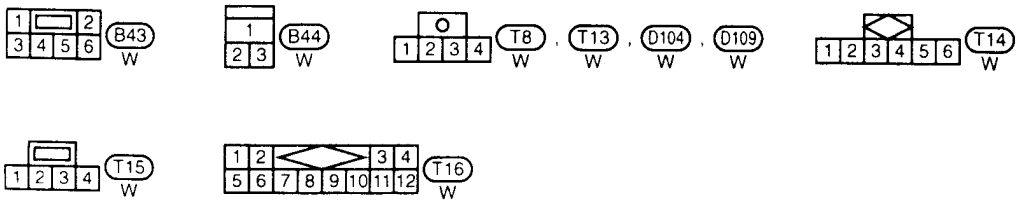
Refer to last page (Foldout page).
M1

YEL696

Back-up Lamp/Wiring Diagram — BACK/L — (Cont'd)

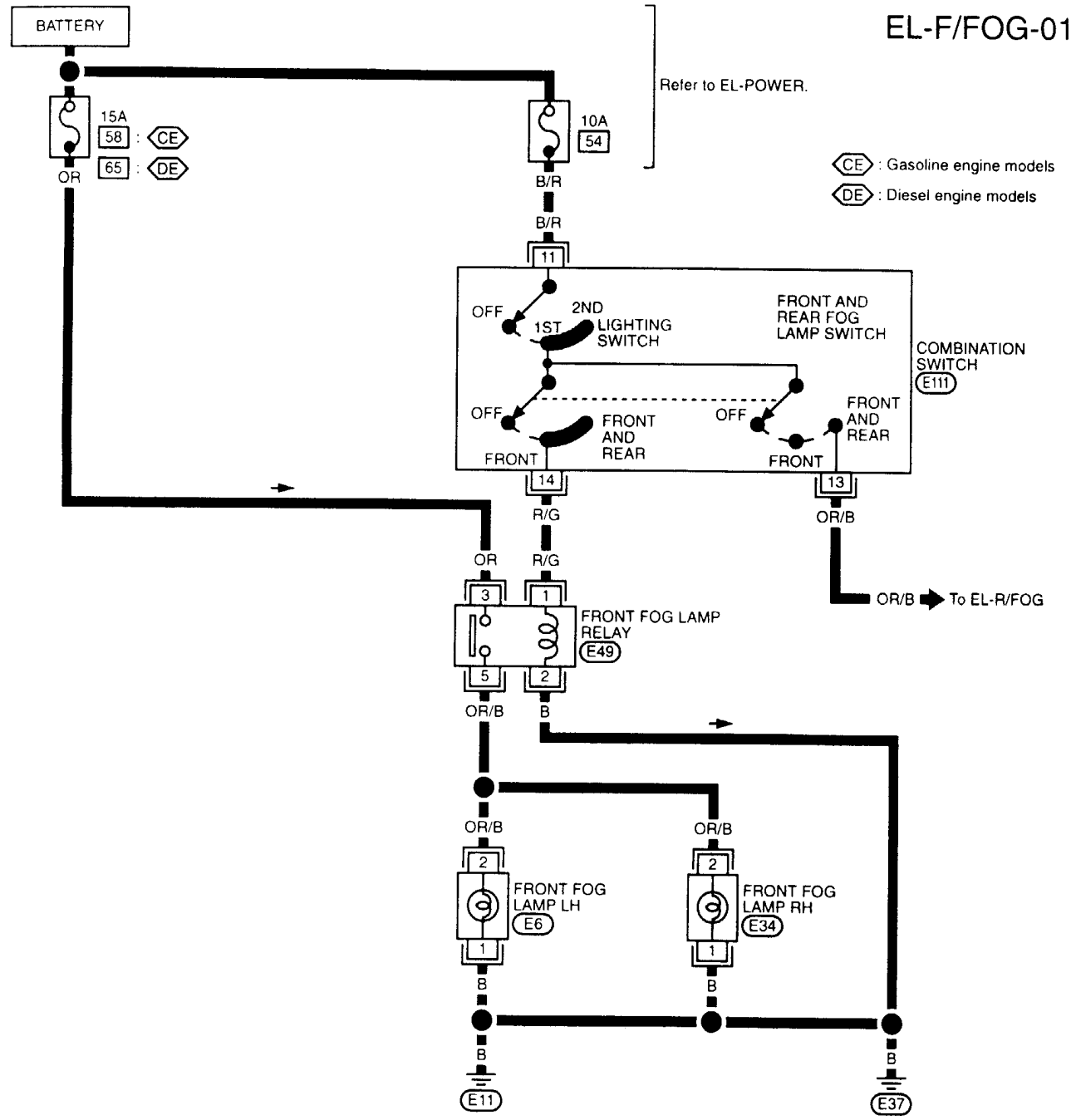
EL-BACK/L-02

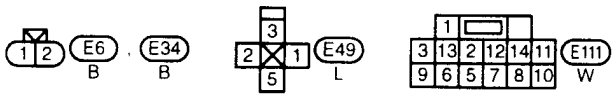




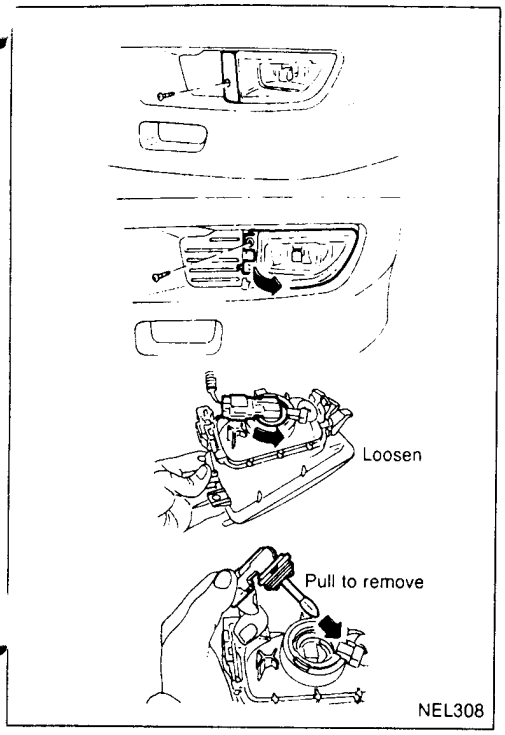
YEL697

Front Fog Lamp/Wiring Diagram — F/FOG —





YEL698



Front Fog Lamp Bulb Replacement

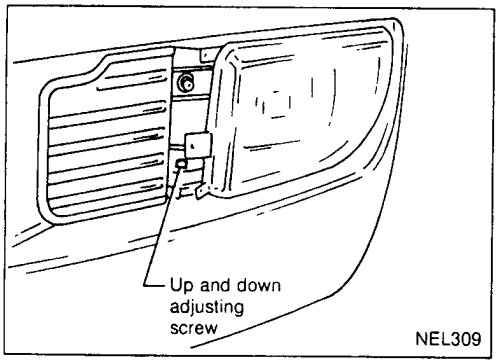
The front fog lamp is a semi-sealed beam type which uses a replaceable halogen bulb.

- **Grasp only the base when handling the bulb. Never touch the glass envelope.**

1. Disconnect the battery cable.
2. Disconnect the harness connector from the back side of the bulb assembly.
3. Turn the bulb assembly counterclockwise and remove it. Do not shake or rotate the bulb when removing it.
4. Install in the reverse order of removal.

CAUTION:

- **Do not leave front fog lamp reflector without bulb for a long period of time. Dust, moisture, smoke, etc. entering front fog lamp body may affect the performance of the front fog lamp. Remove front fog lamp bulb from the front fog lamp reflector just before a replacement bulb is installed.**

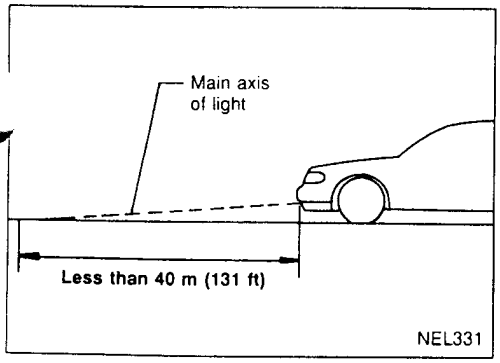


Front Fog Lamp Aiming Adjustment

Before performing aiming adjustment, make sure of the following.

a. Keep all tires inflated to correct pressure.
b. Place vehicle on level ground.
c. See that vehicle is unloaded (except for full levels of coolant, engine oil and fuel, and spare tire, jack, and tools). Have the driver or equivalent weight placed in driver's seat.

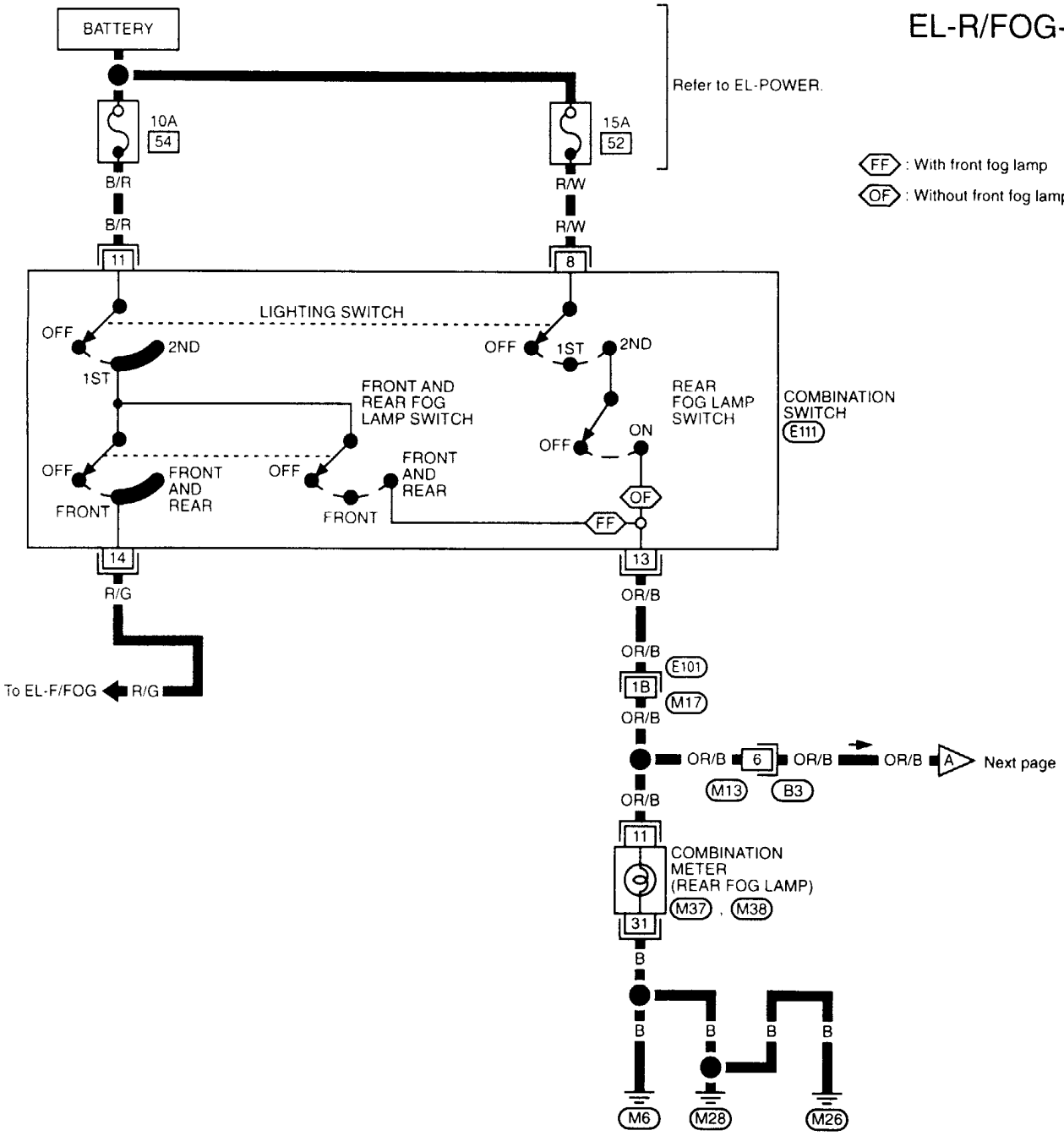
Adjust aiming by turning the adjusting screw.

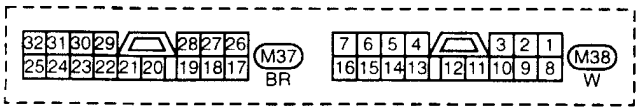


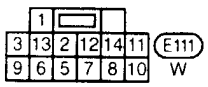
Check the distance between the vehicle and the ground point where the main axis of light of fog lamp reaches. Keep the distance within 40 m (131 ft)

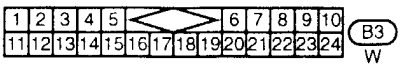
Rear Fog Lamp/Wiring Diagram — R/FOG —

EL-R/FOG-01







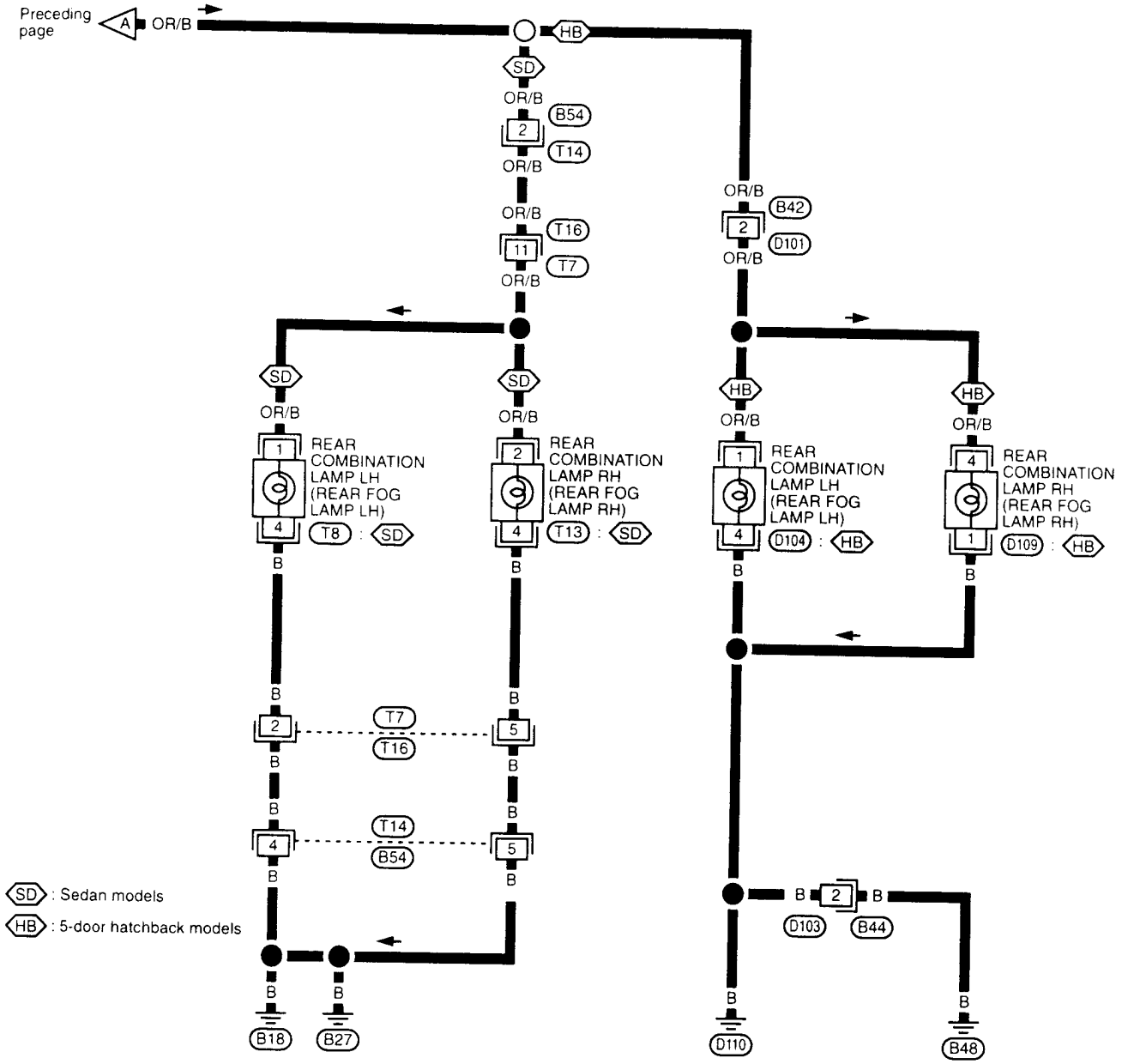


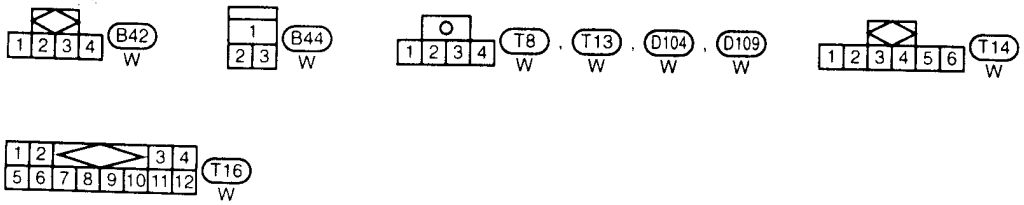
Refer to last page (Foldout page).
M17 , E101

YEL699

Rear Fog Lamp/Wiring Diagram — R/FOG — (Cont'd)

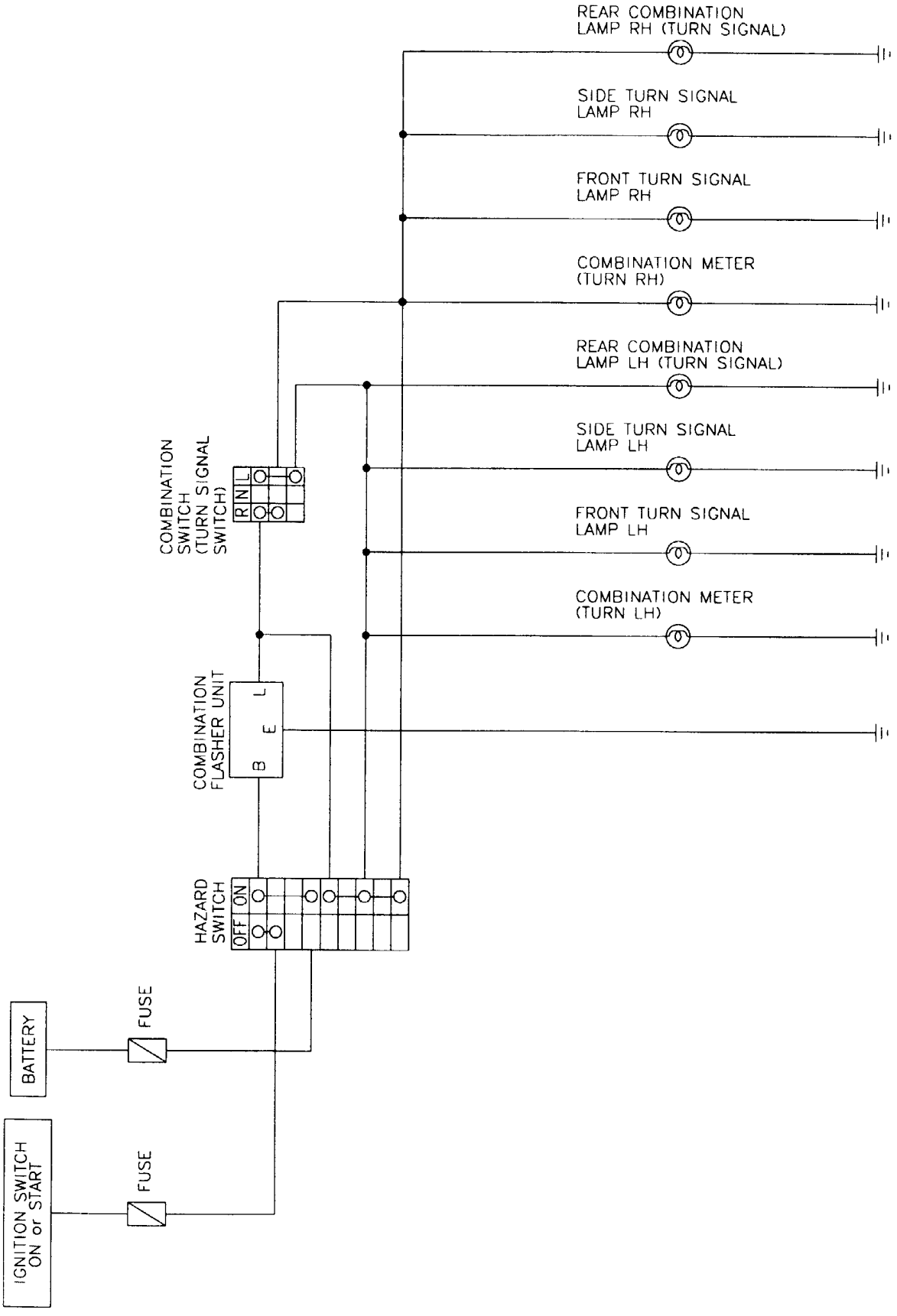
EL-R/FOG-02





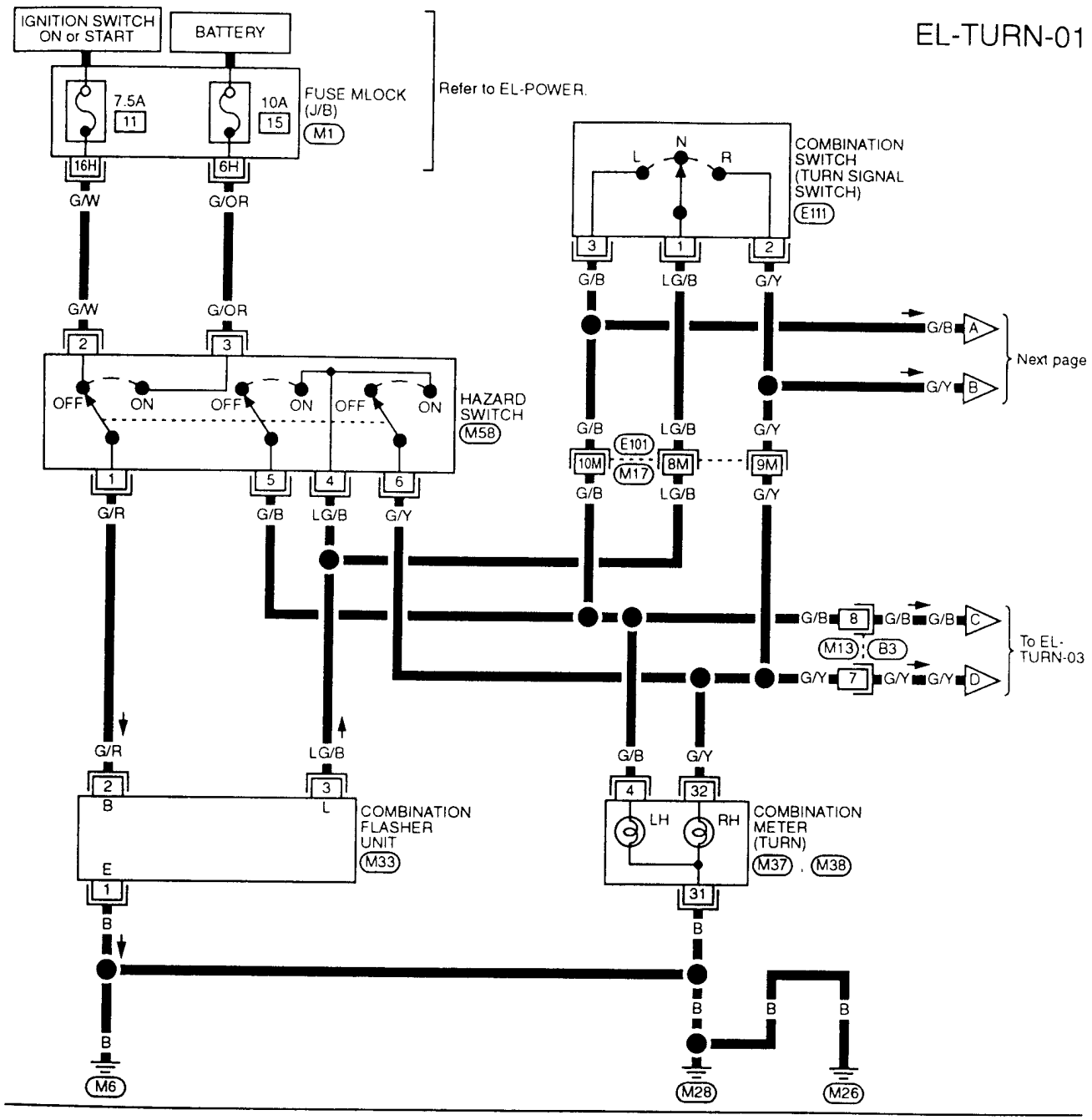
YEL700

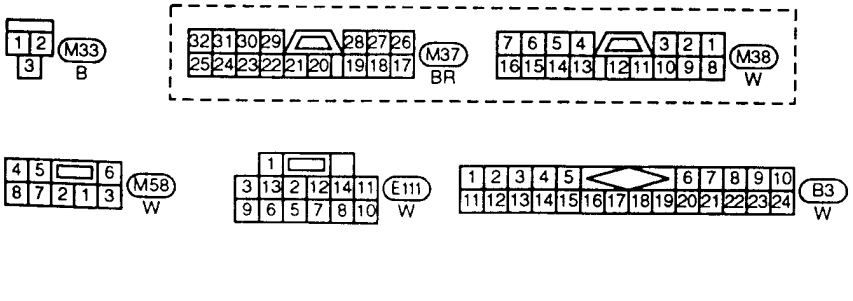
Turn Signal and Hazard Warning Lamps/ Schematic



YEL693

Turn Signal and Hazard Warning Lamps/ Wiring Diagram — TURN —



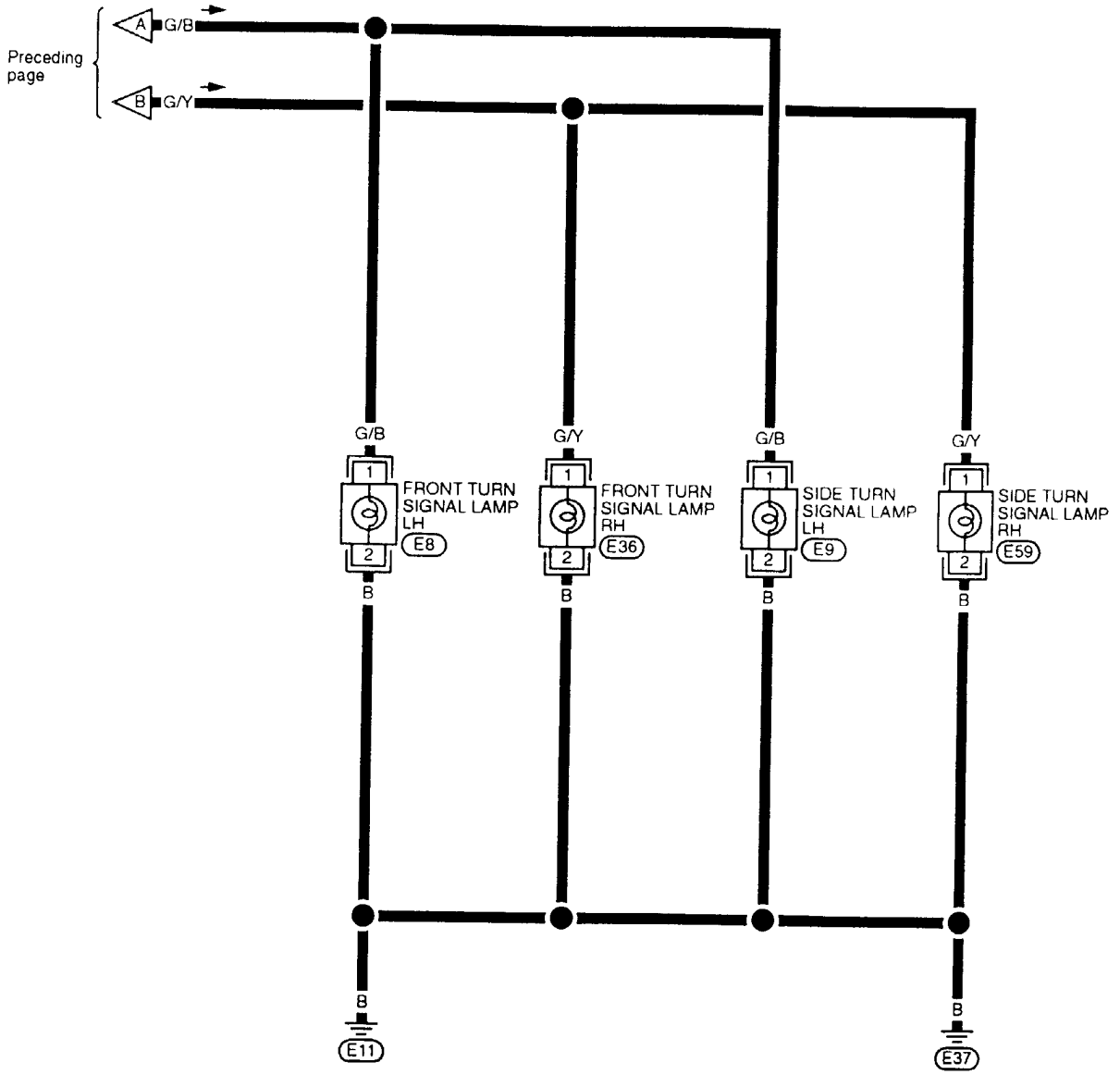


Refer to last page (Foldout page).
M17 , E101
M1

YEL690

Turn Signal and Hazard Warning Lamps/ Wiring Diagram — TURN — (Cont'd)

EL-TURN-02



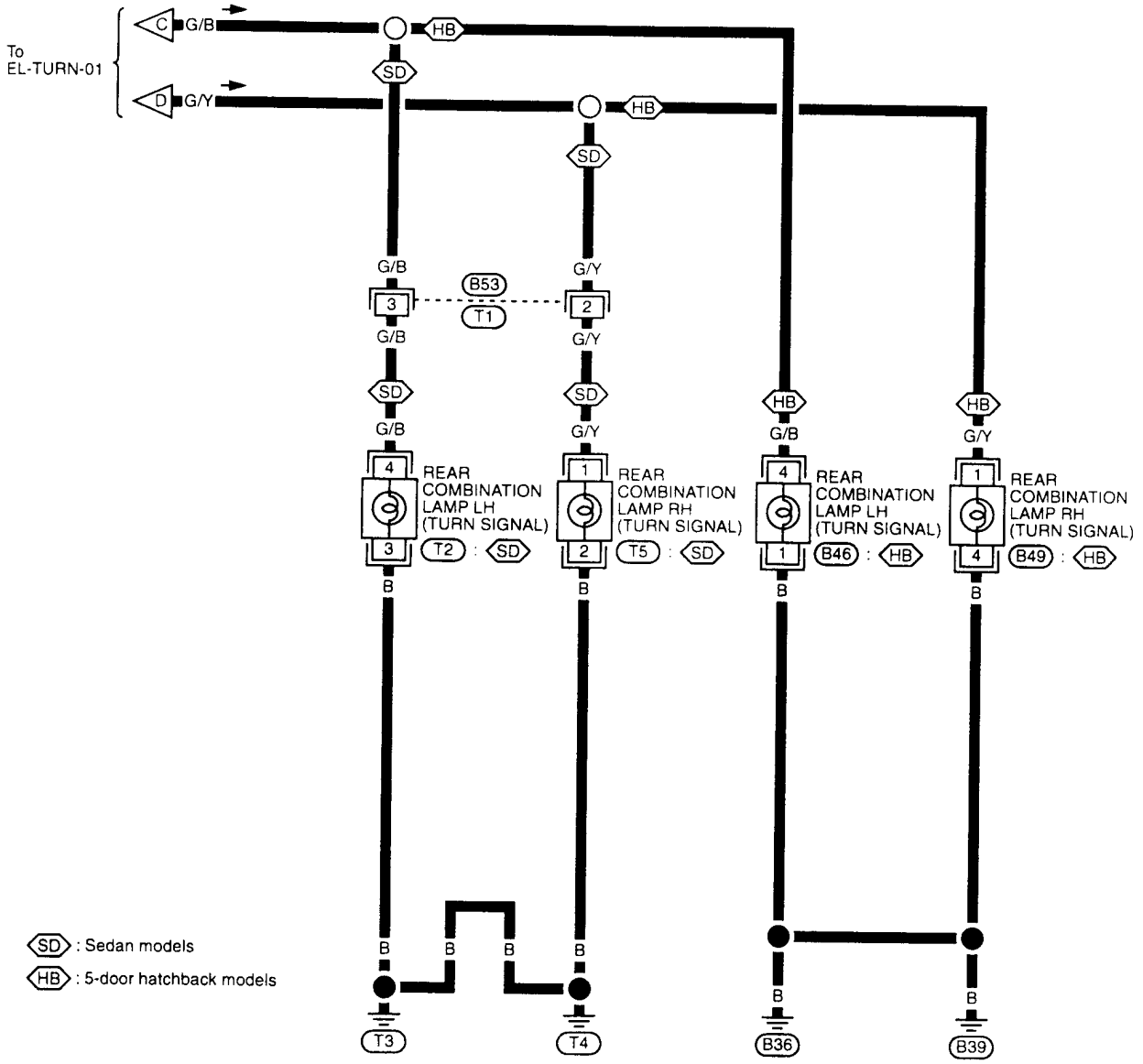
1 2 E8 GY , E36 GY

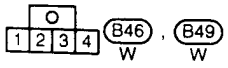
1 2 E9 B , E59 B

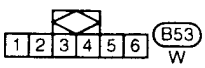
YEL69

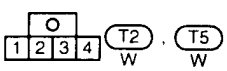
Turn Signal and Hazard Warning Lamps/ Wiring Diagram — TURN — (Cont'd)

EL-TURN-03





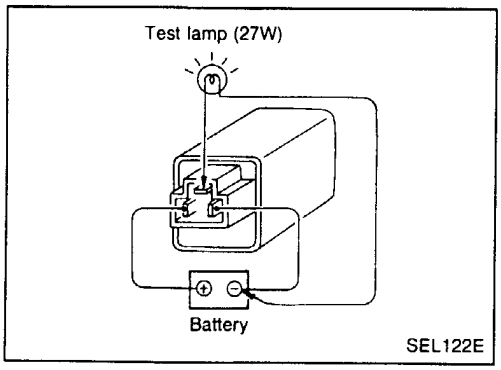




YEL692

Turn Signal and Hazard Warning Lamps/ Trouble Diagnoses

Symptom	Possible cause	Repair order
Turn signal and hazard warning lamps do not operate.	1. Hazard switch 2. Combination flasher unit 3. Open in combination flasher unit circuit	1. Check hazard switch. 2. Refer to combination flasher unit check. 3. Check wiring to combination flasher unit for open circuit.
Turn signal lamps do not operate but hazard warning lamps operate.	1. 7.5A fuse 2. Hazard switch 3. Turn signal switch 4. Open in turn signal switch circuit	1. Check 7.5A fuse (No. 11, located in fuse block). Turn ignition switch to "ON" position and verify battery positive voltage is present at terminal ② of hazard switch. 2. Check hazard switch. 3. Check turn signal switch. 4. Check harness between combination flasher unit terminal ② and turn signal switch terminal ① for open circuit.
Hazard warning lamps do not operate but turn signal lamps operate.	1. 10A fuse 2. Hazard switch 3. Open in hazard switch circuit	1. Check 10A fuse (No. 15, located in fuse block). Verify battery positive voltage is present at terminal ③ of hazard switch. 2. Check hazard switch. 3. Check harness between combination flasher unit terminal ③ and hazard switch terminal ④ for open circuit.
Individual turn signal lamp or turn indicators do not operate.	1. Bulb 2. Grounds	1. Check bulb. 2. Check ground circuit for the bulb.



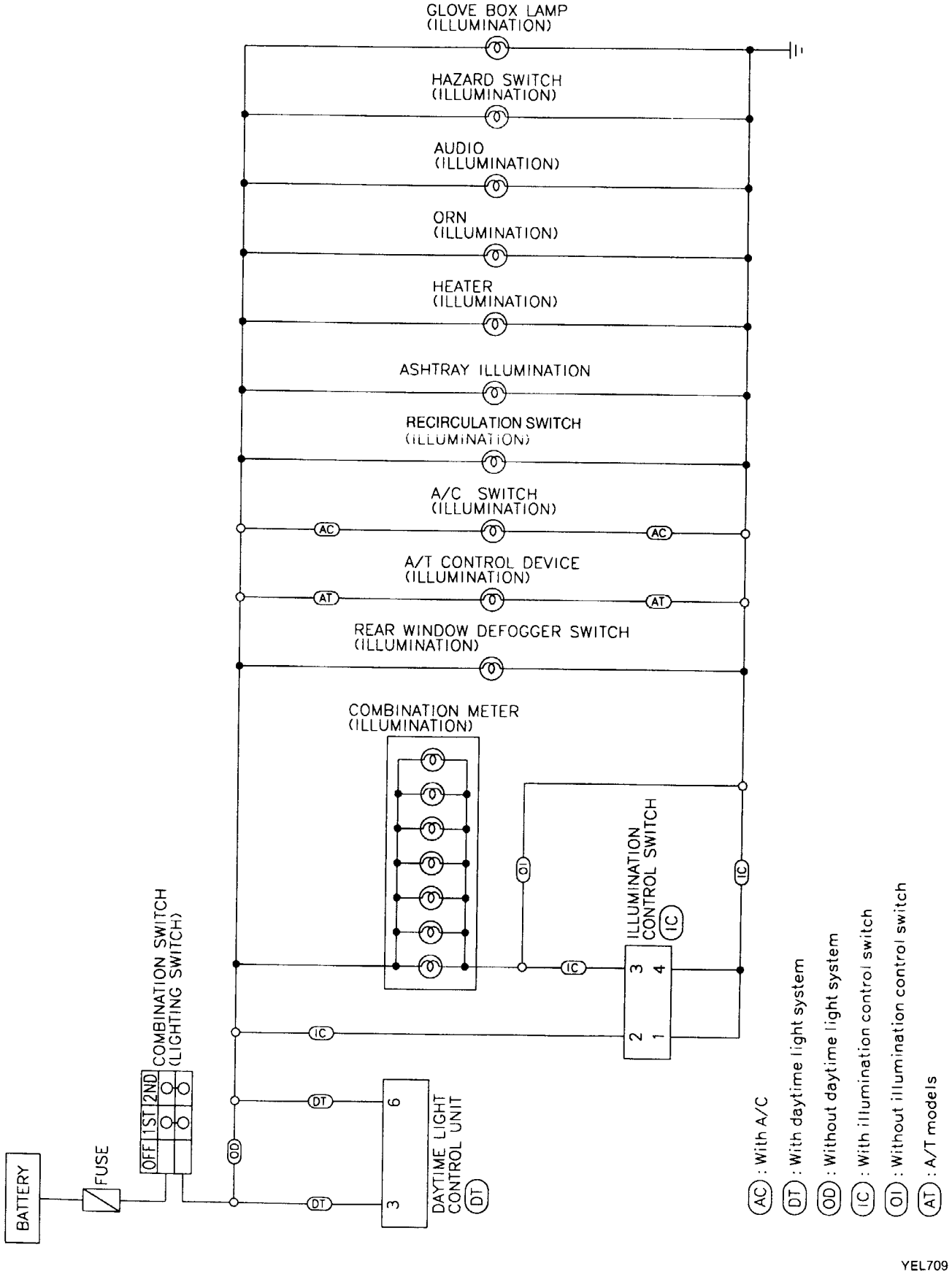
Combination Flasher Unit Check

- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it causes test lamp to flash when power is supplied to the circuit.

Bulb Specifications

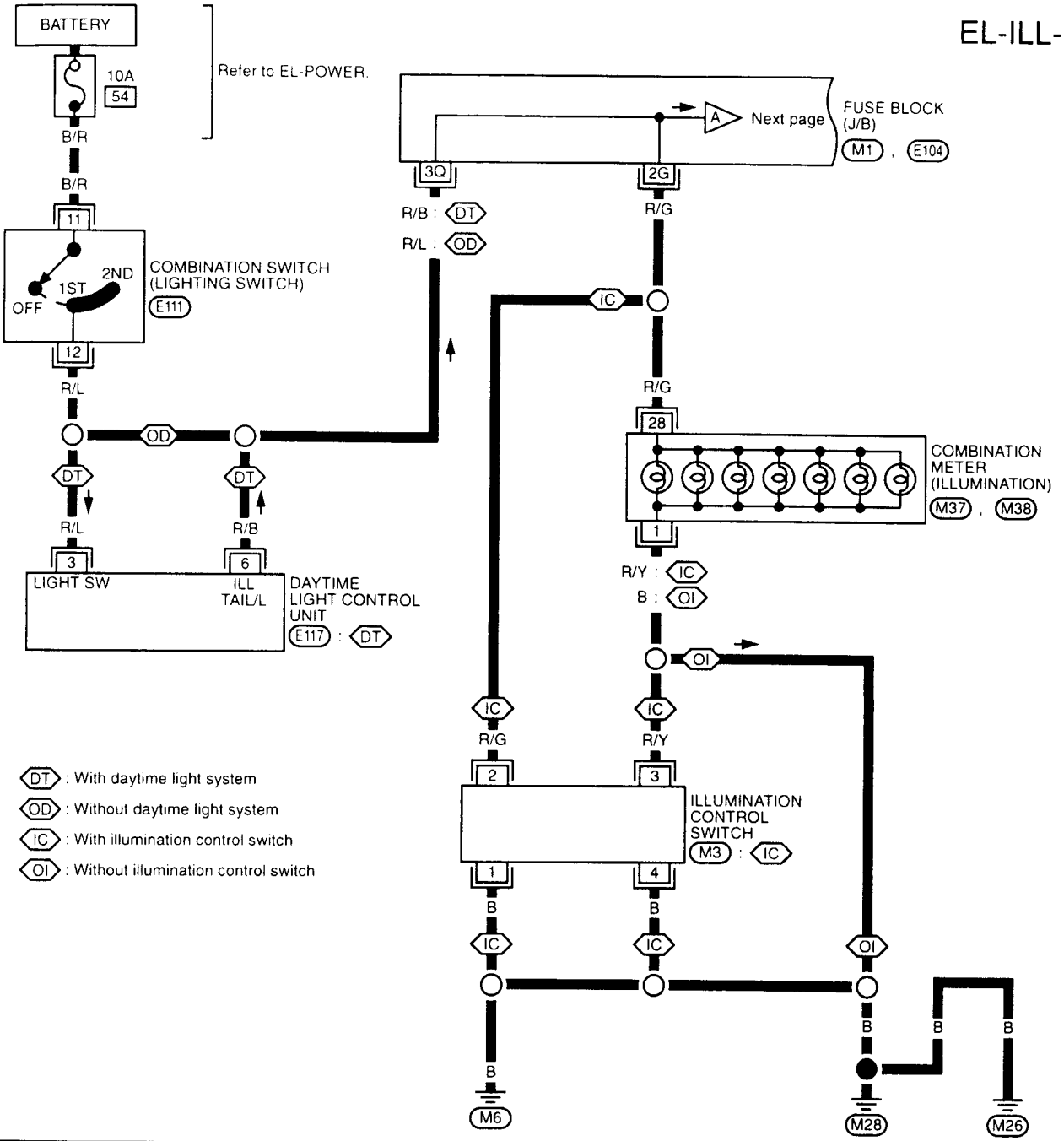
	Wattage (W)
Front turn signal lamp	21
Clearance lamp	5
Front fog lamp	55
Side turn signal lamp	5
Rear combination lamp	
Turn signal	21
Stop/Tail	21/5
Tail	5
Back-up	21
Rear fog	21
License plate lamp	5
High-mounted stop lamp	
Bulb type (Sedan)	21

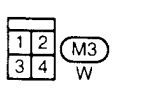
Illumination/Schematic

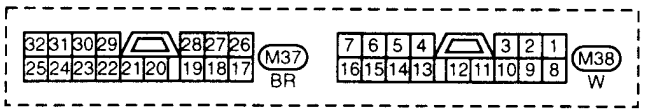


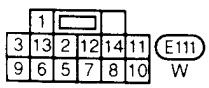
Illumination/Wiring Diagram — ILL —

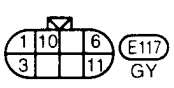
EL-ILL-01











Refer to last page (Foldout page).

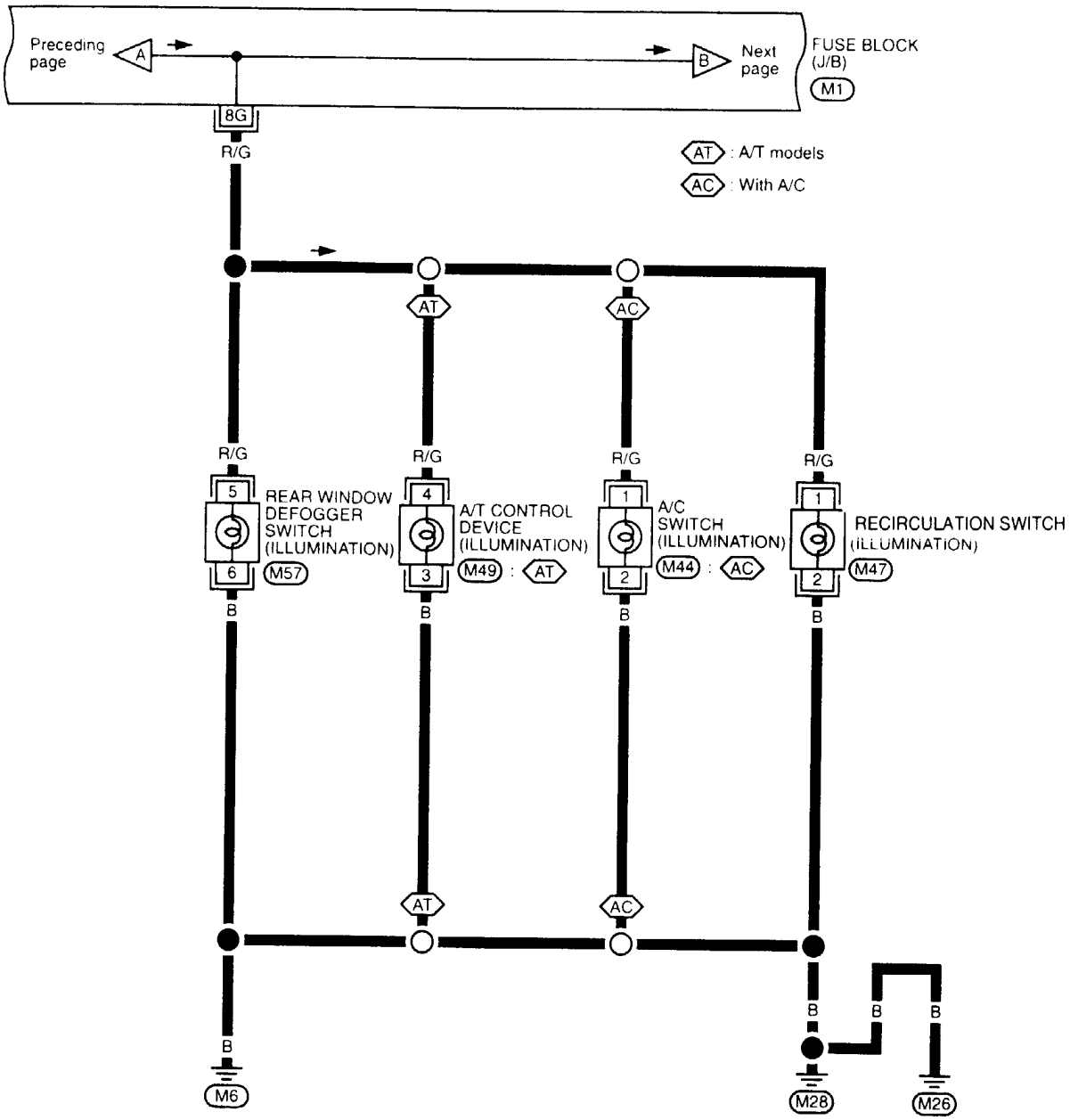
M1

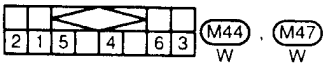
E104

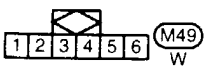
YEL705

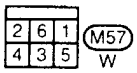
Illumination/Wiring Diagram — ILL — (Cont'd)

EL-ILL-02







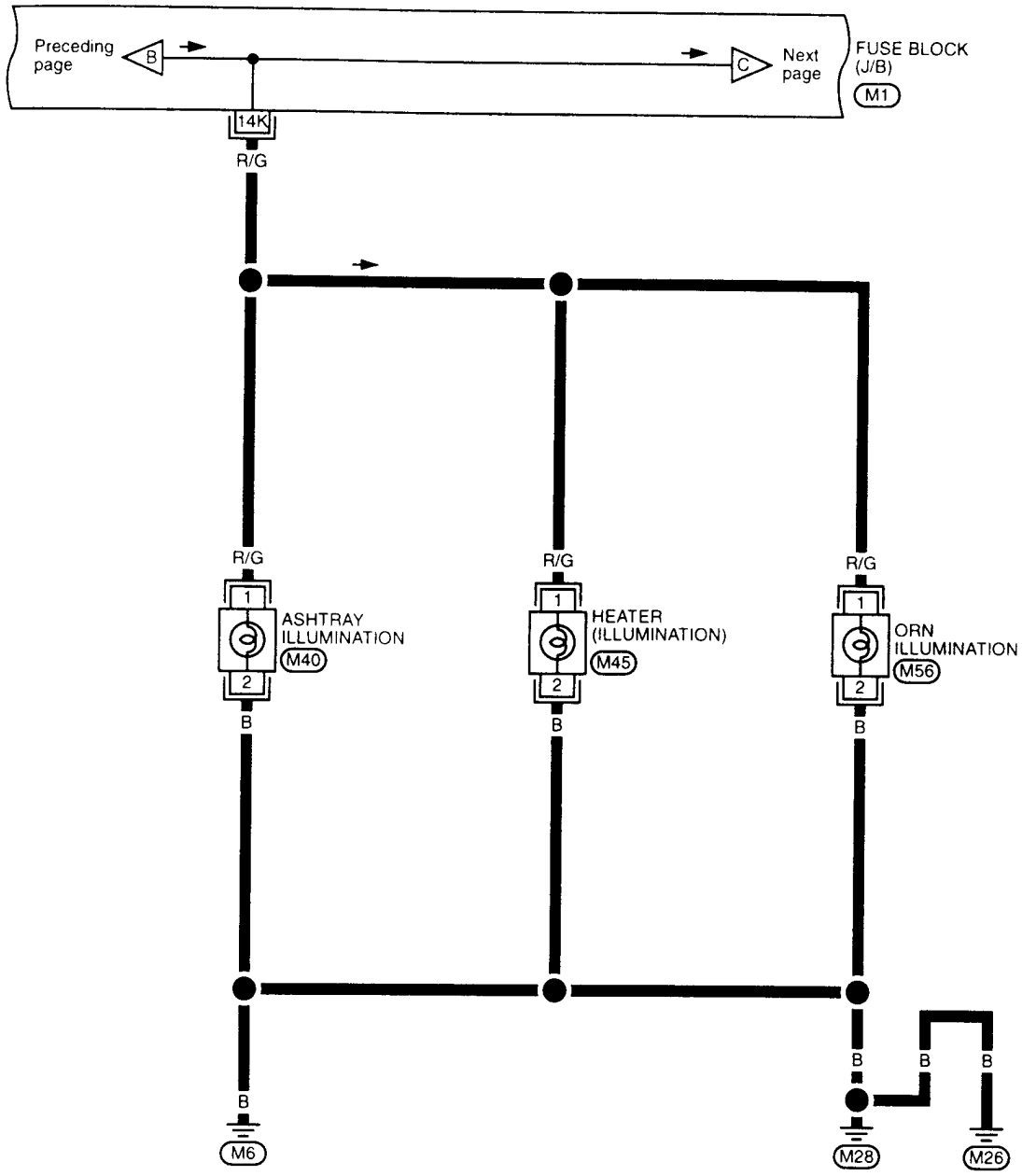


Refer to last page (Foldout page).
M1

YEL706

Illumination/Wiring Diagram — ILL — (Cont'd)

EL-ILL-03



M40 W · M56 W

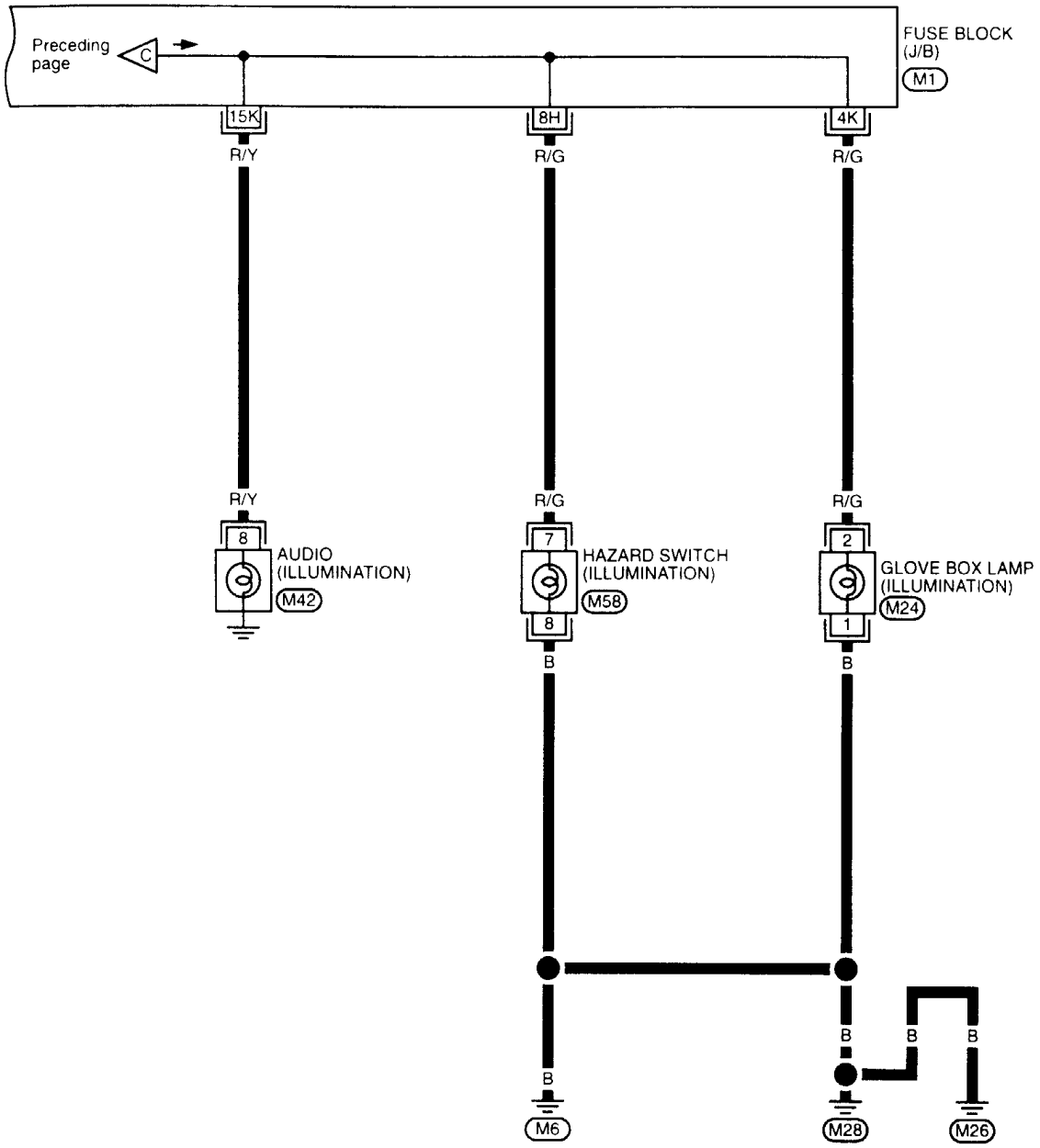
M45 W

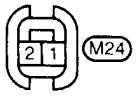
Refer to last page (Foldout page).
M1

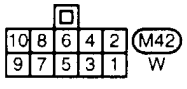
YEL707

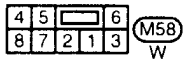
Illumination/Wiring Diagram — ILL — (Cont'd)

EL-ILL-04





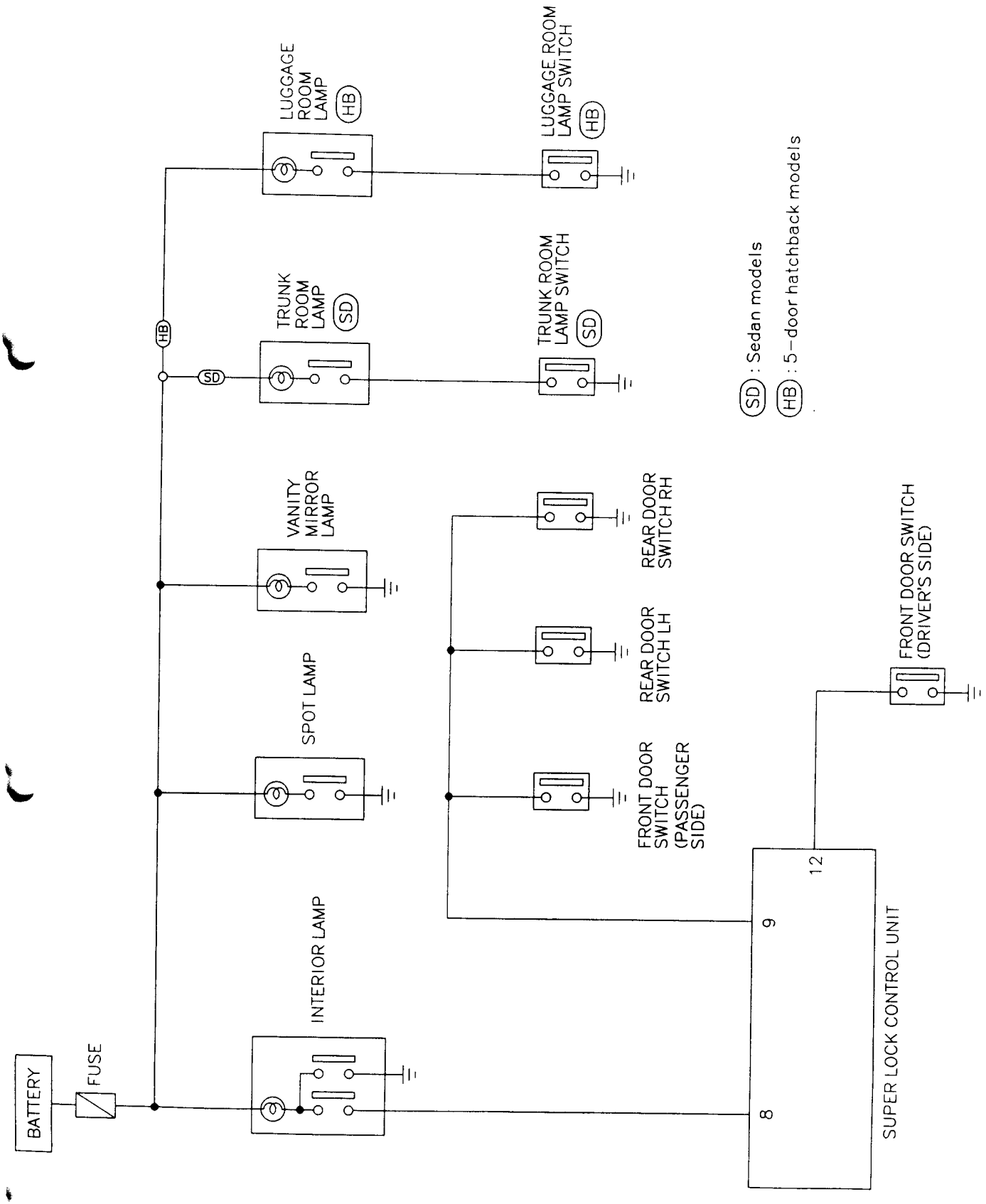




Refer to last page (Foldout page).
M1

YEL708

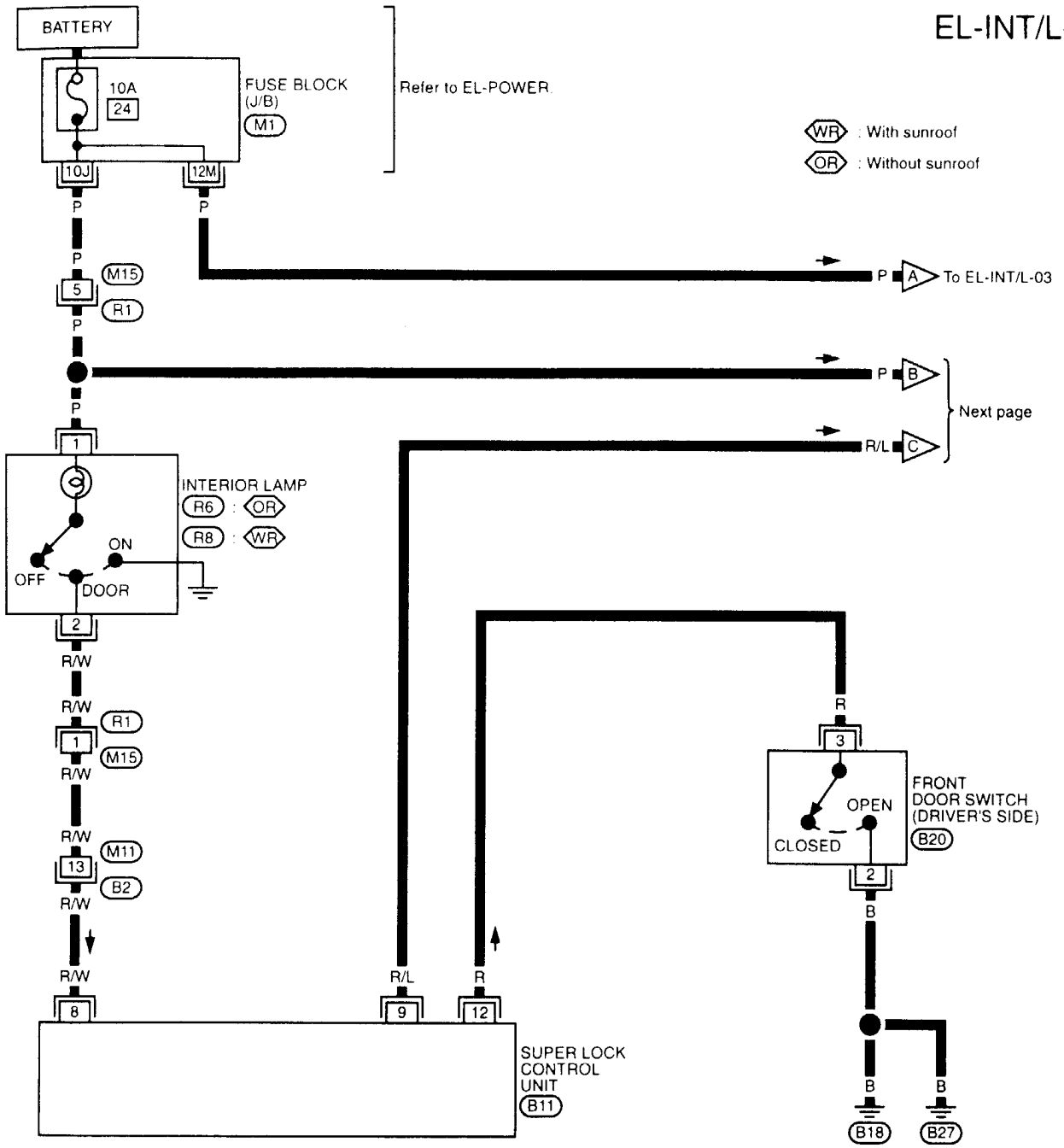
Interior, Spot, Trunk Room and Luggage Room Lamps/Schematic

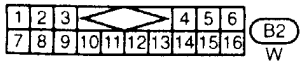


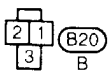
YEL704

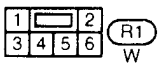
Interior, Spot, Trunk Room and Luggage Room Lamps/Wiring Diagram — INT/L —

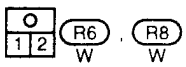
EL-INT/L-01











Refer to last page (Foldout page).

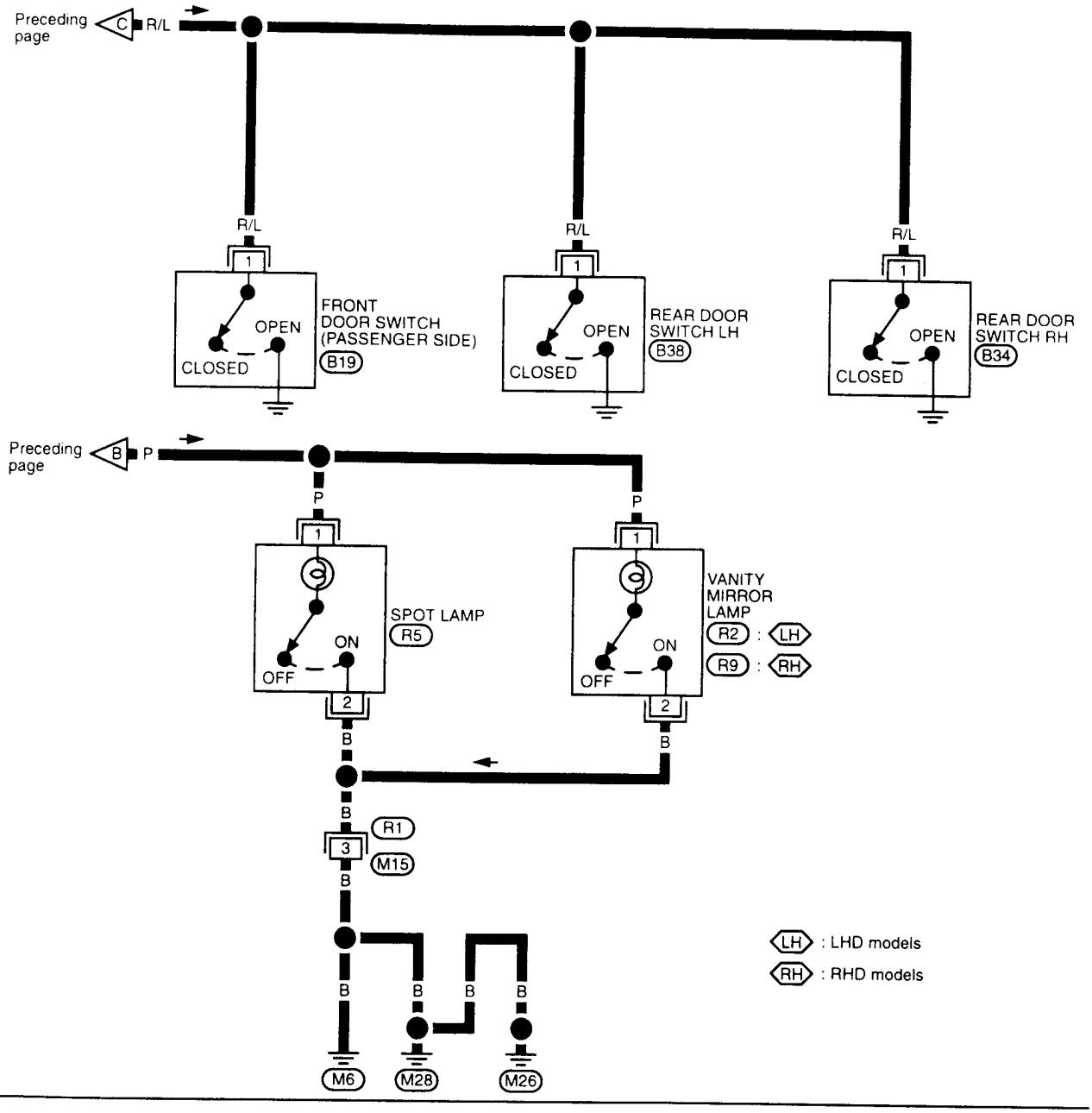
M1

B11

YEL701

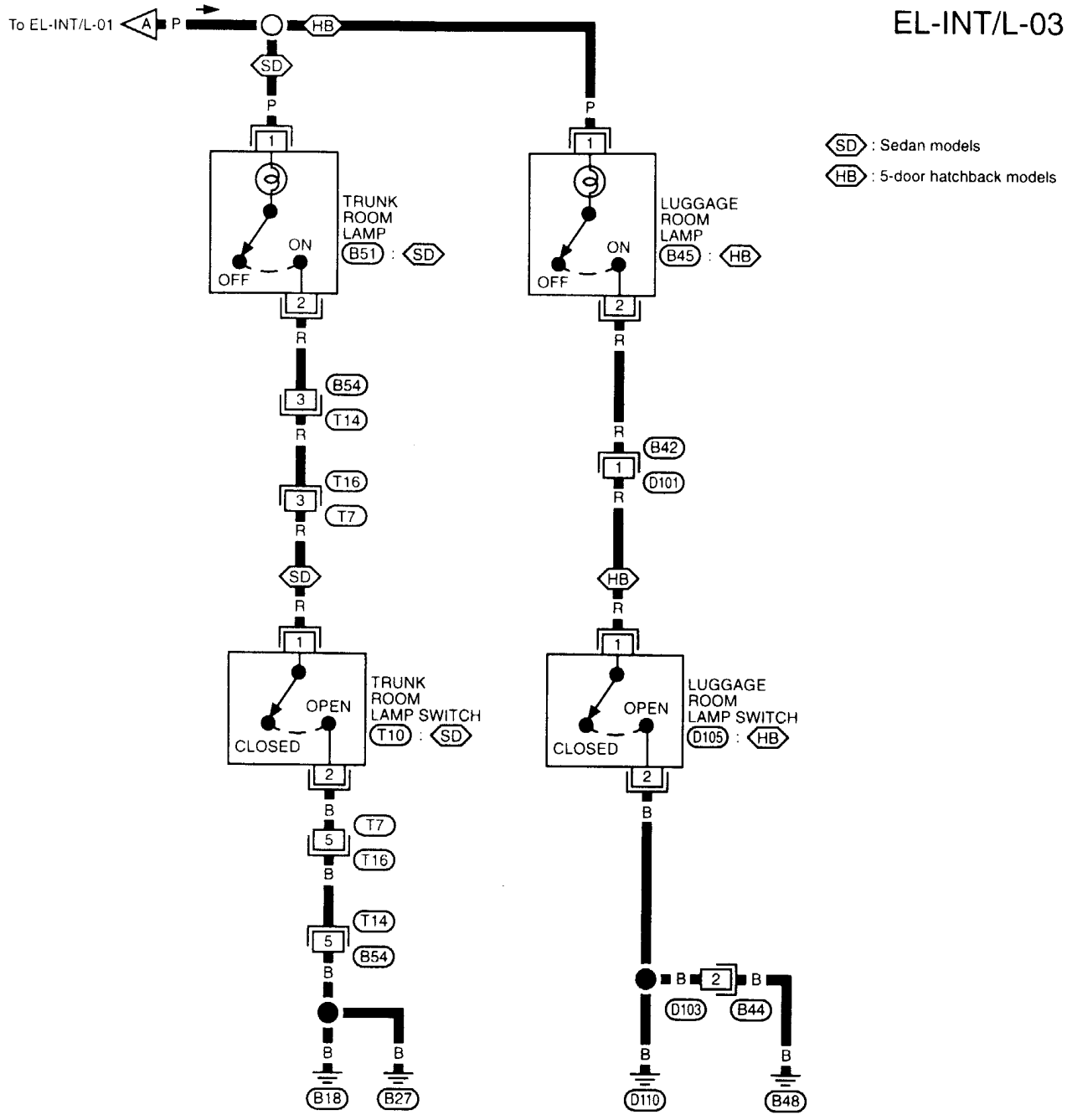
Interior, Spot, Trunk Room and Luggage Room Lamps/Wiring Diagram — INT/L — (Cont'd)

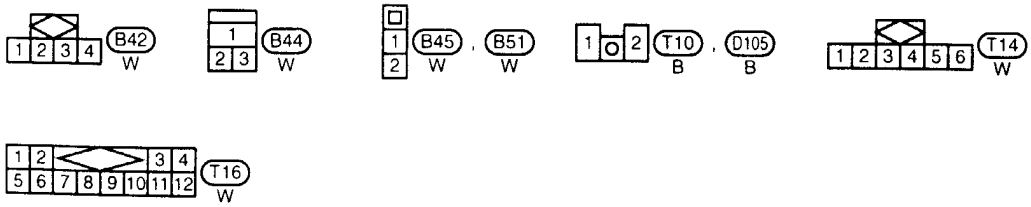
EL-INT/L-02



YEL702

Interior, Spot, Trunk Room and Luggage Room Lamps/Wiring Diagram — INT/L — (Cont'd)



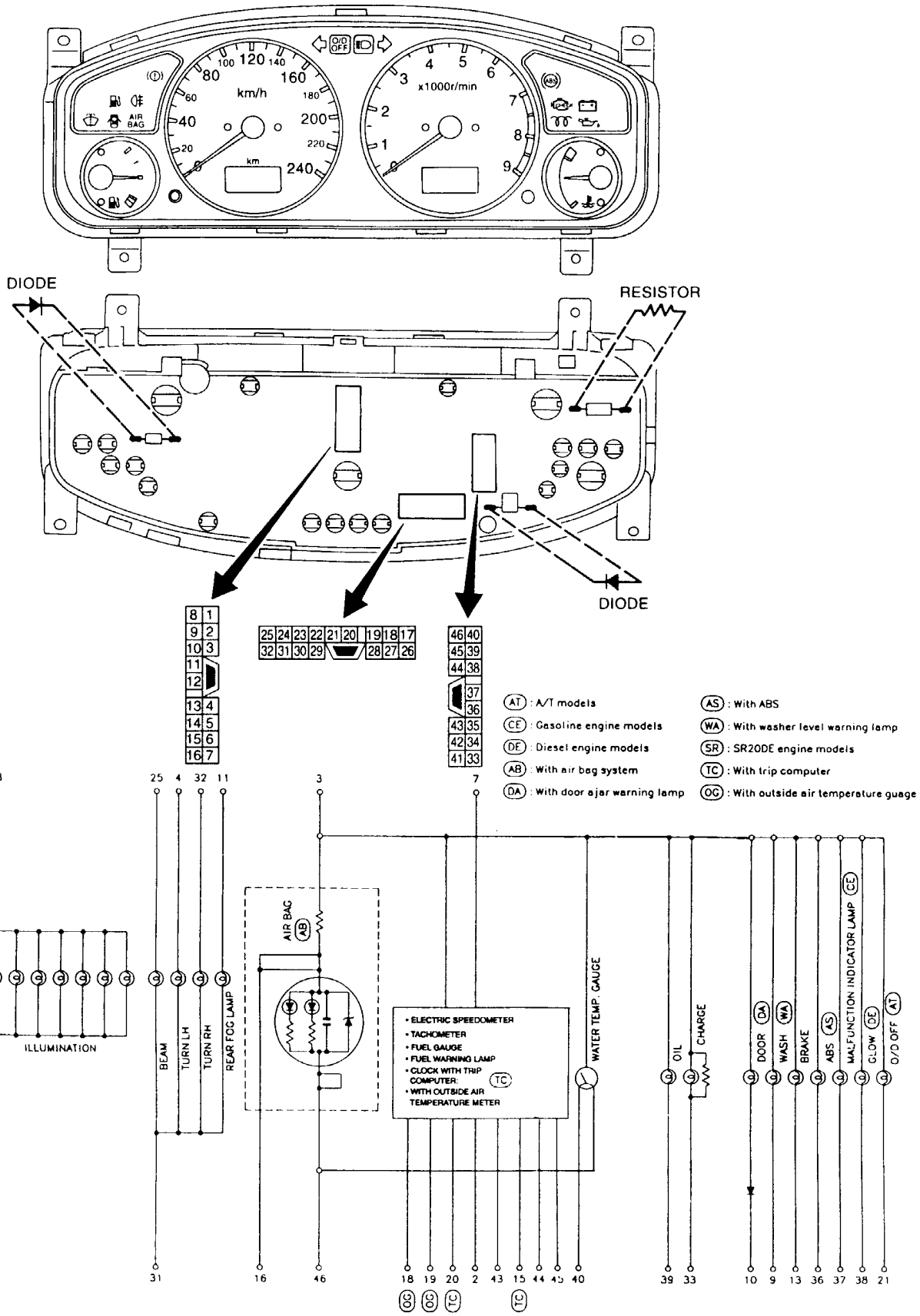


YEL703

Bulb Specifications

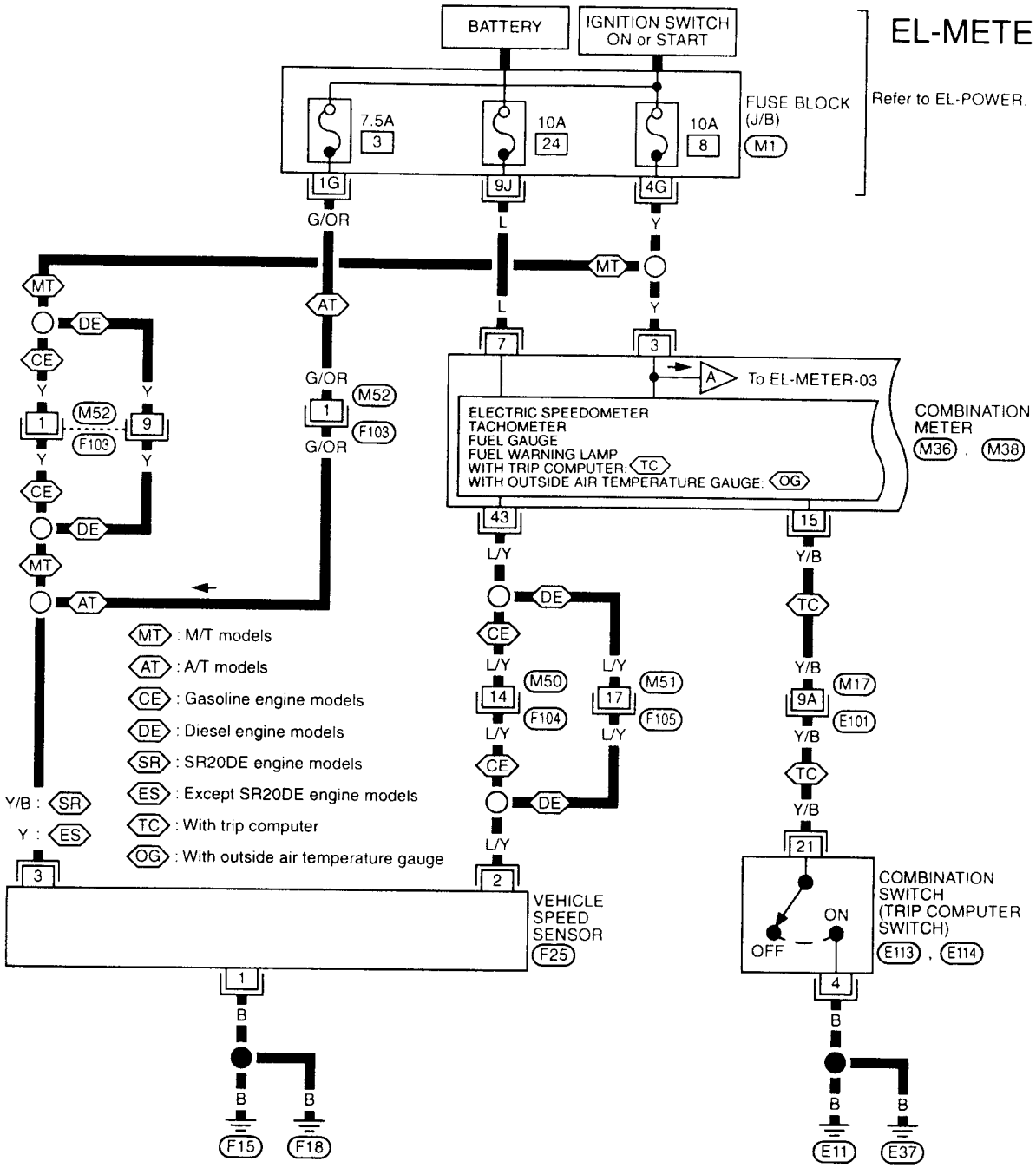
	Wattage (W)
Interior lamp	10
Spot lamp	5 (2×)
Trunk room lamp	3.4
Luggage room lamp	5

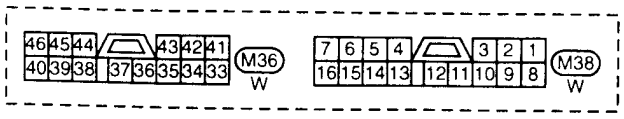
Combination Meter

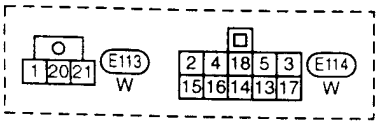


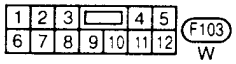
YEL713

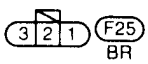
Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER —

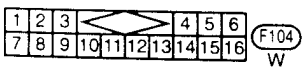


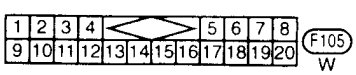










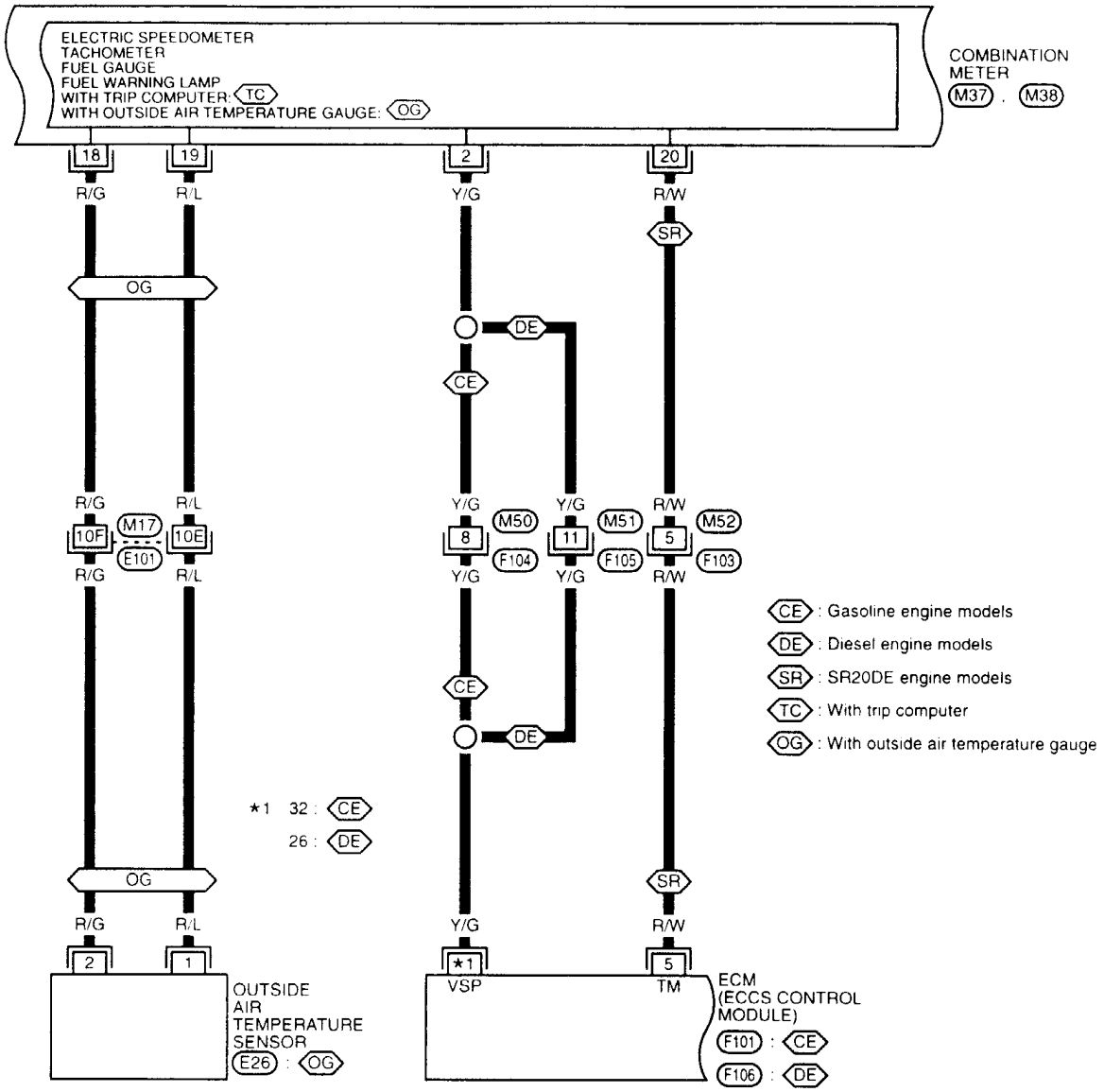


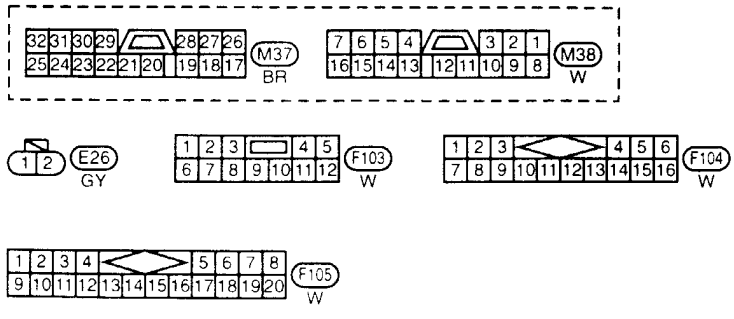
Refer to last page (Foldout page).
M17, E101
M1

YEL710

Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER — (Cont'd)

EL-METER-02



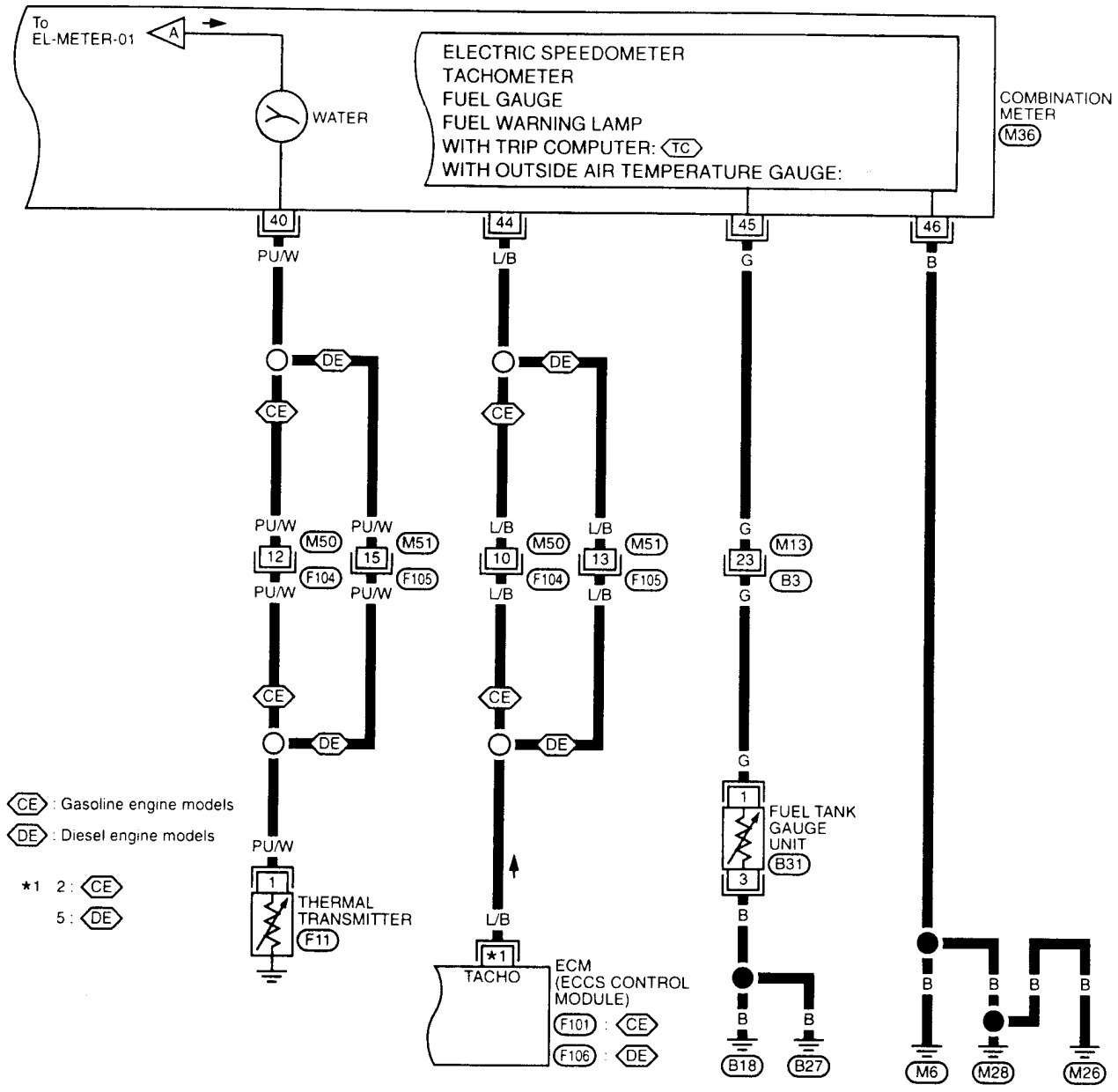


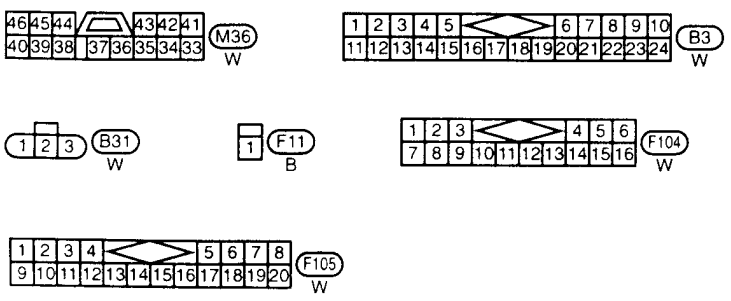
Refer to last page (Foldout page).
M17 , E101
F101
F106

YEL711

Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER — (Cont'd)

EL-METER-03





Refer to last page (Foldout page).
F101
F106

YEL712

Combination Meter Self-Diagnosis

Performing Self-Diagnosis

1. Turn the ignition switch to the "LOCK" position.
2. Press both reset buttons on the combination meter and keep them depressed.
3. Turn the ignition switch to the "ON" position, while keeping the reset buttons pressed.
4. Release both reset buttons.
   Self-diagnosis will start.
   During self-diagnosis, the fuel gauge, speedometer and tachometer repeatedly move through full scale deflection so that the gauge movement may be checked. Since the temperature gauge is not driven by the microprocessor, this will not be operated.
   In addition to the gauge movement, the low fuel level warning lamp and all segments of both LCD displays are activated.
5. Press either of the reset buttons twice **during** self-diagnosis to display the error code on the odometer display.

Self-diagnostic results

Symptom	Repair
Fuel gauge does not move (smoothly) through full range.	Replace Combination meter.
Speedometer does not move (smoothly) through full range.	
Tachometer does not move (smoothly) through full range.	
Not all segments of the LCD displays are shown.	
Low fuel level warning lamp is not activated.	Replace warning lamp bulb.
Error code other than "0000".*	Decode the error code using the table on the next page.

* Error code "0000" indicates that no malfunctions are found.

Combination Meter Self-Diagnosis (Cont'd)

Line 1	128	64	32	16	8	4	2	1	Malfunction	Repair
Line 2	X				X	X		X		
									Fuel level sensor short circuit to ground	Check fuel level sensor circuit
									Fuel level sensor open circuit	
									Speed output signal to ECCS open circuit	Check speed sensor circuit
									EEPROM error. Combination meter error	Replace combination meter
									Tachometer input frequency out of range	Check camshaft position sensor and circuit
									Speed signal out of range	Check speed sensor
									Supply voltage above 16V	Check battery, alternator and power supply
									Supply voltage below 9V	

Error code decoding.

The error code has to be transformed from a decimal into a binary code.

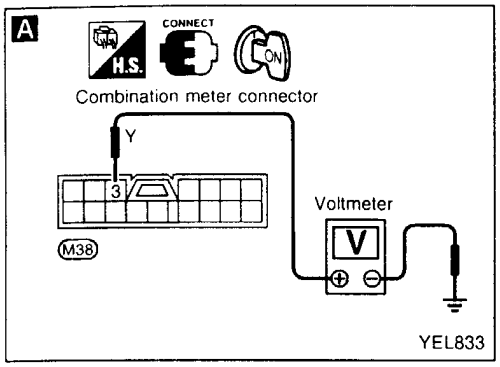
- Substract the largest possible number from line 1 of the table from the found error code and mark the field in line 2.
- Substract the largest possible number from the remainder and again mark the field.
- Repeat this until the remainder is "0".
- Follow the arrows from the marked field(s) to find the malfunction(s).

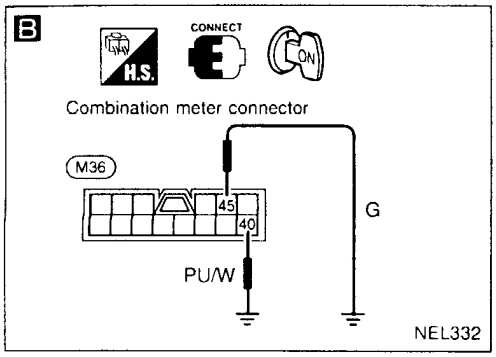
Example: Error code 141

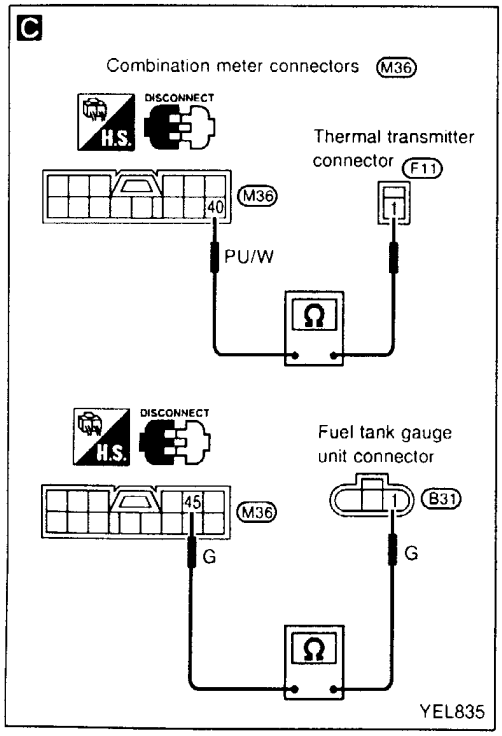
① 141–128=13 Mark line 2 underneath "128"
② 13–8=5 Mark line 2 underneath "8"
③ 5–4=1 Mark line 2 underneath "4"
④ 1–1=0 Mark line 2 underneath "1"

NOTE: – Errors are stored in a history file.
Therefore multiple errors can occur.
– After repair clear the memory by disconnecting the battery for 10 seconds.

Inspection/Fuel Gauge and Water Temperature Gauge







INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch to "ON" position.
2) Check voltage between combination meter connector (M38) terminal (3) and ground.
Battery voltage should exist.

NG → Check the following items:
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and 10A [8] fuse
4) Ignition switch

If NG, replace fusible link, fuse or ignition relay or repair ignition switch harness or connectors.

OK ↓

B

CHECK GAUGE OPERATION.
1) Connect combination meter connector (M36) terminals (45) (Fuel), (40) (Temp.) and ground with wire for **less than 10 seconds.**
2) Check operation of gauge.
Gauge should move smoothly to full scale.
3) For Fuel gauge operation, perform Combination Meter Self-Diagnosis (EL-104).

NG → Replace combination meter.

OK ↓

C

CHECK HARNESS CONTINUITY between terminals as follows.
Continuity should exist.

Terminals		
Combination meter connector	Thermal transmitter connector	Fuel tank gauge unit connector
(40)	(1)	
(45)		(1)

NG → Check the following:
1) Harness connectors (B3), (M13) — Fuel tank gauge
2) Harness connectors (F104), (M50) — Temperature gauge (Gasoline engine models)
Harness connectors (F105), (M51) — Temperature gauge (Diesel engine models)

If NG, repair harness or connectors.

OK ↓

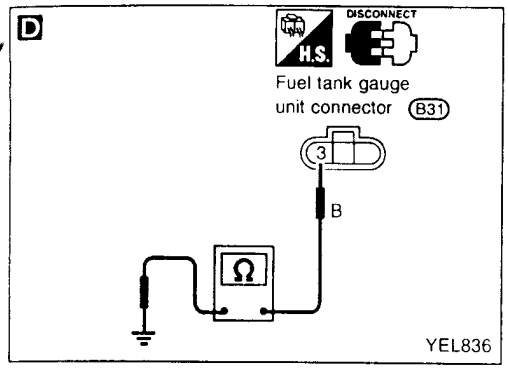
CHECK COMPONENT.
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check" (EL-110) or "Thermal Transmitter Check" (EL-110).

NG → Repair or replace.
Refer to FE section. (Fuel Tank Gauga Unit)

OK ↓

(Go to (A) on next page)

Inspection/Fuel Gauge and Water Temperature Gauge (Cont'd)



Ⓐ

D

Check harness continuity between fuel tank gauge unit harness connector terminal ③ and body ground.
Continuity should exist.

NG → Repair harness or connector.

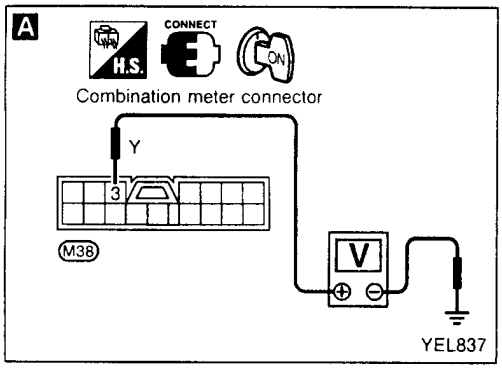
OK ↓

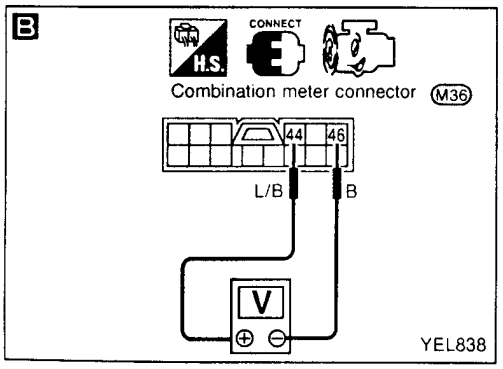
Reinstall any part removed.

↓

INSPECTION END

Inspection/Tachometer





INSPECTION START

↓

Perform Combination Meter Self-diagnosis.

↓

A

CHECK POWER SOURCE.
1) Turn ignition switch to "ON" position.
2) Check voltage between combination meter connector M58 terminal ③ and ground.
Battery voltage should exist.

NG → Check the following items:
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and 10A [8] fuse
4) Ignition switch
If NG, replace fusible link, fuse or ignition relay or repair ignition switch, harness or connectors.

OK ↓

B

CHECK ECM OUTPUT.
1) Start engine.
2) Check voltage between terminals ㊹ and ㊻ at idle and 2,000 rpm.
Higher rpm = Higher voltage
Lower rpm = Lower voltage
Voltage should change with rpm.

NG → Check the following:
1) Harness connectors F104, M50
— Gasoline engine models
Harness connectors F105, M51
— Diesel engine models
2) Harness continuity between ECM and combination meter
3) Combination meter ground connectors
If NG, repair harness or connectors.

OK ↓

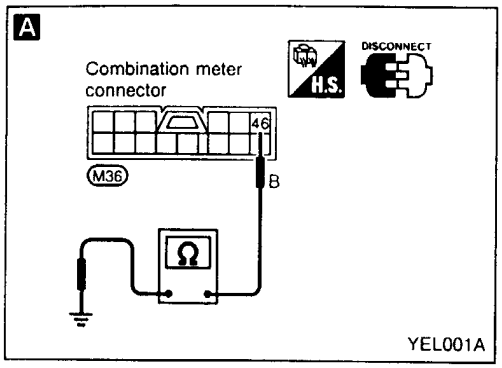
Replace Combination Meter.

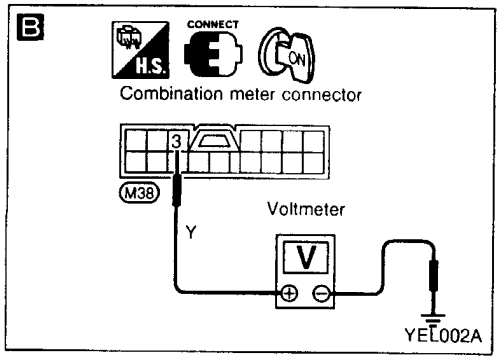
↓

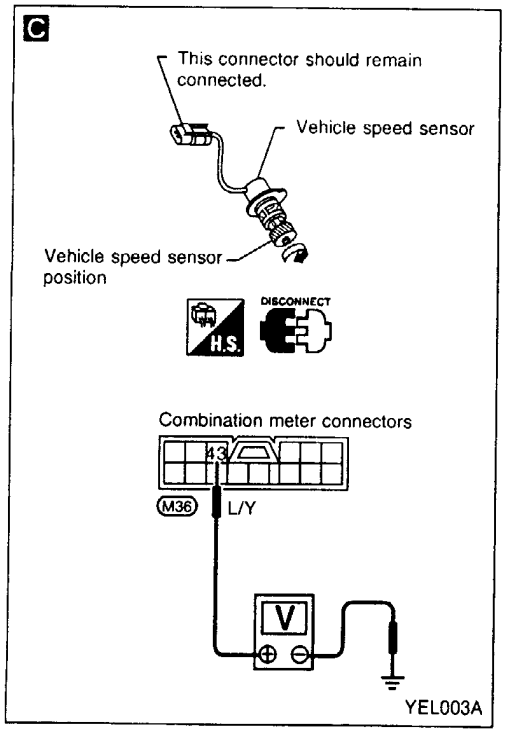
INSPECTION END

Inspection/Speedometer and Vehicle Speed Sensor

SYMPTOM: Speedometer stays at 0 km/h (0 mph).







INSPECTION START

↓

Perform Combination Meter Self-diagnosis.

↓

A

CHECK GROUND CIRCUIT OF SPEEDOMETER.
Check continuity between combination meter connector (M36) terminal (46) and body ground.
Continuity should exist.

NG → Repair harness or connector.

OK ↓

B

CHECK SPEEDOMETER CIRCUIT.
1) Turn ignition switch to "ON" position.
2) Check voltage between combination meter connector (M38) terminal (3) and body ground.
Battery voltage should exist.

NG → Repair harness or connector.

OK ↓

CHECK VEHICLE SPEED SENSOR.
- Raise vehicle drive wheels; start engine; put in gear and rotate drive wheels.

Check output signal of vehicle speed sensor connector terminal (2) using oscilloscope.
Output signal approx. 0V to approx. 12V. (Average approx. 5.6V)

NG → Replace vehicle speed sensor.

OK ↓

C

CHECK VEHICLE SPEED SENSOR OUTPUT.
1) Remove vehicle speed sensor from transaxle.
2) Check voltage between combination meter connector (M36) terminal (43) and body ground while quickly turning speed sensor pinion.
Voltage: Approx. 5.6V

OK → Replace speedometer.

NG ↓

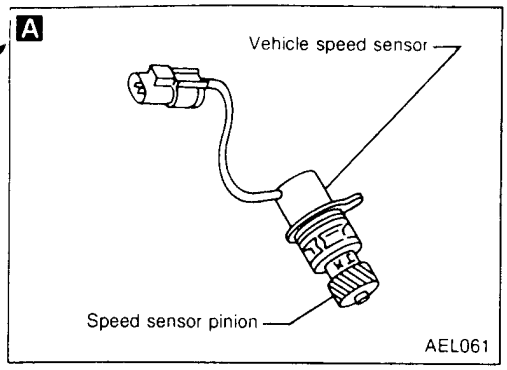
Repair harness or connector between speedometer and vehicle speed sensor.

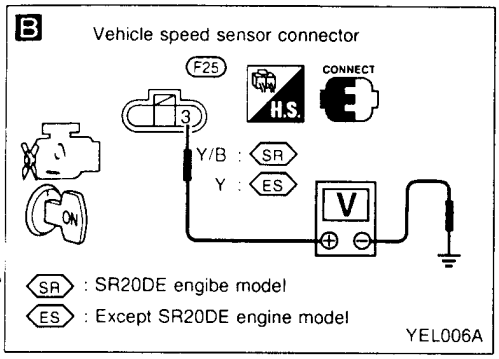
↓

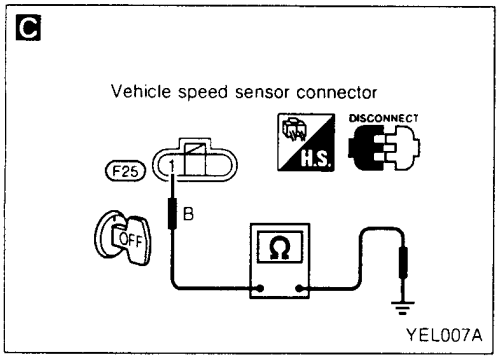
INSPECTION END

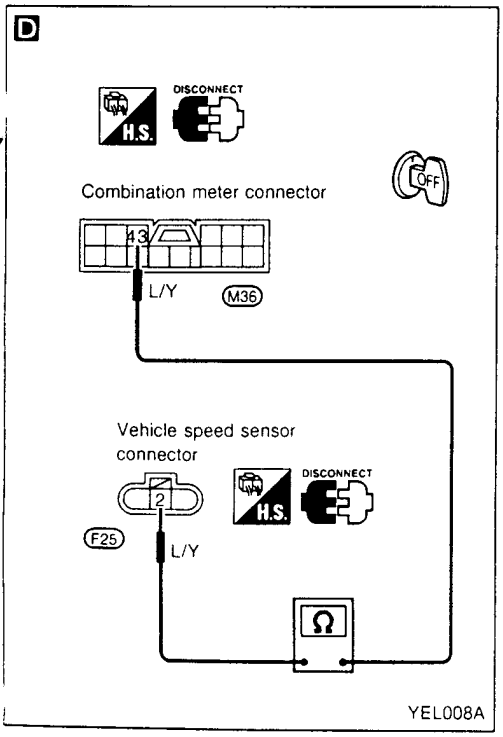
Inspection/Speedometer and Vehicle Speed Sensor (Cont'd)

SYMPTOM: Speedometer indication flutters.









INSPECTION START

↓

Is vehicle speed sensor installed correctly? — NG → Install vehicle speed sensor correctly.

↓ OK

A

Remove vehicle speed sensor and spin pinion. Do you feel resistance when turning vehicle speed sensor pinion? — No → Replace vehicle speed sensor.

↓ Yes

B

CHECK POWER SOURCE
- Re-install vehicle speed sensor.
- Turn ignition switch to "ON" position.

Check voltage between vehicle speed sensor connector terminal ③ and ground.
Battery voltage should exist.

NG → Check the following:
1) Harness continuity between vehicle speed sensor and battery.
2) Fusible link in power supply lines.
3) 10A [8] fuse — M/T models
   15A [3] fuse — A/T models.
4) Harness connectors (F103), (M52).
5) Ignition switch.

If NG, replace fuse or fusible link or repair ignition switch, harness or connectors.

↓ OK

C

CHECK GROUND CIRCUIT OF VEHICLE SPEED SENSOR
- Turn ignition switch to the "LOCK" position.

Disconnect vehicle speed sensor connector.
Check continuity between vehicle speed sensor harness connector terminal ① and body ground.
Continuity should exist.

NG → Repair harness or connector.

↓ OK

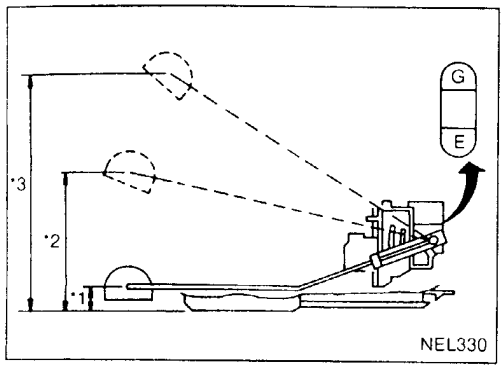
D

Check continuity between speedometer harness connector terminal ㊸ and vehicle speed sensor connector terminal ②.
Continuity should exist.

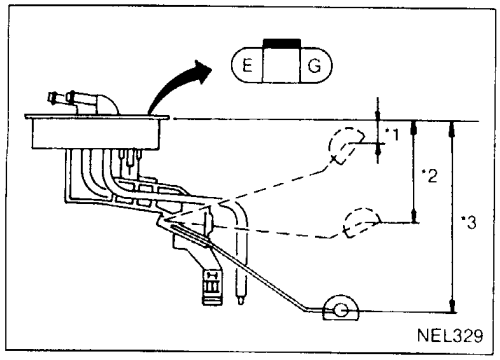
NG → Repair harness and connector.

↓ OK

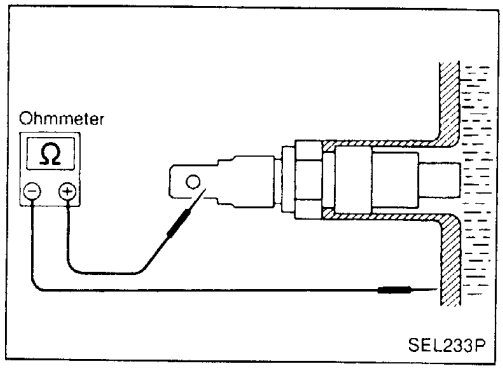
Replace Combination Meter.



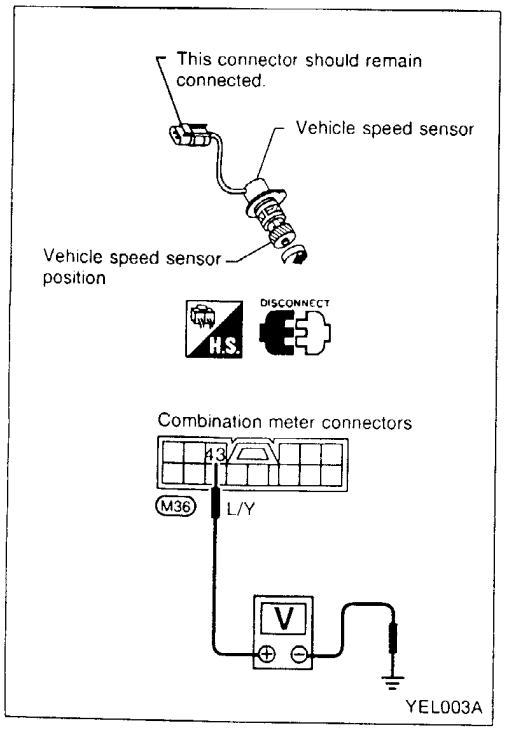
NEL330



NEL329



SEL233P



YEL003A

Fuel Tank Gauge Unit Check

- For removal, refer to FE section ("FUEL SYSTEM").

Check the resistance between terminals (G) and (E).

GA & SR engine models

Ohmmeter (+)	Ohmmeter (−)	Float position mm (in)			Resistance value (Ω)
G	E	*3	Full	151 (5.945)	7.5 - 9.5
		*2	1/2	88 (3.465)	88.5 - 93.5
		*1	Empty	15 (0.591)	180.0 - 186.8

*1 and *3: When float rod is in contact with stopper.

CD20T engine models

Ohmmeter (+)	Ohmmeter (−)	Float position mm (in)			Resistance value (Ω)
G	E	*3	Full	18 (0.709)	7.5 - 9.5
		*2	1/2	84 (3.307)	88.5 - 93.5
		*1	Empty	158 (6.220)	180.0 - 186.8

*1 and *3: When float rod is in contact with stopper.

Thermal Transmitter Check

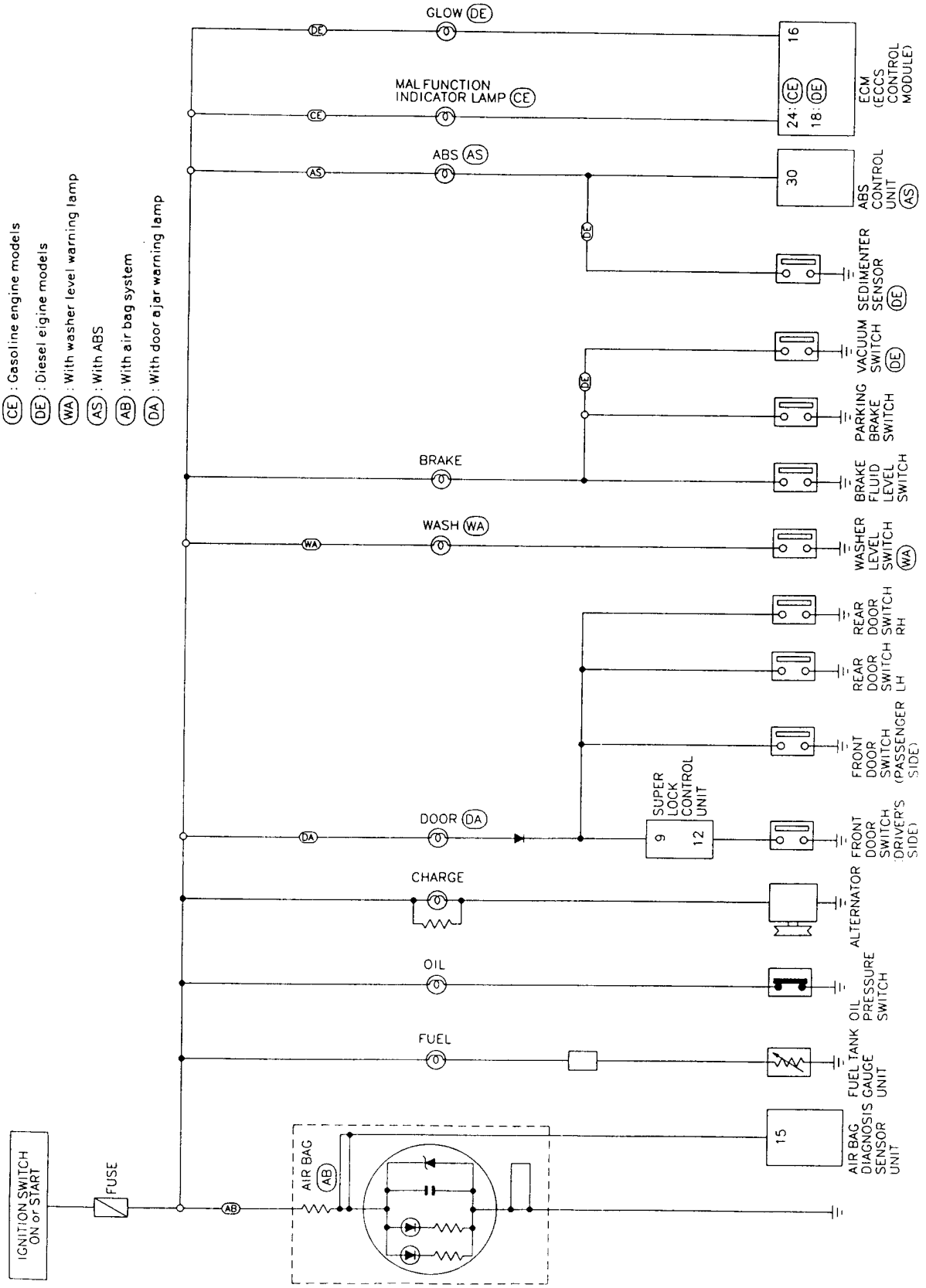
Check the resistance between the terminals of thermal transmitter and body ground.

Water temperature °C (°F)	Resistance (Ω)
65 (149)	Approx. 1,178 - 1,417
91 (196)	Approx. 473 - 569

Vehicle Speed Sensor Signal Check

1. Remove vehicle speed sensor from transaxle.
2. Turn speedometer pinion quickly and measure voltage combination meter connector terminal (43)

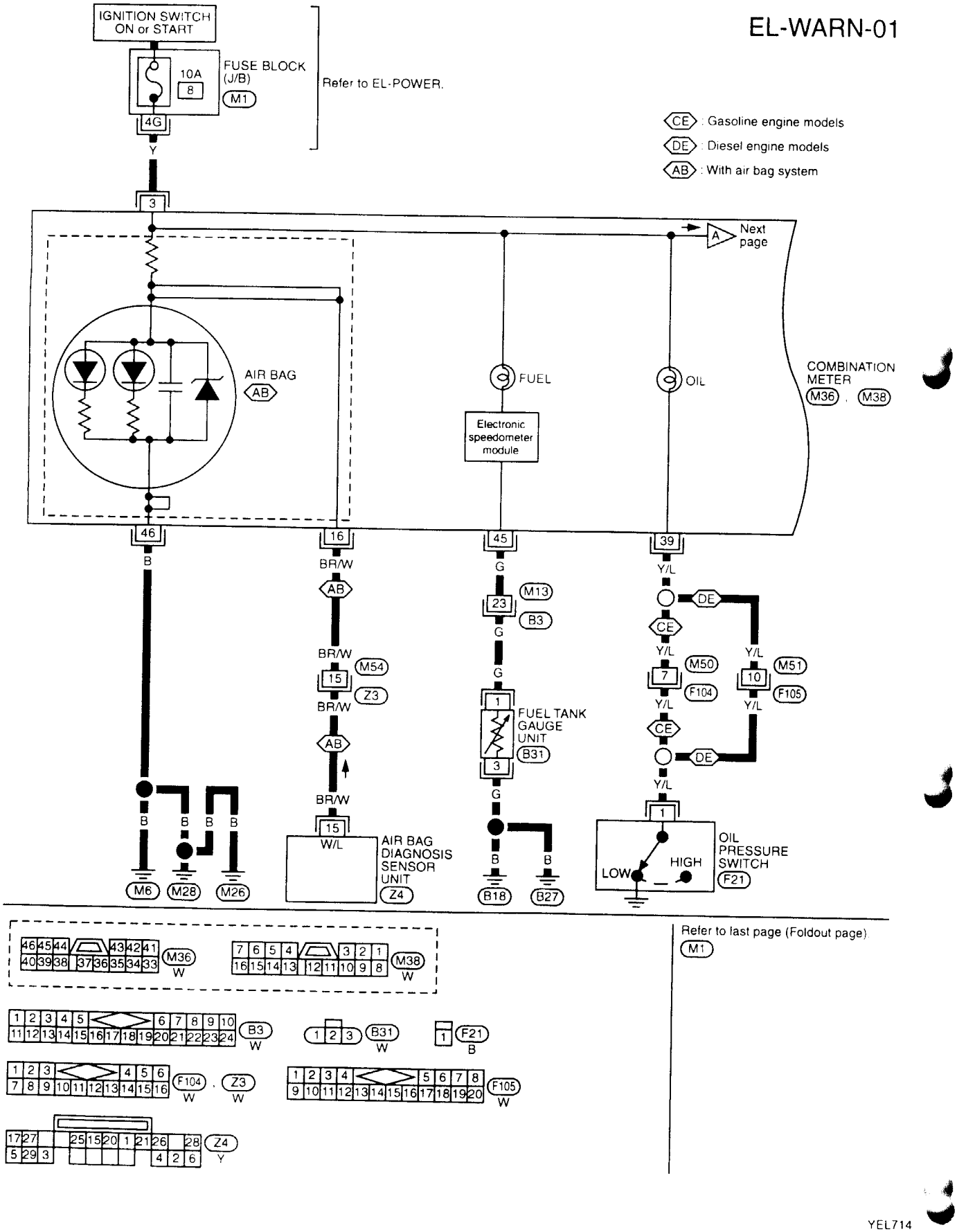
Warning Lamps/Schematic



YEL719

Warning Lamps/Wiring Diagram — WARN —

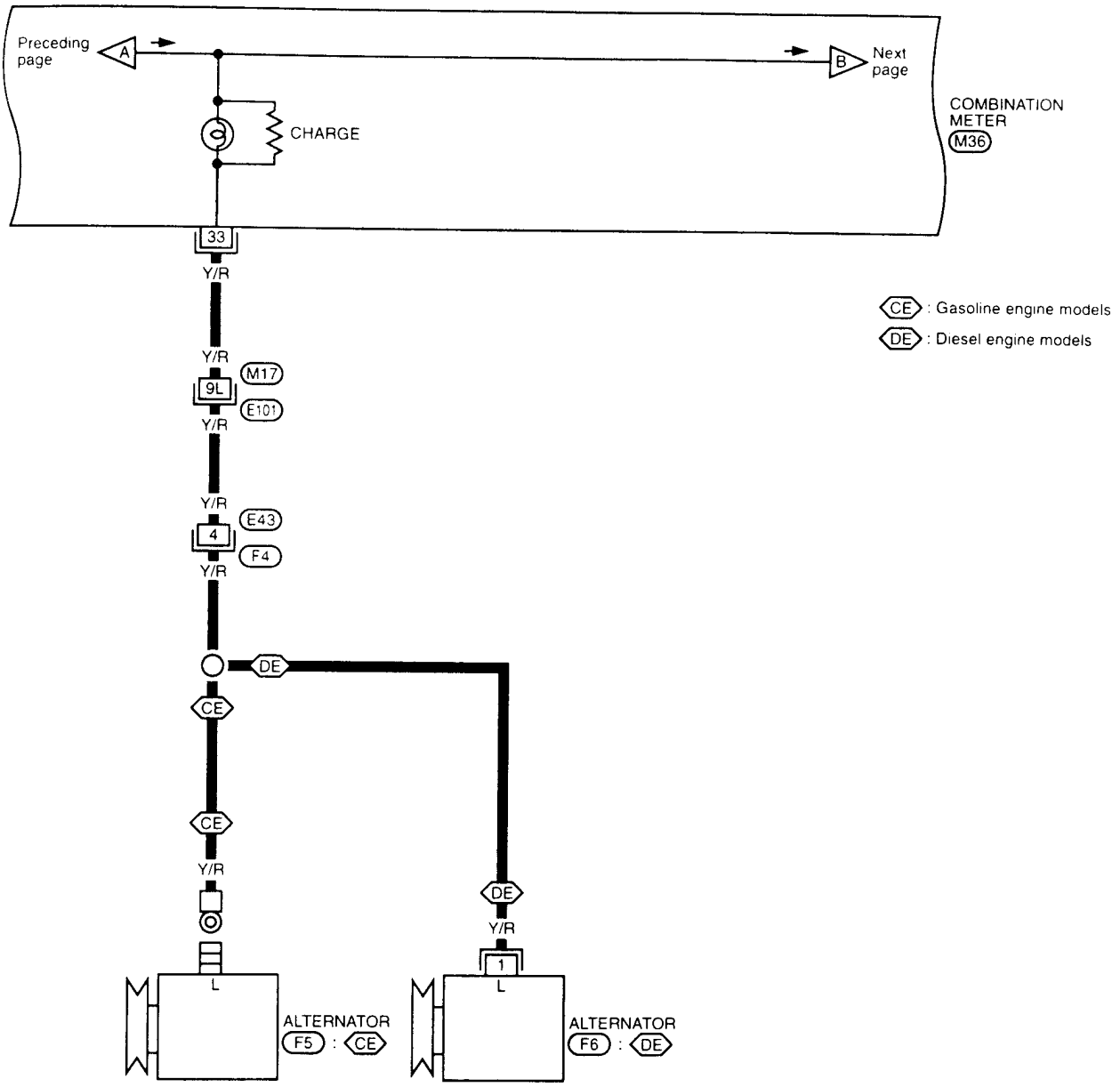
EL-WARN-01

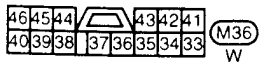


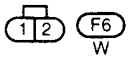
YEL714

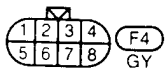
Warning Lamps/Wiring Diagram — WARN — (Cont'd)

EL-WARN-02







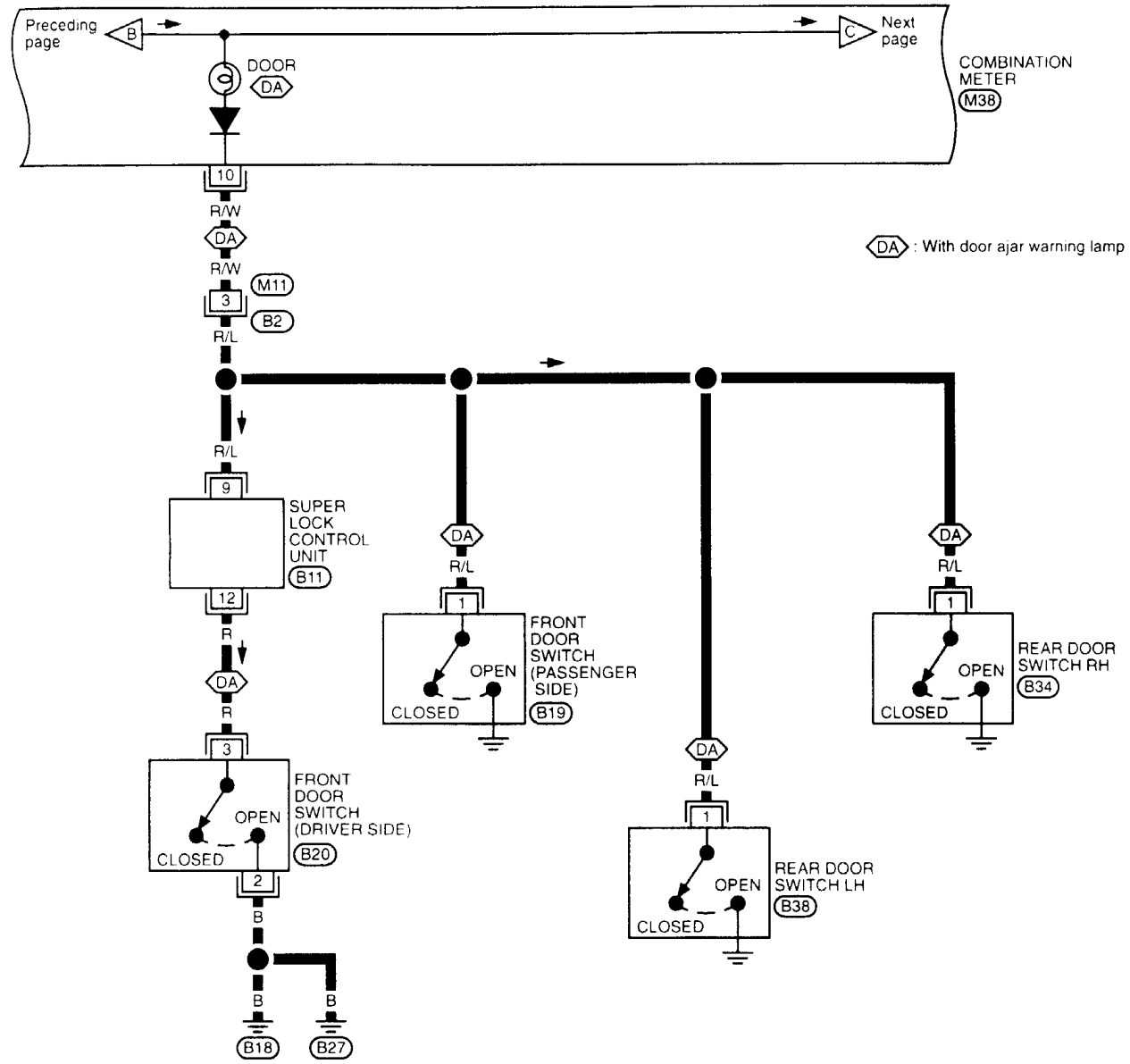


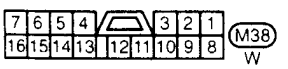
Refer to last page (Foldout page)
M17 , E101

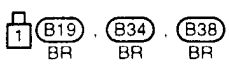
YEL715

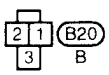
Warning Lamps/Wiring Diagram — WARN — (Cont'd)

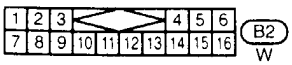
EL-WARN-03









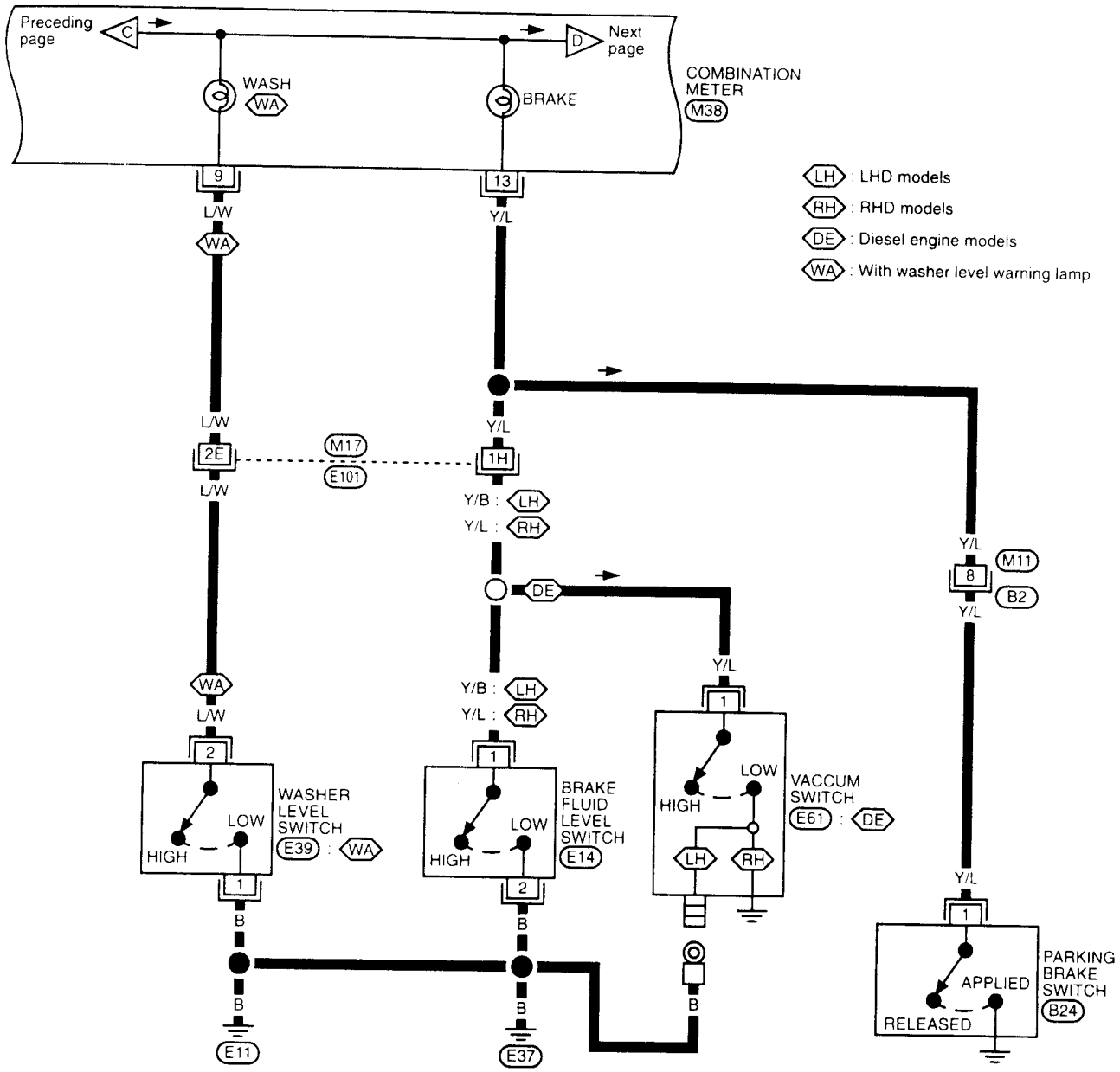


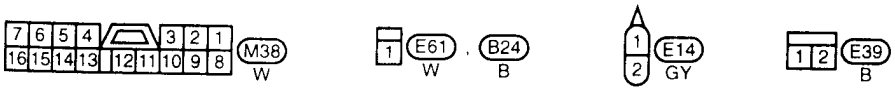
Refer to last page (Foldout page)
B11

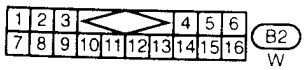
YEL716

Warning Lamps/Wiring Diagram — WARN — (Cont'd)

EL-WARN-04





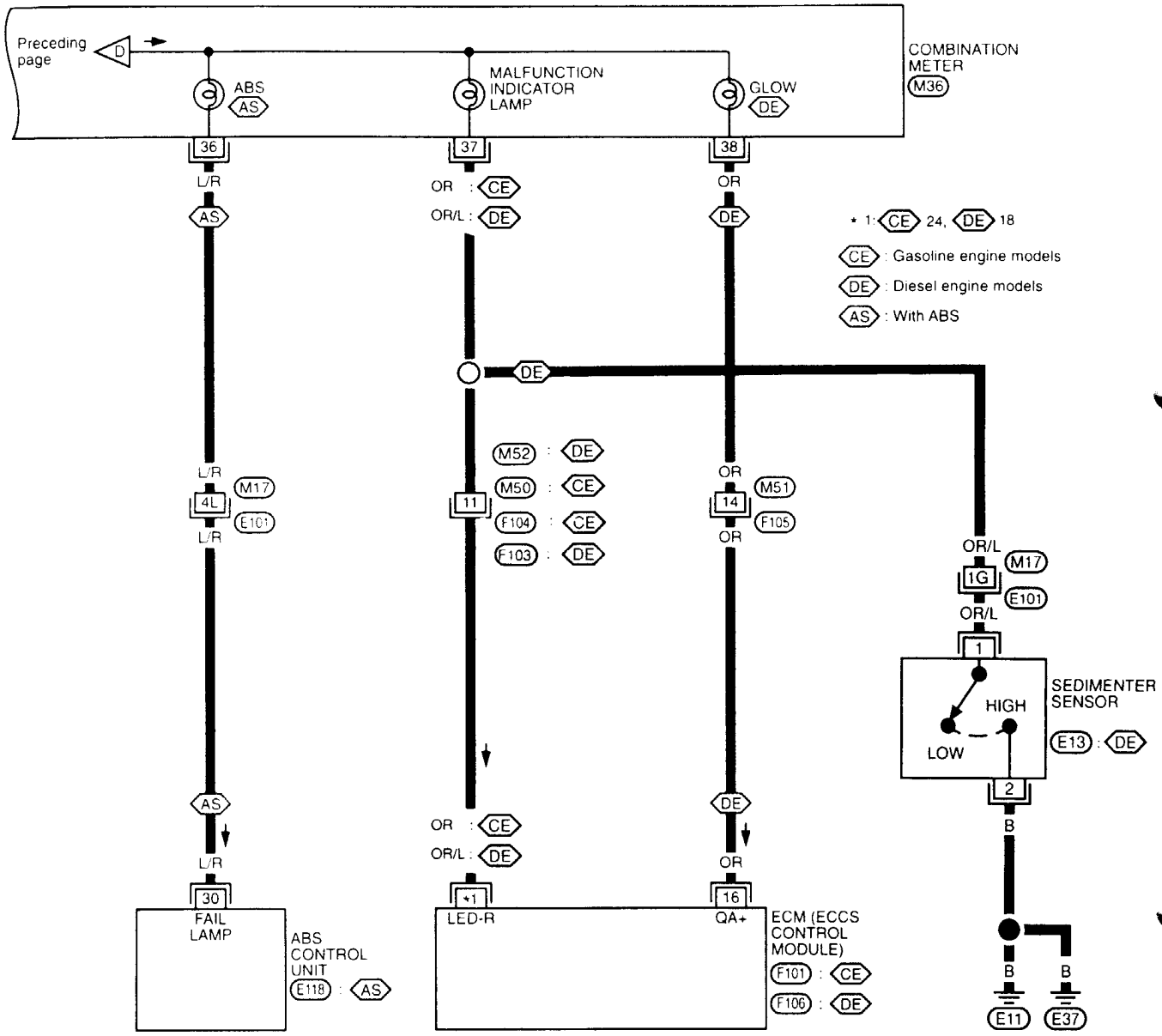


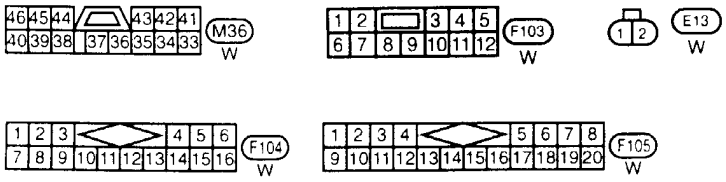
Refer to last page (Foldout page)
M17 , E101

YEL717

Warning Lamps/Wiring Diagram — WARN — (Cont'd)

EL-WARN-05





Refer to last page (Foldout page).

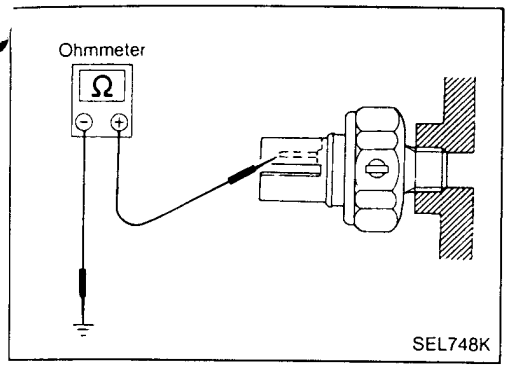
M17 , E101

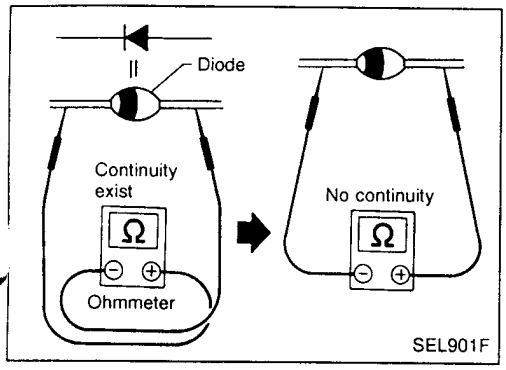
E118

F101

F106

YEL71





Oil Pressure Switch Check

	Oil pressure kPa (bar, kg/cm^2, psi)	Continuity
Engine start	More than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	NO
Engine stop	Less than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	YES

Check the continuity between the terminals of oil pressure switch and body ground.

Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.

NOTE:
Specification may vary depending on the type of tester. Before performing this inspection, be sure to refer to the instruction manual for the tester to be used.

- Diodes for warning lamps are built into the combination meter printed circuit.

Refer to "Combination Meter" (EL-100).

Warning Buzzer/System Description

The warning buzzer is controlled by the super lock control unit.
Power is supplied at all times
- through 10A fuse (No. 24, located in the fuse block)
- to key switch terminal ①.

Power is supplied at all times
- through 10A fuse (No. 54, located in the fuse block)
- to lighting switch terminal ⑪.

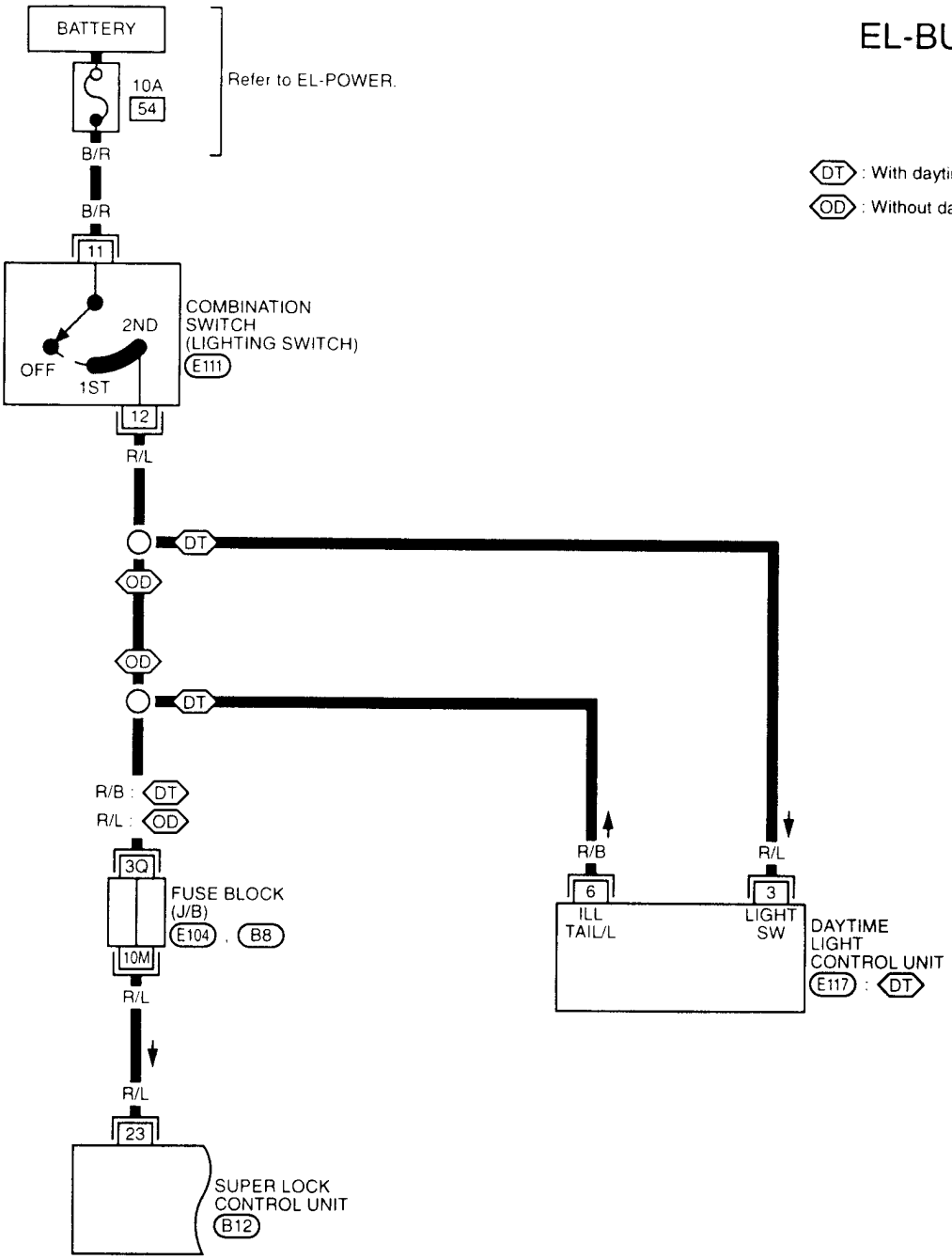
When driver's door is opened, ground is supplied
- through body grounds (B18) and (B27)
- to driver's side door switch terminal ②
- through driver's side door switch terminal ③
- to super lock control unit terminal ⑫.

With ignition switch in the "LOCK" position, driver's door open, and lighting switch in 1ST or 2ND position, warning buzzer will sound. A battery positive voltage is supplied
- through 10A fuse (No. 24, located in the fuse box)
- to warning buzzer connector terminal ①.

Ground is supplied
- to warning buzzer connector terminal ②
- through super lock control unit connector terminal

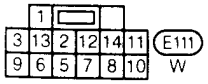
Warning Buzzer/Wiring Diagram
— BUZZER —

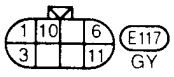
EL-BUZZER-01



DT : With daytime light system

OD : Without daytime light system





Refer to last page (Foldout page).

E104

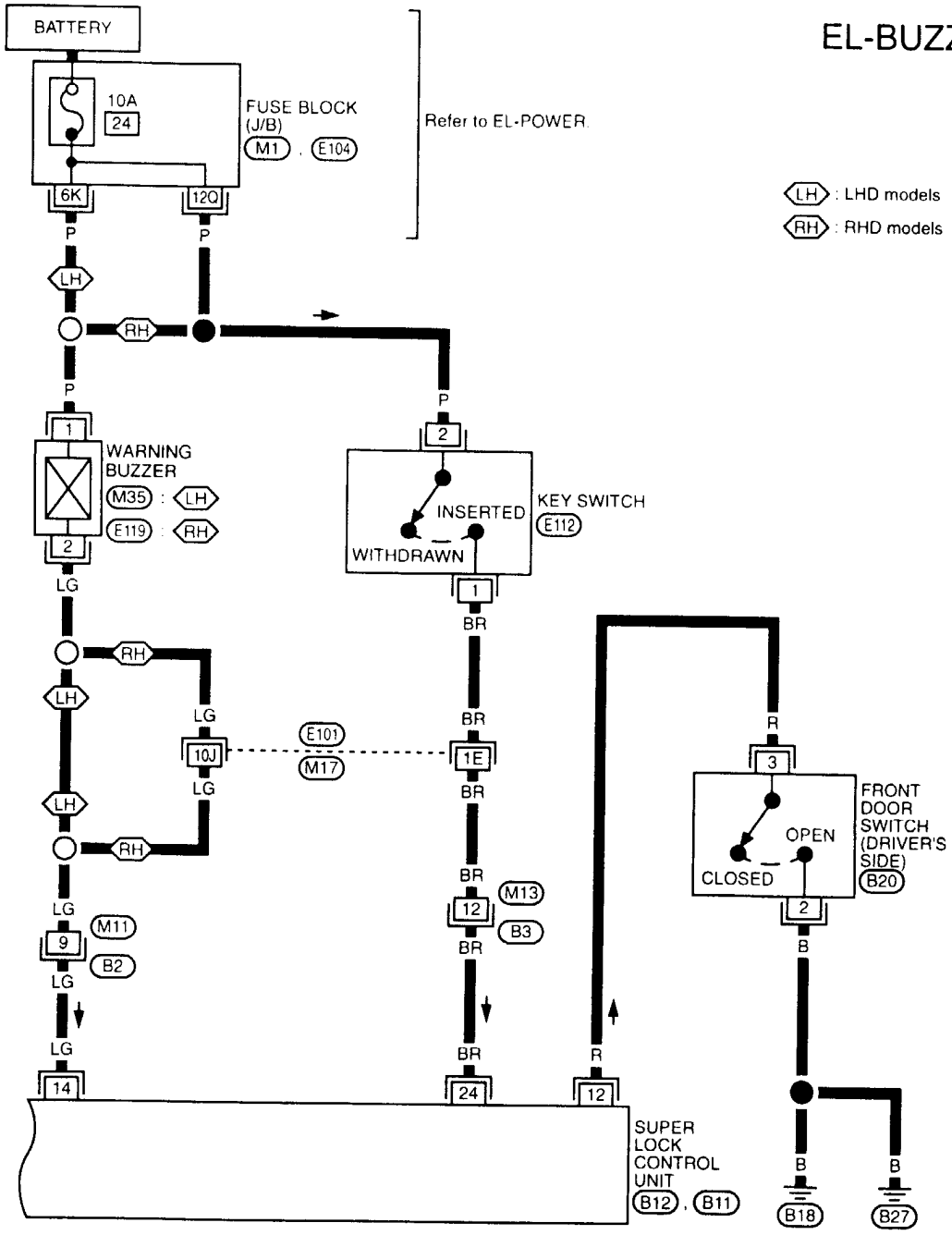
B8

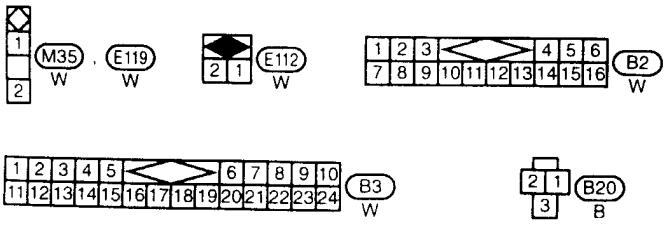
B12

YEL730

Warning Buzzer/Wiring Diagram — BUZZER — (Cont'd)

EL-BUZZER-02





Refer to last page (Foldout page).

M17 . E101

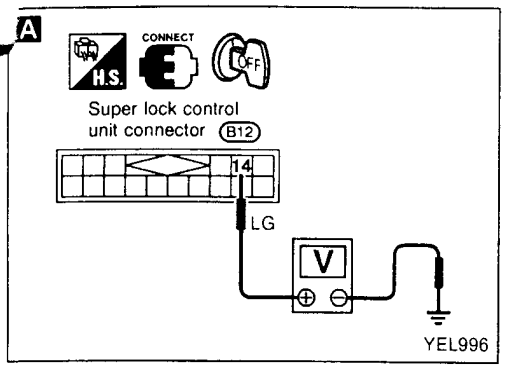
M1

E104

B12

B11

YEL731



Components Inspection — Warning Buzzer

IGNITION POWER SUPPLY CHECK

A

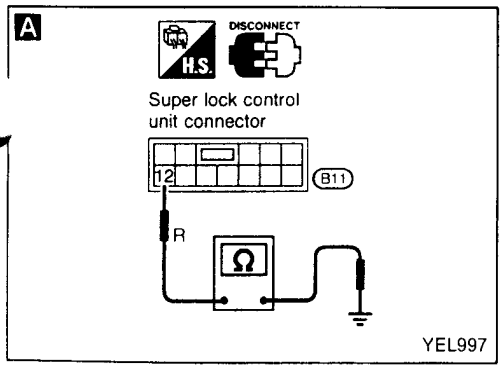
BATTERY POWER SUPPLY CHECK
1) Turn ignition switch to "ON" position.
2) Measure voltage between super lock control unit connector terminal ⑭ and body ground.
Battery voltage should exist.

NG → Check the following:
1) 10A fuse (No. 24, located in fuse block [J/B])
2) Harness connectors B2, M11
3) Warning buzzer
4) Harness connectors M17, E101: RHD models only
5) Harness continuity between battery and super lock control unit

If NG, replace fuse or warning buzzer or repair harness or connectors.

OK ↓

Battery power supply is OK.



DRIVER'S DOOR SWITCH CHECK

A

DOOR SWITCH INPUT SIGNAL CHECK
Check continuity between super lock control unit connector and body ground.

Connector No.	Terminal No.	Front Driver's side door switch — condition and continuity	
		Open	Close
B11	⑫	Yes	No

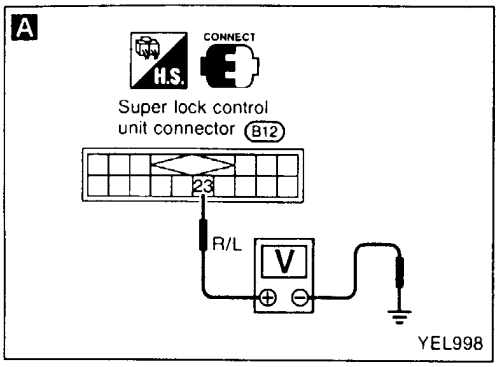
NG → Check the following:
1) Driver's door switch
2) Driver's door switch ground circuit
3) Harness (continuity and ground short)

OK ↓

Driver's door switch is OK.

Components Inspection — Warning Buzzer (Cont'd)

LIGHTING SWITCH CHECK



A

LIGHTING SWITCH INPUT SIGNAL CHECK
Measure voltage between super lock control unit connector and body ground.

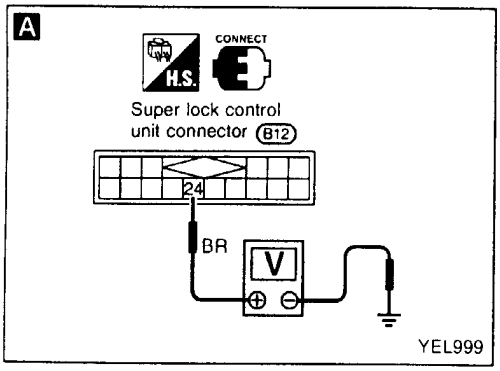
Connector No.	Terminal No.	Lighting switch condition and voltage [V]	
		1st or 2nd	OFF
B12	23	Approx. 12	0

NG → Check the following:
1) 10A fuse (No. 54)
2) Lighting switch
3) Harness connectors E104, B8
4) Daytime light control unit (models with daytime light)
5) Harness continuity between battery and super lock control unit

If NG, replace fuse or Daytime light control unit (where fited), or repair lighting switch harness or connectors.

OK ↓

Lighting switch is OK.



IGNITION KEY-IN SWITCH SIGNAL CHECK

A

KEY-IN SWITCH INPUT SIGNAL CHECK
Measure voltage between super lock control unit connector and body ground.

Connector No.	Terminal No.	Ignition key condition and voltage [V]	
		Inserted	Removed
B12	24	Approx. 12	0

NG → Check the following.
1) 10A fuse (No. 24, located in fuse block [J/B])
2) Ignition key switch
3) Harness connectors M17, E101
4) Harness connectors B3, M13
5) Harness continuity between battery and super lock control unit

If NG, replace fuse or repair key switch, harness or connectors.

OK ↓

Ignition key switch is OK.

Front Wiper and Washer/System Description

WIPER OPERATION

The wiper switch is controlled by a lever built into the combination switch.
There are three wiper switch positions:

- LO speed
- HI speed
- INT (Intermittent).

With the ignition switch in the ACC or ON position, power is supplied

- through 20A fuse (No. 19, located in the fuse block)
- to wiper motor terminal ⑥ and ③.

Low and high speed wiper operation

Ground is supplied to wiper switch terminal ⑰ through body grounds E11 and E37.
When the wiper switch is placed in the LO position, ground is supplied

- Through terminal ⑭ of the wiper switch
- to wiper motor terminal ②.

With power and ground supplied, the wiper motor operates at low speed.
When the wiper switch is placed in the HI position, ground is supplied

- Through terminal ⑯ of the wiper switch
- to wiper motor terminal ①.

With power and ground supplied, the wiper motor operates at high speed.

Auto stop operation

With wiper switch turned OFF, wiper motor will continue to operate until wiper arms reach windshield base.
When wiper arms are not located at base of windshield with wiper switch OFF, ground is provided

- from terminal ⑭ of the wiper switch
- to wiper motor terminal ②, in order to continue wiper motor operation at low speed.

Ground is also supplied

- through terminal ⑬ of the wiper switch
- to wiper amplifier terminal ③
- through terminal ⑥ of the wiper amplifier
- to wiper motor terminal ⑤
- through terminal ④ of the wiper motor, and
- through body grounds M28, M6 and M26 (LHD); E11 and E37 (RHD).

When wiper arms reach base of windshield, wiper motor terminals ⑤ and ③ are connected instead of terminals ⑤ and ④. Wiper motor will then stop wiper arms at the PARK position.

Intermittent operation

With variable intermittent

The wiper motor operates the wiper arms at a set interval of approximately 2 to 20 seconds. This feature is controlled by the wiper amplifier.
When the wiper switch is placed in the INT position, ground is supplied

- to wiper amplifier terminal ④
- from wiper switch terminal ⑮
- through body grounds E37 and E11.
- to wiper motor terminal ②
- through the wiper switch terminal ⑭
- to wiper switch terminal ⑬
- through wiper amplifier terminal ③
- to wiper amplifier terminal ②
- through body grounds E11 and E37.

The desired interval time is input

- to wiper amplifier terminal ⑤
- from wiper switch terminal ⑳.

The wiper motor operates at low speed at the desired time interval.

Front Wiper and Washer/System Description (Cont'd)

Without variable intermittent

The wiper motor operates the wiper arms at an interval of approximately 7 seconds. This feature is controlled by the wiper amplifier.

When the wiper switch is placed in the INT position, ground is supplied

- to wiper amplifier terminal ④
- from wiper switch terminal ⑮
- through body grounds E37 and E11
- to wiper motor terminal ②
- through the wiper switch terminal ⑭
- to wiper switch terminal ⑬
- through wiper amplifier terminal ③
- to wiper amplifier terminal ②
- through body grounds E11 and E37.

WASHER OPERATION

With the ignition switch in the ACC or ON position, power is supplied

- through 10A fuse (No. 50 or 67, located in the fuse block)
- to washer switch terminal ⑤.

When the lever is pulled to the WASH/F position, ground is supplied

- to washer motor terminal ②, and
- to wiper amplifier terminal ⑦
- from terminal ⑱ of the wiper switch
- through terminal ④ of the wiper switch, and
- through body grounds E37 and E11.

Power is supplied

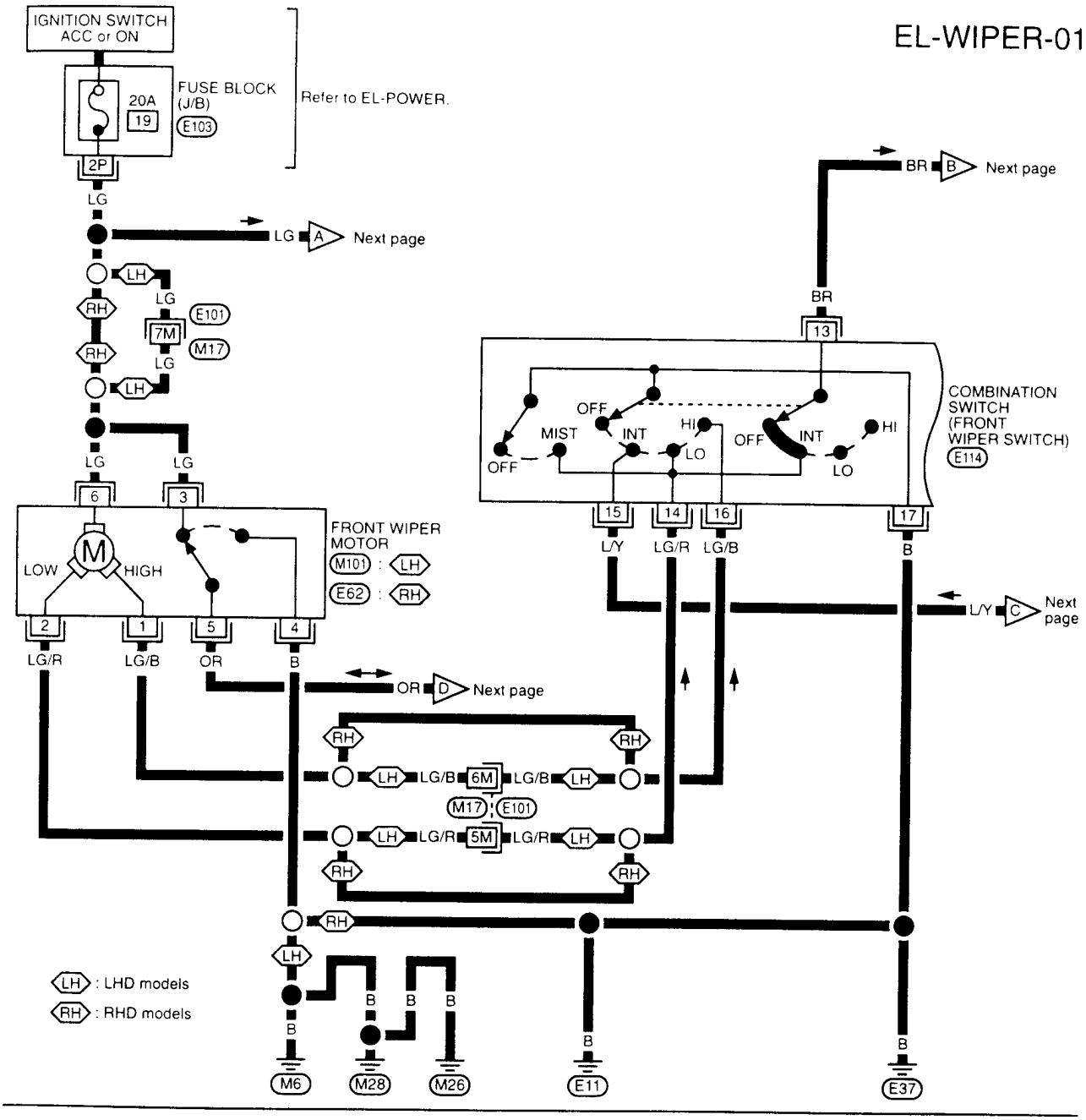
- from terminal ③ of the washer switch
- to washer motor terminal ①.

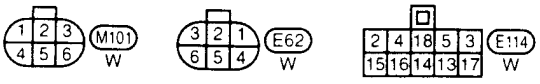
With power and ground supplied, the washer motor operates.

When the lever is pulled to the WASH position for one second or more, the wiper motor operates at low speed for approximately 3 seconds to clean windshield. This feature is controlled by the wiper amplifier in the same manner as the intermittent operation.

Front Wiper and Washer/Wiring Diagram — WIPER —

EL-WIPER-01



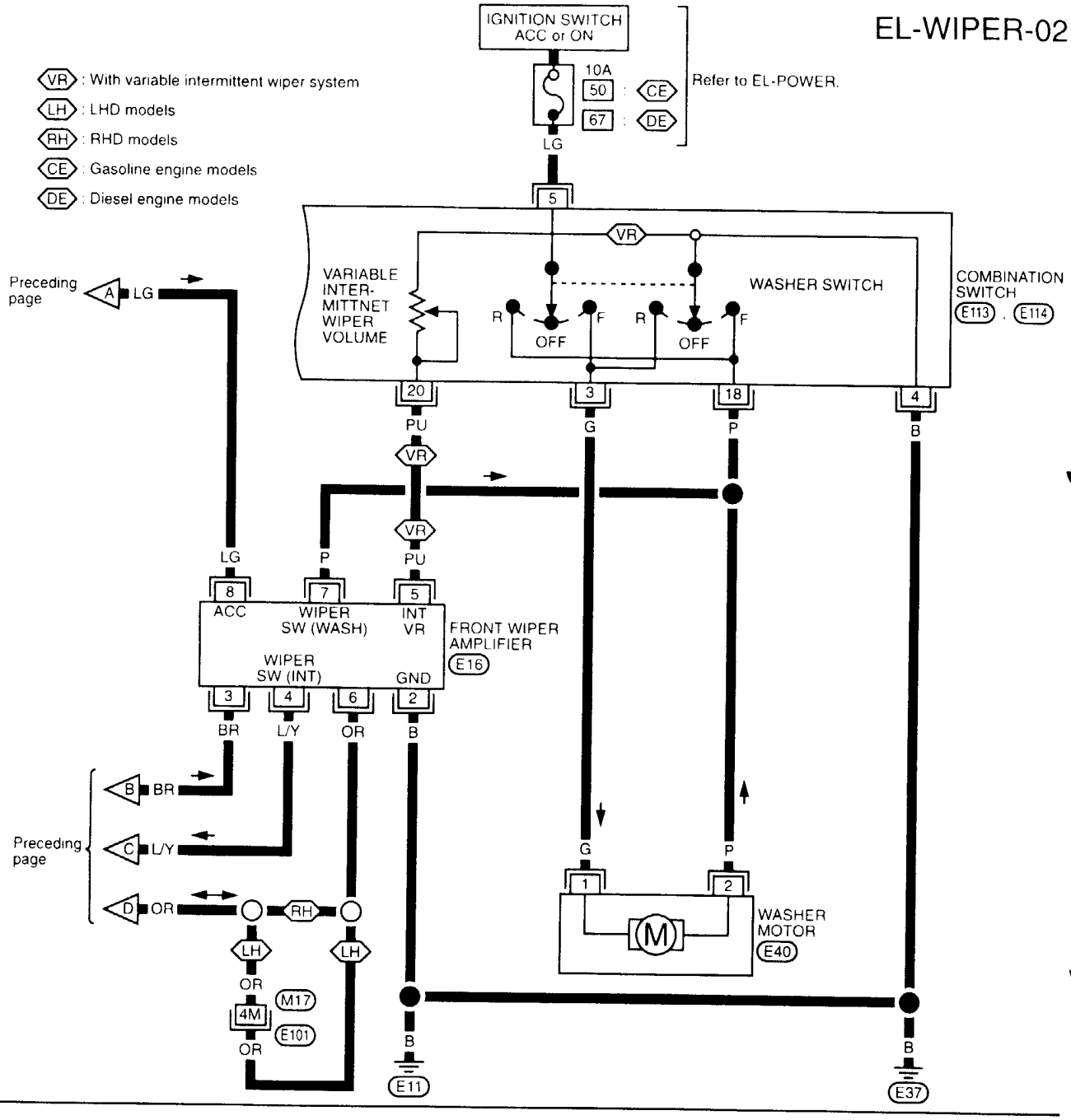


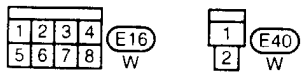
Refer to last page (Foldout page).
M17 , E101
E103

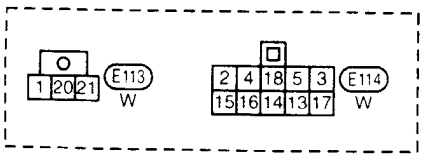
YEL720

Front Wiper and Washer/Wiring Diagram — WIPER — (Cont'd)

EL-WIPER-02

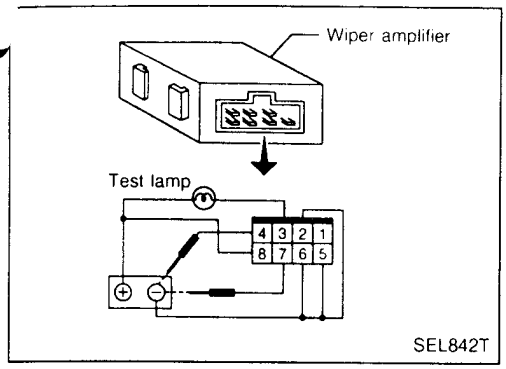






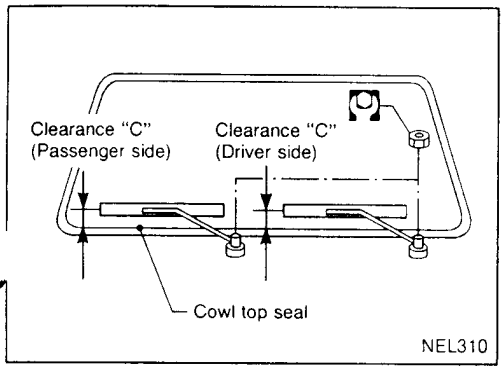
Refer to last page (Foldout page).
M17 . E101

YEL721



Front Wiper Amplifier Check

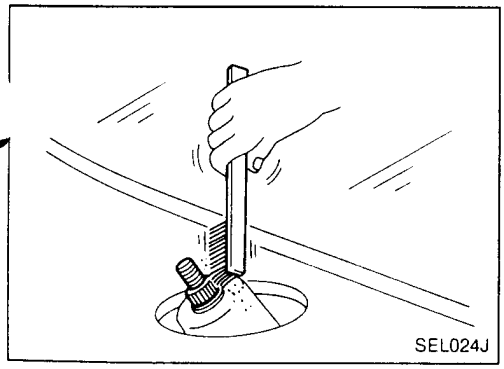
1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal ③ or ⑧ and battery ground, wiper amplifier is normal.



Front Wiper Installation and Adjustment

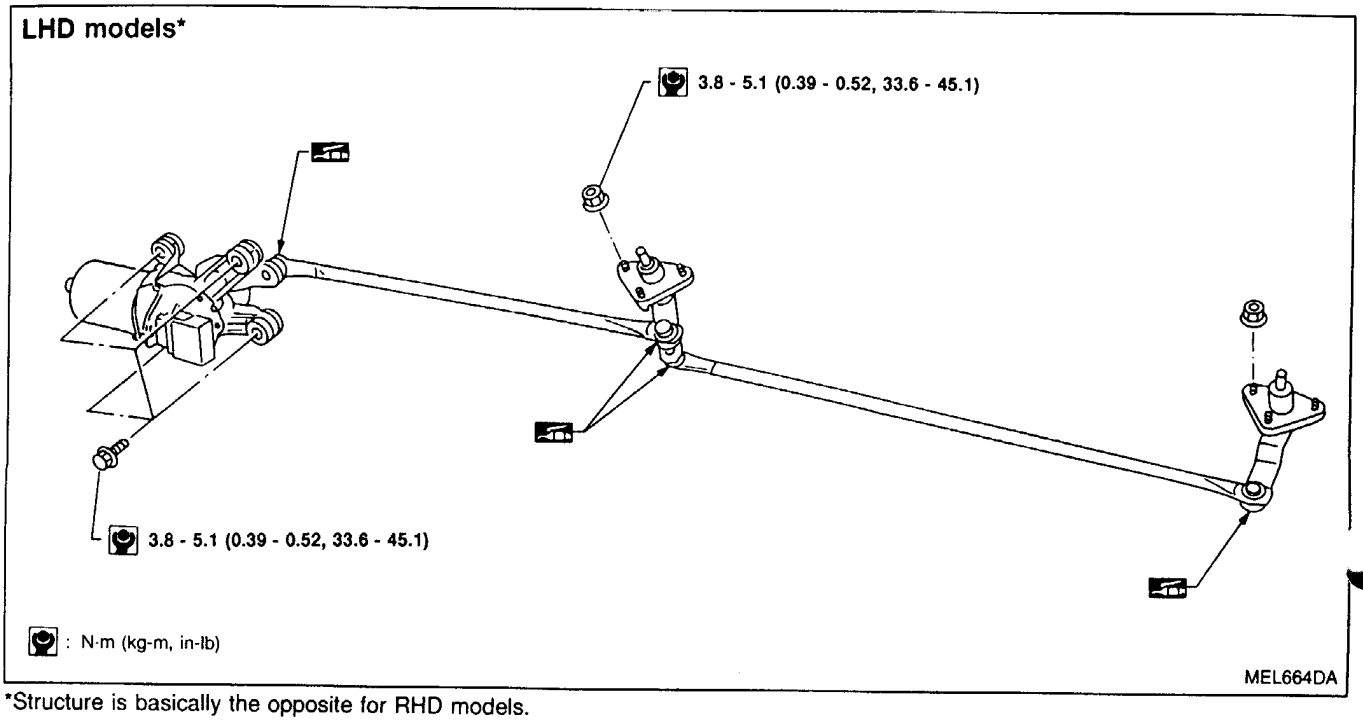
1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Lift the blade up and then set it down onto glass surface. Set the blade center to clearance "C" immediately before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
4. Ensure that wiper blades stop within clearance "C".
   Clearance "C": 19 - 33 mm (0.75 - 1.30 in)

- Tighten windshield wiper arm nuts to specified torque.
  : 21 - 26 N·m (2.1 - 2.7 kg-m, 15 - 20 ft-lb)



- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**

Front Wiper Linkage



*Structure is basically the opposite for RHD models.

REMOVAL

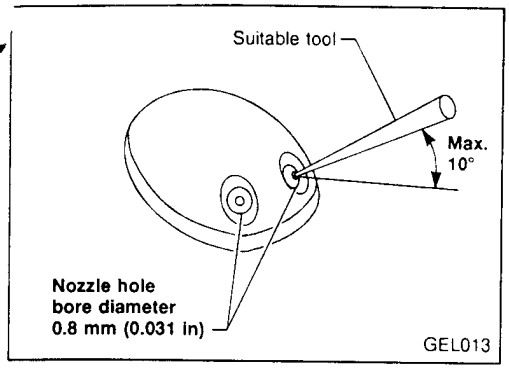
1. Remove 4 bolts that secure wiper motor.
2. Detach wiper motor from wiper linkage at ball joint.
3. Remove wiper linkage.

Be careful not to break ball joint rubber boot.

INSTALLATION

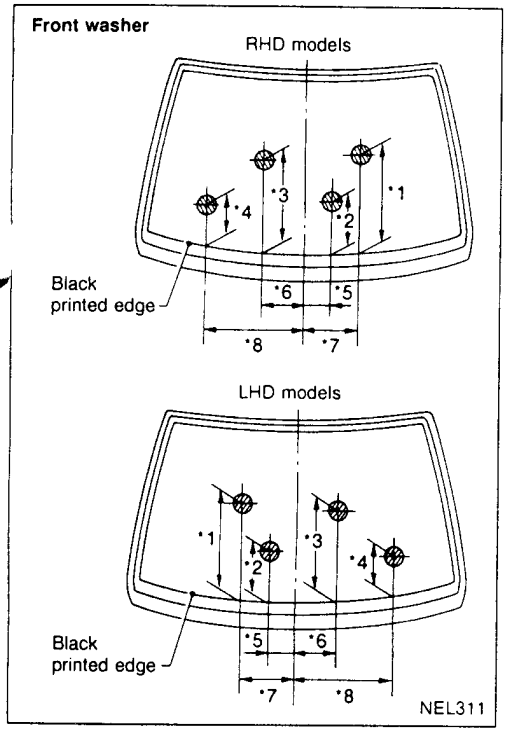
- Grease ball joint area before installation.

1. Installation is the reverse order of removal.



Front Washer Nozzle Adjustment

- Adjust washer nozzle with suitable tool as shown in the figure at left.
  Adjustable range: ±10° (In any direction)

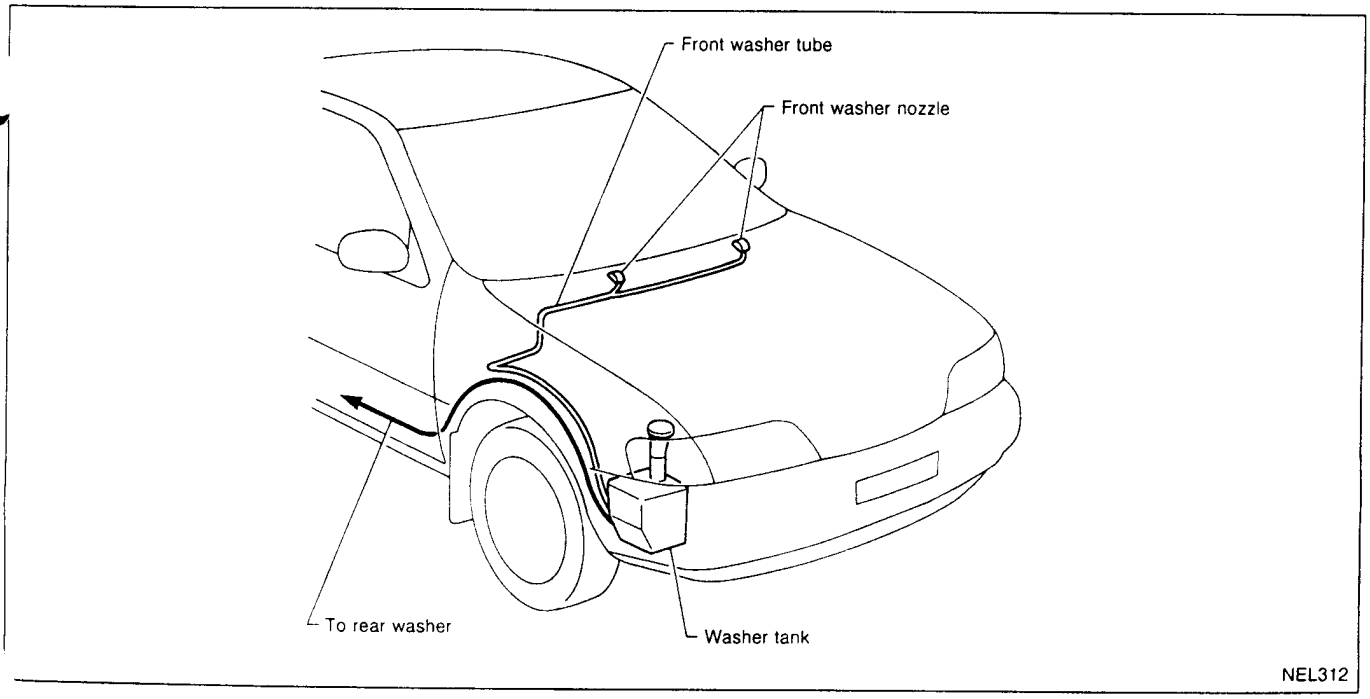


Unit: mm (in)

*1	375 (14.76)	*5	115 (4.53)
*2	160 (6.30)	*6	190 (7.48)
*3	440 (17.32)	*7	320 (12.60)
*4	100 (3.94)	*8	450 (17.72)

Circle diameters are approx. 80 mm (3.15 in).

Front Washer Tube Layout



Rear Wiper and Washer/System Description

WIPER OPERATION

The rear wiper switch and rear intermittent wiper control is built into the combination switch.
There are two rear wiper switch positions:

- ON (LO speed)
- INT (Intermittent).

With the ignition switch in the ACC or ON position, power is supplied

- through 15A fuse (No. 9, located in the fuse block)
- to rear wiper motor terminal ③, and
- to rear wiper relay terminal ①.

Low speed wiper operation

Ground is supplied to rear wiper switch terminal ④ through body grounds E37 and E11.
When the rear wiper is placed in the ON position, ground is supplied

- through rear wiper switch terminal ②
- to rear wiper relay terminal ②.

The rear wiper relay is energized and power is supplied

- through 15A fuse (No. 9, located in the fuse block)
- to rear wiper relay terminal ⑤
- through rear wiper relay terminal ③
- to rear wiper motor terminal ②.

Ground is supplied

- to rear wiper motor terminal ①
- through body grounds B18 and B27 (Sedan); D110 and B48 (H/B).

Auto stop operation

With the rear wiper switch turned OFF, rear wiper motor will continue to operate until wiper arm reaches rear window base.
When wiper arm is not located at base of rear window with rear wiper switch OFF, rear wiper relay is not energized.
Power is supplied

- through 15A fuse (No. 9, located in the fuse block)
- to rear wiper motor terminal ③.

Ground is also supplied

- to rear wiper motor terminal ①
- through body grounds B18 and B27 (Sedan); D110 and B48 (H/B).

When wiper arm reaches base of rear window, rear wiper motor will then stop wiper arm at the PARK position.

Intermittent operation

The rear wiper motor operates the wiper arm one time at low speed at an interval of approximately 7 seconds. This feature is controlled by the rear wiper amplifier.
With the ignition switch in the ACC or ON position, power is supplied

- through 15A fuse (No. 9, located in the fuse block)
- to rear wiper relay terminal ①.

When the rear wiper switch is placed in the INT position, ground is supplied

- to rear wiper amplifier terminal ②.

Ground is also supplied

- to rear wiper relay terminal ②
- through rear wiper amplifier terminal ⑥
- from rear wiper amplifier terminal ⑤
- through body grounds M28, M6 and M26.

When the rear wiper relay is energized, power is supplied

- through 15A fuse (No. 9, located in the fuse block)
- to rear wiper relay terminal ⑤
- through rear wiper relay terminal ③

Rear Wiper and Washer/System Description (Cont'd)

- to rear wiper motor terminal ①.

Ground is also supplied

- to rear wiper motor terminal ①
- through body grounds B18 and B27 (Sedan); D110 and B48 (H/B).

With power and ground supplied, the rear wiper motor operates intermittently.

WASHER OPERATION

With the ignition switch in the ACC or ON position, power is supplied

- through 10A fuse (No. 50 or 67, located in the fuse block)
- to rear washer switch connector terminal ⑤.

When the rear washer switch is turned to the WASH/R position, ground is supplied

- to rear washer motor terminal ①, and
- to rear wiper amplifier terminal ①
- from terminal ③ of rear wiper switch
- through terminal ④ of rear wiper switch, and
- through body grounds E37 and E11.

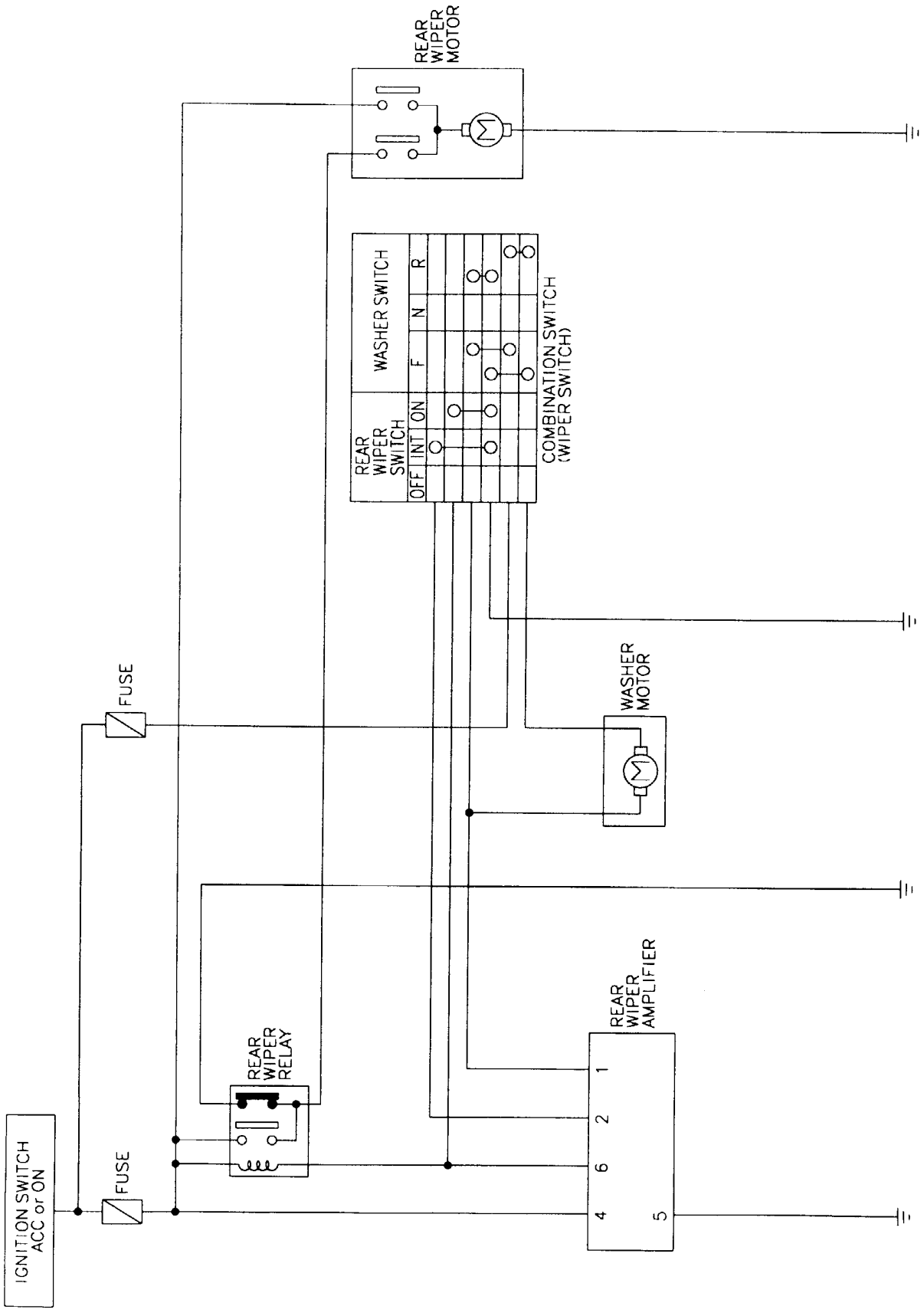
Power is supplied

- from terminal ⑱ of the washer switch
- to washer motor terminal ②.

With power and ground is supplied, the rear washer motor operates.

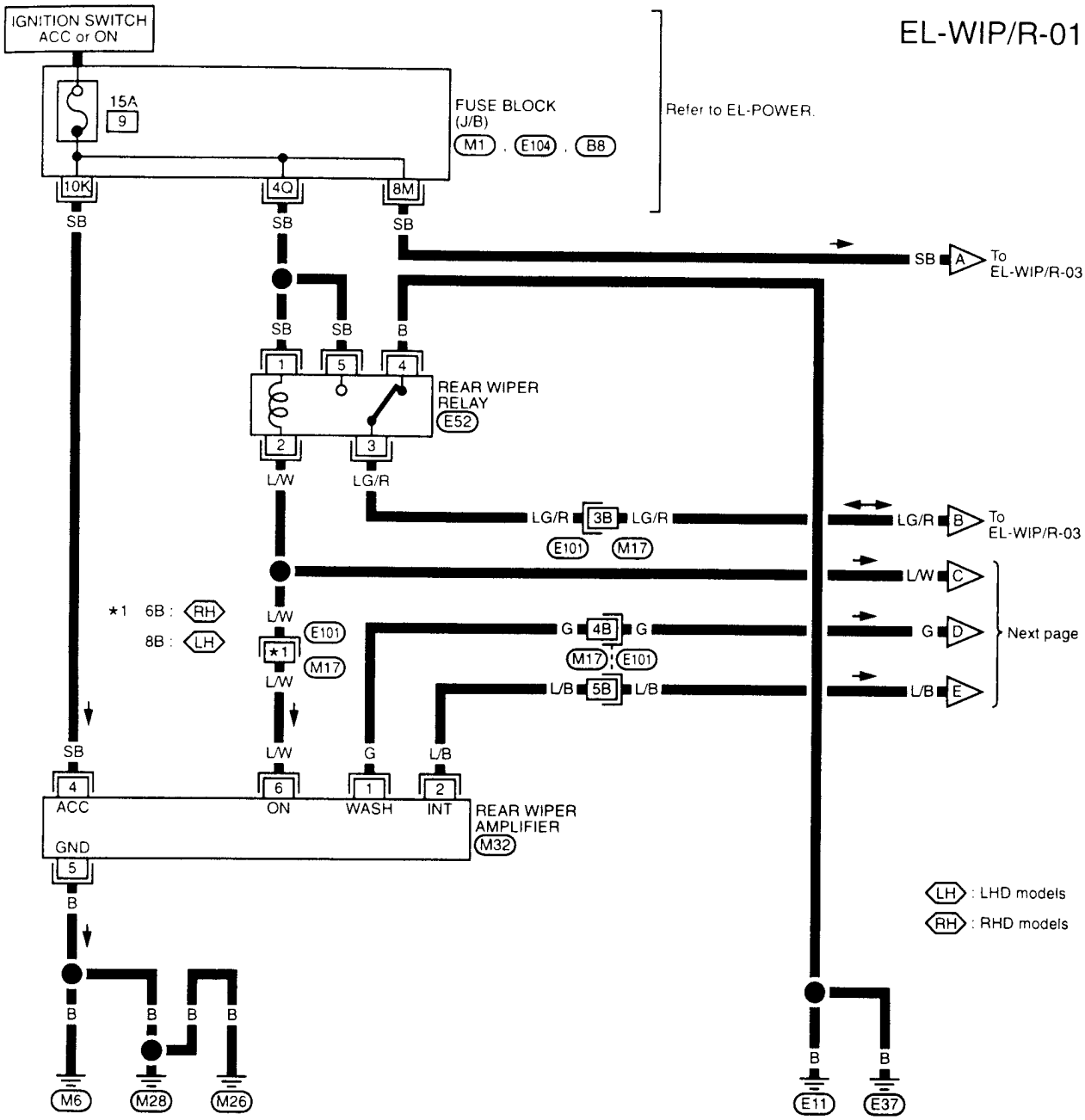
The rear wiper motor operates when the control switch is turned to WASH position for one second or more and for approximately 3 seconds after the switch is released. This feature is controlled by the rear wiper amplifier in the same manner as the intermittent operation.

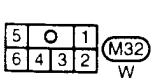
Rear Wiper and Washer/Schematic

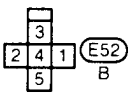


YEL725

Rear Wiper and Washer/Wiring Diagram — WIP/R —





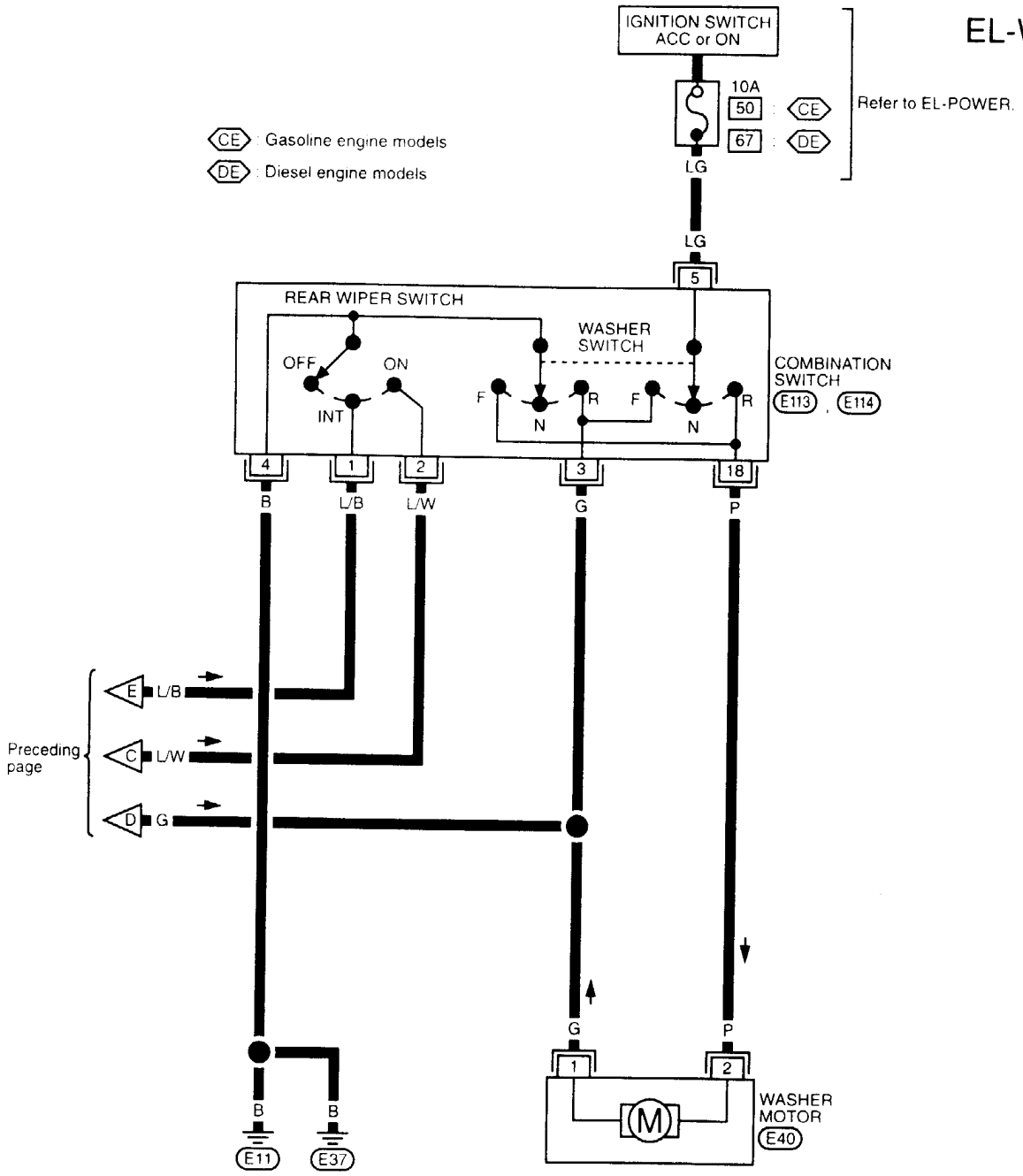


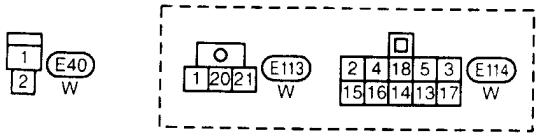
Refer to last page (Foldout page).
M17 , E101
M1
E104
B8

YEL722

Rear Wiper and Washer/Wiring Diagram — WIP/R — (Cont'd)

EL-WIP/R-02



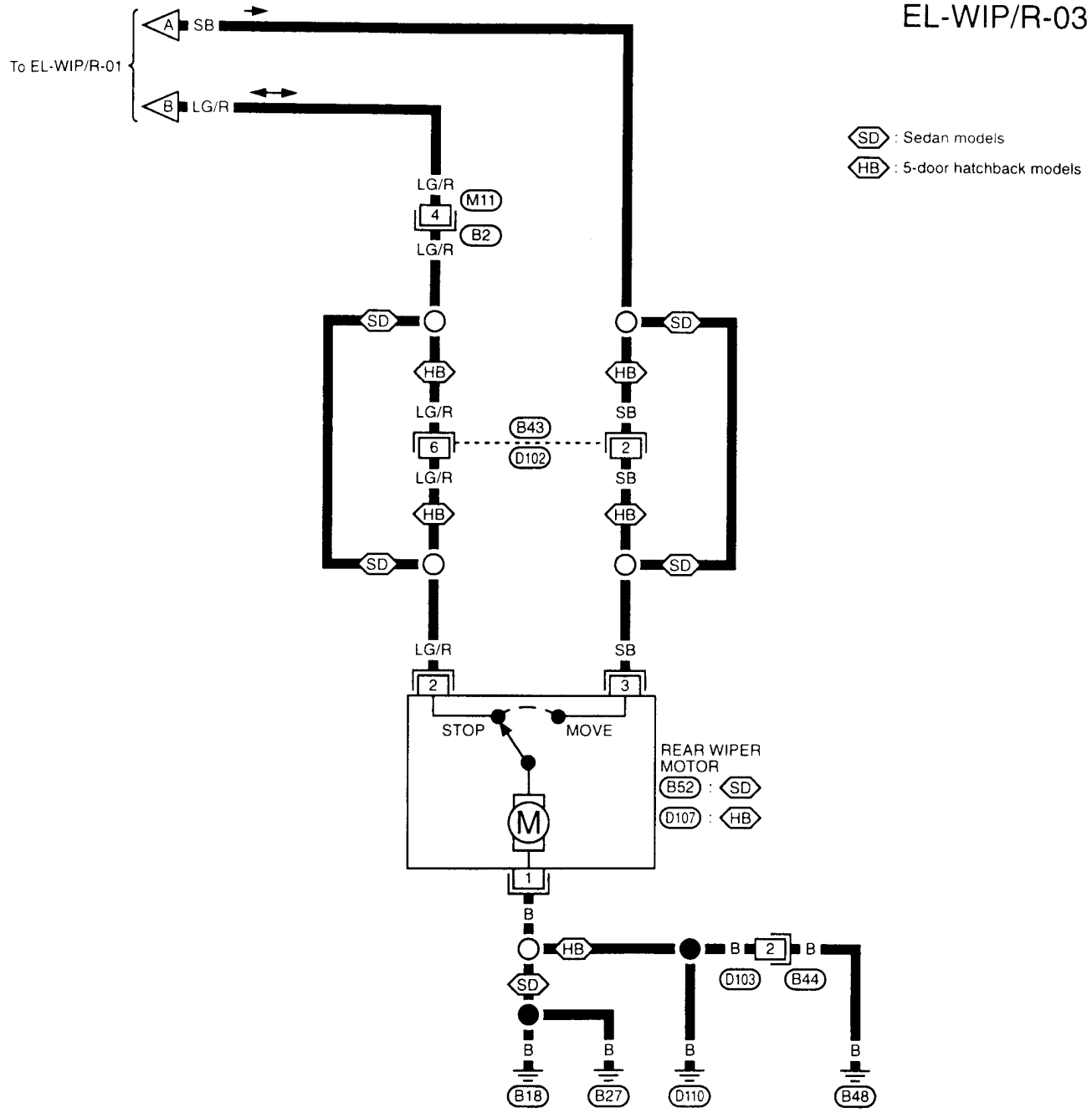


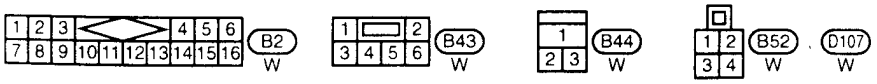
YEL723

Rear Wiper and Washer/Wiring Diagram — WIP/R — (Cont'd)

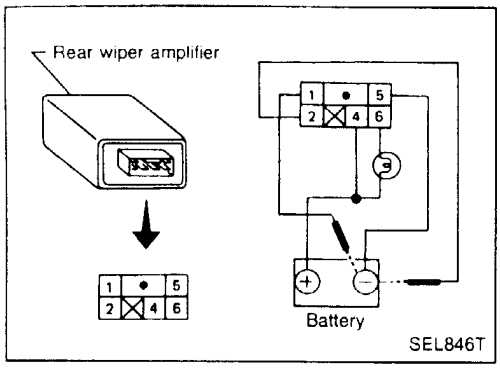
RHD MODELS

EL-WIP/R-03



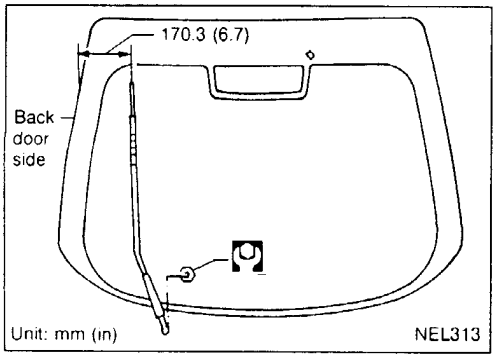


YEL724



Rear Wiper Amplifier Check

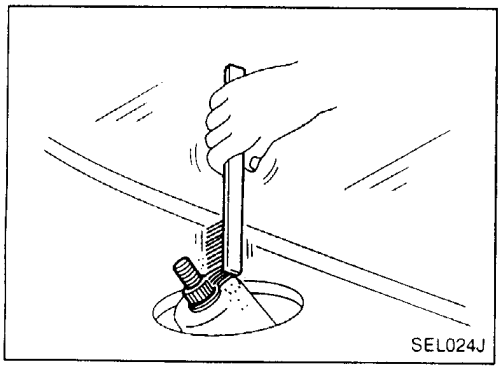
1. Connect as shown in the figure at left.
2. If test lamp illuminates when connected to terminal ① or ② and battery ground, wiper amplifier is normal.



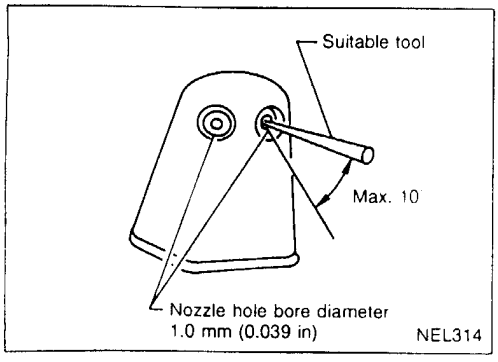
Rear Wiper Installation and Adjustment (5-door models)

1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it off (Auto Stop).
2. Lift the blade up and then set it down onto glass surface. Set the blade center before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it off.
4. Ensure that wiper blade stops in the correct position.

- Tighten windshield wiper arm nut to specified torque.
  : 13 - 18 N·m (1.3 - 1.8 kg-m, 9 - 13 ft-lb)



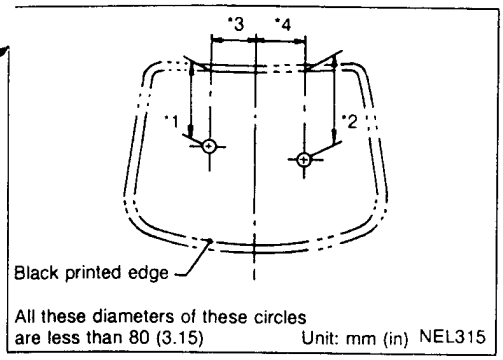
- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**



Rear Washer Nozzle Adjustment

- Adjust washer nozzle with suitable tool as shown in the figure at left.
  Adjustable range: ±10° (In any direction)

Rear Washer Nozzle Adjustment (Cont'd)



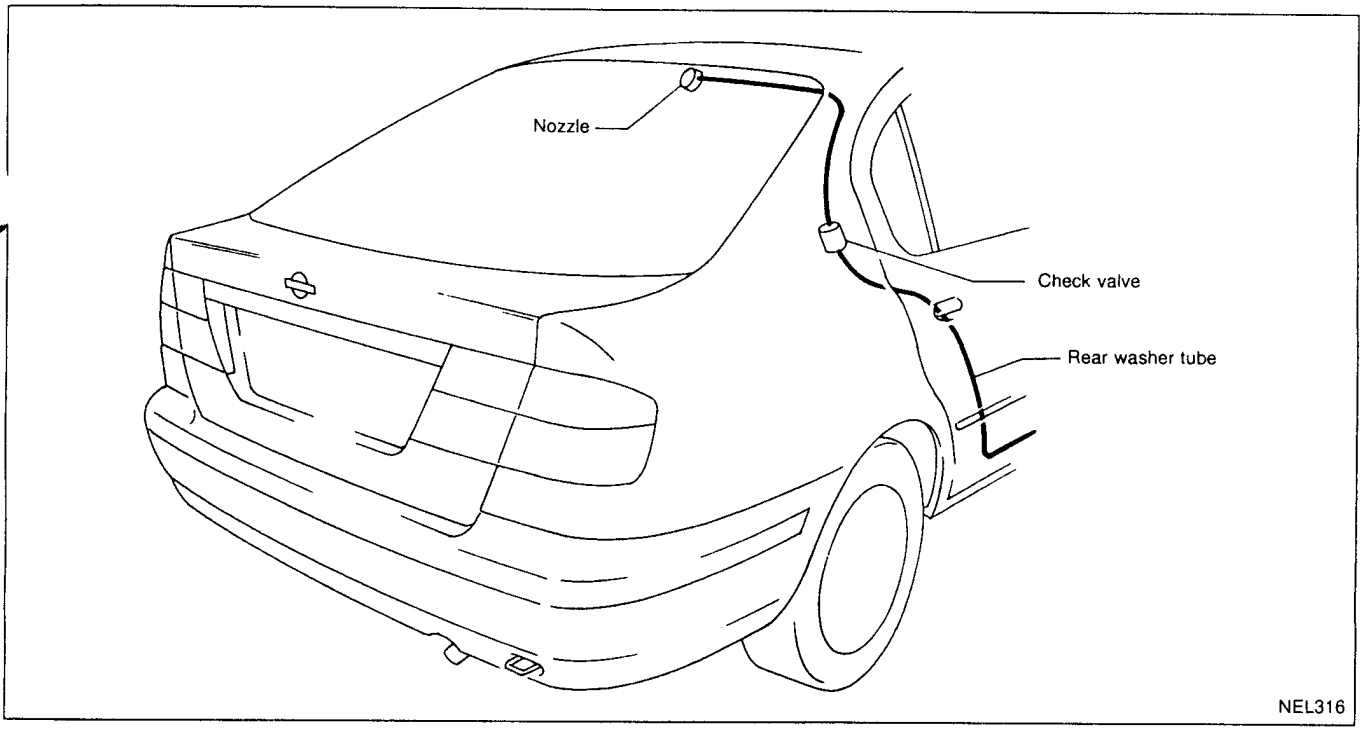
All these diameters of these circles are less than 80 (3.15) Unit: mm (in) NEL315

Unit: mm (in)

*1	150 (5.91)	*3	135 (5.31)
*2	290 (11.42)	*4	170 (6.69)

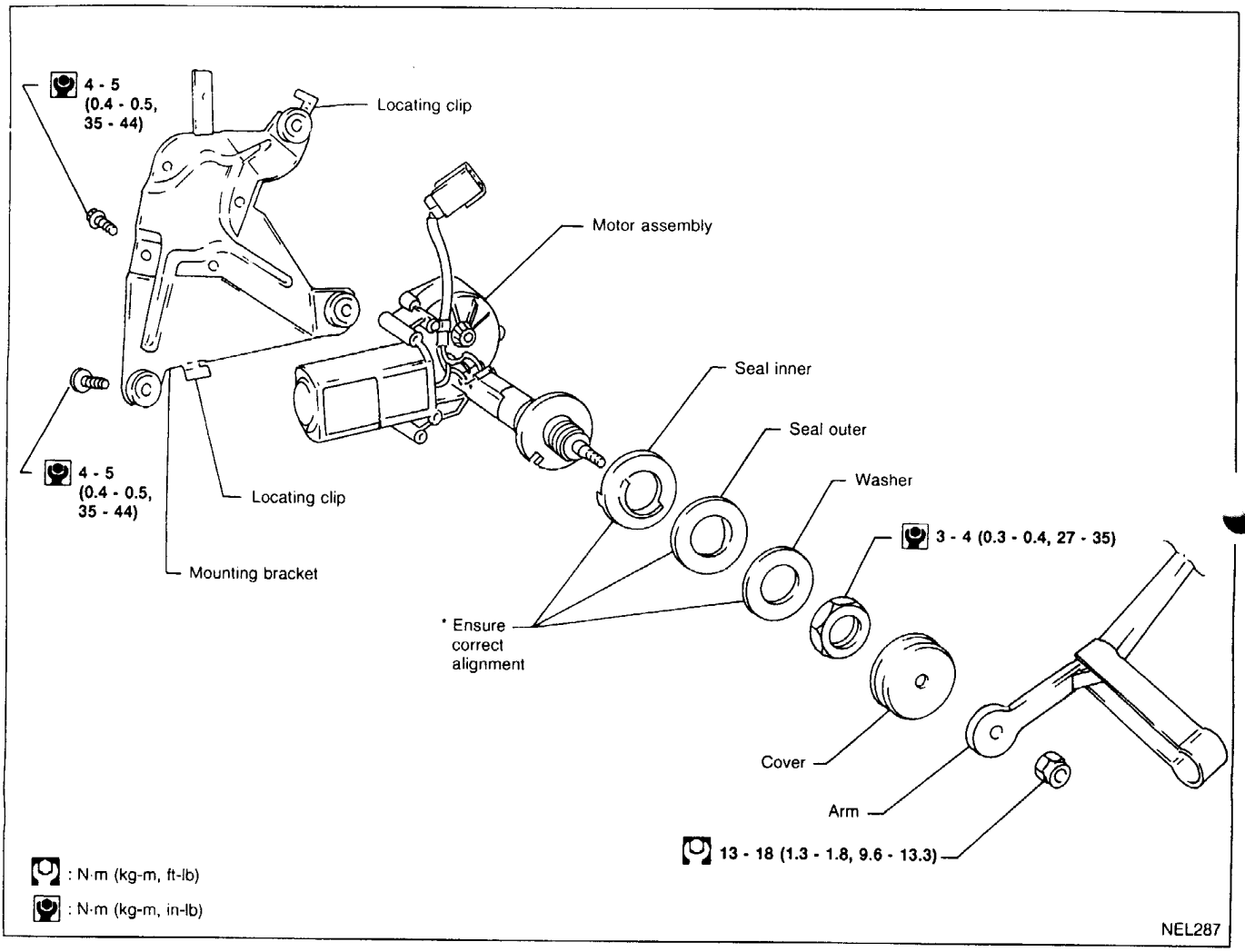
Circle diameters are approx. 80 mm (3.15 in)

Rear Washer Tube Layout (5-door models)



NEL316

Rear Wiper Motor (4-door models)

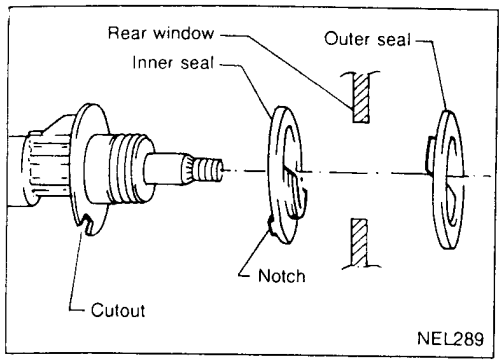


REMOVAL

1. Remove wiper arm.
2. Disconnect wiper motor harness.
3. Remove cover, nut, washer and outer seal.
4. Remove 3 bolts holding the wiper motor bracket to the parcel shelf.
5. Remove the bracket and wiper motor.

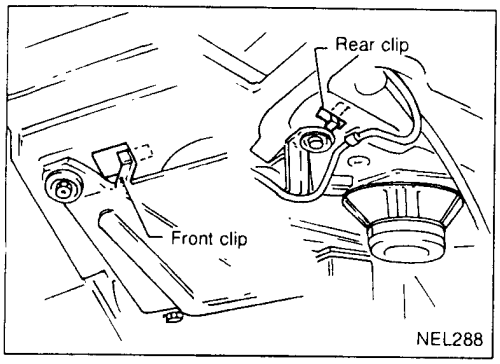
Rear Wiper Motor (4-door models) (Cont'd)

INSTALLATION

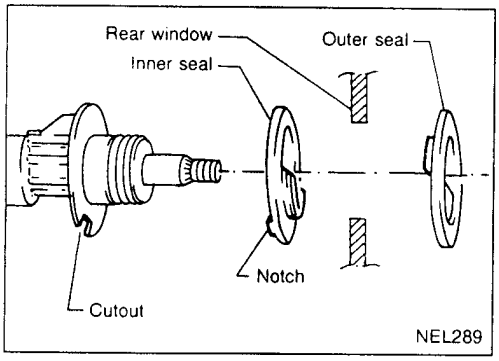


1. Fit wiper motor on the bracket.
2. Install the inner seal over the rear wiper shaft.

Be sure the notch of the inner seal is positioned in the cut-out of the rear wiper shaft.



3. Install the wiper motor bracket to the parcel shelf using the locating clips.
4. Check the alignment in the window.
5. Fit and tighten the bracket bolts.

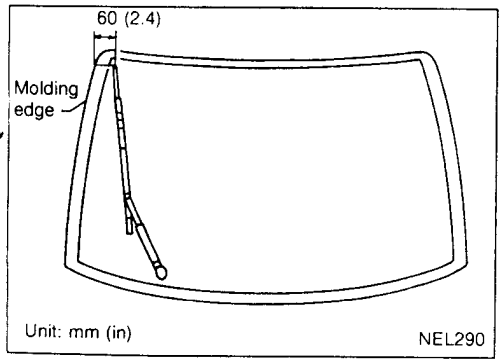


6. Install the outer seal.

Be sure the outer seal is positioned correctly on the inner seal.

7. Install washer, nut and cover.

Rear Wiper Installation and Adjustment (4-door models)

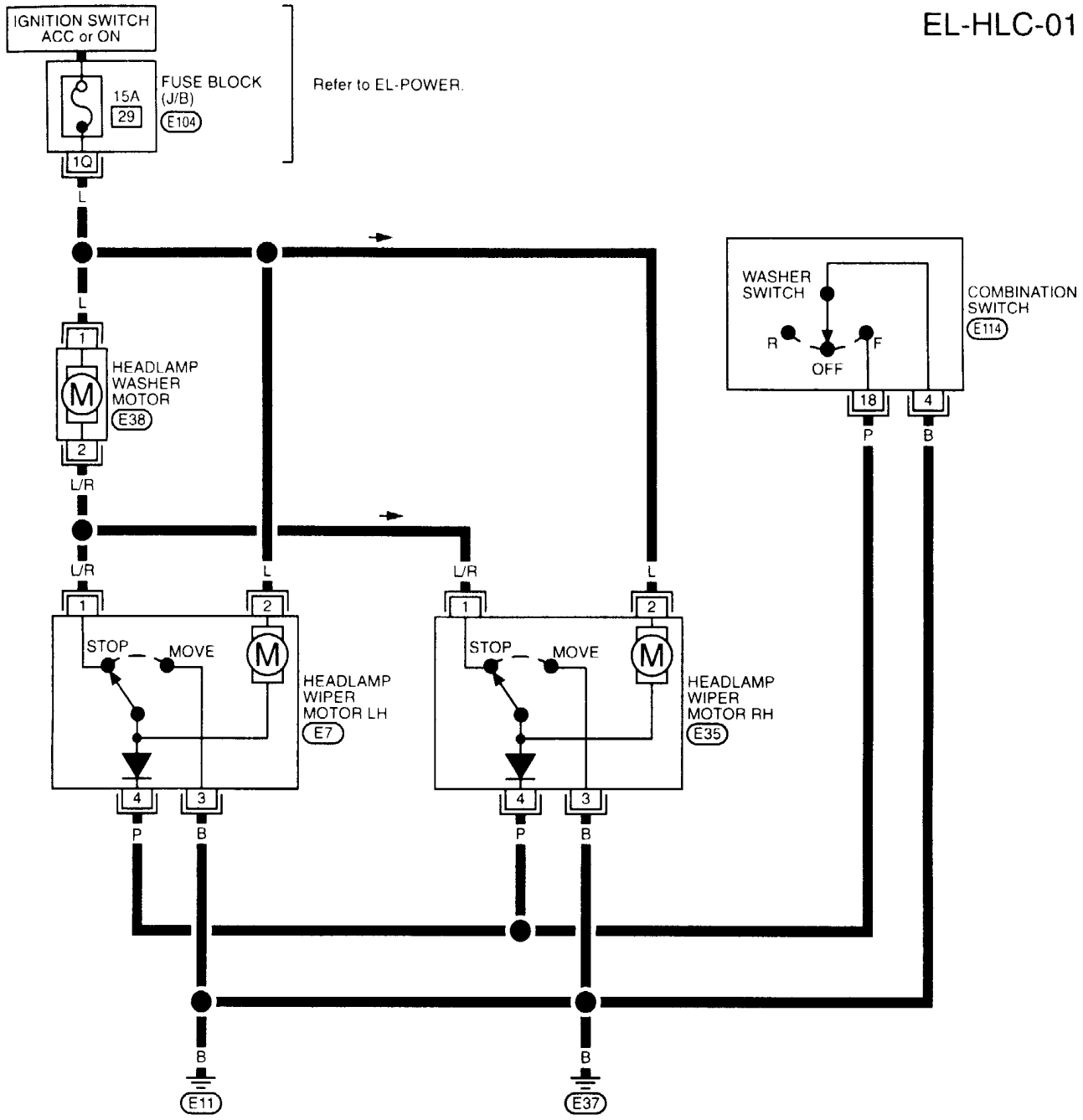


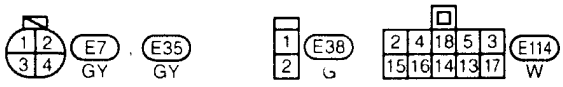
1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it off (Auto Stop).
2. Lift the blade up and then set it down onto the glass surface. Set the blade centre before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it off.
4. Ensure that the wiper blade stops in the correct position.

- Tighten windshield wiper arm nut to specified torque.
  : 13 - 18 N·m (1.3 - 1.8 kg-m, 9 -13 ft-lb)

Headlamp Wiper and Washer/Wiring Diagram — HLC —

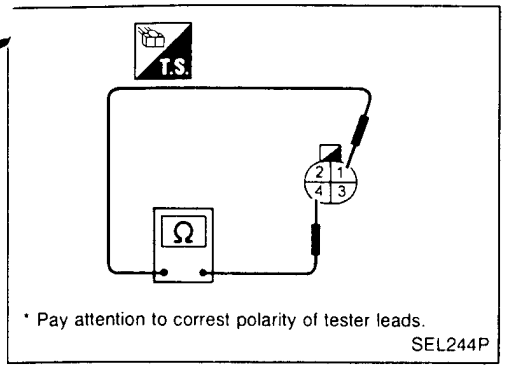
EL-HLC-01





Refer to last page (Foldout page).
E104

YEL727



* Pay attention to correst polarity of tester leads.
SEL244P

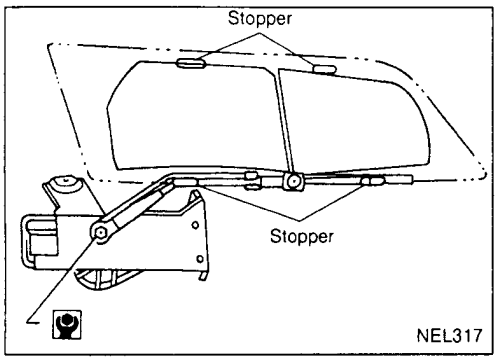
Headlamp Wiper Motor Check

When wiper motor is locked, a protective circuit built into wiper motor activates to stop wiper motor. If wiper motor will not restart even after cause of problems has been eliminated, turn ignition switch to "LOCK" position and leave it off for approx. 1 to 3 minutes.

1. Turn headlamp wiper switch to "OFF" position.
2. Connect ohmmeter and check continuity.

Headlamp wiper motor	Ohmmeter probe		Continuity
	(+)	(−)	
Stop position	①	④*	Yes
	①	②	Yes
	①	③	No

* Pay attention to correct polarity of tester leads.



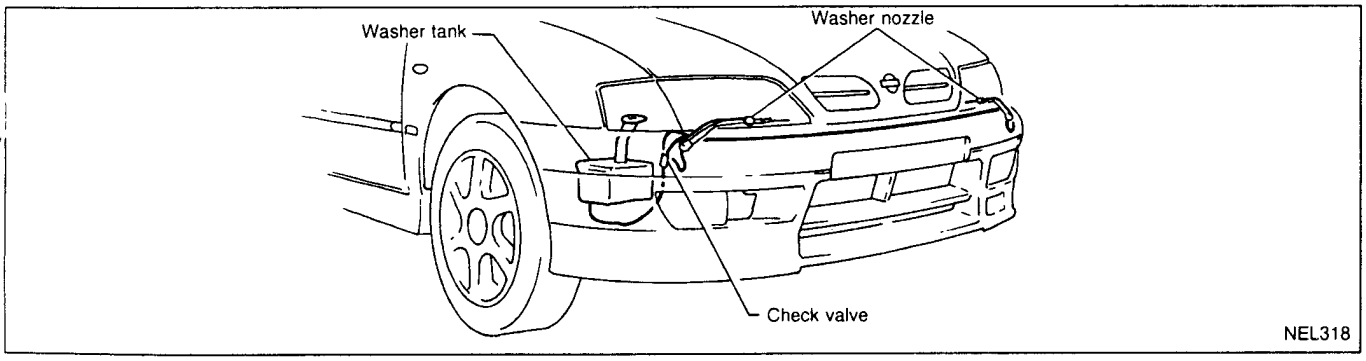
NEL317

Headlamp Wiper Installation

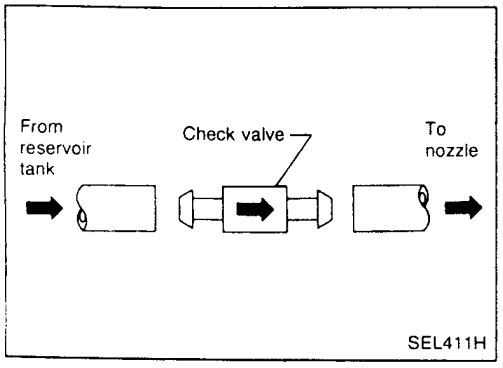
Tighten nut to secure wiper arm with wiper blade held below lower stopper.
After installing wiper arm, position wiper blade on stopper upper surface.

- Tighten headlamp wiper arm nut to the specified torque.
  : 2.5 - 3.9 N·m (0.26 - 0.40 kg-m, 22.1 - 34.5 in-lb)

Headlamp Washer Tube Layout



NEL318



SEL411H

Check Valve (For headlamp washer)

- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

System Description

Power is supplied at all times
- from 40A fusible link (Letter [f] (DE), [e] (CE), located in the fusible link and fuse box)
- to circuit breaker terminal ①
- through circuit breaker terminal ②
- to power window relay terminal ③.

With ignition switch in ON or START position, power is supplied
- through 7.5A fuse (No. [7] located in the fuse block)
- to power window relay terminal ①.

Ground is supplied to power window relay terminal ②
- through body grounds (B18) and (B27).

The power window relay is energized and power is supplied
- through power window relay terminal ⑤
- to power window main switch terminal ⑫,
- to passenger side power window sub-switch terminal ⑤,
- to rear power window sub-switch LH terminal ⑤,
- to rear power window sub-switch RH terminal ⑤.

MANUAL OPERATION

Driver's door

Ground is supplied
- to front power window main switch terminals ②
- through body grounds (B18) and (B27).

WINDOW UP
When a driver side switch in the power window main switch is pressed in the up position, power is supplied
- to driver side power window regulator terminal ①
- through power window main switch terminal ③.

Ground is supplied
- to driver side power window regulator terminal ②
- through power window main switch terminal ④.

Then, the motor raises the window until the switch is released.

WINDOW DOWN
When a driver side switch in the power window main switch is pressed in the down position, power is supplied
- to driver side power window regulator terminal ②
- through power window main switch terminal ④.

Ground is supplied
- to driver side power window regulator terminal ①
- through power window main switch terminal ③.

Then, the motor lowers the window until the switch is released.

Except driver's door

Ground is supplied
- to power window main switch terminal ②
- through body grounds (B18) and (B27).

PASSENGER'S DOOR

NOTE:

Figures in parentheses ( ) refer to terminal Nos. arranged in order when the UP or DOWN section of power window switch is pressed.

Operation by main switch.

Power is supplied

- through power window main switch (⑥, ⑩)
- to passenger side power window sub-switch (③, ①).

The subsequent operations are the same as those outlined under "Operation by sub-switches".

Operation by sub-switches.

Power is supplied

- through passenger side power window sub-switch (②, ④)
- to passenger side power window regulator (①, ②).

Ground is supplied

- to passenger side power window regulator (②, ①)
- through passenger side power window sub-switch (②, ④)
- to passenger side power window sub-switch (①, ③)
- through power window main switch (⑥, ⑩).

Then, the motor raises or lowers the window until the switch is released.

REAR DOOR LH

NOTE:

Figures in parentheses ( ) refer to terminal Nos. arranged in order when the UP or DOWN section of power window switch is pressed.

Operation by main switch.

Power is supplied

- through power window main switch (⑬, ⑭)
- to rear power window sub-switch LH (③, ①).

The subsequent operations are the same as those outlined under "Operation by sub-switches".

Operation by sub-switches.

Power is supplied

- through rear power window sub-switch LH (②, ④)
- to rear power window regulator LH (①, ②).

Ground is supplied

- to rear power window regulator LH (②, ①)
- through rear power window sub-switch LH (④, ②)
- to rear power window sub-switch LH (①, ③)
- through power window main switch LH (⑭, ⑬).

Then, the motor raises or lowers the window until the switch is released.

REAR DOOR RH

NOTE:

Figures in parentheses ( ) refer to terminal Nos. arranged in order when the UP or DOWN section of power window switch is pressed.

Operation by main switch.

Power is supplied

- through power window main switch (⑮, ⑯)
- to rear power window sub-switch RH (③, ①).

The subsequent operations are the same as those outlined under "Operation by sub-switches".

Operation by sub-switches.

Power is supplied

- through rear power window sub-switch RH (②, ④)
- to rear power window regulator RH (①, ②).

Ground is supplied

- to rear power window regulator RH (②, ①)
- through rear power window sub-switch RH (④, ②)
- to rear power window sub-switch RH (①, ③)
- through power window main switch (⑯, ⑮)

Then, the motor raises or lowers the window until the switch is released.

AUTO OPERATION

The power window AUTO feature enables the driver to open or close the driver's window without holding the window switch in the respective position.

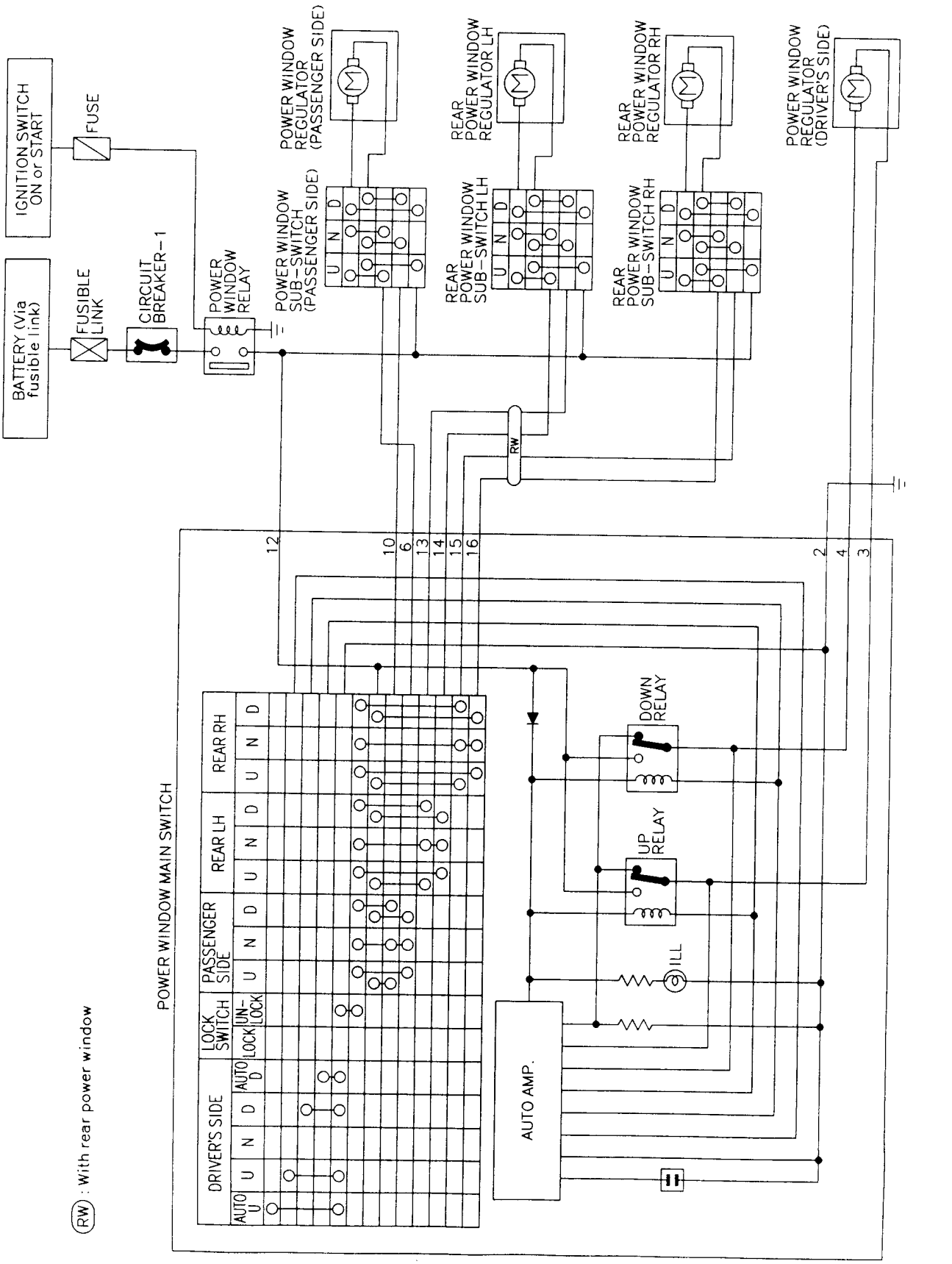
When the AUTO switch in the main switch is pressed and released, the driver's window will travel to the fully open or closed position.

POWER WINDOW LOCK

The power window lock is designed to lock-out window operation to all windows except the driver's door window.

When the lock switch is pressed to lock position, ground of the passenger side switch, rear RH switch and rear LH switch in the power window main switch is disconnected. This prevents the power window motors from operating.

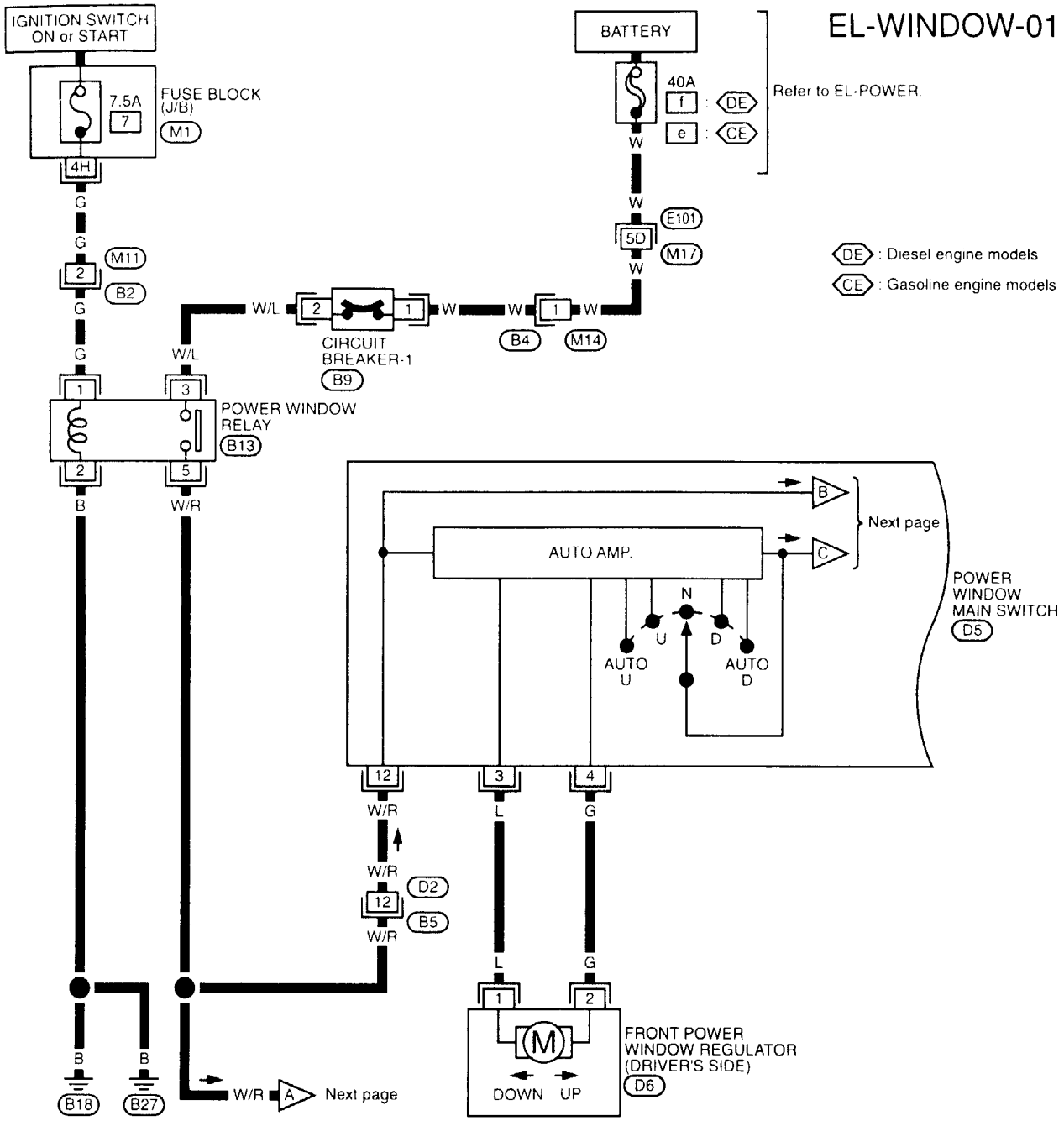
Schematic

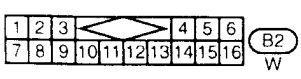


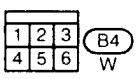
(RW) : With rear power window

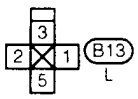
YEL751

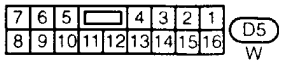
Wiring Diagram — WINDOW —

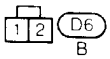










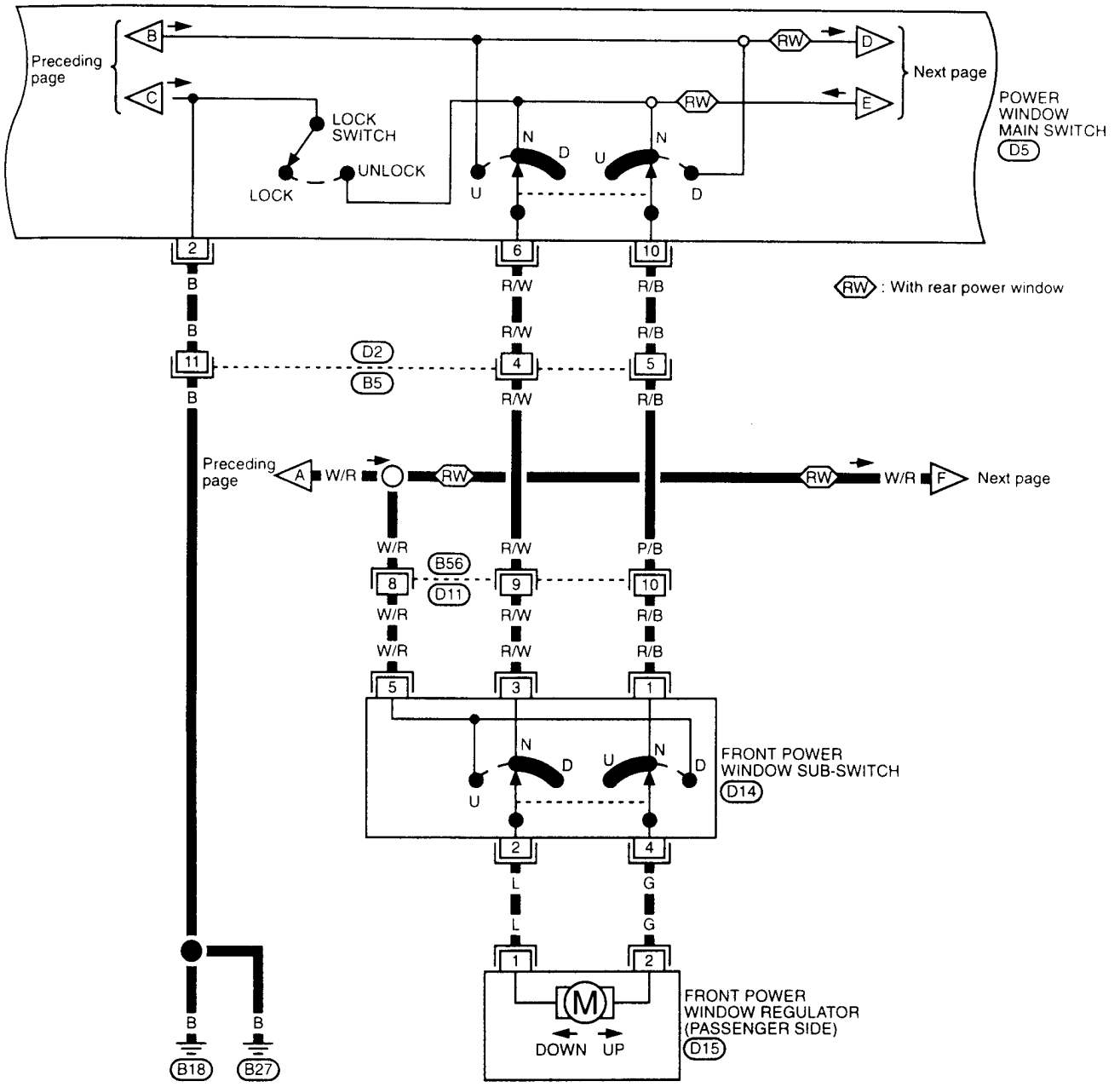


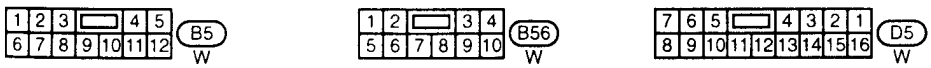
Refer to last page (Foldout page).
M17 , E101
M1

YEL748

Wiring Diagram — WINDOW — (Cont'd)

EL-WINDOW-02

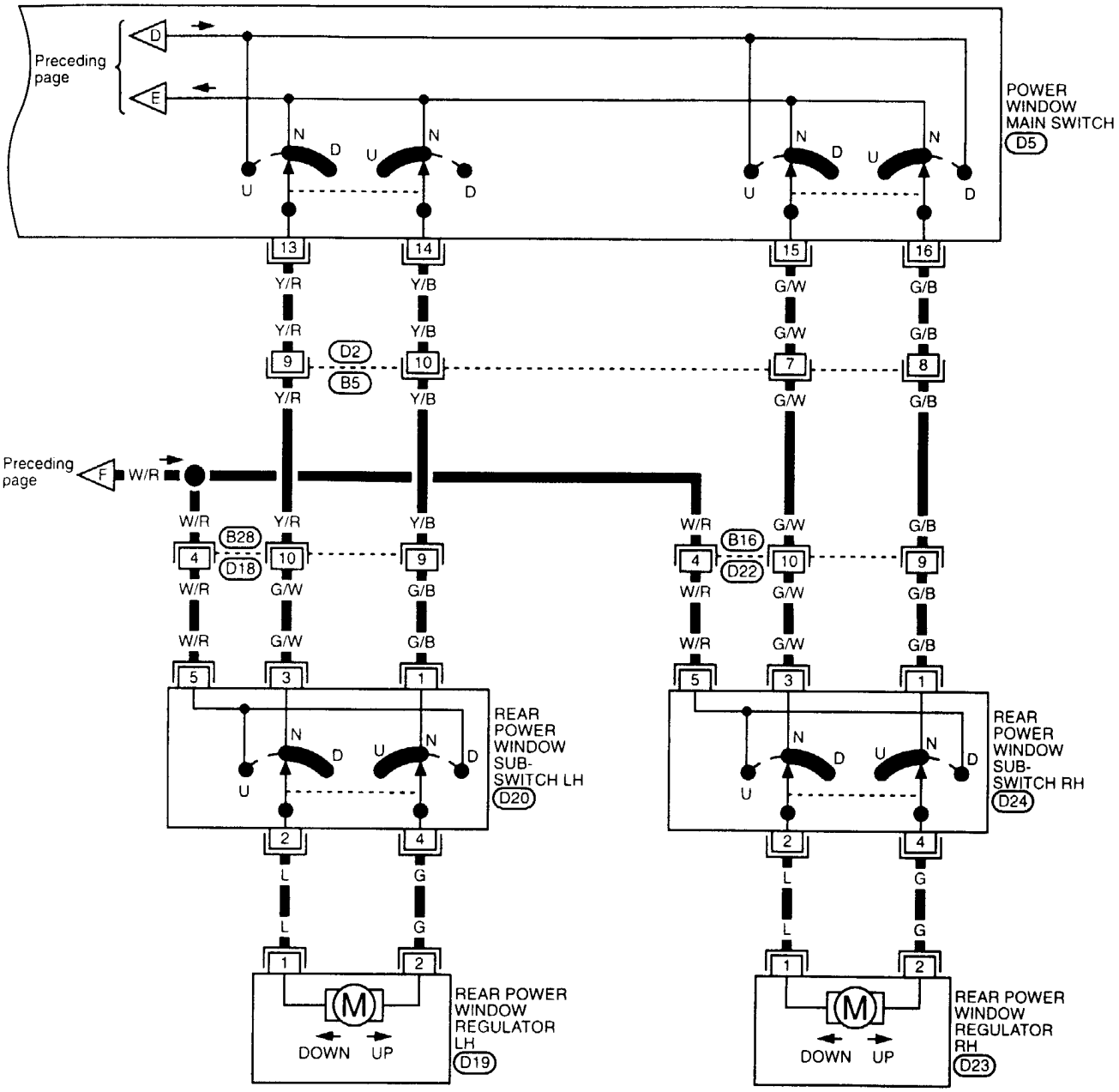


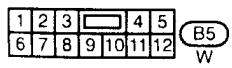


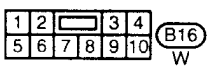
YEL749

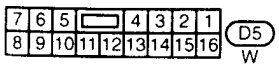
Wiring Diagram — WINDOW — (Cont'd)

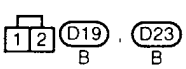
EL-WINDOW-03









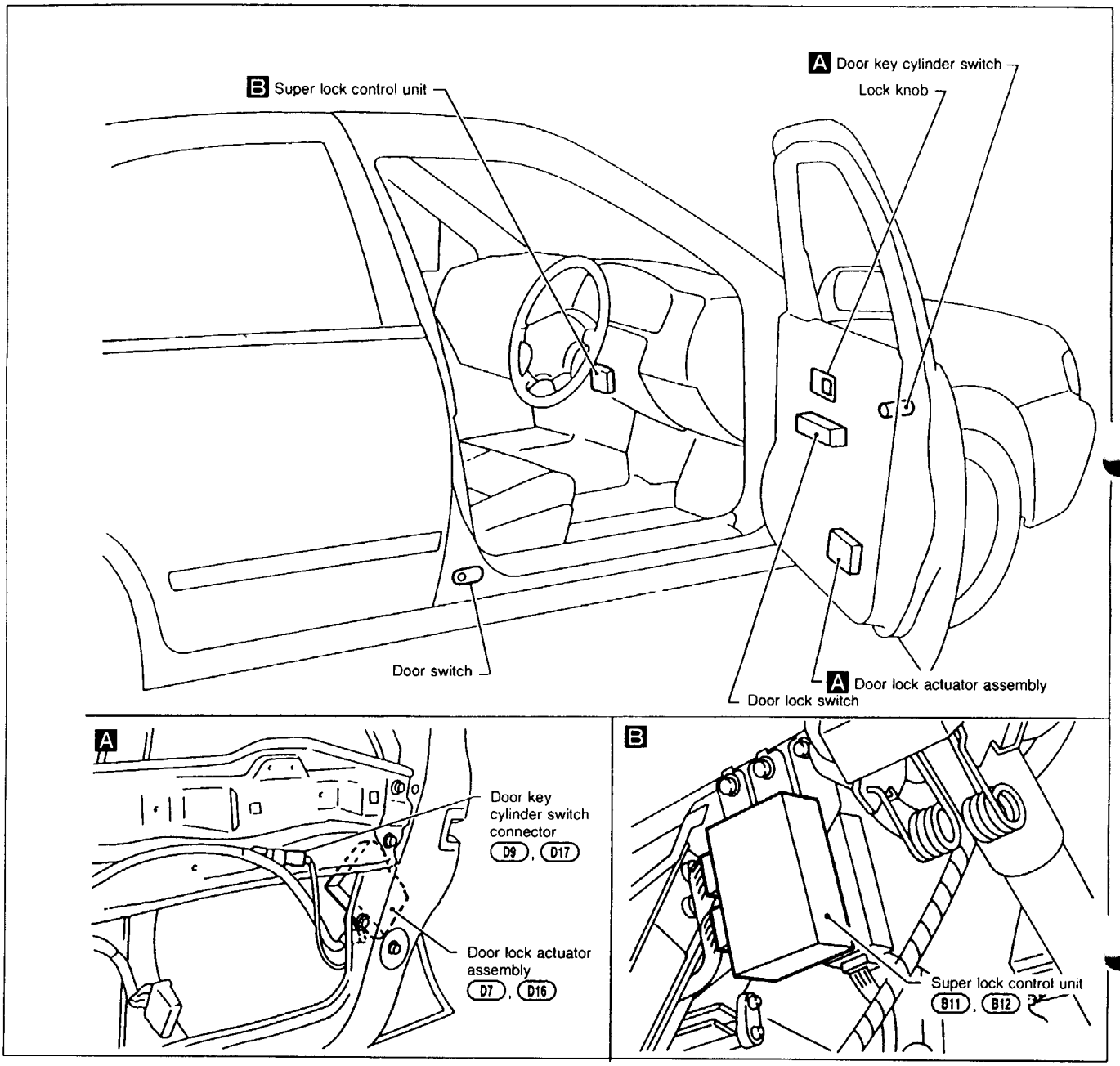


YEL750

Trouble Diagnoses

<table>
<tr><th>Symptom</th><th>Possible cause</th><th>Repair order</th></tr>
<tr><td>None of the power windows can be operated using any switch.</td><td>1. 7.5A fuse, 40A fusible link and (B9) circuit breaker.
2. Grounds (B18) and (B27).
3. Power window relay.
4. Open/short in power window main switch circuit.</td><td>1. Check 7.5A fuse (No. [7], located in fuse block [J/B]), 40A fusible link (letter DE: [f], CE: [e], located in fuse and fusible link box) and (B9) circuit breaker. Turn ignition switch to "ON" position and verify battery positive voltage is present at terminal ⑫ of power window main switch, and other switches as follows.
<table>
<tr><th>Location of sub-switch</th><th>Terminals</th></tr>
<tr><td>Passenger</td><td>⑤</td></tr>
<tr><td>Rear RH</td><td>⑤</td></tr>
<tr><td>Rear LH</td><td>⑤</td></tr>
</table>
2. Check grounds (B18) and (B27).
3. Check power window relay.
4. Check W/R wire between power window relay and power window main switch for open/short circuit.</td></tr>
<tr><td>Driver's side power window cannot be operated but other windows can be operated.</td><td>1. Driver's side power window regulator circuit.
2. Driver's side power window regulator.</td><td>1. Check driver's side power window regulator circuit
2. Check driver's side power window regulator</td></tr>
<tr><td>One or more passenger power windows cannot be operated.</td><td>1. Power window switches (front sub-switch, rear sub-switch RH, rear sub-switch LH).
2. Power window regulators. (Passenger side, rear LH, rear LH.)
3. Power window main switch.
4. Power window circuit.</td><td>1. Check power window switches (front sub-switch, rear sub-switch RH, rear sub-switch LH)
2. Check power window regulators (front sub-switch, rear sub-switch RH, rear sub-switch LH)
3. Check power window main switch
4-1. Check harnesses between power window main switch and power window sub-switches for open/short circuit.
4-2. Check harnesses between power window sub-switches and power window regulators for open/short circuit.</td></tr>
<tr><td>One or more passenger power windows cannot be operated using power window main switch but can be operated by power window sub-switches.</td><td>1. Power window main switch.</td><td>1. Check power window main switch.</td></tr>
<tr><td>Driver's side power window auto function cannot be operated using power window main switch.</td><td>1. Power window main switch.</td><td>1. Check power window main switch.</td></tr>
</table>

Component Parts Location



YEL009A

Nissan Motor Danmark A/S

Egeskovvej 16
DK-3490 Kvistgård
Tlf. 49 13 93 11
Fax 49 13 98 06

Cirkulære

Art:	Fra:		
Servicecirkulære	Serviceafdelingen		
	Ref.: IK/jrn	Dato: 10.10.96	Nr.: Gr.12 Nr.49

NISSAN PRIMERA model P11 og TERRANO II model R20

KODNING AF FJERNBETJENINGER

Vedlagt fremsendes diagram over kodning af fjernbetjeninger på ovennævnte modeller.

Når kodning af fjernbetjening er nødvendig:

* Efter udskiftning af én af fjernbetjeningerne
* Efter udskiftning eller reparation af centrallåsesystem
* Hvis ekstra fjernbetjening skal kodes

Skulle I have spørgsmål til vedlagte diagram, er I velkommen til at kontakte undertegnede.

Med venlig hilsen
NISSAN MOTOR DANMARK A/S

Ib Kaas
Teknisk konsulent

Vedl. Diagram

Forberedelse

* Sørg for at alle fjernbetjeninger, som skal omkodes, er tilstede
* Sørg for at batterierne i alle fjernbetjeninger er i orden
* Sørg for at alle former for andre sendere er uden for rækkevidde af bilen
* Sørg for at bilens batteri er i orden

Drej tændingsnøglen nøjagtigt 6 gange fra "LOCK" til "ON" position inden for 10 sekunder og sæt nøglen i "LOCK" positionen (nøglen skal blive i låsen)

Efter 2 sekunder er registration mode aktiveret. Blinklys indikator vil blinke 2 gange

NG

OK

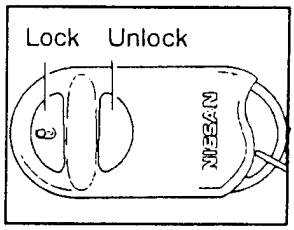
Fortsæt med registration mode

Bemærk:
* tændingen står i "ON" position

Reg.mode er forladt, når:
* 4 fjernbetjeninger er kodet
* ingen fjernbetjening eller tændingsdata er modtaget inden 120 sekunder

Registration mode

Tryk og hold "UNLOCK" knappen (sort) på nøgleemnet



Tryk på "LOCK" knappen (rød) 3 gange

Slip "UNLOCK" knappen (sort)

Hvis fjernbetjeningen er kodet korrekt, vil indikatoren blinke én gang

NG

OK

Skal der kodes flere fjernbetjeninger (max. 4 stk ialt)

Nej

Ja

Efter kodning af fjernbetjeningen bekræftes ID-koden ved at dreje nøglen til "ON" positionen

Hvis kodningen er korrekt udført, vil indikatoren blinke 2 gange

OK

NG

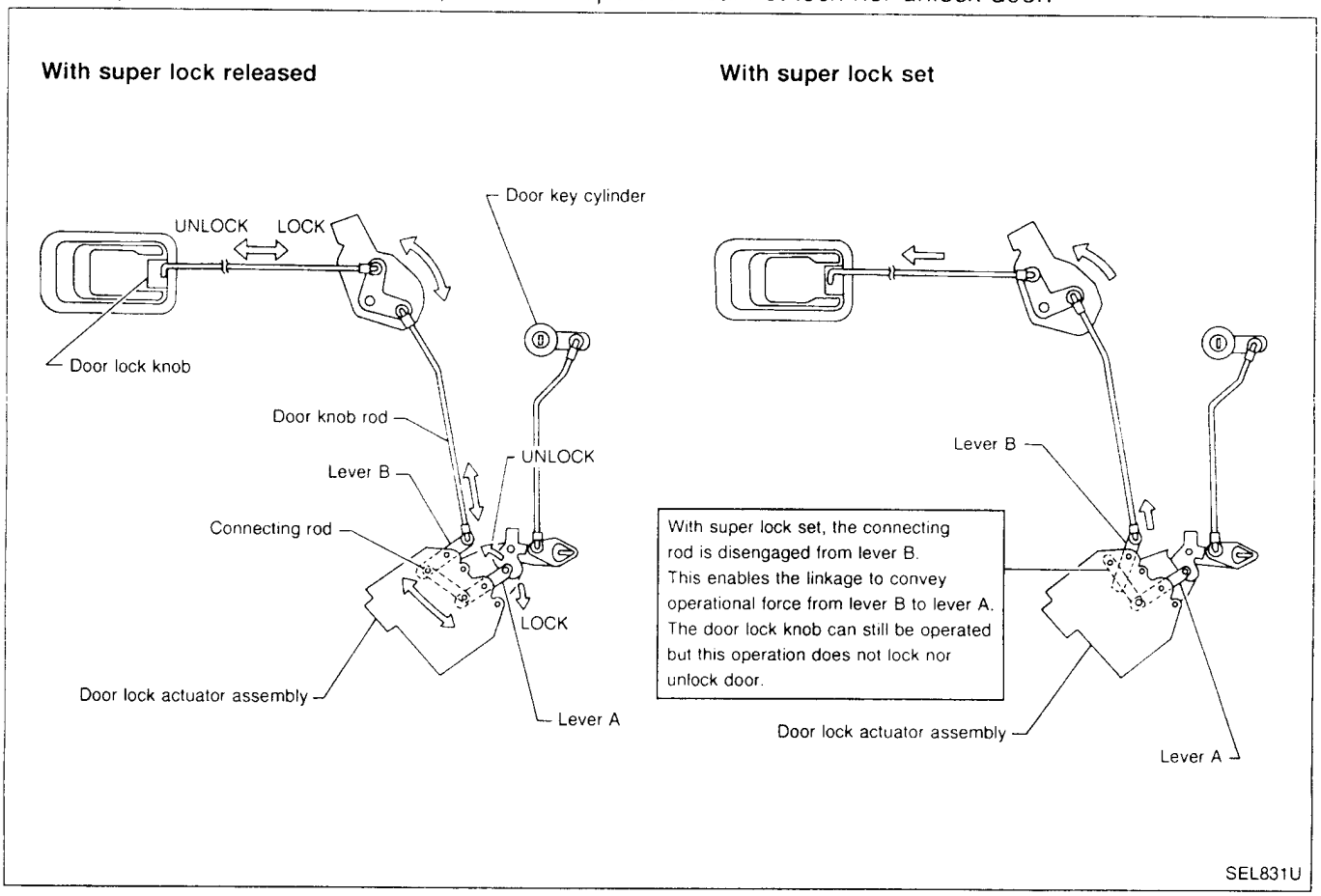
Tag nøglen ud af tændingnen og bekræft registreringen af alle fjernbetjeninger ved at slukke og tænde vognen med hver fjernebetjening

SLUT

System Description

OUTLINE

Power door lock system with super lock and key reminder is controled by super lock control unit. Super lock has a higher anti-theft performance than conventional power door lock systems.
When super lock is in released condition, lock knob operation locks or unlocks door.
When super lock is in set condition; lock knob operation cannot lock nor unlock door.



OPERATION

Power door lock/unlock and super lock set/release operation by door key cylinder

- With the key inserted into door key cylinder on driver or passenger door, turning it to LOCK will lock all doors and set super lock while all doors are closed or one or more door is open.
- With the key inserted into door key cylinder on driver or passenger door, turning it to UNLOCK will unlock all doors and release super lock.

Power door lock and super lock release operation (by NATS IMMU signal)

- With the key inserted in ignition key cylinder and turning it to ON for about 5 - 6 sec. will unlock all doors and release super lock.

Power door lock/unlock operation by lock knob

- With lock knob on driver or passenger door setting to LOCK while all doors are closed will lock all doors. **When one or more door is opened, with lock knob on passenger door setting to LOCK will lock passenger door only. (Power door lock system will not operate.)**
- With lock knob on driver or passenger door setting to UNLOCK while all doors are closed will unlock all doors.

Lock knob operation cannot control super lock.

System Description (Cont'd)

Key reminder system

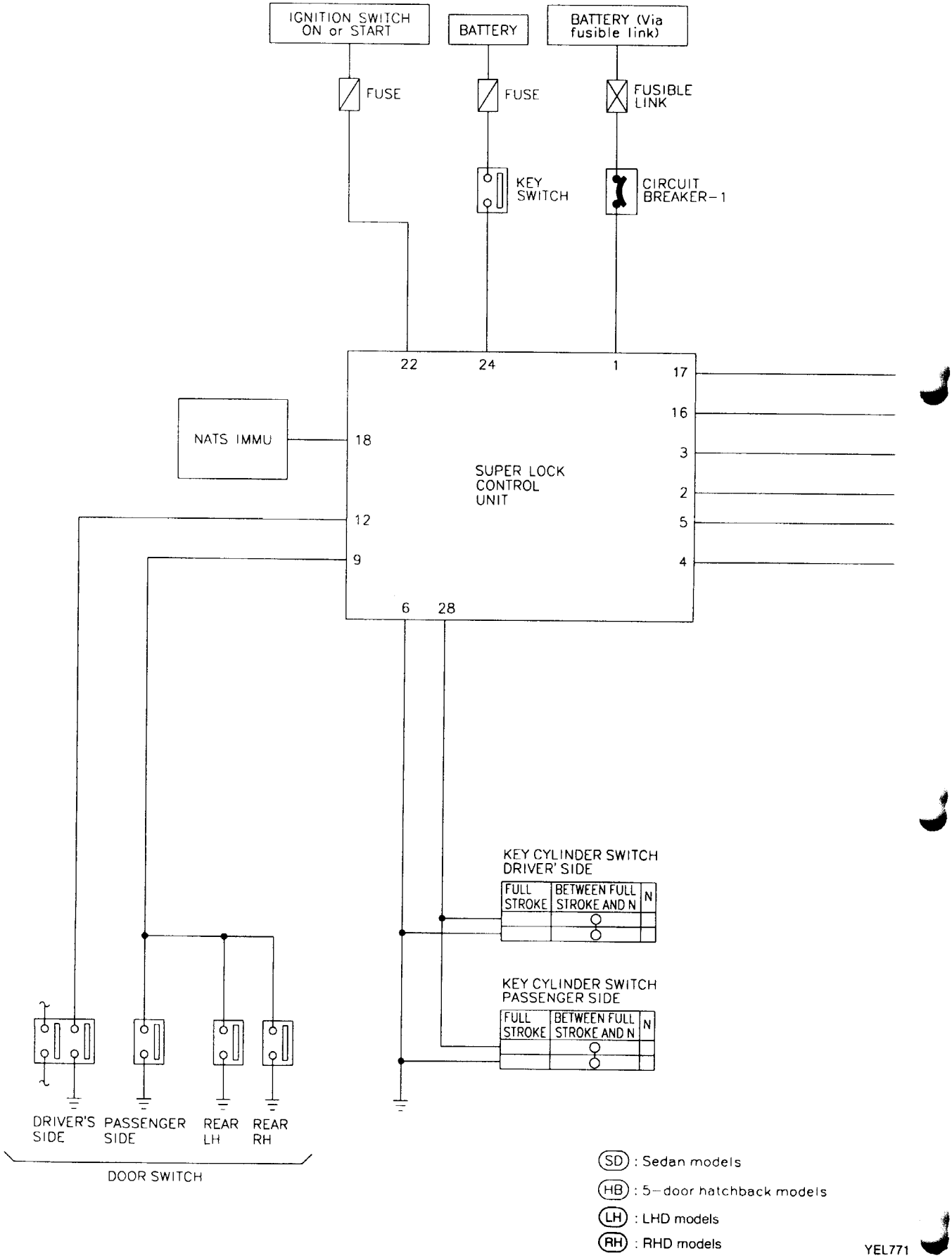
- If the ignition key is in the ignition key cylinder and any door is open, setting the lock & unlock switch and lock knob on driver door to "LOCK" locks the door once but then immediately unlocks it.

System initialisation

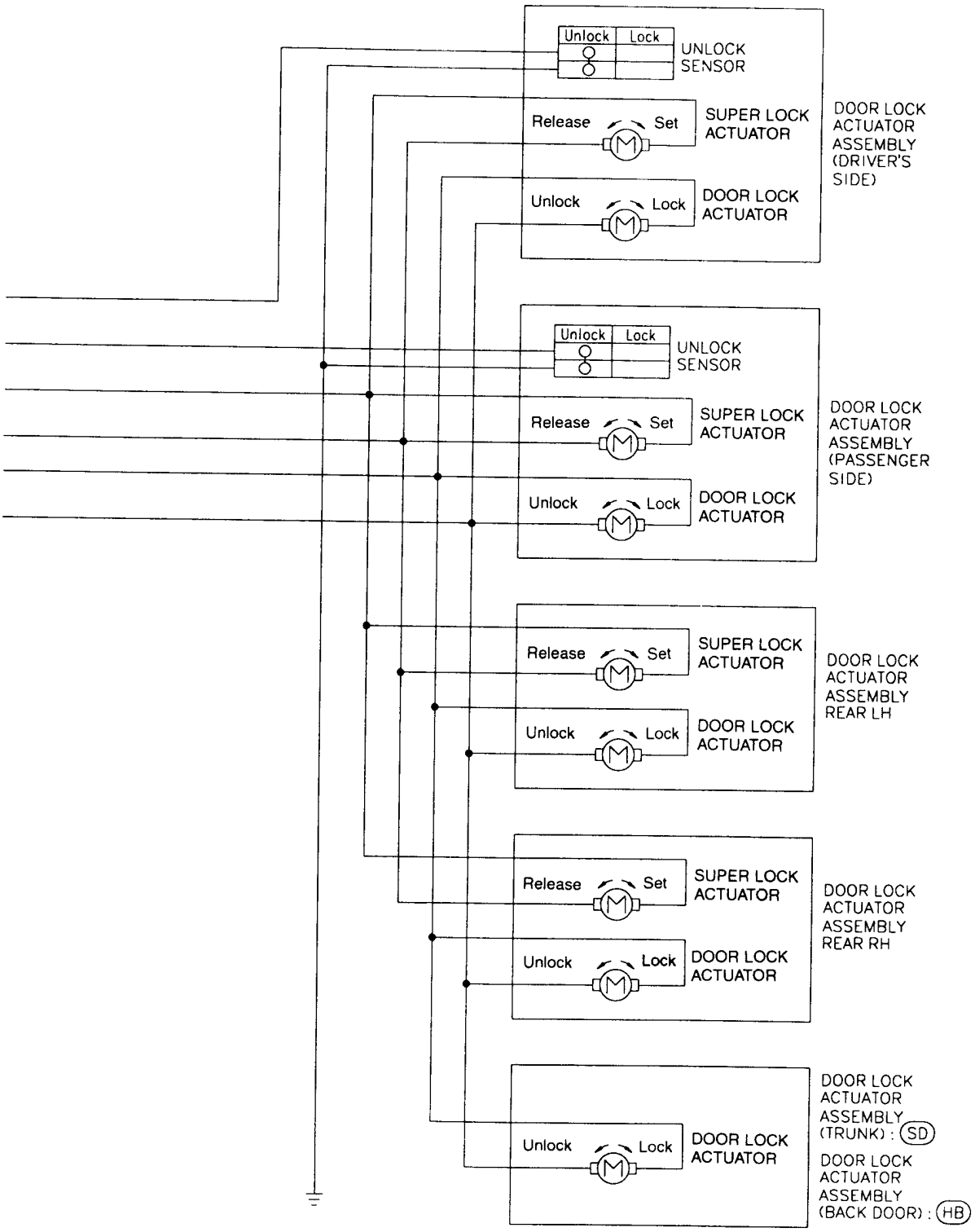
- System initialisation is required when battery cables are reconnected. Conduct one of the following;
  — insert the key into ignition key cylinder and turn it to ON.
  — LOCK/UNLOCK operation using door key cylinder.

Note

Schematic

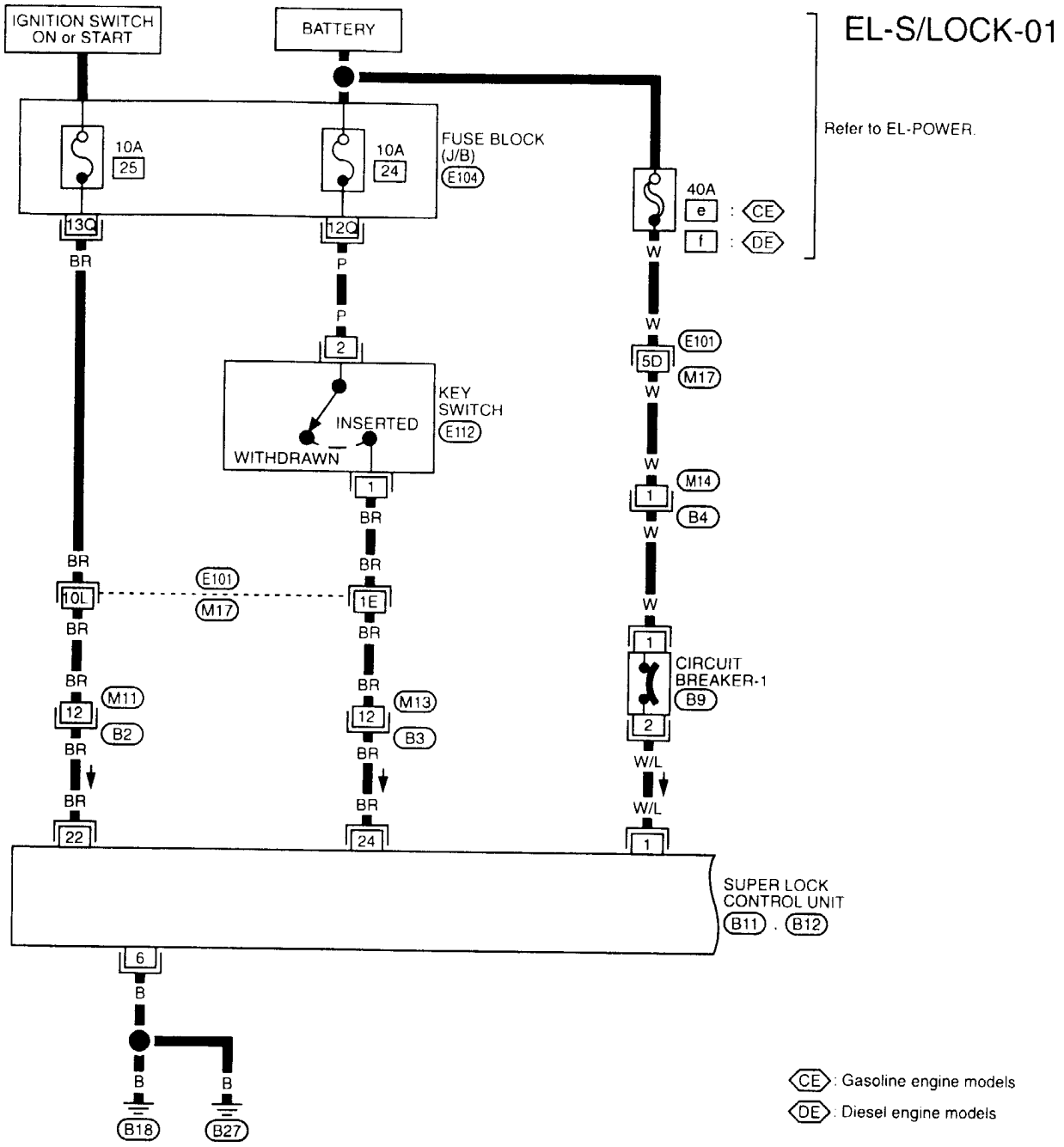

IGNITION SWITCH ON or START
BATTERY
BATTERY (Via fusible link)
FUSE
FUSE
FUSIBLE LINK
KEY SWITCH
CIRCUIT BREAKER–1
22
24
1
17
16
3
2
5
4
NATS IMMU
18
SUPER LOCK CONTROL UNIT
12
9
6
28
KEY CYLINDER SWITCH DRIVER' SIDE
FULL STROKE
BETWEEN FULL STROKE AND N
N
KEY CYLINDER SWITCH PASSENGER SIDE
FULL STROKE
BETWEEN FULL STROKE AND N
N
DRIVER'S SIDE
PASSENGER SIDE
REAR LH
REAR RH
DOOR SWITCH
(SD) : Sedan models
(HB) : 5–door hatchback models
(LH) : LHD models
(RH) : RHD models
YEL771

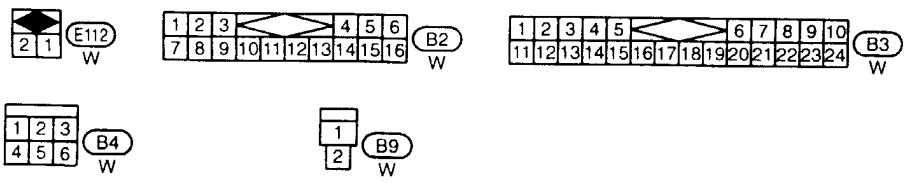
Schematic (Cont'd)



YEL772

Wiring Diagram — S/LOCK —



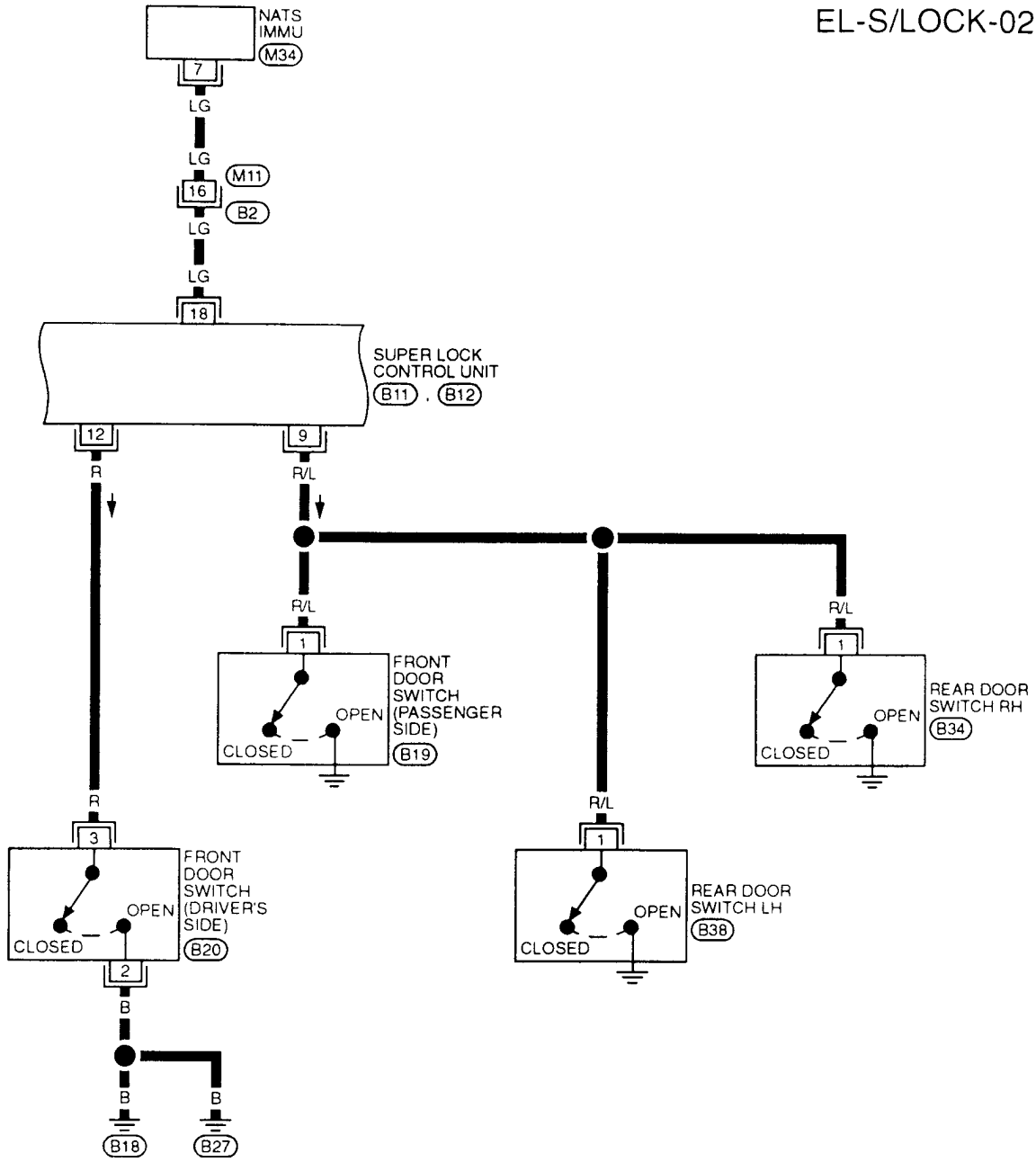


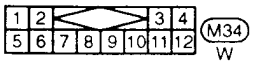
Refer to last page (Foldout page).
M17 , E101
E104
B11
B12

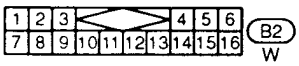
YEL764

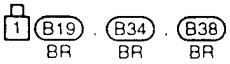
Wiring Diagram — S/LOCK — (Cont'd)

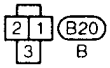
EL-S/LOCK-02











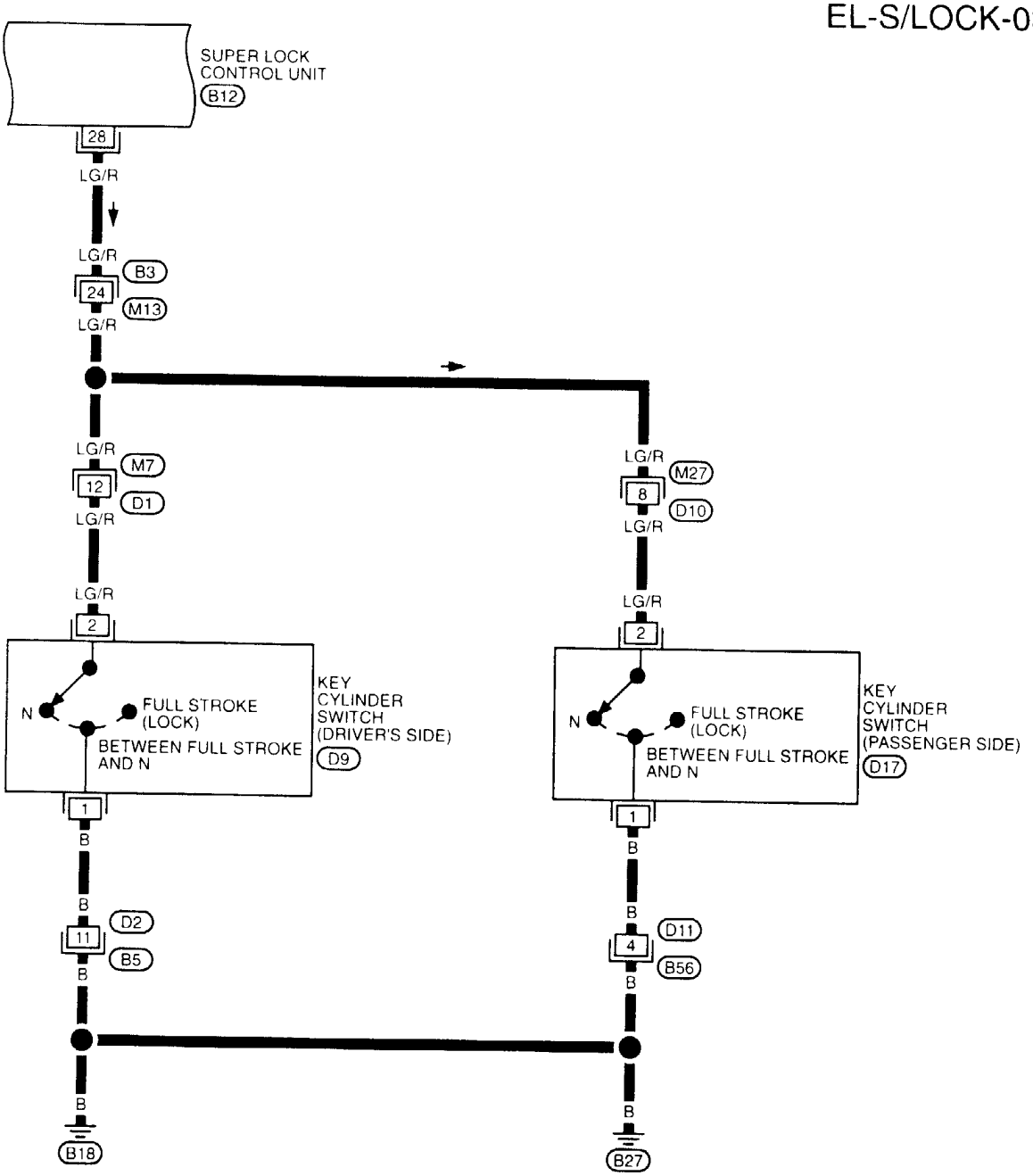
Refer to last page (Foldout page)

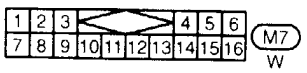
B11

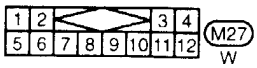
B12

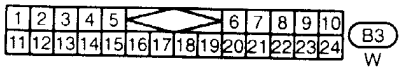
YEL765

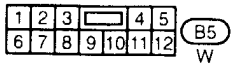
EL-S/LOCK-03

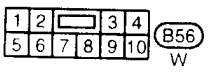


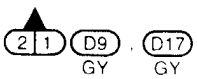










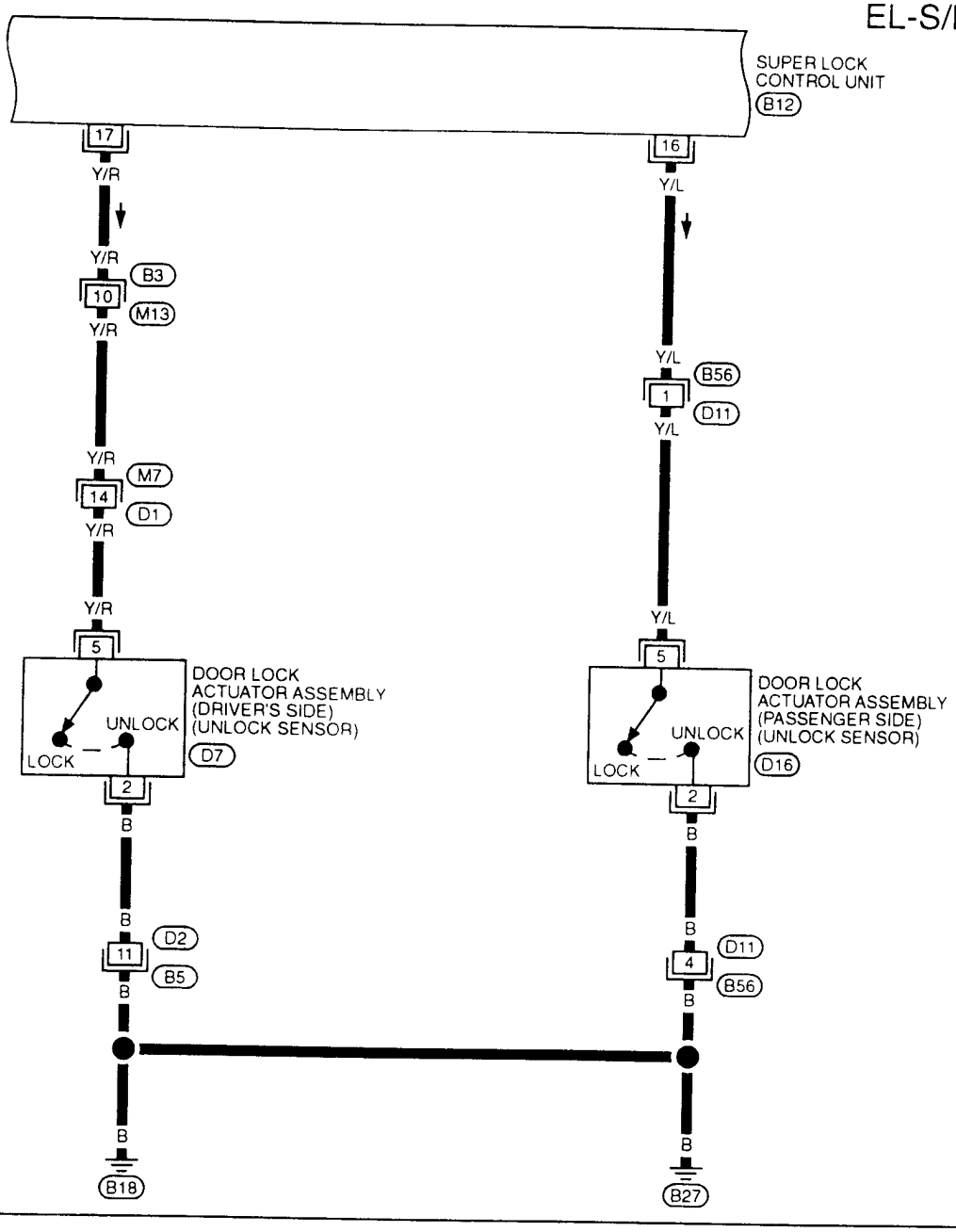


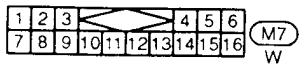
Refer to last page (Foldout page).
(B12)

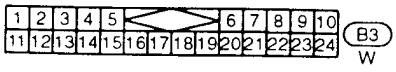
YEL766

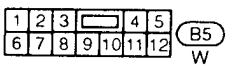
Wiring Diagram — S/LOCK — (Cont'd)

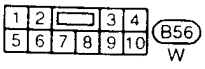
EL-S/LOCK-04

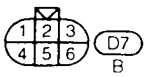


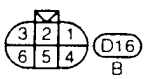












Refer to last page (Foldout page)
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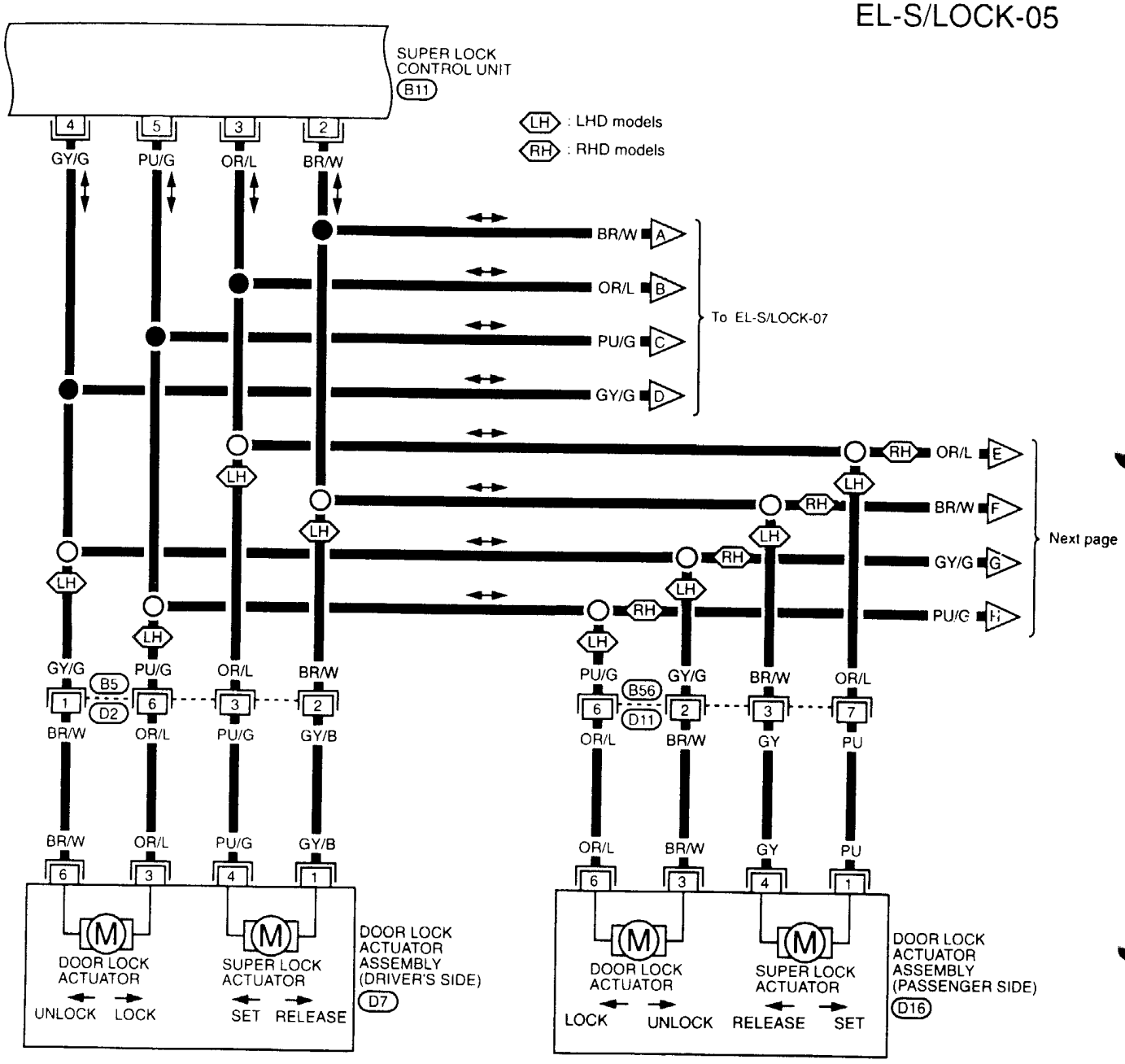
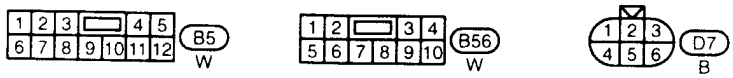
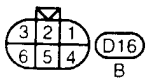
YEL767

Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-05







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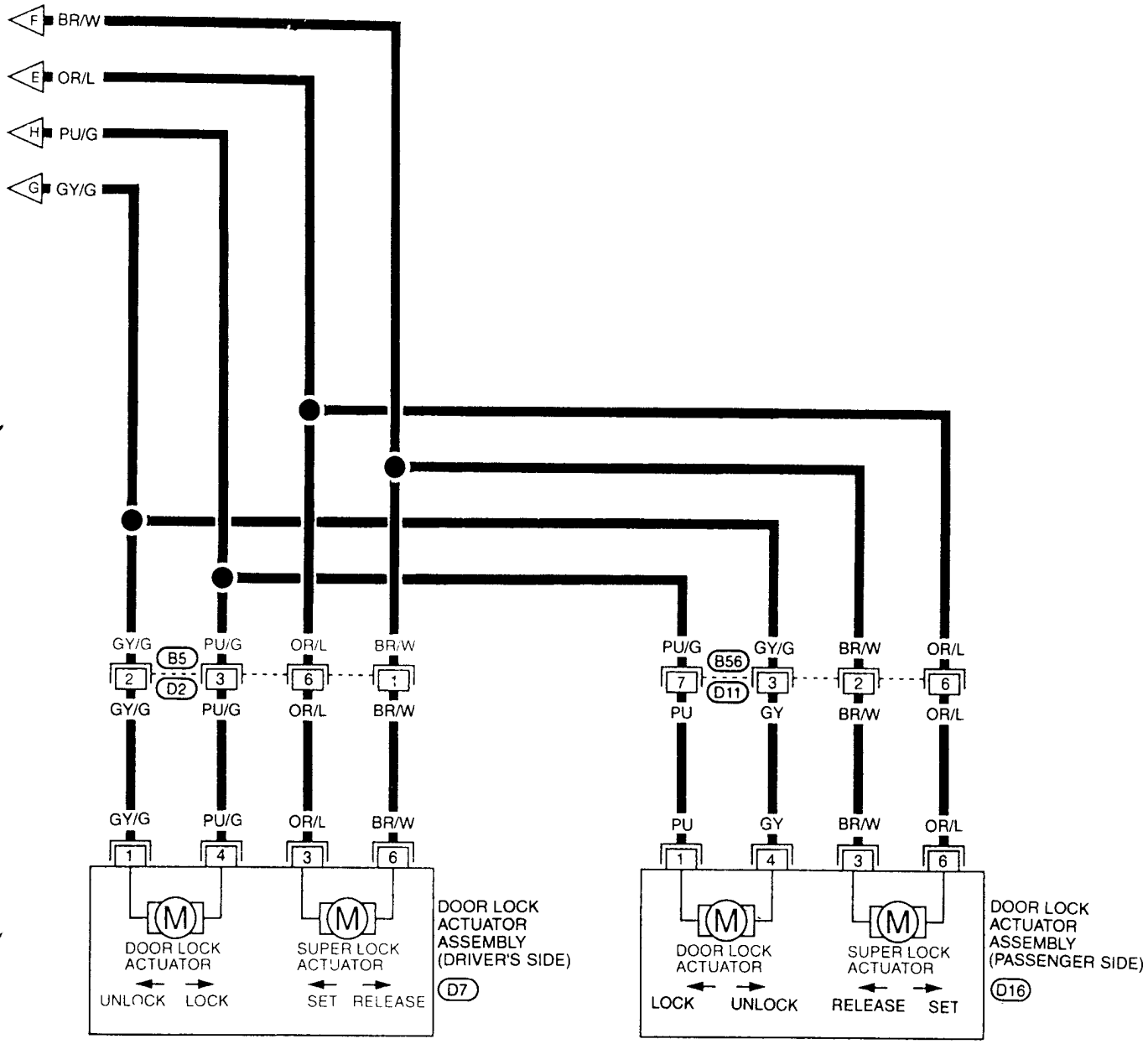
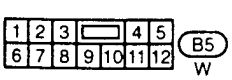
B11

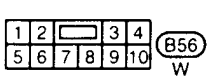
YEL768

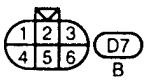
Wiring Diagram — S/LOCK — (Cont'd)

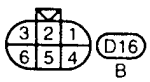
EL-S/LOCK-06







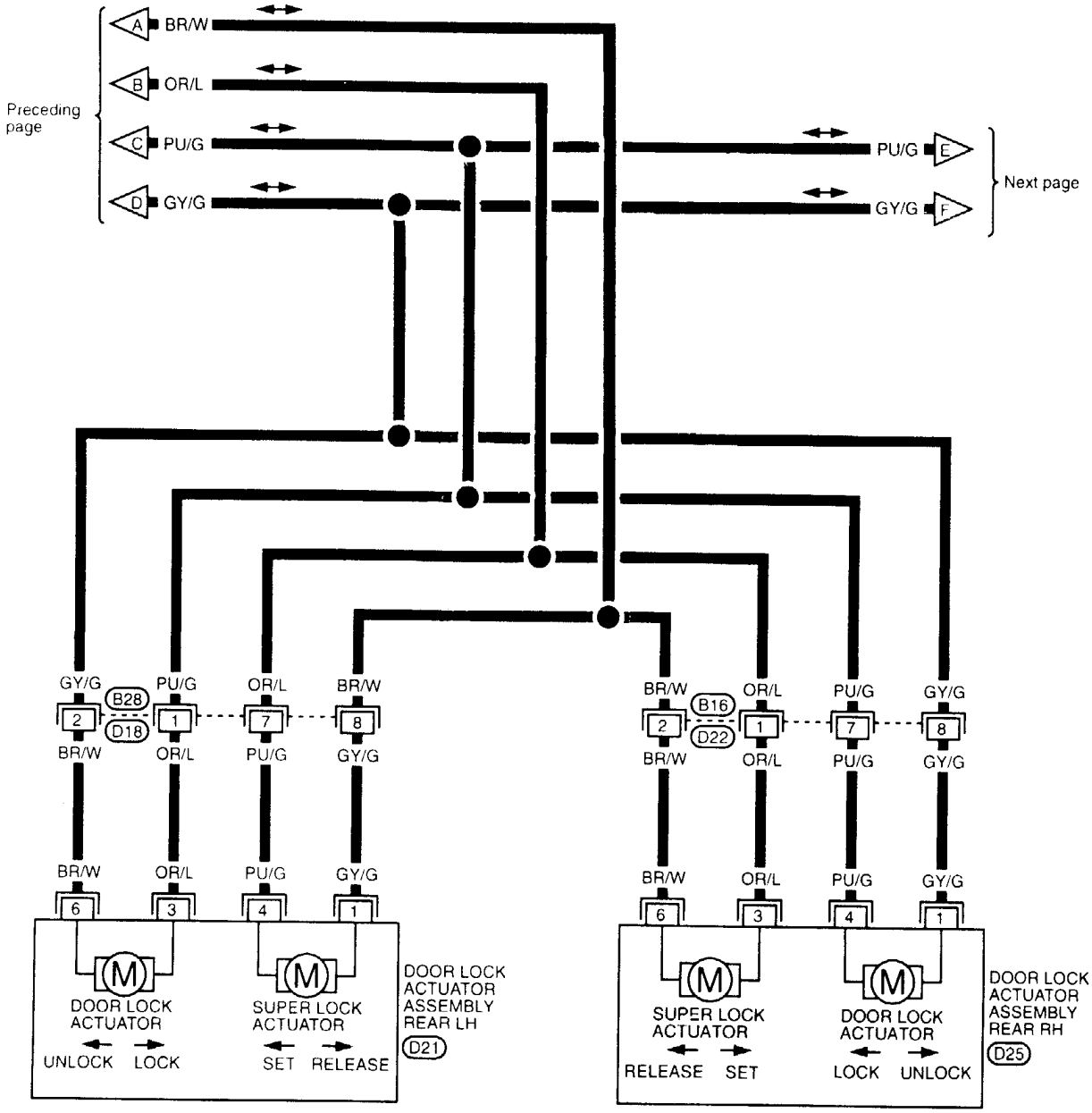


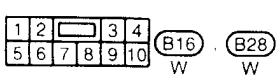


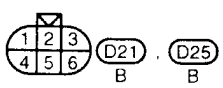
Refer to last page (Foldout page).
B11

YEL021A

EL-S/LOCK-07

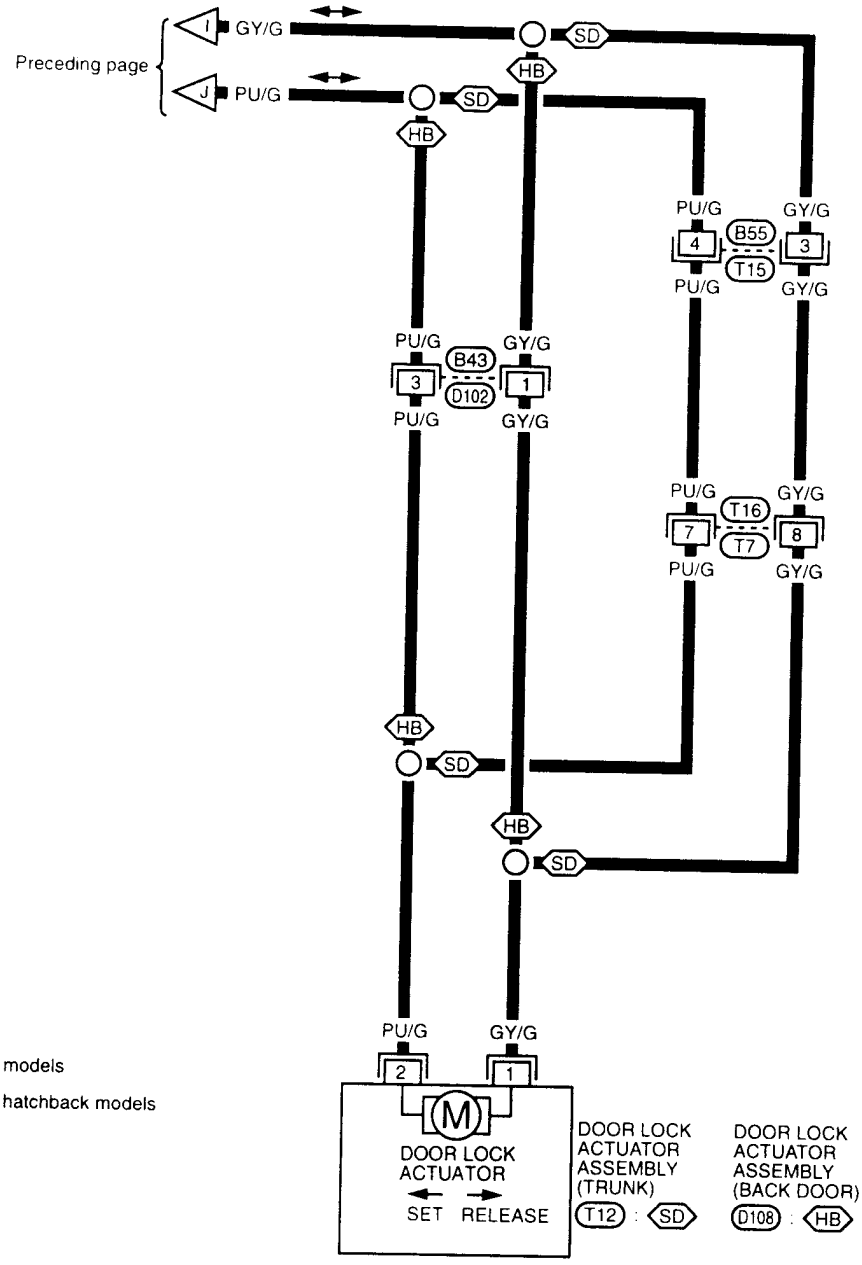


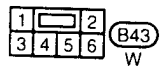


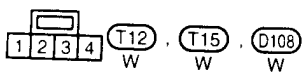


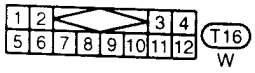
YEL76

EL-S/LOCK-08





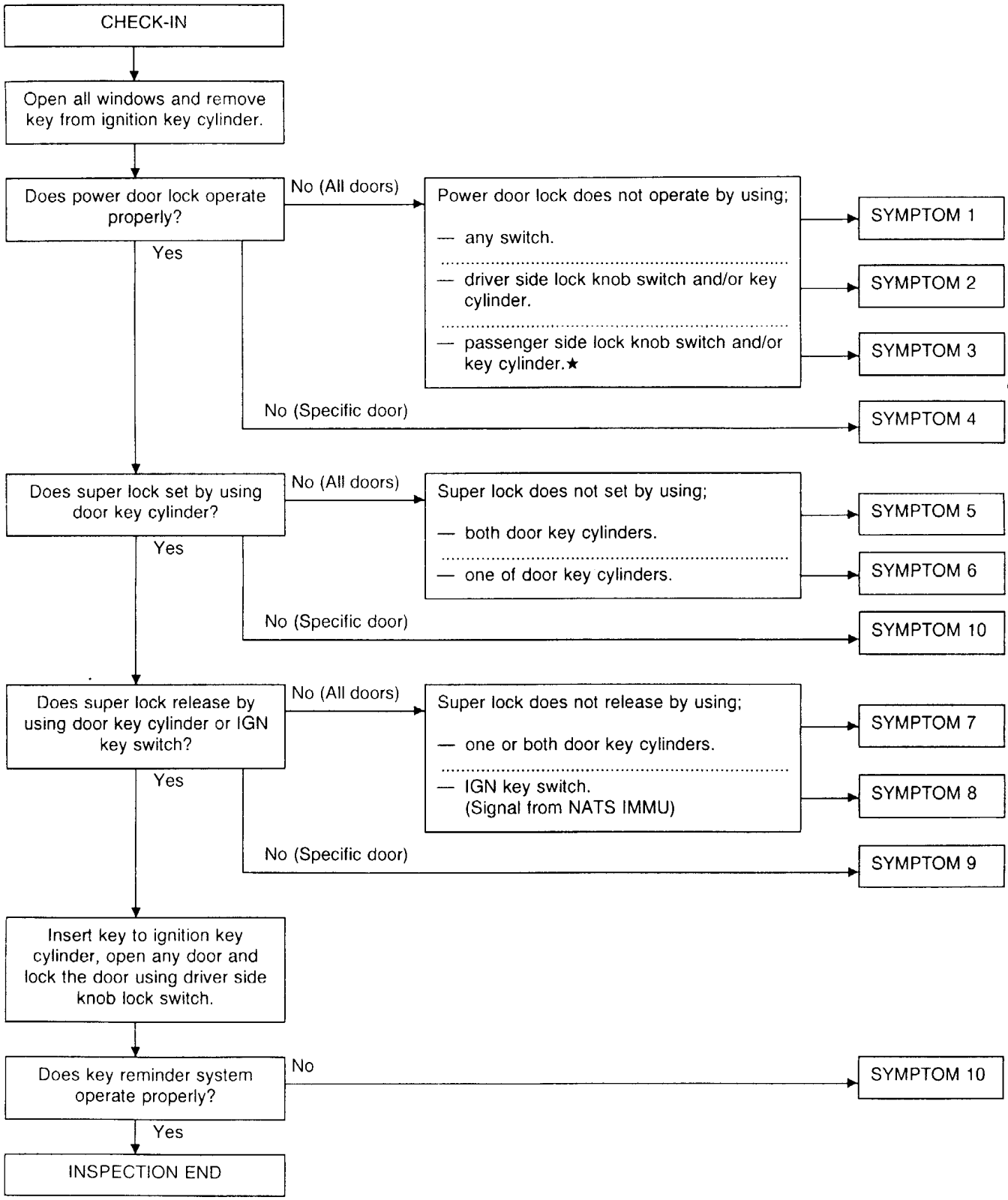




YEL770

Trouble Diagnoses

PRELIMINARY CHECK



After performing preliminary check, continue the diagnostic procedure in symptom chart, EL-165.

★ When one or more doors are opened, with lock knob on passenger door setting to LOCK, will lock passenger door only. (Power door lock system will not operate.)

Trouble Diagnoses (Cont'd)

Before starting trouble diagnoses below, perform preliminary check, EL-164.

Symptom numbers in the symptom chart correspond with those of Preliminary check.

SYMPTOM CHART

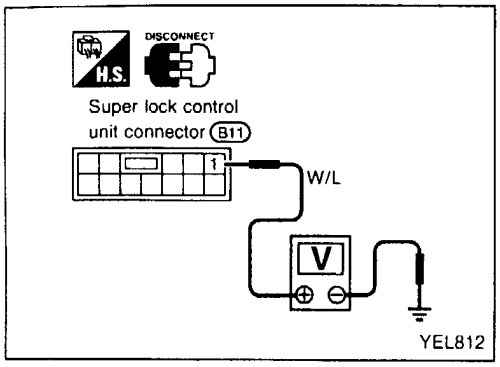
REFERENCE PAGE		EL-166	EL-167	EL-168	EL-169	EL-170	EL-171	EL-172	EL-173	EL-173
SYMPTOM		Power supply and ground circuit check	Procedure 1 (Door unlock sensor check)	Procedure 2 (Door key cylinder switch check)	Procedure 3 (Door lock actuator check)	Procedure 4 (Super lock actuator check)	Procedure 5 (Door switch check)	Procedure 6 (NATS release signal check)	Procedure 7 (Ignition key switch check)	Procedure 8 (Ignition switch "ON" circuit check)
1	Power door lock does not operate using any switch.	X	X		X					
2	Power door lock does not operate with any switch of driver side.		X							
3	Power door lock does not operate with any switch of passenger side.		X				X			
4	Specific door lock acutator does not operate.				X					
5	Super lock cannot be set by both door key cylinders.	X		X		X			X	X
6	Super lock cannot be set by one of door key cylinders.			X						
7	*Super lock cannot be released by one or both door key cylinders.		X							
8	*Super lock cannot be released by ignition key switch. (Signal from NATS IMMU)							X		
9	Specific super lock actuator does not operate.					X				
10	*Key reminder system does not operate.						X		X	

X: Applicable

*: Make sure the power door lock and lights-on reminder system operate properly.

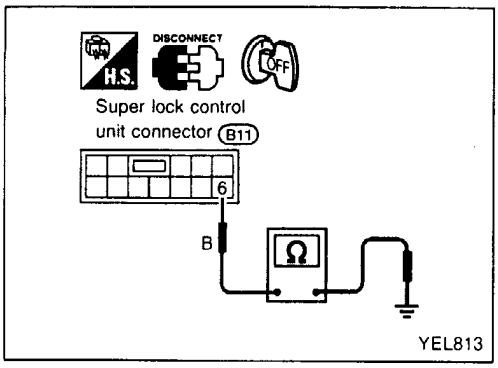
Trouble Diagnoses (Cont'd)

POWER SUPPLY AND GROUND CIRCUIT CHECK



Main power supply circuit check

Terminals		Ignition switch position		
⊕	⊖	LOCK	ACC	ON
①	Ground	Battery voltage	Battery voltage	Battery voltage

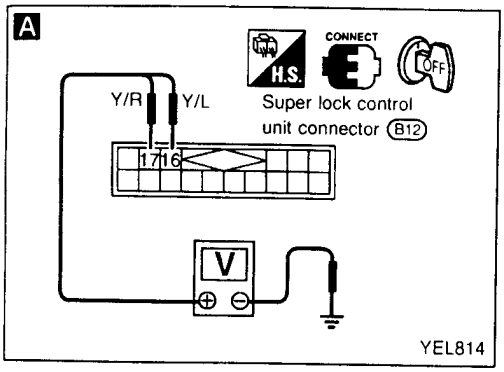


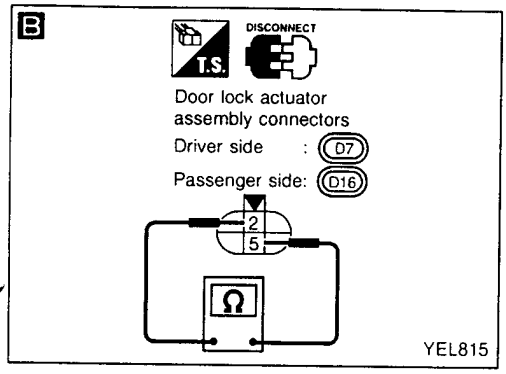
Ground circuit check

Terminals	Continuity
⑥ - Ground	Yes

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1
(Door unlock sensor check)





A

CHECK DOOR UNLOCK SENSOR INPUT SIGNAL.
Check voltage between super lock control unit connector terminals ⑯ or ⑰ and ground.

	Terminals ⊕	Terminals ⊖	Condition	Voltage [V]
Driver side	⑰	Ground	Locked	Approx. 2 (Approx. 20 sec.)
			Unlocked	0
Passenger side	⑯	Ground	Locked	Approx. 12 (Approx. 20 sec.)
			Unlocked	0

OK → Go to the next procedure.

NG ↓

B

CHECK DOOR UNLOCK SENSOR.
1) Disconnect door unlock sensor connector.
2) Check continuity between door unlock sensor terminals.

	Terminals	Condition	Continuity
Front door	② - ⑤	Locked	No
		Unlocked	Yes

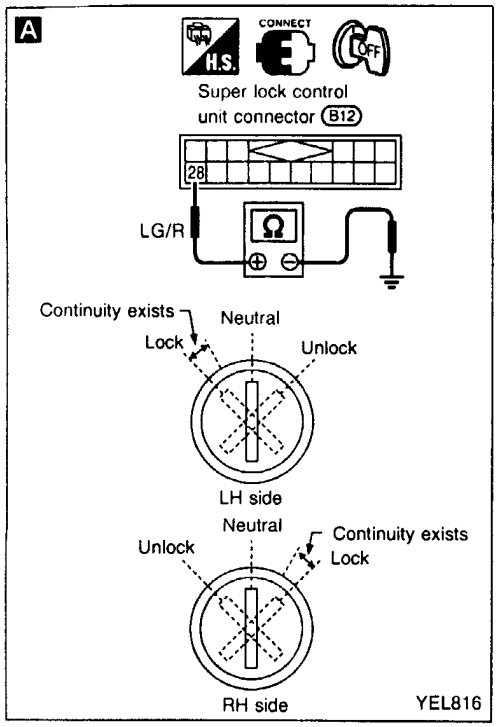
NG → Replace door lock actuator assembly.

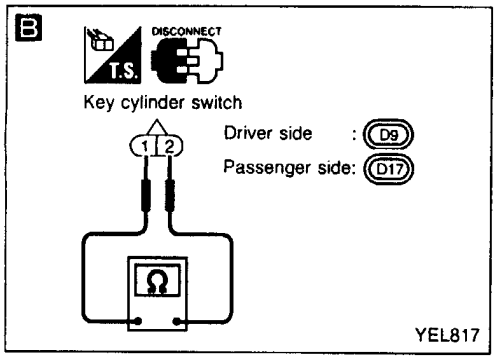
OK ↓

Check the following:
- Door unlock sensor ground circuit.
- Harness for open or short-circuit between super lock control unit and door unlock sensor

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2
(Door key cylinder switch check)





A

CHECK DOOR KEY CYLINDER SWITCH INPUT SIGNAL (LOCK SIGNAL).
Check voltage between super lock control unit connector terminal (28) and ground.

Key cylinder switch operation	Continuity to ground
In lock position	Yes
Neutral/Unlock	No

OK → Go to the next procedure.

NG ↓

B

CHECK DOOR KEY CYLINDER SWITCH.
1) Disconnect door key cylinder switch connector.
2) Check continuity between door key cylinder switch terminals.

Terminals	Key position	Continuity
① - ②	Neutral	No
	Between neutral and lock	Yes
	Unlock/ neutral	No
	Full stroke (Lock)	No

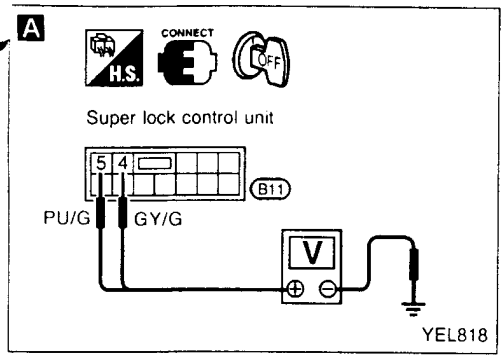
NG → Replace key cylinder switch.

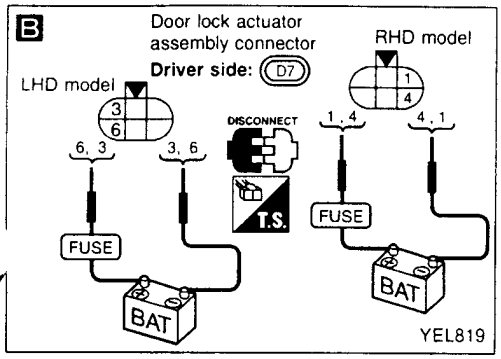
OK ↓

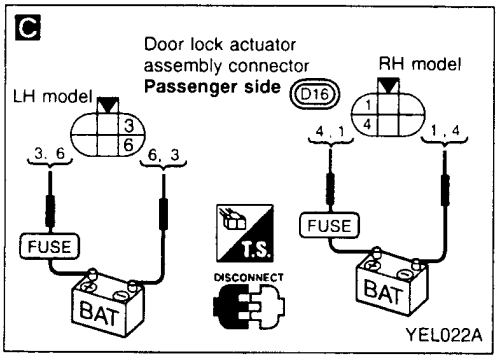
Check the following:
- Harness connectors (M3), (M13)
- Harness connectors (M7), (D1)
- Harness connectors (B5), (D2)
- Door key cylinder switch ground circuit
- Harness for open or short-circuit between super lock control unit and door key cylinder.

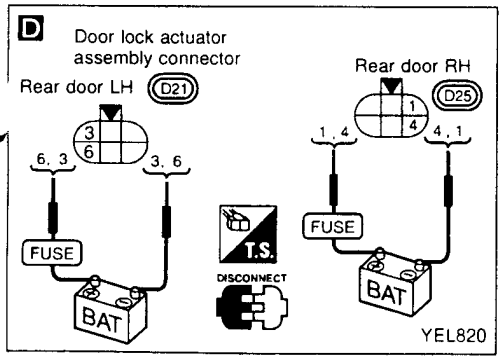
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 3
(Door lock actuator check)









A

CHECK DOOR LOCK ACTUATOR CIRCUIT.
Check voltage for door lock actuator.

Knob lock switch condition	Terminals ⊕	Terminals ⊖	Voltage (V)
Unlock → Lock	④	Ground	Approx. 12 (Approx. 5 seconds)
Lock → Unlock	⑤	Ground	

Before operating passenger side knob lock switch, close all doors.

NG → Go to next procedure.

OK ↓

B C D

CHECK DOOR LOCK ACTUATOR.
1. Disconnect door lock actuator connector.
2. Apply 12V direct current to door lock actuator and check operation.

OK → Check harness between control unit and door lock actuator.

Driver side

Door lock actuator operation	Terminals ⊕	Terminals ⊖
Unlocked → Locked	⑥ : (LHD) ① : (RHD)	③ : (LHD) ④ : (RHD)
Locked → Unlocked	③ : (LHD) ④ : (RHD)	⑥ : (LHD) ① : (RHD)

Passenger side

Door lock actuator operation	Terminals ⊕	Terminals ⊖
Unlocked → Locked	③ : (LHD) ④ : (RHD)	⑥ : (LHD) ① : (RHD)
Locked → Unlocked	⑥ : (LHD) ① : (RHD)	③ : (LHD) ④ : (RHD)

Rear door

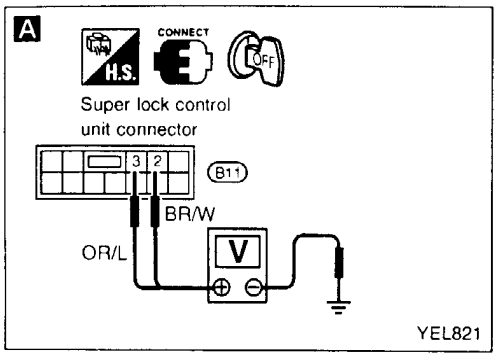
Door lock actuator operation	Terminals ⊕	Terminals ⊖
Unlocked → Locked	⑥ : (LH) ① : (RH)	③ : (LH) ④ : (RH)
Locked → Unlocked	③ : (LH) ④ : (RH)	⑥ : (LH) ① : (RH)

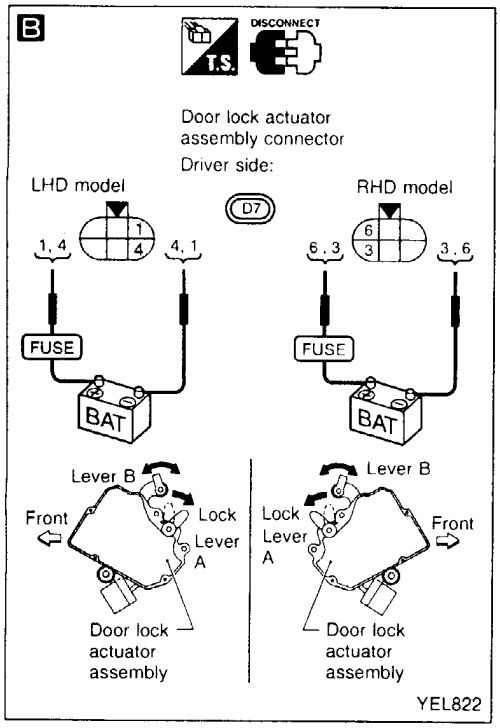
NG ↓

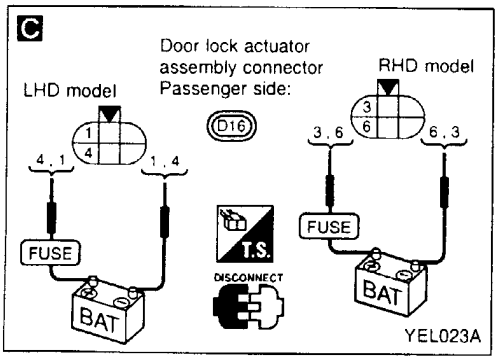
Replace door lock actuator assembly.

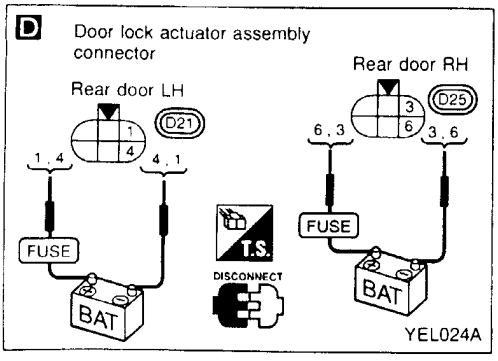
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4
(Super lock actuator check)









A

CHECK SUPER LOCK ACTUATOR CIRCUIT.
Check voltage for super lock actuator.

Door key cylinder switch condition	Terminals ⊕	Terminals ⊖	Voltage (V)
Lock (Set)	②	Ground	Approx. 12
Unlock (Released)	③	Ground	

Note:
Put the system in set condition before checking release signal.

NG → Go to next procedure.

OK ↓

B C D

CHECK SUPER LOCK ACTUATOR.
1. Disconnect door lock actuator assembly connector.
2. Set lever B in lock position.
3. Apply 12V direct current to door lock actuator assembly and check operation.

OK → Check harness between control unit and door lock actuator assembly.

Driver side

Super lock actuator operation	Terminals ⊕	Terminals ⊖	Connection from lever A to lever B
Released → Set	① : (LHD) ⑥ : (RHD)	④ : (LHD) ③ : (RHD)	Disconnect
Set → Released	④ : (LHD) ③ : (RHD)	① : (LHD) ⑥ : (RHD)	Connect

Passenger side

Super lock actuator operation	Terminals ⊕	Terminals ⊖	Connection from lever A to lever B
Released → Set	④ : (LHD) ③ : (RHD)	① : (LHD) ⑥ : (RHD)	Disconnect
Set → Released	① : (LHD) ⑥ : (RHD)	④ : (LHD) ③ : (RHD)	Connect

Rear door

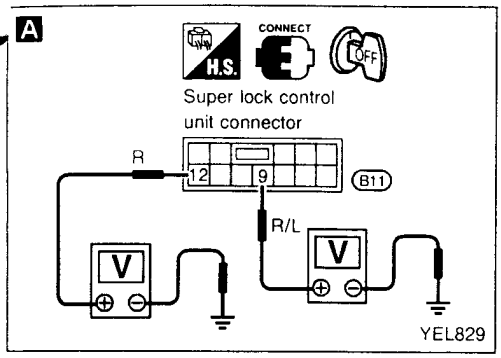
Super lock actuator operation	Terminals ⊕	Terminals ⊖	Connection from lever A to lever B
Released → Set	① : (LH) ⑥ : (RH)	④ : (LH) ③ : (RH)	Disconnect
Set → Released	④ : (LH) ③ : (RH)	① : (LH) ⑥ : (RH)	Connect

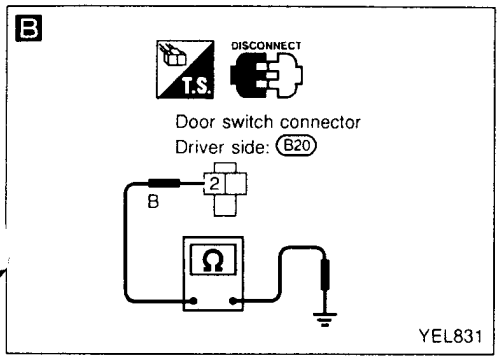
NG ↓

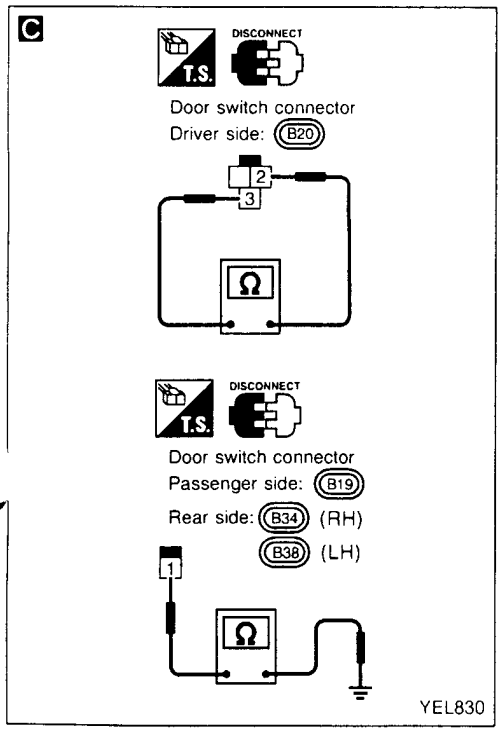
Replace door lock actuator assembly.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5
(Door switch check)







A

CHECK DOOR SWITCH INPUT SIGNAL.
Check voltage between control unit and ground.

	Terminals	Condition	Voltage [V]
Driver side door	⑫	Opened	0
		Closed	Approx. 12
Other door	⑨	Opened	0
		Closed	Approx. 12

OK → Go to the next procedure.

NG ↓

B

CHECK GROUND CIRCUIT.
1) Disconnect driver side door switch connector.
2) Check harness continuity between terminal ② and ground.
Continuity should exist.

NG → Repair harness or connector.

OK ↓

C

CHECK DOOR SWITCH.
1) Disconnect door switch connector.
2) Check continuity between door switch terminals.

	Terminals	Condition	Continuity
Driver side door switch	② - ③	Closed	No
		Open	Yes
Other door switches	① - ground	Closed	No
		Open	Yes

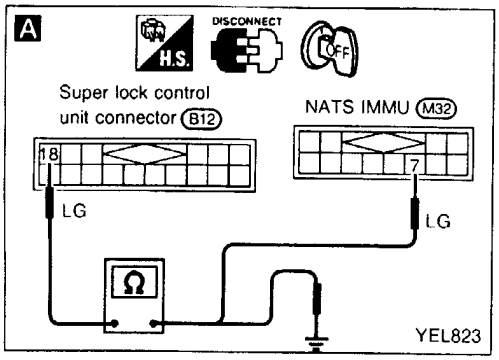
NG → Replace door switch.

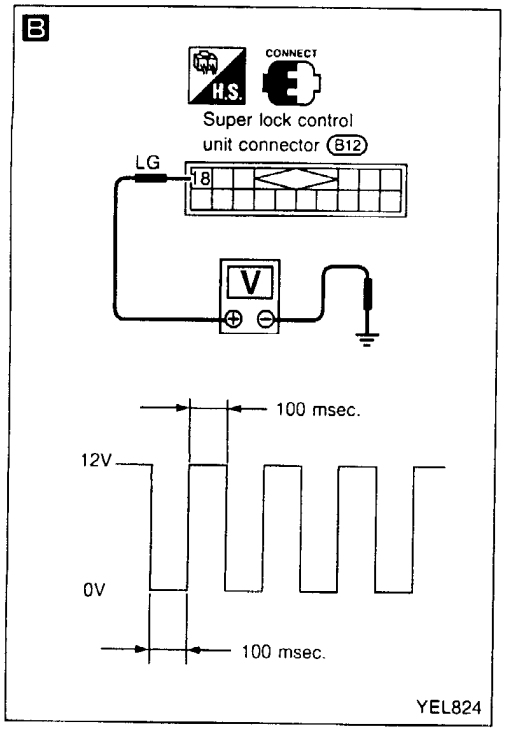
OK ↓

Check the following.
- Door switch ground condition (Except driver side)
- Harness for open or short between control unit and door switch

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6 (NATS release signal check)





Does engine start properly? — No → Check NATS system.

Yes ↓

A

CHECK NATS SIGNAL CIRCUIT.
1) Disconnect control unit connector and NATS IMMU connector.
2) Check continuity between control unit terminal ⑱ and NATS IMMU terminal ⑦.
   Continuity should exist.
3) Check continuity between control unit terminal ⑱ and ground.
   Continuity should not exist.

NG → Repair harness.

OK ↓

B

CHECK NATS RELEASE SIGNAL.
1) Connect control unit connector and NATS IMMU connector.
2) Check voltage between control unit terminal ⑱ and ground.

NG → Check NATS system.

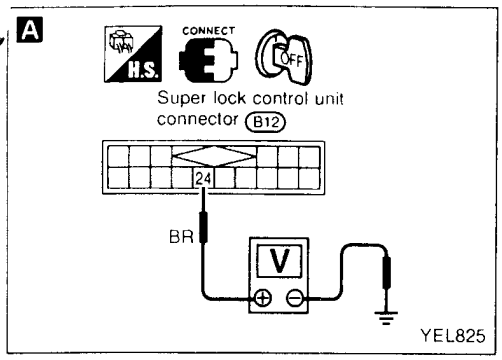
Ignition switch condition	Voltage [V]
LOCK	12
More than 10 seconds after ignition switch turned to "ON" position	
For 10 seconds after ignition switch turned to "ON" position	Pulse

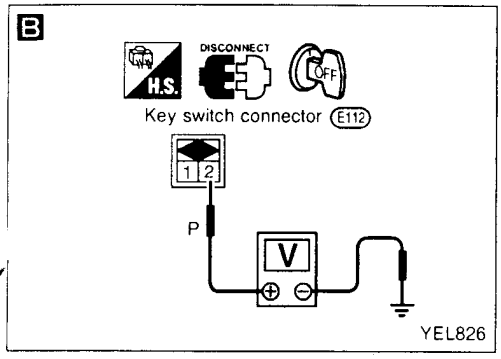
OK ↓

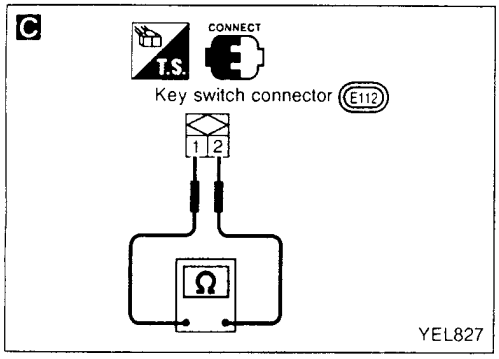
Replace super lock control unit.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7
(Ignition key switch check)







A

CHECK IGNITION KEY SWITCH INPUT SIGNAL.
Check voltage between control unit terminal ㉔ and ground.

Condition of key switch	Voltage [V]
Key is inserted	Approx. 12
Key withdrawn	0

OK → Go to next procedure.

NG ↓

B

CHECK KEY SWITCH POWER SUPPLY.
Check voltage between key switch harness terminal ② and ground.
Battery voltage should exist.

NG → Check the following.
- 10A fuse [No. 24], located in fuse block (J/B)]
- Harness for open or short between key switch and fuse

OK ↓

C

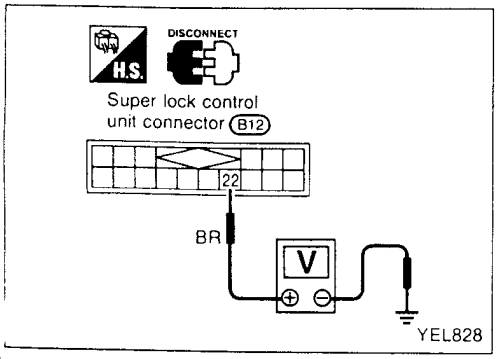
CHECK KEY SWITCH.
1) Disconnect key switch connector.
2) Check continuity between key switch terminals.

Terminals	Condition	Continuity
① - ②	Key is inserted.	Yes
	Key is withdrawn.	No

NG → Replace key switch.

OK ↓

Check harness for open or short between control unit and key switch.



DIAGNOSTIC PROCEDURE 8
(Ignition switch "ON" circuit check)

Terminals		Ignition switch position		
⊕	⊖	OFF	ACC	ON
㉒	Ground	0V	0V	Battery voltage

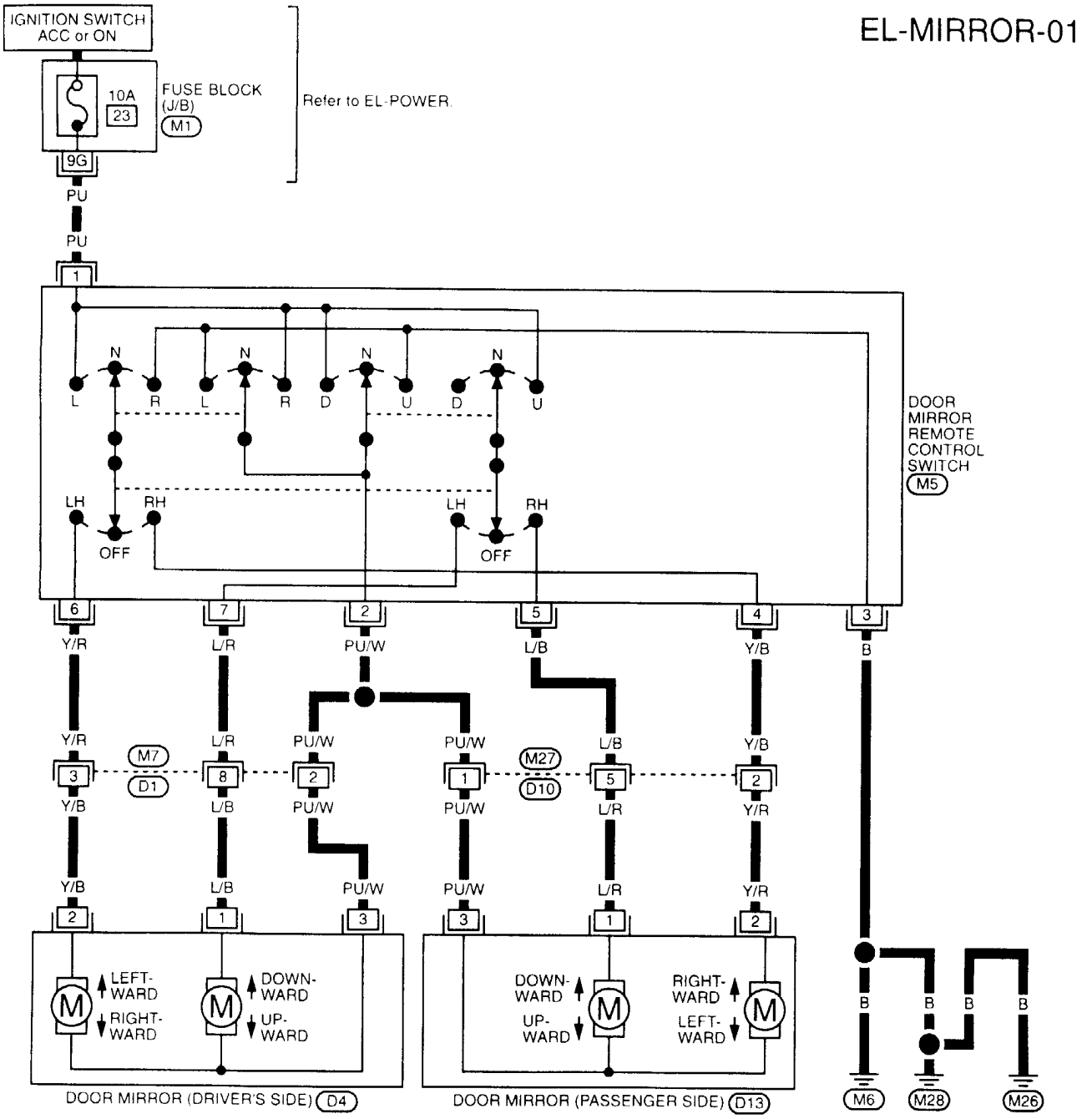
If NG, check the following.
- 10A fuse [No. 25], located in the fuse block (J/B)]
- Harness for open or short

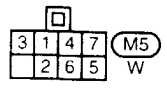
★ For removal of door mirror, refer to "DOOR MIRROR" in BT section.

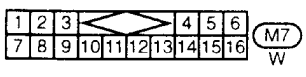
Wiring Diagram — MIRROR —

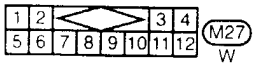
LHD models

EL-MIRROR-01









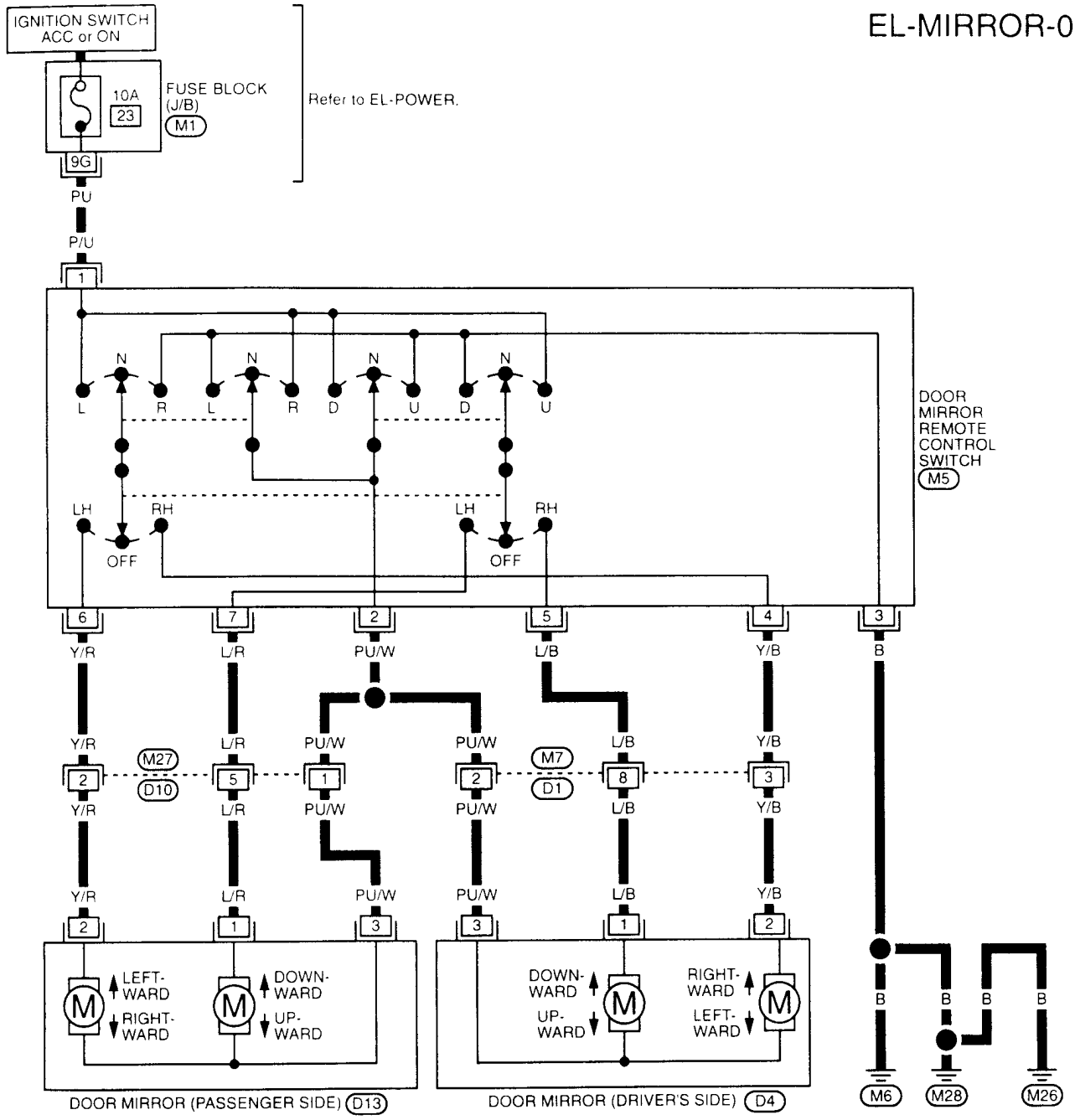
Refer to last page (Foldout page).
M1

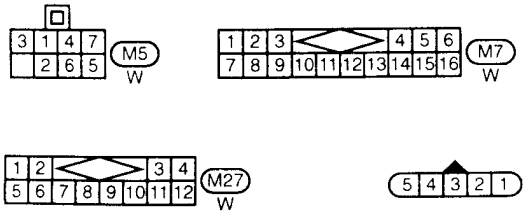
YEL745

Wiring Diagram — MIRROR — (Cont'd)

RHD models

EL-MIRROR-02



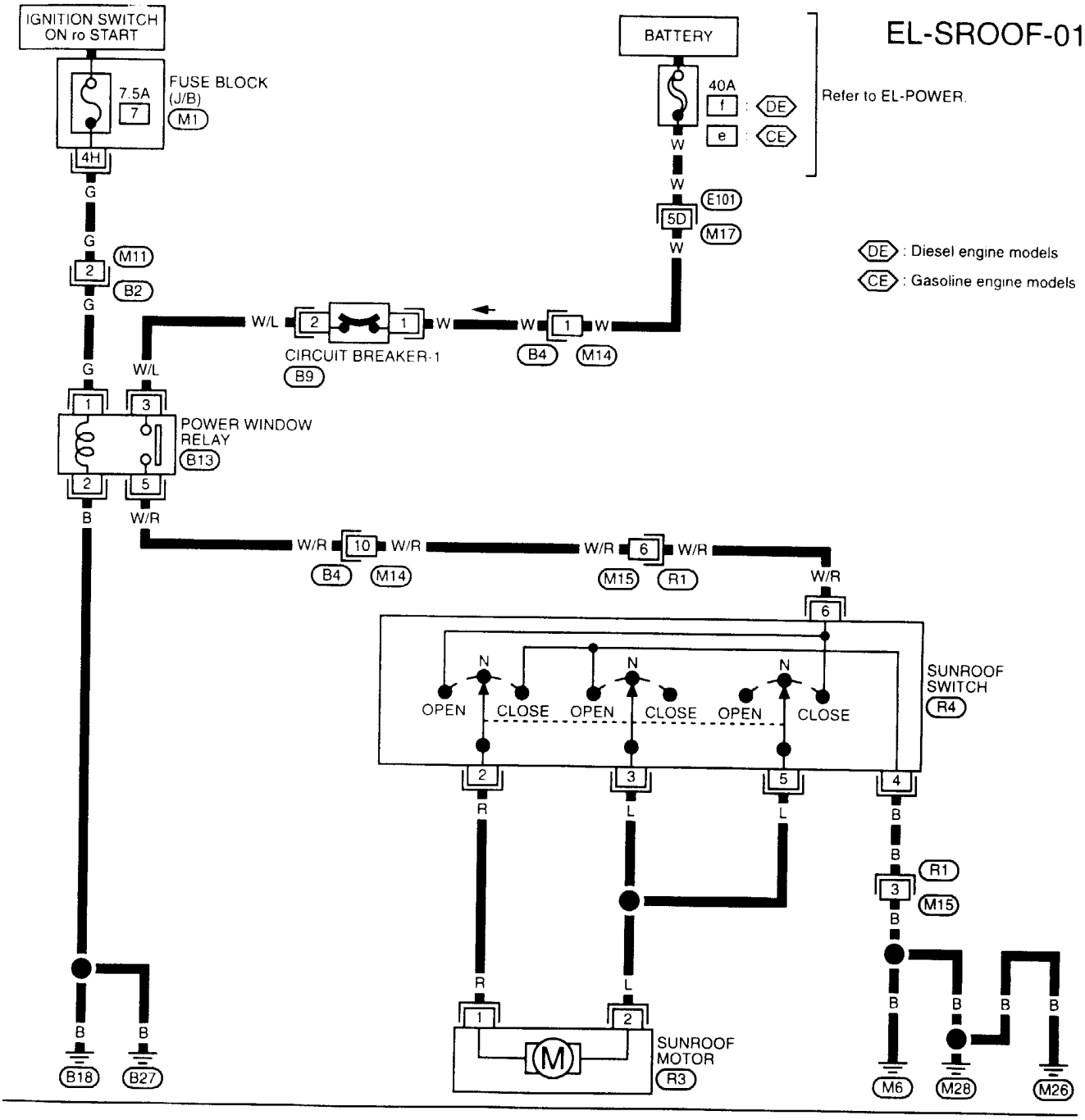


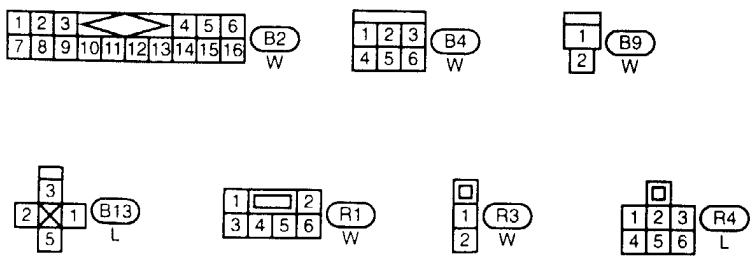
Refer to last page (Foldout page).
M1

YEL746

★ For removal and adjustment of sun roof, refer to "SUN ROOF" in BT section.

Wiring Diagram — SROOF —



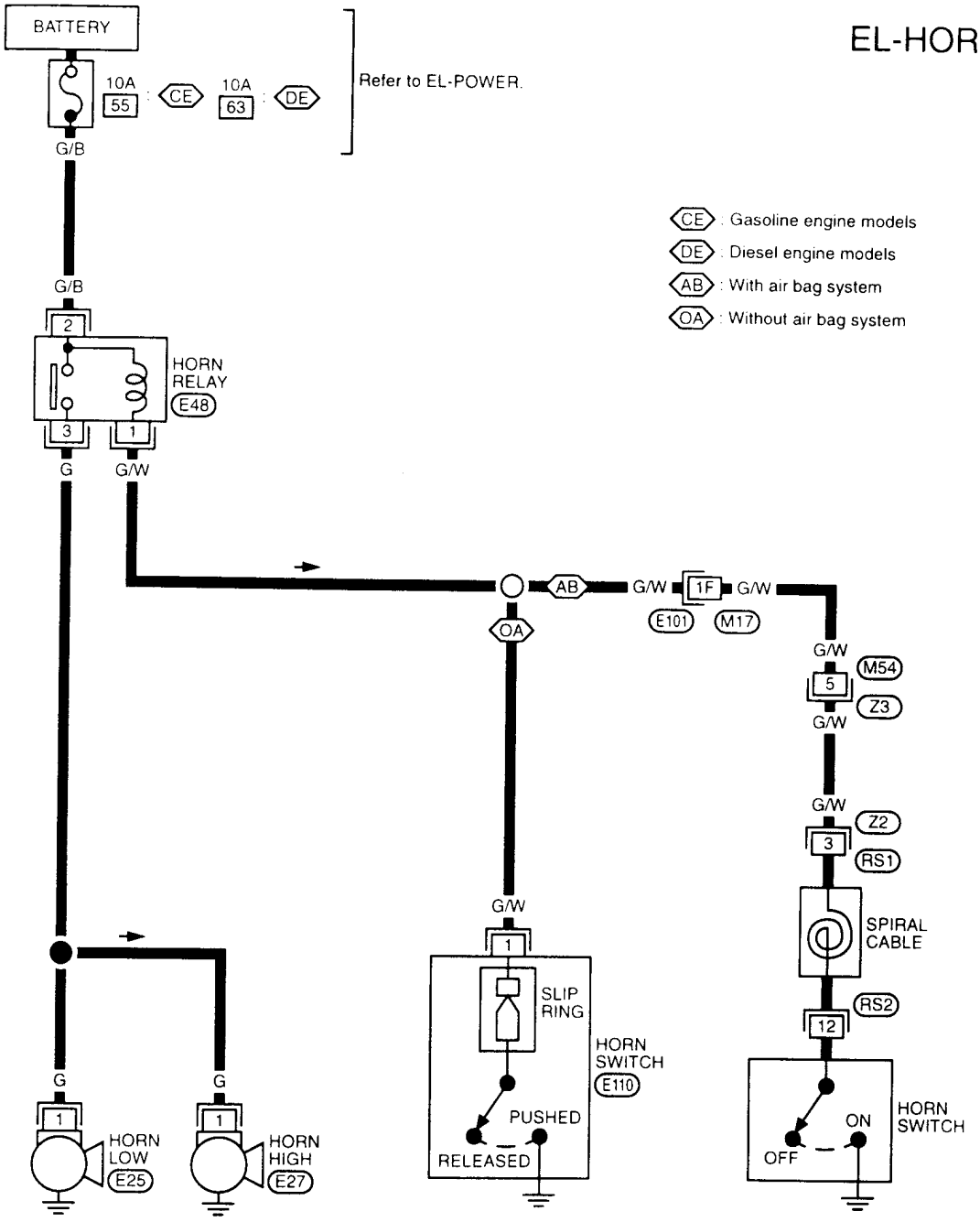


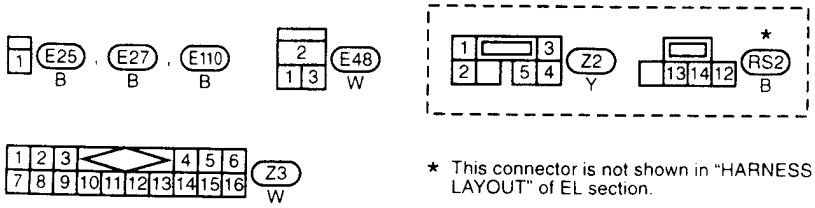
Refer to last page (Foldout page).
M17 , E101
M1

YEL741

Wiring Diagram — HORN —

EL-HORN-01





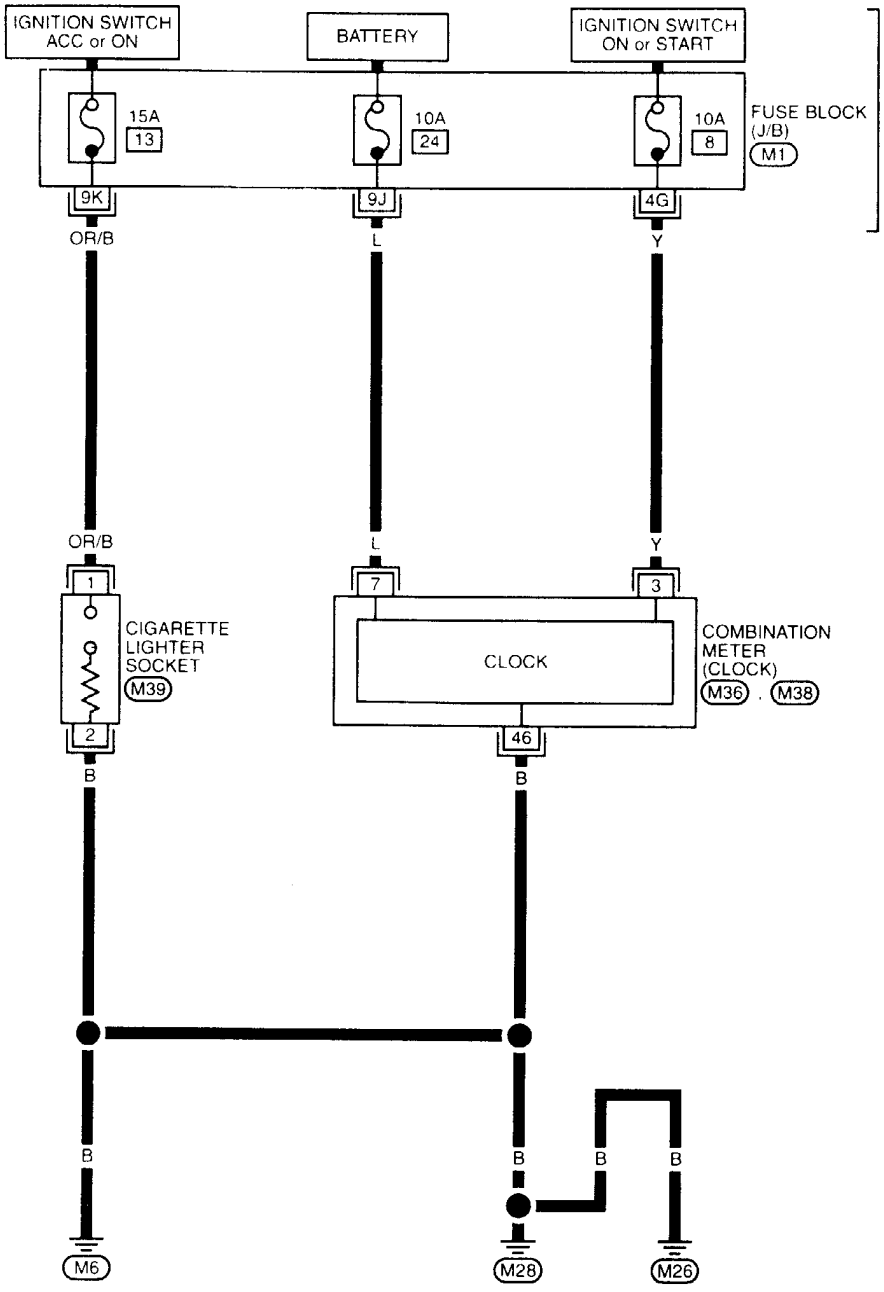
* This connector is not shown in "HARNESS LAYOUT" of EL section.

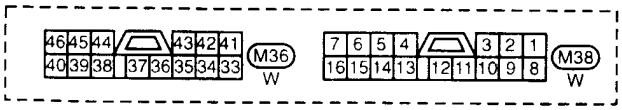
Refer to last page (Foldout page).
E101 , M17

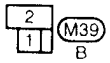
YEL728

Wiring Diagram — HORN — (Cont'd)

EL-HORN-02







Refer to last page (Foldout page).
M1

YEL729

System Description

The rear window and door mirror defogger system is controlled by the super lock control unit.
Power is supplied at the ignition switch ON or START
- to rear window defogger relay terminal ③ and ⑥
- through 15A fuses (No. 57 and No. 56 (Gasoline engine models), No. 62 and No. 61 (Diesel engine models), located in the fuse block).

With the ignition switch in the ACC or ON position, power is supplied
- to mirror defogger relay terminal ③
- through 10A fuse (No. 23, located in the fuse block).

With the ignition switch in the ON or START position, power is supplied
- to rear window defogger relay terminal ② and super lock control unit terminal ㉒
- through 10A fuse (No. 25, located in the fuse block).

Ground is supplied
- to rear window defogger switch terminal ⑥
- through body grounds M28, M6 and M28.

Operation

The ignition switch must be in the ON or START position for defogger operation.
With the rear window defogger switch in the ON position and for approximately 12 - 16 minutes after the rear window defogger switch has turned to OFF from ON, ground is supplied
- through terminal ① of the rear window defogger switch
- to super lock control unit terminal ㉕.

Terminal ⑬ of the super lock control unit then supplies ground to rear window defogger relay terminal ① and door mirror heater relay terminal ②.
With power and ground supplied, rear window defogger relay and mirror defogger relay are energized.
For rear window defogger system, power is supplied
- through terminals ⑤ and ⑦ of the rear window defogger relay
- to condenser terminal ①
- through terminal ② of the condenser
- to the rear window defogger terminal ③.

For door mirror defogger system, power is supplied.
- through mirror defogger relay terminal ⑤
- to each door mirror defogger terminal ④.

Ground is supplied
- to rear window defogger terminal ①
- through body ground (Sedan), B48 and D110 (H/B) and
- to each door mirror defogger terminal ⑤
- through body grounds B18 and B27.

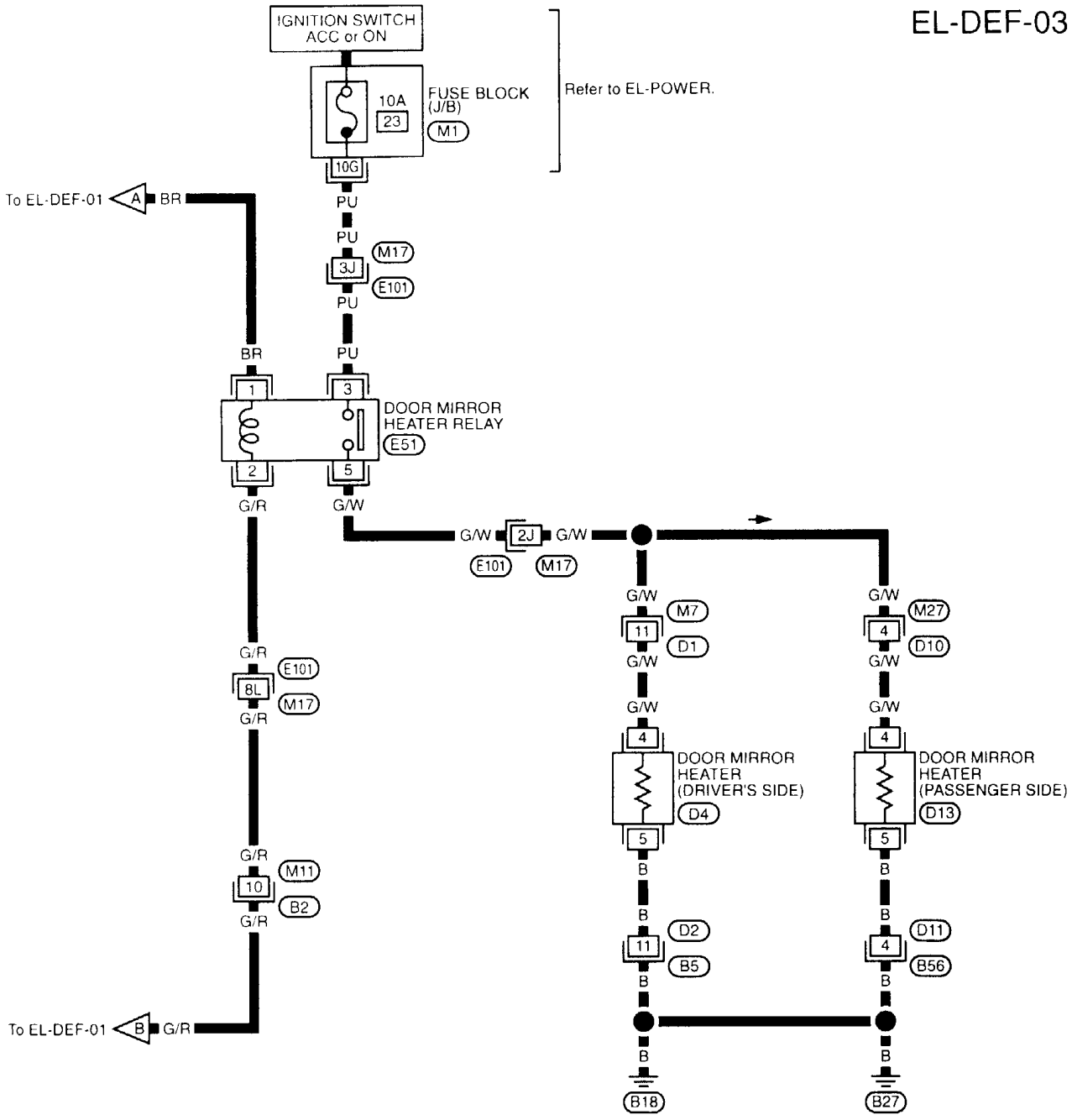
With power and ground supplied, each defogger filament heats and defogs the rear window and door mirror.
When the system is activated, the rear window defogger indicator illuminates in the rear window defogger switch.
Power is supplied
- to terminal ③ of the rear window defogger switch
- from terminal ⑦ of the rear window defogger relay.

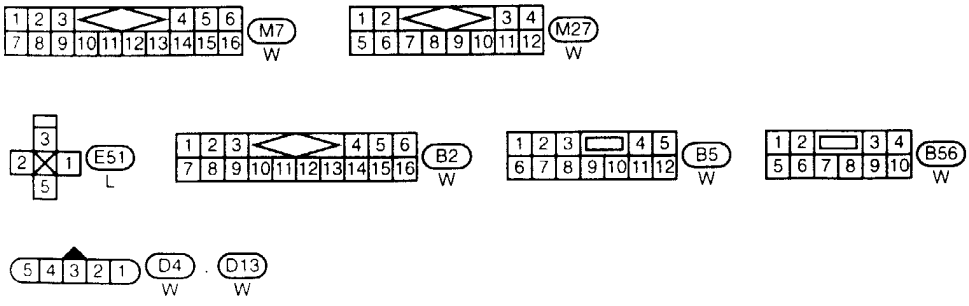
Terminal ⑥ of the rear window defogger switch is grounded through body grounds M28 and M68.

Wiring Diagram — DEF — (Cont'd)

LHD MODELS WITHOUT DAYTIME LIGHT SYSTEM

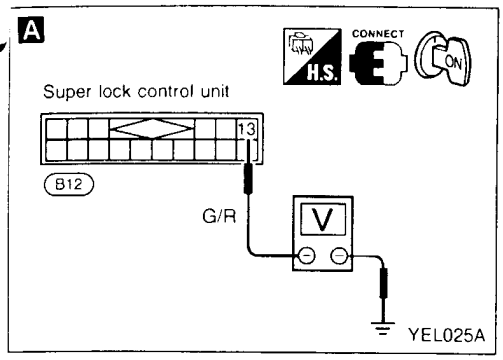
EL-DEF-03

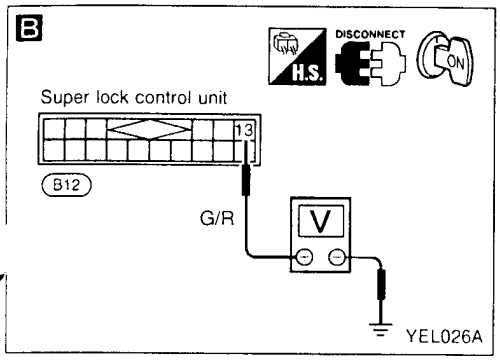


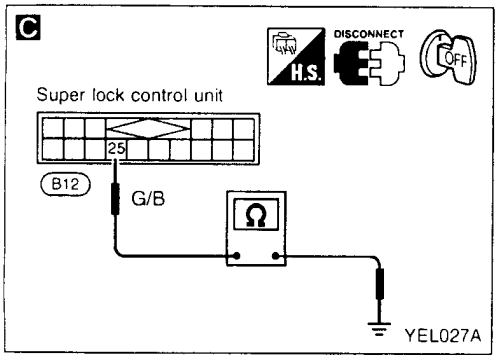


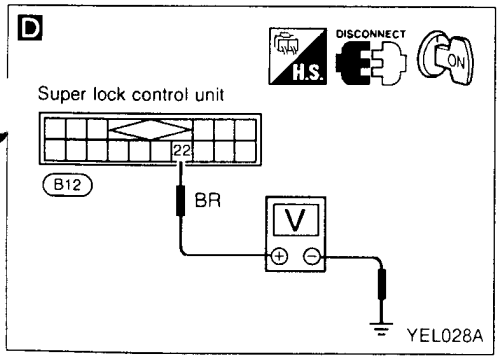
Refer to last page (Foldout page).
M17 , E101
M1

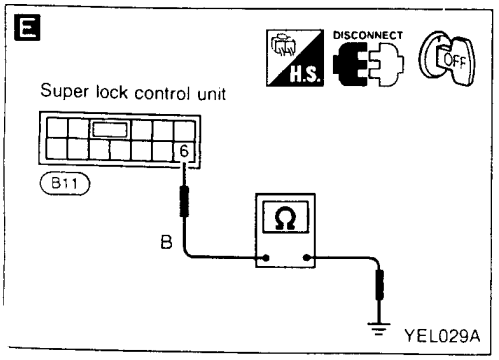
YEL747











Trouble Diagnoses

DIAGNOSTIC PROCEDURE

SYMPTOM: Rear window defogger/door mirror defogger does not activate, or does not go off after activating.

A

CHECK REAR WINDOW DEFOGGER OUTPUT SIGNAL.
1. Turn ignition switch to ON POSITION.
2. Check voltage between control unit harness terminal (13) and ground.

Condition	Voltage [V]
Rear window defogger switch is "OFF".	Approx. 12
Rear window defogger switch is "ON".	0

OK → Check the following.
Rear window defogger relay/door mirror heater relay
- Power supply fuse for relay
- Rear window defogger filament

(Refer to EL-184)

NG ↓

B

1. Disconnect control unit connector.
2. Turn ignition switch to ON position.
3. Check voltage between control unit terminal (13) and ground.

Battery voltage should exist.

NG → Check the following.
- 10A fuse [No. 25], located in the fuse block (J/B)]

Rear window defogger relay
- Harness for open or short between fuse and rear window defogger relay

OK ↓

C

CHECK REAR WINDOW DEFOGGER SWITCH INPUT SIGNAL.
Check continuity between control unit terminal (25) and ground.

Condition of defogger switch	Continuity
Rear window defogger switch is pushed.	Yes
Rear window defogger switch is released.	No

NG → Check the following.
- Rear window defogger switch.
- Harness for open or short between control unit and rear window defogger switch
- Rear window defogger switch gorund circuit

OK ↓

D

CHECK IGNITION INPUT SIGNAL.
Check voltage between control unit terminal (22) and ground.

Condition	Voltage [V]
Ignition switch is "ON".	Approx. 12
Ignition switch is "OFF".	0

NG → Check the following.
- 10A fuse [No. 25] located in the fuse block (J/B)]
- Harness for open or short between control unit and fuse

OK ↓

E

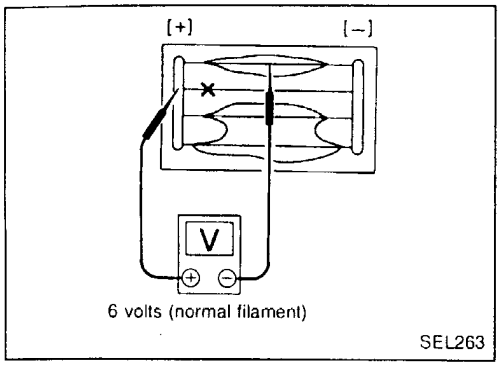
CHECK CONTROL UNIT GROUND CIRCUIT.
Check continuity between control unit terminal (6) and ground.

Continuity should exist.

NG → Repair harness or connectors

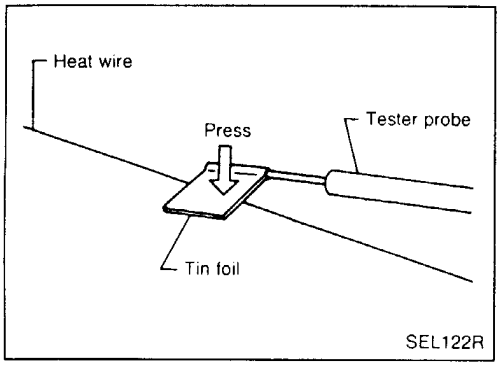
OK ↓

Replace control unit.

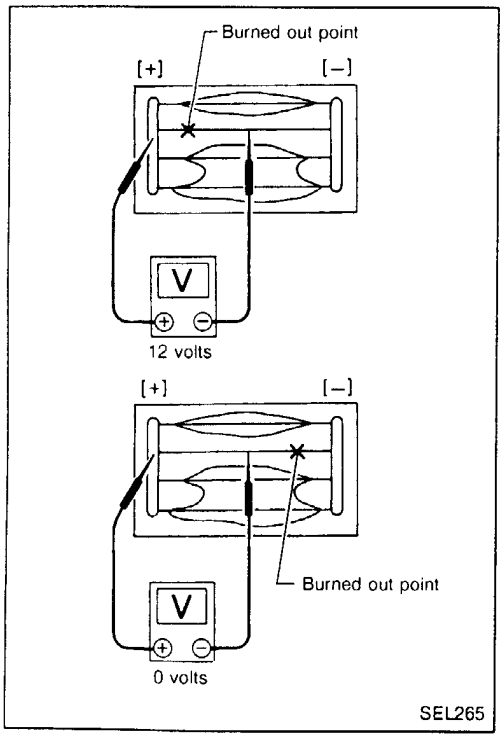


Filament Check

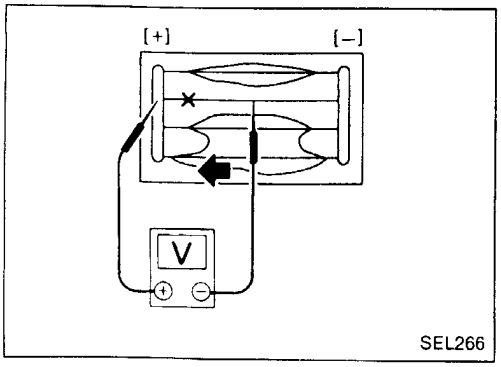
1. Attach probe circuit tester (in volt range) to middle portion of each filament.



- **When measuring voltage, wrap tin foil around the top of the negative probe. Then press the foil against the wire with your finger.**



2. If a filament is burned out, circuit tester registers 0 or 12 volts.

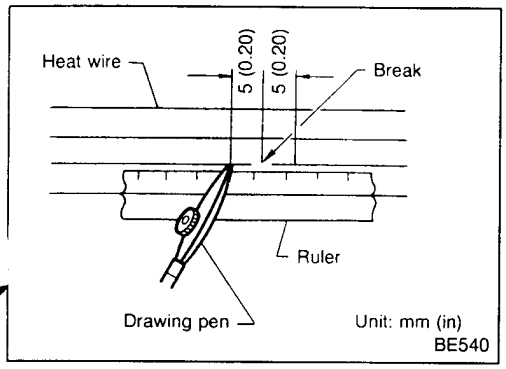


3. To locate burned out point, move probe along filament. Tester needle will swing abruptly when probe passes the point.

Filament Repair

REPAIR EQUIPMENT

1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth



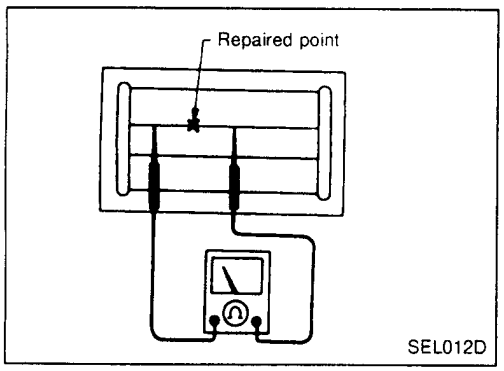
REPAIRING PROCEDURE

1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

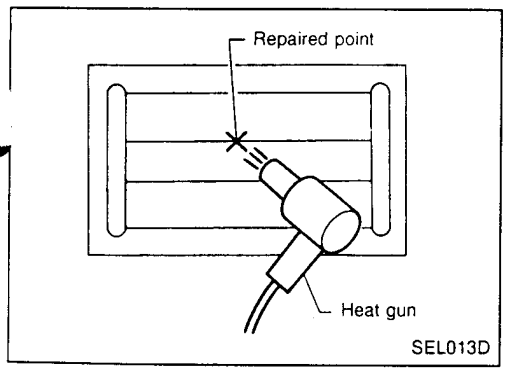
Shake silver composition container before use.

3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.
4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

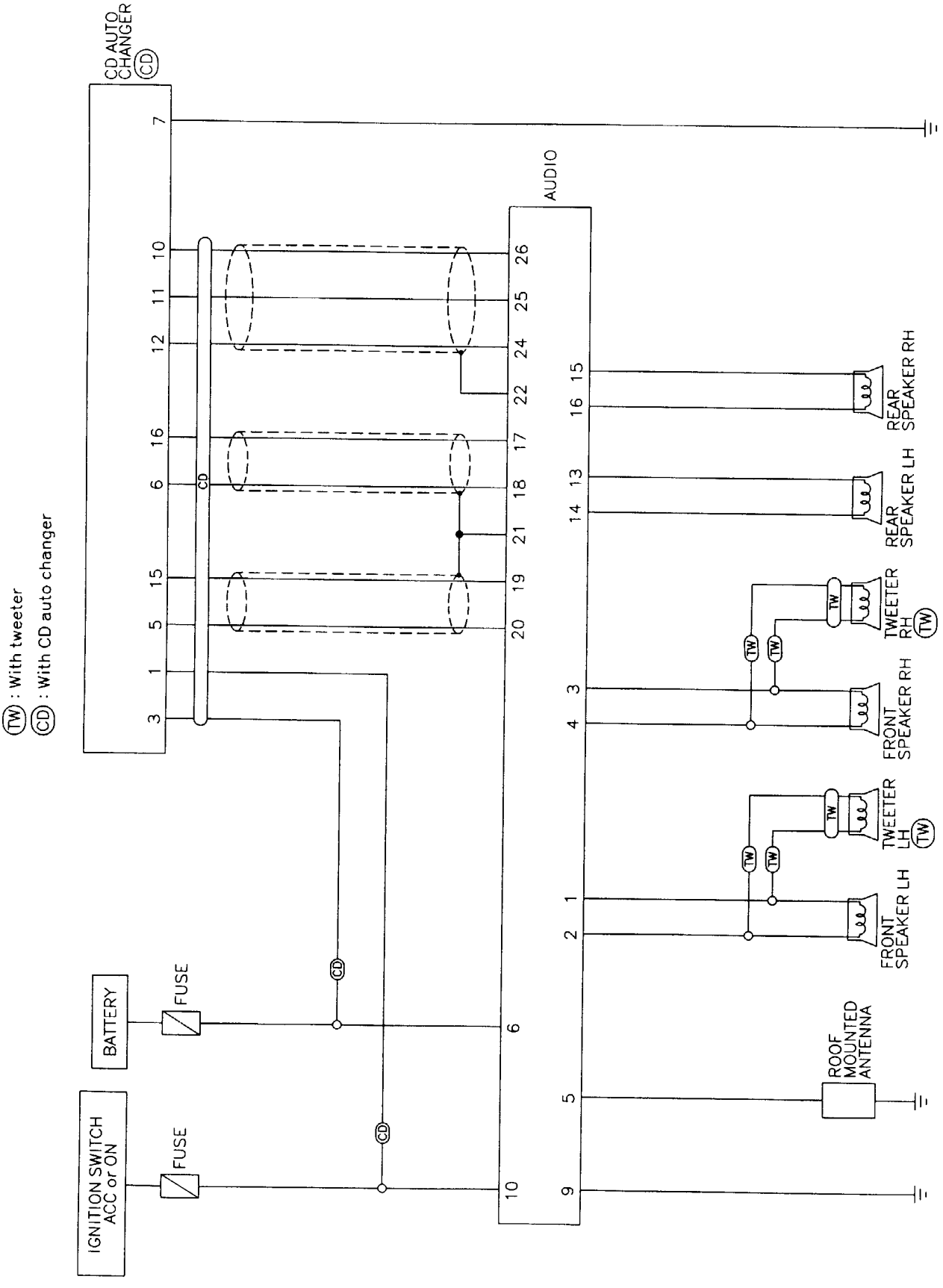
Do not touch repaired area while test is being conducted.



5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

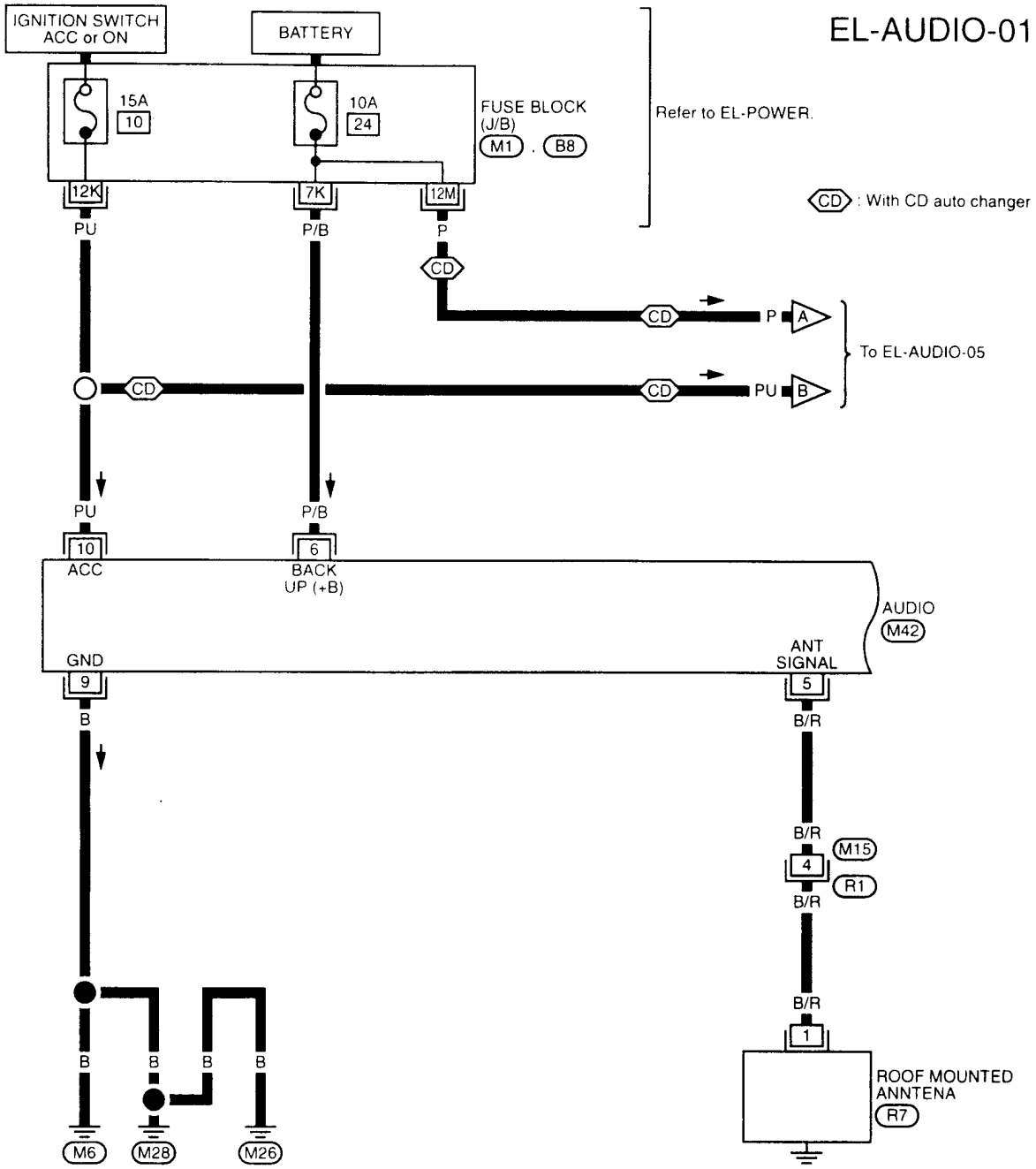


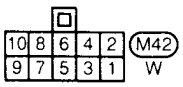
Schematic

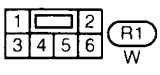


YEL740

Wiring Diagram — AUDIO —





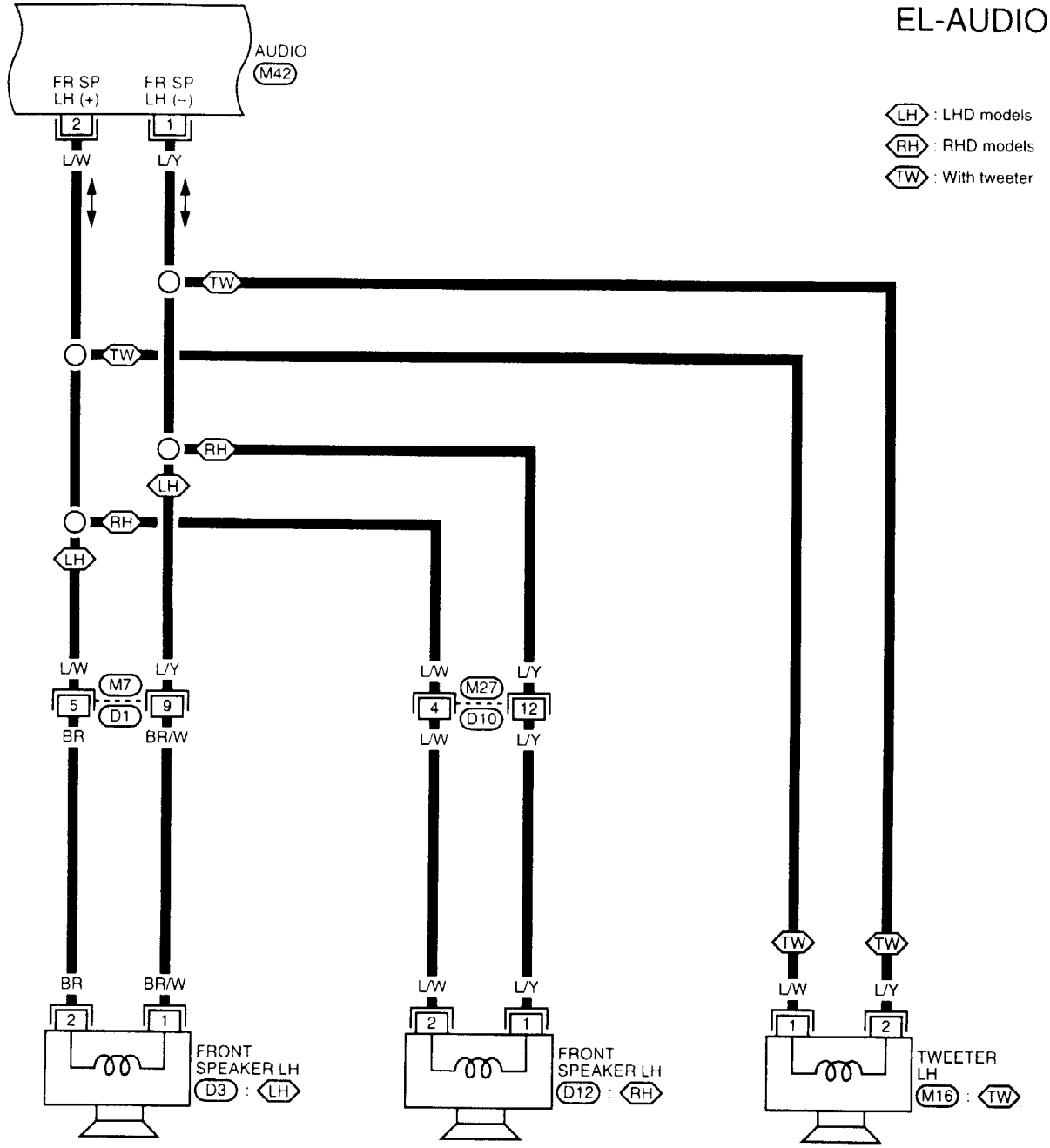


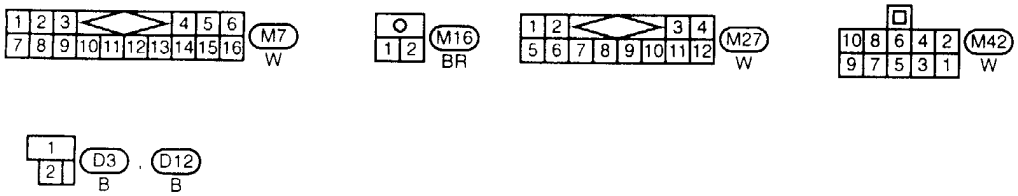
Refer to last page (Foldout page).
M1
B8

YEL734

Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-02

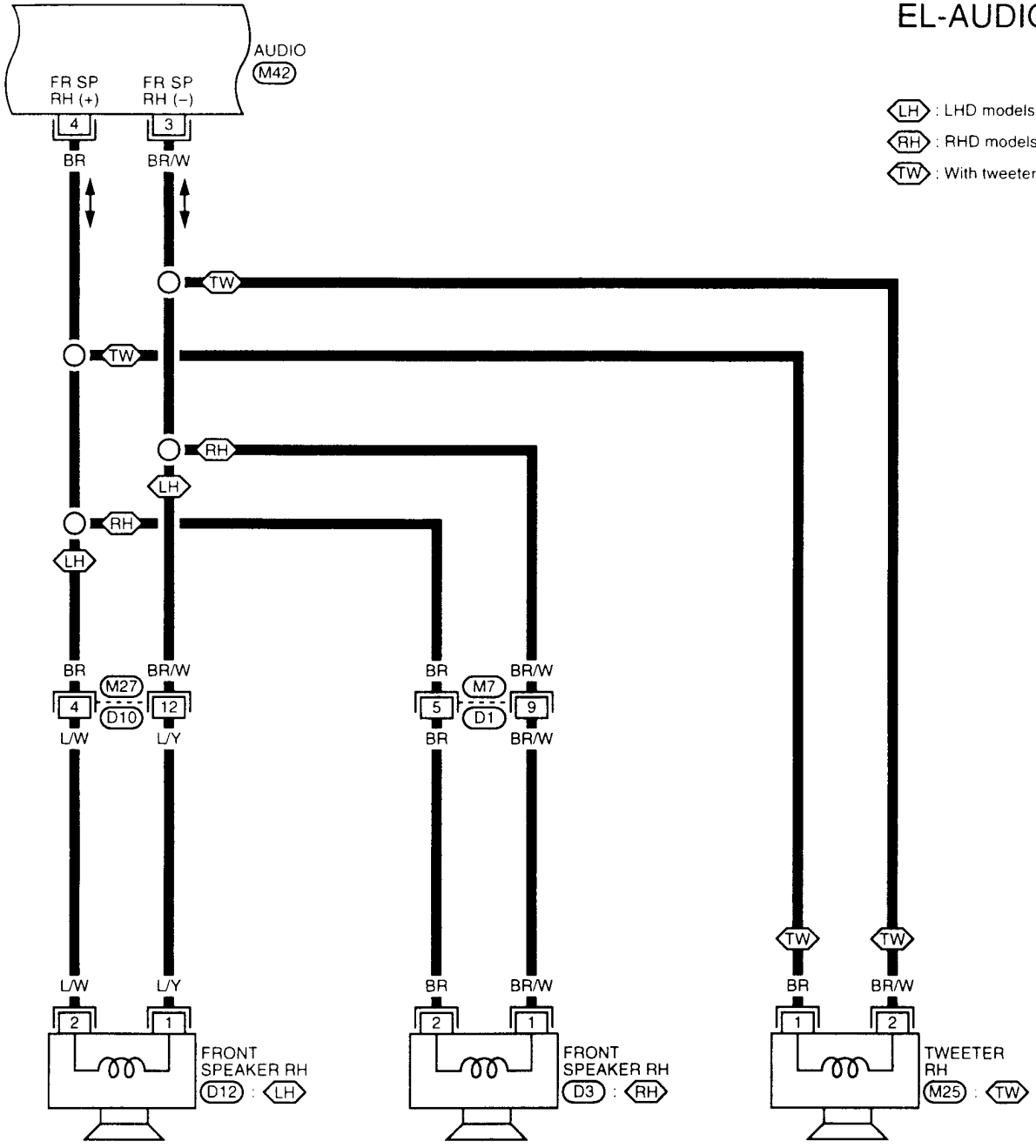


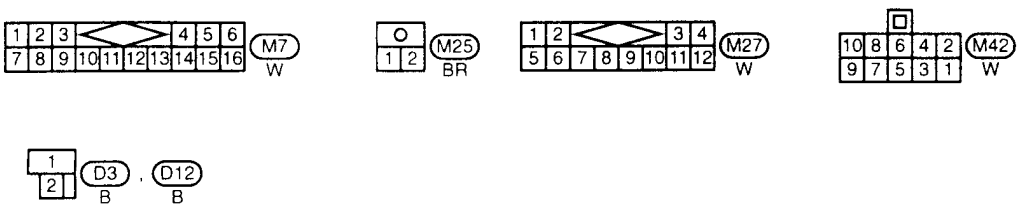


YEL735

Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-03

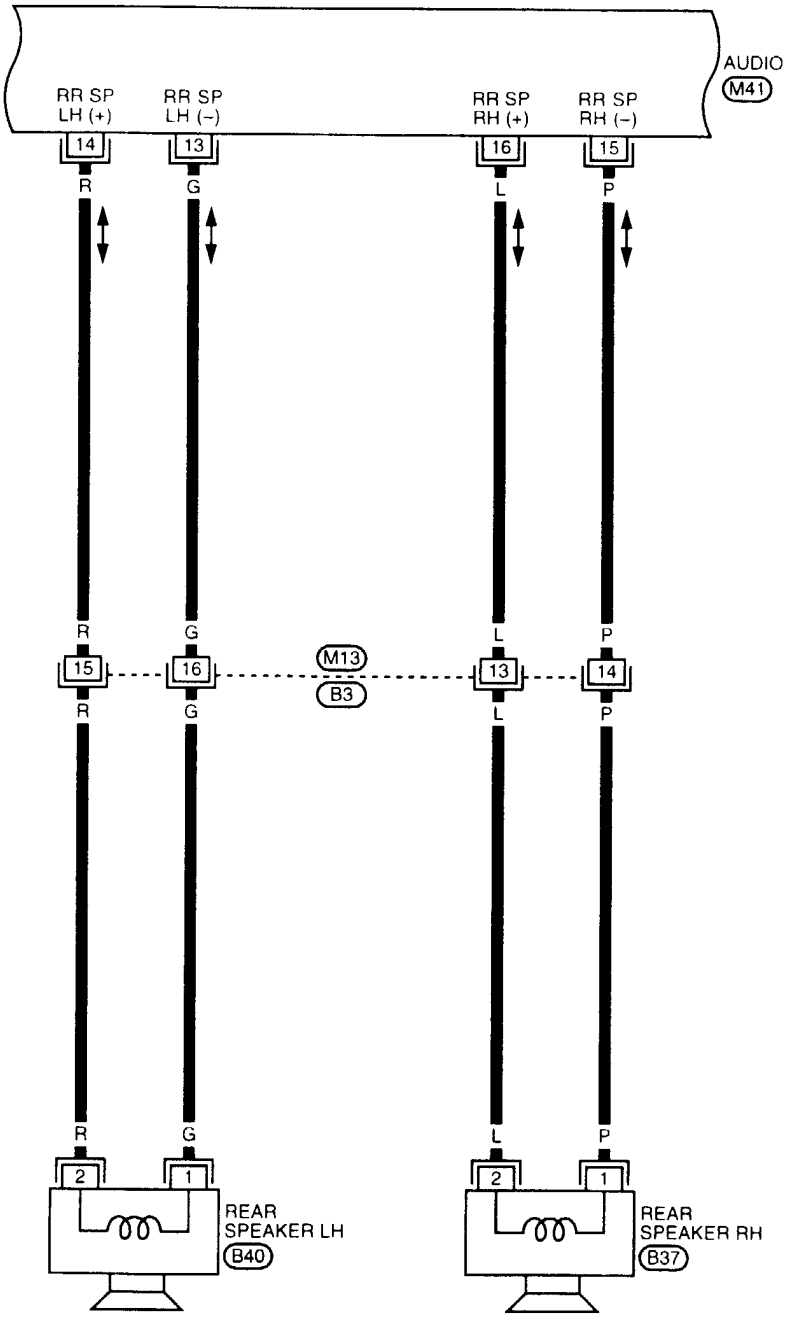


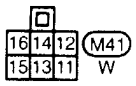


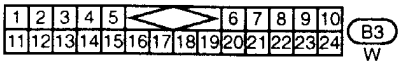
YEL736

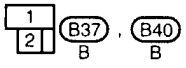
Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-04





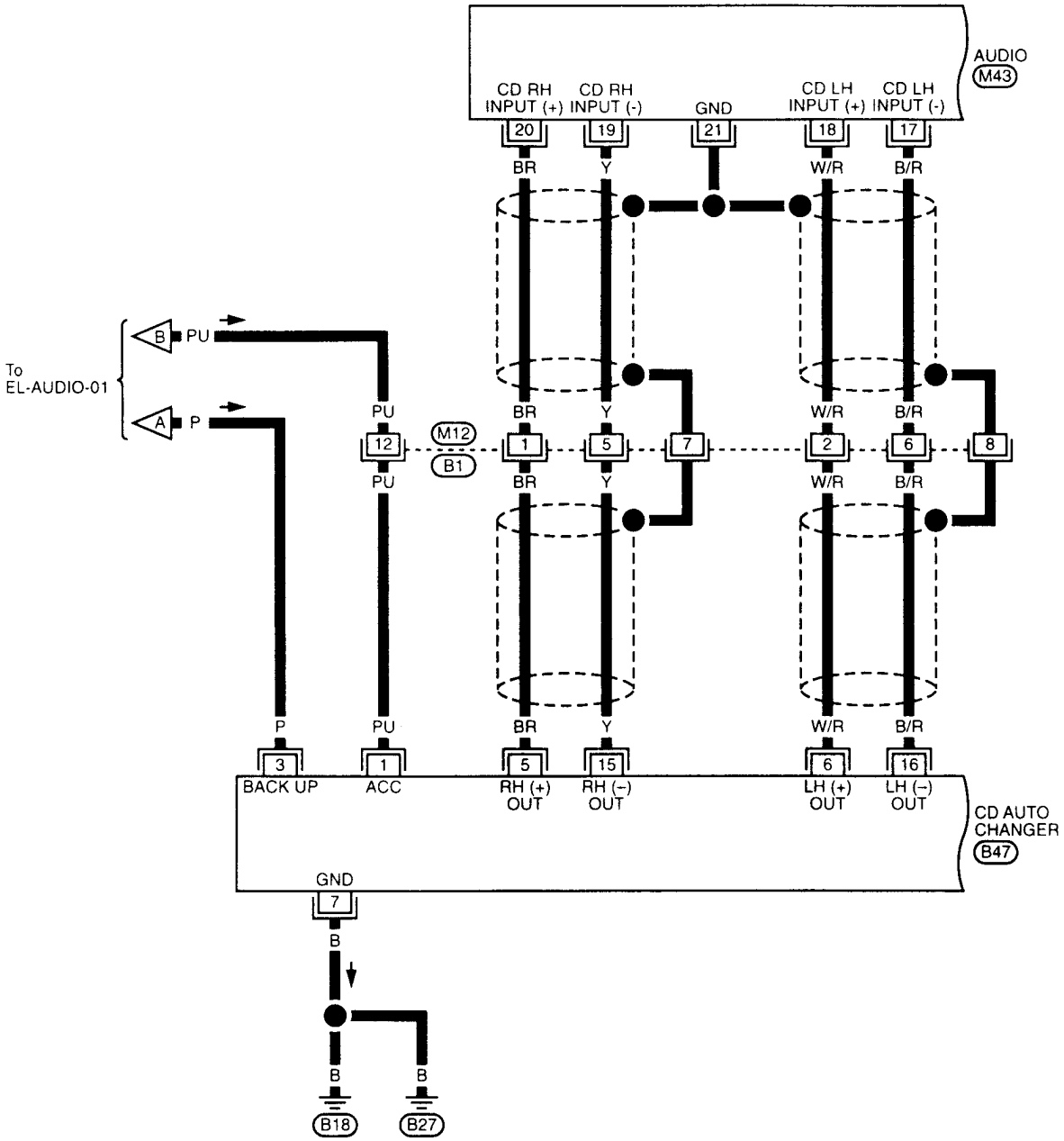


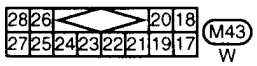


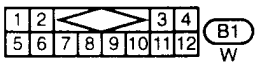
YEL737

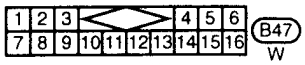
Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-05





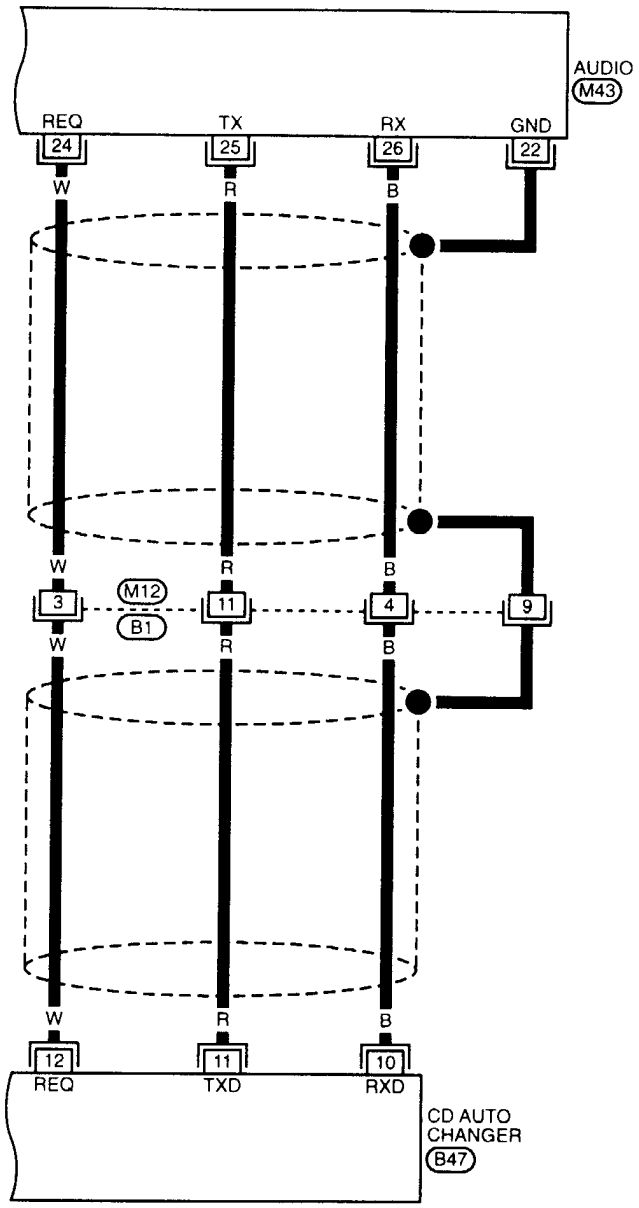


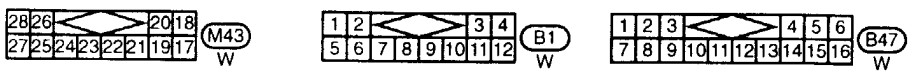


YEL738

Wiring Diagram — AUDIO — (Cont'd)

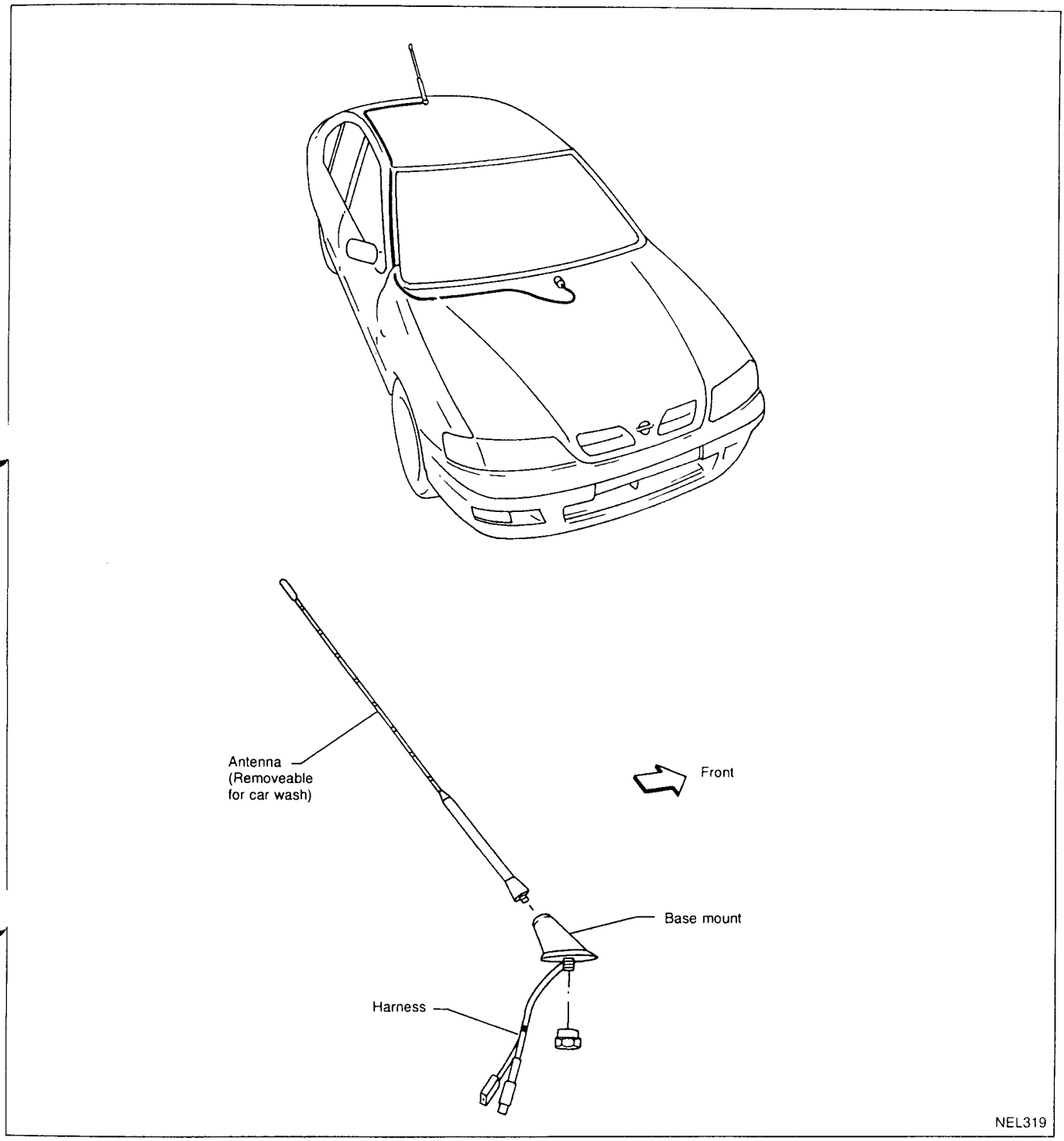
EL-AUDIO-06

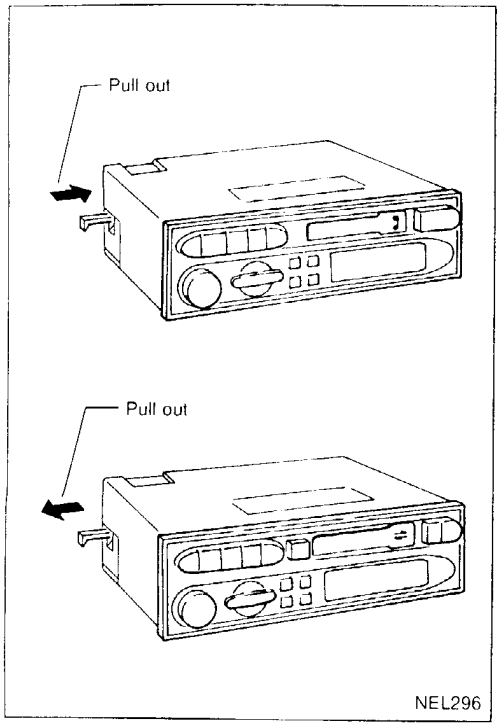




YEL739

Location of Antenna



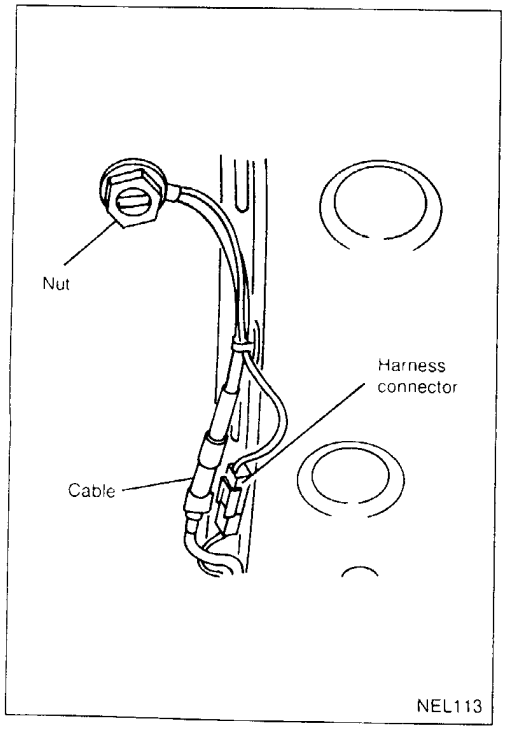


Radio

Before removing the connectors at the back of the radio unit, pull the sliding rod to the "unlock" position.
After having connected the connectors, return the sliding rod to the "lock" position.

ANTI-THEFT SYSTEM

The radio unit is integrated in the vehicle security system.
Due to this feature, the radio unit can only be serviced by a authorised service centre when disconnected from the vehicle.
For the correct service procedure refer to the applicable Technical Bulletin or contact your Distributor.



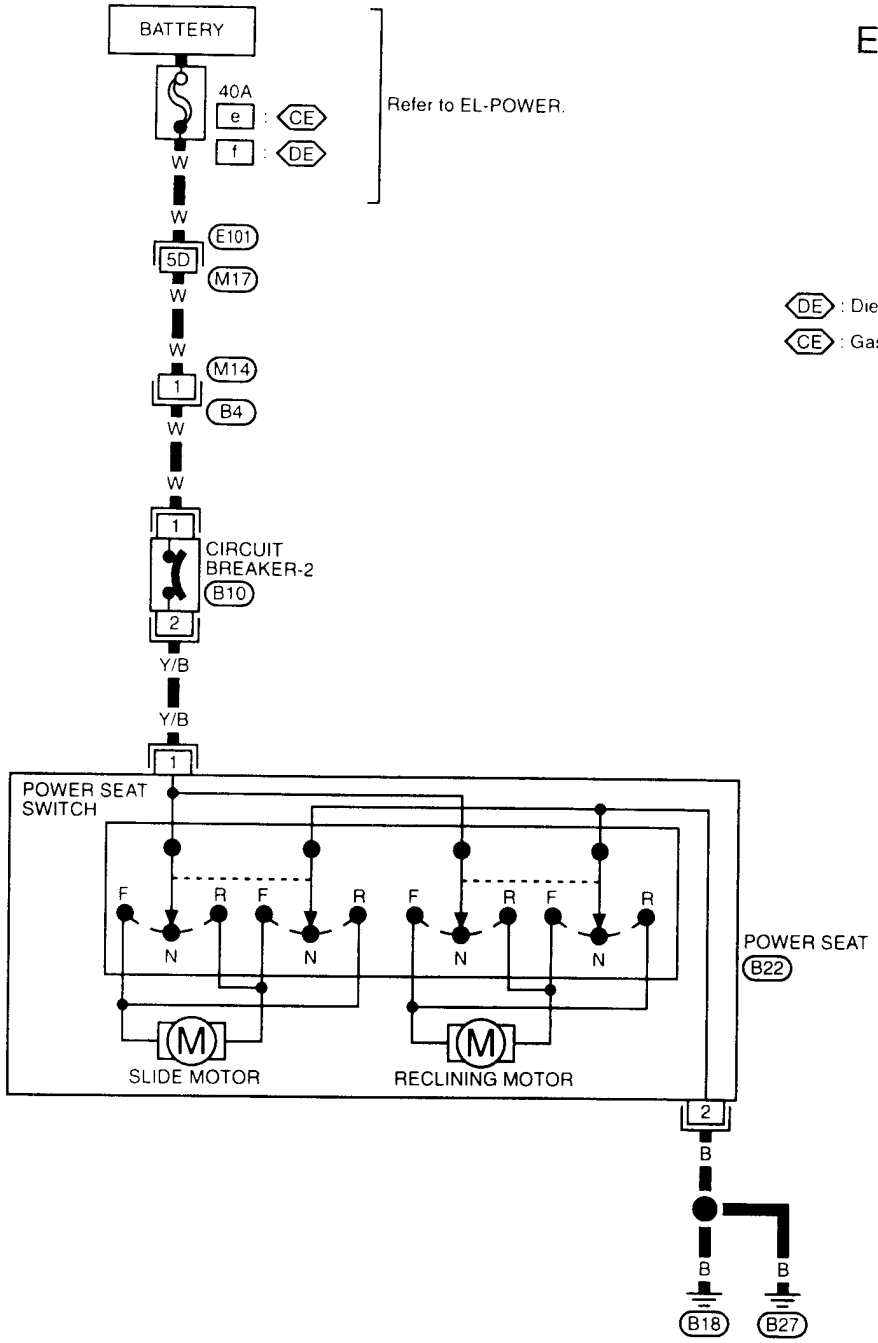
Antenna Rod Replacement

REMOVAL

1. Remove headliner — Refer to BT-section.
2. Disconnect harness and cable.
3. Remove securing nut.
4. Remove antenna.

Wiring Diagram — SEAT —

EL-SEAT-01



B4 W

B10 , B22 W

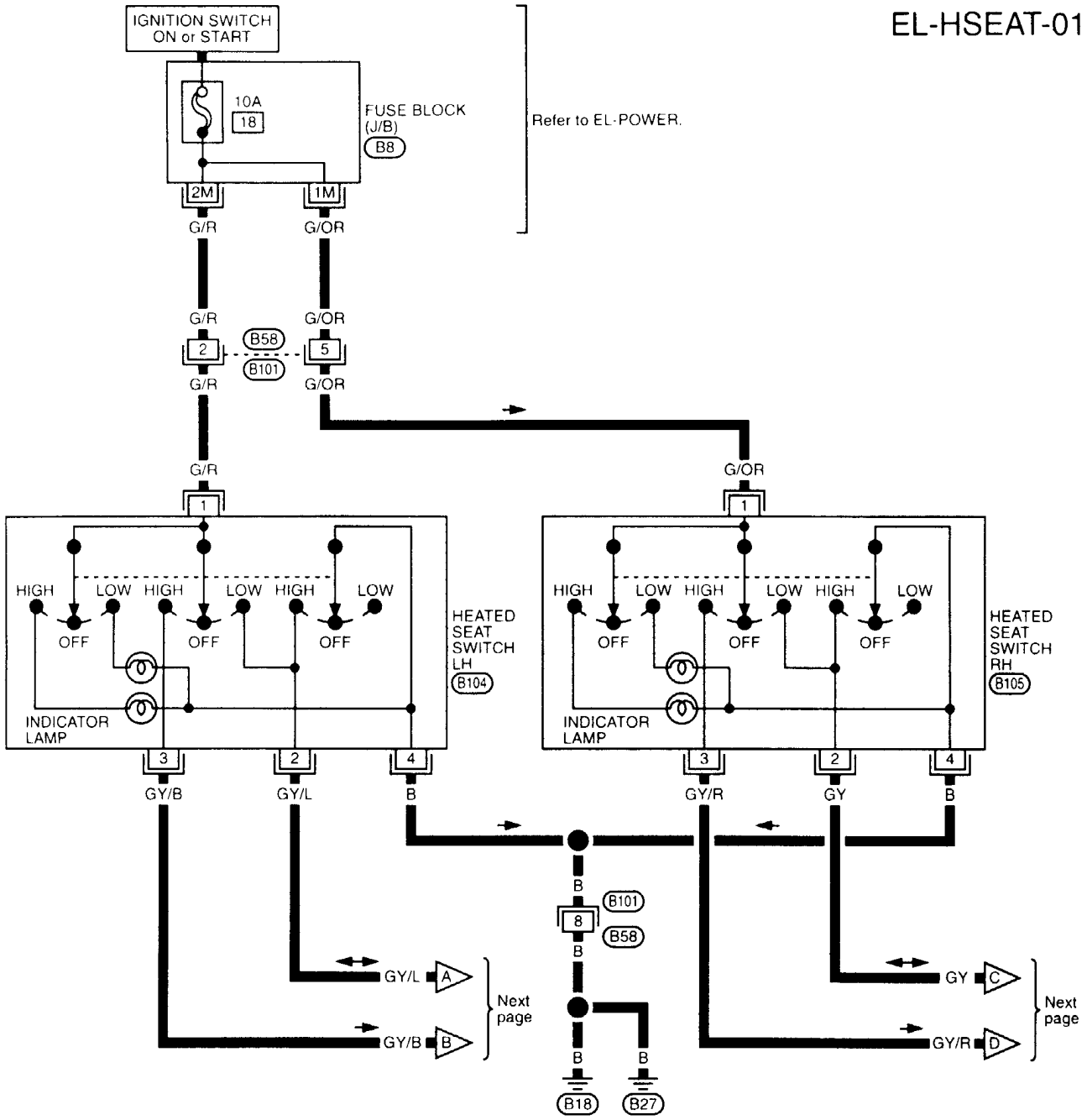
Refer to last page (Foldout page).
M17 , E101

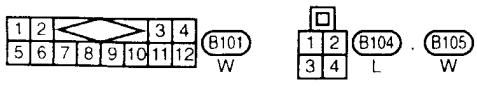
YEL742

★ For location of heating unit, refer to "SEAT" in BT section.

Wiring Diagram — H/SEAT —

EL-HSEAT-01



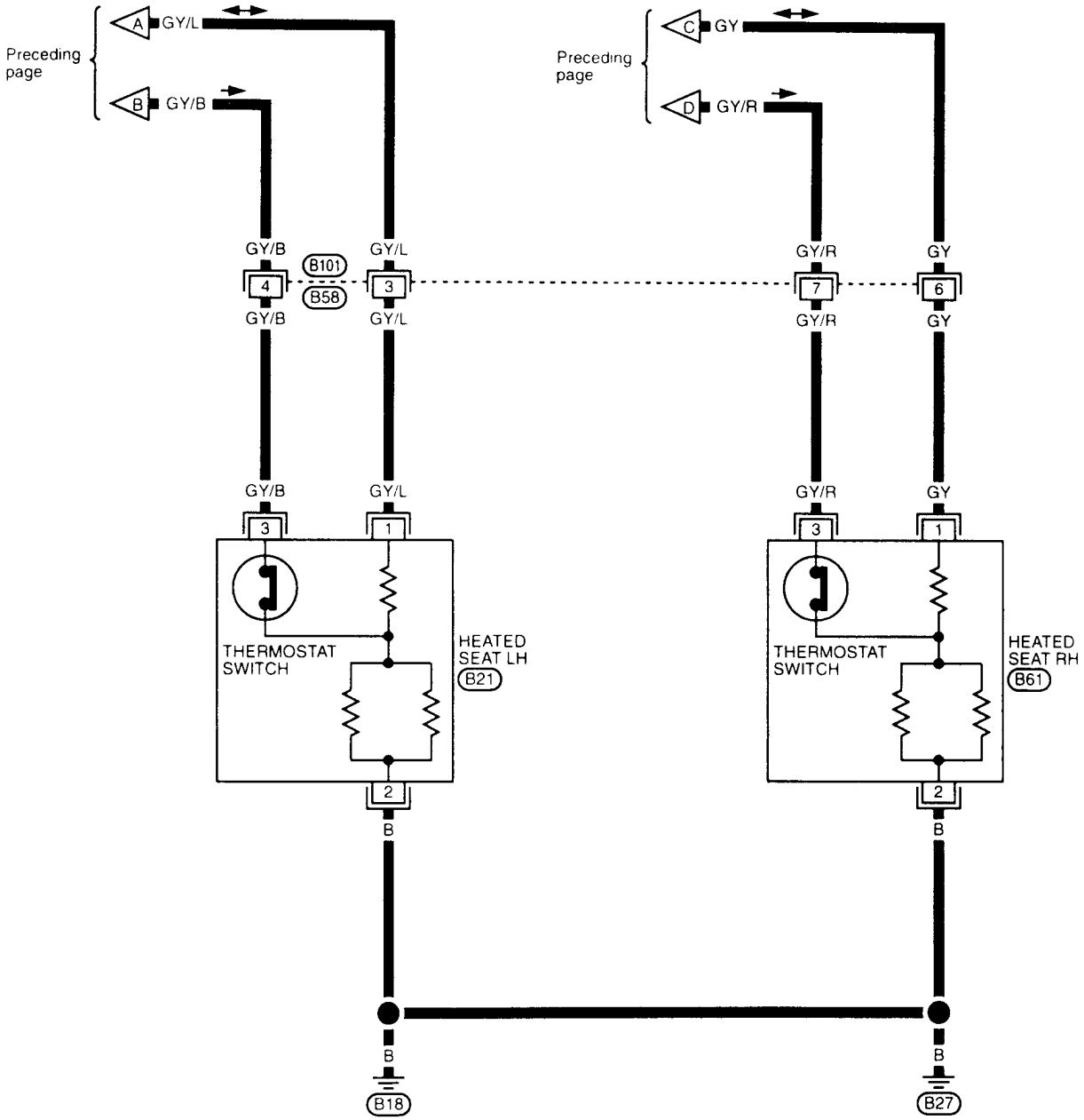


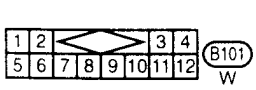
Refer to last page (Foldout page)
B8

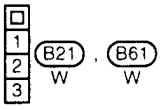
YEL743

Wiring Diagram — H/SEAT — (Cont'd)

EL-HSEAT-02

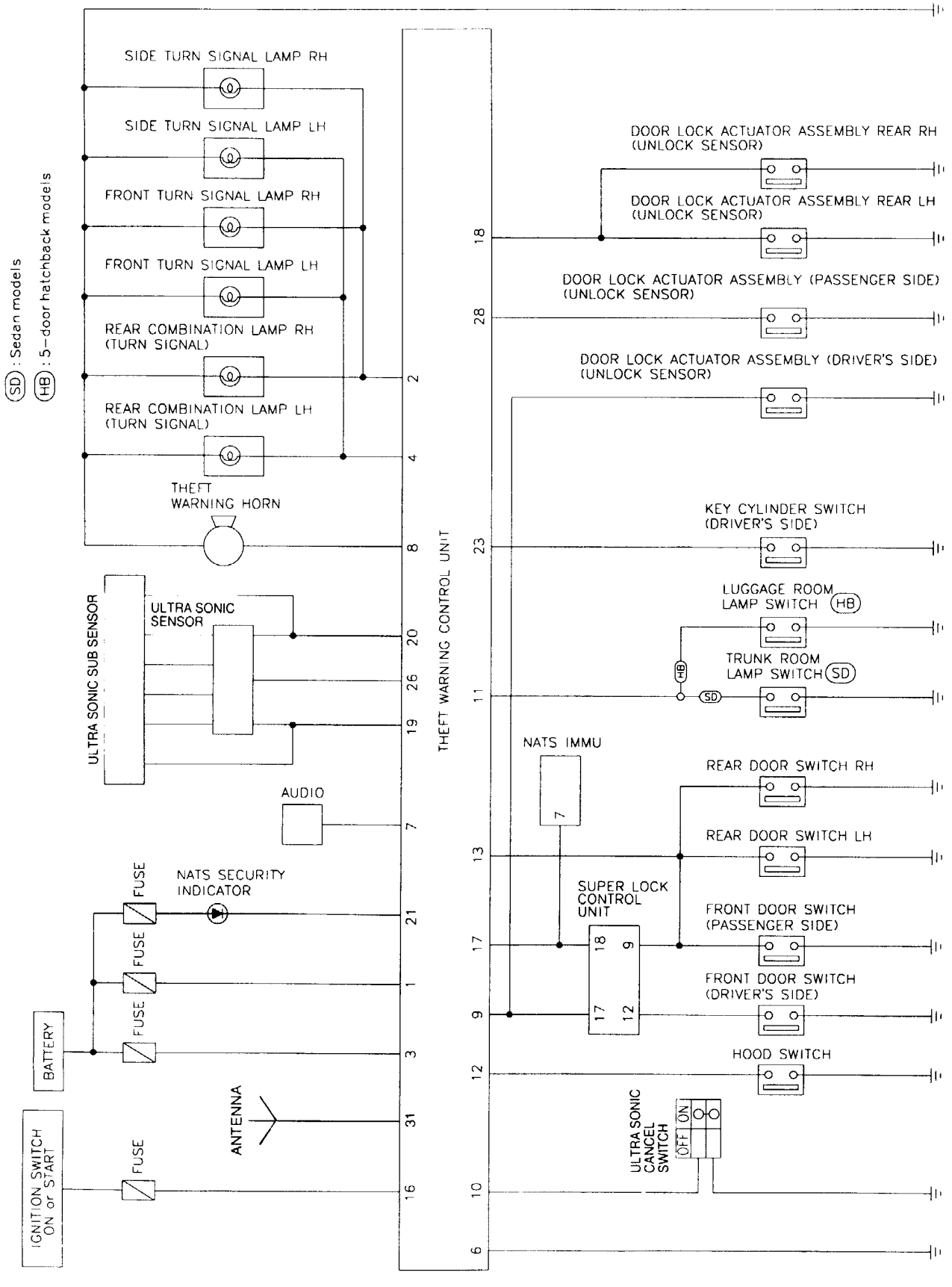






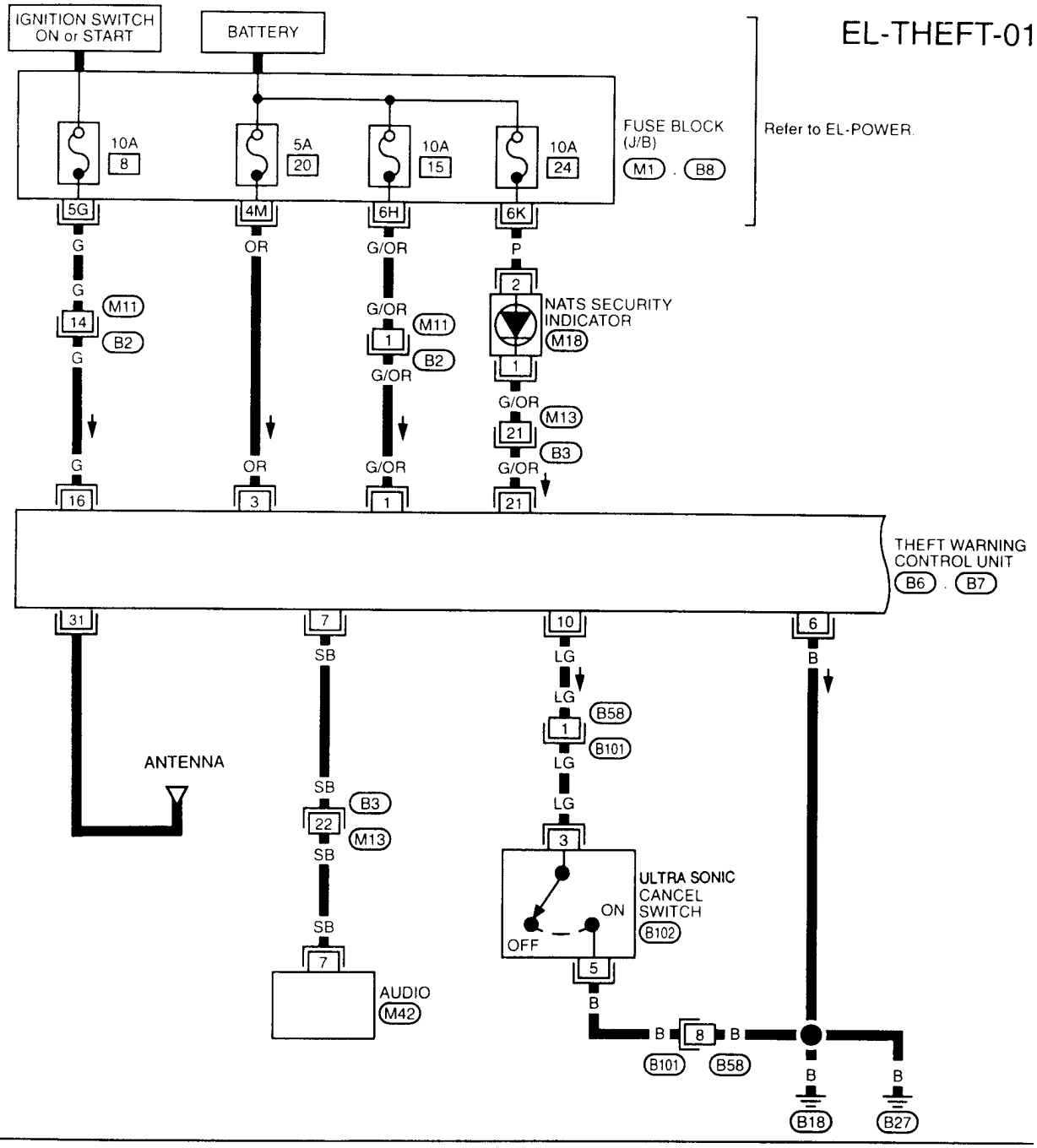
YEL744

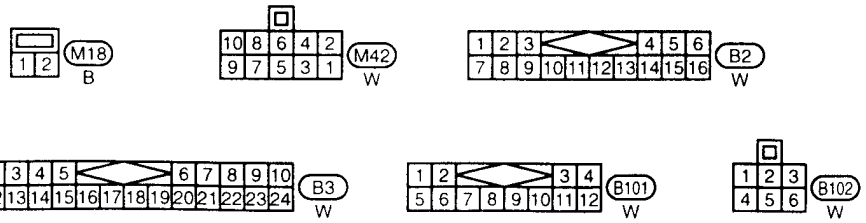
Schematic



YEL761

Wiring Diagram — THEFT —





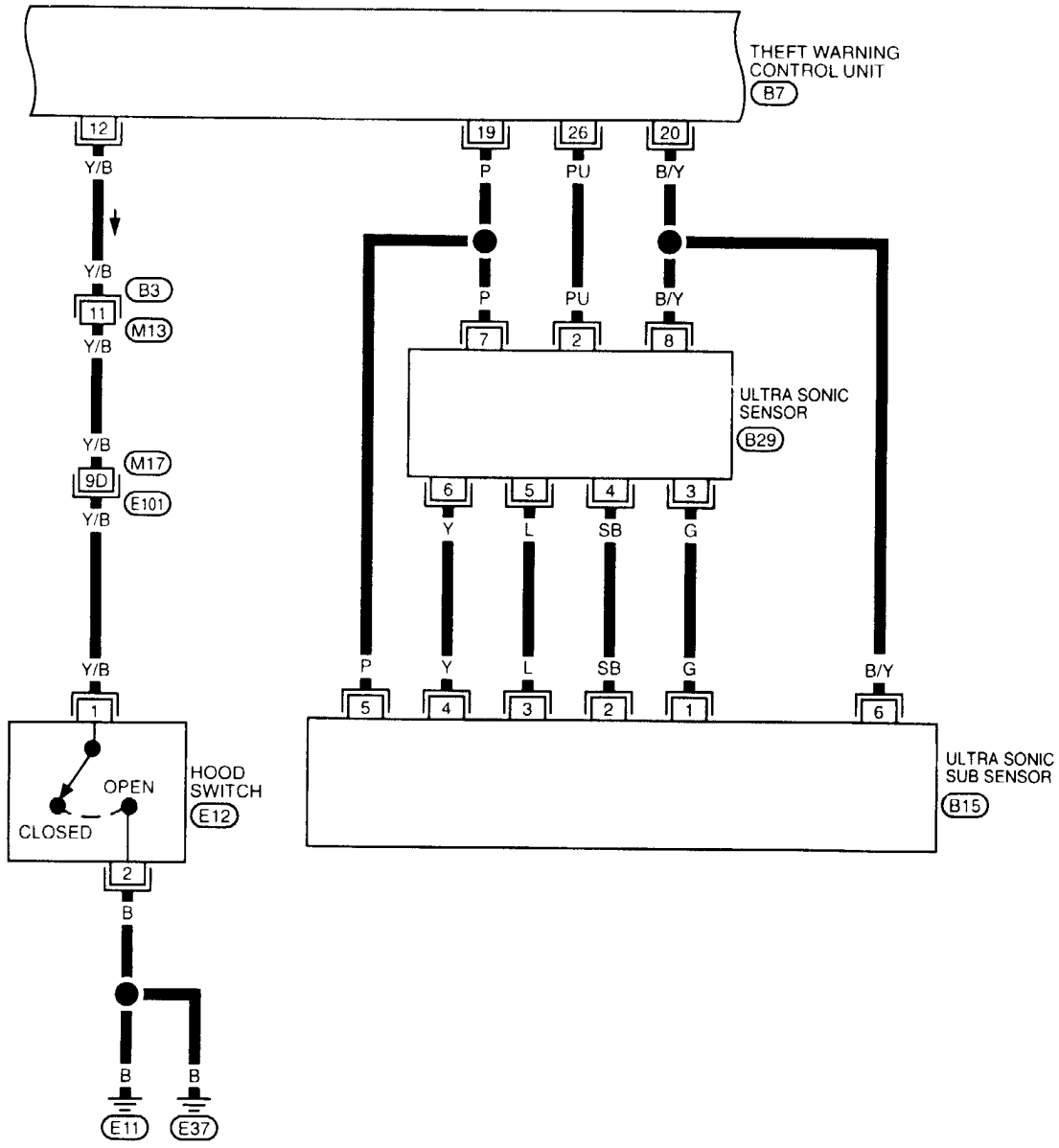
Refer to last page (Foldout page).

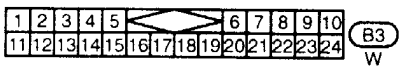
M1
B8
B6
B7

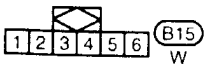
YEL752

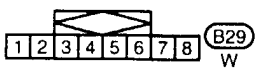
Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-02







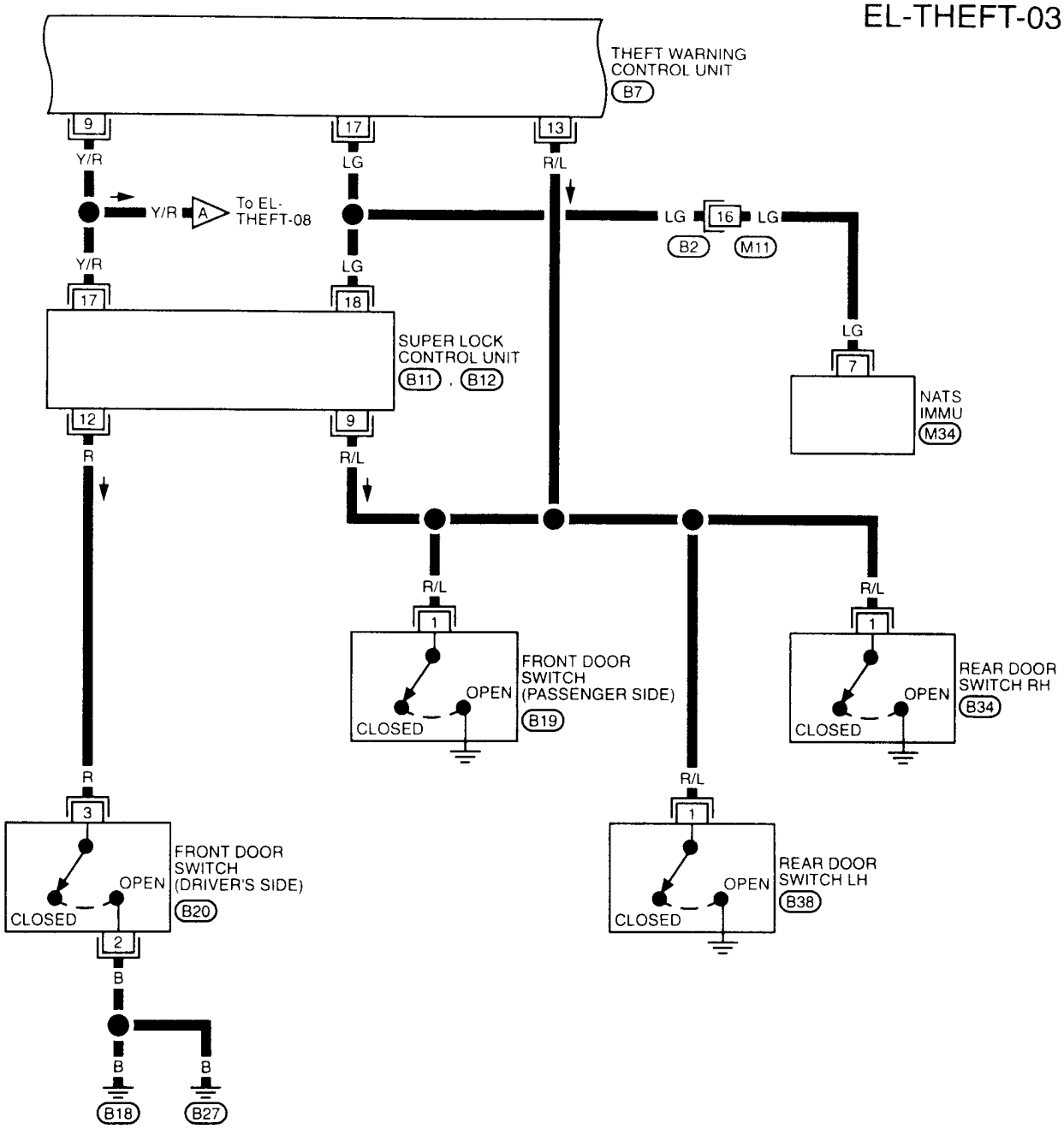


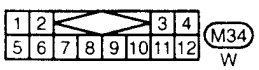
Refer to last page (Foldout page).
M17 , E101
B7

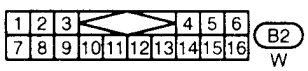
YEL753

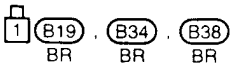
Wiring Diagram — THEFT — (Cont'd)

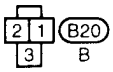
EL-THEFT-03











Refer to last page (Foldout page).

B7

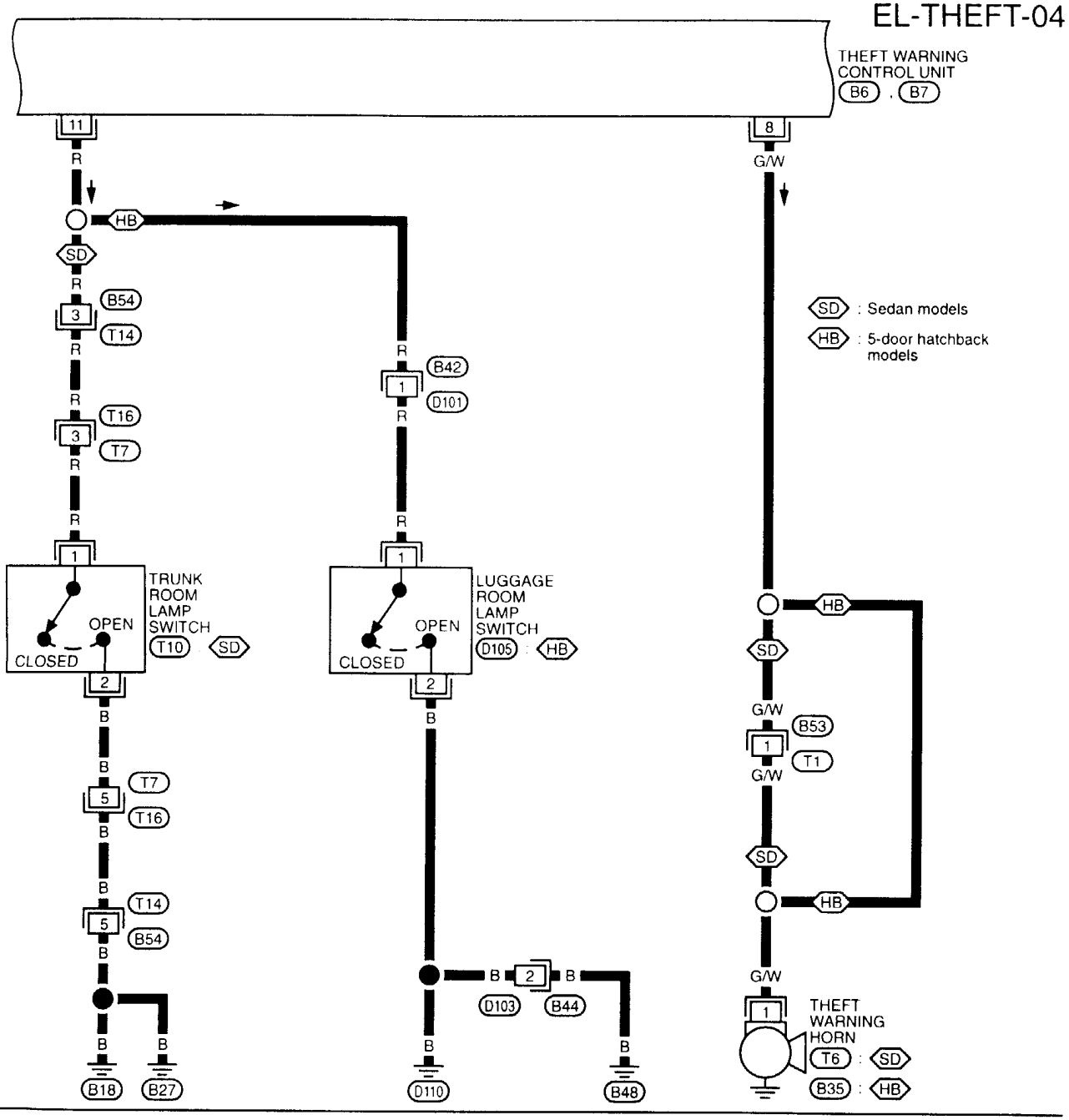
B11

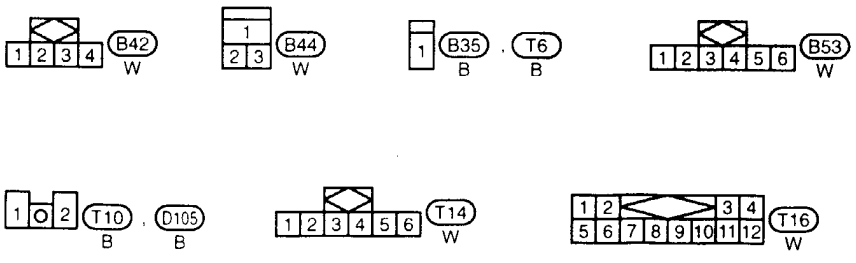
B12

YEL754

Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-04





Refer to last page (Foldout page).

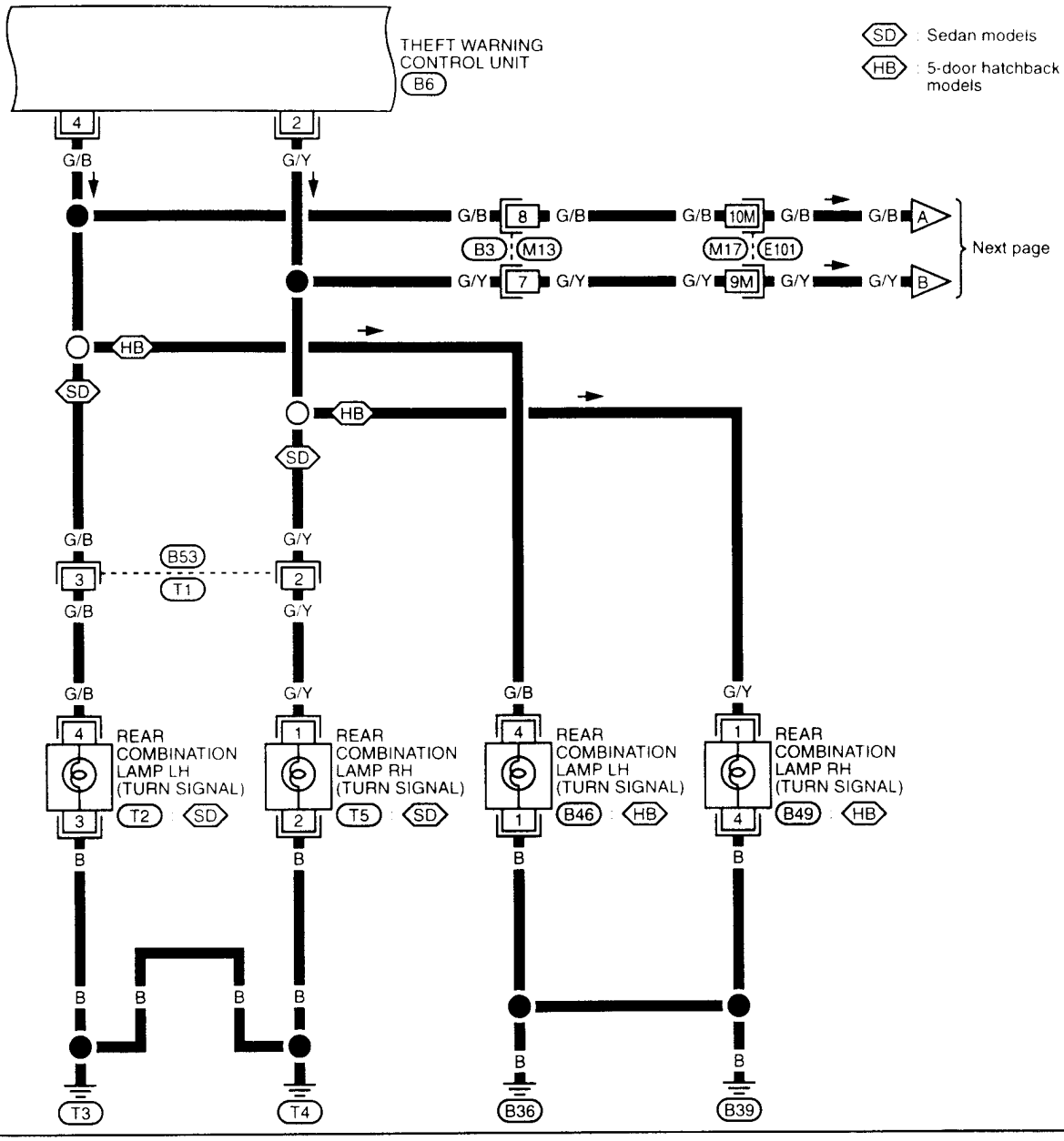
B6

B7

YEL755

Wiring Diagram — THEFT — (Cont'd)

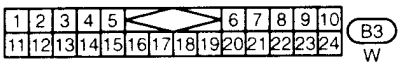
EL-THEFT-05

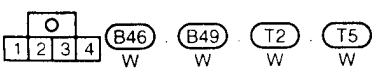


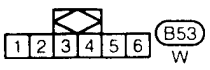
Refer to last page (Foldout page).

M17 · E101

B6



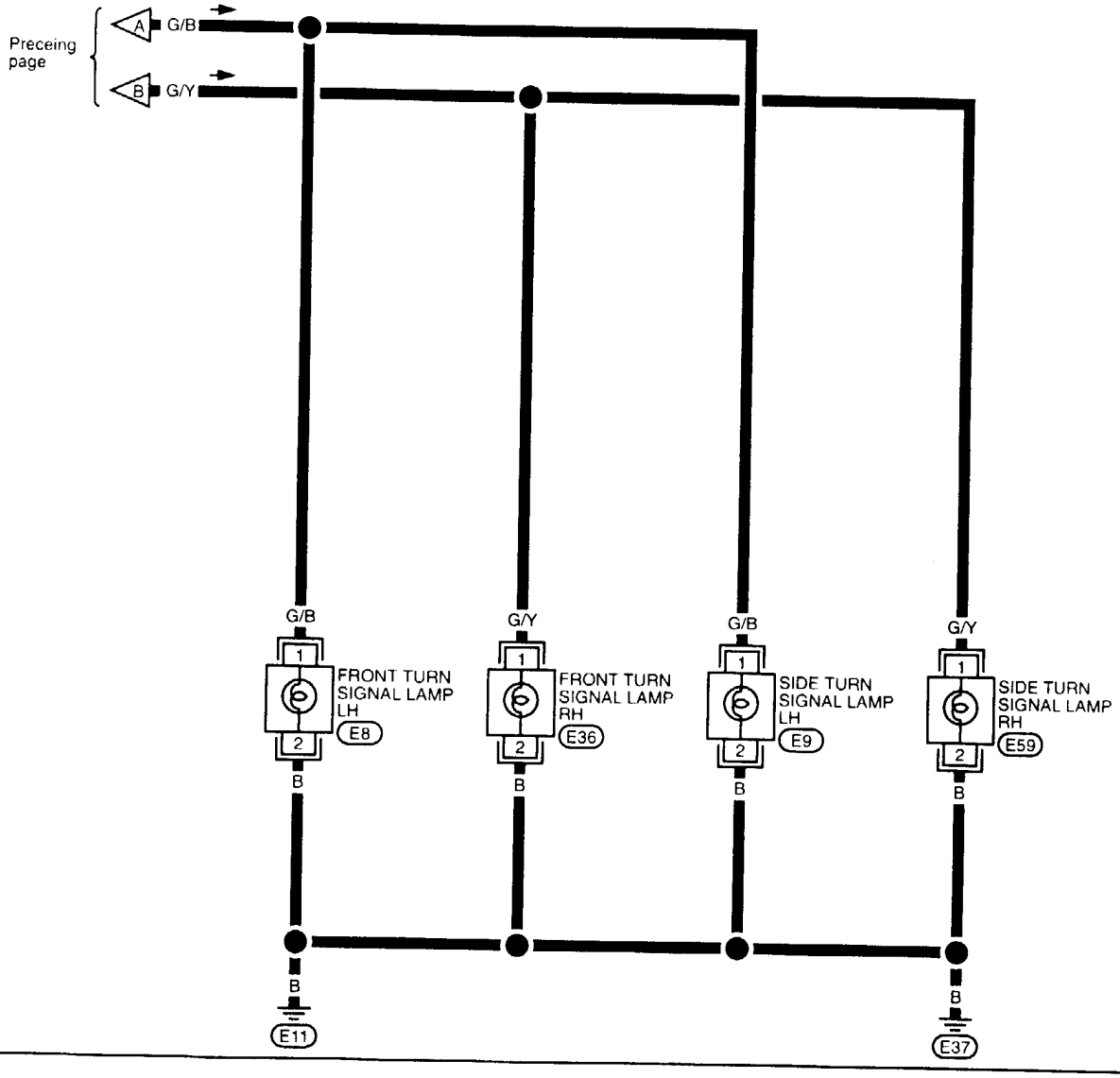




YEL756

Wiring Diagram — THEFT — (Cont'd)

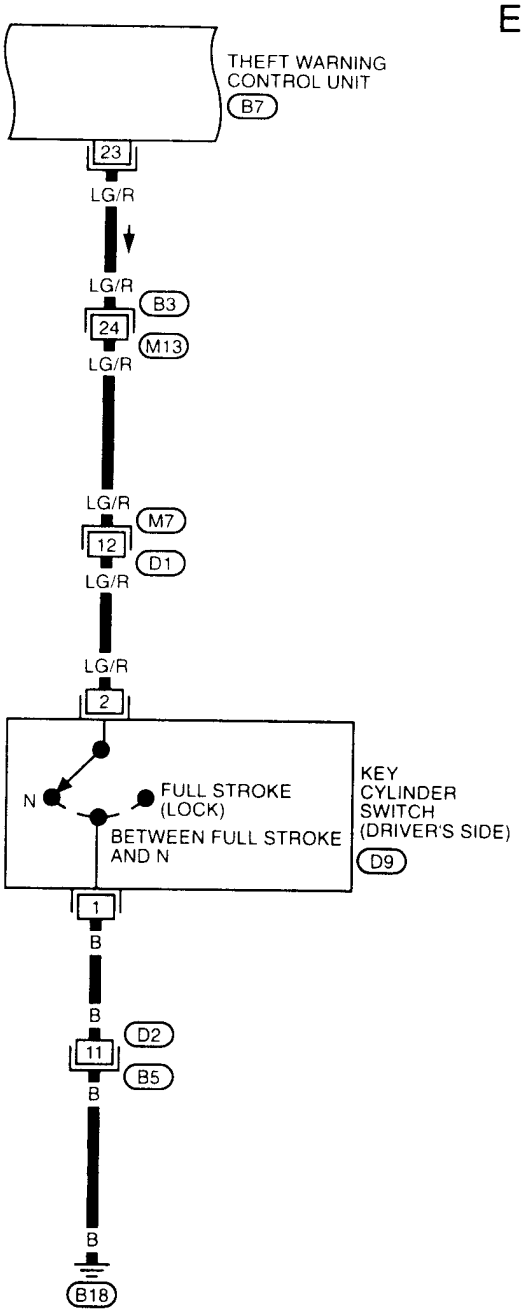
EL-THEFT-06

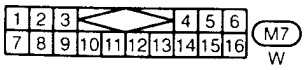


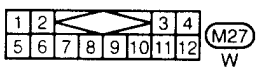
YEL757

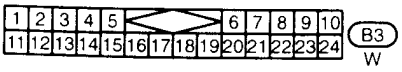
Wiring Diagram — THEFT — (Cont'd)

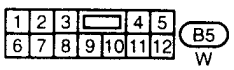
EL-THEFT-07

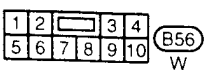


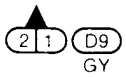










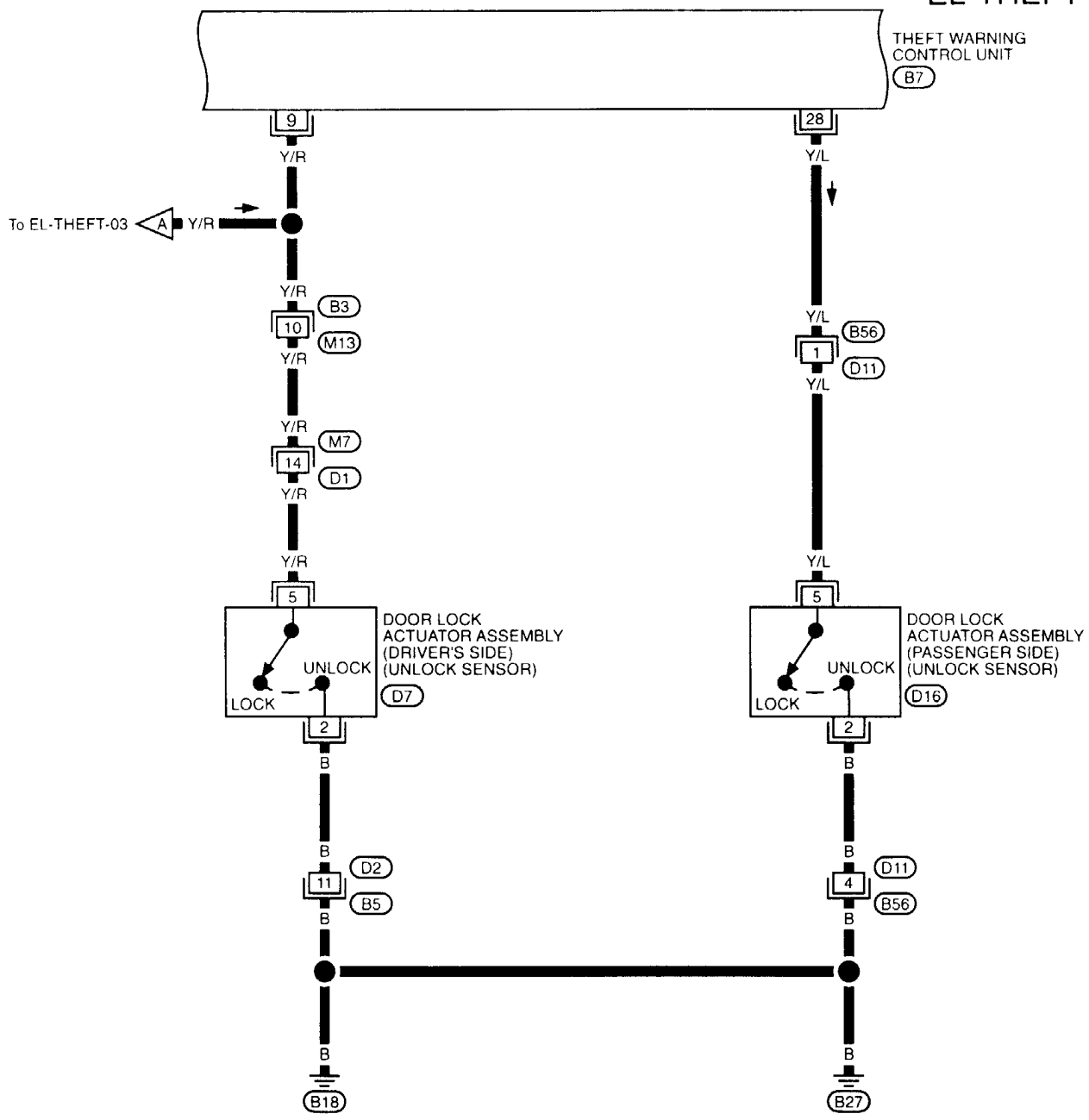


Refer to last page (Foldout page).
B7

YEL758

Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-08



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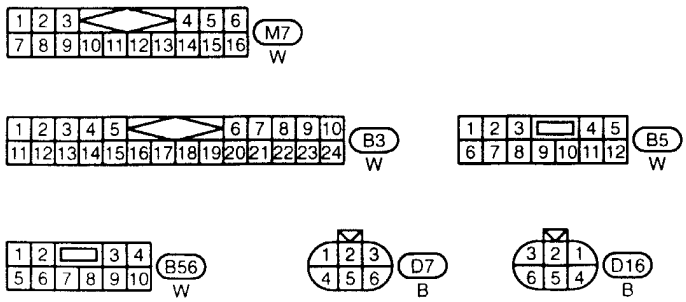
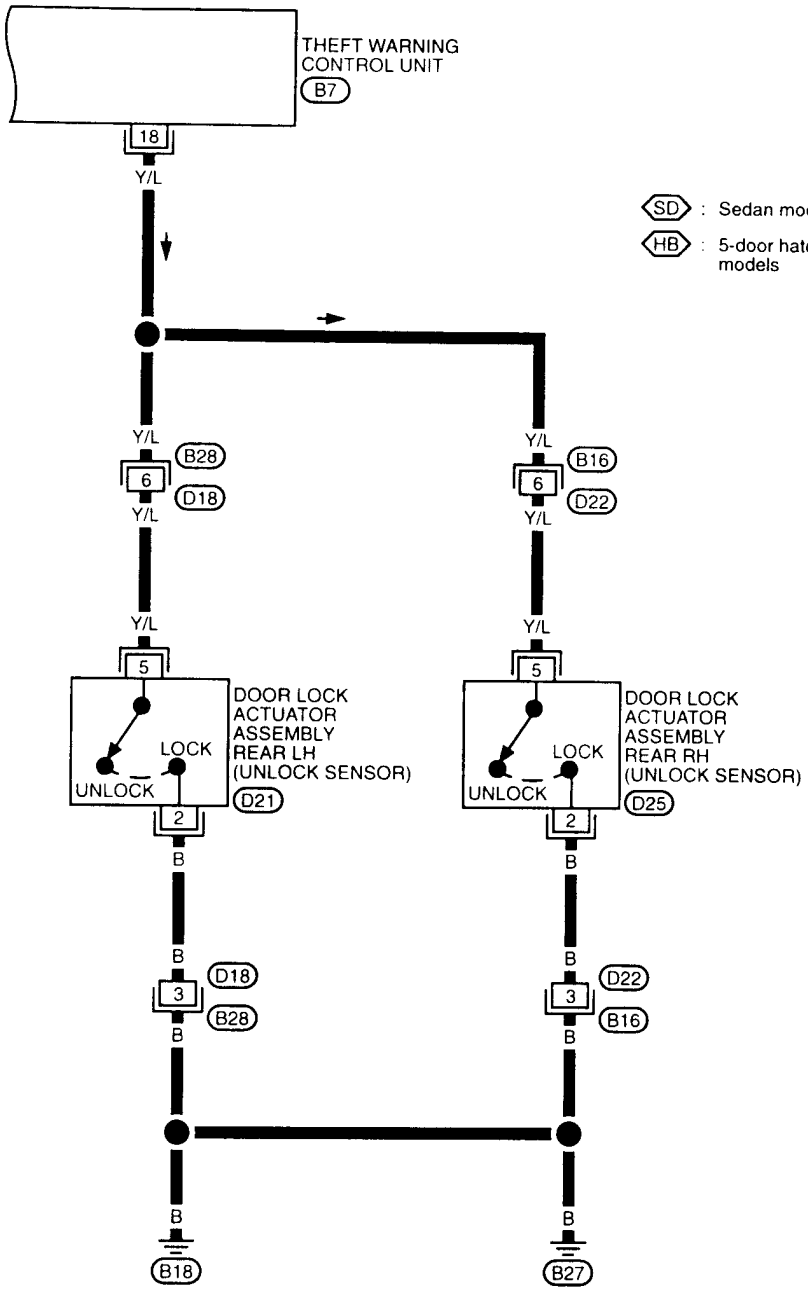
B7



YEL759

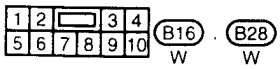
Wiring Diagram — THEFT — (Cont'd)

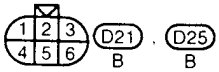
EL-THEFT-09



Refer to last page (Foldout page).

B7





YEL760

System Description

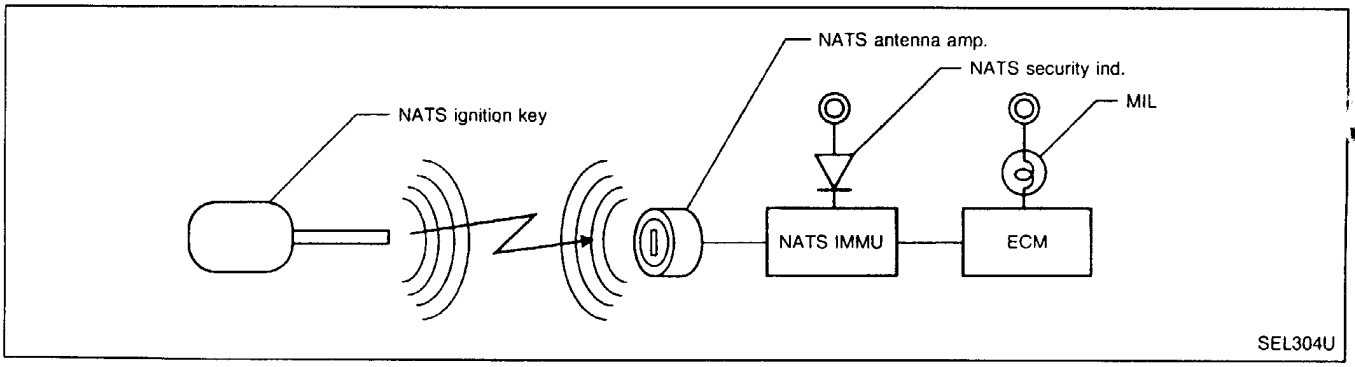
NATS V2.0 for Nissan model P11 has the following immobiliser functions:

- Since only NATS ignition keys, whose ID nos. have been registered into the ECM and IMMU of NATS, allow the engine to run, operation of a stolen vehicle without a NATS registered key is prevented by NATS.
  That is to say, NATS V2.0 will immobilize the engine if someone tries to start it without the registered key of NATS V2.0.
- Both of the originally supplied ignition key IDs have been NATS registered.
  If requested by the vehicle owner, a maximum of four key IDs can be registered into the NATS components.
- The NATS security indicator (NATS security ind.) blinks when the ignition switch is in "LOCK" or "ACC" position. Therefore, NATS warns outsiders that the vehicle is equipped with the anti-theft system.
- When NATS detects trouble, the malfunction indicator lamp (MIL) blinks.
- NATS trouble diagnoses, system initialisation and additional registration of other NATS ignition key IDs must be carried out using CONSULT hardware and CONSULT NATS software.
  When NATS initialisation has been completed, the ID of the inserted ignition key is automatically NATS registered. Then, if necessary, additional registration of other NATS ignition key IDs can be carried out.
  Regarding the procedures of NATS initialisation and NATS ignition key ID registration, refer to CONSULT operation manual, NATS V2.0.
- When diagnosing NATS V2.0 using CONSULT, adapter and adapter harness for NATS V1.0 are not necessary, although a direct DDL cable connection between CONSULT and DDL connector is required.
- When servicing a malfunction of the NATS V2.0 (indicated by flashing of Malfunction Indicator Lamp) or registering another NATS ignition key ID no. , it may be necessary to re-register original key identification. Therefore, be sure to receive all keys from vehicle owner.

System Composition

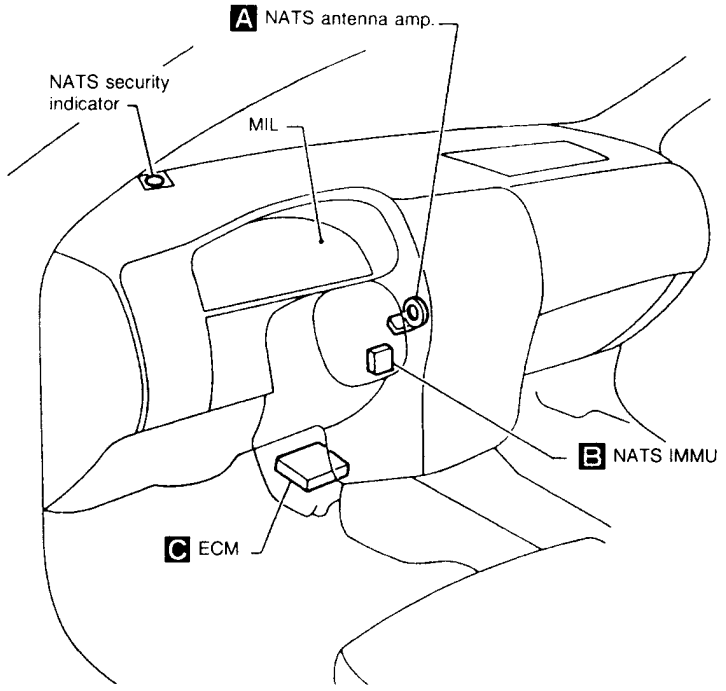
The immobiliser function of the NATS for Nissan model P11 consists of the following:

- NATS ignition key
- NATS antenna amp. located in the ignition key cylinder
- NATS immobiliser control unit (NATS IMMU)
- Engine control module (ECM)
- NATS security indicator located under the center cluster (NATS security ind.)
- Malfunction indicator lamp (MIL)

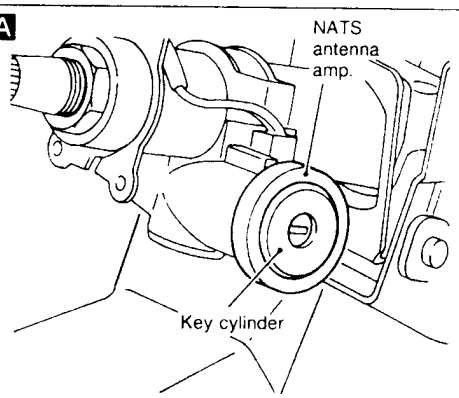


Component Parts Location

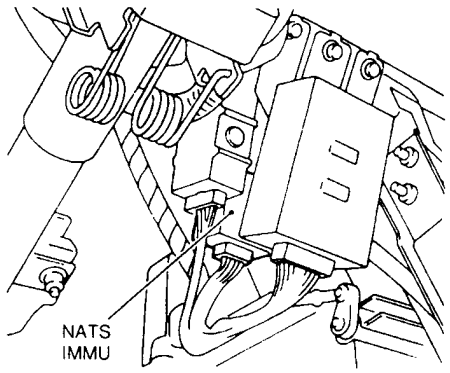
LHD models



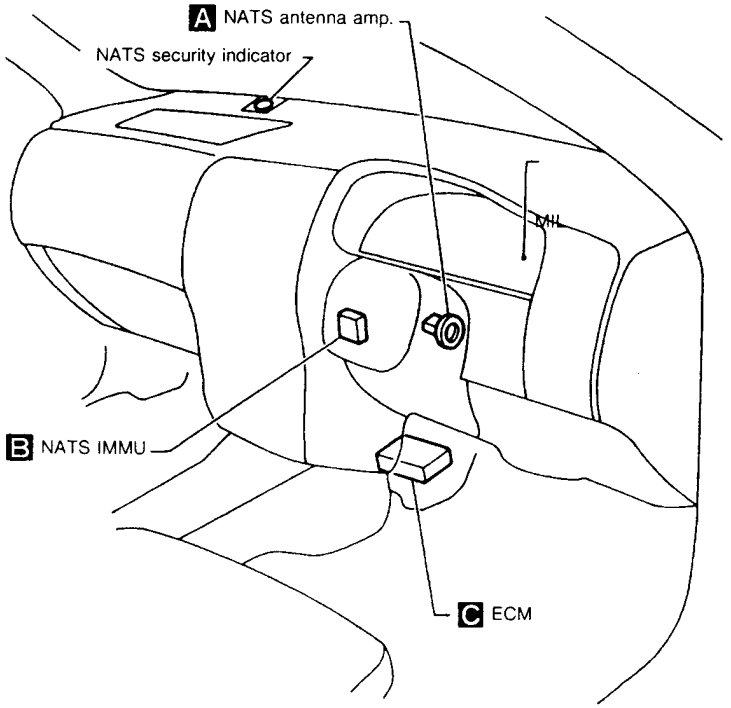
A



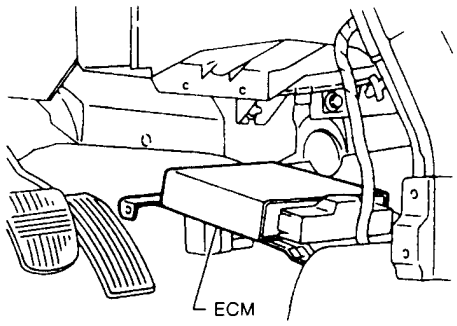
B



RHD models



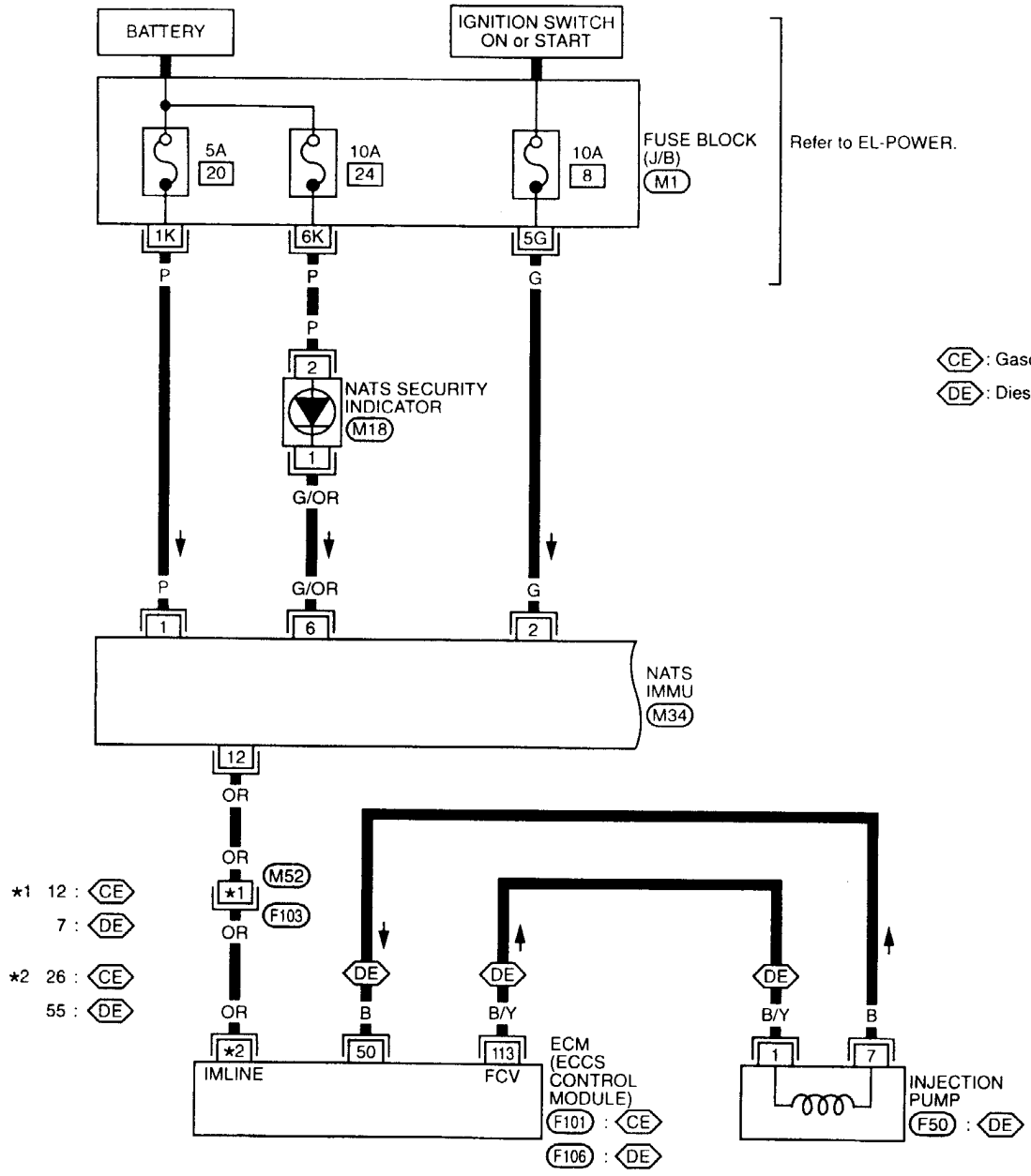
C

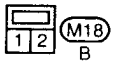


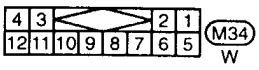
YEL841

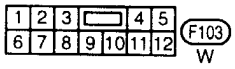
Wiring Diagram — NATS —

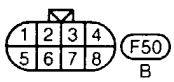
EL-NATS-01











Refer to last page (Foldout page).

M1

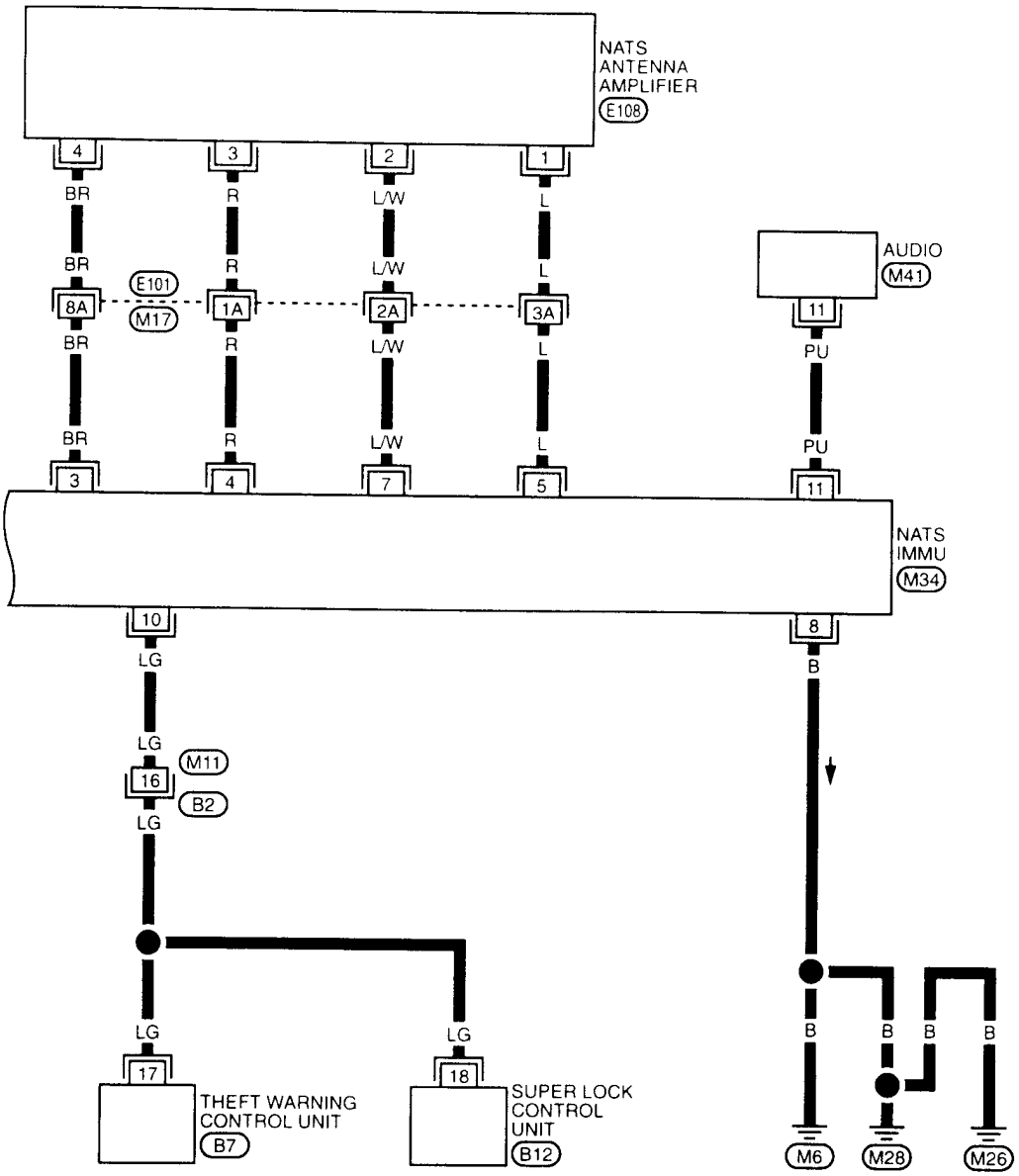
F101

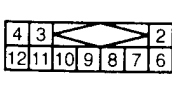
F106

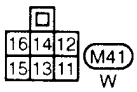
YEL762

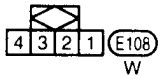
Wiring Diagram — NATS — (Cont'd)

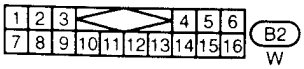
EL-NATS-02











Refer to last page (Foldout page).

M17 , E101

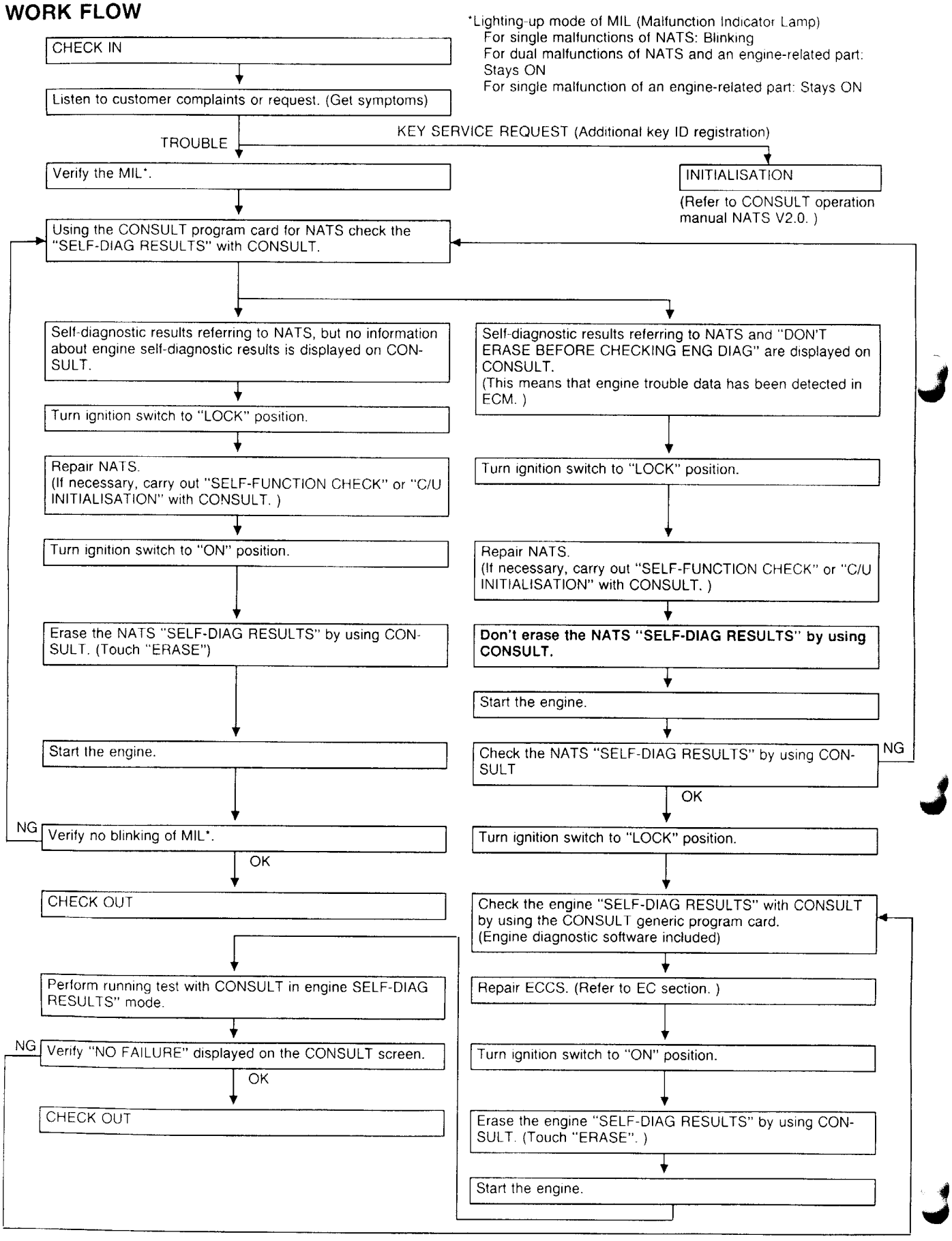
B7

B12

YEL763

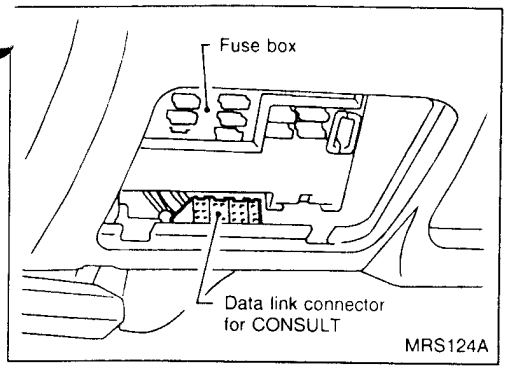
Trouble Diagnoses

WORK FLOW

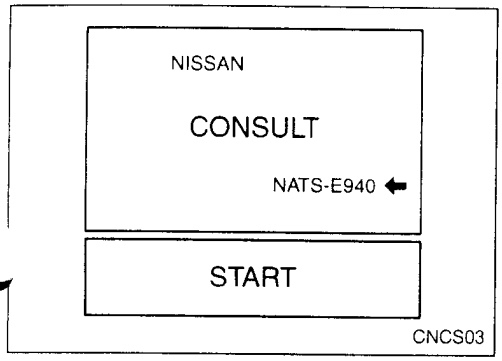


Trouble Diagnoses (Cont'd)

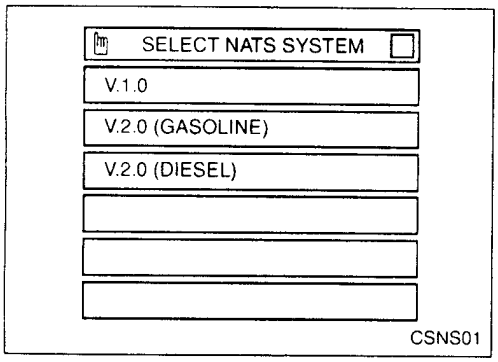
CONSULT INSPECTION PROCEDURE



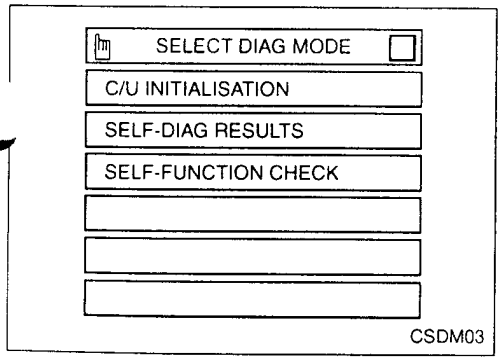
1. Turn off ignition switch.
2. Connect "CONSULT" to Data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



3. Insert NATS program card into CONSULT.
   ⬅ : **Program card NATS-E940**
4. Turn on ignition switch.
5. Touch "START".



6. Touch "V. 2.0 (GASOLINE)".



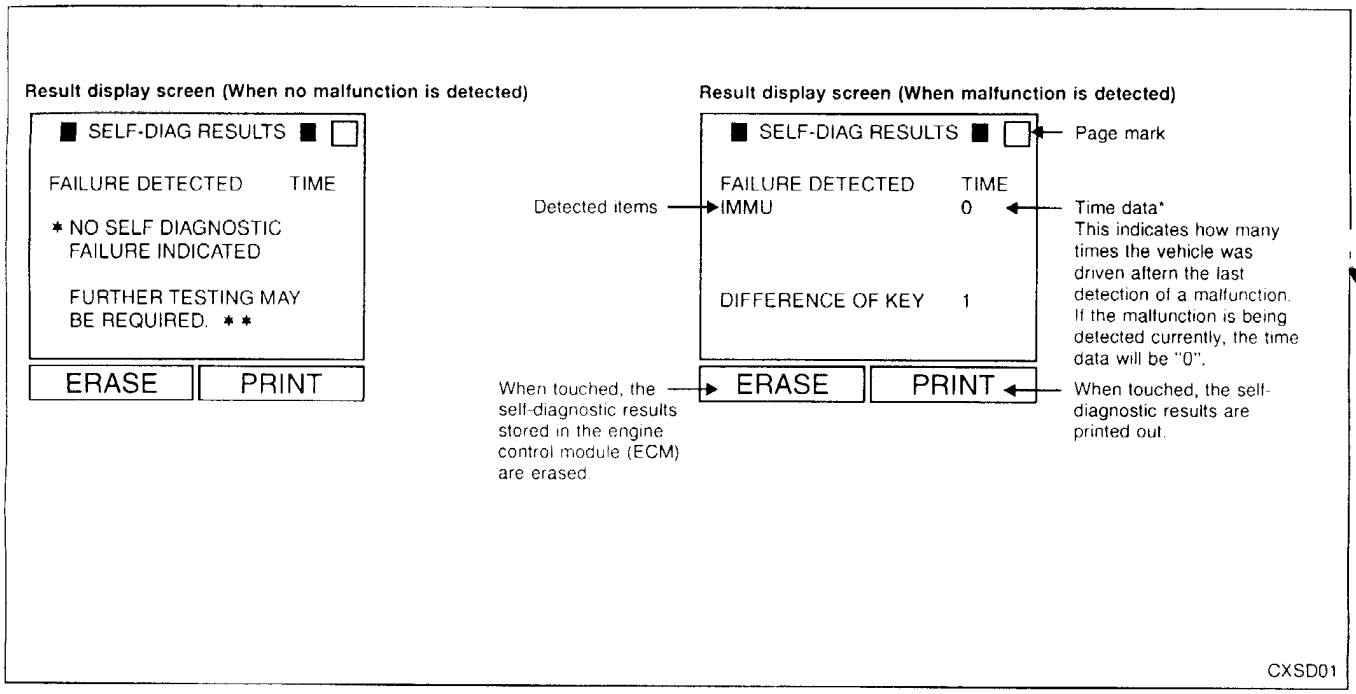
7. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT Operation Manual, NATS V2.0.

CONSULT DIAGNOSTIC TEST MODE FUNCTION

CONSULT DIAGNOSTIC TEST MODE	Description
C/U INITIALIZATION	When replacing any of the following three components, C/U initialization is necessary. [NATS ignition key/IMMU/ECM]
SELF-FUNCTION CHECK	ECM checks its own NATS communication interface by itself.
SELF-DIAGNOSTIC RESULTS	Detected items (screen terms) are as shown in the chart below.

HOW TO READ SELF-DIAGNOSTIC RESULTS



* If trip number is more than 1, MIL does not blink.

SELF-DIAGNOSTIC RESULTS ITEM CHART

Detected items (Screen terms)	Description	Reference page
IMMU	ECM received the signal from IMMU that IMMU is malfunctioning.	EL-217
ECM	ECM is malfunctioning.	EL-217
CHAIN OF ECM-IMMU	Communication impossible between ECM and IMMU.	EL-218
DIFFERENCE OF KEY	IMMU can receive the key ID signal but the result of ID verification between key ID and IMMU is NG.	EL-220
CHAIN OF IMMU-KEY	IMMU cannot receive the key ID signal.	EL-221
ID DISCORD, IMM-ECM	The result of ID verification between IMMU and ECM is NG. System initialisation is required.	EL-223
MINGLE NOISE	Noise (interference) mingled into NATS communication lines during communicating.	EL-224
DON'T ERASE BEFORE CHECKING ENG DIAG	Engine trouble data and NATS trouble data have been detected in ECM.	EL-212
LOCK MODE	When an unregistered ignition key is used, or if the starting operation is carried out two or more times consecutively with the ignition key, IMMU or ECM malfunctioning, NATS will shift the mode to one which prevents the engine from being started.	EL-226

SYMPTOM MATRIX CHART 1 (Self-diagnosis related item)

X: Possibility item, *MIL: Malfunction Indicator Lamp

SYMPTOM	Displayed "SELF-DIAG RESULTS" on CONSULT screen.	DIAGNOSTIC PROCEDURE (Reference page)	SYSTEM (Malfunctioning part or mode)	REFERENCE PART NO. OF ILLUSTRATION ON NEXT PAGE
• Blinking of MIL*. • Engine will start.	IMMU	PROCEDURE 1 (EL-217)	IMMU	A
	ECM	PROCEDURE 2 (EL-217)	ECM	B
• MIL blinking • Engine hard to start	CHAIN OF ECM-IMMU	PROCEDURE 3 (EL-218)	Open circuit in battery voltage line of IMMU circuit	C1
			Open circuit in ignition line of IMMU circuit	C2
			Open circuit in ground line of IMMU circuit	C3
			Open circuit in communication line between IMMU and ECM	C4
			Short circuit between IMMU and ECM communication line and battery voltage line	C4
			Short circuit between IMMU and ECM communication line and ground line	C4
			Open circuit in power source line of ANT/AMP circuit	E3
			ECM	B
			IMMU	A
	DIFFERENCE OF KEY	PROCEDURE 4 (EL-220)	Unregistered key	D
			IMMU	A
	CHAIN OF IMMU-KEY	PROCEDURE 5 (EL-221)	Communication line between ANT/AMP and IMMU: Open circuit or short circuit of battery voltage line or short circuit of ground line	E1
				E2
			Open circuit in power source line of ANT/AMP circuit	E3
			Open circuit in ground line of ANT/AMP circuit	E4
			Malfunction of key ID chip	E5
			IMMU	A
			Antenna amp.	E6

Trouble Diagnoses (Cont'd)

SYMPTOM	Displayed "SELF-DIAG RESULTS" on CONSULT screen.	DIAGNOSTIC PROCEDURE (Reference page)	SYSTEM (Malfunctioning part or mode)	REFERENCE PART NO. OF ILLUSTRATION ON NEXT PAGE
• MIL blinking • Engine hard to start	ID Discord, IMM-ECM	PROCEDURE 6 (EL-223)	System initialisation has not yet been completed.	F
			ECM	F
	MINGLE NOISE	PROCEDURE 7 (EL-224)	Noise interference in communication line	
	LOCK MODE	PROCEDURE 9 (EL-226)	LOCK MODE	D
• MIL staying ON	DONT'T ERASE BEFORE CHECKING ENG DIAG	WORK FLOW (EL-212)	Engine trouble data and NATS trouble data have been detected in ECM	

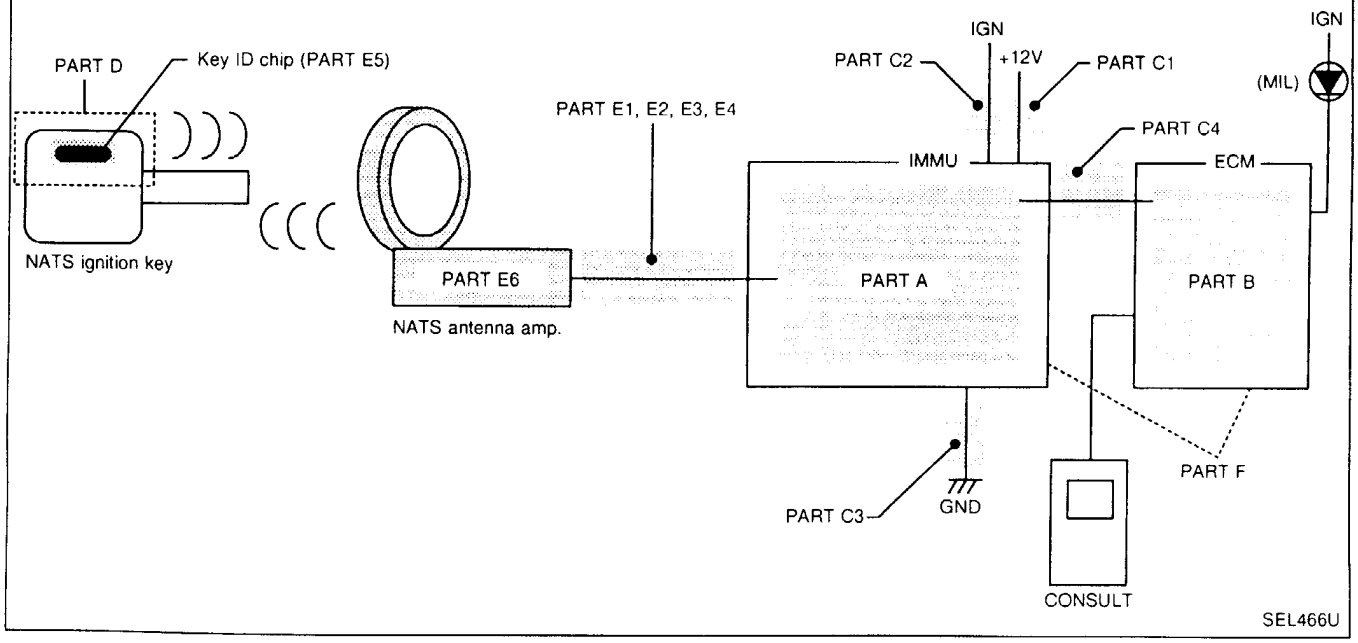
* Lighting-up mode of MIL (Malfunction Indicator Lamp)
For single malfuncgion of NATS: Blinking
For Dual malfunctions of NATS and an engine-related parts: Stays ON
For single malfunction of an engine-related part: Stays ON

SYMPTOM MATRIX CHART 2
(Non self-diagnosis related item)

X: Possibility item

SYMPTOM	DIAGNOSTIC PROCEDURE (Reference page)	SYSTEM (Malfunctioning part or mode)
NATS security ind. does not light up.	PROCEDURE 8 (EL-224)	NATS security ind.
		Open circuit between Fuse and NATS IMMU
		Continuation of initialisation mode
		NATS IMMU

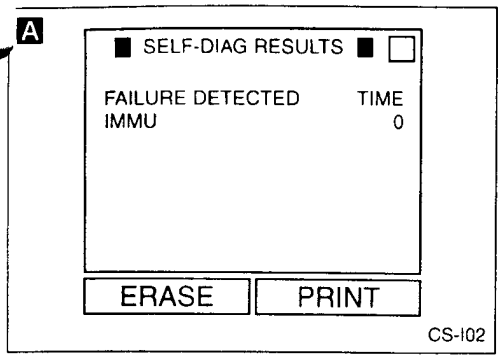
DIAGNOSTIC SYSTEM DIAGRAM



Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

Self-diagnostic results:
"IMMU" displayed on CONSULT screen



A

Confirm SELF-DIAGNOSTIC RESULTS "IMMU" displayed on CONSULT screen.
Ref. part No. * A.

↓ Yes

Replace IMMU.

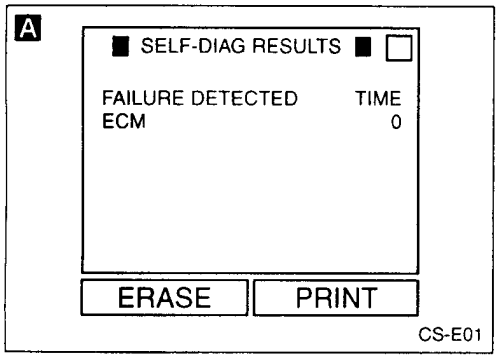
↓

Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

* Ref. part No. : reference part No. of Diagnostic System Diagram on EL-215

DIAGNOSTIC PROCEDURE 2

Self-diagnostic results:
"ECM" displayed on CONSULT screen



A

Confirm SELF-DIAGNOSTIC RESULTS "ECM" displayed on CONSULT screen.
Ref. part No. B.

↓

Replace ECM.

↓

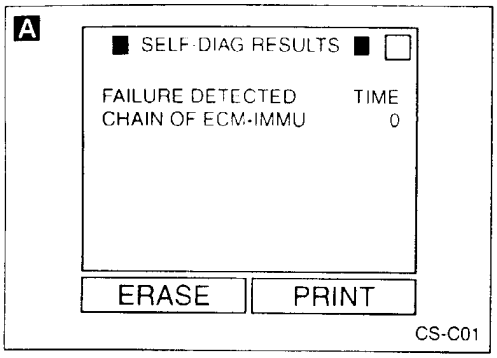
Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 3

Self-diagnostic results:
"CHAIN OF ECM-IMMU" displayed on CONSULT screen

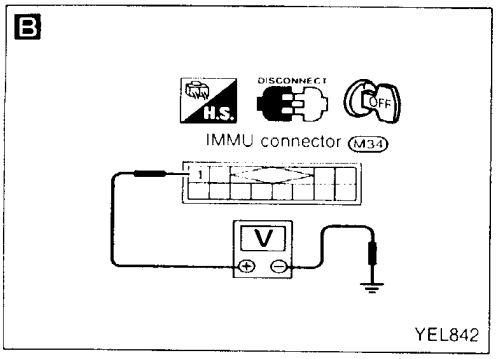
A



Confirm SELF-DIAGNOSTIC RESULTS "CHAIN OF ECM-IMMU" displayed on CONSULT screen.

OK

B



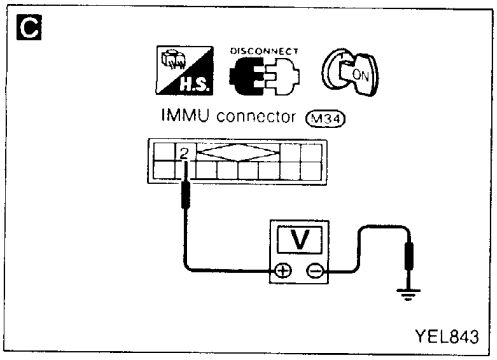
Check voltage between terminal ① of IMMU and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following:
- 5A fuse (No. 20, located in the fusible link and fuse box)
- Harness for open or short between fuse and IMMU connector

Ref. part No. C1

OK

C



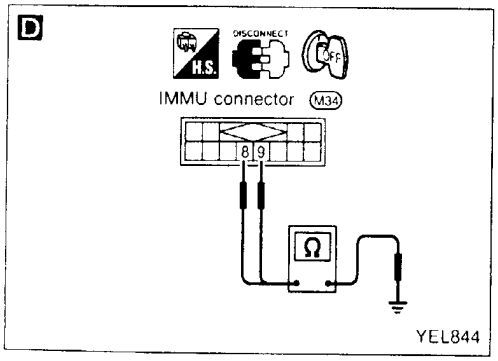
Check voltage between terminal ② of IMMU and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following:
- 10A fuse [No. 8, located in the fuse block (J/B)]
- Harness for open or short between fuse and IMMU connector

Ref. part No. C2

OK

D

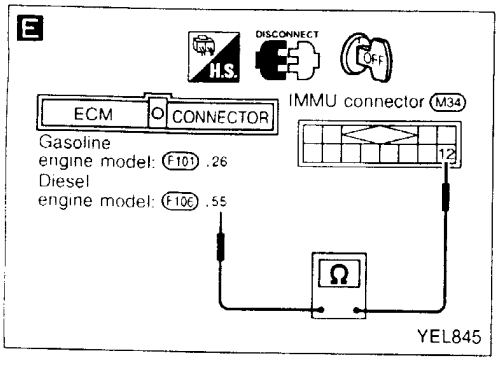


Check harness continuity between IMMU terminal ⑧ and ground.
Continuity should exist.

NG → Repair harness
Ref. part No. C3

OK

E



Check harness continuity between the following ECM terminals and IMMU terminals.

Engine	ECM connector No.	Terminal No.	IMMU terminal No. No.
Diesel	F101	26	12
Gasoline	F106	55	12

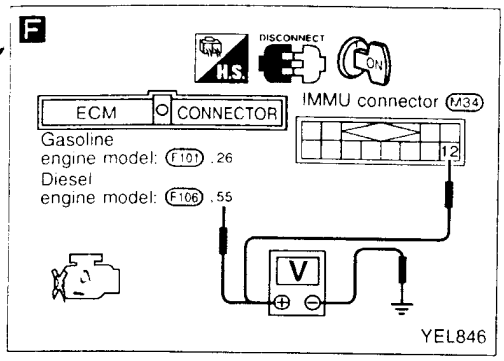
Continuity should exist.

NG → Communication line is open circuit.
Repair harness or connectors.
Ref. part No. C4

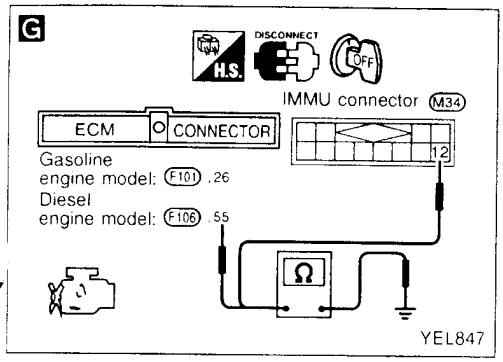
OK

Ⓐ

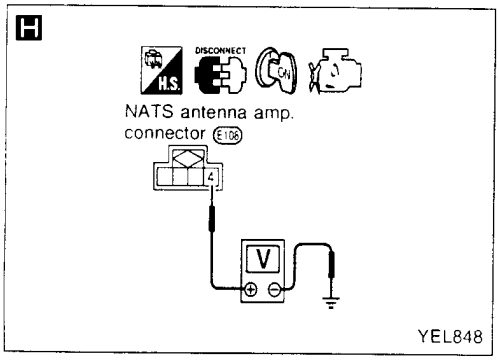
F



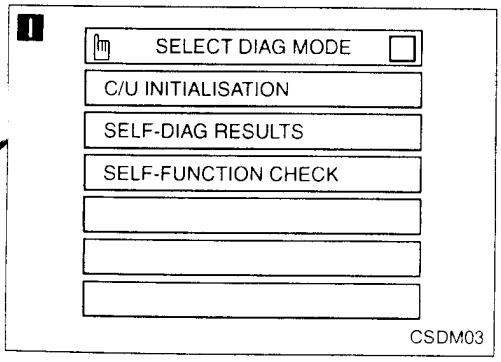
G



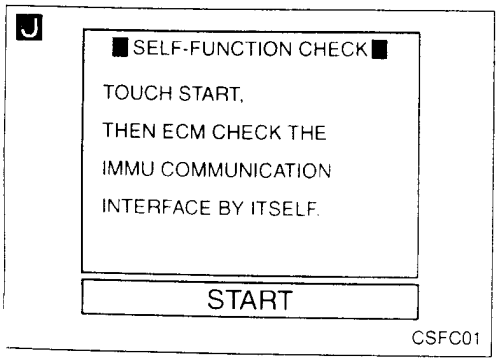
H



I



J



Ⓐ

F

CHECK COMMUNICATION LINE CIRCUIT.
1) Disconnect ECM connector and IMMU connector.
2) Check voltage between the following terminals and ground.

Unit	Connector No.	Terminal No.
Gasoline engine	F101	26
Diesel engine	F106	55
IMMU	M34	12

Voltage: 0V

NG → Communication line is short-circuited with battery voltage line or ignition switch ON line.
Repair harness or connectors.
Ref. part No. C4

OK ↓

G

Check continuity between the following terminals and ground.

Unit	Connector No.	Terminal No.
Gasoline engine	F101	26
Diesel engine	F106	55
IMMU	M34	12

Continuity should not exist.

NG → Communication line is short-circuited with ground line.
Repair harness or connectors.
Ref. part No. C4

OK ↓

H

CHECK NATS ANTENNA AMP. CIRCUIT.
1) Connect IMMU connector.
2) Disconnect NATS antenna amp. connector.
3) Turn ignition switch to "ON" position.
4) Check voltage between antenna amp. terminal ④ and ground.
Voltage: 4.7 - 5.3V

NG → NATS antenna amp. +5V line is short-circuited with battery voltage line or ground line.
Repair harness or connectors.
Ref. part No. E3

OK ↓

I

SELF-FUNCTION CHECK
1) Connect ECM connector and disconnect IMMU connector.
2) Turn ignition switch to "ON" position.
3) Touch "SELF-FUNCTION CHECK" on CONSULT "SELECT DIAG MODE" screen.

J

Touch "START". ECM will then check its communication interface by itself.

NG → **K** (See next page.)
ECM is malfunctioning.
Replace ECM.
Ref. part No. B

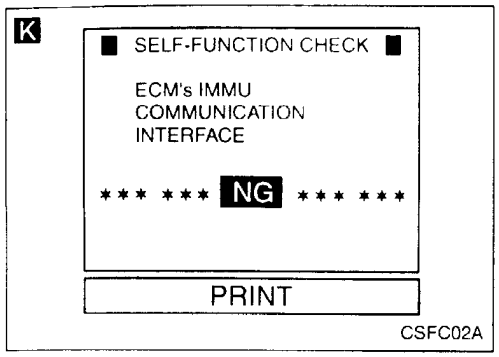
Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

OK ↓

L (See next page.)

Ⓑ

K

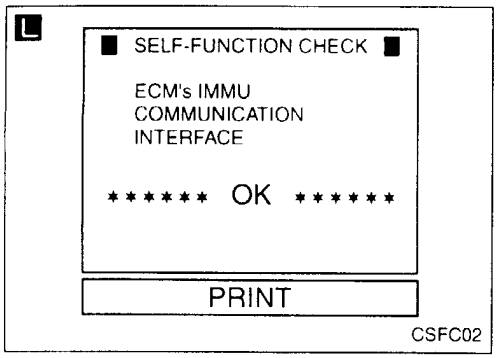


Ⓑ

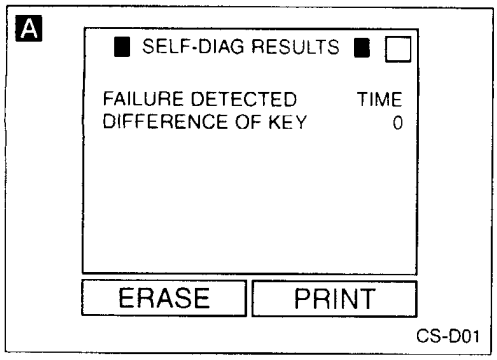
IMMU is malfunctioning.
Replace IMMU.
Ref. part No. A

Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

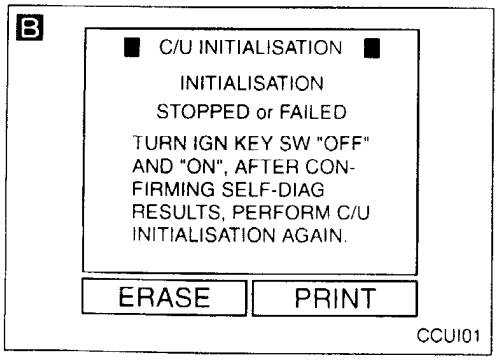
L



A



B



DIAGNOSTIC PROCEDURE 4

Self-diagnostic results:
"DIFFERENCE OF KEY" displayed on CONSULT screen

A

Confirm SELF-DIAGNOSTIC RESULTS "DIFFERENCE OF KEY" displayed on CONSULT screen.

OK

Perform initialisation with CONSULT.
Re-register all NATS ignition key IDs.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

Initialisation incompleted or failed with CONSULT → B

Initialisation completed

Start engine.

END
(Ignition key ID was unregistered.)
Ref. part No. D

B

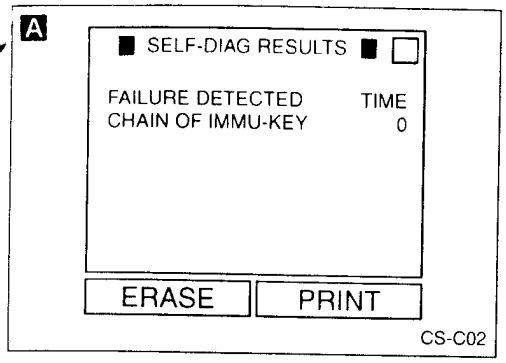
IMMU is malfunctioning.
Replace IMMU.
Ref. part No. A

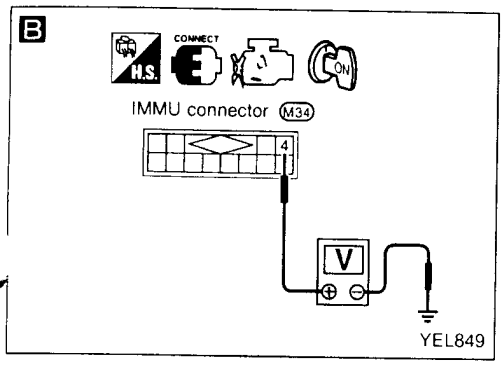
Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

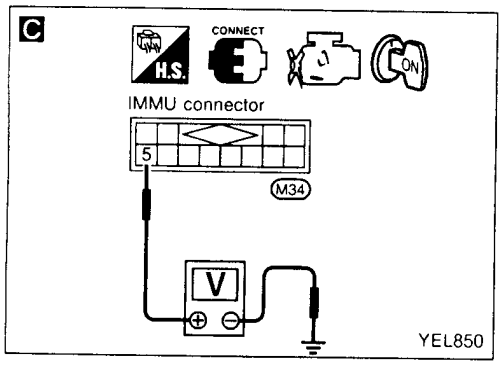
Trouble Diagnoses (Cont'd)

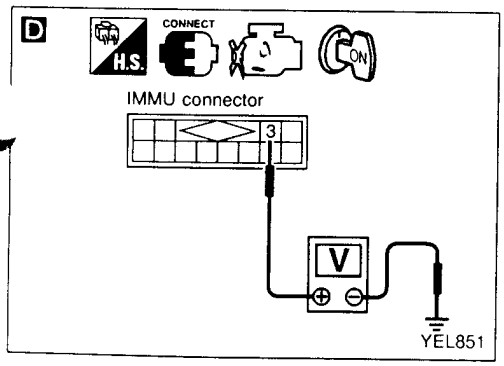
DIAGNOSTIC PROCEDURE 5

Self-diagnostic results:
"CHAIN OF IMMU-KEY" displayed on CONSULT screen









A

Confirm SELF-DIAGNOSTIC RESULTS "CHAIN OF IMMU-KEY" displayed on CONSULT screen.

OK ↓

CHECK NATS IGNITION KEY ID CHIP.
1) Connect NATS antenna amp. connector.
2) Pull the ignition key out
3) Start engine with another registered NATS ignition key.

Start → Ignition key ID chip was malfunctioning. Replace the ignition key **Ref. part No. E5**

OK

Start NG ↓

B

CHECK IMMU FUNCTION 1.
1) Connect IMMU connector and NATS antenna amp. connector.
2) Check voltage between IMMU terminal ④ and ground.

Voltage

Time (After turning ignition switch to "ON" position.)	Voltage [V]
For approx. 0.5 sec	Approx 2.3 - 5
After 1 sec.	0

NG → Replace IMMU. **Ref. part No. A**

Perform initialisation with CONSULT. For the operation of initialisation, refer to "CONSULT operation manuel NATS V2.0".

OK ↓

C

CHECK IMMU FUNCTION 2.
1) Disconnect NATS antenna amp. connector.
2) Turn ignition switch to "ON" position.
3) Check voltage between IMMU terminal ⑤ and ground.
Voltage:
6 sec. after turning ignition switch to "ON" position.
Approx: 2 - 5V

NG → Replace IMMMU. **Ref. part No. A**

Perform initialisation with CONSULT. For the operation of intialisation, refer to "CONSULT operation manual NATS V2.0".

OK ↓

D

CHECK IMMU OUTPUT VOLTAGE.
1) Turn the ignition switch to "ON" position.
2) Check voltage between IMMU terminal ③ and ground.
Voltage: 4.7 - 5.3V

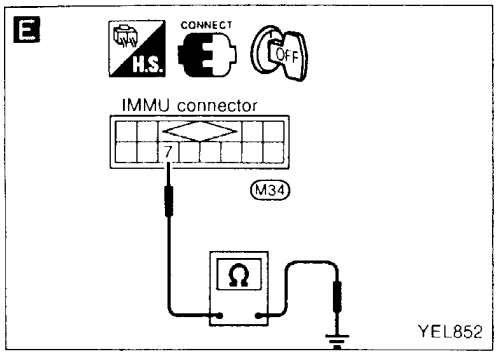
NG → Replace IMMU. **Ref. part No. A**

OK ↓

Ⓐ

Trouble Diagnoses (Cont'd)

E



Ⓐ

E

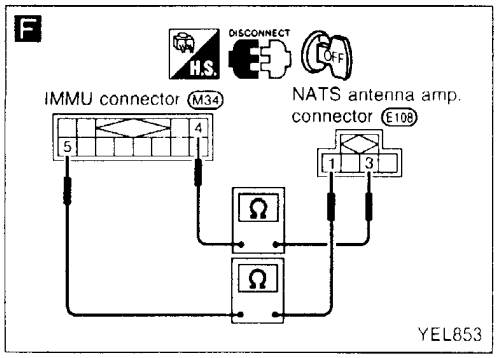
CHECK IMMU GROUND CIRCUIT.
1) Turn ignition switch to "LOCK" position.
2) Connect IMMU connector.
3) Check continuity between IMMU terminal ⑦ and ground

Continuity should exist.

NG → Replace IMMU.
Ref. part No. A

OK ↓

F



CHECK ANTENNA AMP. CIRCUIT.
1) Disconnect IMMU connector and NATS antenna amp. connector.
2) Check continuity between the following IMMU terminals and NATS antenna amp. terminals.

IMMU terminal	NATS antenna amp. terminal	Ref. part No.
④	③	E1
⑤	①	E2

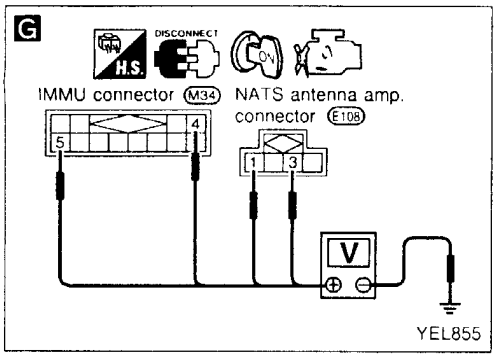
Continuity should exist.

NG → Communication line is open circuit.
Repair harness or connectors

Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

OK ↓

G



Check voltage between the following terminals and ground.

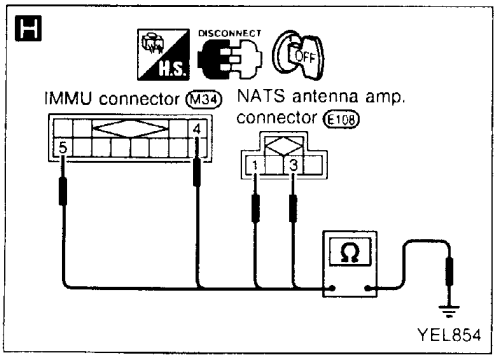
IMMU terminal	NATS antenna amp. terminal	Ref. part No.
④	③	E1
⑤	①	E2

Voltage: 0V

NG → Communication line is short-circuited with battery voltage line or ignition switch "ON" line.
Repair harness or connectors.

OK ↓

H



Check continuity between the following terminals and ground.

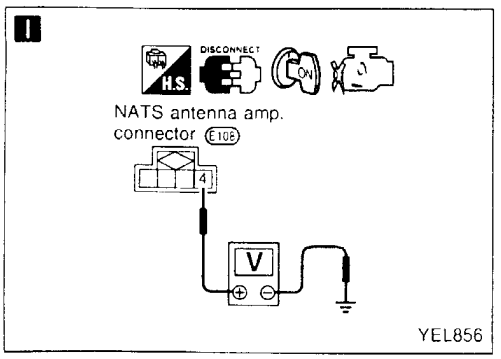
IMMU terminal	NATS antenna amp. terminal	Ref. part No.
④	③	E1
⑤	①	E2

Continuity should not exist.

NG → Communication line is short-circuited with ground line.
Repair harness or connectors.

OK ↓

I



CHECK ANTENNA AMP. POWER SOURCE CIRCUIT.
1) Connect IMMU connector.
2) Check voltage between NATS antenna amp. terminal ④ and ground.

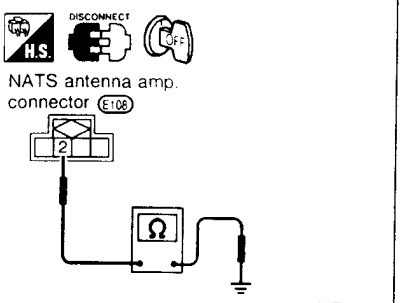
Voltage: 4.7 - 5.3V

NG → Power source line is open circuit.
Repair harness or connector.
Ref. part No. E3 Ref. part No. A

OK ↓

Ⓑ

J



Ⓑ

J

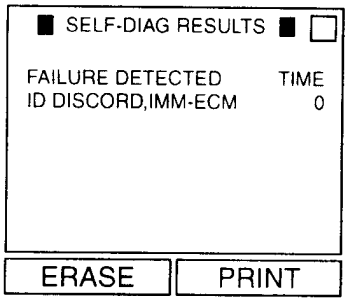
CHECK ANTENNA AMP. GROUND LINE CIRCUIT.
1) Turn ignition switch to "LOCK" position.
2) Check continuity between NATS antenna amp. terminal ② and ground.
Continuity should exist.

NG → NATS antenna amp. ground line is open circuit.
Check harness continuity between IMMU terminal ⑦ and NATS antenna amp. terminal ④.
If NG, repair harness or connectors.
Ref. part No. A

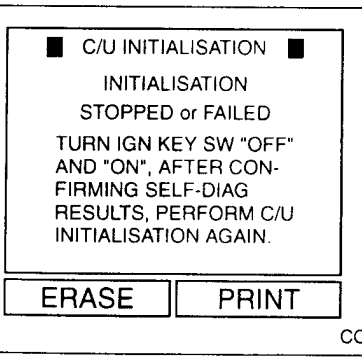
OK ↓

NATS antenna amp. is malfunctioning.
When replacing the amp. hold on to amp. body. Take care not to pull on amp. harness.
Ref. part No. E6

A



B



DIAGNOSTIC PROCEDURE 6

Self-diagnostic results:
"ID DISCORD, IMM-ECM" displayed on CONSULT screen

A

Confirm SELF-DIAGNOSTIC RESULTS "ID DISCORD, IMM-ECM*" displayed on CONSULT screen.

* "ID DISCORD, IMM-ECM":
Registered ID of IMMU is in discord with that of ECM.

↓

Perform initialisation with CONSULT.
Re-register all NATS ignition key IDs.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

Initialisation incompleted or failed with CONSULT → B

ECM is malfunctioning.
Replace ECM.
Ref. part No. F

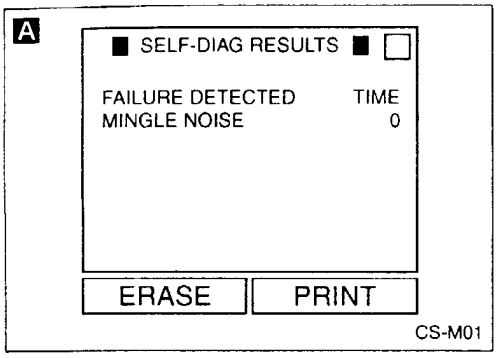
Initialisation completed ↓

Start engine. ↓

END
Ref. part No. F

Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

Trouble Diagnoses (Cont'd)



DIAGNOSTIC PROCEDURE 7

Self-diagnostic results:
"MINGLE NOISE" displayed on CONSULT screen

A

Confirm SELF-DIAGNOSTIC RESULTS "MINGLE NOISE" displayed on CONSULT screen.

↓

Turn off or remove any possible electrical interference noise sources.

↓

A

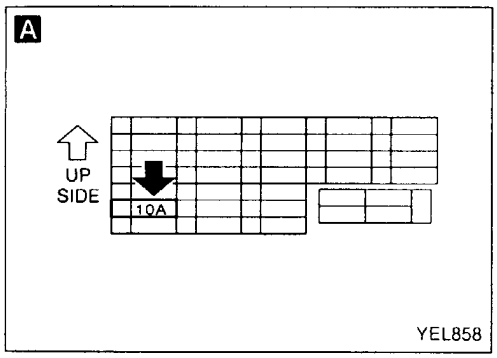
Touch "ERASE" on CONSULT SELF-DIAGNOSTIC RESULTS screen.

↓

Start engine. — NG → (back to Confirm SELF-DIAGNOSTIC RESULTS "MINGLE NOISE" displayed on CONSULT screen.)

↓ OK

END



DIAGNOSTIC PROCEDURE 8

"NATS SECURITY IND. DOES NOT LIGHT UP"

A

Check 10A fuse [No. 24, located in the fuse block (J/B)]. — NG → Replace fuse.

↓ OK

NATS INITIALISATION
1) Install the 10A fuse.
2) Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

↓

Turn ignition switch to "LOCK" position.

↓

Start engine and turn ignition switch to "LOCK" position.

↓

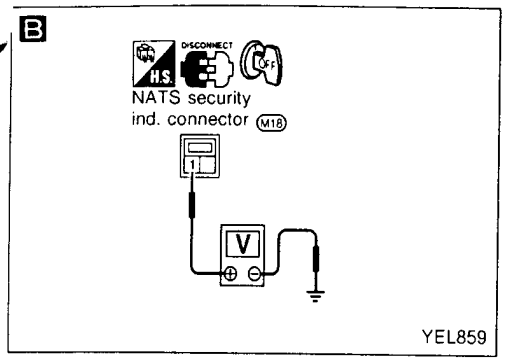
Check NATS security ind. blinking. — OK → END

↓ NG

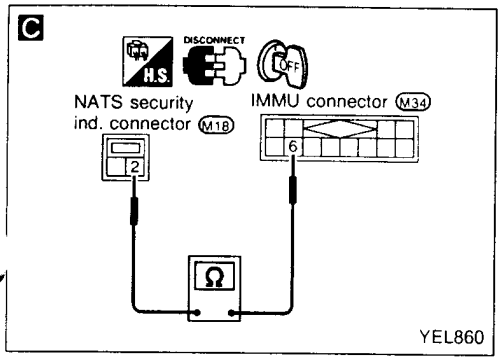
Ⓐ

Trouble Diagnoses (Cont'd)

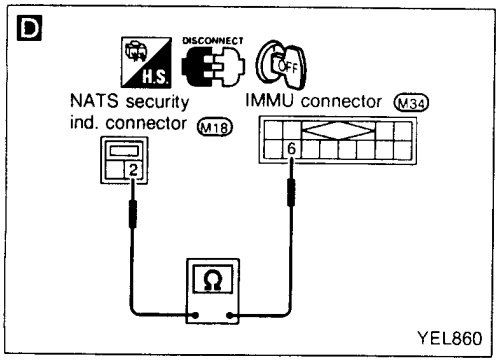
B



C



D



Ⓐ

B

Check voltage between NATS security ind. connector terminal ① and ground.
Voltage : Battery voltage

NG → Check harness continuity between fuse and NATS security ind.

OK ↓

C

CHECK NATS SECURITY IND. CIRCUIT.
1) Disconnect NATS IMMU connector.
2) Check harness continuity between NATS security ind. connector terminal ② and NATS IMMU connector terminal ⑥.
Continuity should exist.

NG → Repair harness.

OK ↓

D

CHECK NATS IMMU FUNCTION
1) Connect NATS IMMU connector.
2) Disconnect NATS security ind. connector.
3) Check resistance between NATS IMMU terminal ⑥ and ground.
Resistance should be less than 1kΩ.

NG → NATS IMMU is malfunctioning. Replace IMMU.

Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

OK ↓

NATS security ind. is malfunctioning.
Pull out NATS security ind. with harness and connector.
Check harness connection

NG → Repair harness.

OK ↓

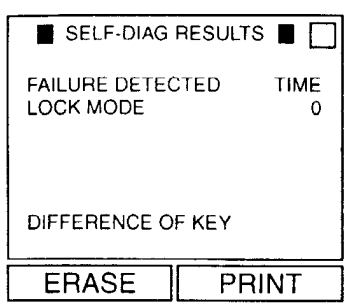
NATS security ind. cell is malfunctioning.
Replace NATS security ind.

Trouble Diagnoses (Cont'd)

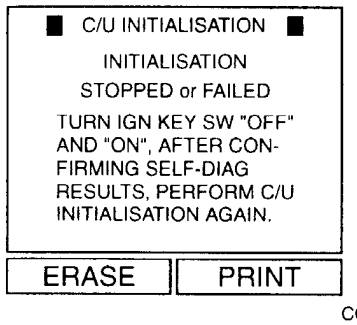
DIAGNOSTIC PROCEDURE 9

Self-diagnostic results:
"LOCK MODE" displayed on CONSULT screen

A



B



A

Confirm SELF-DIAGNOSTIC RESULTS "ID DISCORD, IMM-ECM*" displayed on CONSULT screen.

Perform initialisation with CONSULT.
Re-register all NATS ignition key IDs.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

Initialisation completed

Perform initialisation with CONSULT.
Re-register al NATS ignition key IDs.

After close "C/U INITIALISATION", start engine.

OK

NG

Ⓐ

Perform selfdiagnosis and check "SELF DIAG RESULTS" with CONSULT.
Repair the system as outlined by each DIAGNOSTIC PROCEDURE.

Initialisation completed or failed with CONSULT

B

Perform initialisation with CONSULT again.
Register another NATS ignition key ID which is previously registered.

Initialisation completed

Initialisation incompleted or failed with CONSULT

Go to DIAGNOSTIC PROCEDURE 5, EL-221, to check "CHAIN OF IMMU-KEY".

The ignition key used for the first initialisationis malfunctioning. Replace with a new one.

Perform initialisation with CONSULT.
Re-register all NATS ignition key IDs using the ignition key which has been replaced.
For the operation of initialisation, refer to "CONSULT operation manual NATS V2.0".

Ⓐ

A

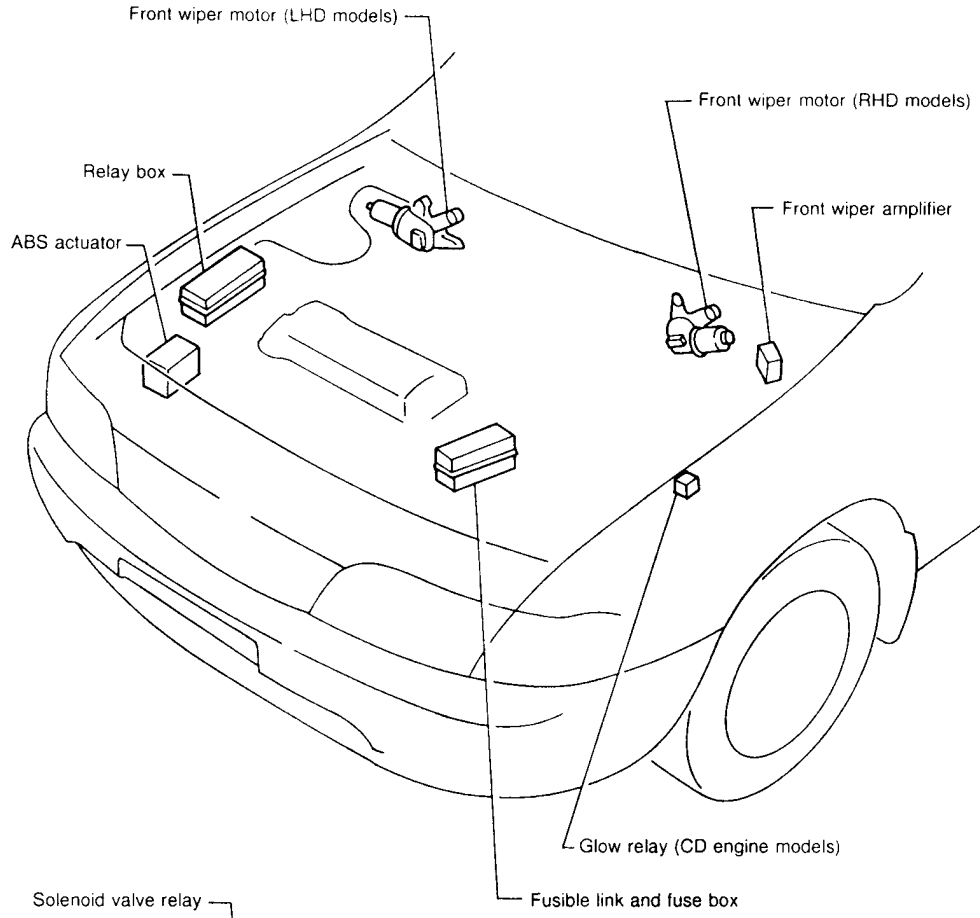
Erase the NATS "SELF-DIAG RESULTS" on CONSULT screen. (Touch "Erase".)

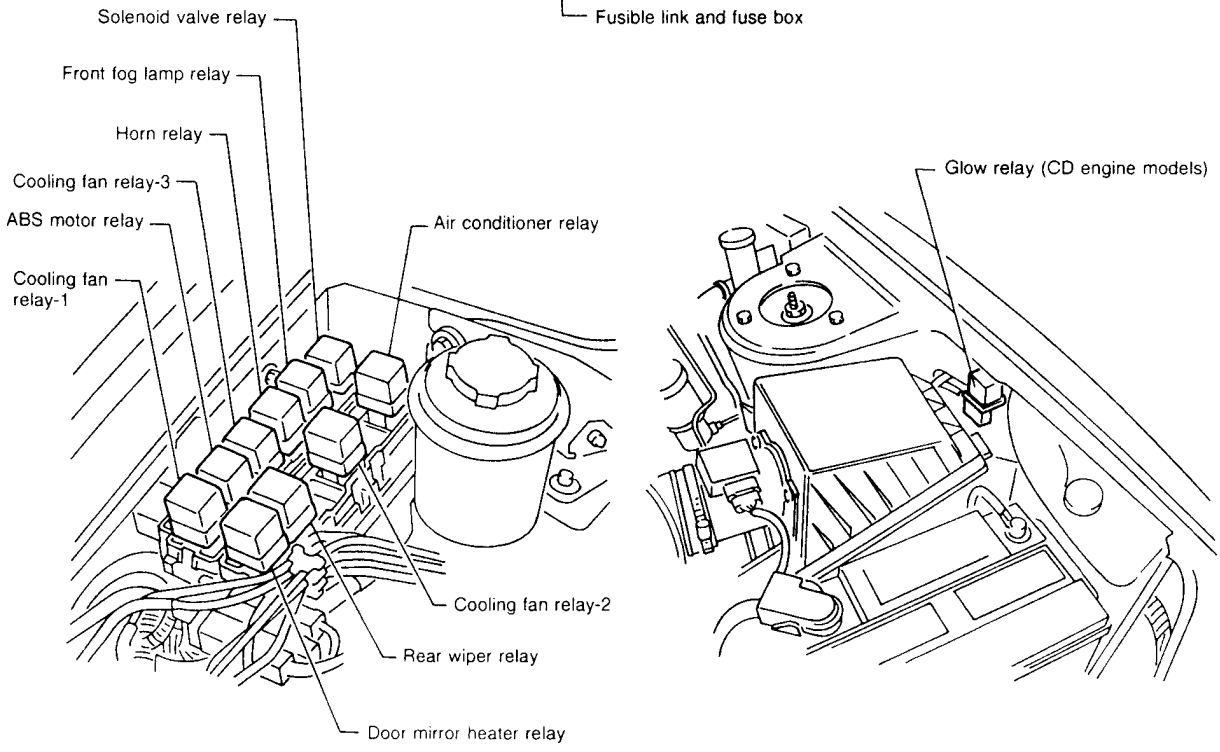
Check NATS security ind. blinking.

*END

*: There is a trace that an engine-start was tried with incorrect key or procedure. No abnormality exists in the system itself.

Engine Compartment

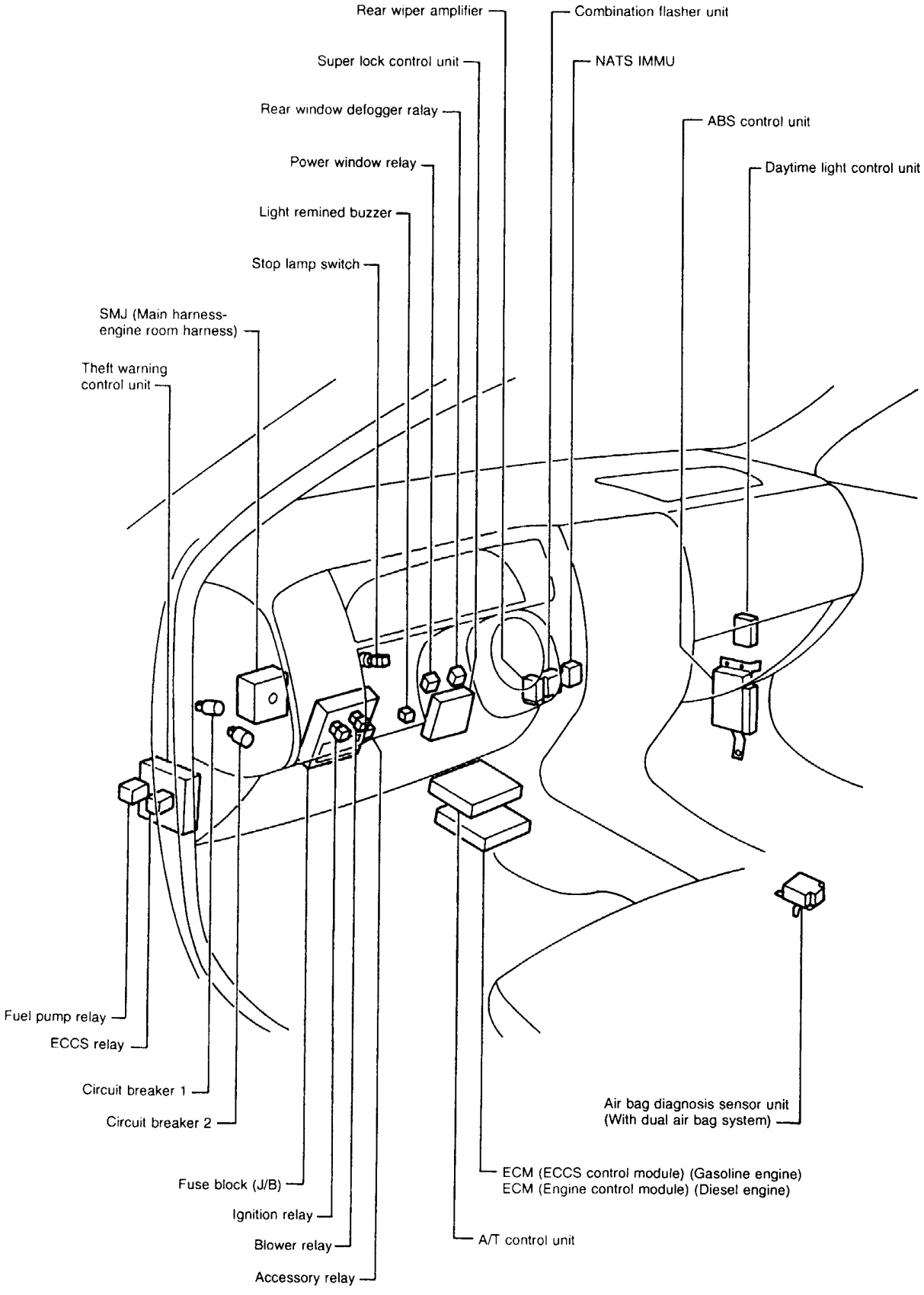




NEL579

Passenger Compartment

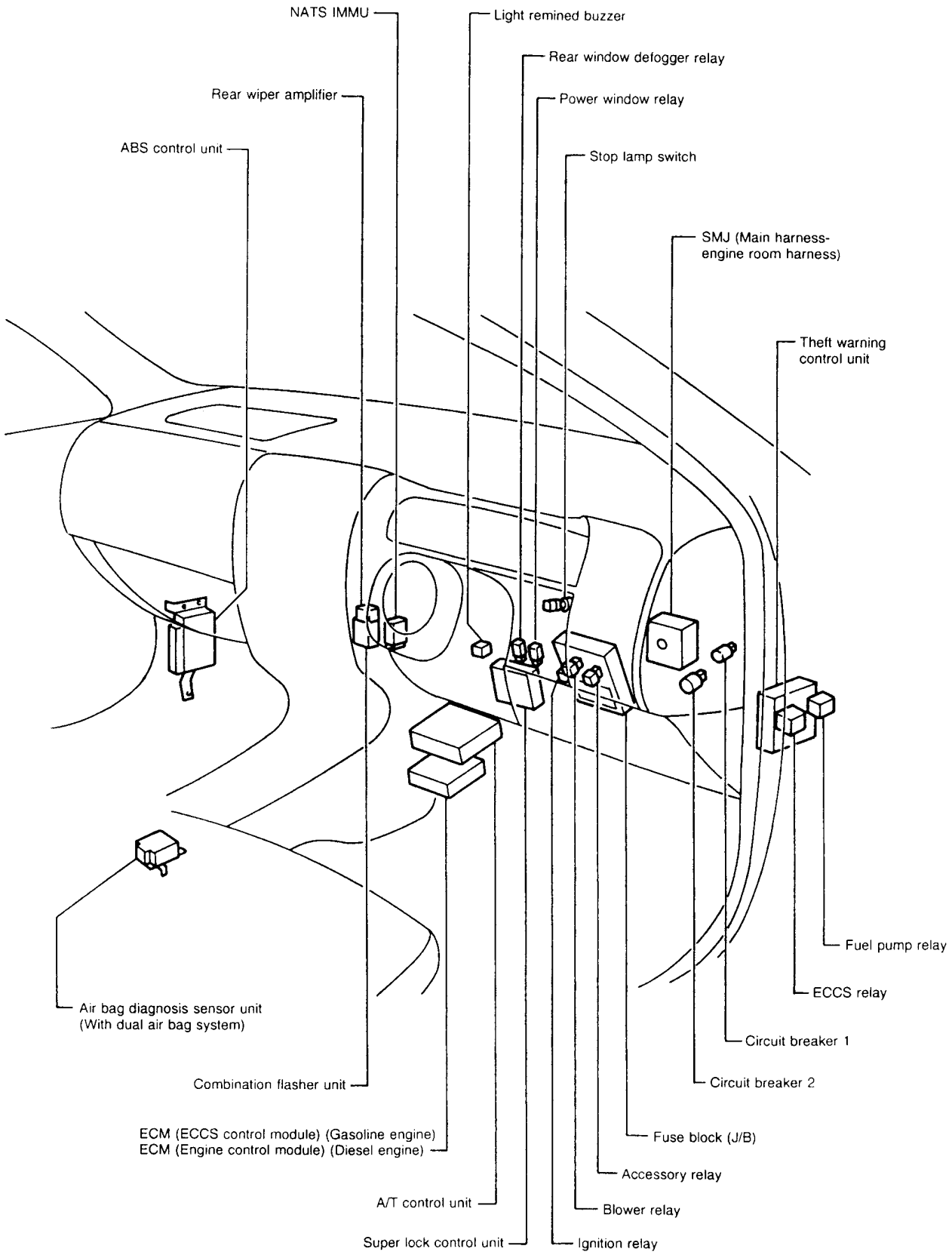
LHD MODELS



YEL896

Passenger Compartment (Cont'd)

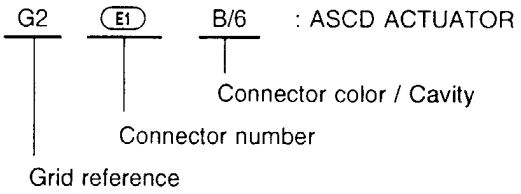
RHD MODELS



YEL897

How to Read Harness Layout

Example:



The following Harness Layouts use a map style grid to help locate connectors on the drawings:
- Engine Room Harness (Engine Compartment)
- Main Harness
- Body Harness

To use the grid reference

1) Find the desired connector number on the connector list.
2) Find the grid reference.
3) On the drawing, find the crossing of the grid reference letter column and number row.
4) Find the connector number in the crossing zone.
5) Follow the line (if used) to the connector.

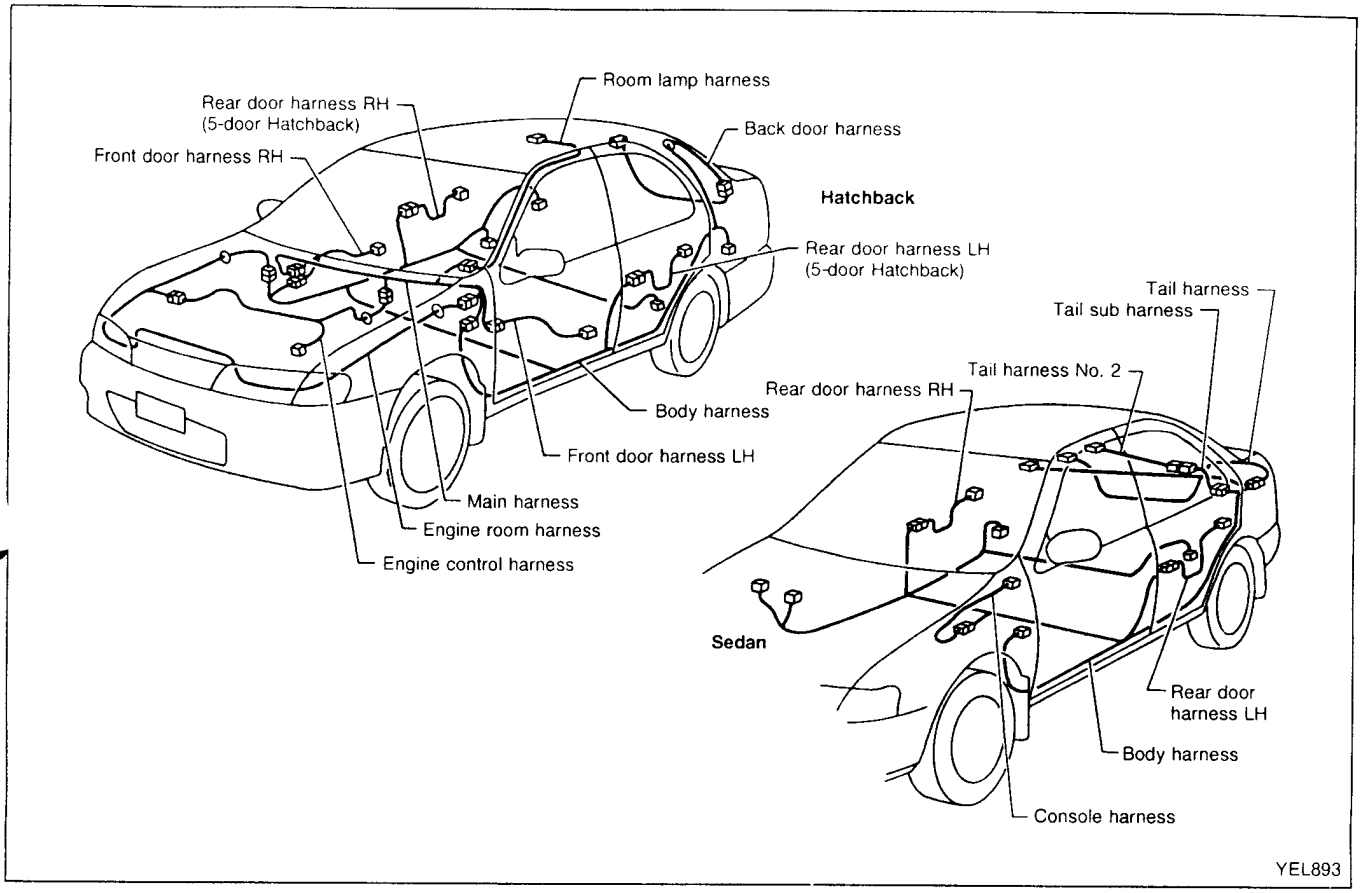
CONNECTOR SYMBOL

Main symbols of connector (in Harness Layout) are indicated in the below.

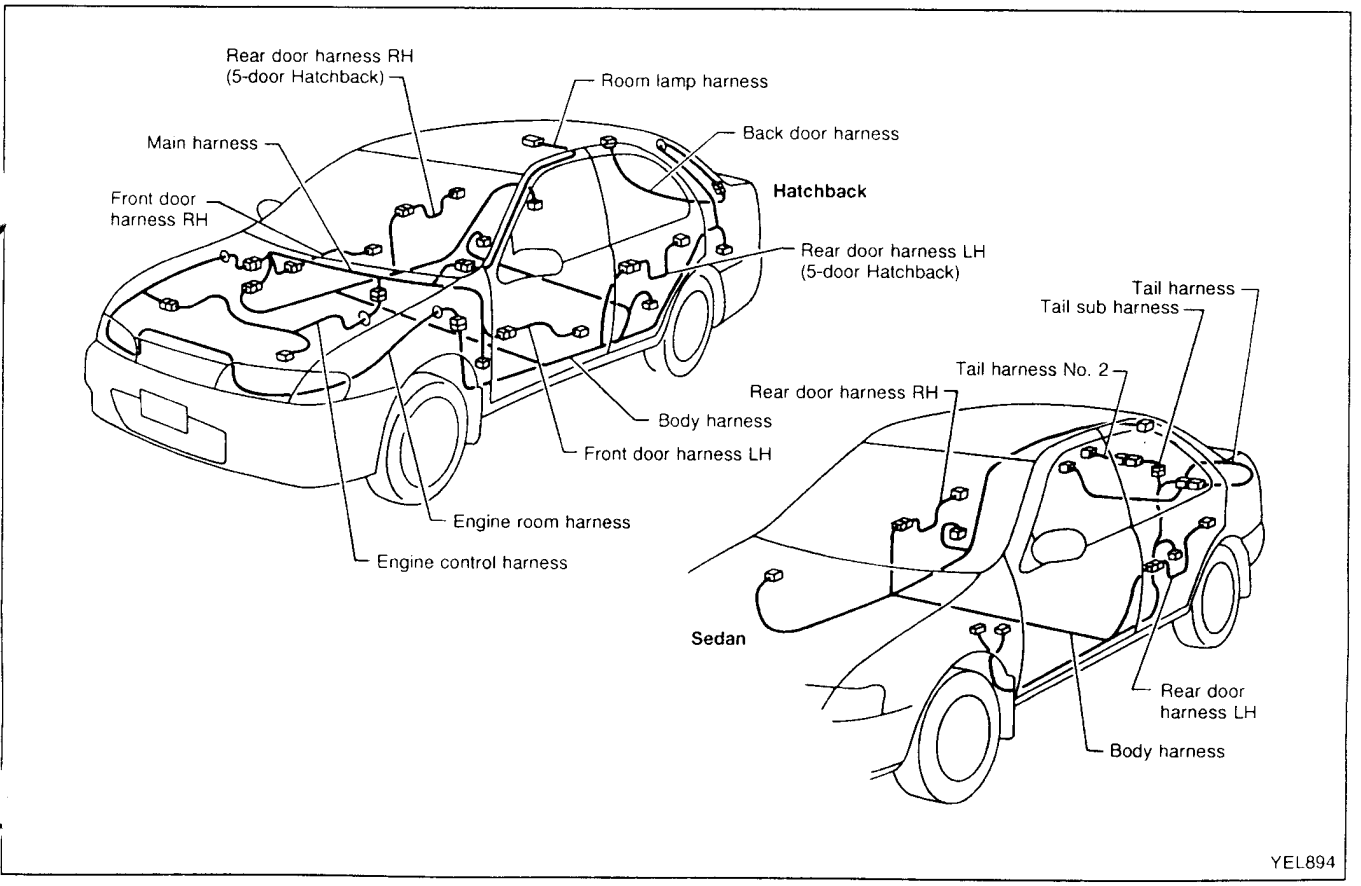
Connector type	Water proof type		Standard type	
	Male	Female	Male	Female
• Cavity: Less than 4 • Relay connector				
• Cavity: From 5 to 8				
• Cavity: More than 9	—	—		
• Ground terminal etc.	—			

Outline

LHD MODELS

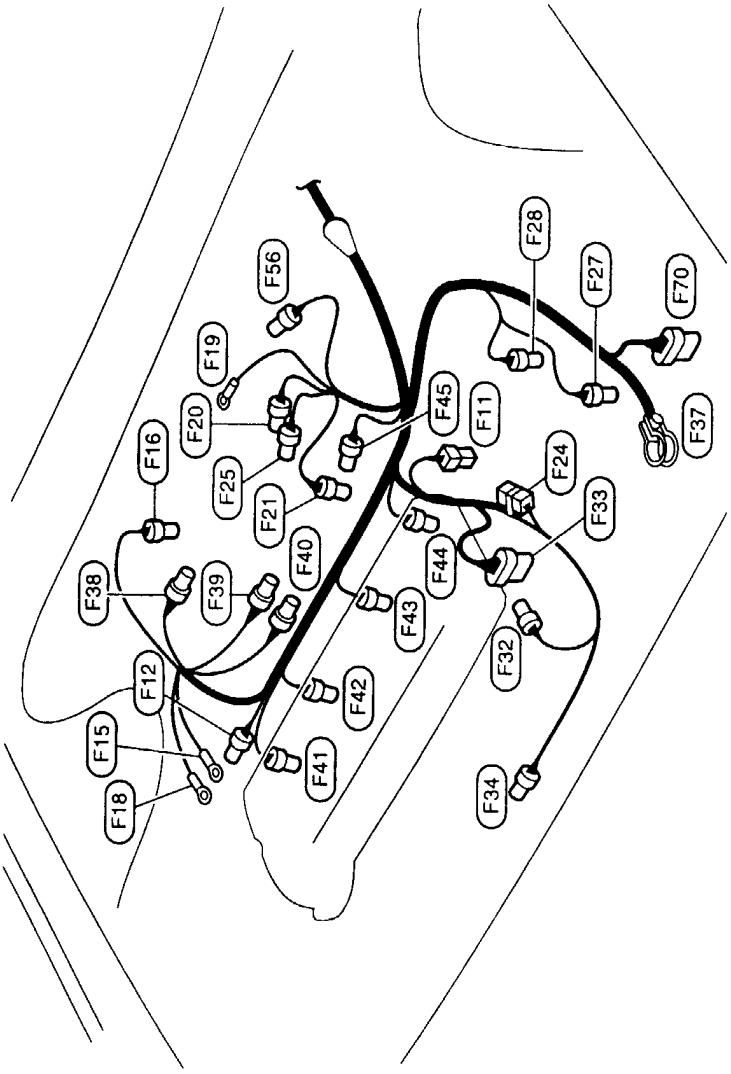


RHD MODELS

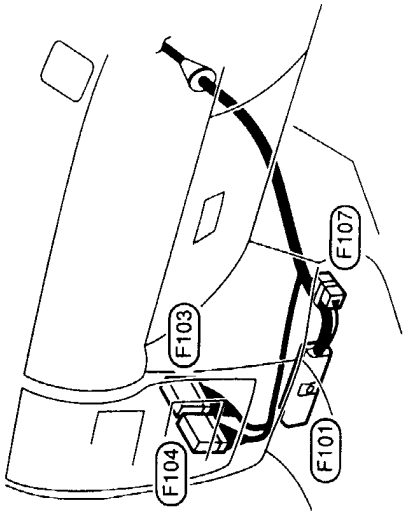


Engine Control Harness

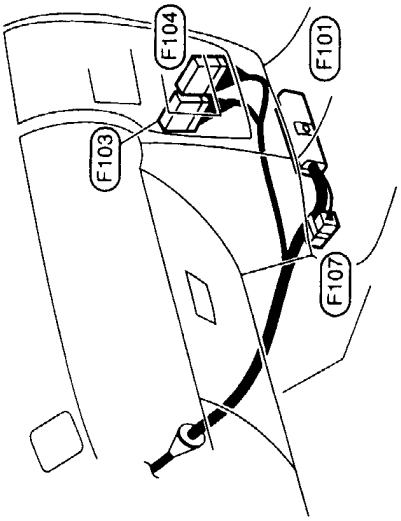
GA16DE ENGINE

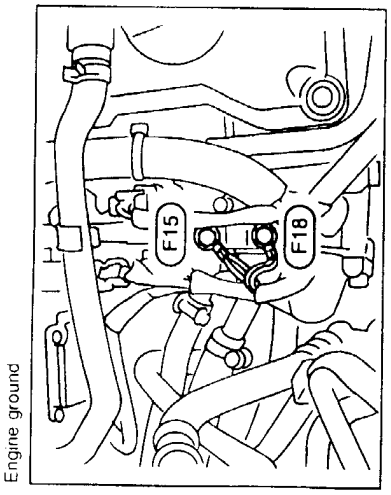


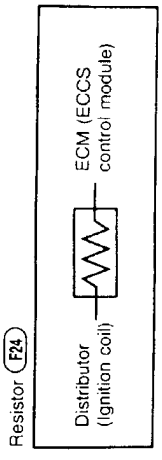
LHD models



RHD models







YEL873

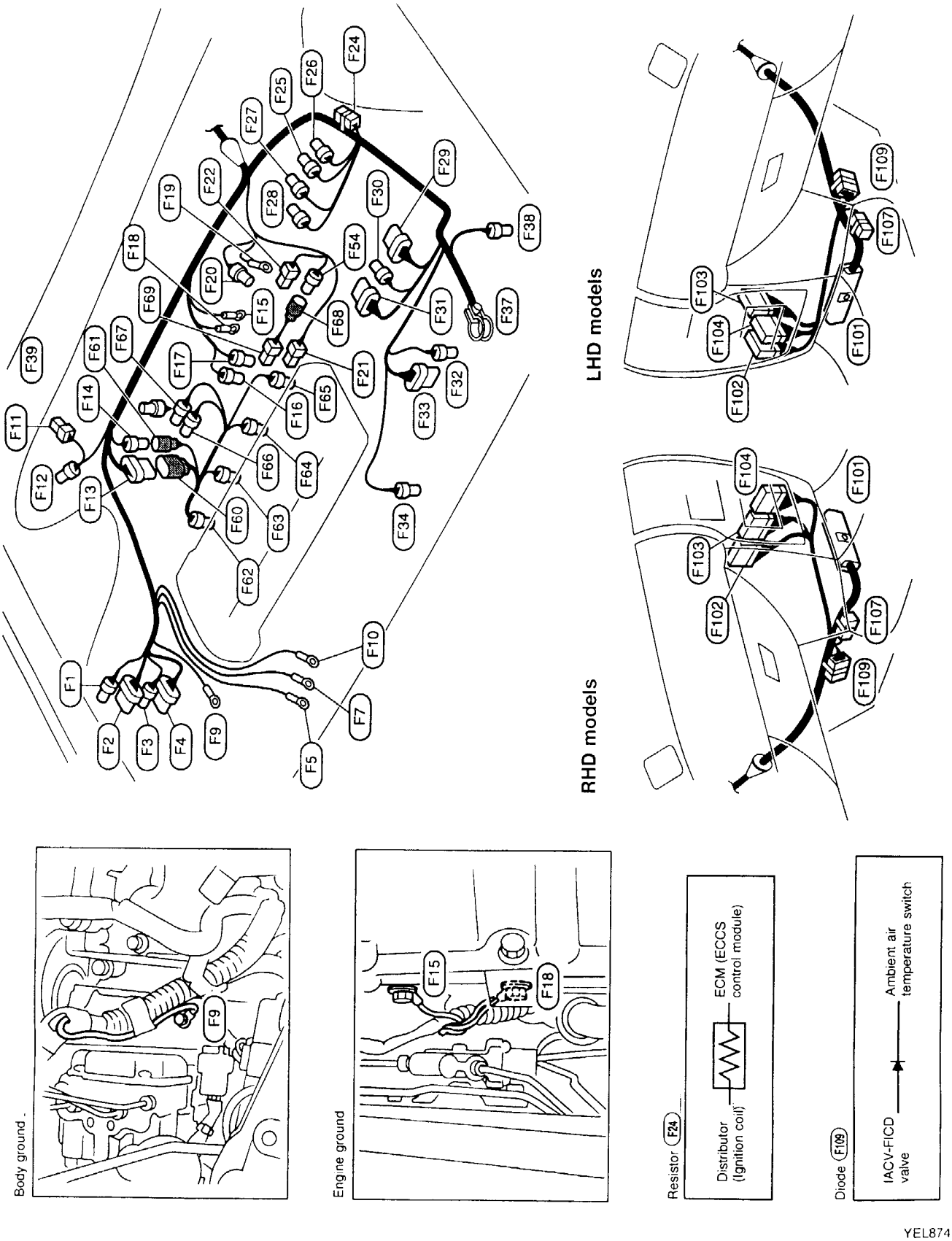
Engine Control Harness (Cont'd)

F11	B/1	Thermal transmitter
F12	GY/2	Engine coolant temperature sensor
F15	-	Engine ground
F16	BR/3	Throttle position sensor
F18	-	Engine ground
F19	-	Starter motor
F20	B/1	Starter motor
F21	BR/1	Oil pressure switch
F24	-	Resistor
F25	BR/3	Vehicle speed sensor
F27	W/2	Back-up lamp switch
F28	B/2	Neutral position switch
F32	GY/2	Distributor (Ignition coil)
F33	GY/6	Distributor (Comshaft position sensor)
F34	W/3	Heated oxygen sensor
F37	-	Battery
F38	GY/3	Mass air flow sensor
F39	BR/2	IACV-AAC valve
F40	PU/2	IACV-FICD solenoid valve
F41	B/2	Injector No. 1
F42	B/2	Injector No. 2
F43	B/2	Injector No. 3
F44	B/2	Injector No. 4
F45	B/2	EGR valve and EVAP canister purge control solenoid valve
F56	GY/1	Starter motor
F70	GY/8	To E65
F101	L/64	ECM (ECCS control module)
F103	W/12	To M52
F104	W/16	To M50
F107	GY/6	Joint connector-1

YEL927

Engine Control Harness (Cont'd)

SR20De/DE ENGINE

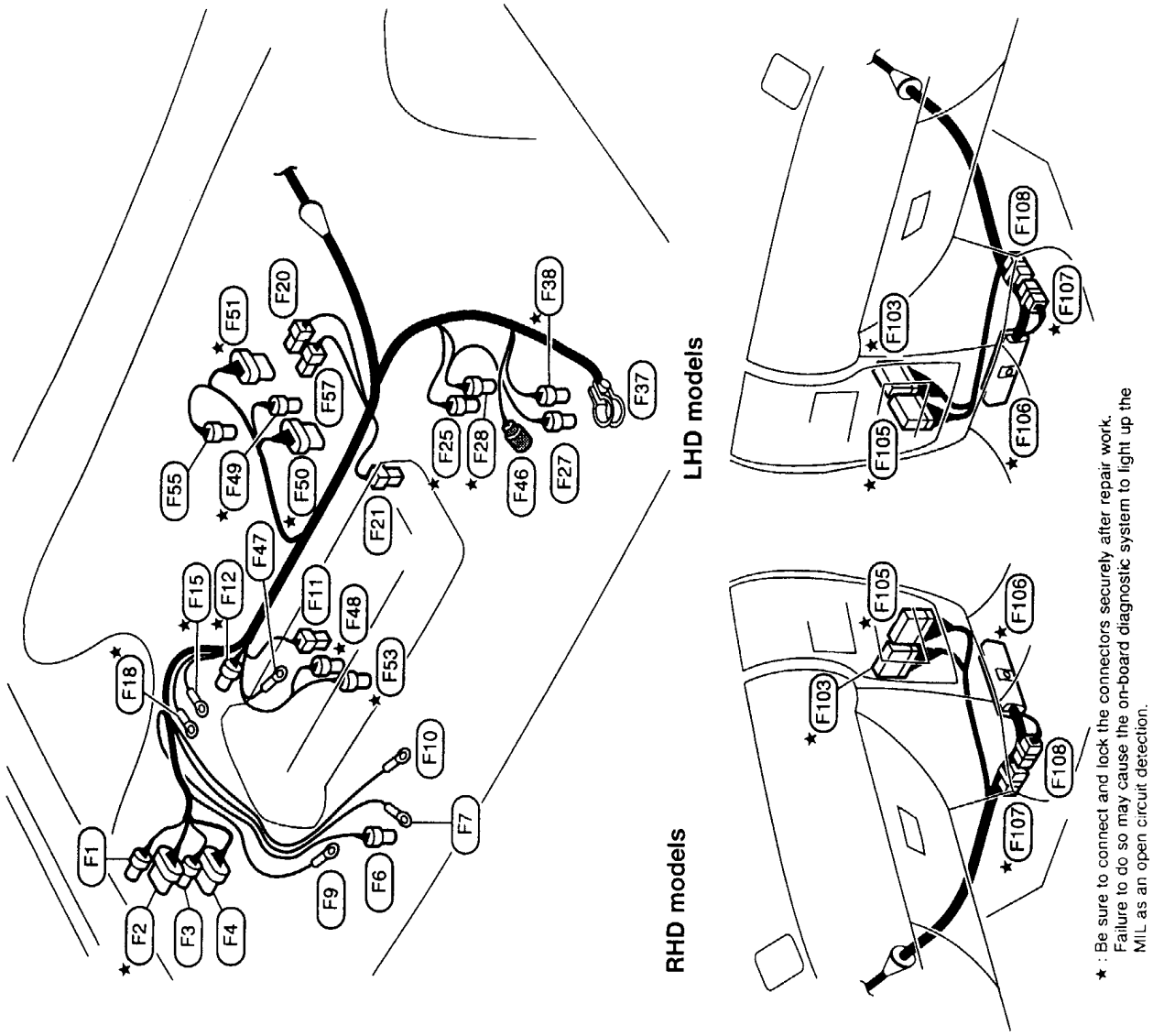


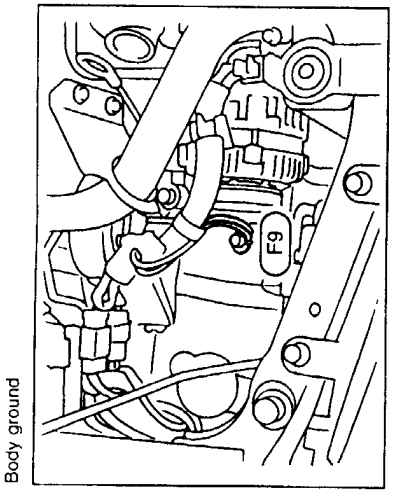
F1	B/2	:	To E41
F2	GY/8	:	To E42
F3	GY/1	:	To E44
F4	GY/8	:	To E43
F5	–	:	Alternator
F7	–	:	Alternator
F9	–	:	Body ground
F10	–	:	Alternator
F11	B/1	:	Thermal transmitter
F12	GY/2	:	Engine coolant temperature sensor
F13	GY/8	:	To F60
F14	B/2	:	To F61
F15	–	:	Engine ground
F16	BR/3	:	Throttle position sensor
F17	GY/3	:	Throttle position sensor
F18	–	:	Engine ground
F19	–	:	Starter motor
F20	–	:	Starter motor
F21	B/1	:	Oil pressure switch
F22	B/2	:	Knock sensor (Base grade models)
F24	–	:	Resistor
F25	BR/3	:	Vehicle speed sensor
F26	GY/3	:	Revolution sensor
F27	W/2	:	Back-up lamp switch (M/T models)
F28	B/2	:	Neutral position switch (M/T models)
F29	BR/8	:	Terminal cord assembly (A/T models)
F30	W/2	:	Inhibitor switch (A/T models)
F31	GY/8	:	Inhibitor switch (A/T models)
F32	GY/2	:	Distributor (Ignition coil)
F33	GY/6	:	Distributor (Camshaft position sensor)
F34	W/3	:	Heated oxygen sensor
F37	–	:	Battery
F38	BR/4	:	Mass air flow sensor
F54	GY/2	:	To F68 (GT grade models)
F60	GY/8	:	To F13
F61	B/2	:	To F14
F62	B/2	:	Injector No. 1
F63	B/2	:	Injector No. 2
F64	B/2	:	Injector No. 3
F65	B/2	:	Injector No. 4
F66	PU/2	:	IACV-FICD solenoid valve
F67	BR/2	:	IACV/AAC valve
F68	GY/2	:	To F54 (GT grade models)
F69	B/2	:	Knock sensor (GT grade models)
F101	L/64	:	ECM (ECCS control module)
F102	W/20	:	To M53
F103	W/12	:	To M52
F104	W/16	:	To M50
F107	GY/6	:	Joint connector-1
F109	–	:	Diode

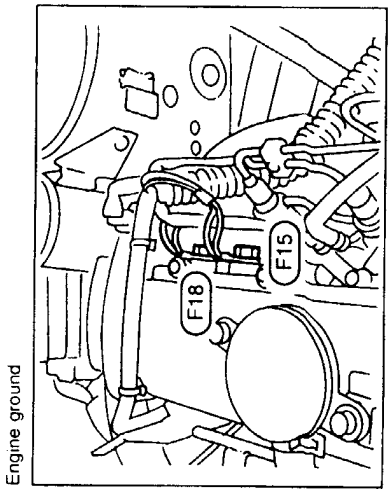
YEL928

Engine Control Harness

CD20T ENGINE







YEL872

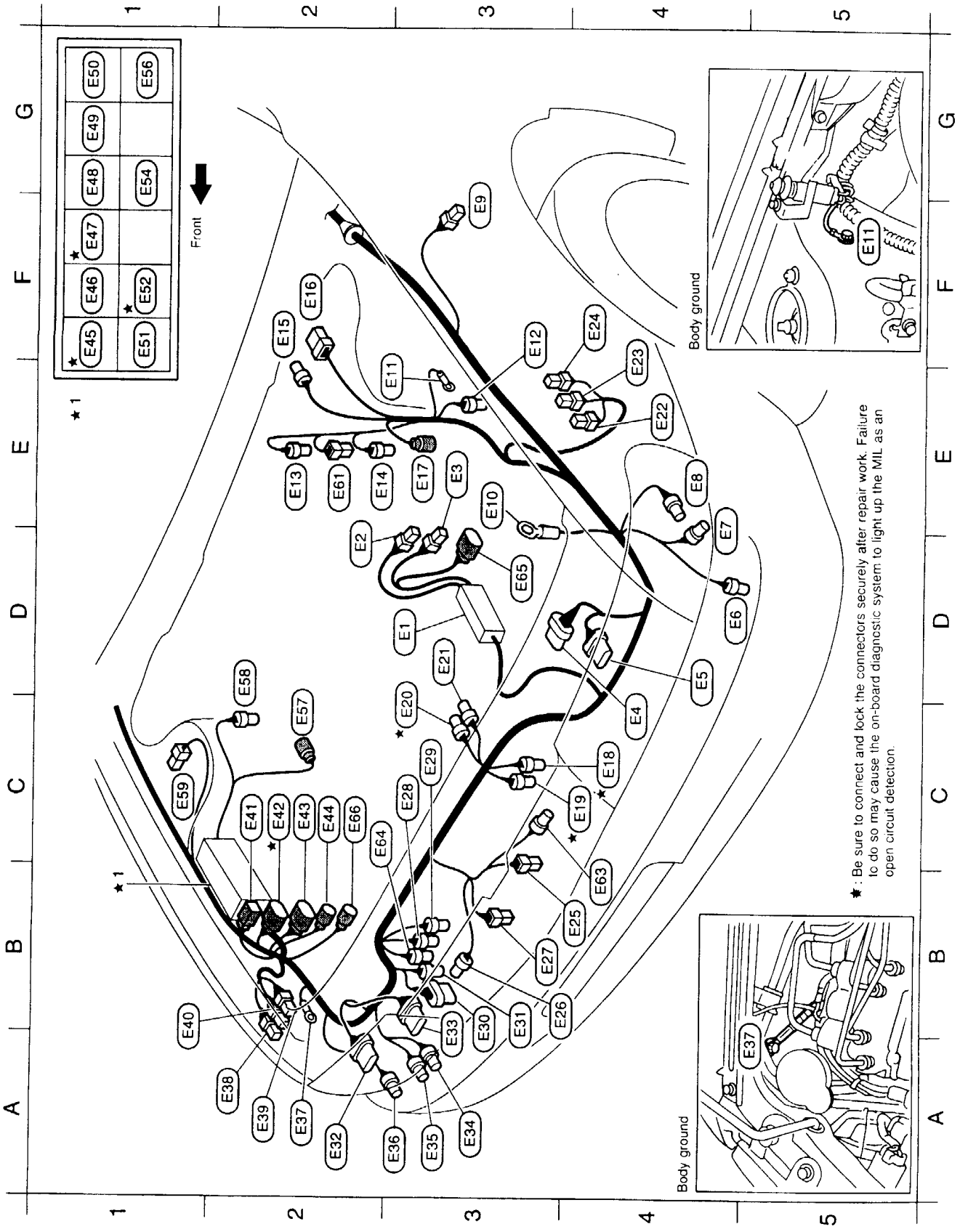
Engine Control Harness

	F1	B/2	To E41
*	F2	GY/8	To E42
	F3	GY/1	To E44
	F4	GY/8	To E43
	F6	W/2	Alternator
	F7	–	Alternator
	F9	–	Body ground
	F10	–	Alternator
	F11	B/1	Thermal transmitter
*	F12	GY/2	Engine coolant temperature sensor
*	F15	–	Engine ground
*	F18	–	Engine ground
	F20	B/1	Starter motor
	F21	B/1	Oil pressure switch
*	F25	BR/3	Vehicle speed sensor
	F27	W/2	Back-up lamp switch
*	F28	B/2	Neutral position switch
	F37	–	Battery
*	F38	BR/4	Mass air flow sensor
	F46	B/1	To E2
	F47	–	Glow plug
*	F48	BR/2	Needle lift sensor
*	F49	GY/3	Camshaft position sensor (Pump)
*	F50	B/8	Injection pump
*	F51	GY/8	Injection pump
*	F53	B/3	Crankshaft position sensor (TDC)
	F55	B/2	EGRC-solenoid valve A
	F57	GY/1	Starter motor
*	F103	W/12	To M52
*	F105	W/20	To M51
*	F106	W/88	ECM (ECCS control module)
*	F107	GY/6	Joint connector-1
	F108	GY/6	Joint connector-2

YEL926

Engine Room Harness

ENGINE COMPARTMENT — LHD models



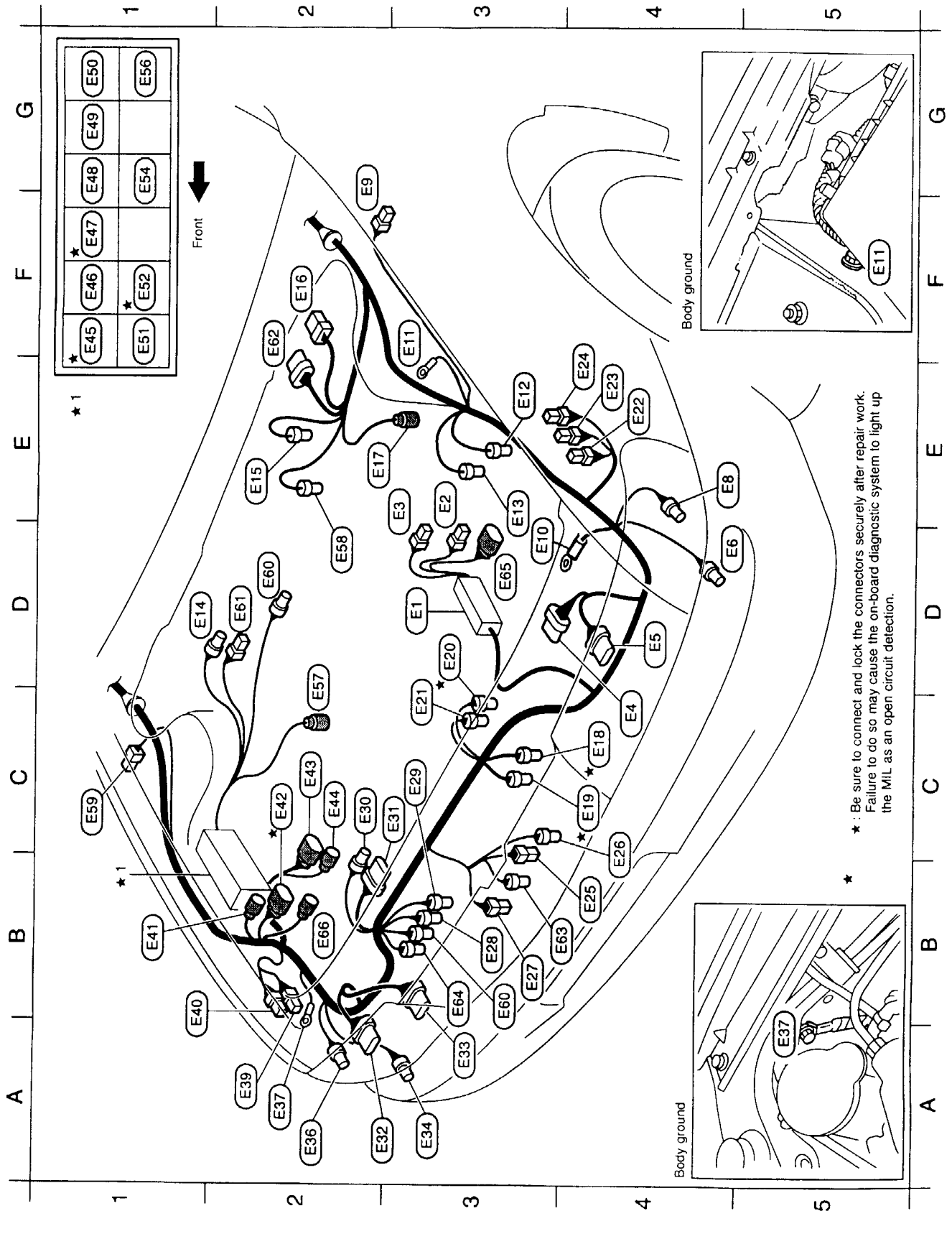
YEL879

D3	E1	SMJ	:	Fusible link holder
E2	E2	B/1	:	To F46
E3	E3	B/1	:	Battery
C4	E4	B/6	:	Headlamp aiming motor LH
D4	E5	GY/6	:	Front combination lamp LH
D4	E6	B/2	:	Front fog lamp LH
E4	E7	GY/4	:	Headlamp wiper motor LH
E8	E8	GY/2	:	Front turn signal lamp LH
F3	E9	B/2	:	Side turn signal lamp LH
F3	E10	–	:	ABS ground
E3	E11	–	:	Body ground
F3	E12	W/2	:	Hood switch
E2	E13	W/2	:	Sedimenter (CD engine)
E2	E14	GY/2	:	Brake fluid level switch
F2	E15	GY/2	:	Dropping resistor
F2	E16	W/8	:	Front wiper amplifier
E3	E17	BR/2	:	Front wheel sensor LH (with ABS)
C4*	E18	B/2	:	Cooling fan motor-2 (CD engine) 4
C4*	E19	B/2	:	Cooling fan motor-1
C3*	E20	B/4	:	Triple-pressure switch
D3	E21	B/2	:	Dual-pressure switch
E4	E22	G/2	:	Glow relay (CD engine)
F4	E23	W/1	:	Glow relay (CD engine)
F4	E24	W/1	:	Glow relay (CD engine)
B4	E25	B/1	:	Horn (low)
B4	E26	GY/2	:	Outside air temperature sensor
B3	E27	B/1	:	Horn (high)
C3	E28	GY/2	:	Cooling fan motor-2
C3	E29	B/2	:	Cooling fan motor-1 (CD engine)
B3	E30	GY/8	:	ABS actuator (with ABS)
B3	E31	B/2	:	ABS actuator (with ABS)
A2	E32	GY/6	:	Front combination lamp RH
A3	E33	B/6	:	Headlamp aiming motor RH
A3	E34	B/2	:	Front fog lamp RH
A3	E35	GY/4	:	Headlamp wiper motor RH
A3	E36	GY/2	:	Front turn signal lamp RH
A2	E37	–	:	Body ground
A2	E38	G/2	:	Headlamp washer motor
A2	E39	B/2	:	Washer level switch
A1	E40	W/2	:	Washer motor
C2	E41	B/2	:	To F1 (Except GA engine)
				To E152 (GA engine)
C2*	E42	GY/8	:	To F2
C2	E43	GY/8	:	To F4
C2	E44	GY/1	:	To F3
F1*	E45	L/4	:	Cooling fan relay-1
F1	E46	B/5	:	ABS motor relay
F1*	E47	L/4	:	Cooling fan relay-3
G1	E48	W/3	:	Horn relay
G1	E49	L/4	:	Front fog lamp relay
G1	E50	B/5	:	ABS valve relay
F1	E51	L/4	:	Door mirror heater relay
F1*	E52	B/5	:	Rear wiper relay
G1	E54	B/5	:	Cooling fan relay-2
G1	E56	L/4	:	Air conditioner relay
C2	E57	GY/2	:	Front wheel sensor RH (with ABS)
D2	E58	L/2	:	EVAP Canister purge control solenoid valve
C1	E59	B/2	:	Side turn signal lamp RH
E2	E61	W/1	:	Vaccum switch (CD engine)
B4	E63	BR/2	:	Ambient air temperature switch
C2	E64	B/1	:	A/C compressor
D3	E65	GY/9	:	To F70 (GA engine)
C2	E66	GY/2	:	To E151 (GA engine)

YEL880

Engine Room Harness (Cont'd)

ENGINE COMPARTMENT — RHD models



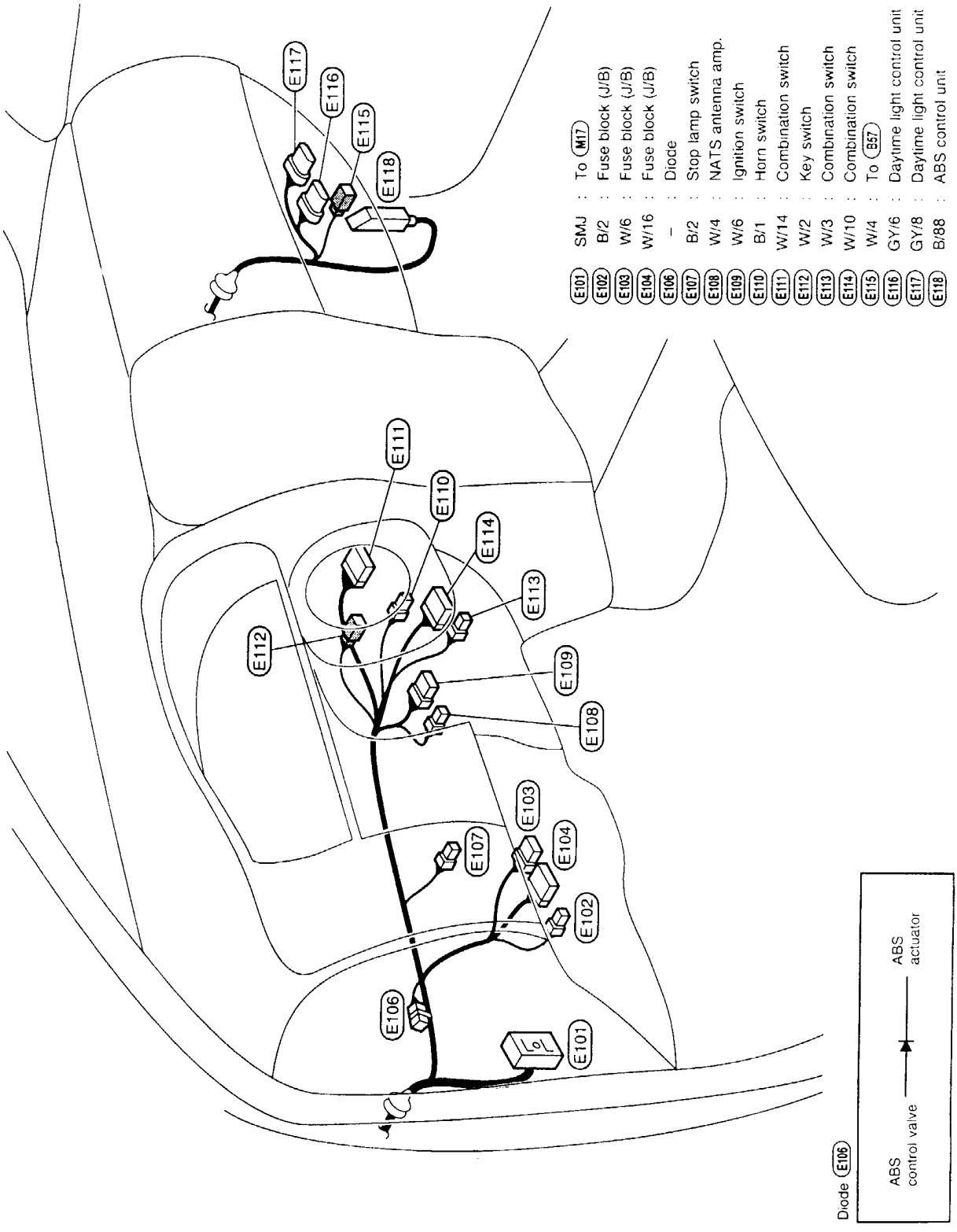
YEL881

D3	E1	SMJ	:	Fusible link holder
E3	E2	B/1	:	To F46
E3	E3	B/1	:	Battery
C4	E4	B/6	:	Headlamp aiming motor LH
D4	E5	GY/6	:	Front combination lamp LH
D4	E6	B/2	:	Front fog lamp LH
E4	E8	GY/2	:	Front turn signal lamp LH
G2	E9	B/2	:	Side turn signal lamp LH
F3	E10	–	:	Body ground
F3	E11	–	:	Body ground
E3	E12	W/2	:	Hood switch
D3	E13	W/2	:	Sedimenter (CD engine)
D1	E14	GY/2	:	Brake fluid level switch
E2	E15	GY/2	:	Dropping resistor
F2	E16	W/8	:	Front wiper amplifier
E3	E17	BR/2	:	Front wheel sensor LH (with ABS)
C4*	E18	B/2	:	Cooling fan motor-2 (CD engine)
C4*	E19	B/2	:	Cooling fan motor-1
C3*	E20	B/4	:	Triple-pressure switch
C3	E21	B/2	:	Dual-pressure switch
E4	E22	G/2	:	Glow relay (CD engine)
E4	E23	W/1	:	Glow relay (CD engine)
E4	E24	W/1	:	Glow relay (CD engine)
B4	E25	B/1	:	Horn (low)
B4	E26	GY/2	:	Outside air temperature sensor
B3	E27	B/1	:	Horn (high)
B3	E28	GY/2	:	Cooling fan motor-2
C3	E29	B/2	:	Cooling fan motor-1 (CD engine)
C2	E30	GY/8	:	ABS actuator (with ABS)
C3	E31	B/2	:	ABS actuator (with ABS)
A2	E32	GY/6	:	Front combination lamp RH
A3	E33	B/6	:	Headlamp aiming motor RH
A3	E34	B/2	:	Front fog lamp RH
A2	E36	GY/2	:	Front turn signal lamp RH
A2	E37	–	:	Body ground
A2	E39	B/2	:	Washer level switch
A1	E40	W/2	:	Washer motor
B1	E41	B/2	:	To F1 (Except GA engine) To E152 (GA engine)
C2*	E42	GY/8	:	To F2
C2	E43	GY/8	:	To F4
C2	E44	GY/1	:	To F3
F1*	E45	L/4	:	Cooling fan relay-1
F1	E46	B/5	:	ABS motor relay
F1*	E47	L/4	:	Cooling fan relay-3
G1	E48	W/3	:	Horn relay
G1	E49	L/4	:	Front fog lamp relay
G1	E50	B/5	:	ABS valve relay
F1	E51	L/4	:	Door mirror heater relay
F1*	E52	B/5	:	Rear wiper relay
G1	E54	B/5	:	Cooling fan relay-2
G1	E56	L/4	:	Air conditioner relay
C2	E57	GY/2	:	Front wheel sensor RH (with ABS)
D2	E58	L/2	:	EVAP Canister purge control solenoid valve
C1	E59	B/2	:	Side turn signal lamp RH
D2	E60	GY/2	:	Power steering oil pressure switch
D2	E61	W/1	:	Vacuum switch (CD engine)
F2	E62	W/6	:	Front wiper motor
B4	E63	BR/2	:	Ambient air temperature switch
B3	E64	B/1	:	A/C compressor
D3	E65	GY/8	:	To F70 (GA engine)
B2	E66	GY/2	:	To E151 (GA engine)

YEL882

Engine Room Harness (Cont'd)

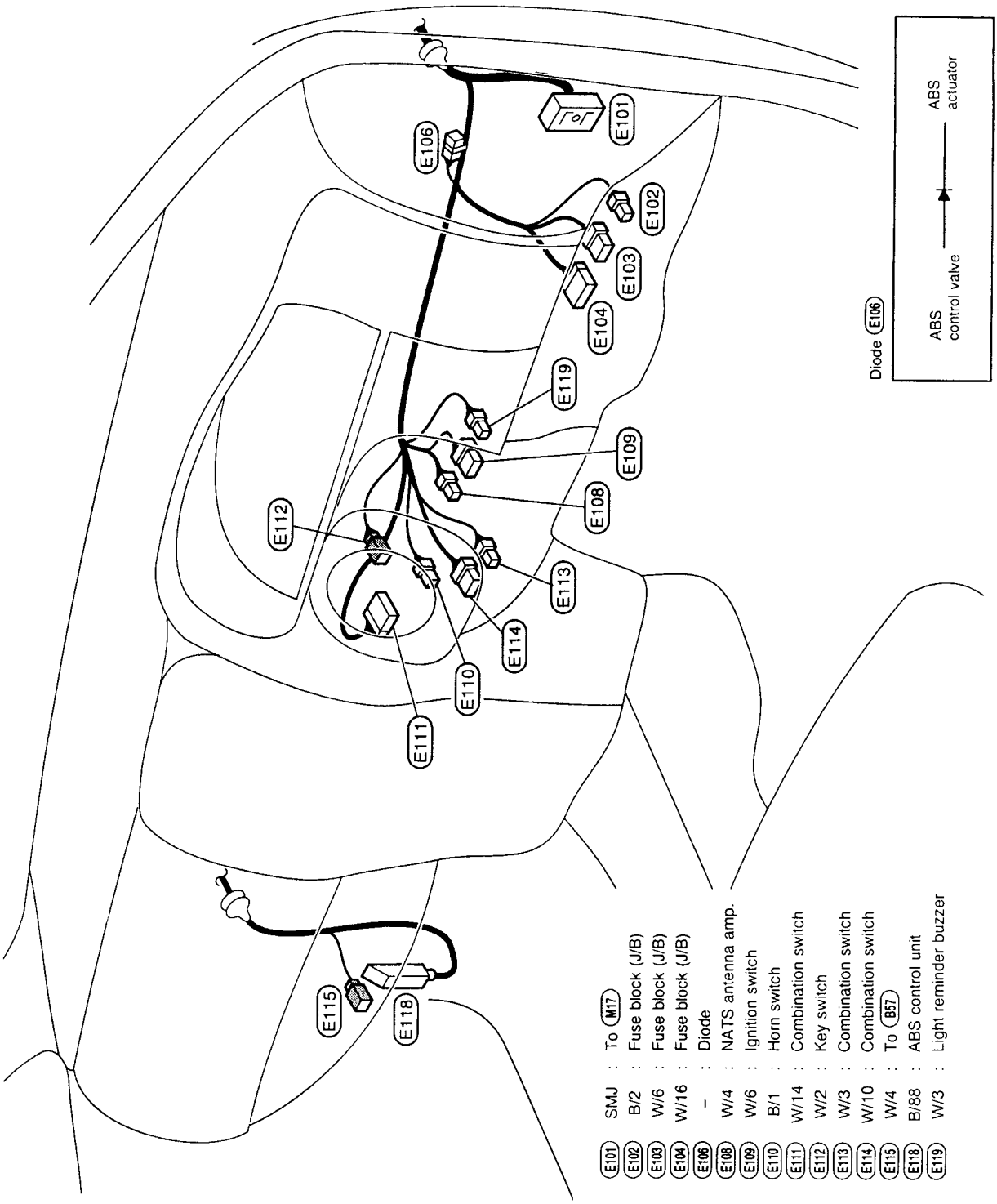
PASSENGER COMPARTMENT — LHD models



YEL883

Engine Room Harness (Cont'd)

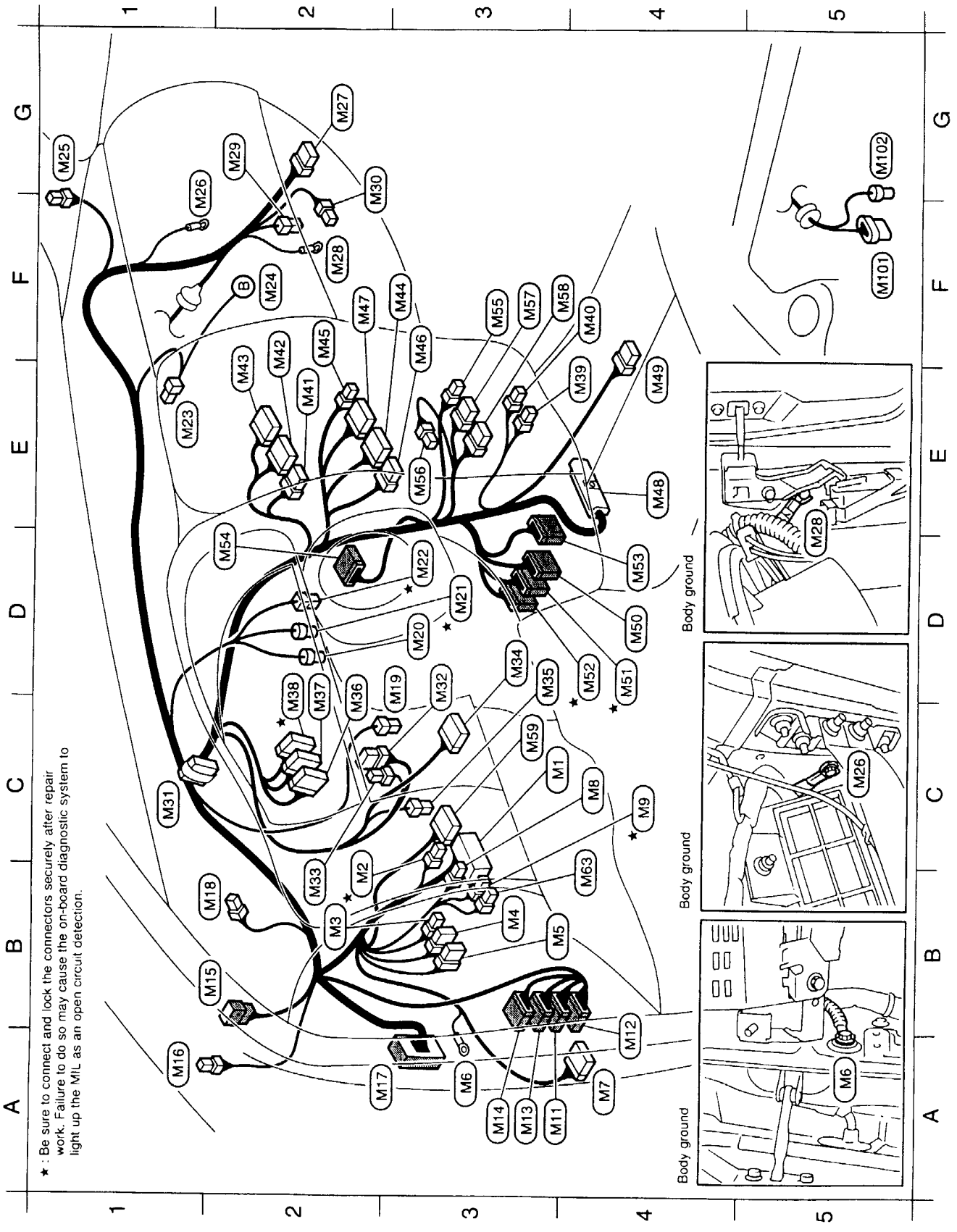
PASSENGER COMPARTMENT — RHD models



YEL884

Main Harness

LHD MODELS



YEL875

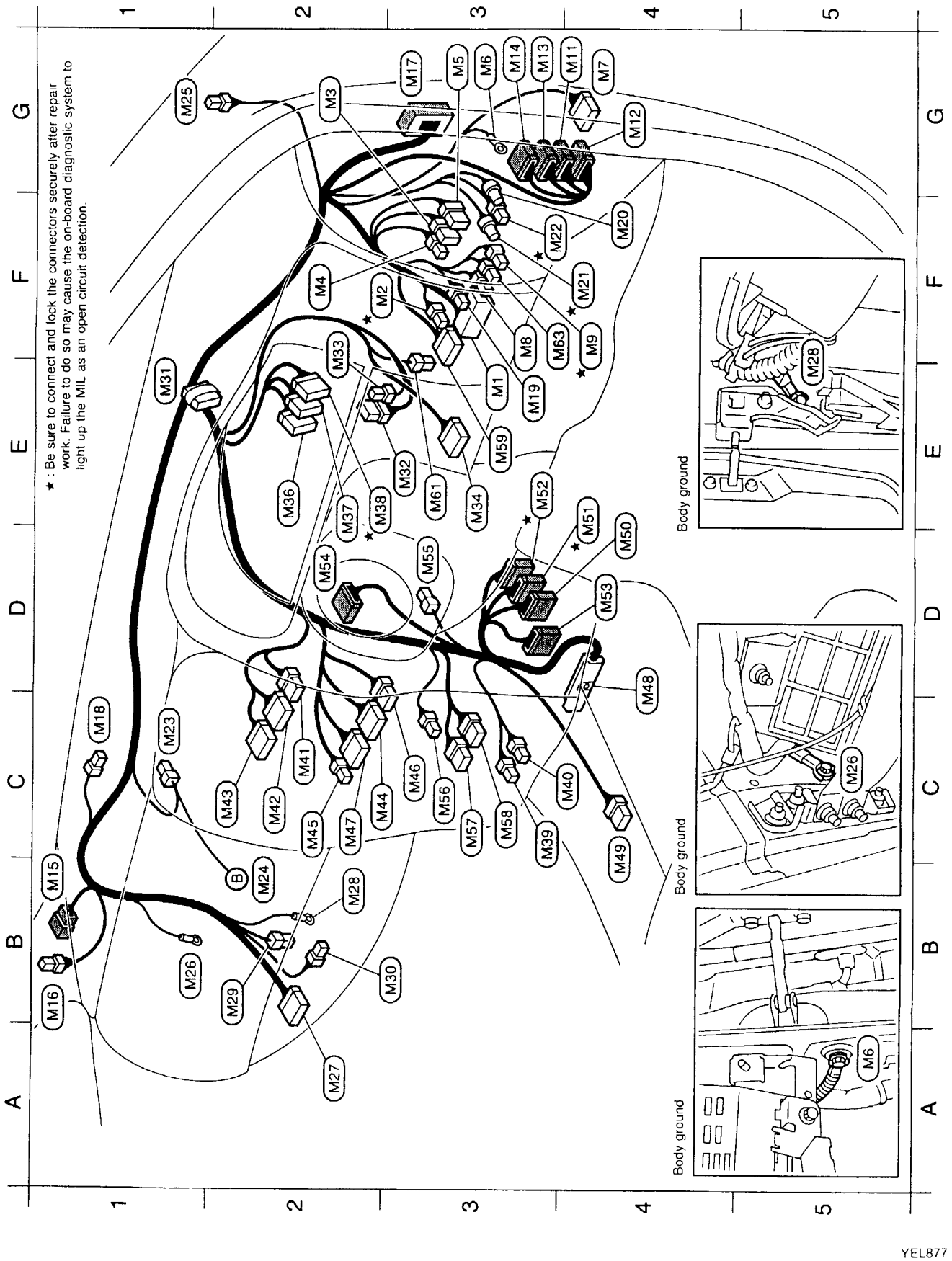
Main harness

C4	M1	–	:	Fuse block (J/B)
B2*	M2	B/2	:	Fuse block (J/B)
B2	M3	W/4	:	Illumination control switch
B3	M4	W/6	:	Headlamp aiming switch
B4	M5	W/8	:	Door mirror remote control switch
A3	M6	–	:	Body ground
A4	M7	W/16	:	To D1
C4	M8	L/4	:	Fuel pump relay
C4*	M9	BR/6	:	ECCS relay (SR and GA engine)
A3	M11	W/16	:	To B2
B4	M12	W/12	:	To B1
A3	M13	W/24	:	To B9
A3	M14	W/10	:	To B4
B2	M15	W/6	:	To R1
A1	M16	BR/2	:	Tweeter LH
A2	M17	SMJ	:	To E101
B2	M18	B/2	:	Nats security indicator
D3	M19	W/2	:	Kickdown switch
D3*	M20	GY/3	:	Throttle position switch
D3*	M21	BR/3	:	Throttle position sensor (CD engine)
D3*	M22	W/3	:	Pedal position switch (CD engine)
E1	M23	W/4	:	Intake door motor
E1	M24	Bulb	:	Glove box lamp
G1	M25	BR/2	:	Tweeter RH
G1	M26	–	:	Body ground
G2	M27	W/12	:	To D10
F2*	M28	–	:	Body ground
G2	M29	BR/4	:	Fan resistor
G2	M30	W/2	:	Blower motor
C1	M31	W/2	:	Joint connector
D3	M32	W/6	:	Rear wiper amplifier
B2	M33	B/3	:	Combination flasher unit
D3	M34	W/12	:	NATS IMMU
D3	M35	W/3	:	Light reminder buzzer
C2	M36	W/14	:	Combination meter
C2	M37	BR/16	:	Combination meter
C2*	M38	W/16	:	Combination meter
E4	M39	B/2	:	Cigarette lighter socket
F4	M40	W/2	:	Ashtray illumination
E2	M41	W/6	:	Audio
E2	M42	W/10	:	Audio
E2	M43	W/12	:	Audio
F3	M44	W/12	:	A/C switch
F2	M45	W/2	:	Heater
E3	M46	W/3	:	Fan switch
F2	M47	W/12	:	Recirculation switch
E4	M48	L/48	:	A/T control unit (A/T models)
E4	M49	W/6	:	A/T control device (A/T models)
D4	M50	W/16	:	To F104 (SR and GA engine)
C4*	M51	W/20	:	To F105 (CD engine)
D4*	M52	W/12	:	To F103
D4	M53	W/20	:	To F102 (SR engine)
D2	M54	W/16	:	To Z3
F3	M55	W/3	:	Thermo control amplifier
E3	M56	W/2	:	ORN illumination
F3	M57	W/6	:	Rear window defogger switch
E3	M58	W/8	:	Hazard switch
C3	M59	GY/14	:	Data link connector to CONSULT
B4	M63	L/4	:	ECCS relay (CD engine)
F5	M101	W/6	:	Front wiper motor
G5	M102	W/2	:	Power steering switch

YEL876

Main Harness (Cont'd)

RHD MODELS



YEL877

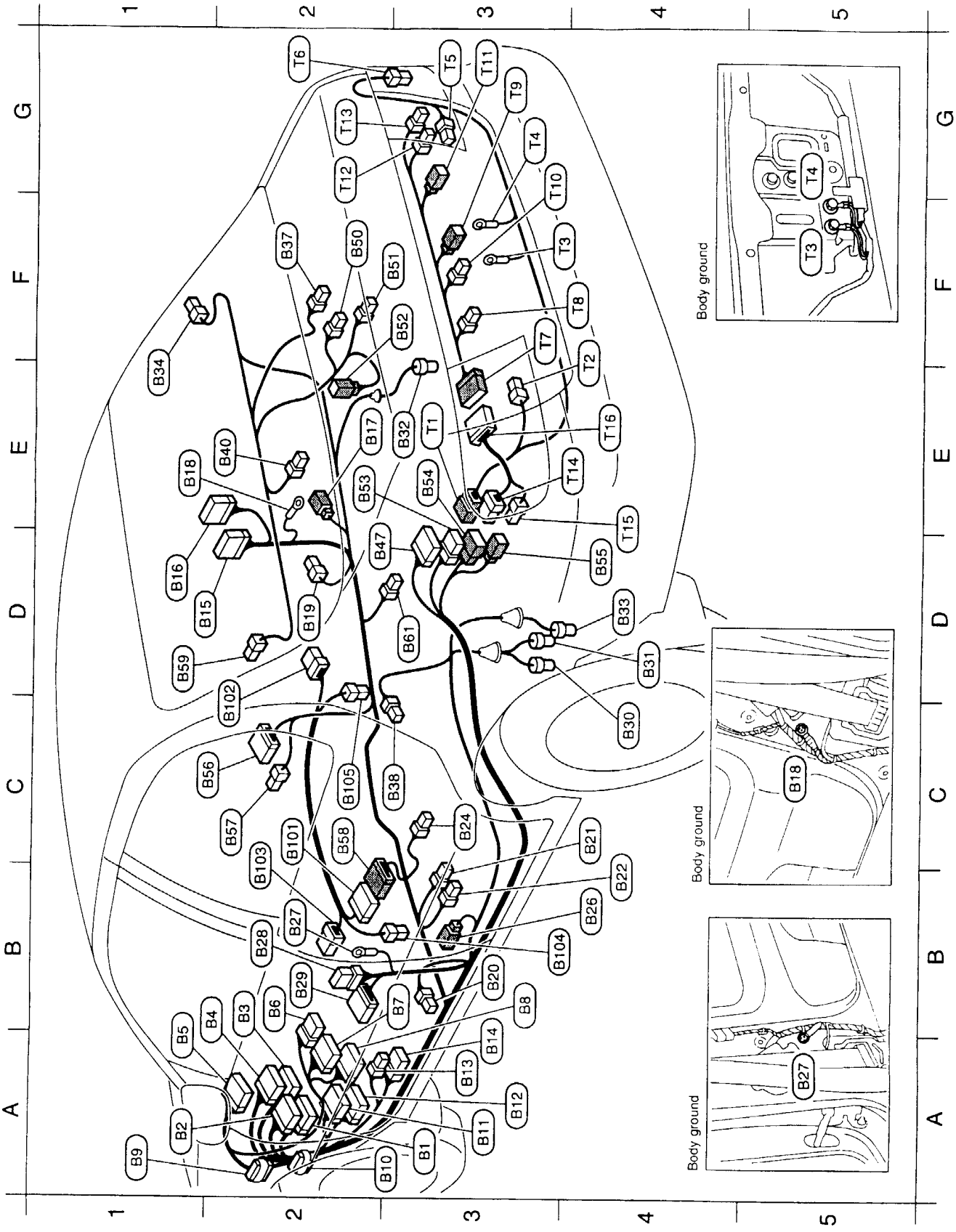
Main Harness (Cont'd)

E3	M1	–	: Fuse block (J/B)	C4	M40	W/2	: Ashtray illumination
F2*	M2	B/2	: Fuse block (J/B)	C2	M41	W/6	: Audio
G2	M3	W/4	: Illumination control switch	C2	M42	W/10	: Audio
F2	M4	W/6	: Headlamp aiming switch	C2	M43	W/12	: Audio
G3	M5	W/8	: Door mirror remote control switch	C2	M44	W/12	: A/C switch
G3	M6	–	: Body ground	C2	M45	W/2	: Heater
G4	M7	W/16	: To D1	C3	M46	W/3	: Fan switch
F3	M8	L/4	: Fuel pump relay	C2	M47	W/12	: Recirculation switch
F4*	M9	BR/6	: ECCS relay (SR and GA engine)	D4	M48	L/48	: A/T control unit (A/T models)
G4	M11	W/16	: To B2	C4	M49	W/6	: A/T control device (A/T models)
G4	M12	W/12	: To B1	D4	M50	W/16	: To F104 (SR and GA engine)
G3	M13	W/24	: To B3	D4*	M51	W/20	: To F105 (CD engine)
G3	M14	W/10	: To B4	E3*	M52	W/12	: To F103
B1	M15	W/6	: To R1	D4	M53	W/20	: To F102 (SR engine)
B1	M16	BR/2	: Tweeter LH	D2	M54	W/16	: To Z3
G3	M17	SMJ	: To E101	D3	M55	W/3	: Thermo control amplifier
C1	M18	B/2	: Nats security indicator	C3	M56	W/2	: ORN illumination
E3	M19	W/2	: Kickdown switch	C3	M57	W/6	: Rear window defogger switch
F4	M20	GY/3	: Throttle position switch	E3	M58	W/8	: Hazard switch
F4*	M21	BR/3	: Throttle position sensor (CD engine)	E3	M59	GY/14	: Data link connector for CONSULT
F4*	M22	W/3	: Pedal position switch (CD engine)	E3	M61	B/2	: Stop lamp switch
C1	M23	W/4	: Intake door motor	F4	M63	L/4	: ECCS relay (CD engine)
B2	M24	Bulb	: Glove box lamp				
G1	M25	BR/2	: Tweeter RH				
B1	M26	–	: Body ground				
A2	M27	W/12	: To D10				
B2*	M28	–	: Body ground				
B2	M29	BR/4	: Fan resistor				
B3	M30	W/2	: Blower motor				
E1	M31	W/2	: Joint connector				
E3	M32	W/6	: Rear wiper amplifier				
F2	M33	B/3	: Combination flasher unit				
E3	M34	W/12	: NATS IMMU				
E2	M36	W/14	: Combination meter				
D2	M37	BR/16	: Combination meter				
E3*	M38	W/16	: Combination meter				
C3	M39	B/2	: Cigarette lighter socket				

YEL878

Body Harness

SEDAN — LHD models



YEL885

Body harness

A3	B1	W/12	:	To M12
A1	B2	W/16	:	To M11
B2	B3	W/24	:	To M13
B2	B4	W/10	:	To M14
A1	B5	W/12	:	To D2
B2	B6	W/8	:	Theft warning control unit
B3	B7	W/20	:	Theft warning control unit
B3	B8	W/12	:	Fuse block (J/B)
A1	B9	W/2	:	Circuit breaker-1
A3	B10	W/2	:	Circuit breaker-2
A3	B11	W/12	:	Super lock control unit
A3	B12	W/16	:	Super lock control unit
A3	B13	L/4	:	Power window relay
A3	B14	BR/6	:	Rear window defogger relay
D2	B15	W/6	:	Ultra sonic sub-sensor
D1	B16	W/10	:	To D22
E2	B17	W/4	:	Seat belt pre-tensioner RH
E1	B18	–	:	Body ground
D2	B19	BR/1	:	Front door switch (Passenger side)
B3	B20	B/3	:	Front door switch (Driver side)
C4	B21	W/3	:	Heated seat LH
B4	B22	W/2	:	Power seat
C3	B24	B/1	:	Parking brake switch
B4	B26	W/4	:	Seat belt pre-tensioner LH
B2	B27	–	:	Body ground
B2	B28	W/10	:	To D18
B2	B29	W/8	:	Ultra sonic sensor
C4	B30	W/2	:	Fuel pump
D4	B31	W/3	:	Fuel pump gauge unit
E3	B32	GY/2	:	Rear wheel sensor RH
D4	B33	BR/2	:	Rear wheel sensor LH
E1	B34	BR/1	:	Rear door switch RH
F2	B37	B/2	:	Rear speaker RH
C3	B38	BR/1	:	Rear door switch LH
E2	B40	B/2	:	Rear speaker LH
D2	B47	W/16	:	CD auto changer
F2	B50	W/2	:	High mounted stop lamp
F3	B51	W/2	:	Trunk room lamp
F3	B52	W/4	:	Rear wiper motor
E2	B53	W/6	:	To T1
E3	B54	W/6	:	To T14
D4	B55	W/4	:	To T15
C1	B56	W/10	:	To D11
C2	B57	W/4	:	To E115
C2	B58	W/12	:	To B101
D1	B59	B/1	:	Rear window defogger
D3	B61	W/3	:	Heated seat RH

Console harness

C2	B101	W/12	:	To B58
C2	B102	W/6	:	Ultra sonic cancel switch
C3	B103	W/8	:	A/T mode switch
B4	B104	L/4	:	Heated seat switch LH
C2	B105	W/4	:	Heated seat switch RH

Tail harness

E3	T1	W/6	:	To B53
E4	T2	W/4	:	Rear combination lamp LH
F3	T3	–	:	Body ground
F3	T4	–	:	Body ground
G3	T5	B/2	:	Rear combination lamp RH
G2	T6	W/4	:	Theft warning horn

Tail harness No. 2

F3	T7	W/12	:	To T16
F4	T8	W/4	:	Rear combination lamp LH
G3	T9	W/2	:	Licence plate lamp
G3	T10	B/2	:	Trunk room lamp switch
G2	T11	BR/2	:	High mounted stop lamp
G2	T12	W/4	:	Door lock actuator assembly (Trunk)
G2	T13	W/4	:	Rear combination lamp RH

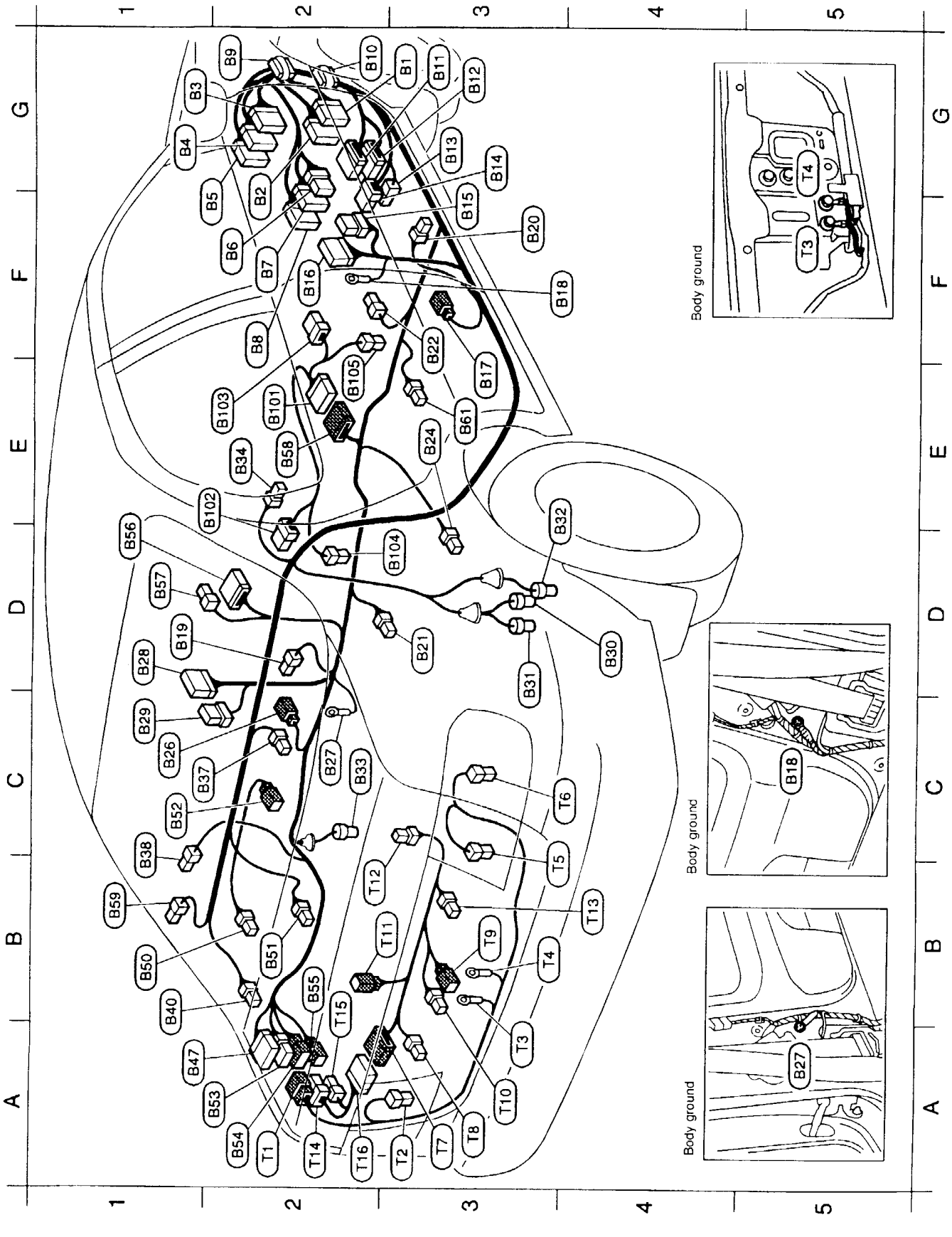
Tail sub-harness

E4	T14	W/6	:	To B54
D4	T15	W/4	:	To B55
E3	T16	W/12	:	To T7

YEL886

Body Harness (Cont'd)

SEDAN — RHD models



Body harness

G3	B1	W/12	:	To M12
F2	B2	W/16	:	To M11
G1	B3	W/24	:	To M13
G1	B4	W/10	:	To M14
F2	B5	W/12	:	To D2
F2	B6	W/8	:	Theft warning control unit
F2	B7	W/20	:	Theft warning control unit
F2	B8	W/12	:	Fuse block (J/B)
G2	B9	W/2	:	Circuit breaker-1
G2	B10	W/2	:	Circuit breaker-2
G3	B11	W/12	:	Super lock control unit
G3	B12	W/16	:	Super lock control unit
G3	B13	L/4	:	Power window relay
G3	B14	BR/6	:	Rear window defogger relay
F3	B15	W/6	:	Ultra sonic sub-sensor
F2	B16	W/10	:	To D22
E3	B17	W/4	:	Seat belt pre-tensioner RH
F3	B18	–	:	Body ground
D1	B19	BR/1	:	Front door switch (Passenger side)
F3	B20	B/3	:	Front door switch (Driver side)
D3	B21	W/3	:	Heated seat LH
E3	B22	W/2	:	Power seat
E3	B24	B/1	:	Parking brake switch
C1	B26	W/4	:	Seat belt pre-tensioner LH
C2	B27	–	:	Body ground
D1	B28	W/10	:	To D18
C1	B29	W/8	:	Ultra sonic sensor
D4	B30	W/2	:	Fuel pump
D4	B31	W/3	:	Fuel pump gauge unit
E3	B32	GY/2	:	Rear wheel sensor RH
C2	B33	BR/2	:	Rear wheel sensor LH
E2	B34	BR/1	:	Rear door switch RH
C2	B37	B/2	:	Rear speaker RH
C1	B38	BR/1	:	Rear door switch LH
B1	B40	B/2	:	Rear speaker LH
C4	B47	W/16	:	CD auto changer
B1	B50	W/2	:	High mounted stop lamp
B2	B51	W/2	:	Trunk room lamp
C1	B52	W/4	:	Rear wiper motor
D2	B53	W/6	:	To T1
D3	B54	W/6	:	To T14
D3	B55	W/4	:	To T15
D1	B56	W/10	:	To D11
D1	B57	W/4	:	To E115
E2	B58	W/12	:	To B101
B1	B59	B/1	:	Rear window defogger
E3	B61	W/3	:	Heated seat RH

Console harness

E2	B101	W/12	:	To B58
E2	B102	W/6	:	Ultra sonic cancel switch
E2	B103	W/8	:	A/T mode switch
E3	B104	L/4	:	Heated seat switch LH
E2	B105	W/4	:	Heated seat switch RH

Tail harness

C3	T1	W/6	:	To B53
A3	T2	W/4	:	Rear combination lamp LH
B3	T3	–	:	Body ground
B3	T4	–	:	Body ground
B4	T5	B/2	:	Rear combination lamp RH
C4	T6	W/4	:	Theft warning horn

Tail harness No. 2

A1	T7	W/12	:	To T16
A3	T8	W/4	:	Rear combination lamp LH
B3	T9	W/2	:	Licence plate lamp
A3	T10	B/2	:	Trunk room lamp switch
B3	T11	BR/2	:	High mounted stop lamp
B2	T12	W/4	:	Door lock actuator assembly (Trunk)
B4	T13	W/4	:	Rear combination lamp RH

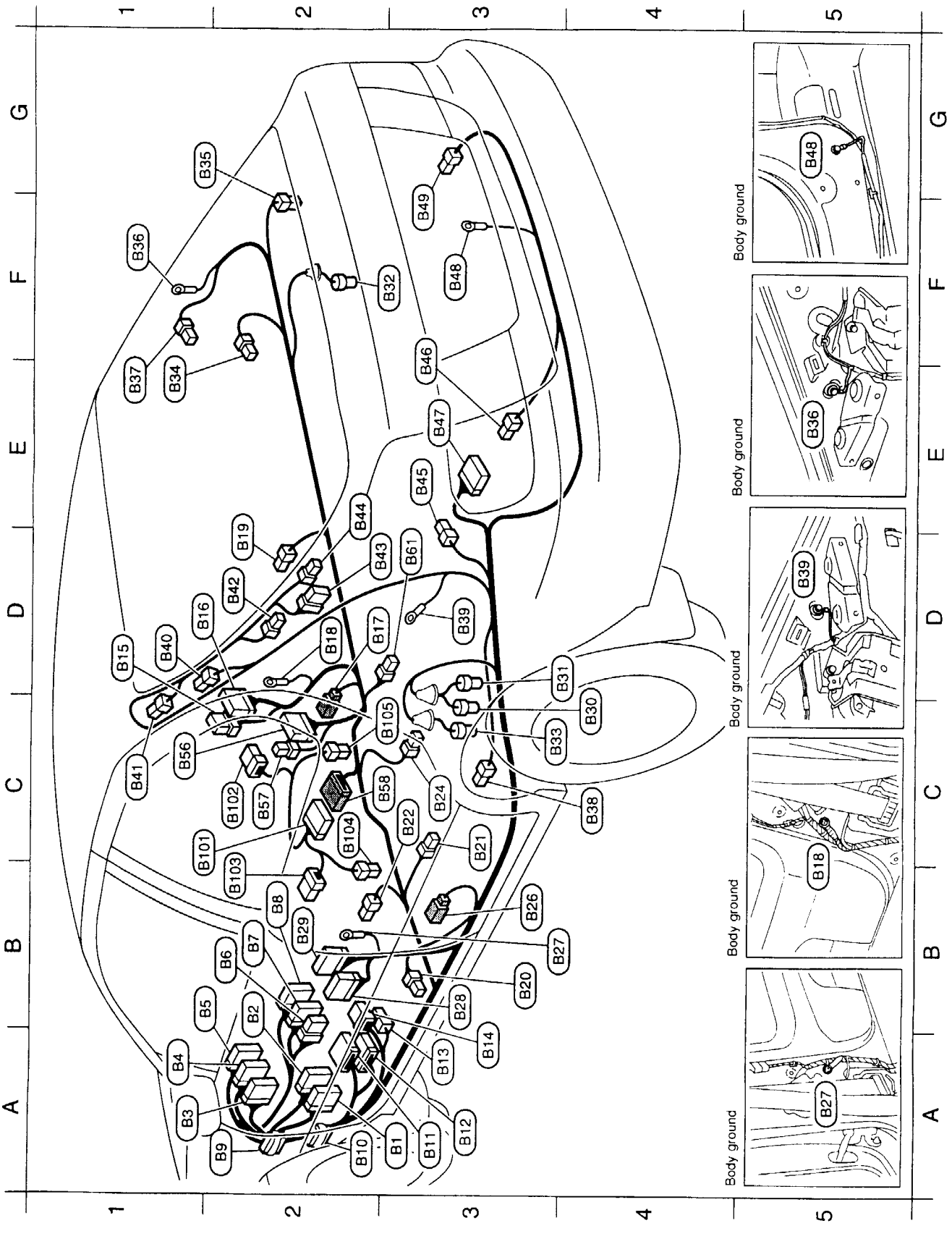
Tail sub-harness

C2	T14	W/6	:	To B54
C4	T15	W/4	:	To B55
A2	T16	W/12	:	To T7

YEL888

Body Harness (Cont'd)

5-DOOR HATCHBACK — LHD models



YEL889

Body harness

A3	B1	W/12	:	To M12
B2	B2	W/16	:	To M11
A1	B3	W/24	:	To M13
A1	B4	W/10	:	To M14
B1	B5	W/12	:	To D2
B2	B6	W/8	:	Theft warning control unit
B2	B7	W/20	:	Theft warning control unit
B2	B8	W/12	:	Fuse block (J/B)
A2	B9	–	:	Circuit breaker-1
A2	B10	–	:	Circuit breaker-2
A3	B11	W/12	:	Super lock control unit
A3	B12	W/16	:	Super lock control unit
A3	B13	L/4	:	Power window relay
A3	B14	BR/6	:	Rear window defogger relay
D1	B15	W/6	:	Ultra sonic sub-sensor
D2	B16	W/10	:	To D22
D3	B17	W/4	:	Seat belt pre-tensioner RH
D2	B18	–	:	Body ground
D2	B19	BR/1	:	Front door switch (Passenger side)
B3	B20	B/3	:	Front door switch (Driver side)
C3	B21	W/3	:	Heated seat LH
C3	B22	W/2	:	Power seat
C3	B24	B/1	:	Parking brake switch
B3	B26	W/4	:	Seat belt pre-tensioner LH
B4	B27	–	:	Body ground
B3	B28	W/10	:	To D18
B2	B29	W/8	:	Ultra sonic sensor
C4	B30	W/2	:	Fuel pump
D4	B31	W/3	:	Fuel tank gauge unit
F2	B32	GY/2	:	Rear wheel sensor RH
C4	B33	BR/2	:	Rear wheel sensor LH
E1	B34	BR/1	:	Rear door switch RH
G1	B35	B/1	:	Theft warning horn
F1	B36	–	:	Body ground
E1	B37	B/2	:	Rear speaker RH
C4	B38	B/1	:	Rear door switch RH
D3	B39	–	:	Body ground
D1	B40	B/2	:	Rear speaker LH
C1	B41	B/1	:	Rear window defogger
D2	B42	W/4	:	To D29
D3	B43	W/6	:	To D102
E2	B44	W/3	:	To D31
E3	B45	W/2	:	Luggage room lamp
E3	B46	W/4	:	Rear combination lamp LH
E3	B47	W/16	:	CD auto changer
F3	B48	–	:	Body ground
F3	B49	W/4	:	Rear combination lamp RH
C1	B56	W/10	:	To D11
C2	B57	W/4	:	To E115
C3	B58	W/12	:	To B101
D3	B61	W/3	:	Heated seat RH

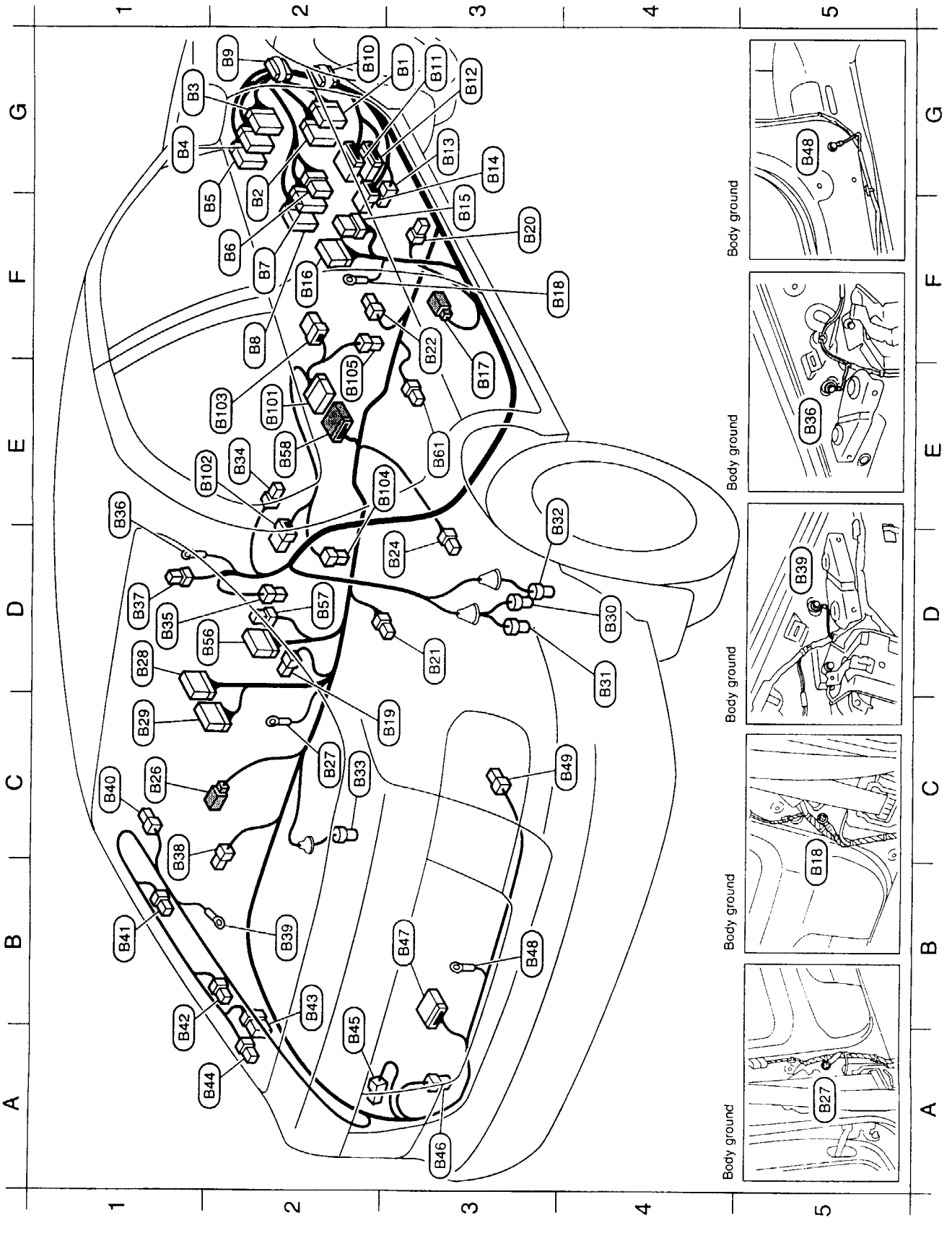
Console harness

C1	B101	W/12	:	To B58
C2	B102	W/6	:	Ultra sonic cancel switch
B2	B103	W/8	:	A/T mode switch
C2	B104	L/4	:	Heated seat switch LH
C3	B105	W/4	:	Heated seat switch RH

YEL890

Body Harness (Cont'd)

5-DOOR HATCHBACK — RHD models



YEL891

Body harness

G3	B1	W/12	:	To M12
F2	B2	W/16	:	To M11
G1	B3	W/24	:	To M13
G1	B4	W/10	:	To M14
F2	B5	W/12	:	To D2
F2	B6	W/8	:	Theft warning control unit
F2	B7	W/20	:	Theft warning control unit
F2	B8	W/12	:	Fuse block (J/B)
G2	B9	–	:	Circuit breaker-1
G2	B10	–	:	Circuit breaker-2
G3	B11	W/12	:	Super lock control unit
G3	B12	W/16	:	Super lock control unit
G3	B13	L/4	:	Power window relay
G3	B14	BR/6	:	Rear window defogger relay
F3	B15	W/6	:	Ultra sonic sub-sensor
F2	B16	W/10	:	To D22
E3	B17	W/4	:	Seat belt pre-tensioner RH
F4	B18	–	:	Body ground
C3	B19	BR/1	:	Front door switch (Passenger side)
F3	B20	B/3	:	Front door switch (Driver side)
D3	B21	W/3	:	Heated seat LH
F3	B22	W/2	:	Power seat
D3	B24	B/1	:	Parking brake switch
C1	B26	W/4	:	Seat belt pre-tensioner LH
C2	B27	–	:	Body ground
D1	B28	W/10	:	To D18
C1	B29	W/8	:	Ultra sonic sensor
D4	B30	W/2	:	Fuel pump
D4	B31	W/3	:	Fuel tank gauge unit
D4	B32	GY/2	:	Rear wheel sensor RH
C2	B33	BR/2	:	Rear wheel sensor LH
E2	B34	BR/1	:	Rear door switch RH
D1	B35	B/1	:	Theft warning horn
E1	B36	–	:	Body ground
D1	B37	B/2	:	Rear speaker RH
C1	B38	B/1	:	Rear door switch LH
B2	B39	–	:	Body ground
C1	B40	B/2	:	Rear speaker LH
B1	B41	B/1	:	Rear window defogger
A1	B42	W/4	:	To D29
B2	B43	W/6	:	To D102
A2	B44	W/3	:	To D31
B2	B45	W/2	:	Luggage room lamp
A3	B46	W/4	:	Rear combination lamp LH
B3	B47	W/16	:	CD auto changer
B3	B48	–	:	Body ground
C4	B49	W/4	:	Rear combination lamp RH
D2	B56	W/10	:	To D11
D2	B57	W/4	:	To E115
E2	B58	W/12	:	To B101
E3	B61	W/3	:	Heated seat RH

Console harness

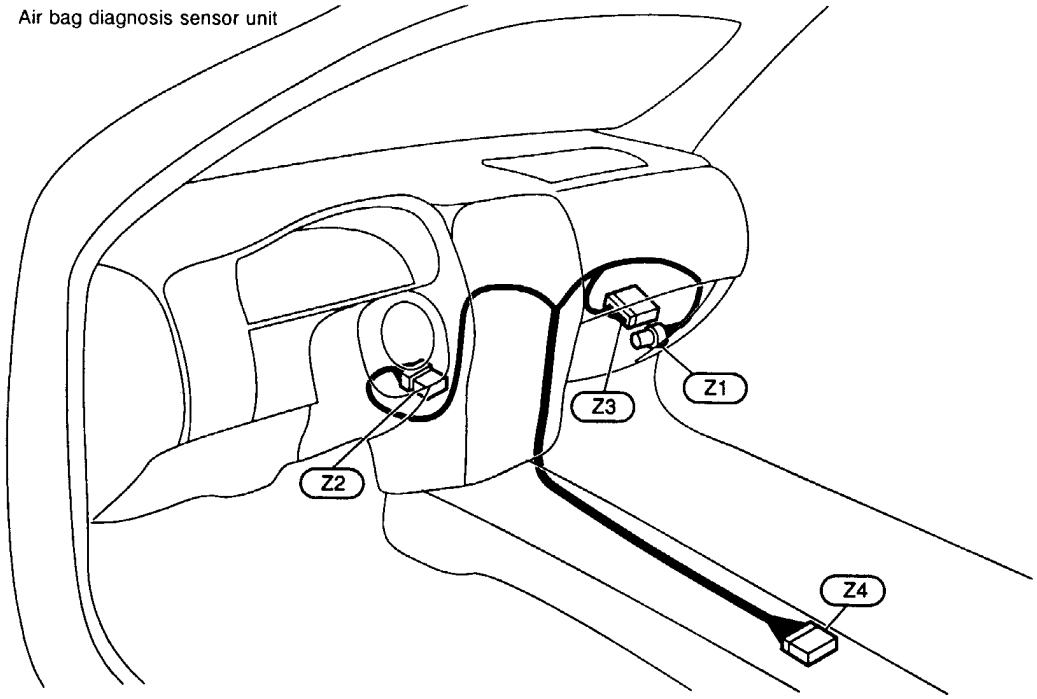
E2	B101	W/12	:	To B58
E1	B102	W/6	:	Ultra sonic cancel switch
E2	B103	W/8	:	A/T mode switch
E2	B104	L/4	:	Heated seat switch LH
E2	B105	W/4	:	Heated seat switch RH

YEL862

Air Bag Harness

LHD MODELS

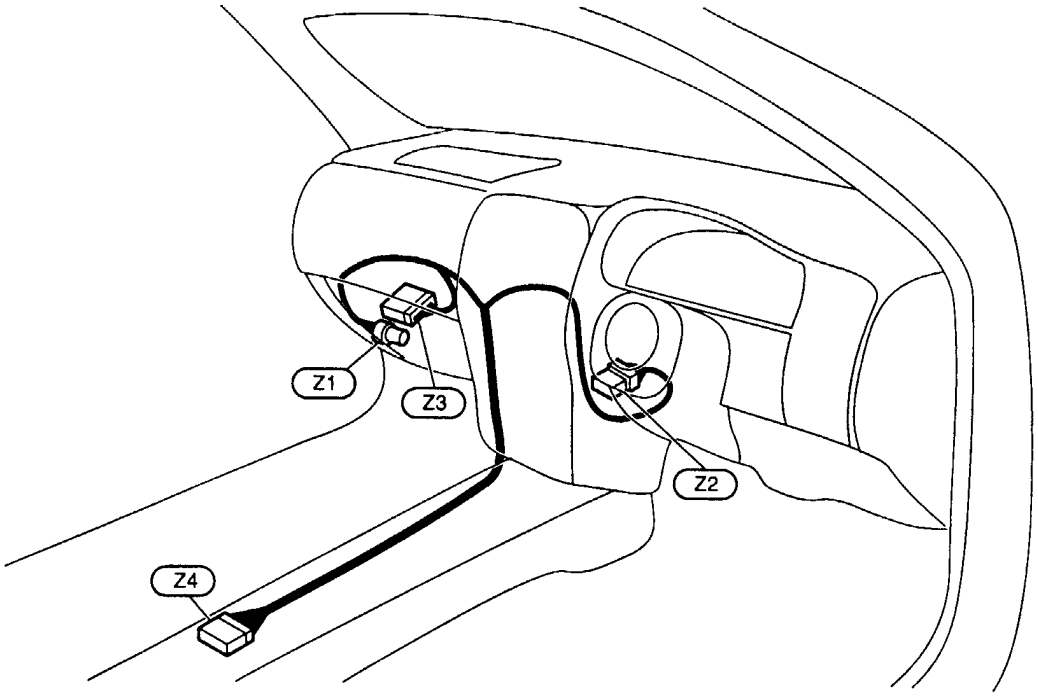
Z1 Y/2 : Air bag module (Passenger side)
Z2 Y/6 : Spiral cable
Z3 Y/16 : To M54
Z4 Y/22 : Air bag diagnosis sensor unit



YEL862

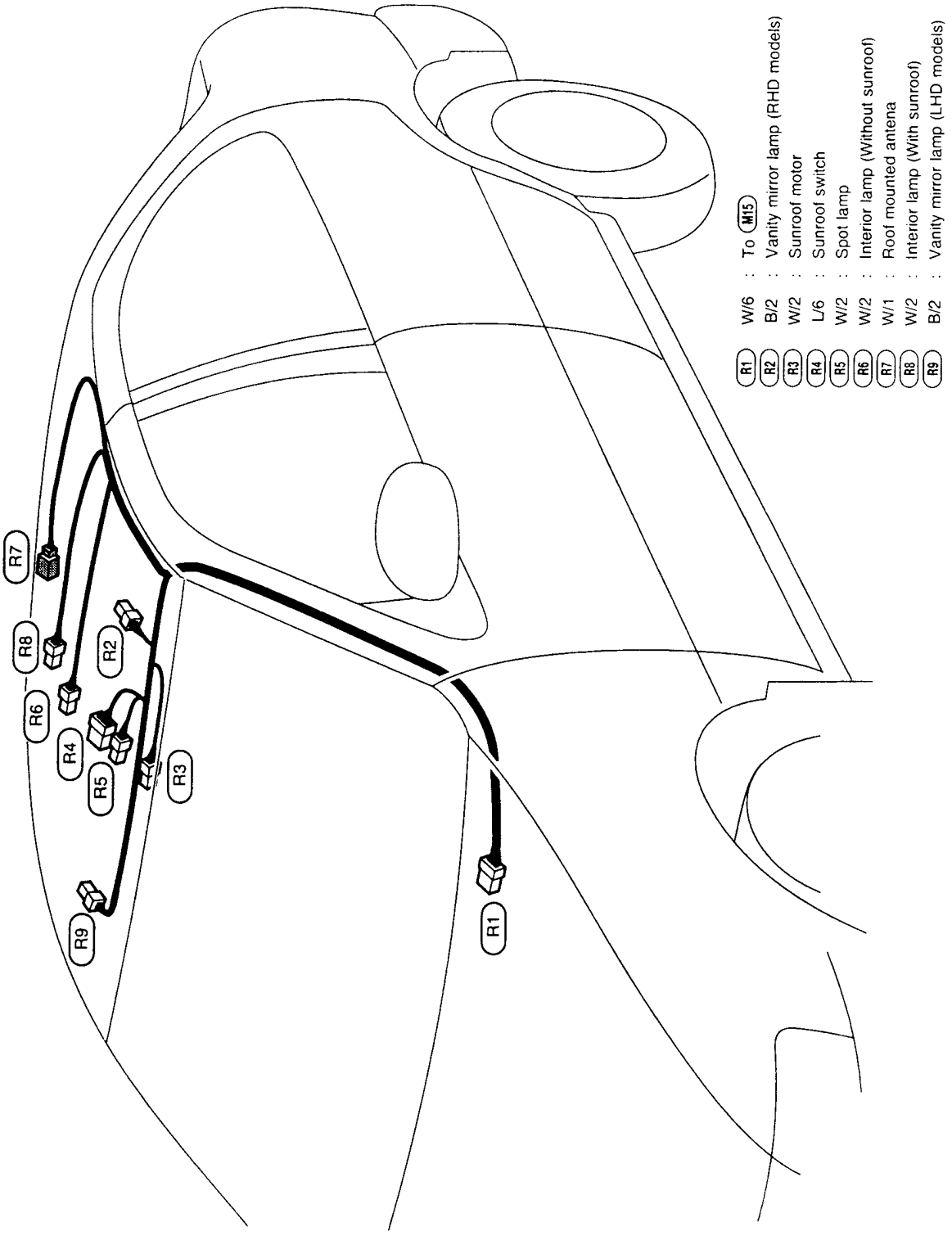
RHD MODELS

Z1 Y/2 : Air bag module (Passenger side)
Z2 Y/6 : Spiral cable
Z3 Y/16 : To M54
Z4 Y/22 : Air bag diagnosis sensor unit



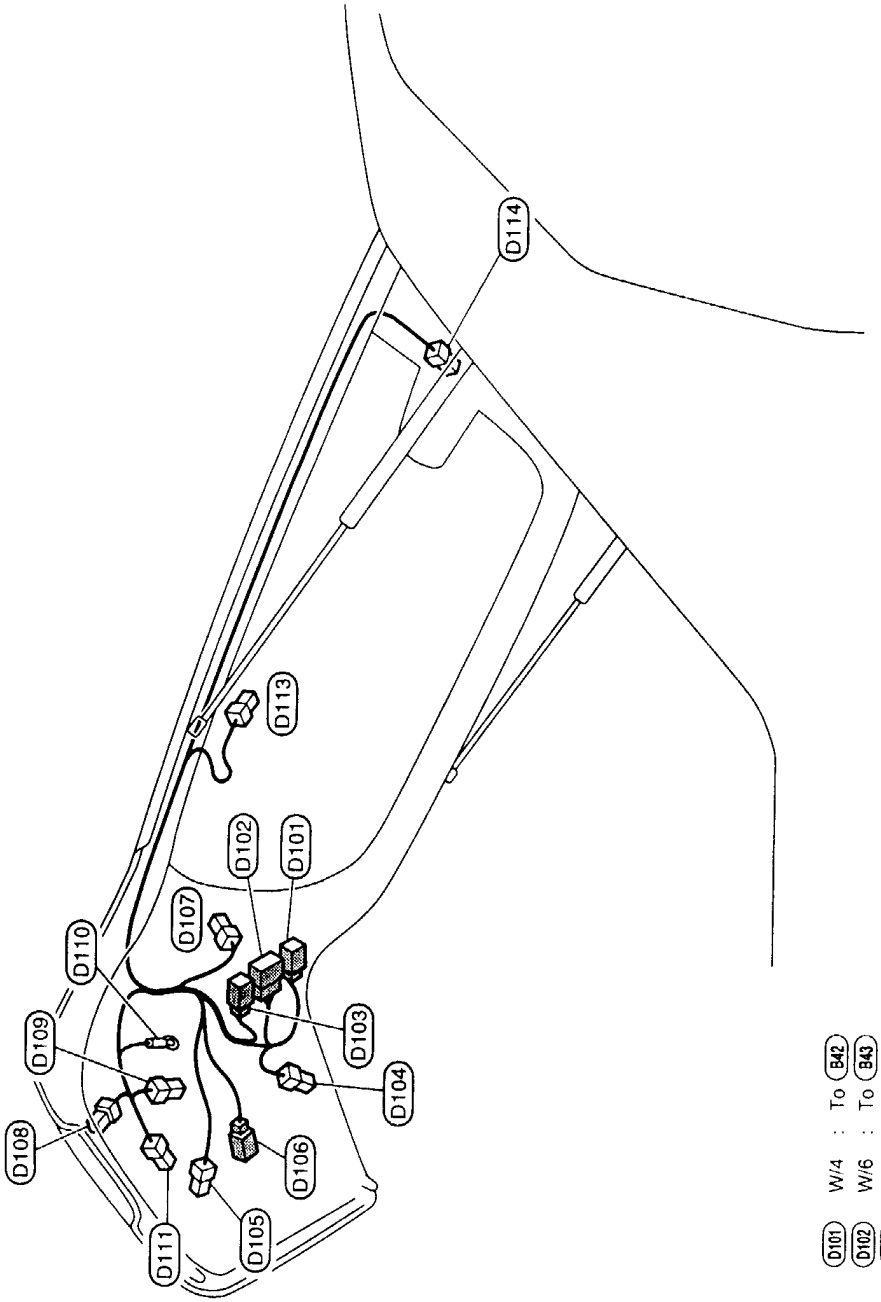
YEL863

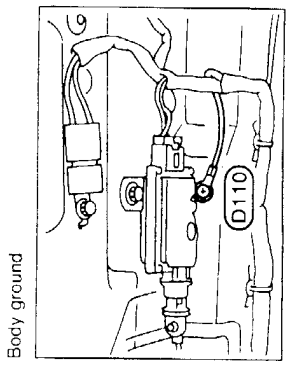
Room Lamp Harness



YEL864

Back Door Harness





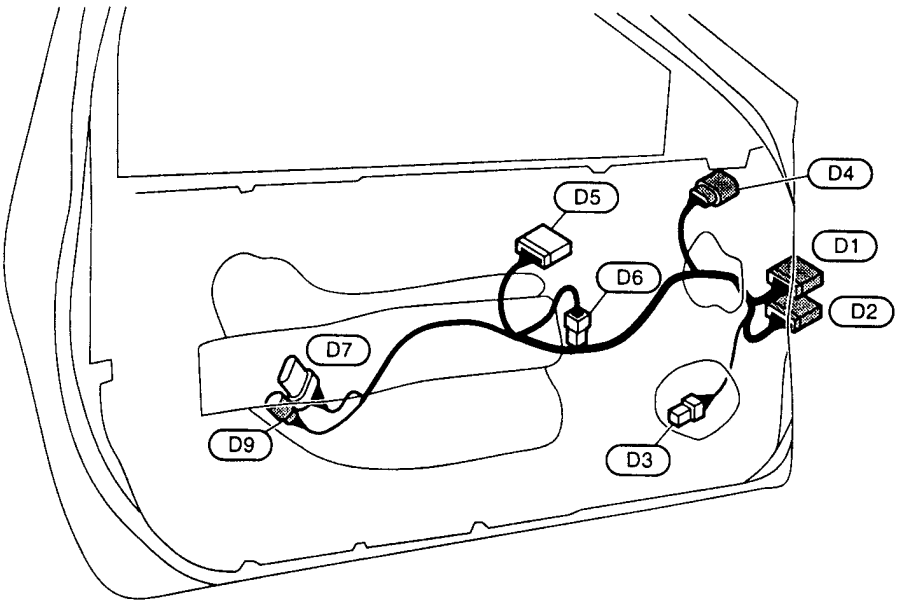
D101	W/4	: To B42	
D102	W/6	: To B43	
D103	W/3	: To B44	
D104	W/4	:	Rear combination lamp LH
D105	B/2	:	Luggage room lamp switch
D106	W/2	:	Licence plate lamp
D107	W/4	:	Rear wiper motor
D108	W/4	:	Rear combination lamp RH
D109	W/4	:	Door lock actuator assembly
D110	–	:	Body ground
D111	B/1	:	Rear window defogger condenser
D113	B/1	:	Rear window defogger
D114	B/2	:	High mounted stop lamp

YEL871

Front Door Harness (LH side)

LHD MODELS

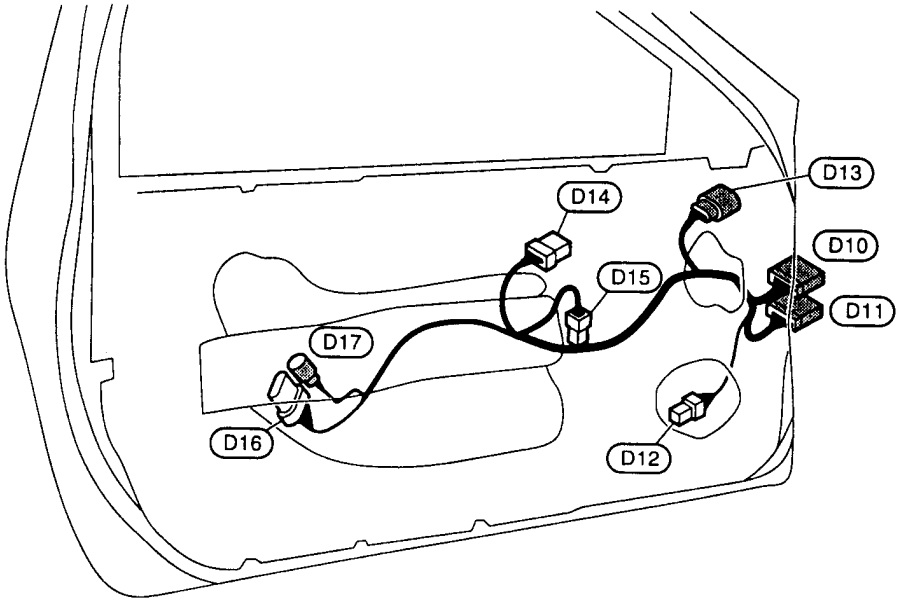
D1	W/16	: To M7	
D2	W/12	: To B5	
D3	B/2	: Front speaker LH	
D4	W/5	: Door mirror (Driver's side)	
D5	W/16	: Power window main switch	
D6	B/2	: Front power window regulator (Driver's side)	
D7	B/6	: Door lock actuator assembly (Driver's side)	
D9	GY/2	: Key cylinder switch (Driver's side)	



YEL865

RHD MODELS

D10	W/2	: To M27	
D11	W/10	: To B56	
D12	B/2	: Front speaker RH	
D13	W/5	: Door mirror (Passenger side)	
D14	W/8	: Front power window sub-switch	
D15	B/é	: Front power window regulator (Passenger side)	
D16	B/6	: Door lock actuator assembly (Passenger side)	
D17	GY/2	: Key cylinder switch (Passenger side)	

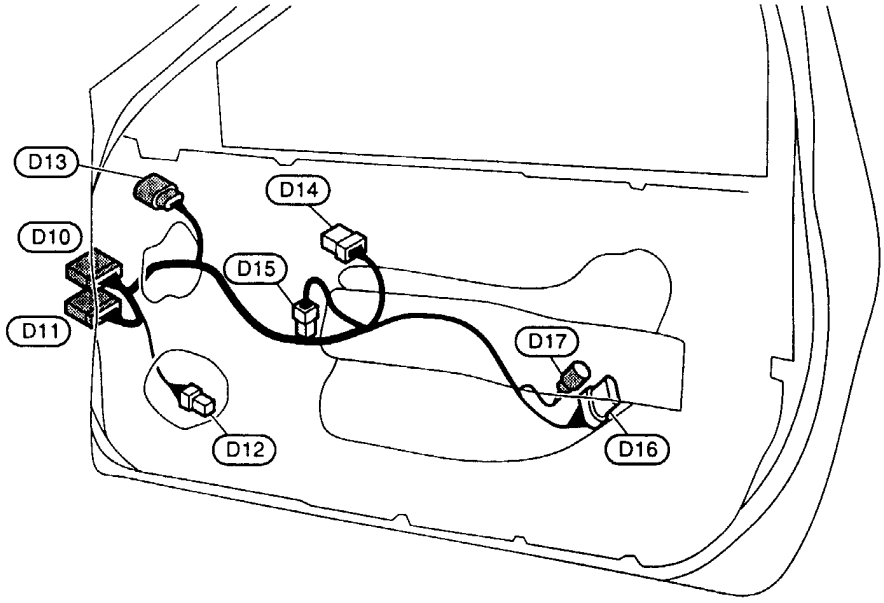


YEL866

Front Door Harness (RH side)

LHD MODELS

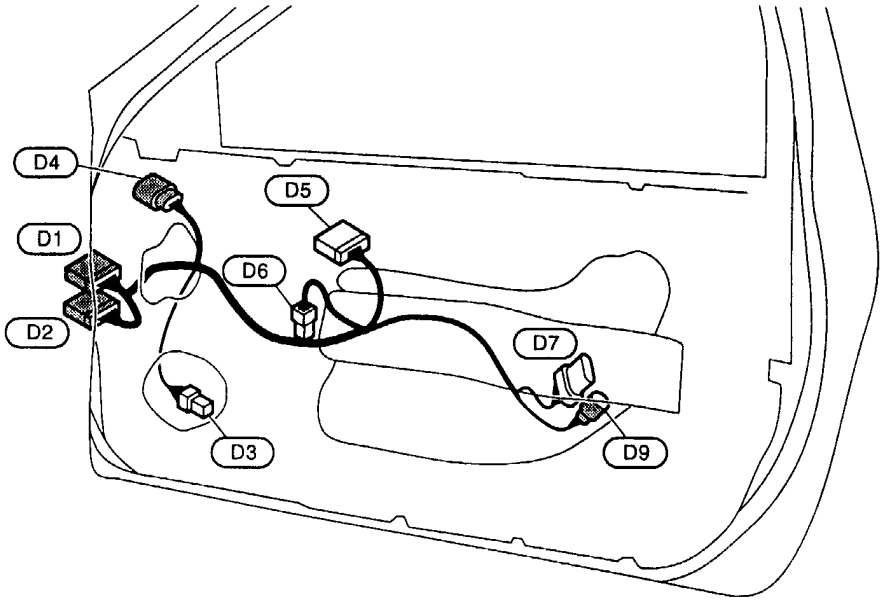
(D10) W/12 : To (M75)
(D11) W/10 : To (B56)
(D12) B/2 : Front speaker RH
(D13) W/5 : Door mirror (Passenger side)
(D14) W/8 : Front power window sub-switch
(D15) B/2 : Front power window regulator (Passenger side)
(D16) B/6 : Door lock actuator assembly (Passenger side)
(D17) GY/2 : Key cylinder switch (Passenger side)



YEL867

RHD MODELS

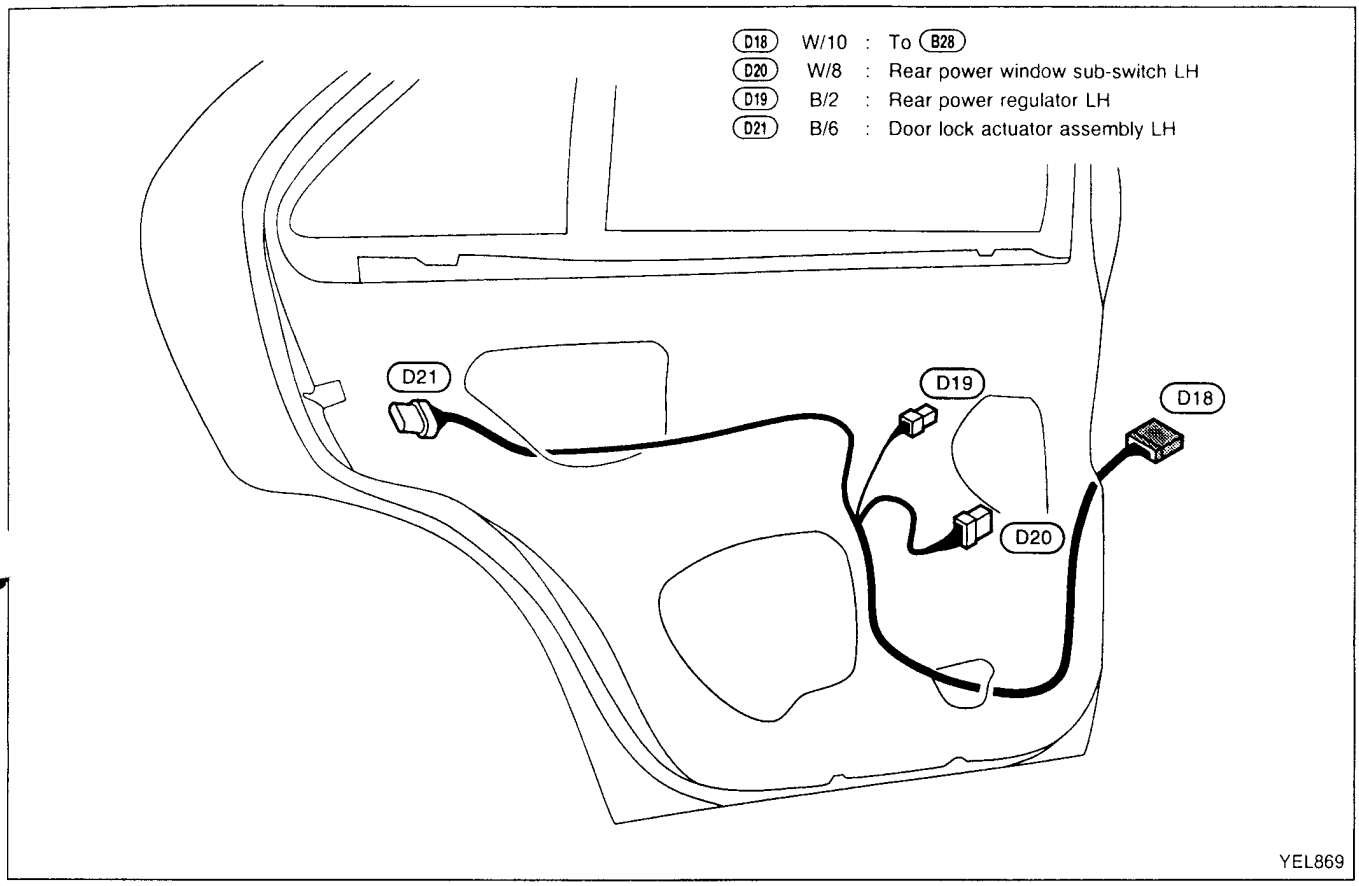
(D1) W/16 : To (M7)
(D2) W/12 : To (B5)
(D3) B/2 : Front speaker RH
(D4) W/5 : Door mirror (Driver's side)
(D5) W/16 : Power window main switch
(D6) B/2 : Front power window regulator (Driver's side)
(D7) B/6 : Door lock actuator assembly (Driver's side)
(D9) GY/2 : Key cylinder switch (Driver's side)



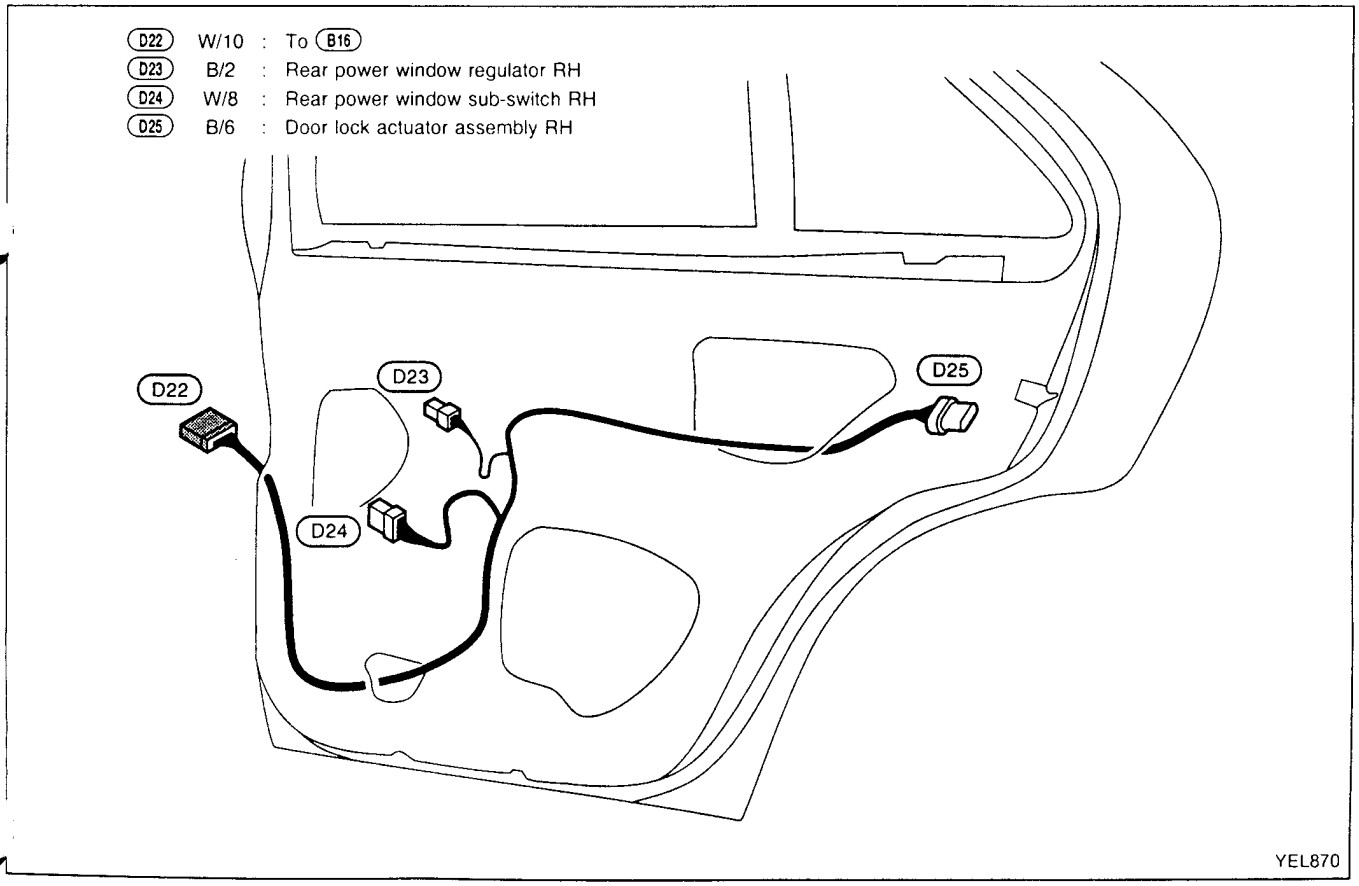
YEL868

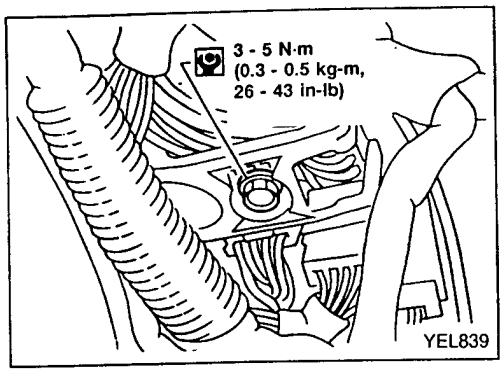
Rear Door Harness

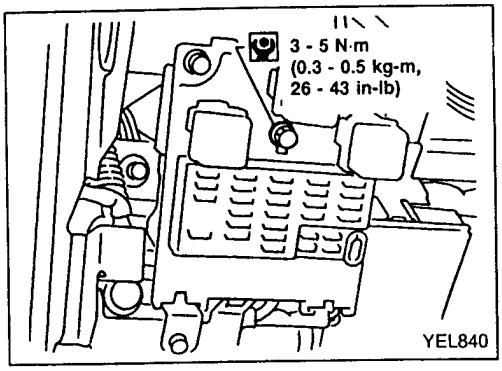
LH SIDE



RH SIDE







INSTALLATION

To install SMJ and FUSE BLOCK (J/B), tighten bolts until orange "fulltight" mark appears and then retighten to specified torque as required.

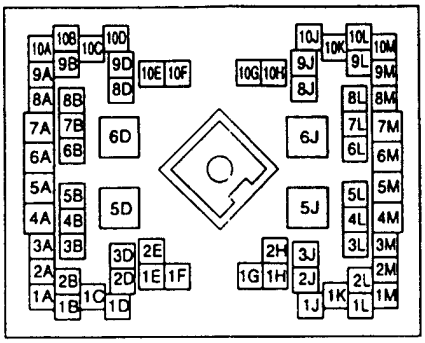
: 3 - 5 N·m
(0.3 - 0.5 kg-m, 26 - 43 in-lb)

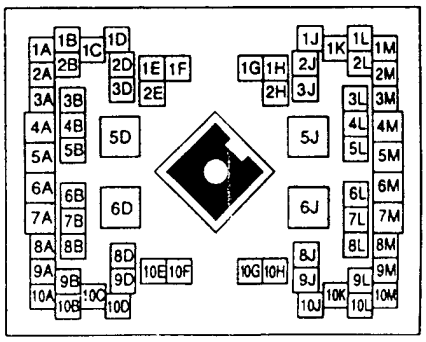
CAUTION:
Do not overtighten bolts, otherwise, they may be damaged.

Terminal Arrangement

T.S.

E101

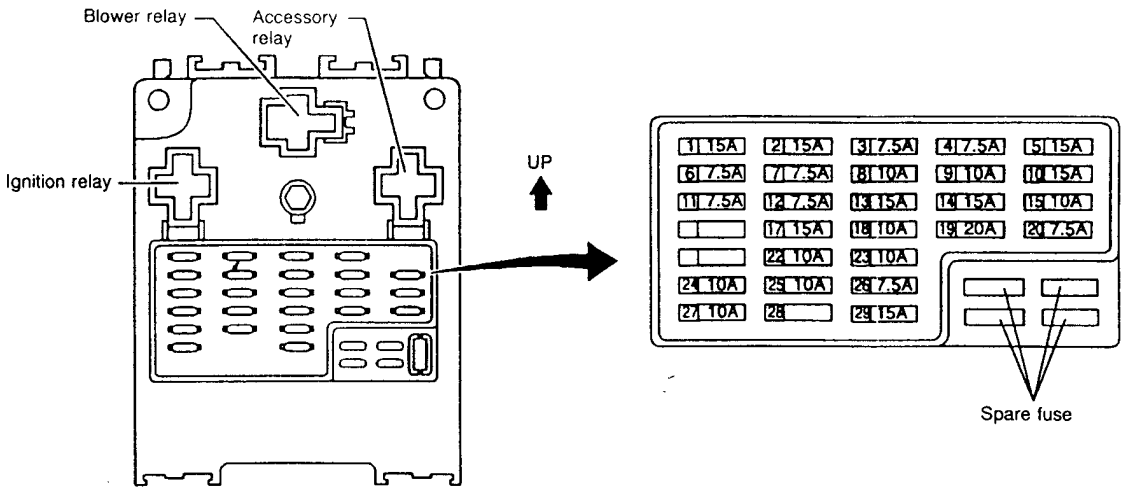


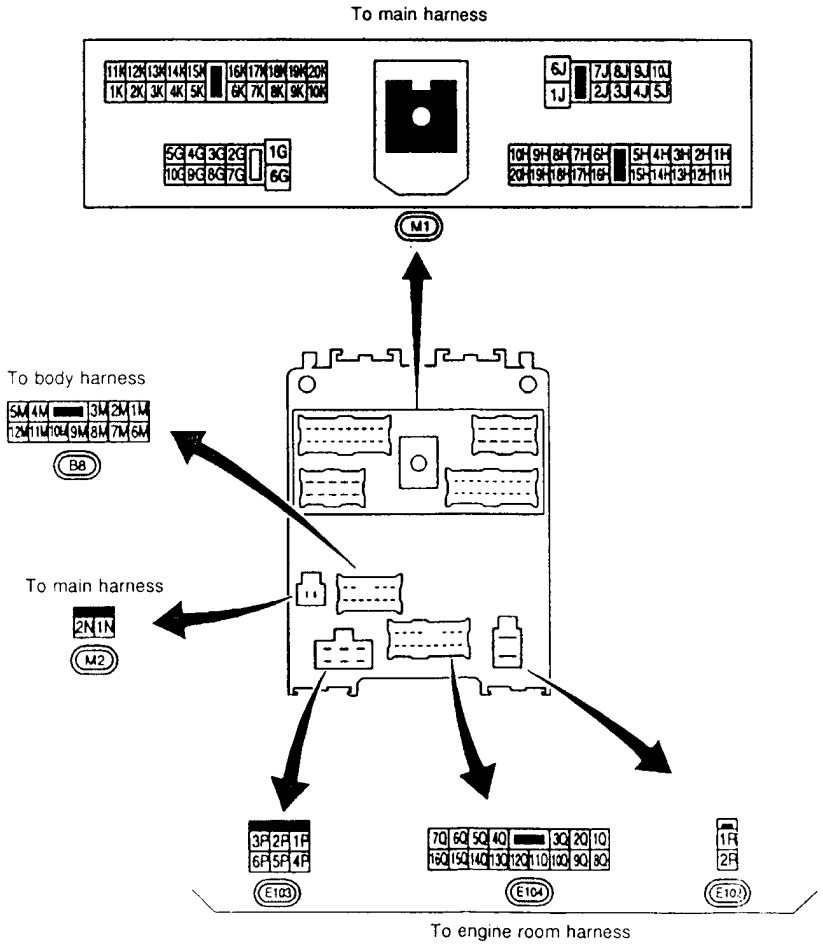


M17

YEL898

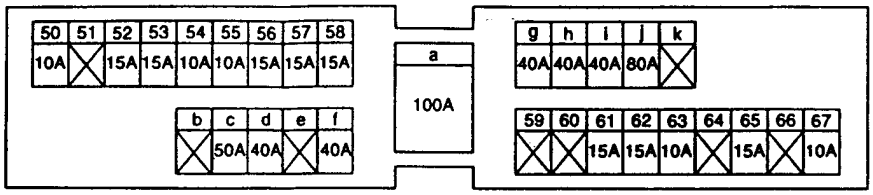
Terminal Arrangement

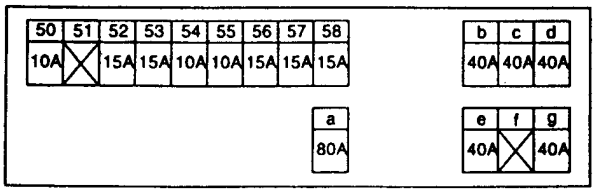




YEL899

FUSE AND FUSIBLE LINK BOX





DE : Diesel engine models
CE : Gasoline engine models

YEL900

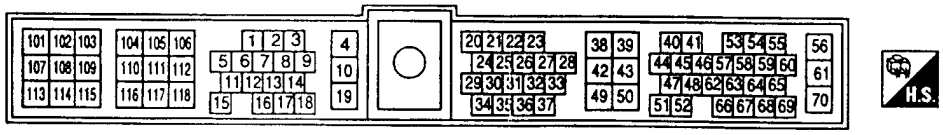
Terminal Arrangement

A/T CONTROL UNIT (M48)

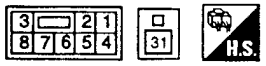
ABS CONTROL UNIT (E118)

ECM (ECCS CONTROL MODULE) (F101)

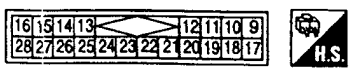
ECM (ECCS CONTROL MODULE) (F106)



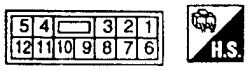
ANTI-THEFT CONTROL UNIT (B6)



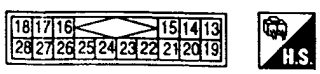
ANTI-THEFT CONTROL UNIT (B7)



SUPER LOCK CONTROL UNIT (B11)



SUPER LOCK CONTROL UNIT (B12)



YEL901

<SUPPLEMENT-II>

ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
• Read GI section, "HOW TO READ WIRING DIAGRAMS".
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".

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ELECTRICAL UNITS ..... Foldout
Terminal Arrangement ..... Foldout

WIRING DIAGRAM REFERENCE CHART

ECCS (Ignition system) ..... EC SECTION
AUTOMATIC TRANSAXLE CONTROL SYSTEM ..... AT SECTION
ANTI-LOCK BRAKE SYSTEM ..... BR SECTION
SRS "AIR BAG" and "SEAT BELT PRE-TENSIONER" ..... RS SECTION
HEATER AND AIR CONDITIONER ..... HA SECTION

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

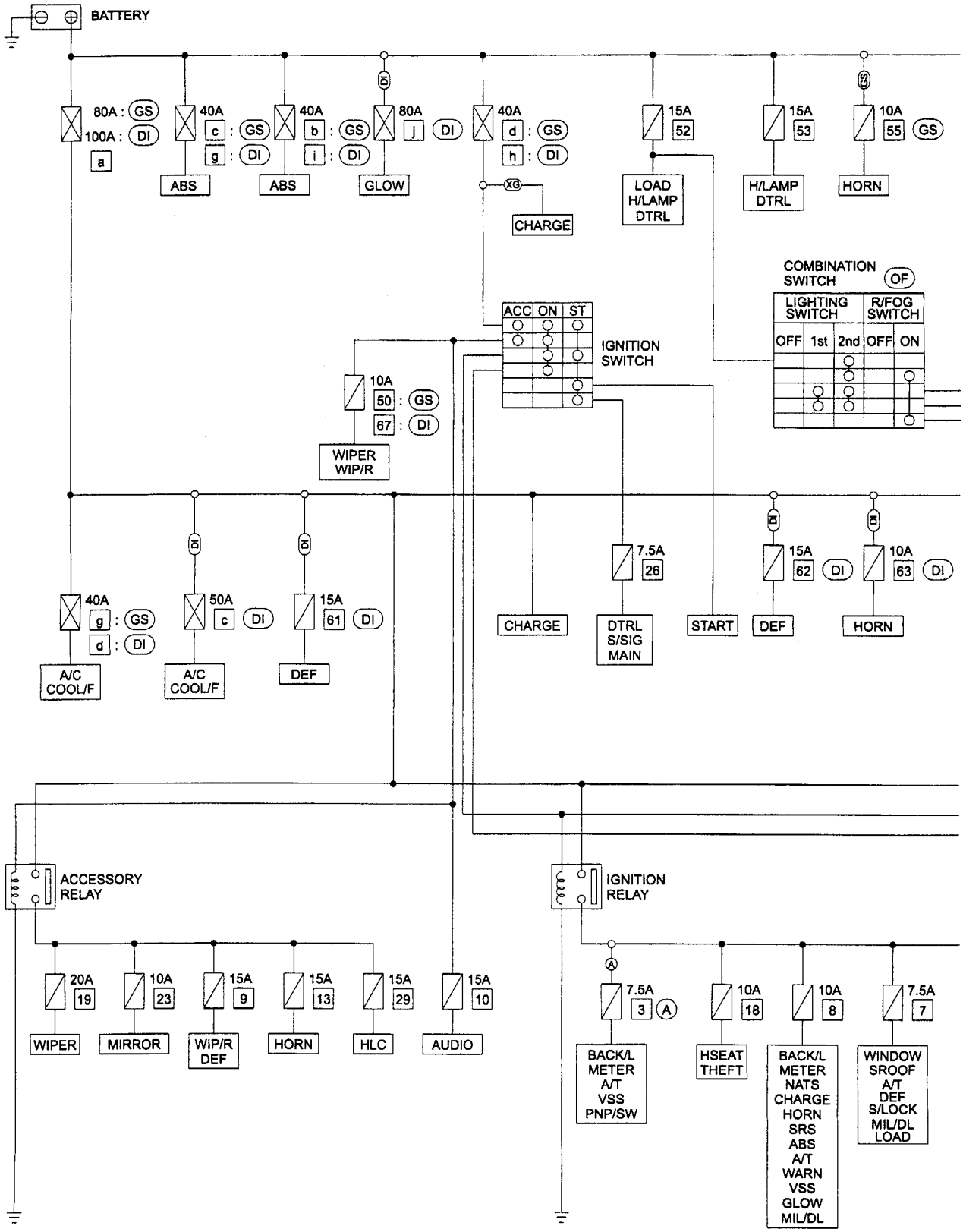
The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, 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 the Service Manual.

If the vehicle is equipped with side air bag (Supplemental Restraint System), the side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (which is one of components of air bags for a frontal collision), wiring harness, warning lamp (which is one of components of air bags for a frontal collision).

WARNING:

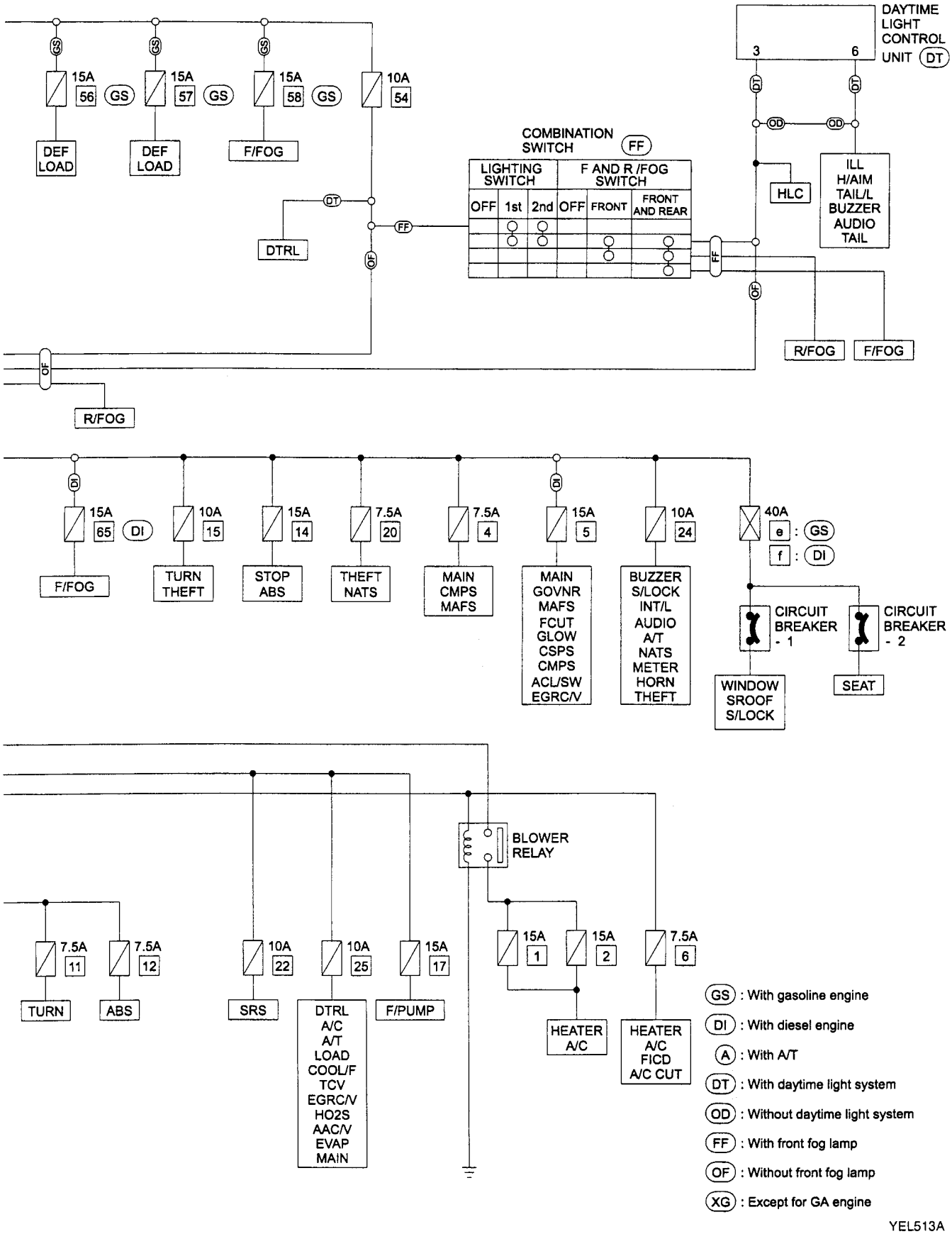
- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation) all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to do so in this Service Manual. SRS wiring harnesses are covered with yellow insulation (either just before the harness connectors or for the complete harness) for easy identification.**

Schematic



YEL512A

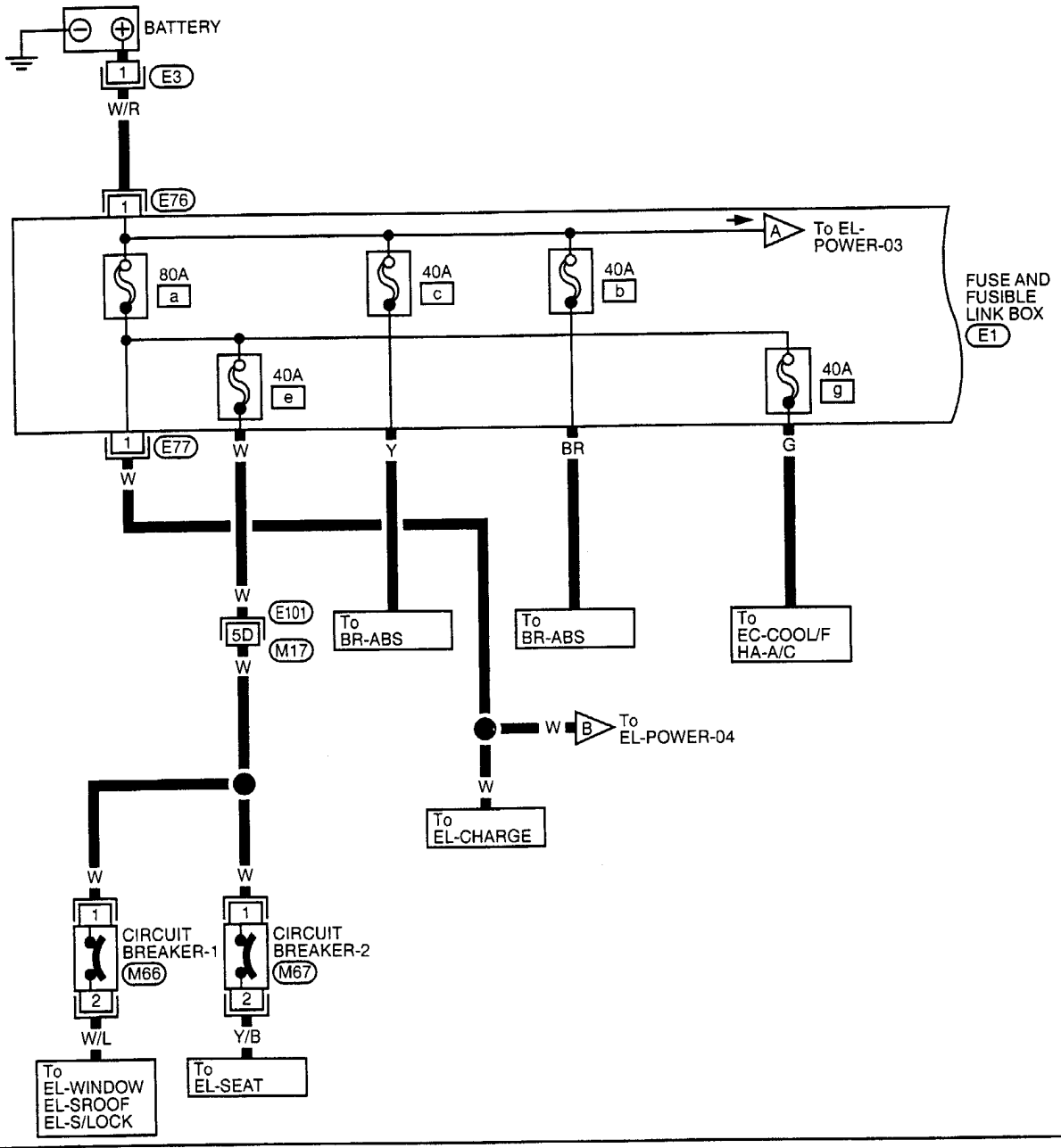
Schematic (Cont'd)

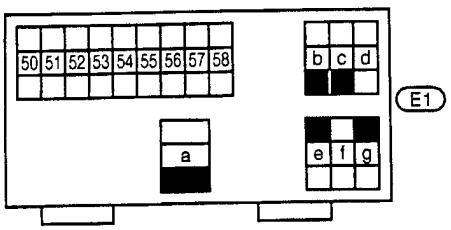


Wiring Diagram — POWER —

GASOLINE ENGINE MODELS

EL-POWER-01



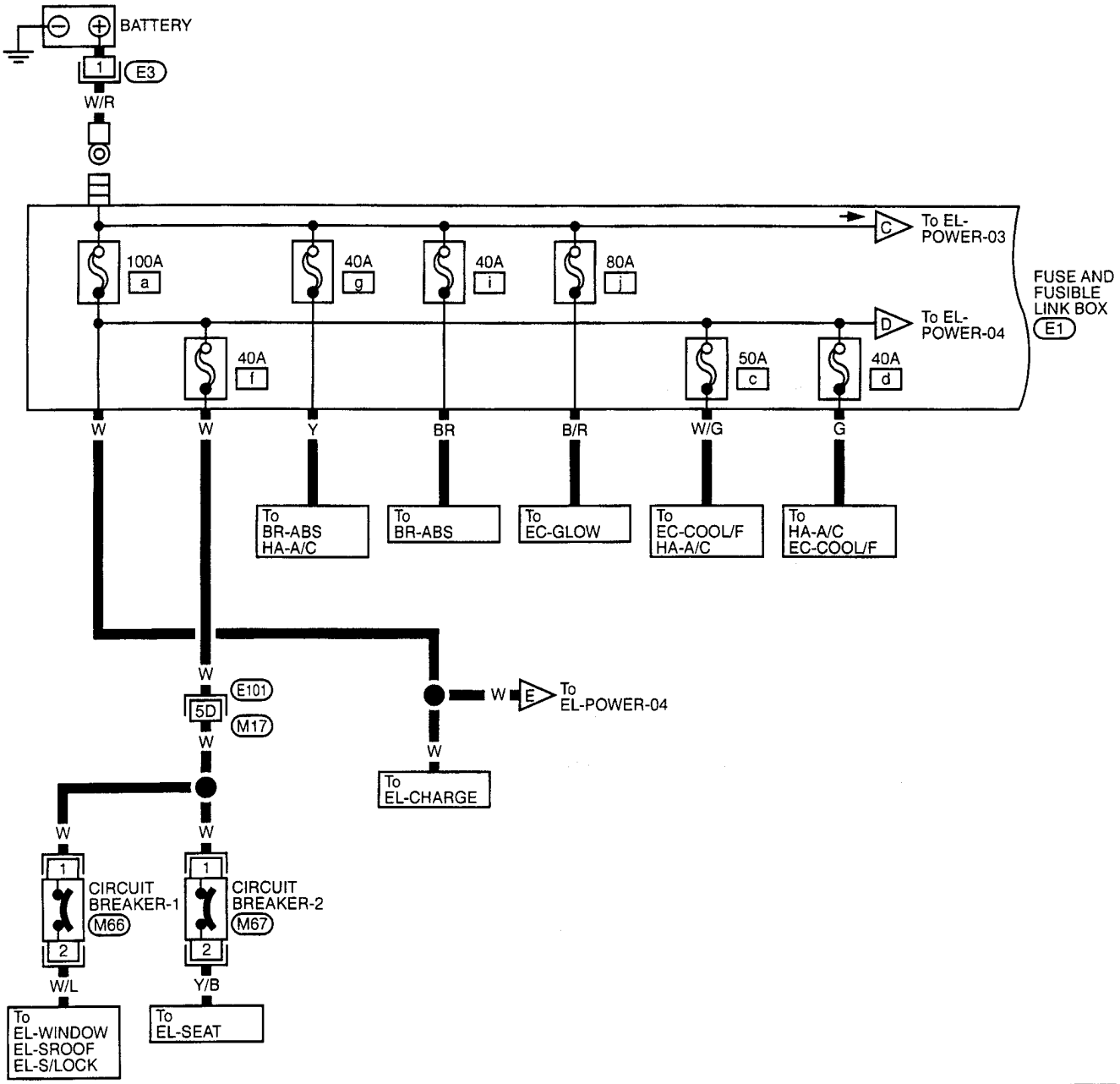


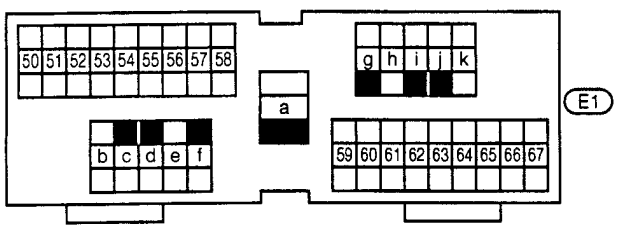
Refer to last page (Foldout page).
M17 , E101

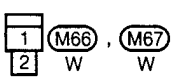
YEL514A

DIESEL ENGINE MODELS

EL-POWER-02





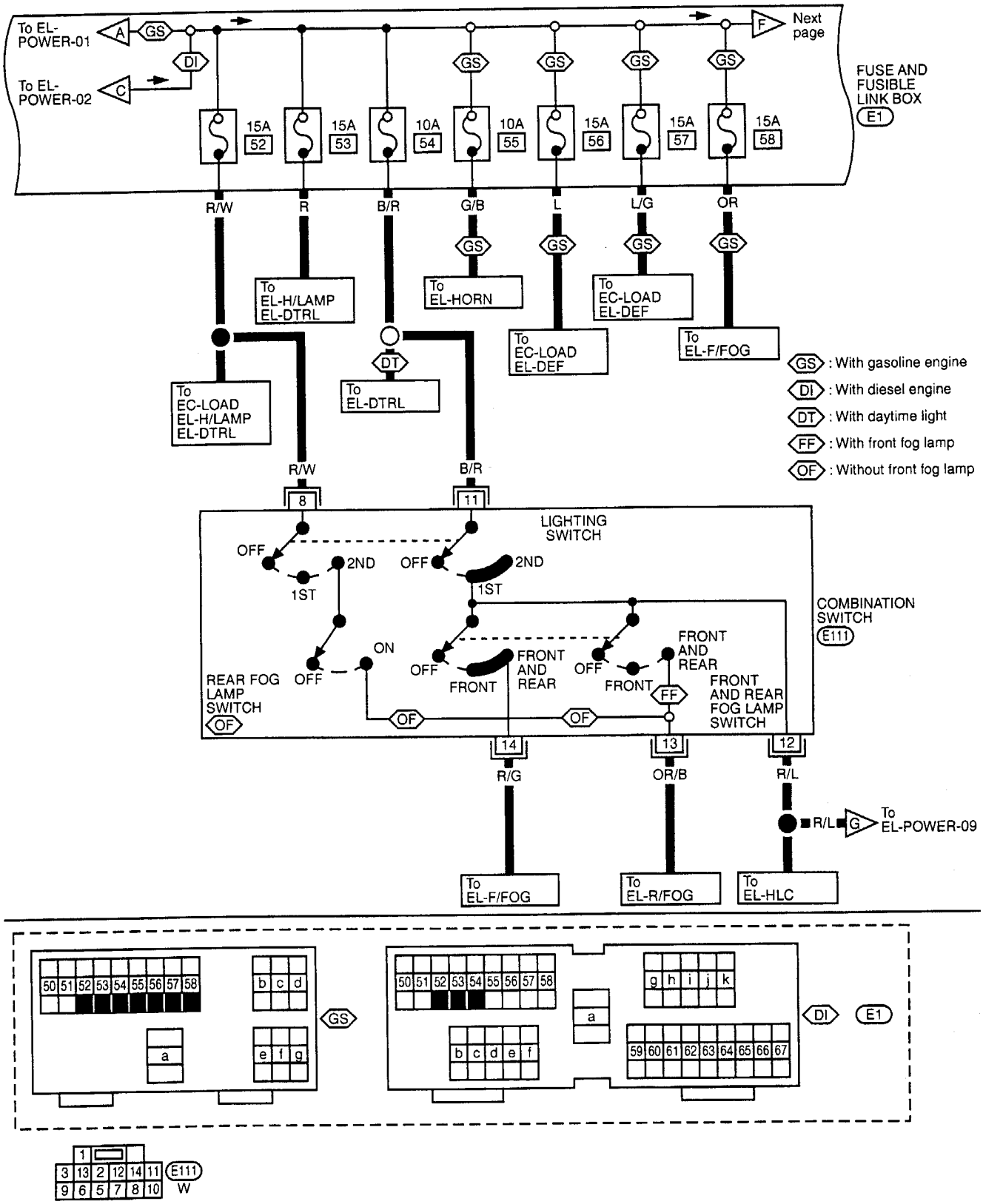


Refer to last page (Foldout page).
M17 , E101

YEL662

Wiring Diagram — POWER — (Cont'd)

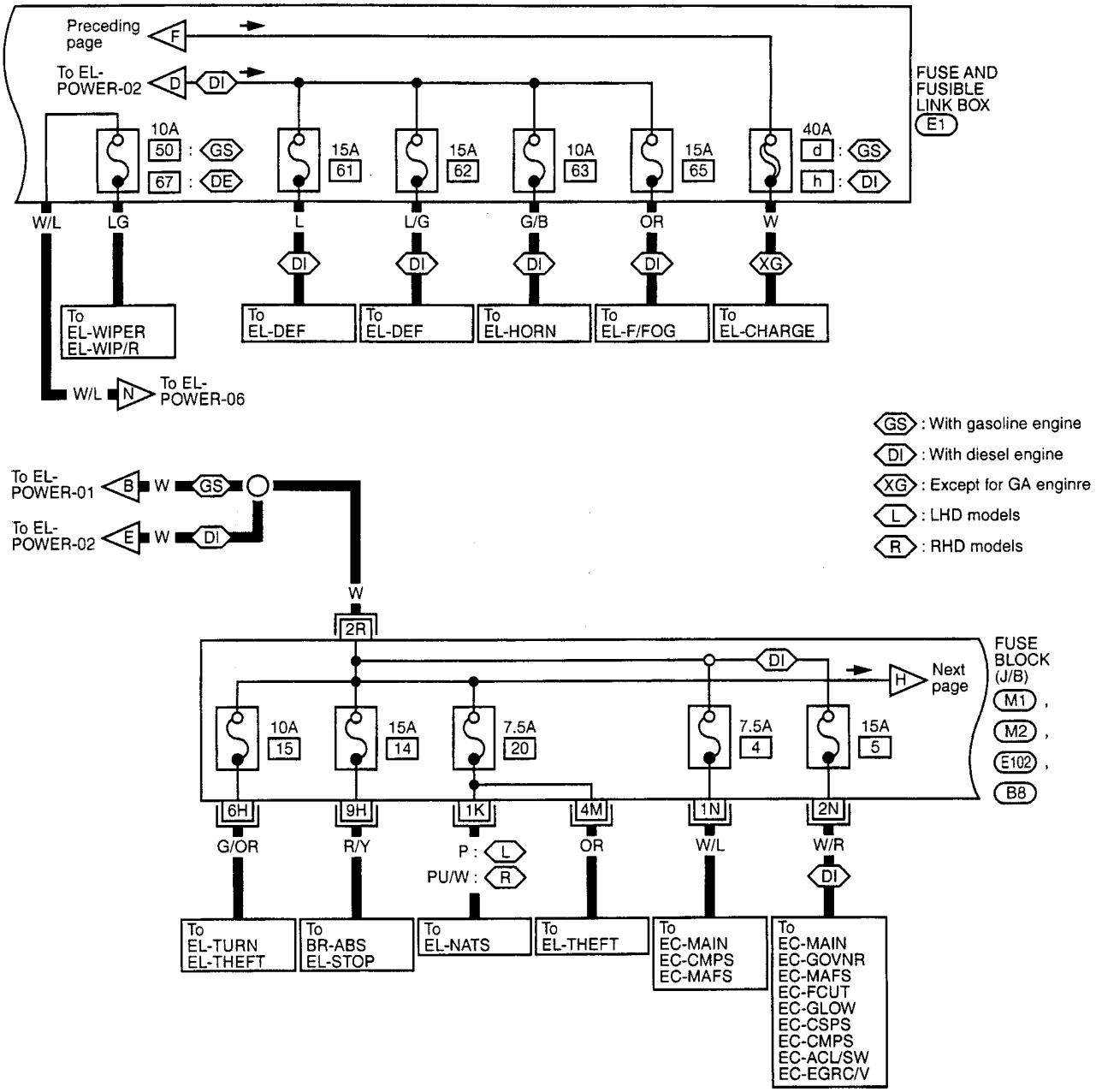
EL-POWER-03

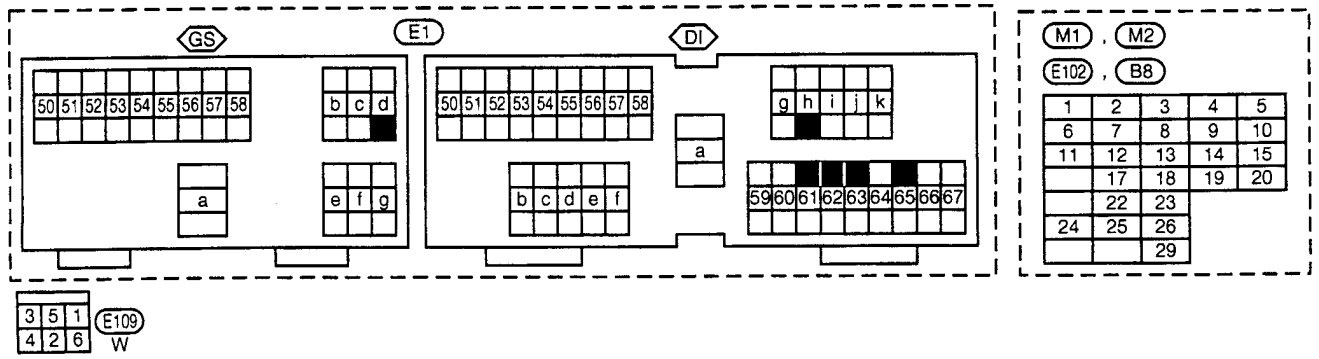


YEL516A

Wiring Diagram — POWER — (Cont'd)

EL-POWER-04

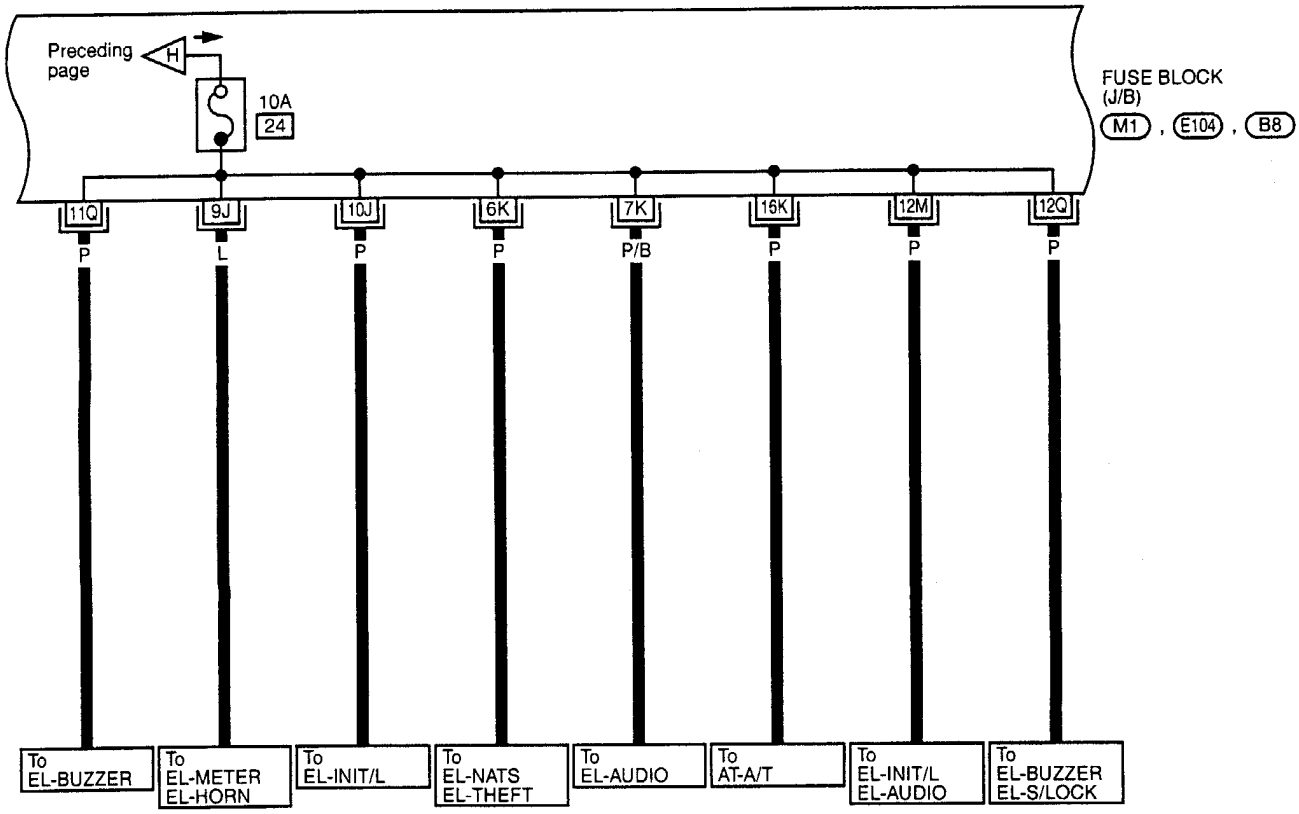




YEL517A

Wiring Diagram — POWER — (Cont'd)

EL-POWER-05



Refer to last page (Foldout page).

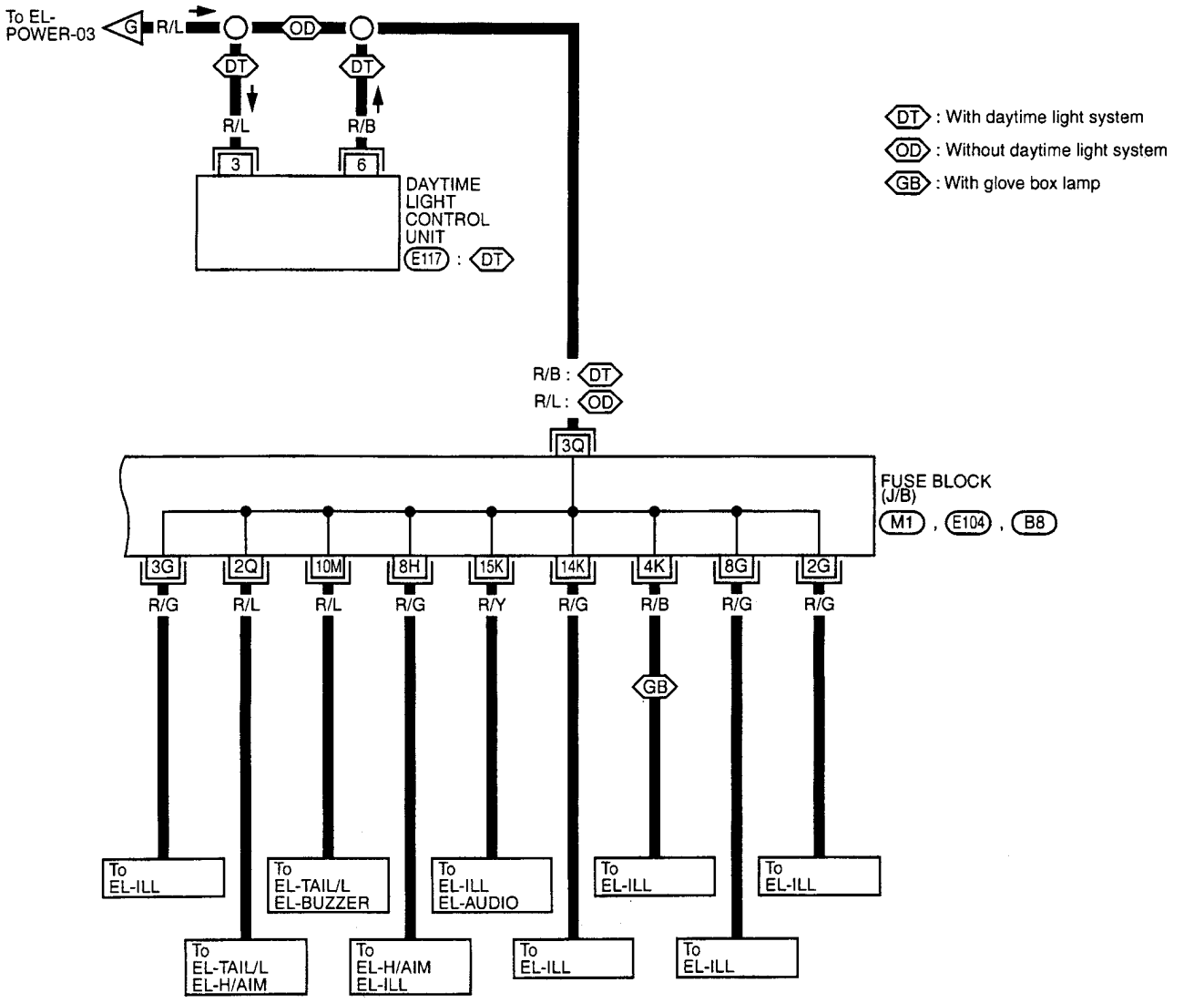
M1 , E104 , B8

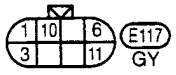
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL518A

Wiring Diagram — POWER — (Cont'd)

EL-POWER-09





Refer to last page (Foldout page).

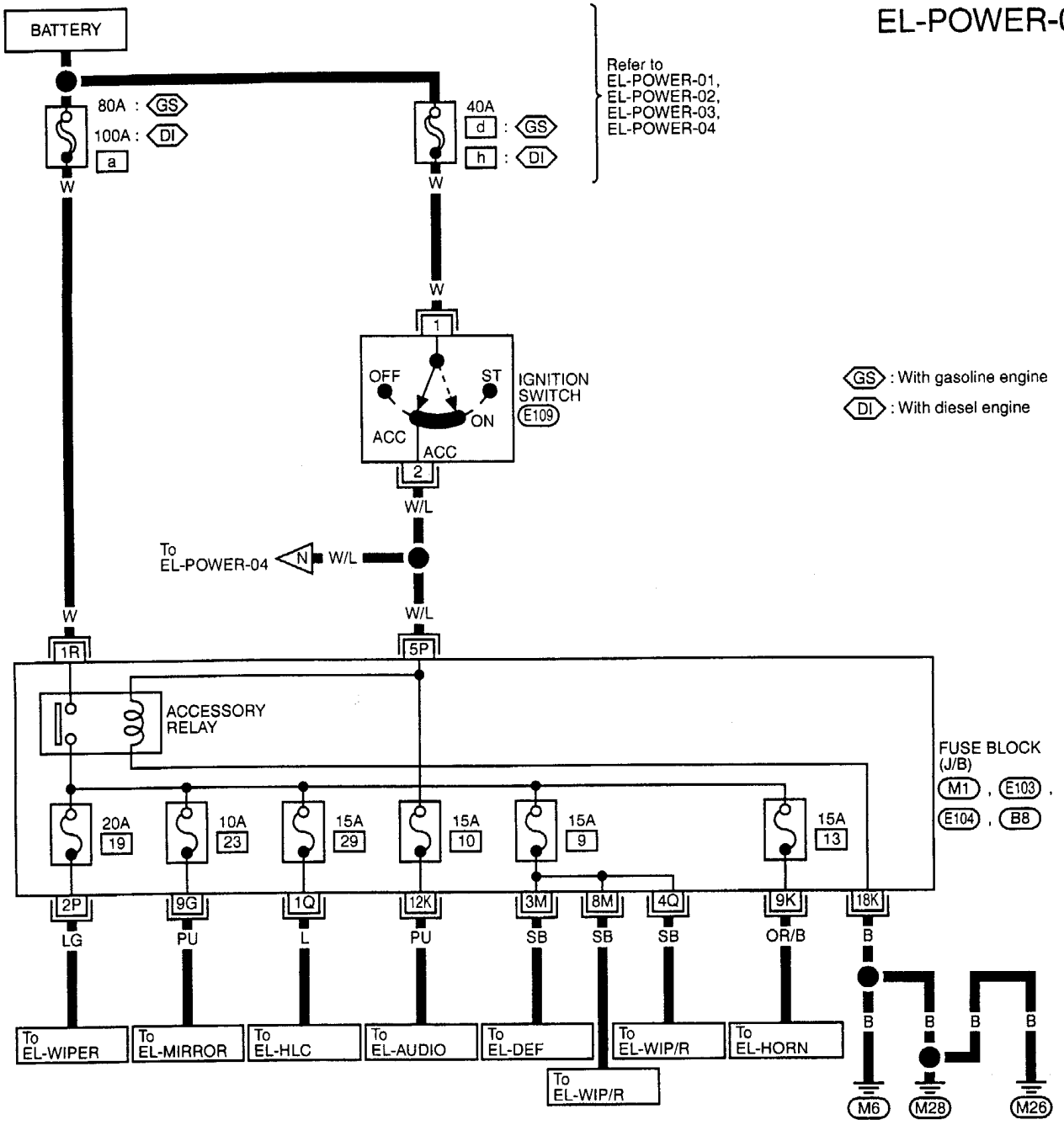
M1 , E104 , B8

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL522A

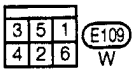
Accessory Power Supply — Ignition SW. in "Acc" or "ON"

EL-POWER-06



GS : With gasoline engine

DI : With diesel engine



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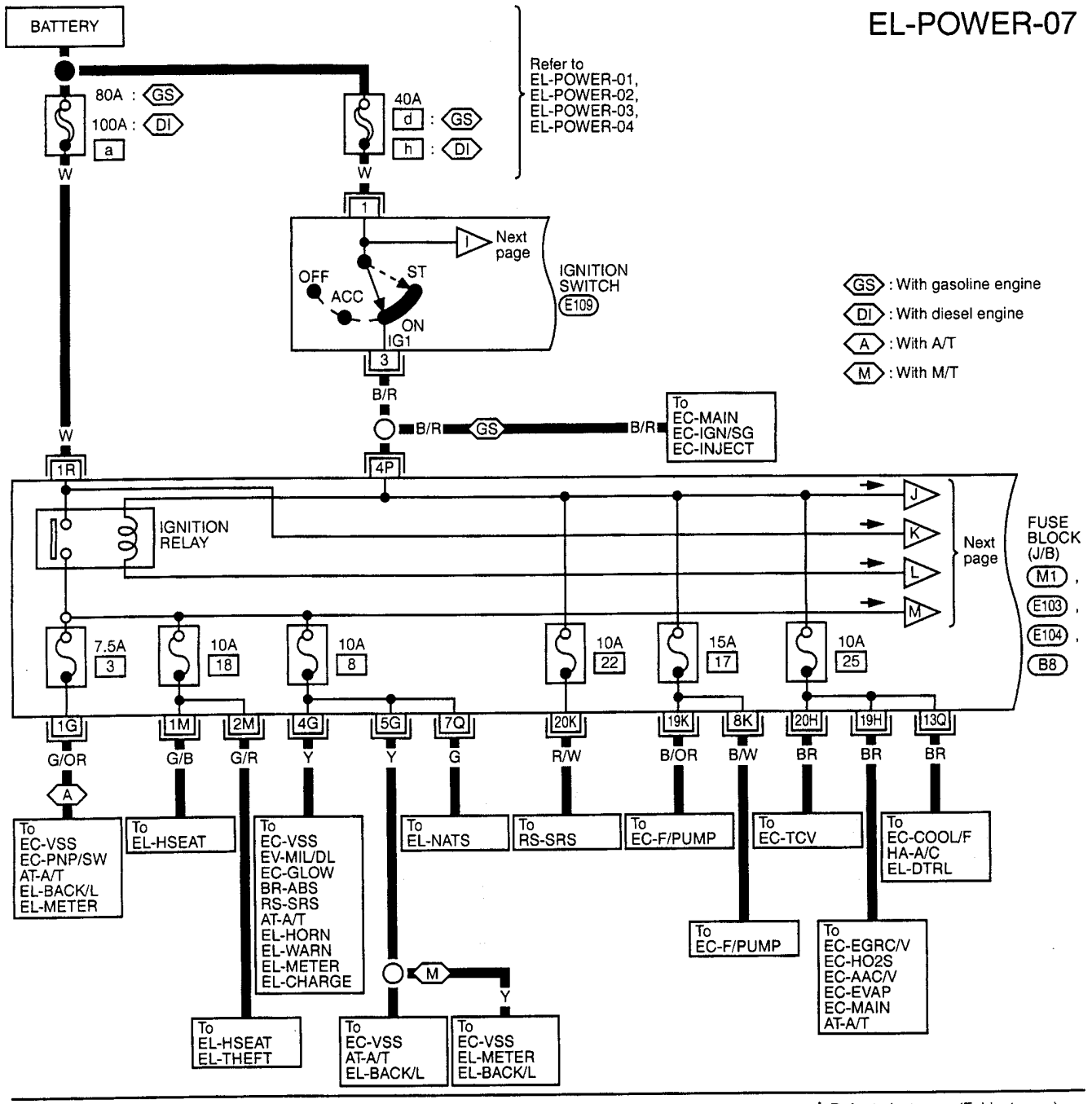
M1 , E103 , E104 , B8

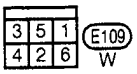
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL519A

Accessory Power Supply — Ignition SW. in "ON" or "START"

EL-POWER-07





Refer to last page (Foldout page).

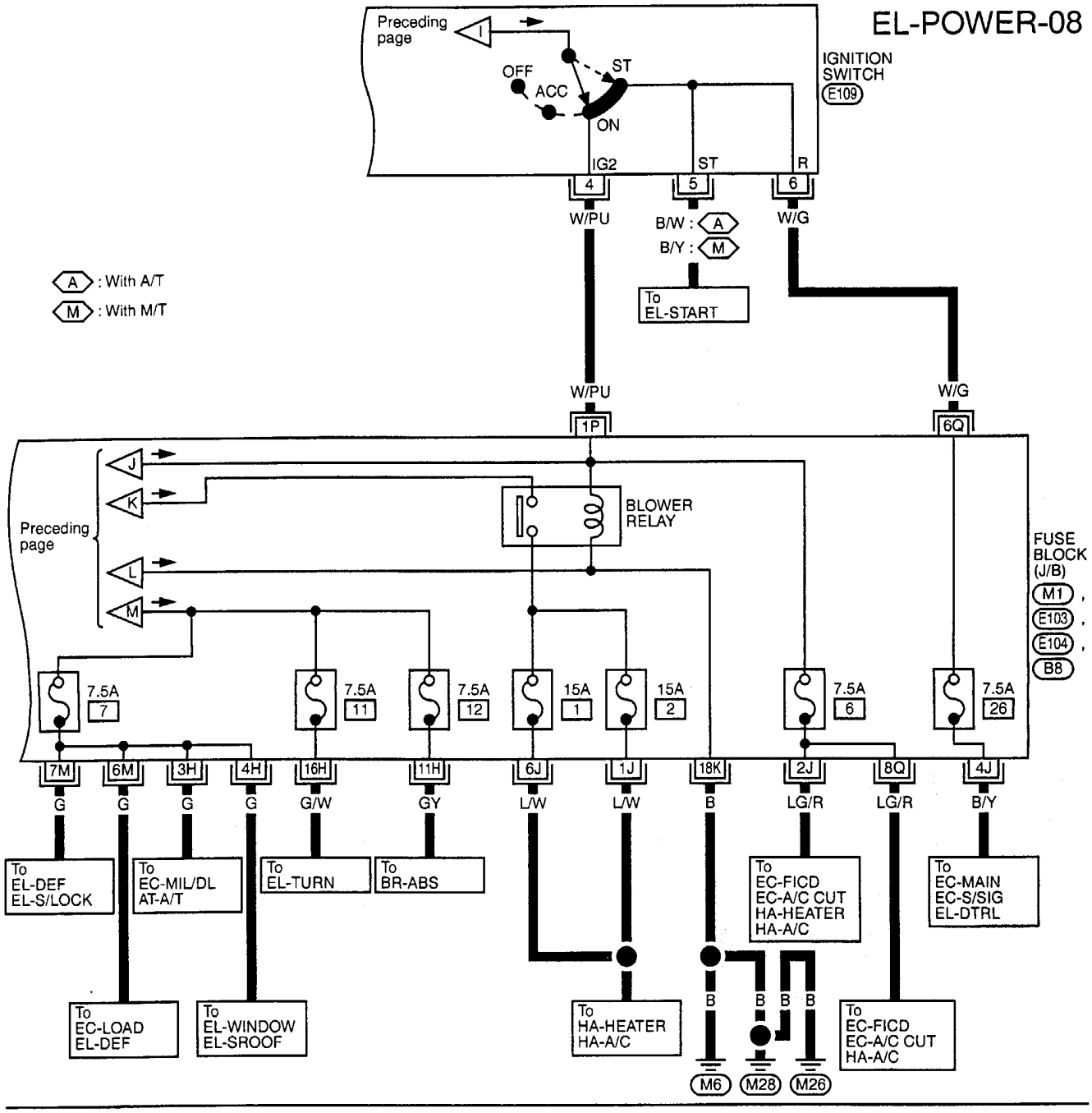
M1 , E103 , E104 , B8

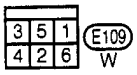
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL520A

Accessory Power Supply — Ignition SW. in "ON" or "START" (Cont'd)

EL-POWER-08





Refer to last page (Foldout page).

M1 , E103 , E104 , B8

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL521A

GROUND	CONNECT TO	CONN. NO.	CELL CODE
M6/M26/M28	COMBINATION METER (HIGH BEAM INDICATOR)	M37	EL-DTRL
	COMBINATION METER (TURN)	M37	EL-TURN
	COMBINATION METER (REAR FOG LAMP)	M37	EL-R/FOG
	COMBINATION METER (SPEEDOMETER)	M36	EC-VSS, EL-METER, AT-A/T
	COMBINATION METER (TACHOMETER)	M36	EL-METER, AT-A/T
	COMBINATION METER (WATER TEMP GAUGE)	M36	EL-METER
	COMBINATION METER (FUEL GAUGE)	M36	EL-METER
	COMBINATION METER (AIR BAG WARNING LAMP)	M36	RS-SRS, EL-WARN
	IGNITION RELAY ACCESSORY RELAY AND BLOWER RELAY (IN FUSE BLOCK)	M1	EL-POWER
	COMBINATION FLASHER UNIT	M33	EL-TURN
	SPOT LAMP	R5	EL-INT/L
	VANITY MIRROR LAMP	R2	EL-INT/L
	ILLUMINATION CONTROL UNIT	M3	EL-ILL
	REAR WINDOW DEFOGGER SWITCH	M57	EL-ILL, EL-DEF
	A/T CONTROL DEVICE	M49	AT-A/T, EL-ILL
	A/C SWITCH	M44	EL-ILL
	RECIRCULATION SWITCH	M47	HA-HEATER, HA-A/C, EL-ILL
	ASHTRAY ILLUMINATION	M40	EL-ILL
	HEATER ILLUMINATION	M45	EL-ILL
	ORN ILLUMINATION	M56	EL-ILL
	HAZARD SWITCH	M58	EL-ILL
	GLOVE BOX LAMP	M24	EL-ILL
	FRONT WIPER MOTOR (LHD models)	M101	EL-WIPER
	SUN ROOF SWITCH	R4	EL-SROOF
	DOOR MIRROR REMOTE CONTROL SWITCH	M5	EL-MIRROR
	FAN SWITCH	M46	HA-HEATER, HA-A/C, EC-LOAD, EC-A/CCUT
	AIR BAG DIAGNOSIS SENSOR UNIT	Z4	RS-SRS
	DATA LINK CONNECTOR FOR CONSULT	M59	EC-MIL/DL, AT-A/T RS-SRS
	KICK DOWN SWITCH	M19	AT-A/T
	POWER STEERING OIL PRESSURE SWITCH (LHD models)	M102	EC-PST/SW
	RDNT BRAKE SWITCH (RHD models)	M64	EL-TAIL/
	COMBINATION METER (ILLUMINATION)	M37	EL-ILL
	VANITY MIRROR LAMP	R9	EL-INT/L
	POWER WINDOW RELAY	M69	EL-WINDOW, EL-SROOF
E11/E37	FRONT COMBINATION LAMP LH	E5	EL-DTRL, EL-TAIL/L
	FRONT COMBINATION LAMP RH	E32	EL-DTRL, EL-TAIL/L
	DAYTIME LIGHT CONTROL UNIT	E117	EL-DTRL
	HEAD LAMP AIMING MOTOR LH	E4	EL-H/AIM

GROUND	CONNECT TO	CONN. NO.	CELL CODE
E11/E37	HEAD LAMP AIMING MOTOR RH	E33	EL-H/AIM
	FRONT TURN SIGNAL LAMP LH	E8	EL-TURN, EL-THEFT
	FRONT TURN SIGNAL LAMP RH	E36	EL-TURN, EL-THEFT
	SIDE TURN SIGNAL LAMP LH	E9	EL-TURN, EL-THEFT
	SIDE TURN SIGNAL LAMP RH	E59	EL-TURN, EL-THEFT
	COMBINATION SWITCH (TRIP COMPUTER SWITCH)	E114	EL-METER
	SEDIMENTER SENSOR (CD engine)	E13	EL-WARN
	WASHER LEVEL SWITCH	E39	EL-WARN
	BRAKE FLUID LEVEL SWITCH	E14	EL-WARN
	FRONT WIPER MOTOR	E62	EL-WIPER
	COMBINATION SWITCH (FRONT WIPER SWITCH)	E114	EL-WIPER
	COMBINATION SWITCH (WASHER SWITCH)	E114	EL-WIPER, EL-WIP/R EL-HLC
	REAR WIPER RELAY	E52	EL-WIP/R
	HEAD LAMP WIPER MOTOR LH	E7	EL-HLC
	HEAD LAMP WIPER MOTOR RH	E35	EL-HLC
	HOOD SWITCH	E12	EL-THEFT
	SOLENOID VALVE RELAY	E50	BR-ABS
	TRIPLE PRESSURE SWITCH (CD engine)	E20	EC-COOL/F, HA-A/C
	COOLING FAN MOTOR-1 (SR, GA engine)	E19	EC-COOL/F, HA-A/C
	COOLING FAN MOTOR-2 (SR, GA engine)	E28	EC-COOL/F, HA-A/C
	COOLING FAN RELAY-2 (CD engine)	E54	HA-A/C, EC-COOL/F
	POWER STEERING OIL PRESSURE SWITCH (RHD models)	E60	EC-PST/SW
	HEADLAMP AIMING SWITCH	E123	EL-H/AIM
	VACUUM SWITCH (LHD MODELS)	E61	EL-WARN
	HEAD LAMP RELAY RH	E75	EL-HLC
	NATS IMMU	E121	EL-NATS
	AMBIENT AIR TEMPERATURE SENSOR	E63	EC-FICD, HA-A/C
	COOLING FAN MOTOR-2 (CD engine models)	E18	EC-COOLF, HA-A/C
	RDNT BRAKE SWITCH (LHD models)	E122	
F15/F18	VEHICLE SPEED SENSOR	F25	EC-VSS, AT-A/T, EL-METER
	IACV-FICD SOLENOID VALVE (GA engine)	F40	EC-FICD, HA-A/C
	A/T CONTROL UNIT	M48	AT-A/T
	SHIELD WIRE (THROTTLE POSITION SENSOR)	F16	EC-TPS, AT-A/T
	ECM (ECCS CONTROL MODULE) (SR-GA engine)	F101	EC-MAIN
	ECM (ECCS CONTROL MODULE) (CD engine)	F106	EC-MAIN
	SHIELD WIRE (CAMSHAFT POSITION SENSOR)	F33	EC-CMPS
	SHIELD WIRE MASS AIR FLOW SENSOR	F38	EC-MAFS

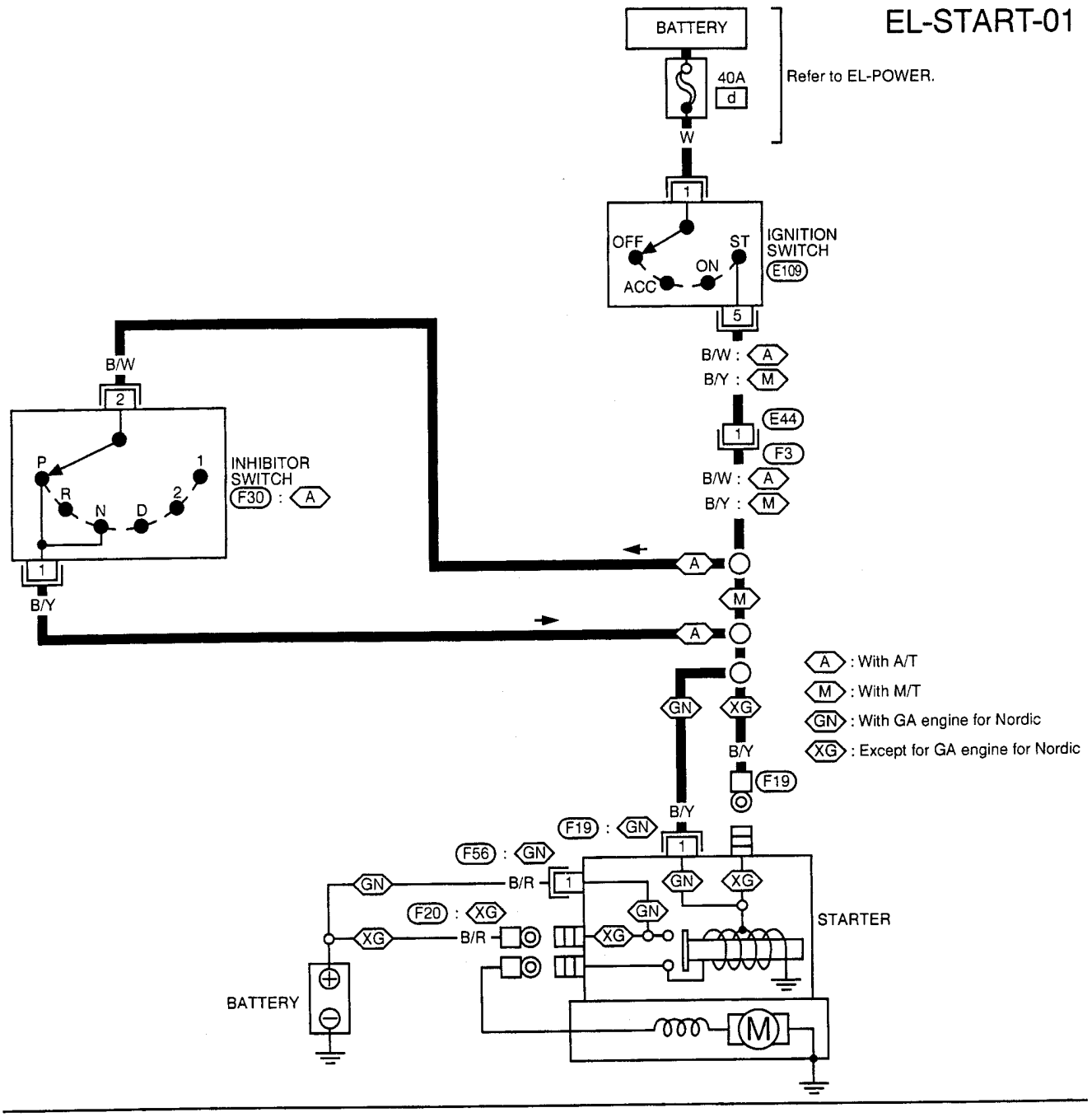
GROUND	CONNECT TO	CONN. NO.	CELL CODE
F15/F18	DISTRIBUTOR	F33	EC-IGN/SG, EC-CMPS
	NEUTRAL POSITION SWITCH	F28	EC-PNP/SW
	SHIELD WIRE (KNOCK SENSOR) (SR20DE engine)	F69	EC-KS
	ACCELERATOR SWITCH (CD engine)	M22	EC-APP/SW
	SHIELD WIRE (ACCELERATOR POSITION SENSOR) (CD engine)	M21	EC-APS
F9	ALTERNATOR	F10	EL-CHARGE
B18/B27	THEFT WARNING CONTROL UNIT	B6	EL-THEFT
	ULTRASONIC CANCEL SWITCH	B102	EL-THEFT
	TRUNK ROOM LAMP SWITCH (SEDAN models)	T10	EL-THEFT, EL-INT/L
	KEY CYLINDER SWITCH (Driver's side)	D9	EL-THEFT, EL-S/LOCK
	KEY CYLINDER SWITCH (Passenger side)	D17	EL-S/LOCK
	DOOR LOCK ACTUATOR (Driver's side)	D7	EL-THEFT, EL-S/LOCK
	DOOR LOCK ACTUATOR (Passenger side)	D16	EL-THEFT, EL-S/LOCK
	REAR DOOR LOCK ACTUATOR LH	D21	EL-THEFT
	REAR DOOR LOCK ACTUATOR RH	D25	EL-THEFT
	SUPER LOCK CONTROL UNIT	B11	EL-S/LOCK
	A/T MODE SWITCH	B103	AT-A/T
	FUEL PUMP	B30	EC-F/PUMP
	LICENCE PLATE LAMP	T9	EL-TAIL/L
	HIGH-MOUNTED STOP LAMP	T11	EL-STOP
	REAR COMBINATION LAMP LH	T8	EL-BACK/L, EL-R/FOG
	REAR COMBINATION LAMP RH	T18	EL-BACK/L, EL-R/FOG
	FRONT DOOR SWITCH	B20	EL-INT/L, EL-WARN, EL-S/LOCK, EL-BUZZER, EL-THEFT, RS-SRS
	FUEL TANK GAUGE UNIT	B31	EL-METER, EL-WARN
	REAR WIPER MOTOR	B52	EL-WIP/R
	POWER WINDOW MAIN SWITCH	D5	EL-WINDOW
	DOOR MIRROR HEATER (Driver's side)	D4	EL-DEF
	DOOR MIRROR HEATER (Passenger side)	D13	EL-DEF
	CD AUTO CHANGER	B47	EL-AUDIO
	POWER SEAT	D22	EL-SEAT
	HEATED SEAT SWITCH LH	B104	EL-HSEAT
	HEATED SEAT SWITCH RH	B105	EL-HSEAT
	HEATED SEAT LH	B21	EL-HSEAT
	HEATED SEAT RH	B61	EL-HSEAT
B48/D110 (5-HATCH BACK models)	REAR COMBINATION LAMP LH	B46	EL-TURN, EL-TAIL/L EL-THEFT, EL-STOP
	REAR COMBINATION LAMP RH	B49	EL-TURN, EL-TAIL/L EL-THEFT, EL-STOP
	REAR WINDOW DEFOGGER	B41	EL-DEF

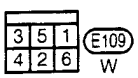
GROUND DISTRIBUTION

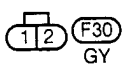
GROUND	CONNECT TO	CONN. NO.	CELL CODE
D110/B48 (5-HATCH BACK models)	LICENCE PLATE LAMP	D106	EL-TAIL/L
	HIGH MOUNTED STOP LAMP	D114	EL-STOP
	REAR COMBINATION LAMP LH	D104	EL-BACK/L, EL-R/FOG
	REAR COMBINATION LAMP RH	D108	EL-BACK/L, EL-R/FOG
	LUGGAGE ROOM LAMP SWITCH	D105	EL-INT/L, EL-THEFT
	REAR WIPER MOTOR	D107	EL-WIP/R
T3/T4 (SEDAN models)	REAR COMBINATION LAMP LH	T2	EL-TURN, EL-TAIL/L EL-THEFT, EL-STOP
	REAR COMBINATION LAMP RH	T5	EL-TURN, EL-TAIL/L EL-THEFT, EL-STOP
E10	ABS CONTROL UNIT	E118	BR-ABS
E68	ALTERNATOR	E71	EL-CHARGE
F18/F15	SHIELD WIRE (HEATED OXYGEN SENSOR)	F34	EC-H02S
	ACCELERATOR WORK UNIT	M68	

Wiring Diagram — START —

GASOLINE ENGINE MODELS





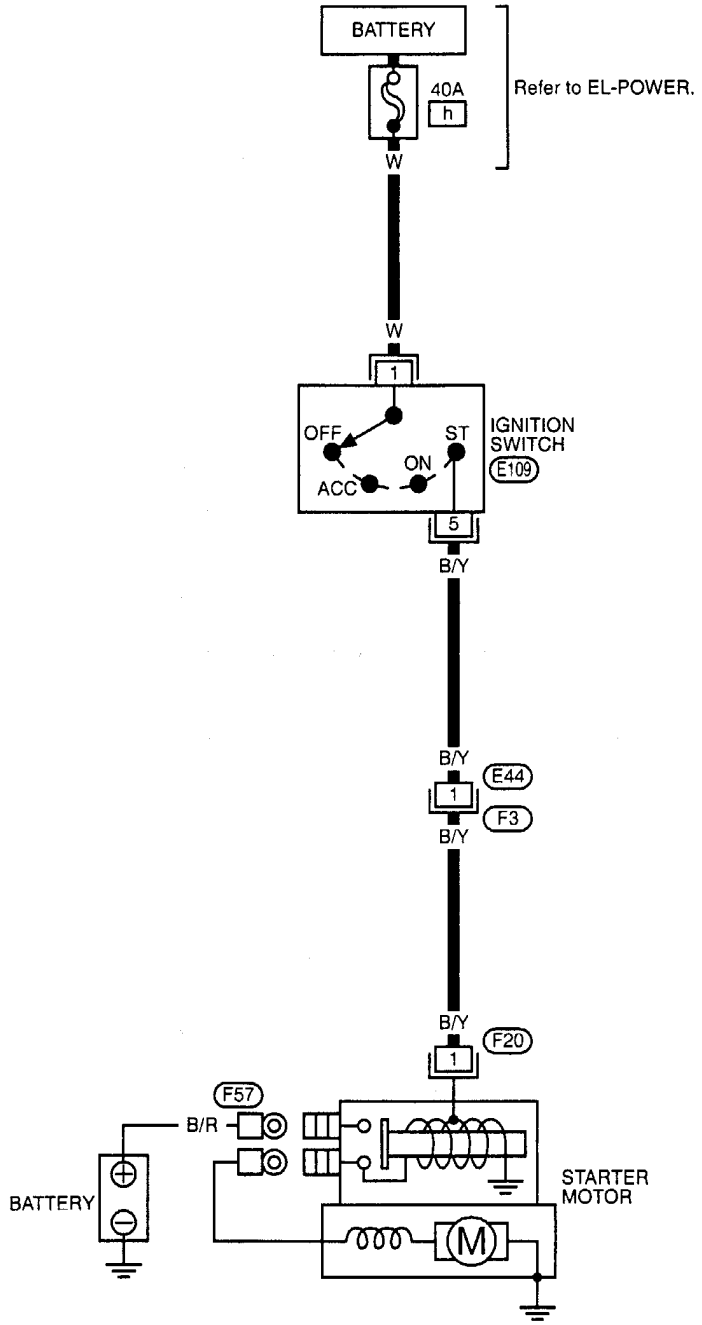


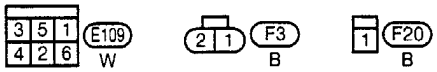
YEL376A

Wiring Diagram — START — (Cont'd)

DIESEL ENGINE MODELS

EL-START-02

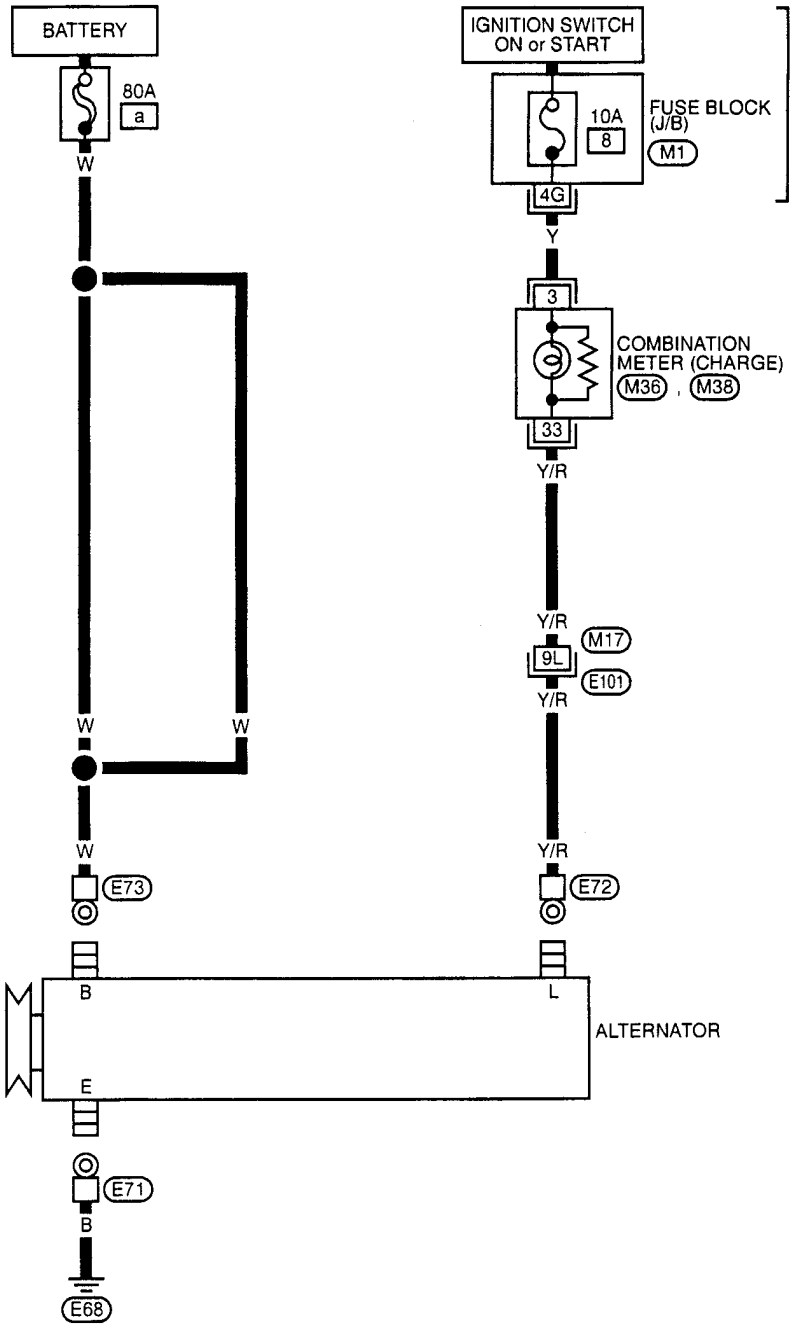




YEL377A

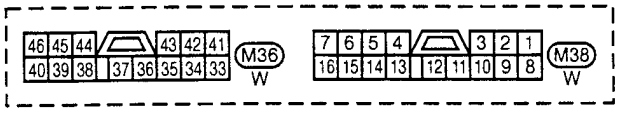
Wiring Diagram — CHARGE —

GA ENGINE MODELS



EL-CHARGE-01

Refer to EL-POWER.



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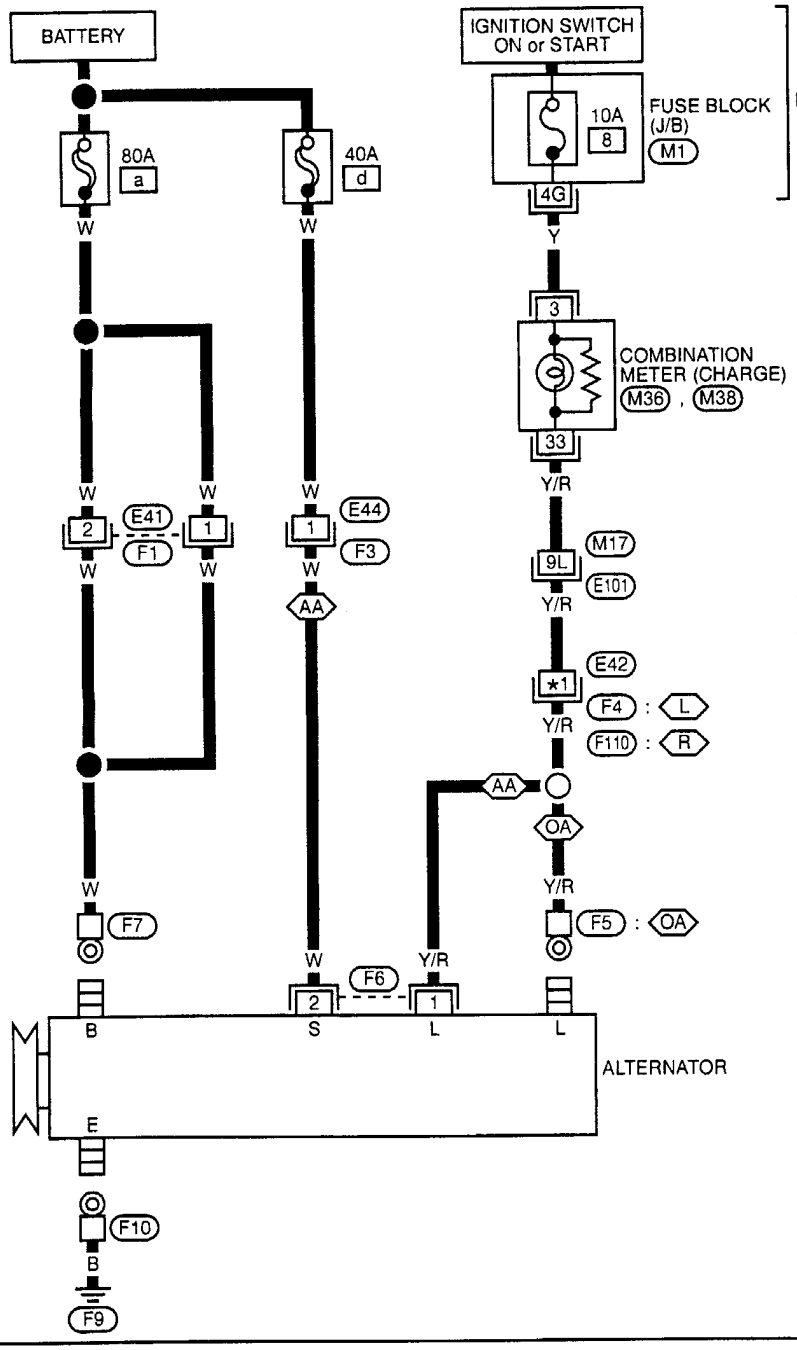
M1

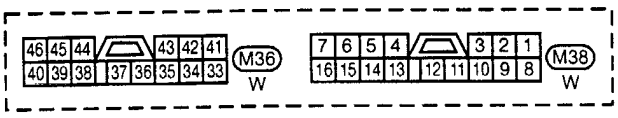
M17 , E101

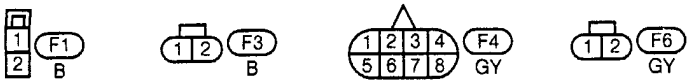
YEL378A

Wiring Diagram — CHARGE — (Cont'd)

SR ENGINE MODELS





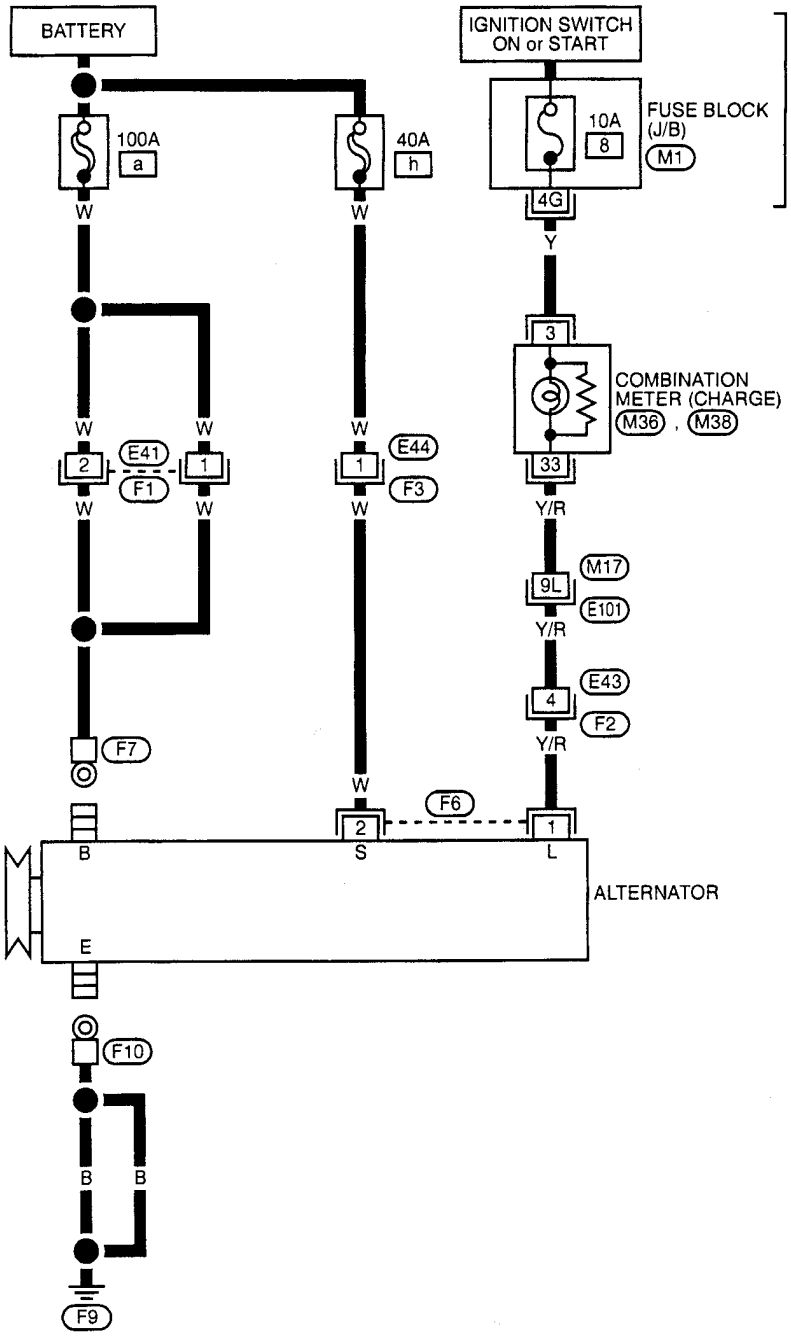


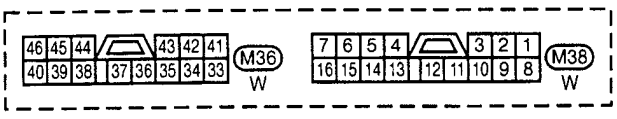
Refer to last page (Foldout page).
M1
M17 , E101

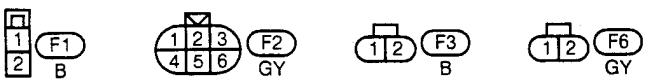
YEL379A

Wiring Diagram — CHARGE — (Cont'd)

DIESEL ENGINE MODELS



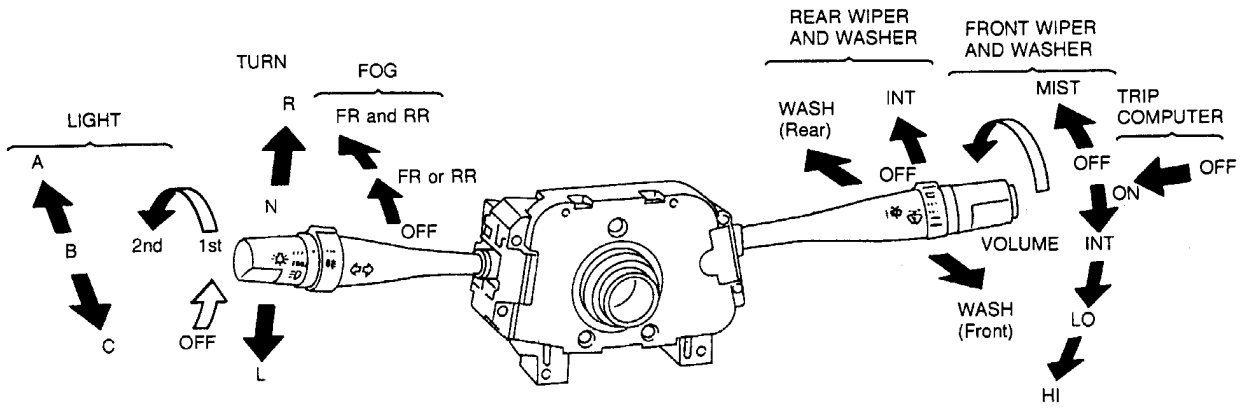


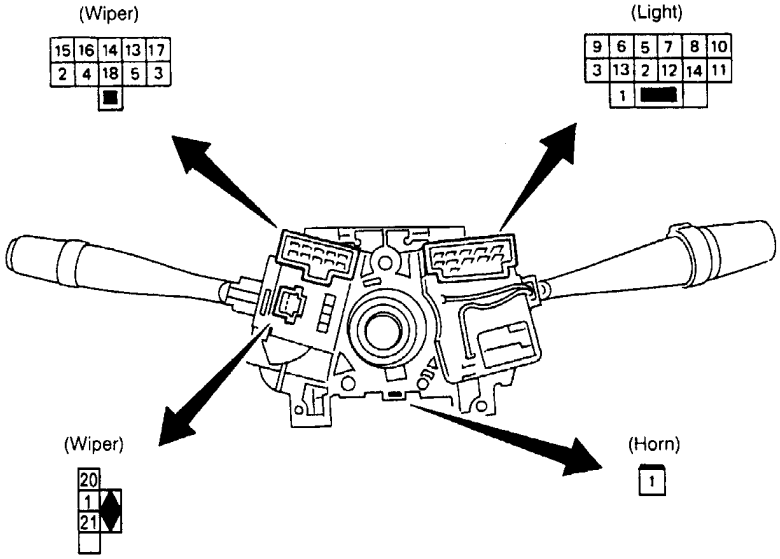


Refer to last page (Foldout page).
M17 , E101
M1

YEL380A

Combination Switch/Check





LIGHTING SWITCH
(With rear fog lamp)

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○			○	○	○	○
6			○			○	○	○	○
7							○		○
8			○			○	○	○	○
9			○			○	○		○
10							○	○	○
⊠							○	○	○
11				○	○	○	○	○	○
12				○	○	○	○		○
13								○	

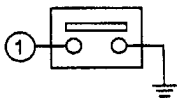
LIGHTING SWITCH
(With front and rear fog lamp)

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○			○	○	○	○
6			○			○	○	○	○
7							○		○
8			○			○	○	○	○
9			○			○	○		○
10							○	○	○
11				○	○	○	○	○	○
12				○	○	○	○	○	○
⊠				○	○	○	○	○	○
13					○		○	○	○
14					○		○	○	○

TURN SIGNAL SWITCH

	L	N	R
1	○		○
2			
3	○		

HORN SWITCH
(Without air bag)



YEL523A

System Description

The headlamp system on vehicles for North Europe contains a daytime light unit. The unit activates the following whenever the engine is running with the lighting switch in the OFF position:

- Low beam headlamps
- Clearance, license, tail and illumination lamps

Power is supplied at all times

- through 15A fuse (No. 52, located in the fusible link and fuse box)
- to daytime light unit terminal ⑦ and
- to lighting switch terminal ⑧.

Power is also supplied at all times

- through 15A fuse (No. 53, located in the fusible link and fuse box)
- to daytime light unit terminal ⑤ and
- to lighting switch terminal ⑤.

Power is also supplied at all times

- through 10A fuse (No. 54, located in the fusible link and fuse box)
- to daytime light unit terminal ① and
- to lighting switch terminal ⑪.

With the ignition switch is in the ON or START position, power is supplied

- through 10A fuse (No. 25, located in the fuse block)
- to daytime light unit terminal ⑫.

With the ignition switch in the START position, power is supplied

- through 7.5A fuse (No. 26, located in the fuse block)
- to daytime light unit terminal ⑧.

Ground is supplied to daytime light unit terminal ⑩ through body grounds E37 and E11.

HEADLAMP OPERATION (Daytime light cancel operation)

Power is supplied at all times

- through 10A fuse (No. 54, located in the fuse and fusible link box)
- to lighting switch terminal ⑪.

When the lighting switch is turned to the 1st or 2nd position

- through lighting switch terminal ⑫,
- to daytime light unit terminal ③.

Then daytime light will be canceled. And the lighting system operation will be the same as for no daytime light system.

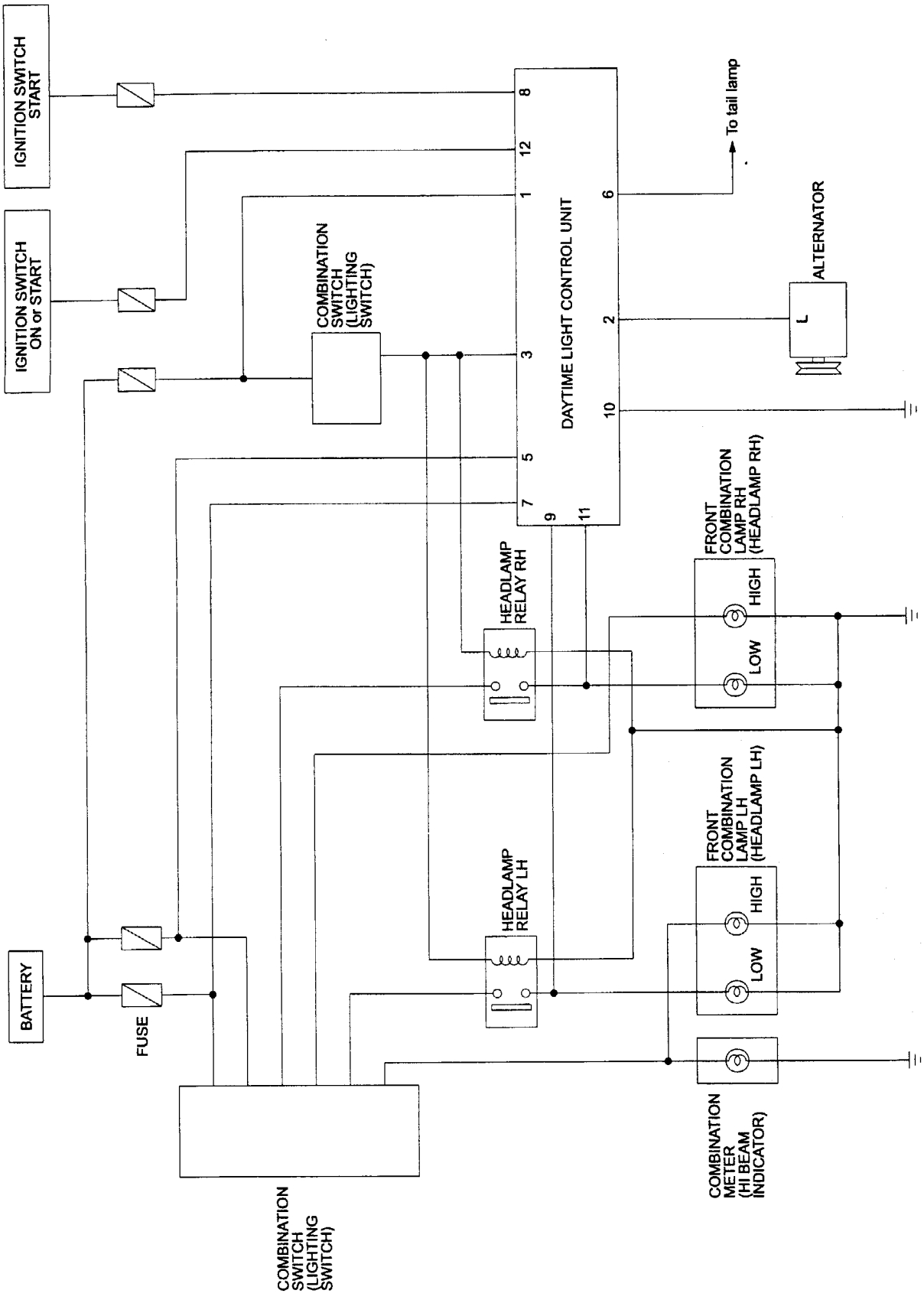
DAYTIME LIGHT OPERATION

With the engine running and the lighting switch in the OFF position, power is supplied

- from alternator terminal Ⓛ
- to daytime light unit terminal ②
- through daytime light unit terminal ⑨
- to terminal ③ of LH headlamp
- through daytime light unit terminal ⑪
- to terminal ③ of RH headlamp
- through daytime light unit terminal ⑥
- to tail lamp and illumination.

Ground is supplied to terminal ① and ⑤ of each headlamp through body grounds E37 and E11.
Ground is also supplied to terminal ⑩ of daytime light unit through body grounds E37 and E11.

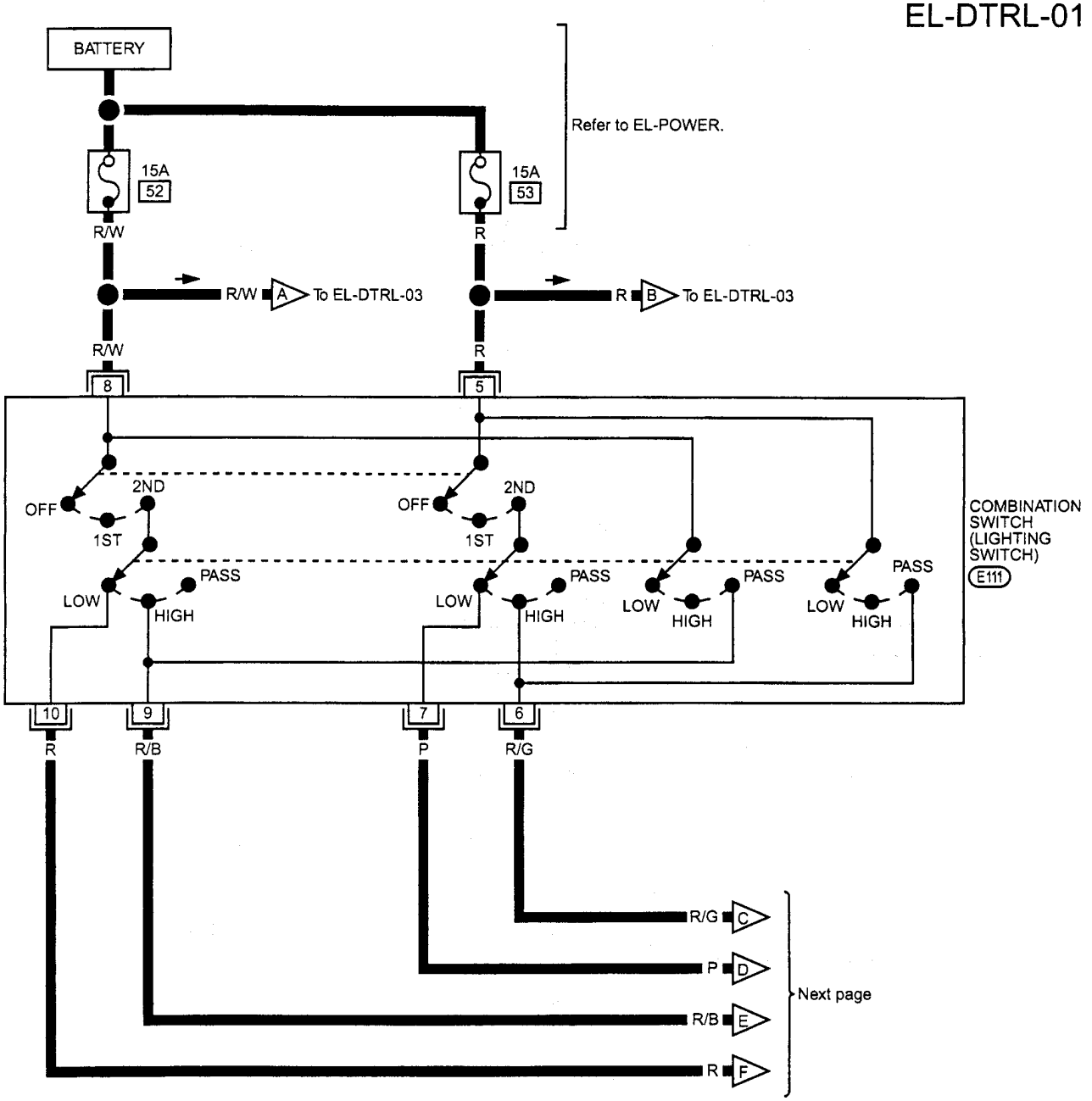
Schematic

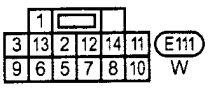


YEL508A

Wiring Diagram — DTRL —

EL-DTRL-01

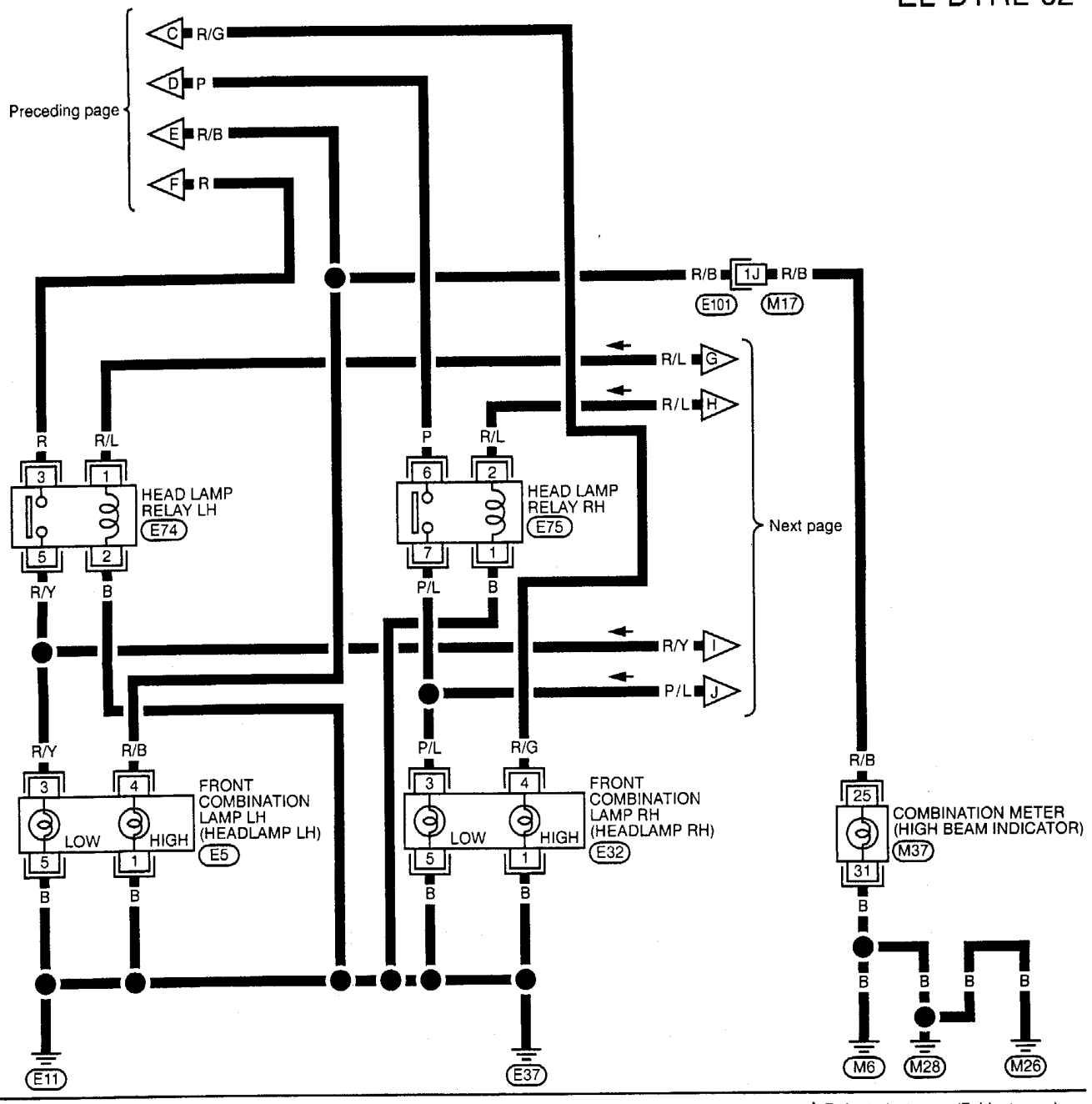


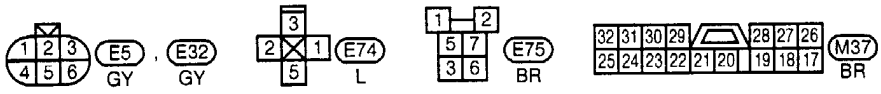


YEL381A

Wiring Diagram — DTRL — (Cont'd)

EL-DTRL-02

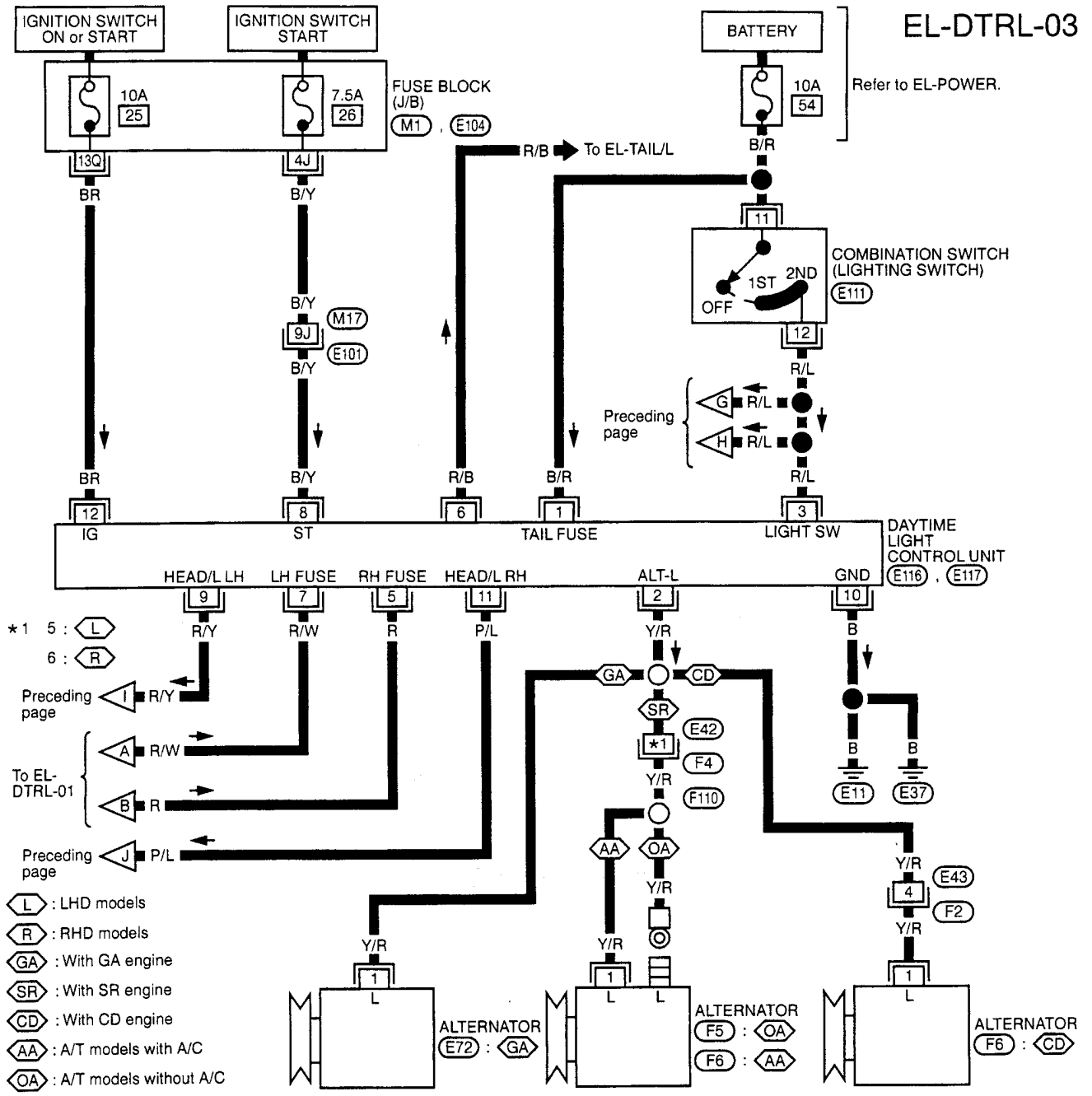


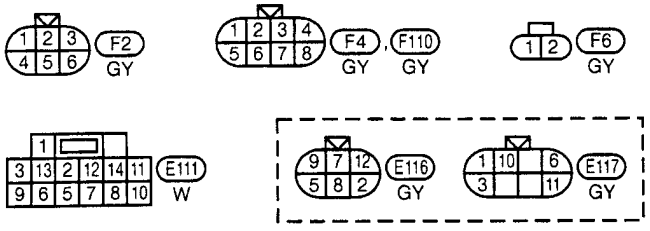


Refer to last page (Foldout page).
M17 , E101

YEL509A

Wiring Diagram — DTRL — (Cont'd)



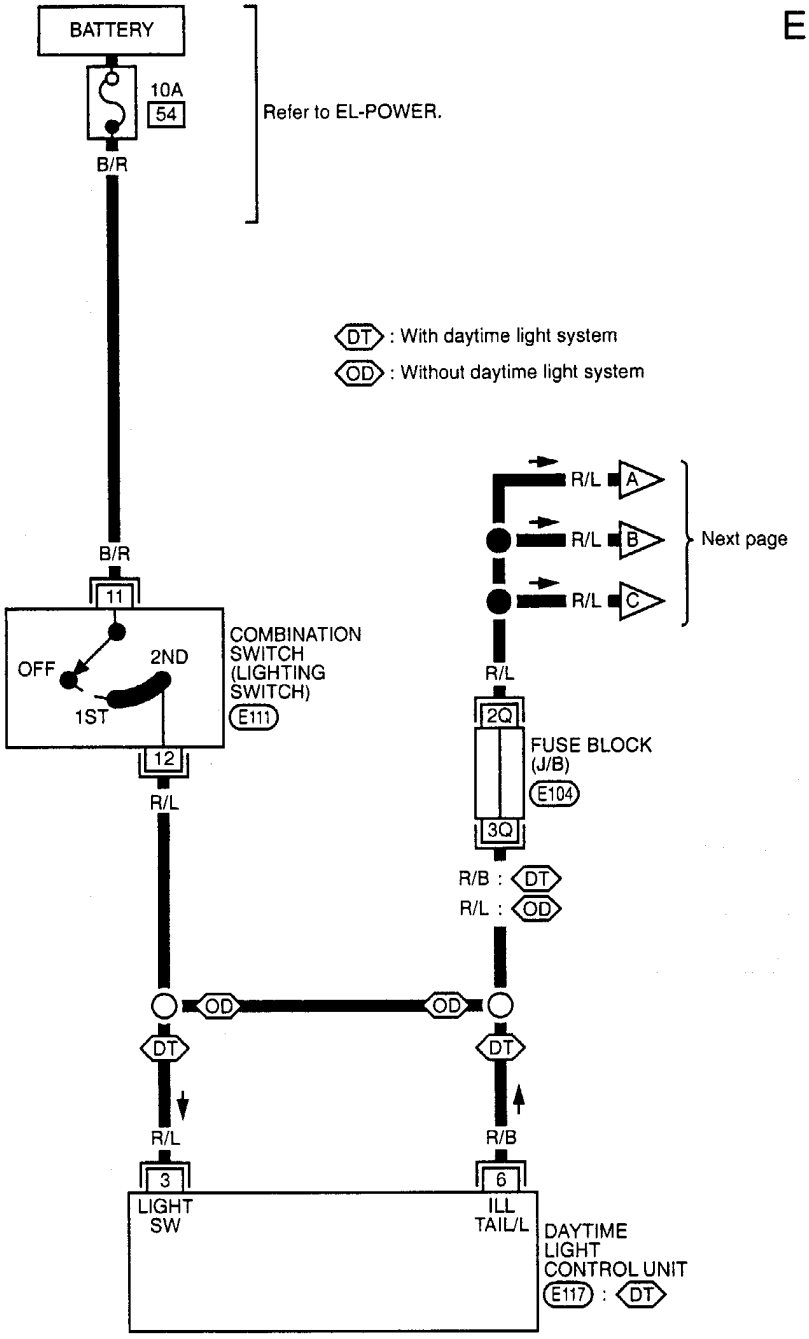


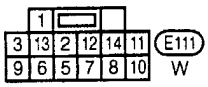
Refer to last page (Foldout page).
M17 , E101
M1
E104

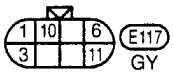
YEL382A

Wiring Diagram — AIM —

EL-H/AIM-01





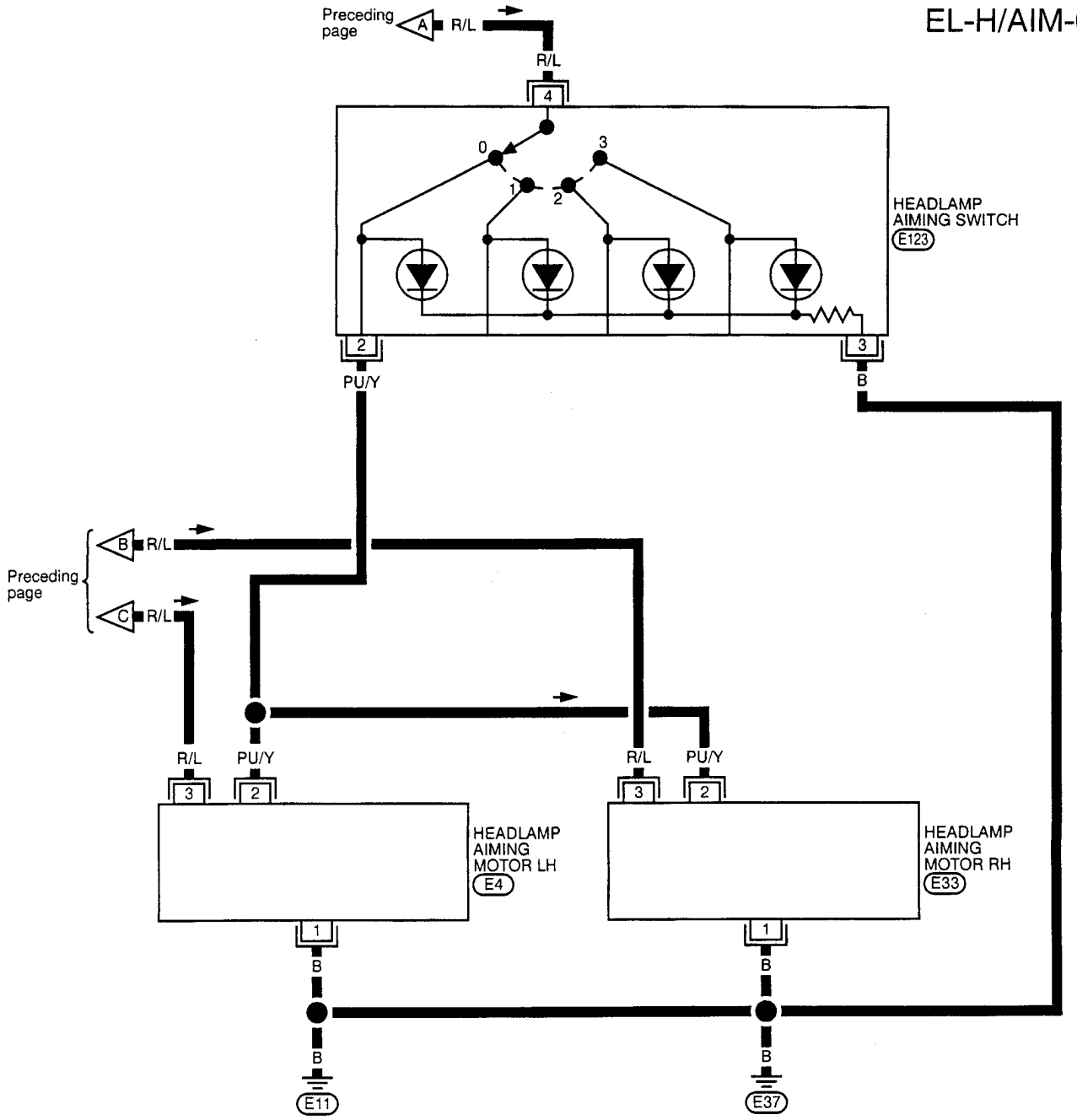


Refer to last page (Foldout page).
E104

YEL383A

Wiring Diagram — AIM — (Cont'd)

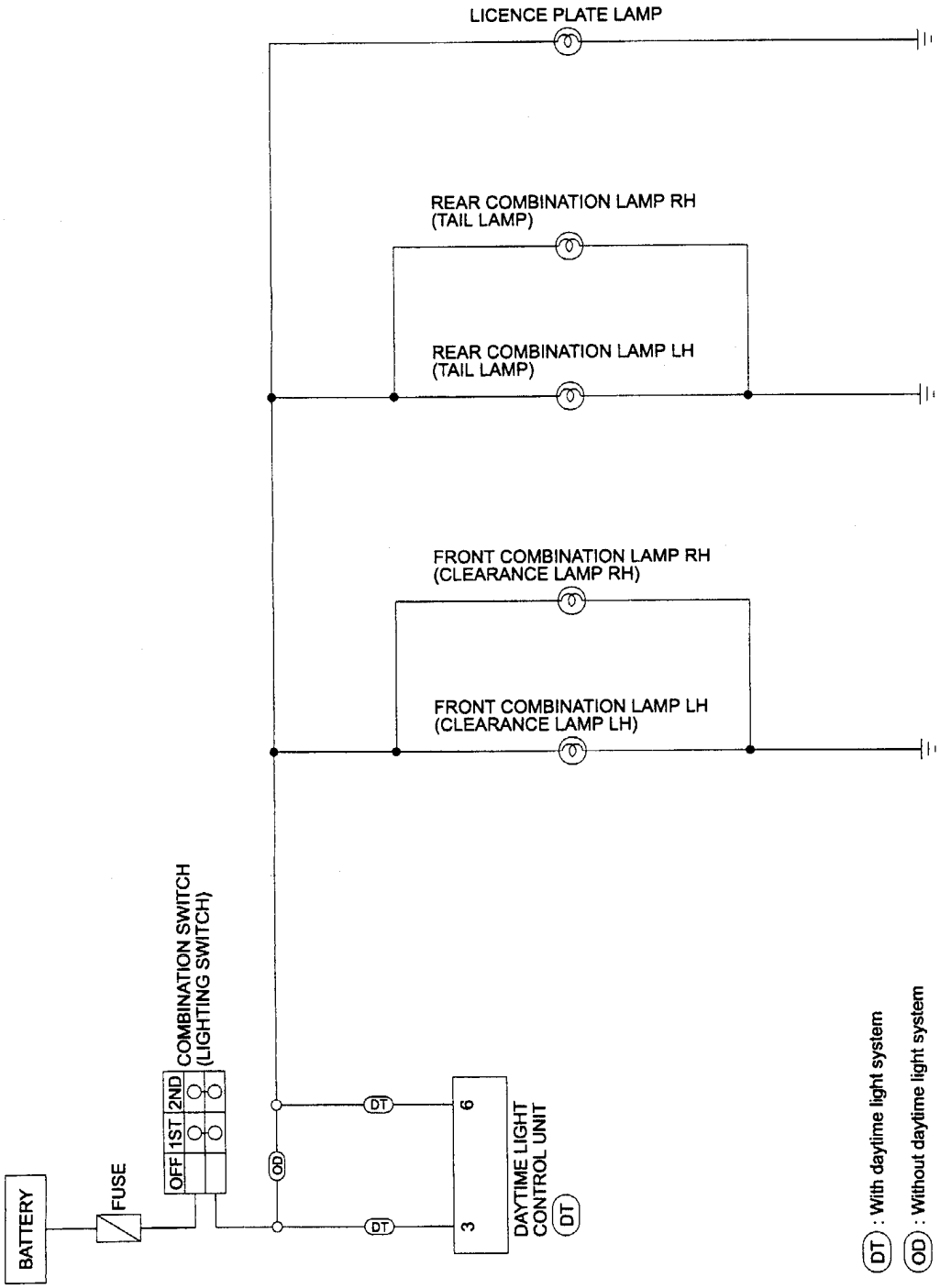
EL-H/AIM-02



Refer to last page (Foldout page).
M17 , E101

YEL384A

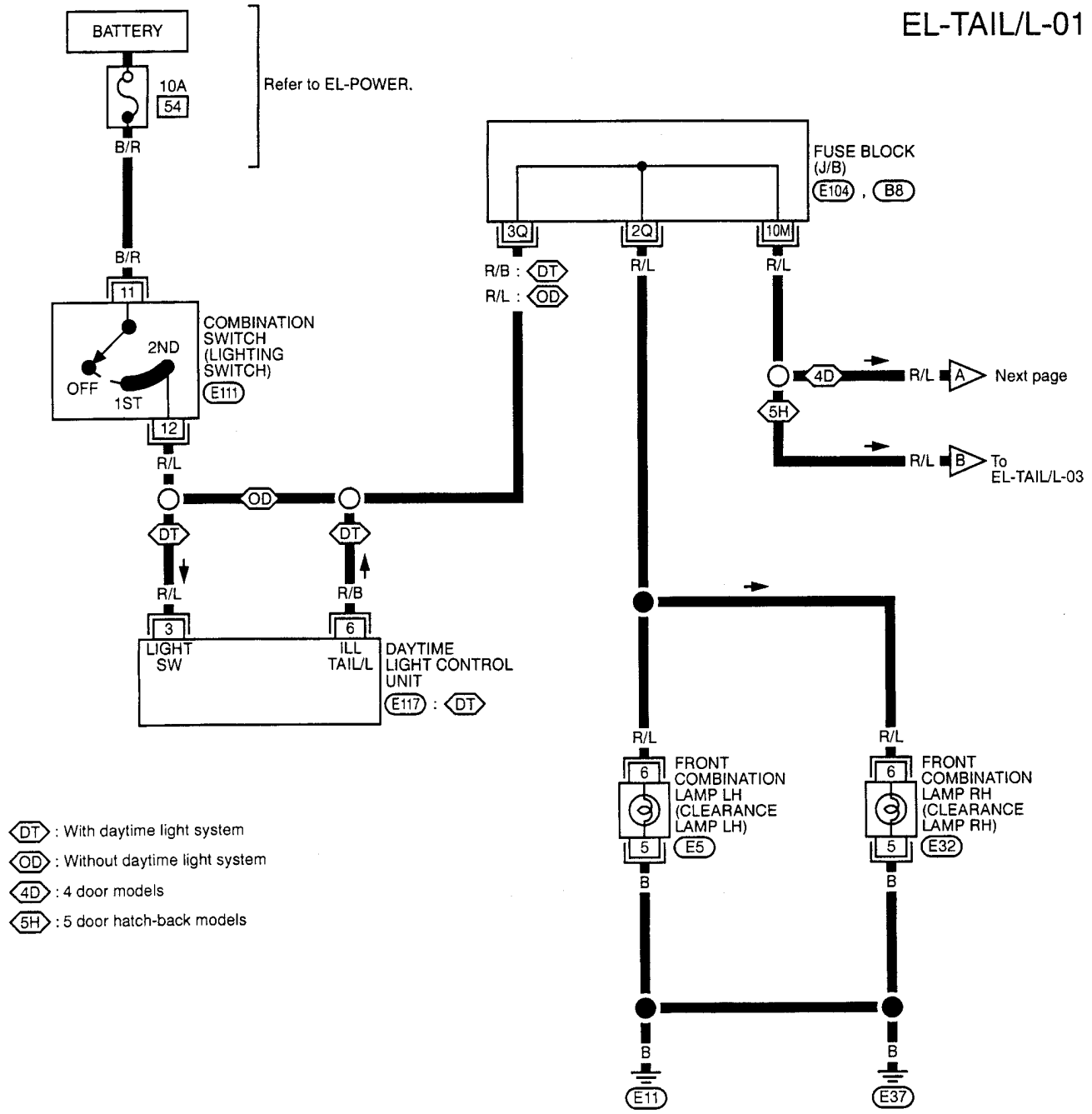
Clearance, License and Tail lamps/Schematic



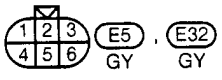
YEL385A

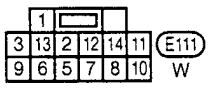
Clearance, License and Tail Lamps/Wiring Diagram — TAIL/L —

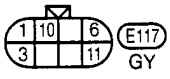
EL-TAIL/L-01



DT : With daytime light system
OD : Without daytime light system
4D : 4 door models
5H : 5 door hatch-back models





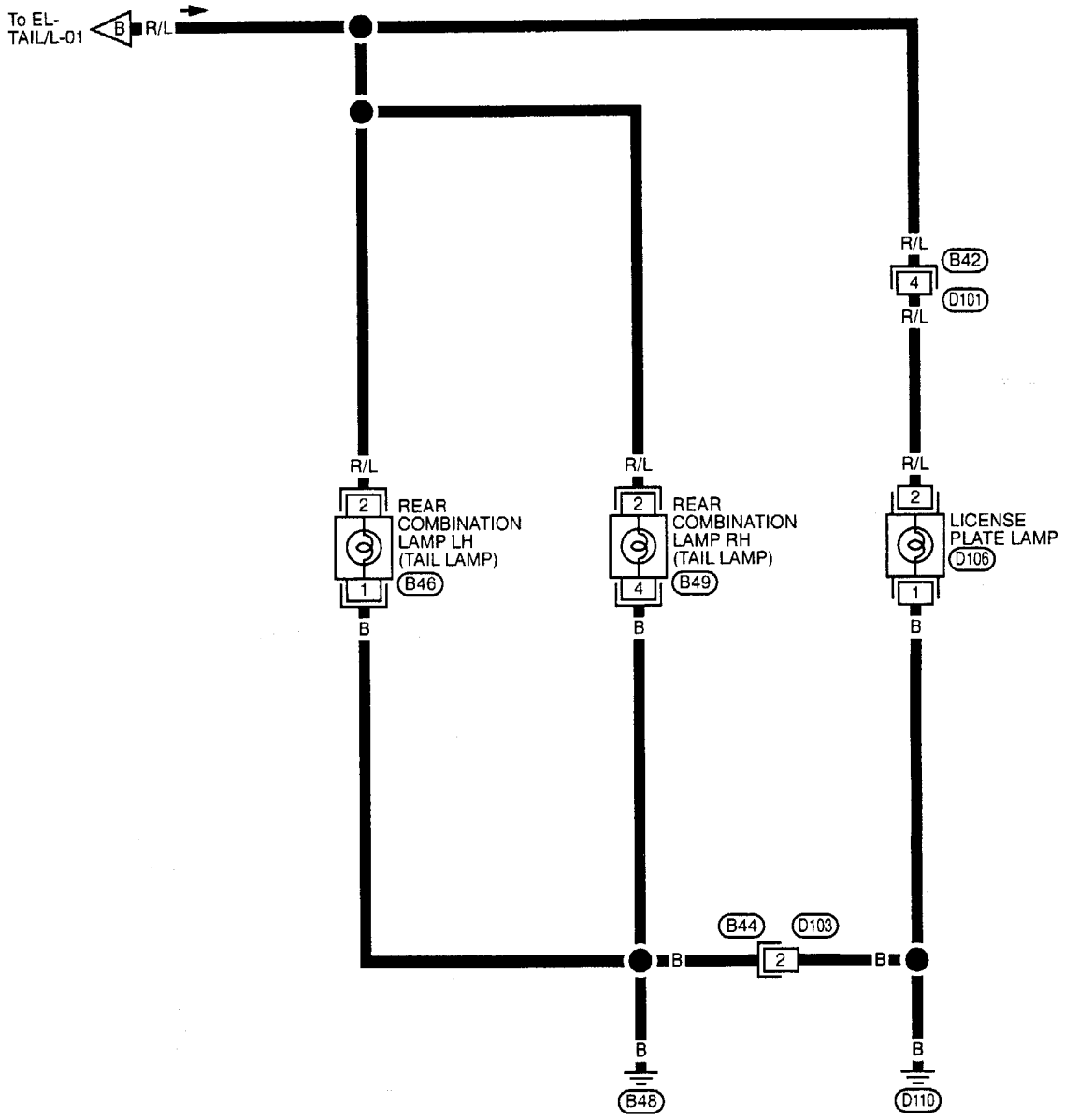


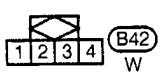
Refer to last page (Foldout page).
E104
B8

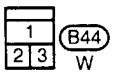
YEL386A

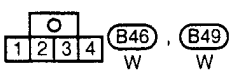
Clearance, License and Tail Lamps/Wiring Diagram — TAIL/L — (Cont'd)

EL-TAIL/L-03





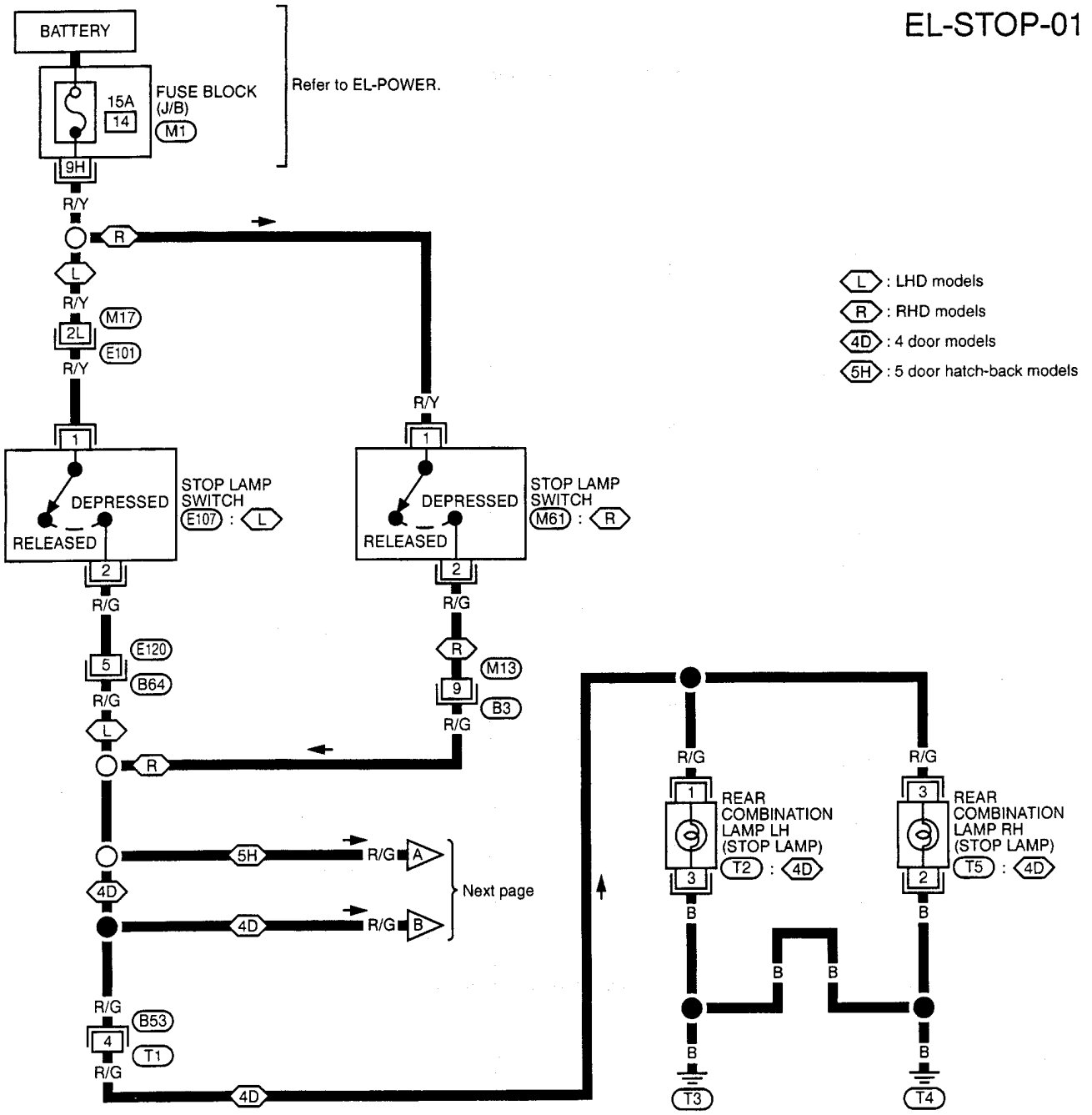


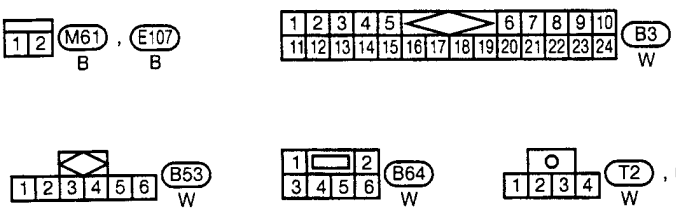


YEL387A

Stop Lamp/Wiring Diagram — STOP/L —

EL-STOP-01



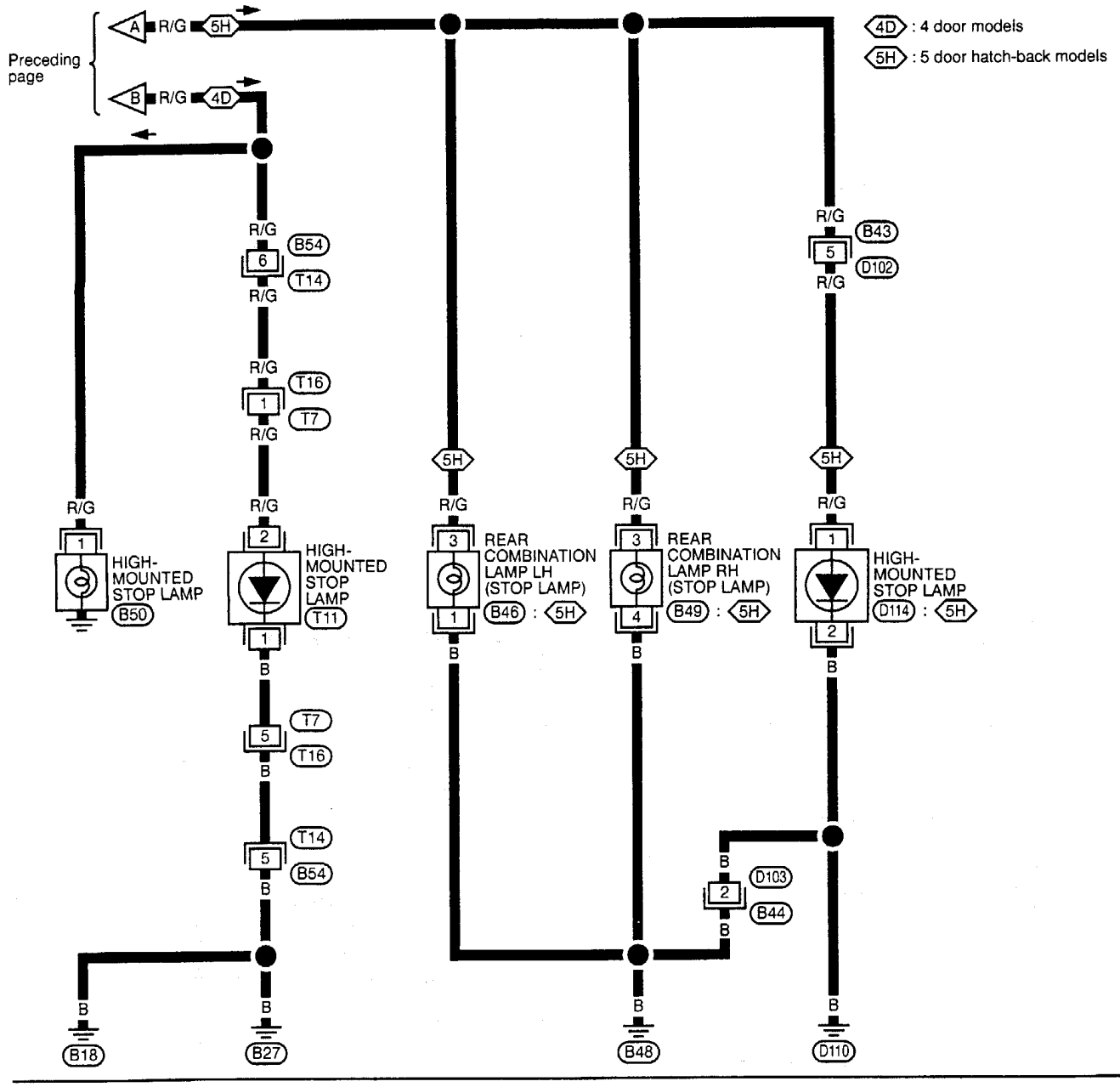


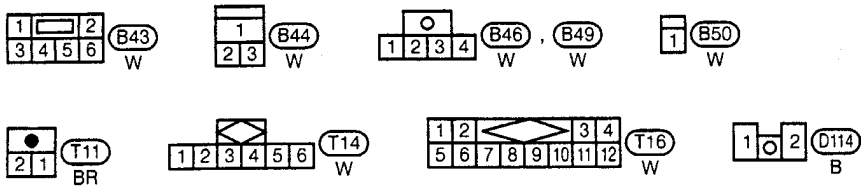
Refer to last page (Foldout page).
M17 , E101
M1

YEL388A

Stop Lamp/Wiring Diagram — STOP/L — (Cont'd)

EL-STOP-02

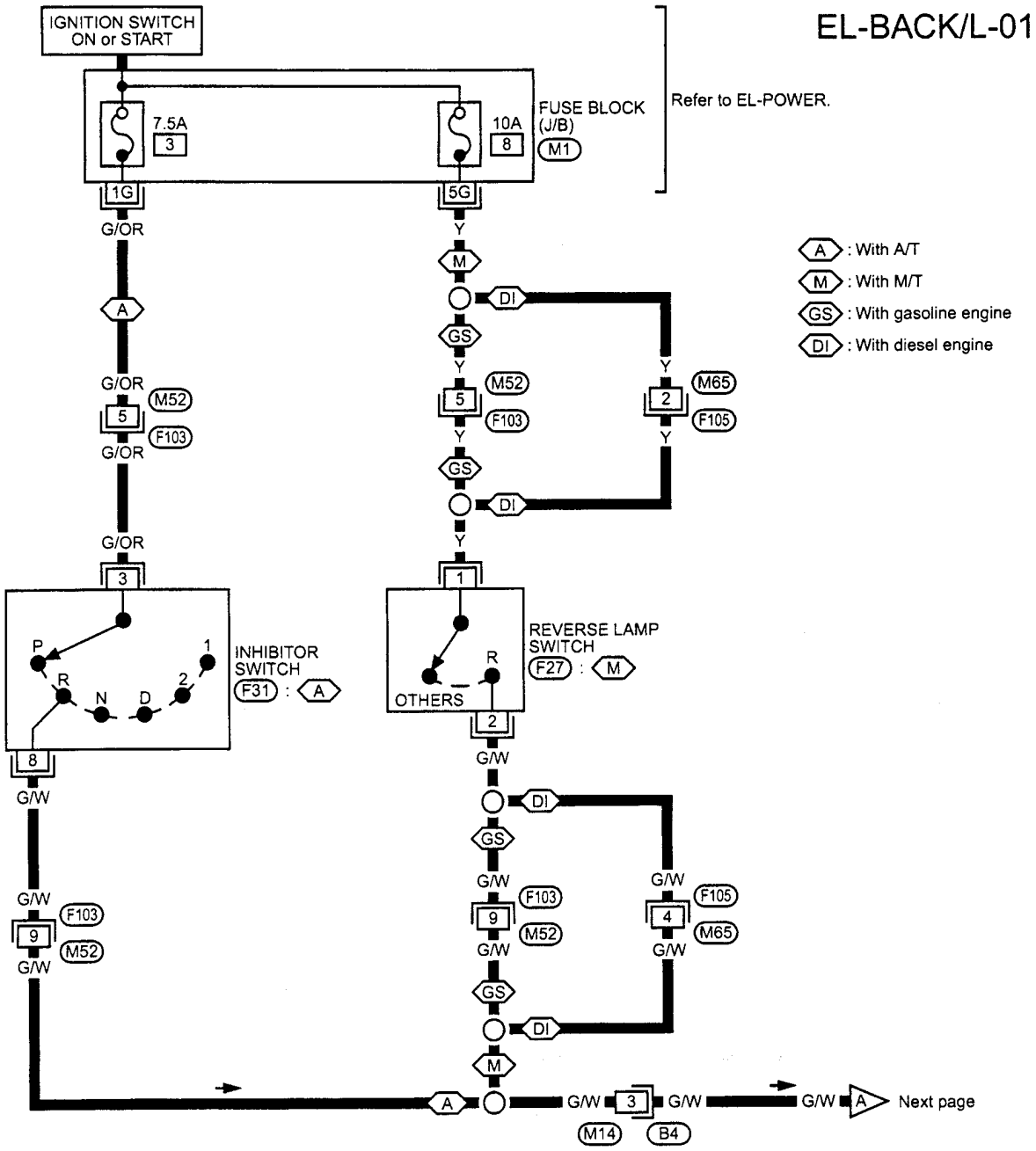


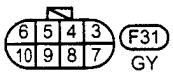


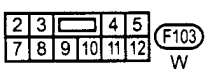
YEL389A

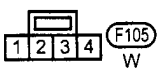
Back-up Lamp/Wiring Diagram — BACK/L —

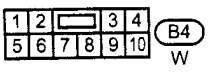
EL-BACK/L-01









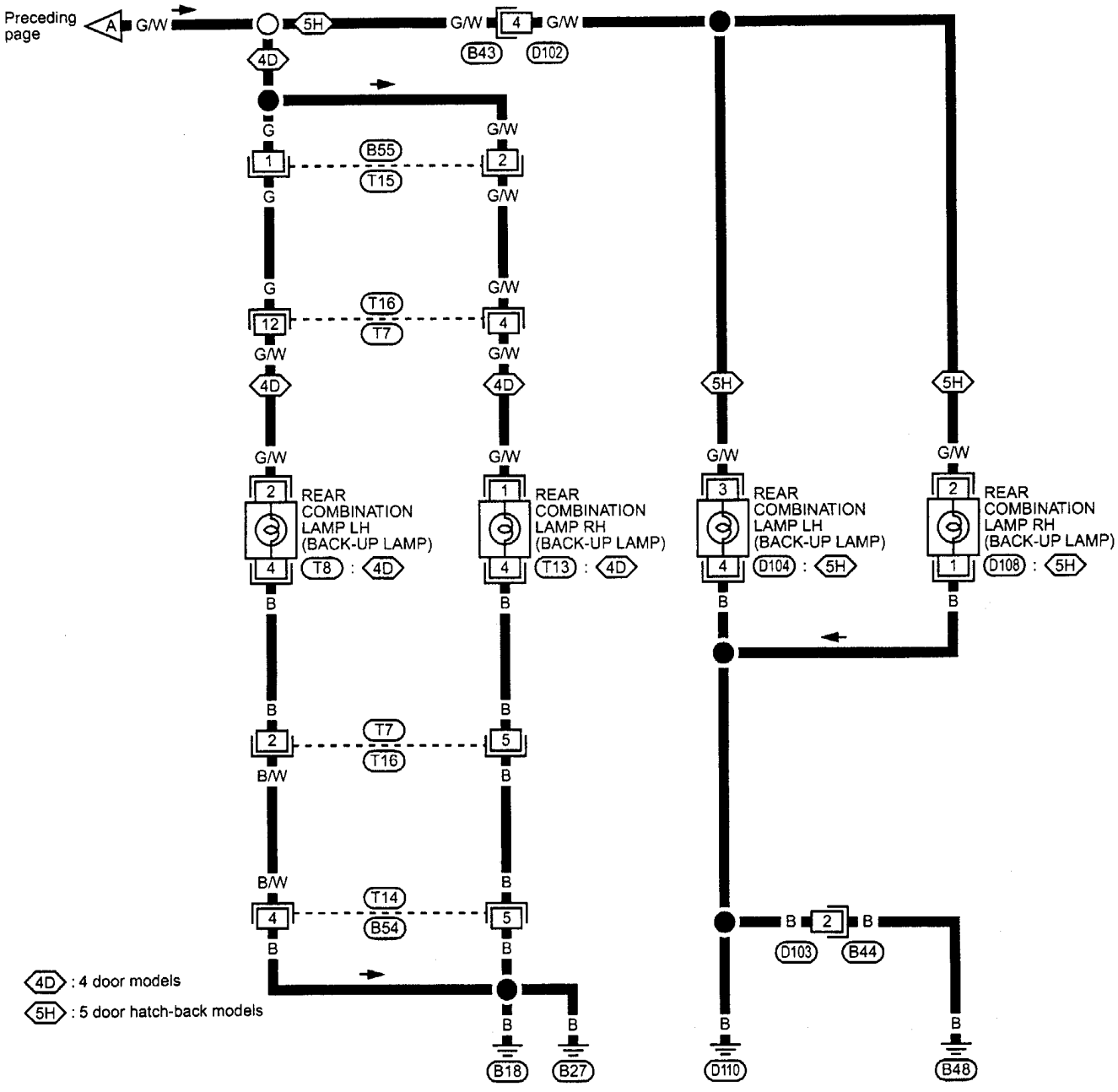


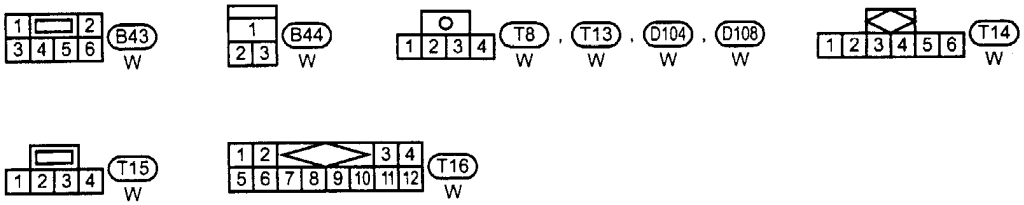
Refer to last page (Foldout page).
M1

YEL390A

Back-up Lamp/Wiring Diagram — BACK/L — (Cont'd)

EL-BACK/L-02

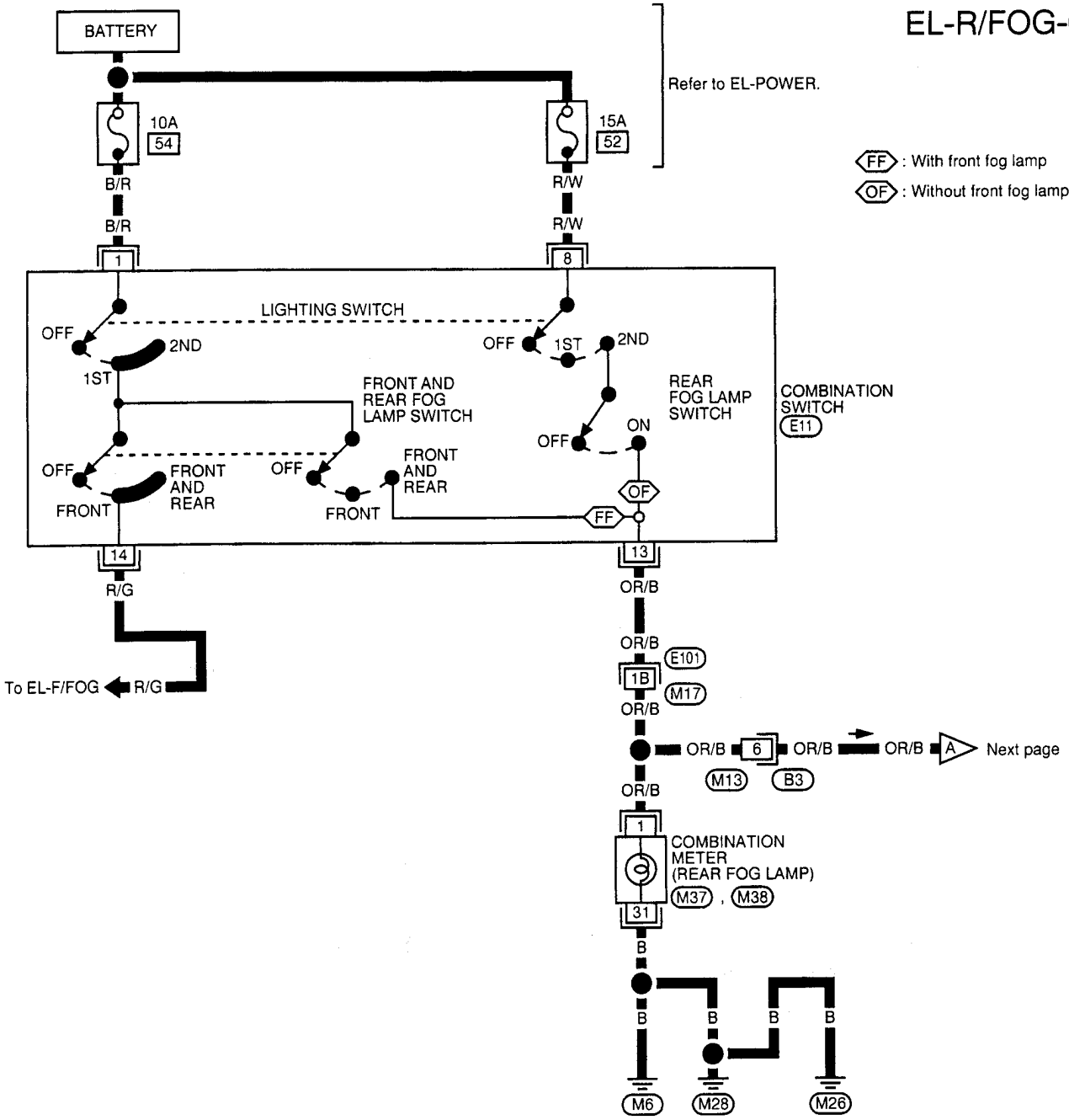


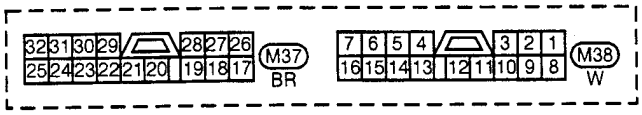


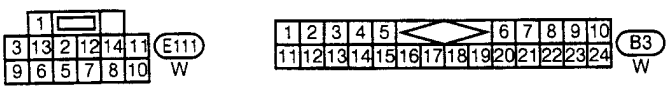
YEL391A

Rear Fog Lamp/Wiring Diagram — R/FOG —

EL-R/FOG-01





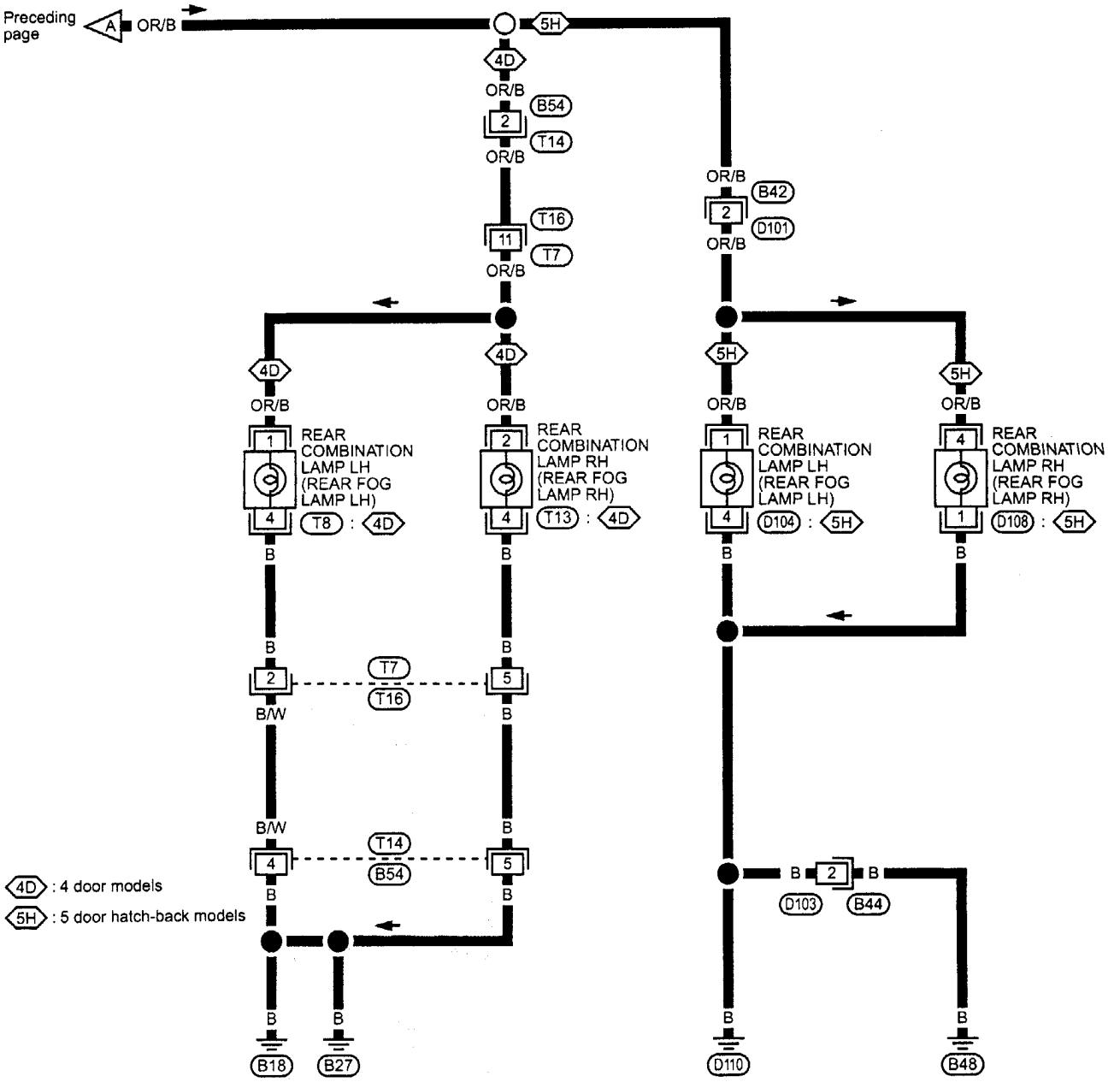


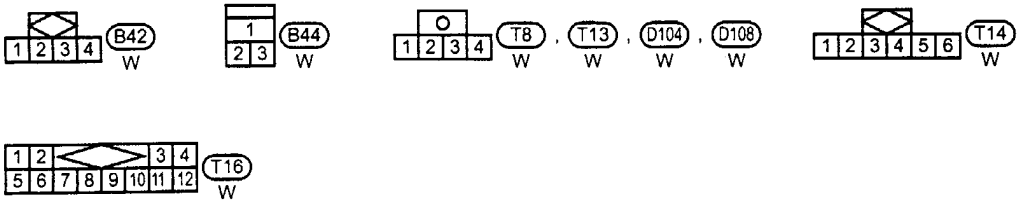
Refer to last page (Foldout page).
M17 , E101

YEL699

Rear Fog Lamp/Wiring Diagram — R/FOG — (Cont'd)

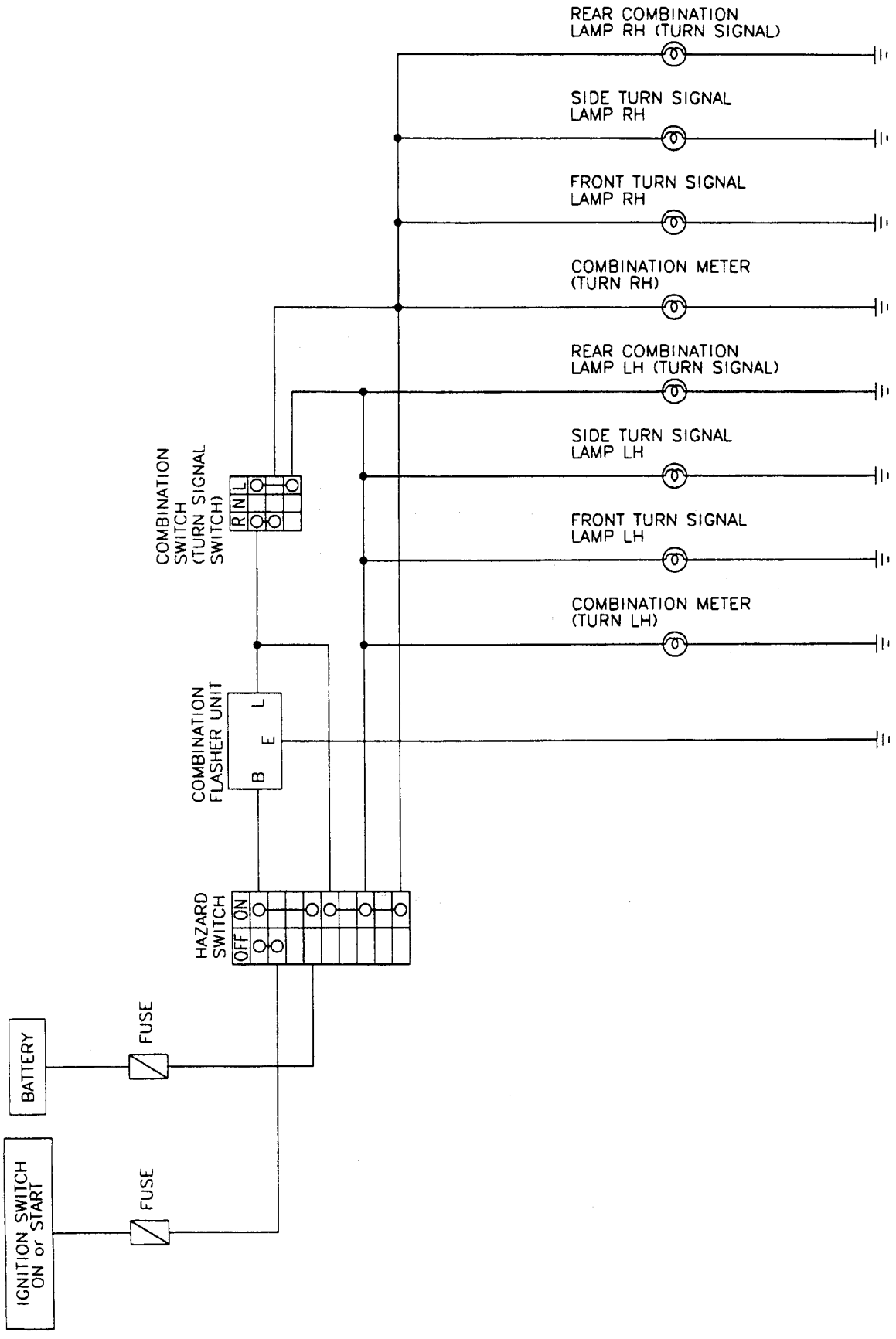
EL-R/FOG-02





YEL392A

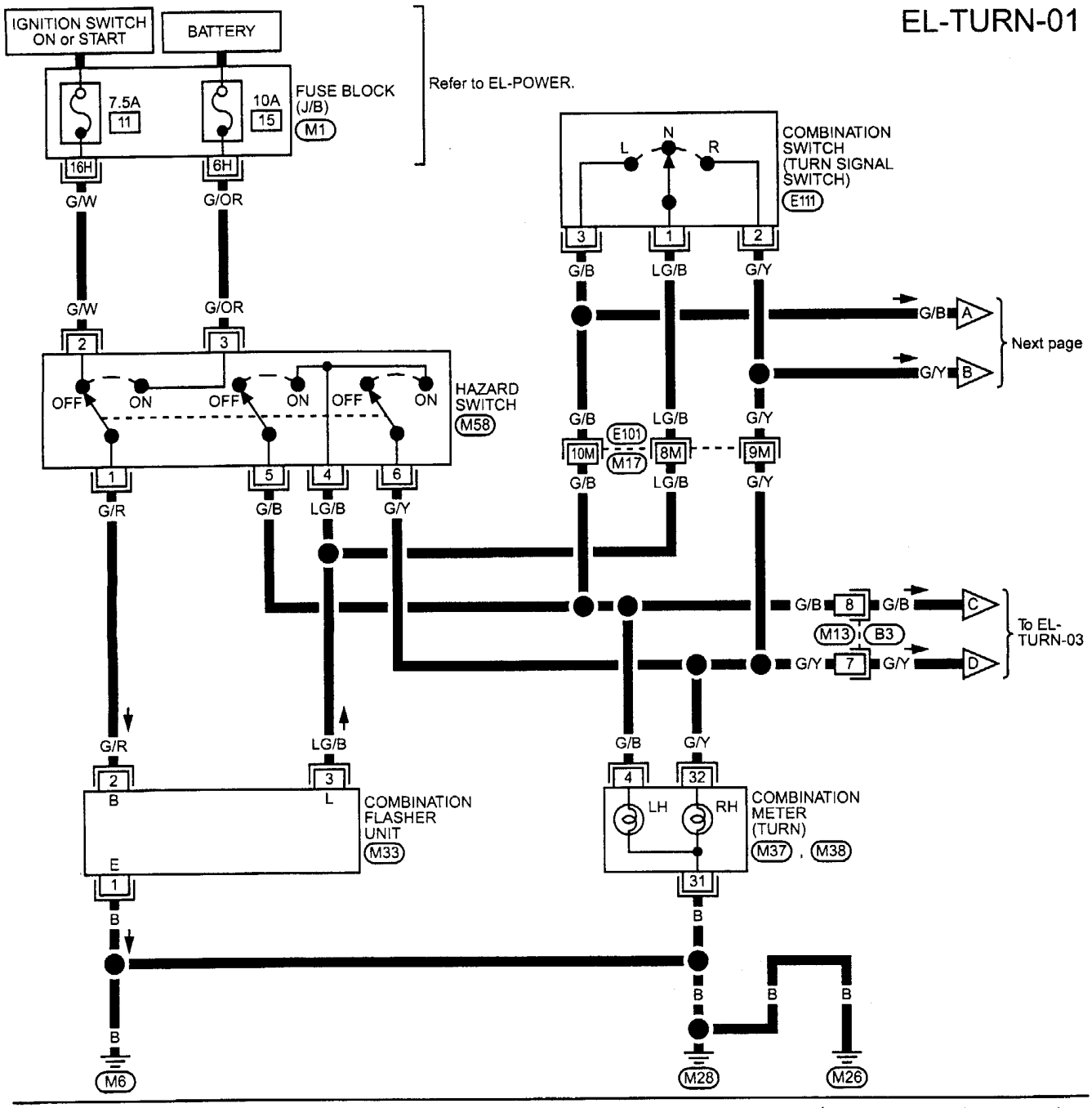
Turn Signal and Hazard Warning Lamps/Schematic

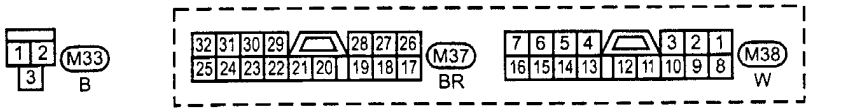


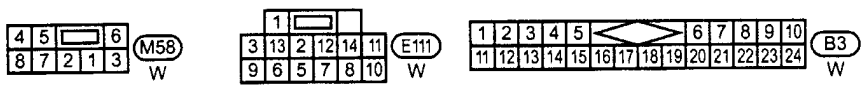
YEL693

Turn Signal and Hazard Warning Lamps/Wiring Diagrams — TURN —

EL-TURN-01





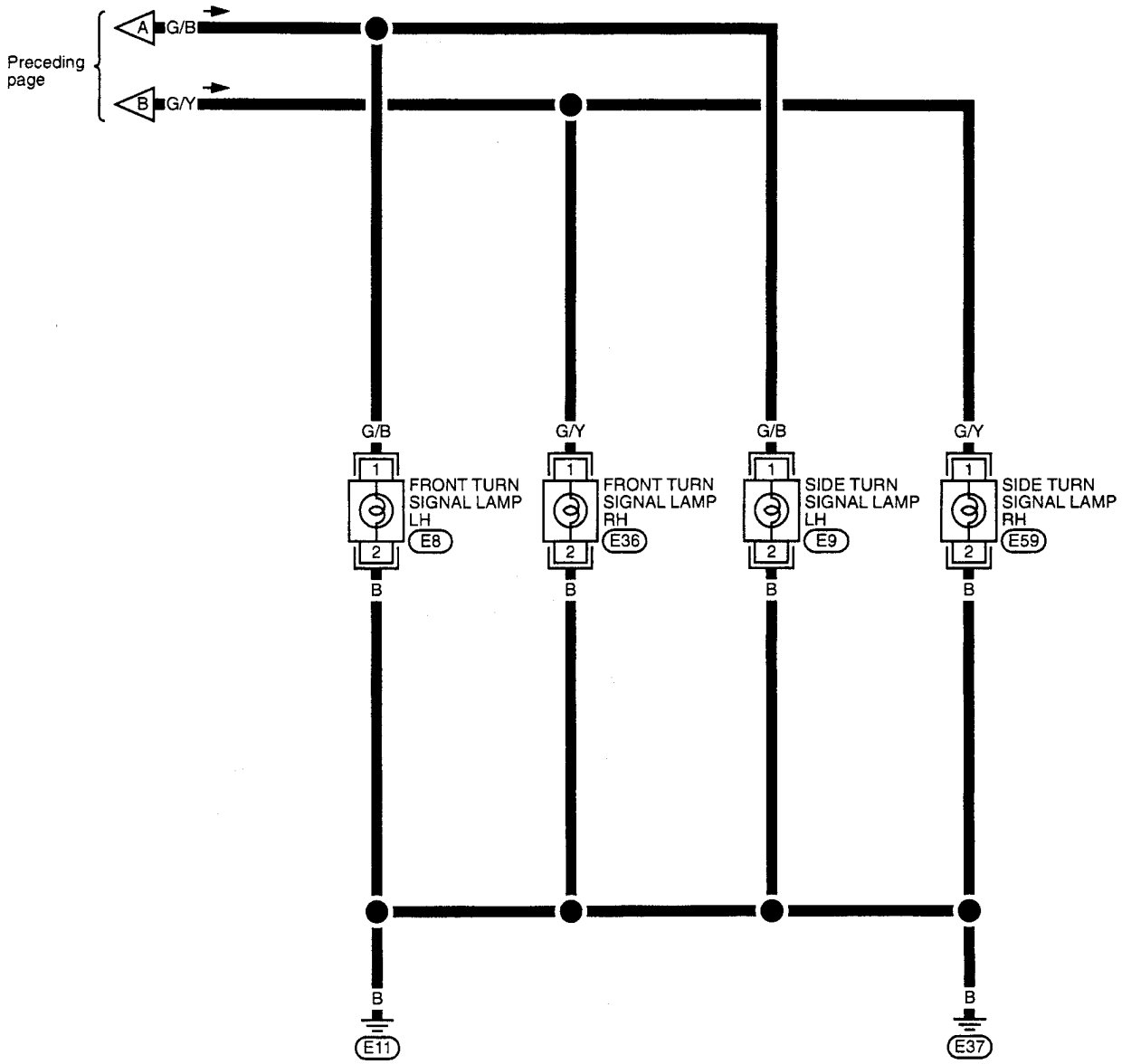


Refer to last page (Foldout page).
M17 , E101
M1

YEL393A

Turn Signal and Hazard Warning Lamps/Wiring Diagrams — TURN — (Cont'd)

EL-TURN-02



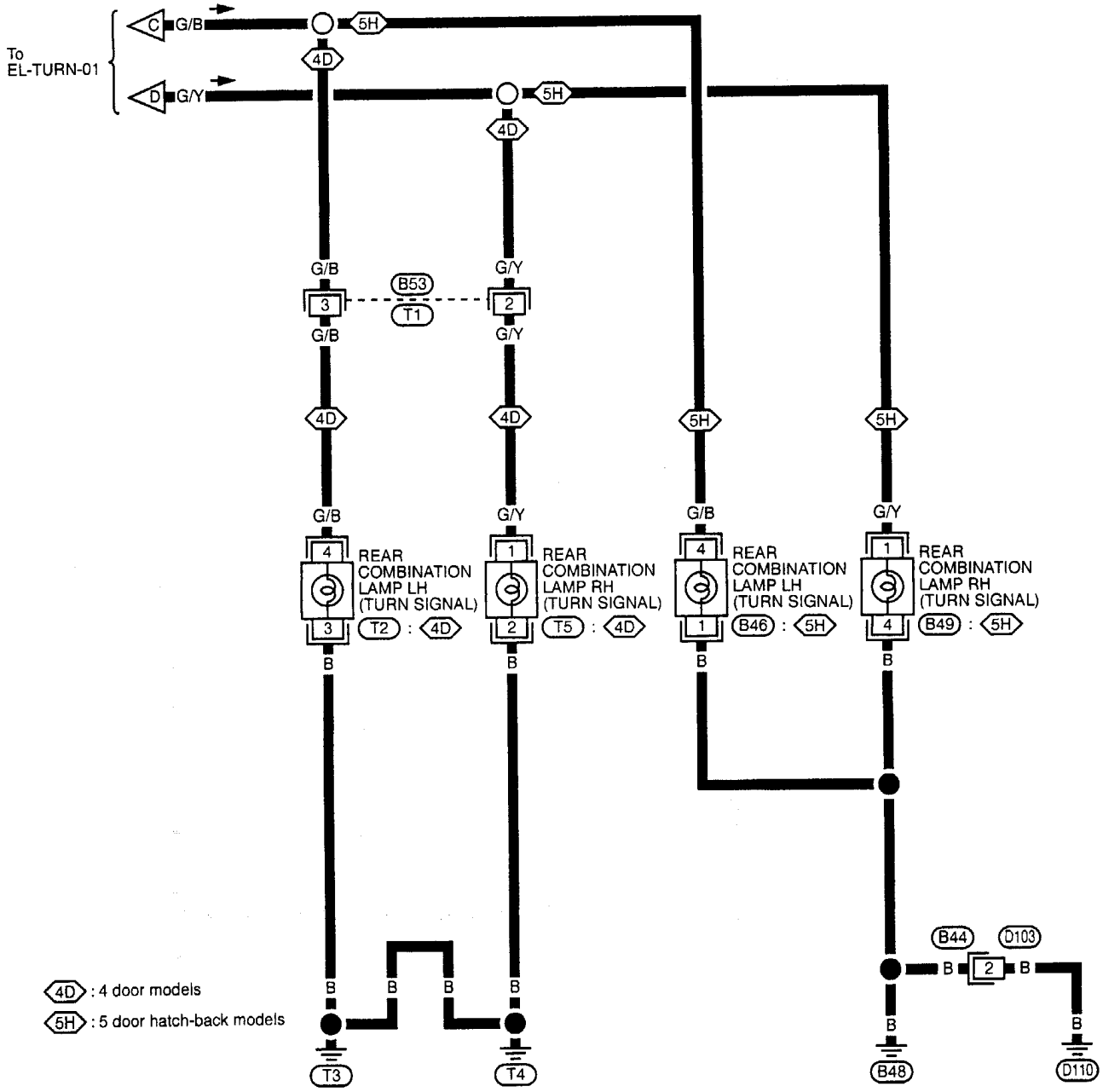
1 2 E8 GY , E36 GY

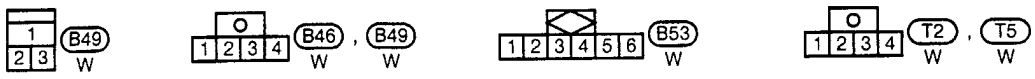
1 2 E9 B , E59 B

YEL691

Turn Signal and Hazard Warning Lamps/Wiring Diagrams — TURN — (Cont'd)

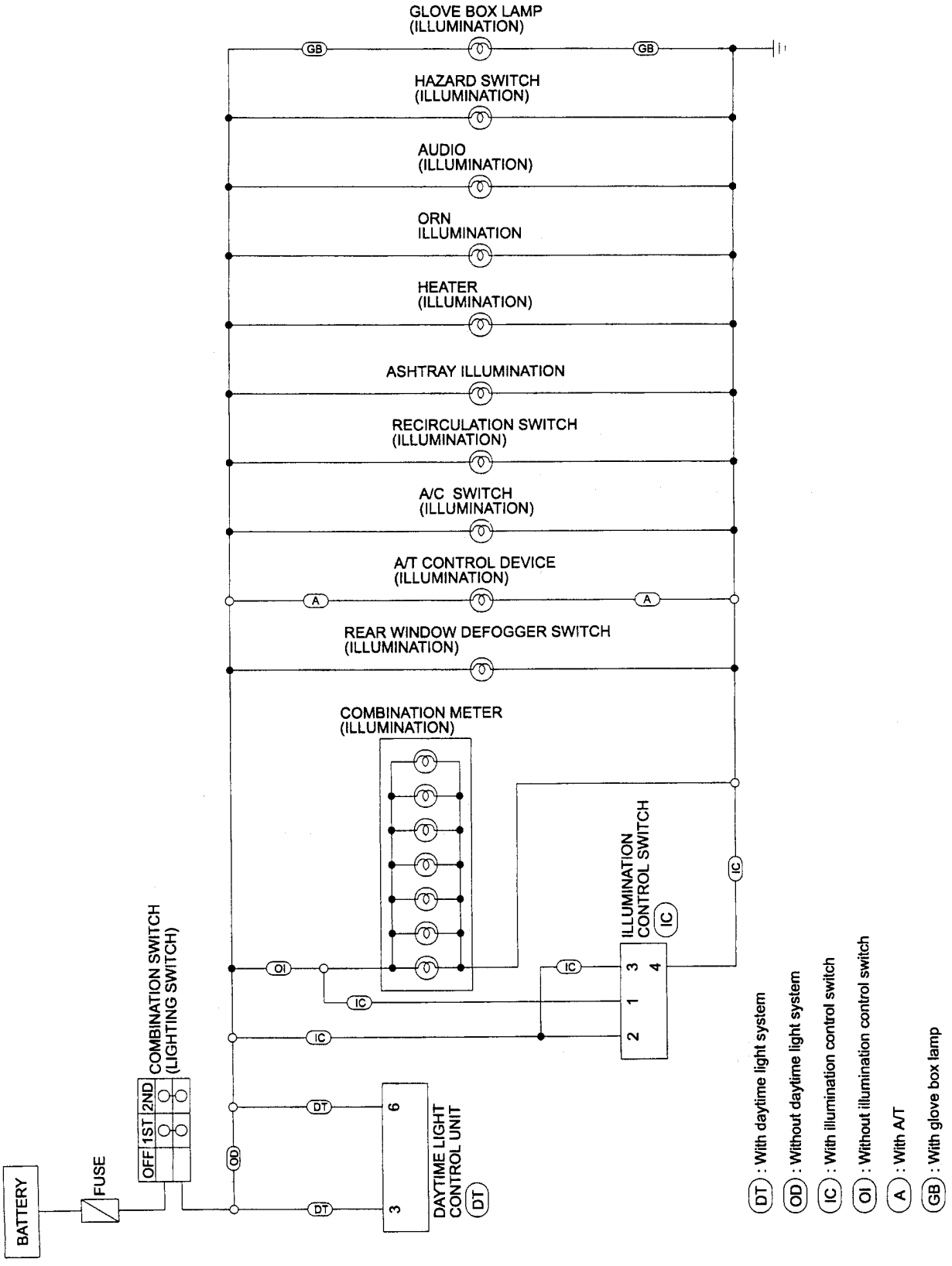
EL-TURN-03





YEL394A

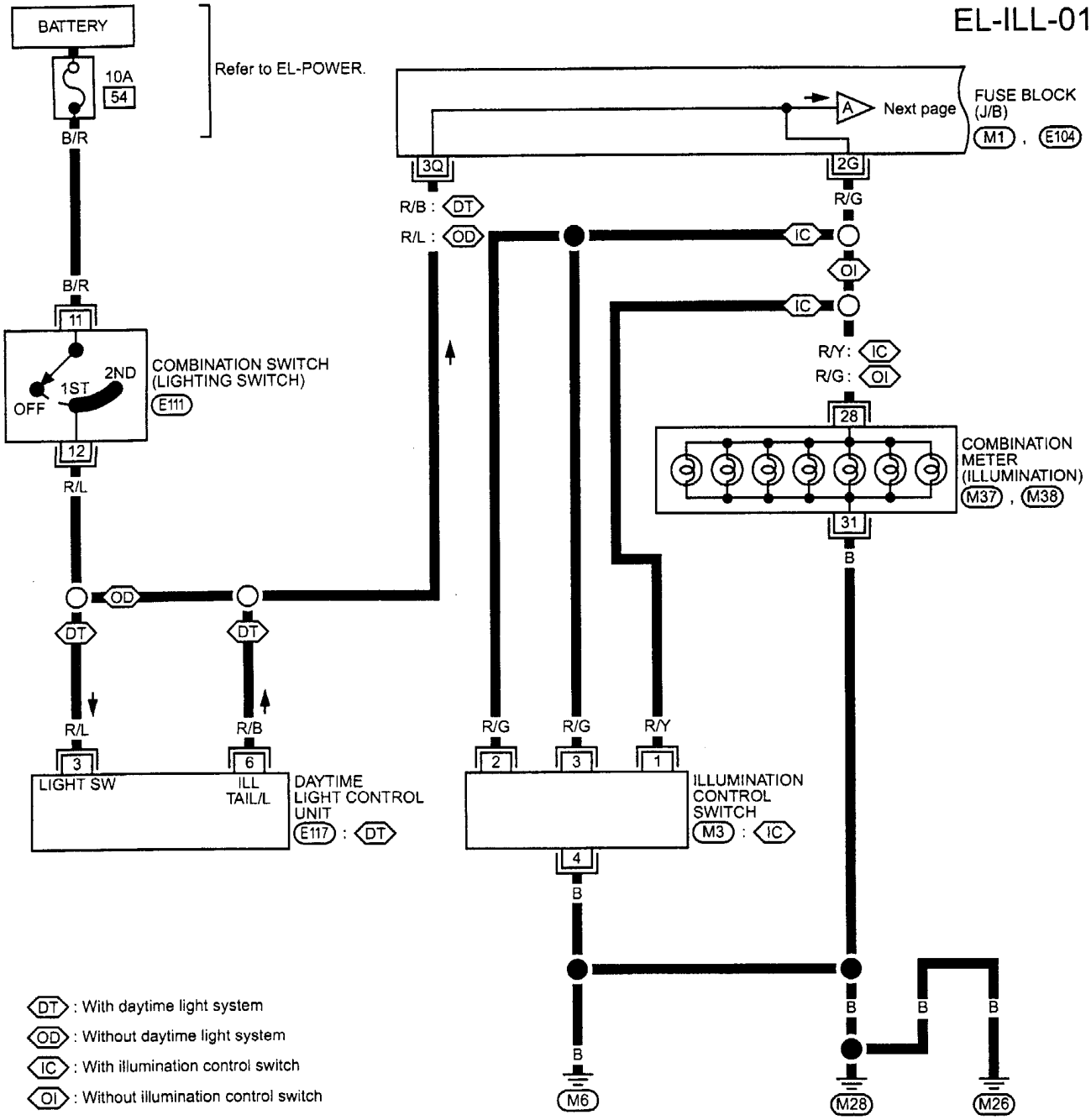
Illumination/Schematic

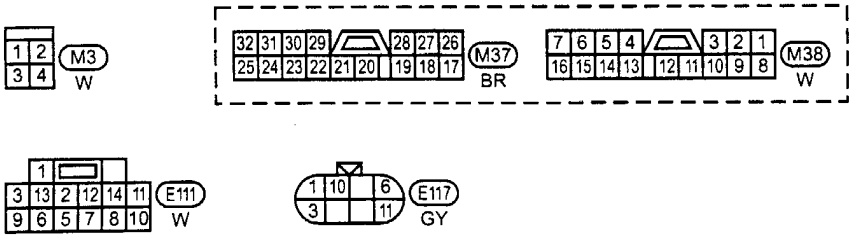


YEL395A

Illumination/Wiring Diagram — ILL —

EL-ILL-01



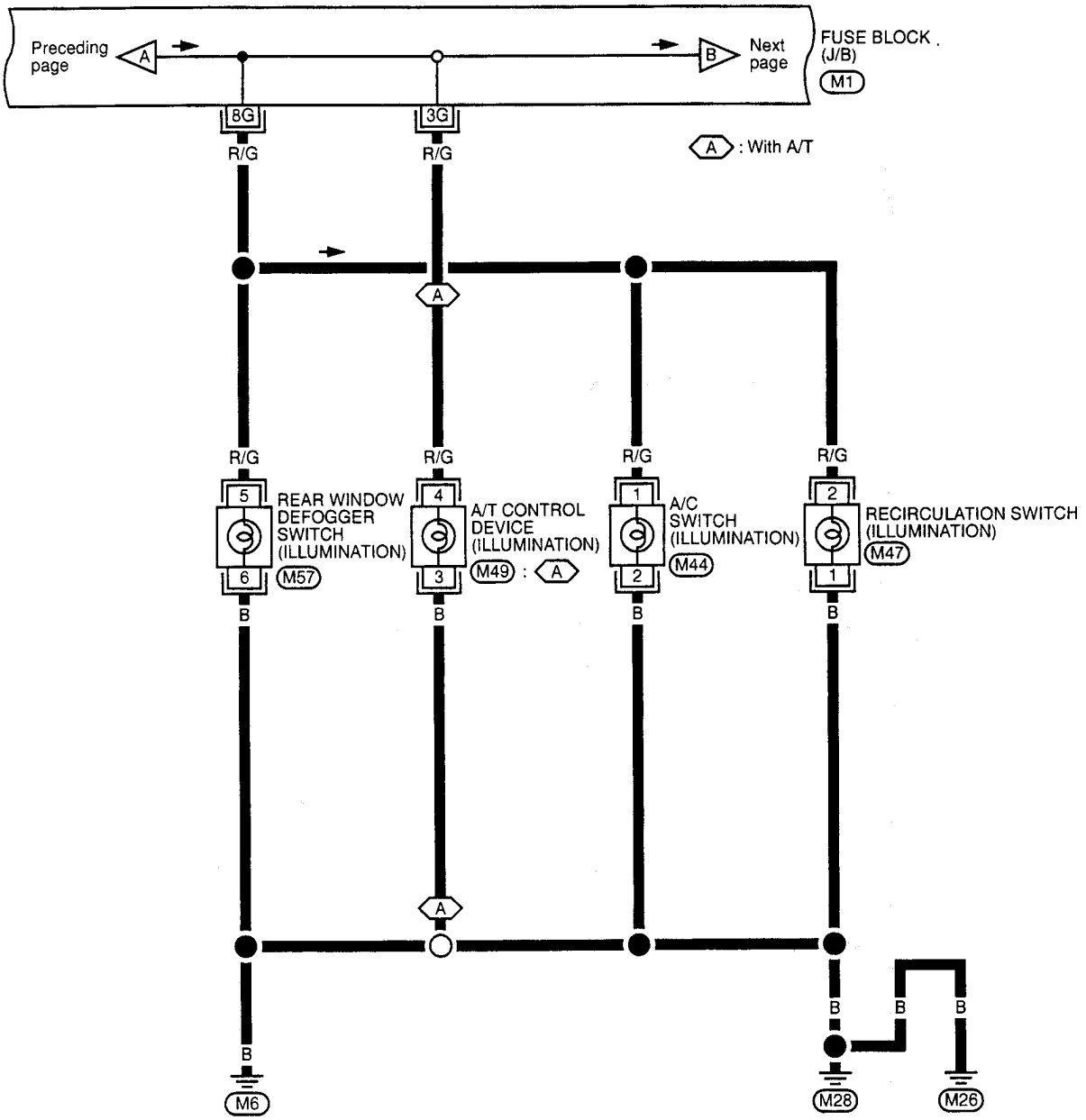


Refer to last page (Foldout page).
M1
E104

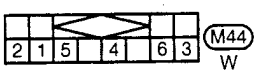
YEL396A

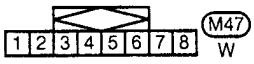
Illumination/Wiring Diagram — ILL — (Cont'd)

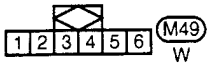
EL-ILL-02

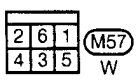


Refer to last page (Foldout page).
M1





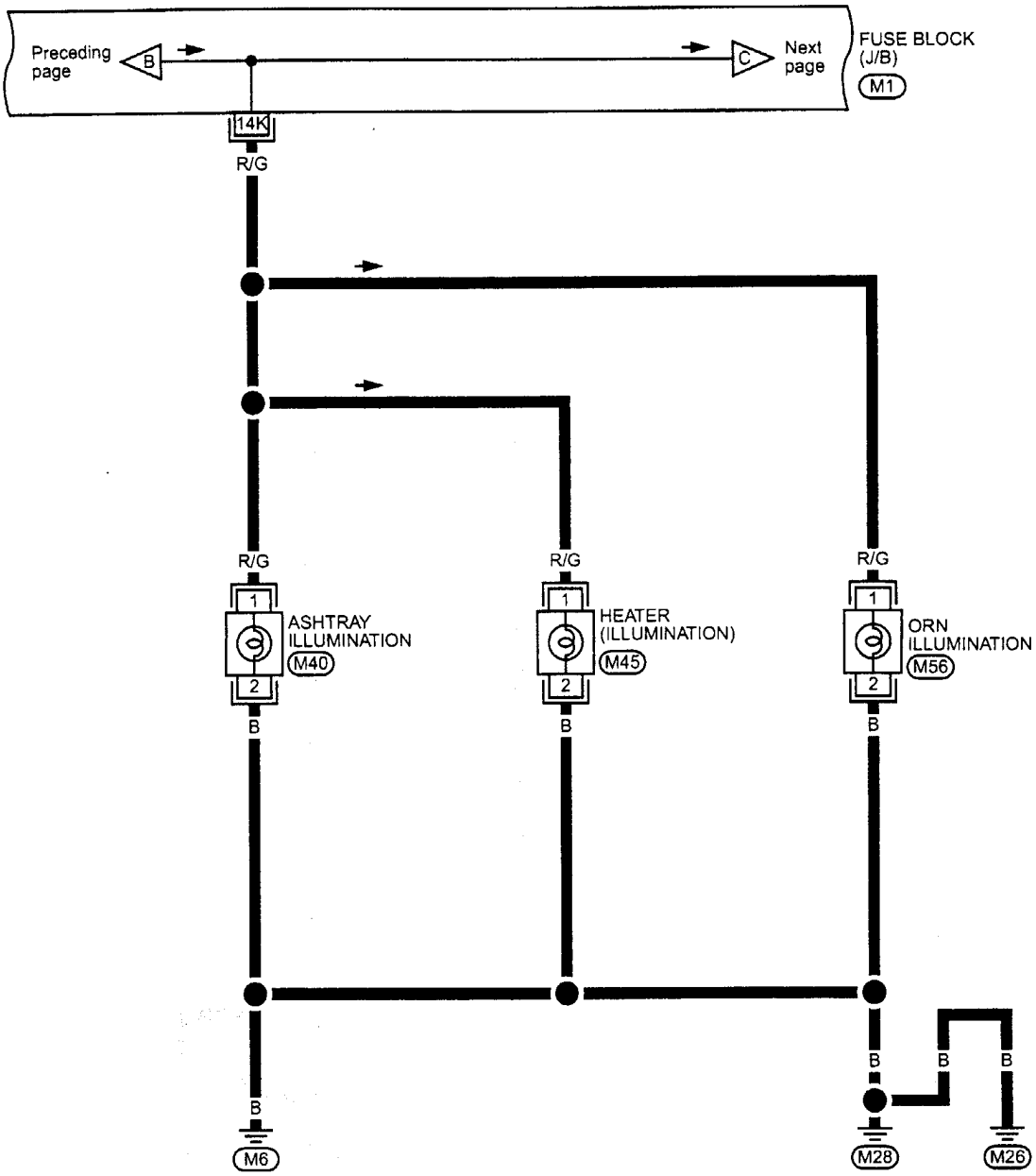


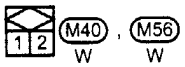


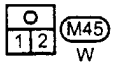
YEL397A

Illumination/Wiring Diagram — ILL — (Cont'd)

EL-ILL-03





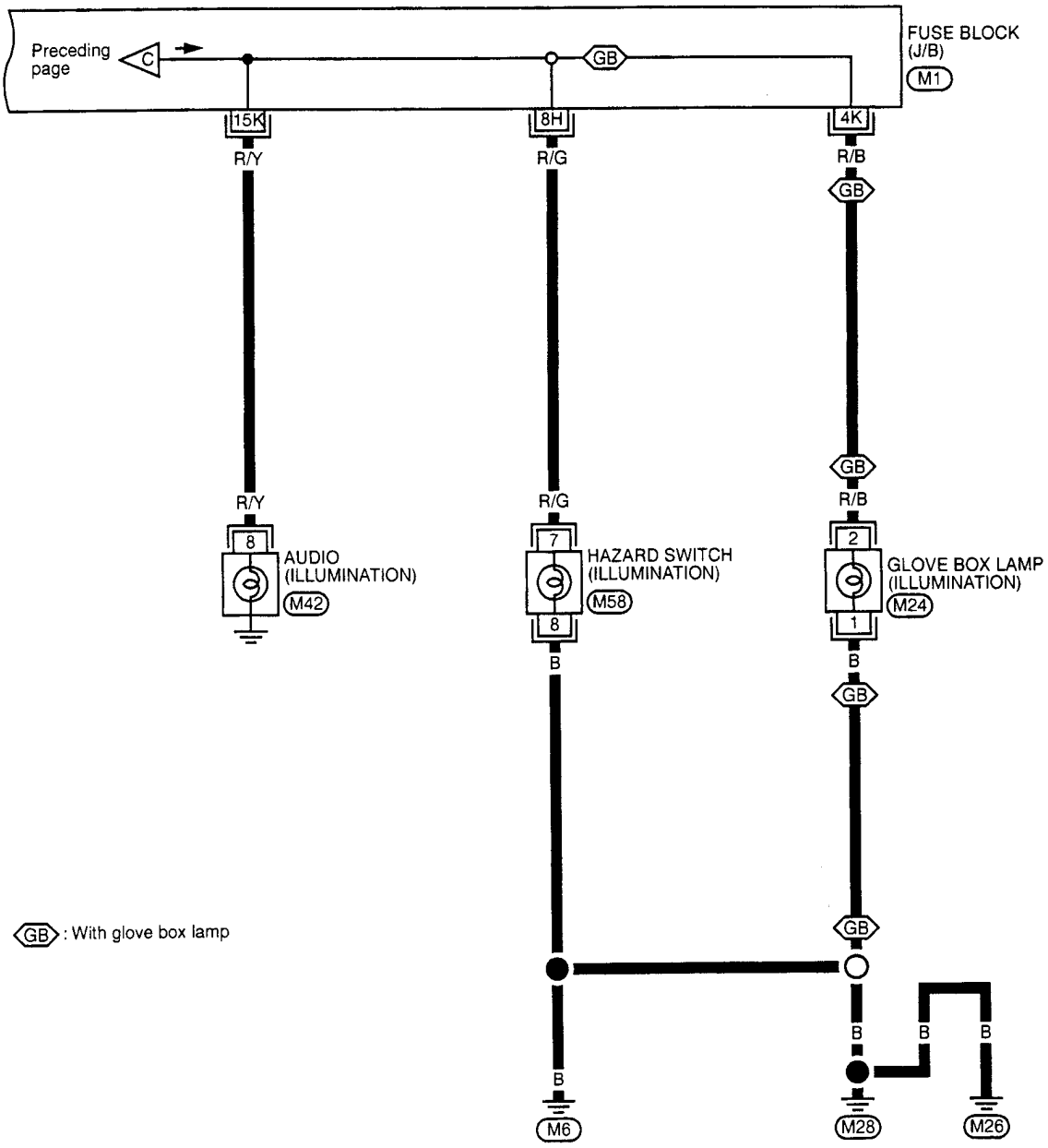


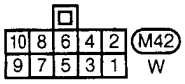
Refer to last page (Foldout page).
M1

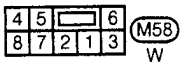
YEL398A

Illumination/Wiring Diagram — ILL — (Cont'd)

EL-ILL-04



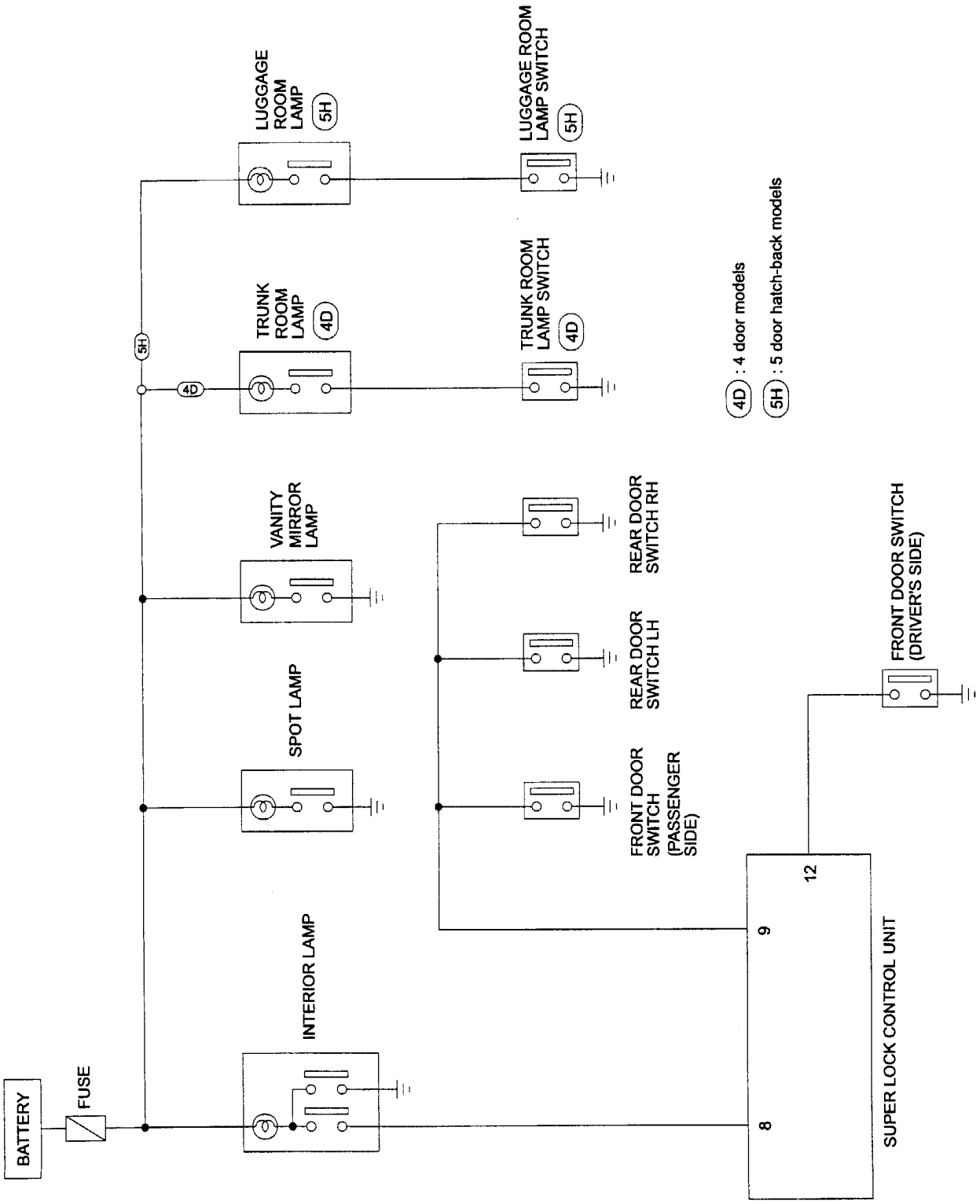




Refer to last page (Foldout page).
M1

YEL399A

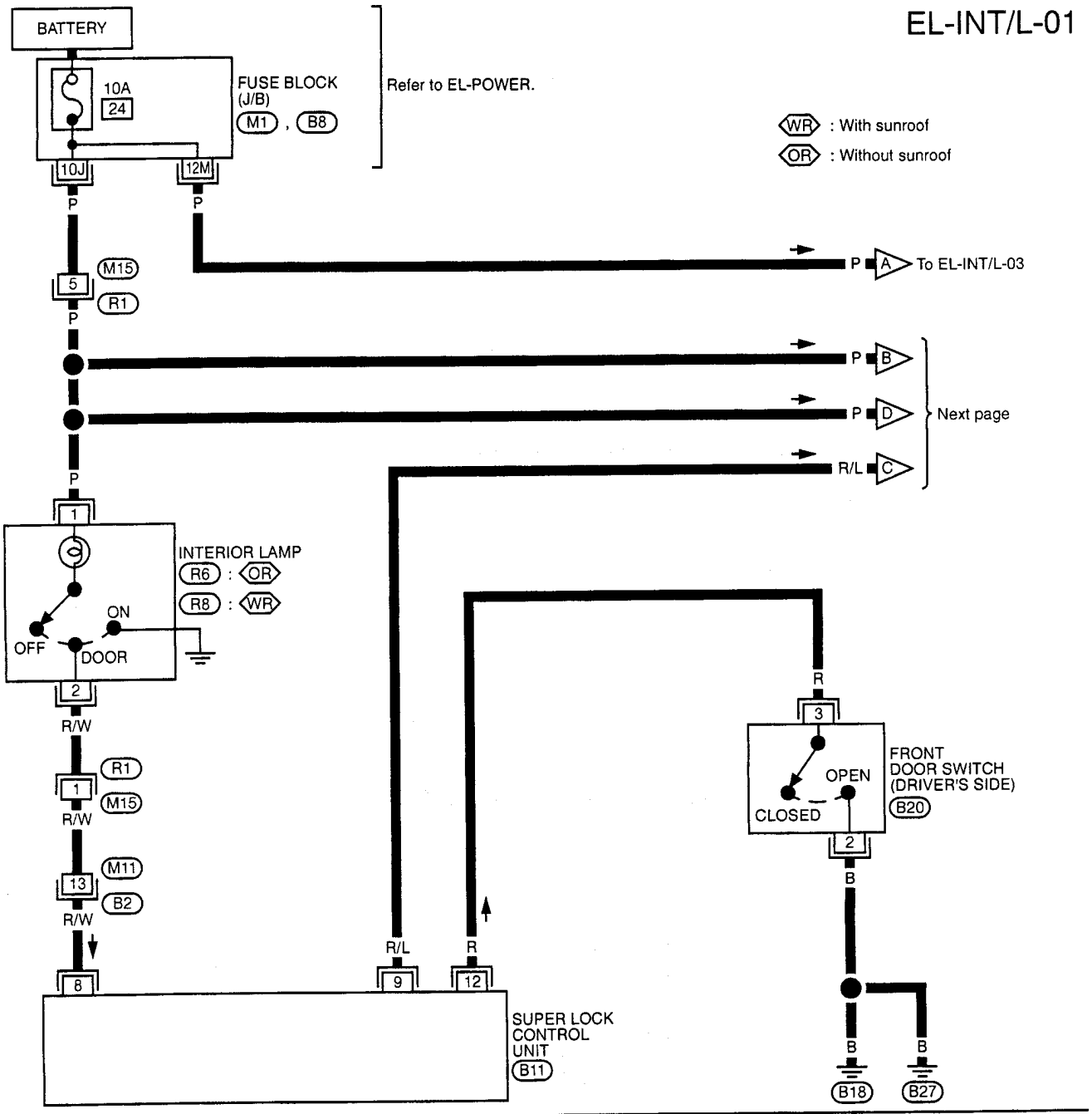
Interior, Spot, Trunk Room and Luggage Room Lamps/Schematic



YEL400A

Interior, Spot, Trunk Room and Luggage Room Lamps/Wiring Diagram — INT/L —

EL-INT/L-01

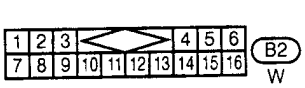


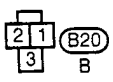
Refer to last page (Foldout page).

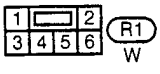
M1

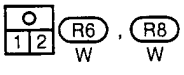
B8

B11





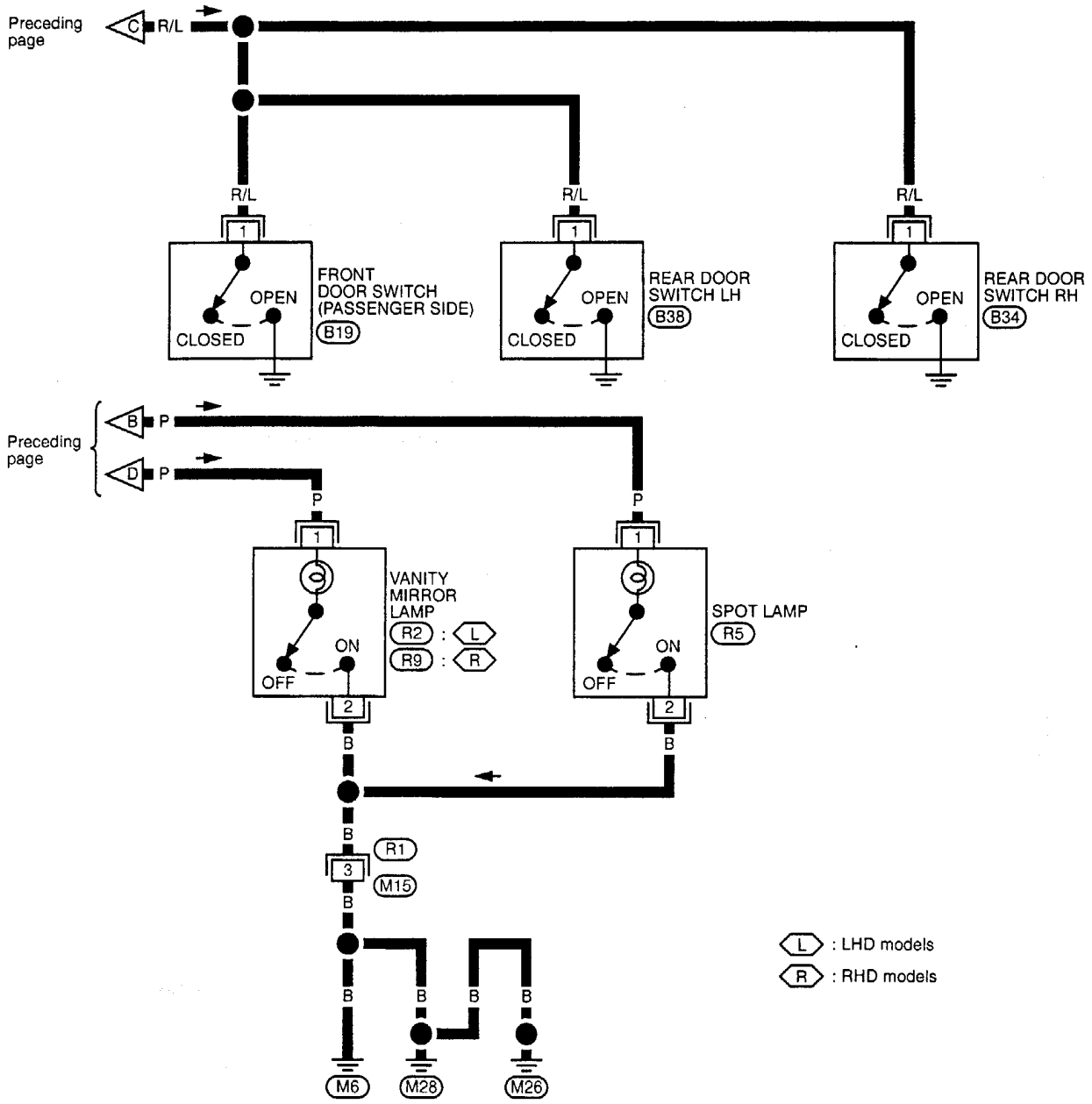




YEL401A

Interior, Spot, Trunk Room and Luggage Room Lamps/Wiring Diagram — INT/L — (Cont'd)

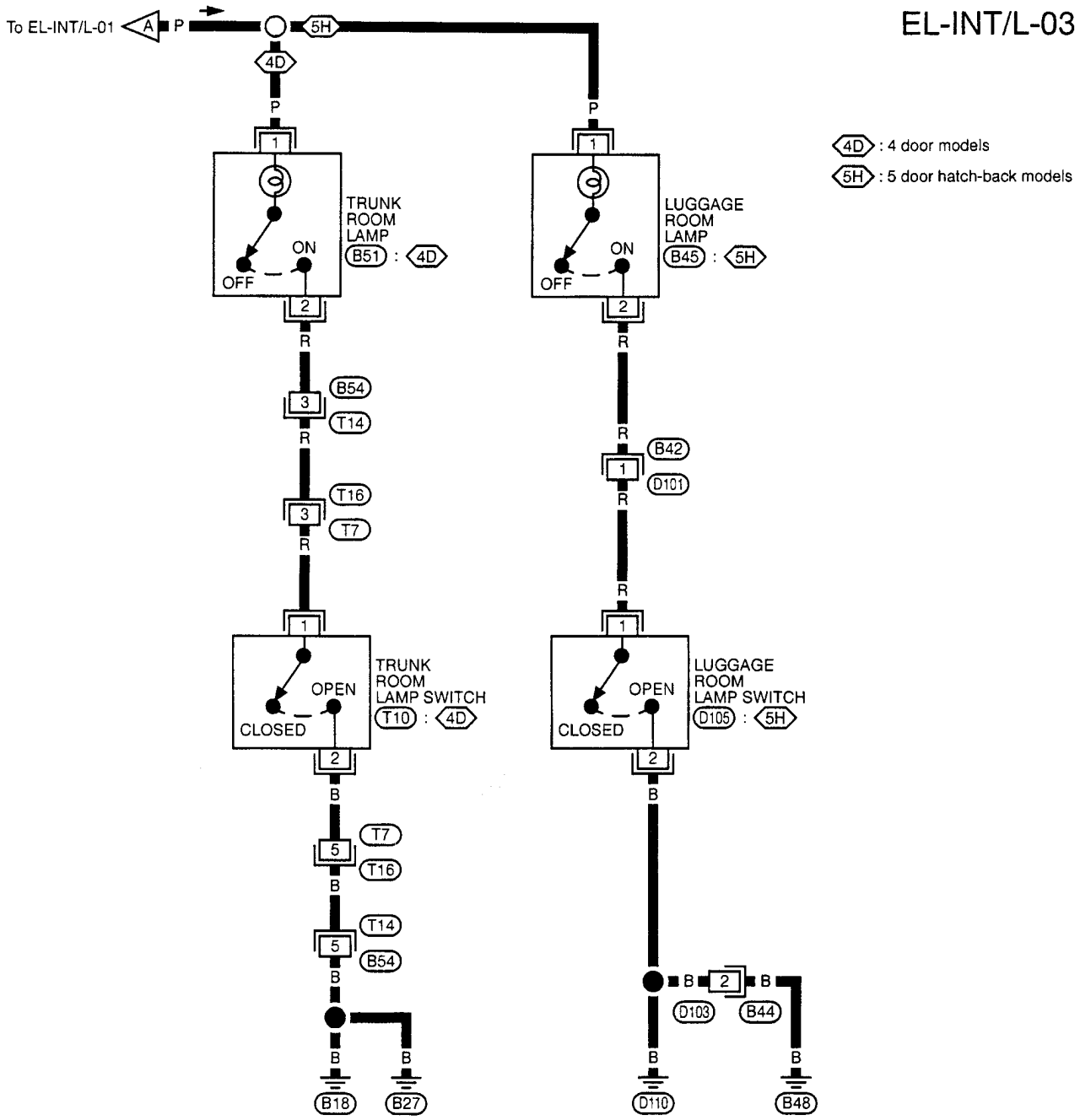
EL-INT/L-02

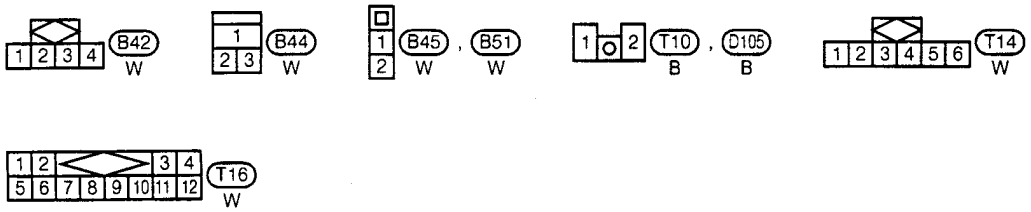


YEL402A

Interior, Spot, Trunk Room and Luggage Room Lamps/Wiring Diagram — INT/L — (Cont'd)

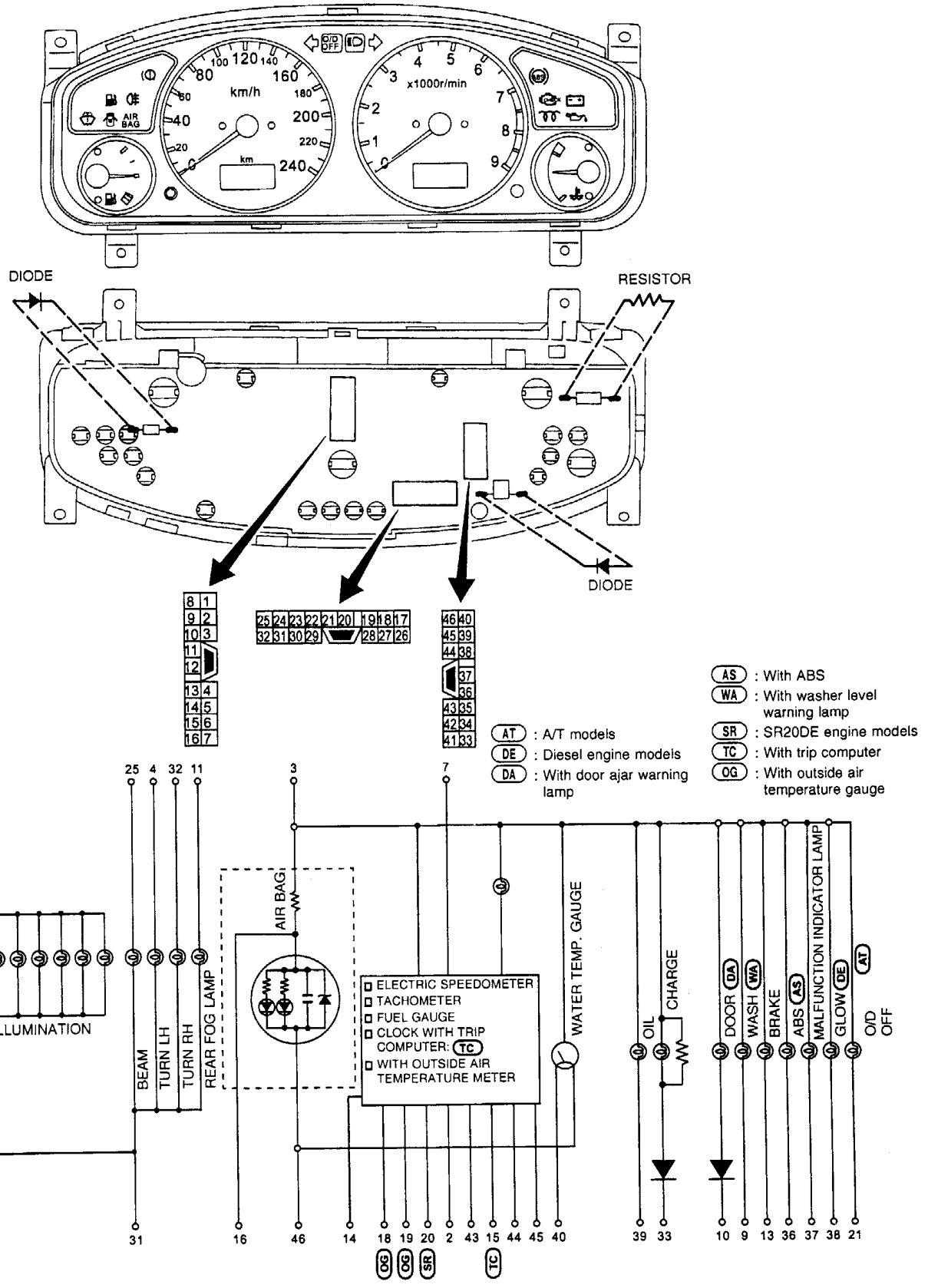
EL-INT/L-03





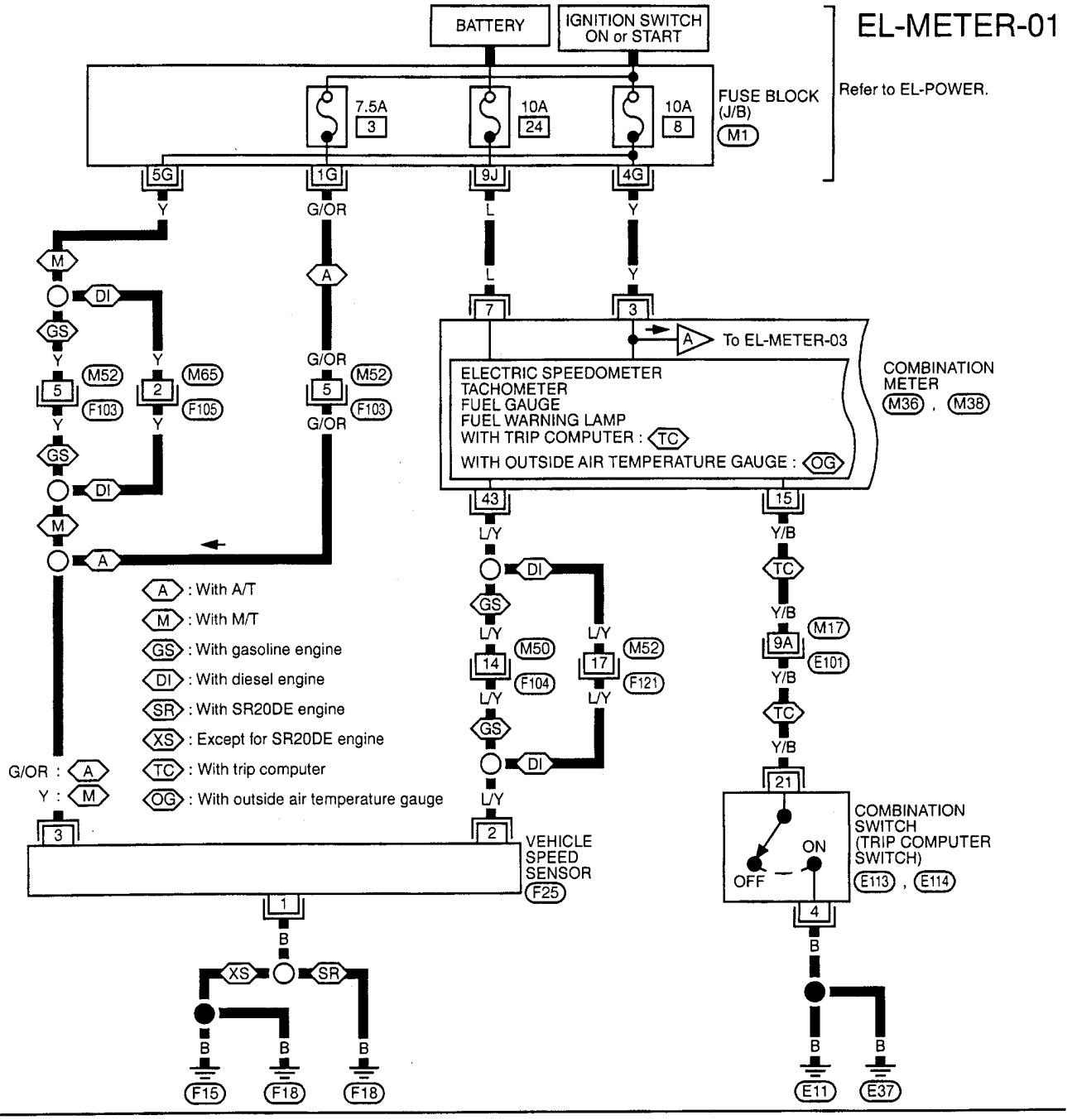
YEL403A

Combination Meter

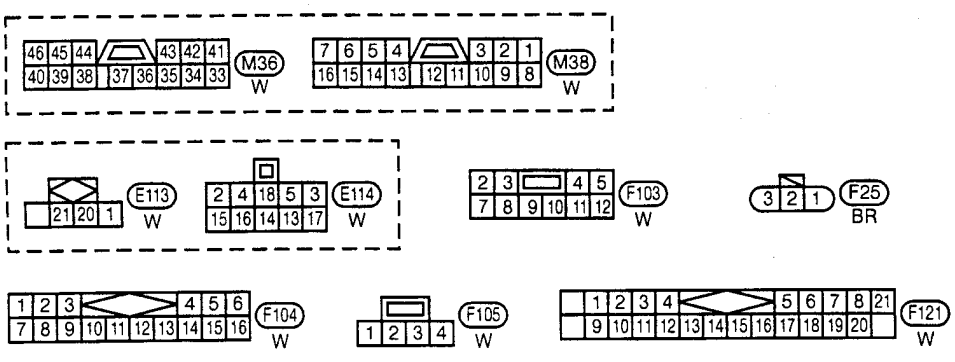


YEL524A

Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER —

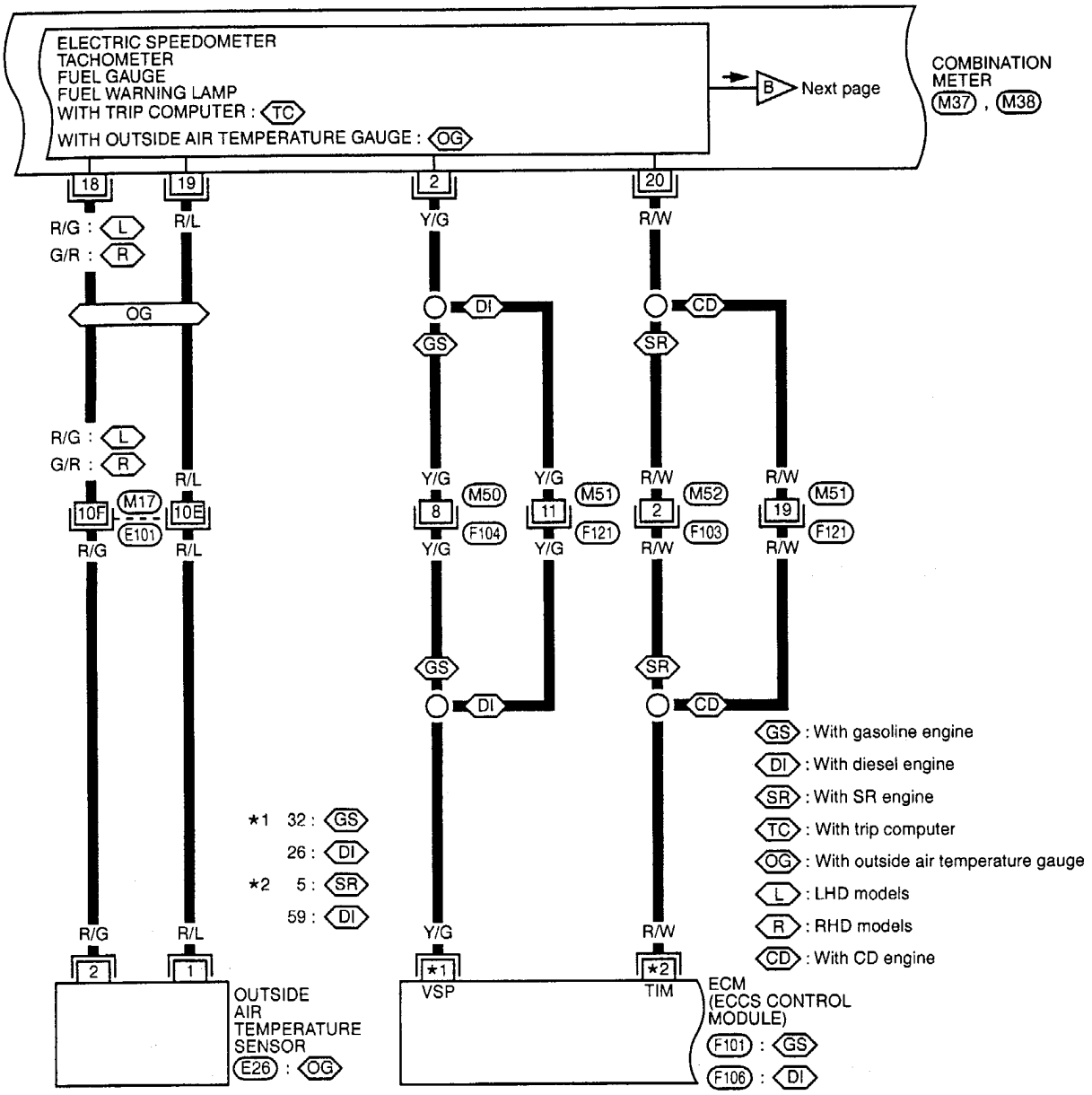


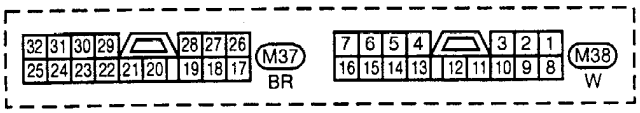
Refer to last page (Foldout page).
M17 , E101
M1

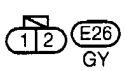


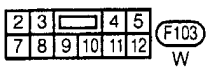
YEL404A

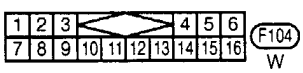
Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER — (Cont'd)

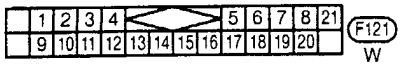










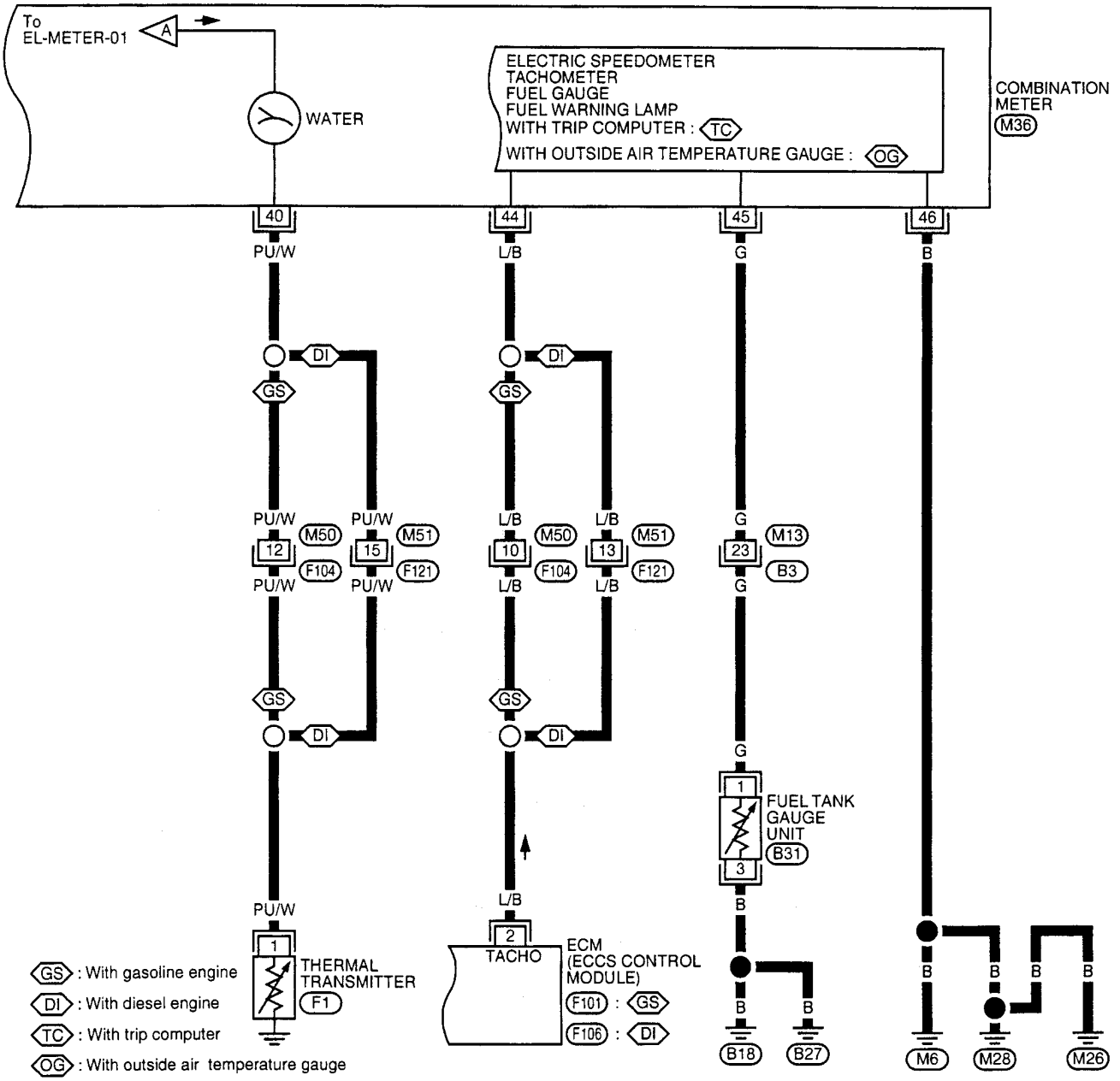


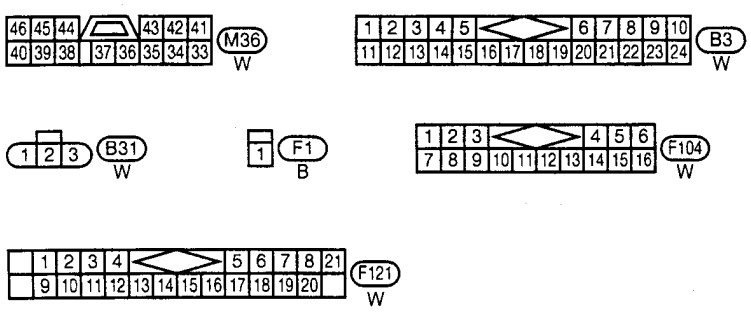
Refer to last page (Foldout page).
M17 , E101
F101
F106

YEL405A

Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER — (Cont'd)

EL-METER-03



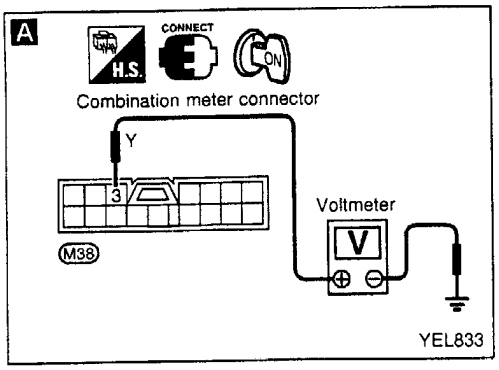


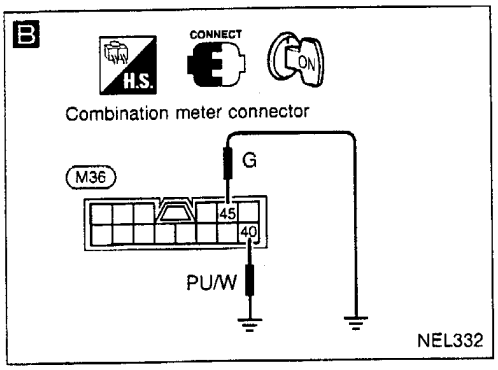
Refer to last page (Foldout page).

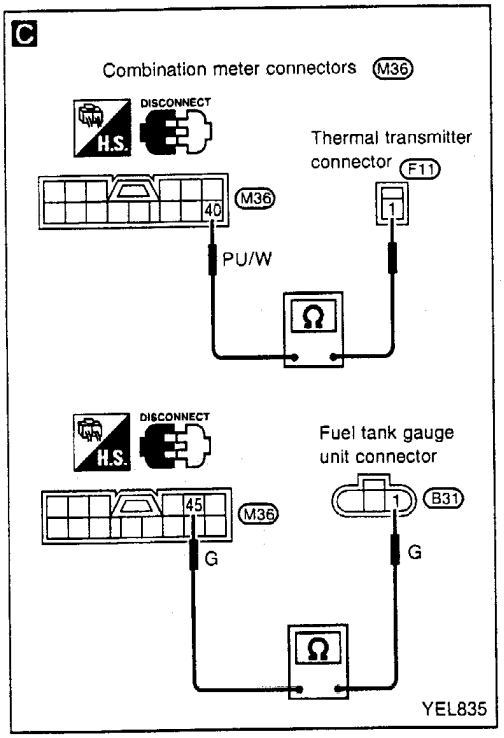
F101

F106

YEL406A







Inspection/Fuel Gauge and Water Temperature Gauge

INSPECTION START

A CHECK POWER SOURCE.
1) Turn ignition switch to "ON" position.
2) Check voltage between combination meter connector (M38) terminal (3) and ground.
Battery voltage should exist.

NG → Check the following items:
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and 10A [8] fuse
4) Ignition switch
If NG, replace fusible link, fuse or ignition relay or repair ignition switch harness or connectors.

OK ↓

B CHECK GAUGE OPERATION.
1) Connect combination meter connector (M36) (Temp.) and ground with wire for **less than 10 seconds.**
2) Check operation of gauge.
Gauge should move smoothly to full scale.
3) For Fuel gauge operation, perform Combination Meter Self-Diagnosis.

NG → Replace combination meter.

OK ↓

C CHECK HARNESS CONTINUITY between terminals as follows.
Continuity should exist.

Terminals		
Combination meter connector	Thermal transmitter connector	Fuel tank gauge unit connector
(40)	(1)	
(45)		(1)

NG → Check the following:
1) Harness connectors (B3), (M13) — Fuel tank gauge
2) Harness connectors (F104), (M50) — Temperature gauge (Gasoline engine models)
Harness connectors (F121), (M51) — Temperature gauge (Diesel engine models)
If NG, repair harness or connectors.

OK ↓

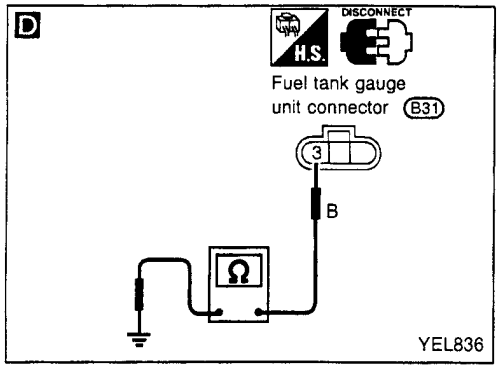
CHECK COMPONENT.
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check" or "Thermal Transmitter Check".

NG → Repair or replace.
Refer to FE section. (Fuel Tank Gauge Unit)

OK ↓

(Go to (A) on next page)

Inspection/Fuel Gauge and Water Temperature Gauge (Cont'd)



(A)

D

Check harness continuity between fuel tank gauge unit harness connector terminal (3) and body ground.
Continuity should exist.

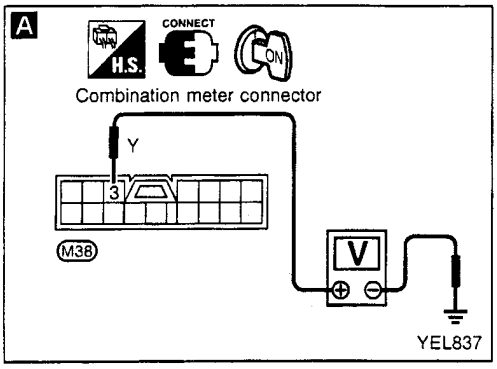
NG → Repair harness or connector.

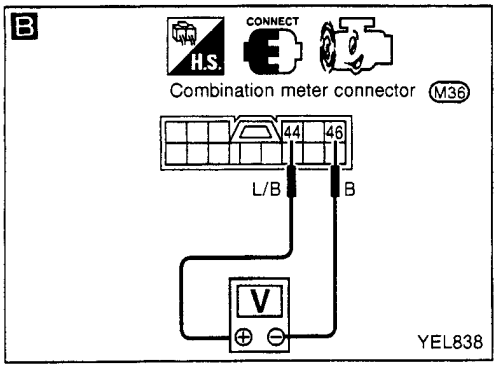
OK ↓

Reinstall any part removed.

INSPECTION END

Inspection/Tachometer





INSPECTION START

Perform Combination Meter Self-diagnosis.

A

CHECK POWER SOURCE.
1) Turn ignition switch to "ON" position.
2) Check voltage between combination meter connector (M38) terminal (3) and ground.
Battery voltage should exist.

NG → Check the following items:
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and 10A [8] fuse
4) Ignition switch

If NG, replace fusible link, fuse or ignition relay or repair ignition switch, harness or connectors.

OK ↓

B

CHECK ECM OUTPUT.
1) Start engine.
2) Check voltage and signal frequency between terminals (44) and (46) at idle and 2,000 rpm.
Voltage and signal frequency should change with rpm.

Refer to "ECM Terminal and Reference Value" oscilloscope data in EC section for each engine model.
GA engine : EC-64
SR engine : EC-200
CD engine : EC-2089.

NG → Check the following:
1) Harness connectors (F104), (M50) — Gasoline engine models
Harness connectors (F121), (M51) — Diesel engine models
2) Harness continuity between ECM and combination meter
3) Combination meter ground connectors

If NG, repair harness or connectors.

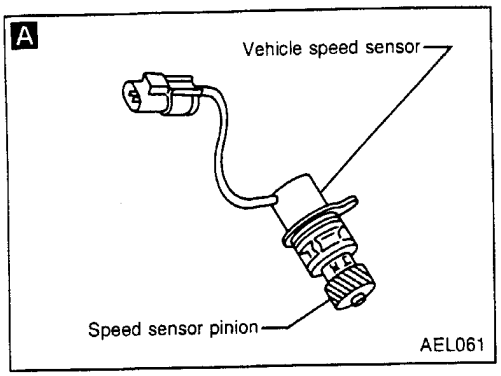
OK ↓

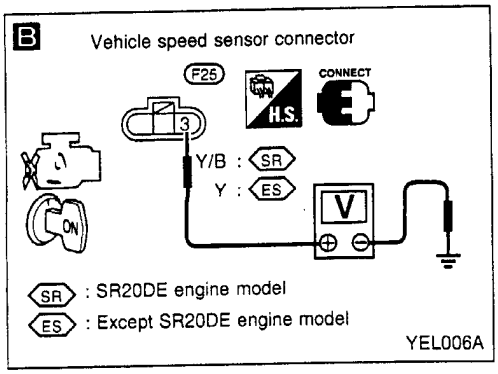
Replace Combination Meter.

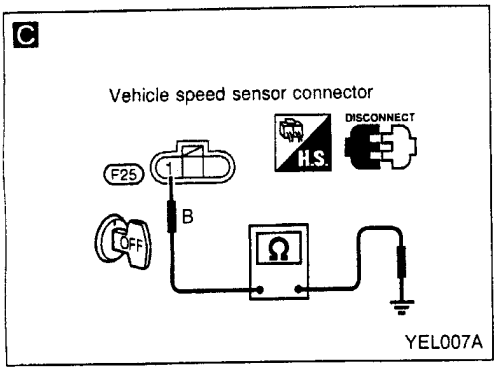
INSPECTION END

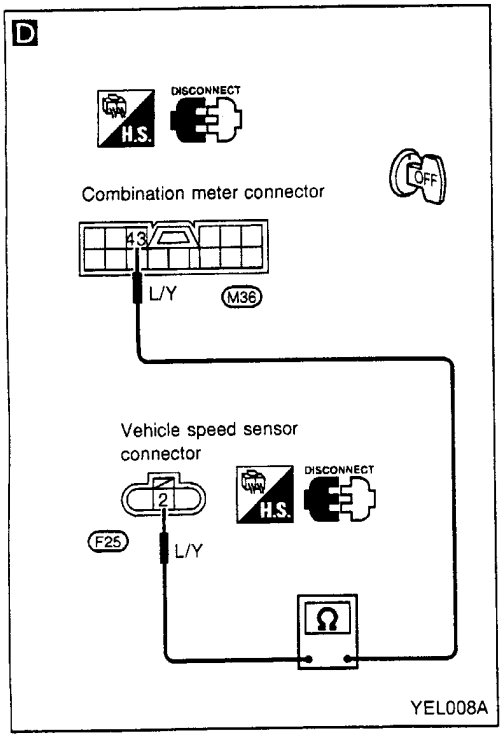
Inspection/Speedometer and Vehicle Speed Sensor

SYMPTOM: Speedometer indication flutters.









INSPECTION START

↓

Is vehicle speed sensor installed correctly? — NG → Install vehicle speed sensor correctly.

OK ↓

A

Remove vehicle speed sensor and spin pinion. Do you feel resistance when turning vehicle speed sensor pinion? — No → Replace vehicle speed sensor.

Yes ↓

B

CHECK POWER SOURCE
- Re-install vehicle speed sensor.
- Turn ignition switch to "ON" position.

Check voltage between vehicle speed sensor connector terminal ③ and ground.
Battery voltage should exist.

NG → Check the following:
1) Harness continuity between vehicle speed sensor and battery.
2) Fusible link in power supply lines.
3) 10A [8] fuse — M/T models
   7.5A [3] fuse — A/T models.
4) Harness connectors (F103), (M52) (Gasoline engine models). (M65), (F105) (Diesel engine models).
5) Ignition switch.

If NG, replace fuse or fusible link or repair ignition switch, harness or connectors.

OK ↓

C

CHECK GROUND CIRCUIT OF VEHICLE SPEED SENSOR
- Turn ignition switch to the "LOCK" position.

Disconnect vehicle speed sensor connector.
Check continuity between vehicle speed sensor harness connector terminal ① and body ground.
Continuity should exist.

NG → Repair harness or connector.

OK ↓

D

Check continuity between speedometer harness connector terminal (43) and vehicle speed sensor connector terminal ②.
Continuity should exist.

NG → Repair harness and connector.

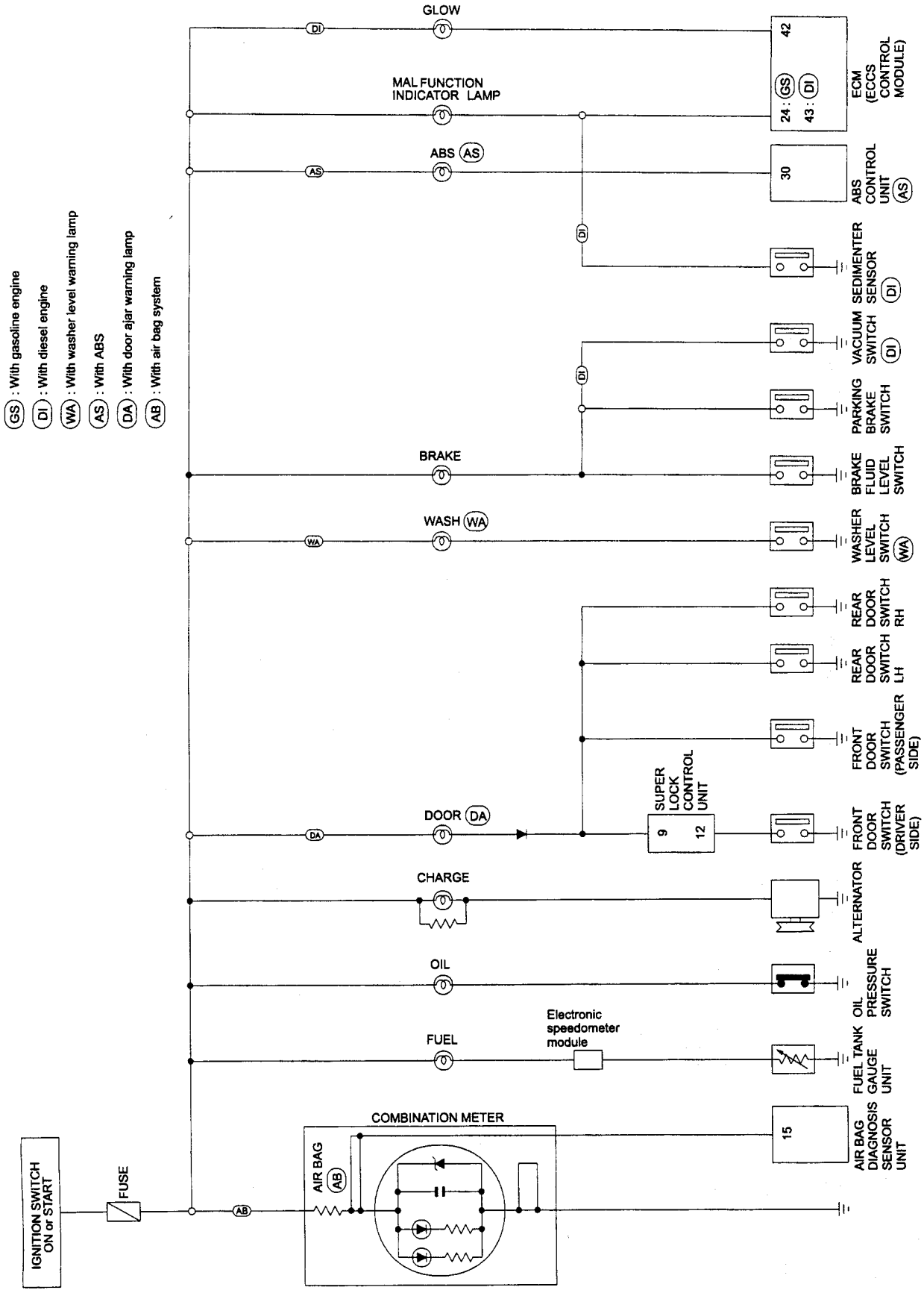
OK ↓

Replace Combination Meter.

↓

INSPECTION END

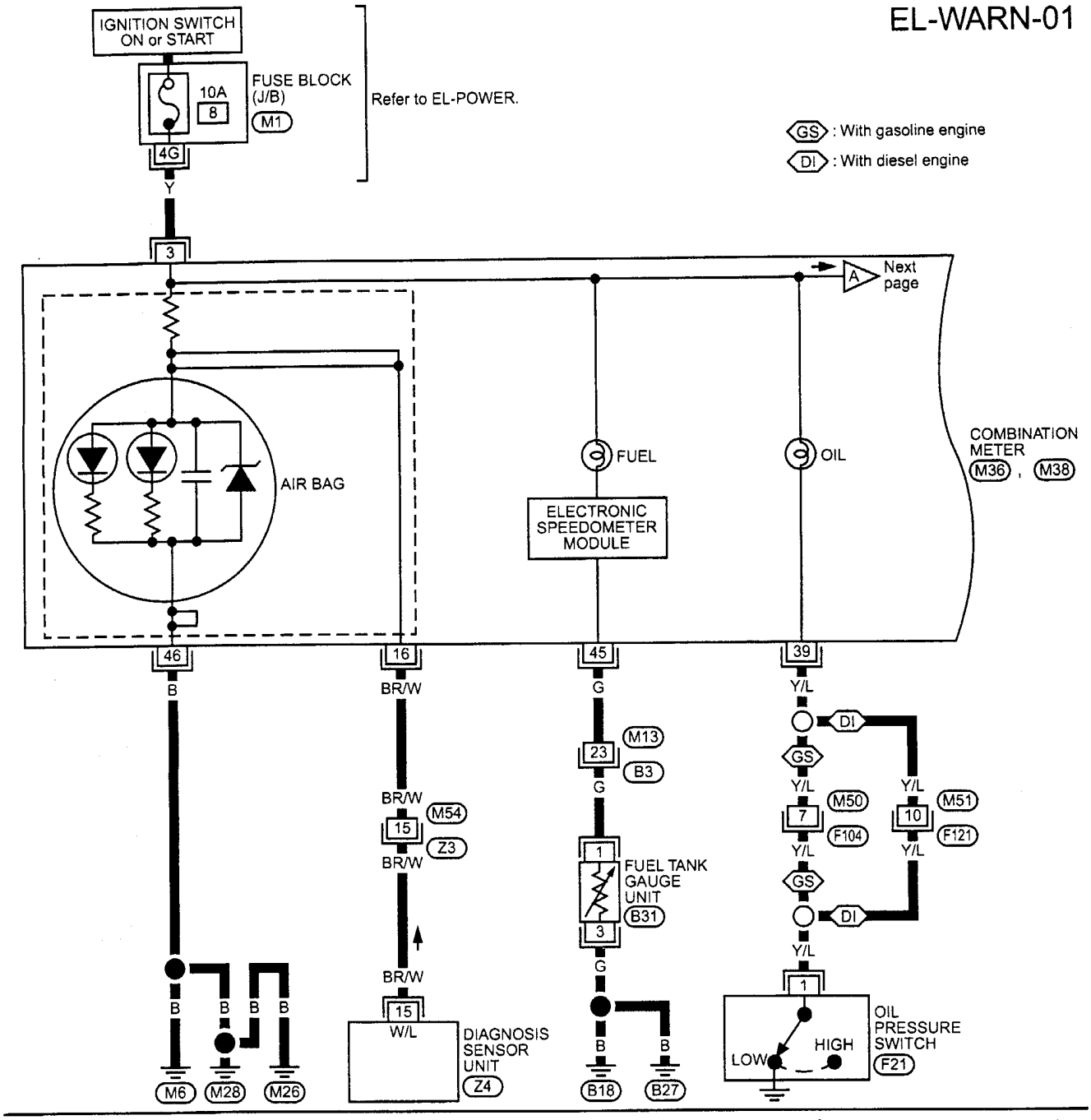
Warning Lamps/Schematic

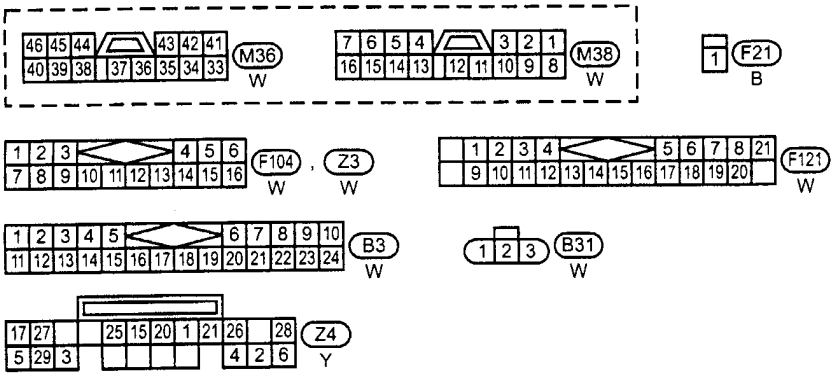


YEL407A

Warning Lamps/Wiring Diagram — WARN —

EL-WARN-01





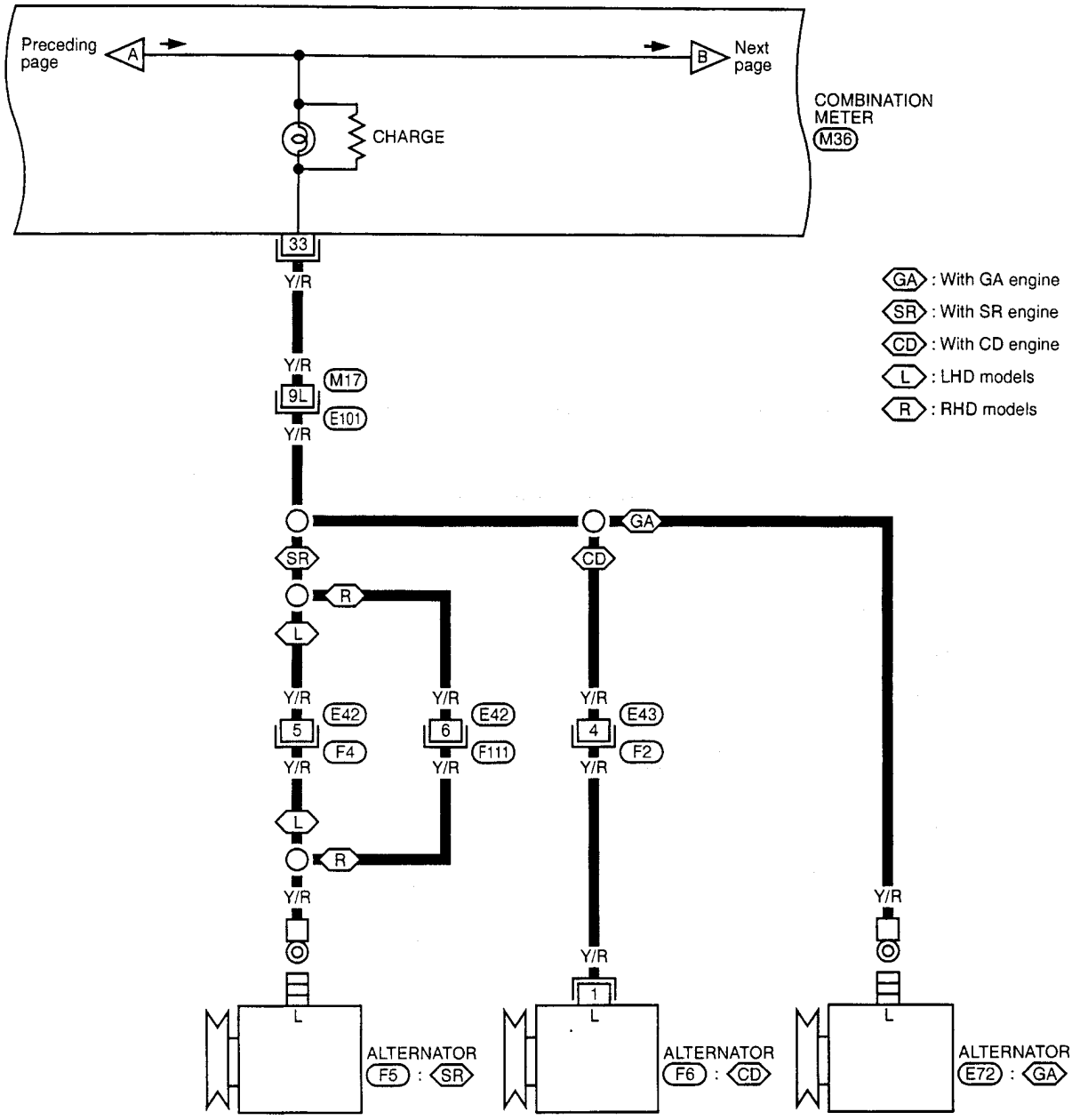
Refer to last page (Foldout page).

M1

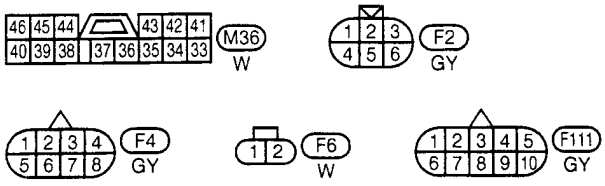
YEL408A

Warning Lamps/Wiring Diagram — WARN — (Cont'd)

EL-WARN-02



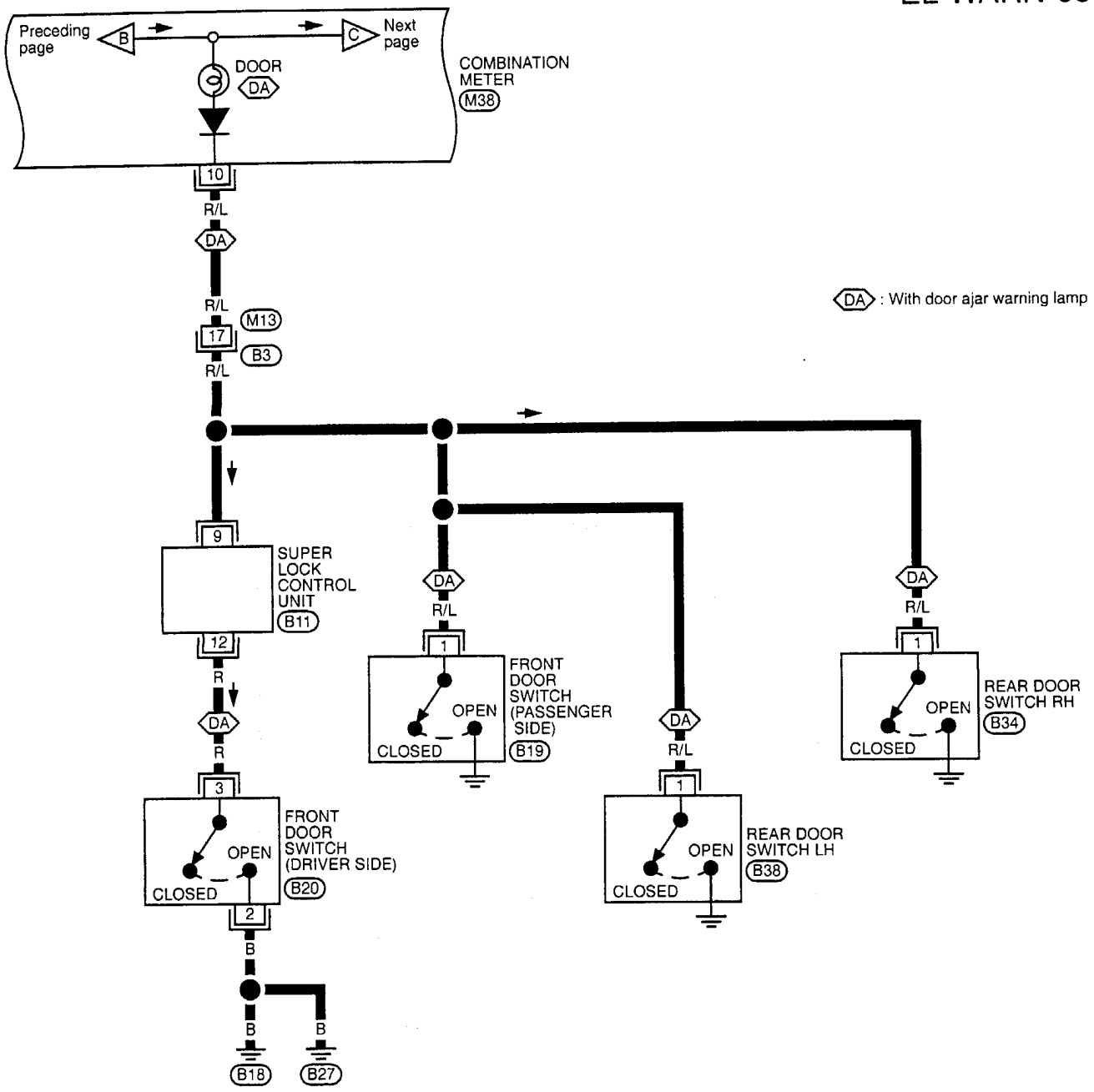
Refer to last page (Foldout page).
M17 , E101



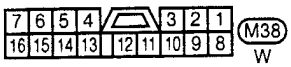
YEL409A

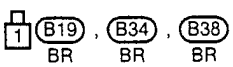
Warning Lamps/Wiring Diagram — WARN — (Cont'd)

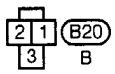
EL-WARN-03

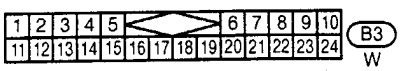


Refer to last page (Foldout page).
B11





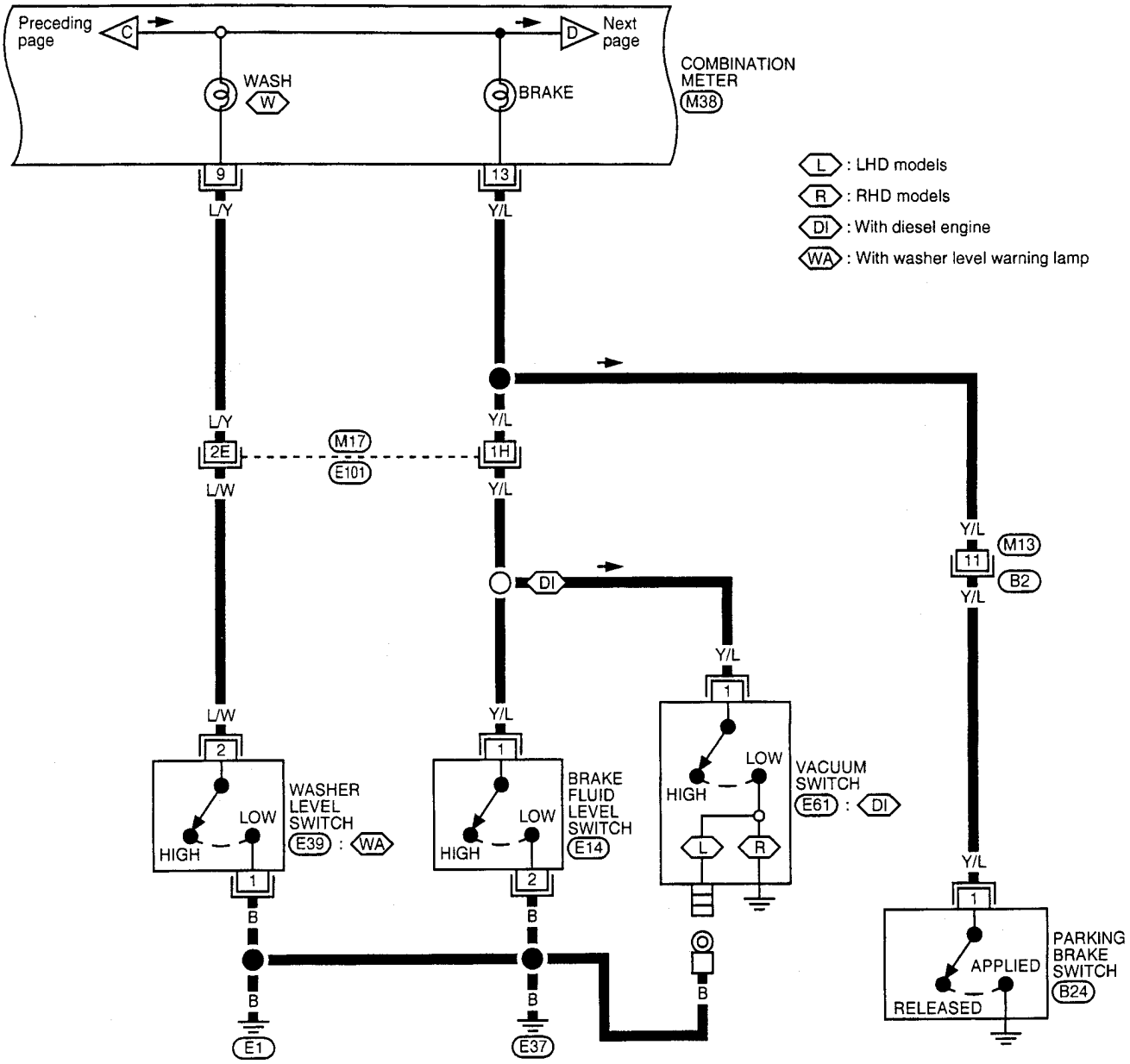


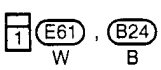


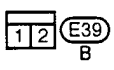
YEL410A

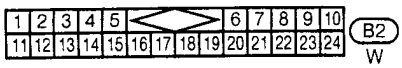
Warning Lamps/Wiring Diagram — WARN — (Cont'd)

EL-WARN-04







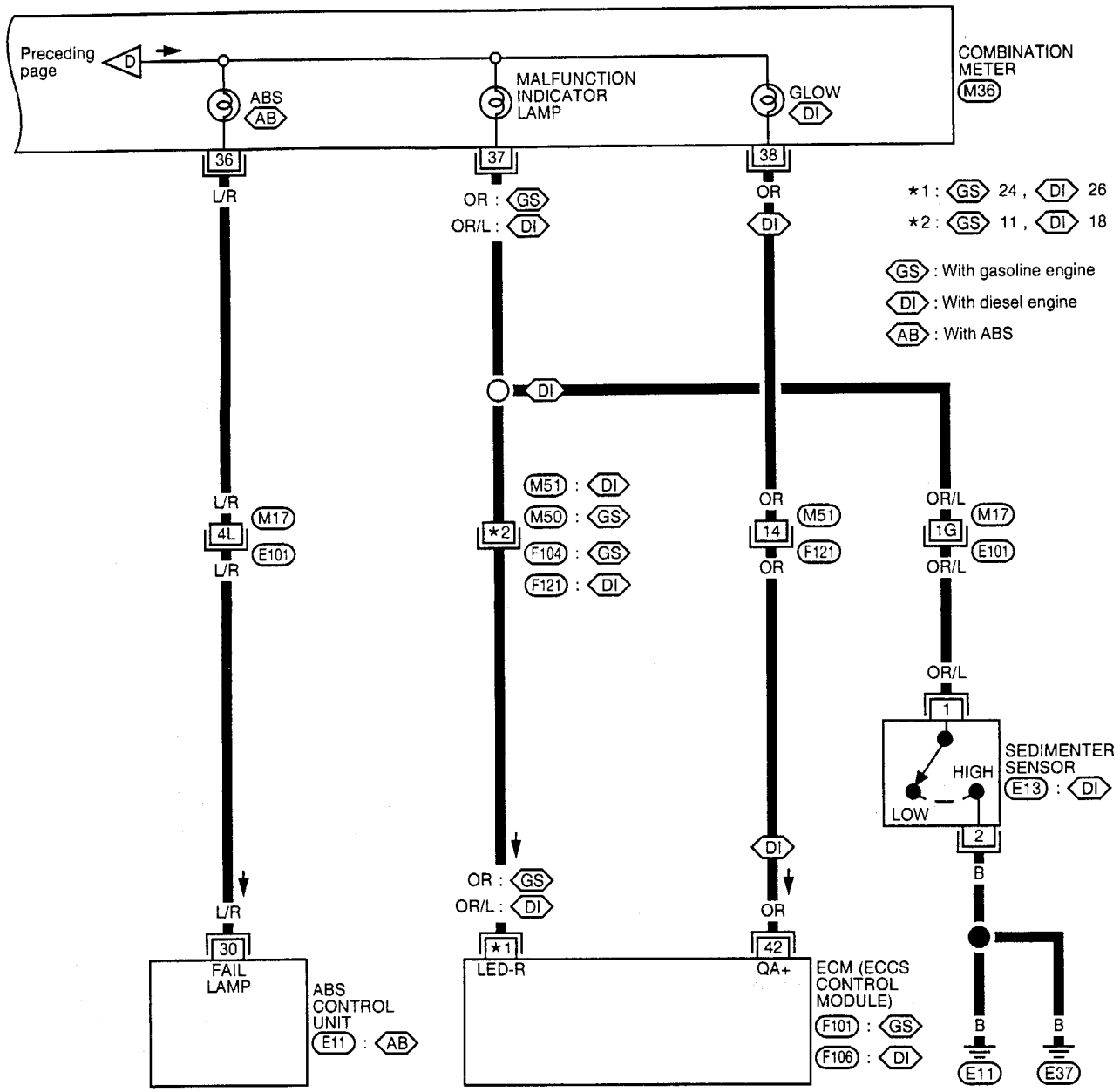


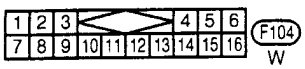
Refer to last page (Foldout page).
M17 , E101

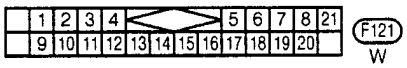
YEL411A

Warning Lamps/Wiring Diagram — WARN — (Cont'd)

EL-WARN-05







Refer to last page (Foldout page).
M17 , E101
E118
F101
F106

YEL412A

Warning Buzzer/System Description

The warning buzzer is controlled by the super lock control unit.
Power is supplied at all times
- through 10A fuse (No. 24, located in the fuse block)
- to key switch terminal ②.

Power is supplied at all times
- through 10A fuse (No. 54, located in the fuse block)
- to lighting switch terminal ⑪.

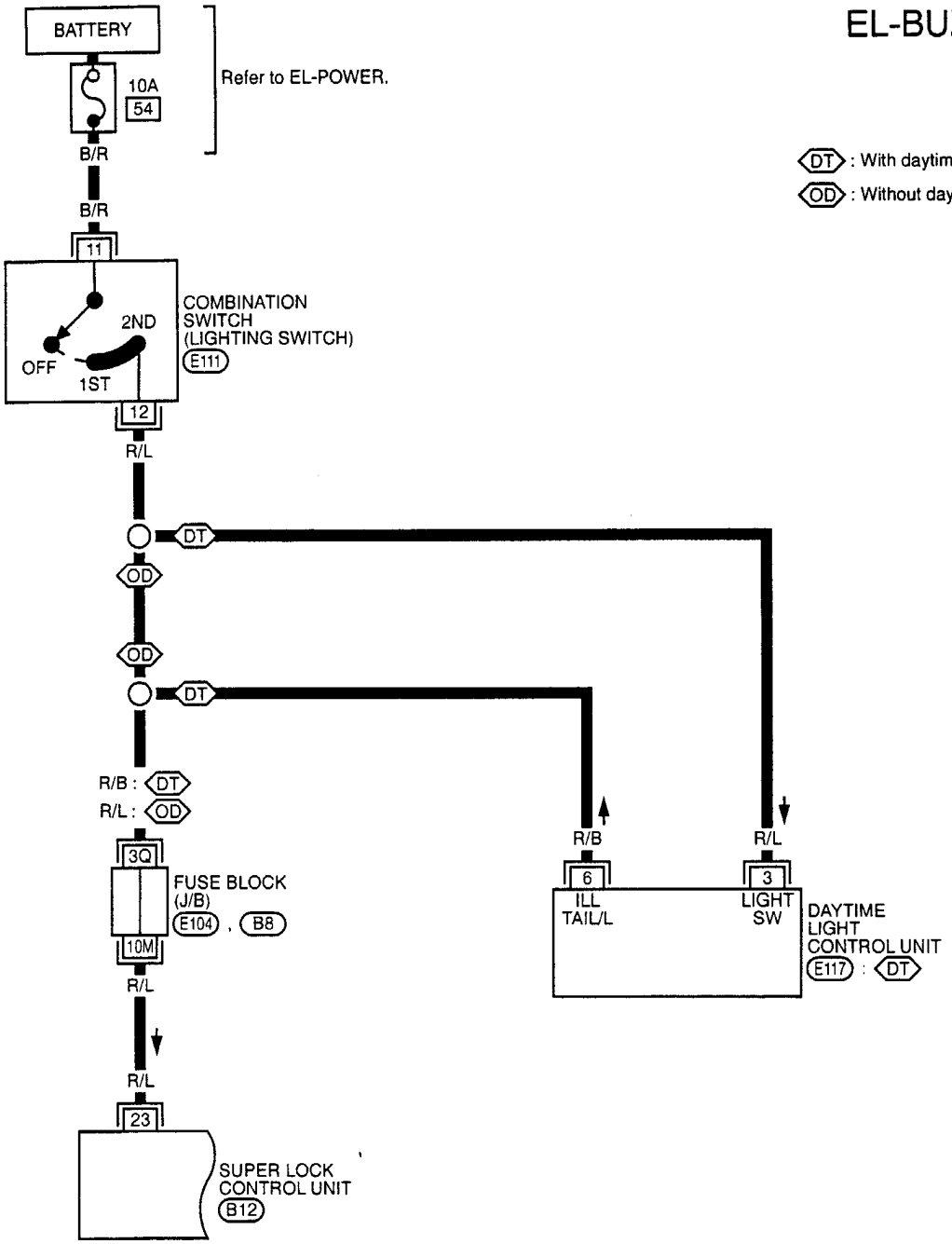
When driver's door is opened, ground is supplied
- through body grounds B18 and B27
- to driver's side door switch terminal ②
- through driver's side door switch terminal ③
- to super lock control unit terminal ⑫.

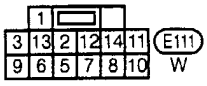
With ignition switch in the "LOCK" position, driver's door open, and lighting switch in 1ST or 2ND position, warning buzzer will sound. A battery positive voltage is supplied
- through 10A fuse (No. 24, located in the fuse box)
- to warning buzzer connector terminal ①.

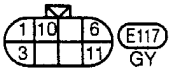
Ground is supplied
- to warning buzzer connector terminal ②
- through super lock control unit connector terminal.

Warning Buzzer/Wiring Diagram
— BUZZER —

EL-BUZZER-01







Refer to last page (Foldout page).

E104

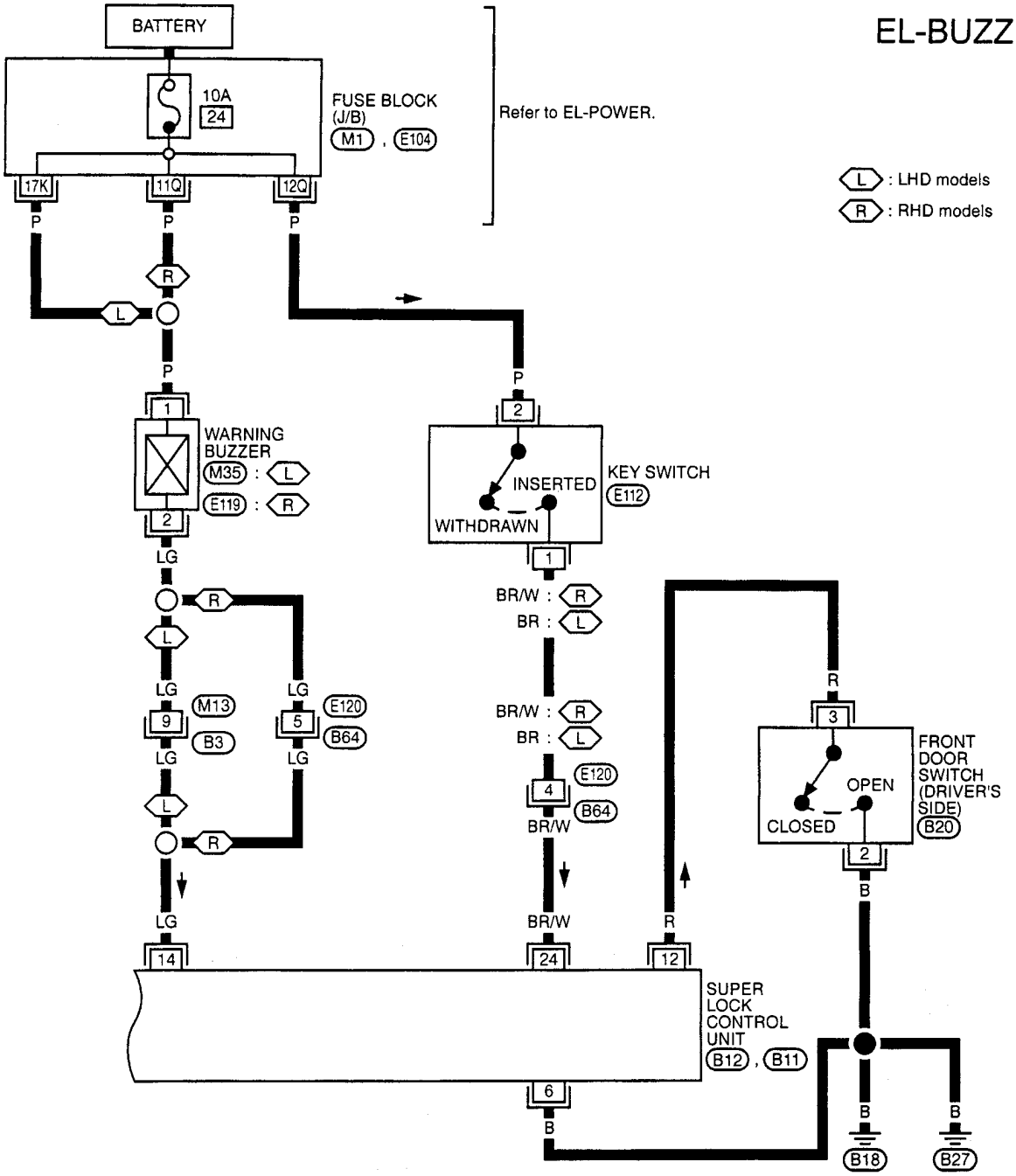
B8

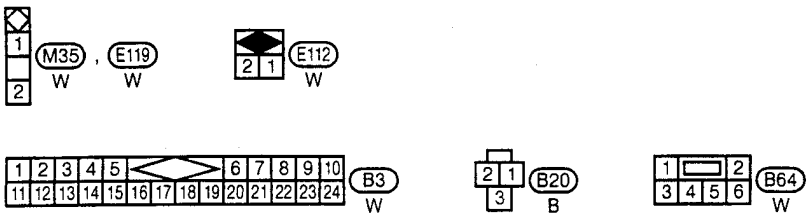
B12

YEL730

Warning Buzzer/Wiring Diagram — BUZZER — (Cont'd)

EL-BUZZER-02

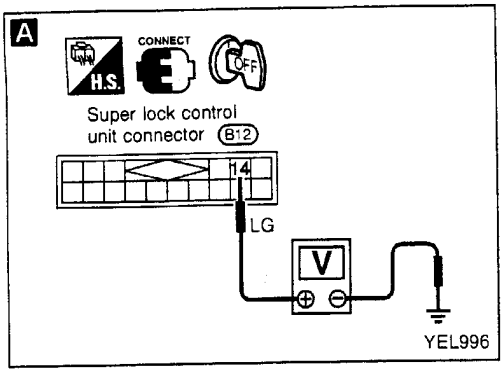




Refer to last page (Foldout page).

M1
E104
B12
B11

YEL413A



Components Inspection — Warning Buzzer

IGNITION POWER SUPPLY CHECK

A

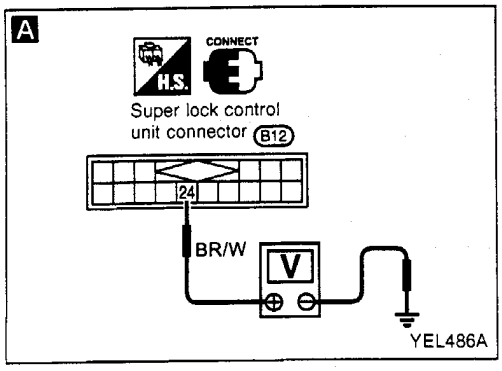
BATTERY POWER SUPPLY CHECK
1) Turn ignition switch to "ON" position.
2) Measure voltage between super lock control unit connector terminal (14) and body ground.
Battery voltage should exist.

NG → Check the following:
1) 10A fuse (No. 24), located in fuse block [J/B])
2) Harness connectors (B3), (M13) LHD models
3) Warning buzzer
4) Harness connectors (B64), (E120): RHD models
5) Harness continuity between battery and super lock control unit

If NG, replace fuse or warning buzzer or repair harness or connectors.

OK ↓

Battery power supply is OK.



IGNITION KEY-IN SWITCH SIGNAL CHECK

A

KEY-IN SWITCH INPUT SIGNAL CHECK
Measure voltage between super lock control unit connector and body ground.

Connector No.	Terminal No.	Ignition key condition and voltage [V]	
		Inserted	Removed
B12	24	Approx. 12	0

NG → Check the following.
1) 10A fuse (No. 24), located in fuse block [J/B])
2) Ignition key switch
3) Harness connectors (B64), (E120)
4) Harness continuity between battery and super lock control unit

If NG, replace fuse or repair key switch, harness or connectors.

OK ↓

Ignition key switch is OK.

Front Wiper and Washer/System Description

WIPER OPERATION

The wiper switch is controlled by a lever built into the combination switch.
There are three wiper switch positions:

- LO speed
- HI speed
- INT (Intermittent).

With the ignition switch in the Acc or ON position, power is supplied

- through 20A fuse (No. 19, located in the fuse block)
- to wiper motor terminal ⑥ and ③.

Low and high speed wiper operation

Ground is supplied to wiper switch terminal ⑰ through body grounds E11 and E37.
When the wiper switch is placed in the LO position, ground is supplied

- Through terminal ⑭ of the wiper switch
- to wiper motor terminal ②.

With power and ground supplied, the wiper motor operates at low speed.
When the wiper switch is placed in the HI position, ground is supplied

- Through terminal ⑯ of the wiper switch
- to wiper motor terminal ①.

With power and ground supplied, the wiper motor operates at high speed.

Auto stop operation

With wiper switch turned OFF, wiper motor will continue to operate until wiper arms reach windshield base.
When wiper arms are not located at base of windshield with wiper switch OFF, ground is provided

- from terminal ⑭ of the wiper switch
- to wiper motor terminal ②, in order to continue wiper motor operation at low speed.

Ground is also supplied

- through terminal ⑬ of the wiper switch
- to front wiper relay terminal ①
- through terminal ④ of the front wiper relay
- to wiper motor terminal ⑤
- through terminal ④ of the wiper motor, and
- through body grounds M28, M6 and M26 (LHD); E11 and E37 (RHD).

When wiper arms reach base of windshield, wiper motor terminals ⑤ and ③ are connected instead of terminals ⑤ and ④. Wiper motor will then stop wiper arms at the PARK position.

Intermittent operation

With variable intermittent

The wiper motor operates the wiper arms at a set interval of approximately 2 to 20 seconds. This feature is controlled by the combination switch wiper amplifier.
When the wiper switch is placed in the INT position, ground is supplied

- to front wiper relay terminal ②
- from wiper switch terminal ①
- through body grounds E37 and E11
- to wiper motor terminal ②
- through the wiper switch terminal ⑭
- to wiper switch terminal ⑬
- through front wiper relay terminal ③.

The desired interval time is input

- to front wiper relay terminal ④
- from wiper switch terminal ⑳.

The wiper motor operates at low speed at the desired time interval.

Front Wiper and Washer/System Description (Cont'd)

WIPER OPERATION

Without variable intermittent

The wiper motor operates the wiper arms at an interval of approximately 7 seconds. This feature is controlled by the combination switch wiper amplifier.

When the wiper switch is placed in the INT position, ground is supplied

- to front wiper relay terminal ②
- from wiper switch terminal ①
- to wiper motor terminal ②
- through the wiper switch terminal ⑭
- to wiper switch terminal ⑬
- through front wiper relay terminal ③.

WASHER OPERATION

With the ignition switch in the Acc or ON position, power is supplied

- through 10A fuse (No. 50 or 67, located in the fuse block)
- to washer switch terminal ⑤.

When the lever is pulled to the WASH/F position, ground is supplied

- to washer motor terminal ②
- from terminal ⑱ of the wiper switch
- through terminal ④ of the wiper switch, and
- through body grounds E37 and E11.

Power is supplied

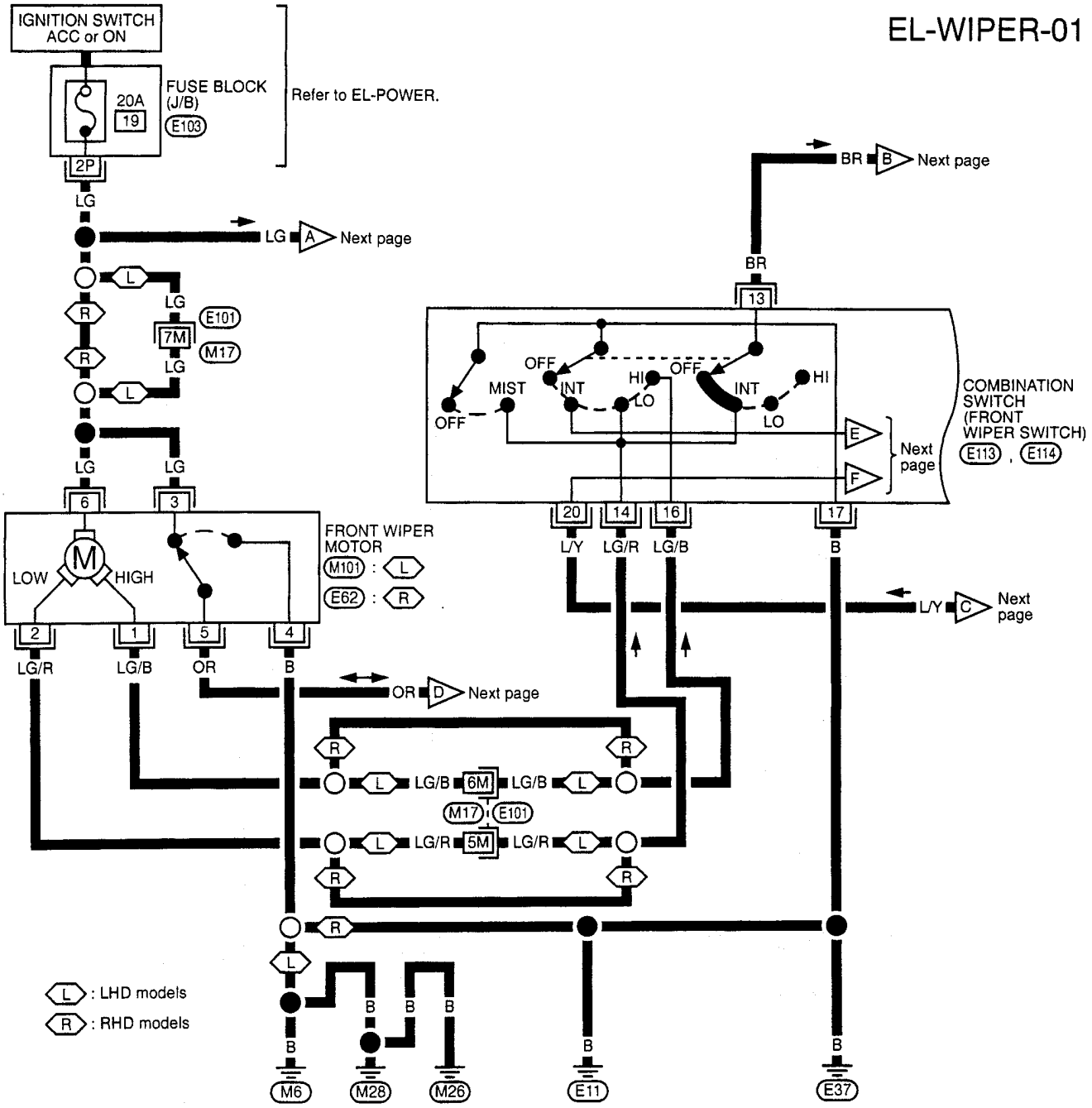
- from terminal ③ of the washer switch
- to washer motor terminal ①.

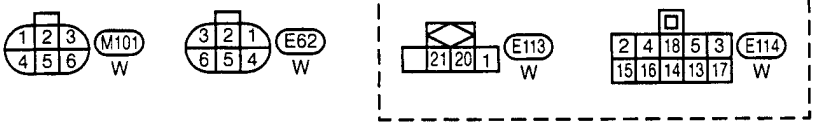
With power and ground supplied, the washer motor operates.

When the lever is pulled to the WASH position for one second or more, the wiper motor operates at low speed for approximately 3 seconds to clean windshield. This feature is controlled by the combination switch (wiper amplifier) in the same manner as the intermittent operation.

Front Wiper and Washer/Wiring Diagram — WIPER —

EL-WIPER-01



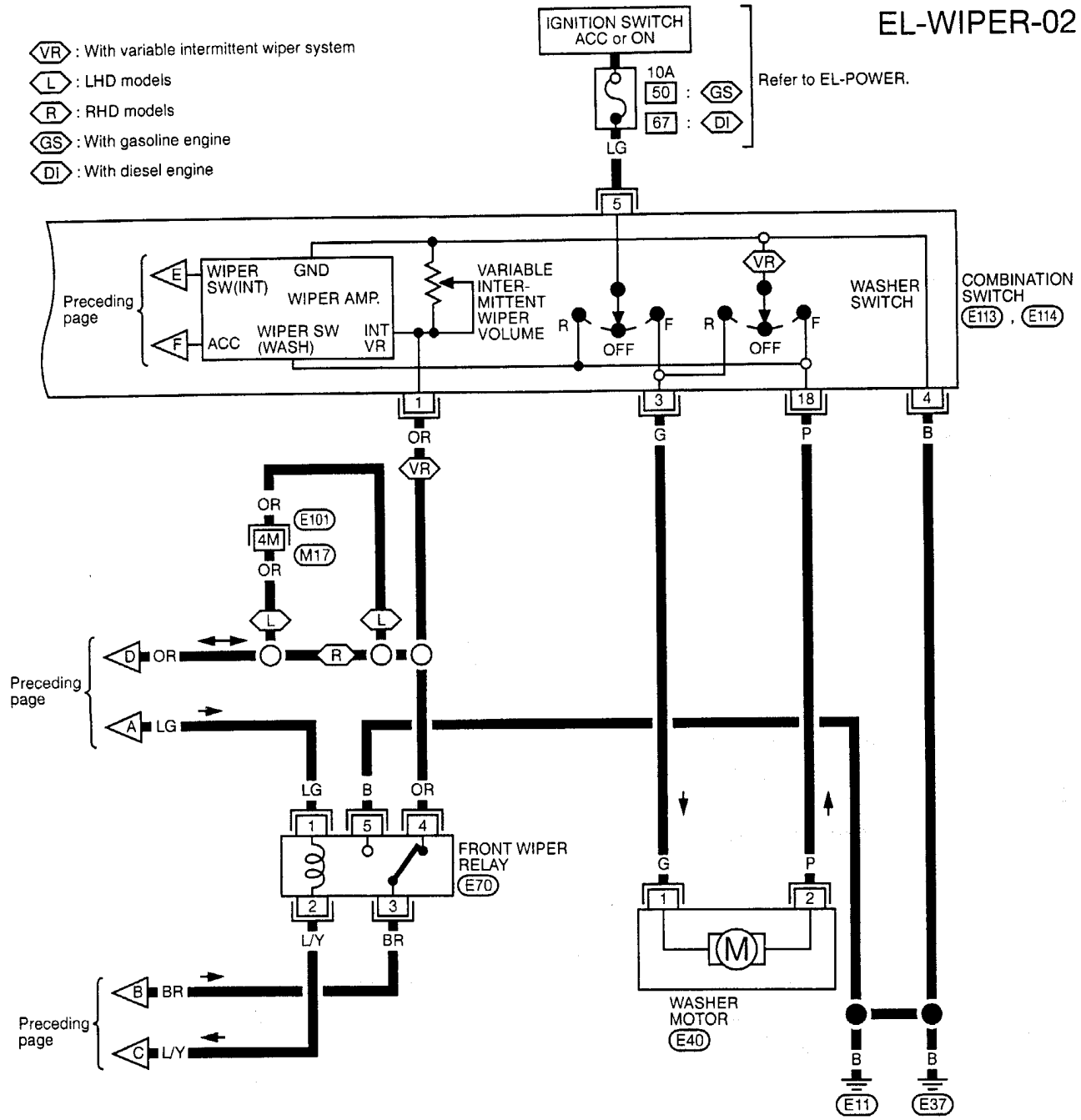


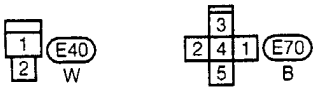
Refer to last page (Foldout page).
M17 , E101
E103

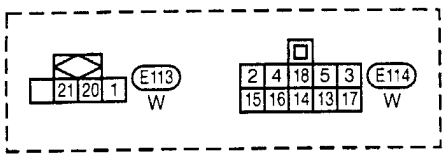
YEL414A

Front Wiper and Washer/Wiring Diagram — WIPER — (Cont'd)

EL-WIPER-02



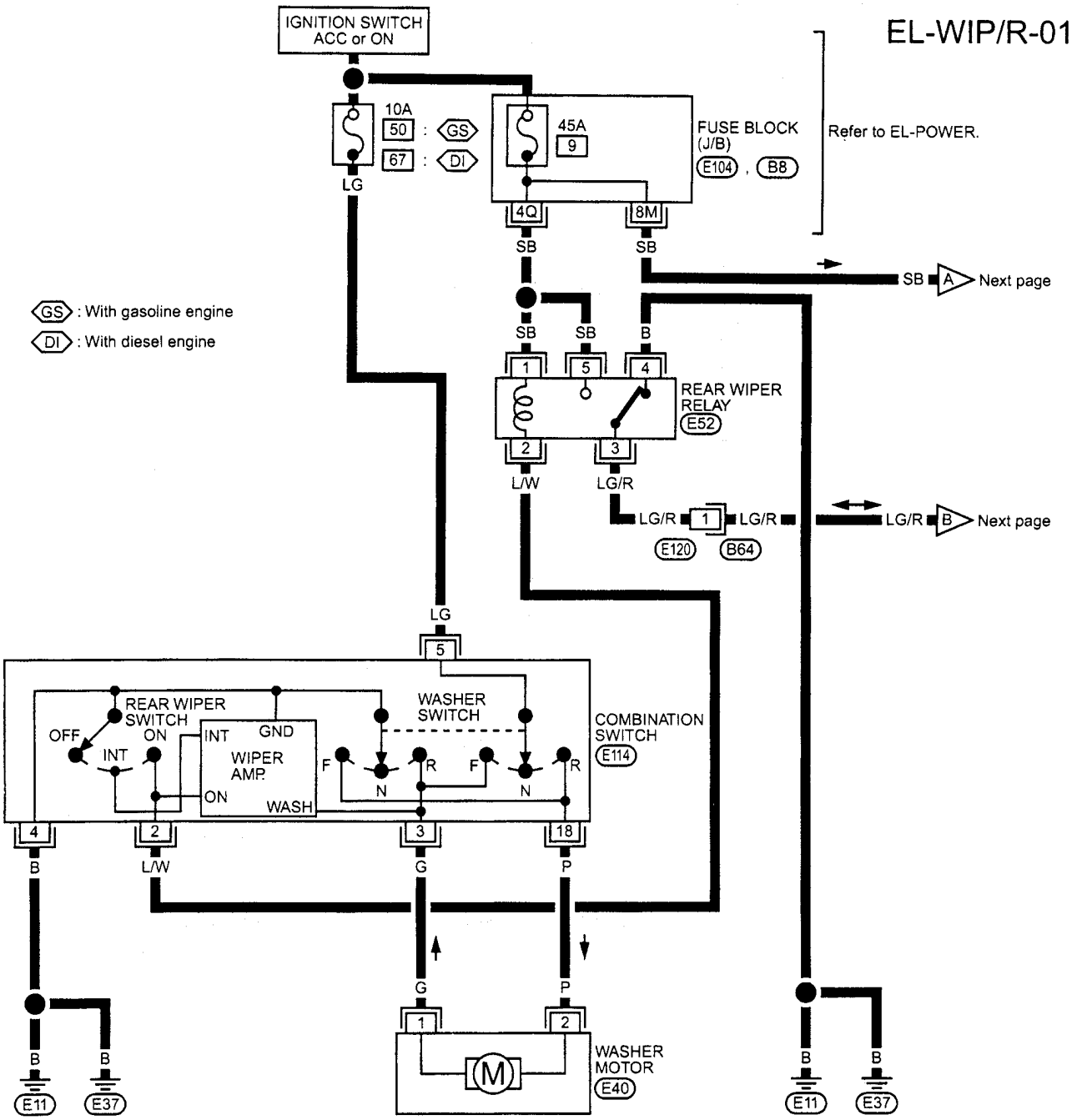


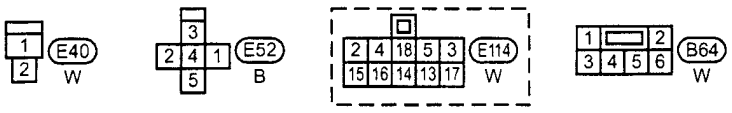


Refer to last page (Foldout page).
M17 , E101

YEL415A

Rear Wiper and Washer/Wiring Diagram — WIP/R —



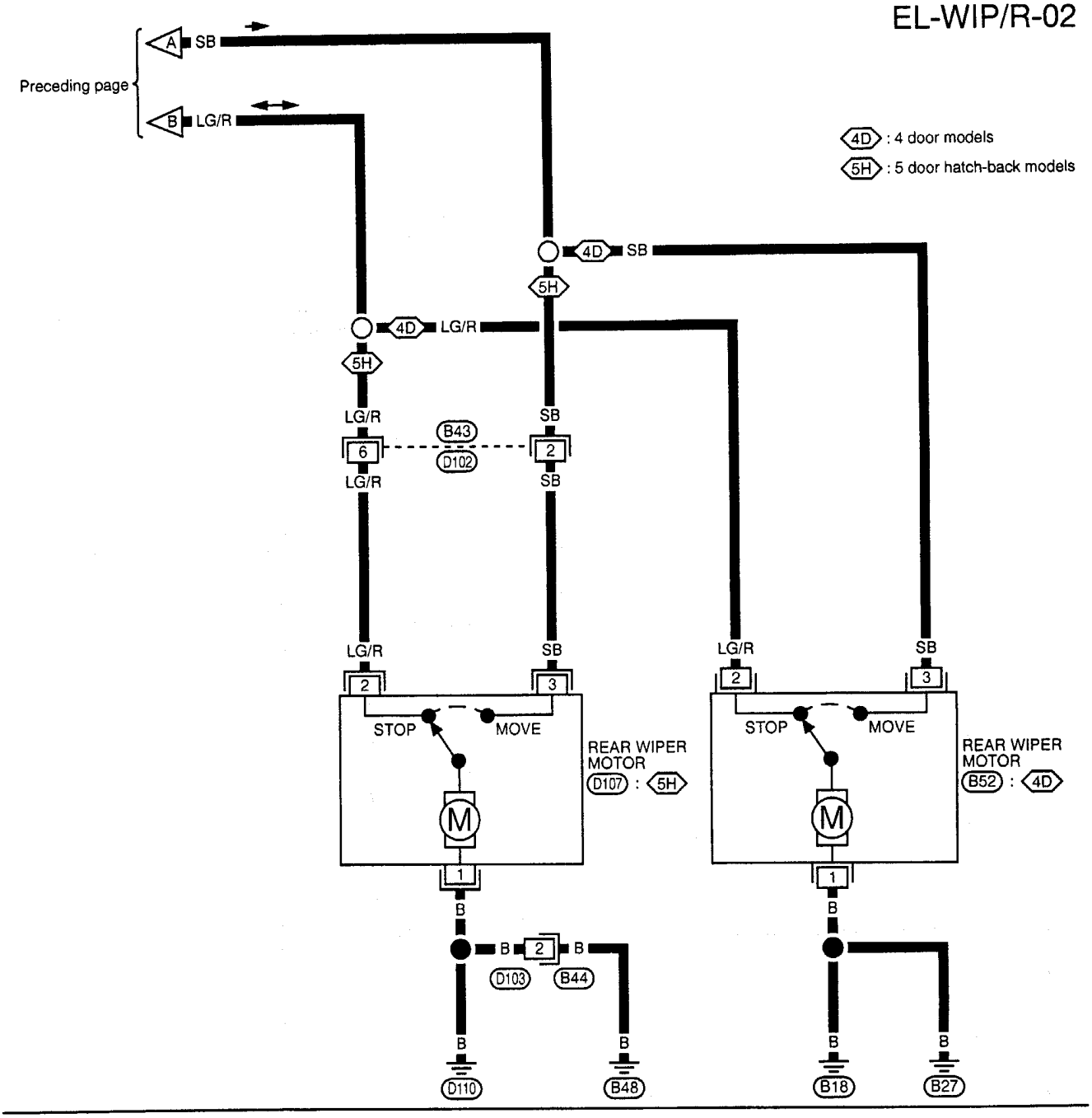


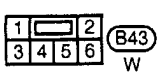
Refer to last page (Foldout page).
M17 , E101
M1
E104
B8

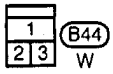
YEL416A

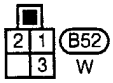
Rear Wiper and Washer/Wiring Diagram — WIP/R — (Cont'd)

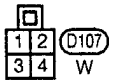
EL-WIP/R-02







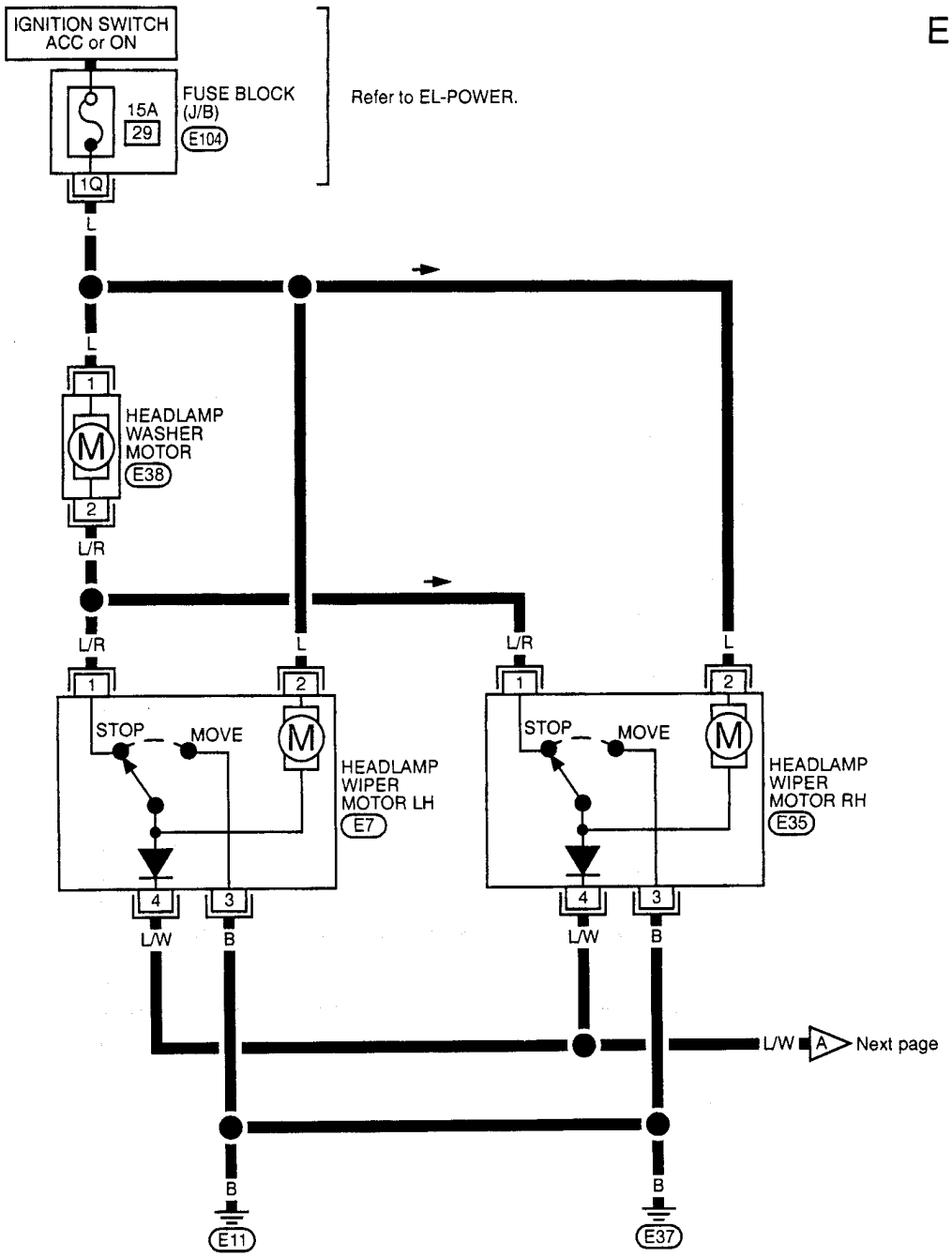




YEL417A

Headlamp Wiper and Washer/Wiring Diagram — HLC —

EL-HLC-01



E7 GY , E35 GY

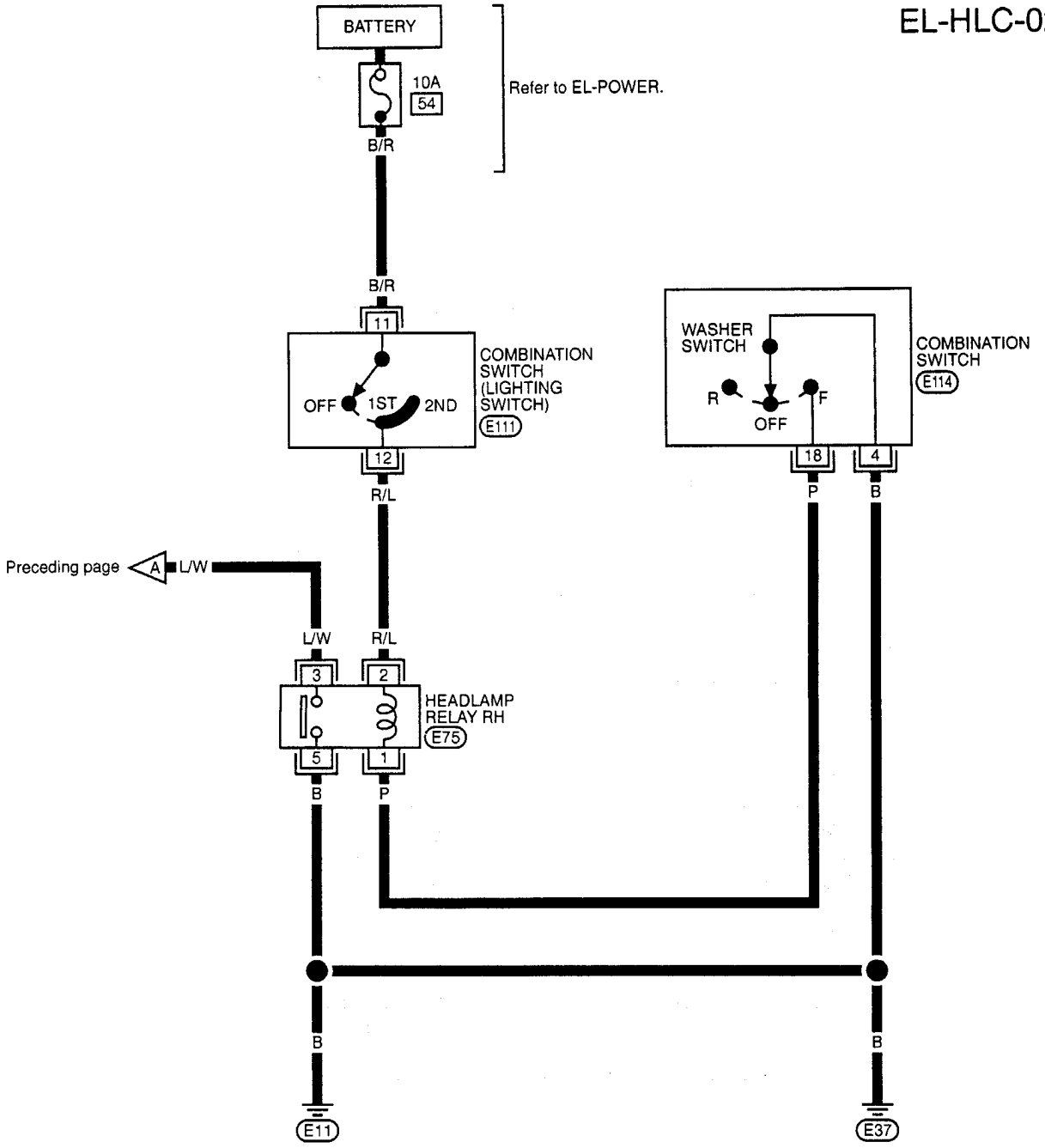
E38 G

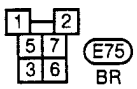
Refer to last page (Foldout page).
E104

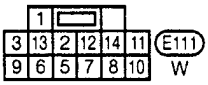
YEL418A

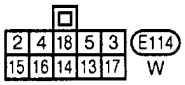
Headlamp Wiper and Washer/Wiring Diagram — HLC — (Cont'd)

EL-HLC-02



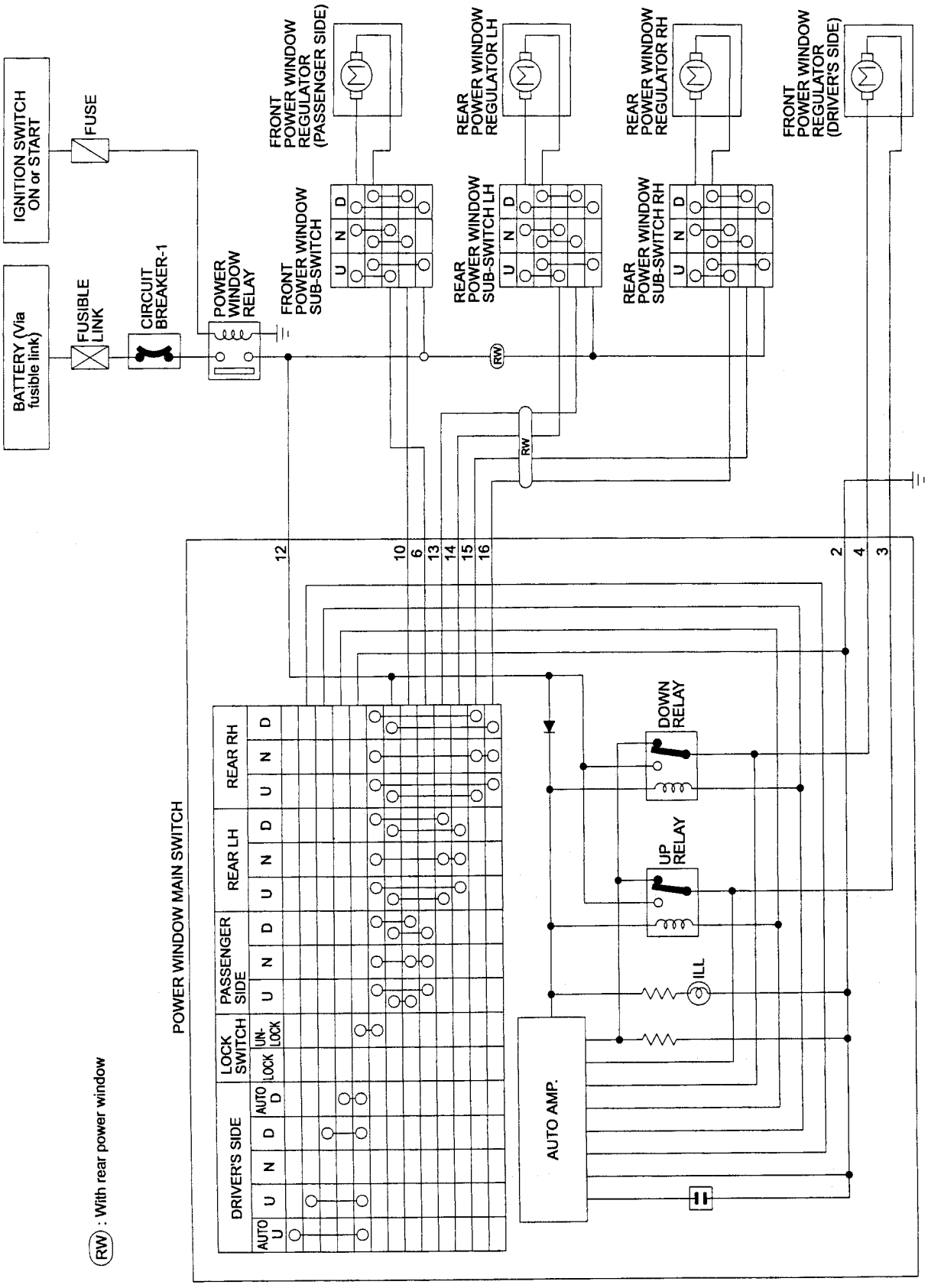






YEL510A

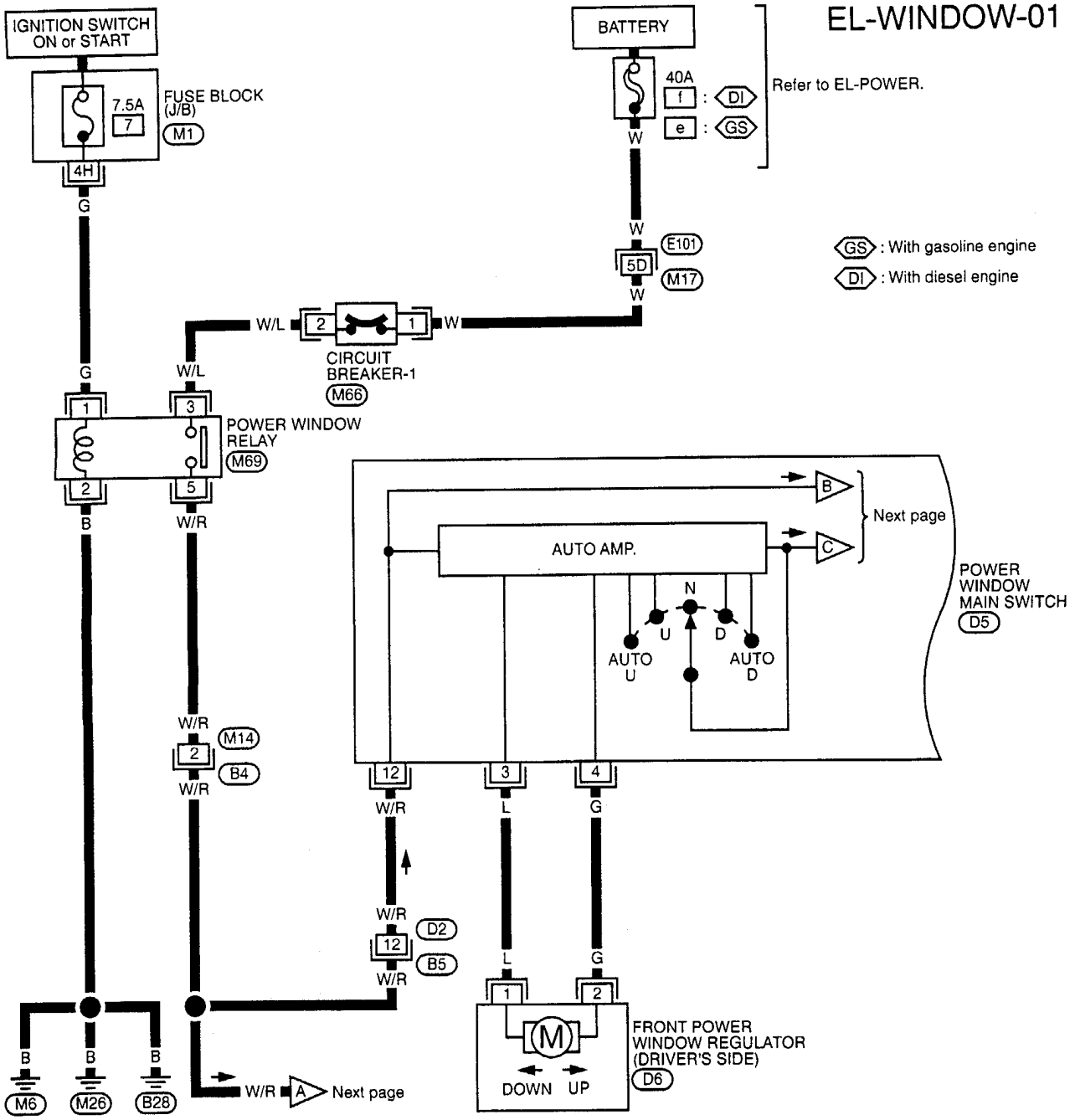
Schematic

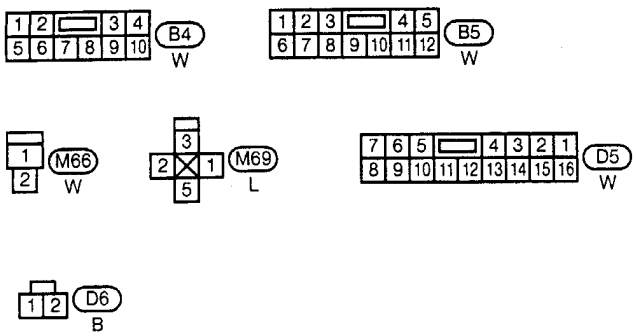


YEL419A

Wiring Diagram — WINDOW —

EL-WINDOW-01



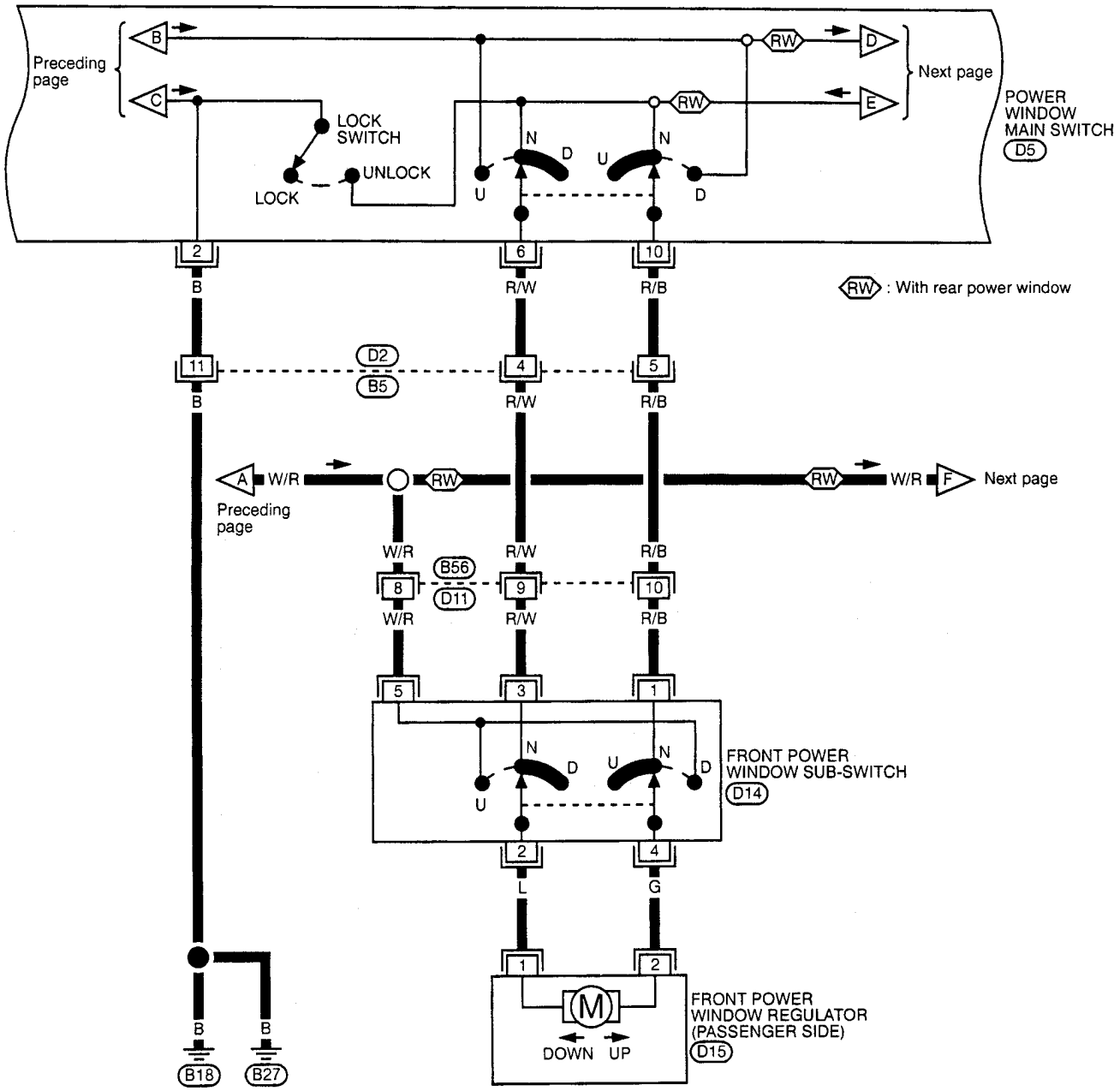


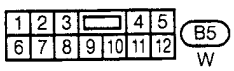
Refer to last page (Foldout page).
M17 , E101
M1

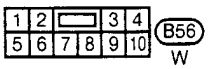
YEL420A

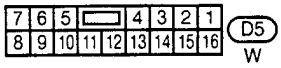
Wiring Diagram — WINDOW — (Cont'd)

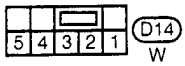
EL-WINDOW-02

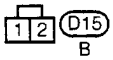








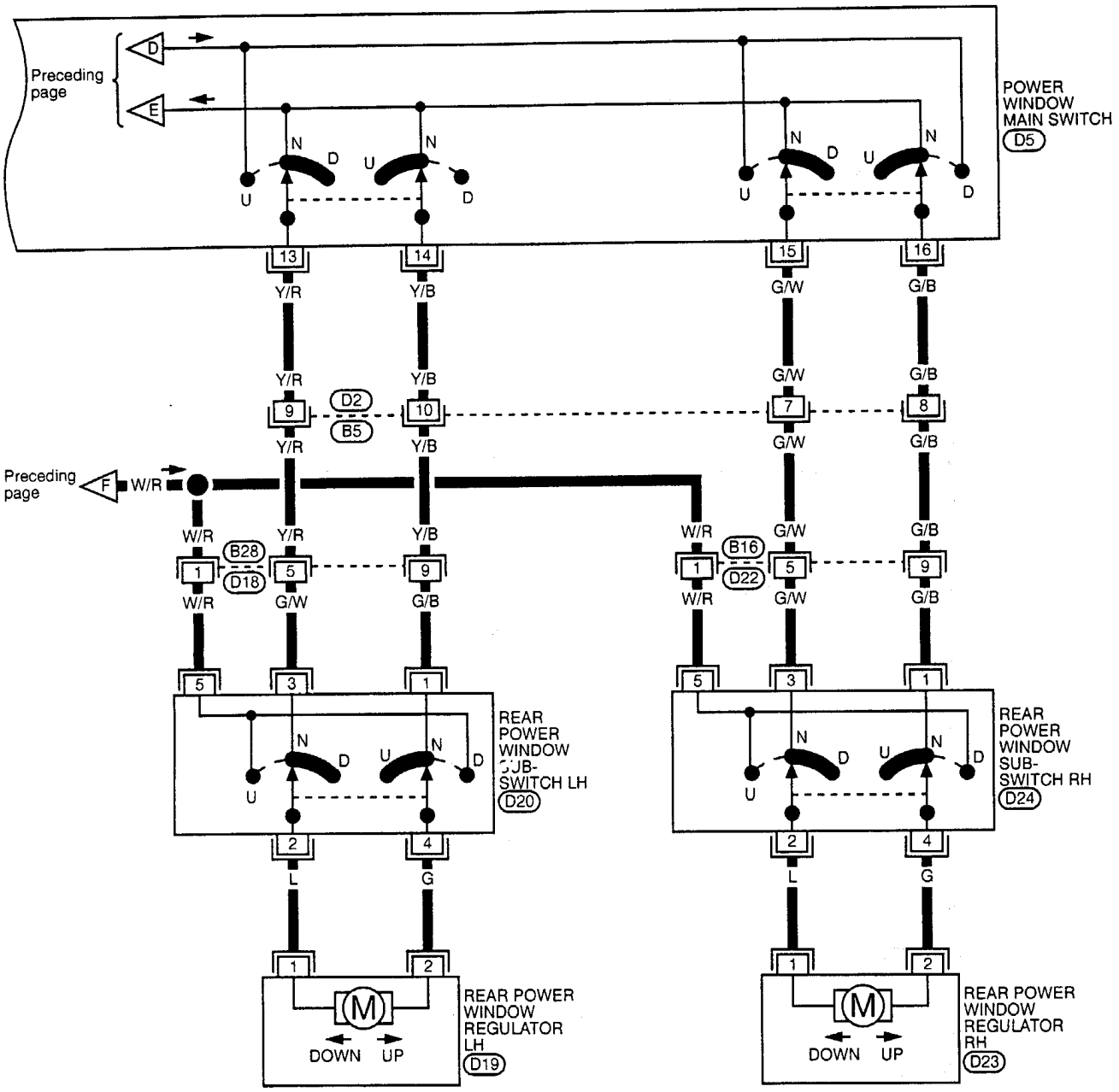


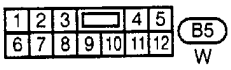


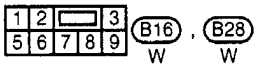
YEL421A

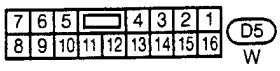
Wiring Diagram — WINDOW — (Cont'd)

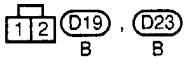
EL-WINDOW-03

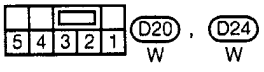










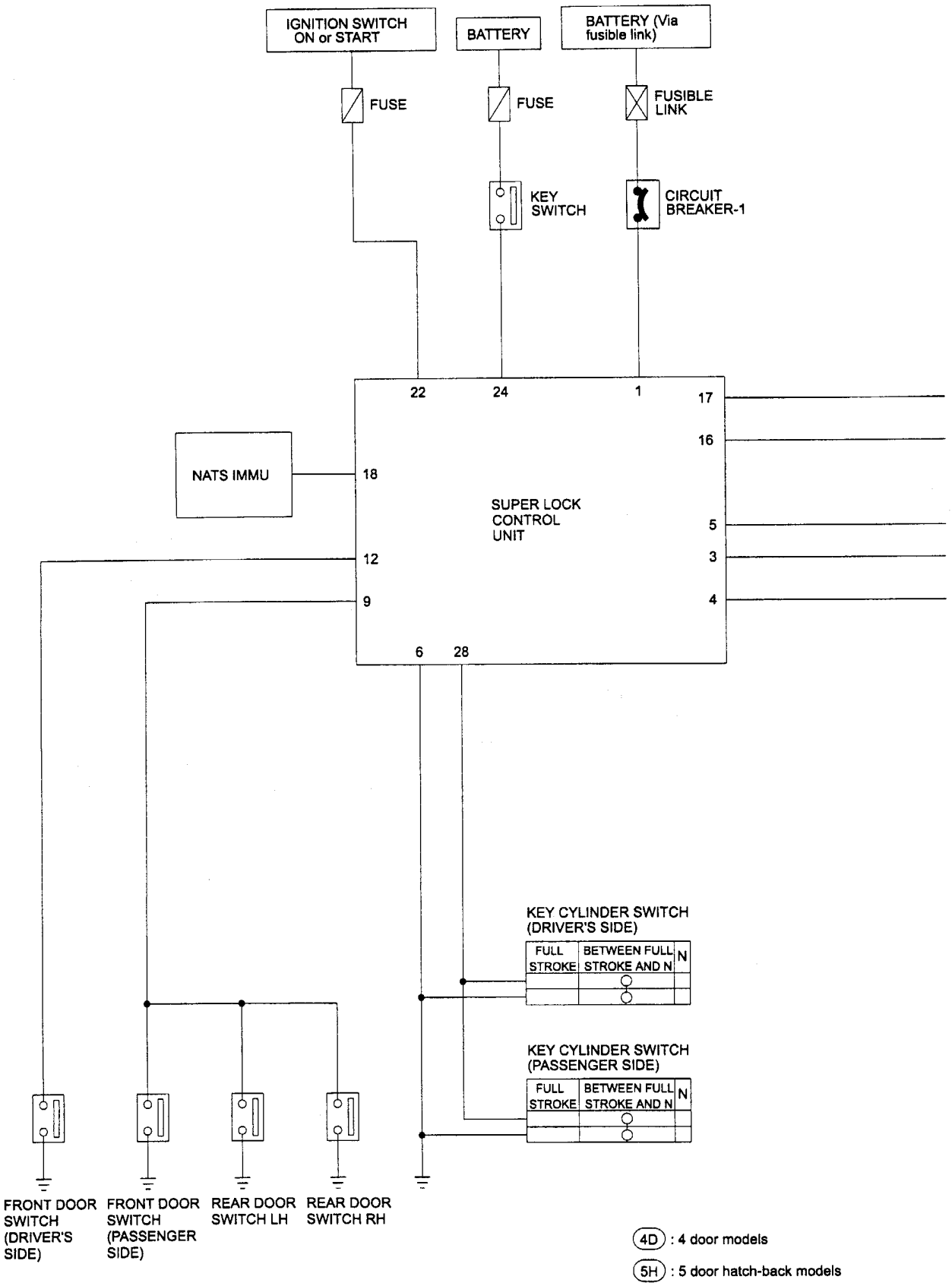


YEL422A

Trouble Diagnoses

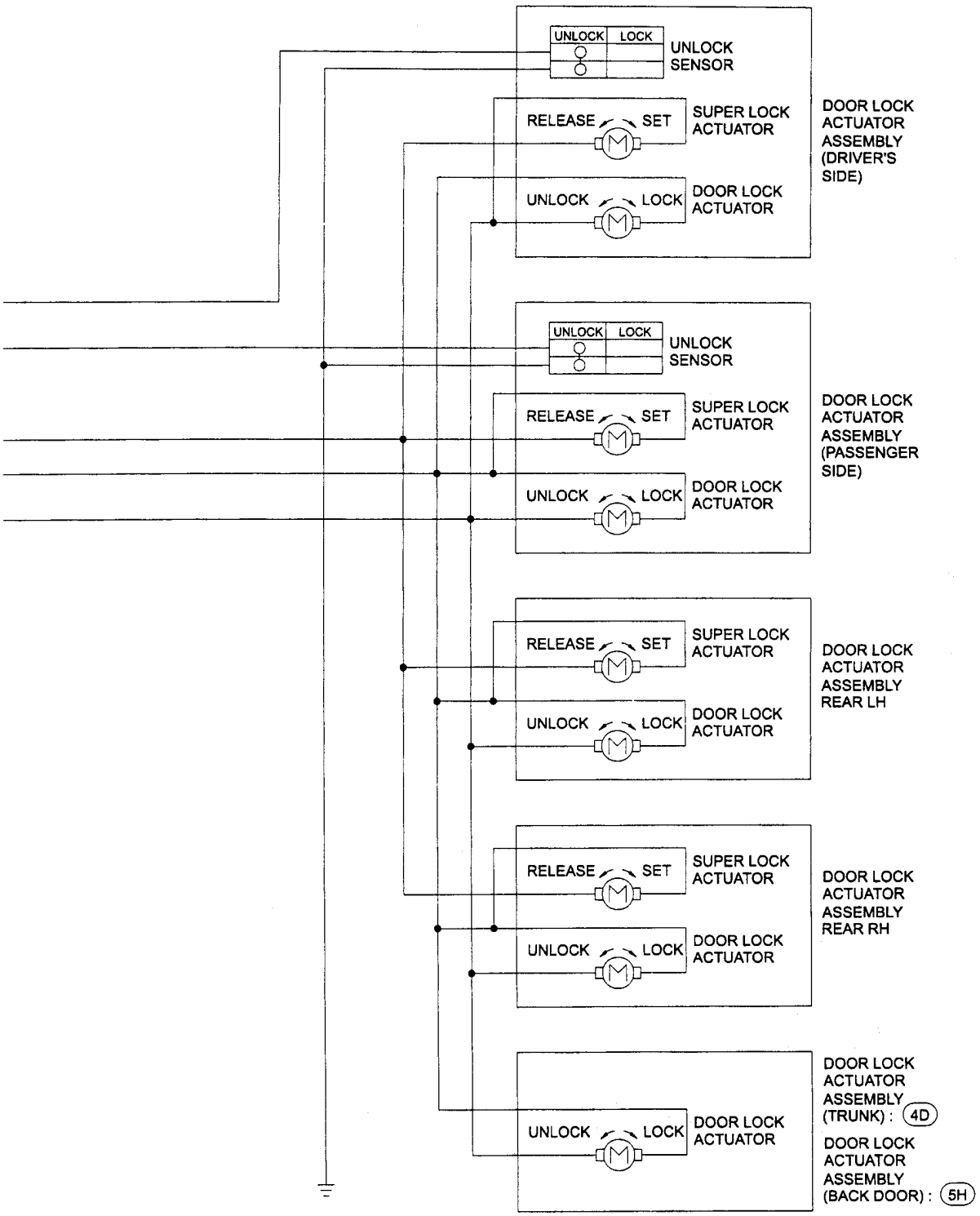
<table>
<tr><th>Symptom</th><th>Possible cause</th><th>Repair order</th></tr>
<tr><td>None of the power windows can be operated using any switch.</td><td>1. 7.5A fuse, 40A fusible link and (M66) circuit breaker.</td><td>1. Check 7.5A fuse (No. 7, located in fuse block [J/B]), 40A fusible link (letter DI: f, GS: e, located in fuse and fusible link box) and (M66) circuit breaker. Turn ignition switch to "ON" position and verify battery positive voltage is present at terminal (12) of power window main switch, and other switches as follows.
<table>
<tr><th>Location of sub-switch</th><th>Terminals</th></tr>
<tr><td>Passenger</td><td>(5)</td></tr>
<tr><td>Rear RH</td><td>(5)</td></tr>
<tr><td>Rear LH</td><td>(5)</td></tr>
</table></td></tr>
<tr><td></td><td>2. Grounds (M6), (M26) and (M28).
3. Power window relay.
4. Open/short in power window main switch circuit.</td><td>2. Check grounds (M6), (M26) and (M28).
3. Check power window relay.
4. Check W/R wire between power window relay and power window main switch for open/short circuit.</td></tr>
<tr><td>Driver's side power window cannot be operated but other windows can be operated.</td><td>1. Driver's side power window regulator circuit.
2. Driver's side power window regulator.</td><td>1. Check driver's side power window regulator circuit.
2. Check driver's side power window regulator.</td></tr>
<tr><td>One or more passenger power windows cannot be operated.</td><td>1. Power window switches (front sub-switch, rear sub-switch RH, rear sub-switch LH).
2. Power window regulators. (Passenger side, rear LH, rear LH.)
3. Power window main switch.
4. Power window circuit.</td><td>1. Check power window switches (front sub-switch, rear sub-switch RH, rear sub-switch LH)
2. Check power window regulators (front sub-switch, rear sub-switch RH, rear sub-switch LH)
3. Check power window main switch
4-1. Check harnesses between power window main switch and power window sub-switches for open/short circuit.
4-2. Check harnesses between power window sub-switches and power window regulators for open/short circuit.</td></tr>
<tr><td>One or more passenger power windows cannot be operated using power window main switch but can be operated by power window sub-switches.</td><td>1. Power window main switch.</td><td>1. Check power window main switch.</td></tr>
<tr><td>Driver's side power window auto function cannot be operated using power window main switch.</td><td>1. Power window main switch.</td><td>1. Check power window main switch.</td></tr>
</table>

Schematic



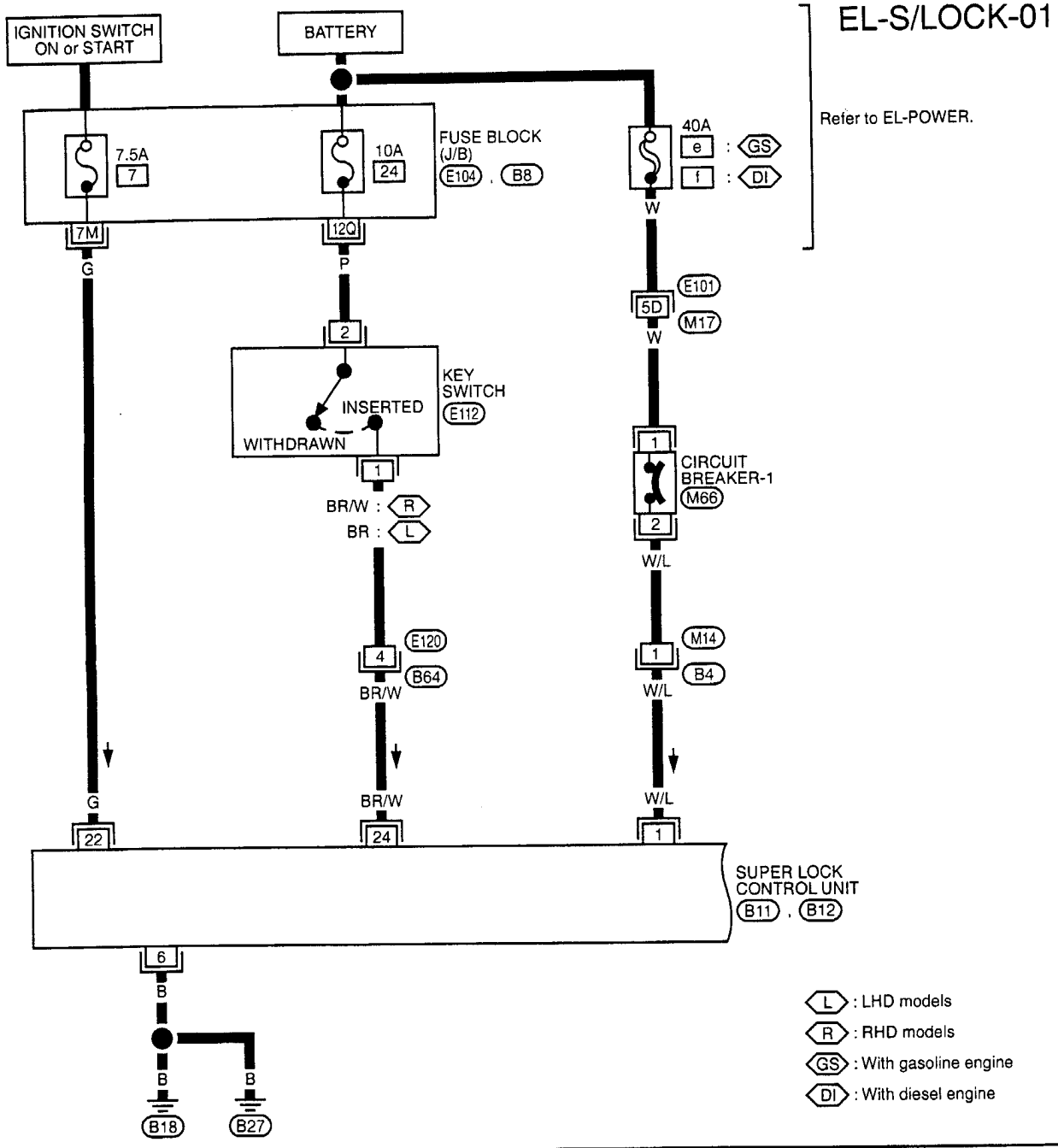
YEL423A

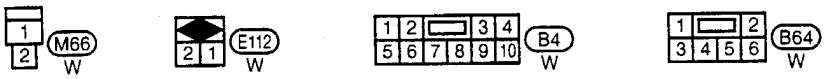
Schematic (Cont'd)



YEL424A

Wiring Diagram — S/LOCK —



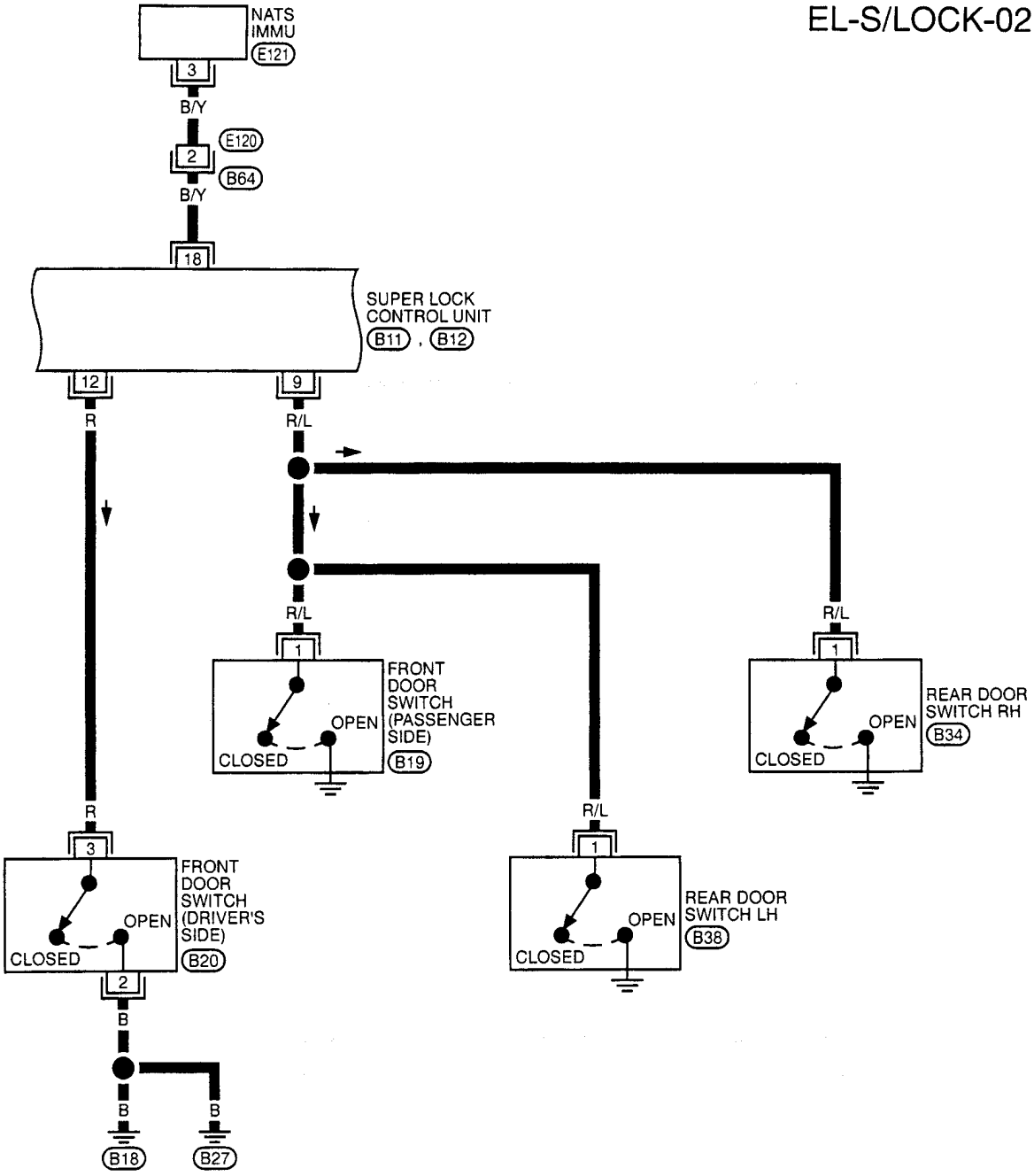


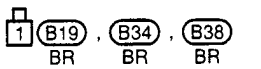
Refer to last page (Foldout page).
M17 , E101
E104
B8
B11
B12

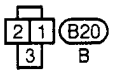
YEL425A

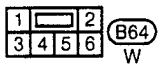
Wiring Diagram — S/LOCK — (Cont'd)

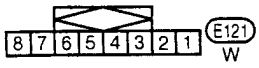
EL-S/LOCK-02











Refer to last page (Foldout page).

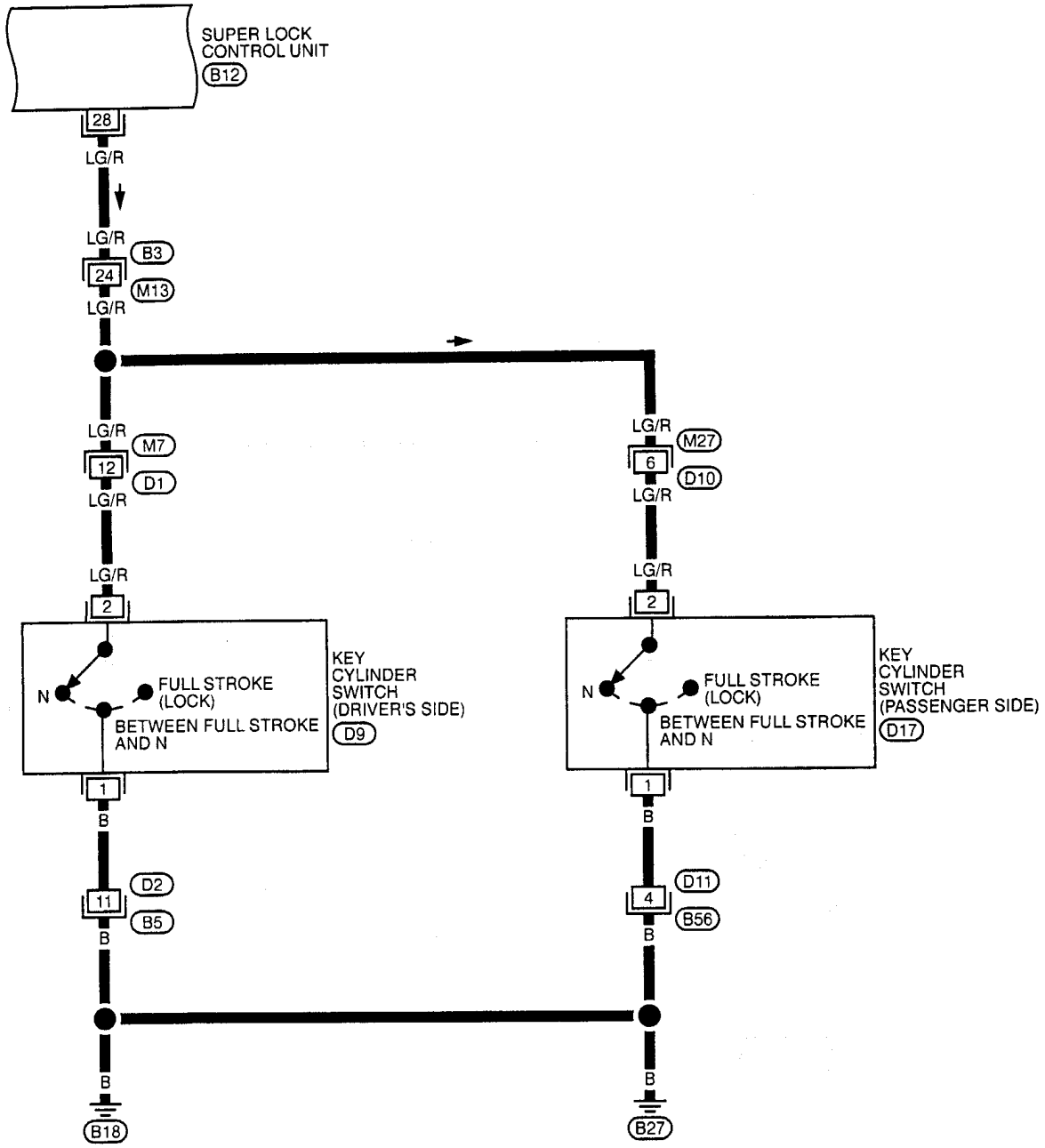
B11

B12

YEL426A

Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-03



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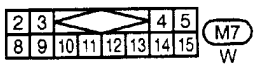
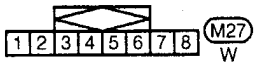
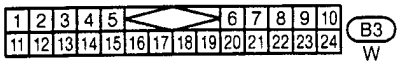
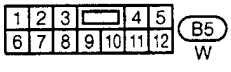
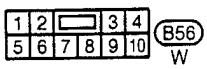
B12

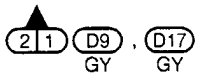








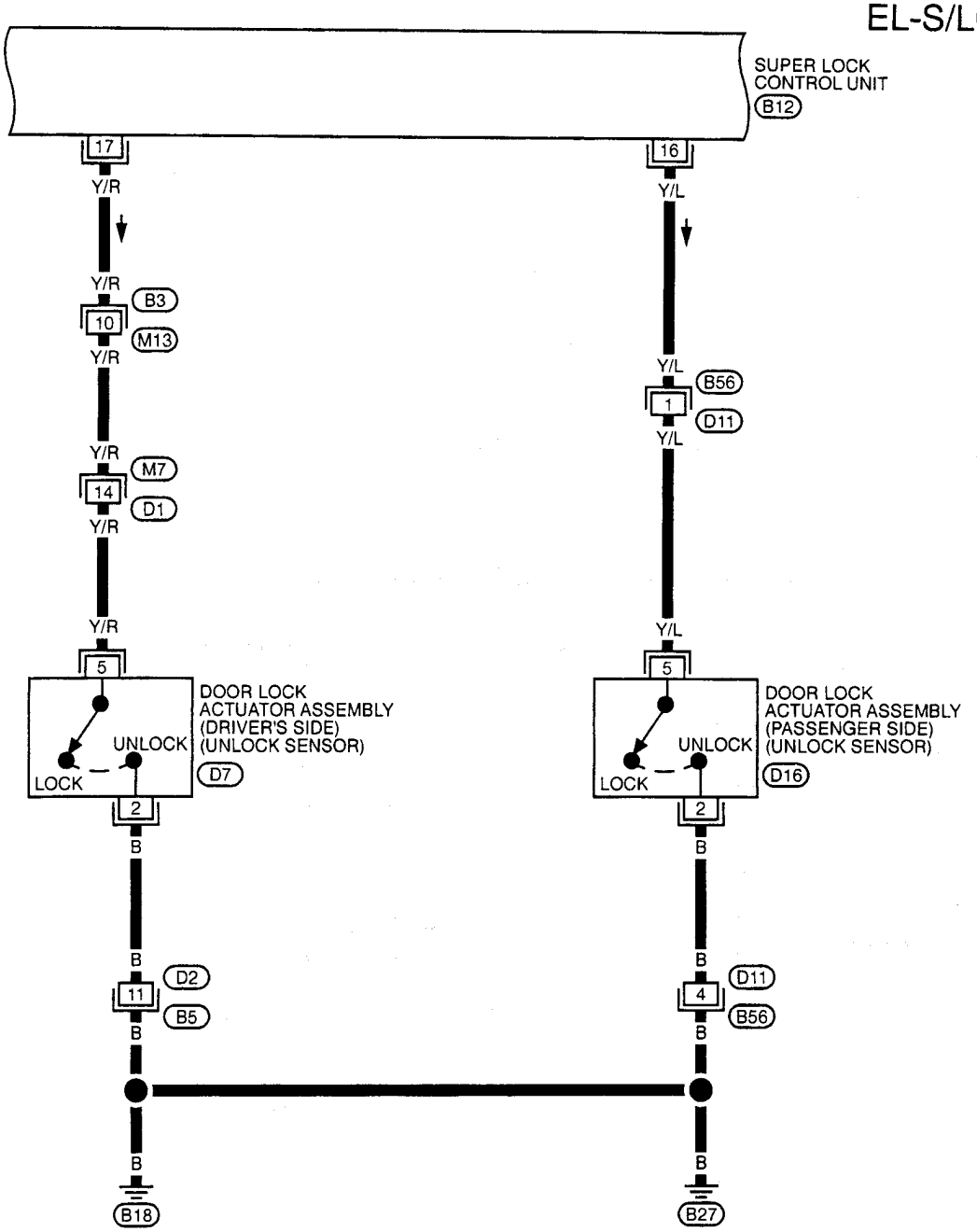




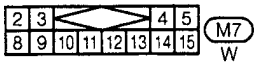
YEL427A

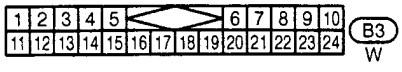
Wiring Diagram — S/LOCK — (Cont'd)

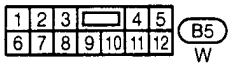
EL-S/LOCK-04

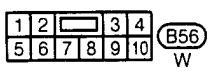


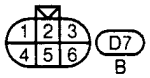
Refer to last page (Foldout page).
B12

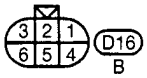








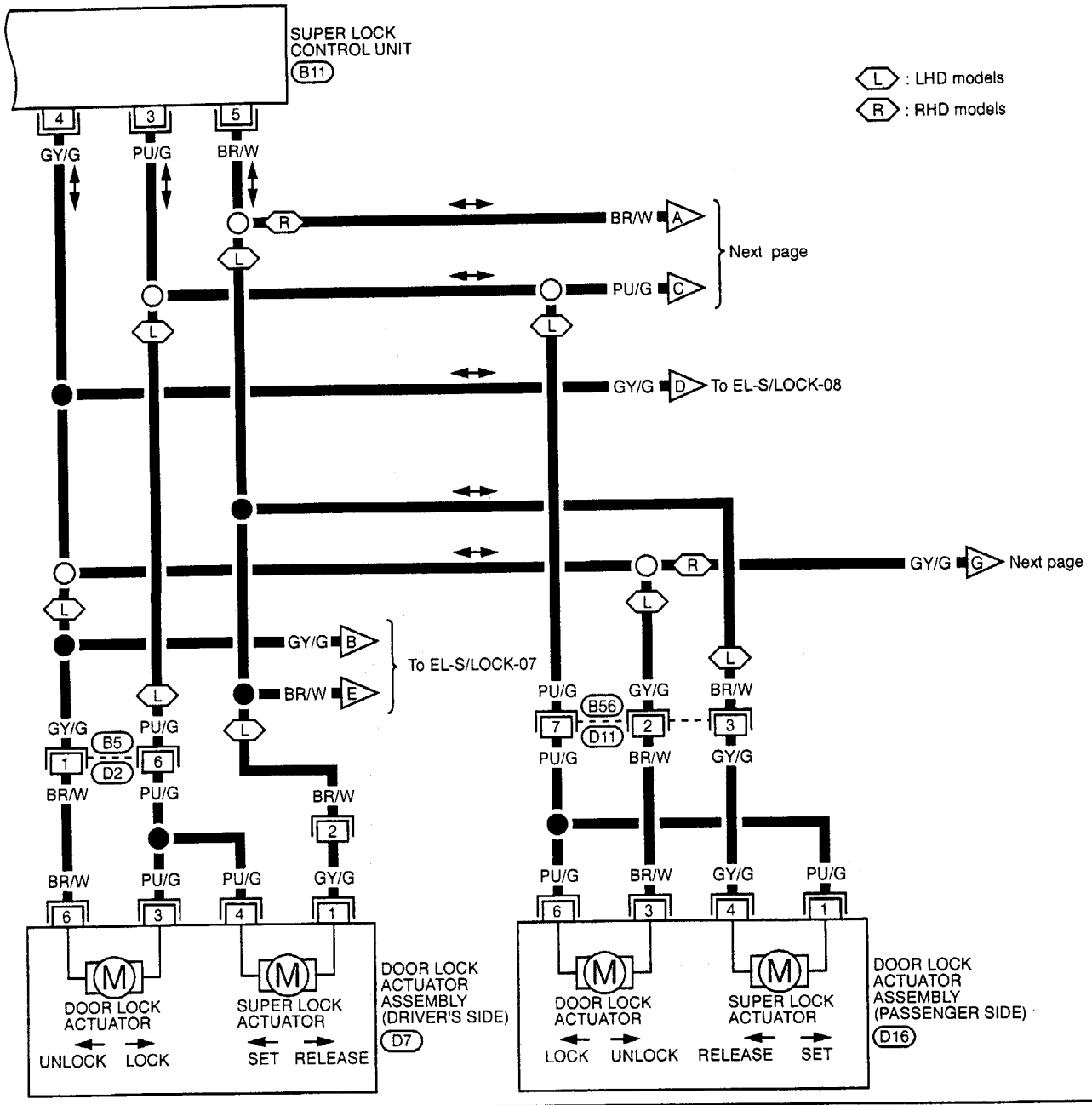


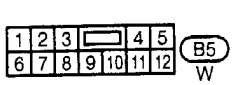


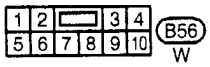
YEL428A

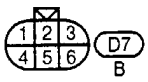
Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-05







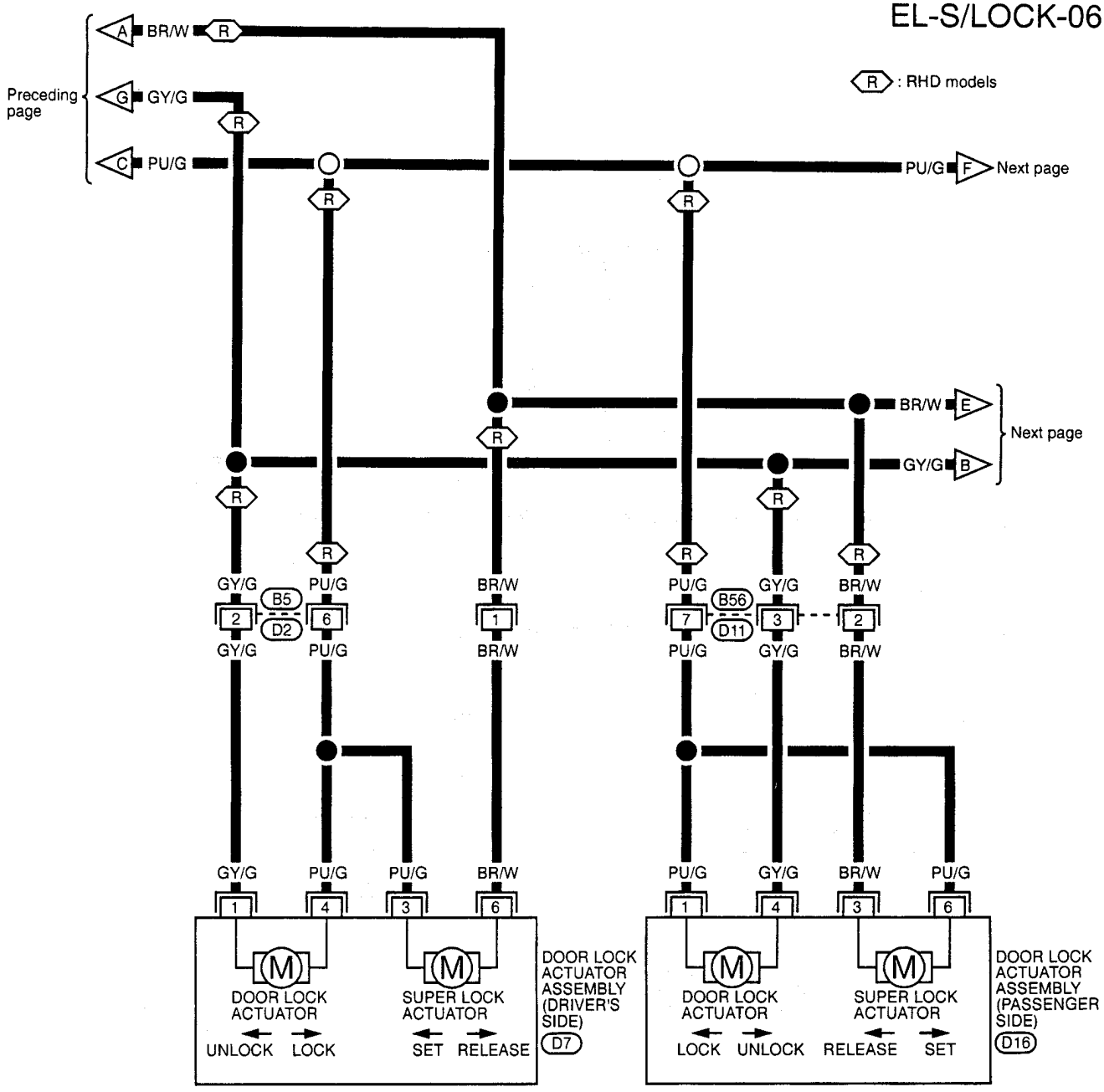


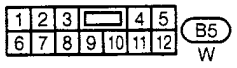
Refer to last page (Foldout page).
B11

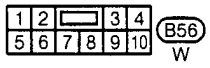
YEL429A

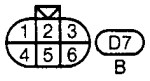
Wiring Diagram — S/LOCK — (Cont'd)

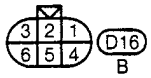
EL-S/LOCK-06











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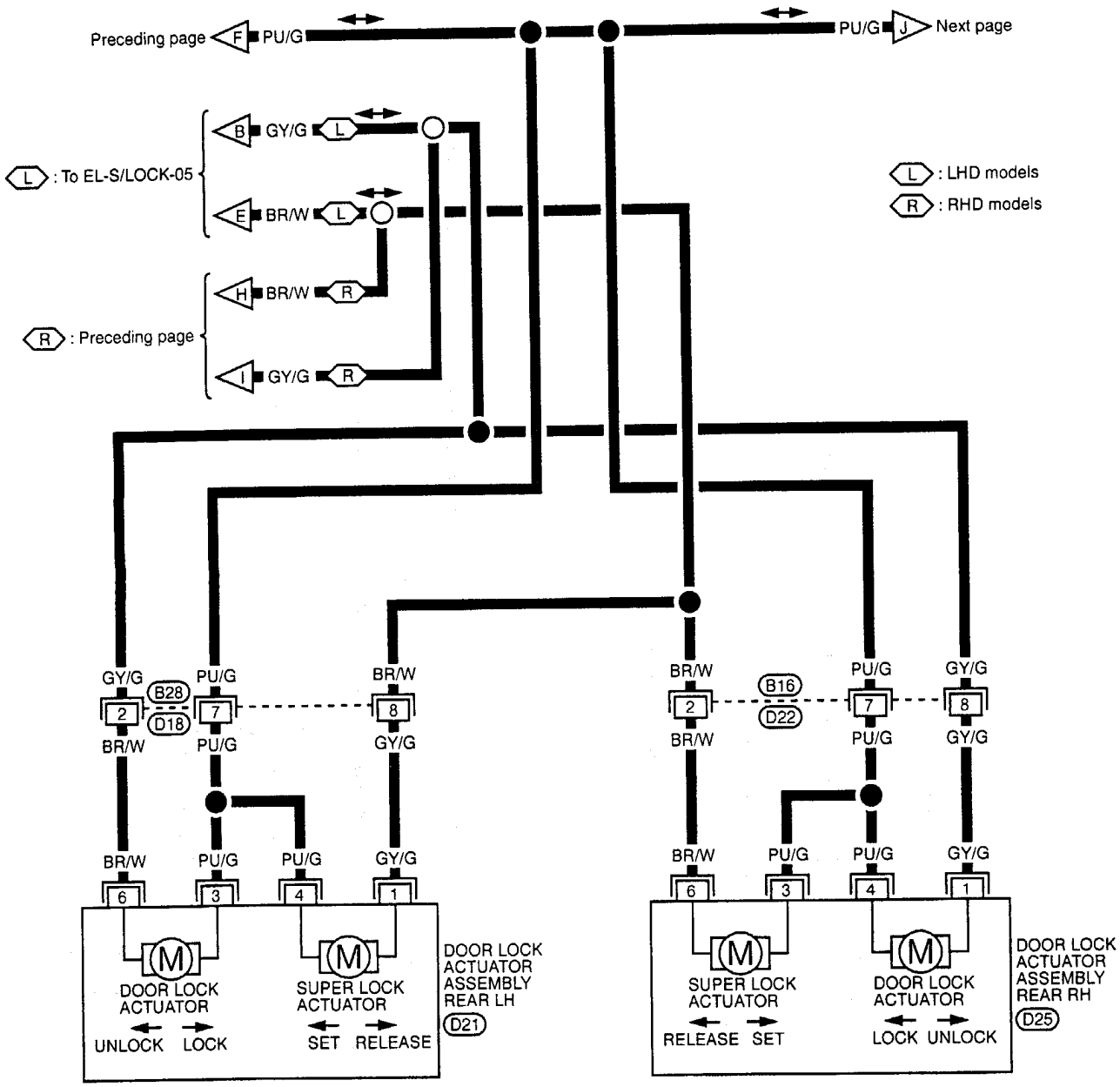
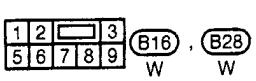
B11

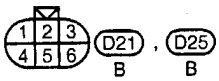
YEL430A

Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-07



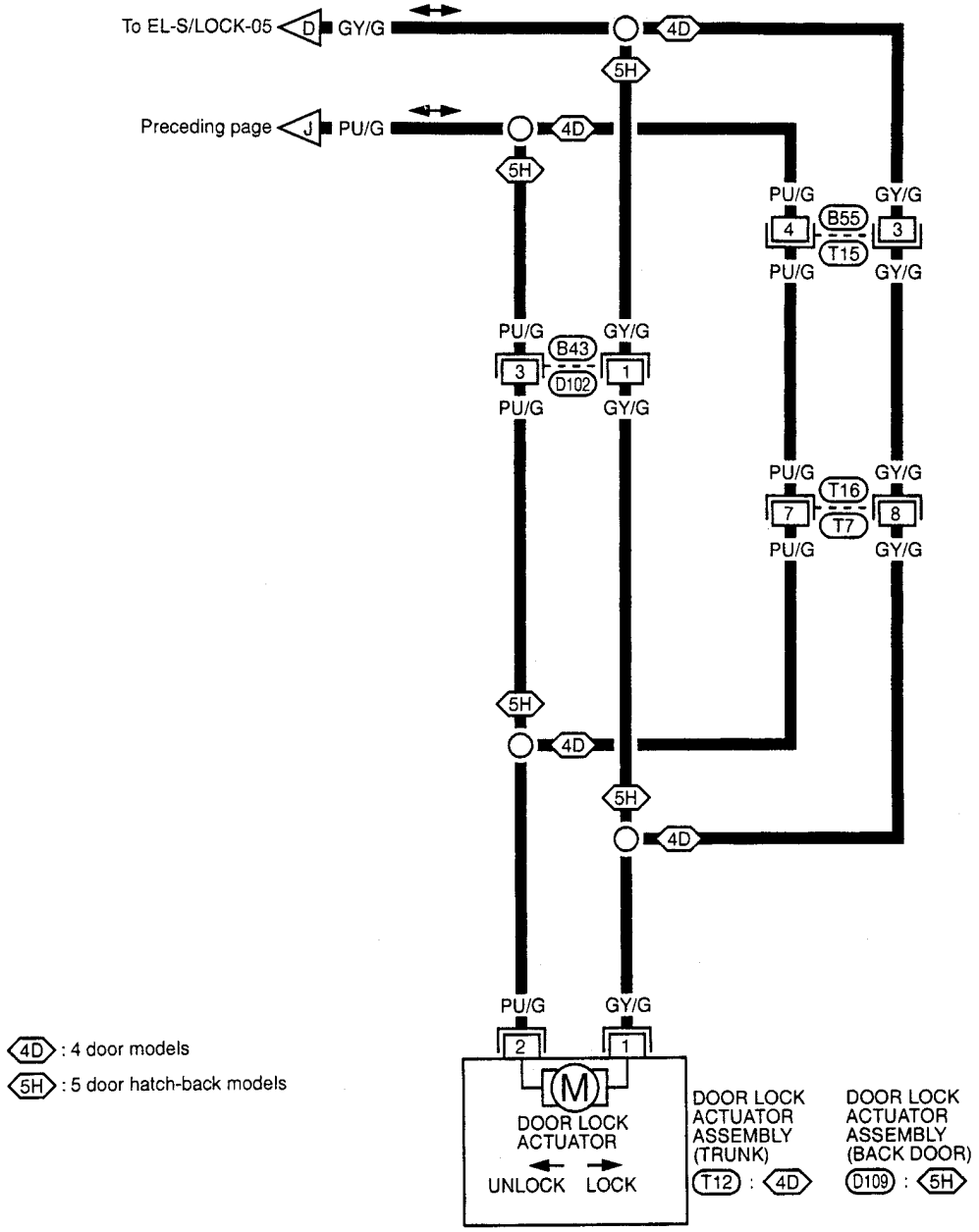


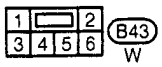


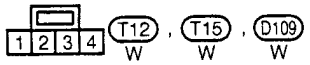
YEL431A

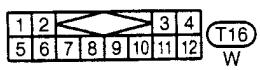
Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-08



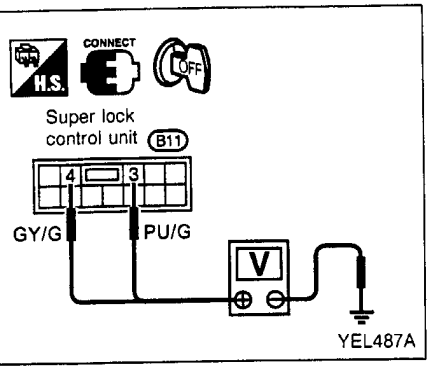






YEL432A

A



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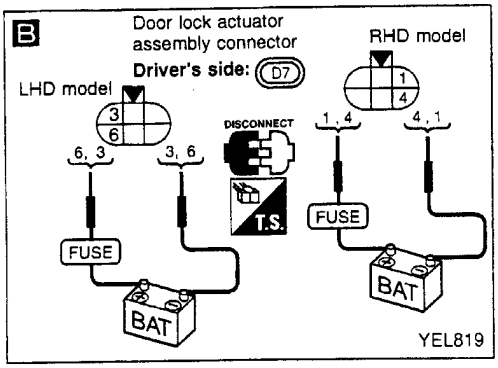

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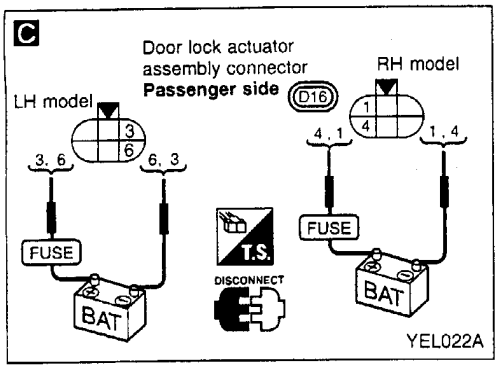

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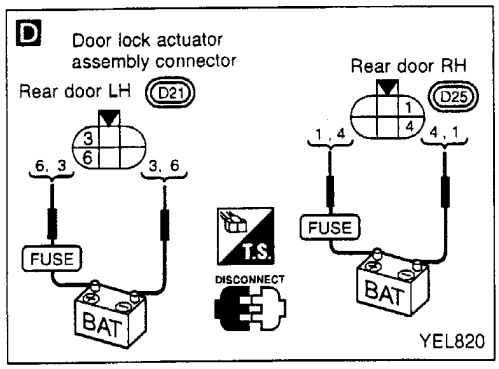


Trouble Diagnoses

DIAGNOSTIC PROCEDURE 3 (Door lock actuator check)

A

CHECK DOOR LOCK ACTUATOR CIRCUIT.
Check voltage for door lock actuator.

Knob lock switch condition	Terminals ⊕	Terminals ⊖	Voltage (V)
Unlock → Lock	④	Ground	Approx. 12 (Approx. 5 seconds)
Lock → Unlock	③	Ground	

Before operating passenger side knob lock switch, close all doors.

NG → Go to next procedure.

OK ↓

B C D

CHECK DOOR LOCK ACTUATOR.
1. Disconnect door lock actuator connector.
2. Apply 12V direct current to door lock actuator and check operation.

OK → Check harness between control unit and door lock actuator.

Driver's side

Door lock actuator operation	Terminals ⊕	Terminals ⊖
Unlocked → Locked	⑥ : (LHD) ① : (RHD)	③ : (LHD) ④ : (RHD)
Locked → Unlocked	③ : (LHD) ④ : (RHD)	⑥ : (LHD) ① : (LHD)

Passenger side

Door lock actuator operation	Terminals ⊕	Terminals ⊖
Unlocked → Locked	③ : (LHD) ④ : (RHD)	⑥ : (LHD) ① : (RHD)
Locked → Unlocked	⑥ : (LHD) ① : (RHD)	③ : (LHD) ④ : (LHD)

Rear door

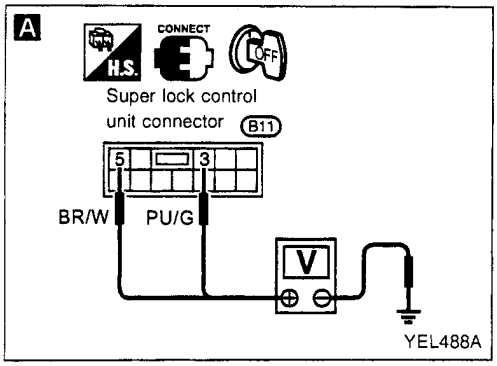
Door lock actuator operation	Terminals ⊕	Terminals ⊖
Unlocked → Locked	⑥ : (LHD) ① : (RHD)	③ : (LHD) ④ : (RHD)
Locked → Unlocked	③ : (LHD) ④ : (RHD)	⑥ : (LHD) ① : (LHD)

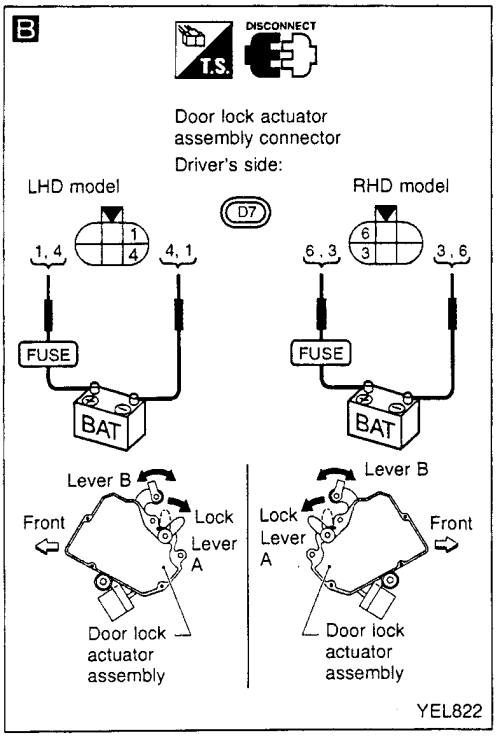
NG ↓

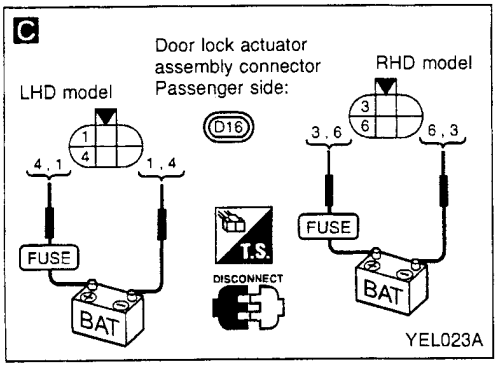
Replace door lock actuator assembly.

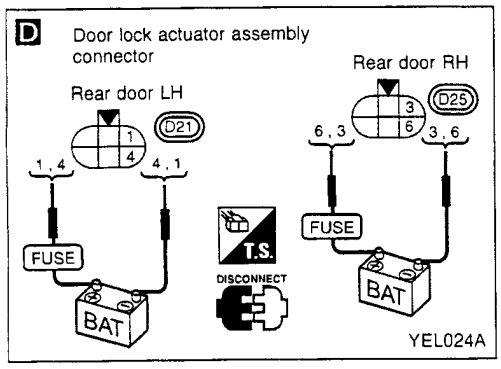
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4
(Super lock actuator check)









A

CHECK SUPER LOCK ACTUATOR CIRCUIT.
Check voltage for super lock actuator.

Door key cylinder switch condition	Terminals ⊕	Terminals ⊖	Voltage (V)
Lock (Set)	⑤	Ground	Approx. 12
Unlock (Released)	③	Ground	

Note:
Put the system in set condition before checking release signal.

NG → Go to next procedure.

OK ↓

B C D

CHECK SUPER LOCK ACTUATOR.
1. Disconnect door lock actuator assembly connector.
2. Set lever B in lock position.
3. Apply 12V direct current to door lock actuator assembly and check operation.

OK → Check harness between control unit and door lock actuator assembly.

Driver's side

Super lock actuator operation	Terminals ⊕	Terminals ⊖	Connection from lever A to lever B
Released → Set	①: (LHD) ⑥: (RHD)	④: (LHD) ③: (RHD)	Disconnect
Set → Released	④: (LHD) ③: (RHD)	①: (LHD) ⑥: RHD	Connect

Passenger side

Super lock actuator operation	Terminals ⊕	Terminals ⊖	Connection from lever A to lever B
Released → Set	④: (LHD) ③: (RHD)	①: (LHD) ⑥: (RHD)	Disconnect
Set → Released	①: (LHD) ⑥: (RHD)	④: (LHD) ③: RHD	Connect

Rear door

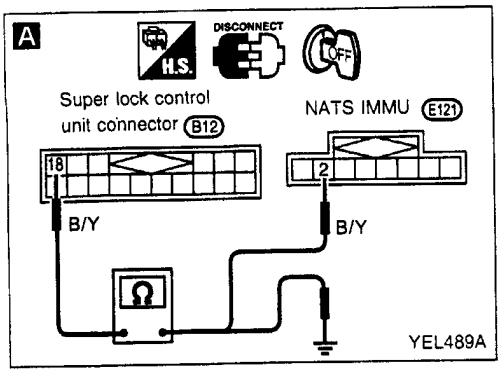
Super lock actuator operation	Terminals ⊕	Terminals ⊖	Connection from lever A to lever B
Released → Set	①: (LHD) ⑥: (RHD)	④: (LHD) ③: (RHD)	Disconnect
Set → Released	④: (LHD) ③: (RHD)	①: (LHD) ⑥: RHD	Connect

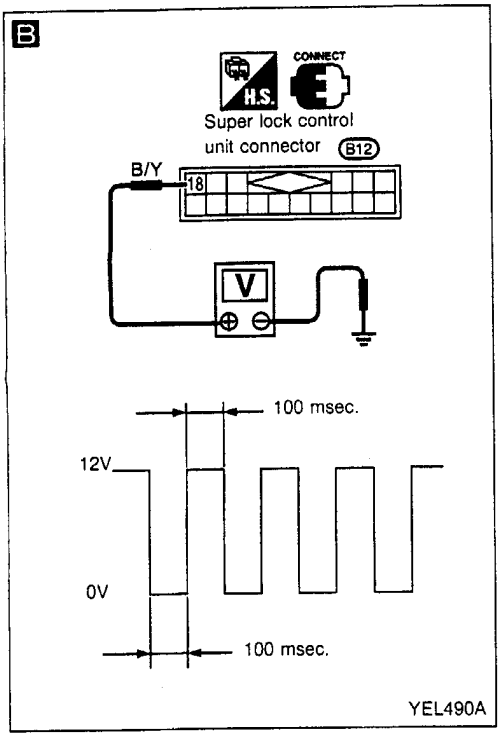
NG ↓

Replace door lock actuator assembly.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6
(NATS release signal check)





Does engine start properly? — No → Check NATS system.

Yes ↓

A

CHECK NATS SIGNAL CIRCUIT.
1) Disconnect control unit connector and NATS IMMU connector.
2) Check continuity between control unit terminal ⑱ and NATS IMMU terminal ②.
   Continuity should exist.
3) Check continuity between control unit terminal ⑱ and ground.
   Continuity should not exist.

NG → Repair harness.

OK ↓

B

CHECK NATS RELEASE SIGNAL.
1) Connect control unit connector and NATS IMMU connector.
2) Check voltage between control unit terminal ⑱ and ground.

NG → Check NATS system.

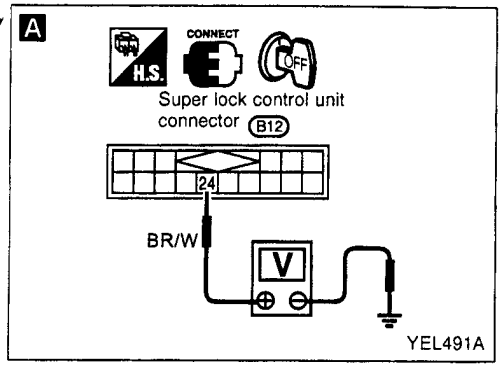
Ignition switch condition	Voltage [V]
LOCK	12
More than 10 seconds after ignition switch turned to "ON" position	
For 10 seconds after ignition switch turned to "ON" position	Pulse

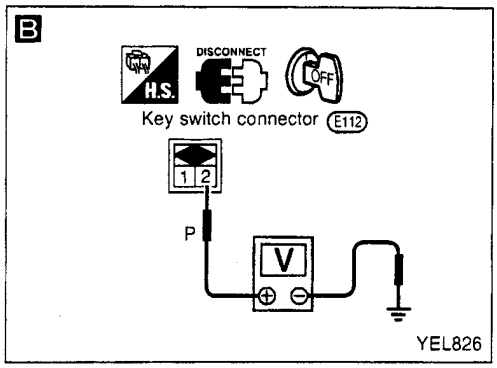
OK ↓

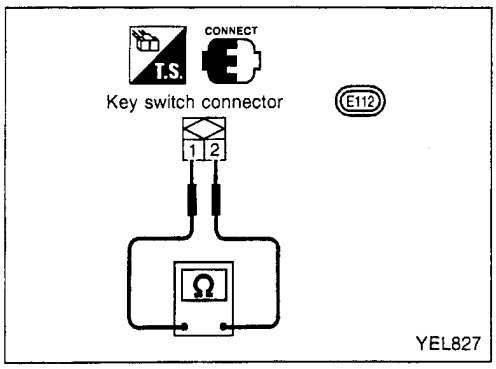
Replace super lock control unit.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7
(Ignition key switch check)







A

CHECK IGNITION KEY SWITCH INPUT SIGNAL.
Check voltage between control unit terminal ㉔ and ground.

Condition of key switch	Voltage [V]
Key is inserted	Approx. 12
Key withdrawn	0

OK → Go to next procedure.

NG ↓

B

CHECK KEY SWITCH POWER SUPPLY.
Check voltage between key switch harness terminal ② and ground.
Battery voltage should exist.

NG → Check the following.
- 10A fuse [No. 24, located in fuse block (J/B)]
- Harness for open or short between key switch and fuse

OK ↓

C

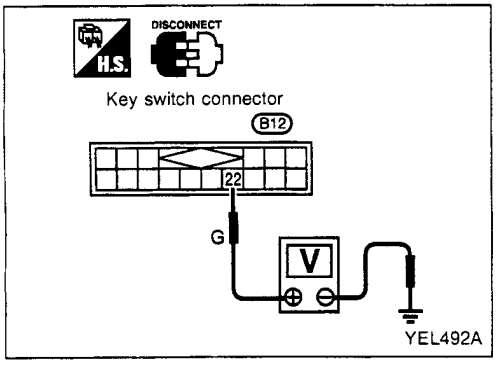
CHECK KEY SWITCH.
1) Disconnect key switch connector.
2) Check continuity between key switch terminals.

Terminals	Condition	Continuity
① - ②	Key is inserted.	Yes
	Key is withdrawn.	No

NG → Replace key switch.

OK ↓

Check harness for open or short between control unit and key switch.



DIAGNOSTIC PROCEDURE 8
(Ignition switch "ON" circuit check)

Terminals		Ignition switch position		
⊕	⊖	OFF	ACC	ON
㉒	Ground	0V	0V	Battery voltage

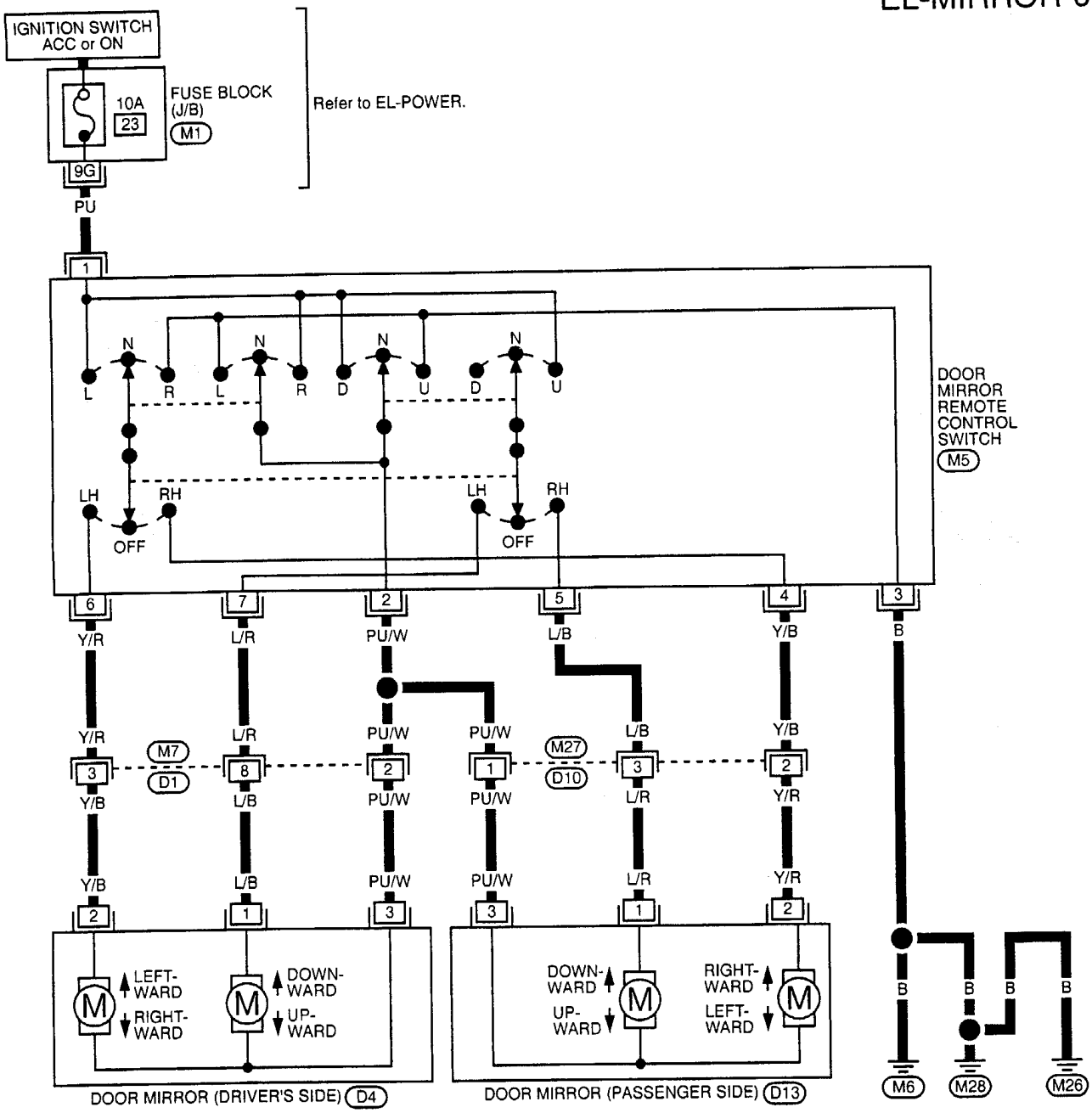
If NG, check the following.
- 7.5A fuse [No. 7, located in the fuse block (J/B)]
- Harness for open or short

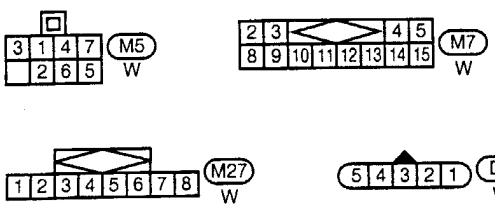
Wiring Diagram — MIRROR —

LHD models

★ For removal of door mirror, refer to "DOOR MIRROR" in BT section.

EL-MIRROR-01





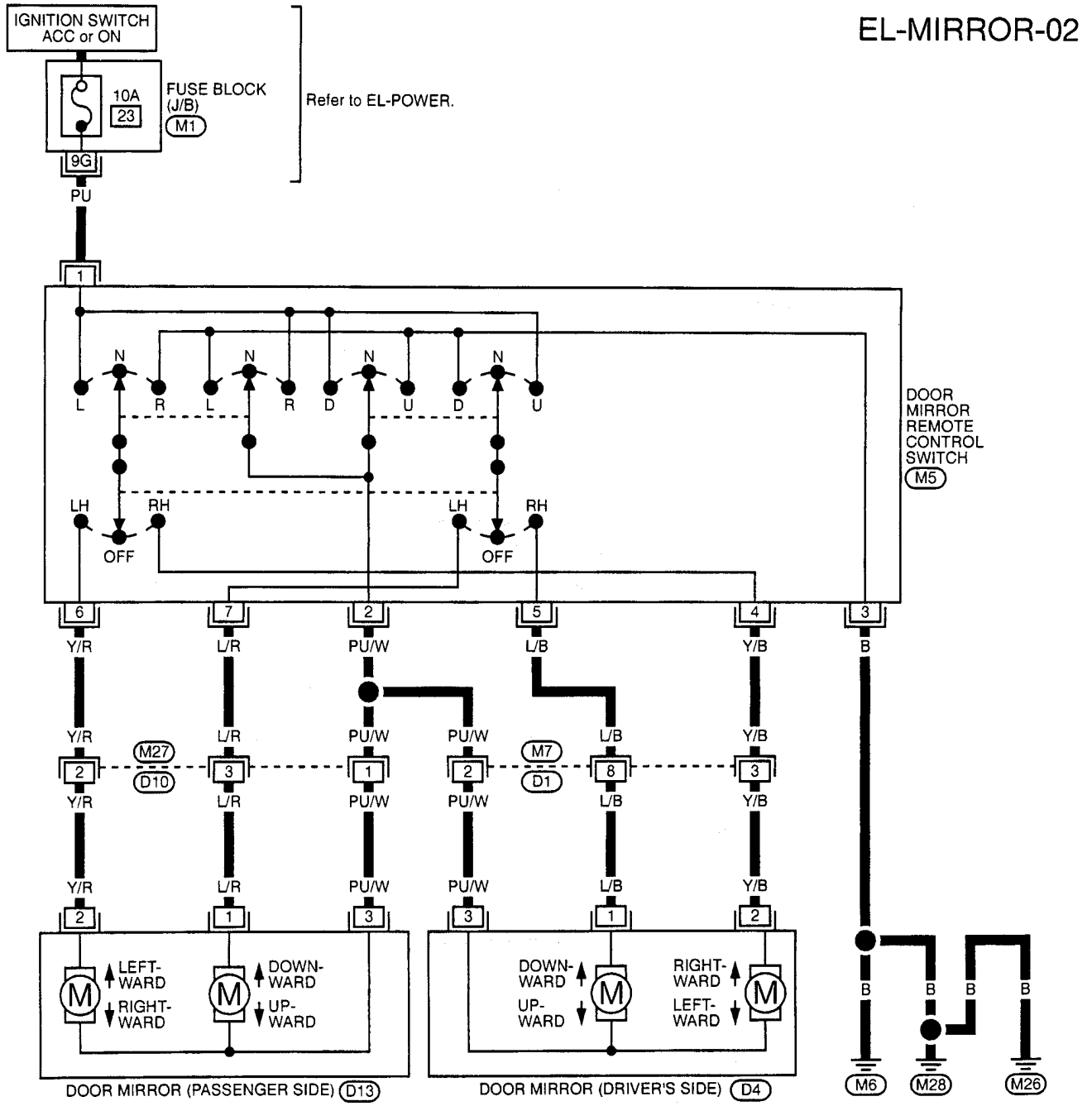
Refer to last page (Foldout page).
M1

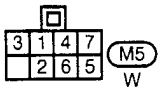
YEL433A

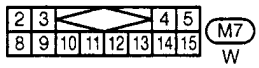
Wiring Diagram — MIRROR — (Cont'd)

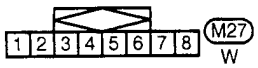
RHD models

EL-MIRROR-02









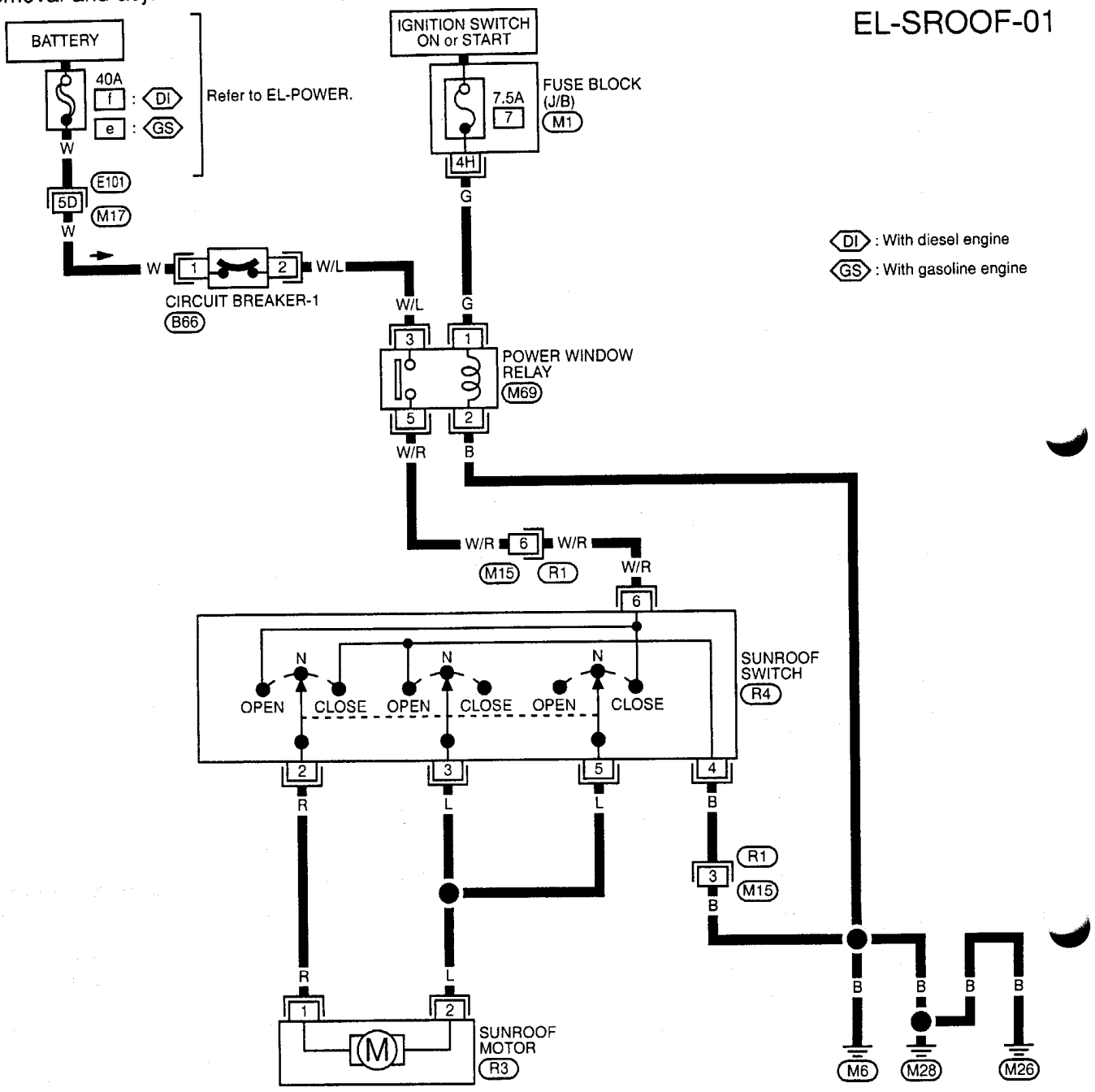
Refer to last page (Foldout page).
M1

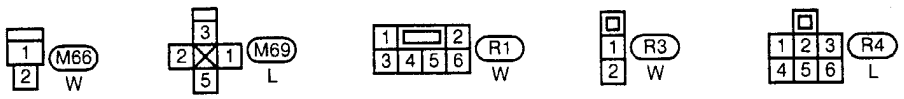
YEL434A

Wiring Diagram — SROOF —

★ For removal and adjustment of sunroof, refer to "SUNROOF" in BT section.

EL-SROOF-01





Refer to last page (Foldout page).
M17 , E101
M1

YEL435A

System Description

The rear window and door mirror defogger system is controlled by the super lock control unit.
Power is supplied at the ignition switch ON or START
- to rear window defogger relay terminal ③ and ⑥
- through 15A fuses [No. 57 and No. 56 (Gasoline engine models), No. 62 and No. 61 (Diesel engine models), located in the fuse block].

With the ignition switch in the Acc or ON position, power is supplied
- to door mirror heater relay terminal ③
- through 10A fuse (No. 23, located in the fuse block).

With the ignition switch in the ON or START position, power is supplied
- to rear window defogger relay terminal ② and super lock control unit terminal ㉒
- through 7.5A fuse (No. 7, located in the fuse block).

Ground is supplied
- to rear window defogger switch terminal ⑥
- through body grounds M28, M6 and M28.

Operation

The ignition switch must be in the ON or START position for defogger operation.
With the rear window defogger switch in the ON position and for approximately 12 - 16 minutes after the rear window defogger switch has turned to OFF from ON, ground is supplied
- through terminal ① of the rear window defogger switch
- to super lock control unit terminal ㉕.

Terminal ⑬ of the super lock control unit then supplies ground to rear window defogger relay terminal ① and door mirror heater relay terminal ②.
With power and ground supplied, rear window defogger relay and door mirror heater relay are energized.
For rear window defogger system, power is supplied
- through terminals ⑤ and ⑦ of the rear window defogger relay
- to condenser terminal ①
- through terminal ② of the condenser
- to the rear window defogger terminal ③.

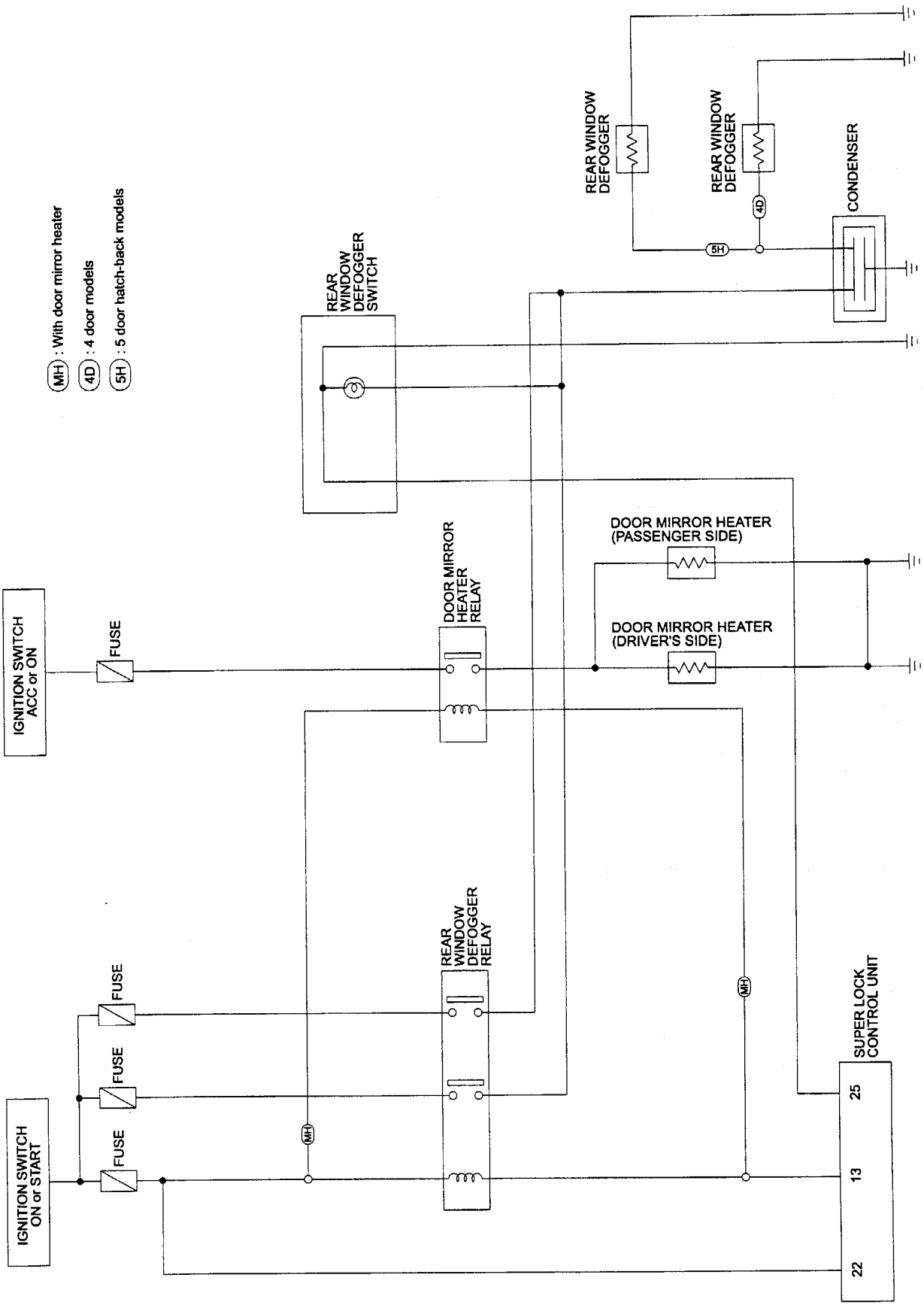
For door mirror defogger system, power is supplied
- through door mirror heater relay terminal ⑤
- to each door mirror heater terminal ④.

Ground is supplied
- to rear window defogger terminal ①
- through body ground (Sedan), B48 and D110 (H/B) and
- to each door mirror defogger terminal ⑤
- through body grounds B18 and B27.

With power and ground supplied, each defogger filament heats and defogs the rear window and door mirror.
When the system is activated, the rear window defogger indicator illuminates in the rear window defogger switch.
Power is supplied
- to terminal ③ of the rear window defogger switch
- from terminal ⑦ of the rear window defogger relay.

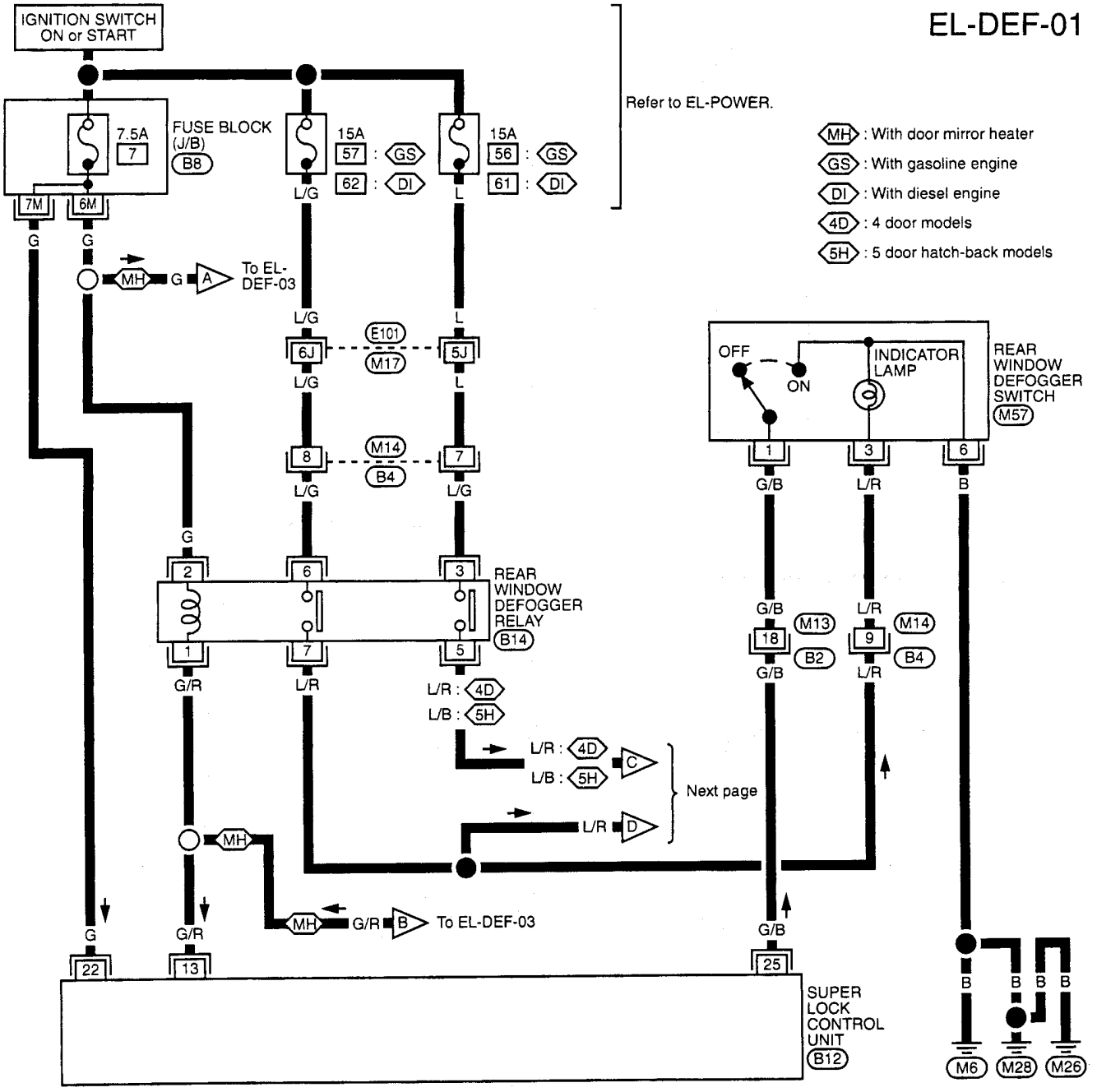
Terminal ⑥ of the rear window defogger switch is grounded through body grounds M6, M26 and M28.

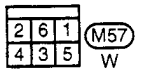
Schematic

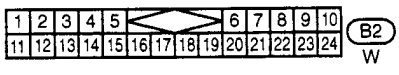


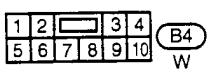
YEL436A

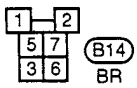
Wiring Diagram — DEF —









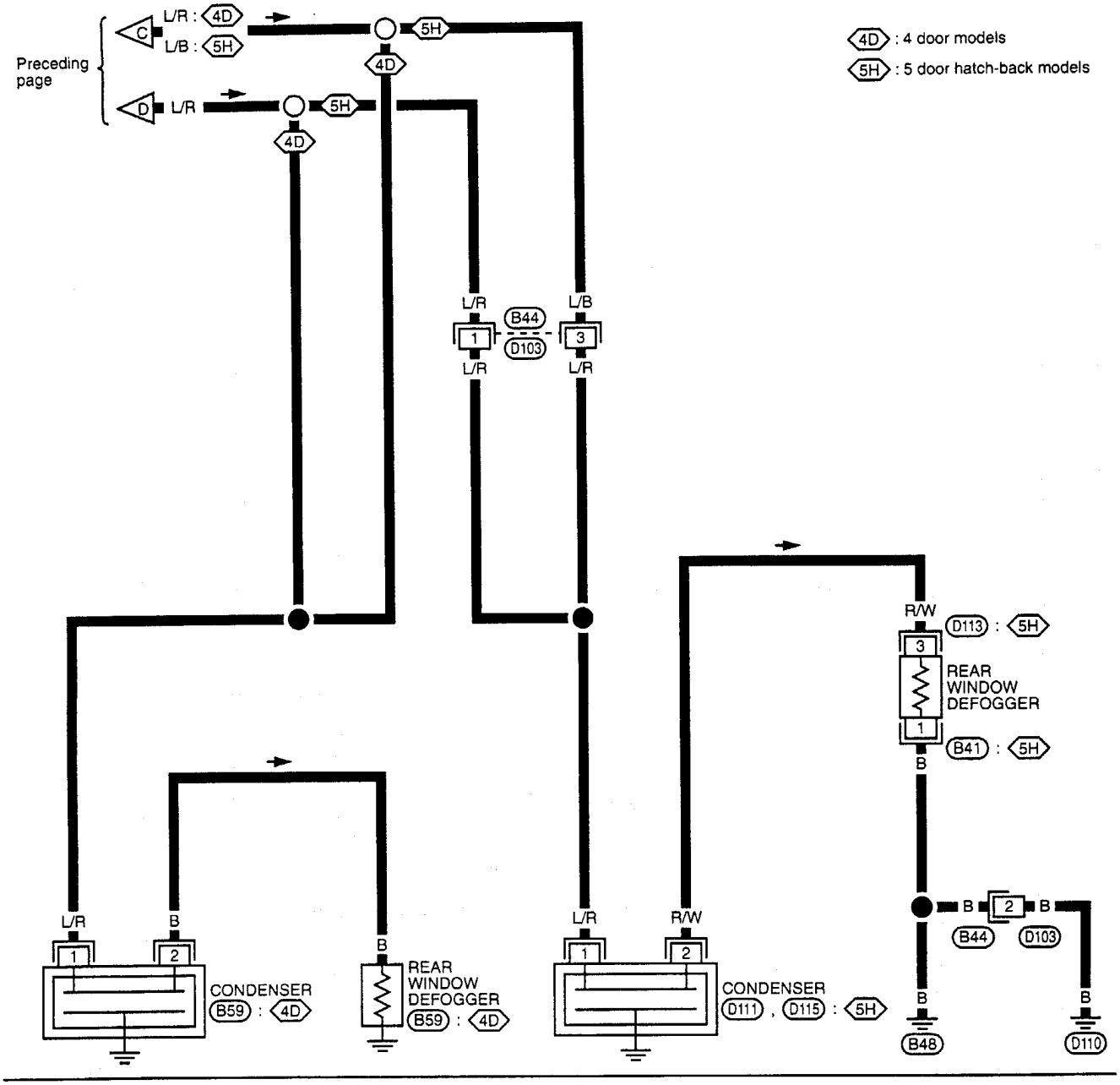


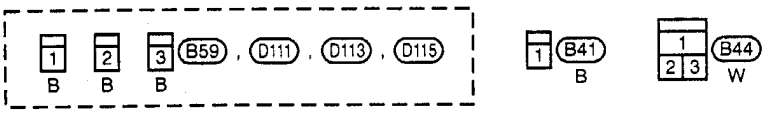
Refer to last page (Foldout page).
M17 , E101
B8
B12

YEL437A

Wiring Diagram — DEF — (Cont'd)

EL-DEF-02

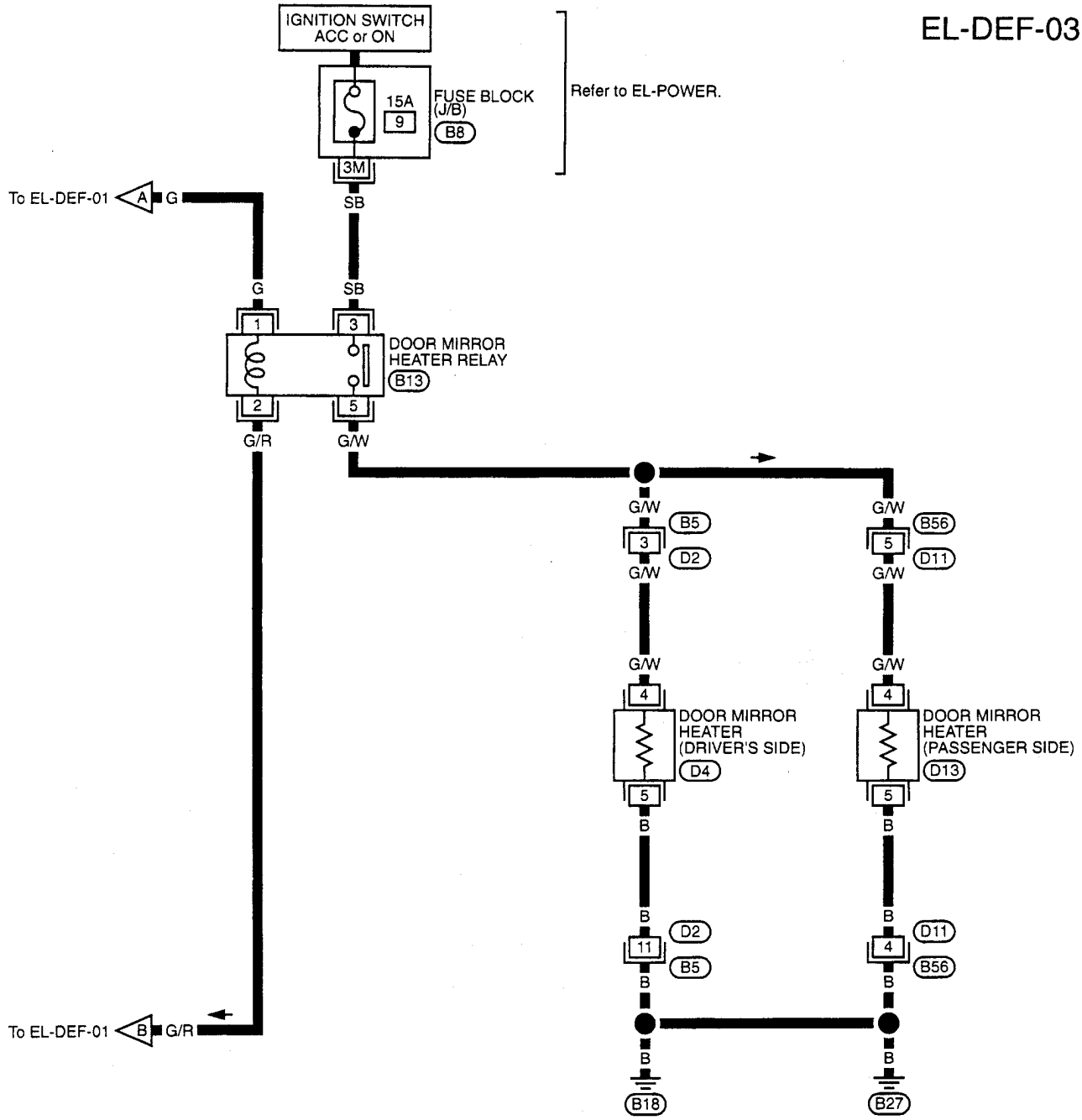


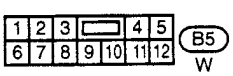


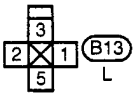
YEL438A

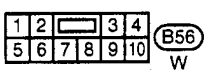
Wiring Diagram — DEF — (Cont'd)

EL-DEF-03









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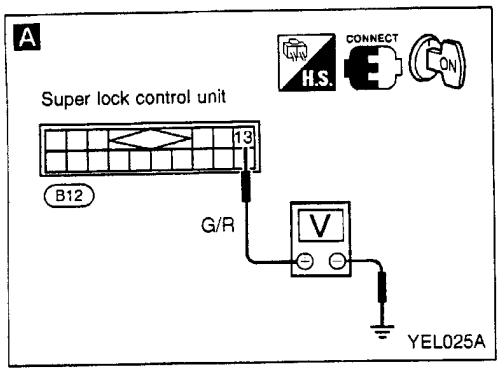
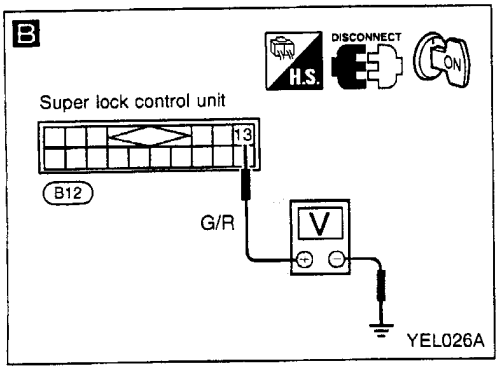
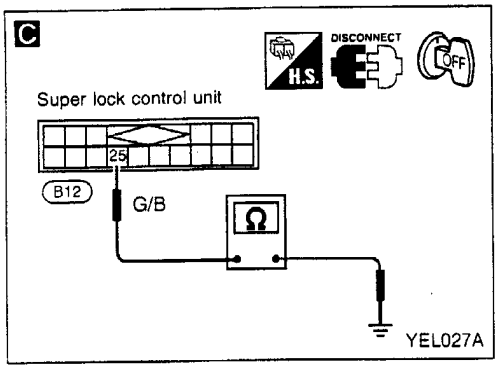
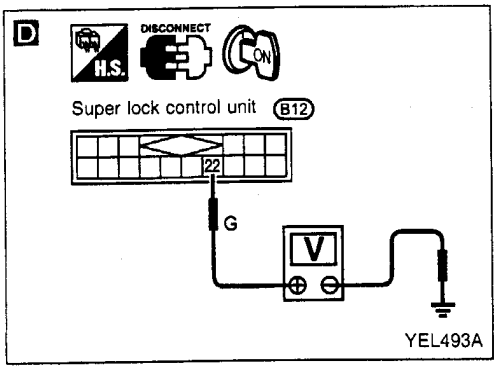
B8

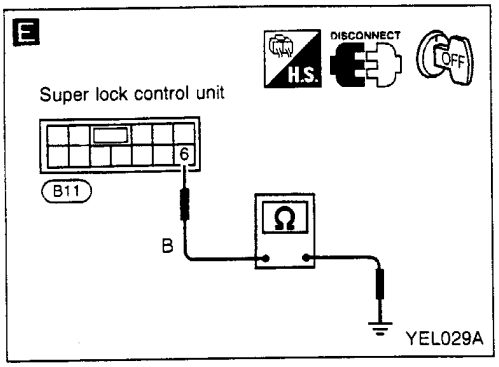
YEL439A











Trouble Diagnoses

DIAGNOSTIC PROCEDURE

SYMPTOM: Rear window defogger/door mirror defogger does not activate, or does not go off after activating.

A

CHECK REAR WINDOW DEFOGGER OUTPUT SIGNAL.
1. Turn ignition switch to ON POSITION.
2. Check voltage between control unit harness terminal (13) and ground.

Condition	Voltage [V]
Rear window defogger switch is "OFF".	Approx. 12
Rear window defogger switch is "ON".	0

OK → Check the following.
- Rear window defogger relay/door mirror heater relay
- Power supply fuse for relay
- Rear window defogger filament

NG ↓

B

1. Disconnect control unit connector.
2. Turn ignition switch to ON position.
3. Check voltage between control unit terminal (13) and ground.
Battery voltage should exist.

NG → Check the following.
- 7.5A fuse [No. 7, located in the fuse block (J/B)]
- Rear window defogger relay
- Harness for open or short between fuse and rear window defogger relay

OK ↓

C

CHECK REAR WINDOW DEFOGGER SWITCH INPUT SIGNAL.
Check continuity between control unit terminal (25) and ground.

Condition of defogger switch	Continuity
Rear window defogger switch is pushed.	Yes
Rear window defogger switch is released.	No

NG → Check the following.
- Rear window defogger switch.
- Harness for open or short between control unit and rear window defogger switch
- Rear window defogger switch ground circuit

OK ↓

D

CHECK IGNITION INPUT SIGNAL.
Check voltage between control unit terminal (22) and ground.

Condition	Voltage [V]
Ignition switch is "ON".	Approx. 12
Ignition switch is "OFF".	0

NG → Check the following.
- 7.5A fuse [No. 7, located in the fuse block (J/B)]
- Harness for open or short between control unit and fuse

OK ↓

E

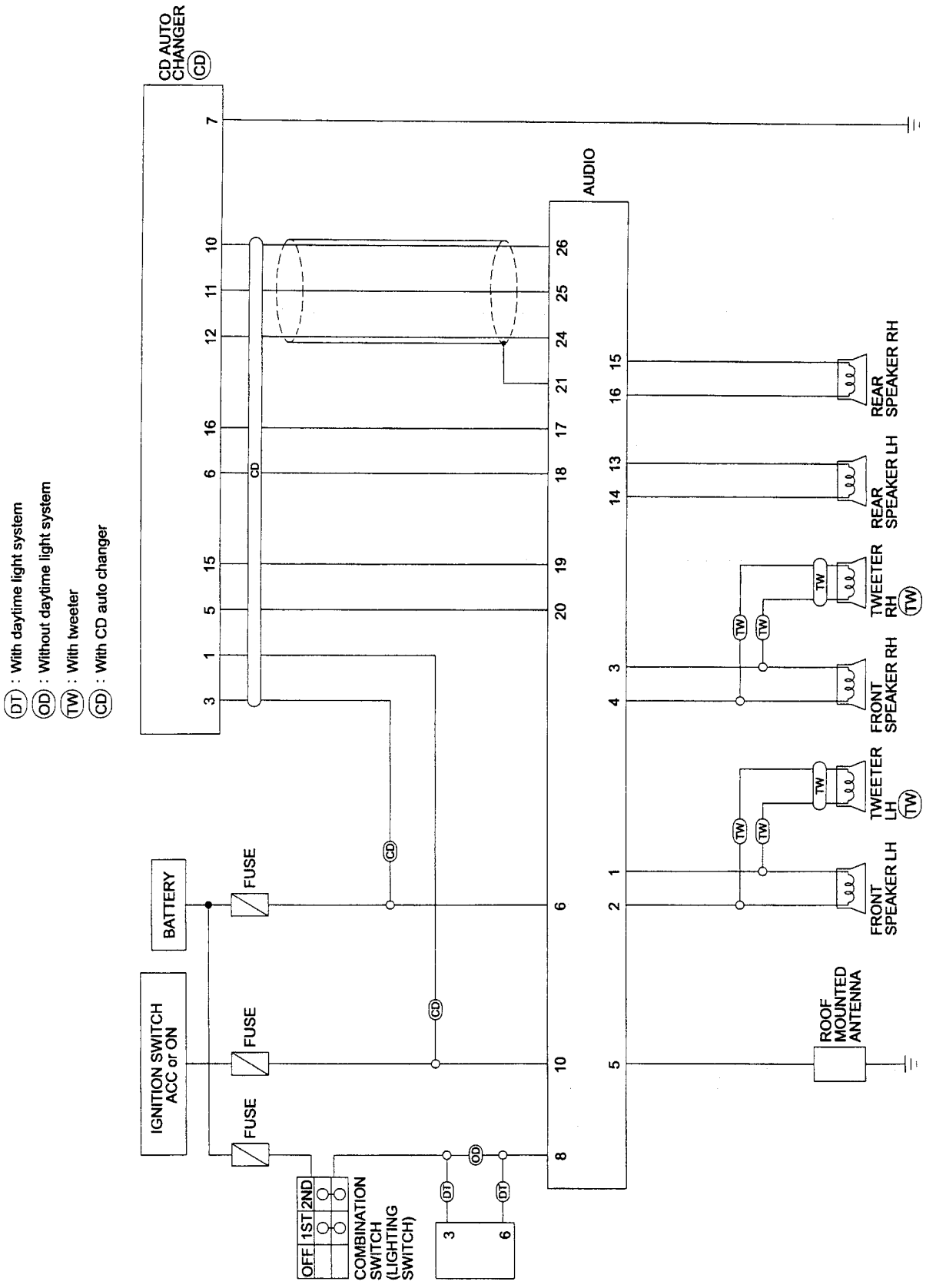
CHECK CONTROL UNIT GROUND CIRCUIT.
Check continuity between control unit terminal (6) and ground.
Continuity should exist.

NG → Repair harness or connectors

OK ↓

Replace control unit.

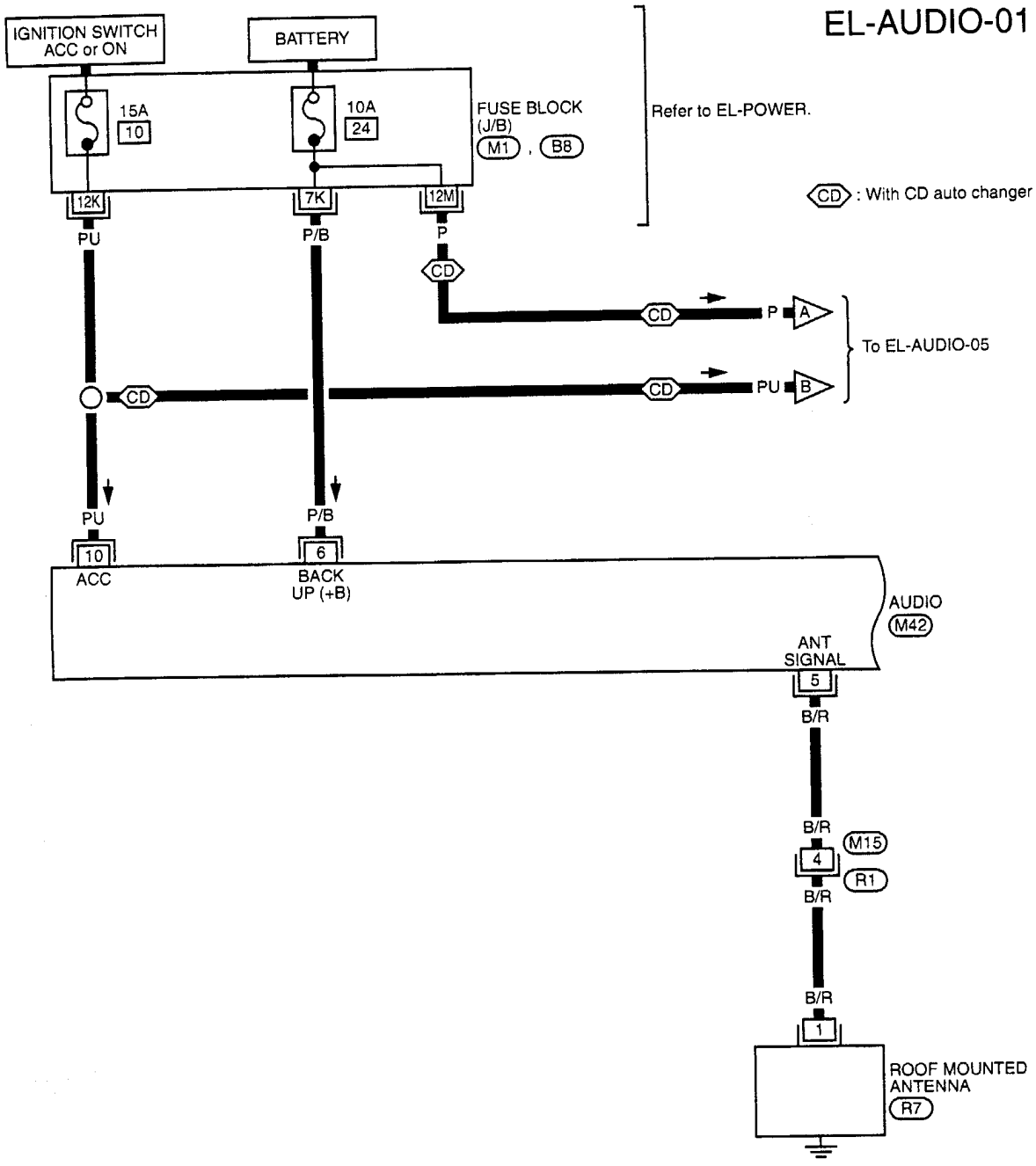
Schematic

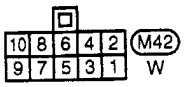


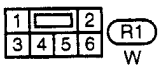
YEL440A

Wiring Diagram — AUDIO —

EL-AUDIO-01







Refer to last page (Foldout page).

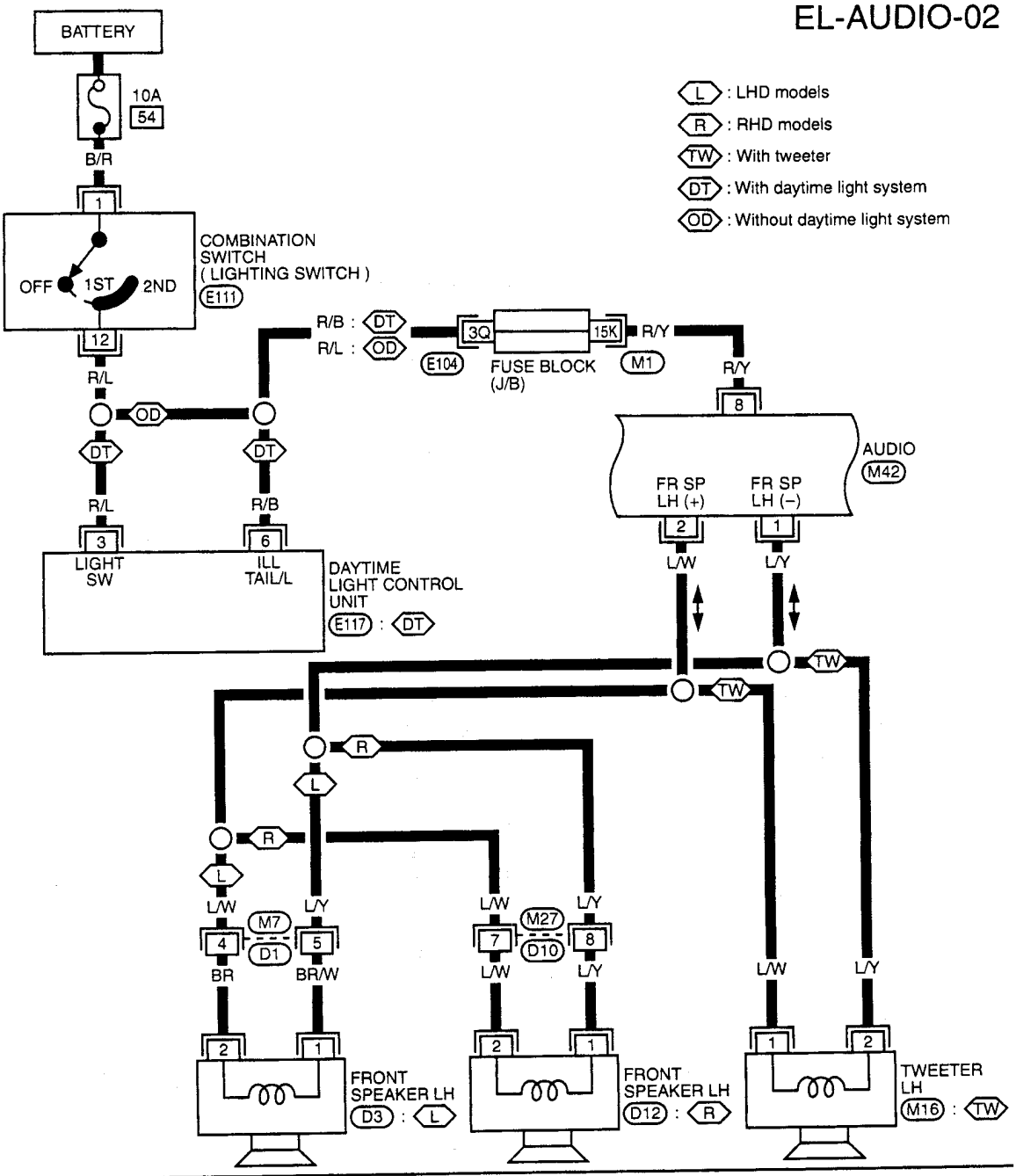
M1

B8

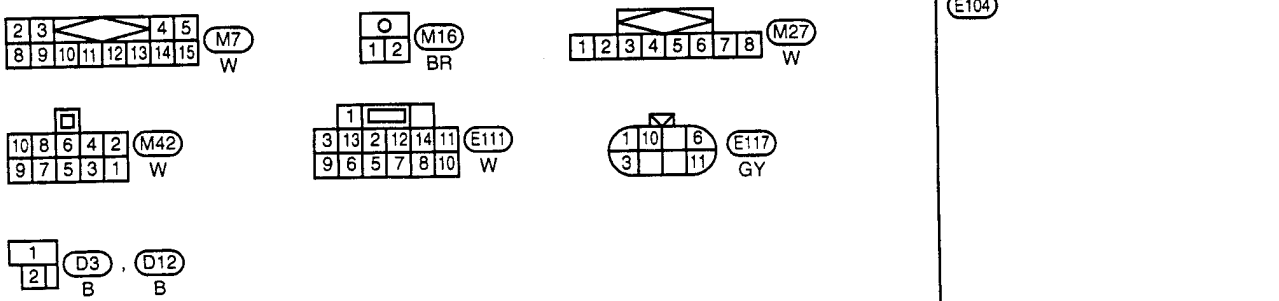
YEL441A

Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-02



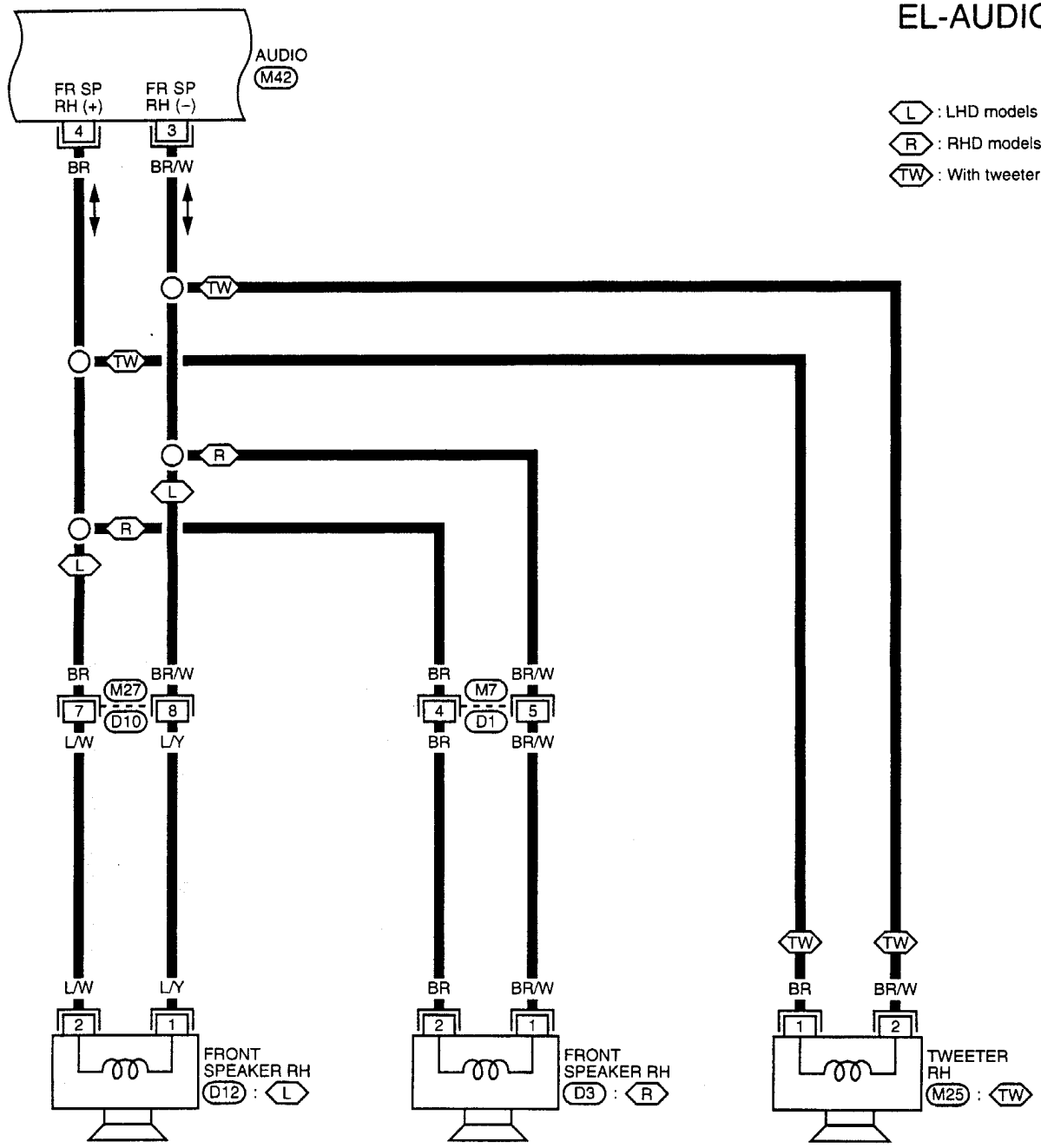
Refer to last page (Foldout page).
E104

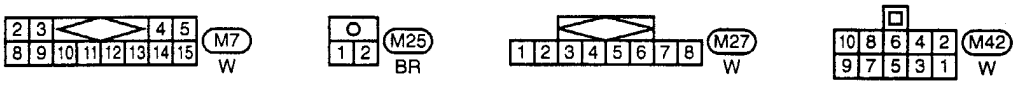


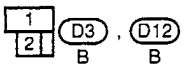
YEL442A

Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-03



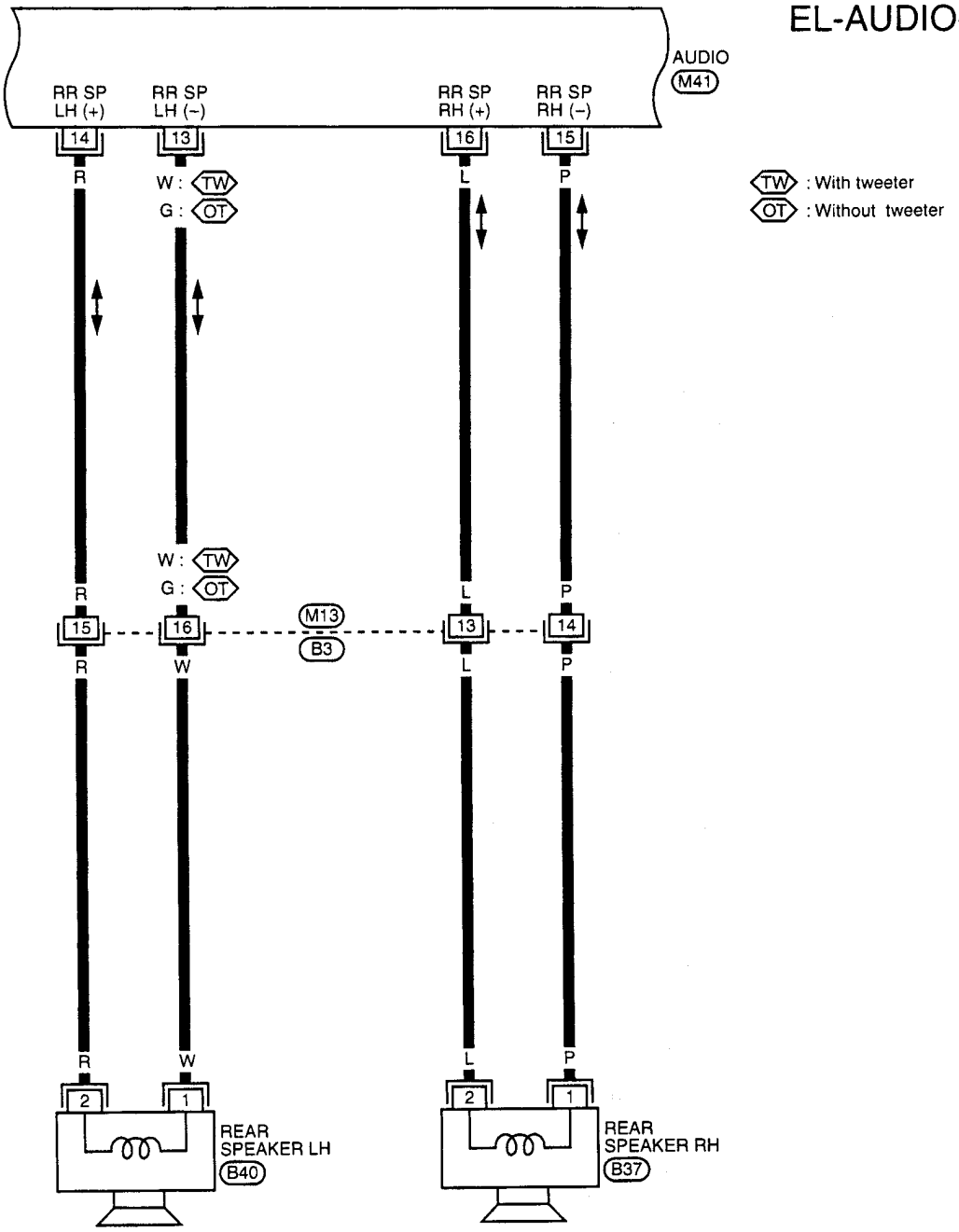


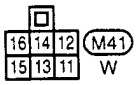


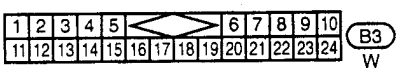
YEL443A

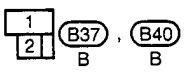
Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-04





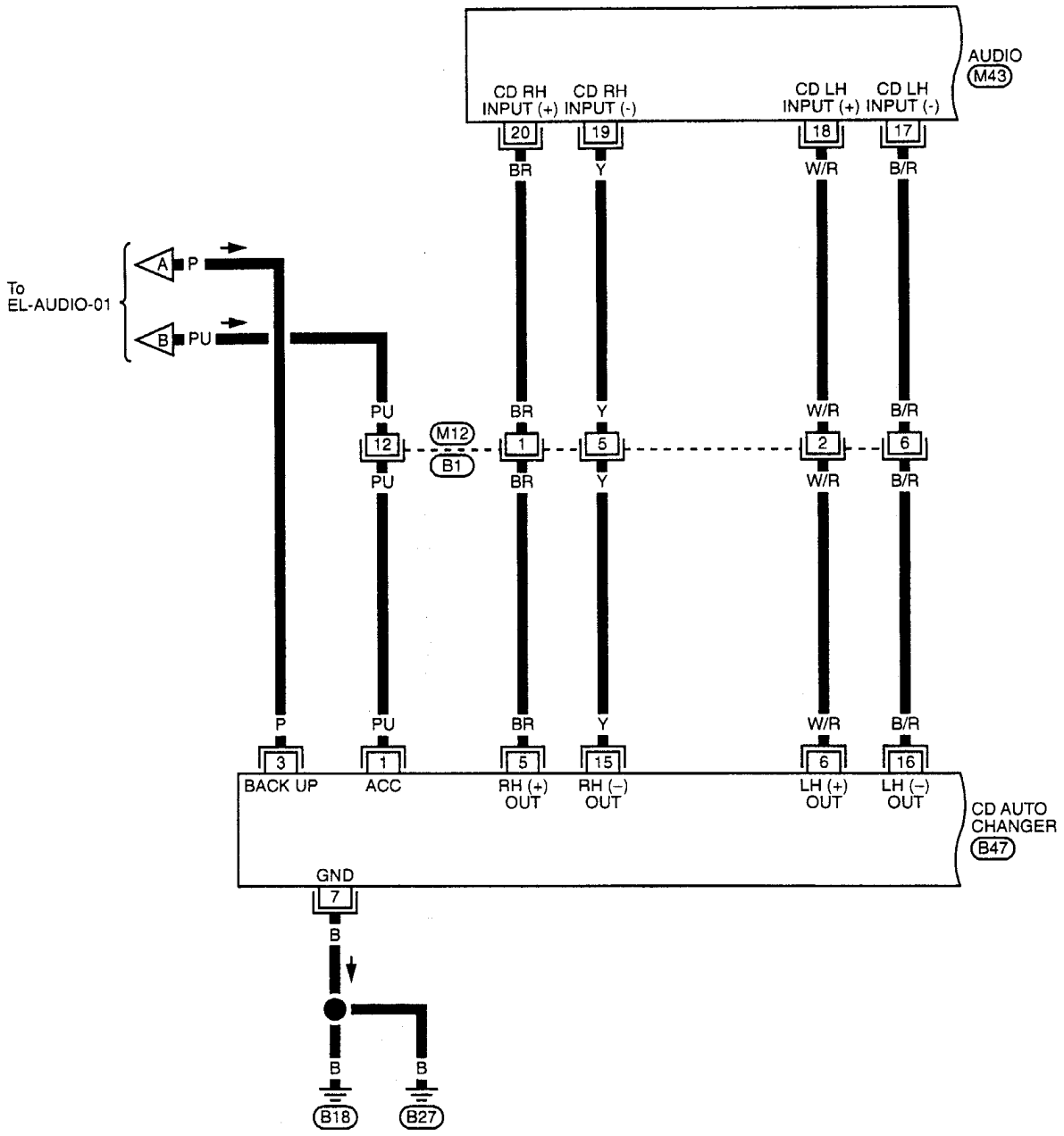


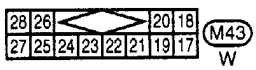


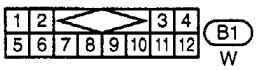
YEL444A

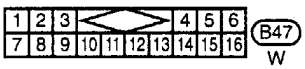
Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-05





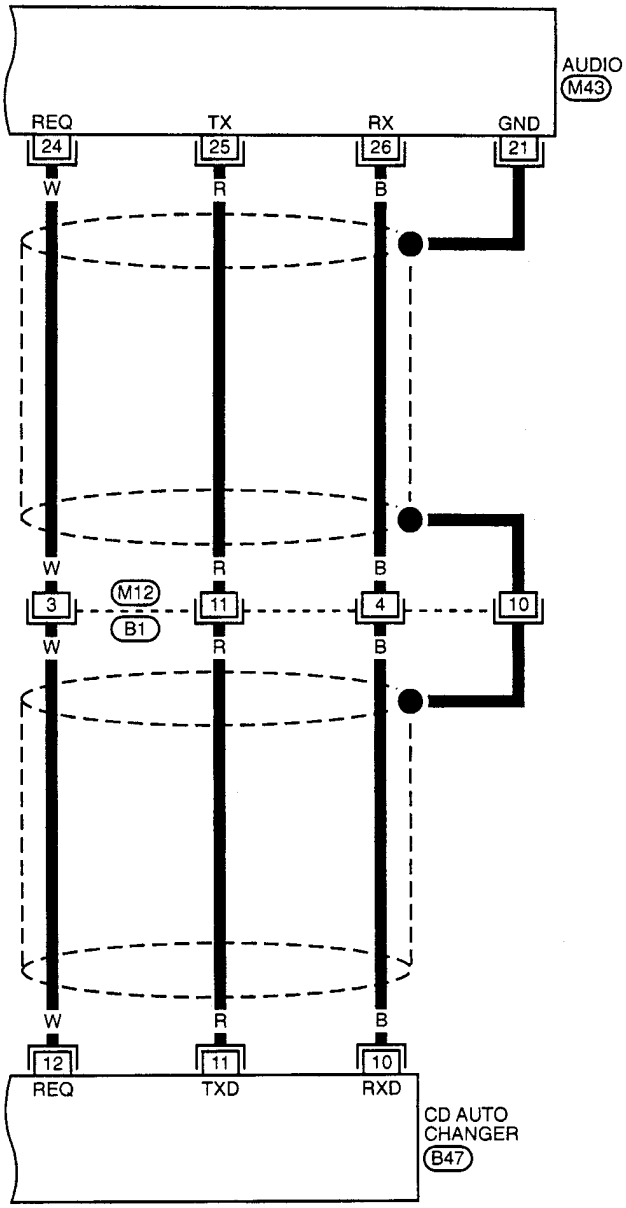


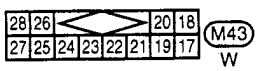


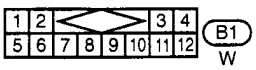
YEL445A

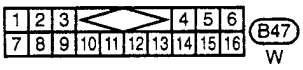
Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-06





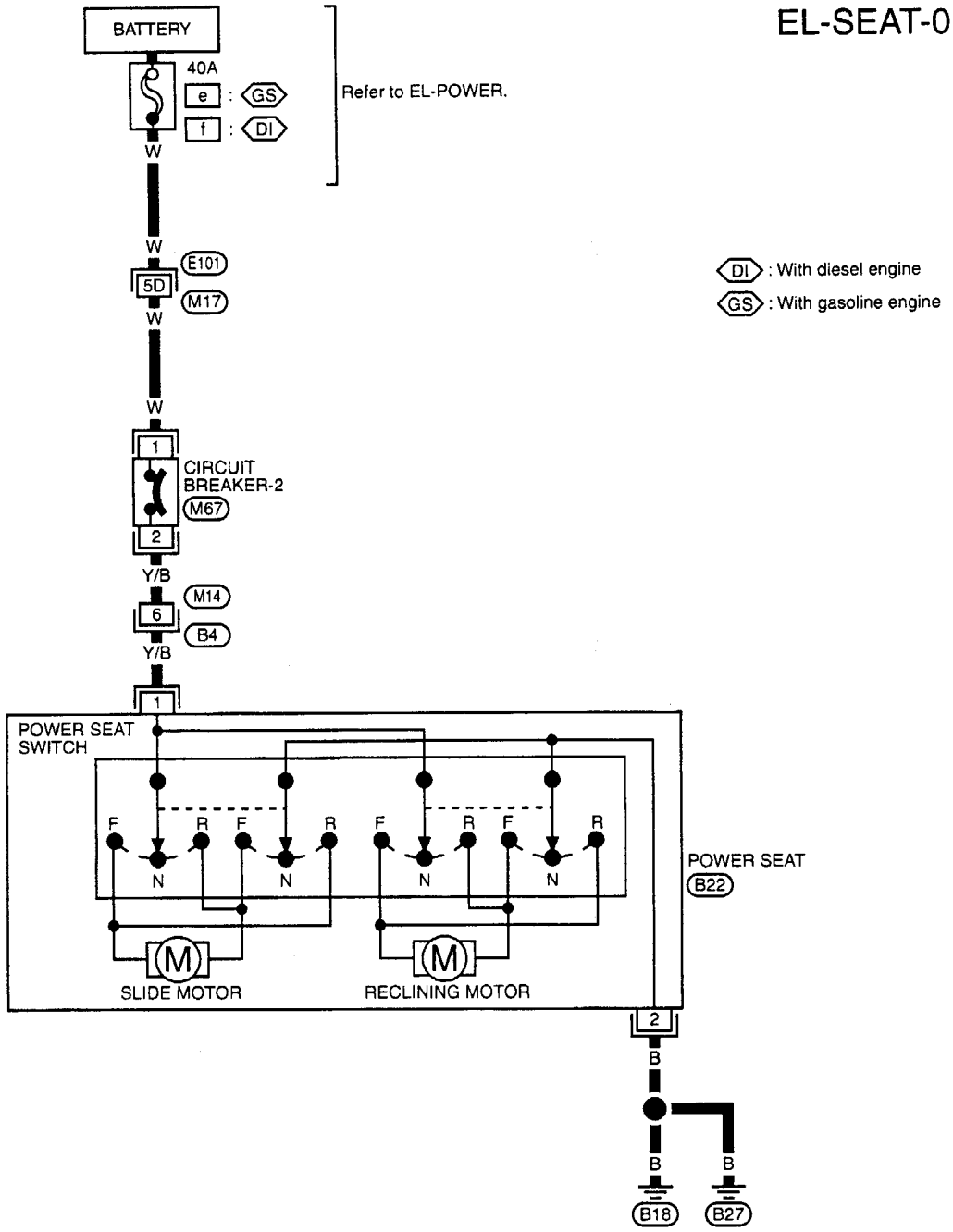


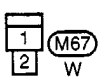


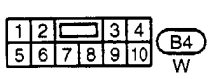
YEL446A

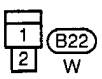
Wiring Diagram — SEAT —

EL-SEAT-01









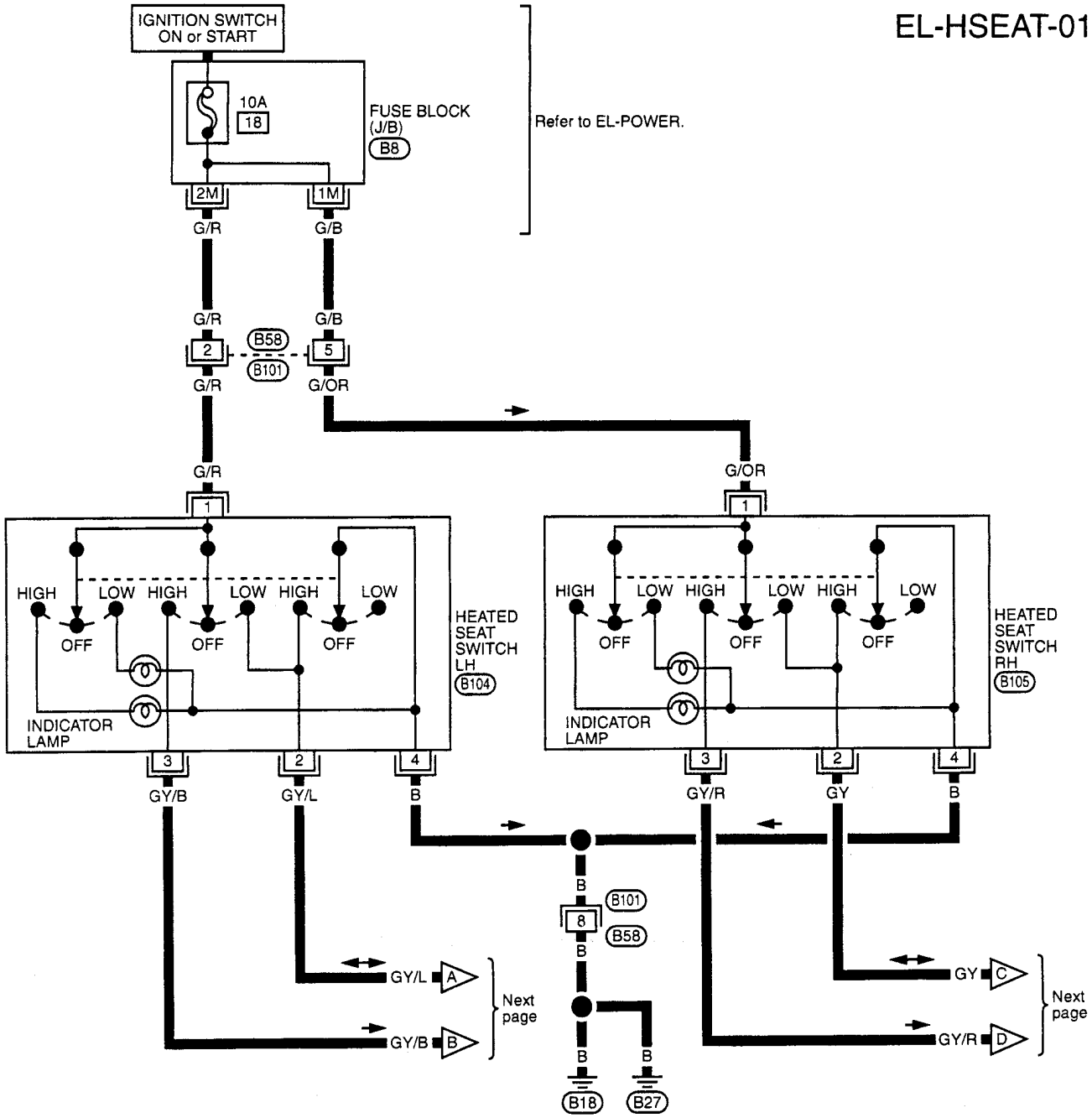
Refer to last page (Foldout page).
M17 , E101

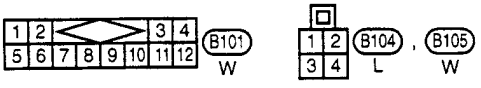
YEL447A

Wiring Diagram — H/SEAT —

★ For location of heating unit, refer to "SEAT" in BT section.

EL-HSEAT-01



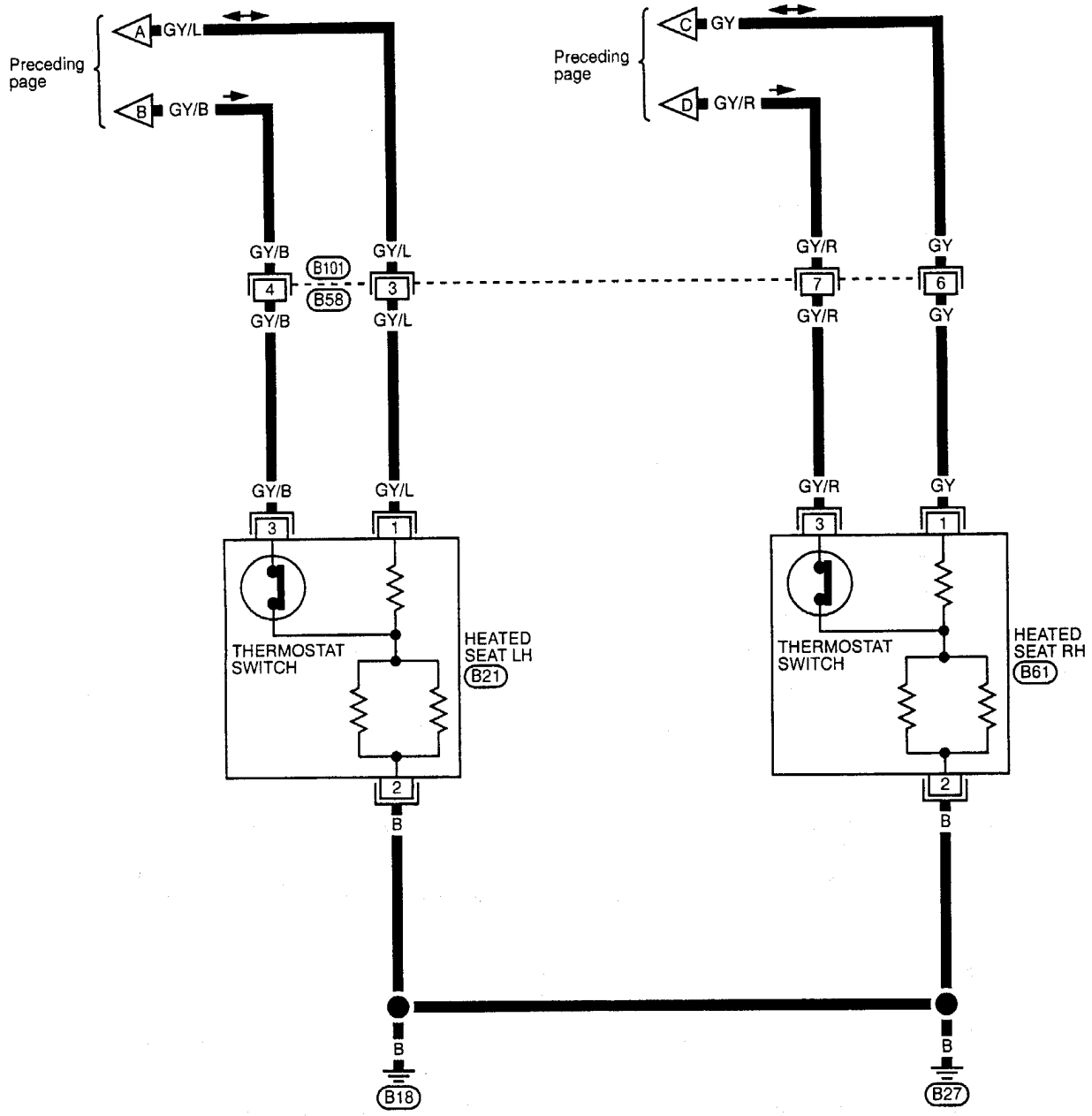


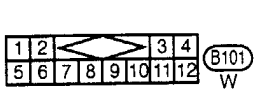
Refer to last page (Foldout page).
B8

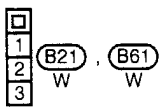
YEL448A

Wiring Diagram — H/SEAT — (Cont'd)

EL-HSEAT-02

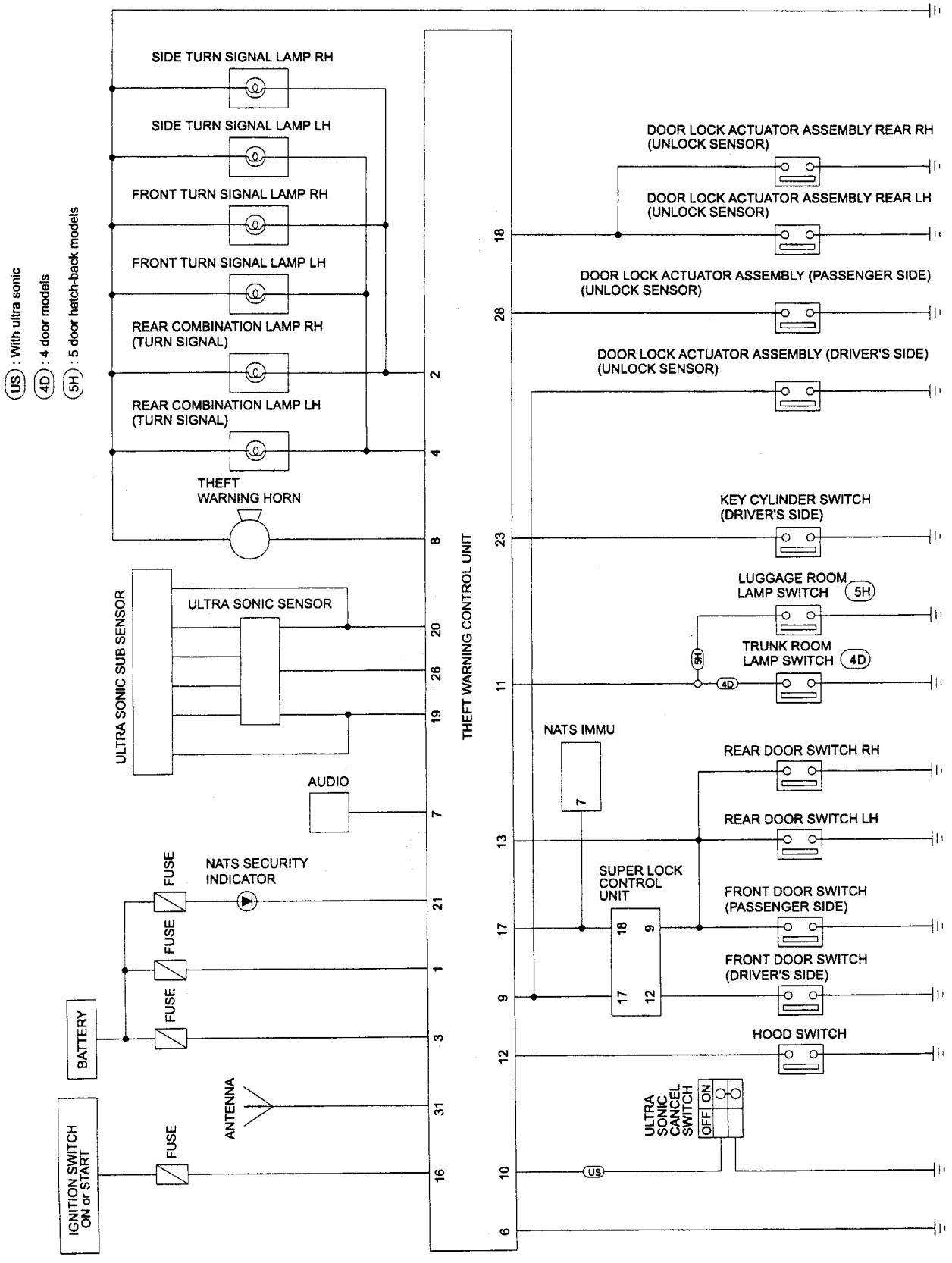






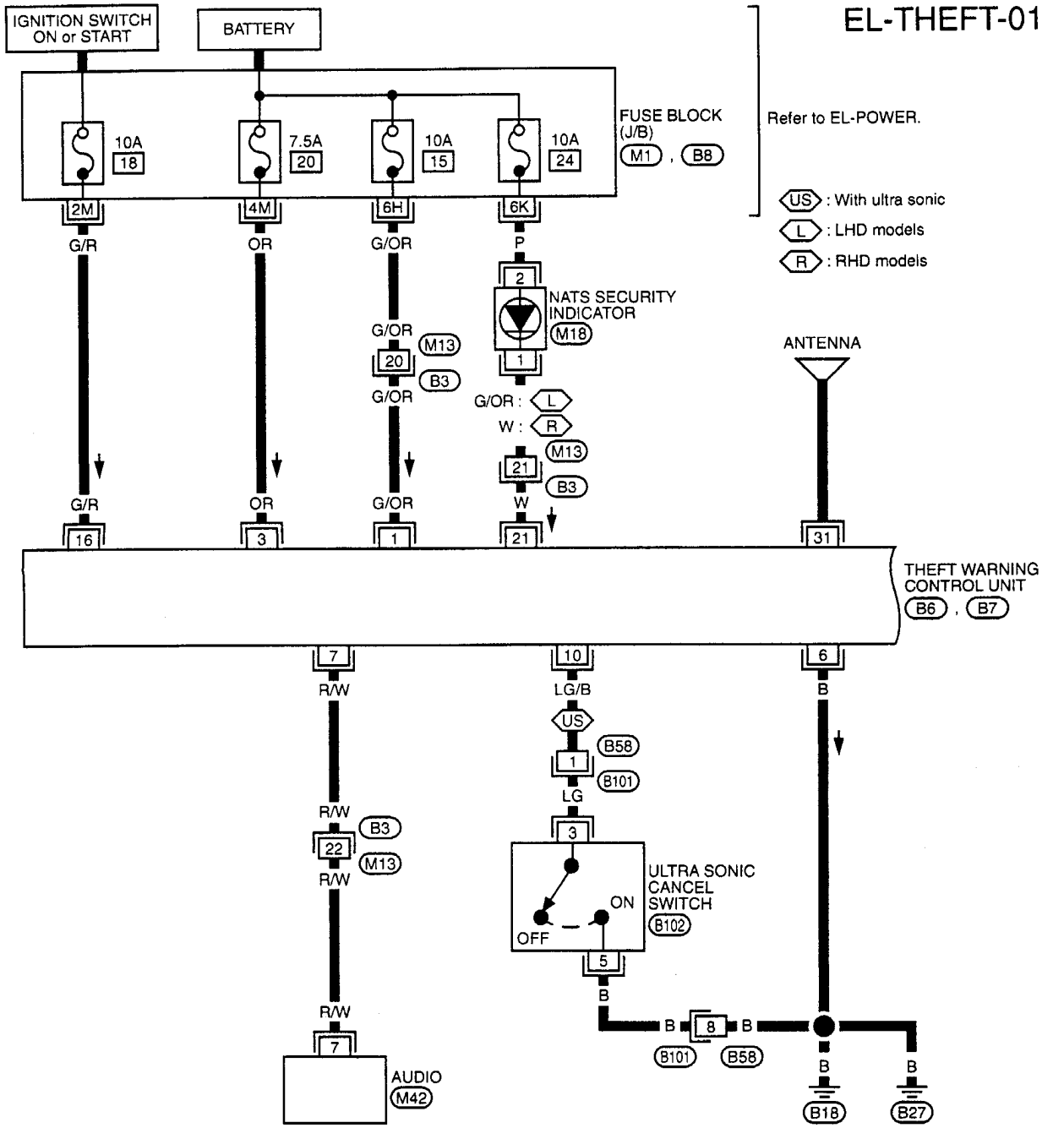
YEL744

Schematic



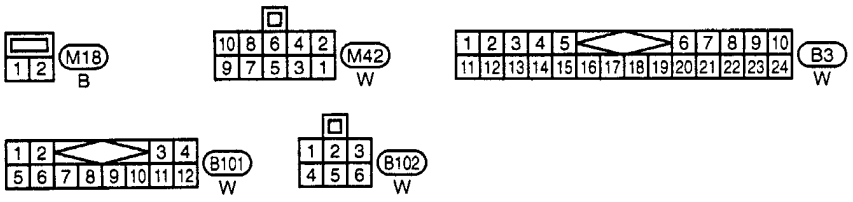
YEL449A

Wiring Diagram — THEFT —



Refer to last page (Foldout page).

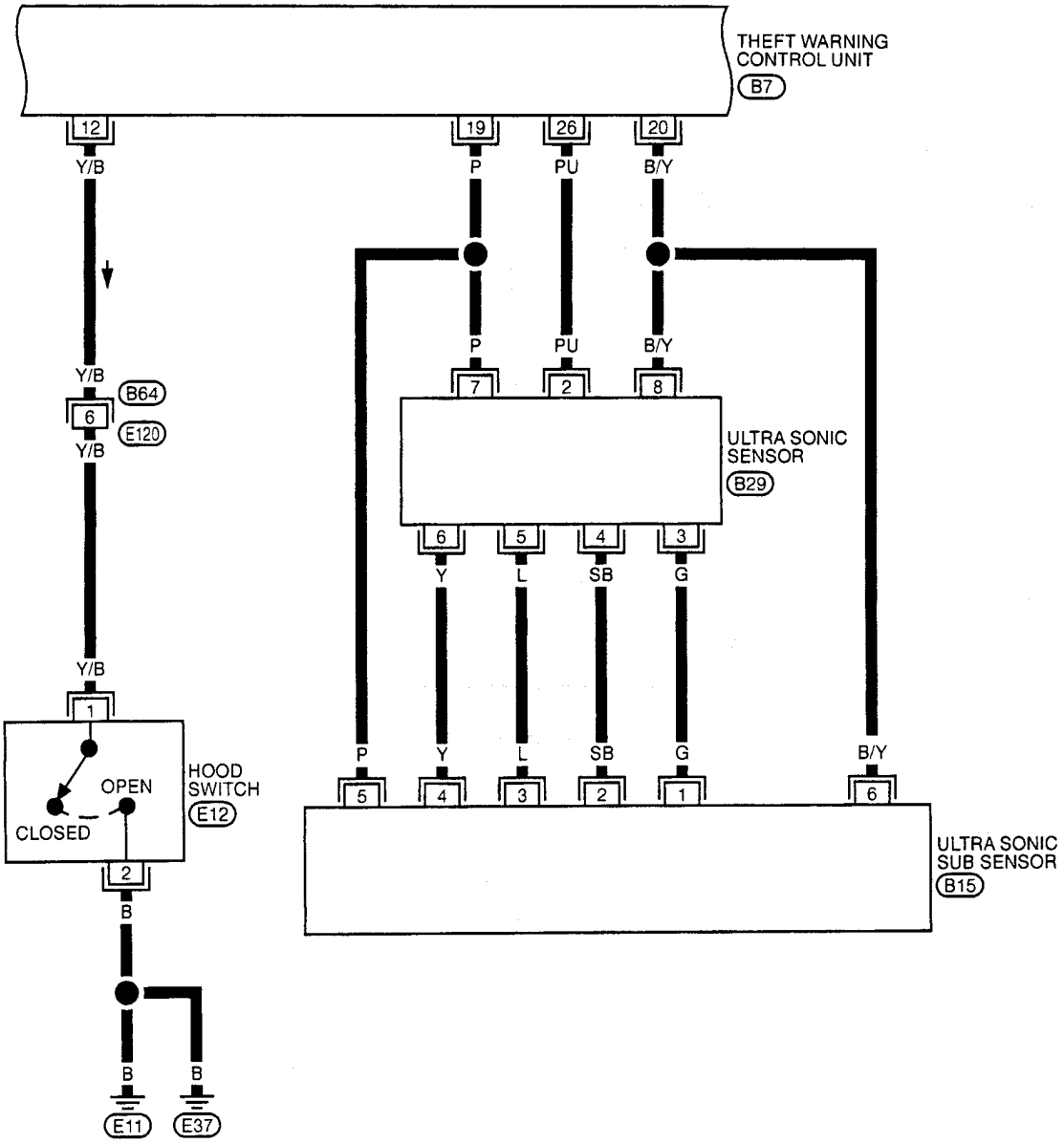
M1
B8
B6
B7



YEL450A

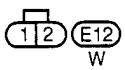
Wiring Diagram — THEFT — (Cont'd)

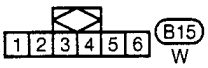
EL-THEFT-02

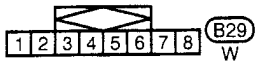


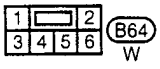
Refer to last page (Foldout page).

B7





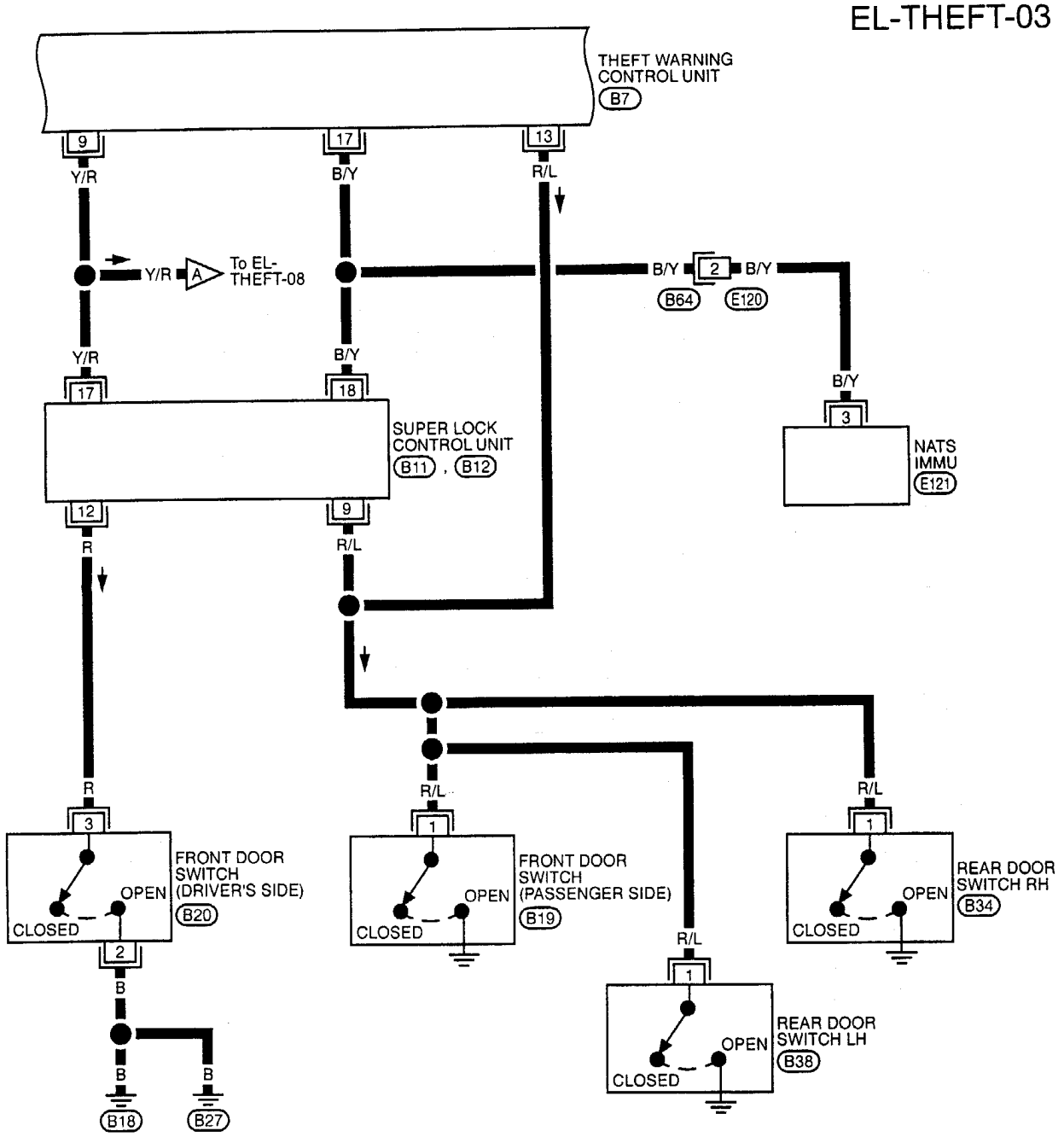


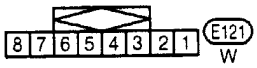


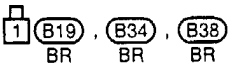
YEL451A

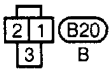
Wiring Diagram — THEFT — (Cont'd)

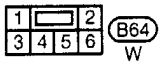
EL-THEFT-03











Refer to last page (Foldout page).

B7

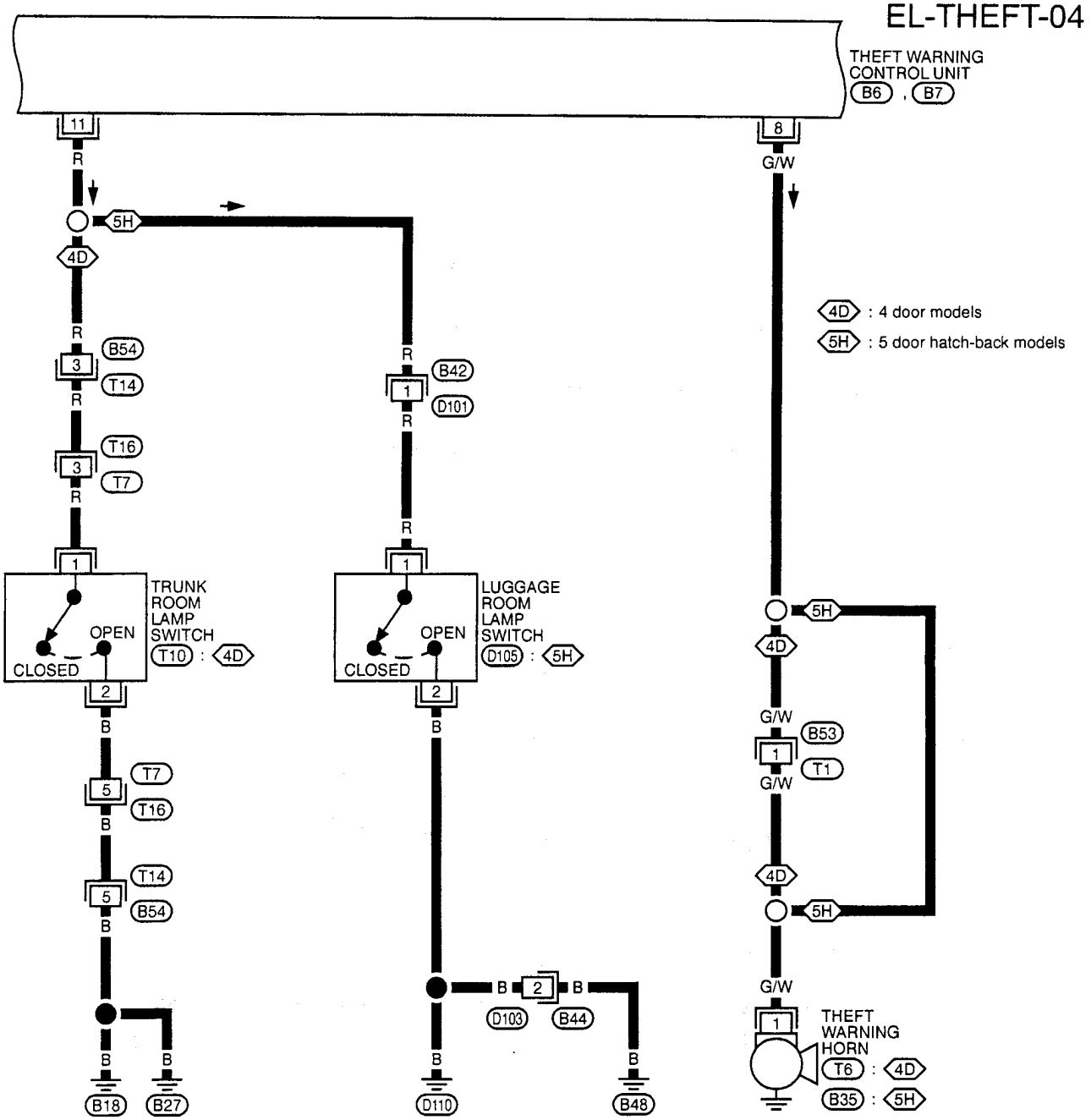
B11

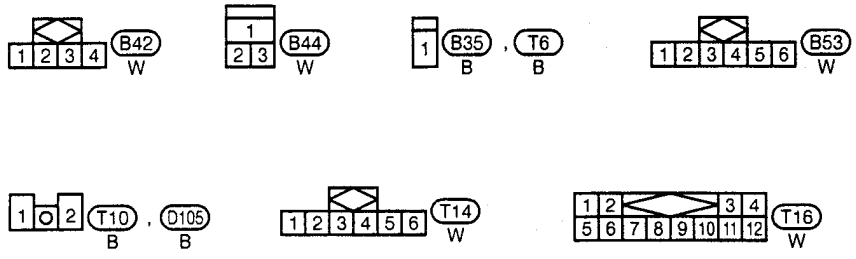
B12

YEL452A

Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-04





Refer to last page (Foldout page).

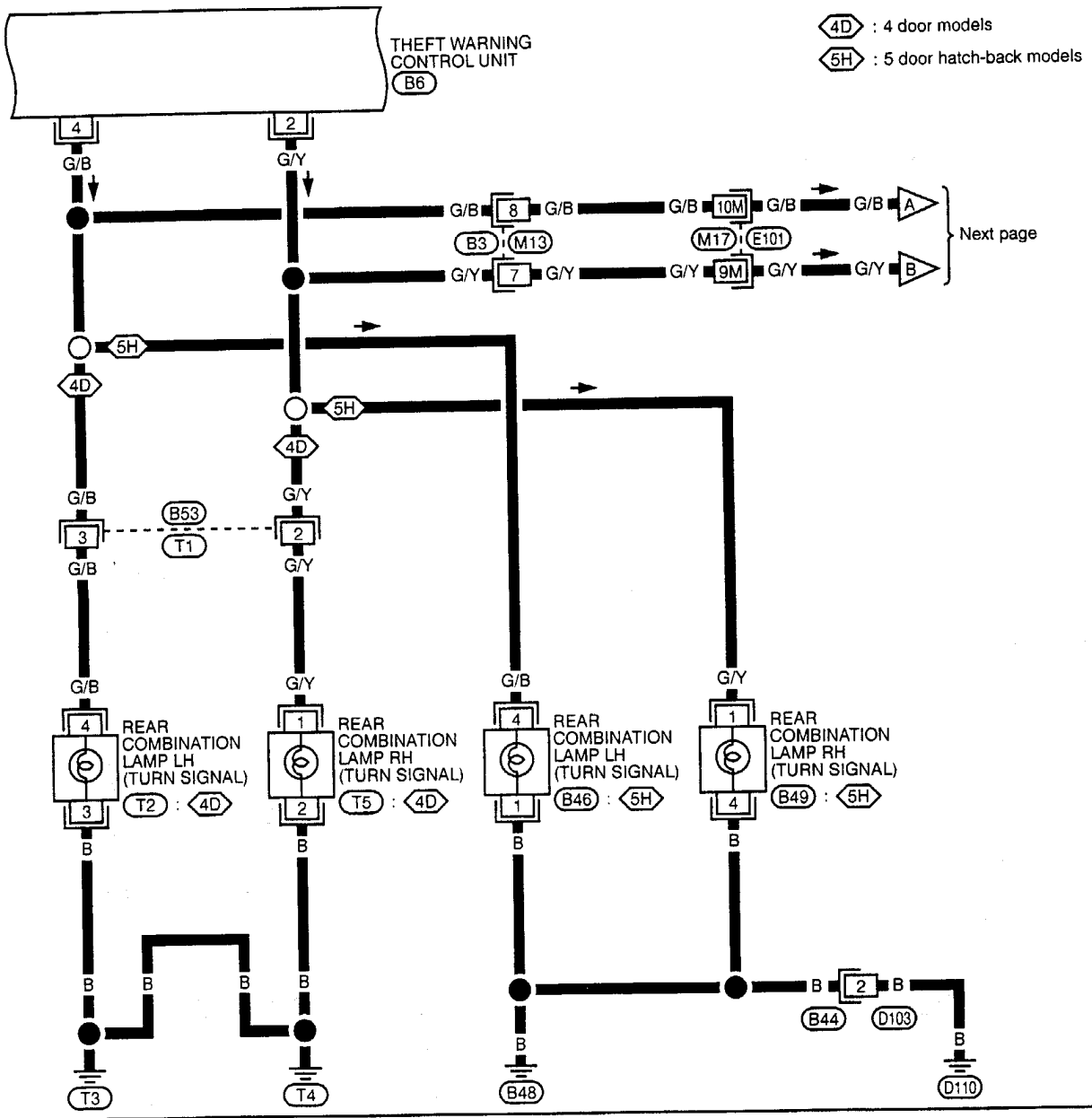
B6

B7

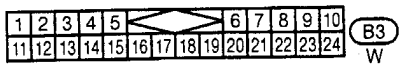
YEL453A

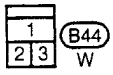
Wiring Diagram — THEFT — (Cont'd)

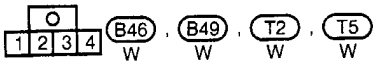
EL-THEFT-05

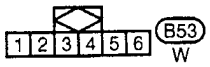


Refer to last page (Foldout page).
M17 , E101
B6





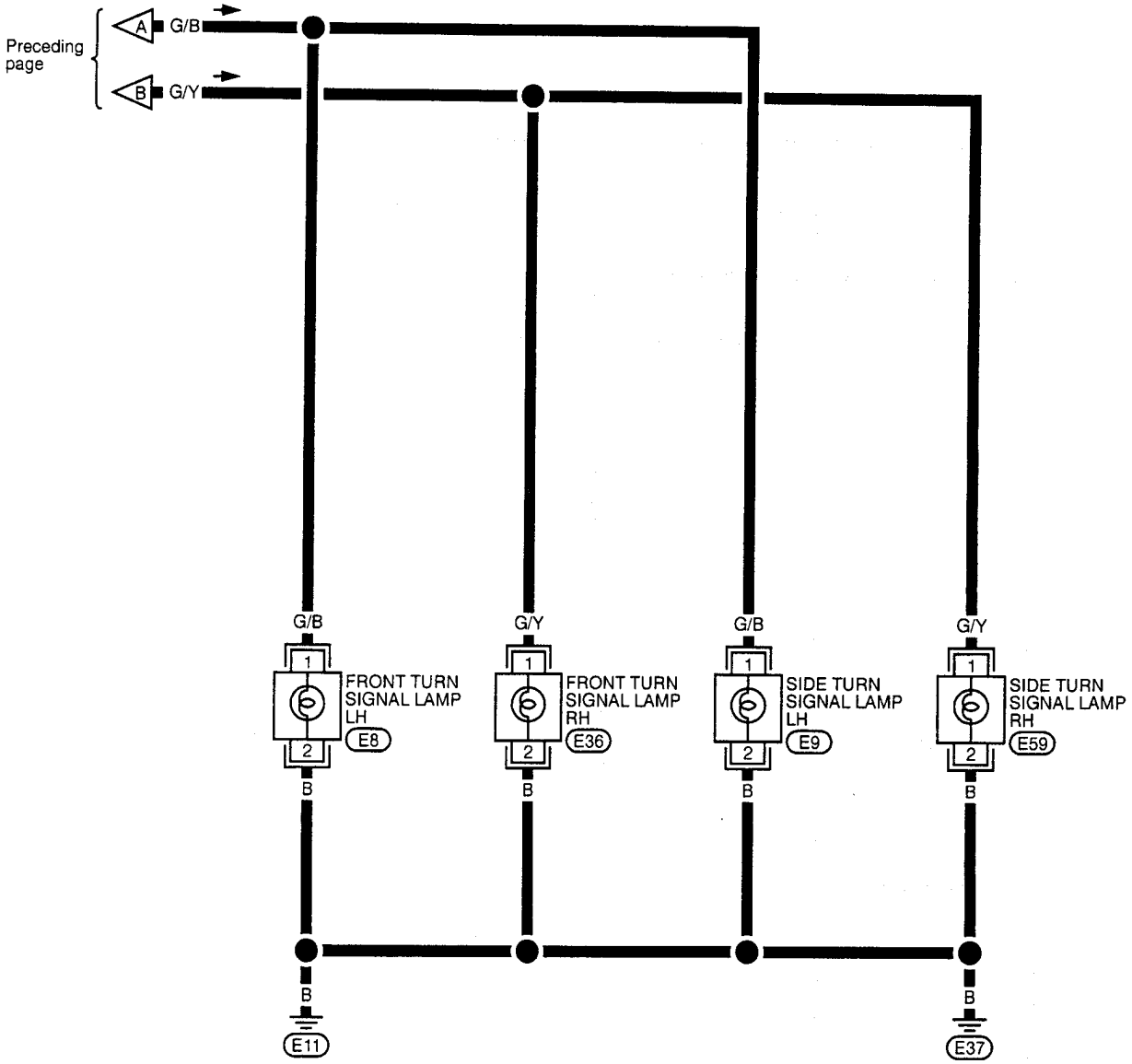




YEL454A

Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-06



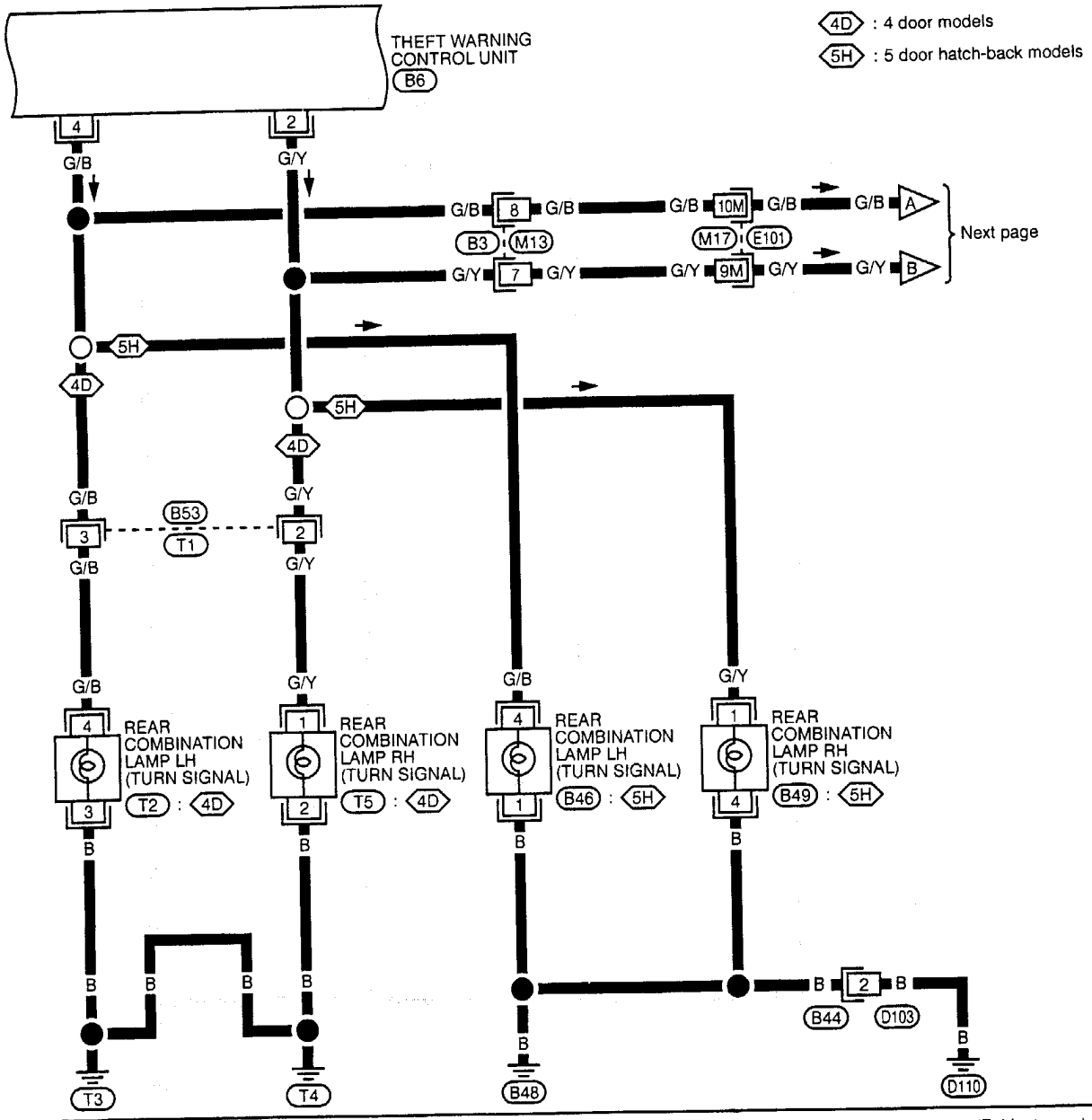
1 2 E8 GY , E36 GY

1 2 E9 B , E59 B

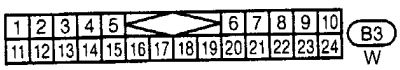
YEL757

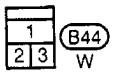
Wiring Diagram — THEFT — (Cont'd)

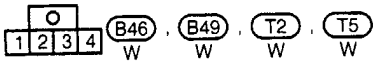
EL-THEFT-05

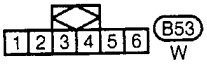


Refer to last page (Foldout page).
M17 , E101
B6





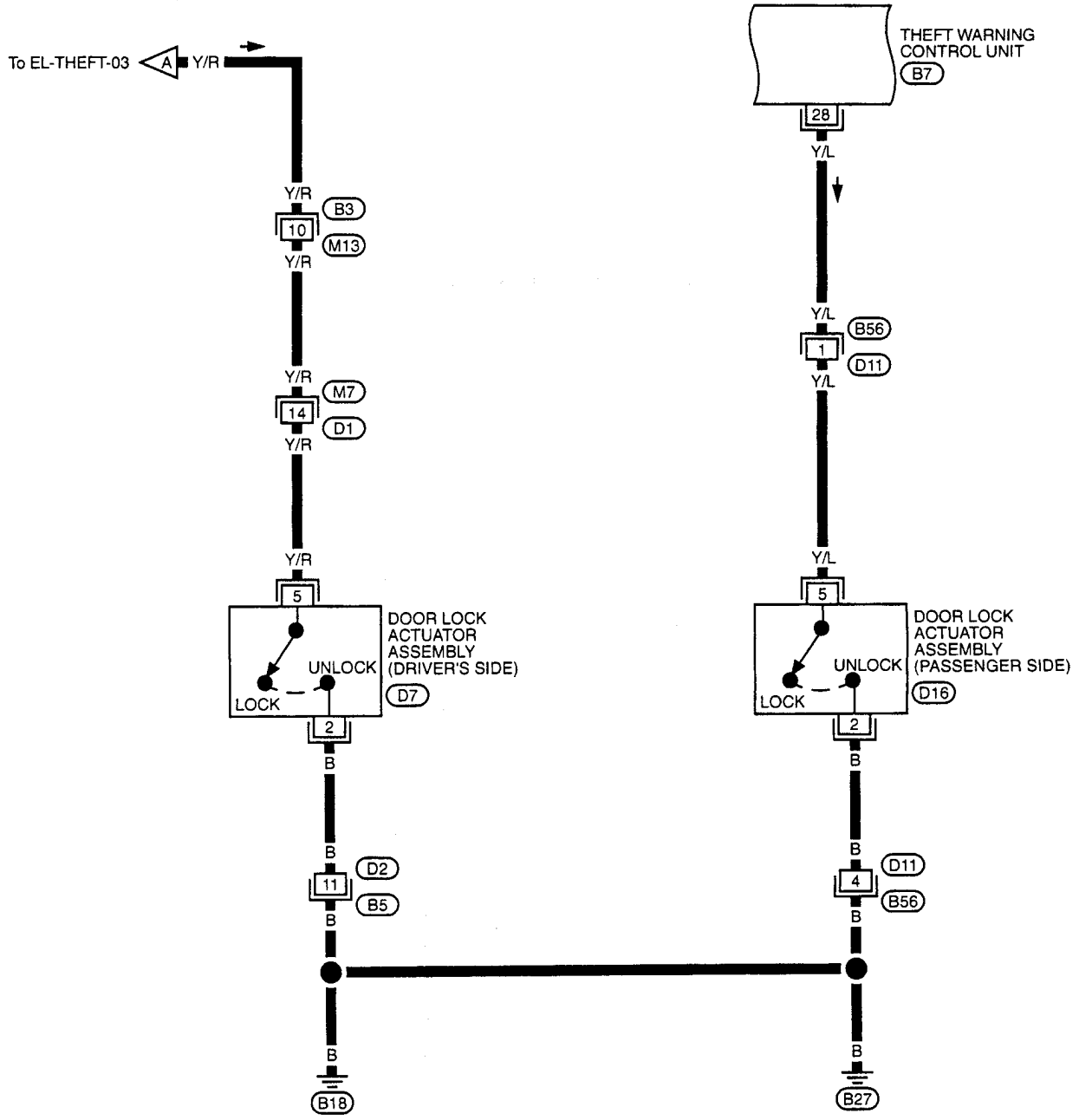




YEL454A

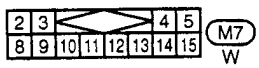
Wiring Diagram — THEFT — (Cont'd)

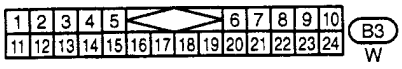
EL-THEFT-08

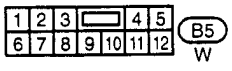


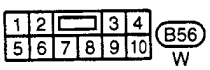
Refer to last page (Foldout page).

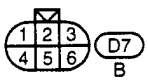
B7

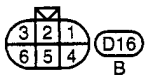








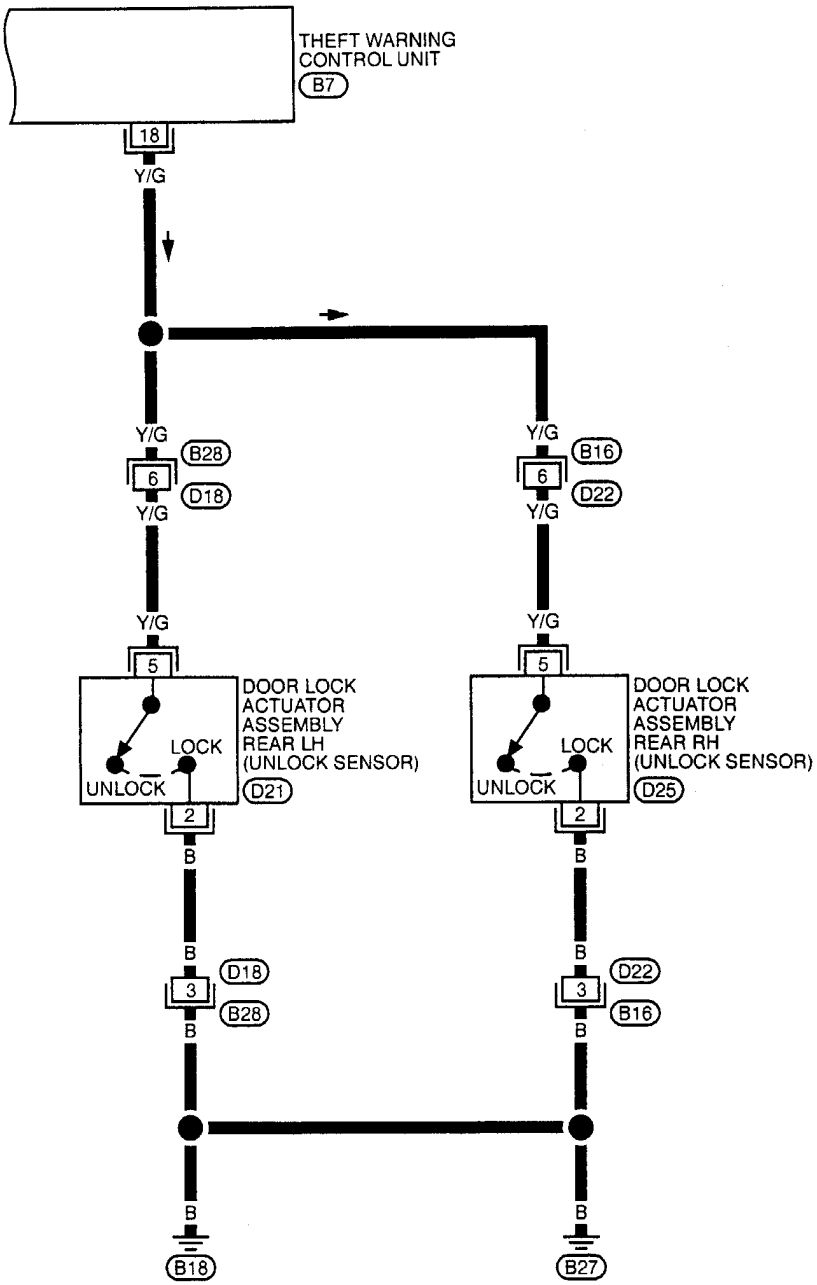


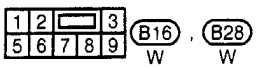


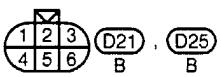
YEL456A

Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-09







Refer to last page (Foldout page).
B7

YEL457A

NOTE:
When performing CONSULT, select "V.2.0 (GASOLINE)" for both electrically controlled diesel and gasoline engines.

System Description

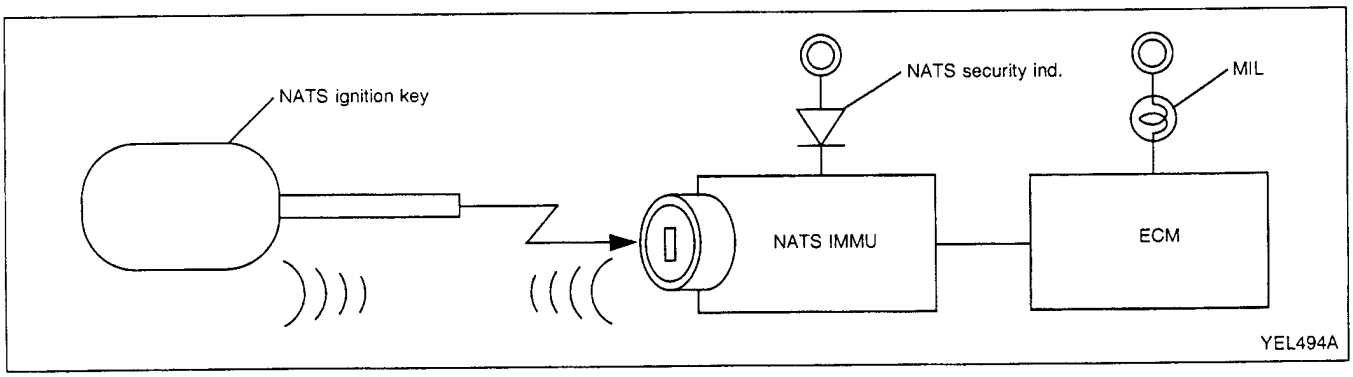
NATS has the following immobiliser functions:

- Since only NATS ignition keys, whose ID nos. have been registered into the ECM and IMMU of NATS, allow the engine to run, operation of a stolen vehicle without a NATS registered key is prevented by NATS.
- Both of the originally supplied ignition key IDs have been NATS registered.
  If requested by the vehicle owner, a maximum of four key IDs can be registered into the NATS components.
- The NATS security indicator (NATS security ind.) blinks when the ignition switch is in "LOCK" or "Acc" position. Therefore, NATS warns outsiders that the vehicle is equipped with the anti-theft system.
- When NATS detects trouble, the malfunction indicator lamp (MIL) blinks.
- NATS trouble diagnoses, system initialisation and additional registration of other NATS ignition key IDs must be carried out using CONSULT hardware and CONSULT NATS software.
  When NATS initialisation has been completed, the ID of the inserted ignition key is automatically NATS registered. Then, if necessary, additional registration of other NATS ignition key IDs can be carried out.
  Regarding the procedures of NATS initialisation and NATS ignition key ID registration, refer to CONSULT operation manual, NATS.
- When servicing a malfunction of the NATS (indicated by flashing of Malfunction Indicator Lamp) or registering another NATS ignition key ID no., it may be necessary to re-register original key identification. Therefore, be sure to receive all keys from vehicle owner.

System Composition

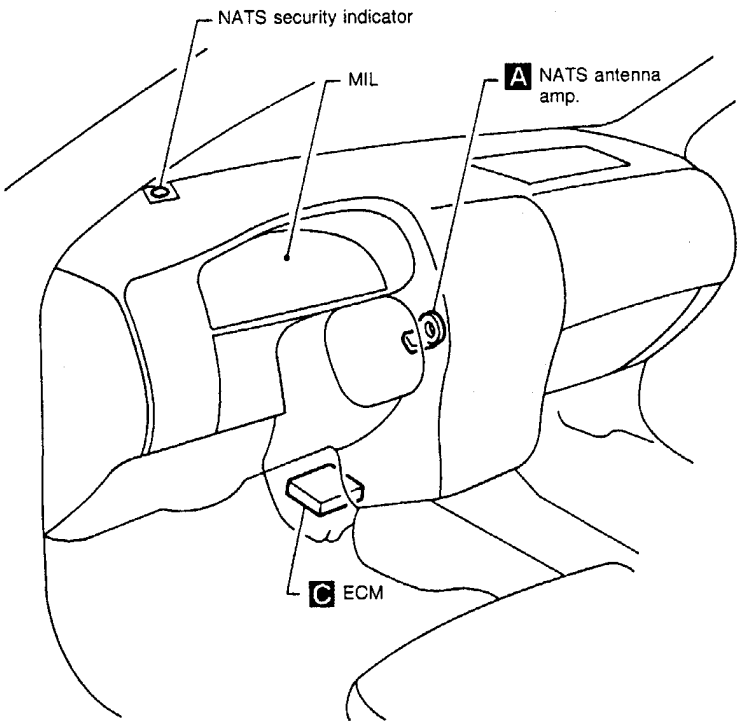
The immobiliser function of the NATS consists of the following:

- NATS ignition key
- NATS immobiliser control unit (NATS IMMU) located in the ignition key cylinder.
- Engine control module (ECM)
- NATS security indicator located under the center cluster (NATS security ind.)
- Malfunction indicator lamp (MIL)



Component Parts Location

LHD models



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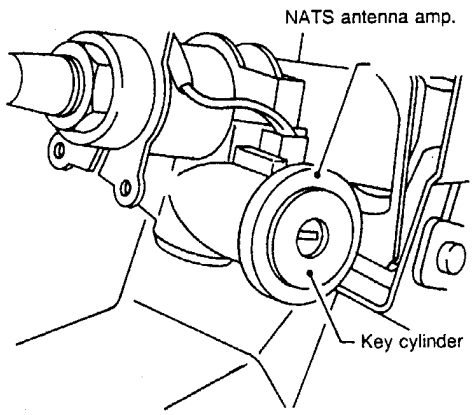
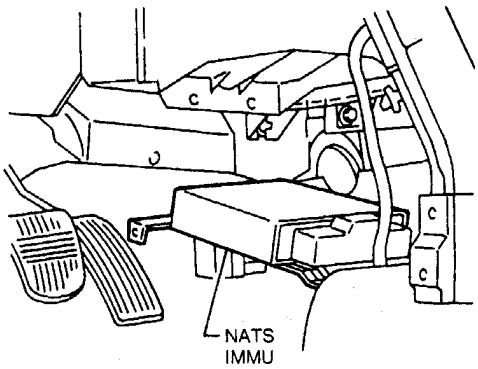
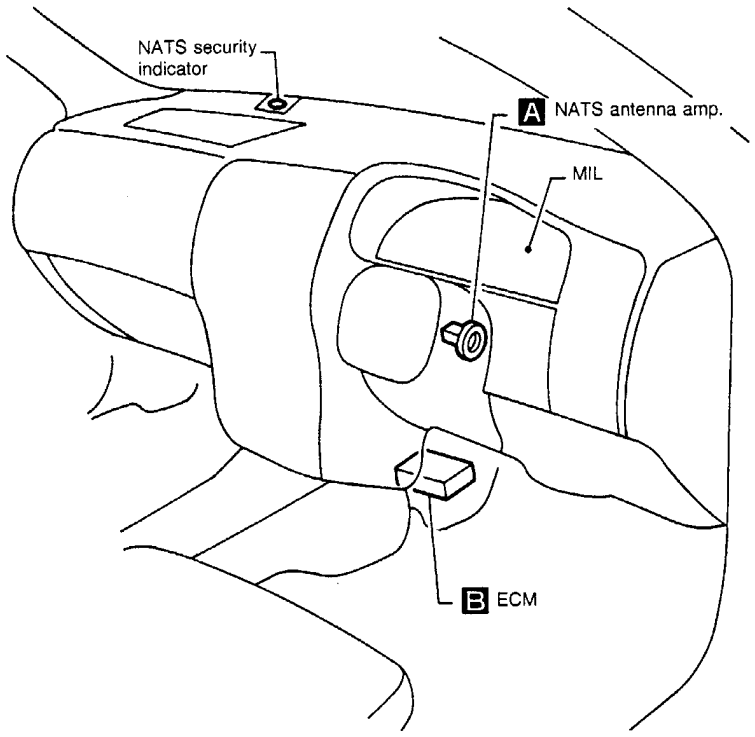


B



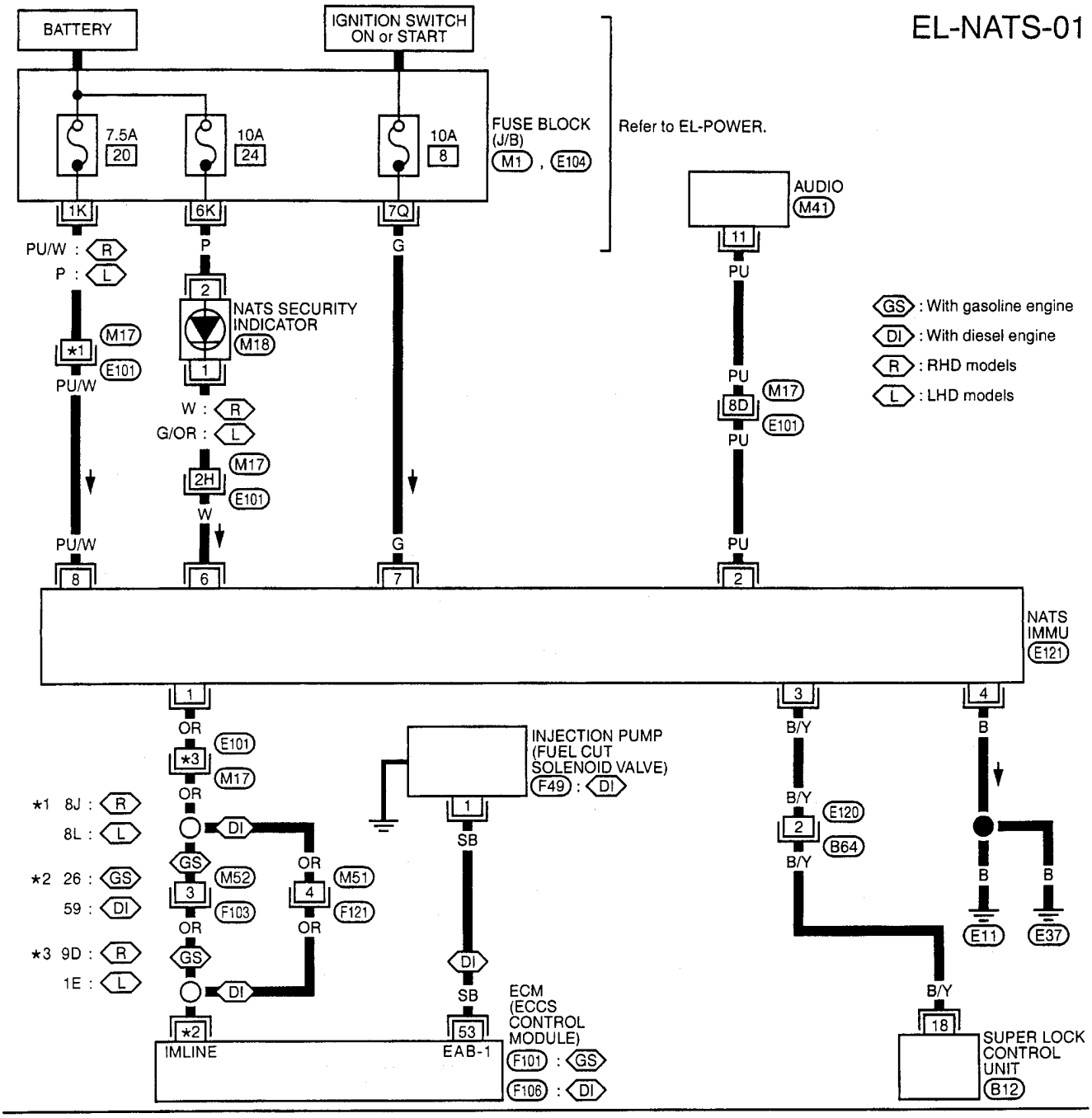
RHD models

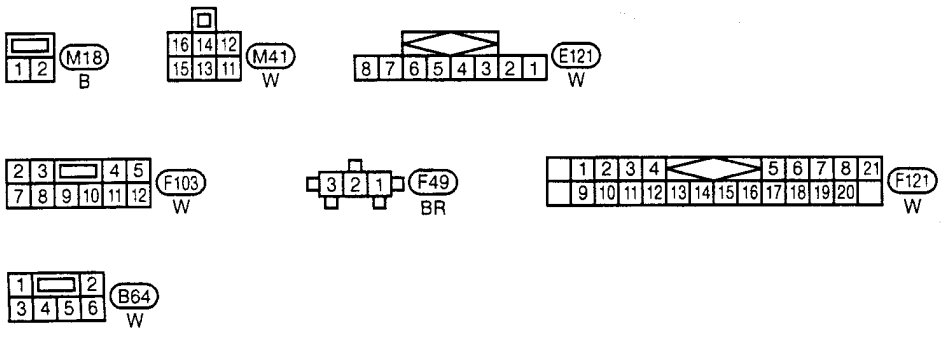


YEL495A

Wiring Diagram — NATS —

EL-NATS-01





Refer to last page (Foldout page).

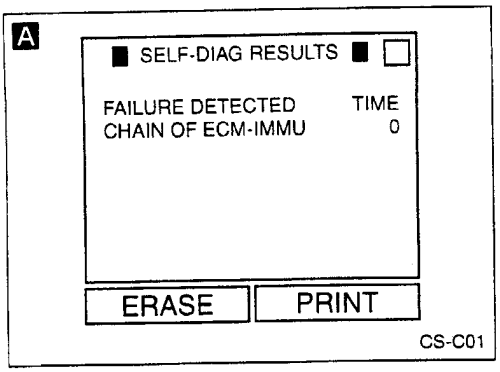
M1
M17 , E101
E104
F101
F106
B12

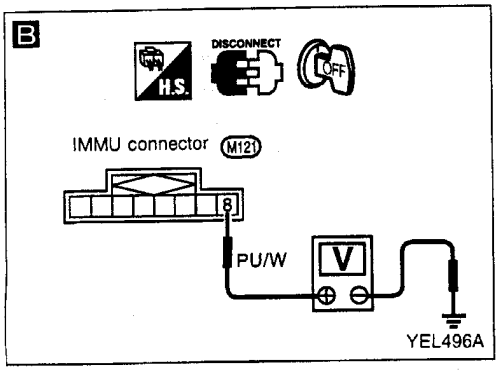
YEL458A

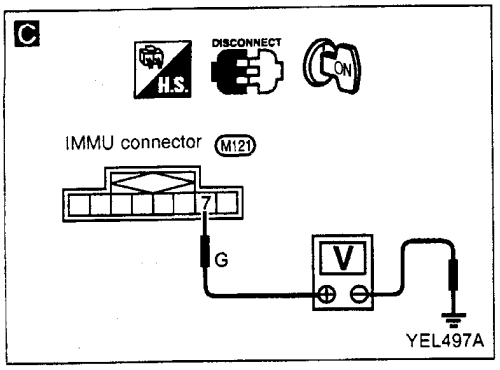
Trouble Diagnoses

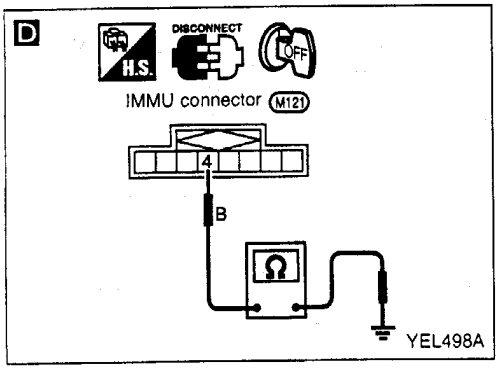
DIAGNOSTIC PROCEDURE 3

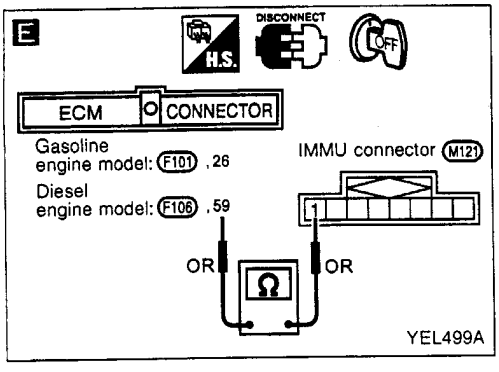
Self-diagnostic results:
"CHAIN OF ECM-IMMU" displayed on CONSULT screen











A

Confirm SELF-DIAGNOSTIC RESULTS "CHAIN OF ECM-IMMU" displayed on CONSULT screen.

OK ↓

B

Check voltage between terminal ⑧ of IMMU and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following:
- 7.5A fuse [No. 20], located in the fuse box(J/B)]
- Harness for open or short between fuse and IMMU connector

Ref. part No. C1

OK ↓

C

Check voltage between terminal ⑦ of IMMU and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following:
- 10A fuse [No. 8], located in the fuse block (J/B)]
- Harness for open or short between fuse and IMMU connector

Ref. part No. C2

OK ↓

D

Check harness continuity between IMMU terminal ④ and ground.
Continuity should exist.

NG → Repair harness
Ref. part No. C3

OK ↓

E

Check harness continuity between the following ECM terminals and IMMU terminals.

Engine	ECM connector No.	Terminal No.	IMMU terminal No. No.
Gasoline	F101	26	1
Diesel	F106	59	1

Continuity should exist.

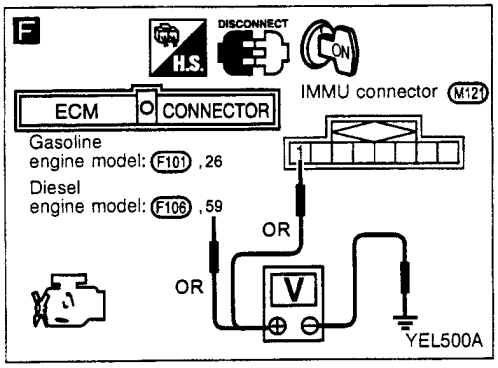
NG → Communication line is open circuit.
Repair harness or connectors.
Ref. part No. C4

OK ↓

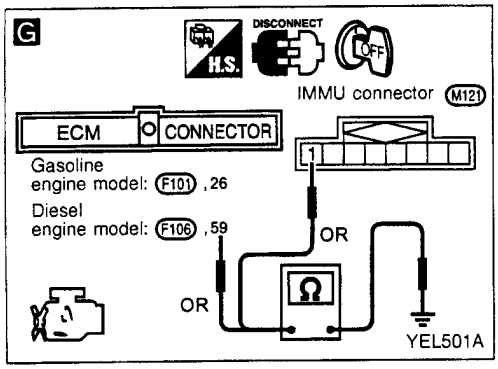
Ⓐ

Trouble Diagnoses (Cont'd)

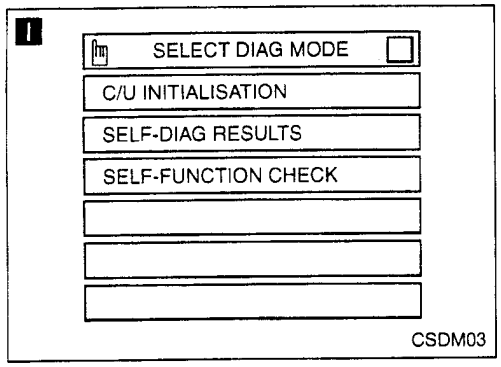
F



G



I



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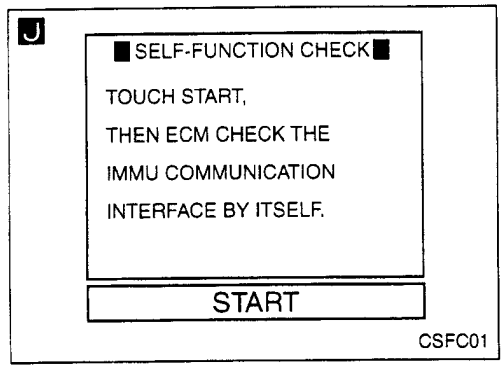


Ⓐ

F

CHECK COMMUNICATION LINE CIRCUIT.

1) Disconnect ECM connector and IMMU connector.
2) Check voltage between the following terminals and ground.

Unit	Connector No.	Terminal No.
Gasoline engine	F101	26
Diesel engine	F106	59
IMMU	M121	1

Voltage: 0V

NG → Communication line is short-circuited with battery voltage line or ignition switch ON line. Repair harness or connectors. **Ref. part No. C4**

OK

G

Check continuity between the following terminals and ground.

Unit	Connector No.	Terminal No.
Gasoline engine	F101	26
Diesel engine	F106	59
IMMU	M121	1

Continuity should not exist.

NG → Communication line is short-circuited with ground line. Repair harness or connectors. **Ref. part No. C4**

OK

H

SELF-FUNCTION CHECK

1) Connect ECM connector and disconnect IMMU connector.
2) Turn ignition switch to "ON" position.
3) Touch "SELF-FUNCTION CHECK" on CONSULT "SELECT DIAG MODE" screen.

I

Touch "START". ECM will then check its communication interface by itself.

NG → **J** (See next page.) ECM is malfunctioning. Replace ECM. **Ref. part No. B**

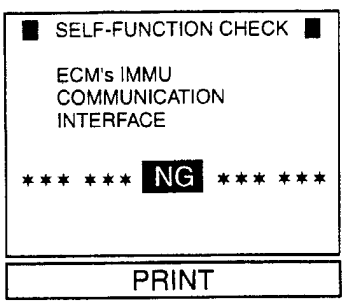
Perform initialisation with CONSULT. For the operation of initialisation, refer to "CONSULT operation manual NATS V.2.0".

OK

K (See next page.)

Ⓑ

J

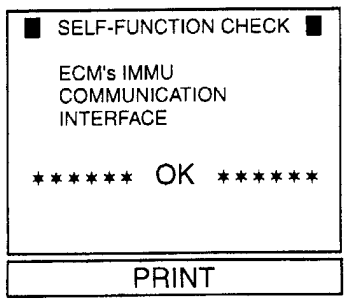


Ⓑ

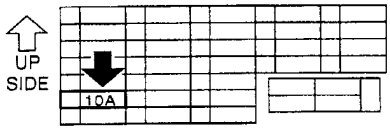
IMMU is malfunctioning.
Replace IMMU.
Ref. part No. A

Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V.2.0".

K



A



YEL858

DIAGNOSTIC PROCEDURE 8
"NATS SECURITY IND. DOES NOT LIGHT UP"

A

Check 10A fuse [No. 24, located in the fuse block (J/B)].

NG → Replace fuse.

OK

NATS INITIALISATION
1) Install the 10A fuse.
2) Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V.2.0".

Turn ignition switch to "LOCK" position.

Start engine and turn ignition switch to "LOCK" position.

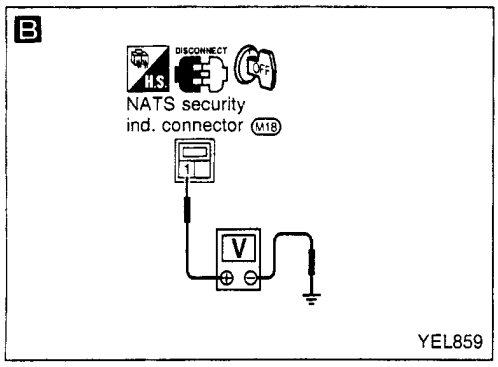
Check NATS security ind. blinking.

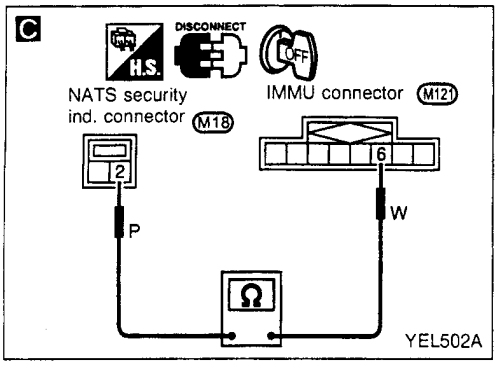
OK → END

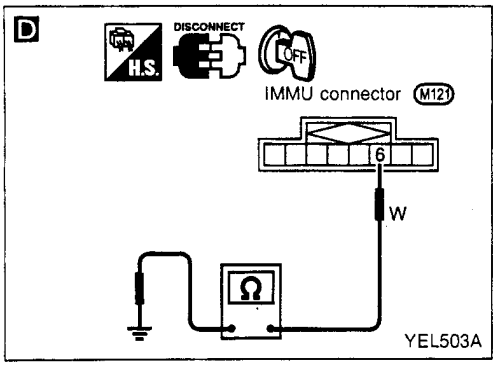
NG

Ⓐ

Trouble Diagnoses (Cont'd)







Ⓐ

B

Check voltage between NATS security ind. connector terminal ① and ground.
Voltage : Battery voltage

NG → Check harness continuity between fuse and NATS security ind.

OK ↓

C

CHECK NATS SECURITY IND. CIRCUIT.
1) Disconnect NATS IMMU connector.
2) Check harness continuity between NATS security ind. connector terminal ② and NATS IMMU connector terminal ⑥.
Continuity should exist.

NG → Repair harness.

OK ↓

D

CHECK NATS IMMU FUNCTION
1) Connect NATS IMMU connector.
2) Disconnect NATS security ind. connector.
3) Check resistance between NATS IMMU terminal ⑥ and ground.
Resistance should be less than 1kΩ.

NG → NATS IMMU is malfunctioning. Replace IMMU.

Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V.2.0".

OK ↓

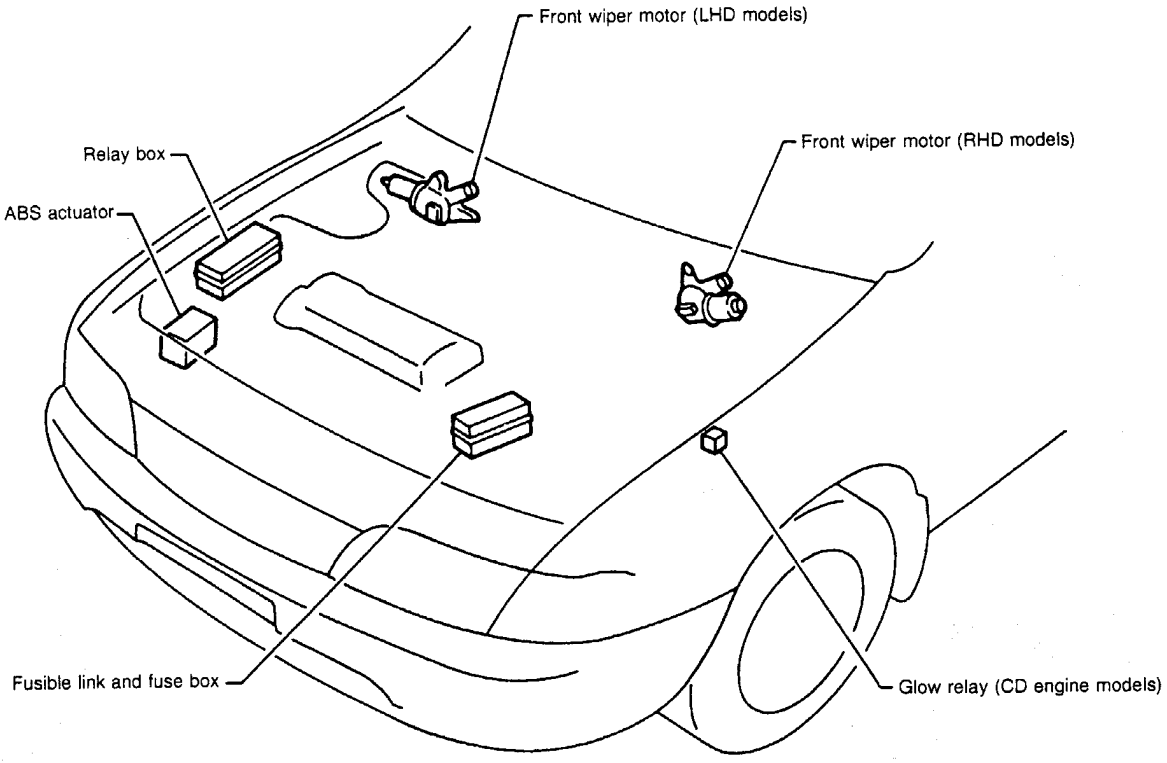
NATS security ind. is malfunctioning.
Pull out NATS security ind. with harness and connector.
Check harness connection

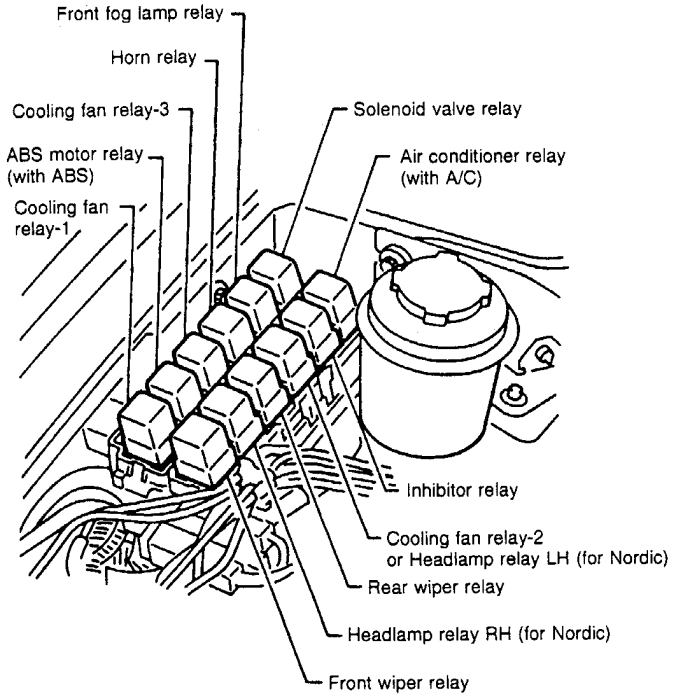
NG → Repair harness.

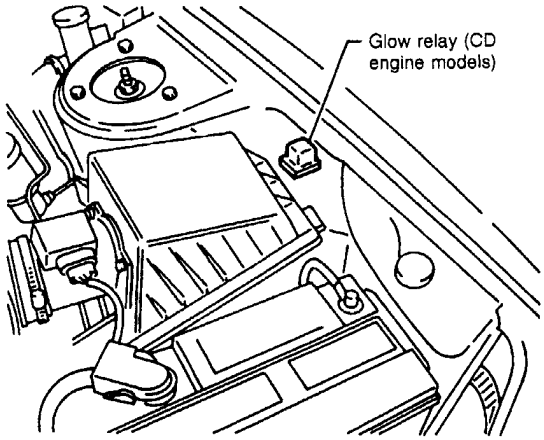
OK ↓

NATS security ind. cell is malfunctioning.
Replace NATS security ind.

Engine Compartment



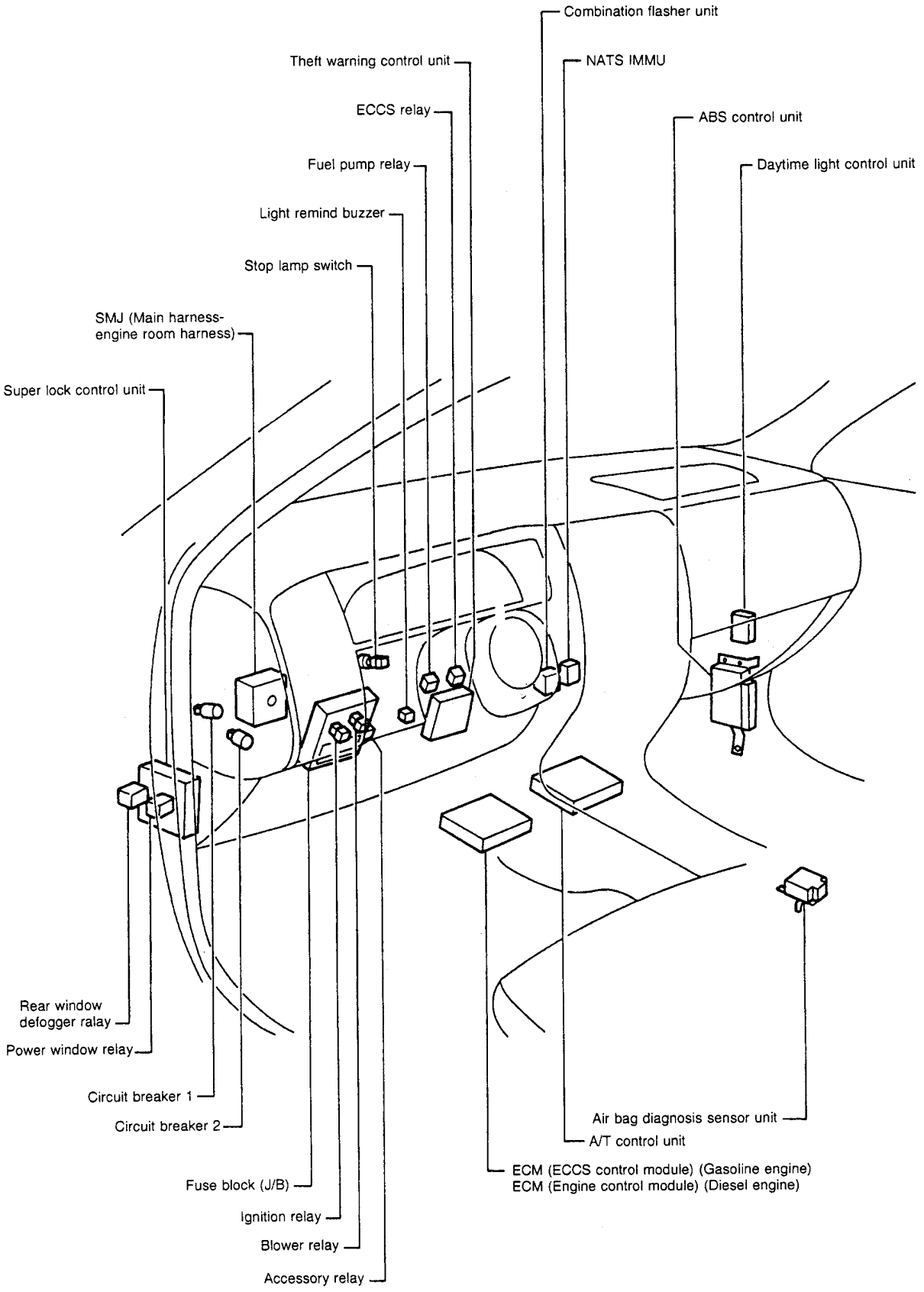




YEL504A

Passenger Compartment

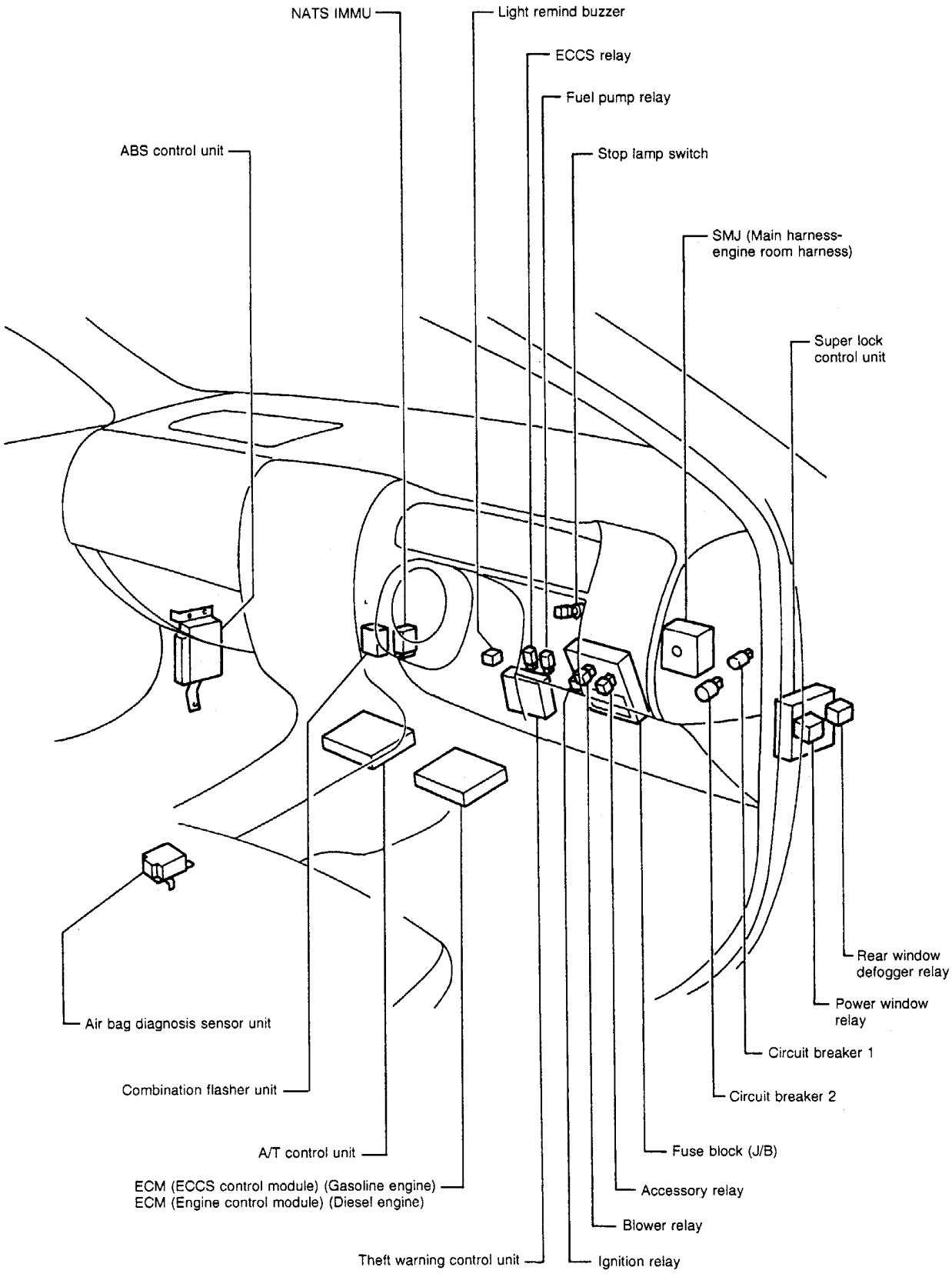
LHD MODELS



YEL505A

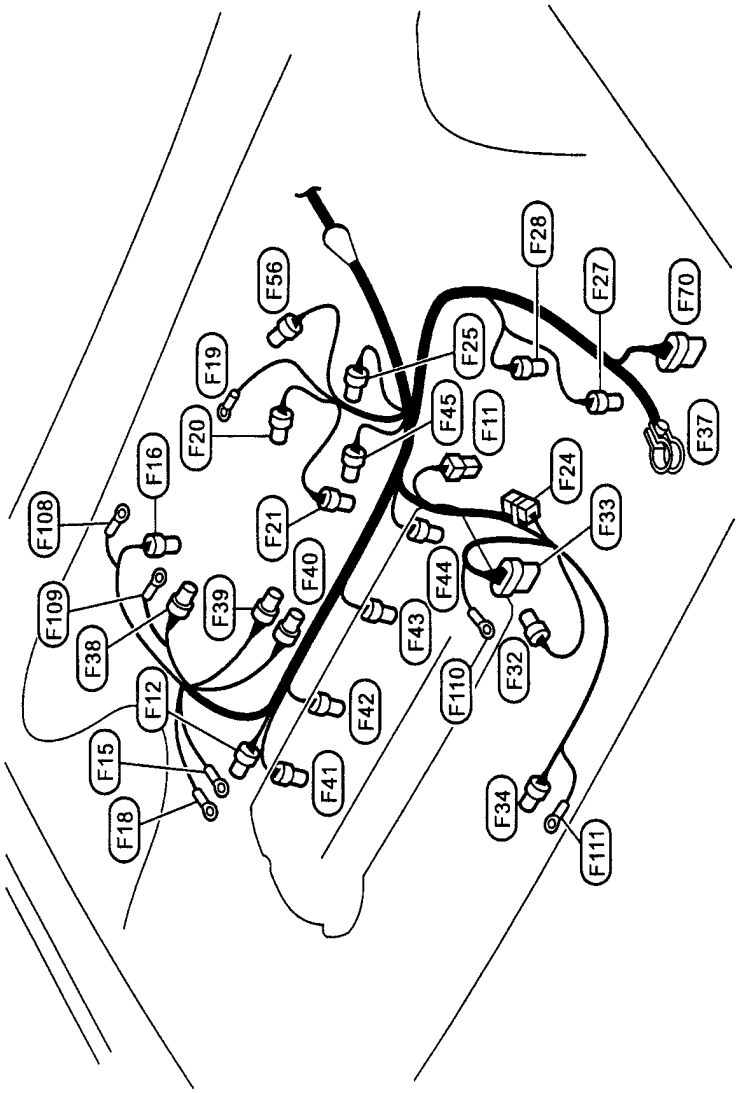
Passenger Compartment

RHD MODELS

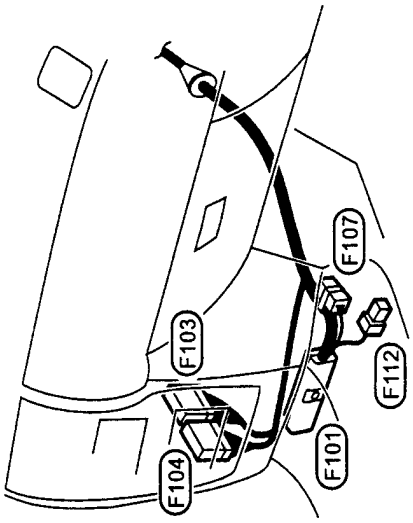


Engine Control Harness

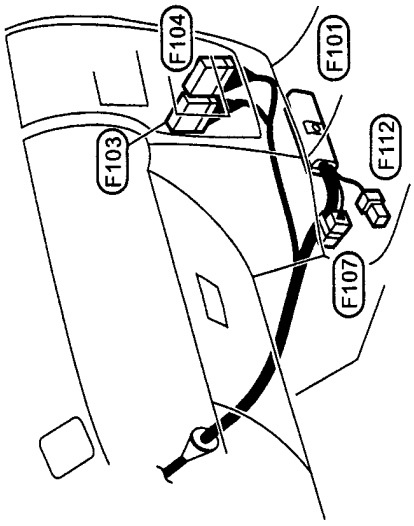
GA16DE ENGINE



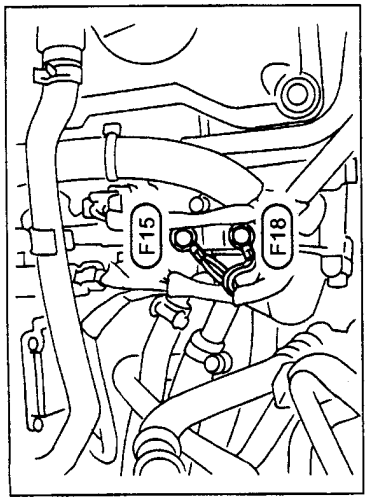
LHD models

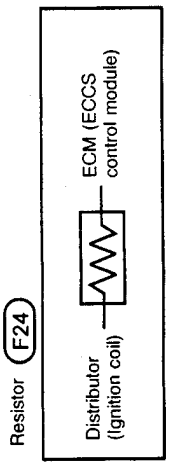


RHD models



Engine ground





YEL343A

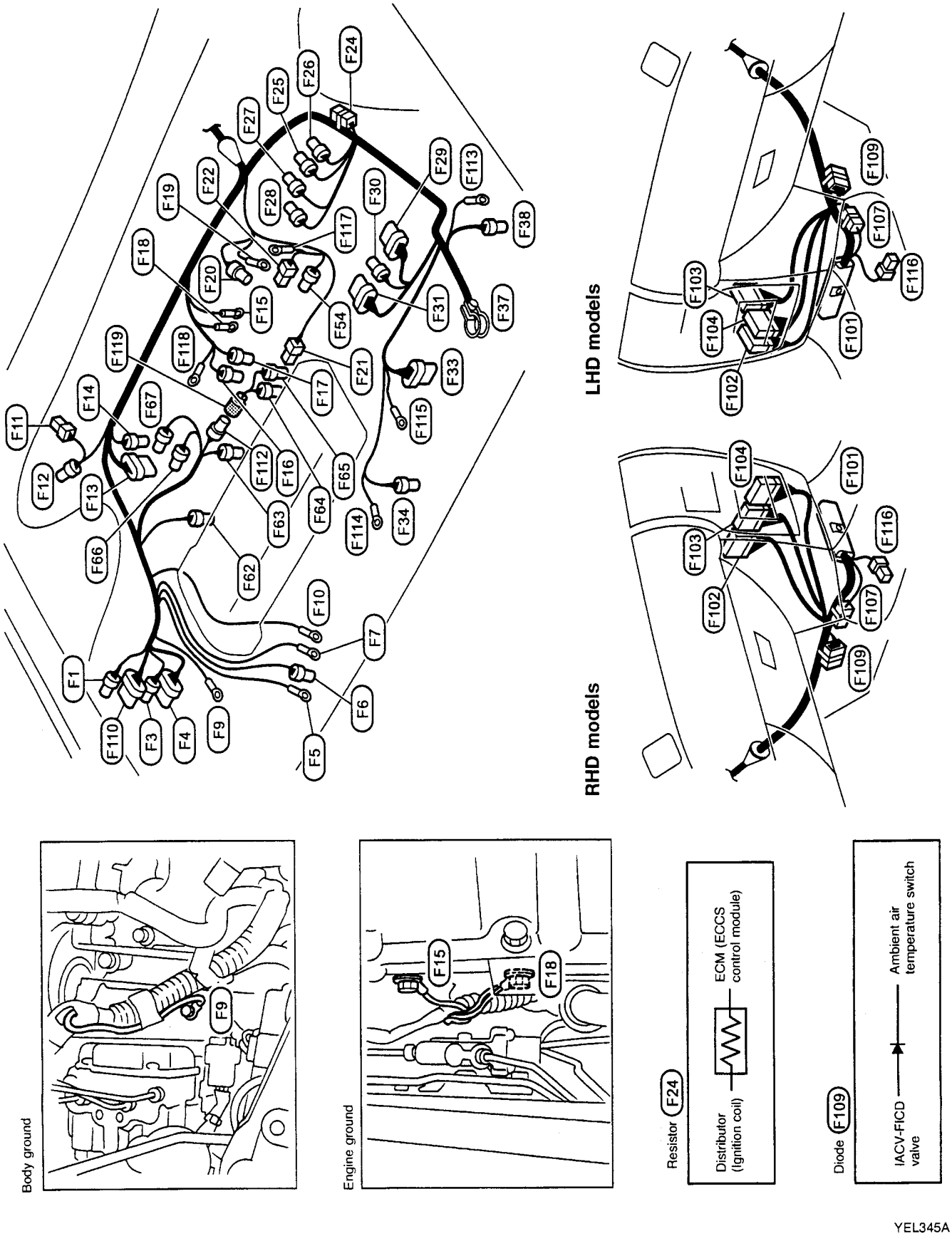
Engine Control Harness (Cont'd)

F11	B/1	:	Thermal transmitter
F12	GY/2	:	Engine coolant temperature sensor
F15	-	:	Engine ground
F16	BR/3	:	Throttle position sensor
F18	-	:	Engine ground
F19	-	:	Starter motor
F20	-/1	:	Starter motor (Except Nordic)
F21	B/1	:	Oil pressure switch
F24	-/2	:	Resistor
F25	BR/3	:	Vehicle speed sensor
F27	GY/2	:	Back-up lamp switch
F28	B/2	:	Neutral position switch
F32	GY/2	:	Distributor (Ignition coil)
F33	GY/6	:	Distributor (Camshaft position sensor)
F34	GY/3	:	Heated oxygen sensor
F37	-	:	Battery
F38	GY/3	:	Mass air flow sensor
F39	BR/2	:	IACV-AAC valve
F40	PU/2	:	IACV-FICD solenoid valve
F41	B/2	:	Injector No. 1
F42	B/2	:	Injector No. 2
F43	B/2	:	Injector No. 3
F44	B/2	:	Injector No. 4
F45	G/2	:	EGR valve and EVAP canister purge control solenoid valve
F56	GY/1	:	Starter motor (Nordic)
F70	GY/6	:	To E65
F101	L/64	:	ECM (ECCS control module)
F103	W/10	:	To M52
F104	W/16	:	To M50
F107	GY/6	:	Joint connector-1
F108	-	:	Throttle position sensor (Shield earth)
F109	-	:	Mass air flow sensor (Shield earth)
F110	-	:	Distributor (Shield earth)
F111	-	:	Heated oxygen sensor (Shield earth)
F112	W/3	:	To A/C harness

YEL344A

Engine Control Harness (Cont'd)

SR20De/DE ENGINE



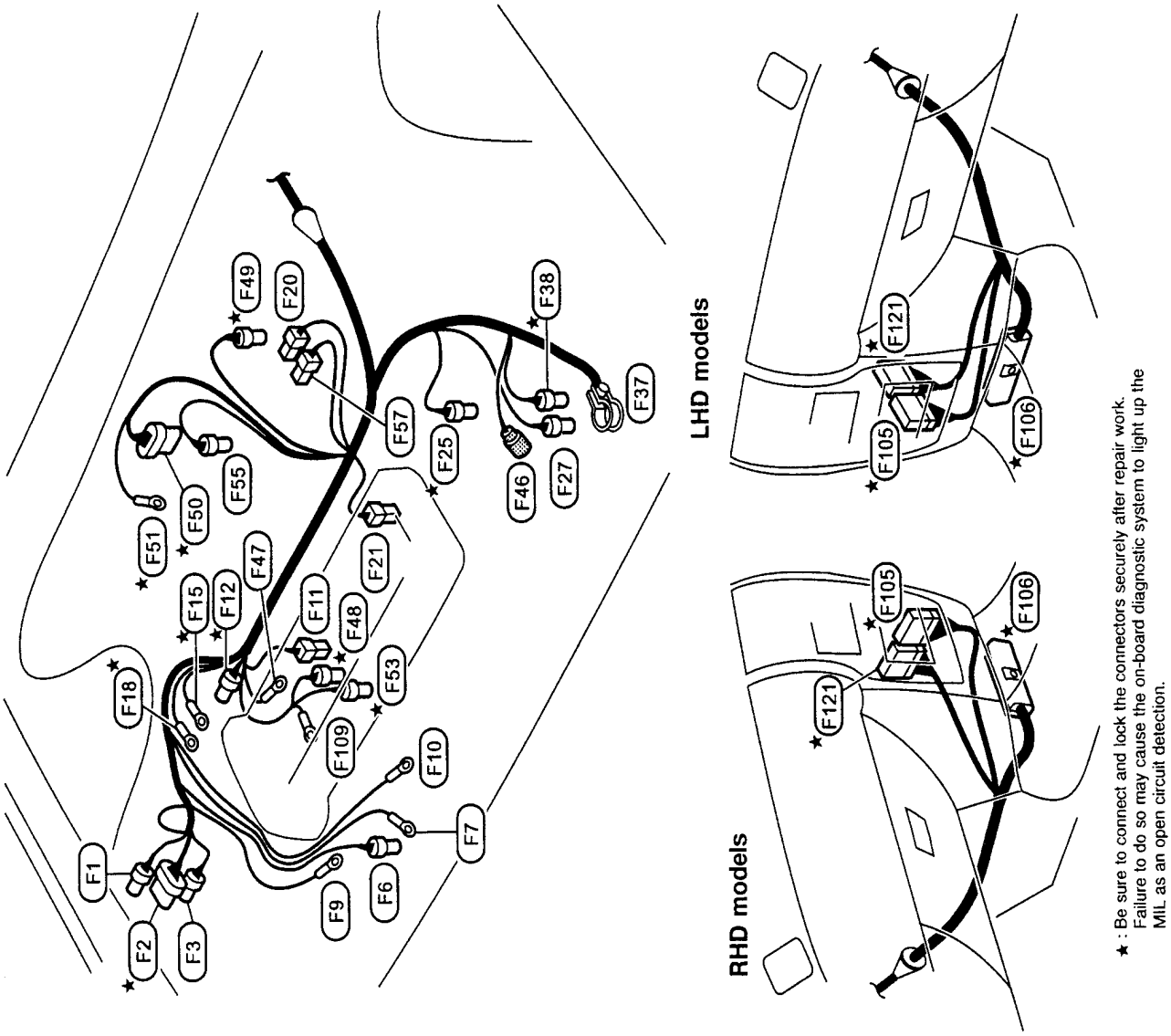
YEL345A

F1	B/2	:	To E41
F3	B/2	:	To E44
F4	GY/8	:	To E43 (LHD)
F5	–	:	Alternator (Except A/T models : with A/C)
F6	GY/2	:	Alternator (A/T models : with A/C)
F7	–	:	Alternator
F9	–	:	Body ground
F10	–	:	Alternator
F11	B/1	:	Thermal transmitter
F12	GY/2	:	Engine coolant temperature sensor
F13	GY/8	:	To Injection sub harness
F14	B/2	:	To Injection sub harness
F15	–	:	Engine ground
F16	BR/3	:	Throttle position sensor
F17	GY/3	:	Throttle position sensor (A/T models)
F18	–	:	Engine ground
F19	–	:	Starter motor
F20	–	:	Starter motor
F21	B/1	:	Oil pressure switch
F22	B/2	:	Knock sensor (Base grade models)
F24	–	:	Resistor
F25	BR/3	:	Vehicle speed sensor
F26	GY/3	:	Revolution sensor (A/T models)
F27	GY/2	:	Back-up lamp switch (M/T models)
F28	GY/2	:	Neutral position switch (M/T models)
F29	BR/8	:	Terminal cord assembly (A/T models)
F30	GY/2	:	Inhibitor switch (A/T models)
F31	GY/8	:	Inhibitor switch (A/T models)
F33	GY/8	:	Distributor
F34	GY/3	:	Heated oxygen sensor
F37	–	:	Battery
F38	BR/4	:	Mass air flow sensor
F54	GY/2	:	Knock sensor (GT grade models)
F62	GY/2	:	Injector No. 1
F63	GY/2	:	Injector No. 2
F64	GY/2	:	Injector No. 3
F65	GY/2	:	Injector No. 4
F66	PU/2	:	IACV-FICD solenoid valve
F67	BR/2	:	IACV/AAC valve
F101	L/64	:	ECM (ECCS control module)
F102	W/20	:	To M53
F103	W/10	:	To M52
F104	W/16	:	To M50
F107	GY/6	:	Joint connector-1
F109	–	:	Diode (With A/C
F110	GY/10	:	To E44 (RHD models)
F112	GY/4	:	To injection sub harness
F113	–	:	Mass air flow sensor (Shield earth)
F114	—	:	Heated oxygen sensor (Shield earth)
F115	—	:	Distributor (Shield earth)
F116	W/3	:	To A/C harness (With A/C harness)
F117	—	:	Knock sensor (Shield earth)
F118	—	:	Throttle position sensor (Shield earth)
F119	GY/4	:	To F112

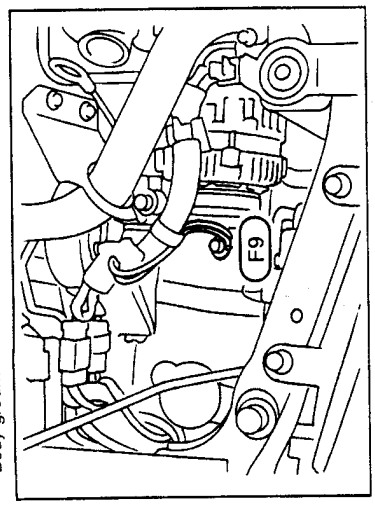
YEL346A

Engine Control Harness (Cont'd)

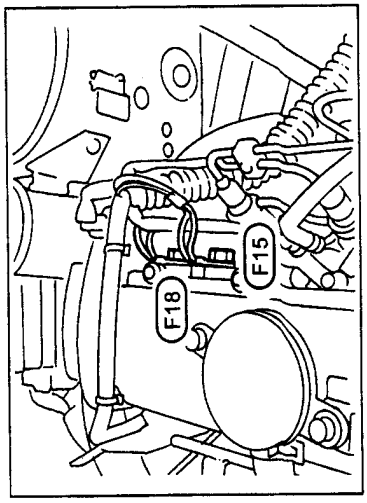
CD20T ENGINE



★: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the on-board diagnostic system to light up the MIL as an open circuit detection.



Body ground



Engine ground

YEL347A

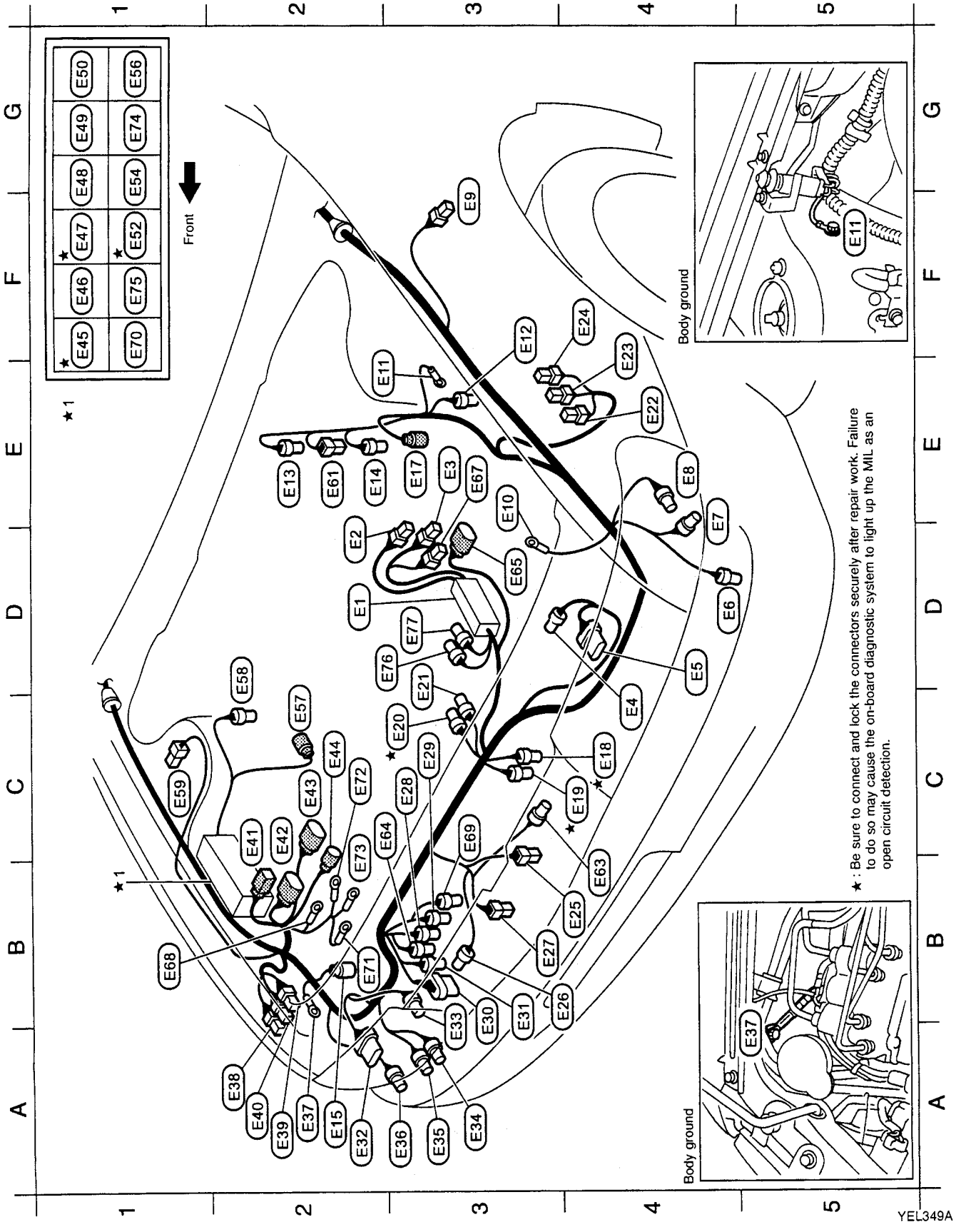
Engine Control Harness (Cont'd)

F1	B/2	: To (E41)	
* F2	GY/6	: To (E42)	
F3	B/2	: To (E44)	
F6	GY/2	: Alternator	
F7	—	: Alternator	
F9	—	: Body ground	
F10	—	: Alternator	
F11	B/1	: Thermal transmitter	
* F12	GY/2	: Engine coolant temperature sensor	
* F15	—	: Engine ground	
* F18	—	: Engine ground	
F20	B/1	: Starter motor	
F21	B/1	: Oil pressure switch	
* F25	BR/3	: Vehicle speed sensor	
F27	GY/2	: Back-up lamp switch	
F37	—	: Battery	
* F38	B/5	: Mass air flow sensor	
F46	B/1	: To (E1)	
F47	—	: Glow plug	
* F48	BR/2	: Needle lift sensor	
* F49	BR/3	: Injection pump (Injection timing control valve and fuel cut solenoid valve)	
* F50	B/7	: Injection pump (Control sleeve position sensor, Electric governor & fuel temperature sensor)	
* F51	—	: Injection pump (Shield earth)	
* F53	B/3	: Crankshaft position sensor (TDC)	
F55	B/2	: EGRC-solenoid valve	
F57	—	: Starter motor	
* F105	W/4	: To (M65)	
* F106	GY/68	: ECM (ECCS control module)	
* F109	—	: Needle lift sensor (Shield earth)	
* F121	W/24	: To (M51)	

YEL348A

Engine Room Harness

ENGINE COMPARTMENT — LHD models

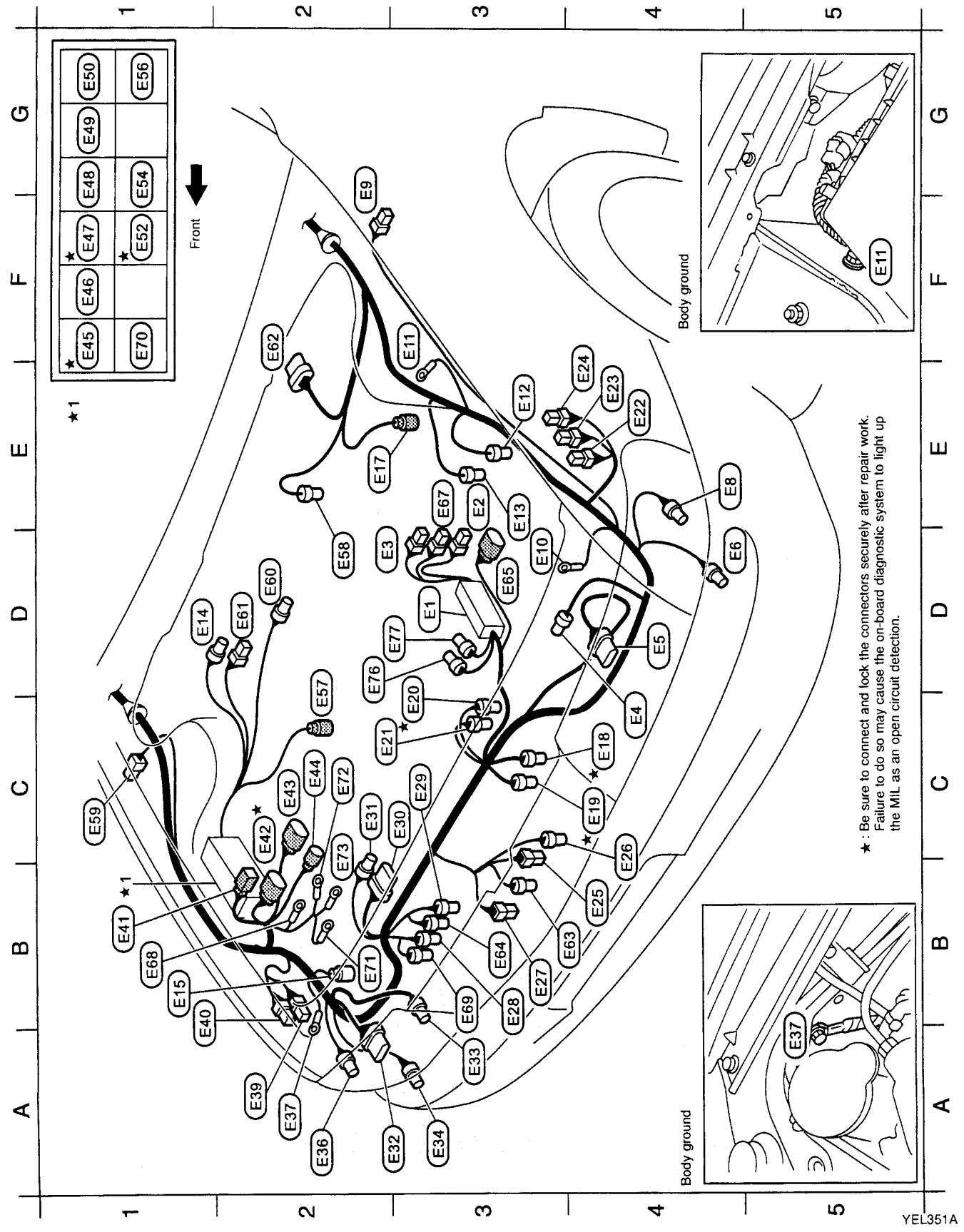


D2	E1	—	:	Fusible link holder
D2	E2	B/1	:	To F46
E3	E3	B/1	:	Battery
C4	E4	B/3	:	Headlamp aiming motor LH
D4	E5	GY/6	:	Front combination lamp LH
D4	E6	B/2	:	Front fog lamp LH
E4	E7	GY/4	:	Headlamp wiper motor LH (With headlamp cleaner)
E4	E8	GY/2	:	Front turn signal lamp LH
F3	E9	B/2	:	Side turn signal lamp LH
F3	E10	–	:	ABS ground (With ABS)
E3	E11	–	:	Body ground
F3	E12	GY/2	:	Hood switch
E2	E13	GY/2	:	Sedimenter (CD engine)
E2	E14	GY/2	:	Brake fluid level switch
A2	E15	GY/2	:	Dropping resistor (A/T models)
E3	E17	BR/2	:	Front wheel sensor LH (With ABS)
C4*	E18	B/2	:	Cooling fan motor-2 (With diesel engine)
C4*	E19	B/2	:	Cooling fan motor-1 (With gasoline engine)
C3*	E20	B/4	:	Triple-pressure switch (CD engine)
D3	E21	B/2	:	Dual-pressure switch
E4	E22	G/2	:	Glow relay (CD engine)
F4	E23	W/1	:	Glow relay (CD engine)
F4	E24	W/1	:	Glow relay (CD engine)
B4	E25	B/1	:	Horn (Low)
B4	E26	GY/2	:	Outside air temperature sensor
B3	E27	B/1	:	Horn (High)
C3	E28	GY/2	:	Cooling fan motor-2 (With gasoline engine)
C3	E29	B/2	:	Cooling fan motor-1 (With diesel engine)
B3	E30	GY/8	:	ABS actuator (With ABS)
B3	E31	B/2	:	ABS actuator (With ABS)
A2	E32	GY/6	:	Front combination lamp RH
A3	E33	B/3	:	Headlamp aiming motor RH
A3	E34	B/2	:	Front fog lamp RH
A3	E35	GY/4	:	Headlamp wiper motor RH (With headlamp cleaner)
A3	E36	GY/2	:	Front turn signal lamp RH
A2	E37	–	:	Body ground
A2	E38	G/2	:	Headlamp washer motor (With headlamp cleaner)
A2	E39	B/2	:	Washer level switch
A1	E40	W/2	:	Washer motor
C2	E41	B/2	:	To F1 (Except GA engine)
C2*	E42	GY/8	:	To F2 (SR engine)
C2	E43	GY/6	:	To F4
C2	E44	B/2	:	To F3 (Except GA engine)
F1*	E45	L/4	:	Cooling fan relay-1
F1	E46	B/5	:	ABS motor relay (With ABS)
F1*	E47	L/4	:	Cooling fan relay-3 (CD engine)
G1	E48	W/3	:	Horn relay
G1	E49	L/4	:	Front fog lamp relay
G1	E50	B/5	:	Solenoid valve relay
F1*	E52	B/5	:	Rear wiper relay
G1	E54	B/5	:	Cooling fan relay-2 (CD engine)
G1	E56	L/4	:	Air conditioner relay (With A/C)
C2	E57	GY/2	:	Front wheel sensor RH (With ABS)
D2	E58	L/2	:	EVAP Canister purge control solenoid valve (SR engine)
C1	E59	B/2	:	Side turn signal lamp RH
E2	E61	W/1	:	Vaccum switch (CD engine)
B4	E63	BR/2	:	Ambient air temperature switch (SR engine)
C2	E64	B/1	:	Compressor (Except CD engine)
D3	E65	GY/6	:	To F70 (GA engine)
C2	E67	B/1	:	To E151 Battery (CD engine)
B1	E68	—	:	Body ground (GA engine)
C3	E69	B/1	:	Compressor (CD engine)
F1	E70	B/1	:	Front wiper relay
B2	E71	—	:	Alternator (GA engine)
C2	E72	—	:	Alternator (GA engine)
C2	E73	—	:	Alternator (GA engine)
G1	E74	L/4	:	Headlamp relay LH (For nordic)
F1	E75	BR/6	:	Headlamp relay RH (For nordic)
D3	E76	W/1	:	Fusible link holder } (Gasoline engine models)
D3	E77	B/1	:	Fusible link holder }

YEL350A

Engine Room Harness (Cont'd)

ENGINE COMPARTMENT — RHD models

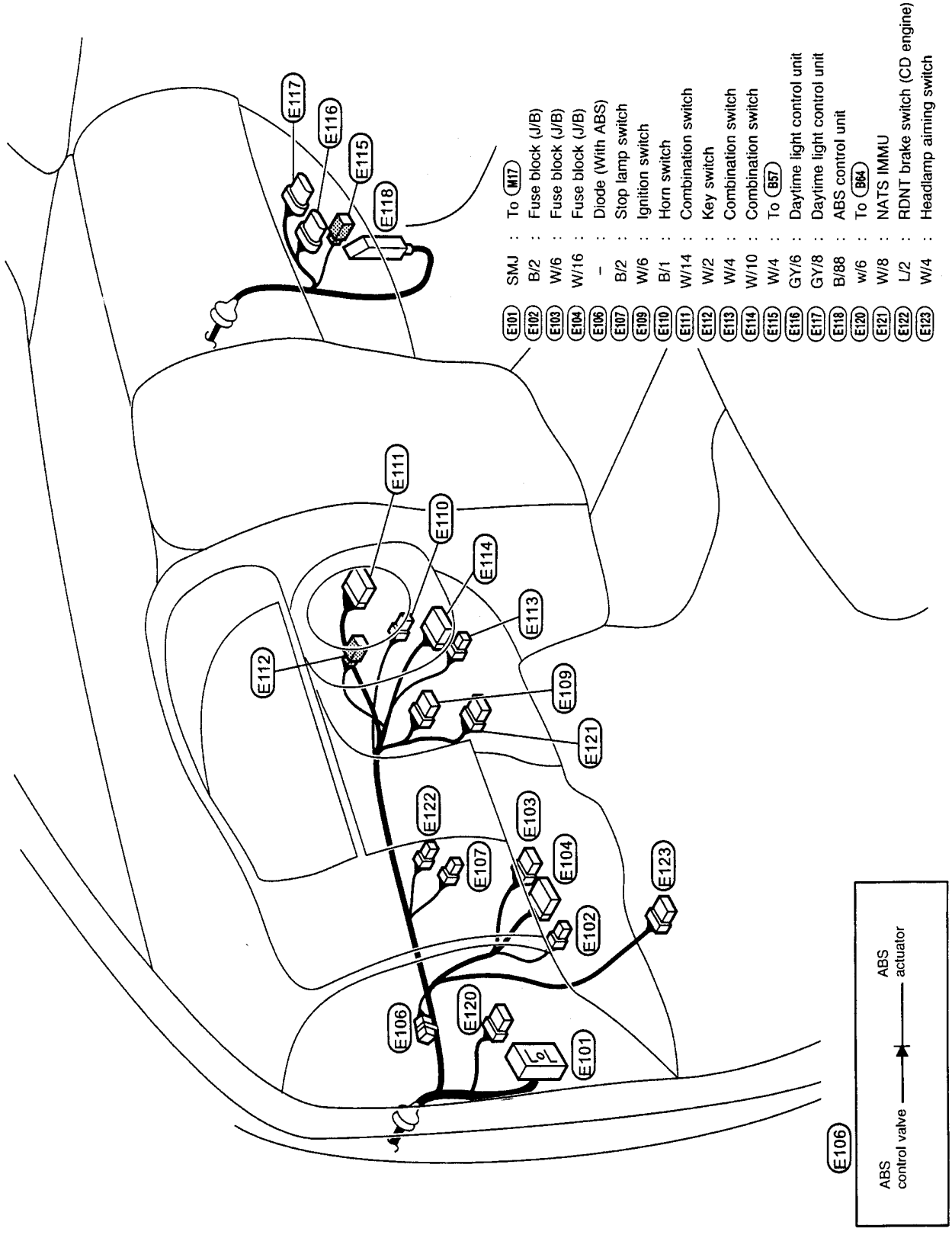


D3	E1	—	:	Fusible link holder
E3	E2	B/1	:	To F46
D2	E3	B/1	:	Battery
C4	E4	B/3	:	Headlamp aiming motor LH
D4	E5	GY/6	:	Front combination lamp LH
D4	E6	B/2	:	Front fog lamp LH
E4	E8	GY/2	:	Front turn signal lamp LH
G2	E9	B/2	:	Side turn signal lamp LH
D3	E10	–	:	ABS ground (With ABS)
F3	E11	–	:	Body ground
E3	E12	GY/2	:	Hood switch
E3	E13	GY/2	:	Sedimenter (CD engine)
D1	E14	GY/2	:	Brake fluid level switch
B1	E15	GY/2	:	Dropping resistor (A/T models)
E2	E17	BR/2	:	Front wheel sensor LH (With ABS)
C4*	E18	B/2	:	Cooling fan motor-2 (With diesel engine)
C4*	E19	B/2	:	Cooling fan motor-1 (With gasoline engine)
C3*	E20	B/4	:	Triple-pressure switch (CD engine)
C2	E21	B/2	:	Dual-pressure switch
E4	E22	G/2	:	Glow relay (CD engine)
E4	E23	W/1	:	Glow relay (CD engine)
E4	E24	W/1	:	Glow relay (CD engine)
B4	E25	B/1	:	Horn (Low)
C4	E26	GY/2	:	Outside air temperature sensor
B3	E27	B/1	:	Horn (High)
B3	E28	GY/2	:	Cooling fan motor-2 (Except CD engine : With A/C)
C3	E29	B/2	:	Cooling fan motor-1 (CD engine)
C3	E30	GY/8	:	ABS actuator (With ABS)
C2	E31	B/2	:	ABS actuator (With ABS)
A2	E32	GY/6	:	Front combination lamp RH
A3	E33	B/3	:	Headlamp aiming motor RH
A3	E34	B/2	:	Front fog lamp RH
A2	E36	GY/2	:	Front turn signal lamp RH
A2	E37	–	:	Body ground
A2	E39	B/2	:	Washer level switch
B1	E40	W/2	:	Washer motor
B1	E41	B/2	:	To F1 (Except GA engine)
C2*	E42	GY/10	:	To F110 (SR engine)
C2	E43	GY/6	:	To F2 (CD engine)
C2	E44	GY/2	:	To F3 (Except GA)
F1*	E45	L/4	:	Cooling fan relay-1
F1	E46	B/5	:	ABS motor relay (With ABS)
F1*	E47	L/4	:	Cooling fan relay-3 (CD engine)
G1	E48	W/3	:	Horn relay
G1	E49	L/4	:	Front fog lamp relay
G1	E50	B/5	:	Solenoid valve relay (With ABS)
F1*	E52	B/5	:	Rear wiper relay
G1	E54	B/5	:	Cooling fan relay-2 (CD engine)
G1	E56	L/4	:	Air conditioner relay (With A/C)
D2	E57	GY/2	:	Front wheel sensor RH (With ABS)
D2	E58	L/2	:	EVAP Canister purge control solenoid valve (SR engine)
C1	E59	B/2	:	Side turn signal lamp RH
D2	E60	GY/2	:	Power steering oil pressure switch (Except CD engine)
D2	E61	W/1	:	Vacuum switch (CD engine)
F2	E62	W/6	:	Front wiper motor
B4	E63	BR/2	:	Ambient air temperature switch (SR engine : With A/C)
B3	E64	B/1	:	A/C compressor (CD engine : With A/C)
D3	E65	GY/6	:	To F70 (GA engine)
E3	E67	B/1	:	Battery (CD engine)
B1	E68	—	:	Body ground (GA engine)
B3	E69	B/1	:	Compressor (Except CD engine : With A/C)
F1	E70	B/5	:	Front wiper relay
B2	E71	—	:	Alternator (GA engine)
C2	E72	—	:	Alternator (GA engine)
C2	E73	—	:	Alternator (GA engine)
D2	E76	W/1	:	Fusible link holder } (Gasoline engine models)
D3	E77	B/1	:	Fusible link holder }

YEL352A

Engine Room Harness (Cont'd)

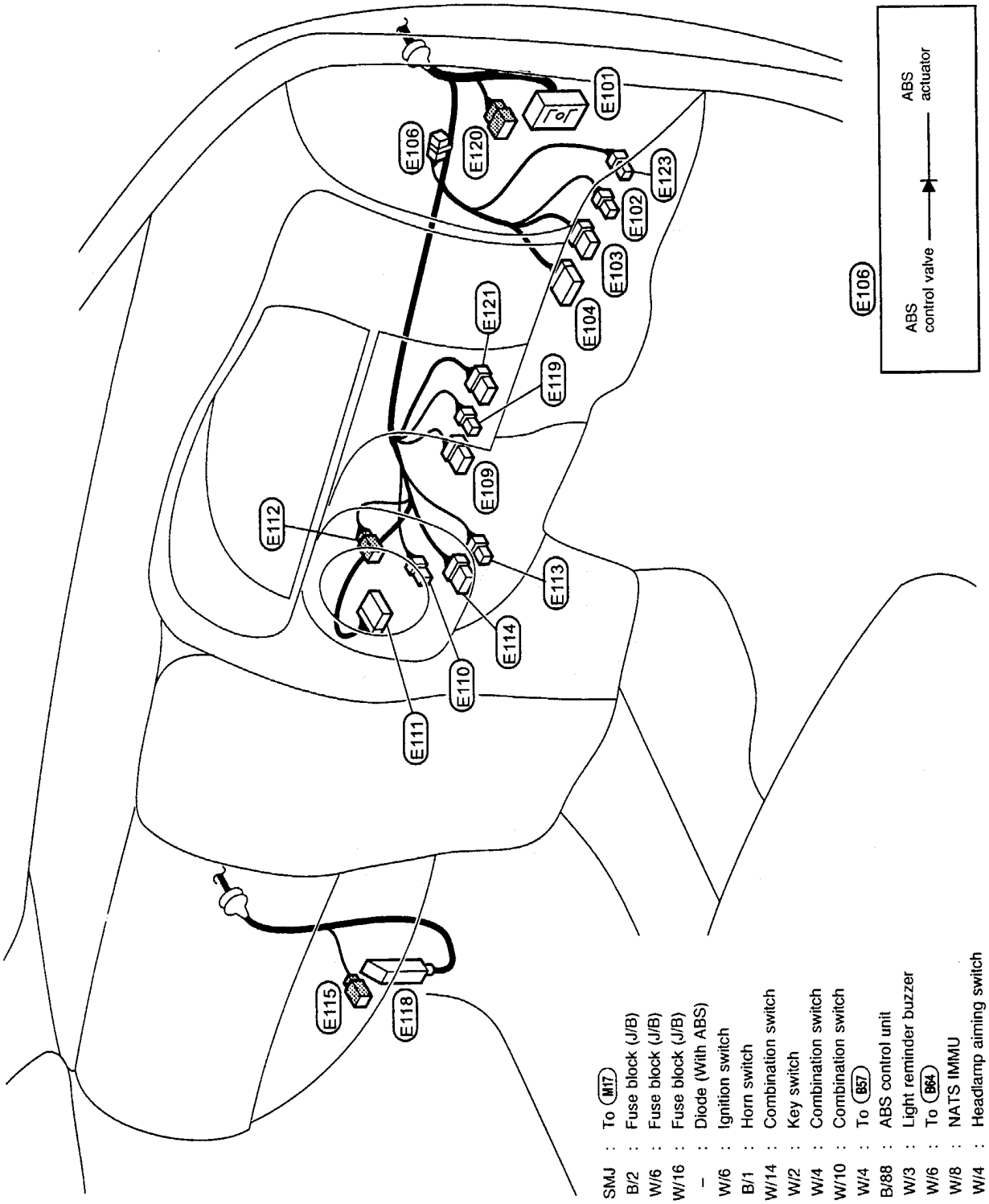
PASSENGER COMPARTMENT — LHD models



YEL353A

Engine Room Harness (Cont'd)

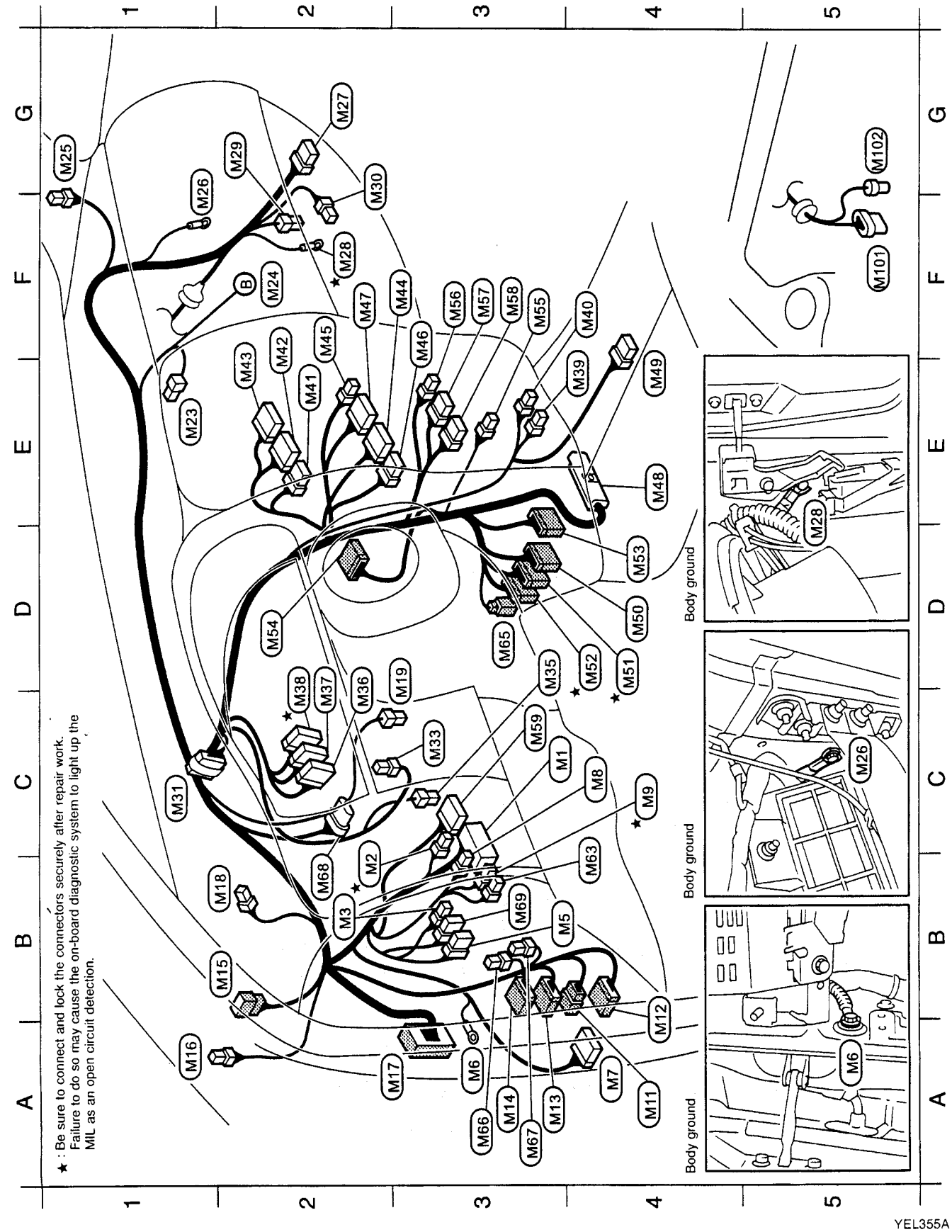
PASSENGER COMPARTMENT — RHD models



YEL354A

Main Harness

LHD MODELS



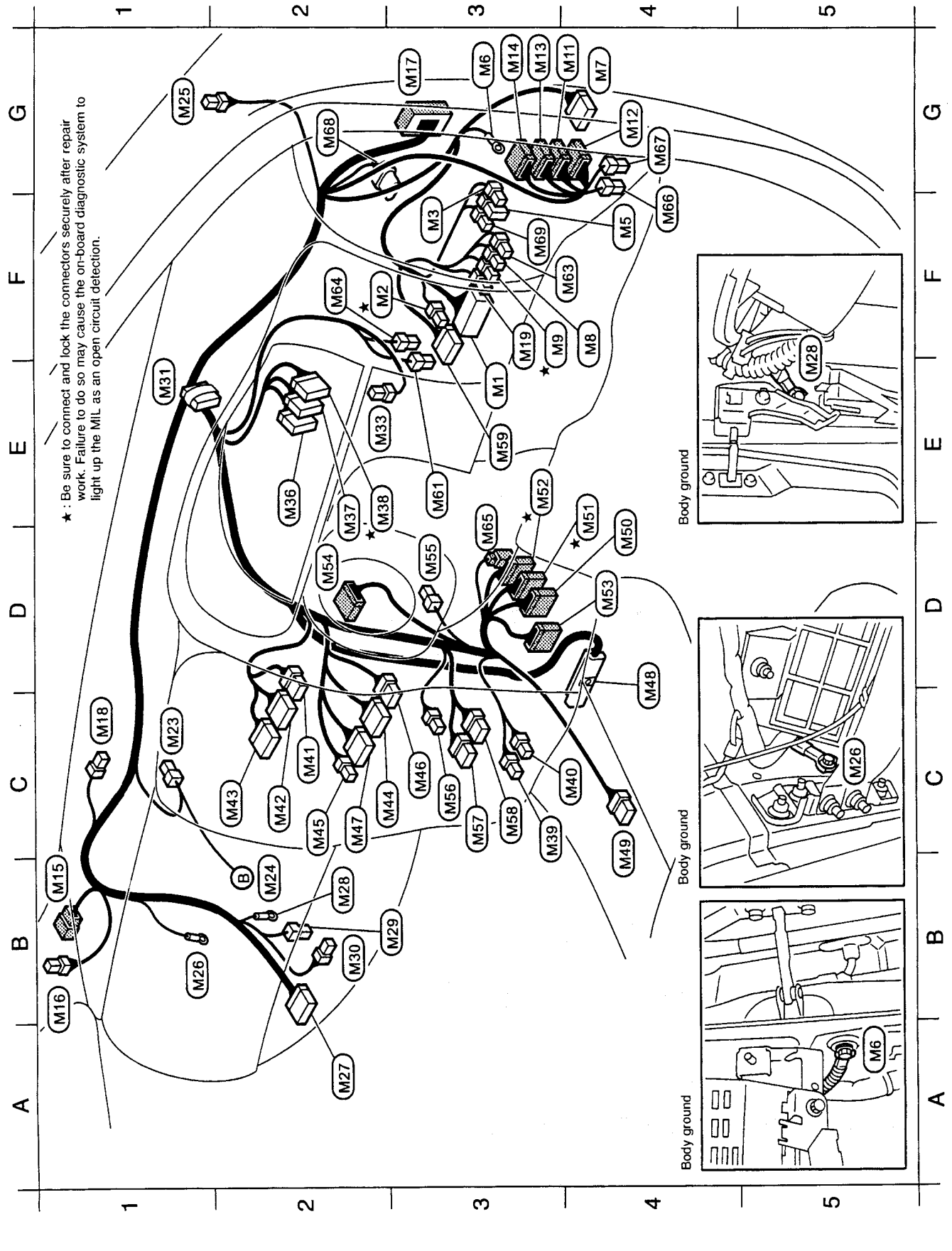
Main harness

C3	M1	–	:	Fuse block (J/B)
B2*	M2	B/2	:	Fuse block (J/B)
B2	M3	W/4	:	Illumination control switch (With illumination control switch)
B3	M5	W/8	:	Door mirror remote control switch (With door mirror remote control switch)
A3	M6	–	:	Body ground
A4	M7	W/12	:	To D1
C4	M8	L/4	:	Fuel pump relay (Except CD engine)
C4*	M9	L/4	:	ECCS relay (Except CD engine)
A4	M11	W/8	:	To B2
B4	M12	W/12	:	To B1
A3	M13	W/24	:	To B9
A3	M14	W/10	:	To B4
B2	M15	W/6	:	To R1
A1	M16	BR/2	:	Tweeter LH (With tweeter)
A2	M17	SMJ	:	To E101
B2	M18	B/2	:	NATS security indicator
D3	M19	W/2	:	Kickdown switch (A/T models: SR engine)
E1	M23	W/4	:	Intake door motor
F2	M24	Bulb	:	Glove box lamp (With glove box lamp)
G1	M25	BR/2	:	Tweeter RH (With tweeter)
G1	M26	–	:	Body ground
G2	M27	W/8	:	To D10
F2*	M28	–	:	Body ground
G2	M29	BR/4	:	Fan resistor
G2	M30	W/2	:	Blower motor
C1	M31	—	:	Diode (Except CD engine)
C3	M33	B/3	:	Combination flasher unit
D3	M35	W/3	:	Light reminder buzzer
C2	M36	W/14	:	Combination meter
C2	M37	BR/16	:	Combination meter
C2*	M38	W/16	:	Combination meter
E4	M39	B/2	:	Cigarette lighter socket
F4	M40	W/2	:	Ashtray illumination
E2	M41	W/6	:	Audio
E2	M42	W/10	:	Audio
E2	M43	W/12	:	Audio (With CD changer)
F3	M44	W/12	:	A/C switch
F2	M45	W/2	:	Heater
E3	M46	W/6	:	Fan switch
F2	M47	W/8	:	Recirculation switch
E4	M48	L/48	:	A/T control unit (A/T models)
E4	M49	W/6	:	A/T control device (A/T models)
D4	M50	W/16	:	To F104 (Except CD engine)
C4*	M51	W/20	:	To F121 (CD engine)
D4*	M52	W/10	:	To F103
D4	M53	W/20	:	To F102 (SR engine)
D2	M54	W/16	:	To Z3
F3	M55	W/3	:	Thermo control amplifier
F3	M56	W/2	:	ORN illumination
F3	M57	W/6	:	Rear window defogger switch
F3	M58	W/8	:	Hazard switch
C3	M59	GY/14	:	Data link connector for CONSULT
B4	M63	L/4	:	ECCS relay (CD engine)
D3	M65	W/4	:	To F105 (CD engine)
A3	M66	W/2	:	Circuit breaker-1
A3	M67	W/2	:	Circuit breaker-2 (With power seat)
B2	M68	B/6	:	Accelerator work unit (CD engine)
B3	M69	L/4	:	Power window relay
F5	M101	W/6	:	Front wiper motor
G5	M102	GY/2	:	Power steering oil pressure switch

YEL356A

Main Harness (Cont'd)

RHD MODELS



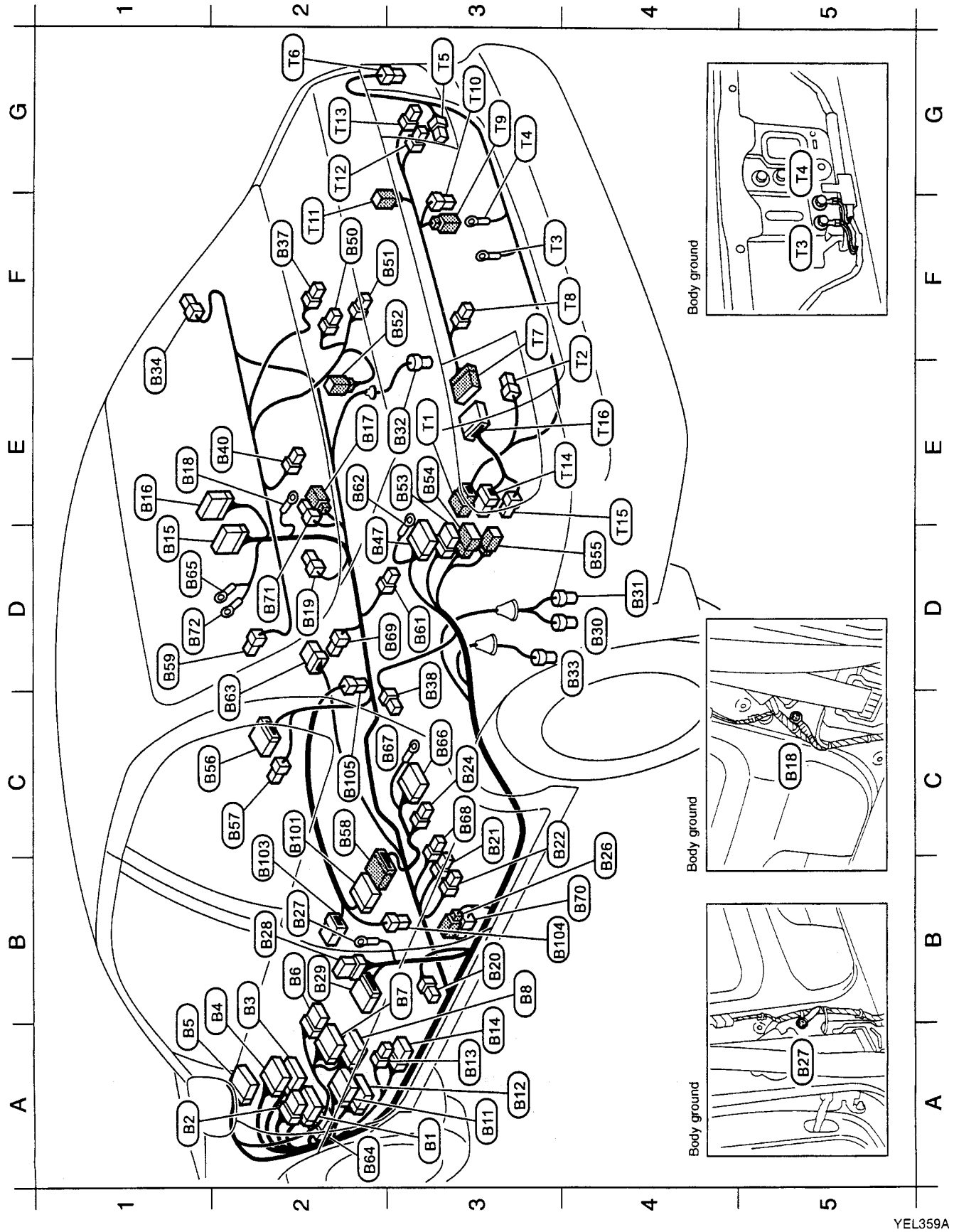
YEL357A

E3	M1	–	:	Fuse block (J/B)
F2*	M2	B/2	:	Fuse block (J/B)
F3	M3	W/4	:	Illumination control switch (With illumination control switch)
F4	M5	W/8	:	Door mirror remote control switch (With door mirror remote control switch)
G3	M6	–	:	Body ground
G4	M7	W/16	:	To D1
F4	M8	L/4	:	Fuel pump relay (Except CD engine)
F3*	M9	L/4	:	ECCS relay (Except CD engine)
G4	M11	W/4	:	To B2
G4	M12	W/12	:	To B1
G3	M13	W/24	:	To B3
G3	M14	W/10	:	To B4
B1	M15	W/6	:	To R1
B1	M16	BR/2	:	Tweeter LH (With tweeter)
G3	M17	SMJ	:	To E101
C1	M18	B/2	:	NATS security indicator
F3	M19	W/2	:	Kickdown switch (A/T models)
C1	M23	W/4	:	Intake door motor
B2	M24	Bulb	:	Glove box lamp (With glove box lamp)
G1	M25	BR/2	:	Tweeter RH (With tweeter)
B1	M26	–	:	Body ground
A2	M27	W/8	:	To D10
B2	M28	–	:	Body ground
B3	M29	BR/4	:	Fan resistor
B2	M30	W/2	:	Blower motor
E1	M31	—	:	Diode (Except CD engine)
E2	M33	B/3	:	Combination flasher unit
E2	M36	W/14	:	Combination meter
E2	M37	BR/16	:	Combination meter
E2*	M38	W/16	:	Combination meter
C3	M39	B/2	:	Cigarette lighter socket
C4	M40	W/2	:	Ashtray illumination
C2	M41	W/6	:	Audio
C2	M42	W/10	:	Audio
C2	M43	W/12	:	Audio (With CD changer)
C2	M44	W/12	:	A/C switch
C2	M45	W/2	:	Heater
C3	M46	W/3	:	Fan switch
C2	M47	W/8	:	Recirculation switch
D4	M48	L/48	:	A/T control unit (A/T models)
C4	M49	W/6	:	A/T control device (A/T models)
D4	M50	W/16	:	To F104 (Except CD engine)
D4*	M51	W/24	:	To F121 (Except CD engine)
E3*	M52	W/10	:	To F103
D4	M53	W/20	:	To F102 (SR engine)
D2	M54	W/16	:	To Z3
D3	M55	W/3	:	Thermo control amplifier
C3	M56	W/2	:	ORN illumination
C3	M57	W/6	:	Rear window defogger switch
C3	M58	W/8	:	Hazard switch
E3	M59	GY/14	:	Data link connector for CONSULT
E3	M61	B/2	:	Stop lamp switch
F4	M63	L/4	:	ECCS relay (CD engine)
F2	M64	L/2	:	RDNT brake switch (CD engine)
D3	M65	W/4	:	To F105 (CD engine)
F4	M66	W/2	:	Circuit breaker-1
G4	M67	W/2	:	Circuit breaker-2 (With power seat)
G2	M68	B/6	:	Accelerator work unit (CD engine)
F3	M69	L/4	:	Power window relay

YEL358A

Body Harness

SEDAN — LHD models



YEL359A

Body harness

A3	B1	W/12	:	To M12
A1	B2	W/8	:	To M11
B2	B3	W/24	:	To M13
B2	B4	W/10	:	To M14
A1	B5	W/12	:	To D2
B2	B6	W/8	:	Theft warning control unit
B3	B7	W/20	:	Theft warning control unit
B3	B8	W/12	:	Fuse block (J/B)
A3	B11	W/12	:	Super lock control unit
A3	B12	W/16	:	Super lock control unit
A3	B13	L/4	:	Door mirror heat relay
A3	B14	BR/6	:	Rear window defogger relay
D1	B15	W/6	:	Ultra sonic sub-sensor
E1	B16	W/8	:	To D22
E2	B17	W/4	:	Seat belt pre-tensioner (Passenger side)
E1	B18	–	:	Body ground
D2	B19	BR/1	:	Front door switch (Passenger side)
B3	B20	B/3	:	Front door switch (Driver's side)
C3	B21	W/3	:	Heated seat LH
C3	B22	W/2	:	Power seat
C3	B24	B/1	:	Parking brake switch
B4	B26	W/4	:	Seat belt pre-tensioner (Driver's side)
B2	B27	–	:	Body ground
B2	B28	W/8	:	To D18
B2	B29	W/8	:	Ultra sonic sensor
D4	B30	GY/2	:	Fuel pump
D4	B31	W/3	:	Fuel pump gauge unit
E3	B32	GY/2	:	Rear wheel sensor RH
D4	B33	BR/2	:	Rear wheel sensor LH
E1	B34	BR/1	:	Rear door switch RH
F2	B37	B/2	:	Rear speaker RH
D3	B38	BR/1	:	Rear door switch LH
E2	B40	B/2	:	Rear speaker LH
D2	B47	W/16	:	CD auto changer
F2	B50	B/1	:	High mounted stop lamp
F3	B51	W/2	:	Trunk room lamp
F3	B52	W/4	:	Rear wiper motor
E3	B53	W/6	:	To T1
E3	B54	W/6	:	To T14
D4	B55	W/4	:	To T15
C1	B56	W/10	:	To D11
C2	B57	W/4	:	To E115
C2	B58	W/12	:	To B101
D1	B59	B/1	:	Rear window defogger
D3	B61	W/3	:	Heated seat RH
E2	B62	—	:	CD auto changer (Shield earth)
C2	B63	w/6	:	Ultrasonic cancel switch
A2	B64	W/6	:	To E121
D1	B65	—	:	Body earth
C3	B66	Y/10	:	Diagnosis sensor unit
C3	B67	—	:	Diagnosis sensor unit
C3	B68	Y/2	:	Side air bag module LH
D3	B69	Y/2	:	Side air bag module RH
B4	B70	GY/2	:	Satellite sensor LH
D2	B71	GY/2	:	Satellite sensor RH
D1	B72	—	:	Body earth

Console harness

C2	B101	W/12	:	To B58
B2	B103	W/8	:	A/T mode switch
B3	B104	L/4	:	Heated seat switch LH
C2	B105	W/4	:	Heated seat switch RH

Tail harness

E3	T1	W/6	:	To B53
F4	T2	W/4	:	Rear combination lamp LH
F3	T3	–	:	Body ground
G3	T4	–	:	Body ground
G3	T5	W/4	:	Rear combination lamp RH
G2	T6	B/4	:	Theft warning horn

Tail harness No. 2

F3	T7	W/12	:	To T16
F4	T8	W/4	:	Rear combination lamp LH
G3	T9	W/2	:	Licence plate lamp
G3	T10	B/2	:	Trunk room lamp switch
F2	T11	BR/2	:	High mounted stop lamp
G2	T12	W/4	:	Door lock actuator assembly (Trunk)
G2	T13	W/4	:	Rear combination lamp RH

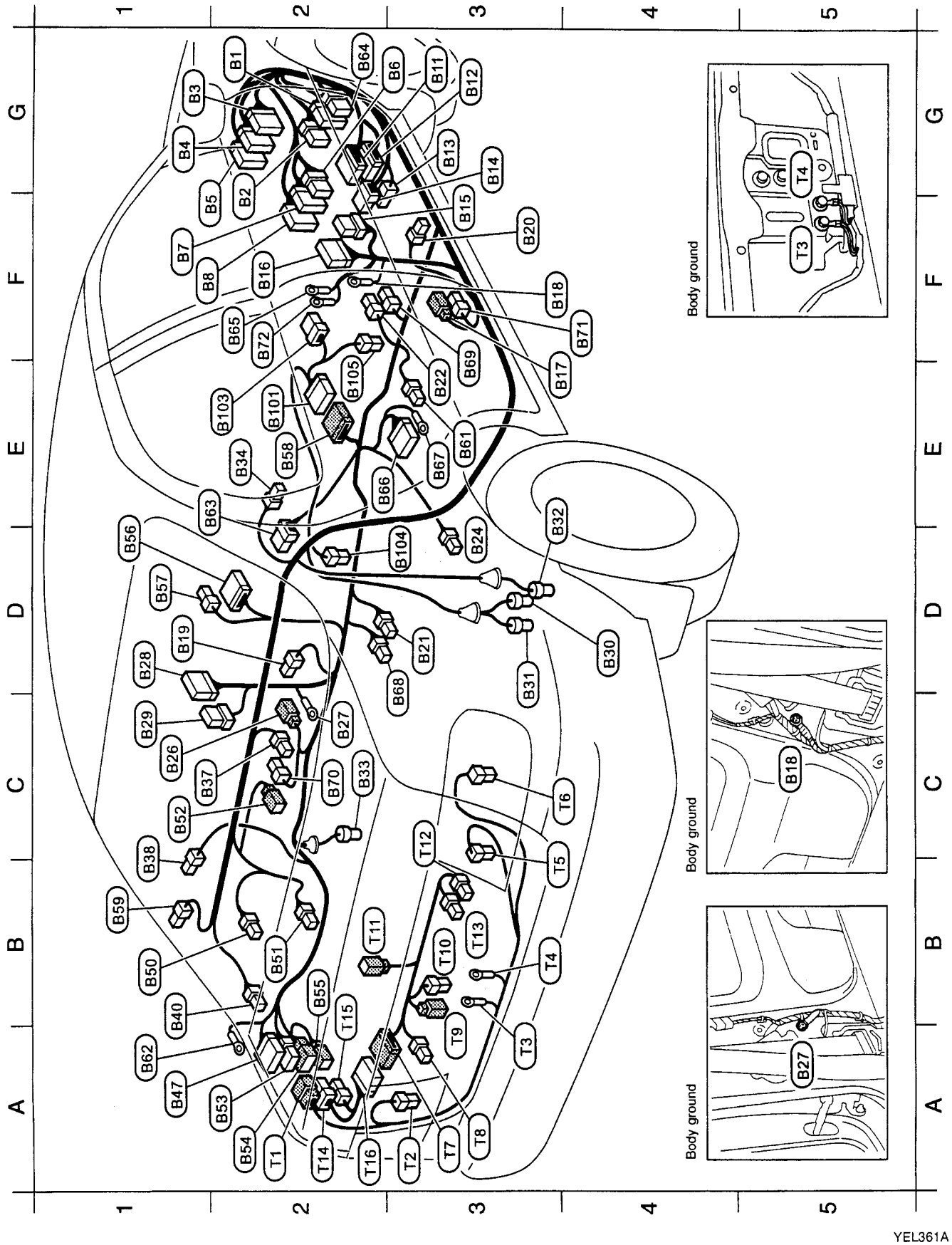
Tail sub-harness

E4	T14	W/6	:	To B54
E4	T15	W/4	:	To B55
E4	T16	W/12	:	To T7

YEL360A

Body Harness (Cont'd)

SEDAN — RHD models



YEL361A

Body harness

G3	B1	W/12	:	To M12
A2	B2	W/8	:	To M11
A1	B3	W/24	:	To M13
A1	B4	W/10	:	To M14
B1	B5	W/12	:	To D2
B2	B6	W/8	:	Theft warning control unit
B1	B7	W/20	:	Theft warning control unit
B2	B8	W/12	:	Fuse block (J/B)
A3	B11	W/12	:	Super lock control unit
A3	B12	W/16	:	Super lock control unit
A3	B13	L/4	:	Door mirror heat relay
A3	B14	BR/6	:	Rear window defogger relay
D1	B15	W/6	:	Ultra sonic sub-sensor
D1	B16	W/8	:	To D22
E2	B17	W/4	:	Seat belt pre-tensioner (Passenger side)
D2	B18	–	:	Body ground
D2	B19	BR/1	:	Front door switch (Passenger side)
B3	B20	B/3	:	Front door switch (Driver's side)
C3	B21	W/3	:	Heated seat LH
B2	B22	W/2	:	Power seat
C3	B24	B/1	:	Parking brake switch
B4	B26	W/4	:	Seat belt pre-tensioner (Driver's side)
B3	B27	–	:	Body ground
B3	B28	W/8	:	To D18
B2	B29	W/8	:	Ultra sonic sensor
D3	B30	GY/2	:	Fuel pump
D3	B31	W/3	:	Fuel pump gauge unit
F3	B32	GY/2	:	Rear wheel sensor RH
D4	B33	BR/2	:	Rear wheel sensor LH
E1	B34	BR/1	:	Rear door switch RH
G1	B35	B/1	:	Theft warning horn
E1	B37	B/2	:	Rear speaker RH
C4	B38	B/1	:	Rear door switch LH
D1	B40	B/2	:	Rear speaker LH
C1	B41	B/1	:	Rear window defogger
D2	B42	W/4	:	To D29
D2	B43	W/6	:	To D102
E2	B44	W/3	:	To D103
E3	B45	W/2	:	Luggage room lamp
F3	B46	W/4	:	Rear combination lamp LH
E3	B47	W/16	:	CD auto changer
F3	B48	—	:	Body ground
F3	B49	W/4	:	Rear combination lamp RH
D2	B56	W/10	:	To D11
C2	B57	W/4	:	To E115
C3	B58	W/12	:	To B101
D3	B61	W/3	:	To Heated seat RH
F3	B62	—	:	Shield earth
C2	B63	W/6	:	Ultra sonic cancel switch
A2	B64	W/6	:	To E120
C1	B65	—	:	Body earth
C3	B66	Y/10	:	Diagnosis sensor unit
C3	B67	—	:	Diagnosis sensor unit
B2	B68	Y/2	:	Side air bag module LH
D3	B69	Y/2	:	Side air bag module RH
B3	B70	GY/2	:	Satellite sensor LH
E2	B71	GY/2	:	Satellite sensor RH
C1	B72	—	:	Body earth

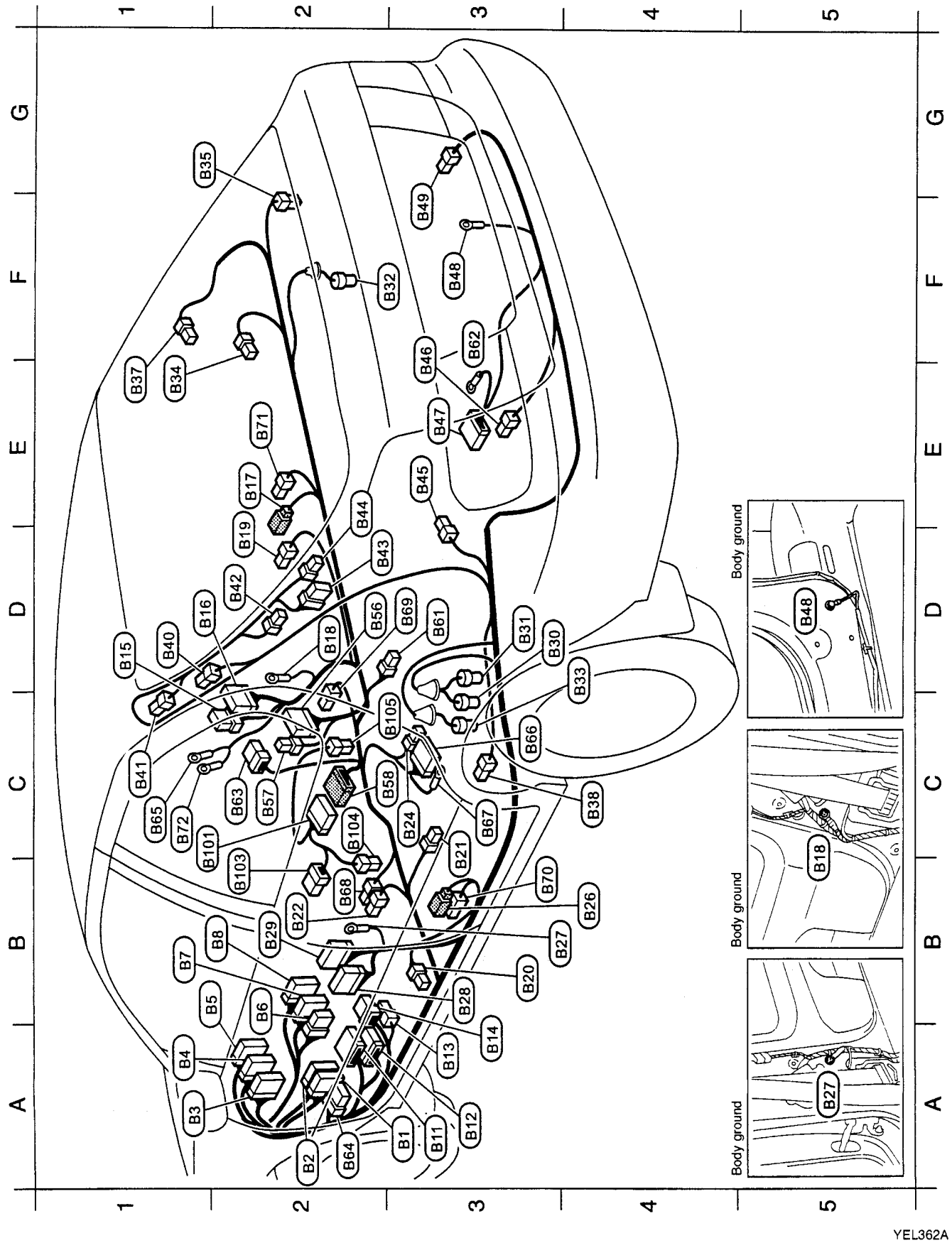
Console harness

C1	B101	W/12	:	To B58
B2	B103	W/8	:	A/T mode switch
C2	B104	L/4	:	Heated seat switch LH
C3	B105	W/4	:	Heated seat switch RH

YEL363A

Body Harness (Cont'd)

5-DOOR HATCHBACK — LHD models



YEL362A

Body harness

G3	B1	W/12	:	To M12
A2	B2	W/8	:	To M11
A1	B3	W/24	:	To M13
A1	B4	W/10	:	To M14
B1	B5	W/12	:	To D2
B2	B6	W/8	:	Theft warning control unit
B1	B7	W/20	:	Theft warning control unit
B2	B8	W/12	:	Fuse block (J/B)
A3	B11	W/12	:	Super lock control unit
A3	B12	W/16	:	Super lock control unit
A3	B13	L/4	:	Door mirror heat relay
A3	B14	BR/6	:	Rear window defogger relay
D1	B15	W/6	:	Ultra sonic sub-sensor
D1	B16	W/8	:	To D22
E2	B17	W/4	:	Seat belt pre-tensioner (Passenger side)
D2	B18	–	:	Body ground
D2	B19	BR/1	:	Front door switch (Passenger side)
B3	B20	B/3	:	Front door switch (Driver's side)
C3	B21	W/3	:	Heated seat LH
B2	B22	W/2	:	Power seat
C3	B24	B/1	:	Parking brake switch
B4	B26	W/4	:	Seat belt pre-tensioner (Driver's side)
B3	B27	–	:	Body ground
B3	B28	W/8	:	To D18
B2	B29	W/8	:	Ultra sonic sensor
D3	B30	GY/2	:	Fuel pump
D3	B31	W/3	:	Fuel pump gauge unit
F3	B32	GY/2	:	Rear wheel sensor RH
D4	B33	BR/2	:	Rear wheel sensor LH
E1	B34	BR/1	:	Rear door switch RH
G1	B35	B/1	:	Theft warning horn
E1	B37	B/2	:	Rear speaker RH
C4	B38	B/1	:	Rear door switch LH
D1	B40	B/2	:	Rear speaker LH
C1	B41	B/1	:	Rear window defogger
D2	B42	W/4	:	To D29
D2	B43	W/6	:	To D102
E2	B44	W/3	:	To D103
E3	B45	W/2	:	Luggage room lamp
F3	B46	W/4	:	Rear combination lamp LH
E3	B47	W/16	:	CD auto changer
F3	B48	—	:	Body ground
F3	B49	W/4	:	Rear combination lamp RH
D2	B56	W/10	:	To D11
C2	B57	W/4	:	To E115
C3	B58	W/12	:	To B101
D3	B61	W/3	:	To Heated seat RH
F3	B62	—	:	Shield earth
C2	B63	W/6	:	Ultra sonic cancel switch
A2	B64	W/6	:	To E120
C1	B65	—	:	Body earth
C3	B66	Y/10	:	Diagnosis sensor unit
C3	B67	—	:	Diagnosis sensor unit
B2	B68	Y/2	:	Side air bag module LH
D3	B69	Y/2	:	Side air bag module RH
B3	B70	GY/2	:	Satellite sensor LH
E2	B71	GY/2	:	Satellite sensor RH
C1	B72	—	:	Body earth

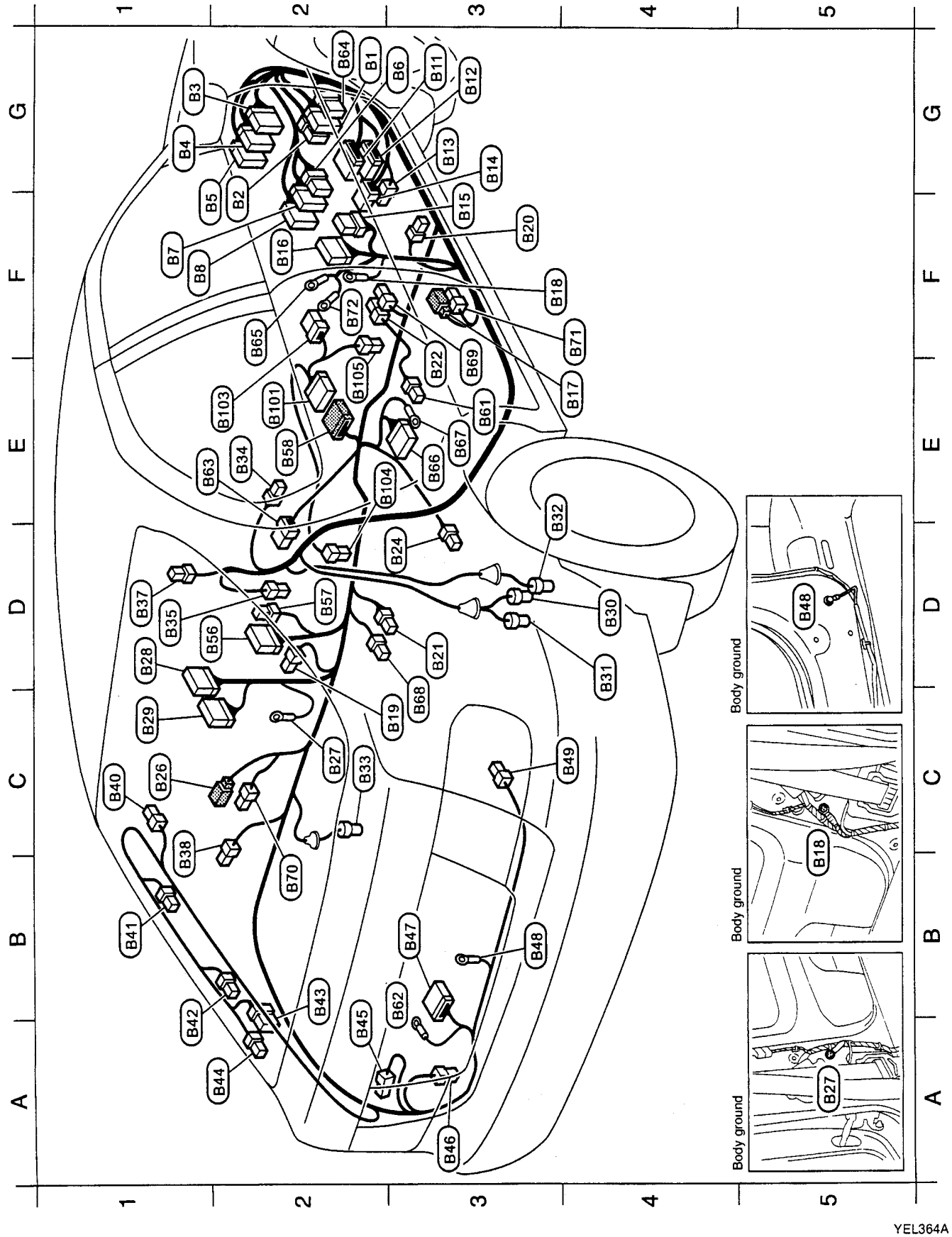
Console harness

C1	B101	W/12	:	To B58
B2	B103	W/8	:	A/T mode switch
C2	B104	L/4	:	Heated seat switch LH
C3	B105	W/4	:	Heated seat switch RH

YEL363A

Body Harness (Cont'd)

5-DOOR HATCHBACK — RHD models



YEL364A

Body harness

G2	B1	W/12	:	To M12
F2	B2	W/8	:	To M11
G1	B3	W/24	:	To M13
G1	B4	W/10	:	To M14
F2	B5	W/12	:	To D2
G3	B6	W/8	:	Theft warning control unit
F1	B7	W/20	:	Theft warning control unit
F1	B8	W/12	:	Fuse block (J/B)
G3	B11	W/12	:	Super lock control unit
G3	B12	W/16	:	Super lock control unit
G3	B13	L/4	:	Door mirror heat relay
G3	B14	BR/6	:	Rear window defogger relay
F3	B15	W/6	:	Ultra sonic sub-sensor
F2	B16	W/8	:	To D22
E4	B17	W/4	:	Seat belt pre-tensioner (Driver's side)
F3	B18	–	:	Body ground
C3	B19	BR/1	:	Front door switch (Passenger side)
F3	B20	B/3	:	Front door switch (Driver's side)
D3	B21	W/3	:	Heated seat LH
E3	B22	W/2	:	Power seat
D3	B24	B/1	:	Parking brake switch
C1	B26	W/4	:	Seat belt pre-tensioner (Passenger side)
C2	B27	–	:	Body ground
D1	B28	W/8	:	To D18
C1	B29	W/8	:	Ultra sonic sensor
D4	B30	GY/2	:	Fuel pump
D4	B31	W/3	:	Fuel tank gauge unit
E3	B32	GY/2	:	Rear wheel sensor RH
C2	B33	BR/2	:	Rear wheel sensor LH
E2	B34	BR/1	:	Rear door switch RH
D1	B35	B/1	:	Theft warning horn
D1	B37	B/2	:	Rear speaker RH
C1	B38	B/1	:	Rear door switch LH
C1	B40	B/2	:	Rear speaker LH
B1	B41	B/1	:	Rear window defogger
A1	B42	W/4	:	To D29
B2	B43	W/6	:	To D102
A2	B44	W/3	:	To D103
A2	B45	W/2	:	Luggage room lamp
A3	B46	W/4	:	Rear combination lamp LH
B3	B47	W/16	:	CD auto changer
B3	B48	—	:	Body ground
C4	B49	W/4	:	Rear combination lamp RH
D2	B56	W/10	:	To D11
D2	B57	W/4	:	To E115
E2	B58	W/12	:	To B101
E3	B61	W/3	:	Heated seat RH
B3	B62	—	:	Shield earth
E1	B63	W/6	:	Ultrasonic cancel switch
G2	B64	W/6	:	To E120
F2	B65	—	:	Body earth
E3	B66	Y/10	:	Diagnosis sensor unit
E3	B67	—	:	Diagnosis sensor unit
C3	B68	Y/2	:	Side air bag module LH
E3	B69	Y/2	:	Side air bag module RH
B2	B70	GY/2	:	Satellite sensor LH
F4	B71	GY/2	:	Satellite sensor RH
F2	B72	—	:	Body earth

Console harness

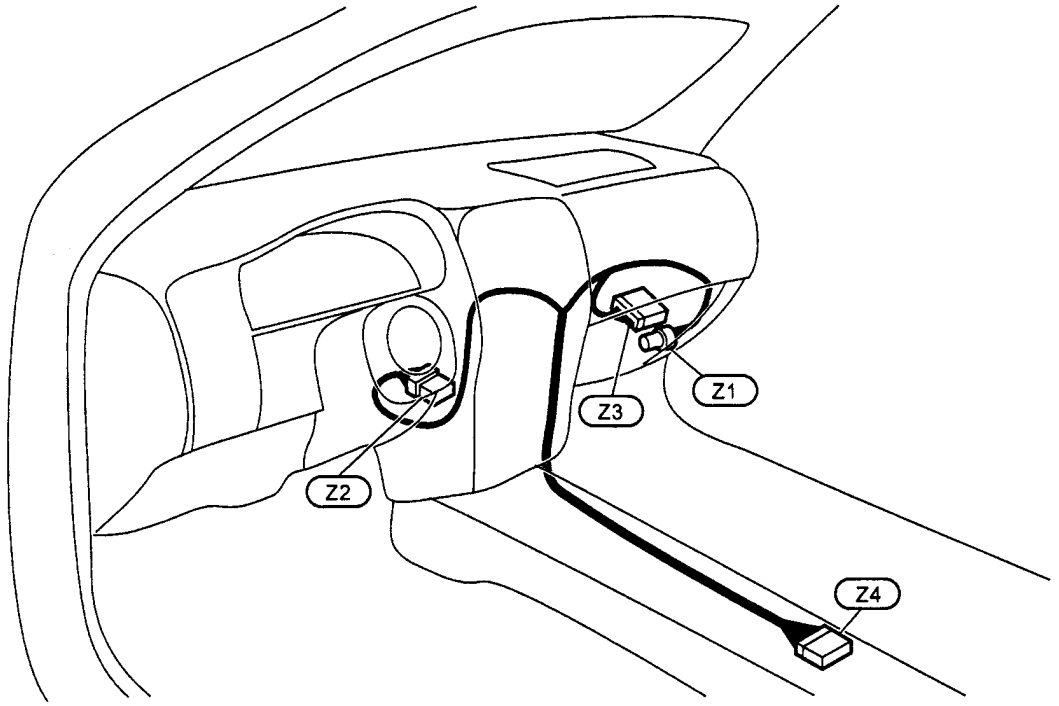
E2	B101	W/12	:	To B58
E2	B103	W/8	:	A/T mode switch
E2	B104	L/4	:	Heated seat switch LH
E3	B105	W/4	:	Heated seat switch RH

YEL365A

Air Bag Harness

LHD MODELS

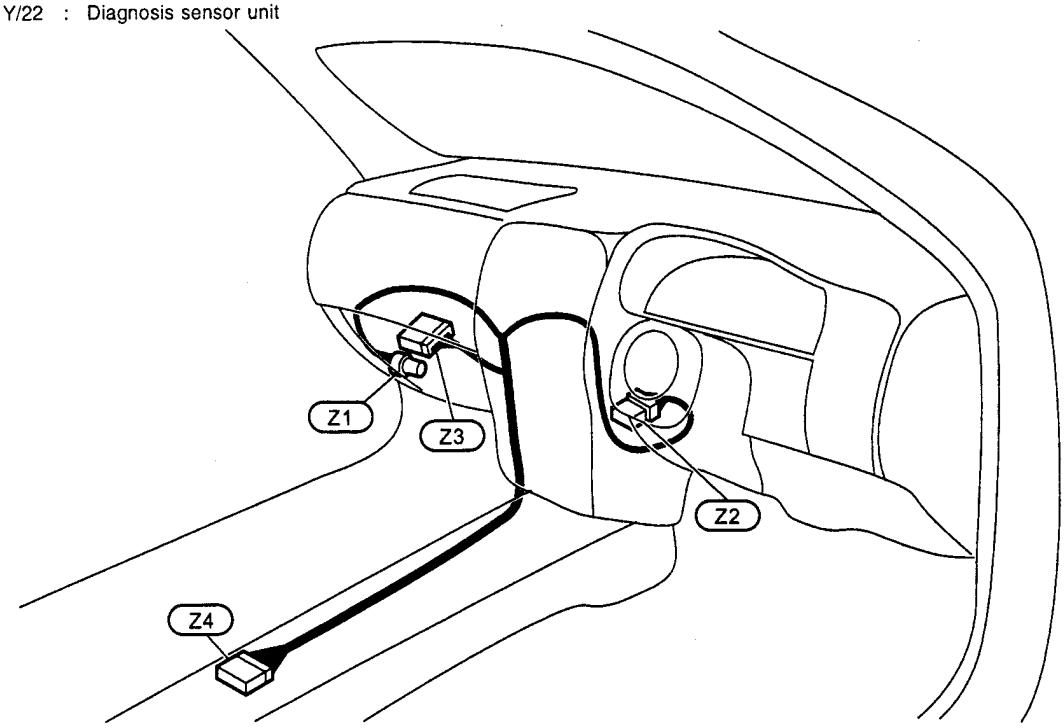
Z1 W/2 : Air bag module (Passenger side)
Z2 Y/6 : Spiral cable
Z3 W/16 : To M54
Z4 Y/22 : Diagnosis sensor unit



YEL366A

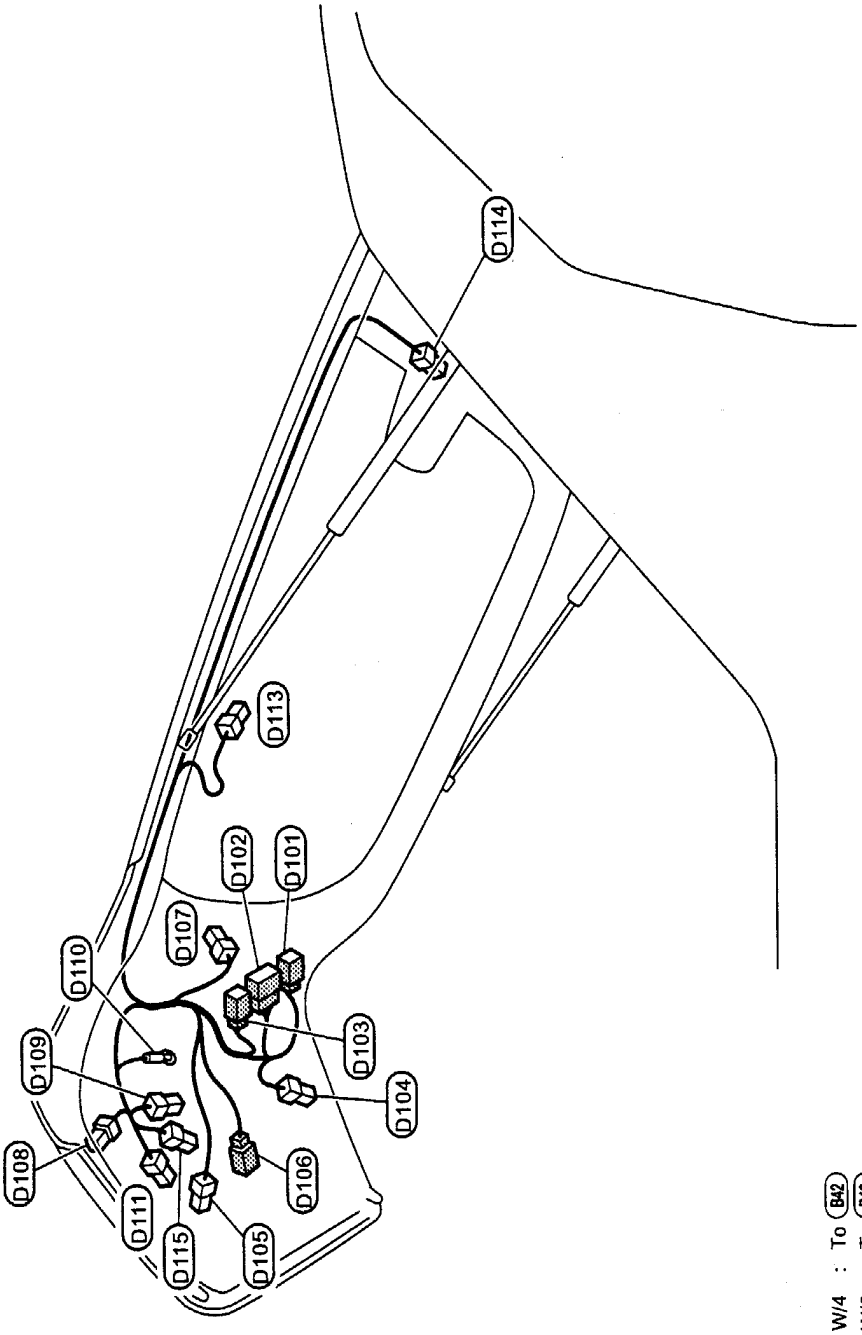
RHD MODELS

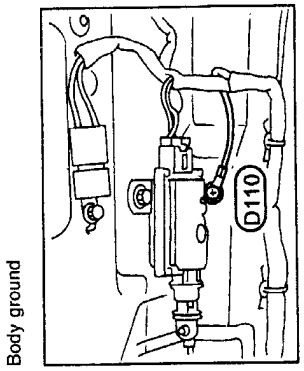
Z1 W/2 : Air bag module (Passenger side)
Z2 Y/6 : Spiral cable
Z3 W/16 : To M54
Z4 Y/22 : Diagnosis sensor unit



YEL367A

Back Door Harness





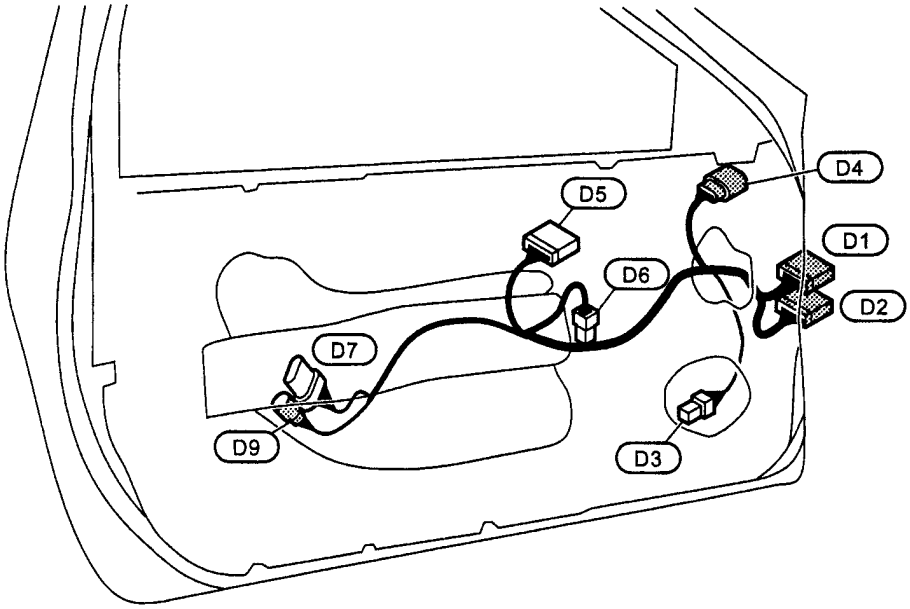
D101	W/4	: To B42	
D102	W/6	: To B43	
D103	W/3	: To B44	
D104	W/4	:	Rear combination lamp LH
D105	B/2	:	Luggage room lamp switch
D106	W/2	:	Licence plate lamp
D107	W/4	:	Rear wiper motor
D108	W/4	:	Rear combination lamp RH
D109	W/4	:	Door lock actuator assembly
D110	–	:	Body ground
D111	B/1	:	Rear window defogger condenser
D113	B/1	:	Rear window defogger
D114	B/2	:	High mounted stop lamp

YEL368A

Front Door Harness (LH side)

LHD MODELS

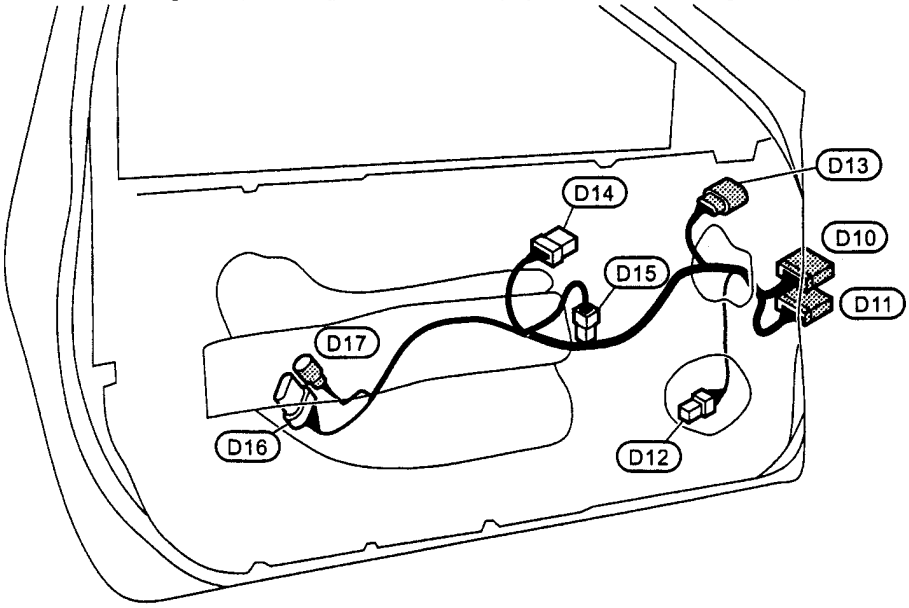
(D1) W/16 : To (M7)
(D2) W/12 : To (B5)
(D3) B/2 : Front speaker LH
(D4) W/5 : Door mirror (Driver's side)
(D5) W/16 : Power window main switch
(D6) B/2 : Front power window regulator (Driver's side)
(D7) B/6 : Door lock actuator assembly (Driver's side)
(D9) GY/2 : Key cylinder switch (Driver's side)



YEL369A

RHD MODELS

(D10) W/2 : To (M27)
(D11) W/10 : To (B56)
(D12) B/2 : Front speaker RH
(D13) W/5 : Door mirror (Passenger side)
(D14) W/8 : Front power window sub-switch
(D15) B/é : Front power window regulator (Passenger side)
(D16) B/6 : Door lock actuator assembly (Passenger side)
(D17) GY/2 : Key cylinder switch (Passenger side)

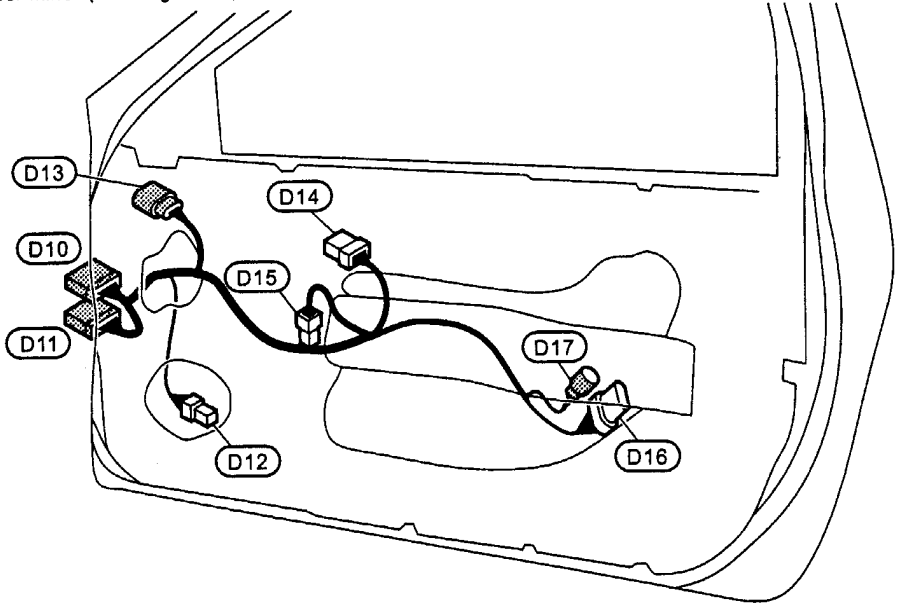


YEL370A

Front Door Harness (RH side)

LHD MODELS

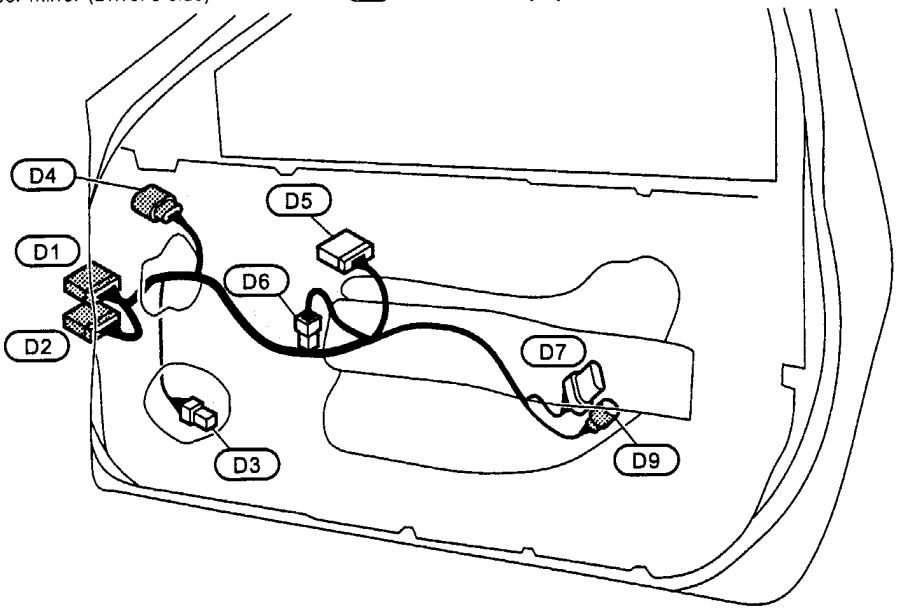
(D10) W/8 : To (M27)
(D11) W/10 : To (B56)
(D12) B/2 : Front speaker RH
(D13) W/5 : Door mirror (Passenger side)
(D14) W/8 : Front power window sub-switch
(D15) B/2 : Front power window regulator (Passenger side)
(D16) B/6 : Door lock actuator assembly (Passenger side)
(D17) GY/2 : Key cylinder switch (Passenger side)



YEL371A

RHD MODELS

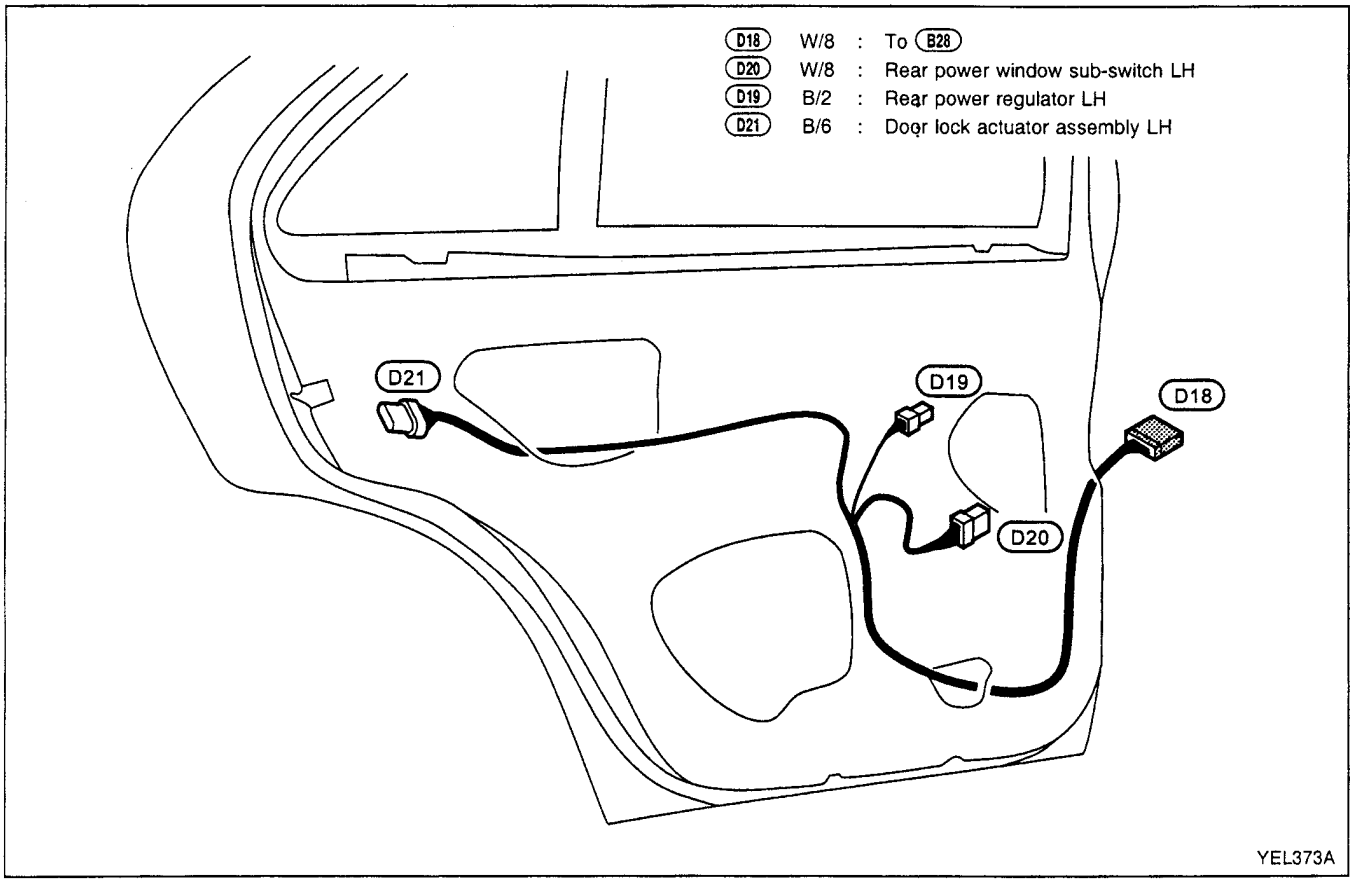
(D1) W/12 : To (M7)
(D2) W/12 : To (B5)
(D3) B/2 : Front speaker RH
(D4) W/5 : Door mirror (Driver's side)
(D5) W/16 : Power window main switch
(D6) B/2 : Front power window regulator (Driver's side)
(D7) B/6 : Door lock actuator assembly (Driver's side)
(D9) GY/2 : Key cylinder switch (Driver's side)



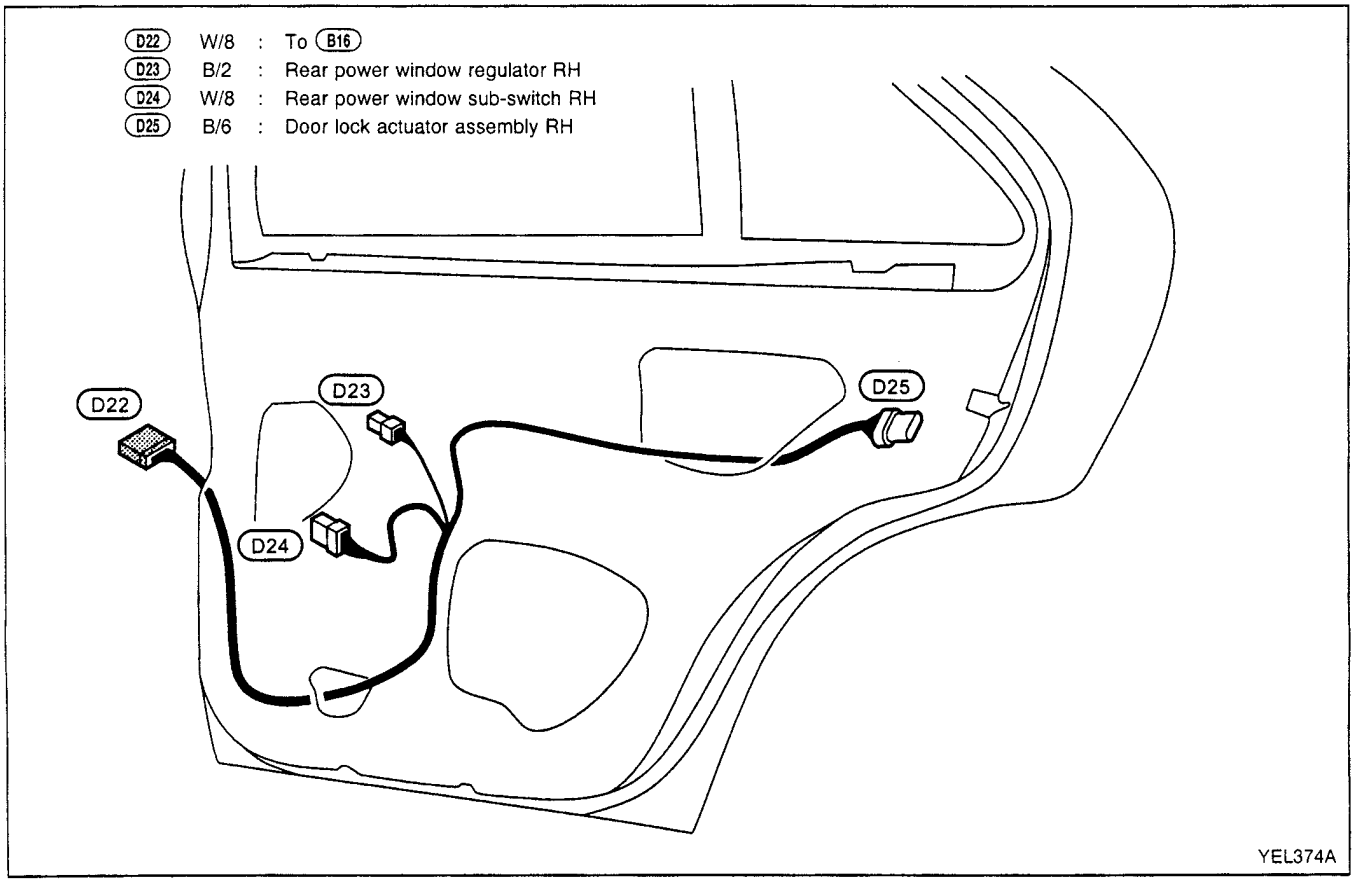
YEL372A

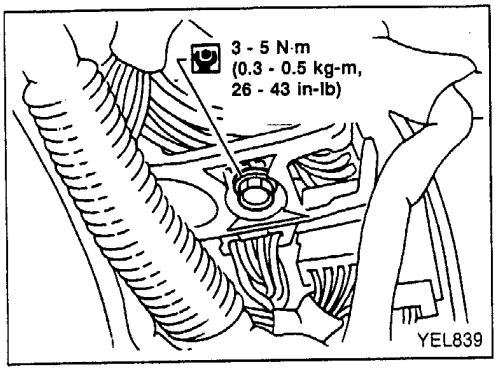
Rear Door Harness

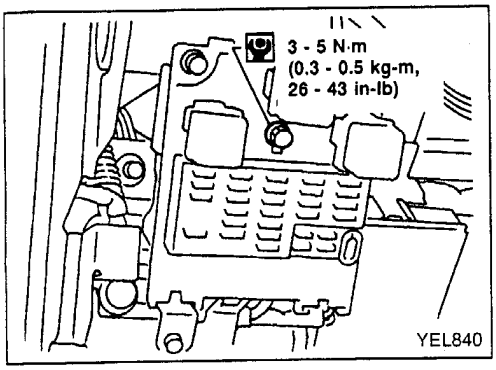
LH SIDE



RH SIDE







INSTALLATION

To install SMJ and FUSE BLOCK (J/B), tighten bolts until orange "fulltight" mark appears and then retighten to specified torque as required.

: **3 - 5 N·m**
(0.3 - 0.5 kg-m, 26 - 43 in-lb)

CAUTION:
Do not overtighten bolts, otherwise, they may be damaged.

<SUPPLEMENT-III> (For wagon models)

ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
• Read GI section, "HOW TO READ WIRING DIAGRAMS".
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".

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WIRING DIAGRAM REFERENCE CHART

ECCS (Ignition system) ..... EC SECTION
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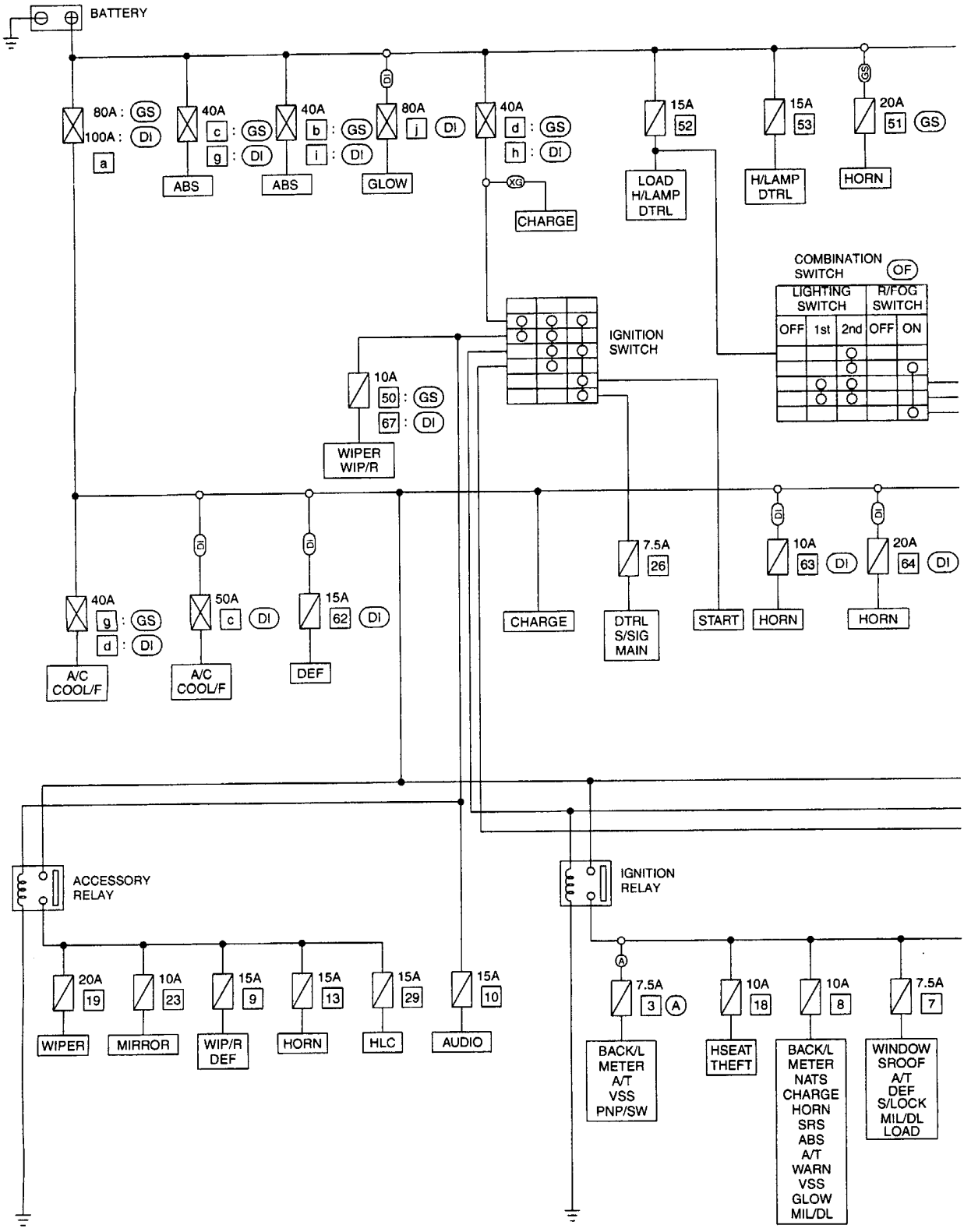
ANTI-LOCK BRAKE SYSTEM ..... BR SECTION
SRS "AIR BAG" and "SEAT BELT PRE-TENSIONER" ..... RS SECTION
HEATER AND AIR CONDITIONER ..... HA SECTION

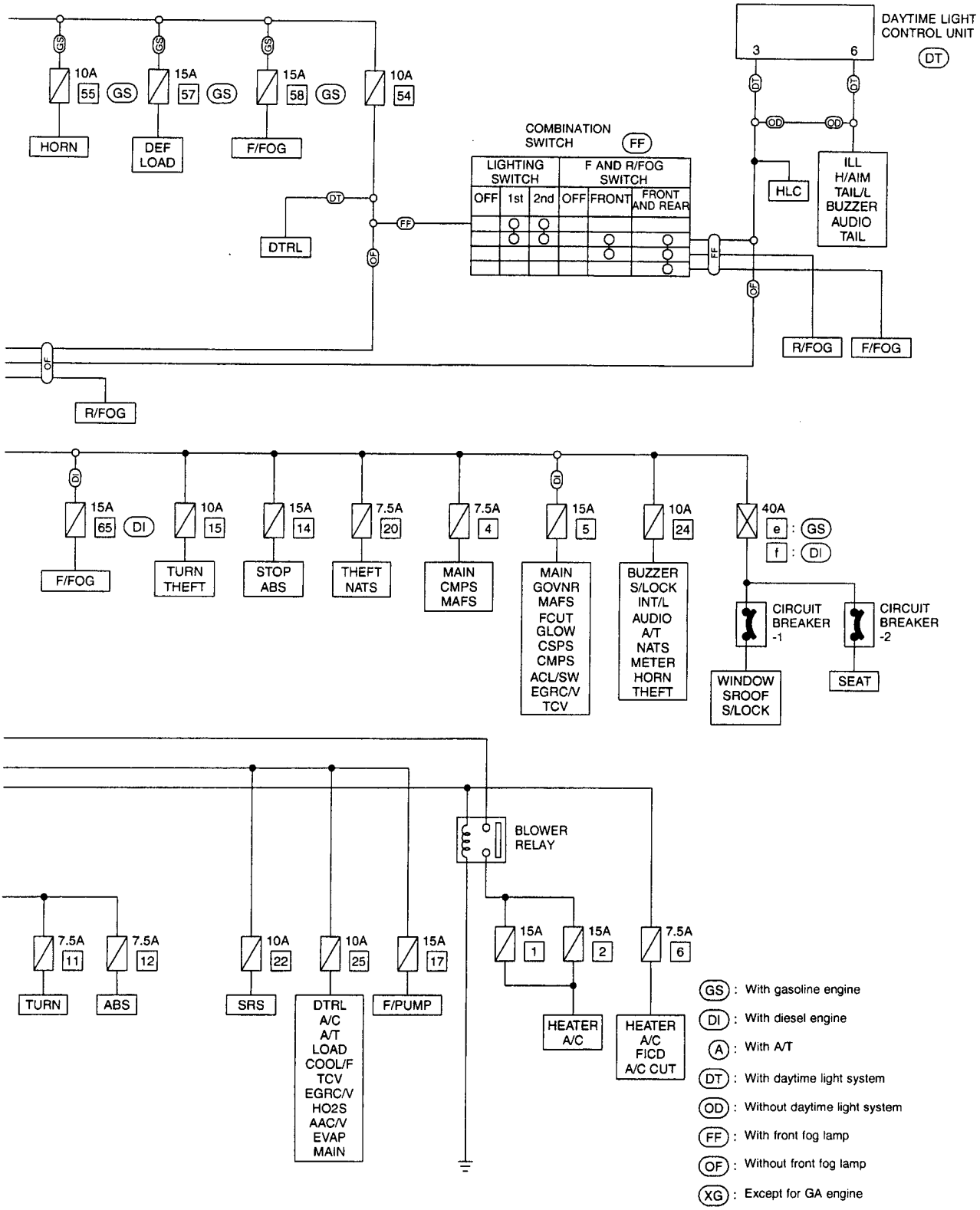
Note

Schematic



YEL562A

Schematic (Cont'd)

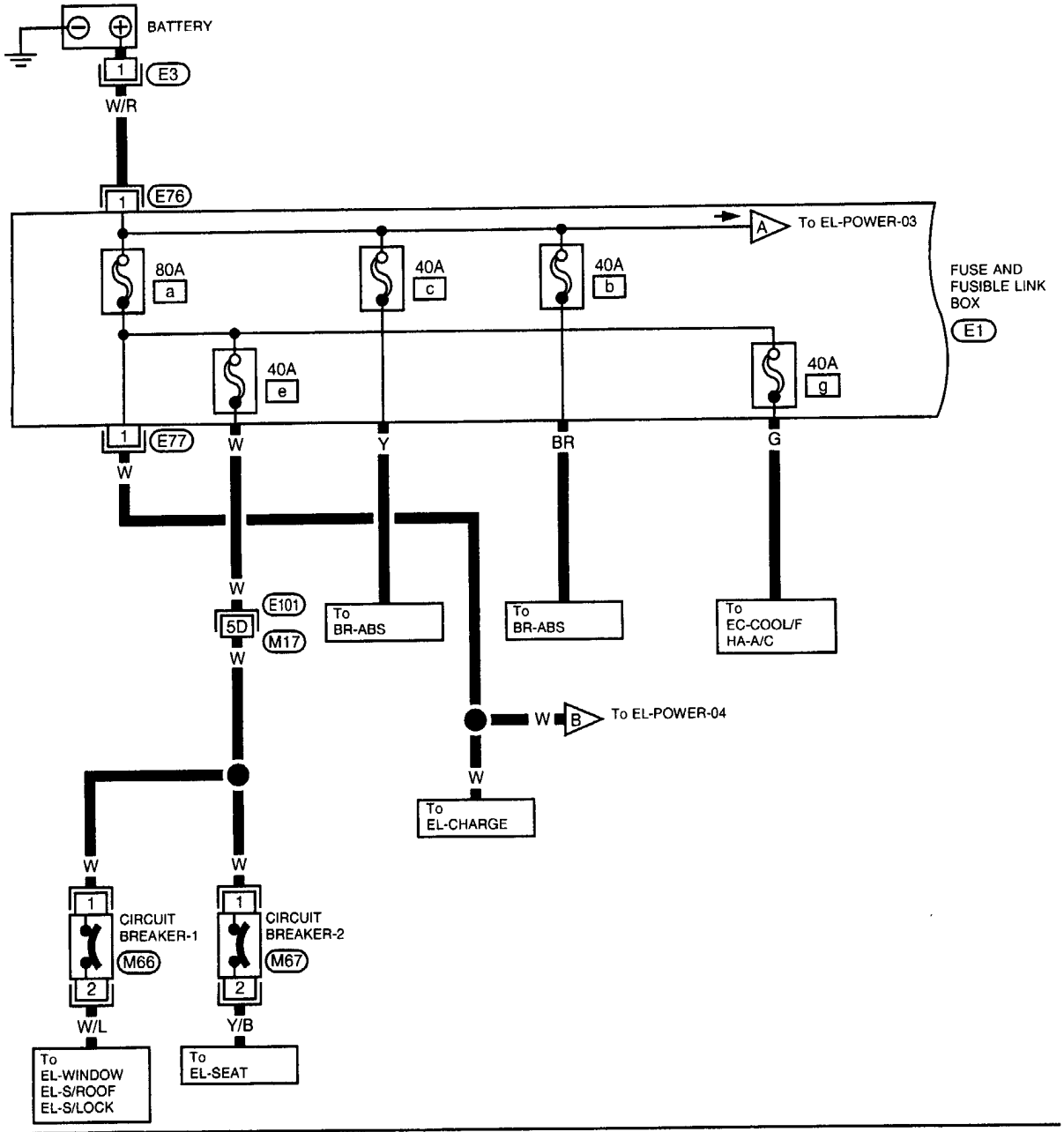


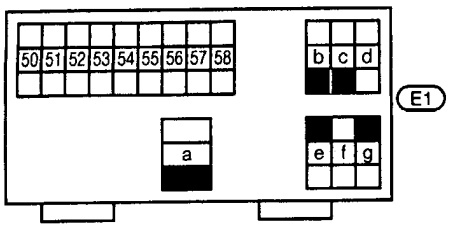
YEL563A

Wiring Diagram — POWER —

GASOLINE ENGINE MODELS

EL-POWER-01





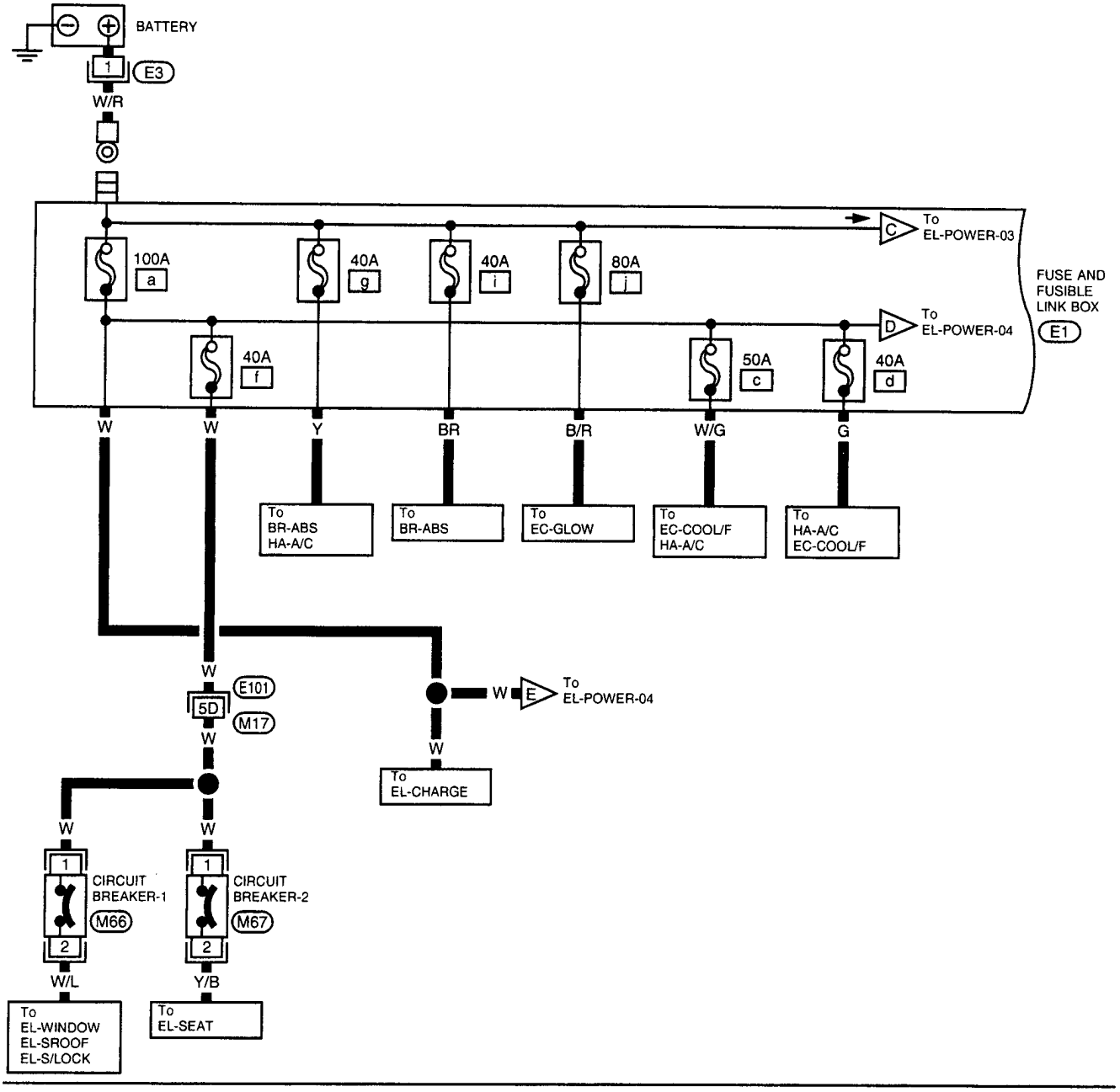
Refer to last page (Foldout page).
M17 , E101

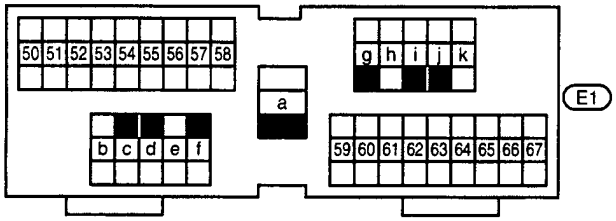
YEL514A

Wiring Diagram — POWER — (Cont'd)

DIESEL ENGINE MODELS

EL-POWER-02





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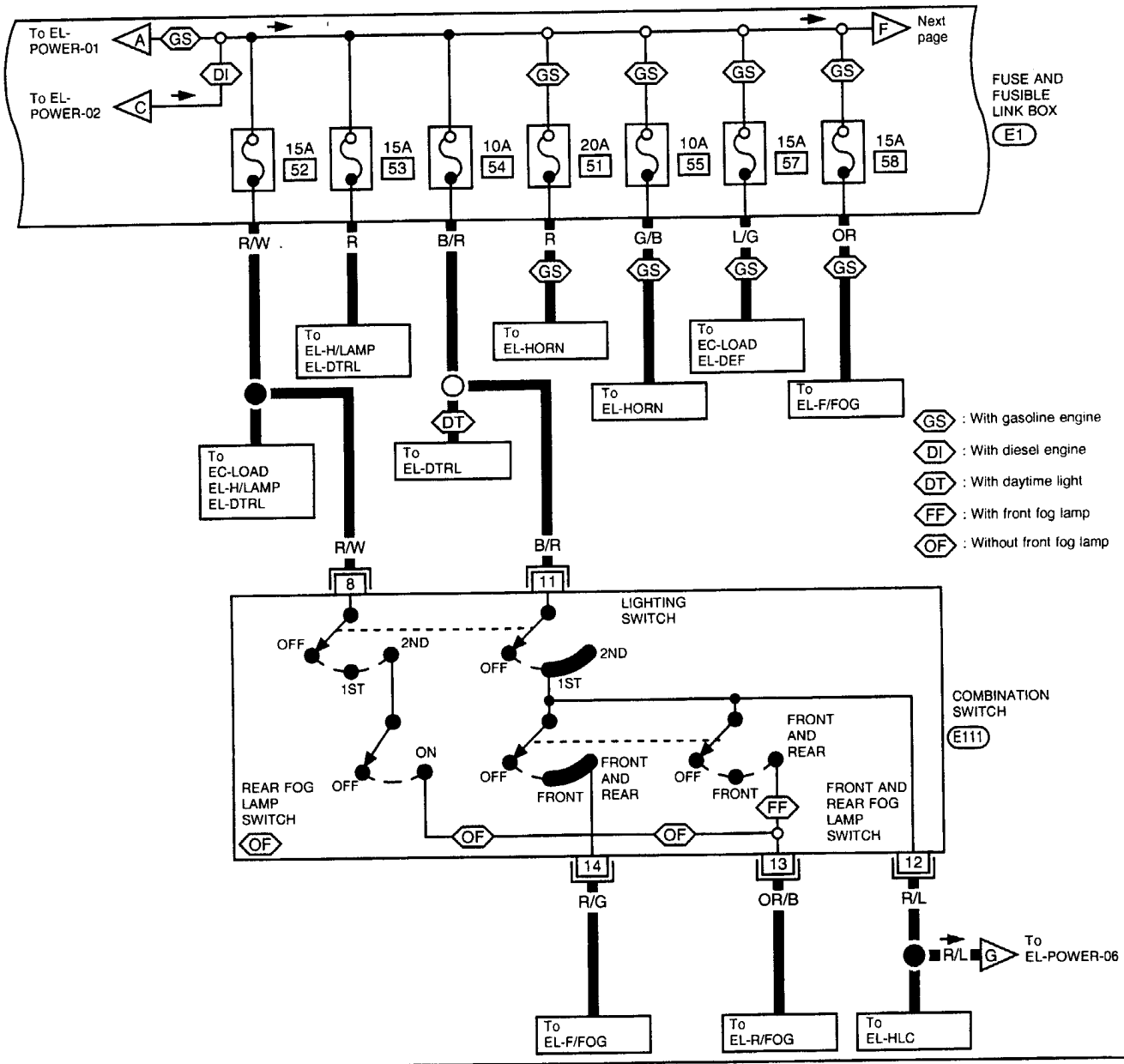
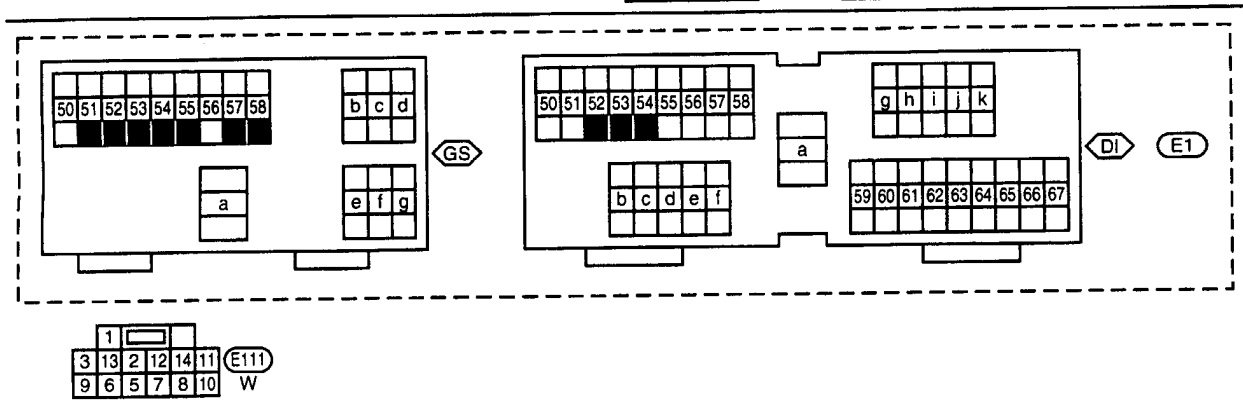
M17 , E101

YEL515A

Wiring Diagram — POWER — (Cont'd)

EL-POWER-03

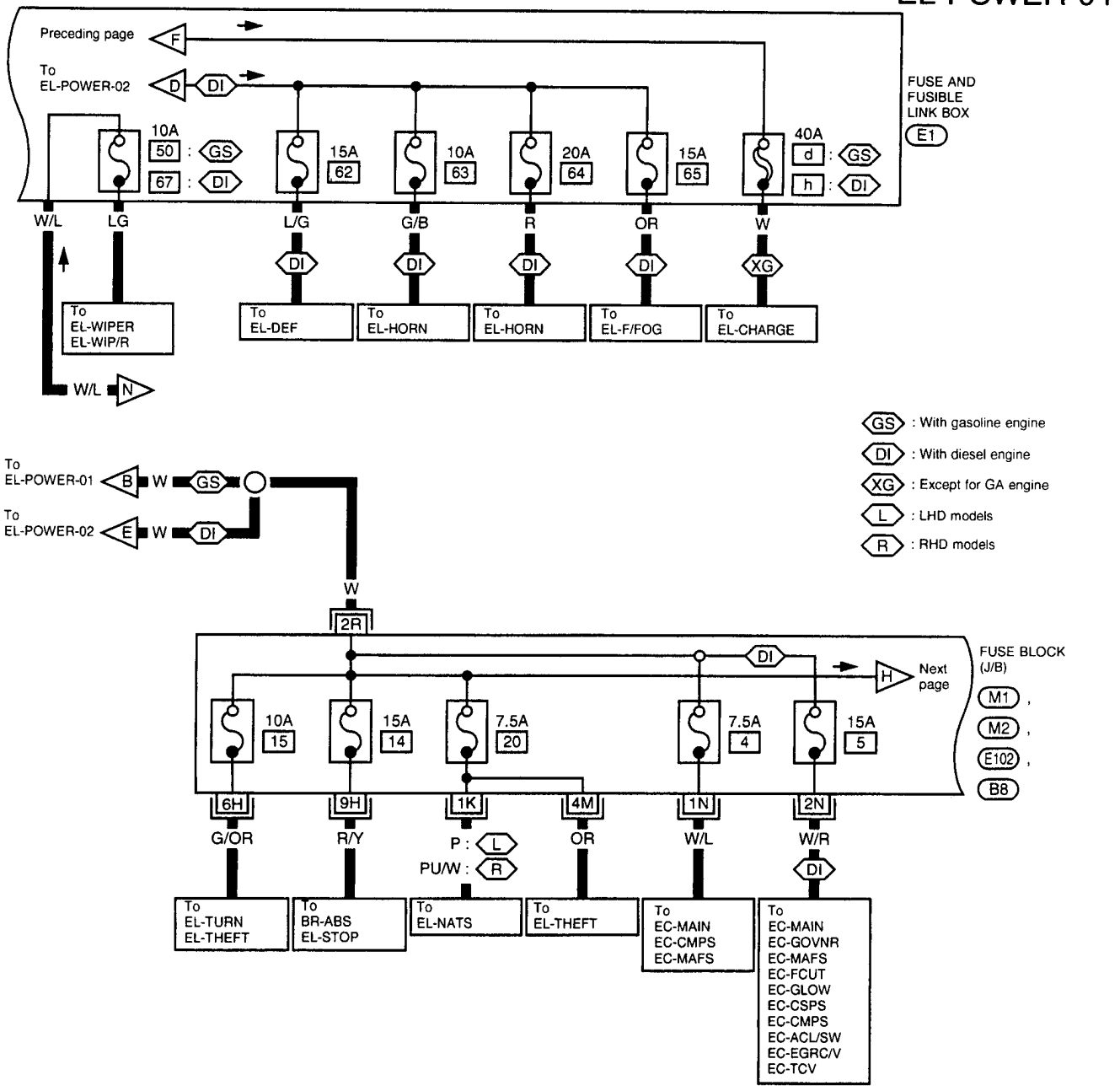


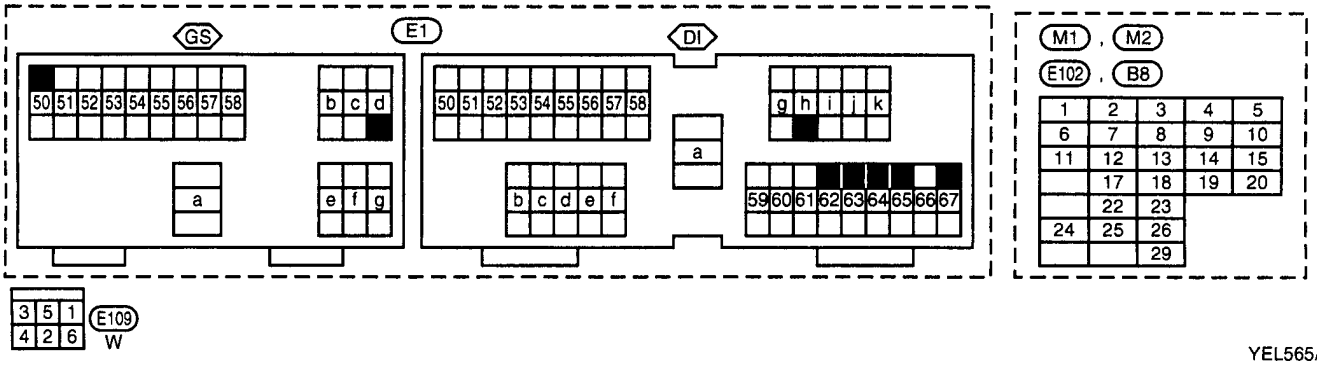


YEL564A

Wiring Diagram — POWER — (Cont'd)

EL-POWER-04

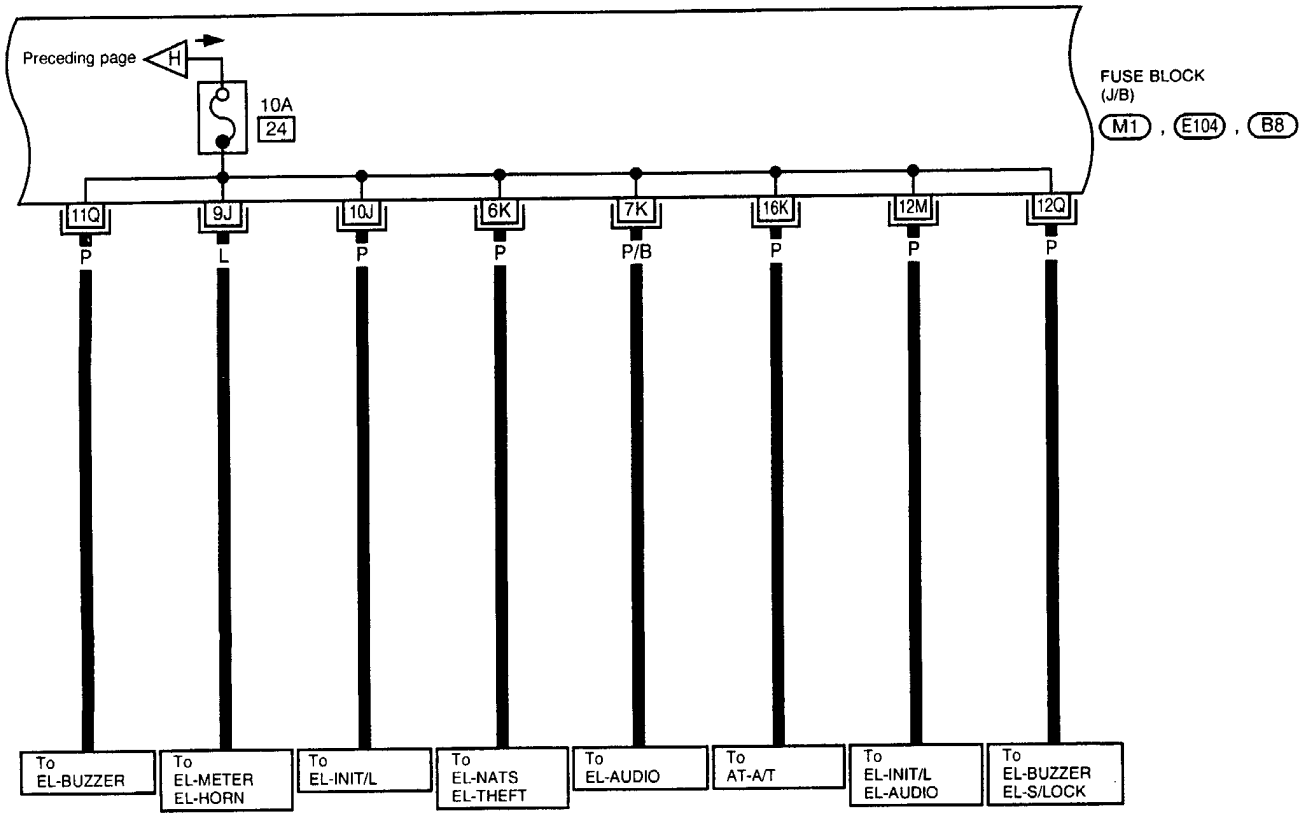




YEL565A

Wiring Diagram — POWER — (Cont'd)

EL-POWER-05



Refer to last page (Foldout page).

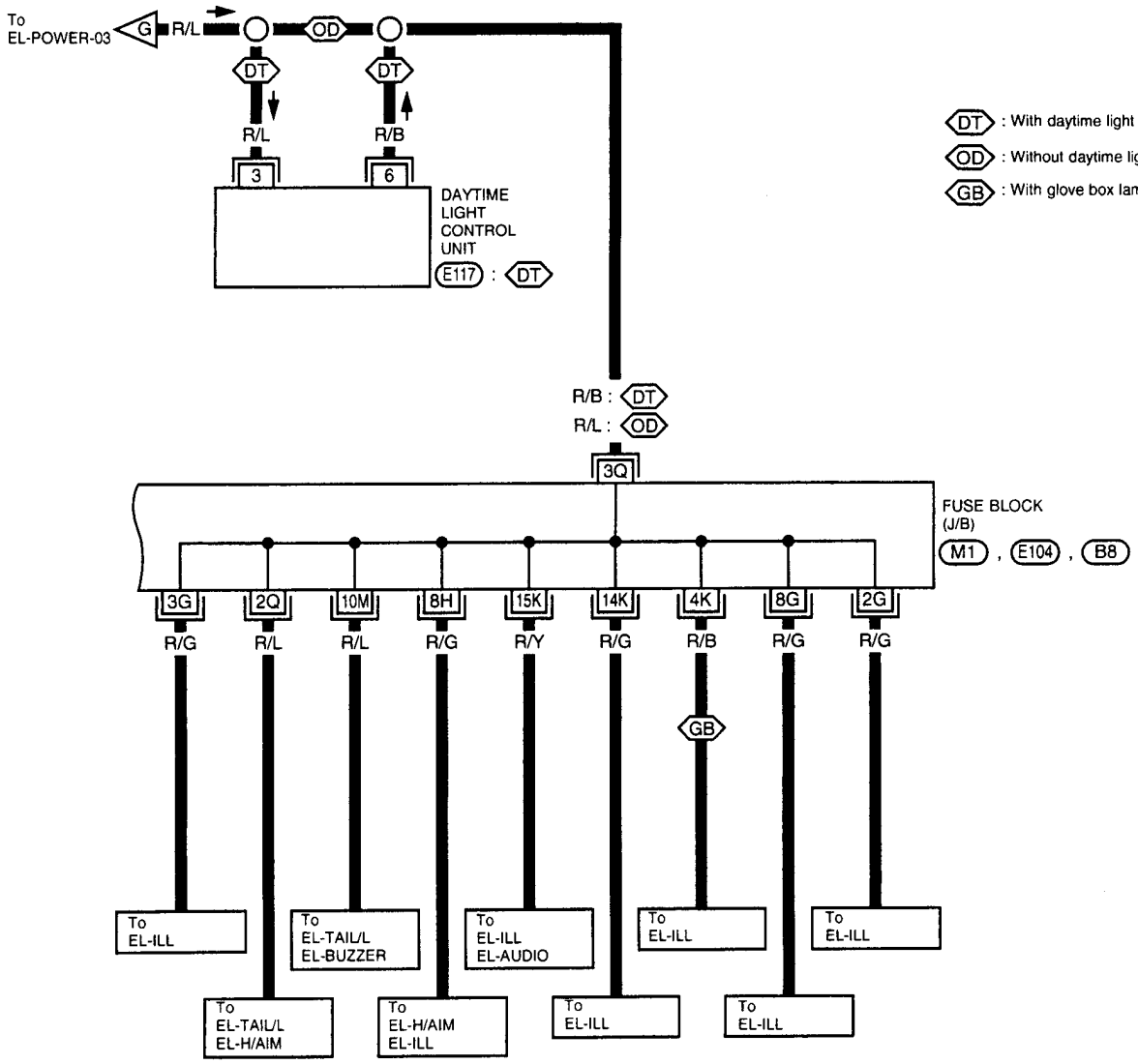
M1 , E104 , B8

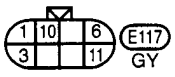
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL518A

Wiring Diagram — POWER — (Cont'd)

EL-POWER-06





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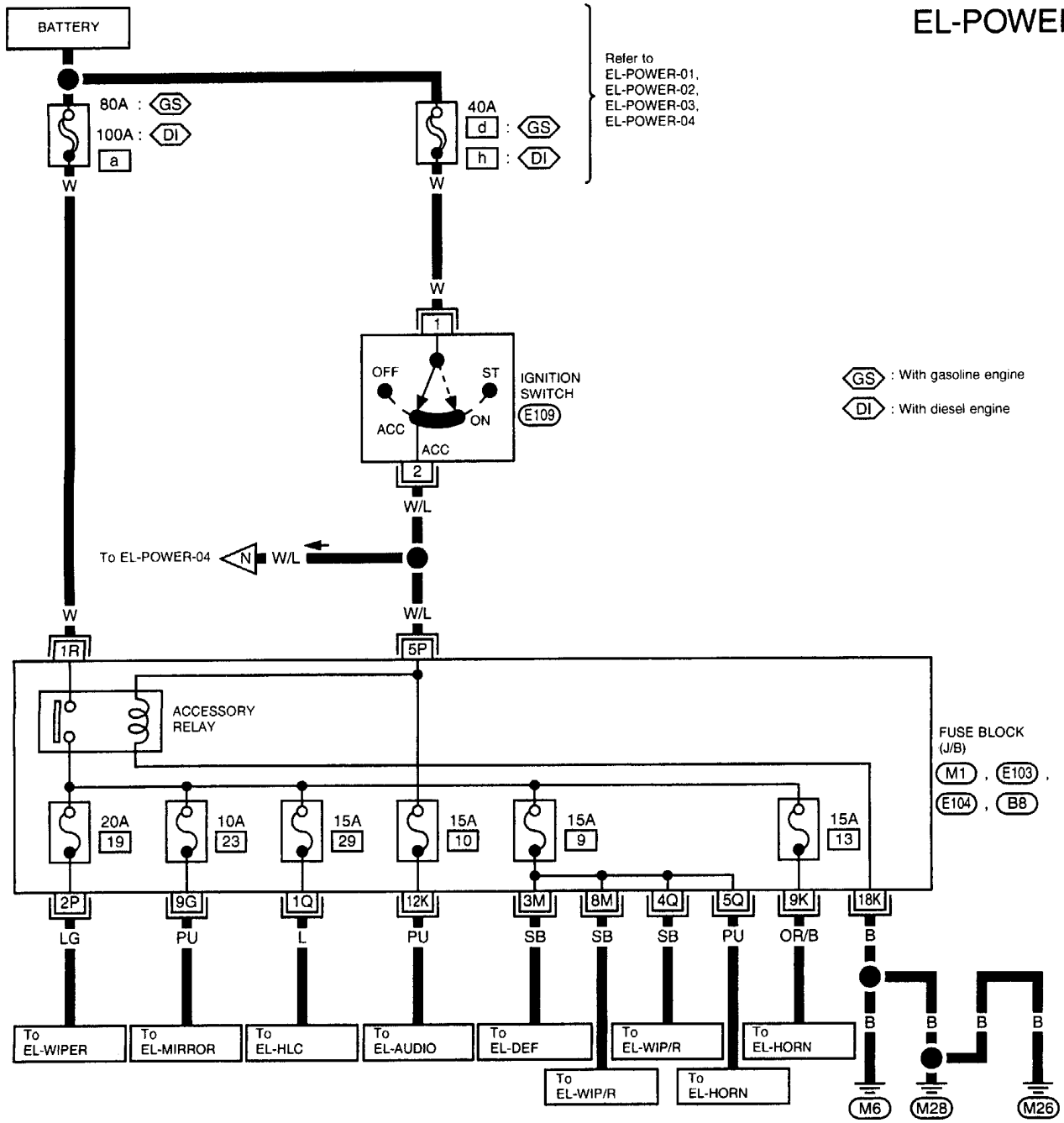
M1 , E104 , B8

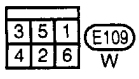
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL650A

Accessory Power Supply — Ignition SW. in "Acc" or "ON"

EL-POWER-07





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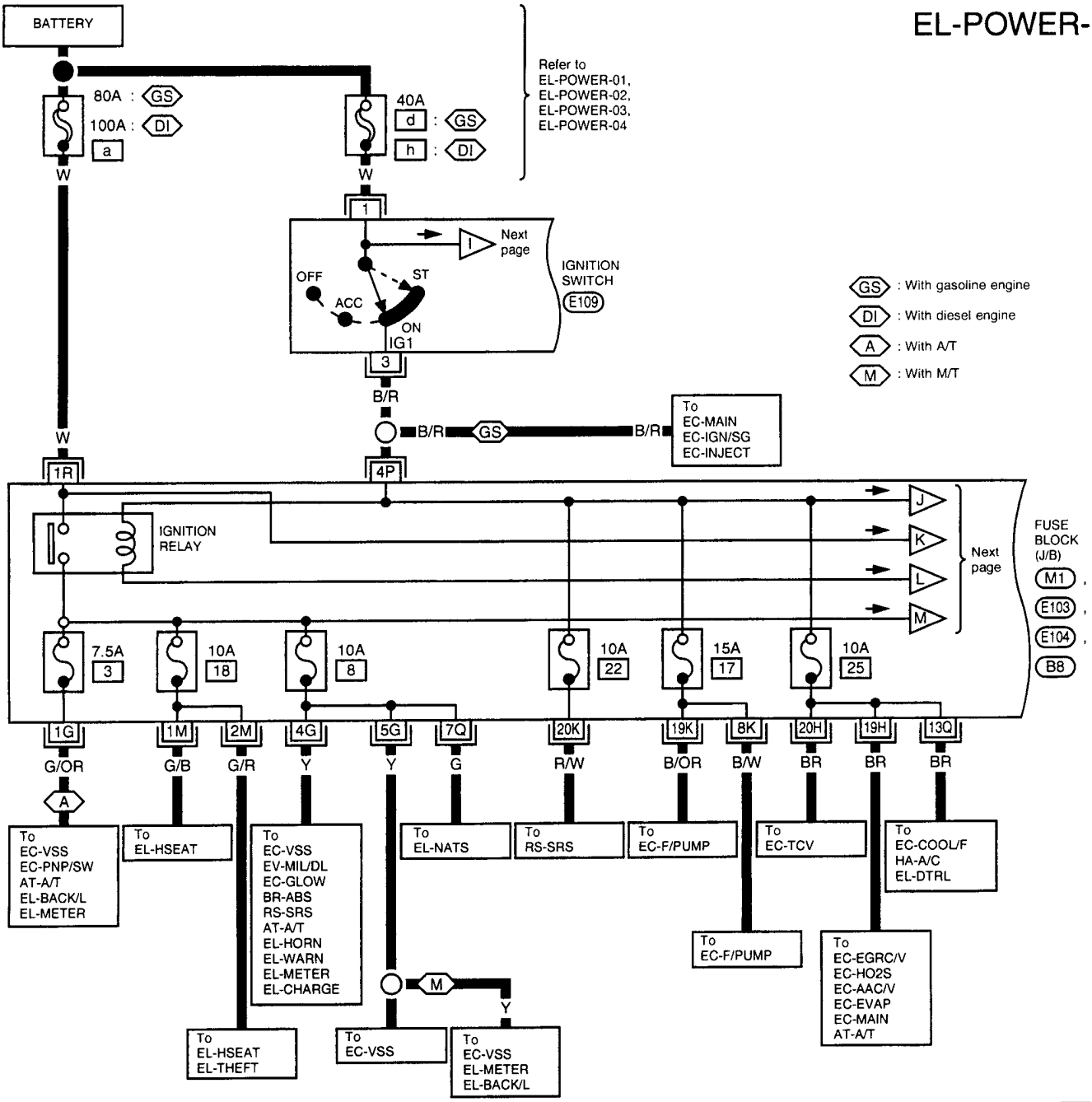
M1 , E103 , E104 , B8

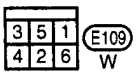
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL566A

Accessory Power Supply — Ignition SW. in "ON" or "START"

EL-POWER-08





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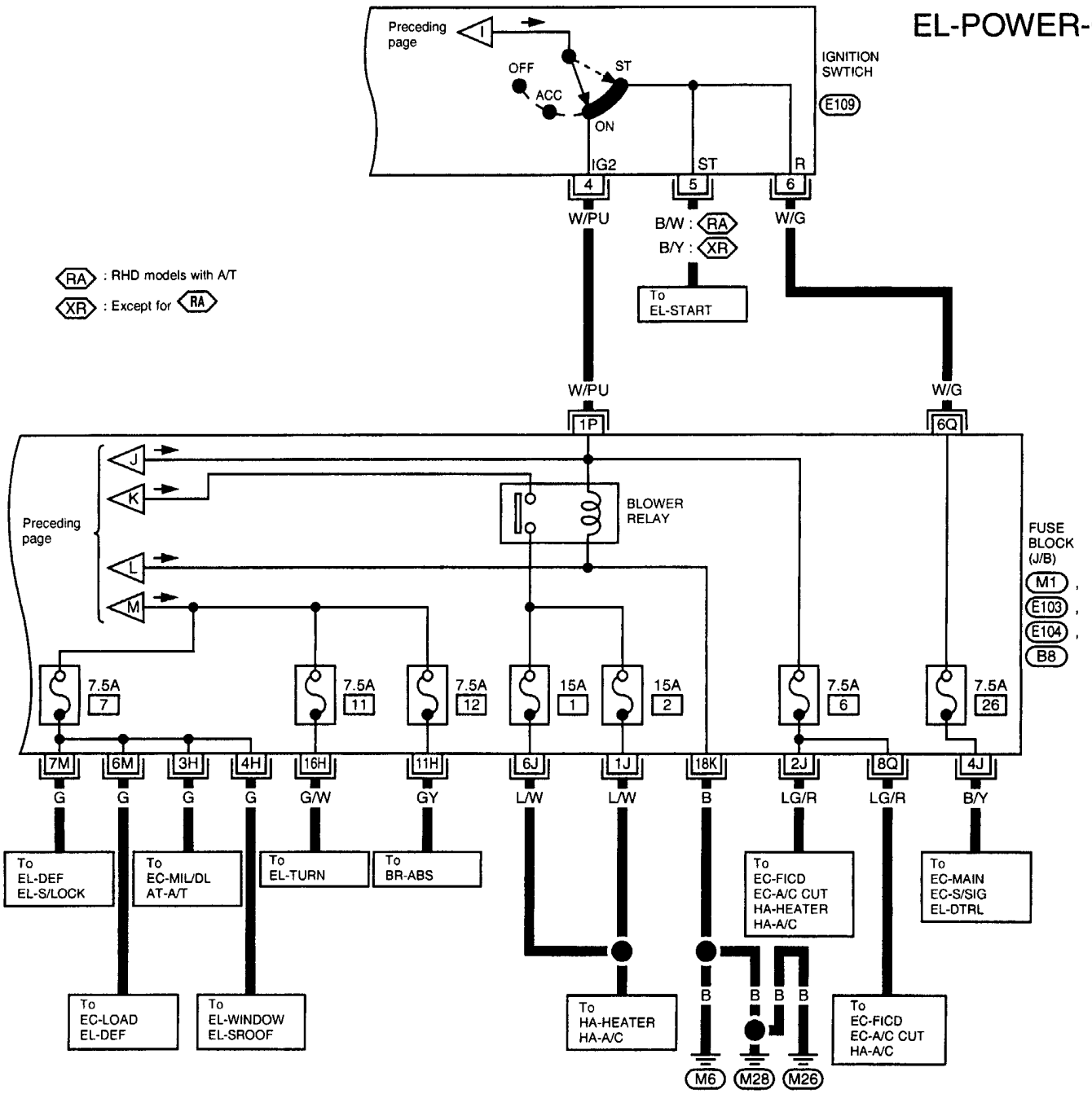
M1, E103, E104, B8

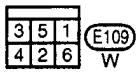
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL567A

Accessory Power Supply — Ignition SW. in "ON" or "START" (Cont'd)

EL-POWER-09





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M1 , E103 , E104 , B8

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
	17	18	19	20
	22	23		
24	25	26		
		29		

YEL568A

GROUND	CONNECT TO	CONN. NO.	CELL CODE
M6/M26/M28	COMBINATION METER (HIGH BEAM INDICATOR)	M36	EL-DTRL
	COMBINATION METER (TURN)	M36	EL-TURN
	COMBINATION METER (REAR FOG LAMP)	M36	EL-R/FOG
	COMBINATION METER (SPEEDOMETER)	M38	EC-VSS, EL-METER, AT-A/T
	COMBINATION METER (TACHOMETER)	M38	EL-METER, AT-A/T
	COMBINATION METER (WATER TEMP GAUGE)	M38	EL-METER
	COMBINATION METER (FUEL GAUGE)	M38	EL-METER
	COMBINATION METER (AIR BAG WARNING LAMP)	M38	RS-SRS, EL-WARN
	IGNITION RELAY ACCESSORY RELAY AND BLOWER RELAY (IN FUSE BLOCK)	M1	EL-POWER
	COMBINATION FLASHER UNIT	M33	EL-TURN
	SPOT LAMP	R5	EL-INT/L
	VANITY MIRROR LAMP (LHD models)	R2	EL-INT/L
	ILLUMINATION CONTROL UNIT	M3	EL-ILL
	REAR WINDOW DEFOGGER SWITCH	M57	EL-ILL, EL-DEF
	A/T CONTROL DEVICE	M49	AT-A/T, EL-ILL
	A/C SWITCH	M44	EL-ILL
	RECIRCULATION SWITCH	M47	HA-HEATER, HA-A/C, EL-ILL
	ASHTRAY ILLUMINATION	M40	EL-ILL
	HEATER ILLUMINATION	M45	EL-ILL
	ORN ILLUMINATION	M56	EL-ILL
	HAZARD SWITCH	M58	EL-ILL
	GLOVE BOX LAMP	M24	EL-ILL
	FRONT WIPER MOTOR (LHD models)	M101	EL-WIPER
	SUN ROOF SWITCH	R4	EL-SROOF
	DOOR MIRROR REMOTE CONTROL SWITCH	M5	EL-MIRROR
	FAN SWITCH	M46	HA-HEATER, HA-A/C, EC-LOAD, EC-A/CCUT
	AIR BAG DIAGNOSIS SENSOR UNIT	Z4	RS-SRS
	DATA LINK CONNECTOR FOR CONSULT	M59	EC-MIL/DL, AT-A/T RS-SRS
	KICK DOWN SWITCH	M19	AT-A/T
	POWER STEERING OIL PRESSURE SWITCH (LHD models)	M102	EC-PST/SW
	RDNT BRAKE SWITCH (RHD models)	M64	EL-TAIL/
	COMBINATION METER (ILLUMINATION)	M36	EL-ILL
	VANITY MIRROR LAMP (RHD models)	R9	EL-INT/L
	POWER WINDOW RELAY	M69	EL-WINDOW, EL-SROOF
E11/E37	FRONT COMBINATION LAMP LH	E5	EL-DTRL, EL-TAIL/L
	FRONT COMBINATION LAMP RH	E32	EL-DTRL, EL-TAIL/L
	DAYTIME LIGHT CONTROL UNIT	E117	EL-DTRL
	HEAD LAMP AIMING MOTOR LH	E4	EL-H/AIM
	HEAD LAMP AIMING MOTOR RH	E33	EL-H/AIM

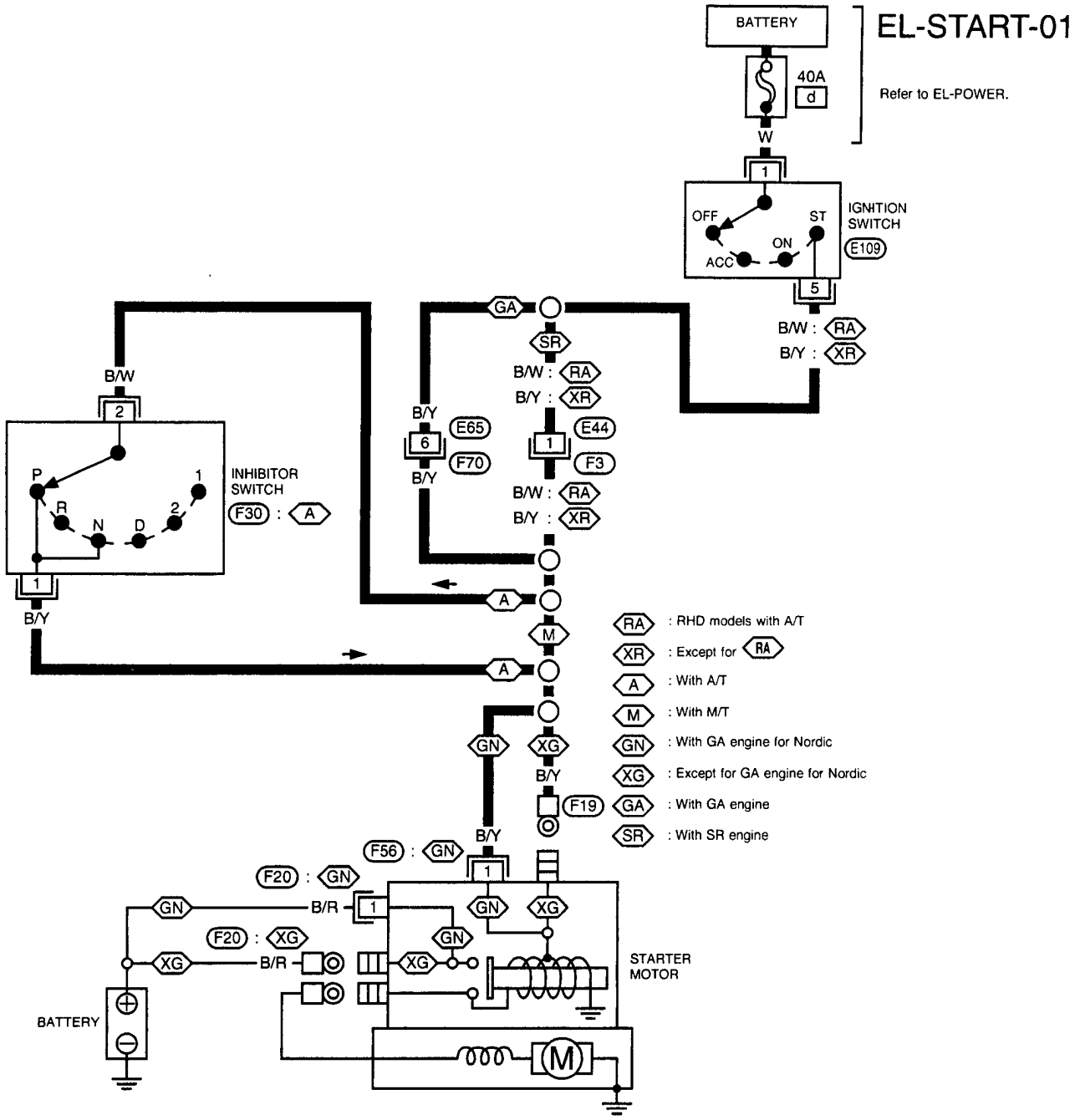
GROUND	CONNECT TO	CONN. NO.	CELL CODE
E11/E37	FRONT TURN SIGNAL LAMP LH	E8	EL-TURN, EL-THEFT
	FRONT TURN SIGNAL LAMP RH	E36	EL-TURN, EL-THEFT
	SIDE TURN SIGNAL LAMP LH	E9	EL-TURN, EL-THEFT
	SIDE TURN SIGNAL LAMP RH	E59	EL-TURN, EL-THEFT
	COMBINATION SWITCH (TRIP COMPUTER SWITCH)	E114	EL-METER
	SEDIMENTER SENSOR (CD engine)	E13	EL-WARN
	WASHER LEVEL SWITCH	E39	EL-WARN
	BRAKE FLUID LEVEL SWITCH	E14	EL-WARN
	FRONT WIPER MOTOR	E62	EL-WIPER
	COMBINATION SWITCH (FRONT WIPER SWITCH)	E114	EL-WIPER
	COMBINATION SWITCH (WASHER SWITCH)	E114	EL-WIPER, EL-WIP/R EL-HLC
	REAR WIPER RELAY	E52	EL-WIP/R
	HEAD LAMP WIPER MOTOR LH	E7	EL-HLC
	HEAD LAMP WIPER MOTOR RH	E35	EL-HLC
	HOOD SWITCH	E12	EL-THEFT
	SOLENOID VALVE RELAY	E50	BR-ABS
	TRIPLE PRESSURE SWITCH (CD engine)	E20	EC-COOL/F, HA-A/C
	COOLING FAN MOTOR-1 (SR, GA engine)	E19	EC-COOL/F, HA-A/C
	COOLING FAN MOTOR-2 (SR, GA engine)	E28	EC-COOL/F, HA-A/C
	COOLING FAN RELAY-2 (CD engine)	E54	HA-A/C, EC-COOL/F
	POWER STEERING OIL PRESSURE SWITCH (RHD models)	E60	EC-PST/SW
	HEADLAMP AIMING SWITCH	E123	EL-H/AIM
	VACUUM SWITCH (LHD MODELS)	E61	EL-WARN
	HEAD LAMP RELAY RH	E75	EL-HLC
	NATS IMMU	E121	EL-NATS
	AMBIENT AIR TEMPERATURE SENSOR	E63	EC-FICD, HA-A/C
	ABS CONTROL UNIT	E78	BR-ABS
	COOLING FAN MOTOR-2 (CD engine models)	E18	EC-COOLF, HA-A/C
	RDNT BRAKE SWITCH (LHD models)	E122	
F15/F18	VEHICLE SPEED SENSOR	F25	EC-VSS, AT-A/T, EL-METER
	IACV-FICD SOLENOID VALVE (GA engine)	F40	EC-FICD, HA-A/C
	A/T CONTROL UNIT	M48	AT-A/T
	SHIELD WIRE (THROTTLE POSITION SENSOR)	F16	EC-TPS, AT-A/T
	ECM (ECCS CONTROL MODULE) (SR-GA engine)	F101	EC-MAIN
	ECM (ECCS CONTROL MODULE) (CD engine)	F106	EC-MAIN
	SHIELD WIRE (CAMSHAFT POSITION SENSOR)	F33	EC-CMPS
	SHIELD WIRE MASS AIR FLOW SENSOR	F38	EC-MAFS

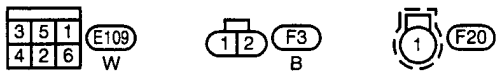
GROUND	CONNECT TO	CONN. NO.	CELL CODE
F15/F18	DISTRIBUTOR	F33	EC-IGN/SG, EC-CMPS
	NEUTRAL POSITION SWITCH	F28	EC-PNP/SW
	SHIELD WIRE (KNOCK SENSOR) (SR20DE engine)	F69	EC-KS
	ACCELERATOR SWITCH (CD engine)	M22	EC-APP/SW
	SHIELD WIRE (ACCELERATOR POSITION SENSOR) (CD engine)	M21	EC-APS
F9	ALTERNATOR	F10	EL-CHARGE
B18/B27	THEFT WARNING CONTROL UNIT	B6	EL-THEFT
	ULTRASONIC CANCEL SWITCH	B102	EL-THEFT
	KEY CYLINDER SWITCH (Driver's side)	D9	EL-THEFT, EL-S/LOCK
	KEY CYLINDER SWITCH (Passenger side)	D17	EL-S/LOCK
	DOOR LOCK ACTUATOR (Driver's side)	D7	EL-THEFT, EL-S/LOCK
	DOOR LOCK ACTUATOR (Passenger side)	D16	EL-THEFT, EL-S/LOCK
	REAR DOOR LOCK ACTUATOR LH	D21	EL-THEFT
	REAR DOOR LOCK ACTUATOR RH	D25	EL-THEFT
	SUPER LOCK CONTROL UNIT	B11	EL-S/LOCK
	A/T MODE SWITCH	B103	AT-A/T
	FUEL PUMP	B30	EC-F/PUMP
	FRONT DOOR SWITCH	B20	EL-INT/L, EL-WARN, EL-S/LOCK, EL-BUZZER, EL-THEFT, RS-SRS
	FUEL TANK GAUGE UNIT	B31	EL-METER, EL-WARN
	POWER WINDOW MAIN SWITCH	D5	EL-WINDOW
	DOOR MIRROR HEATER (Driver's side)	D4	EL-DEF
	DOOR MIRROR HEATER (Passenger side)	D13	EL-DEF
	CD AUTO CHANGER	B47	EL-AUDIO
	POWER SEAT	D22	EL-SEAT
	HEATED SEAT SWITCH LH	B104	EL-HSEAT
	HEATED SEAT SWITCH RH	B105	EL-HSEAT
	HEATED SEAT LH	B21	EL-HSEAT
	HEATED SEAT RH	B61	EL-HSEAT
B48/D110	REAR COMBINATION LAMP LH	B46	EL-TURN, EL-TAIL/L EL-THEFT, EL-STOP
	REAR COMBINATION LAMP RH	B49	EL-TURN, EL-TAIL/L EL-THEFT, EL-STOP
D110/B48	LICENCE PLATE LAMP	D106	EL-TAIL/L
	LICENCE PLATE LAMP RH	D116	EL-TAIL/L
	HIGH MOUNTED STOP LAMP	B85	EL-STOP
	REAR COMBINATION LAMP LH	D104	EL-BACK/L, EL-R/FOG
	REAR COMBINATION LAMP RH	D108	EL-BACK/L, EL-R/FOG
	LUGGAGE ROOM LAMP SWITCH	D105	EL-INT/L, EL-THEFT
	REAR WIPER MOTOR	D107	EL-WIP/R

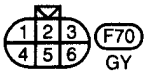
GROUND	CONNECT TO	CONN. NO.	CELL CODE
E10	ABS CONTROL UNIT	E78	BR-ABS
E68	ALTERNATOR	E71	EL-CHARGE
F18/F15	SHIELD WIRE (HEATED OXYGEN SENSOR)	F34	EC-HO2S
	ACCELERATOR WORK UNIT	M68	

Wiring Diagram — START —

GASOLINE ENGINE MODELS





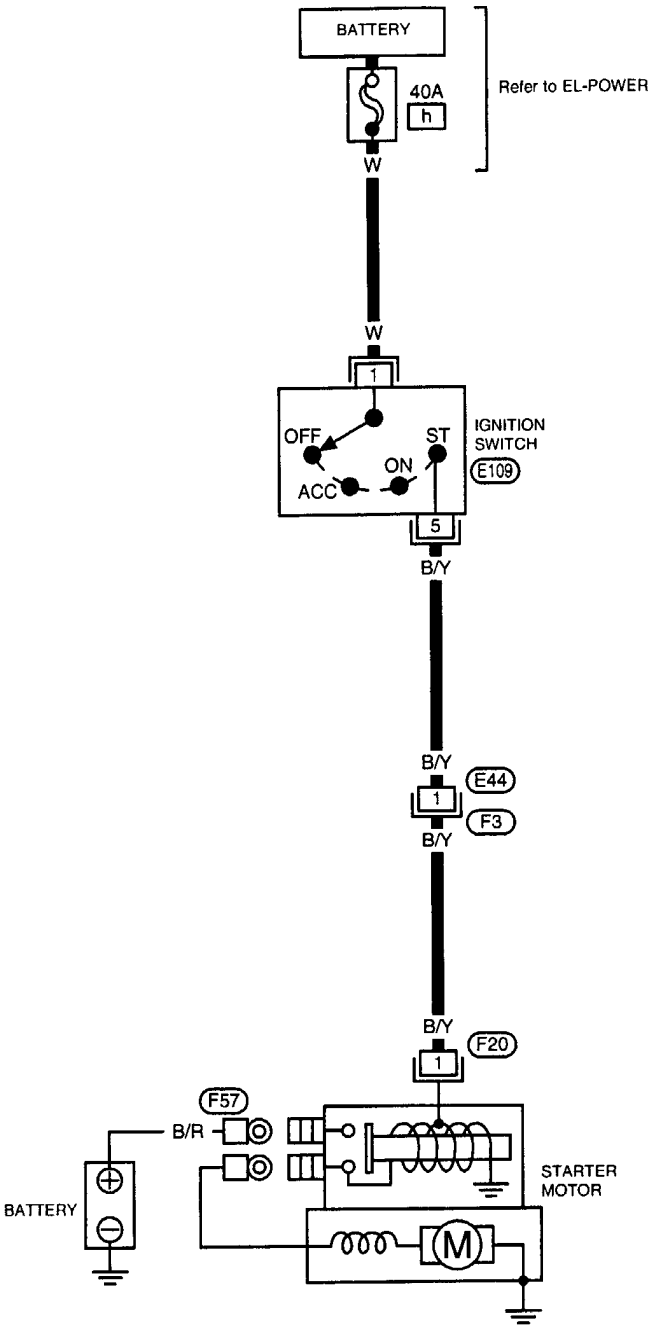


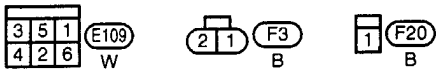
YEL569A

Wiring Diagram — START — (Cont'd)

DIESEL ENGINE MODELS

EL-START-02

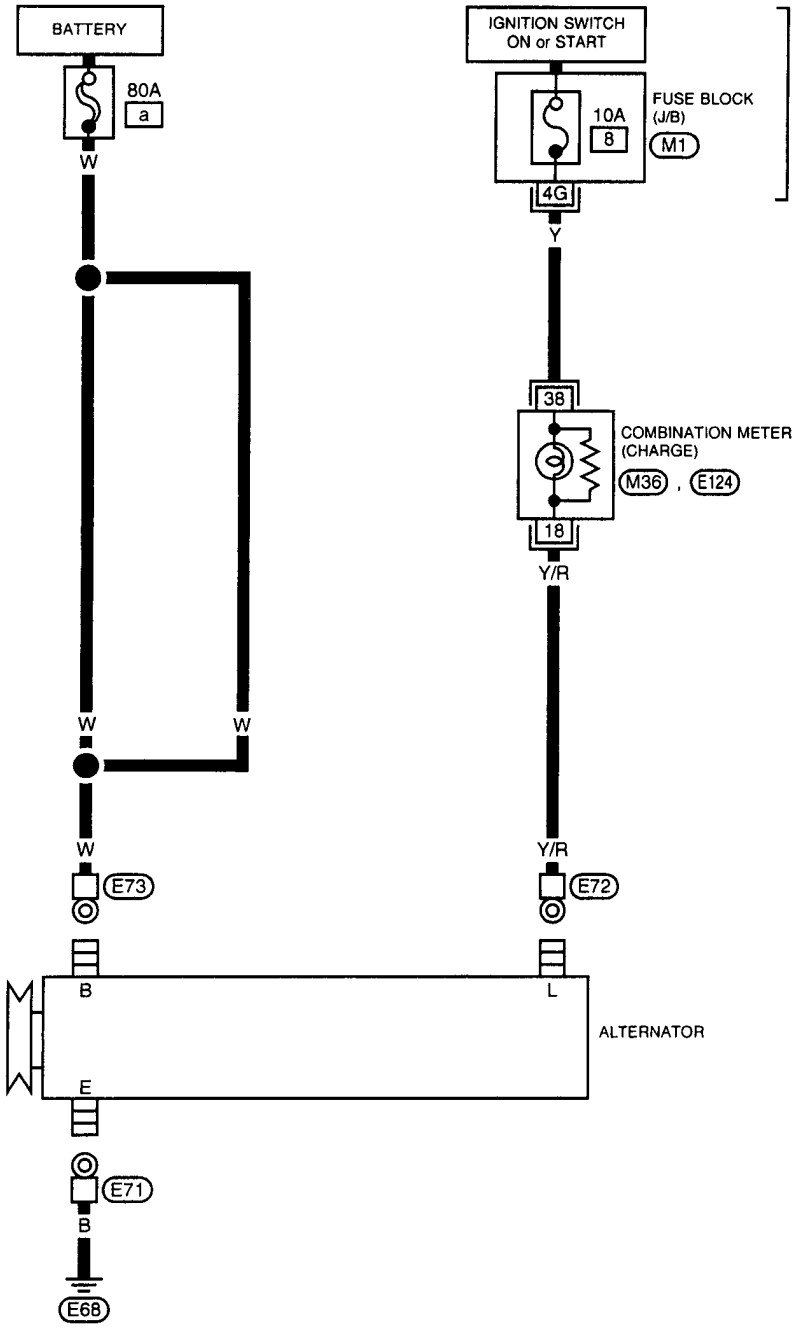


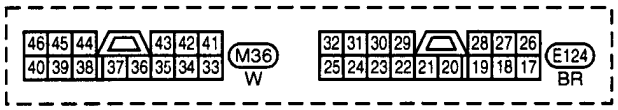


YEL377A

Wiring Diagram — CHARGE —

GA ENGINE MODELS





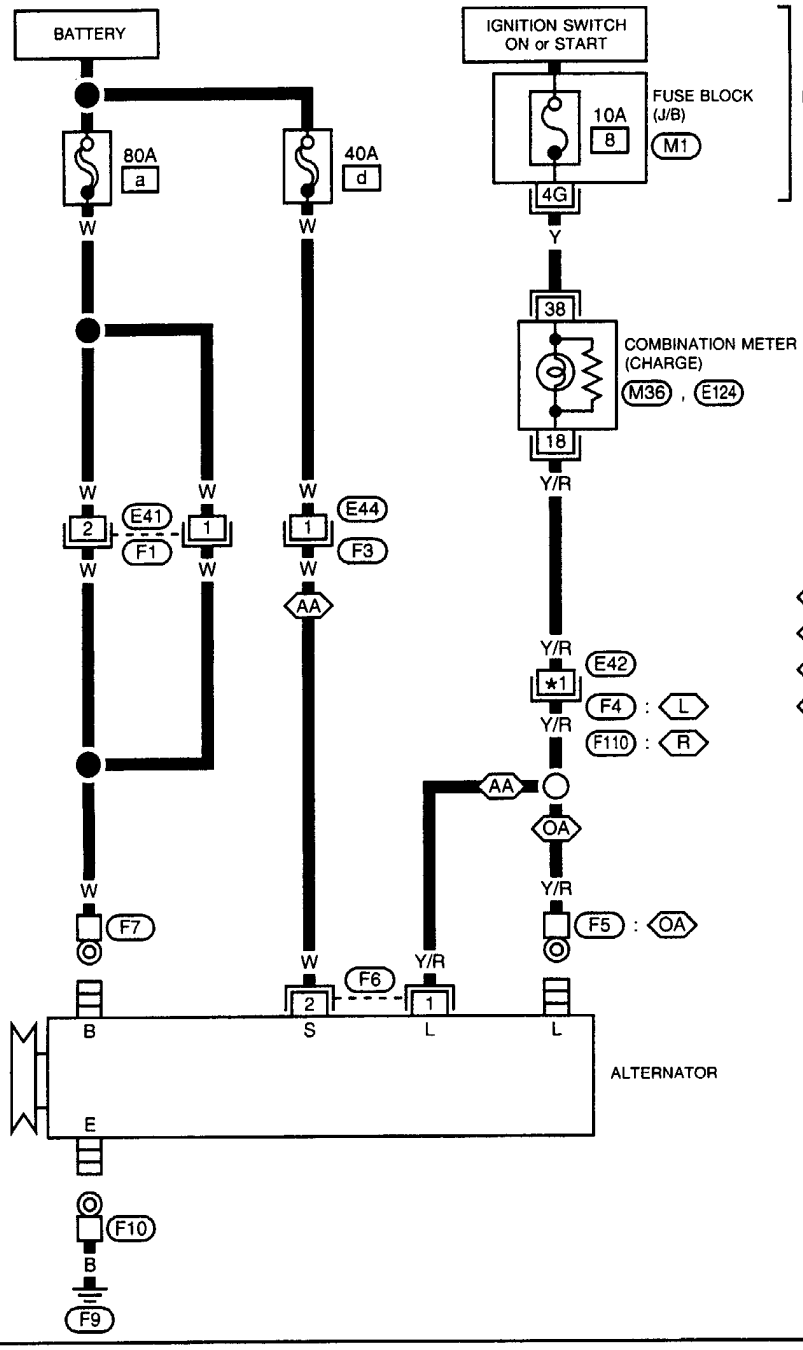
Refer to last page (Foldout page).
M1

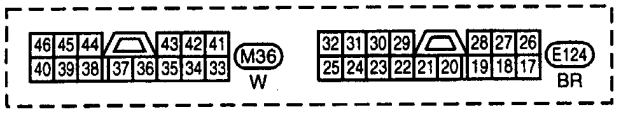
YEL570A

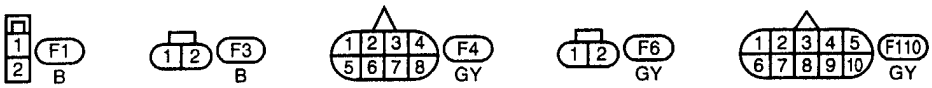
Wiring Diagram — CHARGE — (Cont'd)

SR ENGINE MODELS

EL-CHARGE-02







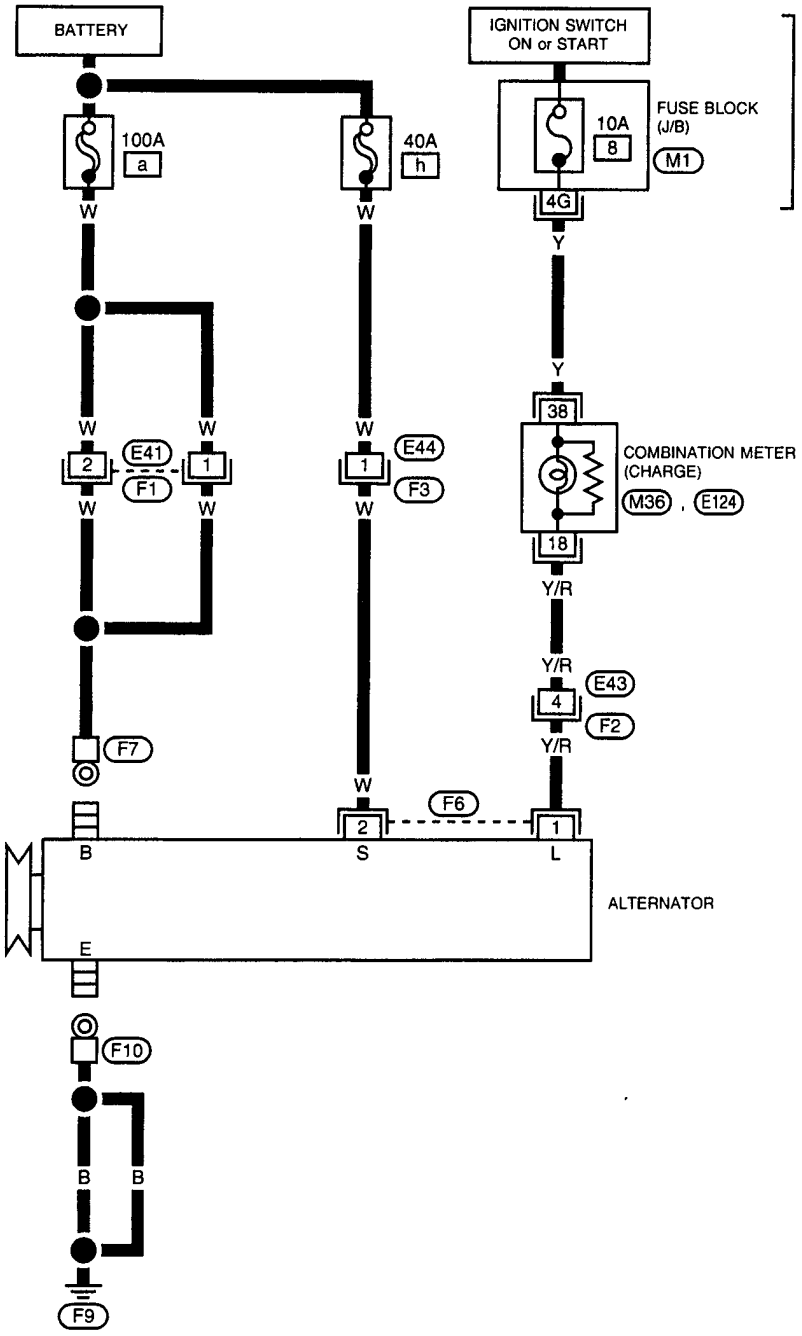
Refer to last page (Foldout page).

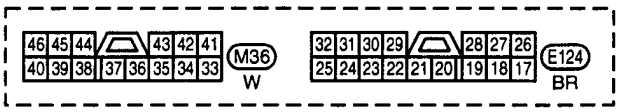
M1

YEL571A

Wiring Diagram — CHARGE — (Cont'd)

DIESEL ENGINE MODELS



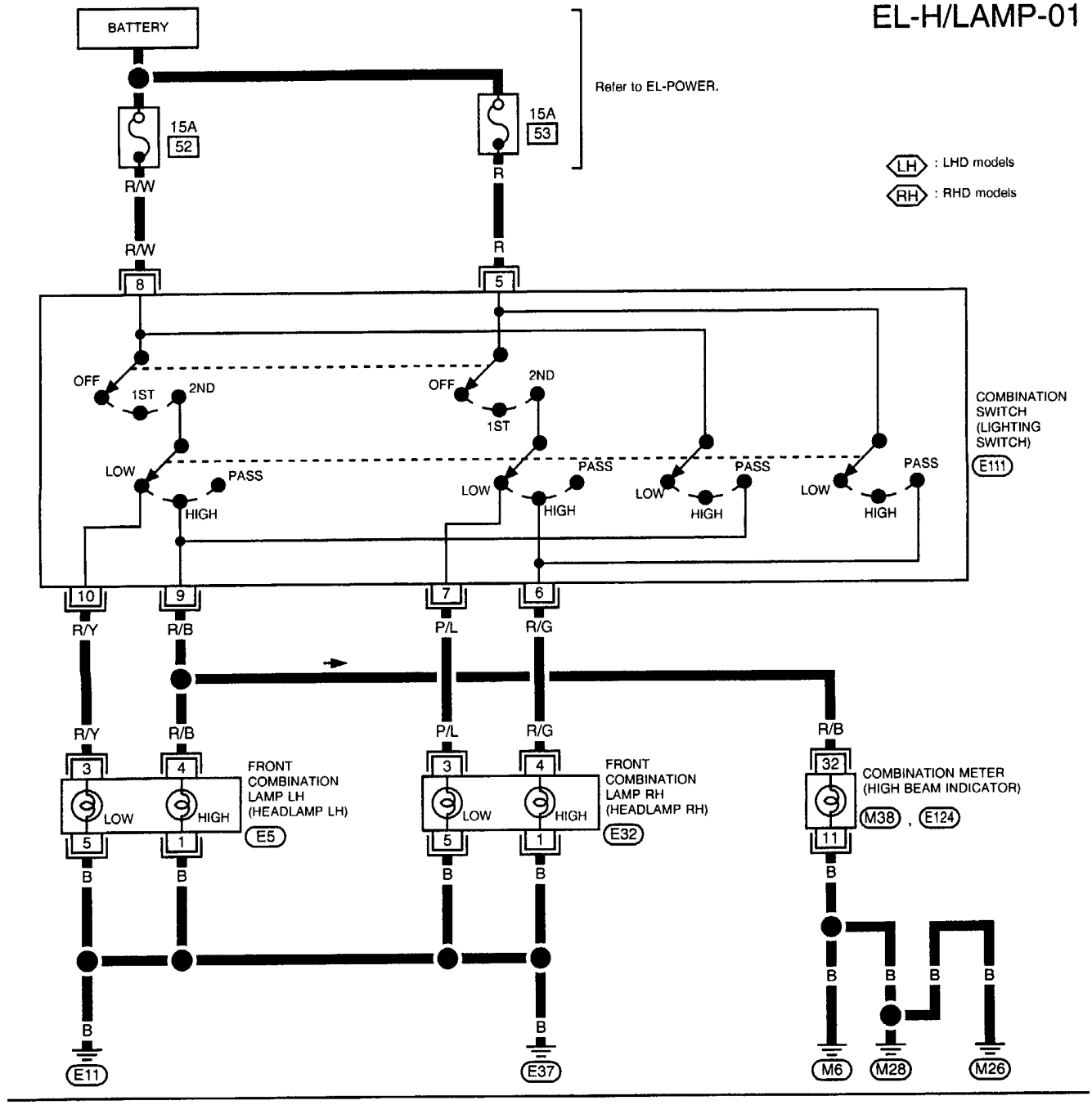


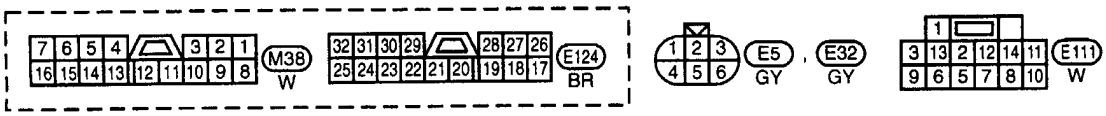
Refer to last page (Foldout page).
M1

YEL572A

Wiring Diagram — H/LAMP —

EL-H/LAMP-01



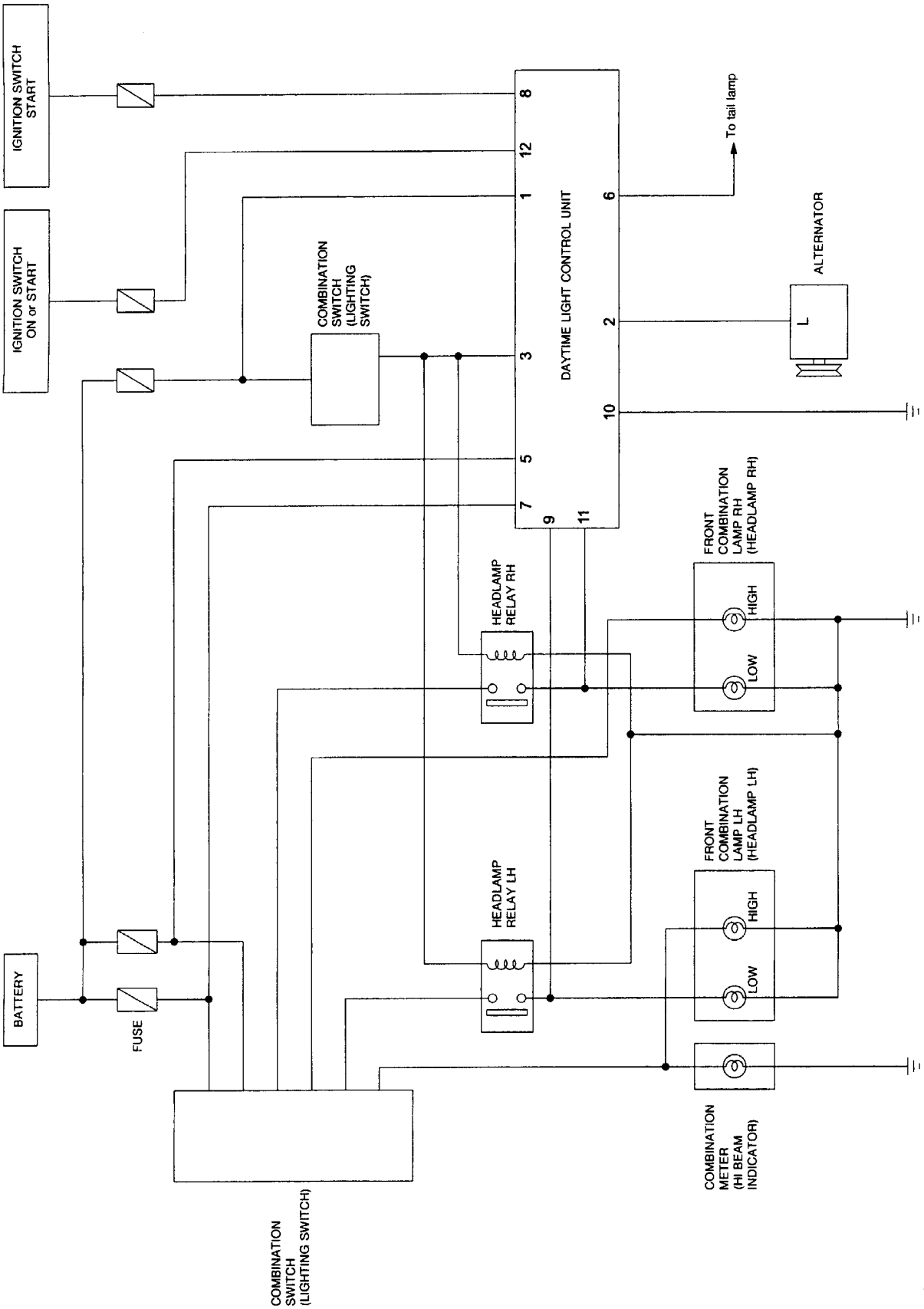


YEL573A

Trouble Diagnoses

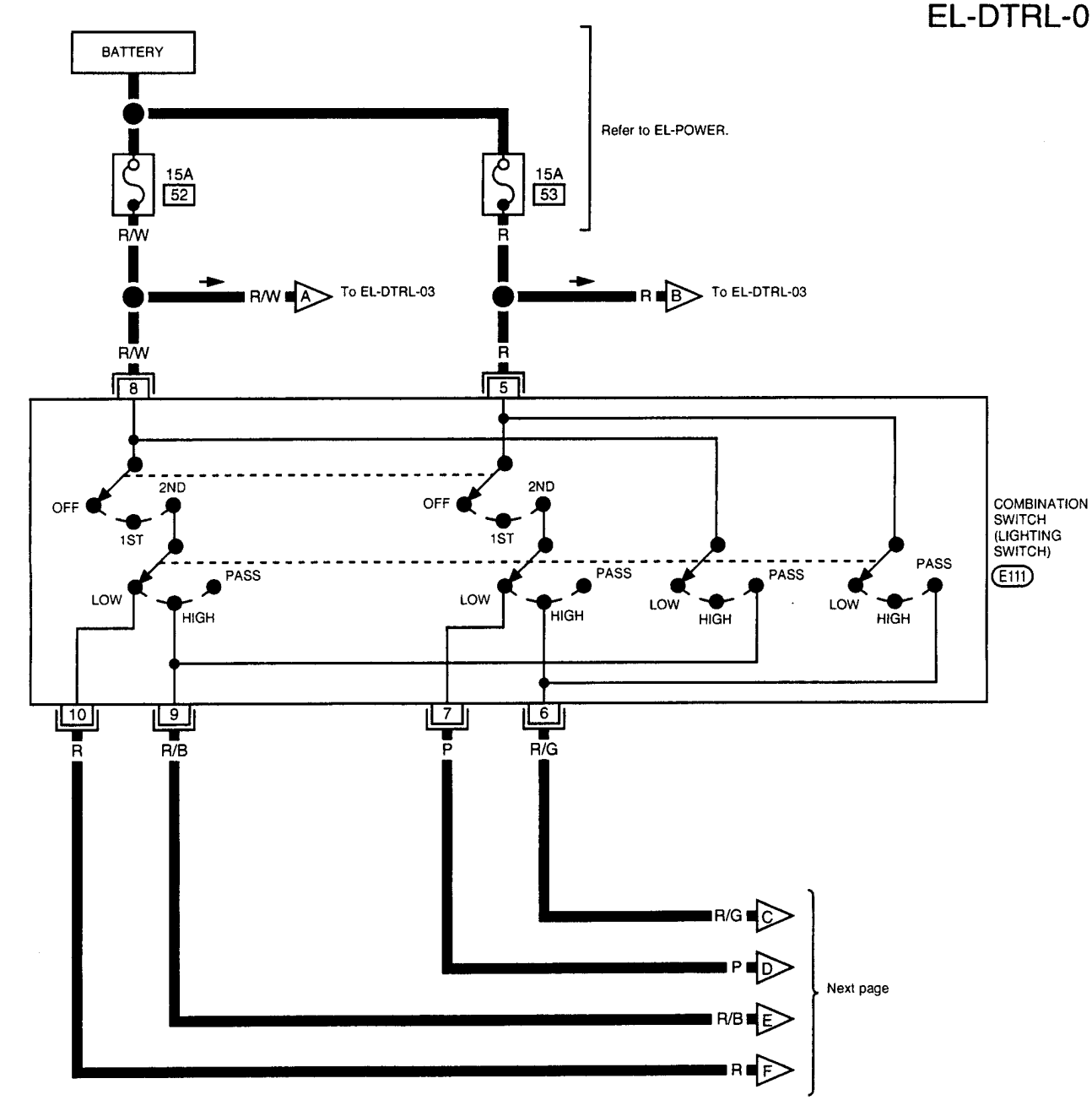
Symptom	Possible cause	Repair order
LH headlamp does not operate.	1. Bulb 2. LH headlamp ground 3. 15A fuse 4. Lighting switch	1. Check bulb. 2. Check LH headlamp ground. (Terminal ① and ⑤) 3. Check 15A fuse (No. 52, located in fusible link and fuse box). 4. Check lighting switch.
RH headlamp does not operate.	1. Bulb 2. RH headlamp ground 3. 15A fuse 4. Lighting switch	1. Check bulb. 2. Check RH headlamp ground. (Terminal ① and ⑤) 3. Check 15A fuse (No. 53, located in fusible link and fuse box). 4. Check lighting switch.
LH high beam does not operate, but LH low beam operates.	1. Bulb 2. Open in LH high beam circuit 3. Lighting switch	1. Check bulb. 2. Check R/B wire between lighting switch and LH headlamp for an open circuit. 3. Check lighting switch.
LH low beam does not operate, but LH high beam operates.	1. Bulb 2. Open in LH low beam circuit 3. Lighting switch	1. Check bulb. 2. Check R/Y wire between lighting switch and LH headlamp for an open circuit. 3. Check lighting switch.
RH high beam does not operate, but RH low beam operates.	1. Bulb 2. Open in RH high beam circuit 3. Lighting switch	1. Check bulb. 2. Check R/G wire between lighting switch and RH headlamp for an open circuit. 3. Check lighting switch.
RH low beam does not operate, but RH high beam operates.	1. Bulb 2. Open in RH low beam circuit 3. Lighting switch	1. Check bulb. 2. Check P/L wire between lighting switch and RH headlamp for an open circuit. 3. Check lighting switch.
High beam indicator does not work.	1. Bulb 2. High beam indicator ground 3. Open in high beam circuit	1. Check bulb in combination meter. 2. Check combination meter ground. (Terminal ㊵) 3. Check R/B wire between lighting switch and combination meter for an open circuit.

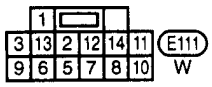
Schematic


IGNITION SWITCH START
IGNITION SWITCH ON or START
BATTERY
FUSE
COMBINATION SWITCH (LIGHTING SWITCH)
COMBINATION SWITCH (LIGHTING SWITCH)
DAYTIME LIGHT CONTROL UNIT
8
12
1
3
5
7
9
11
6
2
10
To tail lamp
ALTERNATOR
L
HEADLAMP RELAY RH
HEADLAMP RELAY LH
FRONT COMBINATION LAMP RH (HEADLAMP RH)
FRONT COMBINATION LAMP LH (HEADLAMP LH)
HIGH
LOW
HIGH
LOW
COMBINATION METER (HI BEAM INDICATOR)
YEL508A

Wiring Diagram — DTRL —

EL-DTRL-01

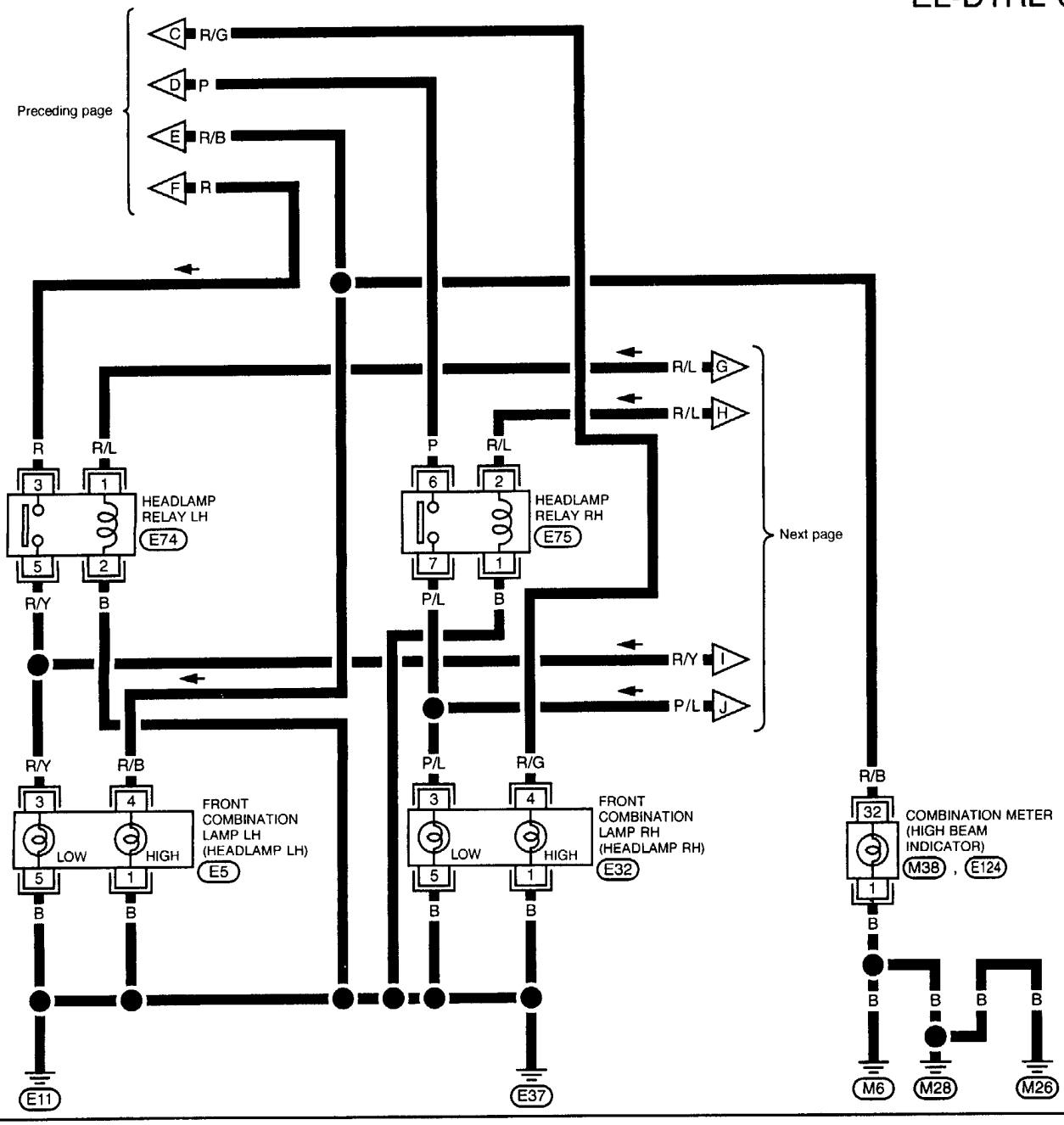


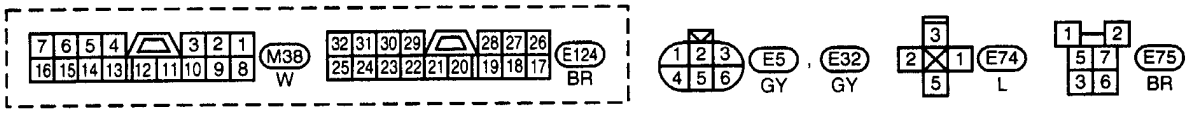


YEL381A

Wiring Diagram — DTRL — (Cont'd)

EL-DTRL-02

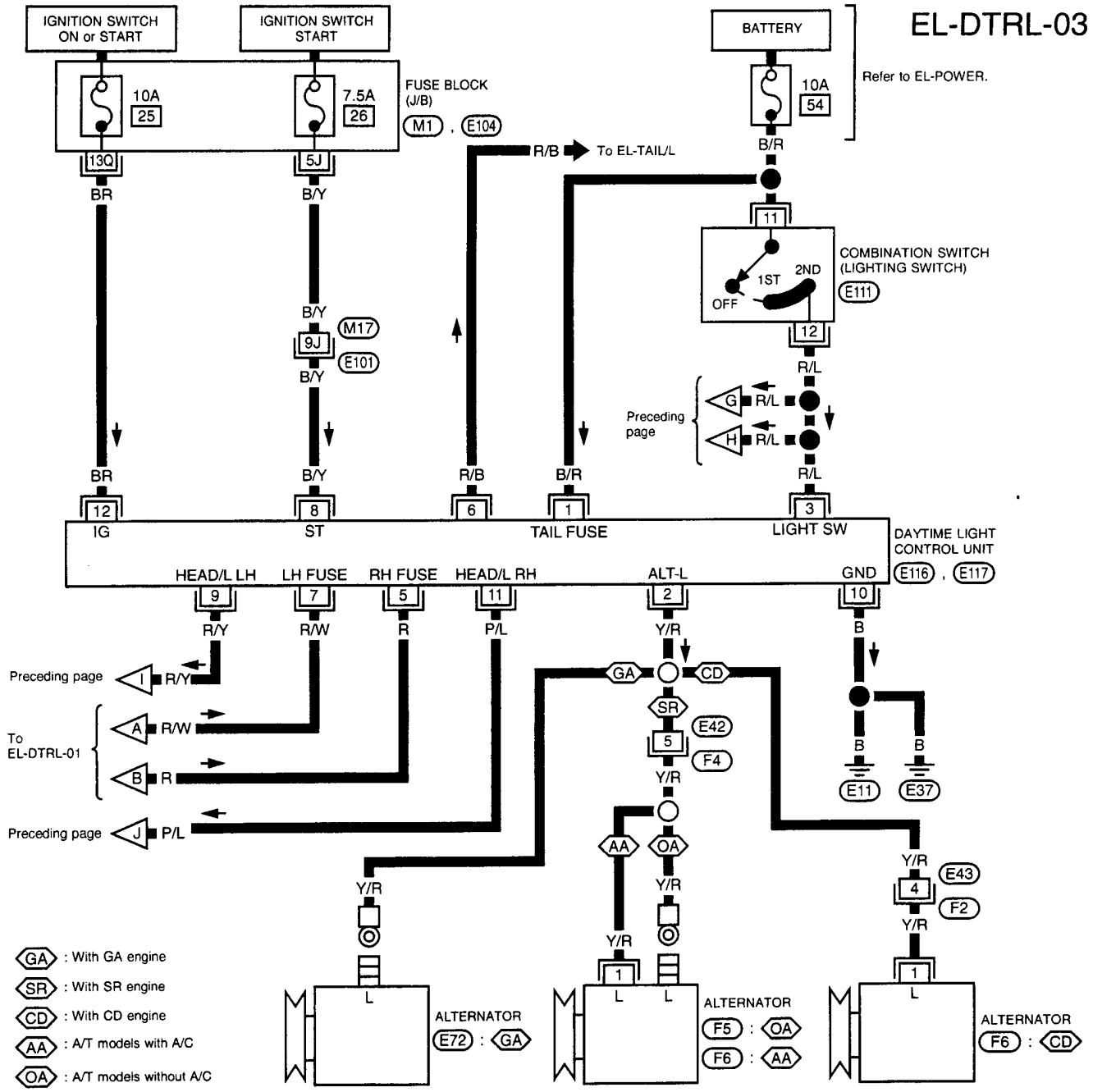




YEL574A

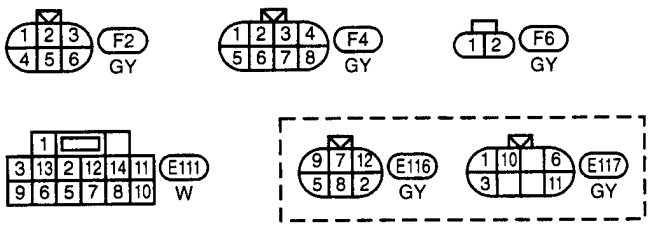
Wiring Diagram — DTRL — (Cont'd)

EL-DTRL-03



Refer to last page (Foldout page).

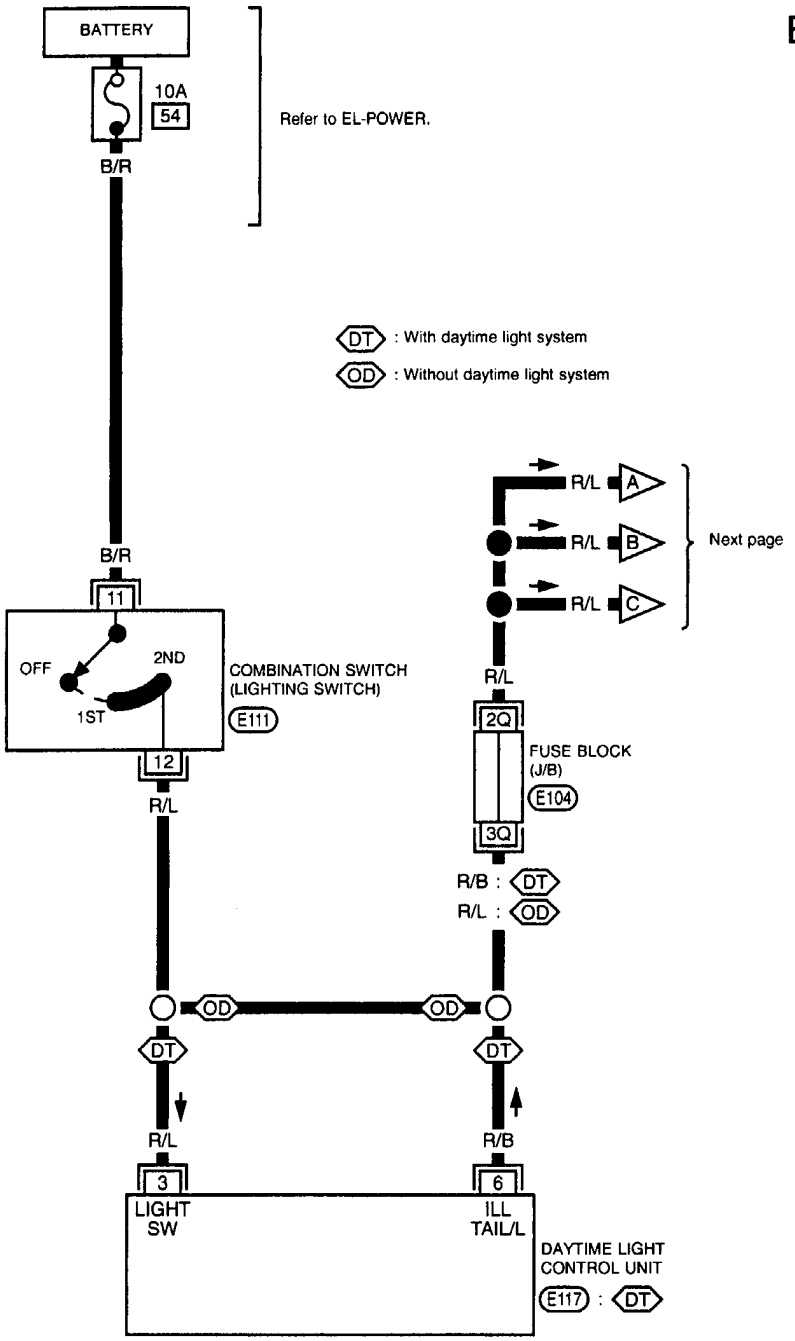
M1
E104
M17
E101

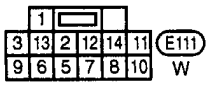


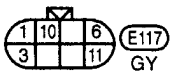
YEL575A

Wiring Diagram — AIM —

EL-H/AIM-01







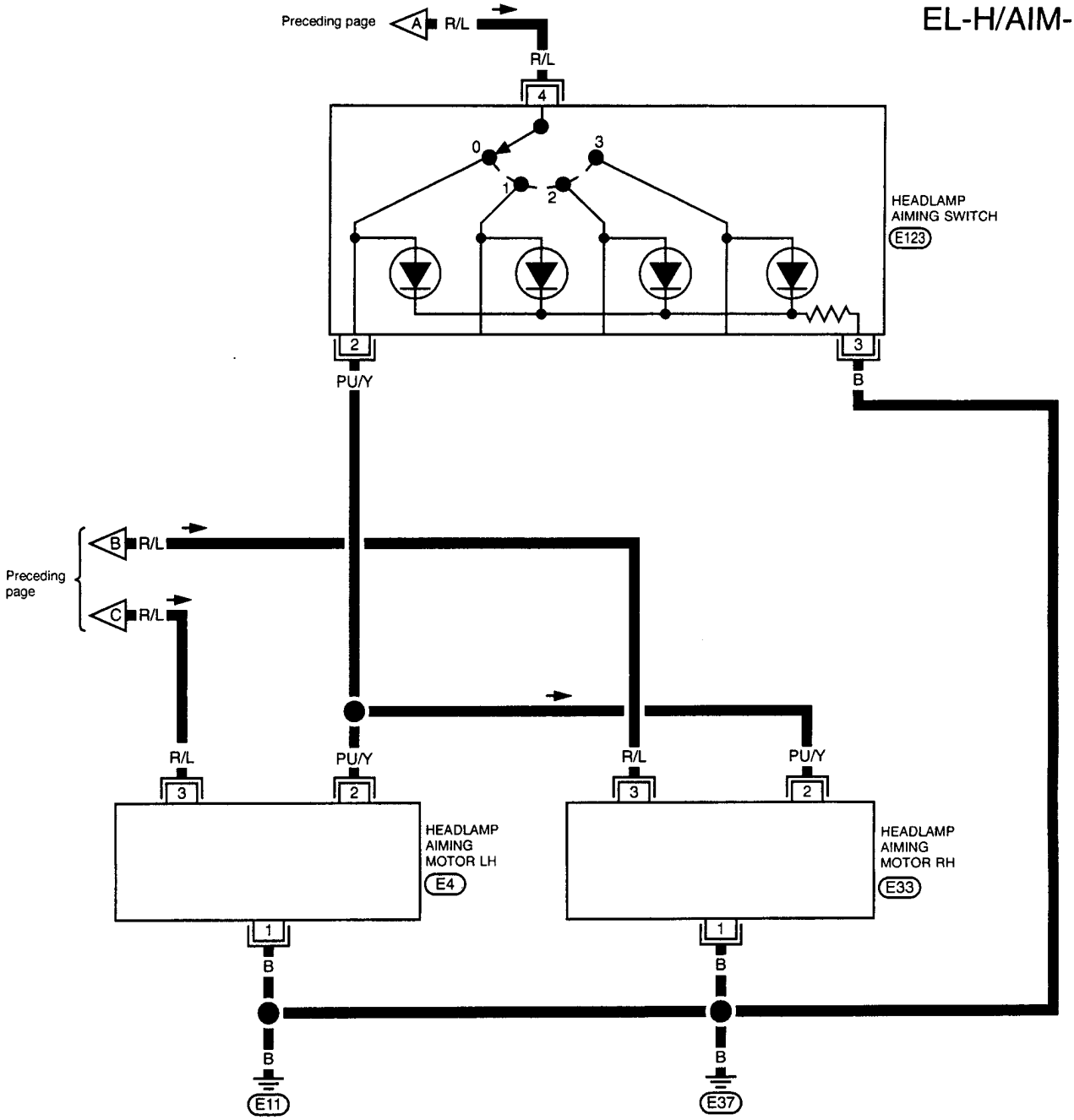
Refer to last page (Foldout page).

E104

YEL383A

Wiring Diagram — AIM — (Cont'd)

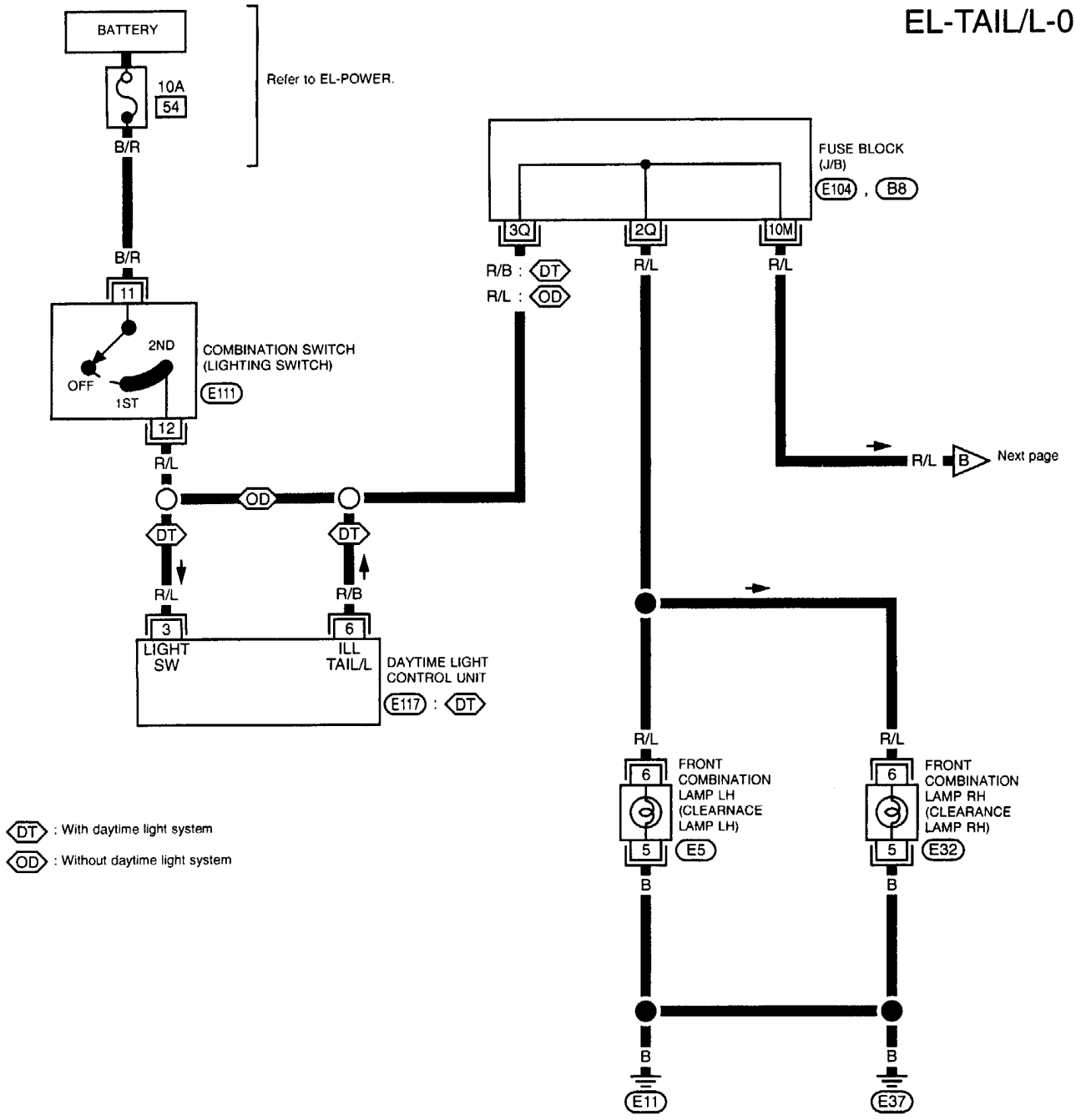
EL-H/AIM-02

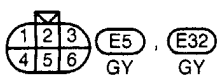


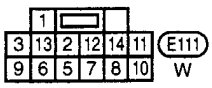
YEL576A

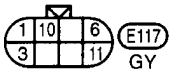
Clearance, License and Tail lamps/Wiring Diagram — TAIL/L —

EL-TAIL/L-01









Refer to last page (Foldout page).

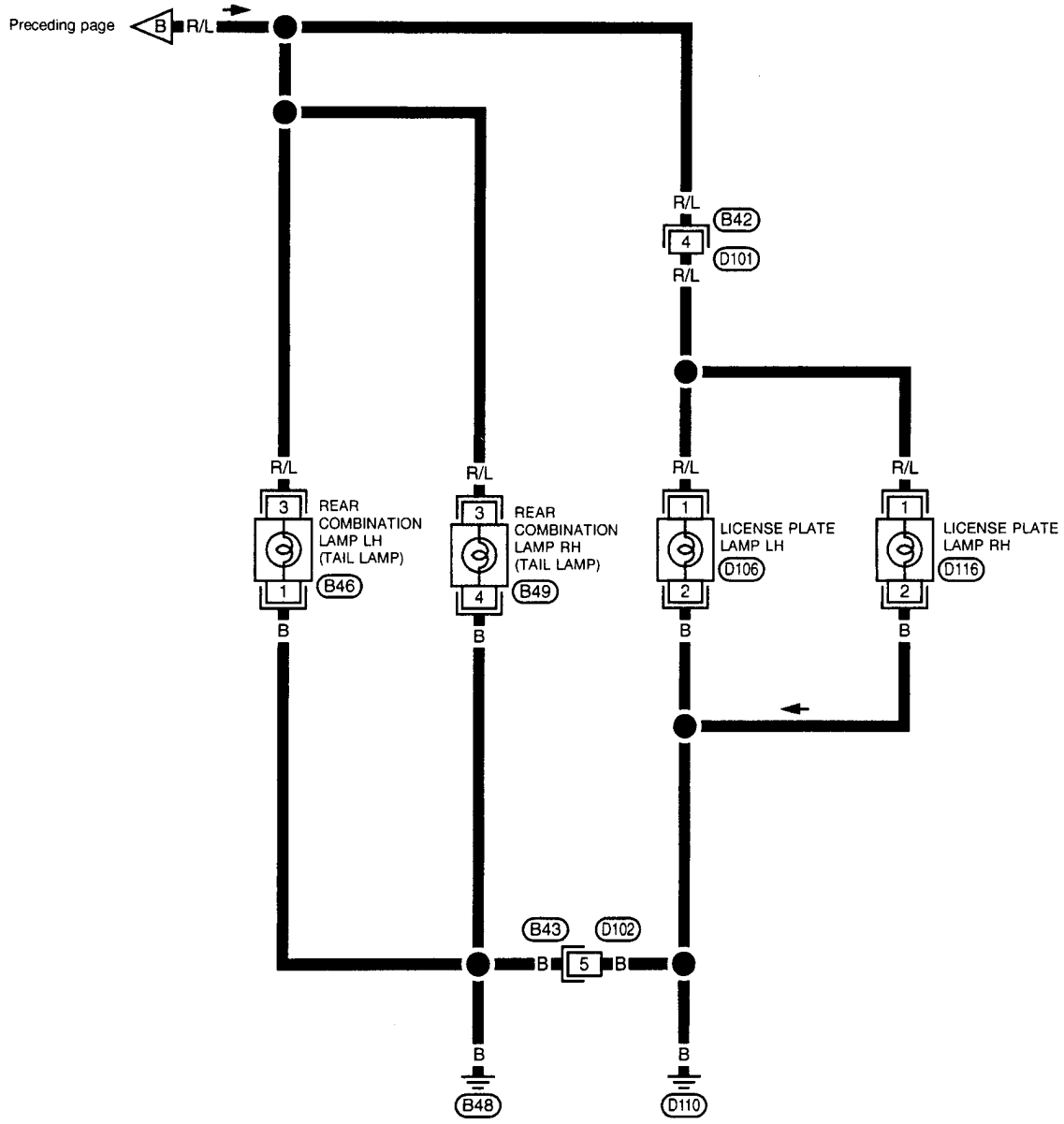
E104

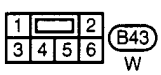
B8

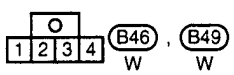
YEL577A

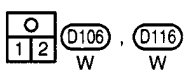
Clearance, License and Tail lamps/Wiring Diagram — TAIL/L — (Cont'd)

EL-TAIL/L-02





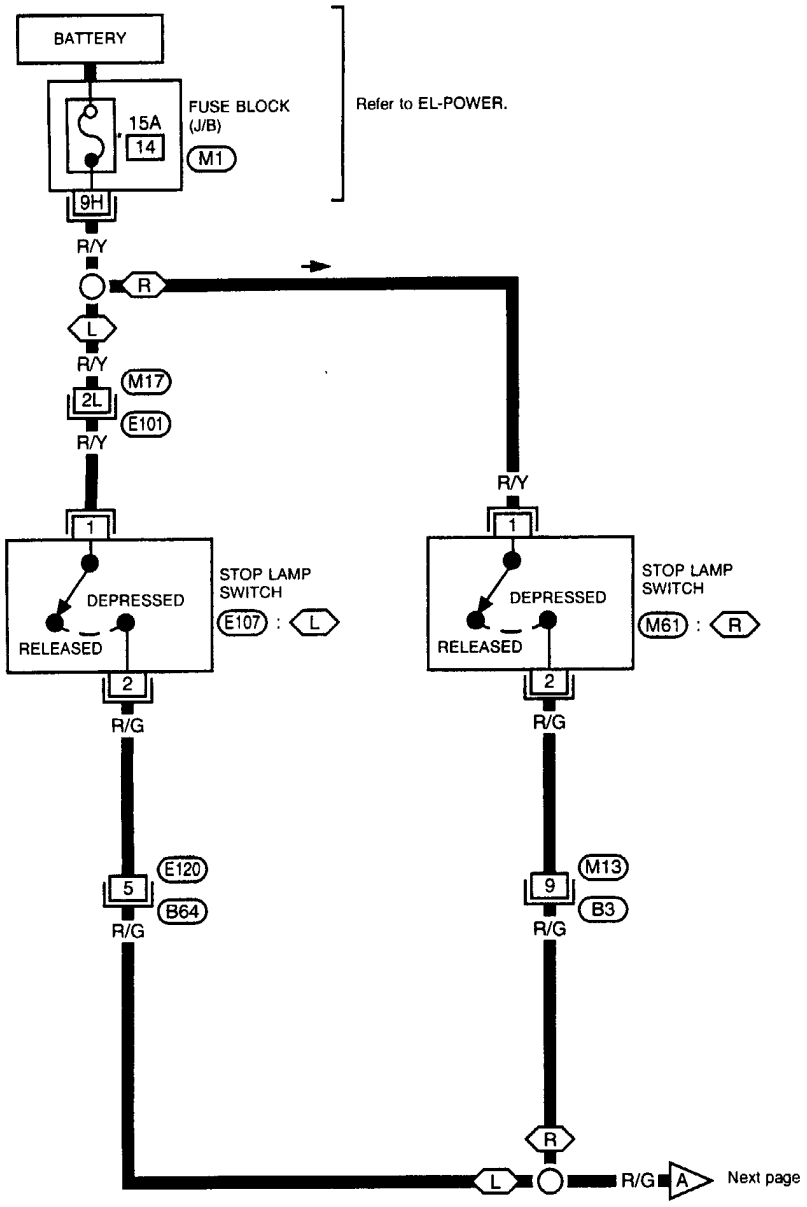




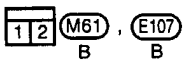
YEL578A

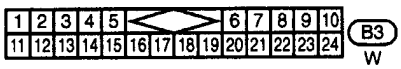
Stop Lamp/Wiring Diagram — STOP/L —

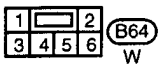
EL-STOP-01



L : LHD models
R : RHD models





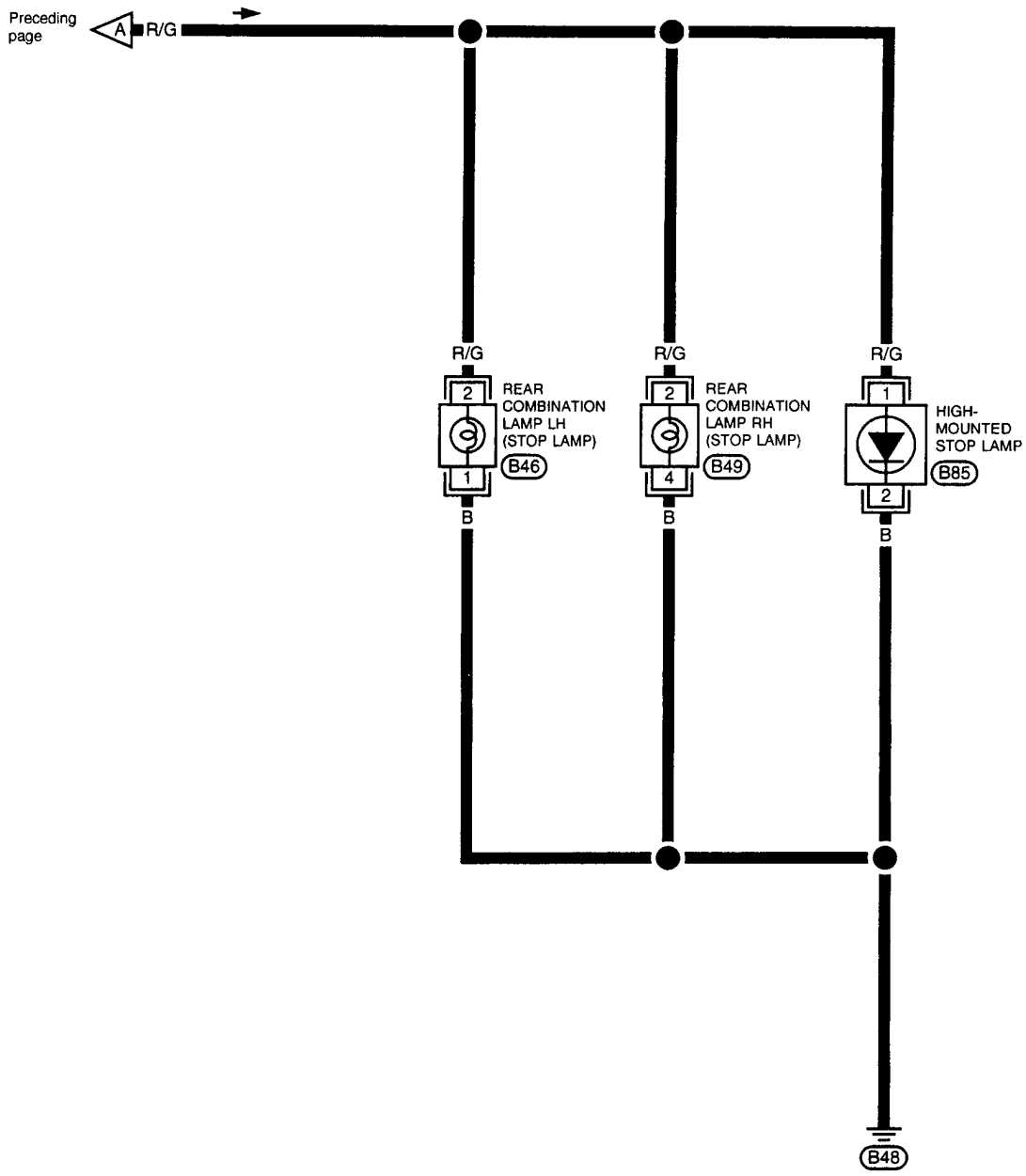


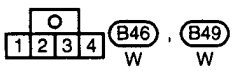
Refer to last page (Foldout page).
M17 , E101
M1

YEL579A

Stop Lamp/Wiring Diagram — STOP/L — (Cont'd)

EL-STOP-02

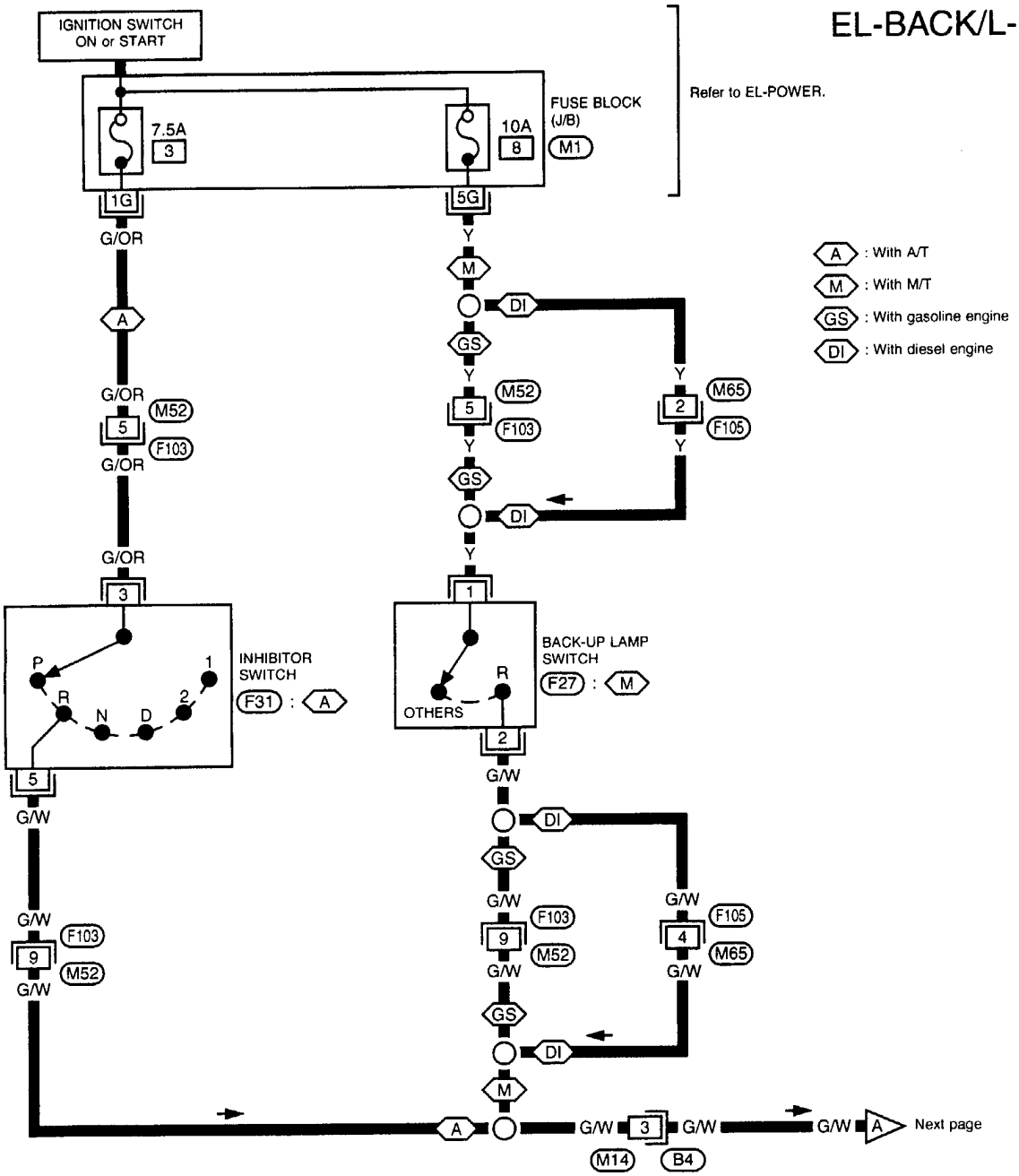


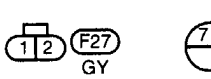


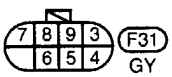
YEL580A

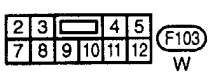
Back-up Lamp/Wiring Diagram — BACK/L —

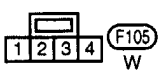
EL-BACK/L-01

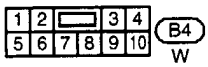










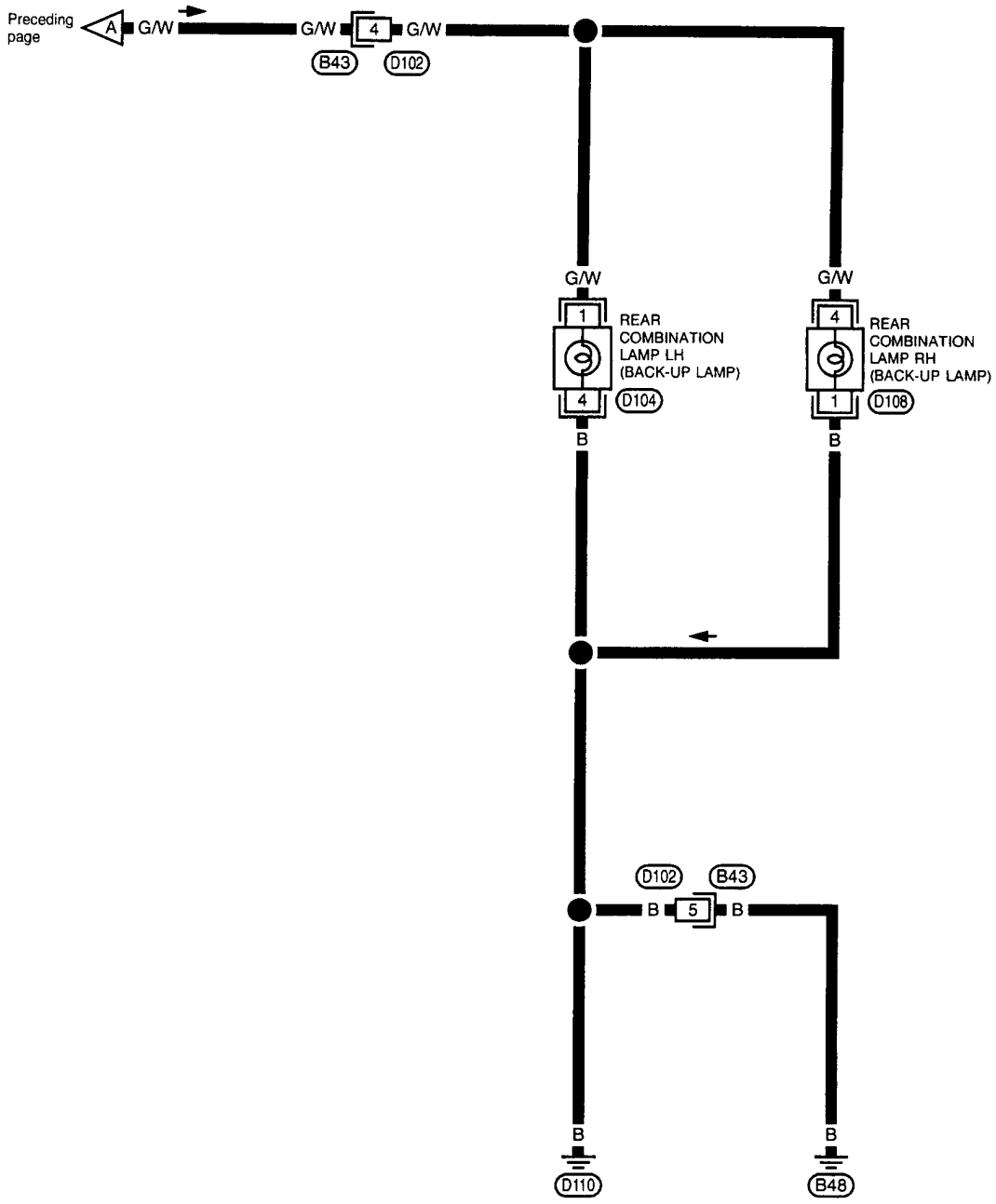


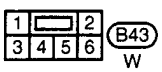
Refer to last page (Foldout page).
M1

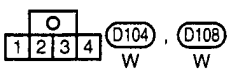
YEL581A

Back-up Lamp/Wiring Diagram — BACK/L — (Cont'd)

EL-BACK/L-02



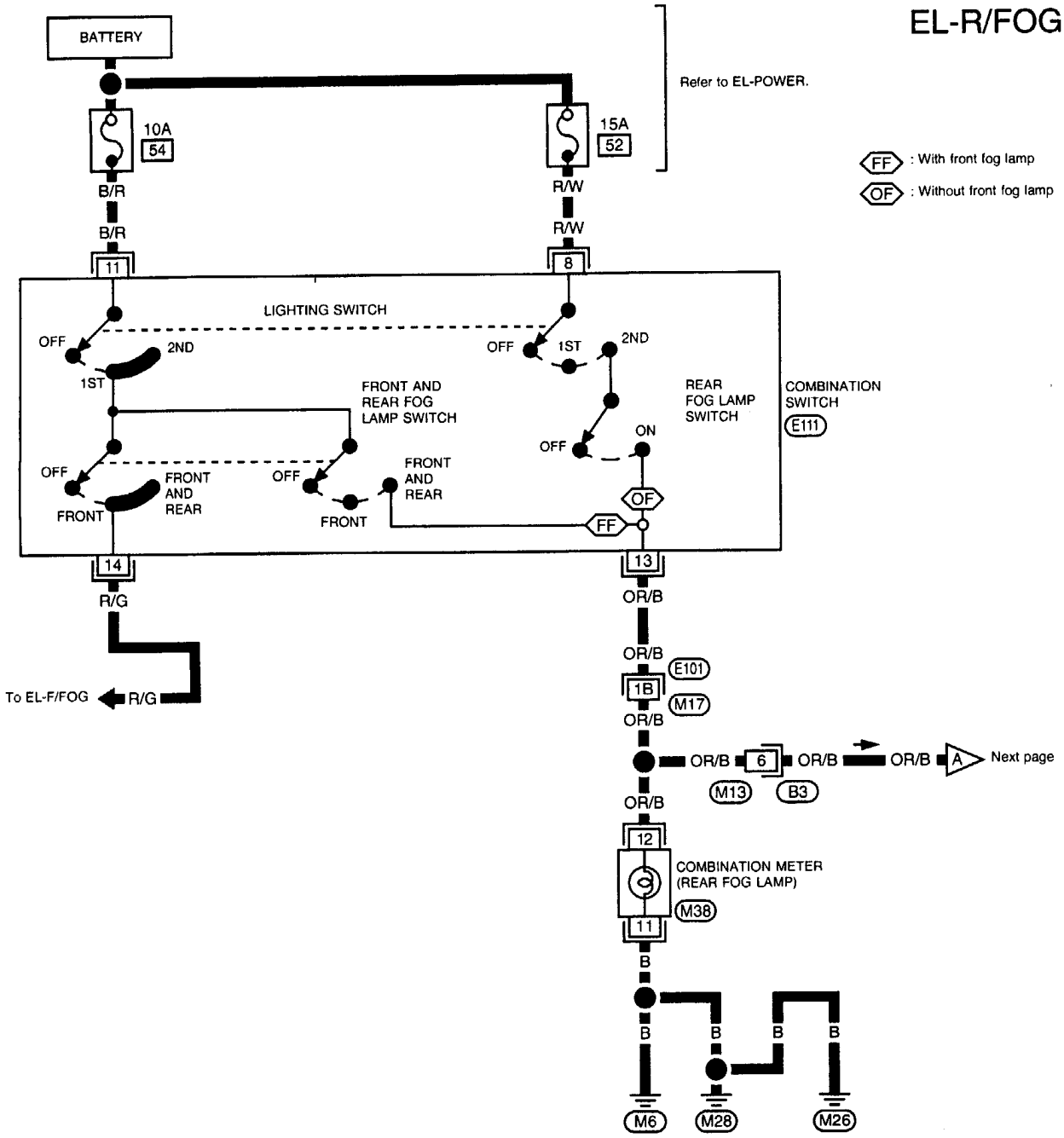




YEL582A

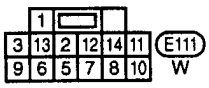
Rear Fog Lamp/Wiring Diagram — R/FOG —

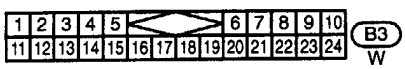
EL-R/FOG-01



: With front fog lamp

: Without front fog lamp





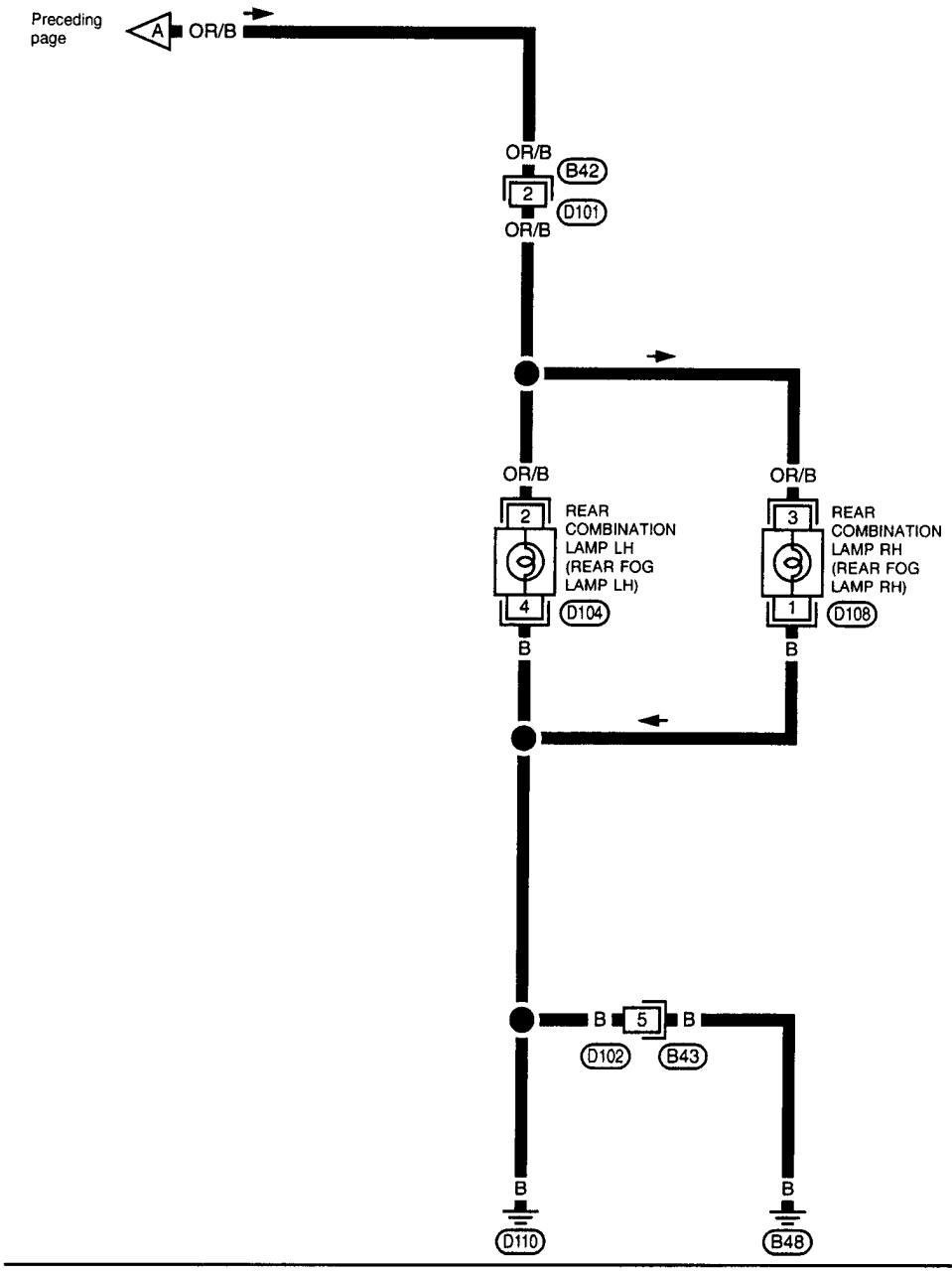
Refer to last page (Foldout page).

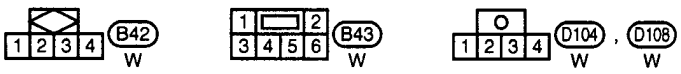
M17 , E101

YEL583A

Rear Fog Lamp/Wiring Diagram — R/FOG — (Cont'd)

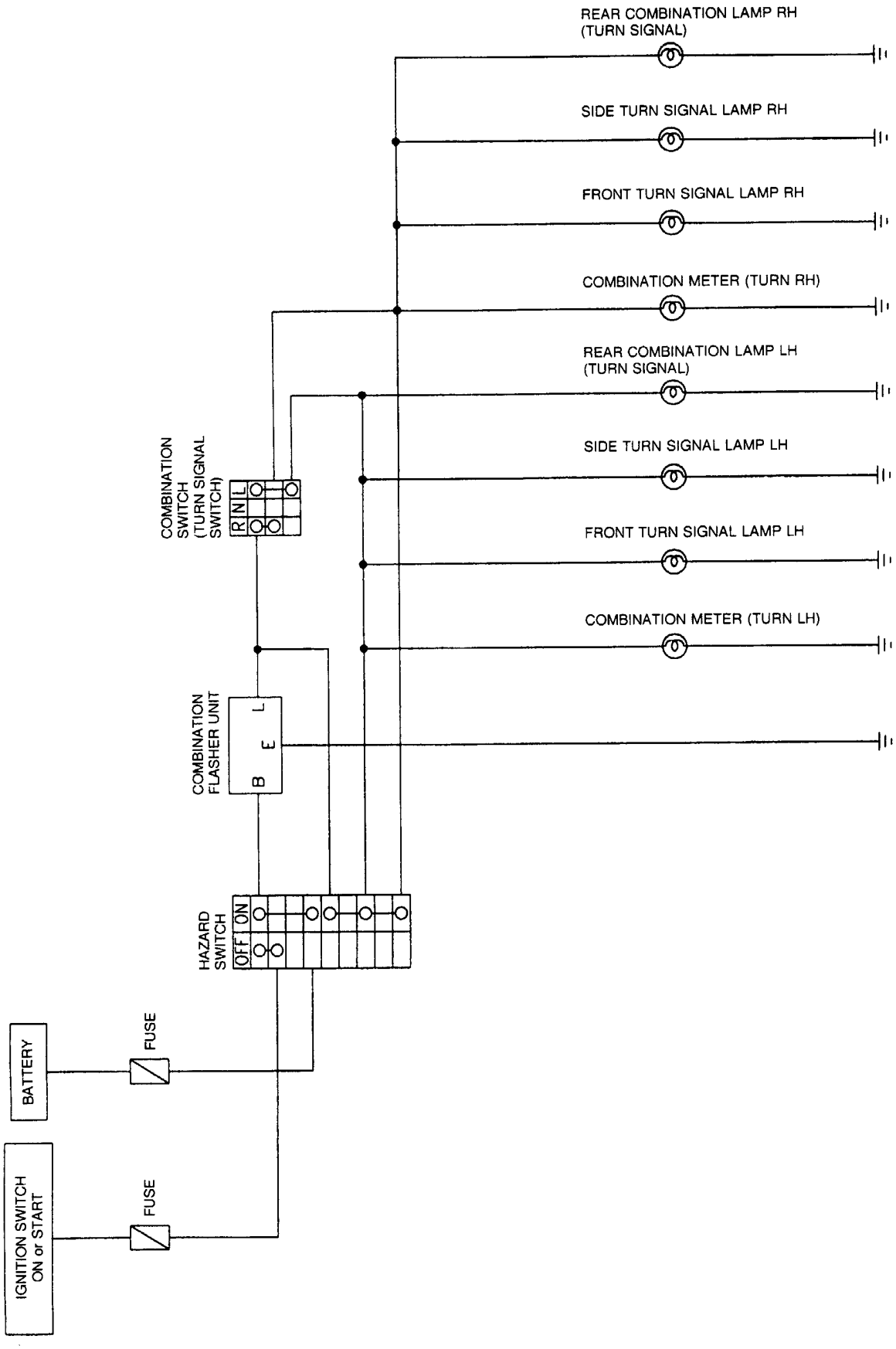
EL-R/FOG-02





YEL584A

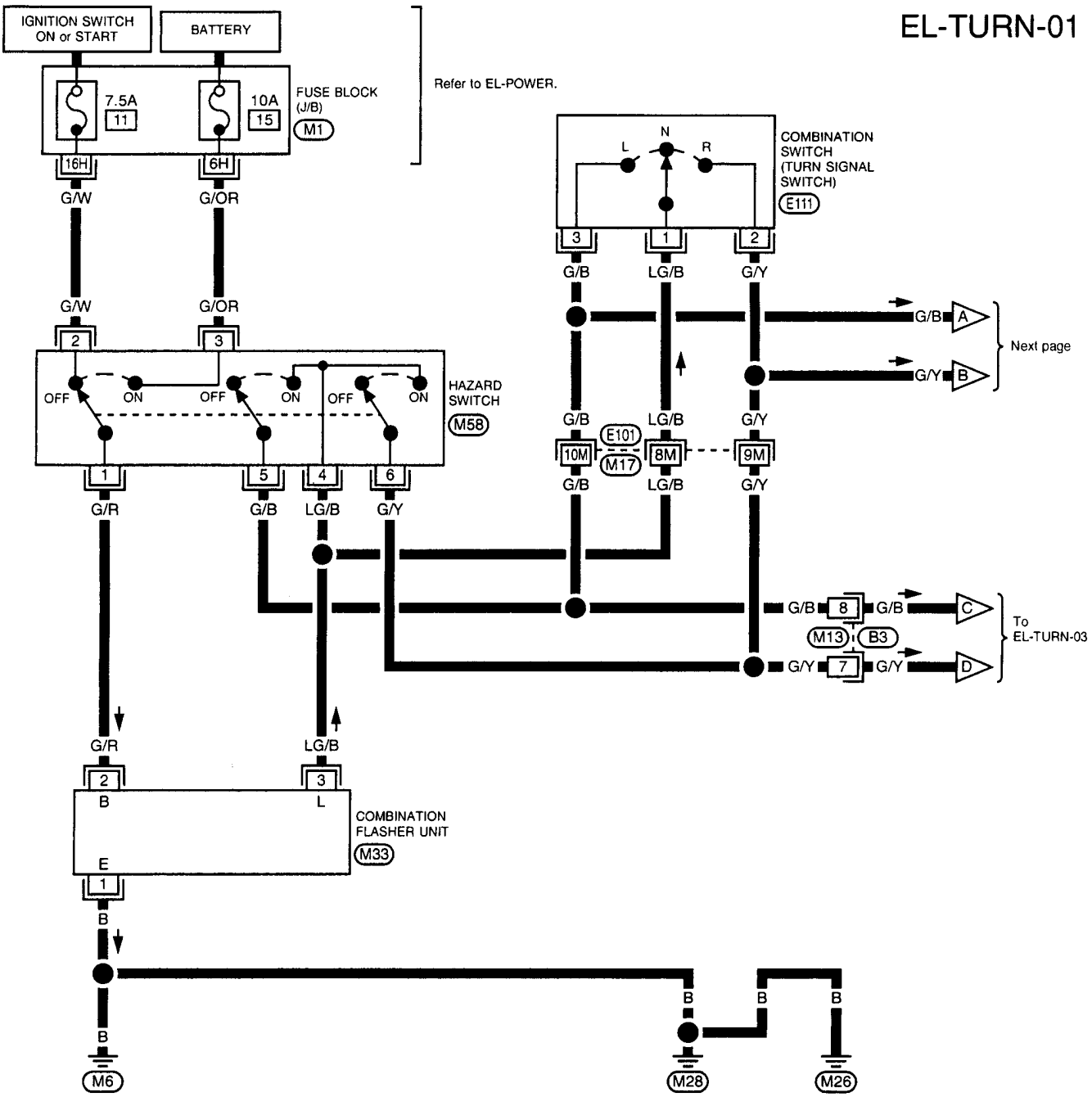
Turn Signal and Hazard Warning Lamps/Schematic

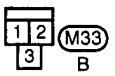


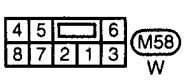
YEL693

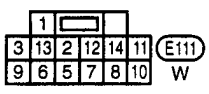
Turn Signal and Hazard Warning Lamps/Wiring Diagrams — TURN —

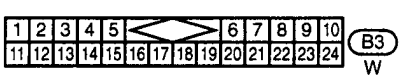
EL-TURN-01









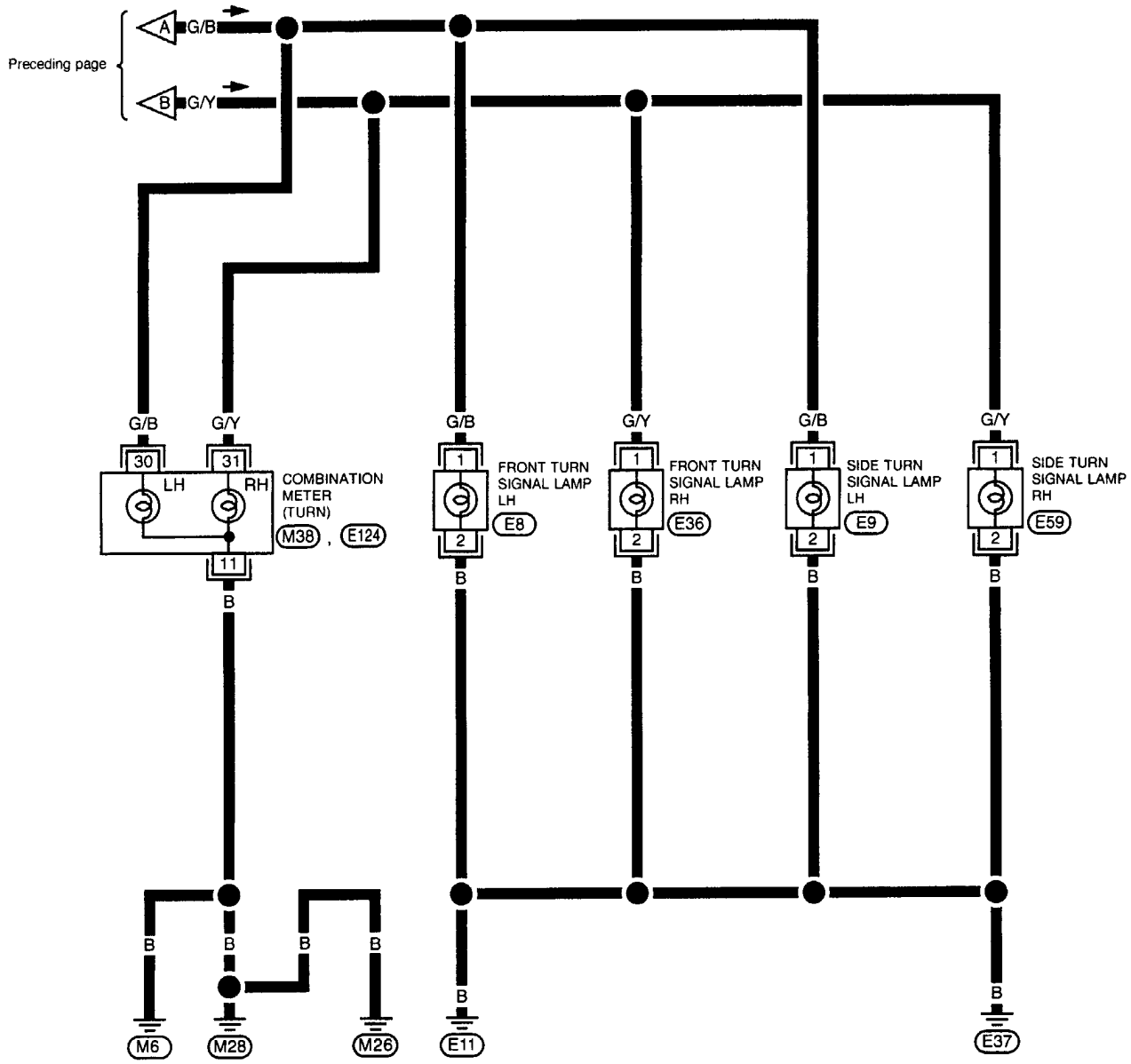


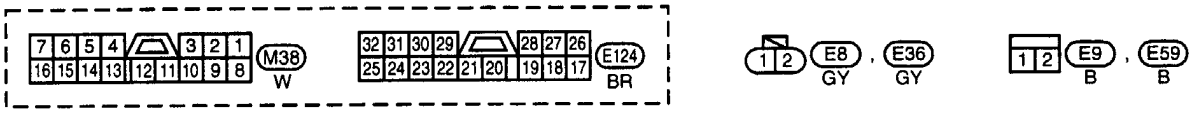
Refer to last page (Foldout page).
M17 , E101
M1

YEL585A

Turn Signal and Hazard Warning Lamps/Wiring Diagrams — TURN — (Cont'd)

EL-TURN-02

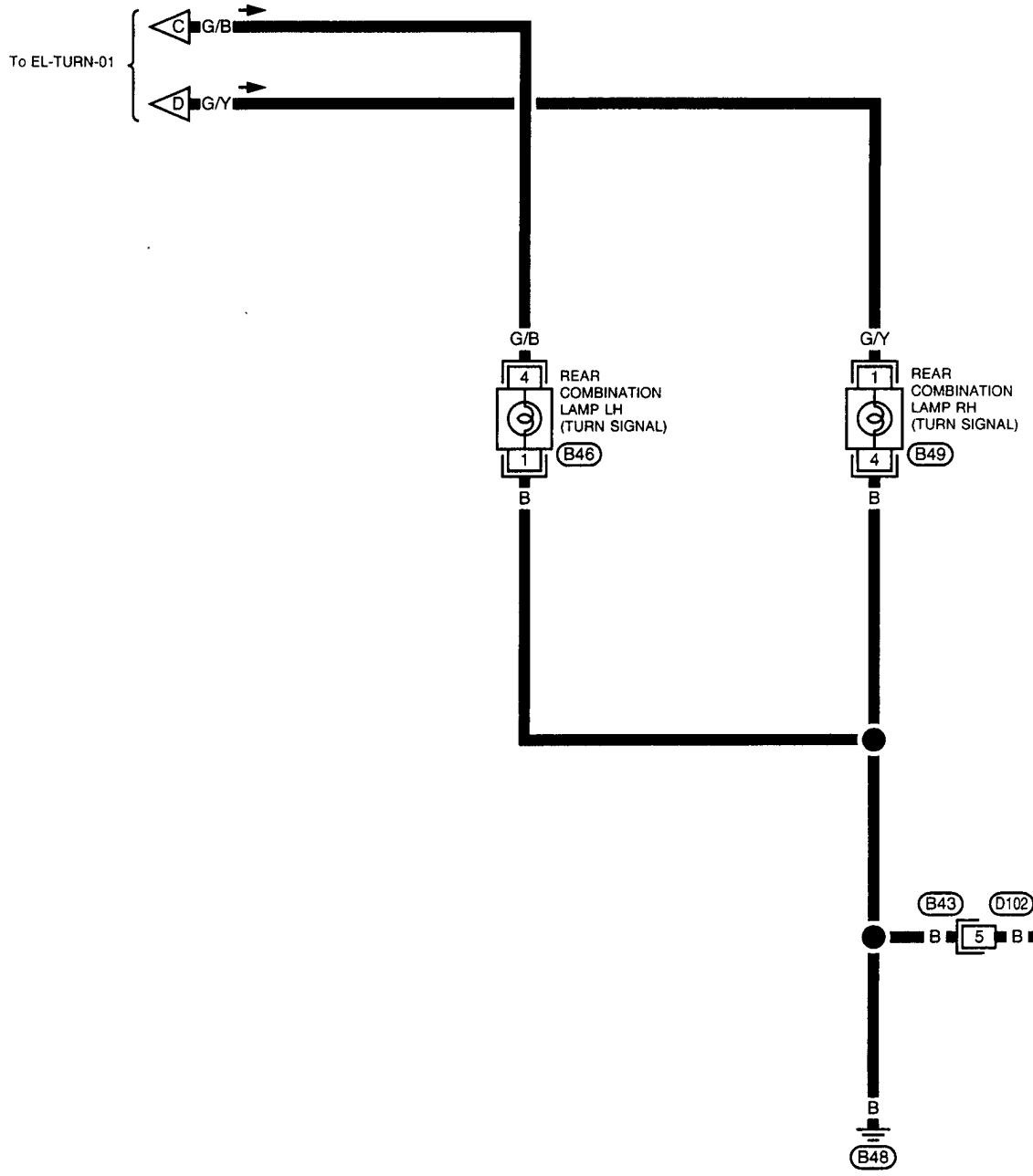


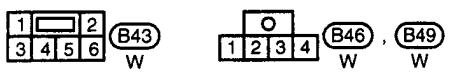


YEL586A

Turn Signal and Hazard Warning Lamps/Wiring Diagrams — TURN — (Cont'd)

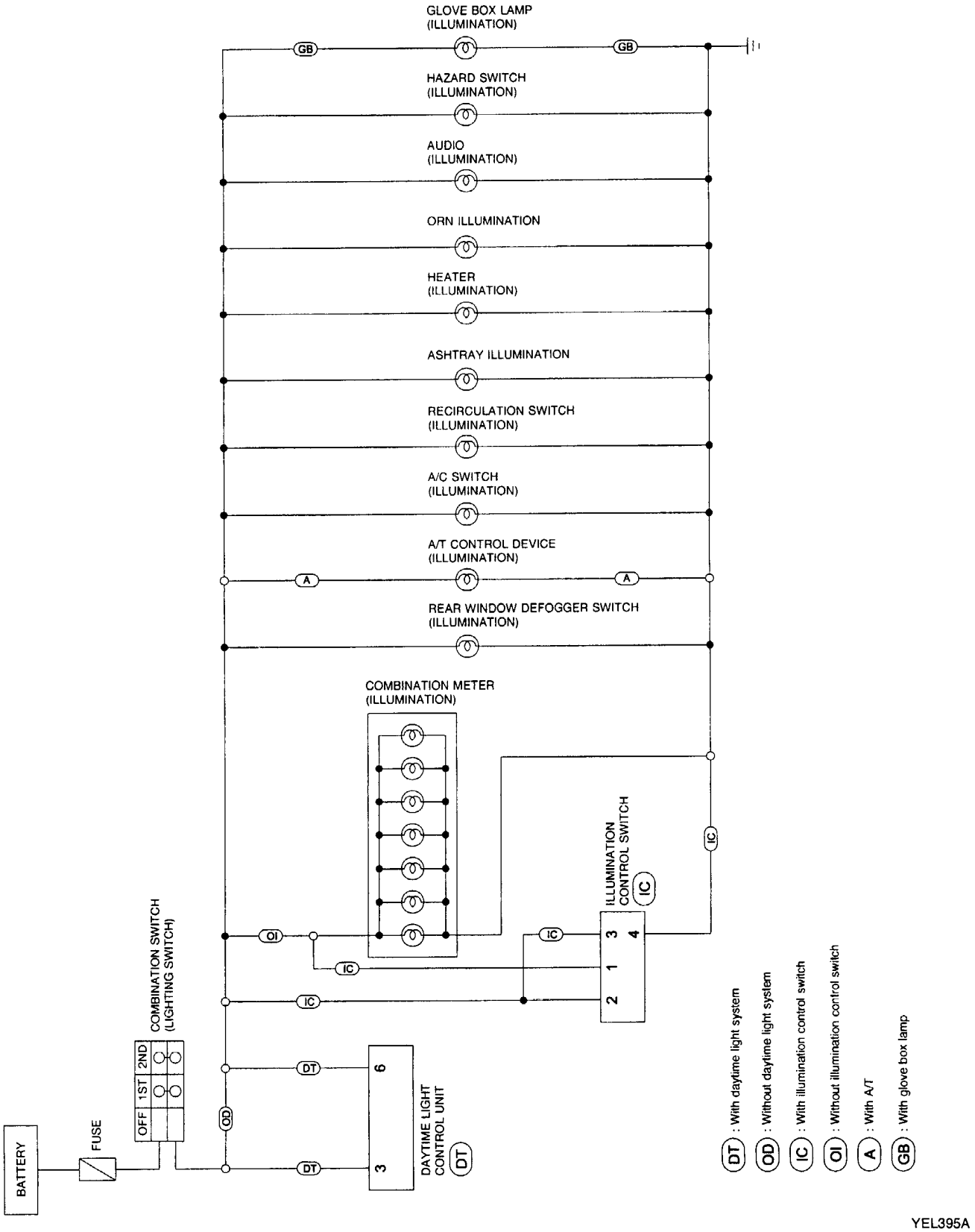
EL-TURN-03





YEL587A

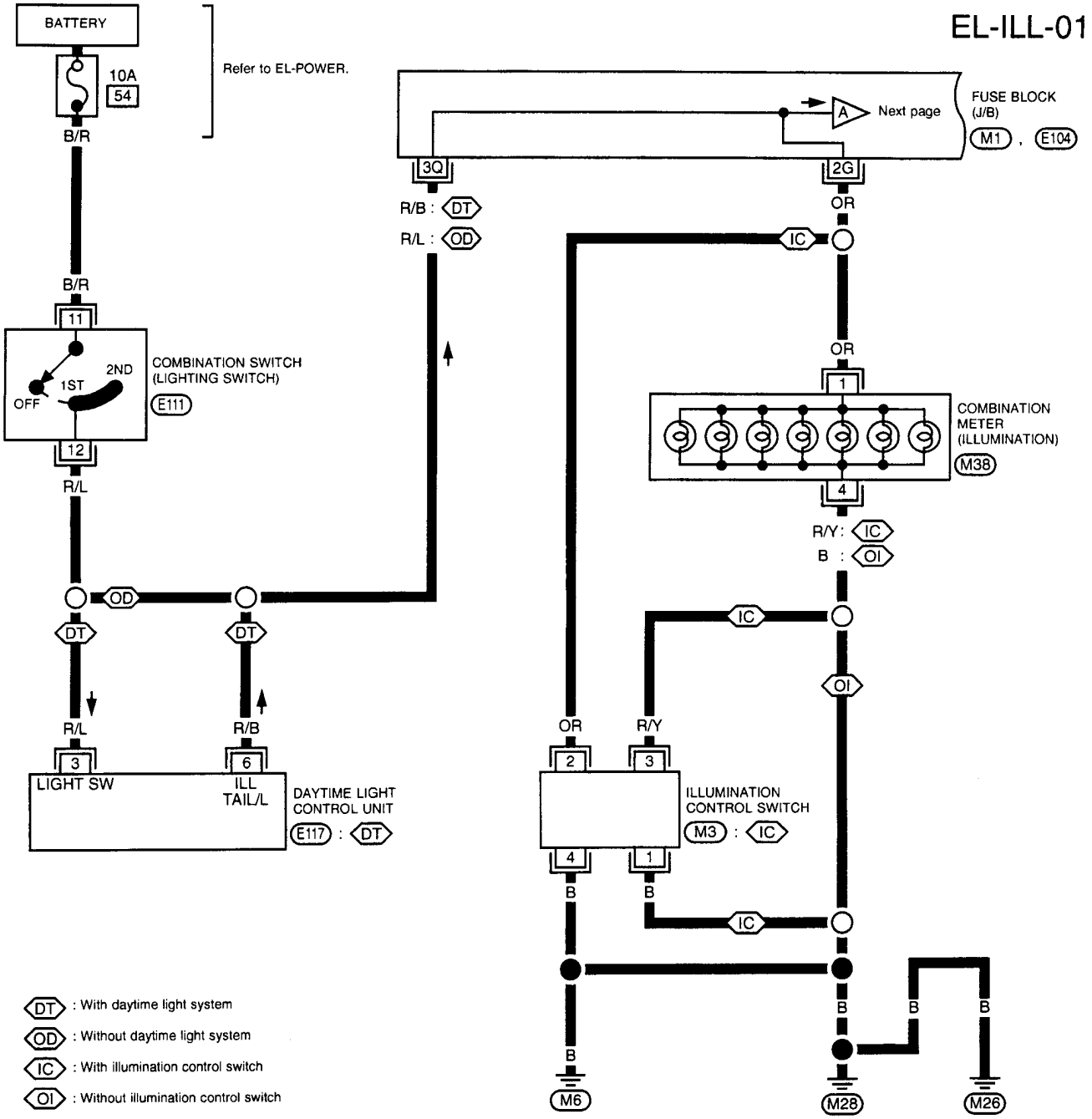
Illumination/Schematic

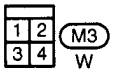


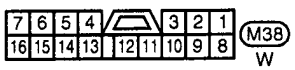
YEL395A

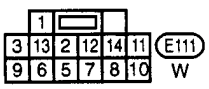
Illumination/Wiring Diagram — ILL —

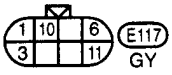
EL-ILL-01











Refer to last page (Foldout page).

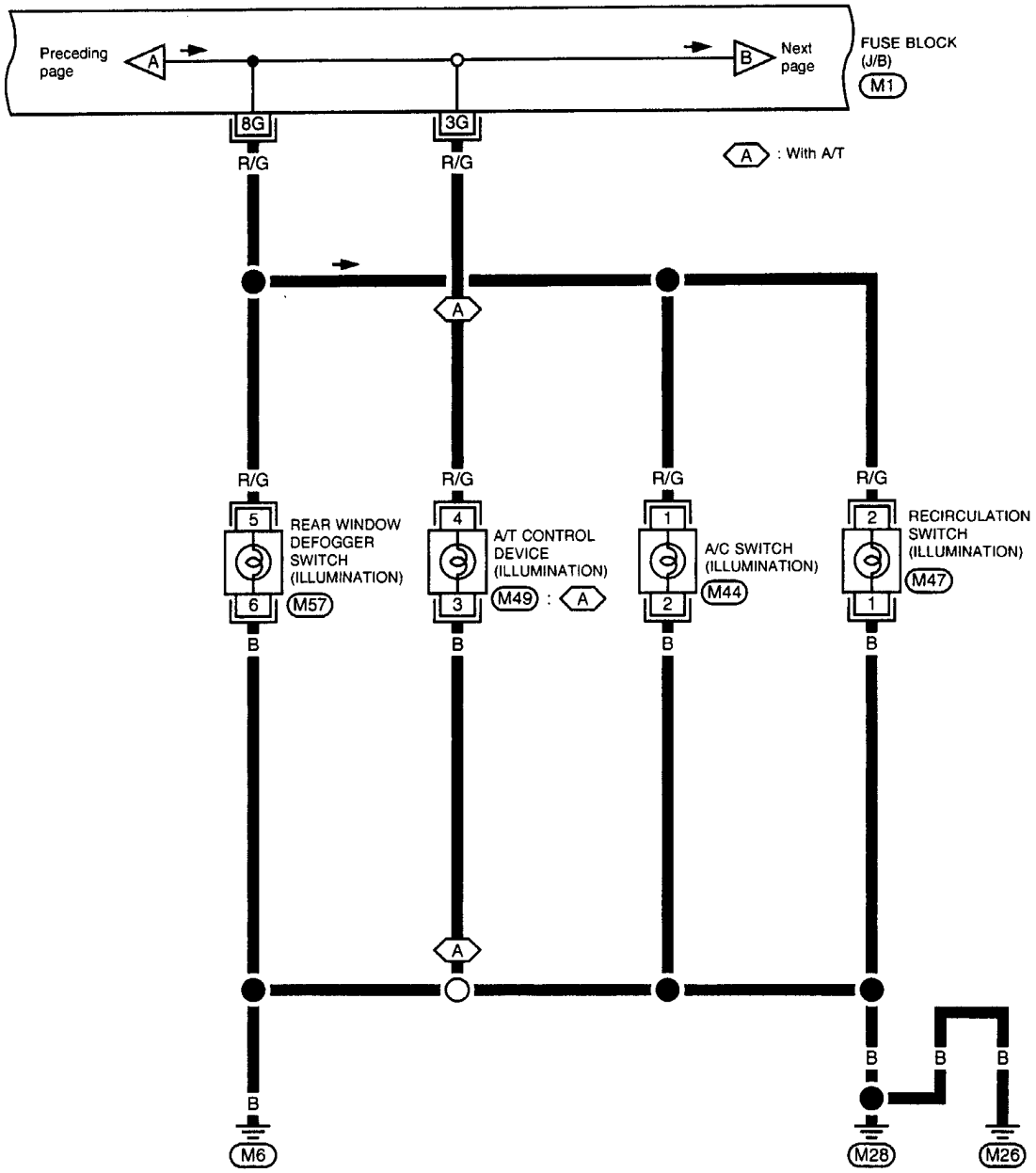
M1

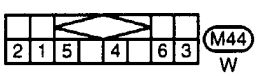
E104

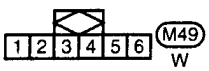
YEL588A

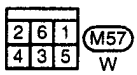
Illumination/Wiring Diagram — ILL — (Cont'd)

EL-ILL-02







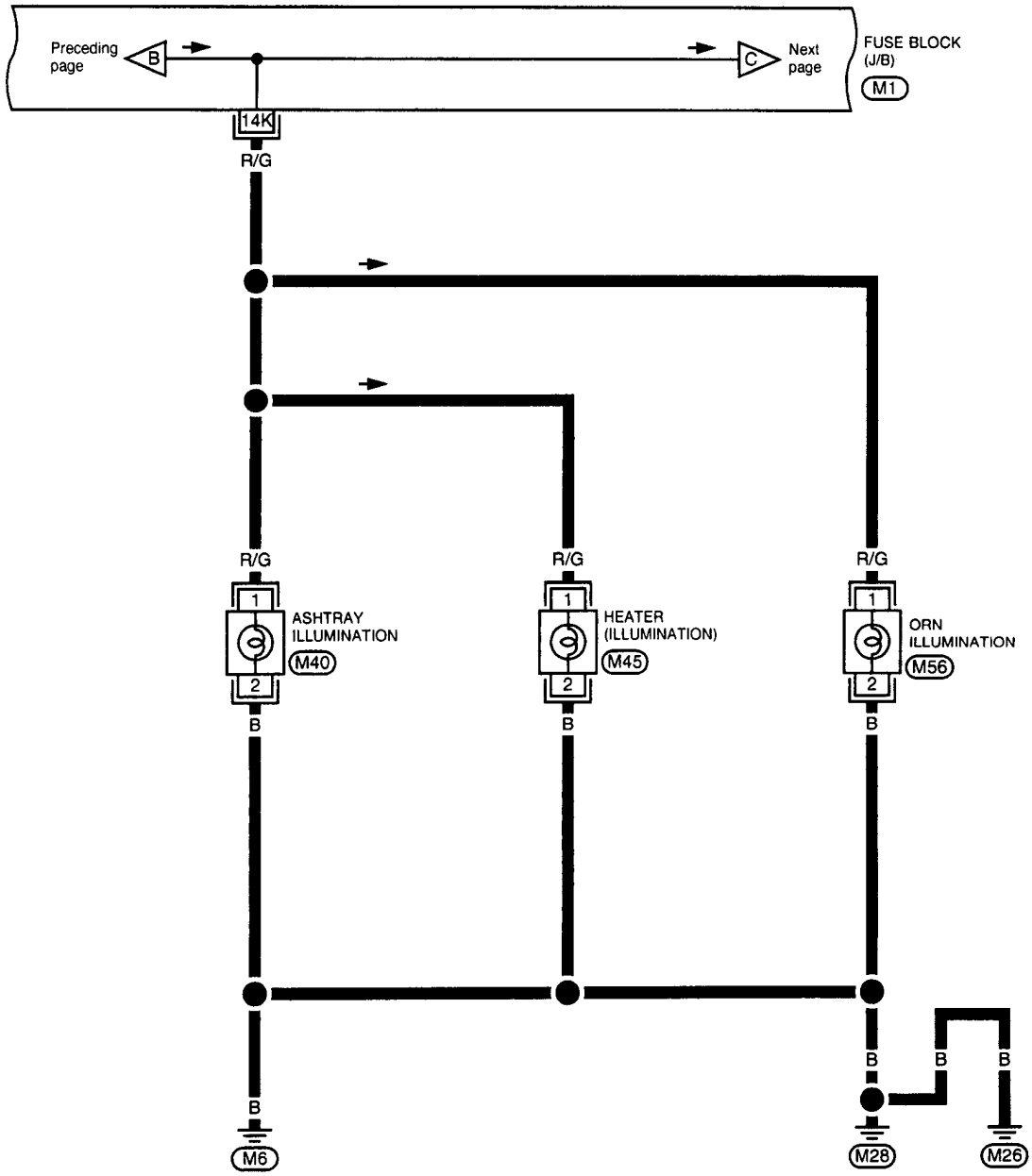


Refer to last page (Foldout page).
M1

YEL397A

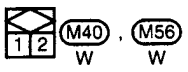
Illumination/Wiring Diagram — ILL — (Cont'd)

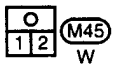
EL-ILL-03



Refer to last page (Foldout page).

M1

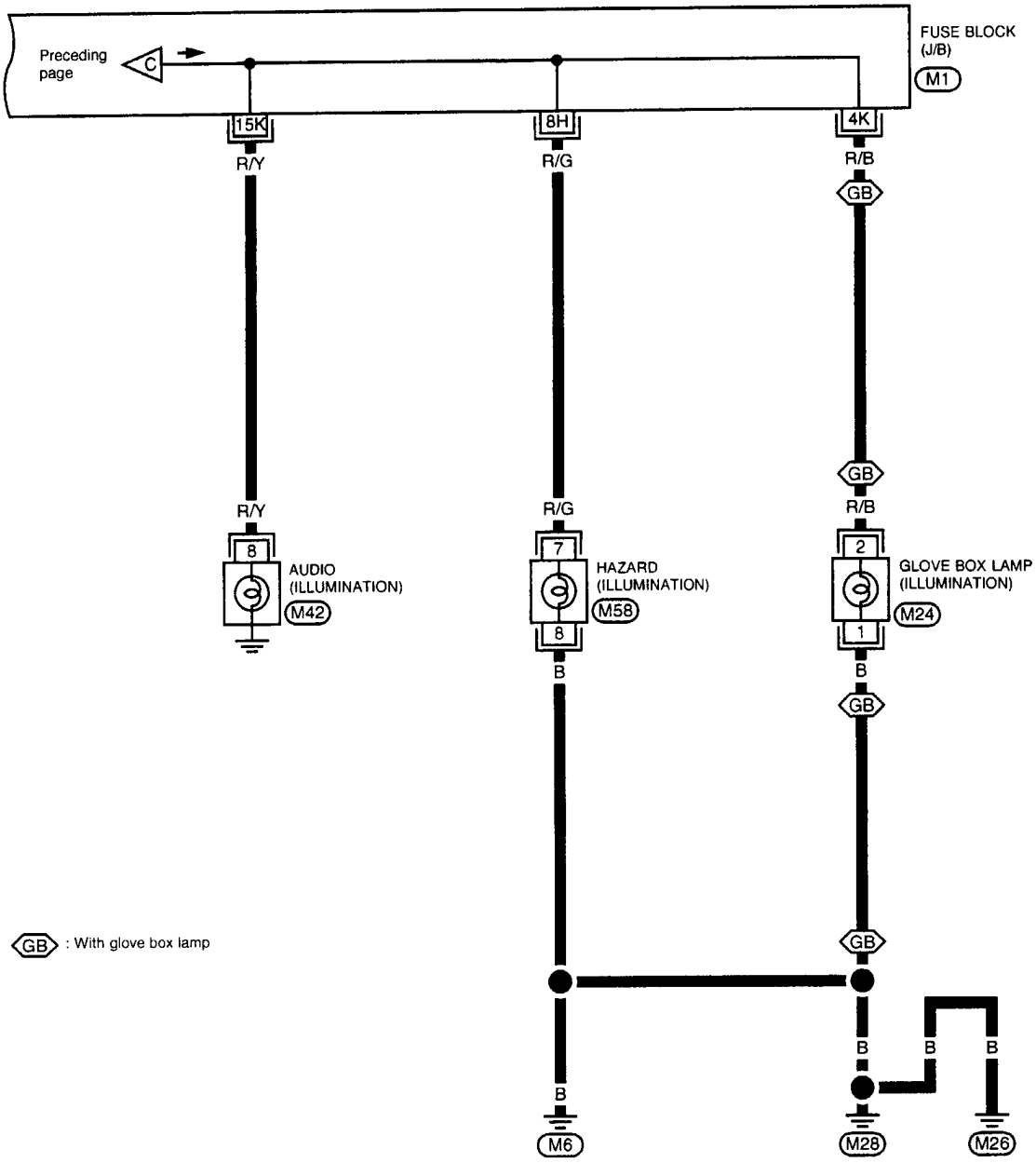


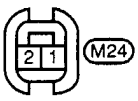


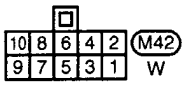
YEL398A

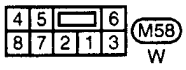
Illumination/Wiring Diagram — ILL — (Cont'd)

EL-ILL-04







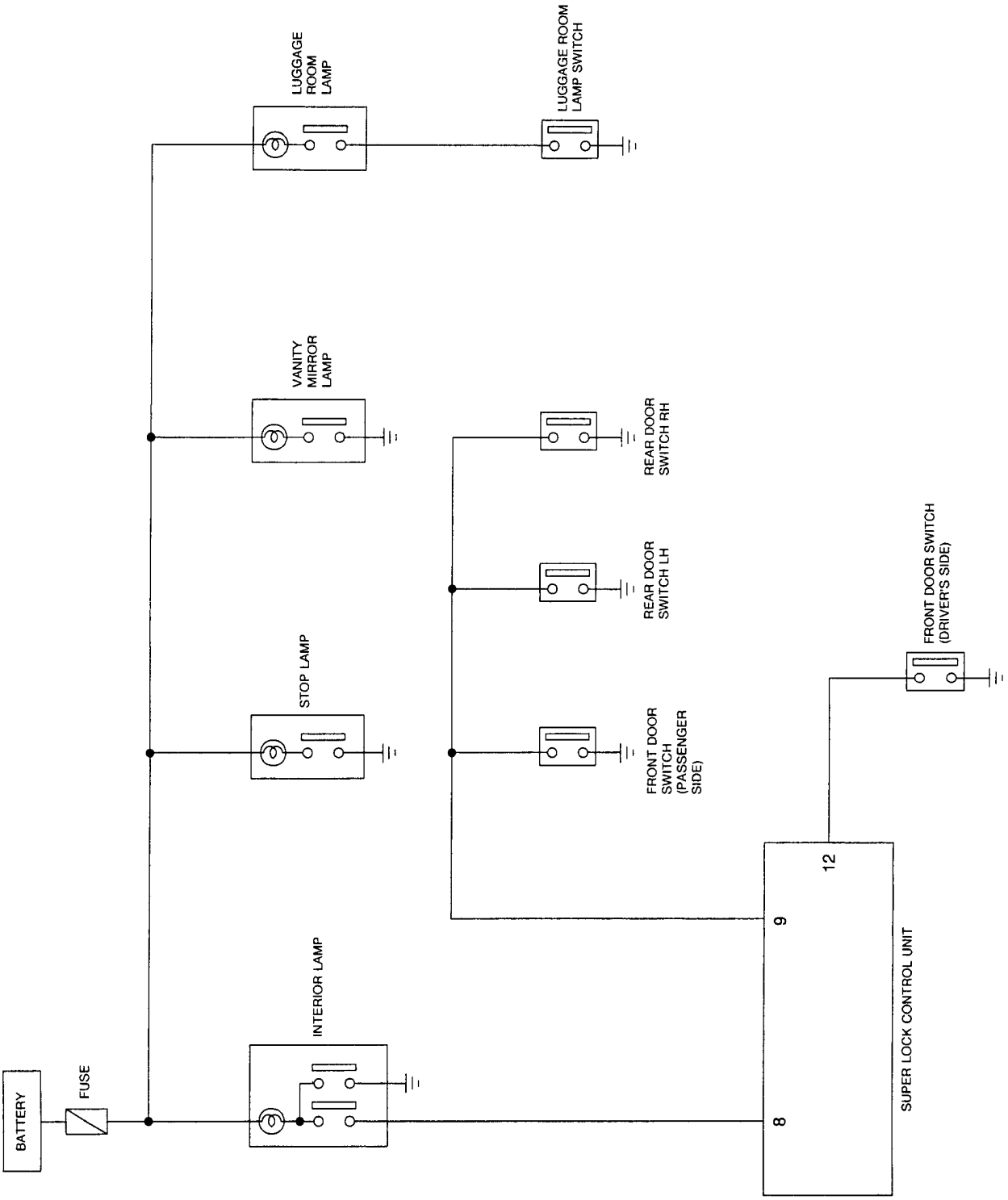


Refer to last page (Foldout page).

M1

YEL399A

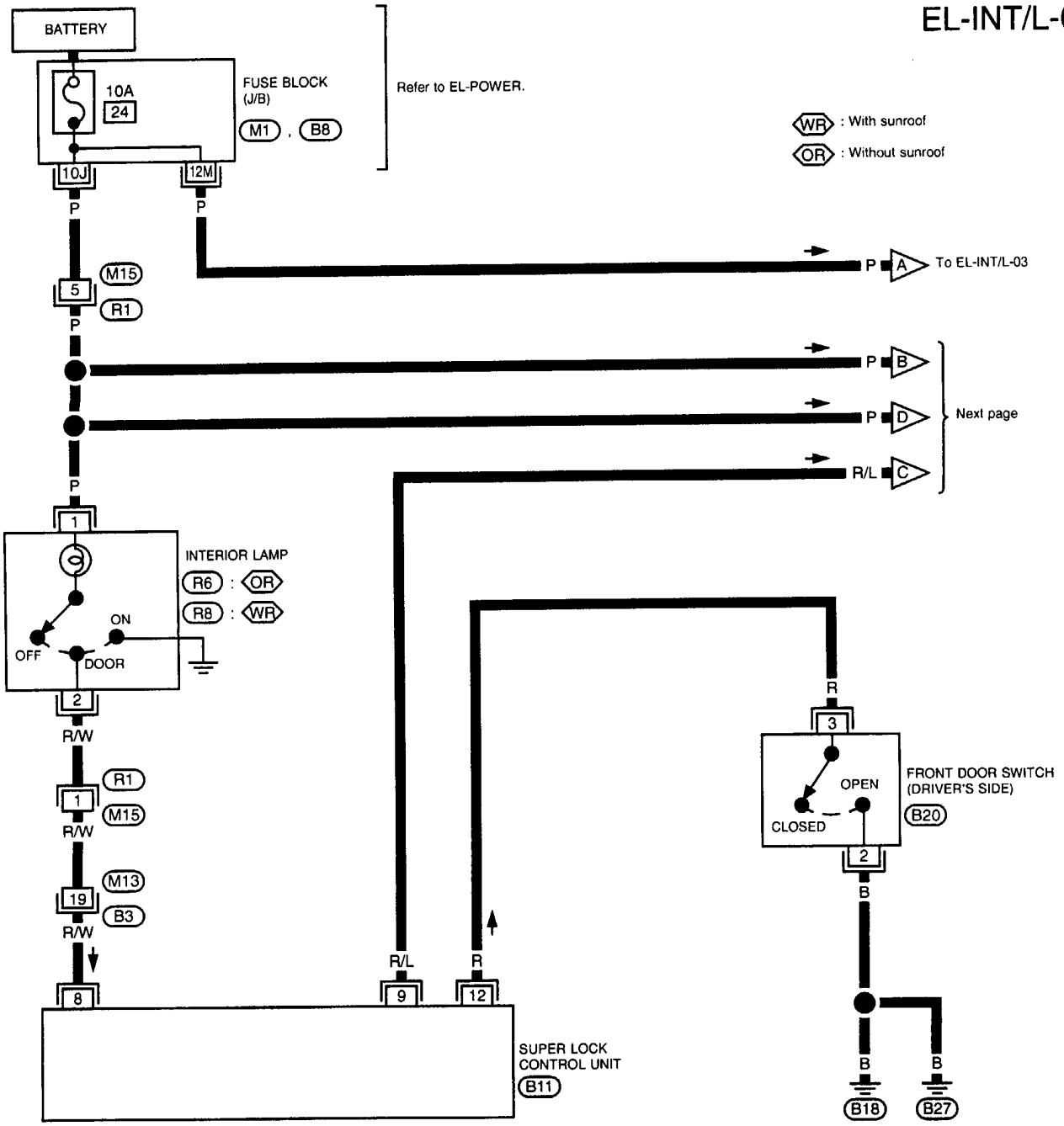
Interior, Spot, Trunk Room and Luggage Room Lamps/Schematic

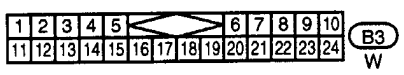


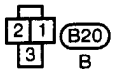
YEL589A

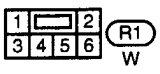
Interior, Spot, Trunk Room and Luggage Room Lamps/Wiring Diagram — INT/L —

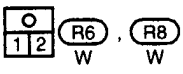
EL-INT/L-01











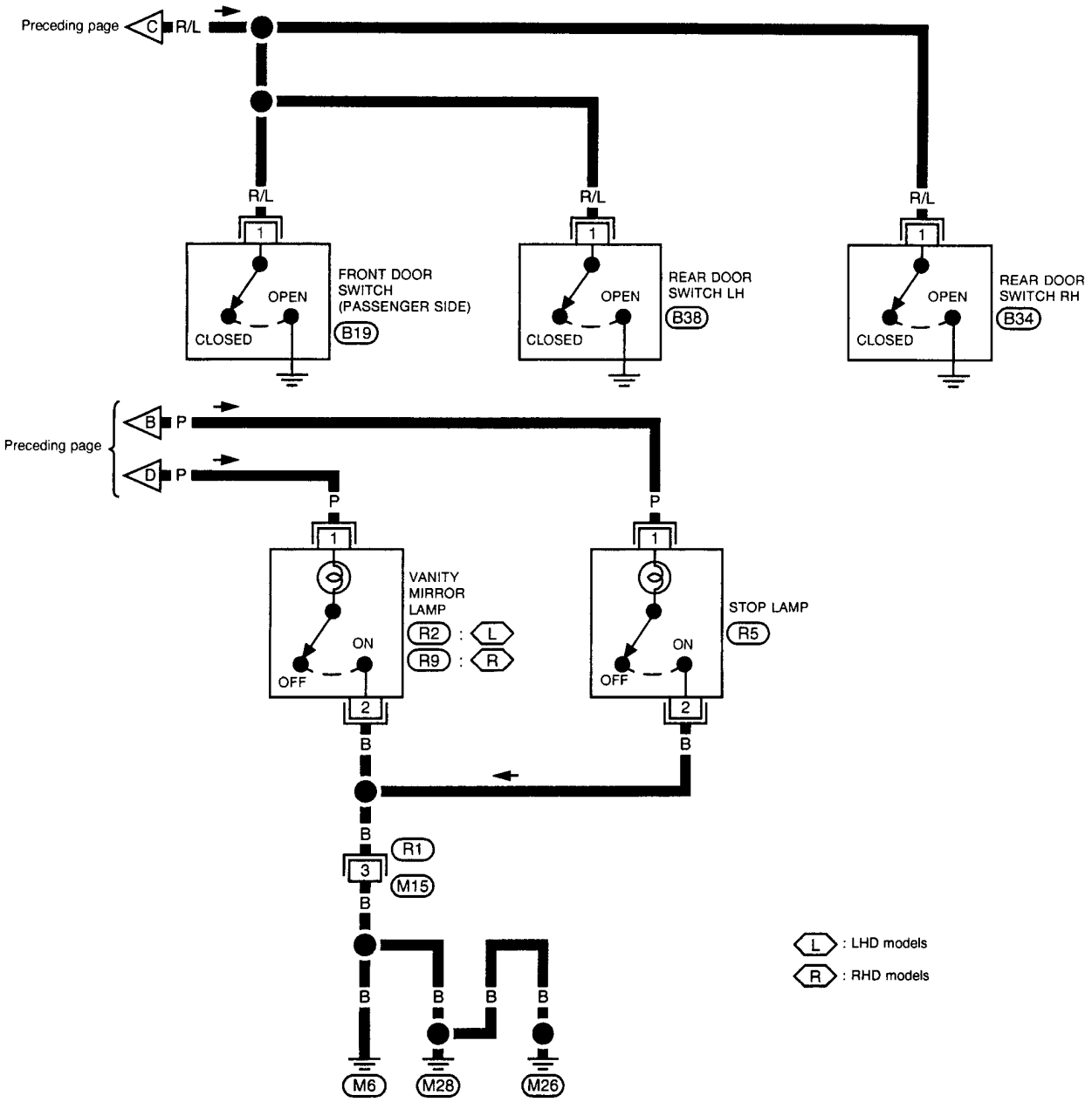
Refer to last page (Foldout page).

M1
B8
B11

YEL590A

Interior, Spot, Trunk Room and Luggage Room Lamps/Wiring Diagram — INT/L — (Cont'd)

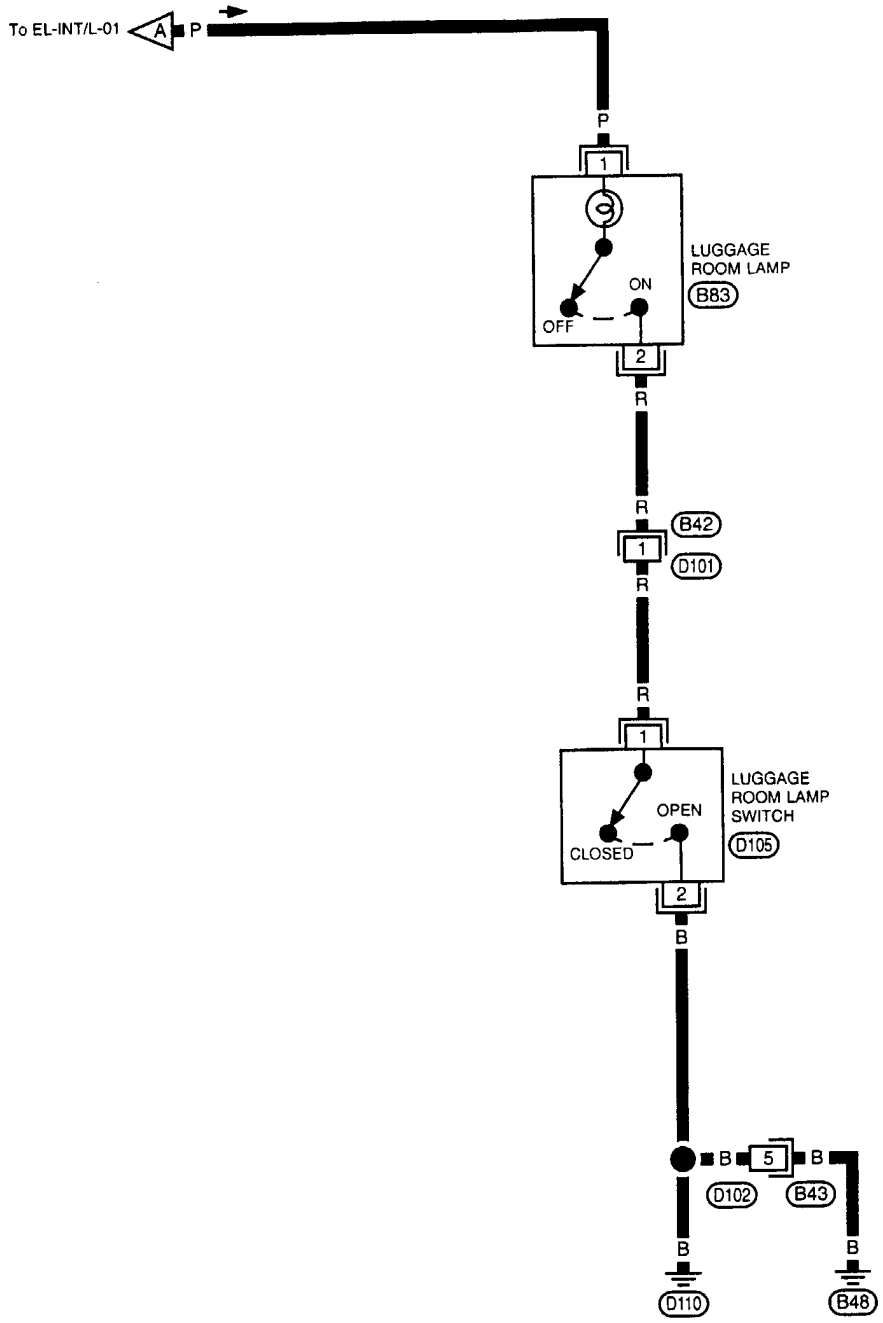
EL-INT/L-02

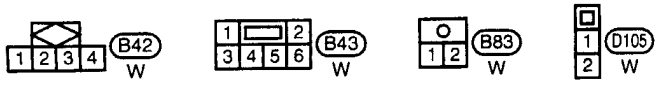


YEL402A

Interior, Spot, Trunk Room and Luggage Room Lamps/Wiring Diagram — INT/L — (Cont'd)

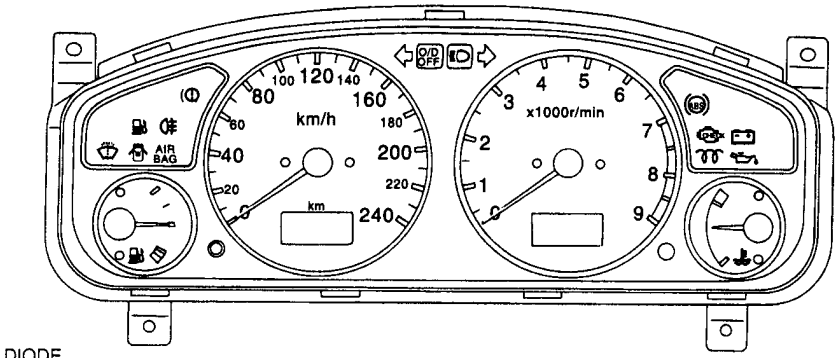
EL-INT/L-03

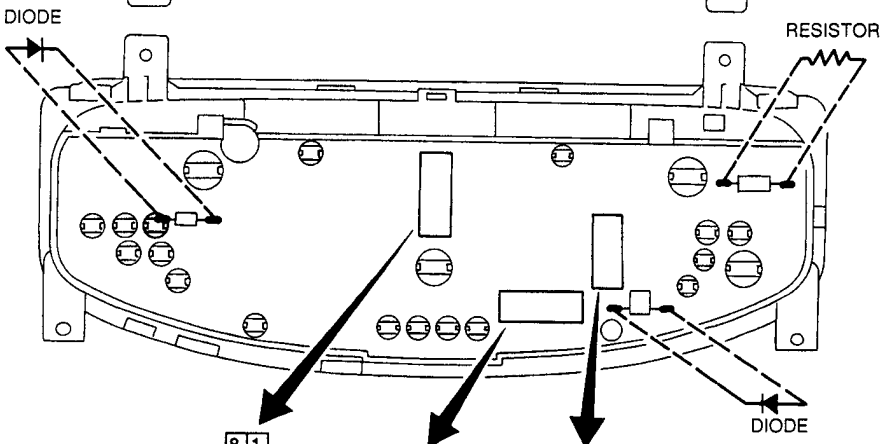


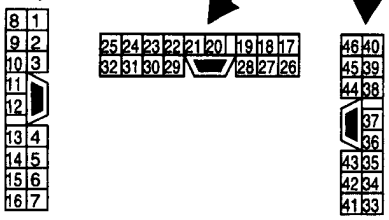


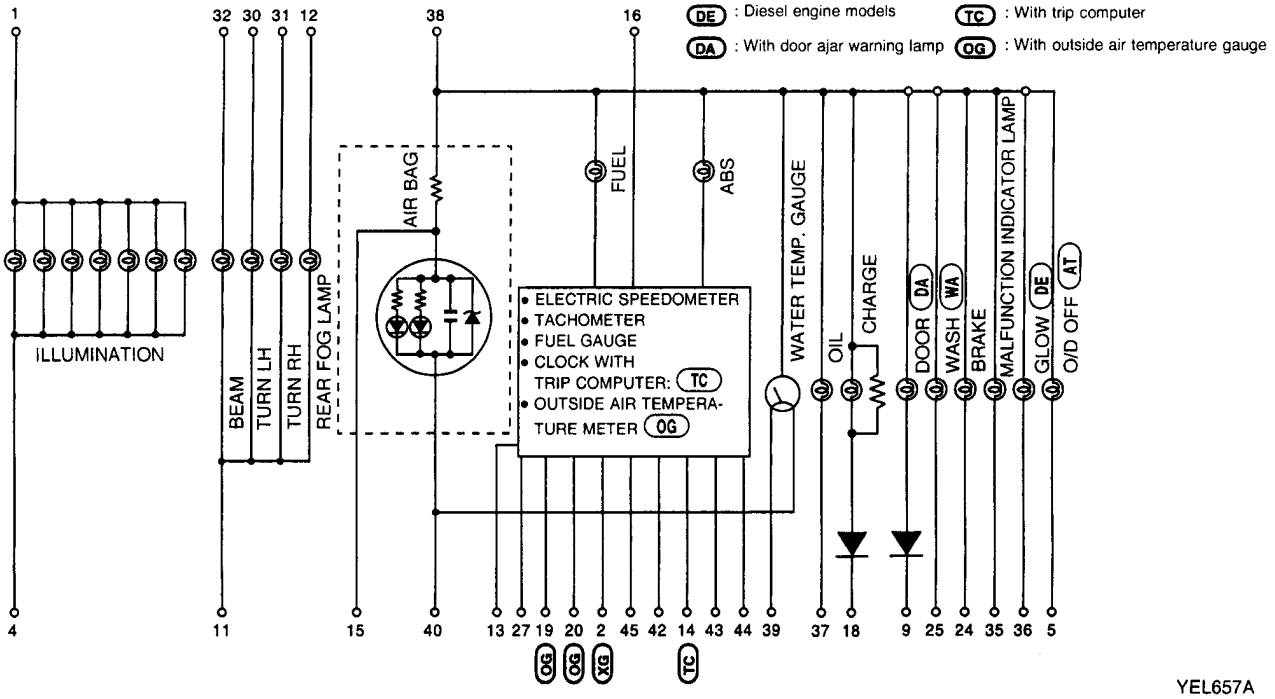
YEL591A

Combination Meter





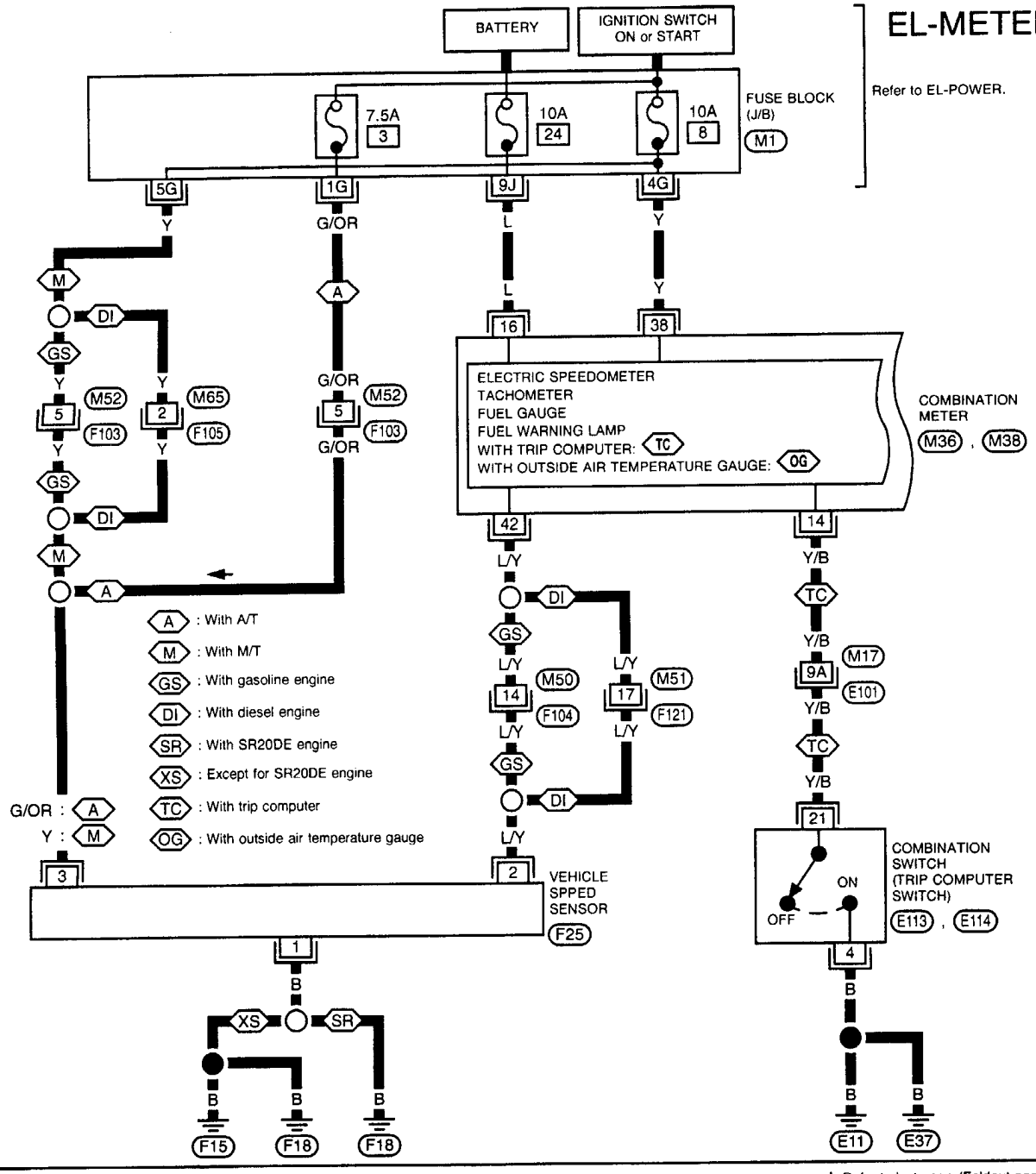




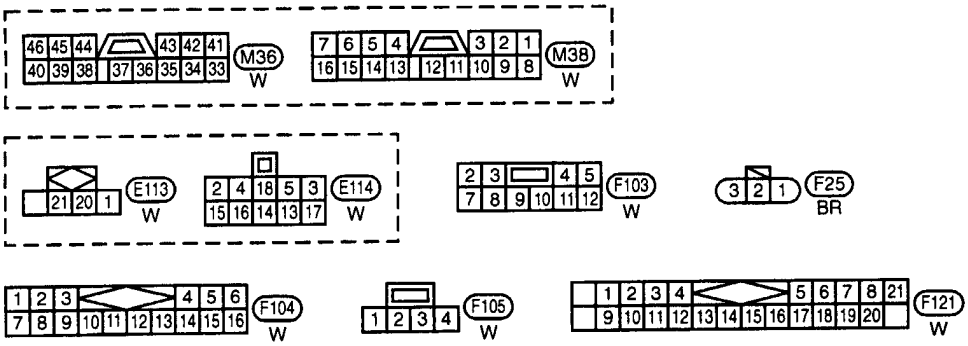
XG : Except GA engine models
WA : With washer level warning lamp
SR : SR20DE engine models
TC : With trip computer
OG : With outside air temperature gauge
AT : A/T models
DE : Diesel engine models
DA : With door ajar warning lamp

YEL657A

Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER —



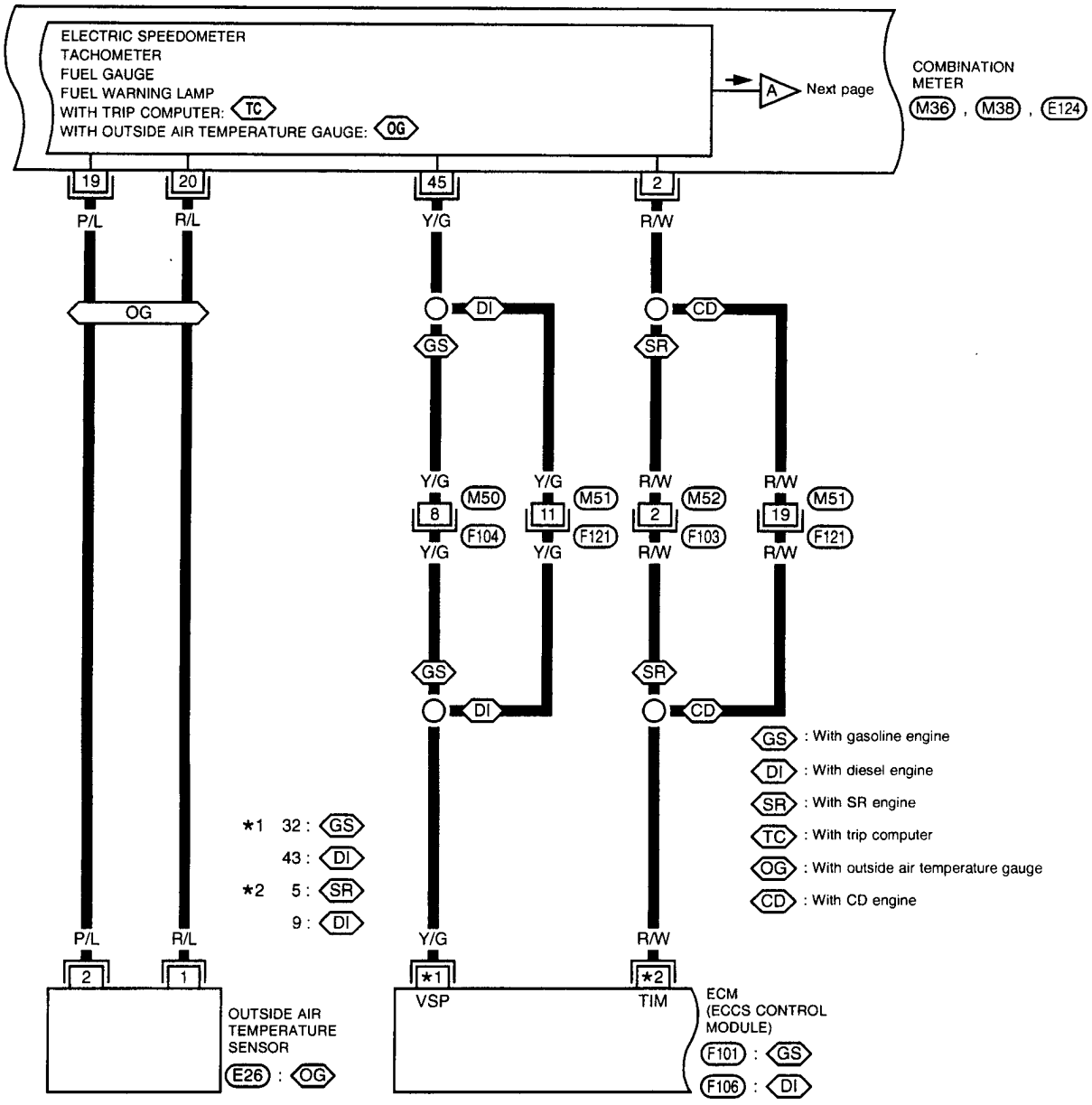
Refer to last page (Foldout page).
M17, E101
M1

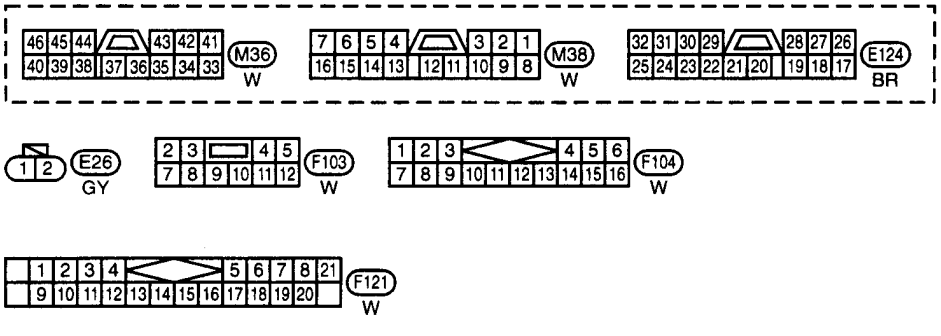


YEL592A

Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER — (Cont'd)

EL-METER-02





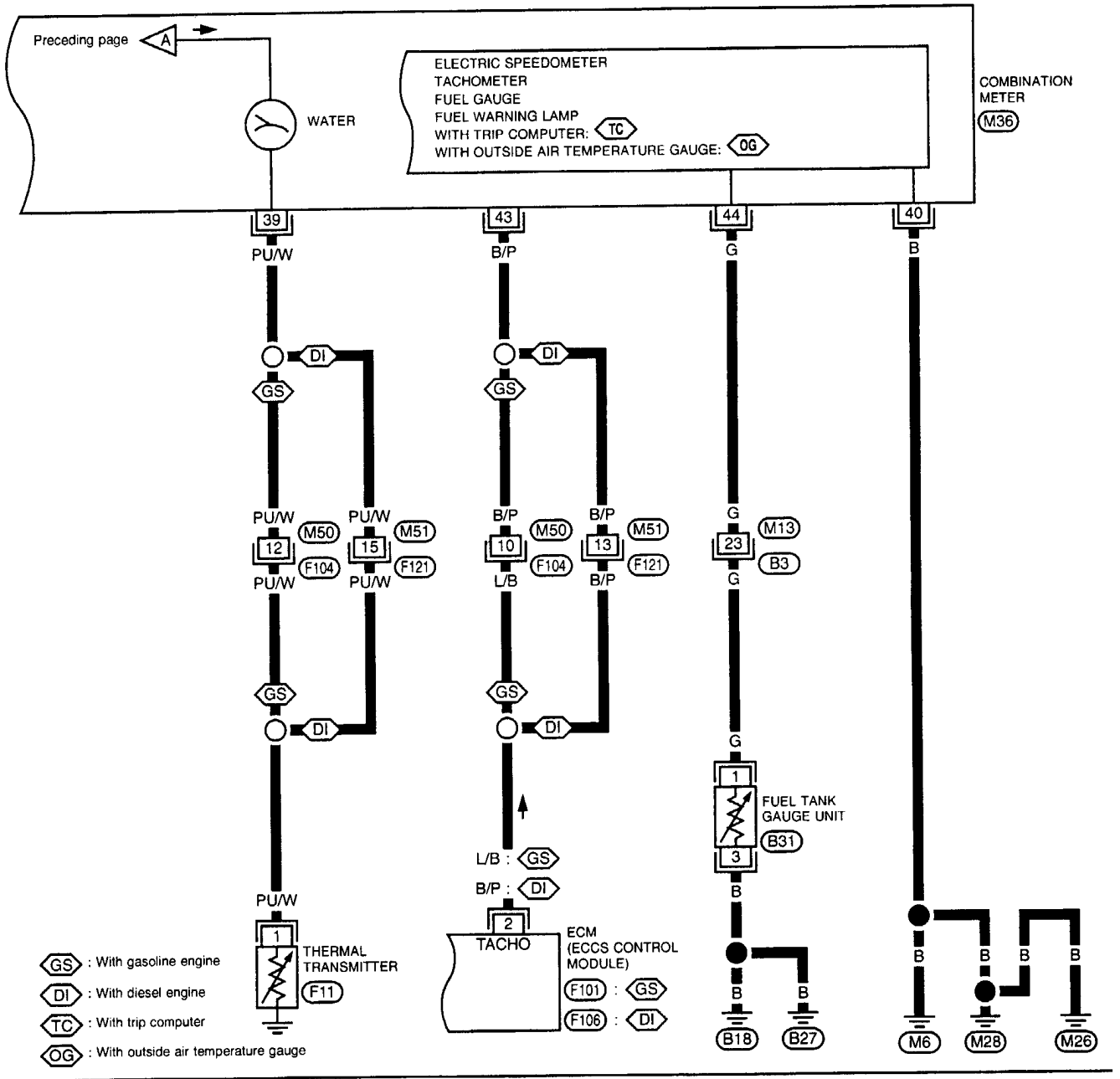
Refer to last page (Foldout page).

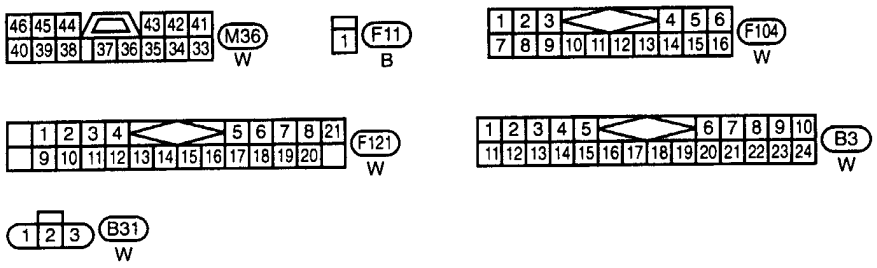
F101

F106

YEL593A

Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER — (Cont'd)



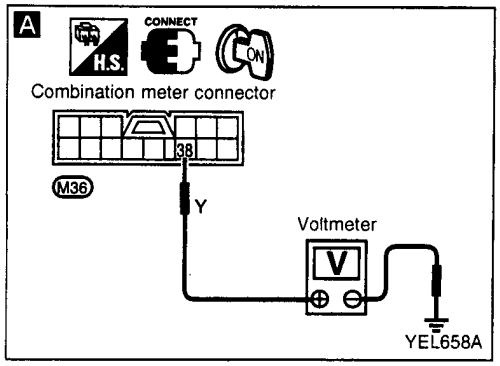


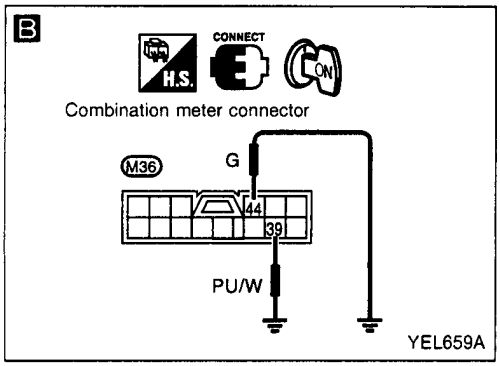
Refer to last page (Foldout page).

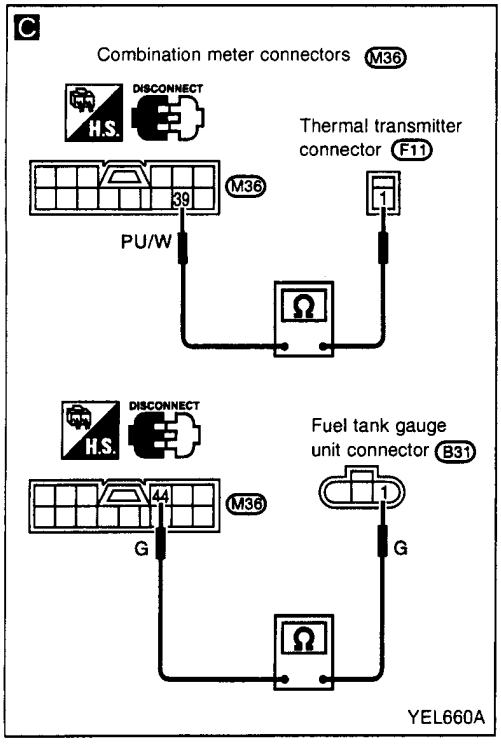
F101

F106

YEL594A







Inspection/Fuel Gauge and Water Temperature Gauge

INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch to "ON" position.
2) Check voltage between combination meter connector (M36) terminal (38) and ground.
Battery voltage should exist.

NG → Check the following items:
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and 10A [8] fuse
4) Ignition switch
If NG, replace fusible link, fuse or ignition relay or repair ignition switch harness or connectors.

OK ↓

B

CHECK GAUGE OPERATION.
1) Connect combination meter connector (M36) terminals (39) (Temp.), (44) (Fuel) and ground with wire for **less than 10 seconds.**
2) Check operation of gauge.
Gauge should move smoothly to full scale.
3) For Fuel gauge operation, perform Combination Meter Self-Diagnosis.

NG → Replace combination meter.

OK ↓

C

CHECK HARNESS CONTINUITY between terminals as follows.
Continuity should exist.

Terminals		
Combination meter connector	Thermal transmitter connector	Fuel tank gauge unit connector
(39)	(1)	
(44)		(1)

NG → Check the following:
1) Harness connectors (B3), (M13) — Fuel tank gauge
2) Harness connectors (F104), (M50) — Temperature gauge (Gasoline engine models)
Harness connectors (F121), (M51) — Temperature gauge (Diesel engine models)
If NG, repair harness or connectors.

OK ↓

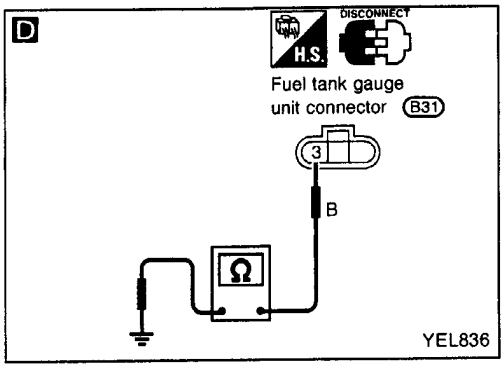
CHECK COMPONENT.
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check" or "Thermal Transmitter Check".

NG → Repair or replace.
Refer to FE section. (Fuel Tank Gauge Unit)

OK ↓

(Go to Ⓐ on next page)

Inspection/Fuel Gauge and Water Temperature Gauge (Cont'd)



Ⓐ

D

Check harness continuity between fuel tank gauge unit harness connector terminal ③ and body ground.
Continuity should exist.

NG → Repair harness or connector.

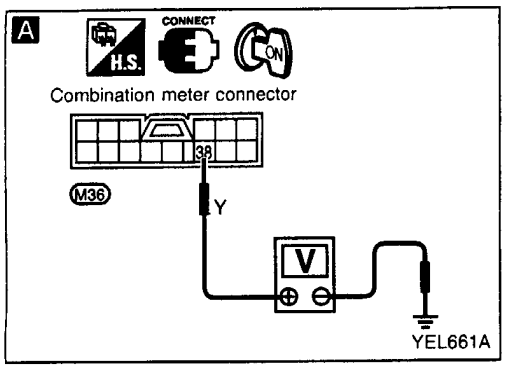
OK ↓

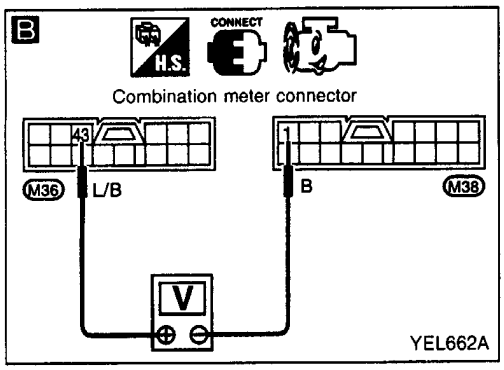
Reinstall any part removed.

↓

INSPECTION END

Inspection/Tachometer





INSPECTION START

↓

Perform Combination Meter Self-diagnosis.

↓

A

CHECK POWER SOURCE.
1) Turn ignition switch to "ON" position.
2) Check voltage between combination meter connector M36 terminal ㊳ and ground.
Battery voltage should exist.

NG → Check the following items:
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and 10A 8 fuse
4) Ignition switch
If NG, replace fusible link, fuse or ignition relay or repair ignition switch, harness or connectors.

OK ↓

B

CHECK ECM OUTPUT.
1) Start engine.
2) Check voltage and signal frequency between terminals ① and ㊸ at idle and 2,000 rpm.
Voltage and signal frequency should change with rpm.
Refer to "ECM Terminal and Reference Value" oscilloscope data in EC section for each engine model.
GA engine : EC-64
SR engine : EC-200
CD engine : EC-2089.

NG → Check the following:
1) Harness connectors F104, M50 — Gasoline engine models
Harness connectors F121, M51 — Diesel engine models
2) Harness continuity between ECM and combination meter
3) Combination meter ground connectors
If NG, repair harness or connectors.

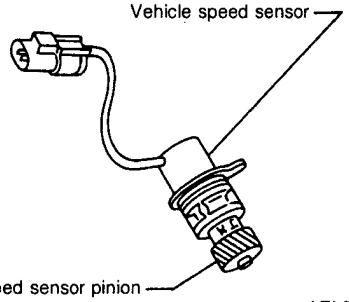
OK ↓

Replace Combination Meter.

↓

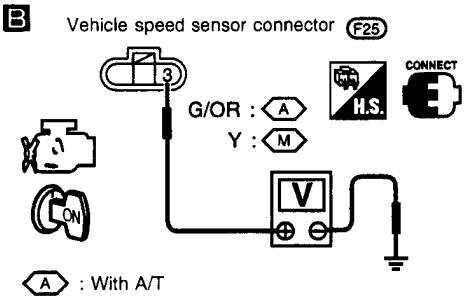
INSPECTION END

A



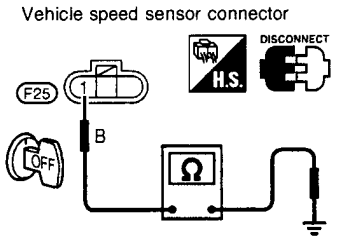
AEL061

B



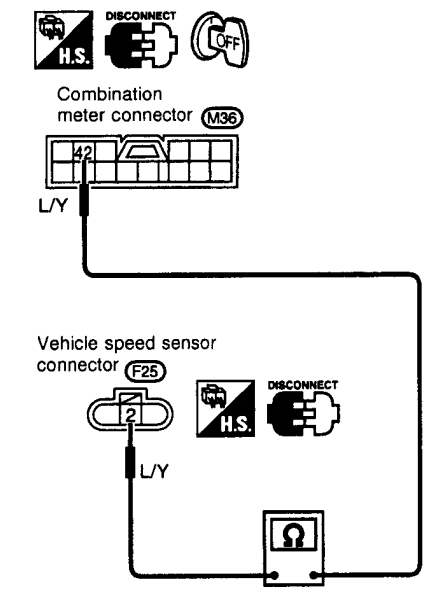
YEL663A

C



YEL007A

D



YEL664A

Inspection/Speedometer and Vehicle Speed Sensor

SYMPTOM: Speedometer indication flutters.

INSPECTION START

Is vehicle speed sensor installed correctly?
- NG → Install vehicle speed sensor correctly.
- OK ↓

A

Remove vehicle speed sensor and spin pinion. Do you feel resistance when turning vehicle speed sensor pinion?
- No → Replace vehicle speed sensor.
- Yes ↓

B

CHECK POWER SOURCE
- Re-install vehicle speed sensor.
- Turn ignition switch to "ON" position.

Check voltage between vehicle speed sensor connector terminal ③ and ground.
Battery voltage should exist.
- NG → Check the following:
  1) Harness continuity between vehicle speed sensor and battery.
  2) Fusible link in power supply lines.
  3) 10A [8] fuse — M/T models
     7.5A [3] fuse — A/T models.
  4) Harness connectors (F103), (M52) (Gasoline engine models). (M65), (F105) (Diesel engine models).
  5) Ignition switch.

  If NG, replace fuse or fusible link or repair ignition switch, harness or connectors.
- OK ↓

C

CHECK GROUND CIRCUIT OF VEHICLE SPEED SENSOR
- Turn ignition switch to the "LOCK" position.

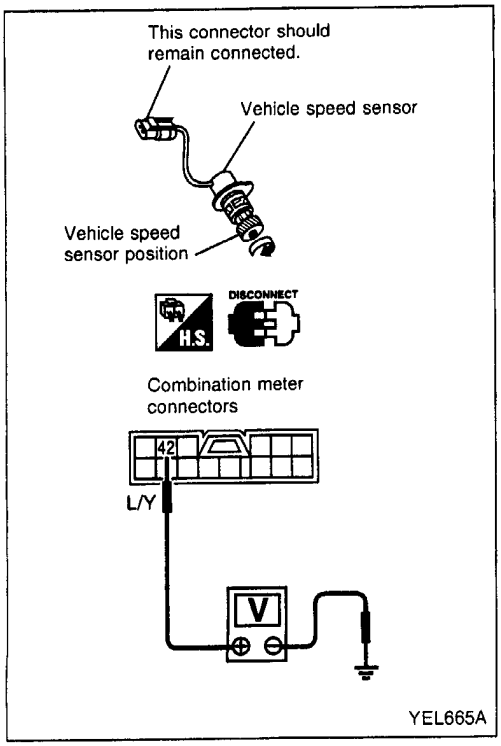
Disconnect vehicle speed sensor connector.
Check continuity between vehicle speed sensor harness connector terminal ① and body ground.
Continuity should exist.
- NG → Repair harness or connector.
- OK ↓

D

Check continuity between speedometer harness connector terminal ㊷ and vehicle speed sensor connector terminal ②.
Continuity should exist.
- NG → Repair harness and connector.
- OK ↓

Replace Combination Meter.

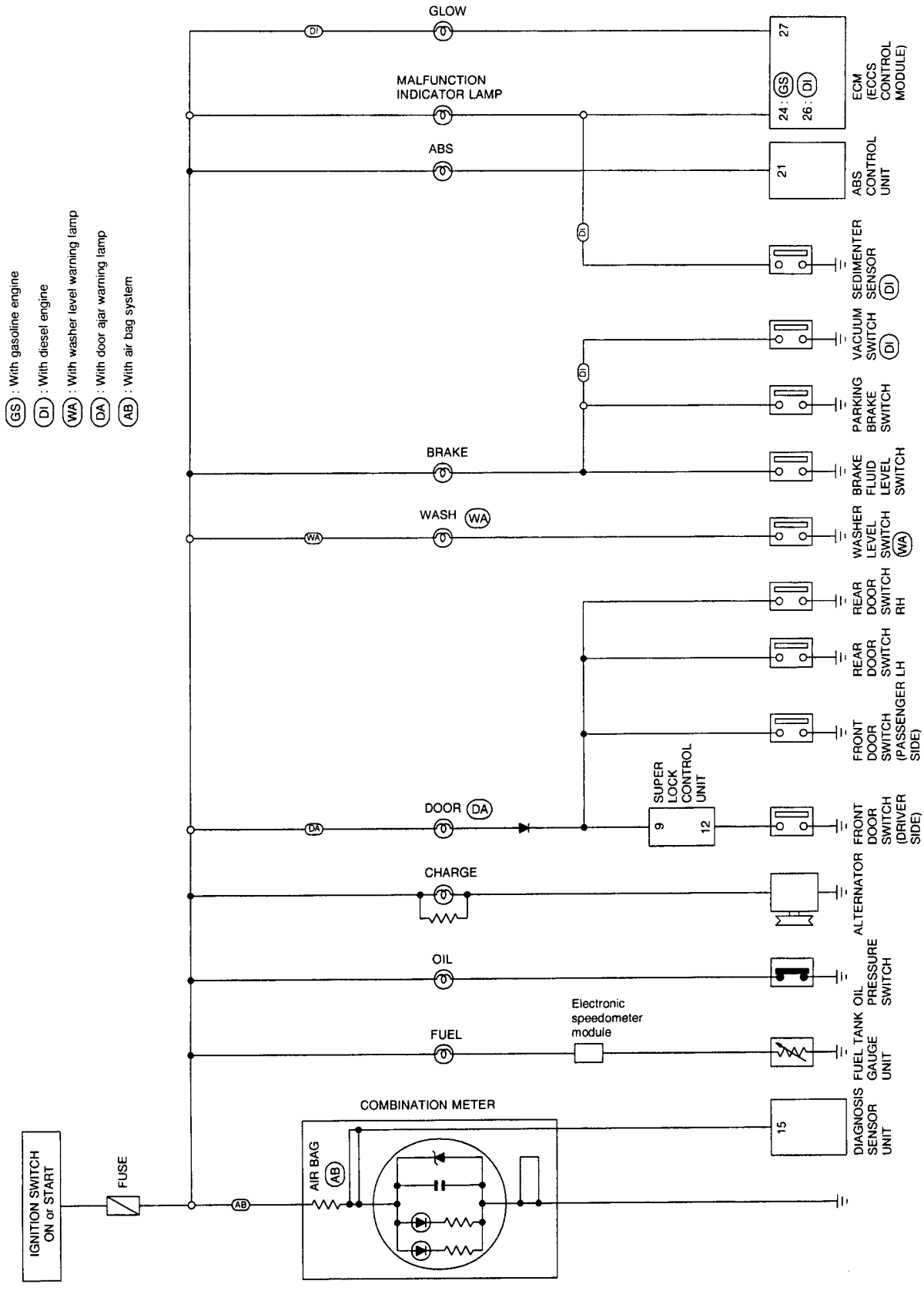
INSPECTION END



Vehicle Speed Sensor Signal Check

1. Remove vehicle speed sensor from transaxle.
2. Turn speedometer pinion quickly and measure voltage combination meter connector terminal ㊷.

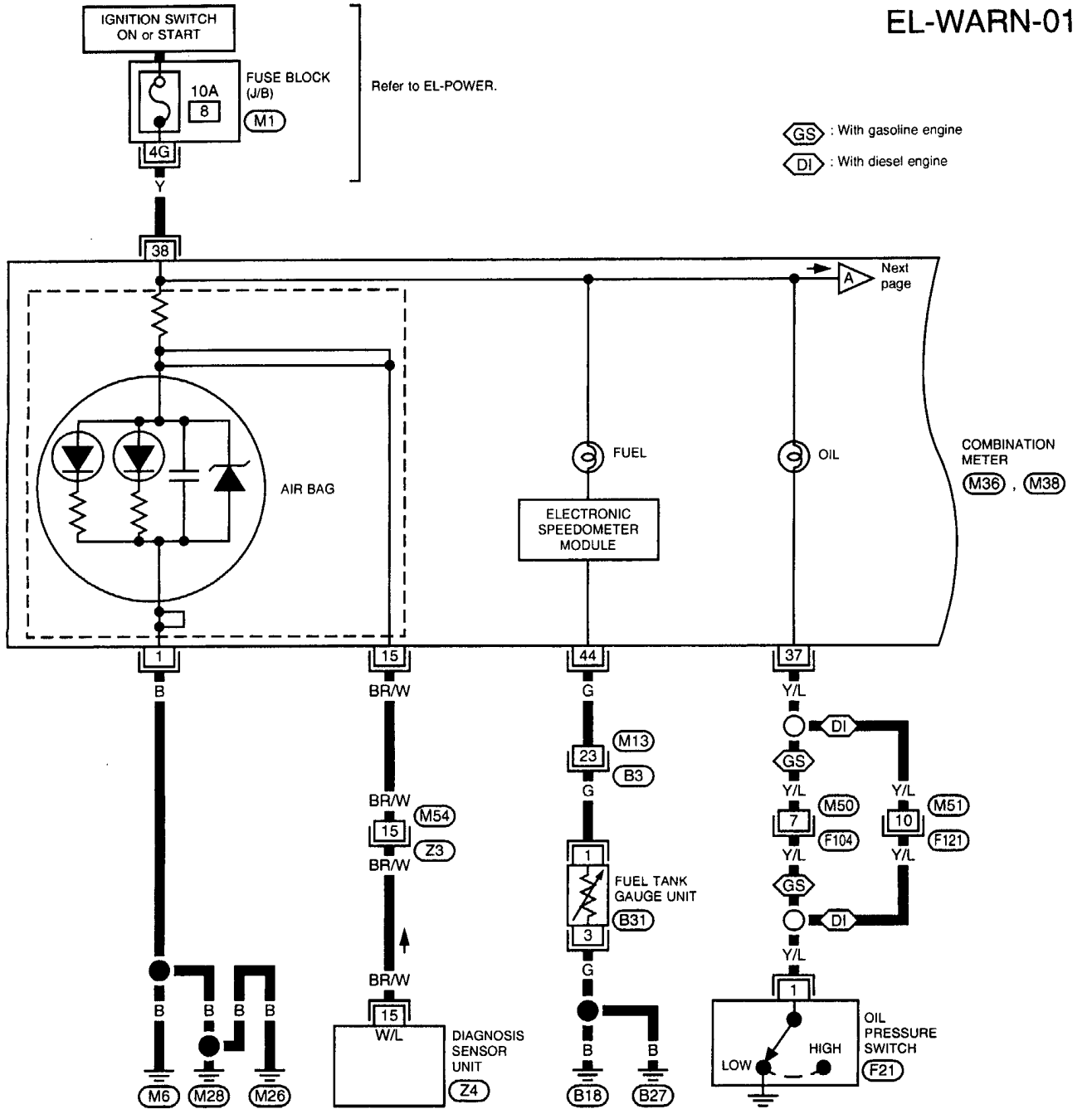
Warning Lamps/Schematic

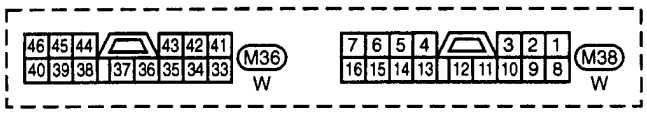


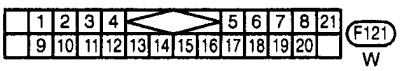
YEL595A

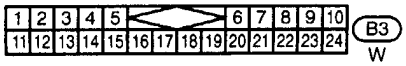
Warning Lamps/Wiring Diagram — WARN —

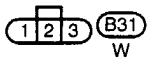
EL-WARN-01

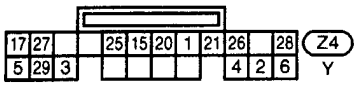












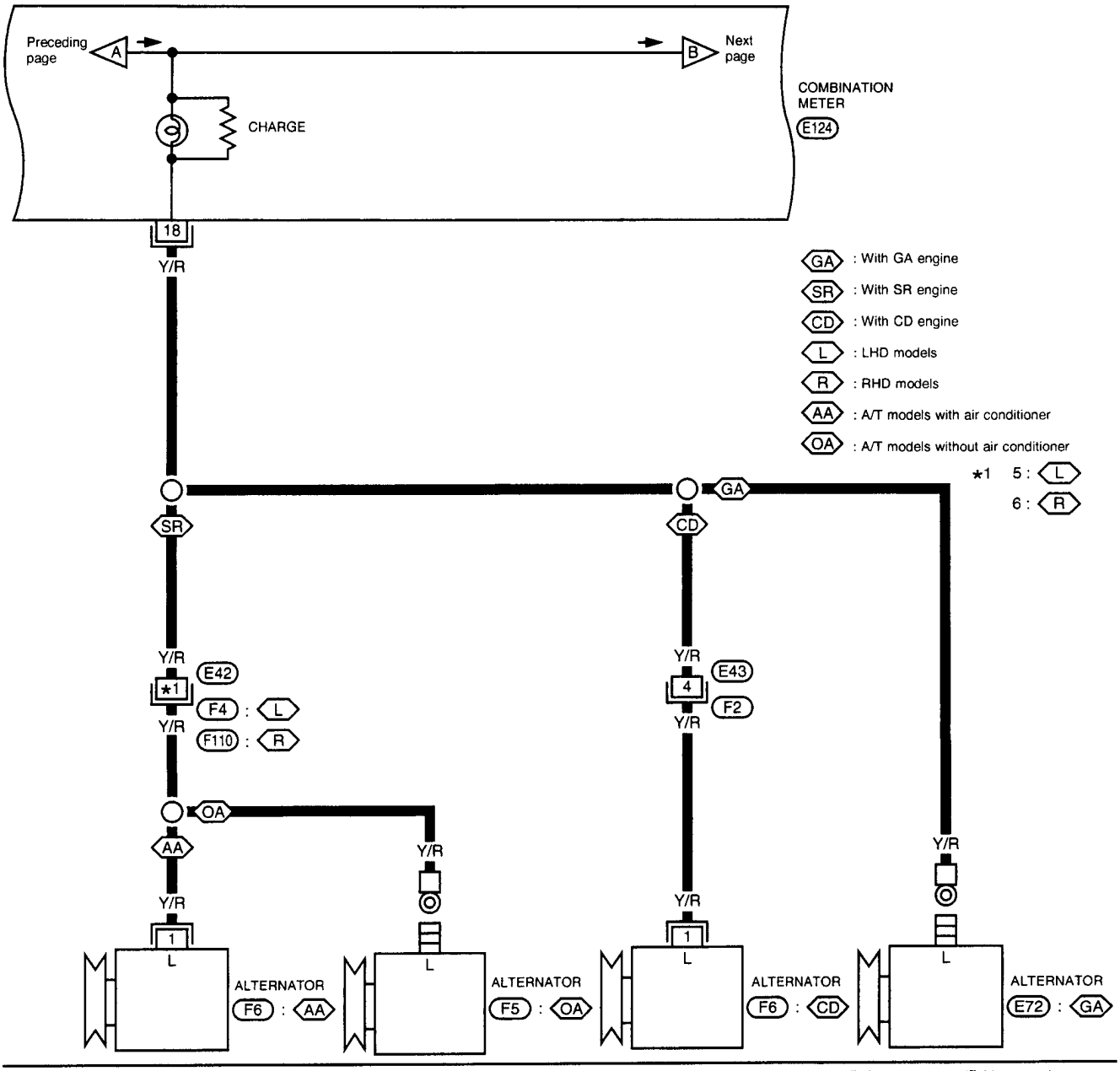
Refer to last page (Foldout page).

M1

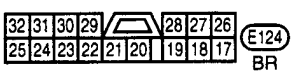
YEL596A

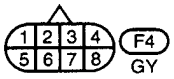
Warning Lamps/Wiring Diagram — WARN — (Cont'd)

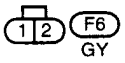
EL-WARN-02

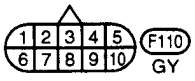


Refer to last page (Foldout page).
M17 , E101





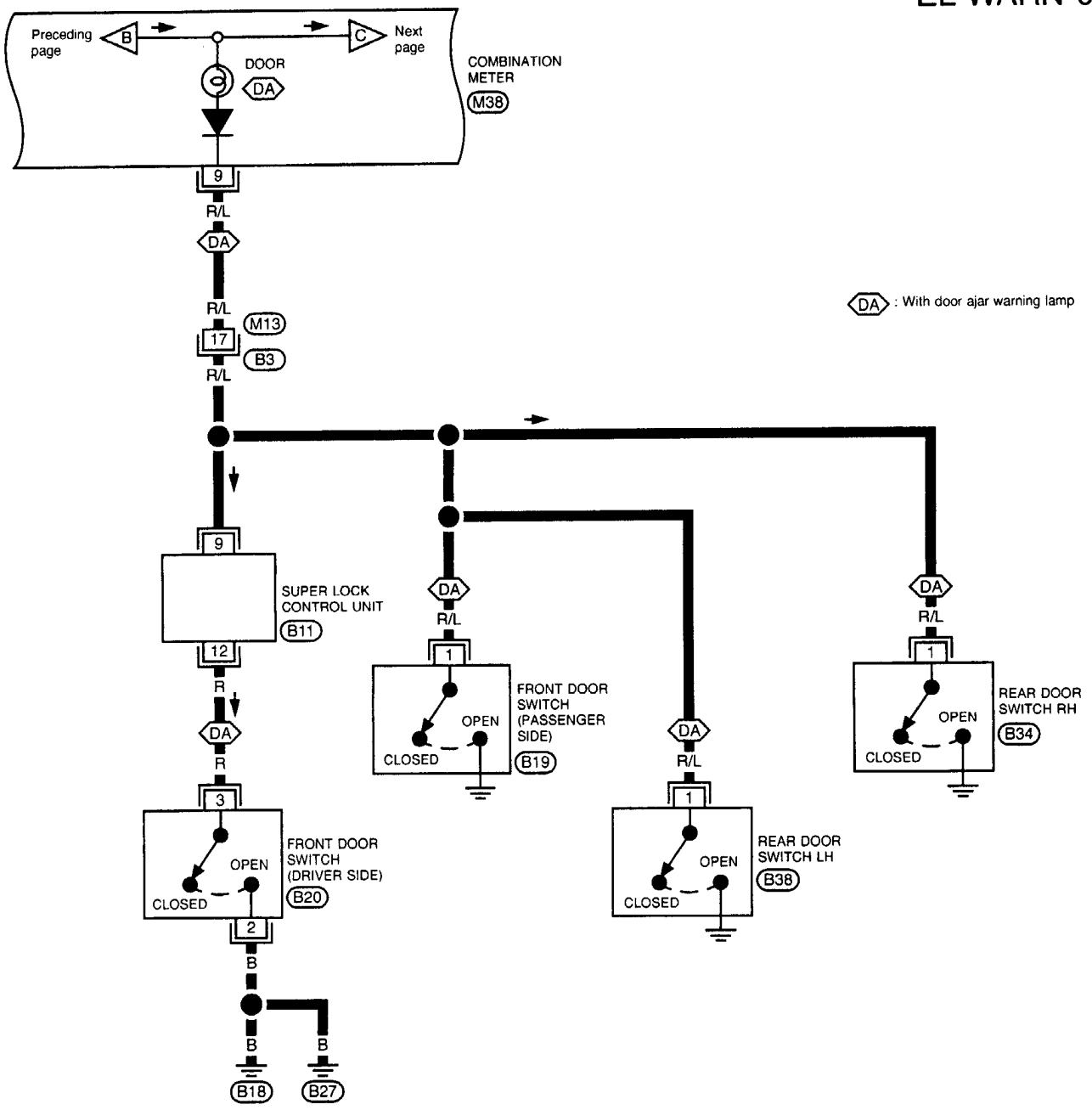


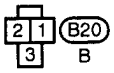


YEL597A

Warning Lamps/Wiring Diagram — WARN — (Cont'd)

EL-WARN-03





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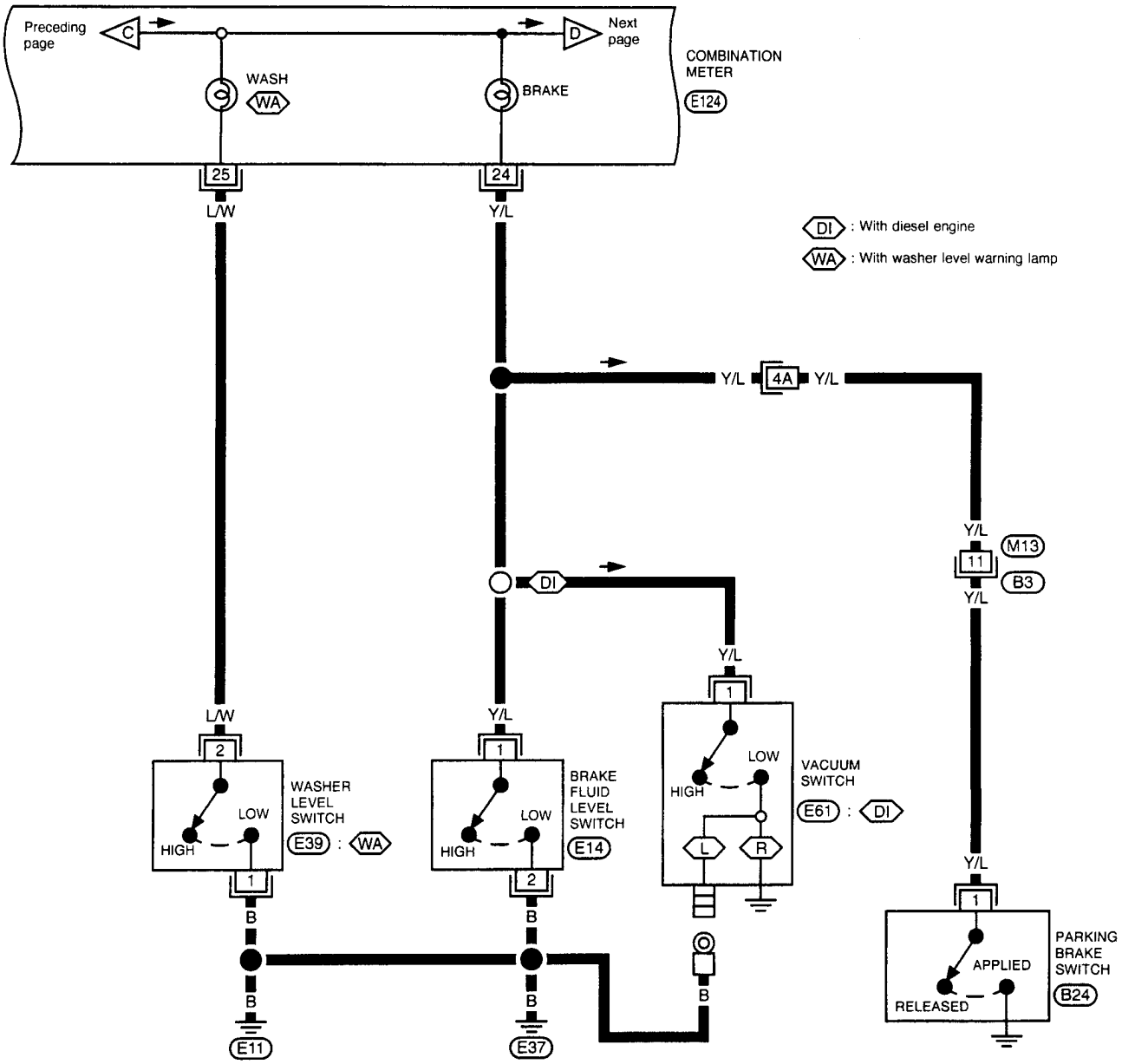
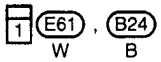
B11

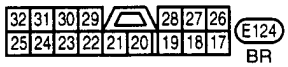
YEL598A

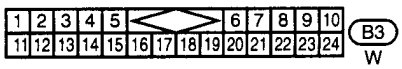
Warning Lamps/Wiring Diagram — WARN — (Cont'd)

EL-WARN-04





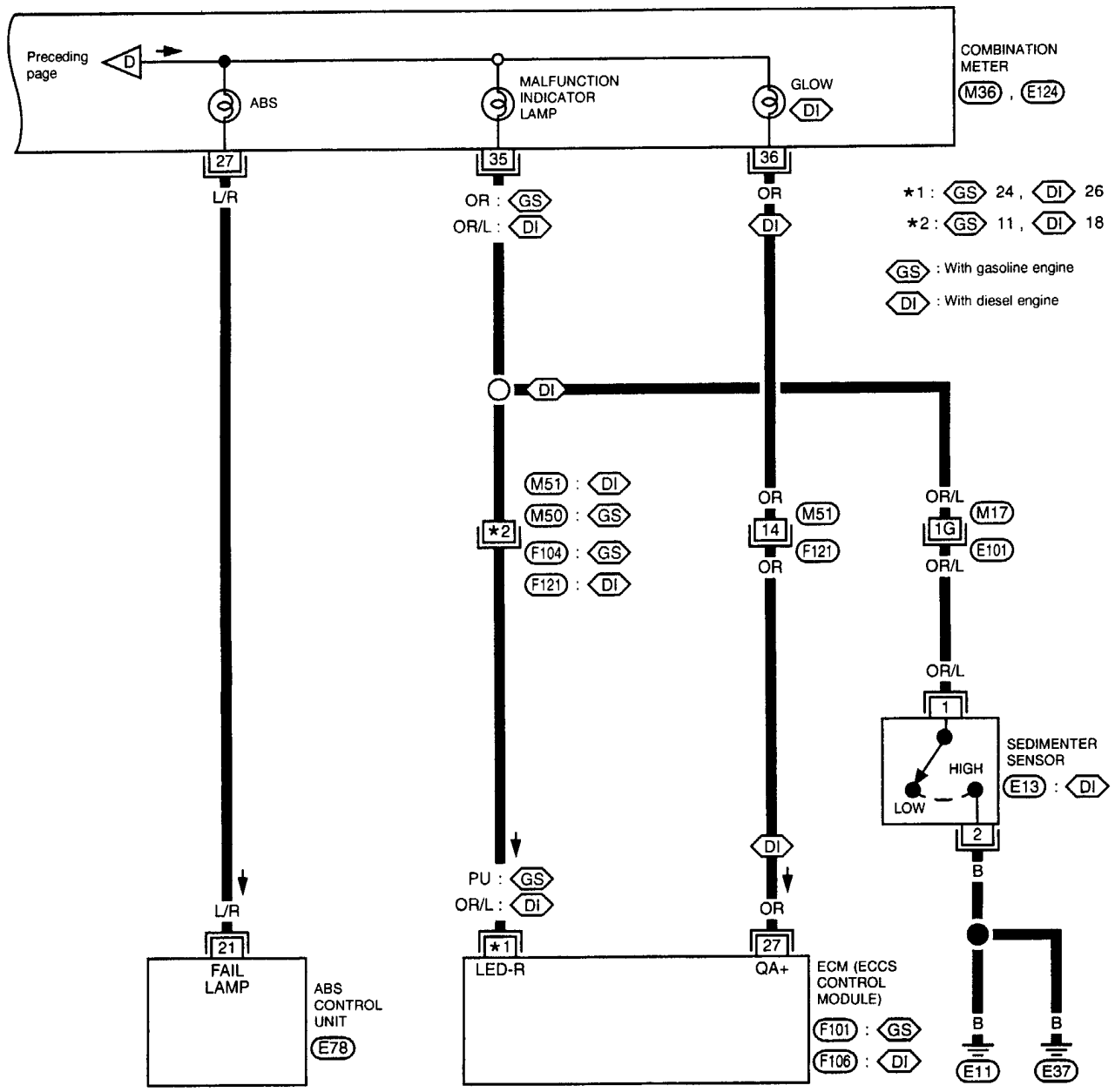


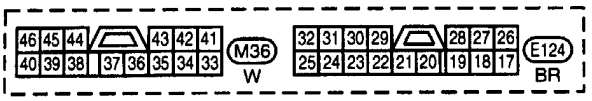


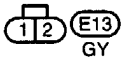
YEL599A

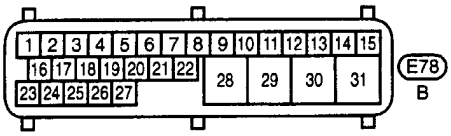
Warning Lamps/Wiring Diagram — WARN — (Cont'd)

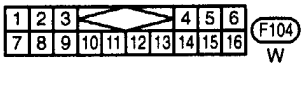
EL-WARN-05

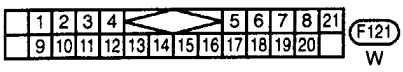












Refer to last page (Foldout page).

M17 , E101

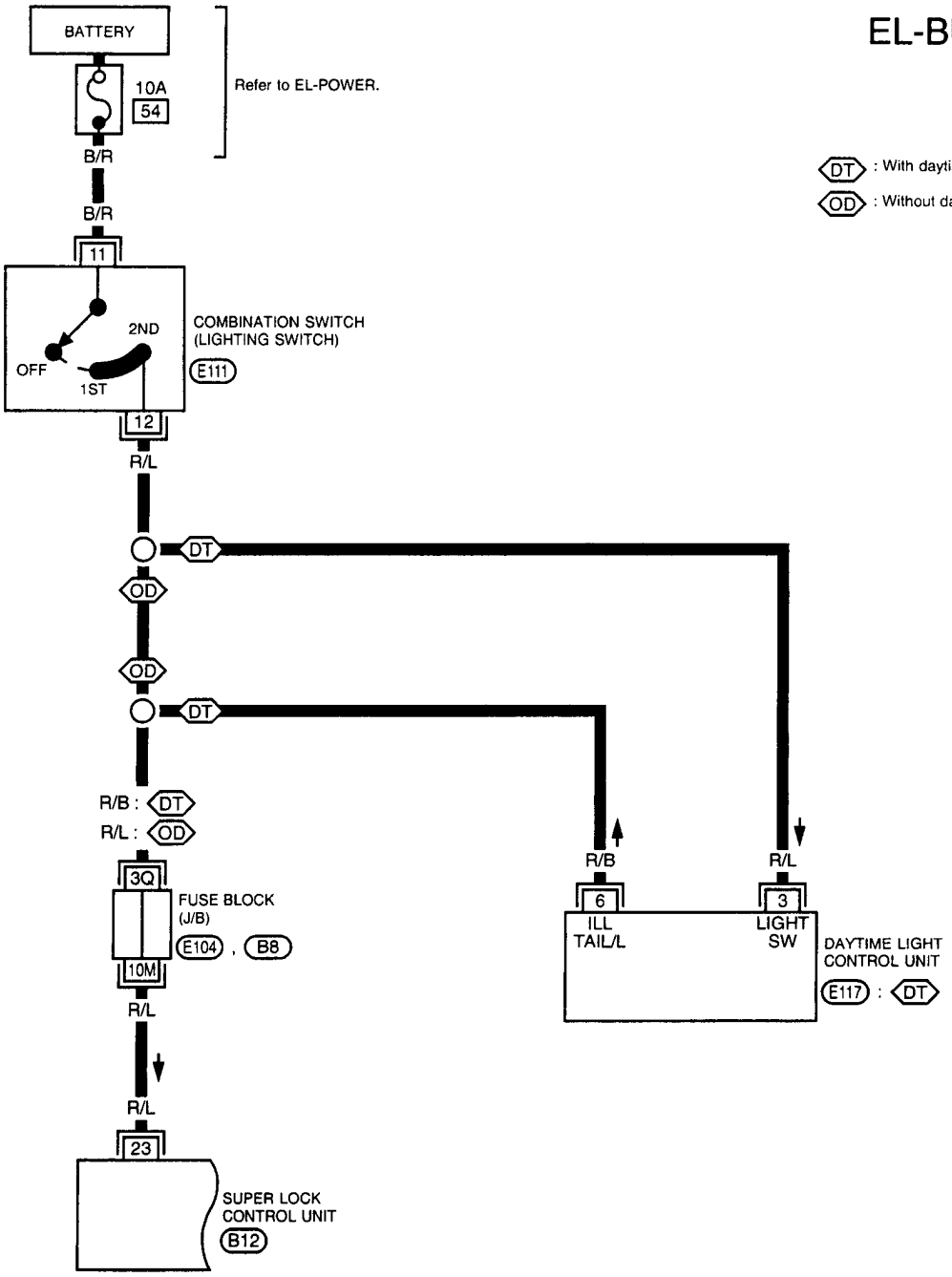
F101

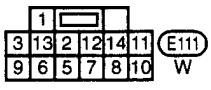
F106

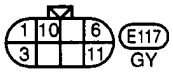
YEL600A

Warning Buzzer/Wiring Diagram — BUZZER —

EL-BUZZER-01







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E104

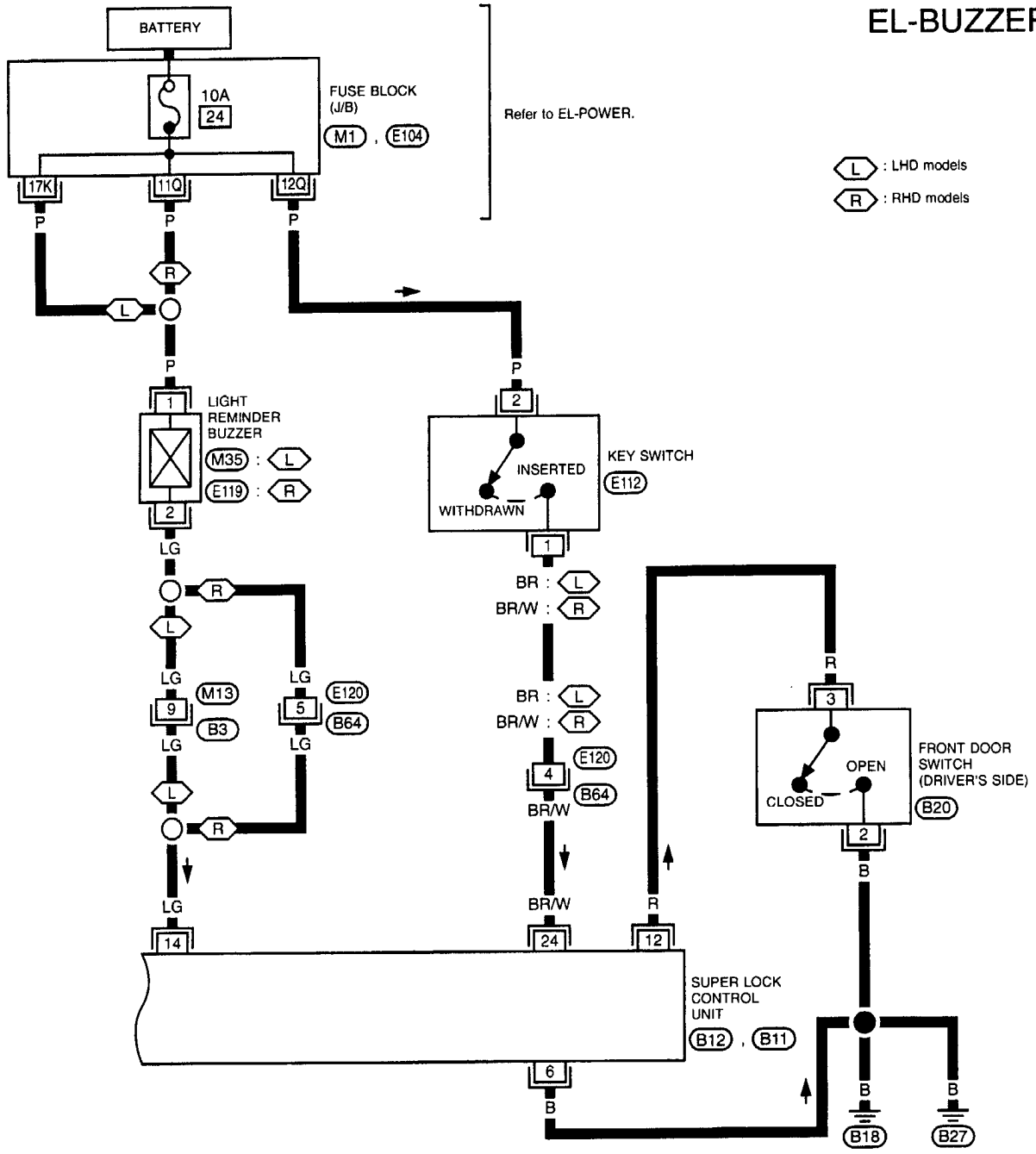
B8

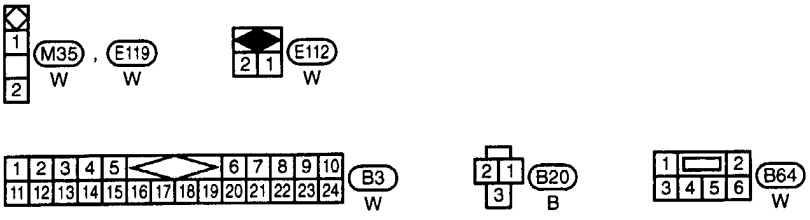
B12

YEL730

Warning Buzzer/Wiring Diagram — BUZZER — (Cont'd)

EL-BUZZER-02





Refer to last page (Foldout page).

M1
E104
B12
B11

YEL601A

Rear Wiper and Washer/System Description

WIPER OPERATION

The rear wiper switch and rear intermittent wiper control is built into the combination switch.
There are two rear wiper switch positions:

- ON (LO speed)
- INT (Intermittent).

With the ignition switch in the ACC or ON position, power is supplied

- through 10A fuse (No. 9, located in the fuse block)
- to rear wiper motor terminal ④
- to rear wiper relay terminals ① and ⑤
- and to rear wiper amplifier terminal ④.

Low speed wiper operation

Ground is supplied to rear wiper switch (combination switch) terminal ④ through body grounds E37 and E11.
When the rear wiper switch is set to the ON position, ground is supplied

- through rear wiper switch terminal ②
- to rear wiper relay terminal ②.

The rear wiper relay is energized and power is supplied

- through 10A fuse (No. 9, located in the fuse block)
- to rear wiper relay terminal ⑤
- through rear wiper relay terminal ③
- to rear wiper motor terminal ②.

Ground is supplied

- to rear wiper motor terminal ①
- through body grounds D110 and B48

Auto stop operation

When the rear wiper switch is turned OFF, the rear wiper motor will continue to operate until the wiper arm reaches rear window base.
When the wiper arm is not located at the base of rear window with the rear wiper switch OFF, the rear wiper relay is not energized.
Power is supplied

- through 15A fuse (No. 9, located in the fuse block)
- to rear wiper motor terminal ④.

Ground is also supplied

- to rear wiper motor terminal ③
- through body grounds D110 and B48.

When wiper arm reaches base of rear window, rear wiper motor will then stop wiper arm at the PARK position.

Intermittent operation

The rear wiper motor operates the wiper arm one time at low speed at an interval of approximately 7 seconds. This feature is controlled by the rear wiper amplifier.
With the ignition switch in the ACC or ON position, power is supplied

- through 15A fuse (No. 9, located in the fuse block)
- to rear wiper relay terminal ①.

When the rear wiper switch is placed in the INT position, ground is supplied

- to combination switch terminal ②.

Ground is also supplied

- to rear wiper relay terminal ②
- through combination switch terminal ②
- via combination switch terminal ④
- through body grounds E11 and E37.

Rear Wiper and Washer/System Description (Cont'd)

When the rear wiper relay is energized, power is supplied
- through 15A fuse (No. 9, located in the fuse block)
- to rear wiper relay terminal ⑤
- through rear wiper relay terminal ③
- to rear wiper motor terminal ②.

Ground is also supplied
- to rear wiper motor terminal ③
- through body grounds D110 and B48.

With power and ground supplied, the rear wiper motor operates intermittently.

WASHER OPERATION

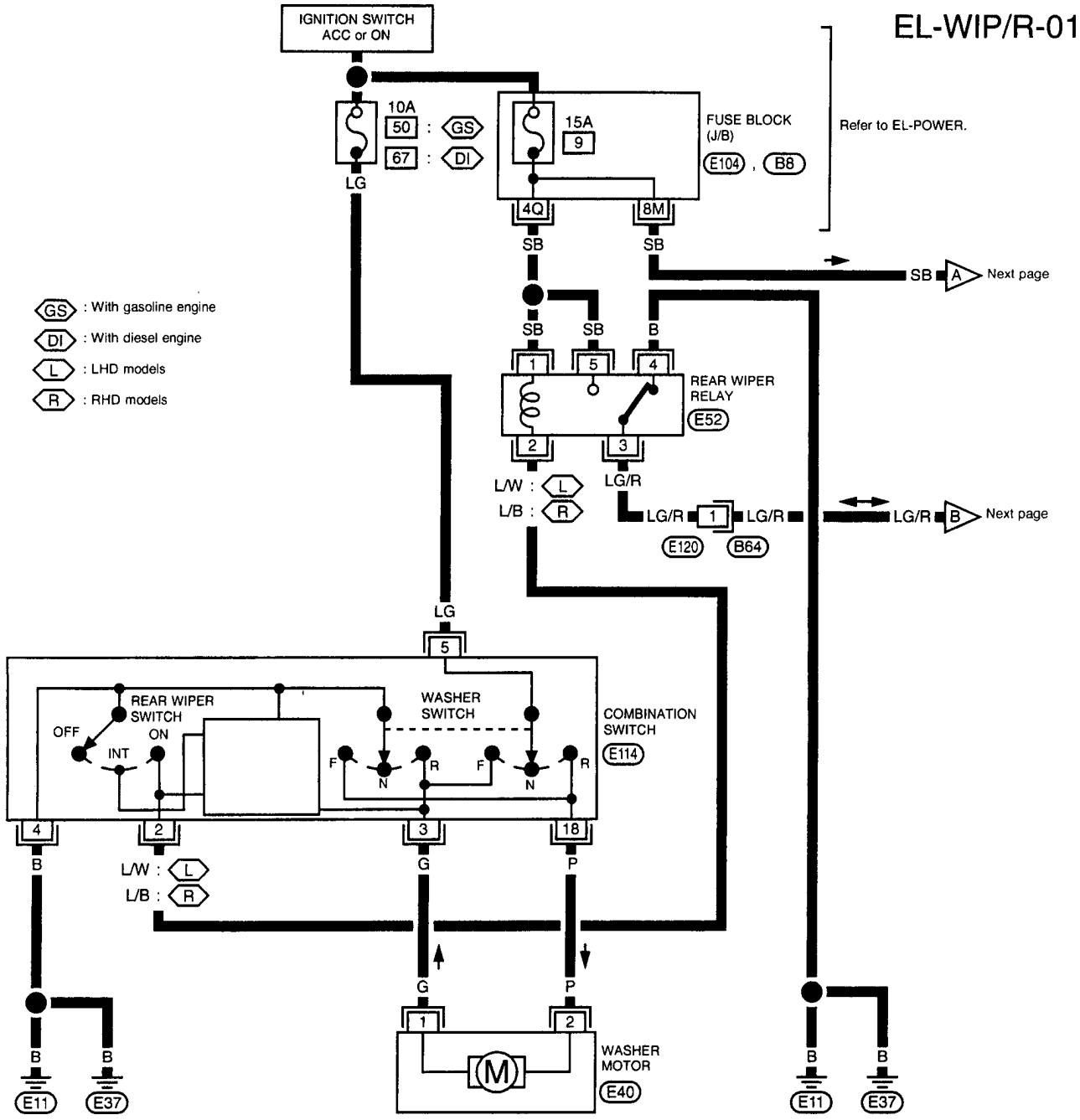
With the ignition switch in the ACC or ON position, power is supplied
- through 10A fuse (No. 50 — Gasoline, No. 67 — Diesel, located in the fuse block)
- to rear washer switch (combination switch) connector terminal ⑤.

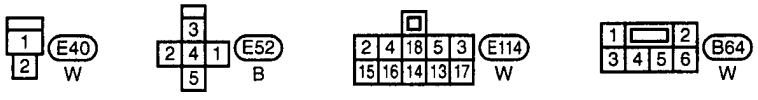
When the rear washer switch is turned to the WASH/R position, ground is supplied
- to rear washer motor terminal ①, and
- from terminal ③ of rear wiper switch
- through terminal ④ of rear wiper switch, and
- through body grounds E37 and E11.

Power is supplied
- from terminal ⑱ of the washer switch
- to washer motor terminal ②.

When power and ground is supplied, the rear washer motor operates.
The rear wiper motor operates when the control switch is turned to WASH position for one second or more and for approximately 3 seconds after the switch is released. The timing of this function is controlled by the rear wiper amplifier.

Rear Wiper and Washer/Wiring Diagram — WIP/R —





Refer to last page (Foldout page).

E104

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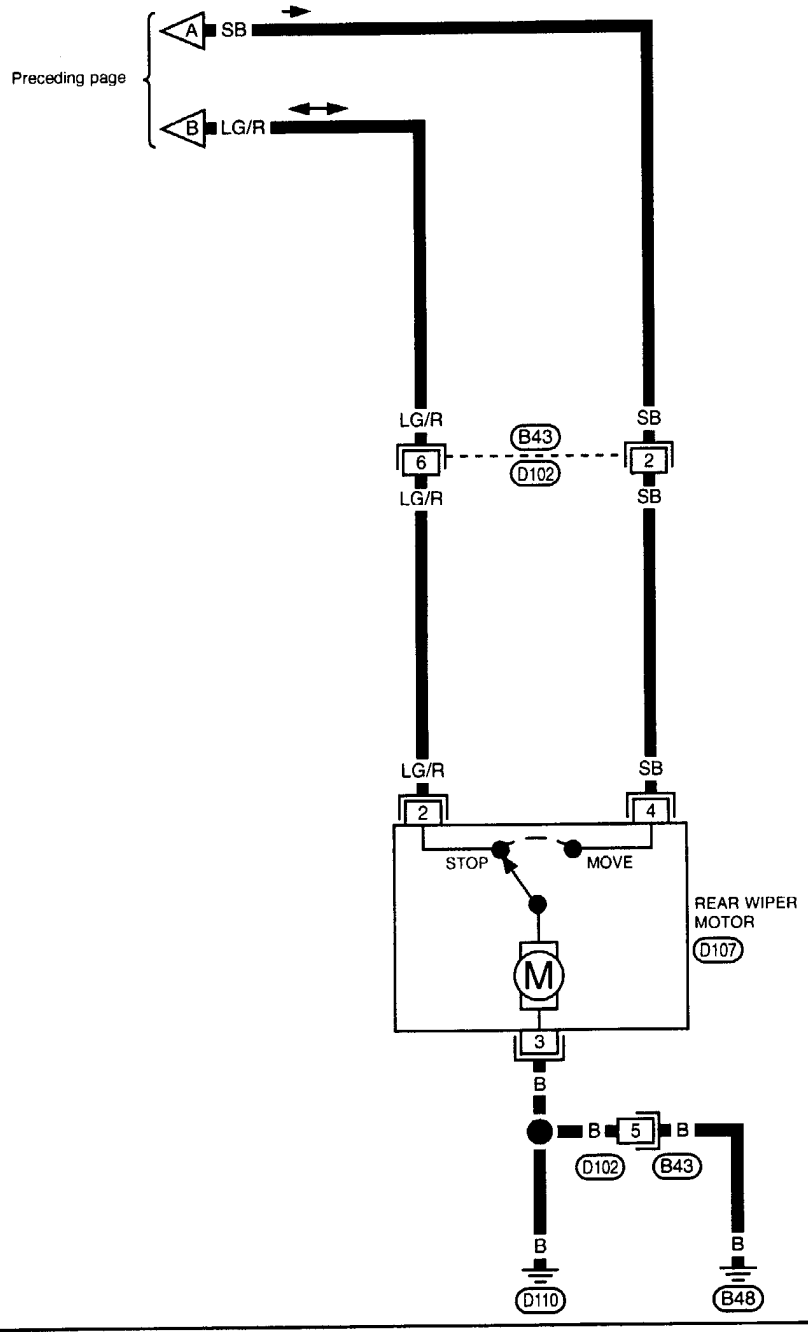
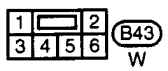
YEL602A

Rear Wiper and Washer/Wiring Diagram — WIP/R — (Cont'd)

EL-WIP/R-02

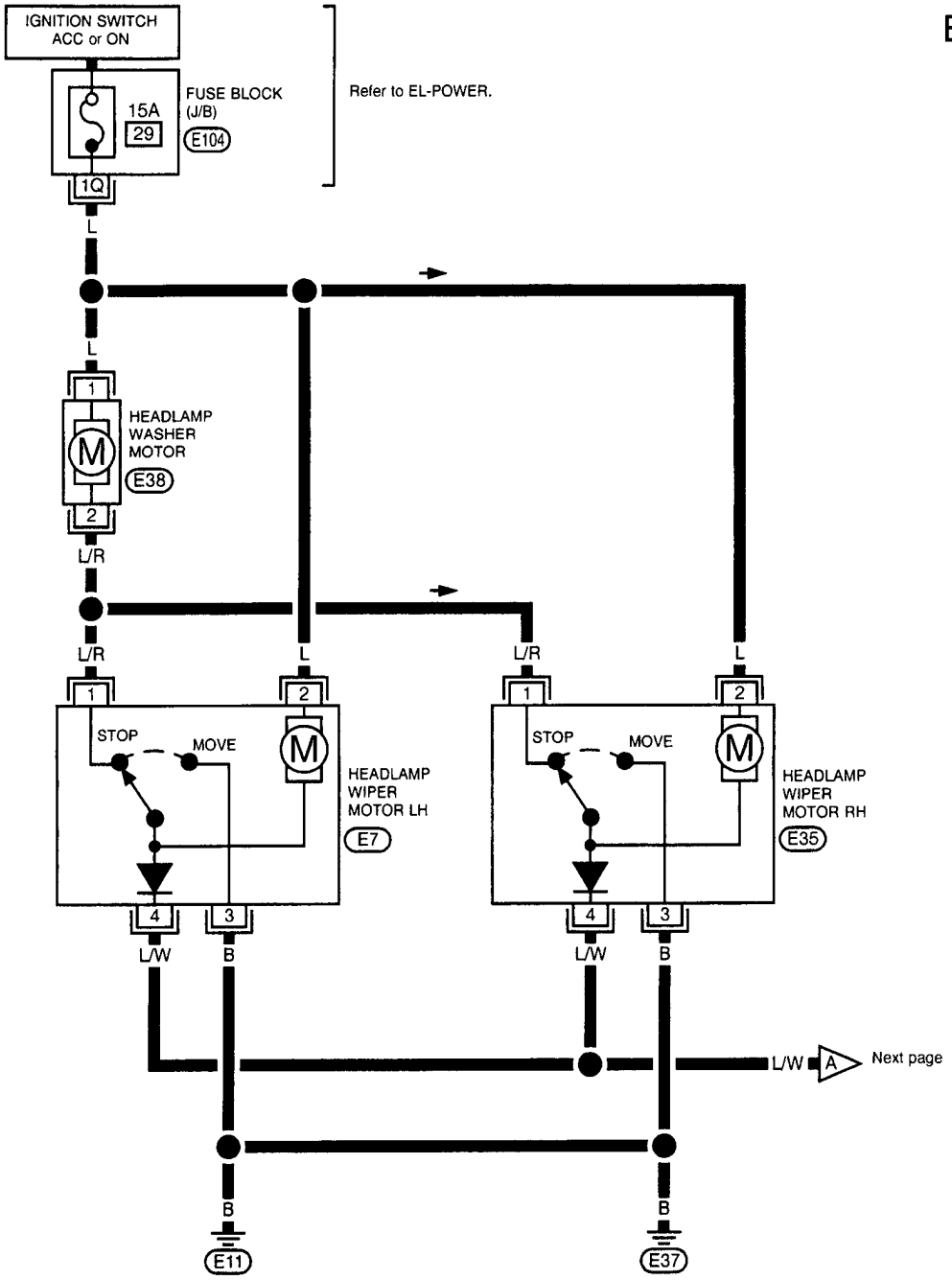


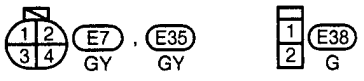


YEL603A

Headlamp Wiper and Washer/Wiring Diagram — HLC —

EL-HLC-01





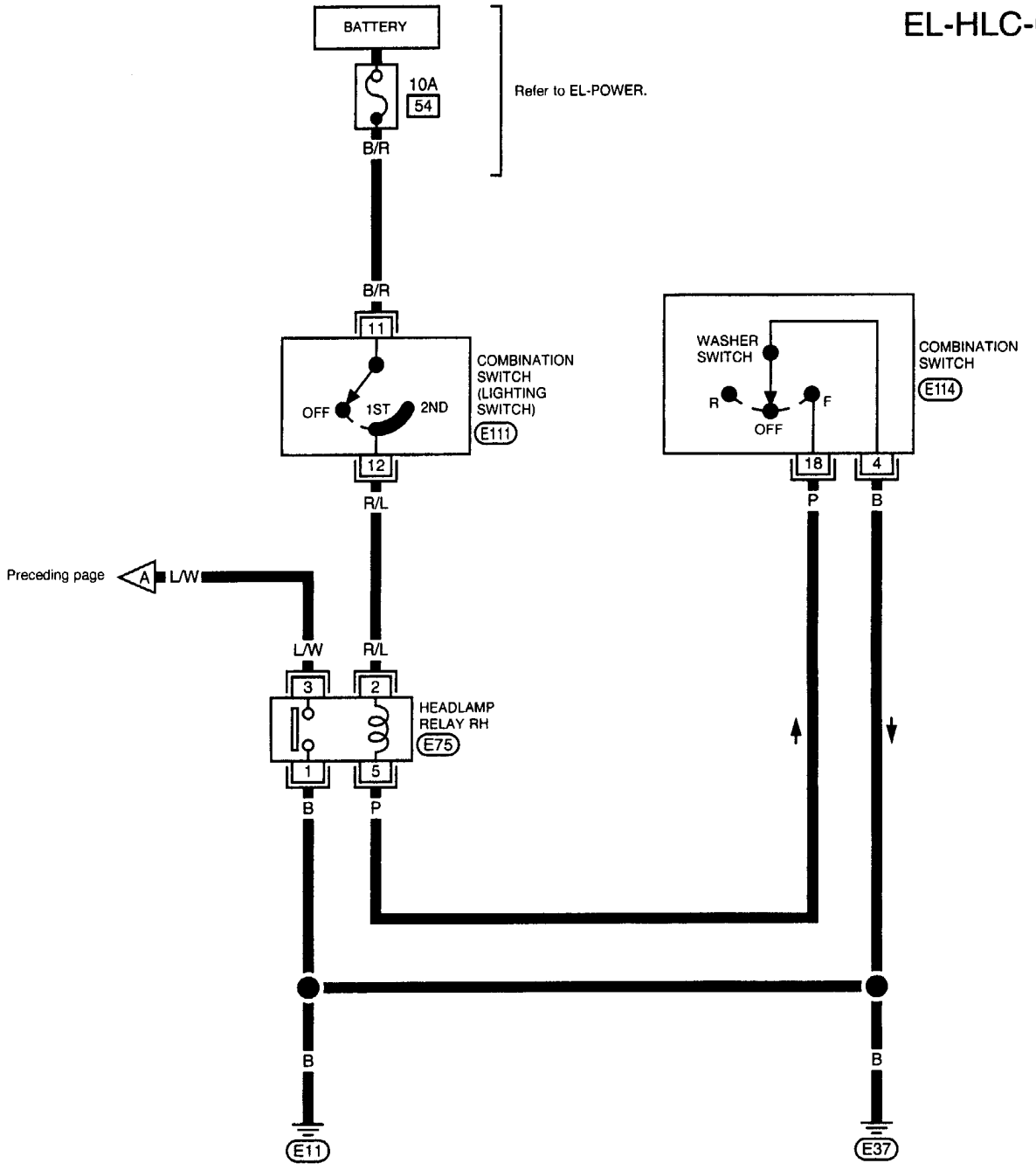
Refer to last page (Foldout page).

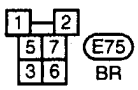
E104

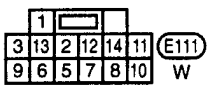
YEL418A

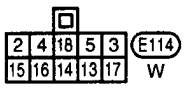
Headlamp Wiper and Washer/Wiring Diagram — HLC — (Cont'd)

EL-HLC-02





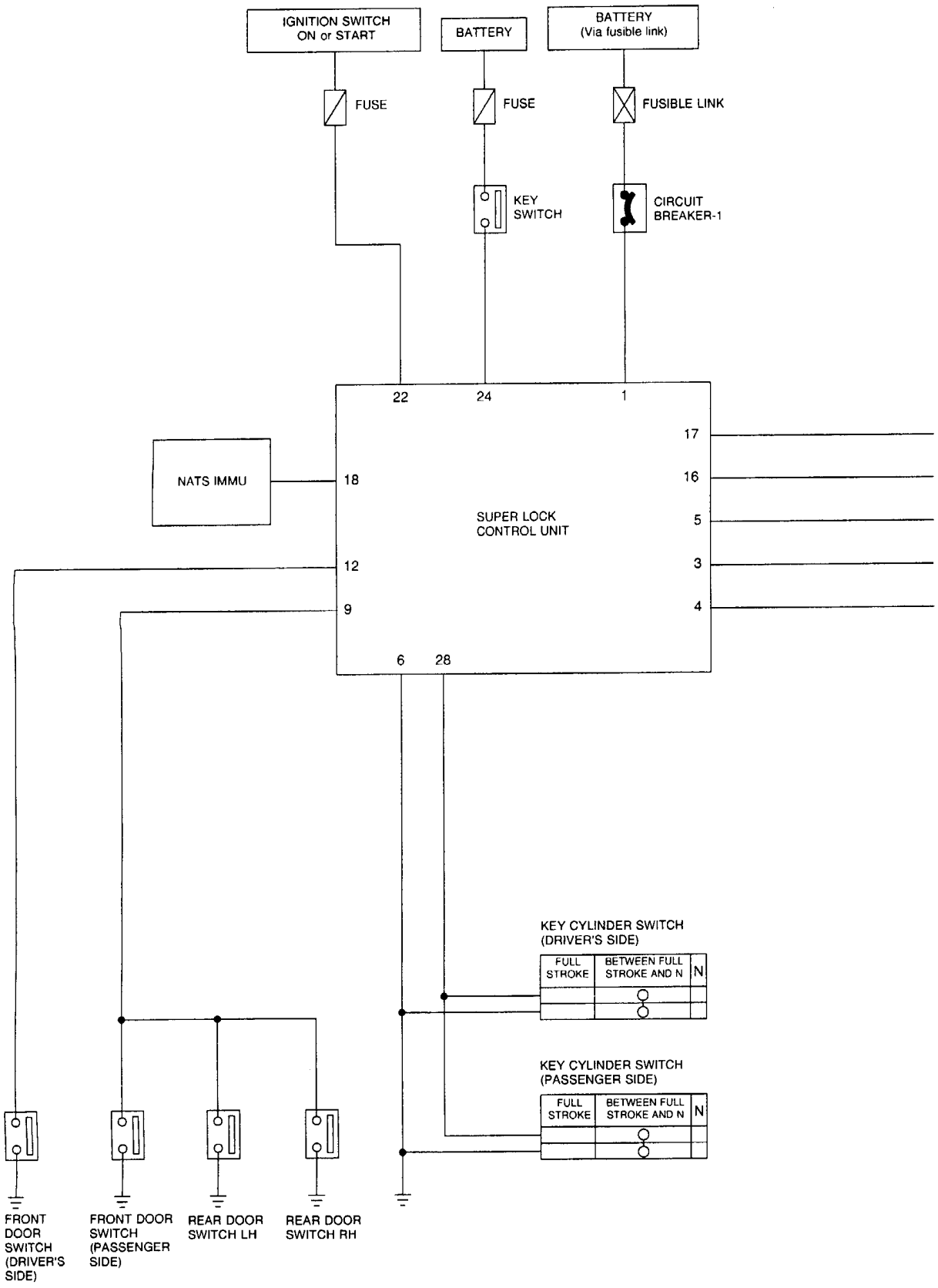




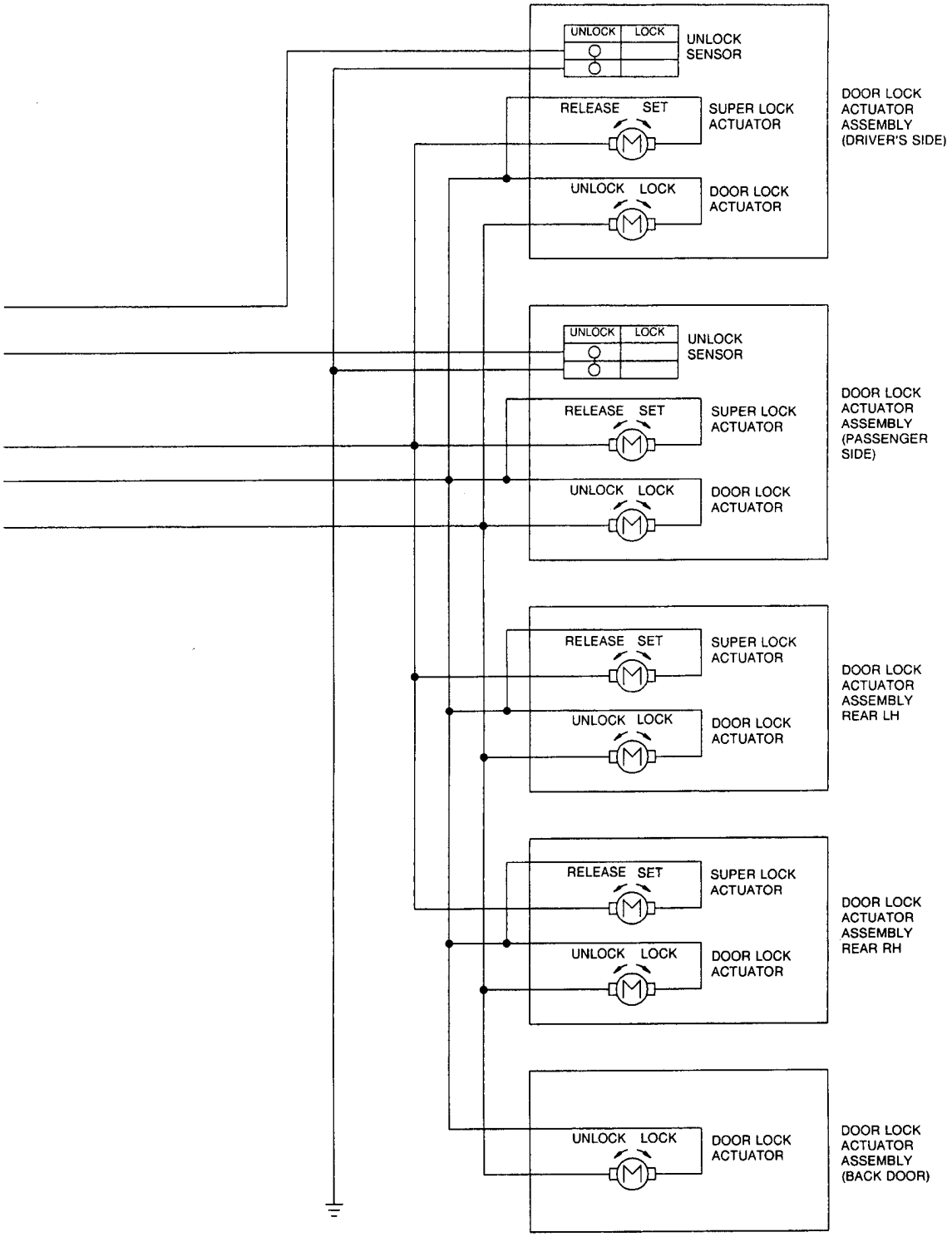
YEL604A

Note

Schematic

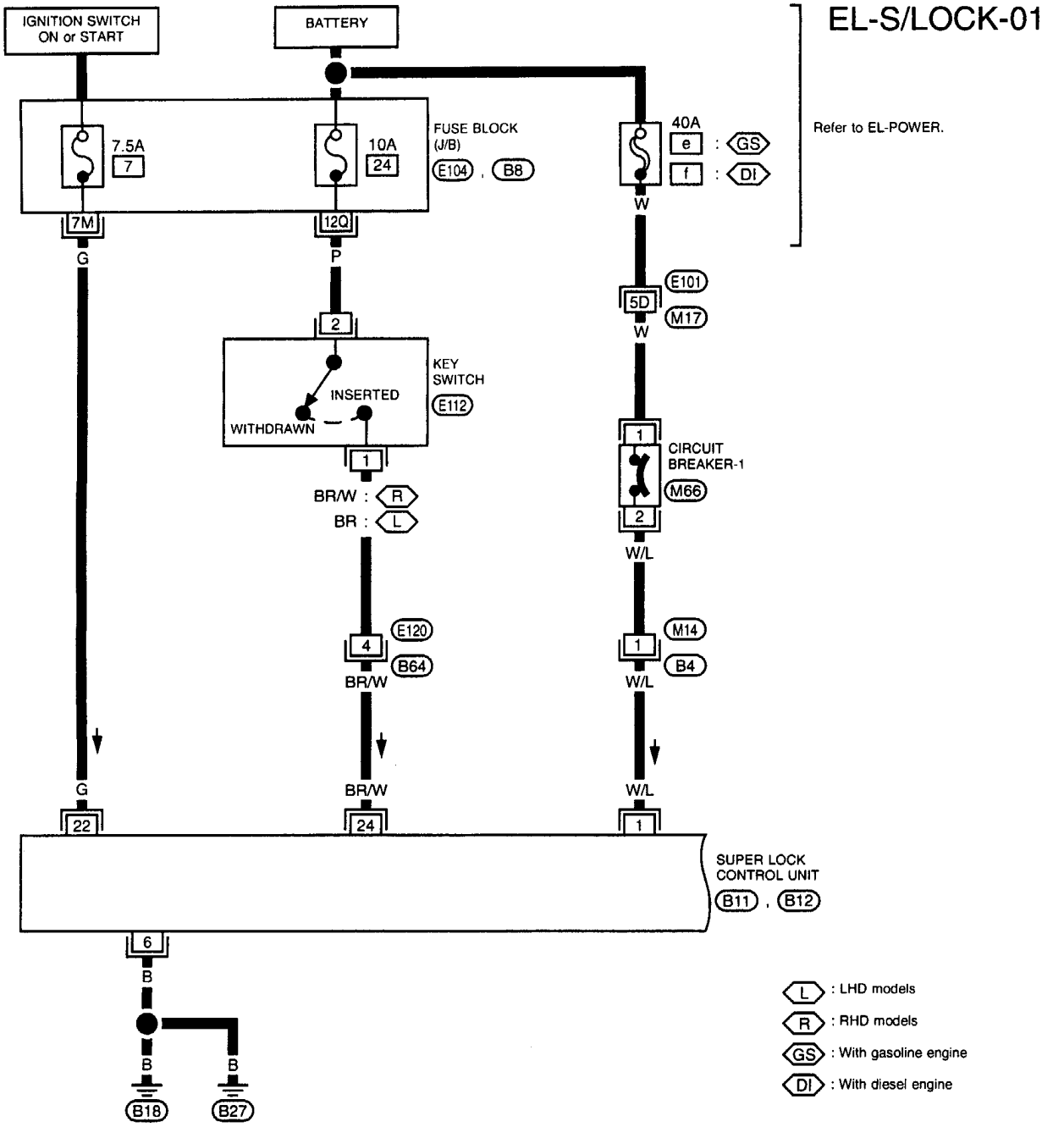

IGNITION SWITCH ON or START
BATTERY
BATTERY (Via fusible link)
FUSE
FUSE
FUSIBLE LINK
KEY SWITCH
CIRCUIT BREAKER-1
22
24
1
NATS IMMU
18
SUPER LOCK CONTROL UNIT
17
16
5
3
4
12
9
6
28
KEY CYLINDER SWITCH (DRIVER'S SIDE)
FULL STROKE
BETWEEN FULL STROKE AND N
N
KEY CYLINDER SWITCH (PASSENGER SIDE)
FULL STROKE
BETWEEN FULL STROKE AND N
N
FRONT DOOR SWITCH (DRIVER'S SIDE)
FRONT DOOR SWITCH (PASSENGER SIDE)
REAR DOOR SWITCH LH
REAR DOOR SWITCH RH

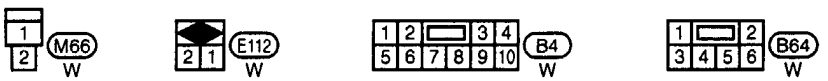
Schematic (Cont'd)



YEL607A

Wiring Diagram — S/LOCK —





Refer to last page (Foldout page).

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B11

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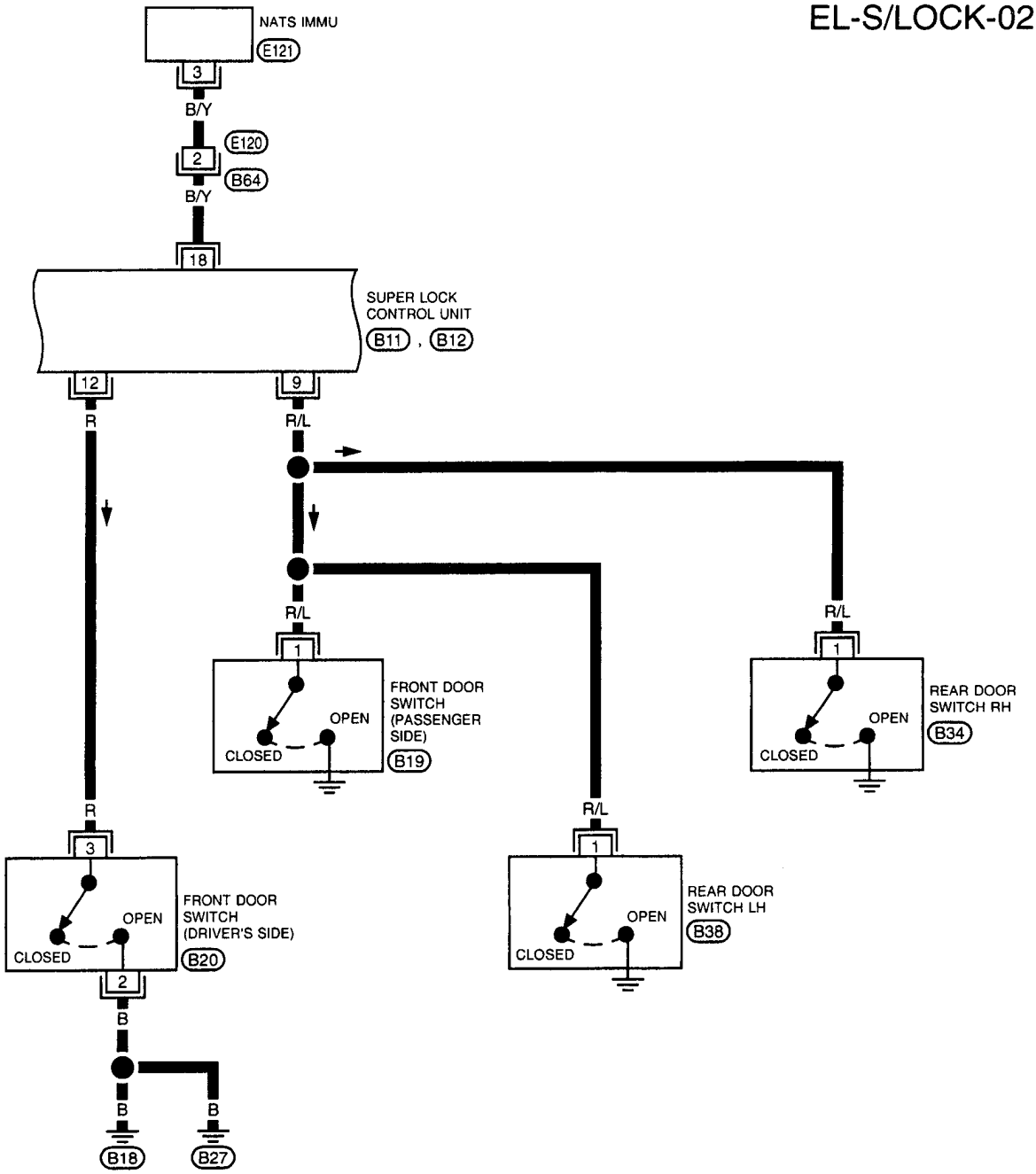
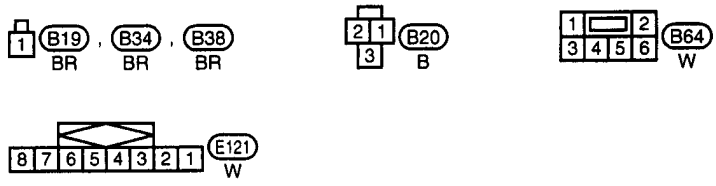
YEL425A

Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-02





Refer to last page (Foldout page).

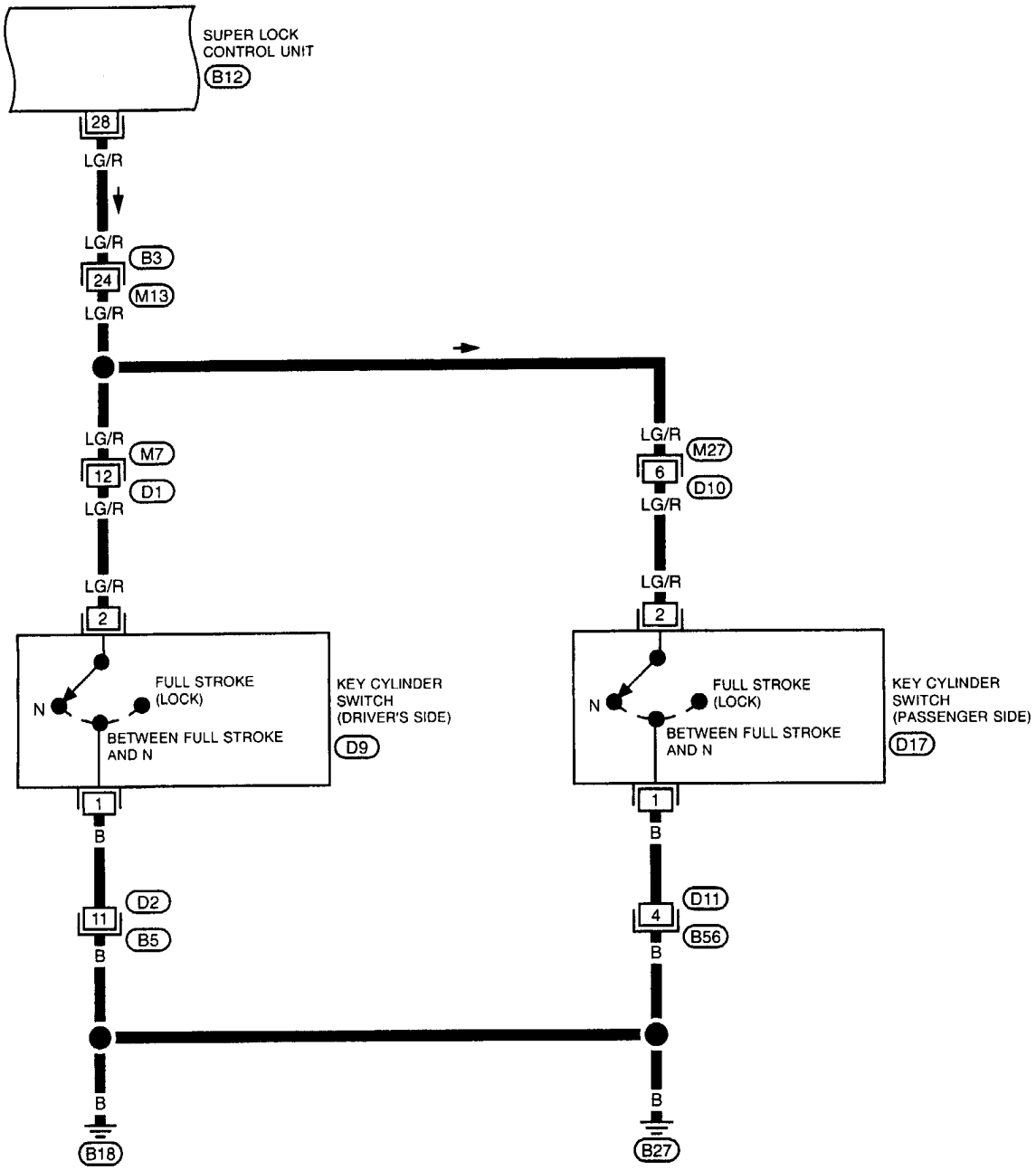
B11

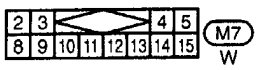
B12

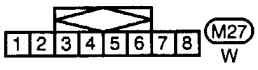
YEL608A

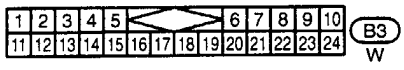
Wiring Diagram — S/LOCK — (Cont'd)

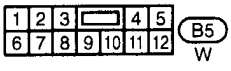
EL-S/LOCK-03

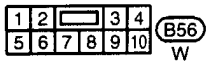


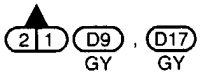












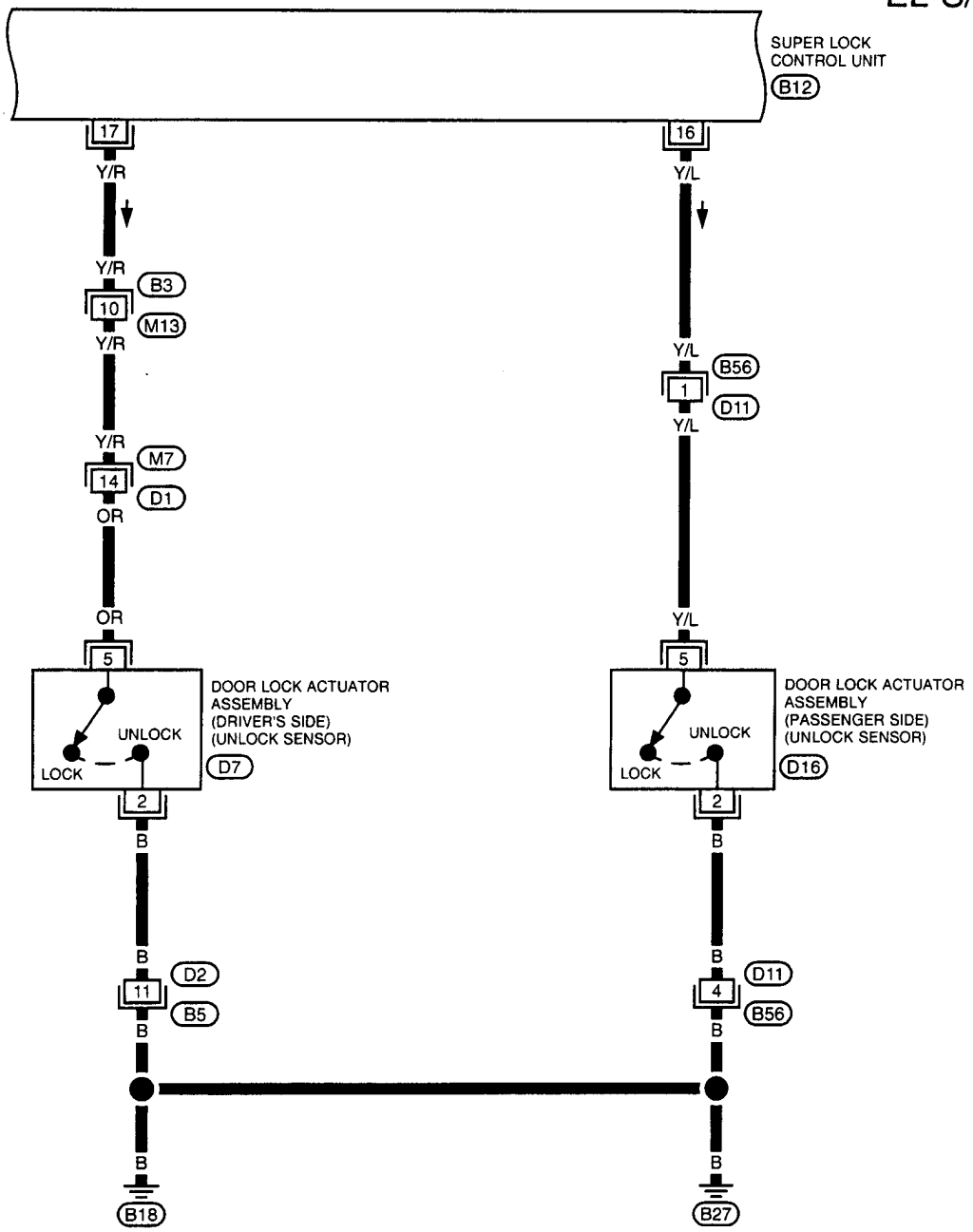
Refer to last page (Foldout page).

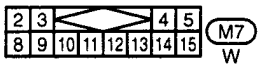
B12

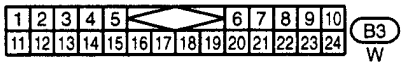
YEL427A

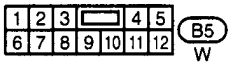
Wiring Diagram — S/LOCK — (Cont'd)

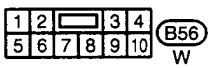
EL-S/LOCK-04

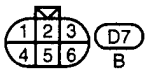


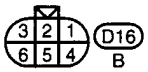












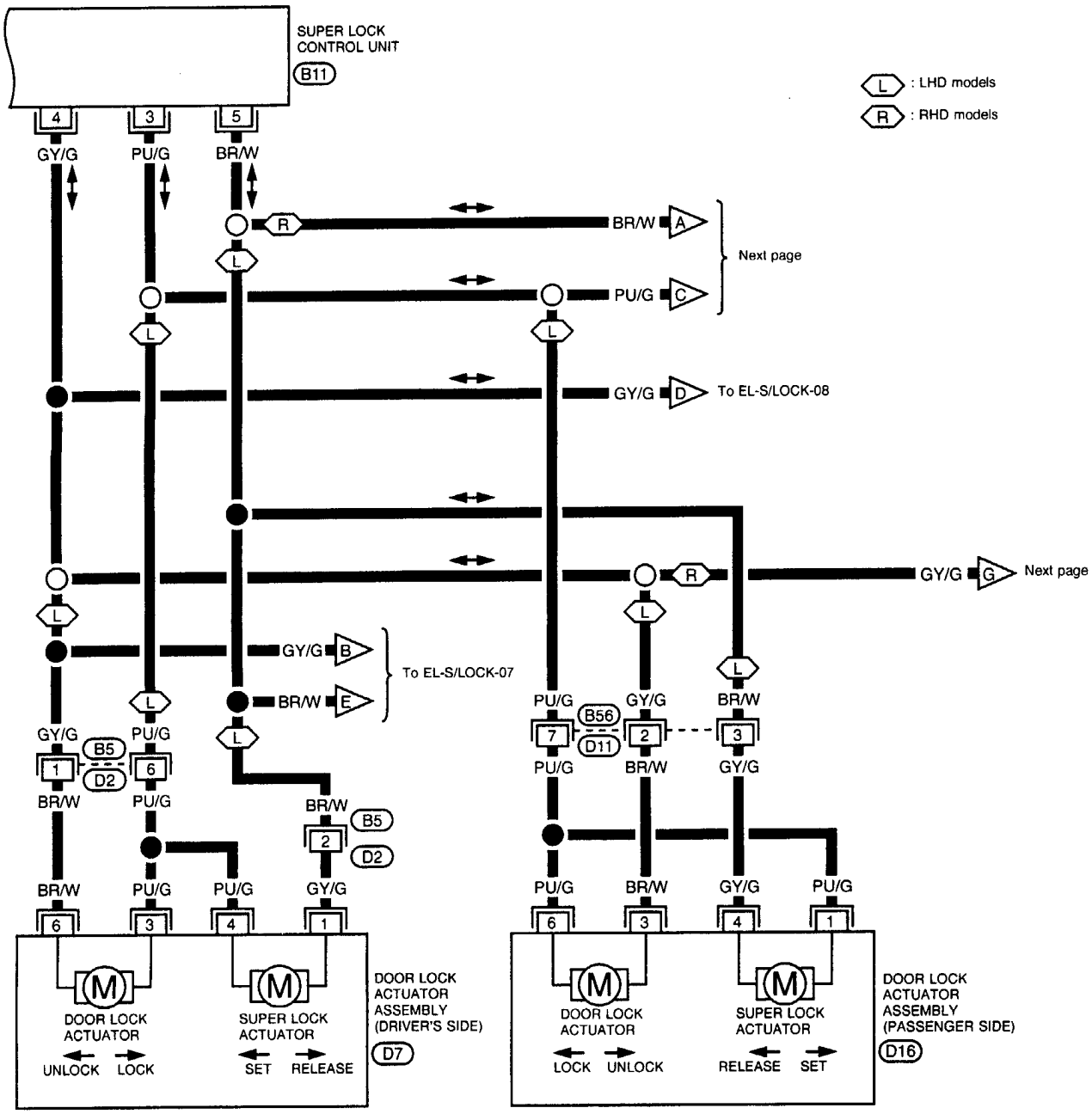
Refer to last page (Foldout page).

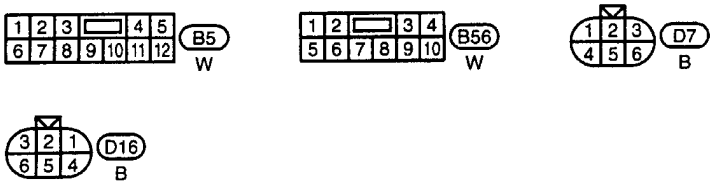
B12

YEL609A

Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-05





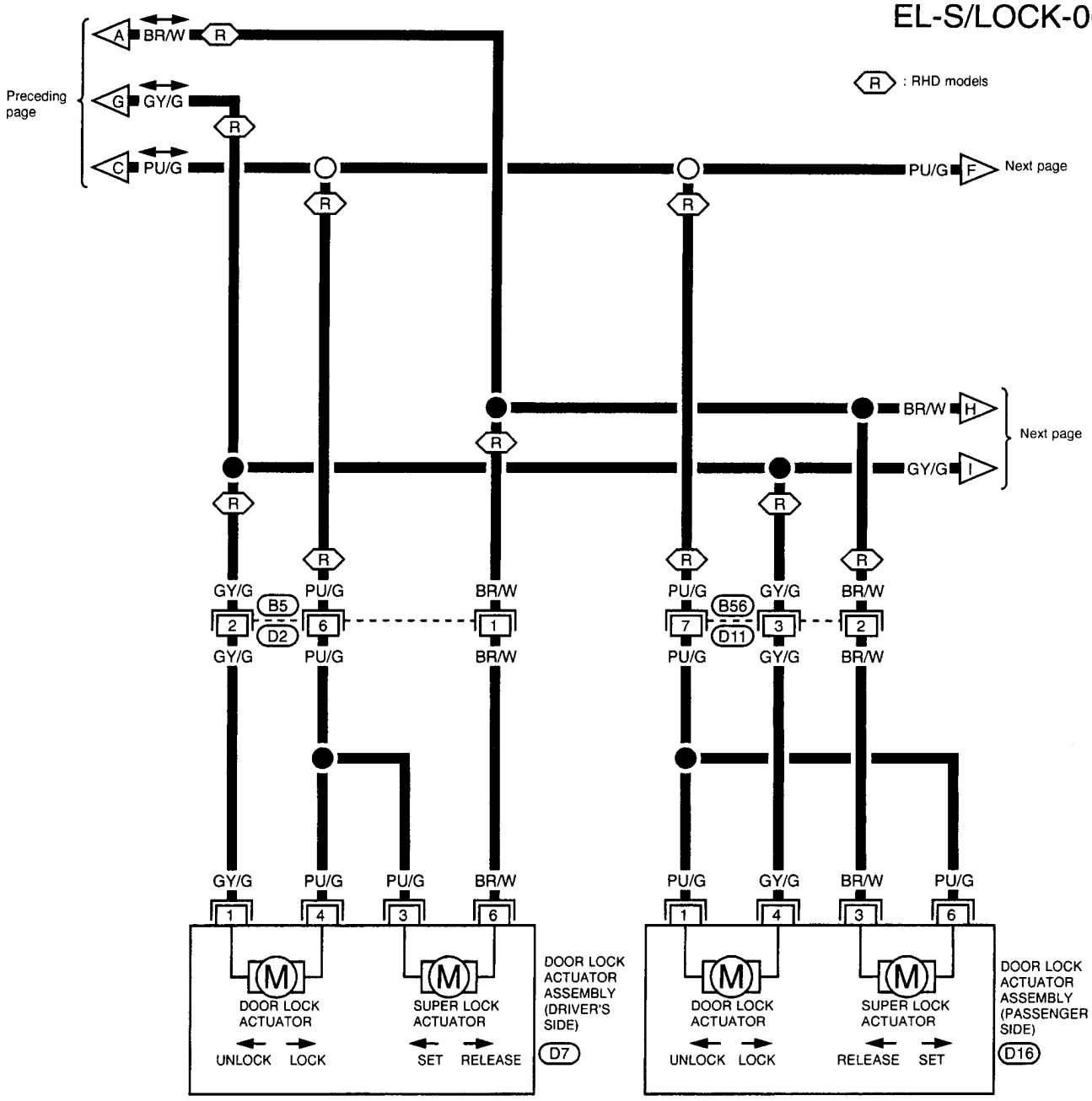
Refer to last page (Foldout page).

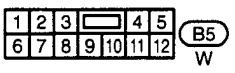
B11

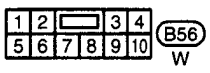
YEL610A

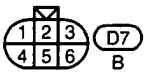
Wiring Diagram — S/LOCK — (Cont'd)

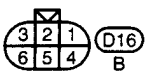
EL-S/LOCK-06











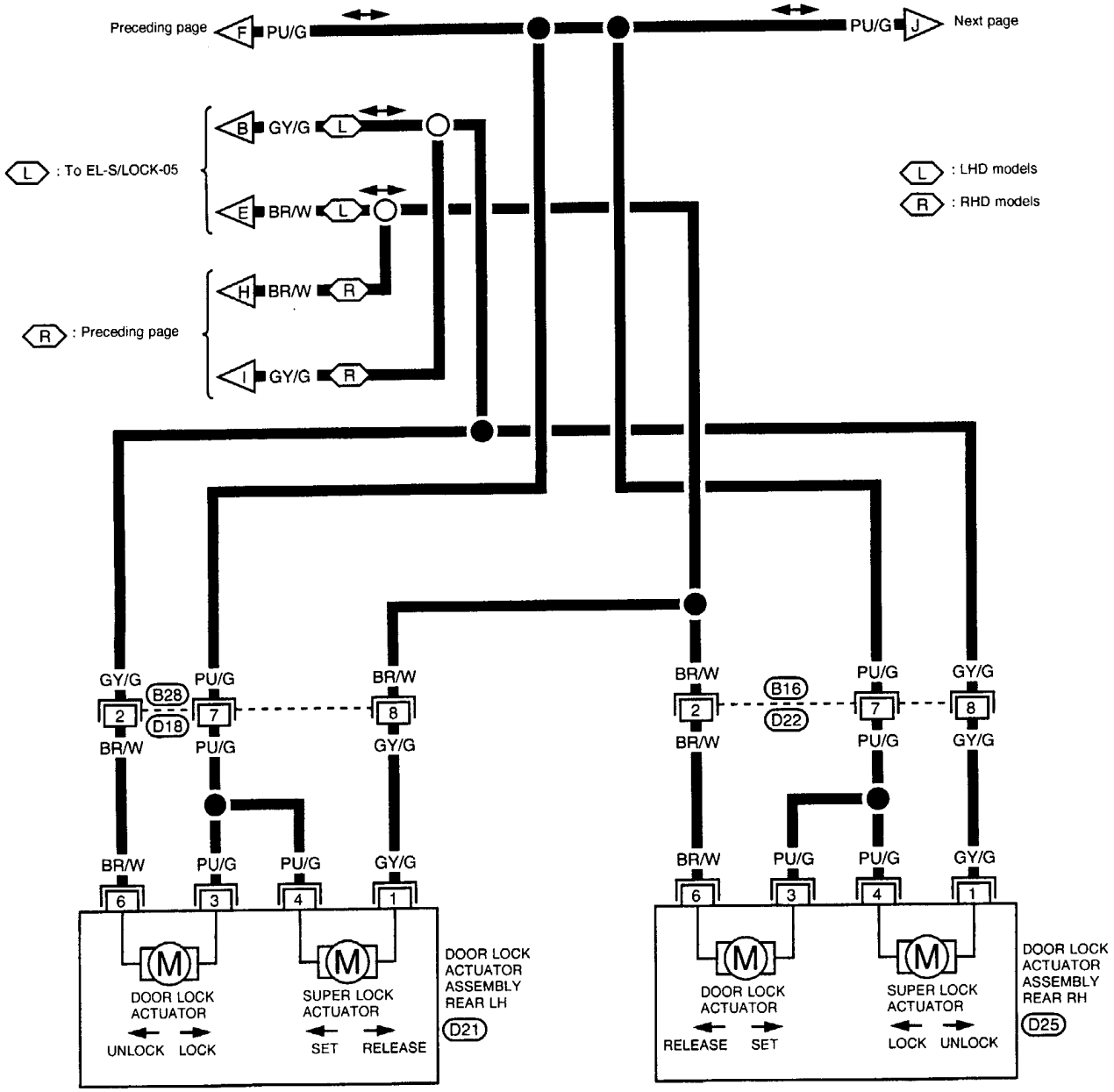
Refer to last page (Foldout page).

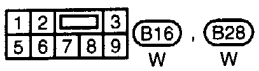
B11

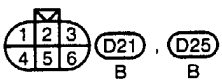
YEL611A

Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-07

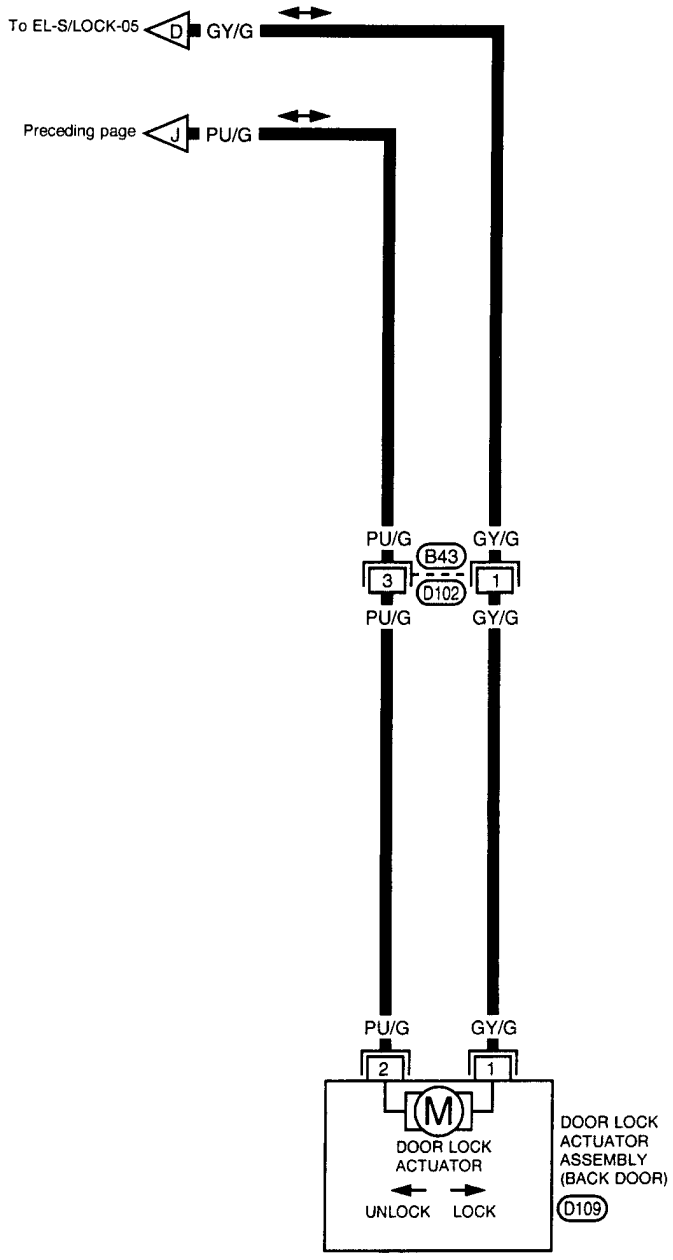


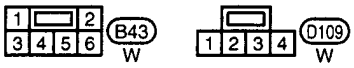




YEL431A

Wiring Diagram — S/LOCK — (Cont'd)



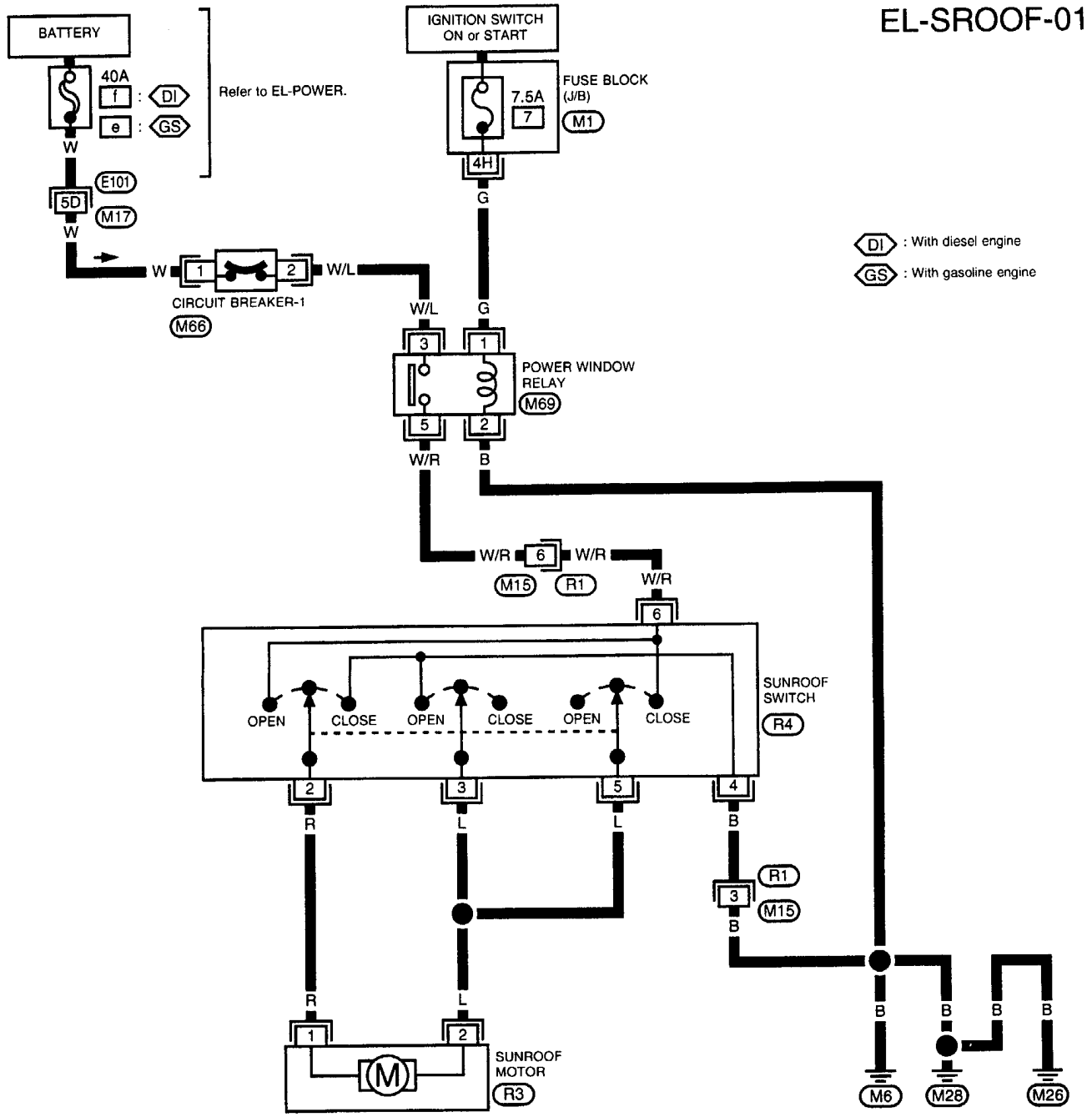


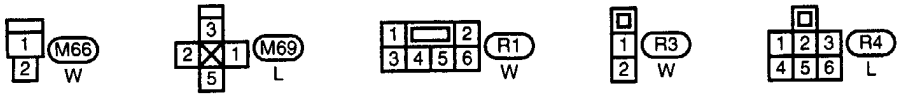
YEL612A

Wiring Diagram — SROOF —

★ For removal and adjustment of sunroof, refer to "SUNROOF" in BT section.

EL-SROOF-01





Refer to last page (Foldout page).

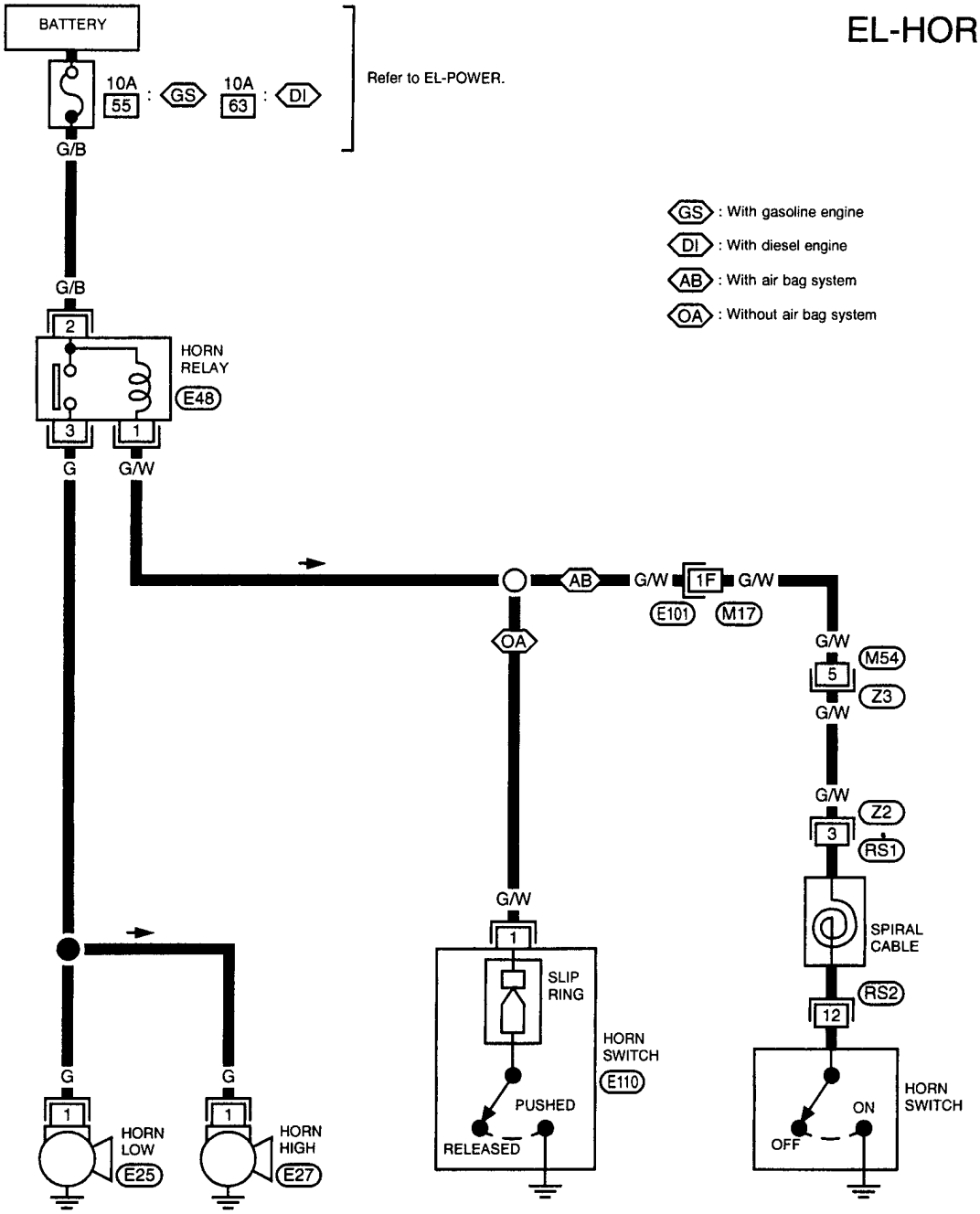
M17 , E101

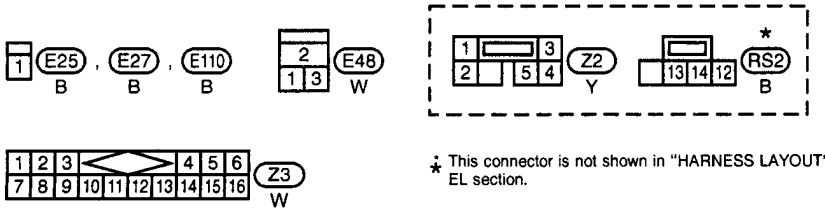
M1

YEL613A

Wiring Diagram — HORN —

EL-HORN-01



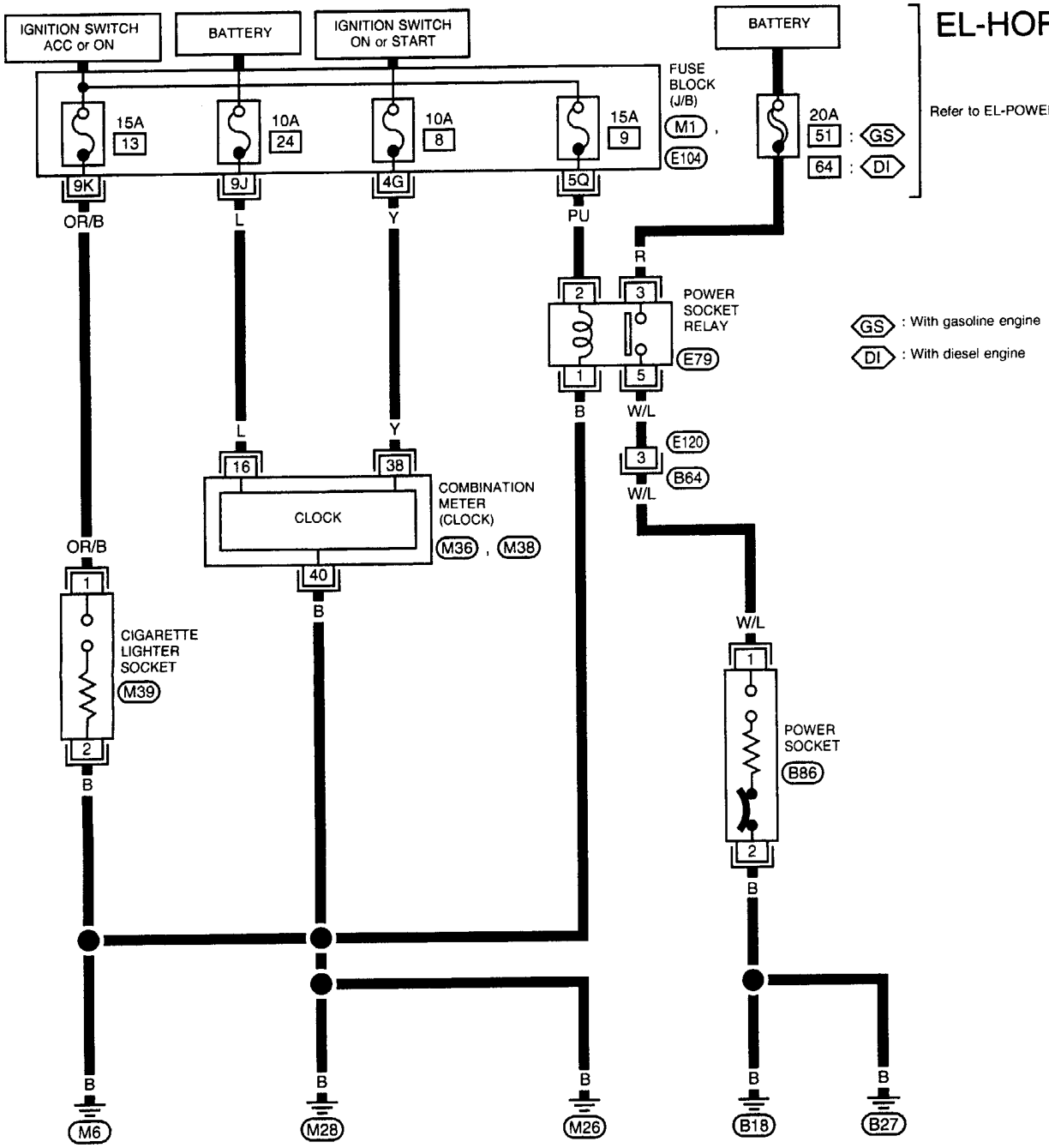


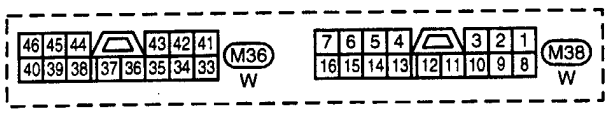
* This connector is not shown in "HARNESS LAYOUT" of EL section.

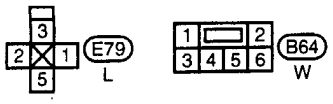
Refer to last page (Foldout page).
E101 , M17

YEL614A

Wiring Diagram — HORN — (Cont'd)







Refer to last page (Foldout page).

M1

E104

YEL615A

System Description

The rear window and door mirror defogger system is controlled by the super lock control unit.
Power is supplied at the ignition switch ON or START
- to rear window defogger relay terminal ③
- through 15A fuse [No. 57 (Gasoline engine models), No. 62 (Diesel engine models), located in the fuse block].

With the ignition switch in the Acc or ON position, power is supplied
- to door mirror heater relay terminal ③
- through 15A fuse (No. 9, located in the fuse block).

With the ignition switch in the ON or START position, power is supplied
- to rear window defogger relay terminal ① and super lock control unit terminal ㉒
- through 7.5A fuse (No. 7, located in the fuse block).

Ground is supplied
- to rear window defogger switch terminal ⑥
- through body grounds M26, M6 and M28.

Operation

The ignition switch must be in the ON or START position for defogger operation.
With the rear window defogger switch in the ON position and for approximately 12 - 16 minutes after the rear window defogger switch has turned to OFF from ON, ground is supplied
- through terminal ① of the rear window defogger switch
- to super lock control unit terminal ㉕.

Terminal ⑬ of the super lock control unit then supplies ground to rear window defogger relay terminal ② and door mirror heater relay terminal ②.
With power and ground supplied, rear window defogger relay and door mirror heater relay are energized.
For rear window defogger system, power is supplied
- through terminal ⑤ of the rear window defogger relay
- to condenser terminal ①
- through terminal ② of the condenser
- to the rear window defogger terminal ③.

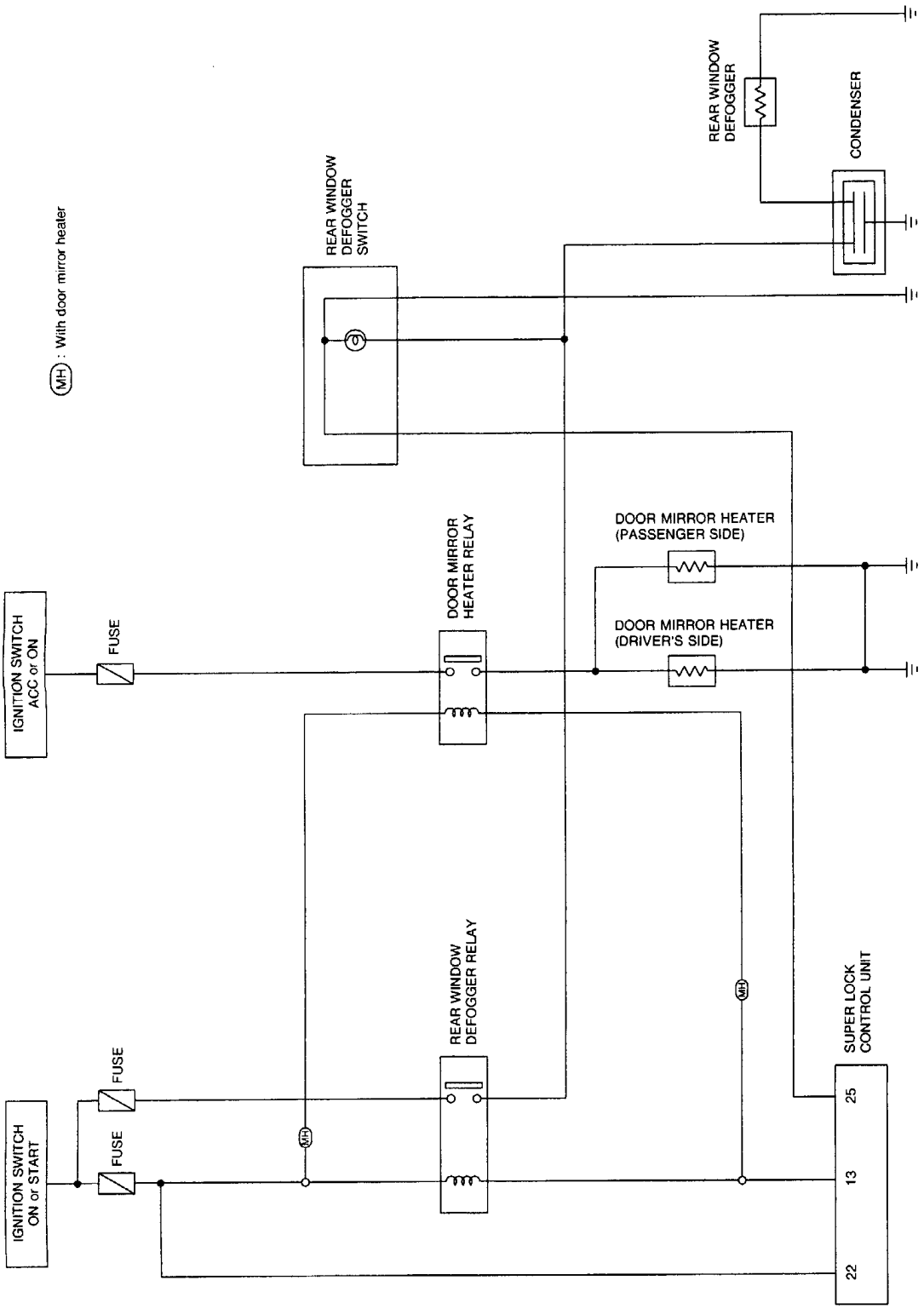
For door mirror defogger system, power is supplied
- through door mirror heater relay terminal ⑤
- to each door mirror heater terminal ④.

Ground is supplied
- to rear window defogger and
- to each door mirror defogger terminal ⑤
- through body grounds B18 and B27.

With power and ground supplied, each defogger filament heats and defogs the rear window and door mirror.
When the system is activated, the rear window defogger indicator illuminates in the rear window defogger switch.
Power is supplied
- to terminal ③ of the rear window defogger switch
- from terminal ⑤ of the rear window defogger relay.

Terminal ⑥ of the rear window defogger switch is grounded through body grounds M6, M26 and M28.

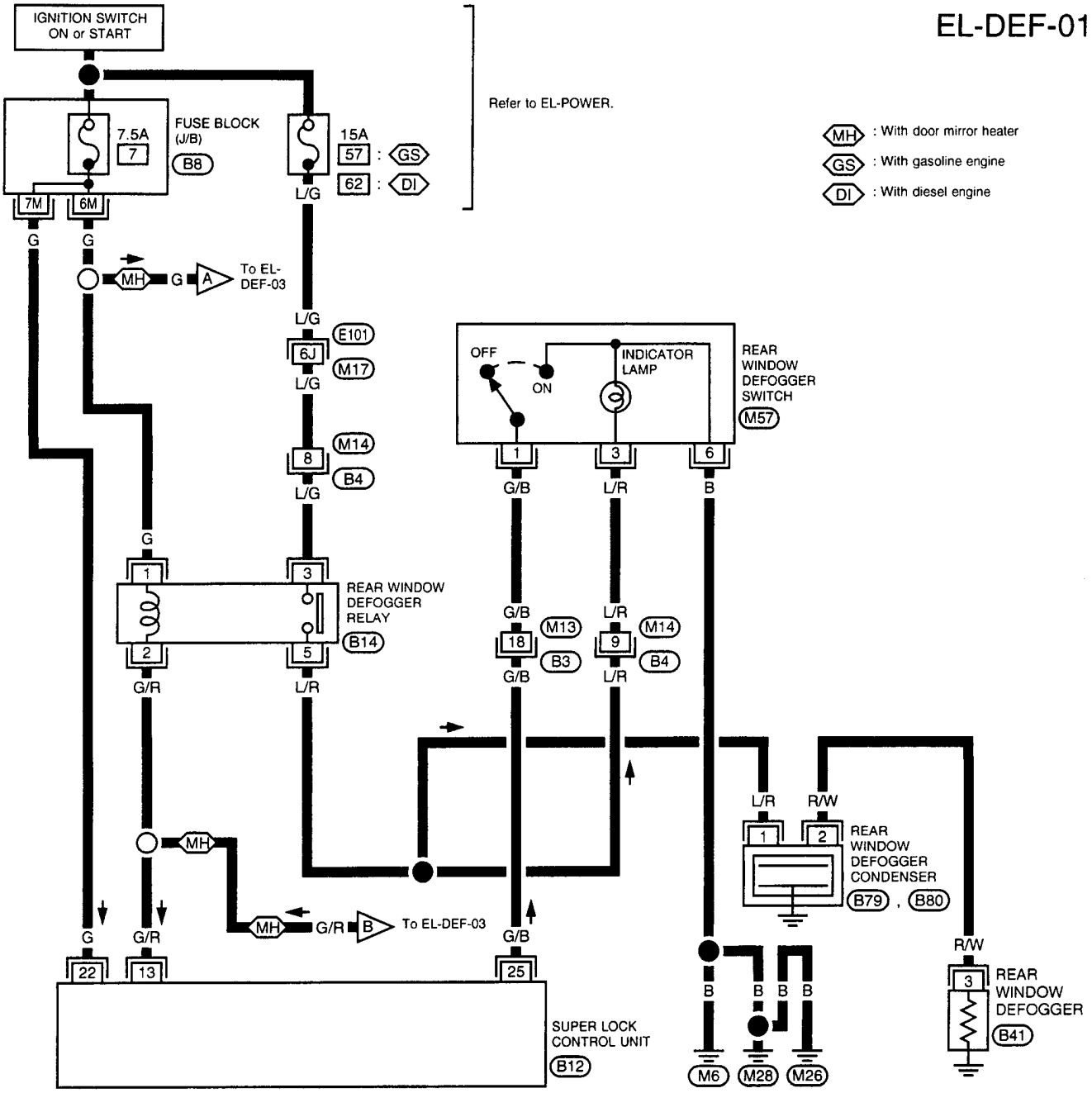
Schematic

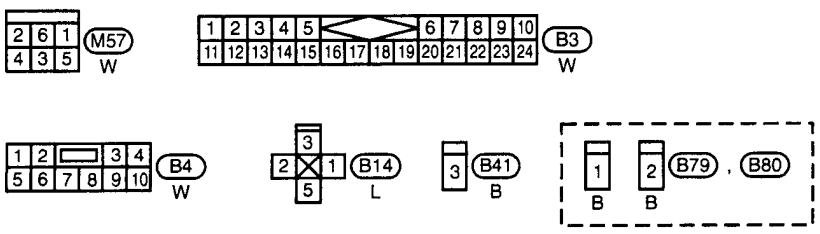


YEL616A

Wiring Diagram — DEF —

EL-DEF-01





Refer to last page (Foldout page).

M17 , E101

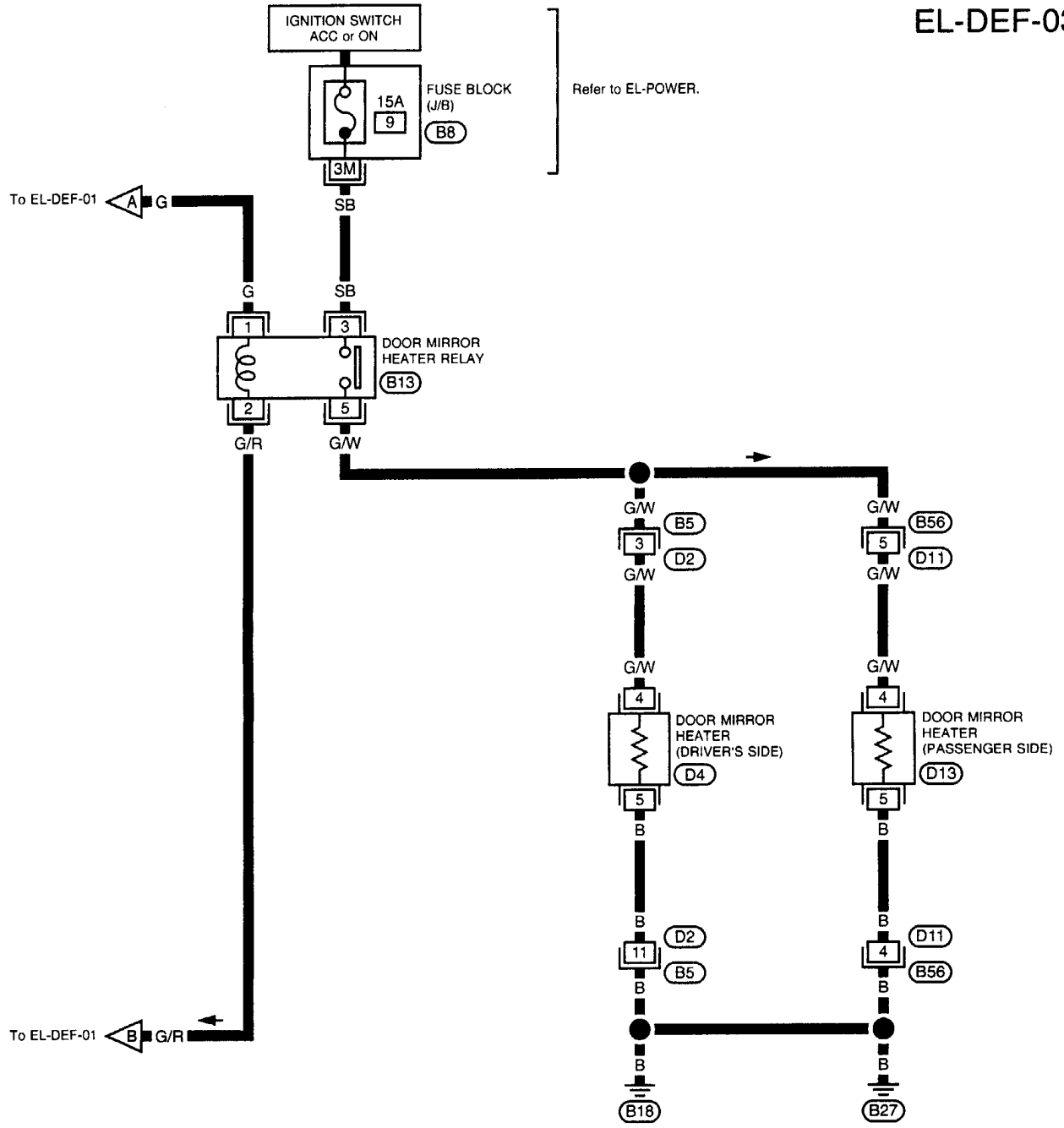
B8

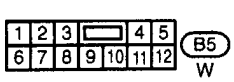
B12

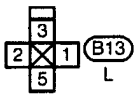
YEL617A

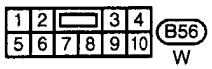
Wiring Diagram — DEF — (Cont'd)

EL-DEF-03







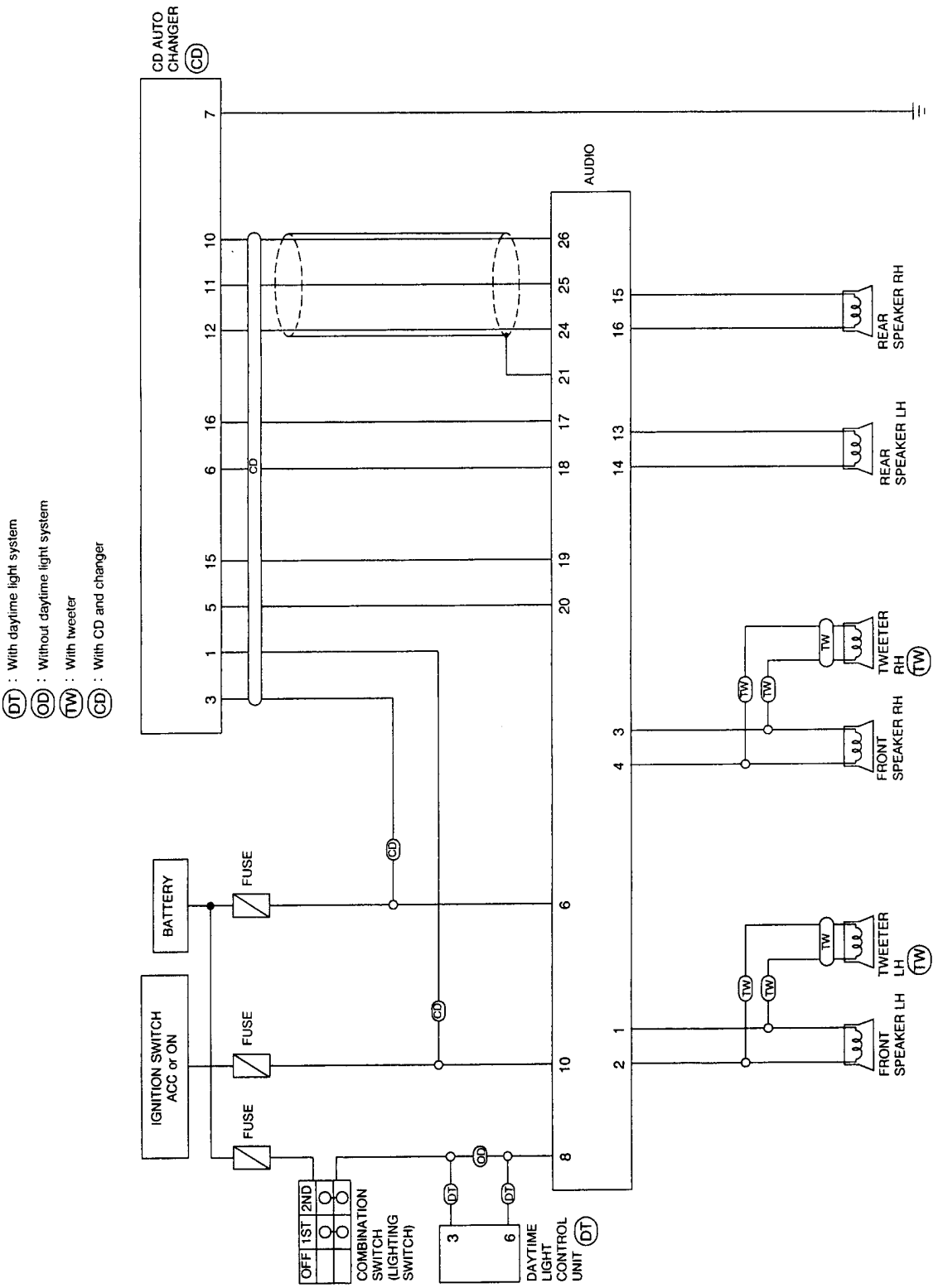


Refer to last page (Foldout page).

B8

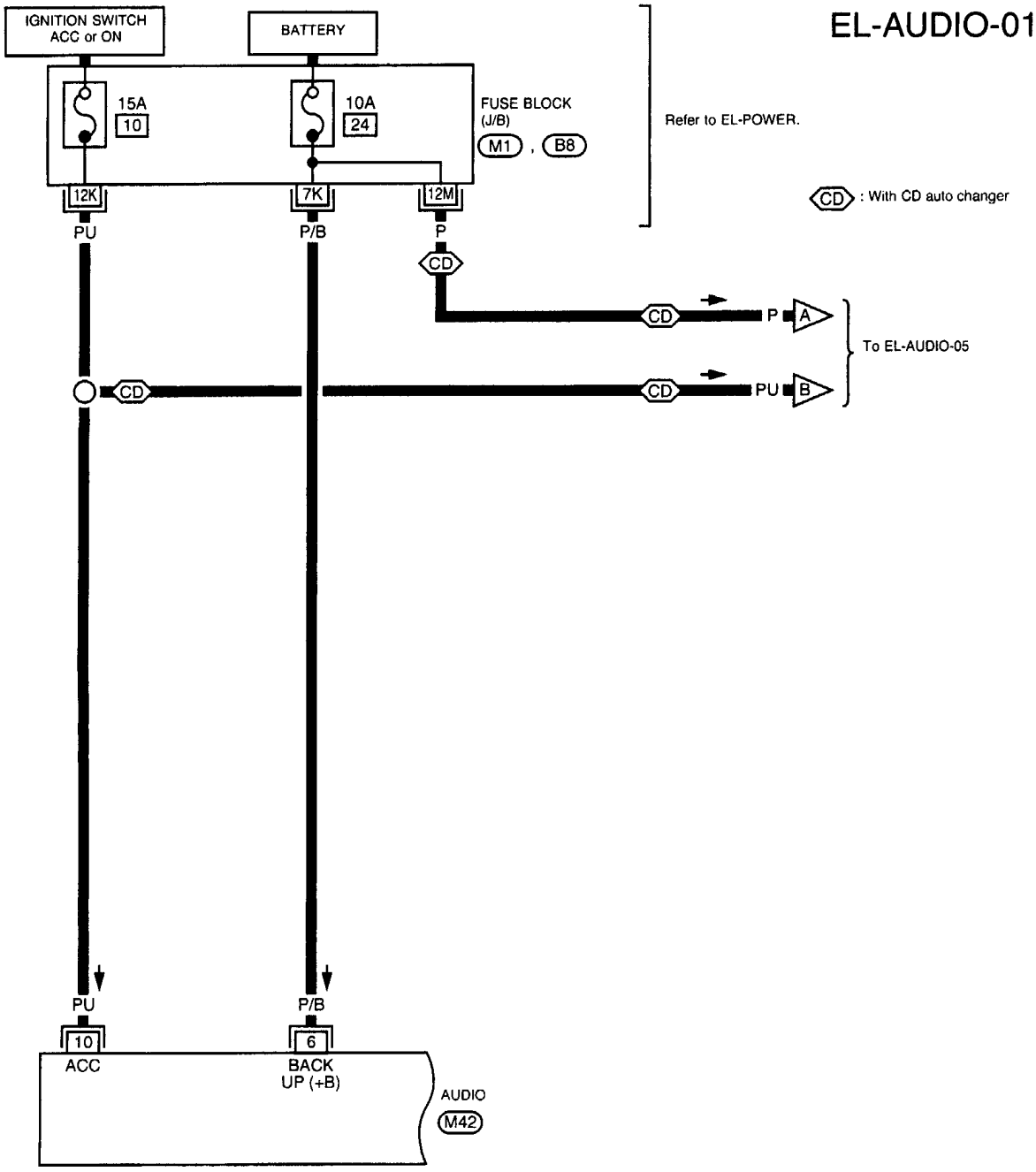
YEL781A

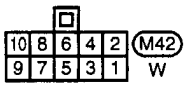
Schematic



YEL619A

Wiring Diagram — AUDIO —





Refer to last page (Foldout page).

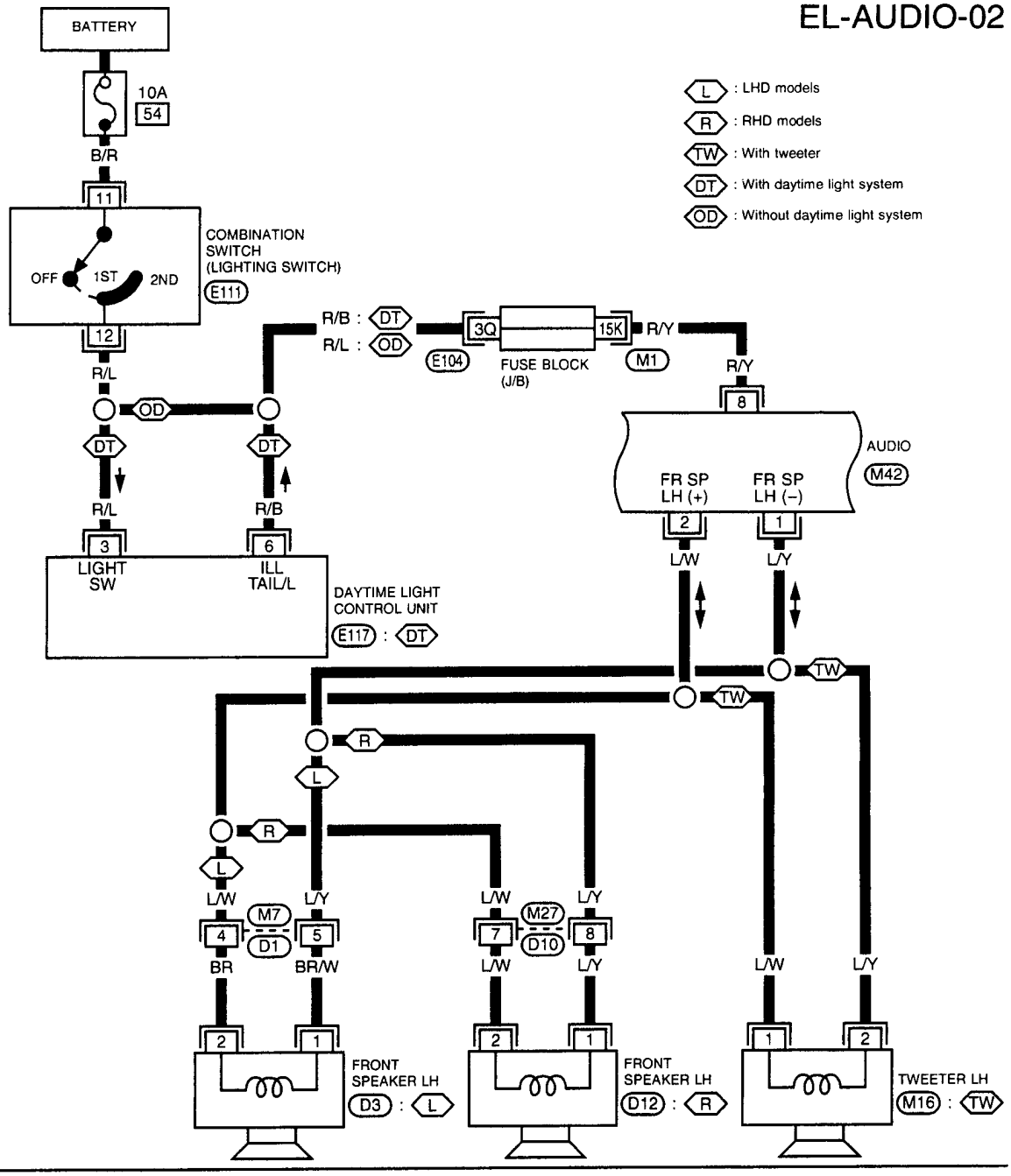
M1

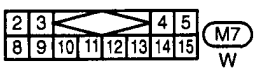
B8

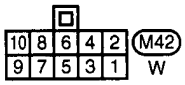
YEL620A

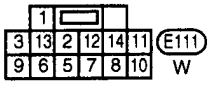
Wiring Diagram — AUDIO — (Cont'd)

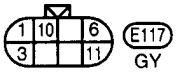
EL-AUDIO-02

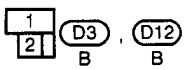












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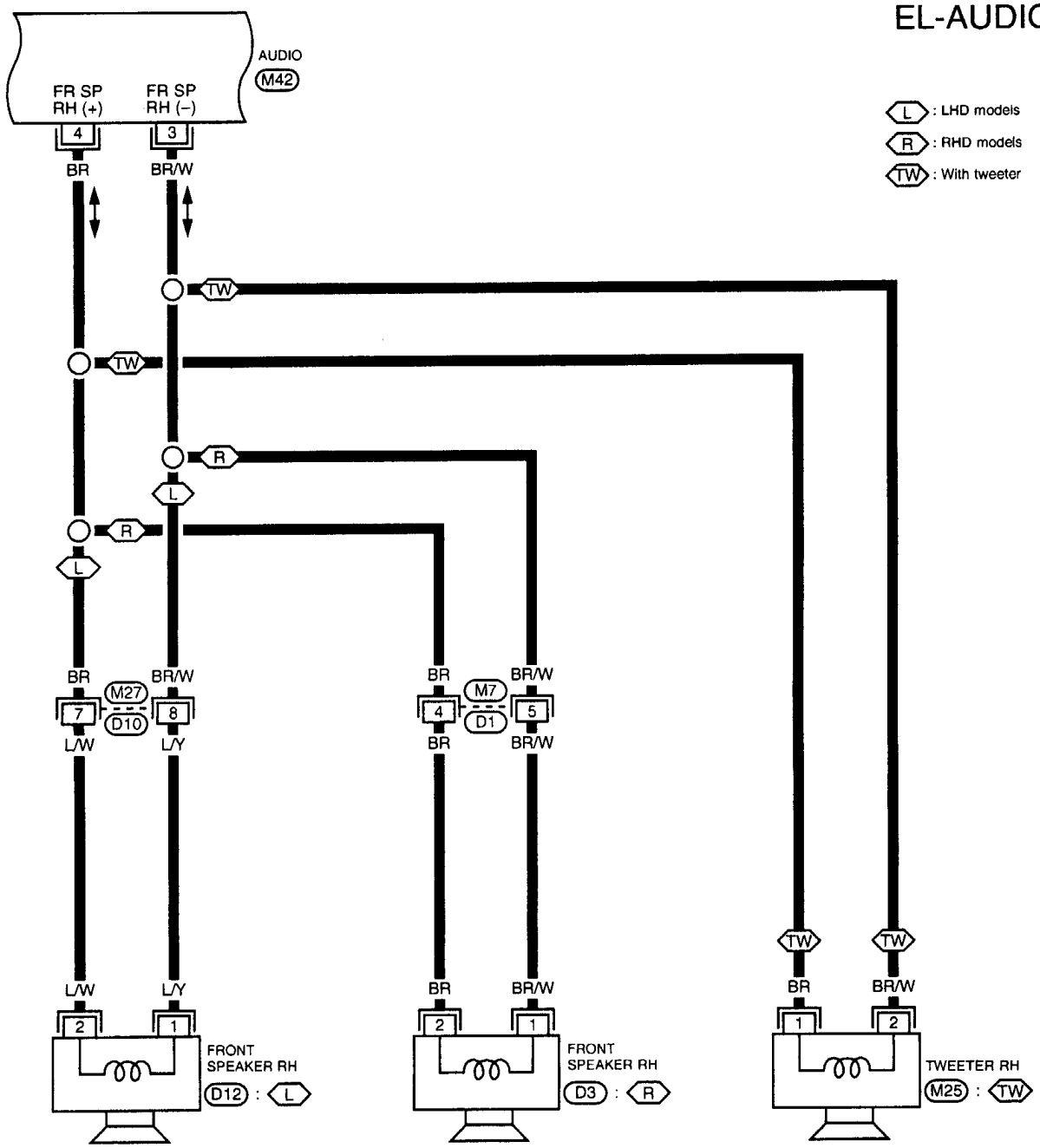
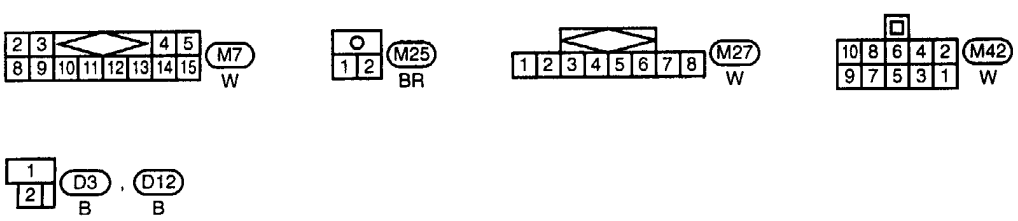
M1 , E104

YEL621A

Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-03

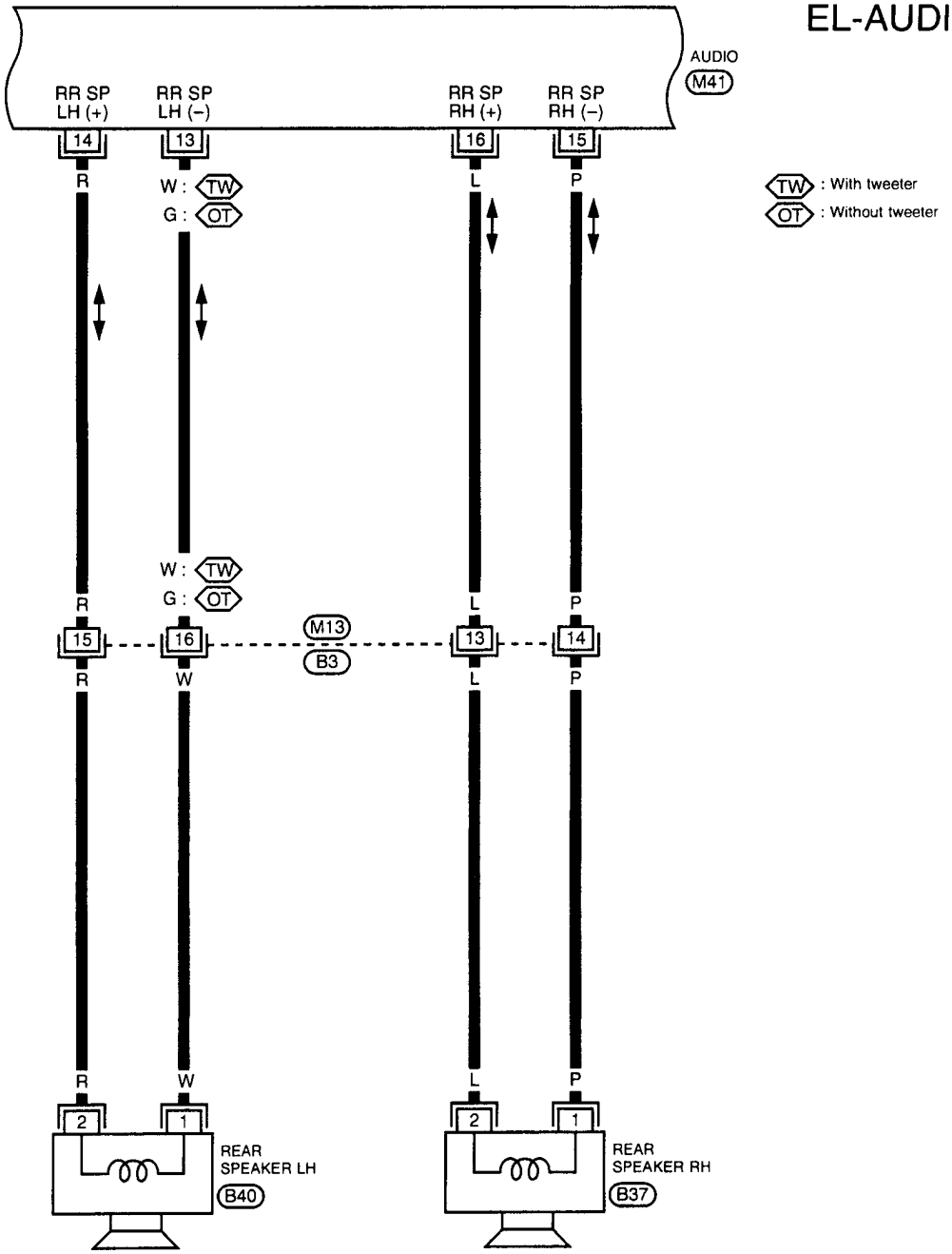


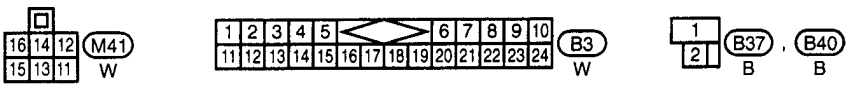


YEL443A

Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-04

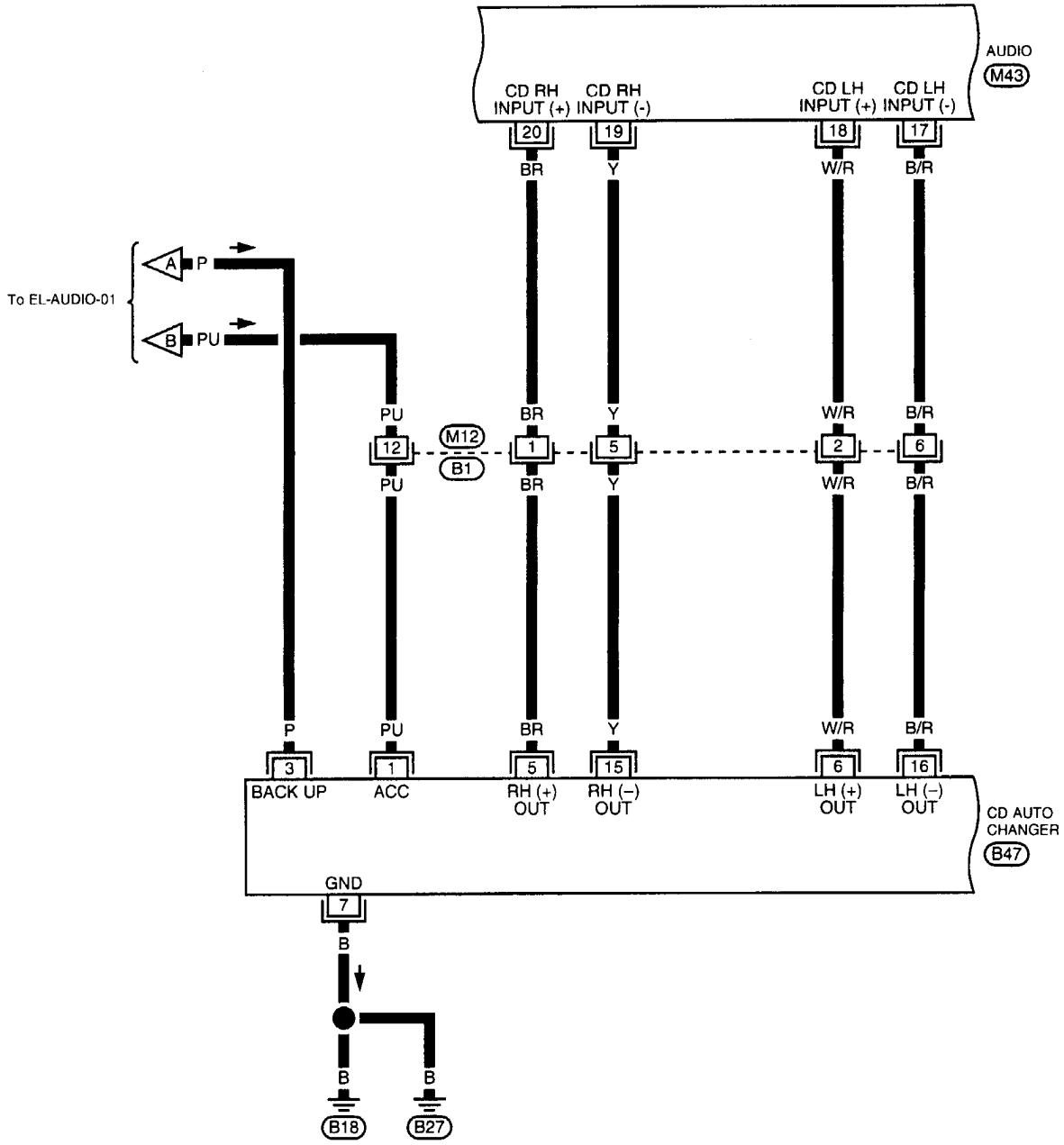


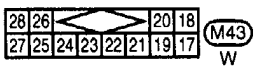


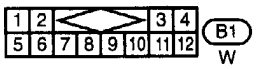
YEL444A

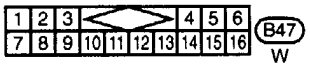
Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-05





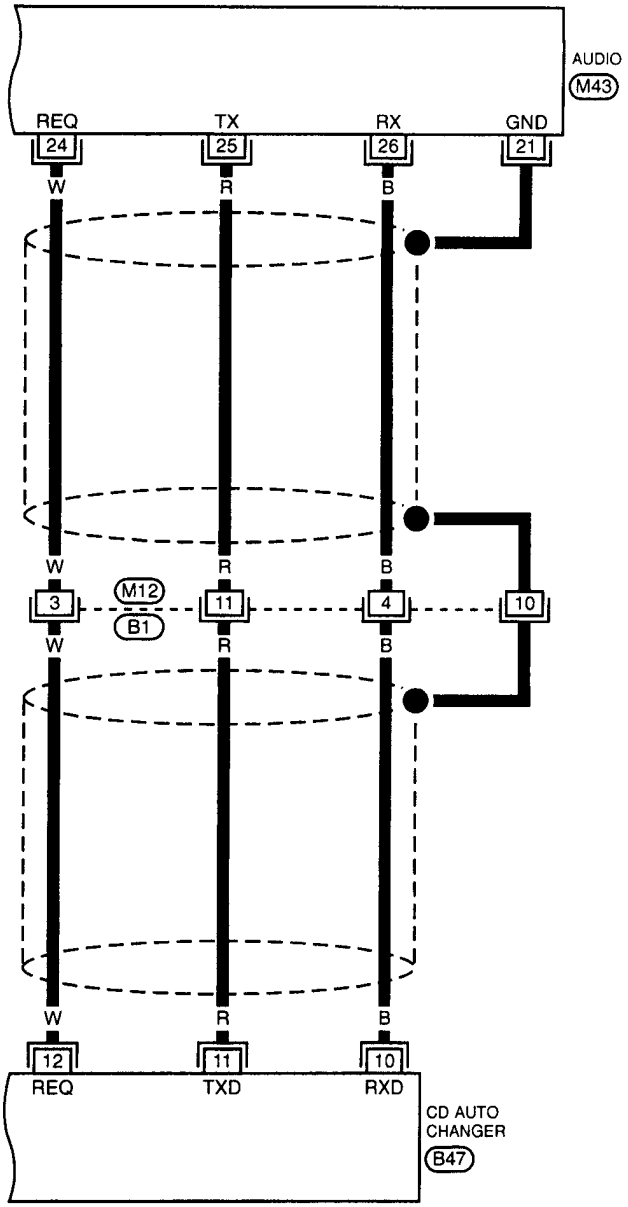


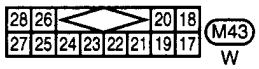


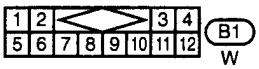
YEL736A

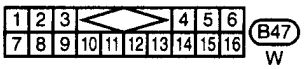
Wiring Diagram — AUDIO — (Cont'd)

EL-AUDIO-06



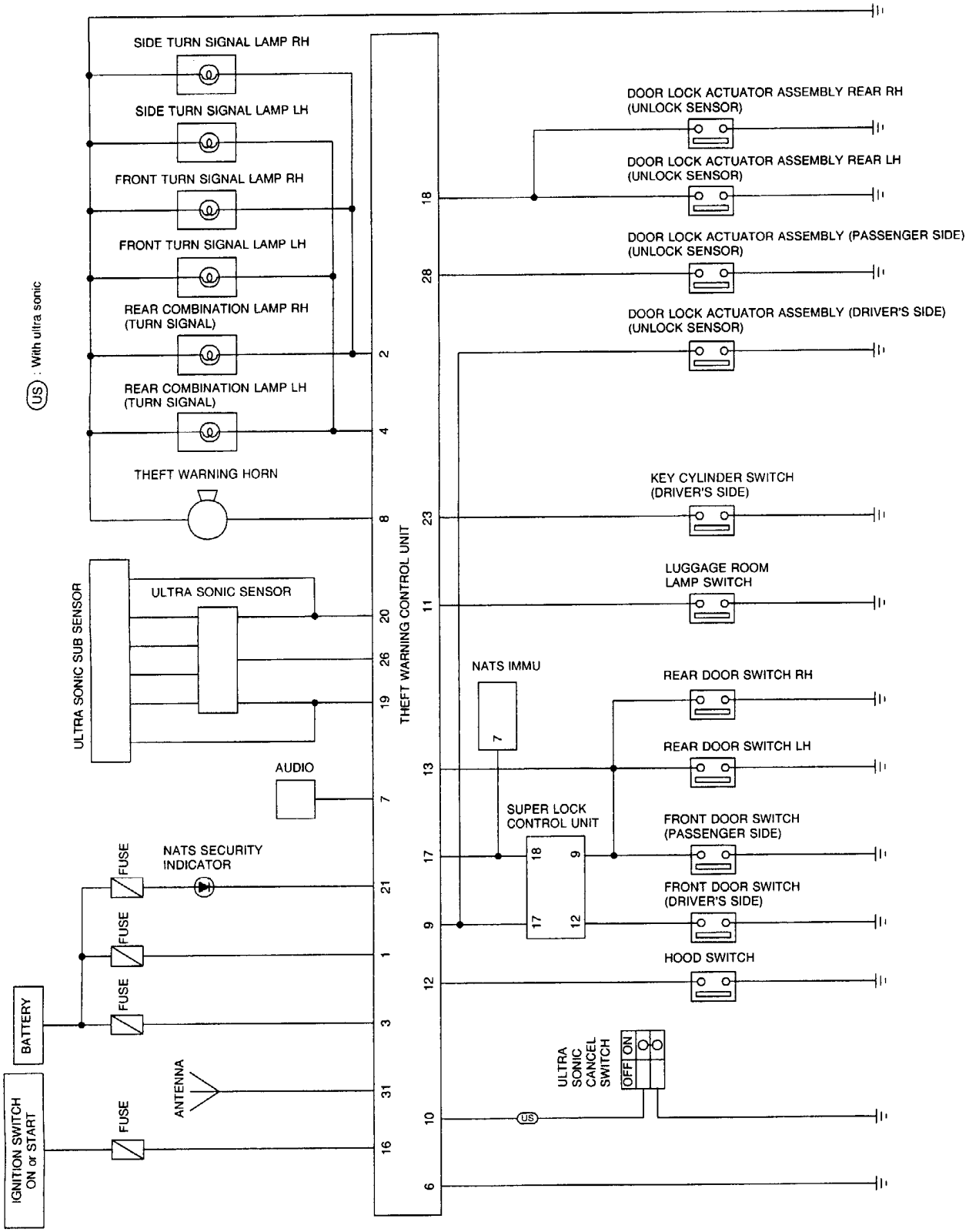






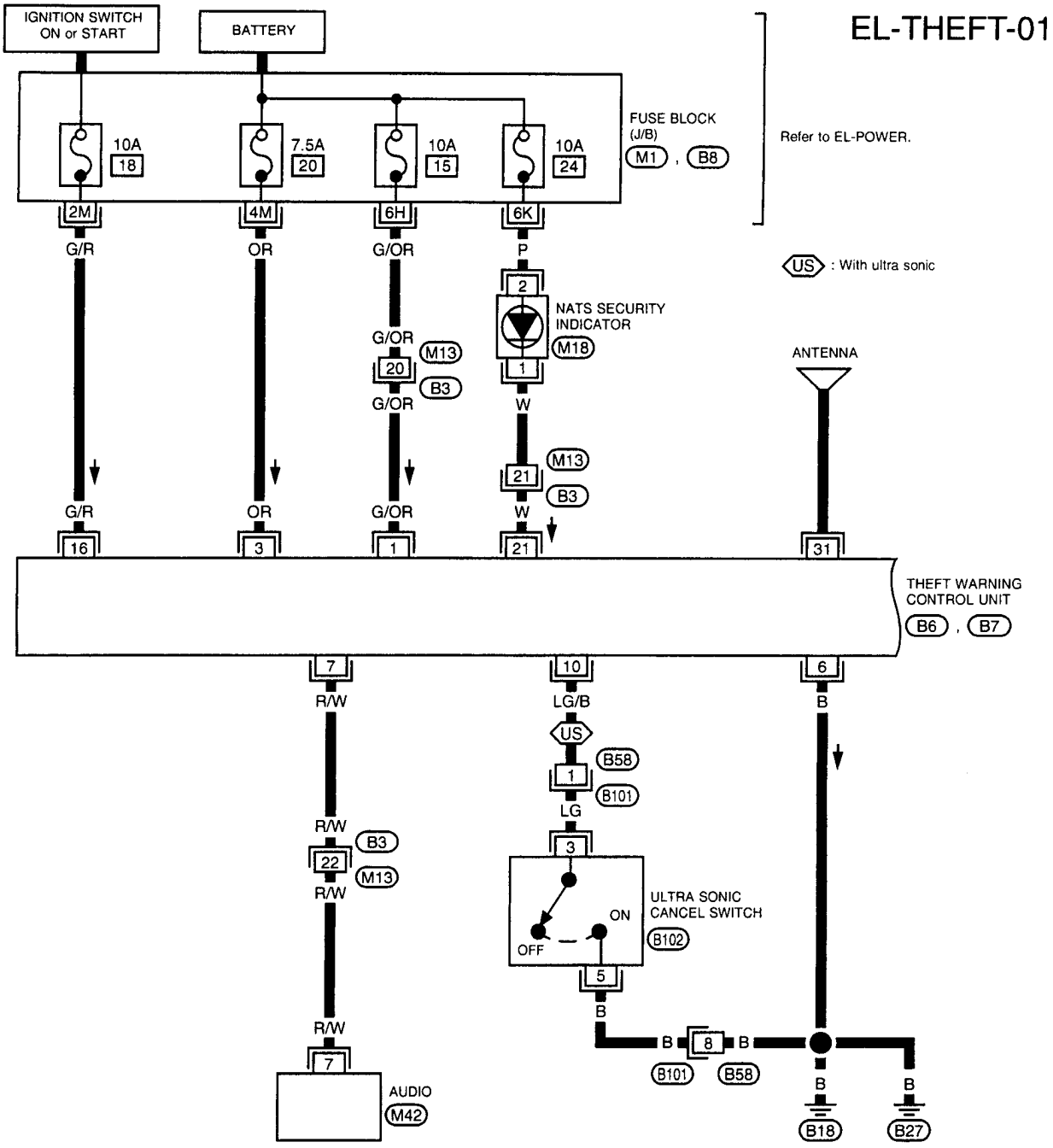
YEL446A

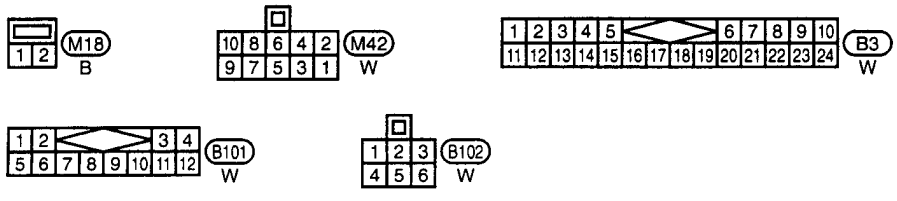
Schematic



YEL622A

Wiring Diagram — THEFT —





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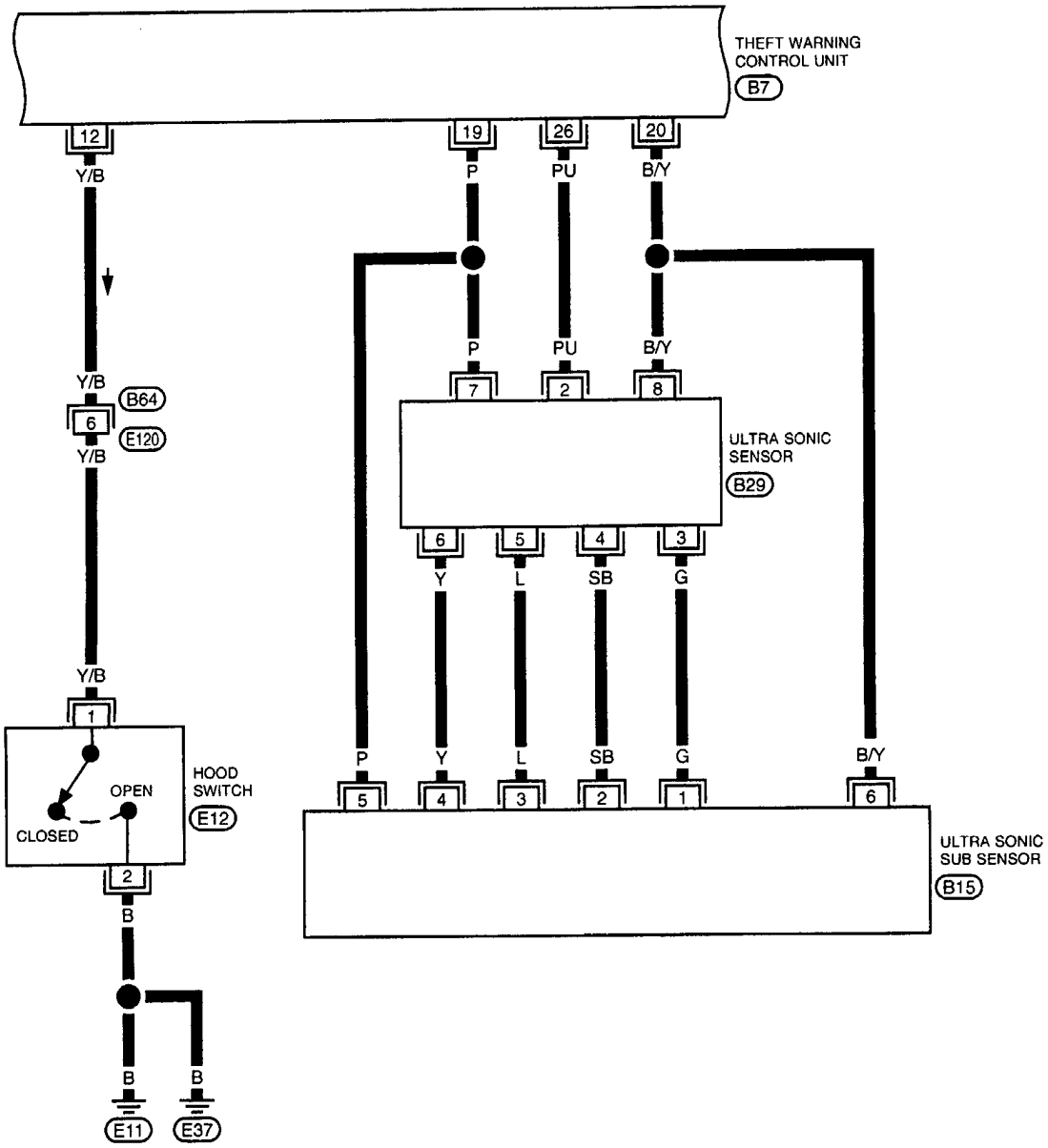
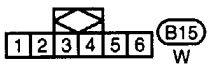
M1
B8
B6
B7

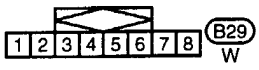
YEL623A

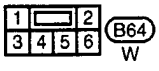
Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-02









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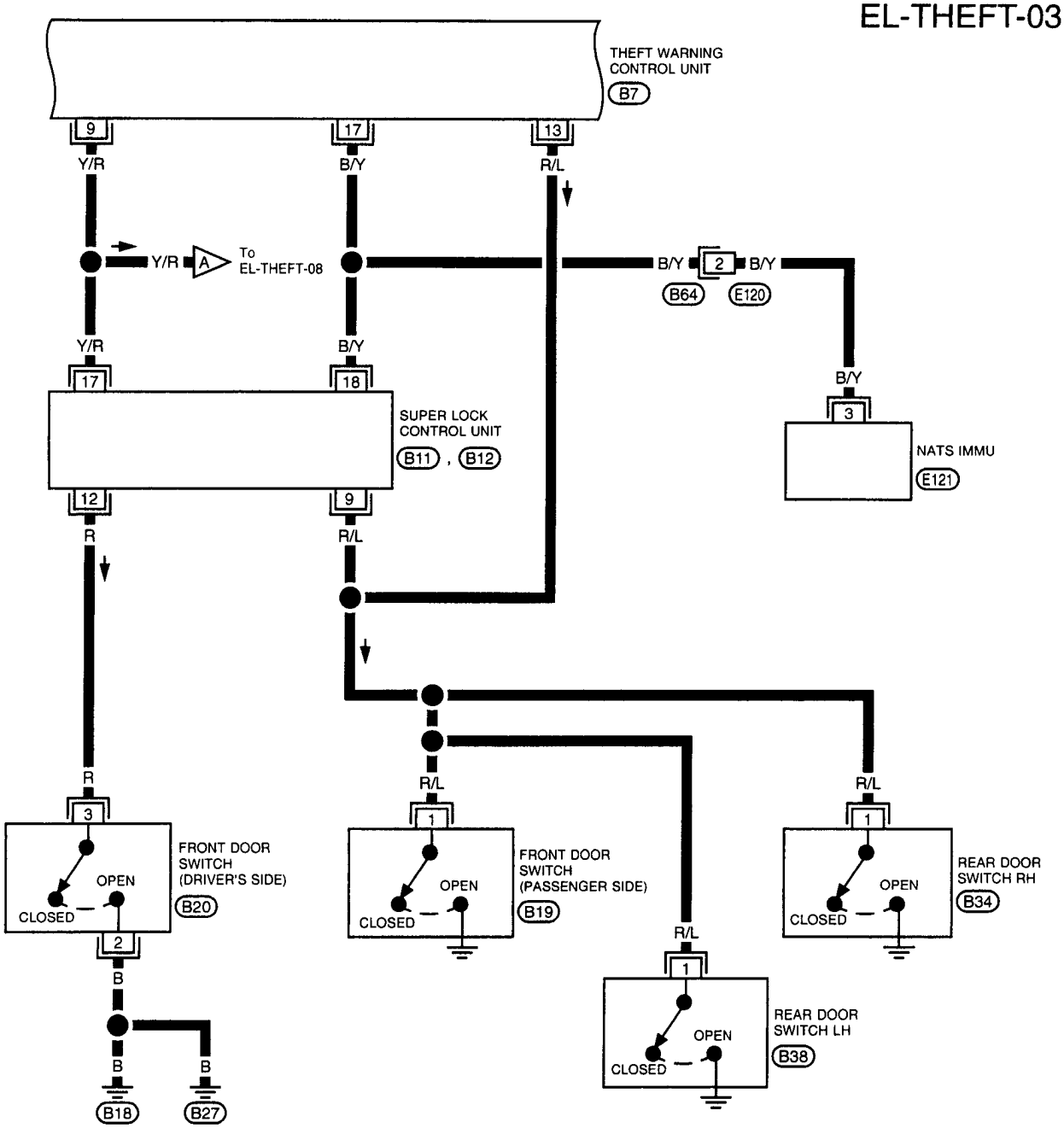
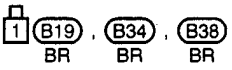
B7

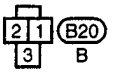
YEL451A

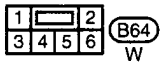
Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-03









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B7

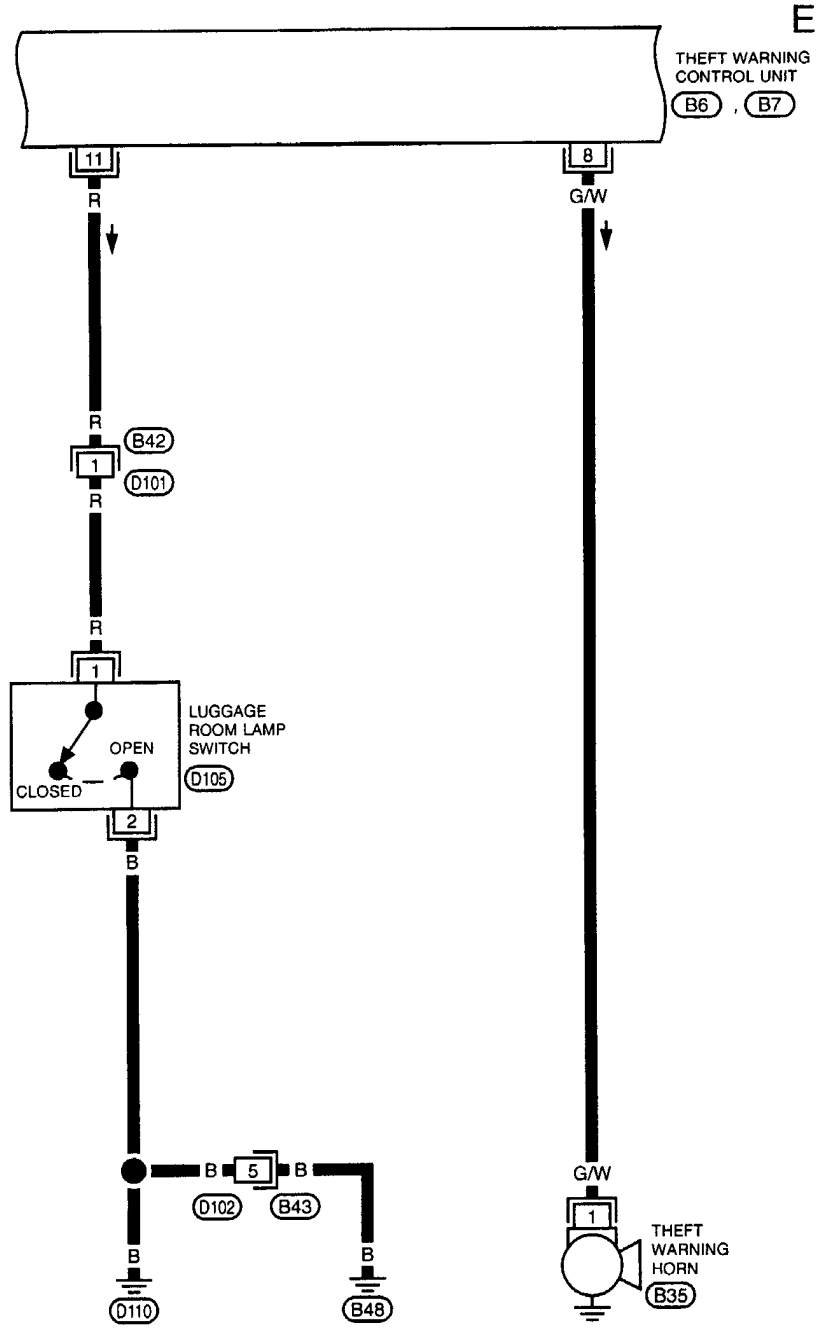
B11

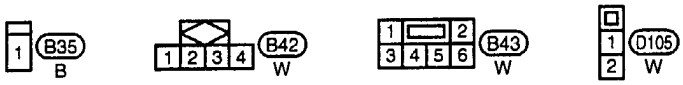
B12

YEL452A

Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-04





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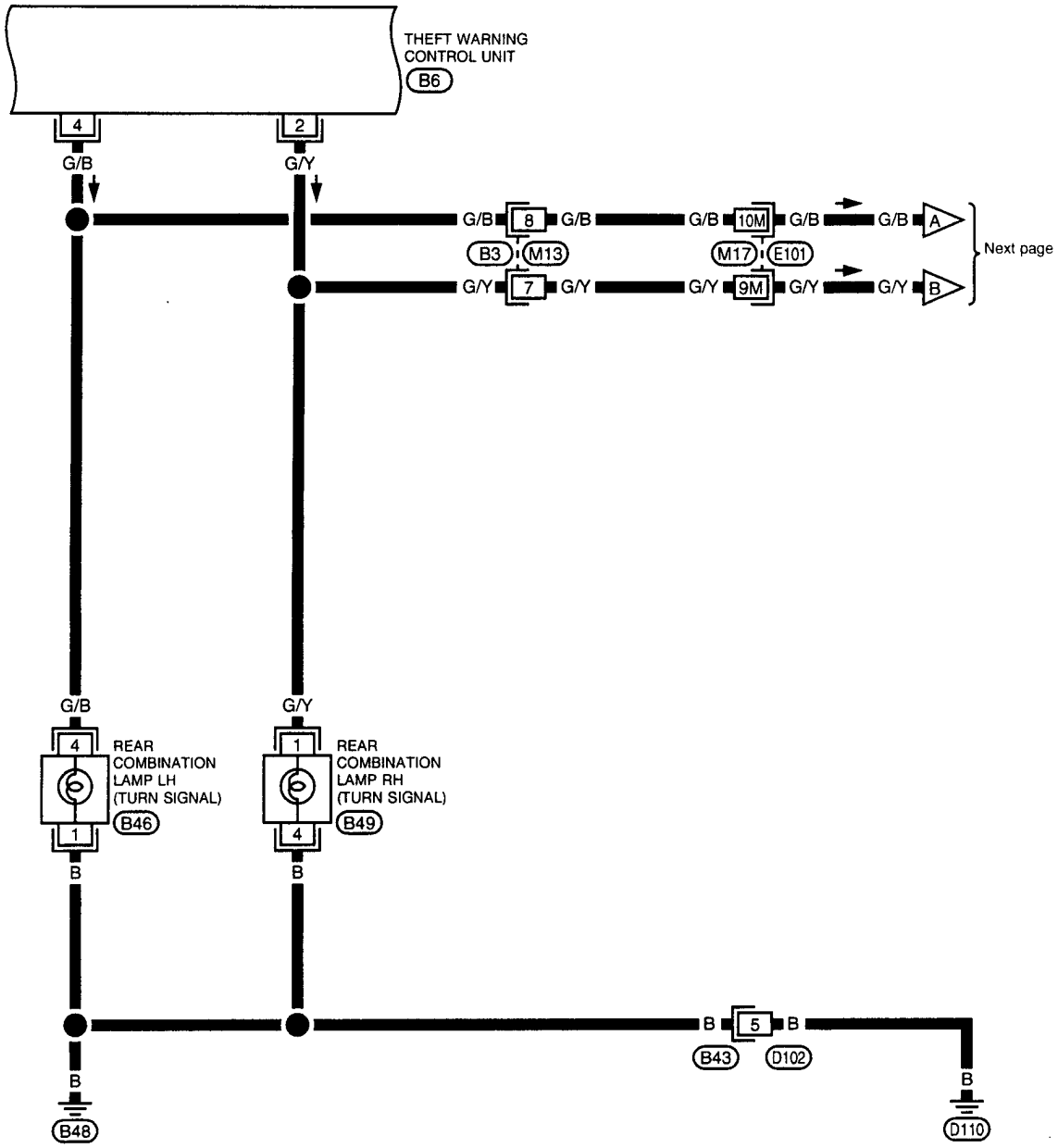
B6

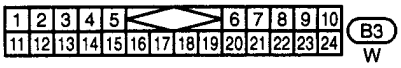
B7

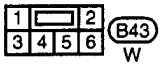
YEL624A

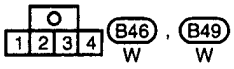
Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-05









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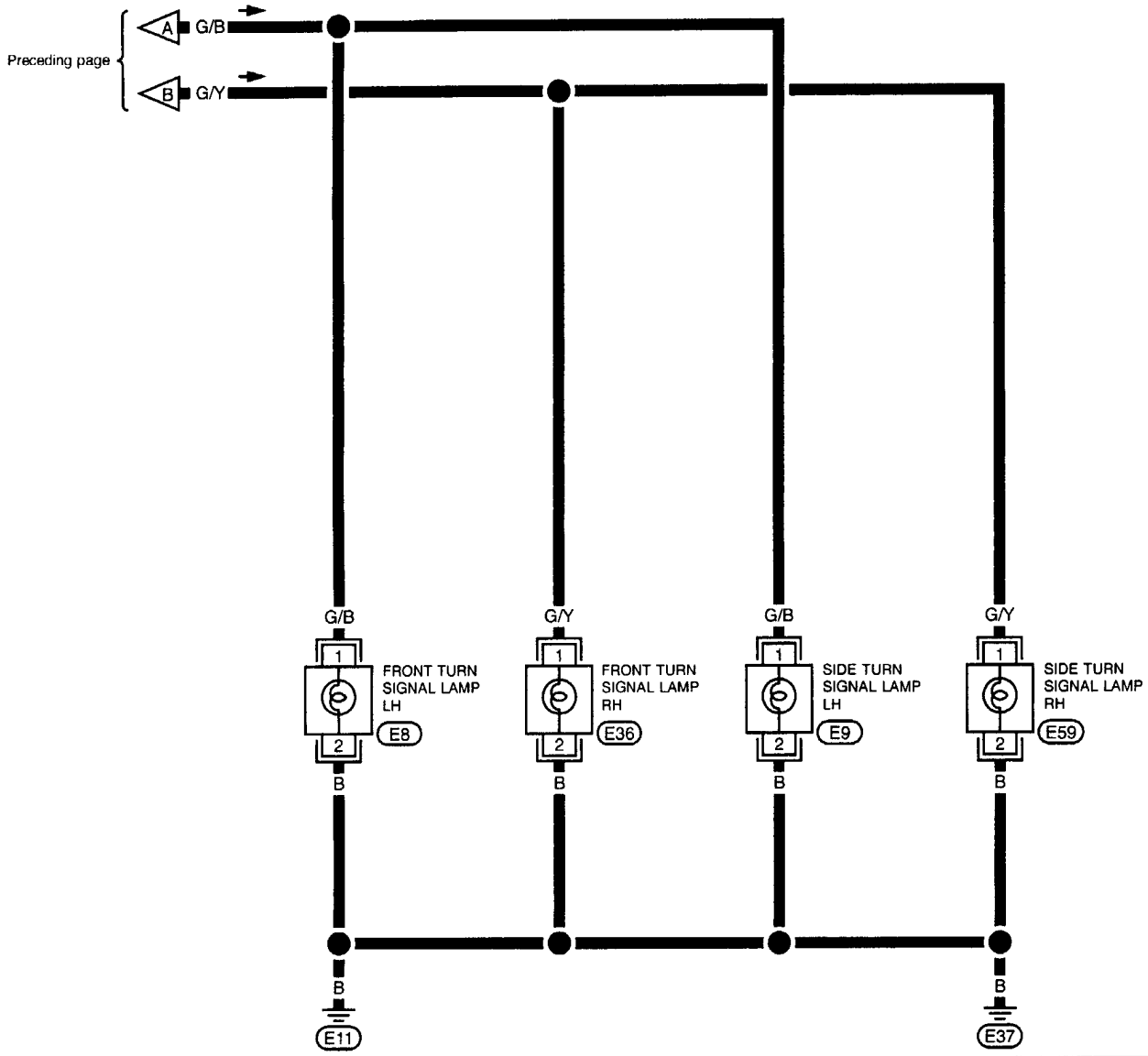
M17, E101

B6

YEL625A

Wiring Diagram — THEFT — (Cont'd)

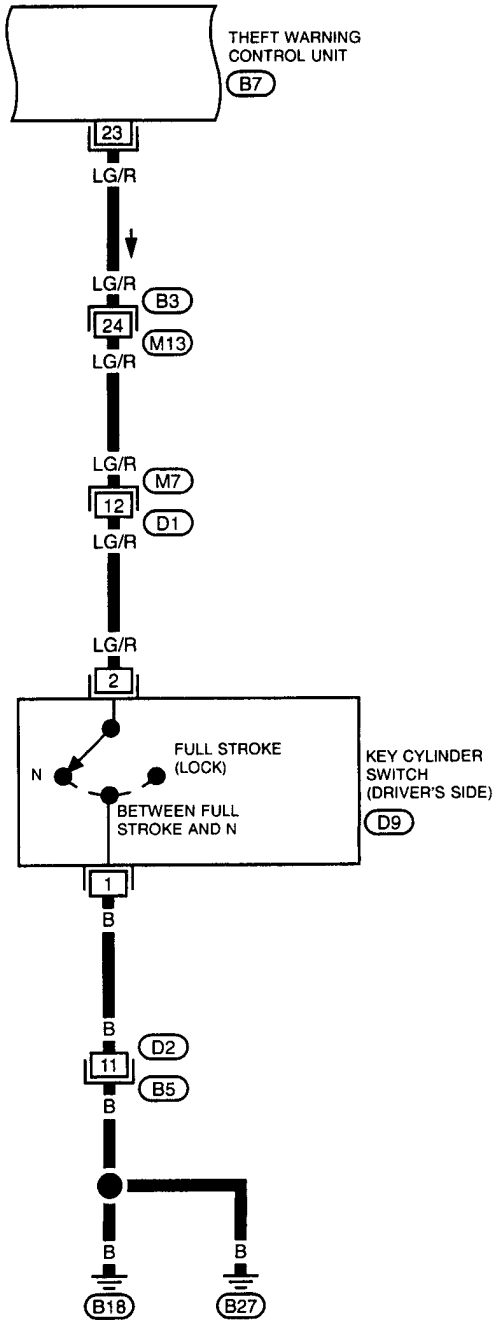
EL-THEFT-06

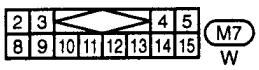


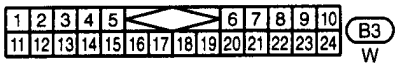
YEL757

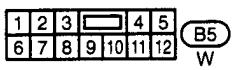
Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-07









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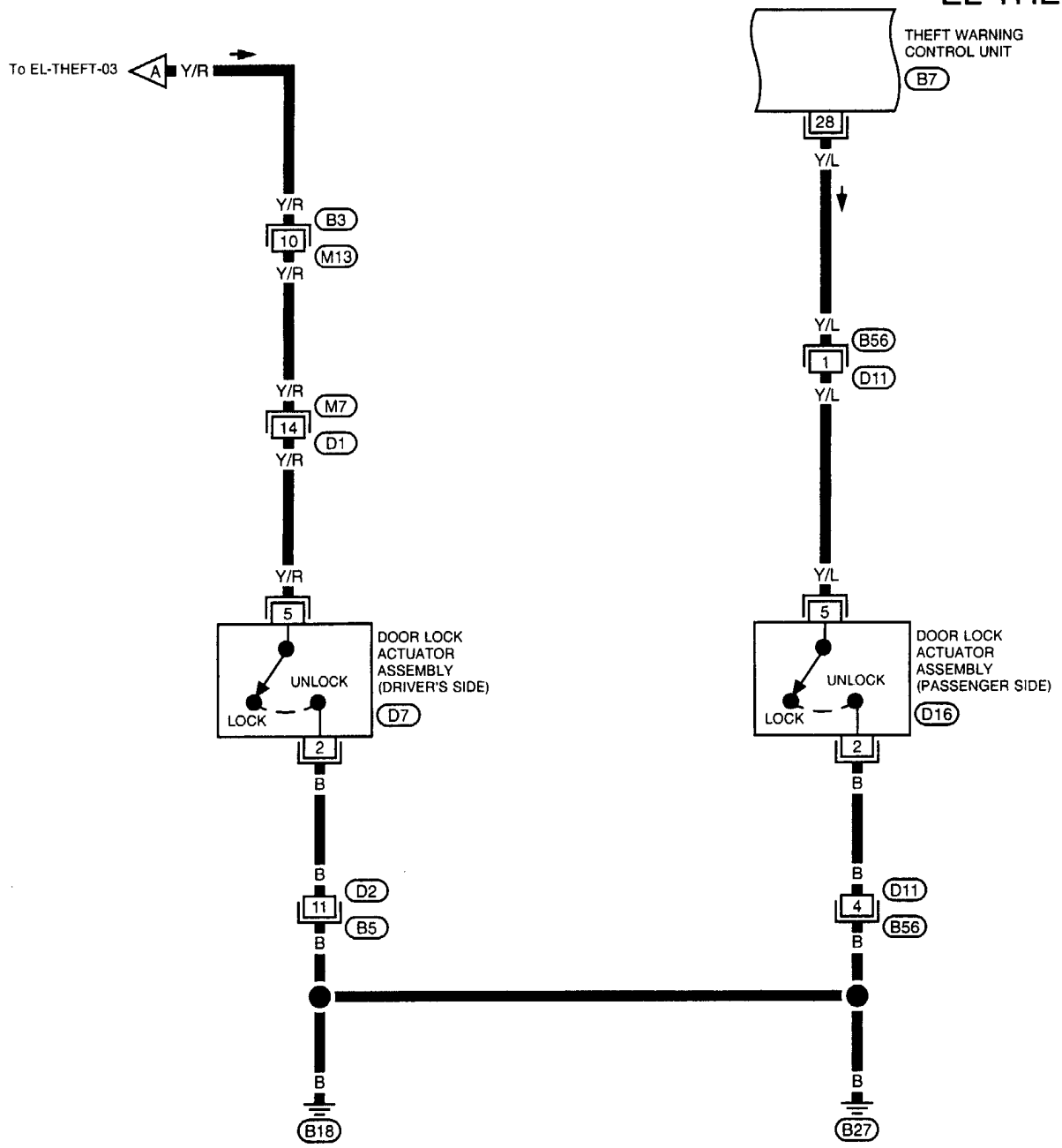
B7

YEL455A

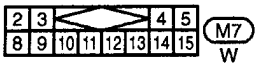
Wiring Diagram — THEFT — (Cont'd)

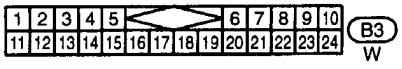
EL-THEFT-08

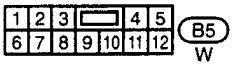


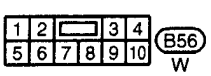
Refer to last page (Foldout page).

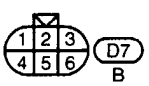
B7

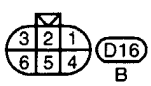








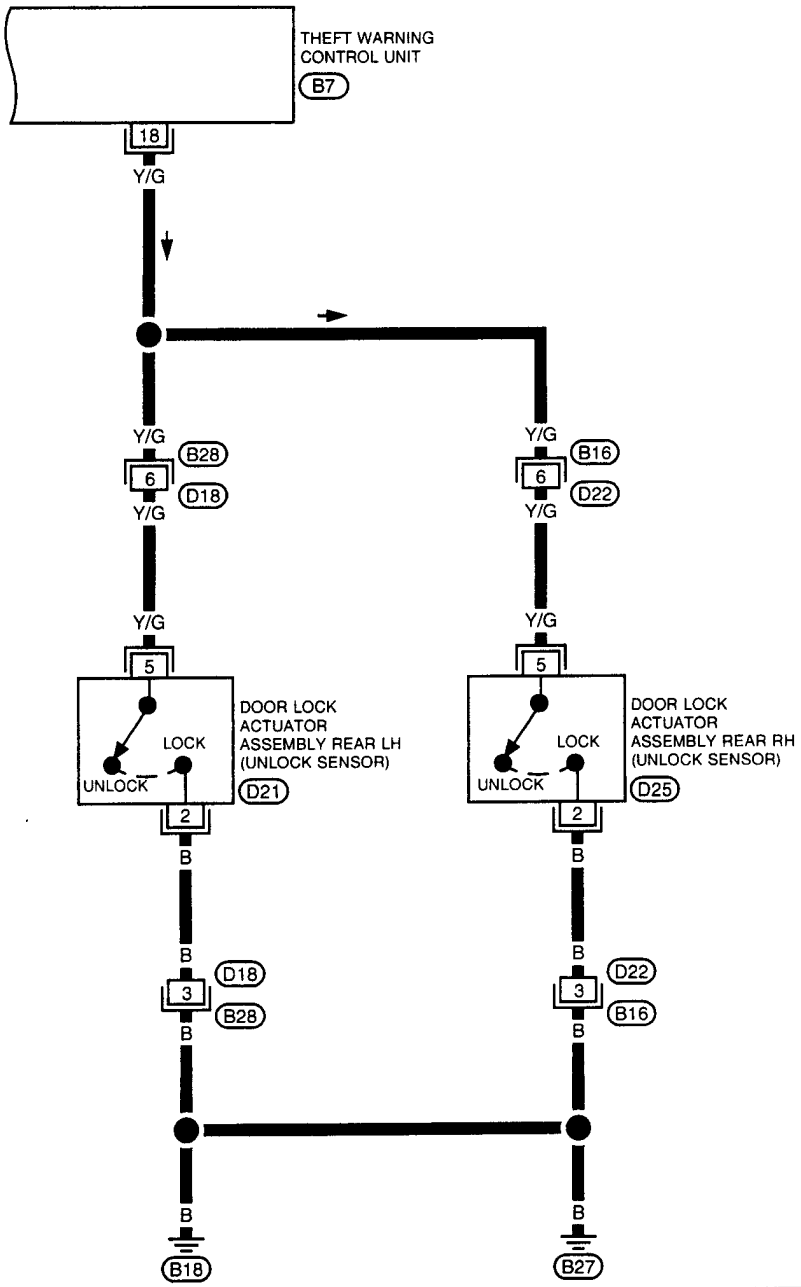


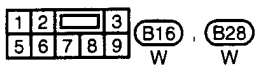


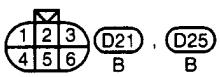
YEL456A

Wiring Diagram — THEFT — (Cont'd)

EL-THEFT-09







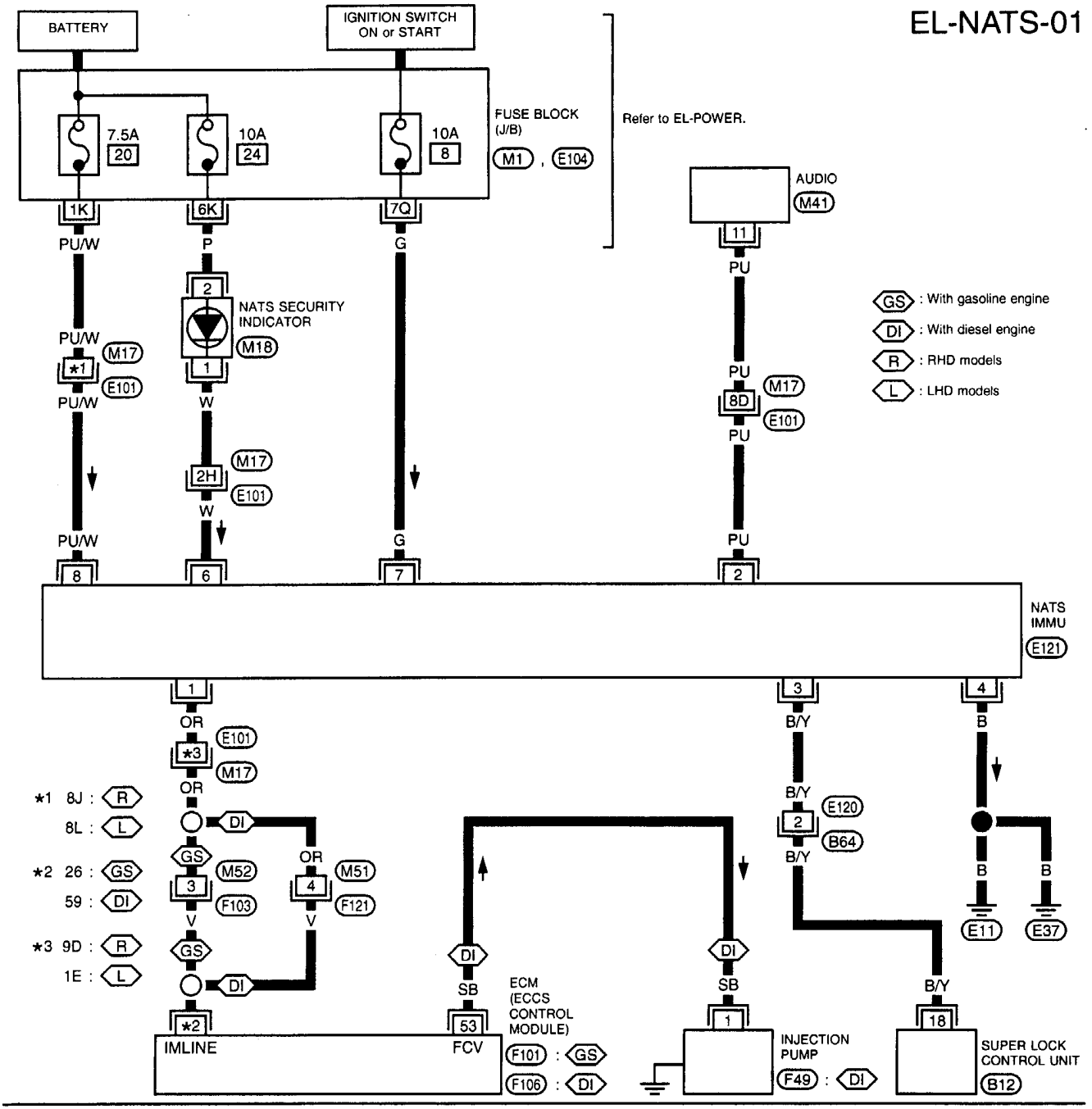
Refer to last page (Foldout page).

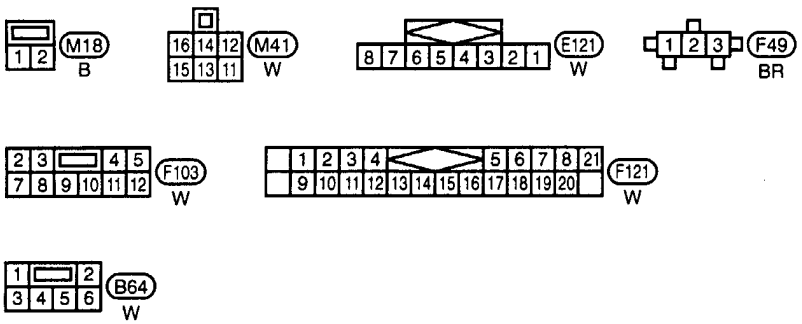
B7

YEL457A

Wiring Diagram — NATS —

EL-NATS-01



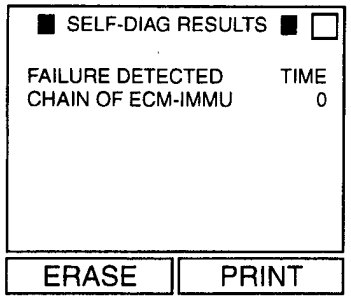


Refer to last page (Foldout page).

M1
M17, E101
E104
F101
F106
B12

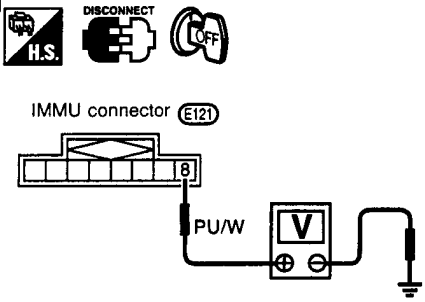
YEL626A

A



CS-C01

B



YEL666A

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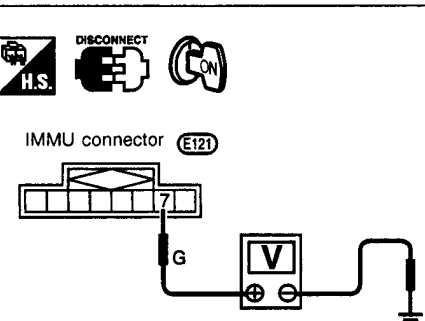

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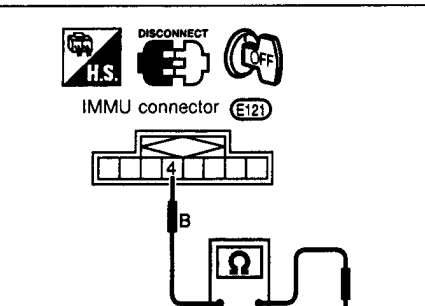

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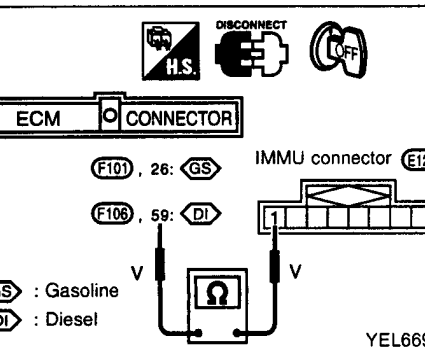
E



YEL669A

Trouble Diagnoses

DIAGNOSTIC PROCEDURE 3

Self-diagnostic results: "CHAIN OF ECM-IMMU" displayed on CONSULT screen

A

Confirm SELF-DIAGNOSTIC RESULTS "CHAIN OF ECM-IMMU" displayed on CONSULT screen.

OK ↓

B

Check voltage between terminal ⑧ of IMMU and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following:
- 7.5A fuse [No. 20], located in the fuse box (J/B)]
- Harness for open or short between fuse and IMMU connector

Ref. part No. C1

OK ↓

C

Check voltage between terminal ⑦ of IMMU and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following:
- 10A fuse [No. 8], located in the fuse block (J/B)]
- Harness for open or short between fuse and IMMU connector

Ref. part No. C2

OK ↓

D

Check harness continuity between IMMU terminal ④ and ground.
Continuity should exist.

NG → Repair harness
Ref. part No. C3

OK ↓

E

Check harness continuity between the following ECM terminals and IMMU terminals.

Engine	ECM connector No.	Terminal No.	IMMU terminal No. No.
Gasoline	F101	26	1
Diesel	F106	59	1

Continuity should exist.

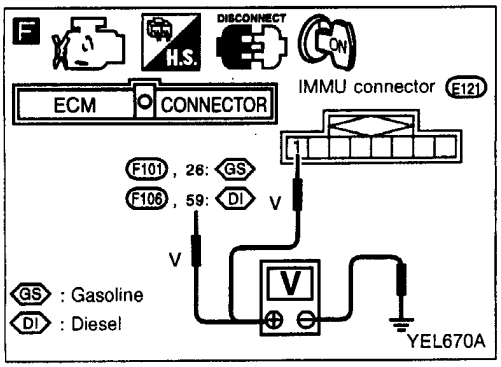
NG → Communication line is open circuit.
Repair harness or connectors.
Ref. part No. C4

OK ↓

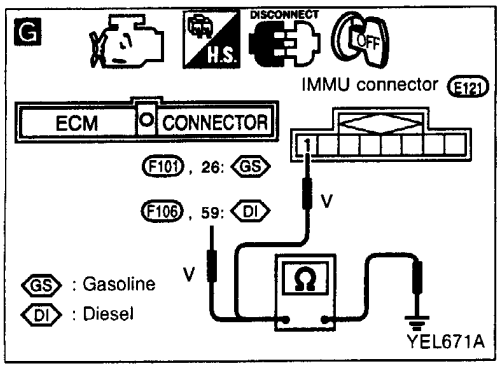
Ⓐ

Trouble Diagnoses (Cont'd)

F



G



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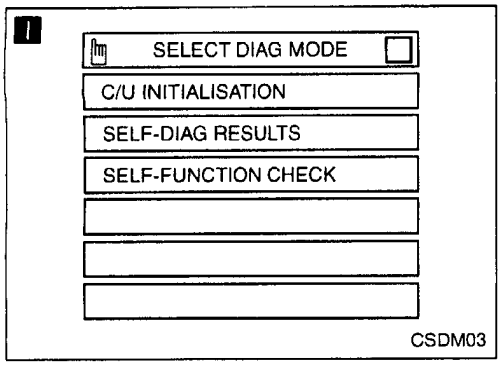

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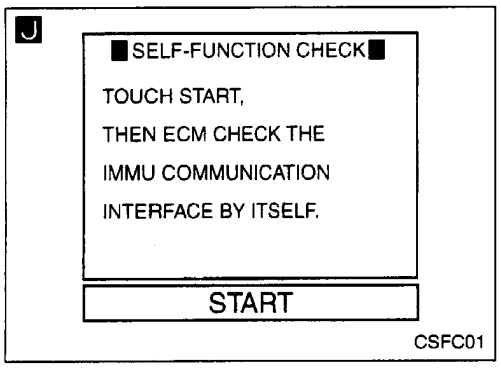


Ⓐ

F

CHECK COMMUNICATION LINE CIRCUIT.
1) Disconnect ECM connector and IMMU connector.
2) Check voltage between the following terminals and ground.

Unit	Connector No.	Terminal No.
Gasoline engine	F101	26
Diesel engine	F106	59
IMMU	E121	1

Voltage: 0V

NG → Communication line is short-circuited with battery voltage line or ignition switch ON line. Repair harness or connectors. **Ref. part No. C4**

OK

G

Check continuity between the following terminals and ground.

Unit	Connector No.	Terminal No.
Gasoline engine	F101	26
Diesel engine	F106	59
IMMU	E121	1

Continuity should not exist.

NG → Communication line is short-circuited with ground line. Repair harness or connectors. **Ref. part No. C4**

OK

H

SELF-FUNCTION CHECK
1) Connect ECM connector and disconnect IMMU connector.
2) Turn ignition switch to "ON" position.
3) Touch "SELF-FUNCTION CHECK" on CONSULT "SELECT DIAG MODE" screen.

I

Touch "START". ECM will then check its communication interface by itself.

NG → **J** (See next page.) ECM is malfunctioning. Replace ECM. **Ref. part No. B**

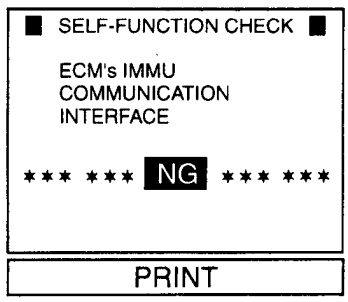
Perform initialisation with CONSULT. For the operation of initialisation, refer to "CONSULT operation manual NATS V.2.0".

OK

K (See next page.)

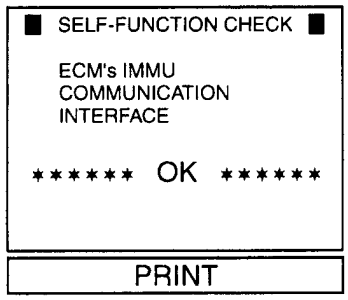
Ⓑ

J



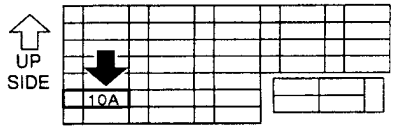
CSFC02A

K



CSFC02

A



YEL858

Ⓑ

IMMU is malfunctioning.
Replace IMMU.
Ref. part No. A

Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V.2.0".

DIAGNOSTIC PROCEDURE 8
"NATS SECURITY IND. DOES NOT LIGHT UP"

A

Check 10A fuse [No. 24, located in the fuse block (J/B)].

NG → Replace fuse.

OK

NATS INITIALISATION
1) Install the 10A fuse.
2) Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V.2.0".

Turn ignition switch to "LOCK" position.

Start engine and turn ignition switch to "LOCK" position.

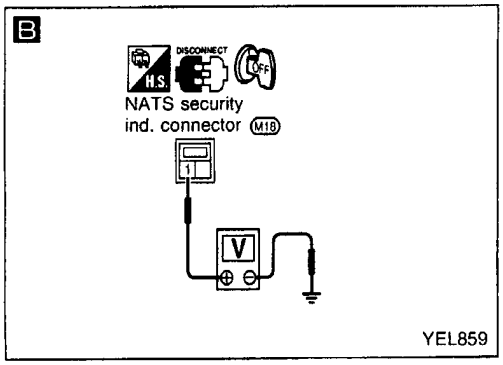
Check NATS security ind. blinking.

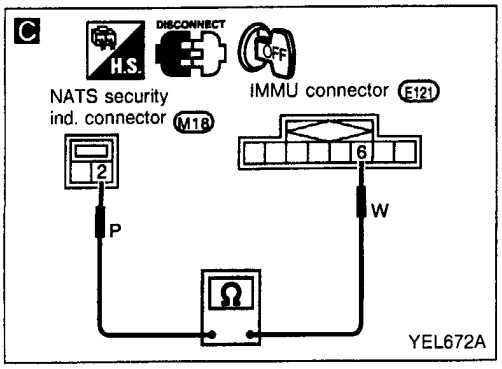
OK → END

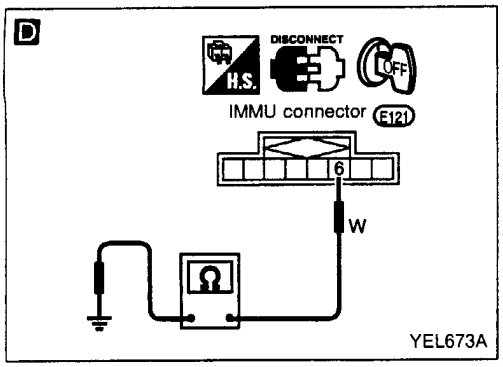
NG

Ⓐ

Trouble Diagnoses (Cont'd)







Ⓐ

B

Check voltage between NATS security ind. connector terminal ① and ground.
Voltage : Battery voltage

NG → Check harness continuity between fuse and NATS security ind.

OK ↓

C

CHECK NATS SECURITY IND. CIRCUIT.
1) Disconnect NATS IMMU connector.
2) Check harness continuity between NATS security ind. connector terminal ② and NATS IMMU connector terminal ⑥.
Continuity should exist.

NG → Repair harness.

OK ↓

D

CHECK NATS IMMU FUNCTION
1) Connect NATS IMMU connector.
2) Disconnect NATS security ind. connector.
3) Check resistance between NATS IMMU terminal ⑥ and ground.
Resistance should be less than 1kΩ.

NG → NATS IMMU is malfunctioning. Replace IMMU.

Perform initialisation with CONSULT.
For the operation of initialisation, refer to "CONSULT operation manual NATS V.2.0".

OK ↓

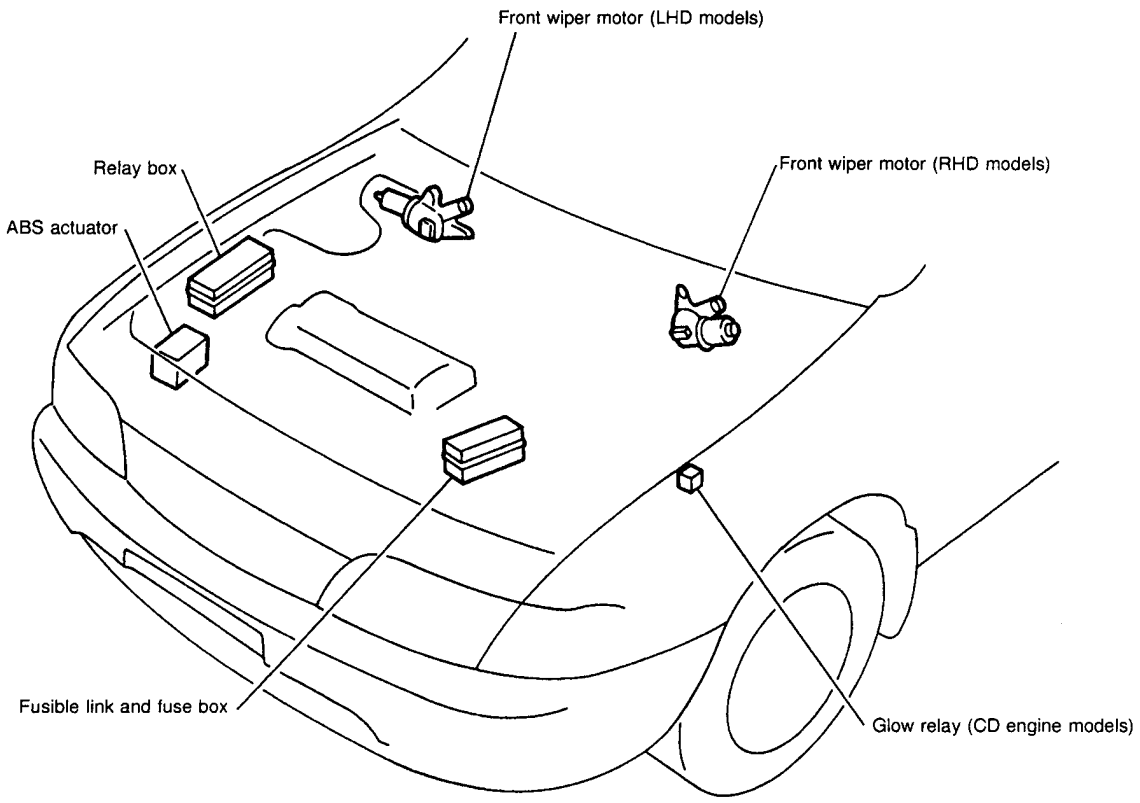
NATS security ind. is malfunctioning.
Pull out NATS security ind. with harness and connector.
Check harness connection

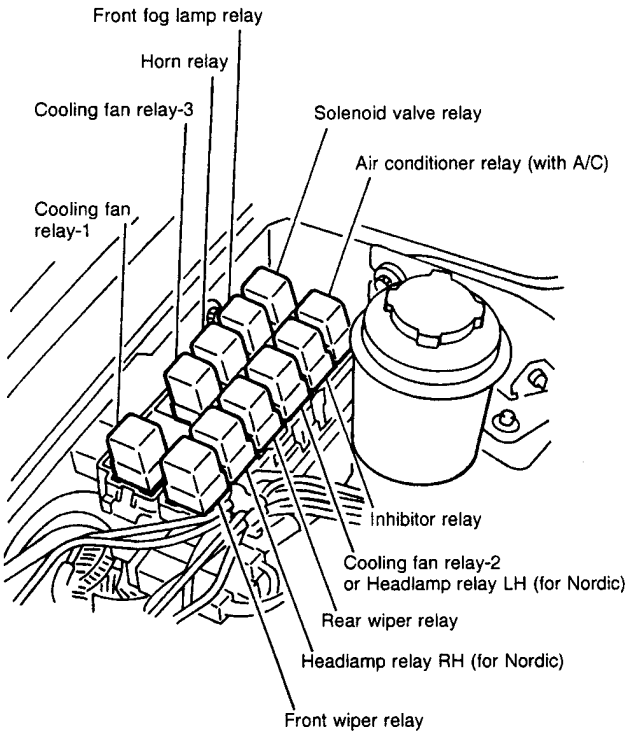
NG → Repair harness.

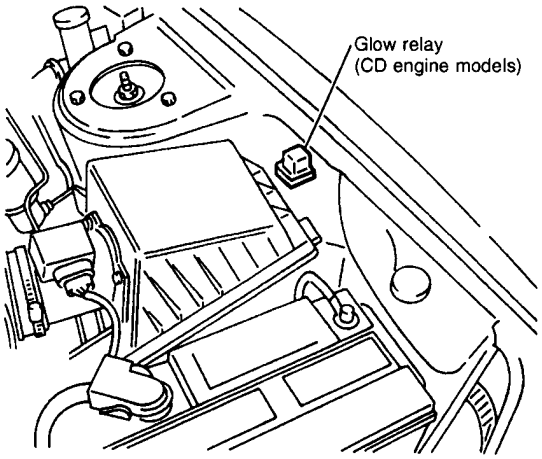
OK ↓

NATS security ind. cell is malfunctioning.
Replace NATS security ind.

Engine Compartment



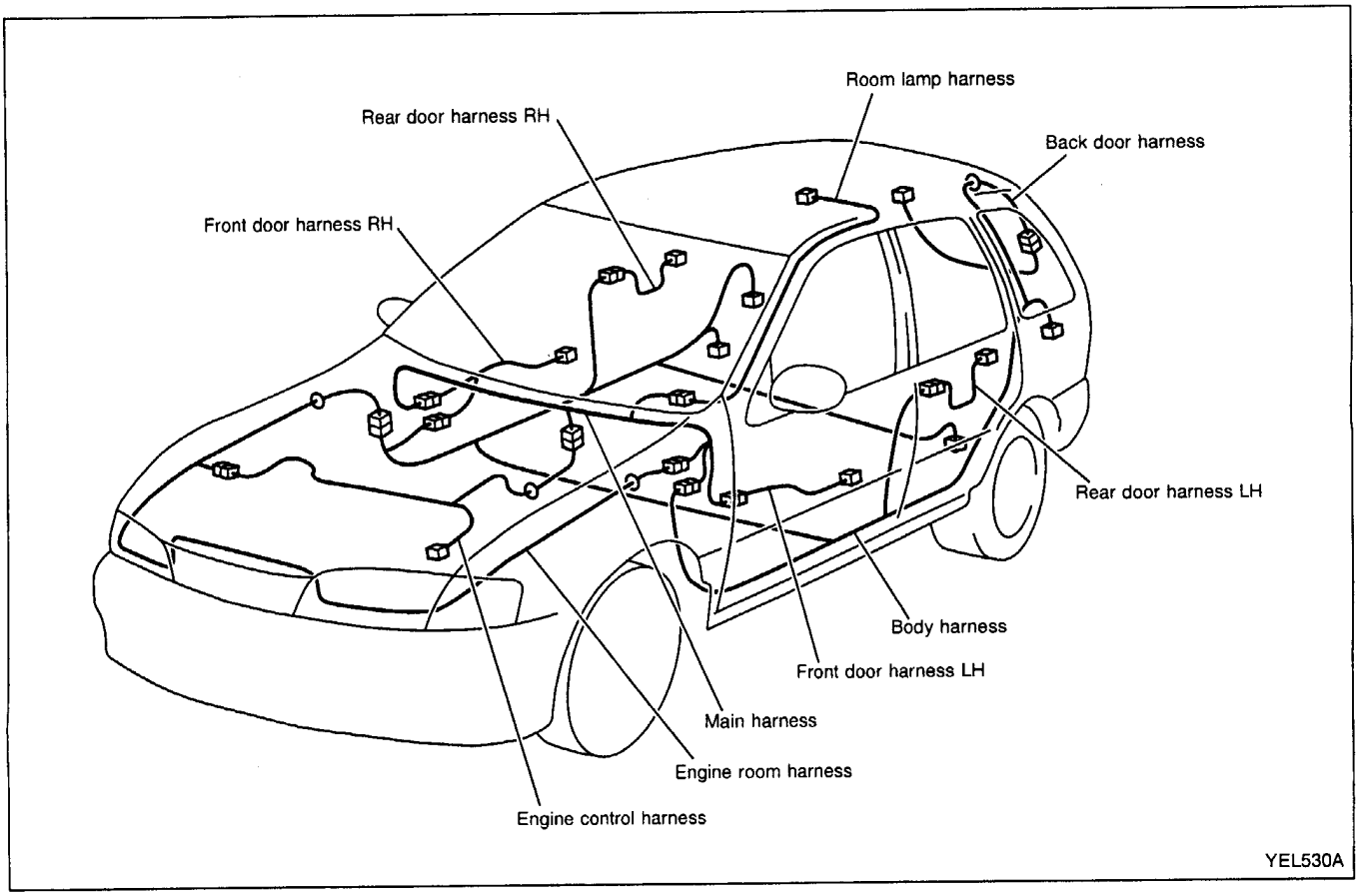




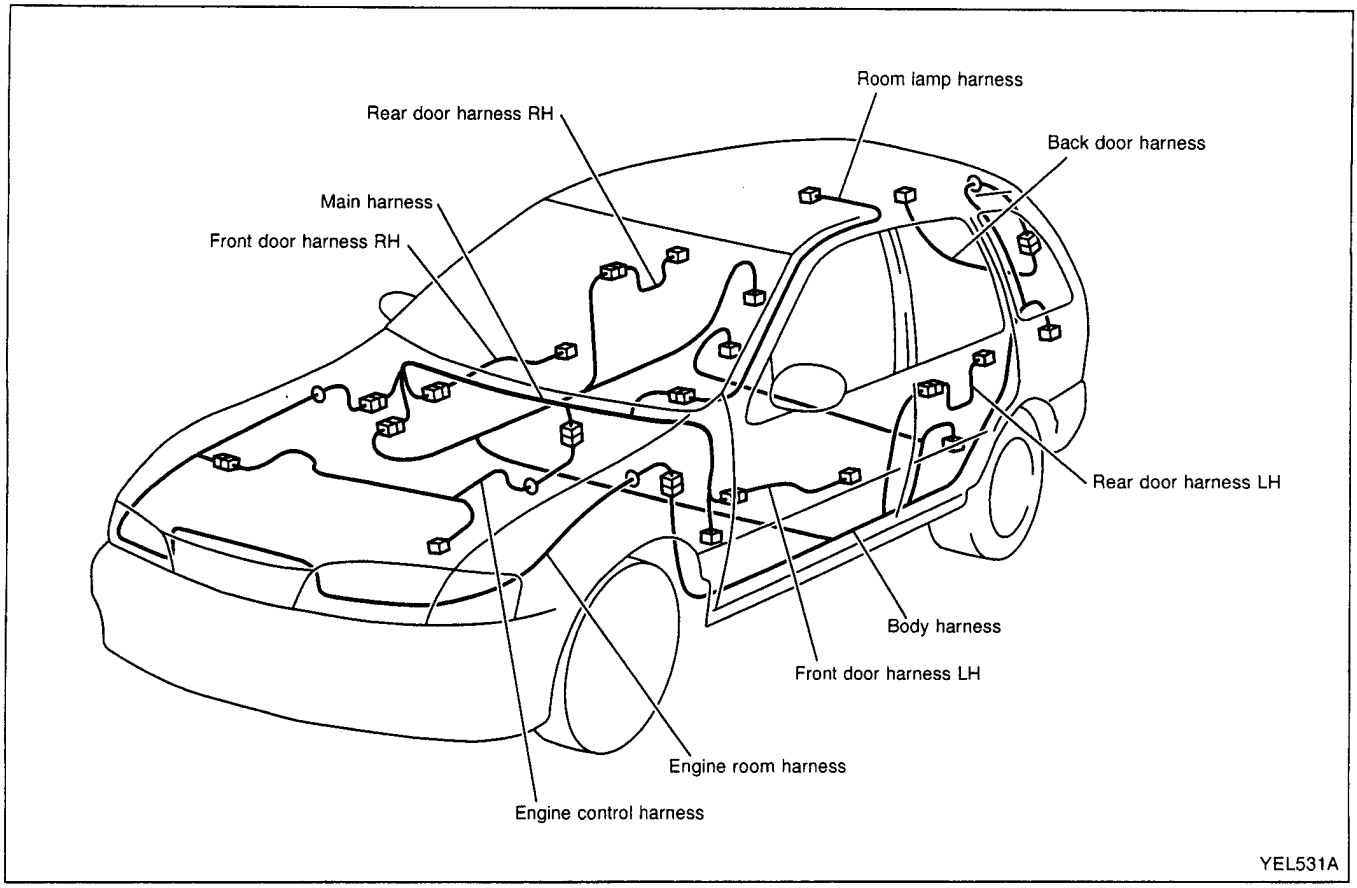
YEL674A

Outline

LHD MODELS

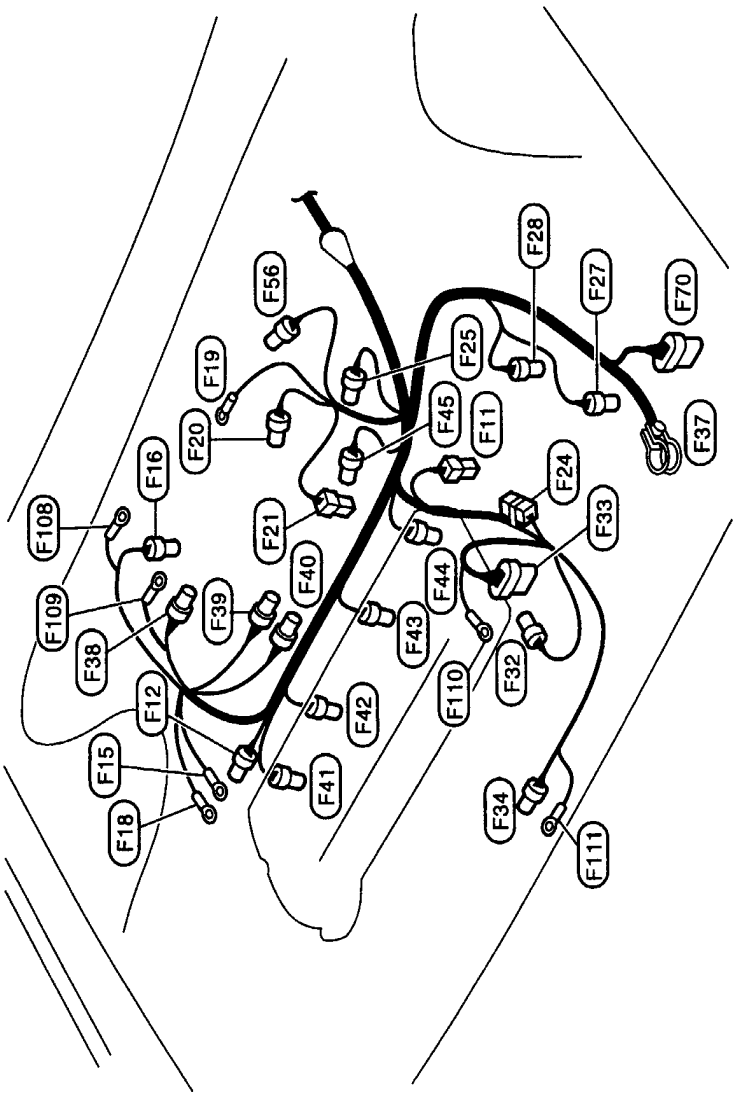


RHD MODELS

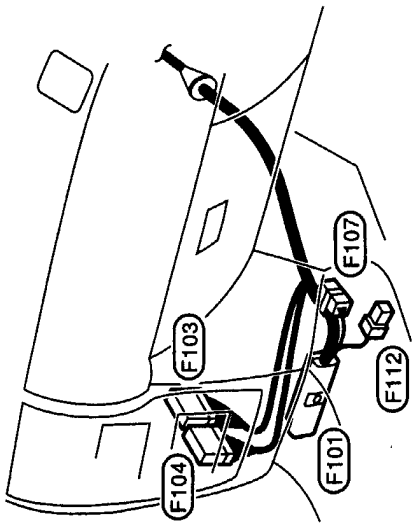

Room lamp harness
Rear door harness RH
Back door harness
Main harness
Front door harness RH
Rear door harness LH
Body harness
Front door harness LH
Engine room harness
Engine control harness
YEL531A

Engine Control Harness

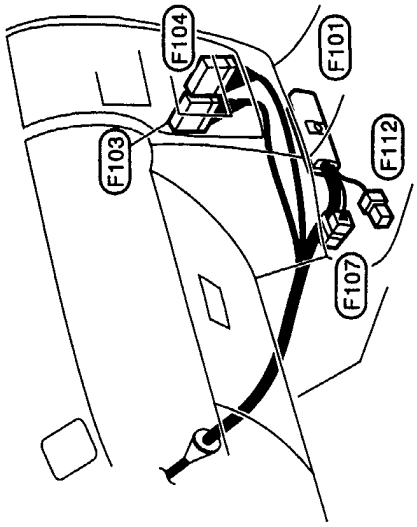
GA16DE ENGINE

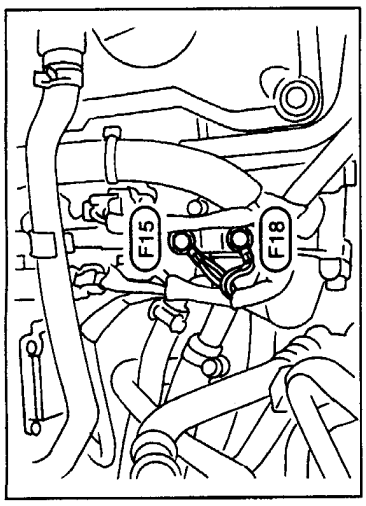


LHD models

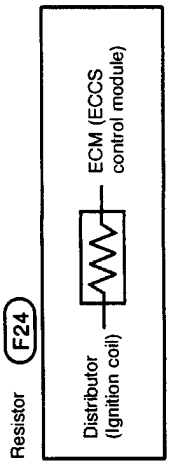


RHD models





Engine ground



YEL651A

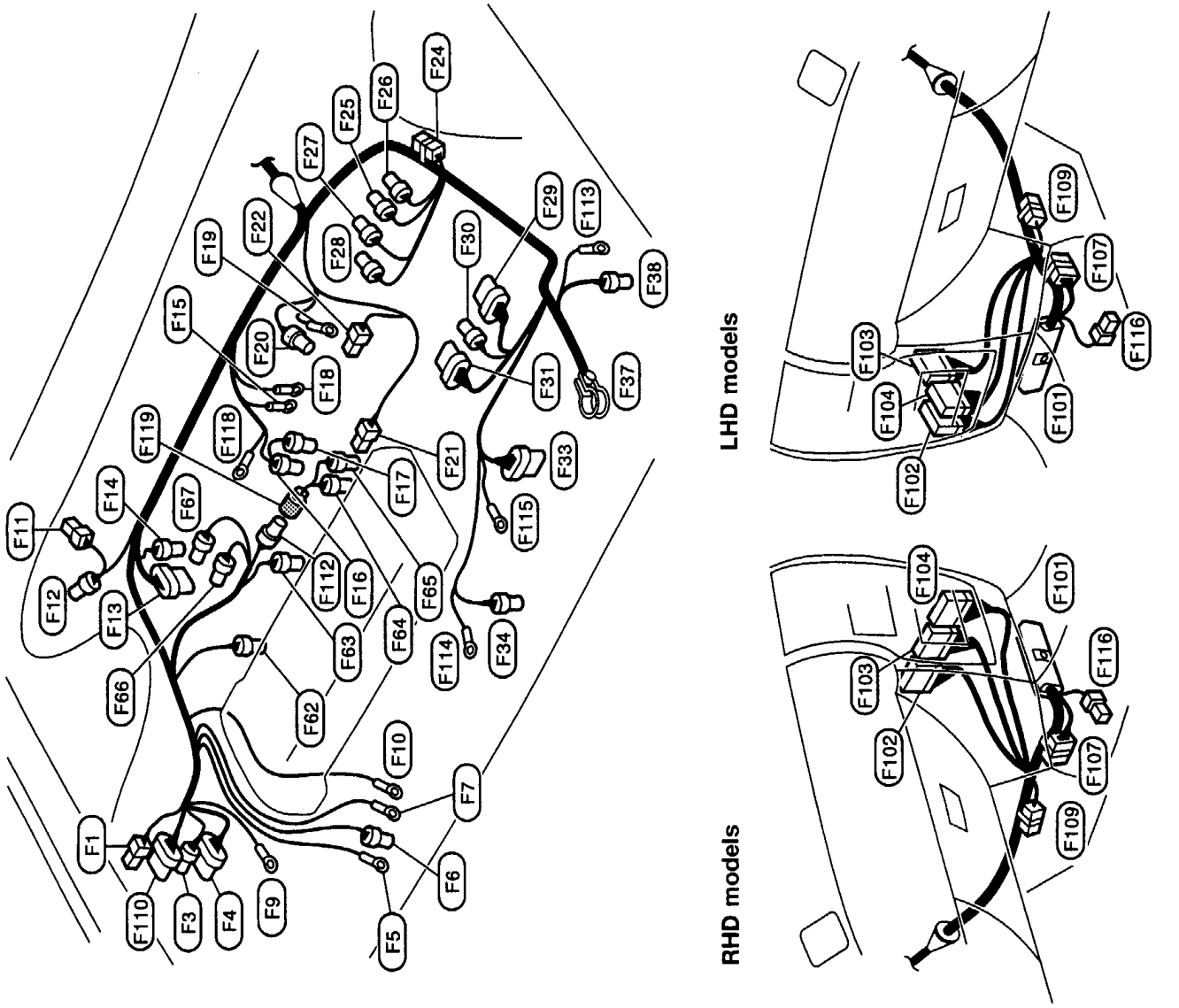
Engine Control Harness (Cont'd)

F11	B/1	Thermal transmitter
F12	GY/2	Engine coolant temperature sensor
F15	-	Engine ground
F16	BR/3	Throttle position sensor
F18	-	Engine ground
F19	-	Starter motor
F20	-/1	Starter motor
F21	B/1	Oil pressure switch
F24	-/2	Resistor
F25	BR/3	Vehicle speed sensor
F27	GY/2	Back-up lamp switch
F28	B/2	Neutral position switch
F32	GY/2	Distributor (Ignition coil)
F33	GY/6	Distributor (Camshaft position sensor)
F34	GY/3	Heated oxygen sensor
F37	-	Battery
F38	GY/3	Mass air flow sensor
F39	BR/2	IACV-AAC valve
F40	PU/2	IACV-FICD solenoid valve
F41	B/2	Injector No. 1
F42	B/2	Injector No. 2
F43	B/2	Injector No. 3
F44	B/2	Injector No. 4
F45	G/2	EGR valve and EVAP canister purge control solenoid valve
F56	GY/1	Starter motor (Nordic)
F70	GY/6	To E65
F101	L/64	ECM (ECCS control module)
F103	W/10	To M52
F104	W/16	To M50
F107	GY/6	Joint connector-1
F108	-	Throttle position sensor (Shield earth)
F109	-	Mass air flow sensor (Shield earth)
F110	-	Distributor (Shield earth)
F111	-	Heated oxygen sensor (Shield earth)
F112	W/3	To A/C harness

YEL652A

Engine Control Harness (Cont'd)

SR20De/DE ENGINE

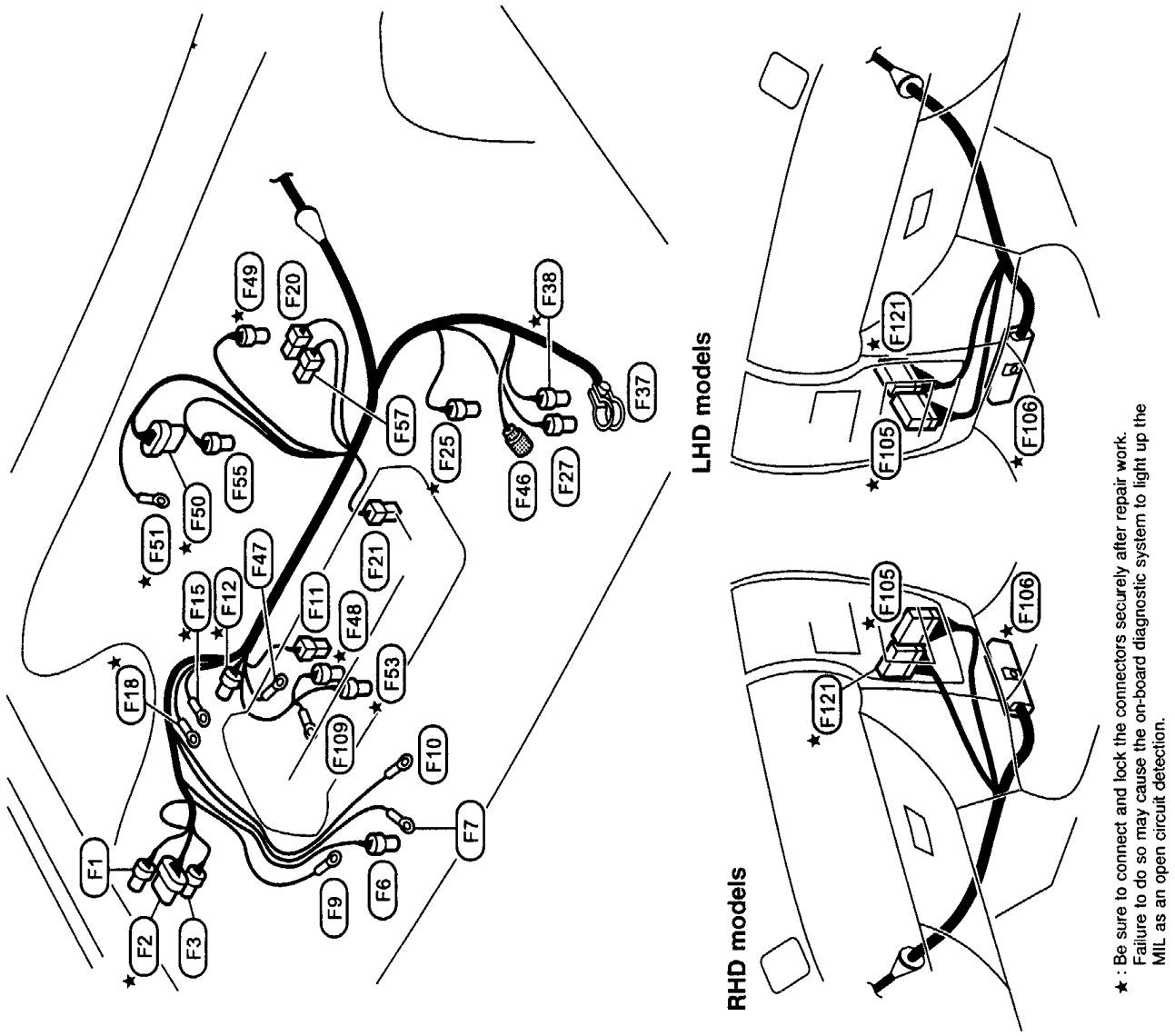


Engine Control Harness (Cont'd)

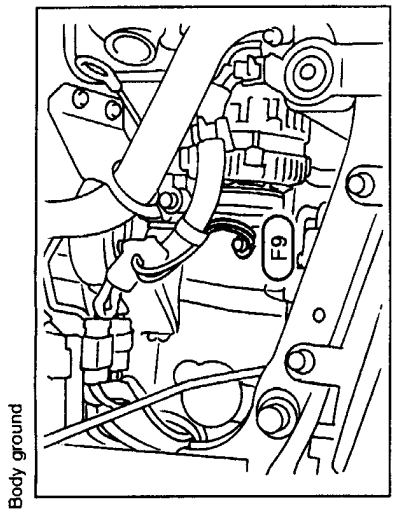
F1	B/2	:	To E41
F3	B/2	:	To E44
F4	GY/8	:	To E42 (LHD)
F5	–	:	Alternator (Except A/T models : with A/C)
F6	GY/2	:	Alternator (A/T models : with A/C)
F7	–	:	Alternator
F9	–	:	Body ground
F10	–	:	Alternator
F11	B/1	:	Thermal transmitter
F12	GY/2	:	Engine coolant temperature sensor
F13	GY/8	:	To injection sub harness
F14	B/2	:	To injection sub harness
F15	–	:	Engine ground
F16	BR/3	:	Throttle position sensor
F17	GY/3	:	Throttle position sensor (A/T models)
F18	–	:	Engine ground
F19	–	:	Starter motor
F20	–	:	Starter motor
F21	B/1	:	Oil pressure switch
F22	B/2	:	Knock sensor
F24	–	:	Resistor
F25	BR/3	:	Vehicle speed sensor
F26	GY/3	:	Revolution sensor (A/T models)
F27	GY/2	:	Back-up lamp switch (M/T models)
F28	B/2	:	Neutral position switch (M/T models)
F29	BR/8	:	Terminal cord assembly (A/T models)
F30	GY/2	:	Inhibitor switch (A/T models)
F31	GY/8	:	Inhibitor switch (A/T models)
F33	GY/8	:	Distributor
F34	W/3	:	Heated oxygen sensor
F37	–	:	Battery
F38	BR/4	:	Mass air flow sensor
F62	GY/2	:	Injector No. 1
F63	GY/2	:	Injector No. 2
F64	GY/2	:	Injector No. 3
F65	GY/2	:	Injector No. 4
F66	PU/2	:	IACV-FICD solenoid valve
F67	BR/2	:	IACV/AAC valve
F101	L/64	:	ECM (ECCS control module)
F102	W/20	:	To M53
F103	W/10	:	To M52
F104	W/16	:	To M50
F107	GY/6	:	Joint connector
F109	–	:	Diode (With A/C)
F110	GY/10	:	To E42 (RHD models)
F112	GY/4	:	To injection sub harness
F113	–	:	Mass air flow sensor (Shield earth)
F114	—	:	Heated oxygen sensor (Shield earth)
F115	—	:	Distributor (Shield earth)
F116	W/3	:	To A/C harness (With A/C harness)
F118	—	:	Throttle position sensor (Shield earth)
F119	GY/4	:	To F112

YEL654A

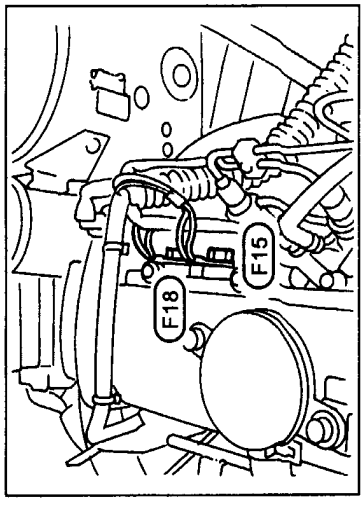
CD20T ENGINE



★: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the on-board diagnostic system to light up the MIL as an open circuit detection.



Body ground



Engine ground

YEL655A

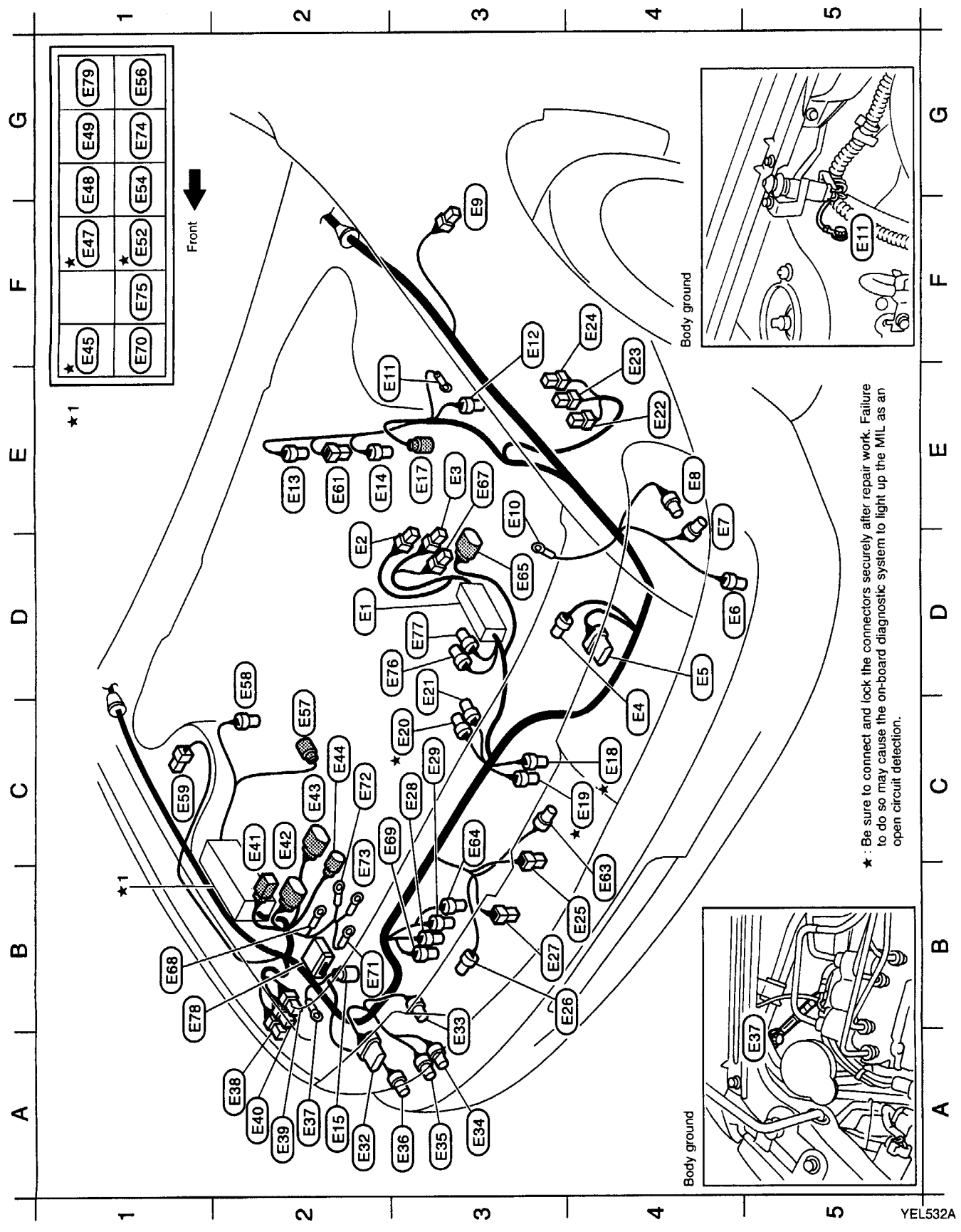
Engine Control Harness (Cont'd)

	F1	B/2	To E41
*	F2	GY/6	To E43
	F3	B/2	To E44
	F6	GY/2	Alternator
	F7	—	Alternator
	F9	—	Body ground
	F10	—	Alternator
	F11	B/1	Thermal transmitter
*	F12	GY/2	Engine coolant temperature sensor
*	F15	—	Engine ground
*	F18	—	Engine ground
	F20	B/1	Starter motor
	F21	B/1	Oil pressure switch
*	F25	BR/3	Vehicle speed sensor
	F27	GY/2	Back-up lamp switch
	F37	—	Battery
*	F38	B/5	Mass air flow sensor
	F46	B/1	To E2
	F47	—	Glow plug
*	F48	BR/2	Needle lift sensor
*	F49	BR/3	Injection pump
*	F50	B/7	Injection pump
*	F51	—	Injection pump (Shield earth)
*	F53	B/3	Crankshaft position sensor (TDC)
	F55	B/2	EGRC-solenoid valve
	F57	—	Starter motor
*	F105	W/4	To M65
*	F106	GY/68	ECM (ECCS-D control module)
	F109	—	Needle lift sensor (Shield earth)
*	F121	W/24	To M51

YEL656A

Engine Room Harness

ENGINE COMPARTMENT — LHD models



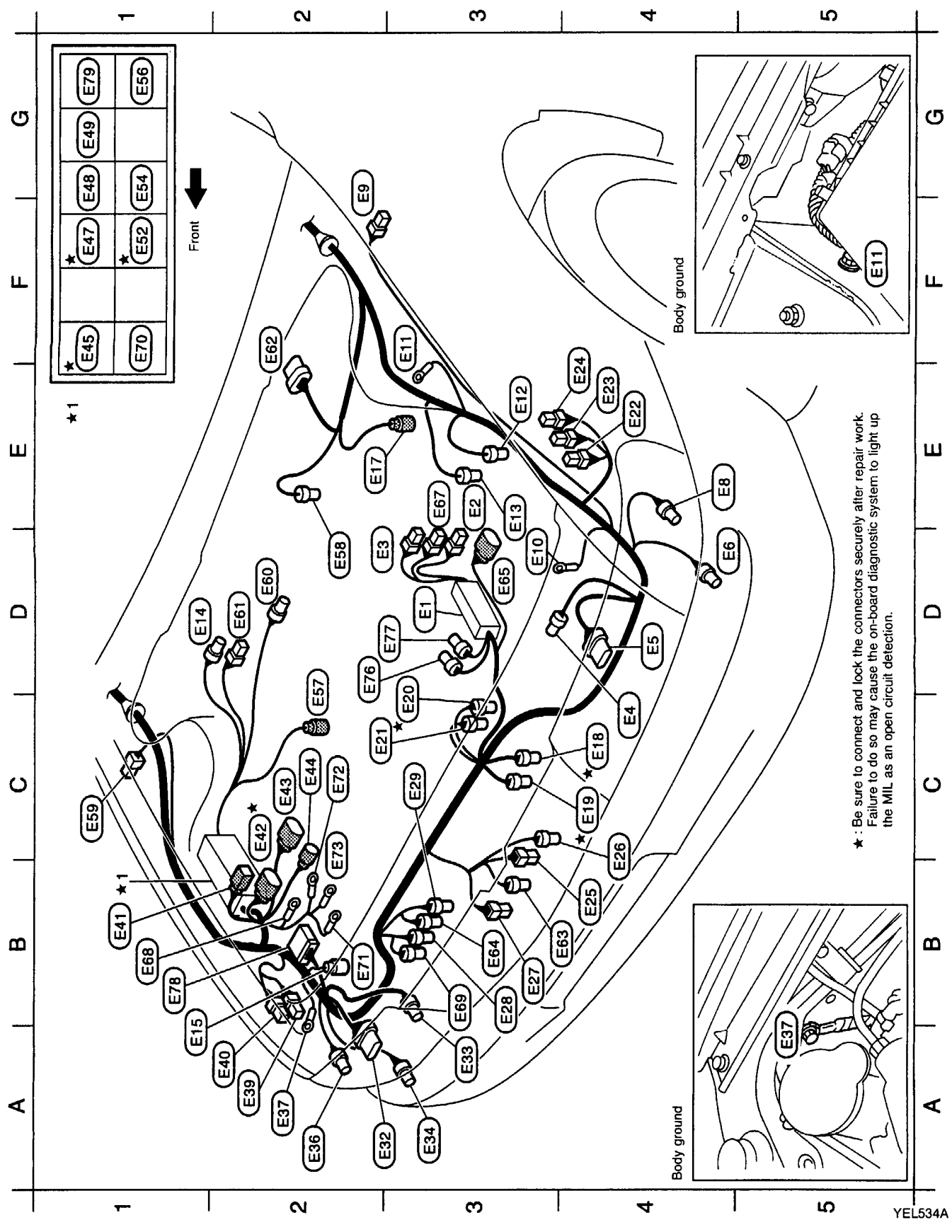
Engine Room Harness (Cont'd)

D2	E1	—	Fusible link holder
D2	E2	B/1	To F46
E3	E3	B/1	Battery
C4	E4	B/3	Headlamp aiming motor LH
D4	E5	GY/6	Front combination lamp LH
D4	E6	B/2	Front fog lamp LH
E4	E7	GY/4	Headlamp wiper motor LH (With headlamp cleaner)
E4	E8	GY/2	Front turn signal lamp LH
F3	E9	B/2	Side turn signal lamp LH
E3	E10	—	ABS ground
E3	E11	—	Body ground
F3	E12	GY/2	Hood switch
E2	E13	GY/2	Sedimenter (CD engine)
E2	E14	GY/2	Brake fluid level switch
A2	E15	GY/2	Dropping resistor (A/T models)
E3	E17	BR/2	Front wheel sensor LH
C4*	E18	B/2	Cooling fan motor-2 (With diesel engine)
C4*	E19	B/2	Cooling fan motor-1 (With gasoline engine)
C3*	E20	B/4	Triple-pressure switch
D3	E21	B/2	Dual-pressure switch
E4	E22	G/2	Glow relay (CD engine)
F4	E23	W/1	Glow relay (CD engine)
F4	E24	W/1	Glow relay (CD engine)
B4	E25	B/1	Horn (low)
B4	E26	GY/2	Outside air temperature sensor
B3	E27	B/1	Horn (high)
C3	E28	GY/2	Cooling fan motor-2 (With gasoline engine)
C3	E29	B/2	Cooling fan motor-1 (With diesel engine)
A2	E32	GY/6	Front combination lamp RH
B3	E33	B/3	Headlamp aiming motor RH
A3	E34	B/2	Front fog lamp RH
A3	E35	GY/4	Headlamp wiper motor RH (With headlamp cleaner)
A3	E36	GY/2	Front turn signal lamp RH
A2	E37	—	Body ground
A2	E38	G/2	Headlamp washer motor (With headlamp cleaner)
A2	E39	B/2	Washer level switch
A2	E40	W/2	Washer motor
C2	E41	B/2	To F1 (Except GA engine)
C2*	E42	GY/8	To F4 (SR engine)
C2	E43	GY/6	To F2
C2	E44	B/2	To F3 (Except GA engine)
F1*	E45	L/4	Cooling fan relay-1
F1*	E47	L/4	Cooling fan relay-3 (CD engine)
G1	E48	W/3	Horn relay
G1	E49	L/4	Front fog lamp relay
F1*	E52	B/5	Rear wiper relay
G1	E54	B/5	Cooling fan relay-2 (CD engine)
G1	E56	L/4	Air conditioner relay
C2	E57	GY/2	Front wheel sensor RH
D2	E58	L/2	EVAP Canister purge control solenoid valve (SR engine)
C1	E59	B/2	Side turn signal lamp RH
E2	E61	W/1	Vaccum switch (CD engine)
B4	E63	BR/2	Ambient air temperature switch (SR engine)
C3	E64	B/1	Compressor (CD engine)
D3	E65	GY/6	To F70 (GA engine)
E3	E67	B/1	Battery (CD engine)
B1	E68	—	Body ground (GA engine)
C2	E69	B/1	Compressor (Except CD engine)
F1	E70	B/5	Front wiper relay
B2	E71	—	Alternator (GA engine)
C2	E72	—	Alternator (GA engine)
C2	E73	—	Alternator (GA engine)
G1	E74	L/4	Headlamp relay LH (For nordic)
F1	E75	BR/6	Headlamp relay RH (For nordic)
D3	E76	W/1	Fusible link holder } (Gasoline engine models)
D3	E77	B/1	Fusible link holder }
B1	E78	B/27	ABS control unit
G1	E79	L/4	Power socket relay

YEL533A

Engine Room Harness (Cont'd)

ENGINE COMPARTMENT — RHD models

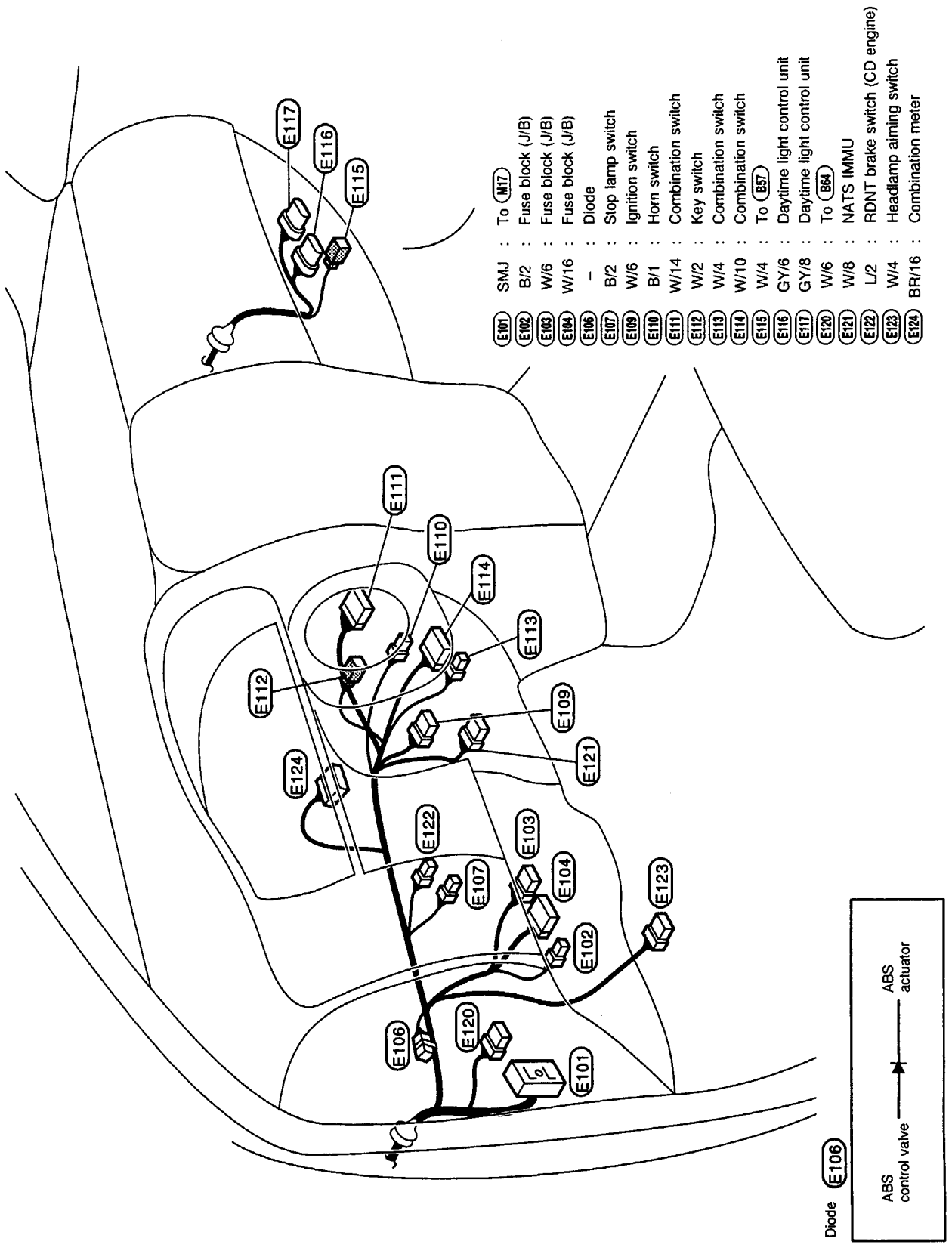


D3	E1	—	:	Fusible link holder
E3	E2	B/1	:	To F46
D3	E3	B/1	:	Battery
C4	E4	B/3	:	Headlamp aiming motor LH
D4	E5	GY/6	:	Front combination lamp LH
D4	E6	B/2	:	Front fog lamp LH
E4	E8	GY/2	:	Front turn signal lamp LH
G2	E9	B/2	:	Side turn signal lamp LH
D3	E10	–	:	ABS ground
F3	E11	–	:	Body ground
E3	E12	GY/2	:	Hood switch
E3	E13	GY/2	:	Sedimenter (CD engine)
D1	E14	GY/2	:	Brake fluid level switch
A1	E15	GY/2	:	Dropping resistor (A/T models)
E2	E17	BR/2	:	Front wheel sensor LH
C4*	E18	B/2	:	Cooling fan motor-2 (With diesel engine)
C4*	E19	B/2	:	Cooling fan motor-1 (With gasoline engine)
C3*	E20	B/4	:	Triple-pressure switch (CD engine)
C2	E21	B/2	:	Dual-pressure switch
E4	E22	G/2	:	Glow relay (CD engine)
E4	E23	W/1	:	Glow relay (CD engine)
E4	E24	W/1	:	Glow relay (CD engine)
B4	E25	B/1	:	Horn (low)
C4	E26	GY/2	:	Outside air temperature sensor
B3	E27	B/1	:	Horn (high)
B3	E28	GY/2	:	Cooling fan motor-2 (Except CD engine: With A/C)
C3	E29	B/2	:	Cooling fan motor-1 (CD engine: With A/C)
A3	E32	GY/6	:	Front combination lamp RH
A3	E33	B/3	:	Headlamp aiming motor RH
A3	E34	B/2	:	Front fog lamp RH
A2	E36	GY/2	:	Front turn signal lamp RH
A2	E37	–	:	Body ground
A2	E39	B/2	:	Washer level switch
A2	E40	W/2	:	Washer motor
B1	E41	B/2	:	To F1 (Except GA engine)
C2*	E42	GY/10	:	To F110 (SR engine)
C2	E43	GY/6	:	To F2 (CD engine)
C2	E44	B/2	:	To F3 (Except GA)
F1*	E45	L/4	:	Cooling fan relay-1
F1*	E47	L/4	:	Cooling fan relay-3 (CD engine)
G1	E48	W/3	:	Horn relay
G1	E49	L/4	:	Front fog lamp relay
F1*	E52	B/5	:	Rear wiper relay
G1	E54	B/5	:	Cooling fan relay-2 (CD engine)
G1	E56	L/4	:	Air conditioner relay (With A/C)
D2	E57	GY/2	:	Front wheel sensor RH
D2	E58	L/2	:	EVAP Canister purge control solenoid valve (SR engine)
C1	E59	B/2	:	Side turn signal lamp RH
D2	E60	GY/2	:	Power steering oil pressure switch (Except CD engine)
D2	E61	W/1	:	Vacuum switch (CD engine)
F2	E62	W/6	:	Front wiper motor
B4	E63	BR/2	:	Ambient air temperature switch (SR engine : With A/C)
B3	E64	B/1	:	A/C compressor (CD engine : With A/C)
D3	E65	GY/6	:	To F70 (GA engine)
E3	E67	B/1	:	Battery (CD engine)
B1	E68	—	:	Body ground (GA engine)
B3	E69	B/1	:	Compressor (Except CD engine : With A/C)
F1	E70	B/5	:	Front wiper relay
B2	E71	—	:	Alternator (GA engine)
C2	E72	—	:	Alternator (GA engine)
C2	E73	—	:	Alternator (GA engine)
D2	E76	W/1	:	Fusible link holder } (Gasoline engine models)
D3	E77	B/1	:	Fusible link holder }
B1	E69	B/27	:	ABS control unit
G1	E70	L/4	:	Power socket relay

YEL535A

Engine Room Harness (Cont'd)

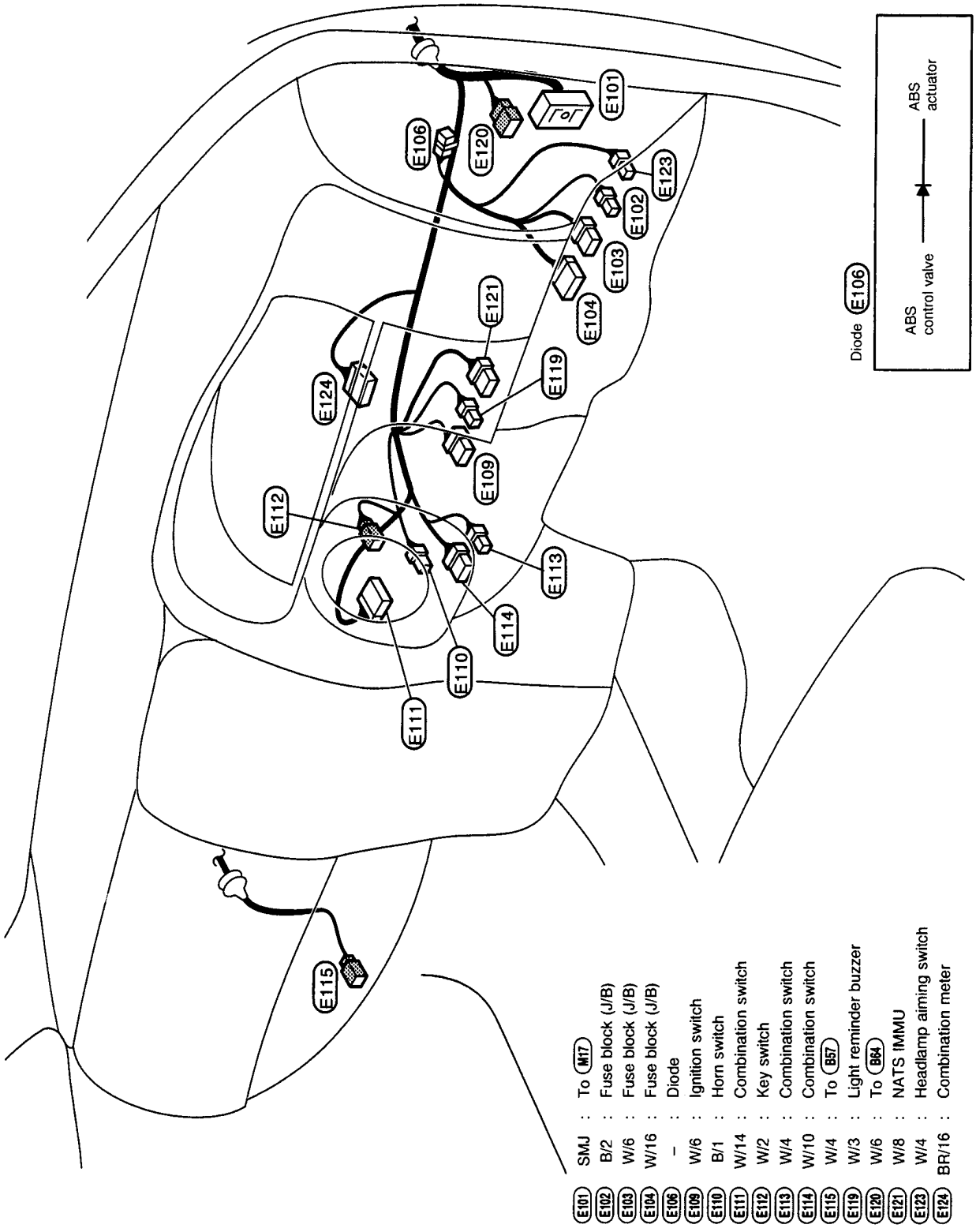
PASSENGER COMPARTMENT — LHD models



YEL536A

Engine Room Harness (Cont'd)

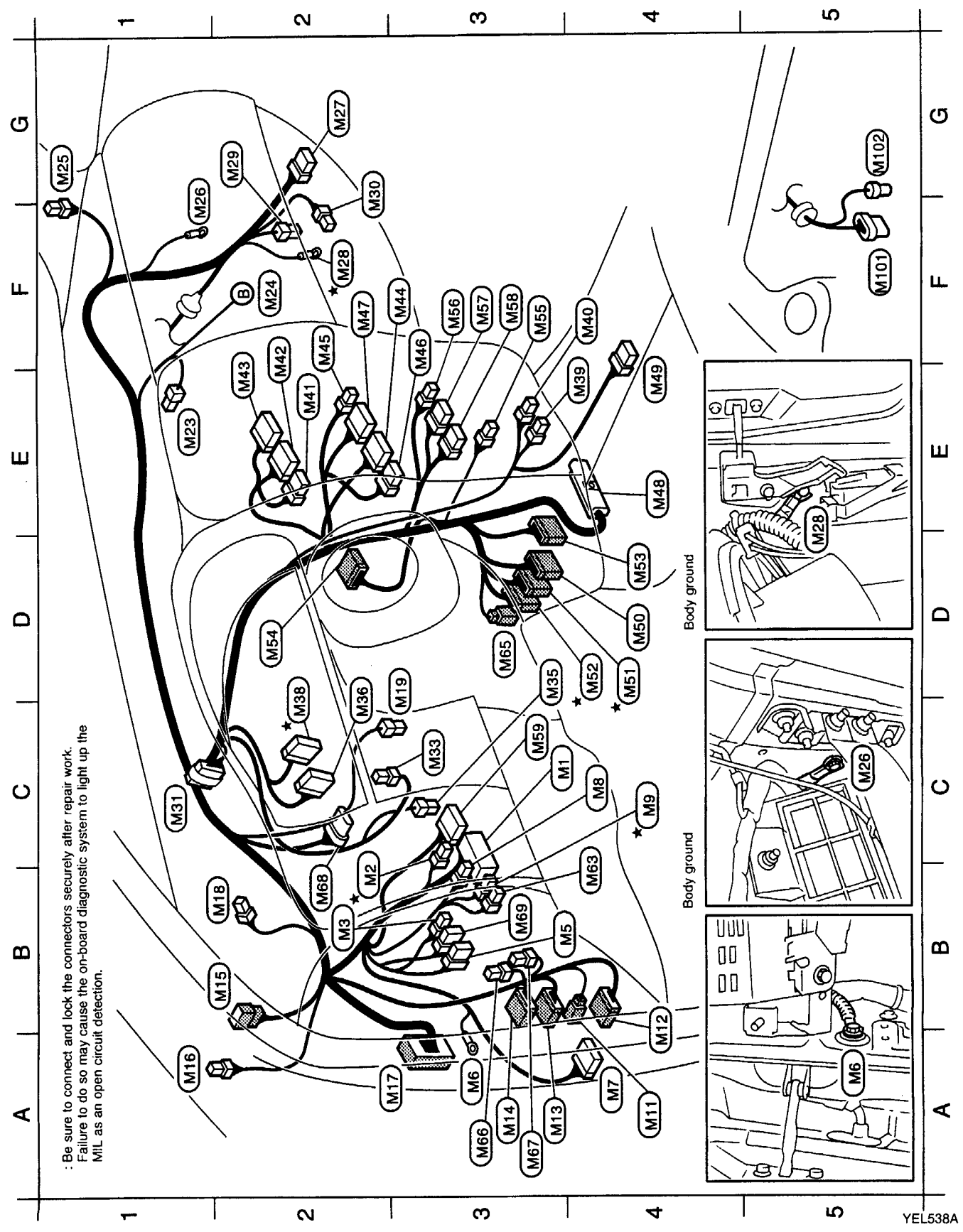
PASSENGER COMPARTMENT — RHD models



YEL537A

Main Harness

LHD MODELS



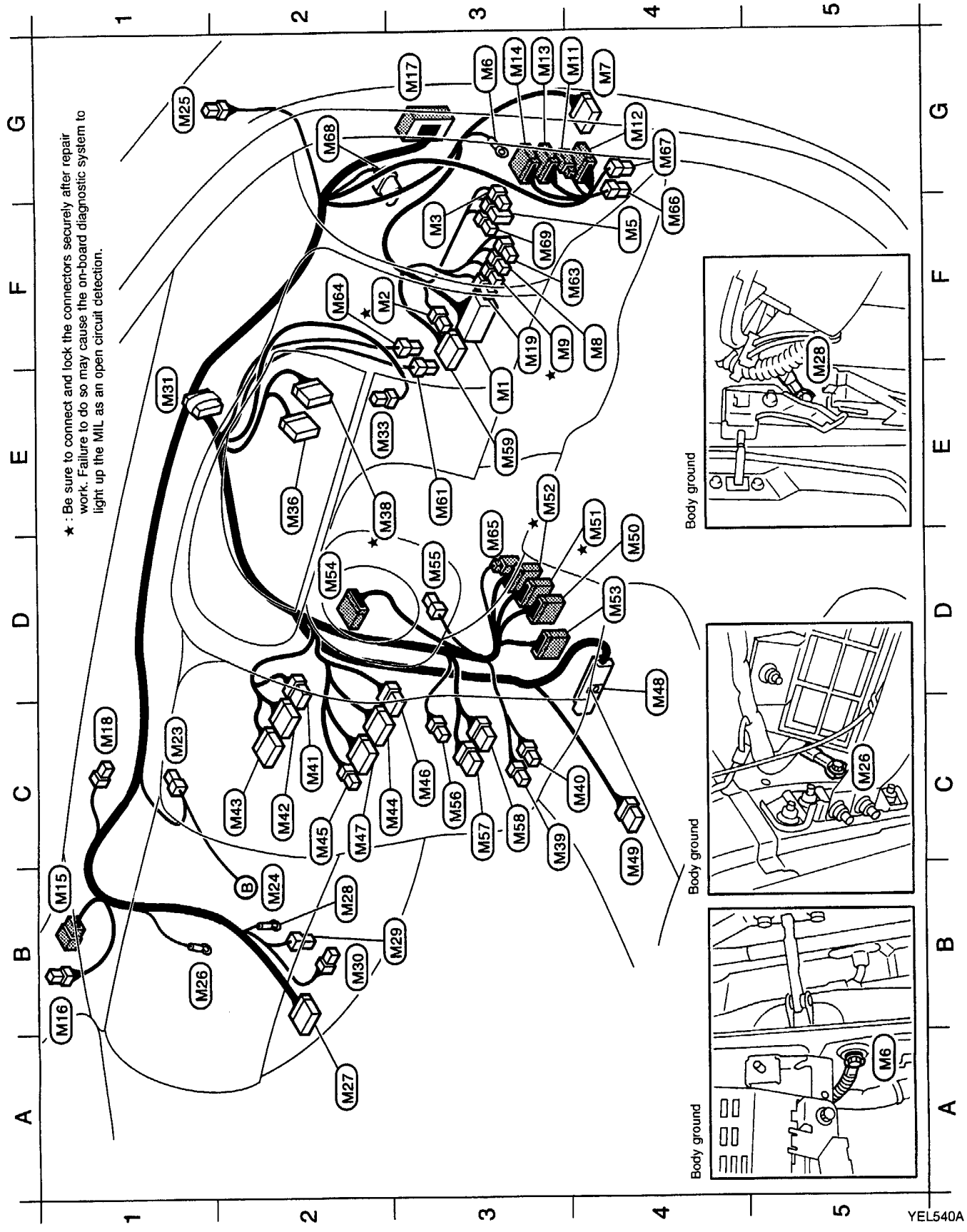
Main harness

C3	M1	–	:	Fuse block (J/B)
B2*	M2	B/2	:	Fuse block (J/B)
B2	M3	W/4	:	Illumination control switch (With illumination control switch)
B3	M5	W/8	:	Door mirror remote control switch (With door mirror remote control switch)
A3	M6	–	:	Body ground
A4	M7	W/12	:	To D1
C4	M8	L/4	:	Fuel pump relay (Except CD engine)
C4*	M9	L/4	:	ECCS relay (Except CD engine)
A4	M11	W/4	:	To B2
B4	M12	W/12	:	To B1
A3	M13	W/24	:	To B3
A3	M14	W/10	:	To B4
B2	M15	W/6	:	To R1
A1	M16	BR/2	:	Tweeter LH (With tweeter)
A2	M17	SMJ	:	To E101
B2	M18	B/2	:	NATS security indicator
D3	M19	W/2	:	Kickdown switch (A/T models)
E1	M23	W/4	:	Intake door motor
F2	M24	Bulb	:	Glove box lamp (With glove box lamp)
G1	M25	BR/2	:	Tweeter RH (With tweeter)
G1	M26	–	:	Body ground
G2	M27	W/8	:	To D10
F2*	M28	–	:	Body ground
G2	M29	BR/4	:	Fan resistor
G2	M30	W/2	:	Blower motor
C1	M31	—	:	Diode (Except CD engine)
C3	M33	B/3	:	Combination flasher unit
D3	M35	W/3	:	Light reminder buzzer
C2	M36	W/14	:	Combination meter
C2*	M38	W/16	:	Combination meter
E4	M39	B/2	:	Cigarette lighter socket
F4	M40	W/2	:	Ashtray illumination
E2	M41	W/6	:	Audio
F2	M42	W/10	:	Audio
E2	M43	W/12	:	Audio (With CD changer)
F3	M44	W/12	:	A/C switch
F2	M45	W/2	:	Heater
F3	M46	W/6	:	Fan switch
F2	M47	W/8	:	Recirculation switch
E4	M48	L/48	:	A/T control unit (A/T models)
E4	M49	W/6	:	A/T control device (A/T models)
D4	M50	W/16	:	To F104 (Except CD engine)
D4*	M51	W/24	:	To F121 (CD engine)
D4*	M52	W/10	:	To F103
D4	M53	W/20	:	To F102 (SR engine)
D2	M54	W/16	:	To Z3
F3	M55	W/3	:	Thermo control amplifier
F3	M56	W/2	:	ORN illumination
F3	M57	W/6	:	Rear window defogger switch
F3	M58	W/8	:	Hazard switch
C3	M59	GY/14	:	Data link connector for CONSULT
B4	M63	L/4	:	ECCS relay (CD engine)
D3	M65	W/4	:	To F105 (CD engine)
A3	M66	W/2	:	Circuit breaker-1
A3	M67	W/2	:	Circuit breaker-2 (With power seat)
B2	M68	B/5	:	Accelerator work unit (CD engine)
B3	M69	L/4	:	Power window relay
F5	M101	W/6	:	Front wiper motor
G5	M102	GY/2	:	Power steering oil pressure switch (Except CD engine)

YEL539A

Main Harness (Cont'd)

RHD MODELS

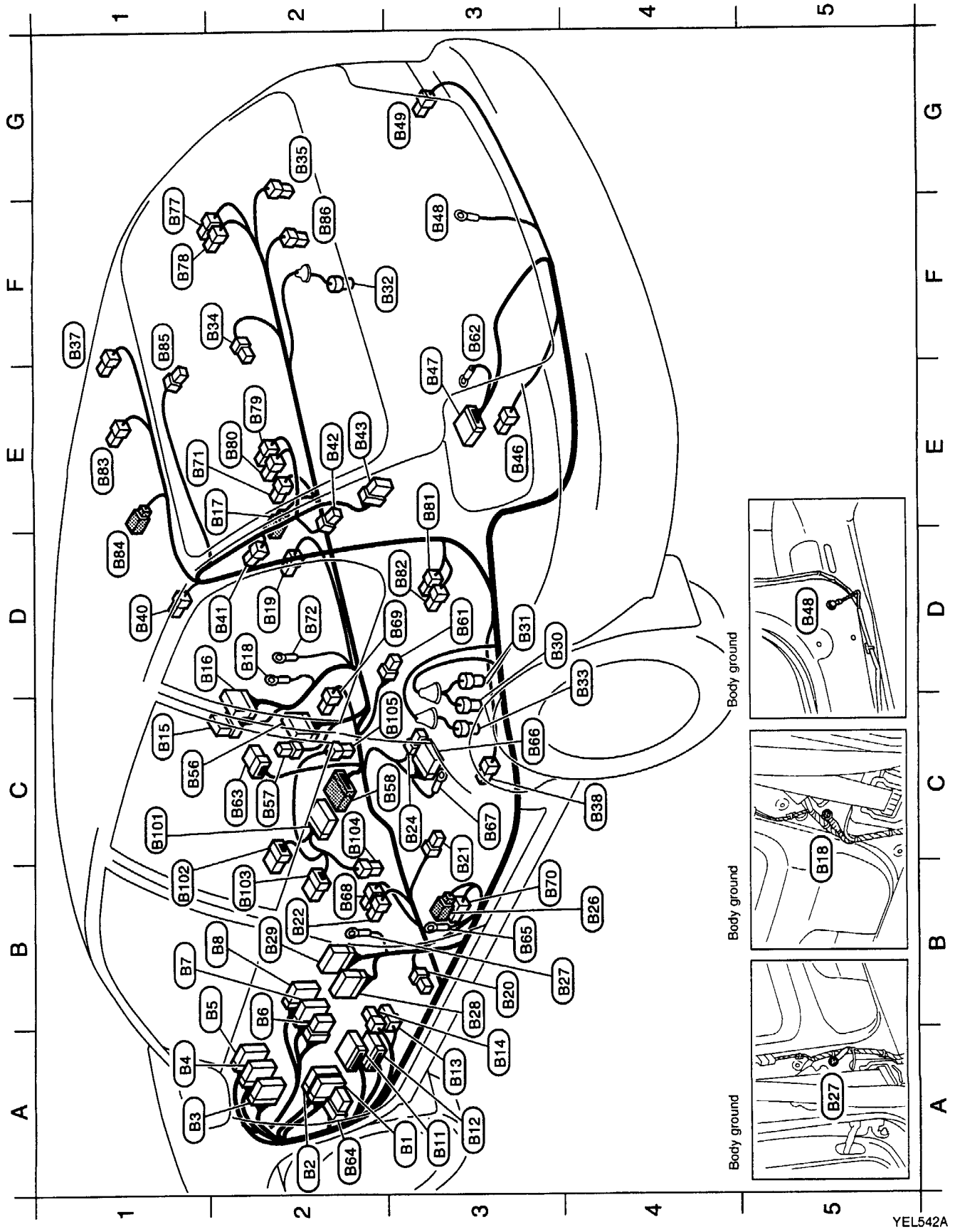


E3	M1	–	:	Fuse block (J/B)
F2*	M2	B/2	:	Fuse block (J/B)
F3	M3	W/4	:	Illumination control switch (With illumination control switch)
F4	M5	W/8	:	Door mirror remote control switch (With door mirror remote control switch)
G3	M6	–	:	Body ground
G4	M7	W/12	:	To D1
F4	M8	L/4	:	Fuel pump relay (Except CD engine)
F3*	M9	L/4	:	ECCS relay (Except CD engine)
G4	M11	W/4	:	To B2
G4	M12	W/12	:	To B1
G3	M13	W/24	:	To B3
G3	M14	W/10	:	To B4
B1	M15	W/6	:	To R1
B1	M16	BR/2	:	Tweeter LH (With tweeter)
G3	M17	SMJ	:	To E101
C1	M18	B/2	:	NATS security indicator
F3	M19	W/2	:	Kickdown switch (A/T models)
C1	M23	W/4	:	Intake door motor
B2	M24	Bulb	:	Glove box lamp (With glove box lamp)
G1	M25	BR/2	:	Tweeter RH (With tweeter)
B1	M26	–	:	Body ground
A2	M27	W/8	:	To D10
B2	M28	–	:	Body ground
B3	M29	BR/4	:	Fan resistor
B2	M30	W/2	:	Blower motor
E1	M31	—	:	Diode (Except CD engine)
E2	M33	B/3	:	Combination flasher unit
E2	M36	W/14	:	Combination meter
E2*	M38	W/16	:	Combination meter
C3	M39	B/2	:	Cigarette lighter socket
C4	M40	W/2	:	Ashtray illumination
C2	M41	W/6	:	Audio
C2	M42	W/10	:	Audio
C2	M43	W/12	:	Audio (With CD changer)
C2	M44	W/12	:	A/C switch
C2	M45	W/2	:	Heater
C3	M46	W/6	:	Fan switch
C2	M47	W/8	:	Recirculation switch
D4	M48	L/48	:	A/T control unit (A/T models)
C4	M49	W/6	:	A/T control device (A/T models)
D4	M50	W/16	:	To F104 (Except CD engine)
E4*	M51	W/24	:	To F121 (CD engine)
E3*	M52	W/10	:	To F103
D4	M53	W/20	:	To F102 (SR engine)
D2	M54	W/16	:	To Z3
D3	M55	W/3	:	Thermo control amplifier
C3	M56	W/2	:	ORN illumination
C3	M57	W/6	:	Rear window defogger switch
C3	M58	W/8	:	Hazard switch
E3	M59	GY/14	:	Data link connector for CONSULT
E3	M61	B/2	:	Stop lamp switch
F4	M63	L/4	:	ECCS relay (CD engine)
F2	M64	L/2	:	RDNT brake switch (CD engine)
D3	M65	W/4	:	To F105 (CD engine)
F4	M66	W/2	:	Circuit breaker-1
G4	M67	W/2	:	Circuit breaker-2 (With power seat)
G2	M68	B/5	:	Accelerator work unit (CD engine)
F3	M69	L/4	:	Power window relay

YEL541A

Body Harness

LHD models



Body harness

A3	B1	W/12	:	To M12
A2	B2	W/4	:	To M11
A1	B3	W/24	:	To M13
A1	B4	W/10	:	To M14
B1	B5	W/12	:	To D2
B2	B6	W/8	:	Theft warning control unit
B1	B7	W/20	:	Theft warning control unit
B2	B8	W/12	:	Fuse block (J/B)
A3	B11	W/12	:	Super lock control unit
A3	B12	W/16	:	Super lock control unit
A3	B13	L/4	:	Door mirror heat relay
A3	B14	L/4	:	Rear window defogger relay
C1	B15	W/6	:	Ultra sonic sub-sensor
D1	B16	W/8	:	To D22
E2	B17	W/4	:	Seat belt pre-tensioner (Passenger side)
D2	B18	–	:	Body ground
D2	B19	BR/1	:	Front door switch (Passenger side)
B3	B20	B/3	:	Front door switch (Driver's side)
C3	B21	W/3	:	Heated seat LH
B2	B22	W/2	:	Power seat
C3	B24	B/1	:	Parking brake switch
B4	B26	W/4	:	Seat belt pre-tensioner (Driver's side)
B3	B27	–	:	Body ground
B3	B28	W/8	:	To D18
B2	B29	W/8	:	Ultra sonic sensor
D3	B30	GY/2	:	Fuel pump
D3	B31	W/3	:	Fuel pump gauge unit
F3	B32	GY/2	:	Rear wheel sensor RH
D4	B33	BR/2	:	Rear wheel sensor LH
E1	B34	BR/1	:	Rear door switch RH
G1	B35	B/1	:	Theft warning horn
F1	B37	B/2	:	Rear speaker RH
C4	B38	BR/1	:	Rear door switch LH
D1	B40	B/2	:	Rear speaker LH
D2	B41	B/1	:	Rear window defogger
E2	B42	W/4	:	To D101
E2	B43	W/6	:	To D102
E3	B46	W/4	:	Rear combination lamp LH
E3	B47	W/16	:	CD auto changer
F3	B48	—	:	Body ground
G3	B49	W/4	:	Rear combination lamp RH
C1	B56	W/10	:	To D11
C2	B57	W/4	:	To E115
C3	B58	W/12	:	To B101
D3	B61	W/3	:	Heated seat RH
F3	B62	—	:	Shield earth
C2	B63	W/6	:	Ultra sonic cancel switch
A2	B64	W/6	:	To E120
B3	B65	—	:	Body earth
C3	B66	Y/10	:	Diagnosis sensor unit
C3	B67	—	:	Diagnosis sensor unit
B2	B68	Y/2	:	Side air bag module LH
D3	B69	Y/2	:	Side air bag module RH
B3	B70	GY/2	:	Satellite sensor LH
E1	B71	GY/2	:	Satellite sensor RH
D2	B72	—	:	Body earth
F1	B77	B/1	:	Smash sensor RH
F1	B78	B/1	:	Smash sensor RH
E2	B79	B/1	:	Rear window defogger condenser
E2	B80	B/1	:	Rear window defogger condenser
D3	B77	B/1	:	Smash sensor LH
D3	B78	B/1	:	Smash sensor LH
E1	B83	W/2	:	Luggage room lamp
D1	B84	W/1	:	Roof mounted antenna
F1	B85	W/2	:	High mounted stop lamp
F2	B86	B/2	:	Power socket

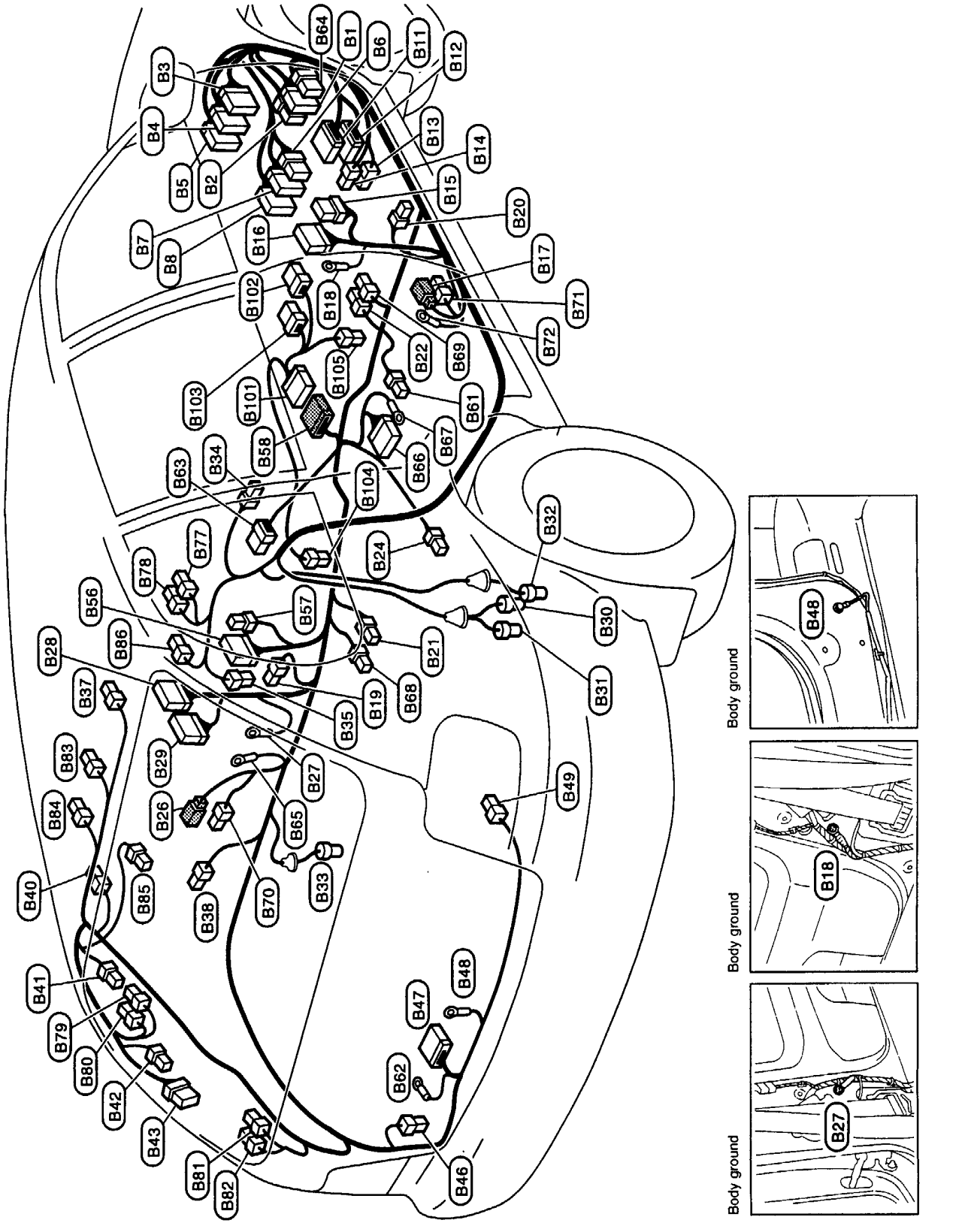
Console harness

C2	B101	W/12	:	To B58
C2	B102	W/6	:	Ultra sonic cancel switch
B2	B103	W/8	:	A/T mode switch
C2	B104	L/4	:	Heated seat switch LH
C3	B105	W/4	:	Heated seat switch RH

YEL543A

Body Harness (Cont'd)

RHD models



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Body harness

G2	B1	W/12	:	To M12
F2	B2	W/8	:	To M11
G1	B3	W/24	:	To M13
G1	B4	W/10	:	To M14
F2	B5	W/12	:	To D2
G3	B6	W/8	:	Theft warning control unit
F1	B7	W/20	:	Theft warning control unit
F1	B8	W/12	:	Fuse block (J/B)
G3	B11	W/12	:	Super lock control unit
G3	B12	W/16	:	Super lock control unit
G3	B13	L/4	:	Door mirror heat relay
G3	B14	L/4	:	Rear window defogger relay
F3	B15	W/6	:	Ultra sonic sub-sensor
F2	B16	W/8	:	To D22
F3	B17	W/4	:	Seat belt pre-tensioner (Driver's side)
F2	B18	–	:	Body ground
D3	B19	BR/1	:	Front door switch (Passenger side)
F3	B20	B/3	:	Front door switch (Driver's side)
D3	B21	W/3	:	Heated seat LH
E3	B22	W/2	:	Power seat
D3	B24	B/1	:	Parking brake switch
C1	B26	W/4	:	Seat belt pre-tensioner (Passenger side)
C2	B27	–	:	Body ground
D1	B28	W/8	:	To D18
C1	B29	W/8	:	Ultra sonic sensor
D4	B30	GY/2	:	Fuel pump
D4	B31	W/3	:	Fuel tank gauge unit
E3	B32	GY/2	:	Rear wheel sensor RH
B2	B33	BR/2	:	Rear wheel sensor LH
E2	B34	BR/1	:	Rear door switch RH
C2	B35	B/1	:	Theft warning horn
D1	B37	B/2	:	Rear speaker RH
B2	B38	BR/1	:	Rear door switch LH
B1	B40	B/2	:	Rear speaker LH
B1	B41	B/1	:	Rear window defogger
A1	B42	W/4	:	To D101
A1	B43	W/6	:	To D102
A3	B46	W/4	:	Rear combination lamp LH
B3	B47	W/16	:	CD auto changer
B3	B48	—	:	Body ground
C4	B49	W/4	:	Rear combination lamp RH
D1	B56	W/10	:	To D11
D2	B57	W/4	:	To E115
E2	B58	W/12	:	To B101
E3	B61	W/3	:	Heated seat RH
A3	B62	—	:	Shield earth
E1	B63	W/6	:	Ultrasonic cancel switch
G2	B64	W/6	:	To E120
C2	B65	—	:	Body earth
E3	B66	Y/10	:	Diagnosis sensor unit
E3	B67	—	:	Diagnosis sensor unit
D3	B68	Y/2	:	Side air bag module LH
E3	B69	Y/2	:	Side air bag module RH
B2	B70	GY/2	:	Satellite sensor LH
F4	B71	GY/2	:	Satellite sensor RH
F3	B72	—	:	Body earth
D2	B77	B/1	:	Smash sensor RH
D1	B78	B/1	:	Smash sensor RH
B1	B79	B/1	:	Rear window defogger condenser
A1	B80	B/1	:	Rear window defogger condenser
A2	B77	B/1	:	Smash sensor LH
A2	B78	B/1	:	Smash sensor LH
C1	B83	W/2	:	Luggage room lamp
C1	B84	W/1	:	Roof mounted antenna
B1	B85	W/2	:	High mounted stop lamp
D1	B86	B/2	:	Power socket

Console harness

E2	B101	W/12	:	To B58
F2	B102	W/6	:	Ultra sonic cancel switch
E2	B103	W/8	:	A/T mode switch
E2	B104	L/4	:	Heated seat switch LH
E2	B105	W/4	:	Heated seat switch RH

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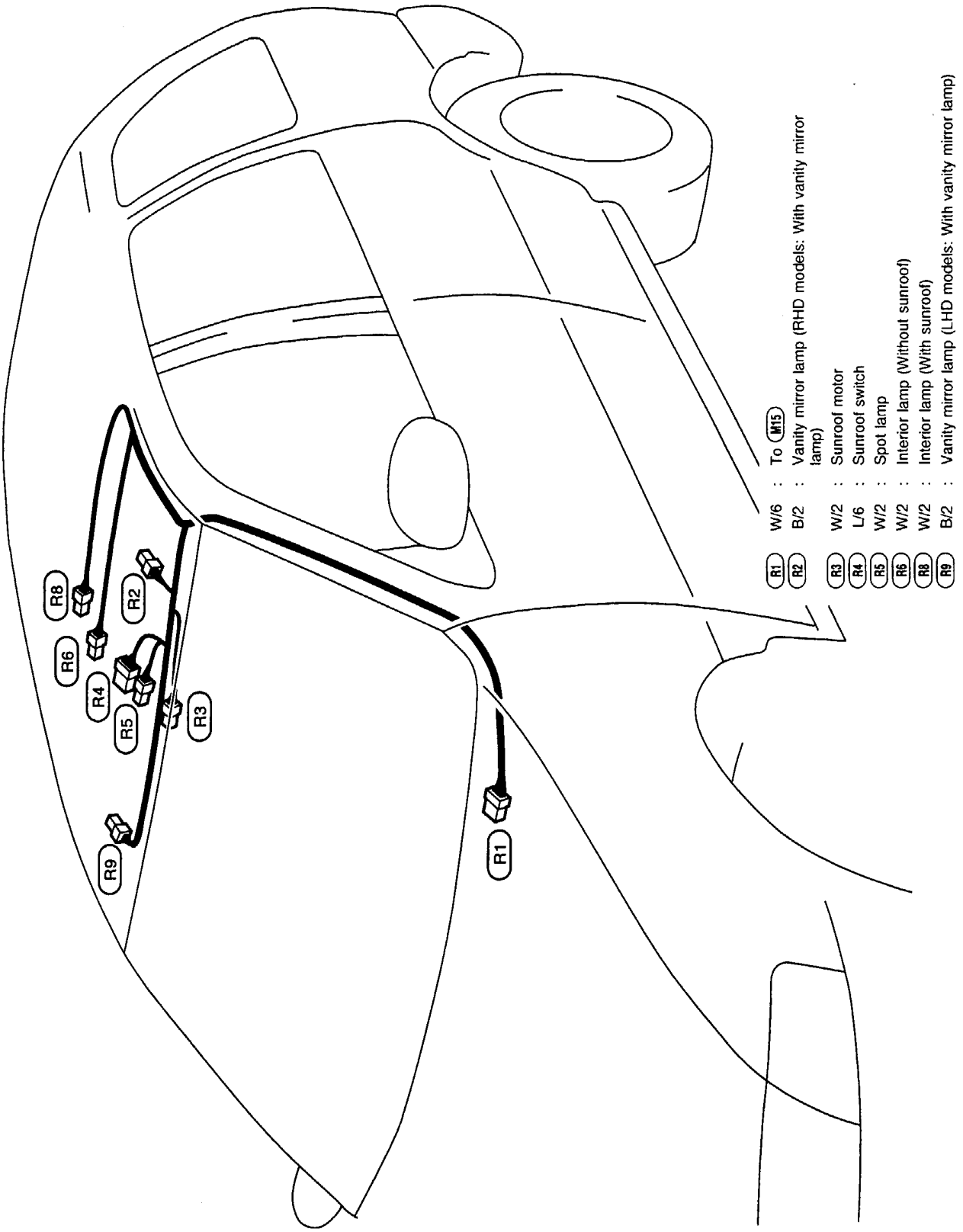
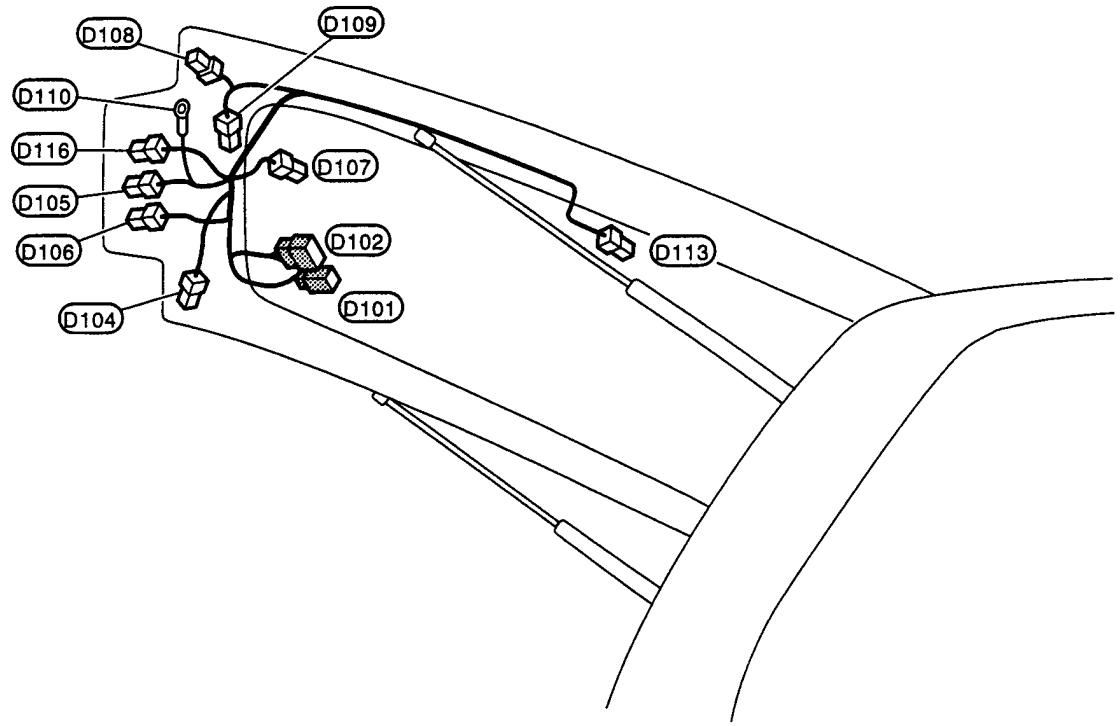
Room Lamp Harness



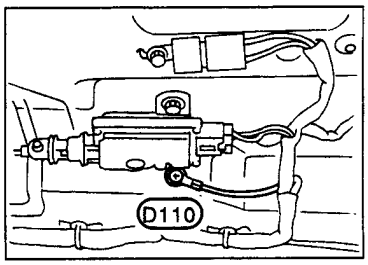
YEL546A

Back Door Harness



D101	W/4	:	To B42
D102	W/6	:	To B43
D104	W/4	:	Rear combination lamp LH
D105	B/2	:	Luggage room lamp switch
D106	W/2	:	Licence plate lamp LH
D107	W/4	:	Rear wiper motor
D108	W/4	:	Rear combination lamp RH
D109	W/4	:	Door lock actuator assembly
D110	–	:	Body ground
D113	B/1	:	Rear window defogger
D116	W/2	:	Licence plate lamp RH

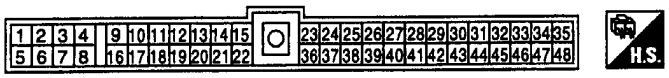
Body ground



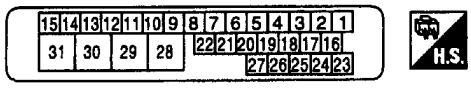
YEL547A

Terminal Arrangement

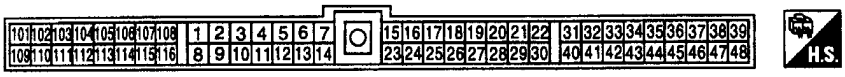
A/T CONTROL UNIT (M48)



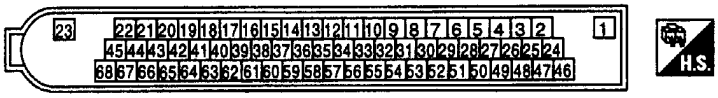
ABS CONTROL UNIT (E79)
LHD models



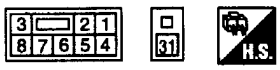
ECM (ECCS CONTROL MODULE) (F101)



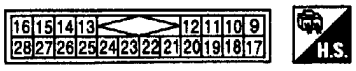
ECM (ECCS CONTROL MODULE) (F106)



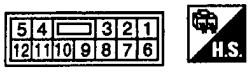
ANTI-THEFT CONTROL UNIT (B6)



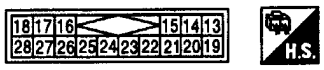
ANTI-THEFT CONTROL UNIT (B7)



SUPER LOCK CONTROL UNIT (B11)



SUPER LOCK CONTROL UNIT (B12)



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NISSAN PRIMERA
MODEL P11 SERIES
SERVICE MANUAL

SUPPLEMENT-III

Edition: January 1998
Printed: January 1998 (01)
Publication No.: SM8E-P11SE0E

NISSAN EUROPE N.V.
Service Department
Amsterdam, The Netherlands